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Submission date: 02-Apr-2024 03:04PM (UTC+0700)
Submission ID: 2337729514
File name: 7785-21018-3-SM.docx (1.28M)
Word count: 3002
Character count: 16060

JIKO (Jurnal Informatika dan Komputer) Accredited KEMENDIKBUD RISTEK, No.105/E/KPT/2022 Vol. x, No. x, April 2024, pp. x-x p-ISSN: 2614-8897
DOI: 10.33387/jiko e-ISSN: 2656-1948

AN EVALUATION OF THE POWER SUPPORT INTERNET INFRASTRUCTURE OF MAKASSAR CITY IN TELEMEDICINE FRAME

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(Received: dd mmm yyyy, Revised: dd mmm yyyy, Accepted: dd mmm yyyy)

Abstract

This research aims to determine the quality of internet in Makassar city that use 10 Mbps service of Indihome provider in support of telemedicine with case studies sending Raw MRI image data to the AWS cloud. In this research use the virtual server from the AWS cloud that used to save raw MRI data image which will be sent through the application of The FTP client namely FileZilla. Based on tests that carried out for 8 times, the results were obtained the Internet quality is based on the QoS (Quality of Service) standard formula from TIPHON (Telecommunications and Internet Protocol Harmonization Over Networks). The results obtained in the form of an average throughput value of 4.53 Mbps, an average loss packet of 0.01%, Average of delay is 1.7ms, Average Jitter is 1.69ms. Based on the standards of TIPHON show that delivery Raw of MRI data image to cloud AWS use service 10 Mbps from indihome providers results produce is satisfying.

Keywords: Amazon Web Services (AWS), Bandwidth , Internet, MRI, Quality of Service.

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1. INTRODUCTION

The progress of technology is very develop fast including on sector health nowadays. The availability technology health will make it easier of power health For detect disease of patients. Accurate patient setup is critical in radiotherapy [1]. One of health technology that available on hospital namely Magnetic Resonance Imaging (MRI).

Magnetic Resonance Imaging (MRI) images are black and white images resulting from the process magnetic resonance exposed to the human body to show the side of the body without doing operation[2]

MRI creates the images using a strong and uniform static magnetic field and radio frequency pulses. When placed in a magnetic field, all substances are magnetized to a degree that depends on their magnetic susceptibility[3].

MRI of the hour of the day Work must in circumstances ready to use . During the machine primary MRI and the computer cannot be deactivated . In its operation of course needed energy electricity For supplying voltage that MRI requires for properly worked

. Trade-offs between materials magnetic susceptibility selection and electrical function should be considered[4].

Radiology departments are major energy consumers within a hospital through operation of CT and MRI scanners, which require energy in the range of 0.5–30 kWh per examination, with peak consumption reaching beyond 100 kW for a short time period[5]. Energy consumption for three CT and four MRI scanners of 1.1 gigawatt-hours[6].

Show that the average energy active of MRI that is 4099 kWh and the average standby energy is 7,481 kWh. The room of MRI assumed operates for 8 hours per day And for the other 16 hours every workday, during weekend And day off keep it ON and Ready used For case imaging rare emergency situation . With assumption ratio 50% utilization will be resulting in 86 hours of time patients per month , which is equivalent with performed 146 MRI services . In consequence, for a month with a total of 730 hours, for 644 machine hours is at in idle mode (MRI is but not used) and consumes 12.68 kW per hour, total 8,165 kWh per month or 56.02 kWh per patient. Then, One of the effort For savings electricity is move to MRI computer used For reconstruct MRI images to the Cloud. Transfer MRI computer to the cloud besides can save usage electricity , too possible telemedicine become more wide[7]. Such devi-ces are capable of acquiring anatomicalsoft tissue images with high spatial andtemporal resolution[8].

For support sending raw MRI data image to the cloud needed Power support internet infrastructure . The Internet (Inter-Network) is bunch network on A connecting computer between site . Good for government site, academic site, and commercial[9].

The internet is bunch network computer that connected each other . As for use Internet among general usually used For connect inter academic site, inter government site , inter commercial site And etc. The Example of service Internet most often used is e-mail And chat[10].

Quality of Service (QoS) is A architectureend-to-end and not is A features it has by network. QoS offer ability For define attributes the service provided is good in a way qualitative nor quantitative . As for objective method of QOS it depends on service needs. QoS is the most significant issue [11]. QoS is more ideal to apply on the customer side rather than on the provider side[12].

Quality of Service (QoS) refers to techniques that function on a network to dependably execute high-priority applications and traffic reliably run high-priority applications and traffic even when the network's capacity is limited[13]. In healthcare applications, efficient computation of QoS is one of the mandatory requirements during the processing of medical records through smart measurement methods [14]. Quality of Service (QoS) can be said to be a term used to define the characteristics of a network service to determine how good the quality of the service is[15].

This research aims to determine the quality of internet in Makassar city that use 10 Mbps service of Indihome provider in support of telemedicine with case studies sending Raw MRI image data to the AWS cloud.

2. RESEARCH METHOD

In this section, each of researchers is expected to be able to make the most recent contribution related to the solution to the existing problems. The Researchers can also use images, diagrams, and flowcharts to explain the solutions to these problems.

In this research , there are some of stages passed in Capable of collecting Quality of Service (QoS) data seen on Figure 1

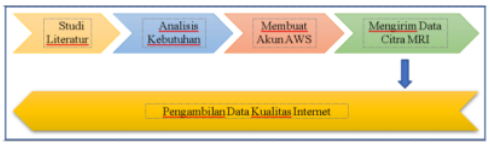

Figure 1 . Stages of study

Based on the study cases, This show that the raw delivery image data to the AWS MRI cloud, then as for stages in this research that is on stage beginning , the researcher do literature studies from book as well as related journals with problem study, after That will be done of analysis need For sending raw image data to AWS Cloud start from hard device need until soft device need. After need analysis has done, it will done of making AWS account for getting access to cloud AWS. Then after making AWS account has finished , next will done test send the raw data image to cloud AWS . On moment delivery currently ongoing , the researcher will do measurement internet quality based standard from TIPHON.

2.1. Trials And QoS Data Retrieval (Quality of Service).

On the test try this done with method by send Raw MRI data image to the AWS Cloud using application namely Filezilla And capture medium protocol walk use application Wireshark when delivery currently taking place. This Delivery done as many as 8 times for get maximum result.

Steps sending raw MRI data image to the AWS cloud and data collection is as following :

1. Downloading citra MRI data

Figure 2. MRI image data

Figure 2 is MRI image data downloaded at www.mridata.org with data size 1.6 Gb

2. Measuring internet speed

Measure Internet speed is required For know on speed How many delivery done. For testing internet speed can use of method access https://www.speedtest.net/ . following appearance from page testing internet speed .

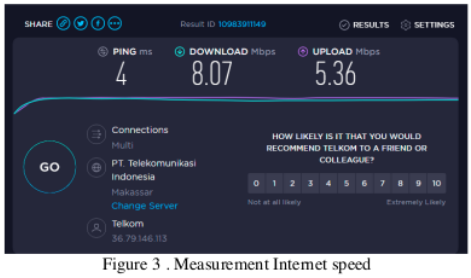

Figure 3 . Measurement Internet speed

3. Sending raw MRI data image to the AWS cloud

Sending raw data image to the AWS cloud is done, so that the researchers can measure the Quality of service (QoS) of network used for send the data. Sending this data researcher use filezilla application.

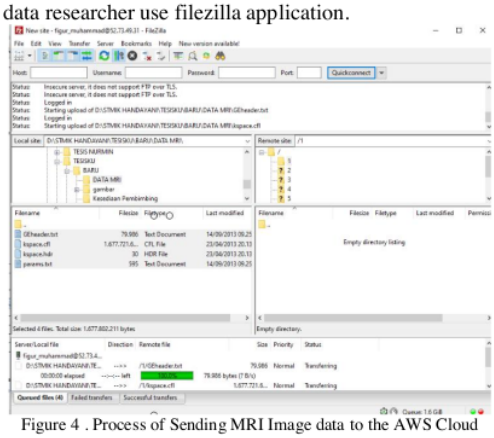

Figure 4 . Process of Sending MRI Image data to the AWS Cloud

4. Retrieval Data using the Wireshark application

This data retrieval is useful for determining network quality when sending raw MRI data image to the AWS Cloud.

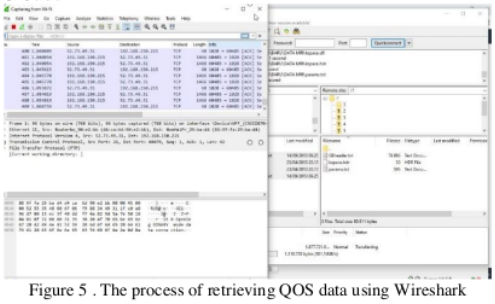

Figure 5 . The process of retrieving QOS data using Wireshark

On Figure 5 can seen the process of retrieving QoS data use Wireshark application during the sending process currently taking place . This retrieval data is useful for determining network quality when sending raw MRI data image to the AWS Cloud. As for results retrieval of data from wireshark can seen on Figure 6 below .

Figure 6 . Results QOS data retrieval using Wireshark

On Figure 6 can be seen results of QoS retrieval data use Wireshark application. Furthermore this data will be analyzed, then obtained the results of internet quality based on TIPHON standard

3. RESULT AND DISCUSSION

3.1. Analysis of Throughput

Mark throughput obtained based on the results of calculations using formula throughput as follows :

$$Thoughput = \frac{Total\ Paket(KB)}{Waktu\ Kirim(s)} \ldots\ldots\ldots\ldots\ldots(1)$$

From the results of the calculations carried out as much 8 time, has obtained mark throughput on table following

Table 6. Throughput Value

No	Total Package (KBytes)	Total Delay (second)	Bandwidth(10 Mbps)		Throughput (Mbps)
			Downloads	Upload	
1	1934159.27	3076,970	9.01	5,11	5.02
2	1932542,904	3262,710	8.07	5.36	4.73
3	1903614,348	3034,939	7.49	5.27	5.01
4	1851968,061	3269,107	8.91	4.26	4.53
5	1883741,790	3206,699	9.30	5.53	4.69
6	1802079,414	3599,713	11.47	3.38	4.05
7	1800626,450	3683,174	11.41	3.55	3.91
8	1869798,637	3455,122	8.01	5.61	4.32
Average			9.21	4.76	4.53

In the first trial was 5.02 Mbps, the second trial as big as 4.73, the third trial that is 5.01, the fourth trial that is 4.53, the fifth trial that is 4.69, the sixth trial that is 4.05 , the seventh trial that is 3.91, And the eighth trial as big as 4.32. From these results in averaged it get mark average throughput as big as 4.53 Mbps.

For get the percentage from throughput, so mark the average throughput shared with speed internet access uploadwhich has been tested using speedtest, namely4.76 Mbps. From these quotient results are obtained percentage throughput as big as 95%.Based on the results of these calculations, , you can conclude that according

to Standardization of TYPHON Throughput Service Wifi Indihome into Very Good category And get index value 4.

3.2. Analysis of Loss Package

Mark Package Losses obtained based on the results of calculations usingformula Package Loss as following :

$$Paket\ Loss = \frac{Paket\ dikirim - Paket\ diterima}{Paket\ Dikirim}\ x\ 100 \ldots\ldots(2)$$

From results calculation Which done 8 times, the Package value has been obtained Losses on table following :

Table 7. Loss Package Value

No	Amount Package sent	Amount Package accepted	Bandwidthth (10MBps)		Package Losses(%)
			Downloads	Upload	
1	2042732	2042732	9.01	5,11	0
2	2023992	2023992	8.07	5.36	0
3	2001231	2001231	7.49	5.27	0
4	1942330	1942330	8.91	4.26	0
5	1972823	1972823	9.30	5.53	0
6	1874162	1874162	11.47	3.38	0
7	1861204	1859758	11.41	3.55	0.078
8	1953740	1953740	8.01	5.61	0
Average			9.21	4.76	0.01

The First trial as big as 0%, the second trial as big as 0%, the third trial as big as 0%, the fourth trial by 0%, the fifth trial big 0%, the sixth trial as big as 0% the seventh trial as big as 0.078% and the eighth experiment was 0%. From results the obtained on average package loss of 0.01%. According to TIPHON standardization about the packet loss category can be concluded that mark the enter in category very good And get mark index 4.

3.3. Analysis of Delay

Mark delay is obtained based on the results of calculations usingformula delay as following :

$$Rata - rata\ delay = \frac{Total\ delay}{Total\ paket\ diterima} \ldots\ldots\ldots\ldots(3)$$

From results calculation Which done 8 times, the delay value has been obtained on table following.

Table 8 . Delay Value

No	Total Package Which accepted	Total Delay (second)	Bandwidth (10 MBps)		Average Delay (ms)
			Downloads	Upload	
1	2042732	3076,970	9.01	5,11	1.50
2	2023992	3262,710	8.07	5.36	1.61
3	2001231	3034,939	7.49	5.27	1.52
4	1942330	3269,107	8.91	4.26	1.68
5	1972823	3206,699	9.30	5.53	1.63
6	1874162	3599,713	11.47	3.38	1.92
7	1861204	3683,174	11.41	3.55	1.97
8	1953740	3455,122	8.01	5.61	1.77
Average			9.21	4.76	1.7

The first trial get delay as big as 1.5 ms, the second experiment was 1.51 ms, the third experiment as big as 1.52 ms, the fourth trial as big as 1.68 m s , the fifth trial as big as 1.63 ms, the sixth trial amounted to 1.92 ms, the seventh experiment amounted to 1.97 ms, the eighth experiment was 1.76 ms. From the results the obtained average delay as big as 1.7Ms. According to standardization by TYPHON, mark the enter in category Good And get index value 3.

3.4. Analysis of Jitter

Jitter value is obtained based on the results of calculations usingformula jitter as following :

$$Rata - rata\ jitter = \frac{Total\ jitter}{Total\ paket\ diterima} \ldots\ldots\ldots(4)$$

From results calculation Which done 8 times, the delay value has been obtained on table following:

Table 9. Jitter Value

No	Total Package Which accepted	Total Jitter (second)	Bandwidth (10 MBps)		Average Jitter (ms)
			Downloads	Upload	
1	2042732	3077,188	9.01	5,11	1.50
2	2023992	3262,941	8.07	5.36	1.61
3	2001231	3044,487	7.49	5.27	1.52
4	1942330	3266,204	8.91	4.26	1.68
5	972823	3206,528	9.30	5.53	1.63
6	1874162	3599,751	11.47	3.38	1.92

7	1861204	3683,172	11.41	3.55	1.97
8	1953740	3455,121	8.01	5.61	1.77
Average			9.21	4.76	1.69

In first Experiment produced a value of 1.5 ms, the second trial of 1.61 ms, the third trial as big as 1.52 ms, the fourth trial as big as 1.68 ms, the fifth trial as big as 1.63 ms, the sixth experiment was 1.92 ms, the seventh experiment amounted to 1.97 ms and the eighth trial amounted to 1.76 Ms. Based on mark the obtained an average jitter of 1.69 ms. According to TIPHON standardization, this value in category Good And get mark index 3.

4. CONCLUSION

Based on the results study, Sending of raw MRI data image with measurements 1.6 GB to the AWS cloud for 8 attempts Which use service 10 Mbps from Indihome providers, it can concluded that average value average throughput of 4.53 Mbps, value index 4 And include in very Good category, average package loss as big as 0.01%, mark index 4 And include in category very Good, flat-flat delay as big as 1.7 ms, mark index 3 And include in Good category , And the average of jitter as big as 1.69 ms, mark index 3 And includ in good category. From the average index results above, so the quality of Internet in sending MRI data image is 1.6 GB to cloud AWS use service 10 Mbps providers indihome enter deep category satisfying. Besides that, based on the results study Also can concluded that Indihome provider with 10 services Mbps include in good category to used in sending MRI data image with a size of 1.6 GB to the cloud AWS.

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