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Future Internet Research and Experimentation

PATHspider: A tool for active measurement of path transparency

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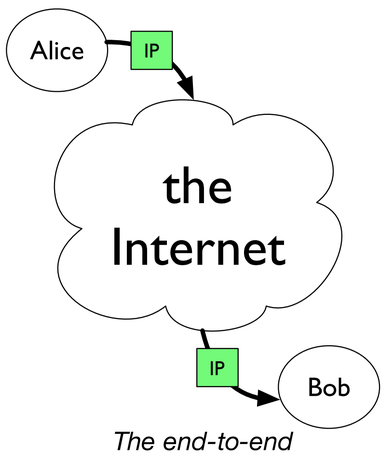
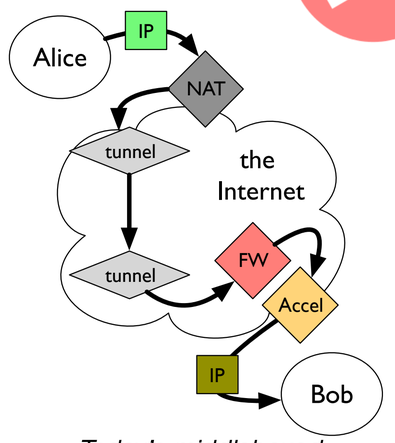
Introduction

PATHspider performs large-scale A/B testing between two different protocols or different protocol extensions to detect protocol-dependent connectivity issues and differential treatment. The A/B test itself is easily customized via a plugin framework.

Connectivity problems can arise from the increasing number of middleboxes in the Internet where either accidental or intentional manipulation causes a connection to fail.



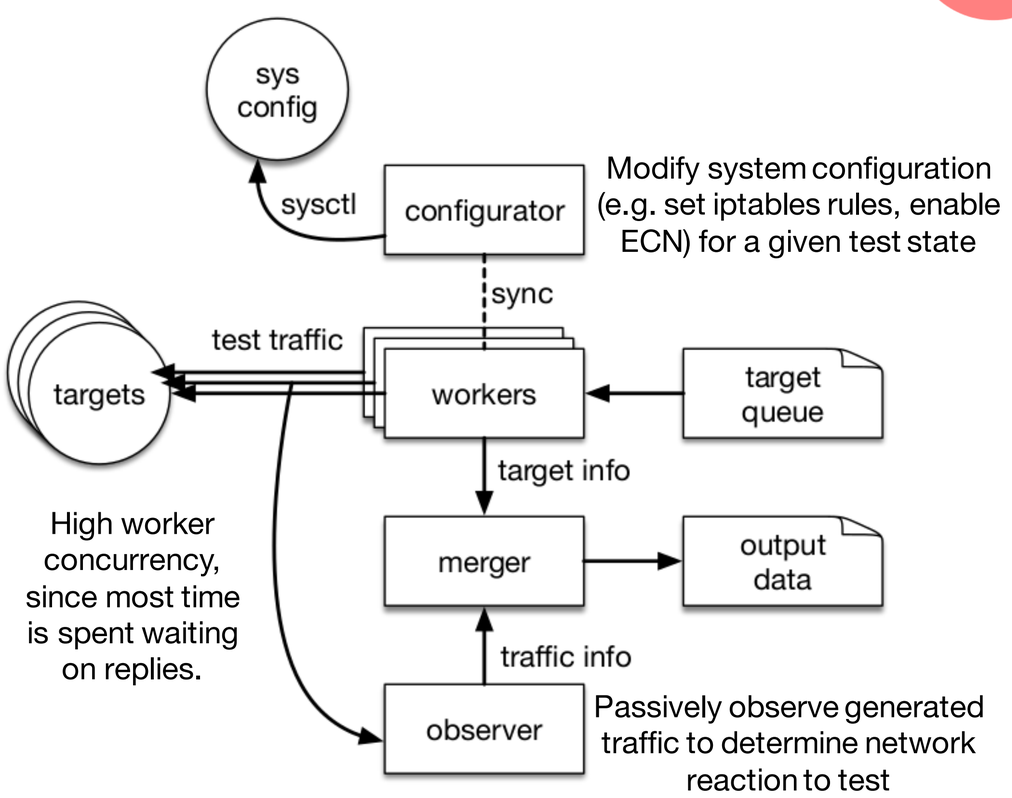
The end-to-end ideal



Today's middleboxed reality

PATHspider

Architecture



Each plugin consists of functions for generating test traffic, observing the resulting packets, and merging data into pre-analyzed observations. Each plugin handles a particular type of impairment (e.g. ECN, TFO, DSCP).

Getting Started

PATHspider is available in Debian unstable:

```
# apt install pathspider
```

0.9.0 alpha was released shortly before ANRW!

Active development on new plugins (e.g. SCTP, UDP-Lite, MPTCP), enhancements, and integration with the MAMI Path Transparency Observatory continues.

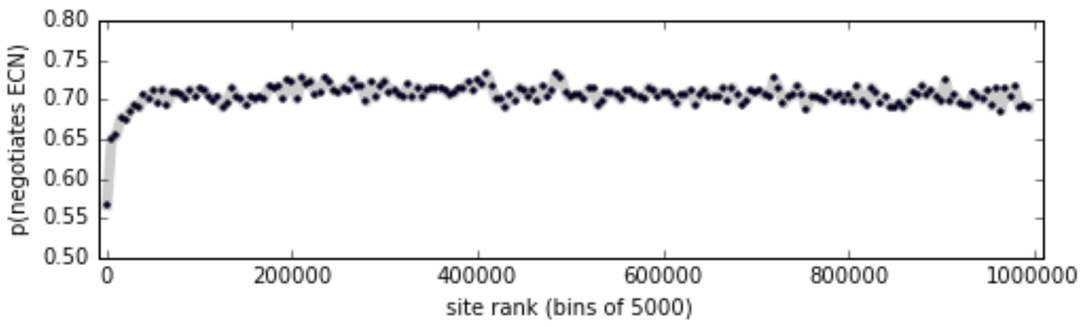
Results

Explicit Congestion Notification (ECN)

State of ECN server-side deployment, as measured from a Digital Ocean vantage point in Amsterdam on 13 June 2016:

	IPv4	IPv6	all
No ECN connectivity issues	**99.5%**	**99.9%**	**99.5%**
ECN successfully negotiated	**70.0%**	**82.8%**	**70.5%**

ECN negotiation by Alexa rank bin: note this is nearly uniform, but higher-ranked servers tend to disable ECN:



DiffServ Code Points (DSCP)

Initial study: 10006 out of 96978 **(10.31%)** of Alexa Top 100k websites had unexpected, non-zero DSCP values. More measurement is necessary to better characterize these anomalies.

TCP Fast Open (TFO)

Initial study: **330 IPv4 and 32 IPv6** addresses in Alexa Top 1M are TFO-capable (of which 278 and 28 are Google properties). DDoS prevention services, enterprise firewalls, and CPE tend to interfere with TFO. More measurement is necessary to analyze impairments.

Learn more at https://pathspider.mami-project.eu/

measurement | architecture | experimentation

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