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Heesook Choi

- Research Interests** My primary research interests lie in security and privacy in distributed systems and wireless mobile networks, focusing on designing algorithms and systems research.
- **Telecommunication Security:** Security Vulnerabilities in 3G and 4G wireless networks, User/Device Authentication, and privacy.
 - **Misbehavior detection**
 - **Location Privacy** in Wireless Networks
 - **Security in MANETs:** Protocols and algorithms for anonymous communication, cooperative forwarding, multicast authentication, location privacy, and embedded system security.
 - **Security in sensor networks:** Key management, Clone and Sybil attacks, anonymity of location and source/sink.

Education

Ph.D. (Computer Science and Engineering)

Fall 2002 – August, 2007 Pennsylvania State University University Park, PA, US

Area of Research Privacy and security aspect in wireless and mobile networks.

Advisor Dr. Thomas F. La Porta

M.S. (Computer Science)

March, 1990 – February, 1992 Chungnam National University, Daejeon, KOREA

B.S. (Computer Science and Statistics)

March, 1986 – February, 1990 Chungnam National University, Daejeon, KOREA

Employment History

1. Research Scientist at Sprint ATL Labs Burlingame, CA, US

- August 27, 2007 - present

2. Research Assistant Penn. State University University Park, PA, US

- January, 2005 – August, 2007
- June, 2003 – June, 2004

3. Teaching Assistant Penn. State University University Park, PA, US

- 2003 Spring – Mobile Networking and Computing
- 2004 Fall – Computer Network Security

4. Senior Research Staff ETRI, Daejeon, Korea

- January, 1998 – July, 2001

5. Research Engineer ETRI, Daejeon, Korea

- February, 1992 – December, 1997

6. Internship

ETRI,

Daejeon, Korea

- 1991 Fall

7. Teaching Assistant Chungnam National University, Daejeon, Korea

- 1990 – 1992 FORTRAN Programming Language and Digital Design

Project Experiences (Sprint)

Next Generation Wireless Network Security

- August 2007 – present
 - Authentication in WiMAX: Authentication is a crucial network entry step which allows legitimate users to access the network services, preventing malicious/non-legitimate users from abusing the network services and mounting various attacks.
 - Security analysis in 3G (CDMA2000) and 4G (WiMAX) networks
 - Cloning/fraud detection and mitigation
 - Multi-realm authentication interworking between CDMA2000 and WiMAX networks
 - Wireless security (Bluetooth, IEEE 802.11, etc.)

Project Experiences (Penn. State University)

Defense against clone attacks in sensor networks

- May 2006 – March 2007

Sensors are deployed and operate in a hostile environment with no centralized control. Inexpensive sensors may not be equipped with tamper-resistant hardware. Thus, private information may be obtained from captured sensors. These sensors may then be cloned and deployed in the sensor network to launch a variety of attacks. In this project, we propose a scheme to detect clones, called SET (Securecomm 2007)

Anonymous Communication in MANETs

- September 2005 – March 2007

Mobile ad hoc networks often support sensitive applications. These applications may require that user's identity, location, and correspondents be kept secret. This is a challenge in a MANET because of the cooperative nature of the network. In this project, we propose a privacy preserving communication system (PPCS) for MANETs. (SECON 2007)

Anonymous and Secure Reporting System in MANETs

- September, 2004 – July, 2005

Mobile nodes in civilian ad hoc networks are rational, i.e., they pursue their own self-interest. Previous research focuses on monitoring the behavior of nodes in such settings based on information learned and provided by neighboring nodes. We proposed a protocol that uses nodes on the data path to securely produce packet forwarding reports. Reporting nodes are chosen randomly and secretly so that malicious nodes cannot modify their behavior based upon the monitoring point. (published in Mobiquitous 2005 and WINET 2007)

Mobile Multilayered IPsec (MML-IPsec)

- June, 2003 – July, 2004 (January, 2005 – December, 2005)

Multi-layered IPsec was proposed to allow intermediate nodes to see a portion of a packet to execute performance enhancements or other functions in the Internet while keeping data payloads secret. In this project, we proposed a model to integrate multi-layered IPsec and Mobile IP. We also defined key distribution protocols to support mobility. We fully implemented and evaluated the key distribution protocols based on IKE version 1 and IKE version 2. (published in INFOCOM 2005 and in the ACM/Kluwer Wireless Networks, 2007)

The key distribution protocol specifications and software are available at

**Industry
Experience**

August, 2007 – Present Research Scientist Sprint ATL, Burlingame, CA

Jan., 1998 – July, 2001 Senior Research Staff ETRI, Daejeon, Korea

- MPLS Traffic Engineering Server for the Internet based on off-line and on-line measurement. We developed RATE (Routing Advisor for Traffic Engineering) in which OSPF routing provides topology information and routers monitor the status of traffic flows and send a report to the server. (Internet Traffic Engineering). We participated in an exhibition held in KOEX in the name of WISE (Wise Internet Service Engineering Server), 2001.
- ANS (ATM Name Server) function and Shortcut Server using Classical IP over ATM
- Signaling protocol and Call/Connection control functions in an ATM private switching system: I was responsible for designing and developing ATM signaling and call/connection control functions in a private switching system project, in which several companies (e.g., LG Telecom) were involved. Our private switching system passed a national benchmarking test by Korea Telecom Inc.
- ATM Traffic Management: I was in charge of designing ATM traffic management function.

Jan., 1992 – Dec., 1997 Research Engineer ETRI, Daejeon, Korea

- Development of Call/Connection Control Function in a private switching system in ATM networks.
- B-ISDN UNI Signaling protocol design and implementation (Layer 2 and 3)
- Inter-working function development in ATM networks (as a bridge among ATM, ISDN phone, and Ethernet)

Publications

(Journal)

1. P. Traynor, R. Kumar, Heesook Choi, G. Cao, S. Zhu and T. La Porta, "**Efficient Hybrid Security Mechanisms for Heterogeneous Sensor Networks**," IEEE Transactions on Mobile Computing (TMC), 2007.
2. Heesook Choi, H. Song, G. Cao, and T. La Porta, "**Mobile Multi-Layered Ipv6**," ACM/Kluwer Wireless Networks (WINET), 2007
3. Heesook Choi, W. Enck, J. Shin, P. McDaniel, and T. La Porta, "**ASR: Anonymous and Secure Reporting of Traffic Forwarding Activity in Mobile Ad Hoc Networks**," ACM/Kluwer Wireless Networks (WINET), 2007

Publications

(Conference/Workshop)

4. Raju Kumar, Heesook Choi, JaeSheung Shin, Thomas F. La Porta, "**Channelization for Network Coding in Wireless Networks**," IEEE INFOCOM, 2008
5. Heesook Choi, P. McDaniel and T. La Porta, "**Privacy Preserving Communication in MANETs**," Fourth Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks SECON 2007
6. Heesook Choi, Sencun Zhu and T. F. La Porta, "**SET: Detecting node clones in Sensor Networks**," 3rd International Conference on Security and Privacy in Communication Networks (SecureComm 2007)
7. P. Traynor, Heesook Choi, G. Cao, S. Zhu and T. La Porta, "**Establishing Pair-Wise Keys In Heterogeneous Sensor Networks**," *Proceedings of the 25th Annual IEEE Conference on Computer Communications (INFOCOM)*, April 2006
8. Heesook Choi, W. Enck, J. Shin, P. McDaniel, and T. La Porta, "**Secure**

Reporting of Traffic Forwarding Activity in Mobile Ad Hoc Networks,”
Proceedings of The Second Annual International Conference on Mobile and Ubiquitous Systems (MobiQuitous), July 2005.

9. Heesook Choi, H. Song, G. Cao, T. La Porta, “**Mobile Multi-Layered IPsec,**” *Proceedings of the 24th Annual IEEE Conference on Computer Communications (INFOCOM)*, March 2005.
10. Heesook Choi, H. Song, G. Cao, T.F. La Porta, “**Mobile IPsec,**” IEEE Communications, Quality and Reliability Workshop (CQR), April, 2005.
11. P. Traynor, H. Choi, G. Cao and T. La Porta, “**Probabilistic Unbalanced Key Distribution and Its Effects on Distributed Sensor Networks,**” Poster Session at ACM Workshop on Wireless Security ([WiSe](#)), October 1, 2004.
12. H. Choi, S. Zhu and T. La Porta, “**SET: Clone detection in sensor networks,**” Networking and Security Center Technical Report NAS-TR-0047-2006, Department of Computer Science and Engineering, Penn State University, August 2006.
13. H. Choi, P. McDaniel and T. La Porta, “**Privacy Preserving Communication in MANETs,**” Networking and Security Center Technical Report NAS-TR-0031-2006, Department of Computer Science and Engineering, Penn State University, March 2006.
14. H. Choi, W. Enck, J. Shin, P. McDaniel, and T. La Porta, “**ASR: Anonymous and Secure Reporting of Traffic Forwarding Activity in Mobile Ad Hoc Networks,**” Technical Report NAS-TR-0034-2006, Network and Security Research Center, Department of Computer Science and Engineering, Pennsylvania State University, University Park, PA, USA, 2006.
15. P. Traynor, R. Kumar, H. Choi, G. Cao, S. Zhu, and T. La Porta, “**Efficient Hybrid Security Mechanisms for Heterogeneous Sensor Networks,**” Technical Report NAS-TR-0044-2006, Network and Security Research Center, Department of Computer Science and Engineering, Pennsylvania State University, University Park, PA, USA, 2006.
16. J. Shin, H. Choi, P. Traynor and T. La Porta, “**Network Formation Schemes for Dynamic Multi-Radio, Multi-Hop Wireless Cellular Networks,**” Networking and Security Center Technical Report NAS-TR-0005-2005, Department of Computer Science and Engineering, Penn State University, July 2005.
17. P. Traynor, H. Choi, G Cao, S Zhu and T. La Porta, “**Establishing Pair-Wise Keys In Heterogeneous Sensor Networks,**” Networking and Security Center Technical Report NAS-TR-0001-2004, Department of Computer Science and Engineering, Penn State University, November 2004. (UPDATED July 2005)

Technical Reports

Graduate Courses

(Penn. State University)

Professional Skills

Computer Architecture, Bioinformatics, Mobile Networking and Computing, Computer Algorithm, Stochastic Process, Analysis of Computer Network, Performance Evaluation, and Computer Security (Audit an advanced computer security course dealing with security policy)

- **Simulation tools** : NS 2 network simulator and CSIM
- **Operating Systems**: Unix, Linux, FreeBSD, and Real time OS (VRTX)
- **Programming languages**: C, C++, and Java

Reviewer IEEE Transactions on Wireless Sensor Networks, Journal of Computer Network, IEEE Journal on Selected Areas in Communications (J-SAC), IEEE International Conference on Communications (ICC), IEEE Transactions on Mobile Computing (TMC), ACM/Kluwer Wireless Networks (WINET), and Globecom

- Professional activity**
- WSNS 2008 TPC Member
 - Percom 2007 TPC member
 - MobiQuitous 2006 conference administrator
 - 1999 - 2001 IETF Traffic Engineering Korean Delegate
 - 1993 – 1997 ITU-T SG 11 Korean Delegate

- Awards and Honors**
- 2008, Oct. – Sprint Excellent Award on CDMA/EVDO Protection(\$\$)
 - 2008, April – Unwanted packet analysis got Sprint Excellent Award(\$\$)
 - 2007 – Sprint Excellent Award (\$\$)
 - 2001 – IT scholarship from Institute for Information Technology Advancement, Korea (\$20,000)
 - 1990 – Chungnam National University Alumni Award (B.S. Graduation Award)
 - 1986 – 1989: Excellent student scholarship of Chungnam National University (top 3%)

Contact Information

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- ETRI (Electronics and Telecommunications Research Institute), Korea
- This résumé does not include paper and patent list in ETRI.