



Department of Computer Science & Engineering

Software Engineering – UE22CS341A

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# Software Requirement Specifications (SRS)

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Airline Management System

SE Deliverable 1

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# 1 Introduction

## 1.1 Purpose

The purpose of this Software Requirements Specification (SRS) document is to define the functional and non-functional requirements for the Airline Management System , which is designed to optimize and manage various airline operations, including flight management, booking management, passenger and crew management, cargo & luggage management, and customer support. This document serves as a reference for all stakeholders, ensuring that the system meets the specified requirements and aligns with the airline's business goals.

## 1.2 Intended Audience

This document is intended for developers, project managers, business analysts, quality assurance testers, stakeholders, and maintenance teams involved in the AMS project. Developers and testers are encouraged to focus on both functional and non-functional requirements, while project managers and business analysts should focus on understanding what the system is intended and not intended to do. The purpose and scope will be reviewed by the stakeholders and executives to see how the system satisfies the business objectives, while system models and interfaces are of primary interest for the maintenance teams when providing post-deployment support.

## 1.3 Product Scope

The Airline Management System will be an intensive platform aimed at managing and smoothing the operations of airlines by providing a method through which flight schedules, ticket booking, passenger management, crew scheduling, and luggage handling will be managed effectively. The main features are control over flights, bookings, passenger profiles, crew assignments, and customer support, with priority given to commercial passenger flights. It will also be scalable, secure, and user-friendly, but aircraft maintenance will not be controlled directly by this system-which means using other third-party systems.

## 1.4 References

This SRS document draws on internal documents such as the Project Charter, Technical Architecture Document, and User Stories, and from external sources including IATA

Regulations, PCI-DSS, and ISO/IEC 27001 with regard to payment processing and information security. Related documents include design specifications and security compliance documentation that provide further guidance to make the system comply with industry standards and best practices.

## 2. Overall Description

### 2.1 Product Perspectives

The airline management system is a modular software system critical in airline operations. It integrates third-party systems like online payment gateways to facilitate monetary transactions, CRM systems for passenger data, and aircraft maintenance management systems for maintaining the fleet. The Airline Management System would replace or upgrade legacy systems with a modern, scalable interface for airline operations. AMS will be accessed through the web and mobile to let airlines staff and passengers use systems anywhere on any device. It needs to ensure that communications with external APIs on flight tracking and weather updates are done securely, while connecting back-office systems such as accounting and inventory systems. The AMS can be configured to suit the requirements of various airlines and may grow with their operations.

### 2.2 Product Functions

#### 2.2.1 **Flight Management:**

- Manage flight schedules and routes.
- Assign aircraft to flights.
- Monitor and adjust real-time flight statuses.

#### 2.2.2 **Ticket Booking System:**

- Search for flights and book tickets.
- Secure payment processing and e-ticket generation.
- Seat selection and booking management.

#### 2.2.3 **Passenger Management:**

- Passenger registration and profile management.
- Online check-in and seat selection.

- Handle special requests (e.g., meals, assistance).

#### 2.2.4 **Crew Management:**

- Schedule and manage crew assignments.
- Track crew availability and certifications.
- Provide alerts for scheduling changes.

#### 2.2.5 **Luggage and Cargo Management:**

- Luggage check-in and tracking.
- Manage cargo bookings and tracking.
- Compliance with luggage and cargo regulations.

#### 2.2.6 **Customer Support:**

- Integrate a helpdesk system for inquiries and complaints.
- Provide real-time customer support.
- Manage and resolve customer service tickets.

#### 2.2.7 **Reporting and Analytics:**

- Generate operational reports and analytics.
- Provide real-time KPI dashboards.
- Analyze trends for data-driven decision-making.

#### 2.2.8 **Administrative Functions:**

- Manage user roles and system settings.
- Monitor system performance and maintain uptime.
- Configure system for different operational needs.

### 2.3 User Classes and Characteristics

#### 2.3.1 **Administrative Functions:**

- **Role:** High-level users responsible for overall system administration, configuration, and management.
- **Characteristics:** Technically proficient, with strong knowledge of airline operations and the ability to make system-wide changes, manage user roles, and configure settings to meet operational needs.

#### 2.3.2 **Flight Operations Managers:**

- **Role:** Users responsible for managing flight schedules, aircraft assignments, and

route planning.

- **Characteristics:** Experienced in airline operations, with a focus on ensuring optimal flight scheduling, managing real-time changes, and coordinating with various departments (e.g., crew, maintenance).

#### 2.3.3 Crew Managers:

- **Role:** Responsible for scheduling and managing flight crew assignments, tracking certifications, and ensuring compliance with regulatory requirements.
- **Characteristics:** Well-versed in crew management and regulatory standards, with the ability to handle complex scheduling and respond to last-minute changes efficiently.

#### 2.3.4 Customer Service Representatives:

- **Role:** Handle passenger inquiries, ticketing issues, and complaints, using the AMS to provide real-time support and manage customer service tickets.
- **Characteristics:** Strong communication skills, customer-oriented, and familiar with the system's ticketing and passenger management modules to resolve issues quickly and effectively.

#### 2.3.5 Passengers:

- **Role:** End-users of the booking system who search for flights, book tickets, check-in online, and manage their profiles and special requests.
- **Characteristics:** Varying levels of technical proficiency, with a need for a user-friendly interface that allows them to complete tasks like booking flights and checking in with minimal effort.

#### 2.3.6 Maintenance Personnel:

- **Role:** Users responsible for coordinating with flight operations and crew managers to ensure aircraft are properly maintained and ready for scheduled flights.
- **Characteristics:** Technically skilled in aircraft maintenance, with a focus on operational efficiency and safety, often interacting with external maintenance systems integrated with the AMS.

#### 2.3.7 Luggage and Cargo Handlers:

- **Role:** Manage the check-in, tracking, and handling of passenger luggage and cargo shipments.
- **Characteristics:** Operationally focused, with a need for accuracy and efficiency in tracking and managing baggage and cargo, ensuring compliance with weight and

size regulations.

#### 2.3.8 **Data Analysts:**

- **Role:** Responsible for generating reports and analyzing data to provide insights into airline operations, performance, and customer trends.
- **Characteristics:** Strong analytical skills, with expertise in data interpretation, reporting, and using analytics tools to support decision-making.

### 2.4 Operating Environment

- 2.4.1 **Hardware:** The solution, AMS, will be hosted on scalable cloud servers and accessible from various devices via reliable internet. It supports load balancing and failover.
- 2.4.2 **Software:** The system is running on Linux servers, using a relational DBMS, web server, and secure middleware. It supports modern web browsers with encryption.
- 2.4.3 **Deployment:** AMS will be deployed in a cloud environment with containerization support and separate development, testing, and production environments using CI/CD pipelines.
- 2.4.4 **External Interfaces:** The system securely integrates with external APIs, such as flight tracking and payments, and with existing airline systems using standard protocols.
- 2.4.5 **Performance:** AMS strives to ensure 99.9 percent uptime, less than 2-second response times, and scaling for peak traffic.

### 2.5 Design and Implementation Constraints

- 2.5.1 **Regulatory Compliance:** The solution should consider IATA, PCI-DSS, and GDPR, thus influencing both design and security measures.
- 2.5.2 **Legacy System Integration:** The compatibility with existing systems may impose restrictions on technology options and necessitate supplementary integration efforts.
- 2.5.3 **Scalability:** The system will have to be designed for peak loads, thus informing decisions on architecture and infrastructure.
- 2.5.4 **Security:** Stringent security protocols encompassing encryption and multi-factor authentication add to the complexity of design.
- 2.5.5 **Performance:** AMS should sustain low latency at peak usage, hence must be optimized through code and DB queries.



2.5.6 **Cross-Platform Compatibility:** The system must work across various devices and OS, limiting UI design and necessitating extensive testing.

2.5.7 **Budget and Time:** Development must stay within budget and deadlines, possibly requiring feature prioritization or phased releases.

## 2.6 Assumptions and Dependencies

### 2.6.1 Assumptions:

- **Stable Internet:** The system will be using stable internet access.
- **User training:** Involves the proper training of airline staff to minimize errors.
- **System Integration:** Compatibility with existing systems and third-party services is assumed.

### 2.6.2 Dependencies

- **Third-Party APIs:** This system depends on third-party APIs to handle services related to flight tracking and payments.
- **Hardware:** Performance depends on cloud servers and network infrastructure.
- **Regulatory Changes:** To be able to meet any change in industry regulations.

## 3. External Interface Requirements

### 3.1 User Interfaces

3.1.1 **Dashboard:** Centralized, role-based dashboard featuring real-time metrics and quick ways to perform key tasks.

3.1.2 **Navigation:** A clean and responsive menu facilitates easy access to modules such as Flight Management and Booking across all devices.

3.1.3 **Reservation System:** Smooth user interface of passenger for flight search, seat selection, and secure payment.

3.1.4 **Forms:** Consistent, intuitive forms with auto-complete and validation for pain-free data entry.

3.1.5 **Alerts:** Real-time notifications on critical events, customizable by user preference.

3.1.6 **Responsive Design:** Fully responsive interfaces for desktops, tablets, and smartphones.

3.1.7 **Help and Support:** In-system guidance through the use of integrated tooltips, FAQs,

and a searchable knowledge base.

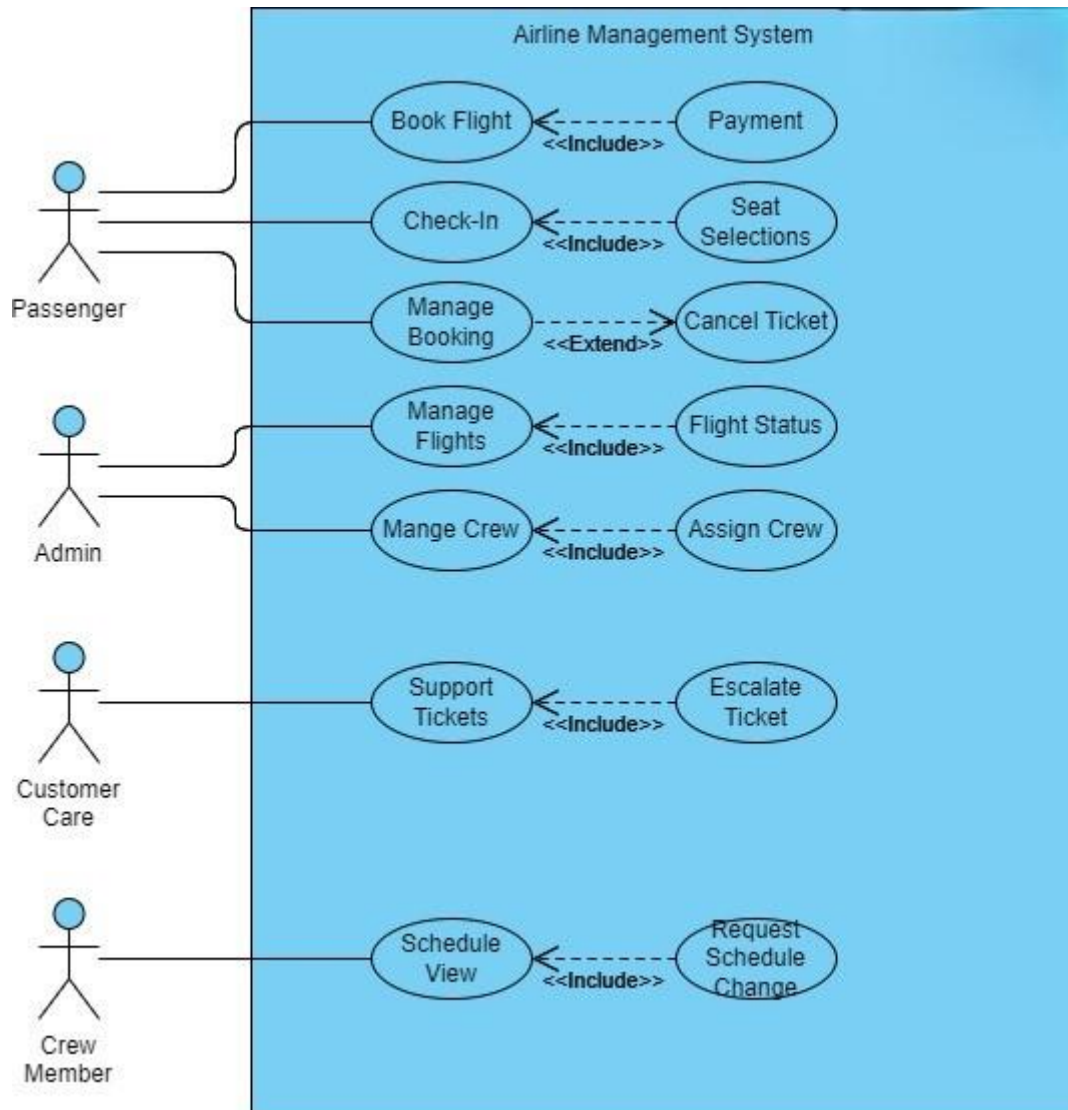
### 3.2 Software Interfaces

- 3.2.1 **Payment Gateways:** Different payment processing services are integrated, like Stripe and PayPal, which securely handle transactions, refunds, and chargebacks.
- 3.2.2 **Flight Tracker API:** This will integrate third-party APIs to provide real-time status updates of flights, weather, and route optimization.
- 3.2.3 **Customer Relationship Management Systems:** This software interfaces with CRM tools to maintain customer profiles, monitor contact, and administer loyalty programs.
- 3.2.4 **Identity Management:** The work authentication services like OAuth, SAML-for user log-in and SSO-are already available within it; besides, users can manage roles.
- 3.2.5 **Email and Notification Services:** Utilize email servers and SMS gateways to transmit booking confirmations, flight updates, and various notifications to users. Database Systems: These provide interfaces to relational databases like MySQL, PostgreSQL that are used for maintaining operational data, booking details, and user information.

### 3.3 Communications Interfaces

- 3.3.1 **Web Services:** AMS uses RESTful APIs and SOAP for communication between different modules and with external systems like payment gateways and flight tracking services.
- 3.3.2 **Messaging:** The SMS Gateways are connected to various SMS services to send real-time notifications, for example, flight updates and check-in reminders, to the passengers. Messaging protocols like RabbitMQ and Kafka build messaging queues that ensure reliable data transfer and execution of tasks, thus enabling asynchronous communication among system components.
- 3.3.3 **VPN and Channel Protection:** This provides secure connections via VPN and utilizes encrypted channels, like SSL/TLS, for internal communications during remote access to critical data.
- 3.3.4 **Third-party Integrations:** Interacts with other services, such as CRM systems or maintenance management, via APIs to guarantee consistency of data without interruptions.

## 4. Analysis Models



## 5. System Features

### 5.1 Flight Management

#### 5.1.1 Description and Priority

The Flight Management is a high-priority feature that allows airlines to efficiently manage flight schedules, routes, and real-time statuses. It is crucial for maintaining smooth airline operations.

#### 5.1.2 Stimulus/Response Sequences

- **Stimulus:** Operations manager inputs new flight schedule.
- **Response:** System updates flight database and notifies relevant departments

- **Stimulus:** Real-time update on flight delay.
- **Response:** System adjusts connected flights and notifies affected passengers.

#### 5.1.3 Functional Requirements

- **REQ-1:** The system shall allow creation and modification of flight schedules.
- **REQ-2:** The system shall enable real-time monitoring and updating of flight statuses.
- **REQ-3:** The system shall facilitate aircraft assignment to specific flights.

### 5.2 Ticket Booking System

#### 5.2.1 Description and Priority

The Ticket Booking System is a high-priority feature that enables passengers to search for flights, book tickets, and manage their reservations. It is essential for generating revenue and providing customer satisfaction.

#### 5.2.2 Stimulus/Response Sequences

- **Stimulus:** Customer searches for flights.
- **Response:** System displays available flights matching search criteria.
- **Stimulus:** Customer selects a flight and completes booking.
- **Response:** System processes payment, generates e-ticket, and sends confirmation.

#### 5.2.3 Functional Requirements

- **REQ-1:** The system shall provide a user-friendly interface for flight search and booking.
- **REQ-2:** The system shall support secure payment processing.
- **REQ-3:** The system shall allow seat selection and booking management.

### 5.3 Passenger Management

#### 5.3.1 Description and Priority

The Passenger Management is a high-priority feature that handles passenger information, check-ins, and special requests. It is crucial for personalized service and efficient operations.

### 5.3.2 Stimulus/Response Sequences

- **Stimulus:** Passenger creates or updates profile
- **Response:** System stores updated information and applies to relevant bookings
- **Stimulus:** Passenger requests special meal
- **Response:** System records request and notifies catering service

### 5.3.3 Functional Requirements

- **REQ-1:** The system shall maintain passenger profiles with personal and preference data.
- **REQ-2:** The system shall support online check-in processes.
- **REQ-3:** The system shall handle and track special requests from passengers.

## 6. Other Non-functional Requirements

### 6.1 Performance Requirements

The Airline Management System (AMS) targets 99.9% uptime with a response time of 2-3 seconds for booking, search, and check-in processes. It supports up to 10,000 concurrent users and 1,000 transactions per minute without performance degradation. Real-time updates should propagate within 1 second, and database queries should execute within 500 milliseconds. The system must handle 1 Gbps data throughput and ensure batch processing completes within 2 hours. In case of failure, full recovery should occur within 30 minutes, with backups restorable in 15 minutes. The user interface should load within 2 seconds across all devices and browsers.

### 6.2 Safety Requirements

The AMS shall perform encryption for confidential data, implement role-based access control mechanisms, and incorporate redundancy that ensures continuity in case of failures. Moreover, a full-pledged disaster recovery plan must be designed, which would entail regular backups, real-time incident monitoring, and strict adherence to aviation safety regulations. In addition, regular safety training among users is very much important for awareness and preparedness against calamities.

### 6.3 Security Requirements

The AMS should ensure the encryption of sensitive data both at transmit and rest, role-based access control, and multi-factor authentication. Security in API communication should be established. It is also part of ensuring no breach incidents that regular security audits are performed, incident response planning is done, and compliance with standards like GDPR and PCI-DSS is maintained. Necessary measures must be taken regarding secure data backup and recovery in order not to lose data.

### 6.4 Software Quality Attributes

The AMS should ensure high performance, reliability, and scalability in order to cope effectively with peak loads and parallel users. Likewise, the system must be designed with security in mind, with appropriate measures like encryption and access control, still maintaining ease of use and being easy to maintain. Applicable regulations and standards shall be strictly adhered to, and it should support seamless integration with external systems to enable full data exchange smoothly.

### 6.5 Business Rules

The Airline Management System (AMS) enforces booking limits of six tickets per transaction and three transactions per day, with refunds only for cancellations within 24 hours or airline-caused cancellations. Passengers must check in 2 hours before domestic and 3 hours before international flights. Changes to bookings are allowed up to 48 hours before departure with possible fees. Crew members need a minimum 12-hour rest between shifts. Any personal information must be kept under the principles of GDPR. Loyalty points are earned per class and distance, which can be utilized in upgrading or carrying forward travels. Aircraft are maintained in respect to flying hours and cycles for safety reasons.

## Appendix A: Glossary

- A.1 **AMS:** Airline Management System, the software system described in this document for managing various airline operations.
- A.2 **API:** Application Programming Interface, a set of protocols and tools for building software applications.
- A.3 **CRM:** Customer Relationship Management, a system for managing interactions with customers and potential customers.
- A.4 **CI/CD:** Continuous Integration/Continuous Deployment, a method to frequently deliver apps to customers by introducing automation into the stages of app development.
- A.5 **GDPR:** General Data Protection Regulation, a regulation in EU law on data protection and privacy.
- A.6 **IATA:** International Air Transport Association, a trade association of the world's airlines.
- A.7 **KPI:** Key Performance Indicator, a measurable value that demonstrates how effectively a company is achieving key business objectives.
- A.8 **PCI-DSS:** Payment Card Industry Data Security Standard, an information security standard for organizations that handle branded credit cards.
- A.9 **REST:** Representational State Transfer, an architectural style for designing networked applications.
- A.10 **SAML:** Security Assertion Markup Language, an open standard for exchanging authentication and authorization data.
- A.11 **SMS:** Short Message Service, a text messaging service component of most telephone, Internet, and mobile device systems.
- A.12 **SOAP:** Simple Object Access Protocol, a messaging protocol specification for exchanging structured information in web services.
- A.13 **SQL:** Structured Query Language, a domain-specific language used in programming and designed for managing data held in a relational database management system.

A.14 **SSO:** Single Sign-On, an authentication scheme that allows a user to log in with a single ID to any of several related, yet independent, software systems.

A.15 **SSL/TLS:** Secure Sockets Layer/Transport Layer Security, cryptographic protocols designed to provide communications security over a computer network.

A.16 **VPN:** Virtual Private Network, a service that allows you to create a secure connection to another network over the Internet.

## Appendix B: Field Layouts

Field	Length	Datatype	Description	IsMandatory
<b>Passenger Details</b>				
Passenger Name	50	String	Passenger's name	Yes
Date of Birth	8	Date	Passenger's birth date	Yes
Passport Number	8	Alphanumeric	Passport number for identification	Yes
Contact Information	10	Numeric	Passenger's email or phone number	Yes
<b>Flight Details</b>				
Flight Number	10	Alphanumeric	Unique flight identifier	Yes
Date	10	Date	Flight departure date	Yes
Departure City	50	String	City of departure	Yes
Arrival City	50	String	Destination city	Yes
Seat Selection	5	Numeric	Seat number chosen by the passenger	No
<b>Payment Information</b>				
Payment Method	20	String	Method of payment (e.g., Credit Card, PayPal)	Yes



Transaction Amount	7	Numeric	Transaction Amount	Yes
Transaction Date	5	Date (MM/YY)	Transaction date	Yes
Transaction Number	20	Numeric	Transaction Number	Yes
<b>Check-In Module</b>				
Booking Reference	10	String	Unique booking reference number	Yes
Flight Number	10	Alphanumeric	Associated flight number for check-in	Yes
Number of Bags	2	Numeric	Number of baggage items to check-in	Yes
Weight per Bag	5	Decimal	Weight of each bag	Yes
<b>Flight Management</b>				
Flight Number	10	Alphanumeric	Unique identifier for a flight	Yes
Aircraft Type	20	String	Type of aircraft assigned to the flight	Yes
Departure Date/Time	19	Date: Time	Scheduled departure date and time	Yes
Arrival Date/Time	19	Date: Time	Scheduled arrival date and time	Yes
<b>Crew Management</b>				
Crew Member Name	50	String	Name of the crew member	Yes
ID	10	String	Unique ID for crew member	Yes
Contact Information	100	Numeric	Contact details of the crew member	Yes
Shift Schedule	50	String	Details of the assigned shifts	Yes
<b>Customer Service</b>				

Support Ticket Number	10	String	Unique identifier for customer support requests	Yes
Issue Description	255	String	Brief description of the customer's issue	Yes
Date Submitted	10	Date	Date the support ticket was submitted	Yes
Resolution Status	20	String	Current status of the support ticket	Yes

## Appendix C: Requirement Traceability Matrix

Requirement ID	Brief Description of Requirement	Architecture Reference	Design Reference	Code File Reference	Test Case ID	System Test Case ID
REQ-001	Passengers can book a flight with personal and payment details.	ARCH-001	DS-001	BookingModule.js	TC-001	STC-001
REQ-002	Passengers can check in online using booking reference and ID.	ARCH-002	DS-002	CheckInModule.js	TC-002	STC-002
REQ-003	Encrypt sensitive data in transit and at rest.	ARCH-003	DS-003	SecurityModule.js	TC-003	STC-003
REQ-004	Manage flight schedules and provide real-time status updates.	ARCH-004	DS-004	FlightManagementModule.js	TC-004	STC-004
REQ-005	Allow crew members to view and manage their shift schedules.	ARCH-005	DS-005	CrewManagementModule.js	TC-005	STC-005

REQ-006	Customers can raise support tickets for issues.	ARCH-006	DS-006	CustomerServiceModule.js	TC-006	STC-006
REQ-007	Comply with aviation safety regulations for crew scheduling.	ARCH-007	DS-007	ComplianceModule.js	TC-007	STC-007
REQ-008	Provide real-time analytics and reporting for flight operations.	ARCH-008	DS-008	ReportingAnalyticsModule.js	TC-008	STC-008
REQ-009	Maintain detailed maintenance logs for all aircraft.	ARCH-009	DS-009	MaintenanceManagementModule.js	TC-009	STC-009
REQ-010	Ensure system scalability to handle peak load.	ARCH-010	DS-010	SystemArchitecture.js	TC-010	STC-010