

Wenbo He

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RESEARCH INTERESTS

Pervasive and Ubiquitous Computing, Cyber Trust & Security, Privacy-preserving Techniques, Networked Embedded Systems, Disruption Tolerant Networks, Energy-aware Scheduling for Server Clusters

EDUCATION

- University of Illinois at Urbana-Champaign**, Urbana, IL *January 2005 — Summer 2008 (expected)*
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 (now at MIT)
- 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
- Nokia's Grants** *May 2007*
for workshop in Information Security Theory and Practices —Smart Cards, Mobile and Ubiquitous Computing Systems
- Student Conference Travel Grant**, *May 2007*
by University of Illinois at Urbana-Champaign
- Best Poster Presentation Award** in Vodafone Symposium *March 2007*
- Mavis Memorial Fund Scholarship Award**, *2006*
by School of Engineering, University of Illinois at Urbana-Champaign
- ACM SIGCOMM'06 Travel Award** *September 2006*
- 4th Place in International MaRTian Task Robot Competition**, *December 2005*
in conjunction with RTSS'05
- GuangHua Scholarship**, Tsinghua University *1997*
- Outstanding Graduating Student**, Harbin Engineering University *1995*
- Meritorious Award**, *1993*
in the Mathematical Contest in Modeling, Consortium for Mathematics and Its Applications(COMAP)
- Scholarship for Outstanding Students**, Harbin Engineering University *1992, 1993, 1994*

PUBLICATIONS

Journal Articles

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) (accepted with minor revisions).

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

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.

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, Wei-qun 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.

Papers in Submission

Dandelion: Mobility-assisted Reliable Message Propagation Protocol in MANETs.

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

Submitted to *the 28th International Conference on Distributed Computing Systems (ICDCS'08)*, Beijing, China.

MobiHerald: Alert Propagation in Mobile Ad Hoc Networks.

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

Submitted to *the ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc'08)*, Hong Kong, China.

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

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

Submitted to *ACM Transactions on Sensor Networks (TOSN)*.

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. Lee.

Submitted to *IEEE Transactions on Information Forensics and Security*.

INDUSTRY EXPERIENCE

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.

RESEARCH EXPERIENCE

CS Department, University of Illinois at Urbana-Champaign (Ph.D. expected)

2005 - present

Research Assistant**Representative Projects:**

Mobi-Herald: a reliable, distributed alert propagation protocol geared for spreading alert messages to the whole network upon detection of malicious/abnormal activity. It prevents and slanders attacks which can be utilized by malicious nodes (slanderers) to defame other network nodes to issue DoS attacks. In this project, we investigated efficiency, robustness, reliability by intensive simulation and theoretical analysis.

iPDA: a system providing prevention and detection against privacy deficiency and integrity violation of data aggregation in wireless sensor networks (paper in INFOCOM'07). The system bridges the gap between collaborative data aggregation and data privacy in wireless sensor networks, and guarantees the integrity of the aggregation as well. We evaluated performance through various simulation scenarios.

SMOCK: a self-contained public key management scheme. It is a new distributed key management paradigm suitable for large scale network environments (paper in PerCom'07).

QoS Middleware: an adaptive middleware to achieve QoS and QoP for mobile multimedia applications (papers in RTAS'06, WCNC'06). Designed and implemented a middleware, deployed into real wireless ad hoc environment and demonstrated various versions of the system on multiple occasions.

ECE Department, University of Illinois at Urbana-Champaign (Master)

1998 - 2000

Research Assistant

Loop-back Recovery in Optical Networks: relies on ring topologies, or on overlaying logical ring topologies upon physical meshes. Loop-back is desirable to provide rapid preplanned recovery of link or node failures in a bandwidth-efficient distributed manner. (Paper in TON)

TEACHING EXPERIENCE

ECE Department, University of Illinois at Urbana-Champaign

01/00 - 05/00

Teaching Assistant

CS445/ECE470/GE421/ME445: Introduction to Robotics.

ECE Department, University of Illinois at Urbana-Champaign

08/99 - 12/99

Teaching Assistant

ECE385: Digital Systems Lab.

Department of Automation, Tsinghua University

02/97 - 06/97

Teaching Assistant

Control Theory and Its Applications.

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.

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).

PROFESSIONAL ACTIVITIES

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