Jacob R. Lorch

1 Microsoft Way
Redmond, WA 98052
USA

lorch@microsoft.com
https://jaylorch.net/

Professional Experience

Senior Principal Researcher, Systems Group, Microsoft Research   2019–present
Principal Researcher, Systems Group, Microsoft Research   2016–2019
Senior Researcher, Systems Group, Microsoft Research   2013–2016
Researcher, Systems Group, Microsoft Research   2002–2013
Microsoft Corporation

- Led, and participated in, research projects advancing the state of the art in systems and security
- Wrote and published papers in top-tier scientific conferences on operating systems, distributed systems, networking, and security
- Incorporated research advances into company products and services, including Azure, Bing, Windows, and System Center Configuration Manager
- Managed Principal and Senior Principal Researchers in the Systems Group
- Mentored summer interns working on research projects

Part-Time Lecturer   Spring 2019
University of Washington

- Taught graduate distributed-systems course (CSE 552)

Graduate Student Researcher   1993–2001
University of California, Berkeley

- Devised and implemented research agenda to analyze the energy consumption of portable computers and develop systems techniques for improving their battery life
- Collaborated with colleagues on other systems research topics
- Published papers in conferences and journals

Research Intern   Summers 1992–1994
Apple Computer, Inc.

- Measured the energy consumption of components of Macintosh computers in different states
- Wrote software to measure the real-life usage of various power states to form a complete picture of computer energy consumption

Course Consultant   1993
National Technological University

- Helped participants in a remote-learning computer architecture class understand the lecture materials
- Graded assignments and exams

Education

Ph.D. in Computer Science   December 2001
University of California, Berkeley

> Dissertation title: "Operating Systems Techniques for Reducing Processor Energy Consumption"
> Committee: Alan Jay Smith (advisor), Randy H. Katz, Geoffrey Keppel

M.S. in Computer Science December 1995
University of California, Berkeley

    Dissertation title: "A Complete Picture of the Energy Consumption of a Portable Computer"
    Advisor: Alan Jay Smith

B.S. in Computer Science, B.S. in Mathematics May 1992
Michigan State University

Honors and Awards

Test of Time Award, USENIX Conference on File and Storage Technologies (FAST)	2021
Distinguished Paper Award, Conf. on Programming Language Design and Implementation (PLDI)	2020
Best Talk Video, Conference on Programming Language Design and Implementation (PLDI)	2020
Distinguished Paper Award, USENIX Security Symposium	2017
Distinguished Reviewer Award, IEEE Symposium on Security and Privacy (S&P)	2017
Best Paper Award, USENIX Symposium on Networked Systems Design and Implementation (NSDI)	2009
Outstanding Graduate Student Delegate, International Achievement Summit	2002
Siebel Scholar	2002
Fellowship Winner, University of California, Berkeley	1996
Fellowship Winner, National Science Foundation	1992–1995
Second Place in World, ACM Programming Contest (team captain)	1992
First Place in Region, ACM Programming Contest (team captain)	1991
Top 50 Finisher, Putnam Mathematics Prize Competition	1992
Top 100 Finisher, Putnam Mathematics Prize Competition	1989–1991

Service

Program Committee Co-Chair, Symp. on Operating Systems Design and Implementation (OSDI)	2021
Program Committee Co-Chair, Symp. on Networked Systems Design and Implementation (NSDI)	2019
Program Committee Co-Chair, International Conference on Peer-to-Peer Computing (P2P)	2015
Program Committee Member, Symposium on Operating Systems Principles (SOSP)	2024
Program Committee Member, Symp. on Operating Systems Design and Implementation (OSDI)	2024
Program Committee Member, Conf. on Architectural Support for PLs and OSs (ASPLOS)	2024
Program Committee Member, Symp. on Operating Systems Design and Implementation (OSDI)	2023
Program Committee Member, Symp. on Networked Systems Design and Implementation (NSDI)	2023
Program Committee Member, Symp. on Networked Systems Design and Implementation (NSDI)	2022
Program Committee Member, Conf. on Architectural Support for PLs and OSs (ASPLOS)	2021
Program Committee Member, Symp. on Operating Systems Design and Implementation (OSDI)	2020
Program Committee Member, Workshop on Hot Topics in Operating Systems (HotOS)	2019
Program Committee Member, Symp. on Operating Systems Design and Implementation (OSDI)	2018
Program Committee Member, Symposium on Security and Privacy (S&P)	2018
Program Committee Member, Symp. on Networked Systems Design and Implementation (NSDI)	2018
Program Committee Member, Symposium on Operating Systems Principles (SOSP)	2017
Program Committee Member, Symposium on Security and Privacy (S&P)	2017
Program Committee Member, Symp. on Networked Systems Design and Implementation (NSDI)	2017
Program Committee Member, Symposium on Security and Privacy (S&P)	2016
Program Committee Member, Symp. on Networked Systems Design and Implementation (NSDI)	2016
Program Committee Member, International World Wide Web Conference (WWW)	2015
Program Committee Member, Conference on File and Storage Technologies (FAST)	2014
Program Committee Member, Network and Distributed System Security Symposium (NDSS)	2014
Program Committee Member, Workshop on Hot Topics in Operating Systems (HotOS)	2013
Program Committee Member, Int. Conference on Distributed Computing Systems (ICDCS)	2013

Program Committee Member, International Conference on Peer-to-Peer Computing (P2P) 2013
Program Committee Member, International Conference on Peer-to-Peer Computing (P2P) 2012
Program Committee Member, Workshop on Massively Multiuser Virtual Environments (MMVE) 2012
Program Committee Member, European Conference on Computer Systems (EuroSys) 2011
Program Committee Member, Workshop on Massively Multiuser Virtual Environments (MMVE) 2010
Program Committee Member, International Workshop on Peer-to-Peer Systems (IPTPS) 2009
Program Committee Member, International Workshop on Peer-to-Peer Systems (IPTPS) 2008

Steering Committee Member, Symposium on OS Design and Implementation (OSDI) 2021–present
Steering Committee Member, Networked Systems Design and Implementation (NSDI) 2019–present
Treasurer, Symposium on Operating Systems Principles (SOSP) 2015
Panelist, NSF Expeditions in Computing 2011
Registration Chair, Symposium on Operating Systems Principles (SOSP) 2009
Sponsorships Chair, Symposium on Operating Systems Principles (SOSP) 2007

Publications

[1] Jacob R. Lorch, Yixuan Chen, Manos Kapritsos, Haojun Ma, Bryan Parno, Shaz Qadeer, Upamanyu Sharma, James R. Wilcox, and Xueyuan Zhao. Armada: Automated verification of concurrent code with sound semantic extensibility. *ACM Transactions on Programming Languages and Systems (TOPLAS)*, 44(2):1–39, June 2022.

[2] Jacob R. Lorch, Yixuan Chen, Manos Kapritsos, Bryan Parno, Shaz Qadeer, Upamanyu Sharma, James R. Wilcox, and Xueyuan Zhao. Armada: Low-effort verification of high-performance concurrent programs. In *Proceedings of the ACM International Conference on Programming Language Design and Implementation (PLDI), Awarded "Distinguished Paper Award"*. Association for Computing Machinery, June 2020.

[3] Peng Huang, Chuanxiong Guo, Jacob R. Lorch, Lidong Zhou, and Yingnong Dang. Capturing and enhancing in situ system observability for failure detection. In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI)*. USENIX, October 2018.

[4] Barry Bond, Chris Hawblitzel, Manos Kapritsos, K. Rustan M. Leino, Jacob R. Lorch, Bryan Parno, Ashay Rane, Srinath Setty, and Laure Thompson. Vale: Verifying high-performance cryptographic assembly code. In *Proceedings of the USENIX Security Symposium, Awarded "Distinguished Paper Award"*. USENIX, August 2017.

[5] Chris Hawblitzel, Jon Howell, Manos Kapritsos, Jacob R. Lorch, Bryan Parno, Michael L. Roberts, Srinath Setty, and Brian Zill. IronFleet: Proving safety and liveness of practical distributed systems. *Communications of the ACM (CACM)*, 60(7):83–92, July 2017.

[6] Peng Huang, Chuanxiong Guo, Lidong Zhou, Jacob R. Lorch, Yingnong Dang, Murali Chintalapati, and Randolph Yao. Gray failure: The Achilles' heel of cloud-scale systems. In *Proceedings of the ACM Workshop on Hot Topics in Operating Systems (HotOS)*. ACM, May 2017.

[7] Srinath Setty, Chunzhi Su, Jacob R. Lorch, Lidong Zhou, Hao Chen, Parveen Patel, and Jinglei Ren. Realizing the fault-tolerance promise of cloud storage using locks with intent. In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI)*. USENIX, November 2016.

[8] Chris Hawblitzel, Jon Howell, Manos Kapritsos, Jacob R. Lorch, Bryan Parno, Michael L. Roberts, Srinath Setty, and Brian Zill. IronFleet: Proving practical distributed systems correct. In *Proceedings of the ACM Symposium on Operating Systems Principles (SOSP)*. ACM, Oct 2015.

[9] Jacob R. Lorch, Andrew Baumann, Lisa Glendenning, Dutch T. Meyer, and Andrew Warfield. Tardigrade: Leveraging lightweight virtual machines to easily and efficiently construct fault-tolerant services.

In *Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI)*. USENIX – Advanced Computing Systems Association, May 2015.

[10] Chris Hawblitzel, Jon Howell, Jacob R. Lorch, Arjun Narayan, Bryan Parno, Danfeng Zhang, and Brian Zill. Ironclad apps: End-to-end security via automated full-system verification. In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI)*. USENIX, October 2014.

[11] Christopher Smowton, Jacob R. Lorch, David Molnar, Stefan Saroiu, and Alec Wolman. Zero-effort payments: Design, deployment, and lessons. In *Proceedings of the ACM International Joint Conference on Pervasive and Ubiquitous Computing (Ubicomp)*, September 2014.

[12] Andrew Baumann, Dongyoon Lee, Pedro Fonseca, Lisa Glendenning, Jacob R. Lorch, Barry Bond, Reuben Olinsky, and Galen C. Hunt. Composing OS extensions safely and efficiently with Bascule. In *Proceedings of the European Conference on Computer Systems (Eurosys)*. ACM, April 2013.

[13] Jacob R. Lorch, Bryan Parno, James Mickens, Mariana Raykova, and Joshua Schiffman. Shroud: Enabling private access to large-scale data in the data center. In *Proceedings of the USENIX Conference on File and Storage Technologies (FAST)*. USENIX, February 2013.

[14] Siddhartha Sen, Jacob R. Lorch, Richard Hughes, Carlos Garcia Jurado Suarez, Brian Zill, Weverton Cordeiro, and Jitendra Padhye. Don't lose sleep over availability: The GreenUp decentralized wakeup service. In *Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI)*. USENIX, April 2012.

[15] Raluca Ada Popa, Jacob R. Lorch, David Molnar, Helen J. Wang, and Li Zhuang. Enabling security in cloud storage SLAs with CloudProof. In *Proceedings of the USENIX Annual Technical Conference (ATC)*. USENIX, June 2011.

[16] Bryan Parno, Jacob R. Lorch, John R. Douceur, James Mickens, and Jonathan M. McCune. Memoir: Practical state continuity for protected modules. In *Proceedings of the IEEE Symposium on Security and Privacy (S&P)*. IEEE, May 2011.

[17] John R. Douceur, Jeremy Elson, Jon Howell, and Jacob R. Lorch. The Utility Coprocessor: Massively parallel computation from the coffee shop. In *Proceedings of the USENIX Annual Technical Conference (ATC)*. Association for Computing Machinery, June 2010.

[18] James Mickens, Jeremy Elson, Jon Howell, and Jay Lorch. Crom: Faster web browsing using speculative execution. In *Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI)*. USENIX, April 2010.

[19] Sharad Agarwal and Jacob R. Lorch. Matchmaking for online games and other latency-sensitive p2p systems. In *Proceedings of the Conference on Computer Communications (SIGCOMM)*. ACM, August 2009.

[20] Dave Levin, John R. Douceur, Jacob R. Lorch, and Thomas Moscibroda. TrInc: Small trusted hardware for large distributed systems. In *Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI), Awarded "Best Paper"*, pages 1–14. USENIX, April 2009.

[21] John R. Douceur, Jeremy Elson, Jon Howell, and Jacob R. Lorch. Leveraging legacy code to deploy desktop applications on the Web. In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, pages 339–354. USENIX, December 2008.

[22] Ashwin Bharambe, John R. Douceur, Jacob R. Lorch, Thomas Moscibroda, Jeffrey Pang, Srinivasan Seshan, and Xinyu Zhuang. Donnybrook: Enabling large-scale, high-speed, peer-to-peer games. In *Proceedings of the Conference on Computer Communications (SIGCOMM)*, pages 389–400, Seattle, WA, August 2008. Association for Computing Machinery.

[23] Nitin Agrawal, William J. Bolosky, John R. Douceur, and Jacob R. Lorch. A five-year study of file-system metadata. *ACM Transactions on Storage*, 3(3), October 2007.

[24] John R. Douceur, Jacob R. Lorch, Frank Uyeda, and Randall C. Wood. Enhancing game-server AI with distributed client computation. In *Proceedings of the International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV)*, pages 31–36, Urbana, IL, June 2007. Association for Computing Machinery.

[25] John R. Douceur, Jacob R. Lorch, and Thomas Moscibroda. Maximizing total upload in latency-sensitive P2P applications. In *Proceedings of the ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, pages 270–279, San Diego, CA, June 2007. Association for Computing Machinery.

[26] Jeffrey Pang, Frank Uyeda, and Jacob R. Lorch. Scaling peer-to-peer games in low-bandwidth environments. In *Proceedings of the International Workshop on Peer-to-Peer Systems (IPTPS)*, Bellevue, WA, February 2007.

[27] Nitin Agrawal, William J. Bolosky, John R. Douceur, and Jacob R. Lorch. A five-year study of file-system metadata. In *Proceedings of the USENIX Conference on File and Storage Technologies (FAST), Awarded "2021 Test of Time Award"*, pages 31–45, San Jose, CA, February 2007. USENIX.

[28] Samuel T. King, Peter M. Chen, Yi-Min Wang, Chad Verbowski, Helen J. Wang, and Jacob R. Lorch. SubVirt: Implementing malware with virtual machines. In *Proceedings of the IEEE Symposium on Security and Privacy (S&P)*, pages 314–327, Oakland, CA, May 2006. Institute of Electrical and Electronics Engineers, Inc.

[29] Jacob R. Lorch, Atul Adya, William J. Bolosky, Ronnie Chaiken, John R. Douceur, and Jon Howell. The SMART way to migrate replicated stateful services. In *Proceedings of the European Conference on Computer Systems (Eurosys)*, pages 103–115, Leuven, Belgium, April 2006. Association for Computing Machinery.

[30] Jacob R. Lorch and Alan Jay Smith. PACE: A new approach to dynamic voltage scaling. *IEEE Transactions on Computers*, 53(7):856–869, July 2004.

[31] Jacob R. Lorch and Alan Jay Smith. Using user interface event information in dynamic voltage scaling algorithms. In *Proceedings of the IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunications Systems (MASCOTS)*, pages 46–55, Orlando, FL, October 2003. Institute of Electrical and Electronics Engineers, Inc.

[32] Jacob R. Lorch and Alan Jay Smith. Operating system modifications for task-based speed and voltage scheduling. In *Proceedings of the International Conference on Mobile Systems, Applications, and Services (MobiSys)*, pages 215–229, San Francisco, CA, May 2003. Association for Computing Machinery.

[33] Atul Adya, William J. Bolosky, Miguel Castro, Gerald Cermak, Ronnie Chaiken, John R. Douceur, Jon Howell, Jacob R. Lorch, Marvin Theimer, and Roger P. Wattenhofer. FARSITE: Federated, available, and reliable storage for an incompletely trusted environment. In *Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, pages 1–14, Boston, MA, December 2002. USENIX.

[34] Jacob R. Lorch. *Operating Systems Techniques for Reducing Processor Energy Consumption*. PhD thesis, University of California, Berkeley, December 2001.

[35] Jacob R. Lorch and Alan Jay Smith. Improving dynamic voltage scaling algorithms with PACE. In *Proceedings of the ACM SIGMETRICS Conference*, pages 50–61, Cambridge, MA, June 2001. Association for Computing Machinery.

[36] Jacob R. Lorch and Alan Jay Smith. The VTrace tool: Building a system tracer for Windows NT and Windows 2000. *MSDN Magazine*, 15(10):86–102, October 2000.

[37] Drew Roselli, Jacob R. Lorch, and Thomas E. Anderson. A comparison of file system workloads. In *Proceedings of the USENIX Annual Technical Conference (ATC)*, pages 41–54, San Diego, CA, June 2000. USENIX.

[38] Jacob R. Lorch and Alan Jay Smith. Energy consumption of Apple Macintosh computers. *IEEE Micro*, 18(6):54–63, November 1998.

[39] Jacob R. Lorch and Alan Jay Smith. Software strategies for portable computer energy management. *IEEE Personal Communications Magazine*, 5(3):60–73, June 1998.

[40] Jacob R. Lorch and Alan Jay Smith. Scheduling techniques for reducing processor energy use in MacOS. *Wireless Networks*, 3(5):311–324, October 1997.

[41] Jacob R. Lorch and Alan Jay Smith. Reducing processor power consumption by improving processor time management in a single-user operating system. In *Proceedings of the ACM International Conference on Mobile Computing and Networking (MOBICOM)*, pages 143–154. Association for Computing Machinery, November 1996.

[42] Radhika Malpani, Jacob R. Lorch, and David Berger. Making World Wide Web caching servers cooperate. In *Proceedings of the International World Wide Web Conference (WWW)*, pages 107–117, Boston, MA, December 1995.

[43] Jacob R. Lorch. A complete picture of the energy consumption of a portable computer. Master's thesis, University of California, Berkeley, December 1995.

[44] Qian Huang, Jacob R. Lorch, and Richard C. Dubes. Can the fractal dimension of images be measured? *Pattern Recognition*, 27(3):339–349, March 1994.

Patents

1. "Hardware protection for differential privacy," Apr. 2021, U.S. Patent No. 10,977,384.
2. "Statelessly populating data stream into successive files," Jan. 2021, U.S. Patent No. 10,901,944.
3. "Executing native-code applications in a browser," Nov. 2020, U.S. Patent No. 10,824,716.
4. "Intents and locks with intent," Jun. 2020, U.S. Patent No. 10,691,622.
5. "Performing scalable, causally consistent reads using a logical wall clock," Feb. 2020, U.S. Patent No. 10,564,665.
6. "End-to-end security for hardware running verified software," Dec. 2018, U.S. Patent No. 10,148,442.
7. "Enforcing deterministic execution of threads of guest operating systems running in a virtual machine hosted on a multiprocessor machine," Sep. 2017, U.S. Patent No. 9,753,754.
8. "Executing native-code applications in a browser," Mar. 2017, U.S. Patent No. 9,588,803.
9. "Decentralized sleep management," Feb. 2017, U.S. Patent No. 9,582,062.
10. "Automated verification of a software system," Jan. 2017, U.S. Patent No. 9,536,093.
11. "Trusted hardware component for distributed systems," Sep. 2016, U.S. Patent No. 9,455,992.
12. "End-to-end security for hardware running verified software," Jun. 2016, U.S. Patent No. 9,363,087.
13. "Partitioned artificial intelligence for networked games," May 2016, U.S. Patent No. 9,327,194.
14. "Utilization of a protected module to prevent offline dictionary attacks," Mar. 2016, U.S. Patent No. 9,294,281.
15. "Securing anti-virus software with virtualization," Jan. 2016, U.S. Patent No. 9,230,100.
16. "Personal identification combining proximity sensing with biometrics," Oct. 2015, U.S. Patent No. 9,152,868.
17. "Operating a sleep management service," Feb. 2015, U.S. Patent No. 8,966,063.
18. "Fast, non-write-cycle-limited persistent memory for secure containers," Aug. 2014, U.S. Patent No. 8,812,908.
19. "Method and apparatus for thwarting traffic analysis in online games," May 2014, U.S. Patent No. 8,719,336.
20. "Leveraging remote server pools for client applications," Oct. 2013, U.S. Patent No. 8,549,106.
21. "Securing anti-virus software with virtualization," Nov. 2012, U.S. Patent No. 8,307,443.

22. "Network coordinate systems using IP information," Mar. 2012, U.S. Patent No. 8,144,611.
23. "Network application performance enhancement using speculative execution," Mar. 2012, U.S. Patent No. 8,140,646.
24. "Partitioned artificial intelligence for networked games," Mar. 2012, U.S. Patent No. 8,137,199.
25. "Collection ordering for replicated state machines," Mar. 2012, U.S. Patent No. 8,135,987.
26. "Automatic commutativity detection for Generalized Paxos," Oct. 2011, U.S. Patent No. 8,046,413.
27. "Isolation environment-based information access," Sep. 2011, U.S. Patent No. 8,024,815.
28. "Reducing bandwidth requirements for peer-to-peer gaming based on error difference between actual game object state and simulated game object state being below an error threshold," Apr. 2011, U.S. Patent No. 7,925,601.
29. "Reducing bandwidth requirements for peer-to-peer gaming based on importance of remote objects to a local player," Dec. 2009, U.S. Patent No. 7,627,632.
30. "Lossless recovery for computer systems with map assisted state transfer," Dec. 2008, U.S. Patent No. 7,472,129.
31. "Efficient changing of replica sets in distributed fault-tolerant computing system," Feb. 2008, U.S. Patent No. 7,334,154.