Anton Burtsev

Assistant Professor
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Research Interests

Operating systems, security, systems support for heterogeneous, disaggregated datacenter

Academic Positions

Assistant Professor, Kahlert School of Computing, University of Utah, 2022–present

Assistant Professor, Department of Computer Science, University of California, Irvine, 2021–2022

Assistant Adjunct Professor, Department of Computer Science, University of California, Irvine, 2016–2021

Research Assistant Professor, School of Computing, University of Utah, 2015–2016

Research associate, School of Computing, University of Utah, 2013–2015

Education

PhD Computer Science, University of Utah, 2005–2013

MS Applied Mathematics (Honors), National Technical University of Ukraine ("Kyiv Polytechnic Institute"), 2000–2002

BS Applied Mathematics (Honors), National Technical University of Ukraine ("Kyiv Polytechnic Institute"), 1996–2000

Research Funding

National Science Foundation CAREER Award: *CAREER: NgOS: Towards Better Operating Systems: Fast, Secure, and Reliable*. Anton Burtsev (PI). August 2023—July 2027. $603,252

Amazon Research Award. *Atmosphere: leveraging language safety and operating system design for verification.* Anton Burtsev (PI). April 2023. $50,000

National Science Foundation Formal Methods In the Field: *Safe, Efficient Persistent Memory Systems*. Anton Burtsev (co-PI). October 2022—September 2025. My team: $352,700

National Science Foundation Computer Systems Research. Research Experiences for Undergraduates Supplement. *Horizon: Secure Large-Scale Scientific Cloud Computing*. Anton Burtsev (PI). July 2020—June 2021. $16,000

VMWare Gift. *Safe and Verified Platform Firmware with Rust* Anton Burtsev (PI). January 2021. $80,000

VMWare Gift. *Safe and Verified Platform Firmware with Rust* Anton Burtsev (PI). July 2020. $40,000

VMWare Gift. *Safe and Verified Platform Firmware with Rust*. Anton Burtsev (PI). July 2019. $40,000

National Science Foundation Computer Systems Research. Research Experiences for Undergraduates Supplement. *Redshift: An Operating System for Pervasive Hardware Acceleration*. Anton Burtsev (PI). July 2019—June 2020. $8,000

National Science Foundation Cybersecurity Innovation for Cyberinfrastructure. Research Experiences for Undergraduates Supplement. *Horizon: Secure Large-Scale Scientific Cloud Computing*. Anton Burtsev (PI). July 2019—June 2020. $16,000

Intel Research Contract. *Safe and Verified Platform Firmware with Rust*. Anton Burtsev (PI), Alexandru Nicolau (co-PI), Alexander Veidenbaum (co-PI). February 2019—January 2020. $75,000

National Science Foundation Secure and Trustworthy Cyberspace Program. *Secure Computation on Large Data*. Stanislaw Jarecki (PI) and Anton Burtsev (co-PI). October 2018—September 2021. $500,000

National Science Foundation Cybersecurity Innovation for Cyberinfrastructure. *Horizon: Secure Large-Scale Scientific Cloud Computing*. Anton Burtsev (PI) and Gene Tsudik (co-PI). September 2018—August 2021. $999,925

National Science Foundation Formal Methods In the Field: *Collaborative Research: RedLeaf: Verified Operating Systems in Rust*. Anton Burtsev (PI). September 2018—August 2022. $350,000

National Science Foundation Computer Systems Research: *Redshift: An Operating System for Pervasive Hardware Acceleration*. Anton Burtsev (PI). June 2018—May 2021. $460,000

National Science Foundation Secure and Trustworthy Cyberspace Program. Research Experiences for Undergraduates Supplement. *Deker: Decomposing Commodity Kernels for Verification*. Anton Burtsev (PI). July 2017—September 2017. $16,000

National Science Foundation Cybersecurity Innovation for Cyberinfrastructure. *CapNet: Secure Scientific Workloads with Capability Enabled Networks*. Anton Burtsev (PI) and Jacobus Van der Merwe (co-PI). September 2015—August 2018. $499,999

National Science Foundation Secure and Trustworthy Cyberspace Program. *Deker: Decomposing Commodity Kernels for Verification*. Zvonimir Rakamarić (PI) and Anton Burtsev (co-PI). June 2015—May 2018. $499,999

NetApp Research Contract. *RAMStore: Decoupling Application and Storage Stacks in a Convergent Store*. Anton Burtsev (PI). February 2015—January 2016. $61,366

National Science Foundation Secure and Trustworthy Cyberspace Program. *XCap: Practical Capabilities and Least Authority for Virtualized Environments*. Award CNS-1319076. John Regehr (PI) and Anton Burtsev (co-PI). October 2013—September 2016. $499,912

Publications

Peer Reviewed Conference and Workshop Papers

Zhaofeng Li, Vikram Narayanan, Xiangdong Chen, Jerry Zhang, Anton Burtsev. *Rust for Linux: Understanding Security Impact of Rust on the Linux Kernel*. In Proceedings of the Annual Computer Security Applications Conference (ACSAC'24), December 2024.

Xiangdong Chen, Zhaofeng Li, Jerry Zhang, Anton Burtsev. *Veld: Verified Linux Drivers*. In Proceedings of the 2nd Workshop on Kernel Isolation, Safety and Verification (KISV 2024), November 2024

Opportunities and Limitations of Modern Hardware Isolation Mechanisms. Xiangdong Chen, Zhaofeng Li, Tirth Jain, Vikram Narayanan, Anton Burtsev. USENIX Annual Technical Conference (USENIX ATC), 2024.

Atmosphere: Towards Practical Verified Kernels in Rust. Xiangdong Chen, Zhaofeng Li, Lukas Mesicek, Vikram Narayanan, Anton Burtsev. Workshop on Kernel Isoltion, Security and Verification (KISV), 2023.

Extending Rust with Support for Zero Copy Communication. Arthur Lafrance, David Detweiler, Zhaofeng Li, Xiangdong Chen, Vikram Narayanan, Anton Burtsev. Workshop on Programming Languages and Operating Systems (PLOS), 2023.

Remote attestation of confidential VMs using ephemeral vTPMs. *Vikram Narayanan*, Claudio Carvalho, Angelo Ruocco, Gheorghe Almasi, James Bottomley, Mengmei Ye, Tobin Feldman-Fitzthum, Daniele Buono, Hubertus Franke, Anton Burtsev. Annual Computer Security Applications Conference (ACSAC), 2023. **Distinguished Paper with Artifacts Award**

Opportunities and Limitations of Extended Page Table Switching for Fine-Grained Isolation. Vikram Narayanan, Anton Burtsev. IEEE Security & Privacy, 2023.

Evolving Operating System Kernels Towards Secure Kernel-Driver Interface. Anton Burtsev, Vikram Narayanan, Yongzhe Huang, Kaiming Huang, Gang Tan, Trent Jaeger. In 20th Workshop on Hot Topics in Operating Systems (HotOS), June 2023.

DRAMHiT: A Hash Table architected for the Speed of DRAM., Vikram Narayanan, David Detweiler, Tianjiao Huang, and Anton Burtsev. In 18th ACM SIGOPS/EuroSys European Conference on Computer Systems (EuroSys'23), Rome, Italy, May 2023.

KSplit: Automating Device Driver Isolation. Yongzhe Huang, Vikram Narayanan, David Detweiler, Kaiming Huang, Gang Tan, Trent Jaeger, and Anton Burtsev. In 16th USENIX Symposium on Operating Systems Design and Implementation (OSDI'22), July, 2022.

Increased PD-L1 and p16 expression are common in oropharyngeal squamous cell carcinoma. Anna Shestakova, Jana Tarabay, Anton Burtsev, Ibe Ifegwu, Jefferson Kim, Vishal Chandan, William B. Armstrong, Tjoa Tjoson and Beverly Wang. Future Science Open Access, Vol. 7, No. 9, October, 2021.

Understanding the Overheads of Hardware and Language-Based IPC Mechanisms. Zhaofeng Li, Tianjiao Huang, Vikram Narayanan, and Anton Burtsev. In 11th Workshop on Programming Languages and Operating Systems (PLOS '21), October 25, 2021.

Isolation in Rust: What is Missing?. Anton Burtsev, Dan Appel, David Detweiler, Tianjiao Huang, Zhaofeng Li, Vikram Narayanan, and Gerd Zellweger. In 11th Workshop on Programming Languages and Operating Systems (PLOS '21), October 25, 2021.

RedLeaf: Isolation and Communication in a Safe Operating System. Vikram Narayanan, Tianjiao Huang, David Detweiler, Dan Appel, Zhaofeng Li, Gerd Zellweger, Anton Burtsev. In 14th USENIX Symposium on Operating Systems Design and Implementation (OSDI'20), November 2020.

Lightweight Kernel Isolation with Virtualization and VM Functions. Vikram Narayanan, Yongzhe Huang, Gang Tan, Trent Jaeger, and Anton Burtsev. In 16th ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE'20), March 2020 (**Best paper award**).

LXDs: Towards Isolation of Kernel Subsystems. Vikram Narayanan, Abhiram Balasubramanian, Charlie Jacobsen, Sarah Spall, Scott Bauer, Michael Quigley, Aftab Hussain, Abdullah Younis, Junjie Shen, Moinak Bhattacharyya, Anton Burtsev. In 2019 USENIX Annual Technical Conference (USENIX ATC'19), July 2019.

RedLeaf: Towards An Operating System for Safe and Verified Firmware. Vikram Narayanan, Marek S. Baranowski, Leonid Ryzhyk, Zvonimir Rakamarić, Anton Burtsev. In 17th Workshop on Hot Topics in Operating Systems (HotOS), May 2019.

CapNet: Security and Least Authority in a Capability-Enabled Cloud. Anton Burtsev, David Johnson, Josh Kunz, Eric Eide, Jacobus Van der Merwe. In ACM Symposium on Cloud Computing (SoCC'17), September 2017.

System Programming in Rust: Beyond Safety. Abhiram Balasubramanian, Marek S. Baranowski, Anton Burtsev, Aurojit Panda, Zvonimir Rakamaric, Leonid Ryzhyk. In 16th Workshop on Hot Topics in Operating Systems (HotOS'17), May 2017.

Abstractions for Practical Virtual Machine Replay. Anton Burtsev, David Johnson, Mike Hibler, Eric Eide, and John Regehr. In ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE'16), April 2016.

Lightweight Capability Domains: Towards Decomposing the Linux Kernel. Charles Jacobsen, Muktesh Khole, Sarah Spall, Scotty Bauer, and Anton Burtsev. In 8th Workshop on Programming Languages and Operating Systems (PLOS 2015), October 2015.

Weir: A Streaming Language for Performance Analysis. Anton Burtsev, Nikhil Mishrikoti, Eric Eide, and Robert Ricci. In 7th Workshop on Programming Languages and Operating Systems (PLOS 2013), November 2013.

Fido: Fast Inter-Virtual-Machine Communication for Enterprise Appliances, Anton Burtsev, Kiran Srinivasan, Prashanth Radhakrishnan, Lakshmi N. Bairavasundaram, Kaladhar Voruganti, and Garth R. Goodson. In USENIX Annual Technical Conference (USENIX ATC'09), June 2009.

Transparent Checkpoints of Closed Distributed Systems in Emulab, Anton Burtsev, Prashanth Radhakrishnan, Mike Hibler, and Jay Lepreau. In Fourth ACM SIGOPS/EuroSys European Conference on Computer Systems (EuroSys'09), Nuremberg, Germany, April 2009.

Other Publications

Advances in Cryptography and Secure Hardware for Data Outsourcing Shanthanu Sharma, Anton Burtsev, Sharad Mehrotra. Tutorial at IEEE International Conference on Data Engineering, 2020.

System Programming in Rust: Beyond Safety. Abhiram Balasubramanian, Marek S. Baranowski, Anton Burtsev, Aurojit Panda, Zvonimir Rakamaric, Leonid Ryzhyk. In ACM SIGOPS Operating Systems Review–Special Topics, Volume 51 Issue 1, August 2017.

Lightweight Capability Domains: Towards Decomposing the Linux Kernel. Charles Jacobsen, Muktesh Khole, Sarah Spall, Scotty Bauer, and Anton Burtsev. In SIGOPS Operating Systems Review, Volume 49 Issue 2, December 2015.

Weir: A Streaming Language for Performance Analysis. Anton Burtsev, Nikhil Mishrikoti, Eric Eide, and Robert Ricci. In ACM SIGOPS Operating Systems Review: Volume 48 Issue 1, January 2014.

Thesis Documents

Deterministic systems analysis. Anton Burtsev. PhD Thesis. University of Utah, 2013.

Distributed operating system architecture based on distributed shared objects. Anton Burtsev and Leonid Ryzhyk. M.Sc. Thesis, National Technical University of Ukraine "Kyiv Polytechnic Institute", 2002.

Intelligent software agents. Anton Burtsev and Leonid Ryzhyk. B.Sc. Thesis, National Technical University of Ukraine "Kyiv Polytechnic Institute", 2000.

Talks and Presentations

RedLeaf: Isolation and Communication in a Safe Kernel. Invited talk at the University of California, San Diego, January, 2021.

Advances in Cryptography and Secure Hardware for Data Outsourcing. Shanthanu Sharma, Anton Burtsev, Sharad Mehrotra, Tutorial at IEEE International Conference on Data Engineering, April, 2020.

Secure Big-Data Processing. Anton Burtsev, Sharad Mehrotra, Shanthanu Sharma, Tutorial at IEEE International Conference on Big Data, December, 2019.

Can We Build a Cloud in Which Users Own Their Data? Invited talk at 15th Cloud Control Workshop, June, 2019.

RedLeaf: Towards An Operating System for Safe andVerified Firmware. Workshop on Hot Topics in Operating Systems, May 2019.

XenTT: Deterministic Systems Analysis with Xen. Invited talk at Platform Security Summit, May, 2018.

CapNet: Security and Least Authority in a Capability-Enabled Cloud. Workshop on Object-Capability Languages, Systems, and Applications, October 2017.

CapNet: Security and Least Authority in a Capability-Enabled Cloud. Invited talk at the Second Annual CROSS Research Symposium at the University of California, Santa Cruz, October 2017.

CapNet: Security and Least Authority in a Capability-Enabled Cloud. Invited talk at VMWare Research, September 2017.

Towards 1000x with Heterogeneous, Programmable Hardware Datacenter. Invited talk at S2I2 High-Energy Physics and Computer Science Workshop at Princeton University, May 2017.

Lightweight Capability Domains: Towards Secure Operating System Kernels. Invited talk at the Cyber Security Seminar, Information Sciences Institute (ISI), University of Southern California, March, 2017.

Lightweight Capability Domains: Decomposing Commodity Kernels for Security. Invited talk at Samsung Research America, October 2015.

Weir: A Streaming Language for Performance Analysis. PLOS, November 2013.

Fido: Fast Inter-Virtual-Machine Communication for Enterprise Appliances. USENIX Annual Technical Conference, June 2009.

Transparent Checkpoints of Closed Distributed Systems in Emulab. EuroSys, April 2009.

XenTT: Deterministic Analysis in Xen. Invited talk at XenSummit North America 2012, San Diego, CA, 2012.

Manycores: Challenges for OS. Multi-Core Discussion Colloquium, School of Computing, University of Utah, October 2007.

Teaching Experience

Operating Systems, mixed under and graduate class, 90 students, University of Utah (Spring 2023, Spring 2024).

Computer Organization, undergraduate class, 200 students, University of Utah (Fall 2022).

Operating Systems, graduate class, 65-90 students, University of California, Irvine (Spring 2020 (9/8.34), Spring 2019 (9/8.14), Winter 2018 (8/7.93), Fall 2018 (8/7.76))[1]

Principles of Operating Systems, undergraduate class, 240-270 students, University of California, Irvine (Fall 2020 (n/a), Fall 2019 (8/7.4) , Fall 2018 (7.0/6.81), Winter 2017 (7/6.81), Fall 2017 (8/7.6))

Computer Architecture, graduate class, 60-70 students, University of California, Irvine (Fall 2019 (9.0/7.7), Winter 2019 (8.0/8.15))

Low-Level Systems Reading Group, co-organizer (with Ryan Stutsman), University of Utah, Spring 2016

Operating Systems, mixed undergraduate and graduate class, 130 students, University of Utah, Spring 2014

Malware Analysis Seminar, co-organizer (with Cody Cutler), University of Utah, Summer 2012

Compilers Reading Group, University of Utah, 2011-2012

Computer Systems Lunch Seminar, University of Utah, 2007-2008

Student Supervision

Current Students and Postdoctoral Fellows

Xiangdong Chen, PhD

Zhaofeng Li, PhD

Boxuan (Jerry) Zhang, PhD

Past Students

Lukas Mesicek, BS

Vikram Narayanan, PhD (**recipient of the IBM PhD Fellowship**), 2023. First employment: Palo Alto Networks

Arthur Lafrance, BS University of California, Irvine, 2023. First employment: TikTok.

David Detweiler, BS University of California, Irvine, 2023. First employment: Atlassian.

Connor Zwick, BS University of California, Irvine, 2022. First employment: Amazon AWS.

Vincent Whizin, BS.

Dan Appel, BS Thesis. *Inter-Process Communication in a Safe Kernel*.

Tianjiao Huang, BS University of California, Irvine, 2021 (**recognized with ICS Outstanding Contribution to Research**). First employment: PhD Student, University of California, Irvine.

Zhaofeng Li, BS University of California, Irvine, 2020. First employment: PhD Student, University of California, Irvine.

Michael Lusher, BS University of California, Irvine, 2021. First employment: Splunk.

Daman M Kumar, BS University of California, Irvine, 2021. First employment: Amazon.

Pramukh Naduthota, BS University of California, Irvine, 2020. First employment: Innovium.

Moinak Bhattacharyya, BS University of California, Irvine, 2020.

Abdullah Younis, BS University of California, Irvine, 2018. First employment: PhD Student, University of California, Berkeley.

Marcos Antonio Avila, BS University of California, Irvine, 2018. First employment: Raytheon.

[1] Median/mean for "overall class evaluation" score out of 9.

Vikram Narayanan, MS Thesis. *Transparent Isolation of Kernel Components*. Saarland University, 2017. First employment: PhD Student, University of California, Irvine.

Abhiram Balasubramanian, MS Thesis. *Towards a Fast NVMe Layer for a Decomposed Kernel*. University of Utah, 2017. First employment: Ubiquiti Networks.

Pankaj Kumar, MS Project. First employment: Pulse

Myungho Jung, MS Project. *On-demand Secure Service with Virtual Machines*. University of Utah, 2016. First employment: Qualcomm.

Scotty Bauer, MS Project. *Fip-see: A Low Latency, High Throughput IPC Mechanism*. University of Utah. 2016. First employment: Intel (NVMe Device Driver Team).

Sarah Spall, MS Project. *kIDL: Interface Definition Language for the Kernel*. University of Utah, 2016. First employment: PhD Student, Indiana University.

Charles Jacobsen, MS Thesis. *Lightweight Capability Domains: Toward Decomposing the Linux kernel*. University of Utah, 2016. First employment: Primary Data.

Michael Quigley, MS Project. *Extensions to Barrelfish Asynchronous C*. University of Utah, 2016. First employment: Google (residency).

Charles Jacobsen, BS Thesis (**Best Undergraduate Student Award**). *Lightweight Capability Domains: Decomposing the Linux kernel*. University of Utah, 2015. Continued at the University of Utah as a masters student.

Muktesh Khole, MS. Fast Data Structures for Capability Access Control and Support for Composable Asynchronous I/O for the Kernel. University of Utah, 2015. First employment: Microsoft (OS kernel team).

Yathindra Naik. MS Project: *Xen-Cap: A Capability Framework for Xen*. University of Utah, 2013. Co-supervised with Robert Ricci. First employment: NetApp (RAID team).

Nikhil Mishrikoti. MS Project: *Performance Analysis of Virtual Environments*. University of Utah, 2013. Co-supervised with Robert Ricci. First employment: Cisco.

Service

NSF Reviewer'25

EuroSys'25. Program Committee.

Workshop on Kernel Isolation, Security and Verification (KISV'24). Organizer and program chair.

SOSP'24. Workshop and Tutorial Chair.

SOSP'24. Program Committee.

EuroSys'24. Program Committee.

Workshop on Kernel Isolation, Security and Verification (KISV'23). Organizer and program chair.

EuroSys'23. Program Committee.

ACM Transactions on Computer Systems, 2021. Reviewer.

PLOS'21. Program Committee.

APSYS'21. Program Committee.

USENIX ATC'21. Program Committee.

USENIX ATC'19. Program Committee.

ICS'19. Program Committee.

ICS'18. Program Committee.

IJPP'18. Reviewer.

PPoPP'13. External Reviewer.

NSDI'13. Shadow Committee Chair.

SOSP'09. Shadow committee.

IEEE/ACM Transactions on Networking. Reviewer.

NSF Panels: 2025 (1), 2020 (2), 2019 (3), 2018, 2017 (2).

Software Artifacts

DRAMHiT Hash Table, 2023. Git repository, web page.

KSplit Static Analysis Framework for Isolation of Device Drivers in the Linux Kernel, 2022. Git repository, web page.

RedLeaf operating system, 2020. Git repository, web page.

Lightweight VMFUNC isolation support in the Linux kernel, 2020. Git repository, web page.

Asynchronous execution runtime for the Linux kernel, 2018. Git repository.

Lightweight capability domains for the Linux kernel, 2018. Git repository, web page.

CapNet object capability OpenStack cloud, 2017. Git repository, web page.

Weir imperative streaming language for performance analysis, 2013. Git repository.

Deterministic replay infrastructure for the Xen virtualization platform, 2012. Mercurial repository, web page.

Honors, Awards, & Scholarships

Annual Computer Security Applications Conference (ACSAC), Distinguished Paper with Artifacts Award, 2023.

National Science Foundation CAREER Award, 2023.

Amazon Research Award, 2023.

University of California, Irvine. Chancellor's Award for Excellence in Undergraduate Research Mentorship, 2021.

VEE'20 Best Paper Award, 2020

NICTA International Internship Scholarship, University of New South Wales, August 2004

MS Diploma with Honors in Applied Mathematics, National Technical University of Ukraine ("Kyiv Polytechnic Institute"), 2002

BS Diploma with Honors in Applied Mathematics, National Technical University of Ukraine ("Kyiv Polytechnic Institute"), 2000

Last updated: January 20, 2025