

Intelligent scheduling of enterprise human resource group based on big data

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Abstract. In order to solve the problem that the dynamic programming of traditional intelligent scheduling algorithm is not perfect, which leads to the operation result taking too long, the author proposes an intelligent scheduling algorithm for enterprise human resources based on big data. This research creates an effective planning model based on big data, realizes the effective business plan of human resources, develops the advanced instruction of the intelligent scheduling algorithm, and proposed intelligent scheduling algorithm based on table precedence. The results showed that the average time of the experimental group was 7.261s shorter than the control group in the 20 stages of the data fusion test. The results show that, compared with the traditional intelligent scheduling algorithm, the intelligent scheduling algorithm proposed by the author can reduce the time required for data fusion and calculation in the stage, and the performance of the intelligent scheduling algorithm based on the previous table is better than those. Practice has proven that the intelligent scheduling algorithm based on the table can help reduce the work of intelligent scheduling of business human resources based on big data.

Keywords: Big data; Human resources group; Intelligent scheduling.

1. Introduction

Multiple project parallelism is a phenomenon in the process of business operations. The need for more balanced plans of human resources, capital, equipment and other resources in their work is often conflicting [1]. If the problem of conflicting resources in the work of many projects is not solved properly, it has made everything bad for the work of the work and the profits of the business. How to effectively coordinate the conflicting resources in various project management has become a major problem that business managers need to solve. With the arrival of the era of business knowledge, human resources have become the main equipment of businesses and the key to ensure the success of projects. In the context of the inconsistency of work activities and the temporary status of resources, the project team is usually composed of temporary workers from different departments. With the changes at different stages of the job life, the job participants are also joining or leaving. Employees will be able to play independent roles in the work, but when they change to another work, they will have problems in team integration, incompetence problems. The effectiveness of human resources in many business project management is not low, which is important in the inability to complete the time and work of the staff appointment time [2]. Therefore, it is the most important problem faced by the human resource scheduling in the business multi-tasking management to send the right person to the specific job in time and successfully good work.

Human resources can be defined in a broad and narrow sense. In a broad sense, people with normal intelligence are human resources; In a narrow sense, people with the ability to work are called human resources. In a word, human resources must be able to propel the whole society forward. In practical applications, the main contents of human resources include: Physical strength, intelligence, knowledge and skill. Human resource is a kind of resource that can be renewed, which is also known as renewable resource. Human resource, the renewable resource studied by the author, is the significance of labor reproduction [3].

In software enterprises, human resources mainly include managers and technical personnel, which can be divided into four categories from the perspective of skills, as shown in Figure 1.



Figure 1. Human resource structure in software development

Scheduling means that after making a plan and meeting the constraints of the real world, allocate reasonable resources and time to various tasks in the plan, coordinate system work to ensure the completion of the task. Scheduling is often called sequencing in mathematics, operations research, and other fields, in project management, the problem of arranging the execution order of tasks with priority order and giving the start time and completion time is called project scheduling problem. In order to solve the project scheduling problem, traditional Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) have been proven to be very effective tools. However, both CPM and PERT do not consider the resource constraint factor in project management, in practical application, these two methods cannot be implemented smoothly under the condition of resource constraint, therefore, a large number of scholars have studied the scheduling problem of resource-constrained projects.

2. Literature Review

Centobelli, P proposed a framework to study the dissemination and adoption of big data (BD) in the supply chain (SC) as a tool for managing process innovation at the technical, operational and strategic levels [4]. Sun, F is effectively exploring α - The application effect of big data technology of support vector machine random gradient descent (SVMSGD) algorithm in third-party logistics, obtaining valuable information hidden in logistics big data, and promoting logistics enterprises to formulate more reasonable planning schemes[5] Xiaofei, Y determines the weight of indicators according to the impact of relative changes of indicators on the whole by calculating the information entropy of indicators and measuring the amount of information in the data [6].

According to the existing research, intelligent scheduling algorithm of business human resources based on big data is proposed. This research creates an effective planning model based on big data, realizes the effective business plan of human resources, develops the advanced instruction of the intelligent scheduling algorithm, and proposed intelligent scheduling algorithm based on table precedence.

3. Intelligent scheduling algorithm of enterprise human resources based on big data

3.1 Problems in enterprise human resource management in the age of big data

(1) Restriction of traditional management thought

The traditional human resource management mode of enterprises has been deeply rooted for the management staff. This is especially true of enterprise leaders. In this regard, under the background of big data, traditional management ideas and advanced technologies need to collide fiercely. The management concept is relatively traditional, which is mainly reflected in the backward management mode and strict requirements for staff. In general, the data and information of staff are in the hands

of leaders. Only staff members can be used during promotion or transfer[7]. The storage mode is relatively complex, and it is not convenient to share and use human resources. In addition, the management idea is more traditional, and the key is to rely on manpower to operate the production equipment, which is far from the current people-oriented management idea. If this kind of traditional management idea is used for a long time, the development speed of the enterprise will be restricted[8]. Therefore, it is necessary to change the management idea and introduce advanced technology, so that big data information technology can be widely used in enterprise human resource management, and improve the internal management quality and efficiency of the enterprise.

(2) Update difficulty

As great changes have taken place in all fields, the enterprise's human resource management needs to actively change its own management mode under the background of big data. However, there are many problems in the process of change, which are common in enterprises. The development of enterprises is affected mainly by traditional ideas, and the progress of management change is restricted by human resources management technicians. Human resources are the basis of enterprise development, and the implementation of management system requires the participation of all staff[9]. At this stage, there is a shortage of professional human resources management staff within the enterprise, especially in the context of big data, there is a shortage of talents with big data thinking and technology. If we want to change the human resource management model, we must actively cultivate professional and complex human resource managers.

(3) Leaders lack innovation awareness

Although all enterprises are building big data, the application of big data technology is not universal within the enterprise, and the application results are far from satisfactory. The role of big data technology in improving the enterprise's own production efficiency and management efficiency has not been fully played. Because enterprises need to invest a lot of human, material and financial resources in the process of implementing big data technology, resulting in more burdens on enterprise human resource management. This causes the leaders of enterprises to ignore the impact of big data technology on the change of enterprise human resource management, and believe that the traditional management model can be used without replacement and change[10]. As a result, the concept of human resource management is relatively backward, and the traditional management concept is still conservative, leading to difficulties in the innovation of enterprise management model. Any technology needs to invest more people, money, material resources and more energy in the initial stage of implementation. Only when enterprise leaders understand the potential value of big data can they build the big data of enterprise human resources, so as to ensure that the human resources management model can better adapt to the needs of the times [11].

3.2 Dynamic planning of enterprise human resources based on big data

The related work of human resources in enterprises, with the improvement of commercialization and intelligence degree of enterprises, has shown a good trend of significantly reduced workload and significantly improved resource integration speed. These changes are inseparable from the application of intelligent cloud platform, which is gradually popularized in the era of big data. In general, the better the computational performance of the platform, the more powerful the processing power in the face of massive data. In view of such realistic conditions, it is necessary to use all kinds of databases based on big data to carry out dynamic planning for intelligent scheduling of human resources. Affected by task scale, sequence and resource consumption, there is no universal intelligent scheduling algorithm for enterprise human resource management[12]. In this regard, it is necessary to integrate the specific situation of the enterprise human resource scheduling task, combined with the dynamic programming theory, the scheduling algorithm needs to be optimized problems, a time as the dividing factor of stage division, it helps to establish the optimal strategy model of enterprise human resource dynamic programming. In the human resource scheduling work of enterprises, the existing algorithms can also determine the working state of the next stage according to the current

state of the work. When the state is confirmed, we can use the Education of state equation to show the law of state inference, the equation is as follows:

$$x_{p+1} = B_p(x_p, w_p(x_p)), p = 1, 2, \dots, n \quad (1)$$

According to the equation of (1), index derivation can be further carried out to help define the whole stage process and all posterior sub-processes, the formula of index function is:

$$Q_{kn}(x_p, w_p, \dots, x_{n+1}), p = 1, 2, \dots, n \quad (2)$$

According to the formula of state transition equation and index function, in the actual scheduling of human resources, decision set x_p can be determined based on the characteristics of state variable x_p and decision variable $W_p(x_p)$, the state transition equation of generation type (1), finally, it is necessary to determine what kind of calculation form is between the index and the index function in the stage, and these calculation forms include but are not limited to the maximum, minimum and the product of two numbers of the index in the stage. Therefore, it is necessary to obtain the recursive equation satisfied by the optimal value function according to the specific situation of enterprise human resource scheduling, and complete the establishment of dynamic programming model[13].

3.3 Design the initial priority list

Because you need to combine the phase task deadline, and the initial priority of the two parameters to design. Therefore, it is necessary to propose a new intelligent scheduling algorithm to develop a real-time priority scheduling scheme to carry out reasonable operation, while considering the initial priority and task time constraints of stage tasks, by combining the design principles of priority Table, the priority table of intelligent scheduling algorithm is designed, as shown in Figure 2. Through the design of Figure 2, we can find that the arrow pointing above represents the real-time priority order of tasks from high to low, the vertical axis represents the relative deadline of the phase task, and the horizontal axis represents the initial priority, the two parameters are arranged from bottom to top. Considering the trend of Figure 2, the design principle of priority list has to be mentioned: When a task with identical initial priority and deadline appears in a certain stage, the real-time priority of the task is divided according to the sequence of task generation, and when the relative deadline of the task to be executed is close, if the generation time of a task is earlier than that of other tasks, the priority table automatically increases the real-time priority of the task. Combined with Figure 2, it can help to deduce the calculation formula of real-time priority, where the real-time priority is C, the task queue queued according to the relative deadline is w, and the task queue queued according to the initial priority is q, then the real-time priority formula is:

$$C = \frac{(w+q-2)(w+q-1)}{2} + q \quad (3)$$

According to Equation (3), the real-time priority of tasks can be calculated, and the execution order of tasks can be divided according to the display order of priority table.

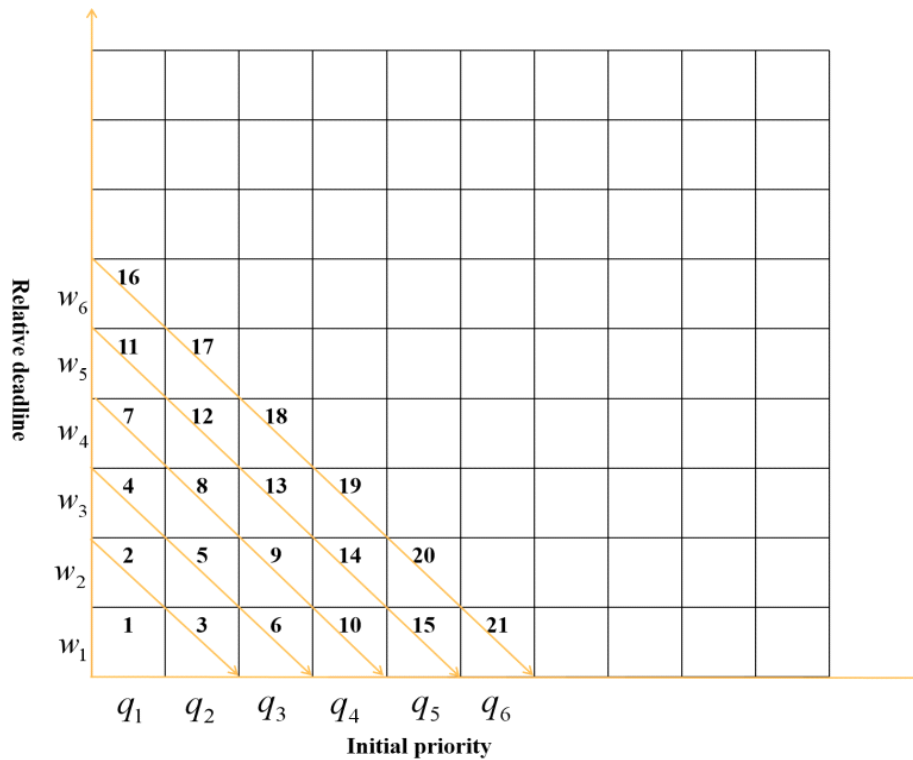


Figure 2. Schematic diagram of the real-time priority level

3.4 Intelligent scheduling algorithm based on priority Table

After the periodic dynamic planning of enterprise human resources is completed, an intelligent scheduling algorithm based on priority Table mode can be proposed on the basis of establishing relevant models. Because the intelligent scheduling of enterprise human resources has great flexibility and nonlinearity of work distribution, it is necessary to integrate the scheduling tasks of enterprise human resources by using the parameter of time. However, in a specific task schedule, the time of task generation and execution cannot be used as a measure other than the execution of the task. At present, human resource intelligent scheduling algorithms based on various modes, in the process of operation, the priority value of the task is always fixed, and the deadline of the operation task is not taken into account. In the use of such an algorithm, there is a serious shortage of control over the execution time required in the execution task. In order to make the intelligent scheduling algorithm based on big data more in line with the needs of enterprise human resource management in the current era. Therefore, it is necessary to fully consider the innovation of the intelligent scheduling algorithm of the platform, by summarizing the advantages and disadvantages of the algorithms that have been put into application before, the algorithm design based on the initial priority table and task deadline is further proposed[14]. The ultimate purpose is to help determine the real-time priority of tasks in each stage, and solve the problems of fixed priority and insufficient execution time constraints often appeared in other algorithms. In the algorithm proposed by the author, a real-time computation task request R should be assumed, and the order is as follows:

$$R = (e_i^{born}, e_i^{wait}, e_i^{dead}, y_i) \quad (4)$$

In Equation (4), i represents the number of the real-time task waiting to be executed, e_i^{born} represents the generation time of the real-time task, and e_i^{wait} represents the longest waiting time when the task is queued to be executed, the value is determined by the number of employees and business volume. e_i^{dead} represents the deadline of the task, and y_i represents the initial priority of

the task, the smaller the value, the higher the initial priority of the task. Then the current time is assumed to be s , and the relative deadline of the real-time task is a_i , content type (5):

$$a_i = e_i^{dead} - s \quad (5)$$

According to Equation (5), we can explicitly calculate the relative deadline a_i of real-time tasks, which will slowly decrease over time, which means that its task priority will increase over time.

3.5 Task Distribution Mechanism

When processing a large amount of data, the receiving node must select the target scheduling node and process the task to complete the scheduling. Reasonable selection can improve efficiency and ensure reliable data processing, the scheduling mechanism is as follows:

(1) In intra-area scheduling, the task with higher priority is selected whose deadline is higher than the propagation delay. The receiving node gives priority to the tasks with high time requirements, if there are too many tasks, the receiving node will dispatch them immediately.

(2) In intra-layer scheduling, it mainly completes the tasks that have long deadline and cannot be handled by busy receiving nodes, schedule it to another area on the same layer.

Figure 3 shows the algorithm flow chart.

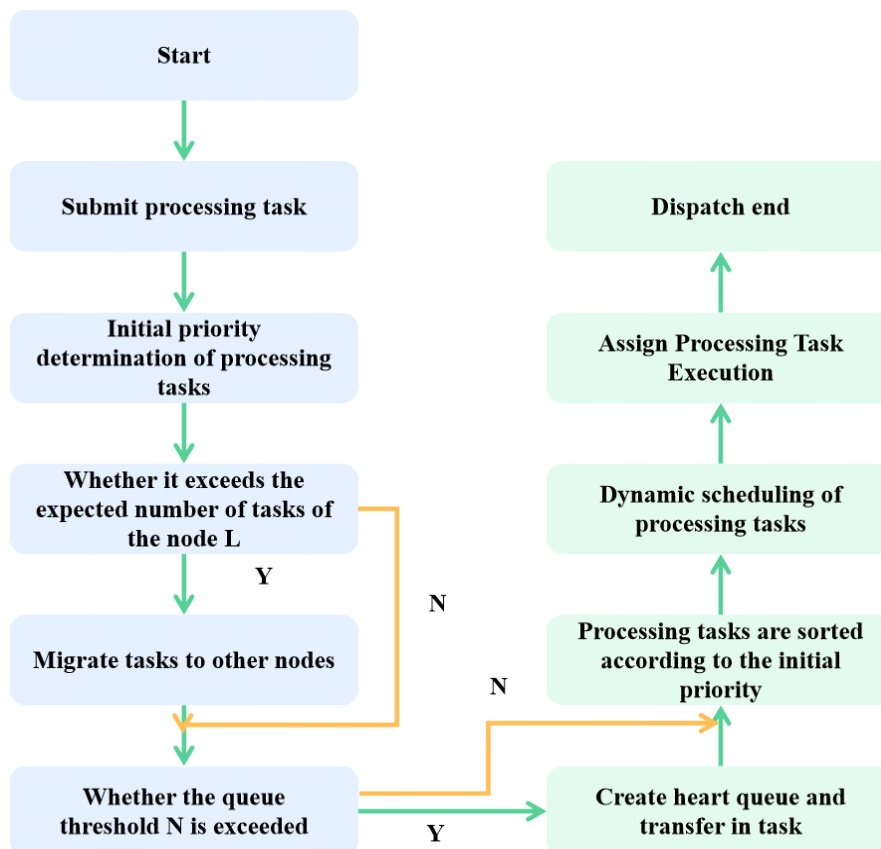


Figure 3. Flow chart of the scheduling algorithm

4. Experimental results and analysis

Through the experiment, the human resource intelligent scheduling algorithm proposed by the author is taken as the experimental group, and the traditional algorithm is taken as the control group, and the operation time of the two algorithms is compared. Figure 4 shows the basic test environment built by the simulation test software[15].

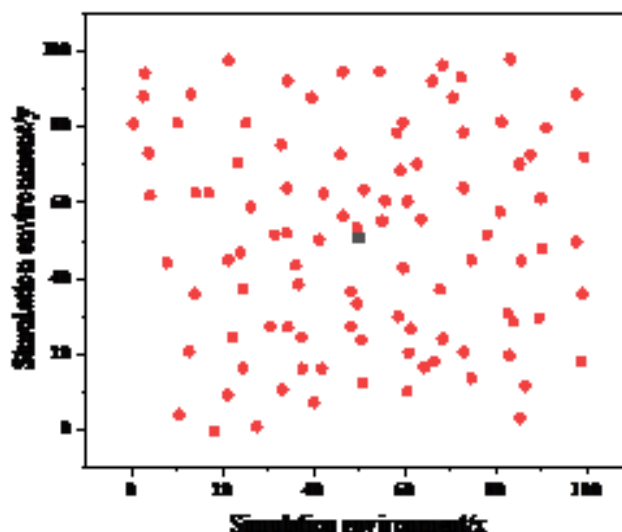


Figure 4. Basic test environment of the simulation test software

As shown in Figure 4, the simulation test environment is a square-size area of 100m * 100m. The rectangle in the center of Figure 4 represents the central nodes of the basic test environment. The other circles are ordinary nodes. In this experiment, the data of the proposed algorithm and the traditional algorithm are respectively brought into the simulation environment. The experimental group was numbered according to the distance from the center node of the triangle, while the control group was numbered according to the order of the stage tasks. After completing all the numbering work arranged by the two algorithms, the relevant data of the stage task are fused respectively, Figure 5 and 6 shows the fusion effect of the two test groups on the stage task data.

According to the data operation results in Figure 5 and 6, under the 20-stage data fusion test, the average time of the experimental group was 7.261s shorter than that of the control group. According to this result, compared with the traditional intelligent scheduling algorithm, the intelligent scheduling algorithm proposed by the author can effectively shorten the required time for the fusion and computation of the stage task data, the human resource intelligent scheduling algorithm based on priority Table is more excellent in performance.

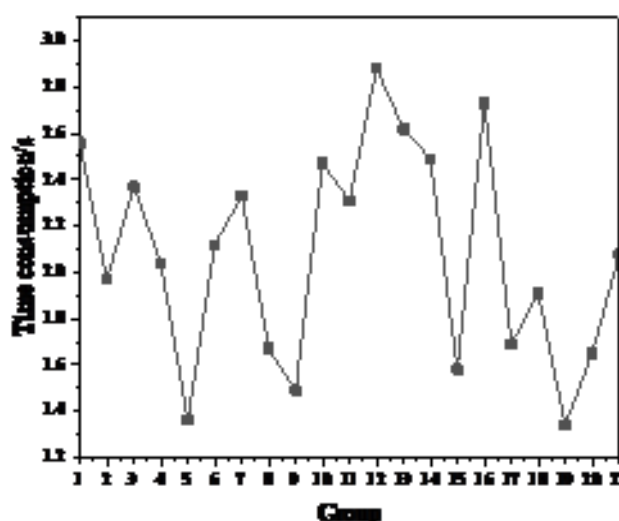


Figure 5. Total time spent in the stage of the data fusion experimental group

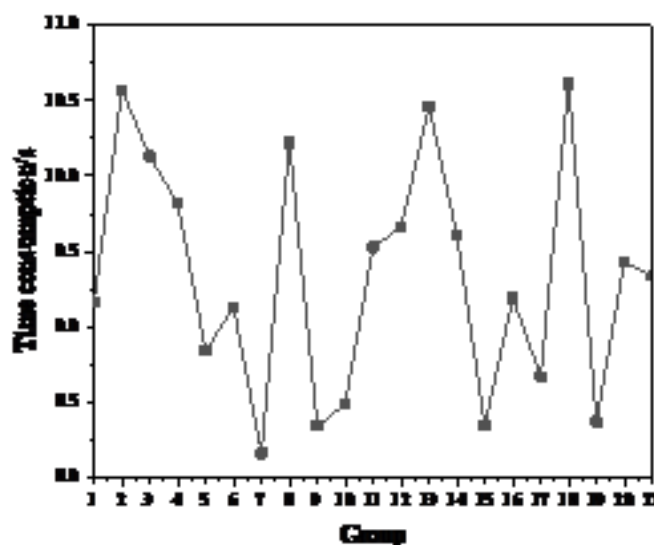


Figure 6. Total time spent for stage 6 data fusion control group

Enterprise managers need to fundamentally recognize and clarify the importance and necessity of human resource management, and start from the actual situation of the enterprise, rely on the progressiveness of big data application technology, conduct serious and careful analysis and research, so as to plan the future prospects of the enterprise in all aspects and from multiple angles, and strive to build an excellent and complete human resource management system. Among them, the construction of the system also requires relevant managers to carry out from multiple perspectives[16]. Human resource management under the new situation needs to be based on improving the satisfaction and loyalty of enterprise employees, and needs to give full play to its leading role. At the same time, use the support and guidance model to ensure that enterprise management can be carried out smoothly. In this process, it is necessary to take enterprise employees as the starting point, and use diversified management models and methods to meet the needs of enterprise employees, so as to significantly enhance the quality and efficiency of enterprise human resource management.

Progressiveness thinking is an important basis for enhancing management quality. As an enterprise manager, we need a clear mind and an idea of keeping pace with the times, and we also need to have a certain diversity and flexibility in thinking. This is the fundamental demand and necessary practice of development in the era of big data. Therefore, we can promote their management ideas to guide and help human resources work from top to bottom. At the same time, the network information technology in the age of big data is updated very quickly, which requires that the management ideas of relevant managers not only actively seek change, but also constantly keep pace with the times, constantly change and update, and strengthen their own information management quality and efficiency[17]. At the same time, managers should be well aware of and understand the basic characteristics of the big data era, such as large amount of data, various types, low value density, fast speed and high timeliness. Under its characteristics, they should strive to create a good and harmonious enterprise information working atmosphere, so as to promote network information technology to bring various advantages and convenience to their management work, and better integrate and develop. Managers should correctly understand that the main body of an enterprise is its employees, and human resources are the first capital for enterprise development. Therefore, it is necessary to establish correct ideas and take employees as the center for humanized service and management. Among them, we can start from the perspective of talent recruitment, while taking into account the talent training program, and constantly promote the high-quality development of enterprise employees. At the same time, managers need to make use of network information technology, and through various ways and means, such as holding exchange meetings, so that enterprise employees can better communicate their excellent work experience and work skills. I believe that in such a good atmosphere, enterprise employees can get more attention and respect, so

as to gradually enhance their own initiative and enthusiasm for learning and work, and hit more sparks of communication, promoting the common development of enterprise employees and the enterprise's ladder like progress[18-20].

5. Conclusion

In this study, based on the background of big data era, the intelligent scheduling algorithm of enterprise human resources was innovatively designed, and a new intelligent scheduling algorithm based on priority table was proposed, compared with the traditional intelligent scheduling algorithm, the time consuming experiment is carried out, and the fusion logic of the algorithm is strengthened, and the excellent effect is achieved. However, there are still many shortcomings in this study, in the future research process of intelligent algorithm, based on the author's research, the innovation of related algorithms is optimized.

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