DMITRII USTIUGOV

About

Dmitrii Ustiugov is a PhD student at the University of Edinburgh, co-advised by Prof. Boris Grot (University of Edinburgh) and Prof. Edouard Bugnion (EPFL). Dmitrii's research interests span Computer Architecture and Computer Systems with a focus on serverless and cloud architectures.

Personal info

Nationality: Russian Federation

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Research interests

Broad: Cloud computing, virtual memory, datacenter and rack-scale systems, emerging memory systems, security.
Current focus: Serverless clouds, including benchmarking, virtualization, and high-speed communication.

Education

Ph.D., Computer Science (09.2014 – ongoing) at **EPFL** (09.2014-08.2019) and the **University of Edinburgh** (from 09.2019).
Advisors: **Prof. Boris Grot** (University of Edinburgh) and **Prof. Edouard Bugnion** (EPFL).

- Thesis: "Data-centric serverless cloud architecture".

M.Sc.&B.Sc. (with Honors), **Applied Math and Physics** (09.2008-08.2014) at **MIPT** (Moscow Institute of Physics and Technology)
Advisor: **Dr. Alexander Butuzov** (Intel/MIPT).

- B.Sc. thesis: "CPU performance analysis using critical path methods".
- M.Sc. thesis: "CPU power consumption analysis based on cycle-accurate microarchitecture simulation".

Awards and Fellowships

- Distinguished Artifact Award at ASPLOS'21.
- The winner of 1-minute research pitch competition at the JOBS workshop co-located with MICRO'20.
- Arm Center of Excellence fellowship at the University of Edinburgh, 2019.
- EPFL PhD Fellowship, 2014.
- Abramov and Frolov's Scholarship at the Moscow Institute of Physics and Technology, 2009-2012.

Current Research Projects

- **vHive**: Open-source framework & ecosystem for serverless experimentation, in collaboration with ETH, AWS, Microsoft Research, Arm, Huawei, and the vHive open-source community (users & contributors at 18+ universities and 6 companies). https://github.com/ease-lab/vhive
- **STeLLAR**: Tail latency analyzer framework for commercial serverless clouds. https://github.com/ease-lab/STeLLAR

Past projects

- Architectural support for address translation in virtualized clouds, https://github.com/ease-lab/PTEMagnet
- Bankrupt covert communication channel, http://github.com/ease-lab/bankrupt
- VISA: Vertically integrated server architecture, https://parsa.epfl.ch/visa
- Scale-out NUMA, https://parsa.epfl.ch/sonuma/sonuma.html
- CloudSuite: A benchmark suite for cloud services, https://cloudsuite.ch
- Google Perfkit Benchmarker, http://www.perfkitbenchmarker.org
- QFlex: Quick and flexible computer architecture simulation, https://qflex.epfl.ch

Refereed Conference Publications

1. **D. Ustiugov**, S. Jesalpura, M.B. Alper, M. Baczun, R. Feyzkhanov, E. Bugnion, B. Grot, and M. Kogias, "Expedited Data Transfers for Serverless Clouds". **Under submission**.
2. D. Schall, A. Margaritov, **D. Ustiugov**, A. Sandberg, and B. Grot, "Lukewarm Serverless Functions: Characterization and Optimization". **International Symposium on Computer Architecture (ISCA'22)**.
3. **D. Ustiugov**, T. Amariucai, and B. Grot, "Analyzing Tail Latency in Serverless Clouds with STeLLAR". **International Symposium on Workload Characterization (IISWC'21).**
4. **D. Ustiugov**, P. Petrov, M. Kogias, E. Bugnion, and B. Grot, "Benchmarking, Analysis, and Optimization of Serverless Function Snapshots". **Architectural Support for Programming Languages and Operating Systems (ASPLOS'21)**. Distinguished Artifact Award.
5. A. Margaritov, **D. Ustiugov**, and B. Grot, "PTEMagnet: Fine-Grained Physical Memory Reservation for Faster Page Walks in Public Clouds". **Architectural Support for Programming Languages and Operating Systems (ASPLOS'21)**.
6. A. Margaritov, **D. Ustiugov**, E. Bugnion, and B. Grot, "Prefetched Address Translation". **International Symposium on Microarchitecture (MICRO'19).**
7. **D. Ustiugov**, A. Daglis, J. Picorel, M. Sutherland, E. Bugnion, B. Falsafi and D. Pnevmatikatos, "Design Guidelines for High-Performance SCM Hierarchies", **International Symposium on Memory Systems (MEMSYS'18).**
8. M. Drumond, A. Daglis, N. Mirzadeh, **D. Ustiugov**, J. Picorel, B. Falsafi, B. Grot, and D. Pnevmatikatos, "The Mondrian Data Engine", **International Symposium on Computer Architecture (ISCA'17).**
9. A. Daglis, **D. Ustiugov**, S. Novakovic, E. Bugnion, B. Falsafi, and B. Grot, "SABRes: Atomic Object Reads for In-Memory Rack-Scale Computing", **International Symposium on Microarchitecture (MICRO'16**).

Refereed Workshop Publications

1. **D. Ustiugov**, P. Petrov, M.R.S. Katebzadeh, and B. Grot, "Bankrupt Covert Channel: Turning Network Predictability into Vulnerability". **Workshop on Offensive Technologies (WOOT) at USENIX Security, 2020**.
2. A. Margaritov, **D. Ustiugov**, E. Bugnion, and B. Grot, "Virtual Address Translation via Learned Page Table Indexes". **Workshop on Machine Learning for Systems (MLSys) workshop at the Conference on Neural Information Processing Systems (NeurIPS), 2018***.*

Refereed Journal Publications

1. S. Novakovic, A. Daglis, **D. Ustiugov**, E. Bugnion, B. Falsafi, and B. Grot, "Mitigating Load Imbalance in Distributed Data Serving Through Rack-Scale Memory Pooling", **Transactions on Computer Systems (TOCS),** *2019.*
2. M. Drumond, A. Daglis, N. Mirzadeh, **D. Ustiugov**, J. Picorel, B. Falsafi, B. Grot, and D. Pnevmatikatos, "Algorithm/Architecture Co-Design for Near-Memory Processing", **SIGOPS Operating Systems Review (OSR)**, 2018*.*

Other Publications

- B. Ziv, G. Haber, L. Rumyantsev, **D. Ustiugov**, "Use Cases for the Critical Path Analyzer Framework". Software Professionals Conference (SWPC), 2013.
- A. Butuzov, O. Shimko, **D. Ustiugov**, "Fast and Easy Ways to Improve Software Development Teamwork Efficiency". Software Professionals Conference (SWPC), 2013.
- K. Garifullin, **D. Ustiugov**, "Performance Simulation and Early Power Modeling of New HW/SW Co-Designed Architecture". Software Professionals Conference (SWPC), 2012.
- N. Kosarev, O. Shimko, **D. Ustiugov**, "Critical path study tool for performance analysis of modern architectures". Software Professionals Conference (SWPC), 2011.
- **D. Ustiugov**, "Survey of the state-of-the-art methods for dynamical power estimation and analysis conducted during early stages of CPU microarchitecture development". MIPT conf., *2012*.
- **D. Ustiugov**, "CPU power estimation method using software cycle-accurate simulator". MIPT conf., *2011*.
- **D. Ustiugov**, "Practical mobile banking with multi-factor authentication". MIPT conf., *2011*.
- **D. Ustiugov**, "High-performance instruction cache for multithreaded architecture". MIPT conf., 2010.

Research and Invited Talks

Invited talks and lectures

- "Turbocharging Serverless Research with vHive and STeLLAR":
  - An **invited talk** at a Knative Community Meetup, May 2022 (planned).

- An **invited talk** at Huawei Dresden Research Center (DRC), Apr 2022 (planned).
- An **invited talk** at the University of Cambridge, Feb 2022 (planned).
- A talk at 6th Annual UK Systems Research Challenges Workshop, Nov 30th - Dec 2nd.
- An **invited talk** at Intel (Processor Architecture Research Lab), Aug 2021.
- An **invited talk** at the Workshop on Cloud-Native Future Innovation, Huawei, Jul 2021.
- An **invited talk** at ETH Zurich's Systems Group, May 2021.

- "Cloud Resources Management", an **invited lecture** at the Extreme Computing (EXC) course at the University of Edinburgh, Nov 2021.
- "Cloud Computing: Evolution, Technologies, Future", an **invited lecture** at the Operating Systems (INFR) course at the University of Edinburgh, Mar 2021.
- "Benchmarking, Analysis, and Optimization of Serverless Function Snapshots", an **invited talk** at Amazon Web Services (Amazon Lambda and Firecracker teams), Feb 2021.
- "Prefetched Address Translation", an **invited talk** at the 5th Computing Systems Day at NTUA, Athens, 2020.
- "Towards High-Performance SCM Hierarchies", an **invited talk** at Oracle, 2017.
- "Server Benchmarking with CloudSuite 3.0" tutorial (led one of the sessions), co-located with the **European Conference on Computer Systems (EuroSys'16)**.

Research talks

- "Analyzing Tail Latency in Serverless Clouds with", **International Symposium on Workload Characterization (IISWC'21)**.
- "Benchmarking, Analysis, and Optimization of Serverless Function Snapshots", **Architectural Support for Programming Languages and Operating Systems (ASPLOS'21)**.
- "Bankrupt Covert Channel: Turning Network Predictability into Vulnerability", **Workshop on Offensive Technologies (WOOT) at USENIX Security, 2020**.
- "Design Guidelines for High-Performance SCM Hierarchies", **International Symposium on Memory Systems (MEMSYS'18)**.
- "Hardware Support for Remote Atomic Reads in Rack-Scale Systems", **EuroSys Doctoral Workshop (EuroDW) co-located with the European Conference on Computer Systems (EuroSys'16)**.

Community Service and Professional Activities

- The leading organizer of the "Turbocharging Serverless Research with vHive" tutorial, held in conjunction with ASPLOS'22.
- EuroSys'21 Shadow TPC member.
- External reviewer for ISCA 2019, ATC 2019, and Computer Architecture Letters (CAL) 2019 and 2020.
- Student ACM member since 2015, student USENIX member since 2020, student IEEE member since 2021.

Participation in Proposal Writing

- Proposal funded by **Huawei** ($250,000): Efficient Serverless Applications via Communication-aware Function Composition. PI: Boris Grot, 2021.
- Proposal funded by **Google** ($73,000): Accelerating Address Translation via a Learned Page Table Index. PI: Boris Grot, 2019.
- Proposal funded by **Oracle Labs** ($90,000): Scalable Memory Server Architecture for Disaggregated Memory Systems. PI: Virendra Marathe, Co-PI: Babak Falsafi, 2018.

Professional Experience

- Research intern at **Oracle Labs**, Apr-Jun 2017. Mentors: Dr. Virendra Marathe and Stephen Byan.
  - Analysis of persistent memory applications and disaggregated memory systems.
- Senior Lua/Perl developer at **IPONWEB**, Dec 2013-Aug 2014. Manager: Lev Leontiev.
  - Developing a high-load big data software platform for real-time bidding.
- Software simulation intern (full-time engineer since Jan 2012) at **Intel**, Jun 2010 - Nov 2013. Mentors: Dr. Alexander Butuzov, Vladimir Gnatyuk.
  - CPU performance/power/energy studies using software simulators and analyzer tools.

Teaching Assistant

- Introduction to Computer Systems (INF2C-CS), Uni of Edinburgh, Fall 2019, 2020.
- Extreme Computing (EXC), Uni of Edinburgh, Fall 2019.
- Mathematical analysis (MAN), EPFL, Spring 2018.
- Computer Architecture I (CS-208), EPFL, Fall 2016, 2017.
- Probability and Statistics (MATH-232), EPFL, Spring 2016.

- Introduction to Multiprocessor Architecture (CS-307), EPFL, Fall 2015.

Student Research Projects Supervision

- "High-speed communication fabric for serverless clouds", Shyam Jesalpura, intern, Uni of Edinburgh / BITS, Jan-Aug 2021.
- "Benchmarking methodology for serverless clouds", Mert Bora Alper, intern, Uni of Edinburgh, Jun-Aug 2021.
- "Representative suite of serverless workloads", Michal Baczun, intern, Uni of Edinburgh, Jun-Aug 2021.
- "Implications of multi-tenancy on serverless hosts", Yuchen Niu, BSc, Uni of Edinburgh, Sep 2020 – Apr 2021.
- "Tail-latency analysis framework for serverless clouds", Theodor Amariucai, BSc, Uni of Edinburgh, Sep 2020 – Jul 2021.
- "End-to-end serverless benchmarking framework", Plamen Petrov, MSc, Uni of Edinburgh, Jun 2020 – Nov 2020.
- "RDMA networks security and covert communication", Plamen Petrov, MSc, Uni of Edinburgh, Jun 2019 – May 2020.
- "Software support for contiguous page tables allocation", Ivy Wang, BSc, Uni of Edinburgh, Sep 2019 – Apr 2020, co-supervised with Artemiy Margaritov.
- "Design space exploration for TLB prefetching", Sean Mullan, BSc, Uni of Edinburgh, Sep 2019 – Apr 2020, co-supervised with Artemiy Margaritov.
- "Design space exploration of cooperative scheduling for latency-critical cloud services", Lei Yan, MSc, EPFL/RWTH Aachen University, Jan – Aug 2018.
- "Analysis of persistent memory systems on modern CPUs", Siddharth Gupta, PhD candidate, EPFL, Sep – Dec 2017.
- "Robust infrastructure for QFlex (Flexus) simulation framework", Nikhil Gupta, intern, EPFL/IIT Delhi, May – Aug 2016.
- "Analyzing CPU front-end efficiency using perf counters", Virgile Neu, BSc, EPFL, Jan – May 2016.