Could Resource Exchange Model for DRAGON-Lab

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Abstract. The DRAGON-Lab supports an opportunity for researchers to exchange Cloud resource on an open platform, but the exchange schemes have not been defined. This paper proposed two resource exchange models, market model and tender/contract model. A comparision testing are given and proven the proposed models are applicable for the DRAGON-Lab, and the market model evaluated have better performance than the tender/contract model. Both of them are justified as reasonable approaches which fulfiled the lacking of this research field.

Keywords: cloud resource, exchange model, DRAGON-Lab

1 Introduction

The DRAGON-Lab, a next generation Internet Cloud experimental platform, has opened its computing resources and network devices to the public. The members of the DRAGON-Lab exchanged their own resources to other members, which has formed a large scale Could resouces centre.[1] However, the management of the resource of DRAGON-Lab has become a research essue limited its development. This paper proposed two resource exchange models as approaches.

Based on the current strategy, all members could consume the Cloud resource without any limitations, which has caused to the resource competition between members.[2] Due to the members belonged to different insitutions, all of them are looking after maximum pay back while sharing their own resources. With the increasing membership of DRAGON-Lab, the kind of competition could affect the network performance. While, the current policy can not manage some members who do not have contributions to Could resources but still as consumers.[3]

On the other hand, in the aspect of heterogeneous resources, the Could resource of DRAGON-Lab located in different areas in different ways. It not only includes the computing resources, such as CPUs, memories, hard disks, also the human resources, teaching resources and experiment resources.[4] The current first-come-first-served resources reserve strategy could not fulfil the requirements and balance the network performance.

2 Market model

For the market model, the resource suppliers charge users depending on the resource services. The supply-demond relationship would play a vital role in the recource pricing schemes; the price could also balance the supply-demond relationship. The market model for DRAGON-Lab could base on the following factors[5][6]:
- ✓ Administration fee
- ✓ Demand and supply relationship
- ✓ Subscription fee
- ✓ Resource cost

The resource suppliers publish their prices through the DRAGON-Lab platform. A simple price example may include the following parameters：

> supplier_id // this can be same membership ID
> peak_time_price // 8am-5pm: office hours on working days
> lunch_time_price // (12.30-2pm)
> offpeak_time_price // (6pm-9am),
> discount_when_lightly_loaded // if load is less than 30% at any time
> raise_price_high_demand // % raise price if average load is above 70%
> price_holiday_time // during holidays and weekends

Traditionally, computational services are priced based on their production cost and desired profit margin. However, the consumers' perception of value is based on parameters such as supply and demand for resources, priority and service quality requirements. Therefore, the resource value in the DRAGON-Lab needs to be considered in many parameters, such as resource strength, cost of physical resources, service overhead,demand, value perceived by the user preferences. The last three parameters are difficult to determine from user unless they see any benefit in disclosing them and they may vary from time to time, from one application to another.[7] However, there are consumers who prefer regular access to resources during a particular period of the day.

Consumers can be charged for access to various resources including CPU, storage, software and the network. The resource supplier can carry out the following steps for supplying resources:

> 1. The supplier identifies service consumer;
> 2. It identifies suitable resources and establishes their prices;
> 3. It selects resources that meet its utility function and objectives (lower cost and deadline requirements met);
> 4. It uses DRAGON-Lab navigator to view the job processing;

3 Tender/contract model

Tender/contract model is one of themost widely used models for service negotiation in a distributed problem-solving environment [8]. It is modeled on the contracting mechanism used by businesses to govern the exchange of goods and services. It helps in finding an appropriate service provider to work on a given task.[9] For DRAGON-Lab, it focuses on the interaction between resource supplier and user in their bid to

meet their objectives. A user asking for a task to be solved is called the manager and the resource that might be able to solve the task is called the potential contractor. From a manager's perspective, the process is[10]:

1. The user announces its requirements (using a deal template) and invites bids from suppliers;
2. Interested suppliers evaluate the announcement and respond by submitting their bids;
3. The user evaluates and awards the contract to the most appropriate supplier(s);
4. The user and supplier(s) communicate privately and use the resource.

From a supplier perspective, the process is:

1. Receive tender announcements/advertisements;
2. Evaluate the service capability;
3. Respond with a bid;
4. Deliver service if a bid is accepted;
5. Report results and bill the user as per the usage and agreed bid.

The advantage of this model is that if the selected supplier is unable to deliver a satisfactory service, the users can seek the services of other suppliers. This protocol has certain disadvantages. A task might be awarded to a less capable supplier if a more capable supplier is busy at the award time. Another limitation is that the user has no obligation to inform potential supplier that an award has already been made. Sometimes a user may not receive bids for several reasons[11]: (a) all potential supplier s are busy with other tasks; (b) a potential supplier is idle but ranks the proposed tender/task below the other tasks under consideration; (c) no suppliers, even if idle, are capable of offering a service .To handle such cases, a user can request quick response bids to which suppliers respond with messages such as eligible, busy, ineligible or not interested.This helps the user in making changes to its work plan. For example, the user can change the deadline or budget to wait for new suppliers or to attract existing suppliers to submit bids.

The tender model allows directed suppliers to be issued without negotiation. The selected suppliers respond with an acceptance or refusal of an award. This capability can simplify the protocol and improve the efficiency of certain services.
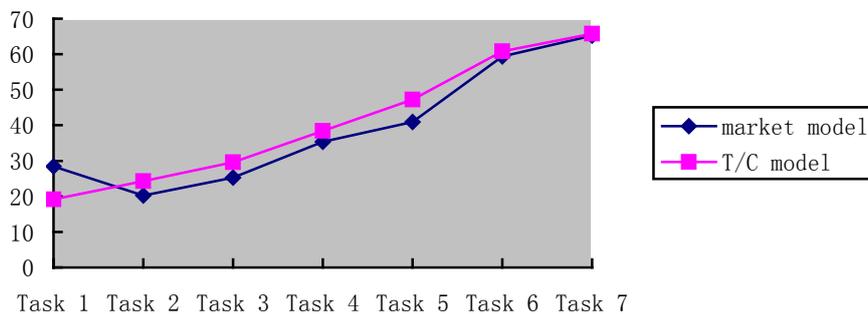
4 Testing and Evaluation

The aim of the research related to enhance the resource exchange of resource supplier and users on the DRAGON-Lab. A comparison test discussed in this section compared the elapsed time on server side between market model and Tender/contract model. Ten testing tasks were designed to test the performance of these two models with different work-load, Task 1 with lightest work-load and Task 7 with the heaviest one. The results of the testing are:

Table 1. Testing Result

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
market model	28.4s	20.2s	25.3s	35.4s	40.9s	59.4s	65.2s
Tender/contract model	19.2s	24.3	29.6s	38.4s	47.2s	60.8	65.8s

The Figure 1 showed the result in a chart, which indicated the trend of the elapsed time.

Fig. 1. Trend of Testing Result

Based on the result, a short evluation can be made as follow:(a)For most of the tasks, the market model spend less time then the tender/contract model, expect task 1, which the work-load is very light and the tender/contract model had a better performance. (b) The result has proven that both models are work-load related. The elapsed time of both models increased in a similar trend. (C) The performance differences of two modles are reduced with the work-load increase. The results of Task 6 and 7 from both models are much closed.

5   Conclusions

The paper proposed two models, maket model and tender/contract model, for the Cloud resources exchange on the DRAGON-Lab.Both of models are proven applicatiable by testing, and the testing results showed the market model had better performance than the tender/contract model in most of the testing tasks.

These two models gave different approaches for resource supplier and users to finish their demandings. The DRAGON-Lab could implement these models to maintain its daily operation, and support a reasonable resource exchange schemes.

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