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Minimizing Communication Overhead of Server in Client Server Communication

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Abstract— **Performance optimization of distributed system in internet is of immense interest in research community. As the number of internet users in distributed system increase the communication between client and server. The server actually performs the communication, so in the distributed system server which is having highest load, its time is considered as the total time of performance of that system. This measures the time of the slowest server which makes complicated Client-server assignment protocol. To reduce this our proposed system provides a way to optimize the request coming towards the server from client end by performing inter server communication and then load will be calculated to distribute among all the servers to achieve equal time of performance by all servers. This will increase the performance of the distributed internet system.**

Keywords- Distributed Internet System(DIS), Load balancing, performance optimization, inter server communication.

I. INTRODUCTION

Numbers of internet users in distributed system are increasing day by day which results in increased communication load on the server in DIS. The clients and servers form a distributed system. The proposed system tends to assign almost equal load on each server in DIS so as to optimize the performance, this will enhance the user's experience in accessing the internet. If any single server is having the maximum load on it as compared to other servers, it degrades the performance of whole system, because time of slowest system is considered as the total processing tome of that DIS. Our proposed system performs the optimization by considering the incoming requests to the servers from clients distributed internet system consists of large number of clients. The addition of all such requests will be done, then equal numbers of requests will be assigned to each server in the DIS by performing inter server communication, it doesn't matter how many number of requests it was having before load balancing. This increases the performance of the DIS by assigning equal amount load on each server in the system after every specific period of time. A denial of service (DOS) system stops responding to the clients if number of requests exceed than the threshold point. Hence we are going to implement inter server communication in order to achieve the optimized client server assignment.

There are various existing systems which are used to optimize the performance of the client- server system, an optimization is achieved by focusing in message length [2] and the memory required processing the respective request. For doing this they check the bandwidth of the message and I/O buses [1] that are used in the system our system does not focus on these things as it tends to complexity in optimization problem. Another approach used is 'proxy server', when the communication overhead increased on particular server in system which may cause failure of that system, in such a situation another server is added and it will work as proxy server. Hence adding proxy server unnecessarily increases the cost for adding new hardware.

Optimization is also done in virtual environments [7] where the cost of virtual environment is a big issue. Achieving optimized performance of such a system is very critical job in virtual environments. Any distributed system or virtual system is represented in the form of graphs and partitioned into two or more groups for making the request distribution i.e. optimization easier. But it is important to grouping of such a system evenly based on the communication load on the servers, not by focusing on group size [9][10], which is also plays an important role in optimization.

Our proposed system divides the number of servers into two groups and then does the balancing using inter server communication technique. We are dividing almost equal number of requests to each server in the system by calculating the total number of requests that are came to each server before the optimization. Unlike the existing systems, our proposed system simplifies the mathematical computations easy. This optimization will be performed after each interval of time. The data recovery in distributed system is a challenging process in case if loss of data. Hence to avoid such a situation our proposed system provides DOS (Denial Of Service) facility, which will prevent the access to the client when request on the servers reach to maximum value request, for specific period of time it will prevent the system from failure.

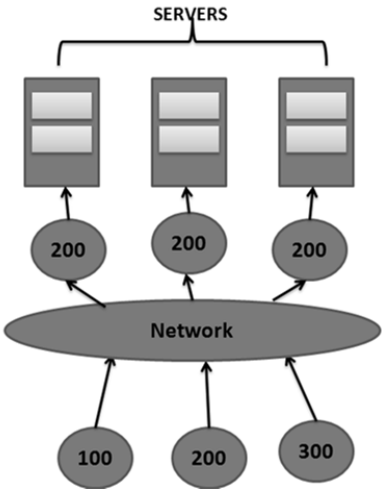


Fig. 1

In above figure 1 shows the value I the circle shows that each server has got how many number of requests. Figure shows that how the load from different clients will be summed and distributed almost equally to each server in the DIS. Here server1, server2 and server3 has got 100, 200, 300 requests respectively but after balancing each of them will get 200 requests only. So the performance degradation due to the overloaded and slowest server in the system can be avoided. Next segment of this paper contains the Literature survey of the existing systems related to our problem statement.

II. RELATED WORK

There are various existing techniques in the area of performance optimization in distributed internet system.

Krishna Kant [1] proposed one method for planning server's capacity for minimizing workload on a server in a network. He tries to minimize the memory required using various I/O buses and with the help of proxy servers, this increases the cost as well as complexity in minimization of work load of the server. D. Saritha [2] proposed a dynamic method, in this method they check the load on the server, message length and the number of available servers in the system. To do this they require message bandwidth, which is not feasible with our problem scenario.

R. Venugopal[14] discussed inherent characteristics, operational process, advantages and disadvantages of various static load-balancing techniques and dynamic load-balancing techniques. Also he has made a comparative study on various parameters of the load-balancing techniques. P. Morillo [3] suggests a method for improving the performance of the distributed virtual machine environment; he partitions the virtual distributed environment system in very low cost for achieving the optimization in client server system but its result shows absence of correlation and the average response remains practically invariable until the system reaches its threshold point. The system that Jeffery Dean [5] has proposed runs on large cluster of commodity systems and they are scalable. This system is easy to use even though the user is not at all having the deep knowledge of it. This system restricts programming model to make it easy and to parallelize and distribute computations to make the system fault tolerant.

Jianbo Shi [6] proposed Normalized Cuts algorithm (NC) to partition the data into two or more groups. It represents the client server system in the form of graphs, where nodes represent the servers and load on the server is represented by the edges with weight. Partition is done according to value of Fncut which is roughly represented as Fc*Fl, it is the multiplication if communication load and its cost. This is mainly suitable for image segmentation and bioinformatics.

For optimizing performance optimization of distributed virtual environment two phase approach is used as suggested by Duong Nguyen [7], these two phases are initial assignment phase and refined assignment phase. This approach works effectively with small size DVEs when the size of DVE increases then it is unable show good performance optimization. Kernel K-means is an algorithm proposed by Indrejit S. Dhillon [8] and it does spectral clustering along with the NC cut algorithm. The objective of this algorithm is recast as a trace maximization and minimization; they developed an EM-system which can be used to solve Kernel K-means problem.

Indrejit S. Dhillon also proposed another algorithm called as Graclus [9], this algorithm minimizes the time consumption for dividing the graph into two separate clusters, hence we can to the optimization within minimum time. Graclus works faster than NC algorithm. This algorithm does the partitioning of graph according to the size of the group, in our problem our main focus is on the load on the particular server not on the size of group of servers, hence this algorithm can't be directly applied to our problem.

Kevin Lang [10] has proposed an algorithm which performs the clustering of group of servers. This algorithm randomizes the flow based rounding method and hence gives better results. But similar to Graclus it does the clustering according to size of the cluster and this is not the case with our problem, that's why it can't be directly applied to our problem even if it is showing better performance in clustering.

There is an algorithm proposed by Zhenyu Wu [11] which partitions the large system into groups by the values associated with the edges in the graph, unlike Graclus, those values on edges in the graph represent the load on that server. This algorithm also tries to include edges in the calculation those who do not have strong connection link between them which causes the imbalance of load among the groups. Inderjit S. Dhillon [12] proposes an algorithm which is mathematically equivalent to popular existing algorithms such as NC algorithm and Kernel K-means algorithm. By using this equivalency, he proposed a system which does clustering of weighted graphs efficiently and faster without using eigenvector calculations. So it reduces computation

complexities. But the refinement phase of Inderjit S. Dhillon's algorithm contains the implementation of kernel k-means algorithm.

Hiroshi Nishida [4] proposes an algorithm which effectively does the client server optimization which gives better performance than various existing techniques also including the popular algorithm which is mainly used for optimization i.e. NC algorithm. It calculates the total load on each server in the system and does the optimization by distributing almost equal load on the each server in the system. This algorithm includes very large computational calculations for optimization which are complex and may consume time.

III. PROPSED METHOD

ALGORITHM FOR LOAD BALANCING :-

This load balancing algorithm collects the requests on each server in the system, divide them almost equally and then we distribute them to the servers for achieving the optimized performance of the distributed client server system. We know that clients requests may unequally assigned to the servers, hence speed of that system is considered as the speed of slowest server in that system. Hence for optimization our proposed algorithm includes following steps:

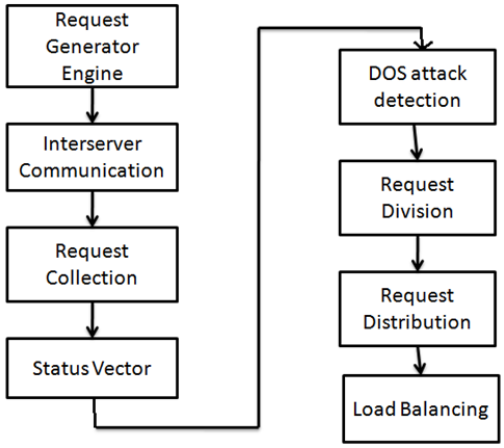


Fig. 2

1) One of the servers in the system will be an inter server communication server which will communicate with all other servers in order to optimize the requests. This server will calculate the total number of requests at each server.
2) The ISC (Inter Server Communication) server actually performs the load balancing in this system.
3) ISC uses the following equations to perform load balancing. Suppose our system has three servers then number of requests of server1 is f1, similarly requests o server2 and server3 are stored in f2 and f3 respectively.
4) Hence total number of requests will be calculated as:
   Tot= f1+f2+f2
   These requests are to be distributed equally among all the servers in the system.
   T1=Tot/number of servers in the system.
   Here we have taken three servers hence above equation becomes,
   T1=Tot/3
   R=Tot-T1
   T2=R/2
   T3=Tot-(T1+T2)

Here T1, T2, T3 are the number of requests that are assigned to the servers after load balancing.

5) For avoiding the system failure when the load on the server increases in large amount, we perform DOS detection. Set a threshold point Hs. If Ts>Hs the perform DOS detection and stop responding to clients. Here Ts is the load on the server i.e T1, T2 or T3. If DOS is detected the server will stop responding to the clients for some period of time, till the servers becomes stable.

Figure 2 shows the stepwise execution of our project. First request generator engine will generate the number of requests and distribute them randomly among all the servers in the system. Then after that the ISC server i.e. inter server communication will add the total number of requests that are came to the servers by all clients. Then the optimization as shown in step 4 of above load balancing algorithm is executed. The resulting answer is the number of requests the server will gate after balancing.

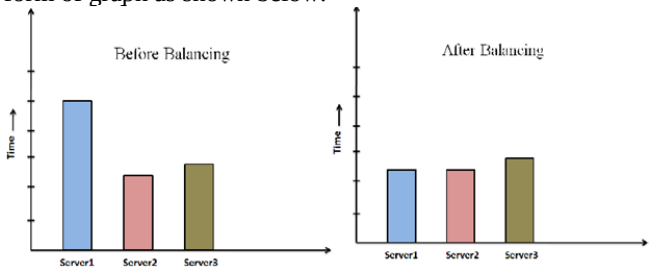
The last step of above algorithm is used for implementing DOS system by checking Ns which is a threshold value that has been set. All the above computations will be done matrix from where we will be maintaining three matrices. One matrix will represent the client to client communication. The numbers of messages that are exchanged between particular clients are represented in matrix form. Another matrix will contain client to server communication details as mentioned in second step of above algorithm. Third matrix will be calculated using first two matrices. Hence we can calculate the total load on each server before optimization by taking total of column values of third matrix.

IV. RESULTS AND DISCUSSIONS

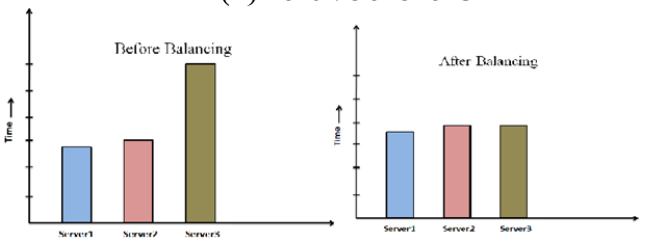
Total Requests	Server 1		Server 2		Server 3	
Load on server	Before	After	Before	After	Before	After
20	5	6	5	7	10	7
30	7	10	7	10	16	10
25	15	8	7	8	8	9
15	7	5	4	5	4	5
50	25	16	12	17	13	17
35	8	11	9	12	18	12

Table 1

Above table shows the load on server before and after load balancing. This can be easily observed by comparing the load on each server in the system. All this is done in an effective manner. This helps us in increasing the speed of the system. Change in performance of the system is represented in the form of graph as shown below.



(A) For division size 25



(B) For division size 35

By referring the various existing terminologies we came to the results that NC algorithm is an effective and most popular method which is used in optimizing the performance in client server communication. Unlike NC, Graclus algorithm does not try to isolate the nodes which do not have stronger connection between them, graclus concentrates on group size instead of communication cost. There are many more technologies which are used to do the clustering of weighted graphs in distributed system, but most of them are dealing with igenvector computations, hence this computation leads to the complexity in optimization.

Hence we came to the result that our proposed algorithm is capable of doing the optimization in better and efficient way as compared to the various existing techniques like NC and Graclus algorithms, also there is no need to add new server for optimization.

V. CONCLISION

Hence the system minimizes the communication overhead of the server by optimizing the client's requests, the system helps to balance the communication cost and communication load on the servers in the distributed environment. Normally the data first comes to the router and distributed among the servers. Admin server performs load balancing and sends the details back to the router. In our system no need to communicate with the router again and again, the data after balancing is distributed among the servers by the ISC server only, this minimizes the communication overhead. DOS attack detection is done by checking the threshold value this helps to improve the server's performance significantly.

VI. FUTURE WORK

There are various emerging applications where the CDD algorithm can be applied especially in social networking sites such as Facebook, Twitter or online commercial sites such as Flipcart, Ebay etc. where the number of clients will be very large and this may cause the large communication overhead on the application, hence this may cause the server failure or performance degradation for providing services to the clients. Hence this load balance algorithm is highly applicable for such systems. This algorithm can be extended to use in large systems such as Facebook application, it will provide higher efficiency than the existing techniques.

This algorithm can be further extended to apply to various chatting applications where large amount of message exchanging is done between buddies or friends such as what's App, Hike, We chat etc. The communication load due to large message exchanges will be reduced and load fairness i.e. load balancing can be achieved without adding new or proxy server. Hence there number of applications where this algorithm can be applied and we can get significantly better results.

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