

Communication System for the Volunteer Fire Department

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Abstract

The unstable availability of volunteer firefighters presents a minor obstacle to rapid response time and deployment. The process of informing members of the department about an urgent event varies across departments. In the worst-case scenario, one person - the chief commander, calls each member individually. This whole process requires a great deal of precious time.

The aim of this work is to create a simple and accessible communication system for volunteer fire departments. The application is designed for the Android operating system and enables real-time communication with database, cloud services, and among individual members.

Users may create and join urgent events and also non urgent events. Convening process during an urgent event is SMS-based. Each SMS triggers loud siren sound and displays a notification with response options. This approach is much faster, effective and simpler than multiple phone calls.

The FireReadyGo system is being developed and continuously tested in collaboration with volunteer firefighters. The application requirements [1] [2] are based on practical experiences.

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1. Introduction

On a daily basis, in television, newspapers or on social networks, we come across news about events that negatively affect many people. Whether it is a car accident, a fire or some natural disaster, they all have one thing in common - people who need urgent help. Primary responders for these kinds of rescue operations should be firefighters. However, firefighters may not always be available, for example in the case of a very large number of emergencies or their on-site arrival time is high because of a long distance from the fire station. Some countries, including the Slovak Republic, have addressed these issues by establishing volunteer fire departments.

Volunteer fire departments are typically not on standby and do not have access to the latest technologies. During emergency, the process of calling individual members sometimes takes a significant amount of time. In crisis situations, every second is crucial.

Existing convening systems for volunteer firefighters like Fireport or Hasičům.CZ are primarily designed for larger and active volunteer fire departments. Additionally, all analyzed systems require monthly fees.

FireReadyGo is an mobile application designed with goal to avoid monthly fees. Core part of the application relies solely on members of the department and their smartphones. No third party services like dispatcher calls are needed. Application is connected to the Firebase cloud services and besides the core functionality offers also many exciting features. FireReadyGo should be able to eliminate the need for other communication services, like social networks, used by volunteer firefighters outside of emergencies.

2. How to Write This Poster Commentary

Volunteer firefighters are only human. They are not paid for their work in the department and perform it in their spare time. Each member has their own work or school obligations.

2.1 Motivation

Unlike professional firefighters, volunteer firefighters do not spend time at the station waiting for an emergency. During emergency they must quickly mobilize and get to the fire station within a specified time limit. Since transportation to the station and prepar-

ing equipment are time-consuming in themselves, it is important to optimize every possible process.

Typically, one person receives the emergency call and then passes the message on to the other members either by sending a SMS or making a phone call. In the worst cases, this process can take tens of seconds or even a few minutes.

2.2 Solution

The FireReadyGo system aims to eliminate the time needed to call members of the volunteer fire department. The system primarily consists of a native mobile application for the Android operating system written in the Kotlin language. The native Android application ensures better performance, faster response time, and longer battery life.[3] [4] Each mobile application is connected to Google's cloud services and a database.

In order for users to use the application, they must go through a verification and registration process. The most important part of the verification process is a valid phone number, as the phone number is used during urgent events to inform all members about the emergency. All data is stored in a real-time database. Any changes to the data cause immediate synchronization with other devices. The application operates in two modes: offline and online. In offline mode, the application can only send SMS during emergencies and receive responses to sent messages.

Users may have different ranks, roles and access/authorization levels. Ranks are mainly informative and do not impact application's behavior. Based on the assigned roles, the user is matched with the most suitable available role when they join an event. Authorization levels are used to deny access to certain users in high-risk parts of the application. For example, only a member with a high authorization level can declare an emergency - create an urgent event.

Each department may customize its own vehicle fleet. Authorized users may create vehicles with some specific parameters and upload custom image of the vehicle.

Application works in two languages - Slovak and English, which is automatically selected based on the primary language in the system. Some parts of the application, such as SMS messages and ranks, are not translated and use only the Slovak language.

2.3 Urgent events

Declaring an emergency (creating an urgent event), is as simple as it can be. The creation of an urgent event begins with pressing a large red button labeled

SOS. Next, it is necessary to choose the type of event and the vehicles that will be used during the event. Confirming the selection sends SMS messages to all relevant members with text in a preset format. FireReadyGo includes a service that runs in the background and analyzes incoming SMS messages. If a message matches the preset format, it generates a notification for the user and triggers a loud alarm for approximately 10 seconds. After the siren sound ends, the volume level returns to its original setting. Generated notification contains 2 options - accept and decline. Each option will send response to the member who started the urgent event.

2.4 Other features

In addition to creating urgent events, authorized users can also create non-urgent events that must be scheduled for a specific time. After creating such an event, users receive a server push notification. Users who meet the criteria can sign up for the event until it starts. When signing up, the user is automatically assigned to a vehicle in a specific position. An authorized user can reassign members between vehicles and change their roles.

When the event is started, another push notification is generated that starts tracking current location. Given an internet connection and access to location tracking, users can monitor their colleagues movements in real-time and also their distance from the fire station.

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