INDONESIA'S PUBLIC APPLICATION PROGRAMMING INTERFACE (API)

APPLICATION PROGRAMMING INTERFACE (API) *PUBLIK INDONESIA*

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Abstract

Indonesia places the fifth position of the most internet users in the world. Consequently, data transaction through HTTP protocol saw an increase. An open API can facilitate Indonesia's users to access data and build application through HTTP protocol. In this paper, 38 open APIs were investigated and classified by using five criteria, namely technology, authentication, scope, source, and approval request.   In general, the open APIs in Indonesia employ RESTful as a web service and JSON format as data format. In term of authentication, API key is a common method in most of open APIs.

Keywords: Indonesia application programming interface, open API, web services,

INTRODUCTION

An open API, also known as a public API, is an application programming interface which is publicly available for everyone such as developers with programmatic access to the interface. API allows software development without having to develop software from scratch. In addition, API owners can retain their code while gaining more publicity for their products.

Recently, Indonesia places the fifth position of the most internet users in the world[1]. Thus, open API is considered as one of the enablers of technology and data growth in Indonesia. For instance, the Indonesian Government introduced an initiative for open government to drive its citizens' involvement in development. Moreover, the open government can enforce all administrative units to involve the citizen in the development planning process through "Perencanaan Pembangunan (development planning)" forum [21]. Meanwhile, on an economic viewpoint, based on Global B2C E-Commerce Report 2016, Indonesia experienced approximately 60% E-commerce sales growth in 2015[3]. Piao concluded that an open API platform could facilitate the development of the innovative application for third-party developers namely 1) establishing a business without significant investment both in software and hardware; 2) contributing to driving traffic to the platform[4]. As a result, the open API technologies potentially broaden the E-commerce business model and boost the sales growth of the e-commerce business.

However, to date, Indonesia is lacking open API. In the case of open government, Indonesia is at an early stage and needs to develop awareness on the matter of open data and policy to support the initiatives [5]. By showing its commitment to open government by participating in Open Government Partnership [2] as a result, currently, government's open data initiatives begin to emerge as open API. For instance, "Jakarta API" which is developed by Jakarta Smart City. Hence, to start an initiative of open data with open API technology, we need to review the current condition of the open API availability in Indonesia..

METHODOLOGY

Indonesia's Public Api

This section describes a list of public APIs that are used in Indonesia.

A. BukaLapak

Bukalapak API is an e-commerce API which is officially developed by Bukalapak[1] Development team. The API provides open API to develop innovative third-party software Development Competition. Bukalapak API provides products, transactions, and users. Bukalapak API uses REST technology to communicate between Bukalapak server and clients and uses JSON format for communication.

B. MatahariMall API for Seller

Similar to Bukalapak, MatahariMall API is also an e-commerce API which is officially developed by the MatahariMall[2] Develompment team. The API documentation provides various resources reference for product management modules and order management modules from a Seller Center API. Both modules are at a high level and intended for

[1] https://www.bukalapak.com/

[2] https://www.mataharimall.com/

those who want to develop using this API. Moreover, the documentation contains public and private actions that will be used for a specific merchant or seller by implementing a token. MatahariMall API uses the REST technology while using the JSON format for communication.

C. Tiket.com API

This API is developed by ticket.com, it enables a user to create its website or mobile application for ticket sales. Tiket.com provides all data. The API exploits REST, which supports JSON, XML, and PHP serialized format. Users are required to register as affiliates of ticket.com[3]. There are two flows of payments that can be considered in using the API:

1. Deposit: by putting money on deposit at Tiket.com, a user can manage his transaction and payment. API will return insufficient funds when deposits are low. Thus the transaction will be failed.

2. Regular: Tiket.com offers another payment channel where users can charge their customer for a transaction. The transaction can be paid by using bank transfer and payment gateway (credit card and BCA KlikPay).

D. Bisatopup

Bisatopup API enables a user to create apps for purchasing mobile phone prepaid credits, Internet Packages, electricity tokens, Game Vouchers and bills payment through bisatopup.com. The API consists of Product List, Product Price, Check Bills. Bisatopup officially develops the API by using the REST technology and JSON format for communication.

E. Jurnal API

Jurnal API enables developers to integrate between their system and online accounting software platforms developed by Jurnal.id. The API is built based on REST technology and will return JSON formatted data upon the requests. To use the API, users are required to have an existing active company in their application. The API is only for the user of Jurnal.id.

F. Midtrans - Payment Gateway

Midtrans API is an online payment gateway service API which is officially developed by PT Midtrans[4]. Midtrans API uses RESTful technology and JSON format to serve a communication bridge between merchants as users and Midtrans's payment channels.

G. iPaymu

iPaymu API is an online payment gateway service API which is officially developed by PT. INTI PRIMA MANDIRI UTAMA[5]. iPaymu API uses REST technology and supports both XML and JSON format to support communication between merchants as users and Midtrans' payment channels.

H. Hot Thread Kaskus (Un-official)

Hot Thread Kaskus API is an unofficial Kaskus[6] forum API Developed by Bayyu[7] using a web scraping technique. The API was developed using REST technology and using the JSON format for communication between clients and server.

I. Data Jakarta

Jakarta smart city[8] Is one of the initiatives for

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[3] https://www.tiket.com/affiliate
[4] https://midtrans.com
[5] https://ipaymu.com/

[6] https://www.kaskus.co.id/
[7] Bayyu.net
[8] http://api.jakarta.go.id/

Indonesia open government. Jakarta API that is developed by Jakarta Smart City. It provides a public data service in Jakarta as such as data on the region, hospitals, CCTVs, busway routes, etc. The API uses REST technology and JSON format for communication between client and server.

J. Kaskus API

Kaskus API is an API for accessing the most popular forum in Indonesia. Kaskus API base URI is located at https://www.kaskus.co.id/api/oauth (without trailing slash) and will be referred to BASE_URI. The API is RESTful. Data is exposed in the form of URIs that represent resources and can be fetched with HTTP clients (like web browsers). This API is developed by Kaskus Development team.

K. Tanggal Lahiran Pasaran Zodiak

This API developed by iBachor is used to learn the signs of zodiacs based on date of birth. It also shows details on date of birth, age, and birthday.

L. Cek Resi

This API is used for tracking receipt of the popular expeditions companies in Indonesia such as JNE, SiCepat, and Wahana. Cek resi API is located on https://www.wahidganteng.ga/api/cek-resi.

M. Paket ID

Similar to CekResi, Paket ID API is also used for tracking shipment. The API version 2 uses universal authorization (auth-user-email and auth-API-key) The API is developed by Paket.id.

N. Raja Ongkir

Two previous APIs are used for tracking shipment. Rajaongkir is used for obtaining information about shipping cost such as JNE, POS, TIKI, etc. RajaOngkir API employs RESTful where the data are taken from each of the expedition websites to maintain data accuracy.

O. Jadwal Shalat

This API presents prayer time schedule by city or date. The API is located on https://www.wahidganteng.ga/api/jadwal-sholat. This API developed by Wahid.

P. Ayo Donor PMI

Ayo Donor PMI API can capture Indonesian Red Cross' activities, particularly in terms of bloodstock. This API consists of Blood Stock, and Blood Transfusion schedule. This API is developed by iBachor.

Q. Halal Product MUI

Halal Product MUI is an API for searching halal products registered by the Indonesia Ulema Council (MUI). The API provides information including product names, certificate number, manufacturers, and validity period of the halal certificate. This API is developed by iBachor[9]. The Halal data are obtained from the MUI halal product website. The API uses RESTful, which provides access to halal information.

R. The departure of Hajj Eestimation

The departure of Hajj estimation is an API for predicting the estimated departure of Hajj. This API is developed by iBachor[1] by exploring the Indonesian Ministry of Religious Affairs' website. It also uses RESTful web services and JSON. The input of the API is the unique number given by the Indonesia's Ministry of Religious affairs.

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[9] https://bachors.github.io/

S. Emergency Contact (Police, Firefighter, Hospital)

Emergency Contacts is an API that provides police, firefighter and hospital contact numbers and address. This API is developed by Farizdotid[10] and can be accessed by using RESTful architecture and presented the data in JSON.

T. Kemendag

Kemendag API provides information about the price of stapple commodities in Indonesia that are provided by the Ministry of Trade of Indonesia . The information includes the commodity name, unit, and the price. This API was developed by iBachor[1] by scrapping the table of stapple commodities price on Indonesia's Ministry of Trade's website. It also uses RESTful web service and JSON to provide access to users.

U. Song Lyrics

iBachor also developed an API for searching song lyrics by using RESTful as a web service and JSON format.

V. Area Name in Indonesia

This API provides a list of areas in Indonesia, including provinces, regencies, cities, sub-districts, and villages. RESTful and JSON are web service technology used by Farizdotid[2] for developing the API.

W.Lapor!

Lapor! is an API which is officially developed by State Ministry of the Empowerment of State Apparaturs and Bureaucratic Reform of Indonesia. The API is part of a citizen reporting management system. Lapor! uses RESTful API to integrate the services of data access and report of Lapor! API. Lapor! Data Access is in JSON format for communication, meanwhile Lapor! Report integration uses XML format for communication. The Lapor! Mobile app is one example application used the API.

X. Postal Code

Postal code is an API that provides the list of postcodes in Indonesia. This API was developed by iBachor[1] and Widnyana Putra[11]. RESTful web services and JSON format are the Technologies for developing the API.

Y. API Pemilu

In 2014, Indonesian Association for General Elections and Democracy (*Perludem*), is one of civil society organizations that utilizes and optimizes general election data and information [20]. In collaboration with the Asia Foundation, *Perludem* implements the API for collecting the general election data. The collected data is converted to machine-readable format and stored in online storage that can be accessed freely by anyone. The storage supports RESTful web service and supported by XML and JSON technology. The API Pemilu has been implemented for some applications such as 1) Pemiluman App; 2) Pemimpin Kita; 3) Pemilu Kita; 4) One Vote; 5) Caleg store, etc.

Z. Mandiri e-cash

Mandiri e-cash API provides solutions for companies/organizations to perform operational, financial management from/to employees/members. The transaction receipt of payments is made by a host-to-host method through open-API. There are two principal transactions which are handled by API:

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1. Operational Fund Management. eCash is used by employee/member account of the organization for debiting contributions, claims and deposits from employees/members to a company.
2. Receipt of Payment eCash can be used to make payments to the Company's Partner (Merchant) by the eCash holders. It is intended for people who do not have a debit or credit card.

Bank Mandiri Developer officially develops Mandiri e-cash based on RESTful web service technology and supported by JSON format as response protocol.

AA. API BPJS Kesehatan

API BPJS Kesehatan is an official API which is developed by Social Security Administrative Body (BPJS) based on RESTful and JSON technology. To access the API, a user is required to have a Consumer ID and Consumer Confidential data. The service consumer only stores consumer-confidential information to maintain security. The Consumer confidential information generates a Signature (X-signature). A list of services provided by this API are: 1) Finding participants based on the BPJS card; 2) Finding participants by identity card number or NIK; 3) Searching referral data by reference number; 4) Searching referral data based on BPJS card; 5) Searching list of referenced patients based on the referral date; 6) Making SEP, etc.

BB. API BCA

Bank BCA develops a list of open APIs which can be used by third-party developers such as business banking API, Sakuku API, and General Information. BCA developers officially developed those APIs by implementing RESTful web services and JSON. BCA APIs are using OAuth 2.0 as the authorization framework. To obtain an access token, a user has to be authorized by a client_id and client_secret. A signature is used by BCA to verify that attackers do not alter the request. This api provides the following services: 1) balance information; 2) account statement; 3) fund transfer; 4) create payment; 5) payment status; and 6) general information (foreign exchange rate, deposit rate, and nearest ATM locator).

CC. Open Data Kota Bandung

Open Data Kota Bandung developers developed an API based on CKAN API[12]. CKAN Action API is a powerful, RPC-style API that exposes all of CKAN core features to API clients. CKAN API also uses RESTful web service. The parameters for the API functions are given in the JSON dictionary. CKAN will also return its response in a JSON dictionary.

DD. API Data KPU

The open data KPU provides web service and JSON. The data provided includes general election, constituency, candidacy, candidate, general election results, etc.

EE. Online Pajak

As an extension of Online Pajak, its developer developed several open APIs that can be used by third-party client integrator. To access online tax services through the API, Online Pajak provides an additional authentication layer. The setup process consists of two steps: 1) create an API key to authenticate the market and 2) create a User ID for new user to this market's users list. Online Pajak is

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[12] https://ckan.org/

used for the preparation, payment and reporting of types of tax returns: VAT, Income 21 and Income Tax 23.

FF. Open Data Kota Banda Aceh

Developer of Open Data Kota Banda Aceh developed API based on the CKAN API. The CKAN API also uses a web service and parameters in the JSON dictionary, and CKAN will also return the response in the JSON dictionary. The services provided are 1) checking a site, 2) displaying metadata from a dataset along with data source, 3) displaying a list of UUIDs from a dataset, displaying a list of all group names, category list, license list, revision list, displaying datasets based on latest updates, etc.

GG. BRI API

BRI develops several open APIs that can be used by third-party developers such as business banking API, Sakuku API, and General Information. The APIs are based on REST and JSON. The BRI's APIs use OAuth 2.0 as the authorization frame. To obtain an access token, users must be authorized by client_id and client_secret. A signature is used by BRI to verify the request not modified by the attacker. Some services provided by BRI API are 1) balance information; 2) mutation info; 3) forex info; 4) make payments; 5) payment status; and 6) general information (foreign exchange rates, and deposit rates).

HH. ATM Bersama API

This API also implements REST and JSON. There are several services provided by this API, such as bank code in Indonesia, shared ATM

location, cash withdrawal, balance information, third party transfers, payment transfers.

II. API-H2H Bisnis

This API is used for ODEO[13] Affiliation to join their business. API authentication employs tokens. For the JSON format, each request must also include an authorization header in the format of token = base64 (MID + ':' + SECRET_KEY) Authorization: The carrier responds 401 for an invalid request. It is unnecessary for appending an Authorization header in XML format because only MID and SECRET_KEY are required when XML body is sent.

JJ. Klik Indonesia API

Klik Indonesia API is a single sign-on and app monetizing services developed by Solusi Dua Satu[14]. The API uses a REST technology and is available in JSON format.

KK. Panel-Pedia API

Panel-Pedia API is an API for selling a bogus endorsement in social media post as such as Facebook's likes, Twitter follows, Instagram likes, etc. Panel-Pedia API is developed by Panel-Pedia15 using the REST technology and available in JSON format.

LL. Satu Data Indonesia API

Satu Data Indonesia API is an open data API initiated by *Unit Kerja Presiden Bidang Pengawasan Pengendalian Pembangunan* (UKP-PPP) or President Staff for monitoring and assessing development as a commitment for open government partnership[16]. The API provides data from the

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[13] https://www.odeo.co.id/

[14] https://kb.klikindonesia.or.id

[15] https://panel-pedia.com

[16] http://data.go.id/tentang/

ministries of Indonesia, government institutions, local government and developed based on CKAN API and available in JSON format.

OPEN API CRITERIA

In this section, we describe a list of criteria used for the classification of the mentioned open APIs. There are five criteria, namely technology, authentication, scope, source and approval request. These criteria were selected for their obvious appearance on API retrieval.

MM. Technology

Technology is a criterion concerning the kind of technology supporting the open APIs.

1. XML

XML (Extensible Markup Language) is a commonly used markup language for generating markup documents with the need for data exchange between multiple systems. [6] XML is an extension of HTML (HyperText Markup Language) which is the standard language for the Internet. [7]. XML design can store data with simple and easy management. The XML keyword is the data (plural of datum) that can provide information by processing it. [8] XML provides standardization to describe the contents of the document but can be modified. [9] XML can describe any database view but in a standard way. [9]

2. JSON

JSON (JavaScript Object Notation) is a computer data exchange format. The format is text-based and easy to understand and is used to represent simple data structures and associative arrays (called objects). Transmission of structured data through a network connection to a process called serialization, often uses JSON. Its main application is on AJAX web application programming by acting as an alternative to the traditional use of XML format.

JSON is based on a set of JavaScript programming languages (specifically, the third edition of standard ECMA-262, December 1999 [10]). JSON is a data format independent of a language. Code for creating and managing JSON data has been provided for many types of programming languages. The json.org website provides a comprehensive list of JSON bundles available, organized by language.

The JSON format is specified in RFC 4627 by Douglas Crockford. The official JSON Internet media type is application/JSON while the file extension is .json.

3. REST

REST (Representational State Transfer), is a software architecture for distributed hypermedia systems such as WWW. Roy Fielding first introduced this term in 2000 on his doctoral dissertation. REST specifically refers to a network architecture that defines and addresses resources. This term is often used to describe all simple interfaces that pass data in specific domains over HTTP without additional message layers such as SOAP or session tracking using HTTP cookies. It is possible to design an extensive software system by using the REST Fielding architecture style without

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17 https://data.kpu.go.id/open/v1/doc.php
18 http://apidoc.achilles.systems/
19 http://data.bandaacehkota.go.id
20 http://docs.briapi.apiary.io

21 http://docs.ppob.apiary.io

using HTTP and interacting with the WWW. The REST allows designing simple XML + HTTP interfaces that do not follow REST principles but instead follow the model of RPC (Remote Procedure Call)[11].

NN.   Authentication

There two authentication methods that are widely used in the open APIs are Oauth and Apikey. Further explanation on both methods are as follows:

 1. OAuth

OAuth is an open protocol for sharing personal resources (e.g. photos, videos, address lists) stored on a website with other sites without the need to provide a username and password. This process uses a token, not a username and password, for their data is hosted by a particular service provider. Each token grants access to a specific site against a specific source for a specified duration. [12]

OAuth provides access to third-party sites to access their information stored on other service providers without having to share their access or overall data permissions. How it works is similar to using a credit card and signing a transaction slip, without giving out its ATM card and PIN.

 2. ApiKeyThe

ApiKey is one of the authentication methods to access API from another website. Usually in the form of code taped to other applications. Some Open APIs use ApiKey for access, and few others do not use it. To obtain an ApiKey, a user must register to API provider.

OO.   Scope

 The scope of our work is the scope API, based on the location where the APIs are implemented at the national or regional level.

PP.   Source

Data provided by an open API can be obtained from either origin sources or scraping websites, which can be explained as follows:

1. Origin Sources

Origin sources are persons or organizations who created data. The knowledge of the source is for data integrity and validity.

2. Scraping

Scraping is a technology solution to extract data from web sites, in a quick, efficient and automated manner, offering data in a more structured and easier way to use the format [18]. Some software companies have designed different tools that enable other people to use scraping techniques. These tools provide an attractive and powerful user interface like web data extractors, data harvester, crawling tools, or web content mining tools.

QQ.   Approval Request

When a user wishes to access an API, sometimes an approval request process pops up, requiring users to complete it before accessing the API. API may be called by the application that creates approval requests in order to submit a newly-created request for the user to the appropriate approver [19] which is automatically approved, or application should approve user manually.

RESULTS AND DISCUSSION

We have described the 38 open APIs in Indonesia. We summarized the APIs based on above criteria into two tables. Table 1 consists of the explanation about technology and authentication. Table 2 describes scope, source and approval request.

Most of open APIs in Indonesia employ Restful and JSON, and few APIs support XML. In terms of authentication, API key is widely used in the APIs since it is simpler of usage than that of OAuth. Some APIs that do scrapping on other websites do not require any authentication methods.

As shown in Table 2, it was only Bandung and Aceh that has explicitly provided open API service for accessing city.-related data. 36% of the APIs display data by scrapping another website. These APIs can be accessed directly without any approval request since the data are publicly available without accessing APIs. In general, the API system can approve the request of API usage; and few APIs still accept request manually using KeyToken.

Table 1. Open API Based on Technology and Authentication

APIs	Technology	Authentication
Bukalapak	JSON, REST	ApiKey, oAuth
Matahari Mall API for Seller	JSON, REST	ApiKey
Tiket.com API	JSON, XML, PHP Serialized, REST	ApiKey
Bisatopup	JSON, REST	ApiKey
Jurnal API	JSON, REST	ApiKey
Midtrans – Payment gateway	JSON, REST	ApiKey
iPaymu	JSON, XML, REST	ApiKey
Hot thread Kaskus (un-official)	JSON, REST	ApiKey
Data Jakarta	JSON, REST	ApiKey

APIs	Technology	Authentication
Kaskus API	JSON, REST	ApiKey
Tanggal Lahiran Pasaran Zodiak	JSON, REST	OAuth
Cek Resi	JSON, REST	None
Paket ID	JSON, REST	ApiKey
Raja Ongkir	JSON, REST	ApiKey
Jadwal Shalat	JSON, REST	ApiKey
Ayo Donor PMI	JSON, REST	None
Halal Product MUI	JSON, REST	None
The departure of Hajj Estimation	JSON, REST	None
Emergency Contact (Police, Firefighter, Hospital)	JSON, REST	None
Kemendag	JSON, REST	None
Song Lyrics	JSON, REST	None
Area Name of the Whole Indonesia	JSON, REST	None
Lapor!	XML, JSON, REST	ApiKey
Postal Code	JSON, REST	None
API Pemilu	XML, JSON, REST	ApiKey
Mandiri e-cash	JSON, REST	ApiKey
API BPJS Kesehatan	JSON, REST	ApiKey
API BCA	JSON, REST	OAuth
Open Data Kota Bandung	JSON, REST	ApiKEY
API Data KPU	JSON, REST	None
Online Pajak	JSON, REST	ApiKey
Open Data Kota Banda Aceh	JSON, REST	None
BRI API	JSON, REST	OAuth
ATM Bersama API	JSON, REST	OAuth
API-H2H Bisnis	JSON, REST	ApiKey
Klik Indonesia API	JSON, REST	ApiKey
Panel Pedia API	JSON, REST	ApiKey
Portal Data Indonesia API	JSON, REST	ApiKey

Table 2. Open API Based on Scope, Source and Approval Request

APIs	Scope	Source	Approval Request
Bukalapak	National	Origin Source	Automatically approved by the system
Matahari Mall API for Seller	National	Origin Source	Automatically approved by the system

APIs	Scope	Source	Approval Request
Tiket.com API	National	Origin Source	Automatically approved by the system
Bisatopup	National	Origin Source	Automatically approved by the system
Jurnal API	National	Origin Source	Automatically approved by the system
Midtrans – Payment gateway	National	Origin Source	Automatically approved by the system
iPaymu	National	Origin Source	Automatically approved by the system
Hot thread Kaskus (un-official)	National	Web scrapping	Manually using KeyToken
Data Jakarta	Regional	Origin Source	Automatically approved by the system
Kaskus API	National	Origin source	None
Tanggal Lahiran Pasaran Zodiak	National	Scraping	None
Cek Resi	National	Scraping	None
Paket ID	National	Scraping	None
Raja Ongkir	National	Scraping	None
Jadwal Shalat	National	Scraping	None
Ayo Donor PMI	National	Scraping	None
Halal Product MUI	National	Scraping	None
The departure of Hajj Estimation	National	Scraping	None
Emergency Contact (Police, Firefighter, Hospital)	National	Scraping	None
Kemendag	National	Scraping	None
Song Lyrics	National	Scraping	None
List of local are in Indonesia	National	Scraping	None
Lapor!	National	Origin	Manually

APIs	Scope	Source	Approval Request
		Source	using KeyToken
Postal Code	National	Scraping	None
API Pemilu	National	Origin Source	Automatically approved by the system
Mandiri e-cash	National	Origin Source	Manually using KeyToken
API BPJS Kesehatan	National	Origin Source	Automatically approved by the system
API BCA	National	Origin Source	Manually using KeyToken
Open Data Kota Bandung	Regional	Origin Source	Automatically approved by the system
API Data KPU	National	Origin Source	None
Online Pajak	National	Origin Source	None
Open Data Kota Banda Aceh	Regional	Origin Source	Automatically approved by the system
BRI API	National	Origin Source	Manually using KeyToken
ATM Bersama API	National	Origin Source	Manually using KeyToken
API-H2H Bisnis	National	Origin Source	Manually using KeyToken None
Klik Indonesia API	National	Origin Source	Automatically approved by the system
Panel Pedia API	National	Origin Source	Automatically approved by the system
Portal Data Indonesia API	National	Origin Source	Automatically approved by the system

CONCLUSIONS

We have investigated 38 open APIs in Indonesia from e-commerce, financial, government, and other domains. RESTful is the popular web service for open APIs. JSON is widely used for data format. Some of the open APIs are unofficial API where the data are obtained from scrapping technique.

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