

# DEVELOPMENT OF GEOGRAPHIC INFORMATION SYSTEMS MAPPING COOPERATIVES MICRO ENTERPRISES SMALL AND MEDIUM (UMKM) BANDUNG

Wida Wati<sup>1</sup>, Tati Harihayati Mardzuki<sup>2</sup>

<sup>1,2</sup> Informatic Engineering – Indonesian Computer University  
Jl. Dipatiukur 112-114 Bandung

E-mail : widawati@email.unikom.ac.id<sup>1</sup>, tati.harihayati@email.unikom.ac.id<sup>2</sup>

## ABSTRACT

Department of Cooperatives micro enterprises small and medium enterprises (DISKOPUMKM) Bandung is one of the Government agencies have a duty to carry out the functions and Affairs of the Cooperative specialized in coaching. In realizing the mission there is one task, namely the development of the cooperative. Currently DISKOPUMKM difficulties in selecting and mapped out cooperative will be given priority in the development of cooperative due to the budget provided by the Government are sometimes incompatible with the objectives so that the budget is wasted a lot. Furthermore, in presenting information using only tables that do not fully illustrate where the constraints of geographical location of cooperative areas prioritized for development. To overcome such problems designed geographic information system (GIS) that can present data and information regarding the spread of agriculture cooperatives in order to spread such information may look evenly due to conditions geographically the town of Bandung so as to facilitate the Department in conducting monitoring and evaluation of cooperative development priorities in Bandung. Based on the results of testing and Blackbox Beta testing that has been done can be inferred that the entire process is functionally on geographic information systems mapping cooperatives micro enterprises small and medium enterprises (UMKM) Bandung is in compliance with the expected.

**Keywords:** cooperatives, development, geographic information systems.

## 1. INTRODUCTION

Cooperative Agency of micro, small and medium enterprises (DISKOPUMKM) is one of the agencies of Government of the city of Bandung has the task to carry out the functions and Affairs of the coaching in the field of cooperatives, micro, small and medium enterprises. The establishment of the Department of cooperatives, micro, small and medium-sized city of Bandung was based on Perda Bandung number 08 2016 Year of formation and composition of the device Area [1] and the Bandung Perwal Number 1394 the year 2016 about Position,

Arrangement The Organization, duties and Functions as well as the layout of work Service cooperatives, micro, small and medium-sized city of Bandung [2]. In the year 2018 DISKOPUMKM Bandung city record that Bandung city has 357 active cooperatives in 30 districts.

The results of the interview with Mr. Drs. Djuniar Sunardi, MM as the head of the development and financing of Cooperative stated that until the year 2018 is the spread of cooperative each subdistrict in the city of Bandung, there's always an increase every year good cooperative loan, multi purpose cooperative the cooperative effort, employees, and other cooperatives. That is because the community of Bandung enthusiasm in entrepreneurship based on UU No. 25 Year 1992 about Perkoperasian [3], that the primary cooperatives were formed and established at least by 20 (twenty) people. With the number of the cooperative Department need to do development of cooperatives that can enhance their role as the basis for the economic growth of the region. The development of cooperative, oriented itself to the Mission of the DISKOPUMKM that is improving the quality of institutional independence and competitiveness of cooperatives and SMALL MEDIUM ENTERPRISES. Then the important selection against the existing cooperative in the city of Bandung to know where a decent cooperative called priorities for assisted in the development of the cooperative. In doing this the required cooperative selection of spatial data and attribute so that the information can be read by equitable geographical conditions by looking at such areas of cooperation so as to help in decision making and quick, the budget released by the Office is not wasted a lot and expected many of the agencies as well as other investors interested in partnering. The current DISKOPUMKM does not yet have a tool or medium for displaying data is geographically spread such cooperative priority in development cooperation. This resulted in the Department in the conduct of information dissemination cannot be evenly.

During this service monitor cooperative manner the cooperative Department visit then check out reports of RAT, the RAT inside if there is a problem then the Department will do this socialization to provide coaching on cooperatives. There is also a cooperative that come directly to the

Office and then discuss the existing problems. The cooperative is a cooperative in prioritized its activities has always had significant developments such as the cooperative is always active in 3 years in a row, the number of members there is always increased, turnover and assets owned in large numbers, and a large percentage of the value of his productivity.

According to the existing problems, it is necessary to display Geographical information systems data is geographically in the priority distribution cooperative providing information in Bandung in order to spread such information may look evenly due to geo-environmental conditions of Bandung so as to facilitate the Department in conducting monitoring towards cooperative development priorities in Bandung. So can intertwine cooperation between cooperatives and other agencies in helping the economy of the city of Bandung.

## **2. RESEARCH CONTENT**

### **2.1 Geographic Information System**

Geographic information systems (GIS) is a computer system that users can perform management, analyze, and map the spatial information following its attributes with the Cartographic accuracy [4]. Geographic information systems is also the management of spatial data and non-computer-based spatial with three basic characteristics, i.e., [9]:

1. Have an actual phenomenon (variable data non-location) that relate to the topic of the problems at the site in question.
2. Is an event in one location and
3. Have a time dimension.

Geographic information systems can be divided into several sub-systems including:

1. Data Input
2. Data Output
3. Data Management
4. Data Manipulation & Analysis

#### **2.1.1 Spatial Data**

Spatial data is one of the components of the information which it included information on Earth includes the Earth's surface, beneath the surface of the Earth, waters, seas and down the atmosphere. Spatial data contain important properties inherent in it.

##### **1. Longitude (Longitude)**

Longitude is used to determine the location in the West or East of the North South line which is often referred to as the line of the meridian. Longitude is measured from 0 degrees in the area of Greenwich to 180 degrees at the International Date Line.

##### **2. Latitude (Latitude)**

Latitude is the line that specifies the location is next to the North or South of the equator. Latitude is measured starting from the point 0° from the equator to 90° at the poles.

##### **3. The Point Coordinates**

The point of intersection of the results was the point coordinates on the latitude and longitude. Basically these two lines (latitude and longitude) that determines the value of a degree he got from a point that is measured.

#### **2.1.2 Non Spatial Data**

The non-spatial data is typically stored and shaped into the form of a line and a column, an example of a non-spatial data is the name of the district, type of home, the website address, the name of mountain [5].

### **2.2 Development**

Development is an undertaking in the form of education and training that can enhance the ability of both technical, theoretical, and conceptual needs. Cooperative development aimed at the equitable distribution of income in society through growth of healthy cooperatives [6]. It is the task of the Government to prosper through cooperative societies.

### **2.3 Monitoring**

Monitoring is done when a policy is being implemented so that gave rise to the cause and effect can be used as material evaluation. This monitoring is needed so that the mistakes that happen can be immediately known and corrective actions can be carried out, thereby reducing the risk of a larger [7].

### **2.4 Evaluation**

Evaluation is an activity to assess the performance level of a policy. Before the evaluation of the monitoring needs to be done in order for obvious reasons as a result so that minimize the risk of the larger [7].

### **2.5 Weighted Product (WP) Method**

Weighted Product (WP) is a method of decision making multy criteria. Multiplication method or methods of WP is different from the method of initial treatment in the SAW against the results of the assessment decision attribute. WP is not necessary in the method of matrix manipulation because this method performs multiplication against the results of each attribute. The results of the multiplication in comparison (shared) with weights. The value of the benefit serves as a positive process of multiplication in rank between attributes, while the value of the cost function as negative rank [8]. The steps in using the weighted product method is:

1. Determine the criteria that will be used as a reference.
2. Determine the suitability of each alternative rating on each criterion.
3. Determine the weighting of preference for each criterion.
4. Multiply the entire attribute for an alternative value of benefit as a positive rank to attribute the advantages and value of the cost of the negative ranking to attribute costs.

5. Add up the results of the multiplication to generate the value of S for each alternative.
6. the search for alternative values i.e. the highest value for each attribute of the benefit and the lowest value for the attribute is cost.
7. Divide the value S of each alternative with a total value of S that will generate V.
8. Look for alternative ideal values.
9. Weighted Product method of weighting is calculated based on the level of the value of the preference.

a. the process of normalization of weighting criteria (W),  $\sum W = 1$  are:

$$w_j = \frac{w_j}{\sum w_j} \quad (1)$$

Description:

Wj: Weight attribute weighting Sum

$\sum W_j$ : attributes

a. Calculate the Vector

$$S = (S_1^{w_j})(S_2^{w_j})(S_3^{w_j}) \dots (S_n^{w_j}) \quad (2)$$

Description: S: x: the value of alternative criteria

w: weighting criteria

alternative i:

a: the criteria

n: the number of criteria

WJ: the rank is positive to attribute benefit, and is negative for attribute cost.

a. Calculate V Preferences:

$$v = \frac{S_1}{S_1 + S_2 + S_3 + \dots + S_n} \quad (3)$$

Description:

V: alternative x: value criteria

w: weighting criteria

i: stating the alternative

a: the stated criteria

n: stated the number of criteria

## 2.6 Analysis of Geographic Information Systems

Geographic information system analysis is the phase where we find out what kind of geographic information system to be created. The following is a diagram of the SIG model can be seen in Figure 1:

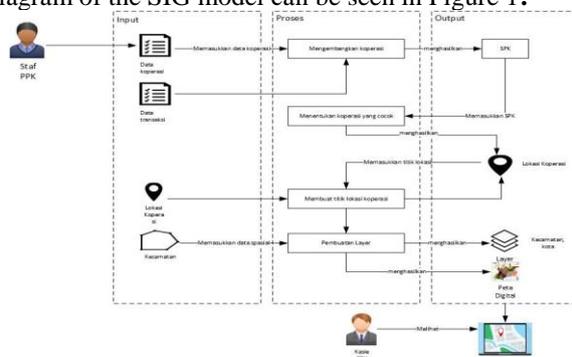


Figure 1. Geographic Information System Model

## 2.7 The Analysis of Spatial Data

Spatial data is the data type, spatial data object consists of three types, namely the shape of points, lines, and areas. Spatial data is used to provide

information about the cooperative in the city of Bandung. Spatial data that will be used i.e. data sub form of polygon with different colors and a cooperative form of point can be seen in table 1.

Table 1. The Analysis of Spatial Data

No.	Description	Spatial Data	Example
1.	Sub Andir	Polygon	
2.	Sub Antapani	Polygon	
3.	Sub Arcamanik	Polygon	
4.	Sub Astana Anyar	Polygon	
5.	Sub Babakan Ciparay	Polygon	
6.	Sub Bandung Kidul	Polygon	
7.	Sub Bandung Kulon	Polygon	
8.	Sub Bandung Wetan	Polygon	
9.	Sub Batununggal	Polygon	
10.	Sub Bojongloa Kaler	Polygon	
11.	Sub Bojongloa Kidul	Polygon	
12.	Sub Buah Batu	Polygon	

No.	Description	Spatial Data	Example
13.	Sub Cibeunying Kaler	Polygon	
14.	Sub Cibeunying Kidul	Polygon	
15.	Sub Cibiru	Polygon	
16.	Sub Cicendo	Polygon	
17.	Sub Cidadap	Polygon	
18.	Sub Cinambo	Polygon	
19.	Sub Coblong	Polygon	
20.	Sub Gedebage	Polygon	
21.	Sub Kiaracandong	Polygon	
22.	Sub Lengkong	Polygon	
23.	Sub Mandalajati	Polygon	
24.	Sub Panyileukan	Polygon	
25.	Sub Rancasari	Polygon	

No.	Description	Spatial Data	Example
26.	Sub Regol	Polygon	
27.	Sub Sukajadi	Polygon	
28.	Sub Sukasari	Polygon	
29.	Sub Sumur Bandung	Polygon	
30.	Sub Ujung Berung	Polygon	
31.	Titik Lokasi Koperasi	Point	

## 2.8 Non Spatial Data Analysis

The non-spatial data (attributes) is an individual of any information system data, digital map data in non-spatial GIS required in this, which will contain information about the spatial data. The non-spatial analysis of data used to construct this system can be seen in table 2.

**Table 2. Non Spatial Data Analysis**

No.	Name	Description	Attribute
1.	Sub	Contains information about the name of the town in the city of Bandung	the name of the Sub
2.	Data cooperative	Contains information about the cooperative data in Bandung	The ID of the cooperative, the cooperative's name, address, latitude, longitude, photos

## 2.9 Analysis determination of Priority Development Cooperative

This analysis uses the Weighted Product Method to determine the priority of the cooperative.

The following is the calculation of flow Weighted Product (WP).

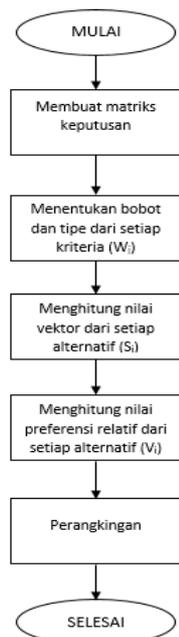


Figure 2. the flow calculation of WP

### 2.9.1 Determine alternatives will be assessed

Alternatives are used namely 357 cooperative that is divided into 5 types namely consumers, services, manufacturers, marketing and store the borrowed. This is assumed to be cooperative with the  $A_i$ . 357 of the cooperative, the author uses cooperative borrow a number of cooperatives as 59 cases.

Table 3. Data Cooperative Loan

No	Cooperative	the initial $s$
1	Koperasi Karya Wanita Indonesia	$A_1$
2	Koperasi Simpan Pinjam Nurhafa Husnul Khotimah	$A_2$
3	Koperasi Pengusaha Nasional Minyak dan Gas Bumi	$A_3$
4	Koperasi Simpan Pinjam Bhakti Wanita	$A_4$
5	Koperasi Simpan Pinjam Dan Pembiayaan Syariah Silih Aping	$A_5$
6	KPRI KANDEPDIKBUD Dinas P dan K Sub Cibiru	$A_6$
7	Koperasi Baitul Maal Wat Tamwil BMT Insanul Kamil	$A_7$
8	Koperasi Simpan Pinjam Dian Pelangi	$A_8$
9	Koperasi Sarana Ekonomi Masyarakat SAREKAT	$A_9$
...	...	...
59	Koperasi Syariah Mardotillah	$A_{59}$

### 2.9.2 Create A Matrix Of Decision Alternatives Against Criteria

Decision matrix is the given value against each of these criteria by each alternative.

Table 4. Matrix of Decision

	C1	C2	C3	C4	C5	C6	C7
$A_1$	3	3	3	4	3	5	5
$A_2$	2	3	3	5	3	5	5
$A_3$	5	4	5	5	5	5	5
$A_4$	1	1	1	1	1	5	1
$A_5$	3	3	4	3	4	5	5
$A_6$	5	4	5	4	5	5	5
$A_7$	2	3	3	4	3	5	5
$A_8$	5	4	5	5	5	5	5
$A_9$	3	3	4	3	4	5	5
$A_{10}$	5	4	5	3	5	5	5
...	...	...	...	...	...	...	...
$A_{59}$	5	4	5	5	5	5	5

### 2.9.3 Determines the weighting of criteria

The weighting of each criterion of normalization with the formula (1) is as follows.

Table 5. The Weighting of Criteria

$C_i$	Weights
$C_1$	0,1724
$C_2$	0,1724
$C_3$	0,1724
$C_4$	0,1329
$C_5$	0,1329
$C_6$	0,1034
$C_7$	0,1034

### 2.9.3 Calculates the value of a vector ( $S_i$ )

Calculate the value of a vector ( $S_i$ ) of each alternative can be done by using the formula (2). The results of the calculations are:

Table 6. Value of Vector ( $S_i$ )

	Vector $S_i$
$A_1$	1,7825
$A_2$	1,7141
$A_3$	2,4719
$A_4$	0,8466
$A_5$	1,8731
$A_6$	2,3970
$A_7$	1,6621
$A_8$	2,4719
$A_9$	1,8731
...	...
$A_{59}$	2,4719

### 2.9.4 Calculate the value of the preference value ( $V_i$ )

preferences ( $V_i$ ) of each alternative can be done by using the formula (3). The results of the calculation can be seen in Table 7.

**Table 7.** Value Preference ( $V_i$ )

	Vektor $S_i$
$A_1$	0.0155
$A_2$	0.0149
$A_3$	0.0215
$A_4$	0.0074
$A_5$	0.0163
$A_6$	0.0209
$A_7$	0.0145
$A_8$	0.0215
$A_9$	0.0163
...	...
$A_{59}$	0.0215

**2.9.5 Do ranking**

Based on the results of the preference value ( $V_i$ ) above, could be done by taking the rank value  $V_i$  is the largest. Note the value of the highest  $V_i$  namely 0.0215 and there are 4 cooperatives that have those values can be seen in table 8 below.

**Table 8.** Result Ranking

	Name Cooperative
$A_3$	Koperasi Pengusaha Nasional Minyak dan Gas Bumi
$A_8$	Koperasi Simpan Pinjam Dian Pelangi
$A_{37}$	Koperasi Syariah Barokah Warga Persatuan Guru Islam Indonesia
$A_{59}$	Koperasi Simpan Pinjam Galuh

**2.10 Monitoring Analysis**

Monitoring the development of the cooperatives have indicators in the observe or supervise existing cooperative and done periodically. Monitoring visits of the cooperative that will be a priority.

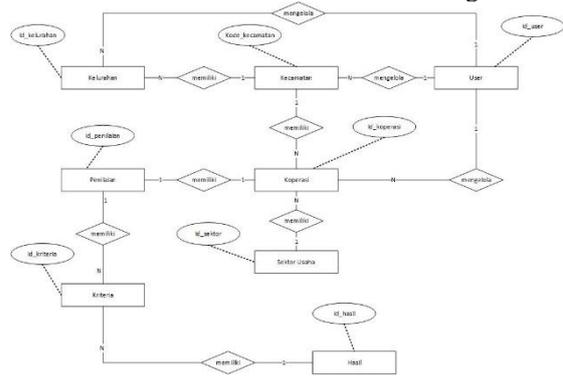
**Table 9.** Monitoring

Indicator	Color	Status
Priority 1		the cooperative became the most prioritized
Priority 2		Cooperative agriculture after all priority one
Priority 3		Cooperative agriculture after all priority one and two is determined

**2.11 The Analysis Database**

The analysis database is intended to identify the structure of the database or field from each table has been compiled in a database. The following is an Entity Relationship Diagram regarding geographic information systems mapping cooperative micro, small, and medium enterprises in the city of Bandung

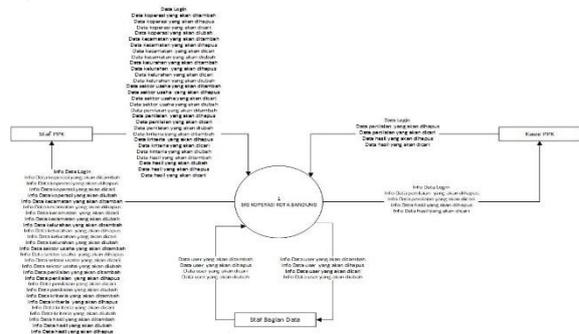
which can be seen in Figure 3.



**Figure 3.** Entity Diagram Relationship

**2.12 Context Diagram**

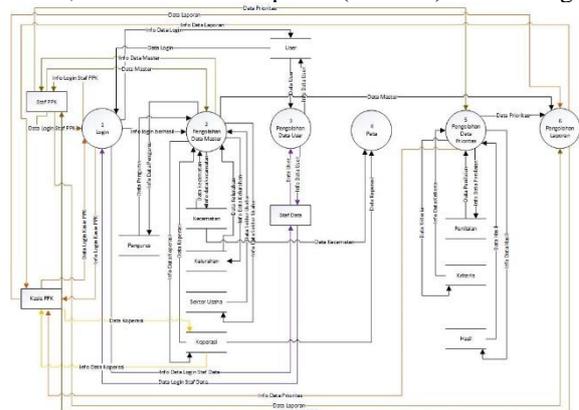
Context diagram is a model that is running widely on how the data is used or the data is transformed to describe the flow of data into a system. The following Diagram Context can be seen in Figure 4.



**Figure 4.** Context Diagram

**2.13 Data Flow Diagram (DFD)**

DFD is one technique that portrays the streams of data that are used as input data from a trip towards the output. Following DFD Level 1 geographic information systems mapping cooperative micro, small, and medium enterprises (UMKM) of Bandung.



**Figure 5.** DFD Level 1 Geographic Information System

**2.14 The Desain of The Interface**

The design of the interface is a description of the sketch display system to be built. It is intended to

make it easier to implement the interface display geographic information system will be built. Following the design of the interface for geographic information system Mapping Cooperative micro, small, and medium enterprises (UMKM) of Bandung.

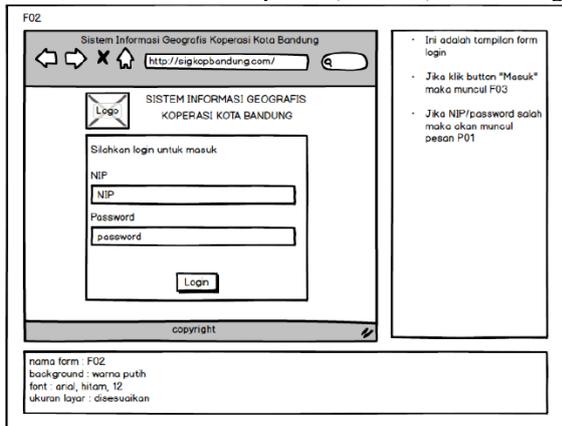


Figure 6. The Design Of Interface Login

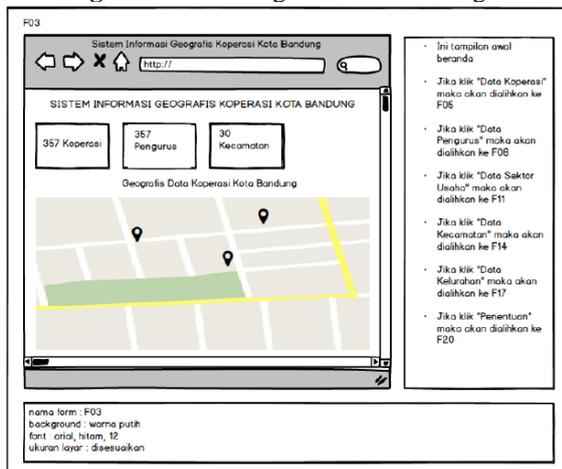


Figure 7. The Design Of Interface Admin

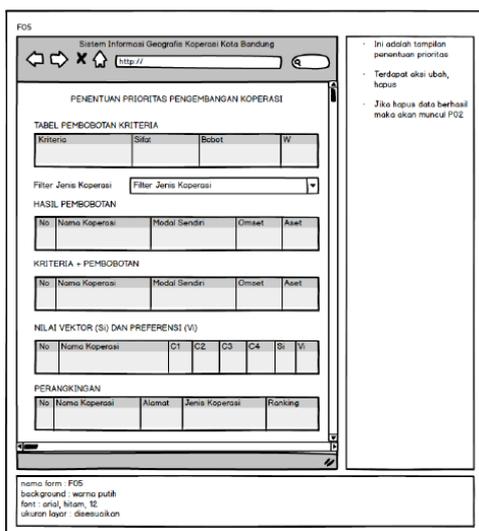


Figure 8. The Design Of The Interface Determination Of Priority

## 2.15 Testing The System

Testing the system aims to find errors or deficiencies in the software tested. The test is done to find out which system is built is it worth to use it or not. Testing conducted include the page Head Section, staff development, and staff Data using the blackbox and beta testing strategies.

## 2.16 Blackbox Testing Conclusions

Based on the results of the testing of the system as a whole can be inferred that the geographic information systems mapping cooperatives micro enterprises small and medium enterprises (UMKM) city of Bandung has been through the stages of the repair process on each of the resulting output expected.

### 2.16.1 Beta Testing Conclusions

Based on the results of beta testing, then the inferred that geographic information systems to determine the distribution of information on cooperatives in Bandung this is in compliance with the expected purpose i.e. can simplify development and Section Head The financing of cooperation in determining the proper priority cooperative with other geographical conditions.

## 3. CONCLUDING

### 3.1 Conclusions

Based on the test results obtained from research conducted in the preparation of this final task and refers to the purpose of the research that has been made, then concluded that the system could help Section of the development and financing of Cooperative to see the spread, take decisions and monitoring cooperative priority in Bandung.

### 3.2 Advice

Based on the results that have been achieved to build geographic information systems Mapping Cooperatives micro enterprises small and medium enterprises (UMKM) Bandung city still has drawbacks. Therefore it is recommended to add things that are able to complete further research include:

1. Geographic information systems that are built can be developed in the future also display on each access rights in order to made more attractive and systems can be integrated with existing systems in the service.
2. Results of the ranking better not to refer to a rank 1, but can vary with rank 2 and 3.
3. In the development of this application in the future scope of information and cooperative assessment is not limited to the area of Bandung City alone but in the whole region in Indonesia.

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