Operation of the Root Name Servers

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The DNS system

• The Domain Name System (DNS) is a hierarchical lookup system.
• It is used before any actual Internet transaction (like web page transfer).
• The root servers are only used as the entry point to the system.
• "Caching" makes clients remember answers, and avoid contacting the root servers whenever possible.
  – Hence the number of lookups is comparatively small.
What we do

• Copy a very small database, the content of which is currently decided by IANA and US Dept. of Commerce.
• Put that database in our servers.
• Make the data available to all Internet users.
• Cooperate among ourselves and with others to maintain the level of service demanded by the modern Internet.

What we do not do

• Interfere with the content of the database.
  – We run the printing presses, we don't write the book.
• Make policy decisions
  – Who runs TLDs, or which domains are in them
  – What systems TLDs use, or how they are connected to the Internet
What are we?

- A highly focused group of professional server operators, with very long experience in DNS and network operations.
- Diversity is stability:
  - Types of organizations
  - Professional experiences
  - Hardware
  - Software

What are we?

- Work stems from a common agreement about the technical basis:
  - The DNS information is not maintained by us.
  - Everyone on the Internet should have equal access to the data.
  - The entire root system should be as stable and responsive as possible.
Where we are

- We are a close-knit technical group.
- High level of trust among operators.
- Root operators show up at many technical meetings, including,
  - IETF, NANOG, RIPE, APNIC, APRICOT, ARIN, AFNOG
  - ... and often at the ICANN meetings.

Who we are

- Not "one group", 12 distinct operators.
- Close operational and technical cooperation
- No formal organization.
  - Recently agreed to explore possibilities of forming a common body.
- Participate in RSSAC as advisory body to ICANN
• Internationalized Domain Names (IDN):
  – Not specifically a root problem. We publish what we get.
• DNSSEC: technical issues with the current version of the specification.
  – We contribute to the IETF work to develop the standard. Has come a long way.
  – We work with the RSSAC to develop procedures.

• IPv6
  – We work with the IETF to resolve the technical issues.
• ENUM
  – Has no relation whatsoever to root servers.
Security

• Physically protected
• Tested operational procedures
• Experienced, professional, trusted staff.
• Major operational threat is DDoS.
  Defense:
  – Anycast
  – Overprovisioning
  – Work with law enforcement and government

Anycast

• Setting up identical copies of existing servers.
  – Same IP address.
  – Exactly the same data.
• Works like transmitter antennas for radio.
  – You will talk to (listen to) the nearest one.
  – Standard Internet routing will bring the queries to the nearest server.
  – Provides better service to more users.
  – Mitigates impact of denial of service attacks.
Communication Procedures

• Normal operations:
  – Regular meetings, three times per year, at IETF.
  – E-mail: internal lists.
  – Normal telephone.
• Special situations:
  – Encrypted e-mail.
  – Private telephone numbers.
  – Conference telephone bridges.

Avoiding Common Misconceptions

• Not all internet traffic goes through a root server.
• Not every DNS query is handled by a root server.
• Root servers are not managed by volunteers as a hobby.
  – Professionally managed and well funded.
• No single organization (neither commercial nor governmental) controls the entire system.
Avoiding Common Misconceptions

- The "A" server is not special.
- We don't administrate the zone content.
  - We publish the IANA-approved data.
- Not 13 machines, but 13 installations providing service! (Number increasing with anycast.)

More information

http://www.root-servers.org/

This presentation will be made available there.