Chair of Network Architectures and Services
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Thesis B.Sc. Thesis M.Sc. IDP

Back-Pressure based Routing in Random Networks

Motivation

Routing algorithms decide on routes based on metrics determined by the algorithm itself or given by network operators. Different commonly known protocols are used in large scale networks such as RIP, OSPF, or BGP. Dynamic routing protocols can use metrics to determine a path including for example path length, reliabily, bandwidth, policies, . . .
For this thesis, the focus lies on Back-Pressure Routing (BPR) [1] and Back-Pressure based routing. BPR aims to optimize network throughput by considering the occupancy of network interface queues. Reducing the queue backlog often comes with a lower packet delay and an overall increased throughput. One drawback of BPR is, that only considering queue occupancy values can lead to unnecessary long paths and therefore increased resource use leading to lower throughput. Different approaches exist that address this drawback such as [2].

Your Task

- Generate suitable random network topologies
- Choose topologies suitable for edge case analyses
- Simulate different scenarios using these topologies
- Conduct measurements of selected scenarios
- Analyse and compare results
- Optional: Implement and evaluate your on BPR based routing algorithm

Requirements

- Basic knowledge of routing principles and computer networks
- Experience using Linux
- Developing software in Python3
- Interest in computer networks

Literature

References

[1] L. Tassiulas and A. Ephremides. Stability properties of constrained queueing systems and scheduling policies for maximum throughput in multihop radio networks. In *29th IEEE Conference on Decision and Control*, pages 2130–2132. IEEE, 1990.

[2] L. Ying, S. Shakkottai, A. Reddy, and S. Liu. On combining shortest-path and back-pressure routing over multihop wireless networks. *IEEE/ACM Transactions on Networking*, 19(3):841–854, 2010.

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