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Guaranteed Delivery in Mobile Ad hoc Network

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Abstract

Mobile Ad hoc network is a collection of mobile nodes without support of any infrastructure. The mobility of nodes makes the transportation of message in the network challenging, as the routes are broken and formed dynamically. The frequent change in routes adversely affects the guaranteed delivery in the network to the multi hop nature, each node also plays an important role to maintain guaranteed delivery. If any node in the network starts misbehaving due to overload, selfishness and software fault, it's also influence on guaranteed delivery. In this paper we have studied the effect of routing misbehavior of DSDV algorithm in the context of delivery rate.

Keywords: *Mobile Ad hoc network etc.*

1. Introduction

Mobile Ad hoc Network (MANET) is cooperative collection of mobile computers communicating with each other through wireless links, without requiring any supporting infrastructure. In MANET [6] all the nodes connect dynamically in an arbitrary manner due to their mobility. All the nodes in MANET also behave as routers and take part in discovering and maintenance of routes to other nodes in the network. Quality of Service of network also depends upon the guaranteed delivery of packets. But some times a node may agree to forward a packet and then fail to do so. This phenomenon is known as routing misbehavior. A node may misbehave because it may be an overloaded, selfish, malicious node or it may have a software fault [2).

Mobile Ad hoc Routing Protocols can be classified either as proactive or reactive. Proactive routing algorithms continuously maintain all the route information within a network. Therefore, whenever a source requires sending a packet, and it can do so immediately as the route is already known. In reactive algorithms, route is discovered only when source needs to forward a packet to the destination node. Reactive algorithms are also known as on-demand routing algorithm [6].

In this paper we have studied the effect of routing misbehavior of DSDV algorithm in the context of following network parameters Network size, Bandwidth, Traffic pattern, Mobility rate, and battery power. Metric used to evaluate the performance is delivery rate because it is overloaded, selfish, malicious, or broken. This characteristics of the node is called routing misbehavior

2. Routing misbehavior

- Due to the multihop nature of the network, any node can become an overloaded node
- In a network some nodes may not be interested to spend their battery power, therefore they can go in power safe mode. These nodes are called selfish node.
- A malicious node launches a denial of service attack by dropping packets.
- A software fault that prevents it from forwarding packets to other node in the network.

Misbehaving nodes can be significant problem in MANET. Even a few misbehaving nodes can have a severe impact on performance of the network.

3. Methodology

We have conducted all simulation on the Network Simulator (NS-2)[3,4,5] , which is widely used by researcher. The NS-2 does not provide a mechanism to simulate routing misbehavior hence it needs modification to incorporate this mechanism. To simulate routing misbehavior we have taken a simplified assumption. In our assumption we consider that a misbehaving node drops packet. To incorporate dropping of packets, we have modified node structure by introducing a variable that takes an account of the node whether it misbehaves or not. Then the routing algorithm is also be modified for taking the value of the variable in consideration before forwarding the packet.

The value of the variable is set 1 when the node is to be marked as misbehaving node. Otherwise die value of variable is set 0 and the node works as a normal node.

When a new packet is received by the node, firstly that node checks the value of the new variable. If the value of new variable is 0, it simply forwards the packet to next node. On the other hand, if the value of new variable is 1, it starts misbehaving i.e. it drops the packets.

To measure metric delivery rate, we have varied network size, mobility rate, traffic pattern, bandwidth and battery power in the simulation. Network size and battery power have been changed directly through Otcl script of DSDV algorithm. We also required traffic-pattern file and node movement file to change the traffic pattern and movement of node. We can easily make these files through the command line.

4. Simulation results

In our simulation, we have considered the following values for network parameters:

1) Network size - 25,50,75 and 100 Nodes
2) Mobility Rate - 1,5,10 and 25 m/s
3) Traffic Pattern - 5, 50 and 120 packets/sec Area that we are you using for simulation is 670 X 670 meter flat space. We considered fixed bandwidth of 1Mbps for each node.

4.1 Delivery Rate

As the number of mobile nodes in the network increases, the delivery rate of the packets decreases. For a large size of network, number of control packets to update the tables increases. This increase in number of control packets results into a large traffic in the network. This large traffic may in turn results into congestion in the network, and thus, the delivery rate decreases. In the Figure 4.1,20% of routing misbehavior shows a very low delivery rate.

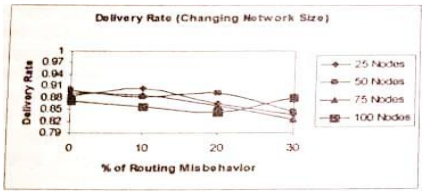

Figure 4.1 Delivery rate Vs Percentage of Routing Misbehavior

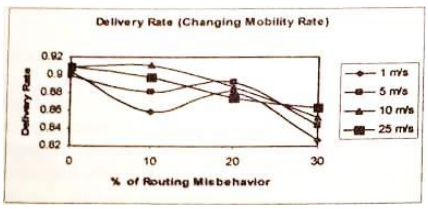

Figure 4.2 Delivery Rate Vs Percentage of Routing Misbehavior

Increased mobility rate causes decrease in successful packet delivery especially for protocols, which demand control messaging for link breakages. This happens because of decreasing reliability of such control messages transmitted in IP level, and mainly due to their losses. DSDV is bi-directional protocol that maintains their successful delivery rate due to their simple management of route maintenance. Proactive protocols suffer for their lateness in adapting to changing topology. In the Figure 4.2, delivery rate decreases upto 20% routing misbehavior gradually. After 20% routing misbehavior delivery rate becomes very low.

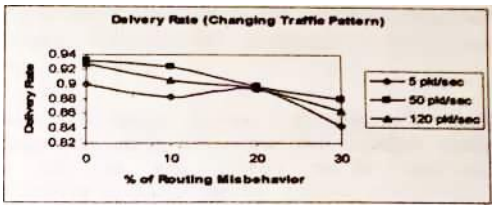

Figure 4.3 Delivery Rate Vs Percentage of Routing Misbehavior

For increases in traffic pattern, we observed that successful packet delivery rate decreases. DSDV has least processing for route maintenance, therefore, it has fast response and performs better in successful delivery for increased load. Increase in load results in more collision due to the increase in control packets. DSDV has lower delay upto the 20% routing misbehavior, packet delivery rate decreases but after that it decreases rapidly.

Conclusion

In the present work simulation study has been conducted to analyze the behavior of DSDV algorithm in the context of routing misbehavior for guaranteed delivery. It has been found difficult in some cases to make definite conclusion from the result given in the graph. This may possibly require more efforts to consider other network context so that better conclusion can be made.

However, the results reveal that increase in the routing misbehavior degrades the performance of the delivery rate. In most of the cases it is found that after the 20% routing misbehavior network behaves veiy badly.

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