FASTER NEWSLETTER

#2

IN THIS ISSUE

# FIRST YEAR OF ACHIEVEMENTS AND PROJECT MILESTONE

> **The COVID-19 pandemic has strongly influenced the life of the population worldwide, placing first responders on the front lines of an emergency unprecedented in size and scope.**

Nevertheless, the FASTER consortium members have worked hard to achieve their goals during this period.

In particular, reaching two additional FASTER milestones: the Technical Specifications and the design of the System Architecture have been defined. Moreover, the innovation Strategy Plan defining a pathway for the overall exploitation of the project has been established.

Furthermore, FASTER has been presented in several national and international events with the aim of spreading the project knowledge and finding new stakeholders to collect feedback and determine user requirements for the FASTER tools. ■
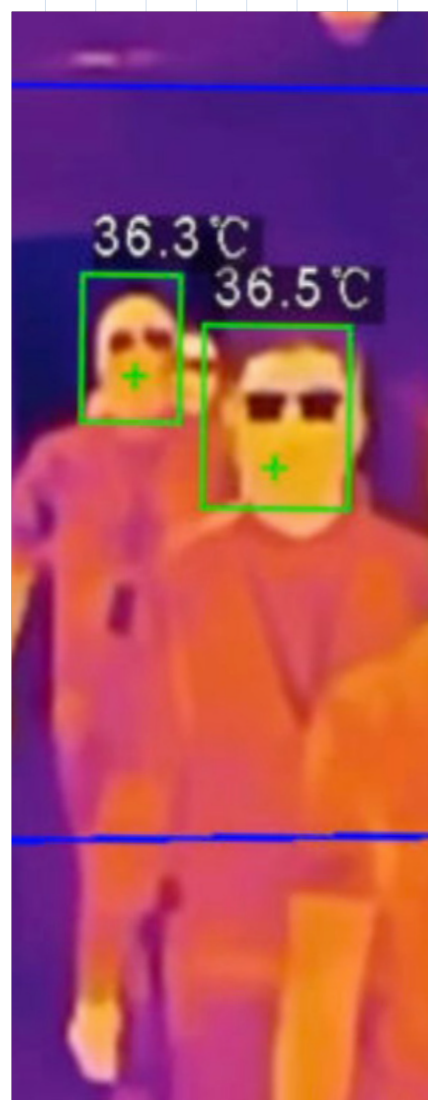
The FASTER consortium plenary meeting in February 2020 in Madrid, Spain included a tour of the region's 112 call center.
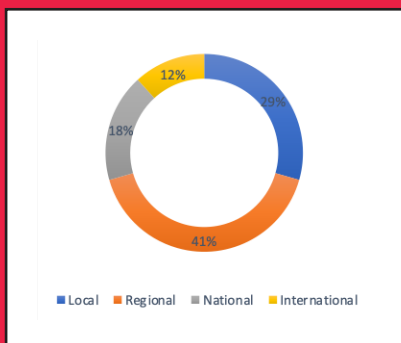
FASTER PLANNED MILESTONES

May 2019	FASTER start
October 2019	User requirements and use cases
April 2020	System architecture designed and components specified
October 2020	First integrated tool and Components Versions Delivered
January 2021	First Pilots Completed
October 2021	Updated Technologies based on the first Pilot
January 2022	Start of final Pilots
May 2022	Official presentation of FASTER system

FIRST YEAR ACHIEVEMENTS

August 2019	Social, Legal, Ethical and Policy Frameworks
September 2019	Communication material presented
October 2019	User requirements and use cases submitted; Dissemination plan submitted
January 2020	Technical specifications defined Innovation Strategy plan defined
April 2020	System architecture defined

FASTER IN THE TIME OF COVID-19

18% are linked with research activities, while experts and civil society representatives each make up 6% of the respondents.

In terms of multilevel representations (International, National, Regional and Local level), the ring chart on the top provides percentages of involvement in questionnaire answers. It is interesting to note that most of the answers come from stakeholders representing Regional or Local entities.

At this stage of the project and facing the COVID-19 challenge, the answers are in line with project developments being focused on the needs and expectations of first responders more than policies and political positions.

Another point is that International and National organisations are few compared to the presence of local ones. Thus, results of our survey should be taken into consideration having in mind this overall breakdown.
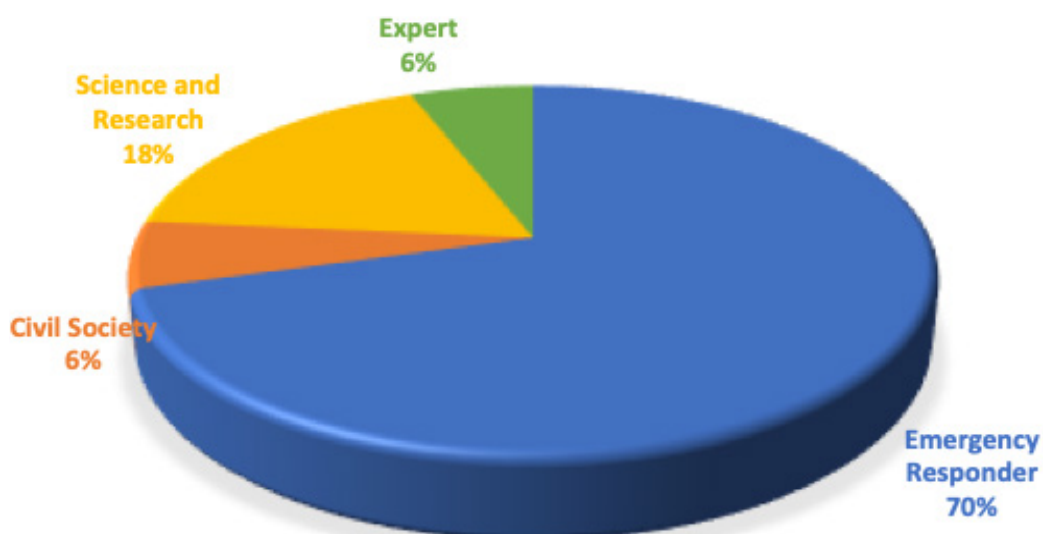
By late February 2020, all of Europe was affected by the COVID-19 pandemic. The project research team started to consider how FASTER technologies could support services useful to pandemic events such the coronavirus outbreak. One result of our analysis is the questionnaire submitted to external stakeholders (still open here: https://www.faster-project.eu/questionnaire-en-08-04-2020/) that includes answers from almost 1/3 of the engaged stakeholders. In the chart on the bottom of this page, the stakeholders have been categorized by profession. As shown in the picture, 70% of stakeholders are directly involved in operations,

QUESTION #1: USEFULLNESS

According to your experience, in which areas could the FASTER project have an impact in the management of an emergency such as the COVID-19 one?

Emergency Responders views:

• The project could improve the use of drones to advise/enforce citizens not to stay in public areas because of the confinement;

• Swarms of drones could be used to patrol territories providing early evaluations to the control rooms helping the risk assessment and coordination of interventions (also with temperature measuring);

• Information gathering, coordination, support to respective authorities.

• FASTER could support and coordinate diagnostic criteria;

• Provide better situational awareness, less face-to-face contacts between first responders and better knowledge about their vital signs;

• Sharing good indicators to allow proper planning;

• Drones and rovers could be useful in materials transportation and delivering medicines and specific devices (masks, thermometers, ventilators) to first responders;

• Enabling safe communication between patients and families during the emergency.

Analysing the answers and trying to draw a possible strategy it is clear that some answers are out of scope for the FASTER project, such as the coordination of diagnostic criteria or the communication between patients and families. The role of drones, instead, could be crucial in a pandemic crisis and an internal discussion is underway in order to better understand how and whether the research team could support first responders needs. In particular, the use of swarm of drones with capabilities to support decision making could be an interesting feature as well as the use of drones and autonomous vehicles to support civil communities in delivering goods and medicines without the risk of contamination. First responders are definitely very sensible to situational awareness achieved reducing the need for face-to-face contact.

We know most of these needs are out of scope for the FASTER project, but it will be interesting to open an internal discussion in order to understand if the project can prepare the baseline for further research.

Experts, Scientists and Researchers view:

• Data collection and contact tracing;

• In the early stages of dealing with the pandemic, quick and effective contact tracing is invaluable to curb the spread, therefore knowing who people interacted with and where (interaction, proximity, and location data) and the use of social media is one of the ways to address that;

• In the delay phase, tracing is not the highest priority; instead, social distancing is more valuable and data can be used to monitor, develop policy, and for authorities enforce (location data becomes the priority) and drones with other patrolling devices could help in this phase;

• Perform triage en route to hospital and not at its entrance (as, e.g., in Israel);

• Better address how to manage personal data in such a pandemic, in the context of GDPR.

It is interesting to note how experts and researchers are focused on giving the proper answers to the emergency. The general approach is a recovery strategy based on two phases, where in the first phase the priority is to understand how the pandemic is moving and to help first responders in managing health services and applying the lockdown. In the second phase the priority moves to the management of a progressive release of lockdown measures. During phase 2, new technologies could support social distancing as well as monitoring of crowd behavior. In both phases the importance of the use of social media data is a priority to better understand the overall scenario. Data privacy and security are specific issues and will be addressed in the next question.

QUESTION #2 : DATA AND PRIVACY

Please tell us your opinion toward the use, during a COVID-19 type of emergency, of personal data such as localisation to better manage actions and resources.

Emergency Responders views:

• Localisation of people is needed during emergencies and it should be an acceptable temporary reduction of privacy;

• We should monitor not only the effectiveness of measures adopted, being able to learn from their results, but also the compliance of the population with them;

• Long-term solutions like contact tracking apps will be extremely valuable for providing data for epidemic studies, thus in this case it is necessary to take into account the proper protection measures for privacy, etc (anonymization plus geolocation-agnostic). Mobile tracking of the affected persons could be very effective (South Korea-type tracking);

• Lack of scientific experience at the beginning of the pandemic.

There are two clear messages: the first one is related to privacy issues during emergencies, they could be bypassed if the objective is to provide better support to citizens; the second one is related to collected data, which should be retained only for the absolutely necessary time frame and then destroyed.

A general consideration is related to person tracking after the emergency, probably it should be important to track people after the COVID-19 hot emergencies but the researchers should study how

to do that respecting the GDPR principles.

Experts, Scientists and Researchers view:

• COVID-19 is an emergency, therefore the restrictions posed by GDPR should be bypassed;

• Clear communication on how the collected data are used, for what period of time, data anonymity and who has access

need to be clearly communicated to citizens. Although the emergency calls for quick action, important matters and decisions should be well thought through and discussed.

Accountability and transparency of personal data use and are the main suggestion given by experts and researchers. If GDPR rules are relaxed during the emergency, they should be reinstated immediately after.

QUESTION #3 : YOUR STORY

Please describe you own views and suggestions to countering this pandemic.

Emergency Responders views:

- "We have a difficult challenge in which more than ever before, the sharing of information between first responders, local and national institutions and affected countries, is not only relevant, but indispensable to get out of this pandemic. Sharing the same criteria and good practices is necessary from the time the first cases began, how the problem has been dealt with, what measures have been taken, how the number of cases has been affected, and until we can finally say that we have overcome the incidence of the virus."

- "I think we should learn from good practices in Asian countries (South Korea, Singapore), and also try to apply them. I think the project should examine all that information."

- "The best and unique solution to eradicate this virus, according to WHO, is to stay at home. To get this first step is crucial to control the streets and avoid people getting out of their homes. To get that, Police Officers are the best solution. Having patrols around the city informing people, avoiding that citizens break the rules and a good emergency centre to assist citizens when they phone, is the best method to achieve the goal."

- "It is very important to anticipate co-ordinately when the possibility of a pandemic is suspected. This includes, training wearing protective equipment and scientific evidence about the pandemic's origin."

- "After working one month on the following and planning of epidemy, I discover that cases number and mortality are not relevant to follow and anticipate the peak of epidemy. So, we create ad hoc indicators, and study the correlation with our transportation missions."

The COVID-19 pandemic evidenced a strong solidarity among first responders and a very high level of cooperation from the civilian community, which included some limitations on their freedom. Sharing experiences, and also learning from foreign experiences, has been an important asset towards fighting the spread of the virus. Training is also considered a priority due to the need of specific competences to protect first responders and also to give a size to phenomena. Drone use is considered a great opportunity. ∎
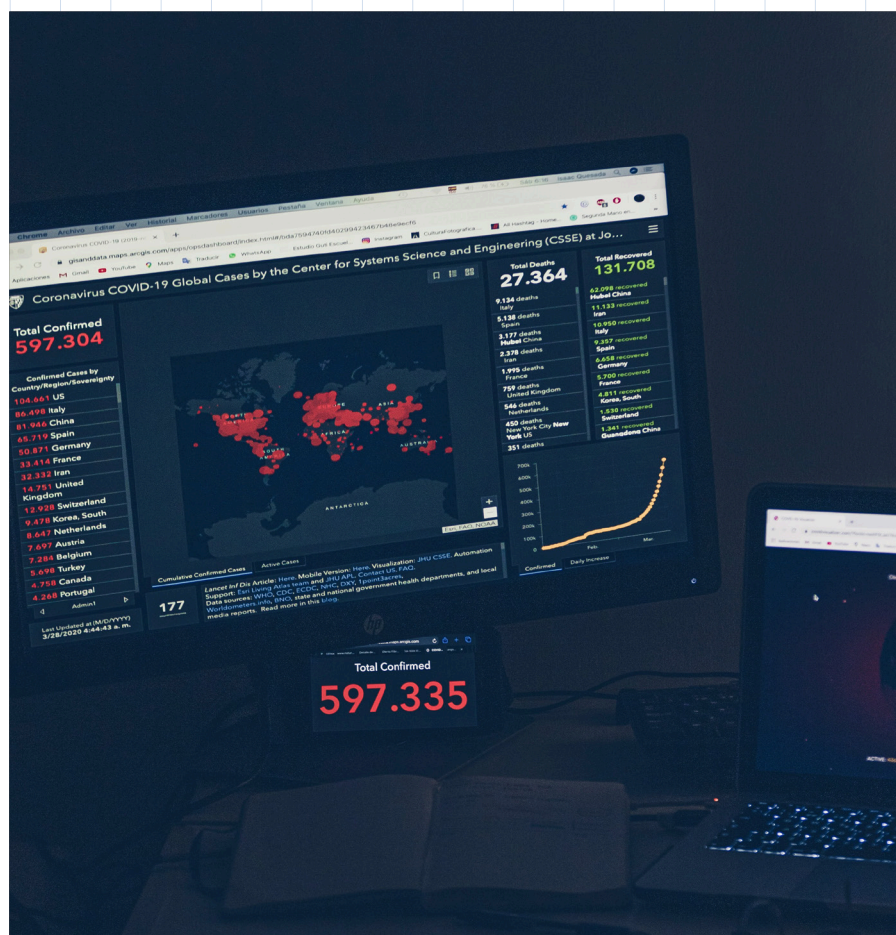
GESTURE RECOGNITION AND K9 WEARABLES

With FASTER actively working on the development of modern technological tools that will be efficiently and effectively used by First Responders (FR) on the field of action, theFASTER partners from the University of West Attica (UniWA), within the university's CoNSeRT lab, are completing the first prototype of a collar worn by K9 units able to collect sensory data and featuring Artificial Intelligence (AI) capabilities, so as to assist the process of victim discovery and support. Furthermore, in order to enhance the tools of FRs in the field, UniWA researchers are also working on the implementation of a Deep Learning Framework named MORSE (MOvement Recognition for firSt rEsponders) for gesture recognition. The framework will be deployed on smartwatches worn by FRs on the field, supporting gesture based communication between the FRs, which will enable them to use gestures in order to automatically generate alerts under hazardous situations without the need of audio-visual signals.

In detail, in the context of FASTER, a novel wearable device for K9s will be developed, featuring several sensors (e.g., gyroscope, accelerometer, GNSS, microphone, camera) along with two actuators (e.g., speaker, vibrator) and a control panel application. A Deep Learning model developed for use on the device will be utilised to extract valuable information about K9's behaviour that will be transmitted wirelessly through IoT communication protocols to the FRs supervising the K9s operations.

At the same time, the definition of a communication protocol will be studied in order to translate the K9's behaviour (e.g., move-

ment or bark) into a message addressed a) either to the person in need in order provide some useful tips that should be followed to facilitate the FR's work (e.g., to not move if (s)he is injured since help is arriving)., and/or b) to the FRs to inform them about the K9's status and provide some useful tips that should be followed to facilitate the FR's work (e.g., to not move if (s) he is injured since help is arriving).

It should be noted that the design of the collar is revived to include an updated security and practical approach following design principles extracted through discussions with experts from the project on K9 operations. The collar design takes under consideration several operational parameters such as weight distribution around the neck of the animal, minimization of protruding parts in order to be less obtrusive, along with a detachable capability to emphasize the safety of the animal in case it is trapped during action.

Considering the hazardous environment where FR's operate, CoNSeRT researchers will develop MORSE, a framework for mobile devices that will capture and identify arm movements exploiting Artificial Intelligence. In more details, a Deep Learning model deployed to wearable devices (e.g., smartwatches equipped by FRs) will be implemented, to classify motion signals to predefined gestures in real-time. After consulting the FR teams in FASTER, four (4) such emergency hand signals, used in aircraft rescue and firefighting communications, have been initially selected which, when performed by a FR and captured by the algorithm, will generate emergency messages in the form of alerts that will be propagated

in the nearby FR's smart-phones and to the Portable Command Centre to increase local situational awareness.

Apart from alerts that will be displayed on the phone (or smart-watch) of the FR's on the field, FASTER will test the proliferation of these alert messages on the field through vibrations on wearable devices following, actual, Morse code. Given that often during operations communication infrastructure has collapsed, messages will be transmitted using IoT communication protocols (e.g., Bluetooth Low Energy; BLE). ■

Prototype of the collars to be worn by K9 units. The collars are able to collect sensory data and feature Artificial Intelligence (AI) capabilities.

1: https://www.skybrary.aero/index.php/Emergency_Hand_Signals

USING DRONES FOR MAPPING THE DISASTER AREA

In crisis situations, having an up-to-date map of the affected area can be invaluable in planning the response and catering to the safety of both victims and first responders. Many disasters, like floods, fires, landslides, and other catastrophes can significantly alter the layout of a region, presenting both obstacles and dangers. Hence, it is imperative that both mission planners and first responders have access to maps updated with the latest developments.

FASTER is developing a fully automated process aiming to integrate on-demand mapping with crisis response mission planning. Mission planners will mark the area of interest on a digital map on FASTER's Portable Control Center application. Drones play an integral role, as they will fly over a selected area following automatically generated flight paths and take overlapping geo-tagged photographs. Those images will then be combined into an up-to-date map (2D orthomosaic), utilizing geo-referencing to blend it seamlessly with the existing digital map in the control center. ∎

GESTURE CONTROL OF DRONES

Drones have been precious in crisis response, helping first responders to detect hazards and locate victims faster. They can scout inaccessible positions or dangerous locations, reducing first responders' exposure to risk. However, traditional drone controllers are cumbersome and require both hands to operate, preventing the operator from performing other manual tasks. During a crisis response operation this can be compromising: first responders may need one or both hands to carry equipment, help victims, open doors or steady themselves.

To make drone use easier and less cumbersome, FASTER is developing single-hand gesture control for drones. First responder operators will be able to pilot drones using simple gestures with one hand, freeing their other hand to perform other tasks. Free of any hand-held equipment, even the controlling hand can be swiftly repurposed when not being used to pilot the drone.

Two modes of gesture control are being tested: Finger-based control allows precise, discrete and sequential commands based on three simple gestures; these correspond to up/down, yaw left/right, and forward. Palm orientation control provides a more complex and intuitive interface of composite commands. The drone follows the orientation and lateral motions of the palm, as if the pilot held it in their hand.

The two modes were integrated in a drone flight simulator and tested by both first responders and members of the public. Palm orientation proved more popular and made for smoother flight with less collisions. However, in tight indoor spaces, or when users were forced to use their off hands, the precision of finger-based gestures won out. ∎
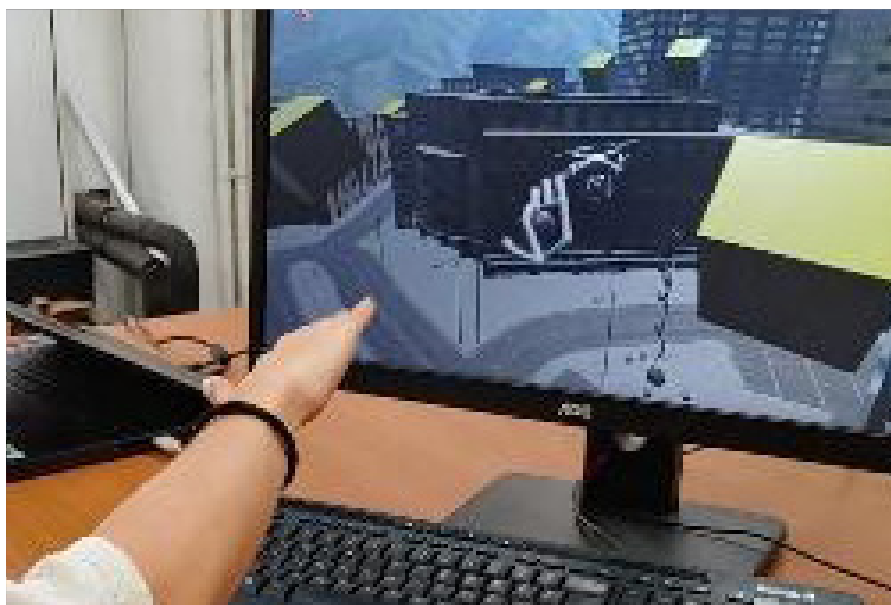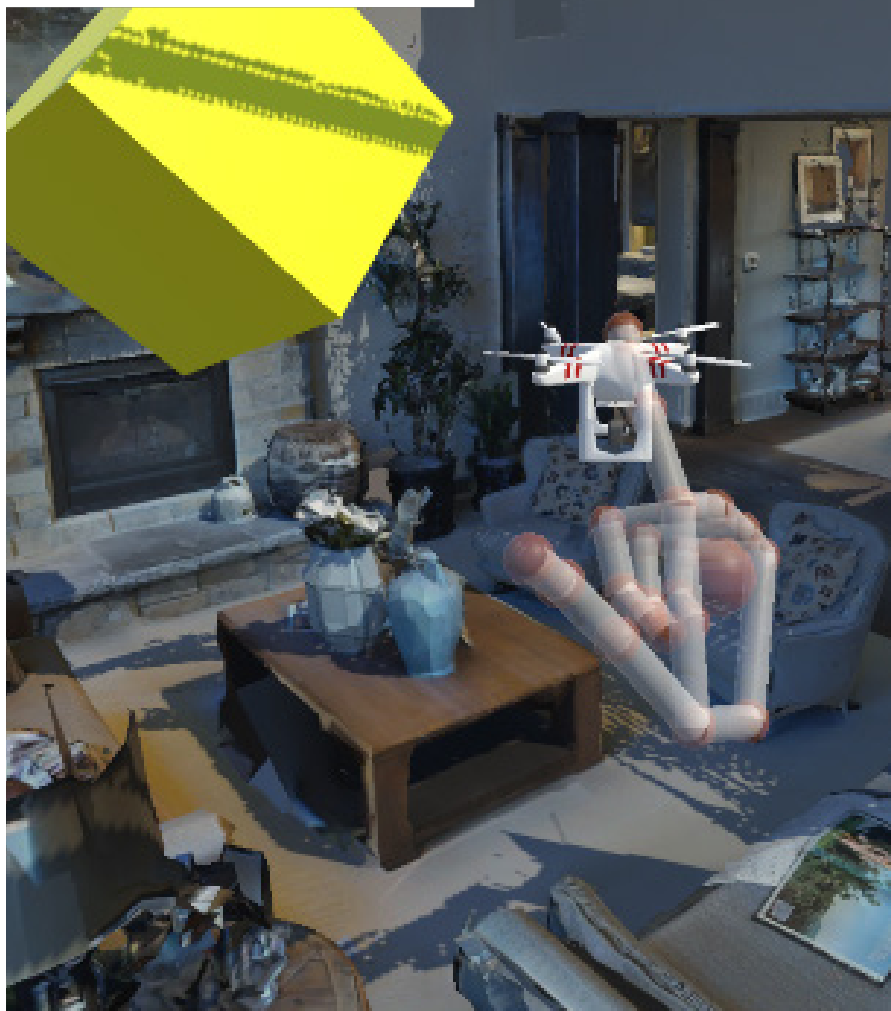
FASTER FROM THE PERSPECTIVE OF A FIRST RESPONDER

Nowadays, there is a change in the way of functioning of emergency services, which are more and more eager to use modern technologies in all phases of crisis management. They are used not only during rescue operations, but also to predict and effectively prevent threats.

In 2017, Motorola Solutions introduced new technologies for emergency services, which aimed to improve their communication and cooperation during a crisis. These included a Virtual Reality for Fire Brigade Dispatchers and a demo version of the Combined Police Officer with Intelligent Virtual Voice Assistant technology.

The first solution is to maintain continuous communication between firefighters and the command by connecting augmented reality with sensors and other devices. This is a technology that allows automatic recording and transmission of data from fire brigade operation scenes, such as fires or accidents, and then displaying them in control centres". In this solution a firefighter is equipped with sensors and devices worn on the body, thanks to which it is possible to automatically record and transmit information about e.g. oxygen level, pulse, breath, or ambient temperature. In addition, a camera with a 360-degree viewing angle, which can be located in various places (e.g. on police cars or drones) passes on to the dispatcher the image from the scene, what enables to "view and interact with a three-dimensional hologram of the operation". The Microsoft HoloLens set, a smart glasses headset with a built-in holographic computer, may also be helpful in comm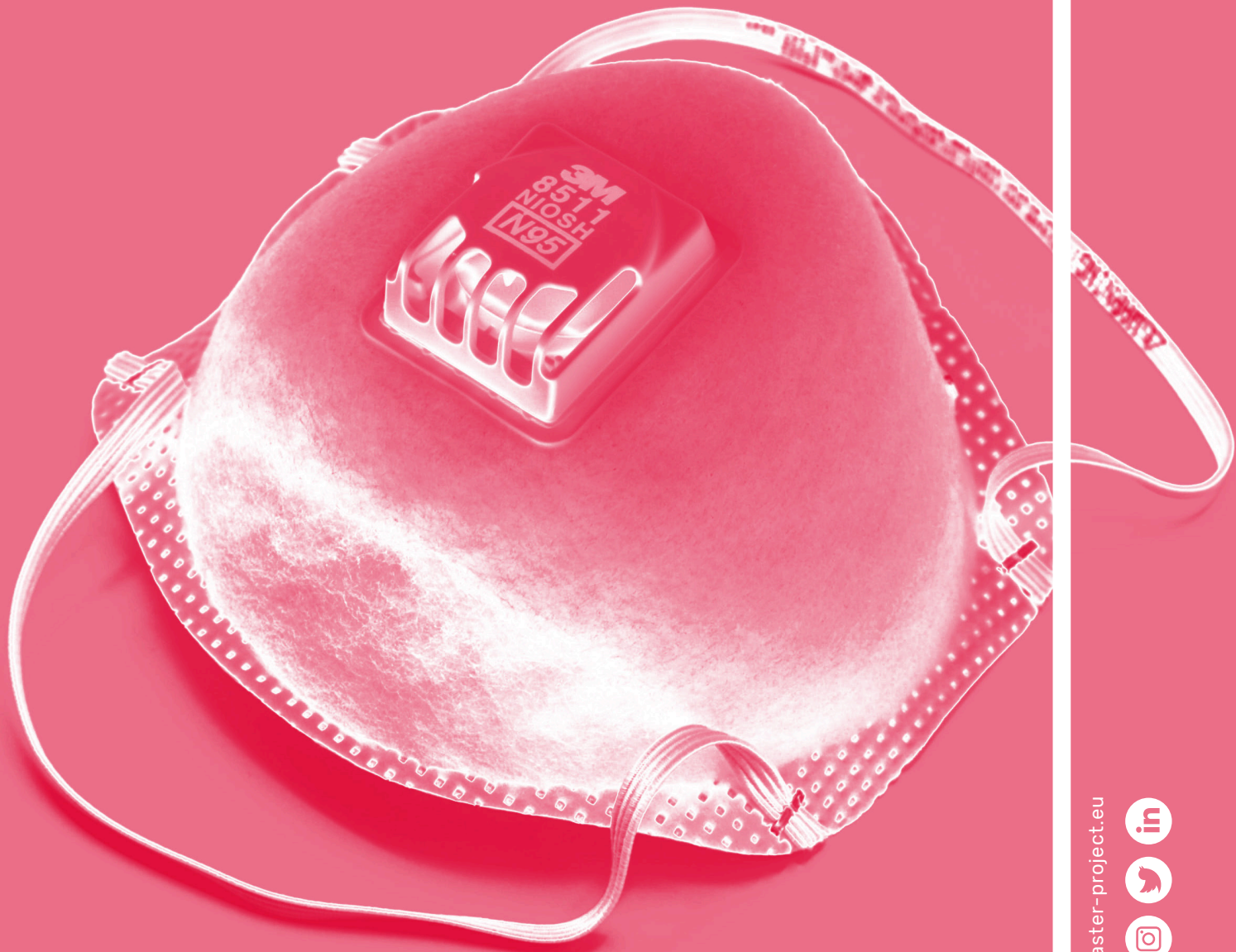unication and cooperation between services. It enables "displaying digital data and interacting with holograms in the surrounding environment".

The second solution enables connecting a police officer with dispatching centres by means of various tools such as mobile cameras, handheld LTE terminals, location sensors or biometric technologies. With their help, permanent and wider communication is to be ensured between the police officer participating in the operation and the dispatcher, who can better coordinate the action. Both the Virtual Reality for Fire Brigade Dispatchers and the demo version of the Combined Police Officer with intelligent virtual voice assistant technology comprise interesting examples of innovative solutions supporting the work and safety of officers in situations of special threats.

Many companies and undertakings are working to create a diverse range of new technology tools to support the activities of emergency services. First of all, there is a particular need for special research on their actual utility and applicability in specific situations and conditions.

The FASTER project includes not only innovative tools for response services, but also their integration into a comprehensive system for information management and rescuers support at the scene of an emergency. The project involves testing such diverse technical solutions as part of planned field trials in Spain, Italy, and Finland. FASTER, through its interdisciplinary approach to technological support for rescuers, provides a holistic approach to the implementation of various technologies for saving human life and health. ■

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