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COMPARATIVE ANALYSIS OF NETWORK PERFORMANCE USING NETWORK TRAFFIC ANALYZER TOOLS IN FSKM LABORATORY

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Abstract

In today's world, academic and operational excellence depend on reliable network connectivity. However, there are several challenges that delay user productivity due to inconsistent Wi-Fi performance and bottlenecks. The aim of this project is to evaluate four network traffic analyzer tools which are Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3 through experiments during and outside teaching and learning sessions to address the challenges. Some key network performance metrics include latency, throughput and packet loss that were analyzed to determine tool accuracy and reliability under various traffic conditions. The methodology involved a testbed consisting of three laptops connected to the UiTM Wi-Fi Student network. The data was collected from different levels and sessions to highlight how performance can be influenced by infrastructure and user density. Wireshark was the best tool that could consistently perform, achieving the lowest latency of 0.57 ms and minimal packet loss 0.2% during outside teaching and learning sessions. While Acrylic Wi-Fi Analyzer recorded up to 92 ms latency, TamoSoft Throughput Test showed the highest throughput of 12.82 Mbps while packet loss pointed to 11.5%, indicating limitations under heavy load. On the other hand, Iperf3 recorded the lowest throughput values as low as 1.08 Mbps in controlled conditions. These results highlight the importance of tools selection based on specific network need while emphasizing the importance of Wireshark for critical environments. This project provides insight into further improvements in academic network performance to ensure better connectivity along with operational efficiency.

Keywords: LAN, WLAN, Wi-Fi, Network Performance Metrics

INTRODUCTION

Network performance is the investigation and assessing collective network information to characterize the quality of services delivered by the underlying computer network (Alkenani & Nassar, 2022). To assurance continuous connectivity, minimize latency, and increase throughput, network performance and efficiency must be optimized (Srinidhi et al., 2019). In the modern digital economy, maintaining a competitive edge and providing excellent services depend on the network's seamless operation. However, because modern networks are dynamic and data traffic levels are always growing, managing optimal network performance has become more difficult (Hassan & Mhmood, n.d.). This is especially accurate in settings like laboratories, enterprise networks, and telecommunications systems where an effective network is necessary.

However, inconsistent network performance in a FSKM laboratory at UiTM Jasin presented a significant challenge for real-time network traffic analysis. Enhancing the program's efficiency to accommodate increased network traffic loads is a significant challenge (Yeshasvi et al., 2023). The inconsistence made it challenging to continuously monitor and analyze network traffic, which requires high-performing systems capable of handling large volumes of data. Additionally, network operations may be impacted by the inability to deliver accurate measurements required for optimal network performance (Jivthesh et al., 2022). Inaccurate data can obscure specific issues such as high traffic loads from various connected devices, network bottlenecks and instability Wi-Fi coverage across multiple buildings, making it difficult to analyze and solve performance problems.

The objectives of this study are to monitor network performance data using different network traffic analyzer tools which are Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3 in the FSKM laboratory. Next, to analyze network performance metrics including latency, throughput and packet loss. Lastly, to evaluate the results of network performance metrics between network traffic analyzer tools.

LITERATURE REVIEW

Overview to Network Traffic Analyzer

A technology called network traffic analyzer is a method of capturing network traffic and examining it in detail to understand or analyze what happened on the network. A network traffic analyzer is crucial in today's scenario with the increasing internet usage. This also can deliver valuable insights by examining network performance in the network through analyzing flows (Mayank Kumar, 2022). Network traffic analyzers can manage data directed specifically to them and can be used for network administrators to monitor and troubleshoot issues within the networks (Siswanto et al., 2019). According to Siswanto et al., (2019), network traffic analyzers typically include several key components

a) Capture filter

Captures the network traffic and filters for the specific traffic, then stores the data in a buffer.

b) Buffers

Store the frames captured by the Capture Filter.

c) Real-time analyzer

Analyzes traffic in real-time and shifts the traffic for intrusion detection.

d) Decode

Conducts protocol analysis.

Network Traffic Analyzer Tools

Network traffic analyzer tools are important for monitoring and analyzing network performance in FSKM Laboratory. There are several tools available, each with unique features and functionalities. However, the project focused on some of the best network traffic analyzer tools, which included Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3. With the right monitoring tools, users can have increased visibility over the network devices and can keep track of all the changes in networks. It is important for real-time data processing and monitoring capabilities in network systems.

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Network Performance Metrics

Network performance can be evaluated through various factors such as latency, packet loss, jitter, throughput, bandwidth, network availability and error rates. Among these, the project focused on three critical metrics which are latency, throughput and packet loss. Focusing on these three factors is justified because they provide a comprehensive insight into the efficiency and reliability of data transmission over a network. These metrics are important in laboratory settings where reliable data transmission is crucial for various educational purposes. Network performance is crucial for laboratories because it ensures the reliability and accuracy of data gathered using a range of tools and devices. For instance, accurate and repeatable studies in network scanning research depend on reliable data delivery.

Latency

Latency is the time it takes for data to move across a network from source to destination. It is a crucial performance indicator for networks, measured in milliseconds (ms), and it can be affected by several variables including the distance between the physical medium, network congestion, and processing speeds at intermediate nodes. (Kurnia Saleh et al., 2022). Since data traveling over longer distances could face more delays, the physical medium distance can contribute to latency. Network congestion is also another important aspect that may increase latency. Delays can be caused by packet loss and retransmission caused by heavy network traffic.

Throughput

Throughput measures the amount of data that can be transmitted over a network in a specific time (Kurnia Saleh et al., 2022). It is usually measured in megabits per second (Mbps) (Maulana et al., 2021). There is a big file that is always transferred through a network, and one uses the time taken to complete the transfer to determine how much throughput such an activity has. Also, it defines the number of data packets that have been seen successfully in a given time. (Rizki Akbar Rabbani et al., 2023).

Packet Loss

Packet loss is the number of packets that do not reach their intended destination during data transmission over a network. When packet loss exceeds a certain threshold, performance degrades significantly and the system may become unusable if the packet loss is excessive (Kurnia Saleh et al., 2022).

Factors Impacting Network Performance

In the modern era, there are many factors that affect the performance of Wi-Fi networks, particularly in a FSKM laboratory setting. Understanding these factors is important to ensure a stable, high-performance network that supports the increasing demands of modern technology. As identified by Morshedi & Noll (2021), several factors affect the quality of wireless communication and while the 802.11 QoS improvements address specific quality categories, they do not resolve all network concerns that continue to annoy end-user. The factors are broadly classified into two categories which are the types of factors influencing the quality of Wi-Fi and the impact of network traffic in FSKM Laboratory.

Types of Factors

Several factors can affect the quality of Wi-Fi including environmental factors. Environmental factors can be influenced by physical barriers such as ceilings, walls and floors particularly when made of materials like concrete, metal or wood which have a considerable impact on Wi-Fi signal attenuation. According to Bytyqi & Jashari (2024), building materials and structures affect indoor radio wave propagation which eventually influence seamless Wi-Fi signal coverage within buildings. These materials absorb or reflect wireless signals causing a decrease in both signal strength and network speed as the signal passes through them. Concrete and metal commonly used in laboratory settings are particularly challenging because they greatly reduce signal quality leading to dead zones or areas with poor connectivity. The structural materials can pose challenges to network efficiency.

Second, the performance of Wi-Fi networks is influenced by the technical standards and settings used. Different generations of Wi-Fi offer improvements in speed, capacity and

reliability. The 802.11 standards display improvements that enhance wireless throughput and range as well as the use of new frequencies as they become available (Ghafar et al., 2020). The network at the FSKM laboratory can be significantly upgraded by implementing the latest Wi-Fi standards. Another serious technical factor is channel utilization and bandwidth management. Wi-Fi networks operate on different channels within frequency bands and effective channel allocation is important for minimizing congestion and interference. As stated by Oliveira et al. (2024), one of the most persistent and pervasive is interference. In many cases, overlapping channels can lead to signal interference, especially in FSKM laboratory which crowded environments. By choosing non-overlapping channels and enhancing the available bandwidth, network administrators can maximize the performance of the Wi-Fi network.

Lastly, the performance of a Wi-Fi network is also affected by human factors particularly the number of connected devices and user behavior. As more devices connect to a network, the available bandwidth for each device decreases leading to congestion, packet loss and slower speeds. According to Ghafar et al. (2020), the more devices communicate on the network simultaneously, the slower its performance thus affecting the Wi-Fi performance and quality of Wi-Fi networks far from satisfactory. Additionally, user activities such as video streaming, large file download or online gaming consume a significant amount of bandwidth which can degrade the quality of Wi-Fi for others on the same network.

Impact of Network Traffic

Wi-Fi performance is significantly influenced by the type and volume of network traffic. As more devices connect and transmit data simultaneously, the network becomes congested, leading to slower speeds, increased latency and higher packet loss. High traffic volumes, especially during peak usage times, cause competition for limited bandwidth, reducing the available throughput for each device. Moreover, different types of traffic such as video streaming, online gaming or file transfers place variable demands on the network. Activities like HD video streaming or large file transfers consume significantly more bandwidth than simple browsing or email, creating possible bottlenecks. Understanding these traffic patterns is important for prioritizing resources and maintaining stable, high-quality Wi-Fi performance.

Related Works

Several related works are using the same method which uses network traffic analyzer tools.

a) *Automatic Anomaly Detection by Network Traffic Analysis (Sahana et al., 2023)*

This article focuses on indicating network traffic flow monitoring methods and using several network monitoring tools such as Wireshark, Microsoft Message Analyzer, NTOP and PRTG to analyze the results. Different networking tools were built to capture the network traffic to understand their behavior.

b) *Performance Analytics of Network Monitoring Tools (Chahal et al., 2019)*

This research highlights the criteria for choosing suitable monitoring tools and compares 15 popular network monitoring solutions. These tools may be used to achieve the objective of high-performance and dependable networks because they can analyze network resources, identify issues and alert administrators to take corrective action. This article also reviews various network monitoring technologies including their features, benefits and limitations. The tools discussed include Nagios, Zabbix, Hyperic, IBM Tivoli, Solarwinds, Cacti and WhatsUp Gold. This article described each tool in terms of its license, data storage method, access control, platform support, logical grouping and distributed monitoring capabilities.

METHODOLOGY

A clarification of the method used to complete this project was specified in this chapter. It outlined the procedures and methods used in the project. The method also provided a detailed explanation of each activity that had to be completed in order. According to Saeed et al., (2019), a set of procedures used to handle each of the phases required for a project to succeed is referred to as project methodology. This project's methodology took an organized approach to address each phase needed to finish the project. The methodology offered a well-defined structure for the project's progress, with each phase being defined in detail and increasing upon the one before it. This method worked efficiently for the project as it has set requirements and a defined scope, and it involves minimal communication between phases. This project's progress through its many phases was clearly defined according to this methodology. This method helped to keep the project on plan and ensures that all tasks and deliverables are complete.

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Research Methodology Framework

Specifics on the research methodology framework of the project to be shown that outline the phases and procedures to follow will be given in this segment. A diagram of the phases can be found in Figure 3.1.

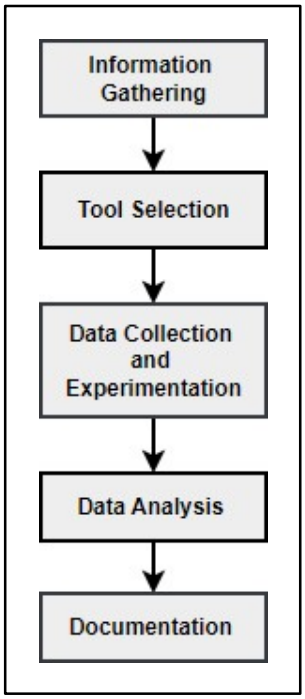

Figure 3.1 Phases Model

Tools Selection

Selecting the right tools is important for the success of the project. The project only focuses on the four best network traffic analyzer tools which are Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3. These tools offered features that are well-suited for analyzing the network performance in the FSKM Laboratory. Each tool was evaluated based on operating system support, protocol support, cost, user-friendliness and key features. In table 3.3 shows the list of tools and where to download it.

Table 3.3 Network Traffic Analyzer Tools Downloader

Tools	Description
Wireshark	https://www.wireshark.org/download.html
Acrylic Wi-Fi Analyzer	https://www.acrylicwifi.com/en/wifi-analyzer/
TamoSoft Throughput Test	https://www.tamos.com/download/main
Iperf3	https://iperf.fr/iperf-download.php

Data Collection and Experimentation

In this project, three laptops, each running different tools, were used as part of a network infrastructure testbed design. The devices accessed the UiTM Wi-Fi Student network, allowing the capture and analysis of network activity during two times, which is 10 a.m. to 12 p.m. and 2 p.m. to 4 p.m. The experiment emphasized comparing network performances across different levels, level 1, level 2 and level 3 within the FSKM laboratory building rather than conducting tests in every lab class. Each level had different network setups and user densities, allowing for a comprehensive analysis of how network traffic analyzer tools perform in numerous real-world settings. To achieve a comprehensive assessment, the experiments were conducted during two different sessions.

a) Experiment 1: During Teaching & Learning

Analyze network traffic during academic activities such as classes, labs and tutorials, representing increased network traffic volumes due to higher usage by students and faculty for academic purposes.

b) Experiment 2: Outside Teaching & Learning

Analyze the network during periods when no formal academic activities are happening such as weekends when the campus network is less utilized.

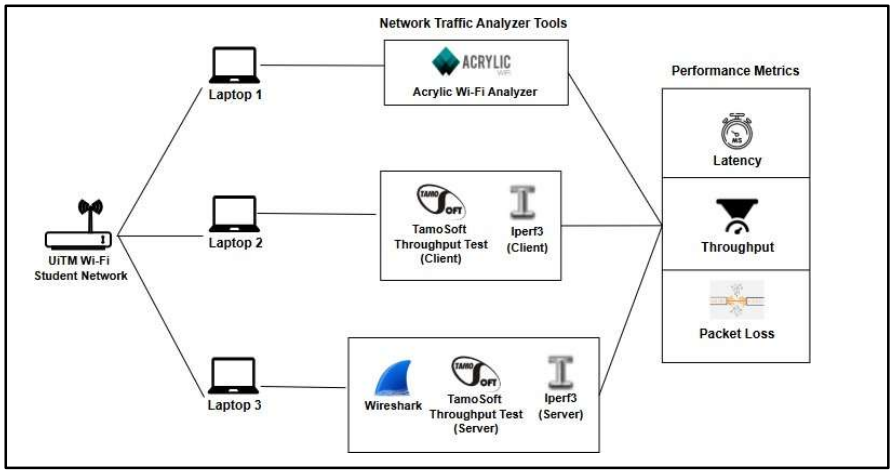

Figure 3.2 Testbed

Figure 3.2 shows the testbed setup will include verifying connections through the tool's capability testing. Based on the given diagram, a three laptop setup will use UiTM Wi-Fi Student network to analyze specific network performance metrics which are latency, throughput and packet loss using different tools. Laptop 1 is configured to run an Acrylic Wi-Fi Analyzer that will focus on analyzing latency and packet loss. Laptop 2 will act as a server running TamoSoft Throughput Test for analyzing latency, throughput and packet loss, while running Iperf3 as a server to analyze throughput only. Meanwhile, laptop 3 will act as a client running TamoSoft Throughput Test to analyze latency, throughput and packet loss. It also run Iperf3 as a client for analyze throughput only and uses Wireshark to analyze all three metrics including latency, packet loss and throughput. Table 3.4 outlines the steps to carry out a network performance experiment in FSKM laboratory.

Table 3.4 Steps of Network Performance Experiment

Description
1. Set up the testbed in the FSKM laboratory. 2. Connect three laptops to the UiTM Wi-Fi Student network. 3. Run Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3 on the laptops. 4. Experiment 1: Run each tool for 10 minutes to capture and analyze network traffic During Teaching & Learning

5. Experiment 2: Run each tool for 10 minutes to capture and analyze network traffic Outside Teaching & Learning.
6. Record all the results.

Data Analysis

The data analysis phase of this project focused on assessing the performance of network traffic analyzer tools under several real-world network environments. By comparing network metrics such as throughput, packet loss and latency during both learning and non-learning sessions, a complete view of the strengths and limits of each tool was gained. This method ensured that the tools were tested through variable levels of network activity from heavy usage to near-idle conditions, offering valuable insights into their overall reliability in monitoring network performance. The following section defined the equations for calculation of each parameter analyzed in this study. The equations for calculating the parameters considered are as follows:

a) $$Throughput = \frac{Packet\ received}{Data\ Transmission\ time}$$

b) $$Latency = \frac{Total\ delay}{Total\ number\ of\ packets}$$

c) $$Packet\ loss = \frac{(Packets\ sent - Packets\ received)}{Packets\ sent}\ x\ 100$$

Documentation

The documentation phase is the final stage of the method used in this project. In this phase, the results and findings from the entire project were finalized and documented in a comprehensive report. This report will include all details of the project including the goals and objectives, methodology, data collection process, testing methods and conclusions. This comprehensive documentation will serve as a reference for future research.

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Research Methodology Flowchart

The flowchart outlined an organized process for installing and using network traffic analyzer tools to monitor and analyze a network. The process started with the installation of the required network traffic analyzer tools which were Wireshark, Acrylic Wi-Fi Analyzer, TamoSoft Throughput Test and Iperf3. Connecting to the network that was analyzed occured next when these tools were deployed. Each tool needs to be opened after it is connected. Metrics related to network performance, including packet loss, throughput, and latency are analyzed using these tools. The method repeated to carry out the analysis if the amount of data collected was sufficient. Verify that there is enough data to cover all required network performance metrics. To make sure the data aligned, compare the information collected through various methods. The next stage was to evaluate the data once it was sufficient. At the end of the workflow concluded when the process was completed. The flowchart for this project is displayed in Figure 3.3.

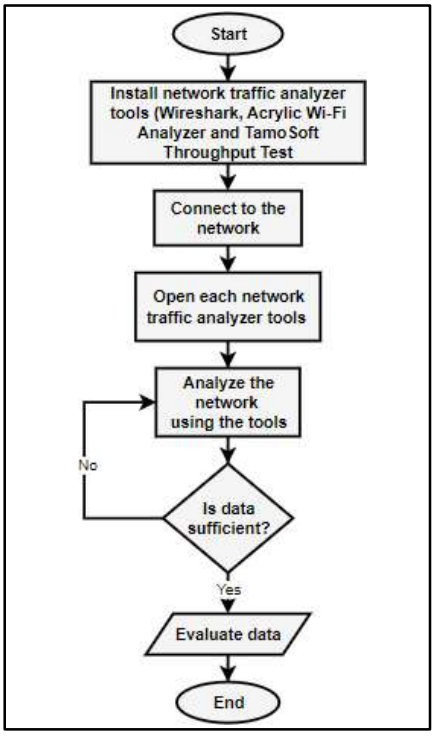

Figure 3.3 Flowchart

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RESULT AND DISCUSSION

Experimental Result

a) Experiment 1: During Teaching & Learning

Table 4.1 Average Result of Experiment 1

Session	Time	Tools										
		Wireshark			Acrylic Wi-Fi Analyzer		TamoSoft Throughput Test					Iperf3
		Throughput (Mbps)	Packet Loss (%)	Latency (ms)	Packet Loss (%)	Latency (ms)	Throughput (Mbps)		Packet Loss (%)		Latency (ms)	Throughput (Mbps)
							Up	Down	Up	Down		
During Teaching & Learning	10 a.m. – 12 p.m.	6.06	0.2	3.81	1.0	82	11.22	6.31	0.4	10.0	66.6	2.16
	2 p.m. – 4 p.m.	4.68	0.2	8.87	0.6	88	8.51	4.88	0.1	11.5	114.0	1.75

Table 4.1 highlights the average results of the network performance analysis during teaching and learning sessions. The highest value of throughput is by TamoSoft Throughput Test from 10 a.m. to 12 p.m. session with an upload of 11.22Mbps while the lowest throughput has been recorded with Iperf3 at a value of 1.75 Mbps during the time between 2 p.m. and 4 p.m. Regarding packet loss, Wireshark demonstrated consistently performance with the lowest packet loss of 0.2% in both time intervals where TamoSoft Throughput Test with a download is very high showing about 11.5% during 2 p.m. to 4 p.m. session. On the side of latency, the lowest value that could be recorded was performed by Wireshark at a value of 3.81ms within the session ranging from 10 a.m. to 12 p.m. While TamoSoft Throughput Test has the highest latency which is 114ms from 2 p.m. to 4 p.m. This comparison underlines the variability of performance metrics across the different tools and time intervals.

b) Experiment 2: Outside Teaching & Learning

Table 4.2 Average Result of Experiment 2

Session	Time	Tools										
		Wireshark			Acrylic Wi-Fi Analyzer		TamoSoft Throughput Test					Iperf3
		Throughput (Mbps)	Packet Loss (%)	Latency (ms)	Packet Loss (%)	Latency (ms)	Throughput (Mbps)		Packet Loss (%)		Latency (ms)	Throughput (Mbps)
							Up	Down	Up	Down		
Outside Teaching & Learning	10 a.m. – 12 p.m.	7.62	0.2	0.57	0.2	32	12.82	8.38	0.2	0.0	32.46	3.16
	2 p.m. – 4 p.m.	5.93	0.1	0.60	0.5	92	8.51	9.97	0.6	11.1	20.59	1.49

Based on table 4.2, here is the analysis result of network performance metrics. The following section will describe the throughput, packet loss and latency observed for the outside teaching and learning sessions. Throughput has the highest value and can be shown in TamoSoft Throughput Test during the session from 10 a.m. to 12 p.m. with an upload of 12.82Mbps and download of 8.38Mbps. Meanwhile, the lowest throughput recorded by Iperf3 was 1.49Mbps for the 2 p.m. to 4 p.m. session. For packet loss, both TamoSoft Throughput Test with and upload and Wireshark have a constant lowest packet loss of 0.2% during 10 a.m. to 12 p.m. session. While TamoSoft Throughput Test has the highest packet loss of download in the 2 p.m. to 4 p.m. session at 11.1%. Regarding latency, the lowest latency is recorded by Wireshark at 0.57ms during 10 a.m. to 12 p.m. session, where Acrylic Wi-Fi Analyzer records the highest latency at 92ms during 2 p.m. to 4 p.m. session. This analysis highlights knowing variations in network performance metrics across tools and time intervals that reflect the dynamic nature of Wi-Fi performance in outdoor teaching and learning environments.

Discussion

a) During Teaching & Learning: Latency

The pie chart of Figure 4.1 below represents the latency in ms measured by three tools during teaching and learning hours and shows Wireshark as the most efficient option. Wireshark recorded the lowest latency at 3.81 ms accounting for only 2.6% of the total because of passive packet capturing which reduces processing overhead and ensures accurate real-time analysis without any additional delays. In contrast, the highest latency at 73.0 ms, 50.3% of the total was measured by resource intensive analysis and visualization in Acrylic Wi-Fi Analyzer. TamoSoft Throughput Test measured 68.2 ms of latency which is 47.0% of the total because of it is active testing approach which involves interacting with the networks that can cause result in moderate delays. Latency during this session is a result of high network traffic by web browsing, file download, accessing the learning platforms and other by students that cause congestion at access point and increased queuing times. Processing and testing overhead from the tools like Acrylic Wi-Fi Analyzer and TamoSoft Throughput Test make the delays worse. In contrast, Wireshark's passive approach avoids these issues, making it the most reliable tool for latency analysis during high traffic conditions.

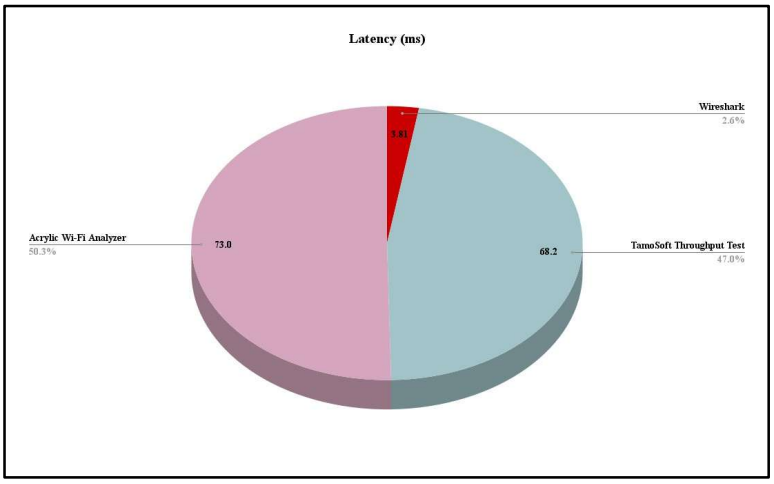

Figure 4.1 Pie Chart of Latency During Teaching & Learning

b) During Teaching & Learning: Throughput

Figure 4.2 shows the throughput measured in Mbps by selected tools during teaching and learning hours. TamoSoft Throughput Test for upload had the highest throughput at 11.22 Mbps which is 43.5% of the total. For download, 6.31 Mbps which is 24.5% of the total and reflects the effect of both traffic prioritization download and upload and probably shared bandwidth usage during peak network activity. Wireshark recorded 5.96 Mbps or 23.1% of the total as it passively monitors traffic and does not introduce traffic, providing reflection of the real-time throughput under natural conditions of the network. The throughput with the lowest value is recorded to Iperf3 at 2.31 Mbps or 8.9% possibly due to focus on lightweight performance testing. This session, which is a throughput, depends on the share of bandwidth among users, prioritization of certain types of traffic and the way these tools test for methodologies.

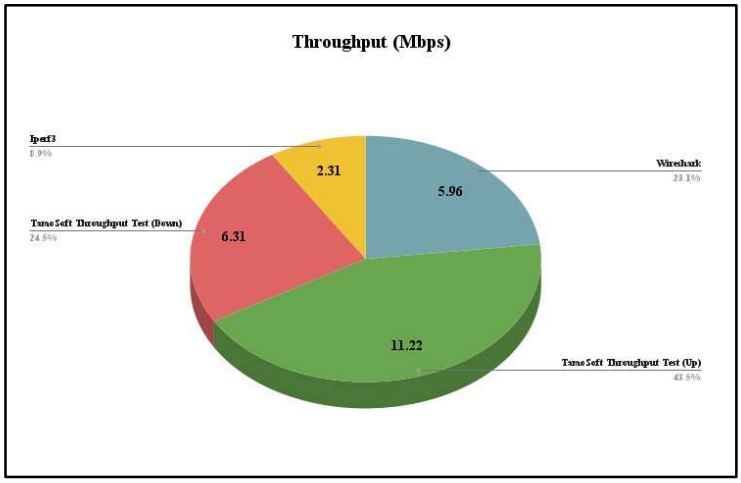

Figure 4.2 Pie Chart of Throughput During Teaching & Learning

c) During Teaching & Learning: Packet Loss

The Figure 4.3 below represents the percentage packet loss recorded by each tool. From the pie chart, there is a variation in performance. The highest percentage packet loss was recorded by Iperf3 with a percentage of 1.0% contributing 55.4% to the total. The high value may suggest that active traffic generation may overload the network during high usage conditions that can cause in a higher rate of dropped packets. TamoSoft Throughput Test for download recorded a packet loss of 0.4% which is 20.3% in total. This is due to heavy contention for bandwidth as it downloads during congested scenarios. On the other hand,

TamoSoft Throughput Test upload was at 0.3% packet loss or 15.1%. This is mainly because upload traffic is less congested than its download traffic. In Wireshark, the packet loss was the lowest at 0.2%, which is only 9.2% of the total.

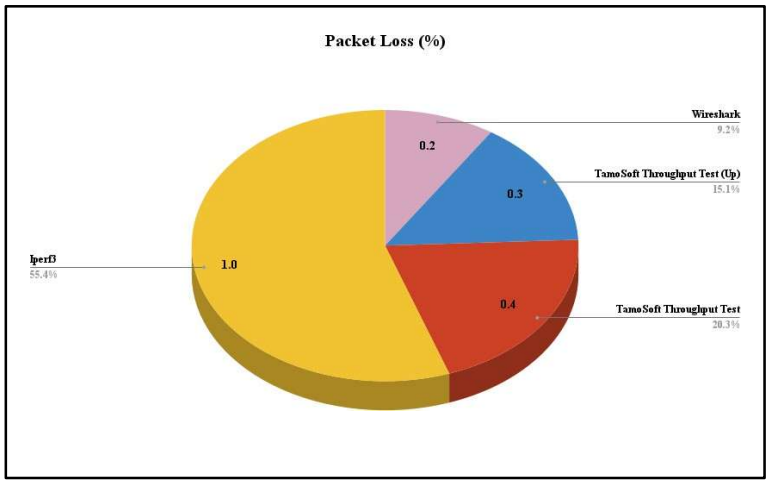

Figure 4.3 Pie Chart of Packet Loss During Teaching & Learning

d) Outside Teaching & Learning: Latency

The pie chart in Figure 4.4 illustrates the latency in ms recorded by each tool for outside teaching & learning sessions with clear differences in performance. The highest latency of 64.0 ms was from Acrylic Wi-Fi Analyzer taking up to 64.3% of the total. The high latency during outside teaching & learning hours could be attributed to scheduled background activity such as maintenance tasks on the network infrastructure. This activity is regularly done during off-peak hours to minimize disruption but can still generate significant traffic so affecting latency. TamoSoft Throughput Test had a latency of 34.9 ms or 35.0% of the total. In contrast, Wireshark captured the lowest latency with only 0.2 ms or 0.6% of the total.

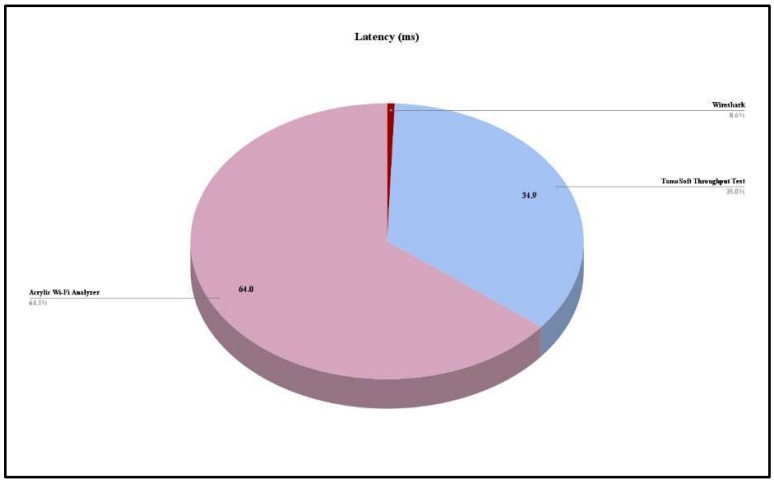

Figure 4.4 Pie Chart of Latency Outside Teaching & Learning

e) Outside Teaching & Learning: Throughput

The pie chart of Figure 4.5 illustrates the throughput in Mbps as measured by each tool for outside teaching & learning sessions showing variation in network performance. TamoSoft Throughput Test for upload reached the highest at 11.51 Mbps accounting for 38.7% of the total. While for download was 8.19 Mbps and represented 27.6% of the total. While the performance is lower compared to that recorded by the upload test. This reflects the important differences in download and upload within the networks. Wireshark recorded at 7.12 Mbps represents 24.0% of the total and reflects its capability for capture with minimal interferences to network resources. Iperf3 recorded the lowest throughput at 2.89 Mbps which is 9.7% of the total.

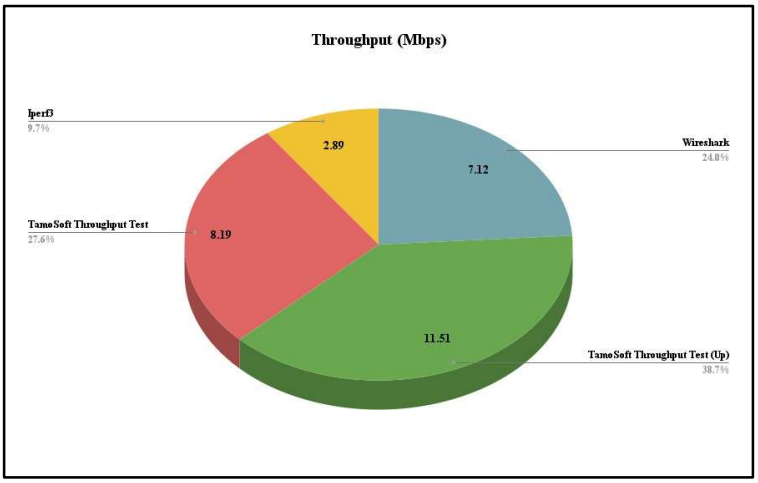

Figure 4.5 Pie Chart of Throughput Outside Teaching & Learning

f) Outside Teaching & Learning: Packet Loss

The pie chart below shows the percentage of packet loss that is observed across various tools during outside teaching and learning that highlights the difference in performance. The TamoSoft Throughput Test of downlaod had the highest packet loss at 5.6% meaning that there is significant inefficiency in network performance even when it is less busy. This may result from environmental factors such as interference and limitations in network hardware. Other contributors including TamoSoft Throughput Test of upload, Wireshark and Iperf3 that demonstrate much lower packet loss values of 0.4%, 0.3% and 0.2% respectively. These lower percentages suggest relatively stable network conditions during monitoring scenarios. Conducting monitoring during outside teaching and learning hours, the 5.6% packet loss in downloads is a concern as it could specify issues related to hardware limitations or external factors such as lack of an access point.

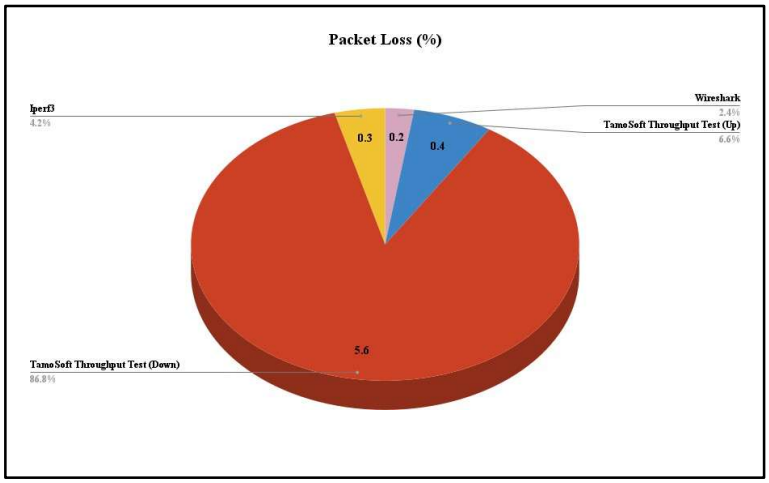

Figure 4.6 Pie Chart of Packet Loss Outside Teaching & Learning

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CONCLUSION

Overall, this project highlights the importance of selecting the right tools and methodologies for analyzing network performance in a laboratory setting. By conducting a comparative analysis of network traffic analyzer tools, the study successfully provided insights into their strengths, limitations, and suitability for some scenarios. This project highlighted critical network performance parameters such as latency, throughput, and packet loss. Showcasing their significance in maintaining reliable connectivity. Additionally, the findings highlight the need for standardized evaluation frameworks and adaptive tools to address the different needs of academic and operational environments. This research not only benefits UiTM Jasin but also serves as a valuable reference for other institutions determined to optimize their network infrastructures.

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