

Seminar Talk

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3:00 p.m. KH 224

Title: Automated Compliance Checking and Adversarial Testing of Network Protocol Implementations

Abstract:

Network protocols have stringent requirements stated in their specifications and standards (e.g., RFCs), which their implementations are expected to comply with. Noncompliance in a protocol implementation can cause interoperability issues, inconsistent behavior, or performance degradation. Worse, some noncompliance can even have security implications. Automatically detecting whether a protocol implementation is noncompliant with a given property is a long-standing and challenging problem. In addition, the lack of robustness of a protocol implementation against malicious attacks---exploiting subtle vulnerabilities in the implementation---mounted by the compromised nodes in an adversarial environment can limit the practical utility of the implementation by impairing the performance of the protocol and can even have detrimental effects on the availability of the network.

Given the stake associated with network protocols, ensuring secure and reliable operations of their implementations calls for pre-deployment measures. In this talk, I will focus on fortifying the implementations of network protocols along two dimensions. I will first present an automated developer-facing verification tool to help developers find bugs and vulnerabilities by automatically detecting whether their protocol implementation is non-compliant with its specifications. Finally, I will present an automated adversarial testing tool to improve the robustness of a given protocol implementation by automatically finding vulnerabilities that can impair the performance of the implementation.

Bio:

Endadul Hoque is a Postdoctoral Research Associate in the College of Computer and Information Science at Northeastern University. He received his PhD in computer science from Purdue University in 2015. His research focuses on ensuring secure and reliable operations of networked systems, with a particular interest in designing and developing automated tools for verification and testing of distributed systems and network protocol implementations. His research interest also focuses on security, verification and testing of



various systems spanning from Internet-of-Things to data-center networks. During his PhD, he was awarded the Graduate Teaching Fellowship in 2014 and the Bilsland Dissertation Fellowship in 2015 to support his dissertation work. His research on automated testing tools has also been used in an educational pilot study conducted at Purdue University to teach students secure distributed systems programming. His research works have resulted in several publications in top international conferences and journals. He is the co-chair of the First International Workshop on Mobile and Pervasive Internet of Things (PerIoT), collocated with IEEE Percom conference.