

Ioannis Vardas

SOLUTION ARCHITECT @EVIDEN - MISSION CRITICAL SYSTEMS

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Summary

PhD in Computer Science and Engineering specializing in High-Performance Computing, with deep expertise in performance analysis and optimization of parallel applications. Proven ability to design and implement performance profiling tools for both MPI-based parallel applications (mpisee) and GPU communication libraries (ncclsee for NCCL), and apply a comprehensive range of analysis techniques, including hardware performance counters, to dissect application behavior. Successfully optimized MPI applications by identifying communication bottlenecks (e.g., within FFT routines) and implementing advanced strategies such as topology-aware process mapping and tailored collective algorithm selection. Combines strong analytical and problem-solving skills and experience collaborating in diverse work environments and a proven ability to communicate complex technical content. Proficient in C/C++, MPI, CUDA, and OpenMP, dedicated to creating efficient, foundational software components for demanding HPC optimization workloads.

Professional Experience

Eviden - Mission Critical Systems SOLUTION ARCHITECT

Austria

Sept. 2025 - Present

TU Wien - Faculty of Informatics: Parallel Computing Research Unit PRE-DOCTORAL RESEARCHER

Austria

June 2021 - June 2025

- Designed and implemented [mpisee](#), a novel profiling tool for MPI applications that analyzes MPI communication per communicator [1, 4, 12]. Utilized to identify performance bottlenecks in scientific applications by dissecting fundamental MPI operations. Made key design decisions about distributed communicator tracking, data collection methodology and analysis framework.
- Designed and implemented process mapping strategies to improve the available memory bandwidth, enhancing cache utilization and reducing communication overheads for colocated MPI applications in HPC systems [2, 3, 13]. Resulted in 2.4x faster completion times for sets of applications over a common exclusive allocation and mapping strategy.
- Collaborated with pharmaceutical researchers to integrate and optimize LigandScout software for molecular screening on HPC systems, communicating technical constraints and opportunities to improve task scheduling [11].
- Contributed to the development of improved algorithms for collective communication and proposing leaner interfaces for the MPI Library [10, 9, 8].
- Developed a [ncclsee](#) lightweight profiling tool for NVIDIA Collective Communications Library (NCCL) operations and their associated asynchronous CUDA kernels using CUDA Profiling Tools Interface (CUPTI). The tool addresses the issue of profiling GPU applications at large scale.

ICS-FORTH - Computer Architecture and VLSI Systems Laboratory RESEARCH ENGINEER

Greece

Dec. 2019 - May 2021

- Conducted research on fault-aware process placement strategies to enhance the resilience of MPI applications on HPC systems [6, 5]. Implemented a simulation environment (using C and Python) for generating synthetic node failures based on the Weibull distribution in a HPC torus cluster.

ICS-FORTH - Computer Architecture and VLSI Systems Laboratory GRADUATE RESEARCH ASSISTANT

Greece

Sept. 2017 - Nov. 2019

Extended the [Slurm resource manager](#) to support heterogeneous architectures (including FPGA-based accelerators) and optimize process placement, demonstrating ability to contribute to complex HPC runtime systems.

Hellenic Army SERVED IN THE HELLENIC ARMED FORCES

Greece

Dec. 2016 - Aug 2017

- Served in the Hellenic Army, Research and Informatics Corps

ICS-FORTH - Computer Architecture and VLSI Systems Laboratory RESEARCH SCHOLARSHIP

Greece

June 2016 - Nov. 2016

- Simulated the behavior of a novel Accurate congestion control for RDMA Transfers on HPC interconnects using Omnet++ [14].

Skills

HPC & Parallel Computing	MPI, CUDA, HIP, OpenMP, POSIX Threads, SIMD Vectorization
Programming Languages	C, C++ (C++11/14/17), Python, Java
Performance Analysis Tools	Score-P, HPCToolkit, Linux Perf, PAPI, Likwid
Development Tools	Git, CMake, Bash scripting, CI/CD pipelines (GitHub Actions), GDB, LLDB, Valgrind
Machine Learning & Data Processing	PyTorch, R, PySpark
System Administration	Linux-based (RHEL, SLES, Debian), Docker, Singularity, QEMU, Spack
Languages	Greek (native), English (CEFR C2), German (Intermediate)

Education

TU Wien

Austria

PHD IN ENGINEERING SCIENCES AND COMPUTER SCIENCES

Oct. 2021 - Sept. 2025

- **PhD Thesis:** Improving Colocated MPI Application Performance via Process Mapping in HPC Systems: Leveraging Hierarchical Process-to-core Mappings and Communicator-centric Profiling.
Advisor: Prof. Jesper Larsson Träff.

University of Crete

Greece

M.Sc. IN COMPUTER SCIENCE AND ENGINEERING

Nov. 2019

- **MSc Thesis:** Process Placement Optimizations and Heterogeneity Extensions to the Slurm Resource Manager[7].
Advisors: Prof. Manolis G.H. Katevenis, Co-Advisor: Dr. Manolis Marazakis.

University of Crete

Greece

B.Sc. IN COMPUTER SCIENCE

Mar. 2016

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

Further Education

CERTIFICATES

- Machine learning from Stanford Online by Andrew Ng.
- Modern C++ software design (advanced level) by Klaus Iglberger.

SUMMER SCHOOLS

- ACM Europe Summer School on HPC Computer Architectures for AI and Dedicated Applications, 2022: [Program Schedule](#).
- International Summer School on Advanced Computer Architectures and Compilation for High-Performance and Embedded Systems (ACACES) 2018.

Other Projects

DESIGN OF A RISC-V CORE IN SYSTEM VERILOG

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

CACHE SIMULATOR

- Designed and implemented [YAC Simulator](#), a cache simulator written in C/C++ for a simple cache scheme.
- Developed for the purposes of the [CS-255](#) Computer Organization course of the University of Crete.

List of Publications

- [1] Ioannis Vardas et al. “Mpisee: Communicator-Centric Profiling of MPI Applications”. In: *Concurrency and Computation: Practice and Experience* 37 (2025). doi: <https://doi.org/10.1002/cpe.70158>.
- [2] Ioannis Vardas et al. “Improved Parallel Application Performance and Makespan by Colocation and Topology-aware Process Mapping”. In: *IEEE/ACM 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid)*. 2024. doi: [10.1109/CCGrid59990.2024.00023](https://doi.org/10.1109/CCGrid59990.2024.00023).
- [3] Ioannis Vardas et al. “Exploring Mapping Strategies for Co-allocated HPC Applications”. In: *Euro-Par 2023: Parallel Processing Workshops*. Springer Nature Switzerland, 2024, pp. 271–276. doi: [10.1007/978-3-031-48803-0_31](https://doi.org/10.1007/978-3-031-48803-0_31).
- [4] Ioannis Vardas et al. “mpisee: MPI Profiling for Communication and Communicator Structure”. In: *IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*. 2022, pp. 520–529. doi: [10.1109/IPDPSW55747.2022.00092](https://doi.org/10.1109/IPDPSW55747.2022.00092).
- [5] Ioannis Vardas, Manolis Ploumidis, and Manolis Marazakis. “Towards Communication Profile, Topology and Node Failure Aware Process Placement”. In: *SBAC-PAD*. 2020, pp. 241–248. doi: [10.1109/SBAC-PAD49847.2020.00041](https://doi.org/10.1109/SBAC-PAD49847.2020.00041).
- [6] Ioannis Vardas, Manolis Ploumidis, and Manolis Marazakis. “Exploring the Impact of Node Failures on the Resource Allocation for Parallel Jobs”. In: *Euro-Par 2021: Parallel Processing Workshops*. Springer International Publishing, 2022, pp. 298–309. doi: [10.1007/978-3-031-06156-1_24](https://doi.org/10.1007/978-3-031-06156-1_24).
- [7] Ioannis Vardas. “Process Placement Optimizations and Heterogeneity Extensions to the Slurm Resource Manager”. 2019. URL: <https://tinyurl.com/mwujn46s>.
- [8] Jesper Larsson Träff, Ioannis Vardas, and Sascha Hunold. “Modes, Persistence and Orthogonality: Blowing MPI Up”. In: *Proceedings of the SC ’24 Workshops*. 2024, pp. 404–413. doi: [10.1109/SCW63240.2024.00061](https://doi.org/10.1109/SCW63240.2024.00061).
- [9] Jesper Larsson Träff and Ioannis Vardas. “Library Development with MPI: Attributes, Request Objects, Group Communicator Creation, Local Reductions, and Datatypes”. In: *Proceedings of the 30th European MPI Users’ Group Meeting. EuroMPI ’23*. ACM, 2023. doi: [10.1145/3615318.3615323](https://doi.org/10.1145/3615318.3615323).
- [10] Jesper Larsson Träff et al. “Uniform Algorithms for Reduce-scatter and (most) other Collectives for MPI”. In: *IEEE International Conference on Cluster Computing (CLUSTER)*. 2023, pp. 284–294. doi: [10.1109/CLUSTER52292.2023.00031](https://doi.org/10.1109/CLUSTER52292.2023.00031).
- [11] Sascha Hunold et al. “Massively Scaling Molecular Screening Workloads on EuroHPC Supercomputers”. In: *Austrian-Slovenian HPC Meeting 2023 - ASHPC23*. 2023, pp. 51–51. doi: [10.25365/phaidra.423](https://doi.org/10.25365/phaidra.423).
- [12] Sascha Hunold et al. “An Overhead Analysis of MPI Profiling and Tracing Tools”. In: *Proceedings of the PERMAVOST workshop*. ACM, 2022. doi: [10.1145/3526063.3535353](https://doi.org/10.1145/3526063.3535353).
- [13] Philippe Swartvagher et al. “Using Mixed-Radix Decomposition to Enumerate Computational Resources of Deeply Hierarchical Architectures”. In: *Proceedings of the SC ’23 Workshops. SC-W ’23*. ACM, 2023, pp. 405–415. doi: [10.1145/3624062.3624109](https://doi.org/10.1145/3624062.3624109).
- [14] 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, 2018. doi: [10.1109/NOCS.2018.8512155](https://doi.org/10.1109/NOCS.2018.8512155).