A

STRUCTURE AND ORGANIZATION OF THE DOMAIN NAME SYSTEM

Torsten Bettinger

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Links:

- Internet Corporation For Assigned Names and Numbers: http://www.icann.org
- WIPO Arbitration and Mediation Center: http://arbiter.wipo.int
- Internet Assigned Numbers Authority (IANA): http://www.iana.org

I. IP Addresses and Domain Names

IA.01 Although the Internet does not have an overall organizational, financial or operational administration responsible for the entire Internet, certain administrative functions must be carried out according to a hierarchical system. One of the most important organizational functions requiring global and hierarchical coordination is the administration of IP (Internet Protocol) addresses and the domain names ascribed to them. The IP address, a sequence of numbers consisting of four bytes (eg 129.187.10.25), is the actual physical network address by which routing on the Internet takes place and which ensures that IP packages sent via the data networks reach the host computer.

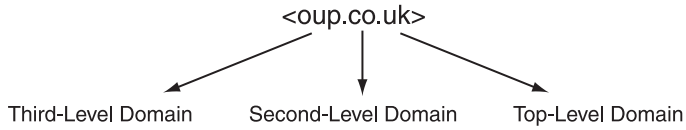
IA.02 Because remembering the sequences of numbers is difficult and inconvenient, a global uniform hierarchical retrieval system (domain name system) was created in 1985 alongside these numeric addresses so that each IP address could be mapped to a globally unique user-friendly domain name.[1]

IA.03 In technical terms, the routing of data to the correct address is still exclusively

[1] The suggestion for a hierarchical name space for the Internet was first publicly described in the RFC document Internet Name Domains by D.L. Mills of Comsat Laboratories in 1981; a few years later (1984), J. Postel and J. Reynolds, in the document Domain Requirements (RFC 920), described a set of generic Top Level Domains (TLDs) that are still in use today.

achieved via use of the IP number, that is, when entering the domain name in the web browser, the latter first accesses the name server of the relevant TLD and receives back from it the numerical IP address allocated to it, thus allowing the corresponding host computer to be located.

IA.04 Each domain name consists of a number of levels (domain levels) separated from each other by dots. For example, in the domain name ⟨oup.co.uk⟩, which is the location of Oxford University Press's United Kingdom website, ".uk" is the top-level-domain, ".co" is the second-level-domain and ".oup" is the third-level-domain.



A domain name can have any number of levels (also known as sub-domains), but in practice there are always five or fewer.

IA.05 The highest level of the hierarchy, known as the top-level domain (TLD), was originally limited to eight generic top-level domains (gTLDs), three of which (".com", ".net" and ".org") are open to all Internet users for registration worldwide without restriction, while four (".edu", ".int", ".gov", ".mil") are reserved for US or international intergovernmental organizations. The TLD ".arpa" is designated to be used exclusively for Internet-infrastructure purposes. In November 2000, the existing eight gTLDs were extended through the addition of seven new gTLDs (".biz", ".name", ".info", ".aero", ".coop", ".pro", ".museum"). For details regarding registration under the gTLDs see para IB.01.

IA.06 In addition to the generic top level domains (gTLDs), there are 243 country code top-level domains (ccTLDs), based on the two-letter ISO-Norm 3166 (eg, ".br" for Brazil, ".fr" for France, ".mx" for Mexico), which are administered by their respective governments or by private entities with the appropriate national government's acquiescence. The second-level domains within a given country code can vary. Some countries have created "generic" second-level domains which are tagged to be used for specific purposes, while in other countries the second-level domains are based upon political geography (eg provinces or states). For details on the registration requirements in the ccTLDs see para IB.53. For example, in the United Kingdom the national registration authority, Nominet UK, introduced various second-level domains under the top-level domain ".uk". These include ".co.uk" for commercial enterprises, ".ltd.uk" for limited companies, "ac.uk" for universities, ".sch.uk" for schools, and ".gov.uk" for government bodies. In such cases, it is the third-level domain that may then be registered by individual organizations or persons.

IA.07 Domain names are registered on a first-come, first-served basis. The requirements for registration vary between the different gTLD and ccTLDs. Some of them are open, in the sense that there are no restrictions on the persons or entities that may register names. Others are restricted, in that only persons or entities satisfying certain criteria (eg, residency in the territory) may register names in them (for details, see para IB.56).

IA.08 As a domain name functions as an address, no two entities can have the same domain name under the same top-level domain. It is, however, possible for the same term to be registered by separate entities in different top-level domains.

IA.09 Third- and fourth-level domains are usually chosen by the registrant of the second-level domain name, but, as seen above, certain registration authorities control the second and third-level domains so as to designate, for example, the purpose or locality of the domain.

II. The Development of the Domain Name System

IA.10 In the foundation stage, addressing in the Internet was exclusively achieved by means of the numeric IP address. The domain name system was only introduced in 1984 and, from 1988, was further developed by the Internet Assigned Numbers Authority (IANA)[2] and its head Jon Postel[3] on behalf of the Defence Advanced Research Project Agency (DARPA), a sub-department of the Pentagon, the National Science Foundation (NSF) and other American research institutions.

IA.11 Before the commercialization of the Internet, domain names were registered on the instructions of the relevant US department by SRI International, a non-profit Silicon Valley research institute. Later, the National Science Foundation (NSF) assumed responsibility for coordinating and funding the management of the non-military portion of the the Internet Infrastructure, and on 31 December 1992 it entered into a five-year cooperative agreement with Network Solutions Inc., which thus acquired sole control and responsibility for the key

[2] The IANA is the authority originally responsible for the oversight of IP address allocation, the coordination of the assignment of protocol parameters provided for in Internet technical standards, and the management of the domain name system (DNS), including the delegation of top-level domains and oversight of the root name server system.

[3] Jon Postel, who died in 1998, is regarded as one of the most important Internet pioneers and he had a decisive influence on Internet administration, first of all as university employee, later as professor and finally as chairman of IANA. Until the Internet was commercialized in the 1990s, it was he who largely determined the development of the domain name system.

registration, coordination and maintenance functions of the Internet domain name system.[4]

IA.12 The commercialization of the Internet from 1994 onwards led not only to substantial revenue for NSI, which took advantage of its registration monopoly to considerably increase registration costs, but also to a continuing increase in the number of domain name conflicts. From 1998 on, NSI and the domain name system as a whole were subject to considerable criticism, directed against NSI's registration policies and the lack of procedures for the extrajudicial resolution of domain name conflicts.

IA.13 In response to the ever-increasing criticism, initial efforts at reform of the domain name system were commenced by the Internet International Ad Hoc Committee (IAHC), which included, amongst others, two trademark protection organizations (the World Intellectual Property Organization (WIPO) and the International Trademark Association (INTA)), three Internet standardization organizations (IANA, ISOC[5] and IAB[6]), the International Telecommunications Union (ITU), and one US federal authority (the Federal Network Council (FNC)).[7]

IA.14 At the beginning of 1997 the IAHC submitted its final recommendations, which included expansion of the name zone through the addition of seven new TLDs to be operated as a monopoly on a non-profit-making basis (registry function) and supervised by a Political Advisory Committee. The actual registration activities (registrar function) were to be conducted by a total of 28 registrars, located in seven regions of the world. The umbrella organization of the registrars, CORE, was to be incorporated in Switzerland. Registration of domain names was to be preceded by a 60-day application procedure in order to give potential trademark holders the opportunity to assert their rights. Domain names which are identical or closely similar to "internationally known" signs, for which demonstrable intellectual property rights existed, were to be held or

[4] The contract initially had a term which ran until 1998 and it has been renewed on several occasions; the texts of the successive contracts are available at http://www.icann.org/nsi/nsi-agreements.htm.

[5] The Internet Society (ISOC) is a professional membership organization with more than 150 organizations and 16,000 individual members in over 180 countries. It addresses technical issues that confront the future of the Internet, and is the organization home for the groups responsible for Internet infrastructure standards, including the Internet Engineering Task Force (IETF) and the Internet Architecture Board (IAB). For details see www.isoc.org.

[6] The Internet Architecture Board (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 oversight and appeal, and the appointment of the RFC Editor.

[7] For more detailed information see IAHC's website at www.iahc.org.

used only by, or with the authorization of, the owner of such demonstrable intellectual property rights.

IA.15 In 1997 the IAHC published the Generic Top Level Domain Memorandum of Understanding (gTLD-MOU), which set out a regulatory model under which the group appointed itself as the new supervisory body over the name zone. Each of the participating organizations was given two seats on the Political Oversight Committee (POC).

IA.16 While the community of Internet technologists joined with the ITU to push for support for this plan, resistance formed in the United States against an international solution that would shift part of the power over the name zone to an organization based in Switzerland. In addition, Network Solutions feared the loss of its monopoly, the operation of the domain name database having become a very profitable business now that a fee was payable for the registration of domain names under the generic TLDs.

IA.17 An alliance of commercial and national interests brought down the IAHC proposals. The US Government took the view that control over the DNS should remain in the United States, and urged the ITU to keep out of the administration of the DNS until it had been given a mandate by its members. The involvement of the ITU gave rise to particular concern in the United States, since it was feared that telephone companies could extend their influence over the Internet. The European Commission also objected to the IAHC, considering that insufficient consideration was being given to European interests. From summer 1997 onwards, the US Department of Commerce gradually took the lead in the further negotiations concerning control of the DNS.

IA.18 The next step, in early 1998, was the Proposal to Improve Technical Management of Internet Names and Addresses ("Green Paper"), in which the US Department of Commerce demanded political control over the Internet infrastructure with the intention of then transferring it to a private organization.[8] Control over Internet names and numbers was to be given to a non-profit-making enterprise to be founded for this purpose, with international participation but operating under Californian law. As a compromise between the supporters and the opponents of additional TLDs, the Department of Commerce proposed delegating five TLDs to five new registries as a means of testing the effects of competition at registry level. The registry and registrar functions were in future to be separated in order to ensure competition in the field of domain name registration as well.

[8] Department of Commerce, 1997, Discussion Draft 1/30sh98, http://www.ntia.doc.gov/ntiahome/domainname/dnsdrft.htm

IA.19 The Green Paper attracted a wave of criticism, with around 650 critical comments being submitted, including a number from international governmental organizations. The criticism was directed at the fact that the US Department of Commerce had made no mention of the IAHC's reform proposals. Many participants regarded the Green Paper as a usurpation of power by the US Government over the previously self-governing regime. Protest was also lodged against what was seen by many international observers as insufficient international involvement in the administration of the Internet.

IA.20 In its Reply to the US Green Paper the European Commission gave clear expression to its dissatisfaction that "the current U.S. proposals could, in the name of the globalisation and privatisation of the Internet, consolidate permanent US jurisdiction over the Internet as a whole, including dispute resolution and trademarks used on the Internet". It recommended that "the US Administration limit its direct regulatory intervention in the Internet only to those relationships which fall clearly under existing contracts between the Agencies of the US Government and their contractors and that all other decisions be referred to an appropriate internationally constituted and representative body".[9]

IA.21 In summer 1998, the US Department of Commerce published the White Paper, in which the Government dealt in close detail with the arguments raised against the Department of Commerce proposals, the basic lines of which it nevertheless confirmed.[10] One of the few significant changes concerned the role that the US Government assumed for itself. Not only was the original plan to select the new name zones even before the future DNS administration had been founded dropped, the same fate also befell the intention to determine the institutional structure of the new organization.

IA.22 The US Government had decided to reform not only the organization of the name zones but also the entire administration of the Internet. The core objective was to replace IANA and the associated control by the technologist community over the net's resources with a professional organization with legal capacity appropriate to the international significance of the Internet. The White Paper proposed four constitution-like principles for the development of the new administrative structure:

[9] Council of the European Union and the European Commission, Reply of the European Community and its Member States to the US Green Paper, 16 March 1998, http://europa.eu.int/ISPO/eif/InternetPoliciesSite/InternetGovernance/MainDocuments/ReplytoUSGreenPaper.html. The European Commission would have preferred an international political solution led by a UN organization such as the ITU, and gave clear expression to its dissatisfaction. The Commission was supported by the Australian Government, which likewise criticized the dominance of American jurisdiction and politics in the administration of the net.

[10] Department of Commerce, 1998, Management of Internet Names and Addresses, http://www.ntia.doc.gov/ntiahome/domainname/6_5_98dns.htm.