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   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

   FINDINGS

   RECOMMENDATIONS/SUGGESTIONS

   CONCLUSIONS

   SCOPE FOR FURTHER RESEARCH

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   REFERENCES

   APPENDIX/ANNEXURE

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

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- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

CORE BASED COMMUNICATION IN MULTICASTING

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ABSTRACT

Multicast is the ability of a communication network to deliver multiple copies of message to group of receiver in distributed. With the proliferation of internet, multicast is widely applied in all kinds of multimedia real-time application, teleconferencing, distributed parallel processing, video conferencing, distance education etc. It is demanding more and more quality of service in broadband group communication to support huge access of internet service and multimedia application. It is also a challenge and hard problem for the next generation Internet and high performance networks. The core based solution is able to full fill this demand a lot. In this paper effort has been put to make it more flexible in comparison to SPAN/COST through a new approach for solving the constrained of a singular multi-core solution. It facilitate of taking the as many number of edge cost in random which is an alternate solution for SPAN/ADJUST.

KEYWORDS
Multicasting, QoS , Core selection , asymmetric.

1. INTRODUCTION

Data communication for internet uses TCP/IP and UDP protocol for reliability and scalability. It uses so many methods like unicast, multicast, any cast and broadcast for audio-video broadcasting, video conferencing, multimedia communication, computer-supported cooperative work, distributed interactive simulation, distributed operating system, software upgrading, resource location,shared workspaces, virtual collaboration application. The importance of multicast communication in computer network is demonstrated by the development and widespread use of the IP multicast by the inclusion of multicast service in standards for the ATM, MPLS networks [11]. A multipoint connection is known as a virtual topology that supports the delivery of multicast data among multiple computers. The topology of a multipoint connection is usually a tree, whose edges represent communication links. The information of routing table entries, are uses to forward the traffic destined for group along branches of the tree. A multicast protocol defines how the multipoint connection is established and maintained. The main objective of multicast tree is to optimize the delay and cost. Multicast routing with delay constraint is a research difficulty in routing problem. The difference between multicasting and uni casting is well understood by host group model which is a common identifying multicast address, all receiving data by sources that may or may not be the member of the same group. A number of multicast protocols have been proposed for use in the internet include the DVMRP, MOSPF, CBT and PIM. It refers to simultaneous delivery of data from multiple sources to multiple receivers of different groups. Group communication create multiple paths from a tree structure. In the beginning the source is considered as a root of the multicast tree. A multicast tree is incrementally constructed as members leave and join a multicast group[13,14]. When an existing member leaves the group, it sends a control message up the tree to prune the branch which has no members attached. The multicasting is used when a lot of information is transmitted to a subset of hosts. Later on a core based tree was introduced in which an intermediate node communicate to remaining down-stream nodes where the core node may also be a source node. The core based multicast tree construct the shortest path between the core and remaining nodes. A minimum average path delay tree can be constructed in $O(n^2)$ time using Dijkstra's shortest path algorithm[15]. The ultimate least cost tree is known to be NP complete. The core based protocols are most suitable for group communication and flexible for large network. Regardless of the number of senders participating in a multicast group only one multicast tree rooted at a single core (Router) is used. Routing with a single core may not satisfy QoS requirements of many distributed group members [12, 13]. In section 2, we outline the literature review. In section 3, we outline about multicast communication. In section 4 we introduce SPAN/COST [6] algorithm and cost estimation. In section 5, we evaluate performance of simulation result. We conclude the paper in section 6.

2. RELATED WORK

Many multicast routing protocols algorithm have been developing such as CBT (Core-Based Tree)[19], PIM(Protocol Independent Multicast)[20] , MOSPF (Multicast Open Shortest Path First)[21], DVMRP (Distance Vector Multicast Routing Protocol) [22] and others [23, 24]. In routing for group communication usually sender transmits a stream of data to a set of receivers. Storing of destination address was making more and more congested and overloaded in the source node. An alternative node has chosen to treat as core node to share the same overload partially to make the group communication more flexible. That make a core rooted trees for the delivery of their stream. It signify "core" as an intermediate node between sources and receivers including sore node in some cases. The core based models, CBT [1] and PIM [5] uses only single core for their purpose. The motivation behind core based tree is to make scalability and to reduce overhead. A source willing to deliver its stream of data to the core from whereon, its transmits packet to multiple receivers. Core-based routing provides a scalable multicast delivery to multi-sender multicast applications since only one multicast data delivery tree rooted at a single core is constructed per group regardless of the number of senders. Data destined to the multicast group routed towards the single core. The core, then distributes the data to all the group members via the multicast tree. Existing core-based routing with QoS support has two major drawbacks. First, it may be difficult for users who are group members to specify exact values of the desired service quality as in the existing work. Second, routing with a single core may not satisfy Qos requirement of many distributed group members. Single core based routing may not satisfy QoS requirements for many distributed group members [12]. The ubiquitous use of internet leads to use of multiple cores in a network. The first multi core tree is OCBT [2]. Multi-core tree extend the single-core approach to trees of higher access point or cores to non-group nodes, while maintaining the advantages of single-core trees. Usually multi-cores have better fault tolerance in case of a core failure compared to single-core trees. The core is the single point of failure in a single-core based tree. A back-up core list is maintained within the bootstrap mechanism in both [9,17] CBT and PIM. Since different senders are likely to multicast through different cores, it is less chances that the entire traffic will be concentrated around one particular core in the multi-core approach. In multi-core architect ures, the traffic concentration decreases as the number of cores increases as cores are randomly distributed around the domain [16,18]. All multi-core trees operate similarly to CBT in protocol specifics other than their tree structures. The CBT, PIM, OCBT tried to implement core selection procedure to improve the quality of service. The other core based trees are Greedy, NAÏVE, DDVCA, QCSA, SPAN [6, 7] contributed a lot [fig. 8]. Zappala, Fabbri and Lo's results[16] shows that multi-core trees with effective sub-optimal core placement mechanisms result in less delay than single-core based trees with optimum placement of the unique core, since the multi-core case allows trees which are likely to be distributed adequately to be more closer to group of sender(s) than a single core. Similarly, multi-core trees gives less total cost of delivering the multicast stream in terms of bandwidth utilization than a single core tree since a new node to join the tree is likely to locate a core among the alternatives, which is potentially closer to it than the only core alternative which is the tree root in the single-core based tree.

3. MULTICAST COMMUNICATIONS

The data communication in multicast group handled the intermediate nodes in routing from sender(s) to receiver(s).The demand of different types of applications using multicast encourage for the development of various improved algorithms and protocols in group communication. It takes care to minimize the network load to optimal value and avoid loops with traffic. Multicast communication support reliable transmission. The routing algorithm tries to select optimal routes and the cost function of available resources, bandwidth, number of links, end-to- end delay. The host sends data to a multicast group using local network multicast capability. Multicast router use IGMP (Internet Group Management Protocol) to collect information for the multicast group. Multicasting facilitates efficient transmission and increases performance in distributed application. The optimal multicast path is select from a group of trees in a domain in account of low delay, low cost and light traffic concentration. The bandwidth used by multicast tree is is distributed to various receivers. The overall efficiency of a particular tree is determined by height, breadth and number of receivers present in a tree. The multicast group members are chosen uniformly out of total number of nodes. The protocols collect and maintain state information that can be used by the routing algorithms for selecting best path to the receivers and to select the most appropriate path among the various paths available using a path selection procedure.

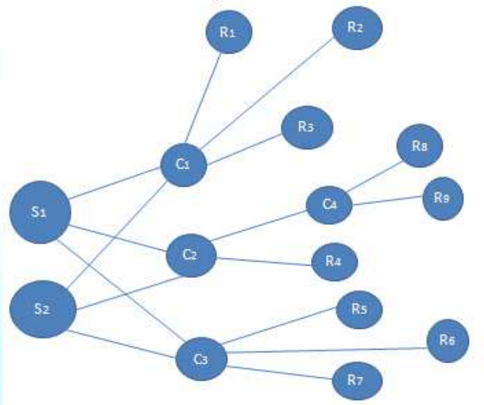
4. SPAN FRAMEWORK

SPAN [6, 8] is a prominent core selection algorithm which is distributed and asymmetric frame work operates both in singular and non singular solution space. SPAN supports multiple metrics and first distributed QoS model to provide constrained core-based solutions in asymmetric network. It incorporate the core selection and tree construction components into a routing framework in which each component can be further elaborated separately achieving QoS-efficiency of the solutions [fig.7] . SPAN initially identifies some intermediate nodes having multiple paths between source and receiver and considered as candidate cores. The ultimate cores can be selected based on the optimized cost of the network basing on that core and multipoint path.

Singular Multi-Core: Each core serves all sources in the group and uniquely defines a shared tree[8].

Non-singular Multi-core: It is not compulsory for a core to serve all sources and each receiver can be dominated by multiple cores varying across sources in the group.

FIG. 1: MULTIPOINT COMMUNICATION PROBLEM



Suppose a receiver *r* is dependent by a core *c* serving a particular source *s* within the delay bound between *s* to *r* through *c,* then we can say that core *c* serves r_s.

In notation we can write *T(c,s)* be core tree rooted at core *c* for all receivers in *D*(*c*,*s*). Similarly *D*(*c*,*S'*) can be use for different source set where $S' \subseteq S$ for all receivers in group and *T*(*c*,*s*) "totally" serves *s*. Let's analyze an example from the figure1. *S* is the source set and $S=\{s_1,s_2\}$. R is the receiver set and $R=\{r_1, r_2, r_3, r_4, r_5, r_6, r_7, r_8, r_9\}$. *C* is the core set and $C=\{c_1,c_2,c_3,c_4\}$. Then we can get dependent sets as $D(c_1,S)=\{r_1,r_2,r_3\}$,$D(c_2,S)=\{r_4,r_8,r_9\}$,$D(c_3,S)=\{r_5,r_6,r_7\}$, $D(c_4,S)=\{r_8,r_9\}$.

4.1 COST ESTIMATION

The cost of a network depends on number of core present in a network[25]. It divides network into number of trees like core to dependent receivers as ***Rtree*** and sources to core as ***Stree***. It uses a metric i.e. domination count. Let there is a delay distance path from node ***i*** to node ***j*** through core ***c*** then cost of the tree, ***Cst*** is sum of average cost of ***Rtree*** , average cost of ***Stree*** and average cost ***Dm***. ***Dm*** is Residual ratio of dominated to un-dominated nodes at the concerned core ***c*** .

Domination Count

For a tree *T*(*c*,*s*) rooted at core c serving the source s for all receivers we can express

Domination Count(*c*,*s*)= $\sum_{s' \in S} | D(c,s) \cap D(c,s') |$

Where *T*(*c*,*s*) serves a source $s' \in$ ***S***.

The Proposed Algorithm:

Input: ***S, R, C*** // No. of Source, Receiver and Core

Output: ***Cu*** //Ultimate core

1. Consider the edges Cost for all receivers in random from & through cores in a particular range.
2. Consider the edges Cost for all sources from each cores if there.
3. $Cu=\Phi$
4. Take the ***D(c,s)*** for all cores.
5. Take the Cost of the Network, ***Cnw*** = ***Cst*** for all the cores.
6. Take the total cost for core C_1=***Cnw***
7. C_2 is increment from C_1
8. if the value of ***Cnw*** for C_1> value of ***Cnw*** for C_2
9. $Cu=C_2$
10. *Else*
11. $Cu=C_1$
12. The value of $C_1=C_2+i=1$

5. SIMULATION ANALYSIS

Simulation has been carried out in MATLAB version 9 in a system having CPU N435 @1.33GHz, 1GB of RAM. It created a difference from what resulted in SPAN/COST algorithm [6]. In the simulation of SPAN/COST algorithm, input of source nodes, receiver nodes, candidates cores and edges cost required to enter which may be too difficult for a network of node sizes more than hundred or thousand. Here a large number of source nodes, receiver nodes and core nodes can take as an input to get optimized cost. The edges cost are taken randomly giving flexible to run the program in few second [10]. The main advantage is that the cost of each edge can be taken randomly by the system. Analysis from different combination of sources, receivers with cores are taken and found the following assumption.

1. If number of source increases w.r t number of receiver and cost of the network increases.
2. The Cost of the network changes w.r.t to no. of cores and inversely to no. of receivers.
3. If the number of sources and cores are constant, raising the number of receiver it decreases the cost of the network.
4. If all source, receiver and core together increases in constant rate the cost of the network decreases in constant rate.

FIG. 2.1

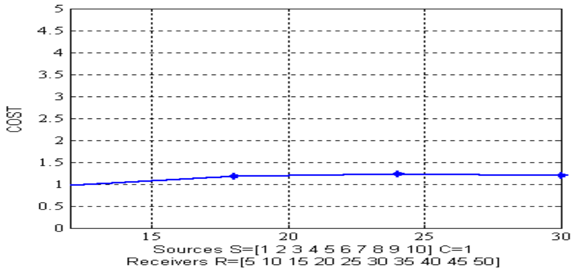
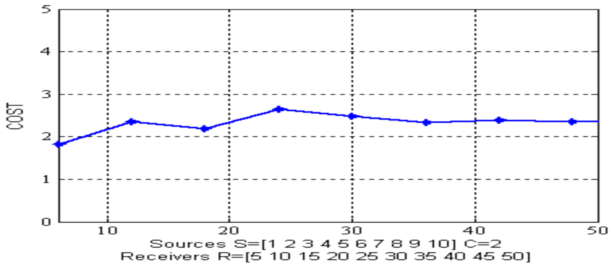


FIG. 2.2



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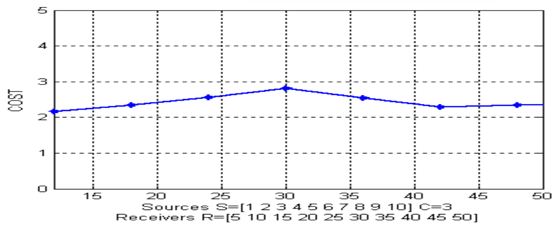

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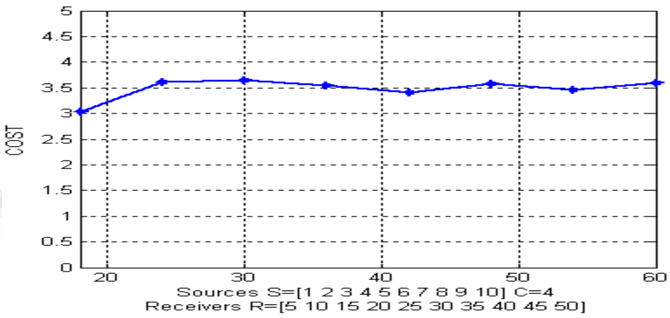

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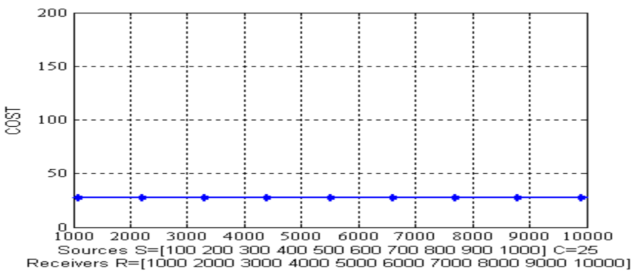

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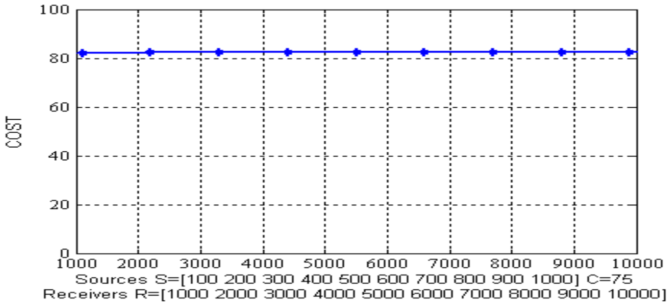

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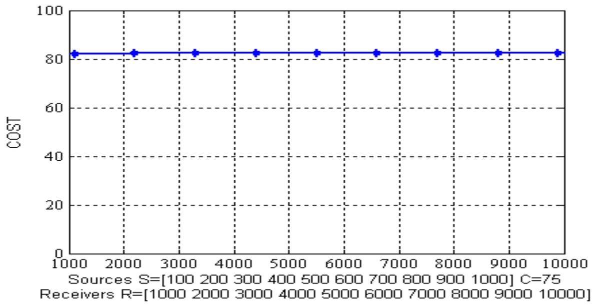


FIG. 2.8

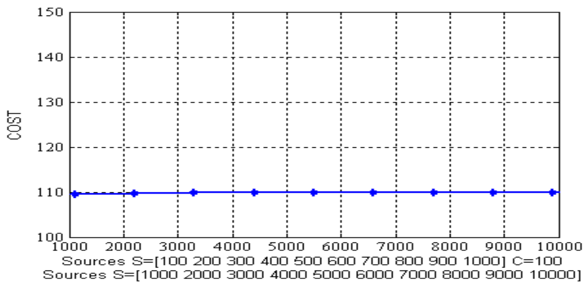
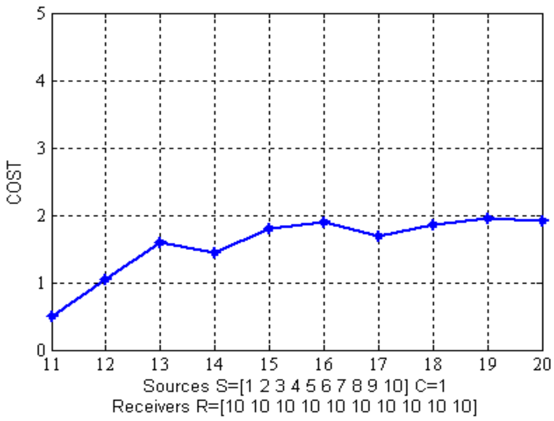


FIG 3.1



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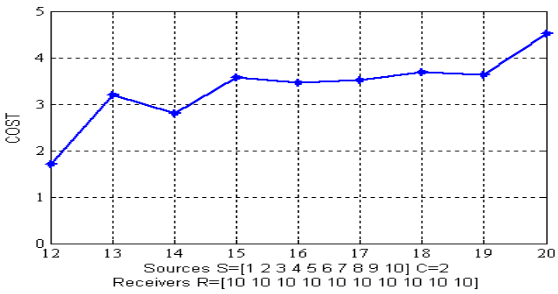

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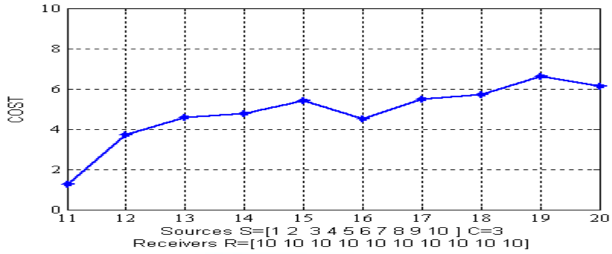


FIG. 3.4

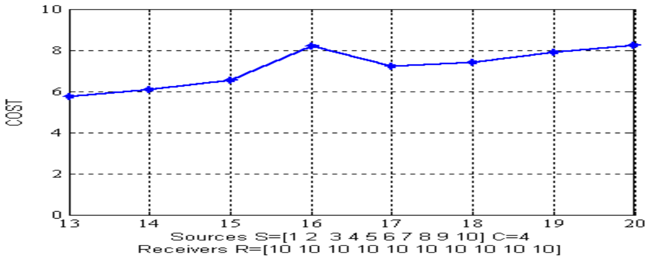


Fig.[3.1, 3.2, 3.3, 3.4] Says Cost of the network increases with respect to increase number of Sources.

FIG. 4.1

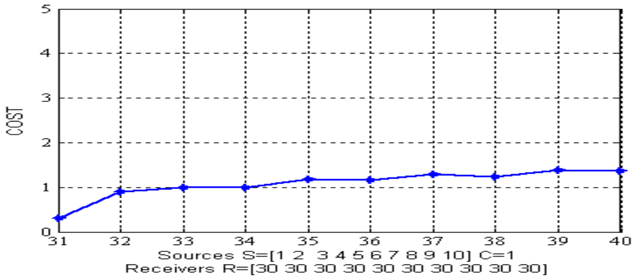
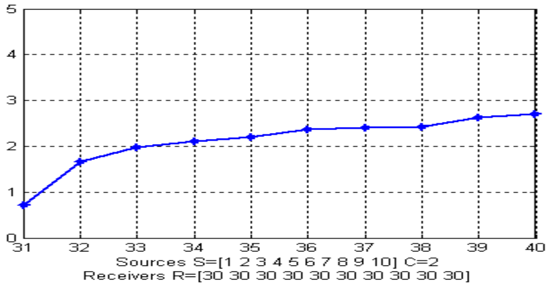


FIG. 4.2



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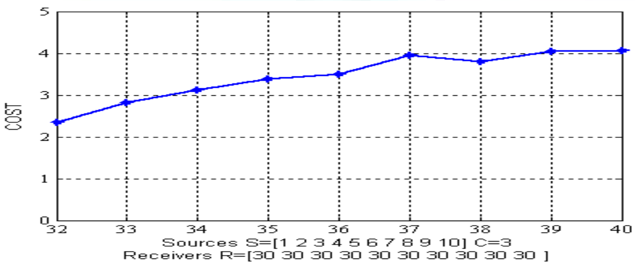

FIG. 4.4

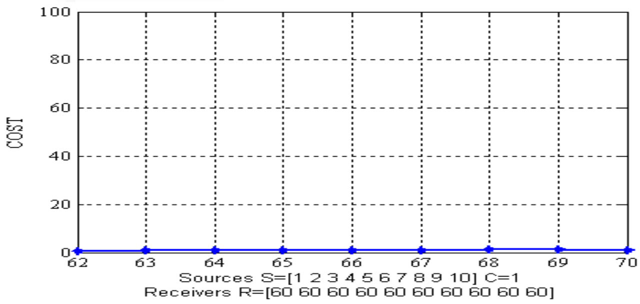

FIG. 4.5

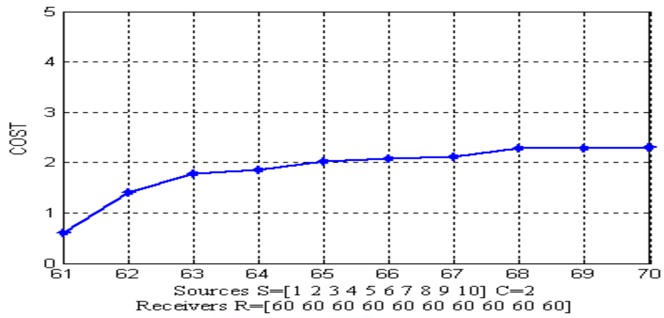

FIG. 4.6

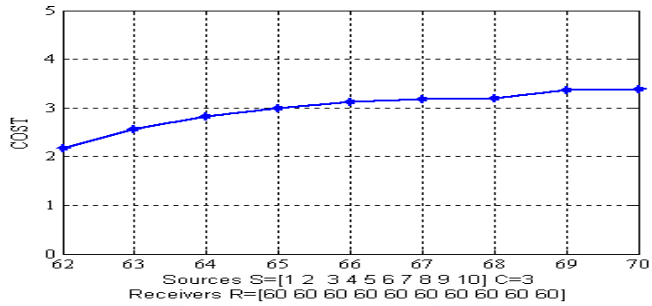

FIG. 4.7

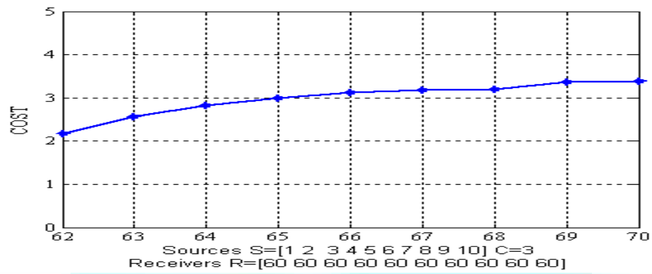

FIG.4.8

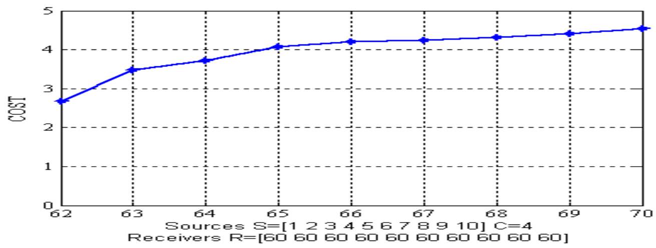

FIG.4.9

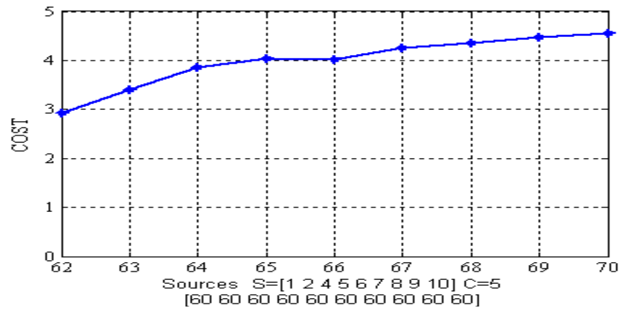

Fig.[4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9] Says , The cost of the Netwrk decreases with decrease in number of receivers.

FIG. 5.1

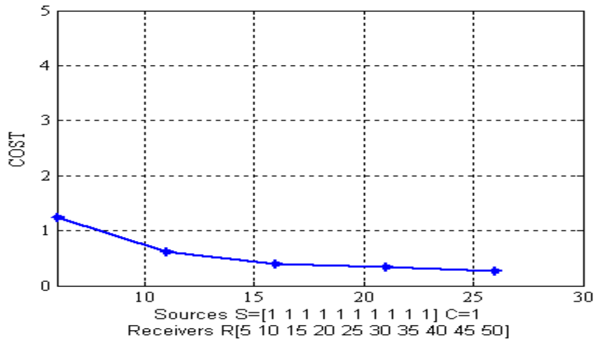

FIG.5.2

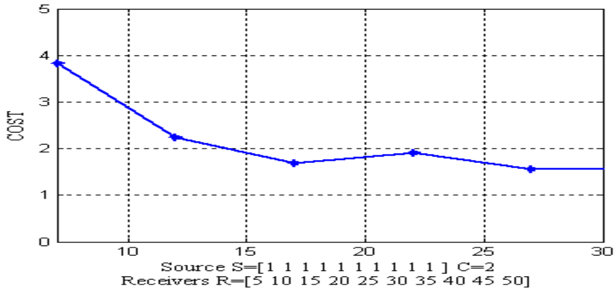

FIG.5.3

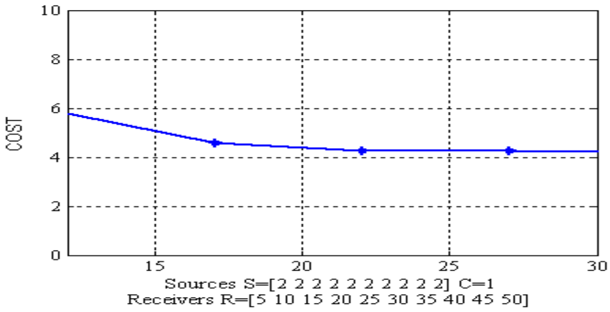

FIG.5.4

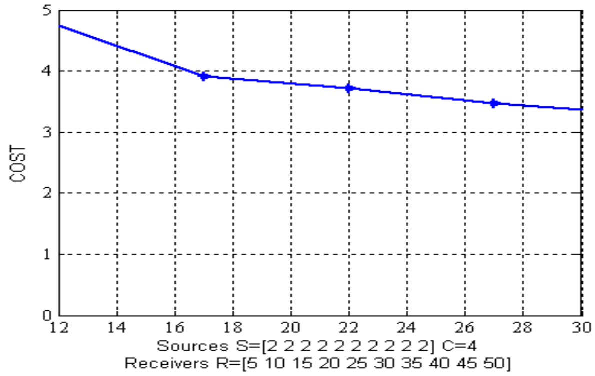

FIG.5.5

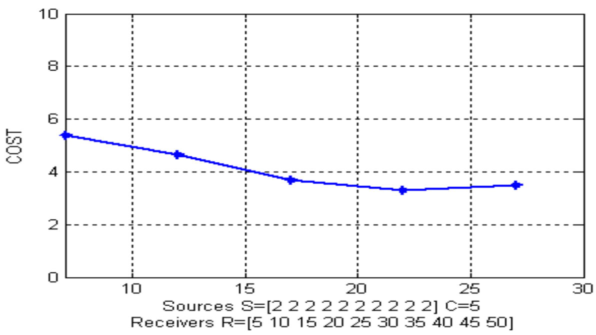

FIG.5.6

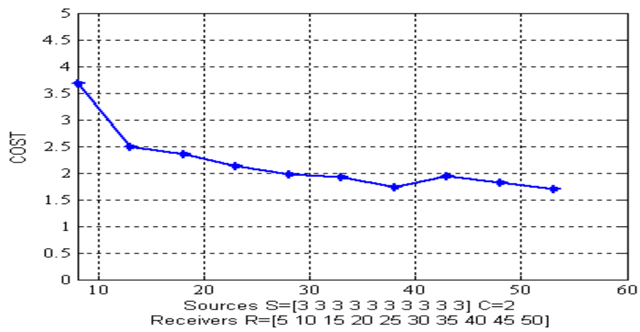

FIG. 5.7

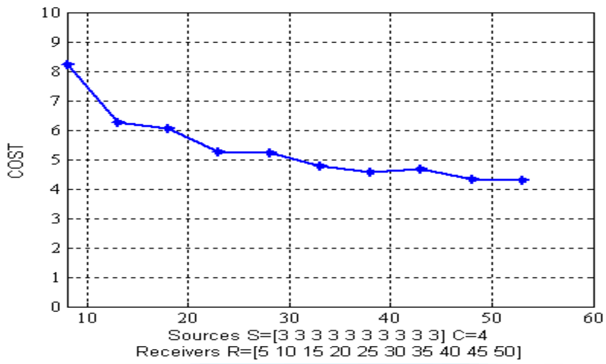

FIG. 5.8

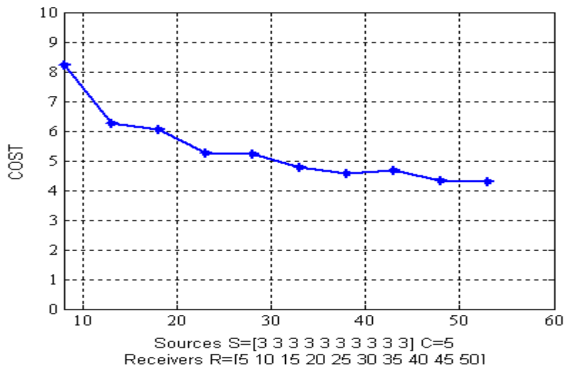

FIG. 5.9

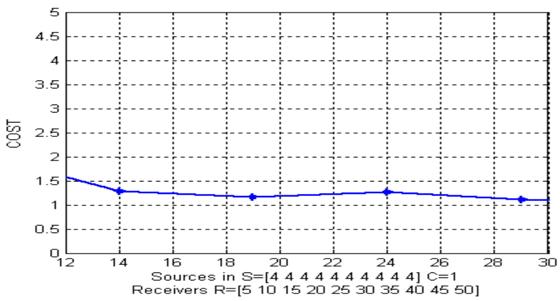

FIG.6.0

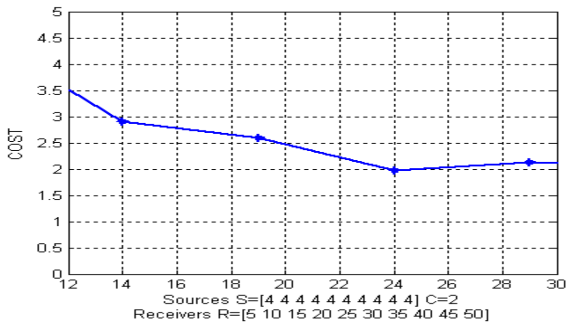

FIG.6.1

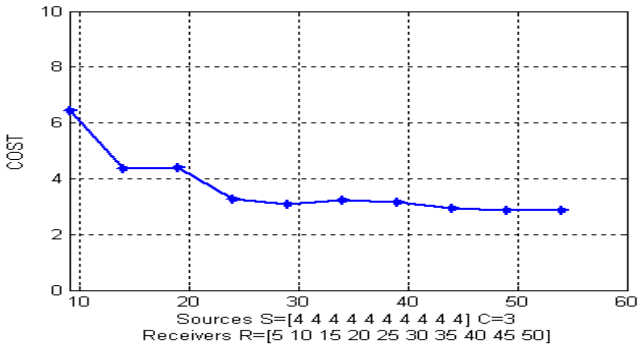

FIG.6.2

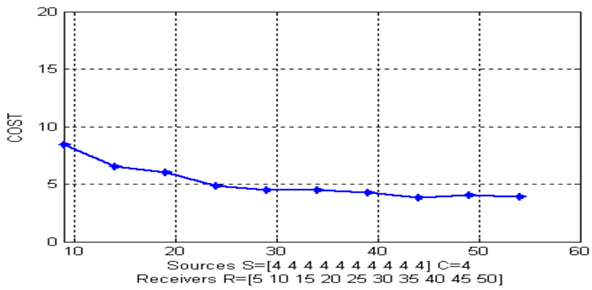

Fig.[5.1, 5.2, 5.3, 5.4, 5.5, 5.6,5.7, 5.8,5.9, 6.0,6.1,6.2]
Says, The increse in number of receivers keeping the sources number constant , decreases the Cost of the Network and increase in Core number increases the Cost of the Network.The Cost of the network varies directly with the rate of increase in receivers

6. CONCLUSION

The design of the multicast routing protocols are mainly applied for distributed domain. The development and maintenance of the multicast tree is mainly dependent on protocol performance. In this paper it has been analyzed and examined core selection to manage the multicast path for its placement in domain and its construction in multi-core environment. It is also concluded that ultimate core is not limited to number of source but instead load of the network. It can calculate the cost of a network having nodes even more than thousand and more which is difficult in existing SPAN/COST algorithm. This technique can be improved through increasing the labels of cores within source to receiver satisfying delay bound.

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