Chair of Network Architectures and Services
Department of Informatics
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Thesis B.Sc. | Thesis M.Sc. | Guided Research

Discerning of TCP Congestion Control Algorithms in an Emulated Environment

Motivation

In 2017 the TCP BBR congestion control algorithm [1] developed by Google was added to the Linux kernel, making it available for modern devices as alternative to the well-known CUBIC algorithm. The new algorithm has clear advantages, however recent publications show, also shortcomings. This reinstitutes the question what the current state of deployment of congestion control algorithms in the Internet is and how it will change with BBR.
In this thesis we want to study how different congestion control algorithms can be discerned using active measurements. For this, we want to extend an existing framework based on Mininet to allow the creation of more complex topologies and the creation of servers configured with a specific congestion control algorithm. As a result, the framework shall be used to implement and experiment with different ways to create traces and visualizations thereof. The starting point can be [2]. These traces will then be analyzed to answer the question if, how well and under what circumstances they can be used to discern and identify the used congestion control algorithms.
The focus is on automation and easy reproduction of the whole process (setup, measurement, plotting), to allow the experimentation with many different types of traces (tweaking parameters, . . .).
This thesis is primarily targeted as Bachelor's thesis, but can also be extended with additional tasks (machine learning, Internet-wide scans) as Master's thesis.

Your Task

- Extend the existing framework based on Mininet to setup webservers with specific congestion control algorithms
- Generate traces and automate the process of visualizing the results
- Play around with different parameters to find the optimal trace discerning the used congestion control algorithm

Basic knowledge of TCP congestion control algorithms (CUBIC, BBR) and previous experience with Mininet are recommended but not required.

References

- [1] Cardwell, Neal, et al. "BBR: Congestion-based congestion control." Queue 14.5 (2016): 50.
- [2] Yang, Peng, et al. "TCP congestion avoidance algorithm identification." IEEE/ACM Transactions on Networking (TON) 22.4 (2014): 1311-1324.

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