Optimizing load balancing system to increase internet service at Benteng Village Office in Ciamis

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Abstract

Internet use is currently growing rapidly in many aspects of life; education, economy, social life, politics and culture. The needs and rapid developments in the use of the Internet network require a balance provision of Internet connection. In fact, connectivity is not always run smoothly because of low bandwidth capacity and network traffic increases. These problems cause network connection interrupted and data lose. Load balancing system is one of the solutions to get a better quality of internet service. Using more than one different ISP (Internet Service Provider) which is then balanced with load balancing system, can make the traffic run optimally, maximize throughput, minimize response time and avoid overload on any of the connection lines. This system worked by distributing the traffic load on two or more connection lines in a balanced way so that traffic can run optimally. By using load balancing system, when the internet is interrupted, then there will be a backup. This study focuses on implementing backups from Internet network sources or backups from dependency on one Internet service provider. The method used in this study is a case study. The instrument used is an observation at the Benteng Village Office in Ciamis. The process started by selecting the right ISP source to be used as a backup. Then continued with the Mikrotik installation and the application of load balancing in Mikrotik. The next steps are testing of the load balancing system which is carried out by technical testing of the implementation. The process includes testing the speed, the function, and optimization of the load balancing. The result shows that the use of load balancing system can be applied optimally. When network traffic increases due to the distribution of balanced connection lanes, it can run without changing the existing network and makes the connection run more optimal.

Keywords: *Internet Service Provider; Internet Standard Services; Proxy*

INTRODUCTION

Rapid progress in the world of information technology and communication has resulted in increasing number of internet users. The Association of Indonesian Internet Service Providers, as cited in Nugroho et al. (2023) claimed that in 2022 internet users in Indonesia has reached 204.7 million or 73.7% of Indonesia's total population. It shows that more than half of the population are internet users. This situation of course should be supported by stable internet access and optimal performance.

The internet users are also increased significantly at the Benteng Village Office in Ciamis. The easier access affected the increased users of internet in Benteng Village Office. Thus, it will automatically affect the amount of bandwidth required. To run the Internet smoothly, an adequate bandwidth quota is required. When the internet usage exceeds the existing bandwidth service, the smooth running of the Internet network will be hampered or stopped. Stopping or halting Internet network services will certainly disrupt the process of service convenience at the Benteng Village Office. For this reason, anticipation is needed to avoid overloading bandwidth usage capacity. For Internet network traffic to continue to run, a redundancy scenario is needed where the system will continue to run even though there are components that are not

functioning, for example, the availability of overloaded bandwidth. Optimization of bandwidth capacity can be done by adding bandwidth sources by implementing a load balancing system.

Benteng Village Office is experiencing network instability problems and the network's inability to support its daily operational performance. By using two types of ISP and making MikroTik as a load balancer using failover technique, it is hoped that it will be able to overcome these obstacles. Technically, load balance is not doubling the connection, but dividing the workload or connection load. MikroTik is also expected to be able to optimize bandwidth for each client who wants to access the internet. The mechanism is that MikroTik will mark packets that want to access the internet, then choose which ISP path to go through and equalize the load on the two ISPs. Meanwhile, if one gateway connection is being disconnected, the failover technique will make the other gateway automatically support all network traffic. Researchers observed the condition of the network at Benteng Village Office. The main network used was the Telkom Indonesia network only. Then the researchers tried to apply load balancing system, where the network use more than one Internet Service Provider (ISP). Currently, the main network is the Telkom Indonesia network, and backup network is taken from another provider that is from PT. Ring Media Nusantara. Thus, thsi study will discuss the impelementation of load balancing system to increase internet service at Benteng Village Office in Ciamis.

Previous research has been done (Amalia et al., 2023; Ceron et al., 2020; Siahaan et al., 2016; Dymora et al., 2014; Mishra et al., 2020; Rabu et al., 2013; Sagala & Pardosi, 2017; Zarlis & Efendi, 2022) similarly they focused their paper on load balancing technique with MicroTik. These supported this paper to become one of the community services report and publication

Load Balancing

Load balancing is a technique for distributing traffic loads on two or more connection lines in a balanced way so that traffic can run optimally, maximize throughput, minimize response time, and avoid overload on one of the connection lines. (Deworobroto, 2009). By having many links, the optimization of resource utility, throughput, or response time will be even better because having more than one link can back up each other when one link connection is down and be fast when a normal network requires high reliability which requires 100 % uptime connections and those who want a different upstream and are made to back up each other (Setiawan, 2009). Daraghmi & Yuan, (2015) resumed that Load-balancing algorithms have become increasingly popular and powerful techniques in modern distributed computing systems in recent years (Chang et al., 2014). They provide opportunities for increasing the performance of large-scale computing systems and applications since they are designed to redistribute the workloads over the components of the distributed system in a way that ensures expanding resource utilization, maximizing throughput, minimizing response time, and avoiding the overload situation (Abdelmaboud et al., 2014). To achieve the goal of maximum performance, it is prerequisite to smoothly spread the load among the nodes to avoid, if possible, the situation where one node is heavily loaded with excess of workloads while another node is lightly loaded or idle (Chwa et al., 2015; Luo et al., 2014).

Computer network

A computer network is a collection of two or more computers that are interconnected to communicate data. Data communication that can be done through a computer network can be in the form of text, image, video, and sound data. To build a computer network, attention must be paid to the situation and conditions of the organization that will build the network, for example, building structure, coverage, access speed, operational costs, and so on (Syafrizal, 2007).

Computers that are stand-alone or stand-alone have many limitations. The existence of a computer network will enable computers to do many things and can help efficiency and effectiveness in the world of work. Just a simple example, with a computer network, it is no longer necessary for 1 computer to have 1 (one) printer, but with just 1 (one) printer it can be used by several computers together without having to move the printer every time it prints. Figure 2.5 explains that it is sufficient to use only one printer for several computer units. The printer can be installed on any computer connected to the computer network.
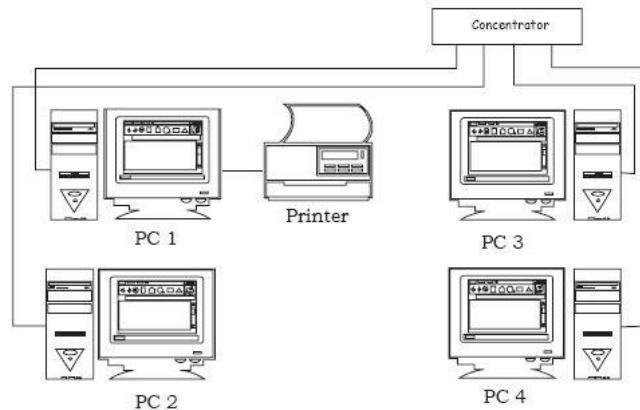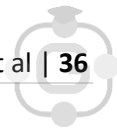
Figure 1. Computer Network

METHODS

This paper used a qualitative case study. It was followed by practice on how to use the internet properly and correctly. The results of the implementation of the training and the manufacture of tools are evaluated for the level of success as a report material.

The training was divided into several stages as follows:

1. Information Delivery
   At this stage, delivery of information technology was implemented. To convey information related to the importance of basic skills in technology and network security, the function of technology in the daily life of both the community and the Benteng village employees. Therefore, it is necessary to convey several materials so that the use of the internet and installed technology can be used, such as socialization and counseling activities.
2. Training and implementation
   It was carried out in the form of skills training in using the internet properly and correctly.
3. Application of technology
   It was carried out in the form of instruction and explanation on how to begin the internet application by opening a browser application and opening several sites that are needed.
4. Monitoring observations of design and manufacturing applications
   Participation of partners in supporting this program, apart from being participants in training activities and implementers, also participates in sharing in the use and utilization of the internet.

RESULTS AND DISCUSSION

The first stage was information delivery in form of training to Benteng village officer and its community. There are several materials delivered in three meetings (Table 1).

Table 1. Training of Benteng village officer

Activity	Meeting	Material
	Meeting I	General material, namely the importance of using the internet
1	Meeting II	Special material is how to use the internet properly and correctly
	Meeting III	Supporting material is an analysis of the function of the internet in everyday life

Figure 2. Information Delivery Activities

Implementation of Load Balancing System

After giving training to Bentneg village officers and its community, then the next stage was the installation process on how to configure load balancing using the Nth method as sharing the bandwidth load is removed from ISP-1 and ISP-2 sources evenly to the Local network. The modem and router used were located in the office.

Figure 3. The location of the Modem and Router used

Application and Installation Process

Set Load Balancing
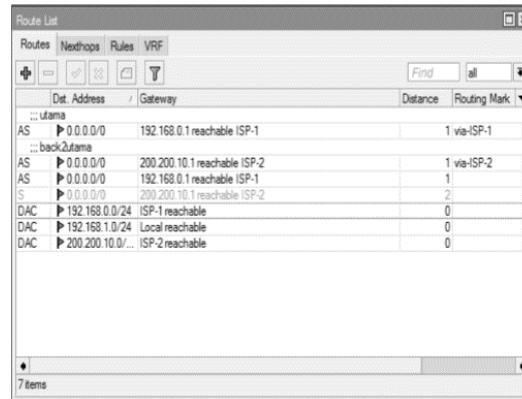
At this stage, the rules was applied to Mangle, along with the configuration rules that was applied to set the Load Balancing policy using the Nth method and regulated the outgoing and incoming packets through the Local router. The following is the result of configuring the Mangle rule to set the Nth method's Load Balancing policy.

#	Action	Chain	Src. Address	Dst. Address	Proto...	Src. Port	
0	mark connection	prerouting	192.168.1.0/24				
1	mark connection	prerouting	192.168.1.0/24				
2	mark routing	prerouting	192.168.1.0/24				
3	mark routing	prerouting	192.168.1.0/24				
4	accept	prerouting	192.168.1.0/24	192.168.1.0/24			
5	accept	prerouting	192.168.1.0/24	192.168.0.0/24			
6	accept	prerouting	192.168.1.0/24	200.200.10.0/24			
7	mark routing	output					
8	mark routing	output					

Figure 4. Set Load Balancing

Configure routes

At this stage, static gateways was provided for the routing marks that have been made on the Mangle Firewall and static gateways for the gateways from ISP-1 and ISP-2. Here are the results of the routes configuration:
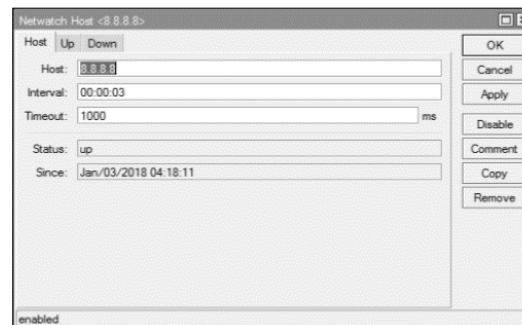

Figure 5. Route Configuration Results

Failover Implementation

The failover technique is used to ensure the availability of a continuous internet connection on a network when a problem occurs on one of the connection lines, such as being disconnected or dead. When there is a failure on one of the connection lines, the internet connection will automatically be diverted to a path that is still available and functioning properly. However, not a single village employee who mastered the technique was found. One of the introduced techniques is the implementation of load balancing. Static gateways were provided for marked routing in this stage.
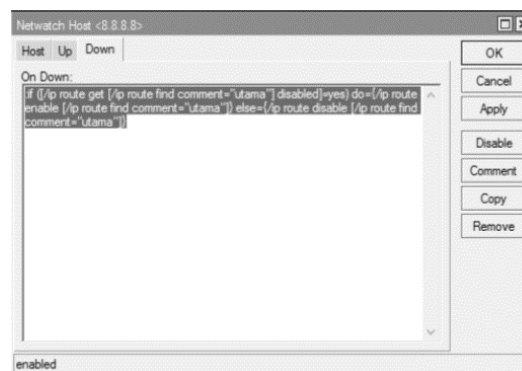
Figure 6. Failover Configuration Results – tab Host

Figure 7. Failover Configuration Results – tab Down

CONCLUSION

The results of implementing failover using load balancing can help balance traffic loads on two or more internet connections and increase internet access speed. However, load balancing is not a perfect solution for dealing with slow or unstable internet connection issues, especially if the problem stems from an internet service provider (ISP) or a network infrastructure failure. The perfect solution to the problem of a slow or unstable internet connection is to ensure that your network infrastructure is sufficient and suitable for your needs. This can include updating hardware, updating operating systems and software, optimizing network configurations, and ensuring that networks are properly managed. In addition, choosing a reliable internet service provider and comparing packages and prices from different ISPs can help ensure that you get the best internet service at an affordable cost. Furthermore, the results that were carried out after the community service turned out to raise many questions from the community and village employees. This indicates that their knowledge is still lacking in technology and networks. There are a few things that look better conditionally.

Table 2. Community Behavior Change

No	Description	Before	After
1.	Technology has made ways of communicating more flexible	Village employees go down to each RT/RW to inform the village program	The community can easily get village program information using the internet
2.	The internet is becoming an important part of everyday life	People don't want to try internet access	People are growing curious about how to use the internet
3	Mikrotik is one of the safest technologies	Employees use modems and randomly share accounts	Employees routinely change user passwords when they are needed

Limitations and future direction

Given the great curiosity of the people and employees of this Benteng village. it is necessary for the future to hold periodic training on topics related to the use of information technology so that it can facilitate the work of village officials at each village/ward office in the Benteng Village Subdistrict.

There is continuity and monitoring of the results of this community service activity so that village secretaries and treasurers can apply the training that has been obtained to their respective sub-district/village environment. Content: situations and conditions that limit research so that it can influence the conclusions of research results. These limitations can provide opportunities for future research.

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