Programmable switches have recently emerged and give researchers and operators a new way to operate, monitor and optimize their network [3]. Our group has designed Blink [2], a system capable of quickly detecting failures and rerouting traffic entirely in the data-plane, using those programmable switches. To do so, Blink relies on data-plane signals such as TCP retransmissions instead of the slow control-plane notifications (e.g., BGP), which can take minutes to converge [4–6].

In a traditional switch, the forwarding decisions are only driven by the control-plane. This is not true anymore with data-plane driven systems such as Blink, where the data-plane itself can change the forwarding decisions. More precisely, with Blink, the control-plane maintains at runtime and for each prefix a list of possible next-hops in the data-plane. Then, whenever Blink detects a failure, it can activate another next-hop in the list to forward packets to a working path, and this entirely in the data-plane.

One challenge is how the control-plane interacts with the data-plane, and especially when there is an outage, as both the data and the control-plane have to update their decisions. The former wants to quickly reroute traffic to working backup paths, while the later wants to update the list of possible next-hops as BGP is converging.

The goal of this thesis is to implement the interaction between the control-plane and data-plane for Blink. The implementation should aim at preventing packet loss and routing oscillations (e.g., because of BGP path exploration [6]) without affecting path optimality.

**Milestones**

- Understand the related works, with a particular focus on Blink;
- Study different approaches for the interaction data-plane/control-plane, and how they affect path optimality, routing correctness and stability;
- Build a virtual network and implement the interaction data-plane/control-plane;
- Evaluate the proposed approach through simulations with mininet [1].

**Prerequisites**

- Being able to program in Python, some knowledge in P4 is a plus;
- Communication Networks (227-0120-00L), or equivalent.

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References


