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

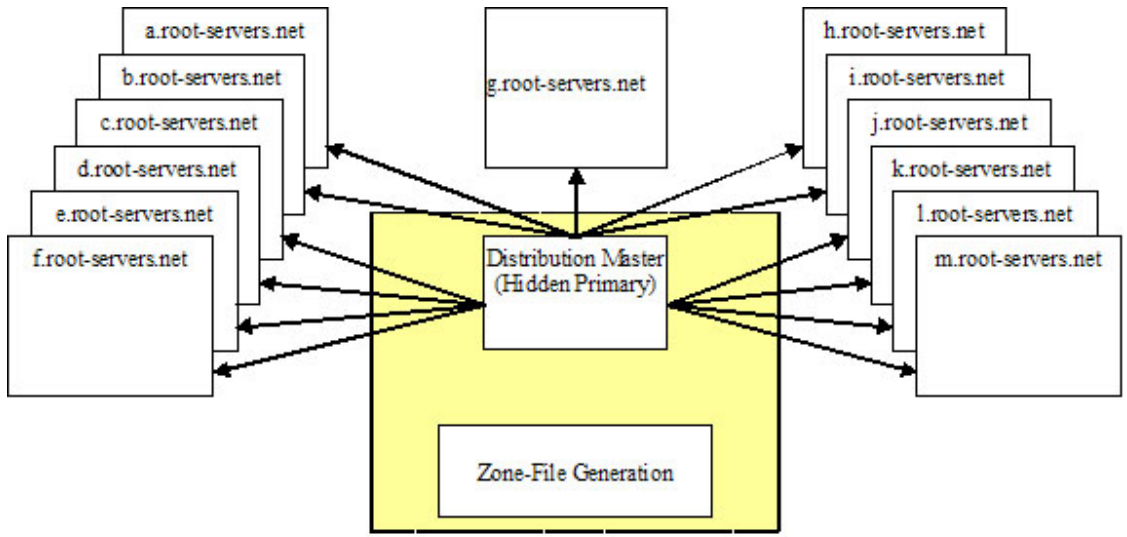
- Provides nameservice for the **root zone**
  - The root DNS node with pointers to the authoritative servers for all top-level domains (gTLDs, ccTLDs).
- Thirteen name server operators
  - Selected by IANA
  - Diversity in organisations and location
  - 13 is a practical limit
  - [a ÷ m].root-servers.net - 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

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

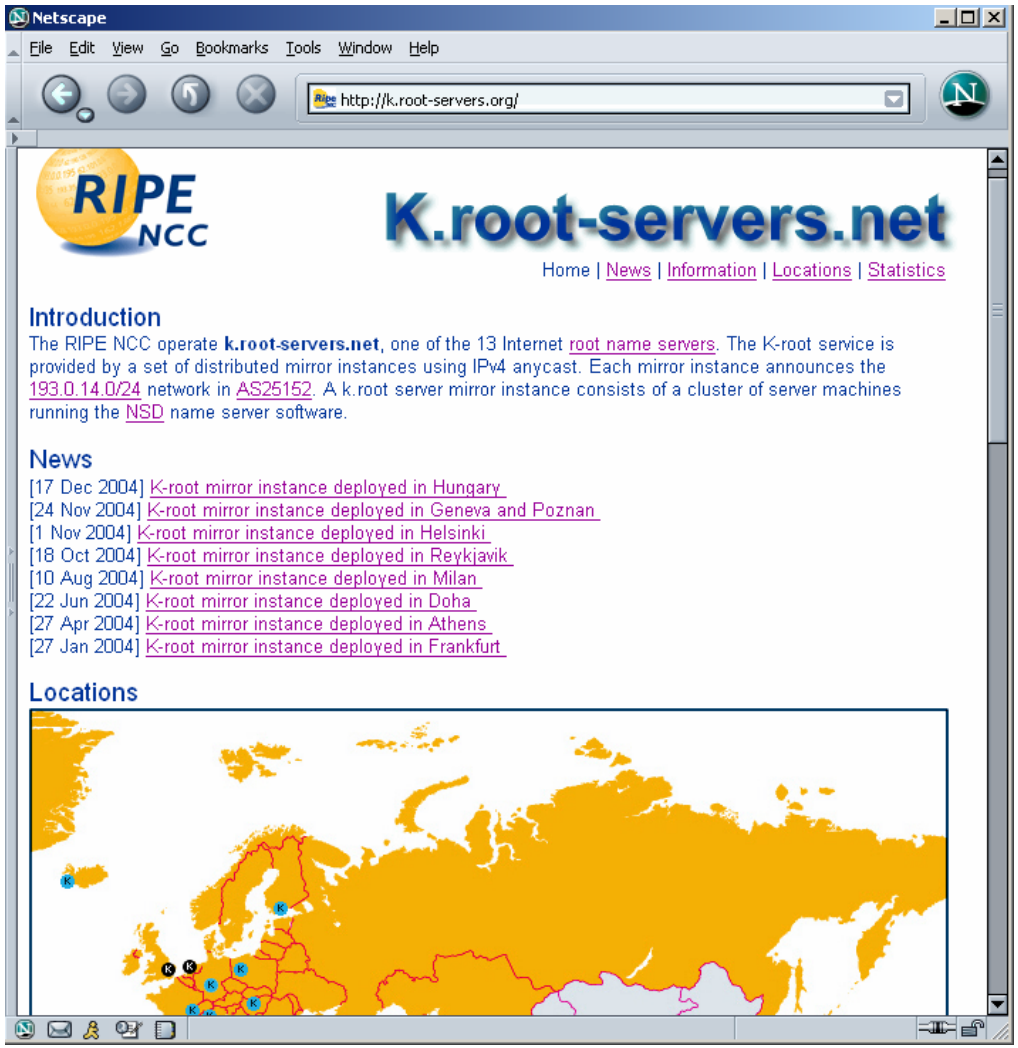
“Local” K-root Mirror Instances

- 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

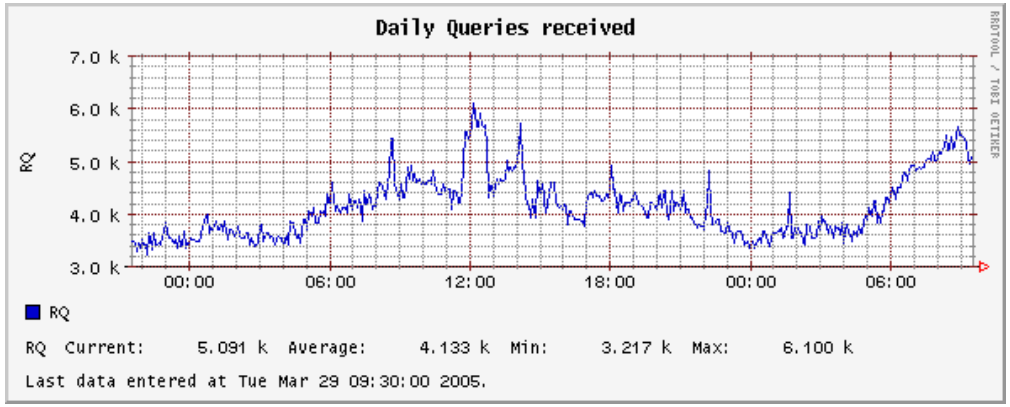
“Global” K-root Mirror Instances

- Ideally located at topologically equidistant places
  - In practice there are not so many choices
- Globally reachable
  - But less preferable then “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

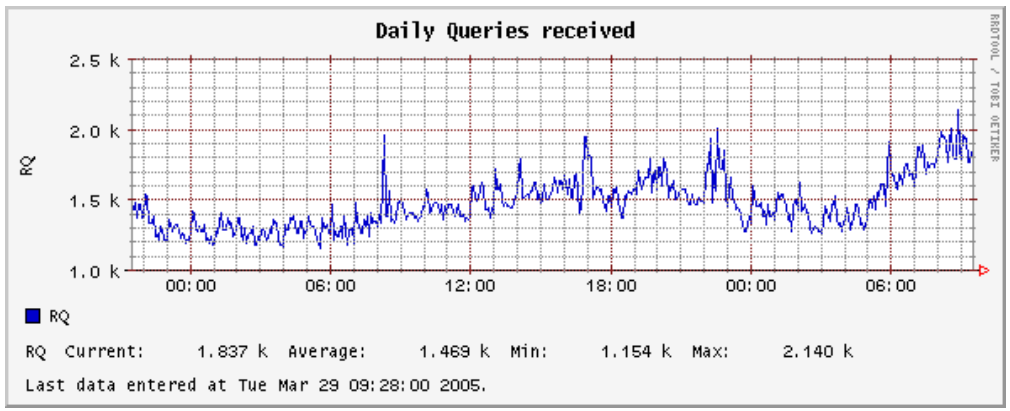
K-root Locations



K-root Statistics



London



Amsterdam

More Information

- Root operators & servers
  - http://www.root-servers.org
  - http://[a-m].root-servers.org
    - http://dnsmon.ripe.net
- Root server analysis
  - http://www.caida.org/projects/dns-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, RIPE- 268, http://www.ripe.net/ripe/docs/ripe-268.html
  - General Requirements and Guidelines, http://k.root-servers.org/docs/hosting-guidelines.html

http://www.ripe.net/presentations