



Implementation of a Real-Time Wi-Fi Voucher Notification System Utilizing Telegram API Bot

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ABSTRACT

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Keywords:

notification system, Wi-Fi voucher, effectiveness, telegram bot notification, wireless access network

This study presents a novel approach to improve the efficacy, efficiency, user engagement, and security in Wi-Fi voucher notification systems. The proposed method leverages the capabilities of Telegram API bot notifications to create an automated, real-time system for Wi-Fi voucher distribution. Notifications are dispatched rapidly and effectively, reducing human intervention and potential delivery issues. The system enhances user engagement by allowing interaction with the bot through predefined commands or responses. This interactive feature enables users to access information about Wi-Fi vouchers, modify their notification preferences, and perform other Wi-Fi-related tasks. To develop this system, the research methodology employed six stages: Preparation, Planning, Design, Implementation, Operation, and Optimization. This resulted in a notification system that could monitor various aspects of the network and inform network managers in real-time. Key features include the purchase of Internet vouchers, active user monitoring, tracking of all users, tracking of multiple subscribers connected to the integrated hotspot network, and monitoring of upload and download traffic on the hotspot network. This research contributes to the field of wireless access networks by demonstrating an effective use of Telegram API bot notifications, thereby setting a precedent for their application in similar scenarios.

1. INTRODUCTION

Telegram bots have recently gained traction as a notable mode of user communication and interaction [1]. Their utility ranges from various purposes, with a notable application being the provision of user notifications [2, 3]. An intriguing avenue of research is the implementation of Telegram bots for the purpose of Wi-Fi voucher notifications, given the widespread usage of this platform [4-6].

Traditional methods of notification delivery, such as Short Message Service (SMS) or electronic mail (email), pose a set of limitations [7]. Extra costs associated with SMS and the potential for emails to be relegated to spam folders serve as significant impediments [8]. As such, this research seeks to investigate the viability of Telegram bots as a more efficient and effective alternative for disseminating Wi-Fi voucher notifications [9].

Leveraging Telegram bot notifications [10] allows for the automation of the notification process, thereby enhancing the flexibility in structuring and customizing outgoing messages [11]. This investigation, therefore, aims to delve into this potential and assess the efficiency and utility of an automated notification system employing Telegram bots [12].

User responsiveness tends to increase when notifications are delivered via platforms in active use, such as instant messaging applications [13]. Hence, the utilization of Telegram bots in this study is expected to boost user

engagement by delivering Wi-Fi voucher notifications through extensively used and interactive platforms [14, 15].

In the realm of Wi-Fi voucher notification systems, user security and privacy emerge as critical considerations [16]. Telegram bots offer a layer of encryption and security, ensuring the confidentiality of transmitted information [17, 18]. Accordingly, this study aims to explore the potential security benefits and privacy enhancements offered by Telegram bots in the context of Wi-Fi voucher notification delivery [19].

The research questions guiding this project are: How can a Wi-Fi voucher notification system be implemented using Telegram bot notifications, and how does the use of such notifications influence the effectiveness, efficiency, user engagement, and security of the Wi-Fi voucher notification system [20, 21]? The objective of this research is to implement a Wi-Fi voucher notification system using Telegram bot notifications and enhance effectiveness, efficiency, user engagement, and security in notifying users about the availability of Wi-Fi vouchers [22].

2. RESEARCH METHODS

PPDIOO is a Cisco network service policy or, more generally, a Cisco method for assessing networks that is intended to identify the beginning of a network failure [23].

PPDIOO stands for Prepare, Plan, Design, Implement, Operate, and Optimize. The PPDIOO paradigm, which stands for Prepare, Plan, Design, Implement, Operate, and Optimize, is a troubleshooting approach that Cisco defines [24]. Consequently, in this study, hotspot network monitoring is designed using Telegram notifications. Figure 1 illustrates the steps taken utilizing this type of study:

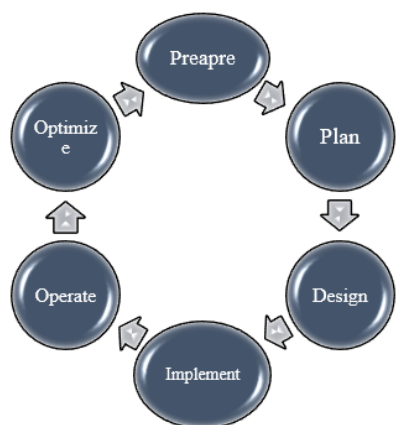


Figure 1. Research methods

(A) Preapre

At this stage, before carrying out a Wi-Fi notification system using telegram bots. at the prepare stage, namely preparing hardware requirements and software requirements.

(B) Plan

At the plan stage, designing an analysis of how the Wi-Fi

voucher notification system works using telegram bots which are converted into block diagrams.

(C) Design

At this design stage discussing high level design and low level design to understand the concept of a Wi-Fi voucher notification system using telegram API bot.

(D) Implement

Monitoring the network and implementing Telegram Bot API alerts are stages of the implementation process.

(E) Operate

At this stage of operation, the experiment uses a bot program integrated with a proxy router to run a Wi-Fi voucher notification system using a telegram bot.

(F) Optimize

at the optimize stage get device maintenance. starting with hardware, software, and other requirements for the bot design, such as observing network influences and including all necessary components.

3. RESULT

At this point, the findings of the research entitled "Wi-Fi voucher notification system using telegram API bot notification" will be discussed.

3.1 Prepare

The author completed the preparation phase, which includes preparing in Table 1 the hardware and Table 2 the software required, before monitoring Internet usage.

Table 1. Hardware requirements (Hardware)

No	Device Name	Function
1.	Laptops	The laptop is used for hotspot configuration on the Mikrotik RouterBoard.
2.	UTP cable	Connecting from a computer to other network devices such as routers and switches
3.	Mikrotik RouterBoard	Connecting from one computer to another computer. So, in a computer network that requires the Internet, a tool is needed to connect it.
.	Smartphone	As a client connected Wi-Fi
5.	Access Point TP-Link CPE 220	As a signal transmitter
6.	Switch Tp-Link Tl Sf1008d	To connect a number of computer devices so that they can exchange packets and forward data to various destination devices.

Table 2. Software requirements (Software)

No	Device Name	Function
1.	Winbox	The utility used for connectivity and configuration of Mikrotik uses the Mac Address or IP protocol
2.	Microsoft Visio	Software used to create flowcharts.
3.	Telegram	We can access the Telegram Bot, even though we are far away. Also, with the Telegram Bot, we can monitor our hotspot voucher system which is far outside the region.

3.2 Plan

After the equipment in the prepare stage has been prepared, create an analysis of the system's workings that is transformed into a block diagram so that researchers may comprehend the system's design's flow or function.

According to Figure 2, the system starts working when a user connects to an SSID hotspot and displays the login page. If the user already has a voucher, they can enter it or scan a barcode. If they don't, they go to the voucher page and choose the sort of voucher they want. The client registers for a Telegram account on the CGR Bot by clicking the "buy" button, which

directs them to the Telegram application where they can access the CGR Bot. Then, after correctly filling out the base deposit to purchase the voucher, the customer can select and purchase a voucher in the deposit. Upon successful purchase, a barcode, voucher ID, and expiration date will be shown. The Administrator can then monitor the total Voucher account on the Wi-Fi network and can monitor clients who are currently using the CGR net Wi-Fi network after the client enters the Voucher id on the login page, successfully logs in, and receives a notification that the client has successfully logged in to the Telegram Bot.

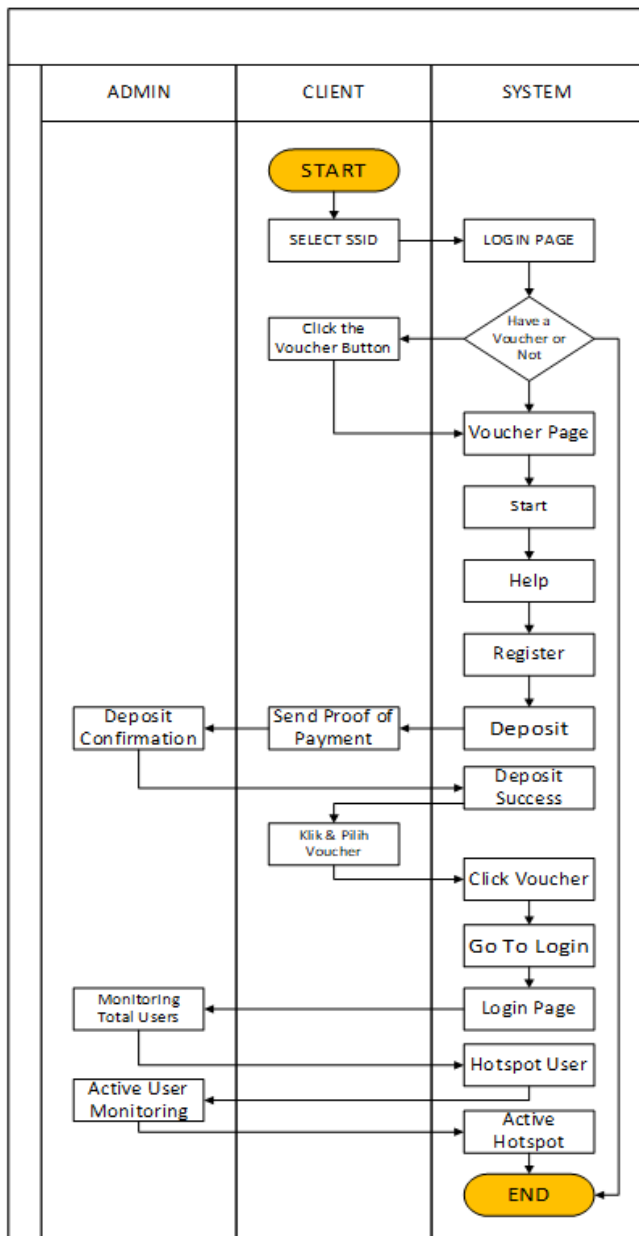


Figure 2. How the system works

3.3 Design

At this point, it has topology and network infrastructure that have been modified to fit the Cibanteng rt01/rw08 environment's Wi-Fi network infrastructure. The network system utilized in this research to explain and facilitate the idea of network topology is referred to as topology. Network topology is displayed in both high-level and low-level designs.

3.3.1 High Level Design Wi-Fi RT.RW Net

The High Level Design of the RT Wi-Fi network structure is shown in Figure 3. An Internet source from an ISP that is obtained using a modem and is identified as RW Net in the Cibanteng environment has an internet provider (IP) address of 192.168.x.x/24. When a client successfully logs in, the Telegram Bot notifies him via Ether 1 mikrotik, which is connected to the modem for setting DHCP Client has IP Address 192.168.x.x/24, gateway 192.168.x.x/24, Access Point is connected to mikrotik for hotspot lines for clients connected wirelessly, and internet provider (IP) Address dhcp with range 10.10.xx.x-xxx. The Dynamic Host Configuration Protocol (DHCP) server for the tp-link t1008sd switch, which connects residential clients using Local Area Network (LAN) cables, is located at 192.168.xx.x-xxx. After a client successfully signs in, the Telegram Bot notifies them.

3.3.2 Low Level Design Wi-Fi RT. RW Net

Low Level Design discusses the RT Wi-Fi network's structural design in Figure 4. RW Net's IP address in the Cibanteng environment is 192.168.x.x/24, and it is used to identify internet traffic flow from Internet Service Provider (ISP). flow of traffic When a client successfully logs in, the Telegram Bot notifies him. Ether 1 mikrotik is connected to the modem for setting Dynamic Host Configuration Protocol (DHCP) Client has internet protocol (IP) Address 192.168.x.x/24, gateway 192.168.x.x/24, Access Point traffic flow is connected to mikrotik for hotspot lines for clients connected wirelessly has internet protocol (IP) Address dhcp with range 10.10.xx.x-xxx. A Dynamic Host Configuration Protocol (DHCP) server at 192.168.xx.x-xxx manages traffic flow from the Tp-Link Tlsf1008sd switch to home clients connecting via Local Area Network (LAN) cable. After a client successfully signs in, the Telegram Bot notifies them.

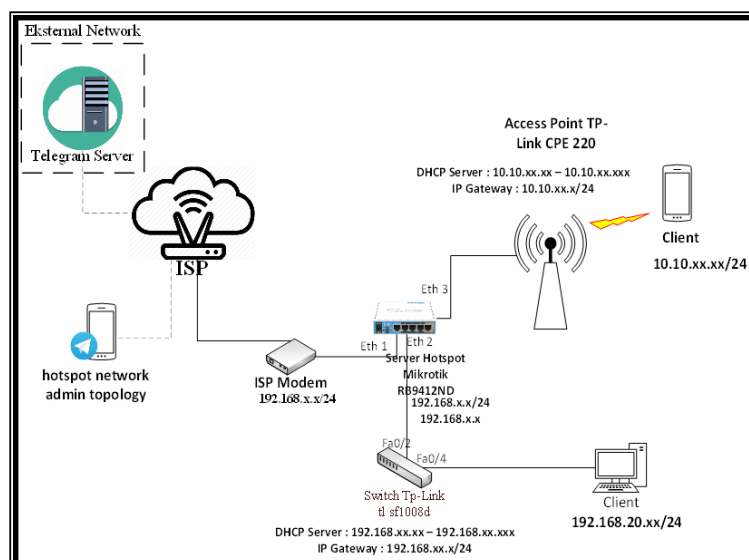


Figure 3. High level design

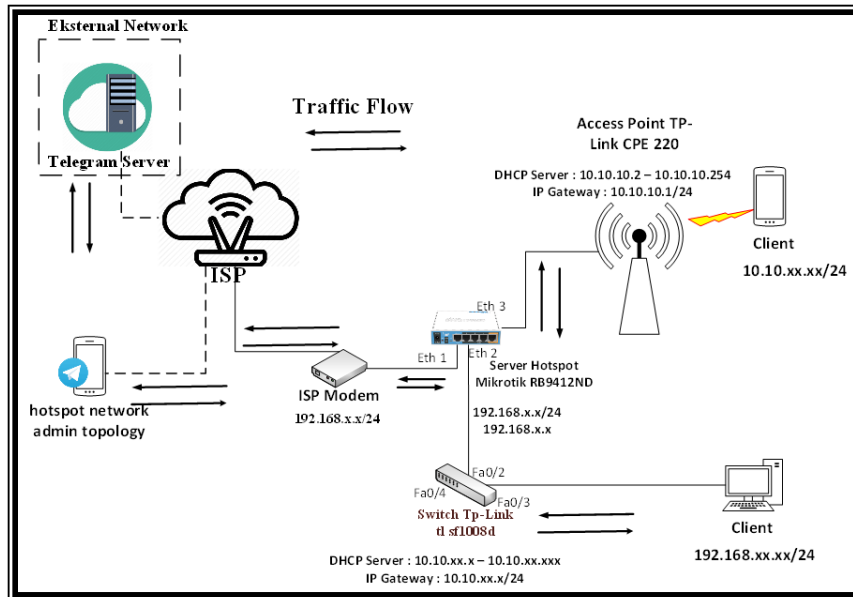


Figure 4. Low level design Wi-Fi RT. RW Net

Interface	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx	FP Tx Packet (p/s)	FP Rx Packet (p/s)
R	internet-ether1	Ethernet	1500	1598	176.9 kbps	7.2 Mbps	286	610	178.6 kbps	7.3 Mbps	294	610
S	lokal-hotspot-e...	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0	0
RS	lokal-lan-ether2	Ethernet	1500	1598	6.9 Mbps	183.4 kbps	584	297	7.4 Mbps	184.5 kbps	635	297
S	lokal-lan-ether3	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0	0
S	lokal-lan-wlan1	Wireless (Atheros AR9...	1500	1600	0 bps	0 bps	0	0	0 bps	0 bps	0	0
S	lokal-hotsp...	Virtual	1500	1600	0 bps	0 bps	0	0	0 bps	0 bps	0	0
R	lokal-master-h...	Bridge	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0	0
R	lokal-master-lan	Bridge	1500	1598	7.3 Mbps	183.4 kbps	621	304	0 bps	178.6 kbps	0	304
R	pwr-line1	PWR	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0	0

Figure 5. Port interface

3.4 Implement

Monitoring the network and removing Telegram Bot API alerts are carried out during the implementation stage. This step of implementation is already finished.

3.4.1 Implement Mikrotik

In Figure 5 there is a port interface, Each computer network's capacity can be configured and shared by Mikrotik, and the bandwidth for international and domestic data traffic can be separated.

On the ether 1 port, namely Public Internet Interface/ISP-ether1.

On the ether 2 port, namely Interface LAN-ether2.

On the ether 3 port, namely Interface LAN-ether3 is for

Mikrotik RouterBoard external access point

(a) Steps in Hotspot configuration

The first thing that needs to be done in order to configure a Mikrotik hotspot is to configure the Access Point on the local-master-hotspot before configuring the hotspot on the ether Access Point.

In Figure 6 Hotspot setup. Open in IP menu -> Hotspot -> Hotspot Setup.

Then click the Hotspot Setup button, the Hotspot wizard will guide us through the settings by displaying dialog boxes at each step.

In Figure 7 Hotspot Interface. Next we are asked to specify the interface where the hotspot will be activated. In this case, the hotspot is activated on the local-master-hotspot, which we have set as an Access Point (ap-bridge). Then click Next.

In Figure 8 DNS Name. The last step, specify the username and password to log into your hotspot network.

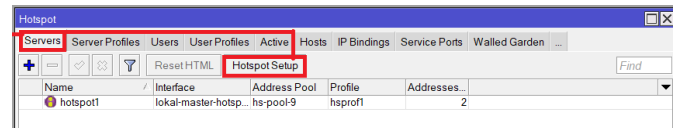


Figure 6. Hotspot setup

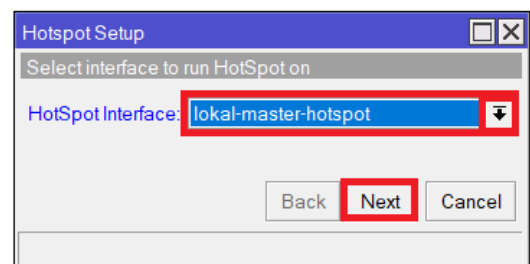


Figure 7. Hotspot interface

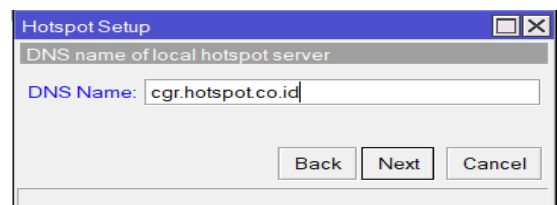


Figure 8. DNS name

Name	Interface	Address Pool	Profile	Addresses...
hotspot1	lokal-master-hotsp...	hs-pool-9	hsprof1	2

Figure 9. Local hotspot-master-hotspot configuration results

Name	Session Time	Idle Timeout	Shared U	Rate Limit (x/tx)
default		none	1	1 2048k/2048k
voucher-6-jam...		none	1	2048k/2048k
voucher-1-jam...		none	1	2048k/2048k
voucher-7-hair...		none	1	2048k/2048k
voucher-12-ja...		none	1	2048k/2048k
voucher-24-ja...		none	1	2048k/2048k
voucher-30-har...		none	1	2048k/2048k

Figure 10. User profile

In Figure 9 Local Hotspot-Master-Hotspot Configuration Result. Next, we have finished configuring the hotspot profile settings.

(b) Configuration Create a User Voucher account and Hotspot login Password

In Figure 10 User Profile. Then, we provide each user a User Voucher account and a password. The secret is to open the IP menu, select Hotspot, choose User, and then enter the server name, password, and profile information. Like the following:

The following stage is to develop a User Profile and restrictions that will be offered to users through the menu: IP >> Hotspot >> User Profile >> add new, enter the name parameter, and adhere to the restrictions. The current rate limits are briefly explained as follows: Transfer to give quota-based limitations, download and upload to assess data speed, and uptime to establish internet access consumption caps.

3.4.2 Implementing The Application

(a) BotFather Telegram

We look for and invite @BotFather in the search column before configuring Telegram since it monitors user logins and lets us know when a user logs out and back in via the Telegram program can keep track of a user for 24 hours, therefore we can keep track of login and logout times. We build the boot using the name: /newBot, and after that, a description will display asking us to choose the name of the Bot that will be created automatically. In Figure 11 bot father this case, I'll create the Bot first as an example: CGR WI-FI Bot.

(b) Fire Bot

Developer which is a separate entry. Its main function is to help human users which is officially supported by Telegram.

• Get API Tokens

As this account has never been used before, I'll use its name, CGR WI-FI Bot, in Figure 12 API tokens here, and it will immediately function as shown in the figure below.

• Running Hotspot Scripts

Script hotspot. This Hotspot script will be able to send login and logout messages to the Wi-Fi hotspot that we got on the Telegram Bot token fire earlier, so next we will insert the script on the User Profile menu -> User hotspot (which we created before) -> Script.

• Mikrotik Script with Telegram Bot

Figure 13 shows a Mikrotik script and a Telegram bot. It goes without saying that you must have a web server and at least a basic understanding of PHP programming in order to develop a Telegram Bot that you can talk with [25]. If you don't have either of those things, however, the process can be very challenging [6]. In this article, we'll create a Telegram bot

that we can use to invite others to "chat" while also keeping an eye on the health of our Mikrotik by using the Scheduler system and system script capabilities [26].

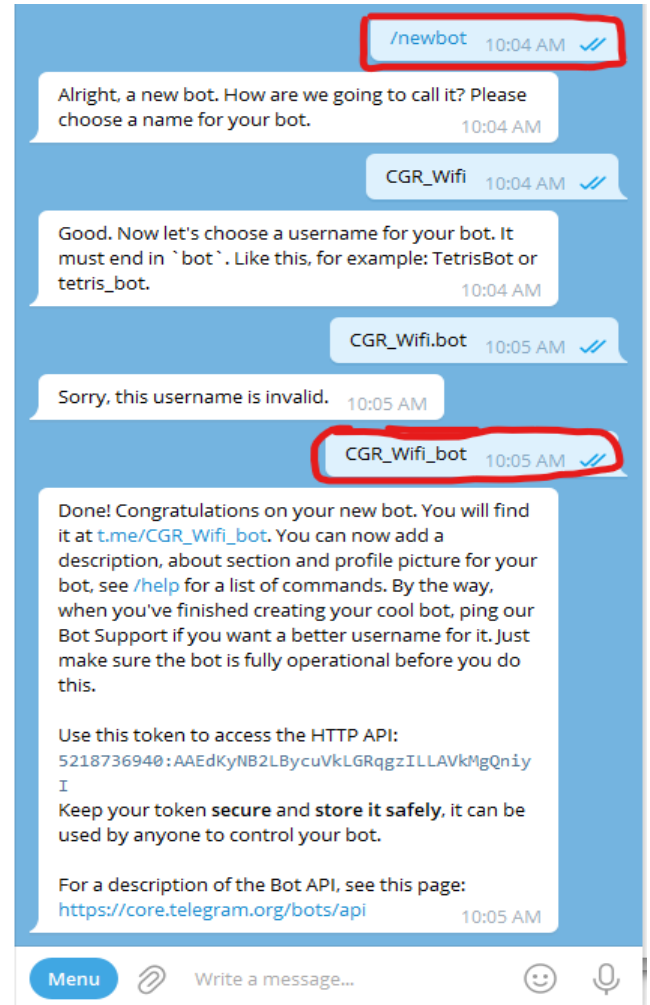


Figure 11. Bot father

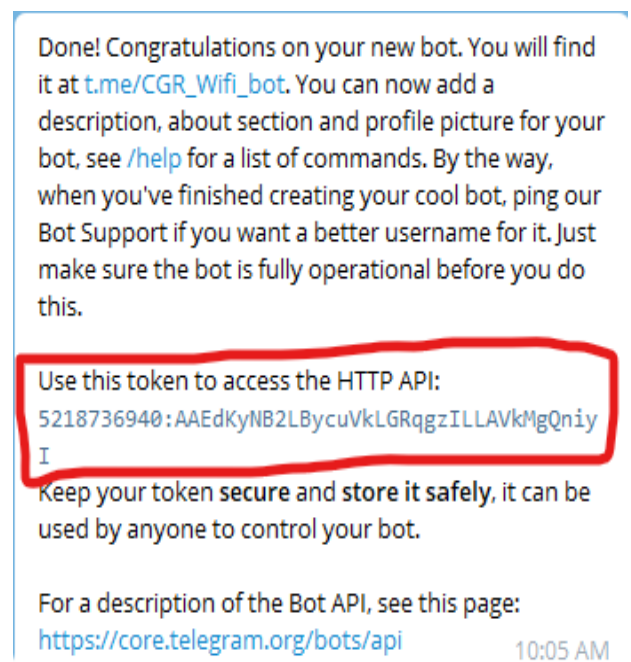


Figure 12. API tokens

Name	Owner	Last Time Started	Run Count
::: mikhmon			
jul/19/2022- -0...	jul2022		0
::: mikhmon			
jul/19/2022- -0...	jul2022		0
::: mikhmon			
jun/15/2022- -0...	jun2022		0
::: mikhmon			
jun/16/2022- -2...	jun2022		0
::: mikhmon			
jun/30/2022- -1...	jun2022		0
::: mikhmon			
mar/26/2022- -...	mar2022		0
::: mikhmon			
mar/30/2022- -...	mar2022		0
::: mikhmon			
mar/30/2022- -...	mar2022		0
::: mikhmon			
may/08/2022- -...	may2022		0
reboot-report	mikhmon	Jul/19/2022 11:03:49	1
tg_cmd_cpu	mikhmon		0
tg_cmd_dhcp	mikhmon		0
tg_cmd_disab...	mikhmon		0
tg_cmd_enabl...	mikhmon		0
tg_cmd_force...	mikhmon		0
tg_cmd_help	mikhmon		0
tg_cmd_hotspot	mikhmon		0
tg_cmd_interf...	mikhmon		0
tg_cmd_monit...	mikhmon		0
tg_cmd_ping	mikhmon		0
tg_cmd_public	mikhmon		0
tg_cmd_reboot	mikhmon		0
tg_cmd_stop	mikhmon		0
tg_config	mikhmon		0
tg_getUpdates	mikhmon	Jul/19/2022 13:28:05	869
tg_getkey	mikhmon		0
tg_sendMess...	mikhmon		0

41 items

Figure 13. Script with telegram bot

3.5 Operate

The operating phase is an experiment in using the created Bot program [27]. The Monitoring system is used to test the Bot software so that each step can be seen.

3.5.1 Instructions via smartphone device

Here are the steps to use ie:

- Connect your smartphone to Wi-Fi using the SSID CGR Net Hotspot as the network name [28].

- When prompted, enter the username and password that the administrator has provided to the user on the hotspot login page. In Figure 14, if the client does not have a voucher code, choose the Voucher button.

Vouchers page in Figure. A voucher page will then open, allowing the customer to select a voucher before clicking the "purchase voucher" button [29, 30].

- Will open the Telegram program page, after which the user clicks the Telegram Bot's restart button to initiate a conversation.

- Shows a list of executable functions in Figure 15. To view a list of executable functions, the client then inputs the Telegram Bot /help function.

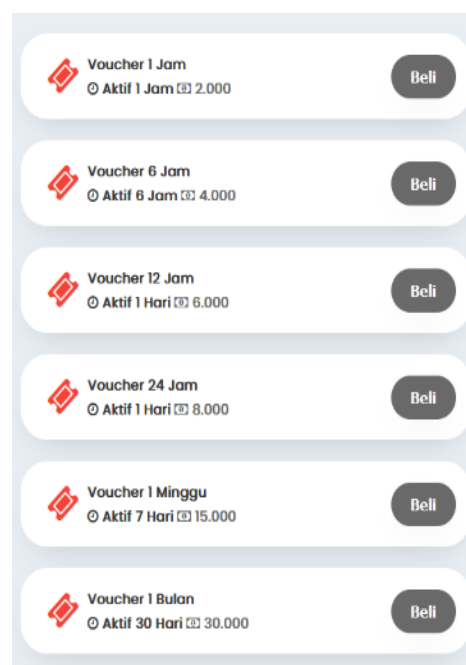


Figure 14. Vouchers page

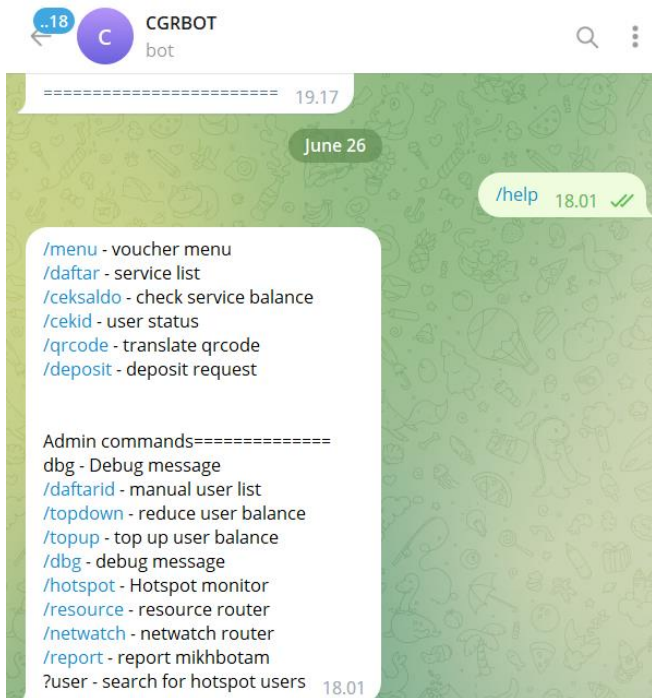


Figure 15. Displays a list of executable functions

The client then enters information on the cgrBot / list page to register the client's User ID with the Admin on the Telegram Bot page.

The client then types on the /deposit page to ask the administrator for a balance deposit.

Once the amount has been successfully topped off, the customer can begin purchasing Vouchers.

Buy vouchers in Figure 16; client to select voucher from list below.

The client hits the Go to Login button in Figure 17 to return to the Wi-Fi Cgrnet login page after receiving a message from the Telegram Bot with the barcode, voucher id, and expiration date.

We then enter the Voucher code that was provided by the Telegram Bot in Figure 18 Login Page Hotspot.

When we succeed, the Telegram Bot we earlier constructed will receive an automatic notification that the hotspot account has signed in.

Once the user has finished using the hotspot account, it automatically logs out on its own and notifies the administrator via the Telegram app that the voucher has successfully logged out. A message from the Telegram Bot will then appear with the IP Address, mac Address, device, voucher package, time used, amount of quota, used quota, remaining quota, and expired information.

Figure 19: Total User On the Hotspot user page, enter the desired search term to view the total number of registered users and Voucher accounts. Monitoring total users also covers user profile kinds, mac addresses, usernames, and passwords.

Figure 20 shows an active user. To find out which client is utilizing the cgr net Wi-Fi, type on the hotspot user page to monitor the presently active client. Id, username, IP address, uptime, byte IN, byte out, session, and login are all included in the message sent by the active monitoring client.

3.6 Optimize

Planning. starting with the necessary gear, software, and other requirements for bot design, such as observing network effects.

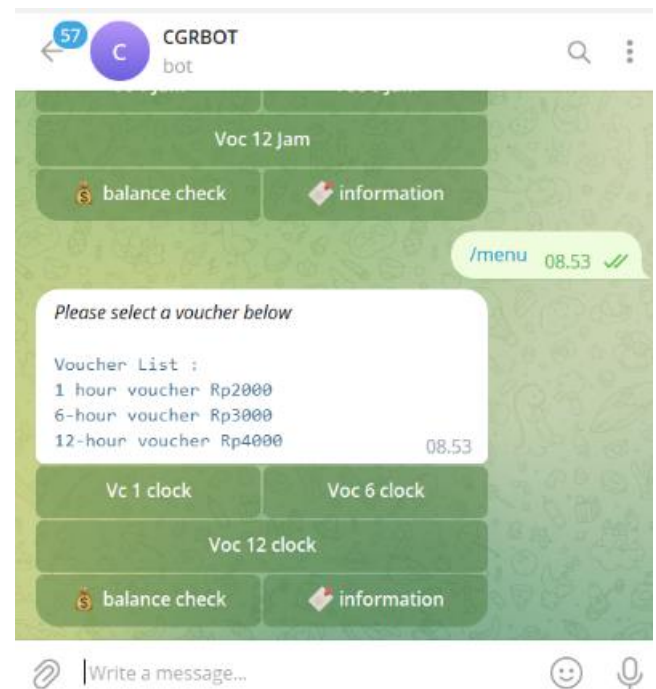


Figure 16. Buy vouchers



Figure 17. Voucher client

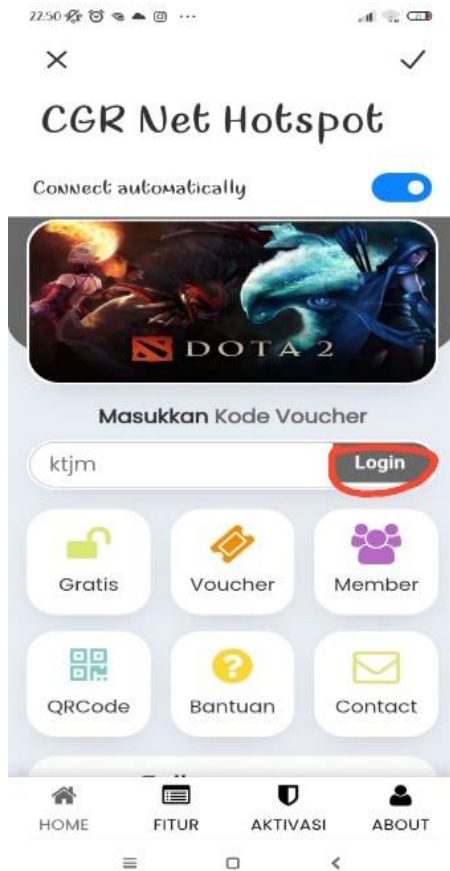


Figure 18. Login page hotspot

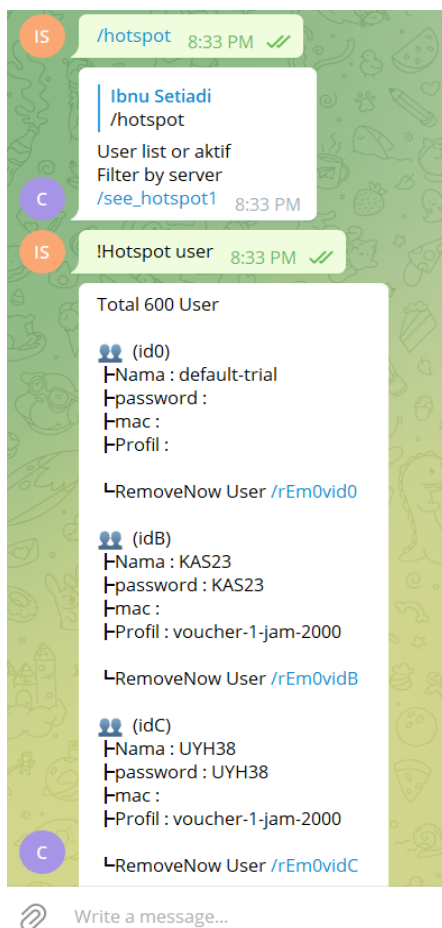


Figure 19. Total user

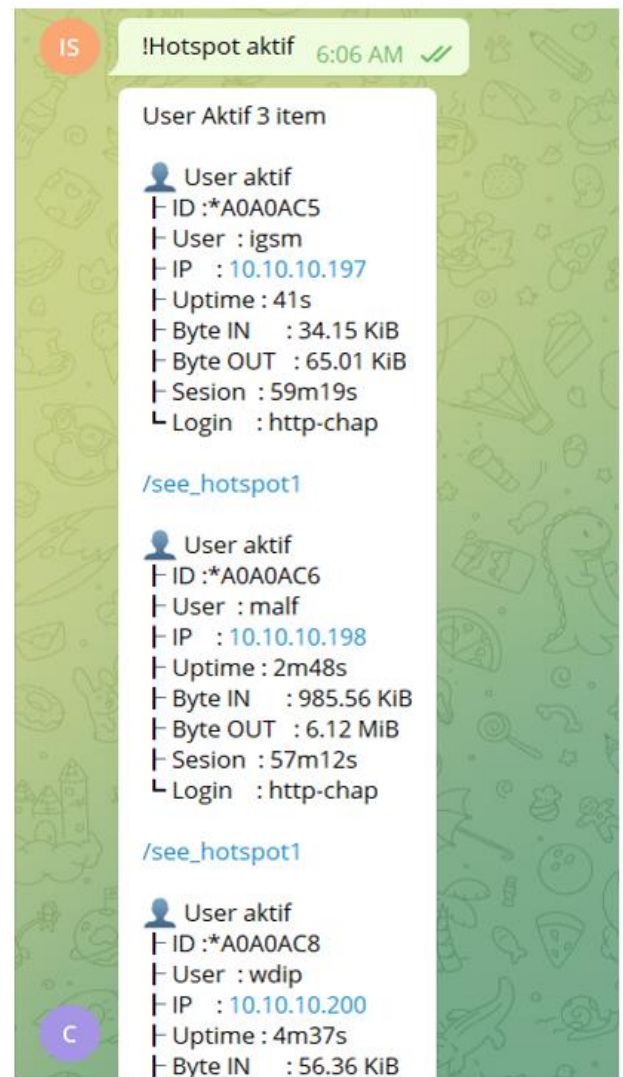


Figure 20. Active user

4. CONCLUSIONS

The following are some of the conclusions that can be drawn: a. RT network system. RW Net network system based on Wi-Fi hotspots as a solution to help people access the internet easily and cheaply. b. Using telegram bots on Internet hotspot vouchers is very helpful for the process of purchasing Internet packages so it is very easy for users. c. By using Telegram Bot, it is hoped that it can make it easier for Admins to monitor users. d. The designed Telegram bot is able to send message information to users via the telegram application regarding the list of hotspot users who are active and inactive. The designed Telegram bot is able to send message information to users via the telegram application regarding the list of hotspot users who are active and inactive.

REFERENCES

- [1] Fernández-Álvarez, P., Rodríguez, R.J. (2022). Extraction and analysis of retrievable memory artifacts from Windows Telegram Desktop application. Forensic Science International: Digital Investigation, 40: 301342. <https://doi.org/10.1016/j.fsidi.2022.301342>
- [2] Nguyen, T.T., Le, A.D., Hoang, H.T., Nguyen, T. (2021).

- NEU-chatbot: Chatbot for admission of National Economics University. *Computers and Education: Artificial Intelligence*, 2: 100036. <https://doi.org/10.1016/j.caeai.2021.100036>
- [3] Zakiyyah, A.M., Rahman, M. (2021). Internet Service Provider (ISP) RT-RW NET Di Desa Kasiyan Timur Kec. Puger Kab. Jember. *Jurnal Pengabdian Masyarakat IPTEKS*, 7(1): 30-36. <https://doi.org/10.32528/jpmi.v7i1.4246>
- [4] Hakim, D.K., Nugroho, S.A. (2020). Implementasi Telegram bot untuk monitoring mikrotik router. *Sainteks*, 16(2): 151-157. <http://doi.org/10.30595/sainteks.v16i2.7132>
- [5] Husna, M.A., Rosyani, P. (2021). Implementasi sistem monitoring jaringan dan server menggunakan zabbix yang terintegrasi dengan grafana dan telegram. *JURIKOM (Jurnal Riset Komputer)*, 8(6): 247-255. <http://doi.org/10.30865/jurikom.v8i6.3631>
- [6] Lim, H.M., Abdullah, A., Ng, C.J., Teo, C.H., Valliyappan, I.G., Hadi, H.A., Ng, W.L., Azhar, A.M.N., Chiew, T.K., Liew, C.S., Chan, C.S. (2021). Utility and usability of an automated COVID-19 symptom monitoring system (CoSMoS) in primary care during COVID-19 pandemic: A qualitative feasibility study. *International Journal of Medical Informatics*, 155: 104567. <https://doi.org/10.1016/j.ijmedinf.2021.104567>
- [7] Campagnola, M., Burlibasa, A., Gutman, L.M. (2022). Barriers and enablers to the delivery of email communication for a helpline service for young people. *PEC Innovation*, 1: 100059. <https://doi.org/10.1016/j.pecinn.2022.100059>
- [8] Bonaretti, D., Fischer-Preßler, D. (2021). The problem with SMS campus warning systems: An evaluation based on recipients' spatial awareness. *International Journal of Disaster Risk Reduction*, 54: 102031. <https://doi.org/10.1016/j.ijdrr.2020.102031>
- [9] Nobari, A.D., Sarraf, M.H.K.M., Neshati, M., Daneshvar, F.E. (2021). Characteristics of viral messages on Telegram; The world's largest hybrid public and private messenger. *Expert Systems with Applications*, 168: 114303. <https://doi.org/10.1016/j.eswa.2020.114303>
- [10] Panjaitan, F., Syafari, R. (2019). Pemanfaatan notifikasi telegram untuk monitoring jaringan. *Simetris: Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*, 10(2): 725-732. <https://doi.org/10.24176/simet.v10i2.3530>
- [11] Adam, S., Suryadi, A. (2022). Monitoring notifikasi status services pada os linux menggunakan bot telegram. *Bulletin of Computer Science Research*, 3(1): 103-108. <https://doi.org/10.47065/bulletincsr.v3i1.219>
- [12] Androutsopoulou, A., KaracAPIlidis, N., Loukis, E., Charalabidis, Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. *Government Information Quarterly*, 36(2): 358-367. <https://doi.org/10.1016/j.giq.2018.10.001>
- [13] Gavilan, D., Fernández-Lores, S., Martínez-Navarro, G. (2020). Vividness of news push notifications and users' response. *Technological Forecasting and Social Change*, 161: 120281. <https://doi.org/10.1016/j.techfore.2020.120281>
- [14] Hanif, M., Kamisutara, M. (2021). Sistem monitoring trafik pada mikrotik berbasis App mobile dengan notifikasi telegram. *Network Engineering Research Operation*, 6(1): 1-10. <http://doi.org/10.21107/nero.v6i1.169>
- [15] Suryanto, Permadi, F.A. (2019). Optimalisasi jaringan internet hotspot menggunakan user manajemen pada pusat pengembangan SDM asuransi Indonesia. *Jurnal Infotech*, 1(2): 59-67. <https://doi.org/10.31294/infotech.v1i2.7083>
- [16] Rosdiyani, T. (2020). Pemasangan jaringan internet berbasis wireless fidelity (WI-FI) di kampung wangun cipurut. *ABDIKARYA: Jurnal Pengabdian Dan Pemberdayaan Masyarakat*, 2(2): 181-191. <https://doi.org/10.47080/abdikarya.v2i2.1074>
- [17] Kresna, M., Susilo, K.E. (2021). Monitoring level air pada waduk secara realtime berbasis IoT memanfaatkan aplikasi telegram. *Jurnal SISKOM-KB (Sistem Komputer dan Kecerdasan Buatan)*, 5(1): 29-37. <https://doi.org/10.47970/siskom-kb.v5i1.223>
- [18] Nastiti, S.D., Ramadan, D.N., Tulloh, R. (2021). Sistem monitoring untuk laporan gangguan indihome dengan bot telegram. *eProceedings of Applied Science*, 7(5): 1892-1907.
- [19] Wahyudi, D., Nalendra, A.K., Wahyudi, M.I., Lestari, H. P. (2022). Penerapan sistem voucher pada jaringan RT/RW-Net menggunakan mikhmon. *JAMI: Jurnal Ahli Muda Indonesia*, 3(1): 51-60. <https://doi.org/10.46510/jami.v3i1.95>
- [20] Sa'adiyah, H., Doni, S., Syamsir, S. (2020). Pemanfaatan telegram bot untuk pemenuhan kebutuhan informasi sivitas akademika UIN imam bonjol padang selama pandemi korona. *TADWIN: Jurnal Ilmu Perpustakaan dan Informasi*, 1(1): 32-43. <https://doi.org/10.19109/tadwin.v1i1.5815>
- [21] Falaq, J.A., Tulloh, R., Iqbal, M. (2021). Implementasi jaringan hotspot berbayar berbasis voucher menggunakan platform google cloud. *eProceedings of Applied Science*, 7(4): 861-876.
- [22] Shaengchart, Y., Kraiwanit, T., Butcharoen, S. (2023). Factors influencing the effects of the Starlink Satellite Project on the internet service provider market in Thailand. *Technology in Society*, 74: 102279. <https://doi.org/10.1016/j.techsoc.2023.102279>
- [23] Pratama, M.F., Irawan, A.S.Y., Suharso, A. (2021). Implementasi routing pada jaringan local area network menggunakan router di PT. Surya Baja Teknik dan Surya Rasa. *Jurnal Ilmiah Wahana Pendidikan*, 7(4): 658-664. <https://doi.org/10.5281/zenodo.5267122>
- [24] Farabi, A. (2021). Penerapan metode PPDIOO pada jaringan internet berbasis wireless di kantor kementerian agama kota prabumulih. *Prosiding Seminar Nasional Sains dan Teknologi Terapan*, 4: 455-459.
- [25] Rahman, M.F., Yaqin, M.A. (2019). Absensi QR code berbasis e-confirmation (bot telegram) dan E-notification dengan teknologi Google Access. *Teknika: Engineering and Sains Journal*, 3(1): 7-12. <http://doi.org/10.51804/tesj.v3i1.402.7-12>
- [26] Mulyanto, A.D. (2020). Pemanfaatan bot telegram untuk media informasi penelitian. *MATICS: Jurnal Ilmu Komputer dan Teknologi Informasi (Journal of Computer Science and Information Technology)*, 12(1): 49-54. <https://doi.org/10.18860/mat.v12i1.8847>
- [27] Mukti, Y.I. (2019). Implementasi jaringan hotspot kampus menggunakan router mikrotik. *Indonesian Journal of Computer Science*, 8(2): 130-138.
- [28] Said, L.Y., Jatmika, A.H., Arimbawa, I.W.A. (2019). Sistem pendaftaran hotspot online berbasis web

- menggunakan mikrotik API, PHP, MySql Pada SMK plus nurul hakim kediri. Jurnal Teknologi Informasi, Komputer, dan Aplikasinya (JTika), 1(2): 141-148. <https://doi.org/10.29303/jtika.v1i2.28>
- [29] Dasmen, R.N., Syarif, A.R., Saputra, H., Amrullah, R. (2022). Perancangan keamanan internet jaringan hotspot mikrotik pada winbox dan wireshark. DoubleClick: Journal of Computer and Information Technology, 5(2): 71-79. <http://doi.org/10.25273/doubleclick.v5i2.11751>
- [30] Tantoni, A., Zaen, M.T.A., Imtihan, K. (2022). Analisis mapping cakupan sinyal SSID dengan metode PPDIOO untuk mendukung pelaksanaan ujian semester sekolah menggunakan smartphone Android. Jurnal Sistem Komputer dan Informatika (JSON), 3(4): 483-492. <https://doi.org/10.30865/json.v3i4.4139>