ETH

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High-performance traffic generation

Semester/Master thesis proposal

Over the recent years the bandwidth of interfaces available for commodity hardware steadily increased. Today, a normal server can support multiple 100 Gb Ethernet interfaces. This bandwidth increase also raised numerous research questions as it is challenging to process, store and generate such a high traffic amount.

Especially the traffic generation part is a fundamental problem which has to be solved first to be able to test other high-bandwidth applications. It is relatively "easy" to fill a 100 Gb link with static, large packets but the task gets much more complicated if the packet size decreases and the packet content dynamically changes (e.g. TCP flows retransmitting packets due to random packet loss).

This thesis first explores existing high-bandwidth traffic generation systems and then tries to improve detected shortcomings. More precisely, the thesis can be divided into the following main work packages:

- **WP1**: thoroughly test an already working traffic generator (WARP17 [3, 6]) on one of our servers with two 100 Gb interfaces. How many flows can we generate in parallel? Can we use the entire bandwidth?

- **WP2**: install other traffic generators (e.g., MoonGen [1, 5] and TRex [2, 4]) and compare their capabilities with the generator from WP1. Can the different systems reach 100 Gbps? What are their individual strengths and weaknesses? How do they handle stateful flow generation (e.g., TCP flows)?

- **WP3**: improve shortcomings detected in WP2. What are the main drawbacks using existing systems? How difficult would it be to implement the missing pieces?

As a semester thesis, the main focus of the work lies on launching and comparing existing systems. In a master thesis, students will also try to develop new/missing features.

Requirements

- Knowledge in working with Linux-based systems (terminal).

- (recommended) Some knowledge of low-level features required for packet processing.

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References

[1] MoonGen GitHub. `https://github.com/emmericp/MoonGen`.

[2] TRex GitHub. `https://github.com/cisco-system-traffic-generator/trex-core`.

[3] WARP17 GitHub. `https://github.com/Juniper/warp17`.

[4] Cisco. TRex. `https://trex-tgn.cisco.com/`.

[5] P. Emmerich, S. Gallenmüller, D. Raumer, F. Wohlfart, and G. Carle. MoonGen: A Scriptable High-Speed Packet Generator. In *Internet Measurement Conference 2015 (IMC'15)*, Tokyo, Japan, Oct. 2015.

[6] Juniper Networks, Inc. WARP17. `https://warp17.net/`.