K-Root Name Server Operations

Andrei Robachevsky

andrei@ripe.net
Outline

• **Root Server System – brief update**
  – Architecture
  – Current locations
  – Anycast deployment

• **K.root-servers.net Server**
  – Major milestones
  – Current status
  – K-Anycast deployment
Root Server System

- Provides nameservice for the root zone
  - The root DNS node with pointers to the authoritative servers for all top-level domains (gTLDs, ccTLDs).

- Thirteen name server operators
  - Selected by IANA
  - Diversity in organisations and location
  - 13 is a practical limit
  - a.root-server.net ÷ m.root-server.net - equal publishers
  - All thirteen are authoritative servers for the root zone

- An average client comes here < 8 times per week
Root servers and operators

• Thirteen nameservers, selected before 1997
  - a.root-servers.net  Verisign
  - b.root-servers.net  USC-ISI
  - c.root-servers.net  Cogent Communications
  - d.root-servers.net  University of Maryland
  - e.root-servers.net  NASA
  - f.root-servers.net  ISC
  - g.root-servers.net  US DoD (DISA)
  - h.root-servers.net  US DoD (ARL)
  - i.root-servers.net  Autonomica
  - j.root-servers.net  Verisign
  - k.root-servers.net  RIPE NCC
  - l.root-servers.net  ICANN
  - m.root-servers.net  WIDE Project

• Look at www.root-servers.org
• Public primary nameserver
  – a.root-servers.net primary
  – Other 12 are secondary
  – NSI generates the zone (Verisign since 2000)

• Enhanced architecture (2002)
  – Hidden distribution master
  – All ‘letter’ servers are equal
  – Authenticated transactions between the servers (TSIG)

• Wide deployment of anycast (2003)
Anycasting

• Point-to-point communication between a single client and the “nearest” destination server
  – Basics described in RFC 1546 in 1993

• “Cloning” a server
  – Multiple locations
  – Same operator
  – Same IP address belonging to the operator
  – Identical data

• Benefits
  – Distribution
  – Resilience
  – Performance
  – Redundancy
  – Simplicity
Location of 13 DNS Root Servers

More than 60 and number is growing
Global context/Major players

• ICANN/IANA
  – Reviews the changes in the zone file
• US DoC
  – Approves the changes
• Verisign
  – Edits the zone (technical)
• RSSAC
  – Advices ICANN regarding the Root Server System
• 13 Root Server Operators
  – Publish the zone
  – Coordinate operations/share information
• Others
  – IETF/IAB, OARC
  – BIND Forum, NLnetLabs, etc.
K-root Milestones

- Operated by RIPE NCC since May 1997
  - Hosted by LINX in London
- Running NSD since February 2003
  - Increased software diversity and performance
- Anycast since July 2003
  - Two global instances: London and Amsterdam
- Wider anycast deployment (2004)
  - 3-5 global nodes (investigating)
  - 10-15 local nodes
    - Frankfurt (DE), January 2004
    - Athens (GR), April 2004
    - Doha (QA), June 2004
“Local” Mirror Instances

• Objectives
  – Improving access to K for a significant ISP community
  – Isolating impact of an “external” DDoS
  – Localising impact of a “local” DDoS

• Location
  – Well connected points with significant ISP community (IXP, etc.)
  – Open peering policy

• Benefits
  – Improved responsiveness for the members of the IX
  – Improved resilience of the whole system for others

• Model
  – Hosted and fully funded by a neutral party

• Operations
  – Exclusively performed by the RIPE NCC
“Global” Mirror Instances

• Ideally located at topologically equidistant places
  – In practice there are not so many choices
• Globally reachable
  – But less preferable than “local” mirror instances
• Powerful in terms of connectivity and CPU
  – Have to sustain DDoS and local nodes failures
• The same management model as for local nodes
  – RIPE NCC is the operator
• Different funding model
  – No distinguished group of local beneficiaries
  – Costs are mainly borne by the RIPE NCC
• Looking for 3-5 locations in Asia and the Americas
  – Excellent global connectivity
K-root Locations

Introduction
The RIPE NCC operate k.root-servers.net, one of the 13 Internet root name servers. The K-root service is provided by a set of distributed mirror instances using IPv4 anycast. Each mirror instance announces the 193.0.14.0/24 network in AS25162. A K-root server mirror instance consists of a cluster of server machines running the NSD name server software.

Locations

[22 Jun 2004] K-root mirror instance deployed in Doha
[27 Apr 2004] K-root mirror instance deployed in Athens
[27 Jan 2004] K-root mirror instance deployed in Frankfurt
K-root Statistics

London

Amsterdam

Andrei Robachevsky

RIPE NCC Regional meeting, 28-29 July 2004, Nairobi

http://www.ripe.net
More Information

• Root operators
  – http://www.root-servers.org
  – http://[a-m].root-servers.org
    • http://dnsmon.ripe.net

• Root server analysis

• Anycasting
  – Host Anycasting Service, RFC1546,
    http://www.ietf.org/rfc/rfc1546.txt
  – Distributing Authoritative Name Servers via Shared Unicast Addresses. RFC3258,
    http://www.ietf.org/rfc/rfc3258.txt
More Information (cont.)

• K-root
  – http://k.root-servers.org

• K-root anycasting
  – Distributing K-Root Service by Anycast Routing of 193.0.14.129, RIPE- 268,
    http://www.ripe.net/ripe/docs/ripe-268.html
  – General Requirements and Guidelines,
    http://k.root-servers.org/hosting-guidelines-200311.html
  – Contact at k-anycast@ripe.net
http://www.ripe.net/presentations