Jaeyeon Jung

CONTACT INFORMATION

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RESEARCH INTERESTS

My research focuses on developing new technologies for protecting consumer privacy, particularly in the areas of mobile systems and emerging connected devices for the home. My recent research efforts can be categorized as the followings:

Measuring privacy risks in mobile applications. My past project, TaintDroid [20], is one of early works that showed how bluntly Android applications collect and share the user's privacy-sensitive data. Our recent work shows how one can build static analysis tools to check whether Windows Phone applications collect the user's privacy-sensitive data without explicit consent and furthermore to add consent prompting if a violation is detected [4].

Designing meaningful privacy mechanisms. The current ultimatum-style permission models work against users' favor. Today, a service operator (or an application developer) sets the term and the only choice available to users is either to accept the term or to give up using the service. My past project, AppFence [13] explored two privacy mechanisms—data shadowing and exfiltration blocking—and examined how these mechanisms can retrofit existing Android applications on mobile devices. Recently, I focus on developing privacy mechanisms for smart homes. Our recent user studies [6][10][14] explore users' receptiveness to sensing and inference in the home or neighborhood and propose technical mechanisms to mitigate their privacy concerns.

RESEARCH IMPACT

The TaintDroid project is a pioneering work that investigated privacy issues with respect to modern smartphone applications. The work advanced state of the art in detecting misuse of users' privacy-sensitive information by applications by integrating dynamic information flow tracking mechanisms within Android operating system. The application study that we conducted using the TaintDroid system discovered widespread sharing of users' private information across popular Android applications, resulted in a number of follow-on research papers in academia and industry.

- The findings of the TaintDroid study were featured in major media outlets including CNET, BBC, and Wired in 2010.
- The TaintDroid source code that we released at `http://appanalysis.org` in September 2010 has been downloaded well over thousand times as of December 2012 and became a foundation of many research prototypes (cited over 680 times as of February 2014) and commercial products (e.g., `http://www.asurion.com/`).
- The TaintDroid work was featured in the March 2014 issue of the Communication of ACM as Research Highlights.

My research on usable privacy and consumer privacy protection was recognized as leading research in mobile privacy by the research and policy makers communities:

- My research talk on "usable privacy" was one of the two research highlights from Microsoft Research presented at Microsoft Global Privacy Summit, September 2012.
- I was invited and presented my work on "permissions, user privacy, & choice architecture" at AT&T Mobile Security Workshop, October 2012.
- I was invited and presented my work on "consumer privacy protection on smarthones & mobile devices" at the Luncheon Salon event hosted by the Brookings Institution and Microsoft, November 2012.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA

Ph.D. in Computer Science, May 2006
Dissertation: Real-Time Detection of Malicious Network Activity Using Stochastic Models
Advisor: Hari Balakrishnan

Korea Advanced Institute of Science and Technology, Daejeon, Korea

M.S., in Computer Science, February 1998
B.A., in Computer Science, *Summa Cum Laude*, February 1996

ACADEMIC EXPERIENCE

University of Washington, Seattle, WA, USA

Affiliate Faculty at CSE July 2007–present
Collaborating with other faculty in the CSE department and advising students in the Ph.D program.

Korea Advanced Institute of Science and Technology, Daejeon, Korea

Adjunct Assistant Professor at CSD February 2008–present
Co-taught a seminar class, CS891 Information Security as a Social Science with Dr. Stuart Schechter in February 2008.

Massachusetts Institute of Technology, Cambridge, MA, USA

Graduate Researcher September 2000–May 2006
Conducted Ph.D. research and completed Ph.D. and Masters-level coursework.

Teaching Assistant for 6.829 Computer Networks September–December 2003
My responsibilities included giving recitation classes, holding office hours, and grading papers

PUBLICATIONS

privacy, security, systems and users

[1] Trinabh Gupta, Rayman Preet Singh, Amar Phanishayee, Jaeyeon Jung, and Ratul Mahajan. Bolt: Data Management for Connected Homes. In *Proc. of NSDI*, April 2014

[2] Trinabh Gupta, Amar Phanishayee, Jaeyeon Jung, and Ratul Mahajan. Towards a Storage System for Connected Homes. In *Proc. of Workshop on Large-Scale Distributed Systems and Middleware*, November 2013

[3] Eun Kyoung Choe, Jaeyeon Jung, Bongshin Lee, and Kristie Fisher. Nudging People Away From Privacy-Invasive Mobile Apps Through Visual Framing. In *Proc. of Interact*, September 2013

[4] Ben Livshits and Jaeyeon Jung. Automatic Mediation of Privacy-Sensitive Resource Access in Smartphone Applications. In *Proc. of USENIX Security*, August 2013

[5] Rebecca Balebako, Jaeyeon Jung, Wei Lu, Lorrie Faith Cranor, and Carolyn Nguyen. "Little Brothers Watching You:" Raising Awareness of Data Leaks on Smartphones. In *Proc. of Symposium on Usable Privacy and Security*, July 2013

[6] A.J. Brush, Jaeyeon Jung, Ratul Mahajan, and Frank Martinez. Digital Neighborhood Watch: Investigating the Sharing of Camera Data amongst Neighbors. In *Proc. of ACM CSCW*, February 2013

[7] Miro Enev, Jaeyeon Jung, Lifeng Bo, Xiaofeng Ren, and Tadayoshi Kohno. SensorSift: Balancing Sensor Data Privacy and Utility in Automated Face Understanding. In *Annual Computer Security Applications Conference*, December 2012

[8] Jaeyeon Jung, Seungyeop Han, and David Wetherall. Short paper: Enhancing Mobile Application Permissions with Runtime Feedback and Constraints. In *Proc. of Workshop on Security and Privacy of Smartphones and Mobile Devices*, October 2012

[9] A.J. Brush, Jaeyeon Jung, Ratul Mahajan, and James Scott. HomeLabs: Shared Infrastructure for Home Technology Field Studies. In *Proc. of HomeSys*, September 2012

[10] Eun Kyoung Choe, Sunny Consolvo, Jaeyeon Jung, Beverly Harrison, Julie Kientz, and Shwetak Patel. Investigating Receptiveness to Sensing and Inference in the Home Using Sensor Proxies. In *Proc. of Ubicomp*, September 2012 **(Best paper nominee)**

[11] Patrick Kelley, Sunny Consolvo, Lorrie Cranor, Jaeyeon Jung, Norman Sadeh, and David Wetherall. An Conundrum of Permissions: Installing Applications on an Android Smartphone. In *Proc. of the Workshop on Usable Security*, March 2012

[12] Peter Gilbert, Jaeyeon Jung, Kyungmin Lee, Henry Qin, Daniel Sharkey, Anmol Sheth, and Landon P. Cox. YouProve: Authenticity and Fidelity in Mobile Sensing. In *Proc. ACM SenSys*, November 2011

[13] Peter Hornyack, Seungyeop Han, Jaeyeon Jung, Stuart Schechter, and David Wetherall. "These Aren't the Droid You're Looking for: Retrofitting Android to Protect Data from Imperious Applications. In *Proc. ACM CCS*, October 2011

[14] Eun Kyoung Choe, Sunny Consolvo, Jaeyeon Jung, Beverly Harrison, and Julie A. Kientz. Living in a Glass House: A Survey of Private Moments in the Home In *Proc. of Ubicomp*, September 2011

[15] Peter Gilbert, Byung-Gon Chun, Landon P. Cox, and Jaeyeon Jung. Automating Security Validation of Mobile Apps at App Markets In *Proc. of Workshop on ACM Mobile Cloud Computing & Services*, June 2011

[16] David Wetherall, Ben Greenstein, Seungyeop Han, Peter Hornyack, Jaeyeon Jung, Stuart Schechter, Xiao Wang, and David Choffnes. Privacy Revelations for Web and Mobile Apps. In *Proc. of HotOS*, May 2011

[17] Gabriel Maganis, Jaeyeon Jung, Tadayoshi Kohno, Anmol Sheth, and David Wetherall. Sensor Tricorder: What does that sensor know about me? In *Proc. of HotMobile*, March 2011

[18] David (Yu) Zhu, Jaeyeon Jung, Dawn Song, Tadayoshi Kohno, and David Wetherall. TaintEraser: Protecting Sensitive Data Leaks Using Application-Level Taint Tracking. *ACM Operating Systems Review*, Vol 45 Issue 1, January 2011

[19] Sunny Consolvo, Jaeyeon Jung, Daniel Avrahami, Polly Powledge, Ben Greenstein, and Gabriel Maganis. The Wi-Fi Privacy Ticker: Improving Awareness & Control of Personal Information Exposure on Wi-Fi. In *Proc. of Ubicomp*, October 2010

[20] William Enck, Peter Gilbert, Byung-gon Chun, Landon P. Cox, Jaeyeon Jung, Patrick McDaniel, and Anmol Sheth. TaintDroid: An Information-Flow Tracking System for Realtime Privacy Monitoring on Smartphones. In *Proc. of OSDI*, October 2010

[21] Peter Gilbert, Landon P. Cox, Jaeyeon Jung, and David Wetherall. Toward Trustworthy Mobile Sensing. In *Proc. of HotMobile*, February 2010

[22] Predrag Klasnja, Sonny Consolvo, Jaeyeon Jung, Ben Greenstein, Louis LeGrand, Pauline Powledge, and David Wetherall. When I am On Wi-Fi, I am Feerless: Privacy Concerns & Practices in Everyday Wi-Fi Use. In *Proc. of ACM CHI*, April 2009

[23] Jaeyeon Jung, Anmol Sheth, Ben Greenstein, David Wetherall, Gabriel Maganis, and Tadayoshi Kohno. Privacy Oracle: a System for Finding Application Leaks Using Black-box Differential Testing. In *Proc. of ACM CCS*, October 2008

networking research meets security

[24] Maria Konte, Nick Feamster, and Jaeyeon Jung. Dynamics of Online Scam Hosting Infrastructure. In *Proc. of PAM*, April 2009 **(Best dataset award)**

[25] Jaeyeon Jung, Rodolfo Milito, and Vern Paxson. On the Adaptive Real-Time Detection of Fast-Propagating Network Worms. In *Proc. of DIMVA*, Switzerland, July 2007.

[26] Roxana Geambasu, Tanya Bragin, Jaeyeon Jung, and Magdalena Balazinska. On-Demand View Materialization and Indexing for Network Forensic Analysis. In *Proc. of NetDB*, Boston, April 2007.

[27] Jayanth Kumar Kannan, Jaeyeon Jung, Vern Paxson, and Can Emre Koksal. Semi-Automatic Session Discovery. In *Proc. of the Internet Measurement Conference*, October 2006.

[28] Seungwon Shin, Jaeyeon Jung, and Hari Balarishnan. Malware Prevalence in KaZaA File-Sharing Network. In *Proc. of the Internet Measurement Conference*, October 2006.

[29] Stuart Schechter, Jaeyeon Jung, Will Stockwell, and Cynthia McLain. Inoculating SSH Against Address Harvesting. In *Proc. of NDSS*, February 2006.

[30] Nick Feamster, Jaeyeon Jung, and Hari Balakrishnan. An Empirical Study of "Bogon" Route Announcements. *ACM Computer Communication Review*, Special Issue on Internet Vital Signs, Volume 35, Number 1, January 2005.

[31] Jaeyeon Jung and Emil Sit. An Empirical Study of Spam Traffic and the Use of DNS Black Lists. In *Proc. of the Internet Measurement Conference*, October 2004.

[32] Stuart Schechter, Jaeyeon Jung, and Arthur Berger. Fast Detection of Scanning Worm Infections. In *Proc. of the Seventh International Symposium on Recent Advances in Intrusion Detection (RAID)*, September 2004.

[33] Jaeyeon Jung, Vern Paxson, Arthur Berger, and Hari Balakrishnan. Fast Portscan Detection Using Sequential Hypothesis Testing. In *Proc. of the IEEE Symposium on Security and Privacy*, May 2004.

[34] Jaeyeon Jung, Balachander Krishnamurthy, and Michael Rabinovich. Flash Crowds and Denial of Service Attacks: Characterization and Implications for CDNs and Web Sites. In *Proc. of the WWW conference*, May 2002.

DNS and web caches

[35] Jaeyeon Jung, Arthur Berger, and Hari Balakrishnan. Modeling TTL-based Internet caches. In *Proc. of the IEEE Infocom*, March 2003.

[36] Jaeyeon Jung, Emil Sit, Hari Balakrishnan, and Robert Morris. DNS Performance and the Effectiveness of Caching. IEEE/ACM Transactions on Networking, October 2002 Volume 10, Number 5, and in *Proc. of the ACM SIGCOMM Internet Measurement Workshop*, November 2001.

[37] Jaeyeon Jung, Dongman Lee and Kilnam Chon. Proactive Web Caching with Cumulative Prefetching for Large Multimedia Data. Computer Networks 33 (2000) pp. 645-655, and in *Proc. of the WWW conference*, May 2000.

[38] Jaeyeon Jung and Kilnam Chon. RepliCache: Enhancing Web Caching Architecture with the Replication of Large Objects. In *Proc. of the ICOIN*, January 1999.

[39] Bradley Huffaker, Jaeyeon Jung, Evi Nemeth, Duane Wessels, and k claffy. Visualization of the Growth and Topology of NLANR Caching Hierarchy, Computer Networks and ISDN Systems 30 (1998) pp. 2131-2139.

[40] Jaeyeon Jung and Kilnam Chon. Nation-wide Caching Project in Korea. In *Proc. of NLANR Web Caching Workshop*, June 1997.

WORK EXPERIENCE

Microsoft Research, Redmond, WA, USA

Researcher **June 2011–**

Advancing state of the art in consumer privacy protection technologies, producing software and system tools for analyzing applications' privacy behavior, developing new research agendas in mobile privacy, and helping to transfer technology and ideas to amplify Microsoft's impact.

Intel Labs, Seattle, WA, USA

Research Scientist **July 2007–April 2011**

Led the privacy-related research in the lab as part of the Trustworthy Wireless project team that was composed of several researchers in HCI, mobile system, and networking.

- Published nine papers at top HCI and systems venues [17-23].
- Filed a US patent based on the Privacy Scope research [E].
- Presented the Privacy Scope research to Intel's CTO (Justin Rattner), May 2010.

Led the engineering of a research prototype, Wi-Fi Privacy Ticker [19], that involved a three-week field study in which over a dozen of participants ran our prototype on Windows XP.

- Released the Wi-Fi Privacy Ticker software to Intel employees.
- Co-led the demo of the Wi-Fi Privacy Ticker at Research at Intel Day in 2010.

Mazu Networks, Cambridge, MA

Software Architect **August 2006–June 2007**

Implemented my TRW scan detection algorithm and tailored it for use in high performance network environments. The TRW scan detection algorithm has been deployed in Mazu's Profiler product since November 2006. Also developed a cache structure to improve Profiler's query performance and a tool to automatically identify application fingerprint in network packets for traffic classification.

MIT Computer Science and Artificial Intelligence Lab., Cambridge, MA

Postdoctoral Researcher **June–August 2006**
Directed a study of the prevalence of viruses in the KaZaA file-sharing network using a home-grown crawler that monitored tens of thousands of KaZaA supernodes.

Harvard University: Leverett House, Cambridge, MA

Assistant Resident Dean **July 2005–June 2007**
Responsible for policies and scheduling of common rooms in resident community of 450 students. Jointly implemented an automated room reservation system that has been well received and highly utilized.

ICSI Center for Internet Research, Berkeley, CA

Summer Researcher **May–August 2003**
Analyzed network traces collected from enterprise networks. Developed a portscan detection algorithm (TRW) that applies Bayesian sequential hypothesis testing.

AT&T Research Lab, Florham Park, NJ

Summer Researcher **May–August 2001**
Analyzed web workload and developed an algorithm to distinguish flash crowd traffic and distributed denial of service attacks toward a busy web server.

Cooperative Association for Internet Data Analysis (CAIDA), La Jolla, SD

Intern **January–August 1998**
Implemented a Java program (Plankton) to interactively display data sets for the NLANR web caching hierarchy.

PATENTS

[A] "Preventing Display of Age Inappropriate Advertising" US patent application filed in December 2013.
[B] "Automatic Mediation of Resource Access in Mobile Applications" US patent application filed in June 2013.
[C] "Secure and Private Tracking Across Multiple Cameras" US patent application filed in December 2012.
[D] "Promoting Breaks from Prolonged Sitting in the Home" US patent application filed in January 2012.
[E] "Sensitive Data Tracking Using Dynamic Taint Analysis." Pub. No.: US2011/0145918 A1. Pub. Date: June 16, 2011.

GRANTS RECEIVED

Electronics and Telecommunications Research Institute (ETRI)
Research on Real-Time Anomaly Detection Using a Probabilistic Approach July 2005—July 2006
Awarded $70,000, which was applied to my and my advisor's salaries, during my final year of study at MIT. In addition, ETRI sent a full time research staff member to perform research under my direction.

AWARDS

- Awarded I3P Postdoctoral Fellowship, 2006
- Awarded NTT Graduate Student Fellowship, 1999

SERVICE AND OTHER ACTIVITIES

Referee Service

- Deputy program chair of USENIX Security 2014
- Co-chair of the SOUPS workshop on Home Usable Privacy and Security (HUPS) 2012

- Co-chair of the SOUPS workshop on Usable Privacy and Security of Mobile Devices (U-PriSM) 2012
- Program committee member for USENIX Security 2012, 2013, 2014; WWW 2014; NSDI 2013; ACM CCS Workshop on Security and Privacy in Smartphones and Mobile Devices (SPSM) 2013, 2012, 2011; ACM Workshop on Mobile Computing Systems and Applications (HotMobile) 2011, 2012; ACM SIGCOMM Workshop on Measurements Up the STack (W-MUST) 2011; ACM Workshop on Mobility in the Evolving Internet Architecture (MobiArch) 2011; ACM Workshop on Mobile Cloud Computing & Services (MCS) 2011; Financial Cryptography and Data Security 2011; ACM CCS 2011; EuroSec 2010; USENIX ATC 2009, 2010; LEET 2008, 2010, 2012; PAM 2009, 2010; RAID 2008-2011; ICISC 2008, 2009; IEEE WCNC 2009; ACNS 2009; IEEE Workshop on Network Security and Privacy 2008; the International Web Caching and Content Distribution Workshop, 1998, 2000, and 2003
- Poster committee member for the WWW conference, 2003
- Reviewer for IEEE Symposium on Security and Privacy (2006), SIGCOMM (2005), WORM (2005), PAM (2005), NSDI (2004), USENIX (2004), RAID (2004), IPTPS (2004), ASPLOS (2004), HotNets (2003), IEEE Transactions on Dependable and Secure Computing (2006), and Computer Networks (2007)

Student Advising

Rebecca Balabeko

Ph.D candidate in Engineering and Public Policy, Carnegie Mellon University. On thesis committee. February, 2013

Seungyeop Han

Ph.D candidate in Computer Science and Engineering, University of Washington. A Study of Third-Party Tracking by Mobile Apps in the Wild. Served as an advisor of his qualifying evaluation. February, 2012

Srinivas Krishnan

Ph.D candidate in Computer Science, University of North Carolina at Chapel Hill. Revisiting the Domain Name System: New directions in modeling and analysis of caching resolvers. Served on the dissertation proposal committee. November, 2011

Peter Hornyack

Ph.D candidate in Computer Science and Engineering, University of Washington. Retrofitting Android to Protect Data from Imperious Applications. Served as an advisor of his qualifying evaluation. March, 2011

MORE INFORMATION

More information and project websites can be found at http://appanalysis.org/jjung.