SAND Project
Self-managing Anycast Networks for the DNS

ICANN 55 TechDay
7 March, 2016

Ricardo de O. Schmidt
SAND Project

• Bring autonomous management to anycast DNS
  • Monitoring: system health, reachability, performance, resilience...
  • Analysis: is everything as expected?
  • Planning: reconfiguration decisions
  • Execution: reconfiguration enforcement
  • Knowledge: data gathered or produced

Monitoring → Knowledge base → Decision making

Monitoring:
- Passive
  • Passive DNS
  • ECS
dnscap
- Active
  • Probing
  • Distributed
- Stats
  • Nagios
  • Icinga
  • SNMP

Decision making:
- BGP
- DNS
- Cloud

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Research Focus

- Most of our research efforts are focused on
  - Monitoring the anycast infrastructure
  - How to use available tools and platforms
  - How to profit from upcoming technologies

- Examples
  - Using worldwide vantage points (RIPE Atlas) to assess reachability and performance of the anycast DNS
  - Use the anycast infrastructure itself for probing
  - Use ECS information for end user mapping
Monitoring Reachability
Monitoring Reachability

What is the origin of queries I see?

Atlanta, US
Monitoring Reachability

What is the origin of queries I see?
Monitoring Performance

Does anycast give good absolute performance?

CDF

RTT (ms)

C-root actual
c--C-root optimal
c--C-root mishit
K-root actual
K-root optimal
K-root mishit
Monitoring Performance

Does location matter more than number of sites?

CDF vs. RTT (ms)

- C-root optimal
- CDG
- CDG + LAX
- CDG + LAX + JFK
- CDG + LAX + JFK + FRA
Visualization Helps!
Lessons Learned

• Fully autonomous is very challenging
  • Mainly due to BGP agreements for new instances
  • Semi-autonomous is definitely possible
  • Testing environment can be very useful

• Measurements are very helpful
  • Uncover hidden problems and misconfigurations
  • Decide on best approaches
  • Major drawback: you have to implement them yourself
    • But not a real drawback, is it?
Anycast Testbed

• We are creating an **anycast research testbed**
  • Measurements, measurements, measurements...
  • We want to go as global as possible
  • Few sites already up and running
  • Traffic is research related and limited to eventual ICMP (pings), traceroutes, and DNS requests

• Resources allocated by SURFnet and RIPE
  • 145.90.8.0/24
  • 2001:678::d0::/48
  • ASN 1133 (temporary - University of Twente, NL)
Anycast Testbed

Help us to build the testbed!

The more the merrier!
Thank you!

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Future

• DNS Anycast Security (DAS) project
  • How to use anycast to prevent and mitigate DDoS
  • Pros and cons of approaches
  • ...

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