

IRENE Y. ZHANG

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EDUCATION	<p>University of Washington Seattle, WA Ph.D. in Computer Science and Engineering Advisors: Hank Levy and Arvind Krishnamurthy</p> <p>University of Washington Seattle, WA M.S. in Computer Science and Engineering December 2013 Advisors: Hank Levy, Arvind Krishnamurthy, and Steve Gribble Thesis: <i>Simplifying Mobile/Cloud Applications with Sapphire</i></p> <p>Massachusetts Institute of Technology Cambridge, MA M.Eng. in Electrical Engineering and Computer Science June 2009 Advisor: M. Frans Kaashoek Thesis: <i>Efficient File Distribution in a Flexible, Wide-area File System</i></p> <p>Massachusetts Institute of Technology Cambridge, MA S.B. in Computer Science and Engineering June 2008</p>
INTERESTS	Operating systems, distributed systems, virtualization and networking
RESEARCH	<p>Building Consistent Transactions with Inconsistent Replication TAPIR – the Transactional Application Protocol for Inconsistent Replication – provides externally consistent transactions using a replication protocol with <i>no consistency guarantees</i>. Unlike conventional protocols that use Paxos, TAPIR does not require a Paxos leader or coordination between replicas in a shard. Thus, TAPIR can commit a transaction <i>in a single round-trip</i> and eliminate the bottleneck at the Paxos leader.</p> <p>Customizable and Extensible Deployment for Mobile/Cloud Applications Sapphire is a new distributed programming platform providing customizable and extensible deployment of mobile/cloud applications. The key concept is an architecture that supports <i>deployment managers</i>, which solve complex distributed systems tasks, such as code-offloading and caching. Rather than writing distributed systems code, programmers compose a custom deployment to meet their application’s needs.</p> <p>User-controlled Privacy for Mobile/Cloud Applications Agate is a new trusted distributed runtime system that gives users control over how mobile/cloud applications share sensitive user data collected on mobile devices (e.g., photos, GPS location). Agate combines aspects of access control and information flow control to allow applications to share user data in application-specific ways, while enforcing user policies without trusting the application or the application programmer.</p> <p>Arrakis: The Operating System is the Control Plane Arrakis is a new operating system that provides high performance I/O by taking advantage of hardware virtualization technology. Hardware virtualization technologies are 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.</p> <p>Improving VM Checkpoint Restore Performance With collaborators at VMware, I developed two techniques for improving the performance of restoring checkpointed virtual machines. The first estimates and prefetches the working set of the checkpointed VM on restore, improving the responsiveness of the VM during restore. The second groups memory pages together on disk that are likely to be accessed together, improving disk efficiency during restore.</p>

CONFERENCE PUBLICATIONS	<p>Irene Zhang, Adriana Szekeres, Dana Van Aken, Isaac Ackerman, Steven D. Gribble, Arvind Krishnamurthy, Henry M. Levy. <i>Customizable and Extensible Deployment for Mobile/Cloud Applications</i>. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Broomfield, CO. October 2014.</p> <p>Simon Peter, Jialin Li, Irene Zhang, Dan R. K. Ports, Doug Woos, Arvind Krishnamurthy, Thomas Anderson, Timothy Roscoe. <i>Arrakis: The Operating System is the Control Plane</i>. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Broomfield, CO. October 2014. Best Paper Award.</p> <p>Irene Zhang, Tyler Denniston, Yury Baskakov, Alex Garthwaite. <i>Optimizing VM Checkpointing for Restore Performance in VMware ESXi</i>. In Proceedings of the USENIX Annual Technical Conference (USENIX ATC). San Jose, CA. June 2013.</p> <p>Irene Zhang, Alex Garthwaite, Yury Baskakov, Kenneth C. Barr. <i>Fast Restore of Checkpointed Memory Using Working Set Estimation</i>. In Proceedings of the ACM Conference on Virtual Execution Environments (VEE). Newport Beach, CA. March 2011.</p> <p>Dan R. K. Ports, Austin Clements, Irene Zhang, Samuel Madden, Barbara Liskov. <i>Transactional Consistency and Automatic Management in an Application Data Cache</i>. In Proceedings of the USENIX Symposium on Operating Systems Design and Implementation (OSDI). Vancouver, Canada. October 2010.</p> <p>Jeremy Stribling, Yair Sovran, Irene Zhang, Xavid Pretzer, Jinyang Li, M. Frans Kaashoek, Robert Morris. <i>Flexible, Wide-Area Storage for Distributed Systems with WheelFS</i>. In Proceedings of the USENIX Symposium on Networked Systems Design and Implementation (NSDI). Boston, MA. April 2009.</p>
IN SUBMISSION	<p>Irene Zhang, Naveen Kr. Sharma, Adriana Szekeres, Dan R. K. Ports, Arvind Krishnamurthy. <i>Building Consistent Transactions with Inconsistent Replication</i>.</p> <p>Adriana Szekeres, Irene Zhang, Isaac Ackerman, Franziska Roesner, Dan R. K. Ports, Arvind Krishnamurthy, Henry M. Levy. <i>User-controlled Privacy: Enforcing Privacy Policies on Mobile/Cloud Applications</i>.</p>
WORKSHOP PUBLICATIONS	<p>Simon Peter, Jialin Li, Doug Woos, Irene Zhang, Dan R. K. Ports, Thomas Anderson, Arvind Krishnamurthy, Mark Zbikowski. <i>Towards High-Performance Application-Level Storage Management</i>. In Proceedings of the USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage). Philadelphia, PA. June 2014.</p>
POSTERS & EXTENDED ABSTRACTS	<p>Irene Zhang, Naveen Kr. Sharma, Adriana Szekeres, Dan R. K. Ports, Arvind Krishnamurthy. <i>Optimistic, Replicated Two-Phase Commit</i>. ACM Asia-Pacific Workshop on Systems (APSys). Beijing, China. June 2014.</p> <p>Irene Zhang, Alex Garthwaite, Yury Baskakov, Kenneth C. Barr, Jesse Pool, Kevin Christopher. <i>Fast Restore of Checkpointed Memory Using Working Set Estimation</i>. ACM Symposium on Operating Systems Principles (SOSP). Big Sky, MT. October 2009.</p> <p>Irene Zhang, Kenneth C. Barr. <i>Improving VMware Workstation Restore using Working Set Estimation</i>. VMworld Conference. Las Vegas, NV. September 2008.</p>

PATENTS	US Patent App. 12/559,484. Saving and Restoring State Information for Virtualized Computer Systems. I. Zhang , K. C. Barr, G. Venkitachalam, I. Ahmad, A. Garthwaite, J. Pool.	
	US Patent App. 13/710,185. Method for Saving Virtual Machine State from a Checkpoint File. A. Garthwaite, Y. Baskakov, I. Zhang , K. Christopher, J. Pool.	
	US Patent App. 13/710,215. Method for Restoring Virtual Machine State from a Checkpoint File. A. Garthwaite, Y. Baskakov, I. Zhang , K. Christopher, J. Pool.	
HONORS & AWARDS	Microsoft Research PhD Fellowship	2015
	Industrial Affiliates Madrona Prize	2014
	OSDI Best Paper Award	2014
	National Science Board Annual Meeting Student Panel	2013
	National Science Foundation Fellowship	2013
	ARCS Foundation Fellowship	2012
	Jeff Dean and Heidi Hopper Endowed Regental Fellowship	2012
	VMware Academic Program Top Intern Project	2008
	CRA Outstanding Undergraduate Award, Honorable Mention	2008
	Northern Telecom/BNR Award for Best Undergrad. Lab Project	2006
TALKS	Operating Systems for Modern Applications CSE Symposium	Jan 2015
	Building Consistent Transactions with Inconsistent Replication Amazon Tech Talk, Host: Andrew Certain	Nov 2014
	Customizable and Extensible Deployment for Mobile/Cloud Applications MSR Tech Talk, Host: Phil Bernstein	Nov 2014
	UW CSE Industrial Affiliates Meeting	Oct 2014
	Symposium on Operating Systems Design and Implementation (OSDI)	Oct 2014
	UW Systems Seminar	Oct 2014
	Symposium on Operating Systems Principles (SOSP) Work-in-Progress	Nov 2013
	UW/MSR Research Day	Apr 2013
	Optimizing VM Checkpointing for Restore Performance in VMware ESXi USENIX Annual Technical Conference (USENIX ATC)	Jun 2013
	Fast Restore of Checkpointed Memory using Working Set Estimation University of Washington Tech Talk	Oct 2011
	Cornell SWE Tech Talk	Sep 2011
	Conference on Virtual Execution Environments (VEE)	Mar 2011

PRESS	<i>Cutting-edge server operating system wins UW computer science prize.</i> GeekWire. October 23, 2014.	
	<i>Faster websites, more reliable data.</i> MIT News. October 14, 2010.	
SERVICE	UW Conference on Potentially Computer Science (PoCSci) Program Co-chair	2015
	UW Graduate Student Committee Graduate Women's Event Coordinator Graduate Visit Days Committee Co-chair	2014-2015 2013-2014
	UW Graduate Student Mentor	2013-2014
	VMware Women's Outreach and Recruiting	2009-2012
	Eta Kappa Nu EECS Honor Society Officer	2008-2009
TEACHING	Distributed Systems (CSE 452) Teaching Assistant, UW Department of CSE	Winter 2015
	Introduction to Operating Systems (CSE 451) Tutor, UW Department of CSE Tutor, UW Department of CSE Guest Lecturer, UW Department of CSE Tutor, UW Department of CSE	Fall 2014 Spring 2014 Fall 2013 Spring 2013
	The Hardware/Software Interface (CSE 351) Tutor, UW Department of CSE Tutor, UW Department of CSE	Winter 2014 Winter 2013
	Operating Systems Engineering (6.828) Teaching Assistant, MIT Department of EECS	Fall 2008
	Intro. to Digital Systems Lab (6.111) Teaching Assistant, MIT Department of EECS	Spring 2008
	Computation Structures (6.004) Lab Assistant, MIT Department of EECS	Spring 2007
	Intro. to Computer Science and Programming (6.00) Lab Assistant, MIT Department of EECS	Fall 2006

WORK EXPERIENCE	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