POLITECNICO DI MILANO

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

Research Area n. 1 - Computer Science and Engineering

THEMATIC Research Field: DESIGN OF EFFICIENT SMARTNICS 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. Here, a recent trend is to leverage programmable hardware (i.e., smartNICs) to offload computation and save precious CPU cycles, thus improving system-wide efficiency [1]. In this scenario, 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). The research aims to advance the state of the art in the design of hardware and software architectures of modern smartNICs targeting evolving workloads and applications requirements. [1] Azure Accelerated Networking: SmartNICs in the Public Cloud (USENIX NSDI 2018) [2] The I/O Driven Server: From SmartNICs to Data Movement Controllers (ACM CCR 2024)
Methods and techniques that will be developed and used to carry out the research	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).
Educational objectives	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. Additional skills will be acquired in the domain of operating systems and networking targeting datacenters.
Job opportunities	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.
Composition of the research group	2 Full Professors 11 Associated Professors 11 Assistant Professors 14 PhD Students
Name of the research directors	Prof. Davide Zoni, Prof. Gianni Antichi

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

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
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)