5G Safety - Phase 1 Industrial survey, sub-phase IR.3

5G Safety Mobile Apps and Novel Interaction Modalities

Result IR.8 activity T.3.2. Mobile Apps and Interaction Modalities

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1. Abstract

This document represents the main result of the activity ***T3.2: Mobile apps and novel interaction modalities*** of the 5G Safety project. In this task, we dealt with the design and implementation of user-centered prototypes for a new generation of mobile apps, aimed for ensuring personal safety of both the citizens and the professional users, as well as with prototyping and research activities of new interaction modalities and related technologies, which are potentially promising for use in the field of public safety.

112 mobile applications for citizens and professional PPDR users, together with advanced dispatching systems (Dispatcher as a Service – DPaaS), comprise a portfolio of new generation 5G-ready products and services, which will be adapted to the needs of the PPDR sector and together represent a prerequisite for developing future strategies for implementation of technologically advanced solutions for emergency communications in a shared virtualized 5G environment with guaranteed security, privacy and backwards compatibility.

Today, mobile broadband technologies, smartphones and sensors represent the commercial technologies we use in everyday life. These carry tremendous potential to address many of the challenges in the PPDR domain, such as: providing advanced location services, rich communications and field data acquisition to build a comprehensive operational picture. In response to this potential, we are witnessing today a fast-growing market for mobile applications, which also offers a number of applications for emergency purposes. However, applications for citizens intended for use in emergency situations typically suffer from a number of critical shortcomings, including:

1. Contacting emergency services is a very rare situation for most citizens, which makes it very likely that the mobile application on the user's phone will be forgotten in a serious emergency situation (the challenge of user awareness) or automatically removed from the mobile terminal due to infrequent use (the challenge of availability);
2. In the flood of new applications, it is difficult for users to distinguish between applications that are official and will provide connectivity to formal emergency systems and other applications that are not formal in nature or are even intended for leisure (the challenge of trust and certification);
3. Most of today's official 112 applications for citizens suffer from a number of shortcomings in terms of functionality and user experience; these include a poorly designed user experience that is not tailored to the specifics of emergencies and requires the user to have a good deal of attention and provide a lot of interaction at best (the challenge of automatic operation and usability), operate only within certain countries / regions (the challenge of international interoperability), or don't support user groups with special needs, such as the deaf and hard of hearing (the challenge of accessibility);
4. While the field of professional PPDR solutions is well developed and, above all, very well standardized, this is not the case for emergency applications (standardization challenge); in addition, professional PPDR systems are typically closed and completely separate from citizen services (integration challenge).

The opportunities arising from the above challenges are the basis for the design and prototyping of applications for citizens and professional users, which are based on modern and well-established communication technologies, paired with detailed knowledge of the specific circumstances and purpose of using planned capabilities in the PPDR context. In addition, the apps aim to leverage additional functionalities that encourage the use in everyday life, as well as during emergency situations, and thus have the potential of building a wider community of users, which is the basis for further development and transfer of designed concepts into practice. The initial requirements and assumptions in the design of applications were to function as unobtrusively and automatically as possible, and even remain in the background for some of the capabilities that are crucial during emergency situations, while offering a range of additional capabilities that are useful and add value in everyday life. The aim was not to replace the classic and well-established forms of communication with 112 (especially the classic voice call and short messages) but to offer an additional channel with contextual information (e.g., personal data, ICE contacts, exact current GPS location) and complementary communication modalities, which would successfully address e.g.: the younger generations, to whom the forms of online / virtual communication are closer than traditional telephony; the people with special needs or communication challenges (deaf, hard of hearing, mute, etc.); foreigners who do not speak the local language; and with the help of fully automated background operation capabilities, even users with lower digital literacy level (seniors, children).

During this activity, special attention was paid to the capabilities for smooth operation of mobile applications in emergency situations, while providing a range of contextual information and services to improve disaster response, rescue and disaster recovery, and the use of modern, well-tested technologies that show significant potential for further development in this field on a global scale. From this point of view, the design and implementation of prototypes were based on modern mobile technologies and platforms, and to support emergency capabilities, the development was based on the family of technological standards ETSI PEMEA - Pan-European Mobile Emergency Application. This enabled us to ensure long-term standardization of the application and technological compliance at the international level and in accordance with the guidelines and recommendations of the European Emergency Number Association (EENA), support for cross-border operation and use of standardized protocols to provide positioning information, as well as compliance of planned prototypes with strategic guidelines for 112 applications in Europe.

We also paid additional attention to the implementation of mobile applications for professional PPDR users, whereby the design of basic functional capacity was based on applications for citizens with the necessary upgrades and modifications. Research and technological feasibility tests and prototype development have further addressed how to make the best use of the latest communication technologies to bridge the gap between the current state of technological maturity in PPDR, which clearly lags behind commercial sectors, and to provide modern multimodal applications and interaction modalities for citizens and professional PPDR users in a way that meets their needs both in their daily work and in emergency situations.

Further, additional potential for the development of prototypes of mobile applications that take advantage of the capabilities and advantages of modern and well-established technologies, are new and emerging technologies. These can allow us to upgrade and deepen communication modalities in ways that have not been possible so far. Primarily these include the areas of advanced data visualization, the use of tactile and automatic techniques for conveying information, and augmented reality (AR). In addition to the innovation potential, these areas today are becoming technology mature, are gaining end-user acceptance, and have already been recognized as useful in several practical implementations on the part of specific vertical sectors, which gives them a good starting point for successful implementation in the future. The use of new interaction modalities for the needs of PPDR remains relatively unexplored and thus represents an interesting research and prototyping challenge, which we integrated into the prototyping of mobile applications within the 5G Safety project, and further researched in the form of specialized prototypes. During the designing and prototyping, we thus explored new forms of communication modalities, including the use of advanced video services, and examined in detail the technological capabilities and consumer potential of augmented reality.

In addition to the applications themselves and the use of advanced technologies for new interaction modalities, it is also crucial to integrate them into a comprehensive critical communication environment that provides end users with direct and reliable access to formal 112 services (as an alternative to existing classical forms of communication, in particular voice calls and short messages to 112), or solutions that enrich these transparently and non-intrusively. In this sense, we addressed three key aspects, namely the integration of mobile 112 applications into the standardized networks, based on the ETSI PEMEA for providing pan-European mobile 112 applications; the connection of the created mobile applications with the professional PSAP environment DPaaS, that sits on the other side of the communication chain of the 112 ecosystem; and an intermediate link of mobile networks and services that provide specific capabilities and configurations adapted to critical 112 services (prioritization and preemption, operation free of charge, user network positioning, customized and guaranteed service quality, etc.) in addition to basic communication capabilities.

As a result of these activities, this document presents the starting points, challenges, design guidelines, designs and prototype specifications for the following components, solutions and subsystems of the wider 5G Safety ecosystem:

- 112 emergency application to ensure the personal safety of citizens,
- customized 112 application for the needs of professional users,
- connection of the applications to the 5G communication network,
- integration of the applications with an advanced PSAP system,
- design guidelines and procedures for the design of communication modalities in the context of 112 and PPDR, and
- two experimental prototypes of the use of AR technology for public safety purposes – an assistant for the use of a fire extinguisher and an application to help find designated assembly areas in the event of an evacuation.

These results summarize the findings of important basic and applied research problems in the field of communication services for public safety and contribute not only theoretical but also practical insights into the applicability of selected technologies and approaches, as well as their short-term and long-term feasibility. At the same time, they represent the basis for further research on feasibility, reliability and user experience within the pilot and validation activities both within the 5G Safety project and beyond. These results thus form the basis for further planning of technical and service development in the field of PPDR, as well as business and strategic aspects of their implementation and adoption in practice by citizens and professional users as well as the industry and European society as a whole.