

Wenbo He

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RESEARCH INTERESTS

Pervasive and Ubiquitous Computing, Privacy-preserving Techniques, Cyber Trust & Security, Cyber-Physical Systems, Networked Embedded Systems, Energy-aware Scheduling for Server Clusters, etc.

PROFESSIONAL EXPERIENCE

Assistant Professor, *August 2008 - now*
Department of Computer Science, University of New Mexico

Intern Researcher, *May 2007 - August 2007*
Microsoft Research, Redmond, WA (Networked Embedded Computing Group)

- Increasing demand for computer resources led to significant growth in the number of data center servers, along with an estimated doubling in the energy consumption in several years. I designed solutions to streamline power consumption for Microsoft Messenger connection servers, and investigated power efficiency and system attributes of the design, such as availability, load balancing, utilization, etc., based on real measurement trace from Messenger service. A paper based on this work has been accepted by *NSDI'08*, and Microsoft Messenger team is considering to implement our design.

Software Engineer, *August 2000 - January 2005*
Cisco Systems, Inc., Champaign, IL (Network Security Management Group)

- Design, develop network security management tools to enable self-defending network strategy provide customers/enterprises with integrated security management for Cisco firewalls, virtual private networks (VPNs), and Intrusion Detection Systems (IDS), etc. I involved in design and developing of software features, the design and developing of software building and installation scripts, as well as the design and implementation and deployment of automated software testing tools, etc.

EDUCATION

University of Illinois at Urbana-Champaign, Urbana, IL *January 2005 — August 2008*
Ph.D., Computer Science
Advisor: Klara Nahrstedt

University of Illinois at Urbana-Champaign, Urbana, IL *August 1998 — August 2000*
Master of Electrical Engineering
Advisor: Muriel Médard

Tsinghua University, Beijing, China *September 1995 — June 1998*
Master of Control Theory and Applications, Department of Automation

Harbin Engineering University, Heilongjiang, China *September 1991 — July 1995*
B.E. with honors, Department of Automatic Control

HONORS AND AWARDS

Vodafone-U.S. Foundation Graduate Fellowship, *2005 - 2006, 2006 - 2007, 2007 - 2008*
by School of Engineering, University of Illinois at Urbana-Champaign

C. W. Gear Outstanding Graduate Student Award, *2007*
by Department of Computer Science, University of Illinois at Urbana-Champaign

NSF TRUST Fellowship *June 2007*
for summer program on ubiquitous secure technology, Cyber-security and privacy

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| Nokia's Grants for workshop in Information Security Theory and Practices —Smart Cards, Mobile and Ubiquitous Computing Systems | May 2007 |
| Student Conference Travel Grant, by University of Illinois at Urbana-Champaign | May 2007 |
| Best Poster Presentation Award in Vodafone Symposium | March 2007 |
| Mavis Memorial Fund Scholarship Award , by School of Engineering, University of Illinois at Urbana-Champaign | 2006 |
| Travel Awards from ACM SIGCOMM'06, ACM MobiCom'07, IEEE RTSS'07, USENIX NSDI'08, CPS Week'08, etc. | |
| 4th Place in International MaRTian Task Robot Competition, in conjunction with RTSS'05 | December 2005 |
| GuangHua Scholarship, Tsinghua University | 1997 |
| Outstanding Graduating Student, Harbin Engineering University | 1995 |
| Meritorious Award, in the Mathematical Contest in Modeling, Consortium for Mathematics and Its Applications(COMAP) | 1993 |
| Scholarship for Outstanding Students, Harbin Engineering University | 1992, 1993, 1994 |

PUBLICATIONS

Journal Articles

- ORTEGA: An Efficient and Flexible Online Fault Tolerance Architecture for Real-Time Control Systems.
Xue Liu, Qixin Wang, Sathish Gopalakrishnan, **Wenbo He**, Lui Sha, Hui Ding, Kihwal Lee.
IEEE Transactions on Industrial Informatics (TII), to appear.
- SMOCK: A Scalable Method of Cryptographic Key Management for Mission-critical Wireless Ad Hoc Networks.
Wenbo He, Ying Huang, Ravishankar Sathyam, Klara Nahrstedt and Whay C. Leey.
IEEE Transactions on Information Forensics and Security, Volume 4, Issue 1, pp 140-150, March 2009.
- End-to-End Delay Control of Multimedia Applications over Multi-hop Wireless Links.
Wenbo He, Klara Nahrstedt, and Xue Liu.
ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP) Volume 5, Issue 2, November 2008.
- McCLS: Certificateless Signature Scheme for Emergency Mobile Wireless Cyber-Physical Systems
Zhong Xu, Guoqing Zhang, **Wenbo He**.
International Journal of Computers, Communications & Control (IJCCC), Vol. III, No. 4, pp.395-411, 2008.
- A Scalable Public Key Management Scheme in Wireless Ad Hoc Networks (MobiCom'06 Poster Abstract).
Wenbo He, Ying Huang, Klara Nahrstedt, and Whay C. Lee.
ACM SIGMOBILE Mobile Computing and Communications Review, Volume 11, Issue 2, April 2007.
- MobiHerald: Alert Propagation in Mobile Ad Hoc Networks (MobiCom'07 Poster Abstract).
Wenbo He, Ying Huang, Klara Nahrstedt, and Whay C. Lee.
ACM SIGMOBILE Mobile Computing and Communications Review, accepted.
- Optimal Real-Time Sampling Frequency Assignment for Wireless Sensor Networks.
Xue Liu, Qixin Wang, **Wenbo He**, Marco Caccamo, and Lui Sha.
ACM Transactions on Sensor Networks (ToSN), Vol. 2(2), 2006.
- Generalized Loop-back Recovery in Optical Mesh Networks.
Muriel Médard, Richard A. Barry, Steven G. Finn, **Wenbo He**, and Steven Lumetta.
IEEE/ACM Transactions on Networking (ToN), Vol. 10(1), 2002.

Conference & Workshop Papers

GreenCloud: A New Architecture for Green Data Center.

Liang Liu; Xue Liu; and **Wenbo He**. The 6th International Conference on Autonomic Computing and Communications, Barcelona, Spain, June 2009.

Optimizing File Retrieval in Delay-Tolerant Content Distribution Community.

Ying Huang, Yan Gao, **Wenbo He**, and Klara Nahrstedt. The 29th International Conference on Distributed Computing Systems (ICDCS'09), June 22-26, Montreal, Quebec, Canada.

A Cluster-based Protocol To Enforce Integrity and Preserve Privacy in Data Aggregation.

Wenbo He, Xue Liu, Hoang Nguyen, and Klara Nahrstedt. The 2nd International Workshop on Cyber-Physical Systems (WCPS 2009), in conjunction with ICDCS 2009.

Challenges Towards Elastic Power Management in Internet Data Centers (invited).

Jie Liu, Feng Zhao, Xue Liu, and **Wenbo He**. The 2nd International Workshop on Cyber-Physical Systems (WCPS 2009), in conjunction with ICDCS 2009.

Energy-Aware Server Provisioning and Load Dispatching for Connection-Intensive Internet Services.

(in **alphabetic order**) Gong Chen, **Wenbo He**, Jie Liu, Suman Nath, Leonidas Rigas, Lin Xiao, and Feng Zhao.

to appear in *the 5th USENIX Symposium on Networked Systems Design and Implementation (NSDI'08)* (acceptance rate = 17%), San Francisco, CA, April, 2008. (This work has been reported on newscientist.com)

iPDA: An Integrity-Protecting Private Data Aggregation Scheme for Wireless Sensor Networks.

Wenbo He, Hoang Nguyen, Xue Liu, Klara Nahrstedt and Tarek Abdelzaher, in MILCOM 2008, in San Diego.

CORPS: Event-driven Mobility Model For First Responders In Incident Scene.

Ying Huang, **Wenbo He**, Klara Nahrstedt, Whay C. Lee, in MILCOM 2008 in San Diego.

DoS-Resistant Broadcast Authentication Protocol with Low End-to-end Delay.

Ying Huang, **Wenbo He**, Klara Nahrstedt, Whay C. Lee,

The 2nd IEEE Workshop on Mission-Critical Networking, in conjunction with IEEE INFOCOM 2008, (acceptance rate = 28%), Phoenix, Arizona.

A Certificateless Signature Scheme for Mobile Wireless Cyber-Physical.

Zhong Xu, Xue Liu, Guoqing Zhang, **Wenbo He**, Guanzhong Dai, Weihuan Shu, *The First International Workshop on Cyber-Physical Systems, in conjunction with ICDCS 2008*, (acceptance rate 27%), Beijing, China.

PDA: Privacy-preserving Data Aggregation in Wireless Sensor Networks.

Wenbo He, Xue Liu, Hoang Nguyen, Klara Nahrstedt, and Tarek Abdelzaher.

Proceedings of the 26th Annual IEEE Conference on Computer Communications (INFOCOM'07), (acceptance rate = 18%), Anchorage, Alaska, May 2007.

SMOCK: A Self-contained Public Key Management Scheme for Mission-critical Wireless Ad Hoc Networks

Wenbo He, Ying Huang, Klara Nahrstedt, and Whay C. Lee.

Fifth Annual IEEE International Conference on Pervasive Computing and Communications (PerCom'07), (acceptance rate = 9.6%), White Plains, New York, March 2007.

Active Queue Management Design Using Discrete-Event Control.

Xue Liu, **Wenbo He**.

Proceedings of the 46th IEEE Conference on Decision and Control (CDC'07), New Orleans, LA, 2007.

MobileAds: Advertisement on Mobile Devices.

Wenbo He, Klara Nahrstedt.

Ph.D. Forum on Deeply Embedded Real-Time Computing, in The 28th IEEE Real-Time Systems Symposium (RTSS'07), Tucson, Arizona, December 2007.

- Control Computing Systems as Queueing Systems: The Case of Optimal Dropping Strategy for Internet Routers.
Xue Liu, and **Wenbo He**.
Second IEEE International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks (FeBID), Co-located with IM 2007, Munich, Germany, May 2007.
- Requirements and System Architecture Design Consideration for First Responder Systems
Ying Huang, **Wenbo He**, Klara Nahrstedt, and Whay C. Lee.
IEEE Conference on Technologies for Homeland Security Conference, Waltham, MA, May 2007.
- Experimental Validation of Middleware-based QoS Control in 802.11 Wireless Networks (Invited paper).
Wenbo He, Hoang Nguyen, and Klara Nahrstedt.
Third International Conference on Broadband Communications, Networks, and Systems (BROADNETS '06), San Jose, CA, October 2006.
- Impact of Upper Layer Adaptation on End-to-end Delay Management in Wireless Ad Hoc Networks.
Wenbo He, and Klara Nahrstedt.
Twelfth IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS '06), San Jose, CA, May 2006.
- An Integrated Solution to Delay and Security Support in Wireless Networks.
Wenbo He, and Klara Nahrstedt.
IEEE Wireless Communications and Networking Conference (WCNC '06), Las Vegas, NV, April 2006.
- A Feedback Control Scheme for Resource Allocation in Wireless Multi-hop Ad Hoc Networks.
Wenbo He, Xue Liu, and Klara Nahrstedt.
International Conference on Mobile and Ubiquitous Systems: Networks and Services (MobiQuitous'05), San Diego, CA, July 2005.
- Building Robust Wireless LAN for Industrial Control with DSSS-CDMA Cellphone Network Paradigm.
Qixin Wang, Xue Liu, Weiqun Chen, **Wenbo He**, and Marco Caccamo.
Proceedings of the IEEE Real-Time Systems Symposium (RTSS '05), Miami, Florida, December 2005.
- Autonomous Motion Planning on Mars.
Wenbo He, Chengdu Huang, Xue Liu, Liqian Luo, and Min Wu (in alphabetical order).
Embedded Real-Time Systems Implementation Workshop (ERTSI '05), in conjunction with the 26th IEEE International Real-Time Systems Symposium (RTSS '05), December, 2005.
- Optimal QoS Sampling Frequency Assignment for Real-Time Wireless Sensor Networks.
Xue Liu, Qixin Wang, Lui Sha, and **Wenbo He**.
Proceedings of IEEE Real-Time Systems Symposium (RTSS '03), Cancun, Mexico, December 2003.

PATENTS

- Motorola Patent** *Nov., 2006*
Method and Apparatus for Alerting nodes of a Malicious Node in a Mobile Ad-Hoc Communication System — U.S. Patent pending, by Wenbo He, Ying Huang, Klara Nahrstedt, and Whay C. Lee.
- Microsoft Patent** *March, 2008*
A Framework for Joint Analysis And Design of Server Provisioning And Load Dispatching for Connection-intensive Services — U.S. Patent pending, by Gong Chen, Wenbo He, Jie Liu, Suman Nath, Leonidas Rigas, Lin Xiao, and Feng Zhao.
- Microsoft Patent** *March, 2008*
Load Skewing for Power-aware Server Provisioning — U.S. Patent pending, by Gong Chen, Wenbo He, Jie Liu, Suman Nath, Leonidas Rigas, Lin Xiao, and Feng Zhao.

IMPACT

- SMOCK was profiled by Technical Insights Division of Frost & Sullivan, which track the latest technology developments and trends in network security technologies. SMOCK was implemented by Trustworthy Cyber Infrastructure for the Power Grid (TCIP), a multi-university program including UIUC, Cornell, Dartmouth College, Washington State University, funded by NSF and DOE.
- PDA was included in graduate seminars at UIUC, McGill University, National Chiao Tung University (Taiwan), among others.
- Mobi-Herald is pending for a US patent.
- QoS Middleware was technology transferred to Motorola Inc.
- Microsoft Messenger team is considering to implement our work Energy-aware Scheduling for Large-scale Internet Service (NSDI'08 paper). This work has been reported on newscientist.com.

PROFESSIONAL ACTIVITIES

Technical Program Committee for several conferences and workshops including INFOCOM'10, IWQoS'09, WCPS'09, ICCCN'09, WiMD'09, ICES'09, AdHocNets'09, and RTCSA'09 (publicity chair).

Reviewer for several journals including IEEE Transactions on Wireless Communications (TWC), IEEE Transactions on Information Forensics and Security, IEEE Transactions on Computers (TC), ACM Transactions on Sensor Networks (ToSN), IEEE Transactions on Mobile Computing (TMC), ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP), IEEE Transactions on Parallel and Distributed Systems (TPDS).

Reviewer for several conferences including IEEE International Conference on Network Protocols (ICNP), IEEE Conference on Computer Communications (INFOCOM), IEEE International Conference on Pervasive Computing and Communications (PerCom), IEEE International Workshop on Quality of Service (IWQoS), ACM Conference/Workshop on Network and Operating System Support for Digital Audio and Video (NOSS-DAV), ACM Conference on Embedded Networked Sensor Systems (SenSys), International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine), IEEE Real-Time Systems Symposium (RTSS), IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), International Workshop on Trustworthiness, Reliability and Services in Ubiquitous and Sensor networks (TRUST), IEEE International Conference on Parallel and Distributed Systems (ICPADS).

Membership IEEE member and member of IEEE Women in Engineering; ACM member.