SMARTBEAR

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Trusted digital solutions and Cybersecurity in Health and Care
TOPIC DT-TDS-01-2019
Smart and healthy living at home

SMART BEAR

"Smart Big Data Platform to Offer Evidence-based Personalised Support for Healthy and Independent Living at Home"

D3.1 –SMART BEAR @ Home Enabling Components v1

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Int = Internal Working Document	

D3.1 –SMART BEAR @ Home Enabling Components v1

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Executive Summary

In this document is presented a demonstration of devices, sensors and the elderly persons' mobile software that was developed in the first period of the Smart Bear project.

The chapter 1 presents an introduction where the contractual expectations are compared with the carried-out implementation of work package 3. The list of all selected devices is also presented; minor re-arrangements may occur in the future aiming to cost reduction and effectiveness increment.

The demonstration of home automation as exhibited in chapter 2 shows how the developers and engineers are interlinking technologies which will be applied at the pilot sites of the project. A secondary objective of the demonstrator aims to familiarize all technicians with the technology of the "off-the-shelf" products used in the project.

The Android mobile application that will be used by the elderly persons participating through the 5 pilot phases is presented in chapter 3. The currently developed screens are displaying related sets of measures.

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1 Introduction

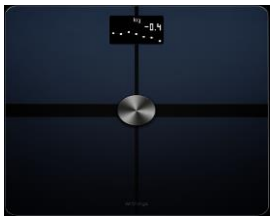
This document presents a demonstration of the implementation towards the objectives of WP3 that are related with the devices and their corresponding software. The HomeHub automation corresponds to an integration of hardware and software components supported by a Raspberry PI computer with low cost and low power consumption. Personal devices that are used to measure physiological and clinical-related values were successfully tested and they are under-integration with the mobile application by utilizing their SDKs and APIs. The home automation is created in the labs of the consortium members and it will be provided to the homes of the elderly persons. Table 1 presents the fulfillment of the deliverable's objectives.

Deliverable Description as described in the Grant Agreement	**Actual Implementation**
SMART BEAR @ Home Enabling Components v1 (Demonstrator): This deliverable will include the first version of the implementation of SMART BEAR @ Home Enabling Components. These components will be the basic SMART BEAR Hub communication software (contributed by T3.1), the monitor (contributed by T3.2), the component supporting the summarization and local analytics of data at the SMART BEAR Hub (contributed by T3.3), and the SMART BEAR mobile application, visualization and user inter-faces (contributed by T3.4).	This version of D3.1 presents the devices and the sensors (the functional and operational details are presented in D3.2) that was integrated and interlinked to create the first version of the home automation. A first version of the mobile application was also created and demonstrated in this document.

Table 1: The expected versus implemented requirements of D3.1.

Table 2 that follows, presents all the devices that are currently selected, tested, integrated and operating. Some of them may refined in the future considering the reduction of costs. By accounting the continued and fast evolution of the technological products, there may be products in the near future that can replace existing one to provide increased functionality.

Device	**Model**	**Cost (estimate)**
Smartphone	Samsung Galaxy S10 https://www.samsung.com/uk/smartphones/galaxy-s10/ 	€500
Smart watch	Garmin Vivosport	€110

	https://buy.garmin.com/en-US/US/p/574602 	
Hearing Aids	Phonak Audeo M (Marvel) 50 https://www.phonak.com/com/en/hearing-aids/phonak-audeomarvel.html 	€800
Smart blood pressure	Withings BPM Core https://www.withings.com/gr/en/bpm-core 	€250
Smart scale	Withings Body+ https://www.withings.com/gr/en/body-plus 	€100
Smart thermometer	Withings Thermo https://www.withings.com/gr/en/thermo 	€100
Smart oximeter	iHealth Smart Pulse Oximeter	€80

	https://ihealthlabs.eu/en/14-wireless-pulse-oximeter-855111003910.html	
Smart home devices	PHILIPS Hue Bridge (Hub) https://www.philips-hue.com/en-gb/p/hue-bridge/8718696516850	€50
	PHILIPS Hue Motion, Temperature & Light sensor (x2) https://www.philips-hue.com/en-us/p/hue-motion-sensor/046677473389	€80
	Bosch Smart RGB bulp (x2) https://www.philips-hue.com/en-us/p/hue-white-and-color-ambiance-1-pack-e26/046677548483	€100
	USB ZigBee adapter https://www.ti.com/product/CC2531	€25
	Aqara Temperature & Humidity sensor https://www.aqara.com/us/temperature_humidity_sensor.html	€13

	Integration Hub (openHAB) on Raspberry Pi kit https://www.raspberrypi.org/products/raspberry-pi-4-desktop-kit/ 	~€70

Table 2: List of the proposed devices for SMARTBEAR.

Notes: Definitions and acronyms are defined in the beginning of the deliverable D3.2.

2 HomeHub and Home Automation

In this chapter it is demonstrated the set of devices and sensors that are currently integrated and linked for the HomeHub automation. The figures and their captions are providing the products used. The material that is displayed will be provided as a ready-made solution to the elderly persons. The setup and installation photos are used to demonstrate the proof-of-concept and the effort required to build the Smart Bear home automation.

Figure 1: The set of devices used before unpacking. Raspberry PI 4 and Philips Hue are installed first.

Figure 2: Unpacking and connecting the Raspberry PI 4 and the Philips Hue Bridge

Figure 3: Connecting the devices to the home router before starting the configuration.

Figure 4: The packaged ZigBee USB adapter (or dongle)

Figure 5: The unpacked CC2531 ZigBee adapter without the plastic cover (Photo from vendor site)

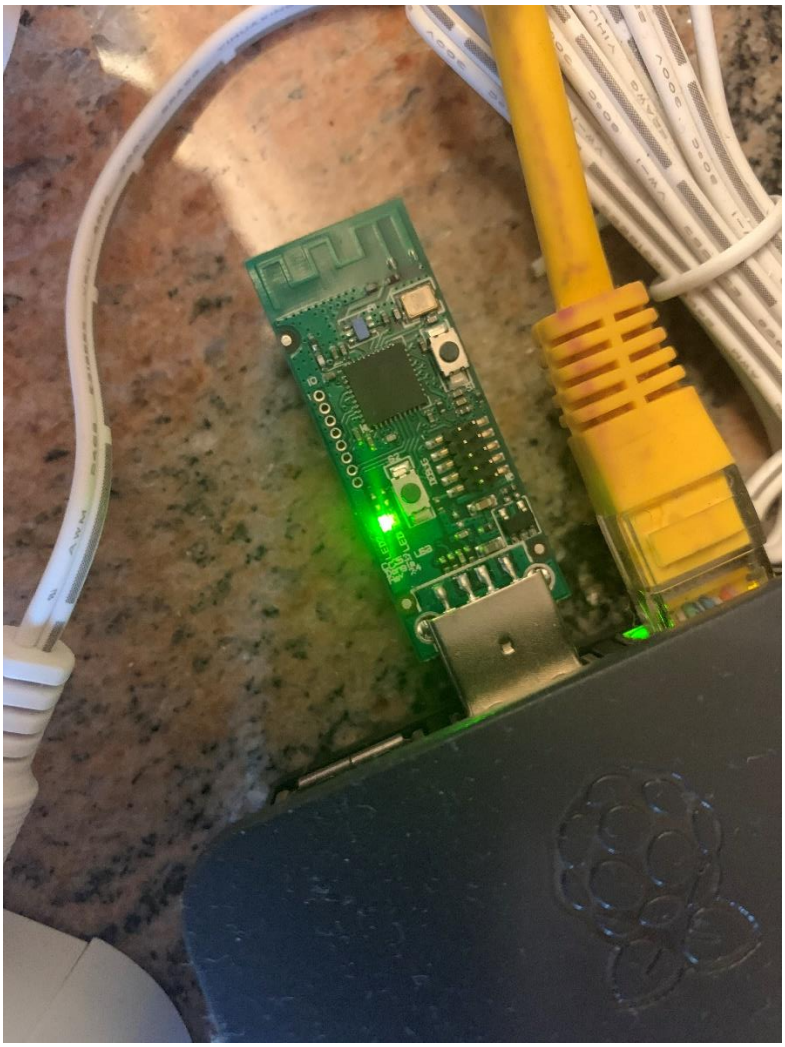


Figure 6: The ZigBee adapter is connected to the Raspberry PI 4 and ready to be configured.

Figure 7: The Philips Motion Sensor unpacked and connected to Philips Hue Bridge

Figure 8: The Xiaomi Aqara Temperature, Humidity and Pressure device connected to the ZigBee adapter

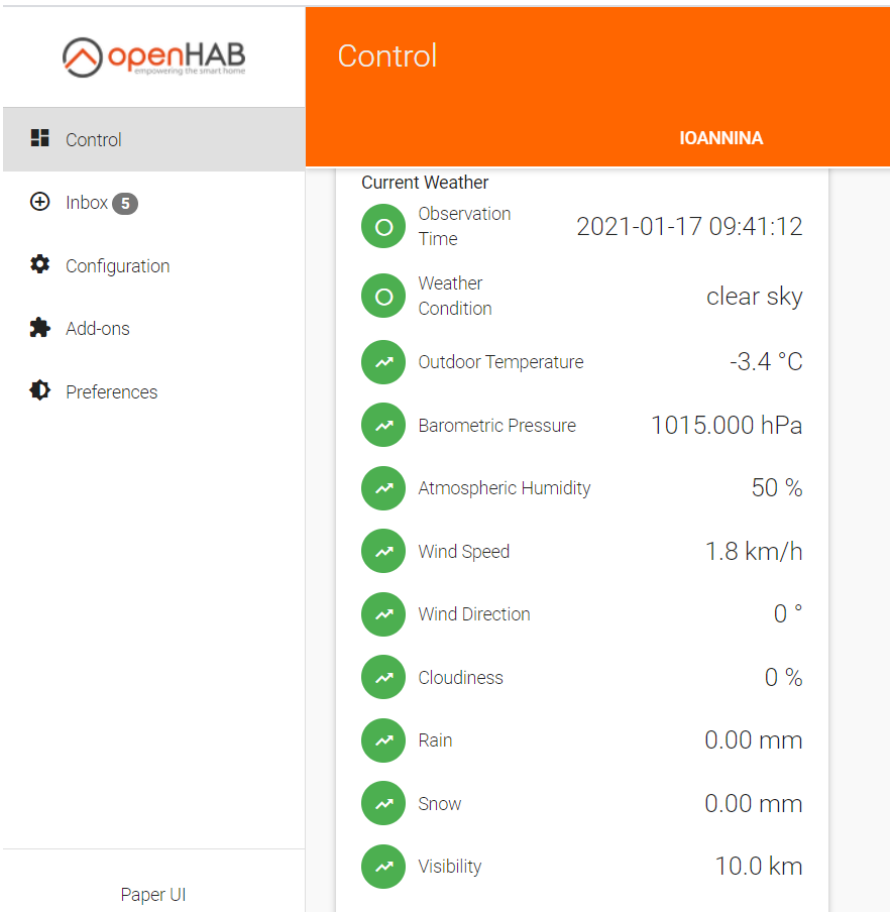


Figure 9: An openHAB view of the weather information from openWeatherMap porta related with the location of the installation.

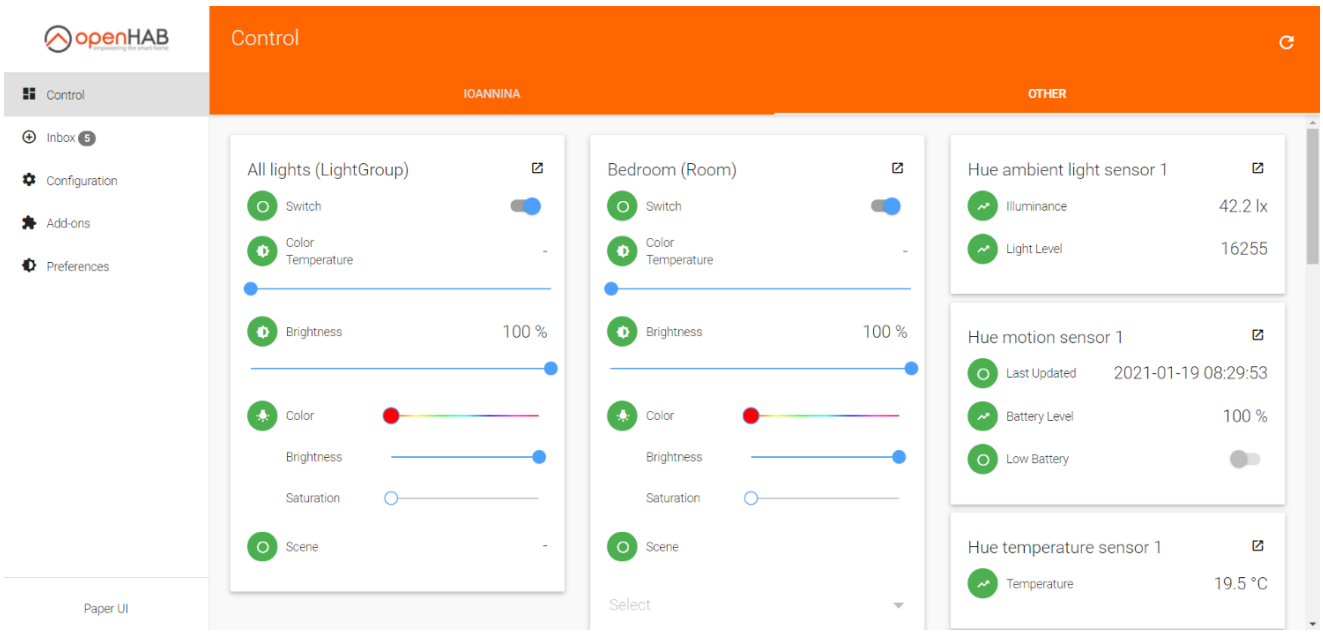


Figure 10: While operating openHAB provides all its measures to an appropriate UI. All values are available to any external integrator through the openHAB REST API as presented by the mobile application related UIs.

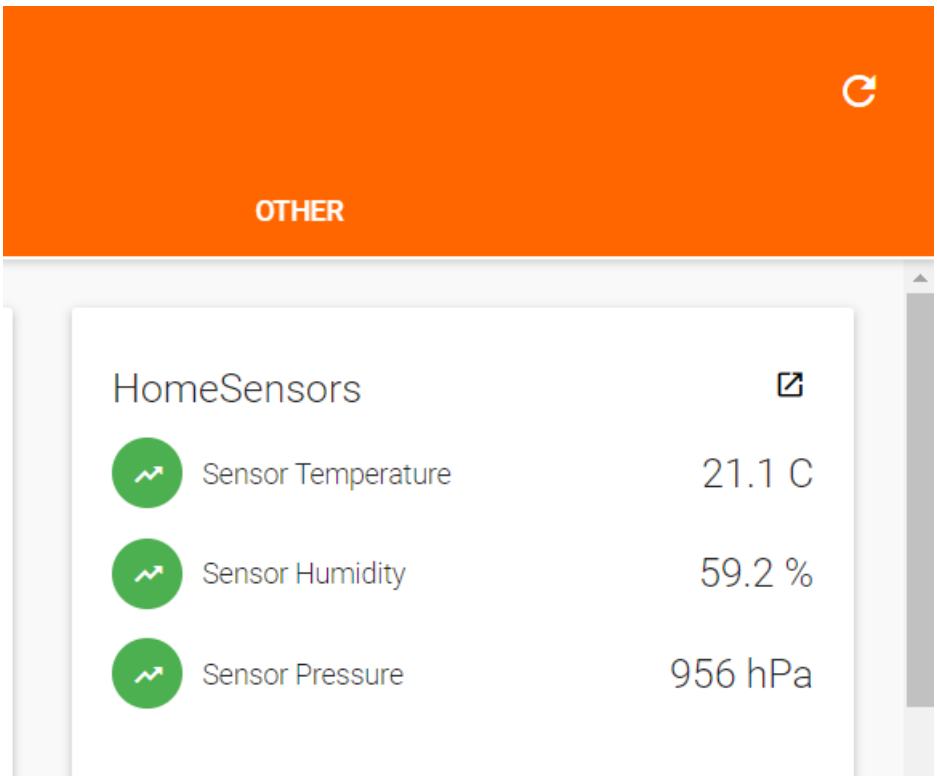


Figure 11: The displayed measurements from openHAB are retrieved from the MQTT topic that is fed from the integrated ZigBee2MQTT platform that is linked with the Aqara device. All software is hosted and executed in the Raspberry PI computer.

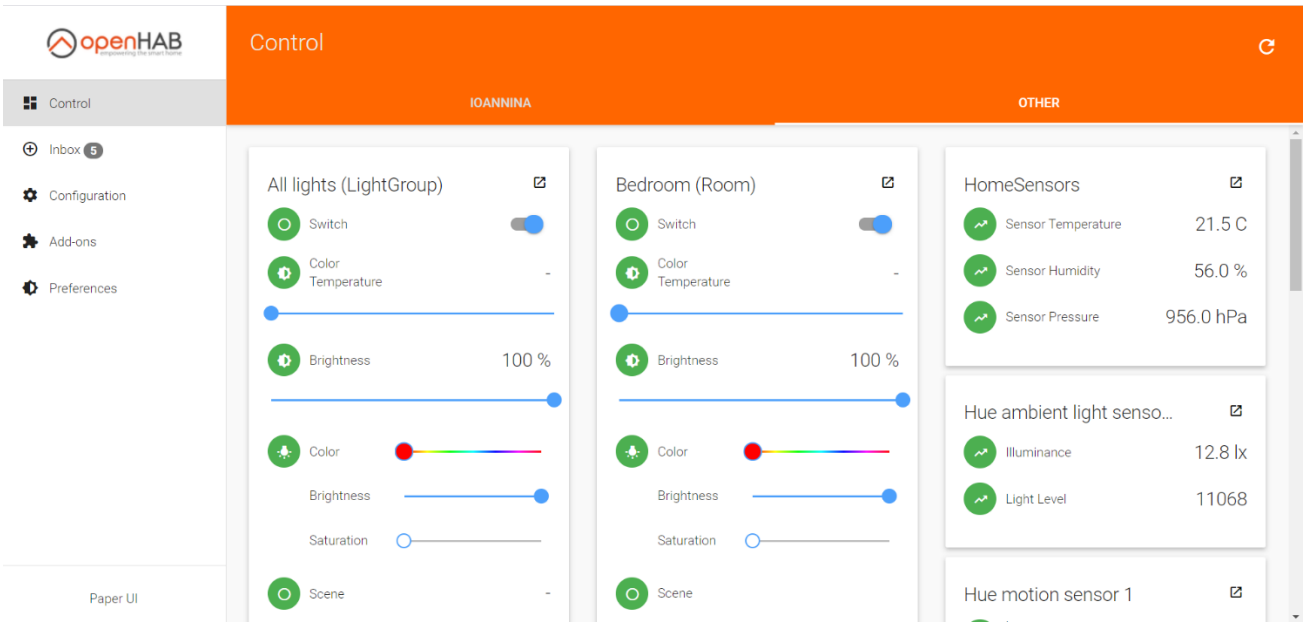


Figure 12: This is an openHAB with all devices integrated to the Raspberry PI and operated with the Hue bridge and Zigbee adapter. A common interface for different technologies and vendors is used with the same functionality.

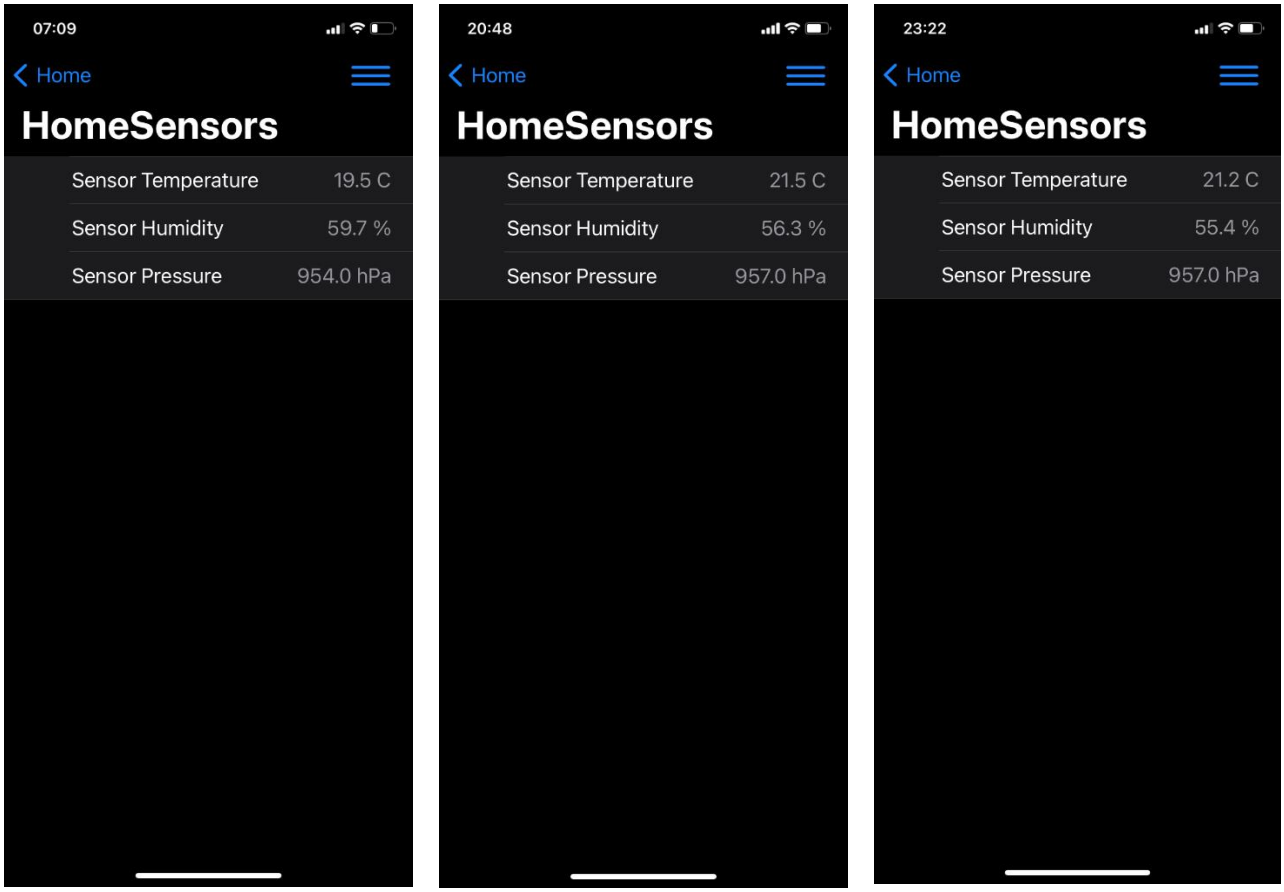


Figure 13: Using the openHAB mobile application for a week we tracked the stability of the HomeHub automation provided from the sensors.

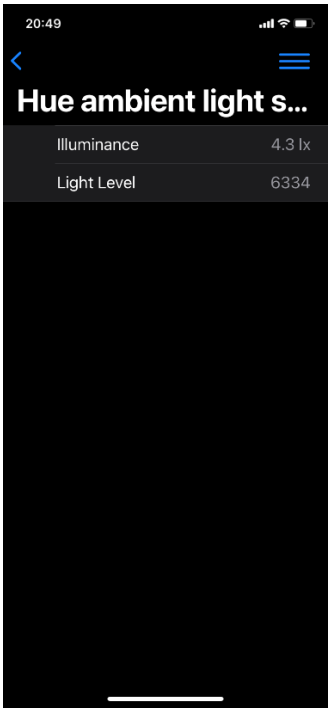


Figure 14: A view from the openHAB mobile application that is used to track the lighting conditions of the environment from the Hue Motion Senor

3 Smart Bear Mobile Application Demonstrator Screens

3.1 *Smart Bear Mobile App User Interface*

(Current working version of the mobile app)

3.1.1 Heart Rate Screens

The latest measurements from the Garmin Vívosport are displayed, as well the history and charts of those measurements.

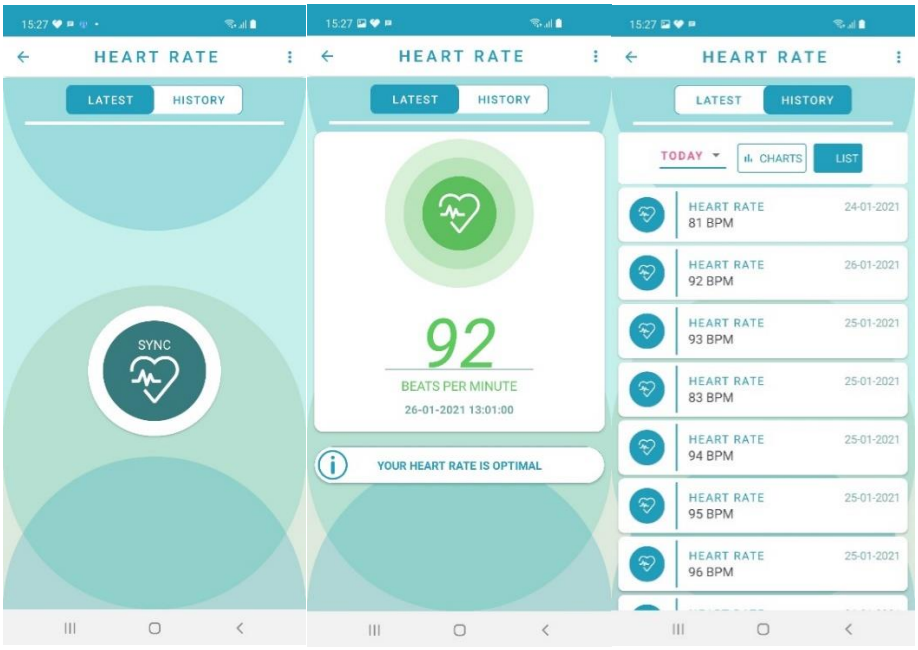


Figure 15: Heart Rate Screens

3.1.2 Blood Pressure Screen

The latest measurements from the Withings BPM Core are displayed, as well the history of those measurements.

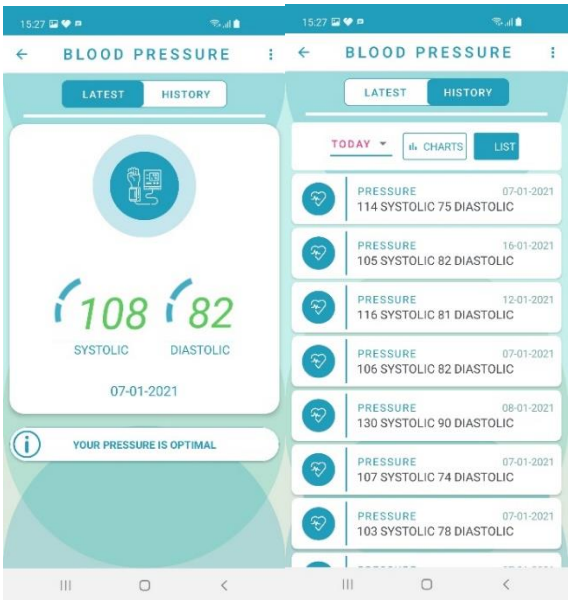


Figure 16: Blood pressure Screens

3.1.3 Sleep Statistics Screen

The Sleep statistics screen provides the user data for his sleep patterns for the previous day.

A corresponding message about the quality of the latest sleep will be shown based on general health rules.

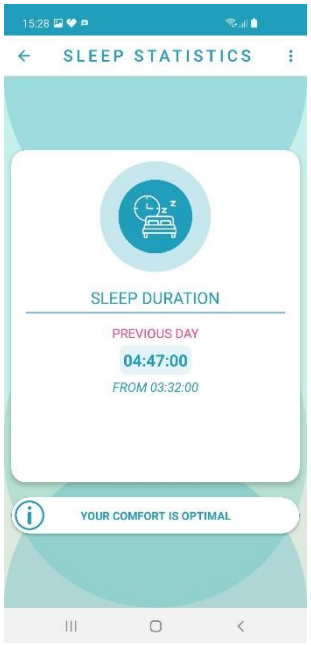


Figure 17: Sleep Statistics Screen

3.1.4 Light Levels Screen

The Light Levels screen displays the state and values of the HomeHub lights. Users are able to select different registered rooms of their accommodations.

Figure 18: Light Levels Screen

3.1.5 Movement Screen

The Movement screen display how much time the user stayed indoors. These data will be retrieved and analyzed from the HomeHub sensors. A corresponding message will be displayed upon general rules.

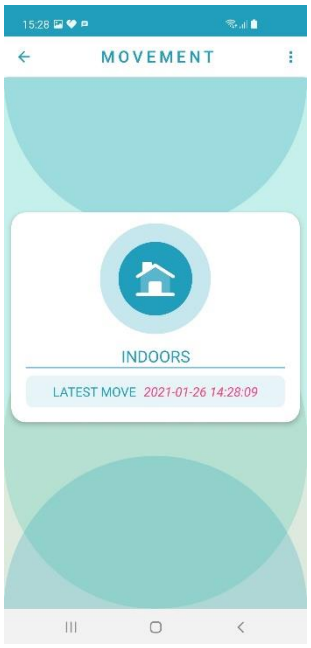


Figure 19: Movement Screen

3.1.6 Comfort Screen

The comfort screen displays the temperature of the users residence A corresponding message will be displayed upon general rules.

Figure 20: Comfort Screen

3.1.7 Incoming Notifications

Sb@app gets incoming notifications and displays them.

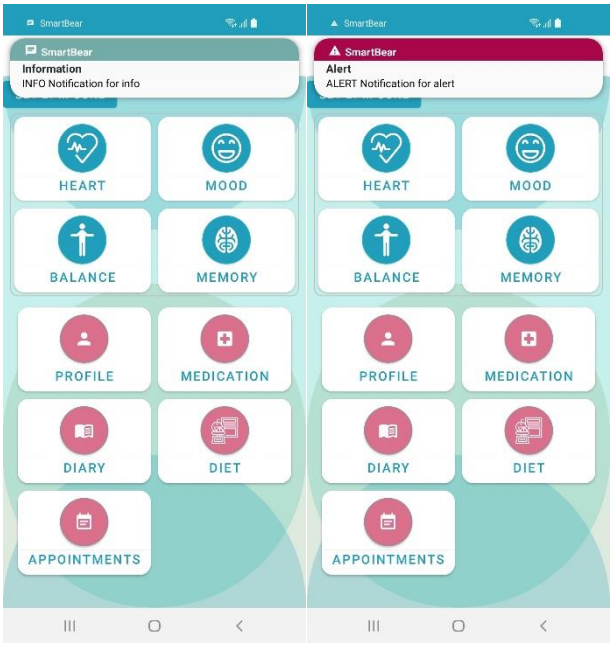


Figure 21: Incoming Notifications

3.2 *Demonstrator*

The executable (.apk) of the demonstrator is available at:
https://play.google.com/store/apps/details?id=gr.atc.smartbear&hl=el&ah=JThFhqX8DyTxe408chh_hoKQuuQ

Please note that for the proper installation and use of the demonstrator it is required that:

- The user must have a google account to access Play Store.
- In order to install the app, under Play Stores closed tracked release you should contact at g.zissis@atc.gr to get an invitation for the current release.
- The mobile device should be connected to Internet.
- Home Hub must be installed and running in the local network and the mobile device must be connected with WIFI on that local network.
- Garmin connect app must be installed and a user must be registered. In order to receive results for the first time please use the vivosport wearable for more than 8 hours. Sleep summary is created the next day.
- Withings Health mate app must be installed and a user must be registered. In order to receive results for the first time please use the BPM core at least once.

Also, a short video presentation of demonstrator is accessible through the following URL:
https://drive.google.com/file/d/1amRtrE2t4F4nkiPLhshUEQlPlG367pxR/view?usp=sharing