Requirements Analysis Document (RAD)

Prepared for

World Plane, Inc. (WPI)

Prepared by

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2.0.0

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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 JSON strings. Comprehensive documentation for Frontend and Backend (API) 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 JSON 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. 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 and modular as a proof of concept, lacking features such as personal information collection, payment processing, reservation deletions, or seat selection.

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.

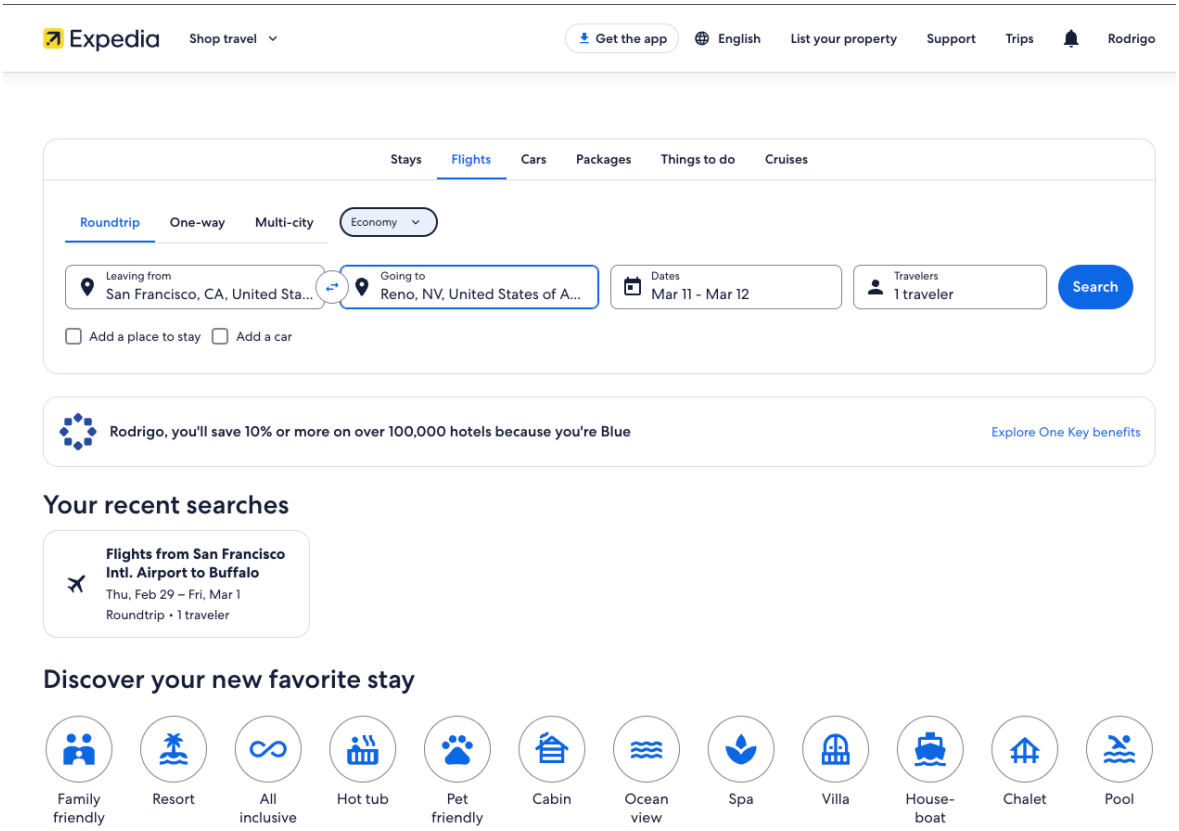

Figure 1 – Current System Frontend

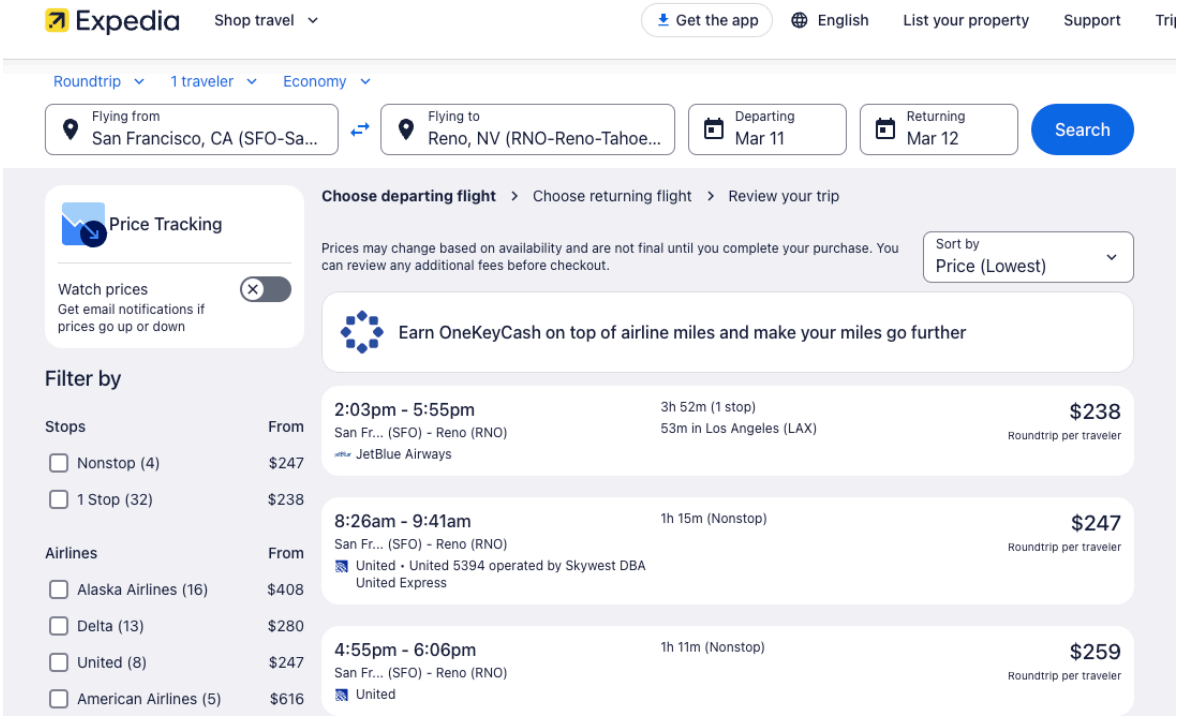

Figure 2 – Current System Flights Search

These web-based airline reservation systems allow users to book trips and search for various flights online. 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 customize the trip (e.g., the number of stopovers and airlines). The system will provide only two airlines for the initial deployment phase, but the design shall consider multiple airlines and routes. According to the Statement of Work, WPI only has a subset of airline flight databases 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, minimalist, 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 approach is still early.

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 analyze how the client addresses the business problem accurately.

3 Proposed System

3.1 Overview

The proposed system (hereinafter called Airline Travel Reservation or ATR for short) will afford the potential traveler greater flexibility. The proposed system will be available online and accessible from anywhere; all required is an Internet-enabled device on which a compatible web browser is installed: Chrome and/or Safari. Also, the proposed system will primarily be offered as an around-the-clock service, making its use far more convenient than agent-based ones. Remember 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 pertinent to a user-associated transaction will be made available to the user and 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. It will even strive to conform to the latest Web Content Accessibility Guidelines (WCAG) and Americans with Disabilities Act (ADA) standards, potentially resulting in a Traveler experience that is no less than intuitive when navigating the system interface. Not to mention, the Traveler can 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) and the processing of monetary transactions, mitigating the potential risk of the Traveler being personally exposed.

3.2 Conceptual Model – Traveler Scenarios

3.2.1 Traveler

A Traveler 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 Traveler is assumed to have access to an Internet-enabled device on which a compatible web browser is installed. Also, a Traveler requires the ability to travel to and from any ATR-listed airport at any date and time of their choosing. Additionally, a Traveler 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 Traveler 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 Airline Travel Reservation System (ATR)

The ATR UI ensures accurate, current, and organized data to be displayed to the Traveler. The ATR API shall allow the Traveler to make flight queries (GET) and reservations (POST). Finally, the ATR UI requires the assurance that their interaction with the ATR database will not adversely impact any in-process and committed user-associated transaction. The ATR also allows developers and DB Admins to enter data (seed data) for testing.

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 functional model use cases below.

Participating Actor	**Use Cases**
Traveler	1. Flight Search 2. Flight Review 3. Flight Booking
ATR	4. Add and Retrieve Records, including data seeding

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	Traveler
Flow of Events (*denotes alternate flow of events)	1. The Traveler makes one of the following for their desired flight type*: a. The Traveler selects a one-way flight. b. The Traveler selects a round-trip flight. c. The Traveler selects a multi-city flight. 2. The Traveler makes one of the following for their desired seat type*: a. The Traveler selects an economy seat. b. The Traveler selects a premium economy seat. c. The Traveler selects a business seat. d. The Traveler selects a first-class seat. 3. The Traveler inputs their desired departure and arrival airports. 4. The Traveler inputs their desired departure date and time. 5. The Traveler quantifies the number of travelers by type*: a. The Traveler quantifies the number of adult travelers. b. The Traveler quantifies the number of children travelers or travelers between 2 and 17 years of age*: i. The Traveler selects a number no less than 2 and no greater than 17. c. The Traveler quantities the number of infant travelers or travelers younger than 2 years of age*: i. The Traveler selects a number no less than 0 and no greater than 1. ii. The Traveler identifies that the traveler will travel on the lap of an older traveler. iii. The Traveler identifies that the traveler will travel in a properly secured safety seat. 6. The Traveler executes the search for available flights. 7. The results of the search are displayed on the ATR interface.
Entry Conditions	• The Traveler navigates to the ATR website. • The Traveler may have a desired departure and arrival airport. • The Traveler may have a desired departure date and time as well as arrival date and time. • The Traveler may have a desired type of flight and seat. • The Traveler 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 Traveler executed based on the user's criteria. • The Traveler abandons the transaction and navigates away from the ATR website.

Quality Requirements	• The ATR website shall be available to the Traveler 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 shall be displayed in 10 seconds or less.
	• All information displayed shall be complete, free of typographical errors, and accurate.
	• The search results must list the following:
	  o The cost of the flight per traveler.
	  o The departure and arrival airports.
	  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.
	• 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 Traveler 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 Traveler sorts the results of their search by a selected criterion in ascending or descending order*: a. The Traveler sorts the results of their search by price. b. The Traveler sorts the results of their search by departure time. c. The Traveler sorts the results of their search by arrival time. d. The Traveler sorts the results of their search by price flight duration. e. The Traveler sorts the results of their search by price number of stops. f. The Traveler sorts the results of their search by price flight operator. 2. The Traveler scrolls through the list of available flights. 3. The Traveler selects a potential flight for further review. 4. A modal window that features additional details for the selected flight is displayed. 5. The Traveler makes one of the following choices*: a. The Traveler reviews the additional details. b. The Traveler exits the modal window and repeats steps 2 through 5 for another potential flight. c. The Traveler elects to book the selected flight.
Entry Conditions	• The Traveler 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 Traveler elects to book a selected flight. • The Traveler abandons the transaction, closes the modal window, and navigates away from the ATR website.
Quality Requirements	• The ATR website shall be available to the Traveler 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 shall be displayed in 10 seconds or less. • All information displayed shall be complete, free of typographical errors, and accurate. • The modal window must list the following:

	○ The cost of the flight per traveler. ○ The number of travelers by type. ○ The number of seats available by type. ○ The departure and arrival airports along with their geographic coordinates and local weather (if time permits). ○ 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. ○ 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 Traveler modifies, cancels and/or finalizes a booking transaction after reviewing the additional details for a selected flight.
Participating Actor	Traveler
Flow of Events (*denotes alternate flow of events)	1. The Traveler reviews the additional details for the selected flight. 2. The Traveler makes one or a combination of the following choices*: a. The Traveler reviews the additional details for the selected flight.

	b. The Traveler exits the modal window and repeats steps 2 through 5 from the Review Flights use case for another potential flight. c. The Traveler reviews and alters as many modifiable details for the selected flight as required. d. The Traveler commits to and finalizes the booking transaction for the selected flight: i. The ATR system requests that the Traveler performs a final review of and confirmation of the additional details before finalizing the booking transaction for the selected flight. e. The Traveler abandons the transaction and navigates away from the ATR website.
Entry Conditions	• The Traveler is on the ATR website. • The Traveler 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 Traveler receives a confirmation message on the modal window that their transaction has been processed. • The Traveler exits the modal window and repeats steps 2 through 5 from the Review Flights use case for another potential flight. • The Traveler abandons the transaction, closes the modal window, and navigates away from the ATR website.
Quality Requirements	• The ATR website shall be available to the Traveler 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, shall 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 shall be completed. • All information displayed shall 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 Traveler 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 shall 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 Traveler

- The Traveler can access the ATR system using an Internet-enabled device on which a compatible web browser is installed.
- The Traveler can search for any available flight listed on the ATR database using the ATR system interface.
- The Traveler can view the details of any available flight listed on the ATR database using the ATR system interface.
- The Traveler 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 Traveler 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 Traveler can modify any modifiable detail of any available flight listed on the ATR database using the ATR system interface.
- The Traveler 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 Traveler can abandon or cancel any transaction prior to committing to said transaction and navigate away from the ATR website.

3.4.2 ATR System

- The ATR system can allow the Traveler 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 Traveler to confirm the details of a flight before committing to a booking transaction.
- The ATR system can allow the Traveler to modify any modifiable details of a flight before committing to a booking transaction.
- The ATR system can allow the Traveler to book a flight based on a set of user-selected criteria.

- The ATR system can allow the Traveler to abandon a transaction at any given time before committing to said transaction.

3.4.3 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 Traveler shall 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 Traveler 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 Traveler shall be able to reserve flights to travel one-way (from departure to destination), or reserve a round-trip flight	HIGH
REQ-F4	The Traveler shall be able to reserve seating of the following types: • Economy • Premium economy • Business • First Class	HIGH
REQ-F5	The Traveler shall be able to search for flights using departure date and time as well as arrival date and time.	HIGH
REQ-F6	The Traveler shall be able to select and save flights.	HIGH

4.2 Nonfunctional Requirements

Requirement	Description	Priority

REQ-NF1	The ATR system shall be accessed by standard HTTP GET API.	HIGH
REQ-NF2	The ATR system must provide documentation for the APIs (Backend), including preconditions, postconditions, invariants, and side effects.	LOW
REQ-NF3	The ATR system must provide documentation for the ATR UI (Frontend), including preconditions, postconditions, invariants, and side effects.	LOW
REQ-NF4	The ATR system must provide a Java subset of functionality similar to other existing web-based airline reservation systems (Proof-Of-Concept).	LOW
REQ-NF5	The ATR system must allow the Traveler 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-NF6	The ATR system must allow the Traveler 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-NF7	The ATR system must restrict situations where requested seating is not available for all legs of the flight.	NA
REQ-NF8	The ATR system must not offer flight choices with unreasonable layover times.	HIGH
REQ-NF9	The ATR system must allow concurrent use by multiple users running against the same database server.	HIGH
REQ-NF10	The ATR system must support concurrency by locking the server database, prohibiting changes during the Traveler reservation session but will be released within a reasonable period.	MEDIUM
REQ-NF11	The ATR system must not support any monetary transactions.	HIGH
REQ-NF12	The ATR system must remain simple.	MEDIUM

REQ-NF13	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.	NA
REQ-NF14	The ATR system must not store any Traveler personally identifiable information (PII) on the server.	HIGH
REQ-NF15	The ATR system must not allow a reservation to be deleted once it is made.	HIGH
REQ-NF16	The ATR system must display flights sorted by price, departure time, arrival time, and travel time.	MEDIUM
REQ-NF17	All time values displayed by the ATR system must adjust to the user's local time zone.	HIGH
REQ-NF18	The ATR system must confirm flights selection before saving the Traveler reservation.	HIGH
REQ-NF19	The ATR system shall be responsive to Traveler actions.	MEDIUM
REQ-NF20	The ATR system must support testing and developing by having a finite number of flights and airports.	HIGH

5 Glossary

Definitions, Acronyms & Abbreviations

Term	**Definition**
Reservation	A Traveler 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. The ATR includes Frontend (UI), Backend (API) and Database
User	Refers to the customer or a person who uses the software application.
JSON	JSON is an open standard file format and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and arrays. It is a commonly used data format

	with diverse uses in electronic data interchange, including that of web applications with servers.
PII	Personally Identifiable Information
ATR UI	Frontend that allows interaction between the System and the Traveler.
ATR API	The backend is responsible to make reservations and retrieving flights
Data Seeding	Data seeding is the process of populating a database with an initial set of data