



Deliverable 2.4

Service specifications

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Introduction

In the following chapters we present the service specifications of the NOAH system.

Overview

The services offered by the NOAH system are tailored to the three user profiles: system administrators, end-users and caregivers (caregiver/caregiver assistant/relative), each with its own set of features, tuned to their targeted goals.

The services provided for each user profiles are:

- For administrators:
 - o Accounts management service
 - o NOAH Kits management service
 - o Data collecting service
 - o Alerts generation service
 - o Behavioural analysis service
- For end-users:
 - o Account management service
 - o Well-being feedback service
 - o Alerts service
 - o Social connection service
- For caregivers:
 - o Register service
 - o Account management service
 - o Sensors data service
 - o Alerts service
 - o Notifications service

There are a few general services that are not specific to an user type:

- Authentication and authorization service
- Auto-updating service

The end-users and caregivers services are offered through a mobile application and the administrators use the IBM Bluemix user interfaces.

The design of the services followed the people-centric approach.

People-centric service design

The end-user monitoring starts with the investigation of assessing the level of behaviours used in daily activities is measured with the ABAS II questionnaire. The areas that are being investigated are: Communication; The use of community resources; Functional behaviours learned in school; Family life; Health and safety; Leisure; Self-care; Social behaviour. The questionnaire results are included in an individual report for each end-user, where the individual strengths and / or weak points are determined.

The results of the questionnaire will be discussed together with the caregiver to identify the current state of behaviours used in daily activities for the end-user. Following discussions with the caregiver and the end-user, some activities will be proposed to improve certain behaviours. Integrating this assessment by including caregivers' feedback in the project aims to objectively investigate the behaviour of individuals and improving the daily behavioural areas that could make their lives easier.

Administrators' services

Accounts management service

Description:

Service that allows the creation of new users in the NOAH system.

Details:

The administrator of NOAH system can create accounts for new users: end-users and caregivers. An unique code is attached to each end-user, so it can be shared with its caregivers to give them access to the end-user's data.

Caregivers can create their own accounts by using the *NOAHCare* mobile application and the register service.

The features of this service are available through the *IBM Bluemix* user interface or through a database client.

NOAH Kits management service

Description:

This service helps administrators of the system to registers NOAH kits and to create the storage structure (a table in the database) able to receive the data coming from the sensors in the kit.

Details:

The NOAH kits must be registered in order to activate the collecting of data. Each sensor has an unique id, which is linked to an abstract entity – the NOAH kit – that receives an id (e.g. NOAH-RO-00). The data collecting service uses this information to accept and redirect data coming from the *IoT platform* to the right table in the database.

The user interface is offered by *IBM Bluemix* or by a database client.

Data collecting service

Description:

The data collecting service runs the processes required to collect the data and offers tools to identify issues and their cause.

Details:

Data coming from sensors are collected by the *IoT platform*, which sends them the NOAH collecting web service to be processed. The data is stored in the corresponding table (based on the unique sensor id and the NOAH kit to which the sensor belongs). The service keeps a register for the current status of every sensor in the NOAH network.

Tools for querying the sensors status register and re-initialization were developed.

Alerts generation service

Description:

This service generates specific alerts based on the data received from the sensors and offers tools for querying and cancelling active alerts.

Details:

The NOAH system generates alerts based on the data it receives from the sensors. There are 2 types of alerts: technical alerts – related to the physical conditions of the sensors (e.g. weak battery, unplugged cable, bad sensor, etc) and safety-related alerts (e.g. door left open). A register of active alerts is maintained in the cloud.

Tools for querying and cancelling active alerts were developed.

Behavioural analysis service

Description:

This service generates notification related to the well-being of the end-users based on an analysis of the data collected from sensors.

Details:

The NOAH system generates behavioural-related notifications based on the data it receives from the sensors and it conveys them to the caregivers through the *NOAHCare* application.

End-users' services

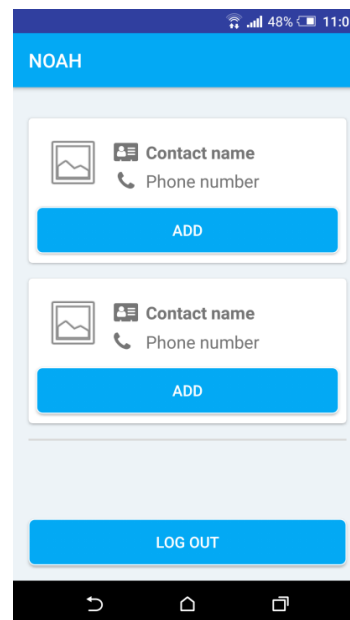
Account management service

Description:

The end-user has the possibility to manage his/her own contacts for the speed dial feature. There are two available slots for contact persons that can be chosen from the phone's contacts.

Details:

Two buttons provides the functionality of Quick Dial. That means the user can set two contacts from their phone to call them faster and easier. In case there is no contact set on the button, pressing it will redirect the user to another screen (see picture below) from where the contacts settings can be managed. Pressing the add button will open the phone contacts application and let the user choose the desired person. After setting up the contact, the action on the button will open the Phone application with the number filled only to have to call.



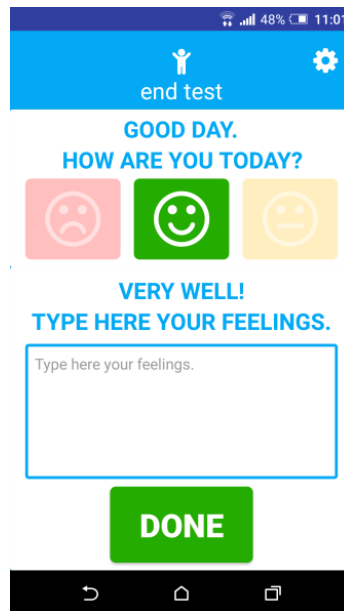
Well-being feedback service

Description:

The end-user has the opportunity to give a feedback to the caregiver about his/her well-being.

Details:

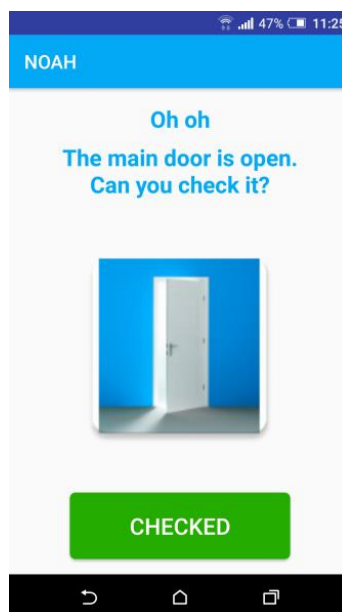
On the screen shown below the end-user has a status section, where he/she can provide a feedback to the caregiver regarding his well-being using some emoticons expressing feelings and a text field to write a message. This feedback can be filled as many times as the user desires.

**Alerts service***Description:*

The end-user receives alerts about different events captured by the sensors kit.

Details:

The end-user application also provides alerts that will pop up as a new screen whenever the system receives information about scenarios like a forgotten open door etc. In case many events happening at the same time the alerts will be displayed one by one.



Caregivers' services

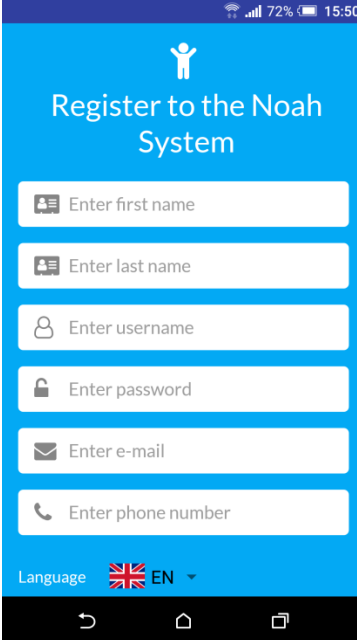
Register service

Description:

The caregiver users can create his NAOH account.

Details:

Regarding the fact that there are many caregivers and they can often change, this user needs to create his own account from the registration form within his application. This process is shown in the figure below.



The screenshot shows a mobile application registration screen with a blue background. At the top, there is a white icon of a person with arms raised, followed by the text "Register to the Noah System". Below this, there are six white input fields with blue borders, each containing a small icon and a label: "Enter first name" (person icon), "Enter last name" (person icon), "Enter username" (person icon), "Enter password" (lock icon), "Enter e-mail" (envelope icon), and "Enter phone number" (phone icon). At the bottom left, there is a "Language" label with a UK flag icon and "EN" next to it. The top status bar shows signal strength, 72% battery, and 15:50. The bottom navigation bar has three icons: back, home, and recent apps.

Caregiver user has to fill the needed information to identify himself, a name, an username, a password, an email address, a phone number, the preferred language and his location.

Account management service

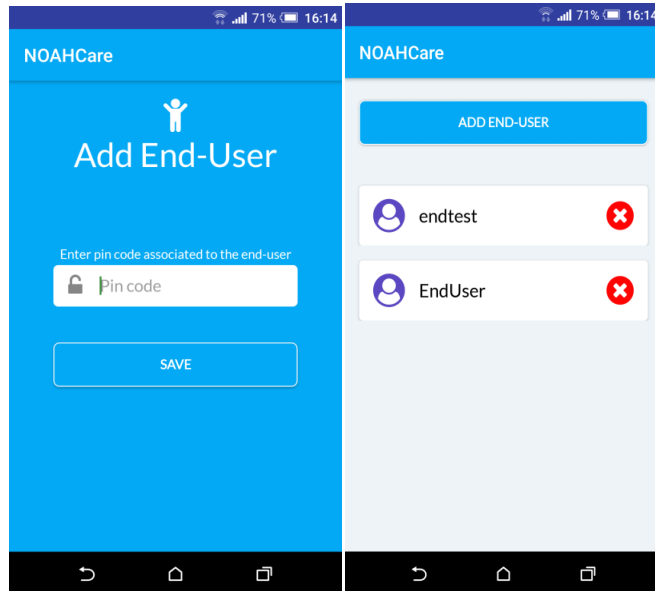
Description:

The caregiver user is able to manage his account and association of the end-users.

Details:

The user can manage his account from his account accessing the account settings screen. There he can change his personal information, the language of the application and his location.

Furthermore, the caregiver user can manage his associated end-users. He can register a new end-user to take care of or delete an old one.



In order to register a new user there is necessary the PIN code of the end-user, provided on account creation.

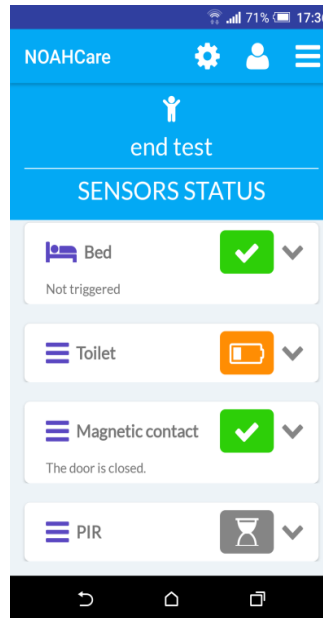
Sensors data service

Description:

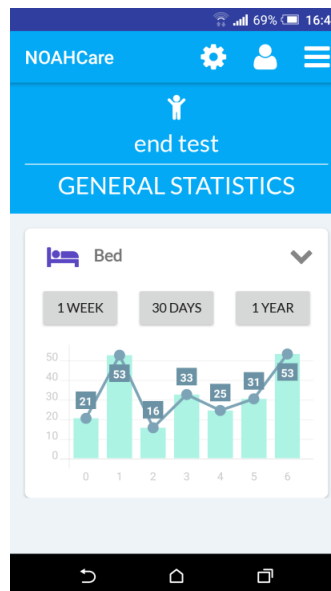
The caregiver user has an overview of the sensor status and stored data.

Details:

In the Sensors screen there are displayed the sensors linked to the NOAH kit end-user has, with their statuses and a description of it. (see picture below)



Whenever a sensor status changes or there are any technical issues with that sensor, the caregiver receives notifications about it.



In the Stats screen there are displayed graphics that show a overview of the gathered data from the end-user NOAH Kit sensors. The statistics are shown on each sensor and also on many time periods that can be chosen by the user. (see picture above)

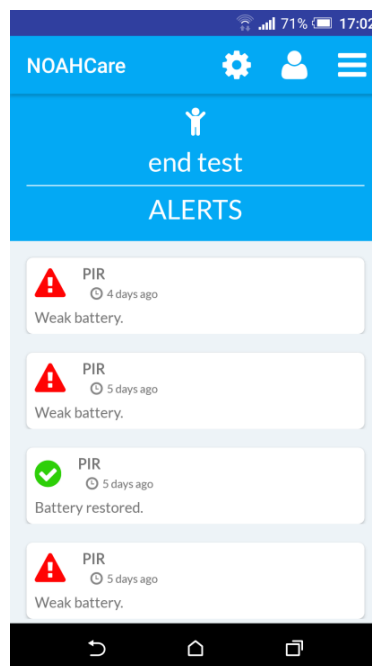
Alerts service

Description

Alerts are being generated when a sensor's status changes.

Details:

In the Alerts screen there are displayed all the alerts the application received about the sensors states, as technical information. Most popular are about connecting and disconnecting a sensor and battery level as shown in the next picture.



Notifications service

Description:

Notifications are generated for changes in the behaviour of the end-user.

Details:

In Changes in behavior screen there are displayed the notifications that were produced by the Behavioral Analysis Module of the system, representing changes or issues detected in end-user's behavior. These notifications are the same with those from the landing page.

General services

Authentication and authorization service

Description:

This service is used by the user interfaces of the NOAH system to grant access only to the authorized users.

Details:

The users are identified through the username-password pair (*authentication*) and the persistence of session are implemented using tokens (*authorization*).

Auto-update service

Description:

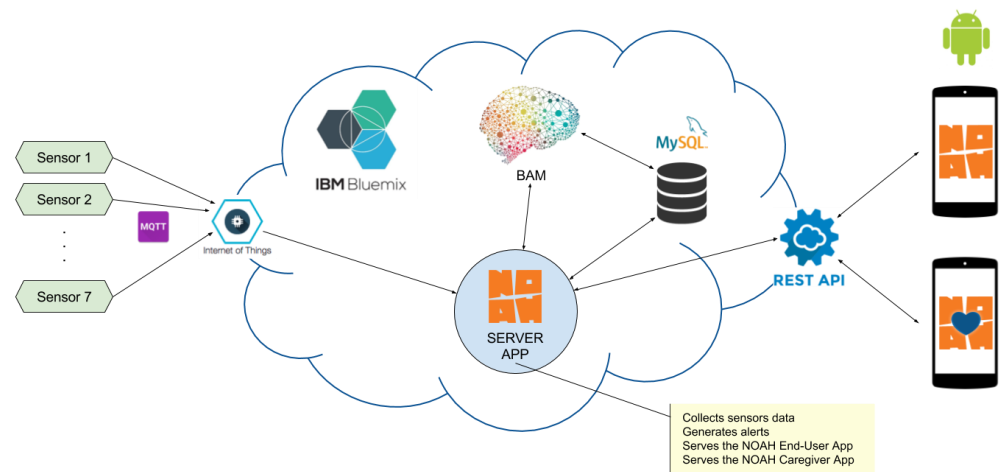
The auto-update service keeps up-to-date the application installed on the mobile devices used by the NOAH users.

Details:

A registry of NOAH mobile applications is kept and endpoints are exposed, so the applications can be automatically updated. The updates are of two types: optional (the user can decide not to update) or mandatory (no features will be available until the application is updated).

Services implementation overview

The NOAH project is built based on the client-server architecture. The entire system overview is represented in figure below.



The project's server side is developed and hosted on *IBM Bluemix*, IBM's cloud platform. This implies a continuously running cloud foundry application which uses two services, *Internet of Things Platform* and *Compose for MySQL*.

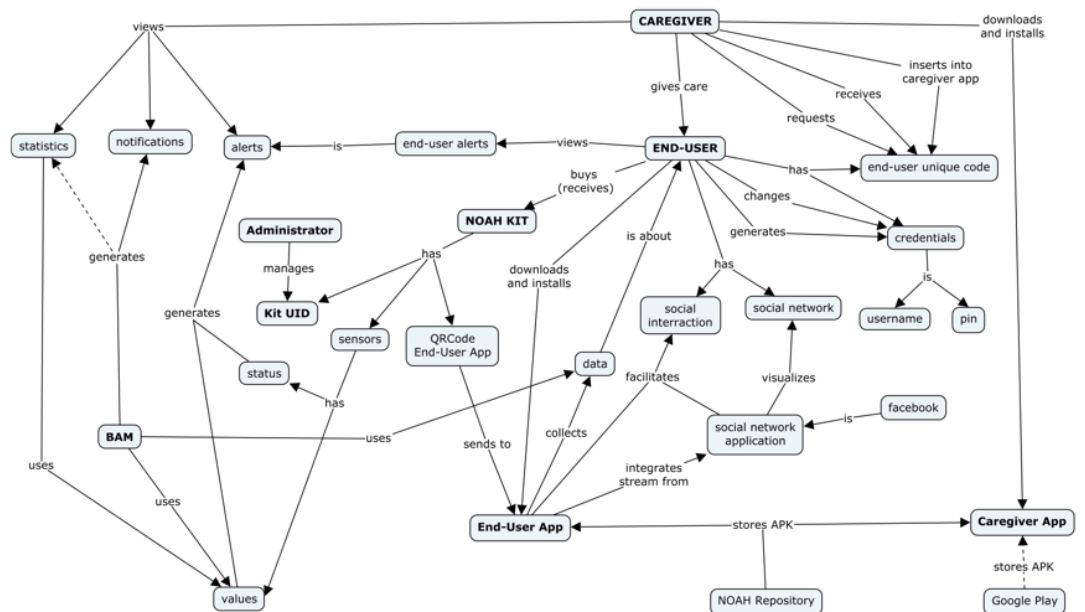
The *Internet of Things Platform* communicates with the registered devices and has the role to collect data from the sensors and transmit them to the server application, while *Compose for MySQL* provides the storage for the retrieved data and for all the other details that the application requires to run.

The *Behavioral Analysis Module* (BAM) processes the sensors data to detect behavior patterns that can indicate the well-being state of the monitored person and sends the results to the server application, which in turns must convert them to notification/alerts for the users.

The project's client side is represented by two applications, one for the caregivers and one for the end-users. These are developed, native, in Android and represent mobile applications that can be used on a wide variety of devices.

The communication between the application's components, client, respectively the server side, is realized using REST API, through HTTP protocol. The Android application builds a HTTP request corresponding to user's intentions and commands and sends it to the server using the Internet. The server will provide an appropriate HTTP response, the client application will parse this response and it will offer an information to the user.

A conceptual map of the entire system is represented in the figure below and it offers detailed information about the system's workflow.



Conclusion

Using people-centric service design approach results in services that are closer to the users' expectations and needs and can help in delivering better features and products.

This is a continuous process, so the NOAH system will evolve accordingly.

The social connection feature is not yet implemented so we have not included it in this document. It needs a further analysis to be implemented.

