Time on Demand Distance Vector Protocol with Fault Tolerance for Mobile Ad-hoc Networks

Sukhwinder Pal Singh[1], O.S.Khanna[2]

[1] Senior Lecturer, Department of Electronics & Communication, SRS Govt. Polytechnic College for Girls, Ludhiana.,
[2] Associate Professor, Department of Electronics & Communication, NITTR, Chandigarh.,

Abstract:

A MANET consists of mobile nodes, with high mobility with multiple hosts and wireless communication devices. Since Mobile Ad-hoc Devices are typically used as ad-hoc manner and use to provide backbone to complete network, they have the nature that the mobile communication is not constant and due to absence of monitoring devices, Mobile Ad-hoc devices are more tends to fail, slowdown and link failures. Hence, it is important to defend them against link or node failures. Faults have more chances to occur when it comes to AODV protocol. Moreover when it comes to Time constraints for AODV protocol then fault tolerance can prove to be a difficult task. With new concept of RNC (Route Node Collection packet) to find better route selection, faulty conditions are also occurred along. In this Research, a Fault Tolerance mechanism will be proposed for TAODV protocol base on optimal selection of nodes for routing process.

Keywords: *Time on Demand Distance Vector Protocol, Ad-hoc On Demand Distance Vector Protocol, Fault Tolerance Mechanism, Routing Protocols, Mobile Ad-hoc Network, Route Request, Route Reply*.

1. Introduction

Quality of Service (QoS) is a defined level of performance in a wireless network which is required by every type of network traffic. Quality of service is always required in many network situations, such as in sensitive infrastructure and sensitive military applications.

Effective mobile ad-hoc networks (MANETs) require Quality of Service capabilities that give fault tolerance and better recovery when some links failure occurred on an intermittent or permanent basis. [4]

Mobile Ad-hoc Network topologies can change often and unpredictably. Most protocols for multi-hop MANET routing maintain best effort routes.

In this experimentation, we will focus on the fault tolerance mechanism for timely based networks so that we can enhance the quality of service which in turns provides fault tolerance mechanism.

2. AODV (Ad hoc On-demand Distance Vector)

AODV is an on-demand routing protocol [2]. The AODV algorithm gives an easy way to get change in the link situation. [3] If link failure occurred than notifications are sent only to the affected nodes within range in the network. Generally after receiving this notification, it cancels almost all the routes through this affected node. [7]

Generally maintenance of AODV process is based on timely updates which suggest that entries into AODV process expired after timer expires. Further updated information is passed to the neighbors so that it can be updated about route breakage. Discovery of various routes from single source to various destinations is totally based on query and reply packets and intermediate nodes use logs to store the information of routes in route table.

3. TAODV Protocol

The original AODV uses destination sequence numbers to identify the most recent path. The source node and intermediate nodes contain the next hop information for packet transmission.

The policy of an on demand protocol is that the source node floods the Route Request (RREQ) whenever it sends data through the network, since the source couldn't find any routes to forward the data. In the process of finding route there may be possibility of finding several routes to destination. According to original AODV the path is found by using destination sequence number. Whichever the route is having the highest destination sequence number compared to that of last stored, the path will be get selected for data transmission.

4. Problem Definition

A MANET is a multi-hop Ad-hoc wireless network where nodes can move arbitrary in the topology with variation of speed and trajectory. The MANET network has no infrastructure or dependency and can be implement quickly in any environment but due to limited computing power, low bandwidth, high mobility and absence of central coordinating entity, behavior of different routing protocols are difficult to calculate in different environments.

Reactive protocols seek efficient resource utilization when required. Some related work suggested time based on demand distance vector protocol which shows quite better results compared to simple on demand protocols. The protocol design presented here suits the MANETS dynamic topology perfectly in finding the best path or route for data communication. Since MANETS are typically used as wireless backbones, they have the nature that the wireless communication is not constant. Hence, it is important to defend them against link or node failures.

The requirement for quality of service is increasing day by day as the more attacks, faults, congestion is occurring in Mobile ad-hoc infrastructure. Fault tolerance is most essential part for providing quality of service in Mobile ad-hoc devices. Moreover fault tolerance based on time constraints are need to be explored which demand refined and stable fault tolerance mechanism. The fault tolerance mechanism is done by improving quality of service by avoiding unwanted usage of energy and node failures in between wireless nodes. This research will reflect the link failure and the will provides solutions for it. This work will be focus on the Time based on demand distance vector protocol so that the faulty networks can be prevented. It particularly works on the detection of faulty nodes at the early state of the node connectivity. It will find out the nodes which have low resources to sustain in whole process of routing and by removing these node we can filter out the week links from whole topology which in turns can enhance the quality and fault tolerance. Initially work will start with battery resources as the prime factor in deciding the propose work and latter we can find out other dependent factors. At initial state after finding faulty nodes (Nodes with very less battery resources), these nodes will be in sleep mode and will not participate in routing process. After shredding those nodes we will proceed with other mechanisms based on time constraints. Quality of the network will be the final target as quality is directly link to the amount of faults.

Parameters for fault tolerance would be throughput, failure of nodes, delay, network load, overhead. These parameters will distinguish the normal working of the network and fault tolerance in network.

5. Objectives

The proposed work is suitable for fault tolerance of the node and objectives for proposed work are given below:

"To develop a more effective mechanism for fault tolerance for MANET by applying the time constraints and battery checking scheme for avoiding the faulty conditions in network".

6. Methodology

This research will focus on providing solution for said problem by providing quality of service and fault tolerance mechanism.

Method for Fault Tolerance: In this research, will present better solution for fault-tolerant by improving quality in selection of nodes which are best fitted for routing in between wireless nodes. This research will reflect the link failure and will provides solutions for it. This work will be focus on the Time based on demand distance vector protocol so that the faulty networks can be prevented. It particularly works on the detection of faulty nodes at the early state of the node connectivity. It will find out the nodes by checking the energy carried by node in buffer; buffer will tell the battery level and detect node which have low resources to sustain in whole process of routing and by removing these node we will shred out the week links from whole topology which in turns can enhance the quality and fault tolerance. Initially work will start with battery resources as the prime factor in deciding the propose work and latter we will find out other dependent factors like refined routing table, topology management etc. At initial state after finding faulty nodes (Nodes with very less battery resources), these nodes will be in sleep mode and will not participate in routing process. After shredding those nodes we will proceed with other mechanisms based on time constraints.

7. Experimentation

Basic parameters used for experimentation. Some of the experimentation done for checking the behavior of TAODV protocol are given below:

Parameters	Value
Simulator	OPNET
Simulation Time	900
No of nodes	50
Routing Protocol	AODV, TAODV
Traffic Model	CBR
Pause Time	100 sec
Speed	11 mps

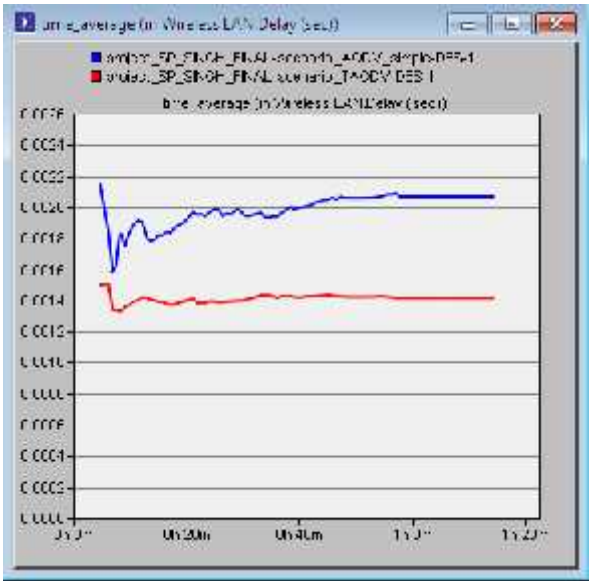

Figure.1. Delay comparison of AODV and TAODV with Delay variation.

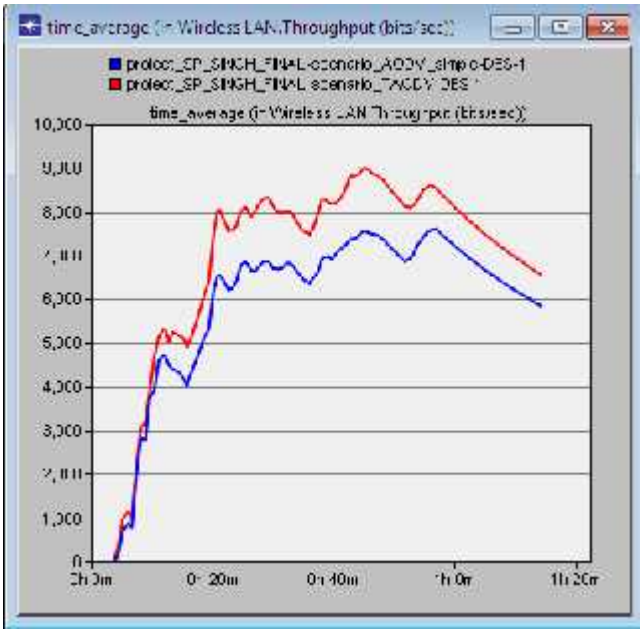

Figure.2. Throughput variation of AODV and TAODV

The variation of the throughput from AODV and TAODV scenario.

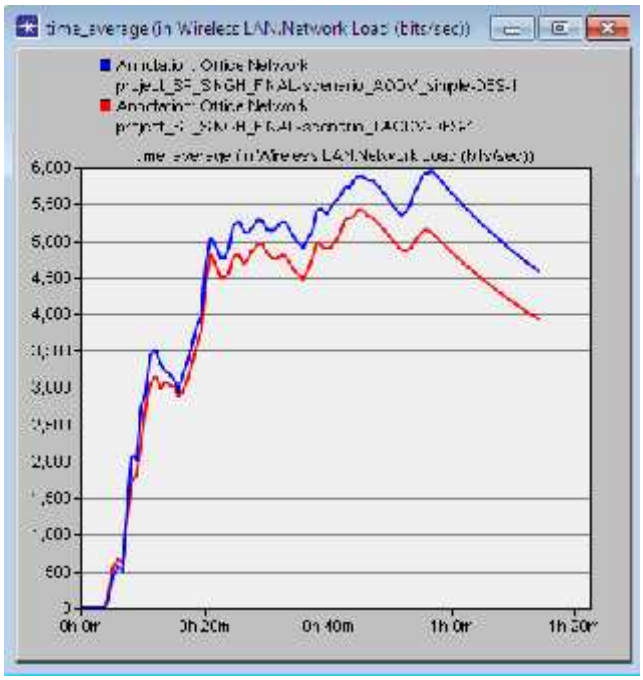

Figure.3. Network Load of AODV and TAODV

The variation of the network load of AODV and TAODV scenario

In above experimentation we have considered AODV and TAODV protocol with 50 mobile nodes and application Traffic used is HTTP. Tie on demand based protocol provides good improvements as compared to normal AODV. TAODV has been implemented and simulation shows the variation in throughput (Figure.2) and delay (Figure.1) in both cases. At initial stage throughput is same but as network progresses, performance increases continuously in case of TAODV.

7. Conclusion

This Research is our continuous study and we will find the better results in preventing faults by introducing energy level concept and will include the cluster approach to provide quality of service. This Research is still in process and experimentation in running phase to test the developed algorithm on Mobile Ad-hoc Networks. A new concept has been developed which can provide both quality and fault tolerance.

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