Politecnico di Milano

Software Engineering 2

Requirements Analysis and Specifications Document

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Contents

Chapter 1

INTRODUCTION

1.1 Purpose

TODO

1.2 Scope

TODO

1.2.1 Goals

Visitor should be able to:

[**G1**] sign up into the system;

User should be able to:

[**G2**] log into the system;

[**G3**] create event specifying location, date, starting and ending time;

[**G4**] obtain the best path according to his preferences and the list of eventual alternative paths to reach a location;

[**G5**] change the selected path with an alternative path;

[**G6**] obtain a daily schedule that allows to attend to every event in program;

[**G7**] apply constraints on travel means;

- [**G7.1**] related to the length of travel;
- [**G7.2**] related to the period of day;

[**G8**] deactivate one or more travel means;

[**G9**] select combinations of transportation means that minimize carbon footprint;

[**G10**] reserve time for lunch or break events;

[**G11**] arrange trips;

- [**G11.1**] buy needed tickets;
- [**G11.2**] find available sharing vehicle.

1.2.2 Domain properties

[**D1**] username must be unique;

[**D2**] every event is related to a location;

[**D3**] events must happen in an existing place;

[**D4**] events cannot be in the past;

[**D5**] starting time is always specified;

[**D6**] ending time is not mandatory;

[**D7**] a person can travel only on one travel mean at once;

[**D8**] allowed travel means are cars, trains, metro, on foot, trams, bicycles, taxis, car sharing, bike sharing;

[**D9**] every travel is programmed with a combination of one or more travel means;

[**D10**] a person can be only in one place at once;

[**D11**] all travel means are related to information about average carbon footprints;

[**D12**] flexible timeslots can have a daily or periodical validity;

[**D13**] every flexible timeslot has a minimum amount of time that must be reserved;

[**D14**] to use a public transport a ticket is required;

[**D15**] a ticket may have a daily validity or a different periodicity;

[**D16**] user can own day/week/season passes;

[**D17**] to use a sharing vehicle a payment is required;

[**D18**] a sharing vehicle must be parked in an allowed position.

1.3 Definitions, Acronyms, Abbreviations

TODO

1.3.1 Acronyms

- RASD: Requirement Analysis and Specification Document;
- API: Application Programming Interface.

1.3.2 Abbreviations

- Gn: n-goal.
- Dn: n-domain assumption.
- Rn: n-functional requirement.

1.4 Revision history

TODO

1.5 Reference Documents

- Specification Document: "Mandatory Project Assignments.pdf".

1.6 Document Structure

TODO

Chapter 2

OVERALL DESCRIPTION

2.1 Product perspective

TODO

2.2 Product functions

TODO

2.2.1 Requirements

Visitor should be able to:

G1] sign up into the system:

[**D1**] username must be unique;

[**R1**] the system checks if the email inserted is real;

[**R2**] user cannot sign up with the same mail twice.

User should be able to:

[**G2**] log into the system:

[**D1**] username must be unique;

[**R3**] mail and password inserted must be correct;

[**R4**] incorrect credentials prevent the user to log in.

[**G3**] create events specifying location, date, starting and ending time:

[**D2**] every event is related to a location;

[**D3**] events must happen in an existing place;

[**D4**] events cannot be in the past;

[**D5**] starting time is always specified;

[**D6**] ending time is not mandatory;

[**R5**] user must specify all mandatory fields to add the new event;

[**R6**] the system reserves the specified time for the event;

[**R7**] the system warns the user if the inserted event overlaps with an existing one;

[**R8**] if ending time is not specified, the systems considers as ending time the hour of departure for the next event;

[**R9**] when an event is inserted after an event without a specified ending time, its ending time is anticipated as stated in [[R8]].

[**G4**] obtain the best path according to his preferences and the list of eventual alternative paths to reach a location:

[**D7**] a person can travel only on one travel mean at once;

[**D8**] allowed travel means are cars, trains, metro, on foot, trams, bicycles, taxis, car sharing, bike sharing;

[**D9**] every travel is programmed with a combination of one or more travel means;

[**R10**] every proposed path must be feasible in the available time (the interval between two consecutive events);

[**R11**] if the travel involves more than one travel mean, starting location of the first proposed path and ending location of the last proposed path must coincide with starting and ending location of the whole planned travel;

[**R12**] the system does not consider paths that violate constraints on travel means defined by the user;

[**R13**] the system checks user preferences to decide which is the best path;

[**R14**] the system warns the user if it isnt possible arrive at the location before the event to attend starts;

[**R15**] appropriate travel means must be suggested according to the type of event that they are related to;

[**R16**] if a strike occurs the system wont consider involved travel means;

[**R17**] if it rains the system wont consider paths involving the bicycle.

[**G5**] change the selected path with an alternative path:

[**D7**] a person can travel only on one travel mean at once;

[**D8**] allowed travel means are cars, trains, metro, on foot, trams, bicycles, taxis, car sharing, bike sharing;

[**D9**] every travel is programmed with a combination of one or more travel means;

[**R18**] the system must show to the user all possibilities to reach a location in according with the requirements of [[G4]];

[**R19**] the system allows the user to change the path only if doesnt generate overlapping with events added later to the involved one.

[**G6**] obtain a daily schedule that allows to attend to every event in program:

[**D10**] a person can be only in one place at once;

[**R20**] the combination of the paths proposed for the day must be feasible in the allotted time;

[**R21**] if there are multiple events at the same time the system will propose in the schedule only the first event added.

[**R22**] if the user forces into the schedule an event that overlaps with events present in the schedule, these are removed from the schedule.

[**G7**] apply constraints on travel means:

[**D7**] a person can travel only on one travel mean at once;

[**D8**] allowed travel means are cars, trains, metro, on foot, trams, bicycles, taxis, car sharing, bike sharing;

[**D9**] every travel is programmed with a combination of one or more travel means;

[**R23**] the system requires min/max length allowed for a path to impose a constraint on a travel mean;

[**R24**] the system requires an interval of time allowed to impose a constraint on a travel mean;

[**R25**] the system doesnt consider solutions that violate constrains.

[**G8**] deactivate one or more travel means:

[**D7**] a person can travel only on one travel mean at once;

[**D8**] allowed travel means are cars, trains, metro, on foot, trams, bicycles, taxis, car sharing, bike sharing;

[**D9**] every travel is programmed with a combination of one or more travel means;

[**R26**] the system allows the user to specify one or more travel means that cant be used.

[**R27**] the system doesnt consider solutions that include deactivated travel means.

[**G9**] select combinations of transportation means that minimize carbon footprint:

[**D11**] all travel means are related to information about average carbon footprints;

[**R28**] for each path, the system estimates carbon footprint produced.

[**G10**] reserve time for lunch or break events:

[**D12**] flexible timeslots can have a daily or periodical validity;

[**D13**] every flexible timeslot has a minimum amount of time that must be reserved;

[**R29**] the system allows the user to specify a flexible interval and a minimum amount of time to schedule a break;

[**R30**] if there is enough time for a break, the system reserves it within the specified flexible interval;

[**R31**] if there isnt enough time into the flexible interval specified a warning is thrown.

[**G11**] arrange trips:

[**D14**] to use a public transport a ticket is required;

[**D15**] a ticket may have a daily validity or a different periodicity;

[**D16**] user can own day/week/season passes;

[**D17**] to use a sharing vehicle a payment is required;

[**D18**] a sharing vehicle must be parked in an allowed position.

[**R32**] the system shows to the user if he holds a ticket for a proposed travel;

[**R33**] the system allows the user to buy public transportation tickets according to proposed travel;

[**R34**] the system shows to the user where sharing vehicles are located;

[**R35**] the system provides information about time of departure and arrival of the proposed travels.

2.3 User characteristics

TODO

2.4 Assumptions, dependencies and constraints

TODO

Chapter 3

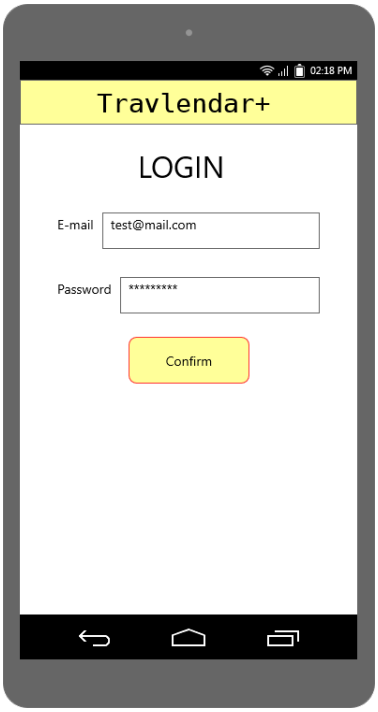
SPECIFIC REQUIREMENTS

3.1 External Interface Requirements

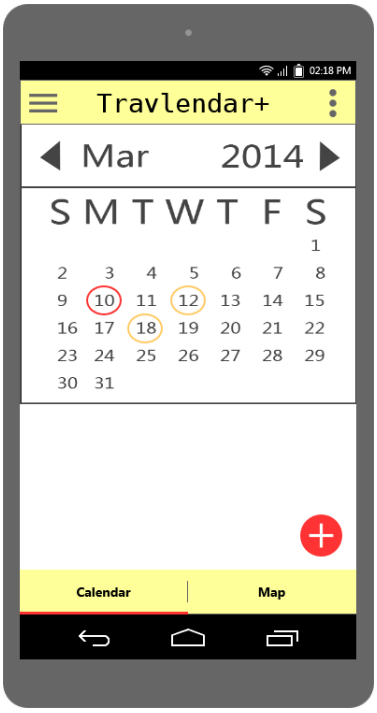
3.1.1 User Interfaces

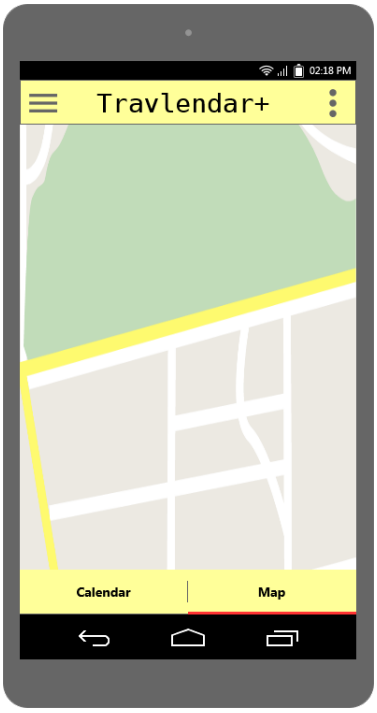
The following mockups are a representation of the look of the app in its first release.

3.1.1.1 Login

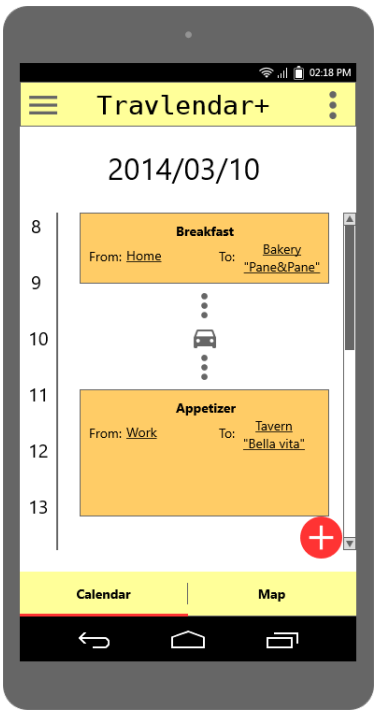


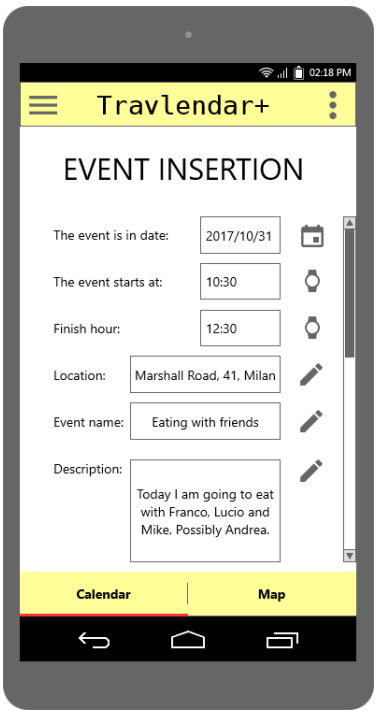
3.1.1.2 Calendar and Map views



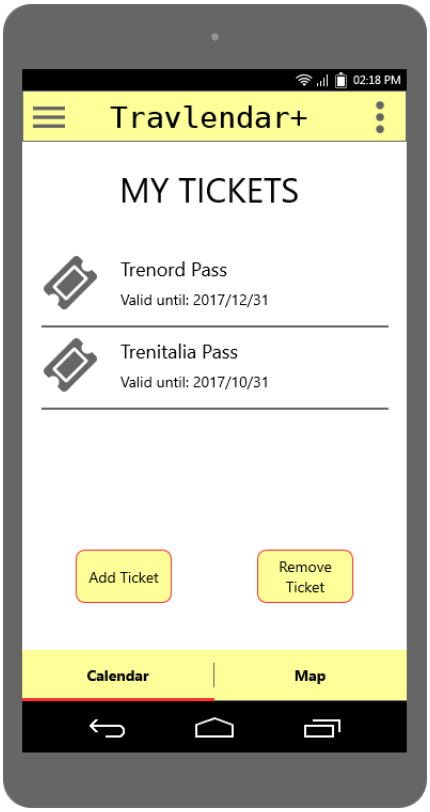


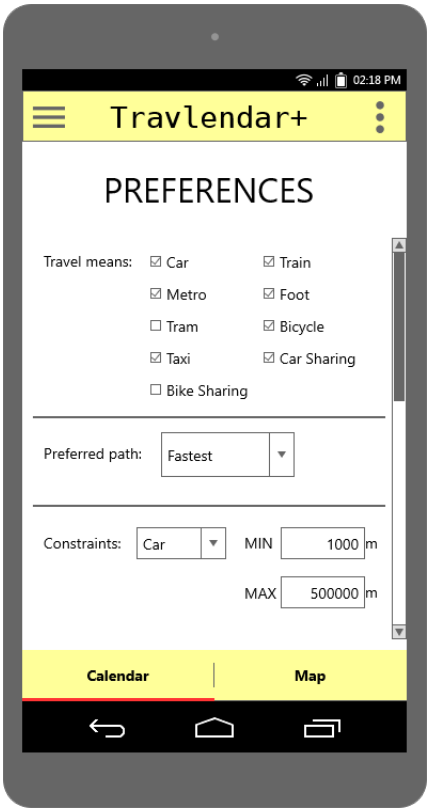
3.1.1.3 Day Viewer and Event Creation





3.1.1.4 My Tickets and Preferences





3.1.2 Hardware Interfaces

TODO

3.1.3 Software Interfaces

TODO

3.1.4 Communication Interfaces

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3.2 Functional Requirements

3.2.1 Scenarios

3.2.1.1 Scenario 1

Oscar is a businessman who travels a lot and he would like to organize his travels quickly and precisely. A friend advises him to try Travlendar+. Oscar enters the Travlendar+ website and loads the registration page by clicking on the 'signup' button, he fills all the mandatory fields and then he receives a confirmation email and he clicks on the confirmation link inside. Then Oscar log in and starts using Travlendar+.

3.2.1.2 Scenario 2

Nigel lives in Milan and tomorrow hes going to have an appointment in Lecco, so he has to decide how to reach his appointment location; Nigel accesses the log in page from his personal computer's browser, fills the username and password fields and click on the 'confirm' button and after he clicks on the dedicated button to add a new event, he fills all the requested fields, including setting the events type as 'work meeting' in order to obtain a proper suggested travel means according to the situation and confirms the event creation. The day after Nigel travel to lecco according to the travel schedule proposed by his Travlendar+ app, reaching in time his appointment.

3.2.1.3 Scenario 3

Jasper insert an event into his Travlendar+ calendar but the location of his event is too far away his previous event and doesn't exist a feasible path to reach the events location in the allotted time. Jasper is notified by a warning that he will not be able to reach his appointment in time.

3.2.1.4 Scenario 4

Ophelia insert a new event into his Travlendar+ calendar but that events overlaps with another already existing event. Ophelia is notified by her app and the system asks Ophelia to choose which one of the overlapped event she wants to attend, she choose the event she has just inserted. She reads then the travel means proposed to respect hers new time schedule.

3.2.1.5 Scenario 5

Henrietta wants to personalize hers Travlendar+ experience, so she on the menu button and then the preferences button. She select her preferred travel means, she choose to obtain always the fastest path and then, since she walks with a limp, she insert a maximum walking distance of 500 m. Before clicking on the confirm button she see a polluting trucks outside hers window and then she decide to follow always travel paths that minimize carbon footprint. She selects the relative option in hers preferences. She clicks on the confirm button and she observe that her suggested travels are changed according to her preferences.

3.2.1.6 Scenario 6

Arthur cant concentrate on his work if he doesn't eat his lunch between 12.00 and 13.00 and he need at least 25 minutes to consume a proper lunch. So Arthur inserts a flexible break event into his Travlendar+ calendar in order to be sure that every day his app reserve a time slot for lunch every day. After a week Arthur inserts a new event whose travel overlap with his flexible lunch event and his app notifies him. Arthur decide to ignore the warning, since he'll eat during his travel.

3.2.1.7 Scenario 7

Gwendolyn looks at her Travlendar+ app and discover that the next day she has to travel first by train to Milan and then take a bike of MoBikes sharing system in Milan. She clicks on the train travel slot in order to buy the proper ticket and the apps redirect her in the right Trenords online shop webpage. When she is about to buy the ticket she suddenly remember that she has a weekly Trenord pass, so she cancel the transaction and add her pass informations into her Travlendar+ app in order to do not make the same mistake twice. The next day Gwendolyn take the train to Milan and when she arrive she opens her Travlendar+ app in order to find the nearest bike of MoBikes. Gwendoline arrives in time at her appointment.

3.2.1.8 Scenario 8

Harvey have to reach an appointment near his home next week and then he adds an event in his Travlendar+ calendar. He observe that the suggested travel means is using a bike. The day before his appointment the weather forecast rain and so Harvey is notified by his app that due to the forecast he should avoid to take the bike, suggesting instead to reach his appointment by car.

3.2.1.9 Scenario 9

Sara inserts an event in her Travlendar+ calendar, and she looks at the proposed travel path. Since she didn't like the proposed travel she clicks on the proposed path and select another feasible alternative. The next day Sara will travel according to the travel path she likes more.

3.2.2 Use case descriptions

3.2.2.1 Registration

Participating actors	Generic visitor
Entry Condition	There are no entry conditions.
Event Flow	1. The visitor clicks on the Register button displayed onto the homepage; 2. The visitor fills all the mandatory fields shown required by the system including his email, his password (twice) and a captcha; 3. The visitor clicks on Confirm button; 4. The visitor receives a confirmation email and clicks on the confirmation link; 5. The system saves all user data inserted.
Exit Condition	The visitors registration is completed successfully, so the visitor is registered as an user of Travlendar+ and he can log in into the system as a registered user.
Exception	If: • The visitor insert an email already connected to an existing account; • Insert invalid infos into in some mandatory field; • Leave empty a mandatory field; Then the system will request the visitor to complete/ revise all uncorrected field, highlighting them. if the visitor doesnt activate the account, after a month the activation link will expire and all user data will be deleted.

Table 3.1: registration use-case

3.2.2.2 Login

Participating actors	Unauthenticated User
Entry Condition	There are no entry conditions.
Event Flow	1. The visitor clicks on the 'Login' button displayed on the home-page; 2. The visitor inserts the email and the password previously used for registration; 3. The visitor clicks on 'Confirm' button; 4. The system redirect the user to the main view of Travlendar+.
Exit Condition	The Visitors login is completed successfully, so the visitor can use all the Travlendar+ functions.
Exception	If: • The email inserted is not one of the emails previously used by an user to sign up; • The password inserted by the visitor is not the one associated with the email inserted; • At least one of the field is left empty; Then the system will notify the visitor to complete/ revise all un-corrected field, highlighting them.

Table 3.2: Login use-case

3.2.2.3 Create event

Participating actors	User
Entry Condition	The user must be logged/registered in Travlendar+.
Event Flow	1. The user clicks on the dedicated button to add a new event; 2. The user insert: date, starting time, eventually ending time, location, name of the event, type of event (predefined or personalized), description, starting location (previous one or others); 3. The user confirms the events creation; 4. The system computes the best possible path according to users preferences Describe the Exit Condition;
Exit Condition	The system redirects the user to the calendar and add the travel time slot required to reach that event (comprehensive of travel description).
Exception	The inserted event overlaps with one or more previously added events (also the travel is considered in the eventual overlap). The user is notified with a warning message and the overlapping event isnt considered in the user travel planning schedule (but remain saved into the calendar), the system have to choose which one of the overlapped event he want to attend.

Table 3.3: Create event use-case

3.2.2.4 Define preferences

Participating actors	User
Entry Condition	The user must be registered and logged in Travlendar+.
Event Flow	1. The user opens the menu; 2. The user selects the tab 'preferences'; 3. The system shows a page containing fields to fill; 4. The user defines his preferences by filling the fields on the page; 5. The user clicks on the 'save' button.
Exit Condition	The user has selected his preferences, which have been saved correctly.
Exception	If the user exits the page without clicking the 'save' button, then the system will not save the preferences modified by the user.

Table 3.4: Define preferences use-case

3.2.2.5 Define flexible breaks

Participating actors	User
Entry Condition	The user must be logged/registered in Travlendar+.
Event Flow	1. The user clicks on the dedicated button to add breaks into the schedule; 2. The user inserts a flexible period of time (specifying start and end times) into which the break must happen and the minimum amount of time that must be dedicated to the break; 3. The user also specifies the return period of the break (daily, weekly, monthly or until a specified date) or if it refers only to certain days of the week (until a specified date);
Exit Condition	The system notifies the user that the info about break are correctly saved.
Exception	It is not possible to dedicate the required time into the schedule of one or more days because of previous added events. The system asks to the user to change the length of the break.

Table 3.5: Define flexible breaks use-case

3.2.2.6 Arrange trips

Participating actors	User, Transport service provider
Entry Condition	The user must be logged in Travlendar+.
Event Flow	1. The user opens his calendar 2. The user clicks on the trip he want to arrange; 3. The system shows all tickets to be buyed and the tickets already bought; 4. The user clicks on the ticket he want to buy. 5. The system redirect the user to the right website (of the right Transport service provider) in order to buy the tickets.
Exit Condition	The user has successfully arranged his travel.
Exception	There are no exceptions.

Table 3.6: Arrange trips use-case

3.2.2.7 Locate the nearest sharing vehicle

Participating actors	User, Transport service provider
Entry Condition	The user has opened the arrange trip tab and is about to travel.
Event Flow	1. The user open the map; 2. The system shows in the map the nearest vehicle of car sharing according to the chosen path and the infos provided by the transport service provider;
Exit Condition	The user take and use the suggested vehicle.
Exception	• If no near vehicle is found the system re-compute another path and show it to the user; • if the user take a shared vehicle, but not the suggested one nothing happen, just as he has taken the suggested vehicle;

Table 3.7: Locate nearest sharing vehicle use-case

3.2.2.8 Add ticket possessed

Participating actors	User
Entry Condition	The user has opened the arrange trip tab.
Event Flow	1. The user selects the tab 'my tickets'; 2. The system show a page containing all the tickets and passes possessed by the user; 3. The user clicks on the 'add ticket' button; 4. The system show a page containing fields to fill; 5. The user inserts info regarding the ticket/pass possessed; 6. The user clicks on the 'save' button; 7. The system adds the ticket/pass to those already present in the user account.
Exit Condition	The user has successfully inserted his ticket/pass in the system.
Exception	If the user exits the page without clicking the save button, then the system will not save the ticket added by the user.

Table 3.8: Add ticket possessed use-case

3.2.2.9 Obtain feasible travel paths

Participating actors	User, google maps APIs
Entry Condition	The user must be registered and logged in Travlendar+.
Event Flow	1. The user open the calendar tab; 2. The user selects a day in the calendar; 3. The system shows the proposed feasible paths (shown as travel events) between the events; 4. If the user want to select an alternative travel path he can click on the travel event in order to choose among the proposed feasible alternatives.
Exit Condition	The user has seen the possible travel paths that can be used to reach his meetings.
Exception	If no feasible travel path exist between two events, the system shows a warning in the calendar.

Table 3.9: Obtain feasible travel paths use-case

3.2.2.10 Create personalized event profiles

Participating actors	User
Entry Condition	The user must be registered and logged in Travlendar+.
Event Flow	1. The user opens the menu; 2. The user selects the tab 'create personalized type of event'; 3. The system shows a page containing a text field to fill; 4. The user inserts the name of the personalized type of event that he wants to create; 5. The user inserts the constraints on travel means related to that type of event; 6. The user clicks on the 'save' button; 7. The system adds the new type of events to those already existing.
Exit Condition	The user has successfully created a new personalized type of event in the system.
Exception	If the user exits the page without clicking the 'save' button, then the system will not save the new personalized type of event created by the user.

Table 3.10: Create personalized event profiles use-case

3.2.2.11 View calendar

Participating actors	User
Entry Condition	The user must be logged in Travlendar+.
Event Flow	1. The user clicks on the calendar button; 2. The system shows a calendar including all inserted events, and the travel paths related.
Exit Condition	The system let the user check his calendar.
Exception	There are no exceptions.

Table 3.11: View calendar use-case

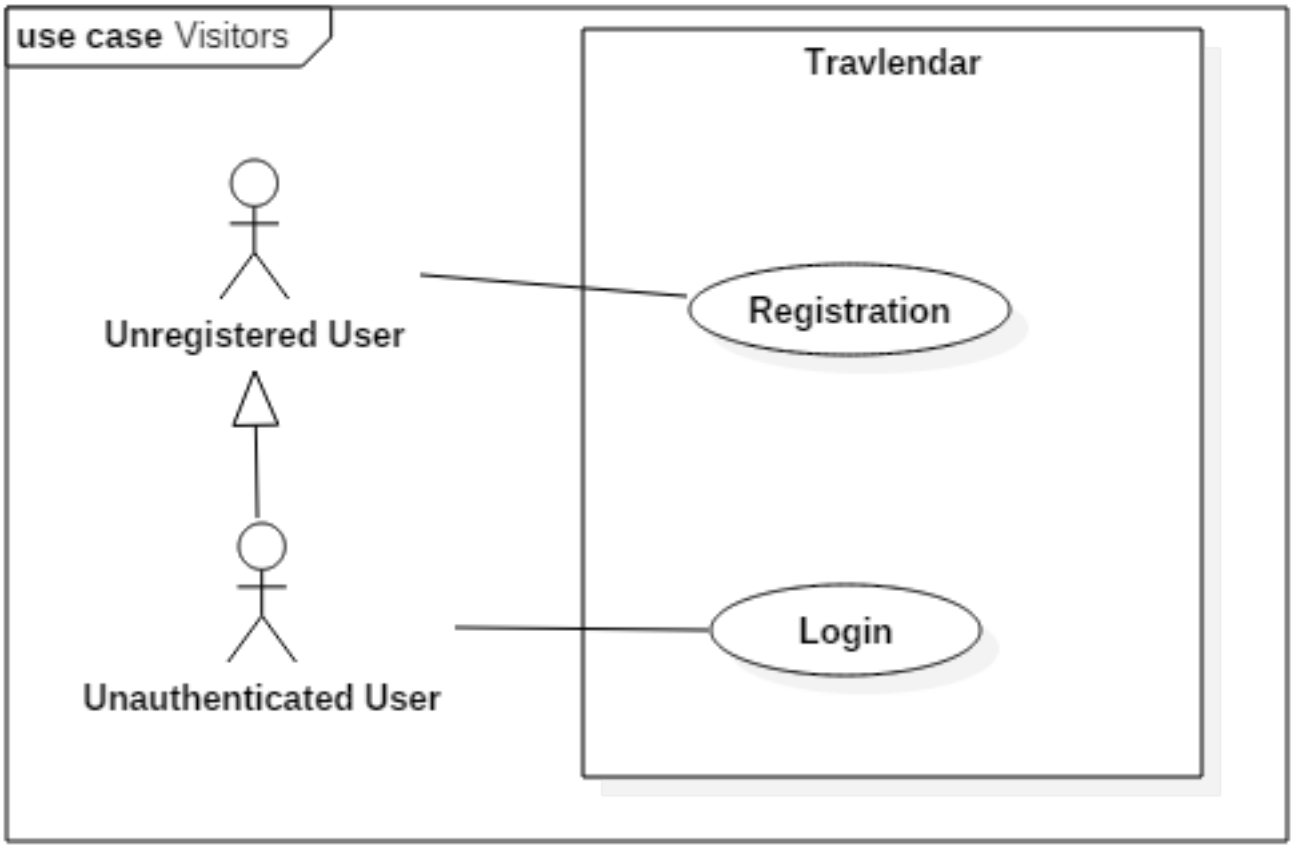
3.2.2.12 Choose between overlapping events

Participating actors	User
Entry Condition	The user must be logged in Travlendar+, at least two events are overlapped.
Event Flow	1. The user clicks on the calendar button; 2. The system shows a calendar including all inserted events, and the travel paths related, the overlapping events are displayed in a separate way in respect to the actual day schedule; 3. The user drag the chosen overlapping event into his day schedule; 4. The system remove the precedent event (in conflict) and put it into the overlapping event list; 5. The system shows the new day schedule, with updated travel paths.
Exit Condition	The system let the user check his calendar.
Exception	There are no exceptions.

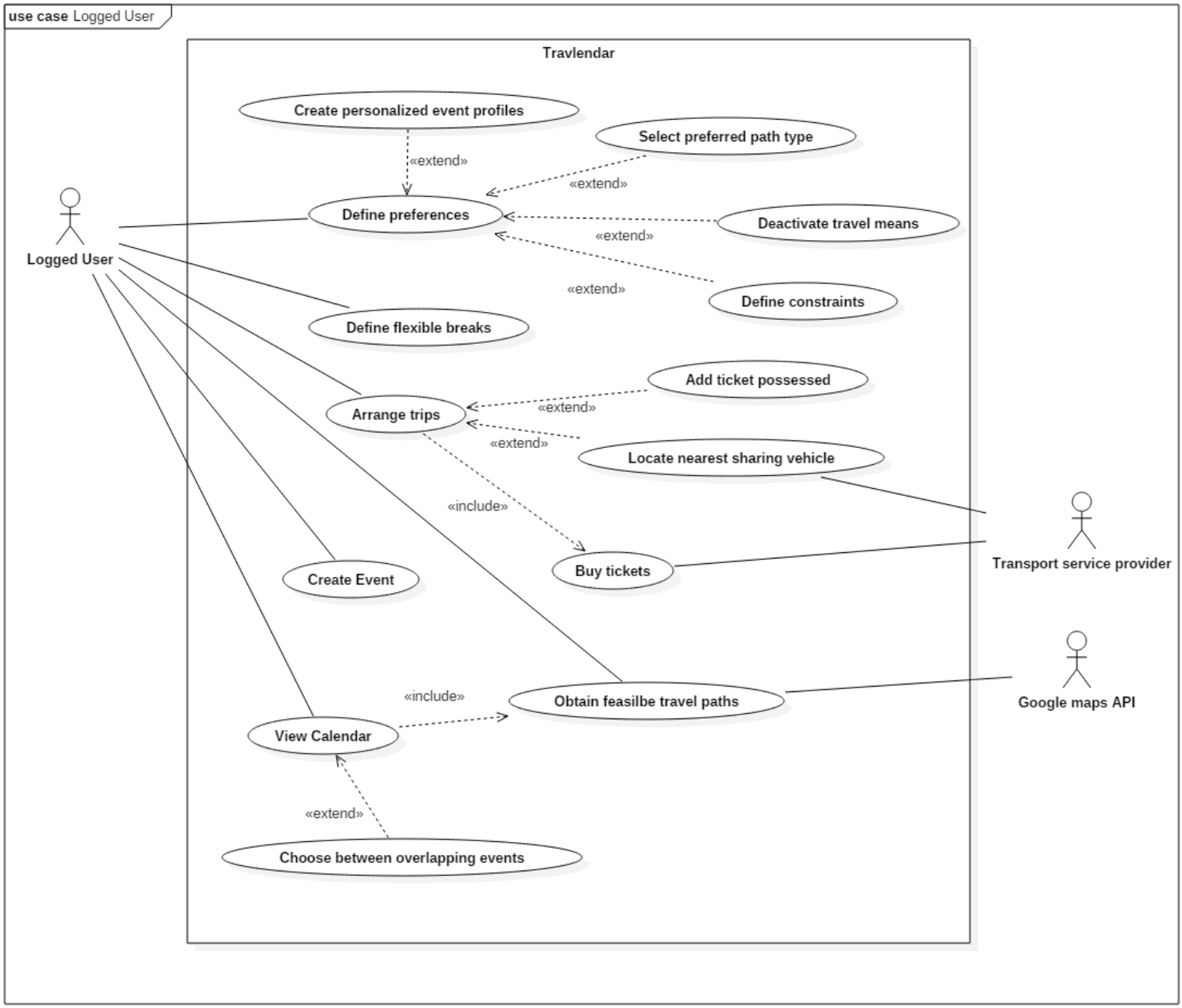
Table 3.12: Choose between overlapping events use-case

3.2.3 Use case diagrams

3.2.3.1 Visitors



3.2.3.2 User



3.3 Performance Requirements

TODO

3.4 Design Constraints

3.4.1 Standards compliance

TODO

3.4.2 Hardware limitations

TODO

3.4.3 Any other constraint

TODO

3.5 Software System Attributes

3.5.1 Reliability

The reliability (Nb = 1 - Probability of failure) requested is related to many factors: the software developed must be stable and efficient in both server and client side, the user must satisfy the minimum requirement specifications specified in this document otherwise the reliability of the client app or the browser interface are not guaranteed; The reliability of the servers must be also taken into account and guaranteed by a proper maintenance .

3.5.2 Availability

The system must offer an availability of 99% (an overall 24/7 service). The remaining 1% (at maximum) shall take into account the time spent for ordinary maintenance sessions. A backup server will be provided in order to maintain the availability of the service even after the main server failure.

3.5.3 Security

All user's data will be stored and encrypted using a proper hashing mechanism, even system administrators must not been able to access personal user's data. The GPS location of the users, detected by the mobile app, during the user's travels, is not to be memorized. All the connections established between users and server must use the HTTPS protocol. Every communication between server and client will be encrypted.

3.5.4 Maintainability

A version control system will be used in order to manage and organize all the different code revisions. In the development phase the entire source code will be properly documented and commented in order to ease the effort of possible future developers of understanding how the system has been designed and how it works. The documentation will also facilitate the system's maintenance.

3.5.5 Portability

The web application must support main browsers (such as Google Chrome, Mozilla Firefox, Microsoft Edge, Safari) latest version.
The mobile application will be developed at first for Android architecture and then for iOS architecture. The server-side of the application

Posso dire che il server scritto in java e che pu essere

Chapter 4

FORMAL ANALYSIS USING ALLOY

TODO

Chapter 5

EFFORT SPENT

TODO

Chapter 6

REFERENCES

TODO