

Website Interface Monitoring Client Activities Using Mikrotik on Ubuntu Server 18.04 LTS

Lalu A. Syamsul Irfan Akbar¹, Rayasa Puringgar Prasadha Putra¹, Suthami Ariessaputra¹

¹ Department of Electrical Engineering Faculty of Engineering University of Mataram, Indonesia

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ABSTRACT

Internet network is beneficial to be able to support the needs of the learning process. However, a large number of internet users, for example, who access university data, can cause weaknesses in a system, making it very vulnerable to data theft, damage, and leakage of confidential documents. The obstacle faced is that the internet is getting slower due to many users using the internet network and not knowing the amount of bandwidth usage. A system is needed to determine the bandwidth usage for each client. This system to simplify the process of monitoring the internet network. It can view client browsing history and block website domains so that internet users in the world of education have positive characteristics and the internet is not slow. In this system, the admin will monitor the use of internet clients connected to the campus environment through the user name and password obtained for each student. The results of this research are the creation of an internet monitoring system for a proxy to monitor the maximum amount of bandwidth usage for each client, view the client's browsing history, and block website domains and client IPs. The admin can observe the internet network and monitor client activity that uses the internet network in the campus environment using the monitoring application.

Corresponding Author:

Suthami Ariessaputra, Department of Electrical Engineering Faculty of Engineering University of Mataram
Jl. Majapahit 62, Mataram, Lombok NTB, INDONESIA
Email: suthami@unram.ac.id

1. INTRODUCTION

Modernization that is currently happening goes hand in hand with the rapid development of technology, one of which is the development of applied technology. The development of applied technology is expected to contribute a lot to improving the quality of education [1]. The use of technology in education has the potential to increase the productivity of resources supporting educational activities. One of the most influential technologies in the world of education is the internet network [2]. The internet network is very useful for meeting the needs of the learning process in the university environment by providing internet services so that visitors and university students can use it. However, the large number of internet users who access data at universities can cause weaknesses in a system, which is very vulnerable to theft, damage, and leakage of confidential documents [3]. The obstacle that many admins face is not knowing the activities of clients who are connected to the internet, and the internet is slow because the amount of bandwidth used by clients varies greatly. As a result, the admin does not know the amount of bandwidth used on each client [4].

Optimizing hotspot network performance and maximizing bandwidth on hotspot networks using the Mikrotik Router OS which was carried [5]. Then further research explained about implementing a Mikrotik router OS installed on a computer that is used to manage bandwidth management and web filtering that has been implemented in cafes so that the features that have been implemented are direct testing of end-users [6]. In addition, there is also research regarding Mikrotik-Based Scheduling System Time, which is a system that blocks certain sites during working hours automatically, blocking is done in the morning until late in the evening, system block access with Mikrotik Router Board to block sites like Facebook, YouTube, and

Twitter [7][8]. Searching for information through search engines like Google and Yahoo is a daily human need. The website helps users and admins in finding the data needed in a fast time [9].

Based on this, the researcher created a website interface to find out client activity or browsing history. In addition, the internet network on each client has a different bandwidth usage. So that the admin cannot know how much bandwidth usage is. In order to make it easier for the admin to make observations on the internet network so that this application can also block client IPs, as well as block urls visited by clients. This is also useful for smoothing the internet network so that it is not slow and can also maintain the security of the client's internet network.

2. METHOD

Monitoring client activity is carried out to find client internet browsing activity to block IPs or URLs and find the bandwidth needed by each client. This process uses a proxy to find client activity obtained by rsyslog on the Ubuntu server to store client data. The Flow Chart of Research Stages can be seen in **Fig. 1**.

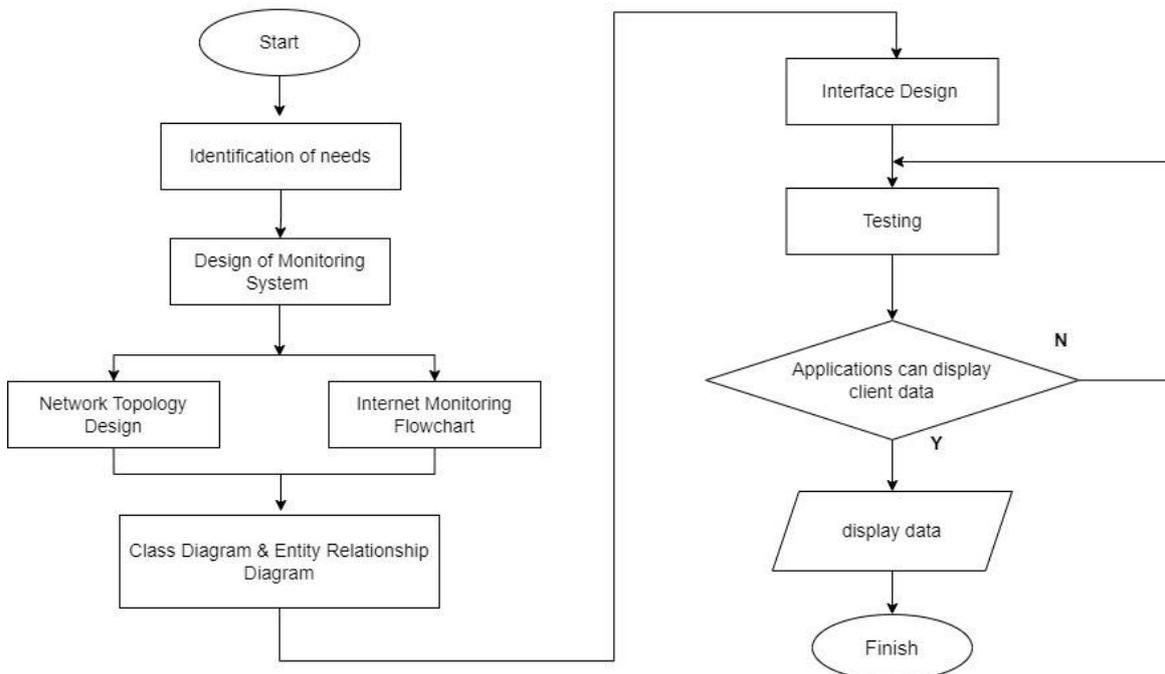


Fig 1. Flowchart of research

2.1. Identification and Analysis

Requirements analysis consists of hardware and software requirements. Some of the hardware needed includes: Server computer with Processor specifications: Intel Core 2 Quad CPU Q9400 @ 2.66 GHz, RAM: 4 GB, Hard disk: 500 GB, Mikrotik rb 1100 AHx 4 and Access Point TL WA 721 N.

This website system uses Codeigniter, Rsyslog and Lampp frameworkwork as web servers. The data used on this website are user/client name data, bandwidth usage, and history visited by the client, and can block the client's IP. The software requirements needed in this study are:

- a. RouterOS V 6.45.
- b. Ubuntu Server 18.04.2 LTS Linux Operating System.
- c. mysql-server package.
- d. php7 package.
- e. Rsyslog.

2.2. Network Topology

Fig. 2 is the design of the internet monitoring network topology which will first configure the monitoring website with the proxy so that the proxy is used to view all client activity on the web interface, displays client status such as the active client name, maximum bandwidth usage for each client, browsing history and block ip. The network topology describes the network model used so that it can record client activity [10], [11]. This helps researchers to explain the network topology process that will be implemented for internet monitoring. Internet monitoring will make it easier for admins and operators to carry out the

monitoring process without having to open the Winbox on the proxy. In addition, network simulation is carried out to see the needs of a network when conducting research or observation so that the tools used in this study are proxy routers, access points, internet networks and Ubuntu servers to store data that has been carried out by proxy.

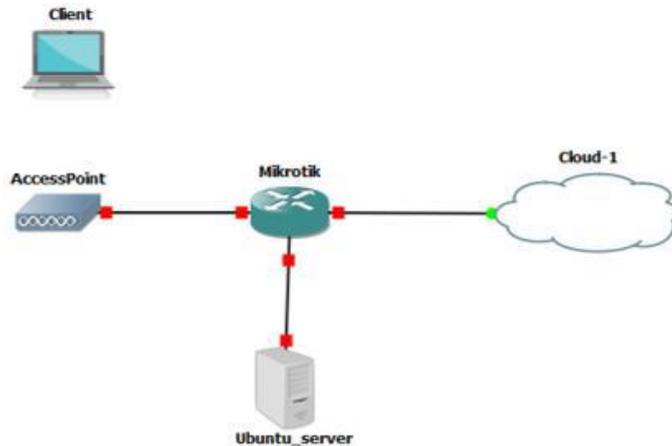


Fig 2. Network Topology Design

2.3. Internet Monitoring System

The internet monitoring flowchart will explain how monitoring works, internet monitoring will work in general starting from the client connecting to the internet, where the internet network has been broadcast by the access point so that the client can connect to the internet [12], [13]. Based on the internet monitoring stages, this process will start with the client connection which will be connected to the internet network, emitted by the access point, then the proxy is connected if successful it will record all internet browsing activities carried out by the client. And will monitor bandwidth usage on each client. After recording all client activity or client data is complete, then it appears via the web interface.

2.4. Class Diagrams

Class diagrams are diagrams that describe the structure of the system in terms of defining the classes that will be made to build the system [14], [15]. The class has 3 main parts, namely attribute, operation, and name.

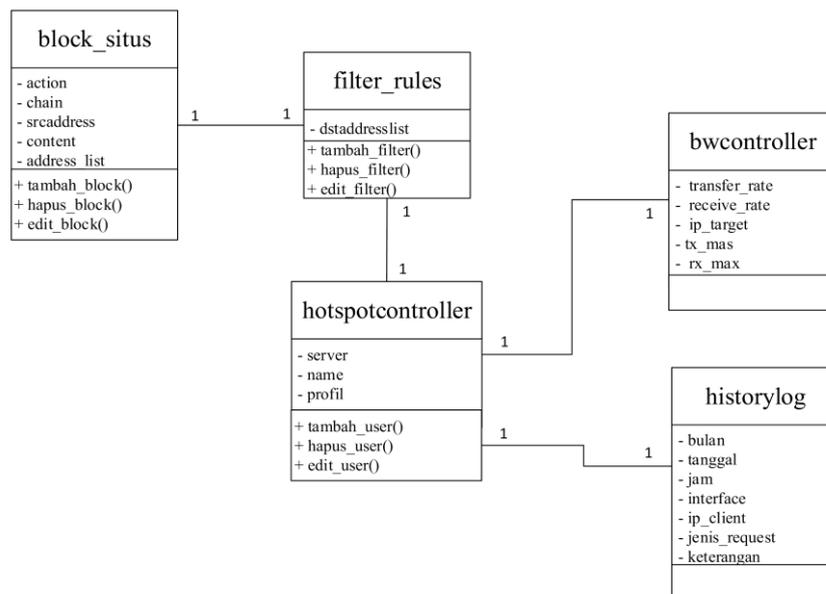


Fig 3. Class diagrams

2.5. Entity Relationship Diagram (ERD)

In the entity relationship diagram is a component set of entities and sets of relationships [16]. Components will be transformed into tables. Attributes on an entity relationship diagram are represented as fields from a table. The entity relationship diagram of this internet monitoring application is shown in the image below.

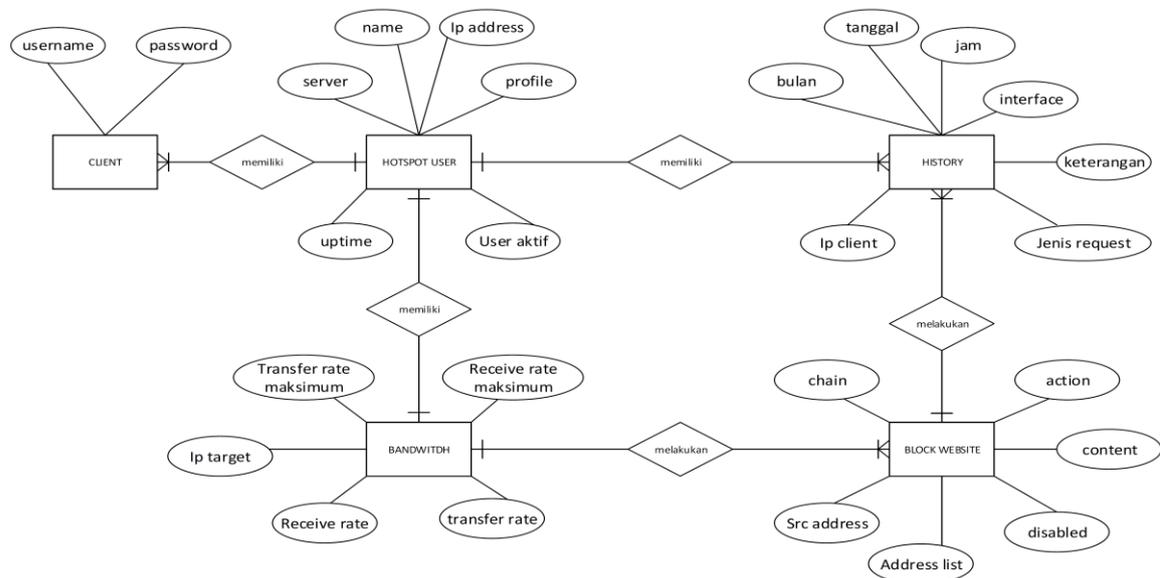


Fig 4. Entity Relationship Diagram

1. Client entity with hotspot user entity, that is, there is a many to one (m to 1) relationships, which means that many clients have one hotspot user,
2. hotspot user entity and bandwidth entity, that is, there is a many to one (m to 1) relationships, which means that many hotspot users have one bandwidth,
3. the hotspot user entity and the history entity, that is, there is a many to many (1 to m) relationships, which means that one hotspot user has much history,
4. bandwidth entity with website block, that is, there is a one-to-many (1 to m) relationship, which means that one bandwidth can block many websites,
5. historical entities with block websites, namely, there are many doing one block website.

2.6. Design interface (GUI)

GUI design results can affect user comfort and satisfaction[17]. Based on **Fig. 5**, it is a design to create an internet monitoring display or interface to design the desired application, the specifications that can be explained are:

1. Hotspot user will display the number of users registered on the proxy, and can display the number of active users connected to the internet network. The hotspot user page in this study can accommodate a maximum of 500 users;
2. Block website which will display the url that you want to block using mangle and filter rules to fill in the domain of the website that you want to block, on testing the domain that is blocked as many as 50 domains;
3. Bandwidth to see the amount of bandwidth used by each client when accessing data via a browser or the internet. On the bandwidth page there is no sorting function but will only display the amount per second and the maximum bandwidth usage in units of kb (kilobits) for each data bandwidth in each client;
4. History will display data from the client's browsing results consisting of month, date, time, interface, client IP, type of request, a description containing the url that was opened by the client. On the history page the data stored cannot be used for 2 months due to the increasing amount of browsing data; and
5. The table is a display to display client browsing activity, number of hotspot users, client bandwidth, and displays block URLs.

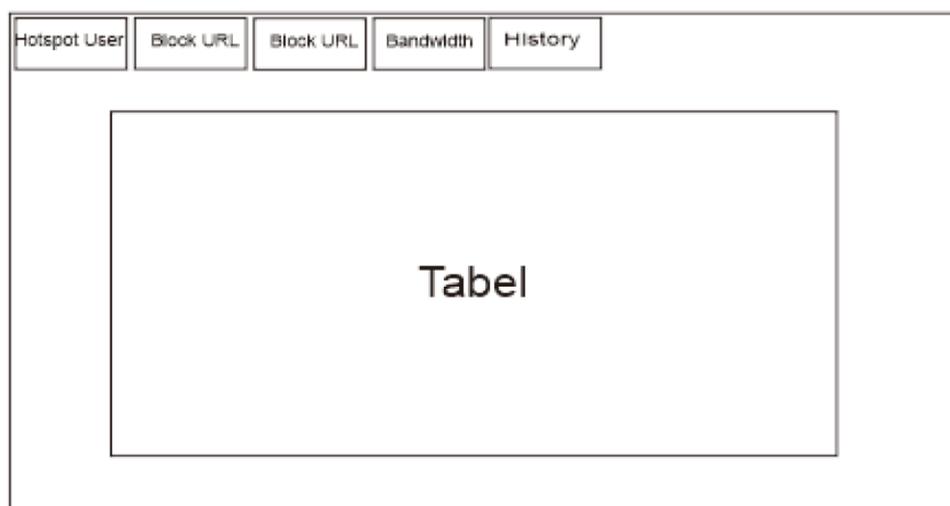


Fig 5. Interface design

In the explanation of the interface design that the display will be opened by the administrator to be able to monitor client activity.

3. RESULTS AND DISCUSSION

In Fig. 6 is the display of the website's initial page interface (interface) on monitoring the proxy, which displays only the user name that can use the internet. In this view there is only the server, user name, profile, uptime and remove or disable button.

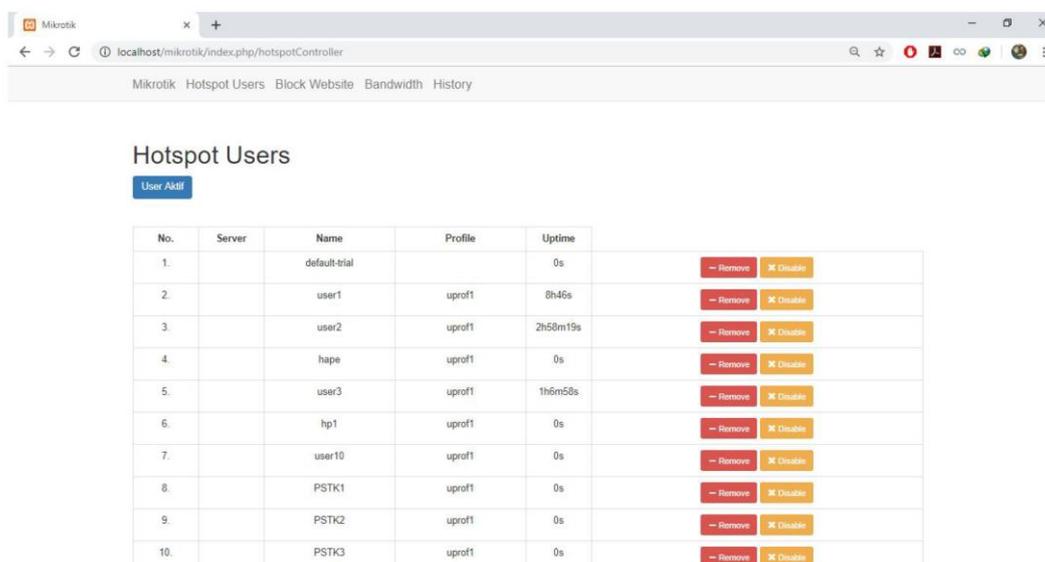


Fig 6. Home Page

3.1. Hotspot users Page

In Fig. 7 it can be seen that there are user names that have been registered with the proxy. The server column functions to display on certain servers registered client users. If the hotspot user is not specifically configured, then the user will be registered as a general user or all, so the name of the server cannot be displayed in the server column. The profile column functions as bandwidth management for certain users. In addition, there are buttons to show active users, names, and uptime, namely how long the client is connected to the internet, and admin can also remove to delete users and disable or enable which functions to block the client the admin wants.

Hotspot Users

User Aktif

No.	Server	Name	Profile	Uptime	
1.		default-trial		0s	Remove Disable
2.		user1	uprof1	4h59m33s	Remove Disable
3.		user2	uprof1	2h58m19s	Remove Disable
4.		hape	uprof1	0s	Remove Disable
5.		user3	uprof1	1h6m58s	Remove Disable
6.		hp1	uprof1	0s	Remove Disable

Fig 7. Hotspot users Page

In Fig. 8, an active user consists of a table of user names or users, the IP address on the client, and the uptime is the time the client is connected to the internet network.

Hotspot Users

User Aktif

No.	User	Address	Uptime
1.	user2	192.168.40.251	28m38s
2.	user1	192.168.40.252	1h3m31s
3.	PSTK19	192.168.40.253	18m45s
4.	PSTK4	192.168.40.254	17m28s

Fig 8. User Address

3.2. History page

On the history page, there is a process that will display url data opened by the client. The displayed result on the proxy will be forwarded to the website interface process that has been made, namely the command in the form of source code in the *controller/historyLog.php* file to process existing data before being displayed on the monitoring website. In the data retrieval process carried out by Mikrotik, it will be saved to the Ubuntu server in the form of a *mikrotik.log* file, using an additional application in the form of *rsyslog* software which is open source so that admin can change the application according to the desired results.

In the Fig. 9, the process of taking client history is carried out by website monitoring. After the client is connected to the internet network, the monitoring website will work, and when the client opens the HTTP website, the proxy will immediately save the log, and then the proxy will send the log to the server. After the proxy sends the log, the server will save or write logs to *mikrotik.log*. After the log is saved, the monitoring website will display the history log contained in the *mikrotik.log*. Then the client history retrieval process is complete. If the client process opens the HTTP website unsuccessfully, the recording cannot appear, and the process will immediately finish.

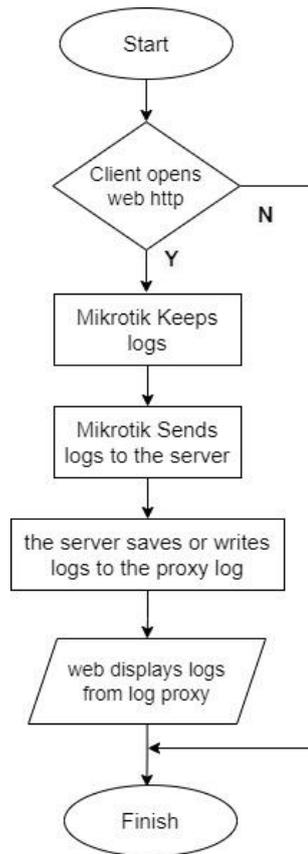


Fig 9. History flowchart

Jun	17	15:16:11	192.168.40.1	192.168.40.252	GET	http://su.ff.avast.com/R/A4AKIDFmNz/M2YzFhY/NhMjQ4NWM2FkYTY1MGQxZDNjZjE3EgQEFgYZGHgIA8qBwgEELC uXdfMmNUBjjae9GQCm9XVPwSICCKA==
Jun	17	15:16:11	192.168.40.1	192.168.40.254	GET	http://connectivity-check.ubuntu.com/
Jun	17	15:16:32	192.168.40.1	192.168.40.252	GET	http://su.ff.avast.com/R/A4AKIDFmNz/M2YzFhY/NhMjQ4NWM2FkYTY1MGQxZDNjZjE3EgQEFgYZGHgIA4qBwgEELC uXdfMmNUBjjae9GQCm9XVPwSICCKA==
Jun	17	15:16:38	192.168.40.1	192.168.40.254	POST	http://ocsp.digicert.com/
Jun	17	15:16:38	192.168.40.1	192.168.40.254	POST	http://ocsp.digicert.com/
Jun	17	15:16:42	192.168.40.1	192.168.40.251	POST	http://data.mistat.intl.xiaomi.com/mistats/v2
Jun	17	15:17:28	192.168.40.1	192.168.40.252	GET	http://www.ui.ac.id/
Jun	17	15:17:31	192.168.40.1	192.168.40.252	GET	http://www.ui.ac.id/
Jun	17	15:17:33	192.168.40.1	192.168.40.252	GET	http://su.ff.avast.com/R/A4AKIDFmNz/M2YzFhY/NhMjQ4NWM2FkYTY1MGQxZDNjZjE3EgQEFgYZGHgIA8qBwgEELC uXdfMmNUBjjae9GQCm9XVPwSICCKA==
Jun	17	15:17:33	192.168.40.1	192.168.40.252	GET	http://www.ui.ac.id/wp-content/uploads/2014/07/fevicon.ico
Jun	17	15:26:06	192.168.40.1	192.168.40.249	GET	http://clients3.google.com/generate_204
Jun	17	15:26:06	192.168.40.1	192.168.40.249	GET	http://clients3.google.com/generate_204
Jun	17	15:26:06	192.168.40.1	192.168.40.249	POST	http://c.whatsapp.net/chat
Jun	17	15:26:07	192.168.40.1	192.168.40.249	GET	http://connectivitycheck.gstatic.com/generate_204

Fig 10. URL history from user

In the image above is a page that displays the history URL opened by the client. In **Fig. 10** there is a month, date, time, client IP and type of request. To be able to see the URL or client history that was opened, there is a request type that displays the URL or client history.

3.3. Bandwidth Page

A display shows the bandwidth utilization for each client on the bandwidth page. In addition, the process on the proxy will be forwarded to the website interface using specific commands. The command can be source code in the controller/BwContoller.php file, which processes existing data before displaying it on the monitoring website. The following is the flowchart of the bandwidth retrieval process for each client:

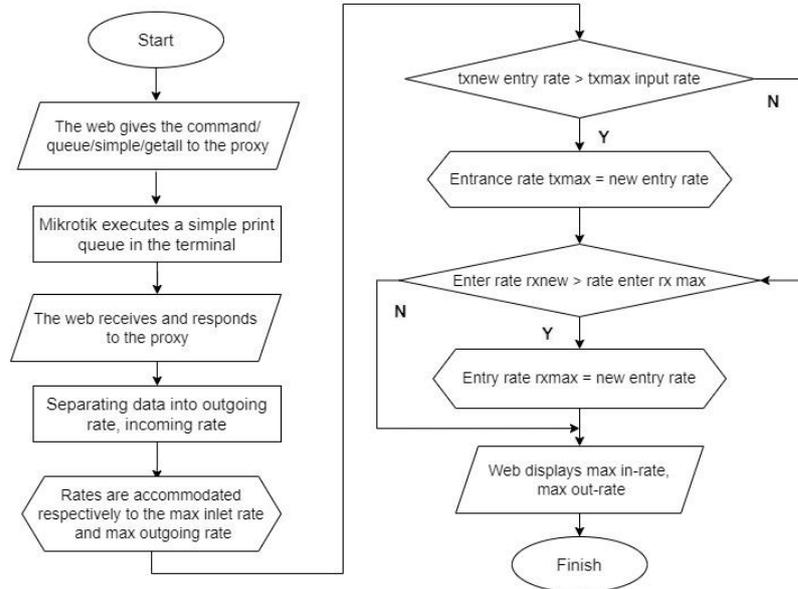


Fig 11. Bandwidth Flowchart

After the Client has connected to the internet network, the monitoring process has started by the monitoring website. The monitoring website will give commands to the queue/simple/getall contained in the proxy. Next, the proxy will execute it with the simple print queue command in the proxy terminal. Once the website receives and responds to the proxy separator data, it becomes an outgoing rate, an inbound rate.

The tariff is the default from the proxy API (Application Programming Interface), where the tariff is an array to accommodate transfers and receive from the proxy. Next, it will enter each incoming max rate and max outgoing rate.

Bandwidth

No.	transfer rate	receive rate	ip target	transfer rate maksimum	receive rate maximum
1	8149.992 kb/s	186.2 kb/s	192.168.40.248/32	8952.04 kb/s	227.904 kb/s
2	0 kb/s	0 kb/s	192.168.40.245/32	3116.808 kb/s	101.672 kb/s
3	369.672 kb/s	13.736 kb/s	192.168.40.247/32	7416.256 kb/s	181.336 kb/s
4	415.984 kb/s	45.144 kb/s	192.168.40.249/32	415.984 kb/s	45.144 kb/s

Fig 12. Data bandwidth used

The picture above displays the bandwidth used on several clients in **Fig. 12**. There are transfer rates, receive rates, target IP, Tx max, and Rx max. Tx max is the amount of bandwidth usage on the client, and Rx max is the upload bandwidth used to send data to the internet.

3.4. Block Website page

On the block website page there is a process that will display how to block websites with mangle and filter rules, the process that takes place on the proxy will be forwarded or processed into the website interface that has been made, namely commands in the form of source code in the controller/blocksite.php file and the controller /filterrules. php to process existing data before displaying it on the monitoring website.

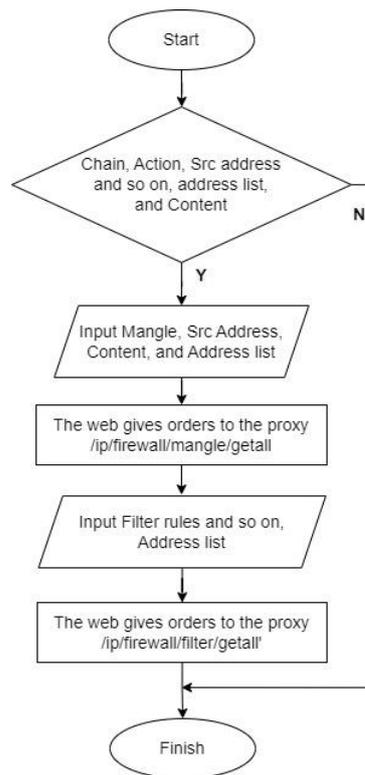


Fig 13. Block website flowchart

Mangle

Data berhasil ditambahkan!

No.	Chain	Action	Src Address	Address List	Content	Disabled	#
1.	forward	add-dst-to-address-list	192.168.40.0/24	youtube-blok	youtube	false	<input type="checkbox"/> Update <input type="checkbox"/> Remove <input type="checkbox"/> Disable
2.	forward	add-dst-to-address-list	192.168.40.1	facebook-blok	facebook		<input checked="" type="checkbox"/> Update <input type="checkbox"/> Remove <input checked="" type="checkbox"/> Enable

+ Tambah

Fig 14. Address page blocked

Form Mangle

SrcAddress:

Content:

AddressList:

Fig 15. Packet blocked

Fig. 15 displays "from mangle" to enter the packet to be blocked. The *srcaddress* is the ethernet IP connected to the access point, and the IP number is 192.168.40.1/24. the content is the marked website package. After that, there is an address list to give a name to the marked content.

3.5. Filter rules page

In the **Fig. 16**, the filter rules block previously registered packets already in the address list. There is an update, remove, and disable or enable buttons that have the same function as mangle to be able to connect to the package to be blocked.

Mikrotik Hotspot Users Mangle Filter Rules Bandwidth History						
7.	hs-input	accept				Update Remove Enable
8.	hs-input	jump				Update Remove Enable
9.	hs-unauth	reject	tcp-reset			Update Remove Enable
10.	hs-unauth	reject	icmp-net-prohibited			Update Remove Enable
11.	hs-unauth-to	reject	icmp-host-prohibited			Update Remove Enable
12.	unused-hs-chain	passthrough			true	Update Remove Enable
13.	forward	reject	icmp-network-unreachable	youtube-blok	true	Update Remove Enable
14.	forward	reject	icmp-network-unreachable	facebook-blok	false	Update Remove Disable

+ Tambah

Fig 16. Filter rule page

Fig. 17 shows the form for the page blocked by the address. There is a `dstaddress` list which functions to fill in the `dstaddress` list to add packets that have been marked with mangle.

Form Filter Rules

DstAddressList

Simpan Batal

Fig 17. Address page blocked

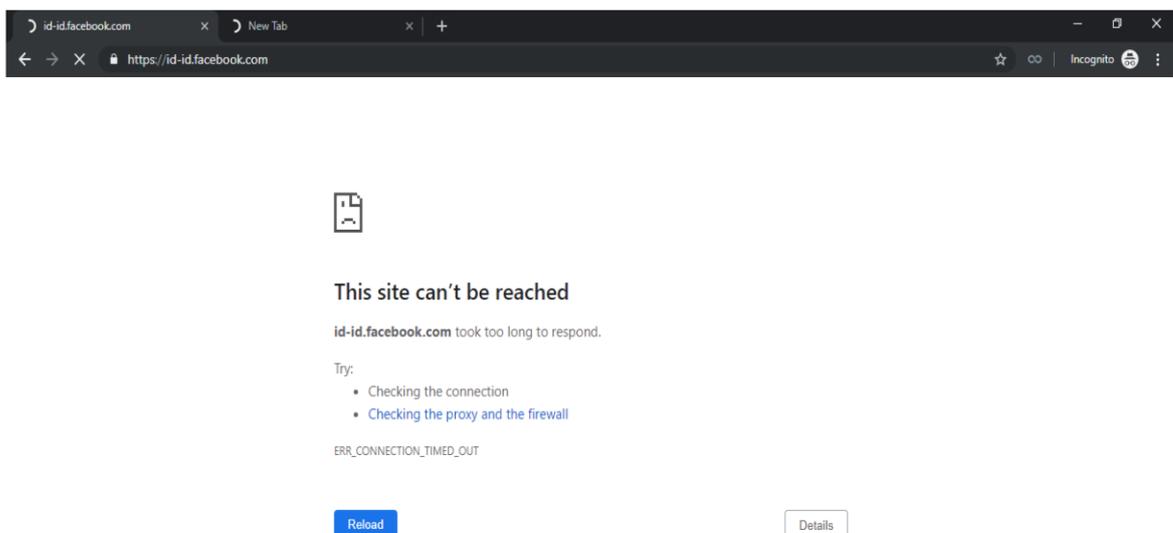


Fig 18. Displays block access that the client wants to open but was successfully blocked.

4. CONCLUSION

This application displays 25 users registered with the proxy, and displays four active users/clients or those connected to the internet network. Each client's bandwidth is different, so the admin can see clients that use a high bandwidth and have block IP features or URLs. Admins usually choose positive URLs so that clients can continue to access them. The system can block websites using mangle to mark packages that want to block and filter rules to block packages that have been marked in the mangle. The monitoring system can create a history file as a browsing client using rsyslog to save the client log and forward it to the mikrotik.log file on the ubuntu server so it can be used to view URLs.

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