



**ESR Project title:** End-to-end communication/computing resource management for low-latency beyond 5G MEC [ESR14]

**Contact names:**

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**Institution:** CTTC, Spain

**Application deadline:** May 31, 2021

**ESR Project Description:** This project focuses on the design of end-to-end wireless network architectures and communication/compute resource management techniques for enabling high-capacity low-latency communications through a cost-effective and energy-efficient use of the wireless spectrum. Within the framework of next generation Open Radio Access Network (O-RAN) architectures, several radio/compute access techniques will be derived, which can be dynamically adjusted to the computation and communication requirements of different latency-critical scenarios (such as Industry 4.0 and vehicular scenarios) through novel mobility, interference, and computing management schemes. The strategies will consider convex optimization frameworks and machine-learning frameworks to optimize the available communication, networking, and computation resources to meet the requirements of future low latency services, while considering the challenging mobility, propagation, and traffic conditions of future scenarios.

**Expected Results:** Develop new end-to-end wireless network architectures and radio/compute resource management techniques based on theoretical analysis and system-level simulations. Theoretical analysis to assess the achievable gains of the proposed architectures and schemes, along with their fundamental performance limits. Machine-learning-based optimization of network configuration and critical system parameters. System-level simulations to compare theoretical performance limits with practical implementation's performance.

**Supervision and Mobility Program:**

Once hired, the candidate:

- will work at CTTC, performing full-time research under the supervision of Dr. Paolo Dini and Dr. Sandra Lagén.
- will be enrolled in the PhD program at Universitat Politècnica de Catalunya (UPC), under the supervision of Mario Garcia Lozano.
- will additionally pursue two secondments at CEA (Grenoble, France) and Nokia Bell Labs (NBL) (Stuttgart, Germany), for a respective duration of 5 and 5 months.

**Required, Preferred and Desired Prerequisites/Skills:<sup>1</sup>**

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<sup>1</sup> **Required**, means mandatory to pass the eligibility check. **Preferred**, means highly welcome and recommended. **Desired**, means additional, not strictly needed, but still very much appreciated.



- **Required:** At the time of recruitment, the applicant must not have lived in Spain for more than 12 months in the previous 36 months (3 years).
- **Required:** No more than 4 years spent in research/work activities after the achievement of the MS degree.
- **Preferred:** A Master's degree in Telecommunications, Computer Science, Data Science or equivalent.
- **Preferred:** Knowledge on mobile networks and cloud computing techniques.
- **Preferred:** Programming skills (e.g., C/C++, Python, TensorFlow, Keras, PyTorch, SciKit, NumPy, R).
- **Desired:** Working/research experience in the areas of mobile networks and cloud computing is an advantage.
- **Desired:** Knowledge of Optimization Theory (convex and non-convex optimizations) and Machine Learning (reinforcement learning and deep learning) is an advantage.
- **Desired:** Knowledge of next generation RAN architectures (O-RAN, 3GPP, and hybrid centralized-RAN) is an advantage.
- **Desired:** Experience with system-level simulations (e.g., ns-3) is an advantage.
- **Preferred:** Very good communication skills in oral and written English.
- **Preferred:** Open-mindedness, strong integration skills and team spirit.
- **Preferred:** Ability and motivation to conduct high-quality research, including publishing the results in relevant venues.
- **Desired:** Previous MS-level training on machine learning techniques.