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Performance Analysis of Wireless Protocols Nstreme and IEEE 802.11 with Quality of Service (Qos Parameters: a Case Study at Universitas Akprind Indonesia

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ABSTRACT

This study explores wireless protocol modes in producing stable bandwidth on a point-to-point network, analyzing throughput, jitter, delay, and packet loss according to Quality of Service (QoS) parameters. Using a full-duplex method for simultaneous data transmission and reception, testing was performed with a MikroTik RouterBoard Metal 52ac device on 20 MHz, 20/40 MHz, and 20/40/80 MHz wireless interface configurations. The results show the Nstreme protocol performs best on the 20/40 MHz channel width, achieving 6368 Kbps throughput, 1.4 ms delay, and 0.22 ms jitter, outperforming the smaller 20 MHz width due to its efficiency in reducing overhead and interference. The IEEE 802.11 protocol also performs better on the 20/40 MHz channel width, with 1881 Kbps throughput, 2.5 ms delay, and 4.6 ms jitter. Both protocols outperform on 20/40 MHz versus 20/40/80 MHz, as they utilize the wider spectrum more effectively and leverage Multiple Input Multiple Output (MIMO) technology better. Packet loss is very low for both protocols; Nstreme performs better at 0.9991% on 20 MHz, while IEEE 802.11 shows 0.9994% on 20/40 MHz. Overall, the QoS parameters place the protocols in a very good category according to the TIPHON standard.

Keywords: IEEE 802.11, NSTreme, Quality Of Service, Bandwidth, Throughput

INTRODUCTION

In line with technological advancements, many new innovations have emerged wherein communication is no longer limited to cable networks but also involves the use of wireless networks (Fredriansyah, 2023). Wireless network technology uses radio frequency waves for exchanging information or data between hosts and users (Bina Restadi, 2019).

For the use of LAN Radio, the ISM Band is allocated at a frequency of 5.8 GHz, a safe and legal frequency radius of 5800 MHz. According to Kominfo Regulation Number 2 of 2023, based on a permit for the frequency class of 5725 MHz to 8575 MHz, the frequency may be used outdoors with a transmitting power of 200 milliwatts or 23 dBm (Hasbi & Saputra, 2021). The most commonly used wireless protocol currently is the IEEE 802.11 protocol. Network hardware companies such as MikroTik have contributed to wireless technology development by creating the Nstreme protocol and Nstreme version 2 (Nv2) (Akubo, 2021). From the various developments by MikroTik, each wireless protocol offers different connection qualities (Jaber, Kadhim, & Al-Araji, 2022). The quality of this connection directly impacts the bandwidth generated by each protocol (Cahya et al., 2019).

In this study, the author uses a literature review similar to previous research to compare the results with existing literature (Juwari & Asyhari, 2022). Related research by (Bina Restadi,

2019) entitled "Implementation of the Nstreme Wireless Mikrotik Protocol to Increase Throughput" tested a remote link using the Nstreme protocol with a value of 19,800 Kbps compared to the IEEE 802.11 protocol with a result of 8,300 Kbps. Therefore, the throughput value in the Nstreme protocol is superior and stable because it uses polling mode (Citra Web Solusi Teknologi, 2014; Citra Web Solusi Teknologi, 2015a; Citra Web Solusi Teknologi, 2015b).

Another study by (Widiantoro et al., 2019) entitled "Analysis of Interference Values on the Performance of Access Point Edimax BR-6428NS V2 N300 Based on Quality Of Service" used the same frequency at adjacent access points. It can be concluded that the QoS value obtained by testing using adjacent frequencies yields a fairly good value, with a download speed of 10.10 Mbps and an upload speed of 1.31 Mbps (Citra Web Solusi Teknologi, 2019).

Factors causing decreased performance and Quality of Service values in wireless connections include increasing distance from the access point, which results in reduced signal quality (Mahmood et al., 2020). The presence of other access points operating on the same frequency may also cause interference and degrade network quality (Widiantoro et al., 2019). One previous study presented a comparison of IEEE 802.11 and Nstreme protocols using the half-duplex method in throughput value testing (Oghogho, 2020; Qadri, Arif, & Azmi, 2021; Rosyida, 2023; Salim, 2019). Hence, this research aims to use the full duplex method to compare throughput, jitter, delay, and packet loss values to obtain bandwidth quality according to Quality of Service. Furthermore, in wireless access point and client station connections, to avoid interference, proper WLAN installation with channel frequency mapping should be conducted to prevent overlapping with currently operating frequencies (Bina Restadi, 2019).

Based on the background described above, the author proposes the research titled Performance Analysis of Wireless Protocol Nstreme and IEEE 802.11 with Quality of Service Parameters: A Case Study at Akprind University Indonesia.

METHOD

This research employed a quantitative experimental approach to analyze and compare the performance of two wireless protocols, Nstreme and IEEE 802.11, within a real-world point-to-point network environment. The study was conducted as a case study at Universitas AKPRIND Indonesia, focusing on the specific need to improve bandwidth quality and optimize the institution's wireless network. The primary data population consisted of all network performance data points generated by the MikroTik RouterBoard Metal 52ac devices under test, including metrics for throughput, delay, jitter, and packet loss across different protocol and channel width configurations.

The research sample was a purposive sample of performance data collected from a single, controlled point-to-point link established between two specifically configured MikroTik RouterBoard Metal 52ac devices. The sampling technique was not based on random selection but rather on deliberate, repeated testing under specific, controlled conditions. The main research instruments included the physical networking hardware (MikroTik RouterBoard Metal 52ac radios), WinBox software for device configuration and initial connectivity testing, and Wireshark software (version 4.2.5 x64) for precise capture and analysis of network traffic to measure key QoS parameters.

Data collection involved a combination of observation of the existing network topology and conditions, literature review to establish theoretical foundations, and direct experimentation. Experimental data were gathered by systematically configuring the devices with different protocols (IEEE 802.11 and Nstreme) and channel widths (20 MHz, 20/40 MHz, 20/40/80 MHz) and measuring the resulting performance. Data analysis was quantitative, involving direct comparison of numerical results (throughput in Kbps, delay and jitter in ms, packet loss in percentage) obtained from each experimental scenario to determine the superior protocol configuration according to Quality of Service (QoS) parameters and the TIPHON standard.

RESULTS AND DISCUSSION

Pre-requirement

In the stage before installation, the researcher processed the data by measuring the air distance line that obtained the results of the height of the soil profile at access points and stations. Furthermore, the researcher observed the condition of signal to noise and the level of interference in the air at the point-to-point connection using air view tools. This observation is in morning, day, and night conditions. The reference results from Google Earth display the land elevation profile of the radio access point at an elevation of 408 feet while for the station at an elevation of 385 feet with an air distance of 1.7 km. The reference display results of the Air view of the Ubiquity Rocket M5 ac device show an overview of the frequency spectrum used by the same device in the air area around the test device. The use of frequencies that are legal and licensed in accordance with Kominfo regulation number 2 of 2023 starts from 5150 – 5250 MHz, 5250 – 5350 MHz, and 5725 – 5825 MHz. Frequencies with blue color are quiet colors, but this frequency is prohibited from being used between 5500-5695 MHz. For red colors, it is very crowded or crowded with the use of ISP and wireless radio frequencies in the Akprind University Indonesia area. Then at the next stage, the researcher has installed WinBox to facilitate access login and configuration of MikroTik devices of the RouterBoard Metal 52ac type. The website for download can be https://mikrotik.com/download# will be given a WinBox option according to the device's bitrate version. WinBox v3.40 tools for scanning any type of device produced by MikroTik with MAC Address and IP Address (Maulana & Sulistyo, 2024; Mubarok & Mukhtar, 2022; Muliana, Munadi, & Arif, 2020; Nurrobi, Kusnadi, & Adam, 2020).

Wireless Access Point Installation and Configuration

In the installation and configuration of point-to-point wireless radio devices for access points, the researcher uses a configuration according to the type of device with a 5.8 GHz band and uses a safe frequency according to the Industrial, Scientific and Medical (ISM) Band of Indonesia. The configuration of the access point wireless interface uses the IEEE 802.11 protocol standard which the researcher will test to obtain good throughput quality. After the test gets the results, then the test is easily changed by changing the configuration of the Nstreme wireless protocol mode.

Station Bridge Installation and Configuration

In the installation and configuration of point-to-point wireless radio devices for station bridges, researchers use different configurations in the mode section which will only scan the same device according to the identity, then the network point-to-point device will be connected.

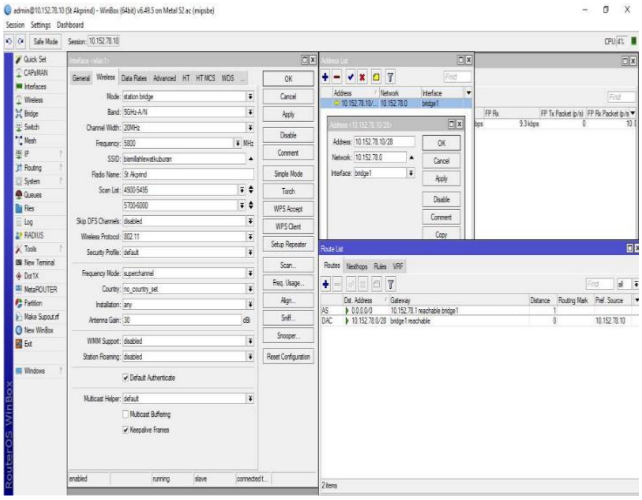

Figure 1. Station bridge configuration view

In figure 1, The configuration of the wireless interface station uses the IEEE 802.11 protocol standard which the researcher will test by obtaining good throughput quality. After the test gets the results, then we test it easily by changing the configuration of the Nstreme wireless protocol mode (Widiantoro, Imansyah, & W, 2019).

Mapping of Channel Frequency usage

The Mikrotik Metal 52ac device has a Noise Floor Threshold menu that can be configured according to environmental conditions. For Noise Floor Threshold values between -110 to -128. However, the standard value given is -110. Noise values can affect signal quality and data transmission. In addition to distance, wind speed and air humidity can also affect signal quality and data transmission.

Frequency usage testing there are many radio frequencies with 5.8GHz waves that are used for other devices around. The Noise Floor Threshold is also still below -110 so that for noise for signal strength quality, we can choose and use the small value by looking at the frequency that is least used by other devices.

Audit (Enforcement)

52ac Metal Radio Connectivity Test

The results of the 52ac Metal Radio connection accessed using WinBox by scanning the MAC Address or IP Address that is still on the same network or using the local internet that can communicate with the IP radio network. To successfully enter, the researcher entered the username and password created by the Network Administrator of Akprind University Indonesia.

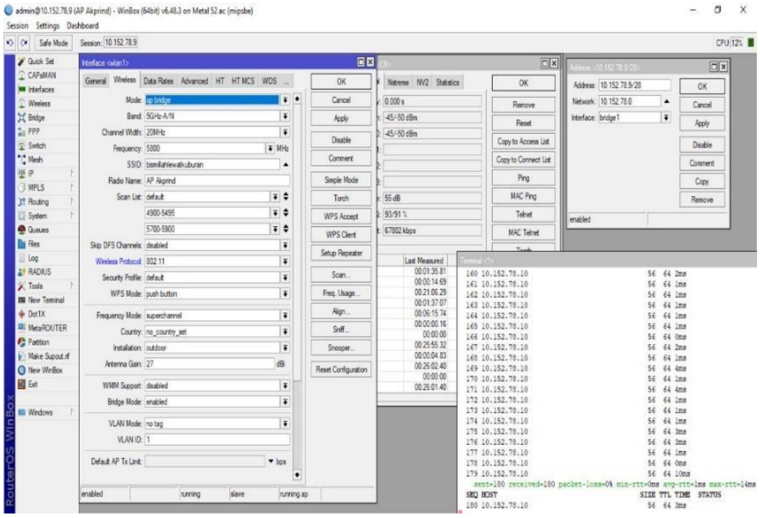

Figure 2. Access point reconfiguration

Figure 2 shows the results of the connectivity test of the well-connected device access point using a 52ac Metal RouterBoard radio. The indicator of this connection uses a terminal with ping between IP Addresses, radio access points and station bridges. The results of the connectivity test of the station bridge parameters are well connected using a 52ac Metal RouterBoard radio with an access point. The indicator of this connection uses a terminal with ping between IP Addresses, radio access points and station bridges (Sun, Han, Zhao, & Deng, 2022).

Table 1. Connectivity test parameter results

	Protocol 802.11						
Half Duplex	Packet loss	Signal Strength	Signal to Noise Ratio	Tx/ Rx CCQ	Throughput Bandwidth Tx:	Rx:	Average Bandwidth
0% dBm	-	-50/-46	63 dB	86%/90%	49127 kbps	22.2 Mbps	18.3 Mbps

Results of table 1. shows that the connection made on the client side gets good connectivity with half duplex mode getting a signal strength of -50/-46 dBm, Signal to Noise 63dB, CCQ 86% / 90% and a throughput of 49127 kbps. The configuration of the access point installation uses the 802.11 wireless protocol mode using the 5GHz-A/N Band, 20MHz Channel Width, 5800MHz frequency, with 30dBi Gain Antenna, and default tx power. For point-to-point ping latency, IP wireless radio is also very good without any Request Time Out (RTO).

Figure 3. ookla *speedtest results*

In figure 3, the results of the internet bandwidth test using the ookla speedtest to determine the quality of uploads and downloads obtained, as well as latency on the quality of connected point-to-point wireless and as a parameter of wireless network quality. In the testing of the speedtest results this time in the condition of hours of use and managed to get a download bandwidth capacity of 22.2 Mbps and upload of 18.3 Mbps with a packet loss of 0% jitter of 3 ms and a delay of 14 ms. Testing the results of the ping of the site google.com this time was in the condition of hours of use and managed to get latency without request time out (RTO). The image above shows that the connection has good signal quality, a high signal-to-noise ratio, and significant throughput in the absence of RTO (Sudaryono, 2014).

Protocol 802.11 Connectivity Test

After the wireless point-to-point configuration was successfully connected, the researcher conducted several experimental evaluations with changes in wireless protocol mode, channel width, and safe channel frequency mapping to find out the maximum results at the frequency of 5725 – 5875 MHz.

Table 2. 20 MHz channel width connectivity results

Full Duplex	*Packet loss*	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
	0%	-52/-48 dBm	61 dB	71%/82 %	36042 kbps	12,7 Mbps	18,9 Mbps

From table 2, the results of the IEEE 802.11 protocol connectivity at a 20MHz channel width which obtained a signal strength quality of -48/-52 dBm in the excellent category and a Signal-to-Noise Ratio of 61 dB in the good category so that it obtained a throughput value of 36042Kbps in accordance with the Quality of Service parameters. Furthermore, the author conducted a re-experiment using a different configuration of the RouterBoard Metal 5 ac radio device, namely with a channel width of 20/40 MHz, a frequency channel of 5800MHz and a wireless protocol of IEEE 802.11 with a bandwidth test using the full duplex method to get a throughput of 54972 Kbps.

Table 3. 20/40 MHz channel width connectivity results

Protocol 802.11

Full Duplex	*Packet loss*	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
	0%	-52/-48 dBm	61 dB	47%/74 %	54972 kbps	26,6 Mbps	31,1 Mbps

From table 3. the results of the IEEE 802.11 protocol connectivity at a channel width of 20/40MHz which obtained a signal strength quality of -48/-52 dBm in the excellent category and a Signal-to-Noise Ratio of 61 dB in the good category so as to obtain a throughput value of 54972Kbps in accordance with the Quality of Service parameters.

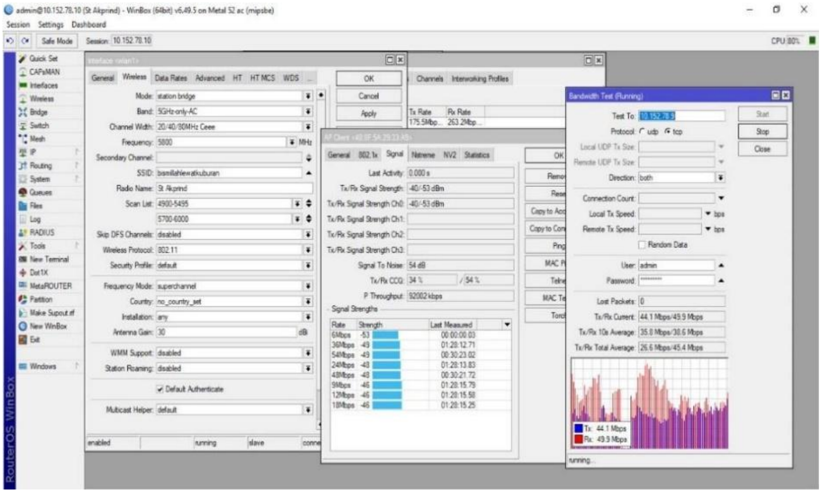

Figure 4. Channel *width* connection results 20/40/80 MHz

Result in figure 4. In the next test, the researcher tried to see the specifications of the MikroTik Metal RouterBoard 52ac radio which has an ac series band with a channel width of 20/40/80 MHz which is expected to produce wireless throughput of up to 1 Gbps. In addition to using the IEEE 802.11 standard protocol, MikroTik also developed new protocols, namely Nstreme and Nv2 (Nstreme v2), which are recognized to improve the quality of connected device links. For the test obtained this time, there was a change in results with the IEEE 802.11 protocol using the 5GHz only-AC band and a channel width of 20/40/80 MHz obtained a throughput result of 92002 Kbps with greater traffic bandwidth.

Table 4. Channel connectivity results width 20/40/80 MHz

	Protocol 802.11						
Full Duplex	*Packet loss*	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
	0%	-40/-53 dBm	54 dB	34%/54 %	92002 kbps	26,6 Mbps	45,4 Mbps

From table 4. the result of the connectivity of the IEEE 802.11 protocol at a channel width of 20/40/80 MHz which gets a signal strength quality of -40/-53 dBm with the excellent category and a Signal- to Noise Ratio of 54 dB with the good category so that it gets a throughput value of 92002 Kbps in accordance with the Quality of Service parameters.

Nstreme Protocol Connectivity Test

Furthermore, the researcher conducted several experimental evaluations by changing the Nstreme wireless protocol mode and using the channel width from default to the maximum. To get the most stable results, channel frequency mapping uses a safe one to find out the maximum results.

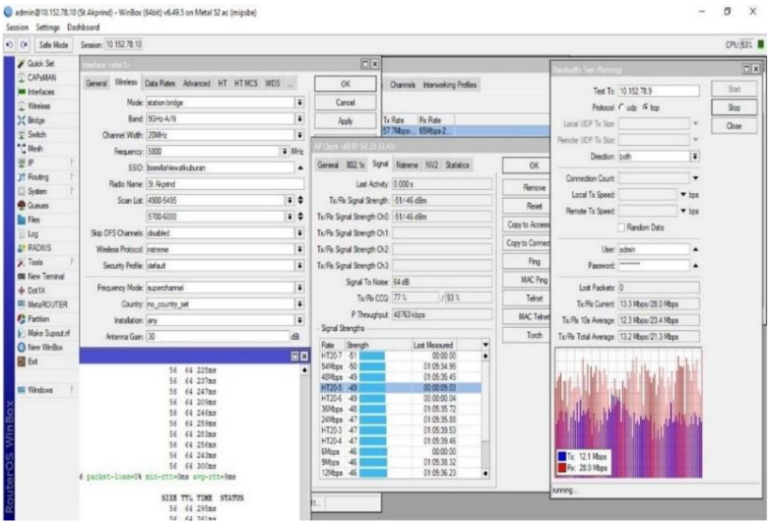

Figure 5. 20 *MHz* channel width connection results

In figure 5. In the next experiment, the author used the basic configuration of a 52ac Metal radio with a channel width of 20 MHz, a channel frequency of 5800 MHz and a wireless protocol of Nstreme using a bandwidth test method of full duplex to get a throughput of 48763 Kbps.

Table 5. 20 MHz channel width connectivity results

	Protocol Nstreme						
Full Duplex	*Packet loss*	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
	0%	-51/-46 dBm	64 dB	77%/93 %	48763 kbps	13,2 Mbps	21,3 Mbps

From table 5, The result of the connectivity of the Nstreme protocol at a channel width of 20 MHz which gets the quality of signal strength - 46/-51 dBm with the excellent category and the Signal to Noise Ratio of 64 dB with the good category so that it gets a throughput value of 48763 Kbps in accordance with the Quality of Service parameters. The next result was that the author conducted a re-experiment using a different configuration of the MikroTik RouterBoard Metal 52ac radio, with a channel width of 20/40 MHz, a channel frequency of 5800 MHz and a wireless protocol of Nstreme using a bandwidth test with full duplex mode to get a throughput of 78947 Kbps.

Table 6. Display of channel width connectivity results 20/40 MHz

	Protocol Nstreme						
Full Duplex	*Packet loss*	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
	0%	-40/-47 dBm	60 dB	80%/98 %	78947 kbps	24,4 Mbps	28,2 Mbps

From table 6. The result of the connectivity of the Nstreme protocol at a channel width of 20/40 MHz which obtained a signal strength quality of -40/-47 dBm in the excellent category and a Signal-to-Noise Ratio of 60 dB in the good category so that it obtained a throughput value of 78947 Kbps in accordance with the Quality of Service parameters. In subsequent tests, the researcher tried to evaluate the specifications of the MikroTik RouterBoard Metal 52ac radio, which has ac series band support with a channel width of 20/40/80MHz. The device is expected to produce up to 1 gigabit per second of throughput. In addition to using the IEEE 802.11 standard protocol for wireless connectivity, MikroTik also developed new protocols, namely Nstreme and Nv2 (Nstreme version 2), which are recognized to improve the quality of connected connections. The test obtained by the researcher showed a change in results with the Nstreme protocol using the 5GHz only-AC band and a channel width of 20/40/80 MHz obtained a throughput result of 83660 Kbps with greater traffic bandwidth with a channel width of 20 MHz and 20/40 MHz.

Table 7. Display of channel width connectivity results 20/40/80 MHz Protocol Nstreme

	Packet loss	*Signal Strength*	*Signal to Noise Ratio*	*Tx/ Rx CCQ*	*Throughput*	*Average Bandwidth Tx*	*Average Bandwidth Rx*
Full Duplex	0%	-40/-45 dBm	64 dB	65%/46 %	83660 kbps	21,4 Mbps	25,5 Mbps

From table 7. The result of the Nstreme protocol connectivity at a channel width of 20/40/80 MHz which gets a signal strength quality of -46/-51 dBm with the excellent category and a Signal-to-Noise Ratio of 64 dB with the good category so that it gets a throughput value of 48763 Kbps in accordance with the Quality of Service parameters.

Results/Evaluation (Enhancement)

At this stage, tests will be carried out on the wireless configuration system that has been developed by MikroTik. Connection testing is done by performing several parameters to determine if the wireless configuration can work properly. This chapter contains two phases, namely: testing/auditing (testing of the configuration that has been built), result analysis (reporting of the output that has been obtained). Throughput, jitter, delay, and packet loss quality testing uses Wireshark software version 4.2.5 x64 to perform measurements. The application is used to capture and analyze network traffic connectivity by capturing data packets from the network interface to the intended server and used for browsing as well as uploading and downloading processes.

Throughput Results

Figure 6 shows the throughput value in full duplex mode from 3 attempts at 20 MHz, 20/40 MHz, and 20/40/80 MHz channel widths.

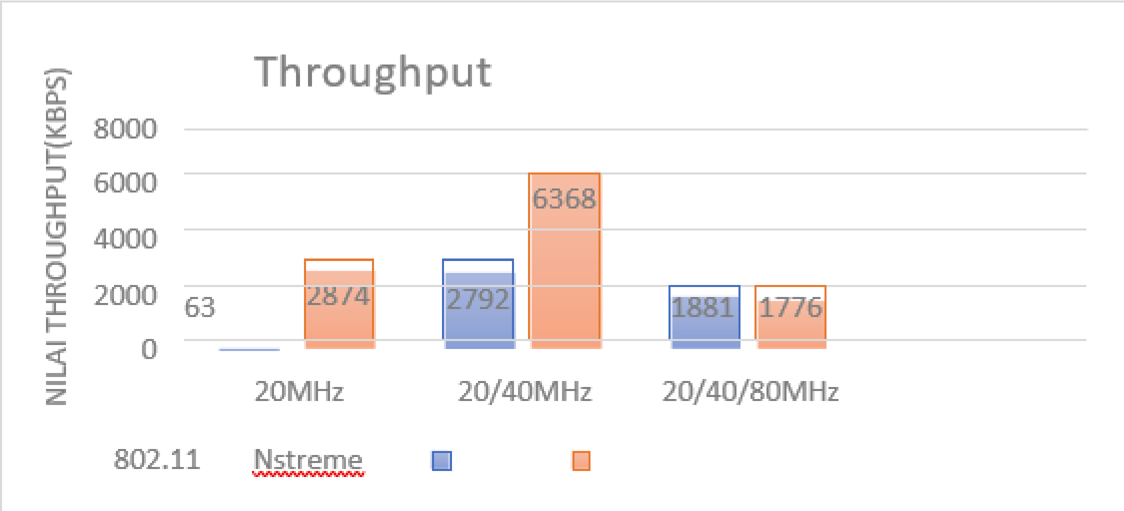

Figure 6. Throughput graph

Result of figure 6, showing the graph on the channel width throughput results of 20 MHz, the Nstreme protocol has a better throughput value with 2874 Kbps compared to the IEEE 802.11 protocol below 63 Kbps. At the channel width of 20/40 MHz, the Nstreme protocol also shows a higher figure of 6368 Kbps compared to the IEEE 802.11 protocol with 2792 Kbps. Furthermore, at the channel width of 20/40/80 MHz, The IEEE 802.11 protocol is slightly superior with a value of 1881 Kbps, while the Nstreme protocol achieves a value of 1776 Kbps. The Nstreme protocol generally shows better throughput performance at 20 MHz and 20/40 MHz channel widths compared to the IEEE 802.11 protocol. At a channel width of 20/40/80 MHz, the IEEE 802.11 protocol has a slightly higher throughput than the Nstreme protocol. Both protocols experience an increase in throughput values with an increase in channel width, but the difference in performance depends on the specifics of the channel used. The results of this measurement are in the category of excellent according to the TIFON standard.

Delay Results

The delay in this measurement is expressed in milliseconds (ms). At a channel width of 20 MHz, the IEEE 802.11 protocol has a delay of 52 ms. While the Nstreme protocol has a delay of 2.5 ms. The results of the Nstreme protocol show that lower delay performance indicates better network performance compared to the IEEE 802.11 protocol. For 20/40 MHz channel width, the IEEE 802.11 protocol has a delay of 2.5 ms. While the Nstreme protocol has a delay of 1.4 ms.

These results show that the IEEE 802.11 protocol has better performance with lower delays compared to the Nstreme protocol. For the 20/40/80 MHz channel width in the IEEE 802.11 protocol, it has a delay of 3.6 ms. Meanwhile, the Nstreme protocol has a delay of 3.4 ms. The IEEE 802.11 protocol again shows better network performance at a lower delay value compared to the Nstreme protocol. The delay in the Nstreme protocol tends to be lower at the 20/40 MHz channel width, but the delay at the 20/40 MHz and 20/40/80 MHz channel widths of the IEEE 802.11 protocol shows lower values. In terms of performance, the IEEE 802.11 protocol is superior in the 20/40 MHz and 20/40/80 MHz channel widths, while the Nstreme protocol excels in the 20/40 MHz channel width. Lower delays usually indicate better network performance, as the time it takes to send data is shorter. The smallest delay value can be seen from 1.4 ms to 52 ms. This result is in the category of very good according to the TIFON standard.

Jitter Results

The value of jitter (deviation of the packet delivery time) in milliseconds (ms). For the two protocols IEEE 802.11 and Nstreme. At a channel width of 20 MHz, the IEEE 802.11 protocol shows a jitter value of 10 ms, while the Nstreme protocol shows a jitter value of 0.5 ms. At the channel width, the 20/40 MHz protocol, the IEEE 802.11 protocol shows a jitter value of 0.14 ms, while the Nstreme protocol shows a jitter value of 0.22 ms. At the channel width of 20/40/80 MHz, the IEEE 802.11 protocol shows a jitter value of 4.6 ms, while the Nstreme protocol shows a jitter value of 4.91 ms. With a channel width of 20 MHz and 20/40 MHz, the Nstreme protocol has a lower jitter value compared to the IEEE 802.11 protocol. At a channel width of 20/40/80 MHz the IEEE 802.11 protocol has a lower jitter value compared to the Nstreme protocol. In general, jitter increases with the increase in channel width for both protocols, with a more significant increase in the Nstreme protocol at the channel width of 20/40/80 MHz. It can be seen that the smallest jitter value is 0.22 ms and the largest is 10 ms..

Packet Loss Results

Figure 4.21. displays packet loss values in full duplex mode in 3 channel width, 20 MHz, 20/40 MHz, and 20/40/80 MHz trials.

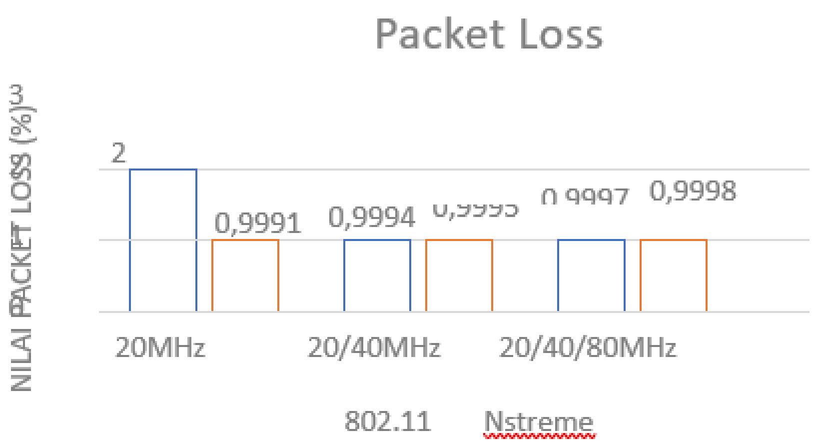

Figure 7. Packet Loss Graph

From figure 7. The results of the graph illustrate the packet loss rate in percentage (%) for the two network protocols IEEE 802.11 protocol and the Nstreme protocol. At the 20 MHz channel width, the IEEE 802.11 protocol shows a packet loss of 2%, while the Nstreme protocol shows a packet loss of 0.9991%. At 20/40 MHz channel width, the IEEE 802.11 protocol shows a packet loss of 0.9994 % and for the Nstreme protocol it shows a packet loss of 0.9995 %. Meanwhile, the channel width of 20/40/80 MHz of the IEEE 802.11 protocol shows a packet loss of 0.9996 % while the Nstreme protocol shows a packet loss of 0.9998 %. From the data of figure 5.14. that the 20 MHz wide-channel Nstreme protocol has better performance than the IEEE 802.11 protocol in terms of packet loss. Meanwhile, the 20/40 MHz wide channel of the IEEE 802.11 protocol is superior with 0.9994 % compared to the Nstreme protocol with 0.9995 %. Furthermore, the two channels of 20/40/80 MHz wide, show almost the same performance with very small packet losses of 0.9997 % in the IEEE 802.11 protocol and 0.9998 % in the Nstreme protocol. This result is in the category of excellent according to TIPON standards.

CONCLUSION

This study concluded that wireless protocol choice and channel width configuration significantly affect point-to-point network performance. The *Nstreme* protocol generally outperformed *IEEE 802.11* in key Quality of Service (QoS) parameters, especially at 20 MHz and 20/40 MHz widths, achieving higher throughput (6368 Kbps) and lower delay (1.4 ms) and jitter (0.22 ms). The *IEEE 802.11* protocol showed a slight throughput advantage at the widest 20/40/80 MHz width and maintained very low packet loss across all settings. Both protocols performed best on the 20/40 MHz channel width, benefiting from broader spectrum use and MIMO technology, with all QoS measures rated “very good” to “excellent” by the TIPHON standard, supporting their suitability for stable bandwidth delivery. Future research should test these protocols under more varied environmental and network load conditions, including longer distances, adverse weather, and higher user traffic, to better simulate real campus scenarios. Additionally, evaluating the newer Nv2 (*Nstreme* version 2) protocol in a similar full-duplex setup and exploring automated frequency and channel width management systems could further improve dynamic QoS optimization without manual intervention.

REFERENCES

Akubo, A. P. (2021). Variable Channel Width. Global Jurnal of Computer Science and Technology, XXI(I), V1 23.

Anwar, M. S. (2022). Analisis QoS (Quality of Service) Manajemen Bandwidth menggunakan Metode Kombinasi Simple Queue dan PCQ (Per Connection Queue) pada Fakultas Teknik Universitas Islam Sumatera Utara.

Bina Restadi, O. (2019). Implementasi Protokol Nstreme Wireless Mikrotik Untuk Meningkatkan Throughput. Jurnal Manajemen Informatika, 9(2), 44–49.

Cahya, S. A., & Widiasari, I. R. (2019). Analisis Kualitas Koneksi Antara Wireless Protocol Nstreme dan Nstreme version 2 (Nv2) Pada Wireless Mikrotik Artikel Ilmiah Analisis Kualitas Koneksi Antara Wireless Protocol Nstreme dan Nstreme version 2 (Nv2) Pada Wireless Mikrotik Artikel Ilmiah. 2(672015033).

Citra Web Solusi Teknologi, P. (2014). Pemilihan Band & Frekuensi Pada Implementasi Wireless. https://citraweb.com/artikel_lihat.php?id=70 diakses pada tanggal 2 Juli 2024

Citra Web Solusi Teknologi, P. (2015a). 802.11, Nstreme, & NV2 pada Wireless MikroTik. https://citraweb.com/artikel_lihat.php?id=147 diakses pada tanggal 2 Juli 2024.

Citra Web Solusi Teknologi, P. (2015b). Channel Width dengan Wireless N Mikrotik. https://citraweb.com/artikel_lihat.php?id=147 diakses pada tanggal 2 Juli 2024.

Citra Web Solusi Teknologi, P. (2019). Multiple Chain di Wireless MikroTik. Citraweb. https://citraweb.com/artikel/328/ diakses pada tanggal 2 Juli 2024

Fredriansyah. (2023). Komunikasi Data Pada Model Transmisi. Jurnal Pendidikan Teknologi Informasi, 2(1), 14–20.

Hasbi, M., & Saputra, N. R. (2021). Analisis Quality of Service (Qos) Jaringan Internet Kantor Pusat King Bukopin Dengan Menggunakan Wireshark. Universitas Muhammadiyah Jakarta, 12(1), 1–7. https://jurnal.umj.ac.id/index.php/just-it/article/view/13596.

Jaber, Z. H., Kadhim, D. J., & Al-Araji, A. S. (2022). Medium access control protocol design for wireless communications and networks review. International Journal of Electrical and Computer Engineering, 12(2), 1711– 1723. https://doi.org/10.11591/ijece.v12i2.pp1711-1723.

Juwari, J., & Asyhari, M. Y. (2022). Analisis Noise Floor Threshold Terhadap Signal Strength Pada Wireless Local Area Network Protokol Nv2. Journal of Information System Research (JOSH), 3(2), 125–136. https://doi.org/10.47065/josh.v3i2.1275.

Mahmood, A., Mat Kiah, M. L., Reza Z'Aba, M., Qureshi, A. N., Kassim, M. S. S., Azizul Hasan, Z. H., Kakarla, J., Sadegh Amiri, I., & Azzuhri, S. R. (2020). Capacity and frequency optimization of wireless backhaul network using traffic forecasting. IEEE Access, 8, 23264–23276. https://doi.org/10.1109/ACCESS.2020.2970224.

Maulana, A., & Sulistyo, W. (2024). Analisis Kualitas Signal Wireless Menggunakan Received Signal Strength Indicator (Rssi) Di Smp Negeri 10. Salatiga. IT-Explore: Jurnal Penerapan Teknologi Informasi Dan Komunikasi, 3(1), 63–78. https://doi.org/10.24246/itexplore.v3i1.2024.pp50-

Mubarok, H., & Mukhtar, H. J. (2022). View of Analisis Kinerja Routing Dinamis Dengan Teknik Open Shortest Path First Pada Topologi Mesh Dalam Jaringan LAN Menggunakan Cisco Packet Tracer. OKTAL: Jurnal Ilmu Komputer 1(06), 593–602. https://journal.mediapublikasi.id/index.php/oktal/article/view/473

Muliana, M., Munadi, R., & Arif, T. Y. (2020). Analisis Performasi Transmisi Video Pada Jaringan Multicast Dan Unicast Dengan Menggunakan Wlan IEEE 802.11N. Jurnal Komputer, Informasi Teknologi, Dan Elektro, 5(2), 6–10. https://doi.org/10.24815/kitektro.v5i2.15567.

Nurrobi, I., Kusnadi, K., & Adam, R. (2020). Penerapan Metode Qos (Quality Of Service) Untuk Menganalisa Kualitas Kinerja Jaringan WIRELESS. Jurnal Digit, 10(1), 47. https://doi.org/10.51920/jd.v10i1.155

Oghogho, I. (2020). Single user TCP downstream throughput probability models in IEEE802.11b WLAN system. Nigerian Journal of Technology, 39(1), 212–218. https://doi.org/10.4314/njt.v39i1.24.

Qadri, D., Arif, T. Y., & Azmi, A. (2021). Analisis Tingkat Kinerja Jaringan Wireless Ieee 802.11N Menggunakan Mikrotik. Jurnal Komputer, Informasi Teknologi, Dan Elektro, 6(2), 21–26. https://doi.org/10.24815/kitektro.v6i2.21848.

Rosyida, M. (2023). Latency adalah: Kecepatan Pengiriman Data melalui Internet. https://www.domainesia.com/berita/latency-adalah/ diakses pada tanggal 2 Juli 2024.

Salim, R. A. (2019). Quality Analysis of Streaming Video Services Based on the 802 . 11 , Nstreme and NV2 Protocols on Wireless Networks. 4(2), 291–294.

Sudaryono. (2014). Teori dan Aplikasi dalam Statistik. Andi. https://andipublisher.com/produk/detail/teori-dan-aplikasi-dalam-statistik.

Sun, H., Han, F., Zhao, S., & Deng, H. (2022). Half-Duplex and Full-Duplex DF Wireless Energy Harvesting Relaying in Rayleigh Fading. Energies, 15(12). https://doi.org/10.3390/en15124220.

Widiantoro, R. E., Imansyah, F., & W, F. T. P. (2019). Analisis Nilai Interferensi Terhadap Performance Access Point Edimax Br-6428ns V2 N300 Berbasis Quality Of Service (QoS). Jurnal Teknik Elektro Universitas Tanjungpura, 1(1), 1–4.