

Load Sharing Intervlan Networks Using Virtual Redundancy Protocol To Maintain Network Availability With EVE-NG

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Abstract- The availability of a network becomes the main thing to keep in mind, techniques, exchange of information quickly and accurately takes a good stability of the network connection. Therefore, created a variety of methods to find out the best path towards a network and minimize disconnection between points so as to create a minimal downtime. One way is to divide the traffic load (load sharing) on the router. The subjects were taken in this study focused on the design load sharing on the network using the VRRP protocol. Design load sharing using VRRP protocol starts from determining the VLAN network topology design is used. in this case, will determine to what group VLAN Router as the master and the router as a backup. In the second configuration Router load sharing in a state (active-active), so that each router will be the master for each group VLAN, and will be the backup router if one of the master router failures. Based on tests performed in this study resulted in the level of high availability network services, and make the connection can continue to run even if there is a link connection is not working.

Keywords- Availability, load sharing, VRRP, VLAN.

I. INTRODUCTION

Multipurpose Building in Jakarta there are so many architecture, there are also advantages and disadvantages of each and this will make consumers confused to choose which building will be used to organize an event bulding in Jakarta [1]. *virtual LAN* (VLAN) is a network that is connected to the same network, although different locations to do in hardware configuration switches with trunking method [2], the switch can be connected to a network router to connect a VLAN that has been determined Therefore, created a variety of methods to find out the best path towards a network and minimize disconnection between points so as to create a minimal down time [3]. When we talk about topology star topology is interconnect between server machines with each other must go through the Head Office as the center of communication [4]. Routing inter-VLAN is the process of forwarding network traffic from one VLAN to another VLAN using the router The main problem in the VLAN is, how can users of one VLAN (broadcast domain), use the services offered by another VLAN [5][6]. Each network has its own needs, although the network is large or small, internal routing, in many cases, very important. In addition to the ability to create VLANs and control of network traffic, this switch can also increase security by using a switch port security capability that functions to handle the kejarangan access rights based on the port - a port owned

by the switch [7]. Popular setup includes separate broadcast domain for essential services such as File Server, Print Server, Domain Controller and the other servers [2]. The experimental evaluation shows improved performance in terms of delivery ratio, latency, throughput, delay, energy remaining and routing overhead [8].

The problem happens when the disruption of routers and links that connect between VLANs (InterVLAN), to overcome these problems and to realize the network VLAN high availability. Virtual Redundancy Router Protocol (VRRP) is a computer network protocol that has automatic scheduling services to ensure that data transfer from source to destination can be carried out properly [9][10]. This aim is implemented VRRP (Virtual Redundancy Router Protocol) is used as the protocol load sharing [11-15]. The ability to segment your network by creating a VLAN, thus reducing network broadcast and improve safety is a technique used by most engineers. Popular setup includes separate broadcast domain for essential services such as File Server, Print Server, Domain Controller and the other servers [13]. Therefore, to provide a network that remains available and reliable and can accommodate the service data, use the configuration Load Sharing using the protocol VRRP, with the VRRP on the network InterVLAN, it is expected that we could have a network that is effective, efficient, and are high availability [14]. Problems in the design and analysis is how to design load sharing using VRRP protocol [15]. Effect of Load sharing network performance VRRP when one router fails on / off based on QoS parameters, and the effect of traffic in the event of a link failure [16][17]. The purpose of this study VRRP can design a network in order to share traffic load or load-sharing [18][19], Finding the optimal configuration in designing a network load sharing using VRRP protocol, Analyzing the Effect of service quality performance in a network in the event of a router failure [20]. VRRP is a protocol open source redundancy which means it can be used in a variety of brands of devices and is designed to improve ketersedianan service of the default gateway on the same subnet VRRP is high availability open standard protocol defined by the IETF RFC 3768 defines First-Hop redundancy Protocol where a router acts as a master and the other as a backup [21].

II. RESEARCH METHOD

Development of the system is an alternative to explore a scientific study. But still have to have a foundation in the development of systems that will be done. In this paper, the development method used is NDLC (Network Development Life Cycle).

a. analysis

This initial stage is to analyze the needs, analyze problems, analyze topology or network to be implemented VRRP.

b. Design

This design phase will create an image of the network topology design to be built, Design can be a topological structure design, design data access, and so on which will give a clear picture.

c. Prototype Simulation

The network topology will be created in the simulation using a network-specific tool, EVE-NG (The Emulated

Virtual Environment-New Generation), this is intended to see the initial performance of the network to be built[22][23][24].

d. Implementation

In implementations will implement all that has been planned and designed before. Implementation is a stage that will determine the success or failure of the project to be built.

e. monitoring

After the implementation stage of monitoring is an important stage, so that the computer and communications networks can run in accordance with the wishes and the early goal, it is necessary for monitoring activities.

f. Management

The management or arrangement, one particular concern is the problem of the Policy, the policies need to be made to create / set the system that has been built and running well can be prolonged and elements of Reliability awake.

III. RESULT AND ANALYSIS

In this chapter the author will explain the process of applying load sharing features on VRRP and contains the analysis and design of the system are made, starting from system analysis, needs analysis and system design.

3.1 Analysis System

System analysis is the decomposition activity of an information system intact and visible into parts or components of a computer that aims to identify and Conduct analysis of any problems and needs required to implement the protocol VRRP Load-sharing on a network.

3.2.1 Problem Analysis

Before building Load-sharing network with VRRP, the first steps taken was to analyze the problems faced by them:

- Network systems are implemented today still use a router, use a router on a computer network, especially on a computer network hub / head office are particularly at risk of impending failure of a router.
- Use of single router and would not guarantee a single link high availability network.
- All traffic is charged at one router, so the possibility of congestion or a slowdown in the paths of data packets and cause decreased performance / slow down

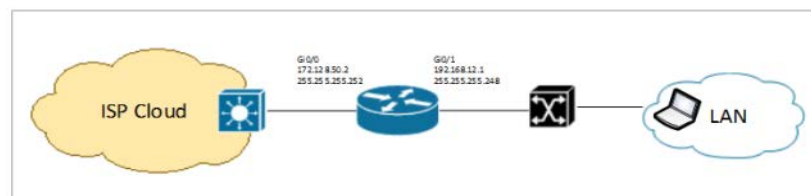


Fig 1. Existing Topology

3.2.2 Solution to problem

From the analysis of the problem, then there is a need that all problems can be solved. Those problems can be solved by means of:

- Adding one Router device and one additional link connection to ensure the availability of a network.
- Build a network Virtual LAN (VLAN) so that they can communicate as well as when the device is connected to the same line, when in fact these devices are on different LAN segments.
- Dividing the traffic load (load-sharing) on both the router, by configuring VRRP on each router in order to implement load-sharing.

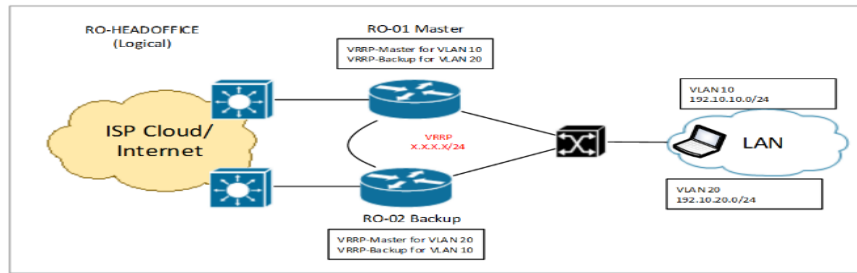


Fig 2. Topology Design The design of load sharing VRRP

3.2 System Planning

In this stage of system design that can be realized for the next stage of the implementation of the system. The step of made in implementing load-sharing protocol used VRRP on a network starts with designing the network topology that is equipped with two links in order to support

the implementation of the method of load-sharing, and then prepare all the necessary tools, followed by the configuration of the router for load-sharing implement and test the availability of the link from the client side by dividing the traffic load.

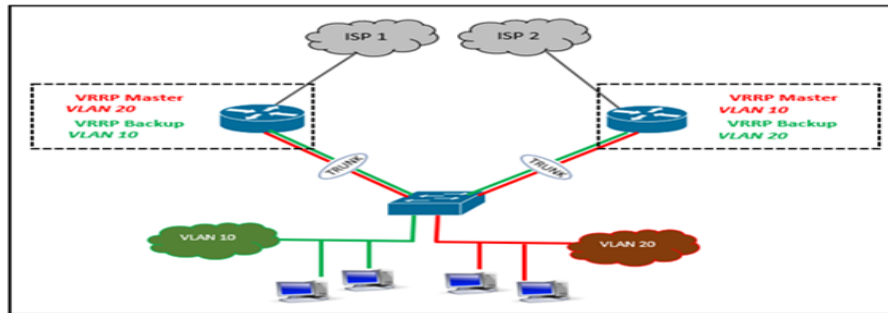


Fig 3. Load-sharing system with VRRP

3.2.1 Vlan Network Design

The performance of a network is needed by the organization, especially in terms of speed in data transmission. One of the contributions of technology to improve the performance of the network is the ability to split a large broadcast domain into several smaller broadcast domains by using VLAN.

The devices used in this design are two Cisco routers, and one Cisco Switch. Stages configuration that should be done is:

- The second stage in the configuration of Cisco routers (subinterface VLAN, IP Address)
- Stage configuration of the device switch (VLAN interface, connection type)
- Phase Testing connectivity between Router.

To further clarify, the configuration stage will be displayed with the flowchart as shown below:

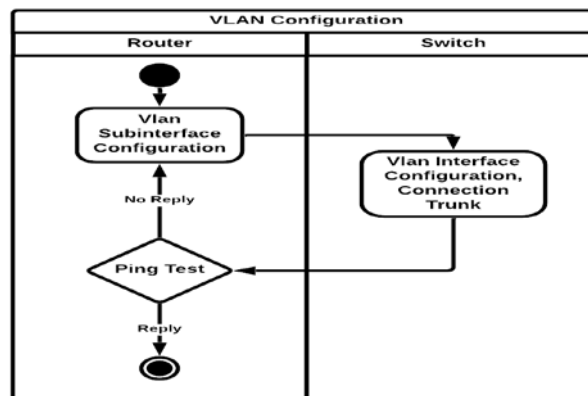


Fig 4. VLAN configuration on routers and switches

By using VLAN, we can segment the network based on function, we can also manage our network in line with the growing needs of the company so that employees can access the same network segment despite being in different locations.

3.2.2 Design and Configuration, Load-sharing VRRP

Load-sharing configuration using VRRP protocol on the router 1 and router 2, is the stage where in doing arrangements parameters contained in a Router.

The parameters that we set the router 1 and router 2 is:

- a) Phase 1 configuration on the router (VRRP group description, VRRP group priority, preempt VRRP group).
- b) Phase 1 configuration on the router (VRRP group description, VRRP group priority, preempt VRRP group).
- c) Phase 1 verification VRRP router (Router 1 10 = Master's VLAN, VLAN 20 = Backup)
- d) Phase 2 verification VRRP router (Router 1 10 = Backup VLAN, VLAN 20 = Master)

To further clarify, the configuration stage will be displayed with the flowchart as shown below:

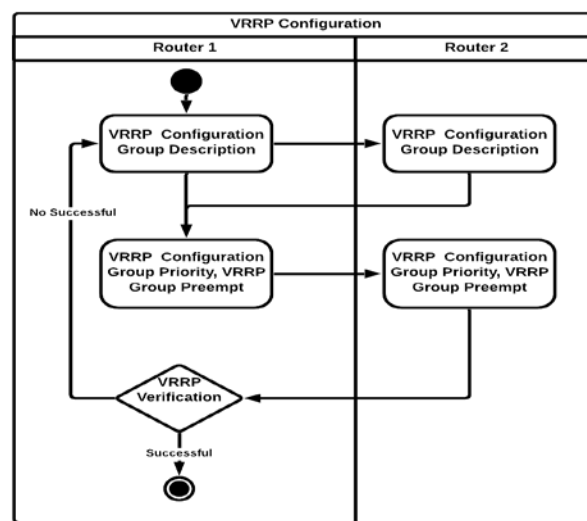


Fig 5. Flowchart VRRP configuration Router 1 and Router 2

3.3 Network Simulation

Some workers will be made in the form of network simulation with the help of special tools in the areas of networking in this case I use the tools of EVE-NG. It is intended to see the initial performance of the network to be built. Based on the design topology which can process network analysis in the previous chapter, then can design topology as shown below.

Based on design drawings topology in Figure 3, the next in the topology design implemented in a network simulation with the help of EVE-NG tools, by adding some objects such as routers and switches.

1. Turn EVE in the Virtual Machine, then access via a web browser and login.
2. Next, create a Lab by clicking the button add-lab, Once the lab to see emerge, next add object Router and Switch devices with the click of button add an object.
3. After adding a few objects in the network simulator EVE-NG, then make connections between objects such as routers and switches, so that nodes can be interconnected in accordance with the existing topology design.

4. After the inter-virtual device is connected according to the topology design, and then turn on the virtual router / switch.
5. After all, virtual devices in a power-ON state, then the next can to be done in accordance with the topology configurations and features that will be simulated, for the configuration of ssh Xshell authors use tools.

3.4 Network Test

Testing of computer networks is a step taken to check whether the network has been simulated using EVE-NG network tools can be connected properly or not. This test is used for things like check the network connection between devices, check whether the network design which made it meets the desired expectations, as well as remote network devices like Switches, Routers, and more.

3.5 Testing Methods

Methods of testing conducted to determine the level of availability of a network when moving to another link by using a network analyzer Wireshark as well as PRTG to see the graph change occurs when the link system disorders.

Networks used for simulation in this paper have limitations, ie not connected to external networks so that no traffic is exactly the same as the original Internet network. With this in mind, we used a simulated network traffic so that the generator can be more like the Internet. To perform such tests carried out several scenarios includes:

Testing connectivity by using the ping command to make sure the network between client and server are already connected and the tracert command to determine which path traversed. As well as using the help of tools wireshark to analyze their networks and PRTG to the monitoring network by using a background in traffick of 350kbps and 350kbps in the router 1 Router 2.

3.5.1 Scenario I

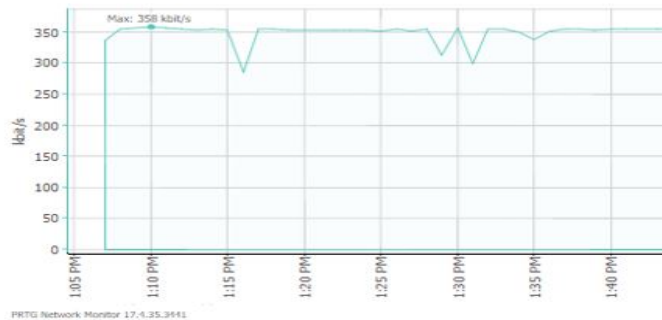


Fig 6. Traffic Capture PRTG Router 1 Scenario I

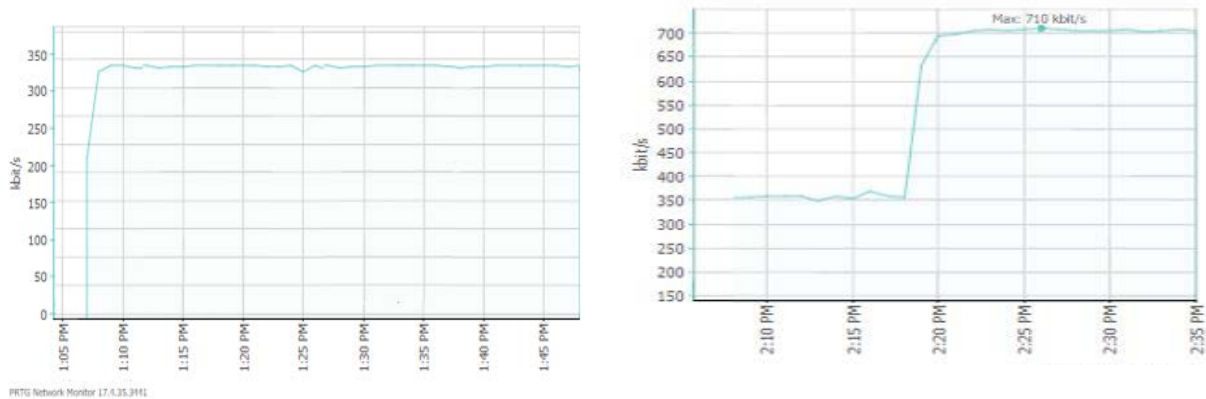


Fig 7. Traffic Capture PRTG Router 2 Scenario I

3.5.2 Scenario II

Testing is done by turning off the Router 1 (R1) or the port to the LAN interface, the expected goal is, the line and load data packet traffic to the router will be transferred to

the router two. With the help of its network analysis tools and Wireshark for PRTG to the monitoring network and use a background in traffic of 350 kbps and 350 kbps in the router 1 Router 2.

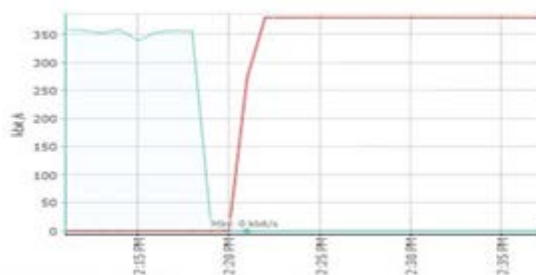


Fig 8. Traffic Capture PRTG Router 1 Scenario II

3.5.3 Scenario III

Tests conducted by the scenario Link Router 2 had failure / die, the destination that is expected is that the

traffic on the two routers will be diverted towards Router 1. With the help of tools and Wireshark to analyze their networks for the PRTG network monitoring and use of the

350 kbps Traffick background in the router 1 and 350kbps on Router 2.

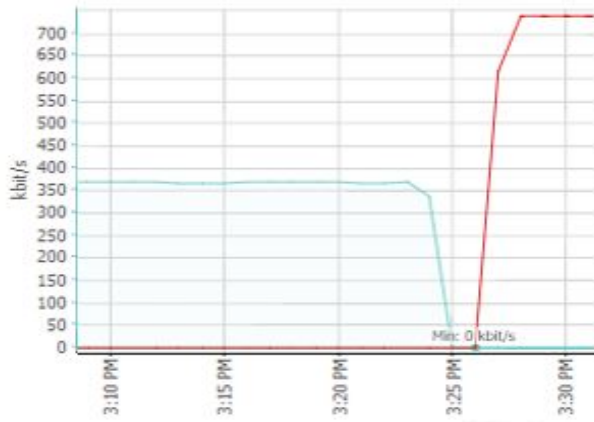


Fig 9. Traffic Capture PRTG Router 1 Scenario III

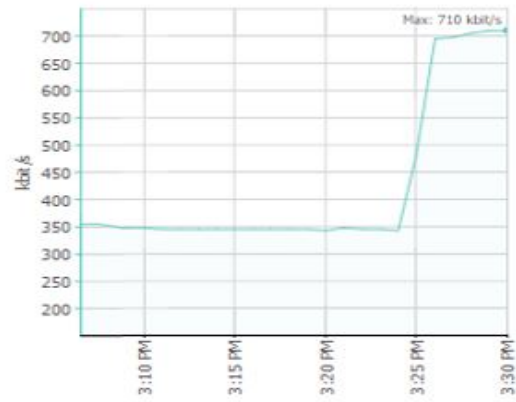


Fig 10. Traffic Capture PRTG Router 2 Scenario III

3.5.4 Performance testing Quality of Service

Performance profiling is one effort in improving the efficiency and effectiveness of the work of a network in order to increase the productivity the work of the network. To test the quality of the performance of systems using the

protocol VRRP load sharing by using QoS. The QoS parameters used in the measurement include *delay*, *jitter*, And packet loss.

a) Testing during the first router failure.

Table 1 Test when Router 1 failure

NO	Test router 1 when it fails		
	Delay (Ms)	Jitter (Ms)	Packet Loss (Ms)
1	1.21	0.11	5
2	1.06	0.21	27
3	1.05	0.11	3
4	0.94	0.08	55
5	1.26	0.02	37
6	1.27	0.08	10
7	1.1	0.32	35
8	0.98	0.12	3
9	1.21	0.04	8
10	1.08	0.07	8
Average	1.116	0.116	19.1
Std.Dev	0.117	0.088	18.18

From table Testing On When Router 1 Experiencing failure can be an average value for Delay 1,116 with a value of standard deviation of 0117, thus $1116 \pm 0117 = 1.3$ ms. jitter 0.116 to 0.088 standard deviation value, so $0.116 \pm 0.088 = 0.204$ ms. and packet loss to the value of standard deviation 19.1 18:18, so $19.1 \pm 18:18 = 37.28\%$.

TIPHON standardization according to delay 1.3 ms, 0.67 ms jitter still in Very Good condition, but for packet loss, in the category is bad.

b) Tests at the time of transfer from one router to router 2.

Table 2 Testing at the time of transition from one router to router 2

NO	Test when switching from router 1 to router 2		
	Delay (Ms)	Jitter (Ms)	Packet Loss (Ms)
1	1.02	0.34	0
2	1.1	0.73	0
3	0.98	0.68	0
4	1.09	0.02	0
5	1.1	0.36	0
6	1.06	0.51	0
7	0.97	0.07	0
8	0.96	0.51	0
9	1.12	0.61	0
10	1.04	0.14	0
Average	1.044	0.397	0
Std.Dev	0.059	0.254	0

From table Testing On When Displacement of Router 1 to Router 2, in can be an average value for Delay 1044 with a value of standard deviation of 0.059, so that $1,044 \pm 0.059 = 1.1$ ms. jitter standard deviation of 0397 with a value of 0254, thus $0397 \pm 0.254 = 0.651$ ms and packet loss 0% with a standard deviation of 0.0, making it $0 \pm 0.0 = 0\%$. by standardization TIPHON to 1.1 ms delay, jitter and packet loss 0.651 0%, are still in Very Good condition.

IV. CONCLUSION

The conclusion that can be drawn from this are:

1. High network availability by utilizing Load sharing to share the burden of traffic within a network can be run using VRRP protocol on Router device.
2. In the test results when the router 1 failure has a good network quality, characterized by delay and jitter values were all in good and excellent categories. While the value of packet loss that occurred during the test is included in the bad category because of the transfer between routers.
3. Based on test results when links or devices from one router fails, then the traffic will be routed automatically to the other router links are active, so availability (availability) of a network is maintained.

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