



Tunneling Design with Point to Point Protocol over Ethernet (PPPoE) using Mikrotik RB-941 (Case Study of SMK Taruna Bhakti)

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ABSTRACT

Ministry of Services or in the sphere of education requires a reliable network and a network that is always ready at all times so it is necessary to plan Anticipation on the Internet network with this one method that wants to be developed using Point-to-Point Protocol over Ethernet (PPPoE) on the Router device . Point-to-Point Protocol over Ethernet (PPPoE) is a very reliable method for use on both small and large scale networks. because it's very effective like Dial Up is faster and access is very secure.

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1. Introduction

The network has become the backbone of the information service because it requires a reliable and efficient network with an easy and fast configuration, because when the network is down it will interfere with performance in the service [1]. The Point to Point Protocol Over Ethernet (PPPoE) method is used to build VPN networks where the connection uses a point to point tunnel. PPPoE As a tunneling protocol, which has very good security, requires some authentication to be connected, so PPPoE requires a delay in the process of sending or transferring data. [2]

2. Theory

2.1. Mikrotik Router

Mikrotik Router is an independent Linux-based operating system specifically for computers that function as routers. [3] Mikrotik is designed to be easy to use and very well used for computer network administration purposes such as designing and building a small to large scale computer network system. [4] Mikrotik Router was established in 1995 which was originally intended for Internet Service Provider (ISP) service companies that serve their customers using wireless technology.

2.2. Types of Mikrotik Routers

Mikrotik is divided into 2 types namely the first is RouterOS software, and the second is RouterBoard hardware. The explanation for the two types of routers is as follows:

a. Mikrotik RouterOS

Mikrotik RouterOS is an operating system and software that can be used to turn computers into network routers that have various features in network technology.

b. Mikrotik RouterBoard

Mikrotik routerboard is a hardware that can run a network router without the need to be installed to a computer, because this proxy router has been designed to run the router OS so that it can become a reliable router for users.

2.3. PPPoE (Point to Point Protocol Over

a. Ethernet)

Point to Point Protocol over Ethernet(PPPoE) is a network protocol for encapsulating Point-to-Point Protocol (PPP) frames in ethernet frames. PPPoE is used to build VPN networks where the connection uses point to point tunnel. PPPoE As a tunneling protocol, which has very good security, requires some authentication to be able to connect to the server. With such security and authentication, PPPoE requires a





delay so that the process of sending or transferring data is slow.

Following is advantages of using the PPPoE method:

- 1) User authentication is available
- 2) The PPPoE server interface connected to the PPPoE client does not have an IP because PPPoE works at OSI layer 2 with the aim of avoiding Denial Of Service (DoS) attacks and IP detection on the main server.
- 3) Cut-Off Facility by PPPoE for users who use additional programs such as Bandwidth enhancers.

3. Research Methods

3.1. Tunneling concept

Tunneling is a method of cloaking or encapsulation of networked data packets. Before sending, the data packet undergoes a slight modification or modification, that is, the addition of a header to the tunnel. When the data has passed through the tunnel and arrived at the destination, the header of the data packet will be returned as before (the tunnel header is removed).

3.2. Types of Protocol Tunneling

Point-to-Point Tunneling Protocol (PPTP), Layer 2 Tunneling Protocol (L2TP), Ethernet over IP (EoIP), IP-in-IP (IPIP), IPSec (Internet Protocol Security).

a. Quality of Service (QoS)

Quality of Service (QoS) is a collection of techniques and mechanisms that guarantee the performance of computer networks (especially on the internet) in the provision of services to applications in computer networks. Delay is defined as the length of time required by the data packet to get to the destination.

Throughput is the rate (rate) of effective data measured in bps. *Throughput* is the total number of successful packet arrivals observed at the destination during a certain time interval divided by the duration of the time interval.

3.3. Software

The software used to support smooth research is as follows: Operating System Windows 7 ultimate 64 bit, WinBox v3.19, RouterOS v6.42, Microsoft Office 2016 and Mozilla Firefox / Google Chrome.

4. Results and Discussion

4.1. Design and Design

To meet the needs of the use of the system, we need a design and design of the design which includes an overview and simulation of the system to be made. To describe the overall workflow of the system can be implemented through network topology.

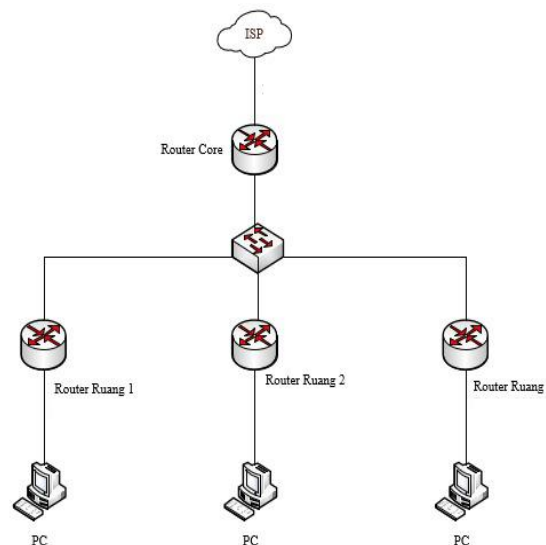


Fig 1. Network Topology



a. Research Flowchart

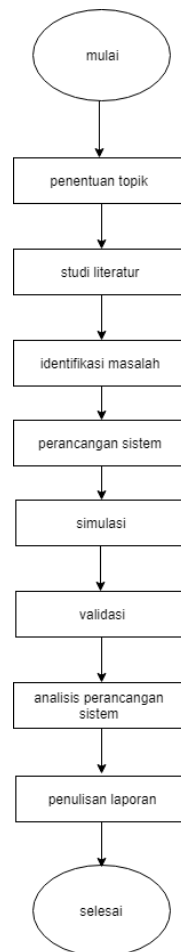


Fig 2. Research Framework Flowchart

b. Distribution of IP Addresses

Table 1
Distribution of IP Addresses

No	Router	Interfaces	IP Address	The gateway
1	Router-Core	Eth-1	DHCP from the ISP	ISP
2	Router-Core	Eth-3	198.28.7.1	198.28.7.1
3	Space-1 Router	Eth-1	198.28.7.3	198.28.7.1
4	Space-2 Router	Eth-1	198.28.7.4	198.28.7.1
5	Space-3 Router	Eth-1	198.28.7.5	198.28.7.1

c. Service Distribution

Table 2
Service Distribution

No.	Router Identity	Interfaces	Service
1	Router-Core	Eth-1	DHCP Client
2	Router-Core	Eth-3	PPPoE Server
3	Space-1 Router	Eth-1	PPPoE Client
4	Space-2 Router	Eth-1	PPPoE Client
5	Space-3 Router	Eth-1	PPPoE Client

d. Configuring PPPoE Server

In this research, the proxy configuration is done using the winbox application which is the default proxy application, by opening the winbox icon on the desktop and detecting the proxy address and then connecting it will enter the winbox window and configurations can be done. Display when detecting





proxy addresses and then connecting can be seen in the image below:

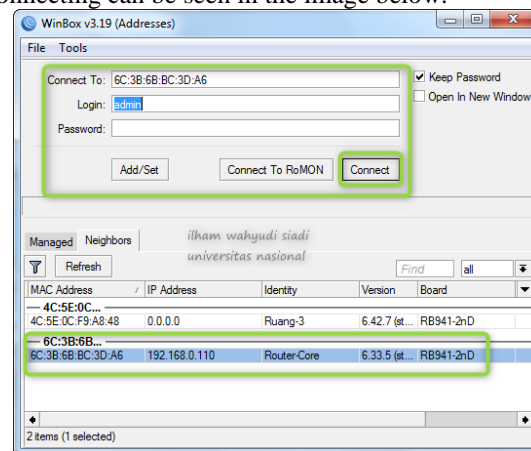


Fig 3. Display Mikrotik login

DHCP client configuration, where the interface column is ether1 which is the IP of the ISP. More details can be seen in the picture below:

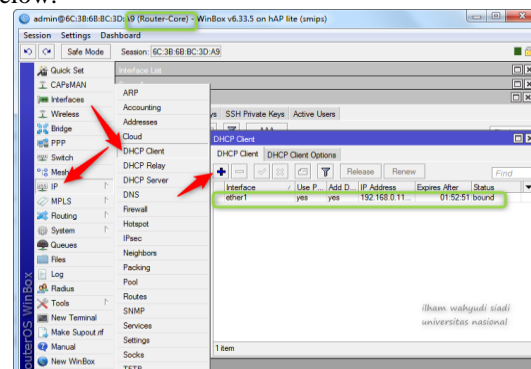


Fig 4. Display DHCP Client

The display above shows that the DHCP client configuration has been successfully performed and the status bound states that it has successfully obtained a network connection from the ISP. The following is the display of the IP address of the proxy, 198.28.7.1 which is ether3 and the IP address of the ISP which is ether1. For more can be seen in the image below:

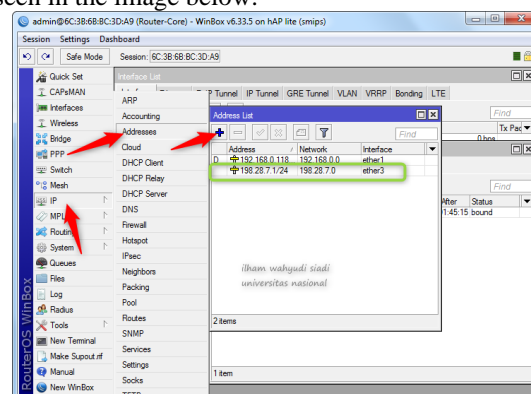


Fig 5. Display IP Address

Configure IP DNS for translation domain name addresses to IP addresses. The DNS IP address has been filled in automatically (dynamically), which is the IP address of the ISP. Display configuration DNS IP address can be seen in the picture below:

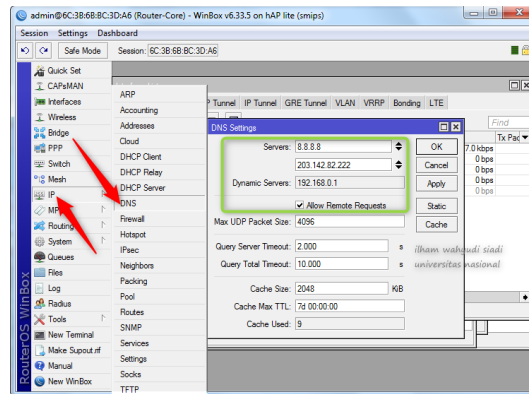


Fig 6. DNS configuration

IP pool configuration, where IP pool provides a set of IP addresses that will be given to the hotspot client. IP addresses provided are from 198.28.7.3 to 198.28.7.9. IP pool configuration display can be seen in the picture:

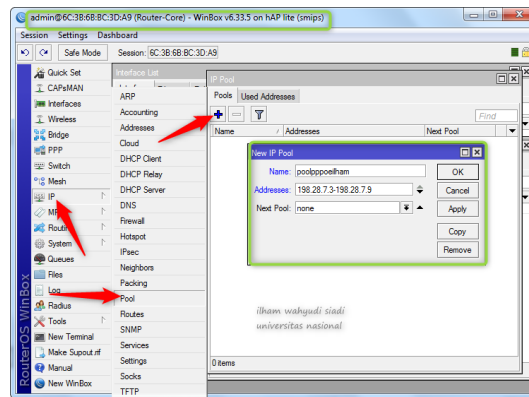


Fig 7. Configuring IP Pool

PPPoE configuration is done after the above configurations have been done. The PPPoE configuration starts by opening the PPP menu to do a number of configurations such as creating a PPPoE profile, configuring the PPPoE server, configuring PPPoE secret for accounts on the client, and configuring NAT so that the client can connect to the internet. PPPoE profile configuration can be seen in the picture:

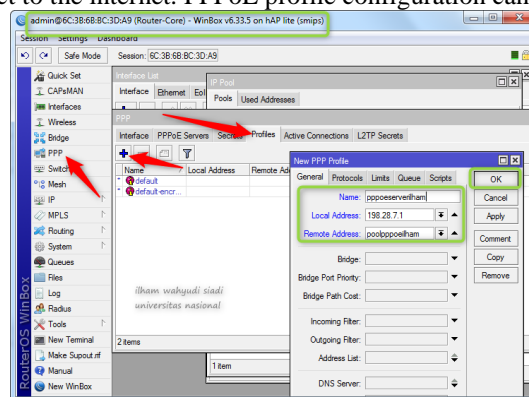


Fig 8. Configuring PPPoE Profile

Configure PPPoE secret. In the default profile column is pppoeservervetham which is the name of the profile that was previously set on the PPPoE profile. Each username and password can only be used by one client. PPPoE secret configuration can be seen in the picture:



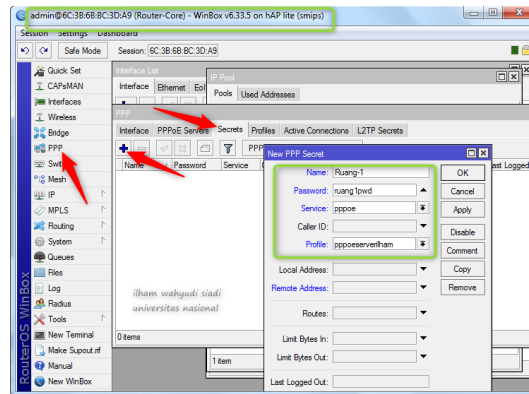


Fig 9. Secret Configuration (Creating a client account)

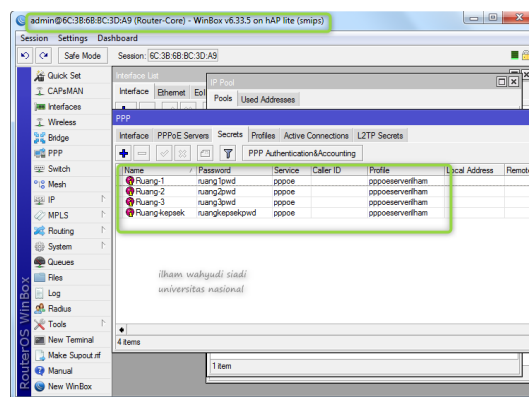


Fig 10. Display All Accounts

Configure PPPoE Service to specify ether and default profile. Display configuration can be seen in the picture:

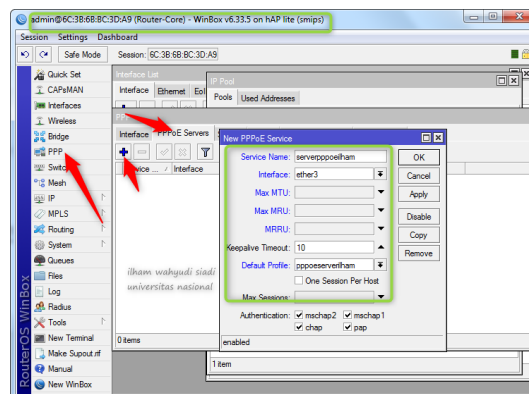


Fig 11. PPPoE Service Configuration

e. Configuring PPPoE Client

Microtik configuration is done using the Winbox application which is a default proxy application, by opening the Winbox icon on the desktop and detecting the proxy address then connecting then it will enter the Winbox window and the configurations can be done. Display when detecting proxy addresses and then connecting can be seen in the image below:



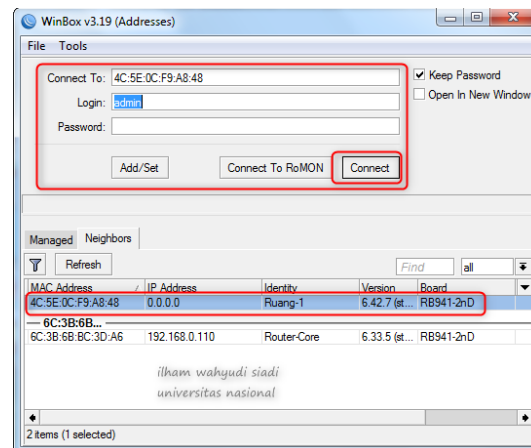


Fig 12. Display Mikrotik Login

Configuring PPPoE Client. In the General column select Ether1 Interface which is the entry point of the PPPoE Server. Each username and password can only be used by one client. PPPoE Client configuration can be seen in the picture:

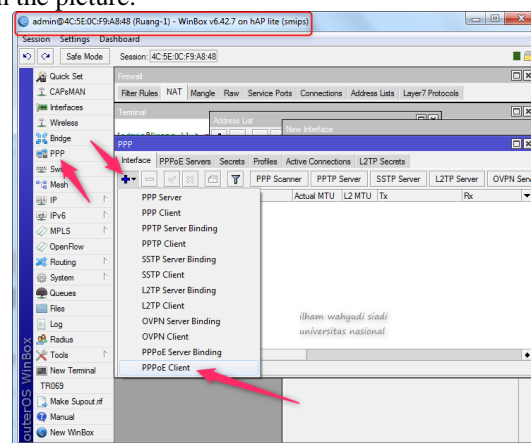


Fig 13. PPPoE Client Menu

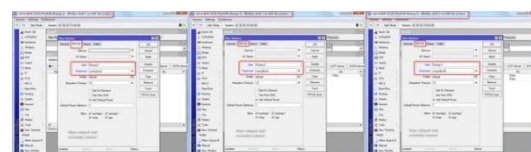


Fig 14. Configuring Client Accounts

The Active Connections Configuration view on PPPoE Server, L indicates that the username and password are from PPP Secret.

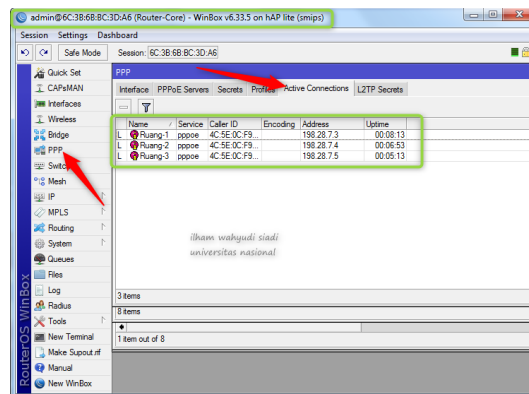


Fig 15. Display of Active Connections

Display *Interface List* on Router-Core, DR shows Dynamic Runing.

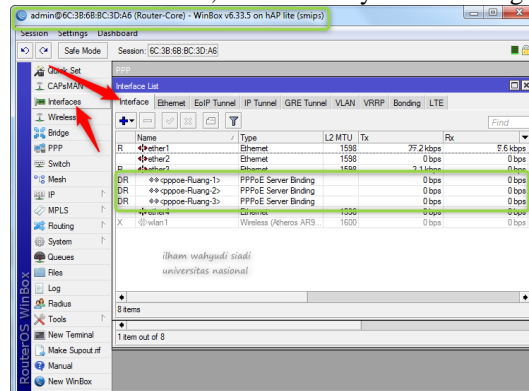


Fig 16. Interface List

Testing internet connection by pinging to webkuliah.unas.ac.id from the Client side.

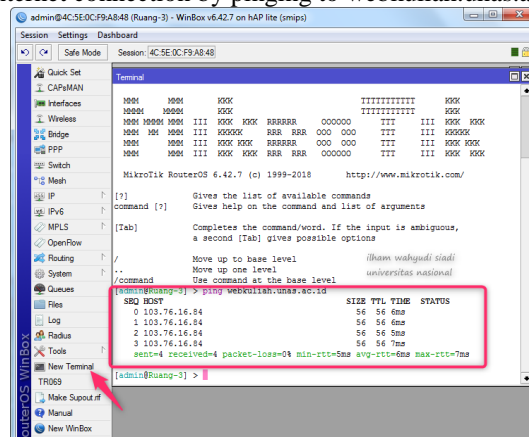


Fig 17. Testing internet connection

5. Conclusion

Based on the conclusion of the discussion of Tunneling Design with Point to Point Protocol over Ethernet (PPPoE) using Mikrotik RB-941, the use of Point to Point Protocol over Ethernet (PPPoE) systems that have been based on authentication which is very safe and easy to configure, is very helpful for implementation when there is many routers are configured. From the Point to Point Protocol over Ethernet (PPPoE) network, the dial up process is much faster, access is very secure because there is a username and password for authentication, although the configuration is a bit complicated but it is very helpful for large and small scale networks. The implication of this research is to make network





configuration faster and more reliable and secure, thus greatly maximizing the use of existing network systems.

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