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

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(Received: 02 April 2024, Revised: 16 April 2024, Accepted: 18 April 2024)

Abstract

This research aims to find the quality of the internet in Makassar City. It uses a 10 Mbps service from Indihome to support telemedicine. The study is a case study of sending raw MRI image data to the AWS cloud. The research uses a virtual server from the AWS cloud. It stores raw MRI image data. The data will be sent via the FTP client FileZilla. The tests were carried out eight times. They used the quality of service standard formula from TIPHON. The results come from 8 tests. In the tests, MRI image data was sent to the AWS cloud. The results show that the average throughput value was 4.53 Mbps with an index of 4. This result is excellent. Packet loss is low at 0.01% with an index of 4, which is very good. The delay is 1.7 ms with an index of 3, which is good. The jitter is 1.69 ms with an index of 3, which is good. The quality of service test results are based on TIPHON standards. They show that sending Raw MRI image data to the AWS cloud at 10 Mbps from Indihome in Makassar City is good.

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

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1. INTRODUCTION

The progress of technology is very developing fast including in sector health nowadays. The availability of technology health will make it easier to power health To detect diseases in patients. Accurate patient setup is critical in radiotherapy [1]. One of the health technologies that are available in hospitals namely Magnetic Resonance Imaging (MRI).

Magnetic Resonance Imaging (MRI) images are black-and-white images resulting from the process of magnetic resonance exposed to the human body to show the inside of the body without doing an 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 certain circumstances ready to use. During the machine's primary MRI and the computer cannot be deactivated. In its operation of course needed energy electricity For supplying voltage that MRI requires for properly working. Trade-offs between the material's magnetic susceptibility selection and electrical function should be considered[4].

Radiology departments are major energy consumers within a hospital through the 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].

Shows that the average energy active of MRI is 4099 kWh and the average standby energy is 7,481 kWh. The room of MRI assumed to operate for 8 hours per day And for the other 16 hours every weekday, during the weekend And days off keep it ON and
In this research, there are some stages passed in
Capable of collecting Quality of Service (QoS) data seen in Figure 1

Based on the study cases, This shows 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 does literature studies from books as well as related journals with problem study, Which will be done of analysis need For sending raw image data to AWS Cloud start from hard device need until soft device need. After the need analysis has been done, it will be done by making an AWS account for getting access to cloud AWS. Then after making the 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 a method by sending Raw MRI data images to the AWS Cloud using an application namely Filezilla And capture medium protocol walk using application Wireshark when delivery currently taking place. This Delivery is done as many as 8 times to get maximum results. The steps for sending raw MRI data images to the AWS cloud and data collection is as follows:

1. Downloading citra MRI 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 deliveries done. For testing internet speed can use method access https://www.speedtest.net/. following appearance
3. Sending raw MRI data images to the AWS cloud

Sending raw data images to the AWS cloud is done, so that the researchers can measure the Quality of service (QoS) of the network used for sending the data. Sending this data researcher uses the FileZilla application.

4. Retrieval Data using the Wireshark application

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

In Figure 5, the process of retrieving QoS data using Wireshark.

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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 gets markaverage throughput as big as 4.53 Mbps.

To get the percentage fromthroughput, so mark the average throughput shared with speed internet access upload which has been tested using speed test, namely 4.76 Mbps. From these quotient results the percentage throughput is as big as 95%. Based on the results of retrieval of data from Wireshark can be seen in Figure 6 below.

FIGURE 6. Results QoS data retrieval using Wireshark

From the results of the calculations carried out as much 8 times, has obtained mark throughput on the Table 6 following.

<table>
<thead>
<tr>
<th>No</th>
<th>Total Package(KBytes)</th>
<th>Total Delay (second)</th>
<th>Bandwidth(10 Mbps)</th>
<th>Throughput (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1934159.27</td>
<td>3076.97</td>
<td>9.01</td>
<td>5.11</td>
</tr>
<tr>
<td>2</td>
<td>1932542.904</td>
<td>3262.710</td>
<td>8.07</td>
<td>5.36</td>
</tr>
<tr>
<td>3</td>
<td>1903614.348</td>
<td>3034.939</td>
<td>7.49</td>
<td>5.27</td>
</tr>
<tr>
<td>4</td>
<td>1851968.061</td>
<td>3269.107</td>
<td>8.91</td>
<td>4.26</td>
</tr>
<tr>
<td>5</td>
<td>1883741.790</td>
<td>3206.699</td>
<td>9.30</td>
<td>5.53</td>
</tr>
<tr>
<td>6</td>
<td>1802079.414</td>
<td>3599.713</td>
<td>11.47</td>
<td>3.38</td>
</tr>
<tr>
<td>7</td>
<td>1800626.450</td>
<td>3683.174</td>
<td>11.41</td>
<td>3.55</td>
</tr>
<tr>
<td>8</td>
<td>1869978.637</td>
<td>3455.122</td>
<td>8.01</td>
<td>5.61</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>9.21</td>
<td>4.76</td>
</tr>
</tbody>
</table>

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these calculations, you can conclude that according to the Standardization of TYPHON Throughput Service Wifi Indihome into the Very Good category And get index value 4.

3.2 Analysis of Loss Package

Mark Package Losses obtained based on the results of calculations using formula Package Loss as follows Equation (2).

\[
\text{Loss Package} = \frac{\text{Package Sent} - \text{Package Received}}{\text{Package sent}} \times 100 \ldots \ldots (2)
\]

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

<table>
<thead>
<tr>
<th>No</th>
<th>Amount Package sent</th>
<th>Amount Package accepted</th>
<th>Bandwidth (10Mbps)</th>
<th>Package Losses(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2042732</td>
<td>2042732</td>
<td>9.01</td>
<td>5.11</td>
</tr>
<tr>
<td>2</td>
<td>2023992</td>
<td>2023992</td>
<td>8.07</td>
<td>5.36</td>
</tr>
<tr>
<td>3</td>
<td>2001231</td>
<td>2001231</td>
<td>7.49</td>
<td>5.27</td>
</tr>
<tr>
<td>4</td>
<td>1942330</td>
<td>1942330</td>
<td>8.91</td>
<td>4.26</td>
</tr>
<tr>
<td>5</td>
<td>1972823</td>
<td>1972823</td>
<td>9.30</td>
<td>5.61</td>
</tr>
<tr>
<td>6</td>
<td>1874162</td>
<td>1874162</td>
<td>11.47</td>
<td>4.76</td>
</tr>
<tr>
<td>7</td>
<td>1861204</td>
<td>1859758</td>
<td>11.41</td>
<td>4.76</td>
</tr>
<tr>
<td>8</td>
<td>1953740</td>
<td>1953740</td>
<td>8.01</td>
<td>5.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>9.21</td>
</tr>
</tbody>
</table>

The first trial got a 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 ms, 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 is as big as 1.7Ms. According to standardization by TYPHON, mark the enter in category Good And get index value 3.

3.3 Analysis of Delay

Mark delay is obtained based on the results of calculations using formula (3) delay as follows:

\[
\text{Average delay} = \frac{\text{Total delay}}{\text{Total Package Received}} \ldots \ldots (3)
\]

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

<table>
<thead>
<tr>
<th>No</th>
<th>Total Package Which accepted</th>
<th>Total Delay (second)</th>
<th>Bandwidth (10Mbps)</th>
<th>Average Delay (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2042732</td>
<td>3077,188</td>
<td>9.01</td>
<td>5.11</td>
</tr>
<tr>
<td>2</td>
<td>2023992</td>
<td>3262,710</td>
<td>8.07</td>
<td>5.36</td>
</tr>
<tr>
<td>3</td>
<td>2001231</td>
<td>3034,939</td>
<td>7.49</td>
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</tr>
<tr>
<td>4</td>
<td>1942330</td>
<td>3269,107</td>
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<td>4.26</td>
</tr>
<tr>
<td>5</td>
<td>1972823</td>
<td>3206,699</td>
<td>9.30</td>
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<td>6</td>
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<td>3599,713</td>
<td>11.47</td>
<td>3.38</td>
</tr>
<tr>
<td>7</td>
<td>1861204</td>
<td>3683,174</td>
<td>11.41</td>
<td>3.55</td>
</tr>
<tr>
<td>8</td>
<td>1953740</td>
<td>3455,122</td>
<td>8.01</td>
<td>5.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>9.21</td>
</tr>
</tbody>
</table>

3.4 Analysis of Jitter

The jitter value is obtained based on the results of calculations using the formula jitter as follows:

\[
\text{Average jitter} = \frac{\text{Total jitter}}{\text{Total Package Received}} \ldots \ldots (4)
\]

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

<table>
<thead>
<tr>
<th>No</th>
<th>Total Package Which accepted</th>
<th>Total Jitter (second)</th>
<th>Bandwidth (10Mbps)</th>
<th>Average Jitter(ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2042732</td>
<td>3077,188</td>
<td>9.01</td>
<td>5.11</td>
</tr>
<tr>
<td>2</td>
<td>2023992</td>
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<td>3034,939</td>
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<td>5.27</td>
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<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>9.21</td>
</tr>
</tbody>
</table>
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 the category Good And get mark index 3.

4. CONCLUSION

Based on the results study. Sending of raw MRI data image with measurements of 1.6 GB to the AWS cloud for 8 attempts using service 10 Mbps from Indihome providers, it can be concluded that the average value average throughput of 4.53 Mbps, value index 4 And including 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 included in the good category. From the average index results above, so the quality of the Internet in sending MRI data images is 1.6 GB to the cloud AWS uses 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 is included in the good category to be used in sending MRI data images with a size of 1.6 GB to the cloud AWS.

5. REFERENCE


