



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 39th cycle

Research Area n. 4 - Telecommunications

**PARTENARIATO PNRR Research Field: OPEN RAN FOR THE MANAGEMENT AND  
CONTROL OF NEXT-GENERATION MOBILE WIRELESS NETWORKS**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1400.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

**Motivation and objectives of the research  
in this field**

This research project is in the framework of  
RESTART  
PARTENARIATO ESTESO RESEARCH AND  
INNOVATION ON FUTURE TELECOMUNICATION  
SYSTEMS AND NETWORKS TO MAKE ITALY MORE  
SMART  
CUP D43C22003080001  
Decreto di Concessione D.D. 1549 del 11/10/2022

The development of next-generation mobile wireless networks is driving the emergence of new networked systems. An example of such networks is Vehicle-to-Everything (V2X) communication, which is anticipated to be one of the primary players in the era after 5G and 6G networks. To ensure the success of these new technologies, extensive management and control mechanisms are required due to the demanding application requirements, the quick unpredictability of the vehicular environment and the harsh propagation conditions. Traditional Radio Access Networks (RANs) may not have the adaptability needed to provide the necessary control primitives, but the emerging idea of Open RAN (O-RAN) seems to be the perfect tool for orchestrating the complexity of the communication in such



	<p>environments. However, the question of how to successfully combine the two ecosystems is an open issue.</p> <p>The goal of this research is to focus on the definition and implementation of innovative approaches to control and manage mobile wireless networks based on principles of intelligence and openness. The challenges and prospects of utilizing O-RAN to provide real-time operations will be explored as potential integration solutions will be defined. Simulation tools will be developed and new potential research directions will be explored starting from the existing state-of-the-art.</p>
<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>The research methodology shall include:</p> <ol style="list-style-type: none"> <li>1) Study of the existing literature on O-RAN and advanced mobile wireless technologies (V2X, etc.).</li> <li>2) Study of the existing software tools for simulation of V2X communication.</li> <li>3) Design of solutions for the integration of O-RAN and V2X.</li> <li>4) Development of novel algorithms.</li> <li>5) Performance evaluation of designed algorithms and comparison with existing ones available in the literature.</li> </ol>
<b>Educational objectives</b>	<ol style="list-style-type: none"> <li>1) acquire an expertise in technologies for next generation of wireless cellular networks;</li> <li>2) develop state-of-the-art skills concerning the integration physical and network layers to improve the performance of wireless communication systems and to reduce power consumption;</li> <li>3) disseminate research results (oral presentations/written publications);</li> <li>4) ability to identify research problems and to conduct research in a highly focused fashion;</li> <li>5) develop team working skills through the collaboration with the research groups on both theoretical and practical topics;</li> <li>6) develop skills for life-long learning and professional development.</li> </ol>
<b>Job opportunities</b>	<p>For the ambitious and disruptive objectives of the research, as well as for the reputation of the involved</p>



	research groups, it is expected that after completion of the PhD program the candidate will be ready for being part of any research team in public and private institutions and centers, universities, and industry.
<b>Composition of the research group</b>	0 Full Professors 4 Associated Professors 2 Assistant Professors 0 PhD Students
<b>Name of the research directors</b>	Prof. Maurizio Magarini

<b>Contacts</b>	
E-mail: maurizio.magarini@polimi.it	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p>List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: Università di Bologna, Università degli Studi di Napoli "Federico II", Politecnico di Torino, Consiglio Nazionale delle Ricerche, Fondazione Ugo Bordoni, Athonet, Vodafone.</p> <p>EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.</p> <p>TEACHING ASSISTANTSHIP: (availability of funding in recognition of supporting teaching activities by the PhD student) There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p> <p>COMPUTER AVAILABILITY: individual use</p>



DESK AVAILABILITY: individual use

D.D. 341 del 15/03/2022 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di "Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base" - nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 "Istruzione e ricerca" - Componente 2 "Dalla ricerca all'impresa" - Investimento 1.3, finanziato dall'Unione europea - NextGenerationEU