Irene Y. Zhang

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Seattle, WA 98195

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http://irenezhang.net

Education

University of Washington — Seattle, WA
Ph.D. in Computer Science and Engineering
Advisors: Hank Levy and Arvind Krishnamurthy

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
Advisor: M. Frans Kaashoek
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 give users the illusion of continuous synchronization 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 — SOSP '15

TAPIR – the Transactional Application Protocol for Inconsistent Replication – provides externally consistent transactions using a replication protocol with *no consistency guarantees*. 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 *in a single round-trip* and eliminate the bottleneck at the Paxos leader.

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*, 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.

Arrakis: The Operating System is the Control Plane — OSDI '14

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.

Conference Publications

Irene Zhang, Niel Lebeck, Pedro Fonseca, Brandon Holt, Raymond Cheng, Ariadna Norberg, Arvind Krishnamurthy, Henry 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.

Brandon Holt, James Bornholt, **Irene Zhang**, Dan R. K. Ports, Mark Oskin, Luis Ceze. *Disciplined Inconsistency.* In Proceedings of the ACM Symposium on Cloud Computing (SoCC). Santa Clara, CA. October 2016.

Irene Zhang, Naveen Kr. Sharma, Adriana Szekeres, Dan R. K. Ports, Arvind Krishnamurthy. *Building Consistent Transactions with Inconsistent Replication..* In Proceedings of the ACM Symposium on Operating Systems Principles (SOSP). Monterey, CA. October 2015.

Irene Zhang, Adriana Szekeres, Dana Van Aken, Isaac Ackerman, Steven D. Gribble, Arvind Krishnamurthy, Henry 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.

Simon Peter, Jialin Li, **Irene Zhang**, Dan R. K. Ports, Doug Woos, Arvind Krishnamurthy, Thomas Anderson, Timothy 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**.

Irene Zhang, Tyler Denniston, Yury Baskakov, Alex 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.

Irene Zhang, Alex Garthwaite, Yury Baskakov, Kenneth 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.

Dan R. K. Ports, Austin Clements, **Irene Zhang**, Samuel Madden, Barbara 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.

Jeremy Stribling, Yair Sovran, **Irene Zhang**, Xavid Pretzer, Jinyang Li, M. Frans Kaashoek, Robert 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

Irene Zhang, Naveen Kr. Sharma, Adriana Szekeres, Dan R. K. Ports, Arvind Krishnamurthy. *When Is Operation Ordering Required in Replicated Transactional Storage?.* IEEE Data Engineering Bulletin. March 2016.

Simon Peter, Jialin Li, **Irene Zhang**, Dan R. K. Ports, Doug Woos, Arvind Krishnamurthy, Thomas Anderson, Timothy Roscoe. *Arrakis: The Operating System is the Control Plane.* ACM Transactions on Computer Systems (TOCS). January 2016.

Workshop Publications

Brandon Holt, **Irene Zhang**, Dan R. K. Ports, Mark Oskin and Luis 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.

Simon Peter, Jialin Li, Doug Woos, **Irene Zhang**, Dan R. K. Ports, Thomas Anderson, Arvind Krishnamurthy, Mark 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

Irene Zhang, Naveen Kr. Sharma, Adriana Szekeres, Dan R. K. Ports, Arvind Krishnamurthy. *Optimistic, Replicated Two-Phase Commit.* ACM Asia-Pacific Workshop on Systems (APSys). Beijing, China. June 2014.

Irene Zhang, Alex Garthwaite, Yury Baskakov, Kenneth C. Barr, Jesse Pool, Kevin Christopher. *Fast Restore of Checkpointed Memory Using Working Set Estimation.* ACM Symposium on Operating Systems Principles (SOSP). Big Sky, MT. October 2009.

Irene Zhang, Kenneth C. Barr. *Improving VMware Workstation Restore using Working Set Estimation.* VMworld Conference. Las Vegas, NV. September 2008.

Awards

NCWIT Collegiate Award Runner-up 2016

UW CSE Industrial Affiliates Madrona Prize Runner-Up 2015

Bob Bandes Teaching Award Honorable Mention 2015

Google Anita Borg Memorial Fellowship 2015

Microsoft Research PhD Fellowship 2015

UW CSE 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

Distributed Operating Systems for Modern Applications
CSE Symposium — Jan 2015

Building Consistent Transactions with Inconsistent Replication
UW Cloud Day — Jun 2016
MSR Tech Talk, Host: Myeongjae Jeon — Mar 2016
Google Tech Talk, Host: Daniel Myers — Dec 2015
UW CSE Industrial Affiliates Annual Meeting — Oct 2015
Symposium on Operating Systems Principles (SOSP) — Oct 2015
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 Annual 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

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.

US Patent App. 13/935,382. *Identification of Page Sharing Opportunities within Large Pages.* Y. Baskakov, A. Garthwaite, R. Venkatasubramanian, **I. Zhang**, S. Kim, N. Bhatia, K. Tati

Press

Bringing women back to computer science: UW in national spotlight over efforts. Crosscuts. March 28, 2016.

Cutting-edge server operating system wins UW computer science prize. GeekWire. October 23, 2014.

Faster websites, more reliable data. MIT News. October 14, 2010.

Service

Workshop on Hot Topics in Cloud Computing (HotCloud)
Program Committee 2016

UW Workshop on Hot Topics in Potentially Computer Science (HotPoCSci)
Workshop Founder 2015

UW Conference on Potentially Computer Science (PoCSci)
Program Co-chair 2016
Program Co-chair 2015

UW CSE Annual Women's Research Day
Chair 2016
Founder 2015

UW Graduate Student Committee
Graduate Women's Event Coordinator 2014-2015
Graduate Visit Days Committee Co-chair 2013-2014

UW Undergrad Women Mentor 2015-2016

UW Graduate Student Mentor 2013-2014

VMware Women's Outreach and Recruiting 2009-2012

Eta Kappa Nu EECS Honor Society Officer 2008-2009

Teaching @UW

Distributed Systems (CSE 452)
Teaching Assistant, UW Department of CSE Winter 2016
Teaching Assistant, UW Department of CSE Winter 2015

Introduction to Operating Systems (CSE 451)
Tutor, UW Department of CSE Spring 2016
Tutor, UW Department of CSE Fall 2014
Tutor, UW Department of CSE Spring 2014
Guest Lecturer, UW Department of CSE Fall 2013
Tutor, UW Department of CSE Spring 2013

The Hardware/Software Interface (CSE 351)
Tutor, UW Department of CSE Winter 2014
Tutor, UW Department of CSE Winter 2013

Teaching @MIT

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