

Christopher J. Rossbach

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Professional Experience

2015–present **Assistant Professor of Computer Science**, *The University of Texas at Austin*.

2014–present **Senior Researcher**, *VMware Research Group*, Palo Alto, CA.

2010–2014 **Researcher**, *Microsoft Research Silicon Valley (MSR-SVC)*, Mountain View, CA.

Education

2010 **Post-doctoral Researcher**, *University of Texas at Austin*, Austin TX.

2009 **Ph.D. in Computer Science**, *University of Texas at Austin*, Austin TX.

Disseration: *Hardware Transactional Memory: A Systems Perspective*

Committee: Prof. Emmett Witchel (advisor), Prof. Mike Dahlin, Prof. Doug Burger, Prof. Yale Patt, Prof. Mark D. Hill

1992 **B.S. in Computer Systems Engineering**, *Stanford University*, Palo Alto, CA.

Research interests

Operating Systems, Accelerators, Virtualization, Synchronization, Parallel Architectures, GPUs, Transactional Memory, Cache Coherence, Programming Models.

Awards

2007 IEEE Micro Top Pick award, one of the 10 best architecture papers of 2007 for “MetaTM/TxLinux: Transactional Memory For An Operating System.”

2019 NSF CAREER 2019

2019 ApSys Best Paper Award for “USETL: Unikernels for Serverless Extract Transform and Load Why should you settle for less?”

Publications

As of March 2020, Google Scholar reports Rossbach’s h-index as 21, i10-index as 27, with 2241 citations.

All publications are refereed and peer reviewed.

Where provided, each entry has a page length (Xp). Each entry for a conference paper has the acceptance rate of the conference (X%), and the number of citations on Google scholar as of January 2019 (gcite:X).

Conference Publications

- [1] Hangchen Yu, Arthur M. Peters, Amogh Akshintala, and **Christopher J. Rossbach**. AvA: Accelerated Virtualization of Accelerators. In *Proceedings of the Twenty-Fifth International Conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS 2020, Lausanne, Switzerland, 2020*. ACM, 2020.
- [2] Eric Schkufza, Michael Wei, and **Christopher J. Rossbach**. Just-In-Time Compilation for Verilog — A New Technique for Improving the FPGA Programming Experience. In *Proceedings of the Twenty First International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, April 2019. 16p 21%.
- [3] Ahmed Khawaja, , Joshua Landgraf, Rohith Prakash, Michael Wei, Eric Schkufza, and **Christopher J. Rossbach**. "Sharing, Protection and Compatibility for Reconfigurable Fabric with AmorphOS". In *Proceedings of the 12th USENIX Symposium on Operating Systems Design and Implementation. (OSDI)*, Carlsbad, CA, October 2018. 23p 17.8%.
- [4] Rachata Ausavarungnirun, Vance Miller Joshua Landgraf, Saugata Ghose, Jayneel Gandhi, Adwait Job, **Christopher J. Rossbach**, and Onur Mutlu. "MASK: Redesigning the GPU Memory Hierarchy to Support Multi-Application Concurrency". In *Proceedings of the Twenty First International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, April. 16p 18% gcite:18.
- [5] Rachata Ausavarungnirun, Joshua Landgraf, Vance Miller, Saugata Ghose, Jayneel Gandhi, **Christopher J. Rossbach**, and Onur Mutlu. "MOSIAC: Transparent hardware-software cooperative memory management for gpus". In *The 51st Annual IEEE/ACM International Symposium on Microarchitecture (MICRO)*.
- [6] **Christopher J. Rossbach**, Yuan Yu, Jon Currey, Jean-Philippe Martin, and Dennis Fetterly. Dandelion: a compiler and runtime for heterogeneous systems. In *Proceedings of the 22nd ACM Symposium on Operating Systems Principles (SOSP)*, Framhingham, Pennsylvania, October 2013. 16p 18% gcite:111.
- [7] **Christopher J. Rossbach**, Jon Currey, Mark Silberstein, Baishakhi Ray, and Emmett Witchel. PTask: Operating system abstractions to manage GPUs as compute devices. In *Proceedings of the 22nd ACM Symposium on Operating Systems Principles (SOSP)*, Cascais, Portugal, October 2011. 16p 18% gcite:218.
- [8] Chen Li, Rachata Ausavarungnirun, **Christopher J. Rossbach**, Youtao Zhang, Onur Mutlu, Yang Guo, and Jun Yang. A framework for memory oversubscription management in graphics processing units. In Iris Bahar, Maurice Herlihy, Emmett Witchel, and Alvin R. Lebeck, editors, *Proceedings of the Twenty-Fourth International Conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS 2019, Providence, RI, USA, April 13-17, 2019*, pages 49–63. ACM, 2019. 16p 21%.
- [9] Tyler Hunt, Zhipeng Jia, Vance Miller, Ariel Szekely, Yige Hu, Christopher J. Rossbach, and Emmett Witchel. Telekine: Secure computing with cloud gpus. In *17th USENIX*

Symposium on Networked Systems Design and Implementation (NSDI 20), Santa Clara, CA, 2020. USENIX Association.

- [10] Youngjin Kwon, Hangchen Yu, Simon Peter, **Christopher J. Rossbach**, and Emmett Witchel. Coordinated and Efficient Huge Page Management with Ingens. In *Proceedings of the 12th USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, Savannah, GA, November 2016. 18p 18% gcite:39.
- [11] Bodun Hu and **Christopher J. Rossbach**. Altis: Modernizing GPGPU Benchmarks. In *Proceedings of the 2020 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)*, March 2020.
- [12] Ahmet Çelik, Pengyu Nie, **Christopher J. Rossbach**, and Milos Gligoric. Design, implementation, and application of gpu-based java bytecode interpreters. *PACMPL*, 3(OOPSLA):177:1–177:28, 2019.
- [13] Arthur Michener Peters, John A. Thywissen, and **Christopher J. Rossbach**. PorcE: a deparallelizing compiler. In Antony L. Hosking and Irene Finocchi, editors, *Proceedings of the 16th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes, MPLR 2019, Athens, Greece, October 21-22, 2019*, pages 117–130. ACM, 2019.
- [14] Michael Wei, Amy Tai, **Christopher J. Rossbach**, Scott Lystig Fritchie, Ittai Abraham, Udi Wieder, Maithem Munshed Medhavi Dhawan, Jim Stabile, Steven Swanson, Michael Freedman, and Dahlia Malkhi. "vCorfu: A Cloud-Scale Object Store on a Shared Log". In *Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, 2017. 17p 18% gcite:13.
- [15] John Vilck, David Molnar, Eyal Ofek, **Christopher J. Rossbach**, Benjamin Livshits, Alexander Moshchuk, Helen J. Wang, and Ran Gal. Surroundweb : Mitigating privacy concerns in a 3d web browser. In *IEEE Symposium on Security and Privacy*, May 2015. 16p 13.5% gcite:15.
- [16] Scott Wolchok, Owen S. Hofmann, Nadia Heninger, Edward W. Felten, J. Alex Halderman, **Christopher J. Rossbach**, Brent Waters, and Emmett Witchel. Defeating vanish with low-cost sybil attacks against large DHTs. In *Proceedings of the Network and Distributed System Security Symposium (NDSS)*, February 2010. 15p 15% gcite:129, Reported in the New York Times <http://www.nytimes.com/2009/09/22/science/22decode.html>.
- [17] **Christopher J. Rossbach**, Owen S. Hofmann, and Emmett Witchel. Is transactional memory programming actually easier? In *Proceedings of the 15th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, January 2010. 10p 17% gcite:159.
- [18] Donald E. Porter, Owen S. Hofmann, **Christopher J. Rossbach**, Alex Benn, and Emmett Witchel. Operating system transactions. In *Proceedings of the 22nd ACM Symposium on Operating Systems Principles (SOSP)*, Big Sky, MT, October 2009. 14p 16% gcite:119.
- [19] Owen S. Hofmann, **Christopher J. Rossbach**, and Emmett Witchel. Maximum benefit from a minimal HTM. In *Proceedings of the Fourteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, March 2009. 12p 26% gcite:27.

- [20] Hany E. Ramadan, **Christopher J. Rossbach**, and Emmett Witchel. Dependence-aware transactions for increased concurrency. In *Proceedings of the 41st Annual International Symposium on Microarchitecture (MICRO-41)*, November 2008. 12p 19% gcite:113.
- [21] **Christopher J. Rossbach**, Owen S. Hofmann, Donald E. Porter, Hany E. Ramadan, Aditya Bhandari, and Emmett Witchel. TxLinux: Using and managing transactional memory in an operating system. In *Proceedings of the 21st ACM Symposium on Operating Systems Principles (SOSP)*, Stevenson, WA, October 2007. 14p 19% gcite:153.
- [22] Hany E. Ramadan, **Christopher J. Rossbach**, Donald E. Porter, Owen Hofmann, Aditya Bhandari, and Emmett Witchel. MetaTM/TxLinux: Transactional memory for an operating system. In *Proceedings of the 34th International Symposium on Computer Architecture (ISCA)*, San Diego, CA, June 2007. 12p 23% gcite:97.
- [23] Jungwoo Ha, **Christopher J. Rossbach**, Jason V. Davis, Indrajit Roy, Hany E. Ramadan, Donald E. Porter, David L. Chen, and Emmett Witchel. Improved error reporting for software that uses black-box components. In *Proceedings of the ACM SIGPLAN 2007 Conference on Programming Language Design and Implementation (PLDI)*, San Diego, CA, 2007. 11p 25% gcite:61.

Journal Publications

- [24] **Christopher J. Rossbach**, Hany E. Ramadan, Owen S. Hofmann, Donald E. Porter, Aditya Bhandari, and Emmett Witchel. TxLinux and MetaTM: Transactional memory and the operating system. *Communications of the ACM (CACM)*, 51(9), September 2008. 8p.
- [25] Hany E. Ramadan, **Christopher J. Rossbach**, Donald E. Porter, Owen S. Hofmann, Aditya Bhandari, and Emmett Witchel. MetaTM/TxLinux: Transactional memory for an operating system. In *IEEE Micro Top Picks in Computer Architecture 2007*, January 2008. 6p.

Workshop and Other Publications

- [26] Henrique Fingler, Amogh Akshintala, and **Christopher J. Rossbach**. USETL: unikernels for serverless extract transform and load why should you settle for less? In *Proceedings of the 10th ACM SIGOPS Asia-Pacific Workshop on Systems, APSys 2019, Hangzhou, China, Augsut 19-20, 2019*, pages 23–30. ACM, 2019.
- [27] Hangchen Yu, Arthur M. Peters, Amogh Akshintala, and **Christopher J. Rossbach**. Automatic virtualization of accelerators. In *Proceedings of the Workshop on Hot Topics in Operating Systems, HotOS 2019, Bertinoro, Italy, May 13-15, 2019*, pages 58–65. ACM, 2019.
- [28] Tyler Hunt, Zhipeng Jia, Vance Miller, **Christopher J. Rossbach**, and Emmett Witchel. Isolation and beyond: Challenges for system security. In *Proceedings of the Workshop on Hot Topics in Operating Systems, HotOS 2019, Bertinoro, Italy, May 13-15, 2019*, pages 96–104. ACM, 2019.

- [29] Amogh Akshintala, Vance Miller, Donald E. Porter, and **Christopher J. Rossbach**. "Talk to My Neighbors Transport: Decentralized Data Transfer and Scheduling Among Accelerators". In *SFMA*, 2018.
- [30] Arthur Michener Peters, John A. Thywissen, and **Christopher J. Rossbach**. "PorcE: A Deparallelizing Compiler". In *SFMA*, 2018.
- [31] John A. Thywissen, Arthur Michener Peters, and **Christopher J. Rossbach**. "Local Operations Should Appear to Be Remote: Consistent Semantics Enable Transparent Distribution". In *SFMA*, 2018.
- [32] Henrique Fingler and **Christopher J. Rossbach**. "CELDA: Cloud Edge Local Dataflow Architecture". In *SFMA*, 2018.
- [33] Hangchen Yu and **Christopher J. Rossbach**. "Full Virtualization for GPUs Reconsidered". In *WDDD*, 2017.
- [34] Arthur Peters, John Thywissen, William R. Cook, and **Christopher J. Rossbach**. "PITCHFORC: Concurrent programming at rack-scale". In *MaRS*, 2017.
- [35] Michael Wei, **Christopher J. Rossbach**, Ittai Abraham, Udi Wieder, Steven Swanson, Dahlia Malkhi, and Amy Tai. Silver: A scalable, distributed, multi-versioning, always growing (Ag) file system. In *8th USENIX Workshop on Hot Topics in Storage and File Systems, HotStorage 2016, Denver, CO, June 20-21, 2016.*, 2016. 5p 41.1% gcite:6.
- [36] **Christopher J. Rossbach** and Emmett Witchel. Albatross: Systems Support for Augmented Reality. In *Proceedings of the 5th Workshop on Systems for Future Multicore Architectures*, SFMA 2015, 2015.
- [37] Naila Farooqui, **Christopher J. Rossbach**, Yuan Yu, and Karsten Schwan. Leo: A profile-driven dynamic optimization framework for GPU applications. In *2014 Conference on Timely Results in Operating Systems, TRIOS '14, Broomfield, CO, USA, October 5, 2014.*, 2014.
- [38] **Christopher J. Rossbach**, Jon Currey, Simon Baker. Supporting iteration in a heterogeneous dataflow engine. In *SFMA 2013. The 3rd Workshop on Systems for Future Multicore Architectures*, April 2013.
- [39] Jean-Philippe Martin, Christopher J. Rossbach, Derek G. Murray, and Michael Isard. Supporting efficient aggregation in a task-based STM. In *Proceedings of the 3rd Workshop on Systems for Future Multicore Architectures*, SFMA 2013, 2013.
- [40] **Christopher J. Rossbach**, Jon Currey, and Emmett Witchel. Operating systems must support GPU abstractions. In *The 13th Workshop on Hot Topics in Operating Systems (HotOS)*, 2011. 5p 25%.
- [41] **Christopher J. Rossbach**, Owen S. Hofmann, and Emmett Witchel. Is transactional memory programming actually easier? In *The 8th Annual Workshop on Duplicating, Deconstructing, and Debunking (WDDD)*, 2009. 9p.
- [42] Hany E. Ramadan, **Christopher J. Rossbach**, and Emmett Witchel. The Linux kernel: A challenging workload for transactional memory. In *Proceedings of the Workshop on Transactional Memory Workloads (WTW)*, June 2006. 6p.

Software

Rosssbach's group hosts its public code on GitHub at <https://github.com/rossbach/> and <https://github.com/utcs-scea/>.

Funding

- 05/19–05/24 NSF CNS-1846169, "CAREER: Operating System Support for Ephemeral and Malleable Accelerators," \$505,996.
- 05/20–05/25 TBD, My share (of a \$16.5M DOE grant) is expected to cover 1 student for 5 years
- 09/16–08/19 NSF CNS-1618563, "CSR:Small:Performance and Fairness with Multiple Page Sizes," with Emmett Witchel, PI. \$500,000.
- 09/10–09/13 NSF CNS-1017785, "CSR: Small: Operating System Abstractions for GPU-Accelerated Interactive Applications," Also with Emmett Witchel, Co-PI \$500,000.
- 09/16-09/19 VMware Earlier Career Award, yearly: 4 x \$75,000

Patents

- 2020 10,635,600 Decoupling Memory Metadata Granularity from Page Size. Jayneel Gandhi, Christopher John Rosssbach, Timothy Merrifield. U.S. Patent, filed March 8, 2018, granted April 28, 2020.
- 2018 9,996,394 Scheduling accelerator tasks on accelerators using graphs. Christopher John Rosssbach, Jonathan J. Currey. U.S. Patent, filed August 8, 2013, granted June 12, 2018.
- 2016 9,424,079 Iteration support in a heterogeneous dataflow engine. Christopher John Rosssbach, Jonathan J. Currey. U.S. Patent, filed June 27, 2013, granted August 23, 2016.
- 2011 8,661,449 Transactional Computation on Clusters. Christopher John Rosssbach, Jean-Philippe Martin, Michael Isard. U.S. Patent, filed February 25, 2011, granted June 17, 2011.
- 2006 8,134,637 Method and system to increase X-Y resolution in a depth (Z) camera using red, blue, green (RGB) sensing. Christopher J. Rosssbach, Abbas Rafii, Peiqian Zhao. U.S. Patent, filed June 1, 2006, granted March 13, 2012.

Professional Service

Program committee membership

- 2020 ASPLOS, Architectural Support for Programming Languages and Operating Systems.
- 2020 NSDI, Networked Systems Design and Implementation.
- 2019 SOSOP, Symposium on operating systems principles.
- 2019 Usenix ATC.
- 2019 ASPLOS, Architectural Support for Programming Languages and Operating Systems.
- 2019 VEE, SIGPLAN/SIGOPS Symposium on Virtual Execution Environments (Co-Chair).
- 2018 SoCC, ACM Symposium on Cloud Computing (Co-Chair).
- 2018 Usenix ATC.
- 2018 ASPLOS, Architectural Support for Programming Languages and Operating Systems.
- 2017 SOSOP, Symposium on operating systems principles.

- 2017 SoCC, ACM Symposium on Cloud Computing.
- 2017 Usenix ATC.
- 2017 Program co-chair for WWW Conference 2017: Infrastructure and Systems Track.
- 2016 OSDI, Operating systems design and implementation.
- 2016 OSDI Poster Session, (chair).
- 2016 Eurosys, European Systems Conference.
- 2016 PPOPP, Symposium on Principles and Practice of Parallel Programming.
- 2016 VEE, Virtual Execution Environments.
- 2013 IPDPS, IEEE International Parallel and Distributed Processing Symposium.
- 2012 IPDPS, IEEE International Parallel and Distributed Processing Symposium.

External review committees

- 2017 Eurosys, European Systems Conference.
- 2017 ASPLOS, Architectural Support for Programming Languages and Operating Systems.
- 2016 ASPLOS, Architectural Support for Programming Languages and Operating Systems.

Workshop program committees

- 2018 SFMA, Workshop on Systems for Future Multicore Architectures (PC-chair).
- 2017 HotOS, Hot Topics on Operating Systems.
- 2017 MaRS, Workshop on Multicore and Rack-scale Systems (PC-chair).
- 2016 MaRS, Workshop on Multicore and Rack-scale Systems (PC-chair).
- 2015 SFMA, Workshop on Systems for Future Multicore Architectures (PC-chair).
- 2014 SFMA, Workshop on Systems for Future Multicore Architectures (PC-chair).
- 2013 SFMA, Workshop on Systems for Future Multicore Architectures (PC-chair).
- 2012 SFMA, Workshop on Systems for Future Multicore Architectures.
- 2010 TRANSACT, ACM SIGPLAN Workshop on transactional computing.

Journal Editor

- 2016 Operating Systems Review.
- 2017 Operating Systems Review.
- 2018 Operating Systems Review.
- 2018 Operating Systems Review.
- 2019 Operating Systems Review.
- 2020 Operating Systems Review.

Current Doctoral Students

- 2016 Vance Miller
- 2016 Joshua Landgraf
- 2017 Hangchen Yu
- 2017 Ahmed Khawaja
- 2016 Arthur Peters
- 2016 John Thywissen

Dissertation committees

- TBD Roshan Dathathri (advisor: Keshav Pingali) "Programming Systems for Graph Analytics, Querying, Mining, and Homomorphic Encryption on Distributed and Heterogeneous Architectures"
- TBD Tyler Hunt (advisor: Emmett Witchel) "Private Computation on Public Clouds"
- TBD Wei-Ju Chen (advisor: Al Mok) "Resource Scheduling and Design of Real-Time Cyber-Physical Systems in the Open System Environment"
- 2020/02 Gurbinder Gill (advisor: Keshav Pingali) "Compiler and Runtime System for Resilient Distributed Heterogeneous Graph Analytics"
- 2020/02 Roshan Dathathri (advisor: Keshav Pingali) "Programming Systems for Graph Analytics, Querying, Mining, and Homomorphic Encryption on Distributed and Heterogeneous Architectures"
- 2019/04 Faruk Guvenilir (advisor: Yale Patt) "Scalable Virtual Memory via Tailored and Larger Page Sizes"
- 2019/08 Kyushick Lee (advisor: Mattan Erez) "Resilient Heterogeneous System with Containment Domains"
- 2019/05 Ahmet Cilik (advisor: Milos Gligoric) "Incremental and Parallel Software Testing and Proof Checking"
- 2018/09 Chunzhi Su (advisor: Lorenzo Alvisi) "Bringing Modular Concurrency Control to the Next Level"
- 2018/08 Youngjin Kwon (advisor: Emmett Witchel) "Designing Systems for Emerging Memory Technologies"
- 2016/09 Sankar Panneerselvam (advisor: Mike Swift) "System Design for Heterogeneous Architectures"
- 2017/10 Rachata Ausavarignirun (advisor: Onur Mutlu) "Techniques for Shared Resource Management in Systems with GPUs"

Invited lectures

- 2016/04 "Making Reconfigurable Fabric Actually Reconfigurable," Presented at ASPLOS WACI Session, Atlanta Georgia
- 2016/04 "Sweet Spots and Limits for Virtualization," VEE, Atlanta, GA
- 2012 Invited Speaker at Microprocessor/SoC Test and Verification (MTV 2012).
- 2009 Panel member at WDDD, ACM SIGPLAN Workshop on Duplicating, Deconstructing, and Debunking.