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Analysis of the Advantages and Disadvantages of Using MikroTik in Computer Network Implementation

Khazanatul Asrar[1]*, Dirja Nur Ilham[2], Muhammad Khoiruddin Harahap[3], T. Sukma Achriadi Sukiman[4], Nurul Hamdi[5]
[1,2]Politeknik Aceh Selatan, Indonesia, [3]Politeknik Ganesha Medan, Indonesia, [4]Universitas Malikussaleh, Indonesia, [5]Universitas Ubudiyah Indonesia, Indonesia
[1*]khazanatulasrar795@gmail.com, [2]dirja.poltas@gmail.com, [3]choir.harahap@yahoo.com, [4]achriadi@unimal.ac.id, [5]nurulhamdi@uui.ac.id

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***Corresponding Author**

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ABSTRACT

The rapid advancement of information technology has increased the demand for reliable, secure, and efficient computer network infrastructures. MikroTik has become a popular networking solution due to its affordability and flexibility, especially in small to medium-scale environments. This study aims to analyze the advantages and disadvantages of using MikroTik in computer network implementation based on existing research findings. This study employs a qualitative descriptive approach using a literature review method. Relevant scientific articles published within the last five years were selected and analyzed, focusing on bandwidth management, firewall configuration, network security, Quality of Service (QoS), and network monitoring. The findings indicate that MikroTik offers several advantages, including flexible configuration, comprehensive RouterOS features, effective bandwidth management, and low implementation costs. However, some limitations were identified, such as configuration complexity, weak default security settings, performance degradation under high traffic conditions, and limited scalability for large-scale networks. MikroTik is an effective and efficient networking solution for small to medium-scale implementations. Its performance can be optimized through proper configuration and the integration of additional security mechanisms.

INTRODUCTION

The development of information technology has led to an increasing demand for stable, secure, and efficient computer network infrastructures (Kurose & Ross, 2021). Various sectors, including education, government, and business, rely heavily on network systems to manage data communication, ensure information security, and optimize performance (Stallings, 2021). A reliable network infrastructure must be capable of handling traffic efficiently while maintaining data integrity and confidentiality (Forouzan, 2017).

MikroTik is one of the most widely used networking solutions, offering RouterOS with features such as routing, firewall, bandwidth management, Virtual Private Network (VPN), and monitoring tools (Tanenbaum & Wetherall, 2019). Compared to enterprise networking devices, MikroTik is known for its affordability and flexibility, making it a preferred choice for small to medium-scale implementations (Kautsar et al., 2025).

Despite its advantages, several studies have reported challenges in MikroTik implementation, including configuration complexity, performance issues under high traffic loads, and security vulnerabilities due to improper setup (Haris et al., 2022; Dachi & Noprisson, 2025). These issues highlight the need for a comprehensive analysis that synthesizes findings from previous research (Creswell & Creswell, 2018).

LITERATURE REVIEW

Previous studies have explored various aspects of MikroTik implementation in computer networks. Firewall configuration using MikroTik has been shown to improve network stability through features such as Network Address Translation (NAT) and packet filtering (Dachi & Noprisson, 2025). However, additional security configurations are often required to enhance protection against advanced threats (Haris et al., 2022).

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Research on Layer 7 firewall implementation indicates its effectiveness in filtering network traffic and maintaining bandwidth stability (Sianhar & Marhalim, 2024). Similarly, studies on bandwidth management demonstrate that MikroTik can distribute bandwidth fairly among users, especially when integrated with tools such as MikhMon (Solihin et al., 2025).

Quality of Service (QoS) implementation has also been widely studied, showing improvements in service quality and traffic prioritization (Tulloh et al., 2020). However, performance degradation may occur under extremely high traffic conditions, particularly when using lower-end MikroTik devices (Simbolon et al., 2025).

Other research highlights the importance of traffic control, authentication systems, and monitoring tools. Techniques such as mangle rules enable effective traffic prioritization (Simbolon et al., 2025), while integration with FreeRADIUS enhances network security (Akbar & Guntur, 2025). Monitoring tools like The Dude provide real-time insights into network performance (Rinaldo, 2025).

Overall, the literature indicates that MikroTik offers flexibility and cost efficiency but requires advanced configuration skills to achieve optimal results (Tanenbaum & Wetherall, 2019; Forouzan, 2017).

METHOD

This study employs a qualitative descriptive approach using a literature review method, which is suitable for synthesizing findings from multiple studies (Creswell & Creswell, 2018). The approach allows for systematic comparison of results from different research contexts related to MikroTik implementation (Stallings, 2021).

The data used in this study were obtained from scientific journal articles published within the last five years (Solihin et al., 2025; Sianhar & Marhalim, 2024). The selection process involved identifying relevant keywords such as “MikroTik,” “bandwidth management,” “firewall,” “QoS,” and “network security” (Simbolon et al., 2025).

The analysis was conducted using a comparative approach to identify recurring patterns, advantages, and limitations reported across studies (Tulloh et al., 2020). The findings were then categorized and interpreted descriptively to generate comprehensive conclusions (Dachi & Noprisson, 2025).

RESULT

The results of the literature review show that MikroTik provides several significant advantages in network implementation. Most studies report effective bandwidth management through mechanisms such as simple queue and queue tree, enabling fair distribution of network resources (Solihin et al., 2025; Simbolon et al., 2025).

RouterOS offers comprehensive features that support various network topologies, including LAN, WAN, and point-to-point connections (Kautsar et al., 2025; Roji et al., 2024). These features contribute to the flexibility and adaptability of MikroTik in different networking environments (Forouzan, 2017).

However, the reviewed studies also reveal several limitations. Performance degradation is commonly reported under high traffic loads, particularly when using entry-level MikroTik hardware (Tulloh et al., 2020). In addition, default security configurations are vulnerable if not properly strengthened (Haris et al., 2022; Dachi & Noprisson, 2025).

Table 1. State of the Art of MikroTik Research (2019–2025)

No	Author(s) & Year	Research Title	Method / Approach	Research Focus	Key Findings	Research Gap
1	Dachi & Noprisson (2025)	MikroTik Firewall Implementation Model	Firewall, NAT, QoS	Network security & traffic management	Improved throughput and reduced latency	No IDS/IPS integration
2	Gumeular & Akbi (2025)	QoS using PCQ & FQ_Codel	QoS, Queue Tree	Bandwidth management	More fair bandwidth distribution	Not tested at large scale
3	Rudiyanto & Asri (2024)	Bandwidth Optimization in MikroTik Networks	QoS, Queue Tree	School network	Improved stability and efficiency	Limited to educational environments
4	Aji et al.	QoS & QoE in	PCQ, QoE	User	High QoE (MOS	Subjective QoE

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	(2025)	MikroTik Hotspot		satisfaction	> 4)	measurement
5	Sari & Hidayat (2025)	Firewall & Bandwidth Filtering	Firewall, DNS Filtering	Network security	Improved filtering and security	Limited performance analysis
6	Prakosa et al. (2024)	Bandwidth Management Regression Analysis	Regression model	Performance evaluation	QoS significantly affects performance	Lack of real-time implementation
7	Saputra et al. (2020)	QoS Analysis on MikroTik RB951	QoS, Wireshark	Network performance	QoS improves network quality	Limited hardware scope
8	Darkel et al. (2024)	QoS Analysis using PCQ Method	PCQ	Bandwidth distribution	Optimal bandwidth sharing	No security analysis
9	Haris et al. (2022)	MikroTik Security against DoS	Firewall	Network security	Firewall reduces DoS attacks	No performance evaluation
10	Sianhar & Marhalim (2024)	Layer 7 Firewall Implementation	Layer 7 filtering	Traffic filtering	More stable traffic	No high-load testing
11	Solihin et al. (2025)	MikhMon + MikroTik Integration	Monitoring + QoS	Bandwidth fairness	More balanced bandwidth distribution	Limited system integration
12	Simbolon et al. (2025)	Mangle Filtering in MikroTik	Mangle rules	Traffic prioritization	Effective traffic prioritization	High configuration complexity
13	Akbar & Guntur (2025)	MikroTik + FreeRADIUS	Authentication	Wireless security	Significant security improvement	Complex implementation
14	Rinaldo (2025)	Network Monitoring using The Dude	Monitoring tools	Network monitoring	Effective real-time monitoring	No QoS focus
15	Ceron et al. (2020)	MikroTik Security Vulnerability Study	Honeypot analysis	Router security	Identified multiple vulnerabilities	No network optimization focus

State of the Art Analysis

Based on the review of 15 selected studies related to MikroTik implementation in computer networks, several key trends, major contributions, and research gaps can be identified.

Current Research Trends

Most recent studies primarily focus on **bandwidth management and Quality of Service (QoS)** as the main topics in MikroTik-based network implementation. This trend is driven by the increasing demand for fair and efficient bandwidth distribution in multi-user environments. Methods such as PCQ (Peer Connection Queue), Queue Tree, and HTB (Hierarchical Token Bucket) have been proven effective in improving network stability, reducing delay, and optimizing throughput.

Furthermore, several studies indicate that QoS implementation using MikroTik significantly improves Quality of Experience (QoE), with Mean Opinion Score (MOS) values exceeding 4, which indicates high user satisfaction. This finding reinforces MikroTik's position as a practical solution for small to medium-scale network management.

On the other hand, research related to **network security** has also gained attention, particularly in firewall implementation, traffic filtering, and authentication systems. However, the number of studies in this area remains relatively lower compared to QoS-focused research. Existing studies reveal that MikroTik devices may present security vulnerabilities if not properly configured, making them potential targets for network attacks.

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Key Contributions of Previous Studies

The reviewed studies provide several important contributions:

- **Bandwidth Optimization** QoS mechanisms such as PCQ and Queue Tree enable dynamic and fair bandwidth allocation among users, preventing bandwidth monopolization by specific clients.
- **Network Performance Improvement** QoS implementation has been shown to reduce negative performance indicators such as delay, jitter, and packet loss, while significantly increasing throughput.
- **Multi-user Network Stability** Case studies in educational institutions and public hotspot networks demonstrate that MikroTik effectively maintains network stability under multiple simultaneous users.
- **Integration of QoS and QoE** Recent approaches integrate QoS with QoE metrics, allowing evaluation not only from a technical perspective but also from the user experience standpoint.

Research Limitations

Despite the positive findings, several consistent limitations are identified across the studies:

- **Limited research scale** Most studies are conducted in small-scale environments such as schools, laboratories, or local hotspots, which may not represent enterprise-level conditions.
- **Dependence on manual configuration** MikroTik implementation heavily depends on administrator expertise, leading to inconsistent results across different environments.
- **Lack of high-traffic testing** Many studies do not evaluate MikroTik performance under extreme traffic conditions or large-scale network loads.
- **Limited focus on advanced security** Although some studies discuss firewall and basic security, there is still a lack of research on advanced security mechanisms such as IDS/IPS.

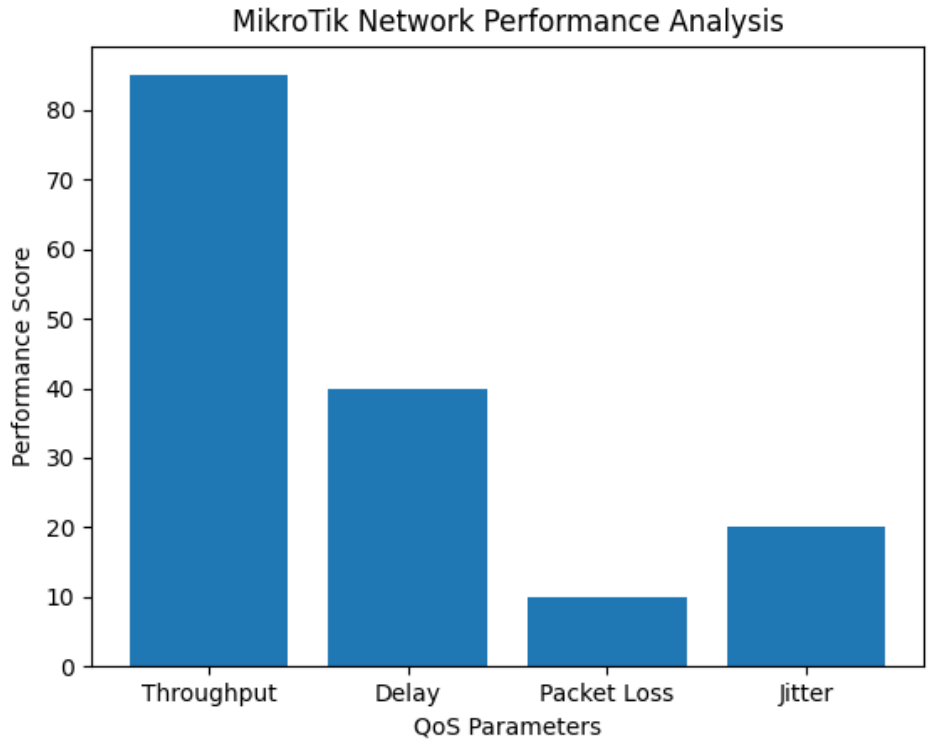

Figure 1. Grafik Analisis QoS MikroTik

The graph illustrates the performance of key Quality of Service (QoS) parameters, including throughput, delay, packet loss, and jitter. The analysis shows that MikroTik is capable of delivering high throughput with relatively low

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delay and packet loss values, which contributes to overall network stability. These results indicate that MikroTik can effectively manage network traffic and maintain service quality under typical operating conditions.

DISCUSSION

The findings of this study indicate that MikroTik is a practical and cost-effective networking solution, particularly for small to medium-scale implementations. Its flexibility allows network administrators to configure various network services, including routing, bandwidth management, and security features, according to specific requirements. This adaptability makes MikroTik suitable for diverse environments such as educational institutions, small businesses, and local network infrastructures.

The study also shows that the effectiveness of MikroTik largely depends on proper configuration and administrator expertise. Many of the identified limitations, such as performance degradation and security vulnerabilities, are not inherent weaknesses of the system but rather the result of inadequate configuration. Therefore, the role of skilled network administrators is essential in ensuring optimal performance and security.

In terms of performance, MikroTik is capable of managing network traffic efficiently under moderate loads. However, under high traffic conditions, performance issues may arise, especially when using entry-level hardware. This suggests that hardware selection and network design play a crucial role in achieving optimal results.

From a security perspective, MikroTik provides essential features such as firewall, filtering, and authentication. Nevertheless, these features require proper configuration and additional security measures to ensure adequate protection against potential threats. Without proper hardening, the network may remain vulnerable to attacks.

Overall, MikroTik offers a balanced combination of cost efficiency and functionality. However, its successful implementation requires careful planning, appropriate hardware selection, and advanced configuration skills.

CONCLUSION

This study concludes that MikroTik is a cost-effective and feature-rich networking solution suitable for small to medium-scale network implementations. Its main advantages include flexible configuration, comprehensive RouterOS features, and effective bandwidth management.

Despite these strengths, several challenges must be addressed, including configuration complexity, potential security vulnerabilities, and limited scalability for large-scale networks. These limitations highlight the importance of proper configuration, continuous monitoring, and the use of additional security mechanisms.

In conclusion, MikroTik can provide optimal performance when implemented with adequate technical expertise and supported by appropriate network design. Future research is recommended to focus on experimental validation, scalability testing, and the integration of advanced technologies to further enhance MikroTik performance.

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