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Cloud Computing Algorithm based on Balanced Scheduling

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Abstract: The experimental results show that: the optimal algorithm combined withant colony and geneticenables the storage, computation and operation of cloud resources to reach the optimal solution, meeting the user's need forusing cloud resources, and it further proves that the algorithm is convergent.

Keywords: Multi-processor; Objective Function; Cloud Utility; Node

1. Introduction

After determining the amount of resources allocated to the previous task, the cloud service provider will sell the remaining resources to the newly arrived cloud user tasks. After the auction quoting phase, the user submits their offer to cloud service providers, cloud service providers to collect all the quotes and then determine the price. Second, they propose a theoretical framework to solve the problem of capacity allocation under the cloud computing framework [1-3]. The scheduling model allows re-allocation of cloud resources after the initial distribution. The focus of the model is to provide fair trade between users and resource providers, while optimizing revenue it also can increase trading service volume, and maintain a reasonable price considering the cloud market. Based on a true cloud computing system, it designed cloud resource scheduling algorithm based on service level agreements. The cloud resource scheduling algorithms based service level agreements can provide liaison between service providers and users and timely provide services for users [4-7].

2. Resources Scheduling Model With High Utilization

Where in: a_j and b_j is an integer and they are the bounds of variable x_j; n is the number of variables x_j. Defined delt $a_j = (b_j - a_j)/(l_j - 1)$, l_j is the number of values of the variables x_j, $j = 1, 2, ..., n$. Feasible solution space is shown in Figure 1.

In Figure 1, x_j has l_i nodes, and each variable in a node of a column, which can form a solution $(x_1, x_2, ..., x_n)$ of the optimization problem. Node number of each column $1 \sim l_j$ is defined as the code of the selected nodes of the j_{th} variable node. A set of solution is as follows:

$$(x_1, x_2, ..., x_n) = (a_1 + (m_1 - 1)\ delta_1, a_2, + (m_2 - 1)\ delta_2, ..., a_n + (m_n - 1)\ delta_n) \quad (1)$$

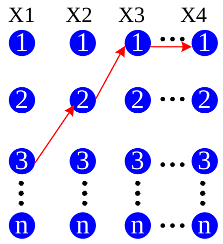

Figure 1. Feasible Solution Space.

3. System Features

Among them, $\partial S(t)$ represents the intensity of cloud resources at the moment T, $\Delta_s^2 x$ 7 indicates the type of information stored, which is defined in terms of the structural characteristics of the studied question of resources. For TSPI problem is defined as U, representing that the shorter the distance speed between the memory used, the greater the probability of being selected. Y represents the relative weight of information resource's optimization scheduling, U is the candidate list of a combination of ants and genetic, i.e. the untapped cloud resource integration. When the access to all cloud resources is finished, stored information of all paths through can be iteratively updated according to formula (2):

$$\begin{cases} \int_s \frac{\partial x}{\partial t} f\, dA + 2\int_s [f \varnothing R - n(\nabla_s f)^T \nabla_s R] dA = 0, \\ \forall f \in R^I(S) \\ \int sRj\, dA - \frac{1}{2}\int_s tr(\varnothing x) j\, dA = 0, \forall j \in R^I(S) \end{cases} \quad (2)$$

Among them, p is the evaporation coefficient, v represents the information strength of stored cloud resources released in path K by the ant and genetic in this cycle Y, which can be defined as:

$$\begin{cases} \frac{\partial x}{\partial t} = -2\Delta_s Hn,\ S(0) = S_0 \\ \partial S(t) = \Gamma \end{cases} \quad (3)$$

C represents the path length of cloud resources storage established by combined a of ant and genetic. It can be seen that the better the path built by ant, the better resource pheromone can be got by each side. Set T = T +1, and then repeat the above process of building and updating information pheromone, until it reaches the termination condition of iterative algorithm.

Ant Colony and genetic optimal algorithm's process is simplified as follows:

Setting the initial point - $X^{(1)}$ is a wholly-zero matrix, that is, any element $x_{ij} = 0$, $l^{(1)} = [1,1,...]^T$, $m^{(1)} = [w_1, w_2, ..., w_n]^T$, Tolerance $e > 0, k = 1$.

Calculating the sub-gradient: $g^{(k)}$

Take l, m into Lagrangian function L; let $\frac{\partial L}{\partial x} = 0$, after solving equations, get the target $x^{(k)}$ with the k iterations is obtained.

If $g(k) \le e$, stop the iteration, otherwise seek step $s^{(k)} = \frac{\overline{L} - L(x^{(k)}, l^{(k)}, m^{(k)})}{g^{(k)\ 2}}$ UsingEquation (11) to update the Lagrangian operator and solve the $l^{(k+1)}$ and $m^{(k+1)}$. $k = k+1$, turn to step 2.

Wherein, each element in the matrix represents the expected time of execution of the i_{th} task on the j_{th} virtual resource.

Algorithm steps:

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According to the need setting the allowable error εthe different optimal solution precision is obtained. In the algorithm the estimated optimal target L is used to estimate through the heuristic search algorithm, it can be get by directly using matlab, LINGO software. In CUM simplified gradient algorithm; after adjusted by step 4, the effect of the results of this bias can be reduced.

3.1. Comparison Between Algorithm's Cloud Resources Rate

In order to verify the capacity of cloud computing schedulingmodel is faster and strongerthan that of traditional one in resource sharing, storage and utilization, this paper analyzes and compares cloudresources' utilization rate with several sets of experimental data, to further prove of the correctness of the experiment. The specific experiments are analyzed as follows:

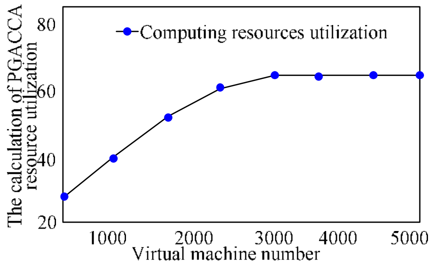

Figure 2. Cloud Computing Resource Utilization.

In Figure 2, the ordinate is the number of virtual technology of resource scheduling, the red line is cloud computing resource's utilization growth rate of greedy algorithm, the blue one indicates cloud computing resource's utilization growth rate of ant colony algorithm, while yellow one is cloud computing resource's utilization growth rate of parallel genetic algorithm. From Figure 5, we can see that in the experiment of three different resource scheduling algorithm, as the number of virtual technology increases, namely when it creases from 120 to 6000, the corresponding growth rate will increase, from 37.4% to 60.5%, and the average also increases to 51.2%, showing that the utilization of cloud computing resource scheduling has a significant increase. Meanwhile in the experiment, from the three coordinate curves with different colors, it can also be seen that when the curvilinear coordinates of different algorithms increase sharply then reach a steady state gradually. This shows that the proposed algorithm's performance is the best and most stable in cloud computing resources's utilization. Because the algorithm combines both the advantages of the ant colony and genetic algorithm, so the calculation of interest rates of this two combined cloud computing resource scheduling algorithm is significantly higher than that of greedy algorithm. Similarly, with the gradual increase of the number of virtual technology, fragmentary resources also increase, which leads to resources' increasing.

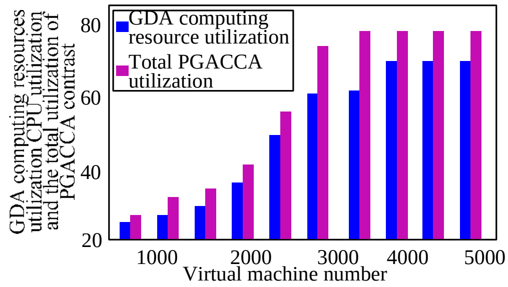

Figure 3. Comparison Of Several Different Algorithms'Resourcesvirtual Technology.

From the experimental data in Figure 3, it can be seen that abscissa is number of resourcesscheduling's virtualtechnology, and the vertical coordinate is the trend of genetic and ant colony's combined algorithm's utilization rate of cloud resources. Through this 10 groups of experimental data with different trends, it can be found that as the number of virtual technology increases, namely when it creases from 120 to 6000, the corresponding growth rate will increase, from 37.4% to 60.5%, and the average also increases to 51.2%, showing that the utilization of cloud computing resource scheduling has a significant increase. From the four coordinate curves with different color of different algorithms, it also shows the blue line's trend. The curvilinear coordinate first increases sharply then reaches a steady state gradually. This shows that the proposed algorithm's performance is the best and most stable in cloud computing resources utilization, and it has a obvious advantage. Because the algorithm combines both the advantages of the ant colony and genetic algorithm, so the calculation of interest rates of this two combined cloud computing resource scheduling algorithm is significantly higher than that of greedy algorithm. Similarly, with the gradual increase of the number of virtual technology, its computational resource's storage, usage, bandwidth, etc. will also increases as the calculating number increases, thereby increasing the magnitude of its resources, and further shows that the resource utilization of the algorithm is the most reasonable.It can fully meet the needs of cloud resources'users and the characteristics of cloud computing data center's system architecture.

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