



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 1 - Computer Science and Engineering

**THEMATIC Research Field: DESIGN OF EFFICIENT COMPUTING PLATFORMS FOR  
DATACENTERS**

**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**

The end of Moore's law and Dennard scaling require a clean-slate approach to the design of modern datacenter platforms. Recent trends are exploring the possibility of employing programmable hardware (e.g., smartNICs) to offload part of the computation and save precious CPU cycles, thus improving system-wide efficiency [1]. To this end, NICs are now no longer simple peripherals but complete compute platforms featuring memory resources and processing capabilities [2]. The problem is that it is hard to design hardware/software architecture for smartNICs that efficiently manage the network requirements (i.e., hundreds of gigabit/s), high-bandwidth memories (i.e., HBM) and interconnect to the CPU host (i.e., PCIe).

At the same time, efficient computing platforms leveraging the novel and royalty-free RISC-V ISA are blooming highlighting a new golden age for the design of next-generation computing architectures [3].

The research aims to combine these two macro trends with the goal of advancing the state of the art in the design of hardware and software architectures for datacenters targeting evolving workloads and applications requirements.

[1] Azure Accelerated Networking: SmartNICs in the Public Cloud (USENIX NSDI 2018)



	<p>[2] The I/O Driven Server: From SmartNICs to Data Movement Controllers (ACM CCR 2024)</p> <p>[3] John L. Hennessy and David A. Patterson. 2019. A new golden age for computer architecture. Commun. ACM 62, 2 (February 2019), 48?60.  <a href="https://doi.org/10.1145/3282307">https://doi.org/10.1145/3282307</a></p>
<b>Methods and techniques that will be developed and used to carry out the research</b>	Design methodologies for efficient computing in datacenters. The research envisions the development of a system-wide methodological approach, targeting both programmable hardware and open-source software stacks (base and application).
<b>Educational objectives</b>	<p>The student will acquire strong skills in hardware/software co-design (Verilog/SystemVerilog alongside C/C++), hardware/software verification frameworks also integrating with commercial CAD tools.</p> <p>Additional skills will be acquired in the domain of operating systems and networking targeting datacenters.</p>
<b>Job opportunities</b>	Recent graduates in this field have been hired by major semiconductor and IT companies. Post-doc research opportunities are also available. Cooperation with other academic institutions and start-up at PoliMI can open additional job opportunities.
<b>Composition of the research group</b>	<p>0 Full Professors</p> <p>7 Associated Professors</p> <p>6 Assistant Professors</p> <p>7 PhD Students</p>
<b>Name of the research directors</b>	Prof. Davide Zoni

<b>Contacts</b>	
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<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>	--



Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

**Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information**

List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: 1. E4 - IT , 2. CINI HPC-KTT Lab - IT

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. 5.707,20 Euro per student

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.

COMPUTER AVAILABILITY: individual use

CALL: HORIZON-CL4-2024-DIGITAL EMERGING-01-CNECT  
 GA NUMBER: 101189551 (CHORYS)