Power Aware Routing Protocol for Mobile Ad Hoc Network using Cluster Head Selection

Umama Shireen Raje* and Dr H N Suresh**
*Department of Electronics and Instrumentation Technology, Bangalore Institute of Technology, VTU
KR Road, V V Puram, Bengalure, India
umamashireen@yahoo.in
**Department of Electronics and Instrumentation Technology, Bangalore Institute of Technology, VTU
KR Road, V V Puram, Bengalure, India
hnsureshbit@gmail.com

Abstract: Mobile ad hoc network is composed of number nodes which are connected without the need of an infrastructure. There is no clear topology as the mobile nodes continue moving starting with one position then onto the next. The devices in MANET are battery worked so the productive power mindful steering convention is acquainted with keep up the battery life and in addition the system lifetime which is been influenced by battery of the mobile nodes. The proposed calculation amplifies the system and battery lifetime by choosing the best nodes each time as cluster head in the system and also taking less number of users getting activated for one transaction which will eventually increases the efficiency of the system.

Keywords: Cluster Head, Mobile ad hoc network, Reactive Protocol, DSR, AODV.

Introduction

Mobile ad hoc networks are multi hop wireless networks without any centralized access point and infrastructure. The MANET gives the advantage of mobility to the nodes. This in turn will create a dynamic topology in the network. If the nodes are in direct range then transmission of data packets takes direct path. If the nodes are not in range then it makes use of the multi hop communication which will in turn make use of other nodes in the network to transmit the data packets. As the nodes in the network have mobility advantage the following constraint with that will be the battery source. All the nodes in the network are battery operated hence battery consumption is an important parameter to be considered.

For Manet's there are three types of protocol they are proactive, reactive and hybrid. In proactive, all the nodes in the network will maintain a table which will consist of the information about all the neighbouring nodes. In case of reactive there is no table maintained instead the neighbouring information is seeked as and when needed. This is also referred as On demand routing protocol. As this protocol takes the information whenever it is needed. The hybrid protocol combines the advantages of both the protocol. The battery in proactive protocol is used more because it has to store and maintain the information whenever the topology changes. This kind of disadvantage is overcome by reactive protocol where the information is stored as a table instead it is a kind of query – reply communication.

Literature Review

In Minimum total transmission power routing [1] it chooses the way that expends least power however on the cost of enacting numerous nodes. Along these lines the disservice is initiation of many intermediate node which will diminish the lifetime of system. In [2] the author considered the nodes to carry the information of all other nodes which will an efficient path with less delay but the disadvantage of such kind of algorithm was overhead of storing information of all other nodes which was leading to consume more power of the mobile nodes. In [3] the authors considered the cluster head in each cluster which will have information of all nodes present in the cluster. When the nodes are in range the information is transferred directly and suppose the nodes are not directly reachable then the node will send the information to their cluster head which will further transfer the data packets to the gateway node if the destination node is far or it will directly send the information to the destination. In this paper the disadvantage was every time the data has to be send to its cluster head and the among the nodes which node should be selected as cluster head is not considered.

Proposed Method

There are two objectives of the paper they are among the nodes which node should be selected as cluster head is considered and other objective is defining a power aware routing protocol which will require less number of users and in turn will delay in the transaction of data packets will be less.

Cluster Head Selection

The entire network is divided into clusters and each cluster should have one cluster head. The cluster head among the mobile nodes are selected based on three parameters. The three parameters are minimum mobility, minimum density and maximum energy. The node having maximum of the above two characters is considered as head node. Suppose if two or more nodes satisfy more than two parameters then the average of each parameter is considered and the one with the high value is considered as cluster head. Every time the mobility of nodes are taking place then the parameters are calculated for each node and then the cluster head is selected among the nodes. The node which is having more energy is considered as it can be present in the network for a longer time. The mobility factor for the head node is considered to be less as more the nodes move then the more the nodes will require energy. Hence these parameters are selected to determine the cluster head among the nodes. This will help in selecting the best node in the cluster which will increase the network lifetime.

Power Aware Routing protocol

In the Power aware routing protocol is to ctivate less number of users to transfer the data packets. Here we have assumed that the destination and the gateway node is static. It considers three types of algorithm which includes when the data packets are at source node, the second is when the data packets are at cluster head and lastly when the data packets are at Cluster head node.

- *Step 1*: Initially the data packets are at source which will transfer the data packets to destination if it is in range or else it transfer the data packets depending of the power consumed by the cluster head and gateway node. The node which will consume less power the data packets will be transmitted to that particular node. If the data packets are transferred to cluster head then the Step 2 is followed or if gateway node is selected then Step 3 algorithm is followed.
- *Step 2:* When the data packets are at cluster head it checks for the destination if it is in range. Direct data transfer takes place if the destination is in range or else cluster head will transfer the data packets to the gateway node and follows the Step 3 algorithm.
- Step 3: Consider now the data packets are at the gateway node which are static. The gateway node checks for the destination if it's in range or if it is not in range then it checks for the next gateway node and cluster head . It checks for which is consuming less power. Among these two the one which consumes less power will be considered and the data packets are transferred to that particular node.

Simulation Work

The simulation is carried out in NS2. The nu,ber of nodes considered is 34 nodes. The nodes are cluster head node for each cluster, gateway node which can be more than one for one particular cluster, normal nodes and the destination node which going to be constant. For this paper their are 34 nodes considered and the network are divided into four clusters.

Results

The analysis is done based on two parameters they are packet delivery ratio with the mobility of the node during the transaction of data packets from source to destination and the other parameter is end to end delay for different transmission rate. The packet delivery ratio with the mobility of the node are shown in Table 1 and is represented in Fig. 1. The parameter is compared between two protocols which are Dynamic source routing (DSR) and Ad Hoc On-Demand Distance Vector protocol (AODV). The packet delivery ratio decreases with increase in the mobility. Among the two protocols the DSR protocol will have much better packet delivery ratio when compared to the AODV. In both protocol there is a decrease in PDR but the DSR finds an improvement over AODV protocol.

Table 1: Packet delivery ratio for different mobility

Mobility (m/sec)	Packet delivery ratio	
	DSR	AODV
10	8.93	8.63
20	8.6	8.2
30	8.4	8.2
40	7.5	7.2
50	7.2	6.95

The second parameter considered for comparison is the end to end delay with the transmission rate. The second parameter is compared between two protocols which are Dynamic source routing (DSR) and Ad Hoc On-Demand Distance Vector protocol (AODV). The table 2 shows the end to end delay with different transmission rate. The Fig. 2 shows the represents

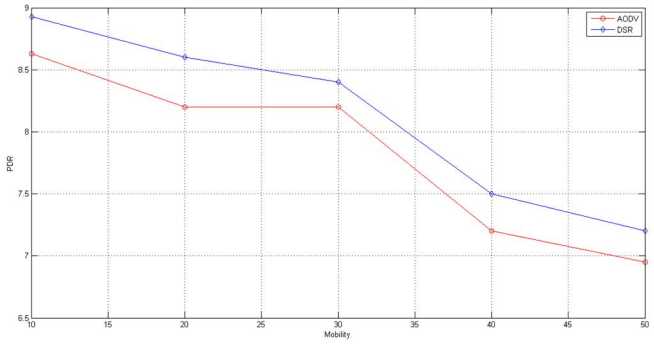

Figure 1: Packet delivery ratio with different mobility

the respective parameters. The end to end delay is less when the transmission rate is less in DSR protocol where as it high in case of AODV. But as the transmission rate increases the end to end increases for DSR protocol but it will be comparatively less for AODV.

Table 2: End to end delay with different protocols

Transmission Rate	End to End delay (sec)	
	DSR	AODV
128	6.94	8.94
256	8.3	10.3
512	10.25	11.25
1024	15.87	11.87

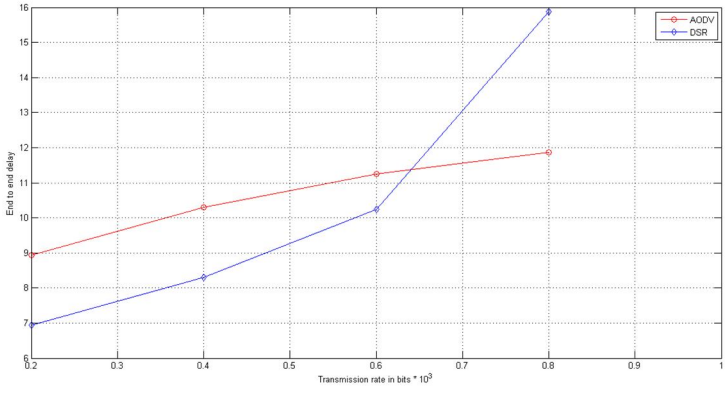

Figure 2: End to end delay with different protocols

Conclusion

As the proposed methodology aimed at delivering the packets of information with less error and having less end to end delay for the transaction between the source to the destination node. With the figure 1 we can see that the packet delivery ratio with the proposed methodology for DSR is much more efficient when compared to AODV. The proposed algorithm also reduces the end to end delay for DSR protocol with less transmission rate. This clustering method can be used for AODV with high transmission rate and DSR for lo transmission rate. In the future the network can be testing with hundreds and thousands of nodes and can be compared with other protocols.

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