Use Case #4

IoT for improving first responders situational awareness and safety

Overview and Objectives

This use case aims to provide comprehensive situational awareness of field operations in PPDR scenarios. It involves monitoring field agents using a combination of geographical and indoor positioning, environmental sensors, and wearable biological sensors, alongside real-time text, audio, and video transmissions. The data is transmitted over 5G and processed at the Command and Control Centre (CCC). This information is then displayed on the platform's front-end upon the operator's request, along with alerts generated by AI and ML algorithms to detect man-down situations and other critical incidents (e.g., gunshots, environmental hazards, physical threats). To gather the necessary knowledge for implementing this ambitious development, several initial tests were defined, along with potential complementary information. Various tests were conducted to measure KPIs relevant for the use case and the PPDR community. The objectives are assessed based on the following criteria: Upgradable (U), Acceptable (A), and Optimal (O).

The primary objective of these experiments was to gather information that demonstrates the benefits of using 5G for vertical applications in PPDR scenarios. The initial tests are designed to collect data on various aspects, including end-to-end (E2E) delay, platform-specific message delay, user equipment (UE) availability, and the satisfaction level of potential CCC operators, while using the application.

At the ALB testbed, ONE performed several lab tests with their private 5G network, and organized several showcase events with key stakeholders. The goal was to measure several network-related KPIs, to assess the feasibility of the 5G infrastructure for emergency scenarios, using the Mobitrust platform.

Use Case Description

The Mobitrust platform is the key technology behind Use Case 4 of 5G-EPICENTRE, which is centered on IoT for improving first responders' situational awareness and safety. Mobitrust has been subject to continuous development by a specialised OneSource team for the past eight years, and the latest enhancements led to the cloudification and split intro microservices of its internal components. The wearable devices, known as BodyKits, are able to use 5GSA, which brings vast improvements to field awareness by delivering reliable communications, low latency and enough bandwidth for real-time HD video from multiple points in the field (Figure 1).

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The platform has a wide range of possible end-users, including police forces, fire departments, civil protection, military forces, industrial workers and emergency medical services. By leveraging multiple technologies and collecting inputs from multiple sources such as sensors (biological, environmental and positioning), cameras, among others, Mobitrust offers the following functionalities:

- Integration with 4G and 5G for public safety communications;
- Data correlation and personalised notifications;
- Integration with Commercial-Off-The-Shelf (COTS) devices;
- Integration with Mobile Device Management;
- Advanced statistics;
- A secure mobile platform;
- Automated actions in response to a set of defined events; and
- Automated alarms in case of an anomalous sensor reading.

All the video, audio and sensors transmissions may be sent to mobile Command and Control Centres (CCCs), as well as to a central location CCC. From these control centres, with the enhanced situational awareness, operators are able to perform better informed decisions and improve the overall safety of field teams and the public in general.

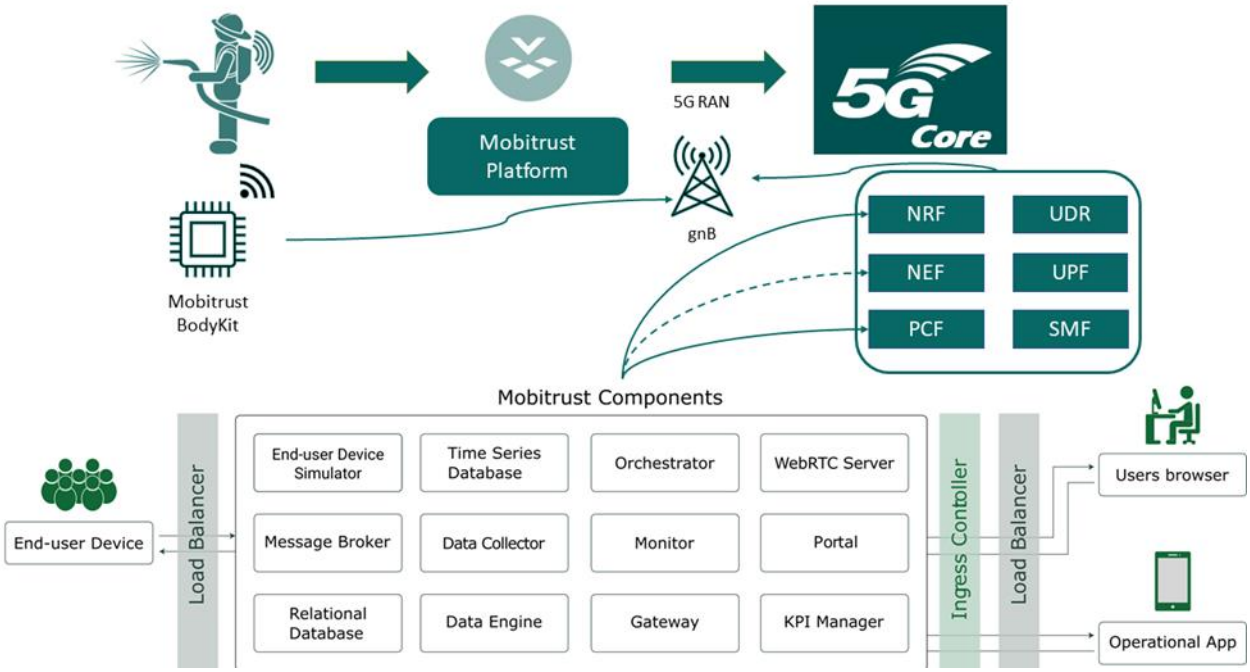

Figure 1: Mobitrust network services

Thought to be used anywhere at any time, the Mobitrust platform is now leveraging the microservice architecture, which allows the split of its internal components into multiple geographical locations. Hence, certain components can be instantiated near the scenarios where operations are taking place. Such proximity will allow a decrease in latency for communications and also the reliability of the whole system by being tolerant to failures in backhaul connectivity, which are known to occur in certain catastrophe scenarios.

Experiment Setup/Methodology/Deployment

The Mobitrust platform was deployed at ALB location and integrated with all testbed features. The devices, drones, AR/VR devices, and all other components were integrated with the testbed and 5G network.
The Mobitrust platform was deployed into the Kubernetes infrastructure using several of the features available (throughout the project duration), starting with the manual deployment, then Helm and, finally, using the 5G-EPICENTRE platform.

Experiment Execution and Results

A survey was presented to stakeholders during various project interactions. The survey focused on evaluating their experience with the Mobitrust CCC, considering satisfaction, usability, and benefits. A feature emphasized by the stakeholders was the seamless access to real-time information for decision-makers and emergency responders. The integration of smartwatches within the CCC was also a notable feature. However, the lack of direct communication with field operations was considered a downside, which is to be expected, since it is a feature being targeted in other use cases besides UC4. Overall, we obtained a user experience rating of 95%, exceeding the target result. This user experience rating is consistent across both testbeds the experiment was carried out on, as both ALB and UMA utilized the Mobitrust CCC in all scenarios.

Conclusions

The network metrics recorded by the UE, i.e., Reference Signal Received Power (RSRP) and Quality (RSRQ), and Received Signal Strength Indicator (RSSI) values, were included. The collection process involved fifteen (15) iterations, with the registration of KPIs over two minutes for each iteration.
For all three primary KPIs, the average values met the goals for the scenario under examination. The network Round Trip Time (RTT, UC4.1) achieved approximately 34ms, while the Message Delay (UC4.2) reached around 37ms. In the case of the Integration Kit (IK) availability (UC4.3), an average value of over 99% availability was attained.
Regarding the collected network KPIs, both RSSI and RSRQ achieved the expected results, with average values of -72dBm and -10Db, respectively. RSRP reached an average value of approximately -83 dBm.