Hyeonmin Lee Postdoctoral Researcher @ Seoul National University

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Research Interests

My research interests lie in network security and its measurement — Are we using the network correctly and securely? How can we make the network (more) secure?
Currently, I'm interested in the security of DNS and Email — How can we solve the security problems that DNS and Email have? How can we solve other network problems by leveraging DNS or Email protocols?

Network Security — DNS and Email security
Security Measurement

Education

Ph.D., Computer Science and Engineering, *Seoul National University*, (Seoul, South Korea) **Mar 2016 — Feb 2022**
- [Dissertation] "Understanding the DANE Ecosystem in Email: How Is It Deployed and Managed?"
- [Supervisors] Prof. Taekyoung "Ted" Kwon (*Seoul National University*) and Prof. Taejoong "Tijay" Chung (*Virginia Tech*)

B.S., Computer Science and Engineering, *Seoul National University*, (Seoul, South Korea) **Mar 2011 — Feb 2016**
Visiting Student, Information Technology, *Uppsala University*, (Uppsala, Sweden) **Fall 2014**

Professional Experiences

Postdoctoral Researcher **Apr 2022 — Present**
Seoul National University *Seoul, South Korea*
- [Web and DANE] Study how the Web ecosystem will be changed if the Web adopts DANE protocol (Related achievement - Grant).
- [STARTTLS] Investigate how to prevent STARTTLS downgrade attacks.
- [DNS and TLS] Analyze how DNS can be exploited to reduce TLS handshake time.

Research Assistant **Mar 2016 — Feb 2022**
Seoul National University *Seoul, South Korea*
- [Email and DANE] Measured how DANE is deployed in the SMTP ecosystem (Related achievement - Publication[C2]).
- [Email and DANE] Measured the underlying reasons for the DANE mismanagement (Related achievement - Publication[C3]).

Visiting Researcher **May 2019 — Aug 2019**
Rochester Institute of Technology *Rochester, USA*
- [Email and DANE] Analyzed DANE to measure its deployment in the real-world (Related achievement - Publication[C2]).

Publications

[C3] Under the Hood of DANE mismanagement in SMTP **USENIX Security'22**
Hyeonmin Lee, Md. Ishtiaq Ashiq, Moritz Müller, Roland van Rijswijk-Deij, Taekyoung "Ted" Kwon, Taejoong Chung
In Proceedings of the 31st USENIX Security Symposium, Boston, United States, Aug 2022

[C2] A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email **USENIX Security'20**
Hyeonmin Lee, Aniketh Gireesh, Roland van Rijswijk-Deij, Taekyoung "Ted" Kwon, Taejoong Chung
In Proceedings of the 29th USENIX Security Symposium, Boston, United States, Aug 2020

[C1] Development of Cellular Core Network Enabling Network Function Virtualization **JCCI'18**
Hyeonmin Lee, Junghwan Song
The 28th Joint Conference on Communication and Information, Yeosu, Korea, May 2018

[J1] TwinPeaks: An Approach for Certificateless Public Key Distribution for the Internet and Internet of Things **Computer Networks**
Eunsang Cho, Jeongnyeo Kim, Minkyung Park, **Hyeonmin Lee**, Chorom Hamm, Soobin Park, Sungmin Sohn, Minhyeok Kang, Ted "Taekyoung" Kwon
Elsevier Computer Networks (SCI-E)

[P1] A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email **USENIX Security'22**
Hyeonmin Lee, Md. Ishtiaq Ashiq, Moritz Müller, Roland van Rijswijk-Deij, Taekyoung "Ted" Kwon, Taejoong Chung
Poster Session in the 31st USENIX Security Symposium, Boston, United States, Aug 2022

Grants

A Study for the Future-oriented DANE-based Web Architecture to Solve Problems in the Current TLS-based Web Ecosystem
Primary Investigator Sep 2022 — Aug 2023
(Funded by *Post-Doctoral Domestic and Overseas Training Program - National Research Foundation of Korea*, ₩60,000,000 ≈ $46,000)

- [Research Goal] Currently, DANE is only used with SMTP (for mail transfer). In this research, I study how the Web ecosystem will be changed if the Web adopts DANE protocol.
- [Keywords] Web, Transport Layer Security, Authentication, DANE.

Research Project Experiences

Project Manager **Mar 2021 — Nov 2021**
Abnormal Detection and Forensic Techniques using IoT Network Traffic Analysis
(Funded by *Korea Institute of Information Security & Cryptology (KIISC)*)

- [Project Goal] Develop a system that detects anomalies (or attacks) in IoT networks and generates evidence for digital forensics by collecting IoT network traffic.
- [Keywords] IoT network, Network security, Machine learning, Abnormal detection.
- [Role] Analyzed IoT network traffic to distinguish abnormal traffic from normal traffic based on an autoencoder model.

Project Manager **Mar 2020 — Dec 2020**
System Designer/ Programmer **Apr 2016 — Mar 2020**
Versatile Network System Architecture for Multi-dimensional Diversity
(Funded by *Institute for Information and Communication Technology Promotion (IITP)*)

- [Project Goal] Design a network architecture that covers diverse network devices, services, or resources, especially, in the edge network.
- [Keywords] Edge/Cloud computing, Mobility, In-network caching, Trustworthiness.
- [Role] Devised/tested a naming system that can effectively express diverse network devices, services, or resources in the edge network. Implemented an ID resolver that handles the mapping between IDs and resources such as ID allocation or mobility handling.

Patents

Method for Performing Mutual Authentication in Communication using Locator ID Separation Protocol, Apparatus, and System for Performing the Same
Ted "Taekyoung" Kwon, **Hyeonmin Lee**, Hyunwoo Lee

- Registration No. 10-2476081
- South Korea, Dec 2022

Network System and Method for Performing Message Security Thereof
Ted "Taekyoung" Kwon, Hyunwoo Lee, Myungchul Kwak, **Hyeonmin Lee**, Junghwan Lim, Yoojung Shin

- Registration No. 10-2265611
- South Korea, Jun 2021

Communication Method Based on Integrated Flat ID and System
Ted "Taekyoung" Kwon, Hyunwoo Lee, Myungchul Kwak, **Hyeonmin Lee**, Dongjun Lee, Hyunchul Oh

- Registration No. 10-2023115
- South Korea, Sep 2019

Awards & Fellowships

Seoul National University Alumni Association Scholarship Aug 2018
Exchange Student Program to Uppsala University (Information Technology) Fall 2014

Talks

USENIX Security, Boston, "Under the Hood of DANE Mismanagement in SMTP" Aug 2022
USENIX Security, Online, "A Longitudinal and Comprehensive Study of the DANE Ecosystem in Email" Aug 2020

Miscellaneous

Expert Research Personnel (military service) **Mar 2019 — Feb 2022**
Seoul National University, Seoul, South Korea
The expert research personnel system is a form of alternative military service in South Korea, where the military service is fulfilled by conducting research at a domestic university or company for three years. I had not been involved in any military research project throughout the service.

References

Taekyoung "Ted" Kwon (tkkwon@snu.ac.kr)
- Professor, Department of Computer Science and Engineering, Seoul National University, Seoul, South Korea

Taejoong (Tijay) Chung (tijay@vt.edu)
- Assistant Professor, Department of Computer Science, Virginia Tech, Blacksburg, VA, United States