ETH *zürich*

Prof. Laurent Vanbever
Networked Systems Group

Towards a not so mini mini-Internet
Bachelor thesis proposal

One practical group project in our communication networks lecture is the routing project [1]. For this project, we build a virtual mini-Internet infrastructure composed of hundreds of routers and dozens of Autonomous Systems (ASes) in one of our server and let the students configure their ASes and virtual devices. They have to configure various routing protocols to enable Internet-wide connectivity, for instance OSPF to enable intra-domain connectivity and BGP to enable connectivity between different ASes. Motivated by the positive feedback we received from the students following our lecture, we decided to make the platform publicly available [2,3]. Several universities and companies have already started to use the platform. As a result, we plan to add new features and improve the existing code.

As of now the platform builds a mini-Internet in a single server. The number of virtual switches, routers and hosts is thus limited by the capacity of the server (especially CPU cores and available memory). For instance, a mini-Internet with 60 ASes, each composed of 8 routers and 4 switches, uses 58% of the memory and 51% of the CPU cores on a server with a total of 24 CPU cores and 256GB of RAM [2]. If the number of students increases or if one requires a larger mini-Internet (*e.g.,* for research purposes), the capacity of a single server may become a limitation. The goal of this thesis is to improve the platform so that a single mini-Internet instance can run across multiple servers. The size of the mini-Internet should then be limited by the overall amount of CPU cores and memory across all the servers. The way the mini-Internet is divided across multiple servers should also be configurable.

Prerequisites: This thesis requires developing in Bash and being familiar with UNIX tools. Before contacting us, please take a look at the implementation of the mini-Internet [2] and see wether you feel like you can help us extending the platform.

In addition, the following skills are required.

- Basic knowledge of virtualization/containerization (e.g., Docker);
- Basic knowledge in cryptography and/or network security (RPKI/BGPSec);
- Communication Networks (227-0120-00L), or equivalents.

Contact

- Thomas Holterbach, thomahol@ethz.ch
- Tobias Bühler, buehlert@ethz.ch
- Prof. Laurent Vanbever, lvanbever@ethz.ch

References

[1] ETH Zurich, Communication Networks course, 2020. https://comm-net.ethz.ch/.

[2] Mini-Internet at ETH Zurich. http://mini-inter.net.

[3] T. Holterbach, T. Bühler, T. Rellstab, and L. Vanbever. An Open Platform to Teach How the Internet Practically Works. *SIGCOMM Comput. Commun. Rev.*, 2020.