APPLICATION OF TINY FLYING WEB SERVER FOR DELIVERY OF STEGANOGRAPHIC IMAGES IN BLANKSPOT AREAS USING SET TOP BOX (STB) MEDIA

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Abstract: *This study aims to optimise the use of Set Top Box (STB)-based web servers in delivering steganographic images in blank spot areas. Steganography is a technique of hiding information in digital media so that its existence is difficult to detect, which plays an important role in communication security systems. The main problem faced is the difficulty of sending secret messages in areas that are not covered by the internet network. The methods used in this study include the development of a web server architecture that can interact with STBs, the installation of the Armbian operating system, and the implementation of web server services for the transmission of steganographic images. The results of the study show that an STB-based web server can function properly in transmitting steganographic images, where secret messages can be received and read correctly by the recipient. Thus, this study provides an innovative solution to improve connectivity and data security in blank spot areas, as well as contributing to the development of Internet of Things (IoT) technology and web server-based applications*

Keywords: Steganography, Web Server, Set Top Box (STB), Blank Spot, Data Transmission, Data Security.

Abstrak: Penelitian ini bertujuan untuk mengoptimalkan penggunaan web server berbasis Set Top Box (STB) dalam pengiriman gambar steganografi di area blank spot. Steganografi merupakan teknik menyembunyikan informasi dalam media digital sehingga keberadaannya sulit terdeteksi, yang memiliki peran penting dalam sistem keamanan komunikasi. Permasalahan utama yang dihadapi adalah kesulitan dalam mengirimkan pesan rahasia di daerah yang tidak terjangkau jaringan internet. Metode yang digunakan dalam penelitian ini meliputi pengembangan arsitektur web server yang dapat berinteraksi dengan STB, instalasi sistem operasi Armbian, dan penerapan layanan web server untuk transmisi gambar steganografi. Hasil penelitian menunjukkan bahwa web server berbasis STB dapat berfungsi dengan baik dalam mengirimkan gambar steganografi, di mana pesan rahasia dapat diterima dan dibaca dengan benar oleh penerima. Dengan demikian, penelitian ini memberikan solusi inovatif untuk

meningkatkan konektivitas dan keamanan data di daerah blank spot, serta berkontribusi pada pengembangan teknologi Internet of Things (IoT) dan aplikasi berbasis web server.

Kata kunci: Steganografi, Web Server, Set Top Box (STB), Blank Spot, Pengiriman Data, Keamanan Data..

INTRODUCTION

Steganography is the art of hiding information in a cover medium in such a way that the existence of the information is unknown (Pratap, 2022). In the military world, steganography plays an important role because it can be used to send secret messages that are difficult for the enemy to detect. These secret messages can be hidden in digital media objects, such as text, images, videos, or audio. Thus, it is difficult for the enemy to detect the existence of these secret messages (Sagar, 2020). Therefore, steganography has become a leading technology in today's security systems. Steganography technology is advancing rapidly due to the power of computing technology and increasing human awareness of data security (Pratap, 2022).

In today's era of computers and the internet, steganographic images are becoming increasingly popular for personal, business, and national security purposes. As a result, tools are needed that allow users to distribute steganographic images securely and efficiently. One tool that can be used to distribute steganographic images is through a website page. To distribute steganographic images within a website page, a web server application service is required. Therefore, to ensure the security of the steganographic data, it is necessary to provide your own web server application.

However, despite advances in steganography techniques and various camouflage methods, there are still weaknesses. One of the most difficult weaknesses to anticipate is if the recipient of the message is located in an area without internet coverage, or what is known as a blank spot. So, no matter how sophisticated steganography technology is, if it does not reach the sender, this mechanism for communicating secret messages will be useless. Indeed, there have been many efforts to expand network coverage to improve connectivity in areas that previously had weak or no coverage at all. For example, there has been research discussing efforts to optimise wireless communication in rural areas, which are often blank spots (Sajjad, 2019). However, the drawback is that the infrastructure required to improve connectivity in these areas is often expensive and requires significant investment.

One solution to solve the problem of sending steganographic images in areas without internet connection (blank spots) is to use drones. Several studies have discussed the use of drones to provide internet services to blank spot locations. One technology discussed in a study shows that drones utilising 5 GHz waves and Long Range (LoRa) technology are capable of collecting cache data with a stable throughput of 3.5 MB/s at an altitude of 140 metres (Zhang, 2020).

For the purposes of steganographic data transmission, the use of drones alone is not sufficient. The drone should also have software capable of providing data communication services, such as a web server service. Therefore, a microcontroller that can run a web server service needs to be added to the drone. There have been several studies describing the development of web servers on Set Top Box devices. In these studies, the web server functions as a place to store, process, and send web pages to clients. The clients accessing it are

smartphone devices. The communication protocol used by the web server and the clients accessing it is Hyper Text Transfer Protocol, or HTTP for short (Macheso, 2021).

Based on the above description, this study proposes combining Set Top Box-based web server technology to transmit steganographic images. The open-source Set Top Box hardware platform has attracted many developers to create IoT (Internet of Things) and network communication-based applications. On the other hand, steganography, which is a method of embedding secret data into existing data, has been used in various situations to maintain data security and privacy. If this steganographic data is combined with the Set Top Box web server service, and the Set Top Box web server service along with the steganographic data is embedded in a drone device, then this combination of technologies can be utilised for data communication in areas without an internet connection (blank spots).

The objective of this research is to optimise the use of Set Top Box web servers that support steganography to overcome data communication gaps in blank spot areas. It is hoped that more secure and efficient data transmission in remote areas can be achieved by combining these two technologies. Furthermore, this research can contribute to the development of Internet of Things (IoT) technology and more inclusive web server-based applications, including the critical data communication needs in military operation areas that are not covered by internet networks.

RESEARCH METHOD

In this discussion topic, researchers present optimisation of web server development for the distribution of steganographic images using Set Top Boxes (STBs). This research method involves several stages, beginning with the design of a web server architecture that can interact optimally with STBs. The method flow in this research is illustrated in Figure 1 below.

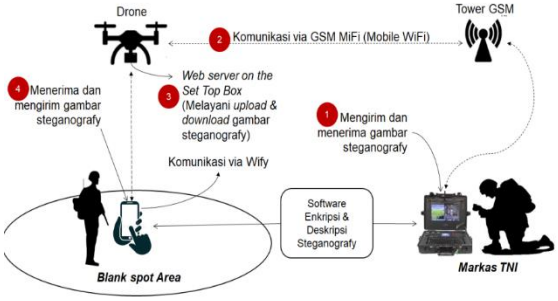


Figure 1 Research method flowchart

IMPLEMENTATION

From the previous chapter on research methods, the researcher has explained the steps in the web server development process. Below, the researcher will show how to install Armbian on this STB (Indihome), but first, the Set Top Box (STB) has been rooted and unlocked by the researcher.

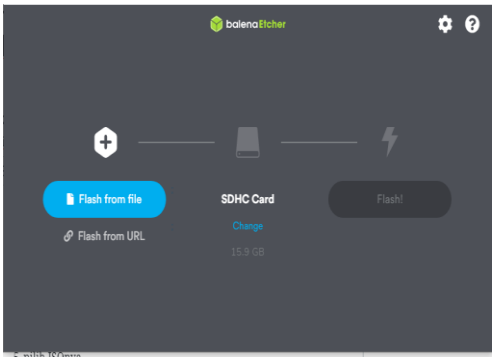
1. Download Armbian 5.89 iso or you can also download a newer version.

2. After downloading, prepare the microSD card with its adapter or you can also use a card reader.

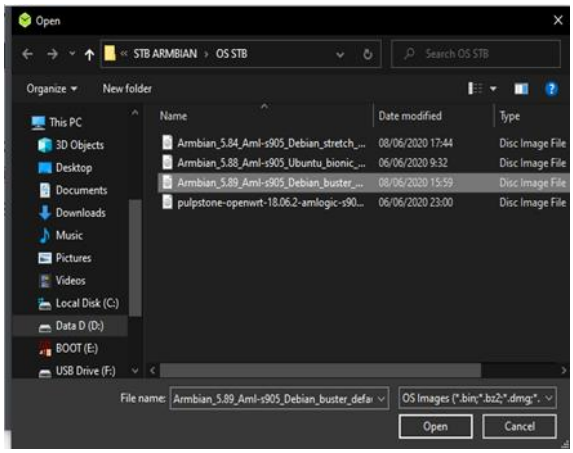
3. To ensure a smooth process, it is recommended to use a Class 10 microSD card, as many have failed when not using Class 10. In this example, the researcher used a 16GB Class 10 SanDisk Ultra card. The researcher has used this SanDisk card many times and it has always worked smoothly without any errors.

4. The researcher used a whale etcher to flash his Armbian OS earlier.

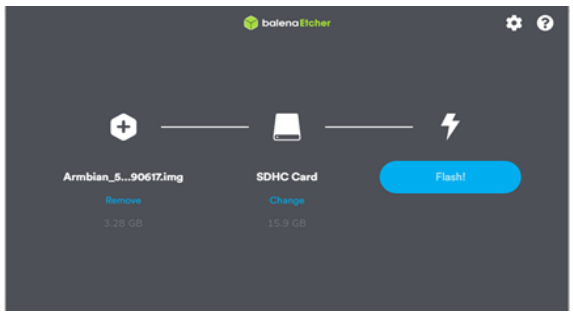
5. Next, insert the microSD card into the adapter, then insert it into your laptop/desktop PC. Once detected, open Balena Etcher.



6. Select the ISO file using the Armbian_5.89 version, then click open.

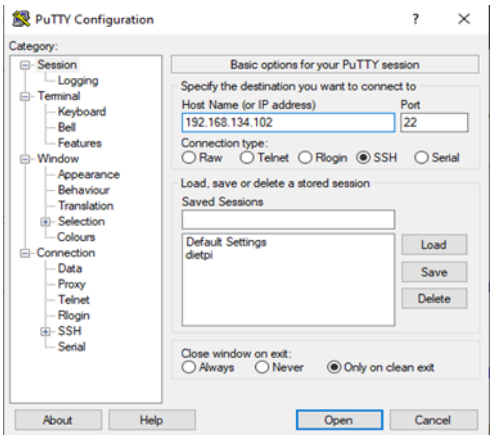


7. Click Flash and wait until it reaches 100%.



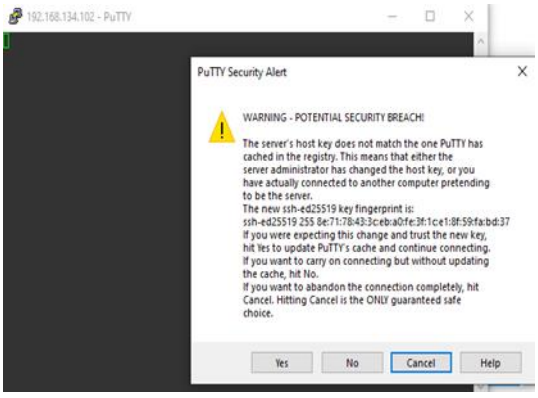
8. If the flashing is successful, it will appear as shown in the following image.

9. After that, remove the microSD card from your laptop/desktop PC and insert it into the STB. Connect it to the network, find out the IP address using an advanced IP scanner, then open PuTTY.



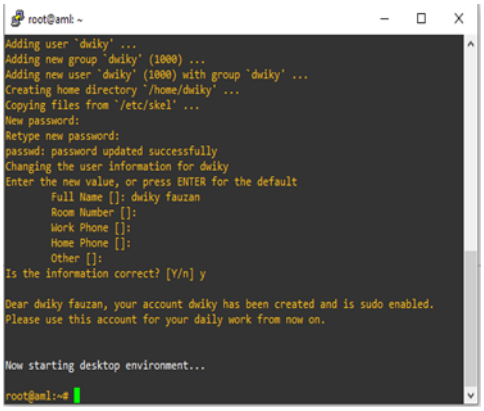
10. Enter the IP address obtained from the STB earlier

11. If you see a notification like the one in the image below, just click yes.



12. For the default user root and password 1234, after logging in, you will be asked to enter the password

1234 again, then press enter, then enter a new password for root. Next, you will be asked to create a new user and password of your choice.



13. If successful, it will appear as shown in the image above.

RESULTS AND DISCUSSION

The steps in this research support the development of a web server for the distribution of steganographic images using a Set Top Box (STB). The stages of web server development are described as follows:

1. Turn on the Set Top Box first, and ensure that the hotspot LED is lit.

Figure 1

2. Connect the laptop to the Set Top Box hotspot, where the researcher uses a name tag (DisplayMasjid) on the Set Top Box.

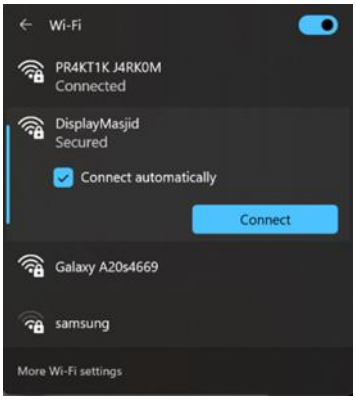


Figure 2

3. Once connected to the Set Top Box hotspot, the image below will appear.

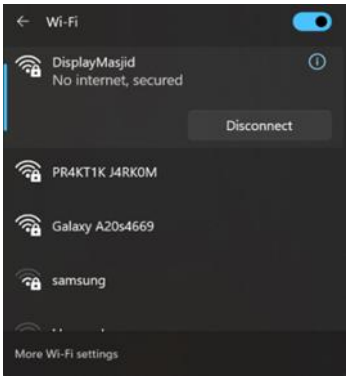


Figure 3

4. Next, open your browser and enter the Set Top Box IP address, which in this case is 10.10.10.10, followed by the steganography domain name. For the domain name, use *kamuflase_steganografi*.

Figure 4

5. After following the steps in number 4, the browser will redirect you to the screen below.

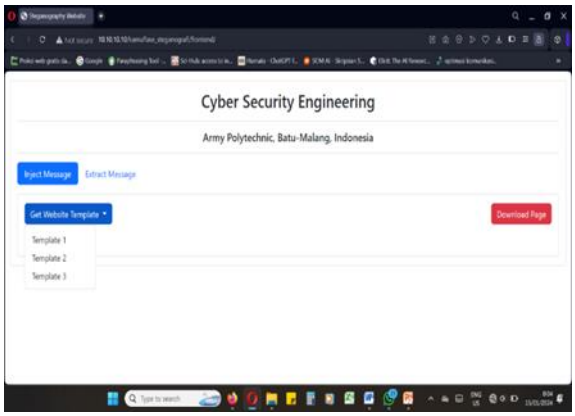


Figure 5

6. The next step is to select template 2.

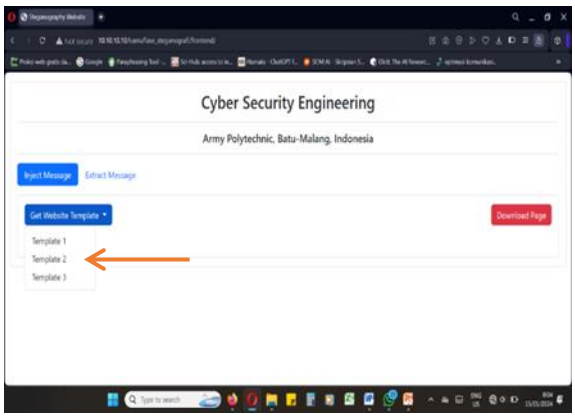


Figure 6

7. After selecting template 2, we will enter the Inject section (to insert a secret message) by double-clicking on the image available on the web page.

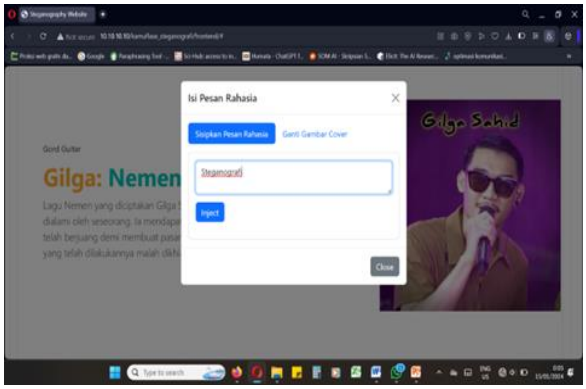


Figure 7

8. Next, after filling in the secret message in the image, we proceed to download the steganography image.

Figure 8

9. When downloading the image, the result will be as shown below.

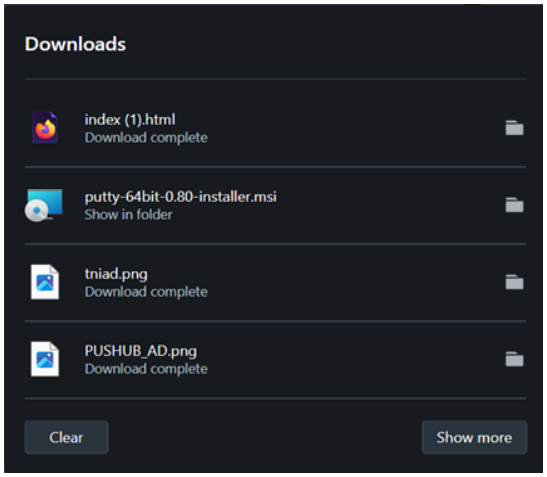


Figure 9

10. Once the download results appear, double-click on the download and an image will appear containing the secret message.

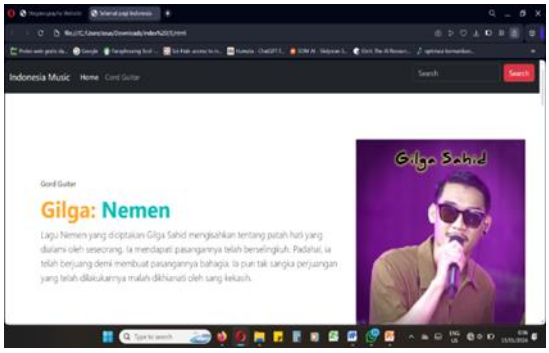


Figure 10

CONCLUSION AND RECOMMENDATIONS

From the results of the research that has been conducted, it can be concluded that the development of a Set Top Box (STB)-based web server for sending steganographic images in blank spot areas can be carried out properly. The stages of developing the web server can run smoothly and according to plan. Based on the test results, steganographic images transmitted via the STB-based web server can be received properly by the recipient. The secret message hidden within the steganographic image can also be read correctly.

Overall, this study has successfully proven that STB-based web servers can be a solution to overcome the problem of steganographic image delivery in blank spot areas. The main advantages of this solution are its relatively low cost and ease of implementation.

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