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INTRODUCTION

This Proceedings comprises papers from the International conference on Information technology and development of education that is held on line on November 25th 2022. The International conference on Information technology and development of education has had a goal to contribute to the development of education in Serbia and in the region, as well as, to gather experts in natural and technical sciences' teaching fields. The expected scientific-skilled analysis of the accomplishment in the field of the contemporary information and communication technologies, as well as analysis of state, needs and tendencies in education all around the world and in our country have been realized. The authors and the participants of the Conference have dealt with the following thematic areas: - Theoretical and methodological questions of contemporary pedagogy - Personalization and learning styles - Social networks and their influence on education - Children security and safety on the Internet - Curriculum of contemporary teaching - Methodical questions of natural and technical sciences subject teaching - Lifelong learning and teachers' professional training - E-learning - Education management - Development and influence of IT on teaching - Information communication infrastructure in teaching process All submitted papers have been reviewed.

The papers presented on the Conference and published in this Proceedings can be useful for teacher while learning and teaching in the fields of IT, informatics, technics and other teaching subjects and activities. At the end of the conference, and based on the papers of our participants, we conclude that the main focus points of this moment in education. Contribution to science and teaching development in this region and wider has been achieved in this way.

The ITRO Organizing Committee would like to thank the authors of papers, reviewers and participants in the Conference who have contributed to its tradition and successful realization.

Chairman of the Organizing Committee
Ph.D Dragana Glušac

IN MEMORIAM PROFESSOR DIJANA KARUOVIĆ
1978-2022.

We especially want to pay tribute to our late colleague professor Dijana Karuović PhD, as one of the founders of the ITRO conference.

To all of us who knew her, professor Dijana Karuović will be a symbol of professional attitude towards work, dedication and loyalty to the institution to which she belonged. Behind HER remain her wonderful children, her many scientific works, her goodness and her love.

We are grateful to have known her.

Also, we will always remember our dear colleague professor Ivan Tasić, PhD, who passed away in 2019.

Our team thus suffered an irreparable loss, and their names will forever remain on the pages of the conference proceedings.

Professor Dijana Karuović and professor Ivan Tasić

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Apache HTTP Server as Forward Proxy Server

M. Kocaleva Vitanova, B. Zlatanovska, E. Karamazova Gelova, A. Stojanova Ilievska and M. Miteva

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Abstract - A server is a specialized computer for running utility software. If we want to protect our data while using Internet, we use a proxy server. In this paper we will talking about proxy server, types of proxy servers and at the end about Apache http serves as forward proxy server. Apache can be also used as reverse proxy server, but that will be discussed in some next paper.

I. INTRODUCTION

When talking about what a server is, it can be stated from two points of view. In the first place, when talking about a physical machine that contains information or data that is needed to solve a situation; and as a second point, the program that resides in a computer, either through hardware or software, is mentioned.

A server is a specialized computer (workstation) for running utility software. Its job is to perform a series of appropriate program services that usually determine the purpose of a given device.

Translated from English, the word "serve" means - "to serve". Based on this, we can think of the server as a kind of large office computer. It is worth noting that, server also refers to the hardware of a regular computer. That is, "charging" a computer, without a mouse, monitor and keyboard.

There is also such a thing as a web server - special software. However, in any circumstances, be it a utility computer or utility software, the utility runs autonomously, without human intervention.

From the outside, a server can look exactly like a system unit. Such units are often found in offices to perform various office tasks (printing, data processing, file storage, etc.)

It is important to note that the size of the server (block) directly depends on the tasks assigned to it. For example, a site with a lot of traffic requires a powerful server, otherwise it simply will not withstand the load. Based on this, the size of the server can be increased tens or even hundreds of times.

Any response offered by the server through the software is available to the user based on his utility. All this relationship remains on the web permanently, so that all users of electronic messages, cyber sites or web browsers can access it without difficulty according to their needs.

With this boom in technology and the virtual world, the emergence of servers was essential, which can be useful to be able to store and present a gallery of data and information in an infinite way. In some cases that can be in the virtual space, where you can consider an internet server, such as any computer at home or even at office, that are structured to stay on 24 hours a day, all year round.

More simply, when you turn on your computer and you can navigate through multiple sites like Opera, Chrome Edge, Firefox and others on the same computer, you are running multiple programs at the same time, that is what is meant by running several virtual programs at the same time; to be able to collect data requested by users or customers over the web through the existing HTTP (Hypertext Transfer Protocol) protocol.

II. PROXY SERVER

Every Internet user should protect their privacy and data. We all want to keep personal information safe and the internal network safe from dangers and unwanted attacks. That's why so many people use proxy servers.

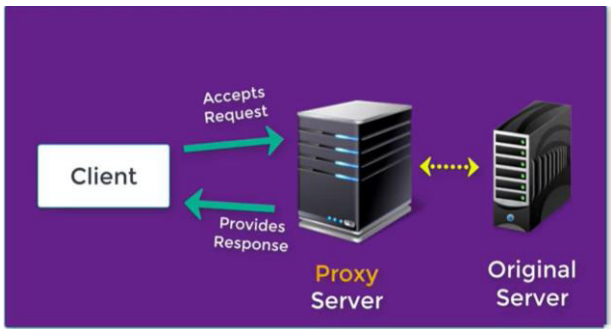

Figure I. Proxy server (accepts request and provides response)

Each request from a personal computer represents a submission of our data to return the correct information. The request always comes to an intermediary - a complex of computer programs that processes the request and sends the client to the address. Access to network resources is not possible directly from the client-server system, but an intermediary connection is required. So, Proxy is an intermediary between the client - computer and the internet systems - servers.

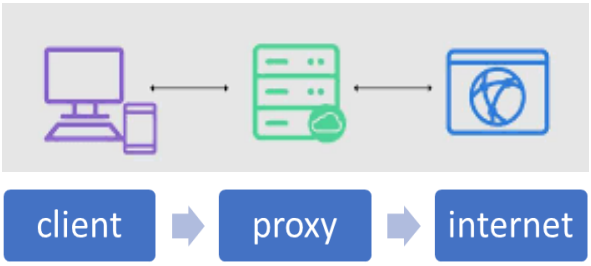

Figure II. How proxy server works

A proxy server is basically a computer connected to the Internet that is equipped with its own IP address. Instead of the user connecting directly to the intended website, the user sends their request to a proxy server that evaluates the request and then completes the request. Proxies function as a method to simplify or manage complex requests and provide an additional layer of security, privacy, and encapsulation structure. Proxies have the potential to mask the identity of the requester from the recourse server.

Hardware proxies are located somewhere between our network and the internet where they receive, evaluate, send, and forward requests. Software proxies are usually provider-hosted or exist in the cloud. Software proxies can be installed sometimes for free or for a fee.

A proxy makes networking much easier and provides anonymity to the client browser. Proxy helps to get around IP blocking, visit restricted site, search internet site in accelerated mode. The basic concepts of the proxy server principle bring user skills to a new level. Before a proxy server can be used, it must first be configured correctly.

III. TYPES OF PROXY SERVERS

There are several types of proxy servers. Some of them are briefly described in the following text.

Forward proxy

• This type of proxy is used to transfer data to groups of users in an internal network. When a request is sent by the sender, the proxy server evaluates the data to decide whether it should proceed and establish a connection.

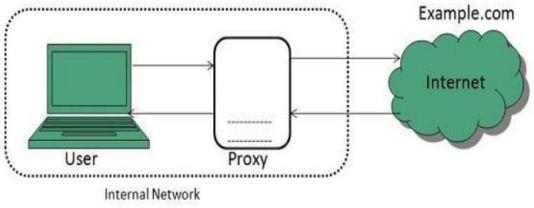

Figure III. Forward proxy

Public proxy

• Public proxies are available to anyone and work by providing their users with their IP address to hide their identity. This proxy, while cheap and readily available, leaves users more at risk of having their data breached.

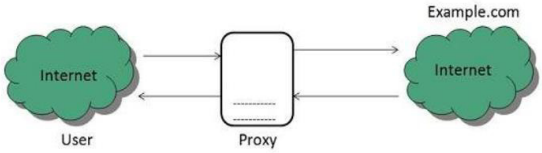

Figure IV. Public proxy

Residential proxy

• This proxy gives the user an IP address that can be traced to a specific physical device where all requests are evaluated and redirected.

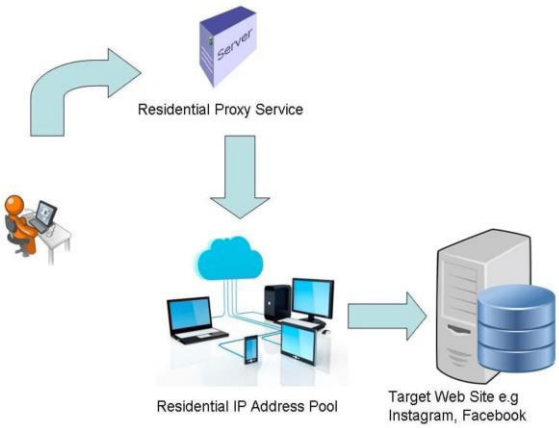

Figure V. Residential proxy

Shared proxy

• This proxy allows multiple users to engage with this proxy at the same time, providing users with a shared IP address.

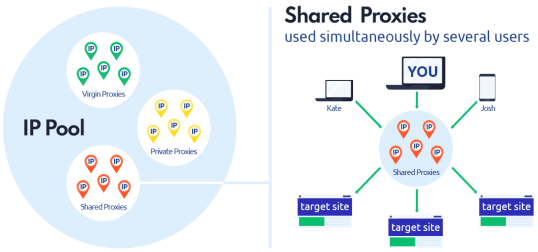

Figure VI. Shared proxy

Anonymous proxy

• Anonymous proxy servers aim to mask internet activity by evaluating a user's request while hiding their identity.

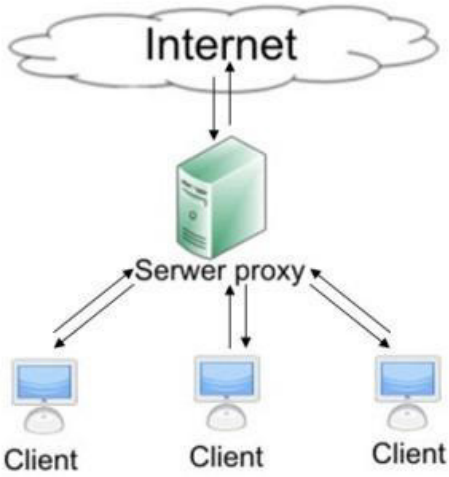

Figure VII. Anonymous proxy

High anonymity proxy

• This proxy is basically an anonymous proxy that takes an extra step to hide the identity of the user. This is done by deleting the user's information before the proxy attempts to connect to the target site.

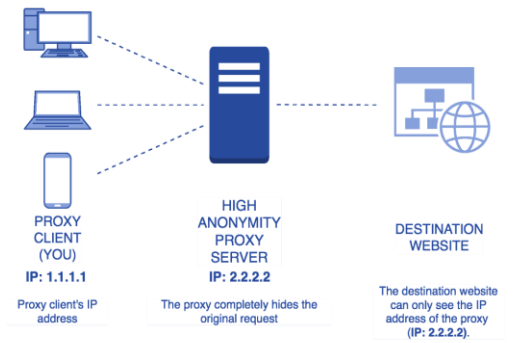

Figure VIII. High anonymity proxy

Transparent proxy

• Transparent proxies can be used to remain hidden from those to whom it is applied. This type of proxy is useful for organizations that want to implement a proxy without making the employee aware that they are using it. Transparent proxies are more vulnerable to specific security threats such as SYN attacks.

• SYN is a form of denial-of-service attack in which an attacker quickly initiates a connection to a server without finalizing the connection. The server must spend resources waiting for half-open connections, which can consume enough resources to make the system unresponsive to legitimate traffic.

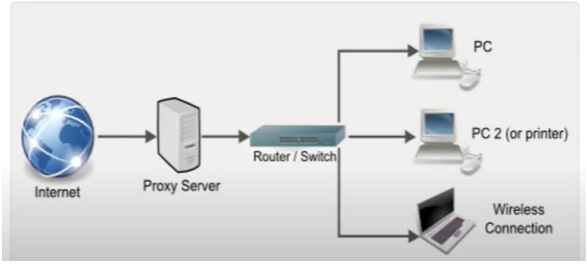

Figure IX. Transparent proxy

Data center proxy

• This proxy server may be physically located in a data center where user requests are evaluated and routed. It is not connected to an internet server, but a separate organization through the data center.

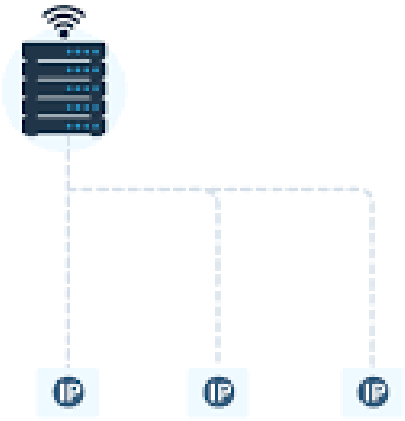

Figure X. Data center proxy

Rotating proxy

• Rotating proxies assign a different IP address to their users, an address that is different from the device that was previously connected to it.

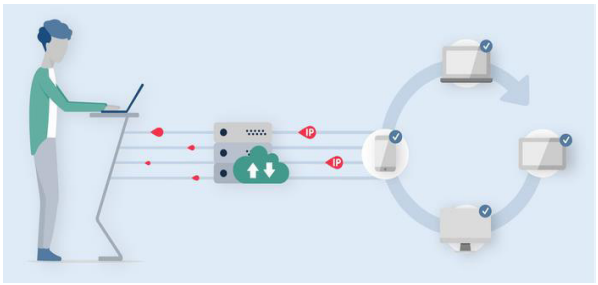

Figure XI. Rotating proxy

Reverse Proxy

• Instead of being placed "in front" of users, a reverse proxy is fixed in front of web servers that evaluate and route requests from the browser to the web server. A proxy server receives requests from the user at the network edge of the web server and then redirects the request received from the original server.

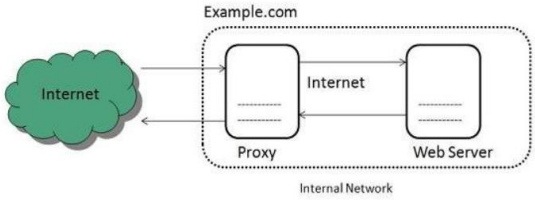

Figure XII. Reverse Proxy

SSL proxy

• SSL Proxy (Secure Sockets Layer) encrypts data sent back and forth on both sides, providing enhanced protection. These proxies are the better option for organizations to have for further security.

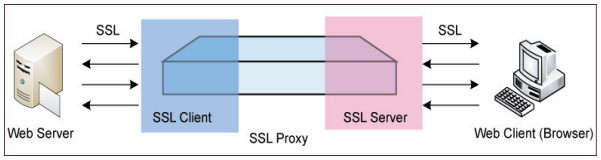

Figure XIII. SSL proxy

TOR proxy

• This proxy routes data through various globally available networks to mask the user's address. Data is encrypted in multiple layers to further protect privacy and when the data reaches its destination, each layer is decrypted to reveal the original data.

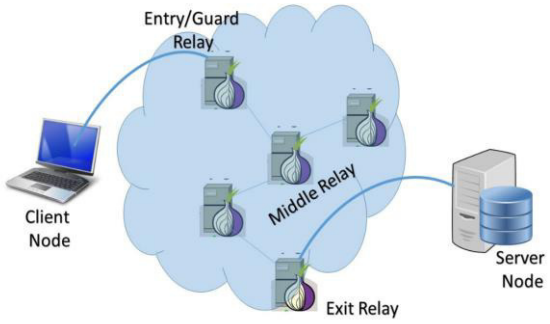

Figure XIV. TOR proxy

I2P proxy

• Like TOR proxy but improved.

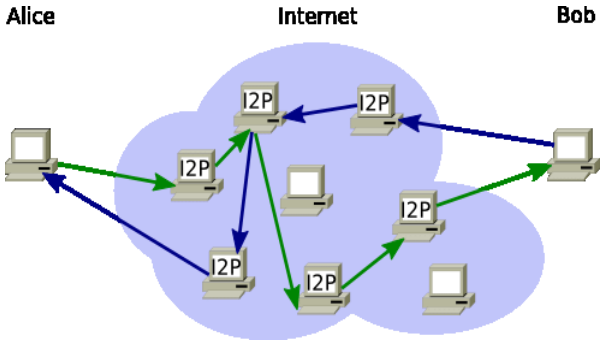

Figure XV. I2P proxy

Web Proxy Server

• This type of proxy forwards HTTP requests. This request is the same as HTTP requests; only URL is passed instead of path. A request is sent to which the proxy server responds. Examples of such proxies are Apache, HAPProxy.

• Proxy client-server autoconfiguration protocol solves the problem of multiple proxy servers.

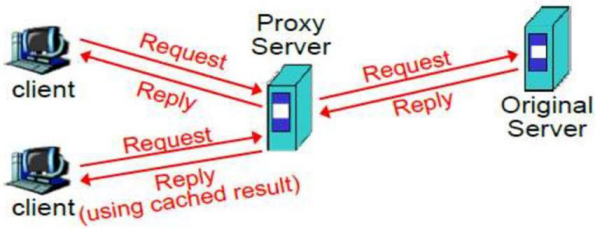

Figure XVI. Web Proxy Server

DNS Proxy

• Unlike other proxies, this type of proxy receives requests in the form of DNS requests and forwards them to the domain server, where they can also be cached, and the flow of requests can also be redirected.

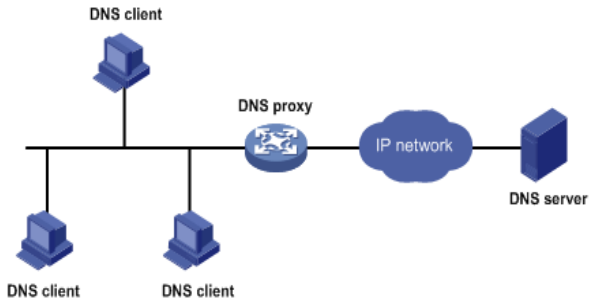

Figure XVII. DNS Proxy

CGI (Common Gateway Interface) Proxy

• This type of proxy is developed to make web pages more accessible. It works by accepting requests for targeting URLs using a web form, processing them, and returning the result to the web browser. It's less popular because of VPN and other privacy policies, but it still gets a lot of requests. Its use is reduced due to the excessive traffic that can be caused to the website after local filtration has passed, leading to collateral damage to the organization.

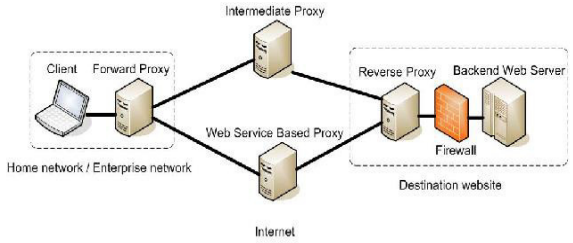

Figure XVIII. CGI (Common Gateway Interface) Proxy

IV. APACHE HTTP SERVER AS FORWARD PROXY SERVER

Apache Friends is a non-profit project to promote the Apache web server and is home to the XAMPP project. XAMPP is an easy-to-install Apache distribution that includes MariaDB, PHP, and Perl. The goal of XAMPP is to build an easy-to-install distribution for developers to enter the world of Apache. To make it convenient for developers, XAMPP is configured with all features included. Currently XAMPP has distributions for Windows, Linux, and OS X. To set up Apache as a proxy server first on our computer we need to have XAMPP installed.

We download XAMPP from the official website and install the .exe file. After successful installation, we open the control panel and configure the Apache server to function as a proxy server.

From the Apache control panel, select Config and open the Apache (httpd.conf) file (Figure 19).

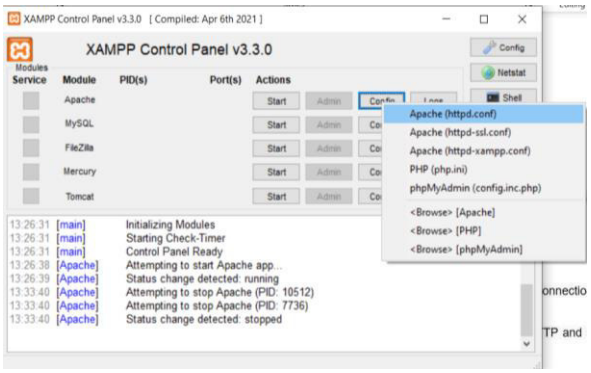

Figure XIX. XAMPP control panel

The file consists of several modules, some of which are enabled and others not. Our task is to enable the necessary modules in this file so that it functions as a proxy server. These are mainly the modules that contain the keyword proxy, but also several other basic modules. We enable modules by deleting the # sign in front of them. The necessary modules that we provide are the following:

- mod_proxy: The main proxy module for Apache that manages connections and redirects them.
- mod_proxy_http: This module implements the proxy features for HTTP and HTTPS protocols.
- mod_proxy_ftp: This module does the same but for FTP protocol.
- mod_proxy_connect: This one is used for SSL tunnelling.
- mod_proxy_ajp: Used for working with the AJP protocol.
- mod_proxy_wstunnel: Used for working with web-sockets (i.e. WS and WSS).
- mod_proxy_balancer: Used for clustering and load-balancing.
- mod_cache: Used for caching.
- mod_headers: Used for managing HTTP headers.
- mod_deflate: Used for compression.
- mod_lbmethod_byrequests: User for load balancer

After enabling the above-mentioned modules, we save the file. Then we go to the beginning of config and select browse Apache to make a few more configuration changes (Figure 20).

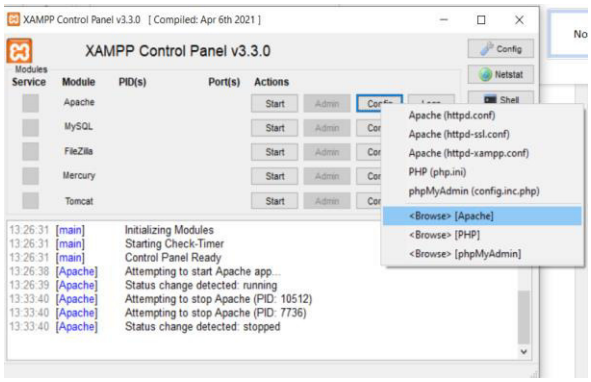

Figure XX. Control panel with selected browse Apache

Here we go to the configuration file (conf), extra and open the file httpd_vhosts.conf (Figure 21). At the end of this file, we will add 2 more virtual host configurations ProxyRequests on and ProxyVia on. We save the file and start the server.

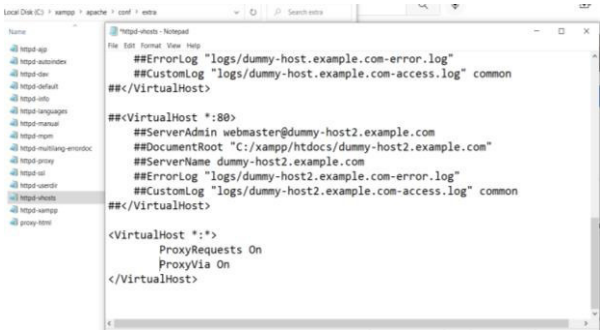

Figure XXI. httpd_vhosts.conf file

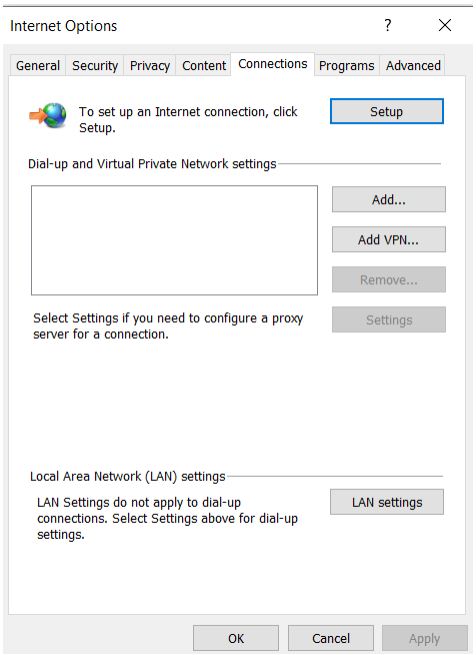

Figure XXII. LAN (Local Area Network) settings

Then open the Internet Explorer browser and select Settings from the upper right corner. From the settings, we select its Internet options (Figure 22). It offers several Internet options (General, Security, Privacy, Content, Connections, Programs and Advanced). From the options offered, we select the section with Connections and from there the local LAN (Local Area Network) settings. To use the browser as a proxy, we first check the box Use a proxy server for your LAN and in the address field we enter localhost and port 80 because Apache runs on port 80 as localhost. We choose ok and finish the settings (Figure 23).

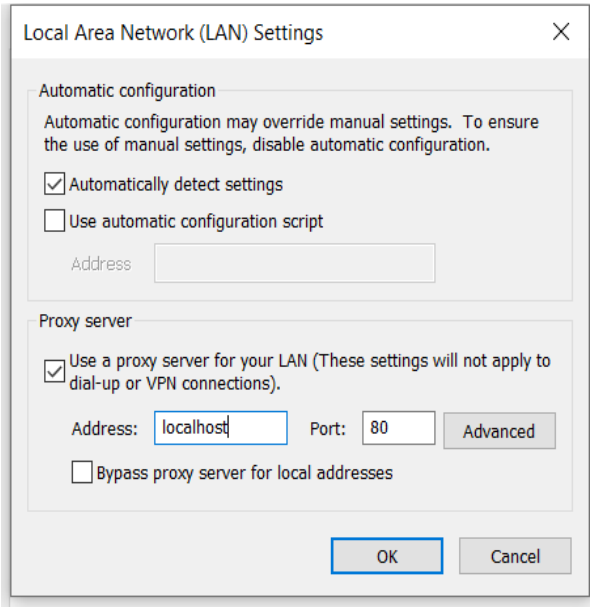

Figure XXIII. Proxy settings

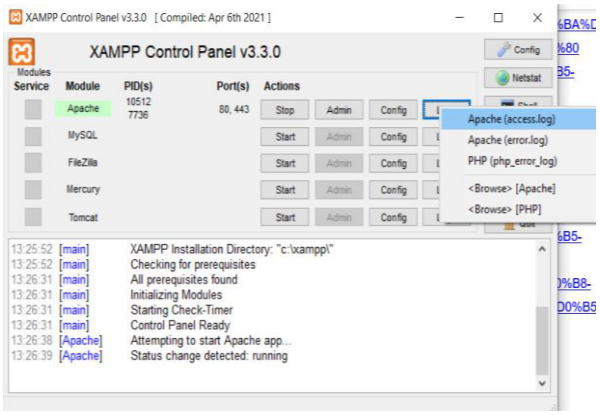

Figure XXIV. Apache (access.log)

Then we open any browser and randomly open several web pages and go to Logs in the XAMPP control panel. Here we open Apache (access.log) (Figure 24) and can see that there are no logs (Figure 25). It means that the settings are fine and the server is working as a proxy server.

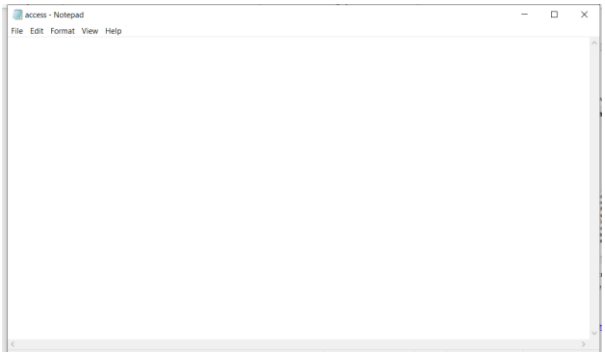

Figure XXV. access.log file

V. CONCLUSION

Proxies help with different types of anonymity needed at different levels, either as a client or as a service provider. They help to counter the information security of different users as well as the internal network. Different types of proxies are available, which follow different routing protocols and serve different purposes at different levels of anonymity.

Proxy servers act as a firewall and web filter, providing shared network connections and data caching to speed up common requests. A good proxy server protects users and the internal network from the bad things that live in the wild internet. Finally, proxy servers can provide a high level of privacy.

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