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Abstract
This document presents the initial technical overview of the development of the iOS application for the SELFBACK project.

## Document History

| Version | Date | Author(s) | Description |
|---------|------|-----------|-------------|
| 0.1 | 28/12/17 | Rasmus Faddersbøll | Initial version of the document |
| 0.2 | 29/12/17 | Christian Jensen | Added screen cast |
| 0.3 | 29/12/17 | Rasmus Faddersbøll | Revision after feedback from Tony Dieu and Søren Kleberg |
| 1.0 | 31/12/17 | Kerstin Bach, Paul Jarle Mork | Submitted version |

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# 1 Introduction

The goal of deliverable 4.5 is to develop the first version of the SELFBACK app for iOS. The application will communicate with the SELFBACK server through a REST API using JSON, providing the user with plans and sending back step data to the server. Based on the feedback and completions from the user, the server provides the user with a new set of tailoring questions. The user's response to these questions is then used to generate a new self-management plan. Part of the self-management plan is physical activity (e.g. the step count per minute), which is recorded by a proprietary wearable wristband that sends data to a designated app and the phone's own health app. The SELFBACK app will be developed for both Android and iOS. These platforms have different interfaces, including health apps (Google Fit for Android and Apple HealthKit for iOS). All necessary data for showing the weekly self-management plan will be stored on the phone (i.e., goal for physical activity, strength/flexibility exercises and educational sessions). Thus, the user will always have access to the current self-management plan, even without internet.

## 2    Interaction Components

### 2.1    Server Communication

The communication with the SELFBACK server is through secure HTTP, this will encrypt the data using a valid SSL certificate before transit from the phone to the server, preventing *man-in-the-middle attacks,* e.g. hackers obtaining your personal health data when sending it to the server. Figure 1 gives an overview of the components the SELFBACK app interacts with.

When the app is first launched it will ask for a user ID and a password, this will be sent to the server and if they match it will return an authentication token. This token will be sent back to the server on every call, to identify the user on the server. The token is stored on the phone, until the app is removed or the user logs out.
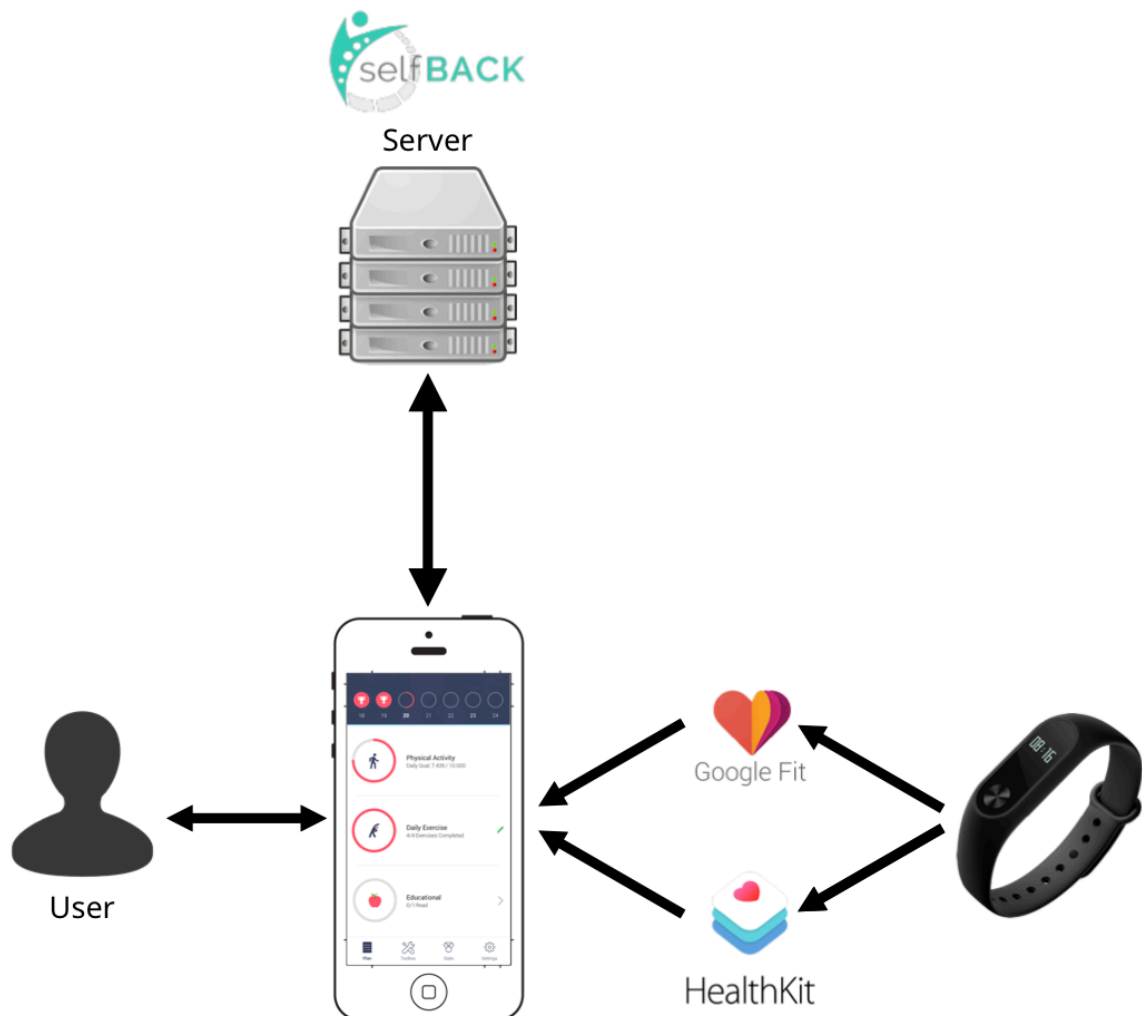


**Figure 1: Components the SELFBACK app interacts with**

## 2.2    Obtaining Physical Activity Measurements from the Wearable

For iOS the user's step count is collected from the Apple HealthKit. Therefore Apple requires the user to explicitly approve data access to HealthKit from apps, including the SELFBACK app. When the user is logged in to the SELFBACK app, during the onboarding process it will open HealthKit asking for read-permissions to step counts. iOS will only allow the app to open this permission window once, because of this, a window with information why the users should allow permissions has been added before asking. When the user has either approved or denied the permissions, the plan screen is shown.

Every time the plan screen is started a request is sent to HealthKit to pull out step counts. If the user has denied the app permission to read HealthKit, the data returned will show as if the user has done no steps. When steps have been pulled from HealthKit, it is processed for the circles on the plan screen and at the same time parsed and sent to the SELFBACK server for use in the CBR engine.

The processed data to visualize the achieved step counts in circles is stored on the phone, to show completions for previous days, without fetching a full dataset from the HealthKit for every day in a week.  Since HealthKit does not immediately return the step data when requested we are using the highest possible resolution (i.e., 1 min intervals) for the step counts; this request takes approximately 20 sec to be returned. With a 20 sec delay, it is not feasible to use data from this request as the only source of data for the circles. This is solved by requesting step counts with a 24 hour resolution in the background, which is returned almost immediately.

## 2.3    Data Storage

All data except images and videos retrieved from the API is stored on the phone until a newer version is retrieved. For this first version of the app the storage is not encrypted. An encryption engine and data parser has been developed; however, this is not implemented yet due to frequent changes on the data structure on both the phone and API.

## 2.4    Language Support

When users signs up to participate in the SELFBACK program, they are required to select a preferred language. This choice is stored in the server's database. When the app retrieves the self-management plan and text from the server (e.g., exercise instructions), this will be provided in the chosen language. Text used in the app, which does not come from the API, will be stored on the phone in different languages. When the user logs in to the SELFBACK app, the user's chosen language will be returned from the server and stored on the phone. This will later be used for determining the language for texts not returned by the API.

## 2.5    Reminders and Notifications

The app is prepared to receive push notifications sent from a server with the correct certificates. When the user has logged in, the app will generate a token and send this to the SELFBACK server. Based on the CBR and data provided by the user the server should then determine when a tailored push message should be sent. The tailored messages will mainly consist of daily reminders to do exercises, complete educational sessions, and reach the physical activity goal. Triggers, messages and server handling of push messages are currently still in development.

## 2.6    Statistics and Personal Summaries

The statistics screen consists of a summary of total steps, exercises and educations done. By providing this information the app should motivate the user to carry on with the suggested self-management plan and complete the program as it is suggested. The data is summarized on the SELFBACK server and sent through the API to the app. Once the screen is opened, this data is downloaded.

## 2.7    Rewards

The rewards screen consists of several achievements and achievement categories, both of them are defined and provided from the SELFBACK server through the API. Defining achievements and achievement categories on the server provides great flexibility when adding more categories or achievements in the future. The completion status of an achievement is calculated on the server before sending it to the app. An achievement basically consists of a title, completion status and an image URL.

## 2.8    Tailoring Questions

Every self-management plan created for a user comes with a start and end date. Once the end date has been reached the plan is no longer valid and the user is required to provide feedback for the plan, though a set of tailoring questions. As the plan is no longer valid, the entire plan screen is replaced by the flow of tailoring questions. The questions, along with valid answers are provided by the server through the API, and displayed in the app by means of sliders, checkboxes and radio buttons. The answers are sent back to the server and a new self-management plan is returned to the app. A plan usually spans over 7 days.

## 2.9    Images and Videos

Icons used in the app for buttons and intro-screens is bundled with the source code and downloaded with the app. Images and videos used in exercises are received in form of a URL from the SELFBACK server API, this URL is a link to a file on a Content Delivery Network (CDN), where the files are downloaded from. A CDN is used to take load of the

SELFBACK server and provides fast download from everywhere in the world, as the files are distributed on multiple server around the world. None of the files downloaded from the CDN are stored on the phone, as this would require significant increased download time when receiving a new plan.

## 3    Screen Cast

We have created a video, which  demonstrates the SELFBACK app on iOS. It shows and explains each screen and the thoughts behind different decisions in the process of creating the app.

3    Screen Cast