Vijay Chidambaram
Curriculum Vitae

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Research Interests

Operating Systems, Distributed Systems, and Storage

Research Summary

My research goal is to build systems that enable users to run any unmodified desktop application on the cloud, obtaining both scale-out performance and guarantees about application behavior in the face of crashes. My research has taken several steps towards this goal. I have developed new file-system techniques that increase scalability and performance while maintaining file-system consistency. I have extended and implemented these techniques in distributed storage systems. To support these techniques, I have developed new storage interfaces and file-system primitives. Finally, I have developed tools to analyze applications to understand their failure semantics.

Education

2011 - 2015	PhD in Computer Science. Advisors: Prof. Andrea Arpaci-Dusseau Prof. Remzi Arpaci-Dusseau *Expected: May 2015*	University of Wisconsin-Madison
2009 - 2011	Masters in Computer Science	University of Wisconsin-Madison
2005 - 2009	Bachelors of Computer Science.	College of Engineering, Guindy, Chennai, India

Honors and Awards

Microsoft Graduate Research Fellowship, 2014.
Alumni Scholarship, University of Wisconsin-Madison, 2009.
Travel Grants for HiPC 08, OSDI 10, FAST 11, DSN 11, FAST 12, SOSP 13, FAST 14, OSDI 14.

Articles on Research

Data Integrity and Availability: The Challenge of Scale for Modern Storage Systems. *IEEE Computing Now*. May 2012.
Link: `http://www.computer.org/portal/web/computingnow/archive/may2012`

Leadership Activities

Google Student Ambassador, UW-Madison	**2010-2011**
Vice President, Student Chapter of the ACM, UW-Madison	**2009-2010**
Google Campus Ambassador, College of Engineering Guindy	**2007-2008**
Executive Director, Computer Society Of Anna University *(Largest student organization of College of Engineering, Guindy)*	**2007-2008**

CONFERENCE PUBLICATIONS

Thanumalayan Sankaranarayana Pillai, **Vijay Chidambaram**, Ramnatthan Alagappan, Samer Al Kiswany, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. All File Systems Are Not Created Equal: On the Complexity of Crafting Crash-Consistent Applications. *Proceedings of the 11th Symposium on Operating Systems Design and Implementation, Oct 2014.*
OSDI 2014

James Mickens, Ed Nightingale, Jeremy Elson, Bin Fan, Asim Kadav, **Vijay Chidambaram**, Osama Khan, Krishna Nareddy, and Darren Gehring. Blizzard: Fast, Cloud-scale Block Storage for Cloud-oblivious Applications. *Proceedings of the 11th USENIX Symposium on Networked Systems Design and Implementation, April 2014.*
NSDI 2014

Thanumalayan Sankaranarayana Pillai, **Vijay Chidambaram**, Jooyoung Hwang, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. Towards efficient, portable application-level consistency. *Proceedings of the 9th Workshop on Hot Topics in Dependable Systems, Farmington, Pennsylvania, Nov 2012.*
HotDep 2013

Vijay Chidambaram, Thanumalayan Sankaranarayana Pillai, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. Optimistic Crash Consistency. *Proceedings of the 24th ACM Symposium on Operating Systems Principles, Farmington, Pennsylvania, Nov 2012.*
SOSP 2013

Vijay Chidambaram, Tushar Sharma, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. Consistency Without Ordering. *Proceedings of the 10th Conference on File and Storage Technologies, San Jose, CA, Feb 2012.*
FAST 2012

Vijay Chidambaram, Yueh-Hsuan Chiang, Bilge Mutlu. Designing Persuasive Robots: How Robots Might Persuade People Using Vocal and Nonverbal Cues. *Proceedings of the 7th ACM/IEEE International Conference on Human-Robot Interaction, Boston, MA, 2012.*
HRI 2012

Abhishek Rajimwale, **Vijay Chidambaram**, Deepak Ramamurthi, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. Coerced Cache Eviction: Dealing with Misbehaving Disks through Discreet-Mode Journaling. *Proceedings of the IEEE/IFIP 41st International Conference on Dependable Systems & Networks, Hong Kong, China, 2011.*
DSN 2011

Thanumalayan S, **Vijay Chidambaram**, Ranjani Parthasarathi. Design-space exploration of flash augmented architectures. *Student Research Symposium, 15th annual IEEE International Conference on High Performance Computing, Bangalore, India, 2008.*
HiPC 2008

OTHER PUBLICATIONS

Vijay Chidambaram. Is Ordering of Disk Updates Required to Maintain File-System Crash-Consistency? *Tiny Transactions on Computer Science (TinyTOCS)*, *Vol 2*, *2013*.

Vijay Chidambaram, Tushar Sharma, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau. Consistency Without Ordering (Extended Edition). *UW-Madison Computer Science Technical Report 1709*, *2012*.

TALKS

Optimistic Crash Consistency at Wisconsin Institute on Software-defined Datacenters in Madison (WISDoM) Workshop '14, UW Madison, Madison, WI. May 2014.

Optimistic Crash Consistency at Wisconsin SyNS Conference '13, UW Madison, Madison, WI. November 2013.

Optimistic Crash Consistency at Symposium on Operating Systems Principles (SOSP '13), Farmington, PA. November 2013.

Combating Loss of Ordering in the Storage Stack at Wisconsin Institute on Software-defined Datacenters in Madison (WISDoM) Workshop, Madison, WI. November 2012.

Designing Persuasive Robots: How Robots Might Persuade People Using Vocal and Nonverbal Cues at Conference on Human-Robot Interaction (HRI '12), Boston, MA, March 2012.

Consistency Without Ordering at Conference on File and Storage Technologies (FAST '12), San Jose, CA, Feb 2012.

Coerced Cache Eviction: Dealing with Misbehaving Disks through Discreet-Mode Journaling at Conference on Dependable Systems & Networks, Hong Kong, China, June 2011.

Coerced Cache Eviction: Dealing with Misbehaving Disks through Discreet-Mode Journaling at Systems Seminar, Madison, WI, April 2011.

WORK EXPERIENCE

Microsoft Research, Silicon Valley, WA   **June-Aug 2014**
Research Intern with Mahesh Balakrishnan

Explored new storage stack architectures where persistent data structures are exposed directly by storage. Demonstrated that is possible to rewrite the Tango server using our new abstractions to get the same performance, while greatly reducing the number of lines of code.

Microsoft Research, Redmond, WA   **June-Aug 2013**
Research Intern with James Mickens

Worked on increasing replicated write performance in a distributed storage system. The design incorporated techniques from Optimistic Crash Consistency, allowing the system to obtain excellent performance while retaining consistency in the event of node crashes. This work was published in NSDI 2014.

Microsoft Research, Redmond, WA   **June-Aug 2012**
Research Intern with Ed Harris

Analyzed the load balancing in Cosmos, a distributed, scalable, storage system developed by Microsoft. Developed a new load balancing algorithm to increase the scalability of Cosmos and help it react better to outages due to machine failure or maintenance.

Google, New York, NY **June-Aug 2010**
Software Engineering Intern with Eric Shrock, Google File System Team

Worked on disaster recovery for the Colossus, the successor to the Google File System. Developed mechanisms to reconstruct metadata from thousands of nodes after a disaster.

Networks Lab, Indian Institute of Technology, Chennai, India **June-Aug 2008**
Developer Intern

Worked on providing Single Sign On and other services for the users of a wide-area network connecting 8 colleges across the state. Built a distributed testbed for network experiments.

HeyMath!, Chennai, India **May-July 2007**
Software Engineering Intern

Created a mailing engine to serve the mass mailing needs of HeyMath!. The user interface was designed for to be easily used by employees across the company.

Teaching Experience

CS 537: Introduction to Operating Systems, UW-Madison **Sep-Dec 2014**
Instructor

Instructor for the intro to OS course. Lectured to a class of 80 students. Set the midterms and the final exam. Set projects based on both Linux and xv6.

CS 736: Advanced Operating Systems, UW-Madison **Feb 2014**
Guest Lecture on Optimistic Crash Consistency

CS 537: Operating Systems, UW-Madison **Nov 2013**
Guest Lecture on Journaling

CS 736: Advanced Operating Systems, UW-Madison **Oct 2013**
Guest Lecture on Optimistic Crash Consistency

CS 302: Introduction to Computer Programming, UW-Madison **Sep-Dec 2009**
Teaching Assistant

Teaching assistant for Introductory programming with Java. Helped students from many different backgrounds learn to program in the lab. Designed assignments to verify understanding of programming concepts.

Research Experience

Application Crash Vulnerabilities [OSDI 2014] **March 2013- Present**

We present the first comprehensive study of application-level crash-consistency protocols built atop modern file systems. We find that applications use complex update protocols to persist state, and that the correctness of these protocols is highly dependent on subtle behaviors of the underlying file system, which we term persistence properties. We build a framework named ALICE that analyzes application update protocols and finds crash vulnerabilities, i.e., update protocol code that requires specific persistence properties to hold for correctness.

Optimistic Crash Consistency [SOSP 2013] **Mar 2012- March 2013**

Optimistic Crash Consistency is the *first* crash consistency protocol that does not require expensive cache flushes for maintaing consistency in the event of a crash. It supports generalized transactions and all other properties of a normal journaling file system. It results in up-to 10x better performance for certain workloads when compared to current journaling file systems that use cache flushes to order writes.

Backpointer-Based Consistency [FAST 2012]   **June 2011- Feb 2012**

Backpointer-Based Consistency is the *first* crash consistency protocol that does not require *any* ordering between disk writes to maintain consistency in the event of a crash. It provides a high degree of consistency and availability while offering performance similar to or better than that of journaling file systems such as ext3.

Coerced Cache Eviction [DSN 2011]   **Jan 2010- Jun 2011**

Coerced Cache Eviction is a new method to force writes to disk in the presence of a disk cache that does not properly obey write-cache configuration or flush requests. We used CCE to build a new journaling mode within the Linux ext3 file system. When mounted in this discreet mode, ext3 uses CCEs to ensure that writes are properly ordered and thus maintains file system integrity despite the presence of an improperly behaving disk.

Design Space Exploration of Flash Augmented Architectures [HiPC 2008]   **Aug 2008- May 2009**

We examined the effects of introducing flash and SSD storage in today's storage hierarchy. Our design replaced all of main and secondary memory with SSD storage. We analyzed the side-effects of the design and identified applications which might potentially benefit from such a design.

OTHER ACHIEVEMENTS

Among **Top 20** out of 200 teams in the International Collegiate Programming Contest (ICPC) North Central America Regionals.   **2009**

Among **Top 5** Conceptors on Topcoder, a competitive software development portal. Conceptors work with the clients and the software designers to mesh out client requirements technically.   **2009**

Conceived and designed Riddles of the Sphinx (ROS), online treasure hunts conducted during the techfest Kurukshetra, with more than 200,000 international participants.   **2007-2009**

Conducted Sparks and Prodigy at College of Engineering Guindy, events aimed at exposing school children to technology.   **2007-2008**

Conducted several online and onsite programming contests.   **2007-2008**

REFERENCES

Remzi H. Arpaci-Dusseau
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