

Implementation of Failover on Mikrotik Router Using Check Gateway and Distance Parameters

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ARTICLE INFO

Received : 30 October 2023
Accepted : 26 November 2023
Published : 09 December 2023

ABSTRACT

At the end of 2019 the world faced the Covid 19 Virus pandemic which also changed activities in daily life. All activities are carried out at home (Work From Home) including meetings and exchanging information via digital. Problems at this time in the office of PT. PLN often loses internet connection, at PT. PLN ULTG Tarahan also uses 2 ISP (Internet Service Provider) lines Indihome and Icon Plus in the server room, there is no system that can regulate the two ISP networks so that they can switch connection lines if there is a disturbance on the main ISP line so that there is a possibility of interruption during activities using the internet network. Failover is a technique for adding connections in Mikrotik, where if one of the internet connections dies (main connection), the other connection (backup connection) will replace the main connection line by defining a check gateway and differentiating the distance value on each routing rule. The results of this study will be able to guarantee the availability of internet at the PT. PLN ULTG Tarahan so as to increase employee productivity.

Keywords : failover, gateway check and distance, mikrotik, network, routing

ABSTRAK

Di penghujung tahun 2019 dunia dihadapkan pada pandemi Virus Covid 19 yang turut mengubah aktivitas dalam kehidupan sehari-hari. Segala aktivitas dilakukan di rumah (Work From Home) termasuk rapat dan bertukar informasi melalui digital. Permasalahan saat ini di kantor PT. PLN sering putus koneksi internet, di PT. PLN ULTG Tarahan juga menggunakan 2 jalur ISP (Internet Service Provider) Indihome dan Icon Plus di ruang server, belum ada sistem yang dapat mengatur kedua jaringan ISP tersebut sehingga dapat berpindah jalur koneksi jika terjadi gangguan pada jalur ISP utama. sehingga ada kemungkinan gangguan pada saat beraktivitas menggunakan jaringan internet. Failover adalah suatu teknik penambahan koneksi pada Mikrotik, dimana jika salah satu koneksi internet mati (koneksi utama), maka koneksi lainnya (koneksi cadangan) akan menggantikan jalur koneksi utama dengan mendefinisikan check gateway dan membedakan nilai jarak pada setiap aturan routing . Hasil penelitian ini akan dapat menjamin ketersediaan internet di PT. PLN ULTG Tarahan sehingga meningkatkan produktivitas pegawai.

Keywords : failover, check gateway dan distance, mikrotik, jaringan, routing

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I. INTRODUCTION

At the end of 2019 the world faced the Covid 19 Virus pandemic which also changed activities in daily life. All activities are carried out at home (Work From Home) including meetings and exchanging information via digital. A reliable, available and maintainable internet connection to support company activities such as Virtual Conferences is really needed to keep company activities running smoothly.

An agency engaged in the field of the largest electricity service provider in Indonesia, namely PT Perusahaan Listrik Negara (PLN) is a state-owned company that takes care of all aspects of electricity in Indonesia. PT. PLN ULTG (Substation Transmission Service Unit) power plant located on Jl. Basuki Rahmat No. 55, Gedong Pakuon, Teluk Betung Selatan District, Bandar Lampung City. Problems at this time in the office of PT. PLN uses 2 ISP (Internet Service Provider) lines Indihome and Icon Plus in the server room, there is no system that can manage the two ISP networks so that they can switch connection lines if there is interference on the main ISP line so the possibility of interference is very large during activities who use the internet network.

At this time the development of technology is very rapid in accordance with the needs and activities in the work environment in the face of intense competition between companies. Therefore, the need for the internet at this time is very much needed to interact digitally between humans in a work environment where activities using the internet are a basic requirement that must be fulfilled and the quality of the internal network is maintained, such as research conducted by Dian Novianto and Ellya Helmud who entitled Implementation of Failover Using the Mikrotik Router-Based Recursive Gateway Method at STMIK Atma Luhur Pangkalpinang which states that applying the Failover method is proven to be able to overcome problems on ISP lines that experience connection problems even though only using one ISP and a second ISP as an additional solution to run this failover method [1].

Failover is a technique for adding connections in Mikrotik, where if one of the internet connections dies (main connection), the other connection (backup connection) will

replace the main connection line. Switching connections from the main connection to the backup connection will run automatically [2]. If the main ISP, namely Indihome, experiences interference or disconnection, it will switch to the backup route, namely ISP Icon Plus, for that we need something system using Mikrotik Router technology with Failover in order to meet the needs of the internet network if the main ISP at PT. PLN is experiencing interference, it will be replaced with an alternative ISP line (backup connection) so that network activity can be optimal. The author uses the check gateway and distance parameters to solve the problem if the main ISP line is interrupted, the Mikrotik Router will check by pinging the Google DNS (Domain Name System) IP from the main ISP and backup ISP whether an RTO (Request Time Out) occurs if an RTO occurs or disconnection will be given time for the connection to move to the ISP backup.

From this presentation, the authors propose this Failover solution to be used, the authors make a study that aims to help solve the problem of interference on the main ISP line during activities that require a stable network.

II. LITERATURE REVIEW

From the Department of Informatics Engineering, Information System, STMIK Atma Luhur entitled Implementation of Failover with the Recursive Gateway Method Based on Mikrotik Router at STMIK Atma Luhur Pangkalpinang. Where in the research conducted by the author raised the problem of how to make ISP lines switch automatically using the failover method on the STMIK Atma sublim Pangkalpinang campus which only uses one main ISP line, namely the Icon Plus provider, but the internet quality in Indonesia is not very good because there are still service outages. internet from the ISP to the user. The results obtained from this study are by applying the ISP failover method, they can switch automatically by pinging directly to the IP DNS Public [1].

From the Faculty of Information and Communication Technology, University of Semarang entitled Implementation of Redundant Links to Overcome Downtime Using the Failover Method. Where in the research conducted by the author raised the

problem of how to combine the two ISP lines which are in different rooms, the Main ISP in the technician room and the backup ISP in the admin room. Researchers focus on monitoring or observing the Failover network using The Dude application. The results obtained from the research conducted by the author are that by combining two ISP lines using the failover method, it can overcome problems on the ISP line locally where downtime or connection breaks occur [3].

From the Information Systems department, STMIK Nusa Mandiri Jakarta entitled Implementation of Automatic Failover Using a Mikrotik Router for Network Optimization. Where in the research conducted by the author raised the problem at PT. Samafitro, which still uses one ISP line, namely the CBN provider (PT. Cyberindo Aditama) often loses connection at the head office which results in branch offices not being able to access the application. The results of the research conducted by the authors prove that applying the failover method can be a solution for ISPs where connection drops often occur [4].

From the Department of Informatics Engineering, Muhammadiyah University Pontianak entitled Implementation of Load Balancing and Failover Using the ECMP Method in Improving Network Service Quality. Where in the research conducted by the author raised the problem of how to be able to share the traffic load on two or more ISPs in a balanced way so that internet access by users can be divided equally. The results of the research conducted by the author by applying the Load Balancing and Failover methods can solve the problem of traffic loads on users and change ISP lines if a connection occurs [5].

From the Information Technology department, Nusa Mandiri University entitled Implementation of Load Balancing Methods Per Connection Classifier and Recursive Failover Using Mikrotik. Where in the research conducted by the author raised the problem at PT. Global Teknologi Servisindo uses one ISP line, namely the Varnion provider, which experiences problems with the speed of the internet, which causes traffic buildup on users. The results of the research conducted by the author by applying the Load Balancing

and Recursive Gateway methods are able to overcome internet speeds that occur when traffic buildup is accessed by users and replace ISP lines that occur when connection drops [6].

III. THEORETICAL BASIS

1. Implementation

Implementation is often interpreted by the implementation of the implementation or implementation. Because implementing means executing. Implementation can also be interpreted as an action of a plan or implementation or implementing a plan that has been made [7].

2. Computer Network

Computer network in terms is a collection of computers that are interconnected and have communication links between them. The connection between the computers allows for operations that are not possible in a stand-alone state. The key word of computer network is communication [8].

3. Mikrotik Routers

Mikrotik router is a sophisticated router based on the Linux operating system. This tool can be used for various computer network purposes, ranging from static routing, dynamic routing, hotspots, firewalls, VPN, DHCP, DNS cache, web proxies, and several other functions. Because of its very easy use, some admins call the Mikrotik Router a heaven device for admins. Mikrotik Router products consist of various versions, ranging from indoor routers, indoor or outdoor wireless routers, embedded 2.4 GHz or 5x GHz, indoor or outdoor antennas, and others [9] as shown in the following figure [10].

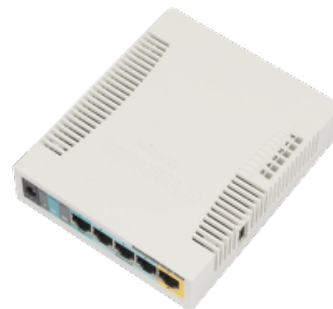


Figure 1. Router Mikrotik

4. Winbox

Winbox is the default application from Mikrotik to perform routerboard administration, all functions of the router can be adjusted and supports the MNDP (Mikrotik Neighbors Discovery Protocol) protocol, which is a protocol that can identify all Mikrotik routers that are directly connected to PCs and routers that are already connected to the network [11] as shown in the following figure [12].



Figure 2. Winbox

5. Failover

Use of Failover in an agency that has 2 or more ISP to run its services. Implementation of Failover will make one ISP will serve as a backup. This backup ISP will be needed when the main ISP experiences problems. On Mikrotik to change so that an ISP that we want to become the main ISP is by increasing the distance from the alternative ISP. The more it goes to 1, the ISP will become the main ISP [5].

6. LAN

LAN (Local Area Network) is a computer network that covers a limited area, such as an office, building, laboratory or one house in a family [13]. LAN now use more technology based on IEEE 802.3 Ethernet switches, or with Wi-Fi [14]. Most run at 10, 100, or 1000 Mbps. The striking difference between a Local Area Network (LAN) and a Wide Area Network (WAN) is that it uses more data, only for a small area, and does not require a network lease. Although now the most widely used ethernet switch at the physical layer uses TCP/IP as the protocol, at least there are still many other devices that can be used to build a LAN. LANs can be connected to other LANs using routers and leased lines to form a WAN.

Besides that, it can be connected to the internet and can be connected to other LANs using tunnels and VPN technology [4].

7. Check Gateway and Distance

Check Gateway and Distance is actually a unit in the configuration on the Mikrotik Router that has been carried out explaining that the Configuration IP address matches the address that has been made and for default routing is done 2 times, each using the Check Gateway ping parameter according to both ISPs. The main ISP has distance = 1 which means this path will take precedence over the second path, has a check gateway option which means this path will continue to be monitored by the router at any time so that it can find out if the path is experiencing interference. The backup path has a distance = 2, which means that this path will be a backup link and will only be used if the main ISP experiences interference. If the main ISP is active again, the configuration on the Mikrotik Router will return the distance path to the main ISP [3].

8. IP Address

IP (Internet Protocol) Address is a series of binary numbers between 32 bits to 128 bits that are used as addresses or identification numbers for each computer host on the network. The IP address works at the OSI layer at layer 3 network, 32 bit numbers are used for addresses or IP address version 4 or IPv4 numbers, while 128 bit numbers are used for IP address version 6 or IPv6. IP addresses are grouped into 5 classes, namely class A, B, C, D, and E, the difference lies in the size and number. Class A IP address for global scale network, Class B IP address for large and medium scale networks, Class C IP address for small scale Local Area Network, IP address D is also defined but not used in users but multicast and class E IP address used for experimental network only [7].

9. ISP

ISP stands for Internet Service Provider or Internet Service Provider / Organizer. ISPs are also often known as Internet Access Providers (ISPs) or providers in short. Internet access subscriptions via ISP can be obtained by contacting the company directly and paying

the required fee. The following are examples of ISPs in Indonesia based on data from APJII (Association of Indonesian Internet Service Providers), namely Biznet, Telkom Indonesia, Icon Plus, First Media, MNC Play, D-Net, GMedia, PadiNet, Indosat, Ooredoo, XL Axiata, Telkomsel [15].

10. Modem

Modem comes from the abbreviation Modulator Demodulator. The modulator is the part that converts the information signal into a carrier signal and is ready to be sent, while the demodulator is the part that separates the information signal containing data or messages from the received carrier signal so that the information can be received properly. Modem is a combination of both, meaning that the modem is a two-way communication device [16].

IV. METHODOLOGY

The implementation stages are carried out by the author in implementing the Failover method on the Mikrotik Router using the Winbox application, as shown in the following figure.

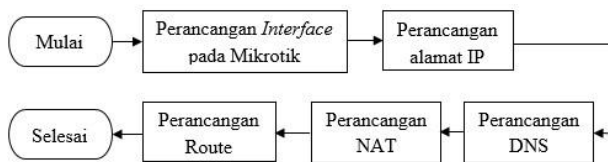


Figure 3. Failover System Implementation Plan

Implementation stages:

1. Interface Design

In this first stage the author makes an interface design on the Mikrotik Router using the Winbox application. This design aims to name all devices that enter the Mikrotik Router.

2. IP Address Design

In this second stage the author designs IP addresses on the Mikrotik Router using the Winbox application. This design aims to enter or register the IP address of the main ISP modem and backup ISP.

3. Design of DNS (Domain Name System)

In this third stage the author designs a DNS (domain name system) on the Mikrotik Router using the Winbox application. This

design aims to enter Google's server IP to be used as an IP ping on the route.

4. NAT (Network Address Translation)

Firewall Design In this fourth stage the author makes a NAT (Network Address Translation) design on the Router Mikrotik uses the Winbox application. This design aims to hide private IP addresses on the LAN network while at the same time creating a mask (protecting/hiding) the IP address that is directly connected to the ISP router, so that the private IP address was not visible to the internet network (public).

5. Route Design

In this fifth stage the author makes a Route design on the Mikrotik Router using an application winbox. This design aims to display all the configuration lists that we have made.

V. RESULTS AND DISCUSSION

The configuration on the proxy router is used to provide identity on each interface used to perform the failover method. The initial display of login to the proxy uses the Winbox application by accessing the IP that has been configured on the laptop, namely 192.168.120.1 login as admin and password 12345 as shown in the following image.

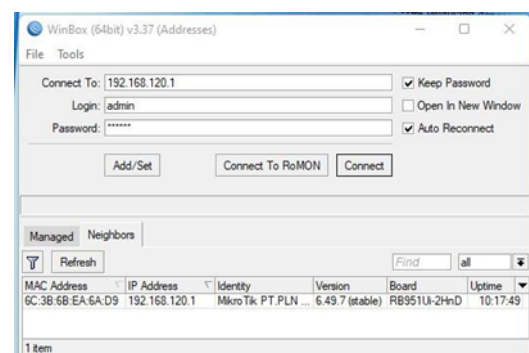


Figure 4. Startup Winbox

The interface configuration is made to determine the interface that is connected to each device that is used as an internet path as shown in the following figure.

1. ether1_ISP main Connect with ether 1 Modem main ISP.
2. ether2_ISP backup Connect with ether 1 Modem ISP backup.
3. ether3_switch Connect with ether 1 Switch.
4. ether4_leptop Connect to Leptop settings.

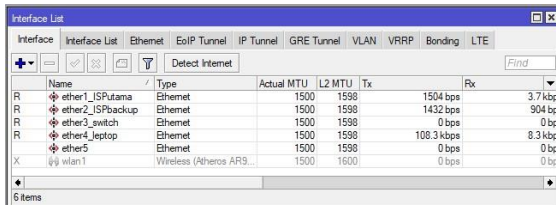


Figure 5. Configuration Interface

IP configuration to provide IP addresses on each interface used for the IP configuration of the author uses class C IP because class C is used for small-scale networks, usually used for LAN networks and to make it easier to configure proxy. At this stage the IP address will be given via the address list as shown in the following figure.

- 192.168.200.50/24 ether1_ISPutama IP from main ISP modem to proxy.
- 192.168.1.50/24 ether2_ISPbackup IP from Modem ISP backup to proxy.
- 192.168.20.1/24 ether3_switch IP from proxy to switch for users.
- 192.168.120.1/24 ether4_leptop IP from proxy to leptop settings.

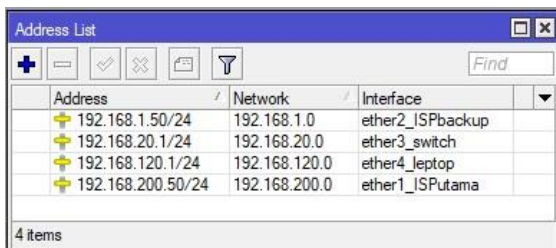


Figure 6. Configuration Address List

NAT firewall configuration to allow users to get internet access from the main ISP and from the backup ISP with the 'masquerade' action which is a method that permits and allows private IPs to connect to the internet using the help of a public IP or masking a public IP. With the help of masquerade, a public IP can distribute internet connections to many private IPs as shown in the following figure.

- srcnat masquerade ether1_ISPutama Internet access from the main ISP modem and the backup ISP will be forwarded to the user.
- srcnat masquerade ether2_ISPbackup Internet access from the main ISP modem and the backup ISP will be forwarded to the user.

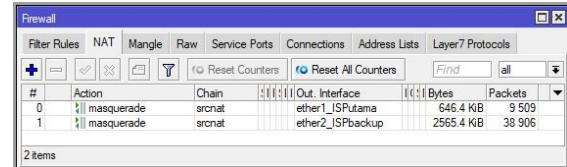


Figure 7. Configuration Firewall NAT

DNS configuration so that users can get access from Google's IP. The Google IPs used are 8.8.8.8 and 8.8.4.4, and the 'allow remote requests' is activated so that if the IP from the ISP changes, the user does not need to change manually again as shown in the following figure.

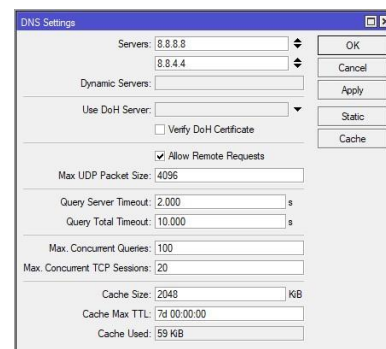


Figure 8. Configuration DNS

In the route list configuration, you will see the failover method running with the condition that the configuration check gateway ping passes through the main ISP IP, namely 192.168.200.10 with distance 1 marked in black which can be interpreted as the path that is currently active and the back gateway ping passes through the backup ISP IP, namely 192.168. 1.10 with a distance of 2 in blue which can be interpreted as an inactive line, and if the main ISP experiences a connection drop, the internet path through the backup ISP will be active marked in black as shown in the following figure.

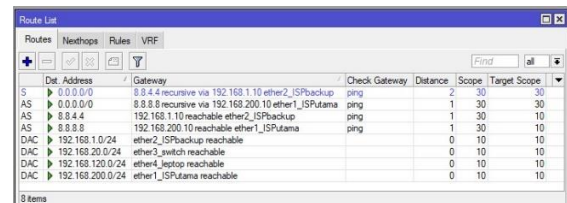


Figure 9. Main ISP Configuration Active

Main ISP test by testing if the FO cable from the main ISP modem is disconnected and experiences RTO whether to move to the backup ISP or not, it can be seen in the route

list when the FO cable is disconnected an RTO has occurred after 20 seconds it has changed paths to the Backup ISP seen with a color change from black to blue which means the ISP is not active to see the failover shift can be seen in the following figure.

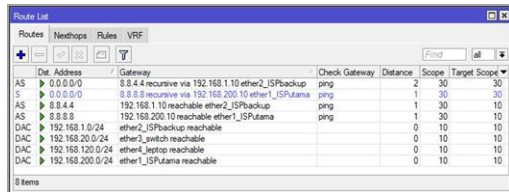


Figure 10. Main ISP Line Change

ISP Backup test by testing if the FO cable from the main ISP modem is reconnected, whether the internet line that is on the backup ISP line will return to the main ISP line or not, the change can be seen from the blue color that changes to black, you can see in the following figure.

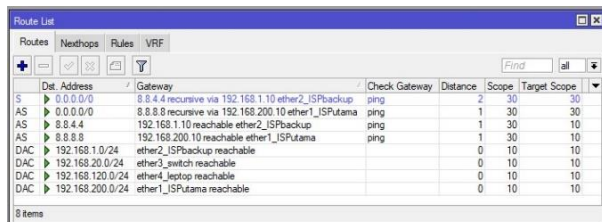


Figure 11. ISP Backup Line Change

Based on the test analysis results obtained in the study, there were significant average time results in network trials after running the failover method, the average time results can be seen in the following table.

Table 1. Average Time Analysis

Date	Time	Disconnect	Connect	Average
27/03/2023	10.00	20 Sec	23 Sec	21 Sec
27/03/2023	12.00	23 Sec	22 Sec	
27/03/2023	14.00	19 Sec	20 Sec	
28/03/2023	10.00	20 Sec	21 Sec	20 Sec
28/03/2023	12.00	25 Sec	20 Sec	
28/03/2023	14.00	22 Sec	23 Sec	
28/03/2023	16.00	19 Sec	19 Sec	
29/03/2023	10.00	21 Sec	21 Sec	21 Sec
29/03/2023	12.00	26 Sec	26 Sec	
29/03/2023	14.00	19 Sec	22 Sec	

After the failover method is implemented in the network topology, there is an average recorded time of 20 seconds in testing the disconnection and connection of the FO cable at the main ISP, the average time is obtained

from the amount of data divided by the amount of data. The recorded time is affected by the usage load of the ISP, the longer the transfer, the more ISP is used and the faster the transfer, the ISP is not used.

VI. CONCLUSION

Based on the discussion and description that has been explained in the previous chapters, it can be concluded that by implementing the failover method on the proxy router with the check gateway and distance parameters to change the ISP line automatically by utilizing the check gateway ping and the distance function to find the path from one of the ISP that is a priority on the route list to move the ISP line automatically in about 20 seconds, it has been successfully implemented

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