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New Protocol For Node Co-Operation In MANET

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Abstract

Adhoc networks are wireless multihop packet networks without any fixed infrastructure. Mobile adhoc network functions properly only if the participating nodes do not show selfish behavior and cooperate in routing and forwarding of packets. Here we propose a model in which no nodes would be selfish it would fairly distribute the traffic load among the nodes in the network. So that no node will be over utilized or underutilized. Each node in the network should be participating in forwarding packets. Mobile ad-hoc networks can be open to any participant that is located hereby. All the participants manage their access control. The fairness in the open mobile adhoc network avoids selfishness and provides cooperative routing in MANET. Our approach is to avoid congestion and provide fairness in adhoc networks; we assume here that the network layer uses the optimized DSR as well as energy aware and path aware routing.

1. Introduction

Mobile Adhoc networks from a class of dynamic multihop network consisting of a set of mobile nodes that inter-communicate on shared wireless channels. Each node in mobile adhoc networks can work as a host as well as a router. In mobile environment ,the resources like the battery power of the device and bandwidth are scare ,so device owner show selfish behaviour by not to utilize these resources as there is a depletion whenever device utilize these resources. Device owner will always try to get benefit from other nodes without cooperating others by giving its own resources which are available for others. Like any social environment where each person involves equally to provide benefits to each other, in open MANETs each member will be participating in forwarding messages as well as in routing. A selfish behaviour threatens the entire community. Some of the important works carried out by the researcher are Sonja Buchegger and Jean Le Boudec [1] proposed CONFIDENT protocol for making misbehaviour unattractive .Nodes which shows selfish behaviour may see that the remaining nodes ignore its requests and they are unable to participate in the network and the node whose behaviour is well in the sense the node support requests should later be rewarded by this protocol. Hugo Miranda and Luis Rodrigues [2] proposed a protocol in an adhoc network that let the participant nodes be allowed to shows any selfish behaviour. The protocol shows some advantages. Its decentralization avoids the usages off complex payment systems and it introduces the concept of "justifies selfishness" that makes the whole systems fairer, not penalizing users by their network topological location.Raju Barskar and Gulfishan Firdose Ahmed [3] presents a secure mechanism to stimulate end users to keep their devices turned on, to refrain from overloading the network, and to thwart tampering aimed at converting the device into a "selfish" one. Here they discuss about the selfish behaviour of node, trust and reputation mechanisms that will stimulate the cooperation between nodes. They address the problem of service availability in mobile ad-hoc WANs. Jamal N. Al-Karaki1, Ahmed E [4] presented a mechanism to detect and exclude potential threats of selfish mobile nodes. This proposed scheme enforce nodes to Cooperate in a selfish adhoc environment by using this scheme, MANETs can be robust against nodes misbehaviour. Nodes show fairness when nodes cooperate with each other. They combine reputation based with virtual currency based schemes to achieve better performance in MANETs.

I decided to design a protocol which avoids selfishness as well as congestion in the network. We propose a new selfishness avoiding technique which is based on load balancing. Each node in the network use the resource equally and equally distributed the services among all the nodes in the network.

2. Backgrounds

In open MANETs each user has its own purpose. User will agree to share the resources if they find some benefit, while it is impossible to prevent or avoid selfish behaviour, it is possible to design algorithms that discourage such behaviour. This can only be achieved by applying some kind of punishment to users i.e. the nodes that show selfish behaviour would not be able to send their own packets through the networks.

3. Protocol

I assume that nodes use path aware as well as energy aware routing protocols. The primary goal of this approach is to discover shortest route between sources to destination as and when feasible. Each node monitors the route to get an optimal sub path. It aims at continuously monitoring the network condition or battery power of the nodes and divert the call due to save the battery if it id happened then life time of that scare node can be extended Node shows selfish behaviour cannot send its own packet. A small amount of memory is required by each of the nodes to maintain a signed integer called credit. This credit shows whether the node exhibit selfish behaviour. If a node shows selfishness then the node cannot send its own packet i.e. if its credit is less than some predefined limit which is defined earlier. These kinds of punishment to the nodes unknowingly or intentionally exhibit behaviour that is not expected discourage them to be selfish.

4. System Model

In this model, the transmission power of every node in the network is assumed to be equal i.e. each node has same amount of energy like battery power of the device. During routing or forwarding packets, some intermediate nodes may change their positions or may be reluctant to foreword messages. How someone can know that intermediate node is forwarding messages. If the previous node of the intermediate host gets a passive acknowledgement then forwarding is confirmed. The node listen to the next node forwarding the packet so gets a passive ACK.

5. Algorithm

If one intermediate node change its position or shows selfish behaviour. Then the previous node to the intermediate node waits for passive acks for 3 times.
Initially the value of credit of each node is 3.
/*Credit is increased for each message that a host forwards and decreased for each message if it does not forward
Initially we have also defined the max credit
/*Max credit is the upper bound to credit

If the intermediate node comes during the previous node waits for passive ack.

Then this node forwards the message if its credit is less than max credit.

Otherwise, some other node which is in the sub optimal path that overhears the packet 3 times can participate in forwarding packet and increase its credit by 1. credit=credit+1

For each packet forwarded and is credit is less than the max-credit.

If node forwards a packet its credit increases by 1 if it receives a packet and do not send the packet credit decreased by 1.

/*punishment

A node with credit less than 3 cannot send its own packet

If any participating node which attains the max-credit then some other node which is in the optimal path and also in the radio range of the node replaces the participating node.

A node when sends it own packet its credit decreases by 1.

The proposed new model is explained below with an example.

6. Example

See the figure-1 in which here we have a path from S to D which is optimal A and B are intermediate nodes.

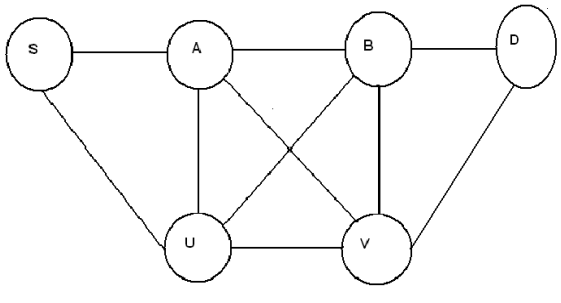

Figure-1

The metric for optimality can be hop count for shortest path routing Thus nodes A and B will be continuously used in forwarding the packets, leaving the other nodes free from the traffic load. As a result energy level of the nodes becomes widely varied, if the path S-D will be

using continuously then the battery supply of intermediate node will be decreased and will die soon. And there may be a chance that congestion occurs at node A that leads to delay of packet forwarding and may also lead to link failure. Here we propose a scheme that is based on route redirection. There are two cases happens.

Case1: If one node found in the optimal path

Here node 'U' is in the radio range of both 'S' and 'A'. Node 'U' can overhear packet which is intended for 'A'. Supposing node 'A' changes its position or is reluctant to forward packets there may be a chance of link failure. We may require a new optimal path .Node 'U' is in the radio range of S and is one of the optimal paths. If node U overhears the same packet for 3 times or different packet for more than 3, than in such a situation node 'U' would voluntarily take part in the routing process and informs the source node to update its cache.

If congestion occurs at node 'A', packets are dropped at that node. If the node 'S' sends the same packet 3 times and if every time the packet is dropped, then node 'U' would replace node A for the connection S-A-B-D and would inform to the source node S about it. Thereafter the source node would follow the path S-U-B-D for subsequent communication i.e. the path S-A-B-D would be replaced as S-U-B-D.

Case2: More than one common neighbour node found in optimal path.

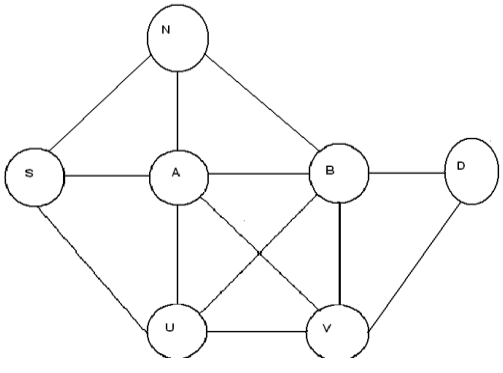

Figure-2

Here in this figure both node 'U' and 'N' are nearby nodes which are common neighbours of both 'S' and 'A'. So both the nodes 'U' and 'N' can overhear packets which are intended for node 'A'. If link failure occurs at node 'A', now we have two optimal path one is S-U-B-D and another one is S-N-B-D. Now the question is which node between 'U' and 'N' will take part in the routing process. Here source node will decide based on which node has approached first.

Open mobile adhoc networks should implement a protocol to get an expected service that give punishment to the users that exhibits selfish behaviour intentionally or unknowingly. If a node shows selfish behaviour then the node can't send its own packet in the network.

In other words if a node does not cooperate in forwarding packets of other nodes, then its own packets would not be forwarded by other nodes in the networks.

7. Conclusions

MANETs is not centralized so there is no human authority to restrict the users. Therefore MANETS are particularly sensible to unexpected behaviours. Users have a tendency to access most of the network resources while to pay as less possible. This kind of behaviour is called selfishness. To provide fairness and cooperation among nodes over a decentralized network applying some punishment like one cannot sends its own packet will discourage the selfishness.

Here I attempted a protocol for MANETs which avoids selfishness. It introduces a concept of fair distribution of services that makes the whole system more co-operative and avoids congestion.

8. References

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