**University of Washington Tacoma**
School of Engineering and Technology

# Travel Rewards System

Book Airfare with Credit Card Points

**Group 10:**
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# Introduction

The decision to create our project came from the lack of a simple process of finding flights using credit card points. While credit card companies have their own steps to redeem reward points for flights, the process lacks the simplicity and efficiency. The main problem we identified with the current reward points redemption system if you have points on multiple different credit card companies there is currently no way to easily switch between reward points balances to search for flights without having to individually log in to each credit card rewards site and compare the differing results. Our main goals for this project were to improve the current system to be more user-friendly and time-efficient when redeeming credit card reward points. Our group decided to design a system that allows users to both search and claim flights on the basis of their credit card reward points and desired flight information that is entered by the user.

We plan on designing a system that will be integrated alongside other flight search systems such as Skyscanner, Expedia, and Google. These companies already have successful and widely used systems for searching for flights and we hope that our system can complement and improve these systems. With our system, users will eliminate many steps needed to redeem their credit card points. It’s a simple solution to a complicated system that leaves users both frustrated and confused at times. To solve one of the problems that we found from personal experience, we wanted to implement a system that will end up helping thousands of users.

# Planning

The planning phase of our project consists of our system request, feasibility analysis, and project Gantt chart that provides an explanation of if the project should be developed and how it will be developed.

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# System Request

| System Request |
| --- |
| **Project sponsor:**<br>Term Project Group 10 |
| **Business Need:**<br>Develop a system that allow user to use points to pay for travel trips.<br>Let users compare how many points each trip cost.<br>Calculate the transfer rate for points |
| **Business Requirements:**<br>The lack of existing systems that allow simultaneously comparing travel cost using points.<br>No easy way to find how much each point actually worth.<br>Too many steps it takes to transfer points to travel partners.<br>Over complicated system that confusing user while booking a trip using points. |
| **Business Value:**<br>User will be more likely to use point to travel when they are easy to use. Once they travel, they are more likely to spend more money. Banks get profit for each transaction fee.<br>Bringing new customers to our travel site.<br>First company to ease the process of transferring/using points for travel. |
| **Special Issues or Constraints:**<br>Contact banks with rewards point that willing to partner.<br>Propose new system plan to Expedia or Google. |

# Technical Feasibility

Measuring the risk of developing a new system is essential, it helps us to understand what kind of risks we will face with the new system development and determine how the risks endanger our success rate in this project. To consider whether or not this system is technically feasible, or can we build the system, we divided into different sessions to measure the risk that we will have to consider when the system is being developed.

## Familiarity with the System:

The risk level for this session should be relatively low. The new system that we are going to develop is straightforward and easy to learn how to use. Many users should be very familiar with our system because the traveler reward system is a common system in different business fields.

## Familiarity with the Technology:

The technology that we are going to use is very popular, but we do not have a lot of experience in those technologies, so the risk level for this area will be rated as medium.

## Project size:

The project size for this term project will be relatively small. In our development team, we will have 3 people to work together to complete the project, we can divide the workload equally to make sure the project can be done before the term ends. Also, the proposed system will be a simple web-based interface system, so the system development complexity will not be high.

**Compatibility:** The risk of compatibility issues are very small in our project. Since we are developing a web-based system, so once there is an internet connection to the system, any device with internet functions can access the system and interact with it. Also, the new system development will have no negative impact on any party.

# Economic Feasibility

Below we have provided our estimates on the cost of producing the system alongside the benefits that will come from its implementation. We believe that adding the ability to use credit card points when searching for flights will increase both site traffic and overall flight booking, creating enough benefits to outweigh the costs of designing, implementing, and maintaining the system

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | | | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
| 2 | **Benefits** | | | | | | | |
| 3 | Booking Increase | | | $30,000.00 | $30,000.00 | $ 30,000.00 | $ 30,000.00 | $ 206,025.00 |
| 4 | Site Traffic Increase | | | $25,000.00 | $27,500.00 | $ 30,250.00 | $ 33,275.00 | $ 116,025.00 |
| 5 | | | | | | | | |
| 6 | **Total Benefits** | | | $55,000.00 | $57,500.00 | $ 60,250.00 | $ 63,275.00 | $ 322,050.00 |
| 7 | **Present Value Total Benefits** | | | $50,000.00 | $52,272.73 | $ 54,772.73 | $ 57,522.73 | $ 214,568.18 |
| 8 | | | | | | | | |
| 9 | **Development Costs** | | | | | | | |
| 10 | Systems Analysts - 2 Personel | | $ 12,000.00 | | | | | $ 12,000.00 |
| 11 | Programmer Analysts - 6 Personel | | $ 20,000.00 | | | | | $ 20,000.00 |
| 12 | GUI Designer - 2 Personel | | $ 8,000.00 | | | | | $ 8,000.00 |
| 13 | Telecommunications Specialist - 1 Personel | | $ 1,000.00 | | | | | $ 1,000.00 |
| 14 | System Architects - 2 Personel | | $ 3,500.00 | | | | | $ 3,500.00 |
| 15 | Database Specialist - 1 Personel | | $ 675.00 | | | | | $ 675.00 |
| 16 | System Librarian - 1 Personel | | $ 3,750.00 | | | | | $ 3,750.00 |
| 17 | **Total Development Costs** | | **$ 48,925.00** | | | | | **$ 48,925.00** |
| 18 | | | | | | | | |
| 19 | **Annual Operating Costs - Personnel** | | | | | | | |
| 20 | 4 Program Analysts - Personnel | | | $15,000.00 | $15,900.00 | $ 16,854.00 | $ 17,865.24 | $ 65,619.24 |
| 21 | **Total Operational Costs** | | | $15,000.00 | $15,900.00 | $ 16,854.00 | $ 17,865.24 | $ 65,619.24 |
| 22 | | | | | | | | |
| 23 | **Total Costs** | | $ 48,925.00 | $15,000.00 | $15,900.00 | $ 16,854.00 | $ 17,865.24 | $ 114,544.24 |
| 24 | | | | | | | | |
| 25 | **Total Benefits - Total Costs** | | $ (48,950.00) | $40,000.00 | $41,600.00 | $ 43,396.00 | $ 45,409.76 | $ 121,455.76 |
| 26 | | | | | | | | |
| 27 | **Cumulative New Cash Flow** | | $ (48,950.00) | $ (8,950.00) | $32,650.00 | $ 76,046.00 | $121,455.76 | |
| 28 | | | | | | | | |
| 29 | **Present Value Total Costs** | | $ (48,950.00) | $13,636.36 | $14,454.55 | $ 15,321.82 | $ 16,241.13 | $ 10,703.85 |
| 30 | | | | | | | | |
| 31 | **Return on Investment (ROI)** | | 181% | | | | | |
| 32 | | | | | | | | |
| 33 | **NPV(PV Total Benefits - PV Total Costs)** | | $ 93,112.42 | | | | | |

# Organizational Feasibility

This analysis is conducted to determine how well the business will use our system and how they can use our system to operate and launch the business successfully. There are two organizational factors that will be discussed in this session, 1) Strategic alignment and 2) stakeholder analysis. Since we are not actually implementing the system for an actual business, so most of the analysis is made by assumption. Still, we are trying to make the project to be realistic, so we will apply the practical concepts to complete our term project. The goal of our system is to help travelers to understand and calculate the best way to redeem reward points that they earn.

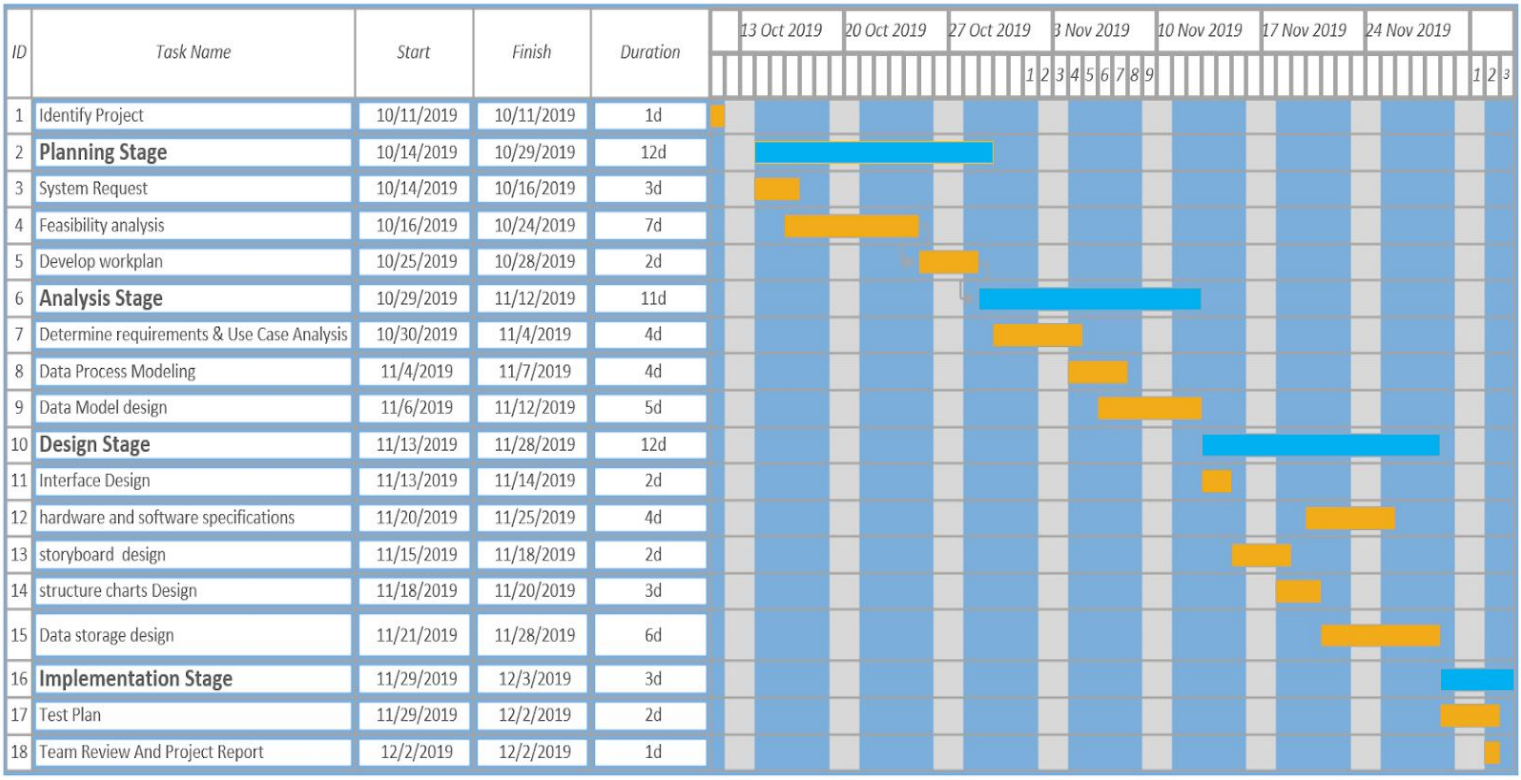
## Strategic alignment

From an organizational perspective, our system can be beneficial to most of the airline business or traveler organizations, which offers reward points systems such as flight miles. Currently, many airline companies offer a reward system, such as SkyMiles or other reward systems across the world. However, many airline organizations do not provide a system that helps the traveler or users to manage how to use the reward balance and compare the flight ticket price after redeeming the reward points. In this term project, we assume that some of the travelers who want to compare the price list before & after redeeming the reward points for different flights, so that they can manage their reward points and earn the most beneficial travel experience.

## Stakeholder Analysis

In this project, we will consider ourselves to be the champion because we initiated the project, we created and completed the system request, and we will demo a simple test plan for our proposed system. Then the organizational management or stakeholders will be the airlines or other traveler organizations. The stakeholders will understand how our system works, and then promote the system to the travelers to compare and interact with the reward system.

# Gantt Chart



| ID | Task Name | Start | Finish | Duration |
|---|---|---|---|---|
| 1 | Identify Project | 10/11/2019 | 10/11/2019 | 1d |
| 2 | **Planning Stage** | 10/14/2019 | 10/29/2019 | 12d |
| 3 | System Request | 10/14/2019 | 10/16/2019 | 3d |
| 4 | Feasibility analysis | 10/16/2019 | 10/24/2019 | 7d |
| 5 | Develop workplan | 10/25/2019 | 10/28/2019 | 2d |
| 6 | **Analysis Stage** | 10/29/2019 | 11/12/2019 | 11d |
| 7 | Determine requirements & Use Case Analysis | 10/30/2019 | 11/4/2019 | 4d |
| 8 | Data Process Modeling | 11/4/2019 | 11/7/2019 | 4d |
| 9 | Data Model design | 11/6/2019 | 11/12/2019 | 5d |
| 10 | **Design Stage** | 11/13/2019 | 11/28/2019 | 12d |
| 11 | Interface Design | 11/13/2019 | 11/14/2019 | 2d |
| 12 | hardware and software specifications | 11/20/2019 | 11/25/2019 | 4d |
| 13 | storyboard design | 11/15/2019 | 11/18/2019 | 2d |
| 14 | structure charts Design | 11/18/2019 | 11/20/2019 | 3d |
| 15 | Data storage design | 11/21/2019 | 11/28/2019 | 6d |
| 16 | **Implementation Stage** | 11/29/2019 | 12/3/2019 | 3d |
| 17 | Test Plan | 11/29/2019 | 12/2/2019 | 2d |
| 18 | Team Review And Project Report | 12/2/2019 | 12/2/2019 | 1d |

# Analysis

The analysis case consists of use cases, system requirements, a process model, a data model, and a CRUD matrix table in order to understand the needs/requirements of the system that will allow for the design and implementation of the system.

**Use Cases**……..10-15
**Requirements**……....16
**Process Model**……..…17
**Data Model**……...18
**CRUD**……19

# Use Cases

## Use Case #1

| Use Case Name: Points Conversion | ID: UWT-P1 | Priority: High |
|---|---|---|
| Actor: Conversion System | | |
| Description: This use case describes how the system calculate the transfer rate for points with users" available traveler points | | |
| Trigger: Conversion system is started up<br>Type: Temporal | | |
| Preconditions:<br>4. Database that stores flight tickets status is created and the data is updated frequently<br>5. Transfer rate conversion is available in the system<br>6. Traveler signed in to the system | | |
| Normal Course:<br>6. The system will check the flight tickets or travel details<br>7. The system has the latest travel reserveration status updated<br>8. The system should calculate the available points that can be converted<br>9. The system will display how much money can be transferred from the available points<br>10. The system has the option to compare how many points points each trip cost | Information for Steps<br>← Travel trips status<br>← flight tickets/available trips status update<br>← Calculation system ready<br>← Trips comparison information | |
| Postconditions:<br>3. Calculation is done and all the information are available to the users<br>4. .User can recaluate the transfer rate with different reward partnerships | | |
| Exceptions:<br>- User can not sign in to the System<br>- Travel trips status are not available or can not be updated<br>- Points conversion has been set incorrectly (Incorrect point transfer percentage) | | |

# Use Case #2

| **Use Case Name:** Points conversion reports | **ID:** UWT-P2 | **Priority:** High |
|---|---|---|
| **Actor:** Traveler/ Users | | |
| **Description:** This use case describes how the traveler request the system to display the reports of travel trips and the points conversion status | | |
| **Trigger:** Traveler request the system to display the tranfer status and display the report out<br>Type: **External** | | |
| **Preconditions:**<br>1. Points conversion rate is available and connected to the system<br>2. Flight/ trip information has been updated to the system to calculate how many points will be converted | | |
| **Normal Course:**<br>1. The system should allow the user to request the reports when the users use the "request report" function<br>2. A report should be generated after points conversion is calculated | **Information for Steps**<br>← Reports request<br>← Trips information<br>← Points Conversion status | |
| **Postconditions:**<br>The reports are displayed to the users from the available system | | |
| **Exceptions:**<br>1. User is disconnected from the system<br>2. System malfunction | | |

# Use Case #3

| **Use Case Name:** Filter Flight Selection | **ID:** UWT-P3 | **Priority:** Medium |
|---|---|---|
| **Actor:** Travelers/Users | | |
| **Description:** System filters the results for flights based on users' preferences on airline, flight-cost/point-cost, and flight dates for departure and arrival. | | |
| **Trigger:**<br>Type: [X] **External** ☐ Temporal | | |
| **Preconditions:**<br>1. The user has successfully linked their airline account<br>2. The user has conditions for filtering they want to satisfy | | |
| **Normal Course:**<br>1. User selects the filter tab on the flight search page<br>2. The system displays a panel of criteria the user can select from<br>3. The user inputs the filter criteria they want to filter the flights by<br>4. The system updates the flight list to filter out flights that don't match the filter criteria<br>5. The system displays the total cost of the flights including points, taxes, and fees. | **Information for Steps**<br>- Select filter<br><br>-Flight List Updates<br>- Display all eligible flights | |
| **Postconditions:**<br>1. Customer is shown results corresponding to the selected filters<br>2. Customer's filter selections are saved during the session until it is reset | | |
| **Exceptions:**<br>1. No flights match the filtered criteria | | |

# Use Case #4

| **Use Case Name:** Flight Search | **ID:** UWT-P4 | **Priority:** Medium |
|---|---|---|
| **Actor:** Traveler/Users | | |
| **Description:** System will display results from user search pertaining to flight departure/destination and date | | |
| **Trigger:**<br>Type: [X] **External** [ ] Temporal | | |
| **Preconditions:**<br>1. Traveler is signed into the system<br>2. Traveler knows where the flight will depart form<br>3. Traveler knows where the flight should arrive<br>4. Traveler knows when their dates or time of travel | | |
| **Normal Course:**<br>1. The user enters the departure and/or arrival destination<br>2. The user states when the flight is departing/arriving<br>3. The system find flight criteria that match the flight details<br>4. The system creates a list of flights<br>5. The list of flights are displayed to the user on website | **Information for Steps**<br>← Filled Search Criteria<br>- Valid match<br>- Updated Flight List | |
| **Postconditions:**<br>1. The list of flights on the web page is updated to show flights that match search criteria<br>2. Customer's search criteria is saved unless search criteria is removed or altered | | |
| **Exceptions:**<br>1. No flights match the destination/arrival<br>2. No flights match the given dates or time of travel | | |

# Use Case #5

| **Use Case Name:** Calculate taxes & fees | **ID:** UWT-P5 | **Priority:** Medium |
|---|---|---|
| **Actor:** Cost Calculation | | |
| **Description:** System will calculate how much taxes and fees the user must pay for booking | | |
| **Trigger:**<br>Type: [X] **External** [ ] Temporal | | |
| **Preconditions:**<br>1. The user has successfully login<br>2. The user has selected their travel plan<br>3. The price of the trip has been updated in real time<br>4. The system has converted the price to points | | |
| **Normal Course:**<br>1. The user select which type of point they would like to use.<br>2. The system update the flight details.<br>3. The system converts the airline ticket cost to selected point currency.<br>4. The system calculate how much taxes and fees the user must pay.<br>5. The system displays the total cost of the flights including points, taxes, and fees. | **Information for Steps**<br>- Select point currency.<br>- Real time update flight status and cost.<br>- Converting cash to points<br>- Use cash value to calculate taxes and fees.<br>- Display all eligible flights | |
| **Postconditions:**<br>1. Calculate taxes and fees by using cash value of the flights.<br>2. Display how much total cost to book a flight using points. | | |
| **Exceptions:**<br>1. User must link their airline account to the booking account.<br>2. Only display flights eligible to pay using points. | | |

# Use Case #6

| **Use Case Name:** Linking airline account | **ID:** UWT-P6 | **Priority:** Medium |
|---|---|---|
| **Actor:** Linking accounts | | |
| **Description:** System will display airline miles cost for certain flights when user is successfully linking their airline account to the travel portal. | | |
| **Trigger:**<br>Type: ☒ **External** ☐ Temporal | | |
| **Preconditions:**<br>1. The user has successfully login to the travel portal.<br>2. The user has an existing account with airline.<br>3. The airline must be one of travel partners.<br>4. Both accounts must have the same user information such as name, date of birth, address. | | |
| **Normal Course:**<br>1. The user select which airline to link their account.<br>2. The system transfer the user to a login page for the airline.<br>3. User must enter a correct login to the airline.<br>4. User must agree to the term and conditions of linking account.<br>5. The system displays a confirmation if the link was successful.<br>6. System will display successful linked airline account on user profile. | **Information for Steps**<br>- Must choose one of the eligible airline partners.<br>- Login to the airline account.<br>- Must have an existing account.<br>- Both accounts must own by the same user.<br>- Successful link will automatic direct the user back to the travel portal.<br>- Airline accounts linked confirmation. | |
| **Postconditions:**<br>1. Email confirmation will be sent to the user once the process is complete.<br>2. Display all linked accounts to the user. | | |
| **Exceptions:**<br>1. User must have an existing account with the airline partner.<br>2. Only eligible airline partner can be linked. | | |

# Requirements

Requirements are statements of both the tasks and processes that allow a system function as well as describing how the system performs. This includes what the business, user, and software needs, as well as the characteristics that make up the design and function of the system. Developing use cases allowed for the creation of the requirements by outlining 6 processes of the system and providing how system processes will function.

**Functional Requirements:**

- Users can log in to the reward points conversion system
- System will display flight search results with detailed information
- System should calculate the reward rates and ticket prices after redeeming the reward points
- System will display available reward balance and the price list reports for users

**Non-functional Requirements:**

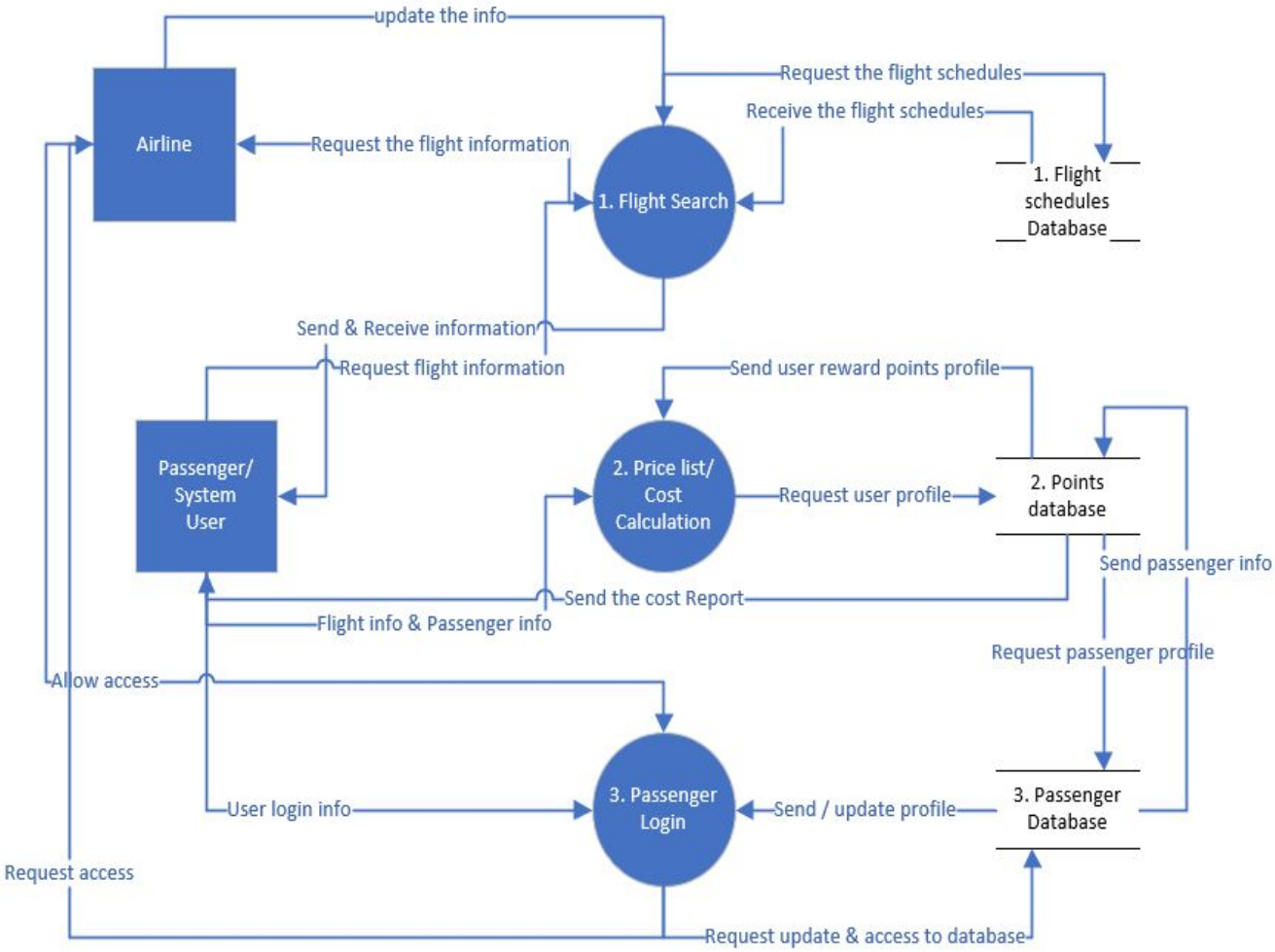
- System should be built with a simple and easy to use
- System should be operable on multiple devices (desktop, tablet, and mobile)
- System should update flight information in real-time

Processes outlined with use cases:

- Filter Flight Selection
- Flight Search
- Points conversion reports
- Calculate taxes & fees
- Linking airline account
- Points Conversion

-

# Process Model (DFD)



# Data Model


Passenger
PK
PSG_Name
PSG_Address
PSG_Email
PSG_OtherInfo
PSG_AccountID
PSG_PhonNnumber
Login
Airline Account
PK
PSG_AccountID
ACC_RewardPoints
ACC_RecentTrasactions
Price Report
PK
REP_RefID
REP_CalculatedPrice
ACC_RewardPoints
FL_FlightDetails
Airline Partner
PK
AL_NameOfAirline
AL_ContactInfo
AL_AirlineDetails
Passenger search multi-flight
Flight Search Filter
PK
FS_Destination
PK
FS_DepartureCity
FS_NumbersOfTraveler
FS_PrefClass
FS_FlightDate
Redeem Reward Points
PK
ACC_RewardPoints
FL_TicketPrice
FL_FlightDetails
ACC_RewardChart
AL_ AirlinePartner
Generate/Print
Generate lists of flight
selected the flight
redirect to redeem page
Flight schedules
PK
FL_ArrivalInfo
PK
FL_DepartureInfo
FL_FlightNumber
FL_TicketPrice
AL_AirlineName
FS_FlightDates
Adjust the flight schedules

# CRUD

The CRUD matrix table allows for the verification of the balance of our both our process and data models. Each letter signifies how data is created and used within the major processes of our system.

| | Flight Search | Cost Calculation | Passenger Login |
|---|---|---|---|
| **Flight Search Filter** | | | |
| FS_Destination | CRU | | |
| FS_DepartureCity | CRU | | |
| FS_NumberOfTravelers | CRU | RU | |
| FS_PrefClass | CRU | | |
| FS_FlightDate | CRU | | |
| **Flight Schedules** | |  | |
| FL_ArrivalInfo | R | | |
| FL_DepartureInfo | R | | |
| FL_FlightNumber | R | | |
| FL_TicketPrice | R | RU | |
| AL_AirlineName | R | | |
| FS_FlightDates | R | | |
| **Airline Partner** | | | |
| AL_AirlineName | RU | | |
| AL_ContactInfo | RU | | |
| AL_AirlineDetails | RU | | |
| **Price Report** | | | |
| REP_RefID | | R | |
| REP_CalculatedPrice | | CRU | |
| ACC_RewardPoints | | RU | |
| FL_FlightDetails | | R | |
| **Airline Account** | | | |
| ACC_RewardPoints | | RU | R |
| ACC_RecentTransactions | | | R |
| PSG_AccountID | | | R |
| **Redeem Reward Points** | | | |
| ACC_RewardPoints | | | R |
| FL_TicketPrice | | | R |
| FL_FlightDetails | | | R |
| ACC_RewardPoints | | | R |
| AL_AirlinePartner | | | R |
| **Passenger** | | | |
| PSG_Name | | | CRUD |
| PSG_Address | | | CRUD |
| PSG_Email | | | CRUD |
| PSG_AccountID | | | CRUD |
| PSG_PhoneNumber | | | CRUD |

# Design

In the Design Phase, we used architecture design, an interface structure diagram, storyboard, structure charts, and data storage design to implement the requirements we got in the Analysis Phase to create a blueprint for the development of the system.

**Architecture Design**……21-23
**Interface Structure Diagram (ISD)**……24
**Storyboard**……25-26
**Structure Chart**……..27
**Data Storage Design**……28

# Architecture Design

## 1. Operational Requirements

**a.** Technical Environment

**i.** The system will work over the web on any internet browser as a web page

**ii.** The system will support use on desktop, laptop, mobile, and tablet browsers

**iii.** The system will always be up to accommodate domestic and international use.

**b.** System Integration

**i.** The system will connect to already accessible flight databases and airline prices

**ii.** When customers purchase flights using their credit card reward points, their reward point balance will adjust accordingly

**c.** Portability

**i.** One additional server will be necessary to store customer login information and any saved flight calculation history

**d.** Maintainability

**i.** After its implementation, an IT maintenance crew will be assigned to ensure the server is running appropriately

## 2. Performance Requirements

**a.** Speed Requirements

**i.** Customer information database must update in real-time to accommodate login attempts at any time of the day

**ii.** Web pages must be able to load as fast as user internet speed may permit

**iii.** Search results should be streamlined to be as instant as possible

**b.** Capacity

**i.** The system should be able to support no less than 150 employees at a time

**ii.** The website should be able to support over 2000 customers at any time of the day

**iii.** System must initially store data for at least 250,000 when it is launched, increasing when deemed necessary

**c.** Availability and Reliability Requirements

**i.** System will operate 24/7, with maintenance being infrequent, short, and during the lowest usage periods

**ii.** System will be designed with

**3. Security Requirements**

**a**. System Value

**i.** System downtime would be critical and would cripple revenue until the system is back up.

**ii.** A small IT team will be trained and in charge of bringing the system back online after any unforeseen potential downside.

**b.** Access Control

**i.** Guest option will be available to customers that decide that they would not like to make an account

**ii.** A permanent account system will be heavily pushed as a way of allowing customers to save details from a previous booking to quickly book another flight

**iii.** Customers will be responsible for a valid email address, a password using at least one special and capital character while being at least 8 characters long, and an option for mobile verification

**iv.** Only employees will be able to directly access the system via their assigned username and custom password (similar requirements to customer password creation)

**v.** Users can only read and use information for flight calculations, without the ability to write or delete items.

**c.** Encryption and Authentication Requirements

**i.** Customer and employee information protection is crucial and must be secured via encrypted and protected storage

**ii.** Website must be encrypted via HTTP encryption and SSL Certification

**iii.** Two-factor authentication via text or email will be provided to customers and required by employees

**d.** Virus Control

**i.** Cybersecurity team will oversee monitoring, combating, and preventing any possible cyber-attacks on the system

**ii.** Firewalls and penetration testing will ensure that data protection is a priority

**4. Cultural and Political Requirements**

**a.** Multilingual

**i.** System will primarily be focused towards users within the United States but will support website translation in major international languages such as Chinese, Spanish, Hindu, Arabic, etc..

**b.** Customization Requirements

**i.** Users will be able to customize their user profile information

**ii.** Users will be able to change the type of credit card rewards points being used

**iii.** Users will be able to change the flight search filter's options

**c.** Unstated Norms

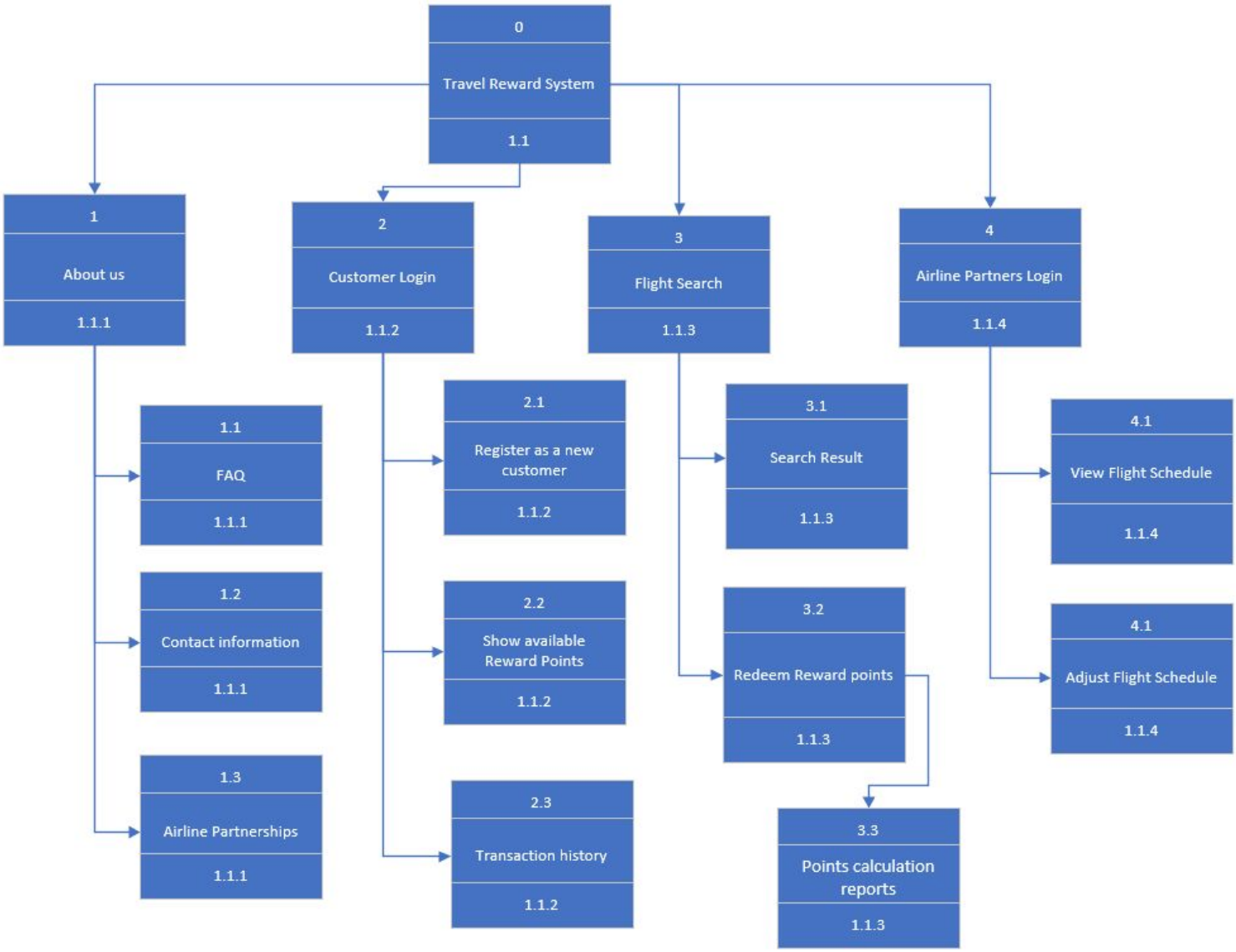
**i.** Flight times will be displayed in regular time (A.M and P.M)

**ii.** Date Fields will be displayed in month-day-year format

**d.** Legal Requirements

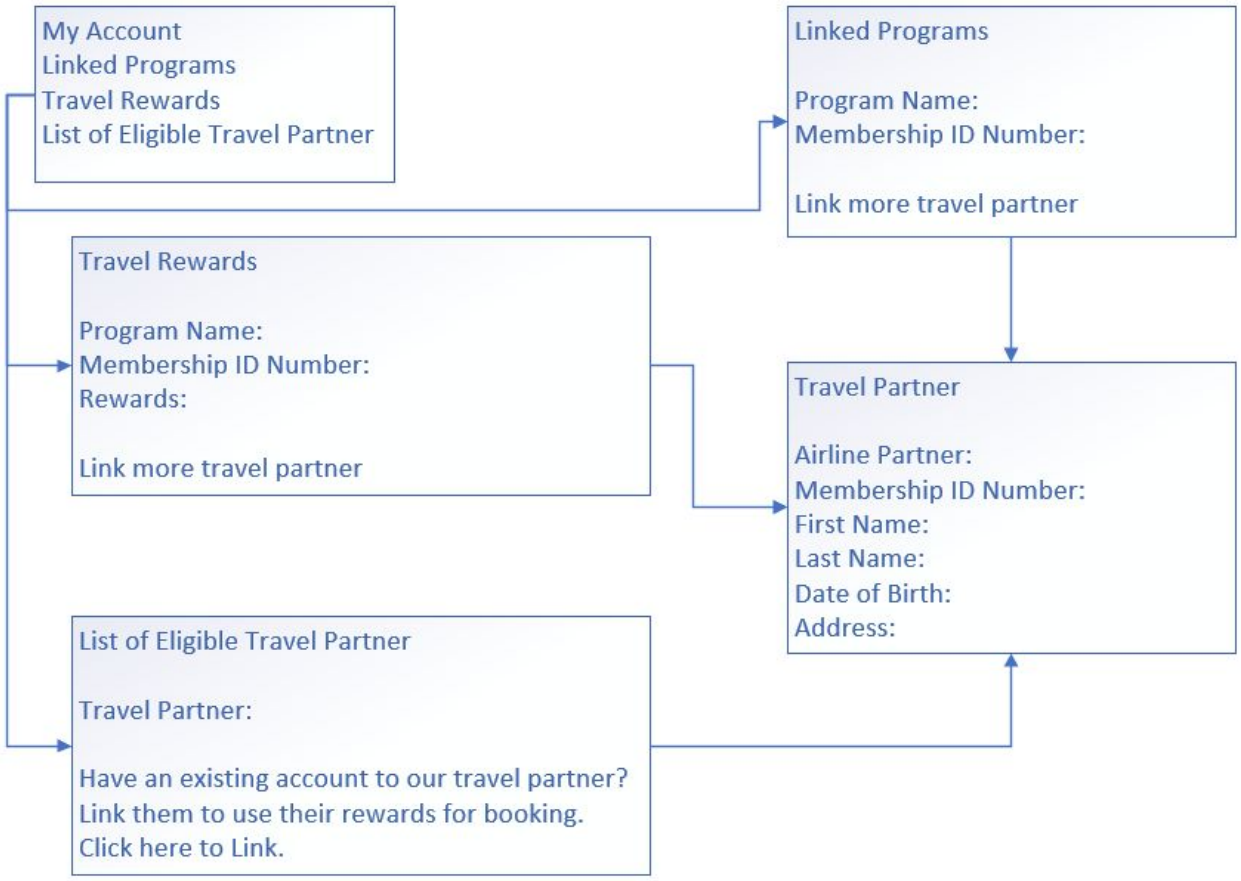
**i.** Must maintain contact with the system's partnered credit card and flight companies to ensure legal requirements are properly met

# Interface Structure Diagram

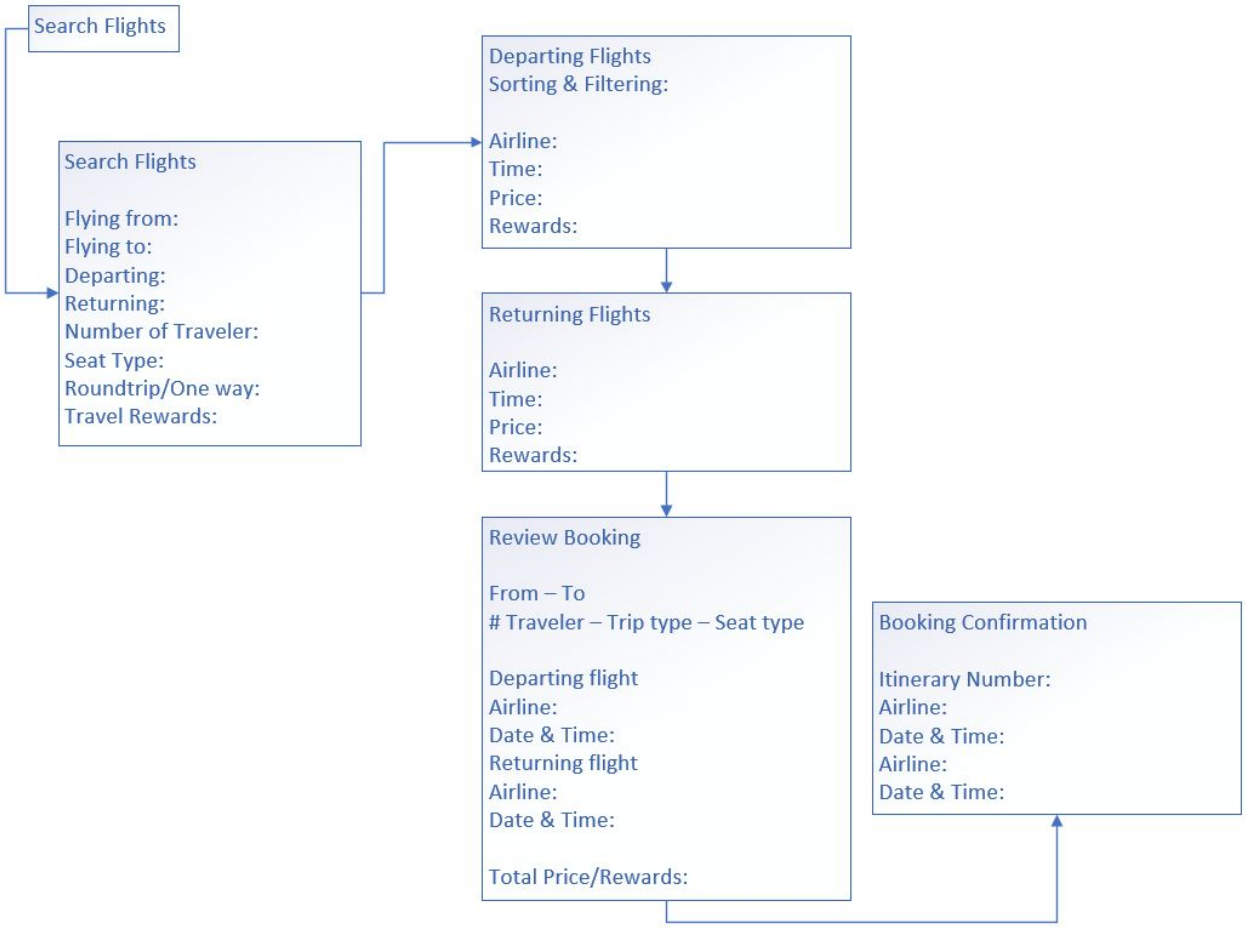


# Storyboard

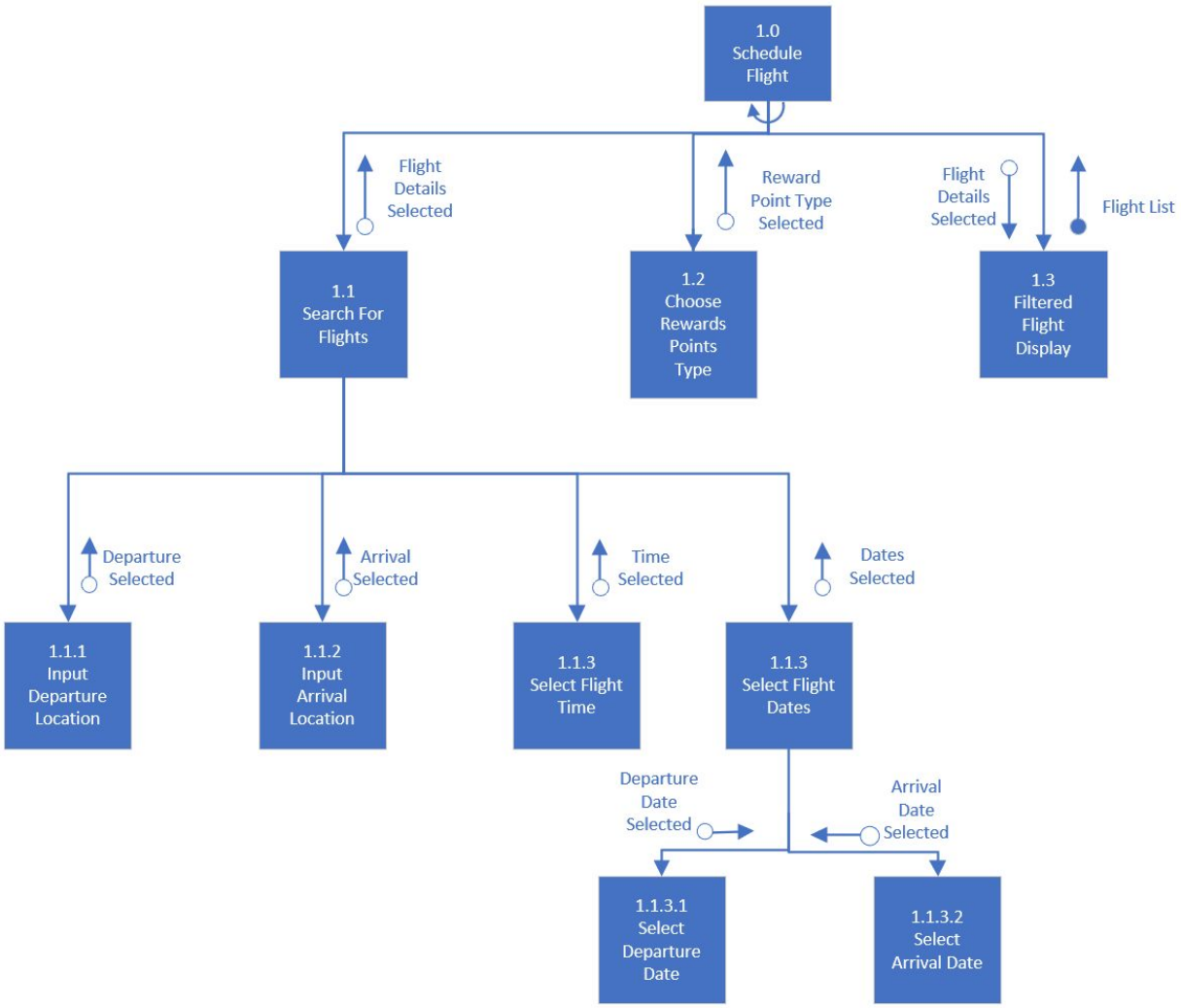
The storyboard below demonstrates how users of the system will be able to link their eligible airline accounts to the system travel portal by logging their existing accounts. The system then will match user information with the airline partner account to verify user identity. Once the system successfully verified the account, airline partner account information will be linked to the travel and display the account information.



The storyboard below demonstrates how a user that has successfully linked their airline account to the system will be eligible to book flights using points. The system will have an option to display eligible reward flights for user to redeem their points to travel. After the user selected their flights the system will display the flight information including the cost of airfare in cash or points.

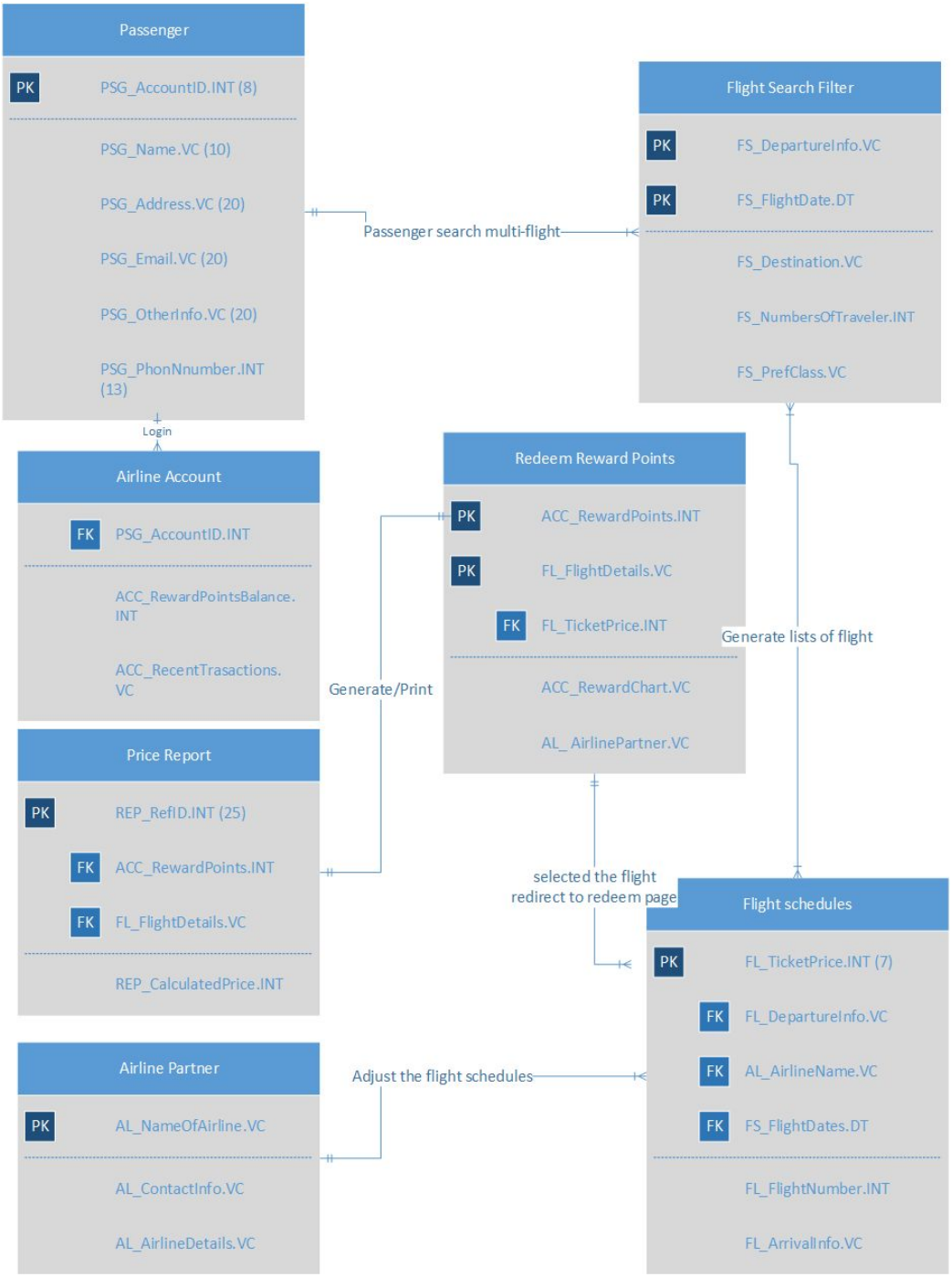


# Structure Chart



# Data Storage Design

This diagram is built in 3NF. For the 1NF, there should be no attribute that occurs more than once. If so, move all the repeated occurrence attributes into separate entities such as the Account ID. Then for the 2NF, move partially-dependent attributes to a new entity like the Airline name to make sure all attributes are dependent on the primary identifier. Lastly, a 3NF will move the attributes that depend on an attribute that is not the entity's primary key to a new entity.



# Implementation

After the website is successfully designed to meet all design requirements we have created test plans that can be used to evaluate our system and make sure that it functions correctly.

**Test Plans**……30-32

# Test Plans

To test our system we would incorporate different types of test plans such as black-box, requirements testing, use scenario, and performance testing. We've created three test plans below to visualize tests we would conduct on a functioning system.

**Program ID:** TP-1 **Version Number:** 1.0

**Tester:** Chi LAU (Isaac) **Date Designed:** 11/29/2019 **Date Conducted:** N/A

**Result:** ☐ Passed **Open Items:**

**Test ID:** UWTP-1 **Requirement addressed:** **Customer Login in & reward points**

**Objective:**

**Customer / Traveler should be able to login the account with account ID and password, then the user can review the reward points that available for redeeming.**

**Test cases**

| Interface ID | Data Field | Value Entered |
|---|---|---|
| 1, Login Terminal 1 | Passenger Account ID | 1750122 |
| 2, Login Terminal 1 | Account password | ********* |
| 3, Validation Process | Account ID check | True |
| 4, Validation Process | Password Check | True |
| 5, Balance display | Account reward points | 25803 |

**Script**

A traveler or customer want to check the available reward points that can be redeemed. The user can login to personal account using the account ID and password. The system checks the prompted input and check with the customer database for validation. If both account ID and password are entered correctly, the user will be allowed to access the personal account and the available reward points will be displayed

**Expected Result/ Notes**

The user should be able to access the personal reward account by entering the correct account info. But this is just a hypothetical result and the actual result needs to be verified after actual implementation is done.

**Actual Results/ Notes**

N/A

**Program ID:** TP-2 **Version Number:** 1.0

**Tester:** Mark Schteiden **Date Designed:** 11/29/2019 **Date Conducted:** N/A

**Result:** ☐ Passed **Open Items:**

**Test ID:** UWTP-2 **Requirement addressed:** **Customer searching for a flight**

**Objective:**

**Customer / Traveler should be able to search for flights by inputting desired travel information in the search area/filter.**

**Test cases**

| Interface ID | Data Field | Value Entered |
|---|---|---|
| 1, Search Terminal | Passenger Flight Departure Details | San Francisco 12/21/19 |
| 2, Search Terminal | Passenger Flight Arrival Details | Seattle 12/27/19 |
| 3, Flight Search Process | Departure Flight Check | True |
| 4, Flight Search Process | Arrival Flight Check | True |
| 5, Search Display | Flight Details Check | Valid |

**Script**

A traveler or customer wants to search for flights using the system's flight search feature. The user must input information regarding their departure details and arrival details into the system. The system checks to prompted inputs and checks the flight search database to check if departure and flight details are correct. The system then checks if there is a valid flight that matches the search criteria and displays it to the traveler or customer a flight along with the cost of the flight corresponding to the credit card reward points they are using.

**Expected Result/ Notes**

The user should be able to find a flight that matches their search criteria if it's available and in the system. Post implementation the results can be verified, but as a design of the test the results are hypothetical.

**Actual Results/ Notes**

N/A

**Test Plan**

**Program ID**: TP-3 **Version Number**: 1.0

**Tester**:Hung **Date Designed**: 11/29/2019 **Date Conducted**: N/A

**Result**: ☐ Passed **Open Items**:

**Test ID**: UWTP-3 **Requirement addressed**: **Reward points report**

**Objective:**

**Customer / Traveler should be view the report that generates from the system. The report should show the fees after redeeming the reward points**

**Test cases**

| Interface ID | Data Field | Value Entered |
|---|---|---|
| 1, Reward Points converted | Reward points | 22000 |
| 2, Flight ticket price | Ticket Price | 1000 |
| 3, Flight info confirmation | Flight details check | True |
| 4, Report Generated check | Reward report | True |
| 5, Report Reference ID | Reference ID | 25468 |

**Script**

A traveler or customer want to view the reward points report after selecting the flight and then input the required information to the redeem points calculator. After the conversion is done, the system should generate the report which includes the reference ID and display how many reward points has been redeemed.

**Expected Result/ Notes**

The user should be able to access the personal reward account by entering the correct account info. Then, there should be a detailed report that generated by the system. The user can also view the same report whenever the user can login to the reward program account.

**Actual Results/ Notes**

N/A

# Conclusion

By working together as a group we were able to complete the planning, analysis, and design phases in creating a system that we believe could be successful, if implemented alongside current flight search systems. With proper communication and effort, our group succeeded in meeting all the project requirements before the given deadline.

The project did provide each of us with its own challenges and we learned important lessons that we can use in future group projects. The main challenge that we faced as a group was following the project work plan and the Gantt chart more strictly might have solved some of the stress that we felt when stretching due dates because of classwork in other classes. We were able to get past this challenge with exceptional communication and holding each other accountable for each others' work but if we hadn't had the level of communication that we had during this project we could have put ourselves and our project in a bad position. Luckily we were all able to realize this problem and can take steps in our next project to stay on track with due dates and keep work more spread out to avoid the stress that we experienced.

Each member was able to contribute equally as we all were able to agree on how to split up the work and each focused on project parts that we felt confident in completing. We were able to incorporate many of the concepts that we learned both in the textbook and class to create our projects and look forward to using these skills in future projects. We are all proud of the work we put into this project and hope that it was able to fully display the potential that we see in the system we created.