

# Last Mile of QR Code Payment

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The Leading IOT solution to  
make EMV QRCPS more  
secure to operate, more easier  
to implement, and more  
payment scenarios to adopt

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**Supplement of EMV® QR  
Code-Based Payment**

By WayGo Finance Technology Co.

## Introduction

WayGoBox module is SOC hardware device build by bluetooth low energy technology . It's specially designed for mobile payment and mobile ticketing verification. WayGo solution is the open platform to support multiple wallet Apps. The goal of WayGoBox is to provide the best solution to solve fragmentation of QR code payment market with simplified architecture and affordable hardware device price.

Since market fragmentation is not conducive to the popularization of mobile payment, EMVCo. has released a specification (EMV QRCPS: EMV® QR Code Specification for Payment Systems) at July 2017. EMV QR code provides common and standard QR code for different Wallet Apps. With the increasing deployment of QR code-based payment methods, it is important that the payments ecosystem provides a consistent experience for merchants and consumers. An effective solution to ensure global interoperability for established payment methods has come through the development and implementation of global specifications. EMVCo is the global technical body that facilitates the worldwide interoperability and acceptance of secure payment transactions by managing and evolving the EMV® Specifications and related testing processes.

This document is focus on how WayGoBox co-works with EMV QRCPS and plays a role as the last mile of EMV® QR code-based payment. WayGoBox fits in common QR code-based payment ecosystem perfectly because sharing single QR Code among multiple Wallet Apps is the core promise of EMV QRCPS.



Fig. 1 Aggregation of Multiple Payment Scenarios

# QR Code Payment

## What is QR Code Payment

With the consumer-presented mode, the user displays the QR code dynamically. The merchant then uses a QR code reader to scan the code. Merchant-presented mode involves the merchant displaying the QR code either statically or dynamically, with the consumer using a smart phone to scan the code.

A transaction is initiated by a consumer who uses a mobile app to scan the EMV Merchant - Presented QR Code and enter the transaction amount for their purchase.

Note 1: The deployment of dynamic Merchant-presented mode QR code is limited and complicated because dynamic QR code including transaction information must be generated by a POS system. Therefore we will focus on static QR code only in this document.

Note 2: Customer-Presented Mode is almost the same with plastic cards. It doesn't increase payment scenario of mobile payment actually. Therefore, we will only focus on Merchant - Presented Mode in this document.

## The Challenge of QR Code Payment

The strength of QR code payment is to utilize the computation power and internet connection capability in consumer's mobile device, merchant only requires VERY LIGHTLY equipment installed.

QR code payment must have at least one Wallet App to scan and decode QR code. Due to the information security reasons, Wallet Apps will have an inclination toward to have their own proprietary encryption and decryption algorithm. However, it is inconvenient for consumers and merchants to install too many Wallet Apps.

There are only two dominant Apps (i.e. WeChat and AliPay) in China. Therefore, too many Wallet Apps is not a concern for consumers and merchants in China. However, it's not in the same situation outside of China...

## Fragmentation of QR Code Payment Market

In China, QR Code payment is dominated by giant Internet companies such as Tencent and Alibaba. They take advantage of their exclusive advantages in communications and e-commerce industries, establish their high penetration rate in mobile apps, and then use these huge apps to gain an oligopoly position in the mobile payment market.

However, in other countries, mobile payment Apps are mostly developed in a mature financial industry. Therefore, the Wallet App market is in a state of contending from the very beginning. In this case, when each wallet App is attempting to develop its own barcode specification and encryption and decryption algorithms, it will naturally fragment the entire market into blocks that are incompatible with each other.

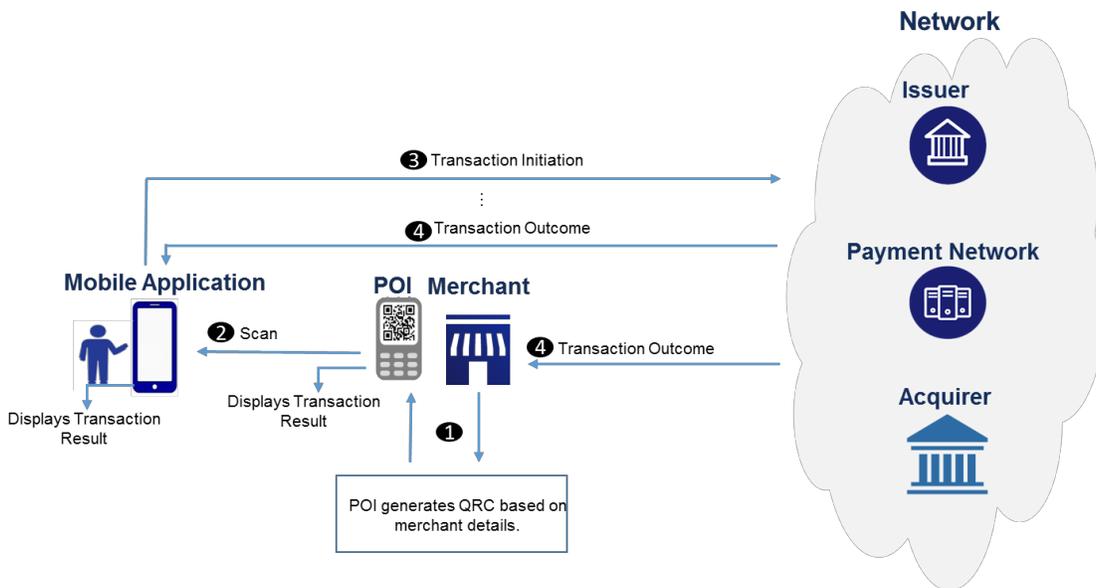
## Why Need EMV QRCPS

For many decades, EMVCo. play key role in setting up kinds of standard specification for financial industry. Since market fragmentation is not conducive to the popularization of mobile payment, EMVCo.

has released a specification at July 2017 (EMV QRCPS: EMV® QR Code Specification for Payment Systems V1.0) .

EMV QR code provides common and standard QR code for different Wallet Apps. With the increasing deployment of QR code payment systems, it is important that the payment ecosystem provides a consistent experience for both merchants and consumers. An effective solution to ensure global interoperability for established payment systems has come through the development and implementation of global specifications. EMVCo is the global technical body that facilitates the worldwide interoperability and acceptance of secure payment transactions by managing and evolving the EMV® Specifications and related testing processes.

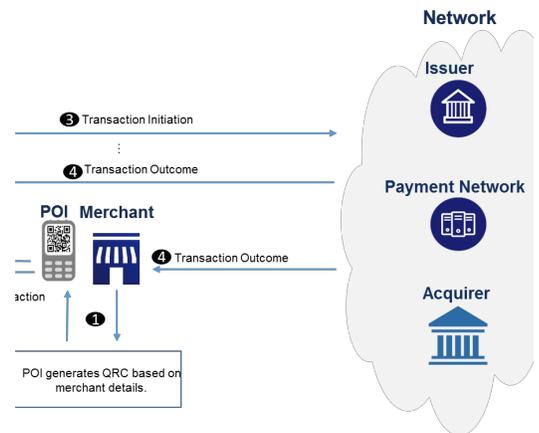
### Transaction Flow of the EMV Merchant-Presented QR Code Payment



Different message flows are possible between the entities involved, depending on type of wallet (Issuer wallet or third-party wallet) and the infrastructure supported by the payment network.

## How merchant get payment transaction result Immediately

1. Consumers show the Wallet App display to the Merchant.
  - Wallet Apps may be faked. It's very difficult to verify App in a very short time.
2. Install Merchant App to accept payment transaction notification from the Network.
  - Merchant must have a smart phone or tablet with internet capability for this merchant App installation. They are extra cost comparing to static QR code.
  - The required message flow of immediately sending transaction results from Issuer bank to acquirer bank may be costly and time consumed.



**Either way above can not be implemented on self-service machines.**

## Key Issues in Applying QR Code Payment to Self-Service Machine

From MRT/Railway gates, bus ticketing machines, vending machines, to a wide range of self-service equipment (such as drinks machines, paid power, door locks, safe deposit boxes), and even future roadside parking.

Aforementioned solution for confirming payment transaction result can not be implemented on these self-service machines. Currently, most IoT payment technologies on the market can only be operated under the premise of a single wallet app and proprietary QR code. However, sharing single QR Code among multiple Wallet Apps are the core promise of EMV QRCPS.

Easy to implement, absolute security, and low maintenance cost are the most important key factors for self-service machine to adopt mobile payment technology.

## Our Solutions

With EMV QR Code and WayGoBox module working in pairs, multiple Wallet Apps can be deployed easily to stores with POS system, booths and all kinds of self-service machines.

WayGoBox module is build upon advanced bluetooth SOC. There is no internet connection for them. There is no way to login locally or remotely, and no way to write any program to WayGoBox module. The only way to operate WayGoBox is through Wallet App with OpenWallet API installed. Therefore, there is zero chance to hack in WayGoBox.

With WayGo Open Wallet API integrated, Wallet Apps can easily communicate with WayGoBox module through BLE. WayGoBox module will perform the corresponding action if and only-if Wallet Apps completes payment transaction properly. It resolves the payment result notification problem without using any internet connection in merchant side.

By advanced encryption and decryption technology, even legal Wallet App can not send fake message to cheat WayGoBox module. And most importantly, different Wallet App can not be counterfeited each other.

## WayGoBox Devices

There are different forms of WayGoBox to fit various scenarios.

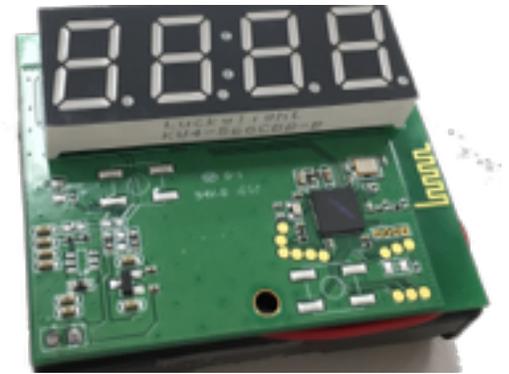
WayGoBox for Store:

- Provide LCD display for people to check payment result.
- Provide lithium battery and micro usb for power supply.
- Provide Previous and Next button for transaction browse.
- Transaction log is stored in internal memory
- Password protection bluetooth protocol for reading transaction log by POS system.
- GPIO and UART IO interface for external machine



WayGoBox Light:

- Provide LED display for people to check payment result.
- Provide lithium battery for power supply.
- Transaction log is stored in internal memory
- Password protection bluetooth protocol for reading transaction log by POS system.
- GPIO and UART IO interface for external machine



WayGoBox Module for Self-Service Machine:

- Transaction log is stored in internal memory
- Password protection bluetooth protocol for reading transaction log by POS system.
- GPIO and UART IO interface for external machine

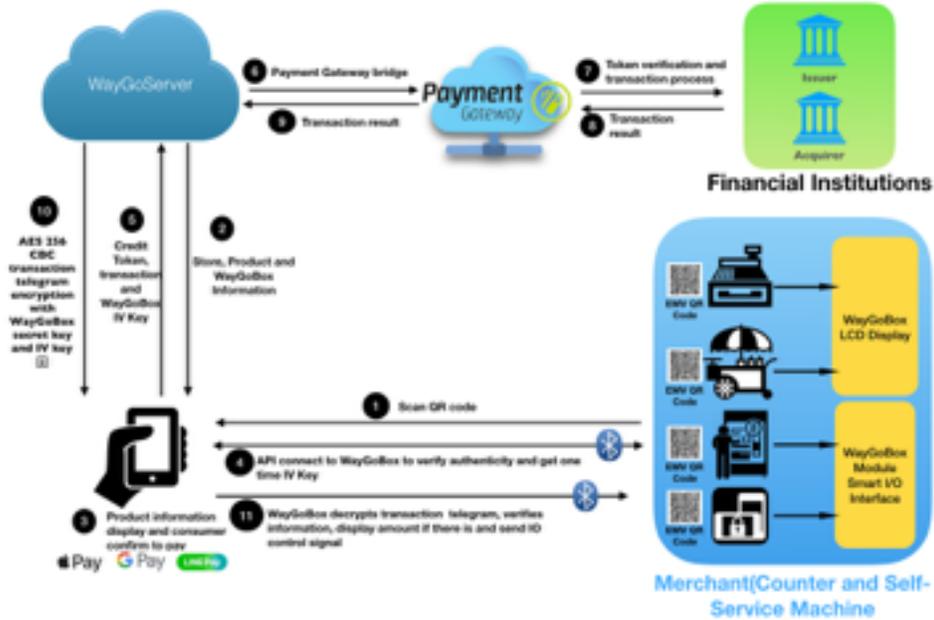


## One Intelligent Device with Multiple Payment Scenarios Support Transaction Flow

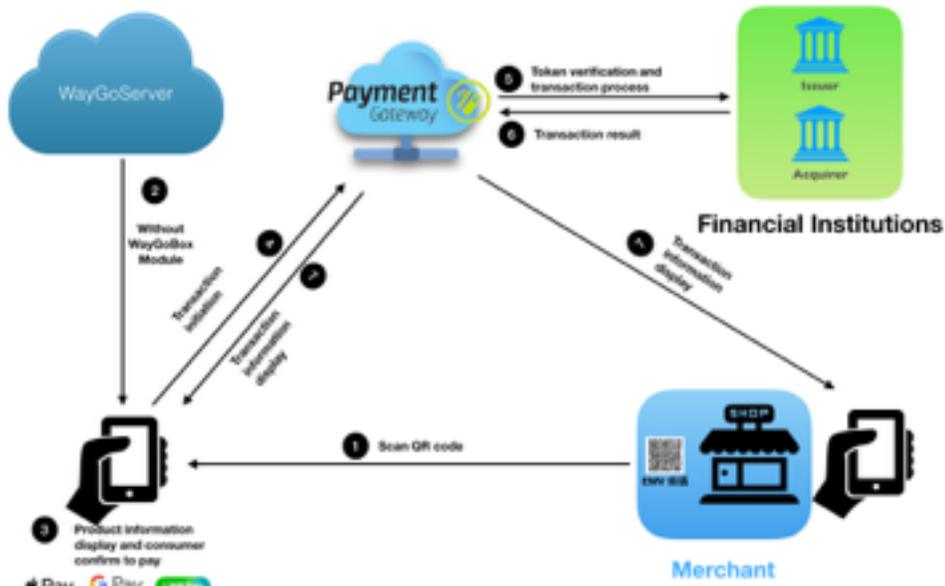
Type	Pay Unit	Input Variable	Action	Example
<b>Pay by Time</b>	Per minute	A multiple of the amount	Continuous High/Low electric potential signal for X minutes to activate relay	Laundry wash machine, Car washer, Treadmill, Massage Chair
<b>Pay by count</b>	Per count	A multiple of the amount	Output X times Y ms pulse signal to simulate coin-box	Crane game, Traditional Vending Machine , Electric toy machine
<b>Once Locker</b>	Per hour	Duration: Start time Duration: End time	Start time: Output Y ms pulse signal to open locker, End time: Output Y ms pulse signal to open locker	Safe deposit box, Parking gate
<b>Multiple Times Locker</b>	Per hour	Duration: Start time Duration: End time	Unlimited pulse signal to open door between start time and end time duration	Hourly rental/Daily rental suites door locker, Rental meeting room door locker
<b>Digital Interface</b>	Unit price of SKU	A multiple of the amount	Output self defined parameters by UART interface	Intelligent Vending Machine, Beer machine, Drinking machine
<b>Merchant Couter</b>	None (by Merchant waiter oral inform)	User input amount	Amount display	General shops, restaurants, vendors, delivery staff, taxi

EMV QR code maybe has WayGoBox in pairs or not. WayGo solution provides two different transaction flow for two different situation. Any Wallet App with Way Go Wallet API integrated can deal with them simultaneously.

Case 1: EMV QR Code with WayGoBox Module



Case 2: EMV QR Code without WayGoBox module



**Key**

# Key Advantage of WayGoBox

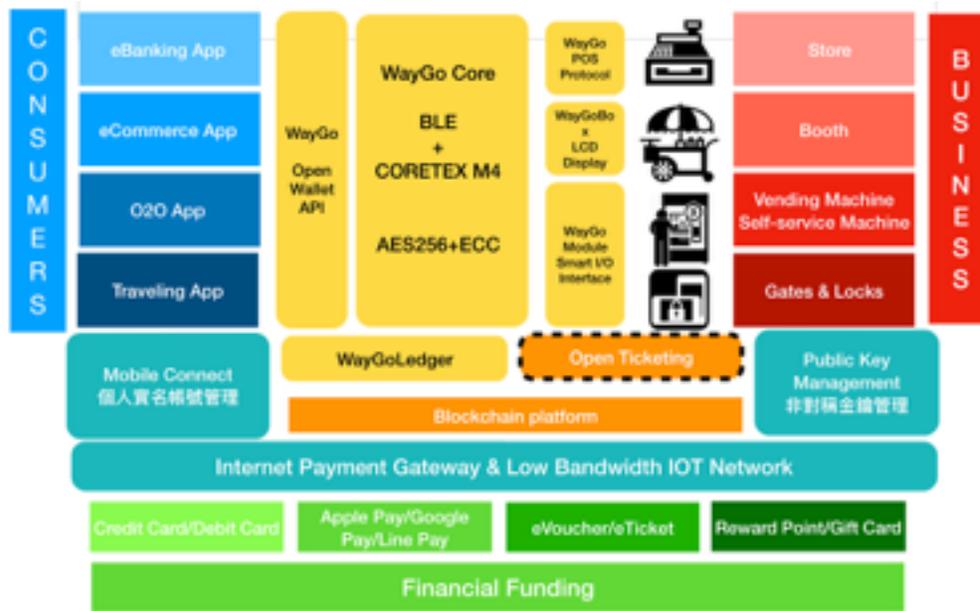
- The core promise of EMV QRCPS is sharing single QR Code among **multiple** Wallet Apps. WayGoBox solution is born to support multiple Wallet Apps from the day one.
- ‘Faking by Duplication’ is known as the major weakness of QR Code Payment. WayGoBox can resolve this problem and enhance the **security** when applying EMV QRCPS.
- BLE SoC based solution, result in low implementation **cost**. No internet connection requirement in merchant side also reduce error rate and operation cost.
- Easy deployment with modularized hardware and parameterized software in Cloud and firmware. WayGoBox can **accelerate** the adoption of EMV QRCPS, and enlarge it to more different **scenarios**.

# Vision and Roadmap

Our vision:

- Decentralized and open architecture for End-to-End/B2B2C mobile payment and mobile ticketing solution.
- Aggregation of multiple payment scenarios from people service stores to different self-service machines.
- Provide Pay Before, Pay Now, Pay After simultaneously.
- B2B: Blockchain technology as Infrastructure for Business Network to build decentralized architecture.
- B2C: Provide smart bluetooth devices as payment verification mechanism.to End-to-End solution and Open Platform for Mobile Payment & Mobile Ticketing.

The following blueprint describes mobile payment & mobile ticketing ecosystem and our technology roadmap to accomplish our vision. Bricks with yellow color represent solution of WayGo.



## **Conclusion**

Supports multiple apps, multiple payment scenarios, multiple hardware, multiple payment accounts. It also supports various business models such as Pay Before, Pay Now, and Pay After.

Allowing different stakeholder in this ecosystem (Apps, financial institutions, business partner, and information infrastructure) can focus on what they are good at, without dealing with unfamiliar agenda. As long as there is a will, any new player can plug in to this ecosystem at any time and then complete the connection with the existing players. Don't need always working on system integration again and again.

Low cost of hardware, simple construction methods, and parameterized hardware integration interface allow traditional industries to upgrade together and jointly enter the global mobile payment market for self-service equipment..

# Section 2

## Solution Overview

### Sequence Diagram with WayGoBox

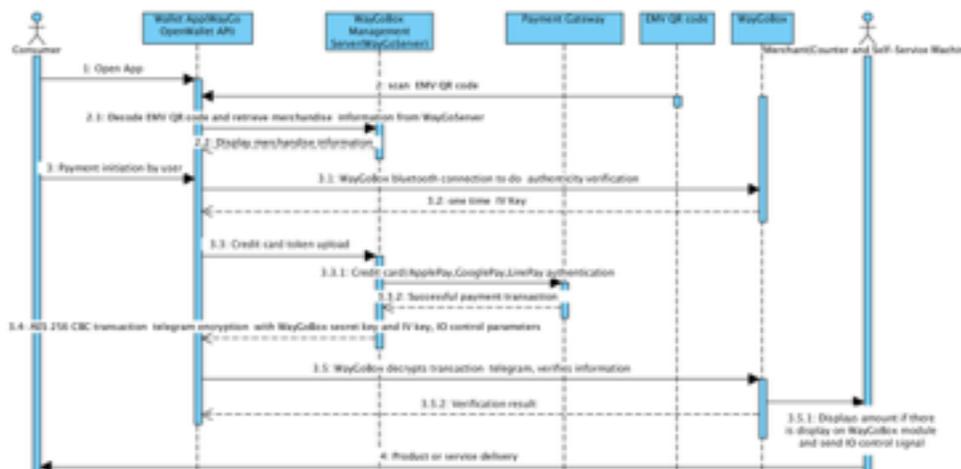


Fig. 2 EMV QR code with WayGoBox

### Sequence Diagram without WayGoBox

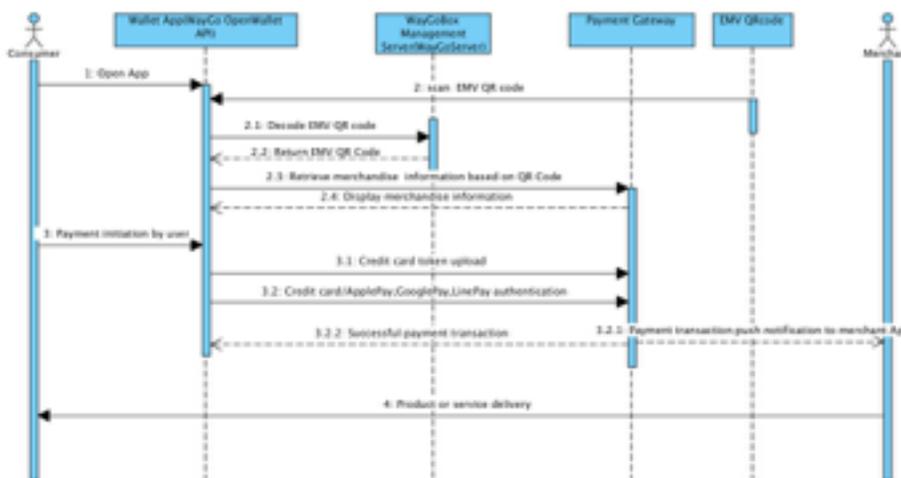


Fig. 3 EMV QR code without WayGoBox

## WayGoBox hardware device features:

- Bluetooth low energy device with BLE 4.2
- Dynamic bluetooth broadcast device identifier
- Two-way authenticity verification between WayGo Open Wallet API SDK and WayGoBox hardware device
- AES 256 CBC cryptography verification mechanism
- Payment transaction information display if there is a display on board
- Four GPIO output, two GPIO input and UART IO interface to external equipment
- Transaction log is stored in internal memory
- Password protection bluetooth protocol for reading transaction log by POS system.

## WayGo OpenWallet API SDK

WayGo OpenWallet API provides iOS and Android APIs for WayGoBox mobile payment. There are three different types of API. Please check WayGo OpenWallet API sample code for more detail.

WayGo OpenWallet API SDK provides the following features:

- Nearby WayGoBox devices functionality can be discovered by RSSI signal strength, by specific WayGoBox device id or without any condition(all devices nearby).
- Two-way authenticity verification between WayGo Open Wallet API SDK and WayGoBox hardware device.
- Connection to send encrypted payment transaction and IO control parameters from wallet App to WayGoBox.
- Provide Android (5.0+) and iOS(9.0+) version

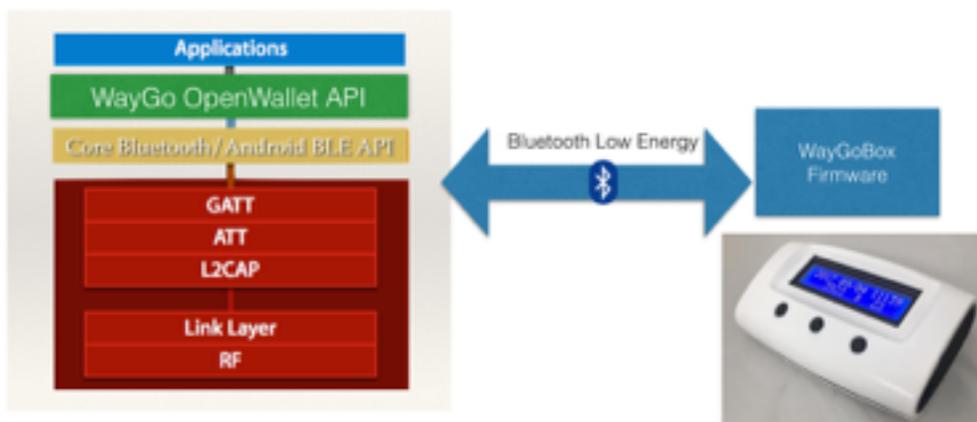


Fig. 4 WayGo OpenWallet API SDK Architecture

WayGo OpenWallet API List:

Type	API Name	Description
<b>WayGoBox Discovering</b>	discoverNearbyPeripherals	Discover nearby WayGoBox peripherals
	discoverNearbyPeripheralBySignalStrength	Detect near field WayGoBox by RSSI signal strength
	discoverNearbySpecificPeripheral	Discover nearby specific peripheral with peripheral device unique id
<b>Authenticity Check</b>	doVerifyPeripheralAuthenticity	Two-way authenticity verification between SDK and WayGoBox module. They will check each other based on proprietary authenticity algorithm. Any illegal App connection will be rejected by WayGoBox automatically.
<b>Mobile Payment</b>	doGetPeripheralIvKey	Get one time AES CBC IV Key generated by WayGoBox
	doMobilePaymentVerificationWithDataWithMachineControl	WayGoBox decrypts AES CBC encrypted transaction sent by server, verify transaction information correctness and display payment information on device if there is display on board. Process IO control parameter to control external machine by GPIO or UART

# WayGo Server

## WayGoServer eWallet Web Service

WayGoServer eWallet Web Service provides server webService to Wallet Apps. WebService is designed to implement the following tasks:

- Response merchandise information to Wallet App based on WayGoBox device id or EMV QR code
- Response transaction request from Wallet App
- As bridge to any financial organization (Payment Gateway or Banks) to finish payment transaction
- Send back AES CBC 256 encrypted transaction telegram based on WayGoBox configuration and activation information

## Payment Management Web Site for Merchant

WayGoServer provides web site to merchants to manage their WayGoBox devices, account authority management, merchandise information, payment management including refund and payment transaction report.

### Authority Center:

- Department Management
- Role Management
- Role Transaction Authority Setup
- Account Management



### Device Management:

- WayGoBox Device Configuration
- WayGoBox Device Shipping Information Import



*Payment Management:*

- Acquirer Setup
- Merchandise Management
- Payment Transaction Management



The screenshot displays the 'WayGo Payment 支付管理' interface. It features a sidebar menu on the left with options like '商户中心', '交易管理', '商户管理', '支付管理', '商户设置', '商户审核', '商户列表', and '商户管理'. The main content area is titled '交易记录查询' (Transaction Record Query) and includes search filters for '商户名称' (Merchant Name), '商户代码' (Merchant Code), '交易日期' (Transaction Date), and '交易金额' (Transaction Amount). Below the filters is a table of transaction records.

交易日期	交易金额	商户代码	交易名称	商品名称	订单	详情
2018-08-07 18:08:18	740.10	2018080801	银联扫码支付	银联	订单	查看详情
2018-08-07 18:02:05	740.10	2018080801	银联扫码支付	银联	订单	查看详情
2018-08-07 18:00:16	740.10	2018080801	银联扫码支付	银联	订单	查看详情
2018-08-07 18:00:00	740.10	2018080801	银联扫码支付	银联	订单	查看详情
2018-08-07 18:00:10	740.10	2018080801	银联扫码支付	银联	订单	查看详情