**Airport Management System**

**Requirement Specifications**  
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—  
Airport Operations & Management Team  
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**Project Overview**

Our vision is to develop an **airport-centric system** designed to streamline airport operations while enhancing the passenger experience. This system will encompass two integrated software solutions: one dedicated to the internal management of airport operations and the other tailored to improving the passenger journey. These software applications will be offered as a comprehensive package. Airports that adopt this system will provide their staff and passengers with full access to both platforms. However, individuals not affiliated with the airport (e.g., external vendors) will have limited access to specific features.

**Airport Management System (AMS)**

**Product Context**

The first software is for the internal management of airport operations. This system is designed for airports worldwide to manage flights, baggage, security, and other critical operations.

**The *stakeholders* of this system include:**

* Airport Operations Staff
* Air Traffic Control
* Security Personnel
* Baggage Handling Teams
* Airlines
* Ground Handling Services
* Maintenance Teams
* Payroll and HR Department
* Procurement Office
* Cargo Services
* Control Office
* First Aid Teams

**User Characteristics:**

* **Airport Operations Staff** manage flight schedules, gate assignments, and runway usage.
* **Air Traffic Control** monitors and directs aircraft movements in real-time.
* **Security Personnel** oversee passenger and baggage screening processes.
* **Baggage Handling Teams** track and manage luggage from check-in to loading onto aircraft.
* **Airlines** manage flight manifests, crew schedules, and passenger boarding.
* **Ground Handling Services** coordinate aircraft refueling, catering, and cleaning.
* **Maintenance Teams** ensure airport facilities and equipment are operational and safe.
* **Payroll and HR Department** manage employee salaries, benefits, and administrative tasks.
* **Procurement Office** handles the procurement of items needed for aircraft maintenance and repairs.
* **Cargo Services** manage the transportation and tracking of cargo shipments.
* **Control Office** oversees overall airport operations and ensures compliance with regulations.
* **First Aid Teams** provide medical assistance to passengers and staff in emergencies.

**Passenger Experience System (PES)**

**Product Context**

This system is designed to enhance the passenger experience by providing real-time information, self-service options, and personalized services.

**The *stakeholders* of this system include:**

* Passengers
* Airlines
* Airport Retailers
* Security Personnel
* Customer Service Teams
* IT Support Teams

**User Characteristics:**

* **Passengers** can check flight status, access boarding passes, receive real-time updates, and use self-service kiosks for check-in and baggage drop.
* **Airlines** provide flight information, manage boarding processes, and handle passenger requests.
* **Airport Retailers** offer promotions and manage inventory through the system.
* **Security Personnel** verify passenger identities and manage security checkpoints.
* **Customer Service Teams** assist passengers with inquiries and issues.
* **IT Support Teams** ensure the system is operational and troubleshoot technical issues.

**Assumptions**

1. The system will integrate with existing airport infrastructure, including flight information displays, baggage handling systems, and security systems.
2. All users will have access to the necessary hardware (e.g., kiosks, scanners) to interact with the system.
3. The system will comply with international aviation regulations and standards.

**Constraints and Dependencies**

**Constraints:**

1. **Scalability:** The system must handle a growing number of flights, passengers, and data without performance degradation.
2. **Budgetary Limitations:** The cost of development, deployment, and maintenance must align with the airport's financial resources.
3. **Interoperability:** Compatibility with existing airport systems (e.g., baggage handling, flight scheduling).

**Dependencies:**

1. **Technological Infrastructure:** Reliable servers, databases, and network connectivity to support the system.
2. **Stakeholder Input:** Collaboration with airport staff, airlines, and passengers to ensure the system meets their needs.
3. **Regulatory Compliance:** Dependence on aviation authorities to ensure the system meets all legal and safety requirements.
4. **Maintenance and Support:** Ongoing technical support and updates to address bugs and improve functionality.

**Requirements - Airport Management System (AMS)**

**Functional Requirements**

**1. Flight Scheduling and Management**

1. **Airport Operations Staff** create and update flight schedules, including departure and arrival times, gate assignments, and runway usage.
2. **Air Traffic Control** monitors and directs aircraft movements in real-time.
3. **System** automatically updates flight statuses and notifies relevant stakeholders of any changes.

**2. Baggage Handling and Tracking**

1. **Baggage Handling Teams** track luggage from check-in to loading onto aircraft.
2. **System** provides real-time updates on baggage location and status.
3. **Passengers** receive notifications if their baggage is delayed or misplaced.

**3. Security and Screening**

1. **Security Personnel** manage passenger and baggage screening processes.
2. **System** integrates with security scanners and provides real-time alerts for suspicious items.
3. **Passengers** are notified of security wait times and checkpoint statuses.

**4. Maintenance and Facility Management**

1. **Maintenance Teams** log and track maintenance requests for airport facilities and equipment.
2. **System** schedules and prioritizes maintenance tasks based on urgency.
3. **Airport Operations Staff** receive notifications when maintenance is completed.

**5. Salary Calculation and Payroll Management**

1. **Payroll and HR Department** calculate employee salaries based on hours worked, overtime, and benefits.
2. **System** automatically generates payroll reports and processes payments.
3. **Employees** can access their salary details and payment history through the system.

**6. Procurement of Items for Aircraft Maintenance**

1. **Procurement Office** identifies and procures items needed for aircraft repairs and maintenance.
2. **System** tracks inventory levels and automatically generates purchase orders when stock is low.
3. **Maintenance Teams** receive notifications when procured items are available for use.

**7. Cargo Services Management**

1. **Cargo Services** manage the transportation and tracking of cargo shipments.
2. **System** provides real-time updates on cargo location and status.
3. **Airlines** and **Customers** receive notifications about cargo delivery status.

**8. First Aid Services**

1. **First Aid Teams** provide medical assistance to passengers and staff in emergencies.
2. **System** tracks medical supplies and generates alerts when restocking is needed.
3. **Passengers** can request first aid assistance through the system.

*or the Airport Management System (AMS):*

1. **Runway Utilization Optimization**  
   Automatically optimize runway assignments based on real-time flight data to maximize efficiency.
2. **Emergency Response Coordination**  
   Integrate a module for dispatching emergency services, alerting appropriate teams, and tracking incident resolutions.
3. **Airport Facility Inventory Management**  
   Monitor and manage supplies and spare parts for airport operations with automated restocking alerts.
4. **Weather Data Integration**  
   Incorporate weather data feeds to inform flight scheduling adjustments and enhance safety protocols.
5. **Ground Transportation Coordination**  
   Manage shuttle buses and ground transport logistics for staff and passengers, ensuring timely pickups and drop-offs.
6. **Vendor and Contractor Management**  
   Allow for the management of external service providers (e.g., cleaning, catering) with contract tracking and performance metrics.
7. **Environmental Monitoring**  
   Track noise levels, air quality, and emissions in real time to ensure compliance with environmental standards.
8. **Energy Management System Integration**  
   Monitor and control energy usage (lighting, HVAC) across terminals to improve operational efficiency.
9. **Flight Delay and Disruption Management**  
   Automatically detect and manage delays, providing alternative scheduling options and notifications to stakeholders.
10. **Digital Signage and Passenger Notification System**  
    Control dynamic displays across the airport to broadcast real-time updates and alerts.

**Requirements - Passenger Experience System (PES)**

**Functional Requirements**

**1. Flight Information and Updates**

1. **Passengers** can check real-time flight status, gate information, and boarding times.
2. **System** sends automated notifications for flight delays, cancellations, and gate changes.

**2. Self-Service Options**

1. **Passengers** can check-in, print boarding passes, and drop baggage at self-service kiosks.
2. **System** integrates with airline systems to ensure accurate passenger information.

**3. Retail and Dining Services**

1. **Airport Retailers** offer promotions and manage inventory through the system.
2. **Passengers** can browse and purchase items from airport retailers via the system.

**4.**  **Self-Service Baggage Drop and Tag Printing**  
Extend self-service kiosks to include baggage tagging and drop-off functionalities, reducing wait times.

**5.**  **Personalized Passenger Itinerary and Travel Assistance**  
Offer personalized itineraries that integrate flight, transfer, and ancillary service details for a streamlined travel experience.

**6.**  **Interactive Wayfinding and Terminal Navigation**  
Provide interactive maps and navigation assistance to help passengers locate gates, lounges, and other services.

**7.**  **Real-Time Passenger Feedback Collection**  
Incorporate feedback tools that allow passengers to rate services and report issues instantly, with results used for continuous improvement.

**8.**  **Digital Advertisement and Promotion Display System**  
Enable targeted advertising and promotional content display based on passenger profiles and real-time context.

**9.**  **Lost and Found Reporting System**  
Allow passengers to report lost items, track status, and receive updates through a dedicated module.

**10.**  **Special Assistance Request Handling**  
Provide an interface for passengers requiring special assistance (e.g., mobility support) to request help promptly.

**11.**  **Lounge and Facility Reservation System**  
Allow premium passengers to reserve lounge access or other airport facilities directly from the system.

**Non-Functional Requirements**

**Product Requirements**

1. **Usability:** The system must have an intuitive interface for both airport staff and passengers.
2. **Performance:** The system must handle up to 10,000 concurrent users during peak times without delays or crashes.
3. **Security:** Sensitive information, such as passenger data and flight manifests, must be encrypted both at rest and in transit.

**Organizational Requirements**

1. **Compliance:** The system must comply with international aviation regulations and standards.
2. **Uptime:** The system must guarantee 99.9% uptime, with automated backup and disaster recovery mechanisms.

**External Requirements**

1. **Global Accessibility:** The system must ensure 24/7 availability for passengers and staff worldwide.
2. **Regulatory Compliance:** The system must adhere to all legal and safety requirements set by aviation authorities.

**Non-Functional Requirements for Both Systems**

1. **Scalability:** Both systems must support a growing number of users, flights, and data without performance degradation.
2. **Interoperability:** Both systems must integrate seamlessly with existing airport infrastructure and third-party systems.
3. **Security:** Both systems must implement multi-factor authentication and encryption to protect sensitive data.

### **Clarification on How They Apply to AMS and PES:**

1. **Usability** → Applies to both AMS and PES
   * AMS: Airport staff must easily navigate and use the system.
   * PES: Passengers need a user-friendly interface for self-service.
2. **Performance** → Applies to both AMS and PES
   * AMS: Handles high traffic from operations and airport personnel.
   * PES: Manages thousands of passengers using self-service options simultaneously.
3. **Scalability** → Applies to both AMS and PES
   * Both systems must scale as airport traffic increases.
4. **Reliability (99.9% uptime)** → Applies to both
   * Critical for AMS to ensure smooth airport operations.
   * Essential for PES to prevent disruptions in passenger services.
5. **Security (Multi-Factor Authentication, Encryption)** → Applies to both
   * AMS: Protects sensitive operational data (e.g., flight schedules, payroll).
   * PES: Secures passenger personal information (e.g., boarding passes, payment details).
6. **Compliance (Aviation and Data Protection Laws)** → Applies to both
   * AMS: Must comply with **IATA, ICAO, and aviation safety regulations**.
   * PES: Must comply with **GDPR and passenger data privacy laws**.
7. **Interoperability (Integration with Existing Systems)** → Applies to both
   * AMS: Must integrate with flight management, baggage handling, and security systems.
   * PES: Needs to sync with airline databases, ticketing systems, and self-service kiosks.
8. **Maintainability (Modular Architecture, Frequent Updates)** → Applies to both
   * Both systems require frequent updates and maintenance with minimal downtime.
9. **Accessibility (For Airport Staff & Passengers with Disabilities)** → Applies to both
   * AMS: Ensures accessibility for employees with disabilities.
   * PES: Supports screen readers, multiple languages, and easy navigation for travelers.
10. **Localization (Multi-language Support)** → More relevant for PES
    * AMS: Could be localized for staff across different countries.
    * PES: Passengers from multiple nationalities need language options.
11. **Availability (24/7 Real-time Updates)** → Applies to both
    * AMS: Must be available at all times for airport personnel.
    * PES: Passengers need real-time updates about flights and services.
12. **Data Integrity (Accurate Information Across Systems)** → Applies to both
    * AMS: Ensures flight data, baggage tracking, and financial records are correct.
    * PES: Ensures flight schedules, check-in details, and passenger information remain accurate.
13. **Disaster Recovery (Backup & System Restoration in Case of Failure)** → Applies to both
    * AMS: Must restore operational data quickly after system failures.
    * PES: Ensures passengers can still check flight details and boarding passes in case of downtime.
14. **Environmental Efficiency (Optimize Energy Consumption & Reduce Waste)** → Applies to AMS
    * AMS: Manages energy use in terminals, baggage handling, and runway lighting.
15. **Responsiveness (Fast Load Times & Performance Optimization)** → Applies to both
    * AMS: Must quickly process flight and baggage data.
    * PES: Should load check-in pages, flight updates, and self-service kiosks without delay.
16. **Error Handling (Detect & Recover from System Failures)** → Applies to both
    * Both systems should log errors and recover automatically from common failures.
17. **Auditability (Track & Monitor System Usage and Changes)** → Applies to both
    * AMS: Logs operational changes for security and accountability.
    * PES: Keeps a record of transactions, complaints, and system usage for review.
18. **Industry Standard Compliance (IATA, ICAO, GDPR, etc.)** → Applies to both
    * Both systems must comply with relevant aviation and data privacy regulations.
19. **Network Resilience (Handle Connectivity Issues Gracefully)** → Applies to both
    * AMS: Must continue working during temporary network failures.
    * PES: Should still provide flight information and boarding passes offline when necessary.
20. **User Training & Support (Guides, Documentation, & Customer Assistance)** → Applies to both
    * AMS: Staff training for system usage, error handling, and troubleshooting.
    * PES: Self-help documentation and customer service options for passengers.

**General Description in Detail**

The **Airport Management System (AMS)** and **Passenger Experience System (PES)** are designed to work in tandem to ensure efficient airport operations and a seamless passenger experience. The AMS focuses on internal operations, including flight scheduling, baggage handling, security, maintenance, payroll, procurement, cargo services, and first aid. The PES enhances the passenger journey by providing real-time flight information, self-service options, and retail services. Both systems are scalable, secure, and compliant with international aviation standards, ensuring smooth operations and a positive experience for all stakeholders.

**Use case diagrams for the Functional Requirements**

**1.**A diagram of a flight schedule

AI-generated content may be incorrect.

**2.** A diagram of a person with a stick figure

AI-generated content may be incorrect.

**3.** A diagram of a security personnel

AI-generated content may be incorrect.

**4.** A diagram of a person's diagram

AI-generated content may be incorrect.

**5.** A diagram of a person's diagram

AI-generated content may be incorrect.

**6.** A diagram of a diagram of a person

AI-generated content may be incorrect.

**7.** A diagram of cargo services management

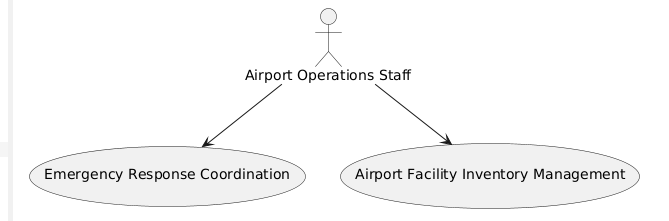
AI-generated content may be incorrect.

**8.** A diagram of a person with text

AI-generated content may be incorrect.

**9.** A diagram of a person with a stick figure

AI-generated content may be incorrect.

**10,11.** 

**12,13.** Diagram of a diagram

AI-generated content may be incorrect.

**14,15.** A diagram of an airport operations staff

AI-generated content may be incorrect.

**16,17.** A diagram of a diagram of a plane

AI-generated content may be incorrect.

**18.** A diagram of a sign

AI-generated content may be incorrect.

**19.** A diagram of a flight information

AI-generated content may be incorrect.

**20.** A diagram of a person with text

AI-generated content may be incorrect.

**21.** A diagram of retail and dining services

AI-generated content may be incorrect.

**22,23.** A diagram of a person's life

AI-generated content may be incorrect.

**24.,25.** A diagram of a person with text

AI-generated content may be incorrect.

**26,27.** A diagram of a person's diagram

AI-generated content may be incorrect.

**28,29,30.** A diagram of a person's identification

AI-generated content may be incorrect.