

5G Safety - Phase 1 Industrial survey, sub-phase IR.2

Studies and conceptual design for network agnostic services and applications

Result IR.6 activity T.2.4. Network Agnostic Services and Applications

Type of document	Result
Record in the archive	5GVAR-IR2-R06-Public.docx
Made for	5G Safety
Authors	Telekom Slovenije d.d., Iskratel, d.o.o., Kranj, Univerza v Ljubljani, Fakulteta za elektrotehniko, OSI d.o.o.
Degree of confidentiality	Public

1. Abstract

We expect the decline of critical networks based on narrowband technologies (TETRA / TETRAPOL / DMR) after 2030. In the period between 2018 and 2025 it will be decided on the future of 4G/5G generation networks for critical communications used by the PPDR organisations at the European level. During this period Member States will be obliged to draw up national strategies. The first commercial use of 5G PPDR technologies is scheduled after the year 2021. By 2025 the plan anticipates a pan-European shift to heterogeneous networks which include both legacy and the latest technologies. Public mobile broadband networks owned by telecommunication operators are modern (4G/4,5G networks), network coverage in urban environments, outdoors and on motorways is excellent, elsewhere the coverage is worse. A backend network based on the architectural concept PEMEA for OTT applications through Internet connections is in place. New concepts for PPDR services and applications for their operations using heterogeneous critical networks follow the conceptual and technological changes and innovations in 5G networks.

The bases for the functional and user requirements are selected scenarios we have verified with the Slovenian PPDR stakeholders. In the document "Example uses and technical requirements" we defined and discussed basic and complex user scenarios. In the present study, we additionally analysed user scenarios in terms of functional and user requirements for services and applications. Individual scenarios were also assessed from the perspective of 5G network key indicators and other non-functional requirements and on that base we established importance of individual indicators for the specified scenario. A comparison of weighted average key indicators for complex scenarios highlighted the following four key indicators important for PPDR networks and we have included them in the planning of services and applications process: high reliability, prioritization, low latency and coverage. Regardless the low weight of some indicators such as group communication and isolated operation, which are rarely represented in the discussed scenarios, we believe that they are nevertheless important for the 5G PPDR networks and we were treating them equally. Certain functional requirements in presented scenarios were duplicated so we prepared a summary list of functionalities, grouped by categories and services within each category and added which of PPDR stakeholders (police, fire, ambulance, other services) and citizens is using certain functionality and what is the type of information (voice transport, transfer live video, data traffic, location data, identifier priorities, etc.). We then extracted user requirements from collected functional requirements. These were sensibly complemented with user requirements from project SALUS, which was dealing with interoperability between emergency services, and from project BroadMap. In this way we tried to achieve as complete as possible overview of user requirements for 5G PPDR networks. We put results of our study in a wider context of project BroadMap results, where the PPDR user requirements were analysed Europe-wide with 900 different stakeholders involved.

Further on we have prepared a review of operational services MCPTT, MC Voice and MCData which are standardized in 3GPP Rel. 15 and used by the Dispatcher as a Service (DPaaS) and equipped a full list of operational services with importance of each service. With the range of addressed services the Slovenian PPDR stakeholders will gain a range of services that are compatible with interoperable PPDR services Europe-wide and in cross-border cooperation, as foreseen within standardised interoperable communication PPDR services for Europe (SpiceNet service network). Any national specifics of a heterogeneous network and PPDR services within will be closed with the help of the "SpiceNet-Hub" national PPDR junction.

Applications for professional users constitute an important area in the context of new and emerging broadband communication solutions for Public Safety, notably BB-PPDR solutions based on 4G and 5G technologies. These are dedicated applications for smartphones, intended for field use by emergency services (police, firefighters, paramedics, and field services), including applications using the latest enhanced and virtual reality technologies. Overview of the current market state with already established practical approaches and standards and recommendations of relevant organizations confirms that industry encourages the formation of such applications ecosystems. However, due to relatively new and emerging industry, there are no uniform practices and approaches, yet.

Starting points for the design of platform-independent 5G PPDR services and applications have been the real needs of existing and future users that are closely coupled with the total cost of PPDR networks ownership, cooperation between the various emergency services and First Responders, international and cross-border networking, maximizing coverage with broadband services and applications, independence of the services and applications from network provider, infrastructure and platform and with SpiceNet network management.

Particular attention in the concept preparation was devoted to adapting services to technological constraints and ways to overcome their effects. One of critical factors related to existing narrowband PPDR networks is that they are not interconnected. With the advent of broadband 4G and 5G networks, the natural consequence for interoperability between the narrowband and broadband networks arose, so intensive work is underway in 3GPP and ETSI standardisation organisations. This will provide solutions for interconnecting networks of the elderly and the most modern technologies in heterogeneous networks, which by its nature will not completely solve the problem of provisioning of some services in the connected networks. For this purpose we conducted a study to adapt modern advanced services, notably broadband, for implementation in heterogeneous networks. To create the concept, we have identified ways to eliminate the effects of other technological constraints such as: over-coupling between hardware, infrastructure and platform services, lack of adaptation to the latest technological standards in the field of cloud computing, solution lock-in and insurmountable connection to the manufacturer due to non-standard proprietary interfaces, non-serial material equipment in relation with closely coupled PPDR systems and technological limitations of applications such as security, robustness and speed (responsiveness).

In drafting the concept of a platform independent services and applications we took into account the legislation restrictions based on review of legal regulation, personal data protection and the impact of the various PPDR organizations jurisdictions.

Based on all the above results, we designed a platform-independent 5G PPDR services and applications, both at the level of network services such as Network as a Service (NaaS) and Network Slice as a Service (NSaaS), as well as at the operational level with Dispatcher as a Service (DPaaS) service. DPaaS design as a platform-independent service includes intelligent adaptation of the volume of services, adjusting the profiles to organizational structure, providing services to various domain groups, and basic, support and domain services. We devoted an important consideration in the conceptual design to openness of DPaaS service, to definition of interfaces and thereby connectivity of DPaaS in the broader application and information space and with other systems. For connectivity to a common information space we also determined the concept of connectivity to external databases such as EUCARIS vehicles database, eCMR road goods carriage database and DATEX II traffic related data.

For actual transition to a detailed conceptual design and preparation of components for validation in laboratory environment we have given the feasibility validation results of the selected user scenarios and concepts. We presented the key EU and Slovenia legal acts, the trends in introducing of new technologies in the emergency intervention practices, prepare highlights in terms of personal data protection and carry out the conformity assessment with the General Data Protection Regulation. By analysing the data collected through fieldwork, we presented the views of PPDR agencies representatives in relation to use cases, presented their vision, strengths, weaknesses, constraints and feasibility assessment. The respondent's also gave us insight into the current communication processes before and during interventions, where the respondents highlighted the strengths, weaknesses and proposed some solutions to improve the situation. Respondents considered discussed use cases particularly useful in case of mass disasters or accidents of larger scale and in cases where dangerous substances are present. The survey results also clearly pointed out the need to consider the impact of the implementation of technological solutions to the financial and human resources of organizations, which we will take into account in business models.

According to collected data, we estimate that the use cases are feasible in practice and that they address many problems faced currently by emergency services. Most respondents felt that solutions could improve their work performance. If the implementation were carried out in a manner that would ensure users the reliability and usefulness of the technology, and users would be adequately and sufficiently educated, mentioned innovations would be welcomed by a large majority.



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE,
ZNANOST IN ŠPORT

5G Varnost



EVROPSKA UNIJA
EVROPSKI SKLAD ZA
REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST

© The investment is financed by the Republic of Slovenia and the European Regional Development Fund. Copyrights governed by the Consortium agreement 5G Varnost.