Qualification of Internet Network Using Zoom Application

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Abstract In this era, all people using internet to do many activities. This circumstance is become more often conducted when Corona virus started to attack all countries in the world. Many activities outside of people are forbidden to do. As a result, all formal-occupations, academic-atmosphere and other types of jobs in market places in general, tend to be done from home. Applying internet connection is solution to do all things from home. Doing meeting online, learning system in schools and colleges, can be performed at home by using Zoom Application. Zoom is a cloud-based collaborative of video conference service that offer online meeting features, group messaging services and protection of recording sessions. To assure Zoom is used well, internet network quality must be guarantee. Hence, Internet-Service-Provider institution that can supply and operate internet well on the clients. Nowadays, there are many complaints about their services when customers using Zoom in their gadgets many times. Therefore, this paper aims to determine qualification of internet-network through 40-users which are supplied by private Internet-Service-Provider institution in Pekanbaru, based on real conditions/obstacles that are experienced of each user when they are implementing Zoom. Results of the research show that 75% from 40-clients get Bad and Unsatisfied of internet-networking, while 25%-users obtain Satisfied and Very-Satisfied in same condition, through QoS-Parameters such as Packet-Loss, Throughput, Delay based on TIPHON. To repair the quality of QoS-Parameters, Internet-Service-Provider should increase bandwidth in total and manage that bandwidth, hence qualification of internet-network in all customers will be improved fairly.

Keywords: Zoom Application, Internet Network, Wireshark Application, QoS-Parameters, Standardization of TIPHON.

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Introduction

Technological advances on the internet are growing and becoming a necessity. In this era, all people using internet to do many activities, such as downloading and uploading file, searching information through website and using Zoom application in meetings if the participants of the meeting are from various different places.

These circumstances are become more often to be performed since Corona virus attacted all around the world. Many activities must be stopped and all people in every country are forbidden to do daily activities outside of their house. As a consequent, all formal occupations in the some office or institutions, all academic atmosphere in schools and universities, ordering food, transportation or other stuffs and other types of jobs in market places in general, tend to be conducted from home. Definitely, internet connection is the solution to do all those things from home.

When doing meeting online of private or government employees in one institution, learning system in schools and colleges, can be done at home by using Zoom Application. To ensure that Zoom will be operated well, so the qualification of internet network must be guarantee. Therefore, a company that take care about internet connection is the party which can supply and operate internet well on the clients. This company is called as an Internet Service Provider institution. An internet Service Provider (ISP) is a company that provides internet connection for individuals and organizations [1].

In this case, there is a private company from Internet Service Provider in Pekanbaru, that has many customers who using their services through wireless connection. Internet Service Provider (ISP) offered same price for all users monthly. Fourty clients using Zoom Application in their daily activities. All users used many different gadgets, such as Personal Computer (PC), laptop or smartphone. However, recently, there are many complaints about ISP’s service. Users experience that internet connection often freezing, suddenly stop working or not working at all when they were implementing Zoom in their gadgets many times.

Caused of these problems, this study has a goal to define the qualification of internet network in a private Internet Service Provider in Pekanbaru through 40 users when using zoom application by doing some testings the parameters of Quality of Service based on standard of Telecommunications and Internet Protocol Harmonization Over Network (TIPHON).
The problem in the research is to determine the qualification of wireless internet network when implementing Zoom Application using Wireshark based on QoS parameters refer to TIPHON Standard. TIPHON is an assessing standard for QoS Parameters by standard institution of European Telecommunications Standards Institute (ETSI) [2]. The scopes of this paper is measuring and testing QoS parameters such as Packet Loss, Throughput and Delay when 40 users are implementing Zoom application using Wireshark in their activities based on real conditions/obstacles that is faced of every customer. Outputs of the research are qualities of each QoS Parameters, such as Packet Loss, Throughput and Delay, according to the real conditions/obstacle that may happen of each user when using Zoom and qualification of internet connection based on QoS Parameter in general, using TIPHON Standard.

Materials and methods

Zoom Application

Zoom Application is a cloud-based collaborative of video conference service that offer online meeting features, group messaging services and protection of recording sessions. Zoom also proposes the ability to communicate directly with individuals that geographically dispersed via computer, tablet or mobile devices [3].

Application of Wireshark

Application of Wireshark is one open source of application which is used as an analyzer tool of network protocol. Wireshark is a packet sniffer of free charge in an application of computer. Wireshark has an instrument to capture, see and examine of data packets [4].

Computer Network

A computer network or data network is a set interconnections between two or more computers to exchange data. The connections or network links between nodes are established using either wired or wireless transmission. Two computers can be called connected if they can exchange data or information with the resources they have. Each computer printer or peripheral that is connected is called a node. [5].

Computer network has a connection between nodes (computers) such as Client - Server. Client-Server is a system that performs client and server functions. Therefore, one each other can share information between them. The client is the requester and the server is the provider of a service. In most client-server environment, the data processing is carried out by the server and the result is returned to the clients, which is made to speed up the rate of performance. [6].

Bandwidth provided by Internet Service Provider for all users is 10 MBps. Bandwidth is a value of data transfer usage. Bandwidth as the area or width of data transmission frequency [7].

Simple Queue

Internet Service Provider using Simple Queue Method in bandwidth management of wireless internet connection for users. Bandwidth management is management of the bandwidth used by users [8]. Simple Queue is a method of simple bandwidth management to arrange usage bandwidth to upload and download for users [9]. Simple Queue can limit traffic based on IP Address. Using bandwidth in Simple Queue faces queue process from top to down [10].

Quality of Service

Quality of Service (QoS) is the capability of a network to deliver good service with diverse levels of service assurance. Support from QoS is very essential to assure many several classes of service [11]. Index of QoS Parameter is illustrated in Table 1.

Table 1. Index of QoS Parameter [12]

<table>
<thead>
<tr>
<th>QoS Value (%)</th>
<th>Index</th>
<th>QoS Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 – 100</td>
<td>3.8 - 4</td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>74 – 94.75</td>
<td>3 - 3.79</td>
<td>Satisfied</td>
</tr>
<tr>
<td>50 – 74.75</td>
<td>2 - 2.99</td>
<td>Unsatisfied</td>
</tr>
<tr>
<td>25 – 49.75</td>
<td>1 - 1.99</td>
<td>Bad</td>
</tr>
</tbody>
</table>

Three QoS Parameters are functioned in this paper such as:
1. Packet Loss: Packet Loss is one factor that explains the real condition of internet connection by presenting total the sum of vanished packets. In addition, attendance of collision and congestion can be displayed on a network [13]. To obtain Packet Loss [12], Equation 1 is used.
\[ \text{Packet Loss} = \frac{Y}{A} \times 100\% \] (1)

Whereas:
- \( Y = \text{Transmitted packet data} - \text{Received packet data} \)
- \( A = \text{Transmitted packet data} \)
- \( B = \text{Received packet data} \)

Packet Loss Standardization based on TIPHON revealed in Table 2.

**Table 2. Packet Loss Standardization based on TIPHON [14]**

<table>
<thead>
<tr>
<th>Packet Loss (%)</th>
<th>Index</th>
<th>Packet Loss Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ≤ ( p &lt; 3 )</td>
<td>4</td>
<td>Very Good</td>
</tr>
<tr>
<td>3 ≤ ( p &lt; 15 )</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>15 ≤ ( p &lt; 25 )</td>
<td>2</td>
<td>Average</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>1</td>
<td>Bad</td>
</tr>
</tbody>
</table>

2. Throughput: Throughput is total amount of monitored packet arrival and target during the detailed time interval divided by period of that time interval [14]. Throughput value [15] can be produced by applying Equation 2.

\[ \text{Throughput} = \frac{\text{Received Data Packet}}{\text{Observation time}} \] (2)

Whereas:
- \( \text{Received packet data: packet total that was observed} \)
- \( \text{Observation Time: Time duration of observation} \)

Standardization of Throughput refers to TIPHON is stated in Table 3.

**Table 3. Standardization of Throughput refers to TIPHON [16]**

<table>
<thead>
<tr>
<th>Throughput</th>
<th>Index</th>
<th>Throughput Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2.1 Mbps</td>
<td>5</td>
<td>Very Good</td>
</tr>
<tr>
<td>1200 Kbps – 2.1 Mbps</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>700 Kbps – 1200 Kbps</td>
<td>3</td>
<td>Average</td>
</tr>
<tr>
<td>338 Kbps – 700 Kbps</td>
<td>2</td>
<td>Bad</td>
</tr>
<tr>
<td>0 Kbps – 338 Kbps</td>
<td>1</td>
<td>Very Bad</td>
</tr>
</tbody>
</table>

3. Delay: Delay is required time duration to traverse distance from origin to final destination [12]. Delay is calculated [15], by using Equation 3.

\[ \text{Delay} = \frac{\text{Total of Delay}}{\text{Total of Received Packet Data}} \] (3)

Whereas:
- \( \text{Total of Delay} = \text{Time consumed in distance from beginning to the end (second)} \)
- \( \text{Total of received packet data} = \text{Quantity of packets that can attain ending destination} \)

Delay Category using TIPHON can be seen in Table 4.

**Table 4. Delay Category using TIPHON [17]**

<table>
<thead>
<tr>
<th>Delay (ms)</th>
<th>Index</th>
<th>Delay Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 150</td>
<td>4</td>
<td>Very Good</td>
</tr>
<tr>
<td>150 – 300</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>300 – 450</td>
<td>2</td>
<td>Average</td>
</tr>
<tr>
<td>&gt; 450</td>
<td>1</td>
<td>Bad</td>
</tr>
</tbody>
</table>
**Literature References**

Reference [4] conducted evaluation from Wireshark application ability as application that detects internet network condition. Result of research showed that testing of first scenario on network traffic capture using Wireshark gave error notification toward network faced trouble. Second scenario was performed by applying filter from network capture’s result. As a result, not all network traffic could be captured.

Reference [17] revealed how to manage bandwidth on client by positioning bandwidth with PCQ – HTB Methods. Network presentation of clients was verified by implementing Quality of Service parameters, for instance Packet Loss and Delay. This study produced values of Packet Loss, Delay and Jitter were 3.4%, 5.83 ms and 10.59 ms respectively.

Reference [18] determined qualification of internet network on a private Vocational Senior Highschool in Riau Province, using parameters of Quality of Service (QoS), such as Throughput, Delay, and Packet Loss. In this case, the qualification of internet network obtained by downloading proses of video file based on network condition using Wireshark in different distances from Access Point. All the results of QoS parameters based on Standard of Telecommunication and Internet Protocol Harmonization Over Network (TIPHON).

Reference [19] executed survey toward bandwidth management in manage data traffic on network which was wrapped in network packet. This study produced that bandwidth management was needed indeed to control given bandwidth, so system could consider allocation of clients’ bandwidth.

Reference [20] performed bandwidth management from an internet network. In this paper, bandwidth was managed to regulate and allocate clients’ bandwidth by determining main priority to the highest bandwidth of the top, while lower priority was given to bandwidth that lies at the bottom. Output of the research showed that Throughput values from Client 1 up to Client 5. Client 1 and Client 2 experienced 210 Kbps and 203 Kbps of Throughput in turn. Client 3, 4 and 5 got 209 Kbps, 204 Kbps and 218 Kbps Throughput in sequence.

**Methodology**

Flowchart of the research is depicted in Figure 1.

![Flowchart of the research](Image)

**Figure 1.** Flowchart of the research.

Due to Figure 1, when customers applying application of zoom on their gadgets, so the condition of the network at the moment is captured by Wireshark. As a result, many components of Throughput, Packet Loss and Delay are obtained and those are used to get their each value. All the calculated marks of each QoS Parameters are compared to TIPHON Standard to define in which category
of every mark. All these categories are added and divided three to procure the category of QoS Parameter, whether the network are Bad, Unsatisfied, Satisfied or Very Satisfied.

**Results and discussion**

Network Testing is performed in Microtics Router in every morning. Network conditions during testing by Wireshark can be described in Figure 2.

![Figure 2. Network conditions during testing by Wireshark](image)

Based on Figure 2, Parameters of QoS can be obtained, such as Packet Loss, Throughput and Delay.

**Testing Results of Packet Loss**

By looking at Figure 2, it is obtained that:

- Data packet sent/captured (A) = 45578 Kbps
- Data packet received/displayed (B) = 4587 Kbps

To procure Packet Loss, Equation 1 is used.

\[
Packet \ Loss = \frac{45578 - 4587}{45578} \times 100\% = 89.94\%
\]

In accordance with Table 2, the Category of 89.94% Packet Loss is Bad in Index 1.
Conducting same steps, the other values of Packet Loss with its Category and Index are illustrated in Table 5.

**Table 5. Packet Loss with its Category and Index**

<table>
<thead>
<tr>
<th>Client</th>
<th>Sent Data Packet (A)</th>
<th>Received Data Packet (B)</th>
<th>Y = A – B</th>
<th>Packet Loss (%)</th>
<th>Index</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45578</td>
<td>4587</td>
<td>090</td>
<td>1</td>
<td>Bad</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>47552</td>
<td>37538</td>
<td>10014</td>
<td>21</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>86032</td>
<td>79678</td>
<td>6354</td>
<td>7</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>96857</td>
<td>89151</td>
<td>7706</td>
<td>8</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>86478</td>
<td>81397</td>
<td>5081</td>
<td>6</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>105443</td>
<td>103891</td>
<td>1552</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>117375</td>
<td>115881</td>
<td>1494</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>130767</td>
<td>129278</td>
<td>1489</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>145002</td>
<td>143562</td>
<td>1440</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>163243</td>
<td>161831</td>
<td>1412</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>185163</td>
<td>18371</td>
<td>166792</td>
<td>90</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>12</td>
<td>3108</td>
<td>950</td>
<td>2158</td>
<td>69</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>13</td>
<td>2214</td>
<td>752</td>
<td>1462</td>
<td>66</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>14</td>
<td>5820</td>
<td>3119</td>
<td>1552</td>
<td>66</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>15</td>
<td>2362</td>
<td>810</td>
<td>2701</td>
<td>46</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>16</td>
<td>1568</td>
<td>581</td>
<td>987</td>
<td>63</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>17</td>
<td>2504</td>
<td>850</td>
<td>1654</td>
<td>66</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>18</td>
<td>2278</td>
<td>742</td>
<td>1536</td>
<td>67</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>19</td>
<td>3269</td>
<td>1459</td>
<td>1810</td>
<td>55</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>20</td>
<td>1670</td>
<td>639</td>
<td>1031</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>21</td>
<td>2281</td>
<td>872</td>
<td>1409</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>22</td>
<td>3590</td>
<td>2894</td>
<td>696</td>
<td>19</td>
<td>2</td>
<td>Average</td>
</tr>
<tr>
<td>23</td>
<td>2146</td>
<td>849</td>
<td>1297</td>
<td>60</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>24</td>
<td>1703</td>
<td>646</td>
<td>1057</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>25</td>
<td>1764</td>
<td>746</td>
<td>1018</td>
<td>58</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>26</td>
<td>1500</td>
<td>537</td>
<td>963</td>
<td>64</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>27</td>
<td>2111</td>
<td>826</td>
<td>1285</td>
<td>61</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>28</td>
<td>2403</td>
<td>1157</td>
<td>1246</td>
<td>52</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>29</td>
<td>2325</td>
<td>765</td>
<td>1560</td>
<td>67</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>30</td>
<td>2439</td>
<td>2116</td>
<td>323</td>
<td>13</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>31</td>
<td>2066</td>
<td>1776</td>
<td>290</td>
<td>14</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>32</td>
<td>1939</td>
<td>1608</td>
<td>331</td>
<td>17</td>
<td>2</td>
<td>Average</td>
</tr>
<tr>
<td>33</td>
<td>2138</td>
<td>1800</td>
<td>338</td>
<td>16</td>
<td>2</td>
<td>Average</td>
</tr>
<tr>
<td>34</td>
<td>2353</td>
<td>2045</td>
<td>308</td>
<td>13</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>35</td>
<td>1603</td>
<td>594</td>
<td>1009</td>
<td>63</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>36</td>
<td>2160</td>
<td>813</td>
<td>1347</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>37</td>
<td>2076</td>
<td>780</td>
<td>1296</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>38</td>
<td>1910</td>
<td>736</td>
<td>1174</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>39</td>
<td>2140</td>
<td>825</td>
<td>1315</td>
<td>62</td>
<td>1</td>
<td>Bad</td>
</tr>
<tr>
<td>40</td>
<td>1774</td>
<td>690</td>
<td>1084</td>
<td>61</td>
<td>1</td>
<td>Bad</td>
</tr>
</tbody>
</table>

According to Table 5, twenty five users from total (62.5%) face Bad of internet service and four customers (10%) are in Average for Packet Loss when using Zoom. On the other side, six clients (15%) experience Good and five customers are Very Good (12.5%) for same condition. It can be said that less than 75% of 40 clients obtain Bad and Average qualification of Packet Loss. Vice versa, more than 25% get Good and Very Good condition of Packet Loss from provider’s internet service when running Zoom on their gadgets by applying TIPHON standard.

Based on the result of Packet Loss testing, it can be stated many things that can cause the loss of packets. For example, the distance of every user to server can influence the network qualification. Longest distance of users from server, weakest signal received on users’s side. Another cause of this condition is the availability of obstacles. In this case, the obstacles could be skyscrapers, buildings/houses, towers, trees and vehicles. Other cause is the queue of users. In Simple Queue, all clients will be served when they join to network. However, the first client(s) get higher and stable bandwidth, compare to the last users joined. With reference to this condition, Clients 6 upto 10 are the first users who uses the internet connection at that time. Then, they are followed by Clients 3, 4, 5, 30, 31 and 34 in closely time. The next client who use this internet network are Clients 2, 22, 32 and 33. Finally, last clients who start to using Zoom application are Clients 1, 11 upto 21, 23 upto 29 and Clients 35 upto 40.
Testing Results of Throughput

Based on Figure 1, it can be revealed that:
- Data packet received (Bytes) = 5873474 bytes
- Observation Time (Time span, s) = 33.011 sec

To obtain Throughput, Equation 2 is used.

\[
Throughput = \frac{5873474 \text{ Byte}}{33.011 \text{ sec}} = \frac{177924.75 \text{ Byte}}{8 \text{ bits}} = \frac{1423398.02 \text{ bps}}{1024} = 1390.04 \text{ Kbps}
\]

Refer to Table 3, Throughput Category (1390.04 Kbps) is Good in Index 4.

By doing the same procedure, the other values of Throughput with its Category and Index are stated in Table 6.

**Table 6. Throughput with its Category and Index**

<table>
<thead>
<tr>
<th>Client</th>
<th>Received Data Packet</th>
<th>Observation Time (s)</th>
<th>Throughput (Kbps)</th>
<th>Index</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5873474</td>
<td>33.01</td>
<td>1390.08</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>57948696</td>
<td>298.39</td>
<td>1517.22</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>61032895</td>
<td>282.73</td>
<td>1686.48</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>4</td>
<td>68320055</td>
<td>298.53</td>
<td>1787.93</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>5</td>
<td>64367554</td>
<td>256.13</td>
<td>1963.34</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
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<td>217210</td>
<td>243.06</td>
<td>6.98</td>
<td>1</td>
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</tr>
</tbody>
</table>
Based on Table 6, 30 from 40 clients get Very Bad Throughput when running Zoom. On the other hand, 10 customers face Good and Very Good of Througput in the same condition. It can be seen that just 25% of 40 users meet Good and Very Good Throughput of internet service when using Zoom. The rest of 40 clients (75%) face Very Bad Throughput, in the same circumstances by implementing TIPHON.

In terms of the result of Throughput testing, some factors can determine the condition of Throughput, like as the existence of distance from server to users. Another factor which can affect the quantity of packet arrival is the presence of obstructions, for instance trees, vehicles, buildings/houses, skyscrapers and towers. Last cause that can involved in the amount of packet arrival is number of customers who stand in line. With reference to condition of Simple Queue, Customers 6, 7, 8, 10 and 11 are the first customers who open Zoom in the net. Then, Customers 1 upto 5 follow the first customers to join in the network. Final customer who using Zoom application are Customer 9 and Customers 12 upto 40.

**Testing Results of Delay**

Posit Figure 2. it is obtained that:

- Data packet sent/captured (A) = 3227.24 seconds
- Data packet received/displayed (B) = 4587

To get Delay, Eqution 3 is used.

$$\text{Delay} = \frac{3227.24}{4587} = 0.70355 \times 1000 = 703.55 \text{ ms}$$

Regarding with Table 4, Delay Category of 703.55 ms is Bad in Index 1.

Performing same sequences, the other values of Delay with its Category and Index are illustrated in Table 7.

**Table 7. Delay with its Category and Index**

<table>
<thead>
<tr>
<th>Client</th>
<th>Delay Total (s)</th>
<th>Total of Received Data Packets</th>
<th>Delay (ms)</th>
<th>Index</th>
<th>Category</th>
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</thead>
<tbody>
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<td>3227.19</td>
<td>4587</td>
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</tr>
<tr>
<td>2</td>
<td>35</td>
<td>37538</td>
<td>0.94</td>
<td>4</td>
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</tr>
<tr>
<td>3</td>
<td>10.5</td>
<td>18371</td>
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<td>4</td>
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</tr>
<tr>
<td>4</td>
<td>27.28</td>
<td>89151</td>
<td>0.31</td>
<td>4</td>
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<tr>
<td>5</td>
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<td>81397</td>
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<td>103891</td>
<td>1.01</td>
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In the matter of Table 7, two consumers (10%) and 17 customers (42.5%) meet Bad and Average of Delay respectively. Otherwise, four customers and 17 users from 40 clients obtain Good and Very Good in turn when using Zoom application. It means that more than 50% from 40 people encounter Good and Very Good Delay of internet service, while less than 25% users procure Bad and Average Delay, when implementing Zoom in their meetings on TIPHON.

In accordance with the result of Delay testing, there are possible conditions that work on the long of duration from source to destination. Firstly is widely space among every user to server. Wider area of server from users in a network, longer time is needed to reach the last goal on users. Secondly, open space and many hindrances such as towers, buildings/houses, vehicles, trees and skyscrapers also have potential to increase/decrease delay in internet network. Thirdly, long queue of customers in a system is the other aspect to escalate delay. Related to Simple Queue’s condition, can be said that Users 23, 25, 26, 28 are users who first time using Zoom Application. After that, Users 12, 15, 19 and 28 join to internet connection parallel. They are followed by Users 13, 17, 18, 20, 21, 23 upto 27, 29 and Users 35 upto 40. Lastly, User 1, and User 16 connected to the internet.

**Testing Results of Quality of Service**

In respect of Table 5 upto Table 7, qualification of Quality of Service on every customer based on the testing results of its parameters can be determined. Quality of Service on all customers related to results of QoS parameters is revealed in Table 8.

**Table 8. QoS Parameter of Each Customer**

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<th>Client</th>
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</tr>
<tr>
<td>32</td>
<td>2</td>
<td>Average</td>
<td>1</td>
<td>Very Bad</td>
</tr>
</tbody>
</table>
Based on Table 8, there are 22 people from 40 experience Bad Connection (Users 12, 13, 15 up to 21, 23 up to 29, and 35 up to 40) and eight users get unsatisfied qualification (Users 1, 14, 22, 30 up to 34) of Internet network. On the other hand, just six persons (Users 2 up to 5, 9, 11) and four users (Users 6 up to 8, and 10) obtain Satisfied and Very Satisfied quality of Internet connection when using Zoom application in their activities through QoS Parameters such packet loss, throughput and delay, based on TIPHON. It means that around 75% users obtain Bad and unsatisfied qualification from Internet network, while no more than 25% obtain Satisfied and Very Satisfied qualification from Internet network when using Zoom Application. Some conditions can cause the qualification of networks like as the distance from server to users, the existence of obstructions, for instance vehicles, trees, towers, skyscrapers, buildings/houses and also the queue of clients in that network. It can be seen that qualification of Internet network on 40 users from the same provider are bad and need to be improved. To improve the qualification of QoS Parameters, in overall, Internet Service Provider must increase bandwidth in general and manage that bandwidth. As a result, qualification of Internet network in all clients will be enhanced appropriately.

Conclusions
From 40 clients, around 75% users meet Bad and Unsatisfied qualification, while 25% encounter Satisfied and Very Satisfied qualification of Internet networking when implementing Zoom in their activities, through QoS Parameters such as Packet Loss, Throughput and Delay, based on TIPHON. There are many things can cause the qualification of networks such as the distance of every user to server, the availability of obstacles, like as skyscrapers, buildings/houses, towers, trees, vehicles and also the queue of clients in that network. To enhance the quality of QoS Parameters, Internet Service Provider should raise bandwidth in general and manage that bandwidth, so qualification of Internet-network in every client will be raised as well.

Conflicts of interest
The authors declare that there is no conflict of interest regarding the publication of this paper.

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References


