Technische Universität München, Department of Informatics

Chair for Network Architectures and Services
Prof. Dr.-Ing. Georg Carle

Thesis B.Sc.

**Thesis M.Sc.**

Guided Research

Asymmetric Route Detection using Return TTLs

Motivation

Tools like `traceroute` which were designed to be used for debugging purposes are nowadays used to create "Internet maps". These tools and the resulting studies have the underlying assumption that routing in the Internet is symmetric which is not necessarily the case. Since relying on symmetric paths these network maps are not accurate.
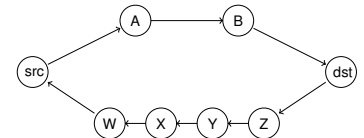
Asymmetric routes

The goal of this thesis is to better understand the phenomenon of asymmetric routing. For this purpose we will be performing bidirectional active measurements and looking at the Time-to-Live field in responses. These active measurements can be done with a modified version of `traceroute` or `paris-traceroute`[a]. The `paris-traceroute` tool already uses the return TTL field for a different purpose (missing link detection). By correlating the TTL in the sent packet with the TTL value in the return packet it is possible to infer route asymmetries. These asymmetries can be looked at on a large-scale and from different vantage points using distributed network measurement services such as PlanetLab, NLNOG Ring, RIPE Atlas, and our own measurement servers. Finally a suitable metric for the comparison of network paths is needed.[b][c] To allow for more in-depth investigations additional measurements can be triggered on demand. The routing asymmetries can finally be further correlated with external data (such as BGP, or rDNS).

[a]http://paris-traceroute.net/
[b]Ken Keys, *Internet-Scale IP Alias Resolution Techniques, 2010.*
[c]Katz-Bassett et al., *Reverse traceroute, NSDI 2010.*

Your Task

- Create a traceroute tool to survey return TTLs
- Deploy tool on distributed measurement platforms
- Perform bidirectional measurements
- Evaluate TTL data and look for asymmetries and other anomalies
- Analyze anomalies and further investigate them using additional measurements and external data sources

Contact

Oliver Gasser   gasser@net.in.tum.de
Quirin Scheitle   scheitle@net.in.tum.de

http://go.tum.de/306574