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Analysis of QOS VLAN Based on Djikstra's Algorithm on Open Shortest Path First(OSPF)

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Abstract— As an institution engaged in SMK Muhammadiyah 03 **Yogyakarta requires network infrastructure as a medium of communication. Infrastructure in SMK Muhammadiyah based VLAN but still using static routing and star topologies as a medium of communication between router. This leads to the main router performance overburdened which makes the network infrastructure down. It is necessary to reform the network, especially in the communication protocol on the router by using protocol Open Shortest Path First(OSPF). OSPF is a link state-based routing protocol that uses Dijkstra's algorithm to find the best path is taken as a communication medium. Makin paths made by considering various aspects of the parameters that affect network traffic. OSPF can minimize down on network infrastructure caused by the buren of a huge traffic to maintain the stability of traffic on communication lines. The results using the method QOS on infrastructure with the OSPF protocol can be classified very nice. It is obtaine from the measurement parameter delay <150 ms, packet loss (0%), an bandwidth has a very goo category based on the standard TIPHON. From the results of the QOS parameters also obtained a decrease in delay value by 31% on infrastructure with the OSPF protocol. This proves that the network traffic is more stable when using OSPF protocol.**

Keywords-bandwidth; delay; OSPF (Open Shortest Path First); packet Loss QoS (Quality of Service); VLAN (Virtual Local Area Network).

I. INTRODUCTION

As one of the institution engaged in education, SMK Muhammadiyah 03 Yogyakarta requires qualify network infrastructure to meet the data communication needs for employees, teachers, and in this case the form of internet access. In the absence of a network infrastructure that facilities institution or organizations [1][2][3] it will be difficult to manage existing resources. Quality of Service (QoS) for network services that provide services susch as Frame Relay, Asynchronous Transfer Mode (ATM), Ethernet networks and 802.1, SONET, and IP-routed networks.[4][5][6][7][8]. Service quality also be defined as the right measurement for the various services and services provided. Making VLANs in the network is useful for dealing with frames that spread across the network by blocking unnecessary packages to access data crash [9][10][11][12][13][14].

II. PURPOSE

The purpose of the research are: 1) Analyzing the network infrastructure of the SMK Muhammadiyah 03 Yogyakarta using OSPF routing. 2) Comparing the effect of using Static routing and OSPF routing on the network infrastructure of SMK Muhammadiyah 03 Yogyakarta using QOS parameters.

III. METHOD

The method in this research is quantitative method. Figure 1 describes the stages of quantitative research that are useful as guidelines in analyzing data and making the information that used to find out the problems.

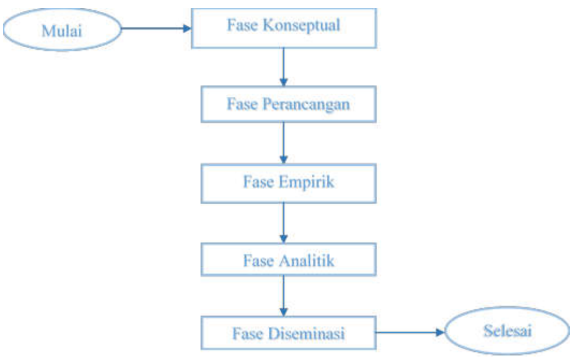

Figure 1. Metodologi penelitian

A. Conseptual Phase

The conceptual phase is the initial phase of the start of research, namely observation, interviews, literature studies.

B. Design Phase

After the research problem is obtained, the researcher makes a research design, both parameter design and research parameter model which will guide the research from beginning to end. The design is :

- Describe the research model, describing and explain the research to be carried out so as to facilitate understanding of the research to be carried out.
- Describe needs in research, design needs for hardware and sofware that will be used in research and describe the network infrastucture topology that willl be used as research objects.
- Data retrieval is done using several different parameter samples.

C. Empirical Phase

In this phase are data collection, data preparation for analysis. Data collection is done by testing the infrastructure before and after using the OSPF protocol.

D. Analytical Phase

Data collected from the field is processed, analysed and an evaluation of the results of the research is conducted to find conclusions from the results of the research conducted. The activities carried out in this phase are:

- Calculating the value of delay, packet loss and bandwidth obtained from the empirical phase.
- Evaluate the parameter values that have been calculated against the QoS standard.
- Evaluate network infrastructure before and after using the OSPF protocol.

IV. RESULT AND DISCUSSION

A. Topology

Existing topology is a topology that is used on the network infrastructure of SMK Muhammadiyah 3 Yogyakarta.

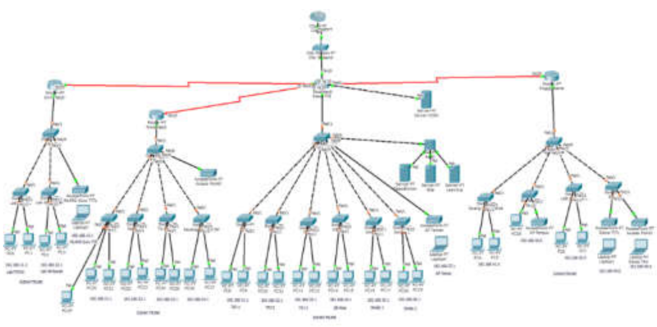

Figure 2. Existing topology of SMK Muhammadiyah 3 Yogyakarta

From Figure 2, it can be seen that the topology used for routing uses the star topology where the function of the TKJ Student router functions as the central node connecting one router to another router. The following are conditions that describe several vulnerabilities in the network infrastructure router topology of SMK Muhammadiyah 3 Yogyakarta:

1) Using a star topology, in this topology each router is connected to the central router only through one path, what if ther connection to the central router is down the network will be down.

2) Using static routing, this means that a network administrator must manually configure the path that will be used to communicate with each other on the router.

3) Still using public IP with subnet which is still standard as a router address, this means the router can still be accessed by other parties or from outside.

This is a network infrastructure design of SMK Muhammadiyah 3 Yogyakarta to be built :

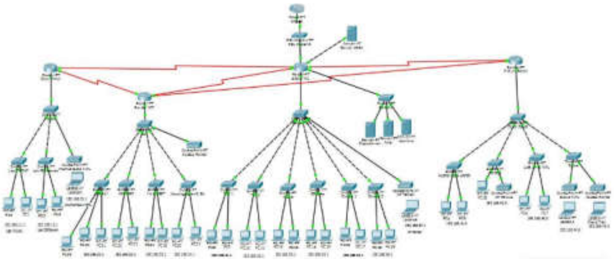

Figure 3. Mesh topology

From the problems, the topology that is felt to be the most appropiate is to use a mesh topology (as shown in Fig. 3). This topology provides various alternative lines of communication between routers.This topology provides various alternative lines of communindication between routers. This topology also supports the use of dynamic routing prtocols such as OSPF, which will make it easier for administrators to manage network infrastructure.

B. Configuring the OSPF on the router

OSPF is a routing protocol on link state routing and is included in the Interior Gateway Protocol. This protocol uses Dijkstra's algorithm to calculate the shortest path to each neighboring router.

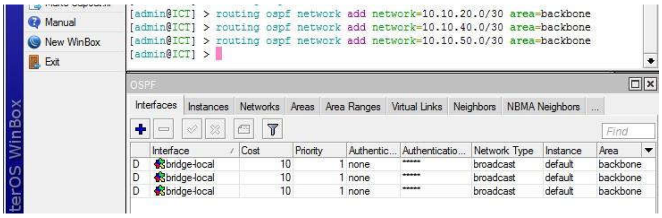

Figure 4. OSPF protocol routing

Figure 4 shows the OSPF protocol that every OSPF network requires an area system to communicate with each other. The OSPF area requires an area system to communicate with each other that is useful for maintaining bandwidth if the betwork infrastructure is too large.

C. Interface Loopback

The Interface loopback (Fig. 5) is the logical interface on each router. The loopback interface is useful as a router ID for

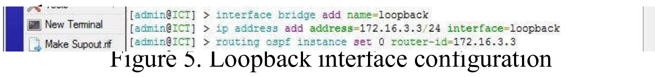

Figure 5. Loopback interface configuration

The interface configuration is done by giving the network the same class on each router.

D. Encapsulation Configuration

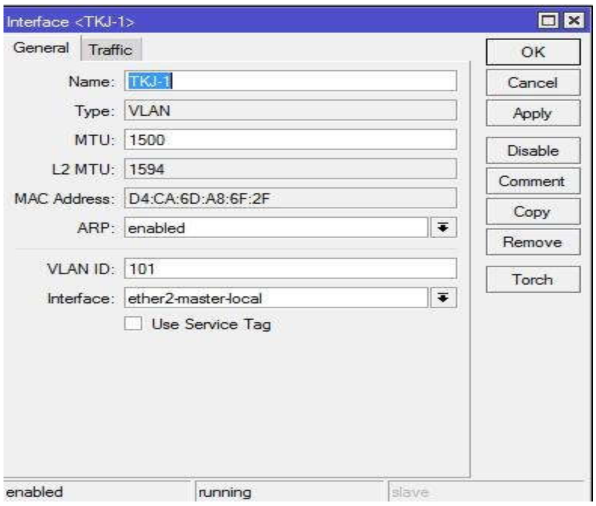

Figure 6. Configuration of VLAN segment

The VLAN segment confguration is made the same as the pre – existing design so that the VLAN configuration does not change. It is shown in Fig. 6.

E. Connectivity Test

Connectivity Test is done by pinging several hosts to find out the status of the host. Figure 7 shows it.

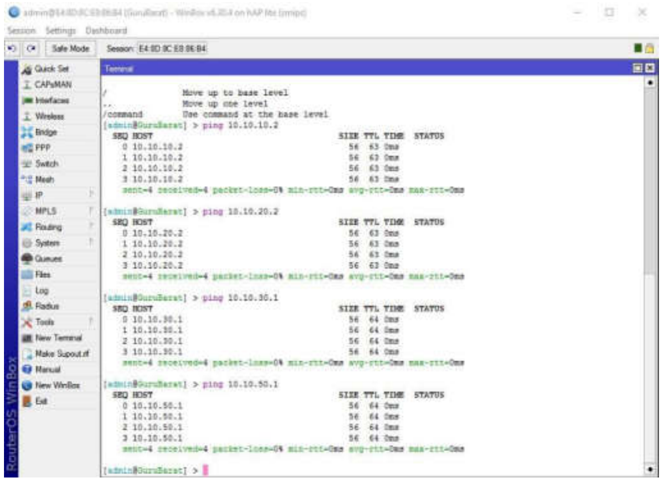

Figure 7. Connectivity Test

F. QoS Analysis Based on OSPF

Qos Monitoring System is used to measure the parameters of delay, packet loss and badwidth. Measurements were made using software axence methods on the ifrasturcture of SMK Muhammadiyah 03 Yogyakarta that had been created.

Based on the results of measurements of delay values on network infrastructure based on Static Routing, the average value of minimum and maximum respone time delay is obtained in milli second scale, namely:

TABLE I. DELAY VALUE A STATIC ROUTING

HOST	LOAD	QUANTITY	DELAY		
			MIN	MAX	AVERAGE
10.10.10.1	32	100	1	4	1
	60000	100	12	18	12
10.10.10.2	32	100	1	5	1
	60000	100	12	18	14
10.10.20.1	32	100	1	3	1
	60000	100	12	22	13
10.10.30.1	32	100	1	4	1
	60000	100	12	18	14
192.168.11.1	32	100	1	4	1
	60000	100	12	17	12

Based on Table 1, the delay value is categorized as good because the average value is below 150ms for standard ping and ping with 60000.

TABLE II. DELAY VALUE OF OSPF

HOST	LOAD	QUANTITY	DELAY		
			MIN	MAX	AVERAGE
10.10.10.1	32	100	1	3	1
	60000	100	8	11	9
10.10.10.2	32	100	1	4	1
	60000	100	9	11	10
10.10.20.1	32	100	1	3	1
	60000	100	8	10	9
10.10.30.1	32	100	1	3	1
	60000	100	8	10	9
192.168.11.1	32	100	1	4	1
	60000	100	8	11	10

Based on the results of the Table II, the OSPF infrastructure delay value can be categorized as good, because the value is below 150ms for standard ping with a load of 60000 bits. Table III shows the results of measurement of packet loss on network infrastructure based on Static Routing, and Table IV shows packet loss value of OSPF.

TABLE III. PACKET LOSS VALUE OF STATIC ROUTING

HOST	LOAD	PACKET LOSS			
		SENT	RECEIVED	LOSSS	LOSS(%)
10.10.10.1	32	100	100	0	0
	60000	100	100	0	0
10.10.10.2	32	100	100	0	0
	60000	100	100	0	0
10.10.20.1	32	100	100	0	0
	60000	100	100	0	0
10.10.30.1	32	100	100	0	0
	60000	100	100	0	0

192.168.11.1	32	100	100	0	0
	60000	100	100	0	0

Packet loss is defined as the failure of a data packet transmission to reach its destination.

TABLE IV. PACKET LOSS VALUE OF OSPF

HOST	LOAD	PACKET LOSS			
		SENT	RECEIVED	LOSSS	LOSS(%)
10.10.10.1	32	100	100	0	0
	60000	100	100	0	0
10.10.10.2	32	100	100	0	0
	60000	100	100	0	0
10.10.20.1	32	100	100	0	0
	60000	100	100	0	0
10.10.30.1	32	100	100	0	0
	60000	100	100	0	0
192.168.11.1	32	100	100	0	0
	60000	100	100	0	0

Based on the results of bandwidth measurements performed on static routing-based network infrastructure, the following data are obtained as shown in Table V.

TABLE V. BANDWIDTH VALUE OF STATIC ROUTING

Host	*Bandwidth* (bit/s)		
	Min	Max	Average
10.10.10.1	38 905 688	78 599 256	72 283 844
10.10.10.2	62 749 984	75 709 496	71 031 652
10.10.20.1	62 637 984	78 281 464	72 445 033
10.10.30.1	53 088 992	77 962 632	74 366 832
192.168.11.1	62 226 104	75 798 072	71 955 291

From Table V it can be concluded that, the results of routing-based infrastructure bandwidth measurements are on average stable on all hosts. Table VI shows bandwidth of OSPF.

TABLE VI. BANDWIDTH VALUE OF OSPF

Host	*Bandwidth* (bit/s)		
	Min	Max	Average
10.10.10.1	61 400 512	78 259 688	74 385 348
10.10.10.2	60 429 112	76 264 840	72 069 083
10.10.20.1	63 128 640	77 764 720	73 396 000
10.10.30.1	61 447 544	78 321 552	73 955 992
192.168.11.1	57 834 536	75 862 976	71 070 615

G. Discussion

TABLE VII. COMPARISON OF DELAY ON 60000 BIT LOADS

Host	Metode	Beban (Bit)	*Delay* (ms)			TIPHON
			Min	Max	Average	
10.10.10.1	Static	60000	12	18	13	Sangat bagus
	OSPF	60000	8	11	9	Sangat bagus
10.10.10.2	Static	60000	12	18	14	Sangat bagus
	OSPF	60000	9	11	10	Sangat bagus
10.10.20.1	Static	60000	12	22	13	Sangat bagus
	OSPF	60000	8	10	9	Sangat bagus
10.10.30.1	Static	60000	12	18	14	Sangat bagus
	OSPF	60000	8	10	9	Sangat bagus
192.168.11.1	Static	60000	12	17	14	Sangat bagus
	OSPF	60000	8	11	10	Sangat bagus

We can see from Table VII that the value delay in the TIPHON and OSPF versions does not have a significant difference. While the load of 60000 bits of delay in the OSPF infrastructure is smaller than Static Routing. Therefore, it can be concluded that OSPF transmission, which is based on link state is faster than static routing.

TABLE VIII. CLASSIFICATION OF PACKET LOSS IN LOADS 32 BIT

Host	Metode	Beban (Bit)	*Packet Loss*				TIPHON
			Sent	Recieve	Loss	(%)	
10.10.10.1	Static	32	100	100	0	0	Sangat bagus
	OSPF	32	100	100	0	0	Sangat bagus
10.10.10.2	Static	32	100	100	0	0	Sangat bagus
	OSPF	32	100	100	0	0	Sangat bagus
10.10.20.1	Static	32	100	100	0	0	Sangat bagus
	OSPF	32	100	100	0	0	Sangat bagus
10.10.30.1	Static	32	100	100	0	0	Sangat bagus
	OSPF	32	100	100	0	0	Sangat bagus
192.168.11.1	Static	32	100	100	0	0	Sangat bagus
	OSPF	32	100	100	0	0	Sangat bagus

TABLE IX. CLASSIFICATION OF PACKET LOSS IN 60000 BIT LOADS

Host	Metode	Beban (Bit)	*Packet Loss*				TIPHON
			Sent	Recieve	Loss	(%)	
10.10.10.1	Static	60000	100	100	0	0	Sangat bagus
	OSPF	60000	100	100	0	0	Sangat bagus
10.10.10.2	Static	60000	100	100	0	0	Sangat bagus
	OSPF	60000	100	100	0	0	Sangat bagus
10.10.20.1	Static	60000	100	100	0	0	Sangat bagus
	OSPF	60000	100	100	0	0	Sangat bagus
10.10.30.1	Static	60000	100	100	0	0	Sangat bagus
	OSPF	60000	100	100	0	0	Sangat bagus
192.168.11.1	Static	60000	100	100	0	0	Sangat bagus
	OSPF	60000	100	100	0	0	Sangat bagus

Based on the value of packet loss shows the data is normal data. They are shown in Table VIII and IX. Based on the results shown after the normality test the data is normal data It is shown in Table X.

TABLE X. BANDWIDTH CLASSIFICATION

Host	Metode	*Bandwidth* (bit/s)		
		Min	Max	Average
10.10.10.1	Static	38 905 688	78 599 256	72 283 844
	OSPF	61 400 512	78 259 688	74 385 348
10.10.10.2	Static	62 749 984	75 709 496	71 031 652
	OSPF	60 429 112	76 264 840	72 069 083
10.10.20.1	Static	62 637 984	78 281 464	72 445 033
	OSPF	63 128 640	77 764 720	73 396 000
10.10.30.1	Static	53 088 992	77 962 632	74 366 832
	OSPF	61 447 544	78 321 552	73 955 992
192.168.11.1	Static	62 226 104	75 798 072	71 955 291
	OSPF	57 834 536	75 862 976	71 070 615

V. CONCLUSION

1) QoS parameters on both network infrastructures have a good value, this can be seen from the delay value is <150ms, packet loss is (0%), and bandwidth has a very good category based on TIPHON standards.
2) QoS parameters on OSPF-based network infrastructure have better value than static routing in terms of delay; this can be seen from a decrease in the delay value of 31% in OSPF-based infrastructure. It proves that OSPF transmission is more optimal than static routing.

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