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D4.3.2 APPLICATION/ SOFTWARE DEVELOPMENT
(Application/Software Development)
«Healthcare Monitoring System Development»

Reporting period: 06/12/2018 – 05/05/2019

WP 4 Joint Monitoring System

project

IMPROVING HEALTHCARE ACCESS THROUGH A PERSONAL HEALTH MONITORING SYSTEM

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The project is implemented in the framework of INTERREG V-A "Greece-Bulgaria 2014-2020" CooperationProgramme and is co-funded by the European Regional Development Fund (ERDF) and by national funds of the countries participating in the Programme

http://www.ehealthmonitoring.eu/

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Summary for the deliverable

The current report of the deliverable «Healthcare Monitoring System Development» is part of the project APPLICATION/ SOFTWARE DEVELOPMENT within the frame of WP 4 Joint Monitoring System of the project IMPROVING HEALTHCARE ACCESS TROUGH A PERSONAL HEALTH MONITORING SYSTEM, according to our contract (14/09/2018 – Ref. No: 44955) and is being implemented within the framework of the Programme INTERREG V-A Greece – Boulgaria 2014-2020.

This deliverable aims to highlight the activities performed within the period 06/12/2018 – 05/05/2019 concerning the design, development and pilot operation of the Integrated Health Monitoring System.

The deliverable describes the system as a whole and focuses on issues that affect its subsystems horizontally. Special reference is made to the platform subsystem that is installed and operates on cloud computing infrastructure and supports the specific applications of the system as described in the following chapters:

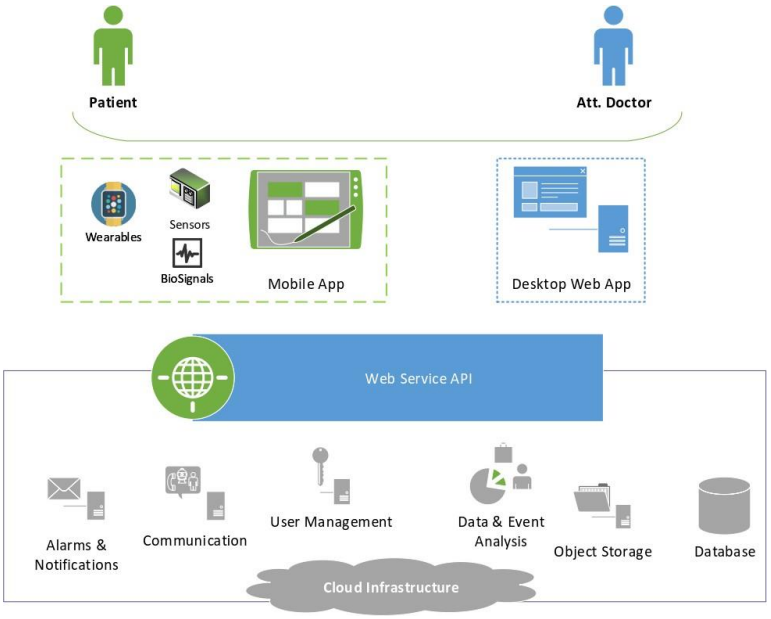
- Web App
- Mobile App (Android)
- Cloud Infrastructure

1 Introduction

The Integrated Health Monitoring System, which will be designed within the frame of the **"EHEALTH Monitoring"** project**,** consists of four main sub-systems that realize the required functionalities, as well as a cloud back-end platform, which supports all other subsystems. These subsystems have been designed and developed utilizing a rich set of state-of-the-art technologies and tools, in order to secure optimal levels of robustness, security and extendibility and the finest user-experience.

The system follows a service-oriented architectural design, exploiting the advancements and flexibility of cloud offerings, and implements modern UIs for all types of users. Cloud Computing allows for ubiquitous access to shared resources and common infrastructure, offering services on-demand, serving the constantly changing needs of the health-centric digital services. To that end, is being developed an integrated system for patient monitoring at home, utilizing Cloud Computing concepts and tools for data managements and analysis. The proposed solution focuses on the system decision support functionality, which is utilized within the smartphone app for initial assessment, as well as in the Cloud.

A combination of Java and JavaScript technologies and frameworks are used for implementation and communication of the various application components and services.



The main functionality of the platform is recording and analysis of biosignals. Java technologies have been utilized for development and the functionality is offered via Web Services. Similarly, synchronization and central administration functionalities of the application subsystems are provided. The following features are supported:

- ✓ User account management
- ✓ Data analysis
- ✓ Data storage
- ✓ Reminders and notifications to patients and other end-users in cases of measurements out of normal range, detection of errors, measurement and medication schedule, etc.
- ✓ Videoconferencing functionality based on the WebRTC protocol, which is utilized both for the Web app and the mobile app.

As mentioned above, the proposed integrated health monitoring system consists of four main sub-systems that realize the required functionalities. These subsystems have been designed and developed utilizing a rich set of state-of-the-art technologies and tools, in order to secure optimal levels of robustness, security and extendibility and the finest user-experience. To that end, the proposed solution follows a service-oriented architectural design, exploiting the advancements and flexibility of cloud offerings, and implements modern UIs for all types of users.

A combination of Java and JavaScript technologies and frameworks are used for implementation and communication of the various application components and services. A cross-layer technology that has a key role on the realization of the communication and videoconferencing functionality is WebRTC[1], which is used both for the desktop and mobile applications.

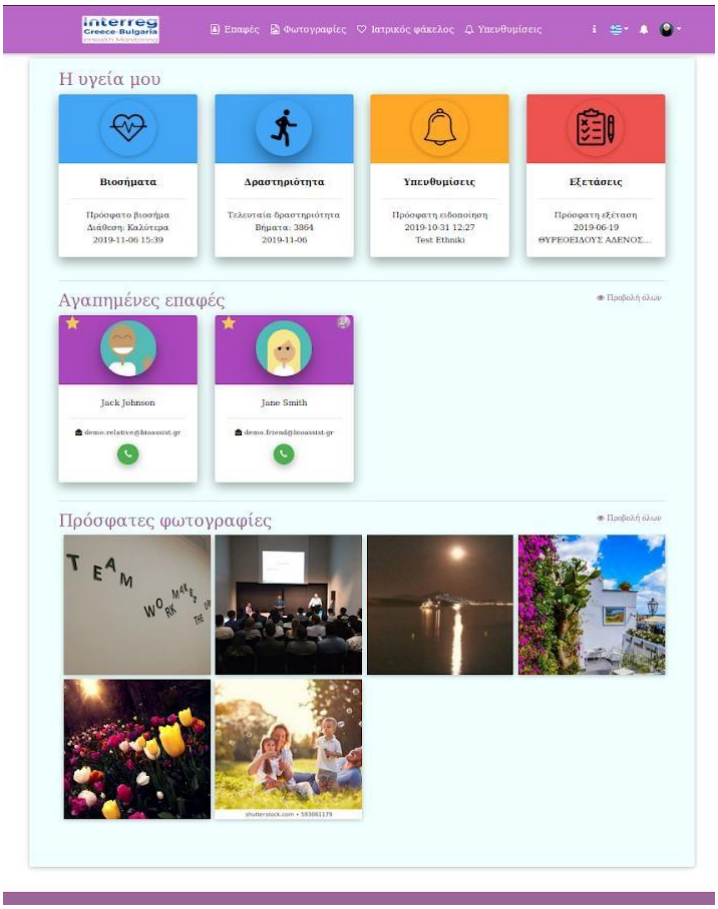
[1] http://www.webrtc.org/

2 Web app

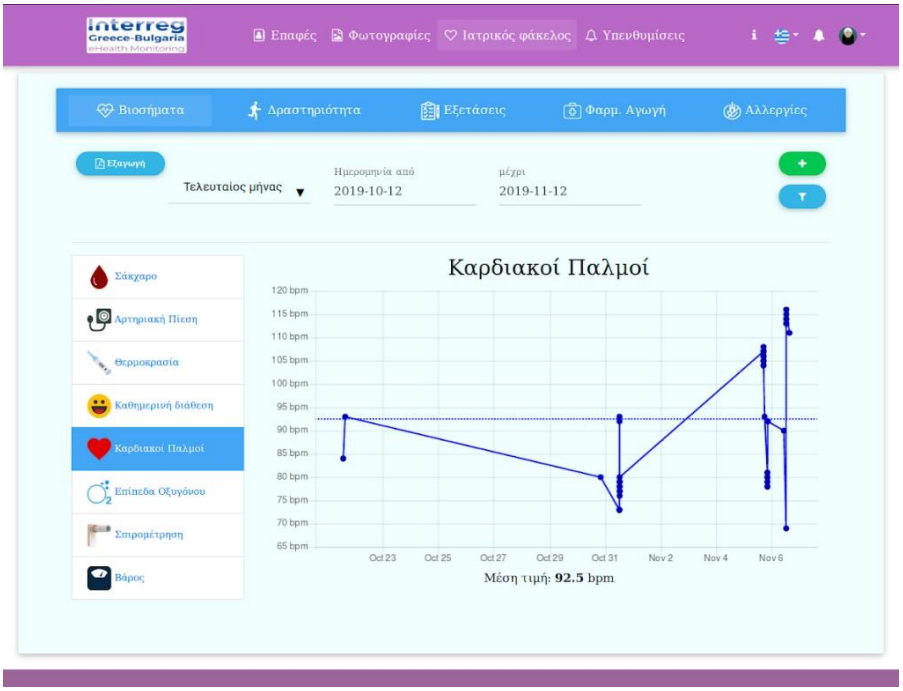
The web app includes the core functionality for interacting with all user types. In contrast to the mobile application, which is lightweight and simplified so as to ease the interactivity with the elderly users and patients, the web application has rich user interface for configuring the user and application parameters, and also for visualizing the biosignals and health records. WebRTC based communication is also provided through the web application.

Sample screenshots of the web app are available below:

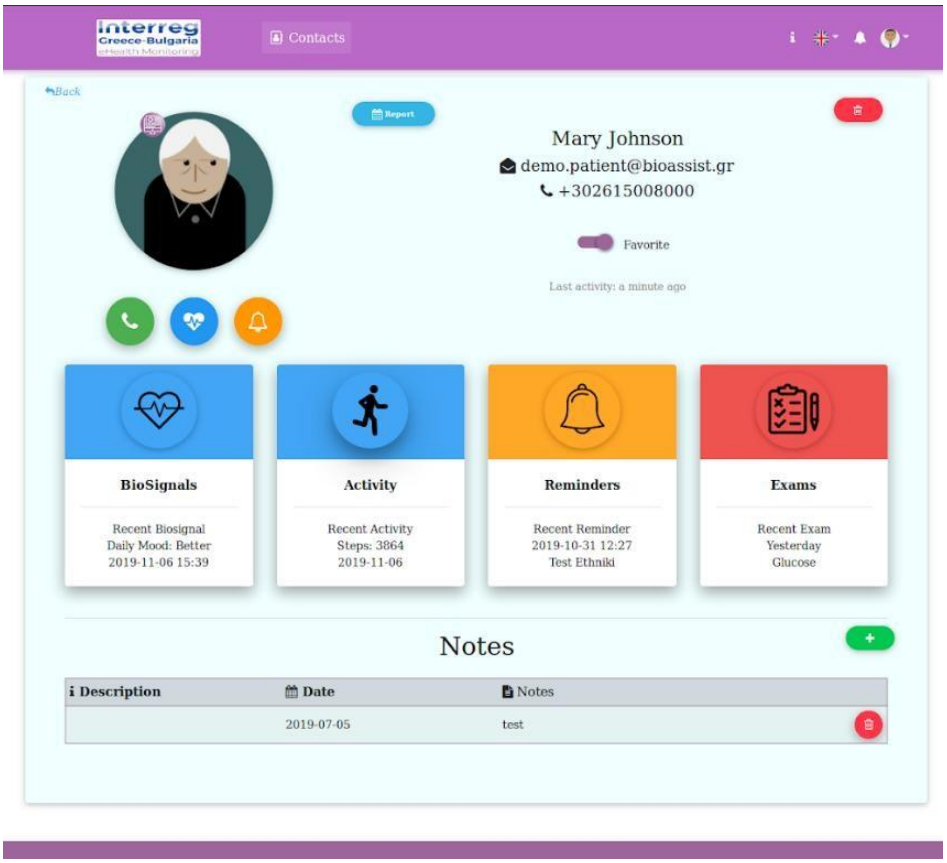
Patient login to the Web platform.



The dashboard available to the patient after the login.



The patient's heartbeat for the last month



Patient information as seen by the doctor.

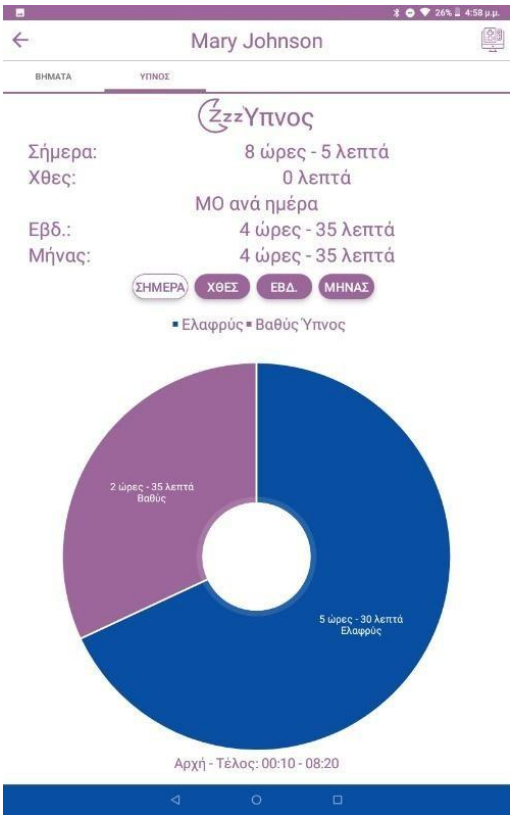
3 Mobile app (Android)

For a simplified, flawless and ubiquitous access to the system, a mobile app for Android devices has been developed. Besides the core functionality for communicating with the backend, the mobile applications allow for the integration of Bluetooth devices, sensors and wearables. The native android application targets (API) Android 21 / Lollipop.

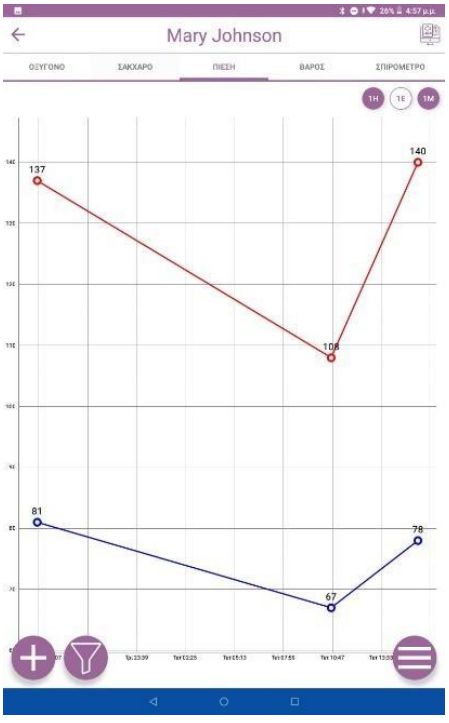
The application incorporates the required functionality for communicating with the cloud-based platform services and also acts as a platform gateway to the various Bluetooth devices (biosensors και wearables).

Sample screenshots of the mobile app are available below:

The dashboard interface of the Android app



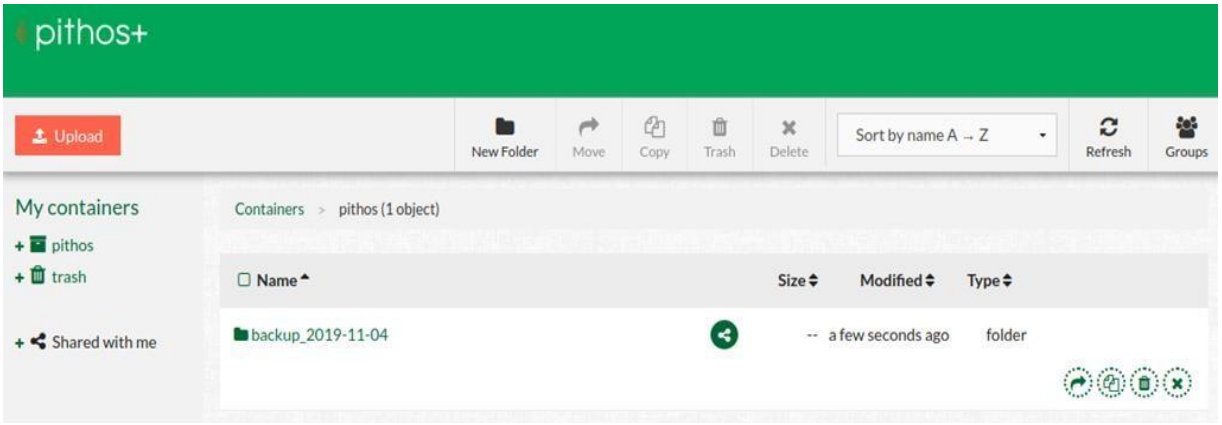
The sleep chart of patient.



A diagram of a patient's blood pressure, as seen by the doctor.

4 Cloud Infrastructure

The cloud infrastructure of okeanos has been configured to host the platform components and services. Sample screenshots are available below:



Backup of the database in okeanos (pithos+).

The eHealth Interreg virtual machine