PARTICIPATING INSTITUTIONS

Tallinn University of Technology (TalTech) - Tallinn, Estonia

TalTech was founded in 1918 and granted university status in 1936. The mission of TalTech is to support knowledge-based economic development through research and science-based higher education in engineering, natural, and social sciences. The University aims to create synergies between technology, natural, health and social sciences. TalTech conducts fundamental and applied research at the international level with potential in developing high-tech applications.

National University of Sciences and Technology (NUST) - Islamabad, Pakistan

The NUST is a public research university established in 1991, primarily for the promotion of STEM subjects but has since then expanded through establishing a more comprehensive curriculum consisting of economics, finance, management and social sciences. The School of Electrical Engineering and Computer Sciences has a research focus on information and coding theory, modulation, signal processing for communications systems, mobile communications and optical communications, to name a few.

Politecnico di Milano - Milan, Italy

Politecnico di Milano is Italy's largest scientific-technological university founded in 1863 and is training engineers, architects and industrial designers. The *Dipartimento di Elettronica, Informazione e Bioingegneria* is one of the biggest European ICT departments, with its sections clustering in systems and control, computer science and engineering, electronics, telecommunications, bioengineering, and electrical engineering.

The NATO Science for Peace and Security (SPS) Programme is an integral part of the NATO Emerging Security Challenges (ESC) Division. The SPS Programme develops and implements practical cooperation and enhances dialogue between NATO nations and partner countries through capacity-building and security-related civil science technology and innovation. All SPS activities contribute to the Alliance's strategic objectives, have a clear link to security and respond to at least one of the SPS Key priorities.

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Science for Peace and Security (SPS) Programme

Emerging Security Challenges Division

SPS Multi-Year Project

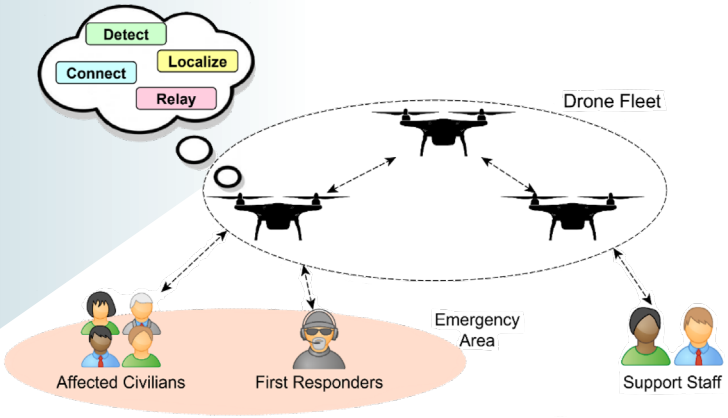
Public Safety Communication in the Context of Terrorist Attacks "COUNTER-TERROR"

CONTEXT

Terrorism in all its forms and manifestations is a persistent global threat. Terrorists continue to carry out attacks around the world with their tactics becoming more coordinated, sophisticated and therefore more devastating. One of the reasons for high causalities is the slow response time to terrorist attacks conducted in public spaces, including in transport hubs, stations and shopping malls. From an information and communication technology perspective, it is important to find an innovative solution to significantly reduce the response time by rapidly providing critical information and overall situational awareness to security forces and law enforcement. To address this shortcoming, this project will develop a heterogeneous network of devices, utilizing smartphones and other devices available on the scene, able to transmit information from a specific zone where an attack is conduced. The innovative technology ultimately enables a rapid response with the potential to save lives and protect critical infrastructure using efficient communications and information processing advancements.

HOW DOES IT WORK?

In emergency situations following terrorist attacks, devices like smartphones, cameras and other sensors located in the zone under attack can be utilized to obtain critical information like the number of devices, their identification and position, as well as images and live videos that can be disseminated by connecting through multi-hop device-to-device (D2D) communication.



D2D communication is attained both in licensed spectrums, driven by cellular, and un-licensed spectrums, driven by other wireless technologies, such as WiFi. The fundamental idea is to connect the devices and establish and maintain that reliable connection. As an additional innovative solution, this project envisages the deployment of Unmanned Aerial Vehicles (UAV) in order to transmit information to the deployed command center, perform signal detection through effective antenna signal processing and hence, accurately locate the devices present in the zone.

GOALS

- Enhance throughput of information through innovative routing and networking strategies.
- Design and evaluate device-to-device (D2D) communication networks for various technologies (for example 4G/LTE Sidelink, WiFi) with innovative interference management capabilities by exploiting machine learning techniques to improve the existing state of the art.
- Increase the lifetime of the network by dynamically adapting transmission.
- Perform UAV-assisted search of signals coming from devices on the ground, possibly enhancing their strength by using antenna arrays and estimating the devices positions.
- Develop and demonstrate testbed platforms for on-ground and in-the-air connectivity using Long Term Evolution, Sidelink and WiFi-direct-based technologies.

IMPACT

The project outcome provides an innovative technological solution to the challenge of delayed response time following terrorist attacks by utilizing advanced communication infrastructure technology. Research and development in pervasive public safety communication will be carried out to enable autonomous, reliable and real-time communication. Thus, to counter the delayed response from police and law enforcement agencies during a terrorist attack, the project envisions to “connect” the on-scene available heterogeneous devices through multi-hop D2D communication to the nearest deployed mobile command center by utilizing UAVs in an efficient way to rapidly disseminate fundamental information.