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Analysis of LAN Network Quality at PTPN7 Senabing Unit in Lahat Regency Using Qos (Quality Of Service)

Amanda Rahma Dwi[1], Dedi Haryanto[2], Apriansyah[3]
[1,3]Department of Information Technology, University of Muhammadiyah Palembang, South Sumatra
[2]Information Technology Study Program, Faculty of Engineering

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ABSTRACT

In the era of globalization, human dependence on telecommunications continues to grow, particularly in communication technology. Modern technology has become essential for enabling fast interaction and efficient information exchange. Internet networks not only provide rapid access to information but also allow users to share and obtain data from various global sources. South Sumatra has experienced significant expansion in internet infrastructure, with more than 4,000 BTS (Base Transceiver Stations) installed to support stable communication, including in Lahat Regency. The region currently offers 2G, 3G, and 4G services from providers such as Telkomsel and Indosat. However, internet performance is often disrupted by unexpected power outages and uneven infrastructure in remote areas, resulting in unstable connectivity. This study aims to evaluate network quality at PTPN 7 Senabing Unit, Lahat Regency, using Quality of Service (QoS) parameters including throughput, delay, packet loss, and jitter. Measurements were conducted using Wireshark to monitor and capture data packet traffic. Results indicate variations in delay between daytime and nighttime transmissions. During daytime hours, the delay value reached 6.4 ms, falling into the "Very Good" category.

Corresponding authors:

Amanda Rahma Dwi
Department of Computer Science and Engineering
University of Muhammadiyah Palembang
South Sumatra, Indonesia
Email: amandarahmadwi1717@gmail.com

1. Introduction

In today's digital era, technology has become a crucial need for humans to interact and exchange information more quickly. In addition to providing easier and more efficient access to information, the internet also enables the exchange of data from various sources worldwide. People's lifestyles have changed with technological advances, as evidenced by the increasing reliance on digital devices for daily activities to support effectiveness and efficiency [1], [2]. However, this convenience also presents new challenges, such as a decline in reading interest among students due to the habit of seeking instant information online [3].

The internet has become a basic need for people from all walks of life. Its advantages are evident in its ability to provide information sources from numerous sites quickly and flexibly [4]. The increasingly widespread use of the internet has resulted in an increase in the intensity of digital activities, both for education, entertainment, and work [5]. The development of internet infrastructure in Indonesia continues to improve, particularly in fiber optic and cellular networks. According to APNIC records, Indonesia has been connected to the internet since 1988 through the UI-NETLAB IP allocation [6]. By 2023, the national fiber

optic network will have reached more than 716,000 km and cover all provinces, including remote areas [7]. Furthermore, the development of cellular networks such as 4G and the expansion of base transceiver stations (BTS) have also improved national connectivity [8].

Network development has also occurred in South Sumatra Province, which now has more than 4,000 BTS units to support communication and internet access [9]. One area experiencing this development is Lahat Regency. The cellular network in this area includes 2G, 3G, and 4G services from various providers, such as Telkomsel and Indosat [10]. However, internet access is still frequently hampered by sudden power outages, bad weather, and limited infrastructure in remote areas [11]. Nevertheless, continued network development offers hope for more equitable internet access in the future.

PT Perkebunan Nusantara VII (PTPN VII) has a Senabing Unit in Lahat Regency, which operates rubber and oil palm plantations covering approximately 1,120 hectares [12]. This unit plays a vital role in the local economy, providing employment and participating in community partnership programs [13]. However, this unit faces internet connectivity issues that impact operational smoothness. Network disruptions such as slowdowns, lag, and disconnections are often caused by extreme weather conditions and other technical issues [14].

To evaluate network quality at PTPN VII Senabing Unit, measurements were conducted using Quality of Service (QoS) parameters, namely throughput, delay, packet loss, and jitter [15]. QoS is an important indicator for assessing how well internet services are performing within a network [16]. Measurements were conducted using the Wireshark application to monitor data traffic in real time and identify potential problems in the packet transmission process [17].

2. Research Methods

Along with the development of the human age, science is increasingly developing. As long as humans are on this earth, there will always be new discoveries emerging. To analyze these findings, a new scientific approach is needed, which can be done by means of research using appropriate methods. With this, qualitative research methods become very relevant in the development of science The qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observable behaviors

The qualitative method is the method used by the author in this study. This method involves data collection through observation, interviews, and analysis of network data, with the aim of describing or explaining the experiences of the research subject.

This time and research was carried out on the implementation of the Pre-Final Project Project and was carried out for 1 day. The location of the research is at PTPN7 Senabing unit in Makartitama village, Lahat District, Lahat Regency, South Sumatra Province.

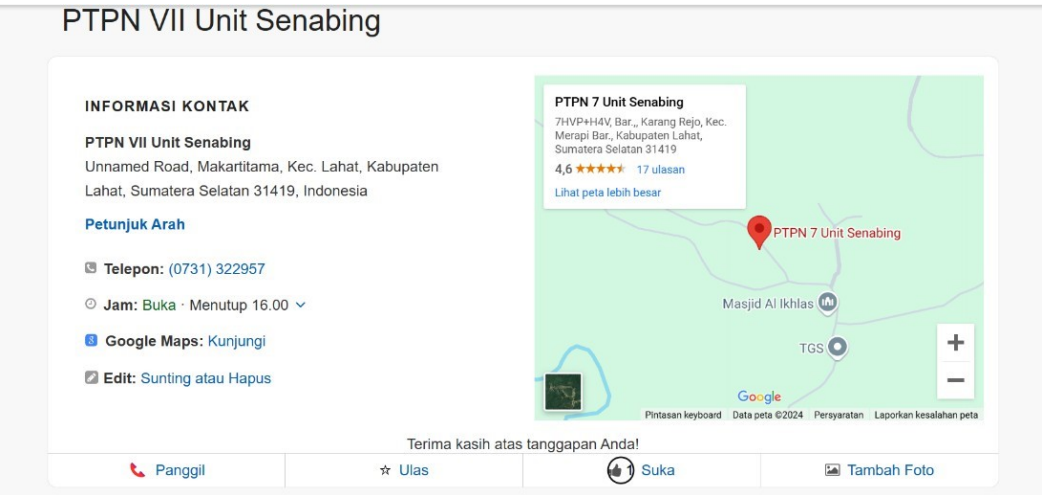

Figure 1. The location of the research is PTPN7 Senabing unit, Makartitama village

3. Results and Discussion

The test was carried out by streaming Youtube for approximately 5 minutes. Figure 4.1 is the result of daytime data collection and Figure 4.2 is for afternoon data collection using *Wireshark* software.

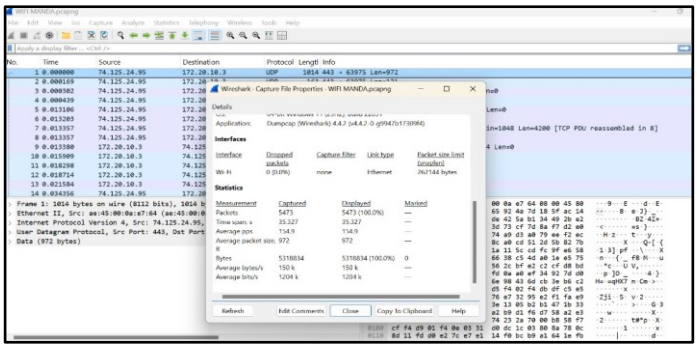

Figure 2. Daytime data capture

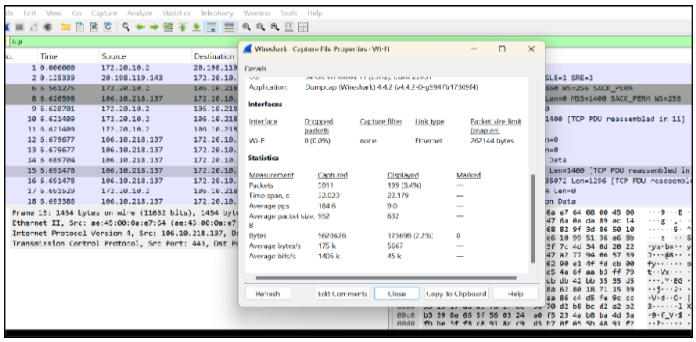

Figure 3. Afternoon data collection

System design is an essential phase in the development of information systems because it determines how a system will function and meet user requirements. This stage translates the results of needs analysis into a structured plan that describes system architecture, data flow, user interaction, and technological components. A well-designed system ensures that all elements work together harmoniously to achieve predefined objectives efficiently and accurately.

In practice, system design includes defining input and output specifications, database structures, processing logic, and interface layouts that are easy to understand and use. It also considers non-functional aspects such as security, performance, scalability, and maintainability. By paying attention to these aspects, system design helps minimize errors during implementation and reduces the risk of system failure in the future. Ultimately, effective system design not only supports the technical success of a system but also increases user satisfaction, because the system is built according to real needs and can be operated reliably in various conditions.

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Parameter Qos siang.txt

File Edit View

```
Parameter Qos


Throughput :
Jumlah Bytes : Times Span = Hasil Bytes
5318834 : 35.327 = 150.560,025 b x 8 (untuk mengubah byte ke kilo byte)
                 =1204 k

Packet Loss :
[((Paket dikirim - Paket diterima) : Paket dikirim) x 100]
        = (5473 - 5470): 1480) x 100
        = (3 : 5473) x 100
        =0,1  = 0%

Delay :
Total Delay : 35,327087 s
Rata-rata delay : 0,006454794 x 1000 = 6,45419 ms = 6,4

Jitter :
Total Jitter : 0,020502 s
Rata-rata Jitter : 374603 x 1000 = 3,74603 ms  =  3,7
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Figure 4. Results of the afternoon data

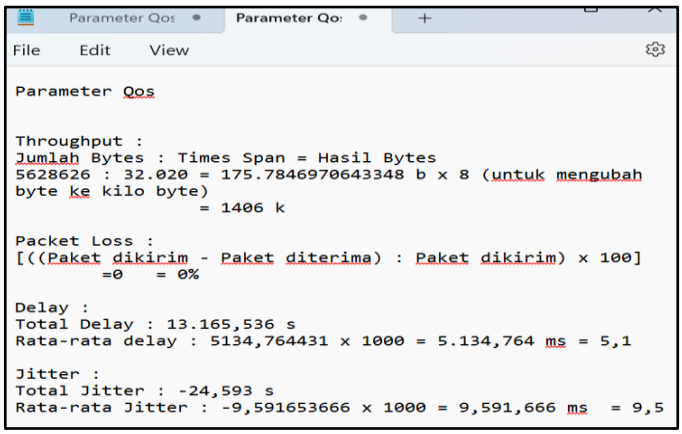

Figure 5. Afternoon data results

Table 1. Recapitulation of PTPN7 SENABING Unit QOS Parameters

Measurement	Packet Loss	Delay (ms)	Jiiter	Throughput
Noon	0%	6,4	0,0	1.204
Afternoon	0%	5,1	0,0	1406

1. Throughput

Measurement results *Throughput* for each time and based on the value *Throughput* according to the TIPHON version as a standardization, i.e. the average index *Throughput* during the day between 13.00 WIB – 15.00 WIB and in the afternoon between 16.00 WIB – 17.00 WIB.

Measurement results *Throughput* shows that *Throughput* It is higher in the afternoon, with a value of 1335k, compared to the daytime time which only reaches 1204k. Although there is a difference in the value *Throughput*, both values still show "Excellent" performance. *Throughput* Higher in the afternoon indicates that the network has enough capacity to handle larger amounts of data, which is important for supporting applications that require high bandwidth.

Table 2. Measurement *of Throughput parameters*

Yes	Time	Average Throughput	Index	Category
1.	Noon	1204k	3	Keep
2.	Afternoon	1406k	4	Very Good

2. Packet loss

The results of *packet loss* measurement for each time and based on the *packet loss value* on the PTPN7 network of Senabing units in accordance with the TIPHON version as a standardization of the average *Packet Loss index* in the afternoon between 13.00 – 15.00 WIB and in the afternoon between 16.00 WIB – 17.00 WIB. The results of *packet loss* measurement at both times showed excellent values, namely 0% during the day and 0.1% in the afternoon. According to the TIFON standard, if the average packet loss is in the range of 0%, then the network can be categorized in the "Very Good" category. This shows that Senabing's PTPN7 network has excellent performance in terms of *packet loss*, which is important to ensure stable data communication.

Table 3. Measurement of *Packet Loss parameters*

Yes	Time	Rata – Rata Packet Loss	Index	Category
1.	Noon	0%	4	Very Good
2.	Afternoon	0%	4	Very Good

3. Delay

The results of *the Delay* Measurement for each building time have *a Delay* according to the THIPON version as a standardization of QoS parameters, namely the average *Delay index* during the day between 13.00 WIB – 15.00 WIB and in the afternoon between 16.00 WIB – 17.00 WIB.

The results of *the delay* measurement showed a very low value, namely 6.4 ms during the day and 5.1 ms in the afternoon. Both of these values are in the "Very Good" category according to the TIPHON standard, which states that a delay lower than 150 ms is still in the acceptable category. This shows that the PTPN7 network of the Senabing unit has excellent performance in terms of latency and response time.

Table 4. Measurement *of Delay parameters*

Yes	Time	Average Delay	Index	Category
1.	Noon	6,4	4	Very Good
2.	Afternoon	5,1	4	Very Good

4. Jitter

Measurement results *Jitter* for each time has a value *Jitter* according to the THIPON version as a standardization of QoS parameters, namely the average index *Jitter* during the day between 13.00 WIB – 15.00 WIB and in the afternoon between 16.00 WIB – 17.00 WIB.

Measurement results *Jitter* shows slightly higher fluctuations in the afternoon, with a value of 9.5 ms, while during the day the jitter value is only 3.7 ms. Despite the increase *Jitter* in the afternoon, both times are still in the category of "Pretty Good". *Jitter* Low is an important factor to ensure the quality of data communication, especially for applications that require low latency, such as VoIP and video streaming.

Table 5. Jitter parameter measurement

Yes	Time	Rata – Rata – Rata jitter	Index	Category
1.	Noon	3,7	3	Good
2.	Afternoon	9,5	2	Keep

5. QoS (Quality Of Service*)* Value Recapitulation

The results of the QoS measurement recapitulation can be seen in the QoS parameter calculation table

Table 6. QoS Parameter Measurement

Yes	QoS Parameters	Noon	Afternoon
1.	*Packet Loss*	0	0
2.	*Delay*	6,4	5,1
3.	*Jitter*	3,7	9,5
4.	*Troughput*	1204k	1406k

4. Conclusion

From the results of the QoS (*Quality of Service*) analysis carried out on the PTPN7 Senabing Unit network, some conclusions that can be drawn are as follows:

a. **Network Quality Measurement Method**

To measure the quality of the internet network in the PTPN7 Senabing Unit network, this study uses the QoS parameter measurement method. The parameters used include *delay, jitter, packet loss*, and *throughput*. This measurement is done using the Wireshark application to monitor and capture the traffic of data packets in the network. This application provides detailed information about network performance and can identify potential problems in the data transmission process.

b. **Difference in Data Transmission Time (Delay)**

Based on the measurement results, there is a difference in the data transmission time received between the data packets sent to the router (*delay*) during the day and evening working hours. During the day, *the delay* value was recorded at 6.4 ms, which is in the category of "Very Good." In the afternoon, the *delay* value was slightly lower, at 5.1 ms, but still in the same category, "Very Good." This shows that despite the slight differences, the two times show excellent performance, with low latency and supporting smooth data communication on the network.

c. **Packet Loss**

The measurement results showed that during the data transmission process, no packets were lost on the PTPN7 Senabing Unit network, both during the day and evening working hours. At both times, the *packet loss* value was recorded at 0%, which is in the category of "Very Good." This shows that the network has a very stable performance in terms of data transmission and can avoid packet loss that can interfere with smooth communication.

d. Throughput

Although the throughput *measurement results* show that *the throughput* is higher in the afternoon (1335k) compared to the daytime (1204k), both values are still in the excellent category. *The high throughput* in the afternoon indicates that the PTPN7 Senabing Unit's network is capable of handling larger amounts of data and supports applications that require high *bandwidth* without sacrificing connection quality. Therefore, *throughput* is one of the main indicators that indicates efficient network performance.

Suggestion

Based on the results of the research that has been conducted, some suggestions that can be submitted for the continuation of research and network development of PTPN7 Senabing Unit are as follows:

a. **Regular System Maintenance**

To ensure optimal network performance, it is very important for PTPN7 Senabing Unit to carry out regular system maintenance. *This maintenance* includes regular checks on the hardware and software used in the network. With regular maintenance, the possibility of network *downtime* or disruption caused by hardware malfunctions can be minimized. Monitoring of the condition of devices such as *routers, switches, and servers* also needs to be done in order to prevent damage that can affect the quality of network services.

b. **Network Infrastructure Improvement**

Although the QoS measurement results show good results, it is good if PTPN7 Senabing Unit continues to monitor and evaluate the network infrastructure to adjust to the development of needs. Infrastructure upgrades, such as replacing outdated network devices or increasing bandwidth capacity, can improve overall network performance. These upgrades will also facilitate increased throughput, which is important to support applications that increasingly require large bandwidth, such as video conferencing and cloud-based applications.

c. **Regular QoS Monitoring**

In addition to system maintenance, regular QoS monitoring using tools such as Wireshark or other network monitoring systems is highly recommended. This monitoring aims to identify any previously undetected performance degradation and to anticipate network issues before they have a greater impact. With regular monitoring, PTPN7 can immediately make improvements or optimizations to network parameters that do not meet the standards that have been set.

d. **Training for IT Staff**

In order for the system and network to run properly, it is very important for PTPN7 Senabing Unit to provide continuous training for IT staff who are responsible for managing the network. This training can include a deeper understanding of QoS parameters, the use of network monitoring devices, and how to diagnose and address network issues that may arise. Well-trained staff will be faster in handling problems and can ensure smooth network operations.

e. **Long-Term Planning for Network Improvement**

PTPN7 also needs to plan for the development and improvement of the network in the long term which refers to future needs. As technology evolves and the number of connected users and devices increases, network capacity and quality need to be adjusted to continue to support operations efficiently.

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