

Advent of Network

Bachelor or Semester thesis proposal

As we see in our lectures, it is helpful to directly apply network concepts in practical projects in order to understand them. While coordinating these projects works relatively well in a lecture setting, it is challenging to scale this process to a larger audience. After all, you might need to run network simulations, maintain and configure services such as a DNS server, or provide endpoints that listen to incoming TCP connections.

Hence, this thesis aims to build a new framework with network challenges for a broad audience. Think of it as an “Advent of Network”, akin to popular coding challenges in the programming world such as Advent of Code [2]. As in Advent of Code, the idea is that anyone can tackle them without a complicated setup process. To this end, we envision a VM which can run various challenges using tools such as the mini-Internet [1] to build the required networks inside the VM.

Possible network challenges could be:

- You receive a trace of packets and need to figure out what type of protocols did generate them.
- You get a network and need to identify a faulty link.
- A malicious network is performing a so-called BGP hijack which prevents you from reaching a specific destination. Configure corresponding countermeasures.

During this thesis you will design and implement a framework which allows to solve such challenges. Important goals are that the VM can be setup quickly and automatically for different challenges; that we can verify the solution or give hints to users if they get stuck; that we can make sure that users cannot “cheat”, i.e. find the solutions in an unintended way; and that the entire VM could be connected with the real Internet to allow for even more realistic challenges.

Requirements

- Good coding skills in Python and Bash.
- Motivation to learn about new network concepts and how we could convey them in riddles.

Contact

- Tobias Bühler, buehlert@ethz.ch
- Coralie Busse-Grawitz, bcoralie@ethz.ch
- Tibor Schneider, sctibor@ethz.ch
- Prof. Laurent Vanbever, ivanbever@ethz.ch

References

- [1] T. Holterbach, T. Bühler, T. Rellstab, and L. Vanbever. An open platform to teach how the internet practically works. *SIGCOMM Comput. Commun. Rev.*, 2020.
- [2] E. Wastl. Advent of Code. <https://adventofcode.com/>.