

TrackMe project - Argiro' Anna Sofia, Battaglia Gabriele, Bernardo Casasole

Design Document

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Download page: https://github.com/BernardoCasasole/ArgiroBattagliaCasasole.git

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1. Introduction

1.1 Purpose

1.2 Scope

Data4Help means to provide services to authenticated users only. Those services are addressed to both:

- Individual Users
- Third parties Users

To dispatch specific functionalities to the user they are reserved, Data4Help System avails itself of:

- a Mobile App, reserved to individual users
- a Web Page, reserved to third party users.

The mobile app, using the GPS location provided by the smartphone, allows the individual user to:

- check his own health parameters (measured by a smartwatch)
- enable and disable additional services (AutomatedSOS and Track4Run)
- give or deny authorization to every third party to access health data about himself.

Data4Helps System handles both data of the past and real time ones. The web page allows the Third-party user to:

- make requests for statistical data of the past or real time
- make a request for individual data of the past or real time (the request is forwarded to the individual user)
- organize and watch run competitions.

This factorization allows the system to be accurate in providing every user with all and only resources he has the right to access: authentication and authorization processes rely on the access control.

The necessity to use a mobile app could prevent third parties from choosing Data4Help over other services of data collection: Data4Help Web Page can be easily accessed from a browser hosted on a computer or a mobile.

1.3 Definitions

- User: a person, third-party or user, that has registered;
- Individual User: every registered person from whom the system collects data;
- Third-Party User: every entity registered with the purpose to request data for external use;
- Live Data: the data on a IU produced in real time.
- Stored Data: the data on a IU collected so far.
- Data Request: a request for data made from a TPU.
- Stored Data Request: a data request for stored data.
- Subscription Request: a request for subscribing to newly generated data.

1.4 Acronyms

- API: Application Programming Interface
- TPU: Third-party User
- D4H: Data4Help
- ASOS: AutomatedSOS
- T4R: Track4Run
- UX: User experience

1.5 Abbreviations

• Ab: abbrevation

1.6 Revision history

- v0.1 27/11/18 Document created
- **v0.2 30/11/18** Component view
- v0.3 2/12/18 Model diagrams, User inteface and High level overview

1.7 Document Structure

Introduction

Architectural Design

User Interface Design

Requirements Traceability

Implementation, Integration and Test plan

Effort Spent

References

2. Architectural Design

2.1 Overview

The architecture style used is a client/server structure with multiple tiers while an event-backbone will handle the dispatch of live data through the system. The presentation layer will be hosted on both client (IUs and TPUs clients) while the application server will host the logic layer and the database server the data layer. The IU client is going to be a thick client, hosting a brach of the application logic to handle better and faster the system functionalities.

Cloud server solutions, over local servers, are the ideal fit for system having variable demands and workload as Data4Help and meet the following needs:

- to avoid hardware faults: improving availability
- to enhance security
- to only pay for the exact amount of server space used
- minimization of data losses and recovery time.

Google cloud platform might be chosen over other cloud-server-hosting providers because of the possibility to use both SQL and NoSQL databases.

2.1.1 High level components and basic interactions

Figure 2.1: High level components' elements

Server Architecture

Mail Server
(Gmail, Outlook...)

Third-party User

Web Server

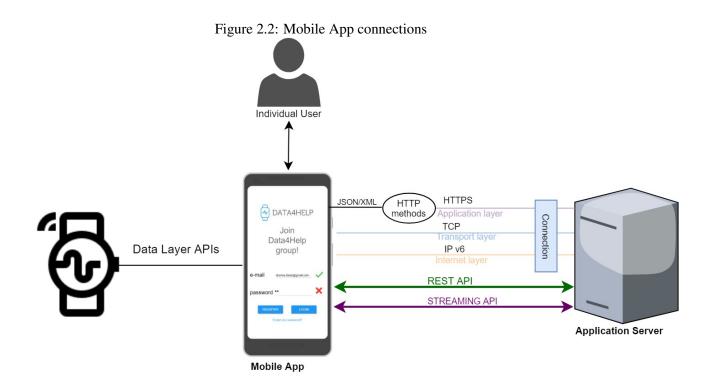
Proxy

Individual User

Web Page

The overall structure, at high level, is made of three main components and their interaction. The red component refers to the tools the individual user needs to interface with Data4Help System, it communicates with the Application Server that is part of the blue component charged with the Server Architecture. This is composed by a Database Server that includes the DBMS, a Mail Server which means to exchange SMTP messages with other Mail Servers (external to the system), an Application Server communicating with any other element in the Server Architecture, a Web Server and a Proxy (meant to dispatch requests to Application and Web Servers). The proxy links the Server Architecture with the green component charged with the interaction with the third party user that takes place through Data4Help Web Page.

2.1.2 Interaction between Server Architecture and Individual User



The Mobile App receives data from the smartwatch, exchanges informations with the Individual User and communicates with the Application Server: at different levels are specified protocols that are supposed to be used.

Interaction between Server Architecture and Third-Party User

Figure 2.3: Connection between Web page and Servers Web Server HTML, CSS, JavaSript XML DATASHELP & NAME JSON HTML, CSS, JavaSript Application Server Proxy 2. REST API **REST API** Data for API call (gathered with GET, POST...) Data for API call Data from API call 4. Data from API call JSON STREAMING API STREAMING API Web Page **XML** request response STREAMING API **DBMS REST API** Database Server External API user

The browser hosting the Web Page needs to communicate both with the Web Server and the Application Server. The Web Server can easily handle and exchange HTML, CSS and JavaScript files with the client; the Application Server manages methods like GET, POST (that are present in the HTML file) receiving a REST API call and forwarding data in JSON format. Data to forward are provided by the Database Server which includes the DBMS: a request in XML is sent by the Application Server, the DBMS processes the request and extracts data from the database that are sent back to the Application Server in a XML file. To establish a communication channel between the Application Server and the Web Server is not a necessity, however it provides an alternative to REST API: developers are up to decide to implement them both or to keep the REST API alone.

2.2 Component view

The system is divided in four subsystem:

- Backbone
- Data4Help
- **AutomatedSOS**
- Track4Run

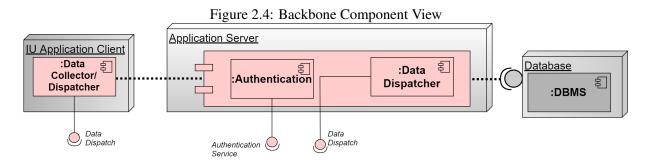
The Backbone is the core of the system: all other subsystems interact with it and don't interact with each other. The backbone provides interfaces for authentication and to receive live data published form the Backbone with a event-based paradigm.

The last three are divided, on the Application server, in a router that provide an interface gathering all the subsystem functionalities, and a module, directly connected to the DBMS to be able to work indipendently, containing all other components of the subsystem.

On the IU and TPU clients the view component represent the presentation layer of the system.

The relation between the components and the model il further defined in figure 2.10.

2.2.1 Backbone



This is the backbone of the system: collects the data on the device, keep it syncronized though the system, stores it onto the database and provide the functionalities to receive live data; Furthermore provide functionality concerning authentication.

Data collector/dispatcher Allow subscribtion and publishes/dispatches the collected live data of the Individual User logged in from the device.

Autenthication Offers services related to User authentication and the functionalities to handle their info.

Data Dispatcher Allow subscribtion and publishes/dispatches the collected live data of all Users and it stores it onto the database.

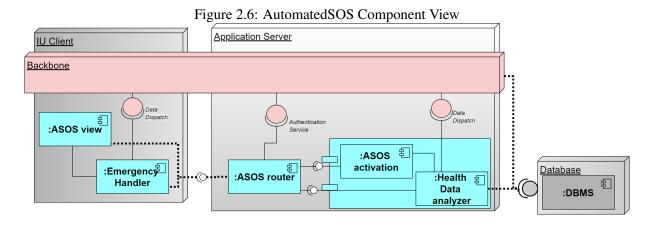
2.2.2 Data4Help

Figure 2.5: Data4Help Component View Application Server TPU Web Page Client Data Request Manager :Blocked 🗧 **TPUs** Manager :Anonymity 🗐 :Request 🗧 IU Client **Status** Evaluator Manager :D4H router <u>Database</u> :DBMS Backbone

D4H router Validate the requests received from the client and dispatch them to the corresponding module or component.

Data Request Manager Provides functionality to create, approve, deny requests, block users and provide the relative data; Anonymity Evaluator is responsible to check anonymity constraints.

2.2.3 AutomatedSOS



ASOS router Validate the requests received from the client and dispatch them to the corresponding module or component.

ASOS Activation Offers the functionality for the activation and deactivation of the ASOS service.

Health Data analyzer Offers functionality to extrapolate the critical health parameters for every Individual User;

Emergency Handler Responsible to handle critical health conditions based on the data published by the *Data collector/dispatcher*

2.2.4 Track4Run

Figure 2.7: Track4Run Component View Application Server IU Client Backbone Authentication Service <u>Database</u> 包 :T4R :Run 包 包 activation :DBMS Status Manager TPU Web Page Client :T4R view

T4R router Validate the requests received from the client and dispatch them to the corresponding module or component.

T4R Activation Offers the functionality for the activation and deactivation of the T4R service.

Run Manager Provides functionality to create, cancel and enrol in runs.

2.2.5 Full system

Figure 2.8: Complete Component View Application Server Manager IU Application Client :Anonymity = :Request 🗐 Status Evaluator :D4H router Manager Backbone 包 :Authentication 包 :Data Dispatcher <u>Database</u> :DBMS Data
Dispatch :ASOS activation :ASOS route :Health 🗐 Data analyzer :Emergency Handler 包 :T4R :Run activation TPU Web Page Client :D4H view :T4R view

Data Managing From a more high level point of view, the backbone provides services to retrive the Individual Users live data.

This makes the red components and modules of the architecture the backbone, collecting and dispatching data, while the other subsystems can handle their unique authorization condition: D4H authorizing data dispatching based on approved requests, ASOS on the activation of the service and T4R on the enrollement in competitions.

This way all subsystem will work independently from each other.

2.2.6 Entity Relationship Diagram

The following section provides a conceptual representation of the model.

Activated Services (0,N)Hearthbeat (0,1) Age Gender IU Blood pressure Address (0,1) Oxygen saturation Weight Height (0,N) (0,N) Time On Individual Request Block (T,E) Request (T,E) Data Identification Name User Request (0,N) Min Age Max Age number Email Password & State Min Weight From Subscription? Anonym ~ Max Weight Time (0,N) Min Height Request 0 Max Height (0.N) Gender Address Organized (1,1)O Path Start Time Run End Time (0,N) Min Age Enrolled Max Age Min participants Max Participants Lenght Time Arrival Postition Identification number

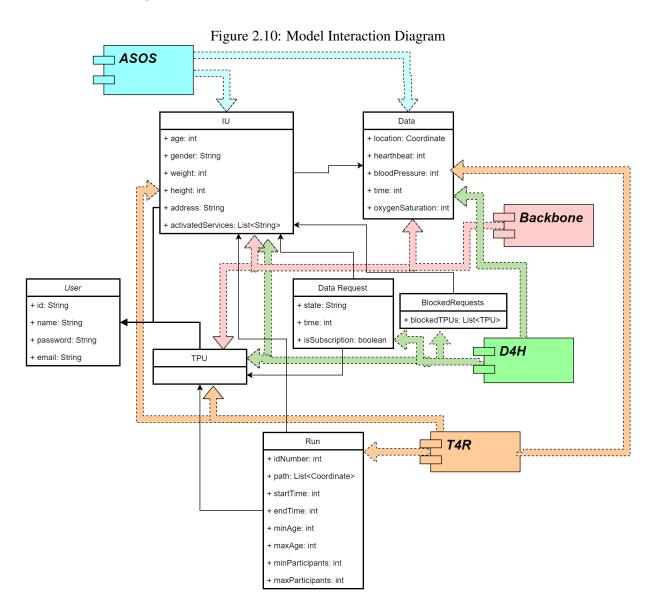
Figure 2.9: Entity Relationship Diagram

Tables

- User(ID, Name, Email, Password)
- TPU(ID, Name, Email, Password)
- IU(ID, Name, Email, Password, Age, Gender, Address, Weight, Height)
- *Data*(<u>IU</u>, <u>Time</u>, Location, Heartbeat, Blood pressure, Oxygen saturation)
- Individual Request (Request Identification Number, IU, TPU, Time, State, Subscription?)
- *Anonym Request*(Request Identification Number, TPU, Time, State, Subscription?, Min Age, Max Age, Min Weight, Max Weight, Min Height, Max Height, Gender, Address)
- *Run*(Run Identification number, TPU, IU, Path, Start Time, End Time, Min Age, Max Age, Min participants, Max Participants)
- Run Result(Run Identification number, IU, Lenght, Time, Arrival Position)

2.2.7 Model Interaction Diagram

The following diagram show a different representation of the model to better highlight its interaction with the application server. For each subsystem module that was connected to the DBMS in 2.2.5 is shown its relationship with the module.



2.3 Deployment view

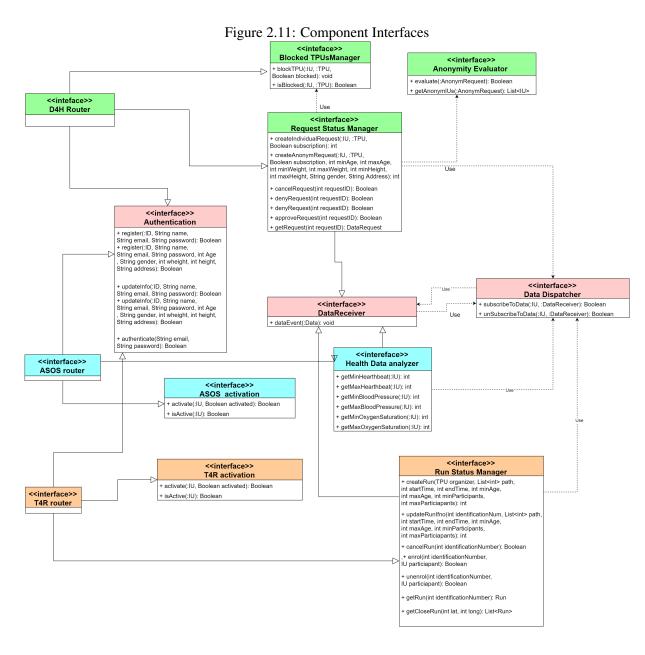
2.4 Runtime view

2.5 Component interfaces

The next diagram shows the most important methods of the components interfaces.

The routers gather oll the method required to provide the client with the corresponding subsystem services.

An generic interface *Data Receiver* is extended by all the interfaces that use the *Data Dispatcher* service, to receive the updates.



- 2.6 Selected architectural styles and patterns
- 2.7 Other design decisions

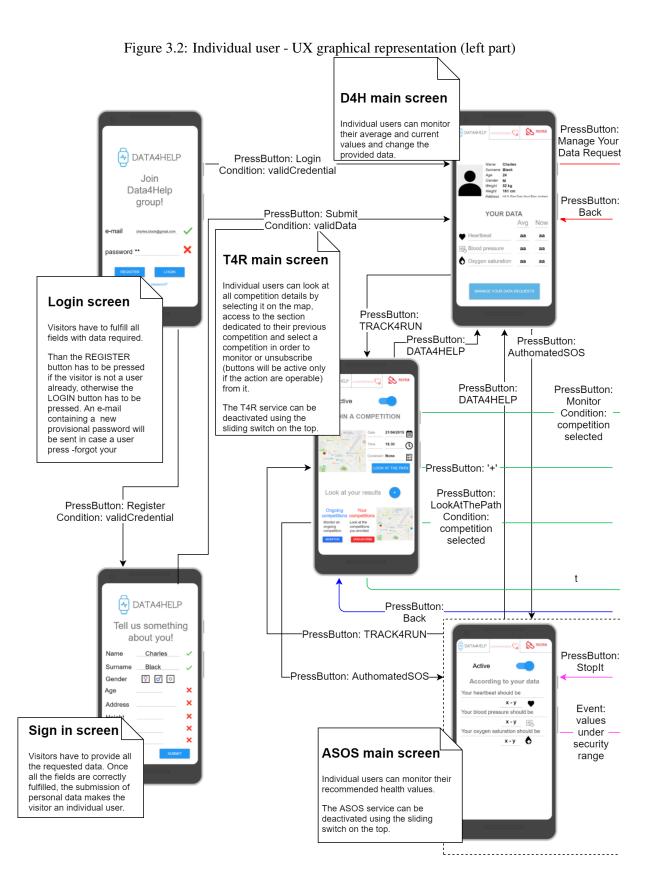
3. User Interface Design

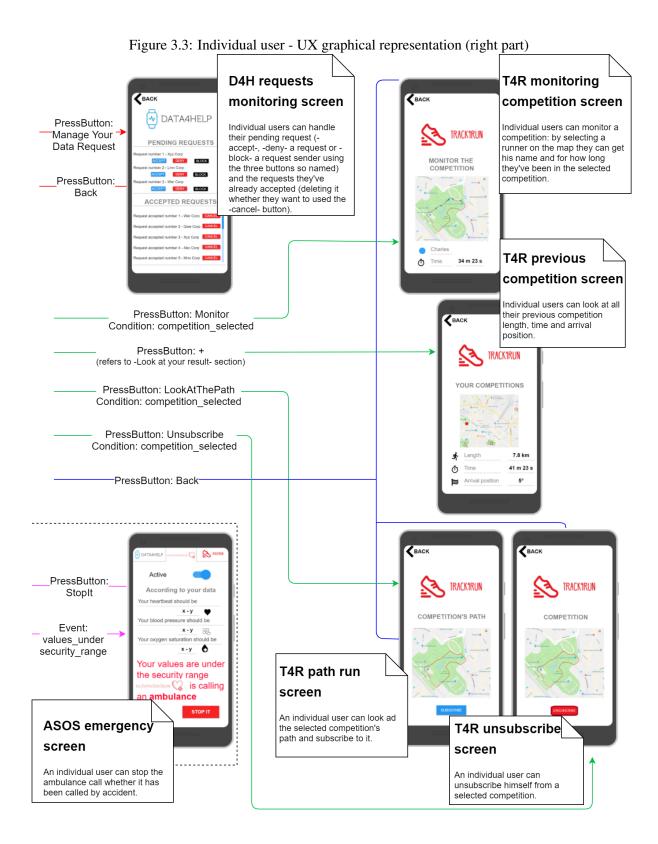
The user interfaces mock-ups are represented in sections 3.1.1, 3.1.2 of RASD. The following UX schemes represents a complete description of the user experience. The screen -T4R unsubscribe screenhas been added and a better description of each mock-up has been provided.

Login window Visitors have to fulfill all fields with data required → DATA4HELP Than the REGISTER button has to be pressed if the visitor is not a third-party user already, otherwise the LOGIN button has to be pressed. An e-mail containing a new provisional D4H main window password will be sent in case a user press forgot your password-Sign in window By the -your requests- and -your subscriptions- section third-party users can monitor and handle the Visitors have to provide all the requested data. Once PressButton: Login requests (one time request and subscription respectively) they've PressButton: Login all the fields are correctly fulfilled, the submission of Condition: validCredential ondition: validCredential sent: they can see whether a request has been denied, has not personal data makes the visitor a third-party user. vet an answer or has been DATA4HELP accepted; if so it's possible for the third party user to check (request) or monitor (subscription) data By the -ask for data- section thirdparty users can subscribe or require (-request- button) one time PressButton: Submit data to an individual user (fulfilling Condition: validData the search field with the user id) or to a group; it is also possible to require API key. PressButton: TRACK4RUN -PressButton: DATA4HELP PressButton: Request PressButton: closeWindow (data regarding groups) PressButton: Submit T4R main window By the -your competitions- section third party user can handle the competition they've organized: if a competition has still to take place then an organizer can D4H data request monitor the subscribers list and eventually cancel the competition using the constrain window By the -organize a competition- section a third party user can organize a running By the -insert your constraints- section third parties users can specify the constraint to be applied to By the -monitor a competition- the organizer can monitor the competition he has organized (after he selected it on the map). group data request.

Figure 3.1: Third-party user - UX graphical representation

Third-party user The scheme above represents the main desktop screens and the way -condition and action needed- how the third-party user can move trough them.





Individual user The two schemes above represents the main mobile screens and the way -condition and action needed- how an individual user can move trough them. The scheme has been divided in two parts in order to provide a better readability.

4. Requirements Traceability

5. Implementation, Integration and Test plan

6. Effort Spent

6.1 ARGIRO' ANNA SOFIA

DATE	DESCRIPTION OF THE TASK	HOURS SPENT
27/11/18	group work	3
2/12/18	high level overview	4

6.2 BATTAGLIA GABRIELE

DATE	DESCRIPTION OF THE TASK	HOURS SPENT
27/11/18	group work	3
30/11/18	component view	4
2/12/18	model diagrams	4

6.3 CASASOLE BERNARDO

DATE	DESCRIPTION OF THE TASK	HOURS SPENT
27/11/18	group work	3
2/12/18	User interface design	4

7. References

7.1 Reference Documents

7.2 Software

- TeXWorks v0.6.2
- Umlet v14.2
- Draw.io v9.4.1
- proto.io v6.3.2.3