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NETWORKING IN CLOUD DATA CENTER USING B TREE

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Abstract: This paper focuses on distribution of network traffic using B tree. The study of network traffic distribution is done on a cloud computing network using control and management of computing and network resources would required for assuring proper traffic performances. Load balancing is an important aspect of cloud computing environment. This paper introduces a control platform for virtualized environments aimed at optimizing virtual machine placement on physical servers using link cost generation techniques like B tree.

I. INTRODUCTION

TRAFFIC ENGINEERING IN SWITCHED NETWORKS

Data centers with huge logical storage capacity are now base of many Internet and cloud computing services. Deploying by switched Ethernet networks, data centers are mostly dominated by different variants of Spanning Tree Protocol. TE problems in Data Center Networks (DCN) are very varied, both in problem formulations and evaluation criteria (objectives). Some typical problem formulations for TE in DCNs are off-line TE, online TE, Virtual LAN (VLAN) to spanning tree mapping, traffic flow to spanning tree assignment, and multiple spanning tree construction. The ultimate objective of a TE method is to avoid the congestion in the DCN. Thus, a minimization of the maximal link utilization value is often the most important evaluation criterion. Other common TE objectives that can be taken into account are link delay, network total load, energy saving, number of used links, and service disruption in case of failures[1].

This research focuses on the design and evaluation of TE techniques to solve four types of problems:

(a)Minimization of the maximal link utilization in the Ethernet networks using spanning tree.

(b)Minimization of the maximal link utilization in the DCNs with multiple spanning trees.

(c)Minimization of service disruption and the worst-case maximal link utilization in the DCNs with multiple spanning trees in case of link failures.

(d)Multi-objective TE for DCNs with multiple spanning trees. For this problem, we take into account three objectives to be minimized: maximal link utilization, network total load and number of used links.

For above problems we have three parameters to take care of

- Maximum Link Utilization
- Total Network Load
- Number of links occupancy on which load has been distributed.

Data center

Data center is a kind of core repository where data is stored, managed and distributed. This may have physical or virtual infrastructure. Different organizations uses data center for their purpose, business people use data center for better understanding their customers or scientist may use it for doing future predictions about weather forecasting say or gaining insight into data for retrieving vital information[1].

Large-scale data centers also enables ever-growing cloud computing and provide the core infrastructure to meet the computing and storage requirements for both enterprise information technology needs and cloud-based services. For supporting this servers are increasing in data centers exponentially which in turn leads to enormous challenges in designing an efficient and cost-effective data center network. [2]

- Data center architecture
- Data center and cloud
- Data center network and switching networks

II. PREVIOUS WORK

LOCAL SEARCH

Local search is promotes as a solution to CSP or CSOP. This search has given name Local because Local Search starts from an initial solution and it iteratively make changes on some features of the solution to move to one of its neighbors. This search is stopped on the encounter of some satisfiable criteria. Further we are going to understand that what is neighborhood and move in Local Search.

2.1) Principles of Local Search:

The neighborhood definition in local search is a set of solution that are produced from a given solution modifying its own feature. This means that the actual solution and the neighbor solution has many common features. A move in Local Search called as Local Move is a simple transformation from one solution into one of its neighbor's solution. Example: the neighbors of a spanning tree can be generated by doing a link replacement on it. In this case, its neighborhood is the set of spanning trees that differ from the given spanning tree by exactly two links.

2.2) Meta-Heuristics

Use of meta heuristics are very important for giving the local search a guidance to escape from the local optima and instead of it to explore the search space effectively. One of the algorithm proposed for this type of guidance and optimization making is the HILL-CLIMBING Algorithm. In this algorithm the first step is to pick arbitrary solution and then repeatedly performs the move to a neighbor having more better solution quality.

Multi-Restarts:

Multi-restart of Local Search is a useful method that prevents the search to skip from local optima. Local search is started with different initial solutions to increase the diversified search

Tabu Search:

Tabu search [3] is a meta-heuristic that offers a diverged search in each of its search steps. The goal of tabu search is to prevent the search from locating the same points to search in the search space.

Simulated Annealing:

Simulated Annealing (SA) [4] is a probabilistic meta-heuristic. The idea behind SA is to search for feasible solutions and to converge to an optimal solution. In each search iteration, it selects a random neighbor. If the quality of neighbor's solution is better than the current solution, then SA immediately make the move towards better solution. If the found neighbor's solution is not better that the current solution then SA is allowed to accept a move that too with the degradation of solution quality based on some probability called acceptance criteria.

2.3) MULTI-OBJECTIVE OPTIMIZATION:

In this preference is given to that solution that only improves all the objectives. But there could be a situation where improvement in one of the objective will lead to degradation og other object or objects. For an example reducing the number of links in any network will increase the load on other links as the sum of the link will be distributed among other links in use. So in consideration to get best results the solution should be developed that makes only up gradation not the degradation. There should be the balanced solution. Thus it is important to define concept of Optimality for Multi-Objective Optimization.

2.5.1 Multiple Objective Optimization Methods:

We have gone through 2 methods proposed for approximating the Pareto Front. The output of each of the methods depends up on the type of multiple objective combinational problems that is to be dealt with and also depends upon the efficiency of its techniques. Some of the methods are defined below:

- Stochastic: Important for finding non-dominates set that approaches the Pareto Front for the problems with an exponential solution space. This method is incomplete.
- Genetic Algorithm: Is a Population based method. It starts with initial population and repeatedly performs the selection and reproduction to obtain a better population. This method is also incomplete
- Linear programming: This is complete method but is limited with linearized problem and computationally difficult for large problems.
- Preemptive Optimization [5], [6]: This ranks the objectives by preference and optimizes them following this order. A good design is required to combine the algorithms for each single objective.

Work already done in this approach:

Many TE techniques have been proposed for IP, MPLS and optical networks in the last decade [7]. In Internet Protocol based networks, TE is usually performed by tuning the OSPF link weights. In MPLS networks, TE techniques use constrained MPLS Labeled Switched Paths to redirect traffic flows around congested links In optical networks, TE techniques allocate traffic flows to wavelengths. Various TE techniques proposed but to the best of our knowledge, there is no previous work dealing with the optimization on the link cost configurations for Ethernet networks using 802.1d STP. We evaluate our work by measuring the improvement of the solution quality in each test compared to the solution given by the STP standard. We also compare our solutions with the ones obtained with the IGP Weight Optimization (IGPWO). The goal of this comparison is to see whether there is a large distance between our solutions and the ones of IGPWO where the routing is offering of Equal Costs Multi Paths with the participation of all links in the network.

Proposed Methodology

Our work gets extended from paper [9] for data generation techniques we use B tree which runs on cloudsim 3.0.3 as a simulator and to run the code we need Eclipse neon. After executing it in Eclipse Neon using CloudSim we get the following results and for the analysis of our results we use Excel as our software tool.For the aforesaid , we use different IP's and geographical distance to route the packet from different locations, this distance shows results in microseconds (both for B Tree and Ethernet network)[9]

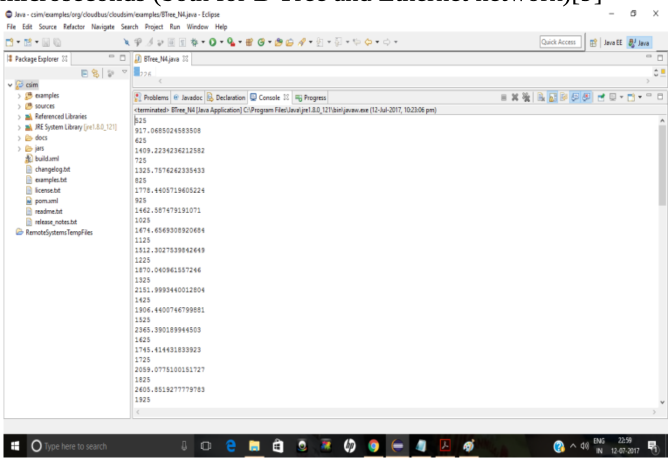

Fig 1: Time in microseconds Via Ethernet network

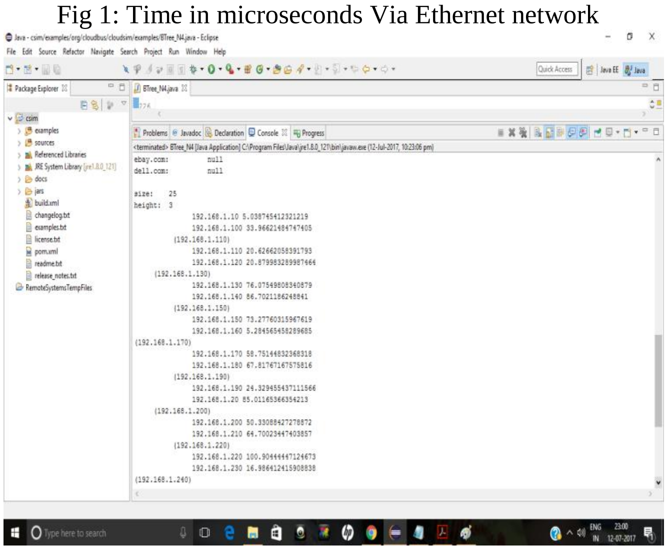

Fig 2Time in microseconds via b tree

Table I table of different IP address with geographical distances

S. No.	IP Address	Geographical distance	Time in microseconds via B-Tree	Time in microseconds via Ethernet Network
1	192.168.1.10	525	5.038	917.068
2	192.168.1.20	625	85.011	1409.223
3	192.168.1.30	725	54.488	1325.757
4	192.168.1.40	825	40.650	1778.440
5	192.168.1.50	925	19.978	1462.587
6	192.168.1.60	1025	60.940	1674.656
7	192.168.1.70	1125	87.657	1512.302
8	192.168.1.80	1225	21.788	1870.040
9	192.168.1.90	1325	23.856	2151.999
10	192.168.1.100	1425	33.966	1906.440
11	192.168.1.110	1525	20.626	2365.390
12	192.168.1.120	1625	20.879	1745.414
13	192.168.1.130	1725	76.075	2059.077
14	192.168.1.140	1825	86.702	2605.851
15	192.168.1.150	1925	73.277	2589.138
16	192.168.1.160	2025	5.284	2853.818
17	192.168.1.170	2125	58.751	2295.591
18	192.168.1.180	2225	67.817	2376.682
19	192.168.1.190	2325	24.329	2537.806
20	192.168.1.200	2425	50.330	3347.179
21	192.168.1.210	2525	64.700	3525.706
22	192.168.1.220	2625	100.904	2662.977
23	192.168.1.230	2725	16.986	3449.580
24	192.168.1.240	2825	100.855	3633.418
25	192.168.1.250	2925	88.427	3025.614

III. CONCLUSION & ANALYSIS

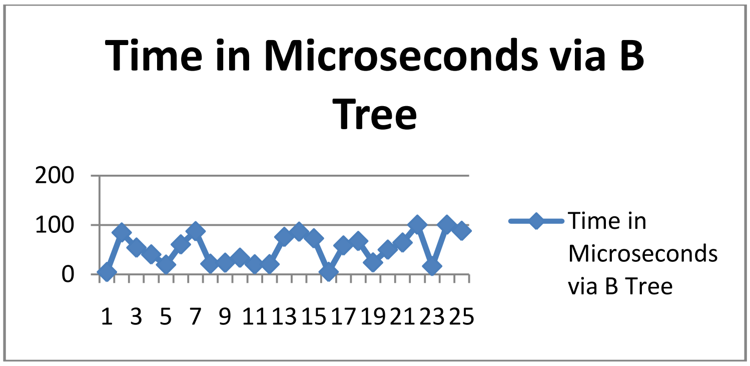

Fig 3. Time in Microseconds via B tree

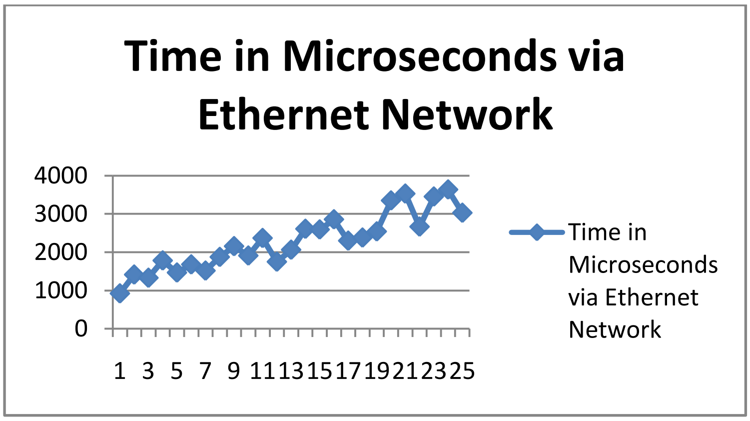

Fig 4 Time in Microseconds via Ethernet network

In this paper the total time taken by B tree is 1289.32 microseconds, but with Ethernet network it is 57081.76 microseconds which tells that our aforesaid used approach of B Tree is 97.7% better than that of Ethernet network.

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