# Acceleration of a Client Based DNSSEC Validation System in Parallel with Two Full-Service Resolvers

Yong Jin*, Kazuya Iguchi**, Nariyoshi Yamai**, Tomoishi Masahiko*

*Tokyo Institute of Technology, *2-12-1 O-okayama, Meguroku, Tokyo, Japan 152-8550*

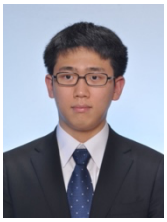
***Tokyo University of Agriculture and Technology, 2-24-16 Naka-cho, Koganei, Tokyo, Japan 184-8588*

yongj@gsic.titech.ac.jp, kazuigu@net.cs.tuat.ac.jp, nyamai@cc.tuat.ac.jp, tomoishi@noc.titech.ac.jp

*Abstract*—**Domain Name System Security Extensions (DNSSEC) is an effective solution for mitigating DNS cache poisoning attacks but it also has many issues on real operations. In the literature, a client based DNSSEC validation system has been proposed in order to solve some existing issues by running DNSSEC validation on each end client. However, in the system, the DNS responses with successful validation will be only used by each end client thus without sharing it with other end clients. In this paper, we propose an acceleration method for the client based DNSSEC validation system by using two different types of external DNS full-service resolvers (DNSSEC-enabled and DNSSEC-disabled) in parallel. As a result, the performance of domain name resolution can be improved by sharing the DNS responses with successful DNSSEC validation. Furthermore, when the domain name resolution on the DNSSEC-enabled external DNS full-service resolver ends with timeout or failure, the end client conducts the DNSSEC validation by itself by querying necessary DNS records to the DNSSEC-disabled external DNS full-service resolver and also a pop-up alert message will warn the users if the DNSSEC validation fails. We implemented a prototype system and evaluated the features as well as the performance of the proposed method. The results confirmed that the proposed method achieved high performance in domain name resolution.**

***Keyword*—DNS, DNSSEC, client based DNSSEC validation, full-service resolver, DNS cache poisoning attack**

**Yong Jin** received M.E. degree in electronic and information systems engineering and Ph.D. degree in Industrial Innovation Sciences from Okayama University, Japan in 2009 and 2012, respectively. In April 2012, he joined the Network Architecture Laboratory of National Institute of Information and Communications Technology, Japan, as a researcher. From October 2013, he joined the Global Scientific Information and Computing Center of Tokyo Institute of Technology. His research interests include network architecture, network security, traffic engineering and Internet technology. He is a member of IPSJ and IEEE.



**Kazuya Iguchi** received B.E. and M.E. degrees from Tokyo University of Agriculture and Technology, Japan in 2019 and 2021 respectively. His research interests include computer network and Internet Technology.

**Nariyoshi Yamai** received the B.E. and M.E. degrees in electronic engineering and the Ph.D. degree in information and computer science from Osaka University in 1984, 1986, and 1993, respectively. After working at Nara National College of Technology, Osaka University, and Okayama University, he has been a Professor at the Institute of Engineering, Tokyo University of Agriculture and Technology since April 2014. His research interests include distributed systems, network architecture, and Internet. He is a member of IEEE CS, IEEE ComSoc, IEICE and IPSJ.

**Masahiko Tomoishi** received the B.E. and M.E. degrees in Computer Science from Tokyo Institute of Technology in 1989 and 1991, respectively. In 1994, he joined the Department of Computer Science, Tokyo Institute of Technology, as a research associate. In 2007, he joined National Institute of Informatics, as a specially appointed research associate. In 2008, he joined Tokyo Institute of Technology, as a specially appointed assistant professor. Since April 2011, he has been a professor in Tokyo Institute of Technology. His research interests include software verification and network/security management. He is a member of IEEE.