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TrackMe

Requirement Analysis and Specification Document
(RASD)

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Chapter 1

Introduction

1.1 Purpose

This document will provide an analysis of requirements and specifications of three new services the *TrackMe* company is willing to launch.
TrackMe is a company that wants to develop a software-based service allowing Third-parties to monitor the location and health status of individuals. Said services are described below.

1.1.1 Data4Help

Data4Help allows *TrackMe* to gather data from Users and to provide them to Third-parties upon request. In particular, it has the following goals:

[G1.1] Third-parties have to be able to monitor the location and health status of Individuals.

[G1.2] Third-parties have to be able to request data of an Individual through his/her fiscal code.

[G1.3] Third-parties have to be able to request data of groups of Individuals.

[G1.4] Third-parties have to be able to subscribe to user data, specifying the frequency of updates and the desired granularity of data.

[G1.5] Individuals have to be able to decide whether share their not anonymised data (gathered through smart devices) or not and to see what they are sharing to whom.

1.1.2 AutomatedSOS

AutomatedSOS lets Third-parties provide assistance to Elderly people in case of sudden illness by sending them an ambulance. Hence, its goals are:

[G2.1] Elderly people's health status has to be constantly monitored.

[G2.2] An ambulance has to arrive to Elderly people's location when their vital signs go below a certain threshold.

1.1.3 Track4Run

Track4Run allows the organisation of runs, the subscription to them and the tracking of runners through *Data4Help* gathered location. These are the objective the service aims to achieve:

[G3.1] Organisers have to be able to define the details of runs.

[G3.2] Runners have to be able to enrol to runs.

[G3.3] Visitors have to be able to track Participants' position on a map.

1.2 Scope

Nowadays being able to retrieve users data is very important for many companies operating in several fields (think about insurance, health, fitness...), since it allows them to provide assistance, tailor their services to the user, and so on. With the rising amount of smart devices capable of gathering data from the wearer, this necessity could easily be satisfied: smart-watches and fitness bands are being refined and they are also becoming more affordable.

On the other hand, there is the need to ask permission to the users to be allowed to exploit their data and they have to be informed about what is being gathered and who is requesting it, especially with the recent the introduction of GDPR (General Data Protection Regulation) in Europe.

TrackMe is willing to satisfy these necessities through ***Data4Help***, a service capable of balancing users' privacy with companies' need of data. This will be done allowing both Individuals and Third-parties to register to the service, so that the latter can perform requests over the former, which can accept or refuse them. Moreover, *TrackMe* wants to launch two more services exploiting ***Data4Help***'s framework:

- ***AutomatedSOS***, a software dedicated to elderly people that will call an ambulance whenever the health signs of the person (gathered through ***Data4Help***) are below a critical threshold;
- ***Track4Run***, a software for runs organisation, where spectators can follow the participants thanks to the localisation provided by ***Data4Help***.

1.3 Definitions, Acronyms and Abbreviations

In this section the definitions, the acronyms and the abbreviations used throughout the document are explained in detail.

1.3.1 Definitions

- **Application, Software**: these terms refer to *Data4Help*, *AutomatedSOS* or *Track4Run*, depending on which of them is being described, in their entirety (design and implementation alike).
- **Health status:** this expression refers to the status of the Individual inferred from the health signals gathered through smart devices.
- **Maps, Map service:** these terms refer to Google's map service, Google Maps.
- **Query, group search:** these terms refer to the data requested by Third-parties through *Data4Help* involving a group of Individuals.
- **Smart devices:** the ones taken into consideration are smart-watches and fitness-bands.
- **Subscription:** this term refers to the request of continuously updated data performed by a Third-party. Such data can belong to an Individual or may refer to a group search.
- **User:** this term refers to all possible customers of *TrackMe*, such as Individuals, Third-parties, Elderly people, Organisers, Runners, Visitors (see section 2.3 for further details).

1.3.2 Acronyms

- **R.A.S.D.:** Requirement Analysis and Specification Document.
- **A.P.I.:** Application Programming Interface.

1.3.3 Abbreviations

- **D4H:** *Data4Help*.
- **ASOS:** *AutomatedSOS*.
- **T4R:** *Track4Run*.
- **[D.1.k]:** *Data4Help*'s k-th domain assumption.
- **[D.2.k]:** *AutomatedSOS*' k-th domain assumption.
- **[D.3.k]:** *Track4Run*'s k-th domain assumption.
- **[D.2-3.k]:** *AutomatedSOS*' and *Track4Run*'s k-th domain assumption.
- **[G.1.k]:** *Data4Help*'s k-th goal.
- **[G.2.k]:** *AutomatedSOS*' k-th goal.

- **[G.3.k]:** *Track4Run*'s k-th goal.
- **[R.1.k]:** *Data4Help*'s k-th requirement.
- **[R.2.k]:** *AutomatedSOS*' k-th requirement.
- **[R.3.k]:** *Track4Run*'s k-th requirement.

1.4 Revision History

Version	Comments
1.0	First delivery of RASD

Table 1.1: Revision history table

1.5 Reference Documents

1. Specification document: *Mandatory Project Assignment A.Y. 2018-2019. pdf*
2. Software Engineering 2 course slides
3. Previous mandatory project examples:
   3.1. Specification document: *Mandatory Project Assignment A.Y. 2017-2018.pdf*
   3.2. *RASD to be analyzed.pdf*
4. 29148-2011 - ISO/IEC/IEEE International Standard - Systems and software engineering – Life cycle processes –Requirements engineering

1.6 Document Structure

The structure of this RASD documents follows IEEE standard for the most part, therefore it is divided into six chapters:

1. Introduction
2. Overall description
3. Specific Requirements
4. Formal Analysis using Alloy
5. Effort Spent
6. References

The overall aim of this document is to state what are the requirements of the software *TrackMe* wants to develop.

In the first chapter a general overview of the purpose of the software-to-be has been provided, together with the description of the context in which it is going to operate. Being an introductory chapter, all the terminology that will be used in the rest of the document has been clearly defined.

In the second chapter a broader description of the software is provided. Here, a class diagram that specifies the relations of the software-to-be with the world can be found, together with the detailed definition of the the assumptions made, the users of the software and its functions.

The third chapter delves into the details of the specification, talking about the various interfaces offered by the software-to-be, defining both its functional requirements through use cases, sequence and activity diagrams, and its non-functional requirements, along with the constraints it has to respect. In this part, differently from the IEEE standard, the description about Performance Requirements is included with the other System Attributes, in order to make the document more homogeneous.

The fourth chapter presents the formal analysis of the most critical parts of the software-to-be using an Alloy model, also showing a world obtained by running such model.

The fifth chapter contains the effort spent by each member of the group in order to realise the RASD.

In the sixth and last chapter all the sources of information exploited to write the present document are listed.

Chapter 2

Overall description

2.1 Product perspective

The application will offer some services based on data gathered from individuals. In particular, the three services are the following:

- The *Data4Help* service has as the main goal of providing user data to Third-parties, allowing them to know their position and health status. To do that, the Individuals have to collect their data through smartwatches and allow the system to store them. Upon successful requests, the system provides Third-parties with the already collected data and will send the new data according to the frequency of updates and granularity specified during the request compilation, if a subscription is performed. At any time, Third-parties can unsubscribe, in this way they won't receive updates but but they can still access already gathered data, relative to past requests.

- The *AutomatedSOS* service has as the main goal of offering an SOS service to Elderly people. To do that, the system accepts Elderly people subscriptions in order to collect and analyses data gathered by their *Data4Help* account. In case of critical health values, the system sends the exact position to the ambulance service, in order to send an ambulance to the rescue.

- The *Track4Run* service has as the main goal of organising runs. The system allows organisers to define all details of a run: path, starting date and time, maximum number of participants. After the creation of a run, people registered to *Data4Help* service can enrol to the race simply through their D4H account. In order to not exceed the maximum participants number, the software keeps track of the number of runners already enrolled. During the competition, everyone (an account is not needed) can monitor on a map the exact position of all runners; at the end of the race,

the system stores the rankings to make it available in the future to both participants and organisers.

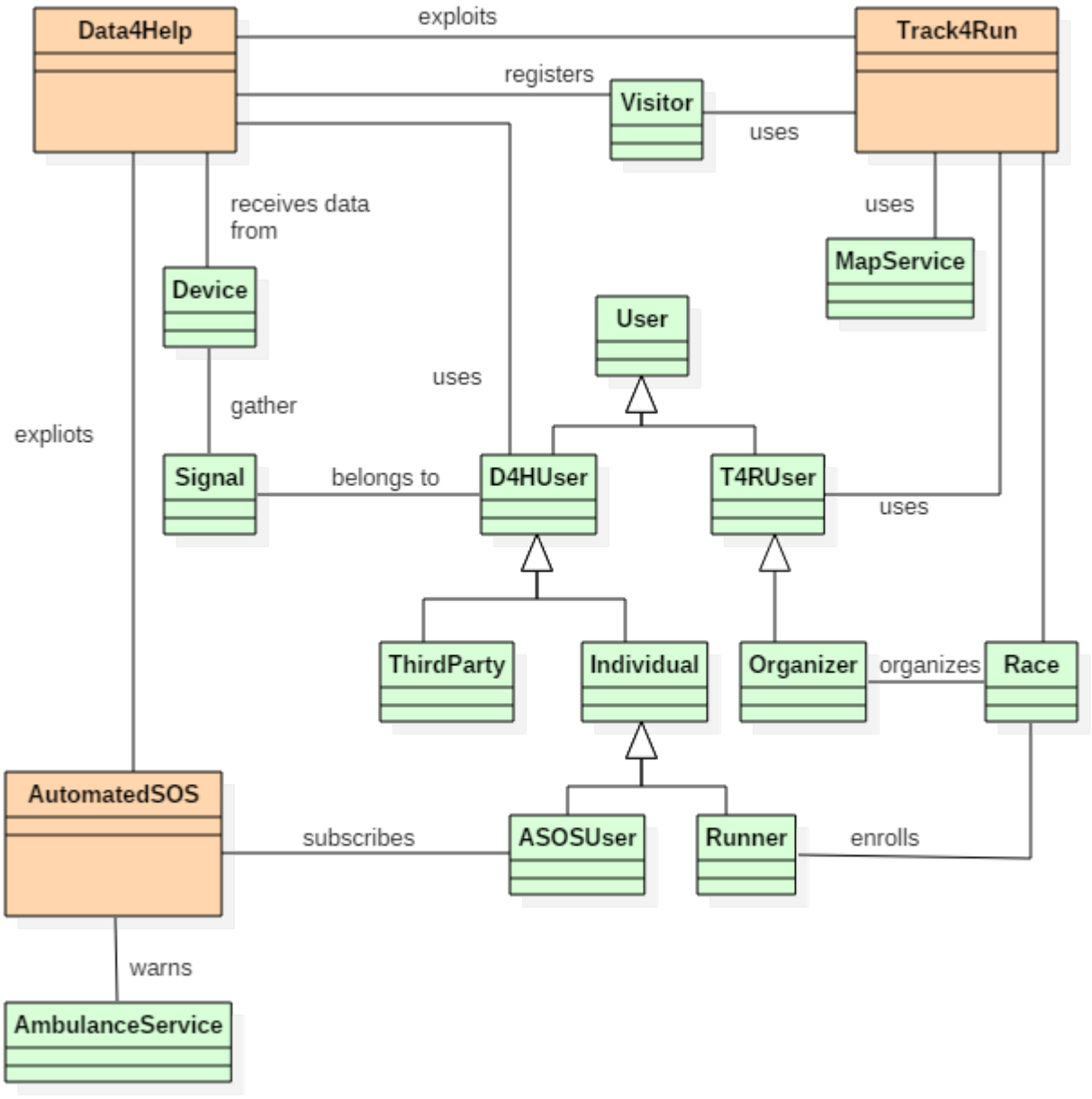

Figure 2.1: Class diagram of the entire system

2.2 Product functions

In this section there is an analysis of functional requirements (group by three main services) that the application need to reach the main goals.

2.2.1 Data4Help

[R1.1] During registration, the system requires name, surname, fiscal code, password and email in order to create a new user account.

[R1.2] During registration, the system requires the company name, VAT number, email and password in order to create a new third-party account.

[R1.3] The application retrieves from smart-watches the following data, associating them to the user:

- beats per minute (bpm);
- number of steps;
- location;
- time-stamp of the measurement.

[R1.4] The system allows to third-parties to request data of single users and to users to accept or refused them.

[R1.4.1] If the user accepts, the system send to third-party all the data gathered from the specified user.

[R1.4.2] If the user refused or he is not registered, the system sends to third-party an error message.

[R1.5] Upon third-parties request, the system can perform parametric searches based on geographical areas, age, genre, time of the day. The result of the query is then stored and evaluated for approval.

[R1.5.1] If the request is approved, the saved data is provided to third-party.

[R1.5.2] if the request is not approved, an error message is sent to the third-party.

[R1.5.3] In order to anonimize data, the application only sends information related to the health status of individuals (e.g. bpm, step).

[R1.6] The application allows third-parties to subscribe to certain date

[R1.6.1] The application, if third-party subscribed to some data (specific users or group searches), sends updates to the third-party aggregating the data with the specified granularity and frequency.

[R1.7] The application allows withdrawals of consent for accessing their data and third-party unsubscriptions.

- [R1.7.1] If the user withdraws consent for the access of his data, a message is sent to the subscribed third-party and data is no longer provided.
- [R1.7.2] If the third-party no longer wishes to collect data from a specific user, a message is sent to him and his data is no longer sent.

[R1.8] The system allows to third-parties to access to their request history and results.

[R1.9] The system allows to users to check gathered data.

2.2.2 AutomatedSOS

[R2.1] The system has to analyse user date and sends the location of the user to the ambulance service in case of emergency, when health values goes under the threshold.

[R2.2] The system gives the possibility to subscribe to the service upon request, only after checking the user age.

2.2.3 Track4Run

[R3.1] The system allows participants to enrol just with their Data4Help account.

[R3.2] The system allows the enrolling of runner only if they are not enrolled in a race at the same time.

[R3.3] The system allows spectators to access the application as host-users, without registration, by giving them only the possibility to track the runners.

[R3.4] The system store the ranks of old races so that both participants and organisers can access to the race history.

[R3.5] The system should allow the registration of organisers without requiring also Data4Help registration,

[R3.6] In order to organise a run, the application requires track, data, time and the maximum number of participants.

[R3.7] The system need to update subscription to the runs, decreasing the number of allowed participants. It should not allow subscription if there are not leftovers places.

[R3.8] The system shouldn't allow that two or more runs are organised neither at the same place and at the same time.

2.3 User characteristics

The main actors who interact with the application will be presented under this section.

- *Visitors*: They are not registered users, the system allows them to register through a sign up service either to Data4Help, becoming individuals or third-parties, or to Track4Run, becoming organizers. The application lets them also to be spectators of a run organized with Track4Run service.
- *Individuals*: They are single users registered to Data4Help service. It means that the system lets them to sign in, in order to interact with the application either to accept or refuse the third-party single user requests or monitor their acquired data.
- *Third-parties*: They are companies that are registered to Data4Help. Also in this case, the application provides a sign in service, so as to let companies to interact and perform single and groups requests.
- *Ambulance service*: The software has to interact with the ambulance service to provide a non–intrusive SOS service to elderly people, in case of illness. The application sends the exact position where the ambulance has to go.
- *Elderly people*: They are Individuals, the software allows them to subscribe to an SOS service provided by AutomatedSOS, through their Data4Help account (they must have one).
- *Map service*: The application needs to interact with the map service, such as *Google Maps*, in order to let visitors and users to see on a map the position of all runners during the run.
- *Organizers*: They are companies that are registered to Track4Run service. The system provides them a sign in interface and, after login, lets them organize runs. They don't need to be registered to Data4Help.
- *Runners*: They are individuals, the application makes them able to enroll in a race through their Data4Help account (they must have one).

2.4 Assumptions, dependencies and constraints

In this section all the domain assumptions made in order for the software-to-be to work are listed, together with the dependecies and the constraints it has to respect.

2.4.1 Domain assumptions

It is assumed that the following properties hold in the world.

Data4Help

[D1.1] Data sampling is frequent enough.

[D1.2] Acquired data is precise enough.

[D1.3] Each Individual can be identified unambiguously through his/her fiscal code.

[D1.4] One anonymized, data cannot be associated to specific Individuals.

[D1.5] Every interaction gets correctly encoded.

[D1.6] Third-partied group queries are accepted only if the number of results is greater than 1000.

[D1.7] Third-parties are assumed to be companies that want to gather data, therefore they have a VAT code.

[D1.8] Third-parties know the fiscal code of the Individual they are looking for.

AutomatedSOS

[D2.1] An ambulance service capable of handling requests exists.

[D2.2] The threshold below which a person is considered to be in need of help is under XXX bpm.

[D2.3] Elderly people are over 65 years old.

[D2.4] The service is offered in Italy (118 is the emergency number for the ambulance service).

Track4Run

[D3.1] Maps and tracking services are accurate enough.

[D3.2] The defined path exists.

2.4.2 Dependencies

It has to be noted that both *AutomatedSOS* and *Track4Run* need *Data4Help* in order to work. In particular, from the point of view of the two applications, these assumptions have to hold:

[D2-3.1] Customer has to be registered to *Data4Help*.

[D2-3.2] User data is gathered through *Data4Help*.

[D2-3.3] Data gathered through *Data4Help* is valid.

Moreover, the services refer to Google Maps for the provision of maps.

2.4.3 Constraints

A smart-watch or a fitness-band are needed in order to use the software and the health data provided is limited to what can be gathered from these devices and to what can be directly calculated from their measuring.

Chapter 3

Specific Requirements

Chapter 4

Specific Requirements

Chapter 5

Formal analysis using alloy

Chapter 6

Effort Spent

6.1 Alessia Buccoliero

DATE	Number of hours	TOPIC
15/10/2018	2	Work Organisation
16/10/2018	3	General discussion and introduction writing
21/10/2018	3,5	Goals and domain assumptions sketch
23/10/2018	4,5	Goals and domain assumptions revision and requirements analysis discussion
24/10/2018	1,5	Goals, domain assumptions and requirements review
26/10/2018	3,5	Class diagram and use cases definition
27/10/2018	3	Chapter 2: Overall description
28/10/2018	1,5	Chapter 2: Overall description

Table 6.1: Alessia Buccoliero's working hours

6.2 Emilio Corvino

DATE	Number of hours	TOPIC
15/10/2018	2	Work Organisation
16/10/2018	3	General discussion and introduction writing
21/10/2018	3,5	Goals and domain assumptions sketch
23/10/2018	4,5	Goals and domain assumptions revision and requirements analysis discussion
24/10/2018	1,5	Goals, domain assumptions and requirements review
26/10/2018	3,5	Class diagram and use cases definition
27/10/2018	1,5	Chapter 1: Introduction (Purpose)
28/10/2018	1,5	Chapter 1: Introduction (Scope)
29/10/2018	2,5	Chapter 1: Introduction
30/10/2018	1	Chapter 1: Introduction, finalisation and refinement
31/10/2018	0,5	Chapter 2: Assumptions, dependencies and constraints

Table 6.2: Emilio Corvino's working hours

6.3 Gianluca Drappo

DATE	Number of hours	TOPIC
15/10/2018	2	Work Organisation
16/10/2018	3	General discussion and introduction writing
21/10/2018	3,5	Goals and domain assumption sketch
23/10/2018	4,5	Goals and domain assumptions revision and requirement analysis discussion
24/10/2018	1,5	Goals, domain assumptions and requirements review
26/10/2018	3,5	Class diagram and use cases definition
28/10/2018	2	D4H Alloy design
29/10/2018	1,5	Use case relative to G1.2 definition and D4H Alloy design
30/10/2018	4	D4H Alloy design and implementation

Table 6.3: Gianluca Drappo's working hours