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УСТИНОВ В. И., БУТУСОВ Ф. В., РУПП А. А.
**Fundamentals of the modern theory of domain names in the
works of foreign researchers**

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Domain names are an important part of WWW that eases the process of surfing the Internet by normal users. The DNS is a complex system running behind the scenes that makes it simple to find target host by its domain name. The topics of this article will range from defining domain names themselves to providing detailed information on how networking with the domain names actually works.

Keywords: Domain names, DNS, network infrastructure, WWW, internet, TLD, networking.

Introduction

During the 1950s and 1960s, researchers working in laboratories undertook the challenge of networking computers to facilitate the exchange of information. During these early years, the connections between computers were known, users were trusted, and computer viruses yet to be invented. These researchers had no reason to emphasize security. They designed the system «to be collaborative, rapidly expandable, and easily adaptable to technological innovation. Information flow took precedence over content integrity; identifying authentication was less important than connectivity.»

Instead of security, the protocols used during these early years of cyber development emphasized speed and adaptability within local area networks. As more individual computer networks emerged, researchers developed standardized protocols to allow the exchange of data between formerly disconnected systems. These standardized protocols also emphasized speed and adaptability over security.

The domain's intentional lack of security is a useful characteristic when viewed from the perspective of its effect on modern society. The ability to access cyberspace freely allows the proliferation of interconnected devices, revolutionizing the movement of data and changing modern life. The unfortunate side effect of this open characteristic is that no agency or group brings order the domain's development. No «one agency, either nationally or multilateral, exerts authority over all parts of the web.»

Further, with the development of networks and their globalization, the World Wide Web was created (in 1989, a project called the «World Wide Web» was approved and implemented. The founder of this project was Timothy John Berners-Lee originally from the UK.

In the fall of 1990, CERN employees received the first «web server» and «web browser», written by Mr. Berners-Lee himself in the NeXTSTEP environment. In the summer of '91, the WWW project, which conquered the scientific world of Europe, crossed the ocean and joined the American Internet.

Work on the project lasted from 1991 to 1993: the developers collected user reviews and based on them carried out the revision of the World Wide Web. In particular, the first versions of the URL protocols (as a special case of the URI identifier), HTTP and HTML were already proposed at that time. The first hypertext-based web browser, the World Wide Web, and the WYSIWYG editor were also introduced.

One of the key properties of WWW has always been the decentralization of nodes. Like the progenitors of the Internet (ARPANET and NSFNet networks), it ensured reliable operation, the absence of geographical boundaries and political barriers.

Since the web began its rapid development in 1991, it has been gradually changing, losing its main features. The root DNS servers were concentrated in the United States, which made the Network more vulnerable.

In the concept of web technologies, there is such a thing as a domain name. A domain name is a unique name that is «understandable to the reader» and linked to a specific website. For example, google.com is a domain name owned by Google Incorporated and is a name used to connect to this website by an ordinary user without knowing its IP address.

When trying to connect to a site by its domain name, our browser sends a request to the DNS server. It contains a list of matches between the names and IP addresses of the website servers.

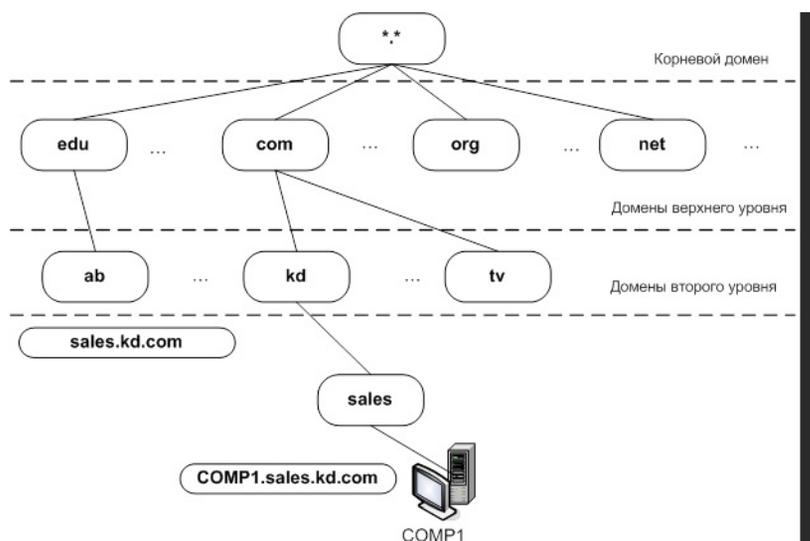
On picture 1, you can see an example of converting a domain name to an IP address.

```
Ravus Rintaro>ping google.com
Обмен пакетами с google.com [74.125.205.139] с 32 байтами данных:
Ответ от 74.125.205.139: число байт=32 время=59мс TTL=102
Ответ от 74.125.205.139: число байт=32 время=45мс TTL=102
Ответ от 74.125.205.139: число байт=32 время=46мс TTL=102
Ответ от 74.125.205.139: число байт=32 время=69мс TTL=102

Статистика Ping для 74.125.205.139:
  Пакетов: отправлено = 4, получено = 4, потеряно = 0
  (0% потерь)
Приблизительное время приема-передачи в мс:
  Минимальное = 45мсек, Максимальное = 69 мсек, Среднее = 54 мсек
Ravus Rintaro>_
```

Picture 1. An example of converting a domain name to an IP address

Domain Names
Top-Level Domain



Picture 2. Domain hierarchy

A top-level domain, or TLD, is the most common part of a domain. The top – level domain is the farthest part on the right (separated by a dot). Common top-level domains are «com», «net», «org», «gov», «edu» and «io».

Top-level domains are at the top of the hierarchy in terms of domain names. To some parties of ICANN (Internet Corporation for Assigned Names and Numbers – Internet Corporation for Assigned Names and Numbers) administrative control over top-level domains is provided. These parties can then distribute domain names within the TLD, usually through a domain registrar.

Top-level domains are categorized into multiple groups by their purpose and presence of special eligibility requirements to buy one.

1.2 Hosts

Within a domain, its owner can define individual nodes that relate to individual computers or services accessible through the domain. For example, most domain owners make their web servers accessible through a bare domain (example.com), as well as through a host set as «www» (www.example.com).

You can have other hosts installed in the shared domain. You can access the API through the «api» host (api.example.com) or get ftp access by defining a host named «ftp» or «files» (ftp.example.com or files.example.com). Hostnames can be arbitrary if they are unique to the domain.

SubDomain

Subdomains are associated with hosts. DNS works in a hierarchy. Top-level domains can have many domains. For example, in the domain «com» there are both "google.com», and "ubuntu.com». The term «subdomain» refers to any domain that is part of a larger domain. In this case "ubuntu.com" can be called a subdomain of «com». This is usually called a domain, or the «Ubuntu» part is called SLD, which means the second level domain.

Similarly, each domain can manage subdomains of the following levels (third, fourth, etc.) that are located under it. This is what we mean by subdomains. For example, you may have a subdomain for your school's history department at "www.history.school.edu». The «history» part is a subdomain.

The difference between a hostname and a subdomain is that the host defines a computer or resource, while the subdomain extends the parent domain. This is a method of separating the domain itself.

When talking about subdomains or hosts, you can start to see that the leftmost parts of the domain are the most specific. DNS also works the same way: if you look from left to right, then from the most specific to the least specific.

1.4 Fully Qualified Domain Name

«Fully qualified domain name», sometimes abbreviated to «full domain name» is what we call an absolute domain name. Domains in the DNS system can be set relative to each other, and, as such, can be somewhat ambiguous. A fully qualified domain name is an absolute name that indicates its location in relation to the absolute root of the domain name system.

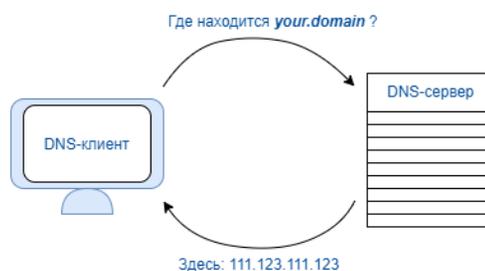
This means that it specifies every parent domain, including the TLD. The correct fully qualified domain name ends with a dot indicating the root of the DNS hierarchy. An example of a fully qualified domain name is "mail.google.com7.». Sometimes software that requests a fully qualified domain name does not require an endpoint, but the endpoint must comply with ICANN standards.

2. The DNS

2.1 Name Server

A name server is a computer designed to translate domain names into IP addresses. These servers do most of the work in the DNS system. Since the total number of domain transfers is too large for any one server, each server can redirect the request to other name servers or delegate responsibility for a subset of subdomains for which they are responsible.

Name servers can be «authoritative», which means that they provide answers to queries about domains under their control. Otherwise, they may point to other servers or serve cached copies of data from other nameservers.



Picture 3. Connection between DNS client and DNS server showing how domain name translates to IP address

2.2 Zone File

A zone file is a simple text file that contains mappings between domain names and IP addresses. Ultimately, this is how the DNS system finds out which IP address should be returned in the response when a user requests a specific domain name.

Zone files are located on name servers and, as a rule, determine the resources available in a particular domain, or the place where you can get this information.

2.3 Records

Records are stored inside the zone file. In its simplest form, a record is, in fact, one mapping between a resource and a name. They can map a domain name to an IP address, identify name servers for a domain, identify mail servers for a domain, etc.

2.4 How does DNS work?

Now that you are familiar with some terminology related to DNS, it's time to answer the question: how does the DNS system actually work?

The system is very simple in a high-level overview, but very complicated when you look at the details. In general, this very reliable infrastructure was necessary for the adoption of the Internet, as we know it today.

2.5 Root Servers

As we already said above, DNS is inherently a hierarchical system. At the top of this system are the so-called «root servers». These servers are controlled by various organizations and delegated authorities from ICANN (Internet Corporation for Assigned Names and Numbers).

There are currently 13 root servers running. However, since there are an incredible number of names that are being requested every minute, each of these servers actually has multiple mirrors. An interesting feature of this setup is that each of the mirrors for the same root server has the same IP address. When requests are made for a specific root server, the request will be routed to the nearest mirror of that root server.

What do these root servers do? Root servers process requests for information about top-level domains. Therefore, if a request is received about something that the lower-level name server cannot process, a request is made to the root server of this domain.

The root servers do not really know where the domain is located. However, they will be able to direct the requester to the name servers that handle the requested top-level domain in this case.

Thus, if the request to "www.sus.ru" will be sent to the root server, the root server will not find the result in its records. It will check the files of his zone for a list that matches "www.sus.ru», but will not find any.

Instead, it will find an entry for the «ru» TLD and give the requesting organization the address of the name server responsible for the «ru» addresses.

2.6 TLD-servers

The requesting party then sends a new request to the IP address (provided to it by the root server) of the TLD server that is responsible for the top-level domain for this request.

Therefore, to continue our example, it would send a request to the name server responsible for storing information about «ru» to find out if he knows where "www.sus.ru" is located.

The TLD DNS server will also search for "www.sus.ru" in its zone files, but will not find this entry in its files.

However, it will find a record indicating the IP address of the name server responsible for "sus.ru». At this point, we are getting much closer to the answer we need.

2.7 Domain-level name servers

At this stage, the requesting party has the IP address of the name server, which is responsible for knowing the actual IP address of the resource. It sends a new request to the name server, asking again if it can resolve (convert to IP) "www.sus.ru».

The name server checks its zone files and finds that it has a zone file associated with "sus.ru». Inside this file, there is an entry for the host «www». This entry tells the IP address where this host is located. The name server returns the final response to the requester.

Conclusion

In conclusion, we can say that the DNS is a very complicated system that lets the Internet run behind the scenes. For the actual end-user, it is not important to know how it works, but for people that want to assemble their own server and a website it is very useful to know. Anyone can buy their own domain names and use them for their server to host a website. Of course, there are limits to what kind of TLD's you can take. For example, there are domains only available for government organizations or businesses (.gov or .biz). One has to verify their eligibility to claim a domain name with this kind of TLDs.

References:

1. Введение в DNS терминологию, компоненты и концепции URL: <https://hackware.ru/?p=9336> (Дата обращения: 27.03.2022)
2. Что такое DNS? Введение в систему доменных имён URL: <https://tproger.ru/explain/domain-name-system/> (Дата обращения: 27.03.2022)
3. Types of Domain Names: A Helpful Guide URL: <https://www.domain.com/blog/domain-name-types/> (Дата обращения: 27.03.2022)
4. What is a domain name? | Domain name vs. URL URL: <https://www.cloudflare.com/learning/dns/glossary/what-is-a-domain-name/> (Дата обращения: 27.03.2022)
5. Traveling Domain Theory: A Comparative Approach for Cyberspace Theory Development Автор: Thomas David McCarthy (Дата обращения: 27.03.2022)