

Airport Management System Requirements Specification

Version 1.0

May 23, 2024

Airport Management System Requirements Specification

TABLE OF CONTENTS

AIRPORT MANAGEMENT SYSTEM REQUIREMENTS SPECIFICATION

VERSION 1.0

MAY 23, 2024

1. EXECUTIVE SUMMARY	4
1.1 Project Overview	4
1.2 Purpose and Scope of This Specification	5
2. PRODUCT/ SERVICE DESCRIPTION	6
2.1 Product Context	6
2.2 User Characteristics	6
2.3 Assumptions	7
2.4 Constraints	7
2.5 Dependencies	7
3. REQUIREMENTS	8
3.1 Functional Requirements	8
3.2 Non-Functional Requirements	12
3.2.1 <i>Product Requirements</i>	12
3.2.1.1 User Interface Requirements	12
3.2.1.2 Usability	12
3.2.1.3 Efficiency	12
3.2.1.3.1 Performance Requirements	12
3.2.1.3.2 Space Requirements	12
3.2.1.4 Dependability	13
3.2.1.4 Security	14
3.2.2 <i>Organizational Requirements</i>	15
3.2.2.1 Environmental Requirements	15
3.2.2.2 Operational Requirements	15
3.2.2.3 Development Requirements	15
3.2.3 <i>External Requirements</i>	16
3.2.3.1 Regulatory Requirements	16

Airport Management System Requirements Specification

3.2.3.2 Ethical Requirements	16
3.2.3.3 Legislative Requirements	16
3.2.3.3.1 Accounting Requirements	16
3.2.3.3.2 Security Requirements	16
3.3 Domain Requirements	17
4. USER SCENARIOS/ USE CASES	18
5. DIAGRAMS	50
Entity Relationship Diagram (ERD)	50
BPMN Diagrams	51
DFD Diagrams	52
Activity Diagrams	56
Use Case Diagram	86
State Diagrams	87
Class Diagram	96
Sequence Diagrams	97
Collaboration Diagrams	127
Interaction Overview Diagram	143
6. DESIGN PATTERNS	144
Template Method Pattern	144
Observer Pattern	145
Façade Pattern	146
APPENDIX	147
APPENDIX B	147
APPENDIX C	147

1. Executive Summary

1.1 Project Overview

The Airport Management System (AMS) is a comprehensive software solution designed to improve airport operations. It covers all aspects of airport management, ensuring smooth communication between departments. The system is divided into four main areas: ground operations, aircraft operations, information systems, billing and payments.

Ground operations include all aviation facility management related to airport management. This includes managing cargo and personnel, maintaining berths and ensuring the best use of passengers. The system helps with border control, general services such as self-service entry and baggage handling, making the process faster and more convenient for passengers.

Aeronautical engineering focuses on the operation and installation control of aircraft. Aeronautical Fixed Telecommunications Network (AFTN) systems facilitate communication between airports and aircraft, exchanging critical information such as traffic, safety, weather and flight data. Apron control is also part of the airside operations, with passengers boarding, loading, flight directions, cleaning, food and refueling the system tracks all this information and calculates costs and adds them to the payment system.

Information management involves the collection, dissemination and updating of information throughout the airport. An Airport Information System (AIS) collects data from airlines and airports, updating passengers on flights, gates, and other relevant information Flight Information Systems (FIDS) display real-time flight status, and Flight The Status Announcement System sends important updates .

Invoicing and billing are necessary to handle the financial side of airport operations. The system calculates charges based on a variety of factors such as aircraft registration, landing time and flight description. It integrates accounting, business intelligence, payroll, and revenue from land operations to ensure proper financial management.

The airport baggage department is responsible for cargo handling and applies the same principles of aircraft handling and charging. It controls communications with the ATC tower and manages loads, calculating costs based on the weight or volume of loads. The system stores detailed information about each shipment, including product description, shipping company, ordering information, and charges.

Overall, the airport management system aims to streamline airport operations, ensure a seamless experience for passengers, airlines and carriers, and track baggage and revenue swell.

1.2 Purpose and Scope of this Specification

The purpose of this documentation is to provide a comprehensive overview of the Airport Management System (AMS). The objective is to define the functional and technical requirements necessary for system development and implementation. This document serves as a guide for project stakeholders, including airport operators, software developers, system integrators and regulatory bodies. It attempts to clarify the scope, objectives and resources of the project.

In scope:

Landside Operations:

- Management of terminals, resources and staff, maintenance, and passenger facilitation.
- Systems related to self-service check-in, baggage handling and border control.

Airside Operations:

- Management of terminals, resources and staff, maintenance, and passenger facilitation.
- Integration of AFTN systems for communication and data exchange.
- Management of ATC tower operations and apron handling services.

Information Management:

- Creation of AIS for data collection, distribution, and updates.
- Implementation of FIDS and airport announcement systems, for communication purposes.

Invoicing and Billing:

- Fee and invoice calculation based on aircraft registration, parking time, airline and cargo fees as well as other relevant data.
- Revenue and financial management.

Out of scope:

Future Improvements and Phases:

- Enhancing the general performance of the system and improving the quality of service.
- Enabling the pilots and other crew members to access the system and perform specific tasks, in order to improve the airport functioning as a whole.

Financial Considerations:

- Challenges regarding the cost of production and maintenance of the system.

Legal Aspect:

- The terms and agreements for the development of the system, which need to satisfy the requirements of both the client and the developers, as well as fulfill all legal obligations and restrictions in Albania.
- The system must insure the protection of privacy and data for all the users, according to Albanian and international laws and regulations.

2. Product/Service Description

2.1 Product Context

This management system software provides a comprehensive and well-designed system, suitable to properly manage airport operations. It prioritizes automating processes, thus improving the performance and speed at which airport operations are performed.

The main aim of the system is to provide a smooth experience for the airport staff by providing a very user-friendly GUI, which is easy to navigate through. The interface is quite simple. Most operations that the users will have to perform can be accomplished by simply pressing a couple of buttons. This software is also very backend heavy, as it is mainly built for the airport staff rather than the passengers.

Our airport management system interfaces with a variety of other related systems, such as AFTN System, Ticket Validation System, Self-Service Check-in System, Security Screening System and more. It establishes strong and secure connections between these systems and provides appropriate troubleshooting instructions for the majority of possible errors.

2.2 User Characteristics

Ground Crew Members

- Moderate to high experience in airport operations.
- Moderate technical expertise. They need to be familiar with operational systems for boarding, cargo handling, fueling and communication with ATC.
- They work in dynamic environments and are task-oriented, meaning they require a list of duties they need to perform.

Flight Administrators

- High experience in flight operations and management.
- High technical expertise. Familiar and even proficient with flight registration systems, gate assignments and coordination software.
- They are responsible for general flight coordination and are detail-oriented. They need reliable information access and control systems.

Certified Employees

- Varied experience depending on their specific roles and responsibilities.
- Varied technical expertise. They need to have specialized knowledge according to their positions.
- They require access to safety procedures and real-time information. Smooth navigation and reliable data access are also important.

Passengers

- Varied experience depending on how many times they have used planes as a mean of transport.
- Low to high technical expertise, based on personal technological knowledge.
- Expect a simple check-in procedure and proper data recording and management.

Information Department Staff

- Moderate to high experience in information management.
- Moderate technical expertise. They need to be familiar with information display management and announcement systems.
- They require a system that is reliable and up-to-date with information. They need a fast system, that can help them manage and display information efficiently.

2.3 Assumptions

- The system will be up and running 24/7 because of the nature of airport operations.
- Users, including administrators, ground crew and other staff will receive appropriate training to use the system properly.
- The airport will provide the necessary hardware and network to support the system.
- The system will provide accurate data and reports for flights, passengers, revenue, cargo and more.
- The system will be able to support concurrent operations and will interact with other systems.

2.4 Constraints

- The system must follow all Albanian and international legal restrictions, regarding aviation regulations set by certain institutions.
- The system should guarantee the safe usage and storage of flight, airline and passenger data.
- The system must interact perfectly with other related systems.
- The system must operate effectively with the restrictions of the hardware and network.
- The system must have good security restrictions, to allow only authorized personnel to access certain parts of it.

2.5 Dependencies

- This system relies on accurate and timely information from external flight data sources, including air traffic control systems and radar systems.
- It is important to integrate border control and security checks into government policies to ensure that everything is according to law.
- The performance and availability of the system depends on how it continues to operate and maintain the underlying hardware infrastructure.
- The system depends on the availability of trained staff to manage the various modules, such as scheduling, ground management and billing.
- Reliable communications with external systems such as AFTN and ATC are critical to the execution of flight operations and demanding conditions emergency management.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvw'd	SME Reviewed / Approved
BR_LR_01	The system allows for creating and managing employee profiles with roles, permissions, and contact information.	Employee Management: This feature ensures that all employees have profiles in the system with appropriate access levels, enabling better security and personalized access based on roles.	1	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_02	Supervisors can assign tasks and schedules to employees within their departments (landside, airside, security, etc.).	Employee Management: Facilitates efficient workforce management by allowing supervisors to allocate tasks and plan shifts according to operational needs.	2	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_03	The system tracks employee training records and certifications, notifying managers of upcoming renewals.	Employee Management: Ensures compliance with regulatory requirements by keeping training and certification records up to date, preventing lapses in qualifications.	2	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_04	Employees can access work schedules, request shift changes, and submit leave requests through the system.	Employee Management: Improves employee satisfaction and operational flexibility by allowing self-service access to scheduling and leave management.	2	03/04/24	Kristi Samara, Engjell Abazaj

Airport Management System Requirements Specification

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_LR_05	Time and attendance can be tracked and managed electronically for payroll purposes.	Employee Management: Automates timekeeping and attendance, reducing errors and streamlining payroll processing.	2	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_06	The system facilitates internal communication between employees and departments.	Employee Management: Enhances coordination and information flow across the airport by providing tools for messaging and notifications.	2	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_07	Performance reports can be generated to analyze employee productivity and identify areas for improvement.	Employee Management: Provides data-driven insights into workforce performance, helping managers to optimize operations and address issues.	2	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_08	Managers can view real-time resource allocation (gates, staff) for optimal terminal operations.	Landside Operations - Terminal Management: Ensures efficient use of airport resources by providing up-to-date information on resource deployment.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_09	The system tracks maintenance schedules and alerts for airport equipment.	Landside Operations - Terminal Management: Prevents equipment downtime and ensures operational readiness by managing maintenance activities.	4	03/04/24	Kristi Samara, Engjell Abazaj

Airport Management System Requirements Specification

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_LR_10	Passengers can use self-service kiosks to check in for flights and print boarding passes.	Landside Operations - Passenger Facilitation: Reduces wait times and improves passenger experience by providing automated check-in options.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_11	Border control officers can efficiently process passenger travel documents using the system.	Landside Operations - Passenger Facilitation: Streamlines border control procedures, enhancing security and reducing processing time.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_12	Security personnel can efficiently verify passenger IDs and boarding passes using the system.	Landside Operations - Passenger Facilitation: Improves security checks and reduces errors by providing digital verification tools.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_13	The system automatically logs flight information (registration, landing/departure times) for statistical purposes.	Airside Operations - AFTN Systems: Provides accurate and reliable data for operational analysis and regulatory reporting.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_14	Ground crew can use the system to manage aircraft servicing (boarding, cargo loading, fueling).	Employee Management: Automates timekeeping and attendance, reducing errors and streamlining payroll processing.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_15	The system calculates fees for ground services based on weight, cargo load, and passenger numbers.	Airside Operations - Apron Handling: Facilitates accurate billing for services rendered, improving revenue management and transparency.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_16	Ground crew can access real-time flight information and service requirements for assigned aircraft.	Airside Operations - Apron Handling: Ensures ground crew are informed and can respond promptly to service needs, minimizing delays.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_17	The system facilitates communication between ground crews and air traffic control.	Airside Operations - Apron Handling: Enhances coordination and safety by ensuring clear and timely communication between ground crews and ATC.	4	03/04/24	Kristi Samara, Engjell Abazaj

Airport Management System Requirements Specification

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_LR_18	Passengers can easily view real-time flight information (gates, boarding times, delays) on display screens.	Information Management - Flight Information Display Systems (FIDS): Improves passenger experience by providing accurate and timely flight information.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_19	Passengers and staff are notified of important updates (gate changes, delays) through announcements.	Information Management - Airport Announcement Systems: Ensures everyone is informed of critical updates, reducing confusion and enhancing communication.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_20	Staff can access relevant airport information, procedures, and safety manuals through the system.	Information Management - Staff Information: Ensures all staff have easy access to important documents, improving compliance and operational efficiency.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_21	The system automatically generates invoices for airlines based on aircraft registration, parking time, landing/departure fees, ground service fees.	Invoicing and Billing: Streamlines the billing process, ensuring accurate and timely invoicing for services provided.	4	03/04/24	Kristi Samara, Engjell Abazaj
BR_LR_22	The system generates monthly reports on total number of arriving and departing passengers, lost luggage incidents and compensation costs, number of flights per airline, total fees collected from airlines (landing, facilities), passenger fees collected, income from private terminals, cargo taxes collected, number of cargo flights and items handled, and employee productivity metrics.	Reporting and Statistics: Provides comprehensive data for analysis, helping management to make informed decisions and improve airport operations.	4	03/04/24	Kristi Samara, Engjell Abazaj

3.2 Non-Functional Requirements

3.2.1 Product Requirements

3.2.1.1 User Interface Requirements

- **Screen Formats and Organization:** The system should have a consistent and intuitive layout, providing clear navigation menus for different user roles (airport staff, airline representatives, passengers).
- **Menu Structures:** Menus should be logically organized by function (e.g., flight information, baggage handling, invoicing) and accessible within 2-3 clicks.
- **Error and Messages:** Error messages should be clear and informative, guiding users on how to resolve issues. Success messages should confirm actions and provide next steps.

3.2.1.2 Usability

- **Learnability:** The system should be designed for easy learning with comprehensive user documentation and context-sensitive help. Training programs should be available to ensure users can quickly become proficient.
- **Ease of Use:** Interfaces should be user-friendly, minimizing the number of steps required to complete common tasks. Interfaces should also be accessible to users with disabilities, adhering to WCAG guidelines.

3.2.1.3 Efficiency

3.2.1.3.1 Performance Requirements

Static Requirements:

- The system should support up to 500 terminals and 10,000 simultaneous users.
- It should handle up to 1 million flight records and 5 million baggage records annually.

Dynamic Requirements:

- 95% of transactions (e.g., check-ins, baggage updates) should be processed in less than 2 seconds.
- During peak times (e.g., holiday seasons), the system should handle up to 50 transactions per second with response times not exceeding 3 seconds.

3.2.1.3.2 Space Requirements

The system should efficiently utilize data storage and processing resources to support large-scale operations. It should ensure high availability and fast access to critical data:

- **Data Archiving:** Automatically archive older data to maintain optimal system performance while ensuring quick retrieval of archived data.
- **Data Backup and Recovery:** Regularly back up all critical data and provide efficient recovery mechanisms to minimize downtime in case of data loss or corruption.

Airport Management System Requirements Specification

3.2.1.4 *Dependability*

Availability

- **Hours of Operation:** The system should be operational 24/7 with scheduled maintenance periods not exceeding 4 hours per month.
- **Level of Availability:** The system should maintain an uptime of 99.99% annually.
- **Geographic Coverage:** The system should support operations across all airport zones, including remote airside locations.
- **Downtime Impact:** Downtime should have minimal impact on critical operations; any downtime must be communicated to users in advance.
- **Maintenance:** Scheduled maintenance should be communicated at least 48 hours in advance. Unscheduled maintenance should be addressed within 1 hour.

Reliability

- **Error Detection and Logging:** The system should include robust error detection, logging all critical errors and generating alerts for immediate resolution.
- **Mean Time Between Failures :** The system should have a mean time between failures around 10,000 hours

Monitoring

- **Health Monitoring:** Implement continuous health monitoring of the system, including real-time tracking of performance metrics (e.g., CPU usage, memory usage, disk I/O).
- **Failure Conditions:** Define and monitor specific failure conditions such as hardware failures, network outages, and software exceptions. The system should automatically trigger alerts and log events when these conditions are detected.
- **Error Detection:** Utilize error detection mechanisms to identify and log system errors. This includes automated testing of critical functions, input validation, and checksum verification.
- **Logging:** Maintain comprehensive logs of all system activities, including user actions, system events, and error messages. Logs should be stored securely and be easily accessible for auditing and troubleshooting purposes.
- **Error Correction:** Implement automatic error correction protocols where possible. For errors requiring manual intervention, provide clear guidelines and tools to assist administrators in resolving issues efficiently.

Maintenance

- **Ease of Maintenance:** The system should be modular, allowing for easy updates and maintenance. Interfaces should be well-documented to facilitate troubleshooting and upgrades.

Airport Management System Requirements Specification

Integrity

The system should include data integrity checks to ensure accuracy and consistency of data across all modules. This includes:

Data Validation: Implement validation rules to ensure data entered into the system meets predefined criteria (e.g., format, range, consistency).

Redundancy and Recovery: Implement redundant data storage solutions to prevent data loss. Regularly back up data and provide mechanisms for data recovery in case of corruption or loss.

3.2.1.5 Security

•**Encryption:** Data transmission and storage should employ strong encryption methods (e.g., AES-256).

•**Access Controls:** Multi-factor authentication should be required for access to sensitive areas of the system. Role-based access control should restrict user permissions.

Authorization and Authentication

•**Authorization:** Implement role-based access control to ensure users only have access to the data and functions necessary for their role. Administrative roles should have higher levels of access, while general users should have limited access based on their specific needs.

•**Authentication:** Use standard authentication tools such as PubCookie for secure login processes. Authentication methods should include:

•**Multi-Factor Authentication (MFA):** Require users to provide two or more verification factors (e.g., password and mobile OTP) to access the system.

•**Password Policies:** Enforce strong password policies, including minimum length, complexity requirements, and regular password changes.

•**Session Management:** Implement session timeouts and automatic logouts for inactive users to enhance security.

3.2.2 Organizational Requirements

3.2.2.1 *Environmental Requirements*

The system should operate reliably under typical airport conditions, including temperature variations between -10°C to 40°C and humidity levels of 10% to 90%.

3.2.2.2 *Operational Requirements*

The system should integrate seamlessly with existing airport infrastructure and third-party systems (e.g., baggage handling systems, ATC systems).

Continuous support and maintenance services should be available to address any issues promptly.

3.2.2.3 *Development Requirements*

- The system should be developed using industry-standard technologies and best practices to ensure maintainability and scalability.
- An agile development methodology should be employed to allow for iterative improvements and rapid response to changing requirements.
- Comprehensive documentation should be provided, covering system architecture, design, user manuals, and troubleshooting guides.
- A dedicated testing environment should be maintained for rigorous testing before deployment.

3.2.3 External Requirements

3.2.3.1 Regulatory Requirements

The system must comply with international aviation regulations, including local aviation authorities' requirements.

3.2.3.2 Ethical Requirements

The system should ensure fair and transparent operations, with mechanisms to prevent and address any form of discrimination or bias.

3.2.3.3 Legislative Requirements

- The system must comply with data protection laws, ensuring user privacy and data security.
- Audit trails should be maintained for all financial transactions to meet regulatory standards.

3.2.3.3.1 Accounting Requirements

The system should generate financial reports in compliance with international accounting standards and local regulations.

3.2.3.3.2 Security Requirements

Regular security audits and vulnerability assessments should be conducted to identify and mitigate potential threats.

3.3 Domain Requirements

The system should meet the specific needs of airport operations, ensuring compatibility with aviation industry standards and best practices. This includes support for various airport modules such as Landside Operations, Airside Operations, Information Management, and Invoicing and Billing, with tailored features for each module to optimize airport efficiency and safety.

4. User Scenarios/Use Cases

Employee Management

1. New Hire Onboarding: An HR representative creates an employee profile in the system, assigning a role, department, permissions, and contact information.
2. Schedule Management: A supervisor assigns tasks and schedules to employees within their department (landside, airside, security) for the upcoming week.
3. Training and Certification Tracking: The system tracks employee training records and certifications, notifying managers when renewals are approaching.
4. Employee Self-Service: Employees log into the system to view their work schedule, request shift changes, or submit leave requests.
5. Internal Communication: An employee sends a message through the system to a colleague or department for quick communication.
6. Performance Review: A manager generates a report analyzing employee productivity (number of flights/nr of staff) and identifies areas for improvement.

Landside Operations

7. Passenger ticket validation: A passenger purchases a ticket and after validation, he is registered as a valid passenger.
8. Passenger reports Lost Luggage.
9. Passenger claims compensation for lost luggage.
10. Passenger Check-in: A passenger uses a self-service kiosk to check in for their flight, print their boarding pass, and select their seat.
11. Border Control: A border control officer scans a passenger's passport using the system to verify their travel documents and grant entry.
12. Passenger Feedback and Complaint Management: The system allows passengers to submit feedback and complaints regarding their airport experience. It manages the feedback process, routes complaints to relevant departments, and tracks the resolution progress.

Airside Operations

13. Registering a New Flight in the Airport Management System
14. Flight Data Exchange: A pilot sends critical flight information (weather, runway conditions) through the AFTN system to the Air Traffic Control tower.
15. Flight Information Logging: The system automatically logs flight data (registration, landing/departure times) upon arrival and departure for statistical purposes.
16. Ground Crew Task Management: A ground crew member uses the system to view assigned tasks for an aircraft, including boarding passengers, loading cargo, and fueling.
17. Ground Service Fee Calculation: The system calculates fees for ground services provided to an aircraft based on factors like weight, cargo load, and passenger numbers.

Airport Management System Requirements Specification

18. Real-time Flight Information: A ground crew member retrieves real-time flight information and service requirements for the aircraft they are assigned to.

19. Ground Crew - ATC Communication: A ground crew member initiates communication with the Air Traffic Control tower through the system to request clearance or relay information.

Information Management

20. Flight Information Display: A passenger arriving at the airport views a Flight Information Display System (FIDS) screen showing real-time flight information (gate, boarding time, delays).

21. Gate Change Announcement: The system triggers an announcement throughout the terminal notifying passengers of a gate change for their flight.

22. Flight Operations Manager: The system dynamically assigns gates to incoming and outgoing flights based on real-time data, optimizing gate utilization and reducing delays.

23. Staff Information Access: An airport employee logs in to the system to access relevant airport information, procedures, and safety manuals specific to their role.

Invoicing and Billing

24. Invoice Generation: Upon aircraft departure, the system automatically generates an invoice for the airline based on aircraft registration, parking time, landing/departure fees, and ground service fees.

Reporting and Statistics

25. Monthly Passenger Report: The system generates a monthly report detailing the total number of arriving and departing passengers for the period.

26. Airline Traffic Report: The system generates a report summarizing the number of flights operated by each airline for a specified period.

27. Revenue Report: The system generates a report detailing the total fees collected from airlines for landing fees, facility usage, and other services.

28. Passenger Fee Report: The system generates a report on passenger fees collected, such as those associated with checked baggage or seat selection.

29. Private Terminal Report: The system generates a report on income generated from private terminals within the airport.

30. Cargo Report: The system generates a report detailing the number of cargo flights handled, the number of items processed, and the cargo taxes collected during the period.

Airport Management System Requirements Specification

UC Name	UC1-New Hire Onboarding
Summary	<i>An administrator creates an employee profile in the system, assigning a role, department, permissions, and contact information.</i>
Dependency	<i>None</i>
Actors	<i>Primary: Administrator</i>
Preconditions	<i>The administrator has access to the airport management system and new hire information.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. Administrator enters new hire information into the system, including name, contact information, department, and role. 2. Administrator assigns permissions to the new hire's profile based on their role. 3. The system saves the new employee profile.
Description of the Alternative Sequence	<p><i>If the admin encounters errors while creating a new employee profile, the system should provide helpful features to guide them through resolving the issue.</i></p> <ul style="list-style-type: none"> • <i>Error correction tools, highlighting mistakes in data entry for easy correction.</i> • <i>Offering clear instructions to diagnose and fix technical glitches.</i>
Nonfunctional requirements	<i>The system should be secure and restrict unauthorized access to employee data.</i>
Postconditions	<i>A new employee profile is created in the system with assigned role, department, permissions, and contact information.</i>

Airport Management System Requirements Specification

UC Name	UC2-Schedule Management
<i>Summary</i>	A administrator assigns tasks and schedules to employees within their department (landside, airside, security) for the upcoming week.
<i>Dependency</i>	None
<i>Actors</i>	<i>Primary: Supervisor (Administrator)</i>
<i>Preconditions</i>	<i>The administrator has access to the airport management system and employee schedules.</i>
<i>Description of the Main Sequence</i>	<ol style="list-style-type: none"> 1. Administrator selects the department and timeframe for which they want to create a schedule. 2. Administrator assigns tasks and shifts to employees within their department. 3. The system saves the employee schedule.
<i>Description of the Alternative Sequence</i>	<i>The administrator may need to adjust the schedule based on employee availability or unforeseen circumstances.</i>
<i>Nonfunctional requirements</i>	<i>The system should be user-friendly and allow administrators to easily view and modify employee schedules.</i>
<i>Postconditions</i>	<i>An updated employee schedule is created for the selected department and timeframe.</i>

Airport Management System Requirements Specification

UC Name	UC3-Training and Certification Tracking
<i>Summary</i>	<i>The system tracks employee training records and certifications, notifying managers when renewals are approaching.</i>
<i>Dependency</i>	<i>None</i>
<i>Actors</i>	<i>Primary: Timer Actor</i>
<i>Preconditions</i>	<i>Employee training records and certification information are entered into the system.</i>
<i>Description of the Main Sequence</i>	<ol style="list-style-type: none"> 1. <i>The system automatically tracks employee training expiration dates.</i> 2. <i>When an expiration date approaches, the system generates a notification for the employee's manager.</i>
<i>Description of the Alternative Sequence</i>	<i>If the system encounters technical difficulties in tracking or generating notifications:</i> <ul style="list-style-type: none"> • <i>It may attempt to resolve the issue automatically.</i> • <i>It may notify administrators for manual intervention if automatic resolution fails.</i>
<i>Nonfunctional requirements</i>	<i>The system should be reliable and ensure accurate tracking of training records.</i>
<i>Postconditions</i>	<i>Managers are notified of upcoming employee training renewals.</i>

Airport Management System Requirements Specification

UC Name	UC4- Employee Self-Service
<i>Summary</i>	<i>Employees log into the system to view their work schedule, request shift changes, or submit leave requests.</i>
<i>Dependency</i>	<i>None</i>
<i>Actors</i>	<i>Primary: Employee</i>
<i>Preconditions</i>	<i>The employee has access to the airport management system and their login credentials.</i>
<i>Description of the Main Sequence</i>	<ol style="list-style-type: none"> 1. Employee logs in to the system. 2. Employee selects the desired function (view schedule, request shift change, submit leave request). 3. The employee enters the necessary information and submits the request. 4. The system processes the request and provides a confirmation or notification to the employee.
<i>Description of the Alternative Sequence</i>	<i>In case of login issues (e.g., forgotten credentials, system errors), the system offers options to recover passwords, report issues, or contact IT support.</i>
<i>Nonfunctional requirements</i>	<i>The system should be accessible and user-friendly for employees with varying technical skills.</i>
<i>Postconditions</i>	<i>The employee views their work schedule, submits a shift change request, or submits a leave request (depending on the chosen function).</i>

Airport Management System Requirements Specification

UC Name	UC5- Internal Communication
Summary	An employee sends a message through the system to a colleague or department for quick communication.
Dependency	None
Actors	Primary: Employee
Preconditions	<ul style="list-style-type: none"> <i>The employee has access to the airport management system and their login credentials.</i> <i>The recipient (colleague or department) has a valid account within the system.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> <i>Employee logs in to the system.</i> <i>The employee selects the internal communication module.</i> <i>The employee chooses the recipient of the message (specific colleague or entire department).</i> <i>The employee composes the message, attaches any relevant files and sends the message.</i> <i>The system delivers the message to the recipient's inbox or displays a notification (depending on system configuration).</i>
Description of the Alternative Sequence	<p><i>There could be technical issues that prevent the message from being delivered. The system should:</i></p> <ul style="list-style-type: none"> <i>Notify the sender of the delivery failure, if possible.</i> <i>Allow the sender to resend the message or take other actions.</i>
Nonfunctional requirements	<i>The system should deliver messages reliably and securely.</i>
Postconditions	<i>The employee's message is sent to the designated recipient(s) through the internal communication system.</i>

Airport Management System Requirements Specification

UC Name	UC6: Performance Review
Summary	<i>A manager generates a report analyzing employee productivity and identifies areas for improvement.</i>
Dependency	<i>UC2: Schedule Management</i>
Actors	<i>Primary Actor: Flight Administrator Secondary Actors: Employees</i>
Preconditions	<i>The Flight Administrator is logged into the system and employee performance has been recorded.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The Flight Administrator keeps track of the number of flights.</i> 2. <i>The Flight Administrator calculates the ratio: number of flights/number of staff.</i> 3. <i>The obtained data is used to generate a report for the Flight Administrator, which shows the productivity of the employees.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The Flight Administrator is given troubleshooting instructions if the system produces an incorrect report.</i>
Non functional requirements	<i>The productivity data is secured and the system can generate the report fairly quickly after this action is requested by the manager.</i>
Postconditions	<i>The manager has obtained a performance review of the airport employees.</i>

Airport Management System Requirements Specification

UC Name	UC 7: Passenger ticket validation
Summary	A passenger purchases a ticket and after validation, he is registered as a valid passenger.
Dependency	UC 15: Flight Information Logging
Actors	<ul style="list-style-type: none"> • Passenger • Passenger Service Employee
Preconditions	<ul style="list-style-type: none"> • The passenger has a valid e-ticket or boarding pass for a specific flight. • The passenger has arrived at the airport for check-in. • The Passenger Service Employee has access to the airline's check-in system and the Airport Management System (AMS).
Description of the Main Sequence	<ul style="list-style-type: none"> • 1: Passenger presents e-ticket/boarding pass at check-in. • 2: Check-in agent scans barcode and sends information to AMS. • 3: AMS validates passenger record (against airline & government data). • 4: AMS sends confirmation back to check-in system. • 5: Passenger Service Employee completes process if validation is successful.
Description of the Alternative Sequence	<ul style="list-style-type: none"> • Case 1: Invalid Ticket: If the AMS identifies the ticket as invalid (e.g., expired, cancelled, fraudulent), the check-in agent receives a notification on their screen. • Case 2: Passenger Data Mismatch: If the AMS detects a mismatch between the passenger information provided and the data in the system (e.g., name misspelling), the check-in agent is notified.
Non functional requirements	<p><i>The systems response should be fast and always reliable</i></p>
Postconditions	<ul style="list-style-type: none"> • The passenger's ticket is validated by the Airport Management System. • The passenger is confirmed for the flight and receives a boarding pass (if needed).

Airport Management System Requirements Specification

UC Name	UC 8: Passenger Reports Lost Luggage
Summary	A passenger reports a lost luggage in the airport
Dependency	<i>None</i>
Actors	<ul style="list-style-type: none"> • Passenger • Passenger Service Employee
Preconditions	<ul style="list-style-type: none"> • The passenger has reported their luggage as lost and a reasonable amount of time has passed • The passenger may have documented proof of the contents of their lost luggage (receipts, photos) – (This may not be required by all airlines)
Description of the Main Sequence	<ul style="list-style-type: none"> • Passenger reports missing luggage to Passenger Service Employee. • Staff enters details and searches for matching reports. • New report is created with tracking number (if not found). • Passenger receives report copy and tracking number.
Description of the Alternative Sequence	<ul style="list-style-type: none"> • Claim Denied: If the claim is denied due to insufficient documentation or exceeding policy limitations, the airline informs the passenger and explains the reasoning. The passenger may have the option to appeal the decision. • Luggage Found After Claim: If the airline locates the lost luggage after the claim is processed, they will notify the passenger and arrange for its return. The compensation may still be awarded depending on the airline's policy and the inconvenience caused to the passenger.
Non functional requirements	<ul style="list-style-type: none"> • Security: Passenger information and claim details
Postconditions	<ol style="list-style-type: none"> 1. Lost Luggage Report Created: This report contains details about the passenger, their flight information, a description of the lost luggage, and a unique tracking number for reference. A copy of this report should be given the passenger and sometimes the airline company can be notified

Airport Management System Requirements Specification

UC Name	UC 9: System keeps track of lost baggage reports.
Summary	<i>After some time has passed without the luggage being found, The Passenger Service Employee receives a notification</i>
Dependency	<i>UC 8 : Passenger reports lost luggage</i>
Actors	<ul style="list-style-type: none"> Primary Actor: Timer Actor
Preconditions	<ul style="list-style-type: none"> A passenger has made a report for lost luggage
Description of the Main Sequence	<ul style="list-style-type: none"> The system keep track of the time a lost baggage report has been in the system for If a certain amount of time has passed the Passenger Service Employee is notified of the passed time, signifying that the lost baggage might be lost forever.
Description of the Alternative Sequence	If the time tracing process raises an exception then the Passenger Service Employee is notified troubleshooting steps.
Non functional requirements	<ul style="list-style-type: none"> Security: Passenger information and claim details
Postconditions	The system keeps track of the lost baggage properly.

Airport Management System Requirements Specification

UC Name	UC 10: Passenger Self-Service Check-In
Summary	A passenger uses a self-service kiosk to check in for their flight, print their boarding pass, and select their seat.
Dependency	UC 7 : Passenger ticket validation
Actors	<ul style="list-style-type: none"> Primary Actor: Passenger
Preconditions	<ul style="list-style-type: none"> The passenger has a valid ticket and travel document The passenger has checked in any baggage they wish to travel with (or meets the criteria for carry-on luggage only). The self-service kiosk is operational and connected to the airline's check-in system.
Description of the Main Sequence	<ul style="list-style-type: none"> Passenger scans boarding pass or enters flight details. System retrieves reservation and flight information. Passenger completes check-in. Kiosk prints boarding pass (if not already an e-ticket).
Description of the Alternative Sequence	<ul style="list-style-type: none"> Technical Issues: The passenger may be redirected to a customer service for assistance with check-in. Special Needs: If the passenger requires special assistance (e.g., traveling with a disability, unaccompanied minor), they may need to proceed to a dedicated check-in counter staffed by airline personnel. Checked Baggage Issues: The passenger may need to visit a dedicated baggage drop-off counter before completing self-service check-in.
Non functional requirements	<ul style="list-style-type: none"> Availability: A sufficient number of self-service kiosks should be available during peak periods.
Postconditions	<ol style="list-style-type: none"> Passenger Checked In: Boarding Pass Obtained: Baggage Tags Printed (if applicable)

Airport Management System Requirements Specification

UC Name	UC 11: Border Control
Summary	A border control officer scans a passenger's passport using the border control system to verify their travel documents and grant entry.
Dependency	None
Actors	<ul style="list-style-type: none"> • Primary Actor: Border Control Officer
Preconditions	<ul style="list-style-type: none"> • The passenger has completed any required customs declarations. • The border control area is operational and staffed with officers.
Description of the Main Sequence	<ul style="list-style-type: none"> • Officer requests travel document (passport or ID). • Officer gets document and scans it (if applicable). • System uses the border control system and verifies document. • Passenger is allowed entry. • Officer instructs the passenger.
Description of the Alternative Sequence	<p>Passenger Doesn't Have Valid Travel Documents:</p> <ul style="list-style-type: none"> • If the officer denies entry then this denial of entry will be logged into the system for security purposes.
Non functional requirements	<ul style="list-style-type: none"> • The system should be fast and reliable
Postconditions	<ol style="list-style-type: none"> 1 Passenger's documents verified 2 Entry accessed 3 The passenger is registered in the system

Airport Management System Requirements Specification

UC Name	Use Case 12: Passenger Feedback and Complaint Management
Summary	The system allows passengers to submit feedback and complaints regarding their airport experience. It manages the feedback process, routes complaints to relevant departments, and tracks the resolution progress.
Dependency	None
Actors	<ul style="list-style-type: none"> • Passenger • Passenger Service Employee
Preconditions	<ul style="list-style-type: none"> • Passenger has used our airport previously • Passengers have access to the feedback and complaint submission interface (website, mobile app, kiosks).
Description of the Main Sequence	<p>Passenger accesses the feedback and complaint submission interface.</p> <p>Passenger selects the type of feedback or complaint and provides details, including any supporting documents or media.</p> <p>Passenger submits the feedback or complaint.</p>
Description of the Alternative Sequence	If something goes wrong during the feedback submission process the passenger is shown troubleshooting steps.
Non functional requirements	<ul style="list-style-type: none"> • The system should be efficient and accurate
Postconditions	The Passenger Service Employee has access to reviews made by the passengers

Airport Management System Requirements Specification

UC Name	<i>UC13: Registering a New Flight</i>
Summary	<i>The flight operations staff register a new flight in the airport management system.</i>
Dependency	<i>None</i>
Actors	<i>Primary Actor: Flight Administrator</i>
Preconditions	<i>The flight operations staff member is logged into the system and has the necessary information to register a new flight in the system.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The user goes to the specific part of the system that can perform the registration.</i> 2. <i>The user enters all the flight details, such as: airline, flight number, departure and arrival time, flight duration, airports etc.</i> 3. <i>The user submits the information and the new flight is recorded in the system.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>If the new flight could not be registered, the user will be asked to try again later or be given troubleshooting instructions.</i>
Non functional requirements	<i>The system has a fast response.</i>
Postconditions	<i>A new flight has been successfully registered by the flight operations staff.</i>

Airport Management System Requirements Specification

UC Name	<i>UC14: Flight Data Exchange</i>
Summary	<i>ATC sends critical flight information (weather, flight conditions) through the AFTN system to the Air Traffic Control tower.</i>
Dependency	<i>None</i>
Actors	<i>Primary Actor: ATC Secondary Actor: AFTN</i>
Preconditions	<i>AFTN can contact the ATC and has gathered all the information that needs to be transmitted.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The AFTN system contacts our airport management system.</i> 2. <i>The system forwards the message to the Air Traffic Control tower.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>If the ATC tower does not receive the message, the flight administrator is notified an error has occurred during communication.</i>
Non functional requirements	<i>All the operations are performed during a small timeframe.</i>
Postconditions	<i>Critical flight information is properly transmitted.</i>

Airport Management System Requirements Specification

UC Name	UC15: Flight Information Logging
Summary	The system automatically logs flight data upon arrival and departure for statistical purposes.
Dependency	<i>None</i>
Actors	<p><i>Primary Actor: Timer</i></p> <p><i>Actor</i></p> <p><i>Secondary Actor: None</i></p>
Preconditions	Flight data is received from external sources (e.g., radar, flight data etc).
Description of the Main Sequence	<ol style="list-style-type: none"> 1. Upon arrival of an aircraft, the system logs registration and landing time. 2. Upon departure of an aircraft, the system logs registration and departure time.
Description of the Alternative Sequence	<i>The system alerts that something went wrong.</i>
Non-functional requirements	<i>The data is collected in a timely manner.</i>
Postconditions	Flight data is logged in the system for statistical analysis.

Airport Management System Requirements Specification

UC Name	UC16: Ground Crew Task Management
Summary	A ground crew member uses the system to view assigned tasks for an aircraft, including boarding passengers, loading cargo, fueling.
Dependency	<i>None</i>
Actors	<i>Primary Actor: Ground Crew Members</i>
Preconditions	Ground crew members are logged into the system.
Description of the Main Sequence	<p>1. The system displays a list of assigned tasks for the selected aircraft.</p> <p>2. Ground crew member views details of each task, including boarding passengers, loading cargo, and fueling.</p>
Description of the Alternative Sequence	<i>None</i>
Non-functional requirements	<i>Task assignment and completion are recorded and updated in real-time.</i>
Postconditions	Ground crew member has accessed and viewed their assigned tasks for the aircraft.

Airport Management System Requirements Specification

UC Name	<i>UC17: Ground Service Fee Calculation</i>
Summary	The system calculates fees for ground services provided to an aircraft based on factors like weight, cargo load, and passenger numbers.
Dependency	<i>UC16: Ground Crew Task Management</i>
Actors	<i>Primary Actor:</i> <i>Input/Output Device</i>
Preconditions	<i>Performance of Ground Crew Members has been recorded.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system retrieves information about Ground Crew Member performance.</i> 2. <i>Based on the retrieved information, the system calculates the correspondent fee.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The manager is given troubleshooting instructions if the system produces an incorrect fee.</i>
Non-functional requirements	<i>Fee information is securely stored into the system and retrieved by the manager.</i>
Postconditions	Ground service fees are calculated and available for billing.

Airport Management System Requirements Specification

UC Name	UC18: Real-time Flight Information
Summary	A ground crew member retrieves real-time flight information and service requirements for the aircraft they are assigned to.
Dependency	<i>UC15: Flight Information Logging</i>
Actors	<i>Primary Actor: Ground Crew Member Secondary Actors: System</i>
Preconditions	<i>Flight information has been correctly logged into the system</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The Ground Crew Member logs into the system</i> 2. <i>The Ground Crew Member retrieves information from the system about a flight.</i>
Description of the Alternative Sequence	<i>Ground Crew Member reports that a problem has occurred with the retrieval process.</i>
Non-functional requirements	<i>The retrieval process should be fast and accurate.</i>
Postconditions	Ground crew member has accessed real-time flight information for the assigned aircraft and may act accordingly.

Airport Management System Requirements Specification

UC Name	UC19: Ground Crew - ATC Communication
Summary	A ground crew member initiates communication with the Air Traffic Control tower through the system to request clearance or relay information.
Dependency	<i>UC15: Flight Information Logging</i>
Actors	Primary Actor: Ground Crew Member Secondary Actors: Air Traffic Control (ATC)
Preconditions	Ground crew member is logged into the system and has authorization to communicate with ATC.
Description of the Main Sequence	<ol style="list-style-type: none"> 1. The ground crew member initiates communication with ATC through the system. 2. The Ground Crew Member retrieves information from the system after it has been provided by the ATC.
Description of the Alternative Sequence	<ol style="list-style-type: none"> 3. <i>The manager is given troubleshooting instructions if the system produces an incorrect report.</i>
Non-functional requirements	<i>The system must provide the Ground Crew Member a reliable, fast and secure connection with Air Traffic Control.</i>
Postconditions	<ol style="list-style-type: none"> 4. <i>Ground Crew Members have successfully communicated with ATC through the system.</i>

Airport Management System Requirements Specification

UC Name	UC20: Flight Information Display:
Summary	A ground crew member requests information from the flight information system to display it to the passenger.
Dependency	<i>UC15: Flight Information Logging</i>
Actors	Primary Actor: Ground Crew Member Secondary Actor: Flight Administrator
Preconditions	The flights information are all logged in the system and the information system works properly
Description of the Main Sequence	<ol style="list-style-type: none"> 1. Ground Crew Member seeks information from the flight information system. 2. The flight information system displays the requested information.
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. Send an error notification to the administrator in case there is a glitch in the system, causing the flight information not to be displayed properly. 2. Administrator forwards the error notification to the ground crew, so that they can act accordingly.
Non-functional requirements	The system must provide accurate and up-to date flight information in real-timing.
Postconditions	Flight information is displayed properly.

Airport Management System Requirements Specification

UC Name	UC21 Gate Change Announcement
Summary	The system triggers an announcement throughout the terminal notifying passengers of a gate change for their flight.
Dependency	<i>UC15: Flight Information Logging</i>
Actors	Primary Actor: Information department staff
Preconditions	A gate change has occurred for a specific flight.
Description of the Main Sequence	<ol style="list-style-type: none">1. The system detects a gate change for a flight.2. The system gives an announcement throughout the terminal because of the gate change.3. Passengers in the terminal hear the announcement and receive notification of the gate change for their flight.
Description of the Alternative Sequence	Send notification to flight administrator.
Non-functional requirements	The announcement system should deliver notifications clearly to passengers throughout the terminal.
Postconditions	Passengers get informed of the gate change for their flight.

Airport Management System Requirements Specification

UC Name	UC22: Flight Operations Manager
Summary	The system dynamically assigns gates to incoming and outgoing flights based on real-time data, optimizing gate utilization and reducing delays.
Dependency	<i>None</i>
Actors	Primary: Flight Administrator Secondary: Ground Crew Staff, Airline
Preconditions	Real-time flight data (arrival and departure times) is available. Gate availability and status are tracked in the system. Ground staff and airline staff have access to the system for updates and notifications.
Description of the Main Sequence	<ol style="list-style-type: none"> 1. The system continuously collects real-time data on flights and monitors gate availability. 2. The system dynamically assigns gates based on real-time data, considering factors like aircraft type, airline preferences, and passenger connections. 3. Updates are communicated to relevant parties. 4. Send a notification message.
Description of the Alternative Sequence	<ul style="list-style-type: none"> • The system reassigns the affected flight to an alternative gate. • Notifications are sent to all relevant parties about the new gate assignment.
Non-functional requirements	The system must process and update gate assignments in real-time with minimal latency. The system should be highly available and fault-tolerant to handle continuous operations.
Postconditions	Gates are efficiently assigned and utilized, reducing delays and improving operational efficiency. All relevant stakeholders are informed of gate assignments and changes in real-time. The system logs all gate assignments and adjustments for audit and analysis.

Airport Management System Requirements Specification

UC Name	UC23: Staff information access
Summary	An airport employee logs in to the system to access relevant airport information, procedures, and safety manuals specific to their role.
Dependency	<i>UC 4 : EMPLOYEE SELF-SERVICE</i>
Actors	Primary Actor: Certified Employees
Preconditions	Employees have valid login credentials.
Description of the Main Sequence	<ol style="list-style-type: none"> 1. An airport employee logs in to the system. 2. The system authenticates the employee's credentials and gives access to the information based on their role. 3. The employee goes through the system to access airport information, procedures, and safety manuals specific to their job responsibilities.
Description of the Alternative Sequence	<p>The airport management system gets a cybersecurity breach, compromising employee login credentials and sensitive information.</p> <ul style="list-style-type: none"> • The system experiences server downtime, making it inaccessible to airport employees.
Non-functional requirements	The system should provide secure and specific role access to airport information for the employees.
Postconditions	The employee accesses the required information for their role.

Airport Management System Requirements Specification

UC Name	UC24: Invoice Generation
Summary	<i>After aircraft departure, the system automatically generates an invoice for the airline.</i>
Dependency	<i>None</i>
Actors	<i>Primary Actor: Input/Output Device</i>
Preconditions	<i>The system is running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system obtains information (input) such as: aircraft registration, parking time, landing/departure fees and ground service fees whenever an aircraft departs.</i> 2. <i>The system uses this input to automatically generate an invoice.</i> 3. <i>The system sends the invoice to the respective airline.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>If the input is not collected normally, the system sends appropriate notifications to the managers and administrator.</i>
Non functional requirements	<i>The invoicing information is kept confidential and secured and the system performs at a good speed rate.</i>
Postconditions	<i>The system has sent the invoices to the respective airlines or has notified the managers and administrators in case of an error.</i>

Airport Management System Requirements Specification

UC Name	UC25: Monthly Passenger Report
Summary	<i>The system generates a monthly report detailing passenger information.</i>
Dependency	<i>None</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system records the number of passengers arriving and departing during one month.</i> 2. <i>The system generates a report based on the collected information.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The system fails to record the number of passengers arriving and departing.</i> 2. <i>The system provides troubleshooting instructions for the user.</i>
Non functional requirements	<i>The information is kept private and safe and the system generates the report at the required time.</i>
Postconditions	<i>A monthly passenger report is created by the system.</i>

Airport Management System Requirements Specification

UC Name	UC26: Airline Traffic Report
Summary	<i>The system generates a report summarizing the number of flights operated by each airline.</i>
Dependency	<i>UC13: Registering a New Flight UC15: Flight Information Logging</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system records the number of flights operated by each airline during a certain time period (day, week, month, year).</i> 2. <i>The system generates a report based on the collected information.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The system fails to record the information.</i> 2. <i>The system provides troubleshooting instructions for the user.</i>
Non functional requirements	<i>The information is kept private and safe and the system generates the report at the required time.</i>
Postconditions	<i>A proper airline traffic report is generated.</i>

Airport Management System Requirements Specification

UC Name	UC27: Revenue Report
Summary	<i>The system generates a report detailing the total earnings.</i>
Dependency	<i>UC24: Invoice Generation</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system collects all the fees from airlines such as landing fees, facility fees and more.</i> 2. <i>The system generates a report based on these fees.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The system fails to obtain the fees.</i> 2. <i>The system provides troubleshooting instructions for the user.</i>
Non functional requirements	<i>The information is kept private and safe and the system generates the report at the required time.</i>
Postconditions	<i>A total revenue report is generated.</i>

Airport Management System Requirements Specification

UC Name	UC28: Passenger Fee Report
Summary	<i>The system generates a report detailing passenger fees.</i>
Dependency	<i>UC10: Passenger Check-in UC25: Monthly Passenger Report</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system collects passenger fees, such as the ones associated with checked baggage and seat selection.</i> 2. <i>The system generates a report based on the collected information.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The system fails to collect the fees.</i> 2. <i>The system provides troubleshooting instructions for the user.</i>
Non functional requirements	<i>The information is kept private and safe and the system generates the report at the required time.</i>
Postconditions	<i>A passenger fee report is successfully generated.</i>

Airport Management System Requirements Specification

UC Name	<i>UC29: Terminal Report</i>
Summary	<i>The system generates a report on income generated from private terminals within the airport.</i>
Dependency	<i>UC15: Flight Information Logging</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"> 1. <i>The system collects data about private terminals.</i> 2. <i>The system generates a report about the income generated from private terminals.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"> 1. <i>The system fails to generate a proper report.</i> 2. <i>The system provides troubleshooting instructions for the user.</i>
Non functional requirements	<i>The information is kept private and safe and the system generates the report at the required time.</i>
Postconditions	<i>A complete private terminal report is generated.</i>

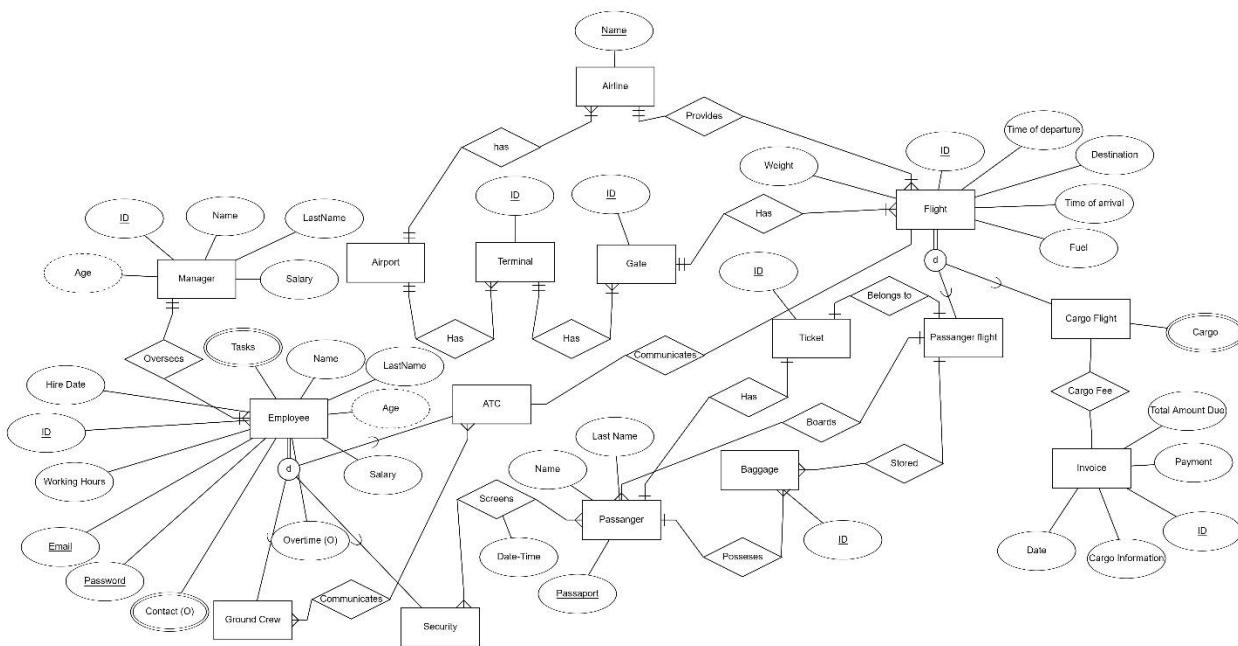
Airport Management System Requirements Specification

UC Name	UC30: Cargo Report
Summary	<i>The system generates a report containing details about every cargo operation.</i>
Dependency	<i>UC13: Registering a New Flight UC15: Flight Information Logging</i>
Actors	<i>Primary Actor: Timer Actor</i>
Preconditions	<i>The system is up and running.</i>
Description of the Main Sequence	<ol style="list-style-type: none"><i>The system obtains information about the number of cargo flights handled, number of items processed and cargo taxes during a period of time (day, week, month, year).</i><i>The system generates a report based on this information for each time period.</i>
Description of the Alternative Sequence	<ol style="list-style-type: none"><i>The system fails to gather information.</i><i>The system provides troubleshooting instructions.</i>
Non functional requirements	<i>The cargo information is kept private and safe, the system generates the report at the correct time.</i>
Postconditions	<i>A detailed cargo report is generated by the system.</i>

Airport Management System Requirements Specification

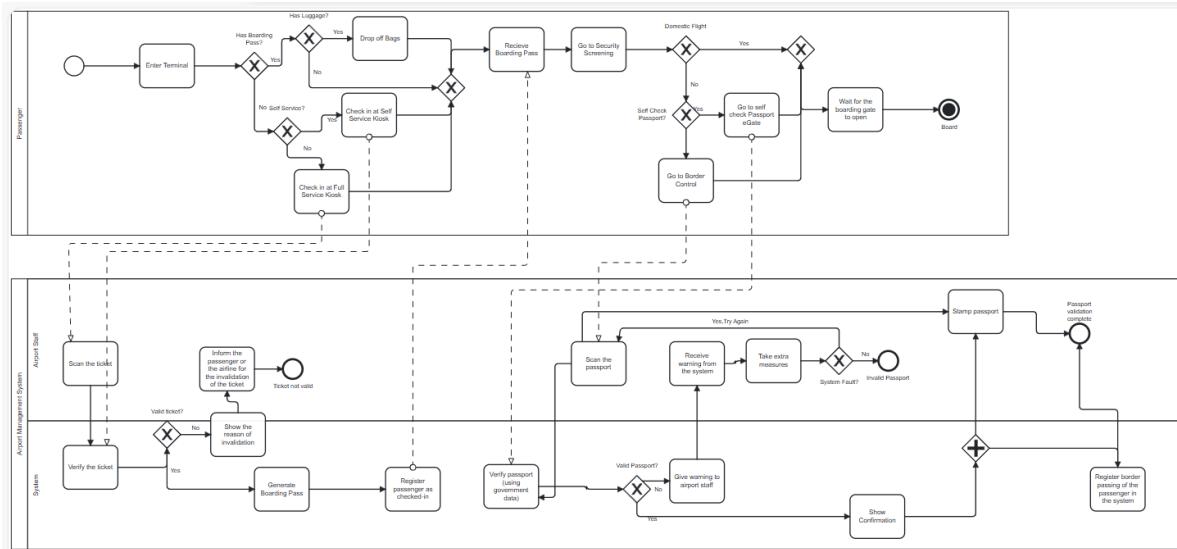
5. DIAGRAMS

Entity Relationship Diagram (ERD)

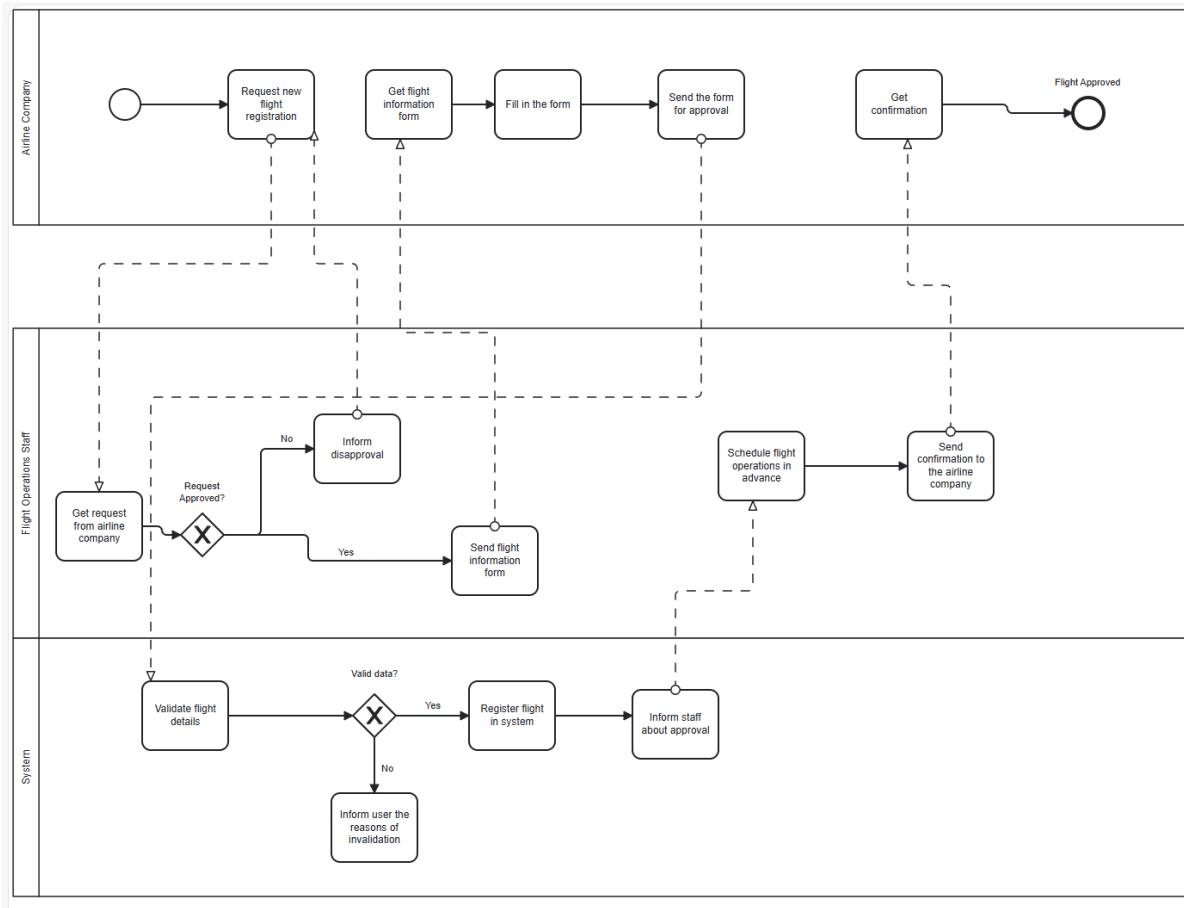


Airport Management System Requirements Specification

BPMN (Passenger Check-in and Boarding)

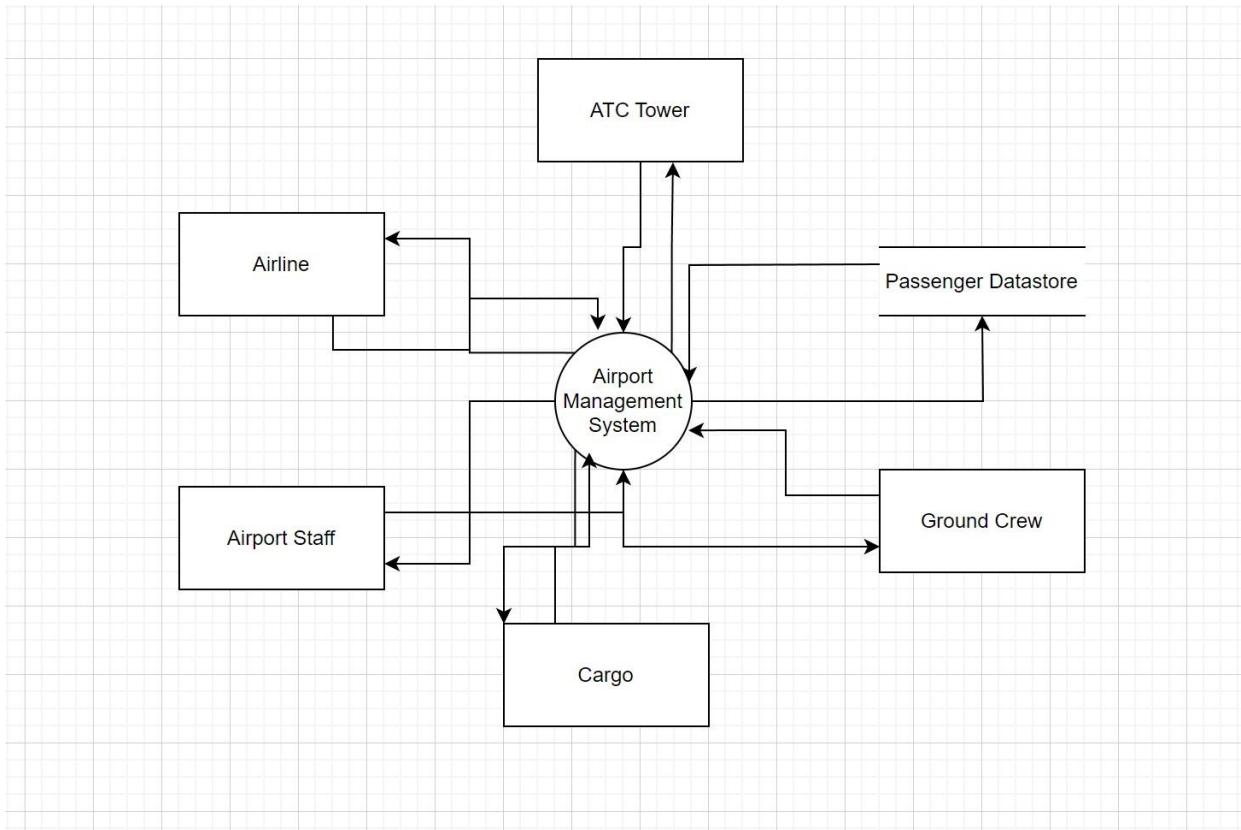


BPMN (Flight Procedure)



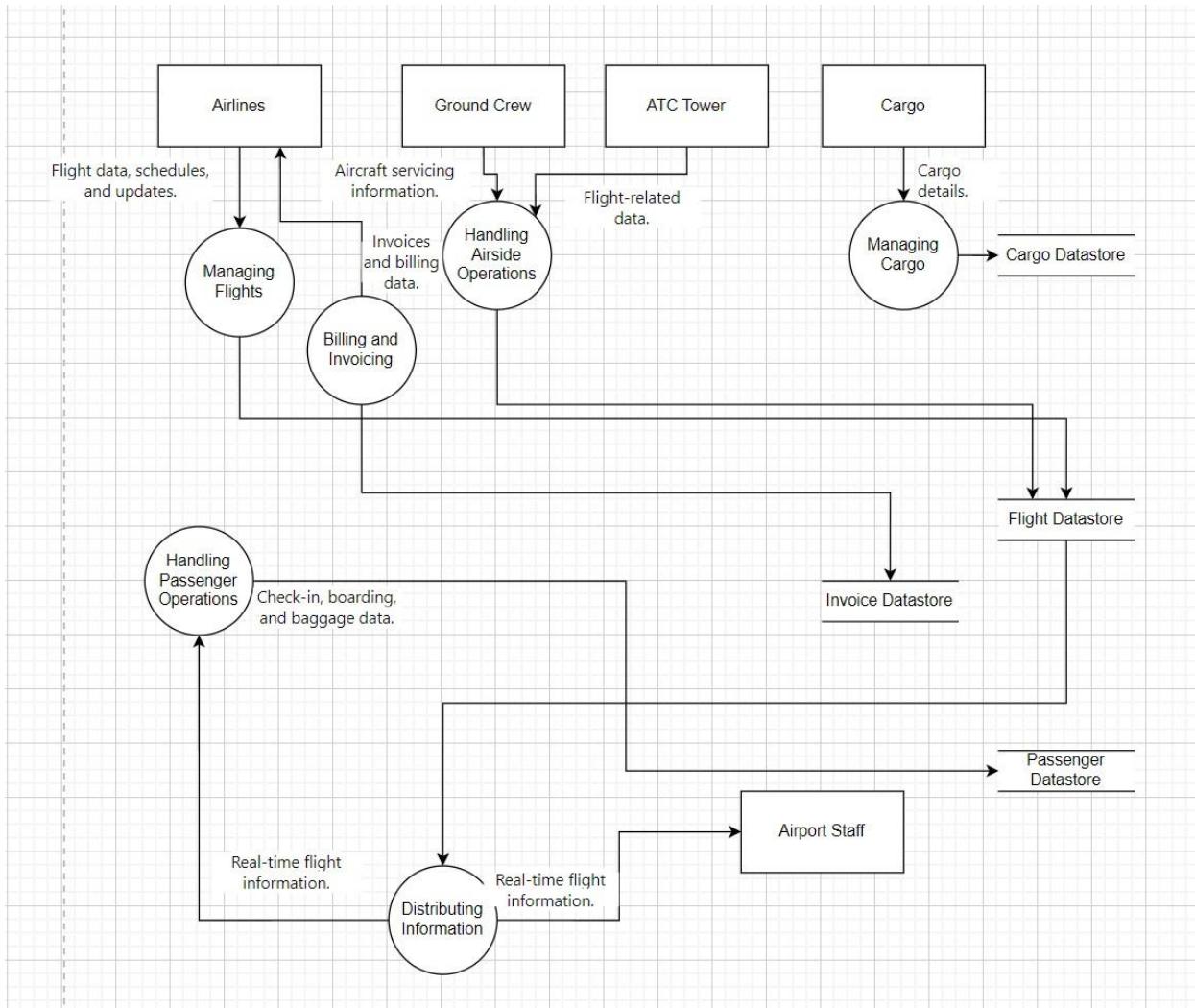
Airport Management System Requirements Specification

DFD Level 0



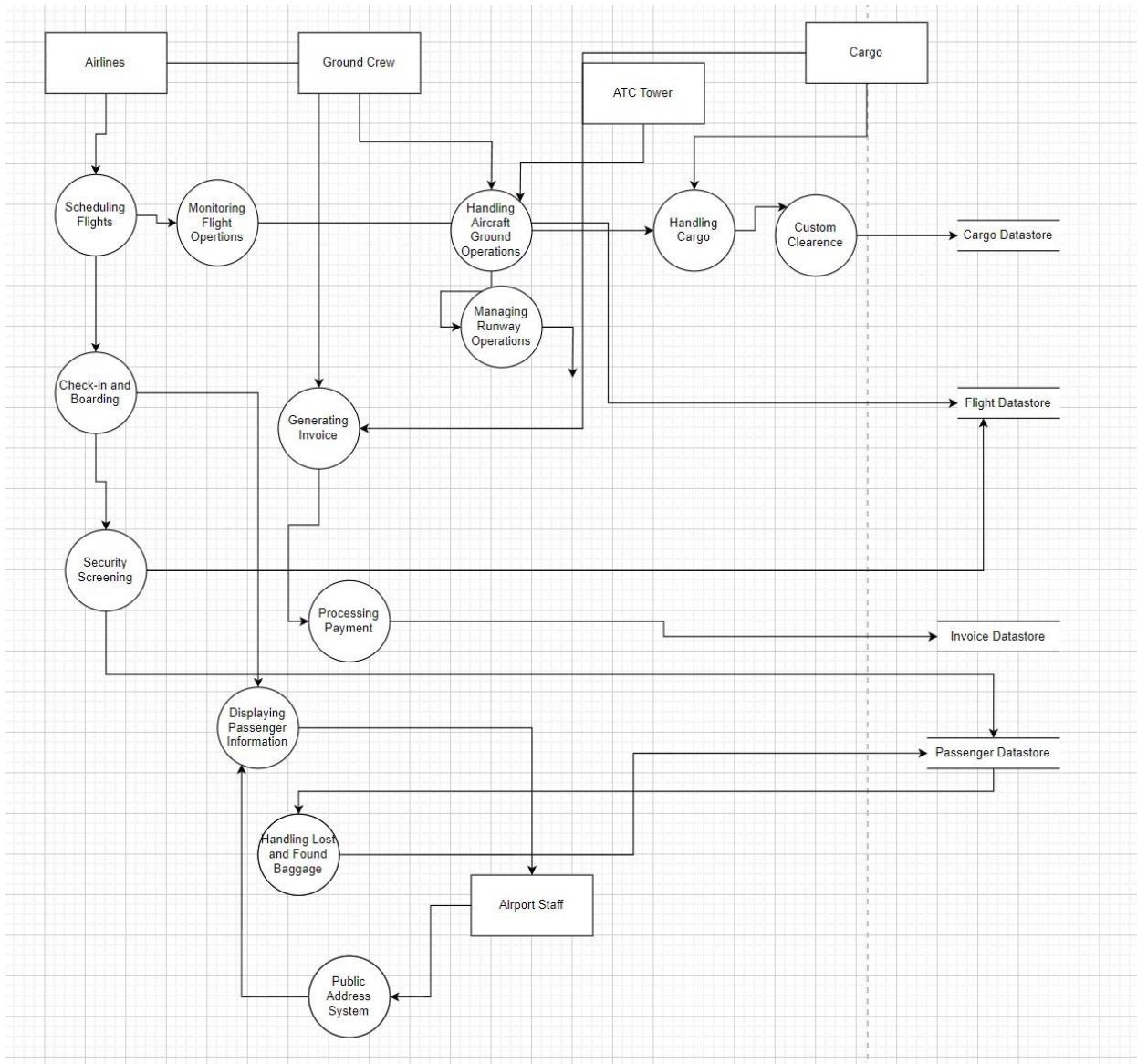
Airport Management System Requirements Specification

DFD Level 1



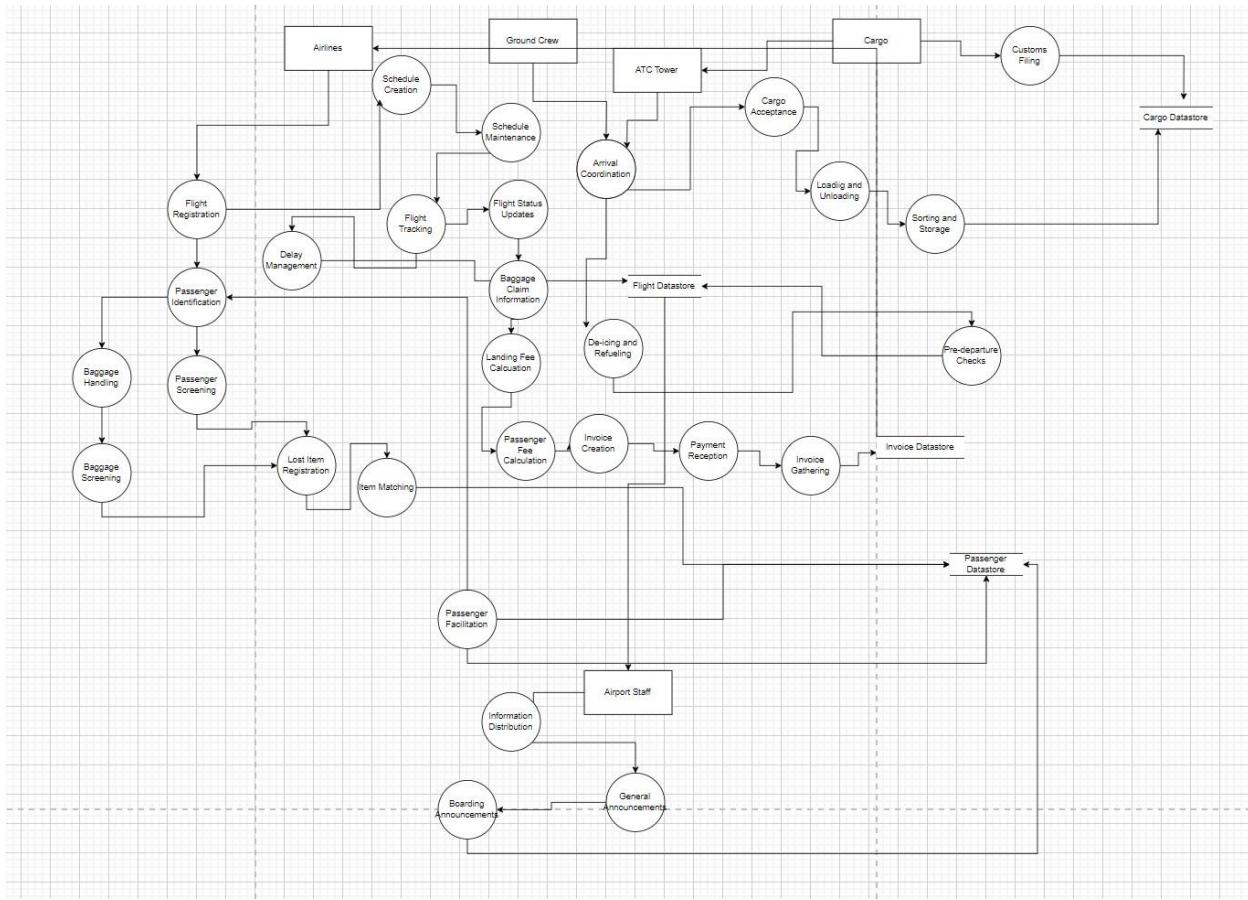
Airport Management System Requirements Specification

DFD Level 2



Airport Management System Requirements Specification

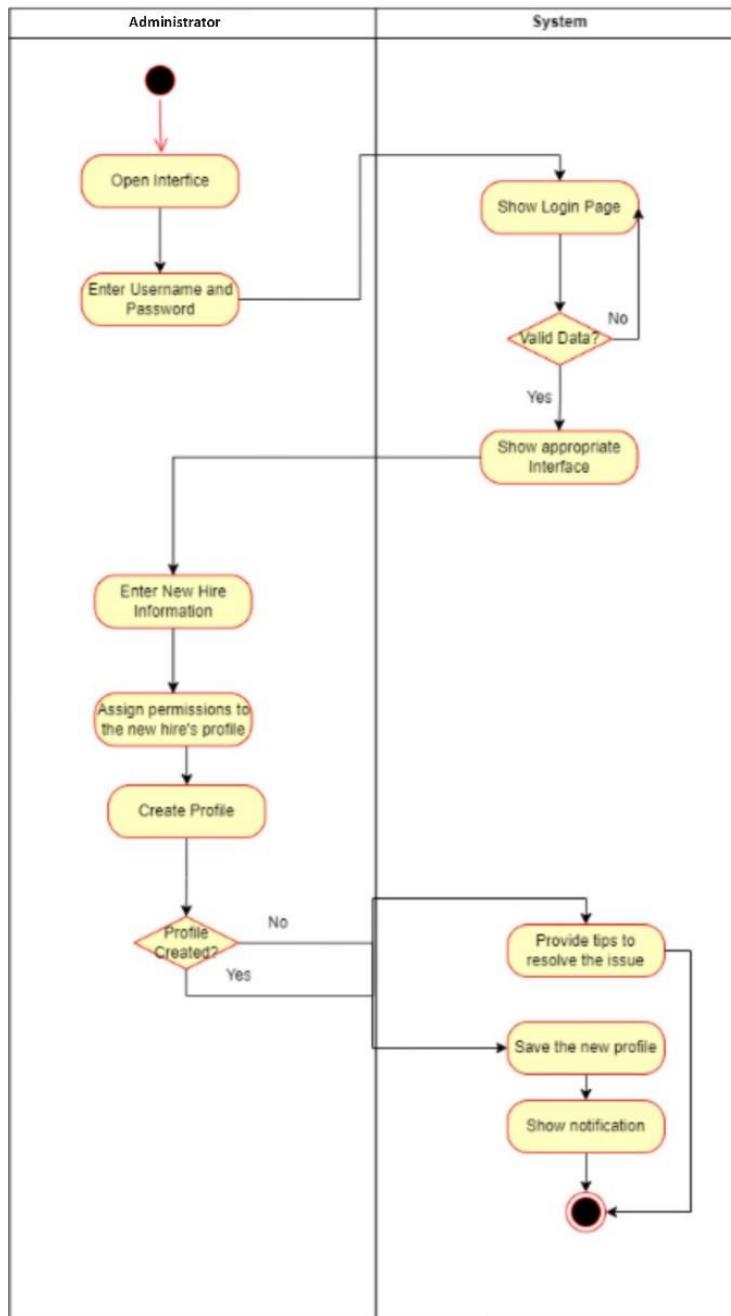
DFD Level 3



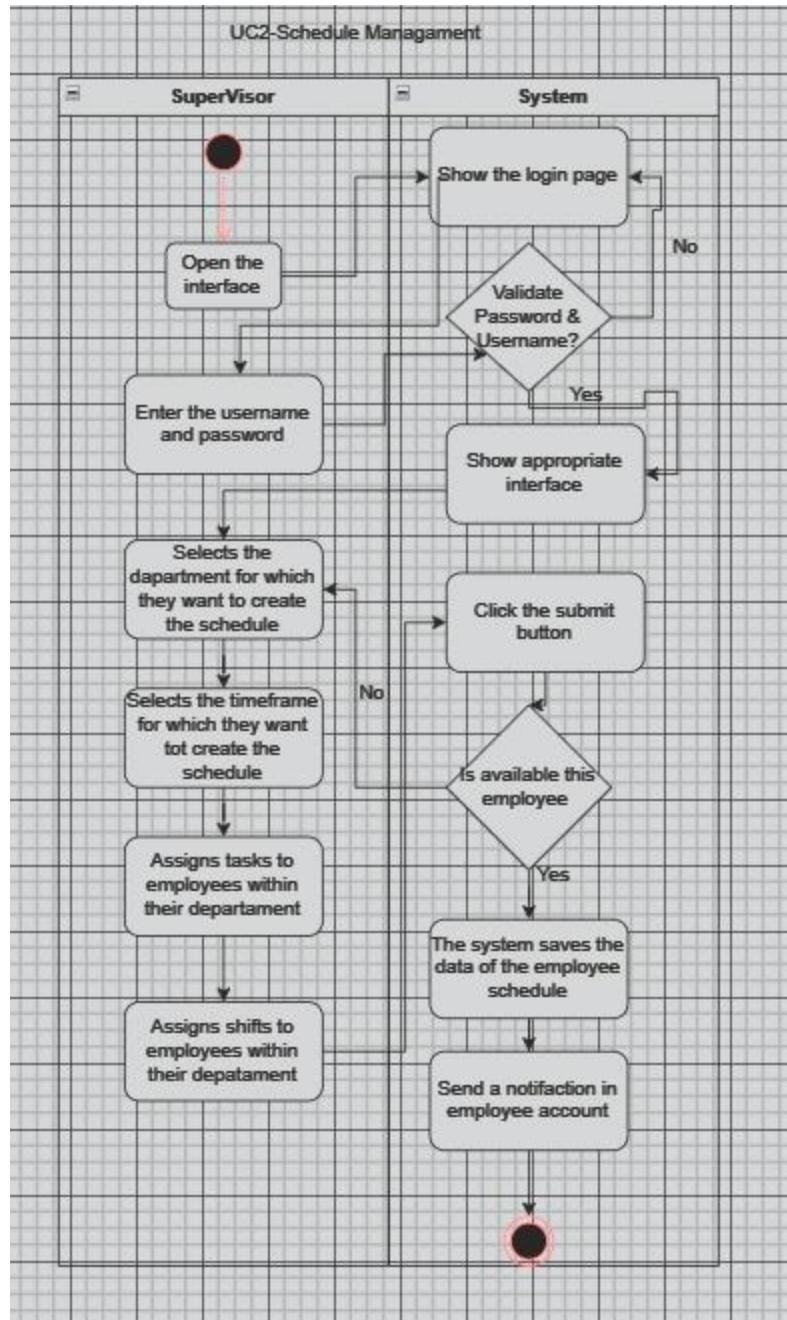
Airport Management System Requirements Specification

Activity Diagrams

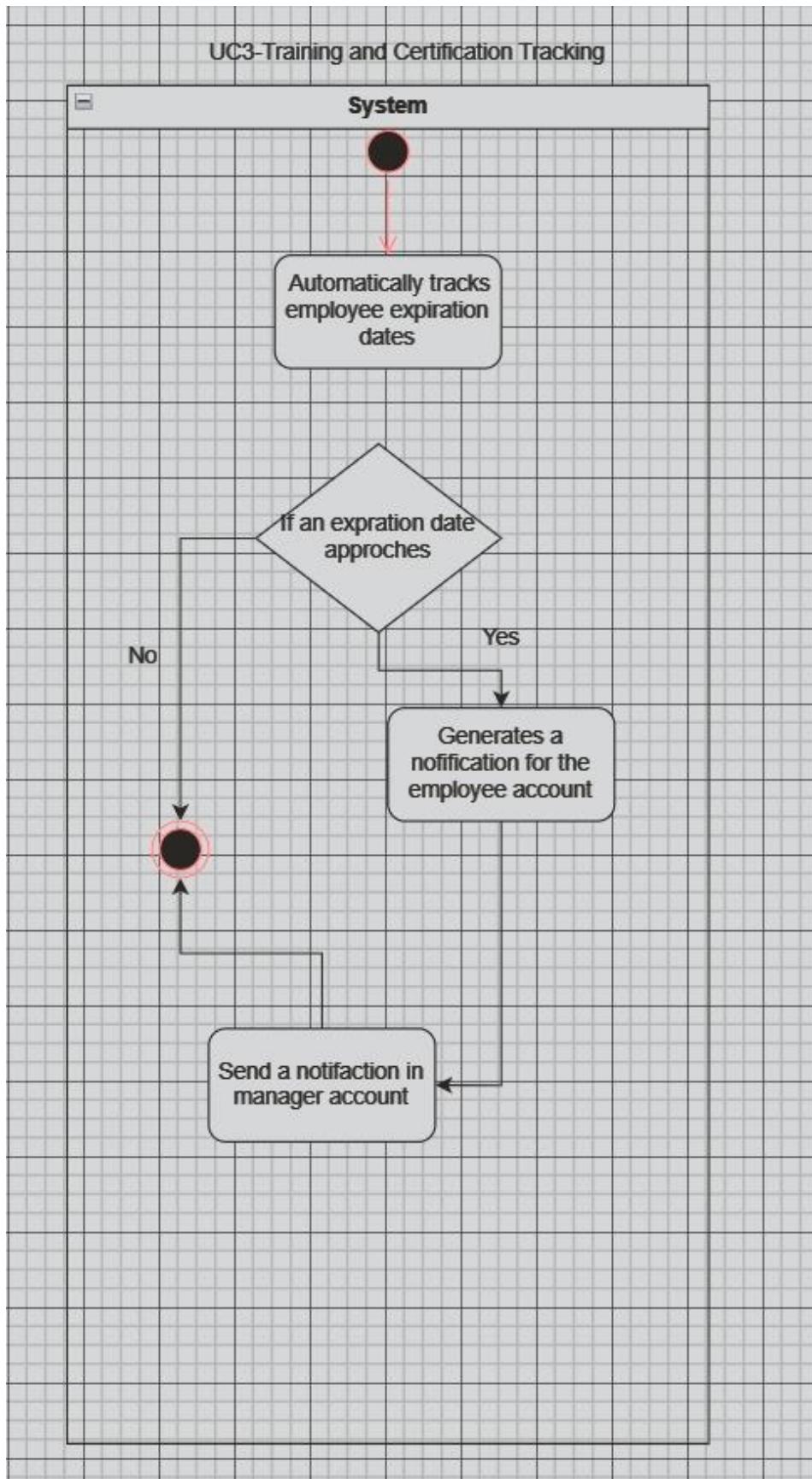
UC1: New Hire Onboarding



Airport Management System Requirements Specification

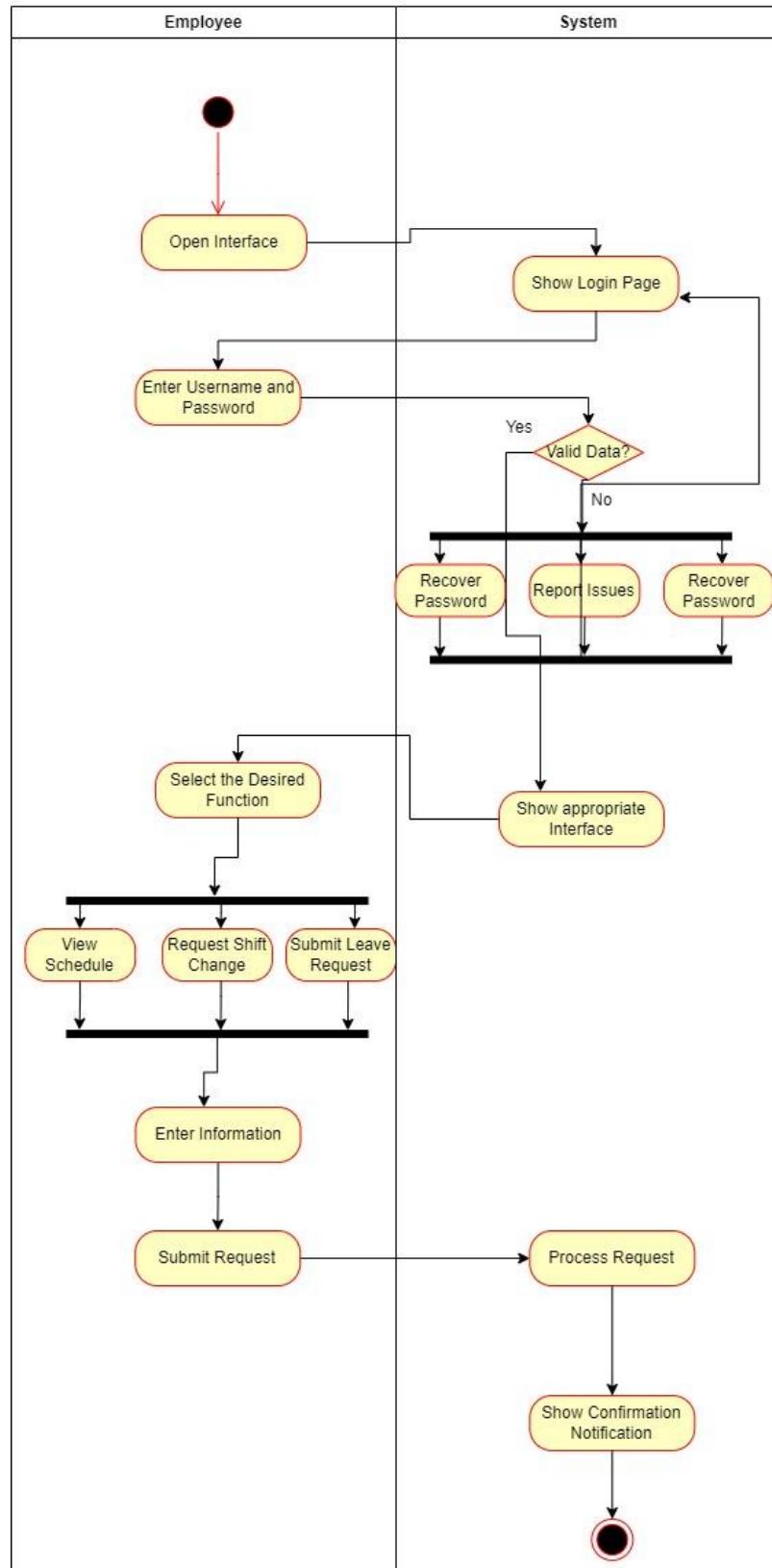


Airport Management System Requirements Specification



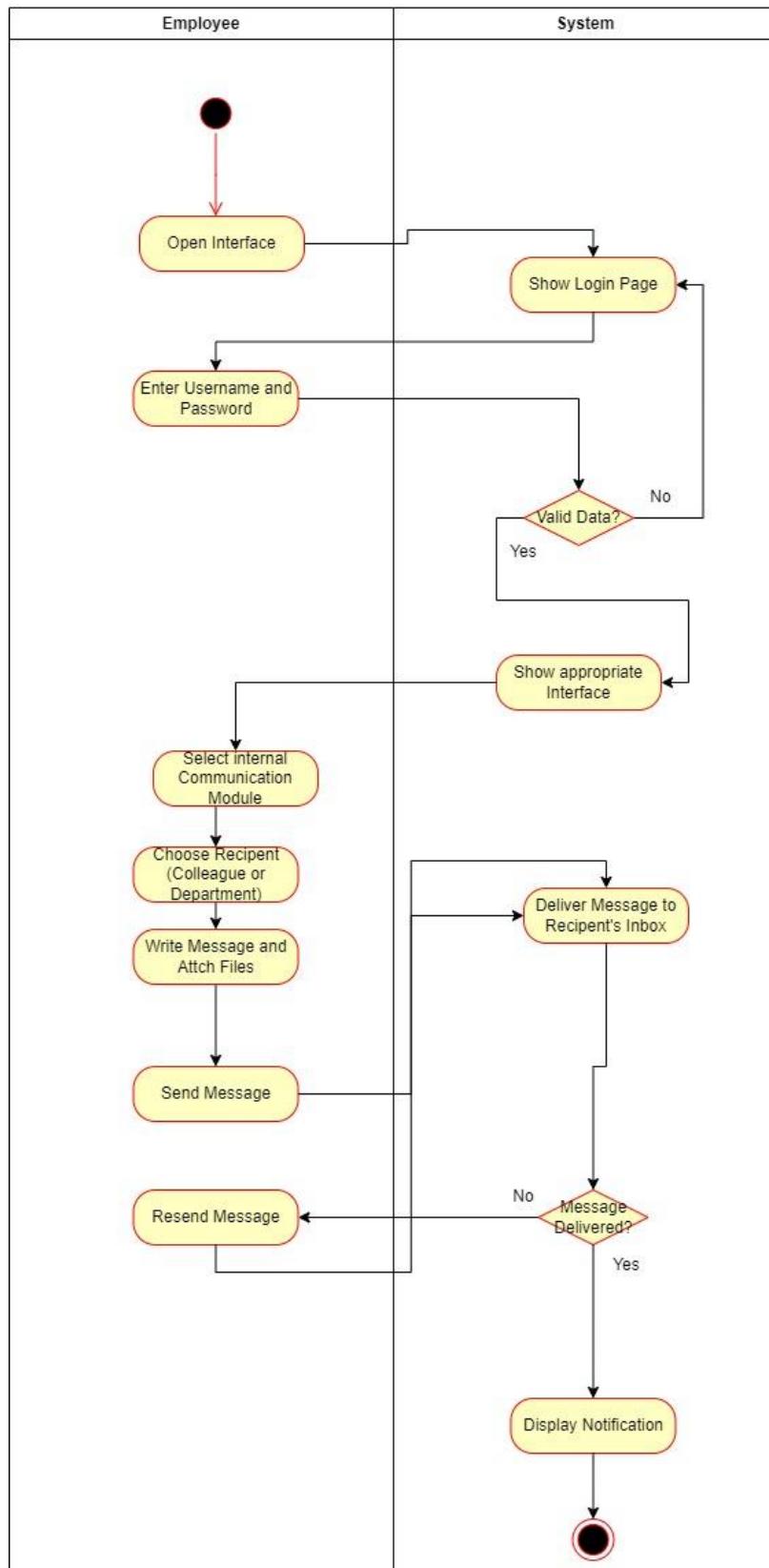
Airport Management System Requirements Specification

UC4: Employee Self-Service



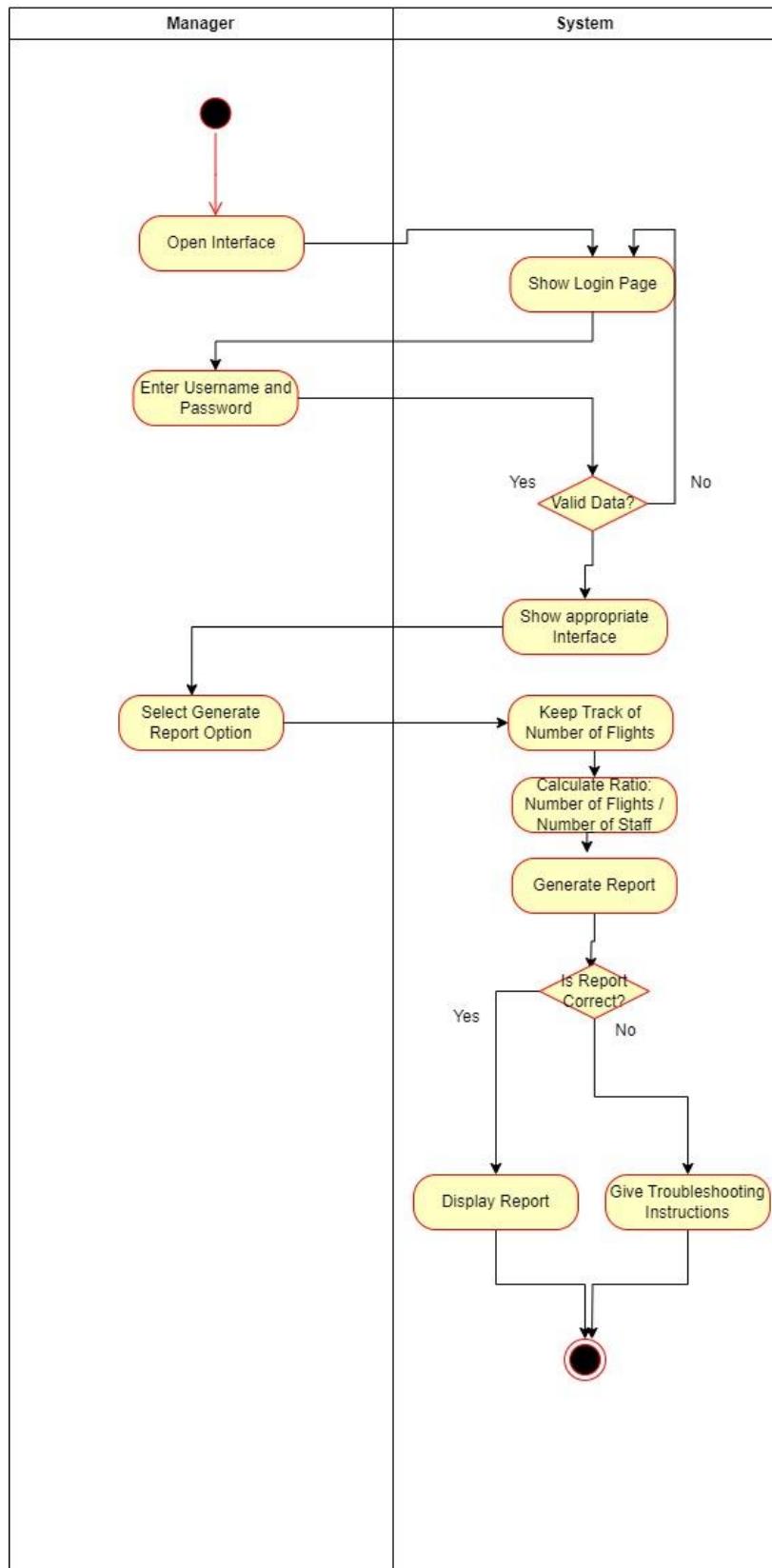
Airport Management System Requirements Specification

UC5: Internal Communication



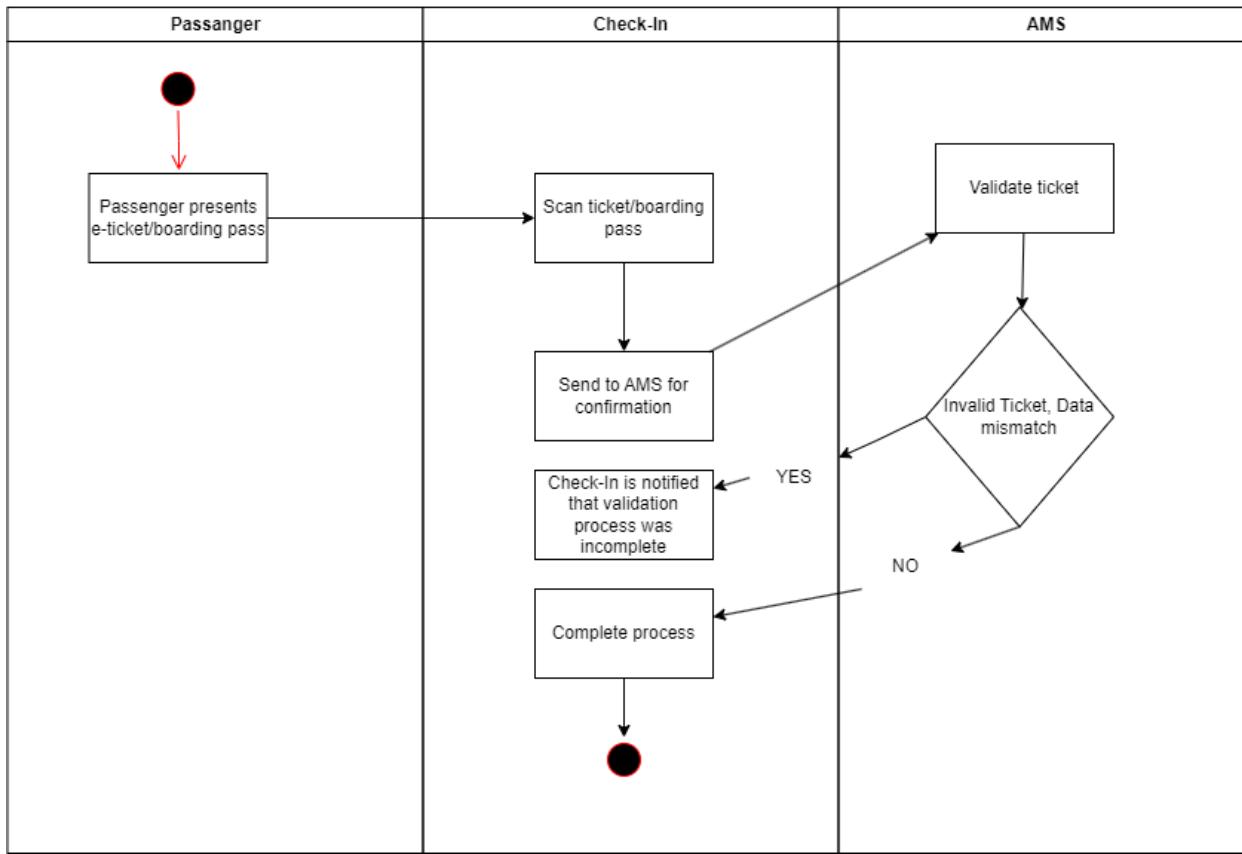
Airport Management System Requirements Specification

UC6: Performance Review



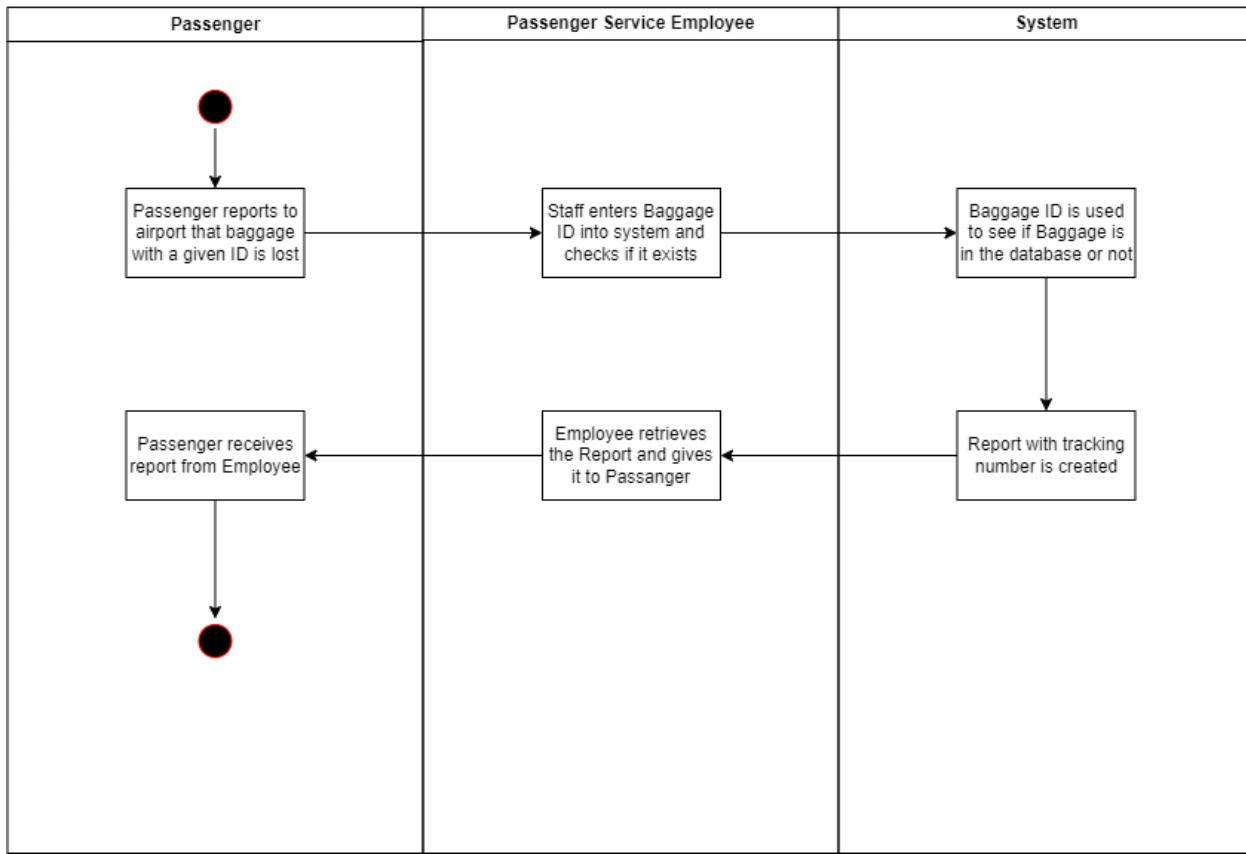
Airport Management System Requirements Specification

UC 7: Passenger ticket validation



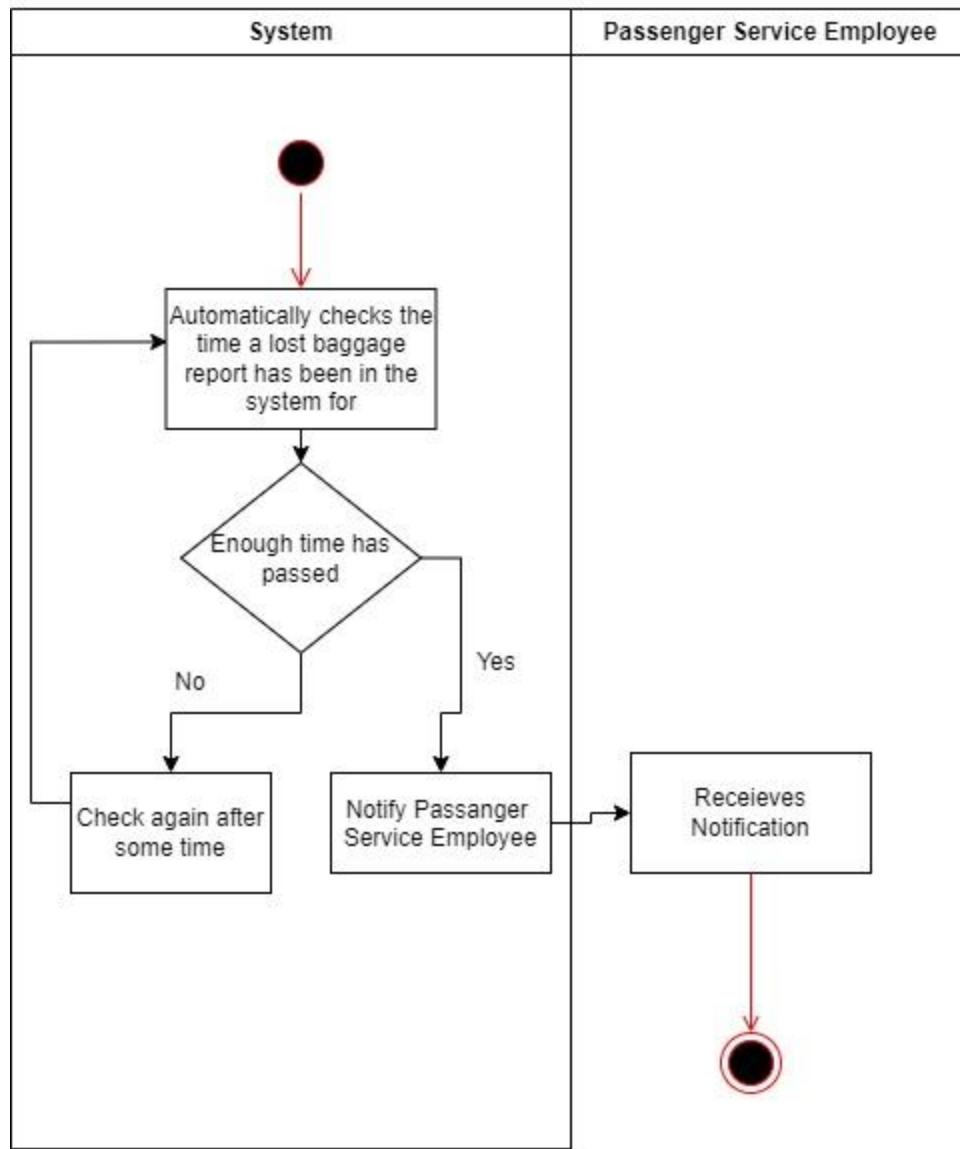
Airport Management System Requirements Specification

UC 8 :: Passenger ticket validation



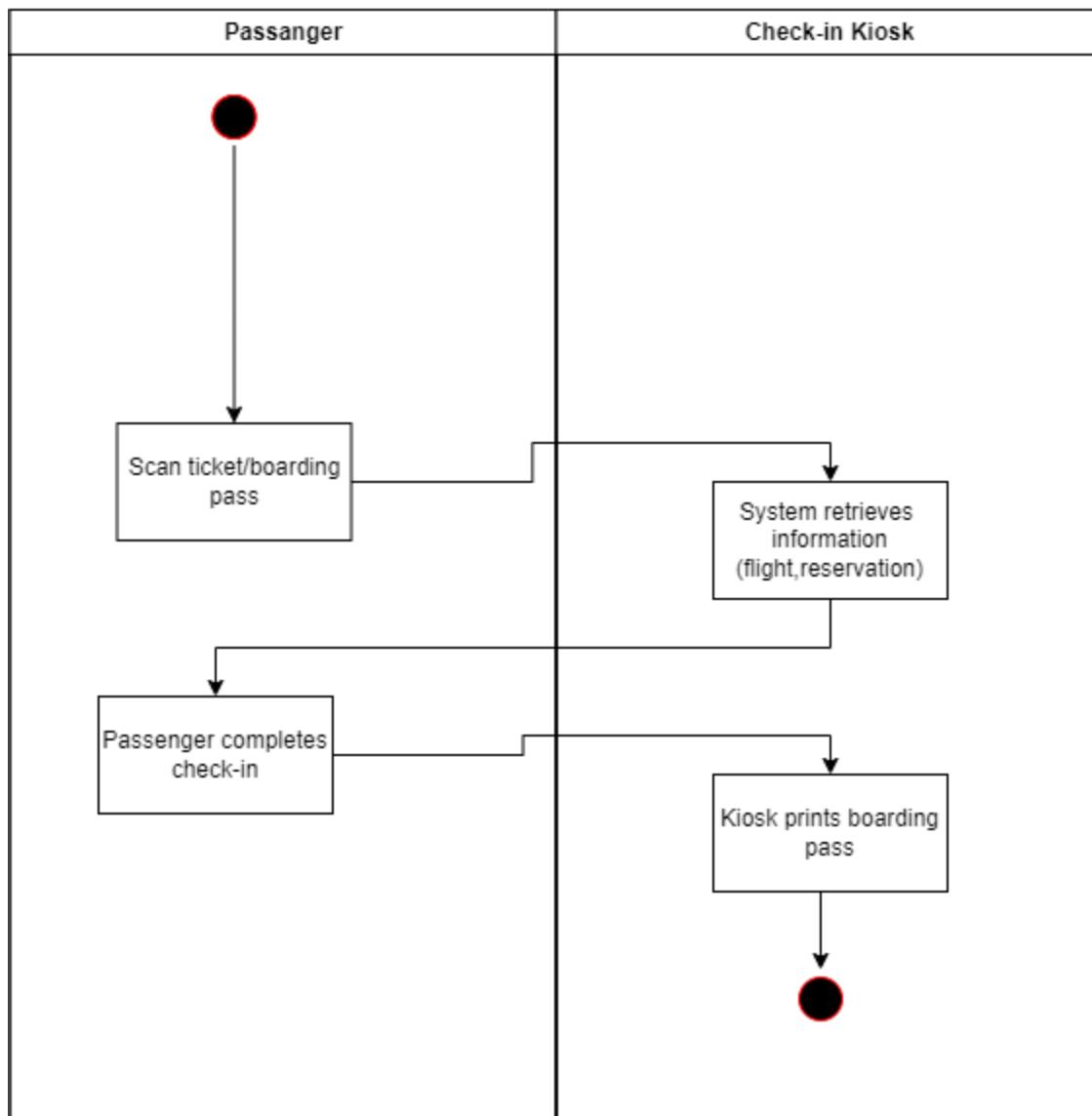
Airport Management System Requirements Specification

UC 9: System
keeps track of lost baggage reports

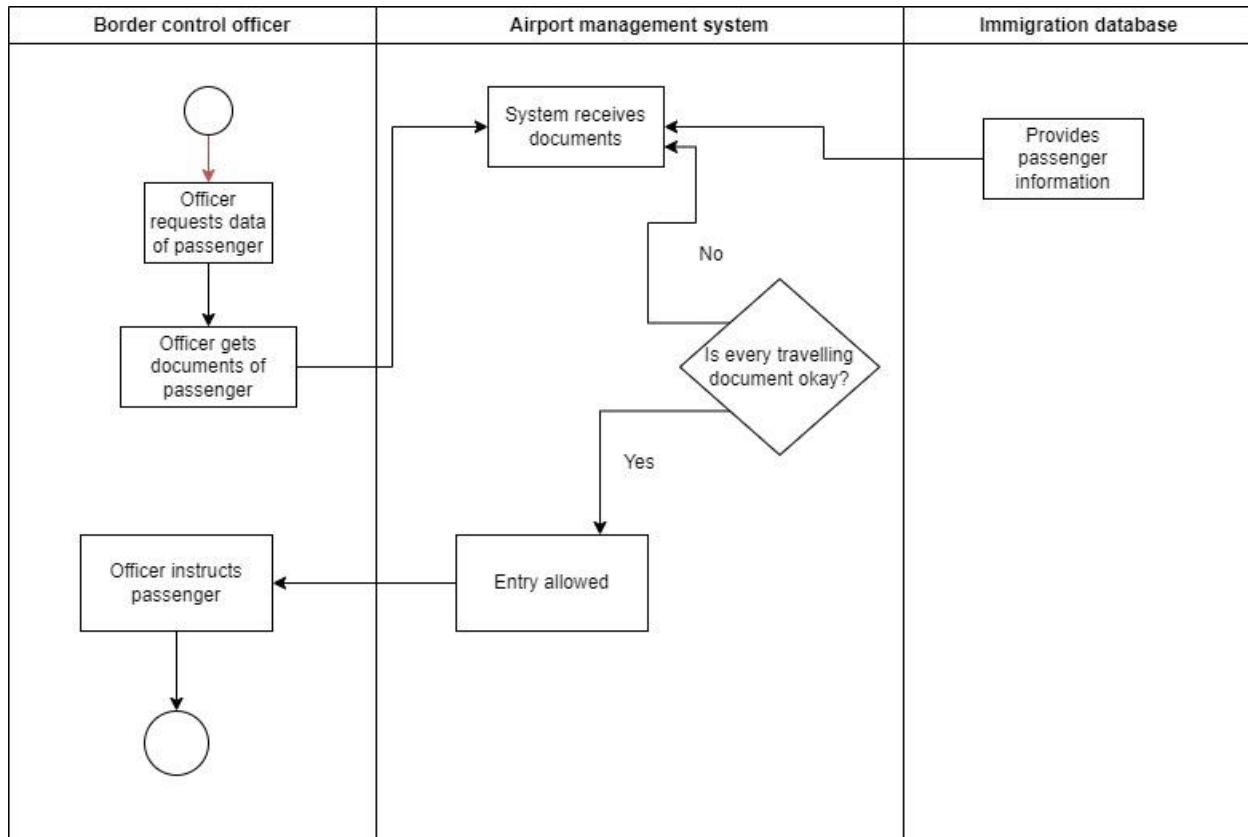


Airport Management System Requirements Specification

UC 10: Passenger Self-Service Check In

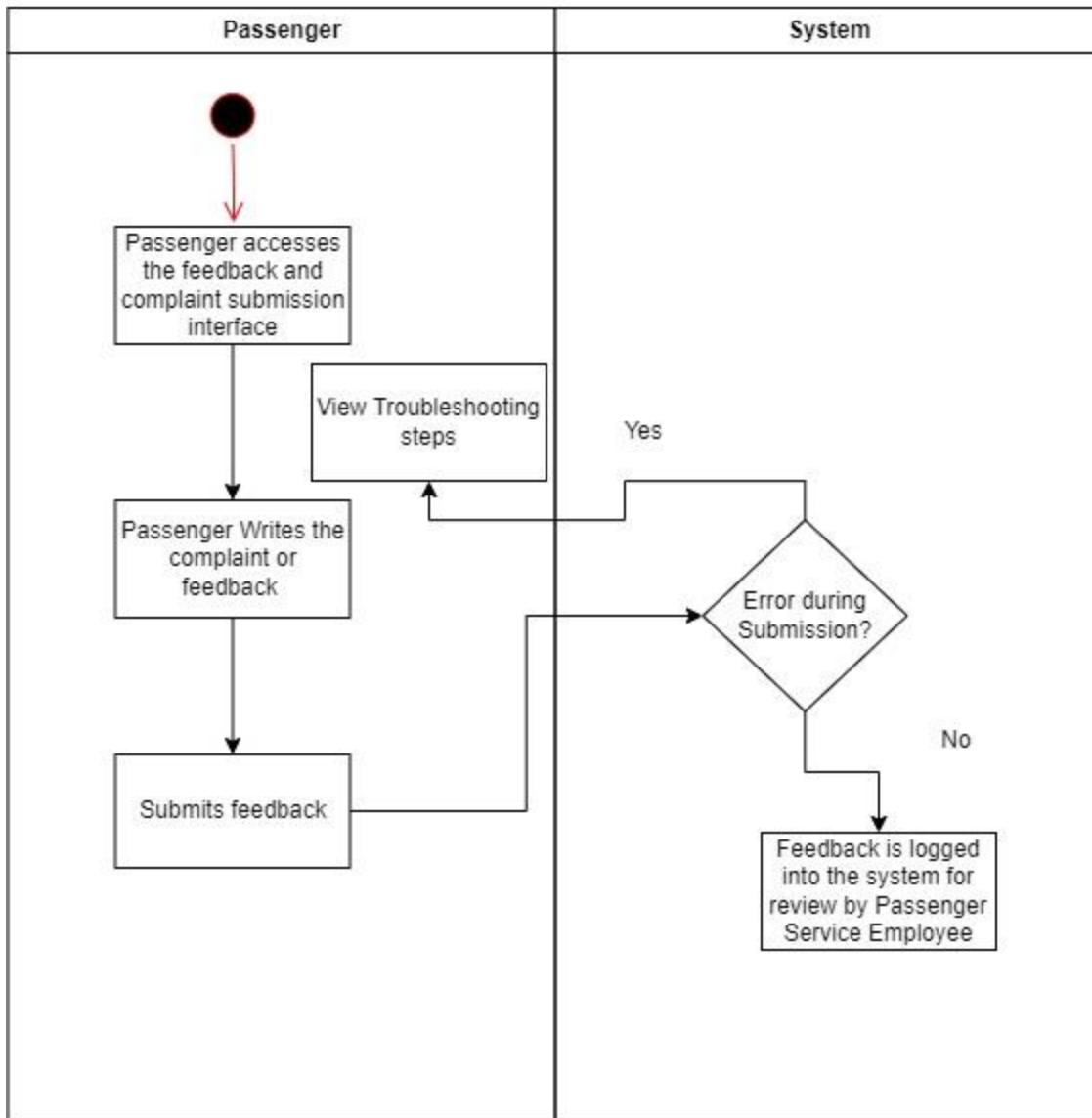


Airport Management System Requirements Specification



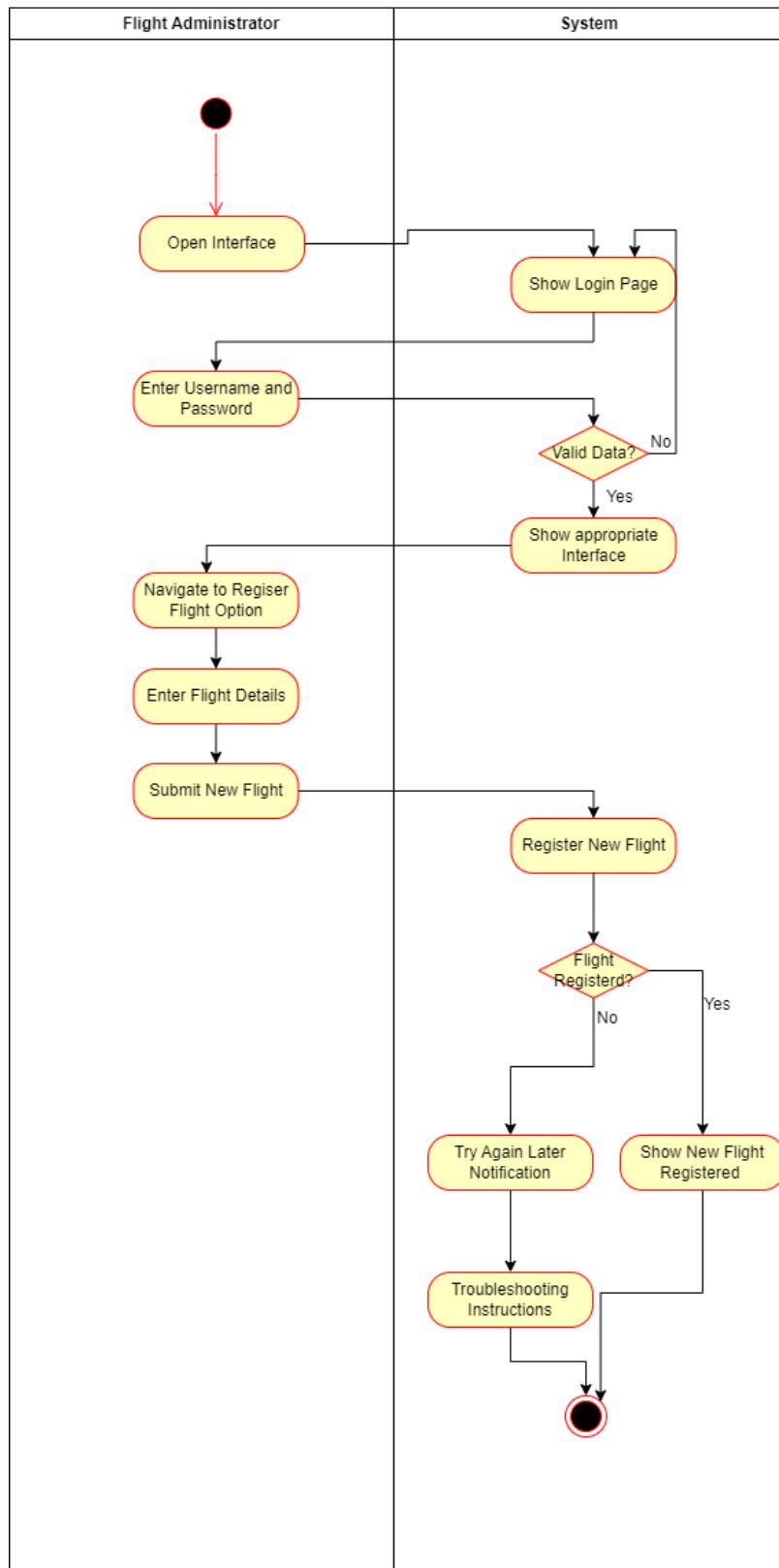
Airport Management System Requirements Specification

Use Case 12: Passenger Feedback and Complaint Management



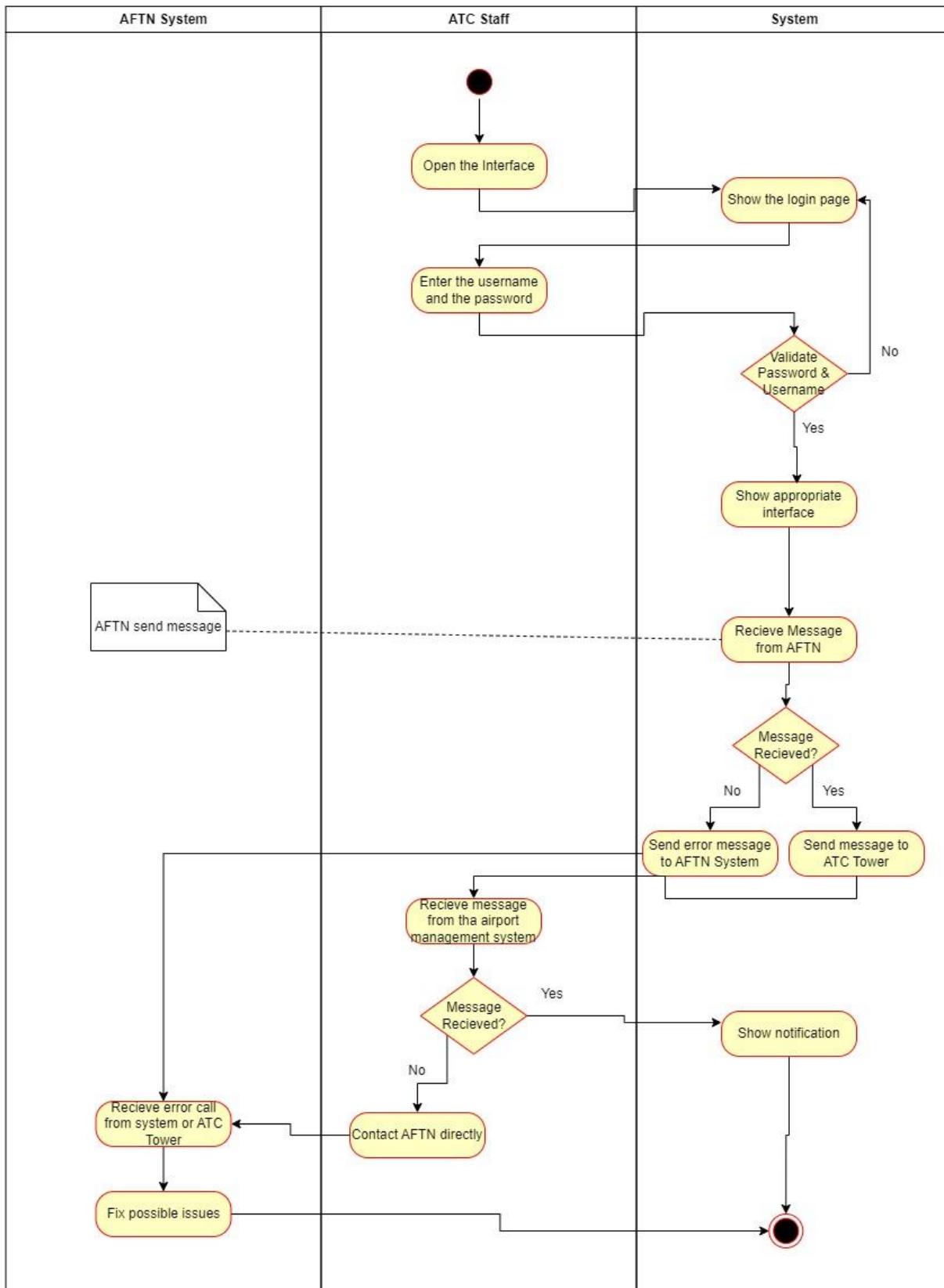
Airport Management System Requirements Specification

UC13: Registering a New Flight



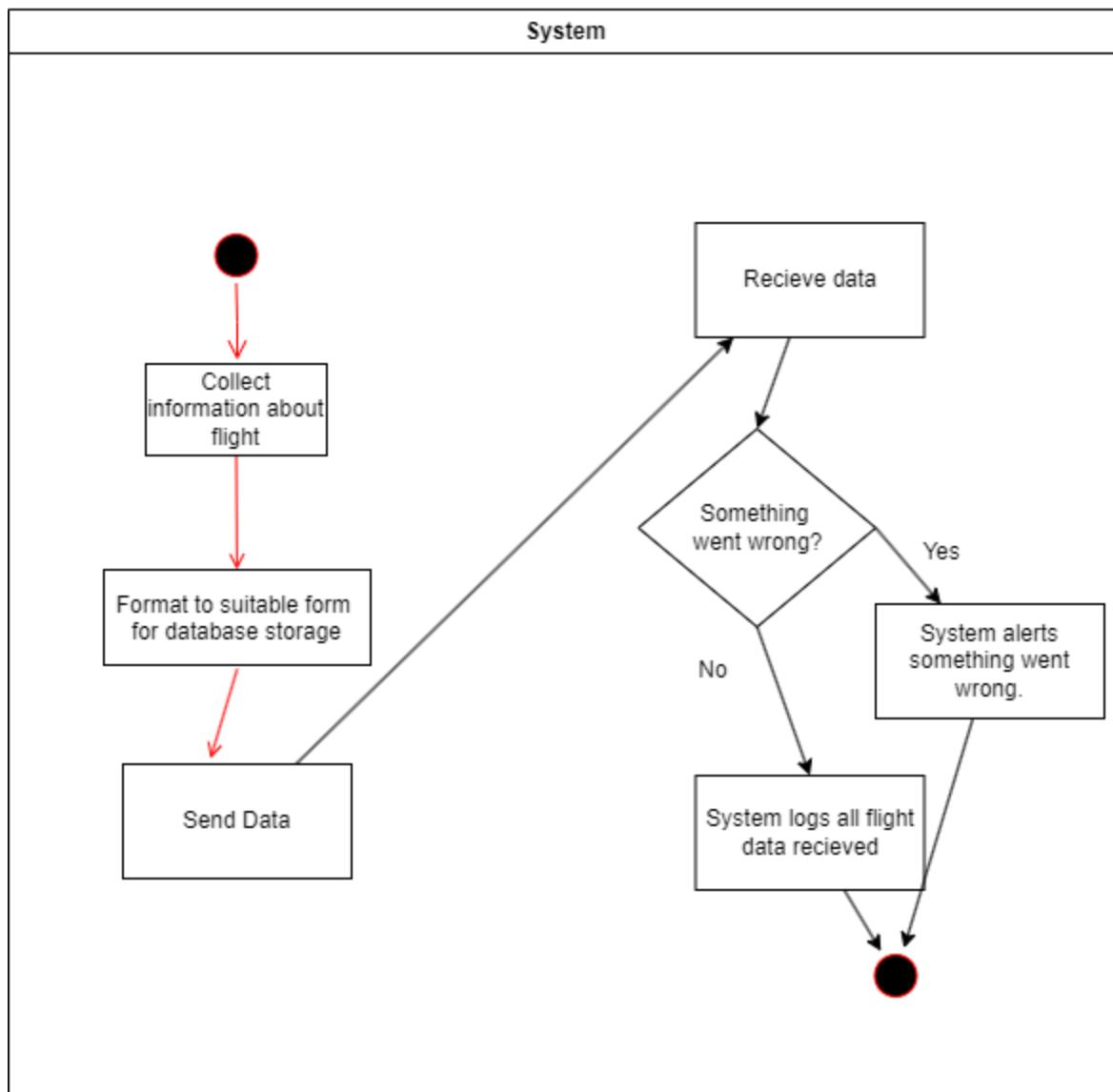
Airport Management System Requirements Specification

UC14: Flight Data Exchange



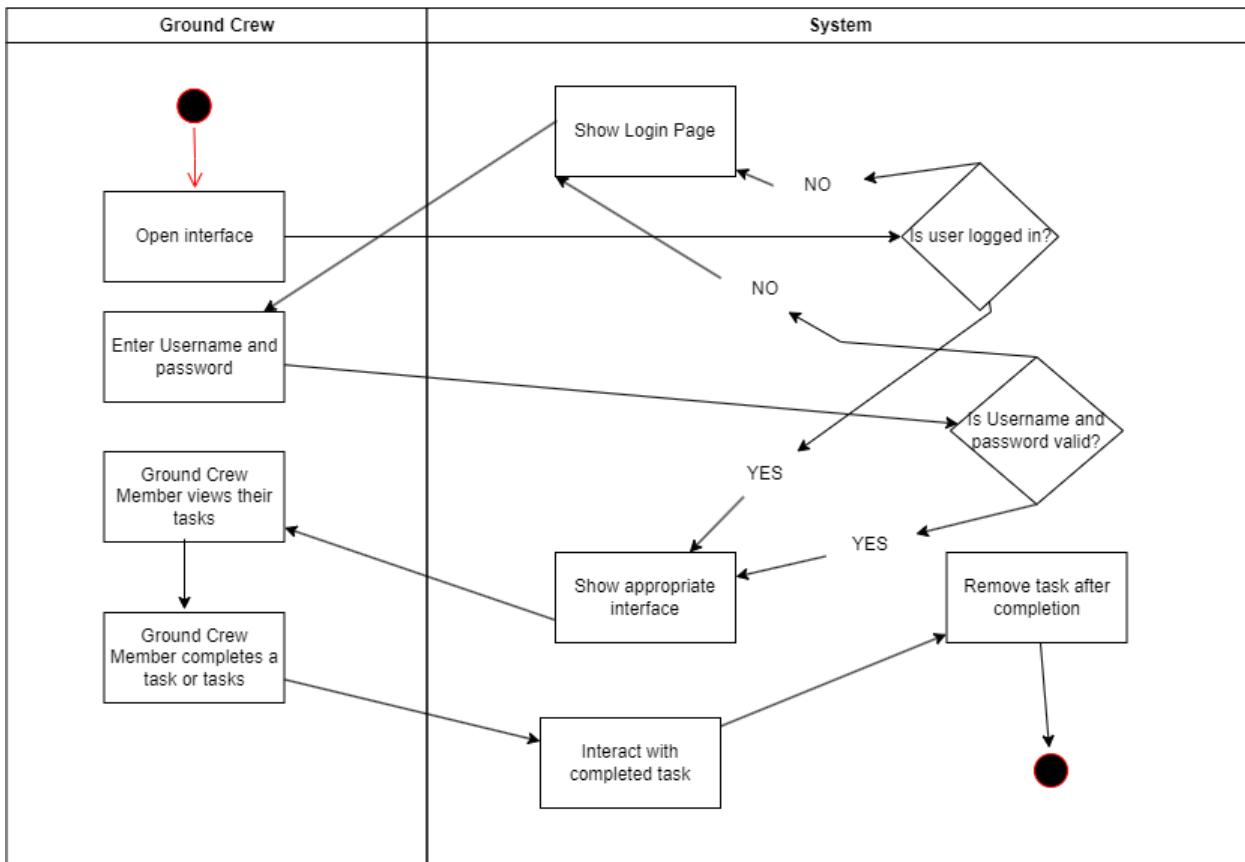
Airport Management System Requirements Specification

UC15.: Flight Information Logging



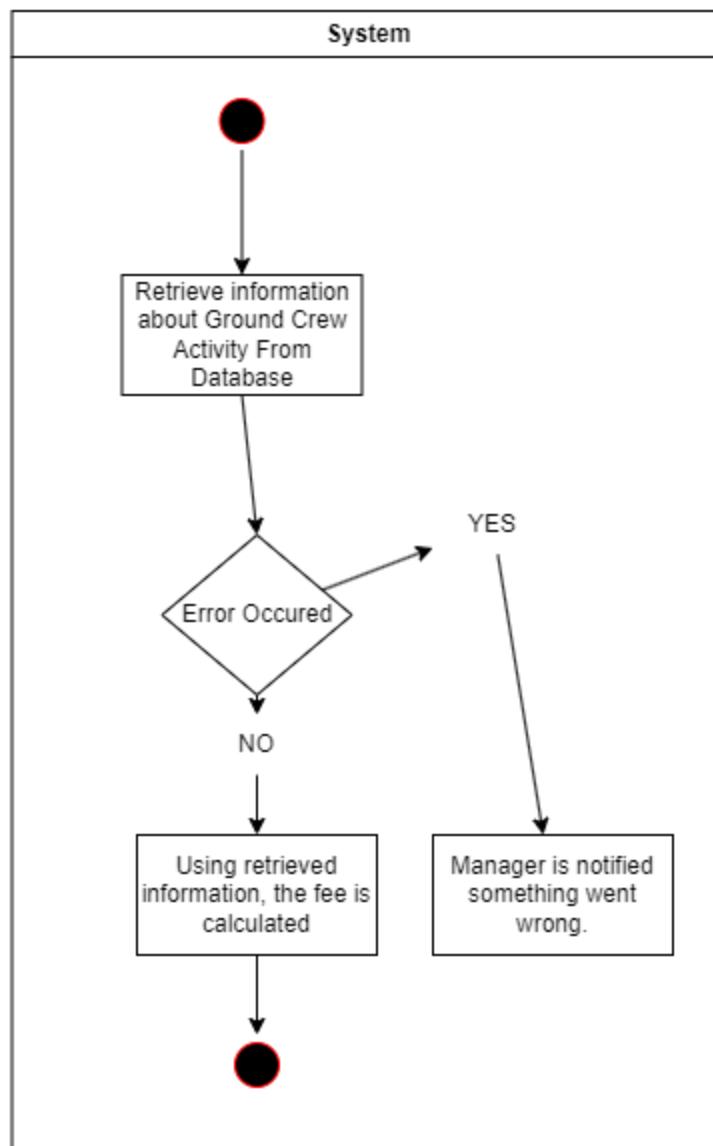
Airport Management System Requirements Specification

UC16 : Ground Crew Task Management



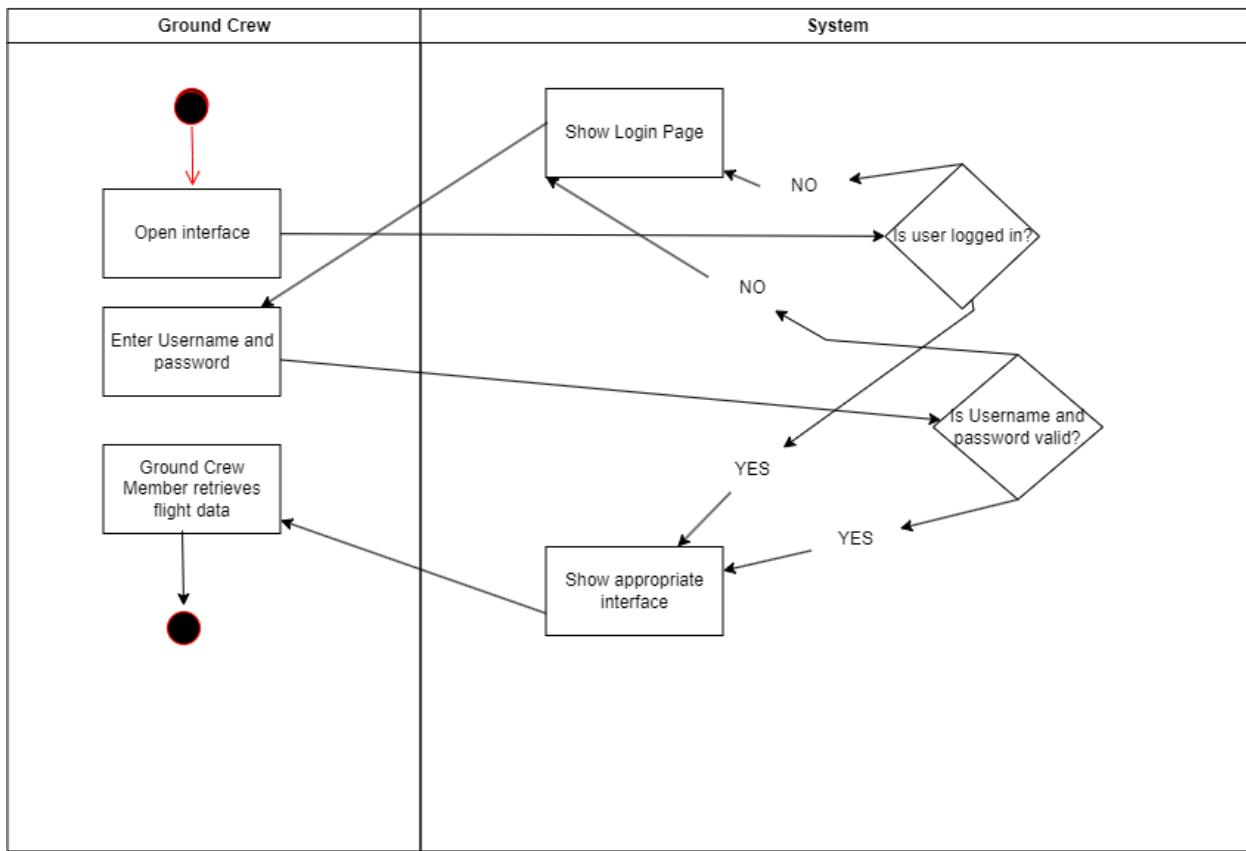
Airport Management System Requirements Specification

UC 17: Ground Service Fee Calculation



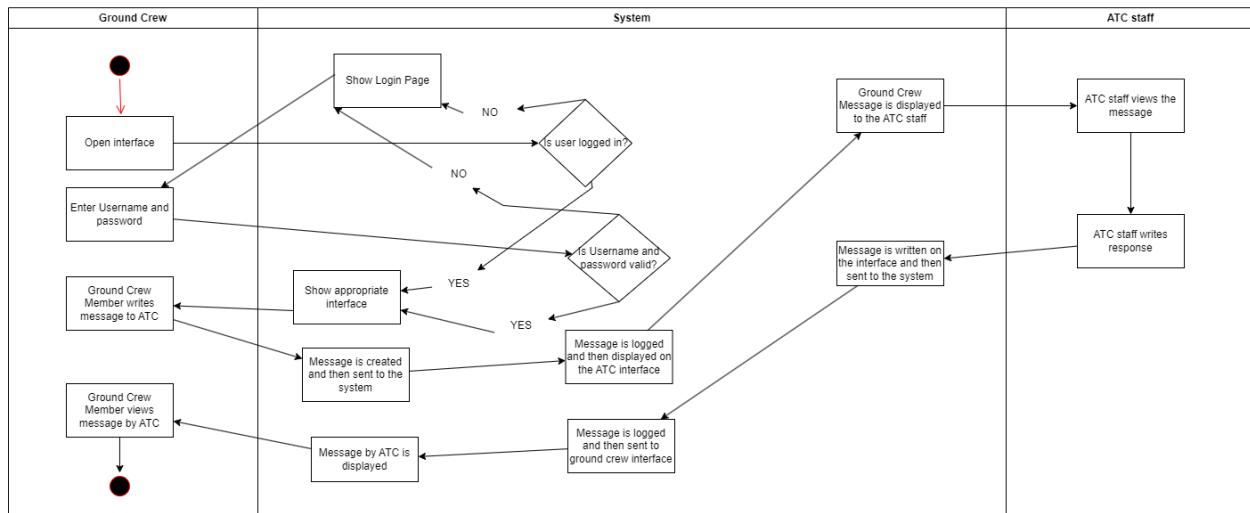
Airport Management System Requirements Specification

UC 18:

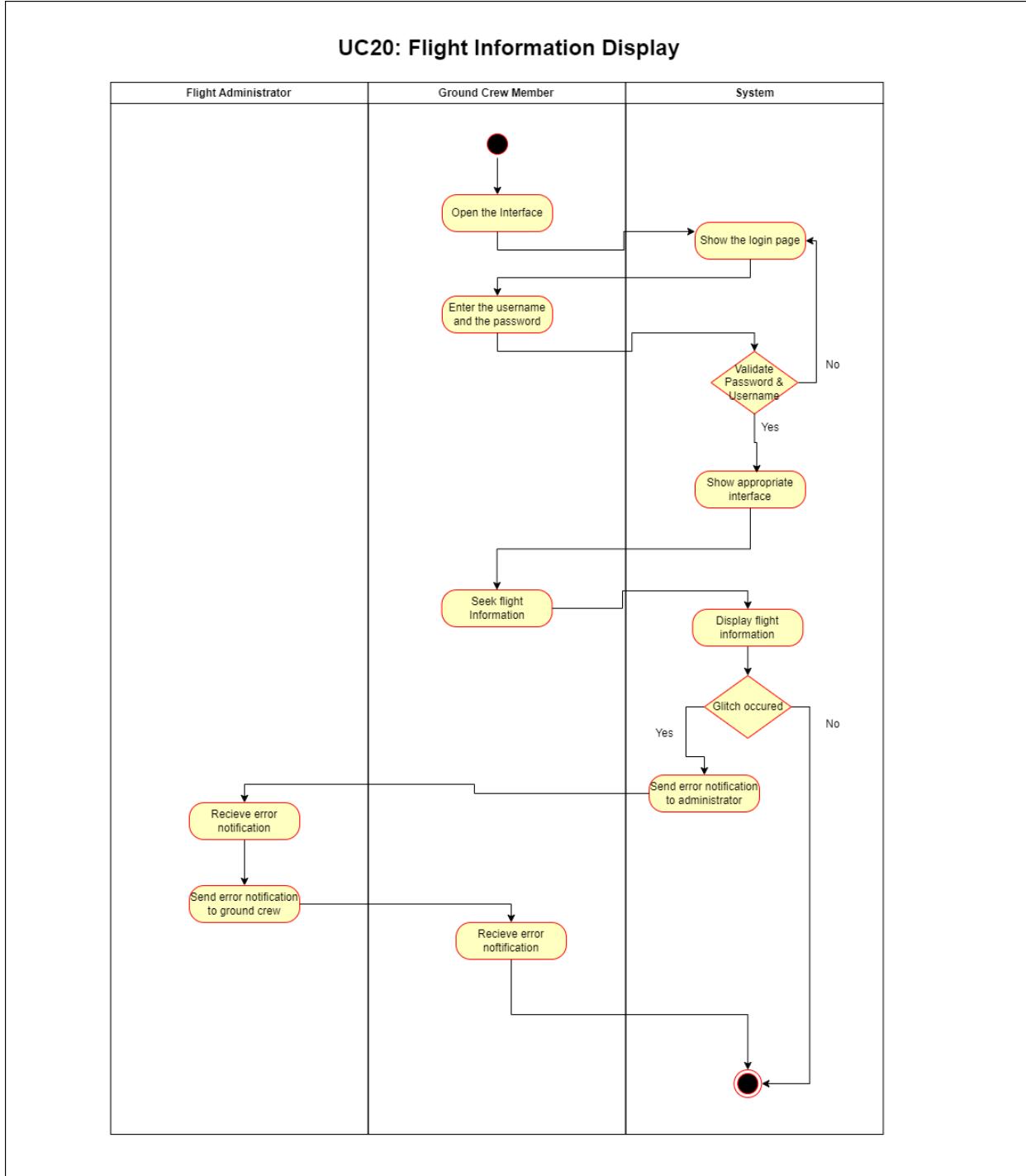


Airport Management System Requirements Specification

UC 19.: Ground Crew - ATC Communication

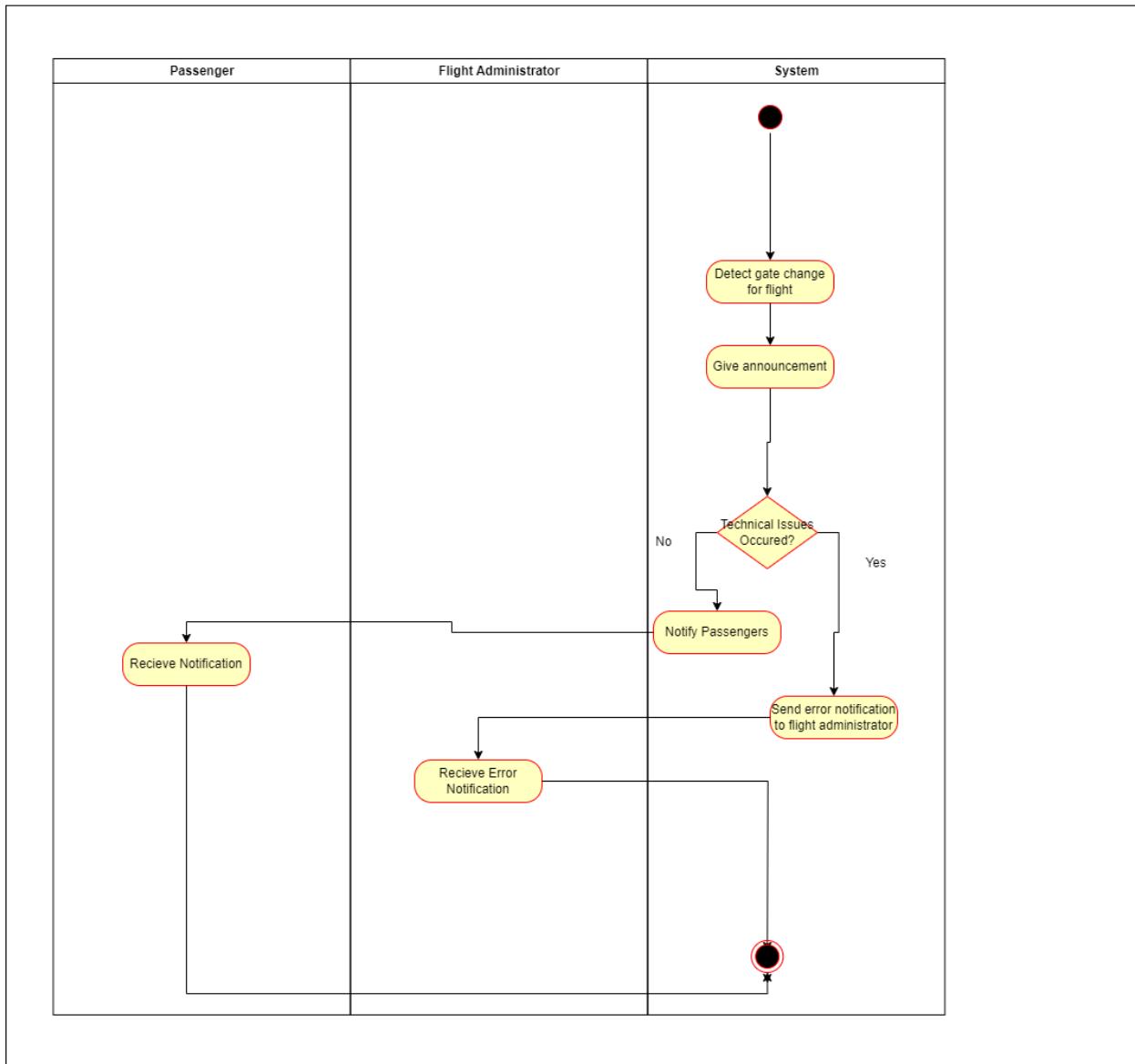


Airport Management System Requirements Specification

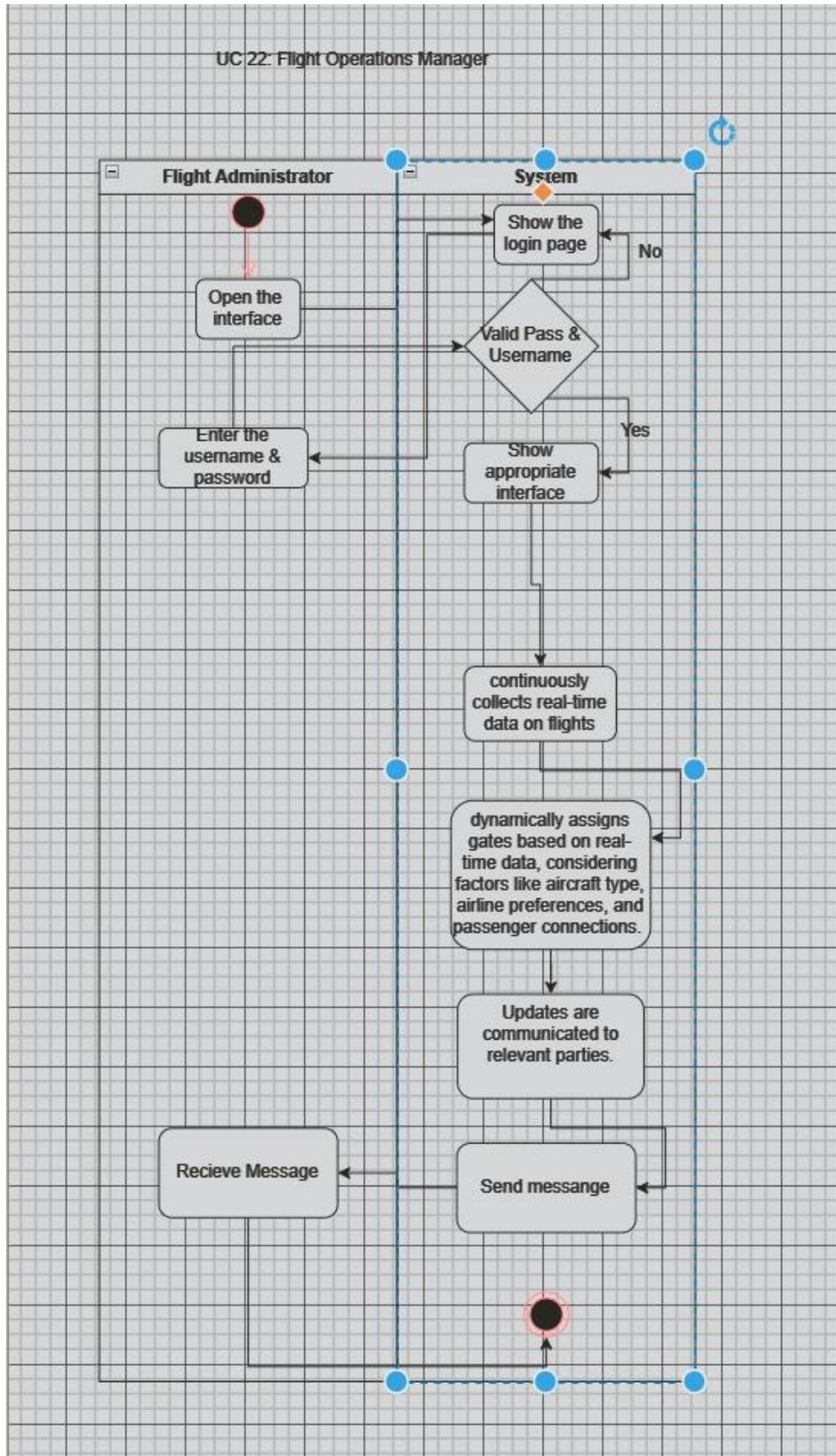


Airport Management System Requirements Specification

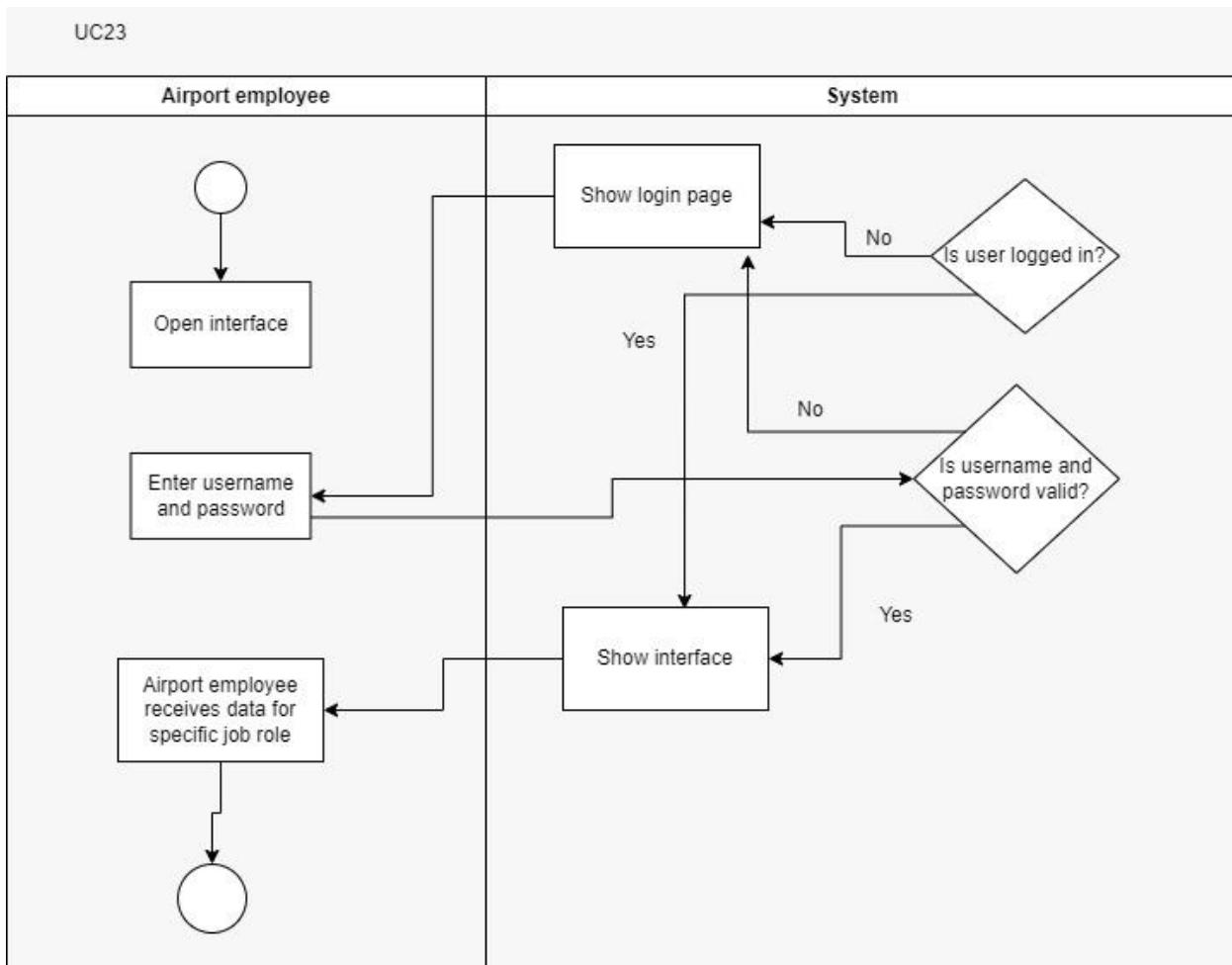
UC21: Gate Change Announcement



Airport Management System Requirements Specification

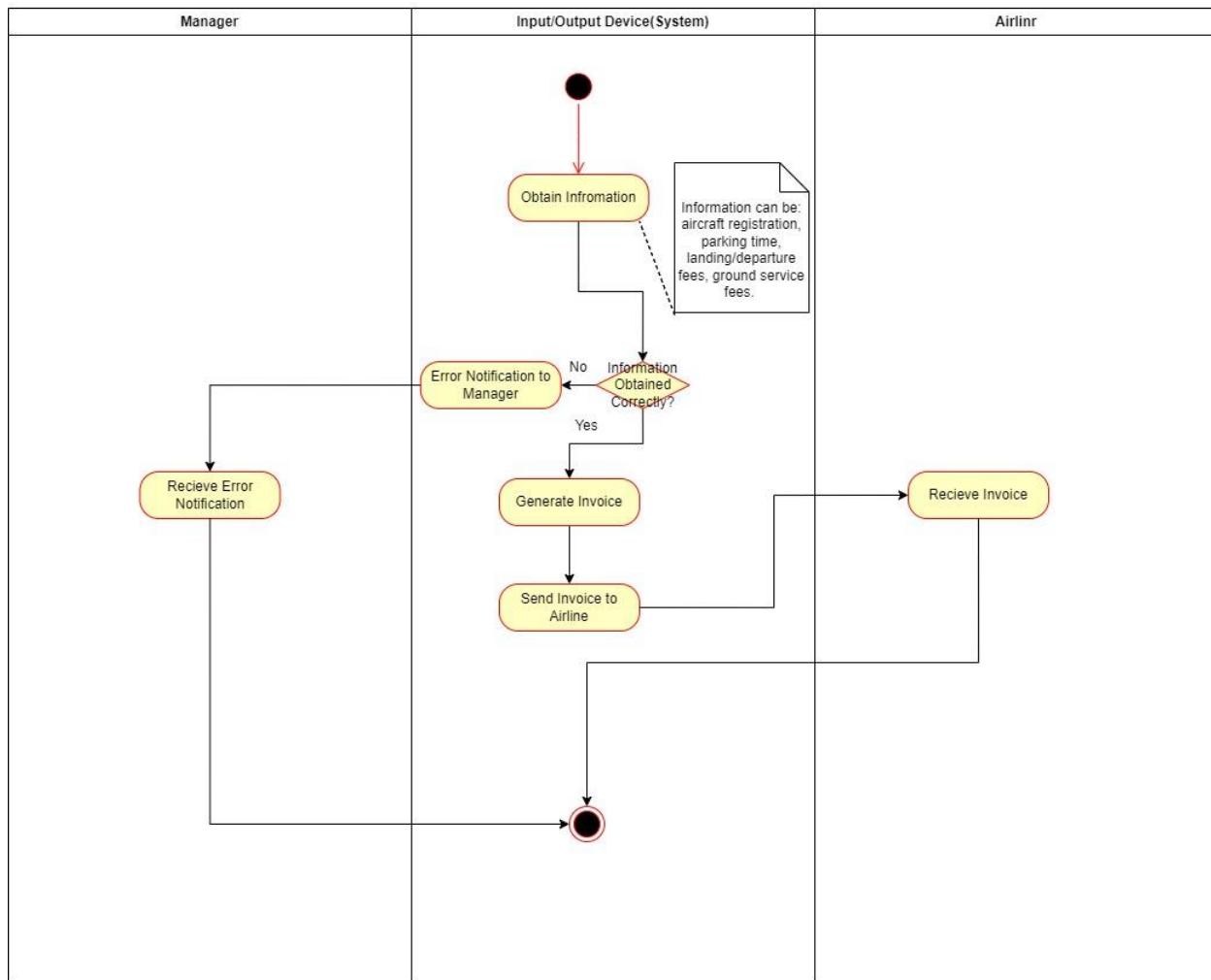


Airport Management System Requirements Specification

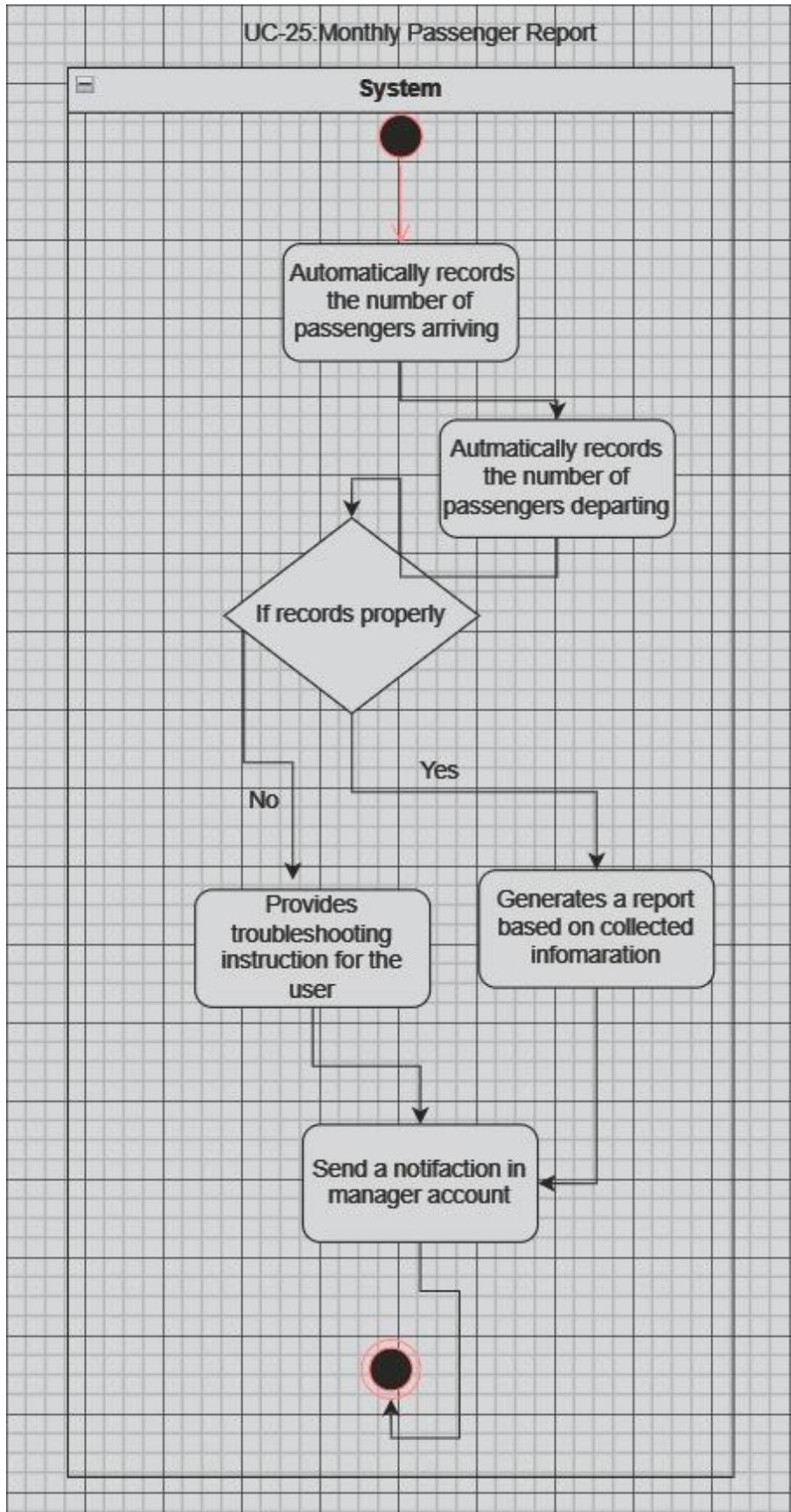


Airport Management System Requirements Specification

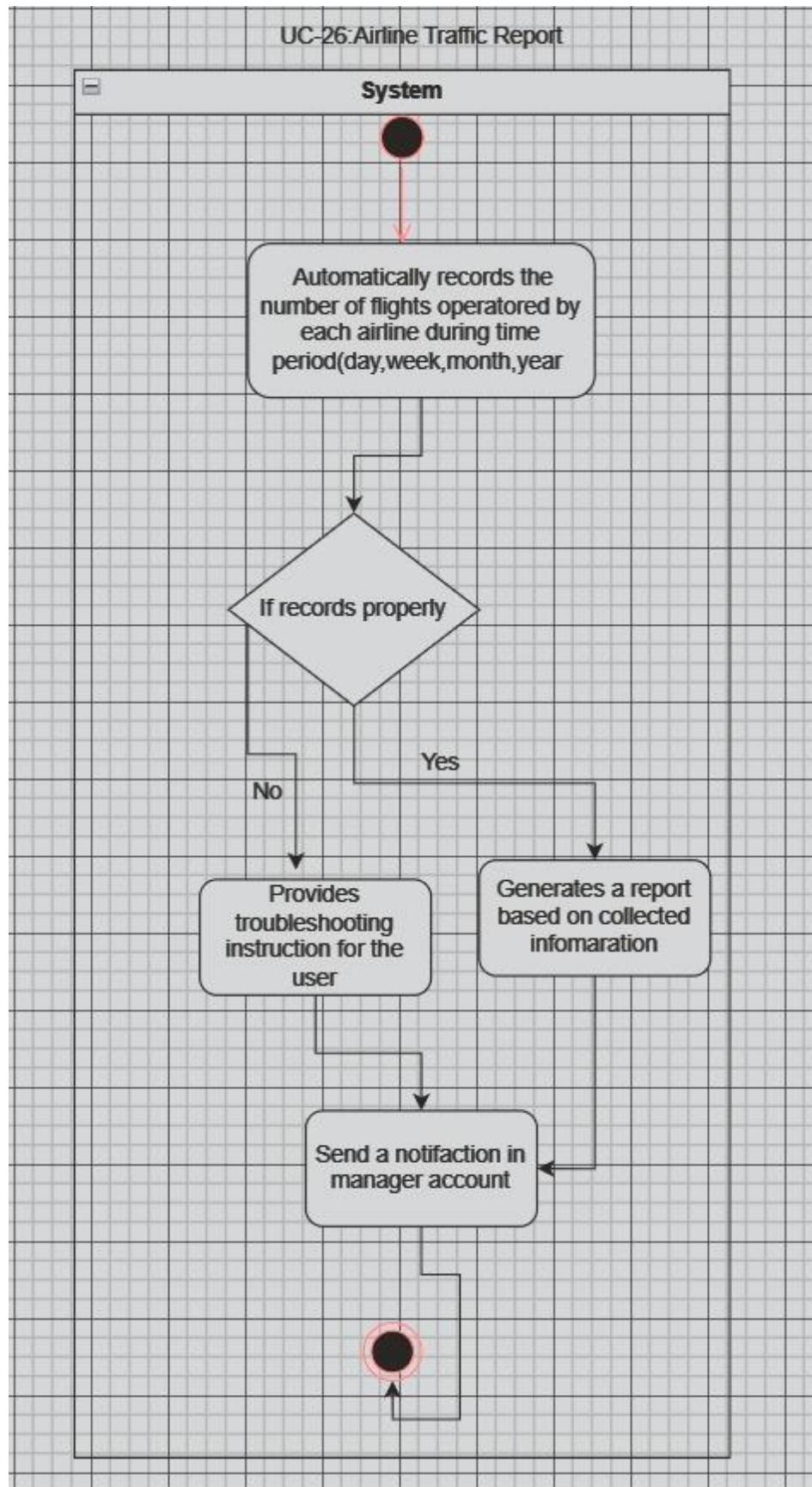
UC24: Invoice Generation



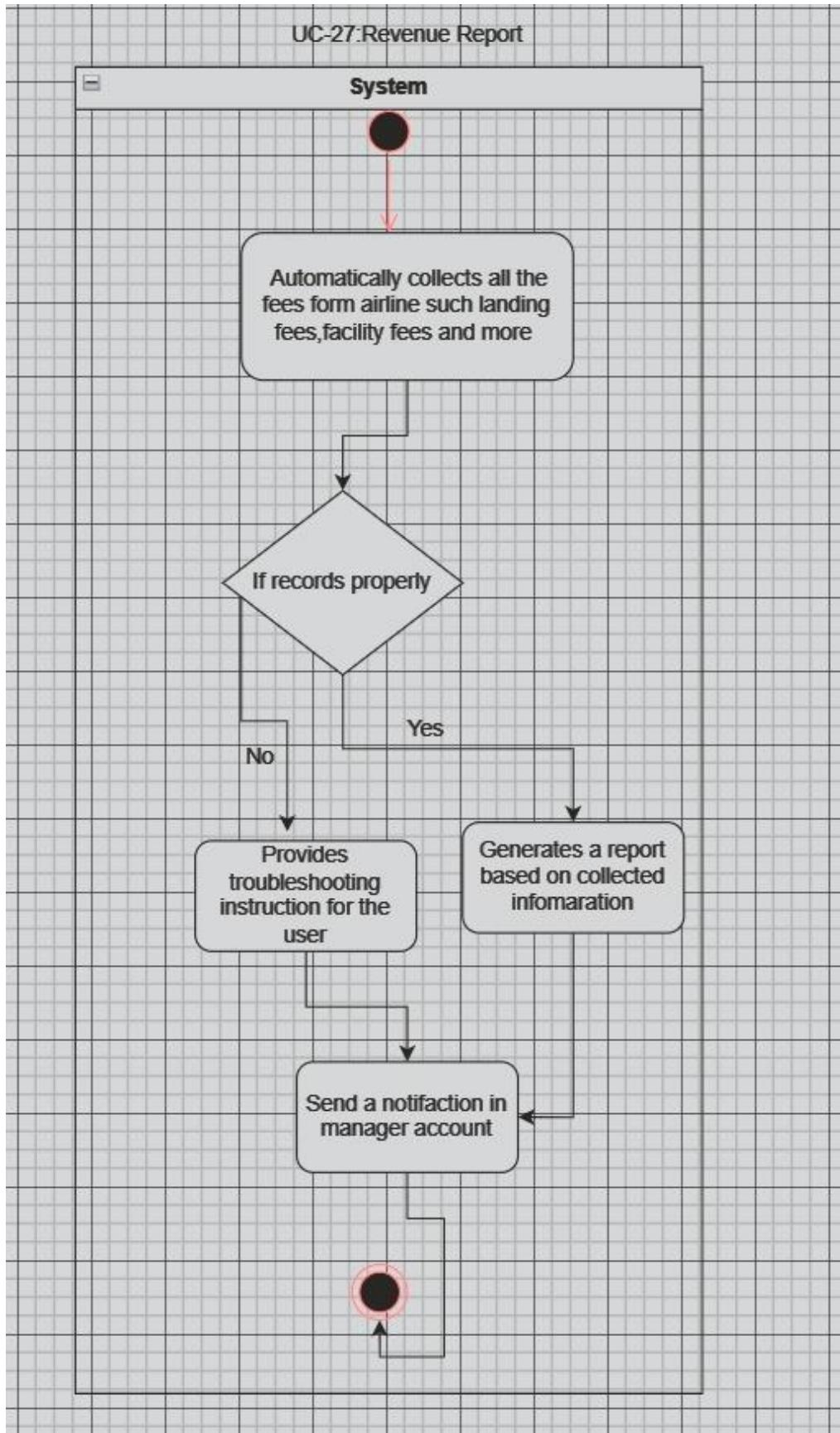
Airport Management System Requirements Specification



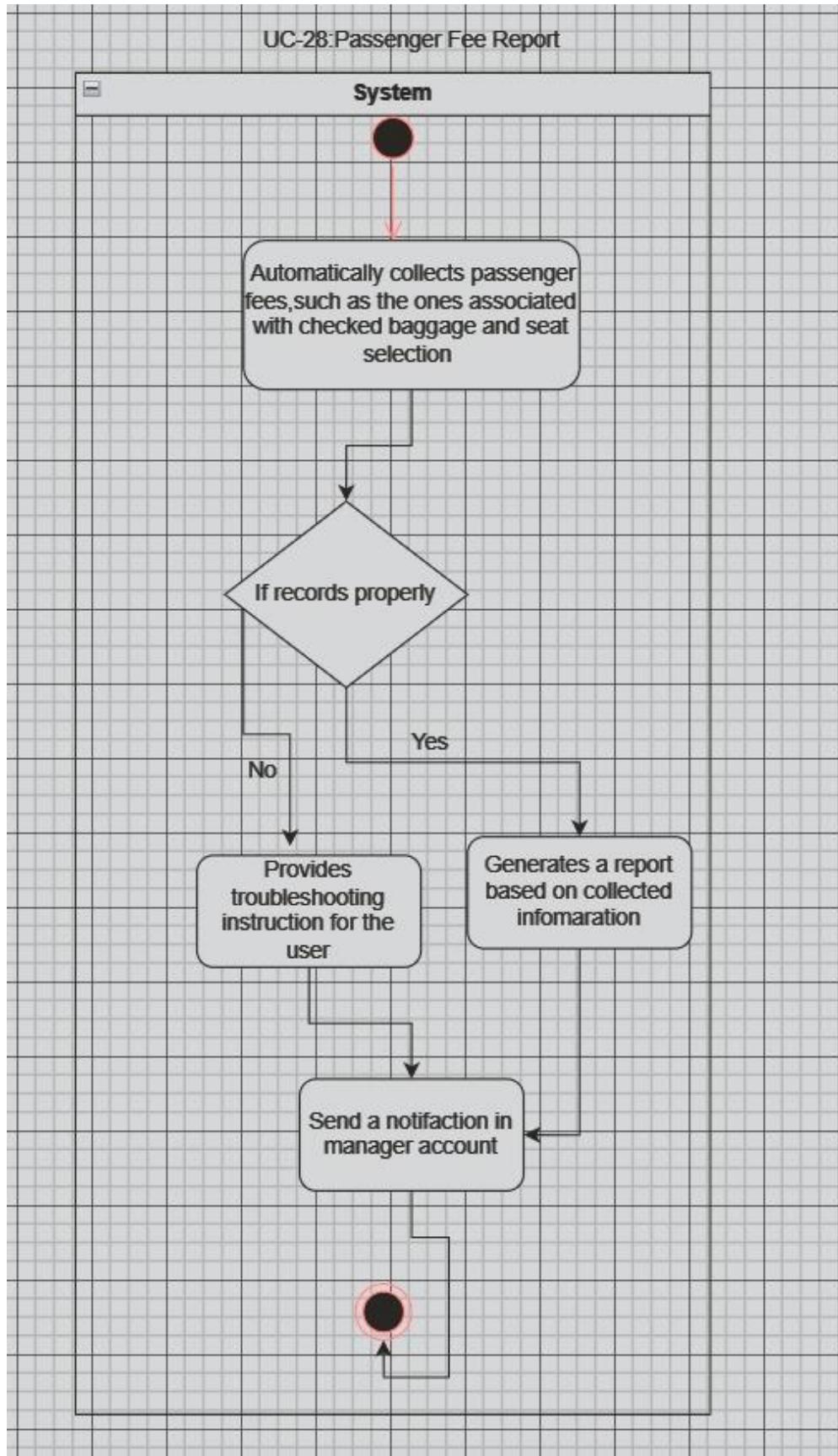
Airport Management System Requirements Specification



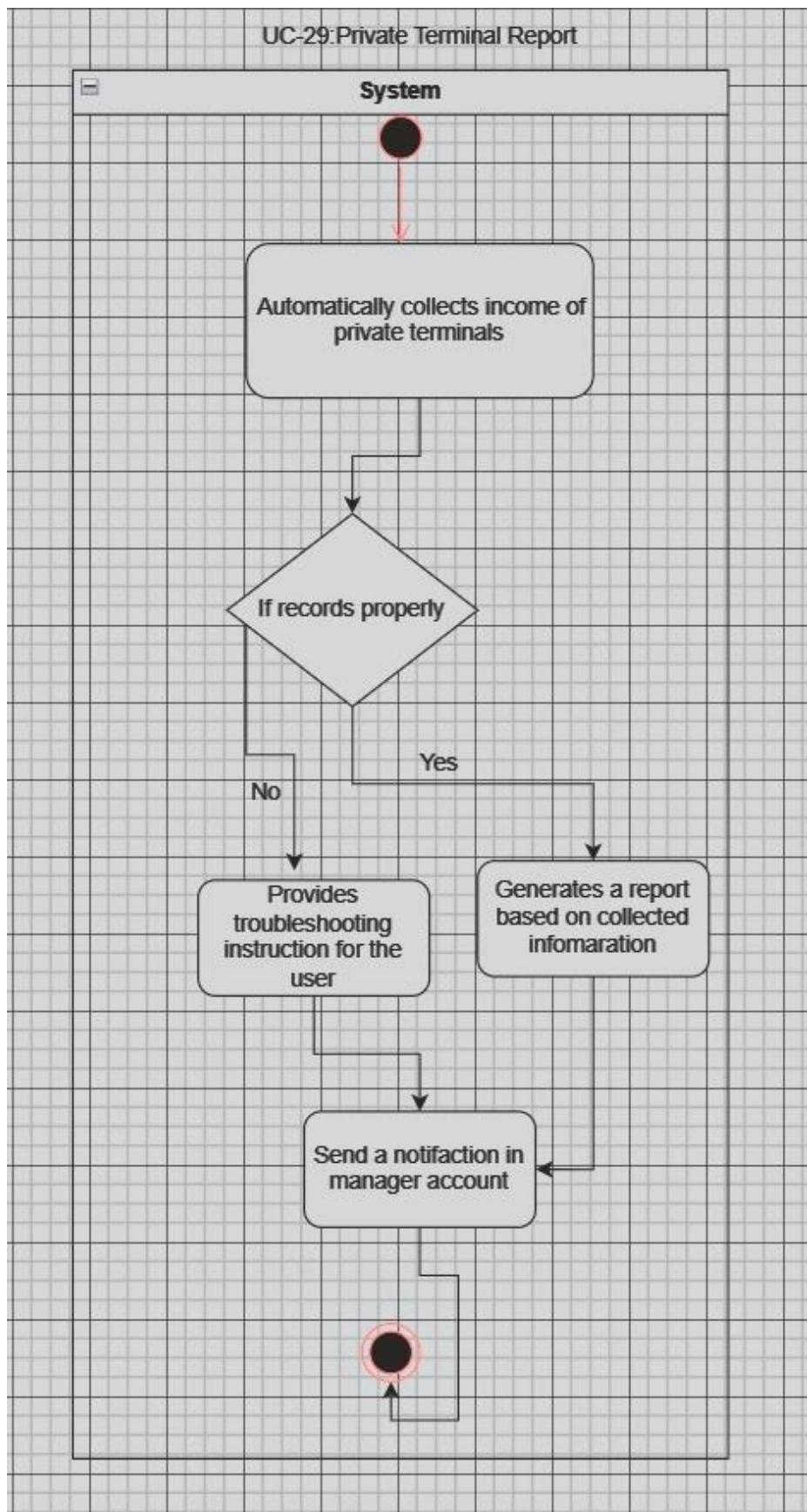
Airport Management System Requirements Specification



Airport Management System Requirements Specification

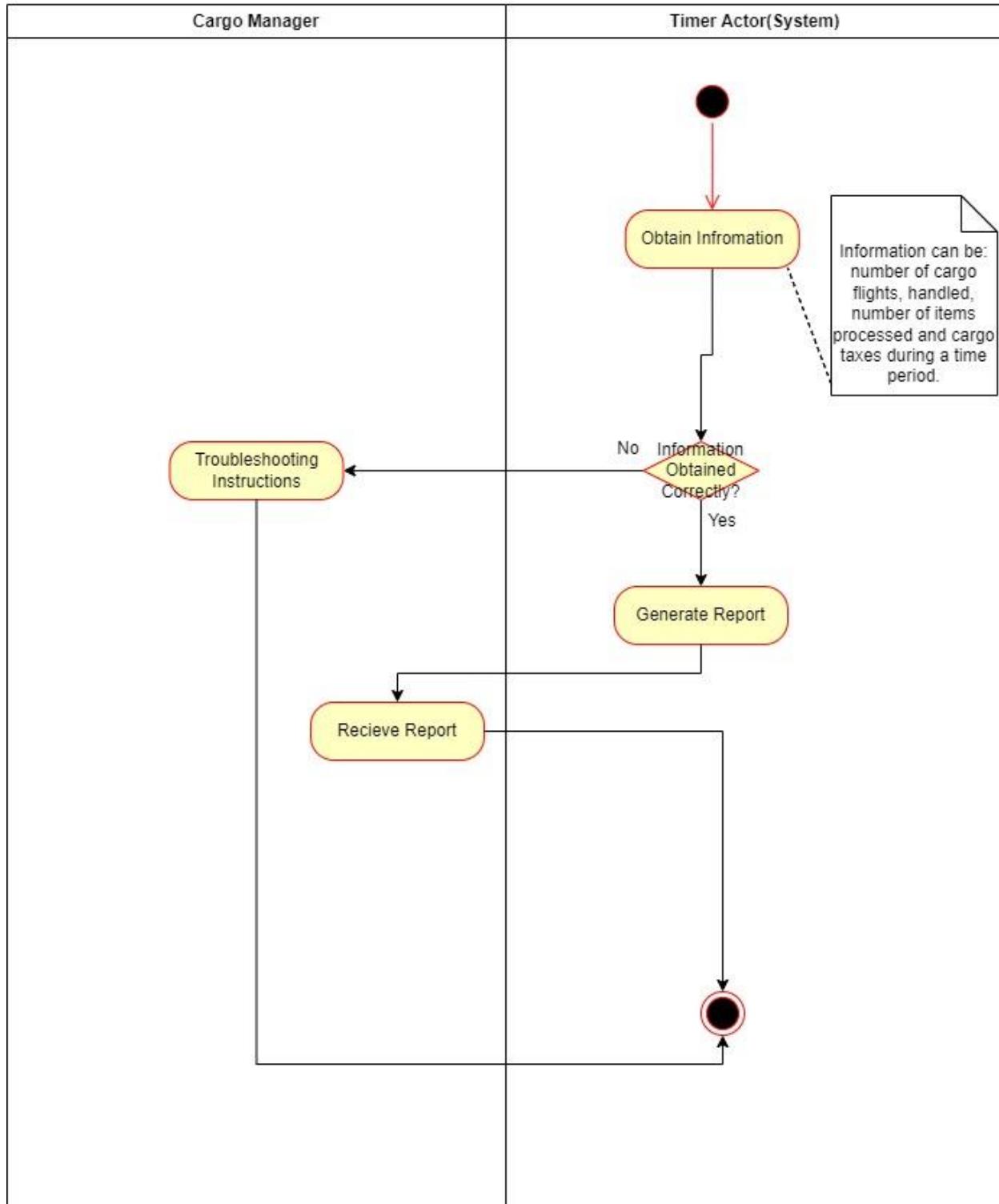


Airport Management System Requirements Specification



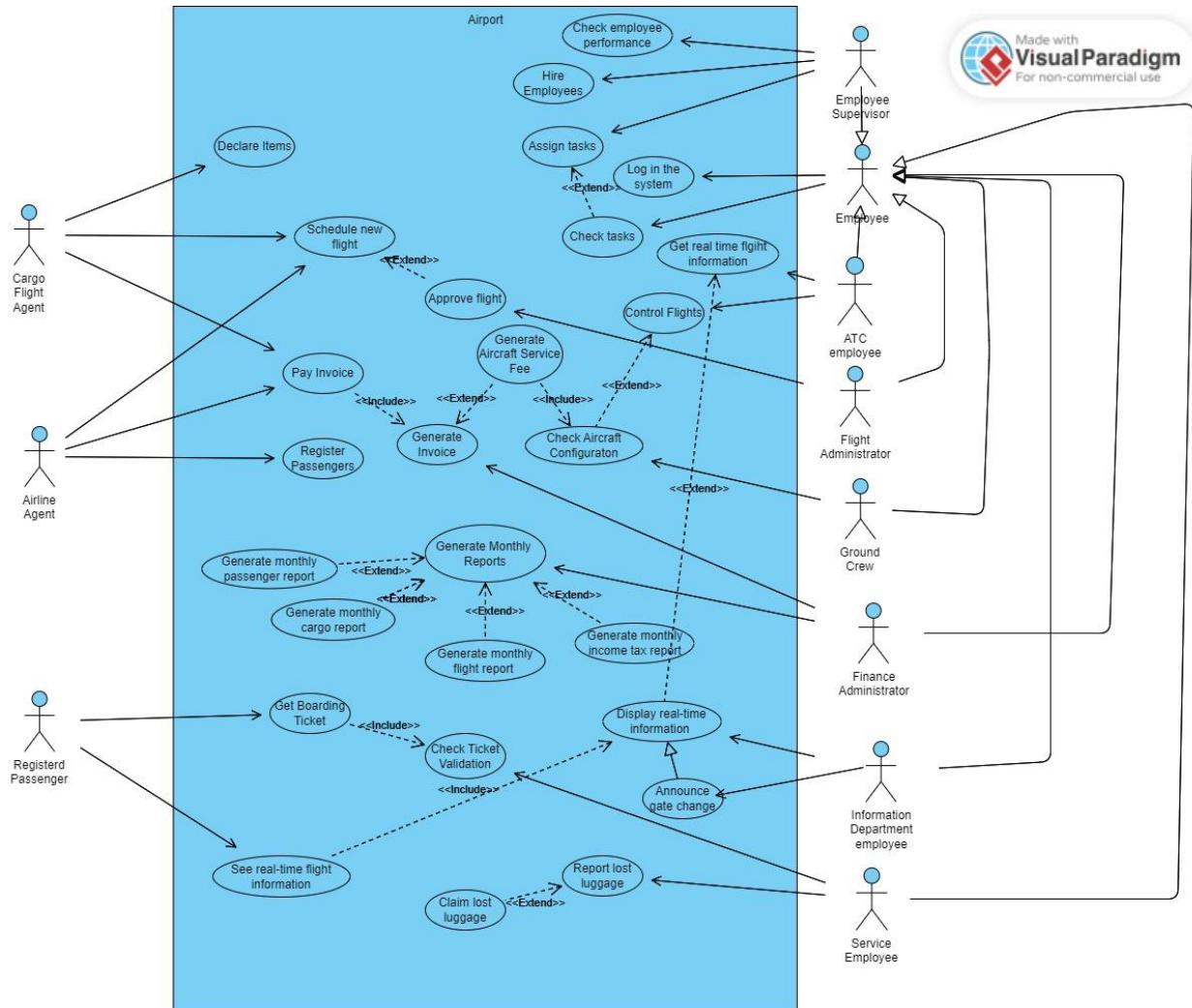
Airport Management System Requirements Specification

UC30: Cargo Report



Airport Management System Requirements Specification

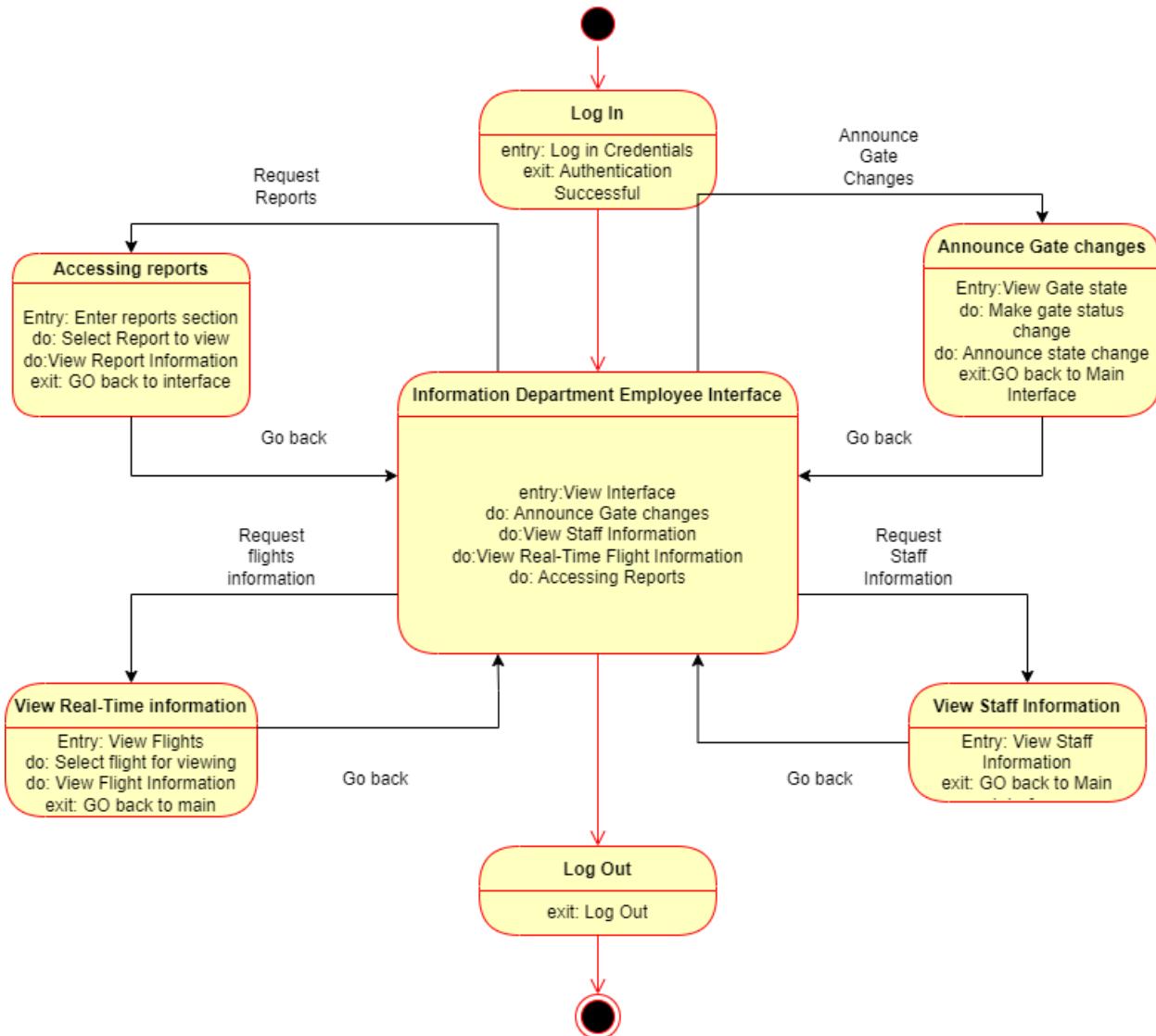
Use Case Diagram



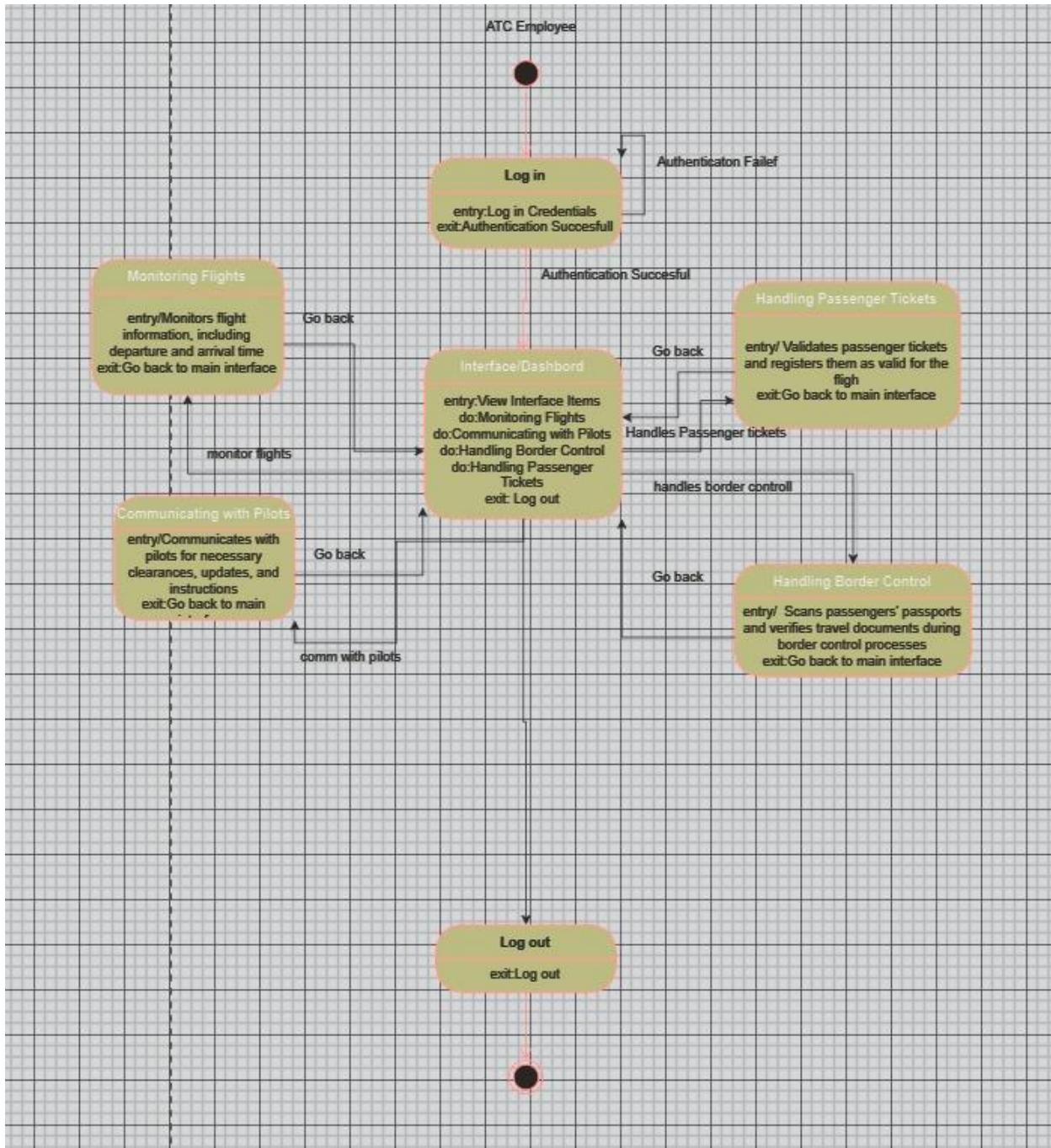
Airport Management System Requirements Specification

State Diagrams

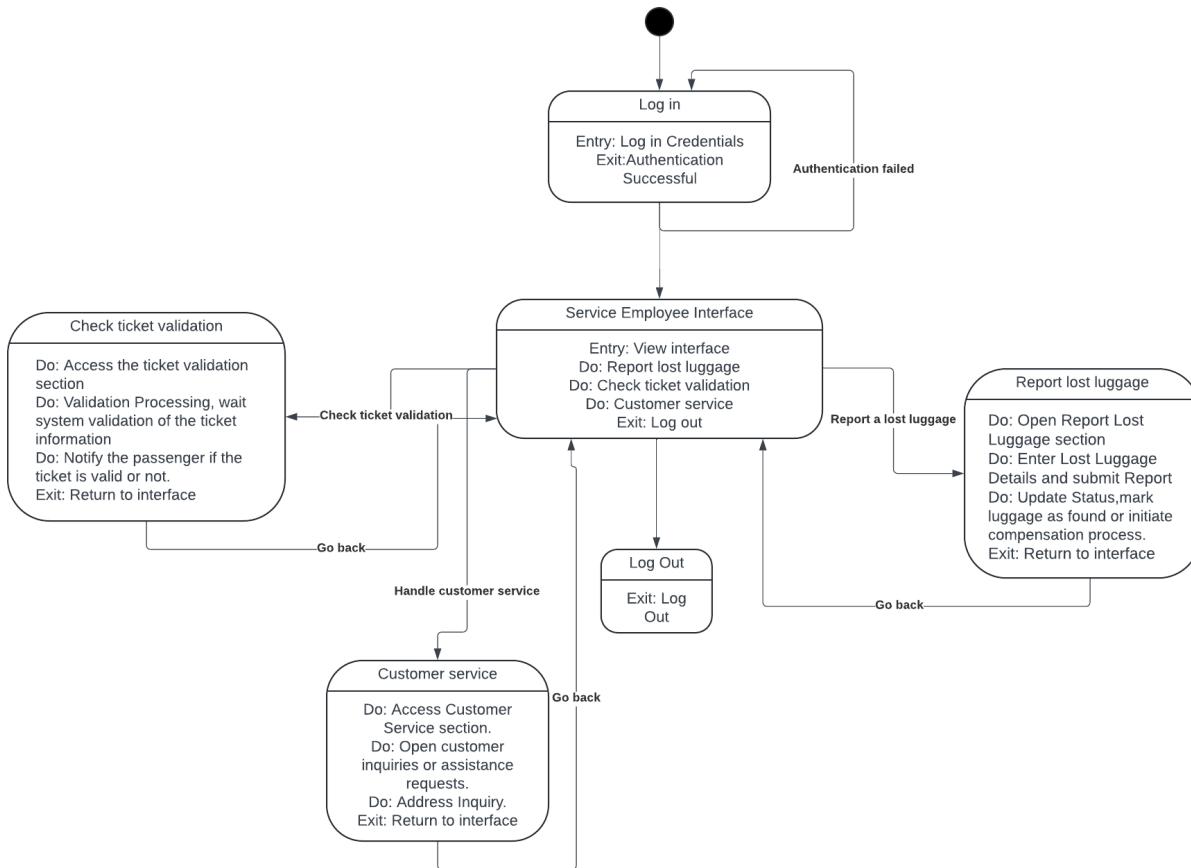
Information Department Employee State Diagram



Airport Management System Requirements Specification

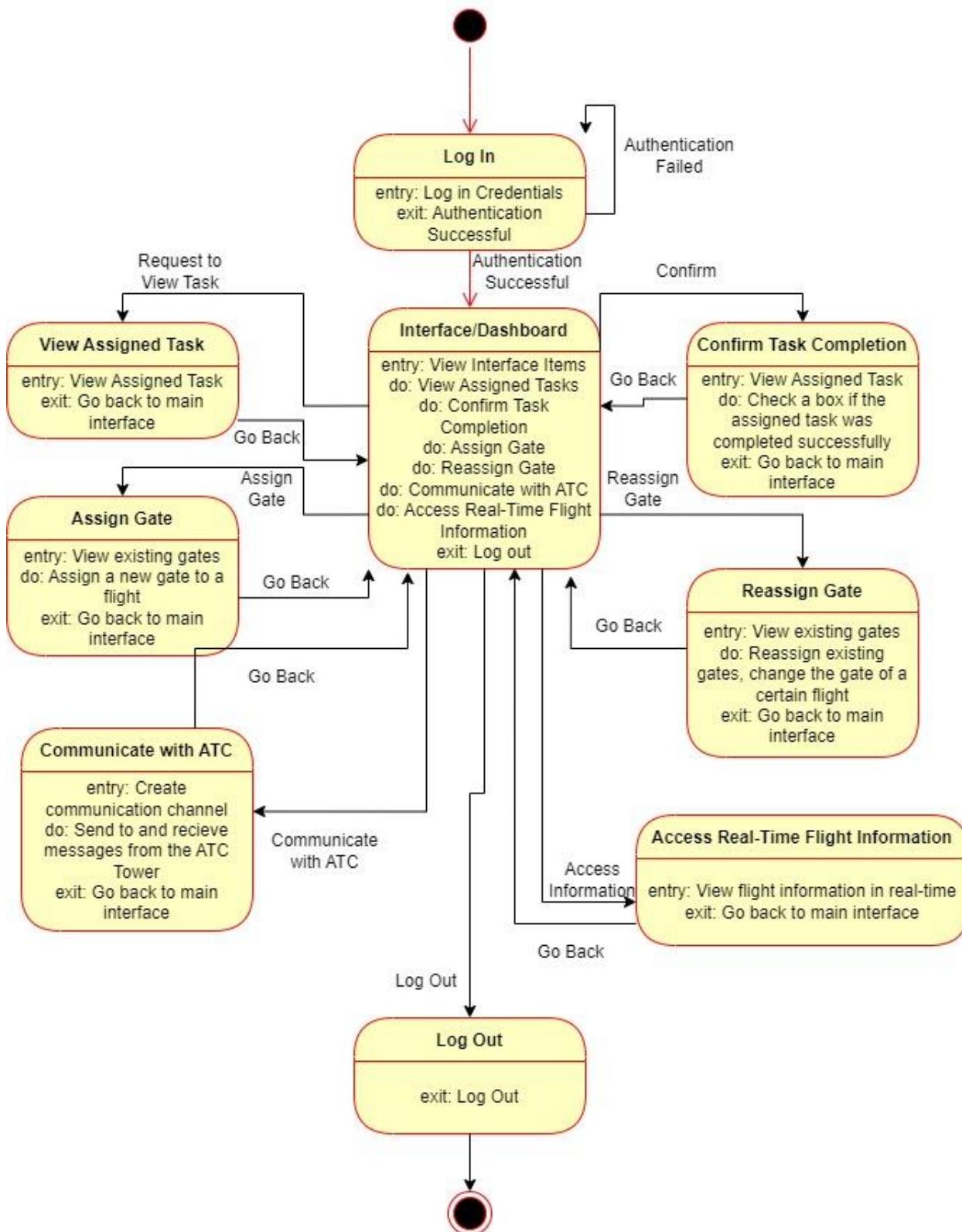


Airport Management System Requirements Specification



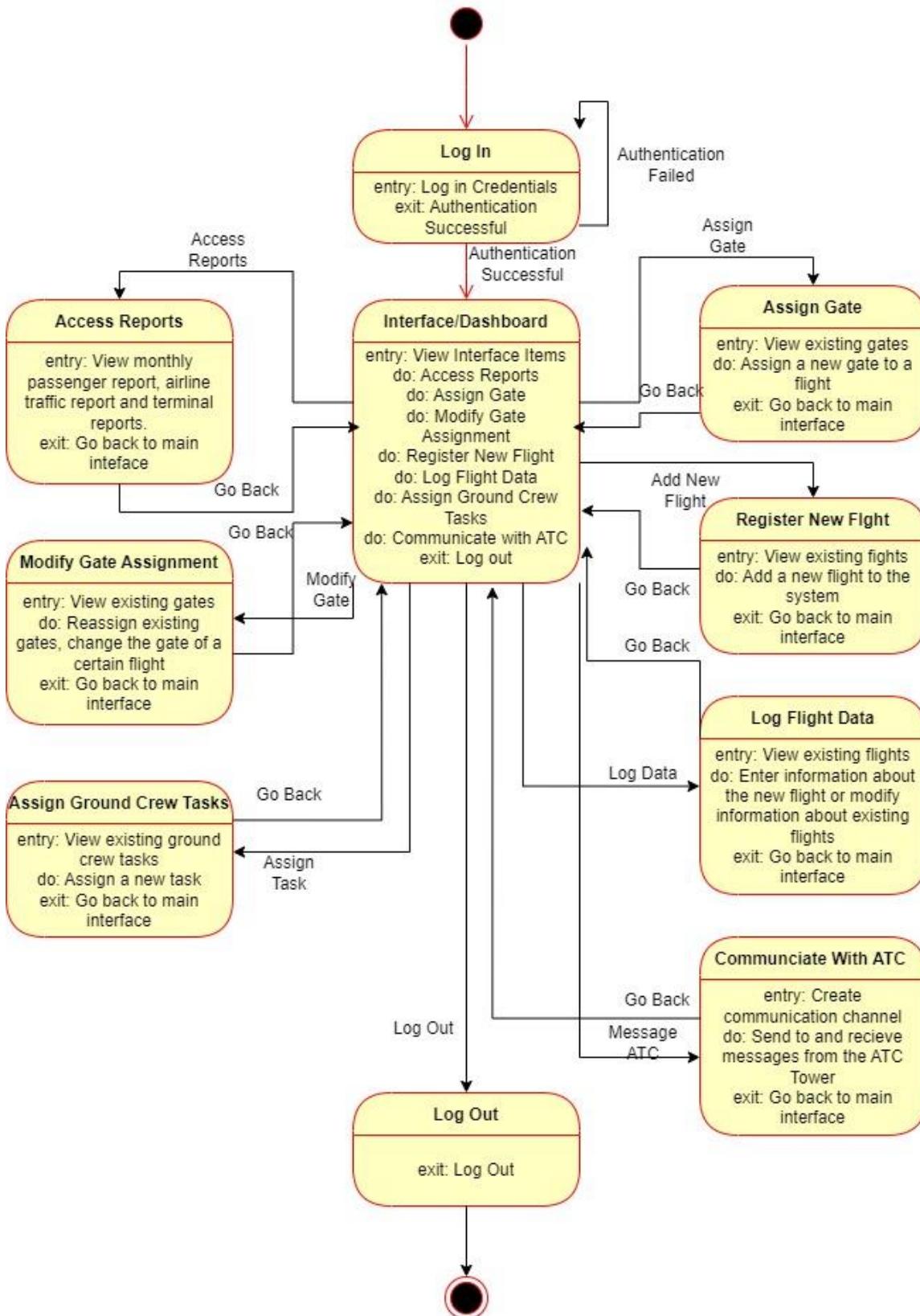
Airport Management System Requirements Specification

Ground Crew State Diagram

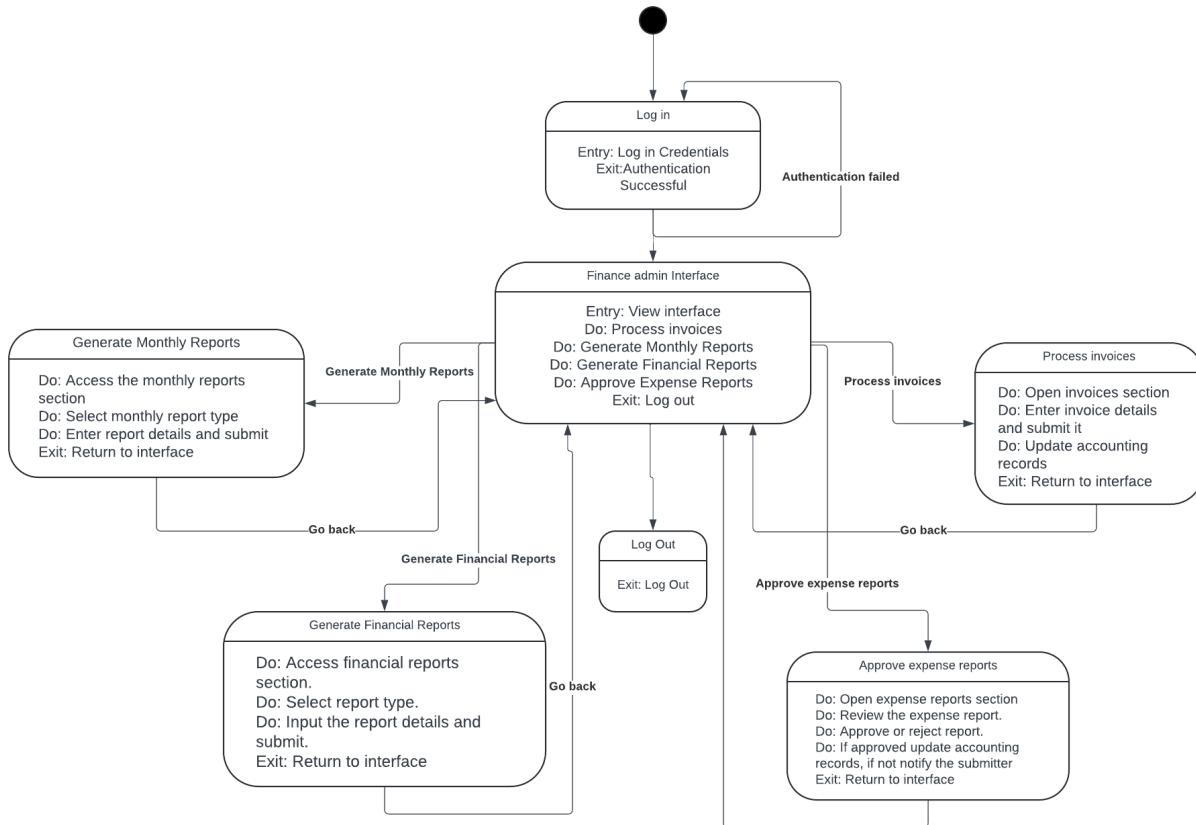


Airport Management System Requirements Specification

Flight Administrator State Diagram

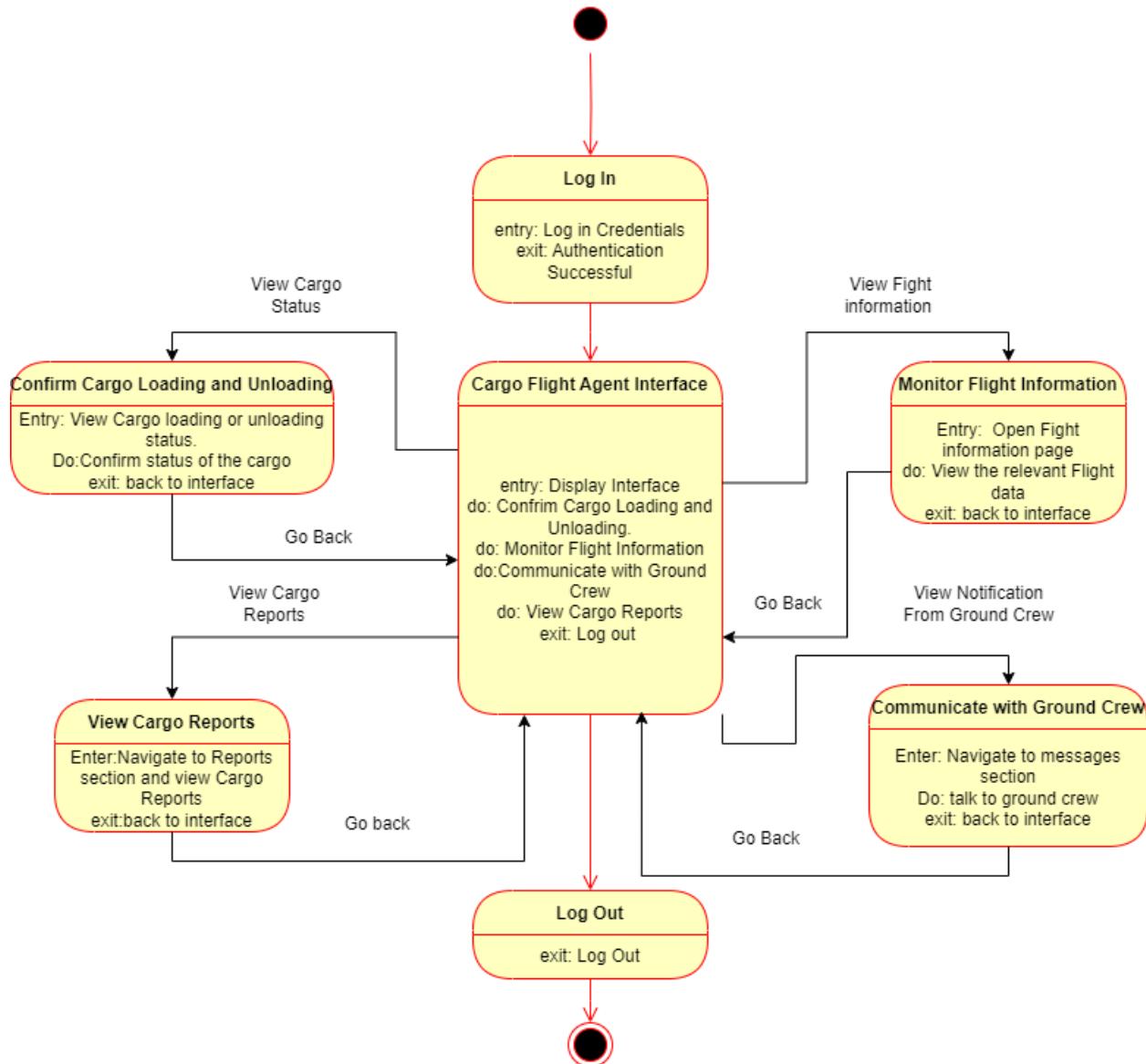


Airport Management System Requirements Specification

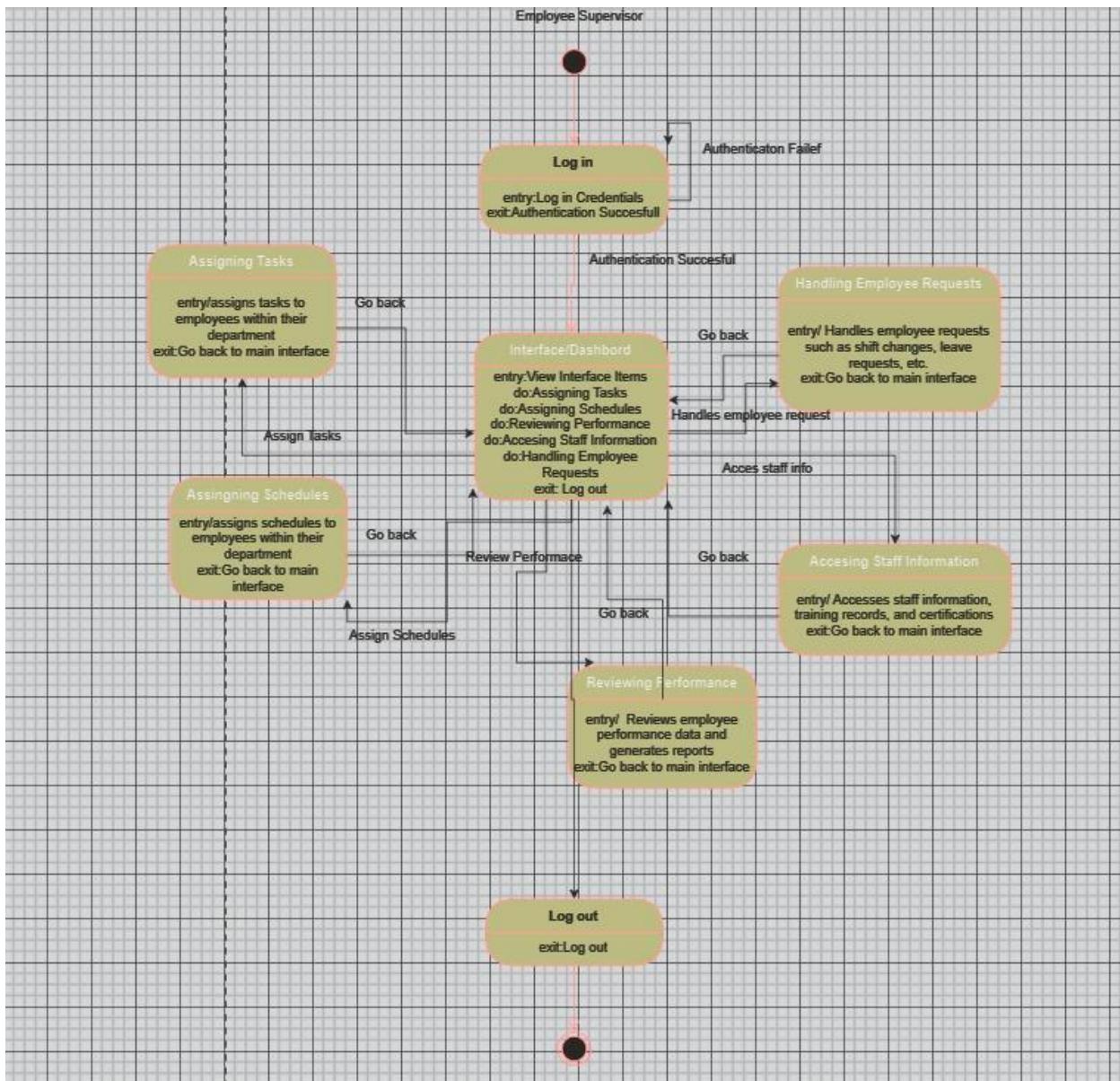


Airport Management System Requirements Specification

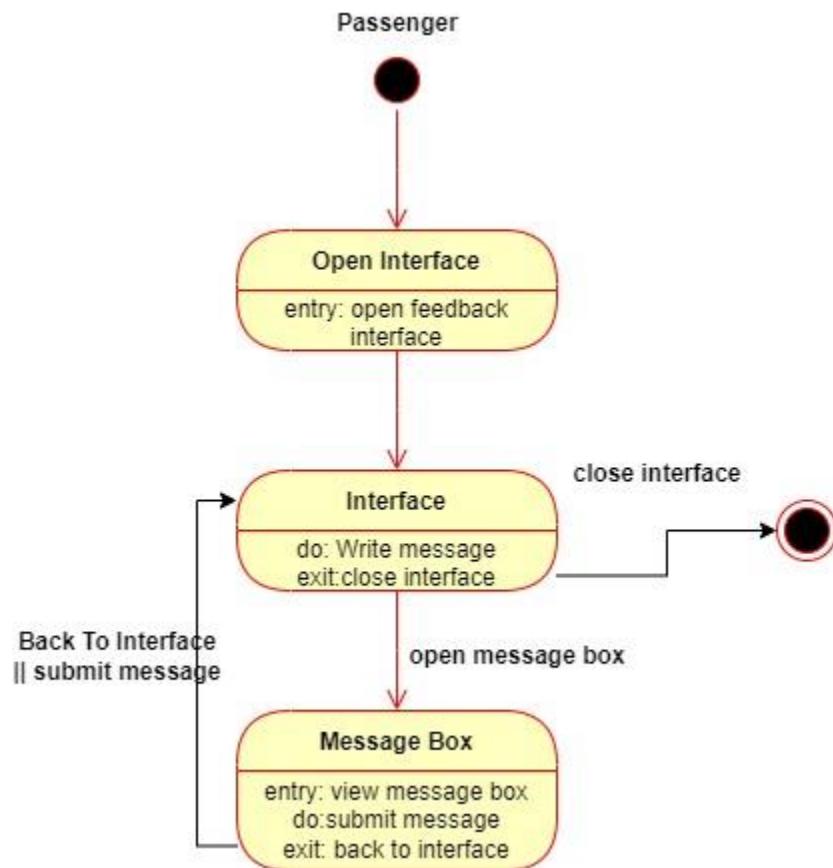
Cargo Flight Agent State Diagram



Airport Management System Requirements Specification

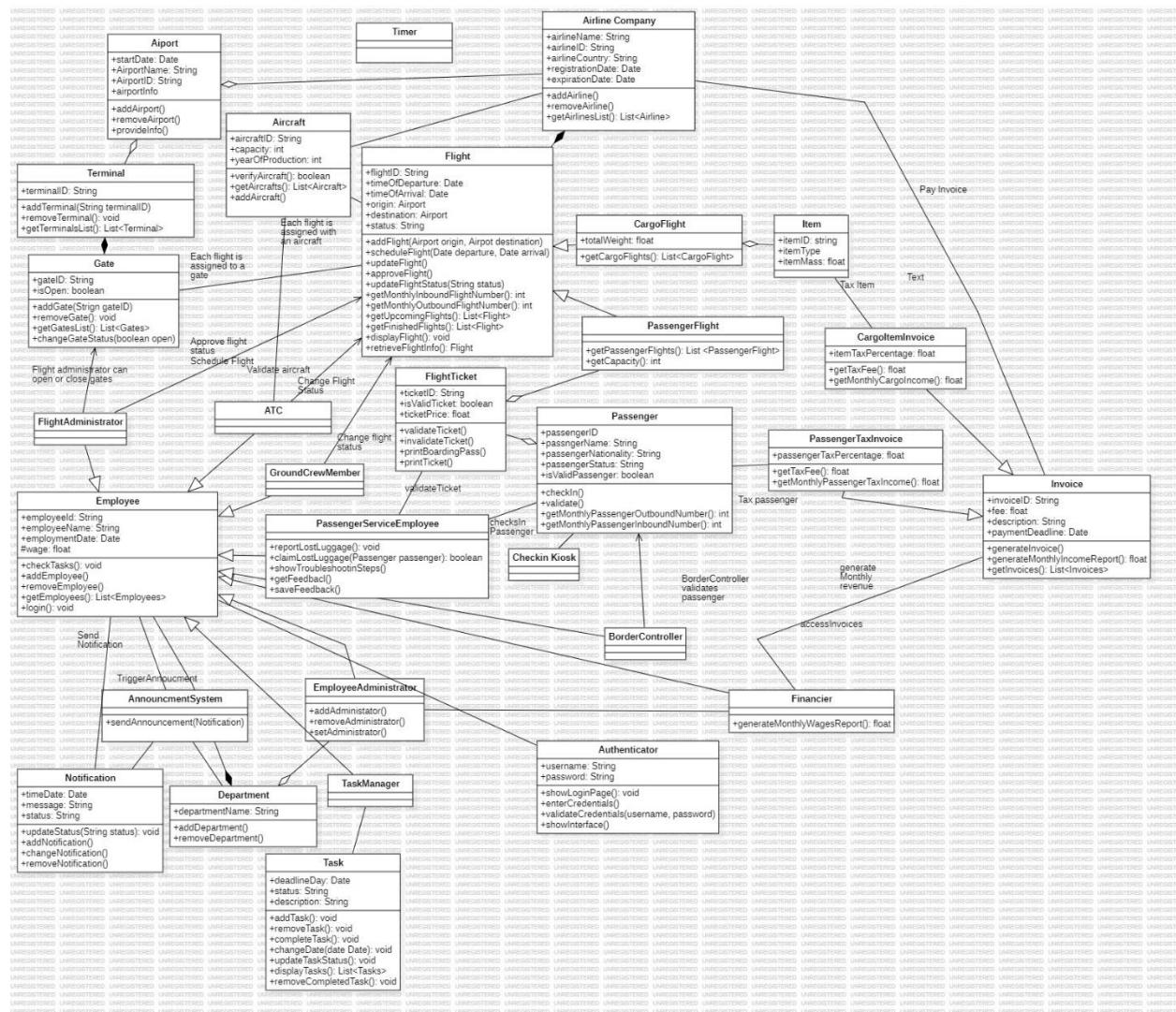


Airport Management System Requirements Specification



Airport Management System Requirements Specification

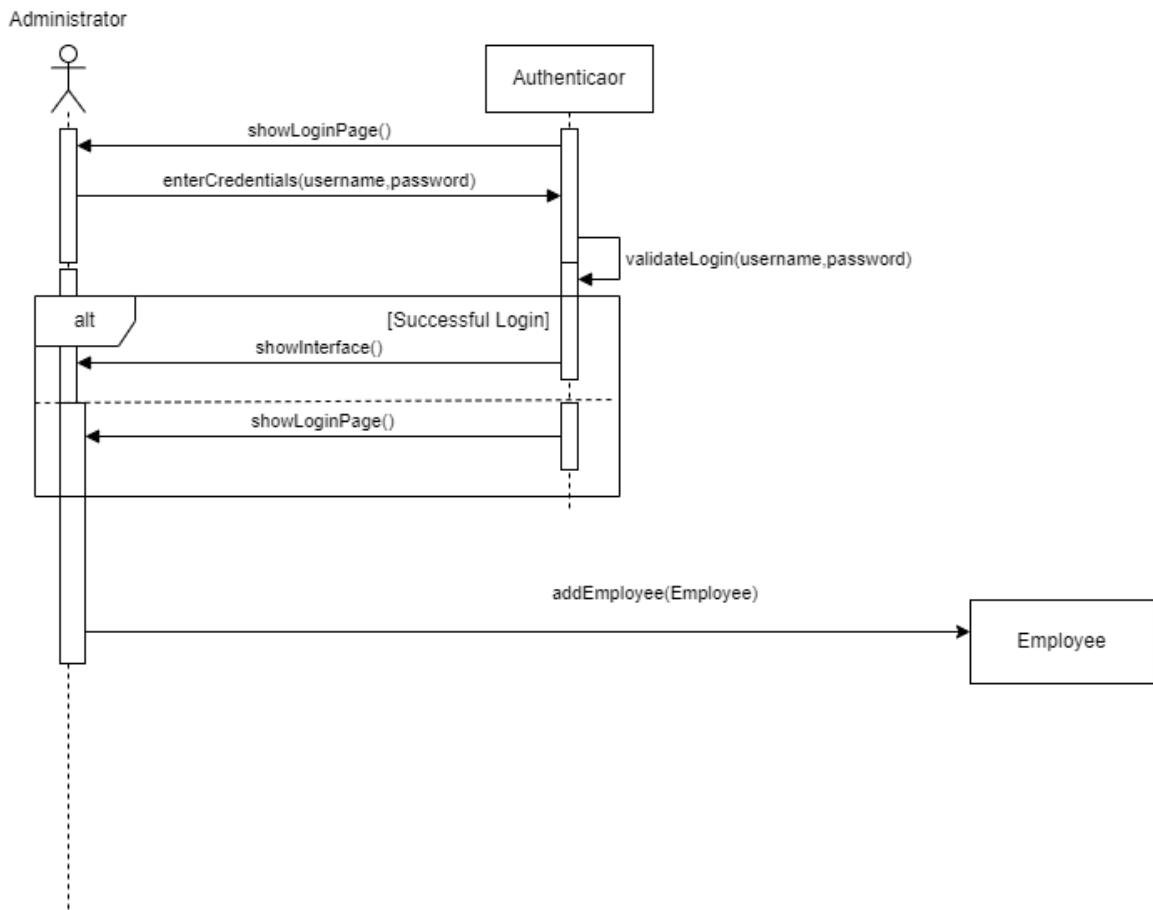
Class Diagram



Airport Management System Requirements Specification

Sequence Diagrams

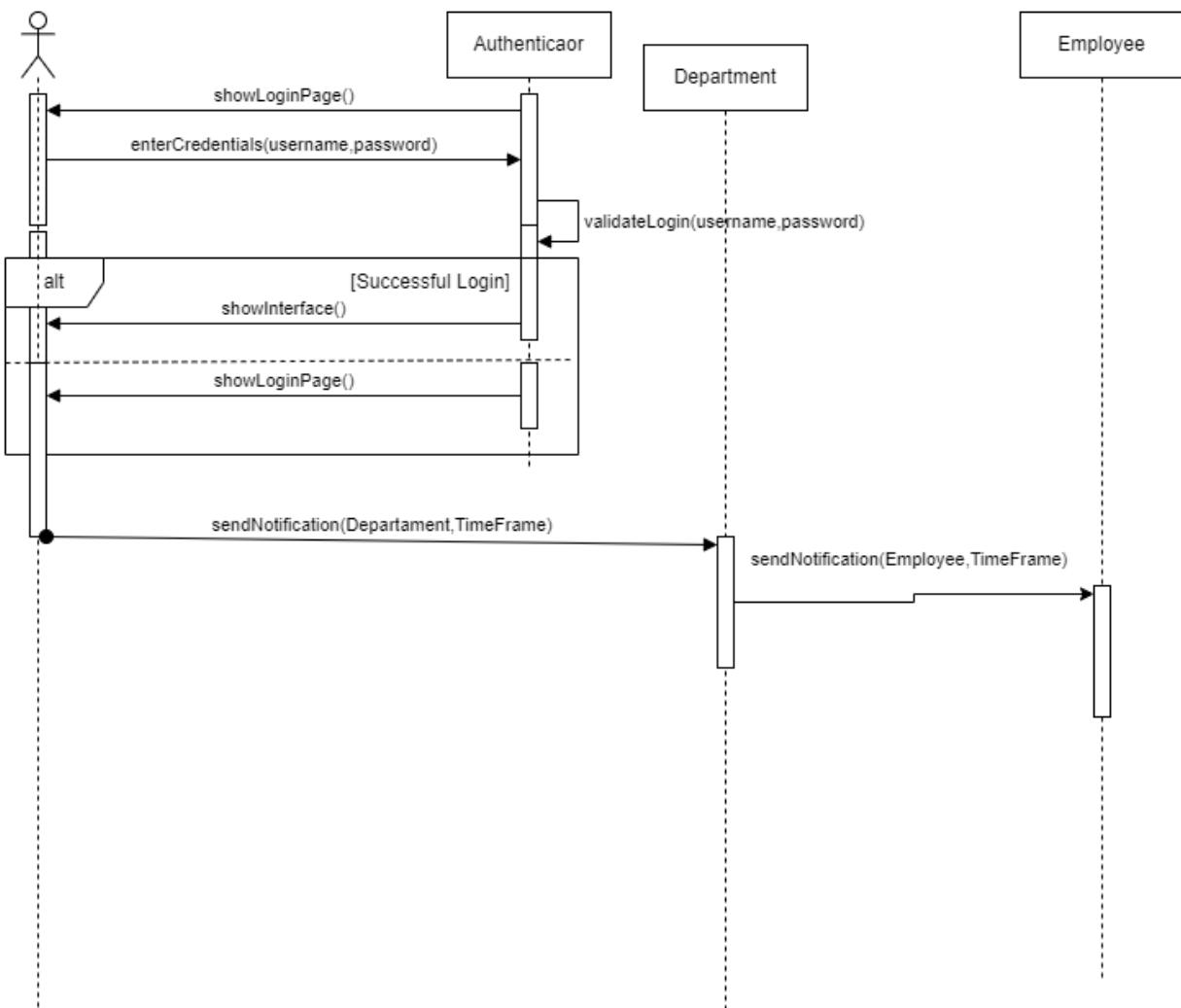
AC 1 : New Hire Onboarding



Airport Management System Requirements Specification

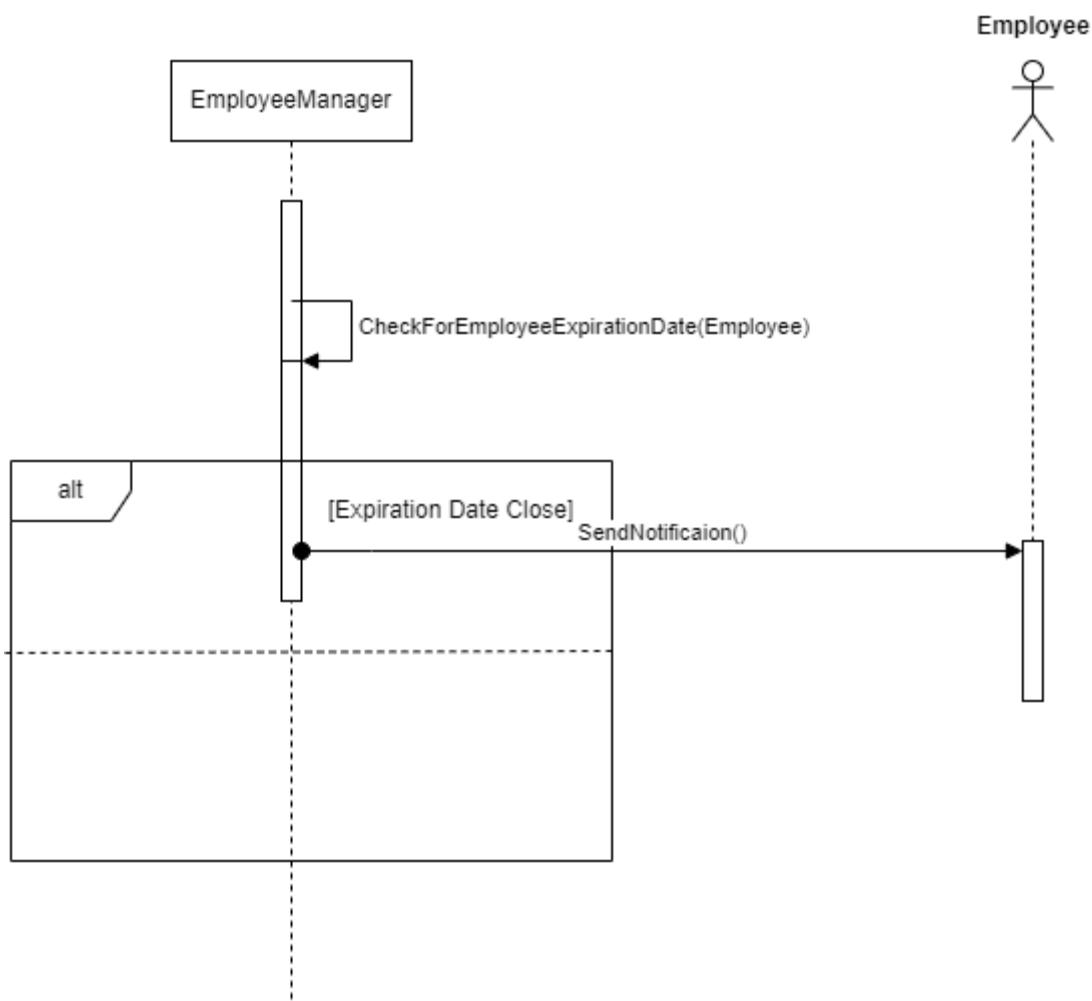
AC2 : Schedule Management

Administrator



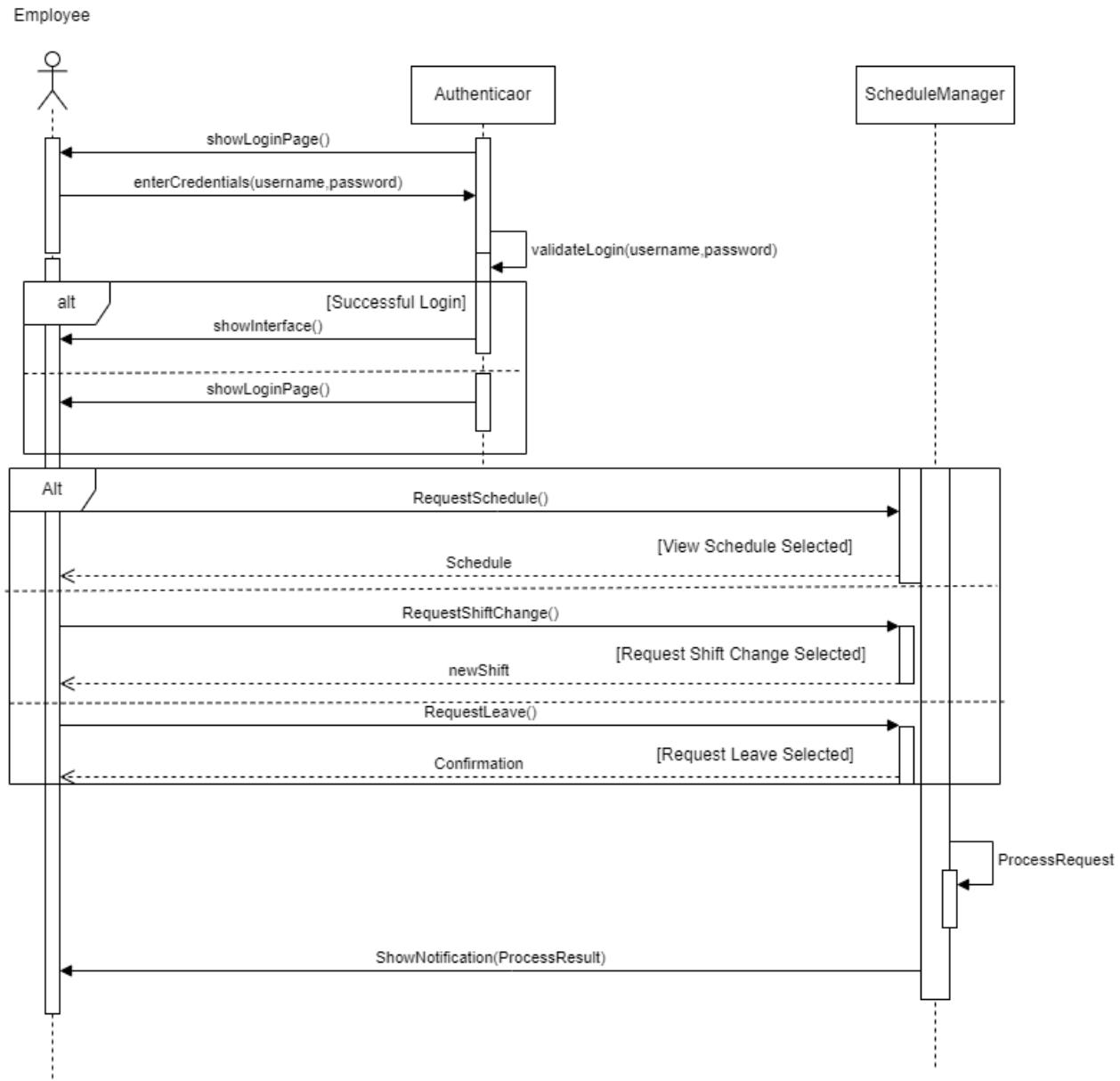
Airport Management System Requirements Specification

AC 3 : Training And Certification Tracking



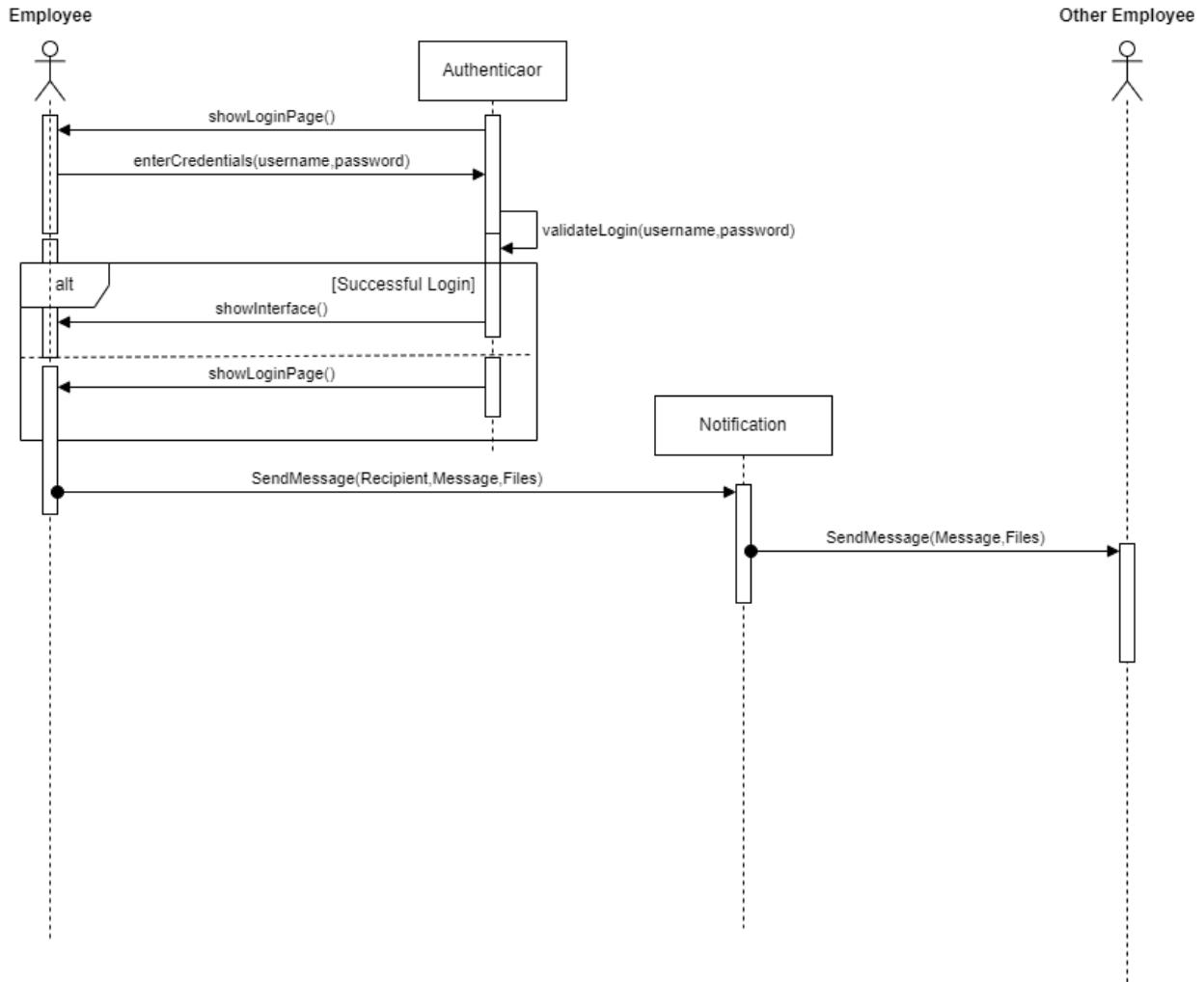
Airport Management System Requirements Specification

AC4 : Employee Self-Service



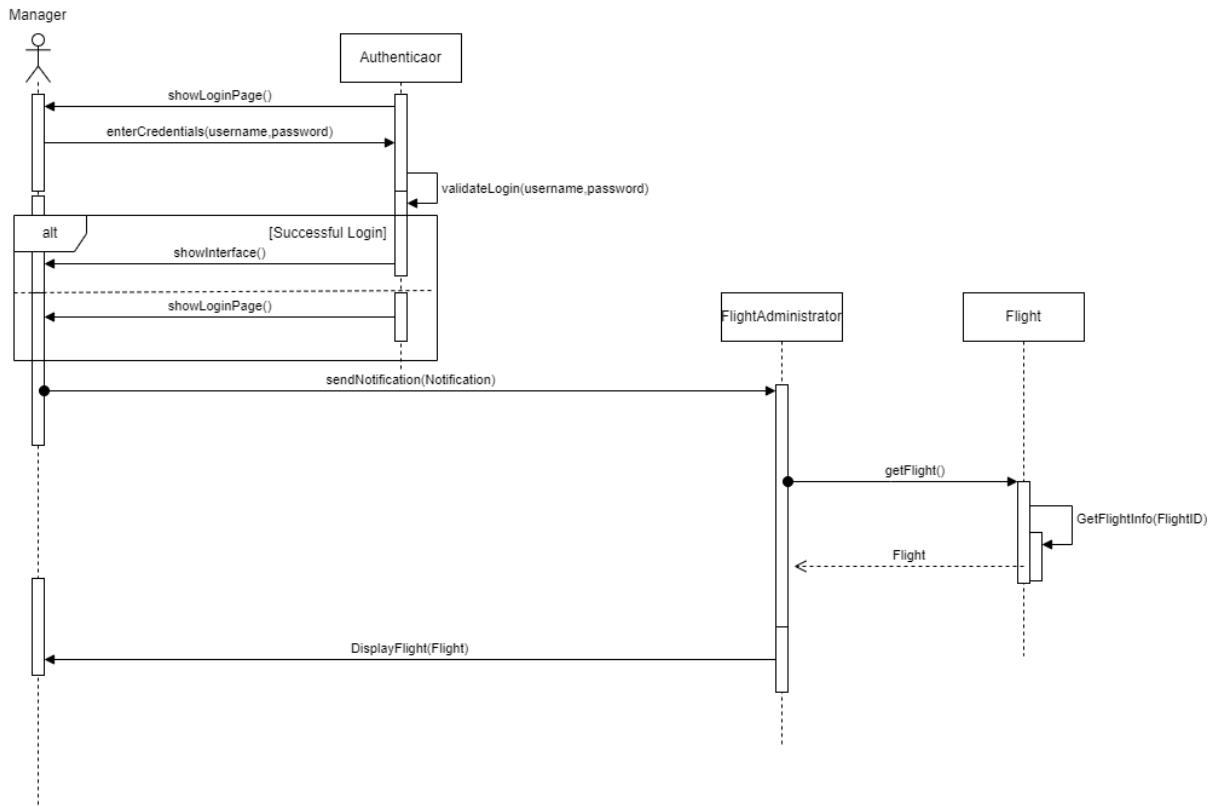
Airport Management System Requirements Specification

AC 5 : Internal Communication



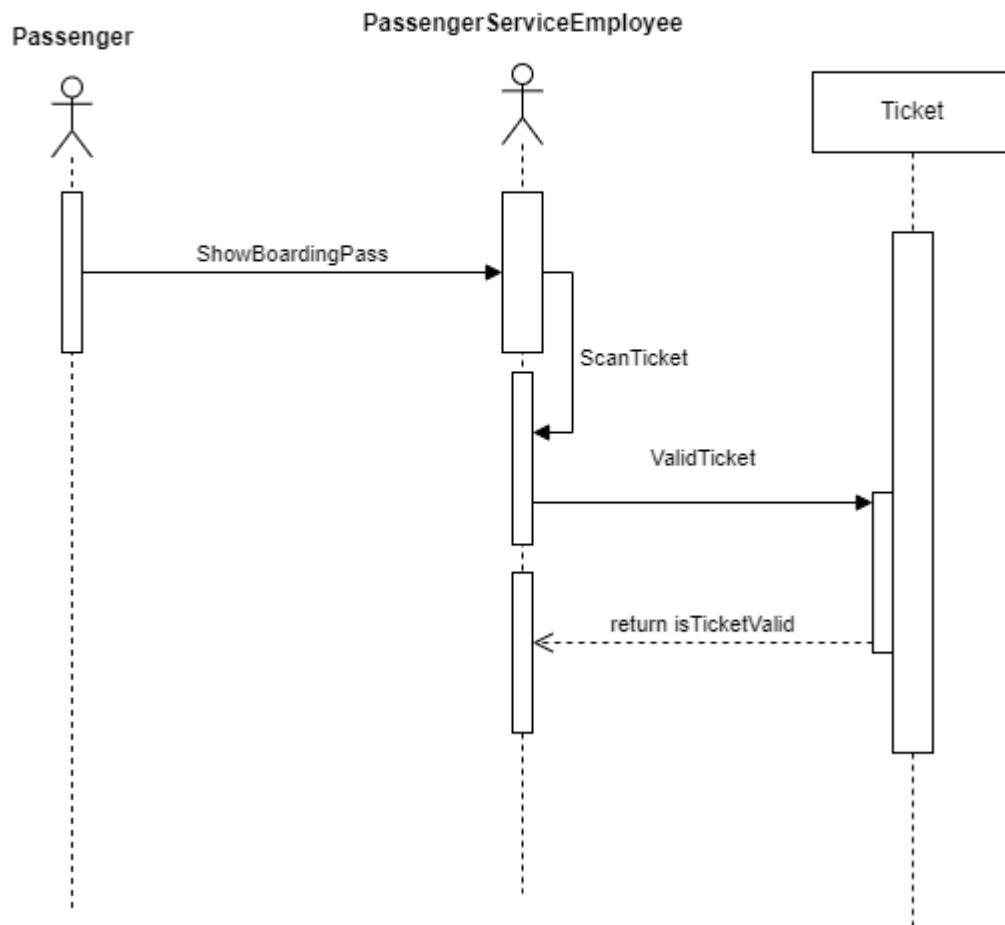
Airport Management System Requirements Specification

AC6:Performance Review



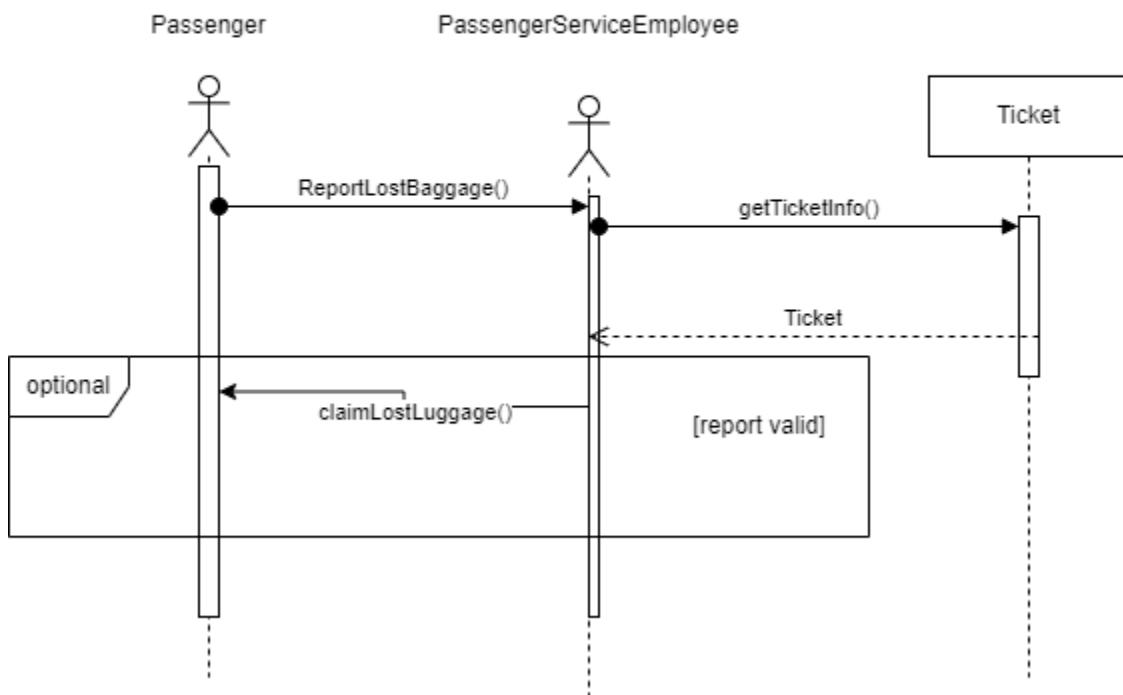
Airport Management System Requirements Specification

SD 7: Passenger Ticket Validation

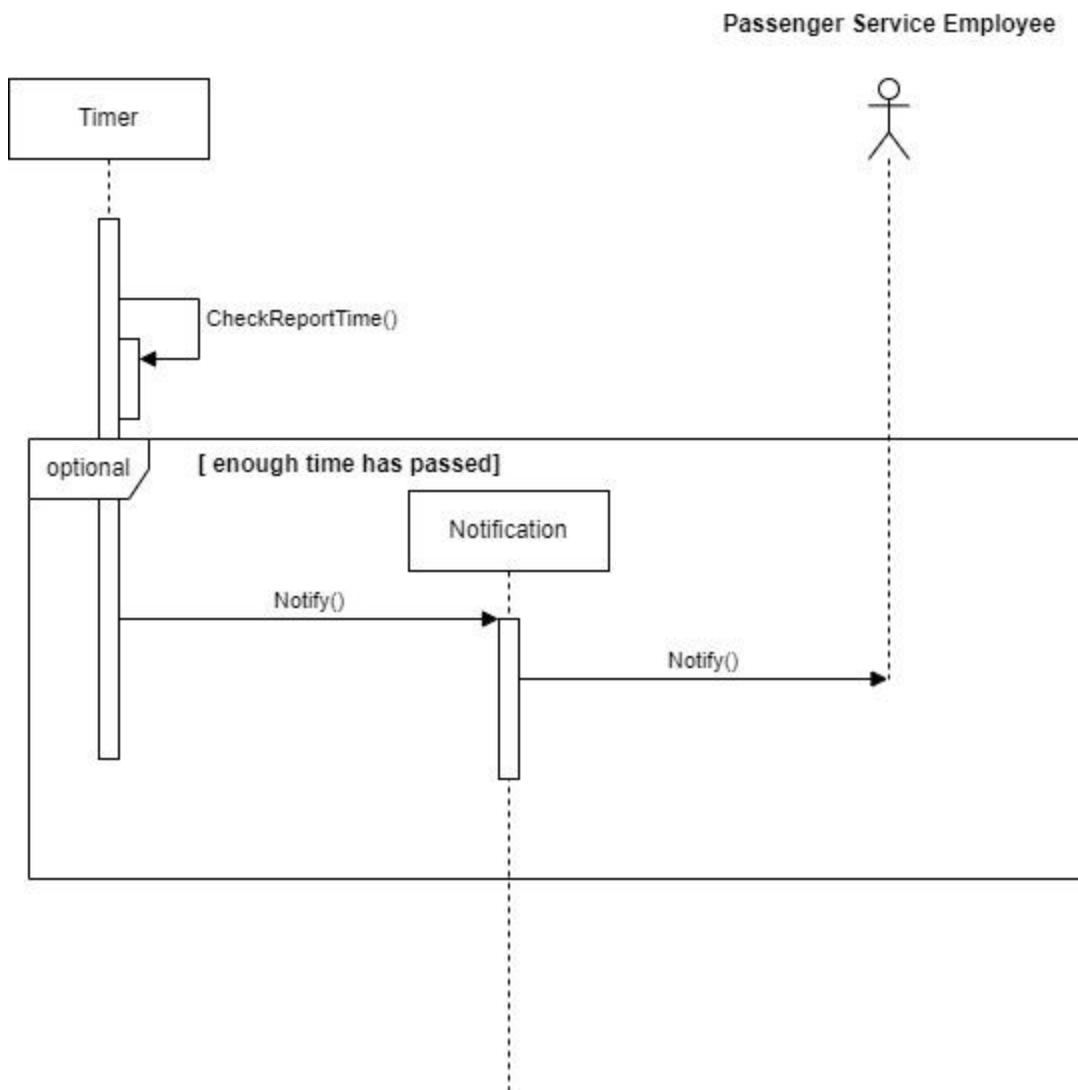


Airport Management System Requirements Specification

SD 8 : Lost Baggage Reporting



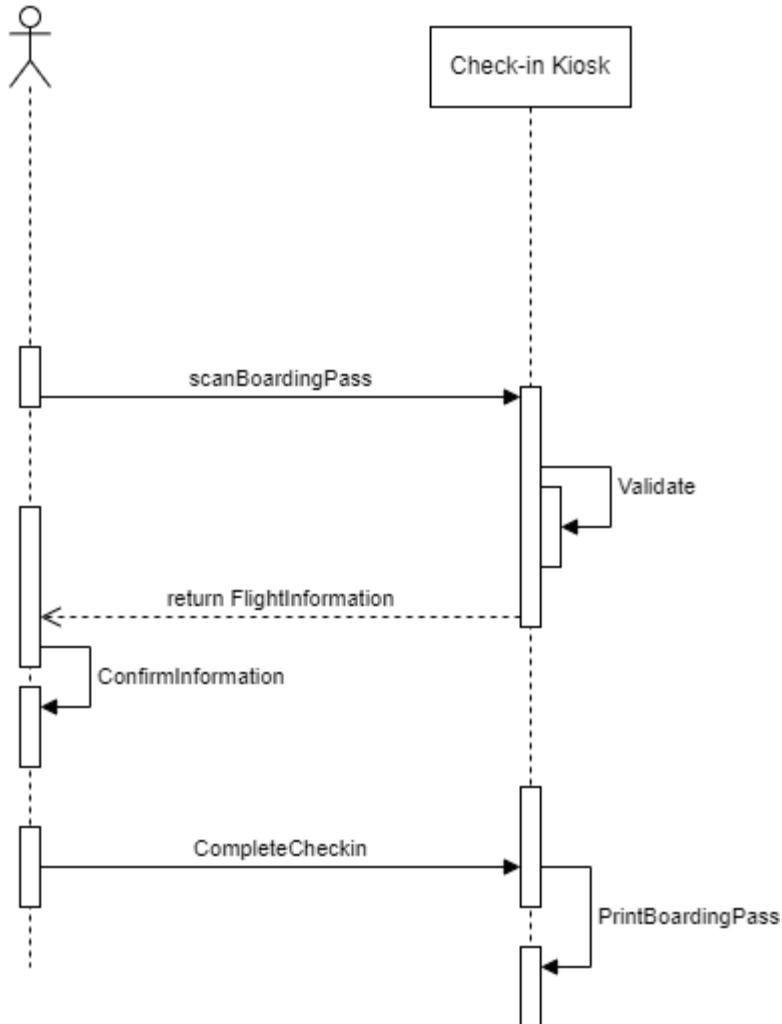
Airport Management System Requirements Specification



Airport Management System Requirements Specification

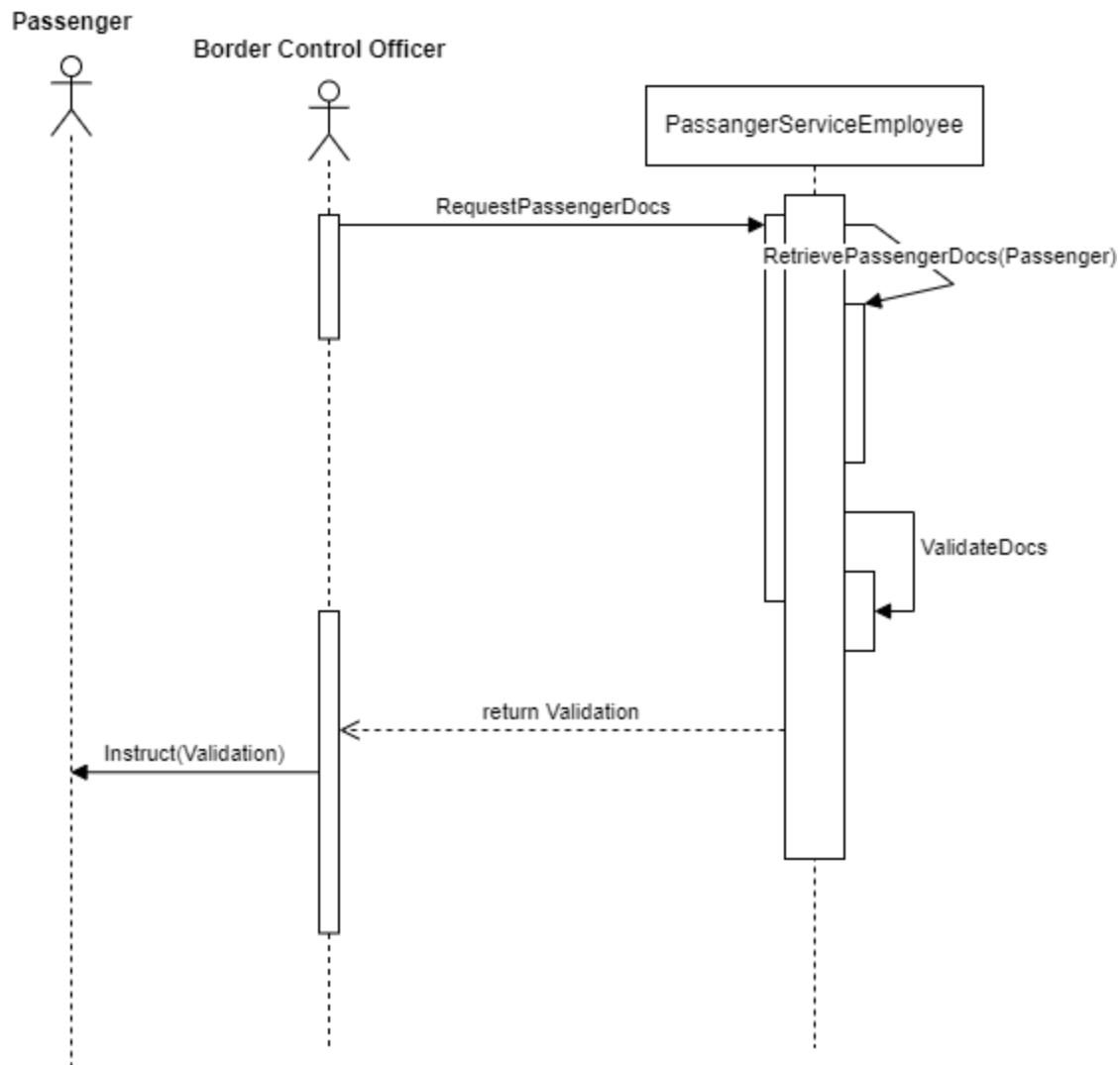
SD 10: Passenger Self-Service
Check-In

Passenger



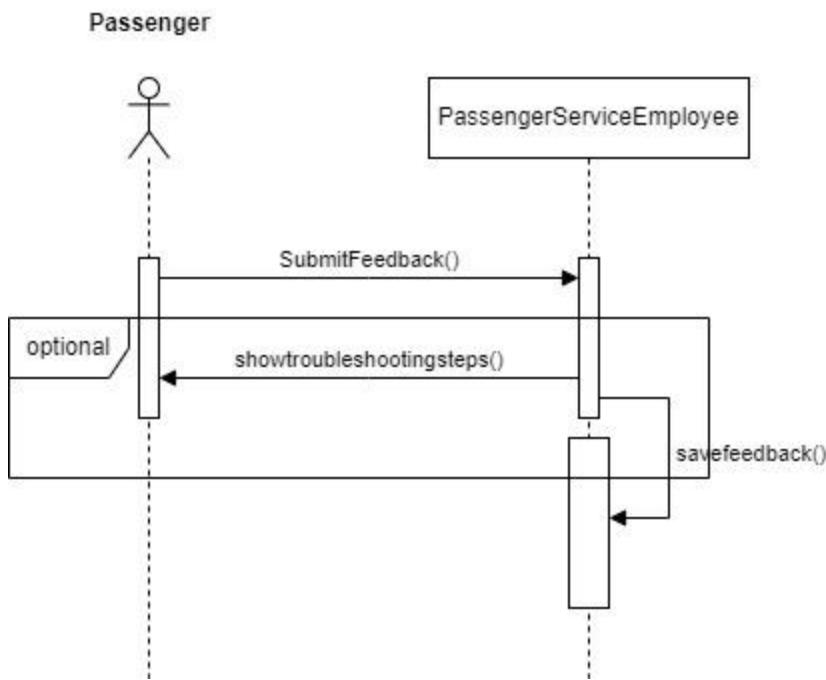
Airport Management System Requirements Specification

AC11 : Border Control



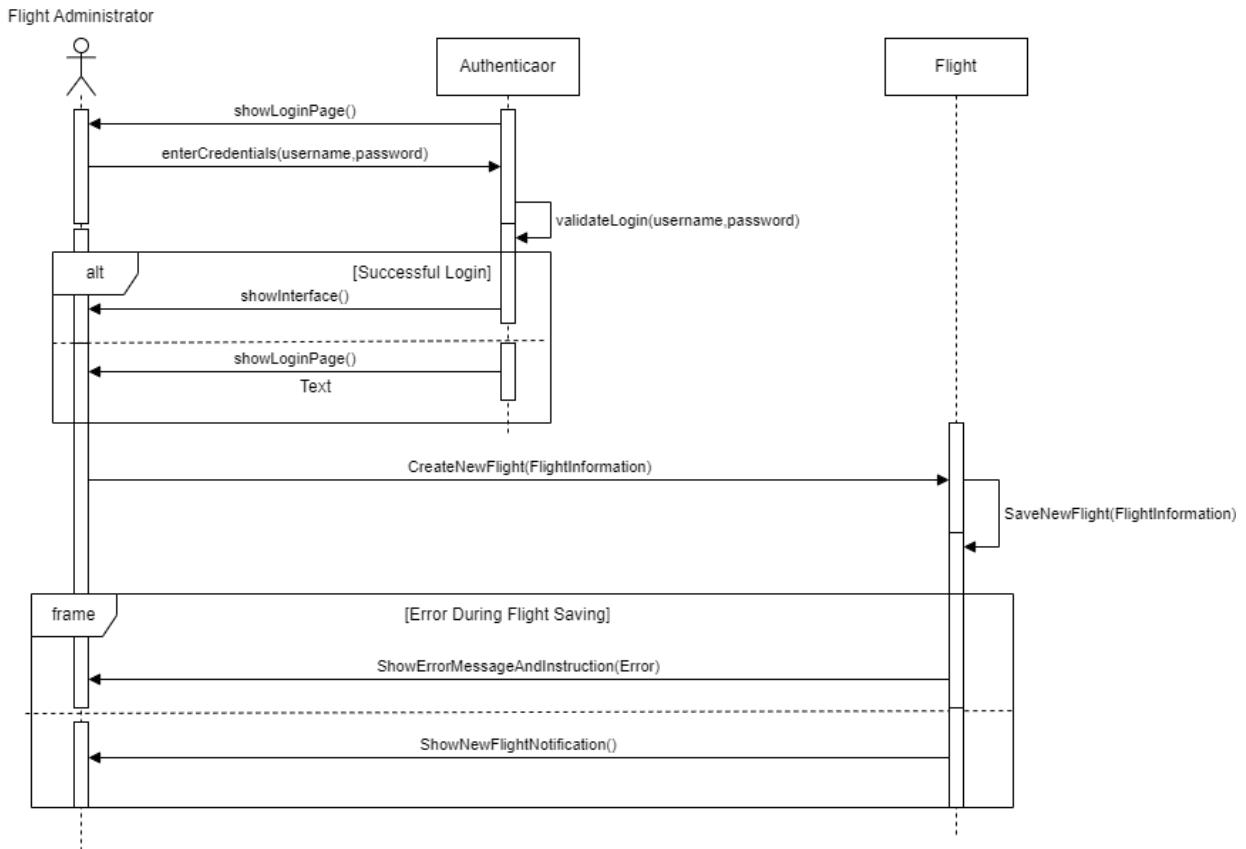
Airport Management System Requirements Specification

AD12 : Passenger Feedback and Complaint Management



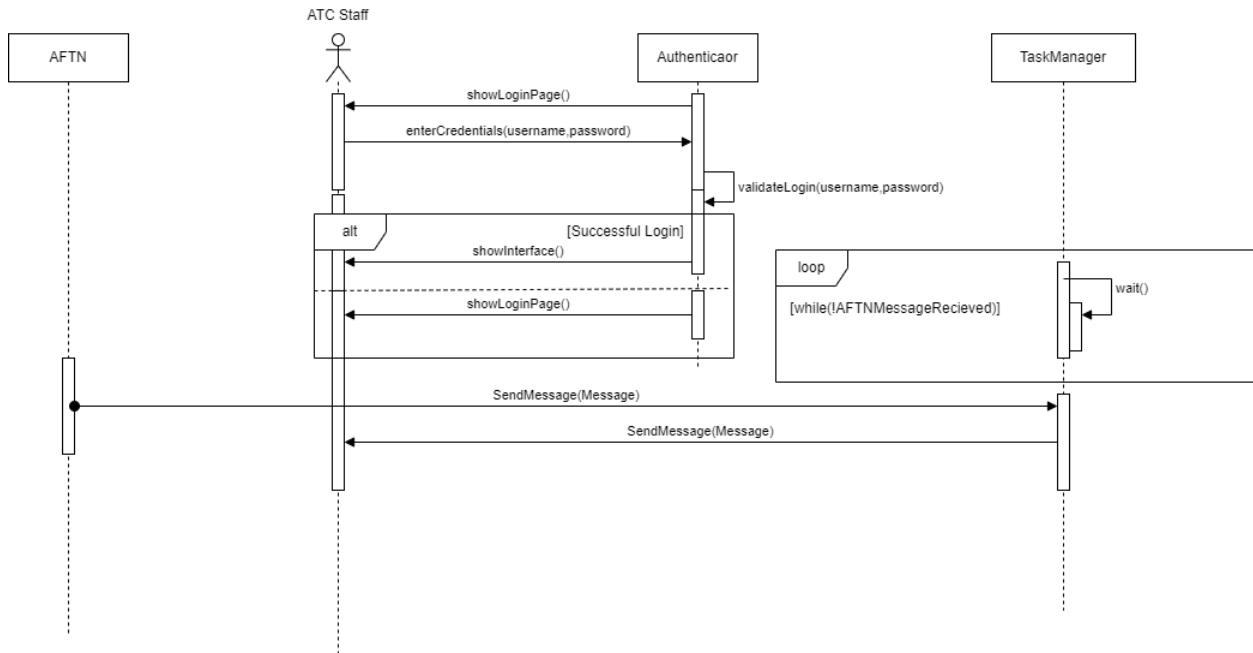
Airport Management System Requirements Specification

AC 13 : *Registering a New Flight*



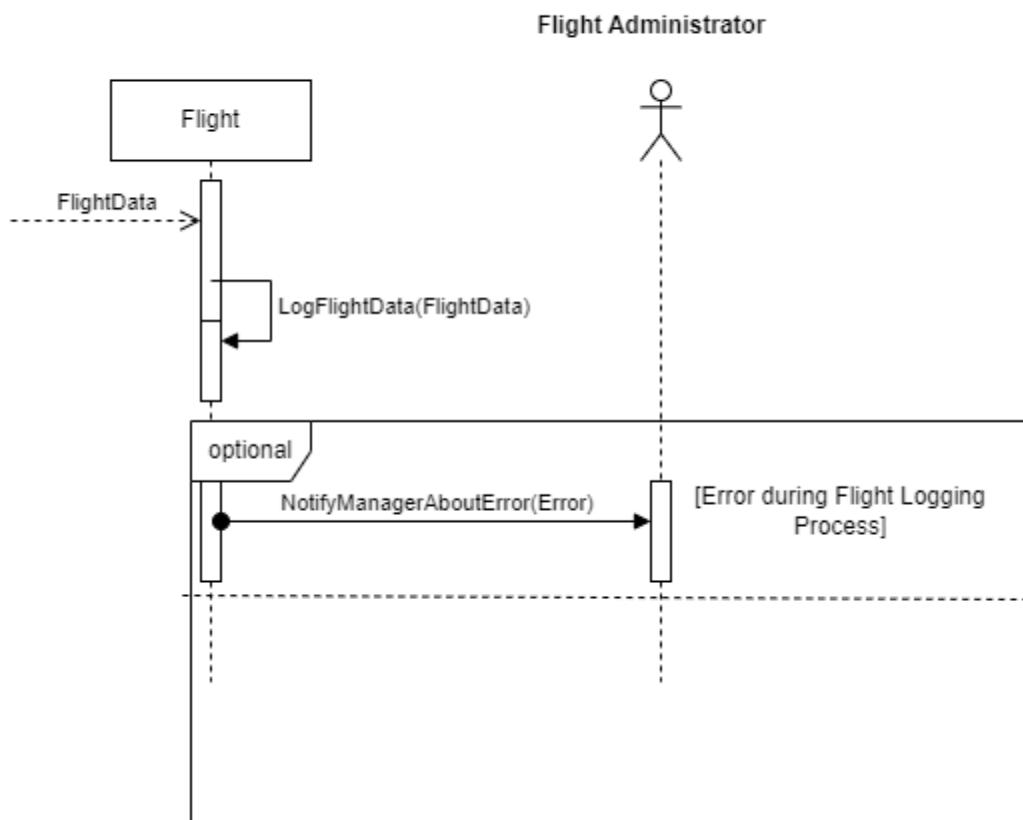
Airport Management System Requirements Specification

AC14: Flight Data Exchange



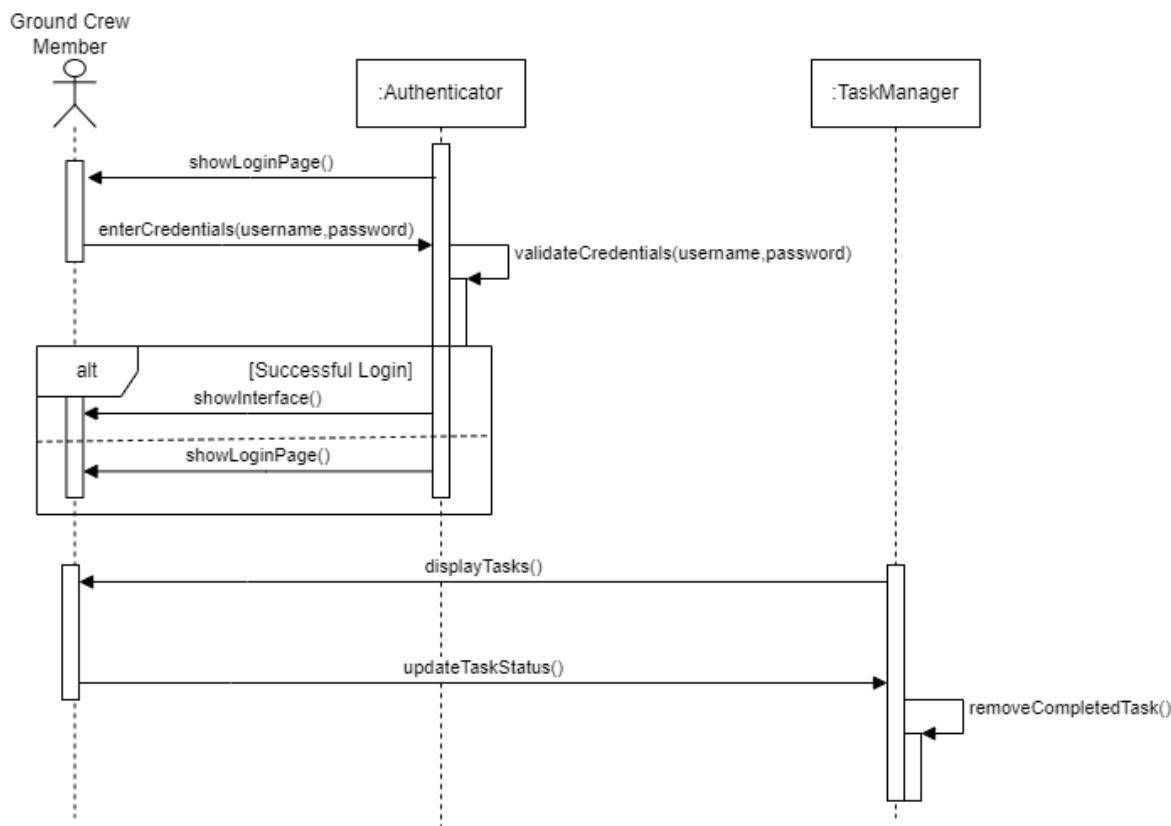
Airport Management System Requirements Specification

AD 15 : Flight Information Logging

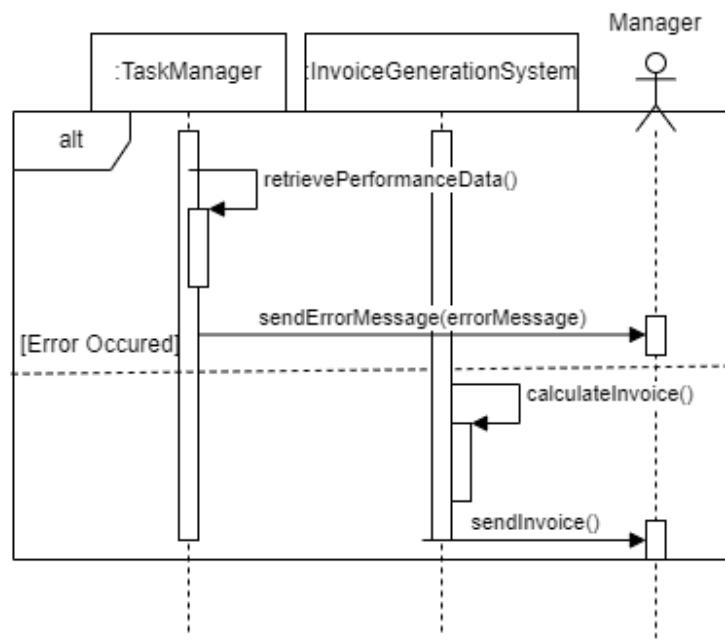


Airport Management System Requirements Specification

SD16:Ground Crew Task Management

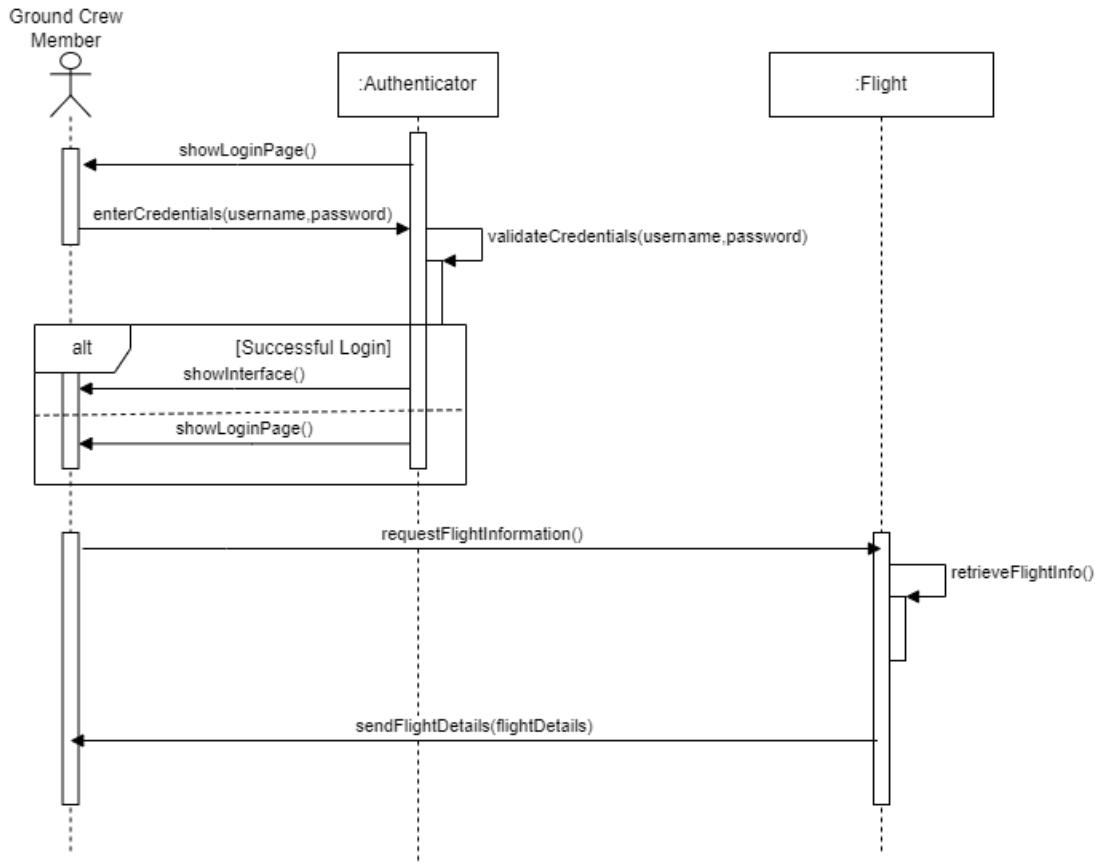


SD17: Ground Service Invoice Calculation

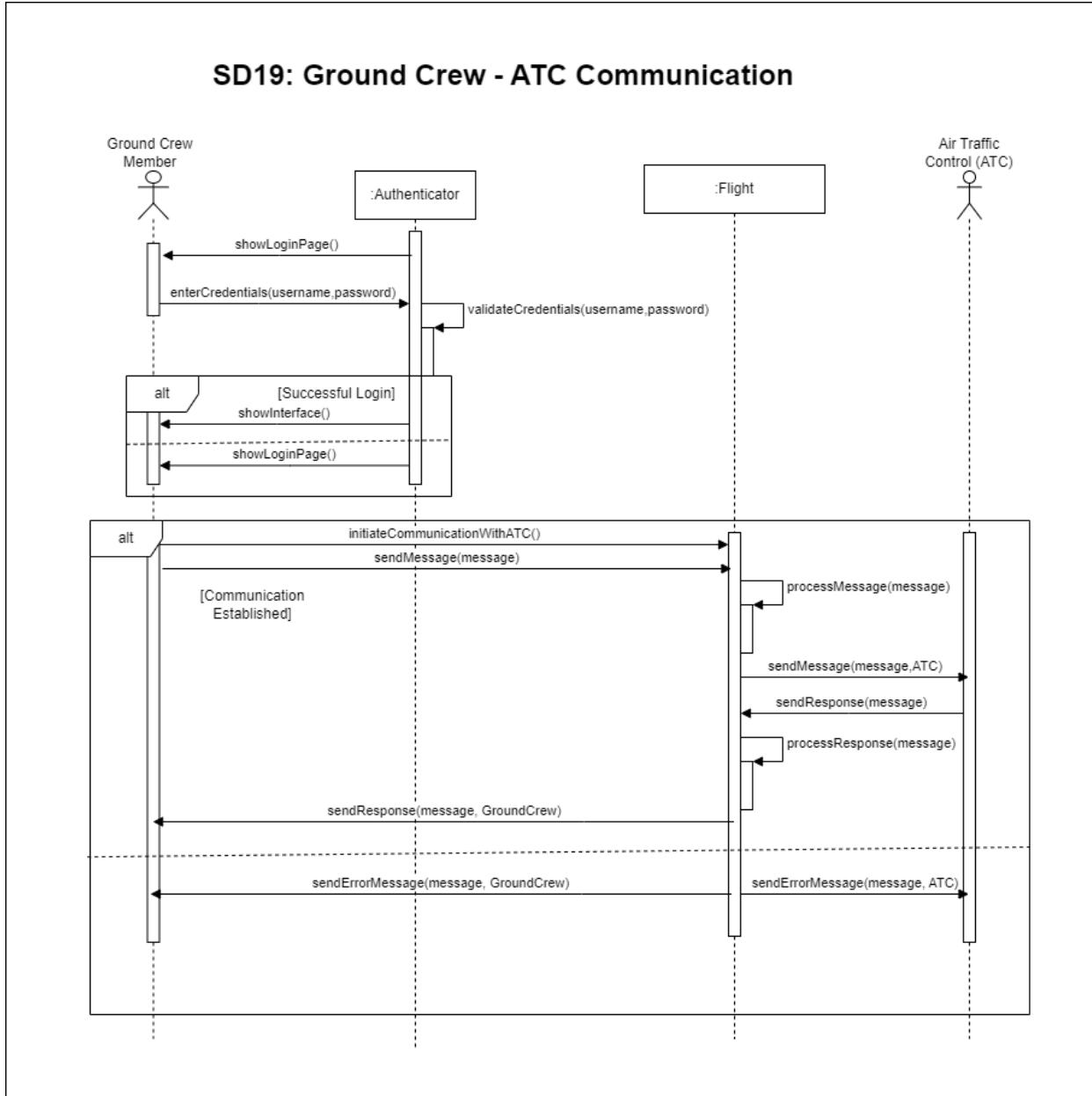


Airport Management System Requirements Specification

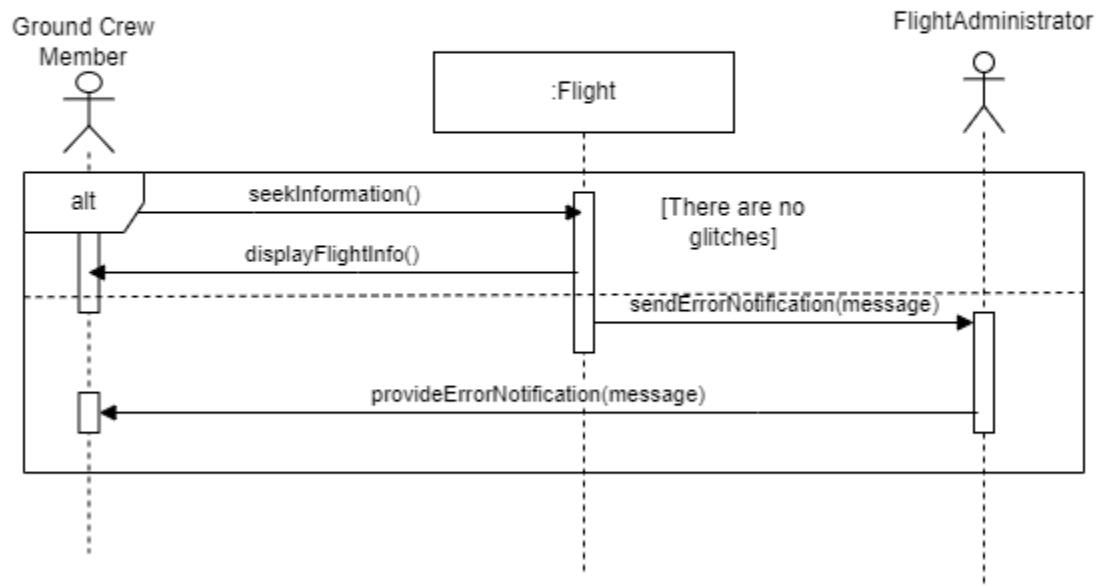
SD18: Real-Time Flight Information



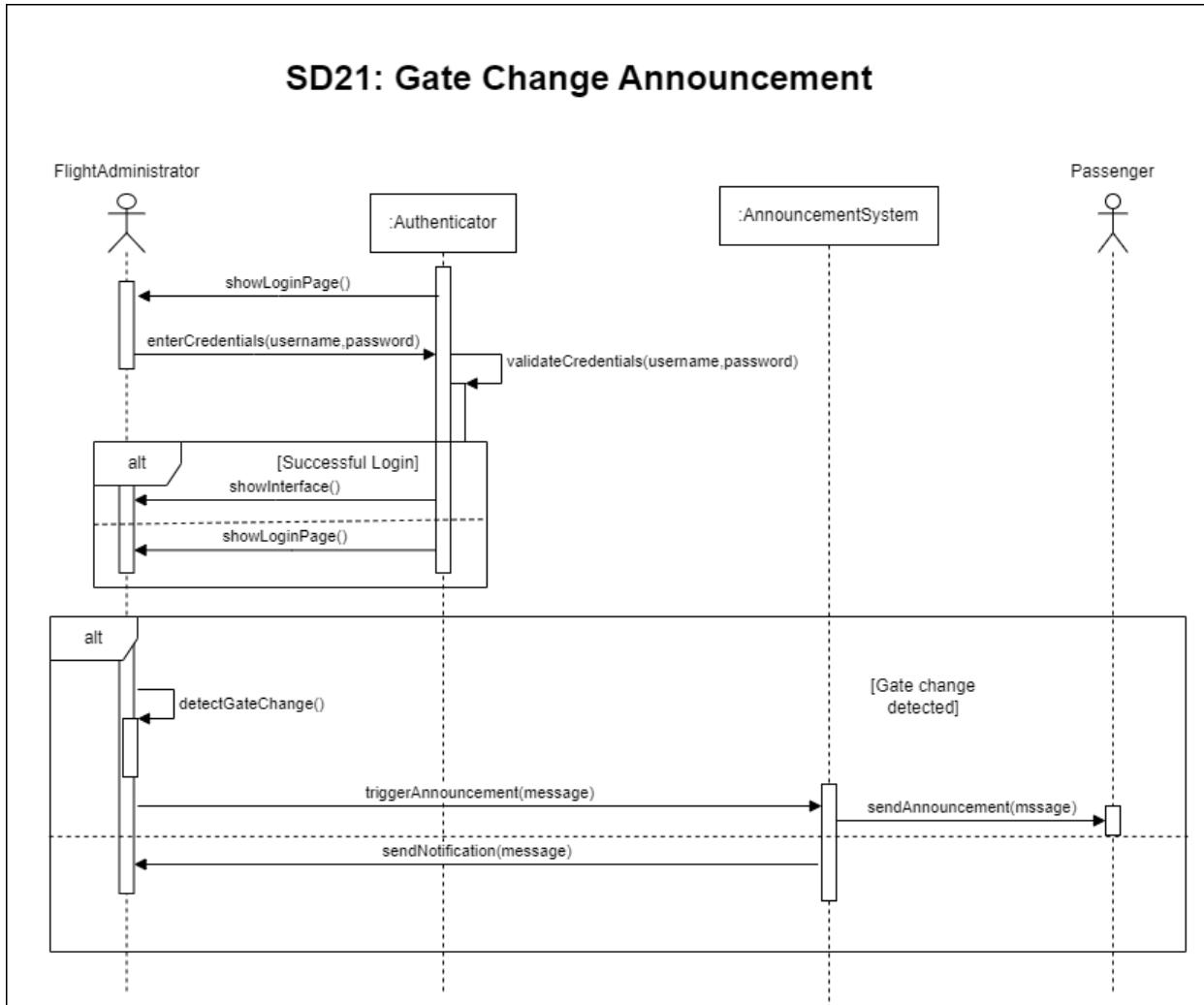
Airport Management System Requirements Specification



SD20: Flight Information Display

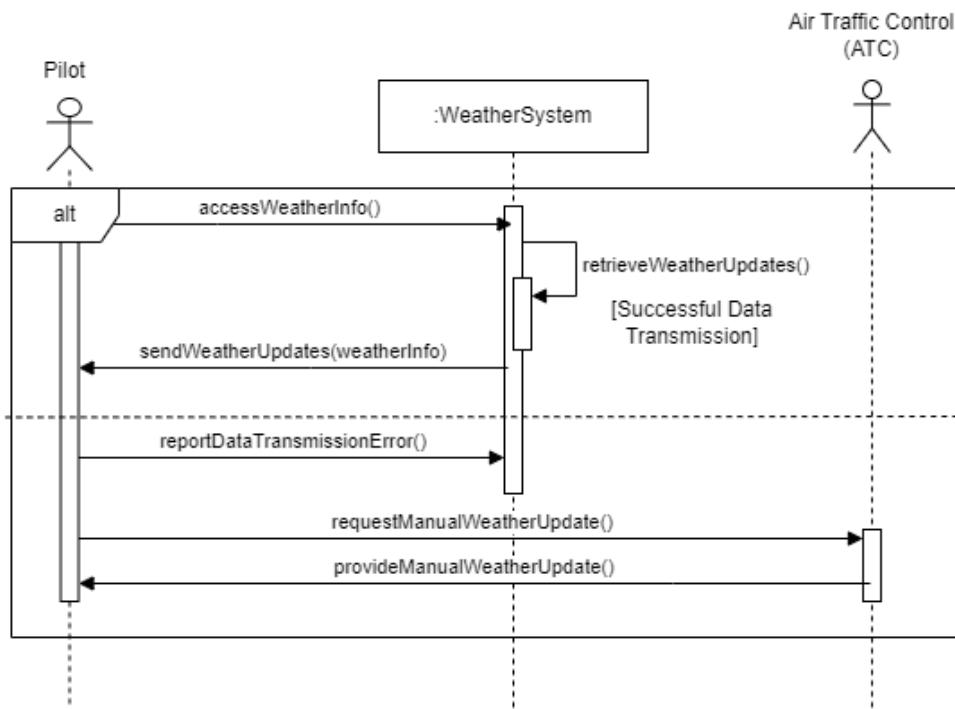


Airport Management System Requirements Specification



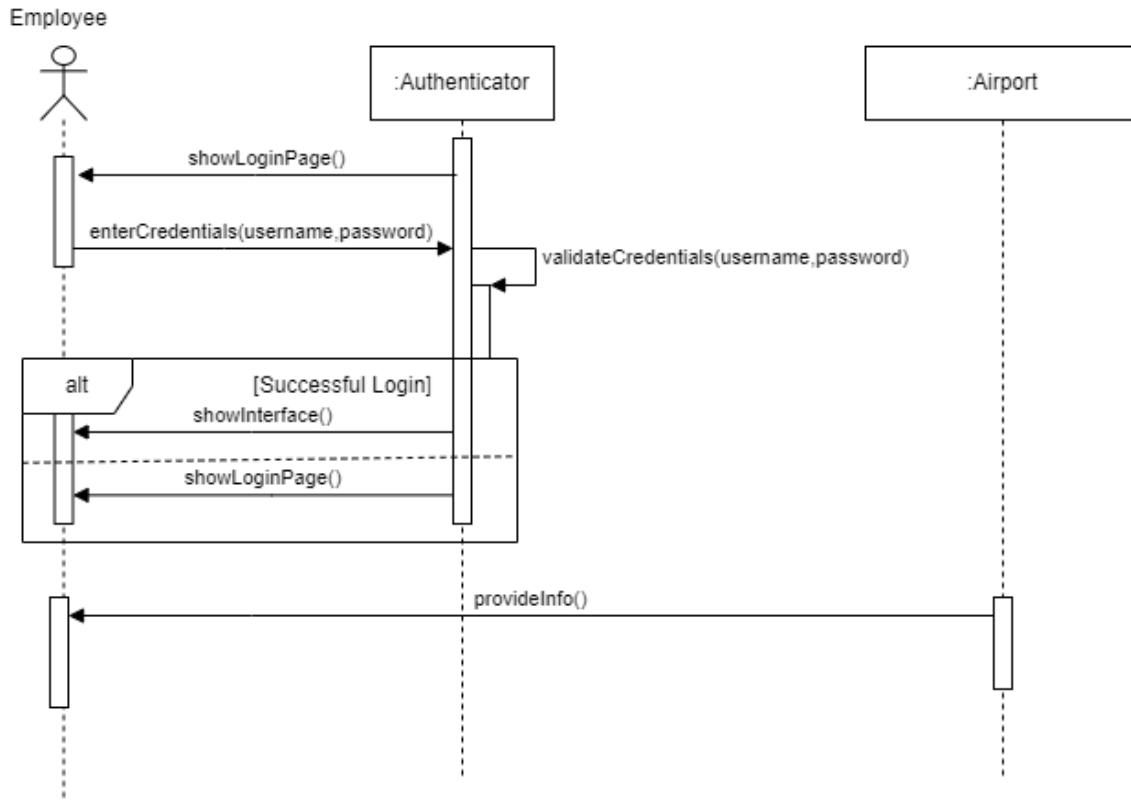
Airport Management System Requirements Specification

SD22: Automated Weather Information



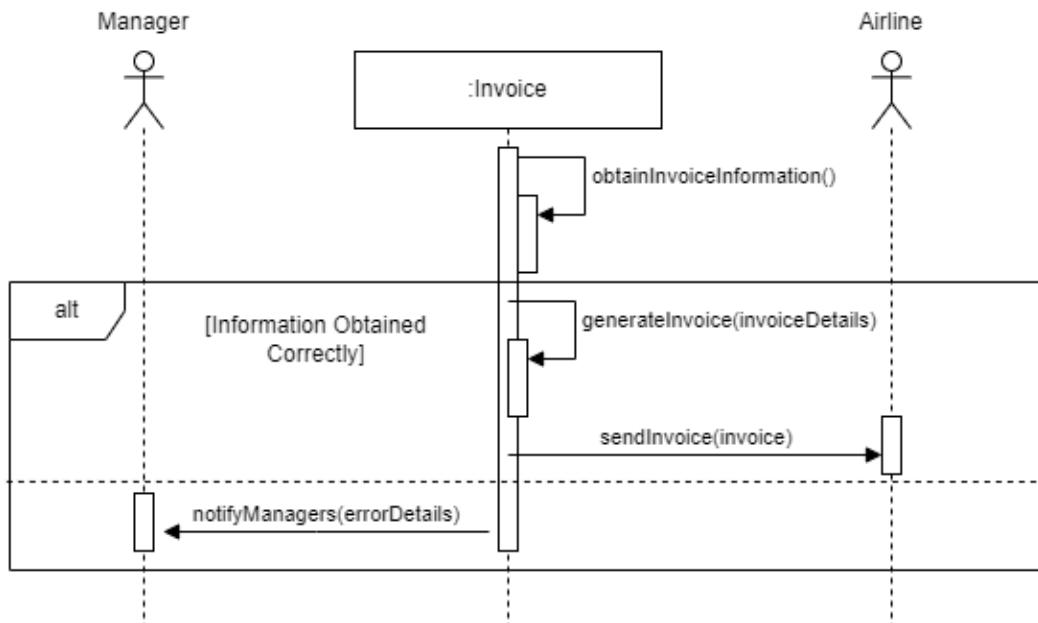
Airport Management System Requirements Specification

SD23: Staff Information Access

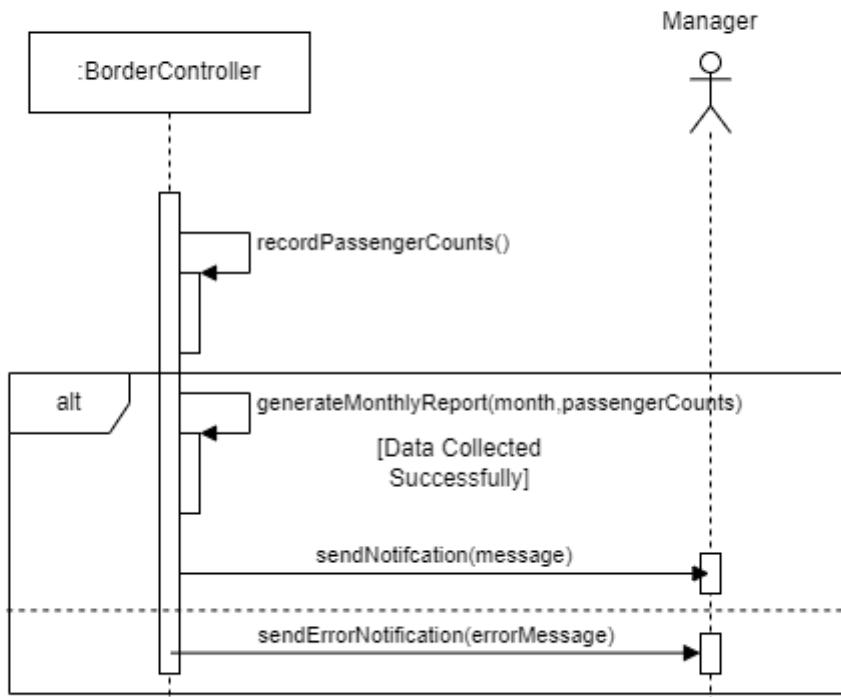


Airport Management System Requirements Specification

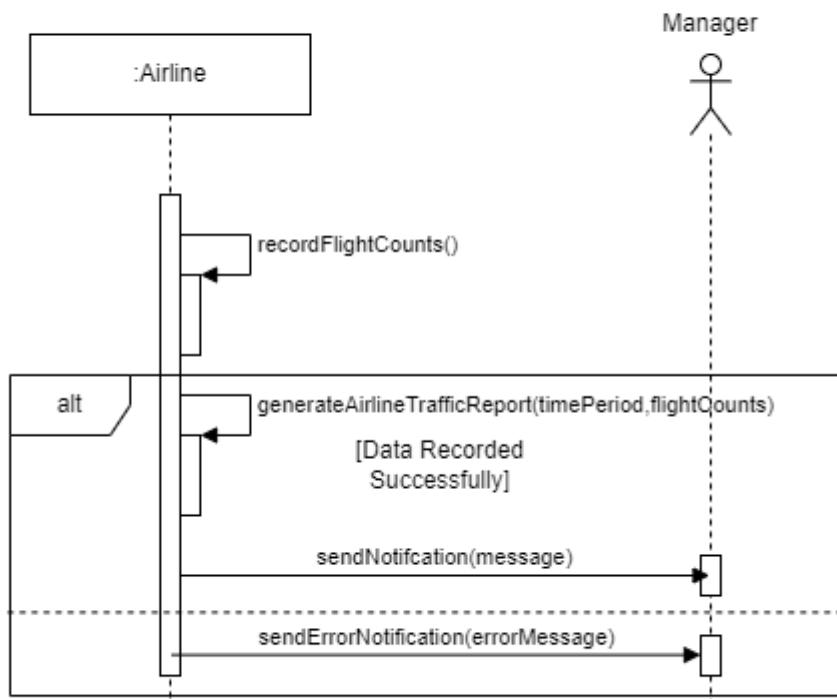
SD24: Invoice Generation



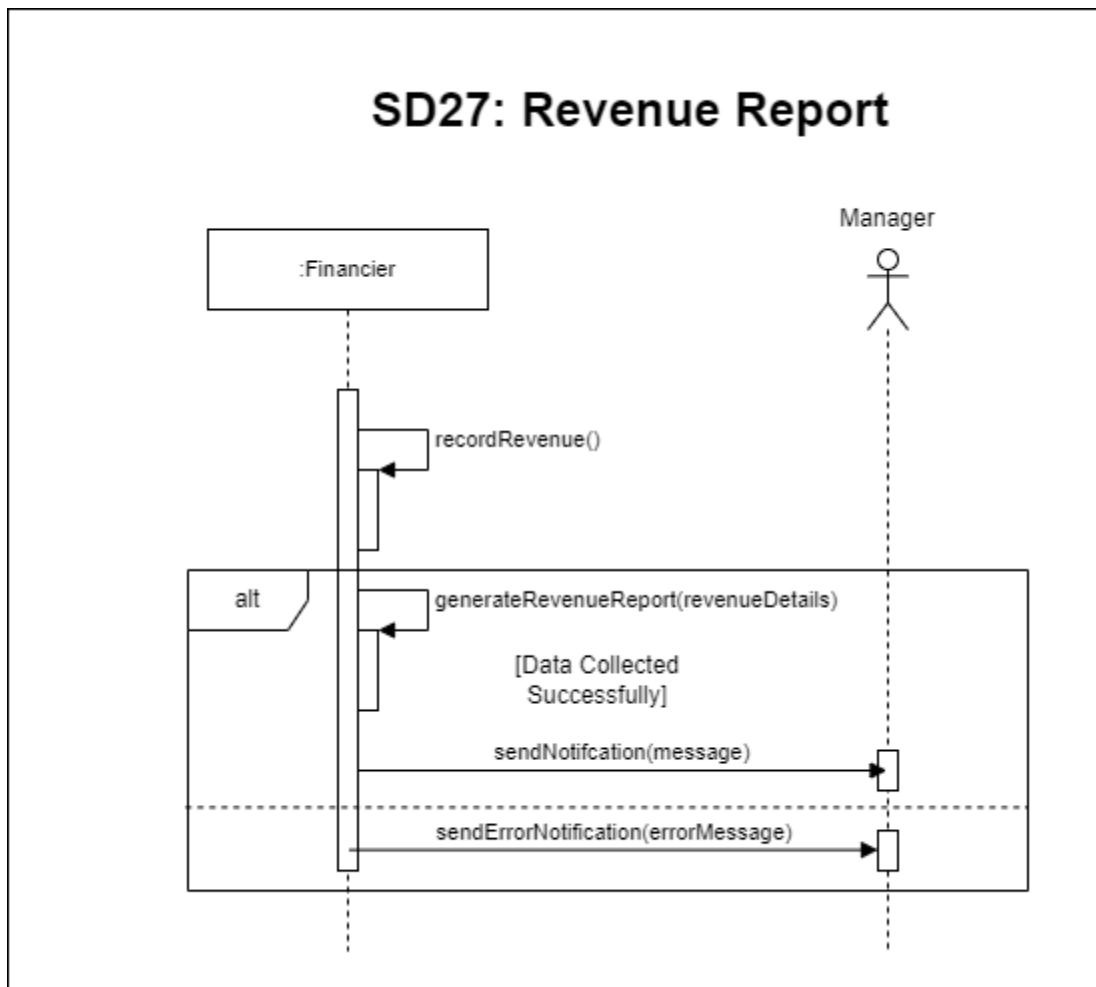
SD25: Monthly Passenger Report



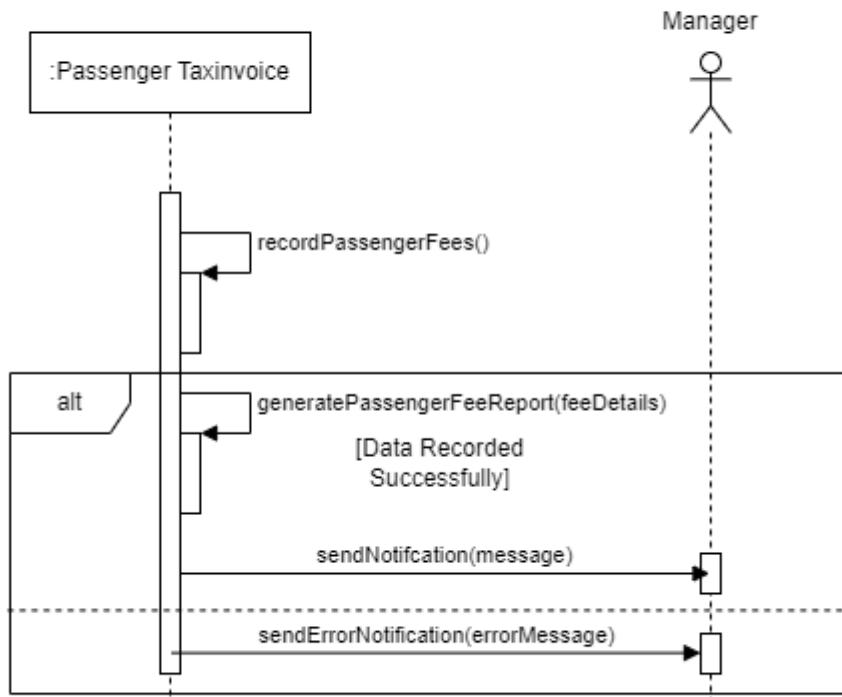
SD26: Airline Traffic Report



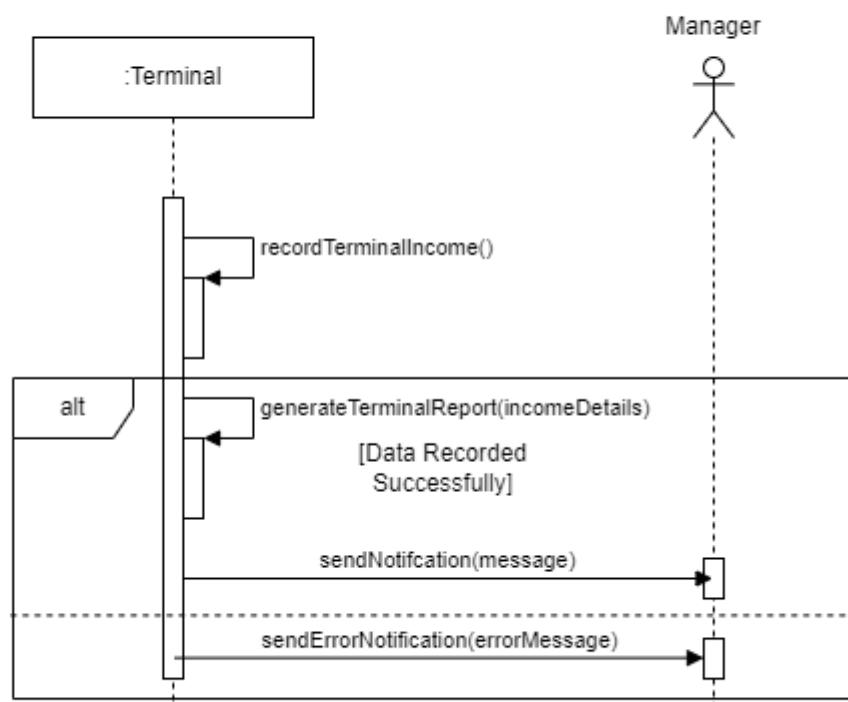
SD27: Revenue Report



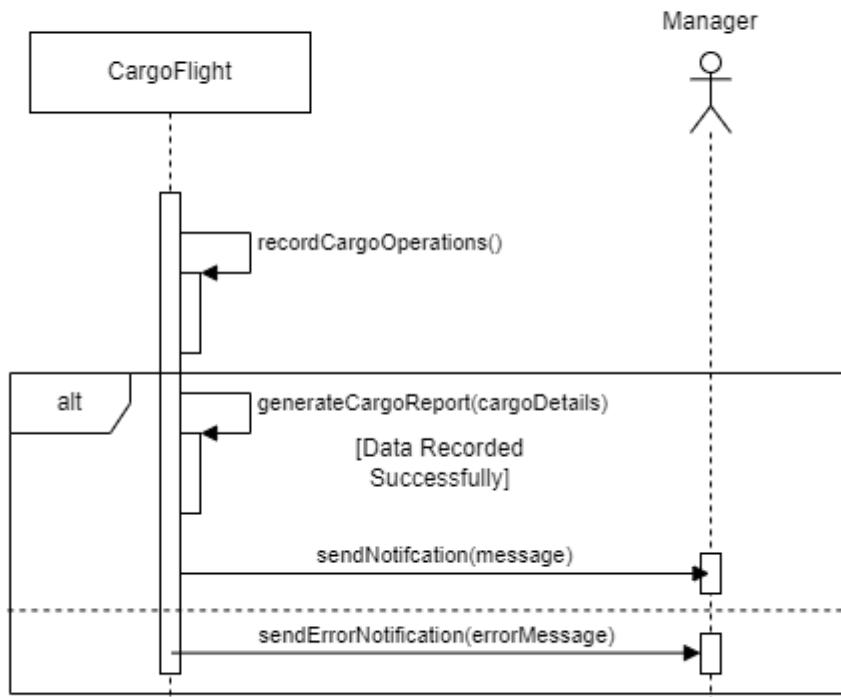
SD28: Passenger Fee Report



SD29: Terminal Report



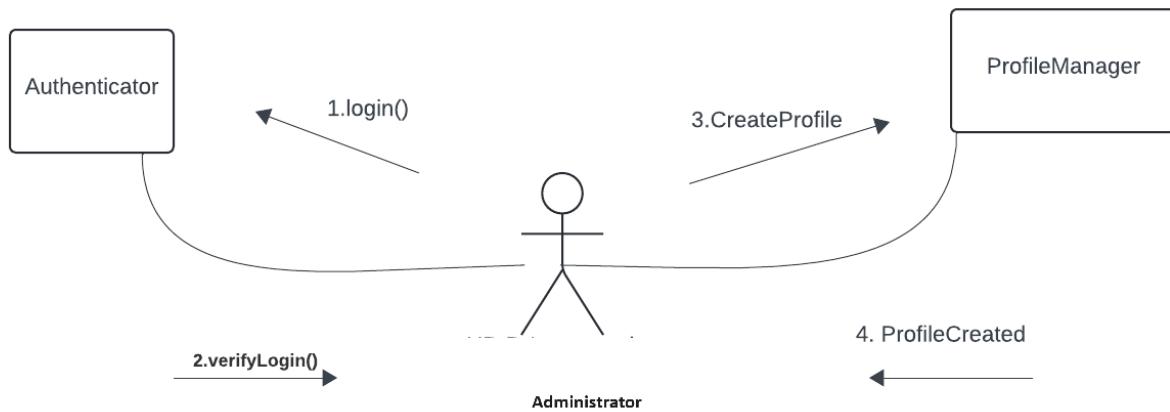
SD30: Cargo Report



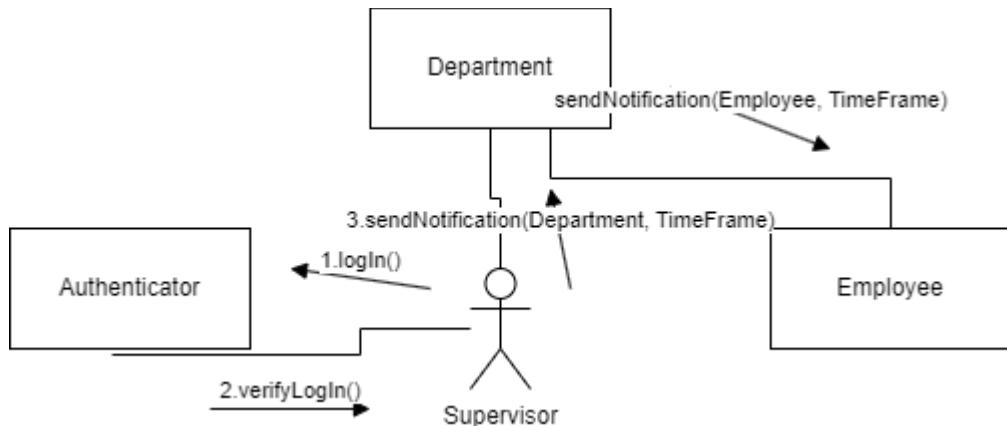
Airport Management System Requirements Specification

Collaboration Diagrams

UC1: New hire onboarding

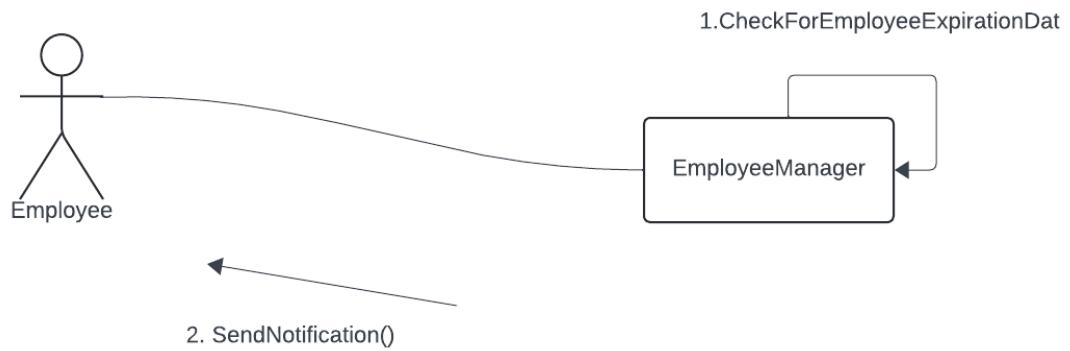


UC2

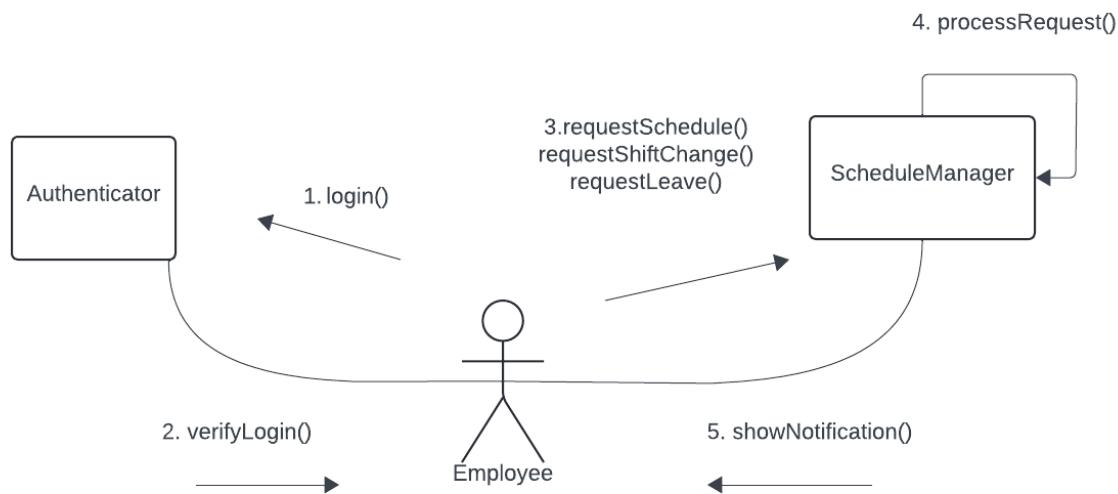


Airport Management System Requirements Specification

UC3: Training and certification training

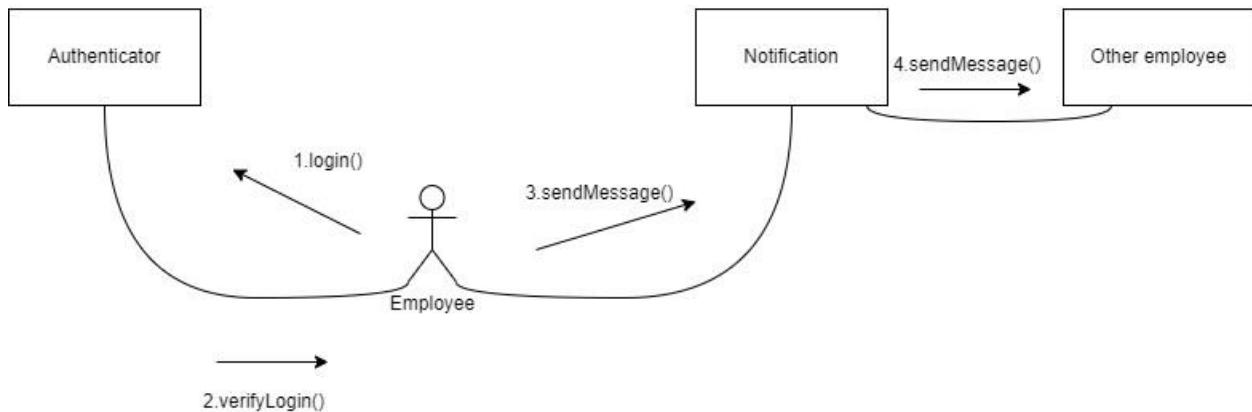


UC4: Employee self-service

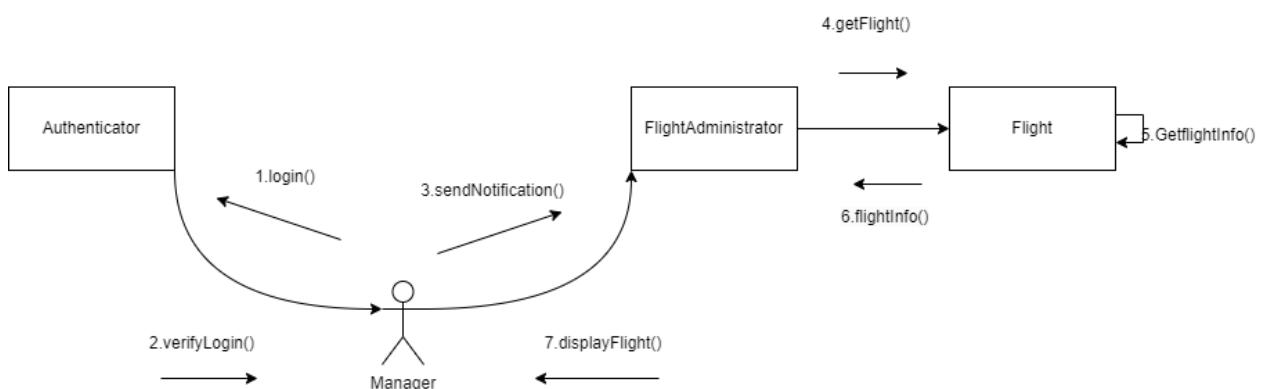


Airport Management System Requirements Specification

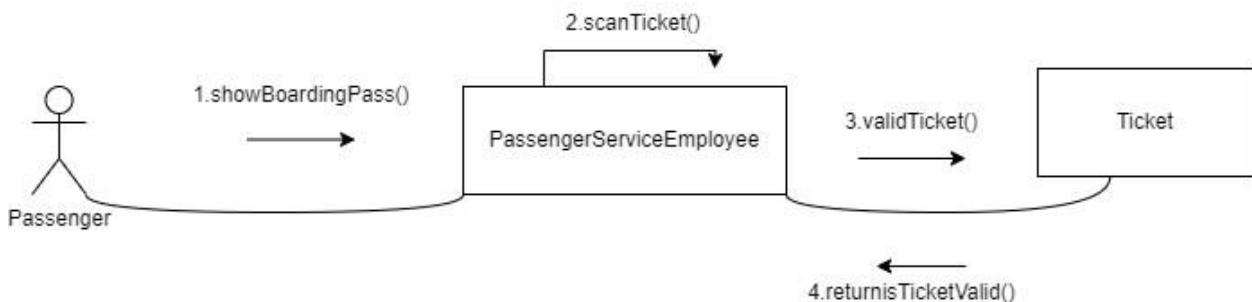
UC5: Internal communication



UC6: Performance review



UC7

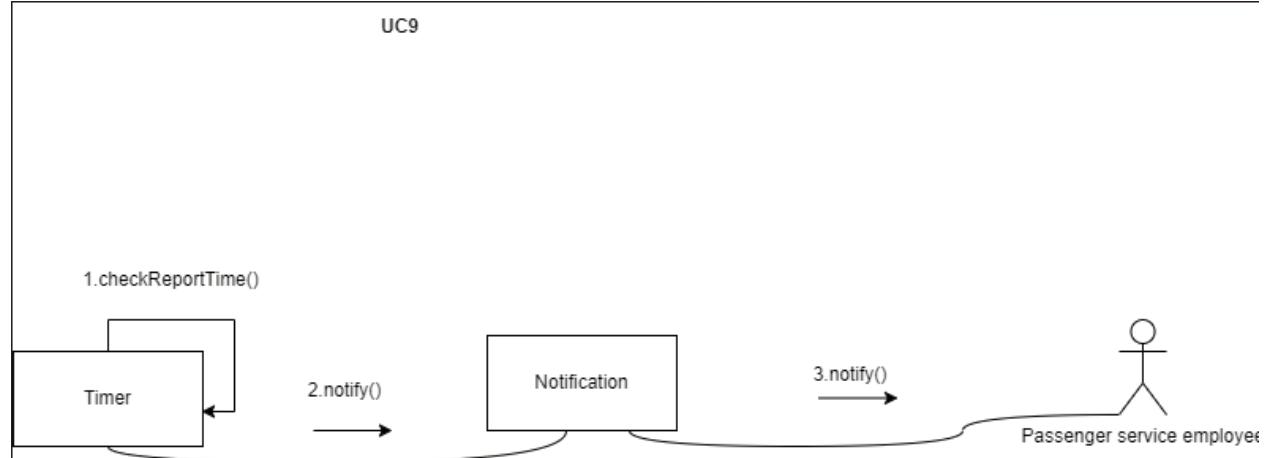


Airport Management System Requirements Specification

UC8:Lost Baggage Report

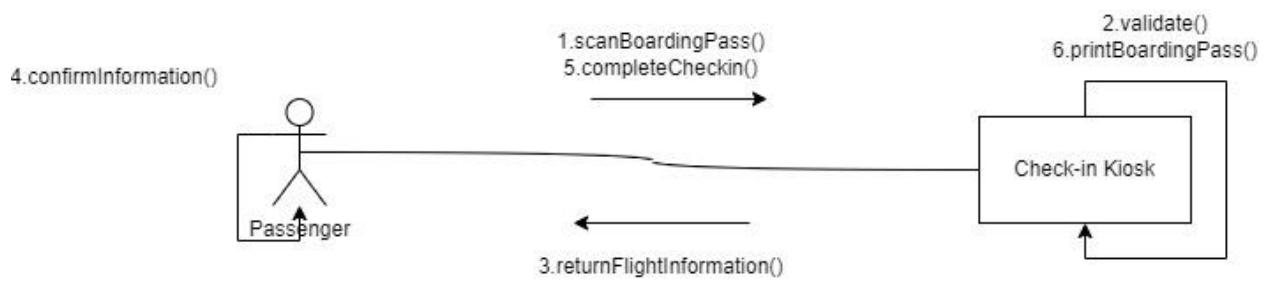


UC9

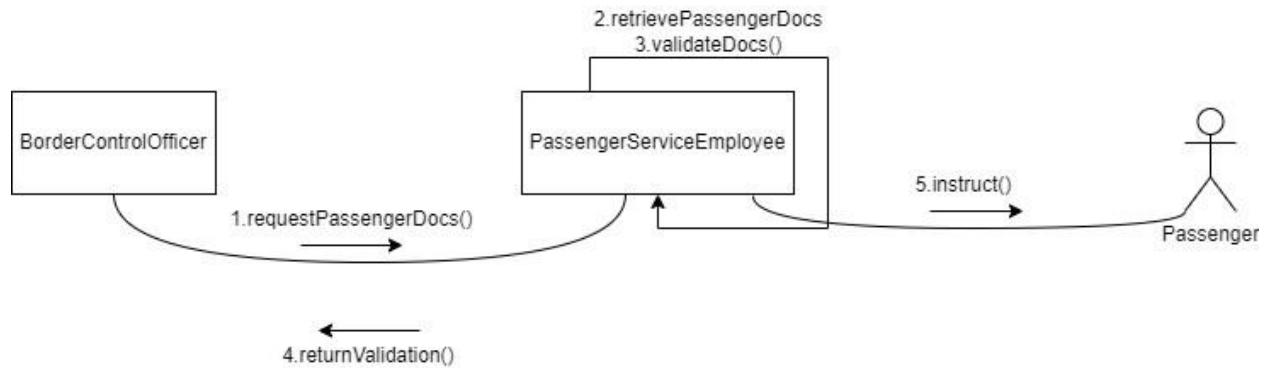


Airport Management System Requirements Specification

UC10: Passenger self-service check-in

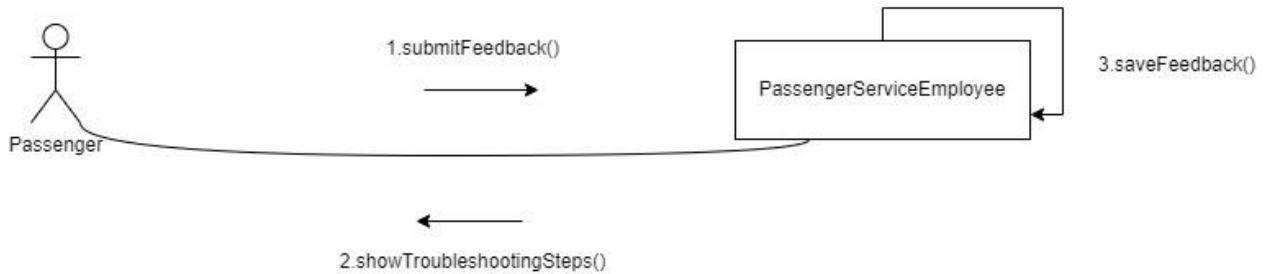


UC11: Border Control

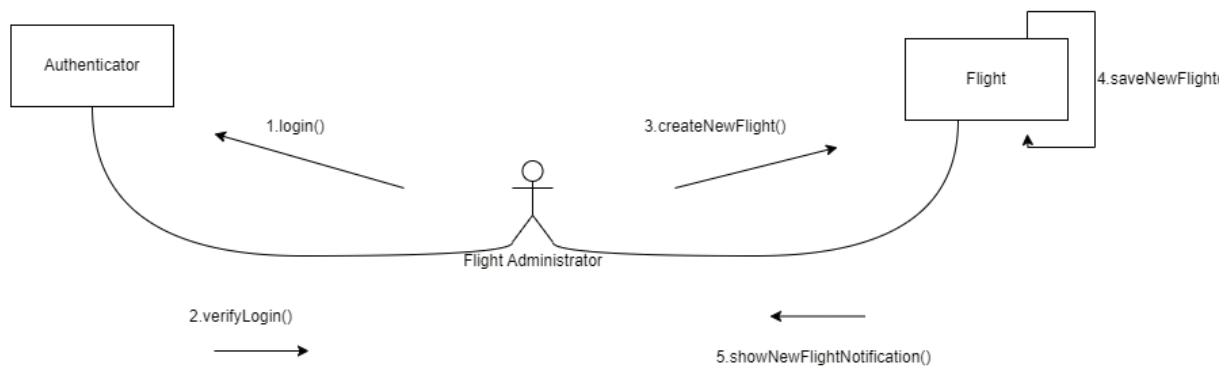


Airport Management System Requirements Specification

UC12:Passenger feedback and complaint management

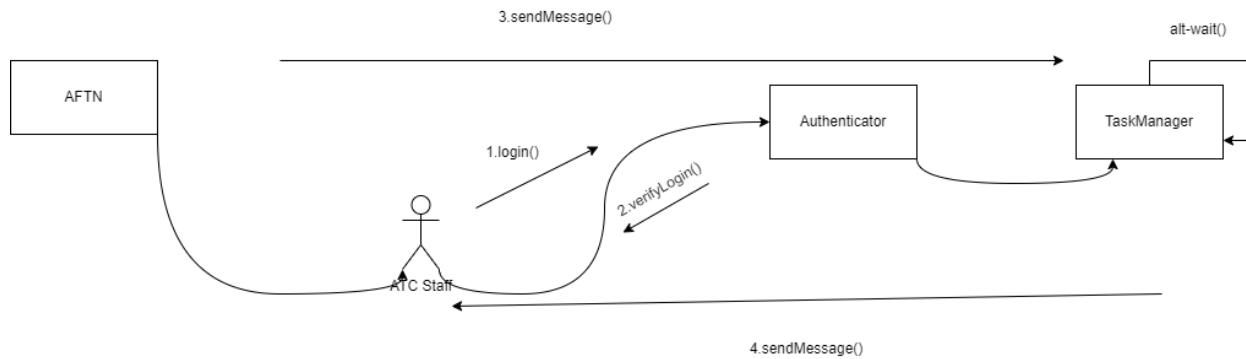


UC13:Registering a new flight

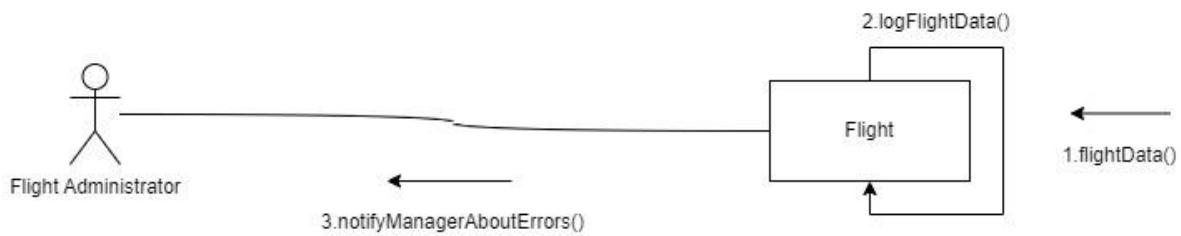


Airport Management System Requirements Specification

UC14: Flight data exchange

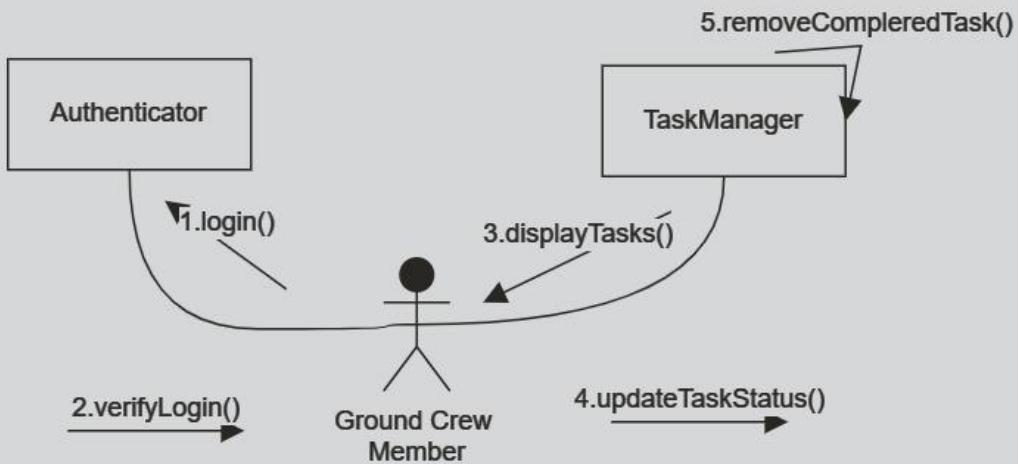


UC15: Flight information logging

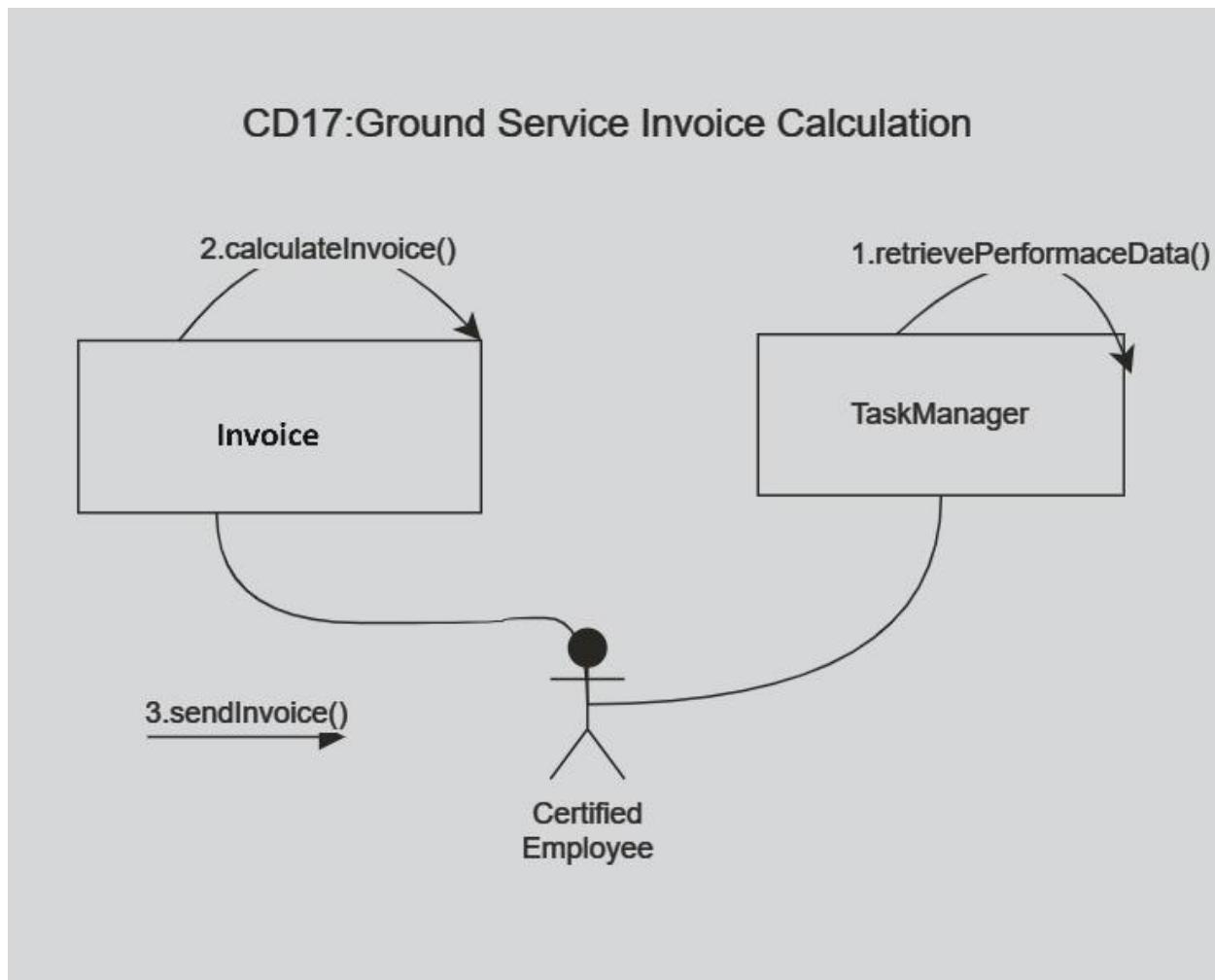


Airport Management System Requirements Specification

CD16:Ground Crew Task Management

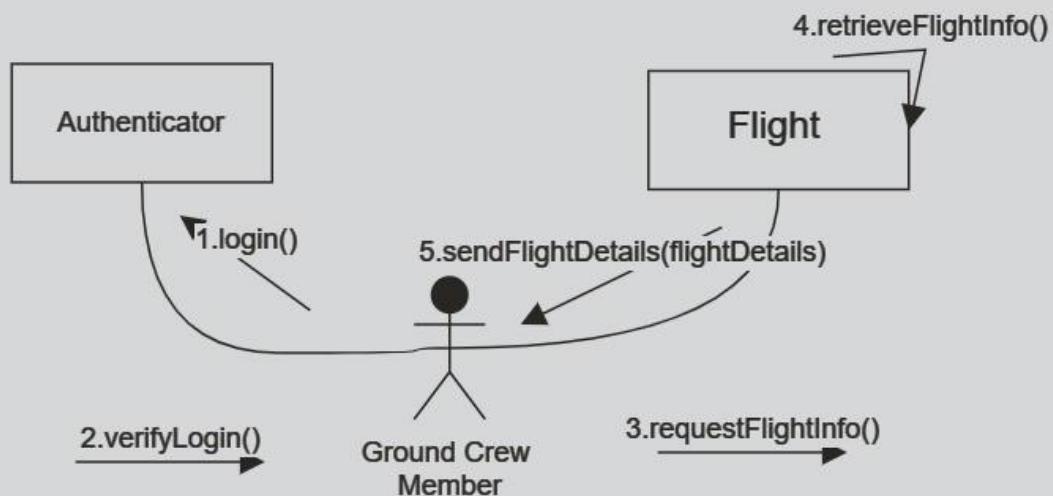


Airport Management System Requirements Specification

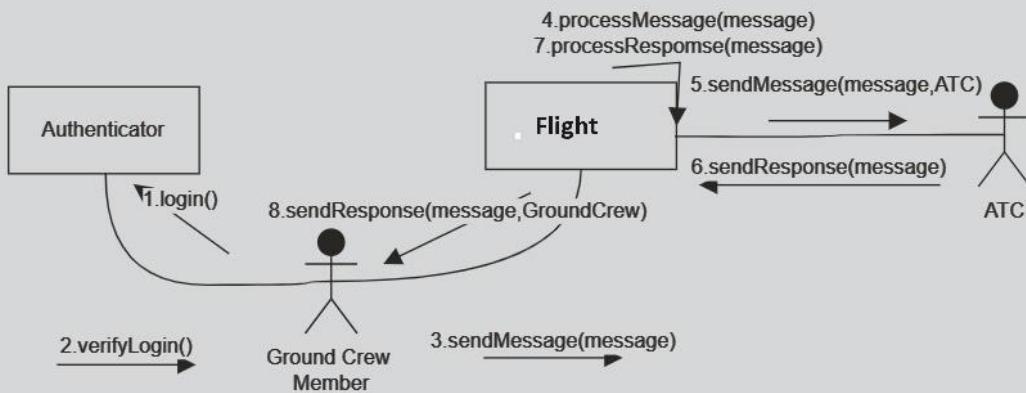


Airport Management System Requirements Specification

CD18:Real-Time Flight Information

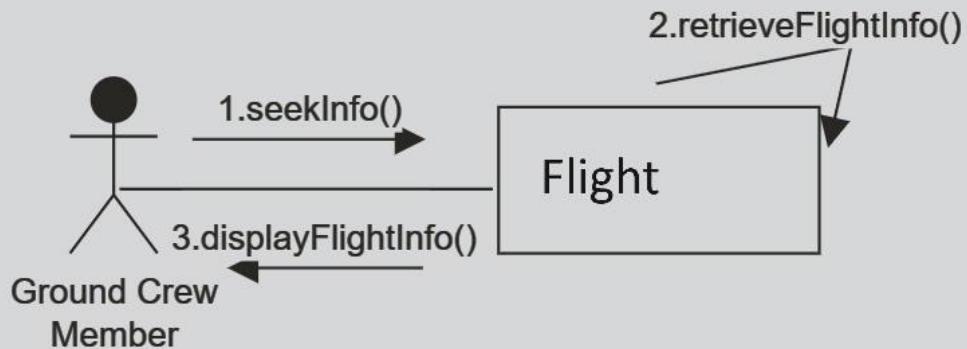


CD19:Ground Crew-ATC Communication

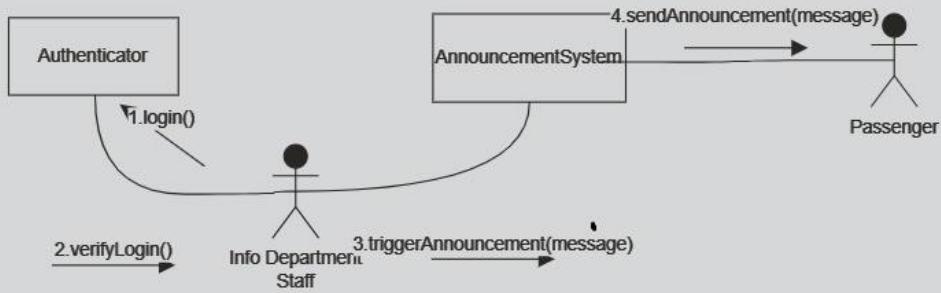


Airport Management System Requirements Specification

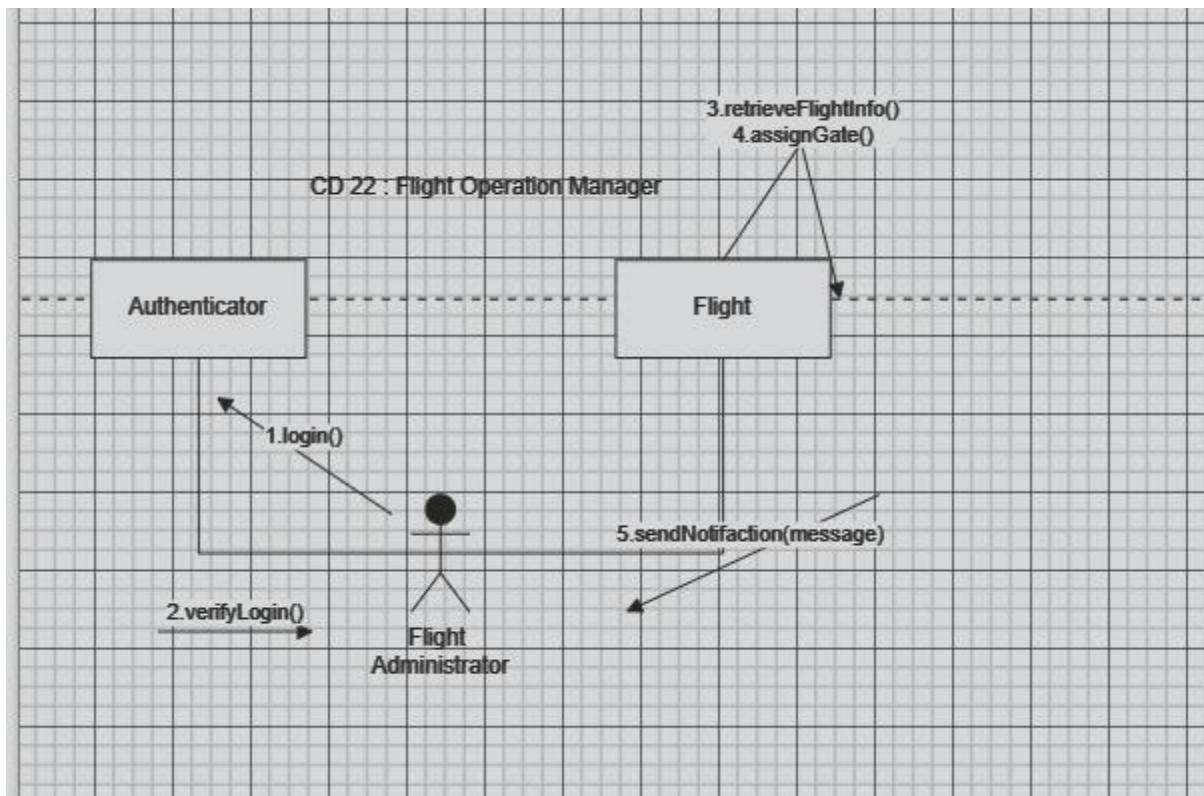
CD20:Flight Information Display



CD21:Gate Change Announcement

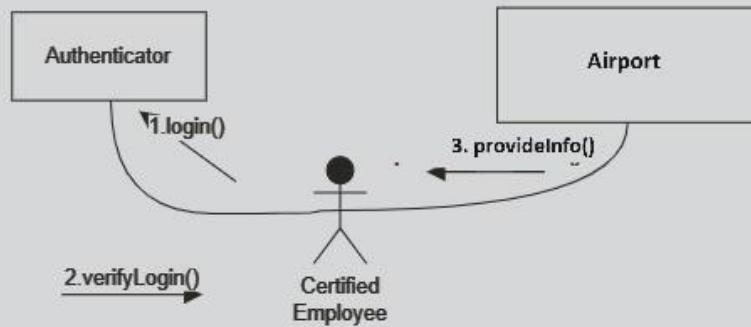


Airport Management System Requirements Specification

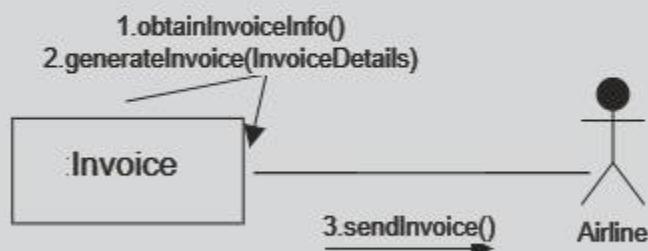


Airport Management System Requirements Specification

CD23: Staff Information Access

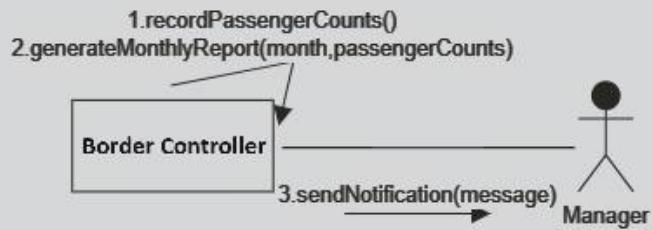


CD24: Invoice Generation

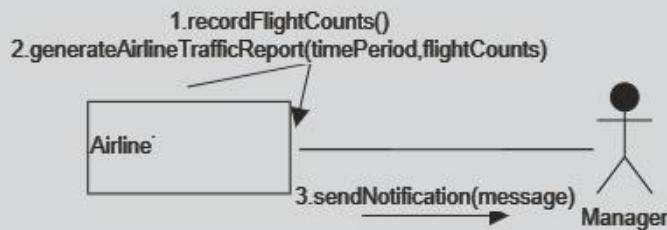


Airport Management System Requirements Specification

CD25:Monthly Passenger Report

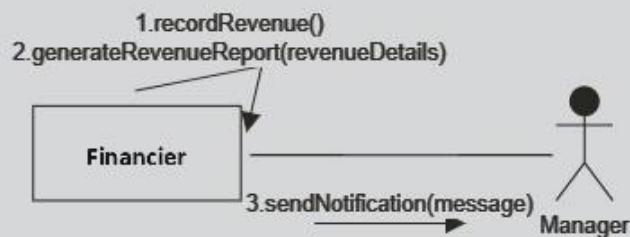


CD26:Airline Traffic Report

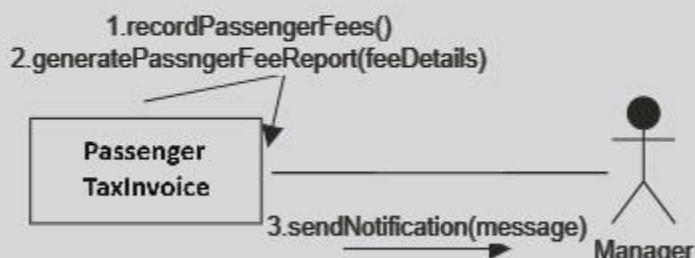


Airport Management System Requirements Specification

CD27:Revenue Report

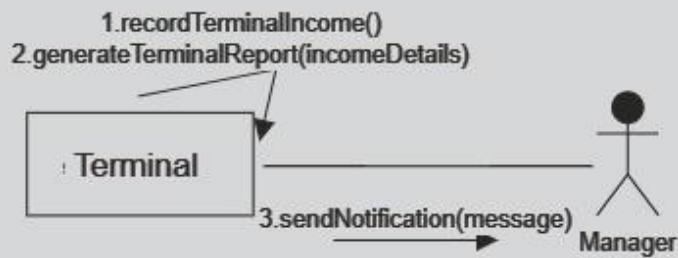


CD28:Passenger Fee Report

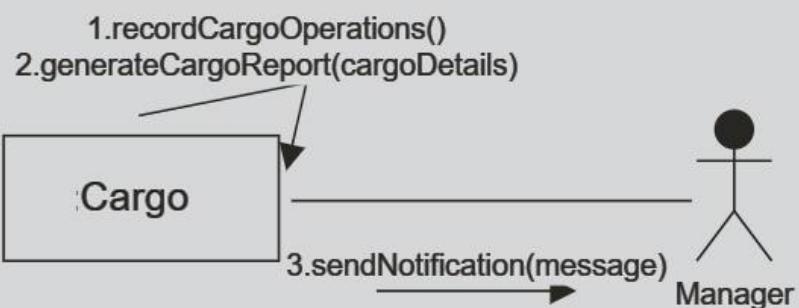


Airport Management System Requirements Specification

CD29: Terminal Report

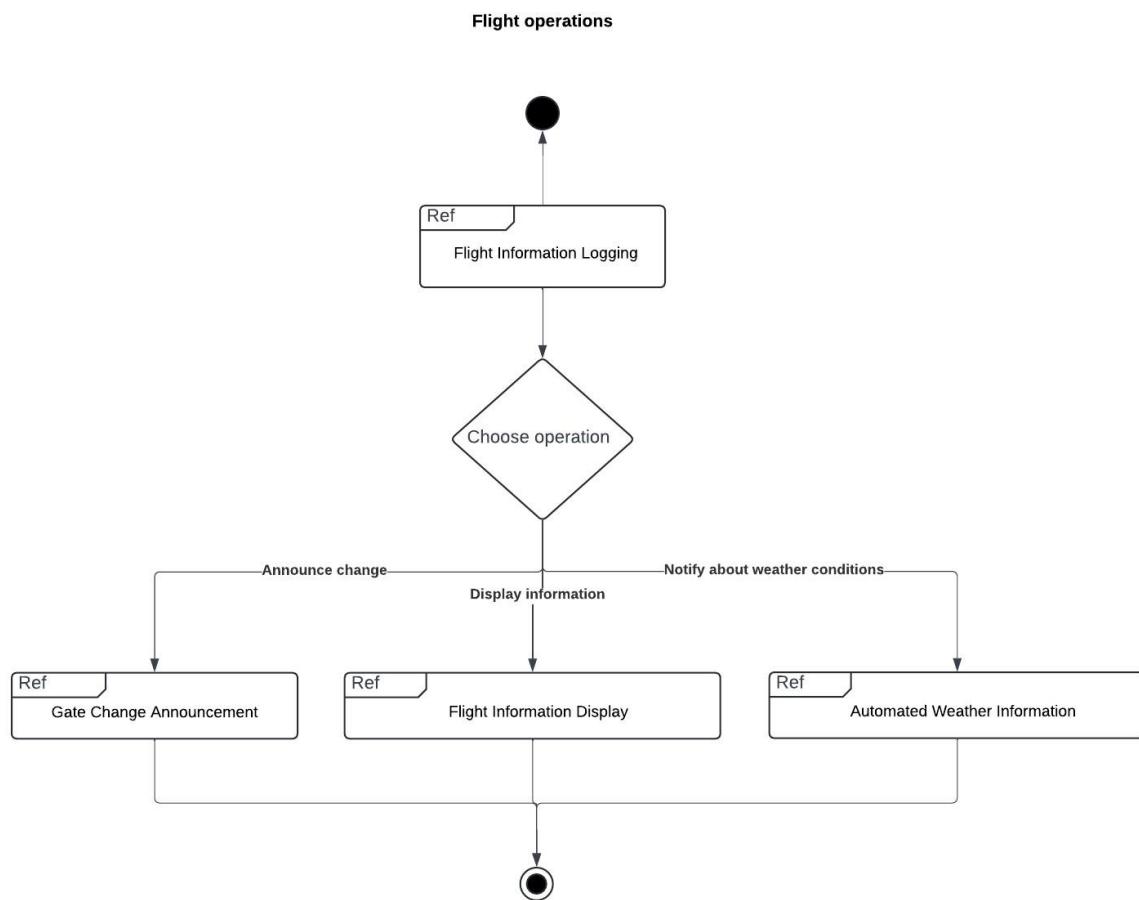


CD30: Cargo Report



Airport Management System Requirements Specification

Interaction Overview Diagram

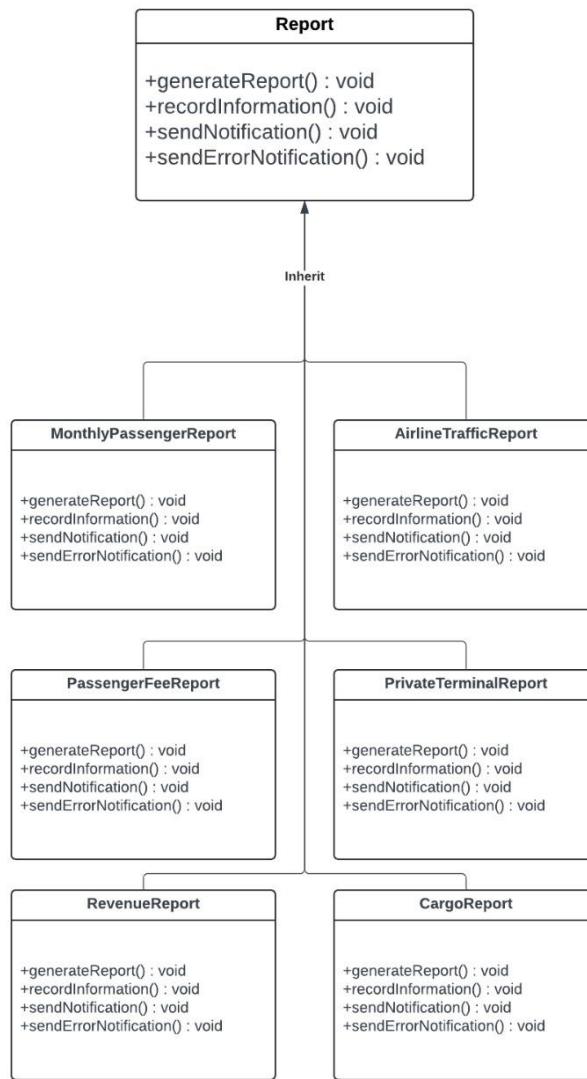


Airport Management System Requirements Specification

6. Design Patterns

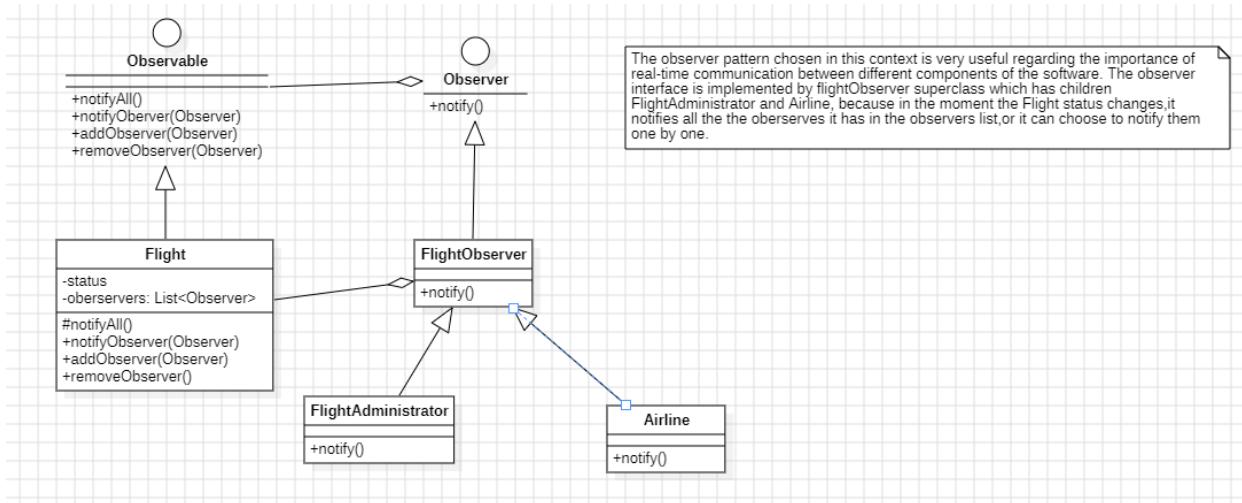
Template Method Pattern

The Template Method Pattern was used in our system to speed up the process of creating multiple sorts of reports while maintaining a consistent structure across them. By developing a template method under the 'Report' superclass, we created a standard design for report production that includes critical processes such as data collection, report layout, and notification handling. This allowed us to centralize the entire report generating logic, assuring consistency and eliminating repetition across report kinds.



Airport Management System Requirements Specification

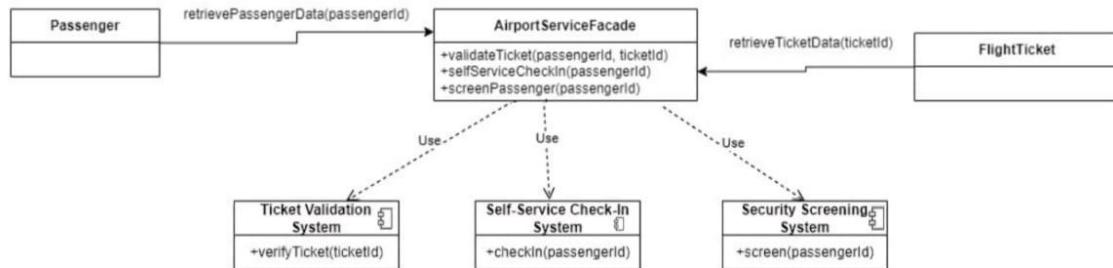
Observer Pattern



Airport Management System Requirements Specification

Façade Pattern

The facade pattern is used to break complex interactions with multiple subsystems. In this example, the subsystems we considered are check-in systems, security systems and flight data systems. The facade is getting passenger and ticket information from Passenger and FlightTicket objects. The facade pattern provides a simplified interface for these systems. This makes the system easier to understand and maintain.



Airport Management System Requirements Specification

APPENDIX

APPENDIX B. Definition, Acronyms and Abbreviations

- AFTN – Aeronautical Fixed Telecommunication Network
- ATC – Air Traffic Control
- FIDS – Flight Information Display Systems

APPENDIX C. References

Our GitHub repository: https://github.com/Smr002/Group01_Airport_Management_System