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A New Intelligent Method in Brokers to Improve Resource Recovery Methods in Grid Computing Network

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ABSTRACT

Network computing enables Virtual organizations to share the geographically distributed resources to achieve common goals with each other. This work occurs with lack of a place and central control and an existing reliable relationship. For solving grid problems, it is required that the best source is found in the fastest possible time and it is used to run part of the problems. Until now, said methods for information retrieval Which Try to Reply to Requests optimally In Lowest time. But none of them cannot coordinate with changing of gird and have flexibility to changes. So it is necessary to present a flexible method in allocation and retrieval of resources in grid networks. Used Innovation in this article is using intelligent brokers for resource allocation to send requests. This intelligent method is created based on reinforcement learning method and it can coordinate with changes of grid network and establishes the best source at the right time for clients.
KEY WORDS: Grid, interface, resource recovery, reinforcement learning, scheduling .

INTRODUCTION

Network computing is Computational model that we can do great calculations on them using of netted multiple computers and to consider them as a unique virtual computer. In other words, grid can use grid computing power several separate computers through the network frequently (the Internet) are associated with each other, solve massive computational problems [1, 2].

What we intend, it is a new algorithm that removes some shortcomings of previous algorithms; we try to optimize allocation and recovery methods and reduce time. In this method, in units Of Grid Network that act like a broker, we put an intelligent program that uses the network over time and these brokers are able Recognize Better the network and resources and they reduce response time. In Indeed we can say we convert every broker to a intelligent agent that is able to learn and can complete its Recognition of Network And nodes over time. Main method is reinforcement learning that is used to make intelligent and learn brokers. Main reason of using reinforcement learning was more coordination that is seen in reinforcement learning method and grid network.

Among we can mention to an important note that Reinforcement Learning Method has an on-line learning and can be used for environments that are visible. Also unlike other learning methods (such methods genetic and neural networks) it does not require very large volume of trainer's data. But in this way, the general trend is that regard to the reward we obtains at the end of a path; we know the past steps in that direction or get a reward. We repeat this procedure to identify resources (nodes) more and in fact we find a better understanding of the network. In continue we will explain existing methods, proposed method, performance and compare this new method and performed experiments to check the performance of this idea with the previous methods.

Introduction of data recovery techniques in Grid Network

Breadth First Search

This method are used in many existing systems such as Gnutella and it works that each node publishes the request message after receiving, to all neighbors except the sender and then it will search its local resources for answers and If it finds answer, it creates a message and sends it for snoop node and the package will apply the way of request message exactly. This package includes information such as CPU power and bandwidth in the node that will be prioritized in effective response. This method does not have a good efficiency along with its simplicity and does not use network resources truly. any requests use from many sources, because it sends to all links, thus links with low bandwidth may have problems [4, 5].In action, for dealing with this problem, a Time To Live parameter are identified for each message . that show the number of nodes that a request can be over [6].

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Random Breadth First Search (RBFS)

This method has a well improvement relatively compared to previous methods and its workmanship is similar to

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ious method except that instead of sending a message to all neighbors, it is sent to only a fraction of neighbors that are selected randomly. The fraction amount is a parameter that must be selected (0.5 is selected in performed tests.) Advantage of this approach is that each node makes a decision completely local and does not need to have a general knowledge of network. On the other hand, performance of his method is quite probability because the link may not be selected that goes to a big part of the network and thus, a request message does not arrive to this section of network [7, 8].

Intelligent search

In this method, the goal is the number of exchanged messages for each request and the number that are considered to be minimized and for this purpose, it does not send a message to all nodes like a previous method, but with the difference that instead of randomly chosen nodes, it selects the nodes that their probability of responsibility are more than all nodes to current request and for this purpose it uses the following components [3]:

Records Registration Mechanism: it is used by each node for registering records of its neighbors. Thus, the neighbor's answers are registered in recent requests by it. For example, for each neighbor, it keeps T answer of its recent request and when the memory is full, it uses LRU mechanism to replace the data [9].

PROPOSED METHOD

For implementation of a request in grid which request is sent to Broker unit on the network. Broker unit chooses the best source with correlation to other units and then sends it to scheduler unit for running. Scheduler unit, set deadlines for the source that in the deadlines set, the source has the opportunity to finish the run of submitted request successfully. Otherwise, this operation is necessary to do for the above request again. ؘ؞Therefore, transfer request assignment to a resource with a high degree, will increase the efficiency of retrieved operation directly. An important point exists in the grid computing network, brokers do not do the source selection operation generally, but they store path and distance of each resource in themselves. In most systems, brokers communicate with center information and Catalog units and store resources in the above unit. Then the best source is selected on the unit, either in terms of efficiency or in terms of distance to the broker and the actual mapping are done between the source and application. Here because the combination of these three units do not cause a problem and does not affect in our method, the three units are considered as a single broker. In reinforcement learning, the goal of agent is expressed in reward signal form which receives of environment. In each time stage , this reward is expressed in simple numerical form. In simple expression, the goal of agent is to make maximize the total reward. Maximize rewards is considered in the long run, and this does not mean maximize rewards at each stage necessarily [10].

For resource allocation optimization in a Grid network, resources chosen will impact on the performance of network. in Figure (1), we put a part in every broker, which its name is decisions control management based on reinforcement learning and it includes the core area of reinforcement learning based on Markov models and dynamic programming, which is in interaction with other units constantly such as Scheduler and it selects the best source based on a time agent for a process in previous mappings and stored information in broker units. RE / PE of rewards and punishments unit that we assume in this Unit , Will be given point to RLDU unit based on true resource allocation for each process +1 point and not suitable resource allocation of each desired process -1 point. Thus in selecting a resource, we also examine its point.

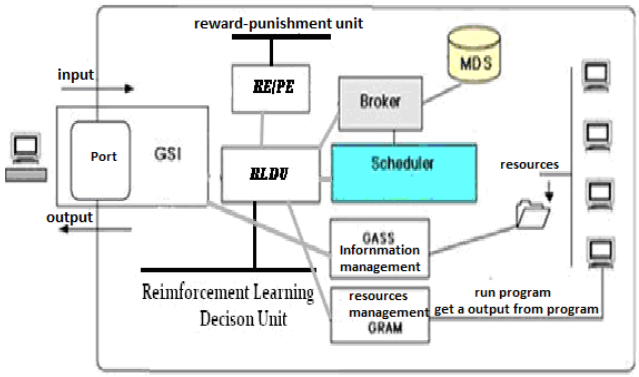

Figure1. Adding the reward and punishment unit to grid model

In general, after the source selection, the above candidate source is sent to the scheduler queue for estimating time and cost. Above request is being in Scheduler queue and then an estimate of time for doing (deadlines) occurs and therefore the actual mapping occurs between the source and request. Now if request is done in the specified deadlines, reward and punishment allocates is a +1 point and otherwise -1 point to the source.

The main reason for this work is for productivity and resource allocation optimization because if the request is delivered to a not suitable source, Probability it will not end before the scheduled time and because of that, resource allocation and scheduling operations must be repeated that this work decreases performance. In this method, the points are allocated to resources ,not requests ,so until the resource allocation and scheduling of process requests is not done, any point are not allocated to any source in the RLDU. Because it is possible that resources of each system do not work in a specific time for any reason, that in state, the desired node must be removed of selection cases and for not responding of resource, the RE/PE allocated -2 points to RLDU and that work causes to remove resource from the list. Of course, the information of sources is updated by BROKER's information constantly.

Actual value of resource

There is an important note that is debating of distance between broker and the candidate node. We assume B1 is a broker. In the beginning of work, B1's broker has distances between the nodes. Suppose that r request is received by B1 and resources selections are 6th and 12th nodes.. But the node points of 12th is 10 and the node points of 6th is 9. Now B1 will search for finding the sources in the network according to paths and their distance.

Distance of B1 to 6th node from the shortest path is 5 and to 12th node are 7. In this case, if judged in terms of points, the request must be sent to 12th node. But if the distance of 6th node to broker is less. So we use the following formula for the real value of each node.

Real value of each node = Amount of points per node × total subtracting the distance away from the broker unit

The used algorithm in the intelligent method

With Starting the program, we put every broker function in a thread until we can advance their works in parallel. Every one acts independent of each other and has learning. Each broker has a table that stores the basic information of adjacent nodes, such as its resources points. In the beginning, Brokers only know that each adjacent node what actions can do (with referring to section catalog and information center), also know their distance from self and the point of each node. With getting a new job, the broker's work begins. Broker will try soon as possible and finding the desired source tracks leave. For this work, first, candidate resources (maximum 5 resource that is be able to run the request.) are sent to broker and broker selects a node according to itself distance and the existed information in RLDU, according to the provided formula, then Scheduler determines a deadline to run the request and request is sent to desired resource. If the request had been done successfully before deadline, reward and punishment unit gives +1 point to the node in broker table (in fact one point is added to its point.) If the request had been done successfully before deadline, the reward and punishment unit gives -1 point.

And when a response is not received from the relevant node after a candidate node is selected and request is sent for it, then the node is specified that its connection has been disconnected from the network. Therefore reward and punishment Unit considers -2 points for this node.

This is the main process and policy of search that some cases will be considered for the better performance. To avoid being complex of solving problem, in continue of this section we will describe some cases separately to add to the whole algorithm for improving performance of intelligent methods in the end, we will describe the overall algorithm.

Acting Randomly

At first, applied Method had problems that reduce efficiency and the speed of learning. This problem arises because the points of all resources are same and thus the nearest neighbor is selected due to less distance. But resources may be farther away with better performance, which they are not used actually. So for solving this problem in each run of program, when the new request comes to broker , broker acts without looking at the source points in 0.2 PROBABILITY. In this way, although more time may be spent in some cases, but on the other hand, process of finding new sources and their ability is done more quickly.

Keeping the record of deleted resources from the network

stored information in RLDU even when a resource (node) is deleted from the network and after the source return to the network, stored points in RLDU will be used to make priority in referral Requests .this work causes that information of previous mappings about the resource is considered and resources have a more chance to select that are at a higher level.

TEST RESULTS AND EVALUATION

In this section, the results of applying the proposed algorithm to search the network computing are presented. For applying exercise testing and comparing existing methods is necessary that other methods are

implemented in the same conditions. So BFS, RFBS, ISM models has been compared with the proposed method (RLS). All methods are the same and the main difference is applied search method in each test.

Initially we have applied these methods in small-scale. We saw that our intelligent method did not have a very good performance and simple BFS will have better performance. The reason of that is that network is small and the worst kind of search does not spend too much time.

In the next stage, the same test is done for large scale and efficiency of presented approach is evident. In Figure (2) we can see that performance of BFS and RFBS methods does not change over time. Performance of ISM method is better with repeating tests, but the proposed method has better performance significantly.

In these diagrams, the horizontal axis is the applied number of requests (the number of repeating tests) and the vertical axis is for time spent to search. Times obtained in all tests have converted to 1000 scale.

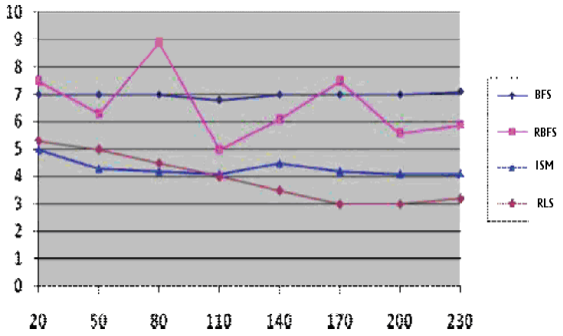

Figure2. Comparing methods when the number of network units is between 100 and 1000

In the third stage, in working styles are changes for removing the slow learning problem. Part of the work is done randomly that performance system will improve with applying these cases and somehow learning process is better. (These cases act such as catalyze for learning.) (Figure3).

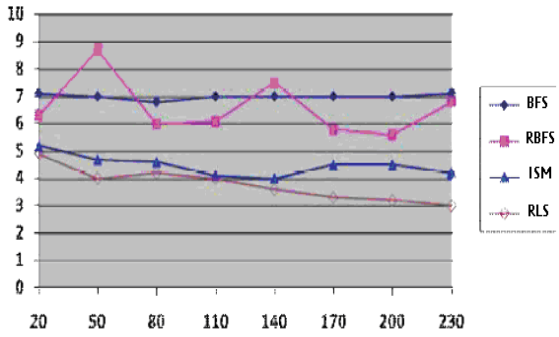

Figure3. Improve the performance of intelligent method

Conclusion

In this article, we try to provide new idea in recovery and resource allocation methods and perusing its efficiency, a small step is taken toward the evolution of resource recovery techniques in Grid networks. We can set the whole obtained results the following conclusions are:

- Proposed method will be increased performance over time with cognition of resources and helping reinforcement learning sector.
- With doing Assistive Methods , such as acting randomly, we can improve growth of Learning and speed and Efficiency .
- In case the network is changed greatly, and input and output of systems to the network is high, above method will increase its efficiency.

In Continue of working on this project, using other intelligent methods for network learning can be one of the future works. Authors proposed method is the probability methods and methods which are based on Bayesian networks.

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