



Reprogramming Internet Routing

During basic networks courses, we learn how to configure traditional network protocols. In OSPF, we set link weights to influence the "shortest" path computation. In BGP, we configure local preferences over routes. Yet, these configuration



knobs only give us limited control over routing. It is in fact extremely difficult today to support arbitrary connectivity requirements, for instance, routing on non shortest paths, using these "traditional" protocols. Even worse, the Internet routing is extremely fragile in the face of malicious entities as evidenced by numerous BGP hijacks and route misconfigurations.

With the rise of the Software-Defined Networking paradigm, today's networks are however becoming highly programmable, exposing well-defined interfaces that can be used to program each single forwarding element in a network.

We offerent thesis on applications of SDN to inter-domain routing:

- **Performance.** In this project, you will incorporate performance-related information in BGP, similarly to SIXPACK [1] and Google Espresso [2]. You will look into the impact of performance-based routing on the global Internet.
- **Security.** In this project, you will improve the security of traffic exchange at IXPs. The goal it to secure the data-plane of an IXP using cryptographic approaches.
- **Verification.** In this project, you will explore techniques to verify whether the agreed Service Level Agreements between two parties have been respected or not.

[1] M. Chiesa et al. "SIXPACK: Securing Internet eXchange Points Against Curious onlooKers". In CoNEXT 2017. <https://doi.org/10.1145/3143361.3143362>

[2] KK Yap et al. "Taking the Edge off with Espresso: Scale, Reliability and Programmability for Global Internet Peering". In SIGCOMM 2017. <https://ai.google/research/pubs/pub46316>