Web Service Development of People Data Using REST API and Access Token Authenticated

Muhammad Iqbal Perkasa[1], Eko Budi Setiawan[2]

Department of Informatics Engineering, Universitas Komputer Indonesia[1,2],
Jalan Dipatiukur 112 Bandung[1,2]
mail@iqbalperkasa.com[1], eko@email.unikom.ac.id[2]

Abstract—Data is one of the most important thing at this information and information technology era that evolving nowadays. One of massive data that government has yet not used maximally is population data. Utilization of this huge population data is the creation of a web service application system with REST API where this data will be open and accessible to those who have access. One of institutions that use this service is Dinas Ketenagakerjaan dan Transmigrasi where the system allow employee to efficiently register job seeker card using population data that already available. Hopefully this application is able to provide and facilitate many parties, such as data administrators to monitor data usage, registration employee in input data, and people able to registration independently.

Index Terms—web service, api, rest api, people data

1. INTRODUCTION

In the year 2010, in a Regency in West Java has recorded 1,443,156 people aged over 15 years. Such data includes the full name, gender, religion, blood type, the date and place of birth, marital status, address, and nationality, as well as other details. But the number of data recorded on the server until the currently underutilized and yet the existence of the page statistics to monitor the use of population data.

The utilization of population data terolah one is used by the Department of Labor and transmigration in filling job seeker data row. One of the tasks of this agency is making or issuance Card job seekers for the community. Every day the officer on duty is able to serve, which publishes the card as much as over 100 cards.

Once analyzed, Department of Labor and transmigration could use the data recorded in the database server Service population and the civil registry are expected to considerably reduce the workload of the officers of the Department of Labor and transmigration. The data provided are open and transparent, though once the develoepr must have access token to access the data on the server.

Based on the above exposure, then a web service to retrieve the data community are expected to accelerate in the writing or the data community.

2. CONTENTS

The content of the paper is the core part of penilitan is done. The content will be divided into four parts, namely, a review of the literature, analysis, implementation, and testing. Will the research results be spelled out and have done with the included testing to test the reliability of the system or application.

2.1. Literature Reviews

Review of literature was the first of the contents of the paper section later. This section will describe the materials and keywords found in this research. Expected readers of the journal will have guidelines and review in understanding the part covered.

A. Web Service

According to the W3C—international institutions engaged in establishing standardization of the web—the web service is a software system designed can be operated machine to the machine over the network. This architecture model the interaction between the three roles: service providers, consumer services, and registrars service [1]. The use of a web service is to connect dynamically from the devices known as well as unknown in one network [2]. Web service allows the means of operation between the software become standard on many different platforms.

B. Access Token

Access token is a unique and random string that contains numbers and letters. The access token is a keyword that is required by an applicant for a service that should be used to identify and verify whether the applicant has the right to access the web service [3]. Each account owner on the web service has a service access token is unique. The access token is used to increase the level of security on a web service, so that the web service can be accessed only by authorized parties only.

C. REST

REST is an architectural style in designing a web service where the design of the REST has a resource that can be accessed through an HTTP URL address unique [4] [5]. REST allows client can perform request via HTTP protocol with ease using a URI

[6]. Each URL refers to a collection of programs that will be executed and it will return the message to the sender commands.

REST is sending a command that will be executed by the server using the HTTP request methods method called verb. There are eight HTTP request method, IE the GET, POST, PUT, DELETE, HEAD, OPTIONS, TRACE, and CONNECT [7] [8]. In the use of the API REST only uses four of these methods, namely: GET, POST, PUT, and DELETE.

Messages received from the server in the form of an HTTP code succeeds or fails in the header and the message body the results of processing of the program itself. These are HTTP codes are often used in the use of the API REST [9]:

a. 200 *OK*
   A command sent to the server correctly and successfully executed.
b. 400 *Bad Request*
   A command sent to the server contains the wrong field.
c. 401 *Unauthorized*
   Sender command sends the wrong access code.
d. 403 *Forbidden*
   The sender commands do not have access rights to the resource in destination.
e. 404 *Not Found*
   Resource yang dituju tidak ditemukan dalam *server*.
f. 429 *Too Many Requests*
   Sender command to access the reach/excess of the limit set of a certain age.
g. 500 *Internal Server Error*
   Server or program snippet in the resource are experiencing errors.

D. Apache JMeter

Application created by Apache Software Foundation this is the function to do the testing against the server, how the server is able to offset the large number of requests coming. This application can be used for testing databases, FTP, LDP, Web services, HTTP, and TCP connections.

E. JSON

JSON is a message format back a small easy-to-read and written by humans, and are also easily written and parsed by machines. JSON is one revert messages that can be used in a REST API.

JSON is divided into two structures, i.e.:

1. The combined name/value, or a known object or record in programming languages.
2. The List of value, or the usual array of known in programming languages.

F. PHP

PHP is an open source programming language intended for web programming and can be applied to HTML. PHP is a scripting language that was planted in the HTML. This means that you can combine HTML and PHP code in the same file [10]. PHP is a server-side programming language in which the program will run on the server and the results will be integrated into the HTML source code.

G. MySQL

MySQL is a database server applications that run on the server, using standard SQL syntax MySQL in its use. MySQL relational nature which allows a single table can be closely related with the other table, thus enabling it does normalization to prevent redundancy in data usage.

2.2. Analysis

At this stage, will be explained about the stages of research done, that is the analysis of the problem which explains about the problem that was discovered; analysis of the formation of the access token, how to process access token was created; flow analysis of validation, the validation request explain each request before the data provided; analysis of the request and the response from the query web service; analysis of the infrastructure; use case diagrams; implementation of the system; testing; and last is the interview data to the administrator community.

A. Problem Analysis

Analysis of the problems found after the identification process in the service of the population and Civil society are data Records that are owned by the Department of population and the civil registry has not been put to good use and data administrators in the Department of population and the civil registry does not yet have an application to monitor the use of data to the community.

B. General Overview

The following is an overview of the API system society that can be seen in Figure 1:

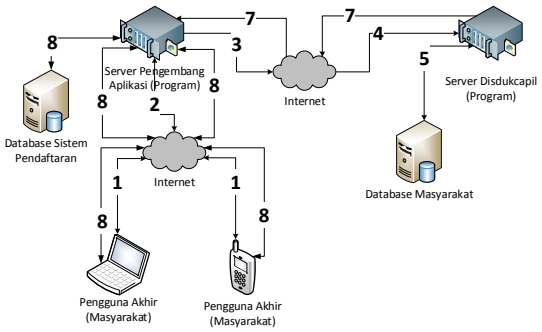


Figure 1. An Overview Of The API System

And a description of Figure 1 are explained with the points per point of how the stages of data retrieval from the server:

1. The end user that is accessing the web community to register their card job seekers on

applications that have been developed by the developer of the application.
2. The request shall enter into the server application developers. The program will read requests from end users, namely the community requests data based on NIK.
3. Server application developers must be connected to the internet to be able to access the server's Service population and the civil registry on a particular domain address.
4. Server application developers access the server service of the population and the civil registry at URL API endpoint addresses that have been created.
5. After successfully validates a valid request from the application developer, the program will connect to a database server on the public database and retrieve data society based on NIK.
6. After successfully retrieving the data in question, the program will write the history entry in the server 's database application API usage limit and reduce the access token, developers are concerned.
7. Server Service population and the civil registry returns the inverse form of Community data formats such as JSON to server application developers.
8. Data that has been obtained will be returned to the application that is used by the end user, i.e. the community.

C. Analysis of Access Token Generation

The establishment of the access token is the assumption of the researcher. This token is obtained from the combination of the email address of the person in charge of the owner 's access token and time timestamp creation access token that is encrypted using the SHA256 method. The following is an example of the formation of the access token which can be seen in Table 1:

Table 1. An Example Of The Formation Of The Access Token

Alamat Email	email@domain.com
Timestamp Pembuatan Token	1492035660 (12 April 2017 22:20)
Fungsi SHA256	sha256('email@domain.com1492035660')
Access Token yang Didapat	91b37dee294eb66ce67c9d8bbbe6f71f0d9baf8f9a697c37f35e4108bbccf9be

Then, it is retrieved from the access token generation was in the form of string `91b37dee294eb66ce67c9d8bbbe6f71f0d9baf8f9a697c37f35e4108bbccf9be`. This String should then be inserted at each request for data API by account `email@domain.com`.

D. Validation Analysis

To verify that the request comes from a clear source and to ensure data security, it needs to be made he stages the validation of the source of the request. Each stage must be met to obtain the required data. There are eight stages of validation to be met, namely:

1. Validation of access token is empty

The system will check if the resource request brings the access token or not. When parameters access token is empty, then the system will return the error code 403 Forbidden error and the message " Harap masukkan access token ".

2. Validation of the format of the access token

The system will check if the resource request brings the access token with a format that is valid or not. The Access token is either a valid string with the string length is sixty-four (64) characters. In a format that is sent is wrong, then the system will return the error code 400 Bad Request and the error message " Format access token salah ".

3. Validation of the truth of the access token

The system will check if the resource request brings the access token that is valid or not. The system compares the access token that is carried by a source with a list of the access token in the database. If the access token is not found, then the system will return the error code 401 Unauthorized and error message " Access token salah ".

4. Validation of access token with a registered domain

The system will check if the domain is the source of the demand originating from domains listed in the access token are concerned. The system will compare the domain from the domain list request with an access token in the specified database. If the domain is not found, then the system will return the error code 403 Forbidden error and the message " Sumber domain tidak terdaftar pada access token ini ". Validation is important to block the AJAX requests from a domain that is not listed.

5. Validation of the limit

The system will check whether the access token in question has the limit of access data or not. The system will check the amount of requests from the access token is concerned of the specific time limit in the database. If limit access token has been achieved, then the system will return the error code 429 Too Many and the error message "Tunggu beberapa saat lagi".

6. Validation of the NIK is empty

The system will check if the resource request bringing NIK or not. If the parameter is empty, then the system NIK will return the error code 404 Not

Found error and the message " Harap masukkan NIK".

7. Validation of NIK format

The system will check if the source requests carry a valid format with NIK or not. NIK is a valid set of numbers with a length numeric is sixteen (16) characters. In a format that is sent is wrong, then the system will return the error code 400 Bad Request and the error message "Format NIK salah".

8. Validation of the truth of the NIK

The system will check if the source requests carry a valid NIK or not. The system will compare the NIK carried by a source with a list of NIK in the database Service population and the civil registry. When NIK is not found, then the system will return the error code 404 Unauthorized and error message "NIK salah".

E. Request-Response Analysis

After a request that goes into the server validated and accepted properly, then the server will process the request connects with the database.

1. URL Endpoint

All requests are accessed through an endpoint URL is located at http://118.97.187.172:8080/api/get_ data_by_nik.

2. Parameters

There are two parameters that are required in each process. Both parameters must be valid in every server will validate the request and will return the inverse error when an error occurs. The parameters are the access_token, lock the access token that is owned by the respective valid account (verified, be active, and have a time limit); and nik, NIK community is to be taken.

3. HTTP Verb

The HTTP Verb that was used for system API it is society `GET`.

4. Authentication

Each request, the system will validate whether the request carries a valid token access or not. The access token is sent through a parameter in the URL.

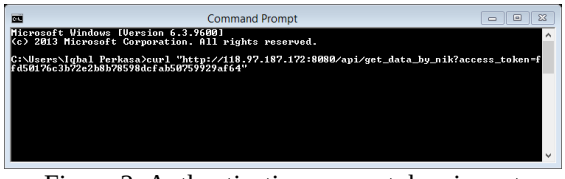


Figure 2. Authentication access token is sent through url parameters

5. Limitting

Each access token has a limit query data by as much as 60 requests per minute. Every minute of this limit will be reset at the back and repeat count. Administrators have the right to change the amount of the limit.

6. Response

If the system successfully validate the incoming request, then the system will return the request is needed. Given the inverse form of JSON format and header information. The following is an example of the inverse of a valid request:

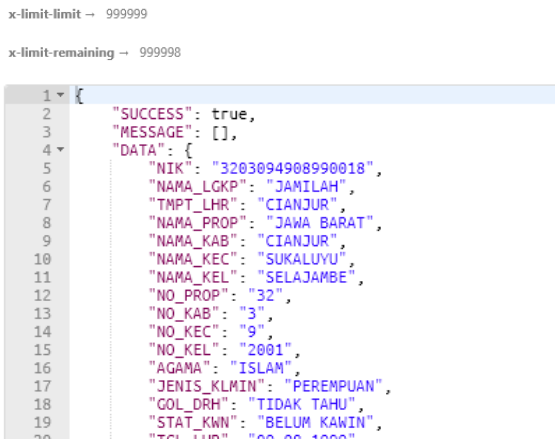


Figure 3. The results of the community in the form of JSON

F. Use Case Diagram

Use Case Diagram is a diagram that illustrates the scope and activities carried out by each of the actors. Here is a use case diagram on applications to be built that can be seen in Figure 4.

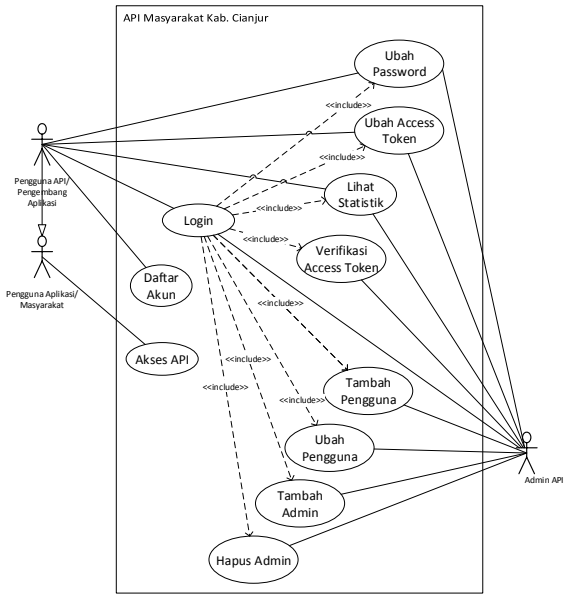


Figure 4. *Use Case Diagram*

2.3. System Implementation

Implementation phase describes the implementations of the discussion and analysis on the previous stages.

A. Software Implementation

At this stage will be explained about the implementation of the software contained in the field which can be seen in Table 2.

Table 2. Software Implementation

No.	Komponen	Spesifikasi
1.	Arsitektur sistem operasi	32 bit
2.	Apache *Server*	versi 2.4.4
3.	PHP	versi 5.5.3
4.	MySQL/MariaDB	versi 5.6.11
5.	Browser	Tersedia

B. Server Implementation

At this stage will be explained about the server implementation is contained in a field that can be seen in Table 3.

Table 3. Server Implementation

No.	Komponen	Spesifikasi
1.	CPU	Intel Xeon X5650 @ 2.67 GHz
2.	Media penyimpanan (HDD/SSD)	1 TB
3.	Memori (RAM)	12 GB
4.	Keyboard	Tersedia
5.	Mouse	Tersedia
6.	Koneksi Internet	Tersedia

C. Database Implementation

Implementation of data base is the implementation of data base tables used to store all data systems that can be seen in Figure 5.

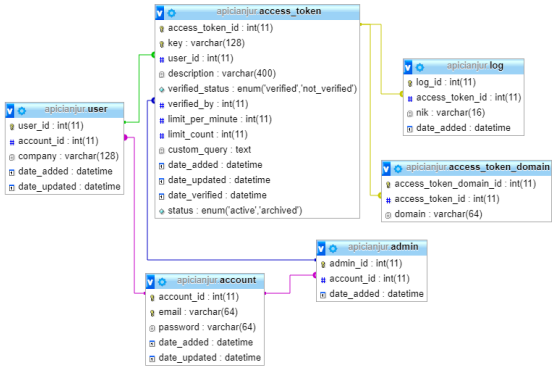


Figure 5. Database Implementation Scheme

D. Interface Implementation

This stage will expose the implementation of the interface of a web page to monitor the use of data that have been used from the people. The interface includes the display to see the use of the data in the form of charts and tables and form data management.

1. *Login*

Interface to display the login form that is used to log into the system. It takes two inputs, namely email and password of the user in question.



Figure 6. Login Interface

2. Account Registration

Interface to display the account registration form is used to register to the system. Each registrant must enter detail data agencies or their company. The data that should be included is the company name, email and password.



Figure 7. Account Registration Interface

3. Dashboard

Interface to display the data usage statistics from the entire community of users in the system. Graph showing the use of the data on those week. To the left of the dashboard there is a sum of data owned by the system, i.e., the amount of data access token, data and number of users, amount of data administrators.



Figure 8. Dashboard Interface

4. Access Token List

Interface to display a list of the access token that is registered in the system. There are three keys to do the action of each line, i.e. the view/change

access token, see the description of the use of an access token, and view statistics.

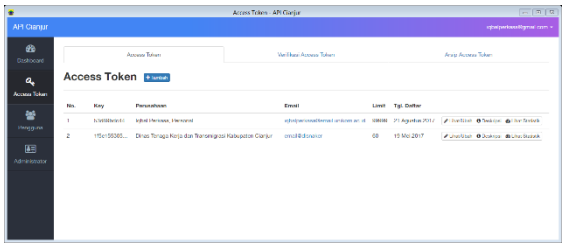


Figure 9. Access Token List Interface

5. Access Token Management

Interface to display the form change the access token that is used to transform the data from each of the access token. There is also a button to regenerate the access token.

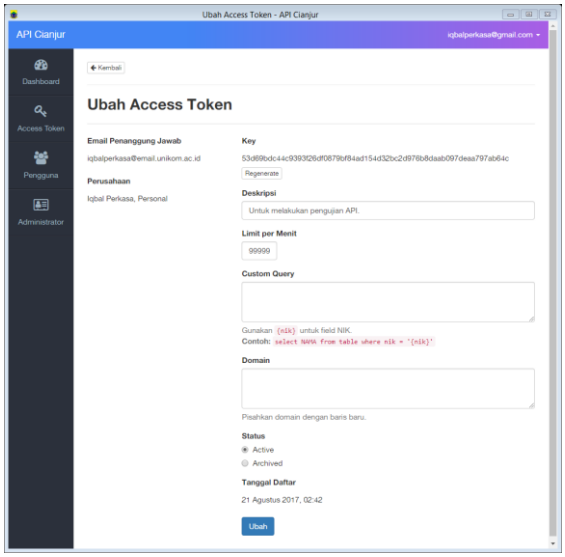


Figure 10. Access Token Management Interface

6. Statistics

Interface for displaying usage statistics data from the access token. Statistics are displayed in the form of graphs and tables. There is also a log of 50 data usage last as well as the amount of usage of the access token in seconds.

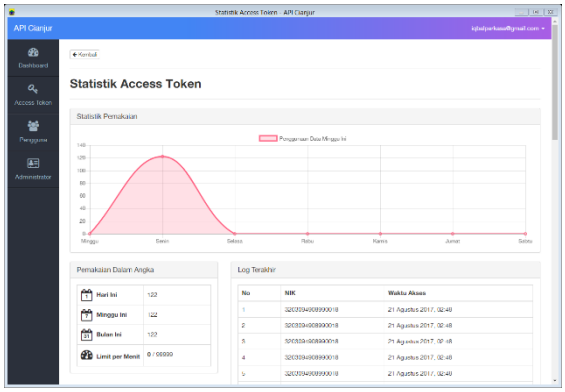


Figure 11. Statistics Interface

2.4. Web Service Testing

The first test is to count the number of cards of job seekers before and after using the web service. Obtained from calculations using the SQL count queries, the number of job seekers before the card is revolved around 300 cards and after using the web service, obtained the number of job seekers is the card range 900 cards.

The next test is the application using Apache JMeter test. With this application we are able to see how the resilience of the server will request request is done. Testing will be done with the sample request 100 times within 1 second. Following are the results of the testing that was done which will be delivered in the form of tables and graphs.

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Table 4. The Results of Testing 100 Sample Request

Sample #	Sample Time (ms)	Sample #	Sample Time (ms)
1	232	51	1198
2	212	52	1169
3	265	53	1198
4	293	54	1226
5	241	55	1196
6	291	56	1449
7	203	57	1469
8	215	58	1245
9	204	59	1256
10	198	60	1243
11	241	61	1524
12	231	62	1503
13	210	63	1261
14	216	64	1248
15	246	65	1322
16	235	66	1623
17	237	67	1281
18	279	68	1524
19	168	69	1235
20	214	70	1215
21	236	71	1240
22	207	72	1225
23	248	73	1237
24	195	74	1234
25	266	75	1508
26	246	76	1300
27	186	77	1293
28	195	78	1284
29	194	79	1256
30	215	80	1554
31	217	81	1341
32	231	82	1603
33	227	83	1259
34	227	84	1642
35	212	85	1360
36	212	86	1330
37	177	87	1292

38	212	88	1356
39	223	89	1326
40	214	90	1361
41	173	91	1428
42	230	92	1409
43	219	93	1360
44	1201	94	1362
45	1233	95	1403
46	1219	96	2288
47	1267	97	5579
48	1259	98	5588
49	1298	99	5605
50	1196	100	5611

We can see that the sample 1–43, the server is able to handle the request quickly, i.e. within a span of 168–293 pp. with average 223,093 ms, then sample 44 – 96 showed a rise time however does not mean that is in a span of 1169–2288 ms with an average of 1,345,453 p. rise simply means is when the server handles more than 96 requests, the time required is more than 5500 p. 100 of the sample is done in 1 second the last sample, four new shows an indication of server encountered a load, then the conclusion to be drawn that the server was able to handle request data community this is ~96 requests in 1 second.

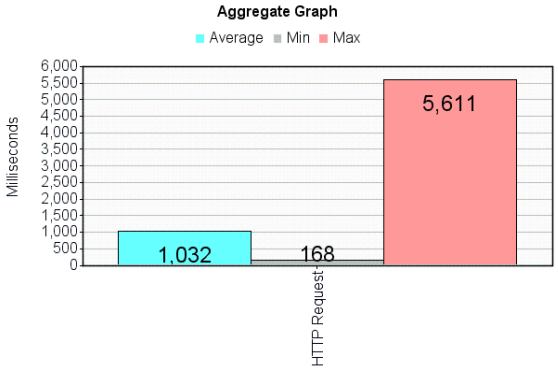


Figure 12. The results of the experiment with 100 sample request

Figure 12 shows a graph of time requests from 100 requests in 1 second. The picture shows the average time is 1032 ms, minimum time is 168 pp., and the maximum time is 5611 ms.

The next thing to do is do an interview with an administrator. The interview was conducted to find out the assessment of the data base administrator as the administrator of the system API communities. After done interview with keynote speaker on Wednesday July 26, 2017, the obtained conclusions interviews as follows:

1. The Data shown in this application are already good at which is displayed in the form of graphs and tables.
2. The offices as the developer and the community can be facilitated by the existence of this web service to facilitate data retrieval community.
3. The look and menu of this application is already good and easy to use.
4. The application is already good and makes it easy to see its, by the look of the already good and proper.

3. COVER

The last part to be covered is the closing section. This section will explain about the conclusions and suggestions of the research. As for the conclusion and suggestions obtained are as follows:

3.1. Conclusions

From the results obtained from the stages that have been done through the process of design, implementation, testing, and interviews with administrators, the following conclusions were obtained:

1. Web service is capable of and can accelerate the registration with the reliability of the server.
2. Population data Administrator can be facilitated in monitoring the use of data of the population and set the access rights of each access token.

3.2. Suggestions

As for a few suggestions that may be submitted are the following:

1. Provide statistical usage data in the community data real-time, to give the user experience better for data administrators.
2. Provide the feature cache in web service for use of data more efficient.

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