Mobile Payment for "PO Tentrem" Bus Rates Based on E-Wallet

Fanizha Dwi Anggraini[1], Rieke Adriati Wijayanti [2], Mochammad Taufik[3]
[1,3] Digital Telecommunication Networks Study Program,
[2] Telecommunication Engineering Study Program,
Department of Electrical Engineering, State Polytechnic of Malang, Malang, Indonesia
[1]vanisaanggraini@gmail.com, [2] riekeaw@polinema.ac.id, [3]m.taufik@polinema.ac.id

***Abstract*— According to the results of a 2022 survey conducted by the Association of Indonesian Internet Service Providers (APJII), internet users in Indonesia continued to increase from 175 million to 220 million users of the total population of Indonesia. The increase was driven by the need for communication during the Covid-19 pandemic in the last two years. Most internet users are on the island of Java, followed by the islands of Sumatra, Kalimantan, Sulawesi, Bali-Nusa, and Maluku-Papua. PT. Tentrem Sejahtera is one of the Inter-City In-Province bus companies based on the island of Java, precisely in East Java. The ordering and payment process is still done manually or offline. Consumers who want to buy tickets must come directly to the terminal, to an authorized agent who has been appointed or do it directly when boarding the bus and make transactions in cash. Where when making manual or cash payments sometimes you have to wait a few minutes to issue money and wait for the ticket given by the conductor, while the level of security in payments is very less, so it is less efficient in this sophisticated era. In addition, there are still unscrupulous brokers at several bus departures who sell tickets that do not match the specified price. This study used the e-wallet electronic payment model method, with a mobile payment system for QRIS-based bus fares. With the National Mercant ID (NMID) listed on the QRIS display, a receipt will be issued on the Thermal Print for proof of payment.**

Keywords*— APJII, e-wallet, NMID, QRIS, QR Code, Thermal Print.

I. INTRODUCTION

Technology is now experiencing very rapid development and is widely used in various fields. This encourages experts or to improve technology development in order to help human activities in one of the fields of public transportation, namely buses. Buses are public transportation designed to carry multiple passengers and long-distance transportation services. Buses are public transportation available for use by the general public, usually managed according to a schedule, operated on predetermined routes, and charged for each trip. Buses are also one of the most widely chosen public transportations to support the mobility of the Indonesian people. The high amount of travel traffic bus management works hard to provide maximum service.

Generally, bus ticket payments are made manually. Payments are made by the conductor who walks and approaches the passengers one by one to make payments. This can be said to be inefficient and takes a long time.

Previous research conducted by [1]-[4] uses a ticket booking application system that can be accessed by passengers via the web. To find out the bus departure schedule and make ticket purchases and make payments that can be made using the easy pay application, then after making and successful payments, you will get a notification in the form of a QR Code which serves to find out the status of the passenger already on the bus or not using a functioning Raspberry Pi. to process the data obtained from the GPS Tracker and QR Code Scanner and use the GPS Tracker to find out the bus point in real time.

Authors in [5]-[8] were motivated by as a solution to Jakarta's congestion to create a transportation system in Jakarta. In its development, many public transport users feel disappointed with the existing services. One of them is the uncertainty of the arrival of the fleet where many feel discomfort. That is what causes passengers to prefer to use private vehicles, causing congestion in Jakarta. The purpose of making this tool is to improve the quality of public transport services. With this system that uses an application installed on a smartphone, which can be used to find out the right route and public transportation to reach the destination on time and there is also an estimated time of arrival feature that makes it easier for passengers to know when they have to approach the bus stop and when they will arrive. at the destination. To make a payment, by scanning a QR code image, the user must be connected to the internet network, open the application and then scan the QR code so that the balance will be deducted automatically and the application will automatically connect to the database. The system is also equipped with earning points when finished making payments, so users who use the application can benefit by earning points after paying for public transportation, which can be redeemed immediately with available discounts.

Research [9]-[11] was conducted to reduce the use of motorized vehicles and reduce traffic congestion and reduce air waste. The problems that are often found by users when they want to use public transportation are that passengers have difficulty understanding bus routes, passengers have to ask for fares every time they want to go, and passengers want a more convenient payment method using available technology. The purpose of this study is to produce an application that can assist users in providing information about public buses such as bus routes using the Google Maps API, and showing the real-time location of buses on Google Maps using a GPS system, can

show fares based on the user's destination location by counting the number of bus stops. and can pay bus fares using a QR code (Quick Response). Implementation of location monitoring accuracy in this study will be used as a reference.

From previous research, electronic payment instruments are needed that can assist passengers in making transactions while boarding bus [12]-[14]. This study aims to design an automatic bus ticket payment system using a QRIS scanner which is found in all e-wallet applications that have a QRIS scanner that functions to facilitate payments, by using a QRIS scanner as a substitute for cash payments, it is necessary to scan QRIS when boarding the bus. And the scanned data will be sent to the thermal print to print bus ticket receipts via the ESP32 module. This can be said to be more efficient than manual payments and also takes a short time.

QRIS aims to make digital payments easier for the public and can be monitored by regulators from one door. There are four aspects of QRIS components that are regulated in the standardization issued by Bank Indonesia, namely Interoperability, Interconnectivity, Security, Inclusion [15]. A payment gateway can be considered the digital equivalent of a credit card processing terminal [16]. Transactions are configured via a plugin to send information and in a format that is acceptable to a particular gateway. Payment gateways encrypt information handled via SSL (Secure Socket Layer). This prevents fraud opportunities and adds security to the transaction process [10].

II. METHOD

A. System Diagram

The block diagram of the system in this study is shown in Fig. 1.

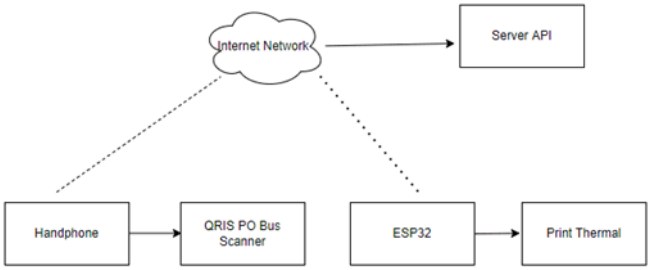

Figure 1 Block Diagram System

1. Figure 1 shows the planning of a mobile payment system that uses mobile phones used by bus passengers to make bus payments. The type of mobile phone used can be android/ios that has applications that support QRIS such as Linkaja, Gopay, Ovo, Shopee Pay, Dana, etc. The QRIS PO Bus Scanner function is used for the scanning process through the QRIS payment application.
2. The QRIS Scanner function found on the e-wallet is used for the QR Code scanning process that is already available on the PO Bus to make payments by means of a QR Code scanner and enter the nominal according to the specified bus destination.
3. ESP32 works if the payment is successful ESP32 will receive a command from the API server to print a ticket receipt as proof that the passenger has made the payment. ESP32 is superior and has a higher processor so that data processing will be faster. In addition, there are more ADC pins on the ESP32 compared to the ESP8266 [11].
4. Thermal Print functions as a means of printing ticket receipts according to incoming payments through the NMID listed on the QRIS.

B. The System Workflow

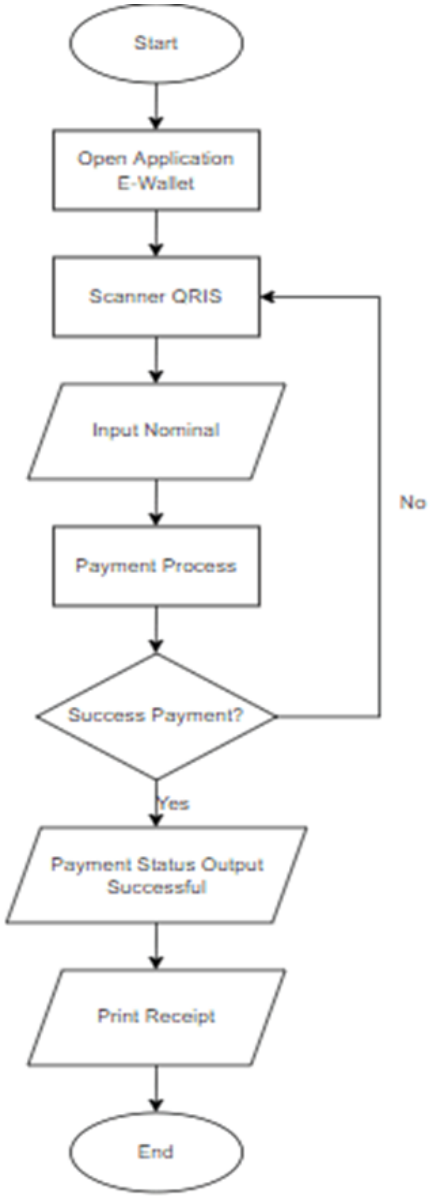

Figure 2 System Workflow

Fig. 2 is a flowchart of how the system works starting from the passenger register/login. To make a payment, the client must have an e-wallet application and also the balance on their respective cellphones to scan the QR Code to make a bus fare payment with a nominal that matches the destination. If the

payment is not successful it will automatically repeat the QR Code scan and enter reset the nominal and if the payment is successful it will automatically print a receipt as proof that the payment has been successful. Passengers can sit on the seats that are still available.

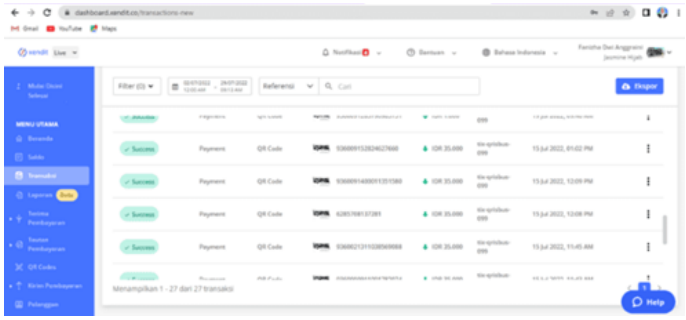

Figure 3 PO Bus Admin Web Display

Web Admin PO Bus serves to display successful transactions. The PO Bus admin can access all the features found on the web, starting from login access, viewing transactions, total accumulated balance and being free to withdraw funds at any time. web applications can be connected by operators or those responsible for data updates, and are not the responsibility of the programmer or webmaster [12].

III. RESULTS AND DISCUSSION

A. *Passenger Procedure*

1. Make sure you have an e-wallet application and sufficient balance.
2. Open the e-wallet application that supports QRS scan then scan the QR Code on the Bus.
3. Enter the nominal according to the purpose.
4. Enter PIN
5. If the payment is successful, the receipt will be automatically printed.

B. *Admin PO Bus Procedure*

1. Login to the web with the link https://dashboard.xendit.co/login/
2. Enter the email and password according to the time of the xendit web registration.
3. Admin can access all features on the web such as viewing transactions, withdrawing funds.

C. *Testing Client*

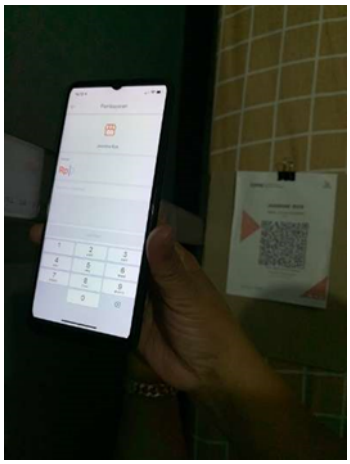

Figure 4 Testing Client

Fig. 4 Passengers must scan the QR Code provided on the bus and enter the nominal according to the destination then enter the PIN and if the payment is successful the receipt will be automatically printed.

Another test is the quality of service, conducted following the procedures in {13-17].

D. *Testing Various Types of E-Wallet*

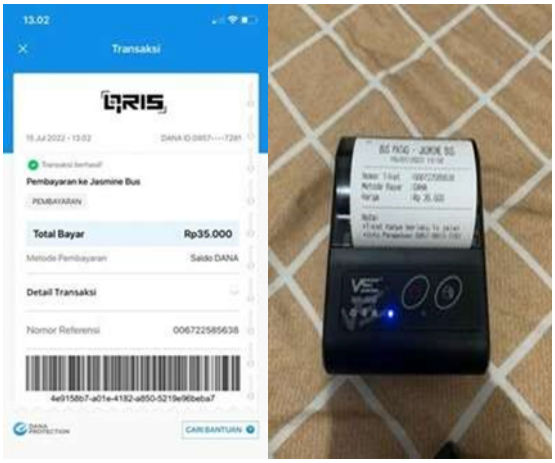

Figure 5 Successful Payment Use Dana

Figure 6 Successful Payment Use Gopay

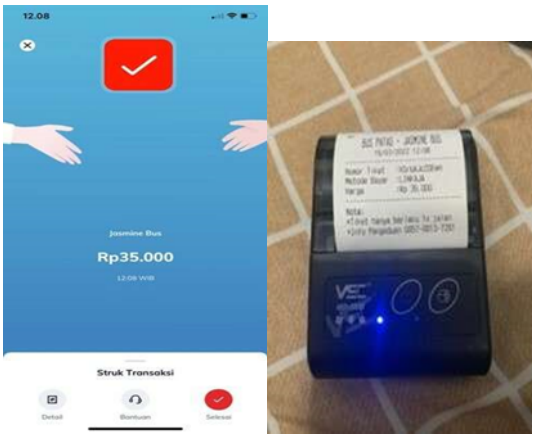

Figure 7 Successful Payment Use LinkAja

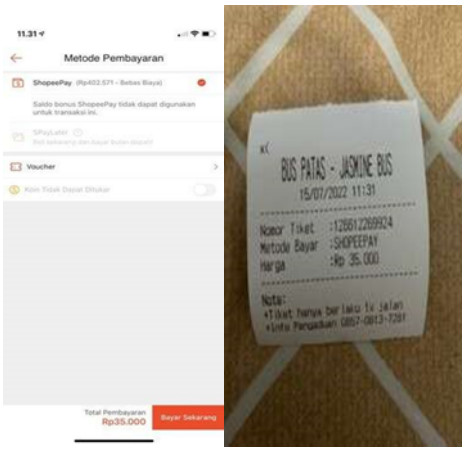

Figure 8 Successful Payment Use Shopeepay

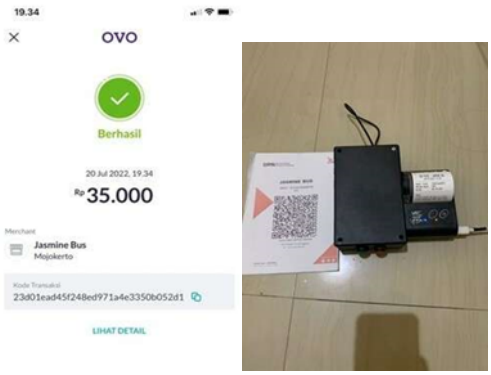

Figure 9 Successful Payment Use OVO

E. *Testing Admin*

Figure 10 Login Page

The PO Bus admin must login by entering the email and password according to the email that has been registered on xendit.

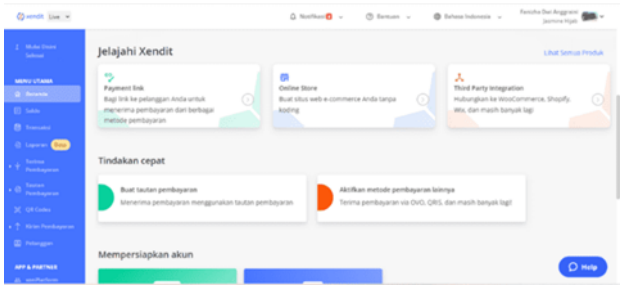

Figure 11 Login Page redirect

After successfully logging in, the PO Bus admin will enter the xendit web where there are various features ranging from transaction history, balances.

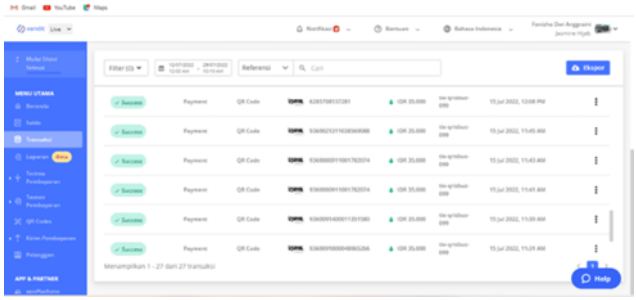

Figure 12 Transaction History

Admin can see a history of successful transactions according to a customizable date.

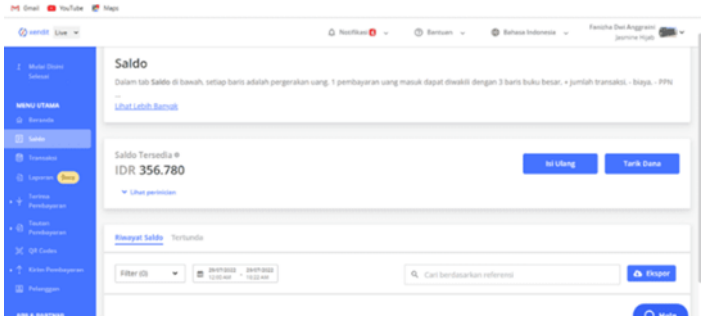

Figure 13 Balance

Admin can see the balance feature that enters the web according to successful transactions.

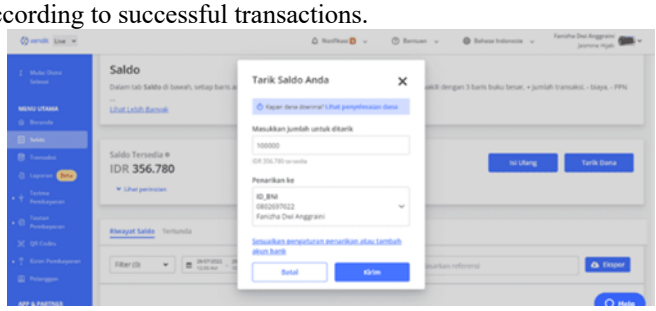

Figure 14 Withdraw Balance

Admin can access the Withdraw balance feature and withdraw the nominal amount of the balance as desired and the withdrawal of money will go to the account number that was registered at the time of xendit registration.

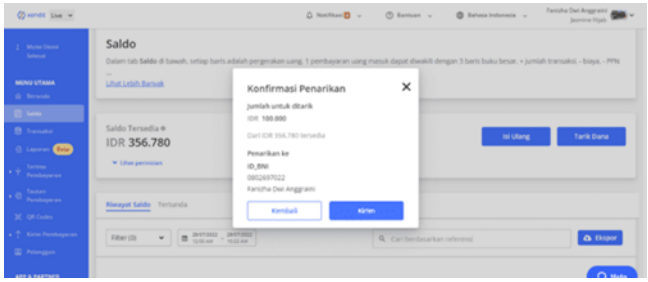

Figure 15 Withdrawal Confirmation

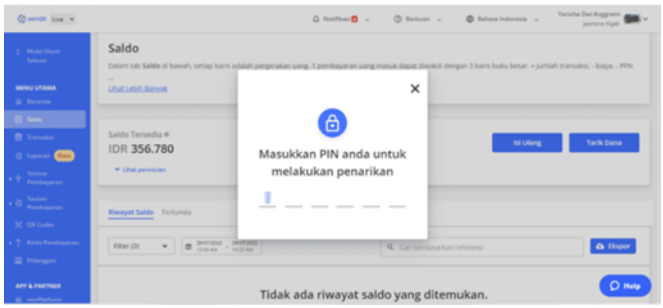

Figure 16 Input PIN

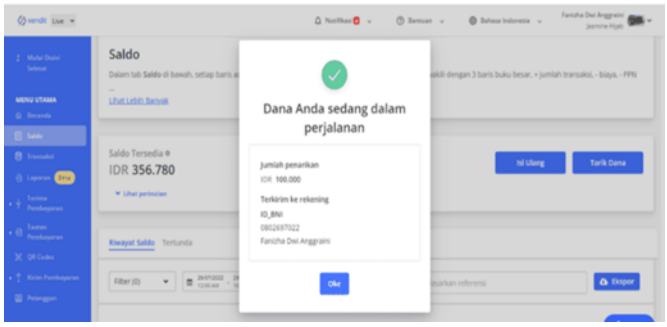

Figure 17 PIN Success

After entering the PIN successfully, the money will enter the account in real time.

IV. CONCLUSION

Designing a bus ticket payment management system through mobile payment, namely with two payment methods, the first using bank transfers and the second using e-wallet.

ESP32 is a microcontroller in this system that functions as a system controller by using Bluetooth communication features and WiFi connections to be able to adjust the system as needed.

The reading of the QR Code is also influenced by the user's network conditions, if the user's device does not have a connection, it will not be able to read the QR Code, while when the connection is unstable, the reading will also be slow. Because the process of sending the data contained in the QR Code to the website requires a stable connection because the application is internet-based. So it requires a connection or network that affects.

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