

# 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

## Issues?

- 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.

## Issues?

- IPv6
  - We work with the IETF to resolve the technical issues.
- ENUM
  - Has no relation what so ever 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.