MeteoCal

Software Enginnering 2 Project

RASD

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Contents

1 Introduction

1.1 Description

We will project and implement *MeteoCal*, a new weather based online calendar for helping people scheduling their personal events avoiding bad weather conditions in case of outdoor activities.

Users, once registered, should be able to create, delete and update events. An event should contain information about when and where the event will take place, whether the event will be indoor or outdoor. During event creation, any number of registered users can be invited. Only the organizer will be able to update or delete the event. Invited users can only accept or decline the invitation.

Whenever an event is saved, the system should enrich the event with weather forecast information (if available). Moreover, it should notify all event participants one day before the event in case of bad weather conditions for outdoor events. Notifications are received by the users when they log into the system.

1.2 Goals

MeteoCal provides a set of specific features which make this platform an absolute news for online calendars:

- Create a personal calendar and visit other users calendar

- Add events to the calendar and invite other users

- Integrate weather conditions and events

- Ricieve notifications for bad weather condition and modify the events

- Manage calendar and events either publicly or in total privacy

1.3 Domain Properties

The world where we suppose to develop *MeteoCal* should respect these conditions:

- When a user creates an event, it does exist in the real world

- Location and weather conditions informations are given from absolutely trusted internet providers

- If some event location can contain a precise number of participants, the creator user knows exactly this information before creating the event

1.4 Glossary

Here follows some important concepts which must be precisely defined:

- **User**: Someone who has signed up to *MeteoCal*

- **Organizer**: A user who created a particular event

- **Public**: Something that can be seen from any user

- **Private**: Something that is (partially) invisible to other users

- **User Page**: Personal page of each user, containing his/her calendar and some other informations

- **Notification**: Message received by a user directly from the system

- **Address Book**: User's personal list, containing name, surname and e-mail address of other *MeteoCal* users.

1.5 Assumptions

There are few points that are not very clear in the specification document, so we will have to assume some facts. We assume that:

- The creator of an event can invite other people at the moment in which the event is created and also until the day the event takes place

- Each user is identified by his e-mail address, and he(she) has exactly one calendar: this means that users can search other users in order to see their calendar

- Calendars and Events can be either public or private, so there can be four situations:

  1. Public calendar with public event: any user can see the calendar and all the event details

  2. Public calendar with private event: any user can see the calendar but the users who do not partecipate to the event, can only see a "busy" mark on that day of the calendar, but not the event details

  3. Private calendar with public event: no one can see the calendar and of course its events, but if some user participates to the same event (which is public) and has a public calendar, the event will be visible on the calendar of that user

  4. Private calendar with private event: no one can see the calendar nor the event, except for people who are invated

- When a User decides to import an existing Calendar, it will overwrite the current Calendar (except for the event created by him); it should be written accordingly to a certain syntax and format, and it must be previously exported from *MeteoCal*. If an event doesn't exist anymore it will not be imported.

- To invite someone to an event, he(she) must be signed up with *MeteoCal*: from the moment in which the event has been created, the Organizer can invite other Users, choosing from his(her) Address Book.

- The creator of an event cannot create a new event which is going to be in a period of time over-lapped to a pre-existing event in his(her) calendar.

- If a user receives an invitation to an event which is going to be in a period of time overlapped to a a pre-existing event in his(her) calendar, he(she) can choose to accept it but he has to delete partecipation to the old event before he can accept. The System will notify the User that the event has been successfully created.

- If for some reason a user deny an invitation for an event, the creator of that event can re-send it.

- Each user can add to his(her) Address Book only *MeteoCal* Users: the system is going to check if that User exists or not. This ensures that only *MeteoCal* Users could be invited to events.

- Each user can set his(her) user page as public or private: if it's public other users can add him(her) to his address book with just a click on a button on the user page.

1.6 Identifying Stakeholders

MeteoCal is going to be a web platform with no limits regarding age, sex or particular abilities in real life, which means that it is not limited to a small target of people who have special interests or abilities. So we could consider the following stakeholders:

- **Companies** that want to organize conferences or other special events with all the employees or simply business dinners.

- **Sportsmen**, who are very interested in wheather conditions while organizing some event

- **Individuals** in general, who want to keep a precise schedule of their events, without the need of being always up-to-date with weather conditions, and of course invite their friends

- **Professor of SE2**, that is the "financial" stakeholder of this project, or simply the one who's interested in developing this new kind of application.

1.7   Proposed System

MeteoCal is going to be a very professional web platform that wants to be an absolute news with respect to the other platforms such as social networks. This means that there is no friendship concept nor wall sharing contents, but it focuses on organizing events and invite other people. There is no meaning in try to compete with Facebook™ or similars, because they offer yet a good way to create events but ignoring weather forecast functionalities that *MeteoCal* is going to offer.

1.7.1   Software Interfaces and Server Requirements

1. **DBMS**

   - Name: MySQL
   - Mnemonic: MySQL
   - Version number: 5.6.22
   - Source: http://dev.mysql.com/downloads/mysql/

2. **Application Server**

   - Name: GlassFish
   - Mnemonic: GlassFish
   - Specification number: Open source edition
   - Version number:4.1
   - Source: https://glassfish.java.net/download.html

3. **Operating System**: must support MySQL, Glassfish and the JVM (Java Virtual Machine)

1.7.2   Software Interfaces and Client Requirements

There's no limitation on Operating Systems but the web browser must support HTML 4/XHTML, CSS3, Javascript and, of course, the client must be on a stable internet connection.

2 Requirements

It is possible to categorize the actors involved in using *MeteoCal*, in particulare we have:

- **Guest**: someone who wants to access *MeteoCal* but not signed up

- **User**: someone who has signed up to *MeteoCal*

- **Organizer**: a user who created a particular event

2.1 Functional Requirements

Here it is the list of functional requirements for each actor of *MeteoCal*:

- **Guest**:

    1. Sign up to *MeteoCal*

- **User**:

    1. Log in
    2. Accept invite to events
    3. Decline invite to events
    4. Delete partecipation to events
    5. See public events details
    6. See public events participants
    7. Create public events
    8. Create private events
    9. Invite users to an event he created
    10. Import calendar
    11. Export calendar
    12. Make the calendar public
    13. Find users
    14. See public calendars
    15. Change password
    16. Recover lost password
    17. Unregister

- **Organizer**, who needs the same requirements of a normal user and also:

    1. Update events he(she) created
    2. Delete events he(she) created

The system must also satisfy these requirements:

1. An event should contain information about when and where the event will take place, whether the event will be indoor or outdoor

2. During event creation, any number of registered users can be invited

3. Whenever an event is saved, the system should enrich the event with weather forecast information (if available)

4. The system should notify all event participants one day before the event in case of bad weather conditions for outdoor events. Notifications are received by the users when they log into the system

5. If user A has a public calendar, other users will see all the time slots in which A is busy but without seeing the details of the corresponding events if they don't parecipate and the event is private, in any other case they can see all details about the event.

6. In case of bad weather conditions for outdoor events, three days before the event, the system should propose to its creator the closest (in time) sunny day (if any).

7. The system will provide email notifications (both for invitation and cloudy outdoor events alerts)

8. Manage time consistency when creating an event by avoiding conflicts with existing events

9. Update weather information associated to events periodically, and of course, notify outdoor event participants in case the forecast has changed

2.2 Non Functional Requirements

2.2.1 User Interface

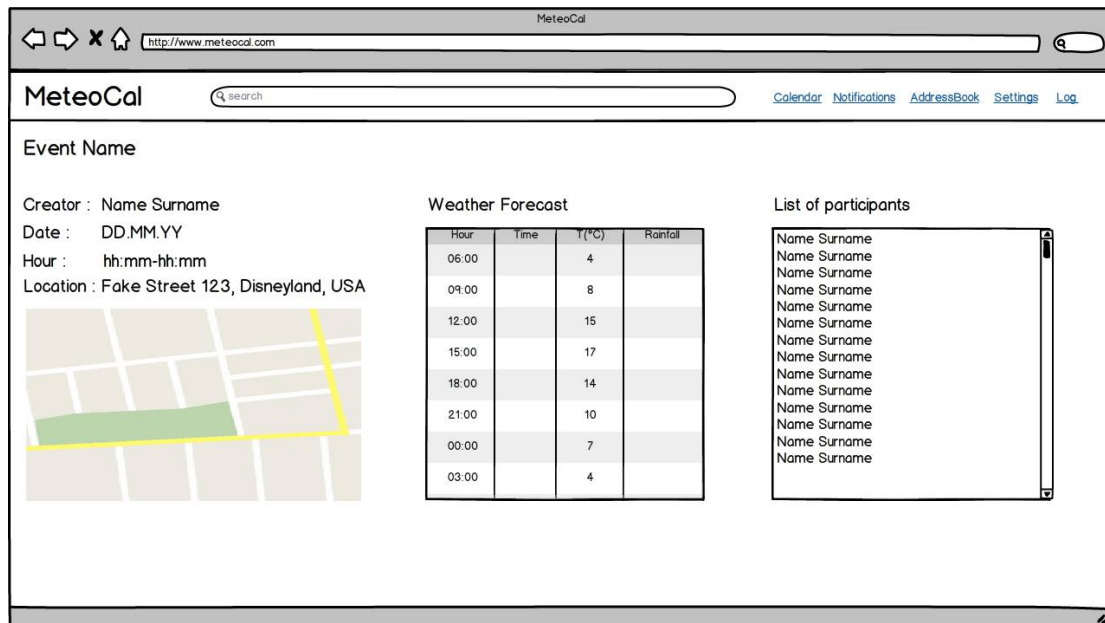The basic idea is to create a minimal but very effective user interface. Here we have a pair of possible web pages, just to figured out the idea of what are we looking for. This won't be exactly the final result, because design problems will be discussed later in the development.
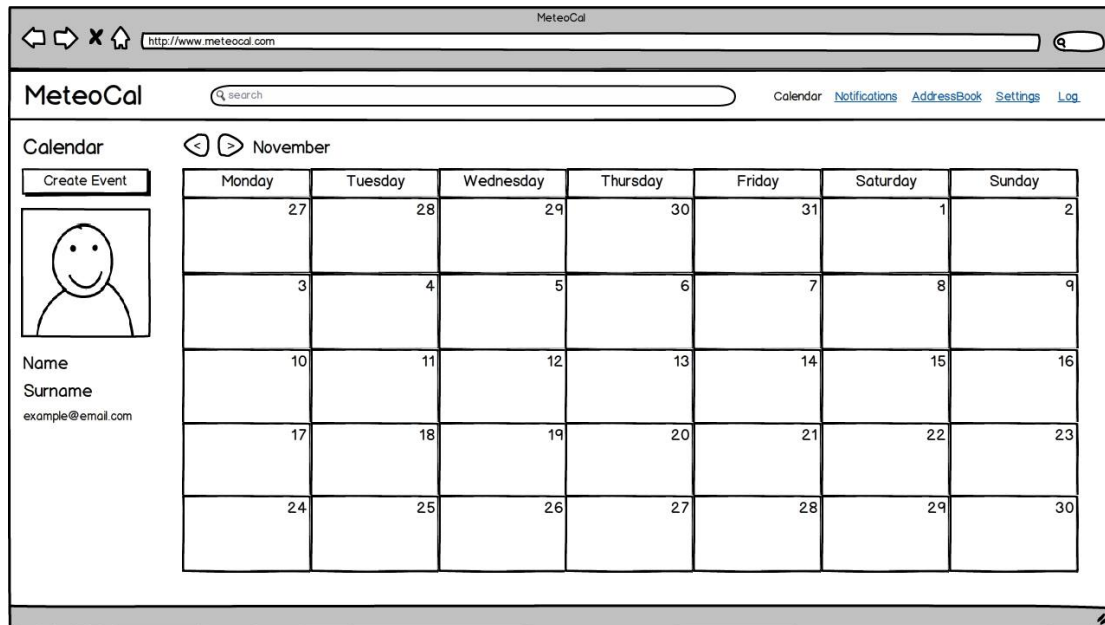
Mockup of user interface

2.2.2 Documentation

Here it is the list of document regarding *MeteoCal* development:

- **Project Plan**: to define tasks and development timing

- **RASD**: Requirement Analysis and Specification Document

- **DD**: Design Document, to define the real structure of the web application and its tiers

- **JavaDoc** comments in the source code: to make anyone that wants to develop the platform or do maintenance on it, understand the code.

- **Installation Manual**: a guide to install *MeteoCal*

- **User Manual**: a guide to use *MeteoCal*

- **Testing Document**: a report of our testing of another *MeteoCal* project.

2.2.3 Architectural Considerations

MeteoCal will be developed with the J2EE platform and MySQL database in which all system's information will be stored. What is this information will be clearer watching the Class Diagram given below, because it could be considered as a basis for our database, but the precise ER Diagram will be drawn in the DD. An Internet connection is needed to use *MeteoCal* and also a recent web browser.

2.2.4 Other Considerations

- **Availability**: The system should be online 24h/7d, also during maintenance

- **Security**: Log in phase will be supported by password hashing according to last standards (MD5) and possibly in the future, connection will be under SSH protocol.

- **Maintainability**: There could be server-side modification or upgrades for future features, but never client-side maintenance

- **Portability**: *MeteoCal* only needs a web browser and an internet connection: it supports any kind of device

3   Scenarios Identifying

3.1   Cene Eleganti

Emilio is very sad because his friend Silvio, no more invites him to his "Cene Eleganti"; Emilio and Silvio are both registered to *MeteoCal*, but Emilio doesn't remember his password because it's a long time since his last login. So Emilio decides to use the recovery password option to restore his password. After that he decides to search for Silvio's calendar (which is public) but then he realizes that all Silvio's events are private and he cannot stalk him in anyway.

3.2   Bad Weather for Renato

Renato is a party planner and he needs a software that could help him to schedule every party he organizes. A friend of his suggests him to sign up *MeteoCal* because of its features related to weather conditions, that would be very useful, especially for outdoor events. First of all he signes up *MeteoCal*, and then starts to use the calendar in order to insert the next party he was going to plan. The party will be on Friday and it will take place in a garden. On Tuesday (three days before the party) he receives an email from *MeteoCal*, notifying that Friday will be rainy, suggesting him to change the date into Sunday (because it's the first sunny day). Renato is an anxious person, so he decides to change the party location, choosing an indoor one. All the participants receive the change notification.

3.3   Lovely Lunch

Nichi wasn't doing fine using "weatherCal" a weather based online calendar, because it does not inform users if the weather forecast of an outdoor event has changed. So he decides to use another online calendar, *MeteoCal*. During sign up the system advise him that the choosed password is very weak but he ignore the warning. After some days Nichi change his ideas and, after login, he goes into the setting page to change his password. Now Nichi feels more secure. Then he decides to make his calendar as public, in order to make his friends see if he is busy or not. Two days later he creates a new public event for his birthday, and invites some friends who are *MeteoCal* users for a lunch in a French restaurant .

3.4   Beautiful

Maria Elena and Matteo are going to get married and they want to create a new event using *MeteoCal* for their marriage party. They create the event and send an invitation to their friends registered to *MeteoCal*. A week later Maria Elena decides to change the date of the party because in that day the place when they wanted to do the party is busy, so she changes the location into "Leopolda Station in Florence" and all the participants receive the notification. Some days later, Maria Elena catches another woman in bed with Matteo, and obviously she cancels the marriage and the party.

3.5   V-Day

GianRoberto wants to add Beppe (a colleague of his) into his AddressBook, but he doesn't know whether he is signed up to *MeteoCal*. So he uses the research function of *MeteoCal* inserting the Beppe's email (he had got it written in his papery address book) in order to check it. Once he finds it in *MeteoCal*, he add the contact to his AddressBook from Beppe's page. Now he can create the "V-Day" Event and invite Beppe that immediately accepts. The next day Beppe heedlessly remove his partecipation to "V-Day" Event so he decides to import his calendar backup (Beppe once a week exports his calendar from *MeteoCal* in three different format) previously exported to recover his partecipation.

4 UML Models

4.1 Use Case Diagram
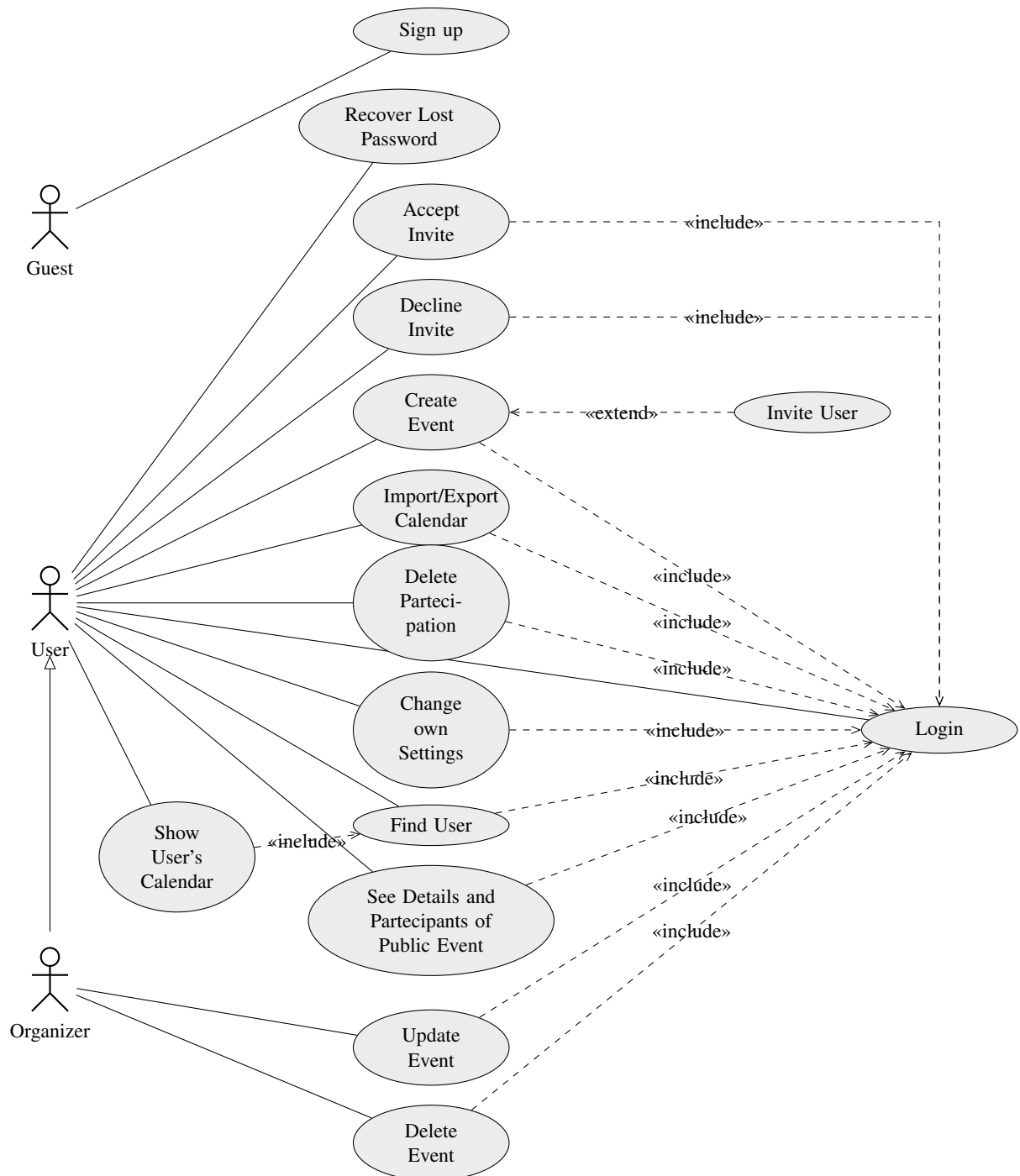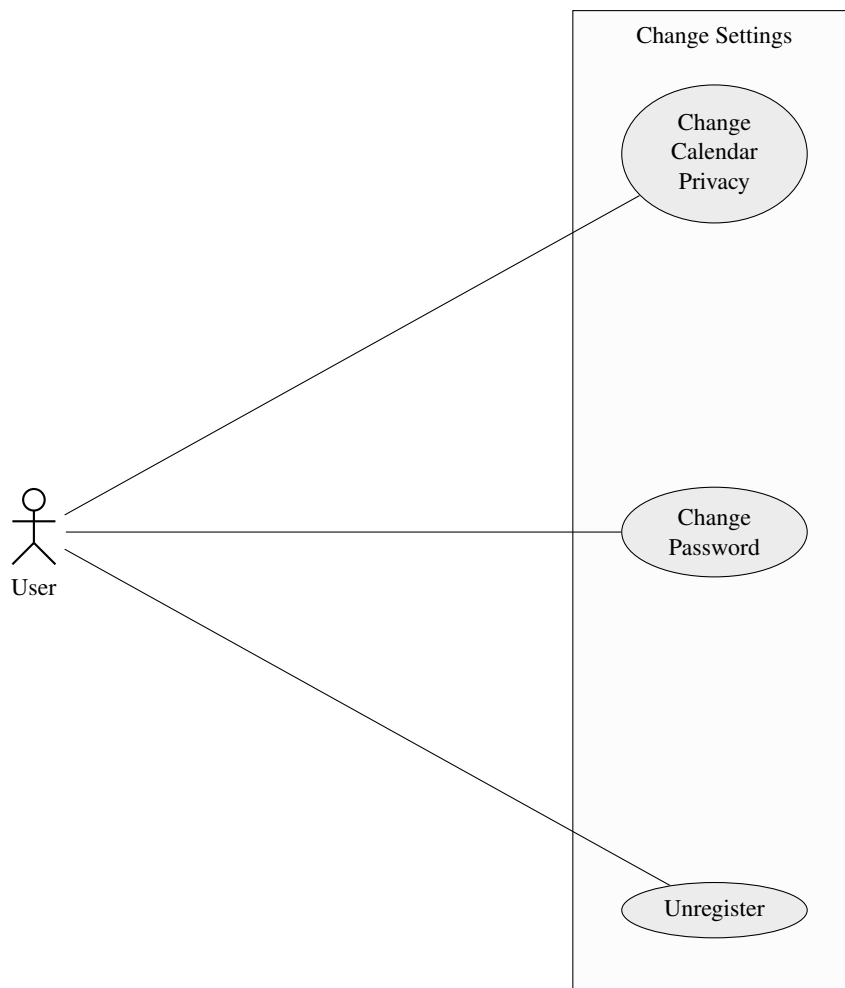
SignUp

Description	Guest sign up into the system
Goal	Guest wants to sign up to *MeteoCal* Application
Actors	Guest
Entry Condition	- Guest has not already registered - Guest is on HomePage
Exit Contition	The guest's information is stored into the database system
Flow of Events	1. Fulfill sign up's form 2. Click on "Create an Account" 3. The system verifies the inserted email 4. The system shows message of correct results of operation

Exceptions	**Wrong email:** email hasn't provider (@provider.com)
	Email already exist: email is already in the database
	In each case system shows an error message

Login

Description	User login into the system
Goal	User wants to use *MeteoCal* Application
Actors	User
Entry Condition	User is on home page
Exit Contition	User successfully logged into *MeteoCal* and he is on his personal page

Flow of Events	1. The user opens the login page of *MeteoCal*
	2. The system show the requested login page
	3. The user enters his e-mail address and password in the input form provided
	4. The user clicks the button "log in"
	5. The system verify inserted credentials
	6. The system shows the user's personal page

| Exceptions | **Wrong credentials:** the system displays an error message |

Event Creation

Description	User creates new event
Goal	User wants to create new event
Actors	User
Entry Condition	User is on his userpage
Exit Contition	User successfully created event

Flow of Events	1. The users clicks on "Create Event" button
	2. The system show the requested event creation page
	3. The user enters all requested data in the provided forms
	4. The user clicks on "Create" button
	5. The system checks timing of event
	6. The system checks in the user's calendar that he doen't has another event at the same time
	7. The system send invitations to the existing users
	8. The users see confermation message on his userpage

Exceptions	**Wrong time or date:** the system asks to re-insert data
	Time consistency failed: the system show the relative error message
	No existing user: the system show which email aren't related to registered user

Accept/Decline Invitation

Description	User accepts or decline the event invitation
Goal	User wants (or not) to partecipate to the event
Actors	User
Entry Condition	The system has just loaded the userpage
Exit Contition	User successfully added to event partecipants (or the invite was completly destroyed)
Flow of Events	1. The users clicks on "Notifies" link 2. The system shows user's notifies 3. The users clicks on selected notify 4. The system show a popup 5. The user clicks on "Accept" or "Deny" 6. The system verifies if the user has another event on the same time 7. In case the user has accepted the invite, the system add him to event partecipant and add the event to his calendar 8. In case the user has not accepted the invite, the system removes the invitation 9. In each case the user remain in the notification page
Exceptions	**User has another event:** the system shows a warning that if the user wants to accept the invitation he must previously remove all timing overlapping events.

Export Calendar

Description	User exports his calendar
Goal	User wants to save own calendar
Actors	User
Entry Condition	The user is on userpage
Exit Contition	User successfully saved his calendar on file
Flow of Events	1. The users clicks on "Settings" button 2. The system shows the requested settings page 3. The users clicks on the icon that correspont to the choosen format 4. The system starts download operation
Exceptions	There are no exceptions

Import Calendar

Description	User imports his calendar
Goal	User wants to use his offline calendar on *MeteoCal*

Actors	User
Entry Condition	The user is on userpage
Exit Contition	User successfully overwrite his *MeteoCal*'s calendar with an other of-fline one

Flow of Events

1. The users clicks on "Settings" button

2. The system shows the requested settings page

3. The users clicks "Choose" button

4. The browser shows popup windows with user's folders

5. The user chooses a file

6. The system starts upload operation

7. The system verifies the correctly structure of the file

8. The system overwrites user's calendar

Exceptions

File not Valid: the system shows an error

Change calendar's privacy

Description	User change his calendar's privacy
Goal	User wants to make his calendar public(private)
Actors	User
Entry Condition	The user is on userpage
Exit Contition	User successfully changes his calendar's privacy

Flow of Events

1. The users clicks on "Settings" button

2. The system shows the requested settings page

3. The users clicks "MakePublic" (or "MakePrivate") button

4. The system updates user's info on the database

5. The user is redirect to his user page

Exceptions	There are no exceptions

Show an user calendar

Description	User watch an other user's calendar
Goal	User wants to see another calendar
Actors	User
Entry Condition	The user is on userpage
Exit Contition	User successfully see another calendar

Flow of Events	1. The user types email, name or surname of an other user in the search box
	2. The system shows him the results page
	3. The user select one of the results
	4. The system shows him the user's calendar
Exceptions	**No user found (or private user):** The system shows "No results found"

See Details of Event

Description	User see all details of a public event
Goal	User wants to see all details of a public event
Actors	User
Entry Condition	The user is on any userpage
Exit Contition	User successfully see all detail of a public event

Flow of Events	1. The users clicks on name of event he wants to see details
	2. The system shows a popup with a short description of the event and a button to go into the Event Page
	3. The user clicks on the button
	4. The system shows the event page with all information
Exceptions	There are no exception

Update Event

Description	Organizer update the event that he has created
Goal	Organizer wants to update the event
Actors	Organizer
Entry Condition	Organizer is on the event page
Exit Contition	• Organizer successfully modify the event • the partecipants receive the notification of the update

Flow of Events	1. The organizer click on "Change Event Info" button
	2. The system shows modifyEvent page
	3. The organizer changes the settings he wants to modify as if he is creating new event
	4. When the organizer ended the modify, clicks on "Save Event" button
	5. The system checks timing of event
	6. The system checks in the user's calendar that he had not another event at the same time
	7. The system update the event in the database
	8. The system sends a notification with the new info to all partecipants
	9. The system redirect the organizer on the event page

Exceptions	**Wrong time or date:** the system asks to re-insert data
	Time consistency failed: the system show the relative warning message but the updating process will continue without error.

Delete Event

Description	Organizer delete the event that he has created
Goal	Organizer wants to delete the event
Actors	Organizer
Entry Condition	Organizer is on the event page

Exit Contition	• Organizer successfully delete the event
	• the partecipants receive the notification of deletion

Flow of Events	1. The organizer click on "Change Event Info" button
	2. The system shows modifyEvent page
	3. The organizer clicks on "Delete" button
	4. The system delete the event in the database
	5. The system sends notification of the deletion to all partecipants
	6. The system redirect the organizer on his personal page

Exceptions	There is no exceptions

Recover Lost Password

Description	User losts his password
Goal	Guest wants to recover his password to login in *MeteoCal* Application
Actors	User
Entry Condition	User is on HomePage
Exit Contition	The user has recovered his password

Flow of Events	1. The user clicks on "Forgot Password?" link 2. The system shows a PasswordRecovery page with a wizard to recover the password 3. The user inserts his email and clicks on "next" button 4. The system sends him an email with a token to change the password (if the email exist in the database) and shows the next step of the wizard 5. The user inserts a new password in the provided form and the token he received via email 6. The user clicks on "Change Password" button 7. The system redirect user on the homepage 8. The system shows message of correct results of operation
Exceptions	**Email Not Exist:** the system shows an error message

4.2 Sequence Diagram

The following diagrams aren't perfectly in accordance with standards, due to libraries we have used in latex.

Login

SignUp

```
     Guest                          System                        DB_User

                              load(HomePage)
                              ┌──┐◄┄┄
                              └──┘◄┄┄┘
          show(HomePage)
      ◄───────────────────────────┤

      FulFill(inputForm, "Name", "Surname", "Email", "Password")
      ┌──┐◄┄┄
      └──┘◄┄┄┘
          ClickOn("SignUp")
      ├───────────────────────────►▐▌

  ┌─────────┐─────────────────────────────────────────────────────────────┐
  │ SignUp ╱  Resistration Block                                           │
  │                              CheckWellFormedEmail                      │
  │                              ┌──┐◄┄┄                                   │
  │                              └──┘◄┄┄┘                                  │
  │  ┌──────┐──────────────────────────────────┐                          │
  │  │ Alt ╱  Email not well formed             │                         │
  │  │        ShowError("Email is not valid")   │                         │
  │  │   ◄──────────────────────────────────┤   │                         │
  │  └──────────────────────────────────────────┘                         │
  │                              Check("Email")                           │
  │                         ├───────────────────────────────────────►▐▌   │
  │                         ◄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄▐▌   │
  │  ┌──────┐──────────────────────────────────┐                          │
  │  │ Alt ╱  Email error                       │                         │
  │  │        ShowError("Email already exist")  │                         │
  │  │   ◄──────────────────────────────────┤   │                         │
  │  └──────────────────────────────────────────┘                         │
  │  ┌──────┐──────────────────────────────────────────────────────────┐  │
  │  │ Alt ╱  Succesfully Sign Up                                        │ │
  │  │     AddUser("Name", "Surname", "Email", "Password")               │ │
  │  │                         ├────────────────────────────────►▐▌       │ │
  │  │                              sendEmail()                          │ │
  │  │                              ┌──┐◄┄┄                              │ │
  │  │                              └──┘◄┄┄┘                             │ │
  │  │     ShowMessage("Succesfully Sign Up")                            │ │
  │  │   ◄───────────────────────────┤                                   │ │
  │  └──────────────────────────────────────────────────────────────────┘ │
  └─────────────────────────────────────────────────────────────────────┘
```
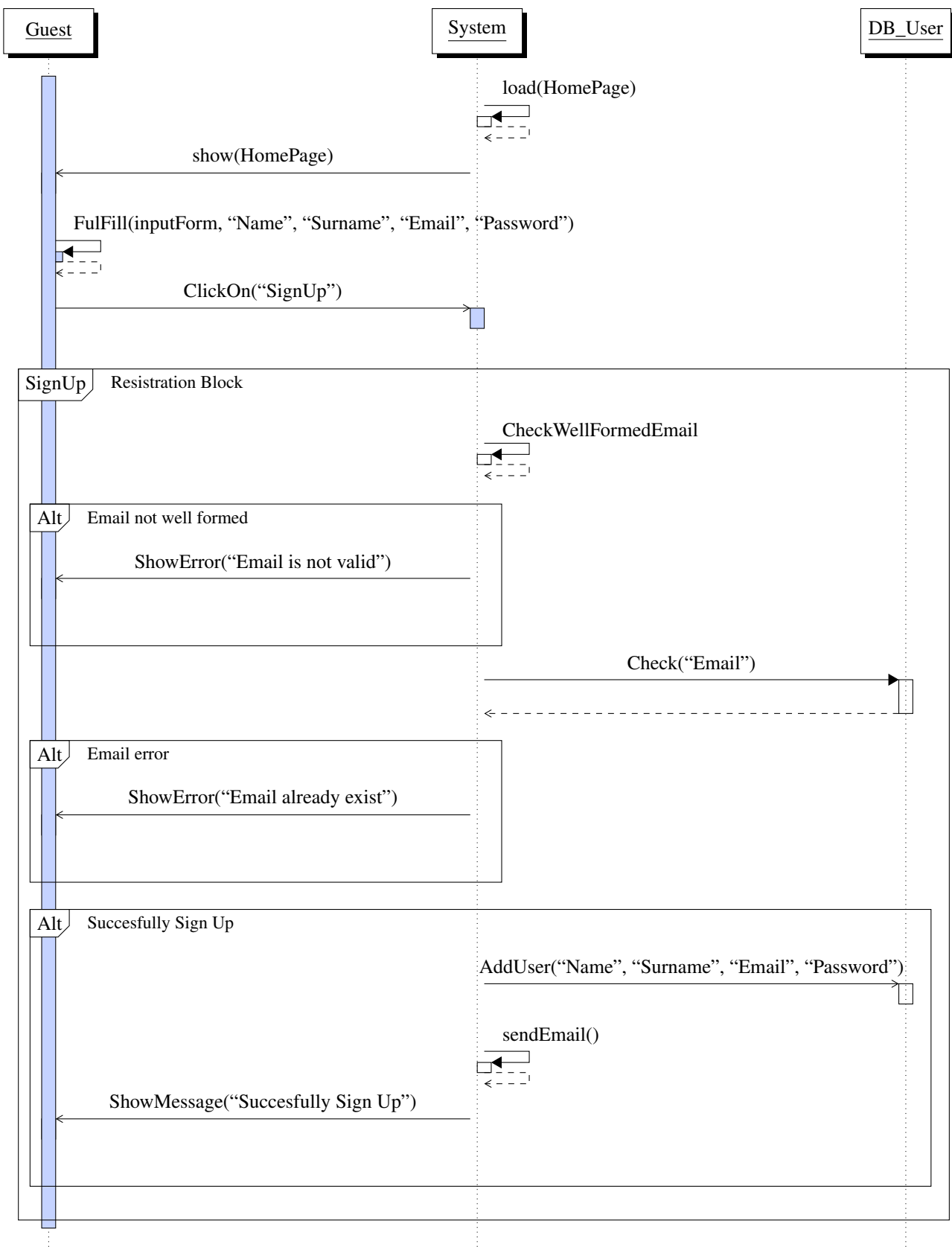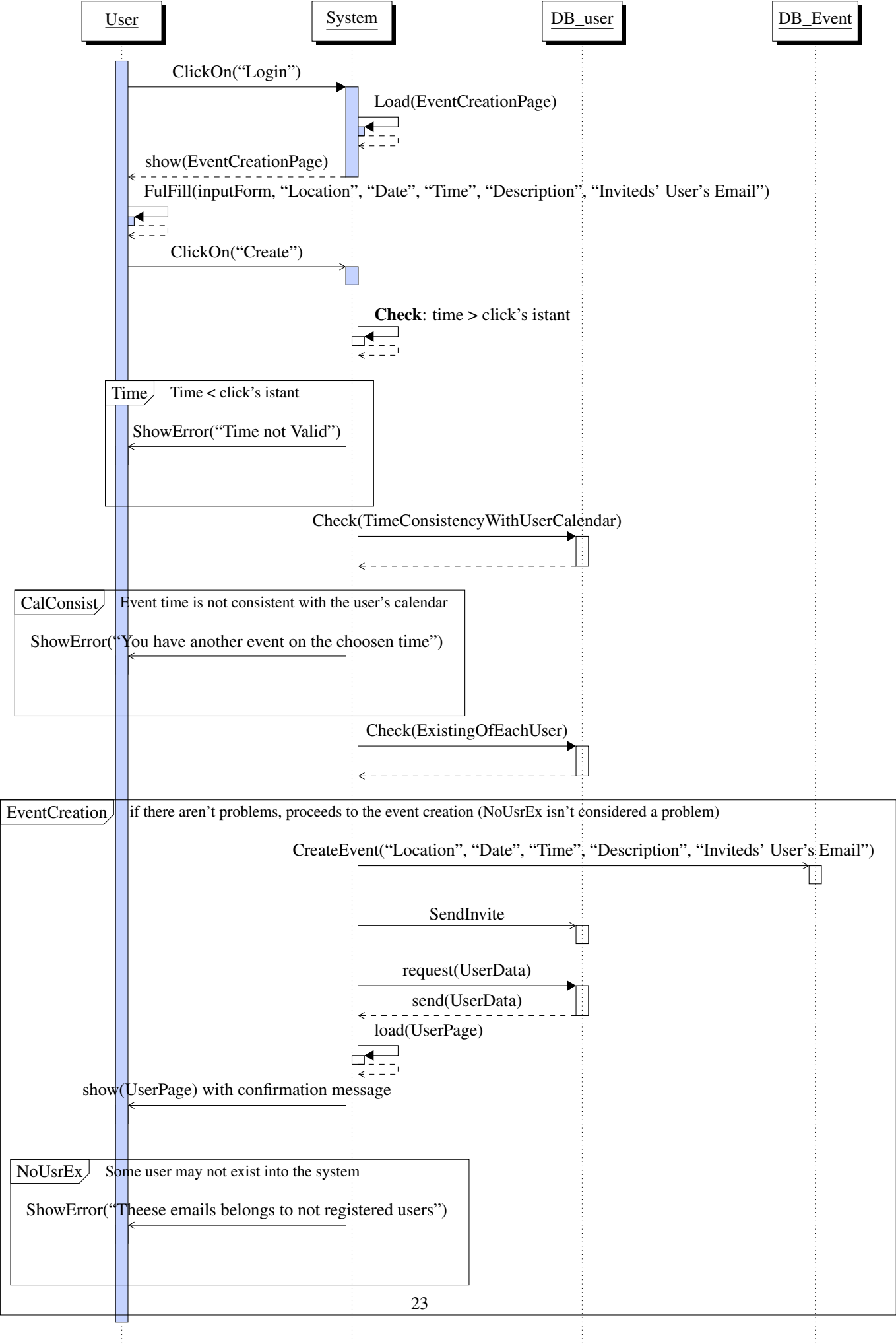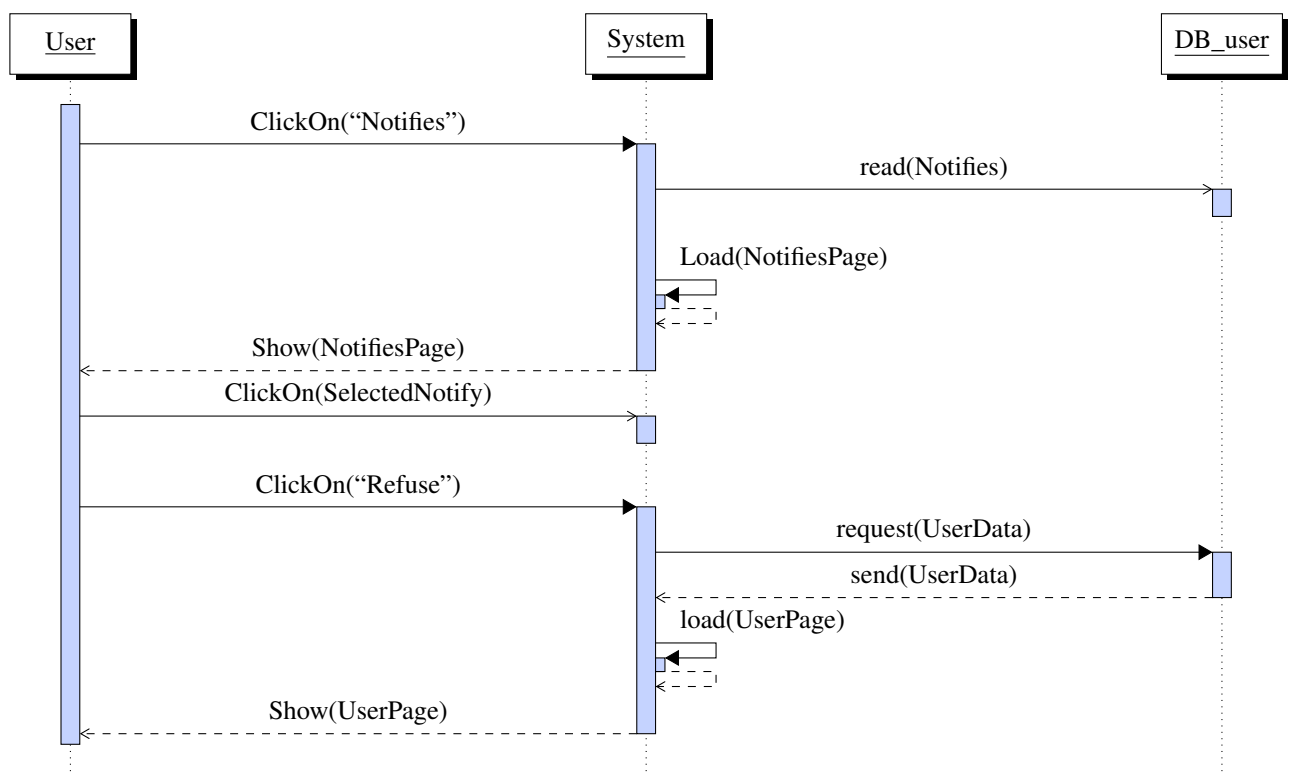
Event Creation

Decline Invitation

```
   User                          System                    DB_user
    │                               │                          │
    │  ClickOn("Notifies")          │                          │
    │──────────────────────────────▶│                          │
    │                               │      read(Notifies)      │
    │                               │─────────────────────────▶│
    │                               │                          │
    │                               │  Load(NotifiesPage)       │
    │                               │◀──┐                      │
    │                               │◀ ─┘                      │
    │      Show(NotifiesPage)       │                          │
    │◀ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ │                          │
    │  ClickOn(SelectedNotify)      │                          │
    │──────────────────────────────▶│                          │
    │                               │                          │
    │  ClickOn("Refuse")            │                          │
    │──────────────────────────────▶│                          │
    │                               │   request(UserData)       │
    │                               │─────────────────────────▶│
    │                               │     send(UserData)        │
    │                               │◀ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─│
    │                               │  load(UserPage)           │
    │                               │◀──┐                      │
    │                               │◀ ─┘                      │
    │      Show(UserPage)           │                          │
    │◀ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ │                          │
    │                               │                          │
```
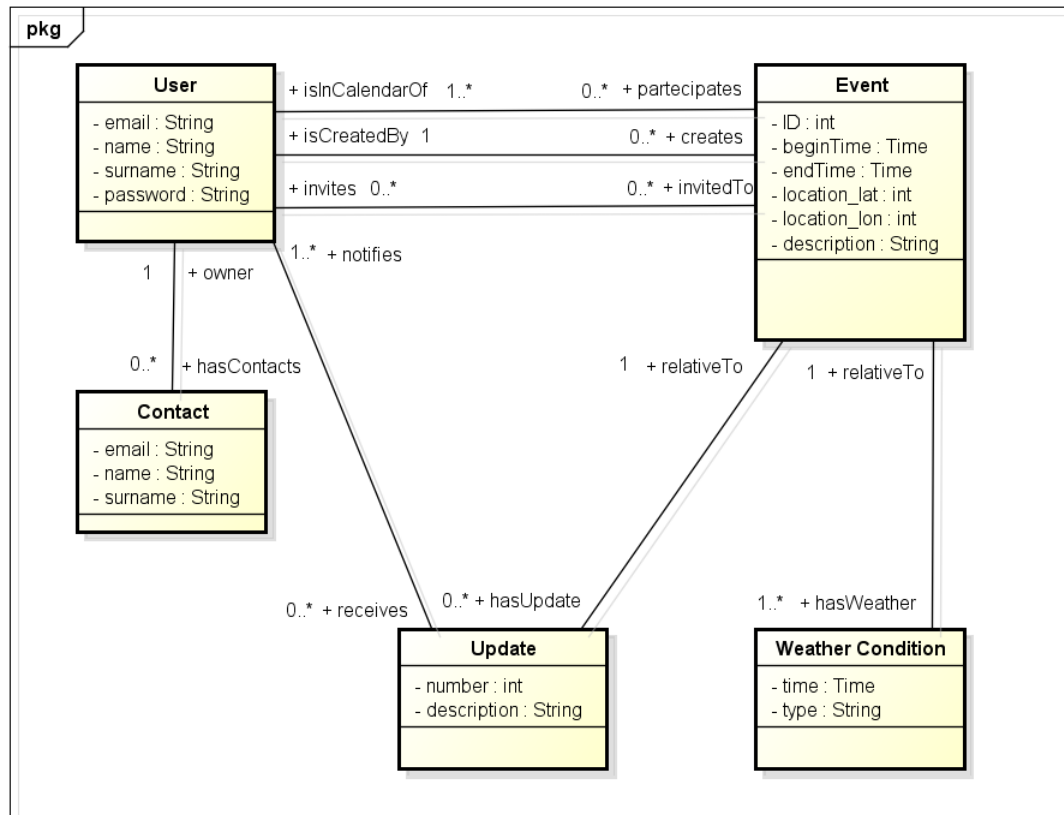
4.3 Class Diagram

5 Alloy Modelling

Listing 1: MeteoCal Alloy

```
1  module  MeteoCal
2
3  // empty SIGNATURES
4  sig  Text{}
5  sig  Email{}
6  sig  ID{}
7
8  //SIGNATURES
9
10 sig  User{
11     name : one Text,
12     surname : one Text,
13     email : one Email,
14     password : one Text,
15
16     partecipates : set Event,
17     creates : set Event,
18     invitedTo : set Event,
19     hasContacts: set Contact,
20     receives : set Update
21 }
22
23 sig  Contact{
24     name : one Text,
25     surname : one Text,
26     email : one Email,
27
28     owner: one User
29 }
30
31 sig  Event{
32     id : one ID,
33     beginTime : one Int,
34     endTime : one Int,
35     location_lat : one Int,
36     location_lon : one Int,
37     description : one Text,
38     isCreatedBy : one User,
39     hasWeather : some WeatherCondition,
40
41     isInCalendarOf : some User,
42     invites : set User,
43     hasUpdate : set Update,
44 }
45
46 sig  Update {
47     number : one Int,
48     description : one Text,
49     relativeTo : one Event,
50
51     notifies : some User
52 }
53
54 sig  WeatherCondition{
55     time : one Int,
56     type : one Text,
57     relativeTo : one Event
58 }
59
60 //FACT
61
62 fact  existanceOfElements {
63
64     //for each contact exists at least one user with that email
65     all c : Contact | some u : User | c.email = u.email
```

26

```alloy
66
67        // for each email exists at least one user with that email
68        all e : Email | some u : User | e = u.email
69
70        // for each ID exists at least one event with that ID
71        all i : ID | some e : Event | i = e.id
72
73        // for each update exists at least one event with that update
74        all u : Update | some e : Event | u in e.hasUpdate
75
76        // for each weather condition exists at least one event with that weather condition
77        all w : WeatherCondition | some e : Event | w in e.hasWeather
78
79 }
80
81 fact unicityOfRelation {
82
83        // not exists disjoined users with the same email
84        no disj u1,u2 : User | u1.email = u2.email
85
86        // not exists disjoined events with the same id
87        no disj e1,e2 : Event | e1.id = e2.id
88
89        // not exists disjoined contact of the same user with the same email
90        all disj c1,c2 : Contact | all u : User | (c1 in u.hasContacts and c2 in u.
       hasContacts)
91                                                  implies c1.email != c2
       .email
92
93        // not exists disjoined update of the same user with the same number
94        all disj up1,up2 : Update | all u : User | (up1 in u.receives and up2 in u.
       receives)
95                                                  implies up1.number !=
       up2.number
96
97 }
98
99 fact inverseRelations{
100
101        all u : User | all e : Event | e in u.partecipates <=> u in e.isInCalendarOf
102
103        all u : User | all e : Event | e in u.creates <=> u in e.isCreatedBy
104
105        all u : User | all e : Event | e in u.invitedTo <=> u in e.invites
106
107        all u : User | all c : Contact | c in u.hasContacts <=> u = c.owner
108
109        all u : User | all up : Update | up in u.receives <=> u in up.notifies
110
111        all up : Update | all e : Event | up in e.hasUpdate <=> e = up.relativeTo
112
113        all e : Event | all w : WeatherCondition | w in e.hasWeather <=> e = w.relativeTo
114
115 }
116
117 fact noOwnContact {
118
119        // for each user,event if a user has a contact, then the contact can't have the
       same email of the user
120        all u : User | all c : Contact | c in u.hasContacts implies c.email != u.email
121
122 }
123
124
125 fact timeConsistency {
126
127        all e : Event | e.beginTime < e.endTime
128
129 }
```

```
130
131  fact creatorHasEventInCalendar {
132
133       //for each user, for each event if the user is the creator of the event then
134       // the event is al least in the calendar of that user
135       all u : User | all e : Event | (u = e.isCreatedBy ) implies (e in u.partecipates)
136
137  }
138
139  fact inviteEvent{
140
141       //for each event,user, if the user is the creator of the event he is not invited
                to it
142       all e : Event | all u : User | (u = e.isCreatedBy ) implies (e not in u.invitedTo)
143
144       //for each event,user, if the user partecipates to an event and he is not the
                creator
145       //then he has been invited to it
146       all e : Event | all u : User | (e in u.partecipates and u != e.isCreatedBy )
147                                          implies (e in u.invitedTo)
148
149  }
150
151  fact contactConsistency {
152
153       all u : User | all c : Contact | c.email = u.email implies
154                                             (c.name = u.name and c.surname = u
            .surname)
155
156  }
157
158  //PREDICATES
159
160  pred addEvntToCalendar[u,u' : User, e : Event]{
161       u'.partecipates = u.partecipates + e
162  }
163
164  pred removeEvntFromCalendar[u,u' : User, e : Event]{
165       u'.partecipates = u.partecipates − e
166  }
167
168  //ASSERTS
169
170  assert eventInAtLeastOneCalendar {
171
172       all e : Event | some u : User | e in u.partecipates
173
174  } check eventInAtLeastOneCalendar
175
176  assert chkAddEvntToCalendar{
177
178       all e : Event | all u,u' : User | addEvntToCalendar[u,u',e] implies e in u'.
            partecipates
179
180  } check chkAddEvntToCalendar
181
182  assert chkRemoveEvntToCalendar{
183
184       all e : Event | all u,u' : User | (addEvntToCalendar[u,u',e] and
            removeEvntFromCalendar[u,u',e])
185                                                       implies u=u'
186
187  } check chkAddEvntToCalendar
188
189  //SHOWS
190
191  pred showContacts(){
192       #Event = 0
193  }
```
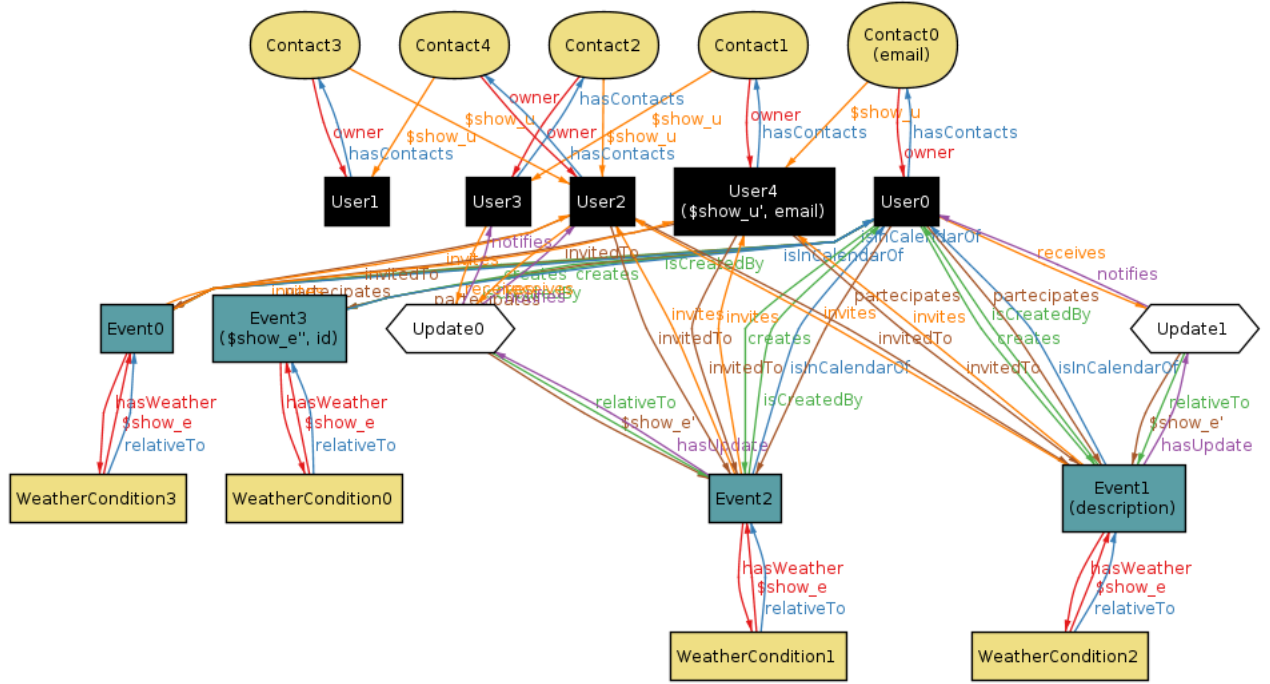
28

```
194 run showContacts for 5
195
196 pred showEvent(){
197     #Contact = 0
198 }
199 run showEvent for 3
200
201 pred show(){}
202 run show for 5
```

5.1 Generated World

In this paragraph we report some worlds generated by *Alloy Analizer* in order to make understand that our model is consistent.

We report below a general world generated, and three asserts verified with the *Alloy Analizer*. Further specific representations are reported below in order to better understand the characteristics of the model.

Assert Verification

5.1.1   Contact World

In this section is reported an example of smaller world about how contacts work.
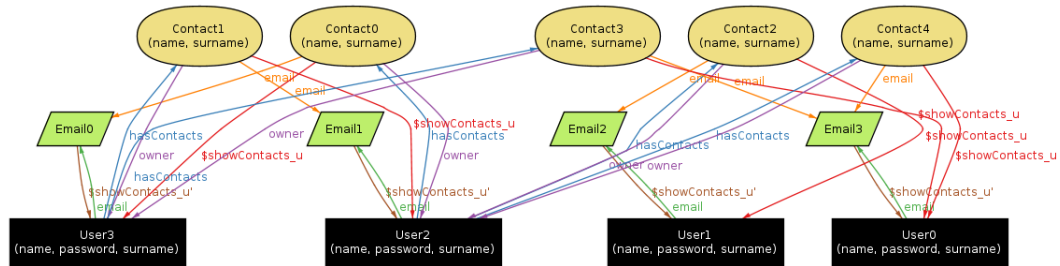
5.1.2   Event World

In this section is reported an example of smaller world about how events work.
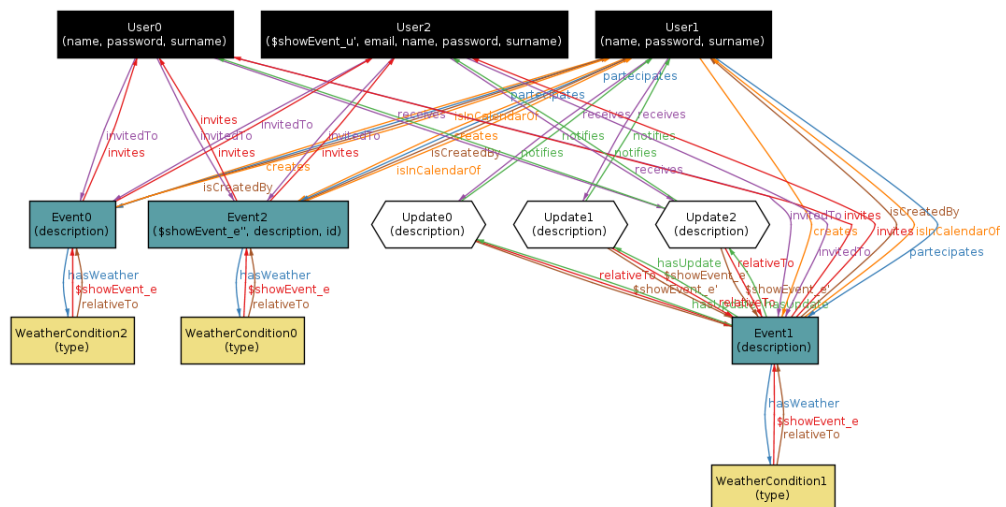
6 Working Hours Schedule

	Pensa	Pini	Pintus	h/sect
Problem Analysis	2	2	2	**6**
Non Functional Requirements	6	4	5	**15**
Functional Requirements	6	4	3	**13**
Alloy Specifications	4	9	8	**21**
h/pers	**18**	**19**	**18**	**55**

7 Changing History

2014/11/21:

- Layout
- Class Diagram
- Alloy

2015/01/21:

- Some functionalies (not the required) have been updated