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Hierarchy Aware Load Balancing: A Concept

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Abstract-Cluster computing has emerged as a primary and efficient platform for running parallel and communication-intensive applications that transfer a huge quantity of information among the nodes of a cluster via network. Conventional load balancers are effective in increasing the use of CPU, memory, and disk I/O resources. However, very few load-balancing schemes can take all network assets into consideration, which may be in halt state at some point of time and due to this it is difficult to balance the load properly. Due to this, we have proposed a hierarchy-aware load balancing technique which is capable of improving the performance of communication-intensive applications. This load-balancing strategy can fully utilize this model to quickly and exactly determine the load induced by a variety of simultaneously running applications. Hierarch always be maintained even though any of the module within respective network will fails, so that to continue the flow of information with proper load balancing.

Index Terms - Cluster, Hierarchy-aware computing, parallel computing, load balancing.

1. INTRODUCTION

With the rapid development of network in today's society, services provided by network are becoming more and more diverse and data traffic is growing rapidly. The estimating workloads on each node in networks are growing day by day. Cost does not affected by the hardware conditions of network equipments of the network that is comparatively small also it not possible for each node to manage heavy workload separately. Due to this the load-balancing mechanism comes into view. There are numerous distributed load-balancing schemes for clusters that have been developed.

Load-balancing system is a cluster system composed many hosts. In which each host can supply services independently without any external help form other hosts and has similar status in the system. They form a cluster in a regular pattern that function as a single large virtual machine. Even if the load will heavy, the cluster system is able to quickly respond. Now a day's cluster becomes a primary and fast growing platform for high-performance scientific computing due to it significant cost advantages.

In case of applications with constant load the static load balancing can be used as a pre-processor to the computation. Other applications that have unknown workloads or load vary during the computation, these applications needs dynamic load balancers. In general the load balancing technique falls into two categories: centralized load balancing and distributed load balancing. In the centralized load balancing schemes basically there is a head node that is responsible for handling the load distribution. As soon as the size of cluster goes on increasing, the head node experiences from the bottleneck situation those results in noticeable performance degradation. To solve this scalability problem, the workload from the load balancer can be delegated to multiple nodes. In addition to it the centralized scheme has the potential problem of poor reliability because permanent failures of the central load balancer can result in a complete failure of the load balancing mechanism. Therefore, the focus of this proposed paper is on designing a decentralized hierarchy-aware load balancer for clusters.

2. LITERATURE REVIEW AND RELATED WORK

Even a simple load balancing algorithm generates better performance in a distributed system than a system without any load balancer. Load balancing algorithms is used allocate the loads from heavily loaded nodes to the lightly loaded nodes to keep all the nodes in a network to be busy in so that the maximum use of the resources can occur to get the better performance. In centralized approach of load balancing the information is collected by a separately designated central node and in distributed load balancing approach each node has the autonomy to collect the information about the load of the system [1].

In [2], authors proposed a methodology on load balancing under the of title communication aware load balancing. This paper specifies behavioral model for parallel applications with large need of network, CPU, and disk I/O resources. This model is particularly beneficial to

clusters where resource demands of applications may not be known in advance. So, load balancers can fully utilize this model to determine the load quickly and accurately that is induced by different types of parallel running applications. After this the authors have addressed the issue of improving the effective bandwidth of networks on clusters at the software level without requiring any additional hardware.

In [3], G. Zheng we presented a hierarchical load balancing method which combines the advantages of centralized and fully distributed load balancing. It takes a phase based load balancing approach that is designed for iterative applications that exhibit persistent computational and communication patterns.

In [4], author focused on the idea of applying the dynamic policy management framework to the load balancing scheduling. Load balancing scheduling algorithm is the core of the whole system. Hence, the design algorithm will affect the performance of the system directly. The dynamic policy of scheduling algorithm presented in this paper is inspired by bi-driven algorithm which retains its advantages and increases dynamic features.

In [5], author proposed a better dynamic load balancing algorithm to solve the problems of load balancing in order to get high performance from cluster system. By experiment they had prove it has the availability and practicability in parallel computing task.

In [6], A. Bendjoudi presented a paper for solving combinatorial optimization problems exactly using parallel B&B algorithms requires a huge amount of computing resources that are used for computation which will get with their execution.

In [7], this article attempted to study load balancing in parallel systems and presented a new load balancing algorithm which has new capabilities, the most significant of which is its independence of a separate route-finding algorithm functioning as path-finder between the sender and receiver workload nodes.

3. ANALYSIS OF PROBLEM

Within the network established for communication between the client and the server, the load balancing is necessary to manage the load of requests and response between them in clusters.

While doing so some problems were arise like the failure of hardware module such as working Nodes, Masters and even Server can be failed. This will cause in degradation of advantages of load balancing scheme and causing communication problems.

Hence to avoid these situations and utilize benefits of load balancing our proposed scheme under title “Hierarchy-Aware Load Balancing for Parallel Application on Clusters” is to maintain the network in balance state even if any of the modules is failed. This will be achieved by replacing the failed module by some other working module so that the hierarchy will maintained.

Other benefits of load balancing are reserved as same as they before.

4. PROPOSED WORK

As the problem is discussed in analysis of problem we are now go towards the solution of these problems.

The modules in our proposed system are as follows:

Module 1: Creation of client

Here the client will be responsible send data to the server.

Module 2: Development of Server

Here the server would be developed in order to take inputs from the client and then process it.

Module 3: Development of Master

The master will be accountable for taking load from the Server, Taking capacity from the nodes, checking which nodes are alive and sending the request to the Node for solving the TSP with the help of capacity based load balancing technique.

Module 4: Development of Nodes

Travelling Sells Man Problem Solvers with request/response mechanism will be developed in order to get the output of the TSP problem which is given at the input to the node.

Module 5: Hierarchy Maintenance

Hierarchy would be maintained in order to provide fault tolerance to the system.

Following example will help to understand the proposed work:

Suppose if one of the Masters which is connected to a server and nodes will fail, that causing the unbalance in load of that sub network. Our proposed work will solve this problem and maintain the load to be balance.

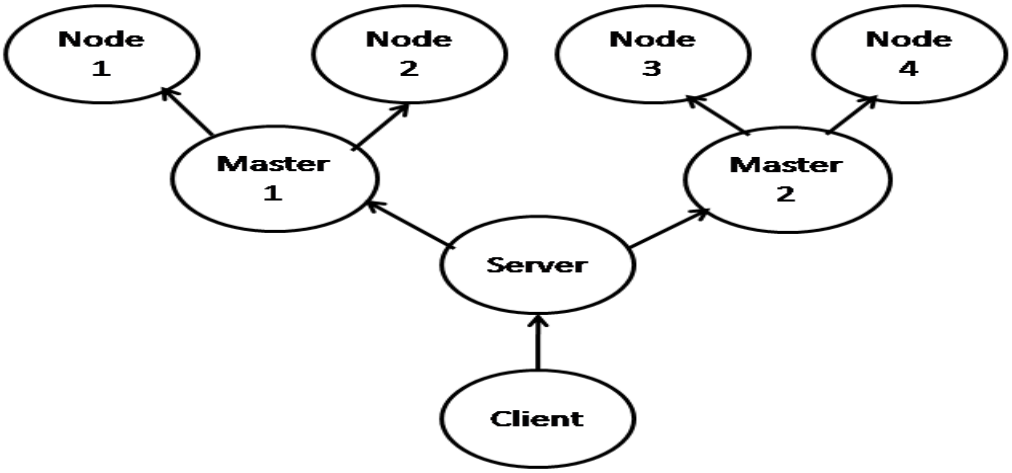

Fig 1: Balanced Network

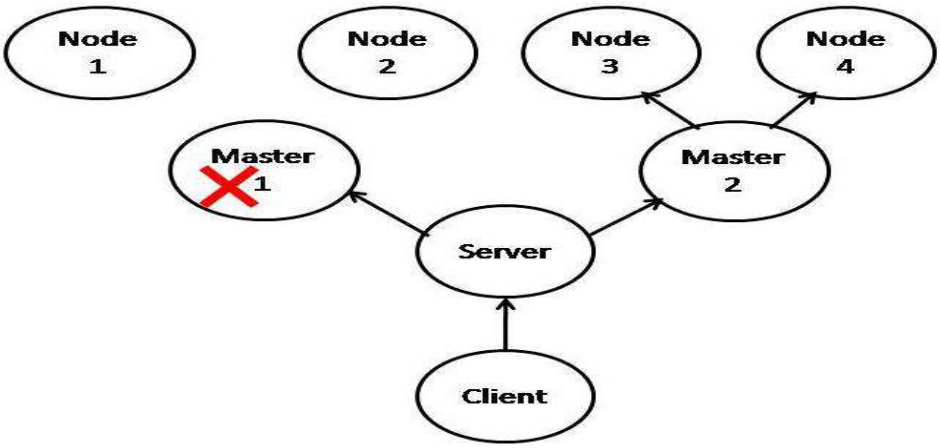

Fig 2: Unbalanced Network due to failure of master 1

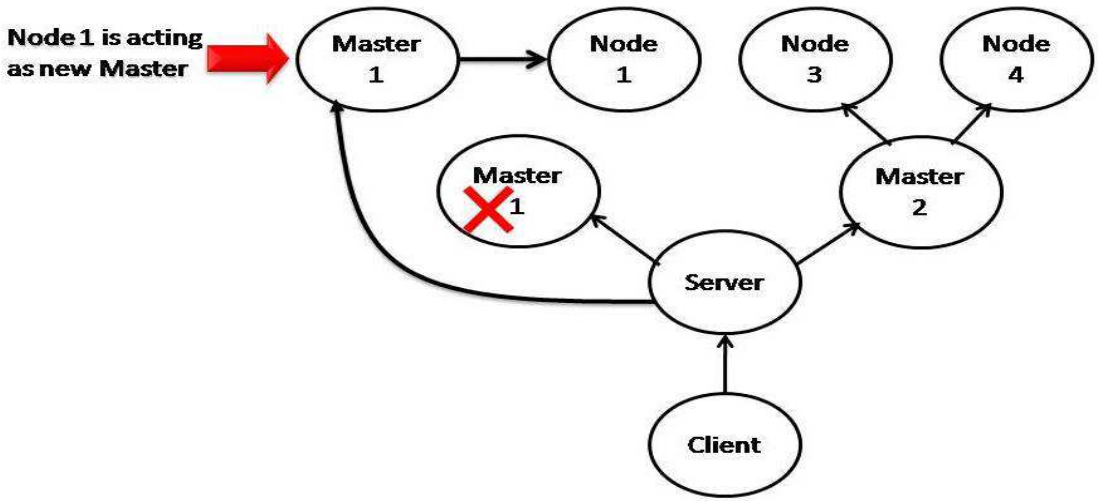

Fig 3: Balanced Network: Hierarchy maintain by making Node 1 As Master 1.

5. CONCLUSION

Our base paper has introduced a behavioral model for parallel applications with large requirements of network, CPU, and disk I/O resources. The model is particularly beneficial to clusters where resource demands of applications are unknown in advance. That's why load balancer will fully utilize this model to quickly and correctly determine the load induced by a variety of parallel applications. Maintaining the load of network is the purpose of any load balancing technique, but at the condition of failure of any node in the network, these advantages are of no use. If the node in network is failed to work the network will be unbalanced, so to overcome these situation and take the advantages of load balancing the proposed technique will be useful, and it also concentrate on improving the CPU, Memory and Disk I/O utilization.

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