COMPARISON OF NORMAL SELFISH OVERLAY NETWORK AND SELFISH OVERLAY NETWORK WITH DEPLOYMENT OF OVERLAY NODES USING FUZZY LOGIC

S.Prayla Shyry*
suja200165@yahoo.com
Department of cse ,Sathyabama University
Jeppiaar Nagar,Old Mahabalipuram Road
Chennai-600119
India

V.Ramachandran*
Professor
Department of Information science & Technology,
Anna University, Chennai, India

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 select routes in an egocentic fashion to optimize their own performance without considering the system wide criteria which in turn cause performance degradation .The main concept behind the selfish overlay network is whenever there is a link failure the overlay nodes in the network will route the packet to their concerned destination.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.The demerit of such deployment of overlay nodes is memory consumption in the Selfish Overlay Network.To overcome such demerits overlay nodes are deployed dynamicaly in selfish overlay network using fuzzy logic and the result was compared with the normal selfish overlay network without fuzzy logic.Simulation results shows that selfish overlay network with overlay nodes deployed using fuzzy logic gives better result than the selfish overlay network with random deployment of overlay nodes.

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.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 in Selfish Overlay Network(SON) 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 and when there is link failure.

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 Results and Discussion and Section 5conclude the work.

2. Review of deployment of overlay of nodes in network

Recent studies involve many placement problem algorithms.Filip et al presented several algorithms to select the subset of overlay nodes that should be part of the overlay topology and their selection is based on the current and (estimated) future network load and the locality of the clients and servers connected to the overlay network.Their concept is as network load or conditions change, additional nodes can be dynamically (de)activated.They have compared their result with the existing overlay topology construction protocols[1].Several recent studies stems from the fact that overlay paths might overlap with each other when overlay nodes are selected without considering the underlying topology.Junghee et al developed measurement based heuristics for placement of overlay nodes inside an ISP.They showed that the proposed clustering based deployment reduced the number of overlay nodes required but kept a high level of availability and performance[2].

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 obsrved that a hybrid approach combining a greedy and a random approach gives a good tradeoff between performance and computational complexity[3].Jianliang et al addressed the problem of replication proxy placement in network and data replica placement on the installed proxies[4].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 calculaing 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 RouteSeer can improve the performance of the network by 50-100%[5].

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

3. Fuzzy logic used to deploy the overlay nodes

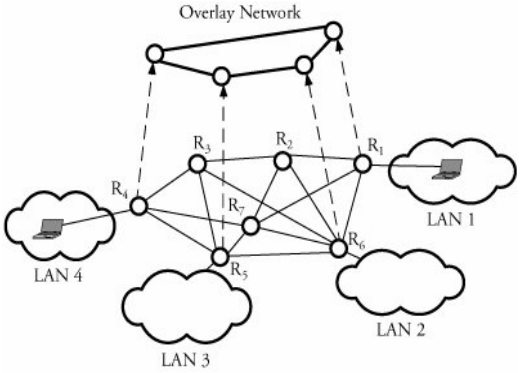

Figure 1:Simple Overlay Network.

Let us consider the overlay network in figure 1 .Here four overlay nodes are placed randomly respectively for the LAN1,LAN2,LAN3,LAN4 respectively.The packet travels through the nodes R1,..R6.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 dynmically to route the same packet.Fo such dynamical deployment of overlay nodes fuzzy logic is used in selfsh overlay network .The linguistic variables are distance and link capacity and the triangular membership values for the variables are low,medium and high.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

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

Table 1:Rule base

D-Distance,LC-Link Capacity,L-Low,H-High,M-Medium,O-Overlay nodes.

4.Results and Discussion

An Overlay Network is created with 100 nodes and selfish routing is applied in the Overlay Network.The overlay nodes are deployed in the network using fuzzy logic and the result was compared with the selfish overlay network with random deployment of overlay nodes.Simulation results shows that the selfish overlay network with deployment of overlay nodes using fuzzy logic gives better result than the normal selfish Overlay network.The results were calculated for short distance and the long distance.As the outgoing data rate increases more bandwith is required for both short and long distance and delay is low for selfish overlay network with fuzzy logic deployment of overlay nodes compared to normal selfish overlay network for long distance than short distance.As the outgoing data rate increases the loss rate of the packets is decreased for selfish overlay network with fuzzy logic deployment of overlay nodes when compared to normal overlay network.More bandwidth is required for the selfish overlay network as the transmission time of the packet increases.As the time increases the delay of the selfish overlay network is decreased for short distance and long distance and the loss rate of the packets is decreased for the selfish overlay network with deployment of overlay nodes using

fuzzy logic compared to normal selfish overlay network.

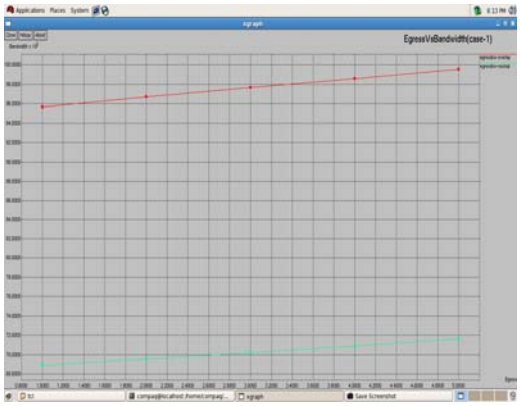

Figure 2:Egress Vs Bandwidth(Short Distance)

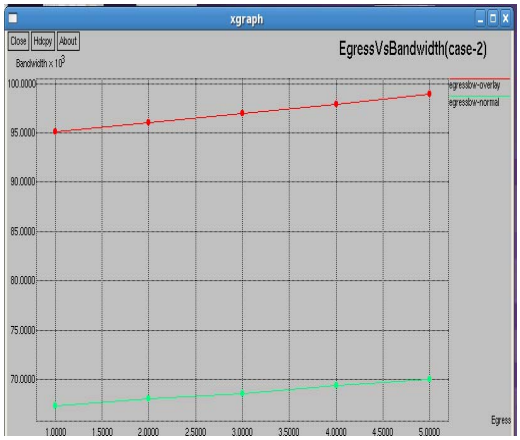

Figure3:Egress Vs Bandwidth(Long Distance)

Figure 4:Egress Vs Delay(Short distance)

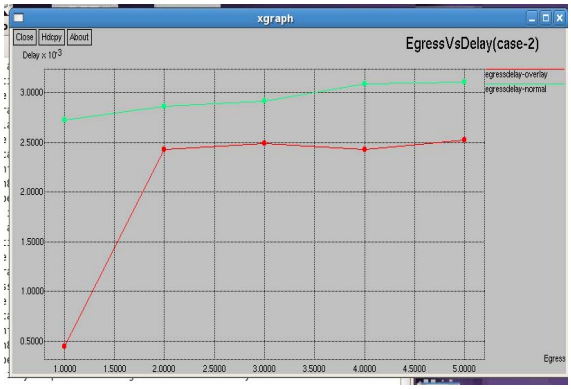

Figure 5:Egress Vs Delay(Long Distance)

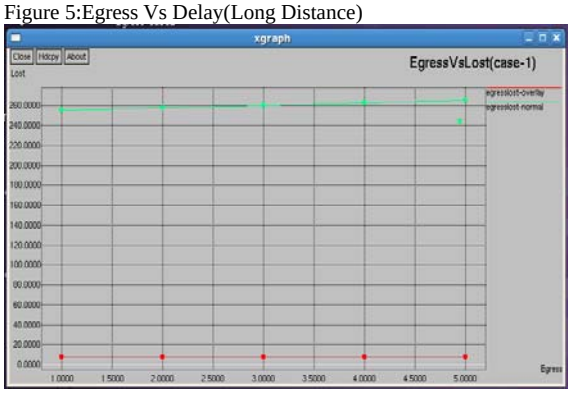

Figure 6:Egress Vs Lost(Short Distance)

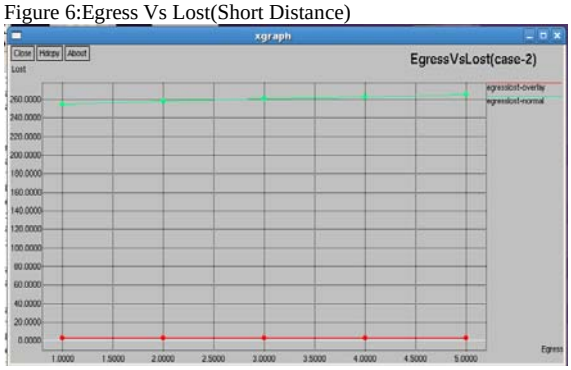

Figure 7:Egress Vs lost(Long Distance)

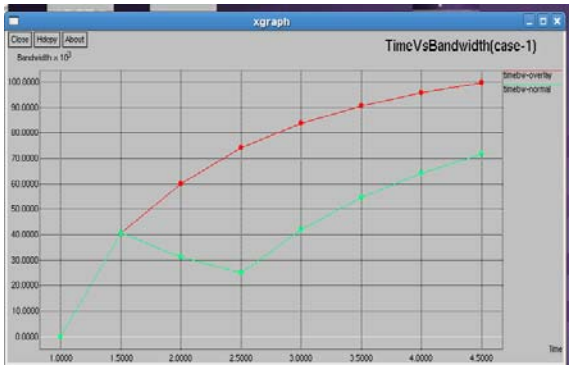

Figure 8:Time Vs Bandwidth(Short Distance)

Figure 9:Time Vs Bandwidth(Long Distance)

Figure 10:Time Vs Delay(Short Distance)

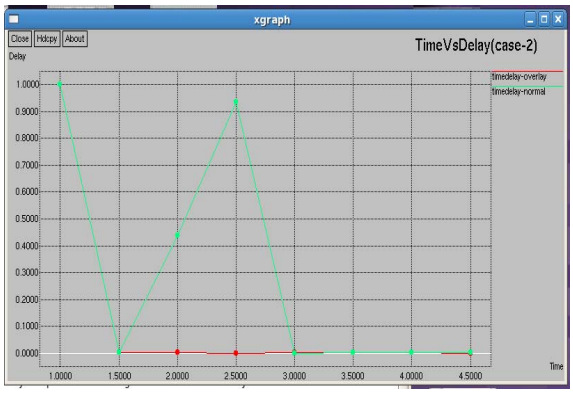

Figure 11:Time Vs Delay(Long Distance)

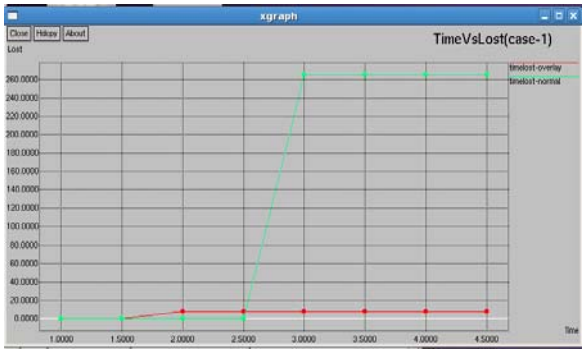

Figure12:Time Vs Lost(Short Distance)

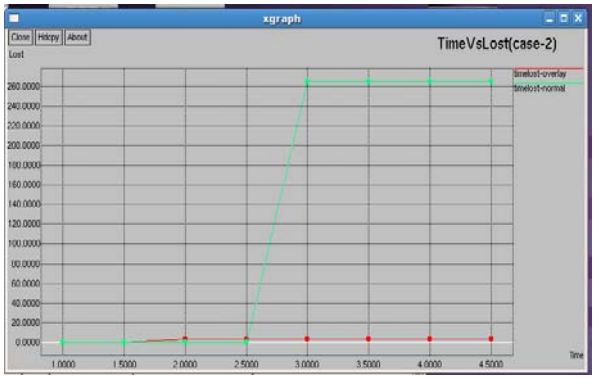

Figure 13:Time Vs Lost(Long Distance)

5.Conclusion and future work

So far Overlay nodes are deployed randomly in selfsh 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 fuzy rules were framed to deploy the overlay nodes dynamicaly in network and the results were compared with the selfish overlay network with random deployment of overlay nodes.Simulation results shows that the selfish overlay network with fuzzy logic based deployment of overlay nodes yeilds better result compared to normal selfish overlay network(selfish Network with random deployment of overlay nodes).The work can be extended by deploying the overlay nodes in selfish overlay network using Neural Network.

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