POLITECNICO
MILANO 1863

Software Engineering 2
Design Document

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1. Introduction

1.1. *Purpose*

This document is thought to be an overview of the TrackMe application, in which is explained how to satisfy the several project requirements stated in the RASD. This document is principally intended for the developers and the testers, with the purpose of providing a functional description of the main architectural components, their interfaces and their interactions, along with the design patterns.

1.2. *Scope*

—Presentation—
TrackMe is structured in a multi-tier architecture. More specifically, the Business logic layer has the task of taking charge of the incoming requests/data, computing checks, and interacting with external third-party services through the use of interfaces. This layer is connected with the Data layer, in which are stored all the Users data (credentials, health data). The Presentation layer is build through the fat Client paradigm in which the client needs to perform computation to temporarily store health data in the local memory in case of missing internet connection between the client and the server.

1.3. *Definitions, acronyms, abbreviations*

1.3.1. Definitions

- User: a registered individual who can use the TrackMe services.
- Third party: a registered entity that can use the TrackMe services.
- Client: A client is a piece of computer hardware or software that accesses a service made available by a server;
- Firewall: A network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules;
- Server: A computer program or a device that provides functionality for other programs or devices, called "clients".

1.3.2. Acronyms

- API: Application Program Interface;
- DBMS: Database Management System;
- DD: Design Document
- GUI: Graphical User Interface;
- HTTP: Hypet Text Transfer Protocol;
- MVC: Model View Controller pattern;
- OS: Operating System;
- RASD: Requirements Analysis and Specifications Document;
- REST: REpresentational State Transfer;

1.3.3. Abbreviations

- Gn: n-goal in the RASD;
- Rn: n-functional requirement in the RASD;

1.4. *Revision history*

1.5. *Reference documents*

- RASD document;
- Mandatory project assignment;

1.6. *Document structure*

The following document is organised in this way:

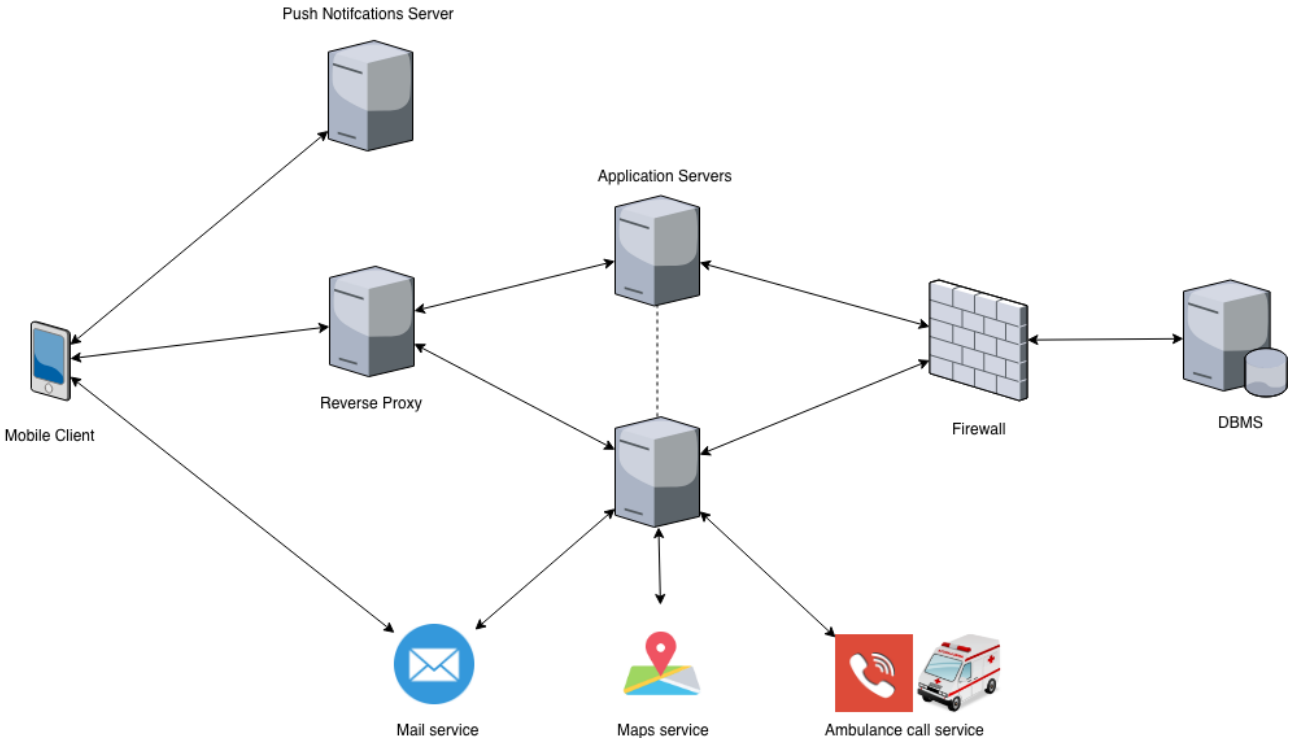
- Architectural Design: this section shows the main components of the system and the connections among them. It will also focus on design choices, styles and patterns.

- User Interface Design: this section includes an improvement of the user interface given in the RASD document. It will be described through the use of UX modeling.
- Requirements Traceability: this section shows how the requirements in the RASD are mapped to the design components presented in the DD;
- Implementation, Integration and Test plan: this section shows the order in which the implementation and the integration of the subcomponents will occur and how the integration will be tested.

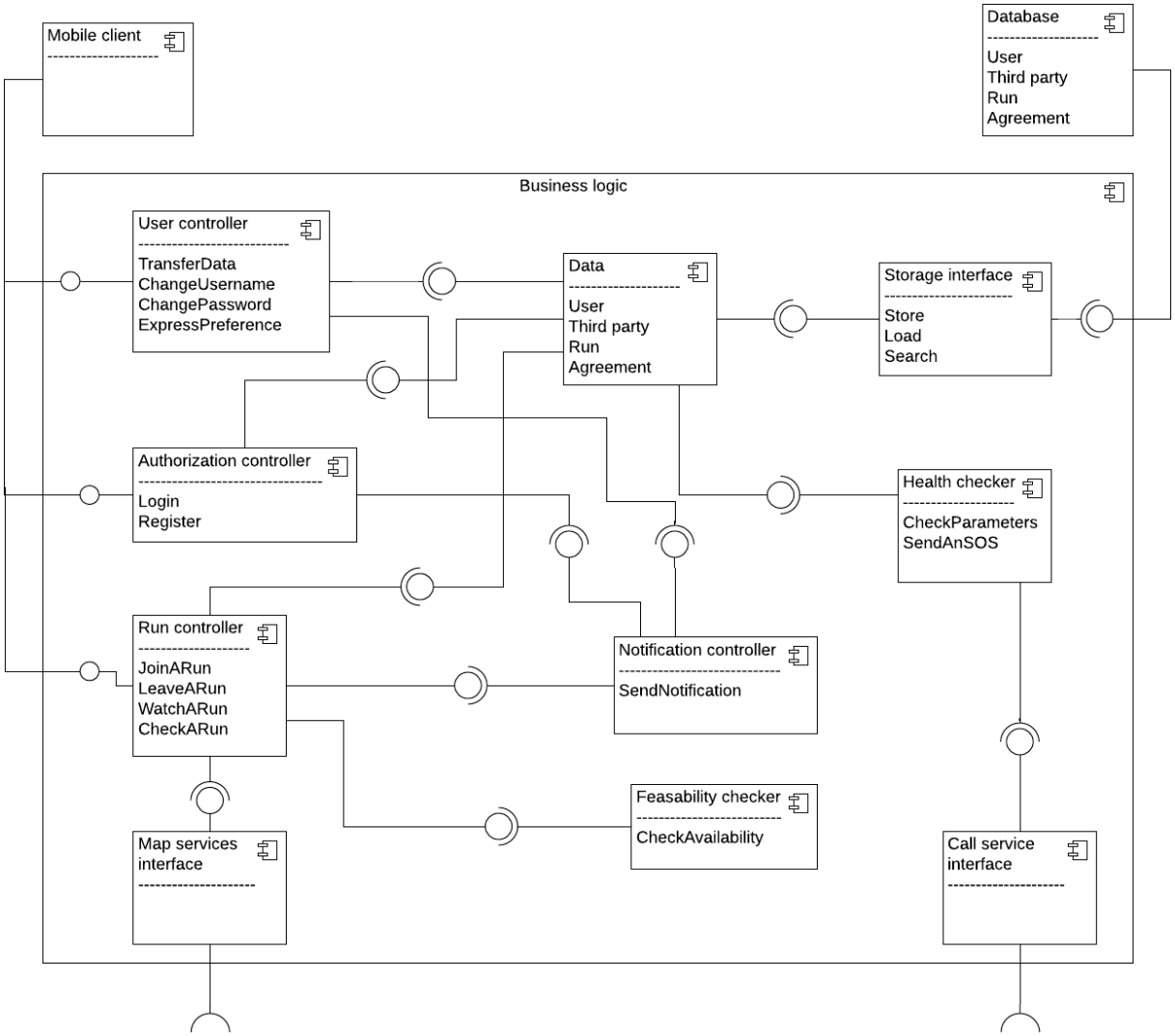
2. Architectural design

2.1. *Overview: high-level components and their interaction*

The figure below represents an high level overview of the system. Further details on the system components and their interaction will be further explained in the next sections.



2.2. *Component view*



The UML component diagram shows the internal structure of the system highlighting the individual modules and the connections among them. Individual components are wired together by using an assembly connector to connect the required interface of one component with the provided interface of another component. Below is the description of the components:

- **User mobile client**
  This is the component that represents the client machine that accesses to the API of the Business Logic container for the user. ?????????????????????????? Da completare in base a come lo vogliamo implementare (dati lato utente o no?)

- **Third party mobile client**
  This component represents the client machine that accesses to the API of the Business Logic container for the third party. ????????????????????????????????????

- **User controller**
  The main role of this component is to manage the transfer of data from the client to the server using the interface provided by the Data component. It also provides methods to accept/refuse a request of agreement and to change login credentials. It can communicate with the Notification controller component to display notifications.

- **Third party controller**
  This component is built to manage the transfer of data from the system to the third party using

the interface provided by the Data component. It also provides methods to send requests of agreement and requests of data to the system. It can communicate with the Notification controller component to display notifications.

- **Authorization controller**
  This component provides authentication and registration processes for both the users and the third parties. It takes the needed data from the Data component and communicates the result of the operations trough the Notification controller.

- **User run controller**
  This component provides the methods to permit a user to join, leave, check and watch a run. It communicates with the external service that provides maps trough the Map services interface. Every time a user wants to join a run, it calls the Feasability checker that checks if all the constraints are satisfied. Finally, it can access data of the runs trough the Data component and it can call the Notification controller to send notifications.

- **Third party run controller**
  This component provides the methods to allow a third party to organize a run. It communicates with the external service that provides maps trough the Map services interface to allow the third party to select the track for the run.

- **Notification controller**
  This component manages the notifications forwarded by the other components. It only shows notifications inside the application.

- **Health checker**
  This component is the core of the service AutomatedSOS. It receives data from the Data component, elaborates them and, if needed, communicates to the Call service interface to send an SOS trough the related external service.

- **Feasability checker**
  This component is built to check if a user can actually join a run that is shown trough the Mobile client. ——— Serve davvero??????????????????????????????????

- **Data**
  The Data component provides the set of Classes corresponding to the tables contained in the Database.

- **Storage interface** This component provides the methods for querying the Database.

- **Database** This component represent the DBMS. It provides the interfaces to retrieve and store data. In the database there are data about users, third parties and the set of agreements among them. It also contains data about the runs.

- **External services interfaces**

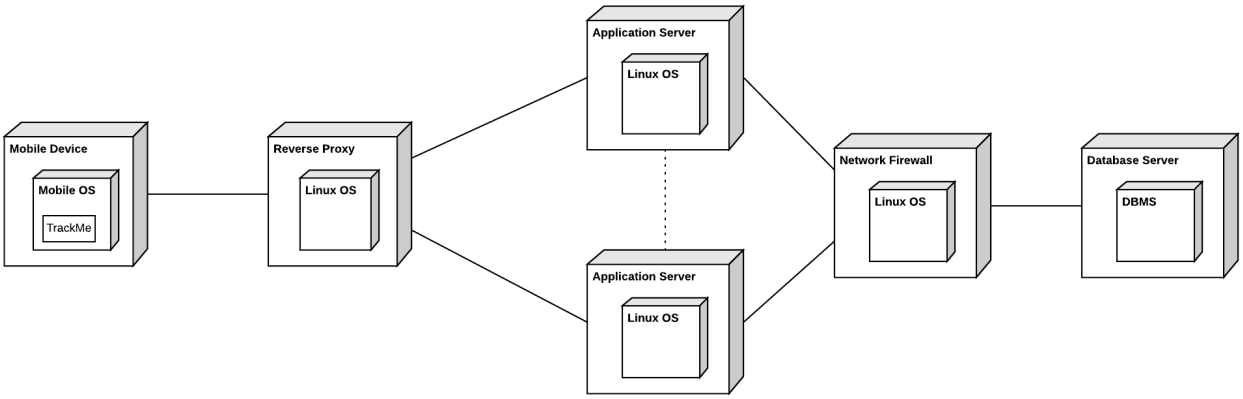
  - **Map services interface**
    It communicates with the map service to allow the third party to select the track and to show the position of runners in real time on the map.

  - **Call service interface**
    It communicates with the external service to dispatch automatic calls (or emails?) in case of emergency.

2.3. *Deployment view*

The figure below shows the deployment diagram of the whole system. Its main goal is to describe

the distribution of components capturing the topology of the system's hardware.



As previously stated in the section 1, the system is structured in a multi-tier architecture. The specific role of each node is clarified here:

Clients
The first tier is composed by the mobile clients machines. The client will be able to access TrackMe functionalities through the dedicated native application.

Reverse Proxy
We chose to deploy a reverse proxy on a Linux machine with Nginx server installed on it, in order to safely increase parallelism of requests and scalability of our application. This architecture leads to several advantages:

- Load balancing, distributing requests among different servers
- Optimising content by compressing it in order to speed up loading times
- Event-driven architecture, increasing parallelism by not locking the CPU
- Very conservative memory-wise

Application Servers
This is the middleware level of the architecture: all the business logic of the system is contained in these servers.

Network Firewall
The access to the Database is mediated by a network firewall in order to avoid unauthorised access to the data and the credentials of the user.

Database Server
This is the last layer of the architecture: all the data are stored in a Database Server accessed through a relational DBMS.

2.4. *Runtime view*

2.4.1. **Sign up Runtime View**

2.4.2. **Login Runtime View**

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