web domains

- A **domain name** is an identification string that defines a realm of administrative autonomy, authority or control within the Internet. Domain names are used in various networking contexts and for application-specific naming and addressing purposes. In general, a domain name identifies a network domain, or it represents an Internet Protocol (IP) resource, such as a personal computer used to access the Internet, a server computer hosting a website, or the web site itself or any other service communicated via the Internet. As of 2017, 330.6 million domain names had been registered.[1]

- Domain names are formed by the rules and procedures of the Domain Name System (DNS). Any name registered in the DNS is a domain name. Domain names are organized in subordinate levels (subdomains) of the DNS root domain, which is nameless. The first-level set of domain names are the top-level domains (TLDs), including the generic top-level domains (gTLDs), such as the prominent domains com, info, net, edu, and org, and the country code top-level domains (ccTLDs). Below these top-level domains in the DNS hierarchy are the second-level and third-level domain names that are typically open for reservation by end-users who wish to connect local area networks to the Internet, create other publicly accessible Internet resources or run web sites.

- The registration of these domain names is usually administered by domain name registrars who sell their services to the public.

- A fully qualified domain name (FQDN) is a domain name that is completely specified with all labels in the hierarchy of the DNS, having no parts omitted. Traditionally a FQDN ends in a dot (**.**) to denote the top of the DNS tree.[2] Labels in the Domain Name System are case-insensitive, and may therefore be written in any desired capitalization method, but most commonly domain names are written in lowercase in technical contexts.[3]

Purpose

- Domain names serve to identify Internet resources, such as computers, networks, and services, with a text-based label that is easier to memorize than the numerical addresses used in the Internet protocols. A domain name may represent entire collections of such resources or individual instances. Individual Internet host computers use domain names as host identifiers, also called hostnames. The term *hostname* is also used for the leaf labels in the domain name system, usually without further subordinate domain name space. Hostnames appear as a component in Uniform Resource Locators (URLs) for Internet resources such as websites (e.g., en.wikipedia.org).

- Domain names are also used as simple identification labels to indicate ownership or control of a resource. Such examples are the realm identifiers used in the Session Initiation Protocol (SIP), the Domain Keys used to verify DNS domains in e-mail systems, and in many other Uniform Resource Identifiers (URIs).

- An important function of domain names is to provide easily recognizable and memorizable names to numerically addressed Internet resources. This abstraction allows any resource to be moved to a different physical location in the address

topology of the network, globally or locally in an intranet. Such a move usually requires changing the IP address of a resource and the corresponding translation of this IP address to and from its domain name.

- Domain names are used to establish a unique identity. Organizations can choose a domain name that corresponds to their name, helping Internet users to reach them easily.

- A generic domain is a name that defines a general category, rather than a specific or personal instance, for example, the name of an industry, rather than a company name. Some examples of generic names are *books.com*, *music.com*, and *travel.info*. Companies have created brands based on generic names, and such generic domain names may be valuable.[4]

- Domain names are often simply referred to as *domains* and domain name registrants are frequently referred to as *domain owners*, although domain name registration with a registrar does not confer any legal ownership of the domain name, only an exclusive right of use for a particular duration of time. The use of domain names in commerce may subject them to trademark law.

Top-level domains

- When the Domain Name System was devised in the 1980s, the domain name space was divided into two main groups of domains.[9] The country code top-level domains (ccTLD) were primarily based on the two-character territory codes of ISO-3166 country abbreviations. In addition, a group of seven generic top-level domains (gTLD) was implemented which represented a set of categories of names and multi-organizations.[10] These were the domains gov, edu, com, mil, org, net, and int. These two types of top-level domains (TLDs) are the highest level of domain names of the Internet. Top-level domains form the DNS root zone of the hierarchical Domain Name System. Every domain name ends with a top-level domain label.

- During the growth of the Internet, it became desirable to create additional generic top-level domains. As of October 2009, 21 generic top-level domains and 250 two-letter country-code top-level domains existed.[11] In addition, the ARPA domain serves technical purposes in the infrastructure of the Domain Name System.

- During the 32nd International Public ICANN Meeting in Paris in 2008,[12] ICANN started a new process of TLD naming policy to take a "*significant step forward on the introduction of new generic top-level domains*." This program envisions the availability of many new or already proposed domains, as well as a new application and implementation process.[13] Observers believed that the new rules could result in hundreds of new top-level domains to be registered.[14] In 2012, the program commenced, and received 1930 applications.[15] By 2016, the milestone of 1000 live gTLD was reached.

- The Internet Assigned Numbers Authority (IANA) maintains an annotated list of top-level domains in the DNS root zone database.[16]

- For special purposes, such as network testing, documentation, and other applications, IANA also reserves a set of special-use domain names.[17] This list contains domain names such as example, local, localhost, and test. Other top-level domain names containing trade marks are registered for corporate use. Cases include brands such as BMW, Google, and Canon.[18]

Second-level and lower level domains

- Below the top-level domains in the domain name hierarchy are the second-level domain (SLD) names. These are the names directly to the left of .com, .net, and the other top-level domains. As an example, in the domain *example.co.uk*, *co* is the second-level domain.

- Next are third-level domains, which are written immediately to the left of a second-level domain. There can be fourth- and fifth-level domains, and so on, with virtually no limitation. An example of an operational domain name with four levels of domain labels is *sos.state.oh.us*. Each label is separated by a full stop (dot). 'sos' is said to be a sub-domain of 'state.oh.us', and 'state' a sub-domain of 'oh.us', etc. In general, subdomains are domains subordinate to their parent domain. An example of very deep levels of subdomain ordering are the IPv6 reverse resolution DNS zones, e.g., 1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.ip6.arpa, which is the reverse DNS resolution domain name for the IP address of a loopback interface, or the localhost name.

- Second-level (or lower-level, depending on the established parent hierarchy) domain names are often created based on the name of a company (e.g., *bbc*.co.uk), product or service (e.g. *hotmail*.com). Below these levels, the next domain name component has been used to designate a particular host server. Therefore, *ftp.example.com* might be an FTP server, *www.example.com* would be a World Wide Web server, and *mail.example.com* could be an email server, each intended to perform only the implied function. Modern technology allows multiple physical servers with either different (cf. load balancing) or even identical addresses (cf. anycast) to serve a single hostname or domain name, or multiple domain names to be served by a single computer. The latter is very popular in Web hosting service centers, where service providers host the websites of many organizations on just a few servers.

- The hierarchical DNS labels or components of domain names are separated in a fully qualified name by the full stop (dot, .).

Internationalized domain names

- *Main article: Internationalized domain name*

- The character set allowed in the Domain Name System is based on ASCII and does not allow the representation of names and words of many languages in their native scripts or alphabets. ICANN approved the Internationalized domain name (IDNA) system, which maps Unicode strings used in application user interfaces into the valid DNS character set by an encoding called Punycode. For example, københavn.eu is mapped to xn--kbenhavn-54a.eu. Many registries have adopted IDNA.

Domain name registration

History

- The first commercial Internet domain name, in the TLD *com*, was registered on 15 March 1985 in the name symbolics.com by Symbolics Inc., a computer systems firm in Cambridge, Massachusetts.

- By 1992, fewer than 15,000 *com* domains had been registered.

- In the first quarter of 2015, 294 million domain names had been registered.[19] A large fraction of them are in the *com* TLD, which as of December 21, 2014, had 115.6 million domain names,[20] including 11.9 million online business and e-commerce sites, 4.3 million entertainment sites, 3.1 million finance related sites, and 1.8 million sports sites.[21] As of July 2012 the *com* TLD had more registrations than all of the ccTLDs combined.[22]

Administration

- The right to use a domain name is delegated by domain name registrars, which are accredited by the Internet Corporation for Assigned Names and Numbers (ICANN), the organization charged with overseeing the name and number systems of the Internet. In addition to ICANN, each top-level domain (TLD) is maintained and serviced technically by an administrative organization operating a registry. A registry is responsible for maintaining the database of names registered within the TLD it administers. The registry receives registration information from each domain name registrar authorized to assign names in the corresponding TLD and publishes the information using a special service, the WHOIS protocol.

- Registries and registrars usually charge an annual fee for the service of delegating a domain name to a user and providing a default set of name servers. Often, this transaction is termed a sale or lease of the domain name, and the registrant may sometimes be called an "owner", but no such legal relationship is actually associated with the transaction, only the exclusive right to use the domain name. More correctly, authorized users are known as "registrants" or as "domain holders".

- ICANN publishes the complete list of TLD registries and domain name registrars. Registrant information associated with domain names is maintained in an online database accessible with the WHOIS protocol. For most of the 250 country code top-level domains (ccTLDs), the domain registries maintain the WHOIS (Registrant, name servers, expiration dates, etc.) information.

- Some domain name registries, often called *network information centers* (NIC), also function as registrars to end-users. The major generic top-level domain registries, such as for the *com*, *net*, *org*, *info* domains and others, use a registry-registrar model consisting of hundreds of domain name registrars (see lists at ICANN[23] or VeriSign).[24] In this method of management, the registry only manages the domain name database and the relationship with the registrars. The *registrants* (users of a domain name) are customers of the registrar, in some cases through additional layers of resellers.

- There are also a few other alternative DNS root providers that try to compete or complement ICANN's role of domain name administration, however, most of them failed to receive wide recognition, and thus domain names offered by those alternative roots cannot be used universally on most other internet-connecting machines without additional dedicated configurations.

Domain name space

- Today, the Internet Corporation for Assigned Names and Numbers (ICANN) manages the top-level development and architecture of the Internet domain name

space. It authorizes domain name registrars, through which domain names may be registered and reassigned.

- The hierarchical domain name system, organized into zones, each served by domain name servers.

- The domain name space consists of a tree of domain names. Each node in the tree holds information associated with the domain name. The tree sub-divides into *zones* beginning at the DNS root zone.

Domain name syntax

A domain name consists of one or more parts, technically called *labels*, that are conventionally concatenated, and delimited by dots, such as *example.com*.

- The right-most label conveys the top-level domain; for example, the domain name *www.example.com* belongs to the top-level domain *com*.

- The hierarchy of domains descends from the right to the left label in the name; each label to the left specifies a subdivision, or subdomain of the domain to the right. For example: the label *example* specifies a node *example.com* as a subdomain of the *com* domain, and *www* is a label to create *www.example.com*, a subdomain of *example.com*. Each label may contain from 1 to 63 octets. The empty label is reserved for the root node and when fully qualified is expressed as the empty label terminated by a dot. The full domain name may not exceed a total length of 253 ASCII characters in its textual representation.[8] Thus, when using a single character per label, the limit is 127 levels: 127 characters plus 126 dots have a total length of 253. In practice, some domain registries may have shorter limits.

- A hostname is a domain name that has at least one associated IP address. For example, the domain names *www.example.com* and *example.com* are also hostnames, whereas the *com* domain is not. However, other top-level domains, particularly country code top-level domains, may indeed have an IP address, and if so, they are also hostnames.

- Hostnames impose restrictions on the characters allowed in the corresponding domain name. A valid hostname is also a valid domain name, but a valid domain name may not necessarily be valid as a hostname.

Technical requirements and process

In the process of registering a domain name and maintaining authority over the new name space created, registrars use several key pieces of information connected with a domain:

- *Administrative contact*. A registrant usually designates an administrative contact to manage the domain name. The administrative contact usually has the highest level of control over a domain. Management functions delegated to the administrative contacts may include management of all business information, such as name of record, postal address, and contact information of the official registrant of the domain and the obligation to conform to the requirements of the domain registry in order to retain the right to use a domain name. Furthermore, the administrative contact installs additional contact information for technical and billing functions.

- *Technical contact*. The technical contact manages the name servers of a domain name. The functions of a technical contact include assuring conformance of the configurations of the domain name with the requirements of the domain registry, maintaining the domain zone records, and providing continuous functionality of the name servers (that leads to the accessibility of the domain name).

- *Billing contact*. The party responsible for receiving billing invoices from the domain name registrar and paying applicable fees.

- *Name servers*. Most registrars provide two or more name servers as part of the registration service. However, a registrant may specify its own authoritative name servers to host a domain's resource records. The registrar's policies govern the number of servers and the type of server information required. Some providers require a hostname and the corresponding IP address or just the hostname, which must be resolvable either in the new domain, or exist elsewhere. Based on traditional requirements (RFC 1034), typically a minimum of two servers is required.

A domain name consists of one or more labels, each of which is formed from the set of ASCII letters, digits, and hyphens (a-z, A-Z, 0–9, -), but not starting or ending with a hyphen. The labels are case-insensitive; for example, 'label' is equivalent to 'Label' or 'LABEL'. In the textual representation of a domain name, the labels are separated by a full stop (period).

Resale of domain names

Main article: List of most expensive domain names

The business of resale of registered domain names is known as the domain aftermarket. Various factors influence the perceived value or market value of a domain name. Most of the high-prize domain sales are carried out privately.

Domain name confusion

Intercapping is often used to emphasize the meaning of a domain name, because DNS names are not case-sensitive. Some names may be misinterpreted in certain uses of capitalization. For example: *Who Represents*, a database of artists and agents, chose *whorepresents.com*,[25] which can be misread. In such situations, the proper meaning may be clarified by placement of hyphens when registering a domain name. For instance, Experts Exchange, a programmers' discussion site, used *expertsexchange.com*, but changed its domain name to *experts-exchange.com*.[26]

Use in web site hosting

The domain name is a component of a uniform resource locator (URL) used to access web sites, for example:

- URL: http://www.example.net/index.html

- Top-level domain: net

- Second-level domain: example

- Hostname: www

A domain name may point to multiple IP addresses to provide server redundancy for the services offered, a feature that is used to manage the traffic of large, popular web sites.

Web hosting services, on the other hand, run servers that are typically assigned only one or a few addresses while serving websites for many domains, a technique referred to as virtual web hosting. Such IP address overloading requires that each request identifies the domain name being referenced, for instance by using the HTTP request header field *Host:*, or Server Name Indication.