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# Implementation of VPN Using Router MikroTik at Al-Basyariah Education Foundation Bogor

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ABSTRACT

*VPN is a connection between one network with another network privately through a public network. At Al-Basyariah Education Foundation is a school that has several buildings far apart. The problems faced today that are in several areas related to and communicating using flash and using file shares for those who already have their own LAN. Meanwhile, to connect with the main building and the branch building using the internet and email to send data and communicate. By using a VPN (Virtual Private Network) build a network using the PPTP (Point-To-Point Tunneling Protocol) method with the Mikrotik Router RB2011L then the main building and branch building can be connected. Thus the Al-Basyariah Education Foundation can be connected and can access computer networks anywhere via the internet.*



## 1. Introduction

With the development of technology, the need for communication networks is increasing. Initially, data exchange was only through hard copy in the form of handwritten documents, monthly reports and so on. When this has developed into communication using the Internet network because of the demands of time and efficiency. Data communication over the Internet network involves transfer speed and security issues. Things that must be considered in carrying out activities in the world of the Internet, namely with the increasing number of people trying to intercept data passing by and other crimes on the Internet.

VPN stands for virtual private network, which is a private network (not for public access) that uses non-personal media (for example the internet) to connect between remote sites securely. The application of certain technology is also needed because this network uses a common medium, but traffic (traffic) between remote-sites cannot be intercepted easily, nor does it allow other parties to sneak undue traffic into remote-sites.[1]

The Al-Basyariah Education Foundation is a school which has several buildings far apart. The problems faced at this time are in several areas relating to and communicating using flash drives and using file shares for those who already have their own LAN. Meanwhile, to communicate between buildings and between buildings using the internet and email to send data and communicate.

To overcome the problems that occur at the Al-Basyariah Education Foundation, a VPN (Virtual Private Network) is needed so that it can be connected to each other between buildings that are in a certain range. Therefore, the authors took the theme with the title "Implementation of VPN (Virtual Private Network) Using a Mikrotik Router at the Bogor Al-Basyariah Education Foundation".

In the research process, a relevant resource is needed to support each idea. Here the authors list three scientific journals that are relevant to the research that the author has discussed. Based on the research conducted.

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The rapid development of computer technology has resulted in business entities and academic institutions implementing this technology for many purposes. Problems arise when connecting users or other networks that are far away or geographically separated. Not only in business entities, academic institutions such as UNDIP also face almost the same problems. The SIA (Academic Information System) service that has long been owned by UNDIP can only be opened from the local network, this is because placing the SIA server on a public network is very risky. One solution that can solve this problem is to build a Virtual Private Network (VPN), with a VPN it is possible for a remote user or network to connect as in a local network. Meanwhile, for web applications, a web proxy application can be used to access local web-based services. The purpose of this research is to study the use, workings and functions of OpenVPN and Glype Proxy to access local applications from public networks, and implement them on the Diponegoro University network.[2]

Computer networks are the right choice for both companies and personalities to provide information and connect a LAN network to the internet. This can be seen from the increasing use of the internet. PT. Valdo International is a company engaged in the Outsourcing Tele Marketing for bank and insurance that always pays attention to client needs for data security on the internet. When clients exchange data information, this is very possible for parties to commit theft as long as the data is transmitted on the internet. One way to build data communication security in the internet network is to use a Virtual Private Network (VPN). Virtual Private Network (VPN) technology allows each user to access resources in the local network, get the same rights and settings as physically being in the place where the local network is located. The use of a VPN (Virtual Private Network) is an alternative for sending voice, which is private or secure, because of the use of an encrypted connection and the use of private keys, certificates, usernames or passwords to authenticate in establishing connections.[3]

The development of computer networks is very rapid. Computer networks have become fundamental in business activities. This can be seen from the majority of people in the world who have accessed the internet. At PT. Anta Citra Arges (ACA) and PT. Interdev (INT), the two companies that are still the same owner, are quite far away and the data exchange that is carried out by these two companies is using email, but for data that is important and large it is quite difficult to use the email media. As a solution in sending and protecting important company data when transmitting data. This research is compiled based on several previous studies, including from research entitled Comparative Analysis of the Performance of a Mikrotik-based VPN Network using the Point to Point Tunneling Protocol (Pptp) and Layer 2 Tunneling Protocol (L2tp) as Data Transfer Media. In his research report, a VPN was built so that the use of a VPN network can provide an alternative to accessing a website that is adjacent to the VPN network itself .[4]

## 2. Research methods

This study uses problem analysis in a correct network which is expected to be able to connect two different locations to be able to communicate smoothly and safely with each other.[5]

### A. Time and Place of Research

The research was carried out by analyzing (directly) to the research site, namely the Al-Basyariah Education Foundation which was conducted from July 2020 to August 19, 2020.

### B. Research Targets

Build a VPN (Virtual Private Network) connection network at the Al-Basyariah Education Foundation so that each building can be connected securely and can access computer networks anywhere via the internet network.

### C. Data, Instruments, and Data Collection Techniques

To support this research, the authors use the following data collection techniques:

#### 1) Observation

In this case the writer made direct observations about the existing network at the Al-Basyariah Education Foundation and documented the results of the observations.

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**2) Interview**

Methods for obtaining information in involving the speaker directly in an interview. The author asks several questions and conducts discussions to obtain the required data.

**3) Literature review**

The method of collecting data is by collecting information and sources or references that are relevant to the issues discussed.

**D. Building Computer Networks**

That the purpose of a computer network is to be able to reach and receive acceptance, every part of the computer network can request and provide services. Parties that apologize or receive services are called clients and those who provide or send services are called servers. This design is called a client-server system, and is used in almost all computer network applications.[6]

Al-Basyariah Education Foundation uses transmission media using unshielded twisted pair (UTP) cables, fiber optic and wireless networks. The topology used in the Al-Basyariah Education Foundation LAN, which the research author uses, uses the Tree topology, because the network that is on the proxy is the center so that different computer networks in buildings will get internet access via mikrotik and other access control.

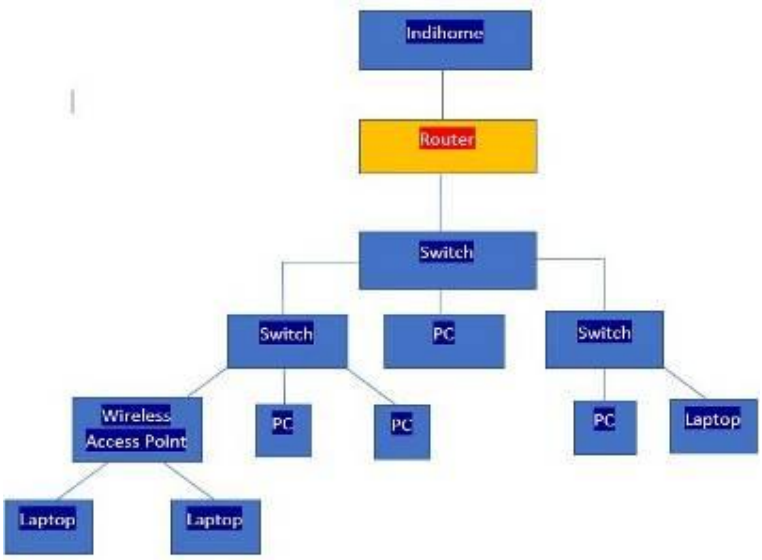


**Fig 1.** Topology at Al-Basyariah

**E. Network Architecture**

The network architecture used by the Al-Basyariah Education Foundation uses a client server model network, in this architecture there is a section called the server. Client server is a network connectivity model that differentiates computer functions as a client and a server. This architecture places a computer as a server. This server is in charge of providing services to other terminals connected to the network system or what we call the client. Servers can also be tasked with providing file sharing services (file servers), printers (printer servers), and communication lines.

In this architectural model, the client cannot function as a server, but the server can function as a client (non-dedicated server). The working principle of this architecture is very simple, where the server will wait for requests from the client, process and provide results to the client, while the client will send requests to the server, wait for the process and see the visualization of the results of the process. This Client Server system is not only intended for large-scale computer network development. This system uses the main protocol Transmision Control Protocol or Internet Protocol (TCP / IP).

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## F. Network Scheme

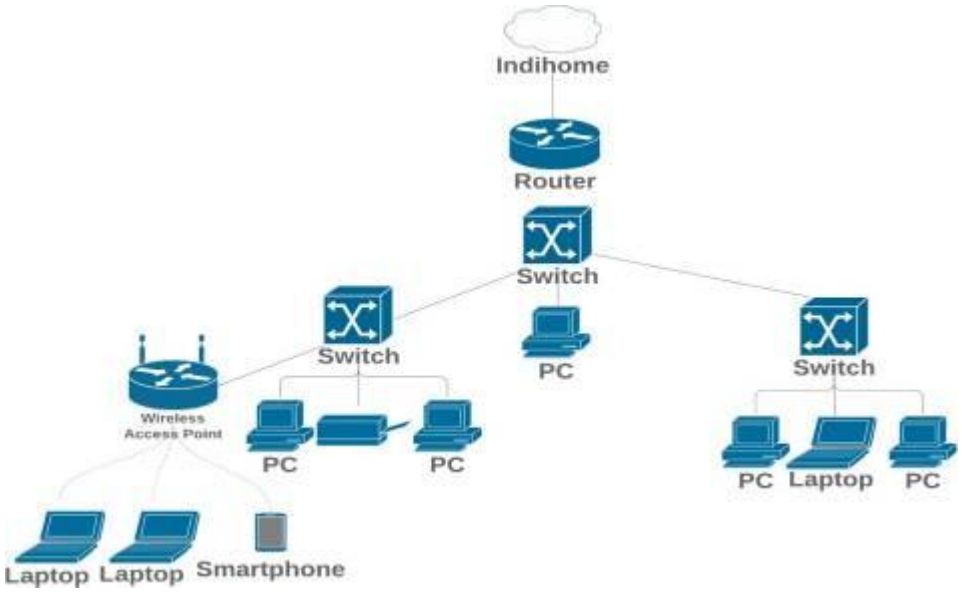


**Fig 2.** Running Network Scheme

The network scheme image above is a network scheme located at the Al-Basyariah Education Foundation, in the network scheme above it can be explained that the internet source in the main building uses an indihome ISP. Mikrotik RouterBoard2011L is able to share the internet network to each PC user connected via the interface port and manage or determine the communication path between the user's computer, through this Mikrotik RouterBoard RB2011L the internet network is distributed to each switch in each room, so that each user can access the internet easily.

## G. Network Hardware and Software Specifications

Based on the research that the author did and data collection based on interviews with network administrator staff, it can be concluded that the hardware and software specifications of the Al-Basyariah Education Foundation are as follows:

**Table 1.**
Network Hardware and Software Specifications

| No | Nama | Spesifikasi | Operating System |
|---|---|---|---|
| 1 | Kabel UTP | Cat 5 | |
| 2 | Mikrotik RB2011L | CPU AR9344 600Mhz<br>RAM 54mb | Router OS |
| 3 | Switch | D-Link DES-1024C | - IEEE 802.3 10 BASE-T<br>- IEEE 802.3u 100 BASE-TX<br>- IEEE 802.3az Energy- Efficient Ethernet |
| 4 | Access Point | Tp-link TL-WA5210G | Point to Point<br>Point to multi point<br>AP/Client/Bridge |

## H. Alternative Troubleshooting

Based on the problems that exist at the Al-Basyariah Education Foundation, the authors provide alternative solutions to problems, here are the alternatives:

Connect the main building to the branch building and create a VPN (Virtual Private Network) network so that the main building and the branch building can be connected securely to access LAN (Local Area Network), can exchange data via an internet connection or other network to transmit data privately. By

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using a VPN (Virtual Private Network), we can avoid intruders when transmitting data that can enter network traffic at any time.

## 3. Result and Discussion

### A. Proposed Network

The need for school activities is quite a lot, requiring speed or time efficiency which is very important in data transfer or data sharing at the Al-Basyariah Education Foundation, with the existence of an interconnection between internal units in each building which can solve the problems that have been faced so far. the slow exchange of information and data exchange that should be done quickly for every staff in the main building and branch buildings without any obstacles so that work and work time becomes more efficient.

In overcoming the problem of limited access speed and data security used by data to exchange data between buildings, the solution can be done with the PPTP (Point-To-Point Tunneling Protocol) method on the microtics that are already available in each building. PPTP (Point-To-Point Tunneling Protocol) is a method for creating a private line over a public line, the implementation of this tunneling method is mostly done by IT circles by utilizing existing computer network devices without having to pay expensive fees to rent a VPN will be an additional expense for the company.

Judging from the addition of the configuration made in the proxy which previously did not use the Tunneling Protocol feature to create a private path between the main building connection and the branch building, the proposed scheme was proposed with the addition of the PPTP Tunneling Protocol configuration that was configured by the proxy in each building as following.

The following is an explanation of the proposed network at the Al-Basyariah Education Foundation :

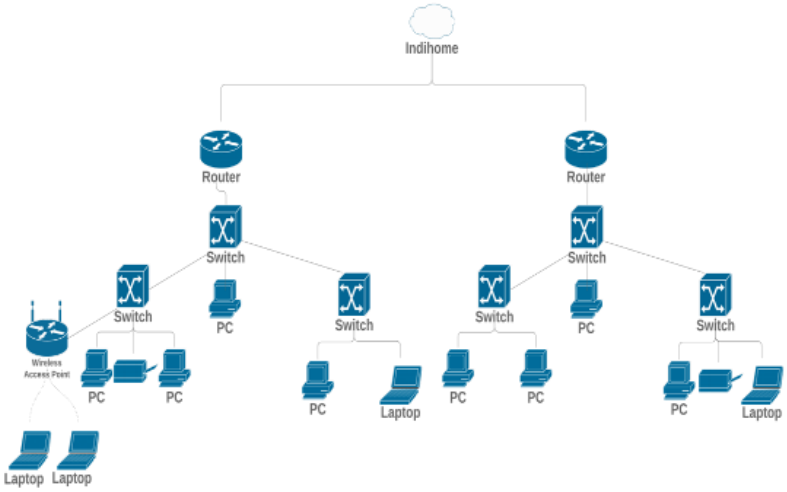


**Fig 3.** Proposed Network Scheme of Al-Basyariah Education Foundation

### B. Initial Network Testing

In the initial network testing phase, it was carried out before the implementation of the PPTP Tunneling method on the proxy router, it can be seen that each user in each building cannot yet be connected.

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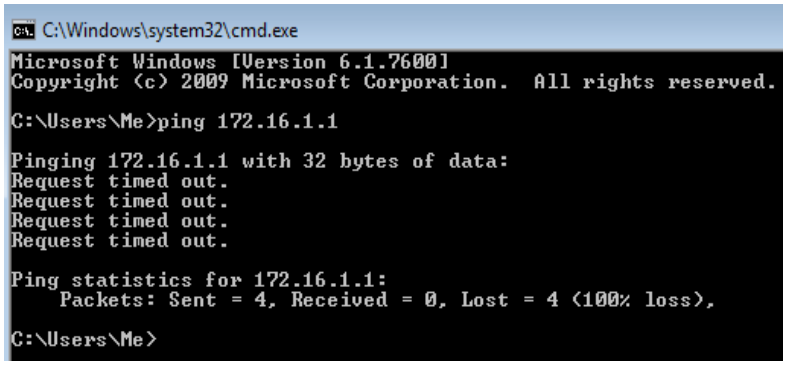


**Fig 4.** Test Ping of the main building (before)

The author performs a ping test on users in the branch building to users in the main building, it can be seen that Request Time Out or it can be called the network is not connected, so is the reverse test.

### C. Final Network Testing

At this stage of network testing, the authors have applied the tunneling method to each proxy.

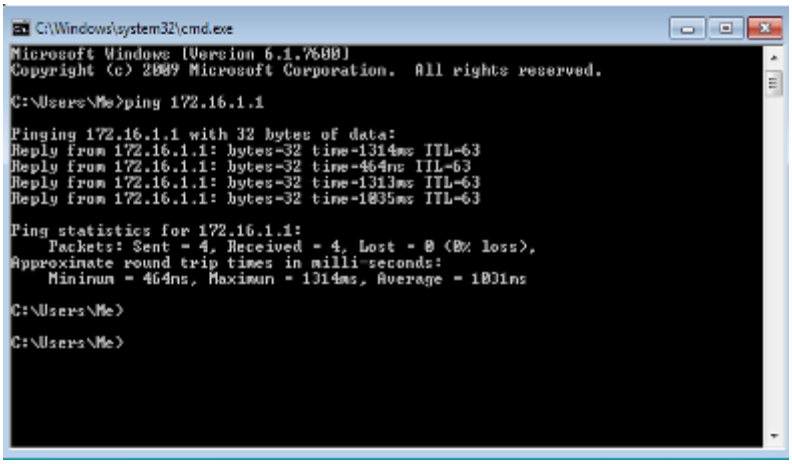


**Fig 5.** Branch building Ping test to main building (after)

The author performs a Ping Test on a user in a branch building to a user who is in the central office, it can be seen that there is communication or the network is connected. Then for the VPN network the author also performs a ping test, it can be seen that the ping request has been successfully replied, thus it can be concluded that the VPN network is running well and can communicate with internally the main building and branch buildings.

## 4. Conclusion

After analyzing computer networks at the Al-Basyariah Education Foundation, it can be concluded that:

1) The network system at the Al-Basyariah Education Foundation uses a tree topology and for internet needs using an ISP (Internet Service Provider) from Indihome.
2) To exchange data, the Al-Basyariah Education Foundation uses a flashdisk and email.
3) There is no connection between the main building and the branch building.
4) After the author proposes the tunneling protocol method PPTP (Point-To-Point Tunneling Protocol) the main building and branch buildings can be connected to each other. And for structured data exchange with the data center server.

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