



K-Root Nameserver Operations

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Outline

- Root Server System
 - What is a root server?
 - Where is the root?
- Anycast Routing
 - The basics
 - Advantages of using anycast
- K.root-servers.net Server
 - History
 - Current status
 - K-Anycast deployment

Root Server System

- Provides nameservice for the **root zone**
 - Root DNS node with pointers to the authoritative servers for all top-level domains (gTLDs, ccTLDs).
- Thirteen nameservers
 - Most of them selected before 1997
 - Diversity in organisations and location
 - 13 is a practical limit
 - a.root-server.net - m.root-server.net
 - All thirteen are secondary servers
- 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

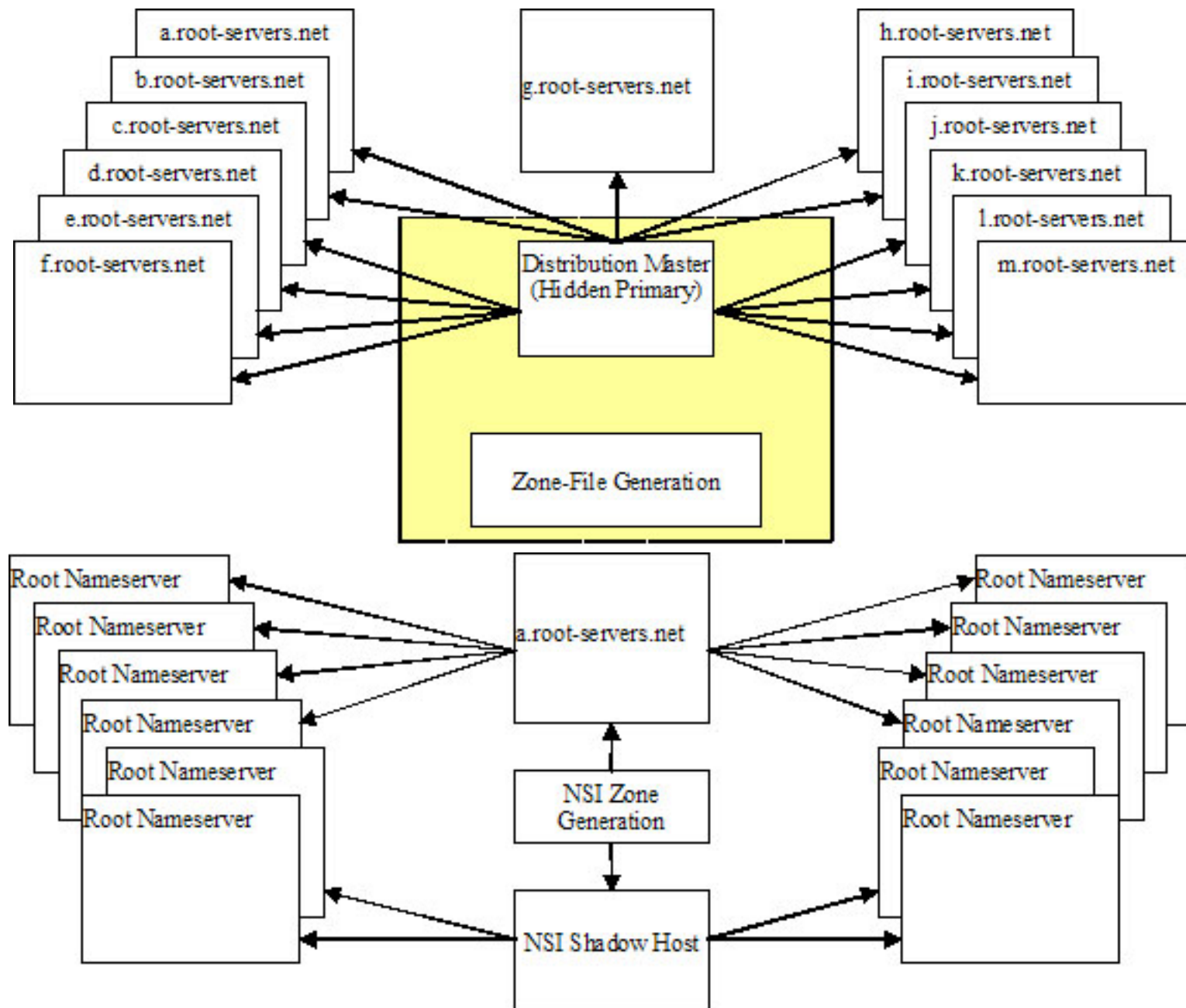


Location of 13 DNS Root Servers (pre-anycast era)



Evolution of Root System Architecture

- Public primary nameserver
 - a.root-servers.net primary
 - Other 12 are secondary
 - NSI generates the zone (Verisign since 2000)
- Enhanced architecture (2002)
 - Hidden primary nameserver
 - 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 IP address
 - Identical data
- Benefits
 - Distribution
 - Performance
 - Resilience
 - Redundancy



Location of 13 DNS Root Servers (spot the differences)





Location of 13 DNS Root Servers (spot the differences)



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 instances: London and Amsterdam

K-root current status

- 2 instances have been deployed
 - LINX & AMS-IX
 - Average load: 3K/2K qps
- Specification
 - Cluster of 2 servers
 - NSD
 - Sniffer box
 - Global reachability
 - Funded by the RIPE NCC (AMS-IX provides 1G port)

Future nodes

- 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.)
 - Main beneficiaries are the members of the IX
- Model
 - Hosted by a neutral party (IXP itself?)
 - Open peering policy
 - Fully funded by a hosting party
- Operations
 - Exclusively performed by the RIPE NCC

More Information

- Root operators
 - <http://www.root-servers.org>
 - [http://\[a-m\].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](http://www.ietf.org/rfc/rfc1546.txt)
 - [Distributing Authoritative Name Servers via Shared Unicast Addresses. RFC3258, http://www.ietf.org/rfc/rfc3258.txt](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/titletoc.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>