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Enhancement of BF, DYMO and ZRP Protocols Using New Cost Functions

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ABSTRACT- One of the biggest issues in routing is to providing satisfactory performance while scaling the wireless mesh network. It is interesting, however to investigate what happens when routing nodes are expanded in different propagation environment and how that affects routing metrics. In this thesis, we examine the usage of different proactive, reactive and hybrid protocols in such a way so that we may be able to built a cost function which helps in selecting the finest grouping of routing protocols for a particular urban wireless mesh network.

KEYWORDS- Wireless Mesh Network (WMN), Quality of Service, Proactive, Reactive and Hybrid protocols.

I. INTRODUCTION

We evaluate the performance of wireless mesh networks using different node densities. Routing parameters values are obtained using simulation with diverse outdoor propagation models. To optimize the performance of WMNs, we propose a non-linear cost function equation based on priority indexing of throughput and delay. This equation helps in selecting the finest combination of proactive, reactive and hybrid protocols to achieve the adequate performance of the network in dissimilar situations. A new cost function which is based on geographical data and takes into account interactions between nodes and the influence of different propagation models. The goals of wireless mesh networks are to provide satisfactory quality of service (QOS). However, it is difficult to determine how the appropriate mesh parameters should be selected to support QOS requirements. To address and resolve the problem, we propose a novel cost function named as mesh cost function (MCF) based on mesh routing parameters like average throughput and average end to end delay as to meet maximum quality of service. This cost function helps in choosing the best pairs of proactive, reactive and hybrid routing protocols in such a way so that maximum performance of mesh network can be achieved by considering different routing priority index constants.

1.1 PRO-ACTIVE ROUTING:

These types of routing protocols maintain fresh lists of destinations and their routes by periodically distributing routing tables throughout the network. Each node in this routing protocol family maintains a routing table which contains routing information for all nodes in the network. Nodes continually exchange their routing information to put forward consistent up-to-date routing information from each node to every other node in the network. As a result, the number of control messages propagated in the network is increased in order to update the nodes' routing tables.

1.2 REACTIVE PROTOCOLS:

This type of routing protocols finds a route on demand by flooding the network with Route Request packets. In this family, a source node (sender) initiates route discovery when it needs to send a packet to a destination. Once the route is discovered, the node stores it in its route cache in order to use it for sending packets. Comparing to proactive protocols, reactive protocols generate less overhead in maintaining routing information.

1.3 HYBRID PROTOCOLS:

These types of routing protocols combine the advantages of proactive and of reactive routing. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. Routing protocols designed for Mobile Ad hoc Networks (MANETs) can be considered as platform for Wireless Mesh Networks, due to the common similarities between the two types of wireless networks.

II. PROPOSED COST FUNCTION EQUATIONS

The goals of wireless mesh networks are to provide satisfactory quality of service (QOS). However, it is difficult to determine how the appropriate mesh parameters should be selected to support QOS requirements. To address and resolve the problem, we propose a novel cost function named as mesh cost function (MCF) based on mesh routing parameters like average throughput and average end to end delay as to meet maximum quality of service. This cost function helps in choosing the best pairs of proactive, reactive and hybrid routing protocols in such a way so that maximum performance of mesh network can be achieved by considering different routing priority index constants.

2.1 Throughput priority based Cost Function Equation

Proposed cost function equation based on throughput is

$$MCF_{throughput} = a * T^{(1/8)} + b * D^{(1/2)} + EAF$$

Where a, b are priority index constants for throughput (T) and delay (D) respectively.
The value of throughput priority index constant a is 0.3.
The value of delay priority index constant b is 0.02.
EAF is effective cost adjustment factor. The value of EAF is 0.1.
The cost function algorithm is designed to find out the value of cost function for a wireless mesh network.
T is in bits/second and D is in seconds.

2.2 Delay priority based Cost Function Equation

Proposed cost function equation based on delay is

$$MCF\ delay = a * T^{(1/4)} + b * D^{(1/8)} + EAF$$

Where a, b are priority index constants for throughput (T) and delay (D) respectively.
The value of throughput priority index constant is 0.02.
The value of delay priority index constant is 0.5.
EAF is effective cost adjustment factor. The value is 0.1.
The cost function algorithm is designed to find out the value of cost function for a wireless mesh network. T is in bits per second and D is in sec

III. RESULTS AND ANALYSIS

On the basis of results obtained during evaluation of different routing protocols, we evaluate the performance of proactive, reactive and hybrid protocols namely BF, STAR, DYMO and ZRP. The main goals of the simulation for different radio propagation models using throughput and delay considerations based on cost function evaluation.

Fig 3.1
Average value in Okumara Hata Model

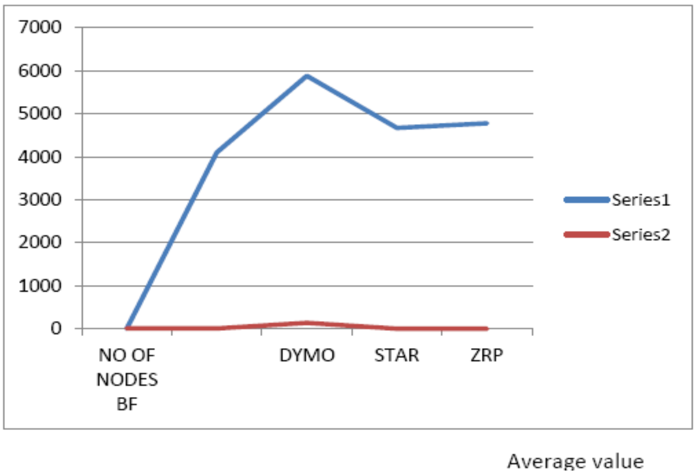


Fig 3.2
Average value in Free Space Model

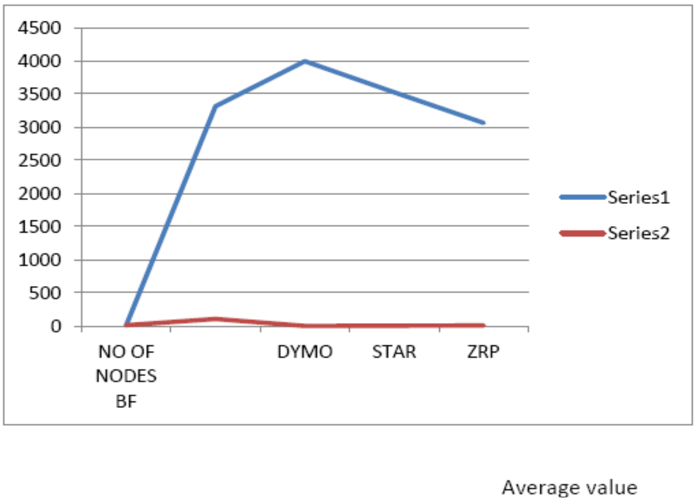


Fig 3.3
Average value in Two Ray Model

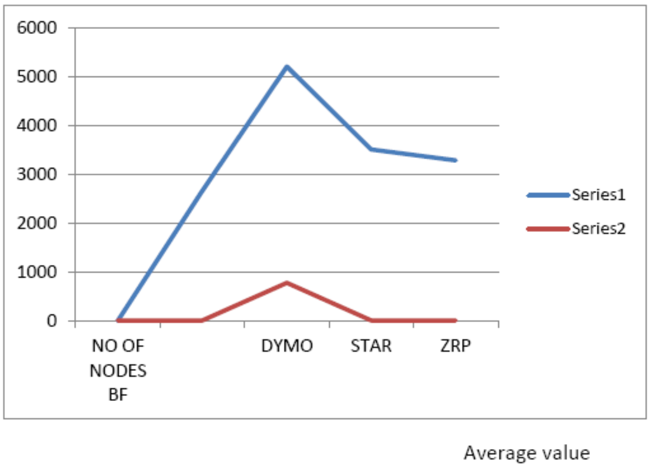
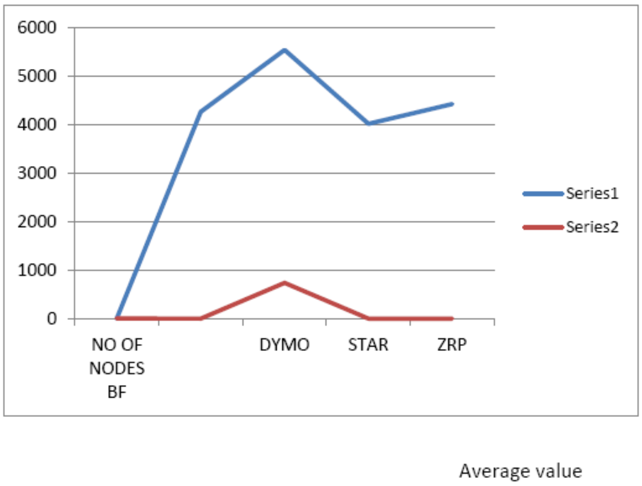


Fig 3.4
Average value in Cost 231 W-1 model



IV. CONCLUSION

We examine the usage of different proactive, reactive and hybrid protocols in such a way so that we may be able to built a cost function which helps in selecting the optimum grouping of routing protocols for a particular urban wireless mesh network. we notice that DYMO protocol helps in obtaining high throughputs but much delay in the transmission of data packets does not make this proactive protocol reliable for urban wireless mesh networking for long distances. The Bellman Ford protocol is best suited for lower node densities and STAR/ZRP protocols are appreciable more on intermediate or higher node densities. As for the propagation model is concerned, we can conclude that reactive and/or hybrid routing can be best suited for Okumara-Hata model. In case of Free Space model, proactive and/or reactive routing may perform well. For Two Ray propagation model, proactive, reactive and/or hybrid routing can achieve good results and so in the case of Cost 231 W - I model.

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