

Thesis
B.Sc.

Thesis
M.Sc.

Guided
Research

High Precision Analysis of Network Paths

Motivation

To analyze the efficiency of routing algorithms together with TSN [2] on the network path in a precise way is difficult as information such as positions of packets, queue filling level, and interferences between packets are needed. We developed a protocol to attach information such as ingress and egress timestamp to each packet. With this protocol, we change the padding of the packet such that additional processing in real applications is still possible as no relevant information is changed. Our protocol is based on eBPF together with XDP and Linux TC [1] as well as the Parallel Redundancy Protocol [3].

The aim of this thesis is to analyze the implementation, perform measurements and evaluate them to provide new information based on the results stored in packets. This allows to gain high precision information about the packets, their flow, and timings within the complete network path. This analysis can be used to provide in-depth knowledge about queue-fill levels, processing-delays and much more with a small granularity. To analyze and prepare the information gathered in such measurements is the main task of the thesis. Additionally, an aim of the thesis is to answer the question, how the gained information can be used.

Your Profile

- General interest in computer networks
- Experience with Python or similar language for analysis
- Interest in C programming

Your Tasks

- Analyzing the existing solution for timestamping packet paths
- Conducting research on packet path analysis
- Extracting information from packets
- Analysis and evaluation of extracted information
- Evaluation of possible applications of the gained information

Literature

- [1] A. Deepak, R. Huang, and P. Mehra. ebpf/xdp based firewall and packet filtering. In *Linux Plumbers Conference*, 2018.
- [2] N. Finn. Introduction to time-sensitive networking. *IEEE Communications Standards Magazine*, 2(2):22–28, 2018.
- [3] M. Rentschler and H. Heine. The parallel redundancy protocol for industrial ip networks. In *2013 IEEE international conference on industrial technology (ICIT)*, pages 1404–1409. IEEE, 2013.

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