

Network Optimization and Network User Access Limitations Using Mikhmon Server at Diskominfo Palembang City

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DOI: 10.5281/zenodo.7607134

ABSTRACT

Technological advancements have a significant impact on how people live their lives and offer a variety of advantages and conveniences. This trend also applies to computer network technology, whose primary goal is to facilitate information sharing among users. Behind these benefits and conveniences, there are drawbacks as well. For example, it is simple for other users to discover what data is sent over the network and enter the network without authorization. The goal of this project is to create a system that uses an authorization mechanism to restrict network users. This system was created by combining various work systems between the Mikrotik router serving as the gateway router for guests logging into the network at DISKOMINFO Palembang City and the Mikhmon server. The Network Development Life Cycle is employed as a technique (NDLC). The server and router's ability to grant internet access for the used voucher code and the time limit's ability to bar users from the network because the time used has passed allows for the verification of the test results produced by the generated voucher code. This technology can help DISKOMINFO Palembang City with its issues with separating its internal network from user guest networks (guest users) and can build a secure network even though guests access the internet through the company's internal network.

Keywords: Limitation; authorization; login vouchers; NDLCs; mikhmon.

Cite as: Guntoro Barovich, Lisa Artika, Fahmi Ajis Manto. (2023). Network Optimization and Network User Access Limitations Using Mikhmon Server at Diskominfo Palembang City. *LC International Journal of STEM*, 3(4), 72–82. <https://doi.org/10.5281/zenodo.7607134>

INTRODUCTION

The development of computer technology greatly affects various fields, both in private and government companies. The use of computer technology as a tool that is able to provide convenience both in data processing and data search, ease in communication, making it easier to market a product, and downloading and uploading data can be done faster. This convenience does not only focus on how to evolve the mechanism of a computer device but must be able to connect another node so that the ease of data processing and data search becomes more optimal both in the form of a cloud service, IoT by using a distributed system mechanism (Arman et al., 2020; Baji, 2018; Gill et al., 2019).

The Palembang City Communication and Informatics Service is a government agency that acts as a government organizer and has responsibilities in the field of communication and informatics, especially the management of e-Government in Palembang. Each official agency in Palembang city co-located its information service system to the communication and informatics service (DISKOMINFO) of Palembang City. So it is necessary to carry out good mechanisms and keep the data needed by each agency accessible quickly and securely. The mechanism that can be done is to do bandwidth management on the server farm path. The application of bandwidth management is very important to maintain network stability when there is data exchange on the network and can be applied on any network such as on a mobile network (Wang et al., 2019), in a data center containing all server services that allow using different types of network cable transmission media (Kolhar et al., 2020). Various methods are used in the application of bandwidth management ranging from using PCQ and HTB methods and can be applied in various router devices to ensure that network connections can be used by all nodes properly and fairly (Saputra et al., 2021; Syukur, 2018). In addition to the application of bandwidth, other mechanisms that can be used are to secure data and restrict access to the network so that data security and confidentiality are maintained. This data security mechanism can use an Access control list (ACL) where the method can filter device users based on user identities such as usernames and passwords and also requests for data accessed by users (Chaidir & Wirawan, 2018). In addition to using the ACL method, access restrictions in maintaining data confidentiality can also use the proxy server method which is at layer 7 of the OSI layer where each user who will access data must pass through the proxy server and the data will be deflected to another port that has been configured. In addition to the proxy server method, it can also take advantage of the burst limit feature combined with a firewall rule base, where user restrictions are also followed by bandwidth access restrictions and can be combined using the IPsec method where user restrictions can be identified from the IP address used (Agustini & Mudzakir, 2019; Ayub et al., 2021; Shomad et al., 2022). In addition, network access restrictions can also use the concept of VLANs. The VLAN method can be effectively used to secure data communication on the network because user communication access is limited to the linkup space or scope of each network and cannot communicate to other networks because VLANs use the VLSM principle which uses a subnet block, as long as a subnet block is not routed to another subnet block, users in a subnet block will not be able to route to other subnet blocks (Adina & Ariyadi, 2021; Dasmen & Rasmila, 2019; Rilvani, 2020). The application of VLANs on a network is very helpful to maintain network stability, network performance, and bandwidth without eliminating the security function of the network itself because networks in a subnet can be isolated and not connected so as to reduce the level of data collision in the network which can cause network performance to be disrupted (AL-Khaffaf, 2017; Fitria & Prihanto, 2018; Haiyan, 2018). In addition to the implementation of VLANs restricting access, users can also use the login voucher mechanism as a substitute for the WPA / WEP / WPA2 method on hotspot networks. The working principle of this concept is to limit the movement of user data starting from the bandwidth limitations used, what types of protocols and service features can be used which of course must be synchronized with router devices, especially on firewalls to open and close the network protocol ports, to limiting user access times. This concept is widely used in local networks to Metronet networks using mobile broadband network technology (Li, 2020; F. H. Purwanto & Amin, 2022). Apart from being the manager of e-Government DISKOMINFO Palembang city also cooperates a lot with other agencies, when there is a visit from outside agencies where guest users use the network to get internet information, it is felt necessary to direct guest users to enter a special network without disturbing the internal network of DISKOMINFO. So the focus of this study is to carry out isolation or limited access to the DISKOMINFO network for guest users and provide user login access by generating using the login voucher method. This aims to provide convenience for users, both guest users during work visits and internal users when accessing the network to carry out the process of completing assigned work.

LITERATURE REVIEW

Network of Computers

Using a transmission means, such as a copper-core cable, optical fiber, or a wireless transmission medium, two or more autonomous systems are connected to one another to form a computer network. (Syafrizal, 2020).

Router Device

A router is a part of a computer network that has the ability to route data to its destination through a network or the internet. In order to transfer data from one network to another, the router serves as a bridge between two or more networks. (E. Purwanto, 2015).

Mikhmon Server

A web-based program called Mikrotik Hotspot Monitor (Mikhmon) uses a proxy device to help manage hotspots. It is part of the Mikrotik API PHP Class. especially for Mikrotik devices that don't yet have support for user management features. Mikhmon itself is not a Radius server, so it is not always active in controlling users. Mikhmon himself can be activated as needed. The advantage of using a Mikhmon server is that it provides good security for clients through centralized authentication, authorization, and user registration so that there are no unauthorized wireless network users and can provide convenience on the network administrator side (Mulyanto & Prakoso, 2020b; Mulyanto & Susanto, 2022).

METHODOLOGY

The Network Development Life Cycle technique was employed in this investigation. The cycle of creating or developing a computer network system is described by this paradigm. (Mulyanto & Prakoso, 2020a). As depicted in figure 1, this model consists of analysis, design, simulation prototype, implementation, monitoring, and management.

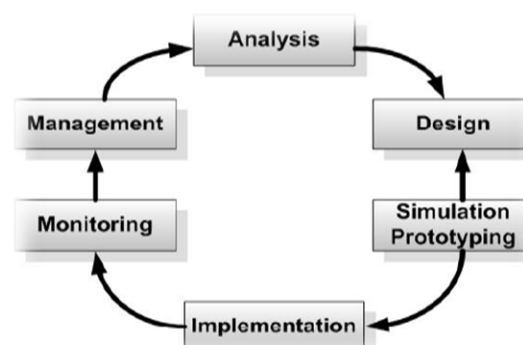


Figure 1. Shows the life cycle of a model network.

Analisis

This initial stage carried out an analysis of system needs, analysis of problems that arise based on the occurrence of current conditions and user desires, and network topology that already exists at Diskominfo Palembang City.

- a. Problem analysis: Based on the findings of the observations, it was discovered that Diskominfo Palembang City's internal network had a small user coverage. Users guests share the same

network and hotspot access as Diskominfo Palembang workers. The internal employee network and the public network for visitor users require new infrastructure to be created.

- b. Problem analysis: based on the observation results, it was found that the limited number of user coverage on the internal network of Diskominfo Palembang City. User guests use the same network as Diskominfo Palembang staff and use the same hotspot access. New infrastructure is needed that separates the internal staff network and the general network for guest users.
- c. Network topology: the network used in implementing this system, still using the parent network or the existing network uses only 1 fork or 1 port on the RB110AHX2IU access router. As shown in figure 2.



Figure 2. Network topology at Diskominfo Palembang City

Design

This second stage is carried out by designing a new topology and workflow diagram of a system that will be implemented related to user access using login vouchers and bandwidth management. The topology proposed in the application of this system is shown in figure 3.



Figure 3. Shows how a hotspot voucher network is being created.

Diagram of the workflow of the hotspot voucher system that will be placed in the DISKOMINFO network in Palembang City. As shown in figure 4. The line gateway used in the guest user hotspot network uses the VLAN concept that has been configured by the Diskominfo Palembang IT team. The use of the Mikrotik RB951G-2HND router aims to create a separate firewall between the internal network and the guest user network so that it does not interfere with the firewall mechanism that has been configured on the internal network. Second, it makes it easier to control, build and repair in the future. The Richmond server which is the data center of the login voucher is placed in the guest user network ecosystem but uses a different IP address segmentation from the IP address that will be used by the guest user. This server is not placed in the Diskominfo Palembang city server farm ecosystem.

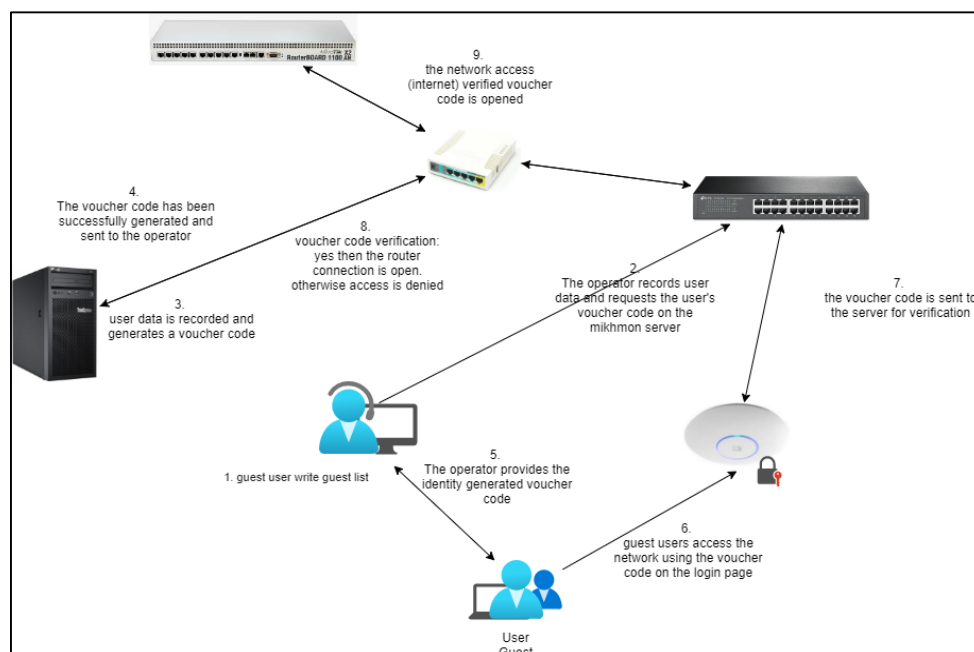


Figure 4. Workflow flowchart for the Hotspot Voucher System

Simulation/Prototype

The third stage is carried out system configuration and simulation using the Mikrotik RB951G-2HND router as a bandwidth management router and Hotspot router and synchronized with the Mikhmon server as a user service server and voucher management.

Implementation

This fourth stage is carried out by the application of server devices and routers into the DISKOMINFO network in Palembang City. The hotspot router gateway line for guest users is taken from the RB110AHx2 IU access router.

Monitoring

The fifth stage is carried out by monitoring and testing whether the entire configuration runs as expected and tests whether the bandwidth usage that has been previously managed runs according to what has been set.

Management

This final stage evaluates and plans for the development of hotspot network mechanisms and systems that have been built.

DATA ANALYSIS AND RESULTS

Results

Whereas the stages of analysis and design have been discussed under the research methodology, this section concentrates on the stages of simulation/prototype, monitoring, and management.

Simulation stages and prototypes

This stage begins with the router device configuration process, which includes opening routing access, implementing a firewall rule base using the Network Address Translation technique, configuring the IP address, Domain Name System (DNS), configuring DHCP on the router to distribute IP addresses for guest users, and configuring the DNS.

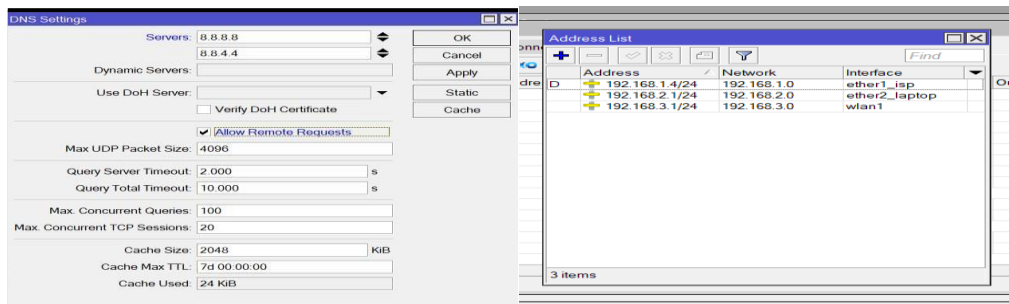


Figure 5. Basic configuration on public and local lines and gateway access

In addition to applying basic configurations on the gateway path and local network user guest, hotspot configuration is also carried out by implementing a login landing page on the hotspot network and configuring user-profiles and wireless frequencies so that the frequencies on the guest user hotspot do not collide with other frequencies. As shown in figure 6.

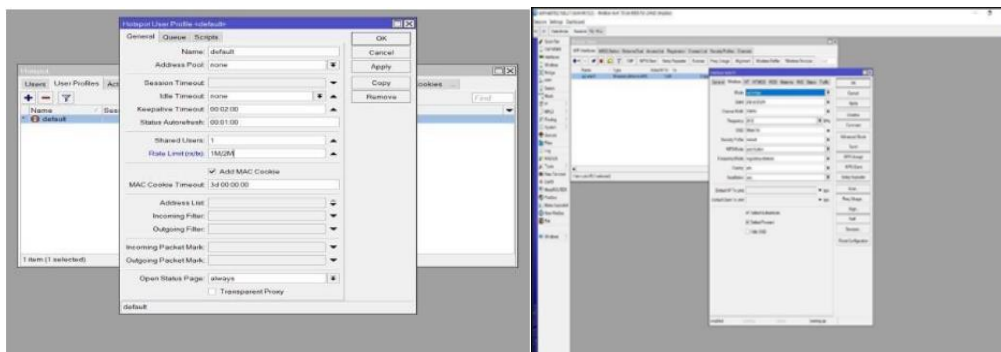


Figure 6. Configure hotspot, user profile and wireless frequency

Meanwhile, to record user data and generate vouchers, a configuration is carried out on the Mikhmon server. The configuration carried out on this server is the service installation process, a configuration of user administrators and operator users, a configuration of the session server between the Mikhmon

server and the gateway router in this case is the Mikrotik RB951G-2HND router which is the gateway router of the wireless network and guest users. As well as synchronizing hotspot services between the Mikhmon server and hotspot services that have been activated on the wireless gateway router and guest users. As shown in figure 7.

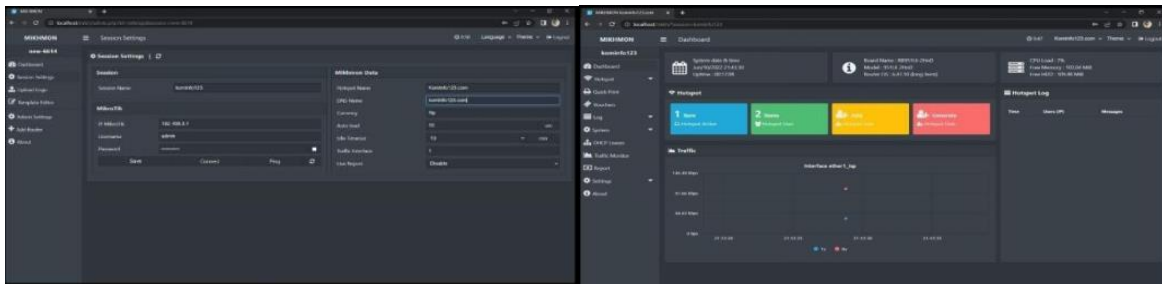


Figure 7. Shows the configuration of the user administrator, the gateway router, and the mikhmon network server.

For the purpose of carrying out the producing procedure, the user profile must first be used to establish how to generate login coupons for guest users. If the user profile being used is legitimate and registered with the system, generate can be performed. according to figure 8.

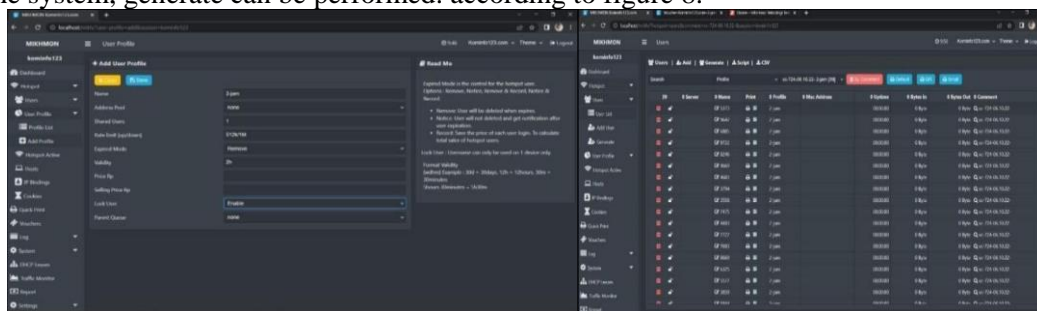


Figure 8. Shows the procedure for configuring the user profile and the outcomes of creating login coupons.

Kominfo123.com [1] Kode Voucher 5373 2h	Kominfo123.com [2] Kode Voucher 9642 2h	Kominfo123.com [3] Kode Voucher 6885 2h	Kominfo123.com [4] Kode Voucher 9722 2h	Kominfo123.com [5] Kode Voucher 8246 2h	Kominfo123.com [6] Kode Voucher 4669 2h	Kominfo123.com [7] Kode Voucher 4683 2h	Kominfo123.com [8] Kode Voucher 3794 2h	Kominfo123.com [9] Kode Voucher 3558 2h
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Kominfo123.com [37] Kode Voucher 9344 2h	Kominfo123.com [38] Kode Voucher 9329 2h	Kominfo123.com [39] Kode Voucher 6728 2h						

Figure 9. The Result Of Generating Vouchers

Stages of System Implementation

The next stage is to carry out the implementation process of the simulated device into the real network, namely on the Diskominfo network in Palembang city. Where before the implementation of the system, network isolation was carried out where the network on the hotspot network for guest users was outstretched directly on the public port and was not allowed to route to the local network (internal users) and the server farm network at Diskominfo Palembang city. As shown in figure 10.

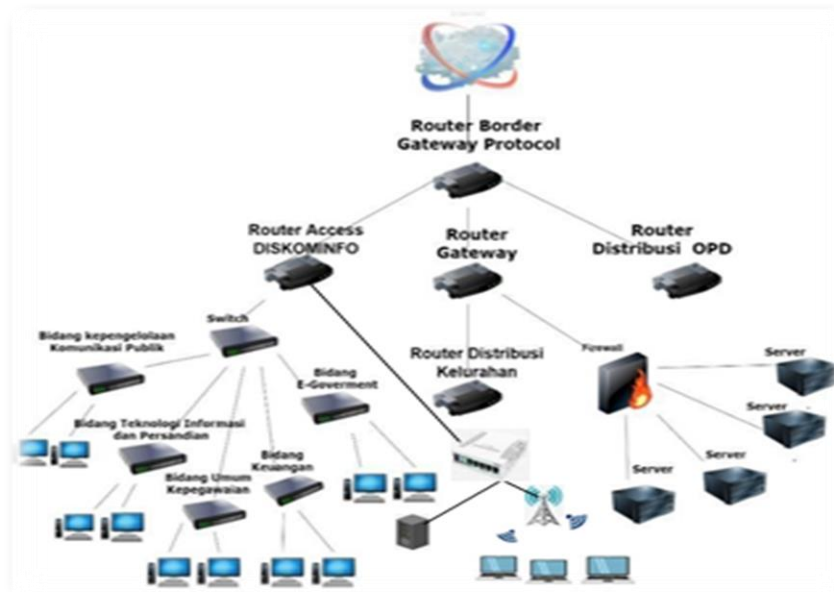


Figure 10. Hotspot voucher system implementation in DISKOMINFO Palembang City's local network

Stages of monitoring and testing

This stage carried out testing of the system that has been created in the prototype phase and implemented in the network. Testing is focused on testing login vouchers to user connectivity in the network. The test results can be seen in figure 11.

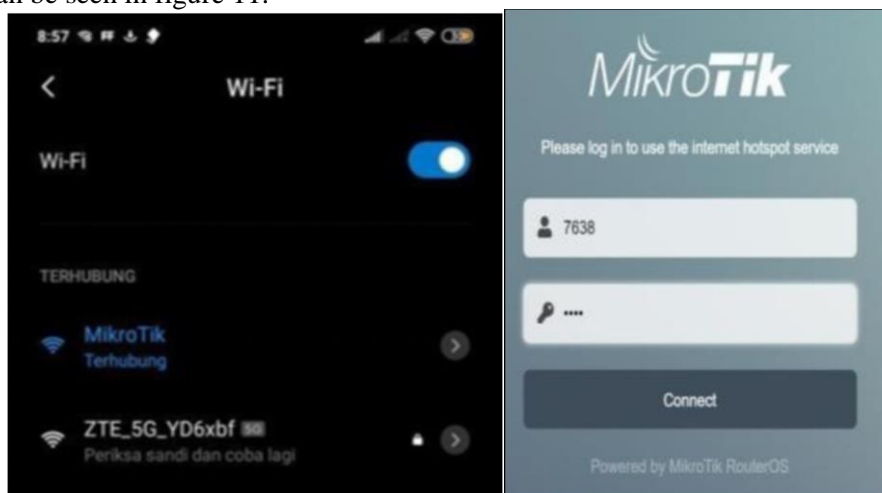


Figure 11. Testing login vouchers on the DISKOMINFO network in Palembang City

The experiment in figure 10 uses one of the voucher codes that have been generated from the username and password that have been given by the guest user to the operator. The test results if the user successfully logged in on the hotspot login page, can be seen on the router dashboard display or on the Mikhmon server dashboard. And the traffic used by guest users when connecting to the network. As shown in figure 12.

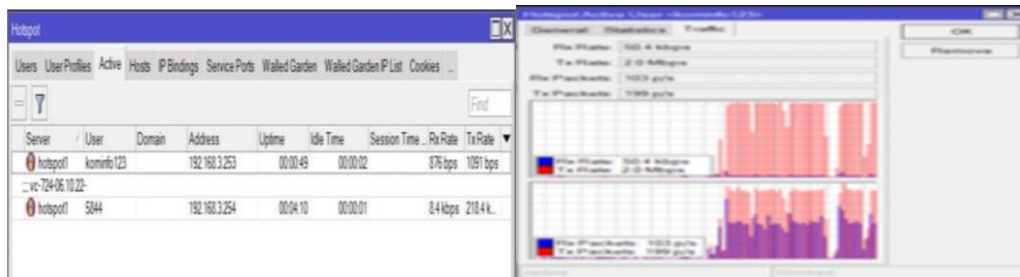


Figure 12. Guest guest login test results using voucher generation

The test results demonstrate that all previously configured functions—from the simulation stage to the implementation stage—are being implemented as intended and are meeting users' expectations in this example, those of Diskominfo Palembang City.. Where guest users can use the Diskominfo Palembang City network but cannot browse the entire internal network, because a special network for guest users is only allowed to surf the internet (isolated from the main network). The function of the voucher-generating service feature on the Mikhmon server runs well and is successful in generating vouchers and the results of generating vouchers are verified and can be used for the login process on the network. The duration of use that has been set in the voucher configuration also successfully terminates user access automatically, if it is found that the duration of time has exceeded the predetermined time limit. User guests will be connected again if they regenerate the voucher and use the new voucher code to be able to connect to the network.

CONCLUSION AND RECOMMENDATIONS

The login voucher feature is very effectively applied in the network specifically for guest users when visiting Diskominfo Palembang City. The Richmond server is used as a voucher management service and user management can be synchronized with the Mikrotik router device both on medium router devices to dedicated routers with high-performance specifications. Synchronization between the Mikhmon server and the router will be possible if the Mikrotik router uses level 6 latency. The voucher feature on the Mikhmon server can overcome the problems faced by users in this case Diskominfo Palembang City is secured to separate internal users and external users or guest users or guest users who visit Diskominfo Palembang City.

ACKNOWLEDGMENT

Thanks are conveyed to the Palembang City Communication and Informatics Office for providing space and space for researchers to conduct research, help solve problems faced and develop networks in Diskominfo Palembang City.

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