Distributed ECS Measurement with Ark

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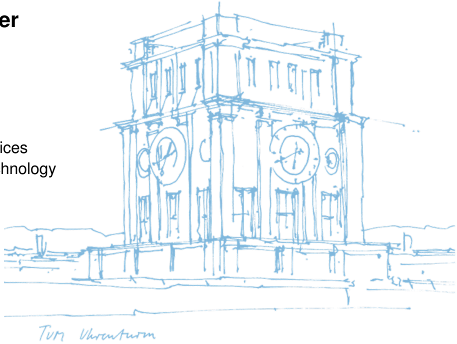

Motivation

- Why look at ECS at authoritative nameservers?
  - Uncovers infrastructure
  - Evaluate load balancing properties
  - Distributed platforms do not cover enough client networks to account for all possible responses
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  - Last big ECS studies on authoritative nameservers from 2013
- Our contributions:
  - We developed a response-aware ECS scanner (ECSplorer)
  - Analyzed the current ECS landscape
  - Available on arXiv and submitted to *CoNEXT*
  - Hackaton to implement it using Ark for distributed scanning

EDNS Client Subnet (ECS)

- Defined in RFC7871 with EDNS OPTION-CODE 8
- Resolver forwards the client IP address to the authoritative name server
- Sends:
  - IP address family
  - IP address
  - Source prefix length (number of relevant bits in the IP address)
  - Scope prefix length (number of bits the response covers)

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- The first scanner to support IPv6 probing
- Code is public `github.com/tumi8/ecsplorer`

Results

- Scanned a collection of top list domains (3.2 M) with a limited number of queries
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- Full address space scan for selected domains
  - Meta uses 137-140 IPv4 and IPv6 addresses (Facebook, Instagram, Whatsapp)
  - Google uses different deployments for Google.com (~2.1k) and YouTube (~1.8k)
  - AWS Route 53 always returns 24 scope prefix lengths
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  - AWS Route 53 always returns 24 scope prefix lengths
    - Customer can apply their custom mapping
  - Cloudflare is the largest provider with such domains (99,7 % of all probed domains witch a Cloudflare authoritative nameserver)
  - It seems to always return the same RRset using an ECS scope length of 24

→ Perform distributed measurements

Initial Distributed Results

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→ Hackaton topic on distributed ECS measurements with Ark

Hackaton Results

We use 30 *distributed* subnets and send queries from 130 Ark nodes

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- Google and Wikipedia provide consistent ECS-based responses within these 30 queries across all VPs

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- Provide an efficient ECS scanning approach
- Increases usefulness of single VP measurements
- Distributed measurements are still necessary
- Distributed ECS scans are the next step to high quality data
- We have indicators that ECS is used to collect fine-grained data on the nameserver side
- More analysis load balancing algorithms needed

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Domain	Total RRsets	Per VP RRsets	# VPs	NSIDs
Domain on Cloudflare 1	11	1	130	130
Domain on Cloudflare 2	11	1	130	130
Domain on Cloudflare 3	2	1	130	125

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	58	20	9	37
	58	21	42	37
	58	22	77	37
	58	23	1	37

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www.facebook.com	22	21	1	3899
	22	22	129	3899
www.wikipedia.org	6	6	130	3
www.google.co.jp	28	28	130	0
www.google.com	29	29	130	0

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