

Wake up Buddy

The smart Alarm which connects you to your dearest Friends

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Abstract—The most recent innovation for waking up in the mornings is the alarm on our smartphones. However, interactions with intelligent technology are moving from our phones to our homes. Consequently, new intelligent technology is released to the market every year, yet the absence of waking-up assistance is evident. This project aims to develop an alarm clock customized for the user's needs. The goal is to invent a new innovation to help users worldwide get up in the mornings. An alarm clock customized for the user's needs was designed. To enable user interaction, software was designed to make it possible to connect with family and friends as a part of the user experience.

Index Terms—Alarm , Interaction, Application, Innovation, Waking-up assistant

Software Developer (Backend)	Thomas Good	Take the lead for the backend system, Creates Tasks and do code reviews with other developers of our team. Also helping Ahmed decide which software system is suitable for our needs.
Development Manager	Ayazhan sapargaliyeva	Communicates with the user and customer to receive feedback and assimilate it into the product. Schedules and delegates tasks required to successfully complete the user's needs. Market validation.

TABLE I
ROLE ASSIGNMENTS

Roles	Name	Task description
User/ Customer	Nicolai Kowol	Define its own needs, test the app and give feedback of its usability, design, etc.
User/ Designer	Celina Burlin	Identify user needs. Identify problems and limitations with existing solutions. Design the user experience. Responsible for the UX and UI. Usability.
Software Developer	Ahmed Shata	application, including front-end, back-end technologies, frameworks, libraries, database, package managers and code editors. Designs and builds an UI that ensures a good user experience.

I. INTRODUCTION

A. Motivation

The motivation for this project is rooted in the experience of students struggling to wake up for school. This assumption resides on the experiences of students at Hanyang University. It was years ago since a new innovative wake-up system entered the market. The built-in alarm clock in our smartphones has made a significant part of users change from analog to digital alarm clocks. The lack of an innovative wake-up system made us think about how a new system could be designed and integrated into our smart homes. As we integrate more technology into our homes, we enable the possibilities of intelligent wake-up systems. As a result of this project, we hope that we can make the experience of waking up better for as many people as possible.

B. Problem Statement

Every day, billions of people wake up to the noise of the alarm from their phones. Out of all these people, not more than about a third say that their experience of waking up is a good one. Why do a majority of people all over the world have a poor experience waking up? Is it possible to design a better wake-up experience?

We know that people struggle to wake up in the mornings. The temptation of touching the snooze button on the alarm clock provided by our smartphones is high among users. It is a fact that our homes are getting smarter with new technologies launched every year. Although we bring new technologies into our homes, it does not seem to solve our problem of getting up in the mornings.

Our goal for this project is to design an intelligent alarm system that motivates users to wake up in the mornings. Social distancing during covid has led to many people feeling lonely. Therefore, we added a goal to integrate connectivity into our alarm clock.

C. Research on any related software

From what we have discovered, there are many related existing products that appear to have inspired us to create our product.

1) Friendship Lamp

Powerful yet simple lamp that also connected to the phone. It was created to connect friends and families separated by distance using Wi-Fi and tapping the top of the lamp making it light up. Also makes the other connected lamp glow, regardless of how many miles apart. In a sense, Friendship Lamp is what we are looking for regarding connecting acquaintances.

2) Alarmy

It's an application that provides many attractive wake up features like shaking mission, photo mission, memory game. Even though we liked the idea, we would like to change the methods of waking up to be more enjoyable.

3) Clock (preinstalled)

These clocks are mostly intended to wake people up in the mornings so that they may begin their days, but they are sometimes used as a reminder as well.

4) Apple Watch

As a wearable Smart Watch provides many characteristics. Digital Touch is one of these features where we can send animated sketches, kisses, heartbeats, and more to our friends and family.

II. REQUIREMENTS

A. Sign-up/Log-in

On the home screen, the user should be able to choose between creating a new account or logging in with an existing

one. If the user decides to create a new account, they shall enter their email address, a display name and a password. These are then stored in a database to be available for new logins. If, on the other hand, they choose to log in with an existing account, they can either use an already created account of this app, or their LG account.

B. Introduction to the App and Setting the initial Settings

After the initial start of the application, the user should get a brief insight into all aspects of it. For this purpose, there should be a short tour through the settings and main features of the app. All points not mentioned should be designed so intuitively that the user does not need any explanation. Furthermore, the most important settings are to be set here for starters. All settings that can be derived from the environmental context of the application, for those should also happen.

C. Profile Personalisation and Permissions

After a user gets introduced to the app, they will have the opportunity to customize their profile, including setting a sleep routine, entering regular meeting times or medications, and connecting their favorite music which they would like to wake up to. Then, the app asks for the needed permissions, including notifications, contacts, microphone, and camera access. The user then can send friend requests to people from their contacts list and invitations to those who don't have an existing profile yet.

D. Setting the Alarm

Setting the alarm should happen as minimalistic as possible. Besides the trivial settings (i.e. time, repetition, etc.) the user should also have the option to send an 'alarm invitation' to people from his friend list.

If the user decides to do so, the 'Alarm Invitation' shall be displayed to the corresponding persons together with all settings of the proposed alarm. Now they have the choice to accept or reject it. Both decisions should be communicated to the inviter.

While in case of rejection nothing further happens, in case of acceptance a new alarm is created with the corresponding settings. If more than one person was invited, a group will be automatically created with all persons who accepted the invitation.

E. Editing/Deleting an Alarm

- Only one person has access to the alarm

If an alarm is used by only one person, this person has unlimited rights with regard to changing and deleting it. It should be possible to send invitations after creating an alarm.

- Several people use this alarm

If an alarm is used by several persons, it is distinguished whether the changes/deletion come from the person who created the alarm or from a person who was invited to it.

III. DEVELOPMENT ENVIRONMENT

If the former is the case, this person has unlimited rights regarding the modification/deletion of the alarm. However, the invited persons will be informed about any change and must agree to it before it becomes active. If they do not agree with it, they shall have the possibility to propose their version. In case of deletion, the invited persons should have the option to keep the alarm.

In the case that the change comes from a person who did not initially set the alarm, it should be sent as a suggestion to the initial creator, who subsequently accepts or rejects it. In case of acceptance, the procedure is the same as described above, in case of rejection, the alarm remains as it is.

F. Report a person

The user should have the possibility to report other persons if they misbehave in any case.

G. Group

In order to connect wake up buddies together, a chat room service is provided to support features like, “Wake me up” and “Wake up together”. The chat is created automatically when a person sends a request to their connections and that request gets accepted. Then, this chat room can be used to leave some notes and agree on some details regarding how to wake up.

H. Alarm Notification

When an alarm rings, the user or all members in a group gets notified by a screen which can be customized from a variety of themes, showing the time and the weather. Also, the chat window is prompted with buttons to send a GIF, make a voice call, or send a message or a voice note. Using the app, other wake up buddies can view the number of snoozes each person is doing and they have the possibility to send funny noises or voice messages that play automatically if someone is not up yet.

I. Smart home compatibility

A further version of the app should support integration with other smart home functionalities, such as a connection to a bulb in order to implement a light-based wake up method which simulates the sunrise. Additionally, the app can be further developed to support AI assistants so that it can support hands-free control of the app by taking voice commands.

J. Monitoring

The app is supposed to have a second tab called Monitoring. In this tab, you can see all the interesting data that the app collects over time. Among other things, the average wake-up time, the average number of snoozes, and the most popular friends are displayed here.

A. Choice of software development platform

1) Platform Selection:

We had to choose between IOS and Android to implement and launch our App. After realizing how complicated it is to launch an App in the Apple Store we choose Android for our first implementation.

2) Programming Languages Used:

To create Apps for Android we had several programming languages to evaluate. After some research we chose Kotlin as our main programming language. Kotlin is a programming language made from JetBrains who is famous for creating one of the if not the best IDEs on the market and also is the Android community with Kotlin quite big.

3) Cost Estimation:

Since JetBrains IDE's are free for students, there are no extra costs from this side. Also Google supports students who are implementing for non profit university projects so we can also host our database for free on clouds.google.com.

Therefore the only costs we're "facing" are our precious hours. Since we're a group of 5 and let's say we're working for 40h on the project that's a total of 200 hours. As a student programmer you usually get around \$20/h so in total that's 4'000\$ in total.

4) Development Environment:

IDE: IntelliJ IDE and Android studio

Version control system: Github

UI Design: Android studio it's XML based

Database: Android SQLite

B. Software in use:

There are many existing algorithms and open-source software available on the market that implement some features we plan on adding to our app. Therefore, such algorithms can be helpful for our team during the development process

1) Alarm Functionality:

To implement the alarm feature, we can build on one of the existing algorithms which can be time-saving. After research, we found that there is a well-documented existing procedure on how to implement the alarm feature in an android app. This algorithm is available on Android's Official Documentation and being used by various open-source programs available on Github. This algorithm is described briefly in the following steps:

- a) Capture the alarm time using the TimePicker widget.
- b) Schedule the alarm using the AlarmManager Class and a pending intent.

- c) Starting the alarm using a Broadcast Receiver.
- d) Activating the Alarm Service using Media Player, Notifications, and Vibration.
- e) Using Intents to handle alarm dismissal and snoozing
- f) Using AlarmManager and a pending intent to handle alarm cancellation.
- g) Handling alarm rescheduling on device boot using MVVM design pattern and Room persistence library

Reference: Schedule alarms — Android Developers & Android Implementation of Simple Alarm Clock — Github

2) *Real-time Messaging and Group Functionality:*

To implement the group feature specified in requirement (F), we plan on using Android's MessagingStyle API. Also, we can use Stream Chat and Virgil Security libraries for encrypted communication.

Reference: MessagingStyle API— Android Developers & An encrypted chat/messaging app with Android and Stream Chat — GitHub

3) *Authentication: Social Media Login:*

To ease the process of signing up and connecting with wake up buddies, we will use social media login APIs. This could be achieved with the help of Google's firebase authentication which we plan on integrating to our backend.

Reference: Authentication API Explorer (auth0.com) & com.google.firebase.auth — Firebase

C. Task Distribution:

Through the development process of the app, we are using the agile project management approach. Thus, having a well-organized team is a must to ensure that we are following the original idea and requirements of the application and getting the required tasks done for every milestone. To achieve this, We need certain roles and responsibilities to be present in the team, including:

- User Researcher/ UX Designer
- Android Developers
- Backend Developer
- Quality Assurance/ Testing Engineer

The roles which each team member is taking in development was assigned based on the range of skills and background they possess. The following table describes our team's task distribution.

TABLE II
TASK DISTRIBUTION

Name	Role	Role Responsibilities
Celina Burlin	UX/UI Designer	Build an intuitive and satisfying user interface through: <ul style="list-style-type: none"> 1) Doing research on potential users' behavior 2) Design the app flow and sketch wireframes. 3) Creating visual app prototypes using Adobe XD. 4) Assist in UI implementation using Android Studio.
Ahmed Shata	Android Developer	Responsible for the technical implementation of the Android app by: <ul style="list-style-type: none"> 1) Turning sketches and wireframes into a kotlin/java code. 2) Ensuring the app supports different android API levels, devices, and screen sizes. 3) Integrating external libraries and APIs into the app. 4) Performing Unit Tests and fixing bugs
Nicolai Kowol	Android Developer	
Thomas Good	Backend Developer	Responsible for building and maintaining the mechanisms that process data and perform actions on the app through: <ul style="list-style-type: none"> 1) building frameworks and the app architecture. 2) setting up the server and the database management system. 3) Using application programming interfaces (APIs) across Devices.
Ayazhan Sapargaliyeva	QA Testing Developer	Monitoring every stage of the development process and ensure adhering to the requirements by: <ul style="list-style-type: none"> 1) Tracking bugs through testing 2) designing test cases and identifying potential challenges users might encounter.

IV. REQUIREMENT SPECIFICATIONS:

A. Sign-up/Log-in

After the logo page the user can sign-up or log in. This window is needed for users to create a new user or enter into the system.

1) Log In “Fig.1”

This page consists of two textboxes where users should insert email and password. The “Log in” button is located under these textboxes. If the credentials are wrong the system prompts an error message. If the credentials are correct, the next page is loaded.

If the user has forgotten their password, the user is able to press the clickable text “Forgot password?” which

is located under the Login button. on this page users should provide an email address which was indicated earlier during the sign-up process. Under this text field, the button “Send a request” is available to send an email containing the code. The system will pop-up a message if an email is not found in the database.

In addition, log in with an LG account is also available. This is to connect home appliances and applications, which will be described in the following sections.

 A mobile app login screen with a white background and rounded corners. At the top, the text "Log into your account" is displayed in bold. Below this are two input fields: "Email" and "Password". Under the "Password" field is a "Log in" button. Below the "Log in" button is a "Log in with LG account" button. At the bottom, there is a link that says "Don't have an account? Sign up".

Fig. 1. Login Screen

2) Sign Up “Fig.2”

It is possible to create a new account by pressing the “Sign up” button. Here, the user provides necessary information such as username, email, and password. For the password textbox, the input characters will be dotted for privacy and at least 5 characters long (has a combination of upper and lowercase letters, numbers, and special symbols). Under these three textboxes, there will be a “Sign-up” button in order to create an account and store it in a database for identification. If the user credentials (email and username) are already created, the system warns the user about it, then the user should provide another credential.

B. App description and Setting the initial Settings

After creating an account or entering the system, the description of this application will be presented before the main page first, and if the user reads it thoroughly, click the READY button and the next window will appear. The following information is included in the application’s description:

- “Let us tell you what can be achieved with Wake up Buddy based in science”. Button “I want to know”
- “Motivational phrases double your will to wake up”. Button “What else?”

 A mobile app sign-up screen with a white background and rounded corners. At the top, the text "Sign up" is displayed in bold. Below this are three input fields: "Name", "Email", and "Password". Below the "Password" field is a "Sign up" button.

Fig. 2. Sign Up Screen

- “Regular exercise, according to studies, might help you wake up feeling more refreshed”. Button “I want to know more”
- “You can connect to you dearest people!”
- “Let in the light! Wake up Buddy can unite with LG home appliances, so you can wake up with natural sunlight from outside”
- “Enjoy a Cup of Coffee! Caffeine boosts serotonin and dopamine levels, which give you energy and help you to focus. With LG and Wake up Buddy you can easily wake up to the sound and smell of fresh brewed coffee”. Button “Ready”.

After a short tour through the main features of the application, the system should get the information such as date, timezone, and LG account from the operating system.

C. Profile Personalization and Permissions

After setting the initial settings in the operating system, the user will be guided to give the application access to the camera, location, contacts, storage, and microphone. This can later be changed in the user settings.

Lastly, the user has the opportunity to send requests to people from their contacts list and invite those who do not have an account yet.

D. Setting the Alarm/Main page “Fig.3”

The main page displays the alarms. The user can activate an alarm simply by clicking on it. It then changes into an iron color, showing the user that it is activated. The box show relevant information to the user, such as the time of alarm, other members using the same alarm, and the LG home appliances connected to the alarm. If the user wishes to change any specifications of the alarm, they can simply edit the alarm. If there are members included in the alarm, the user is not able to change the time of the alarm. If a user wishes to make a

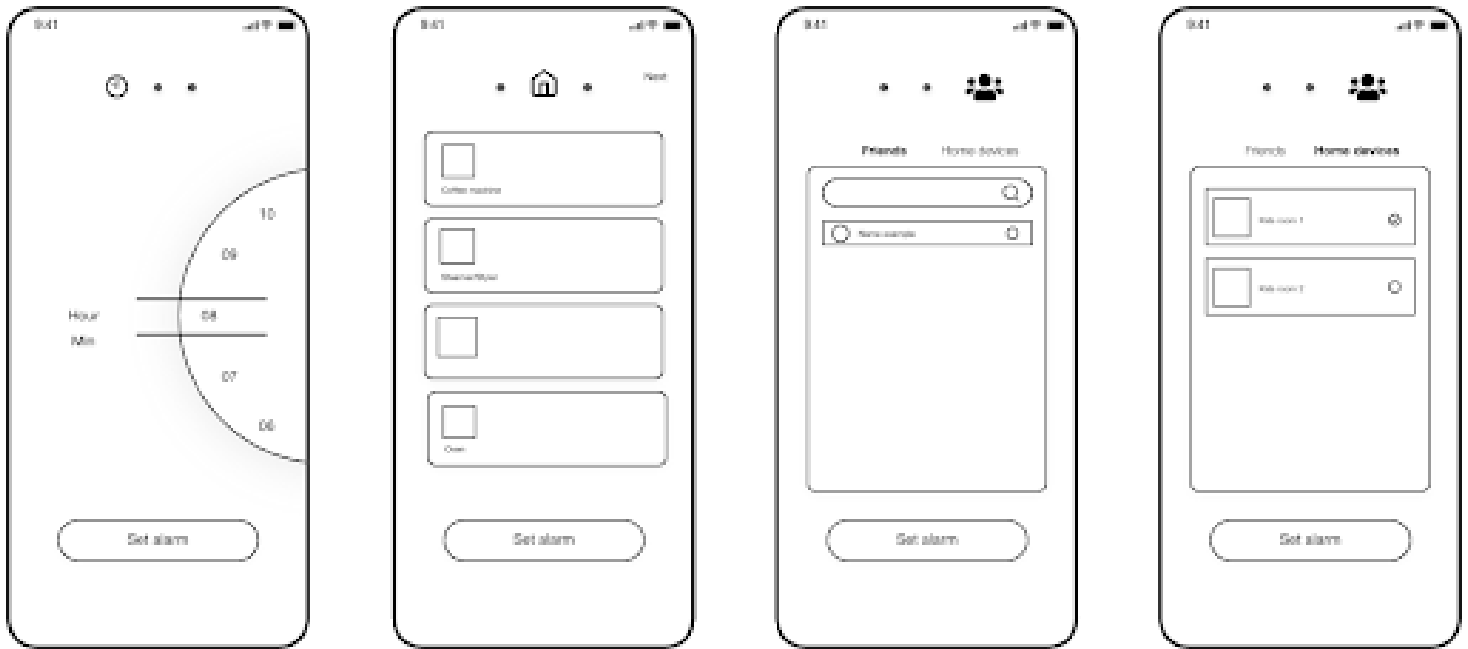


Fig. 3. Sign Up Screen

new alarm, they press the button in the bar menu with the icon (+).

- 1) The first step of setting up the alarm is to select the time, and day of the week. If the user wants to wake up every day at the same time, then the user can press the checkbox "Every day". A way to turn off the alarm, ringer volume, and checkbox "vibration on call" is accessible. Information about how much time is left before the alarm rings are also available. If the user wishes to end the task, the user can press the "set alarm" button.
- 2) The second step is to add LG home appliances connected to the alarm. It can be a smart lamp, making sure the user wakes up to comfortable lightning. It can be connected to the coffee machine in the kitchen or the styler steaming the outfit for the day. If the user wishes to end the task at this point, they can press the "set alarm" button.
- 3) The last step is to send out an invitation to friends or add additional home speakers to the alarm. If the user wish to send out an invitation to a friend, they search for the friend in the search box and then press the button "set alarm". The invitation is sent out automatically with all settings. An invited person can accept it or reject it. If the user wish to attach another home device, for example, a speaker located in one of the children's room, the user can select the speakers the alarm is supposed to be played from. To activate the alarm, the user press the button "set alarm".

Also, in the Main page user can log out from the app.

E. Editing/Deleting an Alarm

On the main page, user selects the alarm which he/she wants to edit. The user slides the box to the right and a red box appears with a cross. If the user press this box, the alarm is deleted. When user clicks "Delete" button the system asks the user "Are you sure you want to delete the alarm?". If the user clicks 'Yes', the alarm is deleted. If the user clicks the blue 'No', the alarm is not deleted and he or she is returned to the previous page.

- 1) If an alarm is personal, the user can freely edit and delete the alarm.
- 2) If there are other members using the alarm, the user can not change the time of the alarm, only regulate the personal home appliances connected to the alarm. If the user wishes to delete the alarm, they can do so and the alarm will be deleted from the local device (not from all devices).
- 3) has unlimited rights with regard to editing and deleting it. It is also possible to send invitations after creating an alarm

F. Report a Person "Fig.4"

The user will have the opportunity to report every other user, if he acts in a suspicious/inappropriate way. To do this, the user should open up the profile of the concerned person. Here he will see a report Button called 'Report' on which he has to click. On the following page, he will be asked the reason why he thinks the other user should be reported. Therefore, he can choose between different reasons (inappropriate behavior, etc.). In the following time, the report will be reviewed (by person/algorithm?) and accepted or declined. In case of

acceptance, the reported user will be punished, otherwise, nothing will happen.

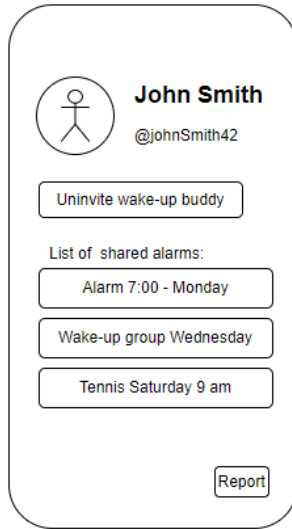


Fig. 4. Reporting a user

G. Group

In the group view you can see the name of the alarm, the wake-up time, the username and picture of each member and a chatbox for communication. In an additional view, the user can see his personal settings for the regarding alarm. These include among others the sound, vibration (on/off) and the connected LG appliances. This view can only be seen and set by the individual user.

There are no administrators in a group, all members have the same rights. That is, a group cannot be deleted. Only if every member has left the group, the group will be deleted automatically by the system.

There are the following interaction possibilities in a group:

- **Leave:** Members can leave the group. If they do so, they have the choice of keeping the alert as a personal one.
- **Invite buddies:** Members can invite other people.
- **Post:** members can post messages to the group and other members can respond (with emojis) or comment. Each post and its comments are mapped as a thread. There is an automatic deletion of messages that are older than 24 hours.
- **Mute alarm:** A member can mute the alarm of a group. However, this will be posted in the group.
- **Change group name:** Any member can change the name of the group.

H. Alarm Notification

When the set date of the alarm is reached, the alarm notification is triggered. This can look different:

- **Default notification (initially set):** A default ringtone will sound and a default view will be shown with the time and date, a snooze button as well as a stop button.
- **Custom (additional options to default):** Further, the user can also add today's weather, temperature, news, his own picture or his own message to the default view. He can also set his preferred alarm sound.
- **Wake-up puzzle:** The user can choose to solve a math puzzle, a physical task (sit-ups, push-ups, etc.) or a team building exercise to stop the alarm.

Regardless of whether the user chooses to snooze or stop, they will then be redirected to the post alert view. This can also look different depending on the alarm type:

- **Not shared alarm:** After the alarm view, the user will be forwarded to the home page of the app.
- **Shared alarm (buddy alarm/group alarm):** After the alarm view, the user will be forwarded to the chat with his wake-up buddy/group chat. Here he has different interaction options: He can send a GIF or an emoji, he can send a typical message or voice message or make a group voice call.

In the group, the number of snoozes made by a member is displayed. The others have the possibility to react to the 'snoozes' by sending funny sounds or voice messages to the 'still sleeping' member, which will be played automatically at this member.

To improve the experience of waking up, we suggest a physical product to be introduced in the LG home appliances product range. It is a speaker/lamp which could be used together with the alarm. The users can select a color, tune or both for each of the members of the group. When the alarm rings, the color scheme/tunes picked by the user's friends will play from the lamp and the user can look at the personal color combination made by their friend, knowing that they picked the colors for them. If the user does not have this device, the light will instead come from the screen of the phone and the audio from the phone's speakers. This is a way to integrate light into the wake-up experience and at the same time remind the user that they have people thinking of them.

I. Smart Home Compatibility

The idea is to give users with LG home appliances a possibility to connect the products to the alarm. The user might want to have their clothes steamed and their coffee made in the mornings. The alarm can automate the task of adapting these systems to the user's wake up time.

A further version of the app will support the integration with other LG smart home functionalities, such as a connection to a bulb in order to implement a light-based wake up method which simulates the sunrise or a connection to the shutters to actually be woken by the sun. The above applications can be selected when creating an alarm clock. However, the app must first be linked to a LG account. If the desired LG home

appliances are linked to this account, they are also available in the alarm.

Additionally, the app can be further developed to support AI assistants so that it can support hands-free control of the app by taking voice commands.

J. Monitoring

The data, which accumulates over time, is stored, analyzed and presented to the user. There will be a separate tab for this. In addition to the average wake-up time, the average number of snoozes and the most popular wake-up buddies of the user, meta-data will also be collected, such as which wake-up buddies make getting up the easiest (measured by the number of snoozes).