Backup Link Reviewed Layer Distribution Method Using Virtual Router Redundancy Protocol (VRRP)

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ARTICLE INFO	ABSTRACT
	Internet networks run 24 hours a day and must provide a stable performance and reliable, the networks of local SMK Tridharma Budhidaya there is only one router and when the router such disturbances then the internet at the school disrupted and therefore to prevent the internet is not happen down the proposed use by implanting method Backup Router Virtual Router redundancy Protocol (VRRP) After that is done four stages of testing and Througputh Loss Package. Software testing is done using Wireshark results in Loss Package testing get 10, 20, 30, 40, 50, 60 Minutes yield value of 0.43%, 0.21%, 0.20%, 0.10%, 0.8% , 0.10% Loss Package Referring TIPHON below 3% is quite good and the testing Througputh for 10, 20, 30, 40, 50, 60 minutes, producing a value 275Bit / s, 280 Bit / s, 282 bits / s, 282 bits / s, 279 bits / s, 278 bits / s referring to standardize TIPHON that the average yield testing Througputh 279 Bit / s is said to be very good. with this result VRRP method is able to provide solutions when the Main Router encountered a problem and still maintain good quality of the network.

1.   Introduction

Failure on the network consists of device failures and link failures. Network device failure means that the device itself is down / experiencing problems, causing Router device failure on the network will be down because no one can forward packets [1]. At SMK Tridharma Budhidaya Frequent disruption of the Internet network and result in activities that use the Internet at school paralyzed, resulting in losses in all sectors, the collapse of the Internet in schools caused by the main router which often have problems error.

The solution of the problem Router main frequently encountered problems is to apply Router Backup using the method of the Virtual Router Redundancy Protocol (VRRP) The goal when Router Top / Master impaired then Router Backup immediately replace the task of Router principal if Router Master has returned to normal then the Router Master back take over its function [2].

Previous research by I Gede Made Surya test the Virtual Router Redundancy Protocol Method backup link without combining with VLAN method and produce Delay, with 80ms Delay value and 16-18% Loss Package. Delay good value calculated according to Standard TIPHON [3]. According to Indra Chaidir From the results of tests performed, Virtual Router Redundancy Protocol (VRRP) can be used to address the device failure occurring on one network and can improve network performance. By applying the protocol VRRP Router when the load is increased and the network has a link failure, it is known that VRRP can work well, so that all the data transmission process continues to run as it should, So based on previous research VRRP method can be used as a solution to overcome the failure of the main links due to problematic and VRRP Router is able to provide optimal network and can be applied to the network in Tridharma Budhidaya vocational school.

2.   Research Methods

The design will be made is to build Backup link at Layer 3 to overcome Link Failure on the main router / Master using the   Method virtual   Router Redundancy Protocol (VRRP) and in komibinasikan

by using VLAN and DHCP method to give naming a bunch of different LANs, and granting IP Address Automatically using Network Simulation Software Generation 3 (GNS3) after that in measuring the quality of Loss Package and Througputh on the network using the Software Wireshark [4].

A. Device needs

There are several devices used in the study, including:

1) hardware: Laptop Windows 10, Strix ROG-i5 Processor G531, 4.1GHz CPU, 16GB DDR4 RAM, 1TB SSHD
2) Software: GNS3 Version 2.2.0
3) tools supporters: Wireshark (Capturing Traffic Network)

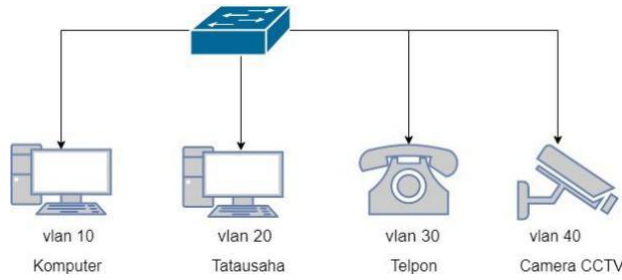B. Methods Virtual Router Redundancy Protocol
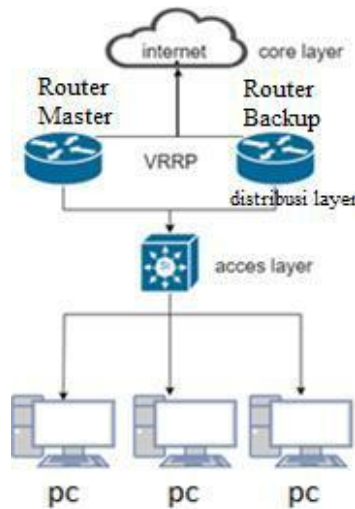
Fig 1 Topology Virtual Router RedudancyProtocol (VRRP)

Figure 1 is a topology (VRRP) is an election protocol that dynamically assign responsibility to one or more of the Virtual Router to Router VRRP on the LAN, which allows several routers on multiaccess links to utilize the same virtual IP address. A VRRP Router configured to run the VRRP protocol in conjunction with one or more other routers attached to a LAN. In a VRRP configuration, the router chosen as the Master router to another router to act as a backup [5]

Table 1
The term in VRRP Method

Term	Definition
router Master	Is router that working forwarding Packet Data (Router Main)
Backup router	Router backup if Router Dead major
Priority 1-254	Priority value priorities given to determine router Master and router backups Priority value is 1-254 If router given the highest value it is the Router Master / Main

C. Methods Virtual LAN (VLAN)

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Fig 2 Virtual LANs (VLANs)

Figure 2 VLAN is a group of devices on a LAN or over, which is configured (using virtual devices) 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 [6].

D.   Method of Dynamic Host Configuration Protoocol(DHCP)

Method DHCP is a service that automatically giving out the IP address of the computer that is requesting it [7].

E.   Parameters Quality Of Service

A parameter calculation about kuliatias on a network that included a Package Loss, Delay, Jitter, Bandwidth, Througputh.

1) Loss Package is a parameter that describes a condition that indicates the total number of packets lost,

Table 2
Standardization Packet Loss Based TIPHON

category	Loss package
Very good	0%
Well	3%
Ugly	15%
Very ugly	25%

In Table 2 Referring to the outcome of the testing TIPHON Standards Loss Package on the Network at say Very Good when the value of 0% Loss Packages, Nice 3%, Medium 15% and the Ugly 25% [8].

2) throughput namely the speed (rate) effective data transfer, measured in bps (bits per second). Throughput is the total number of successful packet arrival observed on goal during a specified time interval divided by the duration of this time interval. Throughput category.
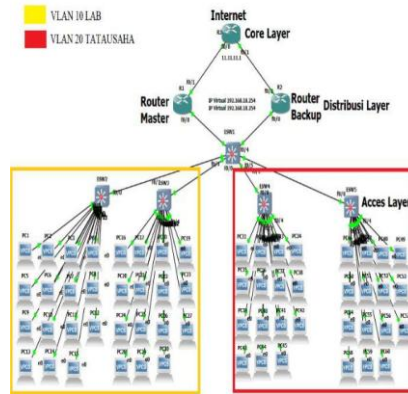
Table 3
Standardization Througputh according TIPHON

Category throughput	Througputh (Bps)
Very good	> 100
Well	75
moderate	50
Ugly	<25

In Table 3 refers to the Standards of Testing Througouth TIPHON results on the network is said to Very Good when the value Throughput 100 Bps, Good 75 bps, 50 bps Average, Poor <25 Bps [8].

3. Results and Discussion

Fig 3 draft topology proposal

In Topology this proposal there are 2 routers each of which serves as a Router Master and Backup if Router Master are having problems then the task Router main taken over by the Router Backup and also there are 5 Switch, 1 as Switch Center to divide VLAN and 4 Switch branch to channel bedasarkan the data sector by VLAN, on the left side is given a colored Yellow Label Lab VLAN 10 and on the right side of the Red colored label given VLAN 20 Business Management.

A.   Configuring VRRP

Table 4
VRRP division at 100 Router Priority Master

interface	vlan	ip Address	Virtual ip	Priority
Int F0 / 0	10	192.168.10.1/24	192.168.10.254	100
Int F0 / 0	20	192.168.20.1/24	192.168.20.254	100

Table 4 is a configuration method in the VRRP Router Master, there are 2 pieces in a configuration interface that is Int F0 / 0 VLAN10 With 192.168.10.1/24 IP address and IP Address 192.168.10.254 on the Virtual Router Interface F0 / 0 VLAN 10 granted Priority 100 The term means that the highest value VRRP method will be made as Primary Router / Master. At Interface F0 / 0 VLAN 20 with an IP address and the IP address 192.168.20.1/24 Virtual Router 192.168.20.254 given VLAN 20 and provided also Priority 100 as the Master.

Table 5
The division of the VRRP Router Priority 10 Backup

interface	vlan	ip Address	Virtual ip	Priority
Int F0 / 0	10	192.168.10.2/24	192.168.10.254	10
Int F0 / 0	20	192.168.20.2/24	192.168.20.254	10

Table 5 is the configuration method in the VRRP Router Backup, there are 2 pieces in a configuration interface that is Int F0 / 0 VLAN10 With 192.168.10.2/24 IP address and IP Address 192.168.10.254 on the Virtual Router Interface F0 / 0 VLAN 10 granted Priority 10 the term means that the lower value VRRP method will be Router Backup. At Interface F0 / 0 VLAN 20 with an IP address and the IP address 192.168.20.2/24 Virtual Router 192.168.20.254 given VLAN 20 and 10 Backup Priority is also given.

B.   VLAN configuration

```
ESW1#show vlan-switch

VLAN Name                             Status    Ports
---- --------------------------------  --------  ------------------------------
1    default                           active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa1/0, Fa1/1
                                                 Fa1/2, Fa1/3, Fa1/4, Fa1/5
                                                 Fa1/6, Fa1/7, Fa1/8, Fa1/9
                                                 Fa1/10, Fa1/11, Fa1/12, Fa1/13
                                                 Fa1/14, Fa1/15
10   lab                               active    Fa0/0, Fa0/1, Fa0/6, Fa0/7
20   tatausaha                         active    Fa0/2, Fa0/5
```

Fig 4 VLAN configuration on Switch center

Table 6
explanation VLAN configuration on Switch Center

Name Part	VLAN	ip Address Range	ip Gateway
Lab	10	192.168.10.11 192.168.10.253	192.168.10.254
System effort	20	192.168.20.11 192.168.20.253	192.168.20.254

Table 6 is the configuration of VLANs on Switch Center, VLAN serves as a grouping of several different LAN Jarigan. in the table above there are two VLANs, namely VLAN 10 and supplied by Label Lab using DHCP IP 192.168.10.11 - IP Gateway and its 192.168.10.253 192.168.10.254, in VLAN 20 by Label Business Management with the IP address 192.168.20.11 Range - 253 192.168.20 and IP Gateway 192.168.20.254.

C.   Testing Method on Router VRRP Master

```
R1(config)#int f0/0
R1(config-if)#shu
R1(config-if)#shutdown
R1(config-if)#
*Mar  1 00:23:40.295: %VRRP-6-STATECHANGE: Fa0/0.10 Grp 1 state Master -> Init
*Mar  1 00:23:40.311: %VRRP-6-STATECHANGE: Fa0/0.20 Grp 2 state Master -> Init
```

Fig 5 when the Master Router is turned off

Figure 5 When the router is turned off, the status of the Master Router Master Master changed previously turned into Init means that all tasks Router Master in devolved to the Router Backup.

```
R2#
*Mar  1 00:23:39.879: %VRRP-6-STATECHANGE: Fa0/0.10 Grp 1 state Backup -> Master
R2#
*Mar  1 00:23:42.183: %VRRP-6-STATECHANGE: Fa0/0.20 Grp 2 state Backup -> Master
```

Fig 6 when Router Backup turned into Master

Figure 6 when the main router processes have died quickly Router Backup replaces the duty of the Master Router for dead. By using VRRP Method Down time of the Main Router to Router Backup active within 1-4 seconds.

```
PC1>
PC1> ping 11.11.11.1 -t
84 bytes from 11.11.11.1 icmp_seq=1 ttl=254 time=41.770 ms
84 bytes from 11.11.11.1 icmp_seq=2 ttl=254 time=40.326 ms
84 bytes from 11.11.11.1 icmp_seq=3 ttl=254 time=43.065 ms
84 bytes from 11.11.11.1 icmp_seq=4 ttl=254 time=41.828 ms
84 bytes from 11.11.11.1 icmp_seq=5 ttl=254 time=35.608 ms
84 bytes from 11.11.11.1 icmp_seq=6 ttl=254 time=38.080 ms
84 bytes from 11.11.11.1 icmp_seq=7 ttl=254 time=41.785 ms
84 bytes from 11.11.11.1 icmp_seq=8 ttl=254 time=41.026 ms
84 bytes from 11.11.11.1 icmp_seq=9 ttl=254 time=44.035 ms
84 bytes from 11.11.11.1 icmp_seq=10 ttl=254 time=38.628 ms
11.11.11.1 icmp_seq=11 timeout
11.11.11.1 icmp_seq=12 timeout
11.11.11.1 icmp_seq=13 timeout
84 bytes from 11.11.11.1 icmp_seq=14 ttl=254 time=23.195 ms
84 bytes from 11.11.11.1 icmp_seq=15 ttl=254 time=28.720 ms
```

Fig 7 when pengetasan of Pc client to the ISP

Figure 7 shows when the client PC and the ISP router to ping when a timeout occurs Router Master switched off 3 seconds after the return to normal.

D.   scenario Testing

Scenario tests performed on the backup system links include:

1) Loss Package Testing on tissue from the Start Backup Router Active headed by testing four stages:
    a)   Testing for 10 Minutes PING to an ISP using ICMP Protocol
    b)   Testing for 20 Minutes PING to an ISP using ICMP Protocol
    c)   Testing for 30 Minutes PING to an ISP using ICMP Protocol
    d)   Testing for 40 Minutes PING to an ISP using ICMP Protocol
    e)   Testing for 40 Minutes PING to an ISP using ICMP Protocol
    f)   Testing for 40 Minutes PING to an ISP using ICMP Protocol

2) testing Througputh
    a)   Testing for 10 Minutes PING to an ISP using ICMP Protocol
    b)   Testing for 20 Minutes PING to an ISP using ICMP Protocol
    c)   Testing for 30 Minutes PING to an ISP using ICMP Protocol
    d)   Testing for 40 Minutes PING to an ISP using ICMP Protocol
    e)   Testing for 50 Minutes PING to an ISP using ICMP Protocol
    f)   Testing for 60 Minutes PING to an ISP using ICMP Protocol
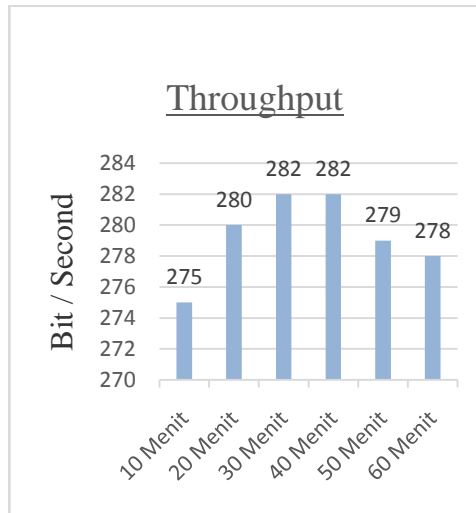
F.   Test result
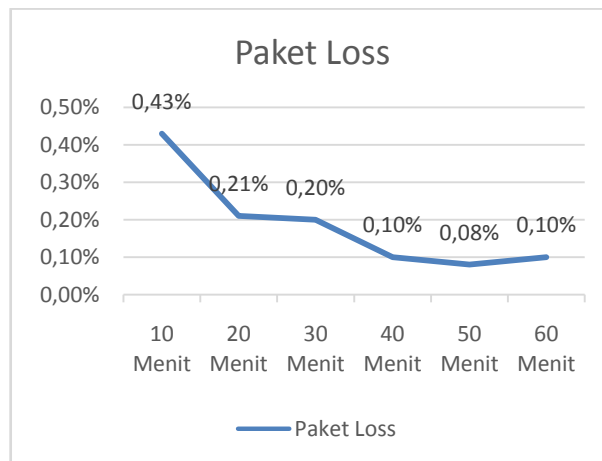
Fig 8 Test results Loss Package

Table 7
The test result packet Loss

Packets received	Packets are lost	testing time	Loss package
1142	5	10 minutes	0:43%
2361	5	20 minutes	0:21%

Packets received	Packets are lost	testing time	Loss package
3458	7	30 minutes	0:20%
4608	5	40 minutes	0:10%
5815	5	50 minutes	0.8%
6935	7	60 minutes	0:10%

In Table 7 are results from testing Loss Package consists of 4 stages of testing that is 10, 20, 30, 40, 50, 60 minutes each get Package Loss of 0.43%, 0.21%, 0.20% 0.10%, 0.8%, 0.10% refers Standards Loss Package TIPHON that results below 3% said Good.

Fig 9. Throughput Testing results

Table 8
Test results Througputh

Condition	Package	testing time	Througputh
router Master turn off	173 903	10 minutes	275 Bps
router Master turn off	350 530	20 minutes	280 Bps
router Master turn off	524 293	30 minutes	282 Bps
router Master turn off	679 688	40 minutes	282 Bps
router Master turn off	850 555	50 minutes	279 Bps
router Master turn off	1020591	60 minutes	278 Bps

In Table 8 are the results of testing Througputh consisting of four phases of testing are: 10, 20, 30, 40, 50, 60 minutes each gain value Througputh by 275Bit / s, 280 bits / s, 282 bits / s, 282 bit / s, 279 bits / s, 278 bits / s, referring to standardize TIPHON that the test results Througputh average 279 bits / s is said to be very good.

4. Conclusion

Based Process Simulation and Virtual Router Redundancy Protocol Virtual Lan also produce several points, namely:
a. (VRRP) is able to maintain network availability if Router Master impaired.
b. (VRRP) capable of backing Link Failure with a time of 1-4 seconds.
c. The parameters of the test results in Loss Pack generates value by testing Loss Package, 10, 20, 30, 40, 50, 60 Minutes, Minute yield value of 0.43%, 0.21%, 0.20% 0.10% 0 , 8%, 0.10% Loss Package Referring TIPHON below 3% in to say good.
d. From the test results Parameter Througputh generates value by testing for 10, 20, 30, 40, 50, 60 minutes, resulting in a value of 275 bits / s, 280 bits / s, 282 bits / s, 282 bits / s, 279 bits / s, 278 Bit / s refers to standardization TIPHON that the test results Througputh average 279 Bit / s is said to be very good.

e. Use of methods to facilitate permberian DHCP IP Address of the client because getting Ip Automatic Computer.

5.   Reference

[1]   Muhammad Yusuf Choirullah, Muhammad Anif, Agus Rochadi, "Analisis Kualitas Layanan Virtual Router Redundancy Protocol Menggunakan Mikrotik pada Jaringan VLAN", JNTETI, Vol. 5, No. 4, 2016.

[2]   P. H. Wisnu, Prayitno Eko, "Perancangan Jaringan Redudancy Link Menggunakan Konsep HSRP dan Etherchannel," Metik Jurnal, vol 2, no. 1, pp 2580-1503, 2018.

[3]   I Gede Made Surya , Nyoman Putra Sastra, NMAE Dewi Wirastuti," Performansi Jaringan TCP/IP Menggunakan Metode VRRP, HSRP, dan GLBP," Majalah Ilmiah Teknologi Elektro, Vol. 18, No.1, 2019.

[4]   Indra Chaidir; Riyandi Al Rino," Implementasi Backup Router Trouble Dengan Metode Virtual Router Redundancy Protocol (VRRP) Pada Diskominfo Depok," Jurnal Ilmu Pengetahuan Dan Teknologi Komputer, 2019.

[5]   C. S. Alif Bilal, " Mengurangi Downtime Jaringan Komputer Dengan Hot Standby Router Protocol Berbasis Cisco Di PT Lumbung Riang Communication," Jurnal Universtitas Mercu Buana, 2017.

[6]   Purwanto Wisnu, "Implementasi Metode HSRP pada Bank Jawa Barat dan Banten Kantor Wilayah 1 dan KCP Simpang Dago," Infotronik Jurnal, vol 3, no 1, pp 2548-1932, 2018.

[7]   Fazl-e-Hadi, AtifNaseer, Fawad Bashir, Khalid Hussain," An Evaluation ofthe Virtual RouterRedundancy Protocol Extension with Multi SegmentLoad Balancing,"IEEE, 2015.

[8]   Rika Wulandari, "Analisis Qos (Quality Of Service) Pada Jaringan Internet (Studi Kasus : Upt Loka Uji Teknik Penambangan Jampang Kulon – Lipi), " Jurnal Teknik Informatika dan Sistem Volume 2 Nomor 2, 2016.