Software Engineering 2 Project

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1 Introduction

1.1 Purpose

TrackMe is a company aiming to support interactions between users, who like keeping track of the health status and their activities, and third parties which can use data and enhance their value.

TrackMe app is composed of three main important service:

- Data4Help: basic support for health data;
- AutomatedSOS: add support for SOS services to elderly people;
- Track4Run: add support for running events.

Each of them will have as targets:

- Individuals users
- Third parties.

Since each service serves both the targets, the project consists of platform divided in a mobile application and a web-based interface to serve third-parties.

The system allows individual users to add and handle data on the app and to third parties to request and have access to these data.

In particular, a user of the application is able to keep track of his/her position during the activities but also during the normal day-life. The users' data are used to monitor the heartbeat and eventually to send an AutomatedSOS. Furthermore, TrackMe, is able to track all the athletes (that are using the application), during a run previously organised. Indeed TrackMe's app provide a section to setup a group run, specifying the path and other useful information.

1.2 Scope

1.2.1 Description of the problem

Nowadays a lot of persons track their activities with smartphone or smartwatch. For this reason TrackMe provide a new complete user experience allowing all the user to read briefly all the information about all activities' history. It's also provided a service to organise a group run, during which it's possible to monitor all the athletes information. Furthermore all the users are monitored and, in case of some trouble, an SOS will be launched.

1.2.2 World Phenomena

- *General user's health condition*: the machine doesn't know the information about possible user's disease.
- *First aid services status*: the machine doesn't know the actual first aid services status.
- *Overall third parties knowledge status*: the machine doesn't know which informations third parties already have about users.

1.2.3 Machine Phenomena

- *Third-parties registration*;
- *User's registration*;
- *Data anonymisation*.

1.2.4 Shared Phenomena

- *Vital parameters*: the machine can read vital parameters of the user such as BPM.
- *User's location*: the machine knows or can read actual and past user's location.

1.2.5 Goals

[G1] Users can be recognised by their credentials.

[G2] Allow users to keep track of their health data.

[G3] Allow users to have access to an overview of their data, including health parameters and performed activities.

[G4] Allow users to manage their data access policy.

[G5] Allow users to monitor their performance during run workouts.

[G6] Each time vital signs go below a threshold value, first aid services have to be notified.

[G7] Allow users to organise running events.

- [G7.1] Allow users to create running events.
- [G7.2] Allow users to en-roll to events.
- [G7.3] Allow spectators to follow participants' live position during events.

[G8] Allow third parties to access data:

[G8.1] Allow third parties to require access to specific user data.

[G8.2] Allow third parties to retrieve anonymised aggregated data.

[G8.3] Allow third parties to subscribe to da

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

- **Event:** An event organized by a user (*e.g scenario 3.6.3).*
- **Notification:** A warning that advise the user of a request by third parties.
- **AGGIUNGERE ALTRO?**

1.3.2 Acronyms

- API: Application Programming Interface;
- ASOS: AutomatedSOS;
- BPM: Beats Per Minutes;
- D4H: Data4Help;
- RASD: Requirement Analysis and Specification Document;
- T4R: Track4Run.

1.3.3 Abbreviations

- [Gn]: n-th goal
- [Dn]: n-th domain assumption
- [Rn]: n-th functional requirement

1.4 Revision history

- 1.0.0 Initial version (10-11-2018)

1.5 Reference Documents

1.6 Document Structure

2 Overall description

2.1 Product perspective

2.1.1 Class Diagram

The product perspective of TrackMe is now explained using the UML paradigms. The main classes of the UML are:

- **User** contains all the information about a user like username, password, fiscalCode, hometown, elderly, runners.
- **ThirdParties** contains all the information about the registered organisation.
- **Data** is an abstract class that has two concrete classes: **Health data** and **Location data**
- **Running Event**
- **Location** contains information like the start point and the end point of a running event.

A user creates an Event specifying the path ie the starting location, the ending location and some specific interesting point along the path. After the creation some user can join in. An organisation, as explained above, can subscribe to a feed of data or directly to a single user.

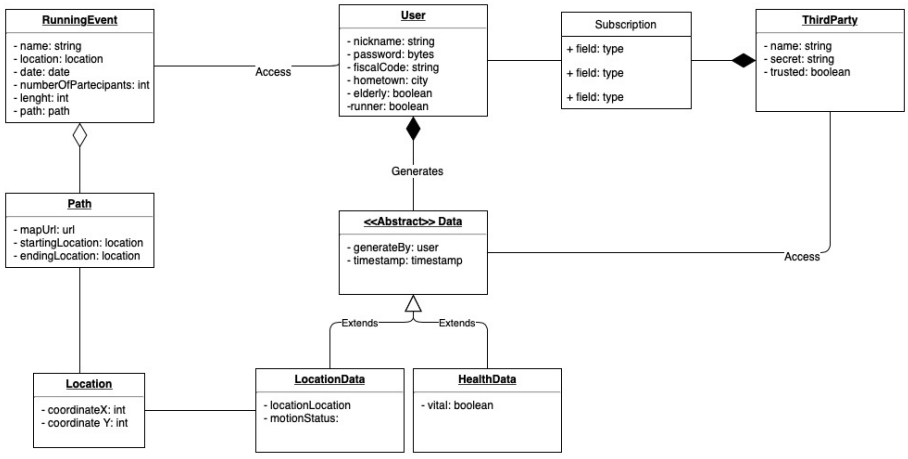

Figure 1: UML diagrams.

2.1.2 State Diagram

The whole system can be also seen as a set of different services relying on the main module Data4Help. Here we describe the main aspects of them with state diagrams.

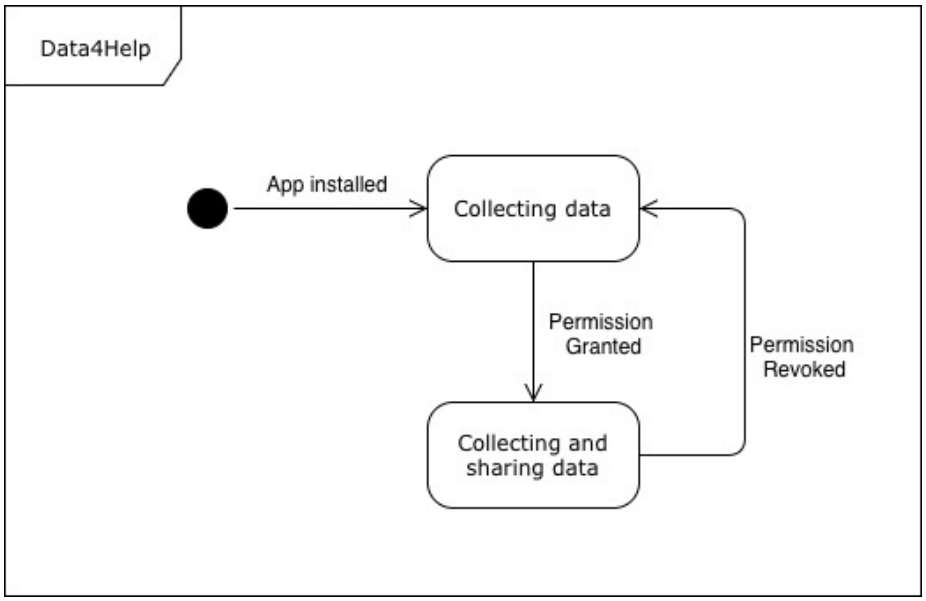

Figure 2: Basic Data4Help service state diagram.

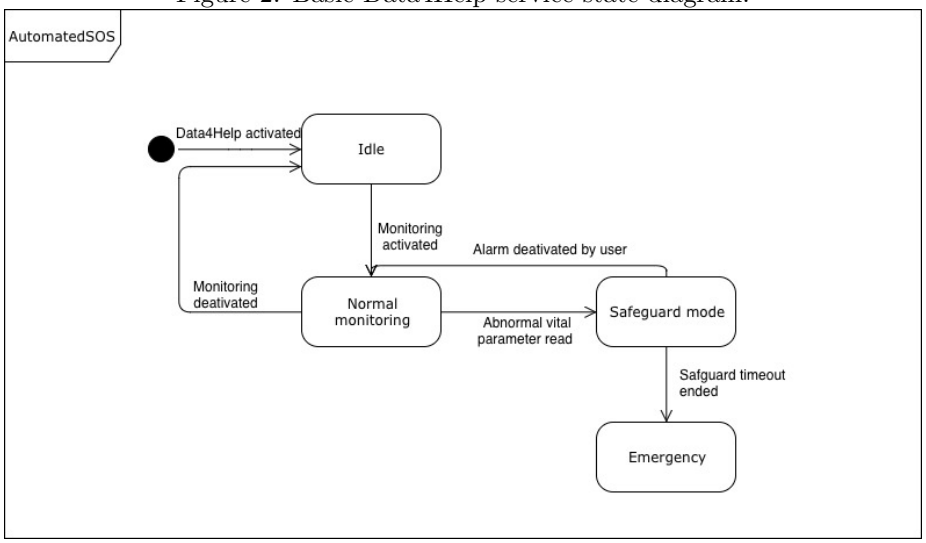

Figure 3: Automated SOS state diagram.

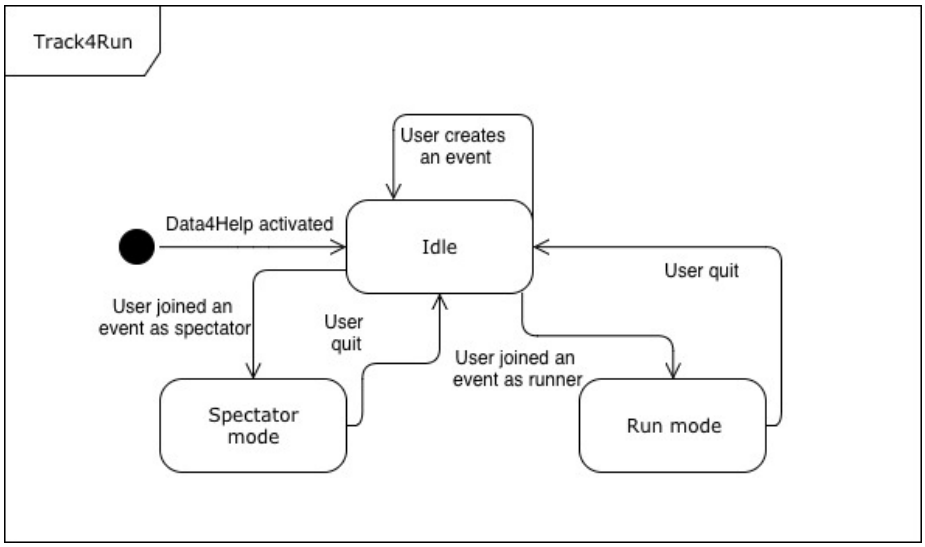

Figure 4: Track4Run state diagram

2.2 Product functions

The software developed by TrackMe included three different services: Data4Help supports user's data acquiring through smartwatches or similar devices, AutomatedSOS, a personalised and non-intrusive SOS service for elderly people and Track4Run, a service to track athletes participating to a run. Data4Help is also a service available for third-parties: in fact, organisations can request data to TrackMe and collect them for pursuing their objectives. Data acquisition can be performed in two different way: directly to a single user or to a groups of individuals. Concerning the single user case, companies, through a social security code, ask permission to access the corresponding information. In the other case, organisations can request, directly to TrackMe, data of group of individuals with particular proprieties (e.g. users between 20 and 30 years old or living in a certain district). In the latter, TrackMe provides data only if it can anonymised them correctly. AutomatedSOS it's great for those elderly people who want to monitor their health status and have the support of an ambulance in case their vital parameters are under certain thresholds. Track4Run it's a service dedicated to the runners: it offers the possibility to organise a run between other runners, define the path and the duration, allowing the invited ones to en-roll. In addition, Track4Run users who do not partecipate to the run can see live time on a map the position of all the runners. Finally, Track4Run supports the synchronisation of data with Data4Help.

All the goals presented in section 1.2.5 are going to be implemented. Here we describe deeply the requirements needed to implement application's functions.

[R1] Users can create an account with credentials.

[R2] Credentials can be retrievable also if forgotten/lost.

[R3] Users can log manually or automatically their data.

[R4] Users have to be able to accept/deny access to single data access request.

[R5] Users have to be able to see current data policies and to change them.

[R6] The machine has to be able to read health and position data.

[R7] The machine has to be able to recognise below threshold parameters.

[R8] The machine has to be able to communicate with third parties.

[R9] The machine has to be able to recognise data fragmentation level

[R10] The machine has to be able to store users' data.

2.3 Users characteristics

Users: any person that will use the service to keep track of health data, positioning or automated SOS during any kind of activities (walking or running during a lone run or an organised event).

Third parties: Organisation or other parties interested in the acquisition for their usage of the data provided by the user activities.

2.4 Assumptions, dependencies and constraints

2.4.1 Domain assumptions

[D1] Data manually logged by users well describes reality.

[D2] First aid services are ready to handle emergency notifications.

[D3] Data inserted by users are truthful

- [D3.1] Data are up to date.
- [D3.2] Data are correctly formatted.

[D4] Running paths proposed by users are well formed (e.g: legit by law).

[D5] External services are reliable.

3 Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

3.1.2 Hardware Interfaces

The system requires one or more dedicated servers for data management and for handling communication between users and third-parties.

3.1.3 Software Interfaces

- **Data4Help**
  User's health data can be inserted in Data4Help section of the application manually or automatically synchronised with data acquired by individual's wearable device with HealthKit API provided by Apple.
  Third-parties can access to the different data through a web-based interface in which, in case the organisation is interested to the information of some specific individual, can select the single user by his/her fiscal code and send to him/her the request of data's visualisation; instead, in the case of interest in accessing data of groups of individuals, companies can select the parameters of interest and send to TrackMe the request on hold for a positive response.
  Data4Help also offers the integration with ResearchKit and CareKit APIs, also provided by Apple, to help third-parties to access more relevant data for their studies.

- **AutomatedSOS**
  Similarly as Data4Help, AutomatedSOS automatically synchronises data acquired from user's wearable device and monitors them to guarantee the safety of elderly people.
  In case of emergency, an ambulance will reach the location of the costumer: AutomatedSOS uses Google Maps API to show live-time the position on the map of the arriving ambulance.

- **Track4Run**
  Since Track4Run aims to schedule and organise runs for the users of the service, it makes use of Google Calendar API to allow individuals to create and en-roll races. Also, for users not taking part of runs, Track4Run supports Google Maps API for live-tracking the position of the participating runners.

3.1.4 Communication Interfaces

3.2 Functional Requirements

3.3 Performance Requirements

3.4 Design Constraints

3.4.1 Standards compliance

The software application should handle a big amount of data, stored online on servers. It also should manage a great number of simultaneous requests when, in example, third-parties ask to access data or during the period of enrollment to a run.
The services offered by TrackMe should also work in background and not only when the application is open.

3.4.2 Hardware limitations

TrackMe is a software application available only on iOS devices. It requests an internet connection (WiFi, 2G, 3G, 4G/LTE) and GPS connectivity.
Some functionalities are available only for the owners of wearable devices.

3.4.3 Any other constraint

The application needs to access to the current position of the user. It also may need to access individual's contact list to easily find possible user's friends.

3.5 Software System Attributes

3.5.1 Reliability

The application and the external services offered by the application must be available 24/7.
Servers' maintenance, communicated to the user in advance and only during determined hours of the day, is the only exceptions accepted.

3.5.2 Availability

TrackMe services are available only in Italy for free.

3.5.3 Security

3.5.4 Maintainability

3.5.5 Portability

3.6 Scenarios

3.6.1 Scenario 1

Tim has to sustain an important medical exam aimed to discover if he suffers or not of tachycardia. He has available the latest model of smartwatch that supports the EGC monitor so his doctor suggests to use Data4Help to monitor for 24/48 hours his heart rate. Data4Help allows Tim to just use his smartwatch, instead of the classic Dynamic ECG machine, for registering his heart's data in the app so that his doctor, after committing a request to Tim through his fiscal code, can examine the results after few hours by the end of the test and give to Tim a response in a very short time.

3.6.2 Scenario 2

Fitness & More is a brand new sport center situated near a very big residential area with many educational institutions from elementary to high schools. The centre offers swimming and tennis lessons with expert instructors and also a well supplied gym with personal coaches.
Fitness & More asks to TrackMe the access to weight and height data of kids between 6 and 19 year old who live in the above mentioned area to make an analysis of the presence of overweighted individuals and so sponsor its sport center.

3.6.3 Scenario 3

The next PolimiRun will be held on the 11th of November in Lecco. Polisport, the sport organisation of the Politecnico di Milano, decided to arrange a few workouts for the runners who are attending the competition and so they suggest to use Track4Run to manage the path of the workouts around the city of Milan and also to let runners en-roll the training sessions.

4 Formal analysis using Alloy

5 Effort spent

6 References