



## ERS POSITIONS AND INDIVIDUAL RESEARCH PROJECTS (IRP)

Fellow <i>ESR6</i>	Host institution <b>IT-Aveiro</b>	PhD enrolment <b>Y</b>	Duration <b>36 months</b>
<b>Project Title:</b> Opportunistic Gathering of Sensing Data			
<p><b>Objectives:</b> In a sensing environment it is important to provide an infrastructure that enables the massive gathering of sensing information. This infrastructure can encompass cellular technologies with large and SCs, and long range radio technologies such as LoRA and SigFox. We consider that a heterogeneous span of these technologies is supported by our approach to provide opportunistic gathering of information. We consider different types of information with different requirements in some aspects, enabling different use cases for the project, e.g. the temperature of a city, parking information. On the choice of technology, we will consider multi-homing and the possibility of the nodes to be connected simultaneously to different networks, optimizing resource management and the delay of the communications. On the opportunistic side, we will make use of extended MAC and network coding with a dynamic feedback multi-hop approach that selects the information to be coded, interfaces to be used for coded information, and required transmitter power to send the information with a good delivery rate.</p>			
<p><b>Expected Results:</b> The expected results to be achieved are as follows: The formulation of a data dissemination model for different types of data and priorities; The formulation of a resource management model for the multi-homing support with different networks and technologies, choosing the amount of information that shall be opportunistically sent through each network and technology, depending on the data requirements, the network and technologies conditions, such as resource management and energy consumption; The design of an optimal mechanism to coordinate the transmission of the information from multiple sensors through the different technologies and networks minimizing the amount of information in the network and the number of transmissions, taking into account energy aspects; The assessment of the proposed design both in simulation and in a real testbed.</p>			
<b>Enrolment in Doctoral degree(s):</b> University of Aveiro			

**Main (host) supervisor/Contact:** Dr. Susana Sargento (IT- Aveiro)

**Additional Information:**

The Networks and Architectures Protocols' group has a strong experience in the leadership of national and international projects, such as FP7 projects (4WARD, Euro-NF, C-Cast, WIP, Daidalos, C-Mobile), EU Coordinated Support Action 2012-316296 "FUTURE-CITIES", EU Horizon 2020 5GinFire, CMU-Portugal projects (S2MovingCity, DRIVE-IN with the Carnegie Melon University), and many other national projects through European funds, and with the industry.

This group has strong experience in the integration of both network and cloud resources in SDN environments, in mobility, QoS, security and routing in wireless and vehicular networks.

We have deployed the largest vehicular network experimental infrastructure in the world, in the city of Porto, comprising a vehicular network of 404 buses and 20 municipal vehicles (BusNet), 23 static environmental and weather sensors plus 23 pedestrian counter sensors (UrbanSense). Static sensors communicate with the backoffice (with 3 cloud servers, and an on-premise infrastructure) either via static WiFi hotspots or using the vehicular delay-tolerant network. This 'living laboratory' for innovation does not only provide a Wi-Fi service to people in the city through a vehicular network, but it also collects large amounts of scientific data that is used to improve energy consumption, reduce the environmental impact and manage public transportation, towards the path to self-driving transportation.

We are also deploying a smart environment in Aveiro, interconnecting cars, drones (aerial and aquatic), 'moliceiro' boats, bicycles and sensors, and we have been using the available information, through artificial intelligence, to improve the mobility of the citizens. Examples of use cases being addressed are eco-routing, virtual traffic lights in 'moliceiros' boats, detection and avoidance of collisions in roads and crosswalks.

Susana Sargento, the leader of the group, has co-founded a vehicular networking company, Veniam ([www.veniam.com](http://www.veniam.com)), a spin-off of the Universities of Aveiro and Porto, which builds a seamless low-cost vehicle-based internet infrastructure. Susana is the winner of the 2016 EU Prize for Women Innovators ([http://ec.europa.eu/research/innovation-union/index\\_en.cfm?section=women-innovators](http://ec.europa.eu/research/innovation-union/index_en.cfm?section=women-innovators)).

Research group: <https://www.it.pt/Groups/Index/36>

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