

Software Requirements Specification

for

Airline Ticket Reservation

Version 4.0 approved

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Document Version Control:

Full name	Date	Change comments	New version	Previous version
Team 6	11.10.2018	Initial version	V1.0	NA
Team 6	17.10.2018	Requirements prioritization according to value, ROI plot graph, prioritization attributes, traceability model, traceability attributes are added	V1.1	V1.0
Team 6	10.11.2018	Non-functional requirements are upgraded, strategic dependency model is constructed, traceability model is upgraded, system goal modelling is performed	V2.0	V1.1
Team 6	19.11.2018	Non-functional requirements are traced, strategic dependency model and KAOS models are upgraded, software intensive system model is introduced, use case diagrams are upgraded	V2.1	V2.0
Team 6	03.12.2018	Scope of the main problem is defined, class diagram, state models, solution-oriented requirements are extracted and documented by being grouped into system features, traceability model is upgraded	V3.0	V2.1
Team 6	09.12.2018	Class diagram is updated, scope is refined, state diagrams are updated, sequence diagram is constructed, solution-oriented requirements are updated	V3.1	V3.0
Team 6	16.12.2018	Sequence diagram is updated, scope is refined, prototype is built	V4.0	V3.1

Requirements Version Control:

Full name	Date	Change comments	New version	Previous version
Team 6	11.10.2018	Initial specification of requirements	V1.0	NA
Team 6	17.10.2018	Refining initial requirements according to criteria of good requirements	V1.1	V1.0
Team 6	10.11.2018	Non-functional requirements are upgraded	V2.0	V1.1
Team 6	19.11.2018	Non-functional requirements are traced, performance, reliability, security, portability, maintainability requirements are upgraded	V2.1	V2.0
Team 6	03.12.2018	Solution-oriented requirements are extracted and documented by being grouped into system features	V3.0	V2.1
Team 6	09.12.2018	Solution-oriented requirements are updated	V3.1	V3.0
Team 6	16.12.2018	Solution-oriented requirements are refined according to criteria of good requirements	V4.0	V3.1

Introduction

1.1 Purpose

This document lists the requirement specifications for an Airline Ticket Reservation System (ATRS). The document is subject the change as the project progresses. The given version of the document is the initial one. Further changes of the project will be recorded to the document.

1.2 Document Conventions

The document is formatted according to IEEE standard.

1.3 Intended Audience

The intended audience for this document consists of requirements engineers, software developers, designers, testers and project manager.

1.4 Product Scope

Subject facet: User Interface, Searching one-way flights, Searching round trip flights, Searching multiple destinations, Flight reservations, Reservation cancellation, Online payment, Request and response for reservation cancellation, Displaying warning messages.

Usage facet: Searching, Sorting of flights, Reservation of tickets, Managing existing reservation, Managing flight details, Keeping the flights up to date.

IT facet: Database, Web-based software system, AAS for logins, Performance maintenance.

Development facet: Internal policy and culture of the airlines company should be taken under consideration.

1.5 Reference Documents

1. Naveed Ali, Richard Lai, A method of software requirements specification and validation for global software development, June 2017, Volume 22, Issue 2, pp 191–214

(<https://link.springer.com/article/10.1007/s00766-015-0240-4>)

2. Lecture slides.

3. Luke Paireepinart, David Keyes, Jingtao Liu, Frank Medjo and Seth Orell, Software Requirements Specification for Airline Flight Booking System, February 2009

(http://www.academia.edu/23567842/Software_Requirements_Specification_for_Airline_Flight_Booking_System_Software_Requirements_Specification_for_Airline_flight_booking_system)

4. www.wikipedia.com

1.6 Overview

The remaining part of the specification document is organized as follows.

- Section 2 defines overall description of the system which defines product perspectives and functions, use-case diagrams, classes and characteristics of involved users, the environment that the system is going to be deployed, constraints on design and implementation of the system, user documentation, assumptions and dependencies.
- Section 3 focuses on requirements and goal modelling. Strategic dependency model, model of software-intensive system, goal and agent responsibility model are used to model goals, while class diagram, state models and sequence diagram are constructed to model requirements.
- Section 4 contains all the specific requirements such as functional requirements, performance requirements and external interface requirements, which in turn includes user, software, hardware and communication interface requirements. Attributes of the software system and nonfunctional requirements are also specified in this section. Solution-oriented requirements extracted from requirements modelling part are documented in this section. Prioritization and traceability of requirements are also included in Section 4.

2. Overall Description

2.1 Product Perspective

ATRS is the digitized version of the traditional manual reservation system at the airline office. Existing manual system requires every customer to come to the airline office in order to make a booking. Apart from the fact that not all customers have time to come to the office, existing system also causes long queues at the office. Some customers get bored from waiting in the queue and airline loses its potential customers.

In addition to that, a hard copy of the passport is required during the reservation at office.

Customers who are not able to present their passports at the office for whatever reason cannot make reservations.

The new system aims to overcome the above-mentioned drawbacks of the existing system. It will allow users to make reservations according their needs from different parts of the world without leaving their places. Furthermore, it will reduce the workload of the employees who are responsible to make reservations at the office.

The system allows customers to check the availability of flights for specific dates and routes, get information about durations of available flights. It also allows customers to check the prices and the things that are included in the ticket such as baggage allowance, meal and etc. and booking the ticket. Administrator can modify, remove existing flights, also add new flights to the system. Furthermore, administrator can see customer requests about cancellation of bookings, and decide whether to accept and reject them.

2.2 Product Functions

The system will have 10 functionalities for customers and administrators and they are listed below.

2.2.1 Search for flights

Description: Using this function a customer is able to search for one-way, round-trip and multiple destination flights by choosing specific dates and destinations.

2.2.2 Specify passengers

Description: With the help of this function customer selects the number of passengers and their category, either adult, child or infant.

2.2.3 Sort flights

Description: Regarding to this functions, customer sorts flights either by price or duration of the flight.

2.2.4 Book flights

Description: This function allows customer to book flights by choosing ticket types and processing online payment.

2.2.5 Request cancellation

Description: This function indicates that customer can request the cancellation of the reserved ticket.

2.2.6 Add new flights

Description: The function grants administrator the privilege of adding new flights to the system.

2.2.7 Modify flight details

Description: Using this functionality administrator can modify the details of the existing flights.

2.2.8 Remove flights

Description: With the help of this function administrator removes the flights from the system that are cancelled for whatever reason.

2.2.9 See cancellation requests

Description: This functionality allows administrator to overview the cancellation requests of customers, and approve or reject them.

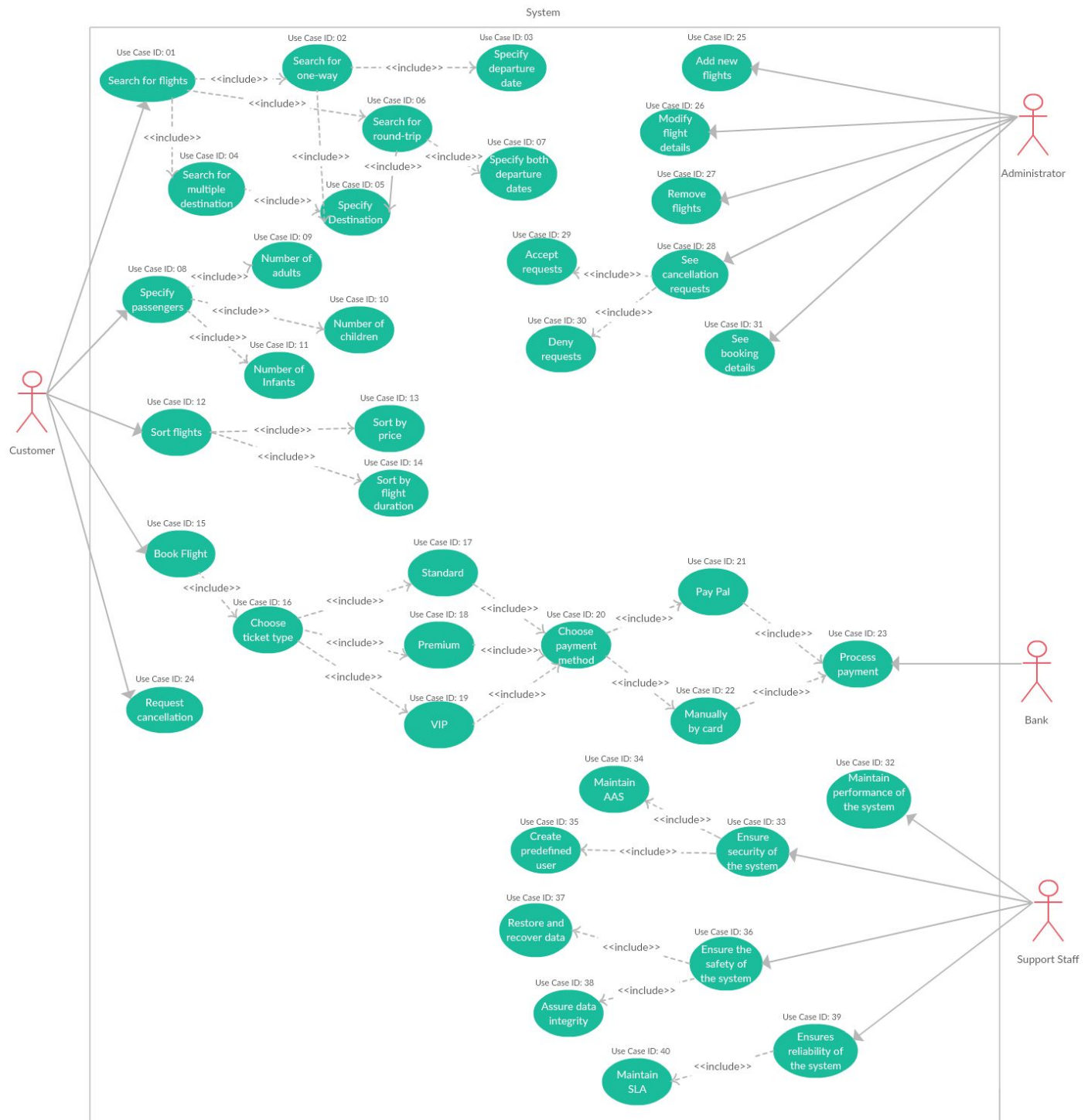
2.2.10 See booking details

Description: This functionality enables administrator to view the customers' booking details.

2.3 Use-case Diagram

Description: In the use case diagram given below, we have displayed how our users interact with the system to accomplish their goals and responsibilities. Here in our diagram we have 4 actors (Customer, Administrator, Support Staff, Bank), 3 of which are the main users (Customer, Administrator, Support Staff). In every use case mentioned in the diagram, the actions of the users are described, and how these use cases are related to one another is represented by the help of arrows. In our Use case diagram all functionalities of the system are displayed. Customer can search for flights based on dates and destination, flights being one-way or round-trip, sort the displayed flights according to price or duration, specify the passengers (how many adults, children or infants), request cancellation, book flight, choose the ticket type and proceed with the payment. The payment is processed by the Bank. Another actor, Administrator, is responsible for adding new flights, modifying flight details and removing flights if needed, see the cancellation request, approve or deny them and see booking details. Our final actor, Support Staff, is

responsible for maintenance of the system, ensuring the security of the system (by creating predefined users and maintaining AAS), safety of the system (by restoring and recovering data and assuring data integrity) and reliability of the system (by maintaining SLA).



Use Case ID:	01		
Use Case Name:	Search for flights		
Created By:	Ilkin Aghayev	Last Updated By:	
Date Created:	9/11/2018	Date Last Updated:	9/11/2018

Actor:	Customer
Description:	Customer searches for the flights on specific dates
Frequency of Use:	1
Preconditions:	Customer should have internet connection and be able to access to the website
Postconditions:	System displays the list of all available flights on a chosen date
Normal Course of Events:	<ol style="list-style-type: none"> 1. Customer enters airline's website 2. Customer chooses the specific date 3. System displays the flights on a given date
Alternative Courses:	NA
Exceptions:	System may not be available
Includes:	Search for one-way, Search for round-trip, search for multiple destinations.
Assumptions:	System is available
Notes and Issues:	NA

Use Case ID:	12		
Use Case Name:	Sort flights		
Created By:	Elchin Aghazada	Last Updated By:	

Date Created:	10/11/2018	Date Last Updated:	10/11/2018
---------------	------------	--------------------	------------

Actor:	Customer
Description:	Customer wants to sort flights.
Normal flow:	<ol style="list-style-type: none"> 1. Customer enters airline's website 2. Customer searches for flights 3. System displays the list of available flights 4. Customer chooses to sort the list of flights either by price or the duration of flight. 5. System displays the sorted list of flights
Preconditions:	System has displayed the list of available flights based on customer's query
Postconditions:	Customer is displayed the sorted list of flights according to his/her sorting criteria
Frequency of Use:	1
Normal Course of Events:	Customer chooses to sort the flights according to price or flight duration on the system.
Alternative Courses:	NA
Exceptions:	System may not be available
Includes:	Sort by price, Sort by duration
Assumptions:	System is available, There are available flights according to customer's search criteria
Notes and Issues:	NA

Use Case ID:	20
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Use Case Name:	Payment		
Created By:	Vusala Shikhaliyeva	Last Updated By:	
Date Created:	10/11/2018	Date Last Updated:	10/11/2018

Actor:	Customer
Description:	Customer proceeds with the payment of the booked flight.
Frequency of Use:	1
Preconditions:	Customer has selected the available flight and ticket type of his/her choice
Postconditions:	Customer has booked the flight and paid for the ticket(s)
Normal Course of Events:	<ol style="list-style-type: none"> 1. Customer clicks “Book Now” button 2. System asks the customer to enter card details as default 3. Customer enters the card details 4. Customer clicks “Make Payment” button 5. System handles the payment 6. System displays the confirmation of the payment 7. System sends an invoice to customer’s email
Alternative Courses:	Customer chooses to pay with PayPal.
Exceptions:	System may not be available.
Includes:	Manually by card, PayPal
Assumptions:	System is available, Customer has enough funds for the payment
Notes and Issues:	NA

Use Case ID:	25
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Use Case Name:	Adding new flights.		
Created By:	Faig Jafarguliyev	Last Updated By:	
Date Created:	10/11/2018	Date Last Updated:	10/11/2018

Actor:	Administrator
Description:	Administrator adds new flights to the system.
Normal flow:	<ol style="list-style-type: none"> 1. Administrator enters the website. 2. Administrator logs in to the admin panel. 3. Administrator adds details about new flights to the system. 4. Administrator submits the addition of the new flights to the system
Preconditions:	Administrator successfully logs in to the system
Postconditions:	The information about new flight can be displayed for respective queries
Frequency of Use:	Once in 6 hours.
Normal Course of Events:	Administrator logs in to the system and adds/modifies flights at the system.
Alternative Courses:	NA
Exceptions:	System may not be available, Administrator may fail to log in.
Includes:	NA
Assumptions:	Administrator is able to access the system.
Notes and Issues:	NA

2.4 User Classes and Characteristics

The system users are divided into three categories: administrators, customers and support staff. Administrators should be trained and have a knowledge about using this application. On the other hand, customers do not need a training or a background knowledge. Support staff consist of specialists who have good analytical and problem solving skills, up-to-date technical knowledge, good interpersonal and customer care skills.

2.5 User Interests

Customers' interests are getting information about available flights of specific dates and routes, knowing their durations, checking the prices of the tickets. They are also interested in what are included in different ticket types in terms of whether the ticket is refundable, include meal, what is the baggage limit for each type of ticket. Moreover, customers concern about booking flights without leaving the places where they are.

Administrator's interests include modifying, removing existing flights and adding new flights to the system. Furthermore, administrator can manage customers' cancellation requests in terms of either accepting or rejecting them.

Support staff's duties are maintaining performance, ensuring security and reliability of the system, alongside controlling AAS in terms of predefining administrator passwords, adding new administrator customized passwords to the system, and granting them administrator privileges.

2.6 Operating Environment

The designed system is thought to be a website and will be available via any web-browser application. It will not be dependent on the technical capabilities or operating system of user's device.

2.7 Design and Implementation Constraints

Flight dates and hours should be displayed according to the city of departure and destinations' time zones and the daylight saving time settings for each country should be considered. Additionally, information about any changes that are made in the database should be displayed with no delay.

2.8 User Documentation

The instructions on how to book a flight will be provided on the website for inexperienced users.

2.9 Assumptions and Dependencies

It is assumed that the user has an internet access and can do online payments. The performance of ATRS depends on the quality and speed of the internet connection.

3. Requirements and Goal Modelling

3.1 Goal Modelling

3.1.1 Strategic Dependency Model

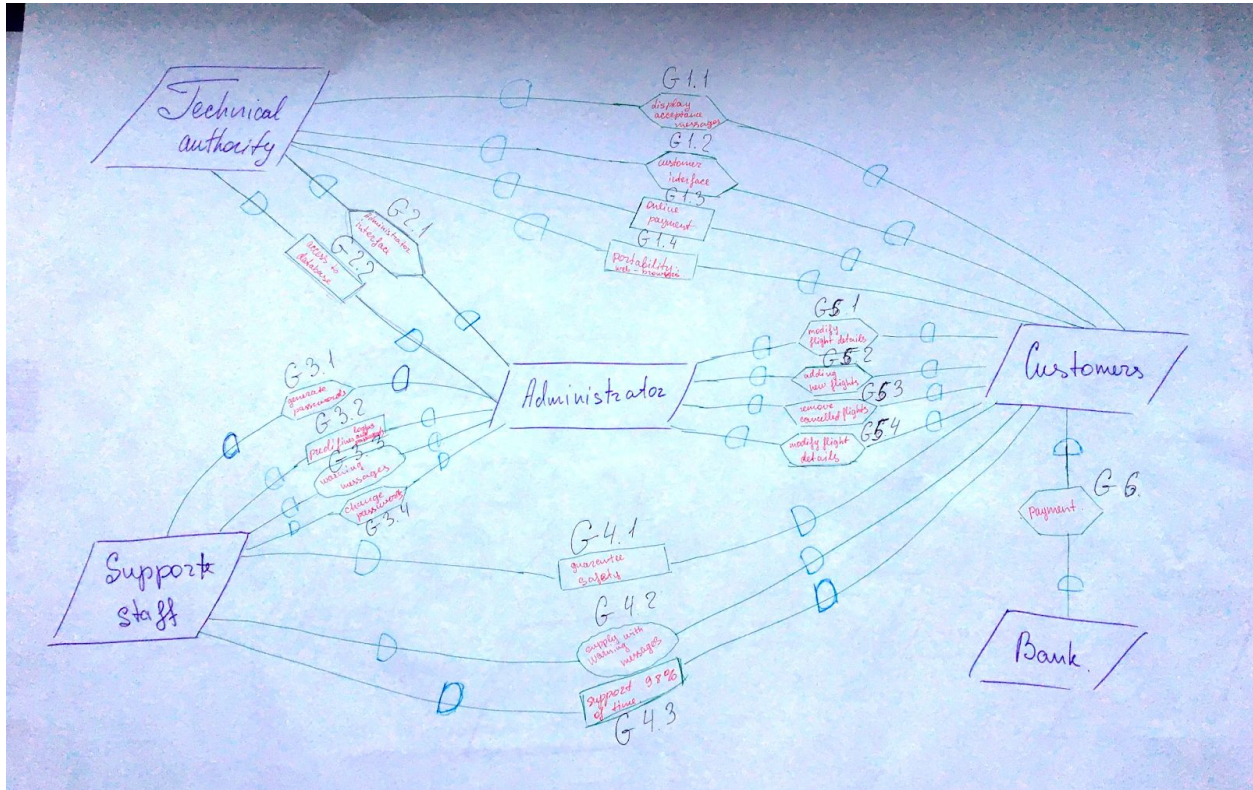


Figure 2. Strategic Dependency Model

Below given table explains the way how Strategic Dependency Model should be read:

ID	Description of Figure 2
G1.1	In order to see acceptance message of successful payment customers are dependent on technical authority
G1.2	Customers are dependent on technical authority for customer interface
G1.3	Customers are dependent from technical authority on online payment
G1.4	For portability of the system in terms of being manageable in multiple browsers customers are dependent on technical authority
G2.1	Administrators are dependent on technical authority for administrator interface

G2.2	Administrators are dependent on technical authority for access to database
G3.1	Administrators are dependent on support staff for predefined passwords
G3.2	In order being able to login with predefined passwords administrators are dependent from support staff
G3.3	In order to see warning messages administrators are dependent from support staff
G3.4	To change their predefined passwords administrators are dependent from support staff
G4.1	Customers are dependent on safety of communication channel from support staff
G4.2	Customers are dependent from support staff for fulfilment of SLA of 98%
G5.1	Customers are dependent on modification of details of existing flights from administrators
G5.2	Customers are dependent on addition of new flights to the system from administrators
G5.3	Customers are dependent from administrators on removal of cancelled flights from the system from administrators
G6	Customers are dependent from bank on making payments

3.1.2 Model of software-intensive system

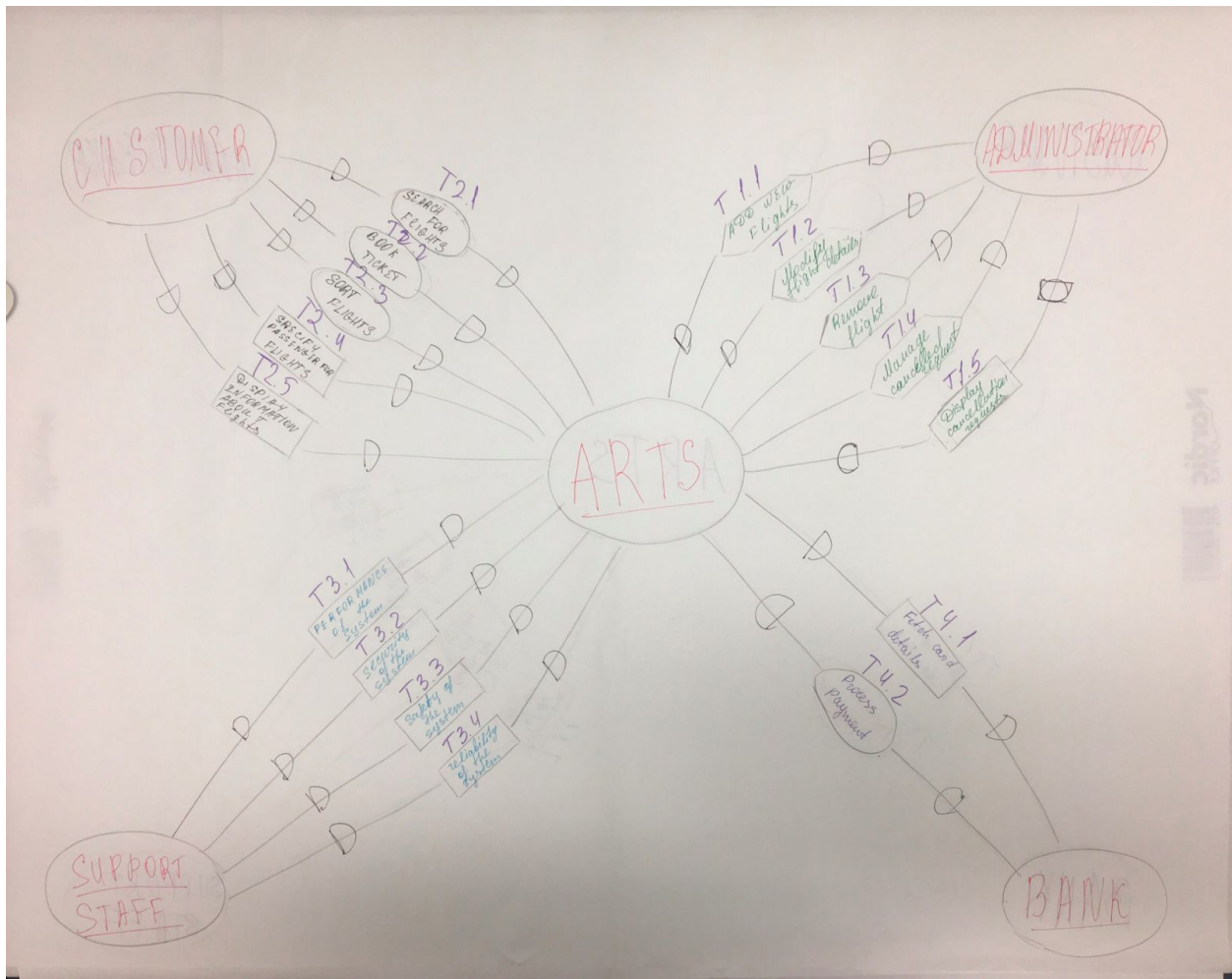


Figure 3. Software-intensive system model

Below given table explains how *Figure 3* should be read:

ID	Description of Figure 3
T1.1	ATRS depends on administrator to add new flights
T1.2	ATRS depends on administrator to modify flights flight details
T1.3	ATRS depends on administrator to remove flights
T1.4	ATRS depends on administrator on management of cancellation requests
T1.5	Administrator depends on ATRS to display cancellation requests
T2.1	ATRS depends on customer's query to search for flights

T2.2	ATRS depends on customer's request to book the ticket
T2.3	ATRS depends on customer's request to sort the flights
T2.4	ATRS depends on customer for specification of passengers
T2.5	Customer depends on ATRS to display information about flights
T3.1	ATRS depends on support staff to maintain performance of the system
T3.2	ATRS depends on support staff to ensure security of the system
T3.3	ATRS depends on support staff to ensure safety of the system
T3.4	ATRS depends on support staff to ensure reliability of the system
T4.1	Bank depends on ATRS to fetch the card details of customer to handle the payment
T4.2	ATRS depends on bank to process the payment

3.1.3 Goal and Agent Responsibility Model

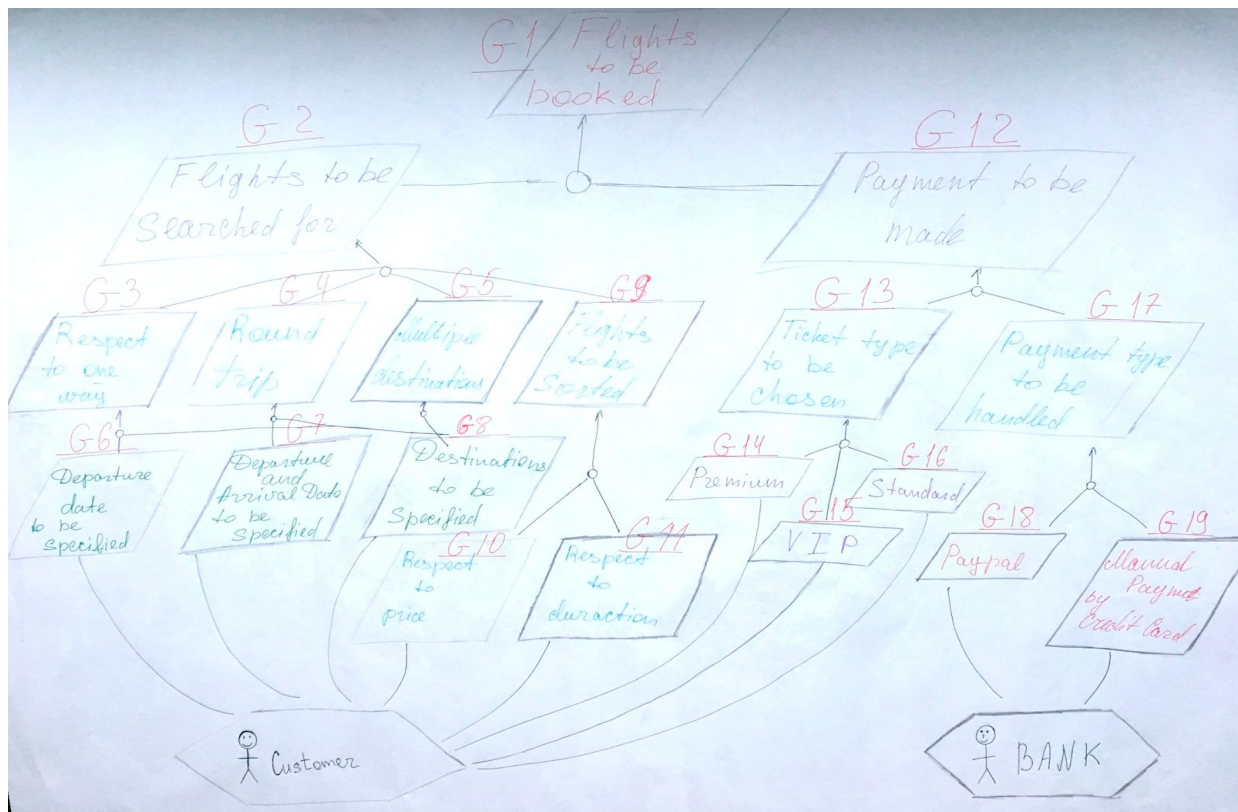


Figure 4. KAOS Model 1

Below given table explains the way *Figure 4* should be read:

ID	Description of Figure 4
G1	Customer wants to book a flight
G2	Customer searches for flights
G3	Customer searches for one-way flights
G4	Customer searches for round trip flights
G5	Customer searches for flights of multiple destinations
G6	Customer specifies departure date of flight
G7	Customer specifies both departure and arrival dates of flight
G8	Customer specifies destinations for flight
G9	Customer wants to sort flights
G10	Customer wants to sort flights respect to price
G11	Customer wants to sort flights respect to duration
G12	Customer wants to make payment to book the flight
G13	Customer wants to choose ticket type to make payment
G14	Customer chooses ticket of Premium type
G15	Customer chooses ticket of VIP type
G16	Customer chooses ticket of Standard type
G17	Bank wants to handle payment
G18	Bank wants to handle payment made manually by credit card
G19	Bank wants to handle payment made by PayPal method

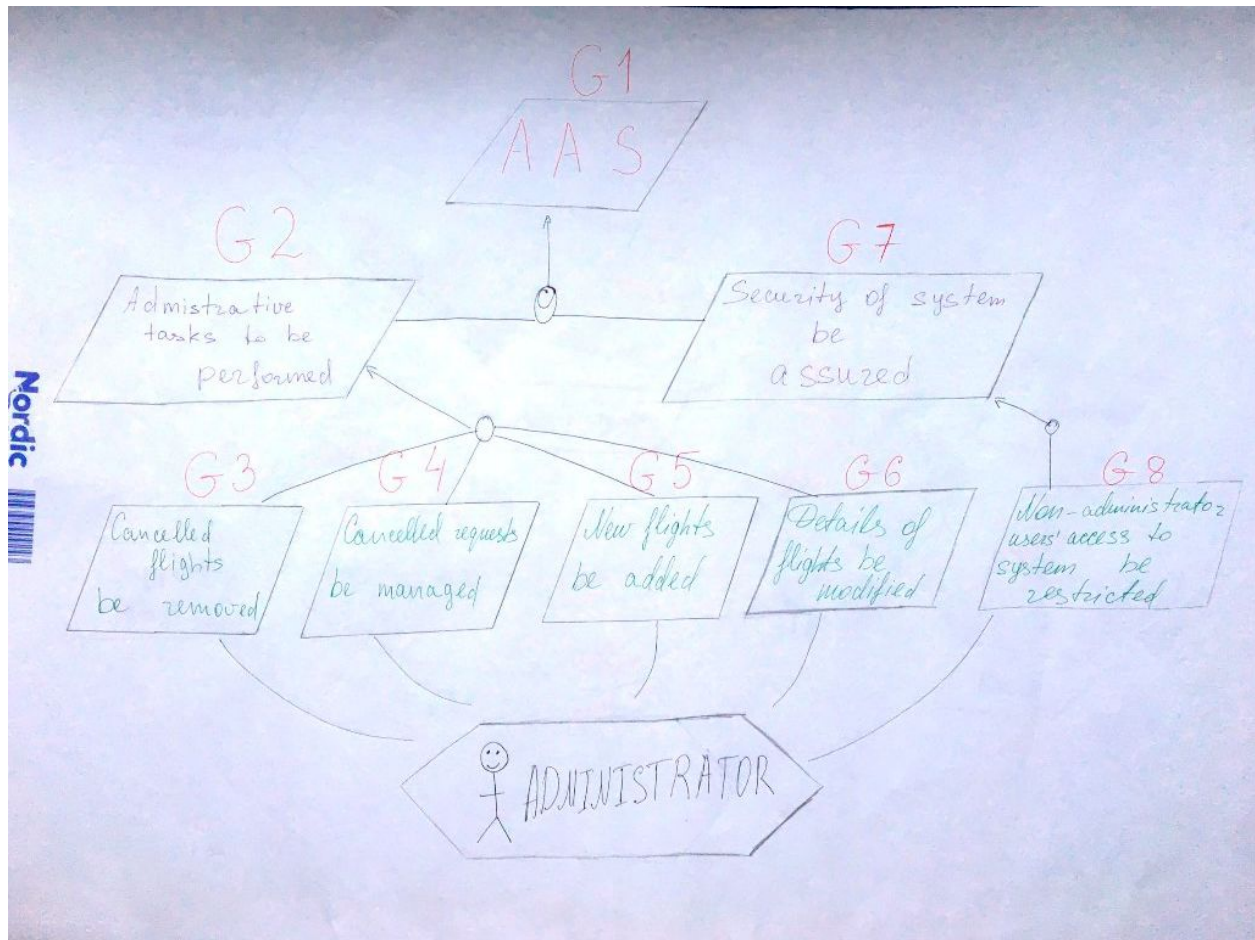


Figure 5. KAOS Model 2

Below given table explains the way *Figure 5* should be read:

ID	Description of Figure 5
G1	Administrator uses AAS
G2	Administrator uses AAS to perform administrative tasks
G3	Administrator wants to remove cancelled flights from the system
G4	Administrator wants to manage customers' cancellation requests
G5	Administrator wants to add new flights to the system
G6	Administrator wants to modify details of existing flights
G7	Customer specifies both departure and arrival dates of flight

G8	Administrator uses AAS to ensure security of the system
G9	Administrator wants to restrict non-administrative users' access to the system

3.2 Requirements Modelling

3.2.1 Scope

Scope for our diagrams is focused on the implementation of Use Case ID 15, to customer booking a flight.

3.2.2 Booking a Flight

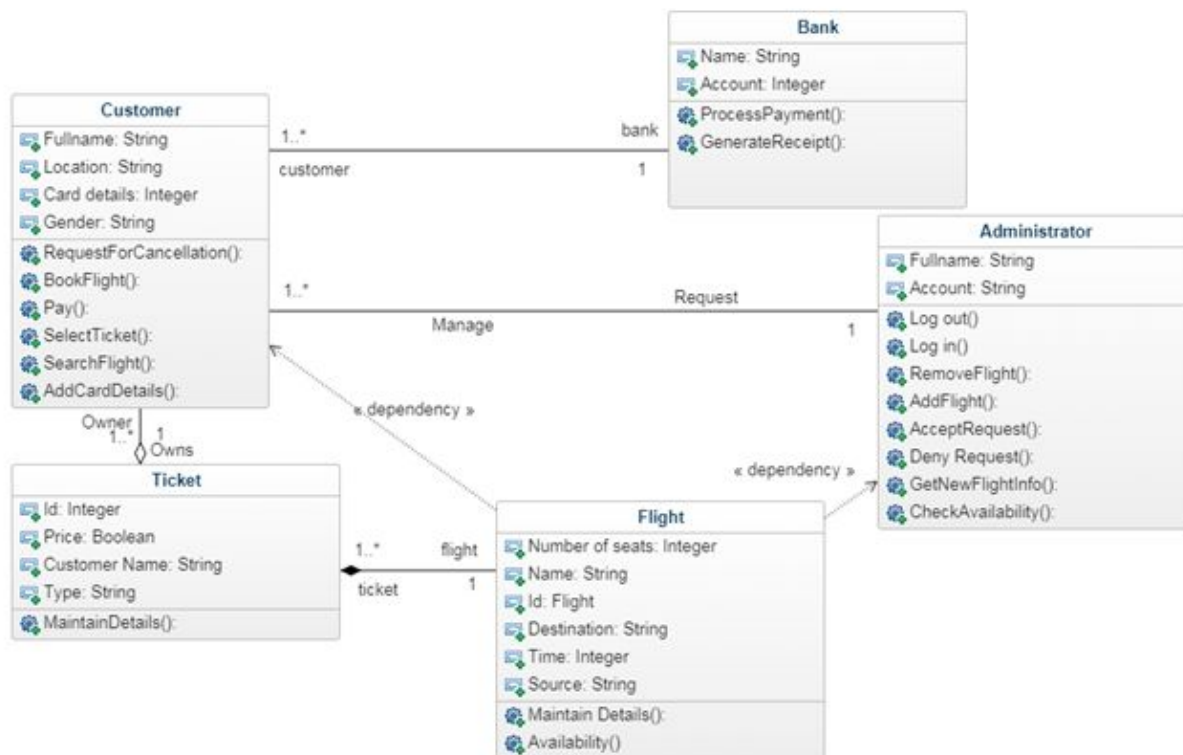


Figure 6. Booking a flight

Description: Customer class contains information about customers, such as their full names, locations, card details and genders. Operations performed by customers via interactions with administrator, bank, flight and flight tickets are contained in the respective part of the Customer class. Administrator class, on the other hand contains the data about the administrator (name and account details) and the operations he/she performs on the system. It relates to customer on approving or rejecting the cancellation requests made by the customer. Flight class is another key class in our diagram and contains information about flight such as destination and origin city, flight date, time and duration, number of seats and flight's availability. Ticket class is also

essential for our diagram and contains the full name of the customer that it belongs to. It has its own unique ID, price and type, which expands to Standard, Premium or VIP class tickets. The last class in the diagram belongs to Bank and as operations its payment processing and receipt generating functions are specified.

3.2.3 State Models

Description: As visible in class diagram, administrator can add or remove flights to the system. In state diagrams these functionalities displayed as finite states. In first diagram, administrator gets information about a new flight, adds the flight to the system and it is visible to the rest of the users of the system. Second one displays administrator being informed of cancelled flight, removing it and checking whether it is still available on the system. In third diagram, booking flight and making payment functionalities of customer are explained. Here, customer books a flight, he/she is asked to proceed with payment, and the process is finished if customer has enough fund to make payment. In the last diagram bank handles the payment made by the customer. Bank receives information about the payment, processes the payment and generates the receipt.

1.1 SD_1 Administrator state

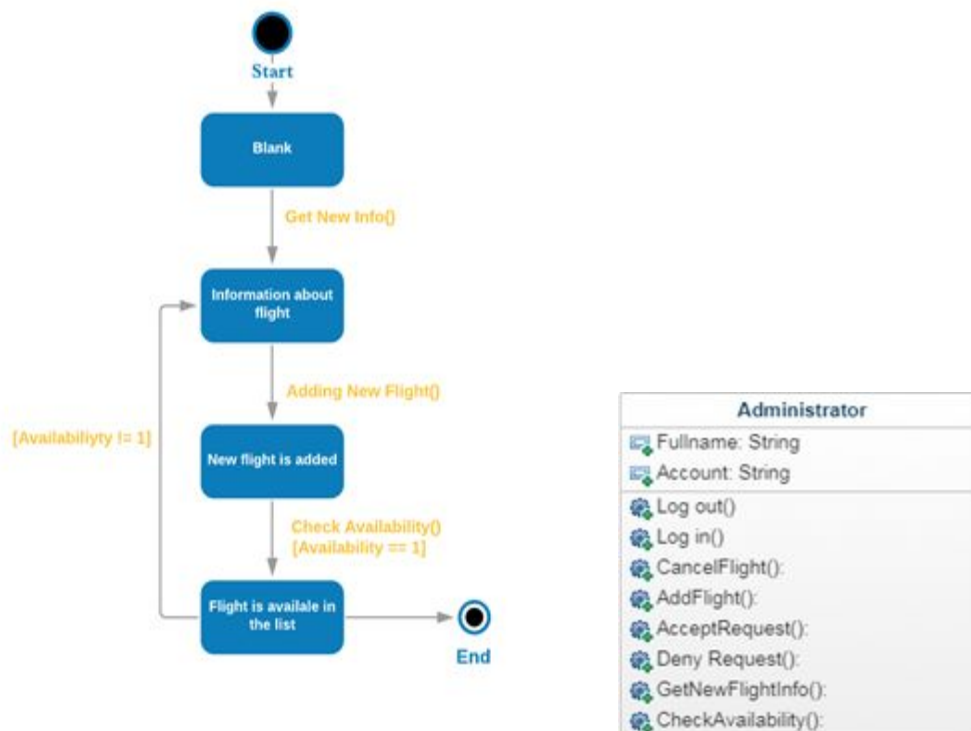


Figure 7. Adding new flight

1.2 SD_2 Administrator diagram

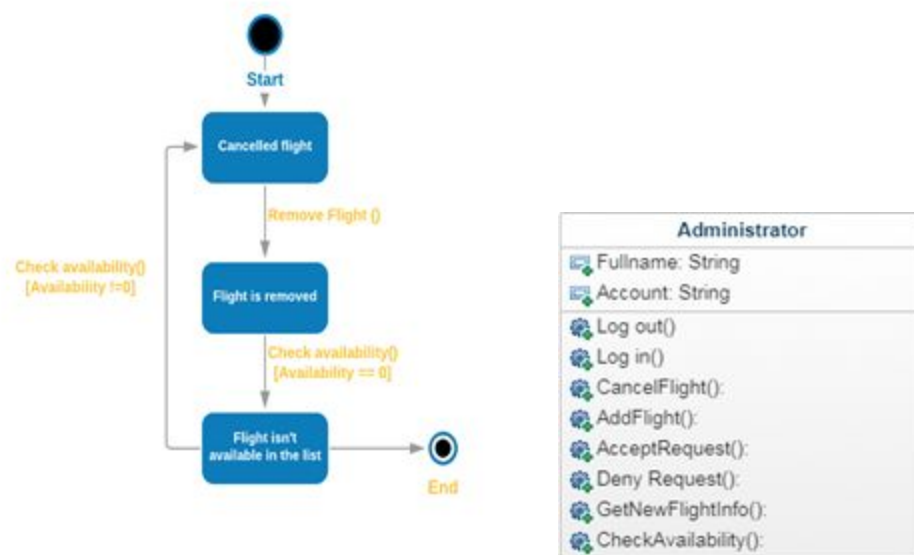


Figure 8. Removing existing flight

1.3 SD_3 Bank statement

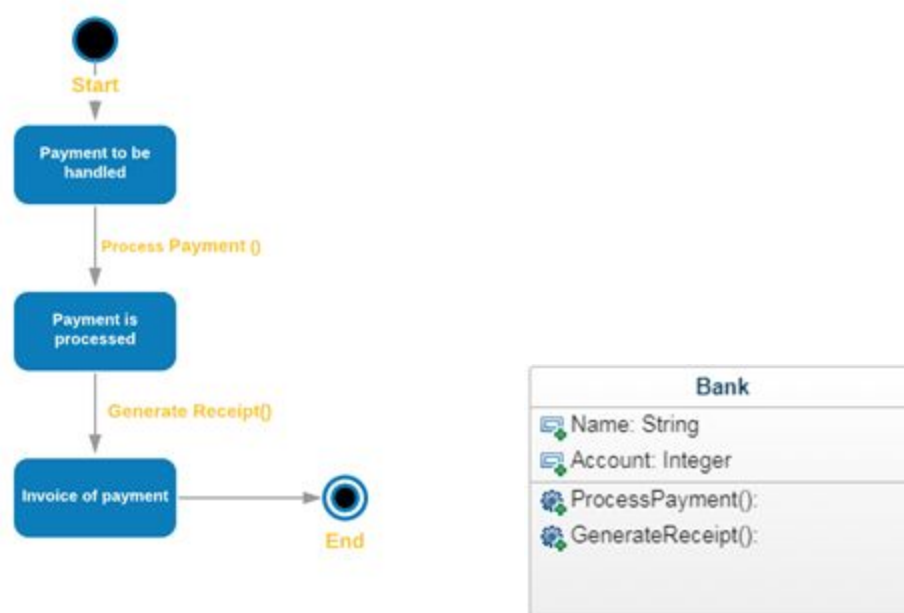


Figure 9. Processing payment

1.4 SD_4 Customer state

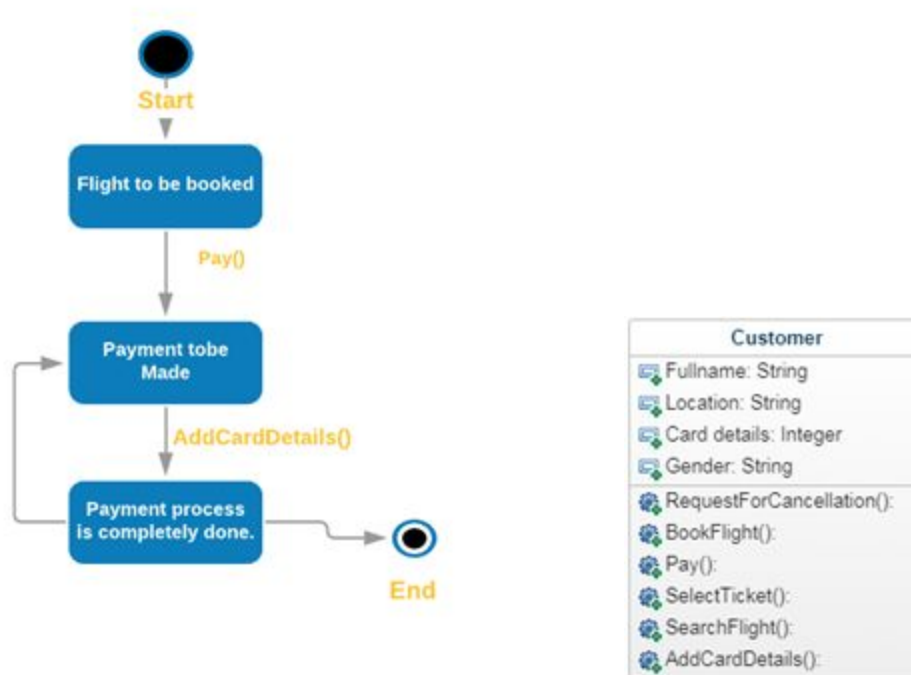
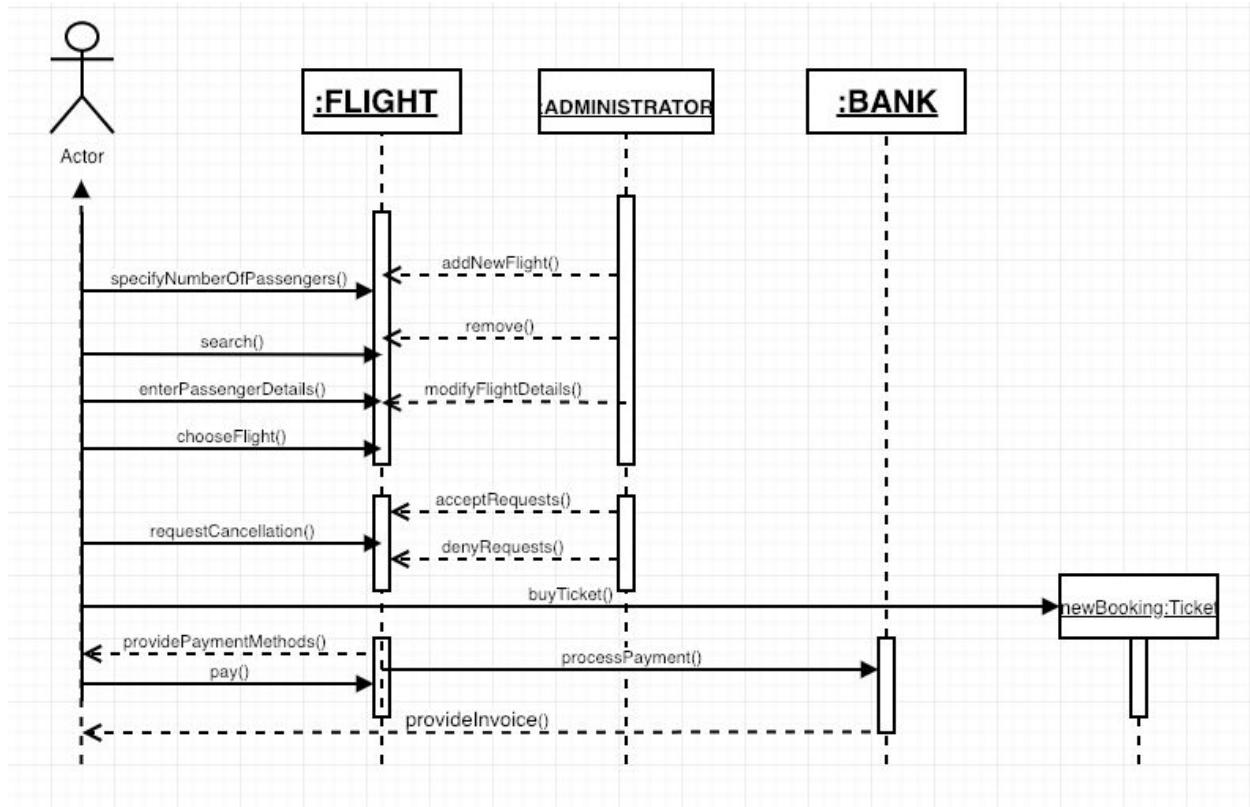


Figure 10. Paying for booking

3.2.4 Ticket Booking Process

Description: In sequence diagram we have displayed how the objects of classes interact with each other throughout the customer's ticket booking process.



4. Specific Requirements

4.1 External Interface Requirements

4.1.1 User Interfaces

- 4.1.1.1 ATRS should have a customer user interface.
- 4.1.1.2 ATRS should have an administrator user interface.
- 4.1.1.3 Customer user interface should have a graphical user interface (GUI).
- 4.1.1.4 Administrator user interface should have a GUI.

4.1.2 Hardware Interfaces

No hardware interface is required for the Airline Ticket Reservation system.

4.1.3 Software Interfaces

- 4.1.3.1 ATRS should be a web-based system.
- 4.1.3.2 It should be possible to open and use the website on the computers with operating systems of Microsoft 7, Microsoft 8, Microsoft 10, Mac Os, Linux, Ubuntu.
- 4.1.3.3 Oracle Database 12C should be used to store the data about flight details.
- 4.1.3.4 Oracle Database 12C should be used to store the data about users.

4.1.4 Communication Interfaces

4.1.4.1 HTTP protocol should be used as an interface of communication between client and server sides.

4.2 Functional Requirements

- 4.2.1 Customer should be able to search flights for a specific date for one-way trips.
- 4.2.2 Customer should be able to search flights for specific dates for round trips.
- 4.2.3 Customer should be able to search flights for multiple destinations.
- 4.2.4 Customer should be able to manually enter the names of departure and arrival cities.
- 4.2.5 Customer should be able to select the names of departure and arrival cities from the list of all flight offered cities.
- 4.2.6 Customer should be able to specify the number of adults from 1 to 6 while searching for a flight.
- 4.2.7 Customer should be able to specify the number of children from 0 to 6 while searching for a flight.
- 4.2.8 Customer should be able to specify the number of infants from 0 to 3 while searching for a flight.
- 4.2.9 Customer should be able to specify the travel class while searching for a flight.
- 4.2.10 Customer should be able to select the currency while searching for a flight.
- 4.2.11 Customer should be able see all the possible flights based on the information he entered.
- 4.2.12 Customer should be able to sort the list of possible flights by price.
- 4.2.14 Customer should be able to sort the list of possible flights by flight duration.
- 4.2.15 Customer should be able to select the type of the ticket.
- 4.2.16 Customer should be able to change the date of the booked ticket without paying extra money if the booked ticket is type of VIP.
- 4.2.17 Customer should be able to change the date of the booked ticket by paying extra money if booked ticket is type of Premium.
- 4.2.18 Customer should not be able to make any changes on the booked ticket if the latter is type of Standard.
- 4.2.19 Customer should be able to request reservation cancellation.
- 4.2.20 Customer should be able to see given response to reservation cancellation request.
- 4.2.21 System should allow a customer to specify only departure date for one-way trips.
- 4.2.22 System should allow a customer to specify both departure and arrival dates for round trips.
- 4.2.23 System should provide the list of possible flights matching criterion of user inputs.
- 4.2.24 System should allow customer to book the ticket to a flight of his choice.
- 4.2.25 System should allow customer to book tickets for maximum of 6 people.

- 4.2.26 System should demand customer to provide his/her full name to book the ticket.
- 4.2.27 System should demand customer not to enter numbers for full name label.
- 4.2.28 System should demand customer to provide his/her number of travel document to book the ticket.
- 4.2.29 System should demand customer to enter only characters for full name label.
- 4.2.30 System should demand customer not to enter specific characters for travel document number label.
- 4.2.31 System should demand customer to choose the payment method.
- 4.2.32 System should offer payment via manually manually entering card details as default payment method to customer.
- 4.2.33 System should be able to handle payments done by the customer via PayPal.
- 4.2.34 System should be able to process the payments done by the customer via manually entering the card details.
- 4.2.35 Provided list of flights should contain information about duration of flight for each flight.
- 4.2.36 Provided list of flights should contain information about price in chosen currency for each flight.
- 4.2.37 Provided list of flights should illustrate the exact hours of departure and arrival for each flight.
- 4.2.38 Provided list of flights should contain information about departure and arrival airport names for each flight.
- 4.2.39 Flight offered cities should be grouped respect to the continents they are located.
- 4.2.40 Types of the tickets should be classified as Standard, Premium and VIP.
- 4.2.41 Administrator should be able to add new flights to the system.
- 4.2.42 Administrator should be able to modify the details of existing flights.
- 4.2.43 Administrator should be able to remove cancelled flights from the system.
- 4.2.44 Administrator should be able to see reservation cancellation requests.
- 4.2.45 Administrator should be able to accept reservation cancellation requests.
- 4.2.46 Administrator should be able to reject reservation cancellation requests.
- 4.2.47 Administrator should be able to see details of existing bookings.

4.3. Software System Attributes

4.3.1 Usability

- 4.4.1.1 Non-technical background of a user should not be an obstacle to understand and use the system.

4.3.2 Robustness

- 4.4.2.1 System should be able to display the most recent inquiry by the user in case of refreshment of page after sudden connection lost.

4.3.3 Consistency

4.4.4.1 Number of available seats for specific flight should be decreased by 1 unit once a transaction of the payment for the flight ticket is made.

4.4 Nonfunctional Requirements

4.4.1 Performance Requirements

3.4.1.1 System should be able to handle 1000 transactions per second. [4.2.21 - 4.2.30]

4.4.2 Reliability Requirements

4.4.2.1 System's Service Level Agreement (SLA) level should be of 98%. [4.2.1 - 4.2.20]

4.4.2.2 Maximum 2 of 1000 online payment transactions through the systems can result in failure. [3.2.31-3.2.34]

4.4.3 Security Requirements [4.2.41 - 4.2.47]

4.4.3.1 System should have an Authentication and Authorization System (AAS) for logins.

4.4.3.2 System should grant administrative privileges only to the one who logins with predefined administrative username and password.

4.4.3.3 System should allow administrator to change his/her system-generated password as he/she wishes.

4.4.3.4 System should allow administrator to login with customized password.

4.4.3.5 System should block access to one who fails to login three time in a row.

4.4.3.6 System should guarantee the security of communication channel.

4.4.3.7 Customized password should be at least 8 characters.

4.4.3.8 Customized password should contain both letters and numbers.

4.4.4 Maintainability Requirements [4.2.35 - 4.2.37]

4.4.4.1 User should be displayed acceptance message within 5 seconds, when he/she submits entered data to the system.

4.4.4.2 Warning messages about entrance data out of defined standards must remain on the screen for 3 seconds.

4.4.5 Portability Requirements [4.3]

4.4.5.1 System should be manageable in web-browsers of Internet Explorer, Google Chrome, Mozilla Firefox, Opera and Safari.

4.4.6 Safety Requirements[4.2.35 - 4.2.37]

4.4.6.1 System should include restore and recover functions in order to prevent data loss.

4.4.6.2 System should assure data integrity.

4.4.7 Other Requirements[4.2.21-4.2.25]

4.4.7.1 System should display a warning message if the customer input for full name label is out of defined standard.

4.4.7.2 System should display a warning message if the customer input for travel document number is out of defined standard.

4.4.7.3 System should display a warning message if the customer wants to book flights for more than 6 people.

4.4.7.4 System should display a warning message if the administrator tries to customize his/her password out of defined standards.[4.2.47]

4.5 Solution oriented requirement

4.5.1 Class diagram requirements [4.2.1,4.2.2,4.2.3,4.2.15,4.2.23,4.2.43]

ID	Requirements	Diagram	Priority
4.5.1.1	System must allow customer to book the ticket to a flight of his/her choice.	Based on CD_1	5 out of 5
4.5.1.2	System must allow administrator to remove cancelled flights.	Based on CD_1	5 out of 5
4.5.1.3	System must allow to customer to see list of possible flights based on the information he/she entered	Based on CD_1	4 out of 5
4.5.1.4	System must allow to customer in order to select the type of ticket.	Based on CD_1	5 out of 5

4.5.2 State diagram requirements [4.2.32,4.2.34,4.2.41, 4.2.43,4.2.46]

ID	Requirements	Diagram	Priority
4.5.2.1	System has to add new flight after checking availability of flight.	Based on SD_1	5 out of 5
4.5.2.2	System has to remove flight after checking availability of flight	Based on SD_2	5 out of 5
4.5.2.3	System has to accept the payment requests that comes from customer, if customer has enough money in his/her cars.	Based on SD_4	5 out of 5
4.5.2.4	System has to reject the payment request that comes from customer, if customer doesn't have enough money in his/her card.	Based on SD_4	5 out of 5
4.5.2.5	System must allow customer in order to add card details and pay the price of ticket.	Based on SD_3	5 out of 5

4.5.3 Sequence diagram requirements [4.4.3.2, 4.2.42, 4.2.34, 4.2.5 - 4.2.17]

ID	Requirements	Diagram	Priority
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4.5.3.1	Customer should be able to pay online.	Based_on SD1_1	4 out of 5
4.5.3.2	Administrator should be able to modify the details of existing flights	Based_on SD1_2	4 out of 5
4.5.3.3	Administrator should be able to reject reservation/cancellation request.	Based_on SD1_3	5 out of 5
4.5.3.4	Customer should be able to see the list of available flights based on the information he entered.	Based_on SD1_4	5 out of 5

4.6 System Features (contains functional, non-functional and solution-oriented requirements)

Features of the system are the followings:

1. User Interface
2. Database about flights, reservations, and user details
3. Communication interface with HTTP protocol
4. Searching flights for specific dates
5. Searching flights multiple destinations
6. Manually entering names of destinations (by city, country, continent)
7. Specifying number of passengers while searching (adults, children and infants)
8. Multi - Currency and language
9. Sort flights either by price or duration
10. Show advantages of VIP and Premium Users
11. Request and response for reservation cancellation
12. Online payment
13. Addition of new flights to system
14. Modification of details about existing flights
15. Removing cancelled flights
16. Management of cancellation requests
17. See and change the details of bookings
18. Performance of ATRS
19. Guarantee security of communication channel
20. System attributes
21. AAS for logins
22. Predefined administrator passwords
23. Ability to change passwords
24. Defined requirements for password

25. Warning messages
26. Booking Tickets
27. Reliability of ATRS
28. Customizing administrator passwords
29. Security of communication channel
30. Acceptance messages

4.7 Requirements prioritization

4.7.1 MoSCoW Method

Must	<ol style="list-style-type: none"> 1. User interface 2. Searching specific dates 3. Database about flights, reservations, and user details 4. Request and response for reservation cancellation 5. Online payment 6. Ticket reservation 7. Addition of new flights to system 8. System attributes 9. Modification of details about existing flights 10. Removing cancelled flights 11. Management of cancellation requests 12. See and change the details of bookings 13. Performance of ATRS 14. Communication interface with HTTP protocol 15. AAS for logins 16. Booking Tickets 17. Guarantee security of communication channel
Should	<ol style="list-style-type: none"> 1. Sort flights either by price or duration 2. Request and response for reservation cancellation 3. Guarantee the safety of the channel 4. Ability to change administrator's password 5. Manually entering the names of destinations (by city, country, continent) 6. Defined requirements for password
Could	<ol style="list-style-type: none"> 1. Searching flights for specific dates 2. Searching by multiple destinations

	3. Specifying number of passengers while searching (adults, children and infants)
	4. Multi - Currency and language
	5. Displaying warning messages
	6. Maintain 1000 transactions in second
	7. Customized administrator passwords
	8. Acceptance messages
Won't	1. Login and sign in for customers
	2. Hotel reservation
	3. Airport pick-up

4.7.2 Prioritisation According to Cost

4.7.2.1 Main

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	1.00	7.00	4.00	5.00	6.00	3.00	9.00	5.00	4.00	2.00	4.00	7.00	9.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	8.00	7.00	2.00	7.00	6.00	7.00	8.00	7.00	9.00	6.00	
2	0.14	1.00	7.00	0.25	0.25	0.17	0.14	0.11	0.19	0.19	0.17	0.30	0.50	0.20	0.25	0.20	0.17	0.30	0.30	0.25	0.30	0.30	0.19	0.14	0.14	0.25	0.30	0.30	0.50	0.14	
3	0.25	0.14	1.00	0.25	0.25	0.17	0.14	0.11	0.13	0.11	0.20	0.50	0.30	0.25	0.25	0.25	0.17	0.30	0.50	0.14	0.30	0.30	0.14	0.17	0.19	0.14	0.30	0.30	0.50	0.19	
4	0.30	0.40	4.00	1.00	0.30	0.20	0.25	0.13	0.14	0.13	0.30	0.50	0.50	0.20	0.20	0.30	0.17	0.50	0.30	0.30	0.30	2.00	0.20	0.20	0.11	4.00	3.00	2.00	0.11		
5	0.17	4.00	4.00	3.00	1.50	3.00	5.00	3.00	0.25	0.19	3.00	6.00	5.00	4.00	5.00	6.00	4.00	0.50	8.00	7.00	5.00	5.00	0.19	4.00	5.00	4.00	5.00	5.00	6.00	5.00	
6	0.30	6.00	6.00	5.00	0.30	1.00	4.00	0.30	5.00	0.14	8.00	4.00	3.00	8.00	8.00	7.00	0.50	5.00	6.00	8.00	5.00	0.25	5.00	6.00	8.00	6.00	8.00	5.00	5.00	6.00	
7	0.11	7.00	7.00	4.00	0.30	0.25	1.00	0.17	0.50	0.25	2.00	0.50	2.00	3.00	3.00	3.00	4.00	0.30	5.00	6.00	7.00	3.00	0.25	4.00	5.00	7.00	7.00	3.00	5.00	5.00	
8	0.20	6.00	9.00	8.00	0.30	3.00	6.00	1.00	0.25	0.30	4.00	5.00	5.00	5.00	6.00	6.00	3.00	8.00	9.00	8.00	5.00	0.30	0.30	6.00	8.00	5.00	8.00	5.00	8.00	6.00	
9	0.25	8.00	8.00	7.00	4.00	0.30	2.00	4.00	1.00	3.00	4.00	6.00	5.00	5.00	6.00	6.00	7.00	2.00	9.00	9.00	9.00	3.00	2.00	5.00	6.00	8.00	8.00	3.00	9.00	4.00	
10	0.50	8.00	8.00	8.00	8.00	7.00	4.00	3.00	0.30	1.00	4.00	6.00	6.00	7.00	7.00	7.00	6.00	3.00	8.00	8.00	9.00	8.00	4.00	3.00	7.00	8.00	8.00	4.00	8.00	8.00	
11	0.25	4.00	5.00	3.00	0.30	0.14	0.30	0.35	0.35	0.25	1.00	3.00	0.30	0.30	0.60	0.30	0.30	0.35	4.00	5.00	5.00	4.00	0.17	0.30	0.17	6.00	5.00	4.00	4.00	0.17	
12	0.14	3.00	5.00	2.00	0.17	0.25	0.20	0.30	0.17	0.17	0.30	1.00	3.00	3.00	3.00	4.00	3.00	1.00	4.00	4.00	3.00	2.00	7.00	8.00	6.00	4.00	3.00	4.00	7.00	6.00	
13	0.11	2.00	3.00	2.00	0.30	0.30	0.50	0.30	0.20	0.17	3.00	0.30	1.00	0.35	0.30	0.30	0.30	0.35	5.00	6.00	4.00	3.00	0.17	7.00	6.00	2.00	6.00	3.00	5.00	6.00	
14	0.10	4.00	5.00	0.25	0.30	0.30	0.30	0.30	0.30	0.14	2.00	0.30	4.00	1.00	0.30	0.30	0.30	0.30	5.00	7.00	5.00	2.00	0.30	6.00	0.30	5.00	5.00	2.00	5.00	0.30	
15	0.11	4.00	4.00	5.00	0.30	0.13	0.30	0.17	0.17	0.14	2.00	0.30	3.00	5.00	1.00	0.30	0.25	3.00	4.00	4.00	0.30	0.17	0.14	0.14	0.30	4.00	4.00	6.00	5.00	0.30	
16	0.17	5.00	4.00	5.00	0.17	0.13	0.30	0.17	0.17	0.14	2.00	0.25	3.00	3.00	3.00	3.00	1.00	3.00	3.00	4.00	0.30	0.17	0.14	0.14	0.30	5.00	4.00	0.17	4.00	0.30	
17	0.14	6.00	6.00	4.00	0.17	0.14	0.25	0.17	0.14	0.17	3.00	0.30	3.00	3.00	4.00	0.30	1.00	4.00	4.00	0.50	4.00	0.30	0.14	0.30	0.25	6.00	4.00	3.00	6.00	0.25	
18	0.10	3.00	3.00	2.00	3.00	2.00	3.00	0.30	0.50	0.30	4.00	0.50	4.00	0.50	4.00	0.30	0.30	0.17	1.00	0.30	0.30	0.14	0.14	0.11	0.14	0.30	0.30	0.14	0.30	0.14	
19	0.11	2.00	2.00	0.30	0.17	0.20	0.20	0.11	0.11	0.13	0.25	0.14	0.20	0.20	0.25	0.25	0.17	3.00	1.00	0.50	0.50	0.17	0.25	0.17	0.30	2.00	0.50	0.17	1.00	0.30	
20	0.20	4.00	7.00	6.00	0.14	0.17	0.17	0.11	0.11	0.11	0.20	0.10	0.17	0.14	6.00	5.00	2.00	5.00	2.00	1.00	2.00	0.30	0.17	0.14	0.25	4.00	3.00	0.30	2.00	0.25	
21	0.10	3.00	3.00	0.30	0.20	0.13	0.14	0.13	0.11	0.13	0.20	0.17	0.20	0.25	0.25	0.30	2.00	0.20	0.50	1.00	0.25	0.25	0.25	0.30	3.00	1.00	0.25	2.00	0.30		
22	0.14	3.00	3.00	0.50	0.20	0.20	0.30	0.20	0.30	0.25	0.25	0.30	0.50	0.30	6.00	6.00	3.00	7.00	6.00	3.00	4.00	1.00	2.00	0.50	0.25	6.00	7.00	1.00	6.00	0.25	
23	0.50	6.00	7.00	6.00	8.00	4.00	4.00	3.00	0.50	0.30	6.00	5.00	7.00	7.00	2.00	7.00	4.00	6.00	4.00	0.50	1.00	0.25	0.25	0.30	8.00	4.00	3.00	4.00	0.30		
24	0.14	7.00	6.00	6.00	0.25	0.20	0.25	3.00	0.20	0.14	5.00	3.00	0.14	0.17	7.00	7.00	5.00	9.00	8.00	7.00	4.00	2.00	4.00	1.00	0.50	7.00	4.00	2.00	6.00	0.50	
25	0.17	6.00	8.00	9.00	0.50	0.17	0.20	0.17	0.13	0.13	6.00	0.17	0.17	0.17	5.00	5.00	5.00	4.00	7.00	3.00	5.00	3.00	4.00	3.00	2.00	1.00	6.00	3.00	4.00	3.00	
26	0.14	4.00	7.00	0.25	0.25	0.17	0.14	0.11	0.19	0.19	0.17	0.30	0.50	0.20	0.25	0.20	0.17	0.30	0.50	0.25	0.30	0.30	0.19	0.14	0.14	1.00	3.00	0.17	0.14	0.17	
27	0.10	3.00	3.00	2.00	3.00	2.00	3.00	0.50	0.30	0.30	4.00	0.50	4.00	0.50	4.00	0.30	0.30	0.17	1.00	0.30	0.30	0.14	0.14	0.11	0.14	0.30	1.00	0.14	0.30	0.17	
28	0.14	3.00	3.00	0.30	0.30	0.20	0.30	0.20	0.30	0.25	0.25	0.30	0.50	0.40	3.00	6.00	3.00	4.00	1.00	2.00	0.50	0.50	0.17	0.25	0.17	0.30	7.00	1.00	7.00	0.30	
29	0.11	3.00	3.00	0.30	0.17	0.20	0.20	0.11	0.11	0.13	0.25	0.14	0.30	0.30	0.25	0.25	0.17	3.00	1.00	0.50	0.50	0.17	0.25	0.17	0.30	7.00	3.00	0.14	1.00	0.19	
30	0.17	6.00	8.00	9.00	0.50	0.17	0.20	0.17	0.13	0.13	6.00	0.17	0.17	0.17	5.00	5.00	5.00	4.00	7.00	3.00	5.00	3.00	4.00	3.00	2.00	1.00	6.00	6.00	3.00	8.00	1.00
	5.72	121.14	126.00	96.07	40.14	41.14	44.08	25.24	15.01	9.94	64.90	45.97	66.84	67.61	67.57	80.32	66.30	75.03	113.30	101.69	119.50	56.73	20.89	55.95	58.54	120.39	100.50	56.73	113.30	58.54	

4.7.2.2 Normalized

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	0.17	0.06	0.00	0.05	0.12	0.07	0.20	0.20	0.27	0.20	0.06	0.15	0.13	0.12	0.10	0.07	0.10	0.11	0.08	0.05	0.07	0.12	0.10	0.13	0.10	0.06	0.07	0.12	0.08
2	0.02	0.01	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00
3	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
4	0.03	0.03	0.03	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.03	0.04	0.01	0.00	0.00	0.03	0.03	0.04	0.03
5	0.03	0.03	0.03	0.03	0.02	0.07	0.11	0.12	0.02	0.01	0.05	0.13	0.07	0.07	0.06	0.06	0.07	0.09	0.00	0.05	0.07	0.04	0.09	0.01	0.07	0.09	0.03	0.05	0.09
6	0.06	0.05	0.05	0.05	0.01	0.02	0.09	0.01	0.20	0.01	0.12	0.09	0.07	0.04	0.09	0.10	0.10	0.01	0.04	0.06	0.07	0.09	0.01	0.09	0.10	0.05	0.07	0.09	0.04
7	0.02	0.06	0.06	0.04	0.00	0.01	0.02	0.01	0.03	0.03	0.01	0.03	0.04	0.03	0.04	0.06	0.00	0.04	0.06	0.06	0.05	0.01	0.07	0.09	0.06	0.06	0.05	0.04	0.09
8	0.03	0.07	0.07	0.08	0.01	0.07	0.14	0.04	0.02	0.03	0.06	0.11	0.07	0.07	0.07	0.07	0.09	0.04	0.07	0.09	0.02	0.01	0.10	0.07	0.07	0.09	0.07	0.09	0.07
9	0.04	0.07	0.06	0.07	0.08	0.00	0.05	0.16	0.07	0.30	0.06	0.15	0.07	0.07	0.07	0.07	0.10	0.03	0.08	0.09	0.08	0.05	0.10	0.09	0.10	0.07	0.08	0.05	0.08
10	0.09	0.07	0.07	0.08	0.16	0.17	0.09	0.12	0.02	0.10	0.05	0.19	0.09	0.10	0.08	0.09	0.09	0.04	0.07	0.09	0.07	0.07	0.14	0.15	0.14	0.07	0.07	0.07	0.14
11	0.02	0.04	0.03	0.03	0.00	0.01	0.02	0.01	0.03	0.03	0.01	0.03	0.04	0.03	0.04	0.06	0.00	0.04	0.06	0.06	0.05	0.01	0.07	0.09	0.06	0.06	0.05	0.04	0.09
12	0.02	0.02	0.02	0.02	0.00	0.01	0.05	0.01	0.01	0.02	0.01	0.02	0.04	0.04	0.03	0.05	0.04	0.03	0.06	0.08	0.05	0.07	0.02	0.09	0.10	0.02	0.05	0.07	0.06
13	0.02	0.02	0.02	0.02	0.02	0.00	0.36	0.01	0.01	0.01	0.02	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.04	0.04	0.06	0.05	0.05	0.01	0.13	0.10	0.02	0.05	0.04
14	0.02	0.04	0.03	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.04	0.07	0.04	0.04	0.01	0.11	0.04	0.04	0.05	0.04	0.04
15	0.02	0.04	0.03	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.04	0.07	0.04	0.04	0.01	0.11	0.04	0.04	0.05	0.04	0.04
16	0.01	0.04	0.01	0.05	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.00	0.03	0.00	0.01	0.00	0.04	0.04	0.04
17	0.02	0.05	0.05	0.06	0.00	0.00	0.01	0.01	0.01	0.02	0.05	0.01	0.04	0.04	0.05	0.00	0.01	0.08	0.05	0.00	0.12	0.01	0.02	0.00	0.00	0.05	0.04	0.01	0.04
18	0.02	0.02	0.02	0.02	0.06	0.05	0.07	0.03	0.03	0.06	0.01	0.06	0.07	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
19	0.02	0.02	0.02	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.04	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.03	0.03	0.06	0.05	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.06	0.03	0.07	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.03	0.02	0.01	0.02
21	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.02	0.01	0.01	0.00	0.02
22	0.02	0.02	0.02	0.01	0.00	0.00	0.01	0.01	0.02	0.03	0.00	0.01	0.00	0.01	0.07	0.07	0.04	0.09	0.05	0.03	0.03	0.02	0.10	0.01	0.00	0.02	0.04	0.01	0.04
23	0.02	0.02	0.02	0.05	0.01	0.00	0.01	0.01	0.02	0.03	0.10	0.02	0.12	0.03	0.09	0.07	0.04	0.09	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
24	0.02	0.06	0.05	0.05	0.01	0.00	0.01	0.12	0.01	0.01	0.08	0.00	0.00	0.00	0.00	0.09	0.07	0.12	0.05	0.07	0.03	0.04	0.19	0.02	0.01	0.06	0.04	0.04	0.05
25	0.03	0.05	0.06	0.09	0.31	0.00	0.00	0.01	0.01	0.01	0.09	0.00	0.00	0.07	0.06	0.06	0.06	0.09	0.03	0.05	0.03	0.07	0.14	0.04	0.02	0.05	0.03	0.07	0.04

Sum	Cost	Percent
2.88	0.10	9.58
0.11	0.00	0.36
0.11	0.00	0.37
0.31	0.01	1.02
1.59	0.05	5.30
1.92	0.06	6.42
1.03	0.03	3.44
1.74	0.06	5.79
2.16	0.07	7.19
2.30	0.08	7.67
0.59	0.02	1.98
1.14	0.04	3.80
1.21	0.04	4.05
0.66	0.02	2.19
0.46	0.02	1.52
0.50	0.02	1.68
0.69	0.02	2.30
0.48	0.02	1.61
0.18	0.01	0.58
0.40	0.01	1.34
0.21	0.01	0.71
0.75	0.02	2.50
1.33	0.04	4.44
1.20	0.04	4.01
1.04	0.03	3.46

4.7.3 Prioritisation According to Value

4.7.3.1 Main

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	1.00	5.00	0.25	0.17	0.30	0.17	0.17	0.20	0.11	0.13	0.25	2.00	0.14	0.14	0.14	0.25	0.14	4.00	3.00	0.30	3.00	0.13	0.13	0.11	0.11	2.00	4.00	0.11	3.00	0.11
2	0.25	1.00	0.25	0.17	0.30	0.17	0.17	0.20	0.11	0.13	0.25	2.00	0.14	0.14	0.14	0.25	0.14	4.00	3.00	0.30	3.00	0.13	0.13	0.11	0.11	2.00	4.00	0.11	3.00	0.11
3	4.00	4.00	1.00	0.30	0.30	0.30	0.17	0.20	0.17	0.25	0.25	0.14	0.17	0.14	0.14	0.17	0.25	0.25	0.33	0.33	0.33	2.00	0.14	0.13	0.17	0.14	0.25	0.13	0.33	0.17
4	6.00	6.00	5.00	1.00	2.00	3.00	3.00	3.00	3.00	3.00	5.00	5.00	6.00	3.00	4.00	3.00	0.33	0.14	0.11	0.13	0.11	2.00	4.00	5.00	0.14	5.00	0.14	5.00	0.11	0.14
5	5.00	5.00	5.00	0.50	1.00	0.50	0.33	0.33	0.33	4.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	7.00	8.00	7.00	8.00	6.00	4.00	5.00	0.30	9.00	7.00	5.00	8.00	0.30
6	6.00	6.00	5.00	0.33	2.00	1.00	0.33	0.33	0.33	3.00	4.00	8.00	6.00	4.00	4.00	4.00	4.00	7.00	8.00	7.00	8.00	6.00	5.00	6.00	0.30	8.00	7.00	6.00	8.00	0.30
7	6.00	6.00	6.00	0.33	3.00	3.00	1.00	3.00	3.00	4.00	2.00	8.00	6.00	4.00	4.00	4.00	4.00	7.00	8.00	7.00	8.00	6.00	5.00	6.00	0.30	8.00	7.00	6.00	8.00	0.30
8	5.00	5.00	5.00	0.33	3.00	3.00	0.33	1.00	0.25	3.00	5.00	8.00	5.00	3.00	3.00	3.00	5.00	8.00	7.00	6.00	7.00	4.00	4.00	0.17	8.00	6.00	4.00	7.00	0.17	
9	6.00	9.00	6.00	0.33	3.00	3.00	0.33	4.00	1.00	4.00	5.00	8.00	4.00	4.00	4.00	5.00	6.00	6.00	7.00	6.00	7.00	6.00	5.00	5.00	0.17	9.00	6.00	1.00	7.00	0.17
10	8.00	8.00	4.00	0.33	0.25	0.33	0.25	0.33	0.25	1.00	6.00	6.00	8.00	7.00	7.00	7.00	6.00	8.00	9.00	8.00	9.00	6.00	0.25	0.17	6.00	8.00	0.25	9.00	0.17	
11	4.00	4.00	4.00	0.33	0.25	0.33	0.25	0.33	0.25	0.17	1.00	6.00	5.00	0.25	0.25	0.25	4.00	5.00	6.00	5.00	6.00	4.00	3.00	2.00	0.13	6.00	5.00	2.00	6.00	0.13
12	6.00	9.00	7.00	0.25	0.11	0.13	0.13	0.13	0.25	0.33	0.17	1.00	6.00	0.14	0.13	0.14	0.11	0.17	0.17	0.14	0.17	0.13	0.13	0.13	1.00	0.17	0.33	0.17	0.13	
13	7.00	7.00	6.00	0.17	0.30	0.17	0.17	0.20	0.25	0.13	0.20	5.00	1.00	0.14	0.14	0.14	0.11	0.17	0.25	0.30	0.25	0.17	0.17	2.00	0.14	5.00	0.17	2.00	0.25	0.14
14	7.00	7.00	6.00	0.33	0.25	0.33	0.25	0.33	0.25	0.14	4.00	7.00	7.00	1.00	4.00	4.00	0.50	6.00	4.00	5.00	6.00	0.17	0.33	0.33	0.14	7.00	6.00	0.33	6.00	0.14
15	7.00	7.00	7.00	0.25	0.25	0.33	0.25	0.33	0.25	0.14	4.00	6.00	7.00	0.25	1.00	0.50	0.50	8.00	8.00	7.00	8.00	0.33	5.00	7.00	0.25	8.00	6.00	7.00	8.00	0.25
16	4.00	4.00	7.00	0.33	0.25	0.33	0.25	0.33	0.25	0.14	4.00	7.00	7.00	0.25	2.00	1.00	3.00	7.00	8.00	6.00	6.00	4.00	4.00	4.00	4.00	7.00	7.00	4.00	8.00	4.00
17	7.00	7.00	4.00	3.00	0.25	0.33	0.25	0.33	0.25	0.17	0.25	9.00	8.00	2.00	0.33	1.00	7.00	6.00	5.00	5.00	0.25	0.25	3.00	0.33	5.00	7.00	3.00	6.00	0.33	
18	0.25	0.25	4.00	7.00	0.14	0.13	0.14	0.17	0.17	0.13	0.20	6.00	6.00	0.17	0.17	0.14	0.14	1.00	0.25	6.00	0.20	0.20	0.14	6.00	0.20	0.20	0.30	0.20	5.00	0.14
19	0.33	0.33	3.00	8.00	0.13	0.11	0.13	0.14	0.14	0.11	0.17	6.00	4.00	0.17	0.13	0.13	0.17	0.20	1.00	0.33	2.00	0.14	0.20	0.33	0.13	6.00	0.20	0.33	2.00	0.13
20	5.00	5.00	3.00	8.00	0.14	0.13	0.14	0.17	0.17	0.13	0.20	7.00	6.00	0.20	0.14	0.17	0.20	4.00	3.00	1.00	0.30	0.17	0.14	0.14	0.11	7.00	4.00	0.14	3.00	0.11
21	0.33	0.33	3.00	8.00	0.13	0.11	0.13	0.14	0.14	0.11	0.17	6.00	4.00	0.17	0.13	0.13	0.20	0.20	0.50	2.00	1.00	0.13	0.20	0.17	0.11	6.00	0.20	0.17	0.50	0.11
22	8.00	8.00	6.00	0.33	0.17	0.14	0.17	0.17	0.14	0.14	0.17	6.00	6.00	6.00	3.00	0.25	4.00	5.00	7.00	6.00	8.00	1.00	3.00	2.00	0.33	6.00	5.00	3.00	7.00	0.33
23	8.00	8.00	7.00	0.25	0.25	0.30	0.30	0.25	0.30	0.17	0.33	8.00	6.00	3.00	0.20	0.25	5.00	5.00	3.00	7.00	5.00	0.33	1.00	0.25	0.30	8.00	5.00	0.25	3.00	0.30
24	9.00	9.00	8.00	0.30	0.30	0.25	0.17	0.25	0.20	4.00	5.00	3.00	0.50	0.30	0.14	0.25	0.33	5.00	3.00	7.00	6.00	0.33	4.00	1.00	0.30	3.00	5.00	2.00	3.00	0.30
25	9.00	9.00	6.00	7.00	5.00	5.00	5.00	6.00	6.00	6.00	8.00	7.00	7.00	4.00	0.25	3.00	7.00	8.00	9.00	9.00	3.00	5.00	3.00	1.00	8.00	7.00	3.00	8.00	2.00	
26	0.50	0.50	7.00	0.30	0.11	0.13	0.13	0.13	0.20	0.33	0.17	0.50	0.30	0.14	0.13	0.14	0.11	0.17	0.17	0.14	0.17	0.13	0.13	0.33	0.13	1.00	2.00	4.00	0.17	0.13
27	0.25	0.25	4.00	7.00	0.14	0.13	0.14	0.17	0.17	0.13	0.20	6.00	6.00	0.17	0.17	0.14	0.14	0.30	6.00	0.25	5.00	0.20	0.20	0.33	0.14	0.50	1.00	0.25	5.00	0.14
28	9.00	9.00	8.00	0.30	0.30	0.25	0.17	0.25	0.20	4.00	5.00	3.00	0.50	0.30	0.14	0.25	0.33	5.00	3.00	7.00	6.00	0.33	4.00	0.50	0.33	0.25	4.00	1.00	0.25	6.00
29	0.33	0.33	3.00	9.00	0.13	0.11	0.13	0.14	0.14	0.11	0.17	6.00	4.00	0.17	0.13	0.13	0.17	0.20	1.00	0.33	2.00	0.14	0.20	0.33	0.13	6.00	0.20	4.00	1.00	0.25
30	9.00	9.00	6.00	7.00	5.00	5.00	5.00	6.00	6.00	6.00	8.00	7.00	7.00	4.00	0.25	3.00	7.00	8.00	9.00	9.00	3.00	5.00	3.00	1.00	8.00	7.00	0.17	4.00	1.00	
	129.62	131.42	119.52	49.17	22.95	20.17	13.78	21.66	17.36	34.50	54.18	102.14	115.15	92.16	49.85	36.60	62.13	109.13	119.36	103.78	124.36	97.60	60.09	56.96	8.11	150.14	110.13	97.96	195.96	10.14

	125.62	131.42	118.50	49.13	22.85	22.17	13.78	21.59	17.36	34.50	54.18	152.14	115.15	52.16	46.85	36.60	52.13	109.13	119.36	103.78	124.36	57.59	60.09	66.36	5.11	152.14	110.13	57.36	120.36	10.11
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4.7.3.2 Normalised

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	0.01	0.04	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.04	0.03	0.00	0.02	0.00	0.00	0.00	0.01
2	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.04	0.03	0.00	0.02	0.00	0.00	0.00	0.01
3	0.03	0.03	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.02
4	0.05	0.05	0.04	0.02	0.00	0.14	0.23	0.14	0.17	0.00	0.00	0.03	0.05	0.06	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.03	0.07	0.05	0.02
5	0.04	0.04	0.04	0.01	0.04	0.02	0.02	0.02	0.02	0.12	0.06	0.06	0.04	0.08	0.00	0.11	0.08	0.06	0.07	0.07	0.06	0.10	0.07	0.09	0.02
6	0.05	0.05	0.04	0.01	0.00	0.05	0.02	0.02	0.02	0.09	0.07	0.05	0.05	0.05	0.06	0.08	0.10	0.07	0.08	0.08	0.07	0.12	0.08	0.07	0.02
7	0.05	0.05	0.05	0.01	0.13	0.14	0.07	0.14	0.17	0.12	0.04	0.05	0.05	0.08	0.00	0.11	0.08	0.06	0.07	0.07	0.06	0.10	0.08	0.11	0.02
8	0.04	0.04	0.04	0.01	0.13	0.14	0.02	0.05	0.01	0.00	0.00	0.05	0.04	0.06	0.06	0.08	0.10	0.05	0.06	0.06	0.06	0.12	0.07	0.07	0.02
9	0.07	0.07	0.05	0.01	0.13	0.14	0.02	0.19	0.06	0.12	0.09	0.06	0.03	0.08	0.00	0.11	0.10	0.05	0.05	0.06	0.06	0.10	0.08	0.09	0.02
10	0.08	0.08	0.03	0.01	0.01	0.02	0.02	0.02	0.01	0.03	0.11	0.04	0.07	0.13	0.15	0.19	0.12	0.07	0.08	0.08	0.07	0.12	0.10	0.00	0.02
11	0.03	0.03	0.03	0.00	0.01	0.01	0.02	0.01	0.01	0.00	0.02	0.04	0.04	0.00	0.01	0.01	0.08	0.05	0.05	0.05	0.05	0.07	0.05	0.04	0.01
12	0.00	0.00	0.06	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
13	0.06	0.05	0.05	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02
14	0.00	0.05	0.05	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.00	0.07	0.05	0.05	0.02	0.09	0.11	0.01	0.05	0.05	0.05	0.05	0.00	0.01	0.01
15	0.00	0.05	0.06	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.00	0.07	0.05	0.06	0.00	0.02	0.01	0.01	0.05	0.07	0.07	0.06	0.01	0.08	0.12
16	0.03	0.03	0.06	0.01	0.01	0.02	0.02	0.02	0.01	0.00	0.07	0.05	0.06	0.00	0.04	0.03	0.06	0.06	0.07	0.06	0.06	0.07	0.07	0.07	0.44
17	0.00	0.05	0.03	0.00	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.06	0.08	0.04	0.04	0.01	0.02	0.06	0.05	0.05	0.04	0.00	0.00	0.05	0.04
18	0.00	0.00	0.03	0.14	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.04	0.00	0.00	0.00	0.02
19	0.00	0.00	0.03	0.18	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.01	0.01
20	0.04	0.04	0.03	0.16	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.05	0.04	0.00	0.00	0.00	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.01
21	0.00	0.00	0.03	0.18	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.01
22	0.06	0.06	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.05	0.05	0.06	0.00	0.01	0.08	0.05	0.06	0.06	0.06	0.02	0.05	0.05	0.04
23	0.08	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.05	0.05	0.06	0.00	0.01	0.10	0.05	0.03	0.07	0.04	0.01	0.02	0.00	0.02
24	0.07	0.07	0.07	0.00	0.01	0.01	0.01	0.01	0.01	0.12	0.01	0.02	0.00	0.06	0.00	0.01	0.01	0.05	0.03	0.07	0.05	0.01	0.07	0.02	0.04
25	0.07	0.07	0.05	0.14	0.22	0.23	0.36	0.28	0.35	0.17	0.15	0.05	0.06	0.13	0.09	0.01	0.06	0.07	0.09	0.07	0.05	0.08	0.05	0.11	

4.7.3.3 Percent

SUM	Value	Percent
0.33	0.01	1.09
0.29	0.01	0.97
0.25	0.01	0.82
1.75	0.06	5.84
1.72	0.06	5.73
1.78	0.06	5.95
2.29	0.08	7.65
1.81	0.06	6.03
2.20	0.07	7.33
1.83	0.06	6.09
0.91	0.03	3.05
0.20	0.01	0.66
0.43	0.01	1.42
1.05	0.04	3.50
1.30	0.04	4.34
2.06	0.07	6.87
1.08	0.04	3.59
0.57	0.02	1.89
0.47	0.02	1.58
0.63	0.02	2.11
0.45	0.02	1.52
1.23	0.04	4.09
0.90	0.03	3.00
0.96	0.03	3.20
3.51	0.12	11.69
0.28	0.01	0.92
0.52	0.02	1.73
1.45	0.05	4.82
0.54	0.02	1.79
3.27	0.11	10.90

4.7.4 Plot ROI Graph

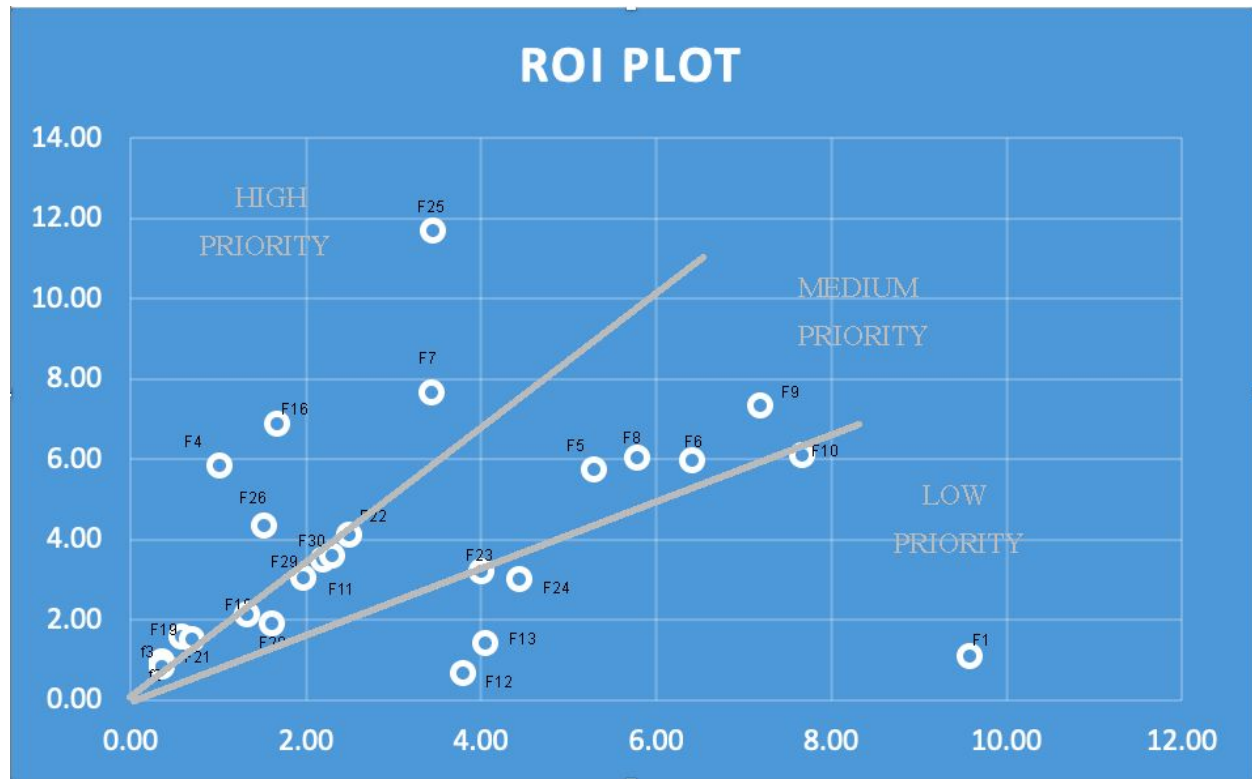


Figure 11. ROI Plot Graph

4.7.5 Hierarchical Prioritization

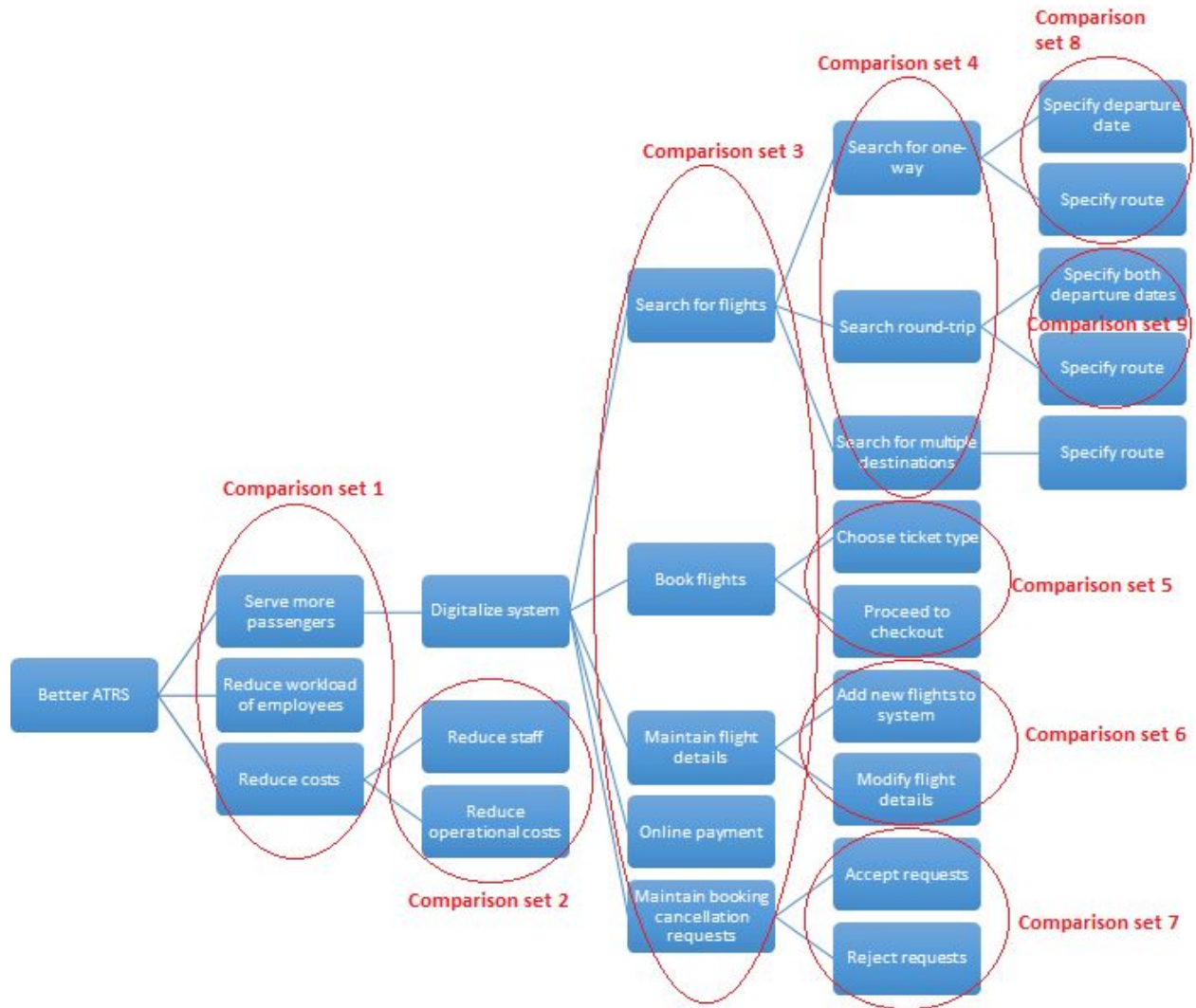


Figure 13. Hierarchical prioritization of requirements

4.8 Requirements Traceability

4.8.1 Traceability Matrix

Scenarios are defined as follows:

Scenario 1 – Customer wants to search for flights.

Scenario 2 – Customer wants search for flights of specific dates.

Scenario 3 – Customer wants to search for flights of specific routes.

Scenario 4 – Customer wants to see flight prices of different ticket types.

Scenario 5 – Customer wants to see what is included in different ticket types.

Scenario 6 – Customer wants to sort available flights according to price.

Scenario 7 – Customer wants to sort available flights according to duration.

Scenario 8 – Customer wants to proceed to payment for booked flight.

Scenario 9 – Customer wants to cancel his/her booked ticket.

Scenario 10 – Administrator wants to add a new flight to the system.

Scenario 11 – Administrator wants to modify the details about existing flights.

Scenario 12 – Administrator wants to remove cancelled flights.

Scenario 13 – Administrator wants to respond to cancellation requests of customers.

Scenario 14 – Customer wants to be sure about security of payment.

Scenario 15 – Customer wants to enter information to the labels.

Scenario 16 – Customer enters non-standard information while filling labels.

Scenario 17 – Administrator wants to log on the system.

Scenario 18 – Administrator types wrong password during log in.

Scenario 19 – Administrator wants to change his/her predefined password.

Scenario 20 – Administrator defines new password out of defined standards.

Scenario 21 – Customers cannot reach website.

Scenario 22 – Customer wants to change the currency and language.

Scenario 23 – Support staff wants to ensure the security of the system.

Scenario 24 – Support staff wants to ensure the safety of the system.

Scenario 25 – Support staff wants to maintain performance of the system.

Scenario 26 – Support staff wants to ensure the reliability of the system.

Traceability matrix according to these scenarios and previous mentioned features (contains functional, nonfunctional and solution-oriented requirements) is constructed as follows:

Requirements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Senarios																										based_on				
Senario 1	based_on	based_on		generalises	generalises	generalises																				based_on				
Senario 2	based_on	based_on		formalises																						based_on				
Senario 3	based_on				formalises	formalises																				based_on				
Senario 4		based_on																								based_on				
Senario 5										based_on																based_on				
Senario 6									satisfies																	based_on				
Senario 7									satisfies																	based_on				
Senario 8											based_on															based_on				
Senario 9											satisfies															based_on				
Senario 10												satisfies																		
Senario 11		based_on											satisfies																	
Senario 12		based_on												satisfies															satisfies	
Senario 13										satisfies					derives	derives														
Senario 14			formalises																satisfies											
Senario 15				satisfies	satisfies	satisfies	satisfies																			contradicts				contradicts
Senario 16																									generalises			generalised		generalises
Senario 17																														
Senario 18																				based_on	based_on							contradicts		
Senario 19																									satisfies			based_on		satisfies
Senario 20																								formalises	based_on	satisfies				satisfies
Senario 21																									conflicts					
Senario 22								satisfies																						
Senario 23																													based_on	
Senario 24																													based_on	
Senario 25																														
Senario 26																											satisfies			

Figure 14. Traceability matrix

4.8.2 Traceability Model

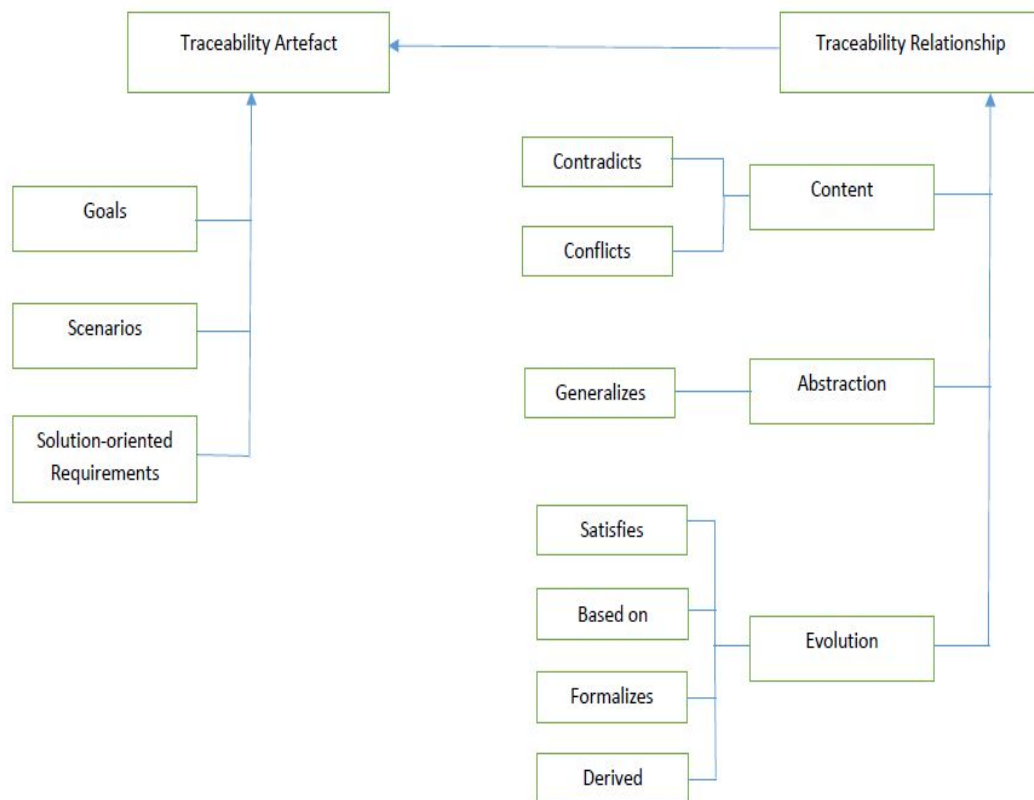


Figure 15. Traceability model

In the given model following subtypes are defined under the traceability types of Content, Abstraction and Evolution:

Content

- *Contradicts* - inconsistency in the requirements artefacts
- *Conflicts* - realisation of requirement A may hinder (but does not necessarily exclude) the realisation of requirement B

Abstraction

- *Generalizes* - artefact is a generalisation of (one or) several other artefacts

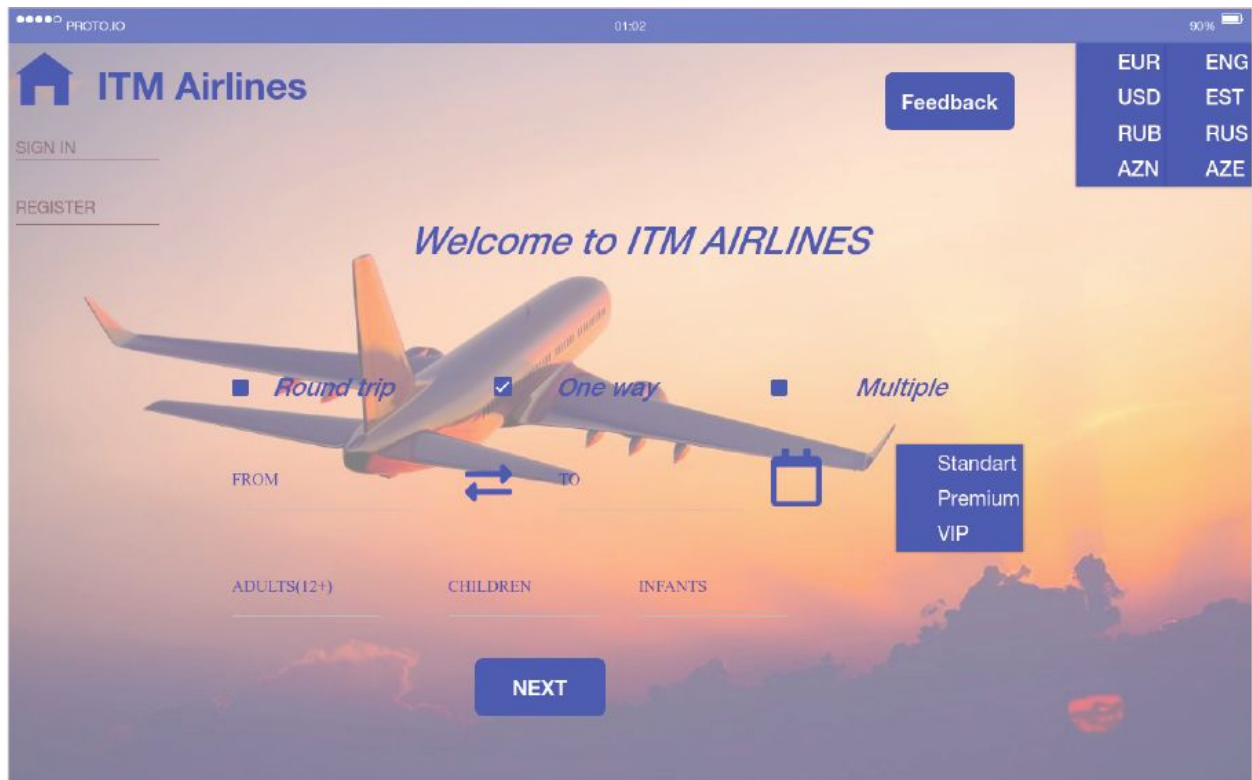
Evolution

- *Satisfies* - if artefact A is realised in the system, artefact B is realised as well
- *Based on* - artefact A has influenced the definition of artefact B
- *Formalizes* - artefact A is a formal documentation of artefact B
- *Derived* - artefact A was derived based on a set of other artefact

5. Prototype

Description: Visualisation of website.

We try to visualize website of ITM Airlines and while customers using this website, they can take several advantage of it. On the other hand, it is narrow version of website in order to make it much more clear and understandable. In the first stage, customers will enter to home page of website. Then, they can choose type of the ticket, number of adults/children/infants, sort tickets either by duration or by price, and in this prototype, customers can only search tickets for one way trip. Moreover, we were add sign in and register buttons for administrators in order to register/enter the system itself. Finally, there are several buttons such as feedback, currency and language buttons that allow customer in order to give their feedbacks about website, change currency and language.



TLL - GYD

19.12.2018

	DEPARTURE	ARRIVAL	FLIGHT	DURATION	PRICE
1.	02:45 TLL	GYD 05:45	SU 2149 Airbus A3	4 h	215 eur
2.	10:50 TLL	SVO 13:45	SU 2156 Sukhoi A1	8 h	200 eur
	14:50 SVO	GYD 18:00	SU 2157 Sukhoi A2		

SORT BY

- ☒ PRICE
- ☐ DURATION

Select

Select

NEXT

	Standard	Premium	VIP
Price	215 €	350 €	540 €
Baggage	1 pc	2 pc	3 pc
Refundable	NO	Yes (Penalty Charge)	Yes (Free)

Book

Book

Book

Appendix A: Glossary

<i>IEEE</i>	The Institute of Electrical and Electronics Engineers
<i>HTTP</i>	Hypertext Transfer Protocol
<i>ATRS</i>	Airline Ticket Reservation System
<i>Authentication</i>	The process of identifying an individual, usually based on username and password
<i>Authorization</i>	The process of granting defined privileges to successfully authenticated individuals
<i>AAS</i>	Authentication and Authorization System
<i>Database</i>	An organized collection of data, stored and accessed Electronically.
<i>Standby database</i>	Database replica created from a backup of a primary database
<i>Server</i>	Computer program that provides functionality to other programs such as clients
<i>World Wide Web</i>	Combination of all resources and users on the Internet that are using HTTP.
<i>Web-browser</i>	Software application to access information on World Wide Web
<i>Client</i>	Computer application, such as web-browser, that runs on a computer and connects to server as necessary
<i>Service Level Agreement(SLA)</i>	States agreed level of availability
<i>VIP</i>	Very Important Person
<i>Adult</i>	12+ years old individuals
<i>Children</i>	0-12 years old individuals
<i>Infant</i>	To 2 years