Announcing the Final Examination of Rhongho Jang for the degree of Doctor of Philosophy

Time & Location: June 4, 2020 at 3:00 PM in Virtual Defense https://ucf.zoom.us/j/6673083892
Title: Towards Scalable Network Traffic Measurement with Sketches

Driven by the ever-increasing data volume through the Internet, the per-port speed of network devices reached 400 Gbps, and high-end switches are capable of processing 25.6 Tbps of network traffic. To improve the efficiency and security of the network, network traffic measurement becomes more important than ever. For fast and accurate traffic measurement, managing an accurate working set of active flows (WSAF) at line rates is a key challenge. WSAF is usually located in high-speed but expensive memories, such as TCAM or SRAM, and thus their capacity is quite limited. To scale up the per-flow measurement, we pursue three thrusts. In the first thrust, we propose to use In-DRAM WSAF and put a compact data structure (i.e. sketch) called FlowRegulator before WSAF to compensate for DRAM's slow access time. Per our results, FlowRegulator can substantially reduce massive influxes to WSAF without compromising measurement accuracy. In the second thrust, we integrate our sketch into a network system and propose an SDN-based WLAN monitoring and management framework called RFlow+, which can overcome the limitations of existing traffic measurement solutions (e.g., OpenFlow and sFlow). In the third thrust, we introduce a novel sampling scheme to deal with the poor trade-off that is provided by the standard simple random sampling (SRS). Even though SRS has been widely used in practice because of its simplicity, it provides non-uniform sampling rates for different flows, because it samples packets over an aggregated data flow. Starting with a simple idea that "independent per-flow packet sampling provides the most accurate estimation of each flow," we introduce a new concept of per-flow systematic sampling, aiming to provide the same sampling rate across all flows. In addition, we provide a concrete sampling method called SketchFlow, which approximates the idea of the per-flow systematic sampling using a sketch saturation event.

Major: Computer Science

Educational Career:
Bachelor's of Computer and Information Engineering, BS, 2013, INHA University
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Approved for distribution by David Mohaisen, Committee Chair, on May 19, 2020.

The public is welcome to attend.