Chair of Network Architectures and Services
School of Computation, Information, and Technology
Technical University of Munich

Thesis B.Sc. Thesis M.Sc. Guided Research

Secure light-weight low-latency virtual networking

Motivation

With SR-IOV, it is possible to share hardware network interfaces with multiple virtual machines bypassing the hypervisor, thus reducing virtualization overhead. Using SR-IOV to set up an entire measurement infrastructure leads to better measurement results than fully virtualized solutions by reducing the overhead of deploying large network topologies using hardware hosts, especially with their flexible setup. SR-IOV is used in our scenario with the IOMMU for direct memory access. We intend to use the proposed setup for experiments in larger networks [2].
We have developed a way to set up an arbitrary topology using SR-IOV and the chair's Testbed Orchestrator, but so far, it uses full virtualization, which imposes a significant overhead on nodes. A more straightforward solution is containers, such as Docker containers or kata containers [1]. In order to improve measurements in large networks, reduce the required resources and improve the results, the solution we have developed needs to be adapted to a container-based solution integrating Docker and Kata-container as Kata container can run in Trusted Execution Environments, this provides essential security benefits.
Therefore, this work aims to evaluate the existing approach, integrate containers instead of full virtualization, and evaluate the result using the testbed resources of our chair compared to a solution with full virtualization.

Your Profile

- General interest in computer networks
- Experience with Linux and Python programming
- Experience with virtualization Solutions especially Docker
- Interest in Container-based systems is beneficial

Your Tasks

- Conducting research on single-root I/O-virtualization and container
- Analyze the currently existing solution
- Rewrite the current solution towards Kata with TEE and Docker
- Evaluate and discuss the results

Literature

[1] C. Anderson. Docker [software engineering]. *IEEE Software*, 32(3):102–c3, 2015.

[2] L. Breslau, D. Estrin, K. Fall, S. Floyd, J. Heidemann, A. Helmy, P. Huang, S. McCanne, K. Varadhan, Y. Xu, et al. Advances in network simulation. *Computer*, 33(5):59–67, 2000.

Contact

Florian Wiedner wiedner@net.in.tum.de
Filip Rezabek rezabek@net.in.tum.de