Journal of Data Analytics, Information, and Computer Science (JDAICS)
Volume 2, No 1 – Januari 2025
e-ISSN : 3032-4696

DESIGN OF A HOTSPOT NETWORK WITH A PREPAID SYSTEM USING MIKROTIK AT REDZ GAMING INTERNET CAFE

Irzon Meiditra[1]*, Fauziah, Cut Mutia, Fitra Yuda
[1,2,3,4]Institut Teknologi Rokan Hilir, Indonesia
[1] meiditrairzon@gmail.com,[2]fauziahnurgayo@gmail.com[3] Cutmutia117@gmail.com
[4]fitrayuda110199@gmail.com

Received: 10-01- 2025	Revised: 20-01-2025	Approved: 29-01-2025

ABSTRACT

This paper discusses the design of hotspot networks with prepaid systems and to optimize the use of hotspot networks in Warnet Redz Gaming.Manajemen is done by limiting and dividing the network equally according to the price of the voucher purchased. With this paper can help the internet café in optimizing the use of its network. One method that can be used as described is the Queue Tree method. The Queue Tree method functions is to implement more complex functions within the bandwidth limit of the proxy where the use of packet mark has a better function. It is used to limit only one direction of connection either download or upload. Based on the test results, it can be concluded that the network quality using the Queue Tree and PCQ queuing methods demonstrates more optimal performance. This is due to the structured bandwidth allocation mechanism, which is applied according to the rules set in bandwidth management. With this method, each client receives a fair allocation of bandwidth according to their needs, preventing competition among users that could degrade network performance. Additionally, the implementation of these queuing methods contributes to network stability, reduces latency, and enhances overall bandwidth distribution efficiency.

***Keyword** : Bandwidth, Queue Tree, Mikrotik, Mark Packet, Download, Upload*

INTRODUCTION

The utilization of network technology as a medium for data communication continues to grow, particularly in the field of internet networks, which are inherently complex(Christanto et al., 2021). As the demand for active internet networks increases, users expect a more optimal network performance. This high demand for internet access impacts the capacity provided by service providers. Therefore, the management of internet access distribution is necessary to ensure that each user receives an appropriate share of access capacity. An uneven distribution of access can result in suboptimal internet performance(Safila Dewi & Syaripudin, 2024).

In larger network environments, configuring TCP/IP parameters on each workstation can be a complex and time-consuming task, especially when changes occur in parameters such as IP addresses and subnet masks. Meanwhile, a LAN (Local Area Network) is a type of computer network confined to a small area, such as a home, internet café, office, building, school, or other relatively compact locations. In the ever-evolving digital era, internet cafes (warnet) have become an integral part of modern society's daily life. Warnet serves as a space where individuals can access the internet, play games, work, study, or simply socialize online. The growth of the internet cafe industry not only reflects advancements in information technology but also highlights significant cultural and social shifts in how we engage with the digital world(Tampubolon et al., 2022).

Warnet plays a vital role in modern society by providing easy and affordable access to the internet. It allows individuals without home internet access to seek information, study online, communicate, and utilize various web services. The users of warnet are diverse, ranging from students, workers, and small business owners to

individuals looking to socialize online. Additionally, warnet is often a popular spot for young people who enjoy playing online games with their friends.

With the design of a prepaid hotspot network system using Mikrotik at Redz Gaming internet cafe, issues such as excess usage time or hotspot users being disconnected from the network after exceeding the allocated time can be avoided. Moreover, most of the users at this internet cafe are children and teenagers who enjoy playing games. By implementing a prepaid system, the hotspot network can be distributed fairly and proportionally based on the amount paid by each user.

In the existing system, several issues are still encountered, such as the Userman application on Mikrotik not being installable due to compatibility issues and hardware limitations of the Mikrotik device used. As a result, certain functions, such as automatic user and voucher creation, cannot be performed. To address this issue, an alternative solution is needed to replace the Userman application on Mikrotik. Therefore, managing the bandwidth capacity of the hotspot network with a prepaid system is necessary to ensure that each user receives appropriate internet access. This network capacity will be allocated to each user based on their priority in using the internet, so that the available capacity can be utilized optimally(Bahtiar et al., 2021).

Based on this, the author addresses this case with the title "DESIGN OF A HOTSPOT NETWORK WITH A PREPAID SYSTEM USING MIKROTIK AT REDZ GAMING INTERNET CAFE" as an approach to design and optimize internet network usage at Redz Gaming internet cafe.

RESEARCH METHODS

A research framework is a concept in a study that explains the relationship between the visualization of one variable and another, allowing the research to be systematically structured and accepted by various parties(Fauziah et al., 2024).

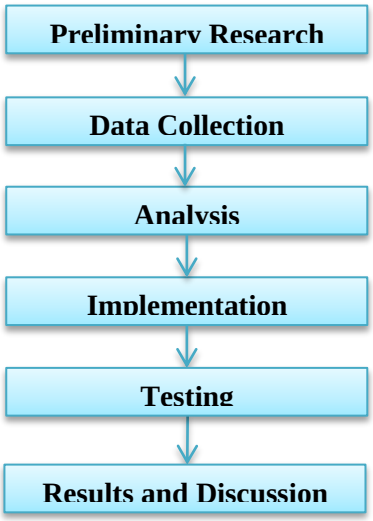

Image 1. Research Framework

Preliminary Research

This research aims to gain a comprehensive understanding of the object being studied, including the problems faced by the object as well as other issues that arise during the research process. It also serves to determine whether the object under study aligns with the research theme established by the researcher.

Data Collection

In this research, several research methods are used, including:

1. Field Research, which is conducted by directly visiting Redz Gaming in Padang City or the relevant object. This field research includes techniques such as:
    - Interviews, where questions are asked to related parties to gather necessary information.
    - Observation, where the existing system's working process is observed and studied in more detail.
2. Library Research, which is used to study sources that support the writing of this research. These sources include books, research reports, scientific journals, and theses. Additionally, materials published online (internet access) are also included in this category.
3. Laboratory Research**,** which is conducted using a computer to directly practice the system design that will be implemented.

Analysis

At this stage, the concept of the system requirements to be developed is formulated, which will serve as the foundation for the system design(Rahman & Nurdin, 2020). This includes the available bandwidth capacity, the number of clients, the bandwidth allocation proportion for each client, and the network topology.

Computer network topology refers to the method or approach used to connect one computer to another. The structure or design of the network that links these devices can be implemented through wired or wireless (cable-free) connections.

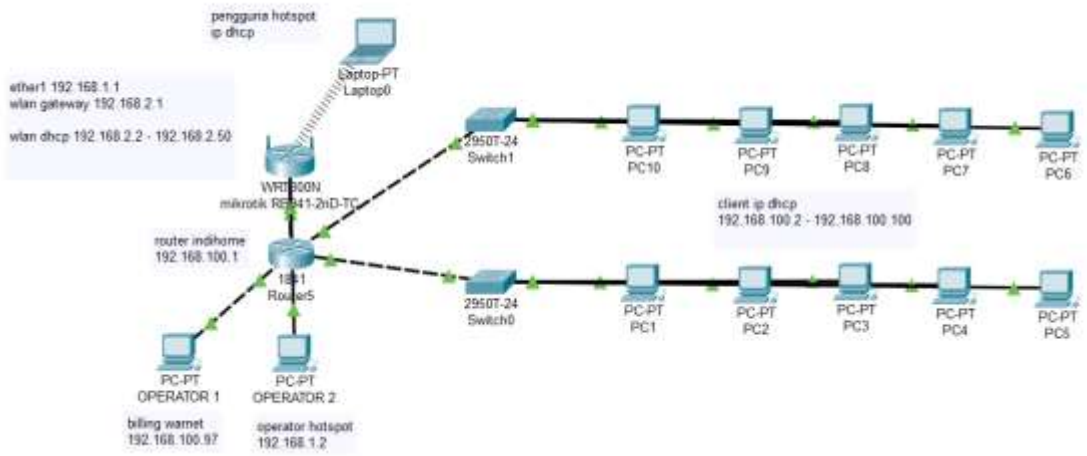

Image 2. Network Topology Design

This is a network topology design for simulation using a tree topology(Nazwa Amelia Purnama et al., 2024). At the top, there is an Internet Service Provider (ISP) connected to the internet via a UTP cable, which is then connected to a Mikrotik router. Here, Mikrotik serves to distribute the network that will be shared with users.

Implamentation

At this stage, bandwidth control is created using Queue Tree based on the system analysis and design. The implementation steps include(Mulyanto & Prakoso, 2020):

1. Installing and configuring the router/gateway using Winbox.
2. Configuring mangle to mark packets.
3. Configuring bandwidth control using Simple Queue.

Testing

At this stage, the system is tested to ensure it operates in accordance with the research objectives. The initial bandwidth management test is conducted using one PC and one mobile phone as success parameters. Both devices are used to download a specified amount of data from the internet, as determined by the researcher. The purpose of this test is to evaluate whether Mikrotik can evenly distribute the available bandwidth according to the implemented bandwidth management settings.

RESULTS AND DISCUSSION

Analysis Of Existing Systems

A network refers to a combination of hardware and software within a system that operates under specific rules to manage the activities and interactions among its members. A network consists of two or more interconnected computers that share information. The primary purpose of a computer network is to achieve its objectives by enabling each component to both request and provide services. The devices that request or receive services are referred to as clients, while those that offer or deliver services are known as servers. This architecture is commonly known as the client-server system and serves as the foundation for most computer network applications.

A computer network can be defined as a group of interconnected computers that work independently while adhering to communication protocols via specific media to share data, information, applications, and hardware such as printers, scanners, CD drives, and hard drives. Furthermore, these networks facilitate electronic communication between connected devices, creating an integrated system designed to support various functions seamlessly.

The network system currently in use at Redz Gaming internet cafe is as follows.

The workflow implemented on the operator's computer at Redz Gaming internet cafe utilizes an Indihome router as the internet source. This network is used for the PC clients in the cafe and is then divided for prepaid hotspot services using a Mikrotik wireless router designed with a tree topology.

All client and operator computers are connected to the internet. However, due to limited bandwidth, Mikrotik is used to manage bandwidth distribution. This ensures that when hotspot users connect to the network, the internet connection for the computers in the cafe that are connected to the PC clients remains stable and secure.All systems related to hotspot services, such as the login page, automatic user creation through a voucher system, bandwidth management, and voucher validity period settings, are managed using Mikrotik.

In the current system, several issues still persist, such as the Userman application on Mikrotik being unable to be installed due to compatibility problems and hardware limitations of the Mikrotik model used. As a result, certain features, such as automatic user and voucher creation, cannot be performed. To address this issue, an alternative application is needed to replace the Userman application on Mikrotik. However, a PC is required to run the alternative application.

Konfigurasi IP Address

The main router, which provides the internet source, is connected to the Mikrotik via a LAN cable on port 1. Then, port 2 on the Mikrotik is connected to the Operator's PC

using a LAN cable(Siregar et al., 2022). After that, open the latest version of Winbox (v6.47.7). In the "Neighbors" tab, click until the Mac Address appears, select that Mac Address, then enter Login: Admin and click "Connect."

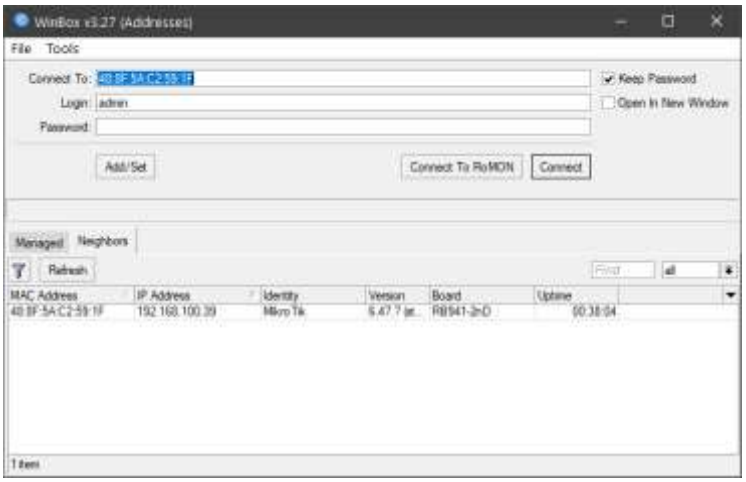

Image 3. Winbox Initial Display

Next, determine the IP address to be used for each interface. There are two interfaces that need to be configured: ether2 for the IP address connected to the operator's PC, and wlan1 for the IP address connected to clients via the hotspot.

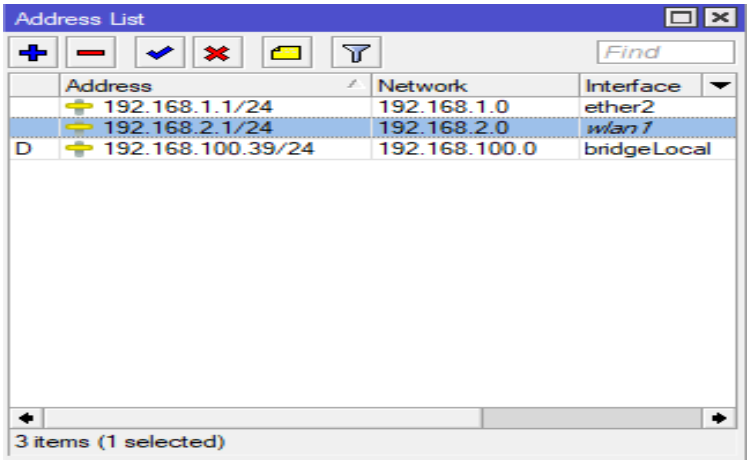

Image 4. IP Address Menu On Mikrotik

Next, set the IP gateway to be used for internet access by clicking on the IP > Route menu. Then, enter Gateway: 192.168.100.1 with the type set to unicast. To configure DNS, go to the IP > DNS menu. In the Servers section, enter: 1.1.1.1, then click OK.

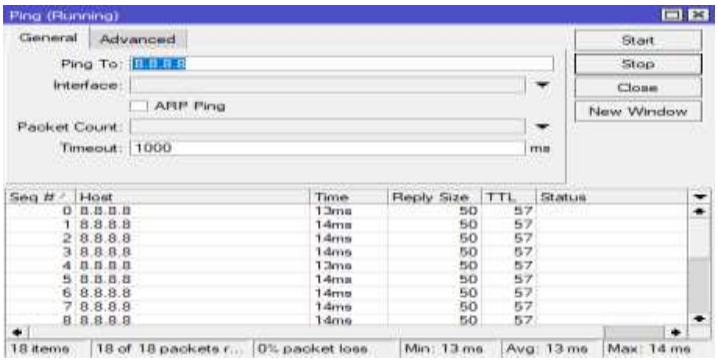

Image 5. Ping Display On Mikrotik

The next step is to set the DHCP IP to be used for the hotspot. Open the IP > DHCP Server menu, then select the DHCP Setup option and configure it as follows:

- DHCP Server Interface : wlan1
- DHCP Address Space : 192.168.2.0/24
- Gateway for DHCP Network : 192.168.2.1
- DHCP Relay : 192.168.2.1
- Addresses to Give Out : 192.168.2.2-192.168.2.50 (IP dibatasi 50).
- DNS Servers : 1.0.0.1

Wireless Configuration

After configuring the DHCP IP, the next step is to enable the access point on Mikrotik. Go to the Wireless menu, and before activating the access point, ensure that the CAP mode is disabled(Basorudin et al., 2021). Select wlan1, click CAP, uncheck the "enabled" option, click OK, and then press the √ button to activate the access point.

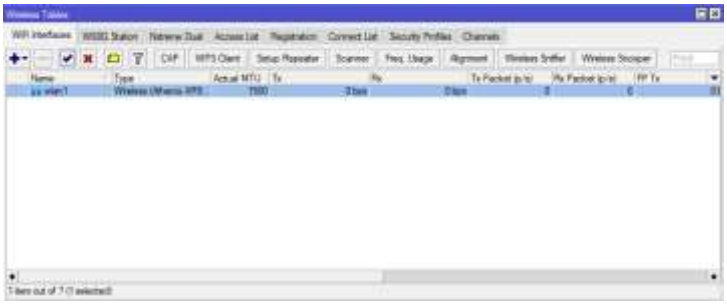

Image 6. Wireless Menu Display

Conduct testing by connecting the client PC to the hotspot via Wi-Fi and ensure that the client obtains an IP address from wlan1.

Image 7. Hospot Testing On Windows

After successfully creating the access point, the next step is to configure the hotspot. The purpose of this configuration is to ensure that users connecting to the

access point are prompted to log in by entering a username and password before accessing the internet. Go to the IP > Hotspot menu, click the + button, and configure it as follows:

- HotSpot Interface : wlan1
- Local Address of Network : 192.168.2.1/24
- Address Pool of Network : 192.168.2.2-192.168.2.50
- Select Certificate : none
- IP Address of SMTP Server : 0.0.0.0
- DNS Servers : 1.1.1.1
- DNS Name : RedzGaming.net
- Name of Local HotSpot User : admin

Upload or import the provided web login template files by selecting all the template files from Windows Explorer and dragging them into the hotspot folder/directory on Mikrotik, as shown in the image below:

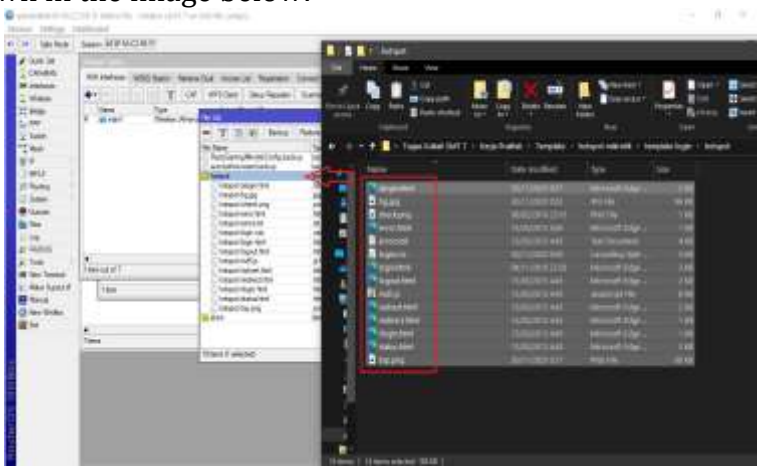

Image 8. Process Of Uploading Hotspot Login Template To mikrotik

Perform a test on the client by connecting the client PC to the hotspot, the user will be directed to the login page, and the login web page will appear as follows:

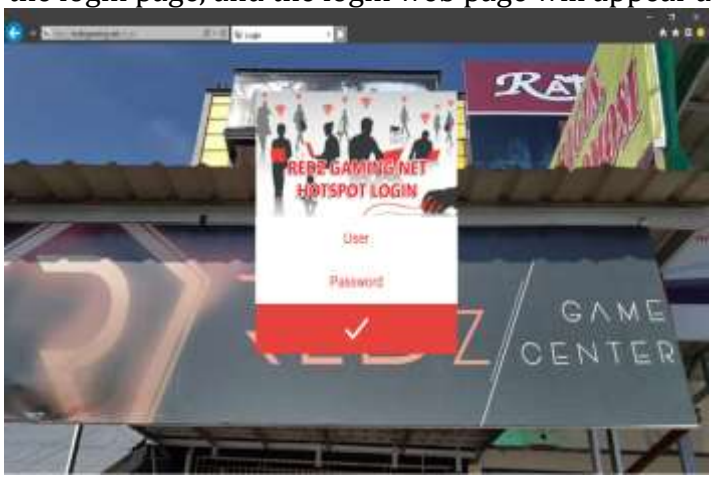

Image 9. Redz Gaming Login Hotspot Display

Also perform a test to verify the username that was created earlier using the admin user. Once the login is successful, the main page will appear, showing the access granted to the user. The displayed interface will include information related to the user session, such as the remaining time, as well as the menus or features accessible to the

admin user. This is to ensure that the login process and access settings are functioning correctly as configured.

Image 10. Login Testing With Admin user

Mikrotik Security Configuration

To prevent potential issues on the main router and Mikrotik router, it is essential to implement access restrictions so that the router can only be accessed and configured by the operator and through the operator's PC. The first step is to block access to WebFig or configuration via the web for users connected to the hotspot. This way, only authorized devices can make configuration changes to the router, enhancing network security and reducing the risk of unauthorized access. These restrictions can also be set to ensure that only admins or operators have full access rights, while other users are limited to the internet services provided(Firmansyah, 2020).

Two separate rules are required to block user access to the Main Router (Indihome) and the Mikrotik Router. Start by configuring the first rule for the Mikrotik router. Go to the IP > Firewall menu, click the Nat tab, then click the + button. Next, click the Comment button and give the rule a name, for example: Block Mikrotik Webfig Access, then click OK.

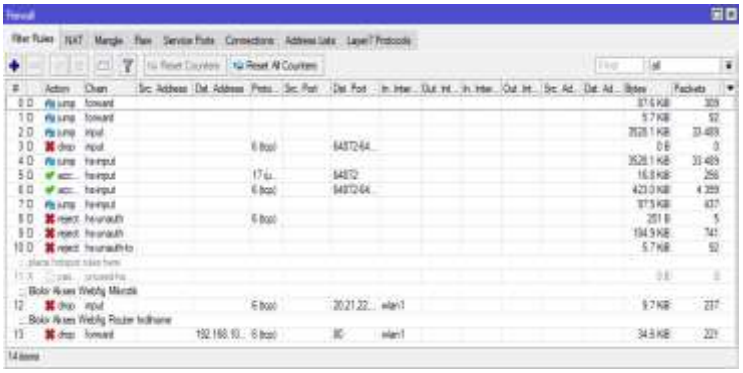

Image 11. IP Firewall menu Display On mikrotik

SNTP and Time Configuration on Mikrotik

Mikrotik cannot retain time settings when the router shuts down suddenly. This can be addressed by configuring a time server so that the router automatically adjusts the time when it connects to the internet(Tia Sundari et al., 2023). To do this, go to the System > SNTP Client menu, check the box for Enabled, and configure it as follows:

- Primary NTP Server: 203.160.128.3

- Secondary NTP Server: 0.0.0.0

Then click OK, and go to the System > Clock menu to check if the time and date are correct. Adjust the Time Zone accordingly and click OK.

Bandwidth Management With Queue Tree + PCQ

The hardware limitations of the Mikrotik RB941 2nd TC make it impossible to install the Userman application on the device. Therefore, an alternative is required, namely TheUserman software, which can only be run on a PC. At this stage, the process involves creating a package list for the hotspot and configuring the allocation of bandwidth or internet speed. Launch TheUserman software, then enter the IP Address, User Login, and Password used to access the Mikrotik via Winbox. fter logging in, the interface will appear as follows(Christanto et al., 2023):

Image 12. The Userman

Generate User and Voucher

TheUserman offers a feature that allows it to automatically generate random usernames and passwords, as well as print vouchers corresponding to the user accounts created in bulk. To generate users, navigate to the "Hotspot User Management" tab and click the "Generate" button located at the bottom. Fill in the required details as shown below, then click "Generate."

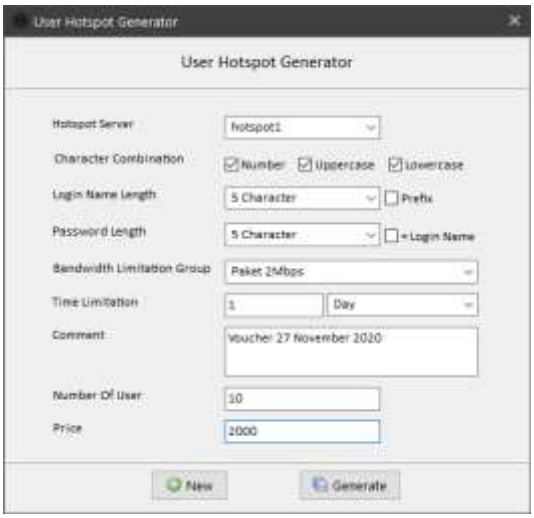

Image 13. User Hotspot Generator TheUserman

Journal of Data Analytics, Information, and Computer Science (JDAICS)
Volume 2, No 1 – Januari 2025
e-ISSN : 3032-4696

Once the users have been successfully generated, the list of users can be printed as vouchers. However, the default voucher design is quite basic. To make the vouchers more visually appealing, you can replace the default design with a pre-made template. To do this, go to the "Tools" tab and select "Voucher Template." Click on "Custom Template," then choose the desired template file. Once done, click the "Save Voucher Template" button.

To print the vouchers, navigate to the "Hotspot User Management" tab, then click the "Export Voucher" button. Select "Export Voucher > All Hotspot User," enter a file name, and click "Save." The printed vouchers will appear as shown(Gitakarma et al., 2022).

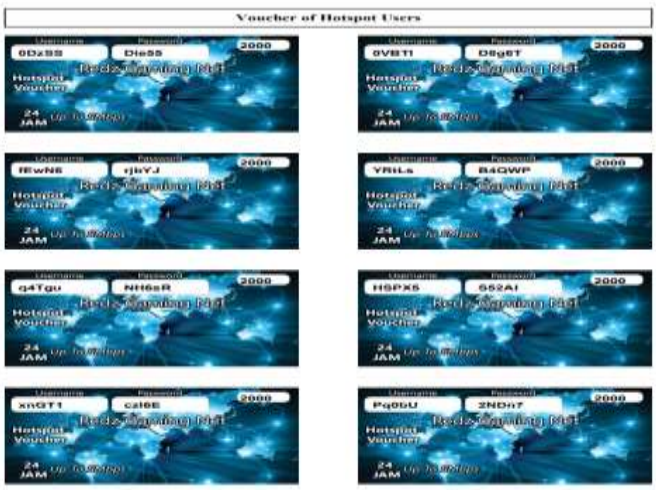

Image 14. Display of Vouchers that have been printed with TheUserman

Hospot User Login testing

Several tests were conducted to ensure that the hotspot system is functioning correctly(Kurniawan et al., 2023). One of these tests involved logging into the hotspot using one of the previously generated user accounts.

Image 15. Testing Login Hotspot

To verify if the user time limit feature functions properly, a test was conducted by reducing the active period/Time Limit from 1 day (1d) to 1 minute (1m). In TheUserman, once a user exceeds the allotted active period/internet usage time, their username will be highlighted in red, as shown in the following image(Andre Rizky Pangestu, ibnu Abi Ziad Fisabilillah, 2024).

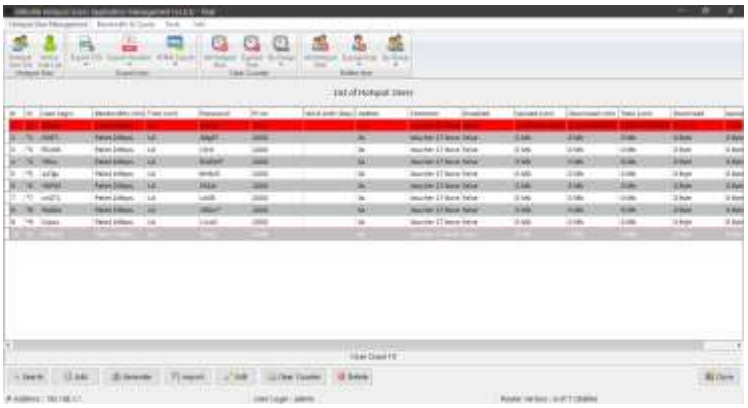

Image 16. Testing Time Limit

The next testing phase aims to ensure that users connected to the hotspot are receiving bandwidth evenly. The test was conducted by connecting one PC and one mobile device to the hotspot network, both logging in with a user account assigned to a 2 Mbps package. Using the Torch tool on Mikrotik, the results were obtained as follow(Prasetia Nanda et al., 2020).

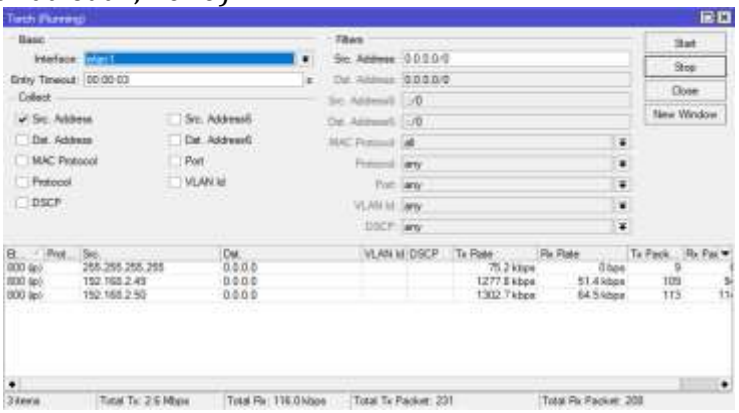

Image 17. Testing PCQ Queue Tree

The final test is conducted to ensure that a single user connected to the hotspot can access the internet at full speed. This test involves connecting one PC to the hotspot network, logging in with a user account assigned to a 2 Mbps package, and then running a SpeedTest via the website https://www.speedtest.net using the Microsoft Edge browser(Santoso, 2020). The results will appear as shown(Suliman, 2023).

Image 18. Internet Speed Testing with SpeedTest

CONCLUSION

Based on the problem description above, as well as the analysis and discussion from the chapters, the following conclusions can be drawn: The issue of uneven bandwidth usage can be easily addressed by implementing Queue Tree, which aims to provide a solution to the problem being studied(Darmawan et al., 2020). With bandwidth management on Mikrotik, the internet cafe operator can run a prepaid hotspot business without interfering with the existing network. Based on the results obtained, it is clear that the network quality using the Queue Tree and PCQ queuing methods is more optimal, as the bandwidth is distributed according to the rules applied in the bandwidth management, preventing clients from competing for bandwidth.

DAFTAR PUSTAKA

Andre Rizky Pangestu, ibnu Abi Ziad Fisabilillah, Y. ramadhan. (2024). *Program Pendaftaran Pengunjung Warnet Microphile*. *1*, 20–26.

Bahtiar, D., Febrianto, W. J., Maulana, A., Saputra, S., Darmawan, W., Tafonao, R. P., Julianto, R., Zai, R., & Djutalov, R. (2021). Pengenalan Dasar Instalasi Jaringan KomputerMenggunakan Mikrotik. *Kreativitas Mahasiswa Informatika*, *2*, 507–518. https://core.ac.uk/download/pdf/524980292.pdf

Basorudin, B., Rouza, E., Yanto, B., & Mustafa, S. R. (2021). Perancangan dan Implementasi Konfigurasi Wifi Router dan Jaringan Wireless dengan Rb951ui-2nd. *Building of Informatics, Technology and Science (BITS)*, *3*(3), 186–193. https://doi.org/10.47065/bits.v3i3.1036

Christanto, F. W., Daru, A. F., & Kurniawan, A. (2021). Metode PCQ dan Queue Tree untuk Implementasi Manajemen Bandwidth Berbasis Mikrotik. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *5*(2), 407–412. https://doi.org/10.29207/resti.v5i2.3026

Christanto, F. W., Daru, A. F., & Kurniawan, A. (2023). Manajemen Bandwidth Dengan Metode Peer Connection Queue (PCQ) dan Simple Queue Di Perumahan PPH 2. *Jurnal Sains Dan Teknologi*, *5*(1), 96–99. https://ejournal.sisfokomtek.org/index.php/saintek/article/view/1353

Darmawan, M. A., Fitri, I., & Iskandar, A. (2020). Manajemen Bandwidth Pada Mikrotik Dengan Limitasi Bertingkat Menggunakan Metode Simple Queue. *INTECOMS: Journal of Information Technology and Computer Science*, *3*(2), 270–280. https://doi.org/10.31539/intecoms.v3i2.1821

Fauziah, Yuda, F., Puspita, R., Mutia, C., Informasi, S., & Informasi, S. (2024). *Analisis dan perancangan sistem informasi produksi buah kelapa sawit berbasis web pada koperasi mekar jaya*. *10*(2), 88–98.

Firmansyah, B. (2020). Dengan Metode Queue Tree Pada Pt . Cipta Banuata Anugrah Jakarta. *Jurnal Ilmiah Teknik Informatika (TEKINFO)*, *21*(1), 94–103. https://journals.upi-yai.ac.id/index.php/TEKINFO/article/view/1144

Gitakarma, M. S., Indrawan, G., & Pracasitaram, I. G. M. S. B. (2022). Pelatihan Pembuatan Hotspot MikroTik Disertai Manajemen User di Desa Tianyar Barat, Kubu, Karangasem. *Seminar Nasional Pengabdian Kepada Masyarakat (SENADIMAS)*, 143–151.

Kurniawan, I., Putra, D. E., & Syaputra, A. E. (2023). Perancangan Jaringan Hotspot Di Universitas Nahdlatul Ulama Sumatera Barat Menggunakan Mikrotik Dalam Manajemen Bandwidth. *Jurnal TEFSIN (Jurnal Teknik Informatika Dan Sistem Informasi)*, *1*(1), 21–25. www.MikroTik.com.

Mulyanto, Y., & Prakoso, S. B. (2020). Rancang Bangun Jaringan Komputer Menggunakan Sistem Manajemen Omada Controller Pada Inspektorat Kabupaten Sumbawadengan Metode Network Development Life Cycle (Ndlc). *Jurnal Informatika, Teknologi Dan Sains*, *2*(4), 223–233. https://doi.org/10.51401/jinteks.v2i4.825

Nazwa Amelia Purnama, Muhammad Dicky Saputra, Gilang Nur Rosyid, Paul Manurung, & Didik Aribowo. (2024). Komunikasi Data Menggunkan Topologi Tree. *Uranus : Jurnal Ilmiah Teknik Elektro, Sains Dan Informatika*, *2*(2), 01–06. https://doi.org/10.61132/uranus.v2i2.95

Prasetia Nanda, A., Aminudin, N., Zulkifli, & M. Islamahdi. (2020). Perancangan Arsitektur Jaringan Local Area Network Pada Smp Muhammadiyah 01 Pringsewu. *Aisyah Journal Of Informatics and Electrical Engineering (A.J.I.E.E)*, *2*(2), 120–125. https://doi.org/10.30604/jti.v2i2.36

Rahman, T., & Nurdin, H. (2020). Abdul Hamid No.77, RT.8/RW.4, Cawang, Kramat Jati, Jakarta Timur 13630 1 Sekolah Tinggi Manajemen Informatika dan Komputer Nusa Mandiri. *Jl. Raya Jatiwaringin*, *5*(1), 23.

Safila Dewi, S., & Syaripudin, A. (2024). Implementasi Jaringan Hotspot Dengan Menggunakan Metode Queue Tree Pada Mikrotik Sebagai Penunjang Pembelajaran Online Di Desa Pasilian. *OKTAL : Jurnal Ilmu Komputer Dan Science Rancangan Dan*, *3*(4), 998–1009.

Santoso, J. D. (2020). Analisis Perbandingan Metode Queue Pada Mikrotik. *Pseudocode*, *7*(1), 1–7. https://doi.org/10.33369/pseudocode.7.1.1-7

Siregar, S. R., Pristiwanto, P., & Sunandar, H. (2022). Workshop Teknik Subnetting IP Address Komputer untuk Siswa Prakerin (Praktek Kerja Industri) Jurusan Teknik Komputer Jaringan Tingkat Sekolah Menengah Kejuruan (SMK). *ULEAD : Jurnal E-Pengabdian*, *1*, 106–111. https://doi.org/10.54367/ulead.v1i2.1720

Suliman. (2023). *Perancangan Jaringan Hotspot Rt / Rw Net Procyber*. *8*(2), 125–136.

Tampubolon, D. S., Hanifah Aprilyani, & Pulungan, R. W. (2022). Perancangan Jaringan dan Manajemen Bandwidth User dengan Mikrotik di Dinas Kominfo Provinsi Sumatera Utara. *Journal of Computer Science and Informatics Engineering (CoSIE)*, *01*(1), 26–37. https://doi.org/10.55537/cosie.v1i1.28

Tia Sundari, Satria, D., & Mustazihim, M. (2023). Perancangan dan Implementasi Jaringan Hotspot Untuk Voucher Internet Via Mikhmon Pada Andaalas Computer. *JUTEKINF (Jurnal Teknologi Komputer Dan Informasi)*, *11*(1), 10–19. https://doi.org/10.52072/jutekinf.v11i1.479