Comparing DNS Resolvers in the Wild

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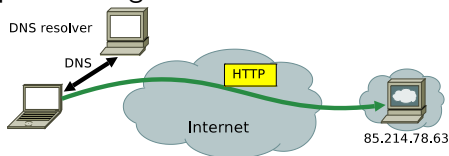{wolfgang.muehlbauer@tik.ee.ethz.ch}

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Domain Name System (DNS)

- DNS: resolve `www.fg-inet.de` to `85.214.78.63`
- Send HTTP request through Internet towards `85.214.78.63`

$\Rightarrow$ Fundamental building block of the Internet
$\Rightarrow$ Its performance is critical

Motivation

DNS according to the text book

- A commodity service: everyone is using it
- Resolves hostnames to IP addresses
- Same view from everywhere
- Caching
- Resolver assigned by ISP

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DNS in the wild

- New (mis)uses of DNS [Vixie'09]
    - Locality aware replies
    - Dynamic load balancing
    - NXDOMAIN catching
    - Use as directory service
- Third party resolvers, e.g., Google Public DNS and OpenDNS

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DNS is changing ⇒ Study across content, locations and resolvers

- Compare DNS deployment of different ISPs and different resolvers
- Metrics: responsiveness and quality of replies

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Data and Approach

Overview

- Custom script
- 3 DNS resolvers: Google DNS, OpenDNS, local resolver
- 10k+ hostnames:
    - Popular content: Top 5000 from Alexa
    - Less popular content: Bottom 2000 from Alexa
    - Many objects on websites: 3000+ "embedded" hostnames
- Two back-to-back queries for each hostname for each resolver

$\Rightarrow$ > 60 traces from all around the globe, > 50 different ISPs
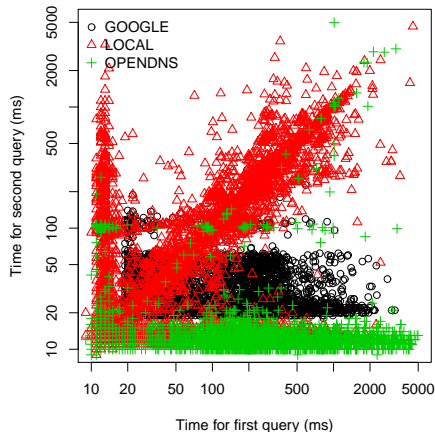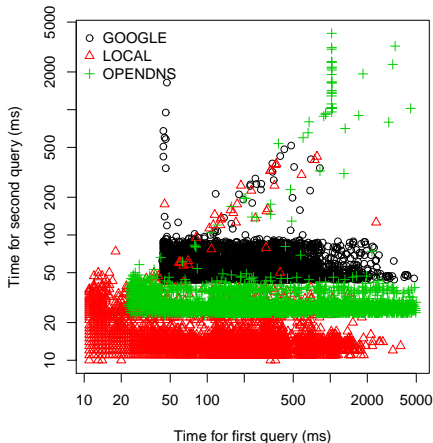
First vs. second query time
The expected
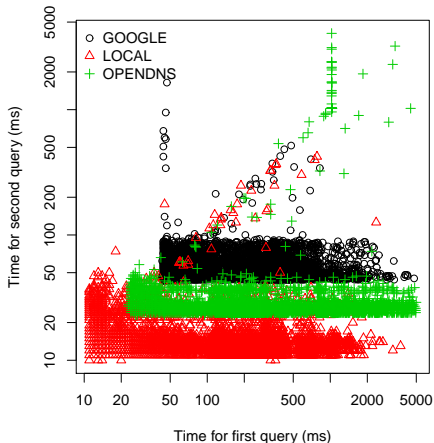
Scatterplot

- 5000 ms timeout
- Minima indicate RTT to DNS server
- Small variance for second query due to caching

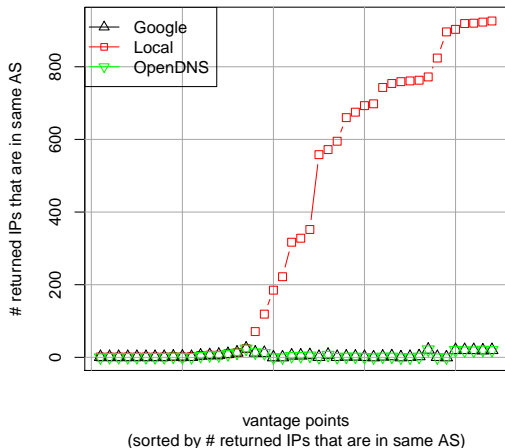⇒ Local DNS apparently better than OpenDNS and GoogleDNS

First vs. second query time

The expected and the unexpected

Impact of redirection

How many replies are in the same AS as the vantage point?

vantage points
(sorted by # returned IPs that are in same AS)

Distant DNS servers

- CDN optimizes for resolver IP address
- Up to 1000 hosts with local resolval available not locally resolved with GoogleDNS/OpenDNS

Summary

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- Application performance depends on DNS deployment
    - Local DNS not always the performance champion
    - But for content locality you have to use local DNS
- DNS is a "battlefield" with many players
- How do we get to an open DNS system that can cope with today's needs?

Current work

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Repeat experiment in wider scope

$\Rightarrow$ Please help and run our new measurement script from
http://www.fg-inet.de/
at your home

- No privacy implications
  - No interference with your personal data
  - Source code fully open
  - Manual trace upload
- Little overhead

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Questions?