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DEPLOYMENT OF OVERLAY NODES IN SELFISH OVERLAY NETWORK USING FUZZY LOGIC

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ABSTRACT

Selfish overlay routing is the technique whereby the sender of the packet can specify the route that the packet should take through the network. Selfish overlay routing allow end users to greedily select routes to optimize their own performance without considering the system wide criteria which in turn cause performance degradation .In selfish overlay network the overlay nodes play an active role to route the packets to the corresponding destination in the case of a link failure. So far the overlay nodes are deployed randomly in the network and it is proved that the overlay nodes are happened to be deployed even in the place where there is no link failure. One of the disadvantage is since more number of overlay nodes are deployed the memory consumption of the network is higher. To overcome all such demerits in this paper overlay nodes are deployed dynamically in selfish overlay network using fuzzy logic. The main advantage in this approach is overlay nodes are deployed only where and when they are required reducing the unnecessary deployment of overlay nodes in the network.

Keywords: Selfish overlay network, Link failure, Fuzzy logic, Overlay Nodes.

1. INTRODUCTION

In selfish overlay routing end hosts are allowed to choose the route of the packets among themselves. Since the selfish overlay routing never bother about the global criteria the performance of the network becomes worser. Earlier studies proved that by reaching nash equilibrium in selfish overlay network latency and loss rate was decreased , link utilization and throughput was increased, giving an optimized output. so effective techniques were used to reduce the latency even more and link utilization. In all the above studies overlay nodes are placed randomly in the network. This may cause

deployment of overlay nodes even in the place where there is no link failure and it occupies more memory since large number of overlay nodes are deployed. In this paper overlay nodes are deployed based on fuzzy logic and the merit of applying fuzzy logic is ,the overlay nodes are deployed only where there is link failure. The linguistic variables considered here are distance and link capacity.

This paper is organized as follows. Section 2 reviews the deployment of overlay nodes in network. Section 3 gives an overview of the fuzzy logic used to deploy the overlay nodes. Section 4 deals with the fuzzy rule base. Section 5 deals with Results and Discussion and Section 6 conclude the work.

2. REVIEW OF DEPLOYMENT OF OVERLAY OF NODES IN NETWORK

Recent studies involve many placement problem algorithms. Sabyasachi et al investigated novel approaches to perform intelligent placement of overlay nodes to facilitate resilient routing and TCP performance improvement. They developed overly placement problems such as SOSR and SLOT Overlay Placement Problems and they observed that a hybrid approach combining a greedy and a random approach gives a good tradeoff between performance and computational complexity. Jianliang et al addressed the problem of replication proxy placement in network and data replica placement on the installed proxies. Zheng he et al achieved intelligent placement of overlay nodes in th network to facilitate transmission control protocol performance improvement. Based on recursive pruning of the least connected vertices they used k-core decomposition to find the coreness of node. After calculating the node coreness they developed a heuristic algorithm for the effective placement of overlay nodes. srinivasan et al studied the overlay node placement problem based on the overlay link resiliency. They proposed a new algorithm called RouteSeer to solve the overlay node placement problem. Routeser placed some overlay nodes called client proxies “close” to the clients of the overlay service and the intermediate overlay nodes by only examining the routing tables at the client proxies and does not require global topology information. Their results showed that Route Seer can improve the performance of the network by 50-100%.

From the literature survey it is understood that the deployment of overlay nodes in the selfish overlay network may cause drastic improvements in the performance.

3. OVERVIEW OF FUZZY LOGIC USED TO DEPLOY THE OVERLAY NODES

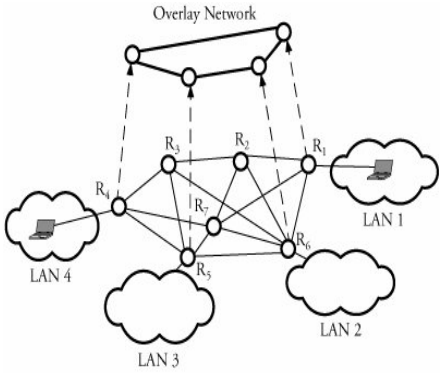

Figure 1: Simple Overlay Network.

Let us consider the overlay network in fig1 .Here four overlay nodes are randomly placed respectively for the LAN.R1,..R6 are the nodes through which the packet travels. R1 is the source and the R4 is the destination and if suppose the route of the packet is R1->R7->R6->R5->R4.and if a link failure is happened to occur between R7->R6 then overlay nodes are to deployed dynamically to route the same packet. For such dynamical deployment of overlay nodes in selfish overlay network fuzzy logic is used. The linguistic variables are distance and link capacity and the linguistic values for the variables are low, medium and high..For the above example since the link failure occurs between R7->R6 ,the distance between the place from where the link failure(from the predecessor node of the failed link) occurred and the destination node is calculated in terms of number of hops.

If the distance from the place of the link failure to the destination node is high/low/medium then the overlay nodes are placed respectively. So longer the distance higher will be the deployment of overlay nodes. The second linguistic variable is link capacity which is defined as the total amount of traffic that the link can carry. If the capacity of the link is too small then there is a chance of link congestion or link failure. hence large number of overlay nodes are to be deployed. So lower the link capacity larger the deployment of overlay nodes. The range of values fo the linguistic variable distance is given in Table 1

Table 1: Overlapping values for the linguistic variable “distance”.

Distance(D)	State
1 to 20	L
15 to 40	M
35 to 49	H

These values are considered in terms of “ number of hops” between the place where the link failure occurred and the destination node in selfish overlay network.

L – Low, M – Medium, H – High

Table 2: Overlapping values for the linguistic variable “Link Capacity”

Link Capacity(LC)	State
10 to 30	L
25 to 55	M
50 to 70	H

Table 3: Number of overlay nodes to be deployed

No of Overlay Nodes(o)	State
1 to 5	L
4 to 8	M
6 to 12	H

4. FUZZY RULE BASE

if D is L and LC is L Then o is H
if D is L and LC is M Then o is M
if D is L and LC is H Then o is L
if D is M and LC is L Then o is H
if D is M and LC is M Then o is M
if D is M and LC is H Then o is M
if D is H and LC is L Then o is H
if D is H and LC is M Then o is H
if D is H and LC is H Then o is H

Table 4: Chart depicting the rule base

D	LC	No. of overlay nodes(o)
L	L	H
L	M	M
L	H	L
M	L	H
M	M	M
M	H	M
H	L	H
H	M	H
H	H	H

5. RESULTS AND DISCUSSION

The above fuzzy rules are framed taking distance and link capacity as linguistic variable and different combinations of states for both the variables are found out. In Fig 2 it was found that if distance is low and link capacity is also low then high number of overlay nodes are to be deployed. By varying the input in rule viewer corresponding output is calculated.

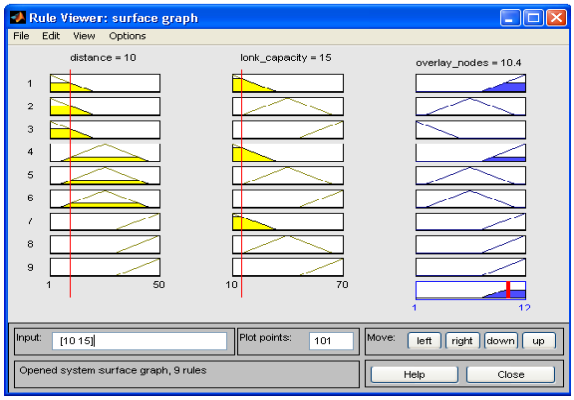

Figure 2: Rule viewer for low distance and low link capacity

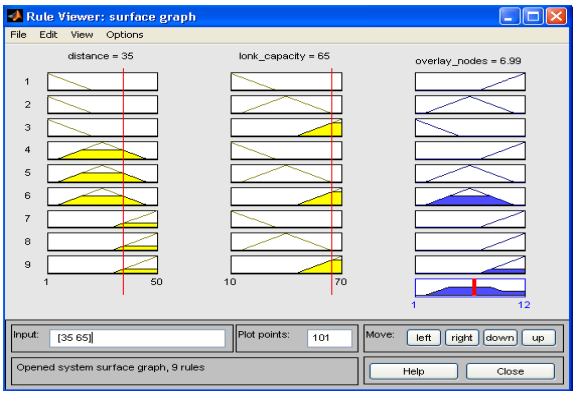

Figure 3: Rule viewer for Medium distance and high link capacity. Results show that Minimum overlay nodes are to be deployed in the above case.

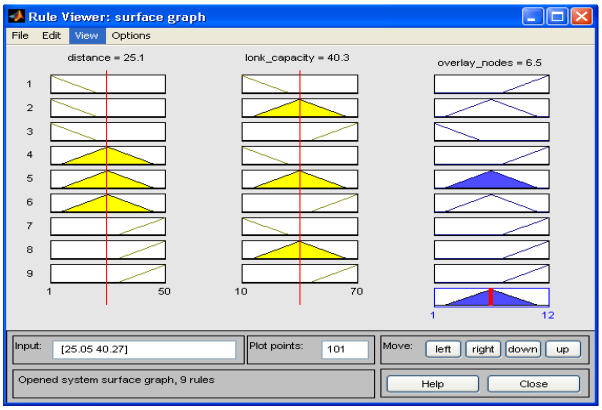

Figure 4: Rule viewer for medium distance and medium link capacity**.**

From the rule viewer it is clear that minimum no of overlay nodes are to be deployed in the above case.

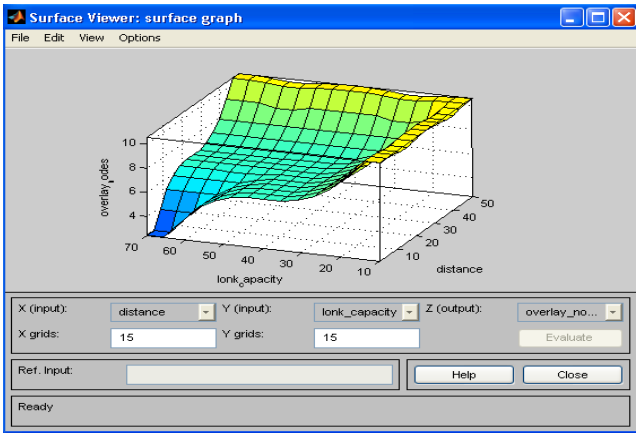

Figure 5: Surface Viewer

This gives a 3D view of distance, link capacity as input and no of overlay nodes as output.

6. CONCLUSION AND FUTURE WORK

So far Overlay nodes are deployed randomly in selfish overlay network and the performance is analysed .Simulation results showed that the performance was increased using effective approaches. But randomly placed overlay nodes may even be in place where they are not required. In this paper fuzzy logic is used and fuzzy rules were framed to deploy the overlay nodes dynamically in network. Distance and link capacity are the two linguistic variables and based on the same variables the number of overlay nodes to be deployed dynamically were found out. Network parameters can be analysed and a comparitive study of both the random deployment of overlay nodes and fuzzy logic based deployment of overlay nodes can be done in future.

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