Representation of Internet Path Transparency
Master / semester thesis

Background

Middleboxes in the Internet are network devices that perform functions other than just forwarding. These function are usually things like access control of firewalls, traffic classification to enhance performance, or other adaptations to align the traffic with the network conditions. Unfortunately this kind of middlebox mangling can also lead to dropping or blocking of unknown and new protocol extensions or completely new protocols. Examples are TCP options such as needed for TCP Fast Open (TFO) [1] or to support Multipath TCP (MPTCP) [2] as well as new UDP-based protocols such as QUIC [3] as proposed by Google. While these new proposals aim to improve network performance, middlebox blocking or interfering with this kind of traffic makes it hard to deploy them on a large scale or might even decrease performance at the end.

Several measurement studies have already been performed to detect middleboxes and the impairments they impose to specific extensions. E.g. measurements on Explicit Congestion Notification [4,5,6] as well as TFO support [7]. Both of these campaigns were performed using a tool for A/B-testing, called PATHSpider [8] that measures connectivity to a target point for both without (A) and with (B) the extension enabled and observe the differences. PATHspider uploads its measurement results to a central repository, the Path Transparency Observatory (PTO) [9], where they can be further analyzed. Currently the PTO only provides public access to limited set of already collected data but more data will be made available for public consumption, e.g. by network operator or protocol designer, in an aggregated way.

Thesis Goals

This thesis will extend the functionality of the PTO for collecting and providing metadate on the observed measurement conditions. This will enable a more advanced representation of the collected measurement data to the user over the PTO webfrontend.
This leads to the following tasks:

1. Analyses of the provided work-flow of the PTO
2. Development of an enhanced design for data analyses and organization
3. Implementation of data management extensions and visual representation on the webfrontend using the provided query language as well as additional imformation that could e.g. be used for path visualization
4. Execution of additional measurement studies as input for the PTO

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