Minho Shin

Contact Information

Institute for Security Technology Studies
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Research Interest

Wireless Networking:
- Wi-Fi, Ad-hoc, Wireless Mesh Networks, Vehicular Networks

Pervasive Networking:
- People-centric Urban Sensing, Pervasive Health Monitoring

Wireless Network Security:
- Authentication, Privacy, Data Integrity, Security Protocol Design

Distributed Algorithms
- Randomized Algorithms, Probabilistic Analysis

Education

Ph.D., Computer Science 2007
University of Maryland, College Park, MD
Advisor: William A. Arbaugh

M.S., Computer Science 2003
University of Maryland, College Park, MD
Advisor: William A. Arbaugh

B.S., Computer Science and Statistics 1998
Seoul National University, Seoul, Korea

Major Achievement

- Significantly improved the performance and the security of WLAN hand-off by real measurement, protocol design (Neighbor Graph included in 802.11f), and prototype implementation, stimulating other research on that field.
- Recognized privacy and data integrity problem of people-centric sensor networks, and proposed the first privacy-aware sensing architecture (AnonySense) and high-integrity sensing framework.
- Improved network performance of multi-radio multi-channel ad-hoc networks by proposing a distributed heuristic algorithm (SAFE) and SDP-based approaches.
- Proposed object lookup technology (Ring Interval Graph Search) specialized for multi-hop wireless networks using distributed hash table (DHT) technology. Publication under preparation.
- Filed six U.S. patents and several foreign patents.

Work Experience

Institution for Security Technology Studies, Dartmouth College Nov 2007–present
Postdoctoral Research Fellow with Prof. David Kotz
Worked on security problems of people-centric sensor networks and health monitoring with focus on privacy and data integrity. Lead *Metrosec* project with three Ph.D students and another post-doctor. Mentored a master student with the health-monitoring project. Published two papers and another paper is under peer review.

Motorola Networks & Systems Lab, Schaumburg, IL Jun–Aug 2006
Mentor: Dr. Judy Fu
Worked on Spontaneous Inter-Provider Roaming project to design a general framework

for spontaneous roaming between providers. With the proposed framework, users can access the visiting network without prior static roaming contract between home network and visiting network. Filed two patents.

Motorola Networks & Systems Lab, Schaumburg, IL Jun–Aug 2005
Mentor: Dr. Madjid Nakhjiri
Implemented prototype for broker-based inter-provider roaming scheme. In this work, the network authenticates visiting users through a broker server. I implemented a prototype with freeRadius server, open1x supplicant, and open1x authenticator. Successfully demonstrated broker-based roaming in an internal meeting.

Samsung Advanced Institute of Technology, Kiheung, Korea May–Jun 2003
Mentor: Dr. Insun Lee, Dr. Kyunghoon Jang
Designed QoS aware hand-off technology using Neighbor Graph. Co-worked with two Ph.D students. Filed a patent.

Research Project

Data Assurance in Pervasive Health Monitoring Nov 2007–Present
This project aims to provide the assurance and assessment of data quality in health-monitoring systems. Mentoring a master student, I am developing a medical-data based patient authentication scheme. Funded by Intel Corporation.

Metrosec: Security of People-centric Sensor Networks Nov 2007–Present
People-centric sensor network exploits mobile devices carried by people for environmental sensing as well as human sensing. Leading the project with three Ph.D students and another post-doctor. Developed a privacy-aware sensing architecture (AnonySense, *Mobisys 2008*) and a high-integrity sensing architecture (under peer review). Currently working on privacy-integrity-aware sensor sharing.

Thesis: Peer-to-Peer Lookup for Multi-Hop Wireless Networks 2006–Present
Most multi-hop wireless networks benefit from peer-to-peer lookup services such as routing and key discovery. My thesis work presents novel approach to building scalable and efficient peer-to-peer lookup services in multi-hop wireless networks. I designed a lightweight lookup algorithm (ValleyWalk) and a DHT-like lookup algorithm (RIGS). Simulations show near-optimal performance for both schemes. Publication is under preparation.

Intelligent Traffic Information System using Vehicular Communication 2007
Designed a travel-time estimation technique based on vehicular ad-hoc network (VANET). For evaluation, implemented an integrated transportation-communication simulation framework. Two simulators *Paramics*, for transportation, and *Qualnet*, for communication, are integrated through inter-simulator communication. This is a joint work with two Ph.D students and Dr. David Lovell, a professor of Department of Civil and Environmental Engineering, University of Maryland. Published in *Transportation Research Board 2008*.

Distributed Channel Assignment in Multi-hop Wireless Networks 2005–2007
Designed a distributed channel assignment algorithm for multi-radio multi-channel multi-hop networks to minimize co-channel interference and maximize communication throughput. Proposed a heuristic-based distributed algorithm, called SAFE, and Semi-Definite Programming algorithms. This is a joint work with Dr. Yoo-ah Kim at University of Connecticut and Dr. Seungjoon Lee at AT&T. Published three papers.

Performance and Security of WLAN Hand-off and Interworking with 3G 2002–2004
This project aims to address the performance and security problems of user hand-offs in WLANs and between WLANs and 3G networks. First, identified impractically large hand-off latencies in WLAN through empirical analysis with state-of-art devices. Proposed a structured support of hand-off, called Neighbor Graphs (NG). Using NG, I reduced hand-off latency latency down to 31 ms from 300 ms. Then, focused on the authentication delay. Proposed proactive key distribution by a centralized authentication server. As a distributed solution, I proposed a proactive context caching by integrating NG with Inter Access-Point Protocol (IAPP). My solution is accepted by the IEEE Standard 802.11f. I extended the notion of NG for inter-network roaming such as between WLAN and 3G. Implemented proposed schemes with custom 802.11 access points on Soekris boards running OpenBSD 3.1. For authentication protocols of IEEE 802.11i, I modified freeRadius servers and open1x codes. This project was funded by Samsung Corporation.

Select Publication

Challenges in Data Quality Assurance in Pervasive Health Monitoring Systems
Janani Sriram, Minho Shin, David Kotz, Anand Rajan, Manoj Sastry, Mark Yarvis
Conference "Future of Trust in Computing", June, 2008, Berlin, Germany

AnonySense: Privacy-Aware People-Centric Sensing
C. Cornelius, A. Kapadia, D. Kotz, D. Peebles, Minho Shin, and N. Triandopoulos
Mobisys 2008, June, 2008, Breckenridge, Colorado, USA (acceptance ratio:17.8%)

An Integrated Transportation and Communication Simulation Framework for Vehicular Ad Hoc Network Applications
Hyoungsoo Kim, Minho Shin, Beomseok Nam, David Lovell
Transportation Research Board 2008 Annual Meeting, Washington D.C., USA.

SDP-based Approach for Channel Assignment in Multi-radio Wireless Networks
Hieu Dinh, Yoo-Ah Kim, Seungjoon Lee, Minho Shin, Bing Wang
Dial M-POMC 2007, Portland, Oregon, USA. (acceptance ratio:35%)

Soft Edge Coloring
Chadi Kari, Yoo-Ah Kim, Seungjoon Lee, Alex Russell, and Minho Shin
APPROX 2007, Princeton University, New Jersey.

AAA for Spontaneous Roaming Agreements In Heterogeneous Wireless Networks
Judy Fu, Minho Shin, J. C. Strassner, N. Jain, V. Ram, S. Upadhyaya, and W. Arbaugh
Autonomic and Trusted Computing 2007, Hong Kong, China.

Distributed Channel Assignment for Multi-radio Wireless Networks
Minho Shin, Seungjoon Lee, and Yooah Kim
MASS 2006, Vancouver, Canada. (acceptance ratio:24.9%)

Wireless Network Security and Interworking
Minho Shin, Arunesh Mishra, Justin Ma, and William Arbaugh
The Proceedings of IEEE on Cryptography and Security 2005

Improving the Latency of 802.11 Hand-offs using Neighbor Graphs
Minho Shin, Arunesh Mishra and William Arbaugh
ACM MOBISYS 2004, Boston, MA. (acceptance ratio: 13.4%)

Pro-active Key Distribution using Neighbor Graphs
Arunesh Mishra, Minho Shin, N. L. Petroni, Jr., T. Charles Clancy, and William Arbaugh
IEEE Wireless Communications Magazine, Feb., 2004

Context Caching using Neighbor Graphs for Fast Handoffs in a Wireless Network
Arunesh Mishra, Minho Shin, and William Arbaugh
IEEE INFOCOM 2003, Hong Kong, China, Mar., 2004 (acceptance ratio:20.8%)

An Empirical Analysis of the IEEE 802.11 MAC Layer Handoff Process
Arunesh Mishra, Minho Shin, and William Arbaugh
ACM CCR, Vol.33 No.2, April, 2003

The Robust Routing Protocol in Ad Hoc Networks
Seungjoon Lee, Bohyung Han, and Minho Shin
International Workshop on Ad Hoc Network(IWAHN) 2002, Vancouver, Canada.

Technical Report

The Design of Efficient Internetwork Authentication for Ubiquitous Wireless Comm.
Minho Shin, Justin Ma, and William A. Arbaugh
Tech. Report of University of Maryland, 2004 (CS-TR-4617, UMIACS-TR-2004-59)

Poster

Reliable People-centric Sensing with Unreliable Participants
Minho Shin, C. Cornelius, D. Peebles, A. Kapadia, P. Tseng, and D. Kotz
Mobisys 2008

Patent

"Dynamic Roaming Agreement of Heterogeneous Networks" (US 11/773122, IN/1410/DEL/2007)

"Authentication method for wireless distributed system" (US 11/433679, KR 2006-41227)

"Method for performing handoff in wireless network" (US 11/003211)

"Probing Method for Fast Handoff in WLAN" (US 11/141179, KR 2004-90573)

"Method for fast roaming in a wireless network" (US 11/752675)

"Reconfiguration of Neighborhood Graph for QoS Support in Heterogeneous Network, and its use for seamless handoff" (KR 2003)

Talk

Distributed Channel Assignment for Multi-radio Wireless Networks
Minho Shin, Seungjoon Lee, and Yooah Kim
MASS 2006, Vancouver, Canada.

Improving the Latency of 802.11 Hand-offs using Neighbor Graphs
Minho Shin, Arunesh Mishra and William Arbaugh
ACM MOBISYS 2004, Boston, MA.

Context Caching using Neighbor Graphs for Fast Handoffs in a Wireless Network
Arunesh Mishra, Minho Shin, and William Arbaugh
IEEE INFOCOM 2003, Hong Kong, China, Mar., 2004

Teaching Experience

Teacher Training Program — May 2008
Dartmouth Center for the Advancement of Learning

Teaching Assistant — 2001–2002
Department of Computer Science, University of Maryland, College Park, MD
- Discrete Mathematics, Data Structure, Introduction to Computer Science

Office Program Instructor — 1993–1994
The Headquarter of the 2nd Fleet, Republic of Korea Navy

Skill

Languages : C, C++, Object C, Java, Ruby, PHP, SQL, Object Pascal
System and Network Programming : TCP/IP Socket, Linux/BSD Kernel
Simulation Tools : Matlab, ns-2, Qualnet, Paramics

Awards & Honors

National IT Fellowship — Feb 2001–Jan 2005
Ministry of Information and Communication of Korea

SNUA Student Scholarship — 2004–2007
Seoul National University Alumni Association

Social Activities

President of Korean Graduate Student Association of CS in UMD — 2003
Founder and president of KGSYS (KGCS System Research Group) in UMD — 2002

Professional Services

Program Committee: IEEE LCN Workshop on Network Security (WNS) 2008
Active Reviewer: IEEE Transactions on Mobile Computing, IEEE Transactions on Networking, IEEE ICC, IEEE Globecom, IEEE HPSR, IEEE Sarnoff, IEEE WCNC, IEEE ICCCN, IEEE PIMRC, IEEE Communications Magazine, ACM IWCMC, European Wireless, European Transactions on Telecommunications

Reference

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Citizenship & Status

Korean (Republic of Korea)
F-1 Student Visa (OPT)