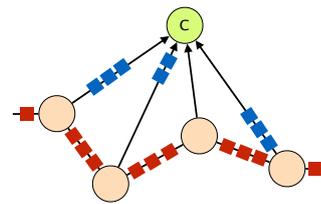


Next-gen network monitoring using programmable network devices

Master thesis proposal

For network operators, it is crucial to know what is going on in the network. Especially for large ISP networks (e.g. DT, AT&T), this is a difficult task: The traffic amount is huge, the network has an asymmetric topology and an operator cannot control the endpoints. Furthermore, most of the forwarding behavior is influenced by external sources. To answer questions like "What is the path of Skype traffic in my network?" operators currently use measurement data from systems such as NetFlow [2].



To reduce the amount of generated measurement data, operators have to use high sampling rates (e.g. 1 out of 1'000 packets). Analysis based on this data only provides rough estimations. Small flows are often completely missed and it is not possible to observe the same packet at multiple locations.

We developed a new system called *Stroboscope* [3]. Instead of randomly sampling packets, we mirror thin traffic slices (~20 ms) based on user-defined queries. This approach can be seen as sampling in time. Traffic slices from different nodes in the network (for the same flow) are collected and compared at a central controller.

This master thesis builds on top of the existing system and can be roughly divided into the following work packages:

- **WP1:** Implement packet mirroring and analysis on top of programmable network devices (e.g. P4 switches [1]);
- **WP2:** Develop a network monitoring application using the primitives from WP1;
- **WP3:** Consider the bigger picture. For example a feedback loop between the programmable devices and the central controller or the deployment of the system if we only have a few programmable devices.

Requirements

- Basic knowledge in Python and C programming;
- Basic understanding of network protocols and measurement techniques.

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- [2] B. Claise. Cisco Systems NetFlow Services Export Version 9. RFC 3954 (Informational), Oct. 2004. <http://www.ietf.org/rfc/rfc3954.txt>.
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