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PERFORMANCE ANALYSIS OF OLSR USING CPWF TECHNIQUE IN MOBILE AD-HOC NETWORK (MANET)

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ABSTRACT

A wireless network is any type of computer network that uses wireless data connections for connecting networks nodes. A mobile ad hoc network is a network that consists of mobile nodes that communicate with each other node over wireless links. These networks contain several nodes in groups as the network size increases ,it generally happens for nodes to be dispersed in a wide area than the range of individual nodes. In these conditions there is need to employ routing techniques such that the out of range nodes may communicate with each other via intermediate nodes. In Optimized Link Routing (OLSR) protocol Greedy Algorithm will choose the nodes with stronger cover ability using Multipoint Relay Selection but this technique creates multiple nodes repetition in MPR Selection which decrease the performance of Network. Multipoint Relaying is a technique to reduce the number of duplicate retransmissions while forwarding a broadcast message. In this paper a new technique CPWF Technique is proposed for selection of Multipoint Relays (MPR) in optimized link state routing protocol to improve the performance. CPWF technique calculate the power of each node and select the node as MPR node which takes less power consumption. The comparison analysis will be carrying out about this routing using MATLAB.

Key words: MANET, Link State Protocol, NFA, BEST, Greedy Algorithm, MPR, CPWF, MATLAB

I. INTRODUCTION

A Mobile ad hoc network is a group of wireless mobile computers (or nodes) in which nodes collaborate by forwarding packets for each other to allow them to communicate outside range of direct wireless transmission. Ad hoc networks require no centralized administration or fixed network infrastructure such as base stations or access points, and can be quickly and inexpensively set up as needed. A MANET is an autonomous group of

mobile users that communicate over reasonably slow wireless links. The network topology may vary rapidly and unpredictably over time, because the nodes are mobile. This kind of network is prone to link failure or node failure due to restricted energy or mobility.

OLSR Protocol in link state routing protocol, all links with neighbor nodes are flooded in the entire network. OLSR protocol is an optimization of a pure link state protocol for mobile ad hoc networks. OLSR protocol reduces the size of control packets. By only declaring only the subset of links with its neighbours i.e.) their multipoint rely selectors. It uses only selected nodes to flood its control packets by using selected nodes called as multipoint relays. Only the MPRs of a node retransmit the broadcast messages. This reduces the number of retransmissions in a flooding or broadcast procedure. A set of nodes is selected for the retransmission of packets. These selected nodes are called as Multipoint Relays (MPRs). The nodes which are not in its MPR set, read and process the packet but do not retransmit them. For this purpose, each node maintains a set of its neighbours which are called the MPR Selectors of the node. This MPR set can change over time, which is indicated by the selector nodes in their HELLO messages.

In the previous approach the Multi Point Relays (MPRs) selected by greedy algorithm [38] and BEST Algorithm [27] are not optimal in terms of performance analysis parameters like redundant retransmission messages (TC messages), packet delivery ratio and throughput.

In this paper CPWF Technique is used to select MPRs .By selecting MPRs using CPWF Technique , in some scenarios this technique improves greedy algorithm and BEST Algorithm in a certain extent. The final results of simulation show that: in different scenarios, packet delivery ratio and throughput calculated by CPWF are increased compared with existing algorithms and the numbers of TC packets are reduced considerably.

II. METHODOLOGY USED BY RESEARCHERS:

Greedy Algorithm: In the Greedy Algorithm MPR node is a set node which is the union of the MPR sets constructed for each interface. In every Hello message, the nodes advertise their willingness to forward traffic on behalf other nodes. A node must advertise the same willingness on all interfaces. The possible values are:

• WILL_NEVER: the node must not be selected as MPR

• WILL_ALWAYS: the node should be selected as MPR.

• WILL_DEFAULT: is the default value.

MPR set for a given node n is as follows:

1. Select all one-hop neighbor nodes with willingness equal to WILL_ALWAYS. 2. Compute the degree of one hop neighbor. The degree of a one-hop neighbor is defined as the number of symmetric neighbors of node n1 excluding the one-hop neighbors of node n and the node itself. 3. Include in the MPR set every one-hop neighbor which is the “only” node to provide reach ability to a node two-hop away. Remove all two-hop neighbor nodes which are now covered by at least one node in the MPR set. 4. While there are two-hop neighbor nodes which are not covered by at least one node in the MPR set, then, (a) For every one-hop neighbor, calculate its

reach ability, i.e., the number of two hop neighbor nodes which are not yet covered by at least one node in the MPR set, and which are reachable through this one-hop neighbor. (b) Select as a MPR the node with highest willingness among the one-hop neighbor nodes with non-zero reach ability. If there are multiple node, select the node with maximum reachability.5. The MPR set is constructed from the union of the MPR sets for each interface [11].

Necessity First Algorithm (NFA): Necessity First Algorithm (NFA) is used to select the optimal Multi Point Relays with the goal of solving performance problem of greedy algorithm. The idea behind NFA is that when there is 1 hop neighbors with Necessity of selecting, deleting the neighbor with poorest cover ability purposely to create necessity of selecting, then choosing the neighbors with necessity of selecting as MPRs. By selecting MPRs from the "necessity of selecting", in some scenarios NFA improves greedy algorithm in a certain extent. The number of MPRs selected by NFA could be reduced by 2%~11% compared with greedy algorithm, and the number of TC packets could be reduced by more than 7% and this is important for the reduction of overhead in the network. The extent of improvement made by NFA in different scenarios shows that, NFA is an algorithm more suitable for the networks with higher density [38].

III. PROPOSED CPWF TECHNIQUE

MANET requires the routing protocols to reduce overhead as much as possible for saving resource of network. In OLSR, there are some lacks with greedy algorithm and NFA, the Multi Point Relays (MPRs) selected by both algorithm are not optimal in terms of performance analysis parameters like redundant retransmission messages (TC messages), packet delivery ratio and throughput.

The idea behind CPWF is to select the MPRs in a way such that all the 2 hop neighbors have the maximum lifetime of a path through the MPRs to the current node like - A network topology extended with the arcs which constitute the transmission powers. The number along the lines indicates the power needed for a successful transmission from a node to a neighbor node. The optimal power path means that the maximum energy consumption on that path is the smaller among the maximum energy consumption of all the possible paths between the source and destination in the partial network topology (the path contains only the MPR nodes).

Each node maintains a routing table and calculates its routing table using CPWF technique so as to find an optimal power path.

In this approach the initial power allocation vector always satisfies the power constraints. At every iteration, it is try to increase the number of bits on the subcarriers or equivalently, to setup a new bit-loading vector that is greater (component wise) when compared to the current bit-loading vector. This leads to the increase of power allocation vector.

In the Standard Greedy initializes is Set of Channels A=0, Set of Sub Channels B=0, Allocated power for each node P=0. Let CCPWF and PCPWF be the continuous bit-loading and power allocation vectors obtained by the CPWF algorithm; B0 and P0 be the discrete bit-loading vector.

It is satisfied by the following condition: $0 \leq B0 \leq CCPWF \Rightarrow 0 \leq P0 \leq PCPWF$.

Algorithm:-

Step 1: Start with an Empty MPR Set=0

Step 3: Select Nodes from 1 Hop Nodes that are only ones able to reach in 2-hop nodes and add these Nodes in MPR Set.

Step 4: Exclude the covered nodes by the last from 2-hop away Nodes from X

Step 5:- While 2 Hop- Nodes is not empty do.

Step 6:-For each node, calculate the transmission power using CPWF Technique

Step 6:- Select the 1 -Hop node that has the highest willingness and minimum power using CPWF Technique.

Step 7: Add to these node in MPR Set.

MPR set U {Highest willingness nodes from 1 Hop Node with CPWF Technique}.

Step 8: Repeat step 4.

IV.SIMULATION MODEL

In this simulation a MANET with 100 nodes in a dense 300 x 300 meter square area. There are CBR/UDP source generated packets are used which are 1000 bytes with different data rates. The Random Waypoint Mobility Model is used as the nodes mobility Model. The pause time is set to 0. To evaluate the performance of modified routing scheme compared to standard OLSR. The common simulation parameters of the variations are summarized in table below.

Table 1.1 Simulation Parameters

Parameter	Value
Size of Network	**300 * 300**
Simulator	**MATLAB**
Gain at Antenna	**1**
Pkt interval	**2/sec**
Mobility Model	**Random Waypoint Mobility Model**
Routing protocol	**OLSR**
Traffic type	**CBR**
Packet Size	**1000 Bytes**
Effective Aperture Area of Antenna	**10**
Distance between Transmitter and Receiver	**150 meter**

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V RESULT

An experiment is performed using MATLAB in the network with the size of 300 x 300 m. All the nodes in experiment use the OLSR protocol with greedy algorithm and BEST algorithm and CPWF Technique respectively. After the execution time, the results are recorded for all sets of mobile nodes. Below Fig. shows the simulation graph for percentage of TC messages flooding in the network. This provides the flow of TC Message which aim is to provide the integrity of routing messages, especially Topology Control messages and prevent intermediate nodes from altering routing messages while forwarding them. The comparison is made for 50, 100, 150, 200, 250 and 300 nodes in these three techniques.

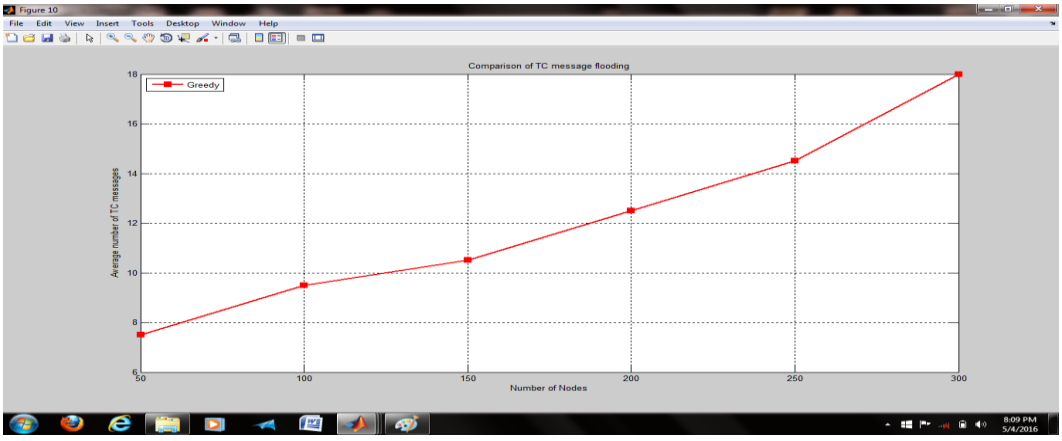

Fig. 1.1.Comparison of TC Message with respect to Different No. of nodes in Greedy Algorithm

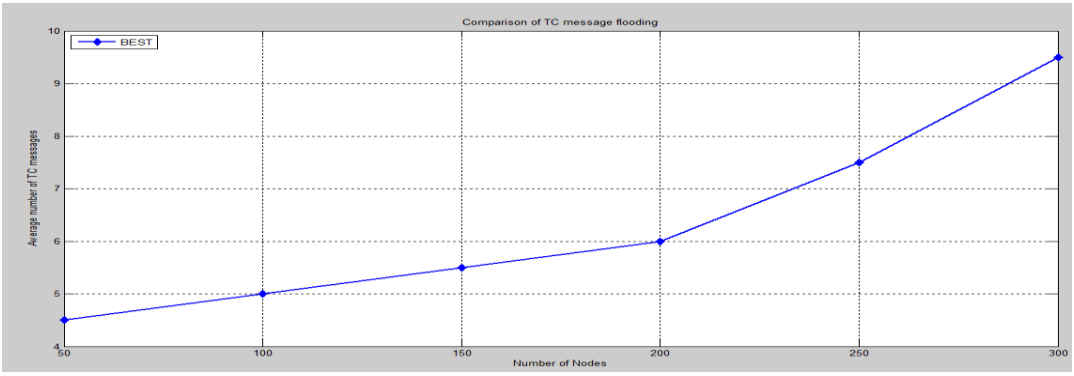

Fig. 1.2.Comparison of TC Message with respect to Different No. of nodes in BEST Algorithm

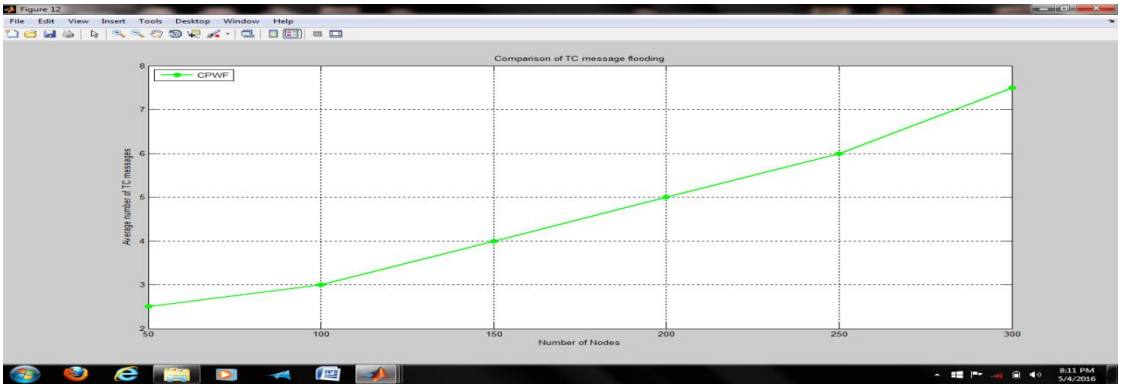

Fig. 1.3.Comparison of TC Message with respect to Different No. of nodes in CPWF Technique

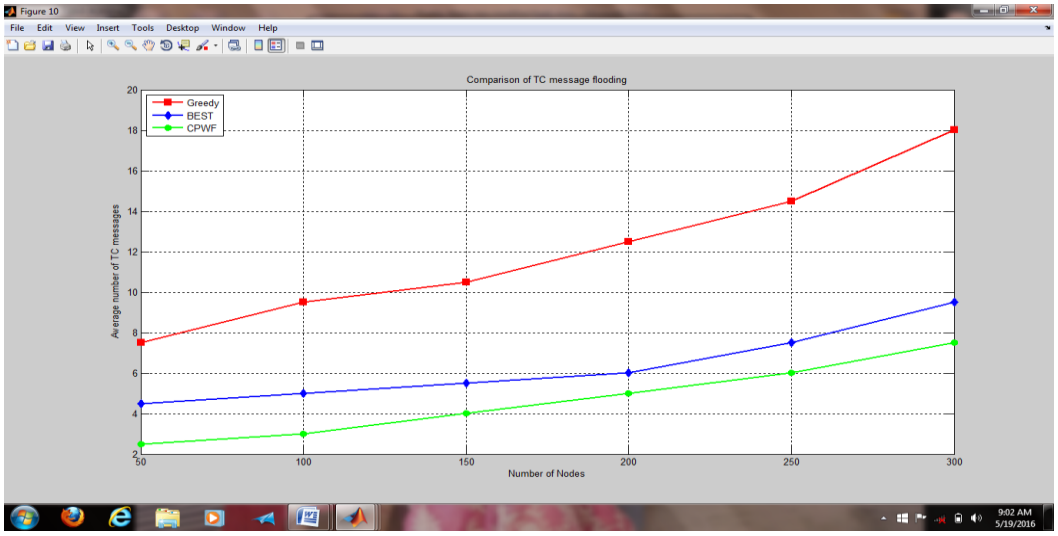

Fig.1.4 Traffic Analysis of TC Message with respect to Greedy, BEST and CPWF Technique in OLSR

VI. CONCLUSION

Major problems in mobile ad hoc networks are (a) limited bandwidth and (b) high rate of topological changes. The goal for a routing protocol is to minimize its control traffic overhead while at the same time, it should be capable of rapidly adapting to link failures and additions caused by node movements. In the OLSR there are some drawbacks with the greedy algorithm and BEST Algorithm such as Multi Point Relays selected by these techniques are not optimal in terms of performance analysis parameters like TC Messages, Throughput, Packet Delivery Ratio. In this paper CPWF Technique is used which improves the performance of the network. In the simulation shows that Numbers of TC packets are reduced in CPWF Technique. The improvement shows that CPWF Technique is more suitable for the networks.

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