Alembic: Automated Model Inference for Stateful Network Functions

Wednesday, February 20th 2019
12:00pm – 1:00pm
CIC 2201

Speaker: Soo-Jin Moon
Soo-Jin Moon is a PhD candidate in the ECE department at Carnegie Mellon University, where she is advised by Vyas Sekar. Her research interests span across network security and computer networks. Prior to joining CMU, she received a BASc in Electrical Engineering from the University of Waterloo, Canada.

Talk Abstract:
Network operators today deploy a wide range of complex stateful network functions (NFs). They typically only have access to the NFs’ binary executables, configuration interfaces, and manuals from vendors. To ensure correct behavior of NFs, operators use network testing and verification tools, which typically rely on models of the deployed NFs. The effectiveness of these tools depends upon the fidelity of such models. Today, models are handwritten, which can be error prone, tedious, and does not account for implementation-specific artifacts. To address this gap, our goal is to automatically infer behavioral models of stateful NFs for a given configuration. The problem is challenging because NF configurations can contain diverse rule types and the space of dynamic and stateful NF behaviors is large. In this work, we present Alembic, which synthesizes NF models viewed as an ensemble of finite-state machines (FSMs). Alembic consists of an offline stage that learns symbolic FSM representations for each NF rule type and a fast online stage that generates a concrete behavioral model for a given configuration using these symbolic FSMs. We demonstrate that Alembic is accurate, scalable and sheds light on subtle differences across NF implementations.

This is a practice talk for NSDI 2019.

Please direct any questions regarding this seminar to Sekar Kulandaivel (skulanda@andrew.cmu.edu) or Shunsuke Aoki (shunsuka@andrew.cmu.edu)