

Jialin Li

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EDUCATION

University of Washington Seattle, WA
Ph.D. in Computer Science and Engineering
Advisors: Dan R. K. Ports and Arvind Krishnamurthy

University of Washington Seattle, WA
M.S. in Computer Science and Engineering June 2014
Advisors: Dan R. K. Ports and Steven D. Gribble
Thesis: *Improving Distributed Systems using Approximate Synchrony in Datacenter Networks*

University of Michigan Ann Arbor, MI
B.S.E in Computer Engineering May 2012
GPA: 3.96/4.0
Minor in Mathematics
GPA: 4.0/4.0

INTERESTS Distributed systems, operating systems

RESEARCH PROJECTS

Replacing Consensus with Network Ordering
NOPaxos presents a new approach to state machine replication in the data center without the performance cost of traditional methods, by carefully dividing replication responsibility between the network and protocol layers. The network orders requests but does not ensure reliably delivery, using a new *ordered unreliable multicast* (OUM) primitive. Our new replication protocol, Network-Ordered Paxos (NOPaxos), exploits network ordering to provide strongly consistent replication without coordination. The resulting system yields throughput within 2% and latency within 16 μ s of an unreplicated system.

Designing Distributed Systems Using Approximate Synchrony
This project explores the co-design of distributed systems with their network layer. We use network-level techniques to provide a Mostly-Ordered Multicast primitive (MOM) with a best-effort ordering property and then build Speculative Paxos, a new replication protocol that relies on the network to order requests in the normal case. By leveraging datacenter network properties, Speculative Paxos can provide substantially higher throughput and lower latency than the standard Paxos protocol.

Predictable Low Latency in Data Center Applications
To provide responsive services to end-users, cloud platforms are designed with low latency in mind. However, the complexity and parallelism of the systems make latency tail hard to predict. This project aims to understand the nature of latency tails in data centers by analyzing the hardware/software stack, and design techniques for constructing data center services with low latency tails.

CONFERENCE
PUBLICATIONS

Jialin Li, Ellis Michael, Naveen Kr. Sharma, Adriana Szekeres, and Dan R. K. Ports. “Just Say NO to Paxos Overhead: Replacing Consensus with Network Ordering”. In *Proceedings of the 12th USENIX Symposium on Operating Systems Design and Implementation (OSDI '16)*. Savannah, GA, USA, Nov. 2016.

James Bornholt, Antoine Kaufmann, Jialin Li, Arvind Krishnamurthy, Emina Torlak, and Xi Wang. “Specifying and Checking File System Crash-Consistency Models”. In *Proceedings of the 21st International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '16)*. Atlanta, GA, USA, Apr. 2016.

Dan R. K. Ports, Jialin Li, Vincent Liu, Naveen Kr. Sharma, and Arvind Krishnamurthy. “Designing Distributed Systems Using Approximate Synchrony in Data Center Networks”. In *Proceedings of the 12th USENIX Conference on Networked Systems Design and Implementation (NSDI '15)*. Oakland, CA, USA, May 2015. **Best Paper Award**.

Jialin Li, Naveen Kr. Sharma, Dan R. K. Ports, and Steven D. Gribble. “Tales of the Tail: Hardware, OS, and Application-level Sources of Tail Latency”. In *Proceedings of the 5th ACM Symposium on Cloud Computing (SOCC '14)*. Seattle, WA, USA, Nov. 2014.

Simon Peter, Jialin Li, Irene Zhang, Dan R. K. Ports, Doug Woos, Arvind Krishnamurthy, Thomas Anderson, and Timothy Roscoe. “Arrakis: The Operating System is the Control Plane”. In *Proceedings of the 11th USENIX Symposium on Operating Systems Design and Implementation (OSDI '14)*. Broomfield, CO, USA, Oct. 2014. **Best Paper Award**.

Andrew DeOrio, Jialin Li, and Valeria Bertacco. “Bridging Pre- and Post-silicon Debugging with BiPeD”. In *Proceedings of the International Conference on Computer-Aided Design (ICCAD '12)*. San Jose, CA, USA, Nov. 2012.

WORKSHOP
PUBLICATIONS

Simon Peter, Jialin Li, Doug Woos, Irene Zhang, Dan R. K. Ports, Thomas Anderson, Arvind Krishnamurthy, and Mark Zbikowski. “Towards High-performance Application-level Storage Management”. In *Proceedings of the 6th USENIX Conference on Hot Topics in Storage and File Systems (HotStorage '14)*. Philadelphia, PA, USA, June 2014.

JOURNAL
PUBLICATIONS

Simon Peter, Jialin Li, Irene Zhang, Dan R. K. Ports, Doug Woos, Arvind Krishnamurthy, Thomas Anderson, and Timothy Roscoe. “Arrakis: The Operating System Is the Control Plane”. In *ACM Transactions on Computer Systems* 33.4, Nov. 2015.

AWARDS

UW CSE Industrial Affiliates Madrona Prize Runner Up	2016
NSDI '15 Best Paper Award	2015
OSDI '14 Jay Lepreau Best Paper Award	2014
UW CSE Industrial Affiliate Madrona Prize Winner	2014
Wang Chu Chien-Wen Research Award	2011
James B. Angell Scholar Award	2011

INVITED TALKS	Replacing Consensus with Network Ordering	
	Symposium on Operating Systems Design and Implementation (OSDI '16)	Nov 2016
	UW CSE Industrial Affiliates Meeting	Oct 2016
	UW CSE Cloud Day	Jun 2016
	Designing Distributed Systems Using Approximate Synchrony	
	UW CSE Systems, Architecture and Networking Retreat	May 2014
TEACHING	PMP Operating Systems (UW CSEP 551)	Seattle, WA
	Teaching Assistant	Fall 2014
	The Hardware/Software Interface (UW CSE 351)	Seattle, WA
	Tutor	Spring 2016
	Tutor	Fall 2015
	Engineering Design Projects (UM ENGR 100)	Ann Arbor, MI
	Teaching Assistant	Winter 2012
	Computer Organization and Design (UM EECS 370)	Ann Arbor, MI
Teaching Assistant	Fall 2011	
WORK EXPERIENCE	VMware, Inc.	Palo Alto, CA
	MTS, Nicira NSX Group	Jun - Sep 2014
	Confucius Institute at the University of Michigan	Ann Arbor, MI
	Office Assistant and Teaching Assistant	Sep 2010 - May 2012