Unique Strengths for Extraordinary Challenges
Why EP.NET?

- Operates “B.ROOT-SERVER.NET” in conjunction w/ USC/ISI
- Manages and promotes global Internet exchange creation by local constituencies since 1994
- Is active in developing Best Practices for DNS operations in conjunction with Government, Industry, and concerned Individuals who manage portions of the DNS hierarchy.
The drivers – internal/external

- Converged Networks – Technology/Policy
- actor interactions
  - Each has invaluable / required assets
  - re-use is key – “rebuilding the airplane in flight”
- Shifting cost/revenue streams – who pays?
- Technology Innovations
  - Advances do not wait. Lightweight, rapid response is a key enabler.

Will we be Overtaken by Events?
What exists today.

- There are rules and processes in place now. These procedures should be well understood before suggesting changes.
- The nature of Internet Protocols as designed and deployed, allow communities of interest to emerge without formal review or license.
- My impression: any governance which may exist, does so with the consent of the governed.
Ways forward?

- Focus on Core competences
- Recognize that all participants are bound by existing rules/laws … are they sufficient?
- Cross-discipline education is key…
A brief review of Root Server operations.

- Presented in the ICANN Rio de Janeiro GAC meeting.
- Additional material from Andrei Robachevsky, presented to APNIC17/APRICOT in KL
Operators of the Root Name Servers reviewing this material

- Lars-Johan Liman, Autonomica AB. “I”
  - John Crain, ICANN, “L”
- Suzanne Woolf, Internet Systems Consortium, “F”
  - Bill Manning, USC/EP.NET, “B”
- Axel Pawlik, Rob Blokzijl, RIPEncc, “K”
- Scott Hollenbeck, Verisign, “A”/”J”
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 the 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 what 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, geographically diverse
  - USA, Netherlands, Sweden, Japan
- High level of trust among operators.
- Root operators show up at many technical meetings and some policy meetings
Who we are

- Not “one group”, 12 distinct organizations.
- Stable, consistent organizational grounding.
- Close operational and technical cooperation.
  - Sometimes in spite of organizational divergence.
- No formal organization for sever operations.
- Participate in RSSAC as advisory body to ICANN
The List

- **Academic/Public Benefit**
  - ISI/EP.NET – B
  - University of Maryland – D
  - Internet Systems Consortium – F
  - RIPE NCC – K
  - ICANN – L
  - WIDE - M

- **Commercial/Private Sector**
  - Verisign – A, J
  - Cogent – C
  - Autonomica – I

- **Governmental**
  - US-NASA – E
  - US-DISA – G
  - US-ARMY – H
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.
  - We work with RSSAC and others to develop procedures.
Issues?

- IPv6
  - We worked with IETF on the technical issues
  - Recommendations to RSSAC/ICANN submitted.

- 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
- Defenses:
  - Diversity
  - Anycast
  - Overprovisioning
  - Work with law enforcement and government.
Evolution Architecture

- Enhanced architecture (2002)
  - Hidden distribution master
  - All ‘letter” servers are equal
  - Authenticated transactions between the servers (TSIG)
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.
Location of 13 DNS Root Servers (1996-2001)
Location of 13 DNS Root Servers (2002-2003)
Communications Procedures

- Normal operations:
  - regular meetings, three times a year, at IETF.
  - E-mail: internal lists.
  - Normal telephone.

- Special situations:
  - Encrypted e-mail.
  - Private telephone numbers.
  - Conference telephone bridges.
  - Other means as appropriate
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 or 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!
  - 36 sites deployed, more planned
  - More sites outside the US than in
  - Planned/Tested/Deployed in less than 24 months
End of combined material…
As an individual and operator… my role is to:

- Empower and enable a high-quality Internet experience.
- Robustness and availability are primary metrics
- Data Integrity is paramount
- All others are secondary.
Fin

Questions?

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