

Flights Manager: design and development of a Java architecture about flights reservation

Alessio Sortino

`alessio.sortino@stud.unifi.it`

Fabio Vittorini

`fabio.vittorini@stud.unifi.it`

Software Architectures and Methodologies

University of Florence, Department of Information Engineering

September 28, 2017



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

1 Introduction

2 Design

- Domain Model
- Use Case Diagram

3 Implementation

- Domain Logic
- Business Logic
- Presentation Pages

4 Test

5 Application

Design and implement a Java application about *Flight Booking*

- Allow users to search and choose available flights
- View, modify and print a reservation
- Allow administrator to manage flights

Requirements & Constraints

Generic user:

- Search and choose flights
- Reserve seats and confirm the reservation

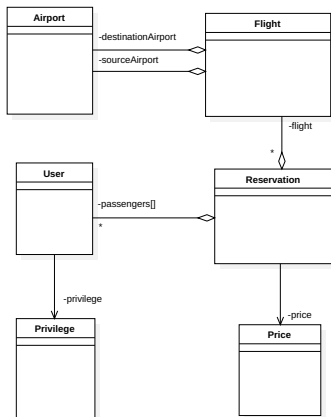
Reserved user:

- View details and print confirm
- Edit passengers data
- Delete reservation

Administrator:

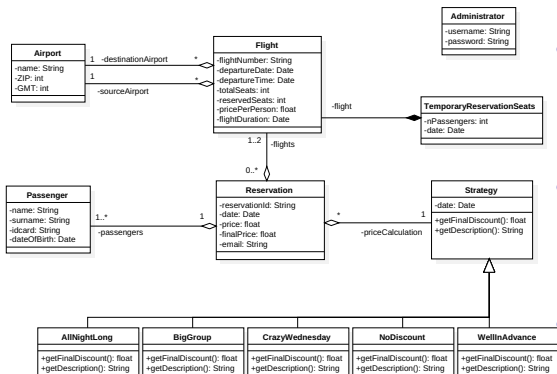
- Create new flights
- Create new airports
- View flights details
- Delete flights with no reservations

Conceptual Model



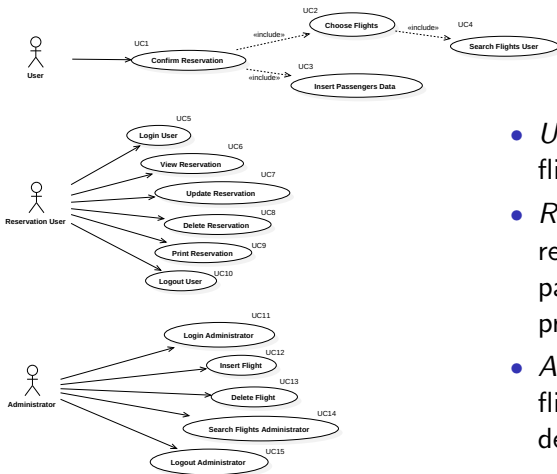
- Reservation has a Price, two Flights and more Users as passengers
- Each Flight has two Airports as source and destination
- A User can also be an Administrator

Domain Model



- A Reservation has a Strategy to compute the discount
- Each concrete Strategy implements different discount methods
- *TemporaryReservationSeats* allows to manage seats concurrency
- There is not a User class: Administrator and Passenger are distincts

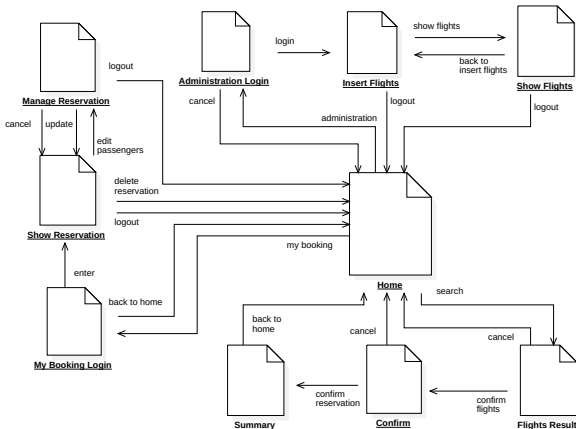
Use Case Diagram



There are 3 actors:

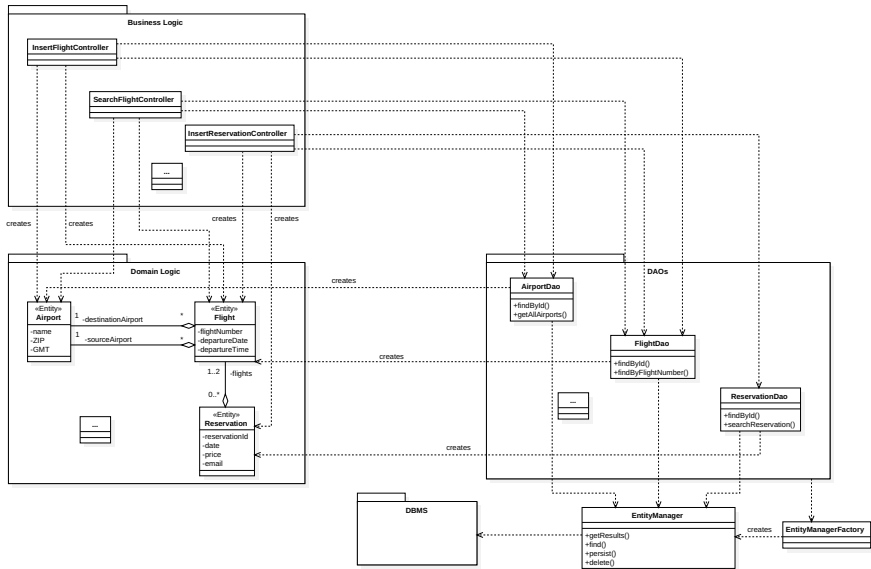
- *User* can search and choose flights to create a reservation
- *Reservation User* can view reservation details, edit passengers data, delete and print the reservation
- *Administrator* can insert a new flight, search existing flights and delete them

Page Navigation Diagram



- At the center the home page
- Three use cases flows

3-tier architecture



We implement 3 different levels according to 3-tier architecture:

- Domain Logic
- DAO
- Business Logic

In the domain logic we have:

- Added the class *Util* to implement additional functions
- Implemented the class *TemporaryReservationSeats* to manage the temporary reservations until they are completed or deleted
- Added the *Strategy* hierarchy overriding the discount method for each concrete class

DAOs (Data Access Objects)

- We have added one DAO for each class from the Domain Model
- Each DAO implements:
 - the methods `save()`, `findById()` and `delete()`
 - some additional methods for specific data retrieval from database, using JPQL

- We have implemented two beans:
 - *AdministratorSessionBean*
 - *ReservationSessionBean*
- These beans manages data about login and session
- Each bean has the annotation `@SessionScoped`

- We have realized about one controller for each presentation page
- The controllers enclose the logic of the application
- Each controller uses DAOs and expose methods for actions offered in the page

For the presentation pages we have used:

- *JSF*
- *HTML5*
- *CSS3*
- *JavaScript*
- *AJAX*

- Test on Domain Logic, DAO and Business Logic
- Check the test coverage with *JaCoCo*

Element	Coverage	Covered Instructio...	Missed Instructions	Total Instructions
swam-flights-manager	88,2 %	9.364	1.255	10.619
src/main/java	75,5 %	2.858	929	3.787
it.unifi.ing.swam.controller	70,1 %	1.467	625	2.092
it.unifi.ing.swam.dao	88,1 %	649	88	737
it.unifi.ing.swam.bean	41,4 %	58	82	140
it.unifi.ing.swam.model.strategy	49,2 %	63	65	128
it.unifi.ing.swam.model	90,7 %	312	32	344
it.unifi.ing.swam.bean.producer	0,0 %	0	17	17
it.unifi.ing.swam.util	94,9 %	261	14	275
it.unifi.ing.swam.model.temp	78,6 %	22	6	28
it.unifi.ing.swam.bean.startup	100,0 %	26	0	26
src/test/java	95,2 %	6.506	326	6.832
it.unifi.ing.swam.controller	93,1 %	3.481	257	3.738
it.unifi.ing.swam.dao	98,4 %	2.550	42	2.592
it.unifi.ing.swam.bean	89,8 %	106	12	118
it.unifi.ing.swam.util	96,9 %	283	9	292
it.unifi.ing.swam.bean.startup	87,5 %	42	6	48
it.unifi.ing.swam.model	100,0 %	44	0	44

- 88.2% of coverage has been reached due to *getter* and *setter* methods

Search flight

☐ One Way ☒ Return

From

Bologna

To

Londra Stansted

Fly out

21/08/17

Fly back

24/08/17

Passengers

1

SEARCH

There are 3 flows:

- *New Reservation Flow*
- *Manage Reservation Flow*
- *Administrator Flow*

Figure 1: *Home Page and Search Flights*

New Reservation Flow

Flights results

Forward flights - From **Bologna** to **Londra Stansted** on **21/08/2017** for **6** passengers

From	Duration	To	Flight number	Price per person
Bologna - 16:45 GMT: +1	01:10	Londra Stansted - 16:55 GMT: 0	F9846	€ 49.99 Ⓢ
Bologna - 08:15 GMT: +1	01:30	Londra Stansted - 08:45 GMT: 0	F6491	€ 79.0 0

Backward flights - From **Londra Stansted** to **Bologna** on **24/08/2017** for **6** passengers

From	Duration	To	Flight number	Price per person
Londra Stansted - 08:56 GMT: 0	01:32	Bologna - 11:28 GMT: +1	F9164	€ 39.0 Ⓢ

CANCEL

CONFIRM FLIGHTS

Figure 2: *Flights result*

Insert passengers data

	First name	Surname	ID-Card	Date of birth
Passenger 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Passenger 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Passenger 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

CANCEL

BACK

CONTINUE TO RESERVATION

Figure 3: *Insert passengers data*

Price	
per person	x 6
Forward flight:	€ 49.99 € 299.94
Backward flight:	€ 39.0 € 234.0
Total:	€ 533.94
Special offer!	€ 507.24

Discount applied for big groups
(5% each 5 people)

Figure 4: *Total price*

Manage Reservation Flow

Your booking details

Reservation date:	2017-08-21 12:41:07.0
Email:	myemail@mail.com
Reservation ID:	FMID-74
Passengers:	6
Total price:	€ 507.24

Your flights

Flight number	Date	From	Duration	To
F9846	2017-08-21	Bologna - 16:45	01:10	Londra Stansted - 16:55
F9164	2017-08-24	Londra Stansted - 08:56	01:32	Bologna - 11:28

Passengers

First Name	Surname	ID-Card	Date of birth
Paolo	Mengoni	R34234	12/04/1956
Marco	Lippi	T43524	29/04/1993

Figure 5: Reservation details

My booking login

Reservation ID

Insert reservation ID

Email

Insert email

[BACK TO HOME](#) [ENTER](#)

Figure 6: Reservation login

Edit passengers

First Name	Surname	ID-Card	Date of birth
Paolo	Mengoni	R34234	12/04/56
Marco	Lippi	T43524	29/04/93
Francesco	Maria	FA12043	06/08/94

[CANCEL](#) [APPLY](#)

Figure 7: Edit passengers

Administrator Flow

Insert flight

Flight number	Date	Departure time (HH:MM)	Flight duration (minutes)	Passengers	Price per person (€)	Repeat for (days)
<input type="text" value="F1234"/>	<input type="text" value="21/08/17"/>	<input type="text" value="17:55"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0.0"/>	<input type="text" value="1"/>

Source airport	<input type="radio" value="existing"/> existing	<input type="radio" value="new"/> new
<hr/>		
From	<input type="text" value="Airport name"/>	<input type="text" value="ZIP"/>
<hr/>		
Destination airport	<input checked="" type="radio" value="existing"/> existing	<input type="radio" value="new"/> new
<hr/>		
To	<input type="text" value="Pisa"/>	
<hr/>		

Figure 8: *Insert flights*

Administration login

Username
<input type="text" value="Insert username"/>
Password
<input type="text" value="Insert password"/>
<input type="button" value="CANCEL"/> <input type="button" value="LOGIN"/>

Figure 9: *Administrator login*

Show flights

Starting date

From To

[VIEW FLIGHTS](#) [BACK TO INSERT FLIGHT](#)

Flight number	Date	Departure time (HH:MM)	Flight duration (minutes)	Total seats	Reserved seats	Price per person	From
F5256	01/08/2017	21:00	70	300	6	€ 75.0	Londra Stansted
F5221	01/08/2017	21:00	70	300	0	€ 75.0	Palermo
F4646	01/08/2017	18:42	56	78	1	€ 130.0	Londra Stansted
F4984	03/08/2017	12:10	98	87	0	€ 15.0	Pisa

Figure 10: *Show flights*