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11 April 2005

## Cluster One B Assessment Report

### 1. Issue: Root Zone File and Root Server Management

#### 2. Institutions

- The **Internet Engineering Task Force (IETF)** is responsible for standard setting with regard to the format of the zone file.
- The **Internet Corporation for Assigned Names and Numbers (ICANN)** is responsible for the initial delegation for new Top Level Domains and for receiving requests for delegation/re-delegation for TLDs.
- The **Internet Assigned Numbers Authority (IANA)**, currently under ICANN, is responsible for maintenance of accurate records of the root zone file information as well as of detailed contact information with regard to the TLD manager, furthermore it is involved in the modification, addition or deletion to the root zone file without any authorizing role.
- The **National Telecommunication and Information Administration (NTIA)** of the US Department of Commerce (DoC) is responsible for the authorization of the publication of modifications, additions or deletions to the root-zone file or associated information that constitute delegation or re-delegation of top-level domains in the Distribution Master (sometimes called the Hidden Primary or Hidden Server) of the authoritative Root Name Server System;
- **VeriSign Registry** currently serves in the role as root-zone file editor and is responsible for the Management of the Distribution Master and the A Root Server of the authoritative Root Server System
- The **Root Server System Advisory Committee (RSSAC)**, composed of the managers of the 13 root servers and additional experts, is a body which gives the ICANN Board of Directors advise with regard to root server problems.
- Furthermore, there are more than **90 entities**, operating mirrored root servers linked via Anycast (with more planned to be brought online).

#### 3. Relationship to the Internet

The Root Zone defines the apex or top of the Domain Name System (DNS) naming hierarchy. It is often referred to as the ".dot." The authoritative servers for this zone form the publication method of the root zone file and together these form the root server system. This system is essential for the functioning of the DNS and, to the extent that the DNS is mandatory for the security and stability of the Internet, this system

carries the same standards of critical care. Root servers host zone files of about 15 generic (gTLDs) and 243 country code (ccTLDs) Top Level Domains (TLDs). Zone files contain the information needed to resolve domain names to Internet Protocol (IP) numbers. Zone files contain domain names, their associated name server names, and the IP addresses for those name servers.

The root zone file describes the delegations of the top level domains and the associated records necessitated by the DNS protocol to implement those delegations. This file is currently created by IANA and distributed by Verisign to all root servers from the primary a.rootserver.net. Change control of this file is held by the IANA with changes, typically modifications of the name servers, for top level domains.

When a user wants to send an e-mail or to visit a website the application sends a query to a domain name server, which may be operated by the user's ISP or some other entity. If the domain name server does not have the answer to the query, it directs the user's application to refer to the root server for the domain name resolution. As following steps, the user's application interactively sends the query to the root server and then to the relevant name server of the wanted TLD.

The authoritative zone file data is made available to the 90-plus authoritative servers via a distribution system on a twice-daily basis. Each of the authoritative servers picks up the updated zone file from the distribution system using cryptographic techniques to ensure that the data is coming from the correct source. Thus the authoritative servers have identical databases and all are enabled to answer to queries coming from any TLD name server.

The editing of existing zone files, the creation of new zone files and the management of root zone file and root name server follows a process, described in the section below.

#### **4. Governance mechanisms**

The management of root zone files and the operation of root name servers can be subdivided in several functions, executed by different organizations, as described below.

##### **1. STANDARD SETTING FUNCTION:**

That is to define the criteria and the process:

- a. For the creation of new TLDs
- b. For the editing of existing TLDs
- c. For the management of the root zone file, including modifications, additions or deletions
- d. For the operation of Root Servers

The technical standard setting function is done by the IETF via the adoption of RFCs. Basic standards are, inter alia, RFC 1034 and RFC 1035, however IETF does not have responsibility for defining criteria and processes for these operational issues. ICANN defines standards for the creation of new TLDs. Standards for the management of the root zone file are also subject of a contractual relationship between ICANN and the DoC.

##### **2. INITIATION FUNCTION**

That is to make proposals for the creation of new TLDs. Proposals can be submitted by any governmental or non-governmental unit but have to follow the criteria and procedures defined in the relevant RFCs. With regard to new gTLDs, this is done on the basis of a Call for Proposals (CFP), published by ICANN after a decision by the ICANN Board of Directors, based on recommendations coming from the GNSO Council.

##### **3. SELECTION FUNCTION:**

That is to decide, whether a proposed TLD should be established and to whom the initial delegation should be made. This is done by ICANN via majority voting of the Board of Directors. There are no defined technical criteria, and no defined processes, under which the ICANN Board approves or rejects a proposed TLD. Some feel that experience to date has indicated more of an *ad hoc* response from ICANN to pressure groups than a proper and well thought through governance response.

4. EDITING FUNCTION:

That is to specify the relevant string of numbers that represent the zone file of the relevant TLD. This is done by the manager of a ccTLD or gTLD, according to his/her special contractual arrangements (where they exist) and in line with the relevant RFCs.

5. IANA FUNCTION:

That is the maintenance of accurate records of root zone file information, including detailed contact information, as well as the management of request for changes of TLD zone files according to the applicable technical and other requirements so that changes are made in a properly authenticated and timely manner, while ensuring the continued security and stability of the root zone. Relevant reports will be sent to the US DoC for approval, except in the case of purely technical information such as the change of a telephone number.

The majority of the TLD Registries (mainly ccTLD Registries) do not have a contractual arrangement with IANA defining the steps, procedures and criteria (number of days etc.) for implementation of the IANA function. This can create delays or other problems, for example, if IANA postpones execution of its function, the concerned TLD Registry has no rights and remains dependent on IANA's execution.

6. AUTHORITY FUNCTION:

The Department of Commerce (DoC) of the US Government (US DoC) authorizes the publication of proposed changes in root zone files and associated information, including modifications, additions and deletions to the root zone file or associated information that constitute delegation or re-delegation of top level domains. Actions by the US DoC on delegation and re-delegation requests are made after reviewing reports submitted by IANA. The authorization is done by the National Telecommunication and Information Authority (NTIA) of the US DoC, which verifies, based on a contract with IANA, whether IANA has followed the proper process and decides, whether the approved Zone File should be introduced into the database of the Distribution Master.

7. PUBLICATION FUNCTION:

That is to publish the edited root zone file in the Distribution Master, according to the authorization by the NTIA/DoC. This is done by VeriSign Registry, which acts as the "root zone editor".

8. MIRROR FUNCTION:

The authoritative data, as approved by the IANA, is made available to the Distribution System by the "root zone editor" on a twice daily basis. The 90-plus authoritative servers are notified, using DNS protocols, that the update is available and they download it using cryptographic techniques to ensure that the data comes from the authoritative source. There are no contractual obligations for the operators of the Root Servers to follow the mirror process of the master copy from the Distribution Master.

Some of the functions are purely technical while other functions include a public policy dimension. While each function has its special meaning, the main technical functions in the day to day operations are the “Editing Function” (done by the TLD Registry) and the “Publication Function” (done by the Distribution system operated by VeriSign Registry) with the “IANA Function” and the “Authorization Function” in between.

The relationship can be compared with the relationship between an “author”, a “corrector”, a “publisher” and a “printing office”. The *author* has the responsibility for the content, the *printing office* is responsible that the right content comes to the user. The IANA function includes next to “book-keeping” also the role of a “*corrector*” who has to check text and eliminating spelling mistakes. The critical point, from a public policy perspective, is the “*publisher*”, that is the individual/group that decides whether the publication should be published at all (or not). An additional role could play an external “*auditor*” who checks *post festum*, whether the involved parties have followed the agreed procedures.

The whole system is managed on the basis of numerous bilateral and multilateral Cooperative Agreements, Memorandums of Understanding (MoU), Sponsorship Agreements, Contracts, Statements of Work (SoW) and voluntary arrangements.

The basic treaty contractual arrangements are the following ones:

- the **Memorandum of Understanding between the DoC and ICANN from November 1998**, which has been six times amended and will terminate, according to the announcement of both parties, in October 2006. This MoU regulates the basic relationship between ICANN and the DoC and defines the task ICANN has to fulfil to become independent.
- the **Contract Between ICANN and the United States Government for Performance of the IANA Function from February, 9, 2000**, which has been modified and amended several times (last version from March, 17, 2003) and will probably terminate in October 2006. This Contract regulates the special elements of the IANA service.
- The **Cooperative Research and Development Agreement (CRADA) between ICANN and US Department of Commerce of 1999**, which was amended twice and has no termination clause. This agreement regulates the special treatment of proprietary information and the so called “CRADA Data”. CRADA has no fixed date for a termination. Article 11.11 says, that “it is mutually recognized that the duration of this project cannot be rigidly defined in advance, and that the contemplated time periods for various phases of the SoW (Statement of Work) are only good faith guidelines subject to adjustment by mutual agreement to fit circumstances as the SoW proceeds”. Article 8, para 2. of CRADA gives the DoC the right to terminate this Agreement immediately if direct or indirect control of the Collaborator (ICANN): “is transferred to a foreign company or government; or, if the Collaborator is already controlled by a foreign company or government, if that control is transferred to another foreign company or government.”
- A **Cooperative Contract between DoC and VeriSign Inc.**, which goes back to an agreement between the US National Science Foundation (NSF) and Network Solutions Inc. from July 1992 which was amended several times and is now part of the contractual relationship between the DoC and VeriSign Inc.
- Ten **Sponsorship Agreements between Registries of generic Top level Domains and ICANN** (1999 ff.)
- Six **sponsorship agreements with ccTLD managers** (2000 ff.)
- Six **MoU with ccTLD Managers** (2002 ff.)

- **A Memorandum of Understanding between ICANN and IETF about the Technical Work of IANA from March, 1, 2000.**
- **A Voluntary Agreement among the 13 Operators of the Root Name Servers** on the mirror function of the distribution master

More than 20 years of Internet practice have shown that the bottom up process, on which this technical administration mechanism is based, has worked and guaranteed the functioning, stability and security of the Internet to date. While more end users create more traffic on the system as a whole, the existing system has demonstrated that it can accommodate even exceptional growth rates.

However, there are some concerns in the current situation that need to be addressed:

- a. The number of root servers cannot presently be increased to more than thirteen due to protocol limitations. No effort has been made to remove this limitation.
- b. The operators of root servers are not involved in the policy making and data modifications and have no clearly defined responsibilities and accountability, especially in relation to the stability and secure functioning of the Internet. Operators should be contracted to publish a root zone file that has been defined by the proper policy making process and bound not to alter it.
- c. The appropriate evolution of the architecture to meet end user requirements needs to be addressed.

There has also been discussion of the possible need to address other issues:

- d. That no single organization recognized by the global community controls the whole system. However, some consider this to be a strength of the current system and reflects the size and complexity of the Internet.
- e. The desirability of ensuring that editing the root zone file is propagated to all 13 servers and their mirrors. However, some consider that this would be a dangerous step and could lead to the implementation of alternative root servers, which many commentators think would be a development capable of destroying the value of the Internet. It has also been commented that there are examples of distributed administration, as in the case of telephone numbers, where this has not eventuated.

The root server system (DNS protocol and root zone file) represents an operational aspect of the Internet network and is therefore important to all countries. Internet Governance is critical to future development of the root server system. It should be addressed in a way that not only attempts to improve the current situation without doing harm to the functioning of the DNS system or its operation, but also considers re-engineering of the concept, creating new procedures, and re-organizing its technical architecture and management in a way that is responsive to the requirements of all users, including countries, the private sector and civil society.

## 5. Evaluation against WSIS criteria

**5.1 Process Criteria** *To what extent to the institution's Internet-related governance mechanisms meet the following criteria, given what could be reasonably expected in light of the governance mechanism used?*

- *Multilateral*
- *Transparent*
- *Democratic*
- *Full involvement of governments, the private sector, civil society and international organizations*

The main actors in this field of the Management/Governance of Root Zone File and Root Name Servers are ICANN, IANA, the NTIA/DoC, VeriSign Inc. and the Root Server Operators themselves.

The process of consultation is rather transparent and involves at different stages different stakeholders to a different degree. . However; the process of decision making is not transparent.

ICANN is mainly accountable to the US DoC and other governments have no direct authority in the decision making of ICANN even though there are some member governments in the Governmental Advisory Committee (GAC).

One problem of particular concern is the procedure of the authorization of the publication of modifications, additions or deletions to the root zone file or associated information that constitute delegation or re-delegation of top level domains. This decision making procedure ("approval" of IANA recommendations by the DoC) is neither multilateral nor democratic and does not involve other governments, private sector, civil society and international organization. How this function should and/or could be internationalized to meet the global community's needs remains a subject for discussion.

**5.2 Role and responsibility criteria** *(To what extent do the institution's Internet-related governance mechanisms enable the different stakeholder groups to fulfill their roles and responsibilities as defined by WSIS? To what extent to the different stakeholder groups have the capacity to fulfill their roles and responsibilities?)*

- Governments
- Private Sector
- Civil society
- Intergovernmental organizations
- Other international organizations

The specific nature of the root zone file management and the operation of root name server calls for a specific evaluation whether the acting institutions are fulfilling their mandate and guarantee the proper functioning of the Internet and its stability and security.

The long record of effective technical management can be taken as a proof, that the involved actors, regardless of their special legal status, rights and responsibilities have demonstrated their capacity to reasonably fulfill the role and to share the responsibilities which are needed to secure the proper functioning of the Internet and in particular the DNS.

However, the existing system reduces the governmental participation in the authorization of modifications, additions or deletions to one single government which has no contractual relationship with other governments with regard to the execution of this function. The system is mainly based on trust, not

on a treaty. Given that the internet is a very valuable resource for sustainable development, (The investment and sovereignty of countries should not be based on trust alone.

Governments and intergovernmental organizations can channel concerns with regard to the root zone file and root name server management via the Governmental Advisory Committee (GAC), but the GAC has no special mandate in this area, is not a legal decision making entity under international law and has a limited membership.

Private Sector members are partly involved as root server operators and service providers. There is no involvement of civil society organizations.

**5.3 Outcome Criteria** *(How effectively to the institution's Internet-related governance mechanisms contribute to achievement of the following goals?)*

- Equitable distribution of resources
- Access for all
- Stable and secure functioning
- Multilingualism

The root server system is one of the key enablers which allow a stable and secure functioning of the internet. Although to date access by end users was generally non-discriminatory, there should be clear governance rules to ensure that this will continue without exception in the future.

While the 13 root servers of the authoritative root, for historical reason, are geographically distributed in an unbalanced way (ten in the USA, two in Europe and one in Asia), it is held that this geographical distribution has had no impact on the functioning of the system globally. The recent introduction of the anycast system with more than 90 new root servers, linked to one of the 13 root servers of the authoritative root, has enabled a distribution of root server capacities in other areas of the globe.

With the introduction of IDNs, the root server system also supports multilingualism to a limited extent. IDNs provides only "partial" multilingualism requiring a mix of Latin and non Latin characters.

There is some concern that the longer term stability of the Internet may be uncertain because of the pending expiry of the agreement between ICANN and the US Government. It has been noted that this also provides an opportunity for constructive developments.

**6. Coordination: How effectively is governance of this issue coordinated with governance of other Internet-related issues?**

There is no direct coordination mechanism between the management of the root zone file and root name server and other issues related to the broader Internet Governance agenda. Coordination is achieved via the ICANN Board of Directors, where the Root Server System Advisory Committee (RSSAC) is represented by a Liaison in the form of a Non-Voting Director. This Liaison guarantees also the coordination with the governance mechanisms established for the management of Domain Names, IP Addresses and Internet Protocols.

There are no mechanisms for specific coordination with governance mechanisms for Internet applications on higher levels. The key issue is to guarantee that these applications can function properly in a stable and secure environment.

## **7. Overall assessment: What are the points that most need improvement in order to meet the WSIS criteria?**

Proposals for improvement need to consider that in general, the existing system has so far functioned properly from the technical point of view for more than two decades and that adjustments, where needed, both for technical and political reasons, have to be made in a proper and adequate way related to the functioning, stability, security and further development of the Internet.

Based on this general evaluation, improvements should be made in the following directions:

- the role and accountability of interested parties in authorizing assignments modifications, additions or deletions to the root zone file or associated information that constitute delegation or re-delegation of top level domains which has to include a clear definition;
- where public policy aspects are involved in modifications, additions or deletions to the root zone file and how governments, based on the principles of international law, as enshrined in the Charter of the United Nations, should be reasonably involved; and
- when these modifications, additions or deletions are of a pure technical nature which do not need necessarily an involvement of governments; and
- which institutional arrangements are needed to guarantee a stable and secure functioning of the Root System;
- the responsibilities and relationships between all institutions involved in the management of the root servers system need to be defined and made binding;
- a requirements analysis prior to possible restructuring of the root server architecture;
- requirements for intergovernmental involvement in the future development and management of the root server architecture needs to be discussed, reviewed and defined;
- the responsibility for the content of the database needs to be reviewed in view of WSIS governance criteria;
- further privatization of the day to day operation of the facilitation and coordination of the root zone of the DNS within 24/7 coverage, which includes receiving requests for and making routine updates of relevant TLD information;
- formal stabilization of the Voluntary Agreement among the Root Server Operators, while noting that this could be a complex task.