

# ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

## Fondazione LINKS/DET - Optical network control based on open interfaces and protocols

<b>Funded By</b>	FONDAZIONE LINKS - LEADING INNOVATION & KNOWLEDGE FOR SOCIETY [Piva/CF:11904960017] Dipartimento DET
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<b>Context of the research activity</b>	The PhD research aims to enhance open optical networks by developing reliable software infrastructures for model interoperability. During the first two years, the candidate will develop interfaces for digital twin models and telemetry planes, integrating various device models and adapting the model to other standards and controllers. In the third year, the research will focus on creating a working demo with new devices, applying the model in real-world scenarios, and extending network functionalities like failure recovery.
<b>Objectives</b>	<p>The PhD student's activity will evolve within the ALLEGRO project (Agile uLtra Low EnerGy secuRe netwOrks), which aims to design and validate a novel end-to-end sliceable, reliable, and secure architecture for next-generation optical networks. The project targets high transmission/switching capacity —10 Tb/s for optoelectronic devices and 1 Pb/s for optical fiber systems —low power consumption/cost with over 25% savings, and secure infrastructures and data transfers. Specifically, the research will focus on open software-defined networking (SDN) management of the optical layer by developing open interfaces according to open standards (e.g., OpenROADM, OpenConfig) and relying on open network operating systems (e.g., ONOS, ODL).</p> <p>Thanks to the innovative ALLEGRO network architecture, including the telemetry plan and the physical-layer digital-twin as-a-service, the research activities will target the lowest-energy optical control. Moreover, proactive failure prevention functionalities leveraging the time-varying digital twin will be implemented. The activities will utilize the ALLEGRO TuriNet experimental testbed (3 nodes, 2000+ km amplified lines, whitebox transponders and muxponders) available at the joint Links-PoliTo open lab. TuriNet is also connected to the TIM labs through dedicated fibers, enabling the activities to take advantage of a large state-of-the-art experimental setup to test the</p>

innovative developments.

Besides collaborating with the EU-funded ALLEGRO project, the PhD student will work with the open network consortium Telecom InfraProject. Specifically, they will develop open interfaces for the open-source project GNPpy, to be used as a vendor-neutral physical layer digital twin.

**Skills and competencies for the development of the activity**

- Fundamental of Computer science
- Fundamental of Communications Engineering
- Open optical networks
- Python coding
- Open networking interfaces and protocols