

# IRENE Y. ZHANG

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EDUCATION	<p><b>University of Washington</b> <span style="float: right;">Seattle, WA</span> Ph.D. in Computer Science and Engineering Advisors: Hank Levy and Arvind Krishnamurthy</p> <p><b>University of Washington</b> <span style="float: right;">Seattle, WA</span> M.S. in Computer Science and Engineering <span style="float: right;">December 2013</span> Advisors: Hank Levy, Arvind Krishnamurthy, and Steve Gribble Thesis: <i>Simplifying Mobile/Cloud Applications with Sapphire</i></p> <p><b>Massachusetts Institute of Technology</b> <span style="float: right;">Cambridge, MA</span> M.Eng. in Electrical Engineering and Computer Science <span style="float: right;">June 2009</span> Advisor: M. Frans Kaashoek Thesis: <i>Efficient File Distribution in a Flexible, Wide-area File System</i></p> <p><b>Massachusetts Institute of Technology</b> <span style="float: right;">Cambridge, MA</span> S.B. in Computer Science and Engineering <span style="float: right;">June 2008</span></p>
INTERESTS	Operating systems, distributed systems, virtualization and networking
RESEARCH	<p><b>Building Consistent Transactions with Inconsistent Replication</b> 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><b>Customizable and Extensible Deployment for Mobile/Cloud Applications</b> 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><b>User-controlled Privacy for Mobile/Cloud Applications</b> 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><b>Arrakis: The Operating System is the Control Plane</b> 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><b>Improving VM Checkpoint Restore Performance</b> 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>

PUBLICATIONS	<b>I. Zhang</b> , N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. <i>Building Consistent Transactions with Inconsistent Replication</i> . In submission.
	A. Szekeres, <b>I. Zhang</b> , I. Ackerman, F. Roesner, D. R. K. Ports, A. Krishnamurthy, H. Levy. <i>User-controlled Privacy: Enforcing Privacy Policies on Mobile/Cloud Applications</i> . In submission.
	<b>I. Zhang</b> , A. Szekeres, D. Van Aken, I. Ackerman, S. D. Gribble, A. Krishnamurthy, H. Levy. <i>Customizable and Extensible Deployment for Mobile/Cloud Applications</i> . In Proc. of OSDI '14.
	S. Peter, J. Li, D. Woos, <b>I. Zhang</b> , D. R. K. Ports, A. Krishnamurthy, T. Anderson, T. Roscoe. <i>Arrakis: The Operating System is the Control Plane</i> . In Proc. of OSDI '14. <b>Best Paper Award</b> .
	S. Peter, J. Li, D. Woos, <b>I. Zhang</b> , D. R. K. Ports, T. Anderson, A. Krishnamurthy, M. Zbikowski. <i>Towards High-Performance Application-Level Storage Management</i> . In Proc. of HotStorage '14.
	<b>I. Zhang</b> , T. Denniston, Y. Baskakov, A. Garthwaite. <i>Optimizing VM Checkpointing for Restore Performance in VMware ESXi</i> . In Proc. of USENIX ATC '13. San Jose, CA. June 2013.
	<b>I. Zhang</b> , A. Garthwaite, Y. Baskakov, K. C. Barr. <i>Fast Restore of Checkpointed Memory Using Working Set Estimation</i> . In Proc. of VEE '11. Newport Beach, CA. March 2011.
	D. R. K. Ports, A. Clements, <b>I. Zhang</b> , S. Madden, B. Liskov. <i>Transactional Consistency and Automatic Management in an Application Data Cache</i> . In Proc. of OSDI '10. Vancouver, Canada. October 2010.
	J. Stribling, Y. Sovran, <b>I. Zhang</b> , X. Pretzer, J. Li, M. F. Kaashoek, R. Morris. <i>Flexible, Wide-Area Storage for Distributed Systems with WheelFS</i> . In Proc. of NSDI '09. Boston, MA. April 2009.
	<b>I. Zhang</b> , N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. <i>Optimistic, Replicated Two-Phase Commit</i> . Poster at APSys '14. Beijing, China. June 2014.
POSTERS & EXTENDED ABSTRACTS	<b>I. Zhang</b> , A. Szekeres, D. Van Aken, I. Ackerman, S. D. Gribble, A. Krishnamurthy, H. Levy. <i>Customizable and Extensible Deployment for Mobile/Cloud Applications</i> . Work-in-Progress talk at SOSP '13. Farmington, PA. November 2013.
	<b>I. Zhang</b> , A. Garthwaite, Y. Baskakov, K. C. Barr, J. Pool, K. Christopher. <i>Fast Restore of Checkpointed Memory Using Working Set Estimation</i> . Poster at SOSP '09. Big Sky, MT. October 2009.
	<b>I. Zhang</b> , K. C. Barr. <i>Improving VMware Workstation Restore using Working Set Estimation</i> . Poster at VMworld '08. Las Vegas, NV. September 2008.
PATENTS	US Patent App. 12/559,484.
	Saving and Restoring State Information for Virtualized Computer Systems.
	<b>I. Zhang</b> , K. C. Barr, G. Venkitachalam, I. Ahmad, A. Garthwaite, J. Pool.

HONORS AND AWARDS	<b>National Science Board Annual Board Meeting Student Panel</b>	2013
	<b>National Science Foundation Fellowship</b>	2013
	<b>ARCS Foundation Fellowship</b>	2012
	<b>Jeff Dean and Heidi Hopper Endowed Regental Fellowship</b>	2012
	<b>VMware Academic Program Top Intern Project</b>	2008
	<b>CRA Outstanding Undergraduate Award, Honorable Mention</b>	2008
	<b>Officer, Eta Kappa Nu EECS Honor Society</b>	2008
	<b>Northern Telecom/BNR Award for Best Undergrad. Lab Project</b>	2006
TEACHING	<b>Operating Systems Engineering (6.828)</b>	Sept - Dec 2008
	Teaching Assistant, MIT Department of EECS Developed and graded labs assignments where students build an exokernel-style OS. Held weekly office hours to help students with labs and OS fundamentals like virtual memory management, interrupt handlers and process management.	
	<b>Intro. to Digital Systems Lab (6.111)</b>	Jan - May 2008
	Teaching Assistant, MIT Department of EECS Taught weekly recitations and helped students with labs using FPGAs and Verilog. Helped students design and implement complex final projects such as 3D object tracking. Received student evaluation of 6.3/7.0, one of the highest ratings in the last 5 years.	
	<b>Computation Structures (6.004)</b>	Jan - Dec 2007
WORK EXPERIENCE	Lab Assistant, MIT Department of EECS Held office hours to help students design and build a processor and small OS kernel in simulation.	
	<b>Intro. to Computer Science and Programming (6.00)</b>	Sept - Dec 2006
	Lab Assistant, MIT Department of EECS Taught students basic computer science concepts using Python such as recursion, abstraction and OOP.	
	<b>VMware, Inc.</b>	Cambridge, MA
	MTS, Virtual Machine Monitor Group	Jan 2010 - Feb 2013
	<b>VMware, Inc.</b>	Cambridge, MA
	R&D Intern, Virtual Machine Monitor Group	Jul - Dec 2009
	<b>VMware, Inc.</b>	Cambridge, MA
	R&D Intern, Core Performance Group	Jun - Aug 2008
	<b>Quickware Engineering and Design</b>	Waltham, MA
	Engineering Intern	Jun - Aug 2007
	<b>Cummins, Inc.</b>	Columbus, IN
	Engineering Intern, Analysis Led Design	Jun - Aug 2005
	<b>Cummins, Inc.</b>	Beijing, China
	International Business Intern	Jun - Jul 2004
	<b>ArvinMeritor, Inc.</b>	Columbus, IN
	Web Development Intern	Aug 2003 - May 2004