

Thesis
B.Sc.

Thesis
M.Sc.

IDP,
Guided
Research

Hardware-assisted instant virtual infrastructure

Motivation

With Virtual Machines (VMs) it is possible to isolate processes and the system as much as possible from interrupts to provide stable latencies [1]. Additionally, with SR-IOV it is possible to share hardware network interfaces with multiple virtual machines bypassing the hypervisor. Using SR-IOV to set up an entire measurement infrastructure leads to improved measurement results compared to fully virtualized solutions by mitigating the overhead of deploying large network topologies using hardware hosts, especially with their flexible setup [1]. Mininet is a network emulation tool for building instant virtual networks using virtual Ethernet pairs as connections and includes several ways to interact with systems [2]. Mininet has several forks, such as Containernet, with additional capabilities.

Therefore, this work aims to evaluate the existing Mininet and its forks, analyze the possibility of creating a new version with VMs instead of namespaces and potentially SR-IOV connections between hosts, implement a prototype, and evaluate the performance between your prototype and the original version on our chair's testbed resources. This is meant to enable flexible, high precise measurements for low-latency applications with high ability to reproduce. For the setting up of SR-IOV, we would use Ansible most probably.

Your Profile

- General interest in computer networks
- Experience with Linux and Python programming
- Experience with virtualization solutions

Your Tasks

- Conducting research on Mininet, latency optimizations, VMs, and SR-IOV
- Analyze the current available Mininet and its forks
- Extend Mininet or a selected fork to support KVM VMs
- Evaluate the prototype and its improvements
- (Master Thesis) Extend your fork to support SR-IOV and evaluate it

Literature

- [1] S. Gallenmüller, J. Naab, I. Adam, and G. Carle. 5G QoS: Impact of Security Functions on Latency. In *2020 IEEE/IFIP Network Operations and Management Symposium (NOMS 2020)*, Budapest, Hungary, Apr. 2020.
- [2] N. Handigol, B. Heller, V. Jeyakumar, B. Lantz, and N. McKeown. Mininet performance fidelity benchmarks. *Tech. Rep.*, 2012.

Contact

Florian Wiedner wiedner@net.in.tum.de
Jonas Andre andre@net.in.tum.de

