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Smart Home Network Design Using The Network Development Life Cycle Method

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Abstract

In this modern era, almost all electronic devices can be connected to a computer network. Not only electronic items such as smartphones, laptops, computers, household appliances can also be connected to a computer network. This is all thanks to the concept of a smart home which allows us to build any device in the home just by talking without supervision, and we can manage it through our closest device. Our life is easier because we do not need to exert much energy anymore. The purpose of this research is how to design and implement a network for a smart home using the Network Development Life Cycle method. This network design is connected to smart home devices such as routers, smart speakers, smart lamps, smart TVs, smartphones, and laptops. The interconnection media used are wired and wireless. The network to be implemented as a security system that is one of the accesses to IoT users and devices and has bandwidth settings so that all devices get bandwidth allocation so that they can be accessed easily.

Keyword:

Computer Networks, Network Security, IoT, Bandwidth Management, Mikrotik, and Smart Home

Introduction

In this modern era, almost all electronic devices can be connected to a computer network. Not only electronic items such as smartphones, laptops, computers, household appliances can also be connected to a computer network. This is all thanks to the concept of a smart home which allows us to manage any device in the house just by talking, without touching, and we can manage it through our closest device. Our life is getting easier because we do not need to spend a lot of energy anymore. Based on the previous explanation, of course we need to know how to connect the devices to the network that we created so that we can manage them via smartphones or smart speakers. Therefore, the aim of this research is how

to design and implement a network for a smart home using the Network Development Life Cycle method.

Literature Review

- **Computer Networks**

Computer networks are several computer devices that are connected simultaneously to one another. Where aims to share resource data. One such data source is the internet (Muhammad, 2020).

- **Internet of Things**

Networks formed by things or objects that have identity, in a virtual world that operates in that space by using interface intelligence to connect and communicate with users, social and environmental contexts (Pritawidyaningtyas, 2015).

- **Bandwidth Management**

Bandwidth Management is away can be used for management and optimize various types of networks with implement Quality of Service (QoS) services for specifies the types of network traffic. While QoS is the ability to describe a level of achievement in a system data communication (Masykur & Prasetiyowati, 2016).

- **Smart Home**

Smart Home is combined application of technology and service devoted to the home environment with specific functions aimed at enhancing safety, efficiency, and convenience occupants. Smart home system usually consists of monitoring devices, control, and automatic devices there are several devices that can be accessed using computer.

Research Method

The following are the research methods used in the development of the Smart Home network which includes: a. Data collection techniques, several data collection techniques that will be carried out, namely: 1) Observation, is a data collection technique by making direct observations of objects. 2) Interview, namely conducting questions and answers with respondents face to face. 3) Literature study, which is studying and collecting various kinds of information through literature, books, the internet, and various sources related to this research. b. Development Model, the author uses the Network Development Life Cycle model for designing a Smart Home network. This method itself is divided into several stages, the following is the explanation (Sanjaya & Setiyadi, 2019):

1. Analysis

At the initial stage, the writer needs to know the needs, problems, and desires of the users as well as the existing network topology. At this stage, the authors analyse it by

conducting a direct survey in the field to determine the state and condition of the real user.

2. Design

After getting the data I need, at this stage, the author will make a network topology design that will be implemented.

3. Prototype Simulation

At this stage, the topology design that has been created will be implemented first with the help of special tools in the network field such as Packet Tracer. The purpose of implementing this tool is as a presentation and sharing material whether the network topology applied is good enough to be applied directly.

4. Implication

This stage will take quite a long time because everything that has been planned and designed in advance will be implemented. This is the stage that determines the failure/success of the project to be built.

5. Monitoring

After the implementation stage, the monitoring stage means observing the smart home network that has been implemented. What needs to be observed as hardware infrastructure, the course of data packets on the network.

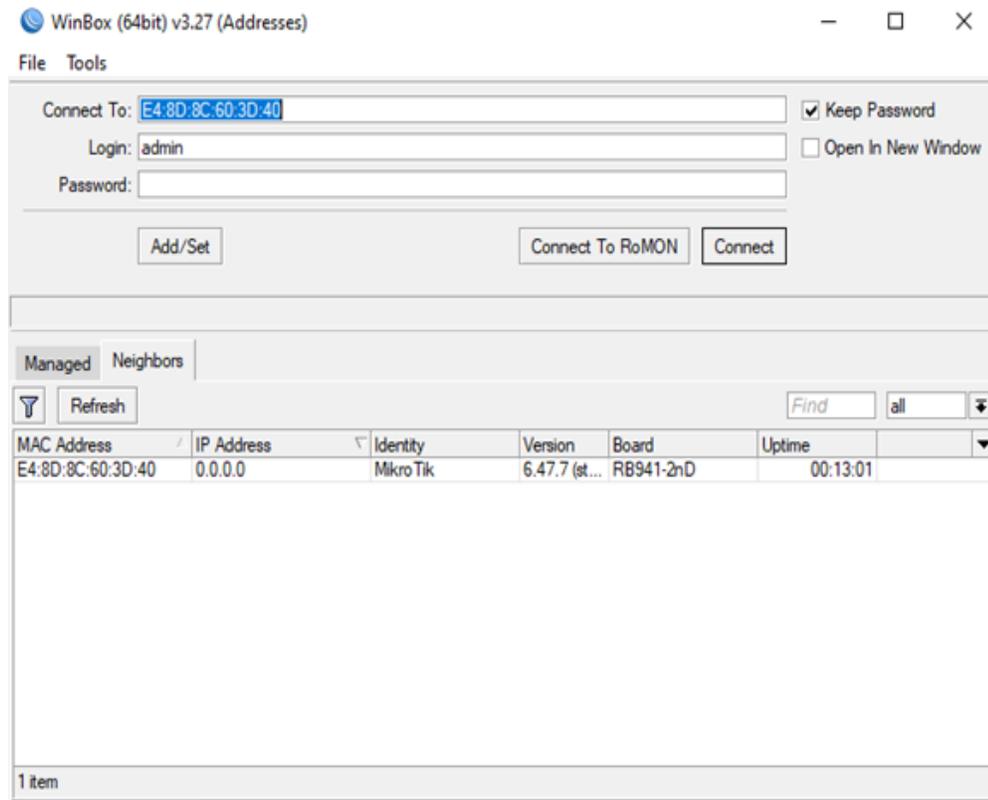
6. Management

At the management stage, it is necessary to make a kind of policy to regulate the system that has been made running well and lasts longer (Putri, 2018).

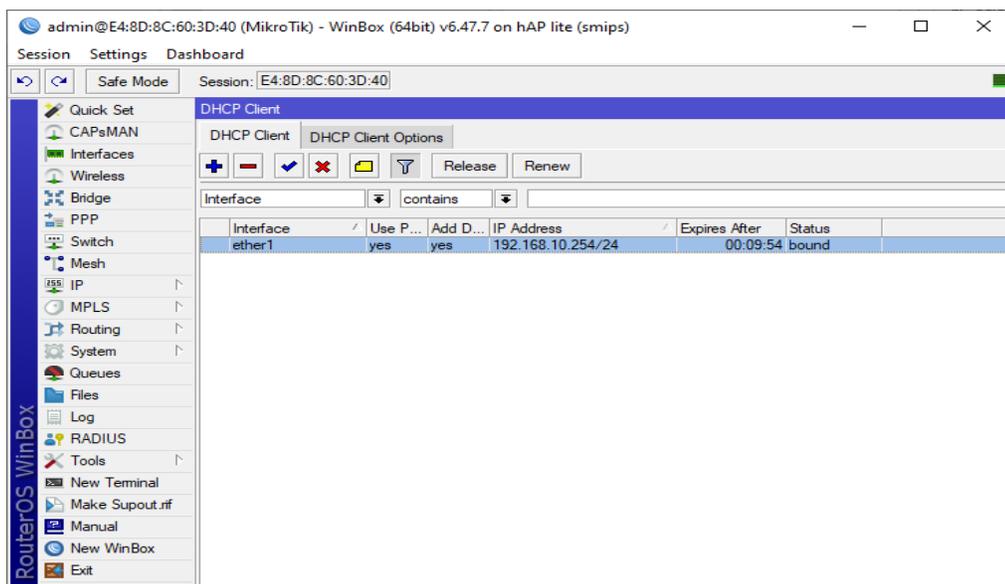
Results and Discussion

At this stage, we will configure the Mikrotik router to connect the LAN network to the internet network. On the Mikrotik router, we will perform network management for the homeowner and guest access.

1. Access the Mikrotik router with Winbox Open the Winbox application that was downloaded at the following link <https://mikrotik.com/download>. Insert the Mac address of the router then click connect after that, if it is successful, a display will appear as shown below.



- To connect to an Internet Service Provider (ISP) we will use a DHCP client on the Mikrotik router to automatically get an IP from the router or ISP modem. On the proxy router, enter the IP menu and then the DHCP client. After that Select add (+), then the New DHCP client will appear, on the DHCP tab select the interface that is connected to the router or the ISP modem on the occasion we use Ether 1, then put a checkmark on Use peer DNS, Use Peer NTP, and Add Default Router select yes. Then click OK. If successful, it will automatically get an IP address from the router or ISP modem as in the image below.



3. Configure the IP address for the LAN network.

At this stage, the LAN network is divided into two (1 for the homeowner's network and the other for guests). The IP address for the homeowner is 192.168.1.0/24, while the IP address for guests is 192.168.2.0/24. For the homeowner's LAN network, it will be configured on a bridge interface involving ports 2,3,4, and WLAN 1, while for guest LAN networks using the WLAN 2 virtual interface. by clicking add (+). In the new window, name the bridge that will be used as shown below, then OK. If successful, it looks like in the image below.

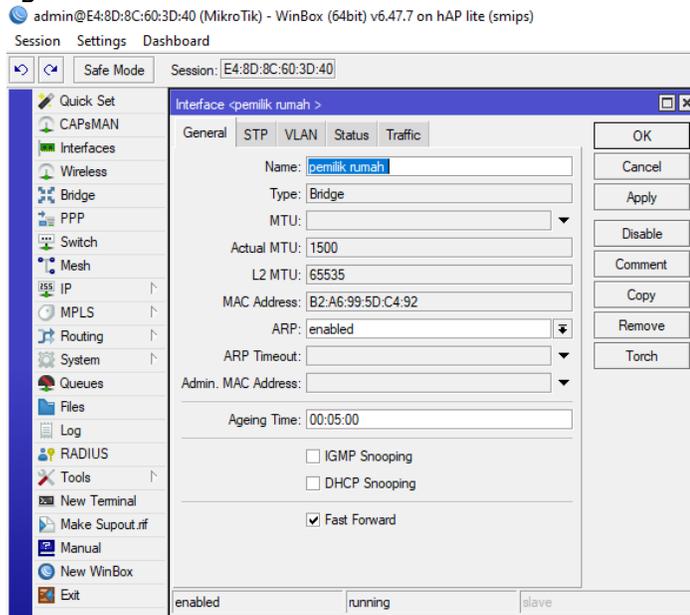


Figure 1 Bridge configuration

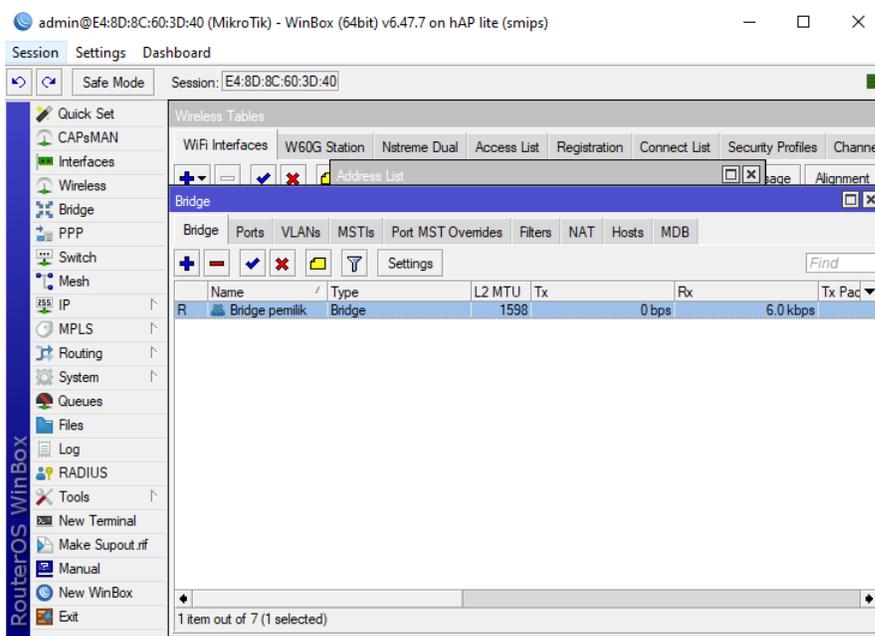


Figure 2 Bridge configuration result

After creating a bridge interface, we will add a port to the following interface, there are also added ports that are either 2, 3, 4, and WLAN 1. Then create a WLAN 2 virtual interface for guests, on the Wireless menu go to the Wi-fi Interface tab then Add (+) add virtual. In the wireless tab select ap bridge mode and name the SSID as shown below and click ok.

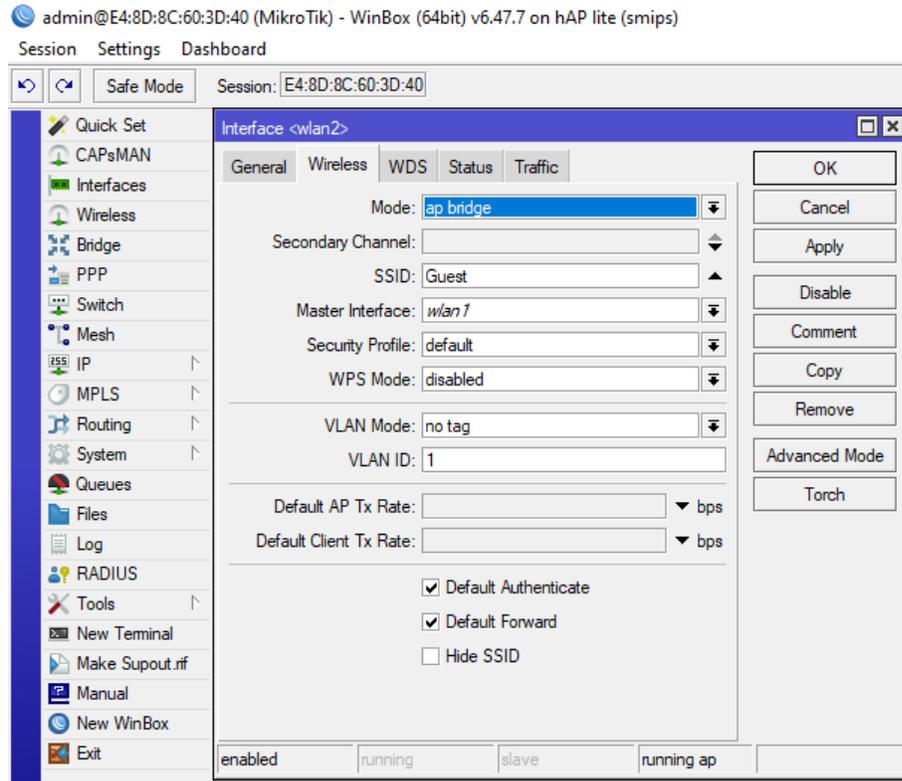


Figure 3 Creating virtual AP

If successful, the image below will appear.

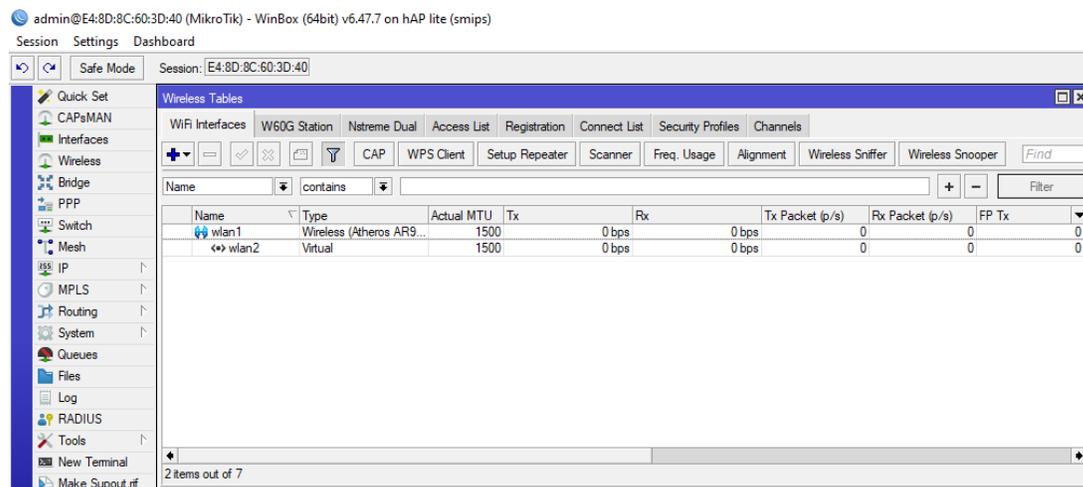


Figure 4 WLAN 2 virtual interface result

After the interface is complete, we will influence the IP address on the bridge owner interface and WLAN 2 for guests. Enter the IP menu and select the address then enter the IP of the house owner that was previously determined, then select the interface here, we will name the homeowner then click OK. Followed by setting WLAN 2 IP for guests and input IP for guests then click OK.

4. Configure Firewall NAT.

Next, go to the IP menu, select Firewall, then select the NAT tab then Add (+) on the general tab select Srcnat, and after that select the action tab and select action: Masquaraded as shown below.

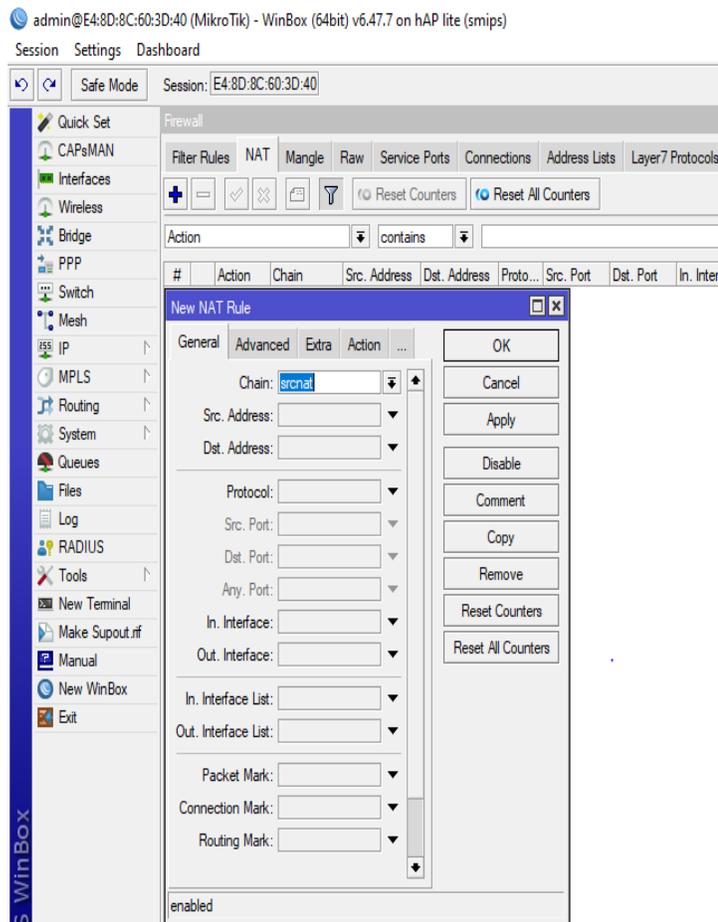


Figure 5 Chain Srcnat

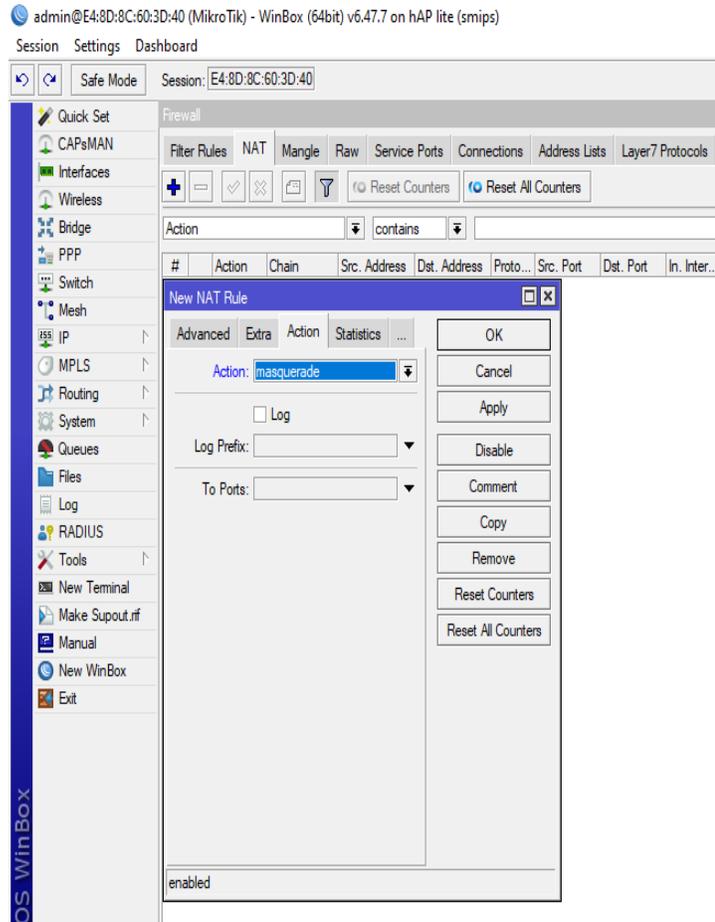


Figure 6 Action Masquarade

If successful, the display will appear as shown below.

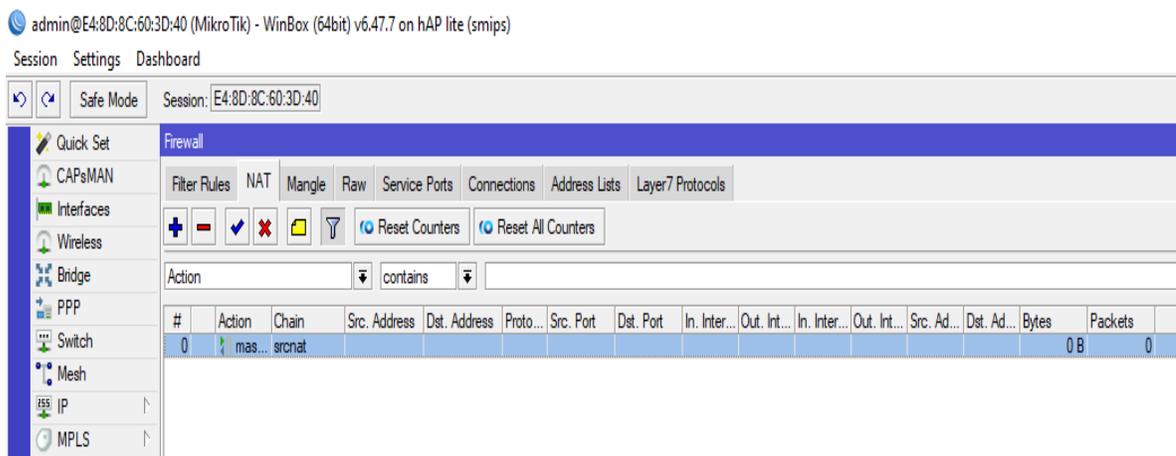


Figure 7 NAT display

5. Configure the DHCP Server.

Then enter the DHCP server menu, then select the DHCP setup tab on DHCP server interface: owner interfaces homeowner click next to finish.

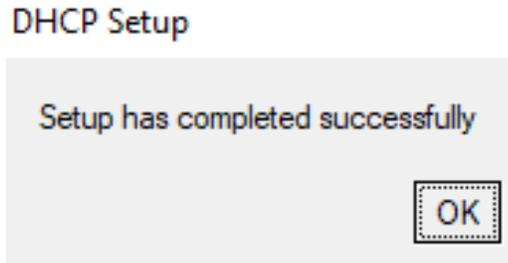


Figure 8 DHCP Server setup success

If it is successful, the image above will appear. Furthermore, DHCP Server configuration for guest networks, the steps are the same in making a DHCP Server for the homeowner's network, the difference is the interface used, on the guest network the interface used is the WLAN 2 interface.

6. Configure the access point.

For the wireless network, two SSIDs will be created, namely 1 for the owner (Owner) and SSID for the guest (Guest). Before we configure the wireless, we first set the SSID password. On the wireless menu, go to the security profile tab then add (+) then give it a name, for example, this time with the name Owner Password, and select dynamic keys mode. Authentication Types put a checkmark on all WPA PSK and WPA2 PSK. For Unicast Ciphers and Group Ciphers, both select Aes ccm then on the WPA pre-shared key and WPA 2 pre-shared key add a password then click OK.

If the SSID password has been configured, the next step is to configure the SSID. The following is the access point configuration for the owner as shown below.

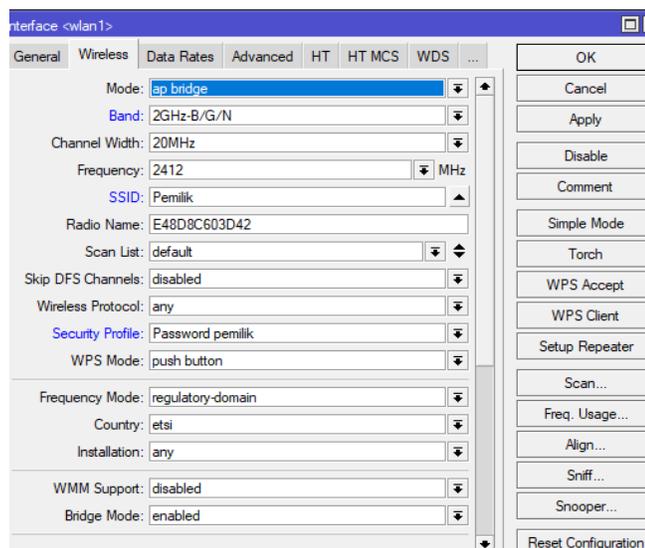


Figure 9 Owner SSID Configuration

The following is the configuration of the access point for guests as shown below.

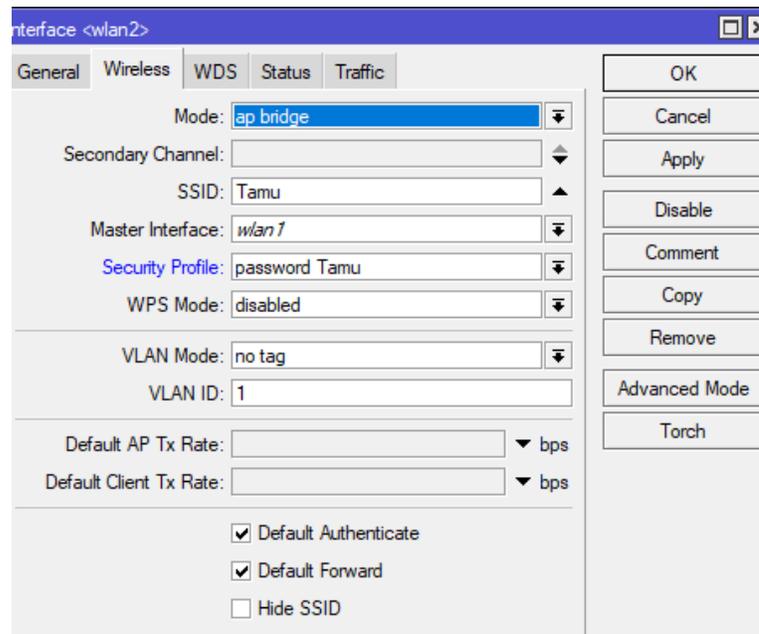


Figure 10 Guest SSID configuration

7. Testing Phase

Connect all devices with laptops, smartphones, and smart tv to the network.

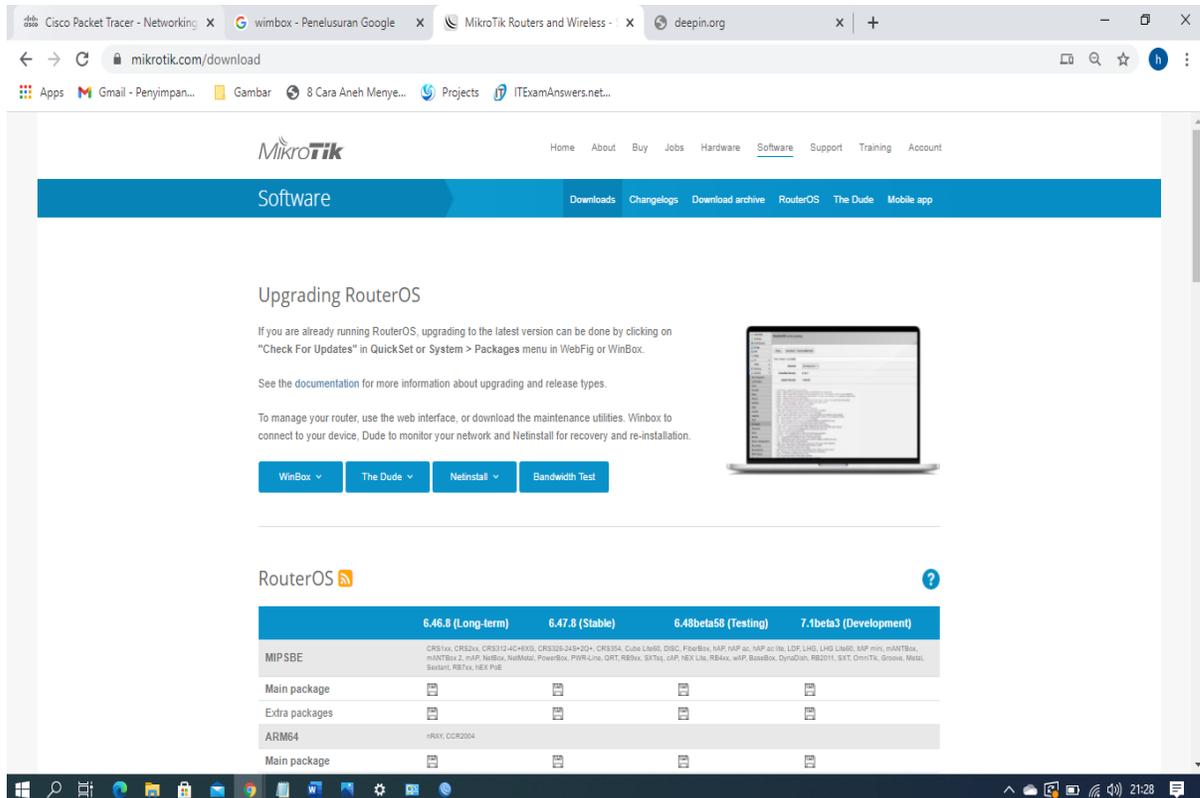


Figure 11 Laptop

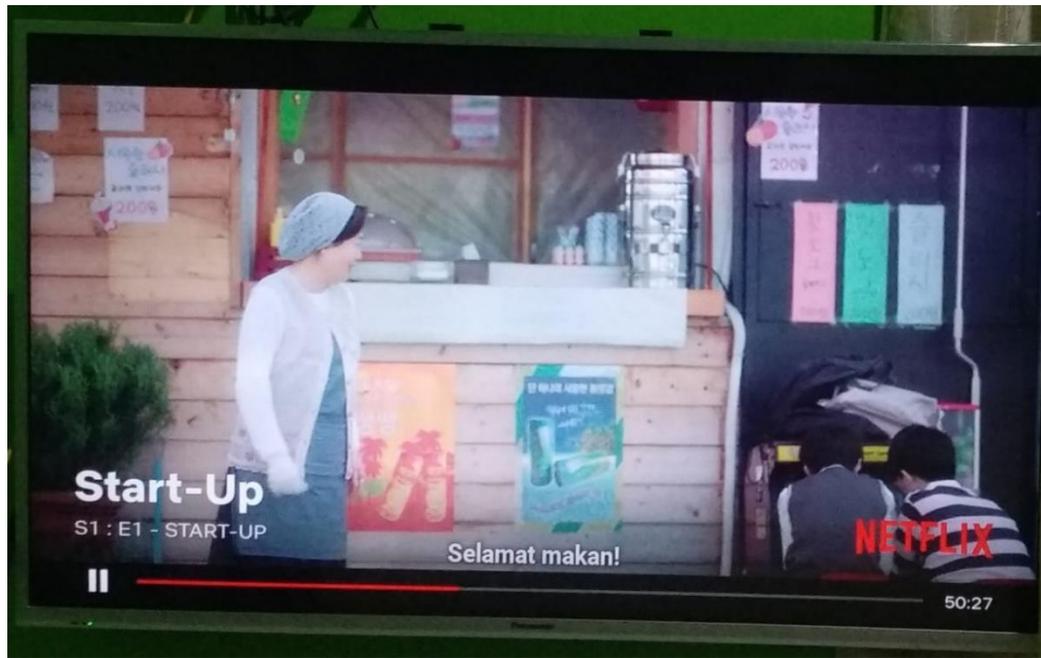


Figure 12 Smart TV



Figure 13 Smartphone

Conclusions

From this research, a lot of configuration is required on the Mikrotik router with the help of the Winbox application, so it is quite confusing for those who are not used to set up a

Mikrotik router. Besides, this research is very helpful for people who want to create a smart home network in their homes.

References

- Masykur, F., & Prasetiyowati, F. (2016). Aplikasi Rumah Pintar (Smart Home) Pengendali Peralatan Elektronik Rumah Tangga Berbasis Web. *SITEKIN*, 14(1), 8.
<https://doi.org/http://dx.doi.org/10.24014/sitekin.v14i1.2185>
- Muhammad, F. (2020). *Pengertian Jaringan Komputer*. Lintang Media.
<https://lintar.net/pengertian-jaringan-komputer>
- Pritawidyaningtyas. (2015). *Internet of Things (IoT)*. Pritawidyaningtyas.
<https://pritawidyaningtyas.wordpress.com/2015/09/15/apa-itu-iot/>
- Putri, D. (2018). *Network Development Life Cycle (NDLC)*. Darmealinda Putri.
<https://darmelinda.wordpress.com/2018/10/21/network-development-life-cycle-ndlc/>
- Sanjaya, T., & Setiyadi, D. (2019). Network Development Life Cycle (NDLC) Dalam Perancangan Jaringan Komputer Pada Rumah Shalom Mahanaim. *Mahasiswa Bina Insani*, 4(1), 1–10. <http://ejournal-binainsani.ac.id/>