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Spotting and stopping the spectrum saboteurs

SOCRATES will shield the electromagnetic spectrum, of vital strategic importance to ensure continuity of services such as GPS or cellular networks

A new research project has been launched with the aim of developing a system for detecting threats to the electromagnetic space. Led by [IMDEA Networks Institute](#) (a networking research organization based in Madrid, Spain), the SOCRATES project has recently been awarded funding by NATO's Emerging Security Challenges Division - Science for Peace and Security Programme (SPS). The two other collaborating partners on the project are the [ElectroSense](#) non-profit association of Switzerland (a crowd-sourcing initiative that collects and analyses spectrum data) and Katholieke Universiteit (KU) Leuven of Belgium. Their work will be concluded by May 2021.

In the 21st century, the security of the electromagnetic spectrum has tremendous strategic importance to society. In particular, the wireless infrastructure that carries services such as cellular networks and GPS is especially critical. However, the cost of commodity radio technology prices is now so low that access to it is no longer restricted to governments and network operators. It is now affordable to individuals, giving them the potential to become malicious intruders. More frequent and more sophisticated threats from such infiltrators could wreak havoc and are among the most serious challenges faced by society. Unauthorized transmissions could threaten the operation of networks used by air traffic control systems, police, security and emergency services, for example. The SOCRATES project will deliver a security system to protect our electromagnetic environment and the services and users that depend upon it.

Dr. Domenico Giustiniano, Research Associate Professor at IMDEA Networks Institute who is coordinating the project, offers an overview of the project: "SOCRATES will provide an accurate, autonomous, fast and secure system based on a novel and disruptive IoT (Internet of Things) architecture. By detecting and locating unusual RF signal and source activity it will identify intruders in the electromagnetic space, before a threat can become serious, learning about its physical layer features and its geographic location."

Describing his institute's contribution to the project, the researcher continues: "IMDEA Networks will lead the investigation of the quality of spectrum sensors in a crowdsourced system, challenged by the large amount of data processed by the system, and of the distributed localization of emitters, challenged by the lack of synchronization among the spectrum sensors - two areas in which we build upon our extensive expertise."

The SOCRATES solution will need to be suitable for real-world implementations. Giustiniano explains how this will be achieved: "We plan to test the SOCRATES system in controlled and realistic conditions, operating in both licensed and unlicensed spectra. Real experiments will showcase the system's ability to detect the waveforms and wireless technologies of adversaries who are misusing wireless resources. We'll also demonstrate how the physical location of an

intruder can be swiftly identified. Adopting an agile approach, we'll build, demonstrate and showcase early prototypes throughout the project.”

By providing the capability to detect, identify and locate potential threats to electromagnetic infrastructure security, **SOCRATES (*Large Scale Collaborative Detection and Location of Threats in the Electromagnetic Space, Grant G5461*)** represents an important step in ensuring society's readiness to respond effectively to them. SOCRATES will shield economic and social structures from those who would harm them.

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***Some keywords that define us:** 5G, Big Data, blockchains and distributed ledgers, cloud computing, content-delivery networks, data analytics, energy-efficient networks, fog and edge computing, indoor positioning, Internet of Things (IoT), machine learning, millimeter-wave communication, mobile computing, network economics, network measurements, network security, networked systems, network protocols and algorithms, network virtualization (software defined networks – SDN and network function virtualization – NFV), privacy, social networks, underwater networks, vehicular networks, wireless networks and more...*

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