Foivos Zakkak | 2023-06-08

foivos@zakkak.net • foivos.zakkak.net • zakkak

Interests

- Process Virtual Machines
- Compilers
- Memory Management
- Performance
- Parallel Programming
- Profiling

Professional Experience

RED HAT — **April 2020 to present**
R&D Senior Software Engineer — *Remote*
Mainly working on the Mandrel distribution of GraalVM and upstream GraalVM

Computer Science Department of University of Crete — **Springs 2018 to present**
Visiting Instructor — *Visitor*
Teaching Managed Runtime Systems

The University of Manchester — **July 2017 to March 2020**
Research Associate — *Manchester, UK*
Technical lead of Maxine VM. Working on the ACTiCLOUD and E2Data projects.

The University of Manchester — **March 2017 to June 2017**
Research Software Engineer — *Manchester, UK*
Technical lead of Maxine VM. Working on the ACTiCLOUD project.

CARV, ICS-FORTH — **December 2016 to February 2017**
Postdoctoral Researcher — *Heraklion, Crete, Greece*

CARV, ICS-FORTH — **January 2013 to November 2016**
Graduate Research Assistant — *Heraklion, Crete, Greece*
Design and implementation of a Java Virtual Machine for non-cache-coherent architectures.

Vector Fabrics B.V. — **September 2012 to December 2012**
Intern — *Eindhoven, North Brabant, The Netherlands*
Power modeling of multicore processors.

CARV, ICS-FORTH — **November 2010 to August 2012**
Graduate Research Assistant — *Heraklion, Crete, Greece*
Evaluation and optimization of task-based runtime systems and programming models. Mainly focusing on source-to-source transformations for performance optimization.

CARV, ICS-FORTH — **November 2009 to November 2010**
Undergraduate Research Assistant — *Heraklion, Crete, Greece*
Evaluation and optimization of task-based runtime systems and programming models. Mainly focusing on source-to-source transformations for performance optimization.

TSL, UoC **February 2007 to November 2010**
Junior IT Systems Administrator *Heraklion, Crete, Greece*
System administration, Deployment of new services etc.

Education

Computer Science Department, University Of Crete **March 2012 to November 2016**
Ph.D. *Heraklion, Crete, Greece*
(Excluding the winter semester of 2012–13)
- Thesis Topic: *Java™ on Scalable Memory Architectures*
- Supervisors: Polyvios Pratikakis and Angelos Bilas

Computer Science Department, University Of Crete **November 2010 to March 2012**
M.Sc. *Heraklion, Crete, Greece*
- Areas of Study:
  - Parallel and Distributed Systems
  - Computer Networks and Telecommunications
- Thesis Topic: *SCOOP: Language extensions and compiler optimizations for task-based programming models*
- Supervisor: Angelos Bilas
- Co-Supervisor: Dimitrios S. Nikolopoulos
- Co-Advisor: Polyvios Pratikakis

Computer Science Department, University Of Crete **October 2006 to November 2010**
B.Sc. *Heraklion, Crete, Greece*
- Thesis Topic: *C source level extensions and optimizations of parallelism on the Cell processor*
- Supervisor: Angelos Bilas
- Co-Advisor: Dimitrios S. Nikolopoulos

Computer Science and Engineering,York University **July 2009**
Summer Session *Toronto, Ontario, Canada*
- *Programming Language Fundamentals (CSE 3301 3.00A J2)*

Publications

Full Papers / Articles

Orion Papadakis, Andreas Andronikakis, Nikos Foutris, Michail Papadimitriou, Athanasios Stratikopoulos, **Foivos S. Zakkak**, Polychronis Xekalakis, and Christos Kotselidis. Scaling up performance of managed applications on numa systems. In *Proceedings of the 2023 ACM SIGPLAN International Symposium on Memory Management*, ISMM 2023, page 1–14, New York, NY, USA, 2023. Association for Computing Machinery.

Iacovos G. Kolokasis, Giannos Evdorou, Shoaib Akram, Christos Kozanitis, Anastasios Papagiannis, **Foivos S. Zakkak**, Polyvios Pratikakis, and Angelos Bilas. Teraheap: Reducing memory pressure in managed big data frameworks. In *Proceedings of the 28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Volume 3*, ASPLOS 2023, page 694–709, New York, NY, USA, 2023. Association for Computing Machinery.

Tim Hartley, **Foivos S. Zakkak**, Andy Nisbet, Christos Kotselidis, and Mikel Luján. Just-in-time compilation on arm—a closer look at call-site code consistency. *ACM Trans. Archit. Code Optim.*, 19(4), sep 2022.

Orion Papadakis, **Foivos S. Zakkak**, Nikos Foutris, and Christos Kotselidis. You Can't Hide You Can't Run: A Performance Assessment ofManaged Applications on a NUMA Machine. In *Proceedings of the 17th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes*, MPLR '20, New York, NY, USA, 2020. ACM. Work In Progress.

Iacovos G. Kolokasis, Anastasios Papagiannis, Polyvios Pratikakis, Angelos Bilas, and **Foivos Zakkak**. Say Goodbye to Off-heap Caches! On-heap Caches Using Memory-Mapped I/O. In *12th USENIX Workshop on*

Hot Topics in Storage and File Systems (HotStorage 20). USENIX Association, July 2020. Awarded Best Presentation!

Timothy Hartley, **Foivos S. Zakkak**, Christos Kotselidis, and Mikel Luján. An Analysis of Call-Site Patching without Strong Hardware Support for Self-Modifying-Code. In *Proceedings of the 16th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes*, MPLR '19, New York, NY, USA, 2019. ACM.

Juan Fumero, Michail Papadimitriou, **Foivos Zakkak**, Maria Xekalaki, James Clarkson, and Christos Kotselidis. Dynamic application reconfiguration on heterogeneous hardware. In *5th ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE'19)*, page 165, April 2019.

James Clarkson, Juan Fumero, Michail Papadimitriou, **Foivos S. Zakkak**, Maria Xekalaki, Christos Kotselidis, and Mikel Luján. Exploiting High-performance Heterogeneous Hardware for Java Programs Using Graal. In *Proceedings of the 15th International Conference on Managed Languages & Runtimes*, ManLang '18, pages 4:1–4:13, New York, NY, USA, 2018. ACM.

Christos Kotselidis, Andy Nisbet, **Foivos S. Zakkak**, and Nikos Foutris. Cross-isa debugging in meta-circular vms. In *Proceedings of the 9th ACM SIGPLAN International Workshop on Virtual Machines and Intermediate Languages*, VMIL 2017, pages 1–9, New York, NY, USA, 2017. ACM.

Colin Barrett, Christos Kotselidis, **Foivos S. Zakkak**, Nikos Foutris, and Mikel Luján. Experiences with Building Domain-Specific Compilation Plugins in Graal. In *Proceedings of the 14th International Conference on Managed Languages and Runtimes*, ManLang 2017, pages 73–84, New York, NY, USA, 2017. ACM.

Foivos S. Zakkak and Polyvios Pratikakis. DiSquawk: 512 Cores, 512 Memories, 1 JVM. In *Proceedings of the 13th International Conference on Principles and Practices of Programming on the Java Platform: Virtual Machines, Languages, and Tools*, PPPJ '16, pages 2:1–2:12, New York, NY, USA, 2016. ACM.

Foivos S. Zakkak and Polyvios Pratikakis. Building a Java™; Virtual Machine for Non-Cache-Coherent Many-core Architectures. In *Proceedings of the 14th International Workshop on Java Technologies for Real-Time and Embedded Systems*, JTRES '16, pages 1:1–1:10, New York, NY, USA, 2016. ACM.

Nikolaos Papakonstantinou, **Foivos S. Zakkak**, and Polyvios Pratikakis. Hierarchical parallel dynamic dependence analysis for recursively Task-Parallel programs. In *30th IEEE International Parallel & Distributed Processing Symposium (IEEE IPDPS 2016)*, Chicago, USA, May 2016. IEEE.

Foivos S. Zakkak and Polyvios Pratikakis. JDMM: A Java Memory Model for Non-cache-coherent Memory Architectures. In *Proceedings of the 2014 International Symposium on Memory Management*, ISMM '14, pages 83–92, New York, NY, USA, 2014. ACM.

Foivos S. Zakkak, Dimitrios Chasapis, Polyvios Pratikakis, Angelos Bilas, and Dimitrios S. Nikolopoulos. Inference and Declaration of Independence in Task-Parallel Programs. In *Pooceedings of the 2013 International Conference on Advanced Parallel Processing Technology*, volume 8299 of *APPT 2013*, pages 1–16. Springer Berlin Heidelberg, 2013.

Journals

Michail Papadimitriou, Juan Fumero, Athanasios Stratikopoulos, **Foivos S. Zakkak**, and Christos Kotselidis. Transparent Compiler and Runtime Specializations for Accelerating Managed Languages on FPGAs. *The Art, Science, and Engineering of Programming*, 5(2), 2021.

Ioannis Manousakis, **Foivos S. Zakkak**, Polyvios Pratikakis, and Dimitrios S. Nikolopoulos. Tprof: An energy profiler for task-parallel programs. *Sustainable Computing: Informatics and Systems*, (0):–, 2014.

Posters

Foivos S. Zakkak, Juan Fumero, and Christos Kotselidis. Enabling RISC-V support on the MaxineVM. RISC-V Workshop '18 Barcelona, May 2018.

Foivos S. Zakkak, Florin Blanaru, and Christos Kotselidis. RISC-V code generation in MaxineVM: An educational use case. RISC-V Workshop '19 Zurich, July 2019.

Short Papers / Extended Abstracts

Christos Kotselidis, Ioannis Komnios, Orestis Akrivopoulos, Sebastian Bress, Katerina Doka, Hazeef Mohammed, Georgios Mylonas, Vassilis Spitadakis, Daniel Strimpel, Juan Fumero, **Foivos Zakkak**, Michail Papadimitriou, Maria Xekalaki, Nikos Foutris, Athanasios Stratikopoulos, Nectarios Koziris, Ioannis Konstantinou, Ioannis Mytilinis, Constantinos Bitsakos, Christos Tsalidis, Christos Tselios, Nikolaos Kanakis, Clemens Lutz, Viktor Rosenfield, and Volker Markl. Efficient compilation and execution of jvm-based data processing frameworks on heterogeneous co-processors. In *Proceedings of the 2020 Design, Automation and Test in Euro Conference*, DATE '20. IEEE, Mar 2020.

Foivos S. Zakkak, Andy Nisbet, John Mawer, Tim Hartley, Nikos Foutris, Orion Papadakis, Andreas Andronikakis, Iain Apreotesei, and Christos Kotselidis. On the future of research VMs: a hardware/software perspective. In Stefan Marr and Jennifer B. Sartor, editors, *Conference Companion of the 2nd International Conference on Art, Science, and Engineering of Programming, Nice, France, April 09-12, 2018*, pages 51–53. ACM, 2018.

Foivos S. Zakkak, Juan Fumero, and Christos Kotselidis. Enabling RISC-V support on the MaxineVM. RISC-V Workshop '18 Barcelona, pages 171–174, May 2018. Poster abstract.

Foivos S. Zakkak, Dimitrios Chasapis, Polyvios Pratikakis, Angelos Bilas, and Dimitrios S. Nikolopoulos. Inference and Declaration of Independence: Impact on Deterministic Task Parallelism. In *Proceedings of the 21st International Conference on Parallel Architectures and Compilation Techniques*, PACT '12, pages 453–454, New York, NY, USA, 2012. ACM.

Foivos S. Zakkak, Dimitrios Chasapis, Polyvios Pratikakis, Dimitrios S. Nikolopoulos, and Angelos Bilas. SCOOP: Source-level COmpiler Optimizations for Parallelism. In Koen De Bosschere, editor, *ACACES 2011 poster abstracts: July 13, 2011: Fiuggi, Italy*, pages 171–174. Academia Press, 2011.

PhD Thesis

Foivos S. Zakkak. *Java™ on Scalable Memory Architectures*. PhD thesis, Computer Science Department, University of Crete, October 2016.

Master's Thesis

Foivos S. Zakkak. SCOOP: Language extensions and compiler optimizations for task-based programming models. Master's thesis, Computer Science Department, University of Crete, March 2012. `http://elocus.lib.uoc.gr/dlib/3/a/3/metadata-dlib-1331627311-453362-1284.tkl`.

Book Chapters

Juan Fumero, Christos Kotselidis, **Foivos Zakkak**, Michail Papadimitriou, Orestis Akrivopoulos, Christos Tselios, Nikolaos Kanakis, Katerina Doka, Ioannis Konstantinou, Ioannis Mytilinis, and Constantinos Bitsakos. *Heterogeneous Computing Architectures: Challenges and Vision*, chapter Programming and Architecture Models. CRC Press, Boca Raton, Florida, 2019.

Technical Reports

Iacovos G. Kolokasis, Giannos Evdorou, Anastasios Papagiannis, **Foivos Zakkak**, Christos Kozanitis, Shoaib Akram, Polyvios Pratikakis, and Angelos Bilas. Freeing compute caches from serialization and garbage collection in managed big data analytics. Technical report, 2021.

Daniel J. Blueman, **Foivos Zakkak**, and Christos Kotselidis. Numascope: Capturing and visualizing hardware metrics on large ccnuma systems. Technical report, February 2020.

Christos Kotselidis and **Foivos Zakkak**. ACTiCLOUD Deliverable 3.6: Hyperscale JVM v2.0. Technical report, January 2019.

Christos Kotselidis and **Foivos Zakkak**. ACTiCLOUD Deliverable 3.2: Hyperscale JVM v1.0. Technical report, June 2018.

Foivos S. Zakkak and Polyvios Pratikakis. DiSquawk: 512 cores, 512 memories, 1 JVM. Technical Report 470, ICS-FORTH, June 2016.

George Tzenakis, Angelos Papatriantafyllou, **Foivos S. Zakkak**, Hans Vandierendonck, Polyvios Pratikakis, and Dimitrios S. Nikolopoulos. BDDT: Block-level Dynamic Dependence Analysis for Deterministic Task-Based Parallelism. Technical Report 426, ICS-FORTH, February 2012.

Deliverables

Georgios Goumas, Vasileios Karakostas, Konstantinos Nikas, Atle Vesterkjaer, Monica Vatteroni, Michail Flouris, Stelios Louloudakis, **Foivos Zakkak**, Christos Kotselidis, Jim Webber, Ewnetu Bayuh Lakew, Ying Zhang, and Martin Kersten. ACTiCLOUD Deliverable 5.8: Final Project Press Release. Technical report, January 2020.

Jim Webber, Georgios Goumas, Vasileios Karakostas, Dimitrios Siakavaras, Stefanos Gerangelos, Stratos Psomadakis, Atle Vesterkjaer, Daniel J Blueman, Michail Flouris, Stelios Louloudakis, Christos Kotselidis, **Foivos Zakkak**, Ewnetu Bayuh Lakew, Joeri van Ruth, Panagiotis Koutsourakis, Ying Zhang, Martin Kersten, and Monica Vatteroni. ACTiCLOUD Deliverable 4.5: ACTiCLOUD Final Evaluation. Technical report, January 2020.

Atle Vesterkjaer, Georgios Goumas, Vasileios Karakostas, Dimitrios Siakavaras, Stefanos Gerangelos, Stratos Psomadakis, Monica Vatteroni, Hazeef Mohammed, Michail Flouris, Stelios Louloudakis, **Foivos Zakkak**, Christos Kotselidis, Jim Webber, Ewnetu Bayuh Lakew, Ying Zhang, and Martin Kersten. ACTiCLOUD Deliverable 4.4: ACTiCLOUD Final Prototype. Technical report, December 2019.

Georgios Goumas, Vasileios Karakostas, Konstantinos Nikas, Atle Vesterkjaer, Einar Rustad, Andrew Attwood, Christos Kotselidis Michail Flouris, **Foivos Zakkak**, Ying Zhang, Panagiotis Koutsourakis, Pedro Ferreira, Joeri van Ruth, Martin Kersten, Jim Webber, Bayuh Lakew, Petter Svärd, and Simon Kollberg. ACTiCLOUD Deliverable 1.2: ACTiCLOUD Architecture. Technical report, April 2018.

Teaching Experience

Visiting Instructor, University Of Crete:

- CS 446 Managed Runtime Systems (Springs 2018–20 and 2022)
  - Course design and implementation
  - Project assignment and supervision
  - Teaching and Marking

Teaching Assistant, University Of Crete:

- CS 100 Introduction to Computer Science (Winters 2011 and 2015–16)
  - Answering Students' questions on the mailing list
  - Marking assignments and examination scripts
- CS 120 Digital Design (Winter 2010)
  - Responsible for two 2 hour laboratories where undergraduate students learn the basics of digital design and implement a simple processor
  - Marking assignments and examination scripts
- CS 225 Computer Organization (Spring 2011)
  - Answering Students' questions on the mailing list
  - Marking assignments and examination scripts
- CS 240 Data Structures (Winters 2013–14)
  - Project co-design with the professor and another TA
  - Answering Students' questions about the project
  - Marking project submissions and examination scripts
- CS 255 Programming Lab (Springs 2012–16)
  - One 2-hour tutorial on GNU Make
  - Two 2-hour tutorials on GDB

- One 1-hour tutorial on GIT
- Answering Students' questions on the Moodle platform
- Marking assignments and examination scripts

Community Contributions

Program Committee

- MoreVMs 2023
- VMIL 2020, 2022

Peer Reviews

- JPDC 2012, 2014–15, 2017
- MULTIPROG 2014–15, 2018
- OPODIS 2015
- TRANSACT 2014
- Euro-Par 2013
- ACM TACO 2013
- PODC 2013
- TPDS 2013

External Evaluator

- ACM Summer School on Data Science 2018–19

Selected Open Source Contributions

- Mandrel and GraalVM 2020–present
- Workspace-Grid 2014–19
- turnin 2014–16
- DiSquawk 2013–15
- Quarkus 2020–present
- PARTEE 2016
- Rendezvous 2014–15
- Maxine VM 2017–19
- mu 2014–16
- SCOOP 2013–15