Michael Wei
Full-Stack Systems Researcher.

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about

I'm a full—stack systems researcher. This places me in a unique position to see synergies that can only be seen by understanding the entire system. For instance, I recognized that building inexpensive hardware can simplify a distributed system. I observed that programming language and architectural techniques can safely cut opaque operating system interfaces. Leveraging these insights, I prototype and build these systems with my colleagues — and most importantly, document research in a way that makes it accessible to all of computer science.

My most recent work looks at blockchains, which I view as the intersection of computer science and finance, and clocks, which still have much untapped potential in computer systems.

I work on a solo home remodel in my free time, tinker with home automation (contributions to home-assistant and Frigate Object Detection), and travel hack flights around the world.

experience

2020–Now	**Senior Research Scientist**	VMware Research

I lead the clocks project, which aims to democratize precision time and leverage it as a distributed primitive. I also serve as a technical advisor to the VMware blockchain product, especially in scaling the VMware Ethereum stack.

2017–2020	**Research Scientist**	VMware Research

I published award-winning papers on a broad range of topics including bridging the semantic gaps between kernel and userspace, interfaces for programmable hardware, RDMA and security.

2015–2017	**Postdoctoral Researcher**	VMware Research

I led the tech transfer of CorfuDB, a high throughput, strongly consistent research database as open-source software with over 50 contributors into NSX, VMware's market leading multi-billion dollar SDN product. CorfuDB now serves as the distributed control plane of NSX.

Winter 2015	**Research Intern**	VMware Research

I led the rebuild of CORFU, a research project I worked on at Microsoft Research, from scratch in Java as CorfuDB, adding object support, in-memory time-travel and new transaction resolution mechanisms.

2011–2013	**Consultant Researcher**	Microsoft Research

I implemented and evaluated ZooKeeper over CORFU, one of the first scale-out applications running on top of the CORFU distributed log.

Summer 2011	**Research Intern**	Microsoft Research

I built a hardware prototype of a CORFU Flash Unit using the BEE3 FPGA Platform.

2010–2017	**Graduate Researcher**	University of California, San Diego

At the Non-Volatile Systems Laboratory (NVSL), I led work on reliably erasing flash memory and reported findings to the military and other government organizations.

2008–2009	**Undergraduate Researcher**	University of California, Irvine

At the Cognitive Anteater Robotics Laboratory (CARL), I worked on an optimized version of the Izhikevich spiking neuron model on the IBM CELL.

2006–Now	**Independent Contractor**	Wei Enterprises

I build hardware and software for startups under tight deadlines. My code runs in consumer products all over the world.

education

2010–2017	**Ph.D., Computer Science**	University of California, San Diego
	Advisor Steven Swanson	
	Thesis CORFU: A Platform for Scalable Consistency	
2010–2015	**C. Phil, Computer Science**	University of California, San Diego
2010–2012	**M.S., Computer Science**	University of California, San Diego
2004–2009	**B.S., Computer Science**	University of California, Irvine
2004–2009	**B.S., Biological Sciences**	University of California, Irvine
2004–2009	**B.A., Philosophy**	University of California, Irvine

awards

2022	**Best Paper Award**	NSDI 2022
	Graham: Synchronizing Clocks by Leveraging Local Clock Properties	
2020	**Best Paper Award**	Eurosys 2020
	Don't shoot down TLB shootdowns!	
2019	**Best Paper Award**	Systor 2019
	Storm: A Fast Transactional Dataplane for Remote Data Structures	
2017	**Best Paper Award**	USENIX ATC 2018
	The Design and Implementation of Hyperupcalls	
2016	**Best Paper Award**	USENIX ATC 2016
	Replex: A Scalable, Highly Available Multi-Index Store	
2014	**Best WACI Talk**	ASPLOS 2014
	Dirty RAM and Rotten Caches: Saving the World From Useless Updates	
2012	**Google Security Hall of Fame**	Google
	Google Voice Authentication Flaw	
2012	**Graduate Research Fellowship Program (GRFP)**	NSF
	Fellow Award Receipient	
2011	**Graduate Research Fellowship Program (GRFP)**	NSF
	Honorable Mention	

publications

Refereed Papers

NSDI '22	Graham: Synchronizing Clocks by Leveraging Local Clock Properties
Best Paper	Ali Najafi and **Michael Wei**
	19th USENIX Symposium on Networked Systems Design and Implementation (NSDI 22), 2022, Renton, WA

SYSTOR '21	Dealing with (Some of) the Fallout from Meltdown
	Nadav Amit, **Michael Wei**, and Dan Tsafrir
	Proceedings of the 14th ACM International Conference on Systems and Storage, 2021, Haifa, Israel. DOI: *10.1145/3456727.3463776*

HotOS '21	Systems Research is Running out of Time
	Ali Najafi, Amy Tai, and **Michael Wei**
	Proceedings of the Workshop on Hot Topics in Operating Systems, 2021, Ann Arbor, Michigan. DOI: *10.1145/3458336.3465293*

USENIX ATC '21	**RainBlock: Faster Transaction Processing in Public Blockchains** Soujanya Ponnapalli, Aashaka Shah, Souvik Banerjee, Dahlia Malkhi, Amy Tai, Vijay Chidambaram, and **Michael Wei** *2021 USENIX Annual Technical Conference (USENIX ATC 21)*, 2021
OSDI '21	**Optimizing Storage Performance with Calibrated Interrupts** Amy Tai, Igor Smolyar, **Michael Wei**, and Dan Tsafrir *15th USENIX Symposium on Operating Systems Design and Implementation (OSDI 21)*, 2021
EuroSys '20 **Best Paper**	**Don't Shoot down TLB Shootdowns!** Nadav Amit, Amy Tai, and **Michael Wei** *Proceedings of the Fifteenth European Conference on Computer Systems*, 2020, Heraklion, Greece. DOI: *10.1145/3342195.3387518*
USENIX ATC '19	**JumpSwitches: Restoring the Performance of Indirect Branches In the Era of Spectre** Nadav Amit, Fred Jacobs, and **Michael Wei** *2019 USENIX Annual Technical Conference (USENIX ATC 19)*, 2019, Renton, WA
SYSTOR '19 **Best Paper**	**Storm: A Fast Transactional Dataplane for Remote Data Structures** Stanko Novakovic, Yizhou Shan, Aasheesh Kolli, Michael Cui, Yiying Zhang, Haggai Eran, Boris Pismenny, Liran Liss, **Michael Wei**, Dan Tsafrir, and Marcos Aguilera *Proceedings of the 12th ACM International Conference on Systems and Storage*, 2019, Haifa, Israel. DOI: *10.1145/3319647.3325827*
ASPLOS '19	**Just-In-Time Compilation for Verilog: A New Technique for Improving the FPGA Programming Experience** Eric Schkufza, **Michael Wei**, and Christopher J. Rossbach *Proceedings of the Twenty-Fourth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 19)*, 2019, Providence, RI, USA. DOI: *10.1145/3297858.3304010*
USENIX ATC '18	**Remote regions: a simple abstraction for remote memory** Marcos K. Aguilera, Nadav Amit, Irina Calciu, Xavier Deguillard, Jayneel Gandhi, Stanko Novaković, Arun Ramanathan, Pratap Subrahmanyam, Lalith Suresh, Kiran Tati, Rajesh Venkatasubramanian, and **Michael Wei** *2018 USENIX Annual Technical Conference (USENIX ATC 18)*, 2018, Boston, MA
USENIX ATC '18 **Best Paper**	**The Design and Implementation of Hyperupcalls** Nadav Amit and **Michael Wei** *2018 USENIX Annual Technical Conference (USENIX ATC 18)*, 2018, Boston, MA
OSDI '18	**Sharing, Protection, and Compatibility for Reconfigurable Fabric with AmorphOS** Ahmed Khawaja, Joshua Landgraf, Rohith Prakash, **Michael Wei**, Eric Schkufza, and Christopher J. Rossbach *13th USENIX Symposium on Operating Systems Design and Implementation (OSDI 18)*, 2018, Carlsbad, CA
HotOS '17	**Hypercallbacks: Decoupling Policy Decisions and Execution** Nadav Amit, **Michael Wei**, and Cheng-Chun Tu *Proceedings of the 16th Workshop on Hot Topics in Operating Systems*, 2017, Whistler, BC, Canada. DOI: *10.1145/3102980.3102987*
SysTeX '17	**Hypercallbacks: A New Mechanism for Trusted, Secure Introspection** **Michael Wei** and Nadav Amit *2nd Workshop on System Software for Trusted Execution (SysTEX 2017)*, 2017, Shanghai, CN
NSDI '17	**vCorfu: A Cloud-Scale Object Store on a Shared Log** **Michael Wei**, Amy Tai, Christopher J. Rossbach, Ittai Abraham, Maithem Munshed, Medhavi Dhawan, Jim Stabile, Udi Wieder, Scott Fritchie, Steven Swanson, Michael J. Freedman, and Dahlia Malkhi *14th USENIX Symposium on Networked Systems Design and Implementation (NSDI 17)*, 2017, Boston, MA
USENIX ATC '16 **Best Paper**	**Replex: A Scalable, Highly Available Multi-Index Data Store** Amy Tai, **Michael Wei**, Michael J. Freedman, Ittai Abraham, and Dahlia Malkhi *2016 USENIX Annual Technical Conference (USENIX ATC 16)*, 2016, Denver, CO

HotStorage '16	**Silver: A Scalable, Distributed, Multi-versioning, Always Growing (Ag) File System** **Michael Wei**, Chris Rossbach, Ittai Abraham, Udi Wieder, Steven Swanson, Dahlia Malkhi, and Amy Tai *8th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 16)*, 2016, Denver, CO
NVMW '15	**AppNVM: A software-defined, application-driven SSD** Matias Bjørling, **Michael Wei**, Jesper Madsen, Javier González, Steven Swanson, and Philippe Bonnet *6th Annual Non-Volatile Memories Workshop 2015 (NVMW 2015)*, 2015, San Diego, CA
USENIX ATC '14	**I/O Speculation for the Microsecond Era** **Michael Wei**, Matias Bjørling, Philippe Bonnet, and Steven Swanson *2014 USENIX Annual Technical Conference (USENIX ATC 14)*, 2014, Philadelphia, PA
SOSP '13	**Tango: Distributed Data Structures over a Shared Log** Mahesh Balakrishnan, Dahlia Malkhi, Ted Wobber, Ming Wu, Vijayan Prabhakaran, **Michael Wei**, John D. Davis, Sriram Rao, Tao Zou, and Aviad Zuck *Proceedings of the Twenty-Fourth ACM Symposium on Operating Systems Principles*, 2013, Farminton, Pennsylvania. DOI: *10.1145/2517349.2522732*
IEEE S&P '13	**Welcome to the Entropics: Boot-Time Entropy in Embedded Devices** Keaton Mowery, **Michael Wei**, David Kohlbrenner, Hovav Shacham, and Steven Swanson *2013 IEEE Symposium on Security and Privacy*, 2013, Oakland, CA. DOI: *10.1109/SP.2013.46*
SYSTOR '13	**Beyond Block I/O: Implementing a Distributed Shared Log in Hardware** **Michael Wei**, John D. Davis, Ted Wobber, Mahesh Balakrishnan, and Dahlia Malkhi *Proceedings of the 6th International Systems and Storage Conference*, 2013, Haifa, Israel. DOI: *10.1145/2485732.2485739*
NSDI '12	**CORFU: A Shared Log Design for Flash Clusters** Mahesh Balakrishnan, Dahlia Malkhi, Vijayan Prabhakaran, Ted Wobbler, **Michael Wei**, and John D. Davis *9th USENIX Symposium on Networked Systems Design and Implementation (NSDI 12)*, 2012, San Jose, CA
FAST'11	**Reliably Erasing Data from Flash-Based Solid State Drives** **Michael Wei**, Laura M. Grupp, Frederick E. Spada, and Steven Swanson *Proceedings of the 9th USENIX Conference on File and Stroage Technologies*, 2011, San Jose, California
BuildSys'10	**Occupancy-Driven Energy Management for Smart Building Automation** Yuvraj Agarwal, Bharathan Balaji, Rajesh Gupta, Jacob Lyles, **Michael Wei**, and Thomas Weng *Proceedings of the 2nd ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Building*, 2010, Zurich, Switzerland. DOI: *10.1145/1878431.1878433*

Journal Articles

Leveraging Hyperupcalls To Bridge The Semantic Gap: An Application Perspective
Michael Wei and Nadav Amit
IEEE Data Eng. Bull. *42.1 (2019) pp. 22–35. 2019*

Consistent Clustered Applications with Corfu
Michael Wei, Medhavi Dhawan, Gurprit Johal, Jim Stabile, Vjekoslav Brajkovic, James Chang, Kapil Goyal, Kevin James, Zeeshan Lokhandwala, Anny Martinez Manzanilla, Roger Michoud, Maithem Munshed, Srinivas Neginhal, Konstantin Spirov, Scott Fritchie, Chris Rossbach, Ittai Abraham, and Dahlia Malkhi
SIGOPS Oper. Syst. Rev. *51.1 (Sept. 2017) pp. 78–82. Association for Computing Machinery, 2017*, DOI: *10.1145/3139645.3139658*

CORFU: A Distributed Shared Log
Mahesh Balakrishnan, Dahlia Malkhi, John D. Davis, Vijayan Prabhakaran, **Michael Wei**, and Ted Wobber
ACM Trans. Comput. Syst. *31.4 (Dec. 2013). Association for Computing Machinery, 2013*, DOI: *10.1145/2535930*

Technical Reports

Dynamically scalable, fault-tolerant coordination on a shared logging service
Michael Wei, Mahesh Balakrishnan, John D Davis, Dahlia Malkhi, Vijayan Prabhakaran, and Ted Wobber

Technical Report MSR-TR-2013-40, 2013

SAFE: Fast, Verifiable Sanitization for SSDs
   Steven Swanson and **Michael Wei**
   Technical Report UCSD TR-cs2011-0963, 2011

Patents

US10545742B2	Annotation-driven framework for generating state machine updates
US20210026785A1	Enforcing code integrity using a trusted computing base
US11055184B2	In-place garbage collection of a sharded, replicated distributed state machine
US11003471B2	Just-in-time hardware for field programmable gate arrays
US11003472B2	Just-in-time hardware for field programmable gate arrays
US10997338B2	Just-in-time hardware for field programmable gate arrays
US10990730B2	Just-in-time hardware for field programmable gate arrays
US10990730B2	Just-in-time hardware for field programmable gate arrays
US11068422B1	Software-controlled interrupts for I/O devices
US10908912B1	Target injection safe method for dynamically inlining branch predictions
US10649981B2	Direct access to object state in a shared log
US10642792B2	Distributed transaction conflict resolution
US10819611B2	Dynamic timeout-based fault detection
US10706005B2	File system interface for remote direct memory access
US10635541B2	Fine-grained conflict resolution in a shared log
US10877881B2	In-place garbage collection of a sharded, replicated distributed state machine
US10574571B2	Method for transparently logging and replicating distributed services
US10599835B2	32-bit address space containment to secure processes from speculative rogue cache loads
US10878085B2	Compilation-time checks to secure processes from speculative rogue cache loads
US20190243966A1	Dynamic binary translation to secure processes from speculative rogue cache loads
US10824717B2	Dynamic binary translation to secure processes from speculative rogue cache loads
US11016767B2	Target injection safe method for inlining instance-dependent calls
US10834255B1	Target injection safe method for inlining large call tables
US10871974B1	Target injection safe method for inlining registration calls
US20190065327A1	Efficient versioned object management
US20190129982A1	Just-in-time multi-indexed tables in a shared log
US20190243776A1	32-bit address space containment to secure processes from speculative rogue cache loads
US20190243965A1	Compilation-time checks to secure processes from speculative rogue cache loads
US20190243990A1	Separate cores to secure processes from speculative rogue cache loads
US20190236229A1	Just-in-time hardware for field programmable gate arrays
US20190235892A1	Just-in-time hardware for field programmable gate arrays
US20190236231A1	Just-in-time hardware for field programmable gate arrays

US20190235893A1   Just-in-time hardware for field programmable gate arrays

US20190236230A1   Just-in-time hardware for field programmable gate arrays

US20180276234A1   Distributed transaction conflict resolution

US20180321963A1   Safe execution of virtual machine callbacks in a hypervisor

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service

2024	**PC Member**	ASPLOS
2023	**PC Member**	OSDI
2022–2023	**PC Member**	NSDI
2020	**PC Member**	HotCloud
2018–2019	**PC Member**	USENIX ATC
2018	**PC Member**	ACM SoCC
2017	**PC Member**	ACM Middleware
2017–2023	**PC Member**	HotStorage
2011–2015	**Web Chair**	NVMW

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