

Decision Support System Internet Disruption Using ORESTE and Geolocation PT Cloud Solution

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ABSTRACT

PT Cloud Solution is a cloud-based internet service provider serving Kudus, Pati, and Jepara in Central Java. The current process of handling service disruptions is manual and lacks an integrated prioritization system and location-based support, resulting in delays, inefficiencies, and inaccurate technician deployment. This study aims to develop a web-based Decision Support System (DSS) that integrates the Organization, Rangement Et Synthèse De Données Relationnelles (ORESTE) method and geolocation technology to improve the prioritization of internet service disruption handling. The ORESTE method is selected due to its ability to process ordinal data and perform objective ranking of alternatives without requiring complex weighting. Geolocation technology enables real-time mapping of customer and technician locations, allowing the system to recommend handling based on proximity and priority levels. The system was developed following the Waterfall model, which included stages of needs analysis, system design using Use Case diagrams, implementation using PHP and MySQL, and testing via the Black Box method. Test results demonstrate that the system effectively produces accurate and efficient handling priorities. This system is expected to enhance the speed and accuracy of technician deployment, reduce response times, and ultimately improve customer satisfaction.

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1. INTRODUCTION

Computers play a very important role in data processing and accurate information presentation, especially in the era of rapidly developing information technology [1]. The use of information technology has made it easier to manage and store data, as well as support the decision-making process in organizations. One form of implementation of this technology is the Decision Support System (DSS), which is a computer-based information system designed to help decision-makers solve semi-structured problems objectively through multi-criteria data analysis [2]. DSS acts as a combination of individual intelligence and technological components to improve the quality of decisions by providing relevant, fast, accurate, and structured information [3].

PT Cloud Solution is a cloud-based internet service provider operating in Kudus, Pati, and Jepara. As the customer base continues to grow ranging from households and micro, small, and medium enterprises (MSMEs) to educational institutions the company faces significant challenges in managing internet service disruptions [4]. One of the main obstacles lies in the damage reporting and handling process, which is still conducted manually. At present, customers report service disruptions via the call center, after which the admin records the report in writing and forwards it to technicians through text messages or verbal communication. This manual approach leads to several issues, including delays in response, the absence of a prioritization system based on the severity of the damage, and inefficient technician allocation due to the lack of integration with customer location data. Consequently, service quality is compromised, resulting in reduced customer satisfaction.

One of the main obstacles lies in the damage reporting and handling system, which is still done manually. Currently, customers report disruptions through the call center, then the admin records the report in writing and conveys it to technicians via text message or verbal communication. This manual approach causes a number of problems, such as delays in handling, the absence of a prioritization system based on the level of damage, and inefficient distribution of technicians due to the lack of integration with customer locations. As a result, service quality is suboptimal and has an impact on decreasing customer satisfaction.

Therefore, a systematic solution is needed that is able to support objective, efficient, and location-based technical decision-making. This study proposes the development of a web-based Decision Support System (DSS) that integrates the ORESTE (Organization, Rangement Et Synthèse De Données Relationnelles) method with geolocation technology. ORESTE is one of the effective Multi-Criteria Decision Making (MCDM) methods for managing ordinal or ranking-based data, without the need to convert it into quantitative values [5]. The stages of this method include compiling a ranking (Besson Rank), calculating the distance between alternatives to the criteria, sorting distance scores into a global ranking, and aggregating to determine priority alternatives [6]. Meanwhile, geolocation technology is applied to map the position of customers and technicians in real-time, so that

it can provide recommendations for technician distribution based on the closest distance and the level of urgency of the damage [7].

Various previous studies have proven the effectiveness of the ORESTE method and geolocation technology in decision-making. Fytya and Ratnawati (2024) applied the ORESTE method in determining UKT relief with an accuracy of 94%, but did not consider spatial aspects or real-time handling needs [8]. Alwendi and Aldo (2020) used ORESTE in selecting the best mobile phone store based on consumer preferences, but the study focused on product ranking, not on service management or technical distribution [9]. Purwadi et al. (2020) utilized ORESTE in selecting the location for installing wifi.id corners, but did not touch on the aspects of reporting and handling disturbances [10]. On the other hand, Ngulum et al. (2024) developed an attendance system based on geolocation and real-time photos to improve attendance accuracy, but did not integrate multi-criteria decision-making methods [11]. Wardhani et al. (2025) compared the Weighted Product and SMART methods in selecting social assistance recipients, but these methods were less than optimal in managing ordinal data [12].

Based on this review, a research gap is apparent: the lack of a system that directly integrates the ORESTE method with geolocation technology in the context of handling internet service failures. Therefore, this research urgently needs to design a system capable of providing objective repair priority recommendations while simultaneously supporting technician work efficiency through real-time location tracking. This research aims to design and build a web-based Decision Support System to handle internet service failures at PT Cloud Solution by integrating the ORESTE method and geolocation technology. The system was developed using the Waterfall model through the stages of needs analysis, design using Use Case Diagrams, implementation, testing using the Black Box method, and maintenance [13]. It is hoped that this system can increase the effectiveness of technician distribution, speed up handling time, and support more accurate and responsive decision making to improve overall service quality.

2. RESEARCH METHOD

2.1. Data Collection Methods

In order to achieve the objectives of this research, it is necessary to apply an appropriate and well-directed methodology to ensure that the data obtained is relevant, accurate, and aligned with the requirements of the system being developed within the PT Cloud Solution environment. The data collection method is a systematic procedure for obtaining information that is directly related to the research problem [14]. This study was conducted at PT Cloud Solution, a company engaged in the field of technology solutions, led by Mr. Riswandha Kurniawan. The data collection techniques employed in this research are as follows:

2.1.1. Primary Data Sources

Primary data is a type of data obtained through observation from a testing location using observations and notes on a testing object [15]. Primary data includes:

- 1) Observation: Observation by coming directly to PT Cloud Solution, this observation aims to obtain information regarding customer service that has been going on so far.
- 2) Interview: One effective and accurate method for research is the interview technique. The system development process will require information related to categorizing potential obstacles in the company's services and solutions to address them. This information can be obtained by interviewing the company's head, Mr. Riswandha Kurniawan.

2.1.2. Secondary Data Sources

Secondary data is a source of data obtained indirectly from the research object [16]. This secondary data can be obtained from literature or books. Secondary data sources include:

- 1) Literature Study: The literature study method is a method of collecting data by looking for information in books such as software engineering books, related reports and can be used as a theoretical basis and can be used as competition material in research that will be carried out by looking at references to existing thesis reports [17].
- 2) Documentation Study: The documentation study method is the collection of data from literature and documentation from the internet, books or other information sources [18]. In this study, the data collection used is by requesting data from the research object such as data regarding process flow, technician data, customer data and others must be consulted as data collectors. This is done so that the information and data received are truly valid.

2.2. System Development Methods

The system development method is a crucial step in creating any system. This study utilized XAMPP and Dreamweaver software, along with PHP programming language and MySQL database. The System Development Life Cycle (SDLC) Waterfall model, often referred to as the linear sequential or classic life cycle model [19], was applied and adapted for the case study at PT Cloud Solution. During the requirements analysis stage, data were collected through observations and interviews to identify both functional and non-functional system requirements. These findings provided a clear foundation for the design stage, which produced the system architecture, UML diagrams, and user interface designs tailored to user needs. The design outputs were reviewed and validated with stakeholders to ensure completeness and accuracy. The implementation stage involved translating the designs into program code using the selected technologies, successfully building the system

as specified. Subsequently, the system underwent black box testing to verify that all functions operated correctly and met the specified requirements. Finally, the maintenance stage took place after deployment, addressing bug fixes, incorporating user feedback for feature adjustments, and optimizing system performance to ensure ongoing stability and responsiveness.

2.3. Alternative Assessment Criteria

In this decision support system, damage management ranking is based on objective criteria relevant to PT Cloud Solution's operational needs. All criteria use an ordinal scale, consistent with the ranking-based characteristics of the ORESTE method. The criteria for determining damage priority can be seen in alternative table 1 below.

Table 1. Alternatives

Code	Criteria	Scale Type
C1	Damage Level	Ordinal
C2	Number of Customers Affected	Ordinal
C3	Location Distance	Ordinal
C4	Duration of Disruption	Ordinal

2.4. ORESTE Methods

ORESTE (Organization, Rangement Et Synthèse De Données Relationnelles) is a multi-criteria decision-making method based on ordinal ranking (order of preference), not quantitative values [21]. This method is very useful when the decision maker cannot provide exact values but is able to provide a preference order for each criterion and alternative[22]. The steps of the ORESTE method are:

1. Make it into Ordinal Form (Besson – Rank) If there are the same values, then the ranking is sought by the average. From these results, sort them from largest to smallest. The ranking of alternative values from the largest criteria is given a value of 1, and for subsequent values, they are sorted based on the value that is the next in order.
2. Finding the Distance Score Finding the Distance Score by calculating each alternative-criteria pair as a "distance" value for the ideal position occupied by the best alternative for the most important criteria using the formula:

$$\mathcal{D}(a, c_j) = \left[\frac{1}{2} rc_j \mathcal{R} + \frac{1}{2} rc_j(a) \mathcal{R} \right] \frac{1}{\mathcal{R}} \quad (1)$$

Information:

$\mathcal{D}(a, c_j)$: Distance Score

rc_j : Besson – rank criterion j

$rc_j(a)$: Besson – alternative rank in j-criterion

$\mathcal{R}$: Coefficient (default = 3).

3. Make the Distance Rank Results into a Global Rank, namely by sorting the results of the Distance Rank in ascending order (small to large).
4. Global Rank Sum Add up all the alternatives in the criteria in one row in each column (often called Summary).
5. The final result (Ascending) of the Summary Results in the Global Rank is sorted. The data with the smallest Summary value is the top priority data (ranked first).

This method is suitable for data conditions that do not have explicit quantitative values but still require ranking.

2.5. System Architecture

This system was developed with a web-based approach using the technology shown in figure 2, namely the decision support system architecture for handling internet service failures at PT Cloud Solution.

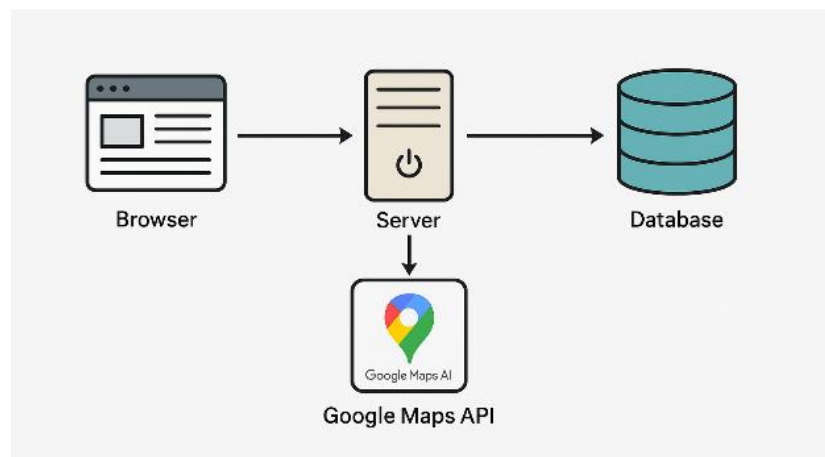


Figure 1. Internet Damage Decision Support System Architecture

2.6. System Testing

Testing was carried out using a black-box approach on all the main features of the system, including:

- a. Input customer data and damage
- b. ORESTE ranking process
- c. Location map visualization
- d. Report output and priorities

All features functioned well and met user needs. Furthermore, the ranking results were validated through interviews with PT Cloud Solution's chief technician, resulting in an 80% agreement between the system's results and field priorities.

3. RESULTS AND DISCUSSION

3.1. System Design

In the development of object-oriented programming techniques, there is a standardization in modelling languages for building software using object-oriented programming techniques, namely the Unified Modelling Language (UML) [23]. A system that uses diagrams and supporting texts with the aim of modelling and communicating in the form of visual language is called UML. The system design in this study uses UML with Use Case Diagram. Use Case Diagram is a diagram that describes the relationship between one or more actors with the system to be created [24]. Use Case Diagram of the Internet Damage Decision Support System with the Oreste Method can be seen in figure 2 below.

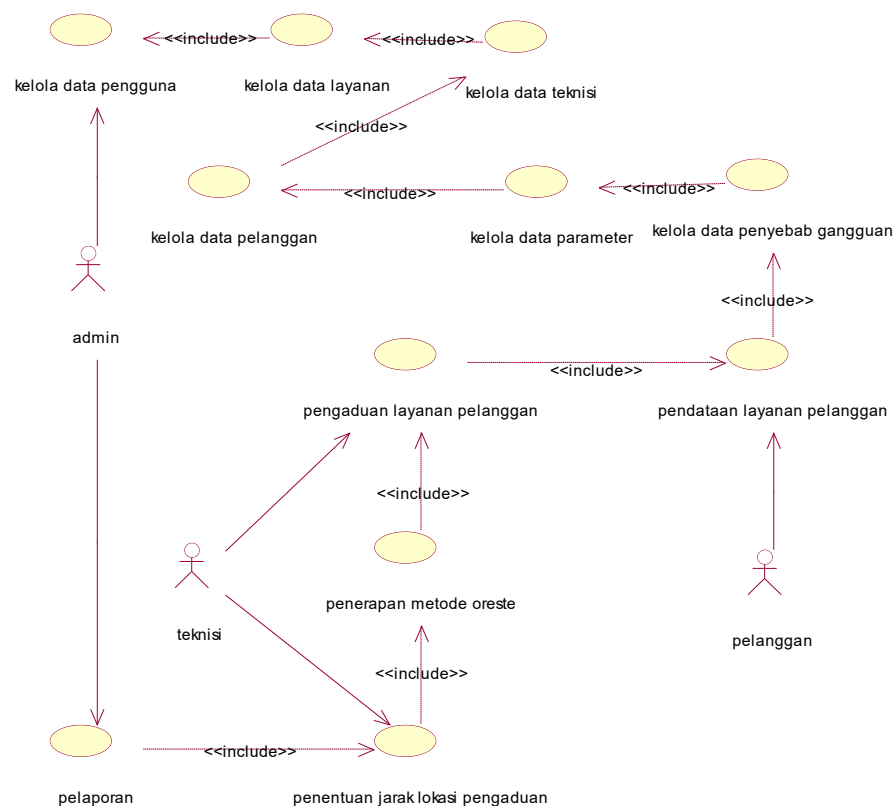
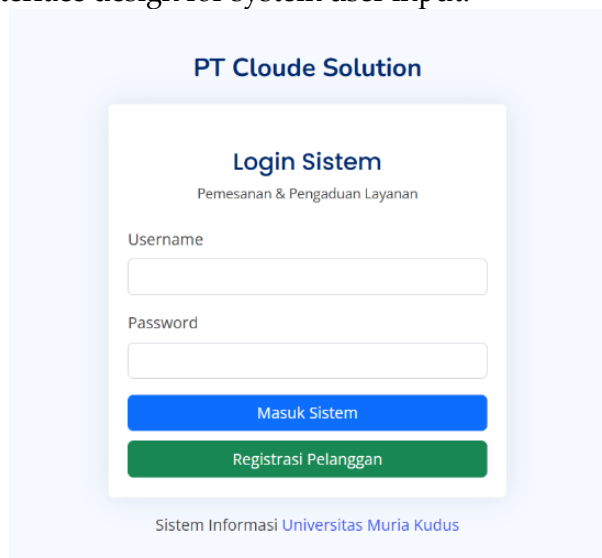


Figure 2. Use Case Diagram Internet Damage Decision Support System

3.2. System Implementation

This Internet Damage Decision Support System is developed as a PHP-based web application and MySQL database. The system contains two main access rights, namely admin and technician. Admin is responsible for entering damage data from customers and

running the priority calculation process using the ORESTE method. Technicians can view a list of damages that have been sorted by priority, equipped with a geolocation feature that displays the location of customers and technicians on a digital map of Google Maps. The following shows the interface design for system user input:



PT Cloud Solution

Login Sistem

Pemesanan & Pengaduan Layanan

Username

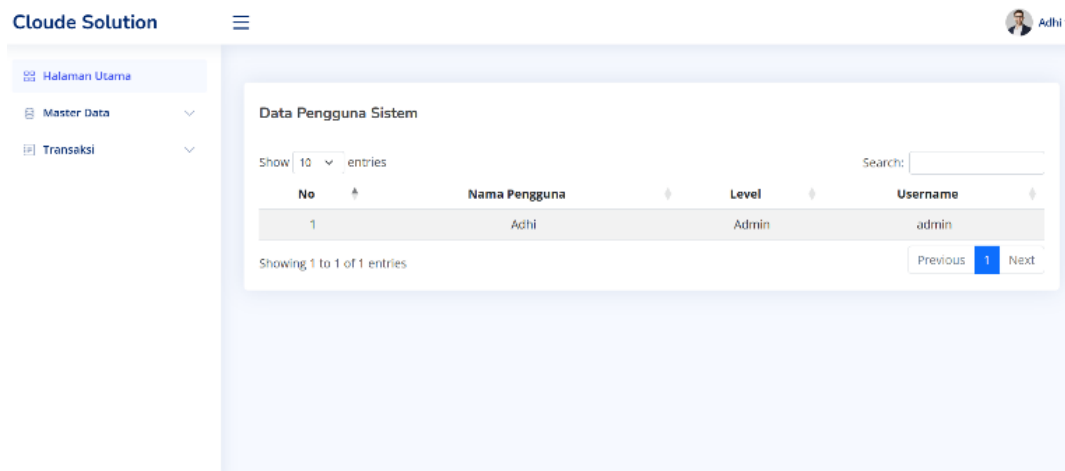
Password

Masuk Sistem

Registrasi Pelanggan

Sistem Informasi Universitas Muria Kudus

Figure 3. Login View



Cloud Solution

Halaman Utama

Master Data

Transaksi

Data Pengguna Sistem

Show 10 entries

Search:

No	Nama Pengguna	Level	Username
1	Azhi	Admin	admin

Showing 1 to 1 of 1 entries

Previous 1 Next

Figure 4. System User View

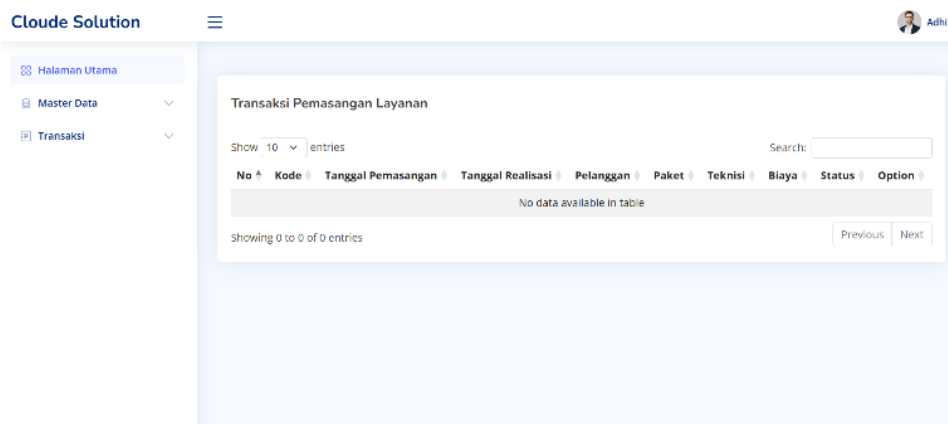


Figure 5. Service Order Transaction Display

3.3 Internet Crash Case Simulation

To test the system, a failure management simulation was conducted using five alternatives (customer locations) and four predetermined criteria. The assessment was ordinal, with scores of 1–5 (1 = very low, 5 = very high).

Table 2. Alternative Data and Assessment Criteria

Alternative	C1 (Damage)	C2 (Affected Customers)	C3 (Distance)	C4 (Duration)
A1	4	5	3	5
A2	2	2	2	3
A3	5	4	4	4
A4	3	3	5	2
A5	1	1	1	1

Once all data is entered into the system, the ORESTE calculation process is carried out automatically by the system. Each criterion is assigned a ranking order, and then the average preference position is calculated.

Table 3. ORESTE Ranking Results

Alternative	Average Preference Value	Order of Priority
A3	2.00	1
A1	2.25	2
A4	3.25	3
A2	3.75	4
A5	5.00	5

Based on the results above, the system prioritizes A3 because it has the highest level of damage and the highest number of affected customers. Meanwhile, A5 is given the lowest priority because all criteria scores are low.

3.4. Geolocation Map Visualization

One of the system's key features is a Google Maps map display that integrates the real-time locations of customers and technicians. Admins can view the location of all incoming service failures and monitor which technicians are currently active. Figure 6 shows a visualization of the Google Maps display.

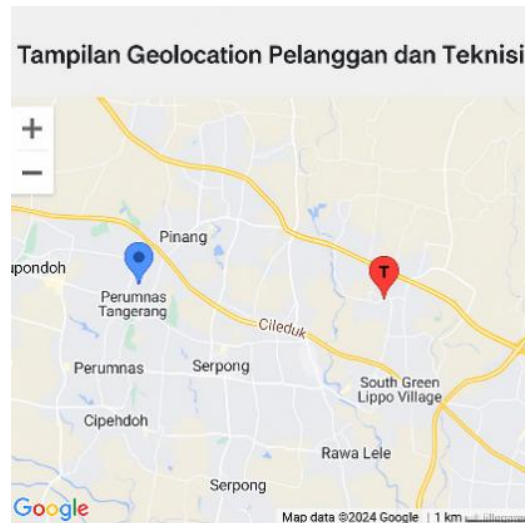


Figure 6 . Customer and Technician Geolocation Display on Google Maps

Figure 6 illustrates the geolocation feature, which serves as a key component in accelerating service disruption handling. Through the integration of digital mapping, the system automatically displays the location points of customers reporting issues. This information enables the administrator to assign technicians who are closest to the location, thereby reducing travel time and increasing operational efficiency. In addition, this feature allows prioritization of tasks based on the severity of the disruption or the number of affected customers in a specific area. This process not only helps reduce operational costs but also improves the accuracy of technician assignments. With real-time monitoring of technician positions, management can ensure transparency in the workflow and facilitate performance evaluation. All these benefits directly contribute to faster response times and higher service quality, ultimately leading to improved customer satisfaction.

3.5. System Testing

System testing was conducted using the black box testing method to evaluate feature performance and ensure the system functions as intended [25]. The goal was to detect errors or incorrect outputs. The test results are presented in table 4.

Table 4. Black Box Testing Results

Test Type	Test Scenario	Expected Result	Test Result
Customer Data Input Testing	Fill in complete customer data (name, address, contact) and click Save	Customer data is stored in the database and appears in the customer list	Passed
Damage Report Data Input Testing	Select a customer, fill in the type of damage, description, and report time, then click Save	Damage report data is stored and displayed in the damage report list	Passed
ORESTE Processing Testing	Enter criteria weights and alternative data, then click Process	The system calculates rankings based on the ORESTE method and displays the results	Passed
ORESTE Input Validation Testing	Leave one of the criteria weights or alternative data blank, then click Process	The system rejects the process and displays a warning message to complete the data	Passed
Location Map Visualization Testing	Access the location map menu after a damage report is entered	The system displays markers indicating the locations of customers experiencing service disruption	Passed
Priority Determination Testing	Process damage report data through ORESTE and open the technician priority page	The system displays a priority list from the highest to the lowest score	Passed
Logout Testing	Click the Logout button after using the system	The system returns the user to the login page and ends the session	Passed

All features functioned well and met user needs. Furthermore, the ranking results were validated through interviews with PT Cloud Solution's chief technician, resulting in an 80% agreement between the system's results and field priorities.

4. CONCLUSION

Based on the results of this study, it can be concluded that the developed web-based Decision Support System (DSS) effectively assists PT Cloud Solution in prioritizing internet service disruption handling in a more structured, objective, and efficient manner. By applying the ORESTE method, which processes ordinal data, combined with real-time geolocation technology, the system provides accurate recommendations for prioritization and technician assignment, thereby accelerating response times and improving operational performance. The main contribution of this research lies in the integration of multi-criteria decision-making methods with geolocation technology, which facilitates management in making data- and location-based decisions simultaneously. This system offers an innovative solution to replace the previously manual, less efficient, and error-prone process. Validation

through data simulations and field testing demonstrated that the system's ranking results closely match actual on-site priorities, making it ready for full implementation in PT Cloud Solution's operations. For future development, it is recommended to add automated notification features, integrate with customer ticket reporting systems, and implement comparative methods such as Simple Additive Weighting (SAW) or Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to enhance flexibility and decision-making accuracy.

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