

SoberIT
Software Business and Engineering Institute
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User's guide

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Introduction

This document describes Get&Check software. Get&Check software is product developed by members of SIDE project, working for SoberIT. SoberIT institute is involved in multiple research projects with broad range of topics including aging, healthcare, ubiquitous computing and intelligent home applications.

Get&Check is a tool, that helps individuals to collect data from various medical and wellbeing devices. The data from the devices is collected via Bluetooth into a smartphone and sent into cloud where it will be aggregated and interpreted. Collected data afterwards is accessible via Get&Check web site for the individual who collected the data. In this way he/she can have a history of the data collected from the different sensors/devices. Get&Check web site has a special secured area for medical personnel and/or researchers where they can monitor data from different individuals that are enrolled in the projects that they supervise.

At this stage three devices can be used with Get&Check: Zephyr Heart Rate Belt (1) and an arm type Blood Pressure measuring device Fora D40b (2). The principal working schema is showing on the figure 1.



Figure 1. Principal working schema of Get&Check

Get&Check service has the following components:

1. Medical/Wellbeing devices
2. Smartphone running Android and mobile application Physical Activity
3. Get&Check web portal

The data from mentioned devices is collected with help of mobile android application Physical Activity using Bluetooth and it is automatically sent via a web service to a cloud. The mobile application sends the data immediately after collection if there is WiFi network available or mobile data transfer connection. If there is no data transfer plan and no WiFi available the data collected and stored in the phone and sent to cloud immediately when internet connectivity is available. Later on the recorded data can be easily visualized online via Get&Check portal for further analysis.

Get&Check is meant for use in researchers projects, where data collection from various range of users is needed. Get&Check gives an easy solution for data gathering and analysis for research purposes.

The following sections will describe main Get&Check components in a depth.

Abbreviations and terms

Bluetooth – is a proprietary open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions in the ISM band from 2400-2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security.

Cloud service – is a service delivered via the internet, which are accessed from web browsers and desktop and mobile apps, while the business software and data are stored on servers at a remote location.

Heart beat rate – is the number of heartbeats per unit of time, typically expressed as beats per minute (bpm)

Blood pressure (BP) – is the pressure exerted by circulating blood upon the walls of blood vessels, and is one of the principal vital signs. The measurement blood pressure without further specification usually refers to the systemic arterial pressure measured at a person's upper arm. It is measured on the inside of an elbow at the brachial artery, which is the upper arm's major blood vessel that carries blood away from the heart. A person's BP is usually expressed in terms of the systolic pressure over diastolic pressure (mmHg), for example 140/90.

The blood sugar – concentration or blood glucose level is the amount of glucose (sugar) present in the blood of a human or animal. Normally in mammals, the body maintains the blood glucose level at a reference range between about 3.6 and 5.8 mM (mmol/L, i.e., millimoles/liter), or 64.8 and 104.4 mg/dL. (1)

ANT – wireless networking protocol and embedded system solution specifically designed for wireless sensor networks (WSN) (2)

ANT+ represents the interoperability function that can be added to the base ANT protocol. A managed network, ANT+ facilitates the collection, automatic transfer and tracking of sensor data for monitoring of all personal wellness information (2)

Using software

This section describes the necessary portable devices, prerequisites, users groups and how to get started with the Get&Check software.

Prerequisites

Portable devices prerequisites:

Get&Check software is fine-tuned to collect data from several devices. Before start using Get&Check, make sure that at least one of devices is available to use. Some devices uses the ANT+ connectivity (2).

List of currently used devices:

- Zephyr Heart Rate Belt sends precise heart rate information to mobile application in real time. Sensor is physically attached to the body (3).
- FORA Blood Pressure Monitor D40b allows blood pressure and pulse measurement and also blood glucose levels (4).
- Garmin Heart Rate Monitor, which helps to measure heart beat data. (5)

Mobile prerequisites:

Current implementation is completed for smartphones running Android OS 2.1 or later which have bluetooth support.

To be able to use use ANT+ belts, smatrphones have to provide ANT connectivity.

The list of mobile phones, possible to use with ANT+ belts:

- HTC Rhyme
- Sony Ericsoon Live with Walkman
- Sony Ericsson Xperia active
- Sony Ericsson Xperia arc
- Sony Ericsson Xperia arc S
- Sony Ericsson Xperia mini
- Sony Ericsson Xperia mini pro
- Sony Ericsson Xperia neo
- Sony Ericsson Xperia neo V
- Sony Ericsson Xperia pro
- Sony Ericsson Xperia ray
- Sony Ericsson Xperia X8
- Sony Ericsson Xperia X10 mini
- Sony Ericsson Xperia X10 Mini pro (6)

User groups

There are two types of user in Get&Check:

- Get&Check users. Persons, who were invited to participate in the experiment or project. They are allowed to use mobile application and monitor their own data via web site. They have limited access to web site. Further called '**users**'.
- Get&Check researchers. Persons, who have the full access to web site and allowed create new projects, to invite other users to the projects, monitor all collected data with in own projects. They are called further as '**researchers**'.

Customers and projects

A Customer can be an individual (private researcher) or an organization (university, research programs etc). Each customer should have at least one associated Project. Customer obtains status Researcher upon email request sent to Get&Check admin.

Customers are allowed to create several research projects and invite there unlimited amount of research participants. Projects are like a folders of information that contain all recorded data collected from Physical Activity application.

Observation types

Get&Check service stores data collected from earlier mentioned devices. There are data of following types:

- *Accelerometer data* - acceleration estimates recorded on 3 axis internal accelerometer in m²/s.
- *Average Heart Beat* - average heart beat per minute estimate is recorded several times per second.
- *Blood pressure data* - diastolic and systolic blood pressure is recorded in mmHg.
- *Glucose data description* - amount of glucose in blood. Recorded in mmol/l.

Get&Check Platform description

Mobile application 'Physical Activity'

Mobile application of service Get&Check is Android Mobile Application Physical Activity, it can be downloaded directly from the link: <http://bit.ly/vlinjn>

As alternative option for quick download of the application by scanning a two-dimensional code image can be used. The code is presented below:



Figure two-dimensional code for downloading Physical activity application

Currently there are 2 servers where the data is uploaded:

1. Playground server - the data is uploaded in real time. Playground is a server where data can be uploaded from mobile via an API. The format of data has to be specified before in the Playground server. This is done by defining a Weblet that contains the structure of the data that will be sent from mobile.
2. SIDE Server - the data is uploaded manually session by session

Physical Activity mobile application

Current features available for Physical Activity mobile application are Record Physical Activity, Vital Parameters, Sessions, Preferences, Clean, all of them are shown of the figure 2

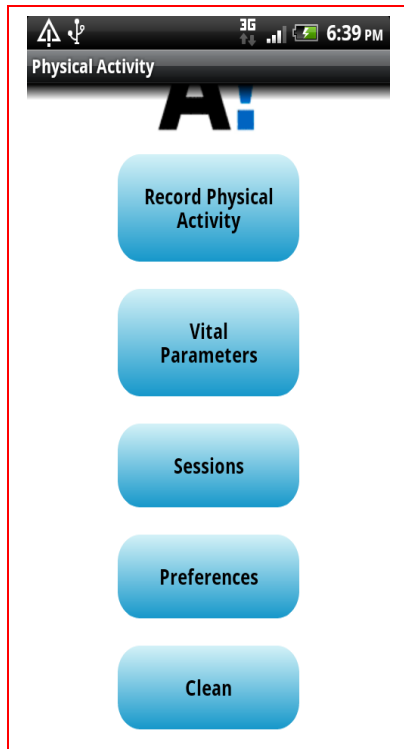


Figure 2 Physical Activity mobile application – general view.

Record Physical Activity

The user can see in real time his hear beat rate represented by the color **red** on the graph and the accelerometer data represented by the color **blue** on the graph (shown on figure 3). The screen indicates the starting time for the data display and the time frame for the display (2 minutes). The displayed data is also collected in the background. This data is uploaded in real-time to Playground. However for SIDE server the collected data will be sent using the Sessions menu item.

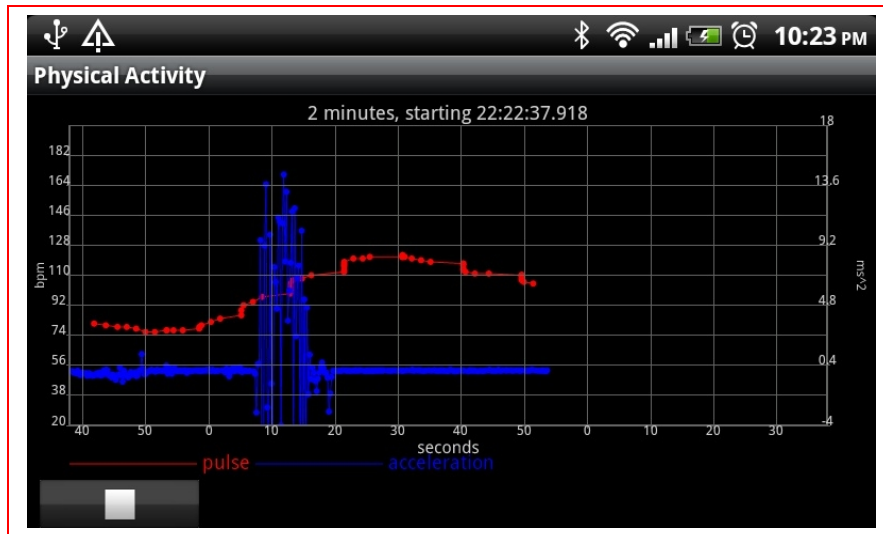


Figure 3 Physical Activity mobile application – accelerometer data graph

Vital parameters

Displays the data received from the FORA Blood Pressure Monitor D40b (figure 4a) and the date and time. The data received and displayed is pulse and blood pressure values: systolic and diastolic.

Turn off connection button has to be pressed after receiving the data from FORA device in order to close the connection and make the collected data available for being uploaded to SIDE server.

Sessions

Users can see here the date and time when data recording was started and finished. The users can upload the data into the SIDE server by pressing longer on a session item list and clicking Upload Session from the contextual menu, (see figure 4b).

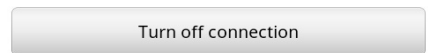
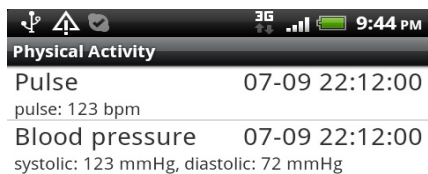


Figure 4a. Data received from the FORA Blood Pressure Monitor D40b

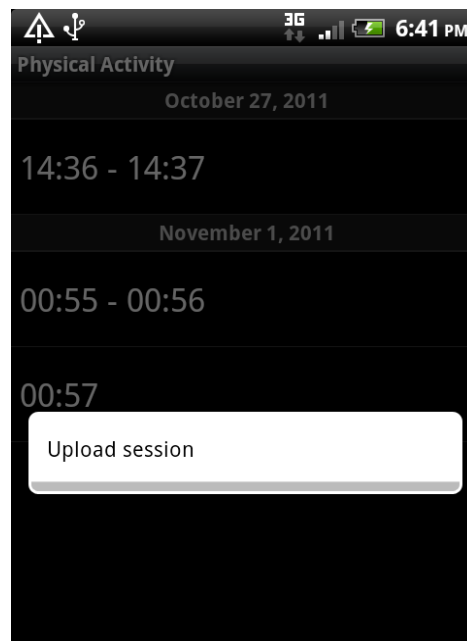


Figure 4b. Physical Activity mobile application – Upload Session

Preferences

Sensor delay - sets the interval of receiving data from devices - it is recommended to use default values.

Optional Values:

- Normal - default
- UI
- Game
- Fastest

Recording frequency – the interval for storing the data from device in milliseconds - it is recommended to use default values.

Broadcasting frequency – the interval for sending data to server in milliseconds - it is recommended to use default values

AHL URL – the URL for the web service which will receive and store the data from devices

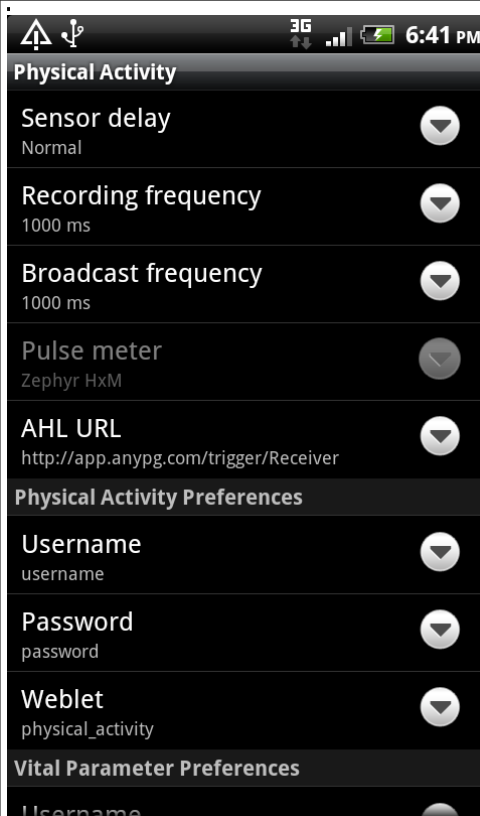
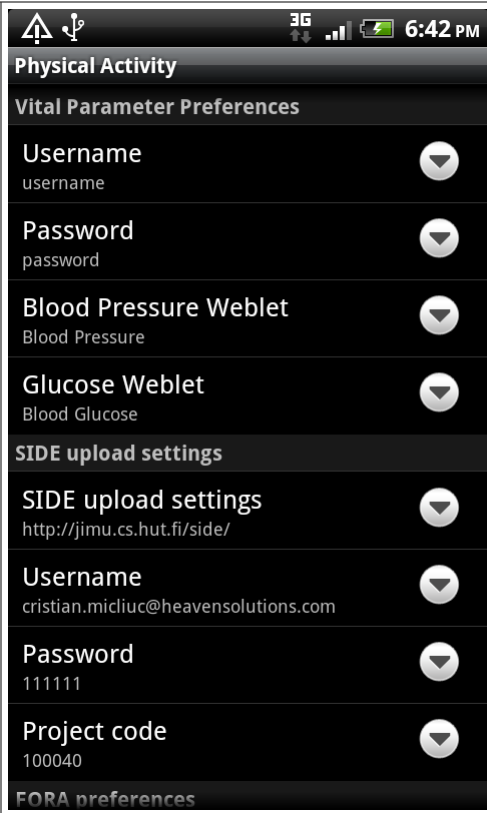
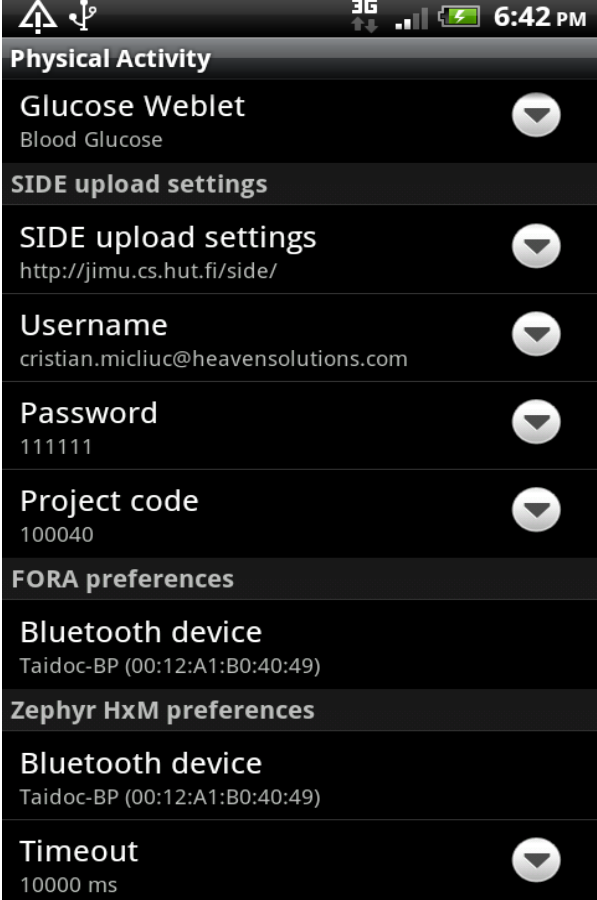


Figure 5. Physical Activity mobile application – List of preferences

<p>Physical Activity Preference Username, Password for uploading the data in the Playground server and Weblet for displaying the data in portal. This is used to store the heart beat measurements.</p> <p>Vital Parameter Preferences Username, Password and Weblet for recording the data on the target server for Blood pressure and Glucose level measurements</p> <p>SIDE upload settings</p> <p><i>SIDE upload settings</i>- the SIDE web service URL where data will be uploaded:</p> <ul style="list-style-type: none"> • <i>Username</i> - SIDE portal username (patient/person SIDE account) • <i>Password</i> - SIDE portal password (patient/person SIDE password) • <i>Project code</i> - Side project code where the person/patient is enrolled 	 <p>The screenshot shows the 'Physical Activity' mobile application interface. At the top, there's a status bar with '3G', signal strength, battery, and time '6:42 PM'. The app title 'Physical Activity' is at the top. Below it, the section 'Vital Parameter Preferences' contains four rows: 'Username' (with 'username' below it), 'Password' (with 'password' below it), 'Blood Pressure Weblet' (with 'Blood Pressure' below it), and 'Glucose Weblet' (with 'Blood Glucose' below it). Each row has a dropdown arrow on the right. Below this is the 'SIDE upload settings' section, which contains three rows: 'SIDE upload settings' (with 'http://jimu.cs.hut.fi/side/' below it), 'Username' (with 'cristian.micliuc@heavensolutions.com' below it), 'Password' (with '111111' below it), and 'Project code' (with '100040' below it). Each row also has a dropdown arrow on the right. At the bottom, there's a section labeled 'FORA preferences'.</p>
	<p>Figure 6. Physical Activity mobile application – vital parameters preferences</p>

<p>Fora preferences <i>Bluetooth device</i>- Select the device to pair with and collect the data from - for blood pressure</p> <p>Zephyr HxM preferences <i>Bluetooth device</i>- Select the device to pair with and collect the data from - for heart beat</p> <p><i>Timeout</i> - Timeout for the bluetooth connection in milliseconds</p>	 <p>The screenshot shows the 'Physical Activity' mobile application interface. At the top, there's a status bar with 3G signal, battery level, and time 6:42 PM. The app title 'Physical Activity' is at the top. Below it, there are several settings sections: 'Glucose Weblet' (Blood Glucose), 'SIDE upload settings' (http://jimu.cs.hut.fi/side/), 'Username' (cristian.midiuc@heavensolutions.com), 'Password' (111111), 'Project code' (100040), 'FORA preferences' (Bluetooth device: Taidoc-BP (00:12:A1:B0:40:49)), 'Zephyr HxM preferences' (Bluetooth device: Taidoc-BP (00:12:A1:B0:40:49)), and 'Timeout' (10000 ms). Each setting has a dropdown arrow on the right.</p>
	<p>Figure 7 Physical Activity mobile application – Device Preference list</p>

Clean

This button will clean all the information stored in the phone by Physical Activity application

Using Get&Check web site

This chapter describes the functionality of Get&Check web site. The site can be accessed on address <http://jimu.cs.hut.fi/getcheck/>

Log in to the site/ registering new user

The front page of the site is shown on the figure 8 below. If person has already registered earlier, then he/she can log in to the site by entering username and password to the fields marked with number 1 on the picture. If person doesn't have yet an account, then it is possible to register a new account by following the link 'Create new account', marked with number 2 on the picture. On the page for creating new account, shown on the figure 9, is necessary to enter the desired user name and email. After submitting the form account details containing password for the site will be sent on mentioned email address. Email will contain the further instructions regarding registering.

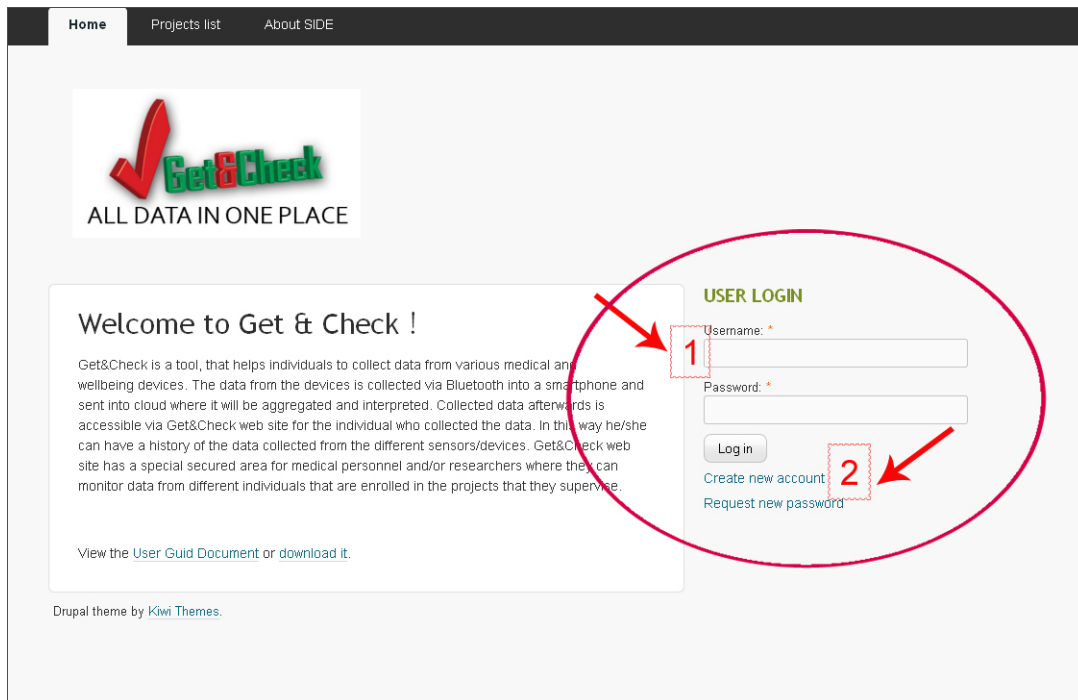


Figure 8. Get&Check frontpage

The screenshot shows the 'Create New Account' page of the Get&Check website. At the top is a navigation bar with links: Home, Projects list, and About SIDE. Below the navigation bar is a large banner featuring the Get&Check logo (a red checkmark and the text 'Get&Check') and the tagline 'ALL DATA IN ONE PLACE'. The main content area is titled 'User account' and contains a breadcrumb trail 'Home > User account'. Below the breadcrumb trail are three buttons: 'Create new account', 'Log in', and 'Request new password'. The 'Create new account' button is highlighted. The form fields include: 'Username: *' (with a note: 'Spaces are allowed; punctuation is not allowed except for periods, hyphens, and underscores.'), 'E-mail address: *' (with a note: 'A valid e-mail address. All e-mails from the system will be sent to this address. The e-mail address is not made public and will only be used if you wish to receive a new password or wish to receive certain news or notifications by e-mail.'), 'Password: *', and 'Confirm password: *' (with a note: 'Provide a password for the new account in both fields.'). A 'Create new account' button is at the bottom of the form.

Figure 9. Get&Check – Create New Account page

Registering a new researcher

While creating a new users account, user gets an email with account details. This email contains instructions for researchers, shown on the figure 10. Registering as a researcher is done upon email request sent to email address mentioned in account details email.

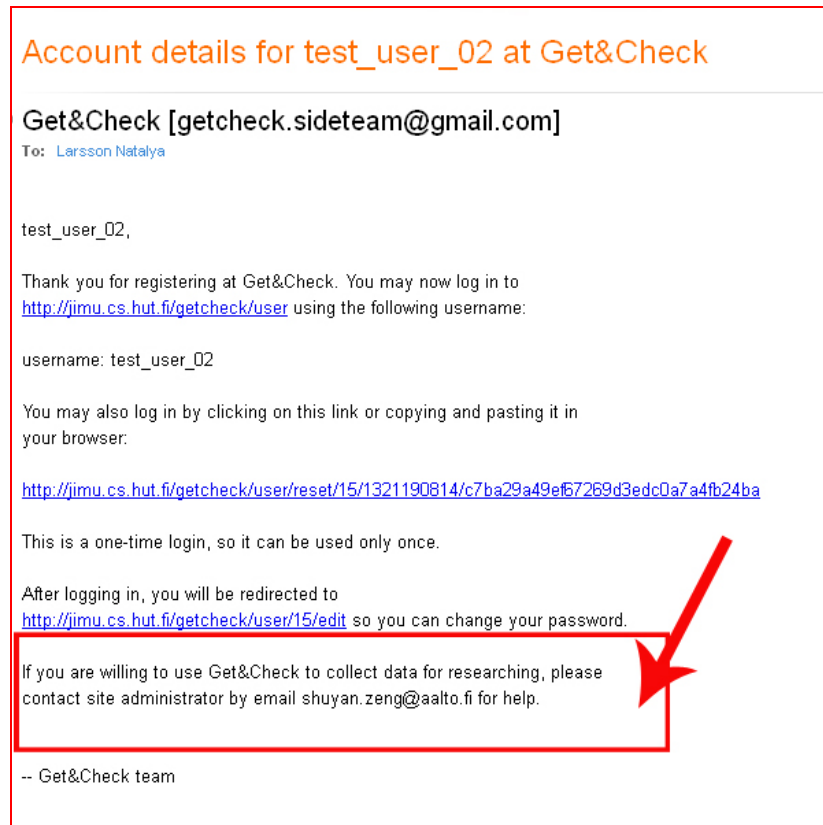


Figure 10. Register as a research instructions

Users view

After logging in user gets in to the service. Users view has three tabs: Home, For person and About SIDE.

Tab *About SIDE* tells about the development team of the project. Questions, feedback and improvements suggestions can be delivered to the team.

Tab *For person* has three submenus: My profile, My observations, My projects.

Users view can be seen on figure 11.

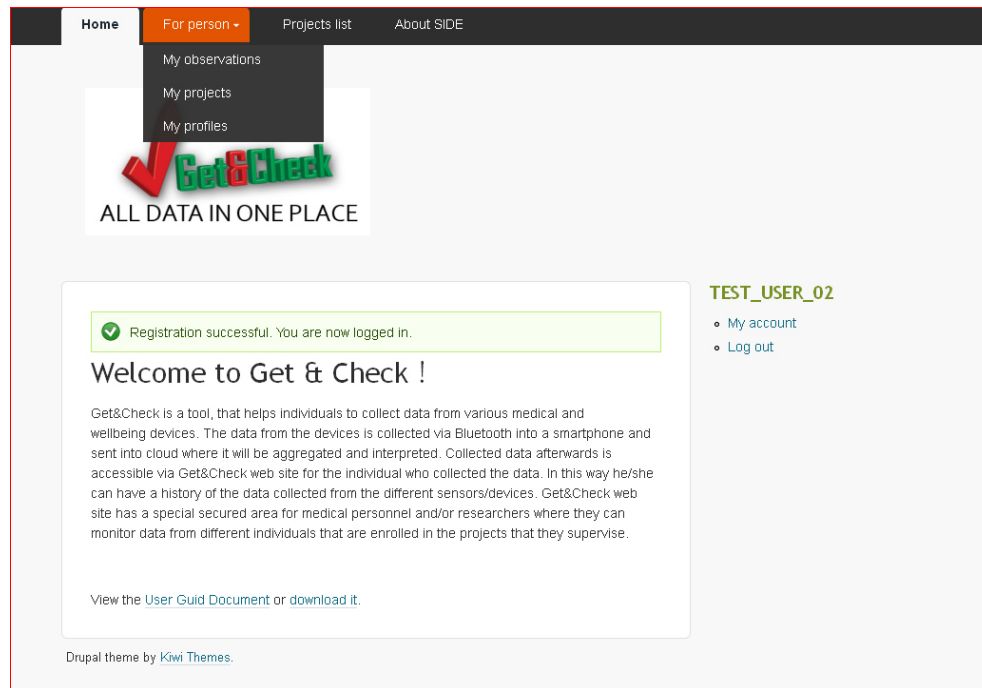


Figure 11. Get&Check – User view

Submenu *My profile* – here user can fill up own profile by entering personal details. The profile information can be changed if needed.

Submenu *My Projects* shows the list of projects, where user participates. User can't join the project by own initiative, user has to be invited by researcher to the project. In case , when use was invited by a researcher, user get an email, shown below:

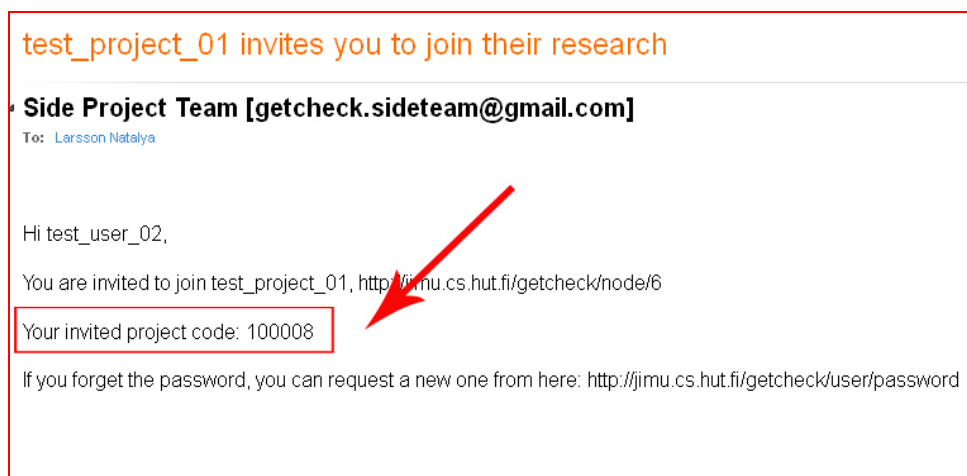


Figure 12. Get&Check – Invitation for the project

User sees only those projects, to which (s)he was invited earlier. Every project has a unique Project code (figure 12). This project has to be used in mobile application Physical Activity to record the observations. Projects page is shown on figure 13.

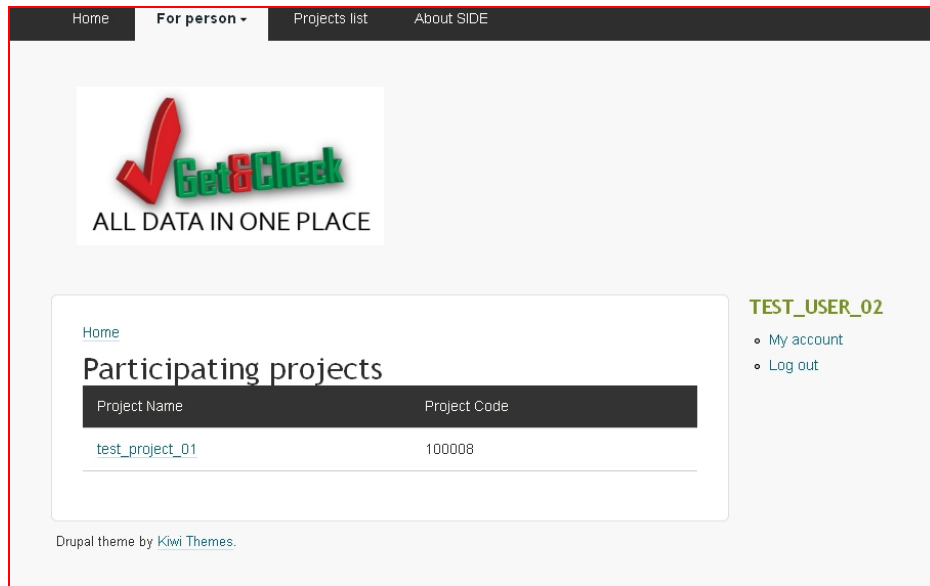


Figure 13. Get&Check – Projects list

Submenu *My Observations* contains data collected by Physical Activity application. All the data can be found by Project name or by Date. The data is presented as a graphs. The example of Average Heart Beat data is presented on figure 14.

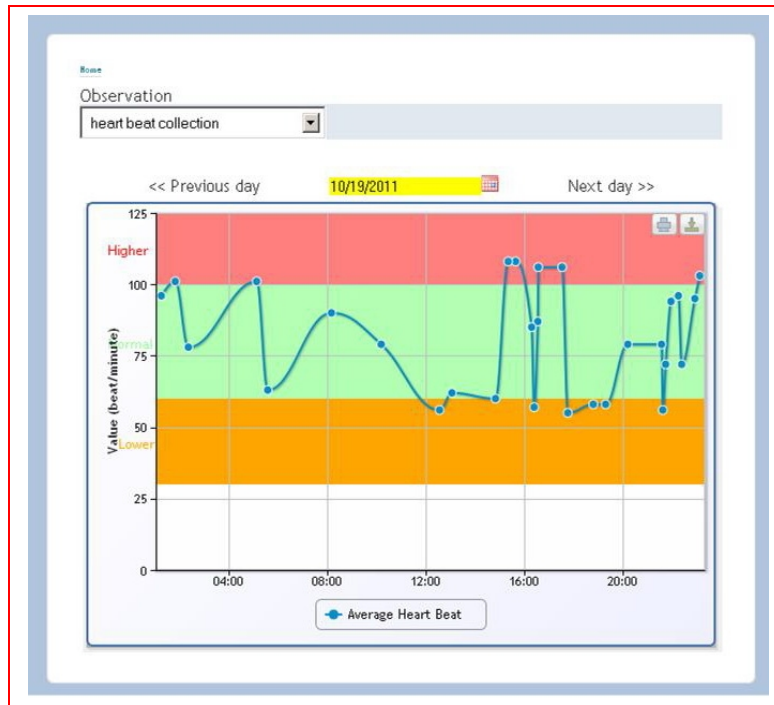


Figure 14. Get&Check – Observation type: Average Heart Beat

Researchers view

The Get&Check service gives a wider range of functionality for researches, home view of service for researchers is shown of the picture 15

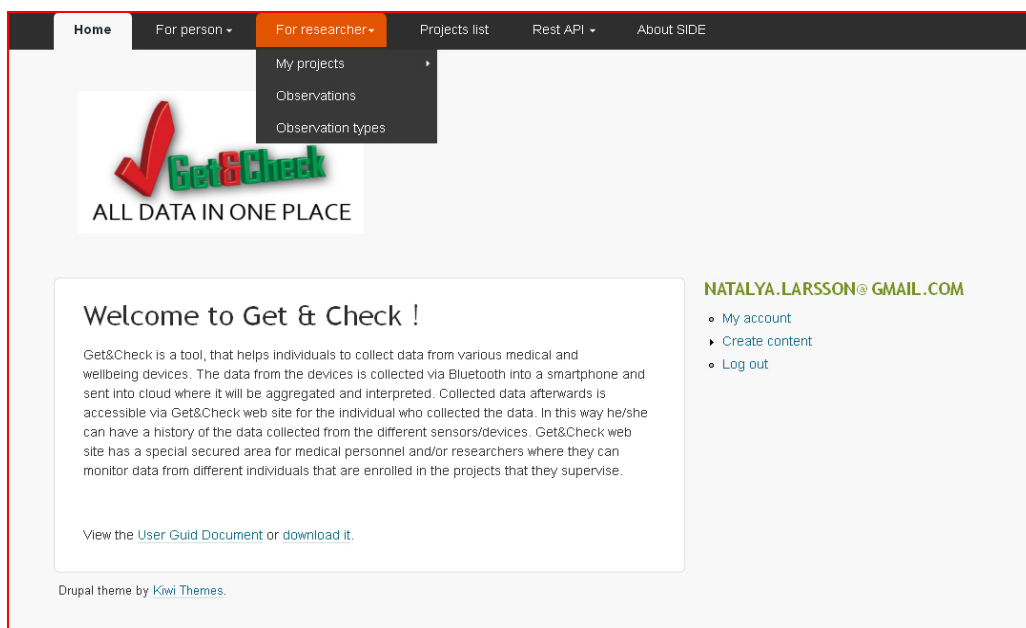


Figure 15 Get&Check – Researchers view

In the tab *My projects*, researcher can view existing projects, created earlier, and also create a new project. Page for creating a new project is presented on the figure 16. Each project has a name (marked 1 on the figure 16) and description field.(marked 3) Researchers can invite test users for participating in the project by sending invitation emails to the users (marked 2). If the invitation sent to the user, (s)he will get an email, where will be given project code. The project code is meant to be used in Physical Activity mobile application.

Figure 16. Get&Check – Create a new project page

The submenu *My Observations* allows researcher to browse all collected data by mobile application Physical Activity. Collected data is presented in form of graph, showing the average heart beat rate depending on time. The average heart beat curves is built upon heart beat rate measurements at certain period of time, the exact heart beat measurements are shown on the graph as bigger dot. By clicking on the graph point the exact timestamp can be checked. The example of Observations is presented on figure 17.

The submenu *Observations types* explains what kinds of observation data can be currently collected and displayed by the application. Currently there two types of data are available: Accelerometer and Average Heart Beat.

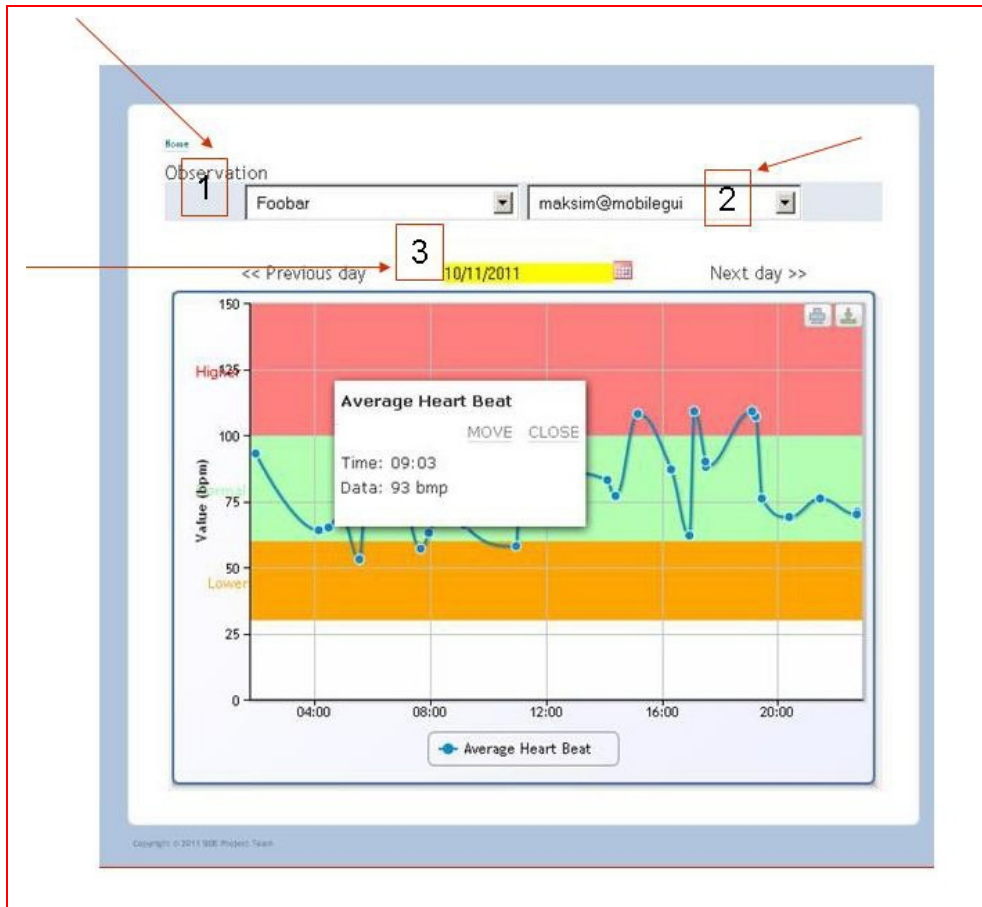


Figure 17 Get&Check – Observations, with numbers are shown the selection types, 1- by projects name, 2- by users name, 3 - by date.

Recommended step sequence for using Get & check platform

This chapter presents the recommended steps sequence for users, who want to start using the platform. There is also available more detailed video instructions.

The sequence shows the complete process installing the mobile application, measuring and collecting data from device FORA d40.

Precondition

Users are invited by a researcher to participate in the project. When researcher invites users, the user gets an email, which contains the 1. Project Code. If the user doesn't have yet the user account in GetCheck portal, then email contains 2. Username and 3. Password as well

Hi natalyak@meta.ua,
You are invited to join test_project_01, <http://jimu.cs.hut.fi/getcheck/node/6>
Your invited project code: 100010 **1**
Visit <http://jimu.cs.hut.fi/getcheck/user>, login to change your password.
Username: natalyak@meta.ua **2**
Password: 11111 **3**

Step 1

After you got an invitation, please, download the application. There are two options for it: download it from URL or by scanning the 2D code. (check the mobile application description).

URL: <http://bit.ly/vlinjn>

OR



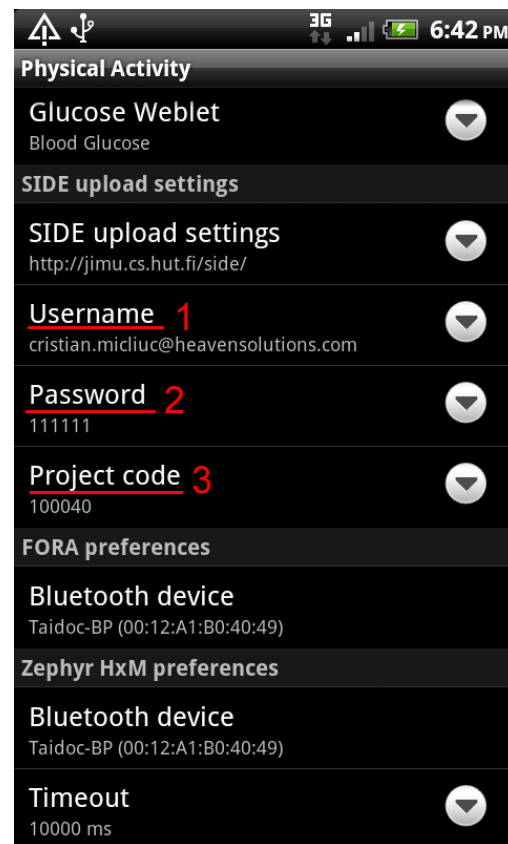
Note: Please, make sure that the option '*Allow install of non-Market application*' is ON on your mobile phone the option. It can be found from Menu/Settings/Applications/Unknown sources

Step 2

After downloading, please, install the application and run it.

Step 3

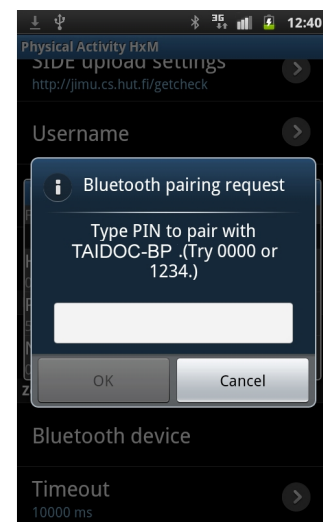
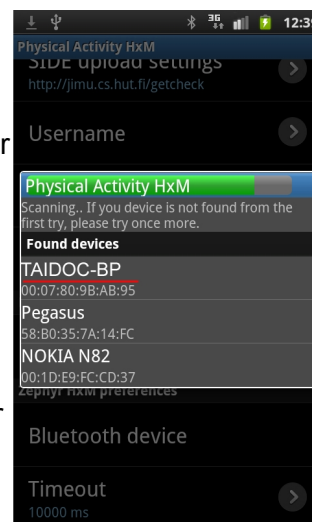
In the application go to section Preferences and enter there 1. Username, 2. Password and 3. Project code, that you got in the invitation email from a researcher



Step 4

Pair the application with **FORA d40**:

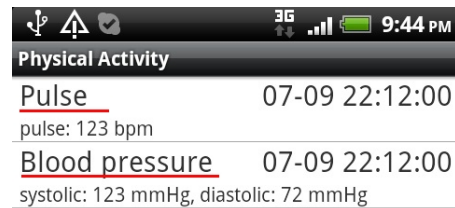
1. turn on the bluetooth button to the device (right top button). Blue indicator should start blinking.
2. In mobile application under section : *FORA preferences* choose *Bluetooth device* and then press *Discover* button.
3. In the list of found devices, choose TAIDOC-BP, which is the name for for a d40 defined by manufacturer
4. In the pairing request window, enter the pairing code of the device: 111111, this code is also defined by the manufacturer (Fore more details read manufacturer manual (4))
5. After entering a correct PIN, comes notification: *Pairing successful*



Step 5

After the devices have been paired with the application, you can proceed with the data measuring.

1. By using FORA device, measure your blood pressure.
2. Turn on the bluetooth connection on the device. Bluetooth indicator has to start blinking.
3. In the main menu of the application, you can choose section '*Vital parameter*'. to check the measured data of pulse and blood pressure.



The screenshot shows the 'Physical Activity' app interface. At the top, there's a status bar with icons for Bluetooth, signal strength, and battery, along with the time 9:44 PM. Below the title 'Physical Activity', there are two entries: 'Pulse' and 'Blood pressure', both dated '07-09 22:12:00'. Under 'Pulse', it says 'pulse: 123 bpm'. Under 'Blood pressure', it says 'systolic: 123 mmHg, diastolic: 72 mmHg'.

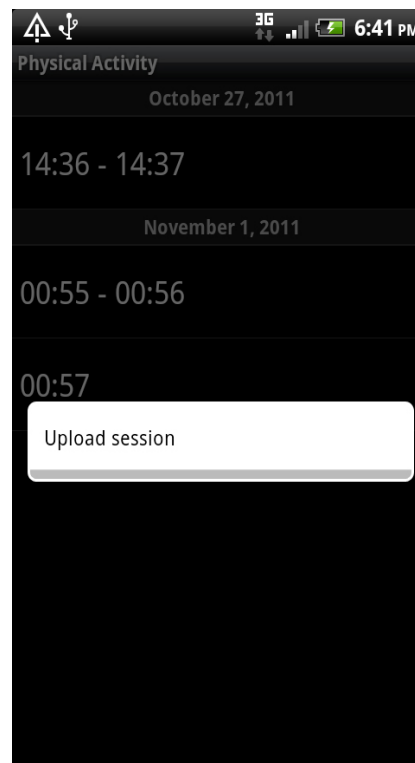
Physical Activity	
<u>Pulse</u>	07-09 22:12:00
pulse: 123 bpm	
<u>Blood pressure</u>	07-09 22:12:00
systolic: 123 mmHg, diastolic: 72 mmHg	

Turn off connection

Step 6

From the main menu go to section 'Session'. It will contain the whole list of all measurements, which have been done before.

1. Choose from the list exactly that session, which data you want to use further, to upload it to the site. Make Long Press on it.
2. Press button "*Upload session*"
3. While data is uploading, you will get an corresponding notification: first "*Uploading data!*" And then "*Upload successful*"



Step 7

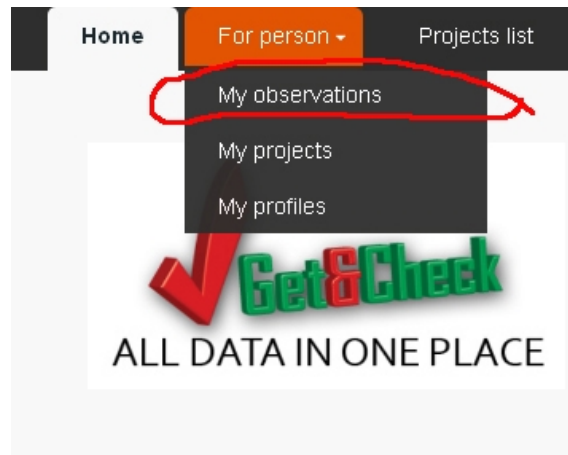
Login to Get&Check web site, using your username and pwd, received earlier.

URL:

<http://jimu.cs.hut.fi/getcheck/>

Step 8

Go to *My observations* and find there the uploaded data by the project name and date.



NOTE:

Correction to the step 4, If you use Zephyr HxM:

1. Put the belt ON. NOTE: the device becomes visible for the bluetooth connection, only if it is already ON, also make sure that the device is fully charged.
2. In mobile application under section : Zephyr HxM *preferences* choose *Bluetooth device* and then press *Discover* button.
3. In the list of found devices, choose HXM007743, which is the name for Zephyr belt defined by manufacturer

In the pairing request window, enter the pairing code of the device: 1234, this code is also defined by the manufacturer (For more details read manufacturer manual (3))

References

1. <http://www.faqs.org/faqs/diabetes/faq/part1/section-9.html>
2. <http://www.thisisant.com/technology>
3. <http://www.zephyr-technology.com/consumer-hxm>
4. <http://www.foracare.com/products-2in1-index.html>
5. <https://buy.garmin.com/shop/shop.do?plD=10996&ra=true>
6. <http://www.thisisant.com/pages/developer-zone/android-api>

Document history

Revision	Date	Description / Changes
-	08 Oct 2011	initial release
Cristian	11 Oct 2011	revision and mobile details added
Natalya	16 Oct 2011	smaller overall corrections, updating Prerequisites chapter
Natalya	20 Oct 2011	name change, schema change etc
Cristian	01 Nov 2011	Add Playground details and modify the mobile user guide to comply with new interface and functionality
Cristian	01 Nov 2011	Add new screenshots and correct some texts
Natalya	11. Nov 2011	New screens, some text update and new links
Natalya	14 Nov 2011	New chapter added: Sequence of steps

Natalya	20 Nov 2011	Last chapter update
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