K-Root Name Server Operations

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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 $\div$ 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
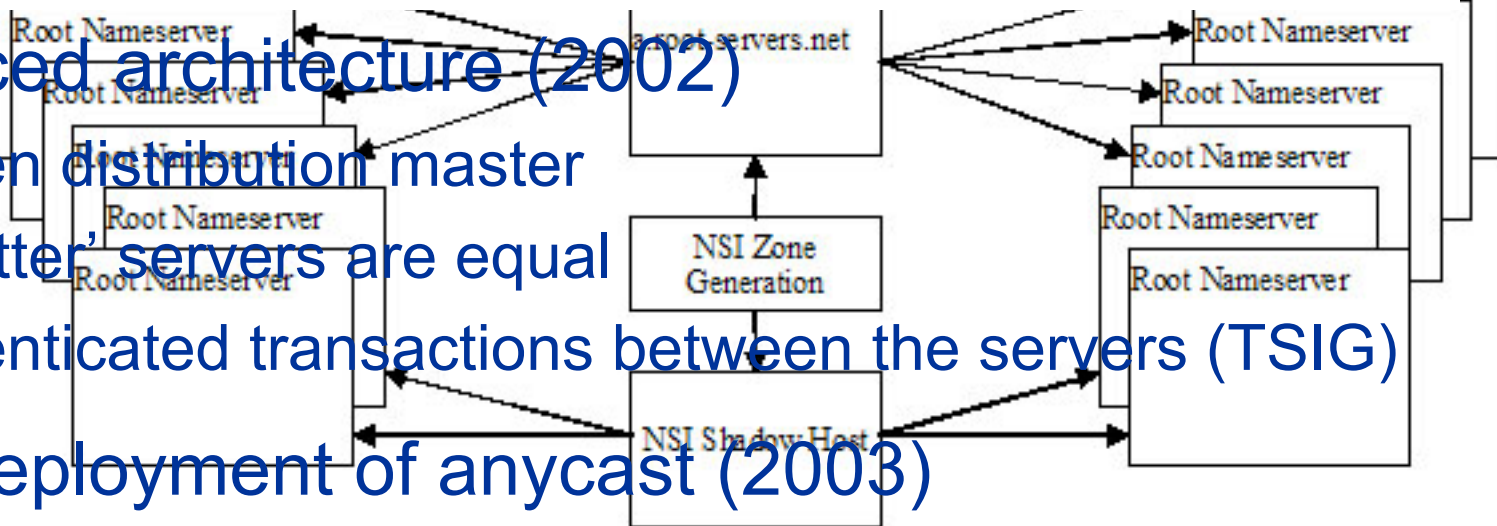- Look at www.root-servers.org

- Public
  - a.ro
  - Oth
  - NS
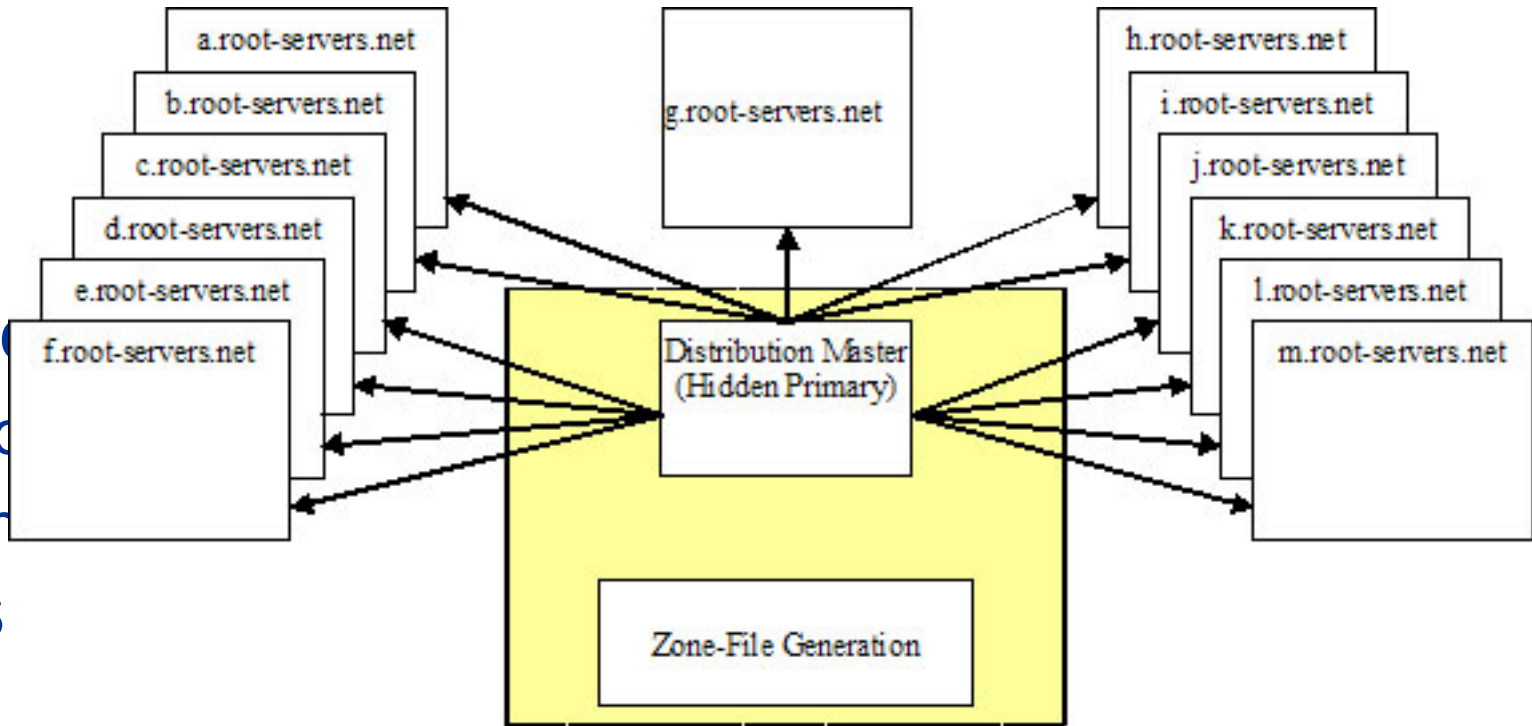
- Enhanced architecture (2002)
  - Hidden distribution master
  - All 'letter' servers are equal
  - Authenticated transactions between the servers (TSIG)

- 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

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 (Asia, Americas)
  - 10-15 local nodes
    - Frankfurt, January 2004
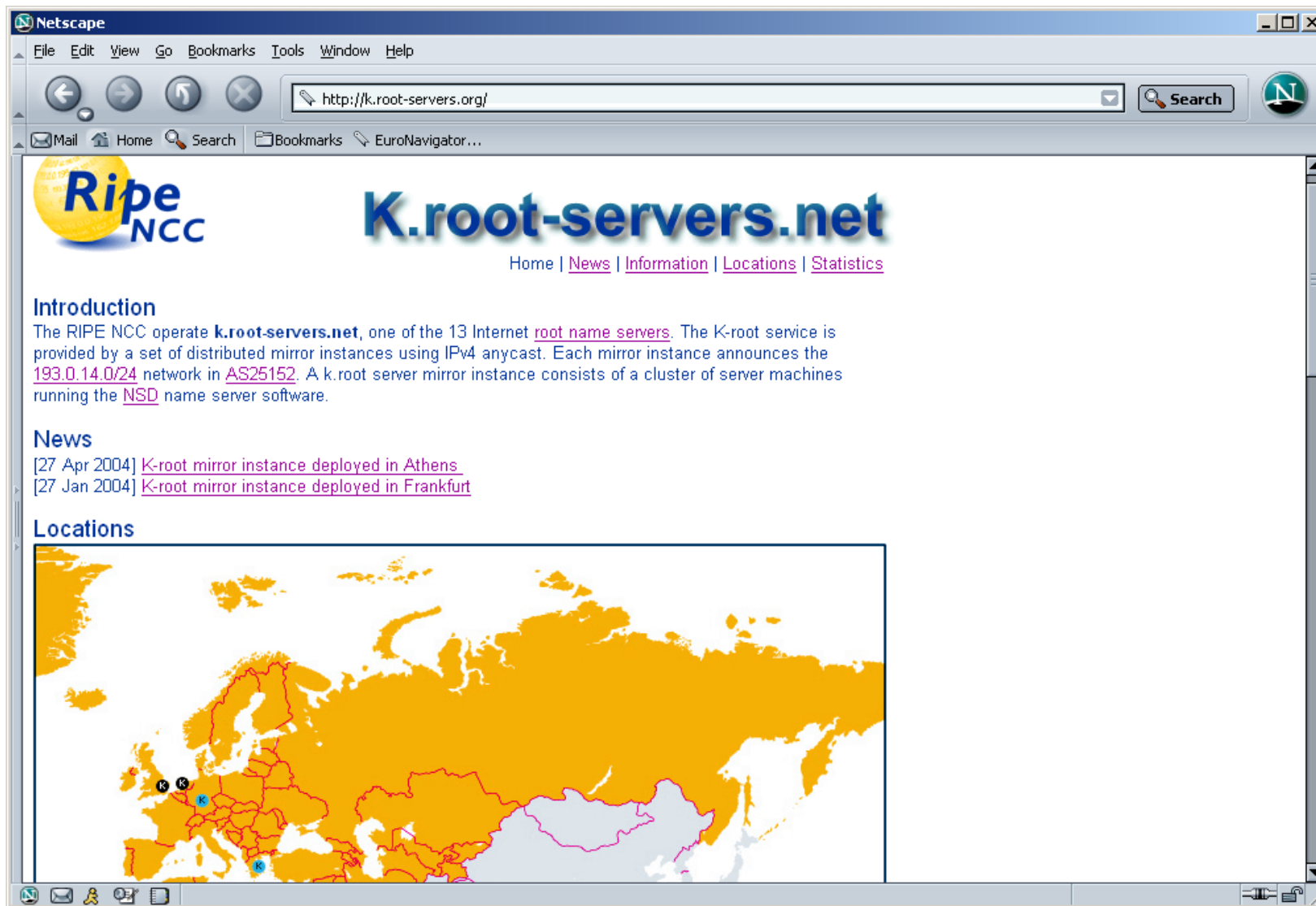   - Athens, April 2004

"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.)
  - Improved responsiveness for the members of the IX
  - Improved resilience of the whole system for others

- Model
  - Hosted by a neutral party
  - Open peering policy
  - Fully funded by a hosting 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 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

Query Load Distribution

3500
3000
2500
2000
1500
1000
500
0

qps

- London
- Amsterdam
- Frankfurt
- Athens
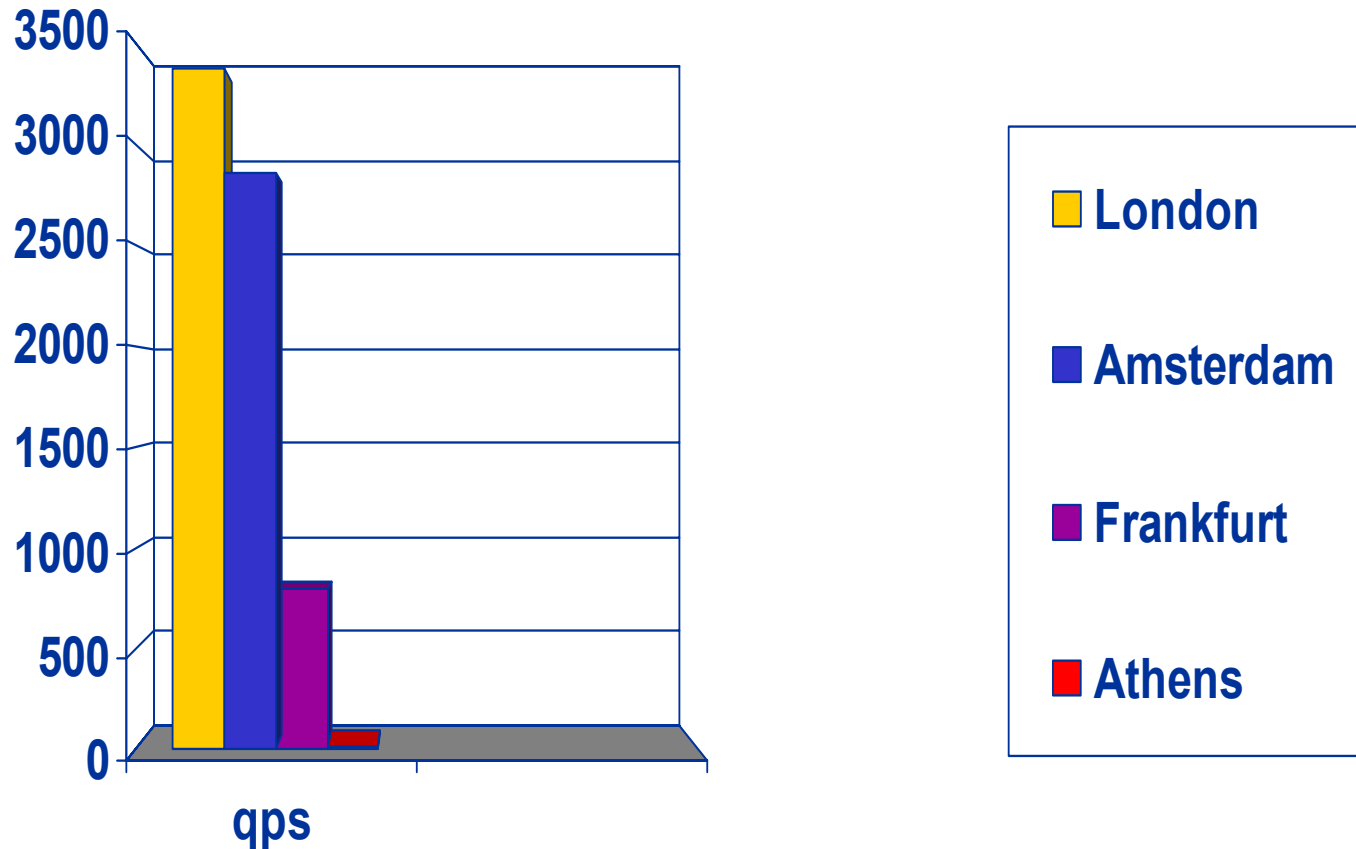
More Information

- Root operators
  - 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 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