

# Ioannis Vardas

INSTITUTE OF COMPUTER SCIENCE - FOUNDATION OF RESEARCH AND TECHNOLOGY HELLAS (ICS-FORTH)

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## Education

### Technical University of Vienna

Austria

PHD IN ENGINEERING SCIENCES AND COMPUTER SCIENCES

October 2021

- **PhD Thesis:** TBD, Advisor: Prof. Jesper Larsson Träff
- **Coursework:** High Performance Computing; Scientific Programming with Python;

### University of Crete

Greece

M.SC. IN COMPUTER SCIENCE AND ENGINEERING, GPA: 8.79/10

November 2019

- **MSc Thesis:** Process Placement Optimizations and Heterogeneity Extensions to the Slurm Resource Manager[2]. Advisor: Prof. Manolis G.H. Katevenis, Co-Advisor: Dr. Manolis Marazakis
- **Graduate Coursework:** Embedded Systems Lab; Principles of Distributed Computing; Internet Systems and Technologies; Computer Architecture; Parallel Computer Architecture; Managed Runtime Systems; Digital Circuits Design Lab Using EDA Tools;

### University of Crete

Greece

B.SC. IN COMPUTER SCIENCE, GPA: 7.03/10

March 2016

- **Graduate Thesis:** Memory Testing through an FPGA with an embedded Processor

## Research

### ICS-FORTH

Greece

#### EXPLORING THE IMPACT OF NODE FAILURES ON THE RESOURCE ALLOCATION FOR PARALLEL JOBS

Dec. 2019 - October 2020

- The main goal is to reduce the average job completion time by avoiding errors due to node failures, while also reducing the cost of communication of the parallel processes by optimizing their mapping to the parallel system.
- In brief, I implemented the following:
  - Profiler for MPI applications that captures bytes and messages exchanged between the MPI processes via MPI point to point and collective calls
  - Fault Aware Node Selection heuristic for 3D Torus written in C language
  - Interface with Scotch Graph mapping library written in C language
  - Evaluation platform for SimGrid Simulator written in Python and C/C++
- For the evaluation I simulated several MPI applications using SimGrid. including NAS parallel benchmarks, LAMMPS and HPL
- Part of this research was published in [1]

#### PROCESS PLACEMENT OPTIMIZATIONS AND HETEROGENEITY EXTENSIONS TO SLURM RJMS

Sept. 2017 - Nov. 2019

- This is the topic of my MSc thesis [2] which introduces three extensions to Slurm Resource and Job Managing System:
  1. A new plugin that enables Slurm to support FPGA-based accelerators as a resource
  2. Enable Slurm to support running workloads in Virtual Machines using QEMU
  3. This extension introduces a number of plugins to Slurm that enable it to map a parallel job to the topology while also avoiding potential faulty nodes

For the implementation of the above extensions I developed several plugins for Slurm as well as extending its core functionality for the second extension which required an in-depth knowledge about Slurm internals. The first extension of Slurm was integrated in the ExaNeSt prototype. This work was supported by the European Union's Horizon 2020 Research and Innovation Programme, ExaNeSt, under grant agreement No. 671553.

#### ACCURATE CONGESTION CONTROL FOR RDMA TRANSFERS

Aug. 2016 - Nov. 2016

- This research introduces a congestion control protocol for dealing with traffic bursts. It attempts fair-share allocation of bandwidth between flows without keeping per-flow state in the network. I contributed to this project by extending the existing simulation environment using Omnet++ (discrete event simulation environment) and running simulations and tests. This project was published in [3].

## Employment history

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### Technical University of Vienna - Faculty of Informatics

[Austria](#)

#### PRE-DOCTORAL RESEARCHER

June 2021 - Present

- Pre-Doctoral Researcher, Parallel Computing Group

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#### RESEARCH STAFF

Dec. 2019 - May 2021

- Research staff, Computer Architecture and VLSI Systems (CARV) Laboratory

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#### GRADUATE RESEARCH ASSISTANT

Sept 2017 - Nov 2019

- Master's degree Scholarship, Computer Architecture and VLSI Systems (CARV) Laboratory

### Hellenic Army

[Greece](#)

#### SERVED IN THE HELLENIC ARMED FORCES

Dec. 2016 - Aug 2017

- Served in the Hellenic Army, Research and Informatics Corps

### ICS-FORTH

[Greece](#)

#### RESEARCH SCHOLARSHIP

Aug. 2016 - Nov. 2016

- Research Scholarship, Computer Architecture and VLSI Systems (CARV) Laboratory

## Teaching Experience

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### Teaching Assistant

[CSD-University of Crete, Greece](#)

#### COMPUTER ORGANIZATION (CS-225)

Spring 2018, 2019

- Oral Examination of students' exercises
- Marking and assessment of exercises
- Participating in marking and assessment of the final and midterm examinations
- Developed the [YAC Simulator](#), a cache simulator written in C/C++ for a simple cache scheme. As I am aware, it is still used to this day for this course

#### DIGITAL DESIGN (CS-120)

Fall 2018, 2019

- Oral examinations of students during the CS-120 Laboratory exercises
- Answering questions both in mailing list and in person
- Participating in marking and assessment of the final and midterm examinations

#### DIGITAL DESIGN (CS-534)

Spring 2016

- Answering questions both in mailing list and in person
- Marking and assessment of students' exercises

## Attended Summer School

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### HiPEAC Summer School - ACACES

[Fiuggi, Italy](#)

#### COURSEWORK

July 2018

- Memory Systems and Memory-Centric Computing Systems: Challenges and Opportunities by Onur Mutlu
- Distributed memory programming and algorithms by Johannes Langguth
- GPU Architectures: From Basic to Advanced Concepts by Adwait Jog
- Architectural Support for Virtual Memory by Abhishek Bhattacharjee

#### PRESENTED POSTER

- Extending Slurm to support Running Workloads in Virtual Machines or VINO-Slurm: Virtual NOdes in Slurm

## Side Project

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## DESIGN OF A RISC-V CORE IN SYSTEM VERILOG

- [Implementation](#) of RV32IC standard with support for stream instructions
- Development done using Synopsys EDA tools for the purposes of Digital Circuits Design Lab Using EDA Tools

## Skills

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<b>Languages</b>	C, C++, Python, Bash, System-Verilog, ARM and MIPS Assembly, Java
<b>Operating Systems</b>	Linux(Gentoo, CentOS, Debian, Arch), FreeBSD, Microsoft Windows
<b>Development and Design Skills</b>	MPI applications, Linux Device Drivers and Modules, Hardware design using Synopsys EDA Tools, Git
<b>Virtualization Platforms</b>	QEMU, Virtual Box, Microsoft Hyper-V
<b>Languages besides native(Greek)</b>	English C2 level. University of Michigan, Certificate of Proficiency in English

## References

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- Dr. Manolis Marazakis, [maraz@ics.forth.gr](mailto:maraz@ics.forth.gr)
- Dr. Manolis Ploumidis, [ploumid@ics.forth.gr](mailto:ploumid@ics.forth.gr)
- Prof. Manolis G.H. Katevenis, [kateveni@ics.forth.gr](mailto:kateveni@ics.forth.gr)
- Prof. Vassilis Papaefstathiou, [papaef@ics.forth.gr](mailto:papaef@ics.forth.gr)

## Publications

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- [1] I. Vardas, M. Ploumidis, and M. Marazakis. "Towards Communication Profile, Topology and Node Failure Aware Process Placement". In: *2020 IEEE 32nd International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD)*. 2020, pp. 241–248. doi: [10.1109/SBAC-PAD49847.2020.00041](https://doi.org/10.1109/SBAC-PAD49847.2020.00041).
- [2] Ioannis Vardas. "Process Placement Optimizations and Heterogeneity Extensions to the Slurm Resource Manager". 2019. URL: [https://publications.ics.forth.gr/tech-reports/2020/2020.TR477\\_MPI\\_parallel\\_jobs\\_Slurm\\_resource\\_manager\\_extensions.pdf](https://publications.ics.forth.gr/tech-reports/2020/2020.TR477_MPI_parallel_jobs_Slurm_resource_manager_extensions.pdf).
- [3] Dimitris Giannopoulos et al. "Accurate Congestion Control for RDMA Transfers". In: *Proceedings of the Twelfth IEEE/ACM International Symposium on Networks-on-Chip*. NOCS '18. Torino, Italy: IEEE Press, 2018. ISBN: 9781538648933.