Marie Sklodowska-Curie Phd Offer – HARMONY European Project

Shared between industry (Thales) and academic (CNRS)
Shared between France and Spain

Ph.D. Thesis: Algorithm distribution and edge processing in emerging satellite networks
(Founded by Industrial Doctorate programme HARMONY, consortium involving 9 industrial and academic partners in Germany, France, Spain and United Kingdom https://euraxess.ec.europa.eu/jobs/777575).

Supervisors: J. Lorandel (Université de Rennes 1 – IETR – CNRS –France), Christophe Moy (Université de Rennes 1 – IETR – CNRS –France), and industrial supervisors from Thales Alenia Space France (Toulouse) and Spain (Madrid).

Consortium and PhD organisation:
Selected candidates from this process will receive a generous employment contract for 36 months (as defined in the Marie Sklodowska-Curie Actions Work Programme) with an additional mobility allowance. Each PhD student will spend as a minimum 50% of their time in the industry sector – including a minimum of 3 months with Thales Alenia Space France.

Context: Part of the European Commission's Horizon Europe Marie Skłodowska-Curie Actions, the Industrial Doctorate programme HARMONY: Innovating New Space Frontiers: Harmonised Federated And Fractionated Systems Unlocking Fresh Perspectives For Satellite Services has opened an immediate opportunity for well-funded PhD positions in the area of space networks exploiting emerging constellations with focus on the underlying architectures, signal processing and antenna technologies. Structured around a major European satellite integrator (Thales Alenia Space in France and Spain), HARMONY will address the emerging New Space landscape, which brings to fore constellations of co-operating satellites as means to improve service offerings whilst reducing costs. HARMONY brings together 3 leading European SMEs developing small satellites (Nanoavionics), deployable structures (LSS) and digital physical layer solutions (MBI) together with 3 academic laboratories in the UK (Heriot-Watt), France (Université de Rennes 1 – IETR - CNRS) and Germany (University of the Bundeswehr Munich). The research programme is highly interdisciplinary covering architectural and system aspects, advanced signal processing and passive & active antenna technologies. We are seeking for highly competitive candidates strongly motivated to contribute to this exciting project.

Objectives addressed: The new generation of networks, including satellite networks, foresee the inclusion of Edge data processing as a constituent part of the network management architecture in order to reduce the latency of the network for critical applications and for overall traffic management and planning. Considering this emerging network architecture, the computational resources are not used or fully used depending on the flying conditions of the

satellite, especially when it reaches “idle radio areas” (Oceans, Deserts, etc.), but remains fully connected to the network.
The PhD will explore the possibility of using this dynamically spare data processing capacity as edge processing resources to cover edge processing needs of the satellite network. This innovative approach is favoured by the current technological trend of implementing the Data Processing Payloads on very high capacity in-flight reconfigurable SoC chips.
This scenario to explore is as system where the main processor of each satellite can be dynamically reconfigured in different moments of its orbit to perform different tasks such as software defined radio processing when providing coverage to users and edge computing functions when flying over specific areas.

The implementation of the presented features necessitates the investigation of these following elements:
1) Distributed data processing in an edge-computing context.
2) Dynamic allocation and resource management techniques applied to state-of-the-art technologies with power consumption and latency issues.

Finally, a prototype shall be developed, to validate and evaluate the performance of the proposed solution.

Duration: 3 years

Ph.D. requirements and eligibility criteria
Candidates should have a master’s degree or equivalent in computer engineering, electronics engineering (FPGA/SoC design), or a related subject. Previous experience in a relevant area, such as digital signal processing, FPGA/SoC design, software radio, is highly desirable.
Candidates can not be recruited in a country where they have been residing for more than 12 months in the past 36 months (i.e. Spain).

Application deadline: end of January 2023

Starting date: ASAP in 2023

How to apply: https://euraxess.ec.europa.eu/jobs/777575

For mor details on the subject: Please contact J. Lorandel (Jordane.lorandel@univ-rennes1.fr) and C. Moy (Christophe.moy@univ-rennes1.fr) with the subject line "HARMONY PhD applications" if you have questions.