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WHAT HAPPENS WHEN A USER ENTERS A WEB ADDRESS INTO A BROWSER

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Анотація

У статті дано спрощену відповідь на вікове питання на інтерв'ю для розробників: "Що відбудеться, коли ви введете google.com в адресне поле свого браущера і натиснете enter?"

Ключові слова: WEB, Інтернет, протоколи передачі даних, мережі, браузер.

Abstract

The article gives a basic answer to the age-old interview question for developers: "What happens when you type google.com into your browser's address box and press enter?"

Keywords: WEB, the Internet, data transfer protocols, networks, browser.

Nowadays, everyone uses the Internet and it's not a secret that the Internet network is a vast network that connects computers all over the world. We are users, the tool we use to request information is a client. The requests are answered by a server. There are many steps in this process, so let us look under the hood. Note: the described information has been deliberately simplified because modern technologies are more complicated than we think but this brief outlook gives a short overview for a basic understanding of how WEB-sites work.

To begin with, let us consider an example: a user opened any browser and typed "google.com" into the URL address field. The user cannot open any website without a URL - Uniform Resource Locator because the browser parses the following information contained in the URL: protocol and resource path. When no protocol or valid domain name is given, the browser proceeds to feed the text given in the address box to the browser's default web search engine [1].

When you hit the Enter button, the browser checks if the domain is in its cache; if not found, the browser calls the function to do the lookup and the DNS comes into action. It translates our human-readable hostname to its corresponding computer-friendly IP address to serve the requested content. An Internet Protocol address is a suite of four numbers, each one in a range from 0 to 255, separated by dots. It is possible to use an IP address directly instead of a hostname but the reason why this is not common is that as humans we remember better words than numbers. So, in my location, the IP for the address "google.com" is 142.250.203.142.

IP is not the only type of protocol used on the Internet. The Internet Protocol Suite is often referred to as TCP/IP (Transmission Control Protocol), and it also contains other types of protocols. In TCP/IP, the connection is built between two hosts (the client and the server) using a process called a TCP 3-way handshake. A client sends an SYN message, if a server is open for a new connection, it responds with an acknowledging message and with a SYN message as well. After this, the client receives the message and acknowledges it by sending an ACK message, which is received by the server, and the TCP socket connection is established.

A connection may be denied with a firewall designed to restrict incoming and outgoing traffic based on a set of security rules defined by the user. A list of IP addresses is verified before establishing any connection, if the IP address you are trying to reach is on the list, then the connection is blocked and it will not be able to exchange data over the network [2].

TCP/IP protocol includes HTTP and HTTPS. HTTPS stands for HyperText Transfer Protocol (Secure). This transfer protocol defines different types of requests such as GET, POST, PUT, etc. and responses served to clients and servers over the network. The HTTPS traffic is encrypted to ensure users that their data can’t be stolen or seen by third parties. We take advantage of this whenever we shop online or file taxes [3].

Each server has an operating system (usually Linux), Web Server software (usually Apache), a database, and Application Server software or scripting for the codebase. Once the server supplies the resources

(HTML, CSS, JS, images, etc.) to the browser, it undergoes the following process: parsing - HTML, CSS, JS and rendering - Construct DOM Tree → Render Tree → Layout of Render Tree → Painting the render tree. After rendering has been completed, the browser executes JavaScript code. Page scripts can cause additional network requests to be performed, as well as modify the page or its layout, causing another round of page rendering and painting [1].

As it has noted at the beginning, it is a deliberately simplified description of real-life processes. Nowadays, the Internet continues growing, networks become increasingly complicated and complex processes run under the hood so that user doesn't even realize what just happened. But keep in mind, that all this stuff was developed in more than one day. An old proverb states that a journey of a thousand miles begins with a single step. January 1, 1983, is considered the official birthday of the Internet and the establishment of a new communications protocol called TCP/IP.

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