Anycasting the DNS

John Crain
Internet Corporation for Assigned Names and Numbers
What is Anycast?

‣ “Anycast is a network addressing and routing scheme whereby data is routed to the "nearest" or "best" destination as viewed by the routing topology.” – Wikipedia

‣ unicast – IP address is a unique interface

‣ multicast – Multiple locations at same IP address all receiving packets.

‣ anycast – IP address points to multiple locations but only one visible.
Limitations

- Because routing information can change!
  - UDP protocols
  - Short lived TCP sessions
    - This sounds a lot like DNS packets :)
- Not good for longer TCP sessions
  - Think of a web session that can last seconds or videostreaming that can last even longer!
Why do it?

- Adds Capacity
  - 2 x 100Mb is more than 1 x 100Mb
- Localizes traffic
  - Means closer, hence faster replies
  - During attacks it also localizes problems
- It’s FUN!!!!
Is it hard?

- Not really but there are some considerations
- Managing the anycast instances takes some thought
- Need multiple IP address ranges...
- More on that.....
Implementing Anycast
Separate DNS server into its own network

- Get a dedicated routable /24 of IPv4 space and a range of IPv6 space

- Also get a dedicated Autonomous System Number (ASN)

  - This is necessary for creating a unique routing entity


    - ICANN L–ROOT (NET–199–7–83–0–1) 199.7.83.0 – 199.7.83.255

    - ASNumber: 20144
A name server

- Has an IP address on which it answers DNS queries. l.root-servers.net > 199.7.83.42
  - (Also 2001:0500:0003::42)

- Announce 199.7.83.0/24
  - Normal = unicast
Anycast
What are the issues?

- From any point on the Network I only see one route to the system at anytime
- How do I as administrator get to a specific instance?
- Administrative/Management IP addresses!
  - These are used to get to a specific host
Administation addresses

199.7.83.0/24
199.7.83.0/24
192.0.2.0/24
192.0.1.0/24
Important factors to think about

- If one of the systems stop answering (NSD/BIND stops?)
  - Make sure that the route gets withdrawn
- Have a “Backdoor” incase your system is not reachable.
  - Have someone local to the machines who can pull the plug in an emergency
Who does this?

- Various TLD operators
- The root-servers
  - Technical Limitation of 13 root-server names
    - a.root-servers.net – m.root-servers.net
    - In a unicast world this also meant 13 locations.
  - In an anycast world this looks different

http://www.root-servers.org/~wnagele/map/version2.html
Thankyou for your attention!

John Crain
john.crain@icann.org