K-Root Name Server Operations

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Outline

• An Overview of the Root Server System
  – Architecture
  – Anycasting

• k.root-servers.net Server
  – Major milestones
  – K-Anycast deployment
  – Current status
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
  – \([a \div m].\text{root-servers.net} - \text{equal publishers}\)
  – All 13 are authoritative servers for the root zone

• An average client comes here < 8 times/week
Root servers and operators

- Thirteen root nameservers
  - 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
Current Root System Architecture

- Hidden distribution master
- All ‘letter’ servers are equal
- Authenticated transactions between the servers (TSIG)
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 85 and number is growing
Global context

• ICANN/IANA
  – Reviews the changes in the zone file
• US DoC
  – Approves the changes
• Verisign
  – Edits the zone (technical)
• RSSAC
  – Advises 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 (since 2004)
  – 10+ local anycast nodes
  – Global nodes
“Local” K-root 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” K-root 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 IP4 anycast. Each mirror instance announces the 193.0.14.0/24 network in AS25152. A K-root server mirror instance consists of a cluster of server machines running the NSD name server software.

News

Locations

http://www.ripe.net
K-root Statistics

London

Amsterdam

Daily Queries received

- RQ
- RQ Current: 5,001 k Average: 4,133 k Min: 3,217 k Max: 6,100 k
- Last data entered at Tue Mar 29 09:30:00 2005.

Daily Queries received

- RQ
- RQ Current: 1,637 k Average: 1,469 k Min: 1,154 k Max: 2,146 k
- Last data entered at Tue Mar 29 09:26:00 2005.
More Information

• Root operators & servers
  – 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
http://www.ripe.net/presentations