



California Airline Software System

Specification Document

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FreeLance

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1. Problem Statement

The following document outlines requirements for the development of airline management software for California Airlines (CAI) such that employees and customers are able to easily view and purchase flights, check flight status, and generate statistics to monitor company performance, among other features.

System Description

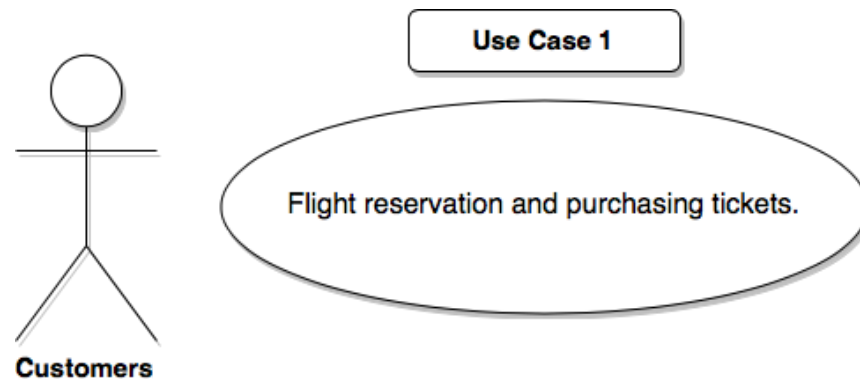
The system will be organized into three major categories: Database, Customer Accounts, and Employee Accounts.

1. **Database** will store information pertaining to flight date, location, price, and passengers, and can only be directly edited by employee accounts. The database will be viewed through a GUI for both employees and customers.
2. **Employee accounts** will be registered to each employee at CAI and allow employees to directly edit the database such as through scheduling flights, setting flight statuses, and setting ticket prices. Employee accounts also have all privileges given to customer accounts.
3. **Customer accounts** allow customers of CAI to view and purchase flights, check in, and view flight statuses. Customers which have not created an account are only able to view flight information and status.

2. Users and Use Cases

Users of this software are employees of CAI and customers of CAI. Employees will have an employee account that allows them to schedule flights, set ticket price, and edit flight status. Customers will have a customer account that allows them to view and purchase flight tickets, check in to flights, and view flight statuses. Customers which have not created an account will only be able to view flights and ticket prices.

Use Case 1: Flight Reservation and Purchasing a Ticket



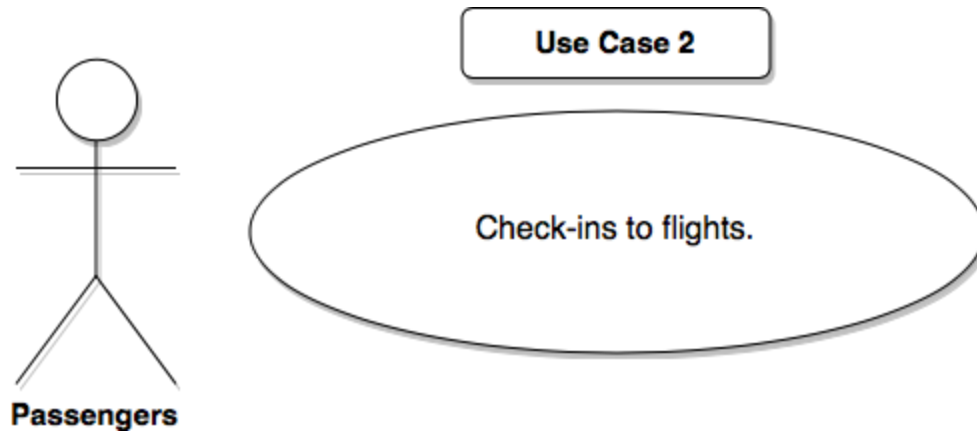
Description

The "Flight Reservation and Purchasing Tickets" use case refers to the ability of a registered customer to reserve a seat on a flight, receiving in return a confirmation number and flight number.

Step-by-step Description

1. Input necessary log-in information which includes:
 - Email
 - Password.
2. Click "Login" button.
3. Click "Book Flight" option.
4. Select Destination from 1 of 6 options in drop down menu.
5. Select Week of Departure.
6. Choose from one of at least two available weekly flights.
7. Select Week of Return.
8. Choose from one of at least two available weekly flights.
9. Click "Confirm Flight Details".
10. Submission will not be accepted with missing/unspecified fields.
11. Input all necessary information to purchase via credit card, which includes:
 - Credit card number
 - Expiration Date
 - CSV
 - Billing Address
12. Click "Confirm Purchase".
13. Submission will not be accepted with missing/unspecified fields.
14. Seats will be reserved on Departure and Return Flights.
15. Confirmation number and Flight number presented to customer via PDF.

Use Case 2: Check in to Flights



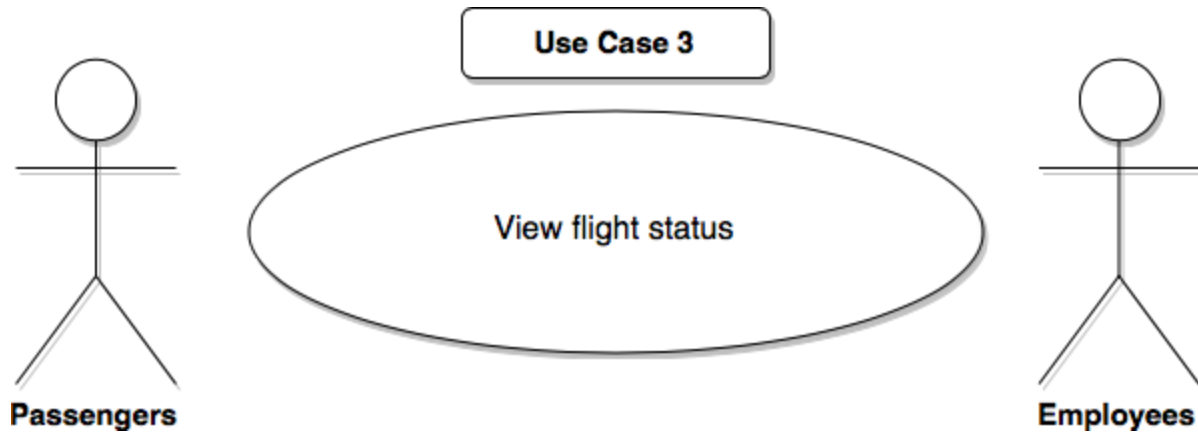
Description

The "Check-ins to Flights" use case refers to the ability of a registered customer who has purchased an upcoming flight to confirm that they will be traveling and receive in return a boarding pass to print.

Step-by-step Description

1. Click the "Check In" button.
 - 1.1. Bags can optionally be purchased by the customer.
 - 1.2. An agreement regarding firearms, hazardous materials, and other important information from TSA will be presented.
2. Receive the generated PDF document containing boarding pass and flight information.
3. The customer's account will be updated to signify that the customer has checked in to the flight.

Use Case 3: Viewing Flight Status



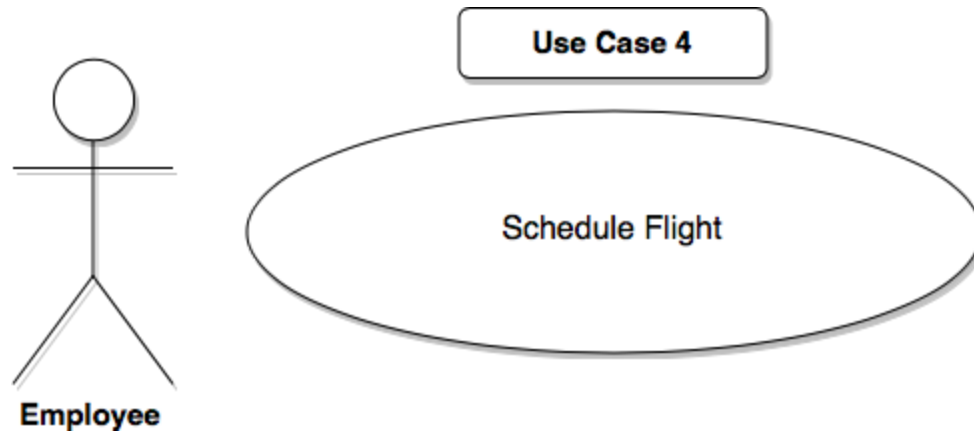
Description

The "View Flight Status" use case refers to the ability of any employee or customer, regardless of whether or not they have purchased a ticket, to view updates on flight status and departure time.

Step-by-step Description

1. Input a flight number.
2. Click "Submit."
 - 2.1. Search the number in the database and display any matching flights.
 - 2.2. Print an error message if no flight is found.
3. Flight status is displayed: On time, Delayed, or Cancelled

Use Case 4: Schedule Flights



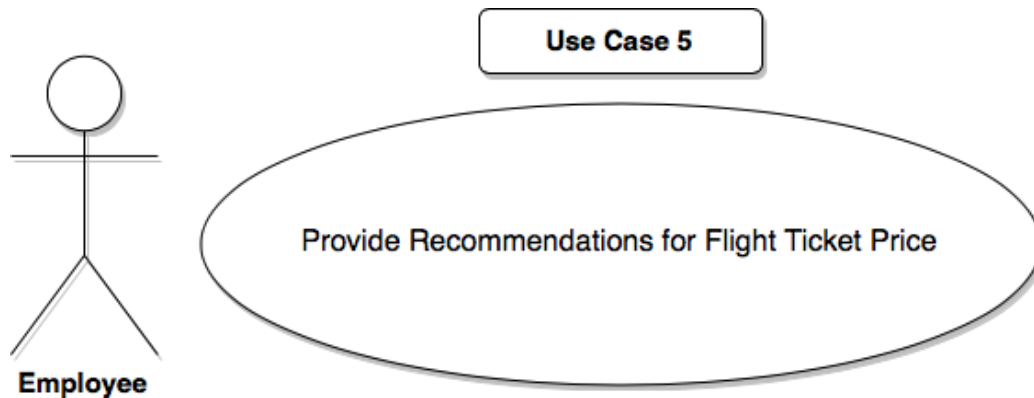
Description

The "Schedule Flight" use case refers to the ability of a CAI employee to schedule an upcoming flight, provided the flight meets requirements such as runway delay time and plane availability.

Step-by-step Description

1. Click "Schedule Flight"
2. Specify flight details.
 - 2.1. Select date and time
 - 2.2. Select Destination
3. Check for conflicts
 - 3.1. Ensure the plane for that route is free
 - 3.2. Ensure the runway is available
 - 3.3. Display warnings if anything in 2 produced an error
4. Click "Save New Flight"

Use Case 5: Provide Recommendations for Flight Ticket Price



Description

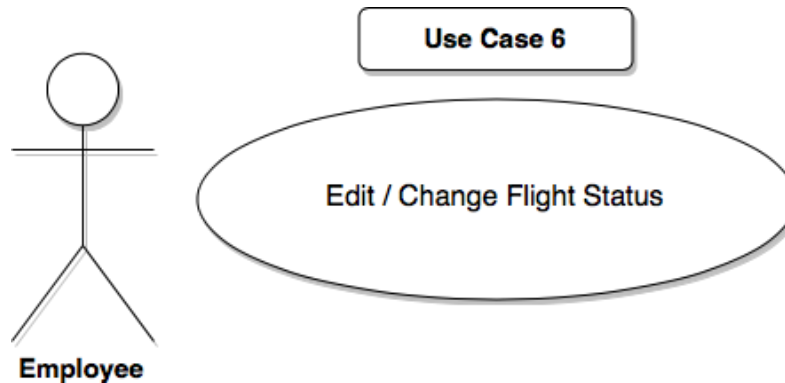
The "Provide Recommendations for Flight Ticket Price" use case refers to the ability of a CAI employee to input a flight on a desired date and time and receive a range of recommended ticket prices based upon empty seats for the past two weeks.

Step-by-step Description

1. Click "Ticket Pricing" from a CAI employee account
2. Select a destination, date, and time
3. A screen is displayed with a recommended ticket price calculated from by the following:
 - 3.1. Price is based upon the percentage of empty seats in the last two weeks for the destination of interest
 - 3.2. The average value of the empty seats (X) is calculated
 - 3.3. Base flight price (P) is retrieved from database
 - 3.4. A fair price for the flight (p) is determined using the formula:

$$p = P - [(X / 2) * P]$$

Use Case 6: Edit / Change Flight Status



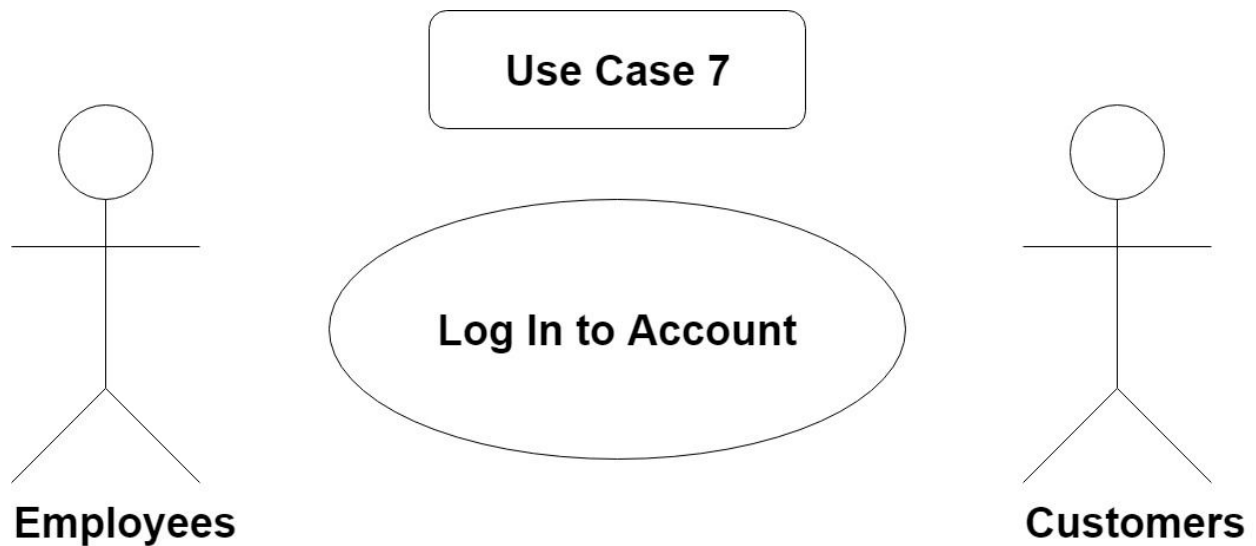
Description

The "Edit / Change Flight Status" use case refers to the ability of a CAI employee to edit the status of an upcoming flight.

Step-by-step Description

1. Click "Change Flight Status"
2. Select flight date, time, and destination
3. Select flight status option:
 - Delayed
 - On Time
 - Cancelled
4. If Delayed was selected, enter a new expected departure time.
5. Click "Save Flight Status"

Use Case 7: Login

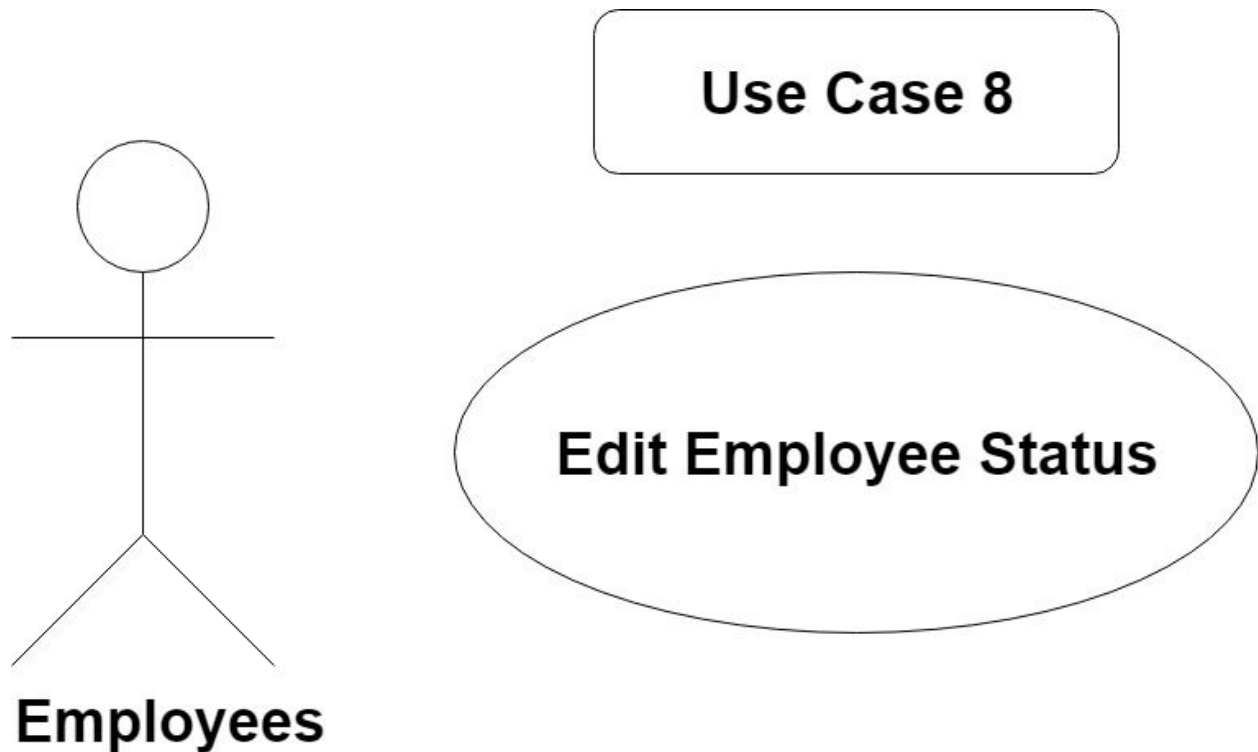


Description

The Login use case refers to the ability of a user to log in to their account on the system as either an employee or customer

Step-by-step Description

1. Click the desired login type: either "Customer" or "CAI Employee"
2. Enter username and password of existing account
3. The appropriate account homepage is displayed based upon login type.

Use Case 8: Employee Edit Other Employee Status**Description**

The "Employee Edit Other Employee Status" use case refers to the ability of a CAI employee to edit another employee's employment status.

Step-by-step Description

1. Click "Edit Employee Status"
2. Select either "Remove" or "Add"
3. Input username of desired employee to edit
4. Error is output if username not found
5. Otherwise, click "Save Employee Status"

3. Requirements

3a. Functional Requirements

- A customer can purchase a ticket
- A customer can check in to a flight
- A customer can view the status of any flight
- A CAI employee can schedule a flight
- The software provides the CAI employee with price recommendations for a specified flight
- A CAI employee can edit flight status

3b. Nonfunctional Requirements

- A database is needed to store customer and employee account information.
- A database supporting six destinations is needed to store flight information.
- An algorithm must compute flight price recommendations based on information queried from the flight information database.
- The software must work on Windows and Mac personal computers.
- The software and database must be available during all working hours.

3c. Acceptance Criteria

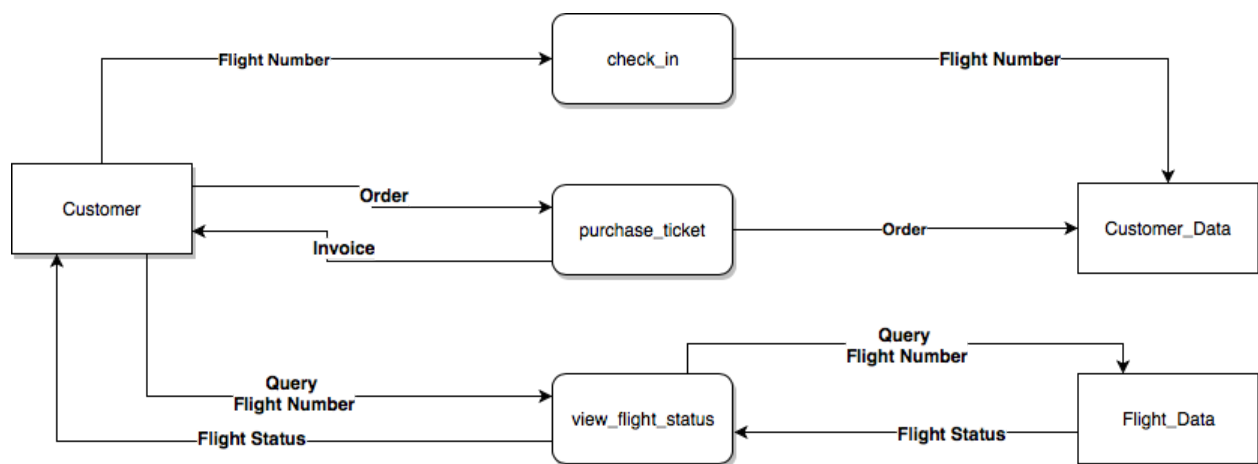
- A customer must be able to purchase a ticket and reserve a seat on a specified flight.
- A customer must be able to check in to a flight for which they have purchased a ticket.
- A customer must be able to view the status of any flight.
- A CAI employee must be able to schedule a flight, if it meets requirements of 40 minute lag in runway usage.
- A CAI employee must be able to edit flight status of an existing flight.
- The software must provide the CAI employee price recommendations for a flight given date, time, and destination.
 - The software takes input of date, time, and destination from a CAI employee.
 - The database is queried for empty seats on flights from the past two weeks for the given destination.
 - The formula $P = P - (\frac{X}{2}) * P$ is used to determine a pricing recommendation, where P is the base price to the given destination, and

X is the average percentage of empty seats calculated using the previous two weeks of flight information.

- The software outputs a price, in USD.

4. Data Flow Diagram

4a. Level 0 Customer Data Flow Diagram

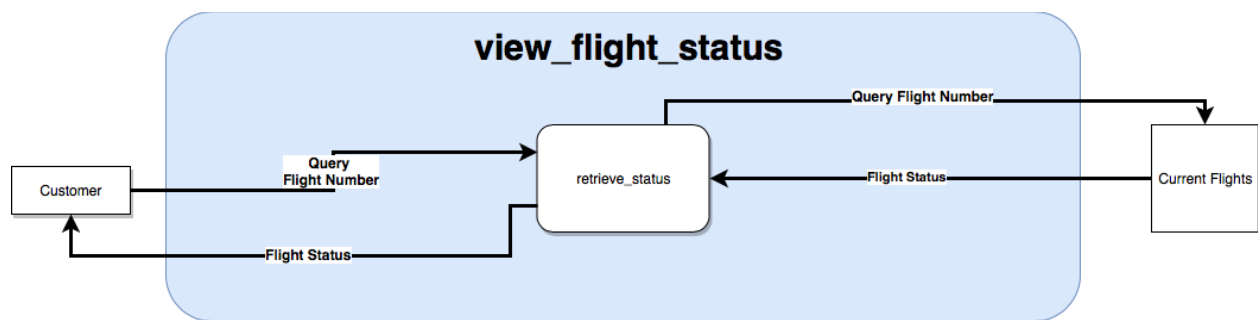


Dictionary for DFD Level 0 - Customer

Name	Description	Narrative
Customer	The account of person purchasing the flight	
check_in	Customer inputs flight number and name, get back confirmation	Updates flight with the check in
purchase_ticket	Customer inputs first name, last name, phone number, and birth date, destination, departure, date Get back invoice	Completes the order
view_flight_status	Customer inputs flight number	Looks up flight status in database

	Get back status (On time, delayed, canceled)	
Flight Data	Information about flight schedule, status, and seats taken	For keeping track of flights
Customer Data	Information about passengers (name, phone number, date of birth, if they checked in, flights they are on)	For use in purchasing tickets

4b. Level 1 Customer Data Flow Diagram

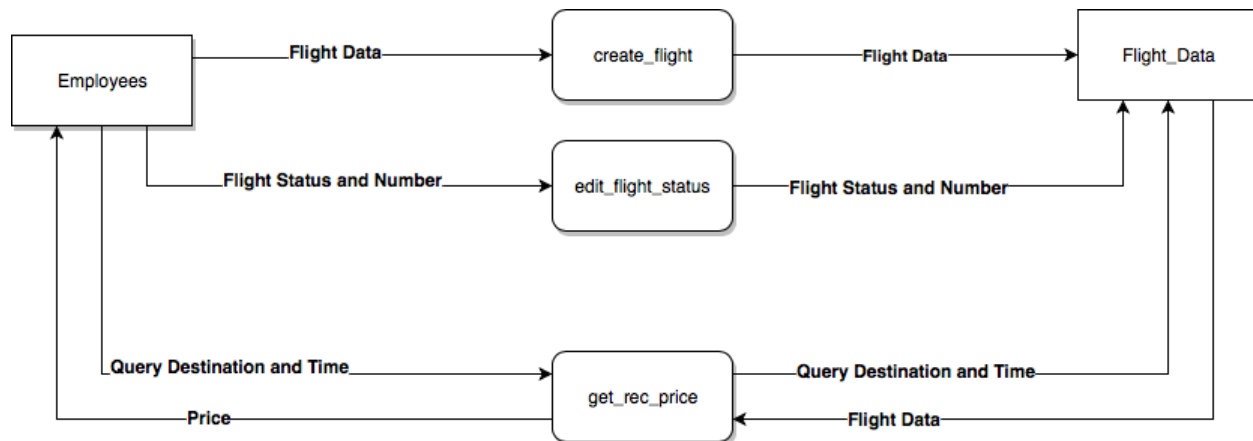


Dictionary for DFD Level 1 - View Flight Status

Name	Description	Narrative
Customer	The account of person purchasing the flight	The customer must have a registered customer account
Flight Number	A unique number specifying a certain flight	The flight number is contained in the Current Flights database
Flight Status	Status of flight. One of these: On Time, Delayed, Canceled	Flight status is stored along with a flight number in the Current Flights database
retrieve_status	Queries the Current Flights database using a flight number, receives flight status, and outputs it to the Customer	

Current Flights	A database of currently scheduled flights	
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4c. Level 0 Employee Data Flow Diagram

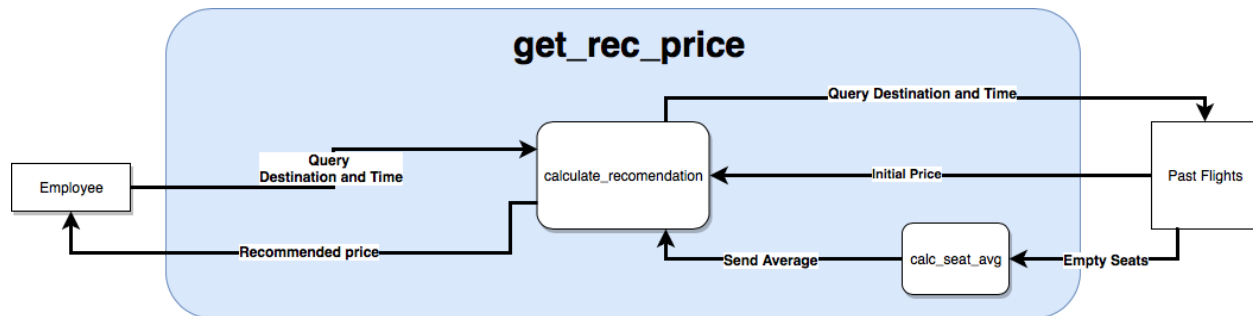


Dictionary for DFD Level 0 - Employee

Name	Description	Narrative
Employee	The account of a registered CAI employee	
create_flight	Employee enters flight time, destination Gets back conflicts	Checks existing flights for conflicts, creates flight plan if no conflicts
edit_flight_status	Employee enters flight number, new status Gets back confirmation	Updates flight status
Flight Data	Information about flight schedule, status, and seats taken	For keeping track of flights
Customer Data	Information about passengers (name, phone number, date of birth, if they checked in, flights they are on)	For use in purchasing tickets
get_rec_price	Enters flight time, destination	Checks prior flights for

	Gets back price recommendations	seats taken
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4d. Level 1 Employee Data Flow Diagram



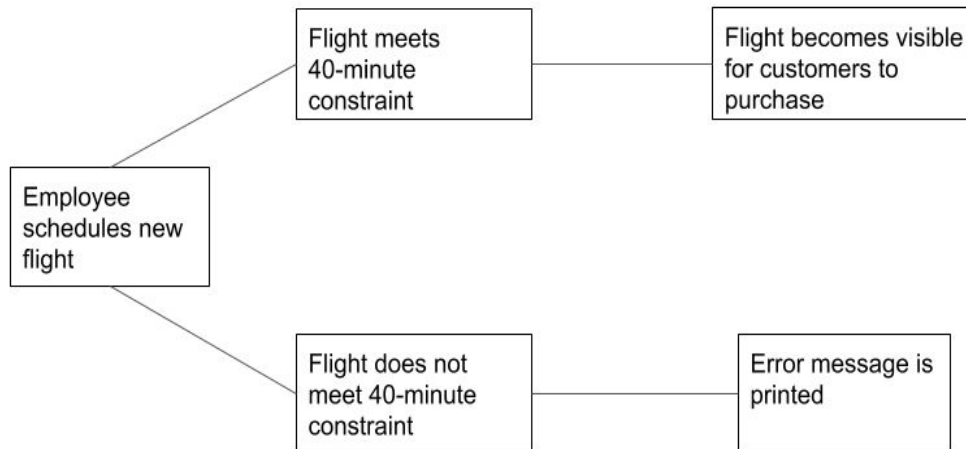
Dictionary for DFD Level 1 - Get Recommended Price

Name	Description	Narrative
Employee	The account of a registered CAI employee	This is the user for the flight price calculation
calculate_recommendation	Calculates the recommendation for price for the given flight based upon empty seats to the given destination in the past two weeks.	This uses the price formula given by $p = p - (X/2)*p$
Past Flights	A database of past CAI flights	This database contains flight information, including seats sold on each flight.
Query Destination and Time	A specific city destination for a flight	
Send Average	The percentage of empty seats in the past two weeks to the destination given by "Destination"	
calc_seat_avg	Calculates the average percentage of empty seats	Receives total number of flights, then multiplies by

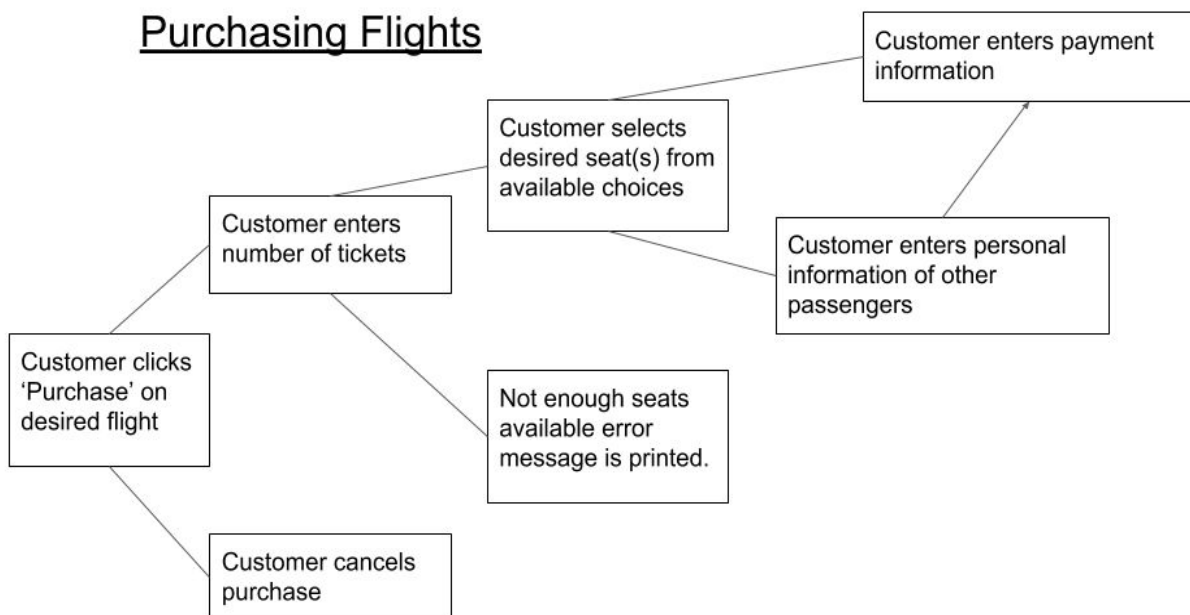
	in the past two weeks. Receives empty_seats, outputs average.	20(seats per flight), and divides total empty seats in all past flights in past two weeks by total seats. Returns result.
Initial Price	Base price for a given flight	
Empty Seats	Total number of empty seats for a destination in the past two weeks	
Recommended Price	The calculated price recommendation	

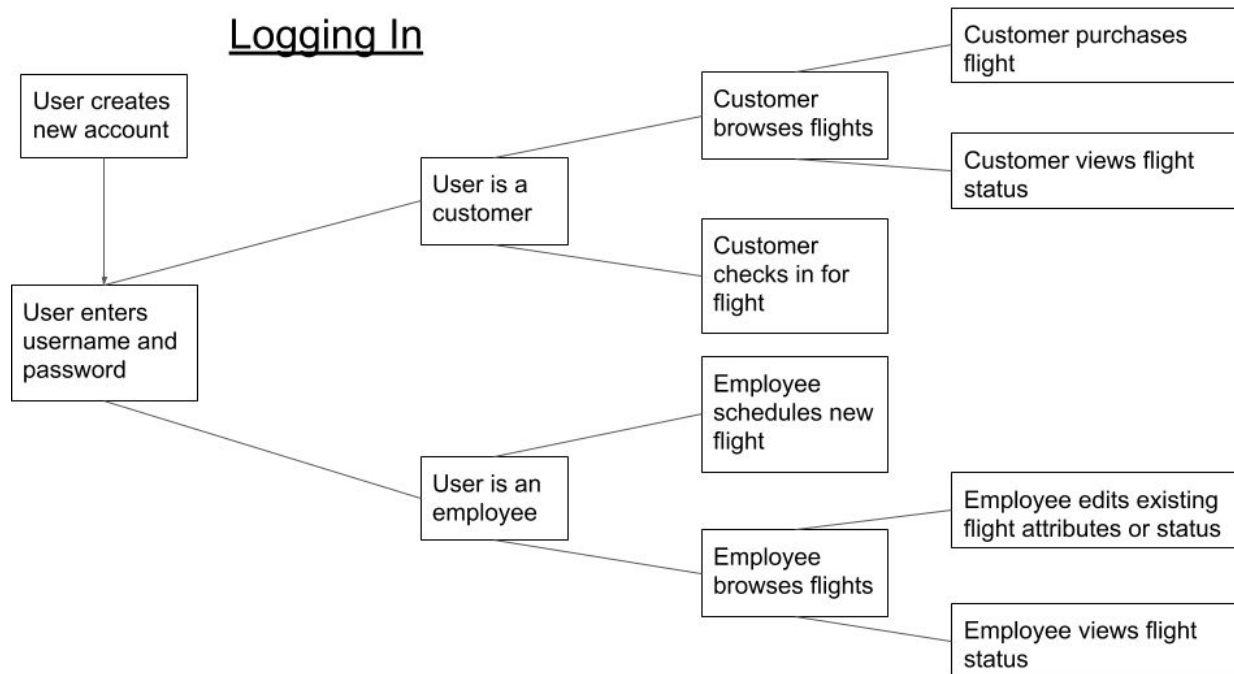
5. Decision Trees

Scheduling Flights



Purchasing Flights





6. Iterations and Deadlines

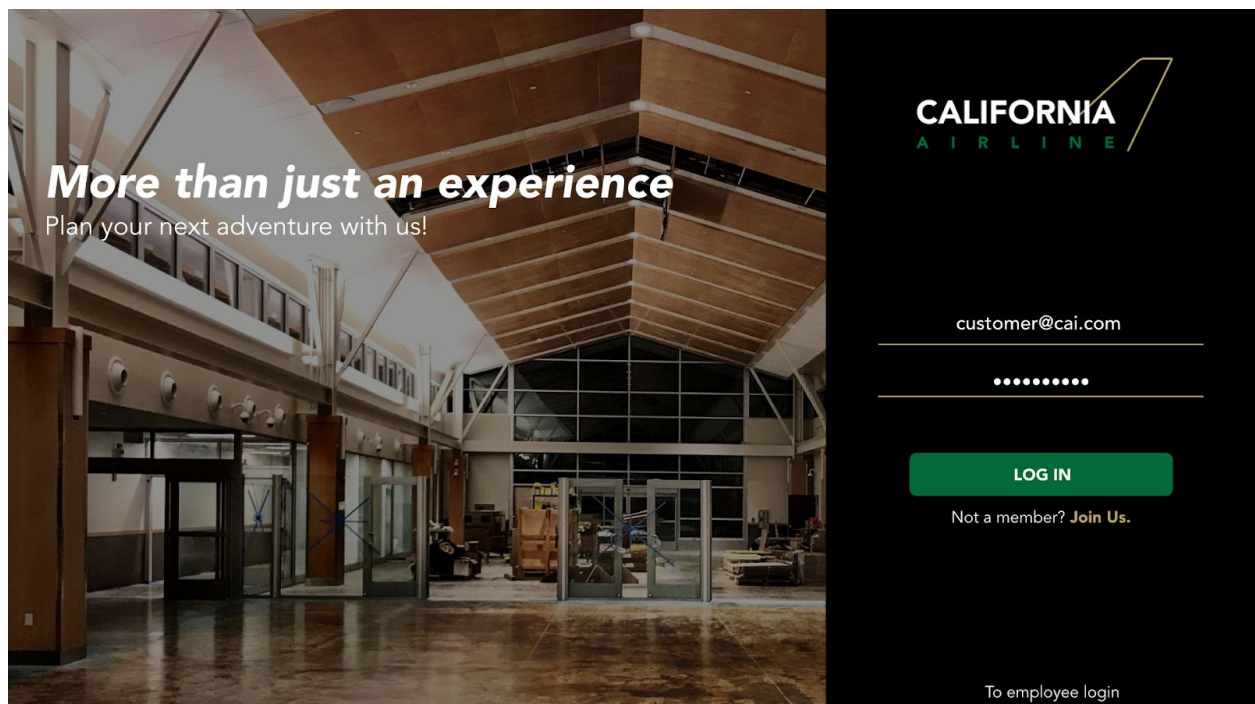
<u>Date</u>	<u>Description</u>
April 26th, 2018	Completion of Formal Requirements Document.
May 10th, 2018	Completion of First Software Iteration and First Iteration Documentation. Software will function from the command line using text files.
May 24th, 2018	Completion of Second Software Iteration and Second Iteration Documentation. Software GUI will be implemented.
June 7th, 2018	Completion of Final Software Iteration and Third Iteration Documentation. Software database will be implemented.

7. User Interface Wireframe


The following are high fidelity interface wireframes that reflects the use cases depicted in Section 2. The design reflects California Airline's color code of Green (PMS 343 C) and Gold (PMS 4515 C).

7a. Customer Interface Wireframe

- Customer - Login



- Customer - Book flight (Choosing flight schedule)



Derek Nguyen

Book flight

My trips / Check-in

Flight status

Cities and dates

☒ Round trip
 ☐ One way

From *

To *

Departure Date *

Arrival Date *


Search

Available flights

From San Luis Obispo To Los Angeles [Confirm flight details](#)

SLO → LA	<input checked="" type="checkbox"/>	Departure: 8:00 AM	05/01/2018	\$103.30
SLO → LA	<input type="checkbox"/>	Departure: 2:00 PM	05/02/2018	\$98.50
SLO → LA	<input type="checkbox"/>	Departure: 6:00 PM	05/03/2018	\$87.00
SLO → LA	<input type="checkbox"/>	Departure: 10:00 PM	05/04/2018	\$78.78

- Customer - Book flight (Payment and confirmation)



Derek Nguyen

Book flight

My trips / Check-in

Flight status

[Cancel](#)

Payment Information

Credit / Debit Card * CSV *

Expiration Date *

Full Name *

Billing Address *


City * State * Zip Code *

Total: \$103.30

Confirm Payment

Flight Confirmation


Passenger: WOW WHAT A REAL NAME **Confirmation Number:** 1234567890
Billing Address: 1234 Made Up Road
 San Luis Obispo, CA 93401

Flight	Departure	Arrival
 Num: 6795	San Luis Obispo (SLO) 05/01/2018 8:00 AM Seat: 1	Los Angeles (LA) 05/01/2018

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- Customer - Check-in (Confirmation Number and Agreement)



Derek Nguyen

Book flight

My trips / Check-in

Flight status

Enter Confirmation Number

Confirmation Number *

Check In

Transportation Security Administration

Flight Safety Agreement

Lorem ipsum dolor sit amet, at eum praesent incorrupte, ludus everti accusata his ne, at sea sumo cibo soluta. In iudico antiopam scribentur duo. Prompta aliquid disputando nam ad, qui te movet solet. Sit amet dolorem persequeris an, vix ea impedit corpora. Solum nobis elaboraret duo cu, everti utamur argumentum per et.


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I Agree

- Customer - Check-in (Baggage and Boarding Pass)



Derek Nguyen

Book flight

My trips / Check-in

Flight status

[Cancel](#)

Baggage

How many will you bring?

Carry On

Weight per Carry On

 lbs.

Check In


Weight per Check In

 lbs.

Check in

Boarding Pass

Have a safe flight!

Flight	Departure	Arrival
 Num: 6795	San Luis Obispo (SLO) 05/01/2018 8:00 AM Seat: 1	Los Angeles (LA) 05/01/2018

- Customer - Flight Status

CALIFORNIA AIRLINE

Derek Nguyen

Book flight

My trips / Check-in

Flight status

Enter flight number

Flight Number *

6795

Submit

Flight Status

SLO —> LA

Departure: 8:00 AM 05/01/2018

DELAYED

7b. Employee Interface Wireframe

- Employee - Login

CALIFORNIA AIRLINE

We are the best!
serving happiness everyday

1234567890

••••••••

LOG IN

To customer login

- Employee - Ticket Pricing Recommendation

CALIFORNIA
AIRLINE

EMPLOYEEID: 1234567890

Ticket Pricing

Schedule Flight

Flight status

Cities and dates

Round trip

One way

From *
San Luis Obispo

To *
Los Angeles

Departure Date *
05/01/2018

Arrival Date *
05/14/2018

Search

Available flights

From San Luis Obispo To Los Angeles

SLO → LA	Departure: 8:00 AM	05/01/2018	\$103.30
SLO → LA	Departure: 2:00 PM	05/02/2018	\$98.50
SLO → LA	Departure: 6:00 PM	05/03/2018	\$87.00
SLO → LA	Departure: 10:00 PM	05/04/2018	\$78.78

- Employee - Check Flight Status

CALIFORNIA
AIRLINE

EMPLOYEEID: 1234567890

Ticket Pricing

Schedule Flight

Flight status

Enter flight number

Flight Number *
6795

Submit

Flight Status


SLO → LA

Departure: 8:00 AM 05/01/2018

DELAYED

Change Flight Status

- Employee - Change Flight Status (Options)


EMPLOYID: 1234567890

Ticket Pricing

Schedule Flight

Flight status

[< Cancel](#)

Current Status

SLO → LA
Departure: 8:00 AM 05/01/2018 **DELAYED**

New Status


On Time ▼

On Time

Delayed

Cancelled

- Employee - Change Flight Status (Delayed)


Derek Nguyen

Ticket Pricing

Change Flight Status

Flight status

[< Cancel](#)

Current Status

SLO → LA
Departure: 8:00 AM 05/01/2018 **ON TIME**

New Status

Delayed ▼

New Departure Time *


9:00 AM

New Arrival Time *

9:45 AM

Save Flight Status

- Employee - Schedule Flight (with conflict)


EMPLOYID: 1234567890
Ticket Pricing
Schedule Flight
Flight status

Route and Times

From *

To *

Departure Date *

Departure Time *

Arrival Date *

Arrival Time *


Conflict

From San Luis Obispo To Los Angeles

SLO → LA
Departure: 4:30 PM Arrival: 5:30 PM 05/01/2018

* Please verify that the flights' departure/arrival times are 40 minutes apart.

- Employee - Schedule Flight (successful)


EMPLOYID: 1234567890
Ticket Pricing
Schedule Flight
Flight status

Route and Times

From *

To *

Departure Date *

Departure Time *

Arrival Date *

Arrival Time *

Successful

From San Luis Obispo To Los Angeles

SLO → LA
Departure: 5:00 PM Arrival: 6:00 PM 05/01/2018

8. Glossary

Account - username and password which allows a user to access the software and perform certain tasks

Arrival - the time a flight arrives

Baggage Policy - number of allowed bags and cost for these bags

Board - get onto plane

Boarding pass - paper that contains a code that a passenger needs to board a plane

Check in - customer logs on and confirms that they are planning to get on a flight and receives a boarding pass

Clearance - amount of time needed between planes on a runway

Departure - the time a flight leaves

Flight - a plan trip from one airport to another

Flight status - whether a flight is on time, delayed, or canceled

Passenger - a customer on board a flight

Round trip - a series of two flights to and then from a destination

Runway - an open space where the plane takes off and lands