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Analysis of Wireless Network Quality Using Quality of Service Method (Case Study: BAPEDA of South of Sumatera Province)

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Abstract

Information technology networks are growing rapidly, especially in computer networks using wireless. Wireless computer networks support various human jobs communicating using the internet, such as uploading or downloading files. We need an exemplary wireless network in its services to carry out these activities. To find a condition of a wireless network functioning correctly, we need a method to measure it. The technique that can be used is Quality of Service (QoS). QoS is a method that uses several indicators to measure the quality of a wireless network. These indicators are bandwidth, delay, and packet loss. The results showed that the measurement of wireless networks in BAPEDA Province South of Sumatera shows good quality. The TYPHON version indicator indicates this, the delay value is below 150 ms, and the packet loss is 0%.

Keywords

bandwidth, packet loss, delay, quality of service method

Introduction

The development of Information Technology is growing rapidly, especially in the technology used in computer networks. In the previous technology, computer networks were still in the form of networks that connected one computer to another using a cable. In computer networks that use this cable, there are still many disturbances, such as unstable data sent, minimal terminal locations arrangement, and usually only located in one room or building. Many computer network users have switched to wireless-based computer networks to reduce these obstacles.

The advantages of using this wireless-based network include good mobility, which means it can be used at any time, the ability to access data on the wireless network in real-time if it is still in a hotspot area, installation speed means a fast installation process because there is no need to use cables, the flexibility of location. The intention is to reach places that cannot be reached by line; this will reduce the budget required to build a wireless-based computer network.

Because of the advantages of the wireless network, many institutions are building wireless networks in both government and private offices. BAPEDAS South of Sumatra is an example of

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an institution implementing a wireless network in its operational office at Jalan POM IX, Lorok Pakjo, Regency West Ilir I, Palembang City.

The use of wireless-based computer networks, besides having advantages, also has several weaknesses, but the benefits of wireless networks dominate when compared to the disadvantages. Deficiencies that often occur, such as Intermittence or often intermittent signals, of course, are very annoying for users, especially when doing the uploading or downloading process. Or the wireless computer network may become unstable during inclement weather, such as heavy rain, lightning, or storms. It also occurs in the wireless network at BAPEDAS, South Sumatra.

So far, the condition of wireless network performance at BAPEDA South Sumatra cannot be monitored with certainty due to the lack of equipment systems to determine the performance conditions. For this reason, monitoring the performance or quality of the wireless network is carried out to get a definite number or a definite value for the quality of the wireless network (Gustav, M. A.,2019). For this reason, a method is needed to do all these tasks, so a technique that can do this is chosen, namely the Quality of Service (QoS) method, to see the quality or performance of a wireless network using bandwidth, delay, and packet loss indicators.

Quality of Service (QoS) or Quality of service is a measurement method used to determine the capabilities of a network, such as; network application, host, or router, to provide a better and planned network service so that it can meet the needs of a service (Charisma, A, et.al.2019). Quality of Service (QoS) in its use has several benefits, such as giving priority to critical applications on the network, maximizing the use of existing network investments, and improving performance for applications that are sensitive to delay, such as Voice and Video (Hafiz, A,.et.al., 2019).

Several researchers have used the QoS method to measure the quality of wireless networks. Measurement of the quality of wireless networks using QoS at the UPT Pejambang Kulon Technical Test Workshop-LIPI showed promising results (Wulandari, 2016). The results of using QoS to measure performance on wireless LAN networks in UAD Campus III are good (Azura, 2020). In his research, Budiman et al. (2020) concluded that using QoS, the Internet network quality at SMK Negeri 7 Jakarta can be categorized into the medium quality category based on the TIPHON standard. Wilyanto Arif (2021) also researched QoS, which concluded that the quality of the wireless network at the Directorate General of Taxes belongs to the category of very satisfactory. In her research, Maria Ulfah (2020) also measured network quality in the Balikpapan Polytechnic Integrated lecture building, obtaining results that the average value of the packet loss parameter from each access point was included in the category has excellent quality (Shankar, R.,2019).

From several research references using the QoS method and considering the advantages of the quality-of-service method, this method is highly recommended for measuring the performance quality of wireless computer networks at BAPEDAS South of Sumatra, especially for the PUSLIA building, which has a wireless network (wireless) or computer networks at other Institutions that are wireless based.

Methodology

1. Action Research Method

The method used in this study is to conduct action or action research, according to Davison et al. (2004), in researchers and action teams who describe, interpret and explain a situation or condition on a Wireless LAN network at BAPEDA of South Sumatra Province to know the factors that affect Reliability, Maintainability, and Availability on Wireless LAN networks so that they can provide even better network services.

The method that will be used in measuring the quality of WLAN networks is QoS which consists of bandwidth, delay, and packet loss parameters from sender to receiver or from end to end and uses the Axence NeTools application with the Windows operating system. The testing stages of the researchers and the action team are: Diagnosing, making an action plan, and carrying out action taking. At this stage, the researcher searches the literature for preparation for implementing the QoS method.

2. Data collection

Collecting data at the research location, the researcher identifies the requirements in hardware or software to measure network quality at the research location. Data collection activities include:

a. Diagnose Stage. At this early stage, activities were carried out to identify problems on the internet network in the research location; the data was obtained through debriefing with employees working in the computer network section.
b. Stage Making an Action Plan at this stage, researchers, by understanding the existing problems, will develop an Action plan to overcome the current problems.
c. Taking Action Stage, at this stage, measurements and testing are carried out on wireless computer networks with the QoS method, with the indicators used are bandwidth, packet loss, and delay.

Results and Discussion

Based on the actions planned in the Action planning stage, the plan is implemented by measuring the quality of the wireless LAN network based on QoS parameters, namely Bandwidth, Delay, and Packet Loss. Measurements were carried out only in three BAPEDA office rooms in South Sumatra Province using the Biznet Speed Test and carried out on Monday, March 6, 2020, and Saturday, March 11, 2020, between 08:00-11:00 and 13:00-16:00.

The results of implementing Bandwidth measurements use the Biznet Speed Test. Meanwhile, Delay and Packet Loss use the Axence NetTools application.

a. Bandwidth Measurement

The BAPEDA office for the Province of South Sumatra uses the Biznet Speed Test application and is carried out on Monday, March 10 to Saturday, March 14, 2020, with times between 08:00-11:00 and 13:00-16:00. Bandwidth measurements in the BAPEDA office room in South Sumatra Province used the Biznet Speed Test application shown in figure 1. The results of the bandwidth measurements carried out are shown in Table 1.

Table 1. Bandwidth Value Test Results

	Time	Bandwidth (bps) (WIB)		PING	Information
		Upload	Download		
Day/Date					
Monday	08:00 – 11:00	13 ms	1.39 Mbps	2.14 Mbps	UPTB
March 9, 2020	13:00 – 16:00	20 ms	2.01Mbps	6.53 Mbps	PUSLIA room
Tuesday	08:00 – 11:00	21 ms	1.81 Mbps	3.84 Mbps	UPTB
March 10, 2020	13:00 – 16:00	5 ms	1.97 Mbps	5.22 Mbps	PUSLIA room

Referring to Table 1, the results of bandwidth measurements in the UPTB PUSLIA room, the bandwidth values observed during measurements during busy hours 08:00-11:30 and off-peak hours 13:00-16:00 in the UPTB PUSLIA room. On Monday, March 9, 2020, the pin speed was 13 ms with an upload speed of 1.39 Mbps and a download speed of 2.14 Mbps for busy times from 08.00 to 11.00.

Figure 1. Bandwidth Measurement with Biznet Speed Test

b. Delay Measurement

The monitoring delay process in the UPTB PUSLIA room of the South Sumatra Provincial BAPEDA office was carried out on Monday, March 9 - Tuesday, December 10, 2020, with times between 08:00-11:00 and 13:00-16:00 using the Axence NeTools application which is shown in Figure 2. The results of observing the delay indicator measurements carried out can be seen in Table 2.

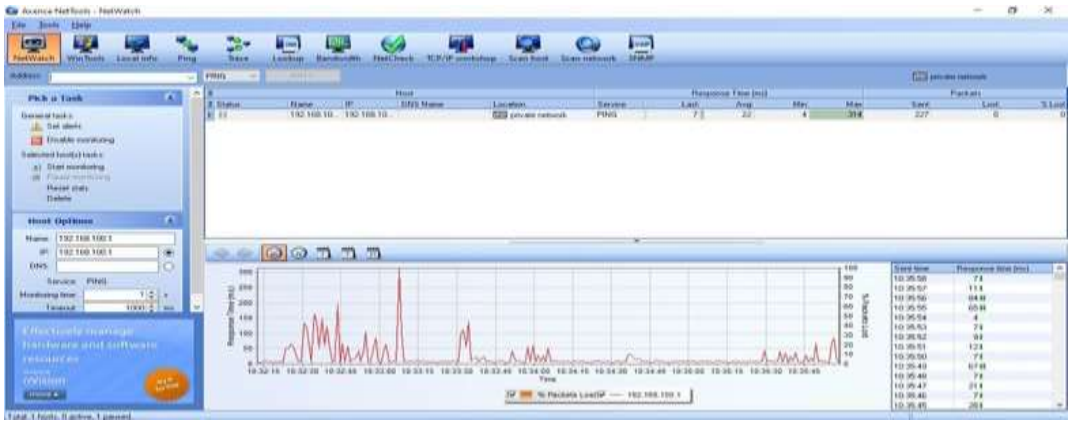

Figure 2. Delay measurement with Biznet Speed Test

Based on the results of observations of delay measurements in Table 2. This table shows the minimum and maximum delays found on the wireless internet network at the South of Sumatra BAPEDA office. The average value of the delay in the UPTB PUSLIA room, BAPEDA office, South of Sumatra Province, in units of milliseconds (ms), is shown in Table 2. That is very good because it is less than 150 ms.

Table 2. Delay Value Test Results

Day/Date	Time (WIB)	Delay (ms)			Information
		Min	Max	Average	
Monday	08:00 – 11:00	3	51	6	UPTB
March 9, 2020	13:00 – 16:00	3	663	10	PUSLIA room
Tuesday	08:00 – 11:00	3	111 49	7	UPTB
March 10, 2020	13:00 – 16:00	3		10	PUSLIA room

c. Packet loss measurement

The packet loss monitoring process in the UPTB PUSLIA room, BAPEDA office, South Sumatra Province, was carried out on Monday, March 9 – Tuesday, March 10, 2020, with peak hours between 08:00-11:00 and off-peak hours between 13:00-16:00 and using the Axence NeTools application. The results of packet loss measurements in the UPTB PUSLIA room using the Axence NeTools 5 application as shown in Figure 3. Meanwhile, the results of packet loss measurements in the UPTB PUSLIA room are seen in Table 3.

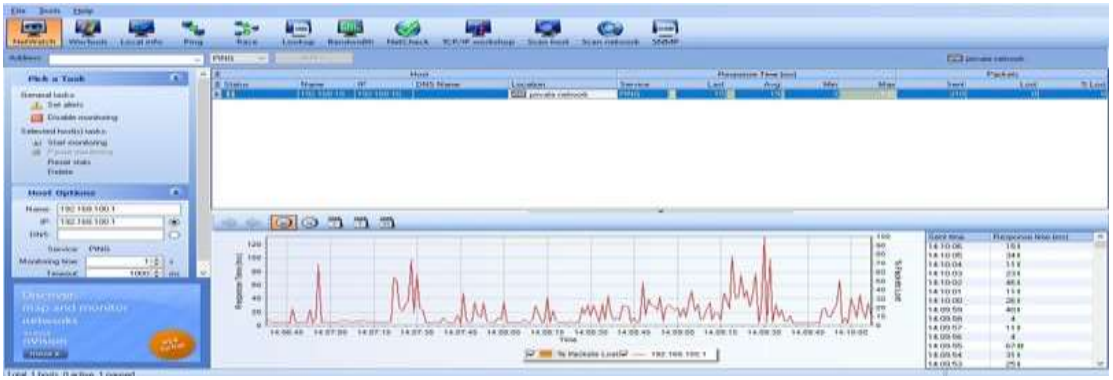

Figure 3. Packet loss measurement with Biznet Speed Test

Table 3 shows the number of data packets sent (sent), data packets lost (lost), and the percentage of lost packets in packet loss measurements using the Axence NeTools 5 application. In the UPTB PUSLIA room, BAPEDA Regional Office of South Sumatra Province. The packet loss value category follows the TIPHON version as a standard; for the packet loss degradation category, it is perfect if the value is 0%. It shows that the internet network quality in the UPTB PUSLIA room is excellent by looking at the value of the packet loss indicator.

Table 3. Packet Loss Value Test Results

		Packet Loss			
Day/Date	**Time (WIB)**	**Sent**	**Lost**	**Lost (%)**	**Information**
Monday	08:00 – 11:00	207	0	0	UPTB
December 9, 2020	13:00 – 16:00	204	0	0	PUSLIA room
Tuesday	08:00 – 11:00	206	0	0	UPTB
December 10, 2020	13:00 – 16:00	217	0	0	PUSLIA room

Conclusion

The research discovered that the UPTB PUSLIA BAPEDA room in South Sumatra Province has a wireless network that falls into the excellent category of the TIPHON version. As determined by the TIPHON version, the packet loss value is zero percent, and the maximum delay value is still less than 150 ms.

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