

MEASURING QUALITY OF WIRELESS LOCAL AREA NETWORK USING QUALITY OF SERVICE FRAMEWROK

*Corresponding author
hafizdahsyat@gmail.com

Aliy Hafiz¹, Dodi Afriansyah², Fathurrahman Kurniawan Ikhsan³,
Bambang Suprpto⁴, Ifo Wahyu Pratama⁵

^{1,5}Departement Of Informatic Management, AMIK DCC Lampung

^{2,4}Departement Of Informatic Management, AMIK DCC Pringsewu

³Departement Of Informatic Management, Mitra Indonesia University

Abstract

The internet has a very important role in education. Many activities are done through internet. AMIK DCC Bandar Lampung is an educational institution that uses the internet as one of the supporting facilities and infrastructures to manage and organize the data and information used by the student to find references about the lecture. There are three buildings on the main campus building A building B and C buildings, where each building using WLAN to deploy internet access. There are some complaints submitted by students related wireless network encourage researchers to study the quality of service WLAN. Thus the researchers wanted to analyze the Quality of Service WLAN networks in building A, building B, and C, in each floor. The method used in this research is Quality of Services (QoS). Where an analysis wireless network by four parameters. There are namely delay, packet lost, bandwidth, and throughput. The results of the measurement and monitoring of Quality of Service WLAN at AMIK DCC Bandar Lampung in building A, building B, C on each floor of the building can be classified in the category of good which value index is 3, and the factors that occurred in the signal range cannot cover every room in every building and have not good bandwidth management.

Keywords: WLAN, Quality of Services, TIPHON

1.0 INTRODUCTION

The development of information technology is currently more advanced by generating new technologies that we often call the Internet technology. Internet with various applications such as Web, VoIP, e-mail is basically a medium used to streamline the communication process, so the internet seemed to be an icon in this era of globalization. Likewise with educational institutions that can not be separated from the use of the Internet for the implementation of educational activities. Form of administrative activities, learning, and research can not be separated from the role of the Internet [1].

The Internet needs a good infrastructure to produce a good internet connection. Poor infrastructure and management will result in bad internet connections. Therefore, the provision of good infrastructure and good management through the maintenance of existing infrastructure is needed. AMIK DCC education institution Bandar Lampung has used the internet as the backbone of its educational, teaching and research activities. Poor internet quality can disrupt the teaching, research, and campus administration process. Therefore a good internet connection is needed to support these activities. But in fact there are several grievances that are felt by the user to the internet through a wireless network. As the slowest

for browsing can not even connect to the internet. The user's complaints against the background of this research. For that it is considered necessary to measure the quality of wireless networks on campus to determine the level of wireless network quality.

1.2 Problem Formulation

How to measure the quality of wireless networks for determine the level of wireless network quality using Quality of Service (QoS).

1.3 Objectives and Benefits of Research

The objective this research for analyze the Quality of Service WLAN networks in campus AMIK Dian Cipta Cendikia.

2.0 THEORETICAL

QoS stands for Quality of Service. QoS is a measure of how well a network is and an attempt to define the characteristics and properties of a service [2]. QoS is usually used to measure a set of specified performance attributes and is usually associated with a service. In IP-based networks, IP QoS refers to the performance of IP packets passing through one or more networks.

QoS is designed to help end users become more productive by ensuring that they get reliable performance from network-based applications.

QoS refers to the ability of the network to provide better service on certain network traffic through different technologies. QoS is a significant challenge in IP and internet based networks as a whole. The purpose of QoS is to satisfy different service needs, which use the same infrastructure. QoS offers the ability to define the network service attributes provided, both qualitatively and quantitatively.

In terms of networking, Quality of Service (QoS) refers to the ability to provide different services to network traffic with different classes. The ultimate goal of Quality of Service (QoS) is to provide better and planned network services with dedicated bandwidth and controlled latency and increase the lost of characteristics, or QoS is the ability to guarantee the delivery of important data streams or in other words a collection of various sets from various performance criteria that determine the level of satisfaction of a service. The quality level of a network is adjusted to the Quality of Service (QoS) standard through the tables issued by TIPHON [3]. Like the table below.

Table 1. Index Parameters of QoS (from : TIPHON)

Value	Presentation(%)	Index
3,8 – 4	95 – 100	Very Good
3 – 3,79	75 – 94,75	Good
2 – 2,99	50 – 74,75	Not Good
1 – 1,99	25 – 49,75	Bad

2.1 QoS Parameters

Performance is a collection of several parameters of technical quantities,

1. Bandwidth

Bandwidth is wide range of frequencies used by signals in the transmission medium. The signal frequency is measured in units of Hertz (Hz). In computer networks, bandwidth is often used as a synonym for data transfer rate (transfer rate) ie the amount of data that can be carried from point to point in a certain period of time (generally in seconds) [4]. This type of bandwidth is usually measured in bps (bits per second).

2. Throughput

Throughput is the actual (actual) bandwidth that is measured with a specific time unit used to transfer data of a certain size. The best download time is the file size shared with bandwidth. While the actual or actual time is the file size in divide by throughput. The

throughput index is adjusted to the standards issued by TIPHON. With the tables released by TIPHON it can be seen whether throughput goes into either good or bad category. The following is the standardized throughput table issued by TIPHON.

Table II. Index Parameter of *Throughput*. (from : TIPHON)

Category Throughput	Throughput		Index
Very Good	100%		4
Good	75%		3
Fair	50%		2
Bad	< 25%		1

3. Packet Lost

It is a parameter that describes a condition that indicates the total number of packets lost, this can occur because of several possibilities such as overload within a network, congestion in the network, errors occurring on physical media, failure on the side the receiver among other things could be due to router buffer over flow or congestion. Packet Lost is adjusted to the Packet Lost index table issued by TIPHON. Here is the Packet Lost table from TIPHON.

Table III. Index Parameter of *Packet Lost*. (from : TIPHON)

Degradation Of Packet Lost	Packet Lost	Index
Perfect	0%	4
Good	3%	3
Medium	15%	2
Poor	25%	1

4. Delay

Delay is the time it takes the data to travel from the origin to the destination. Delay can be affected by distance, physical media, congestion or long processing time. Delay is adjusted to the Delay index table issued by TIPHON. Here is the table index Delay TIPHON.

Table IV. Index Parameter of *Delay*. (from : TIPHON)

Category of Latency	Delay	Index
Best	< 150 ms	4
High	< 250 ms	3
Medium	< 350 ms	2
Low	< 450 ms	1

5. HTB (Hierarchy Token Bucket)

HTB (Hierarchy Token Bucket) is a queue or queue grouping method that handles different types of traffic. The implementation of QoS (Quality of Services) in Mikrotik depends a lot on the HTB queue system (Hierarchical Token Bucket). There are 2 kinds of queue on Mikrotik is Simple Queue and Queue Tree. HTB allows us to make the queue more structured, by performing multi-level groupings. What many do not realize is that if we do not implement HTB on Queue (either Simple Queue or Queue Tree), there are some parameters that do not work as we want. Some parameters that do not work are priority, and dual limitation (CIR / MIR).

CIR (Committed Information Rate) is the lower or minimum limit of traffic (quota-at) that queues can be obtained. Limit-at limits the minimum traffic of a queue, no matter in any condition the queue will not get traffic below this limit.

MIR (Maximal Information Rate) is the upper or maximum limit of traffic (max-limit) that can be obtained queue. - Max-limit limits the maximum traffic of a queue, and each queue will reach this limit if the parent still has a bandwidth reserve.

An example of a simple QoS system, where we want to allocate bandwidth of 400 Kbps for 3 clients, where each client can get a maximum of 200kbps. Among the three clients, have different priorities, namely 1,2, and 3. To facilitate monitoring and verification, will use the queue tree method.

2.2 Tools of QoS

1. BizNet Speed Meter

BizNet Speed Meter is a site (<http://speedtest.biznetnetworks.com/>) that is used to measure how much speed a network can reach that includes bandwidth over a period of time [5].

2. Axence Nettools

Axence Nettools is an application to test connectivity on a network by sending data packets to the server to be in the destination [6].

3. MRTG (Multi Router Traffic Grapher)

MRTG (Multi Router Traffic Graph) is an application used to monitor the traffic load on a network link. MRTG will create an HTML page containing GIF images depicting traffic over the network daily, weekly, monthly and yearly. MRTG is created by Tobias Oetiker using Perl and C and is available for both UNIX and Windows NT operating systems [7].

3.0 METHODOLOGY

3.1 Place of Research

This research was conducted at AMIK DCC Bandar Lampung. The object of this research is WLAN AMIK DCC Bandar Lampung.

3.2 Tools and Materials

The tool used by researchers to analyze the existing network is a laptop that specification using windows 7 ultimate operating system 32-bit, Intel Atom N257 processor 1.66 GHz, 2 GB DDR3 RAM, 320 GB hard drive. Software used include BizNet Speed Meter, Axence Nettools, and MRTG.

3.3 Writing Method

In this stage the researcher will conduct research method of action research [8]. Here are 4 stages of the action research cycle.

1. Diagnosing

Identify existing basic issues in order to become the basis of groups or organizations so that change takes place. In this stage is to make a diagnosis that is enough to inhibit the performance of WLAN network in AMIK DCC Bandar Lampung causing the value of QoS down.

2. Creating Action Planning

The researcher understands the subject matter, and then proceeds to develop a proper action plan on testing the performance of the internet center network with the standard network quality parameters (QoS). At this stage the researcher will also analyze the needs in such way as hardware analysis, software, and also the structure of WLAN network at AMIK DCC Bandar Lampung which will be implemented on QoS measurement.

3. Action Taking

The researcher implements the action plan in the hope of solving the problem by testing the performance of internet center network with the standard of network quality parameter (QoS). The measurement mechanism of QoS parameter is by using Axence NetTools and BizNet Speed Meter that is by sending a packet and burdening it with size

packets to the IP address of each device and wait for the response from the source node to the destination node on the IP layers in the network scheme to be measured. It then retrieves the value information of the QoS parameters from the data packet traffic which will then be sent to the monitoring application and for the usage bandwidth graph can be read in the MRTG application.

Perform network measurement with QoS model monitoring system that is used for QoS parameters in WLAN network at AMIK DCC Bandar Lampung that is bandwidth, delay, throughput, and packet lost on user id in every building of AMIK DCC Bandar Lampung by using application of Axence NetTools and Biznet Speed Meter. Data collection is done in the building A, building B, building C and overall bandwidth usage can be seen in MRTG application. Measurements are also done by testing the connection to the website, here researchers take yahoo.com website.

4. Evaluating

After the implementation period is considered sufficient, then the researcher conducted the evaluation of the results of the implementation (action taking) the authors to evaluate the results of network performance testing based on Quality of Service (QoS) parameters standard on AMIK DCC Bandar Lampung internet connection. The data obtained from AMIK DCC Bandar Lampung will be compared with standard QoS parameters, the researcher uses TIPHON standardization, whether the QoS data can be included in good or bad category.

In charging throughput data, using BizNet Speed Meter software, the software will display the results of download and upload throughput at that time, but the results taken are only the throughput result of the download. The author will calculate what percentage of throughput results can be obtained from the bandwidth provided by the provider, the calculation results in the percentage will be compared with the standardization of Quality of Service (QoS) TIPHON version, so it can be categorized throughput results from the quality of internet network services AMIK DCC Bandar Lampung fall into the category is very good, good, medium, or ugly. In charging delay data, Axence Netools software will display the result of delay monitoring in the form of minimum delay, maximum delay and average delay. The result is the average delay value, the result of the average delay will be compared with TIPHON version of Quality of Service (QoS) and ITU-T version to find out whether the result of delay monitoring on the internet network in AMIK DCC Bandar Lampung comes in. in either category or not. Researchers take delay results from yahoo.com website.

In packet lost data packing, the researcher uses Axence Netools application, the application will display the packet lost result of sent packet (sent), lost packet, and the percentage of packet missing from the total packet sent. The percentage results will be compared with standardization of Quality of Service (QoS) TIPHON version to find out whether or not the results of monitoring packet lost from internet network AMIK DCC Bandar Lampung. Researchers also took the results of packet lost from the website.

And to see bandwidth usage (bandwidth usage) one of the user, then used MRTG application. MRTG will monitor in real time bandwidth usage of the user.

After that, we will create a table that contains the average overall data bandwidth, throughput, delay and packet lost on overall building. The result of the value of throughput delay, and packet lost from the table, will be compared with the standardization of Quality of Service TIPHON version.

4.0 RESULTANTS AND DISCUSSION

4.1 Result Bandwidth and Throughput

In this stage, the researcher performs the testing process to get the bandwidth value of all buildings in AMIK DCC Bandar Lampung, the test is done by using the measurement at www.speedtest.biznetnetwork.com, the test is done by sending data according to bandwidth in wireless user. The following is a table of bandwidth measurement results and throughput on each DCC building in Bandar Lampung.

Table V. Result Measurement of bandwidth and throughput

No	Building	Time	Bandwidth	Throughput	Presentation (%)	Index
1	A	Noon(12-15PM)	20 Mbps	17,59 Mbps	85 %	4
		Noon(12-15PM)	20 Mbps	19,30 Mbps	90 %	4
		Noon(12-15PM)	20 Mbps	16,45 Mbps	78 %	4
		Noon(12-15PM)	20 Mbps	17,30 Mbps	85 %	4
		Noon(12-15PM)	20 Mbps	15,69 Mbps	75 %	3
Average			20 Mbps	17,27 Mbps	85 %	4
2	B	Noon(12-15PM)	20 Mbps	16,35 Mbps	76 %	4
		Noon(12-15PM)	20 Mbps	19,89 Mbps	90 %	4
		Noon(12-15PM)	20 Mbps	14,26 Mbps	73 %	3
		Noon(12-15PM)	20 Mbps	13,58 Mbps	70 %	3
		Noon(12-15PM)	20 Mbps	18,86 Mbps	90 %	4
Average			20 Mbps	16,59 Mbps	78 %	4
3	C	Noon(12-15PM)	10 Mbps	6,36 Mbps	65 %	3
		Noon(12-15PM)	10 Mbps	7,40 Mbps	74 %	3
		Noon(12-15PM)	10 Mbps	9,46 Mbps	95 %	4
		Noon(12-15PM)	10 Mbps	6,40 Mbps	65 %	3
		Noon(12-15PM)	10 Mbps	9,28 Mbps	92 %	4
Average			10 Mbps	7,79 Mbps	78 %	4

In the table above can be concluded that the condition of bandwidth and throughput at AMIK DCC Bandar Lampung as a whole has a good quality. Because it is in the index 3.0 and above which means good.

4.2 Result of Packet Lost Quality

In packet lost testing used to describe a condition that indicates the total number of packets lost, the application used to test the packet lost is Net Tools version 5 where the test is performed by performing PING in monitoring for 10 seconds. From the results of the test results obtained the number of packet lost is as follows:

Table VI. Result measurement of packet lost

No	Building	Time	Packet Lost	Index
1	A	Noon(12-15PM)	0 %	4
		Noon(12-15PM)	15 %	2
		Noon(12-15PM)	3 %	3
		Noon(12-15PM)	25 %	1
		Noon(12-15PM)	7 %	3
Average				2,6
2	B	Noon(12-15PM)	4 %	3
		Noon(12-15PM)	20 %	2
		Noon(12-15PM)	15 %	2
		Noon(12-15PM)	3 %	3
		Noon(12-15PM)	10 %	2
Average				2,4
3	C	Noon(12-15PM)	14 %	2
		Noon(12-15PM)	4 %	3
		Noon(12-15PM)	2 %	3
		Noon(12-15PM)	25 %	1
		Noon(12-15PM)	20 %	2
Average				2,2

The results of the overall building that has been done got that overall quality for packet lost in wireless network AMIK DCC Bandar Lampung on every building in medium category until good category.

A. Result of Delay/Latency

In the evaluation of the delay used the same application when doing the evaluation Packet lost, in the test delay also still use the PING method and in monitoring for 10 seconds. Here is the result table of the delay / latency measurement of the wireless network AMIK DCC Bandar Lampung.

Table VII. Result measurement of delay/latency

No	Building	Time	Delay/Latency	Index
1	A	Noon(12-15PM)	259	3
		Noon(12-15PM)	253	3
		Noon(12-15PM)	550	1
		Noon(12-15PM)	455	1
		Noon(12-15PM)	350	2
Average			373	2
2	B	Noon(12-15PM)	359	2
		Noon(12-15PM)	253	3
		Noon(12-15PM)	259	3
		Noon(12-15PM)	459	1
		Noon(12-15PM)	559	1
Average			377	2
3	C	Noon(12-15PM)	254	3
		Noon(12-15PM)	255	3
		Noon(12-15PM)	459	1
		Noon(12-15PM)	253	3
		Noon(12-15PM)	545	1
Average			353	2

Based on table 3 above can be concluded that the quality of wireless network AMIK DCC Bandar Lampung has a delay / Latency is small so from the Latency of wireless network AMIK DCC Bandar Lampung has a medium value of the index until good with the index value of 3.

B. Result Average of QoS

From the overall evaluation of network service quality parameters that have been done, conducted recapitulation to know the value of wireless network quality index on each building in AMIK DCC Bandar Lampung, so it is known value of network quality in each building. The average recapitulation of the Quality of Service index is as follows:

Tabel VIII. Results Measurement Of WLAN Quality Index Of Overall Building

No	Building	Throughput Index	Delay Index	Packet Lost Index	Average Index	Result TIPHON Standard
1	A	4	2	2,6	3	Good
2	B	4	2	2,4	3	Good
3	C	4	2	2,2	3	Good

Based on the results of recapitulation parameters of network service quality evaluation in get that most of the condition of WLAN network AMIK DCC Bandar Lampung in all buildings get status TIPHON "Good" with the average value of index of 3.

5.0 CONCLUSION

5.1. Conclusion

From result of analysis of WLAN performance covering bandwidth, delay, packet lost, and throughput at AMIC DCC Bandar Lampung, can be concluded as follows:

1. Performance of overall quality WLAN on AMIK DCC Bandar Lampung has an index value of 3 with the result of the TIPHON standard value "Good".
2. Quality Packet Lost, and Delay on wireless network AMIK DCC Bandar Lampung has a Good index value of the standard TIPHON.

5.2. Suggestion

The suggestion for the next researcher is to use other methods to measure network quality, then for the AMIK Dian Cipta Cendikia should improve the quality of network services to maximum service.

REFERENCES

- [1] Hafiz, A., & Susianto, D. 2019. Analysis of Internet Service Quality Using Internet Control Message Protocol. In *Journal of Physics: Conference Series* (Vol. 1338, No. 1, p. 012055). IOP Publishing.
- [2] ETSI. 1999. Telecommunication and Internet Protocol Harmonization Over Network (TIPHON) General Aspec of Quality of Service (QoS).
- [3] Forouzan, A. Behrousz, Sophia Cung. 2007. *Data Communication and Networking Fourth Edition*. McGraw-Hill.
- [4] Malik, Abdul. 2017. Comparison between simple queue method and queue tree method for optimizing management bandwidth using Mikrotik (Case Study: the high court of religion Kendari). *semantik*, Vol.3, No.2, Jul-Des 2017, pp. 1-8
- [5] Axence NetTools 5.0.1 2017, Axence NetTools User Guide, Axence Software Inc
- [6] Biznet 2017, Biznet Metro Bandwidth Meter (<http://www.-biznetnetworks.com/ld/>)
- [7] Susilo, Joko. 2017. Analysing and monitoring of Traffic performance of WLAN at Kominfo office Yogyakarta using MRTG Application SNMP base. *Journal JARKOM* Vol. 5
- [8] Brannick, T and Caghlán, D. 2005. *Doing action research in your own organization*. Sage.