K-root Update

Presented by
Andrei Robachevsky
CTO, RIPE NCC
Outline

• Root Server System
  - Overview
  - Milestones and developments

• 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 nameservers, thirteen letters
  - 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
  - Crucial for the functioning of the global DNS
Root servers and operators

• All letter are equal
• Thirteen root nameservers, twelve operators
  - 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
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
• 12 Root Server Operators
  - Publish the zone
  - Coordinate operations/share information
• Others
  - IETF/IAB, OARC
  - BIND Forum, NLnetLabs, etc.
Root Server System developments

• Ongoing development
  - Anycast network

• Future developments
  - IDN support
  - IPv6 support
  - Signing of the root zone
Anycast network

• Benefits
  - Distribution, Resilience, Performance, Redundancy, Simplicity

• Anycasting
  - 133 servers globally
  - C(4), F(40), I(30), J(30), K(17), L(2), M(4)

• K-root strategy
  - Local nodes (12): improving access and DDoS isolation
  - Global nodes: London, Amsterdam, Tokyo, Miami, Delhi
  - Stable efficient operation, including security and lifecycle management
  - No immediate plans for expanding the network
Location of the Root Servers

More than 130 and number is growing
IDN support in the root zone

- Example.test in 11 languages since 15 October 2007

<table>
<thead>
<tr>
<th>Script</th>
<th>Language</th>
<th>SLD.TLD U-labels</th>
<th>SLD A-label</th>
<th>TLD A-label</th>
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</thead>
<tbody>
<tr>
<td>Arabic</td>
<td>Arabic</td>
<td>متال.إختبار</td>
<td>xn--mgbh0fb</td>
<td>xn--kgbechtv</td>
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<tr>
<td>Arabic</td>
<td>Persian</td>
<td>متال.آزمایشی</td>
<td>xn--mgbh0fb</td>
<td>xn--hgbk6aj7f53bba</td>
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<tr>
<td>Chinese, simplified</td>
<td>Chinese</td>
<td>例子.測試</td>
<td>xn--f5qu00a</td>
<td>xn--0zwm56d</td>
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<tr>
<td>Chinese, traditional</td>
<td>Chinese</td>
<td>例子.測試</td>
<td>xn--f5qu00a</td>
<td>xn--g6w251d</td>
</tr>
<tr>
<td>Cyrillic</td>
<td>Russian</td>
<td>пример.испытание</td>
<td>xn--e1afmkfd</td>
<td>xn--80akhbykunj4f</td>
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<tr>
<td>Devanagari</td>
<td>Hindi</td>
<td>उदाहरण.परीक्षा</td>
<td>xn--p1b6ci4b4b3a</td>
<td>xn--11b5bs3a9aj6g</td>
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<tr>
<td>Greek</td>
<td>Greek</td>
<td>παράδειγμα.δοκιμή</td>
<td>xn--hxaibheg2az3al</td>
<td>xn--jxalpdlp</td>
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<tr>
<td>Hangul</td>
<td>Korean</td>
<td>실레.테스트</td>
<td>xn--9n2bp8q</td>
<td>xn--9t4b11yi5a</td>
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<tr>
<td>Hebrew</td>
<td>Yiddish</td>
<td>בימשך.יעטס</td>
<td>xn--f5bk5d8ap9b8a8d</td>
<td>xn--deba0ad</td>
</tr>
<tr>
<td>Kanji Hirigana, and Katakana</td>
<td>Japanese</td>
<td>例え.テスト</td>
<td>xn--r8jz45g</td>
<td>xn--zckzah</td>
</tr>
<tr>
<td>Tamil</td>
<td>Tamil</td>
<td>தமிழ்மொழியாகத்து</td>
<td>xn--zkc6cc5bi7f6e</td>
<td>xn--hlcj6aya9esc7a</td>
</tr>
</tbody>
</table>
IPv6 support

- Ability to serve queries over IPv6
  - 4 servers are already doing this

- Introduction of AAAA records
  - Hints file
  - Root zone
  - root-servers.net zone

- Significant change
  - AAAA in the hints file
  - Priming response exceeds 512 byte
  - Perceived service degradation in IPv6 world

- SSAC/RSAC recommendation SAC018
Signing the root zone

• Major barriers for implementing DNSSEC
  - Zone-file enumeration, the impact on resources of fully signing a large zone
  - Support for DNSSEC in application software
  - Single trust anchor

• RIPE 54:
  - The lack of progress towards the deployment of DNSSEC is undermining the stability and security of the internet. Operators and implementers are compelled to adopt adhoc, short-term solutions which will create long-term problems. The RIPE community urges ICANN to speed up and improve its efforts to get the root zone signed.

• Nominet position paper
  - http://www.nominet.org.uk/news/latest/?contentId=4549

• IANA is preparing the DNSSEC-ready infrastructure
  - Targeting arpa, in-addr.arpa, uri.arpa, urn.arpa, iris.arpa, ip6.arpa, int
  - https://ns.iana.org/dnssec/status.html
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)
  - 12 local anycast nodes
  - 5 global nodes
K-root Statistics
More Information

- Root operators & servers
  - http://www.root-servers.org
  - http://[a-m].root-servers.org
    - http://dnsmon.ripe.net
- Root server analysis
- Anycasting
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
Questions?