

# IRENE Y. ZHANG

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Seattle, WA 98195

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**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 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** SOSP '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

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	<p><b>I. Zhang</b>, N. K. Sharma, A. Szekeres, D. R. K. Ports, A. Krishnamurthy. <i>Optimistic, Replicated Two-Phase Commit</i>. ACM Asia-Pacific Workshop on Systems (APSys). Beijing, China. June 2014.</p> <p><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>. ACM Symposium on Operating Systems Principles (SOSP). Big Sky, MT. October 2009.</p> <p><b>I. Zhang</b>, K. C. Barr. <i>Improving VMware Workstation Restore using Working Set Estimation</i>. VMworld Conference. Las Vegas, NV. September 2008.</p>																																																
FELLOWSHIPS & AWARDS	<table border="0"> <tbody> <tr> <td><b>Microsoft Research PhD Fellowship</b></td> <td style="text-align: right;">2015</td> </tr> <tr> <td><b>Google Anita Borg Memorial Fellowship</b></td> <td style="text-align: right;">2015</td> </tr> <tr> <td><b>National Science Foundation Fellowship</b></td> <td style="text-align: right;">2013</td> </tr> <tr> <td><b>ARCS Foundation Fellowship</b></td> <td style="text-align: right;">2012</td> </tr> <tr> <td><b>Jeff Dean and Heidi Hopper Endowed Regental Fellowship</b></td> <td style="text-align: right;">2012</td> </tr> <tr> <td><b>OSDI Best Paper Award</b></td> <td style="text-align: right;">2014</td> </tr> <tr> <td><b>CRA Outstanding Undergraduate Award, Honorable Mention</b></td> <td style="text-align: right;">2008</td> </tr> <tr> <td><b>Rising Stars Workshop</b></td> <td style="text-align: right;">2016</td> </tr> <tr> <td><b>NCWIT Collegiate Award Runner-up</b></td> <td style="text-align: right;">2016</td> </tr> <tr> <td><b>UW CSE Industrial Affiliates Madrona Prize Runner-Up</b></td> <td style="text-align: right;">2015</td> </tr> <tr> <td><b>Bob Bandes Teaching Award Honorable Mention</b></td> <td style="text-align: right;">2015</td> </tr> <tr> <td><b>UW CSE Industrial Affiliates Madrona Prize</b></td> <td style="text-align: right;">2014</td> </tr> <tr> <td><b>National Science Board Annual Meeting Student Panel</b></td> <td style="text-align: right;">2013</td> </tr> <tr> <td><b>VMware Academic Program Top Intern Project</b></td> <td style="text-align: right;">2008</td> </tr> <tr> <td><b>Northern Telecom/BNR Award for Best Undergrad. Lab Project</b></td> <td style="text-align: right;">2006</td> </tr> </tbody> </table>	<b>Microsoft Research PhD Fellowship</b>	2015	<b>Google Anita Borg Memorial Fellowship</b>	2015	<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>OSDI Best Paper Award</b>	2014	<b>CRA Outstanding Undergraduate Award, Honorable Mention</b>	2008	<b>Rising Stars Workshop</b>	2016	<b>NCWIT Collegiate Award Runner-up</b>	2016	<b>UW CSE Industrial Affiliates Madrona Prize Runner-Up</b>	2015	<b>Bob Bandes Teaching Award Honorable Mention</b>	2015	<b>UW CSE Industrial Affiliates Madrona Prize</b>	2014	<b>National Science Board Annual Meeting Student Panel</b>	2013	<b>VMware Academic Program Top Intern Project</b>	2008	<b>Northern Telecom/BNR Award for Best Undergrad. Lab Project</b>	2006																		
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PRESS	<p><i>Geek of the Week: UW Ph.D. student Irene Zhang has big ideas to make life easier for programmers.</i> GeekWire. December 16, 2016.</p> <p><i>Bringing women back to computer science: UW in national spotlight over efforts.</i> Crosscuts. March 28, 2016.</p> <p><i>Cutting-edge server operating system wins UW computer science prize.</i> GeekWire. October 23, 2014.</p> <p><i>Faster websites, more reliable data.</i> MIT News. October 14, 2010.</p>
SERVICE	<p><b>ASPLOS, External Reviewer</b> 2017</p> <p><b>OSDI, External Reviewer</b> 2016</p> <p><b>HotCloud, Program Committee</b> 2016</p> <p><b>UW HotPoCSci, Founder</b> 2015</p> <p><b>UW PoCSci, PC Chair</b> 2015-2016</p> <p><b>UW CSE Annual Women's Research Day Committee</b> 2017</p> <p><b>Chair</b> 2016</p> <p><b>Founder</b> 2015</p> <p><b>UW Graduate Student Committee</b></p> <p>Graduate Admissions Committee 2014-2016</p> <p>Graduate Women's Event Coordinator 2014-2015</p> <p>Graduate Visit Days Committee Co-chair 2013-2014</p> <p><b>UW Undergrad Women Mentor</b> 2015-2016</p> <p><b>UW Graduate Student Mentor</b> 2013-2014</p> <p><b>VMware Women's Outreach and Recruiting</b> 2009-2012</p> <p><b>Eta Kappa Nu EECS Honor Society Officer</b> 2008-2009</p>
TEACHING	<p><b>Distributed Systems (UW CSE 452)</b> Seattle, WA</p> <p>Teaching Assistant Winter 2016</p> <p>Teaching Assistant Winter 2015</p> <p><b>Introduction to Operating Systems (UW CSE 451)</b> Seattle, WA</p> <p>Tutor Spring 2016</p> <p>Tutor Fall 2014</p> <p>Tutor Spring 2014</p> <p>Guest Lecturer Fall 2013</p> <p>Tutor Spring 2013</p> <p><b>The Hardware/Software Interface (UW CSE 351)</b> Seattle, WA</p> <p>Tutor, UW Department of CSE Winter 2014</p> <p>Tutor, UW Department of CSE Winter 2013</p> <p><b>Operating Systems Engineering (MIT 6.828)</b> Cambridge, MA</p> <p>Teaching Assistant Fall 2008</p> <p><b>Intro. to Digital Systems Lab (MIT 6.111)</b> Cambridge, MA</p> <p>Teaching Assistant Spring 2008</p> <p><b>Computation Structures (MIT 6.004)</b> Cambridge, MA</p> <p>Lab Assistant Spring 2007</p> <p><b>Intro. to Computer Science and Programming (MIT 6.00)</b> Cambridge, MA</p> <p>Lab Assistant Fall 2006</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.

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

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

REFERENCES

Henry M. Levy  
Chairman & Wissner-Slivka Chair  
Department of Computer Science & Engineering, University of Washington  
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