

Experimental Data on Anycast

Characterizing DNS query
distribution in an anycast cloud

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Overview

- Review: what is Anycast?
 - How does it work?
 - Why and when is Anycast suitable for DNS?
- Who is using Anycast for DNS?
- Why study DNS Anycast?
- How to study DNS Anycast?

Review: What is Anycast?

- Multiple servers behind the same IP address
- Name/IP address becomes service locator
- Allows Internet routing to select “closest” or “best”
 - Deemed more efficient than application selection by RTT or server selection by other means
 - Works best with UDP, less stable for TCP

Review: DNS and Anycast

- DNS protocol limits the number of authoritative servers for a domain as contained in referral
- DNS auth servers hand out the same answer to the same question
- DNS does bulk of its work over UDP

DNS and anycast were made for each other.

Anycast for DNS

- Improves fault tolerance: in case of node failure, seamless failover to a different node
- Lowers client latency
- Improves attack resistance, particularly against DDoS
 - Raises aggregate bandwidth available to cope
 - Partitions clients so dispersed attackers can't easily attack one target together

Who is Using DNS Anycast?

- Root server operators
 - B, C, F, I, J, K, M
 - Undertaken primarily for attack resistance
- Some TLD operators, e.g. UltraDNS
- Large, e-commerce-critical lower-level zones
- Some large ISPs for their caching resolvers

Why Study DNS Anycast?

- Distributed system in the real world
 - DNS is large, complex, and not a lab toy
 - This is not how DNS was expected to work: how does removing one assumption change system behavior? (*I.e., it's interesting!*)
- What benefits does anycast really provide to the user base? What costs does it impose?
- Is Anycast dangerous in some way?

How to Study DNS Anycast?

- Supposed benefits include seamless failover, reduced average latency
- So....
 - Instrument everything
 - Start breaking things (I.e. taking nodes out of the cluster), watch where the traffic goes
 - Turn them back on, watch where the traffic goes

Predictions

- Overall, anycast helps latency. (*We hope to be able to quantify this*)
- If we shut off node X in the F-root cluster, most of its traffic will go to other F-root nodes
- If we turn node X in the F-root cluster back on, most of the same traffic will come back

Participation

- I-root (Autonomica) and F-root (ISC)
- ISC/CAIDA providing design and analysis
- Funding by US NSF
- Later phases
 - Instrument more roots to watch more traffic shifts
 - Measure convergence times, churn
 - Cross-reference: dnsmon, other datasets