Requirements Analysis Document (RAD)

Prepared for

World Plane, Inc. (WPI)

Prepared by

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Requirements Analysis Document (RAD)

1 Introduction

1.1 Purpose of the system

World Plane, Inc. (hereinafter referred to as WPI) aims to assess the viability of migrating our Travel Agency airline travel reservation system to a Retail Customer airline reservation system. To achieve this objective, WPI seeks the development of a small-scale 'proof of concept' software application.

1.2 References

- Statement of Work (SOW) provided by World Plane, Inc.
- Kickoff Meeting, held on January 10, 2024, 6:00 pm EST.

1.3 Scope of the system

WPI currently operates a portion of its airline flight database on an Internet-accessible server, with data retrievable via a standard HTTP GET API returning plain text XML strings. Comprehensive API documentation will be furnished to all project development teams, including preconditions, postconditions, invariants, and side effects. Additionally, sample Java code illustrating API calls and methods for parsing XML results will be supplied, along with result samples to facilitate comprehension of the XML document structure.

1.4 Core System Functionalities

The client software allows retail customers to select departure and arrival airports for one-way or round-trip flights, choosing between first class or coach seating. It calculates layover times and displays flight times in local and GMT formats. Concurrent development by multiple contractor teams is supported through database locking. However, the system remains simple as a proof of concept, lacking features such as personal information collection, payment processing, or reservation deletions.

1.5 Objectives and Success Criteria of the Project

The application's success depends upon meeting the following core set of objectives and requirements described in Section 4 of this document.

2 Current System

2.1 Existing System

Retail airline reservation systems such as Expedia, Booking.com, and Kayak exist at present. These are web-based airline reservation systems that allow users to book trips and search for various flights on one single web. In these systems, users select a departure airport and an arrival airport, enter the leaving date and returning date (if the user is booking a round trip), and make customizations to the trip (e.g., the number of stopovers and airlines). Currently, given by the Statement of Work, WPI only has a subset of airline flight database running on an Internet

accessible server. To augment this travel agency airline travel reservation system to a retail customer airline reservation system, we plan to incorporate front-end, back-end, and database developments to create a user-friendly and technologically advanced platform. This will involve adding functionalities similar to those found on the existing retail airline reservation systems. However, these established retail systems will not be entirely replaced due to their maturity and the extensive systems already deployed and continuously upgraded to meet users' needs. Compared with these systems, our proposed system is still at an early stage.

2.2 Current Operations

The Statement of Work did not include details of the client's current business practices regarding their business practices. Without access to specific details of business practices or direct information from the stakeholders, it is difficult to accurately analyze how the client currently addresses the business problem.

3 Proposed System

3.1 Overview

The proposed system (hereinafter referred to as Airline Travel Reservation or ATR for short) will afford the potential traveler and/or user a greater degree of flexibility. The proposed system will be available online and will be accessible from anywhere; all that will be required is the use of an Internet-enabled device on which a compatible web browser is installed. Also, the proposed system will, for the most part, be offered as an around-the-clock service, making its use far more convenient than those that are agent-based. Keep in mind that agent-based services can be off-putting to potential travelers due to the physical location from which they operate and their hours of operation.

The proposed system will boast a sufficient degree of transparency and accuracy, as every piece of information that is pertinent to a user-associated transaction will not only be made available to the user but also be as accurate as possible, facilitating and bolstering the overall flight booking process. Speaking of which, the proposed system will be designed to be as user-friendly as possible and will even strive to conform to the latest Web Content Accessibility Guidelines (WCAG) and Americans with Disabilities Act (ADA) standards, potentially resulting in a user experience that is no less than intuitive when navigating the system interface. Not to mention, the user will maintain the ability to cancel an in-process booking transaction at any time. Finally, the proposed system will disallow the collection and/or storage of any personally identifiable information (PII) as well as the processing of monetary transactions, mitigating the potential risk of the user being personally exposed.

3.2 Conceptual Model – User Scenarios

3.2.1 User

A user is any person who interacts with the ATR system to search for, review information pertaining to, and/or book a reservation for a flight. Moreover, a user is assumed to have access

to an Internet-enabled device on which a compatible web browser is installed. Also, a user requires the ability to travel to and from any ATR-listed airport at any date and time of their choosing. Additionally, a user requires a user-friendly experience and complete transparency when interacting with the ATR system. That is, any information resulting from any user-associated transaction is expected to be pertinent, complete, and accurate. Finally, a user is expected to maintain the ability to modify and/or cancel their reservation at any time while interacting with the ATR interface but before committing to any transaction.

3.2.2 Data Entry Clerk

A data entry clerk is any person who ensures that the ATR database is accurate, current, and organized. Moreover, a data entry clerk requires a database user role that matches their designated duties. Specifically, a data entry clerk, based on their database user role, requires the ability to add, delete, retrieve, and update ATR database records. Finally, a data entry clerk requires the assurance that their interaction with the ATR database will not adversely impact any in-process and/or committed user-associated transaction.

3.3 Functional Model - Use Case Model

The varying functionalities that the proposed system will provide and the way they relate to one another are described using the below functional model use-cases.

Participating Actor	**Use Cases**
User	1. Flight Search 2. Flight Review 3. Flight Booking
Data entry clerk	4. Add/Delete/Modify/Retrieve Record

3.3.1 Flight Search

Name	Flight Search
Description	This use case describes the scenario during which the user searches for available flights based on the user's inputted criteria.
Participating Actor	User
Flow of Events (*denotes alternate flow of events)	1. The user makes one of the following for their desired flight type*: a. The user selects a one-way flight. b. The user selects a round-trip flight. c. The user selects a multi-city flight.

	2. The user makes one of the following for their desired seat type*: a. The user selects an economy seat. b. The user selects a premium economy seat. c. The user selects a business seat. d. The user selects a first-class seat. 3. The user inputs their desired departure and arrival airports. 4. The user inputs their desired departure date and time. 5. The user quantifies the number of travelers by type*: a. The user quantifies the number of adult travelers. b. The user quantifies the number of children travelers or travelers between 2 and 17 years of age*: i. The user selects a number no less than 2 and no greater than 17. c. The user quantities the number of infant travelers or travelers younger than 2 years of age*: i. The user selects a number no less than 0 and no greater than 1. ii. The user identifies that the traveler will travel on the lap of an older traveler. iii. The user identifies that the traveler will travel in a properly secured safety seat. 6. The user executes the search for available flights. 7. The results of the search are displayed on the ATR interface.
Entry Conditions	• The user navigates to the ATR website. • The user may have a desired departure and arrival airport. • The user may have a desired departure date and time as well as arrival date and time. • The user may have a desired type of flight and seat. • The user may know the number of travelers by type and age.
Exit Conditions	• The ATR application displays information that is pertinent to the search that the user executed based on the user's criteria. • The user abandons the transaction and navigates away from the ATR website.
Quality Requirements	• The ATR website must be available to the user over the Internet no less than 90 percent of the time (and 99.9 percent of the time if hosted across multiple server instances across two or more availability zones).

	• The search results must be displayed in 10 seconds or less.
	• All information displayed must be complete, free of typographical errors, and accurate.
	• The search results must list the following:
	  ○ The cost of the flight per traveler.
	  ○ The departure and arrival airports.
	  ○ The departure date and time.
	  ○ The arrival date and time.
	  ○ The flight operator and flight number.
	  ○ The duration of the flight.
	  ○ If the flight is nonstop or the number of stops if any, with each stop being listed with their duration and the airport where they occur.
	• All displayed time values must match the time zone of the user.
	• The search results will only include flight reservations with 2 or less stops between the user's departure and arrival airports.
	• Listed stops are no less than 30 minutes and no more than 1 hour in duration.

3.3.2 Flight Review

Name	Flight Review
Description	This use case describes the scenario during which the user reviews the information that resulted from their search for available flights using their selected set of desired criteria.
Participating Actor	User

Flow of Events (*denotes alternate flow of events)	1. The user sorts the results of their search by a selected criterion in ascending or descending order*:
	  a. The user sorts the results of their search by price.
	  b. The user sorts the results of their search by departure time.
	  c. The user sorts the results of their search by arrival time.
	  d. The user sorts the results of their search by price flight duration.
	  e. The user sorts the results of their search by price number of stops.
	  f. The user sorts the results of their search by price flight operator.

	2. The user scrolls through the list of available flights. 3. The user selects a potential flight for further review. 4. A modal window that features additional details for the selected flight is displayed. 5. The user makes one of the following choices*: a. The user reviews the additional details. b. The user exits the modal window and repeats steps 2 through 5 for another potential flight. c. The user elects to book the selected flight.
Entry Conditions	• The user is on the ATR website. • The results from the user's search for available flights based on the user's inputted criteria are displayed on the ATR interface.
Exit Conditions	• The user elects to book a selected flight. • The user abandons the transaction, closes the modal window, and navigates away from the ATR website.
Quality Requirements	• The ATR website must be available to the user over the Internet no less than 90 percent of the time (and 99.9 percent of the time if hosted across multiple AWS server instances across two or more availability zones). • The modal window with the additional details for the selected flight must be displayed in 10 seconds or less. • All information displayed must be complete, free of typographical errors, and accurate. • The modal window must list the following: o The cost of the flight per traveler. o The number of travelers by type. o The number of seats available by type. o The departure and arrival airports along with their geographic coordinates and local weather (if time permits). o The departure date and time. o The arrival date and time. o The flight operator and flight number. o The duration of the flight. o If the flight is nonstop or the number of stops if any, with each stop being listed with their duration and the airport where they occur.

	○ Listed stops are no less than 30 minutes and no more than 1 hour in duration. ○ Any special conditions pertaining to the booking transaction (e.g., refundability, cancellations allowance and penalties, discounts extended by the flight operator, etc.). • All displayed time values must match the time zone of the user. • The search results must only include flight reservations with 2 or less stops between the inputted departure and arrival airports.

3.3.3 Flight Booking

Name	Flight Booking
Description	This use case describes the scenario during which the user modifies, cancels and/or finalizes a booking transaction after reviewing the additional details for a selected flight.
Participating Actor	User
Flow of Events (*denotes alternate flow of events)	1. The user reviews the additional details for the selected flight. 2. The user makes one or a combination of the following choices*: a. The user reviews the additional details for the selected flight. b. The user exits the modal window and repeats steps 2 through 5 from the Review Flights use case for another potential flight. c. The user reviews and alters as many modifiable details for the selected flight as required. d. The user commits to and finalizes the booking transaction for the selected flight: i. The ATR system requests that the user performs a final review of and confirmation of the additional details before finalizing the booking transaction for the selected flight. e. The user abandons the transaction and navigates away from the ATR website.
Entry Conditions	• The user is on the ATR website. • The user scrolled through the list resulting from their search of available flights and selected a potential flight.

	• A modal window that features additional details for the selected flight is displayed.
Exit Conditions	• The user receives a confirmation message on the modal window that their transaction has been processed. • The user exits the modal window and repeats steps 2 through 5 from the Review Flights use case for another potential flight. • The user abandons the transaction, closes the modal window, and navigates away from the ATR website.
Quality Requirements	• The ATR website must be available to the user over the Internet no less than 90 percent of the time (and 99.9 percent of the time if hosted across multiple AWS server instances across two or more availability zones). • The booking transaction, after finalization, must be processed in 10 seconds or less. • In the event of an extended loss of Internet connectivity, any user-associated transaction that is in the process of being finalized must be completed. • All information displayed must be complete, free of typographical errors, and accurate.

3.3.4 Add/Delete/Modify/Retrieve Record

Name	Add/Delete/Modify/Retrieve Record
Description	This use case describes the scenario during which the data entry clerk adds, deletes, and modifies the ATR database flight records.
Participating Actor	Data Entry Clerk
Flow of Events (*denotes alternate flow of events)	1. The data entry clerk accesses the ATR database management system. 2. The ATR database management system authenticates the data entry clerk and grants them access. 3. The data entry clerk queries the database for a record of interest and reviews said record for content. 4. The data entry clerk makes one or a combination of the following choices*: a. The data entry clerk executes the appropriate command to retrieve a record.

	b. The data entry clerk executes the appropriate command to add a record. c. The data entry clerk executes the appropriate command to modify a record. d. The data entry clerk executes the appropriate command to delete a record. e. The data entry clerk repeats steps a, b, c, and d as required for additional records. f. The data entry clerk queries the ATR database to confirm the successful execution of steps b, c, and c as required. 5. The data entry clerk logs off the ATR database management system.
Entry Conditions	• The data entry clerk is assigned a database user role based on their designated duties. • The data entry clerk is assigned a list of records to add to, modify, and/or delete from the ATR database. • The data entry clerk accesses the ATR database management system during their designated work hours.
Exit Conditions	• The ATR database is update as required.
Quality Requirements	• The ATR database management system must always be available to the data entry clerk. • All records that are added and/or modified must be complete, free of typographical errors, and accurate. • In the event a data entry clerk adds, modifies, and/or deletes an ATR database record, the result of the transaction should be nearly instantaneously viewable by the user.

3.4 Analysis Model – Object Model

The following represents the initial static object model and illustrates the varying classes and how these classes are associated. Finally, the object model supports the functional use cases.

3.4.1 User

- The user can access the ATR system using an Internet-enabled device on which a compatible web browser is installed.
- The user can search for any available flight listed on the ATR database using the ATR system interface.
- The user can view the details of any available flight listed on the ATR database using the ATR system interface.

- The user can select any available flight listed on the ATR database by type (i.e., one-way, round-trip, and multi-city) using the ATR system interface.
- The user can select any available seat on any available flight that is listed on the ATR database by type (i.e., economy, premium economy, business, and first class) using the ATR system interface.
- The user can modify any modifiable detail of any available flight listed on the ATR database using the ATR system interface.
- The user can commit to any transaction using the ATR system interface pertaining to a selected flight from the list of flights available on the ATR database.
- The user can abandon or cancel any transaction prior to committing to said transaction and navigate away from the ATR website.

3.4.2 Data Entry Clerk

- The data entry clerk can access the ATR database using their assigned database role during their designated working hours.
- The data entry clerk can retrieve any flight record listed in the ATR database.
- The data entry clerk can delete any flight record listed in the ATR database.
- The data entry clerk can modify any flight record listed in the ATR database.
- The data entry clerk can add a flight record to the ATR database.

3.4.3 ATR System

- The ATR system can allow the user to retrieve and view the specific set of flight information that comprises its database based on a set of user-selected criteria.
- The ATR system can allow the user to confirm the details of a flight before committing to a booking transaction.
- The ATR system can allow the user to modify any modifiable details of a flight before committing to a booking transaction.
- The ATR system can allow the user to book a flight based on a set of user-selected criteria.
- The ATR system can allow the user to abandon a transaction at any given time before committing to said transaction.

3.4.4 ATR Database

- The ATR database can store the specific set of flight information that the ATR system uses to process flight booking transactions on a series of tables and rows.
- The ATR database can relate the tables and rows comprising the specific set of flight information that the ATR system uses to process flight booking transactions.
- The ATR database can permit the manipulation (i.e., add, delete, retrieve, and modify) of the specific set of flight information listed on its tables and rows using structured query language (SQL).

4 Requirements

4.1 Functional Requirements

Requirement	Description	Priority
REQ-F1	The user must be able to reserve travel from the destination airport to an arrival airport using a series of connecting.	HIGH
REQ-F2	The ATR system must allow the user to reserve travel from a departure airport to an arrival airport with stops of sufficient duration to allow the users to transition between gates.	HIGH
REQ-F3	The user must be able to reserve flights to travel one-way (from departure to destination), or reserve a round-trip flight	HIGH
REQ-F4	The user must be able to reserve seating of the following types: • Economy • Premium economy • Business • First Class	HIGH
REQ-F5	The user must be able to search for flights using departure date and time as well as arrival date and time.	HIGH
REQ-F6	The user must be able to select and save flights.	HIGH

4.2 Nonfunctional Requirements

Requirement	Description	Priority
REQ-NF1	The ATR system must be accessed by standard HTTP GET API.	HIGH
REQ-NF2	The ATR system must provide documentation for the APIs, including preconditions, post conditions, invariants, and side effects.	LOW
REQ-NF3	The ATR system must provide a Java subset of functionality similar to other existing web-based airline reservation systems (Proof-Of-Concept).	LOW

REQ-NF4	The ATR system must allow the user to reserve travel from a departure airport to an arrival airport using a series of connecting flights with no more than two (2) stops.	HIGH
REQ-NF5	The ATR system must allow the user to reserve travel from a departure airport to an arrival airport with steps of sufficient time to allow the airline to transfer the traveler's bags from one flight to the next.	HIGH
REQ-NF6	The ATR system must restrict situations where requested seating is not available for all legs of the flight.	HIGH
REQ-NF7	The ATR system must not offer flight choices with unreasonable layover times.	HIGH
REQ-NF8	The ATR system must allow concurrent use by multiple users running against the same database server.	MEDIUM
REQ-NF9	The ATR system must support concurrency by locking the server database, prohibiting changes during the user reservation session but will be released within a reasonable period.	MEDIUM
REQ-NF10	The ATR system must not support any monetary transactions.	HIGH
REQ-NF11	The ATR system must remain simple.	MEDIUM
REQ-NF12	The ATR system must have the ability to reserve different seat types (i.e., economy, premium economy, business, and first class) for each leg of a flight.	HIGH
REQ-NF13	The ATR system must not store any user personally identifiable information (PII) on the server.	HIGH
REQ-NF14	The ATR system must not allow a reservation to be deleted once it is made.	HIGH
REQ-NF15	The ATR system must display flights sorted by price, departure time, arrival time, and travel time.	MEDIUM
REQ-NF16	All time values displayed by the ATR system must adjust to the user's local time zone.	HIGH

REQ-NF17	The ATR system must confirm flights selection before saving the user reservation.	HIGH
REQ-NF18	The ATR system must be responsive to user actions.	MEDIUM
REQ-NF19	The ATR system must support testing and developing by having a finite number of flights and airports.	HIGH
REQ-NF21	The ATR system must provide documentation for the APIs, including preconditions, post conditions, invariants, and side effects.	LOW

5 Glossary

Definitions, Acronyms & Abbreviations

Term	**Definition**
Reservation	A user commits to a reservation or reserves a specific type of seat on a specific flight from a specified airport to another for a specific set of dates and times.
Software Application	Refers to the ATR system or ATR for short.
User	Refers to the customer or a person who uses the software application.