

Wenchao Zhou

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Education

University of Pennsylvania, Philadelphia, PA September 2007 - May 2012 (expected)
Ph.D. in Computer and Information Science.

Thesis: Secure Time-aware Provenance towards Forensics in Distributed Systems

Advisor: *Boon Thau Loo*

Committee Members: *Zachary G. Ives, Val Tannen, Andreas Haeberlen, Micah Sherr, and Margo Seltzer*

University of Pennsylvania, Philadelphia, PA September 2007 - May 2009

M.S.E. in Computer and Information Science. GPA: 3.98/4.0.

Advisor: *Boon Thau Loo*

Tsinghua University, Beijing, China September 2002 - June 2006

B.S.E. (Highest Honors) in Computer Science and Technology. GPA: 89.6/100 (top 10%).

Advisor: *Xia Yin*

Selected Publications

- **FSR: Formal Analysis and Implementation Toolkit for Safe Inter-domain Routing**
Anduo Wang, Limin Jia, Wenchao Zhou, Yiqing Ren, Boon Thau Loo, Jennifer Rexford, Vivek Nigam, Andre Scedrov, and Carolyn Talcott
In *the IEEE/ACM Transactions on Networking (ToN)*, 2012.
- **Secure Network Provenance** [18.4% acceptance]
Wenchao Zhou, Qiong Fei, Arjun Narayan, Andreas Haeberlen, Boon Thau Loo, and Micah Sherr
In *the 23rd ACM Symposium on Operating Systems Principles (SOSP)*, Cascais, Portugal, Oct 2011.
- **A Batch of Pnuts: Experiences Connecting Cloud Batch and Serving Systems**
Adam Silberstein, Russell Sears, Wenchao Zhou, and Brian F. Cooper
In *the 30th ACM SIGMOD International Conference on Management of Data (SIGMOD)*, Athens, Greece, Jun 2011.
- **Efficient Querying and Maintenance of Network Provenance at Internet-Scale** [20.8% acceptance]
Wenchao Zhou, Micah Sherr, Tao Tao, Xiaozhou Li, Boon Thau Loo, and Yun Mao
In *the 29th ACM SIGMOD International Conference on Management of Data (SIGMOD)*, Indianapolis, Indiana, June 2010.
- **A3: An Extensible Platform for Application-Aware Anonymity** [15.4% acceptance]
Micah Sherr, Andrew Mao, William R. Marczak, Wenchao Zhou, and Boon Thau Loo
In *the 17th Annual Network & Distributed System Security Symposium (NDSS)*, San Diego, California, Feb 2010.
- **Unified Declarative Platform for Secure Networked Information Systems** [16.8% acceptance]
Wenchao Zhou, Yun Mao, Boon Thau Loo, and Martin Abadi
In *the 25th International Conference on Data Engineering (ICDE)*, Shanghai, China, Apr 2009.
- **Recursive Computation of Regions and Connectivity in Networks** [16.8% acceptance]
Mengmeng Liu, Nicholas E. Taylor, Wenchao Zhou, Zachary G. Ives, and Boon Thau Loo
In *the 25th International Conference on Data Engineering (ICDE)*, Shanghai, China, Apr 2009. (**Best Paper Award at ICDE'09**)
- **Declarative Reconfigurable Trust Management** [27.1% acceptance]
William R. Marczak, David Zook, Wenchao Zhou, Molham Aref, and Boon Thau Loo
In *the 4th Biennial Conference on Innovative Data Systems Research (CIDR)*, Pacific Grove, California, Jan 2009.

Prototype Demonstrations

- **FSR: Formal Analysis and Implementation Toolkit for Safe Inter-domain Routing**
Wenchao Zhou, Yiqing Ren, Anduo Wang, Limin Jia, Alexander J.T. Gurney, Boon Thau Loo, and Jennifer Rexford
In *the ACM SIGCOMM Conference on Data Communication (SIGCOMM) - demo*, Toronto, Canada, Aug, 2011. (**Runner-up for the ACM Student Research Competition at SIGCOMM'11**)
- **NetTrails: A Declarative Platform for Provenance Maintenance and Querying in Distributed Systems**
Wenchao Zhou, Qiong Fei, Shengzhi Sun, Tao Tao, Andreas Haeberlen, Zachary Ives, Boon Thau Loo, and Micah Sherr
In *the 30th ACM SIGMOD International Conference on Management of Data (SIGMOD) - demo*, Athens, Greece, Jun 2011.

Papers and Demonstrations under Review

- **TapTrails: Provenance of Changes for Distributed Systems**
Wenchao Zhou, Suyog Mapara, Yang Li, Andreas Haeberlen, Zachary Ives, Boon Thau Loo, and Micah Sherr
Under review for *the ACM SIGMOD International Conference on Management of Data (SIGMOD)*.
- **Specification and Optimization of Real-Time Cloud-Edge Applications**
Wenchao Zhou, Badrish Chandramouli, and Suman Nath
Under review for *the ACM SIGMOD International Conference on Management of Data (SIGMOD)*.
- **Declarative Time-aware Provenance in Distributed Systems with TapTrails** (demonstration)
Wenchao Zhou, Suyog Mapara, Yiqing Ren, Yang Li, Andreas Haeberlen, Zachary Ives, Boon Thau Loo, and Micah Sherr
Under review for *the ACM SIGMOD International Conference on Management of Data (SIGMOD)*.
- **RACE: Real-time Applications over Cloud-Edge** (demonstration)
Badrish Chandramouli, Joris Claessens, Suman Nath, Ivo Santos, and Wenchao Zhou
Under review for *the ACM SIGMOD International Conference on Management of Data (SIGMOD)*.
- **Private and Verifiable Interdomain Routing Decisions**
Mingchen Zhao, Wenchao Zhou, Alexander J.T. Gurney, Andreas Haeberlen, Micah Sherr, and Boon Thau Loo
Under review for *the ACM SIGCOMM Conference on Data Communication (SIGCOMM)*.
- **Declarative Secure Distributed Information Systems**
Wenchao Zhou, Tao Tao, Boon Thau Loo, and Yun Mao
Under review for *the International Journal of Computer Languages, Systems & Structures (COMLAN)*.
- **The Design and Implementation of the A3 Application-Aware Anonymity Platform**
Micah Sherr, Harjot Gill, Taher Aquil Saeed, Andrew Mao, William R. Marczak, Wenchao Zhou, Boon Thau Loo, and Matt Blaze
Under review for *the International Journal of Computer Networks (COMNET)*.

Books

- **Declarative Networking** (Synthesis Lectures on Data Management)
Boon Thau Loo, Wenchao Zhou, and M. Tamer Özsu
Morgan & Claypool Publishers (Invited, Under review)

Grants

- TC: Small: Collaborative Research: **Towards a Formal Framework for Analyzing and Implementing Secure Routing Protocols**. Boon Thau Loo (PI), Limin Jia (PI), and Wenchao Zhou (Senior Personnel), \$499,000.

Patents

- **Cloud-Edge Topologies.** Badrish Chandramouli, Suman K. Nath, and Wenchao Zhou, Microsoft Docket Number 334558.01, U.S. Patent Application, December 2011.

Other Publications

- **Recent Advances in Declarative Networking**
Boon Thau Loo, Harjot Gill, Changbin Liu, Yun Mao, William R. Marczak, Micah Sherr, Anduo Wang, and Wenchao Zhou
In *the International Symposium on Practical Aspects of Declarative Languages (PADL)*, Philadelphia, PA, Jan 2012.
- **Having your Cake and Eating it too: Routing Security with Privacy Protections**
Alexander J. T. Gurney, Andreas Haeberlen, Wenchao Zhou, Micah Sherr, and Boon Thau Loo
In *the 10th ACM Workshop on Hot Topics in Networks (HotNets-X)*, Cambridge, MA, Nov 2011.
- **TAP: Time-aware Provenance for Distributed Systems**
Wenchao Zhou, Ling Ding, Andreas Haeberlen, Zachary Ives, and Boon Thau Loo
In *the 3rd USENIX Workshop on the Theory and Practice of Provenance (TaPP)*, Heraklion, Greece, June 2011.
- **Towards a Data-centric View of Cloud Security**
Wenchao Zhou, Micah Sherr, William R. Marczak, Zhuoyao Zhang, Tao Tao, Boon Thau Loo, and Insup Lee
In *the 2nd International Workshop on Cloud Data Management (CloudDB), in conjunction with CIKM*, Toronto, Canada, Oct 2010.
- **Maintaining Recursive Views of Regions and Connectivity in Networks**
Mengmeng Liu, Nicholas E. Taylor, Wenchao Zhou, Zachary Ives, and Boon Thau Loo
In *IEEE Transactions of Knowledge and Data Engineering (TKDE) Journal, 2009*. (Special Issue on Best Papers of ICDE)
- **DMaC: Distributed Monitoring and Checking**
Wenchao Zhou, Oleg Sokolsky, Boon Thau Loo, and Insup Lee
In *the 9th International Workshop on Runtime Verification (RV)*, Grenoble, France, Jun 2009.
- **Provenance-aware Secure Networks**
Wenchao Zhou, Eric Cronin, and Boon Thau Loo
In *the 4th International Workshop on Networking meets Databases (NetDB), in conjunction with ICDE*, Cancun, Mexico, Apr 2008.

Research Experience

University of Pennsylvania, Philadelphia, PA September 2007-present
Graduate Research Assistant, performed research in secure distributed systems, database technologies, and trust management systems, covering the following topics:

- **Secure Network Provenance (SNP):** Explored the processing and optimization of network provenance which “explains” the derivations of any network state. Developed bandwidth efficient techniques for maintaining and querying network provenance. Proposed secure network provenance (SNP) that enforces the authenticity and integrity of network provenance in adversarial environment. (*in collaboration with Prof. Andreas Haeberlen, Prof. Boon Thau Loo, and Prof. Micah Sherr*)
- **Formally Verifiable Routing (FVR):** Developed the FSR (Formally Safe Routing) toolkit that unifies research in routing algebras with declarative networking to produce provably correct distributed implementations for inter-domain routing. Conducted performance evaluation based on Rocketfuel and CAIDA datasets. (*in collaboration with Dr. Limin Jia, Prof. Boon Thau Loo, and Prof. Jennifer Rexford*)

- **Declarative Secure Distributed Systems (DS2):** Developed a unified specification of declarative networking and logic-based trust management. Extended the pipelined semi-naive query evaluation to incorporate secure communications. Performed a comprehensive evaluation to discuss the performance of DS2. (*in collaboration with Prof. Boon Thau Loo*)
- **Application-Aware Anonymity (A3):** Developed an extensible platform for applications to deploy anonymity-based services on the Internet, which enables compact specifications of path selection and instantiation policies to balance anonymity properties and system performance. (*in collaboration with Prof. Micah Sherr, and Prof. Boon Thau Loo*)
- **Meta-programmable Trust Management (LBTrust):** Conceptualized and implemented LBTrust, a reconfigurable, and meta-programmable system for extensible trust management, where security constructs can be customized and composed in a declarative fashion. (*in collaboration with Prof. Boon Thau Loo, and LogicBlox Inc.*)
- **Distributed Monitoring and Checking (DMaC):** Explored the problem of deploying runtime verification of distributed systems. Designed and developed DMaC, a system that monitors and checks running systems against formally specified properties in a distributed fashion. (*in collaboration with Prof. Insup Lee, Prof. Boon Thau Loo, and Prof. Oleg Sokolsky*)

Microsoft Research Redmond, Redmond, WA

May 2011 - Aug 2011

Summer Intern, participated in the following research project, aiming at the specification, deployment, and optimization of real-time applications over *Cloud-Edge* topologies:

- **Real-time Applications over Cloud-Edge (RACE):** Studied the specification of Cloud-Edge applications in a declarative temporal language. Proposed an efficient algorithm that generates provably optimal query placement for Cloud-Edge applications. Conceptualized and developed a full-fledged prototype implementation of the RACE system. (*in collaboration with Dr. Badrish Chandramouli, and Dr. Suman Nath*)

Yahoo! Research Labs, Santa Clara, CA

May 2010 - Aug 2010

Summer Intern, participated in the following research project, aiming at improving the performance of cloud database systems under serving and batch workloads:

- **Cloud Serving and Batch System:** Studied trades off between low-latency serving performance and batch processing throughput. Developed techniques, based on the Hadoop and PNUTS system, to improve batch job performances (*in collaboration with Dr. Adam Silberstein, Dr. Russell Sears, Dr. Brian Cooper, and Dr. Raghuram Krishnan*).

Microsoft Research Asia, Beijing, China

September 2005 - January 2007

Visiting Student, participated in the following research projects, aiming at improving user experience of online search:

- **Visualization of MSN Social Networks:** Studied the projection of a point from a high-dimensional space onto a hyperbolic plane, and applied the techniques to visualize the hierarchy of MSN spaces (*in collaboration with Dr. Benyu Zhang*).
- **Customizable Multi-Criteria Page Ranking:** Proposed and implemented a novel online algorithm for page ranking under multiple criteria. The work is incorporated in the MSN personalized search (*in collaboration with Dr. Chenxi Lin*).

Teaching Experience

- Teaching Assistant, CIS 505 - Software Systems, University of Pennsylvania, Spring 2009.
- Teaching Assistant, CIS 553/TCOM 512 - Networked System, University of Pennsylvania, Fall 2008.
- Student Coach, Team China for International Olympiad for Informatics (IOI), 2003.
- Teaching Assistant, the C++ Programming Language, Tsinghua University, Fall 2002.

Selected Awards and Honors

- Runner-up, ACM Student Research Competition at SIGCOMM'11, Toronto, Canada, 2011.
- Best paper award at ICDE'09, Shanghai, China, 2009.
- ShundeWu Couple Scholarship, Tsinghua University, Beijing, China, 2005.
- Runner-up, ACM International Collegiate Programming Contest Asia Division, Beijing, China, 2004.
- Dongfeng Motor Group Co. Fellowship, Tsinghua University, Beijing, China 2004.
- Hosogoe Fellowship, Tsinghua University, Beijing, China, 2003.
- Gold Medal, the 18th National Olympiad in Informatics (NOI), Xi'an, China, 2001.

Professional Activities

- External Reviewer, *International Conference on Management of Data (SIGMOD)*, 2011.
- External Reviewer, *International Conference on Very Large Data Bases (VLDB)*, 2007/2008/2009.
- External Reviewer, *International Conference on Data Engineering (ICDE)*, 2009/2010.
- External Reviewer, *Biennial Conference on Innovative Data Systems Research (CIDR)*, 2009/2011.
- External Reviewer, *International Conference on emerging Networking EXperiments and Technologies (CoNEXT)*, 2009.
- External Reviewer, *Conference on Computer Communications (InfoCom)*, 2009.
- External Reviewer, *Transactions on Programming Languages and Systems (TOPLAS)*, 2007.

References

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