Inferring OpenFlow Rules by Active Probing in Software-defined Networks

Po-Ching Lin, Ping-Chung Li, Van Linh Nguyen

Department of Computer Science and Information Engineering

National Chung Cheng University

pclin@cs.ccu.edu.tw, x30346@gmail.com, nvlinh@cs.ccu.edu.tw

***Abstract*—Software-defined networking (SDN) separates the control plane from underlying devices, and allows it to control the data plane from a global view. While SDN brings conveniences to management, it also introduces new security threats. Knowing reactive rules, attackers can launch denial-of-service (DoS) attacks by sending numerous rule-matched packets which trigger packet-in packets to overburden the controller. In this work, we present a novel method ``INferring SDN by ProbIng and Rule Extraction'' (INSPIRE) to discover the flow rules in SDN from probing packets. We evaluate the delay time from probing packets, classify them into defined classes, and infer the rules. This method involves three relevant steps: probing, clustering and rule inference. First, forged packets with various header fields are sent to measure processing and propagation time in the path. Second, it classifies the packets into multiple classes by using k-means clustering based on packet delay time. Finally, the apriori algorithm will find common header fields in the classes to infer the rules. We show how INSPIRE is able to infer flow rules via simulation, and the accuracy of inference can be up to 98.41% with very low false-positive rates.**

***Keyword*—flow rules, inference, probing, SDN security**

Po-Ching Lin received the Ph.D. degree in computer science from National Chiao Tung University, Hsinchu, Taiwan, in 2008. He joined the faculty of the Department of Computer and Information Science, National Chung Cheng University (CCU), Chiayi, Taiwan, in August 2009. He is currently an associate professor. His research interests include network security, network traffic analysis, and performance evaluation of network systems.

Ping-Chung Li received his master's degree in Computer Science and Information Engineering from National Chung Cheng University in 2016. His research interests include SDN security.

He received the B.E and M.S.c degree in Data Communication and Networking from University of Information and Communication Technolgy and the University of Engineering and Technology, Vietnam National University, respectively. He is currently working towards Ph.D. degree in Computer Science and Information Engineering at National Chung Cheng University, Taiwan. His research interests are in the areas of network security, Internet of Things and Mobile Edge Computing, with current focus on secure network service in next generation Internet. He is a student member of the IEEE.