Draft WGIG Issue Paper on the Administration of Internet Names and IP Addresses

This paper is a 'draft working paper' reflecting the preliminary findings of the drafting team. It has been subject to review by all WGIG members, but it does not necessarily present a consensus position nor does it contain agreed language accepted by every member. The purpose of this draft is to provide a basis for the ongoing work of the group. It is therefore not to be seen as a chapter of the final WGIG report, but rather as raw material that will be used when drafting the report. This draft working paper has been published on the WGIG website for public comment, so it will evolve, taking into account input from governments and stakeholders.

Overview

IP addresses and Internet domain names constitute together the primary addressing system of the Internet.[1] While IP addresses are mandatory to any Internet operation in order to enable computers and devices to communicate, domain names simplify communication and accessibility of the Internet for all users.

Originally, the Internet Assigned Numbers Authority (IANA), chartered by the Internet Engineering Task Force (IETF) and the Internet Society (ISOC), was "the overall authority for the IP Addresses, the Domain Names, and many other parameters, used in the Internet".[2] The execution of the IANA functions, otherwise known as the technical management of the unique identifiers of the Internet, comes under the responsibilities of the Internet Corporation for Assigned Names and Numbers (ICANN) in co-operation with the IETF, ISOC, the RIRs, and the gTLD and ccTLD registry operators and registrars. The respective roles of these co-operating organizations have been the result of an evolution over 35 years of the Internet's development.[3]

A description of the domain name system can be found in many of the IETF Request for Comments (RFC)[4], such as RFC 1591, RFC 1034 and RFC 1035[5], and the description of the architecture for IP Address Allocation can be found in RFC 1518.[6] While overall guidelines for

[1] One could argue that administration of IP addresses and administration of domain names should be described separately, and some of the WGIG members have raised this as an issue. However, this paper follows the structure set out by the WGIG during its meeting in Geneva, 23-25 November 2004.
[2] RFC 1591, Domain Name System Structure and Delegation, p 1, Jon Postel, March 1994
[3] It is important to note that the administration of the Internet's names and addresses is much more than the mere allocation of numbers or the assignment of names. It involves integrating technological developments, relevant engineering standards, and related technical policies, as well as the administration thereof.
[4] A RFC, or Request for Comments, is a series of documents about the Internet dating from 1969. It is IETF (Internet Engineering Task Force), or more precisely IESG (Internet Engineering Steering Group) who decides whether a document can become a RFC after submission. See http://www.ietf.org/rfc/rfc2026.txt, saying: The Internet Standards process is an activity of the Internet Society that is organized and managed on behalf of the Internet community by the Internet Architecture Board (IAB) and the Internet Engineering Steering Group (IESG).
[5] RFC 1591, Domain Name System Structure and Delegation, Jon Postel, March 1994, RFC 1034, Domain Names – Concepts and Facilities, P. Mockapetris, November 1987, RFC 1035, Domain Names – Implementation and Specification, P. Mockapetris, November 1987
[6] RFC 1518, An Architecture for IP Address Allocation with CIDR, Y. Rekhter et al., September 1993.

the allocation of IP addresses with a largely historical background are set out in RFC 2050 even though it is has been replaced by more refined policies.

Background

The Internet addressing system consists on one hand of Internet names, also referred to as domain names, and on the other hand of IP addresses. It is the Domain Name System (DNS) that ensures the universal resolvability of the two parts of the addressing system.

The basic objective of the Internet's DNS is to ensure universal resolvability so that all users of the Internet can find all valid addresses in an unambiguous way. This is achieved, first, by making sure that every computer on the Internet has a unique numerical address called its "IP address" (Internet Protocol address). In this way, around 1 billion Internet users world-wide have access to information and knowledge available on computers distributed over some 200,000 public and (mostly) private networks around the globe.[7]

The DNS helps users find their way around the Internet. As stated, every computer on the Internet has a unique numerical address called its "IP address" (Internet Protocol address). An example IP address is 207.142.131.236, which is an IP address under IPv4. IPv6 numbers have and even more complex structure. Because IP addresses are hard to remember, the DNS allows a more mnemonic, familiar string of letters to be used instead, which is the domain name such as un.org. Domain names also provide a persistent address for some service when it is necessary to move to a different server, which would have a different IP address.

Translating the name into the IP address is called "resolving the domain name". The goal of the DNS is for any user to be able to reach a unique and specific host IP address by entering its domain name. Domain names are also used for reaching e-mail addresses and for other Internet applications.

The data in the DNS is stored in hierarchical and widely distributed sets of machines known as "name servers". These machines are in turn queried by "resolvers", which are often part of the operating system or software on the user's computer. The top of the hierarchy is known as the "root" and the set of internationally distributed root servers mirror the root and provide redundancy and robustness to the domain name system. These servers contain information enabling resolvers to find details of the level below, known as the Top Level Domains (TLD). The name servers of these, often referred to as "TLD-servers", in turn contain data for the level below.

Top level domain names are subdivided into two categories: Country Code TLDs (ccTLDs), such as .no, .br and .jp, are associated to territories[8], while generic TLDs (gTLDs), such as .org, .com

[7] Internet names have evolved from a relatively obscure technical naming function restricted to an experimental network (the early Internet) into a well-known and widely used method for finding and conveying information in the modern Information Society. Registration of domain names has grown rapidly and in 2005, there are some 55 million second level domains. It is important to note that there are likely a great many more domain names at lower levels, since the hierarchy allows a second level domain name user to make further hierarchical assignments without registration in name servers other than his/her own at the third or fourth level.

[8] These are assigned according to a two-letter code based on the table determined by the International Standardisation Organisation in the so-called ISO 3166-1 standard 'Codes for the Representation of Names

and .biz, are meant to be used globally[9]. The gTLDs can then be further divided into Unsponsored TLDs (uTLDs), which are meant for use by any type of end user, and Sponsored TLDs (sTLDs), which are associated to a sponsoring entity representing a well defined community, and in which domain names may be only registered by members of that community[10].

As for the assignment of IP addresses, these are assigned by the four regional Internet registries[11] based on demonstrated needs. Earlier, the assignments were based on the following three classes:

- Class A - supporting 16 million hosts on each of 126 networks
- Class B - supporting 65,000 hosts on each of 16,000 networks
- Class C - supporting 254 hosts on each of 2 million networks

Because of the fear of IP-addresses running out, Classless Interdomain Routing (CIDR) was specified in 1993.[12] In the past a considerable amount of IP-addresses was wasted when assigning a Class B address to a network that only required one thousand hosts. With CIDR this waste is avoided and a dynamic system of matching the demands of IP addresses is used. As a result, IPv4 addresses continue to be available still for many years, and are assigned to ISPs (sometimes named as LIRs) by the RIRs, and RIRs by IANA.

As the IP addresses under IPv4 have been assigned by the time they have been requested for the companies which demanded them,[13] the need for new IP addresses become apparent due to the growth of the Internet. In December 1995 a new version of the Internet Protocol (IPv6)[14] was published and further developed, see RFC 2460.[15] This specification was created among many other features to increase the number of global IP-addresses with IPv6 increasing the IP address size from 32 bits to 128 bits. As a consequence, IPv6 supports addresses which are four times the number of bits as IPv4 addresses, namely increasing the amount from around $4{,}3*10^9$ IP addresses to $3{,}4*10^{38}$ IP addresses, or more precisely 340,282,366,920,938,463,463,374,607,431,768,211,456 IP addresses under IPv6. The result is that IP addresses under IPv6 are practically inexhaustible.[16] In theory IPv6 gives approximately 665,570,793,348,866,943,898,599 IP addresses per square meter of the surface of the planet Earth (assuming the earth surface is 511,263,971,197,990 square meters).[17] In addition to solving the

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of Countries and Their Subdivisions". ICANN does not determine whether a geographical entity has a right to be assigned a ccTLD, but resorts to the decisions taken by ISO for inclusion in the ISO 3166 list.

[9] For historical reasons, some gTLDs (.edu, .gov, .mil) are still reserved to United States entities only.

[10] For example, the .aero sTLD, introduced in 2001, is associated to the air transport industry, and is sponsored by SITA.

[11] APNIC (Asia Pacific Network Information Centre, since 1996), RIPE NCC (Réseaux IP Européens Network Coordination Centre, since 1992), LACNIC (Latin American and Caribbean Internet Addresses Registry, since 2002), ARIN (The American Registry for Internet Numbers, since 1997).

[12] RFC 1518, An Achitecture for IP Address Allocation with CIDR, Y. Rekhter et al., September 1993.

[13] This concept of assignment has also been referred to as: "first come, first get and distribution demand". It is to be noted that within the concept of "distribution demand", no RIR or LIR has so far been refused IP addresses if a demand has been justified.

[14] RFC 1883, Internet Protocol, Version 6 (IPv6), Specification, S. Deering and R. Hinden, Desember 1995

[15] RFC 2460, Internet Protocol, Version 6 (IPv6), Specification, S. Deering and R. Hinden, Desember 1998

[16] However, one could argue that the inexhaustibility of IPv6 addresses will depend on the distribution mechanisms, especially since the amount of IPv4 addresses seemed to be a lot in the beginning. On the other hand, the conversion from IPv4 to IPv6 shows that the marked, computer engineers and Internet actor became quickly aware of the possible lack of IPv4 addresses and introduced IPv6 long before any governments became aware of the possible lack. In the future a new upgrade may be an alternative if IPv6 addresses are used up.

[17] http://playground.sun.com/pub/ipng/html/INET-IPng-Paper.html

problem of the limited number of IP addresses, IPv6 also adds many improvements to IPv4 in areas such as security and network auto configuration.[18] IPv6 is expected to gradually replace IPv4, with the two coexisting for a number of years during a transition period.

The allocation of primary IP Address blocks and Top Level Domains is one of the central tasks of the Internet. Today, the oversight of this task lies within the responsibilities of ICANN, who maintains the IANA functions and operates according to bottom-up developed set of ICANN bylaws.[19] At the same time, the allocation of individual domain names is carried out by each individual TLD registry, and the allocation of IP addresses is made by Local Internet Registries (LIRs), such as ISPs.

The administration of Internet names and IP addresses can be described as in Figure 1: *Administration of Internet Names and IP Addresses and Root Server System*. This describes the different actors involved in the administration, from the MoU between the US Department of Commerce and ICANN regarding the IANA functions, down to end users. This paper does not address the administration of the Root Server System. However, it is vital to understand the interaction between the administration of Internet Names and IP Addresses on one hand, and the Administration of the Root Server System on the other hand. This interaction is important both on an end user level and on an administration level.

While the political implications of the administration of the DNS are relevant, so are also the consequences of DNS policies on the Internet industry – especially on domain name registrars/resellers and ISPs – and on the accessibility of the Internet to end users. While these policies are done on a national basis for ccTLDs, they are instead done on a global basis by ICANN for what regards gTLDs, which naturally do not belong to any national authority, and which now account for about 60% of all registered domain names.[20]
On the Internet, domain names determine the visibility and accessibility of a web site or any other service; by removing a domain name, all services associated to it are suddenly made unreachable.[21] As such, policies concerning the registration, transfer, cancellation and resale of domain names, the identification or anonymity of registrants, the resolution of disputes, and the preservation of the stability of the DNS, have significant implications on end users, involving rights such as free speech, freedom of association, and privacy. Such policies are also of strong interest to commercial entities, for example for matters related to the protection of intellectual and industrial rights.

The administration of the DNS also includes policies related to the prompt and effective introduction of internationalized domain names, which is of foremost importance for most Internet communities outside the Anglo-Saxon world. One of the reasons why ICANN was initially created was to introduce competition in the domain name market for gTLDs. ICANN has partially met this mission by introducing the registry-registrar model, which now allows many

[18] One could also argue that IPv6 introduced Quality of Service (QoS), or at least the possibility of QoS.
[19] http://www.icann.org/general/archive-bylaws/bylaws-19apr04.htm
[20] Source: ICANN data at February 1st, 2003. The important of gTLD administration also derives by the fact that some historical gTLDs have gained huge market acceptance and are *de facto* the sole resource for domain names to be used for specific purposes, such as global commerce (.com) or network services (.net).
[21] Even if services were still technically accessible, for example by using the IP address associated with the server, end users would not be able to know of this possibility and the popularity and links to the services would have to be re-built from zero.

registrars to compete for gTLD registrations by end users, and by approving seven new gTLDs;[22] however, a final mechanism for the regular addition of new gTLDs has still to be created.[23]

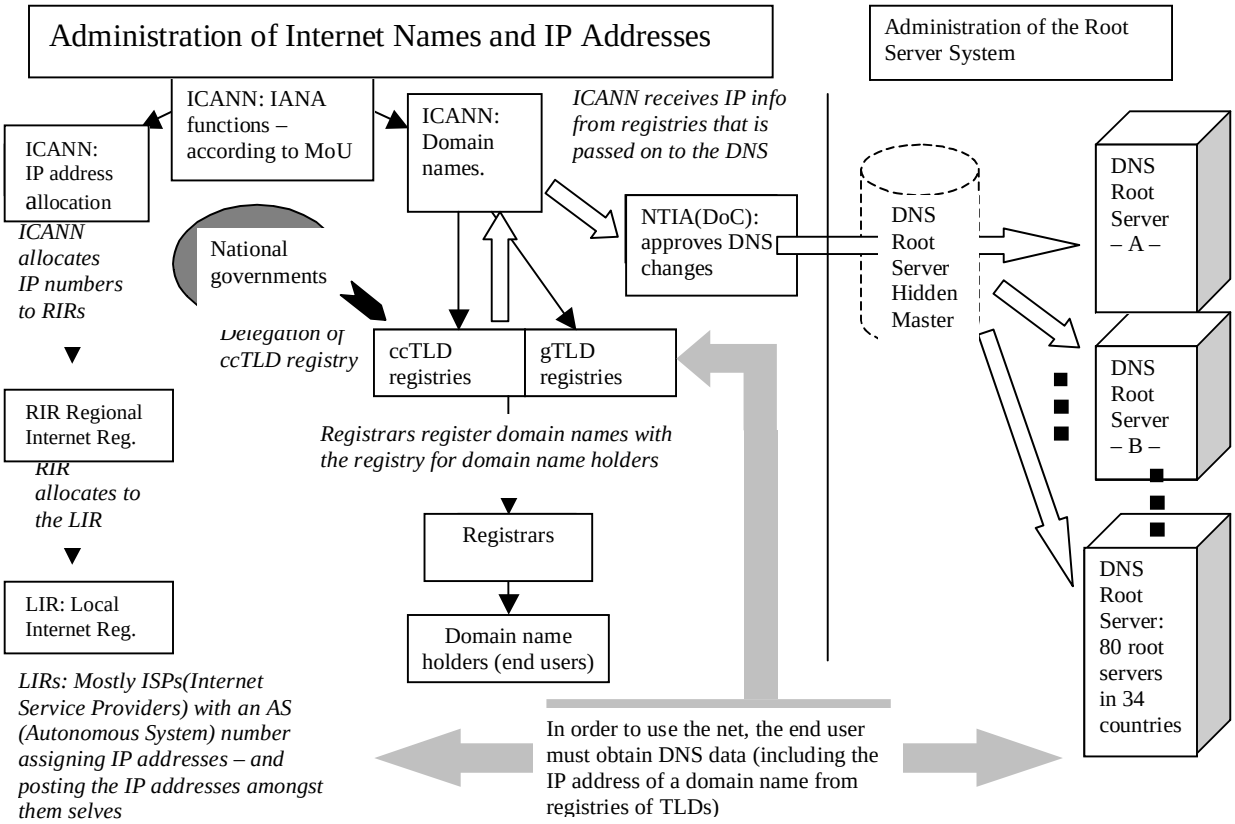

Fig. 1: Administration of Internet Names and IP Addresses and Root Server System[24]

Attribution to Categories

The administration of Internet Names and IP Addresses is applicable to the areas of Equitable Distribution of Resources and the Stable and Secure Functioning of the Internet.

Actors

The most relevant actors involved in the administration of Internet Names and IP Addresses have been placed in Fig. 1 (above), while an attempt to define their role is made in this section.

General

[22] A few other additions will be finalized in 2005.
[23] Some interest groups oppose the addition of new gTLDs at all.
[24] The naming of the "hidden master" is highly argued and several alternatives have been raised, such as "distribution master" and "public security server", see below under Actors/NTIA.

ICANN: ICANN is an internationally organised, non-profit organisation with responsibility for the technical management of the unique parameters of the global Internet such as (i) coordination of Internet Protocol (IP) address space allocation, (ii) protocol identifier assignments, and (iii) maintenance of the root zone file for the generic (gTLD) and country code (ccTLD) Top-Level Domains.[25] Historically, this technical management was performed under R&D contract to the US Government by the Internet Assigned Numbers Authority (IANA) within the University of Southern California and other entities. ICANN now performs the IANA functions under the terms of a Memorandum of Understanding (MoU) with the US Department of Commerce (DOC)/National Telecommunications and Information Administration (NTIA) of November 1998 reaffirmed in a number of Amendments, the latest being Amendment 6 dated September 6, 2003. The MOU was undertaken by the U.S. Department of Commerce as directed by the President to "…privatize the management of the domain name system (DNS) in a manner that increases competition and facilitates international participation in its management"[26], and following broad international consultation with governments, the private sector and academic institutions worldwide. Further, the MOU stated that the intention was to transfer the, "…U.S. Government management of the DNS to such an entity based on the principles of stability, competition, bottom-up coordination, and representation."[27] The MoU expires in September 2006.

ICANN also includes a wide group of constituencies. These being advisory committees and supporting organizations described under forums.

NTIA (US Government): In addition to having issued the MoU with ICANN, the NTIA (National Telecommunications and Information Administration), which lies under the US Department of Commerce, provides a due diligence function in verifying that ICANN has followed proper procedure in the determination of foreseen changes to the root zone file. Once confirmed that proper process and procedures have been followed, the changes foreseen by ICANN/IANA to the root zone file are implemented on the root servers, or more precisely, put in the "hidden master"[28] that updates the other DNS root servers. In addition to the MoU, the DoC has a zero-dollar purchase order for the IANA function.[29]

Internet Engineering Task Force (IETF): The IETF is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. The IETF, through a consensus-based, multi-stakeholder, open process establishes the protocol standards for Internet technologies. IANA, the function carried out by ICANN, is the central coordinator for the assignment of unique parameter values for Internet protocols in addition to the functions it carries out related to domain names and IP addresses.

Internet Architecture Board (IAB): The IAB is chartered both as a committee of the Internet Engineering Task Force (IETF) and as an advisory body of the Internet Society (ISOC). Its responsibilities include architectural oversight of IETF activities, Internet Standards Process

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[25] For ICANN's own description of its responsibilities, see www.icann.org/general/. It is important to note however that other "non-ICANN" Top Level domains are possible and do exist. These exist in what are known as alternate roots. See "http://www.new.net/" for example.
[26] Memorandum of Understanding between the U.S. Department of Commerce and Internet Corporation for Assigned Names and Numbers, paragraph II.A.
[27] Ibid
[28] Or rather "the Public Security Server" as proposed by Wolfgang Kleinwächter or "distribution master" as proposed by Avri Doria.
[29] See http://www.icann.org/general/iana-contract-09feb00.htm

oversight and appeal. The IAB is also responsible for the management of the IETF protocol parameter registries, and IETF liaisons with other standards development organisations (SDOs).

Internet Society (ISOC): The Internet Society (ISOC) is a professional membership society with more than 100 organisations and over 20,000 individual members in over 180 countries. It provides leadership in addressing issues that confront the future of the Internet, and is the organisational home for the groups responsible for Internet infrastructure standards, including the Internet Engineering Task Force (IETF) and the Internet Architecture Board (IAB). The Internet Society has served as the international organisation for global coordination and cooperation on the Internet, promoting and maintaining a broad spectrum of activities focused on the Internet's development, availability, and associated technologies. The IANA is chartered by the Internet Society (ISOC) to act as the clearinghouse to assign and coordinate the use of numerous Internet protocol parameters.

Domain names

National governments: National governments have as a point of departure sovereignty over their own territory. As a consequence, it is up to each national government to decide if they wish to delegate or re-delegate the task of national registry for the country code top level domain.[30] If they do (and they have the necessary legal basis), they can implement this policy locally provided that ICANN/IANA also makes the necessary changes in the IANA database.[31]

ccTLDs managers (Country Code Top Level Domain registries): The 240+ national ccTLD managers administrate the relevant ccTLD registry. The ccTLD managers are very different in nature from territory to territory, and they include informal groups, non-profit organizations, for-profit corporations, industry associations, governmental departments, and in some cases even volunteer individuals.

Only the registry's own changes regarding name server information that require changes in the root server are reported to ICANN. While all ccTLDs have an entry in the root zone file and communicate with IANA (which pre-dated ICANN), most however have yet to join the ICANN supporting organisation for ccTLDs (ccNSO) or to sign a contract with ICANN.

Policies of ccTLDs are usually defined locally by the local Internet community, not by ICANN or any other external body. In this context, the Local Internet Community is considered to include local government. Some countries have been directly regulating the policy-making process, while others have been implicitly or explicitly leaving the task to the ccTLD manager or to national multi-stakeholder forums. Often, the policy-making authority is incarnated in a so-called Policy Advisory Body, which, according to the country, may or may not include all stakeholders.

gTLDs (Generic Top Level Domain Registries, hereunder also Sponsored Top Level Domain Registries (sTLDs)): gTLD managers, who include both sponsored and non-sponsored Top Level Domains, are businesses or organizations responsible for providing a registry for a specific gTLD or sTLD and governed by the individual Registry or Sponsorship Agreement (i.e. contract) with ICANN.[32] The registry Operator or Sponsor differs with each TLD; some are for-profit entities

[30] See GAC ccTLD Principles, http://194.78.218.67/web/WG4_ccTLD_Dec_2004/ccTLD_Final_Draft.pdf.
[31] Complications arise however when the ccTLD manager is located outside the territory/jurisdiction of the country concerned. In such cases, lengthy delays have sometimes followed in cases where the re-delegation is "hostile" (without the approval of the existing manager) as ICANN (responsible for changing delegation information in the root zone file) have sought to mediate between an aggrieved government and a reluctant manager.
[32] See http://www.icann.org/registries/agreements.htm.

and some are non-profit organizations. The contracting party provides technical data to ICANN if changes in the root zone file are required.

Registrars: A registrar, or a domain name registrar, provides the technical support for the forwarding of requests for a domain name to the registry, on behalf of the registrant. The registrar may also be the registry itself or a reseller for the registry in a ccTLD. Only an accredited registrar may change the database (i.e. the identification and contact details of the domain name holder in the database) of the gTLD, which is based on an agreement between the registry and the registrar. A way to understand this is to see the Registries as wholesale vendors and Registrars as retailers in direct contact with domain-name consumer individuals or organizations. However, as registrar accreditation with ICANN is costly and requires some technical efforts, often the registrar's customer is a smaller domain name reseller, such as an ISP or a web design company, which will in turn deal with the customer.

Registrants/Domain name holders: Registrants will approach a registrar or an intermediate agent in order to register a domain name. If it is available, the registrant will become the holder of the domain name.[33] Registrants are often subdivided into business users, who use their domain names for commercial purposes, and non-commercial users, who use their domain names for personal and social purposes.

End User: An end user of the Internet may need to resolve a domain name into an Internet address. This is done by requesting information from a name server as a result of typing a domain name into a browser or by simply sending an email by using a domain name as an address. A domain name holder may also be an end user.

IP Addresses

RIRs (Regional Internet Registries); The RIRs consist of APNIC (Asia Pacific Network Information Centre), RIPE NCC (Réseaux IP Européens Network Coordination Centre), LACNIC (Latin American and Caribbean Internet Addresses Registry), ARIN (The American Registry for Internet Numbers) and AfriNIC (African Network Information Centre). AfriNIC is preliminarily recognized by ICANN and full recognition is expected in 2005. ICANN/IANA allocates blocks of IP address space to the RIRs that in turn allocate IP addresses and AS numbers[34] to organisations in the region of each RIR. The RIRs entered in 2004 into a Memorandum of Understanding with each other to establish the NRO (Number Resource Organisation). The NRO then entered into a MoU with ICANN and assumed the ASO (Address Supporting Organisation) responsibilities.[35]

LIRs (Local Internet Registries): LIRs are members of their respective regional Internet registry. As a consequence of their membership they can get IP addresses and AS numbers from their regional RIR, and thereafter assign these resources to the IP end users who may be

[33] In the case of ccTLDs and sTLDs, there may be specific qualification requirements that must also be fulfilled.
[34] An Autonomous System (AS) is a group of IP networks run by one or more network operators with a single, clearly defined routing policy. When exchanging exterior routing information, each AS is identified by a unique number: the Autonomous System Number (ASN). An AS is also sometimes referred to as a routing domain. The AS Numbers are allocated by IANA to the RIRs, see http://www.iana.org/assignments/as-numbers.
[35] See http://www.aso.icann.org/docs/aso-mou2004.html

individuals or other companies running smaller networks.[36] A LIR will normally be an ISP (Internet Service Provider), a telecommunication organization or a large corporation.[37]

IP End Users: An IP End User is an entity that uses IP address space for its network only and does not normally further allocate IP/AS Number services to customers. Strictly speaking, IP End Users are not part of the Internet Registry System. The LIR will assign IP numbers to IP End Users. The IP address will sometimes be associated (via the relevant TLD registry) connected to one or more domain names. While every user needs an address when accessing the Internet, most users do not have a domain name.[38]

Forums

ICANN is a private-public partnership organisation dedicated to preserving the operational stability of the Internet, promoting competition, achieving broad representation of global Internet communities, and developing technical policy appropriate to its mission through bottom-up, consensus-based processes. Within its structure, governments and international treaty organisations work in partnership with businesses, organisations, and individuals to address issues that directly concern ICANN's mission of technical coordination, including the IANA functions. ICANN is governed by an internationally diverse Board of Directors overseeing the policy development process, which is composed of 15 voting members and 6 non-voting liaisons. The Board is set up to meet anti-trust and competition policy requirements e.g. relating to the avoidance of capture. Three times a year, members of the ICANN community meet to discuss matters related to ICANN's functions. The Board meetings during these sessions are open to the public. Supporting Organisations and constituency groups also meet during the year.
ICANN provides many online forums which are accessible through ICANN's website (www.icann.org). The Supporting Organizations and Advisory Committees have active mailing lists for participants. Additionally, ICANN holds public meetings throughout the year. Recent meetings have been held in Bucharest, Montreal, Shanghai, Rio de Janeiro, Accra, Tunis, Rome and Cape Town.

ICANN Constituencies: The ICANN constituencies consist of a large group of Internet users and Internet organisations, primarily divided into supporting organisations and advisory committees. All of these are of considerable importance to IP addressing and naming, and their make-up is as follows: the ASO (Address Supporting Organisation), the GAC (Governmental Advisory Committee), the ccNSO (the Country Code Names Supporting Organisation), GNSO (the Generic Names Supporting Organisation), the ALAC (At-large Advisory Committee), the Security and Stability Advisory Committee (SSAC), and the Root Server System Advisory Committee (RSSAC).[39] Most constituencies also gather through out the year. In general the constituencies as forums are the primary venue for the proposition, analysis, and further perfectioning of domain-name and IP addressing decisions.

[36] See example from RIPE NCC: http://www.ripe.net/membership/
[37] In fact in some regions, the terminology used is directly ISP instead of LIR.
[38] It is also useful to note that domain names do not technically need to be associated with any IP address, and can be registered independently of any address information. This is particularly true as we examine the case of domain name warehousing and other speculative registrations.
[39] More about the committees can be found at http://www.icann.org/committees/

The Board of Directors of ICANN are given advice from 90+ governments[40] through the Governmental Advisory Committee (GAC), both at physical meetings and through other communications. This advice is of particular importance in areas of potential impact on public policy of national reach, or where incompatibilities or different approaches of national legislation and regulation present challenges to ICANN in the adoption of coherent, unique technical policies that are to be applied to the Internet as a whole around the globe. GAC also drafts advice in form of guidelines and principles, such as the GAC ccTLD guidelines and principles for delegation and re-delegation of ccTLDs[41], meant as a common sharing of experience between more and less experienced countries within the field of Internet.

ICANN, through its Supporting Organisations and constituencies, utilises an inclusive, bottom-up mechanism for development of technical policies related to its work..

RIR's Policy Development Process: The RIRs are structured similarly as non-profit, member-based organisations. They facilitate the development of consensus-based policies in a bottom-up, industry self-regulating manner in response to the requirements of the many and varied stakeholders in their respective communities. This policy development is open to anybody, and includes the active participation of both public and private sector bodies as well as civil society.

The RIR structure enables the RIRs to provide service in a fair, responsive, neutral and impartial manner. All four RIRs have an open membership policy. Each RIR hosts public policy meetings that are open to anyone regardless of membership status. This means that anyone can participate in discussing IP-related issues and in developing number resource management policies. These meetings, along with publicly available, open mailing lists, allow the RIRs to gain a broad perspective on the issues that impact the community. The RIRs make concerted efforts to help their communities build consensus-based policies. The RIRs ensure that these policies are applied fairly and consistently, including those that are in common with other regions.

The RIRs do not develop policies; the policies are developed by the community and implemented/executed by the RIRs.

Governance Mechanisms

Objectives of the rules system

Governmental participation in many of these mechanisms is indirect though the relationship that the GAC has with other ICANN constituencies and with ICANN itself. The one exception is the direct relationship that the US government has with ICANN by virtue of the MoU with ICANN. Of course, for ccTLDs in particular, governmental influence takes place directly through local governance mechanisms (e.g. regulation of electronic services, IPR related to domain names, data protection and privacy measures etc). By comparison, gTLD public policy issues are generally dealt with via the GAC, but the GAC is first and foremost an advisory group dealing with technical issues related to the ICANN scope, even though it takes into consideration policy issues arising from ICANN practices.[42]

[40] The list of GAC members: http://194.78.218.67/web/contact/reps/index.shtml
[41] See http://194.78.218.67/web/WG4_ccTLD_Dec_2004/ccTLD_Final_Draft.pdf
[42] ICANN has until now not acted contrary to advice given by the GAC.

Apart from governmental provisions and responsibility (for ccTLD matters in particular), the *governance* of the administration of IP addresses and Top Level Domains was intended to lie within ICANN through a bottom-up approach to policy making and administration. ICANN with its constituencies is intended to reflect this consensus model, aiming to establish consensus in the constituencies before deciding matters before the Board of Directors. Another part of the governance issue lies within the NTIA powers of approving changes requested from ICANN to the hidden master.

On another level, the delegation and re-delegation of ccTLDs is for most countries a matter of national sovereignty. However, the process is based on a triangle system, where national governments may select or delegate a ccTLD registry, but the delegation must also be accepted by ICANN and the NTIA before changes can be made in the hidden master.

National policy regarding the respective ccTLDs is a matter for each nation and is governed locally.

Important governance also takes place on the local and regional level (i.e. outside ICANN) in relation to the allocation of IP numbers and AS numbers from the RIRs to the LIRs. The policy development process (PDP) of the RIRs is transparent, participative and open to every interested party, including governments.

ICANN/IANA has no role in the regional policy development process but they have a role in the development of global policies as stated in the ASO MoU signed between NRO and ICANN. The policies which apply in each region are developed based on the regional PDP.

Content of principles, norms and rules

The decision making of ICANN rests in the end with the Board of Directors.[43] Decisions are usually taken by a majority vote. The Board consists of a minimum of 9 and a maximum of 19 members, hereunder also requiring a geographic representation.[44] Furthermore, there is no veto right for any members of the board.

As for the nature of decisions related to national governments, this is a matter of national sovereignty, while decisions by the RIRs seem to me more on an administrative level.[45]

SWOT Analysis

Strengths

The administration and operation of the domain names and IP addresses-allocation (also referred to as the IANA functions) function. In the past, the allocation of IP addresses has not generated much attention from governments, presumably because allocation policy has been relatively efficient and not generated complaints. In effect, IP numbers v4 has not been a scarce resource, and with IPv6 it is even more unlikely to become a scarce resource. There may however now be other public policy issues that governments wish to discuss in relation to the deployment of IPv6.

[43] ICANN Bylaws, Article IV.
[44] ICANN Bylaws, Article V.
[45] The question remains as to whether this should be included in the paper.

The ICANN system of private-public partnerships has so far been inclusive and flexible. This innovative flexibility is important for the fact that the Internet and its applications have evolved so rapidly. It is a well tested system that has evolved over the last 35 years of development of the Internet itself. The overall partnership seem to be well aware of the inherently global characteristics of the Internet and the overriding need for global interoperability (both horizontally between networks and vertically between networks and applications), and for security and stability of the entire Internet. Another advantage is that the partnership is built on the strength of each partner in their respective areas, and allows for all those interested in the various activities associated with the development of the standards and the relevant technical policies to be involved.

The RIR System is also a successful self-regulation model.

Weaknesses

The weaknesses of the administration of Internet names and the IANA functions can be divided into several problems:

- The balance within the private-public partnerships.
- The lack of outreach, namely, namely how does the international community, both private and governmental, influence the IANA-functions.
- The position of the NTIA/US Government and thus, the MoU between the NTIA and ICANN. A weakness of the current system is also the lack of clarity as regards the limits of national sovereignty in relation to delegation and re-delegation. Currently, a national government may select or delegate a ccTLD registry, but technically this delegation must still be approved by ICANN and NTIA before changes may be made. In the future, the intention of NTIA is to "release" ICANN. However, the question remains as to whether NTIA will maintain its position regarding their power to deny/approve changes in the root server (hidden master, see the link between NTIA and the root server in Fig. 1).
- The lack of political and corporate accountability[46] in relation to the administration of Internet names and IP addresses, even though there are parts of the system where accountability exists.[47] There has been focus on control, but emphasize must also be placed on the responsibility.
- The difficulty to integrate public policy concerns in the considerations of the various technical organizations.
- The difficulty to establish a common ground for all actors under which there can be a common form of collaboration and common hierarchical structure.
- The need to complete a full internationalization of ICANN, with an increase of the internal diversity in terms of spoken languages, global participation, variety of participating stakeholders and organizations, and involvement of the general public.

[46] Wikipedia.com defines accountability as: "Accountability is the aspects of responsibility involving giving a statistical or judicial explanation for events. Judgement may follow… In politics, and particularly in representative democracies, accountability is an important factor in securing good governance. Accountability differs from transparency in that it only enables negative feedback *after* a decision or action, while transparency also enables negative feedback *before* or *during* a decision or action. Accountability constrains the extent to which elected representatives and other office-holders can willfully deviate from their theoretical responsibilities, thus reducing corruption. The goal of accountability is at times in tension with the goal of leadership. See: http://en.wikipedia.org/wiki/Accountability

[47] Not all do agree that there is a lack of accountability, especially when it comes to the administration of IP addresses.

Opportunities

It would seem opportune to develop principles for a broad framework of accountability, that will be subscribed to by all organisations active in the area of Internet Domain Names and IP addressing, that aim to provide better, easier accessible, accountable ways of informing the broader community (rather than only the expert community of each organisation) of processes, redress methods, decisions, impacts, and so forth.

Furthermore, there is opportunity to develop further a unique partnership that has effectively been addressing the many technical challenges associated with the Internet. In particular,

In particular, given the overall awareness of the importance of the Internet and the concerns about its future, there is now an opportunity to determine the best ways in which public policy considerations can be considered in all of the mentioned organisations, or how to ensure that the full power of the tri-partite partnership between the private sector, civil societies, and governments can be utilised and exploited.

The creation of ICANN and the organisation of the relations between ICANN and other Internet operators is an experience without precedents. There is a great opportunity to correct those aspects of the current system that could be necessary to change, preserving the most important aspects of the ICANN model and taking advantage of the huge amount of energy and work dedicated by thousands of people from different countries, cultures and sectors, including a lot of governmental representatives, to create a system for coordinating many technical issues regarding Internet functioning.

Threats

There are some threats to the system of Internet Names and IP Addresses. Among those can be mentioned:

- The uncertainty of the structure of the future administration of Internet names and IP addresses and lack of global participation may result in the division of the Internet into more than one "net".
- The problem of spam, overloading the Internet, is one of the serious and apparent threats to the DNS system.
- The lack of transition from IPv4 to IPv6 and lack of the implementation of IPv6, so that IP addresses in practice becomes a scarce resource in certain parts of the world.[48]
- The lack of assuring the implementation of IDN (Internationalized Domain Names) in all parts of the world, and thus creating a division of the Internet.

The largest and most significant threat at the moment is that 35 years of development of experience in setting up a single, interoperable, global Internet infrastructure will fracture not only in the organisational partnership that manages the administrative and technical standards and policies, but that also the underlying infrastructure will fracture, almost inevitably along national boundaries or regional blocks. The economic and political consequences could also be significant.

[48] It can be discussed whether IP addresses in practice can become a scarce resource. On one hand, it has been pointed out that IPv6 addresses only in theory can become scarce. On the other hand, the intention behind this section is to point out that in certain countries, due to lack of resources, sufficient resources may not be prioritized to make the transition from IPv4 to IPv6 in terms of new software and equipment.

Adequacy Measured Against Criteria

Multilateral

The ICANN process is multilateral in its nature. The ones interested in being involved in the process are welcome to do so, and even if physical presence in ICANN meetings is not possible, the meetings are made available over the Internet. Interested parties may also take part in discussions on the Internet.

The multilateral aspect of ICANN is also apparent during the Regional Forums that are being held during the ICANN meetings. This was most apparent during the Regional forum at the ICANN meeting in Cape Town, where ICANN strongly involved the local African Internet community and the community's interest in getting involved.

However, even though the ICANN process is multilateral with a large participation, the question is whether actual influence is given. There is a certain lack of global outreach, and the proceedings of ICANN still take place in the English language.[49] A digital divide is also apparent in relation to the actual participation in meetings and resources allocated in less developed countries for such participation. An example can be found in the GAC (Governmental Advisory Committee), which consist of almost 100 countries being members, while only 40 take part in the meetings.

Transparent

Even though the ICANN process is international and multilateral, it lacks transparency as regards issues such as budgets and spending within ICANN. The lack of transparency also means that there is less accountability. Also, the informal culture of the ICANN community and the need to cope with the speed of Internet changes sometimes make it hard for some stakeholders to participate or to understand what is happening; more care could be taken in making agendas and schedules reliable and known well in advance.

However, ICANN has a strong tradition of transparency and open participation, for example by holding an open one-day Public Forum at every meeting, webcasting all its Board meetings, Public Forums and many other important events, publishing minutes and audio recordings of meetings on its website, and allowing the remote public to submit comments and questions by e-mail – even in real-time, during Public Forums – or through web forums. Another aspect of transparency in relation to ICANN is the use of the ICANN ombudsman, which also increases transparency and ads to the democratization of ICANN.[50]

Democratic

ICANN is an open organization where all interested parties may take part, independent of their position and status. All arguments are heard and taken into account, promoting freedom of speech. Taking into account that ICANN is a private non-profit corporation, its openness provides for a reasonably democratic organization. However, the balance between the private and public involvement, as well as that between civil society and the private sector, and the need to properly

[49] Real time translation into other languages, such as French, Spanish and Portuguese, has taken place in certain meetings, but not on a regular basis.
[50] See http://www.icann.org/ombudsman/.

balance the influence of different commercial interest groups, remain important tasks for the future.

The use of an ICANN ombudsman also promotes the democratization of ICANN.

Capacity to address Internet governance in a coordinated manner

ICANN is very aware of the WSIS and WGIG process. During the ICANN Cape Town, Kuala Lumpur and Rome meetings, ICANN held workshops entirely dedicated to Internet Governance.

Also, the regular attendance of ICANN meetings by participants in other governance forums (from RIRs to groups involved in WSIS) ensures the flow of information.

Multi-stakeholder approach

ICANN includes a large group of Internet users and organizations. In addition, there has been focus on involving new areas, such as the establishment of AfriNIC with the active support and cooperation of the other RIRs.

While multi-stakeholder participation in ICANN is more advanced than in most other global governance institutions, there still is the need to find a proper and final balance among the different stakeholders, in terms of role, participatory structures, and actual decision-making power.