**Master’s Thesis**

**Vendor Interoperability**

**At Large Internet Exchange Points**

**Abstract**: The Internet is growing every day. Innovative solutions to accommodate new needs are standardized (in Request for Comment documents, RFCs) and, thus, hardware vendors must periodically release new firmware versions implementing the latest advancements. Interoperability verification becomes especially important for Internet Exchange Points (IXPs), as thousands of routers meet in a single network; a place where correct router interoperability is crucial for the overall resilience of the Internet.

With many different firmware versions from different vendors, verifying their interoperability becomes increasingly challenging. The number of combinations is large – and makes manual verification infeasible.

This work comprises implementation and evaluation of a parametrizable “containerlab” testbed of virtual routers that aims at testing interoperability for various RFCs, different vendors, and firmware versions. Research questions like the division of the large exploration space regarding accuracy vs. runtime tradeoffs and performance analysis of different approaches of the former are evaluated by scientific means. Furthermore, the insights achieved contribute to a working group project of the European association of IXPs. Comparison to existing technologies qualifies this work as a potential system-paper publication candidate.

This work will reduce the cost and effort for IXP operators to verify the interoperability of the routers in their network regarding new RFCs. This effectively helps adopting new standards at IXPs and, hence, improving the overall stability and security of the Internet.

Required skills:

* Internet Routing / Networking Basics
* Network Programming (bash, python3, containerlab)

What we provide

* Access to bleeding edge technology and hardware
* Experience real-world research projects
* Pursuing work’s publication

DE-CIX is a worldwide leading Internet Exchange operator. Since starting operations in 1995, DE-CIX in Frankfurt is the Internet Exchange (IX) with the world’s highest data throughput peak times, reaching over 18.1 Terabits per second (Tbps) at peak times. Traffic rates in Frankfurt and the other DE-CIX locations around the globe continue to grow at a fast pace. Thus, our platforms must be ready for the next five to ten years' growth. This is where you come in.

The DE-CIX Products & Research Team is shaping the technology of tomorrow’s Internet! In close cooperation with partners from industry and academia, we are working on many research and development projects to continue to offer attractive and innovative services.

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