Irene Y. Zhang

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EDUCATION	**University of Washington**	Seattle, WA

University of Washington Seattle, WA
Ph.D. in Computer Science
Advisors: Hank Levy and Steve Gribble

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*
Graduate GPA: 5.0/5.0

Massachusetts Institute of Technology Cambridge, MA
S.B. in Computer Science and Engineering June 2008
Undergraduate GPA: 4.7/5.0

INTERESTS Operating systems, virtualization, distributed systems and networking

RESEARCH **Access Locality-based Organization of Checkpointed VM Memory**
Work on improving the performance of concurrent restore on VMware ESXi Server. New workloads demand better performance for restoring checkpointed VMs and previous checkpointing systems have primarily focused on checkpoint save performance. We propose a new organization for checkpointed memory that groups memory pages into blocks based on access locality. By saving pages with other pages that are likely to be accessed together, we can more efficiently prefetch on each disk access.

Improving VMware Workstation Restore using Working Set Estimation
Work on measuring and improving the performance of restoring saved virtual machines. We developed a time-to-responsiveness metric that better reflects the time until the VM appears restored to the user, based on minimum mutator utilization. To reduce the time until the VM appears restored, we proposed working set restore, a hybrid restore technique where the working set of memory is prefetched before the VM starts and the remainder of memory is restored slowly in the background while the VM runs.

Transactional Consistency and Automatic Cache Management
Work with Dan Ports on an application-level cache with transactional consistency and automatic invalidations. In-memory application caches like memcached introduce significant complexity to web applications because they provide a simple get-put interface, violate the consistency guarantees of the underlying database and leave cache invalidations to the application. TxCache addresses these problems by providing a programming model for caching, transactional consistency across the entire system and automatic cache invalidations generated by the database.

WheelFS and Large File Distribution
Work with Jeremy Stribling on a flexible, wide-area distributed file system. The goal of WheelFS is to provide a general wide-area storage solution with a standard POSIX interface. The challenge is that any storage system operating in the wide-area must make trade-offs for performance and trade-off decisions are often better made by applications. WheelFS solves this problem by allowing applications to configure the file system using keywords embedded in the pathname. My thesis work focused on adding support for efficient file distribution to WheelFS for distributing large files and handling flash crowds.

Fresh Breeze Multiprocessor Architecture
Work with Prof. Jack Dennis implementing a cycle-accurate simulator for the Fresh Breeze multiprocessor architecture. Led a 3 student team in the design and implementation of a tool for interacting with the Fresh Breeze simulator. The goal of the Fresh Breeze architecture is to provide a sound base for executing programs written following the principles of modular software construction. The architecture introduces three major departures from conventional multiprocessor design: simultaneous multithreading, global shared address space, and no memory update, cycle-free heap.

WORK
EXPERIENCE

VMware, Inc.   Cambridge, MA
Member of the Technical Staff, Virtual Machine Monitor Group   Jan 2010 - Feb 2013

VMware, Inc.   Cambridge, MA
R&D Intern, Virtual Machine Monitor Group   Jul - Dec 2009

MIT Computer Science and Artificial Intelligence Lab   Cambridge, MA
Research Assistant, Parallel and Distributed Operating Systems   Feb 2008 - Jun 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

MIT Computer Science and Artificial Intelligence Lab   Cambridge, MA
Undergraduate Research Assistant, Computation Structures Group   Feb - Dec 2006

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

TEACHING

Operating Systems Engineering (6.828)   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.

Intro. to Digital Systems Lab (6.111)   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.

Computation Structures (6.004)   Jan - Dec 2007
Lab Assistant, MIT Department of EECS
Held office hours to help students design and build a processor and small OS kernel in simulation.

Intro. to Computer Science and Programming (6.00)   Sept - Dec 2006
Lab Assistant, MIT Department of EECS
Taught students basic computer science concepts using Python such as recursion, abstraction and OOP.

<table>
<tr><td>P<small>UBLICATIONS</small></td><td>I. Zhang, T. Denniston, Y. Baskakov, A. Garthwaite. *Optimizing VM Checkpointing for Restore Performance in VMware ESXi.* In Proc. of USENIX ATC '13. San Jose, CA. June 2013.</td></tr>
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I. Zhang, A. Garthwaite, Y. Baskakov, K. Barr. *Fast Restore of Checkpointed Memory Using Working Set Estimation.* In Proc. of VEE '11. Newport Beach, CA. March 2011.

D. Ports, A. Clements, I. Zhang, S. Madden, B. Liskov. *Transactional Consistency and Automatic Management in an Application Data Cache.* In Proc. of OSDI '10. Vancouver, Canada. October 2010.

J. Stribling, Y. Sovran, I. Zhang, X. Pretzer, J. Li, F. Kaashoek, R. Morris. *Flexible, Wide-Area Storage for Distributed Systems with WheelFS.* In Proc. of NSDI '09. Boston, MA. April 2009.

I. Zhang, A. Garthwaite, Y. Baskakov, K. Barr, J. Pool, K. Christopher. *Fast Restore of Checkpointed Memory Using Working Set Estimation.* Poster at SOSP '09. Big Sky, MT. October 2009.

I. Zhang, K. Barr. *Improving VMware Workstation Restore using Working Set Estimation.* Poster at VMworld '08. Las Vegas, NV. September 2008.

HONORS AND AWARDS	**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
	Officer, Eta Kappa Nu EECS Honor Society	2008
	Northern Telecom/BNR Award for Best Undergrad. Lab Project	2006