

IRENE Y. ZHANG

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EDUCATION

University of Washington Seattle, WA
Ph.D. in Computer Science and Engineering Sept 2017
Advisors: Hank Levy and Arvind Krishnamurthy
Thesis: *Towards a Flexible, High-Performance Operating System for Mobile/Cloud Applications*

University of Washington Seattle, WA
M.S. in Computer Science and Engineering December 2013
Advisors: Hank Levy, Arvind Krishnamurthy, and Steve Gribble
Thesis: *Simplifying Mobile/Cloud Applications with Sapphire*

Massachusetts Institute of Technology Cambridge, MA
M.Eng. in Electrical Engineering and Computer Science June 2009
Advisors: M. Frans Kaashoek and Jeremy Stribling
Thesis: *Efficient File Distribution in a Flexible, Wide-area File System*

Massachusetts Institute of Technology Cambridge, MA
S.B. in Computer Science and Engineering June 2008

INTERESTS Operating systems, distributed systems, virtualization, and networking

RECENT RESEARCH

Automating Data Management for Reactive Applications OSDI '16
Diamond is a new data management system for wide-area, reactive applications. Reactive applications automatically propagate updates across across mobile devices and the cloud server. Diamond simplifies this task by providing applications with persistent cloud storage, reliable synchronization between storage and mobile devices, and automated execution of application code in response to shared data updates.

Building Consistent Transactions with Inconsistent Replication SOSPP '15
TAPIR – the Transactional Application Protocol for Inconsistent Replication – provides externally consistent transactions using a replication protocol with *no consistency guarantees*. TAPIR eliminates the need for a Paxos leader and commits transactions *in a single round-trip*. Compared to a conventional protocol, TAPIR halves the commit latency and triples the throughput.

Simplifying Deployment for Mobile/Cloud Applications OSDI '14
Sapphire is a new distributed programming platform providing customizable and extensible deployment of mobile/cloud applications. The key concept is an architecture that supports *deployment managers* (DMs), which solve complex distributed systems tasks, such as code-offloading and caching. Rather than writing distributed systems code, programmers compose a custom deployment using DMs to meet their application's needs.

Enforcing User Privacy Policies for Mobile/Cloud Applications
Agate is a new trusted distributed runtime system that enforces user sharing policies on untrusted applications. Agate uses information flow control to give users both *access control* (i.e., which applications have access to their data) and *flow control* (i.e., whom applications can share that data with). Agate leverages the mobile OS to automatically tag user data without trusting the application or the application programmer.

Arrakis: The Operating System is the Control Plane OSDI '14
Arrakis is a new operating system that provides high performance I/O using hardware virtualization technology, which is designed to eliminate the hypervisor from fast-path I/O operations. Arrakis takes this technology a step further by using it to eliminate the operating system as well, allowing applications to directly access the hardware during normal execution and providing significantly better performance, reliability and customizability.

CONFERENCE
PUBLICATIONS

I. Zhang, N. Lebeck, P. Fonseca, B. Holt, R. Cheng, A. Norberg, A. Krishnamurthy, H. M. Levy. *Automating Data Management for Wide-area, Reactive Applications*. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Savannah, GA. November 2016.

B. Holt, J. Bornholt, **I. Zhang**, D. R. K. Ports, M. Oskin, L. Ceze. *Disciplined Inconsistency*. In Proceedings of the ACM Symposium on Cloud Computing (SoCC). Santa Clara, CA. October 2016.

I. Zhang, N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. *Building Consistent Transactions with Inconsistent Replication..* In Proceedings of the ACM Symposium on Operating Systems Principles (SOSP). Monterey, CA. October 2015.

I. Zhang, A. Szekeres, D. Van Aken, I. Ackerman, S. D. Gribble, A. Krishnamurthy, H. M. Levy. *Customizable and Extensible Deployment for Mobile/Cloud Applications*. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Broomfield, CO. October 2014.

S. Peter, J. Li, **I. Zhang**, D. R. K. Ports, D. Woos, A. Krishnamurthy, T. Anderson, T. Roscoe. *Arrakis: The Operating System is the Control Plane*. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Broomfield, CO. October 2014. **Best Paper Award**.

I. Zhang, T. Denniston, Y. Baskakov, A. Garthwaite. *Optimizing VM Checkpointing for Restore Performance in VMware ESXi*. In Proceedings of the USENIX Annual Technical Conference (USENIX ATC). San Jose, CA. June 2013.

I. Zhang, A. Garthwaite, Y. Baskakov, K. C. Barr. *Fast Restore of Checkpointed Memory Using Working Set Estimation*. In Proceedings of the ACM Conference on Virtual Execution Environments (VEE). Newport Beach, CA. March 2011.

D. R. K. Ports, A. Clements, **I. Zhang**, S. Madden, B. Liskov. *Transactional Consistency and Automatic Management in an Application Data Cache*. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Vancouver, Canada. October 2010.

J. Stribling, Y. Sovran, **I. Zhang**, X. Pretzer, J. Li, M. F. Kaashoek, R. Morris. *Flexible, Wide-Area Storage for Distributed Systems with WheelFS*. In Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI). Boston, MA. April 2009.

JOURNAL
PUBLICATIONS

I. Zhang, F. Adib, P. Bailis. *Research for Practice: Distributed Transactions and Networks as Physical Sensors*. ACM Queue. October 2016.

I. Zhang, N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. *When Is Operation Ordering Required in Replicated Transactional Storage?*. IEEE Data Engineering Bulletin. March 2016.

S. Peter, J. Li, **I. Zhang**, D. R. K. Ports, D. Woos, A. Krishnamurthy, T. Anderson, T. Roscoe. *Arrakis: The Operating System is the Control Plane*. ACM Transactions on Computer Systems (TOCS). November 2015.

WORKSHOP
PUBLICATIONS

A. Szekeres and **I. Zhang**. *Making Consistency More Consistent: A Unified Model for Coherence, Consistency and Isolation*. In Proceedings of the Workshop on Principles and Practice of Consistency for Distributed Data (PaPoC). Porto, Portugal. April 2018.

B. Holt, **I. Zhang**, D. R. K. Ports, M. Oskin and L. Ceze. *Claret: Using Data Types for Highly Concurrent Distributed Transactions*. In Proceedings of the Workshop on Principles and Practice of Consistency for Distributed Data (PaPoC). Bordeaux, France. April 2015.

S. Peter, J. Li, D. Woos, **I. Zhang**, D. R. K. Ports, T. Anderson, A. Krishnamurthy, M. Zbikowski. *Towards High-Performance Application-Level Storage Management*. In Proceedings of the USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage). Philadelphia, PA. June 2014.

POSTERS &
EXTENDED
ABSTRACTS

- I. Zhang**, N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. *Optimistic, Replicated Two-Phase Commit*. ACM Asia-Pacific Workshop on Systems (APSys). Beijing, China. June 2014.
- I. Zhang**, A. Garthwaite, Y. Baskakov, K. C. Barr, J. Pool, K. Christopher. *Fast Restore of Checkpointed Memory Using Working Set Estimation*. ACM Symposium on Operating Systems Principles (SOSP). Big Sky, MT. October 2009.
- I. Zhang**, K. C. Barr. *Improving VMware Workstation Restore using Working Set Estimation*. VMworld Conference. Las Vegas, NV. September 2008.

FELLOWSHIPS
& AWARDS

- UW CSE William Chan Memorial Dissertation** 2018
- Microsoft Research PhD Fellowship** 2015
- Google Anita Borg Memorial Fellowship** 2015
- National Science Foundation Fellowship** 2013
- ARCS Foundation Fellowship** 2012
- Jeff Dean and Heidi Hopper Endowed Regental Fellowship** 2012
- OSDI Best Paper Award** 2014
- CRA Outstanding Undergraduate Award, Honorable Mention** 2008
- Rising Stars Workshop** 2016
- NCWIT Collegiate Award Runner-up** 2016
- UW CSE Industrial Affiliates Madrona Prize Runner-Up** 2015
- Bob Bandes Teaching Award Honorable Mention** 2015
- UW CSE Industrial Affiliates Madrona Prize** 2014
- National Science Board Annual Meeting Student Panel** 2013
- VMware Academic Program Top Intern Project** 2008
- Northern Telecom/BNR Award for Best Undergrad. Lab Project** 2006

SERVICE

- NSDI, Program Committee** 2019
- ASPLOS, Program Committee** 2019
- OSDI, Program Committee** 2018
- USENIX ATC, Program Committee** 2018
- VEE, Program Committee** 2018
- ASPLOS, External Reviewer** 2017
- OSDI, External Reviewer** 2016
- HotCloud, Program Committee** 2016
- UW HotPoCSci, Founder** 2015
- UW PoCSci, PC Chair** 2015-2016
- UW CSE Annual Women's Research Day Committee** 2017
- Chair** 2016
- Founder** 2015

TEACHING	Distributed Systems (UW CSE 452)	Seattle, WA
	Teaching Assistant	Winter 2016
	Teaching Assistant	Winter 2015
	Introduction to Operating Systems (UW CSE 451)	Seattle, WA
	Tutor	Spring 2016
	Tutor	Fall 2014
	Tutor	Spring 2014
	Guest Lecturer	Fall 2013
	Tutor	Spring 2013
	The Hardware/Software Interface (UW CSE 351)	Seattle, WA
	Tutor, UW Department of CSE	Winter 2014
	Tutor, UW Department of CSE	Winter 2013
	Operating Systems Engineering (MIT 6.828)	Cambridge, MA
	Teaching Assistant	Fall 2008
Intro. to Digital Systems Lab (MIT 6.111)	Cambridge, MA	
Teaching Assistant	Spring 2008	
Computation Structures (MIT 6.004)	Cambridge, MA	
Lab Assistant	Spring 2007	
Intro. to Computer Science and Programming (MIT 6.00)	Cambridge, MA	
Lab Assistant	Fall 2006	
PATENTS	US Patent App. 12/559,484. <i>Saving and Restoring State Information for Virtualized Computer Systems.</i> I. Zhang , K. C. Barr, G. Venkitachalam, I. Ahmad, A. Garthwaite, J. Pool.	
	US Patent App. 13/710,185. <i>Method for Saving Virtual Machine State from a Checkpoint File.</i> A. Garthwaite, Y. Baskakov, I. Zhang , K. Christopher, J. Pool.	
	US Patent App. 13/710,215. <i>Method for Restoring Virtual Machine State from a Checkpoint File.</i> A. Garthwaite, Y. Baskakov, I. Zhang , K. Christopher, J. Pool.	
	US Patent App. 13/935,382. <i>Identification of Page Sharing Opportunities within Large Pages.</i> Y. Baskakov, A. Garthwaite, R. Venkatasubramanian, I. Zhang , S. Kim, N. Bhatia, K. Tati	
WORK EXPERIENCE	Microsoft Research	Redmond, WA
	Researcher, Systems Research Group	Oct 2017 - current
	VMware, Inc.	Cambridge, MA
	MTS, Virtual Machine Monitor Group	Jan 2010 - Feb 2013
	VMware, Inc.	Cambridge, MA
	R&D Intern, Virtual Machine Monitor Group	Jul - Dec 2009
	VMware, Inc.	Cambridge, MA
	R&D Intern, Core Performance Group	Jun - Aug 2008
	Quickware Engineering and Design	Waltham, MA
Engineering Intern	Jun - Aug 2007	
Cummins, Inc.	Columbus, IN	
Engineering Intern, Analysis Led Design	Jun - Aug 2005	
Cummins, Inc.	Beijing, China	
International Business Intern	Jun - Jul 2004	
ArvinMeritor, Inc.	Columbus, IN	
Web Development Intern	Aug 2003 - May 2004	