Optimization of Network Security Using Website Filtering With Microtic Routerboard

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Abstract. The need for internet availability today is very important and greatly improved, people are now so dependent on the role of information technology that it has a very important impact. For that purpose there must be a good and efficient internet service provider system that should be economical. The Internet has had a huge effect on the dissemination of information, so that more and more people are accessing data over the Internet. These problems can be solved using MikroTik as a regulator of Internet data bandwidth and filtering sites that can interfere with computer network connectivity and interfere with job performance in accordance with established rules. This research was conducted using several steps, among others: process analysis to determine the traffic flow through the filtering process using Layer 7 Protocols, design to get the most effective and efficient way to implement router, implementation and testing by direct test to the web page or website with web browser. Based on research that has been done using MikroTik Routerboard whose result can fulfill system requirement specially in doing application filtering according to user requirement.

1. Introducing

The development of the world of telecommunications today is very rapid in line with the increasing need of fast and efficient services, data communications, ranging from connections between two computers to a computer network. Computer networks today are a much needed service. Computer networks have more benefits compared to personal computers. Computer networks enable the shared use of data, software and tools. So that working groups can communicate more effectively and efficiently[1].

MikroTik Router is one of the operating systems that can be used as a reliable network router, covering full range of features for network and wireless. In addition, MikroTik can also serve as a firewall for other computers and give priority to other computers in order to access Internet data and local data. MikroTik aims to set the bandwidth and perform computer network management. The placement of MikroTik router on a computer serves as a network gateway. Computer gateway serves to distribute data in and out of and from other computers so that all computers can access data together like Internet sharing [2].

Local network management (Local Area Network, LAN) is one of the solutions to the problem to get maximum service. This paper presents the implementation of MikroTik Router to manage Internet data traffic as well as filtering some applications that can disrupt the connectivity of computer networks in accordance with established and mutually agreed rules[4].
2. Methodology

2.1 Local Area Network (LAN)
LAN is a private-owned network within a building or campus measuring up to several kilometers in order to share resources and exchange information [7]. LAN was created to save costs in the shared use of tools but its function is continually increasing. A communication channel can be shared by multiple computers connected to each other. The shared use of communication channels is the key to streamlining computer networks into a very large network such as the Internet [5].

2.2 TCP / IP (Transmission Control Protocol / Internet Protocol)
Protocol is a formal specification that defines the procedures to be followed when sending and receiving data [8]. The protocol defines the type, time, sequence and error checking used in the network. Transmission Control Protocol / Internet Protocol (TCP/IP) is a protocol for sending data between computers on the network. This protocol is a protocol used for Internet access and is used for global communications. TCP/IP consists of two separate protocols. TCP/IP uses a layer approach when constructing this protocol. This layered approach allows for the construction of several small services for specific tasks. TCP/IP consists of five layers, namely:

a. Application Layer, within this layer applications like FTP, Telnet, SMTP, and NFS are implemented.
b. Layer Transport, inside this layer TCP and UDP add transport data to packets and pass them to the Internet layer.
c. Internet Layer, this layer takes packets from the transport layer and adds address information before sending it to the network interface layer.
d. Network Interface Layer, within this layer the data is sent to the physical layer through the network device.
e. Physical Layer, this layer is a cable system used to send and receive data.
TCP / IP is sent to each local network as subnets where each subnet has been assigned an address. IP that uses addressing is called IP Address. This IP Address is used to identify subnets and hosts logically within TCP / IP [6].

2.3 Firewall
A firewall is a system or group of systems that implements an access control policy against network traffic passing through access points in a network. The firewall task is to ensure that no extras beyond the scope are allowed. Firewalls are responsible for ensuring that the access control policy is followed by all users within the network. Firewalls are similar to other network tools in terms of controlling the flow of network traffic. However, unlike other network tools, a firewall must control network traffic by incorporating consideration factors that not all data packets it sees are like those visible. A firewall is used to control access between the internal network of an Internet organization. Today the firewall is increasingly becoming the standard functionality added for all network-related hosts [3].

Common firewall functions are as follows:

a. Static packet filtering
b. Dynamic packet filtering
c. Stateful filtering
d. Proxy.

2.4 Network Address Translation (NAT)
NAT is a method for connecting more than one computer to an Internet network using a single IP address. NAT is a technology that allows IP Private to share internet access network connections designed to simplify IP addresses, and also play a role in protecting the network and the ease and flexibility in network administration. The many uses of this method is due to the limited availability of IP Address addresses. NAT acts as a translator between two networks. IP address as a means of addressing on the internet increasingly becomes luxury and exclusive goods. No indiscriminate person
can now get a valid IP address easily. Therefore it takes a mechanism that can save IP address. A simple logic for saving an IP address is to divide a valid IP address number into several other client IP addresses. Or in other words, some computers can access the internet even if it has only one valid IP address. One of the mechanisms is provided by NAT. NAT works by converting IP addresses to one or more other IP addresses. Converted IP address is the IP address assigned to each machine in the internal network. The IP address that results from a conversion lies outside of the internal network and is a valid legal IP address.

2.5 Traffic Filtering
Traffic filtering is a technique for controlling the forwarded data traffic to and from a network across a router. This function involves designing a security policy. Different networks often have different levels of security. In its implementation, filtering of data traffic can be designed to form a firewall environment. As for a simple implementation, IP filtering can be a rule access list that permits ("permit") or blocks ("deny") certain data types based on source IP address [1].

2.6 MikroTik RouterOS
Mikrotik is a Linux-based independent operating system specifically for computers that function as a router. Mikrotik is designed to be easy to use and very well used for the purposes of computer network administration such as designing and building a small to complex computer network system. Mikrotik began to be established in 1995 which was originally intended for Internet service providers (ISPs) that served customers using wireless technology. Currently MikroTik provides services to many wireless ISPs for Internet access services in many countries of the world and is also very popular in Indonesia. Mikrotik on standard hardware based Personal Computer (PC) is known for its stability, quality control and flexibility for various types of data packets and routing process handling (routing). Mikrotik is made as a computer-based router much useful for an ISP who wants to run multiple applications ranging from the lightest to advanced. In addition to routing, Mikrotik can be used as access capacity management (bandwidth, firewall, wireless access point (WiFi), backhaul links, hotspot systems, Virtual Private Network servers and many others. Mikrotik is not free software if you want to use it fully, it takes a license from MikroTik to be able to use it by paying. Mikrotik is known as Level on its license.

3. Results and Discussion
3.1 Research Tools and Materials
The program code is taken from www.mikrotik.co.id as the main research material. Libraries are to configure MikroTik as a gateway and computer network management.

a. Software Equipment
   - Mikrotik OS
   - Browser Application (Google Chrome, Mozilla firefox)
   - Winbox is a utility used to remotely to a mikrotik server in GUI mode.
   - Windows 7 for winbox setting on PC or Laptop.

b. Hardware Tools
   - Routerboard RB750r2 Hex Lite
     hEX (RB750r2) as the name implies is the second generation product of RB750. It has 510/100 ethernet ports, with a new Qualcomm 850MHz processor. It is included with level 4 license and 12V adapter.
   - Laptop / PC
   - Hub Switch
   - UTP cable (Straight)
   - Huawei Modem HG8245A

c. Supporting Equipment
At the time this research was conducted the writer using IndiHome Internet connection service from Telkom Indonesia with total bandwidth of 10 Mbps to connect with Internet network.

3.2 Analysis
Analysis Process is a process to determine the requirement needed to build a computer network, gateway system as well as filtering some applications. The analysis was conducted to create a form of computer network design to be used in this study. Selection of the right topology will give maximum results. The network topology applied in this study makes use of star topology.

3.3 Network Devices
The selection of network devices used as shown in Figure 2 consists of a set of PCs, RouterBoard, Hub and Managable Switch. These network devices have great stability and reliability in the process of implementation.

![Figure 1. The network device used](image)

3.4 Process Analysis
Process analysis is the stage to determine the flow of traffic passing through the filtering process using firewalls (Figure 2).
3.5. Design

Design is a research phase to find the most effective and efficient way to implement the system with the help of data obtained in the analysis phase. Here are the details of the design done in this research:

In Figure 4 can be seen the flow of data packet sequence requested by client via MikroTik router.
3.6. Testing
The final step in this research is testing the application filtering system using MikroTik. This test is done to determine whether the system has been running properly. This test is done by stress test method (Figure 5). Stress testing is a test designed to fight against the system in abnormal circumstances. Stress testing is done by accessing some web addresses that have been filtered by MikroTik.

![Figure 5](image.png)

*Figure 5. The results of website display that has been filtered by Mikrotik RouterOS*

In Figure 5 can be seen the flow of data packet sequence issued by the router to be forwarded to the client via MikroTik.

4. Conclusion
Router applications using MikroTik generated can be to meet the needs of the system, especially in filtering applications in accordance with the user’s needs, so the application cannot be not accessed by the user in accordance with the regulations that have been previously designed and agreed.

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