Communication and bandwidth optimization technique using MikroTik

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Abstract: Wide Area Network (WAN) is one of the most important parts of communication technology in the world, and the Internet is an idle example for WAN. But, without bandwidth nobody is able to communicate via the internet. Moreover, day to day increases the number of user traffic on the internet. In this case medical science also consumes a huge number of bandwidths by the A.I operation technique. Therefore, bandwidth distribution is one of the vital issues for the technology of communication. This paper shows how MikroTik will be able to fulfill the needs of bandwidth management in future.

Keywords: Internet, Traffic, Bandwidth, MikroTik.

I.   INTRODUCTION

From the internet user point of view in January 2024 (fig.1), almost 66.2% [1] of the global population is used internet, and 62.3% [1] of the global population who are used social media i.e., Facebook, LinkedIn, WhatsApp etc. Study from [2], it has seen that the internet traffic is normally generated from three different field of internet users i.e., desktop internet user, mobile internet user, tablet internet user respectively and we have presented those categories of internet traffic by the fig. 2 [3].
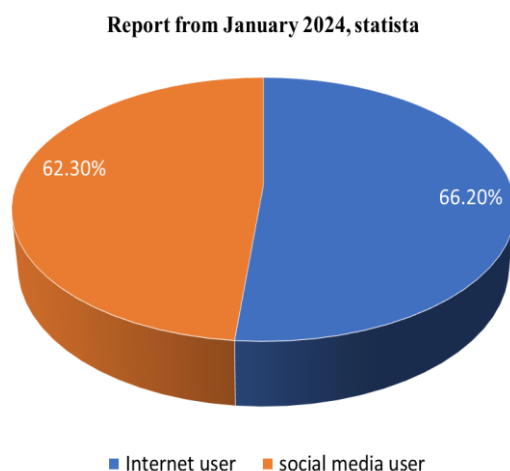

Fig. 1: A statistical report for internet and social media user of global population.

It has also seen that each and every sector in the world getting benefit from the WAN technology i.e., internet [4]. Bandwidth provide a vital role for the sector of internet user because without bandwidth data will not send and receive via internet [5]. Again, from the research study of [6], explained the importance of resource management i.e., bandwidth for the sector of communication technology. Therefore, proper distribution of bandwidth is a crucial task for any internet service provider (ISP) [7-8].
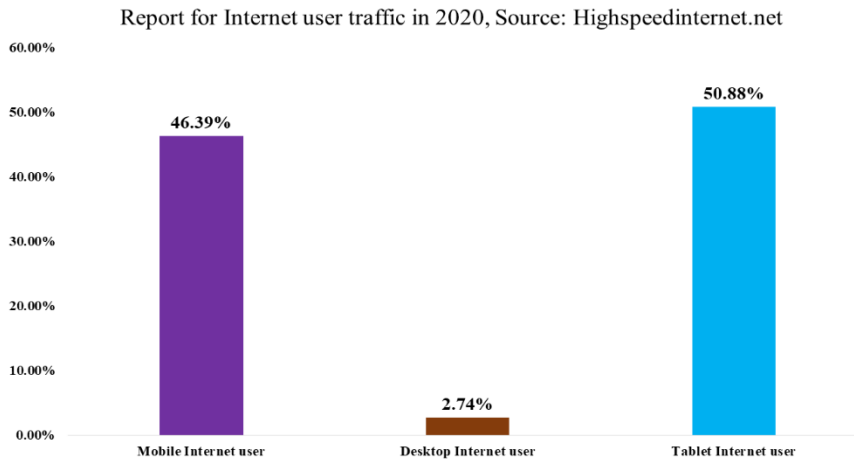

Fig.2: A scenario of internet user traffic.

II.   BACKGROUND AND LITERATURE REVIEW

From the field of technology point of view, mesh networking was developed first by the communication device MikroTik. This technology was introduced by the Latvian company. According to the sector of wireless communication, MikroTik also provides an important role for developing this area. A dependable network router can be created on a computer by using the operating system (OS) and software MikroTik RouterOS, which covers a wide range of capabilities such as routing, hotspot, DHCP (Dynamic Host Configuration Protocol) server, point-to-point tunnelling protocol, DNS (Domain Name System) server, and many more [9], [10]. But, from the study in [11], it has been seen that this communication device is more popular by the ISP (Internet service provider) and hotspot provider. fig.03 an overview of how a hotspot network functions. No additional software or other components are needed for the installation of MikroTik. However, MikroTik is made to be extremely user-friendly and effective for managing computer networks, including the creation and construction of simple to intricate computer networks [11]. MikroTik can be divided into two categories according to the type of hardware being used i.e., one is the ISO software version of MikroTik RouterOS can be obtained from either www.MikroTik.com or www.MikroTik.co.id. This software is considered to be installed on computers of PC/X86 and another one is the MikroTik Router-board is a hardware device that has been specifically designed and packaged to include the MikroTik RouterOS [9], [12], [13].
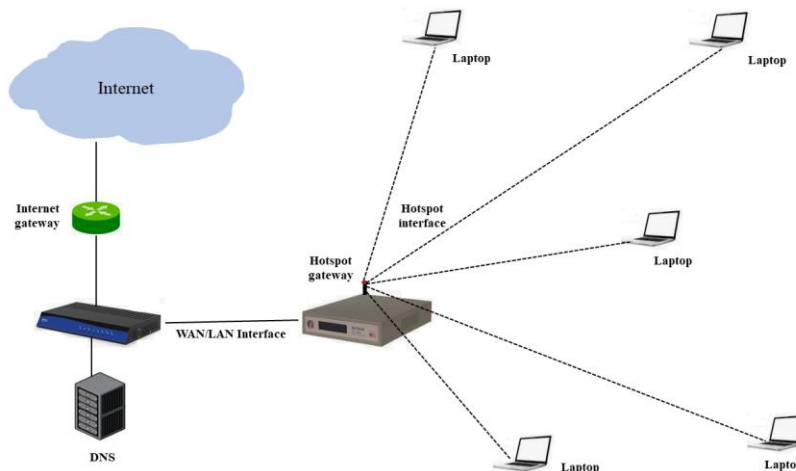

Fig. 3: A scenario of network using Hotspot.

III.   EVALUATION ABOUT THE OPERATING SYSTEM AND HARDWARE FOR MIKROTIK

MikroTik's hardware components include routers, switches, antennas, and other supporting equipment. The most advanced software is MikroTik RouterOS, as shown in fig.4. This software serves as an operating system capable of transforming a computer system into a dependable network router. It boasts a plethora of features tailored for IP networks and wireless networks, making it ideal for ISPs and hotspot providers. MikroTik RouterOS does not necessitate additional software or tools for installation. Specifically designed for administrative purposes, it aids in tasks like computer network design, spanning from small-scale setups to intricate network systems.

Fig. 4: The operating system (OS) of MikroTik router.

See the MikroTik Router Board in fig.5. It's the MikroTik embedded router products. Because router boards have processors, RAM, ROM, and flash memory, they can be thought of as integrated tiny PCs. It makes use of RouterOS, which performs multiple functions such as hotspot, DHCP, DNS, proxy, bandwidth management, and network router. Numerous router boards in the RB411, RB433, and RB600 series can also be used as WiFi access points, bridges, or WDS clients. The majority of ISPs operate as either clients or access points by using the Wireless LAN feature. Since the router already has all of its features, it may be used without relying on a PC. The router board is more compact, smaller, and uses less power when compared to a PC running RouterOS compared to only utilizing an adapter. PoE can be used as a current source and the network placed on the tower for Wi-Fi use.
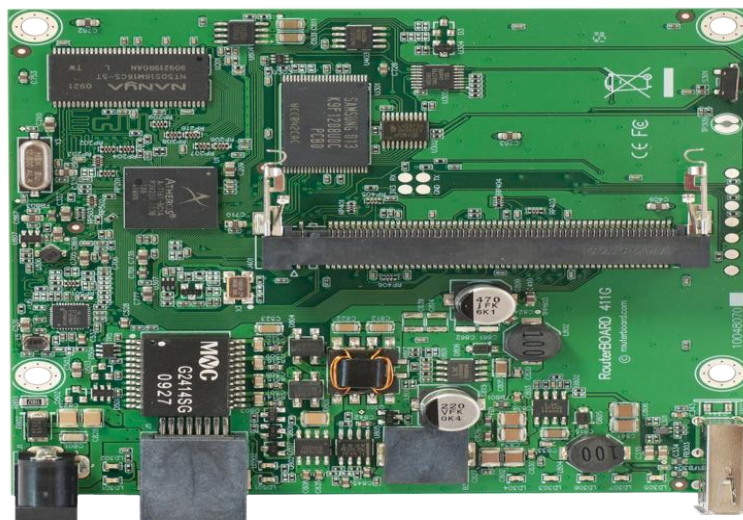

Fig. 5: The router board (RB) of MikroTik router.

IV.   ANALYSIS THE CONTROL OF NETWORK SCENARIO AND MIKROTIK

After the ADSL or Internet modem, MikroTik needs to be installed once. Any device placed in front of the router board will be ignored and unable to be controlled by it. Everything beneath the router board is managed by it. The exact location of the Router board is shown by the fig.6. Presently, the board of the router regulates the PC (personal computer) clients via the communication device i.e., switch or the speed of the connection from the AP (access point).

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From the configuration point of view, we have taken a few concurrents about the preparation of configuration i.e., WinBox, Public IP (Internet Protocol), Gateway, DNS (Domain Name Service) Server respectively. Moreover, we have also set an IP for the motherboard of MikroTik.
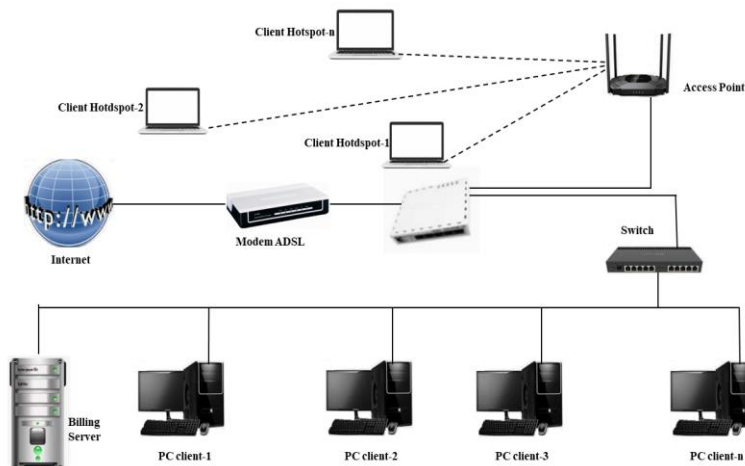

Fig. 6: A complete scenario of communication network using the topology of MikroTik.

Setting up the PC's IP address is the first thing to do. Useful IP address is 192.168.1.105. All categories of rule which have been specified on the router of MikroTik are followed by this Internet protocol (IP).
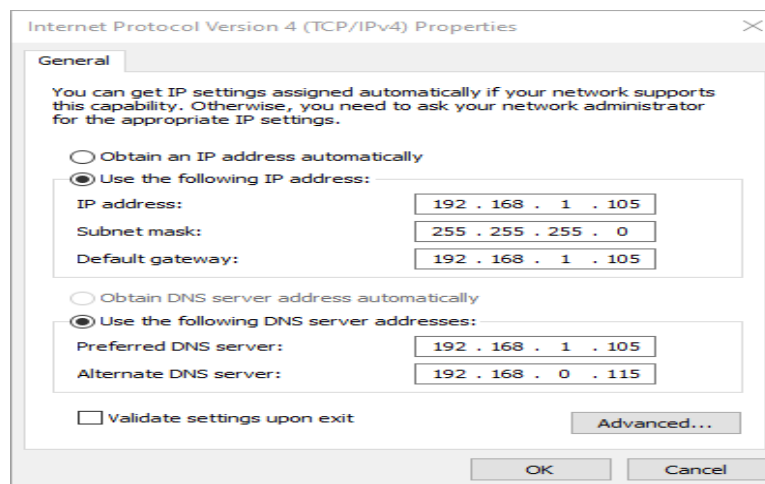

Fig. 7: Configuration of address using IPv4.

The configuration of the IP is shown in fig.7. One can configure the IP address in class A, B, or C. Entering the command in Terminal Prompt will allow you to ping the MikroTik router first. After connecting the PC and router, launch the WinBox application, choose the desired IP router address by name, and click Connect.
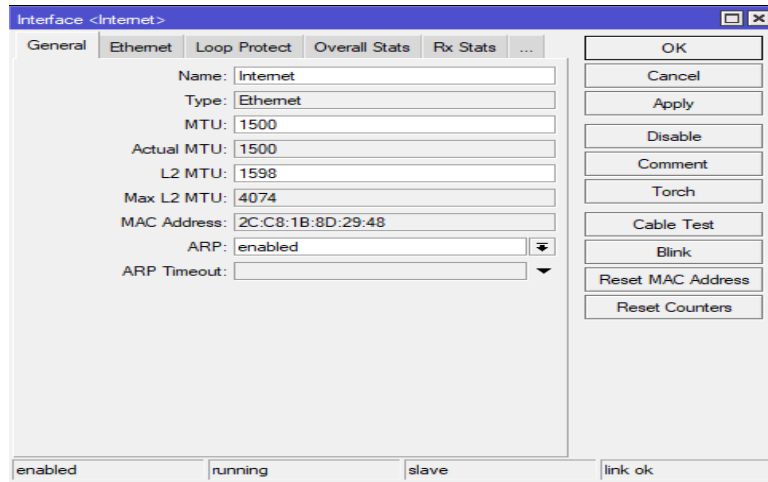
Fig. 8: The interface of MikroTik for internet.

Following a connection, some Ethernet ports will be shown in the "interfaces" toolbar on the program's start screen. This study makes use of five Ethernet ports. "Internet" and "LAN" will be the new names given to two of these ports. Click twice on the Ethernet port you want to rename, then enter the new name (LAN or Internet) in place of the old one. The method for changing the port name is depicted in the accompanying figure.

Setting the new name for the interface is demonstrated in fig.08 and fig.09. A MAC Address is specific to each Ethernet. It is also possible to determine the transmit and receive bandwidth for restricted values.
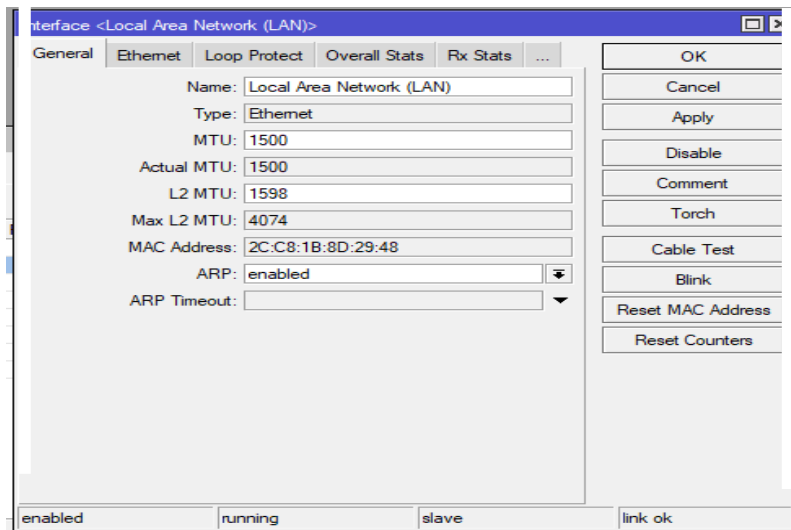

Fig. 9: The interface of MikroTik for Local Area Network (LAN).

The configuration of the NAT Rule comes next. NAT, also known as network address translation, is a technique for using a single IP address to link many computers to the Internet. Due to the restricted supply of IP addresses, the requirement for communication and client security, and the ease and flexibility of network administration, this strategy is used a lot. The IP protocol that is now in widespread usage is version 4. An address with a length of 4 bytes indicates that 2 to the power 32, or we can say the total IP address is 4,294,967,296, are accessible. The number of PCs that can theoretically connect to the WAN (wide area network) for example the internet directly is this amount. Due to this restriction, the majority of Internet service providers will only assign a single, dynamic address to a single user. Each time a user connects to the Internet, their IP address will be unique. A single IP address can only be linked to the internet, therefore on one hand, the user can request many computers connected to the network. NAT can be used to get around this. Multiple computers can share an IP address and connect to the Internet at the same time when NAT gateways are installed on a single machine.

Distributing bandwidth to each user comes next after NAT Rule setting is finished. You can accomplish this by visiting the menu queues. Click Queues from the toolbar, then click the plus symbol (+) to add or add it. The General section of Simple Queue is filled in as follows:
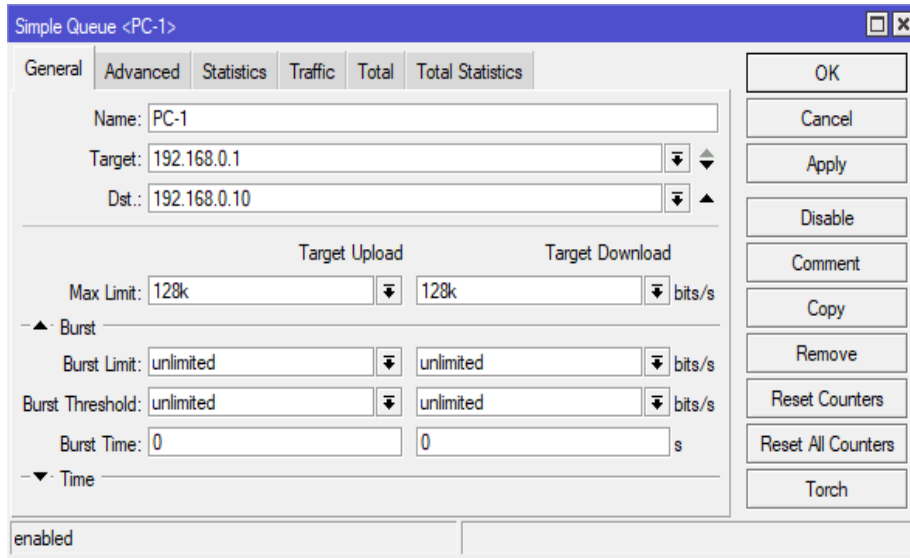

Fig. 10: The simple queue of MikroTik for PC1.

According to the fig.10, we have set 192.168.0.1 for target address, where 128 kbps has set for target upload and download and all of those has set for the PC1. Moreover, from the fig.11 point of view, we have set 192.168.0.2 for target address and 128kbps has set for both target upload and download and all of those has set for the name of PC is PC2.
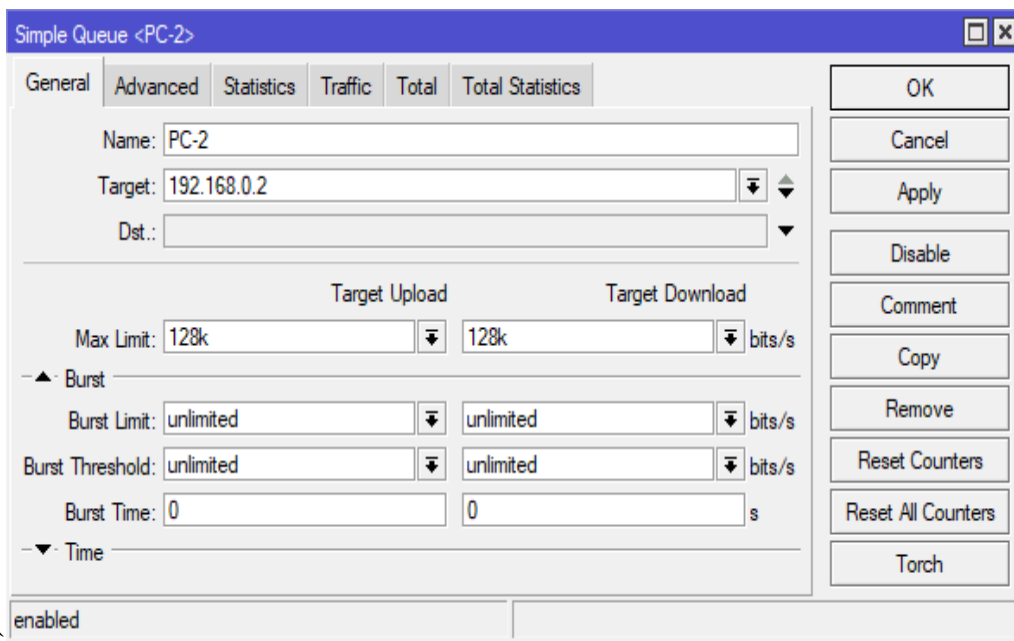

Fig. 11: The simple queue of MikroTik for PC2.

The bandwidth configuration is depicted in Figures 10 and 11. The trial's goal is to increase the bandwidth of 192.168.0.1 IP Address by 128 kbps, while the PC2 with the IP Address 192.168.0.2 will increase its overall bandwidth capacity by 128 kbps. The bandwidth capacity distribution is shown in the following figure.
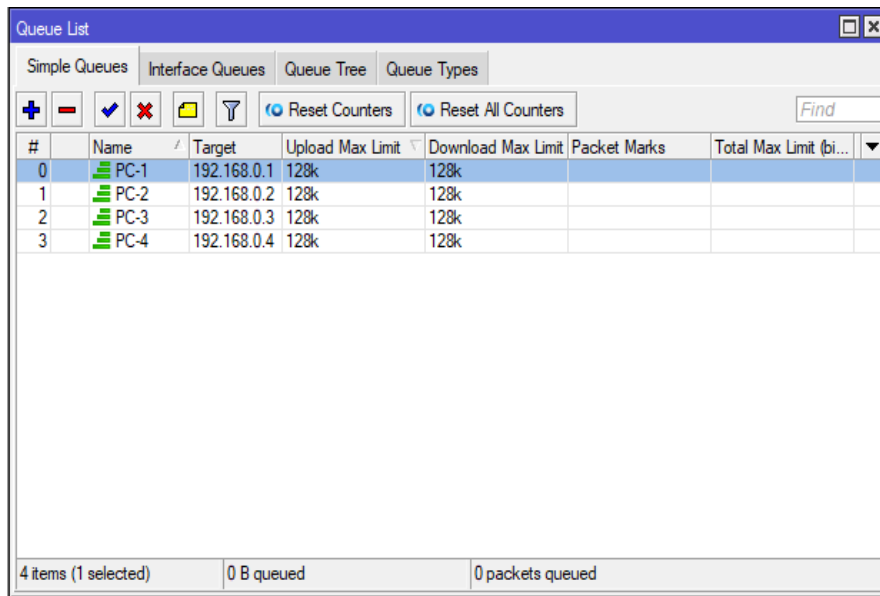
Fig. 12: The list of queues.

One method to check if the bandwidth limiter is effective after setting it up is to visit a few websites. The Torch tool menu, as illustrated in fig.13, allows one to view each user's activity. It is useful for real-time traffic monitoring in specific networks. When viewing the queue, red indicates that the available bandwidth has already been used, yellow indicates that just half of the allotted bandwidth has been used, and green indicates that there is still available bandwidth or that it is idle.
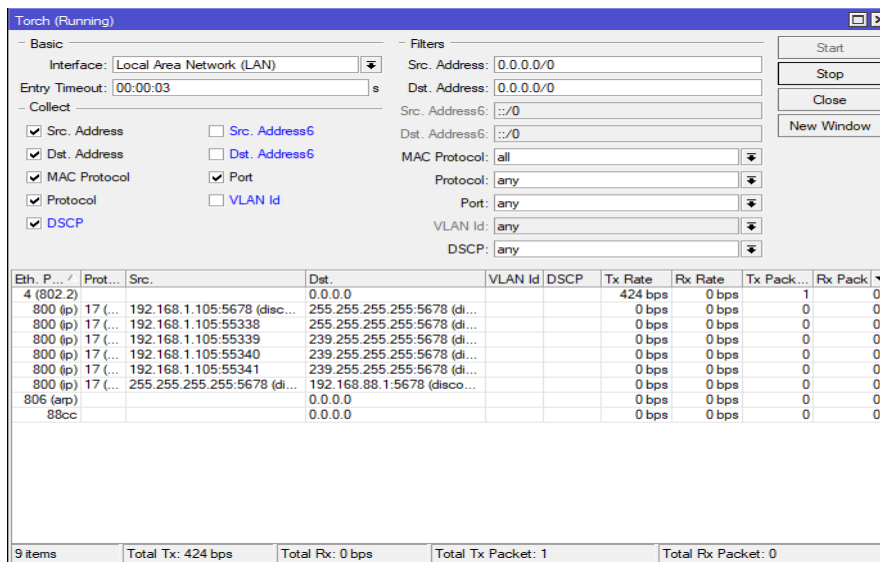

Fig. 13: The complete menu of Torch.

V. CONCLUSION

According to the conclusion we can say that, the widespread user prosperity is increased by using the communication device MikroTik to maintain the proper balance of network traffic. Quotas can be used properly and efficiently by each user. Installation requires certain hardware requirements. If you compare the Mikrotik program to having one computer manage the network, it's not too expensive. In order to achieve a proper optimization for allocation of bandwidth, Mikrotik control bandwidth consumption can increase the functional distribution of bandwidth to the customers. Even when multiple computers are utilizing the internet simultaneously, everything works smoothly and steadily for all machines. The computing unit's components all receive bandwidth in accordance with their identified needs. It will be simpler for the Administrator to manage bandwidth if MikroTik is not used.

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BIOGRAPHY

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Mohammad Arifin Rahman Khan - Received his Research degree from Edith Cowan University, Australia in 2019 and completed his M.Sc. degree from London Metropolitan University, London in 2010. According to his professional career, Mohammad khan has teaching experience from national and foreign universities, moreover more than 5 years he has also experienced from the position of research assistant. His research interests include mobility management, multimedia transmission, and quality-of-service (QoS) etc. provision issues in the next-generation of wireless/mobile networks.

Mohammed Ibrahim Hussain - He has completed the Masters in E-Commerce from London, UK. He had completed Bachelor Degree in Computer Science and Engineering from The National Technical University of Ukraine, Kiev, Ukraine. He has successfully completed Cisco Certified Network Associate (CCNA), MicrosoftCertfied Technology Specialist (MCTS) and Microsoft Certified T Professional (MCITP) on Server 2008 platform. He is also nominated Book Reviewer of The National Curriculum of Textbook Board. His research interest includes Operatig Systems, Networking, and Microwave Technology.

Mohd Abdullah Al Mamun is a dedicated professional currently pursuing a second MBA in Information Technology at Westcliff University, USA. With a strong academic foundation, he holds a Post Graduate Diploma in Human Resource Management from the Bangladesh Institute of Management, an MBA in Human Resource Management from BRAC University, Bangladesh, and a BBA in Human Resource Management from Stamford University Bangladesh. He has contributed his expertise to both the non-profit sector and the financial industry, particularly in the human resources, where he played a pivotal role in organizational development and employee management. His passion for information technology and its crucial role in today's world, his commitment to extensive research aimed at advancing the field and honing his skills. Mr. Mamun's diverse educational background uniquely positions him to contribute valuable insights to the intersection of information technology and human resource management, making him an asset in various research and journal endeavors.

At the moment Syed Mominul Islam is working with his thesis project under the department of Computer science and engineering, Bangladesh University. He is working as an executive software developer with REVENCO. In future he wants to work with a research team under the sector of communication technology.

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MD Tanver Rana Sobur has completed his bachelor degree from the course of computer science and engineering in 2023. Now he is working with a government project where his role is like a python trainer. Moreover, he is also awarded by Stellarlocal Volunteer and Program Participator from NASA international Space Apps Challenge. In the future he wants to work in Artificial Intelligence and learn a lot of knowledge about the machine learning and deep learning.