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An Adaption of Reactive Measure for Enhancement and performance characterization of routing protocol under different traffic source

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ABSTRACT

Mobile Ad-hoc Network (MANET) is autonomous self organized infrastructure less network of mobile nodes connected by wireless link. For end-to-end communication traffic and mobility scenarios play an important role In MANET, as it support continuous changing network topology, often causing failures in data transfer. Additionally, the failures happen when the signal congestion is high in the M ANET; the efficiency of data transfer therefore decreases. Thus, routing in M ANET with high speed movement and high signal congestion is challenging. in this article, we present AODV - ACARP algorithm which use cross layer technique that calculate availability of channel at the link-layer .thus are propose algorithm introduces an enhancement and give better result then existing AODV .thus his article also compare with other existing reactive DSR and pro-active DSDV routing protocol. The major objective of this protocol is to provide assurances of reliability of proper channel utilization and reduce the number of control bits per data bit transmitted. In this protocol, each node maintains a counter that represents the current status of neighbour at each node which are in active state. The counter value is adaptively adjusted based on the packet delivery ratio. This results in less energy consumption and reliability in the network-wide communication. By simulation results, under different traffic consideration we show that the proposed protocol shows better result in term of normalize routing load, Average End-to-End delay, and packet delivery fraction. For our simulation we used a discrete event simulator known as Network Simulator version 2.34.

Keywords

MANET, Mobility, AODV-ACARP AODV, DSR, DSDV, TCP, CBR, NS2

1. INTRODUCTION

A Mobile Ad-Hoc Network (MANET) is a set of wireless mobile nodes which forms a temporary infrastructure-less network and does communicate with each other and support de-centralized administration. Quick and easy deployment of ad-hoc network makes them feasible to use in battlefield environments, disaster relief and conference. In MANET, nodes can move independently thus, each node function as a router and forward packet. Due to high node mobility network topology changes frequently. Therefore, routing in ad-hoc network becomes a more challenging task. Therefore it become recent research area in MANETs, Many routing protocol and their algorithm have proposed in the RFC 4728[1], RFC 2501[2] for ad hoc network for finding routes, as it is in the literature[3][4][5], with the advance of wireless communication low cost and powerful trans-receiver are widely used in mobile application. The main aim of this paper is to perform comparative analysis between reactive and proactive routing protocol, they are Ad hoc on Demand Distance Vector (AODV) [6], Dynamic Source Routing (DSR) [7] are reactive and Destination Sequence Distance Vector (DSDV) [8] are proactive routing protocol, in variable pause time for a constant number of nodes to bring out their relative advantages. The main objective is to understand their internal mechanism of working and suggest in which situations where one is preferred than the other.

2. DESCRIPTION FOR ROUTING PROTOCOL FOR AD-HOC NETWORK

2.1 Ad-Hoc on Demand Distance Vector (AODV)

The Ad-hoc On-demand Distance Vector routing protocol [3, 4, and 6] is a reactive protocol that enables multi-hop routing between the participating mobile nodes wishing to establish and maintain an ad-hoc network.

Different types of messages have been used in AODV to discover and maintain links. Whenever a node wants to try and find a route to another node it broadcasts a Route Request (RREQ) to all its neighbors. The RREQ propagates through the network until it reaches the destination or the node with a fresh enough route to the destination. Then the route is made available by uncasing a RREP back to the source.

The algorithm uses hello messages (a special RREP) that are broadcasted periodically to the immediate neighbors. These hello messages are local advertisements for the continued presence of the node, and neighbors using routes through the broadcasting node will continue to mark the routes as valid. If hello messages stop coming from a particular node, the neighbor can assume that the node has moved away and mark that link to the node as broken and notify the affected set of nodes by sending a link failure notification (a special RREP) to that set of nodes.

2.2 Dynamic Source Routing (DSR)

DSR is a reactive routing protocol i.e. determines the proper route only when packet needs to be forwarded [4, 7]. For restricting the bandwidth, the process to find a path is only executed when a path is required by a node (On-Demand Routing). In DSR the sender (source, initiator) determines the whole path from the source to the destination node (Source-Routing) and deposits the addresses of the intermediate nodes of the route in the packets. Compared to other reactive routing protocols like ABR or SSA, DSR is beacon-less which means that there are no hello-messages used between the nodes to notify their neighbors about their presence. DSR is based on the Link-State-Algorithms which mean that each node is capable to save the best way to a destination. Also if a change appears in the network topology, then the whole network will get this information by flooding. The DSR protocol is composed of two main mechanisms that work together to allow discovery and maintenance of source routes in MANET.

Route Discovery: When a source node S wishes to send a packet to the destination node D, it obtains a route to D. This mechanism called Route Discovery. The procedure of Route Discovery is used only when S attempts to send a packet to D and has no information of a route to D.

Route Maintenance: When there is a change in the network topology, the existing routes can no longer be used. In such a scenario, the source S can use an alternative route to the destination D, if it knows one, or invoke Route Discovery. This is called Route Maintenance.

2.3 Destination sequence distance vector

In DSDV [8] routing messages are exchanged between neighboring mobile nodes. Routing updates are triggered in case routing information from one of the neighbors forces a change in the routing table. The entry of data packet for which the route to its destination is not known is cached while routing queries are sent out. The packets are cached until route-replies are received from the destination. There is a maximum buffer size for caching the packets waiting for routing information beyond which packets are dropped.

The main contribution of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. Routing information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently. If a router receives new information, then it uses the latest sequence number. If the sequence number is the same as the one already in the table, the route with the better metric is used. Stale entries are those entries that have not been updated for a while. Such entries as well as the routes using those nodes as next hops are deleted.

3. DESCRIPTION OF PROPOSED AODV-ACARP

This article presents AODV-ACARP (Ad hoc on demand distance vector with adaptive channel availability reliable routing protocol), which is an improvement of AODV routing protocol to effectively use for MANET applications, where nodes travel rapidly and where the channel density is higher. The speed and reliability of communication application mode data transmission are focused in our proposed work.

3.1 Calculation of Channel Availability

In ad hoc network every node chooses an equally distributed random time interval known as conversation interval. If a node broadcast a message ,then each node will receives the message that lie in their transmission path and then nodes forwarding the message take place that are connected at least by that path . Therefore in dynamic with the conversation protocol can made almost all nodes in a network to receive the message. If all node in a network go to sleep with probability p, all the active node almost stay connected without using the network connectivity. A node that wish to communicate maintain control variable C which represent active node to the current number of neighbor at each node. The higher C represents the more power the node uses to send messages make communication more reliable. The network of can be in active mode p or sleep mode 1-p state. Suppose when source node X needs to broadcast a data packet, X looks up its neighbor list for the distance between itself and its neighbors numbered C. X then calculates the amount of power needed to send the packet to that neighbor. Initially, every node initializes C to one. This means that a node initially broadcasts data packets only to its closest neighbor, thus requiring the least power. After sending data packet, node X waits for a feedback from destination. While receiving packets at the destination, the successful delivery of data packet D is calculated and it will be sent as a feedback to the source. If X hears a feedback D for the data packet below a reliability threshold RTH, X increases the value of C there by increasing the probability of active nodes. These assure the increase in successful delivery of data packet and thus increase the power consumption. When D becomes greater than or equal to RTH, the value of C is decreased adaptively to decrease the number of forwarding nodes and there by decrease the probability of active nodes which will reduce the power consumption. This process continues until either X hears a feedback for the packet or the value of C reaches reliability threshold RTH, which is determined by the total number of neighbors.

The major objective as proposed in this protocol is to achieve channel efficiency by putting some nodes in a sleep mode, and thus the simulation result reveal under different network condition that our proposed reactive routing protocol perform better result then other reactive routing protocol (such as AODV ,DSR) and proactive routing protocol(DSDV).

4. MOBILE AD-HOC NETWORK PERFORMANCE METRICS

Performance of proposed protocol is evaluated using the following metrics:

4.1 Packet delivery ratio-

Packet delivery fraction is the ratio between the numbers of packets originated by the CBR sources to the number of packets received by the CBR sinks at the final destinations.

4.2 Average end-to-end delay of data packets-

This includes delays caused by buffering of data packets during route discovery, queuing at the interface queue, retransmission delays at the MAC.

4.3 Normalized routing load (NRL)-

NRL is the number of routing packets transmitted per data packet delivered at the destination.

This simulation analysis is made from the graph sources. Here we analyze various parameters with respect to varying pause times.

5. SIMULATION SETUP

For simulation we have used NS-2.34[9, 10] which is a discrete even simulator in the platform Linux Ubuntu 11.10. We have generated 36 scenarios (6 for each mobility scenario) and four traffic patterns with varying number of sources for each type of traffic (CBR and TCP). The simulation is run using these scenarios and traffic patterns for both these protocols. To overcome the effect of randomness in the output we have taken the averages of the results to get their realistic values. We have varied mobility and the number of sources to measure their performance. Simulations are carried out by varying the number of speed 1, 5, 10, 15, 30 and 50 (meter/second). The simulation results reveal some important characteristic differences between the routing protocols. The different basic internal working mechanism leads to the performance differences in the protocols.

6. SIMULATION AND PERFORMANCE ANALYSIS

In this paper, we have taken two different traffic scenarios CBR and TCP with different pause time. Simulation analysis has been made between AODV, DSDV, DSR and AODV-ACARP protocols. Identical mobility pattern are used across protocols to gather fair results.

6.1 Simulation Parameters for CBR and TCP Scenario

In the first scenario, we have chosen the simulation based on CBR traffic pattern. Parameters of this scenario are summarized in TABLE I. CBR sources are used that started at fixed Pause times with different mobility (m/s)

TABLE I

S. No.	Parameter	Value
1	Routing Protocols	AODV,DSR and DSDV
2	MAC Layer	802.11
3	Terrain Size	1500x1500
4	Nodes	60
5	Node Placement	Random
6	Mobility Model	Random Way Point
7	Data Traffic	CBR , TCP
8	Simulation Time	200 second
9	Pause Time	10
10	Mobility	1,5,10,15,30,50 m/s
12	Connection rate	3 packet/second

Here, TCP sources are used which use flow and error control with retransmission feature. The channel capacity we used in our simulation for mobile host is 2Mbps. the distributed coordination function (DCF) of IEEE 802.11 MAC layer protocol (for wireless LANs) is used. It has the functionality to notify the network layer about link breakage. In the simulation, mobile nodes move in a 1500 meter x 1500 meter region for different speed. The number of mobile nodes is kept as 60. We assume each node moves independently with the same average pause time. All nodes have the same transmission range of 250 meters .The simulated traffic is Constant Bit Rate (CBR) and TCP. The pause time of the mobile node is kept as 10 sec.

7. RESULTS AND PERFORMANCE COMPARISION

Performance of routing protocols is evaluated under both CBR and TCP traffic pattern.

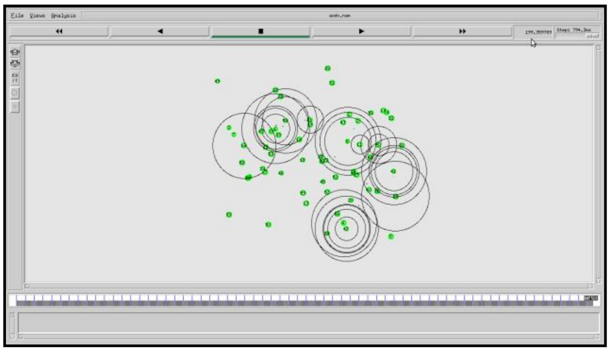

Figure1. shows the simulation topology of 60 mobile nodes that does the communication by sending the data packet to the node which is in active mode.

7.1 Normalized Routing Load-

Performance of proposed protocol AODV-ACARP, and other protocol such as AODV, DSR and DSDV are evaluate under different traffic consideration such as CBR and TCP traffic, So from the analysis of CBR and TCP traffic, both reveal that are proposed protocol AODV-ACARP require much less control bit per data bit transmission then AODV .And also are proposed protocol give far better result then other reactive protocol (like DSR) and pro-active protocol (like DSDV see figure 1).

As the analysis of the experiment have been taken from highly congested network (i.e. of high load and mobility condition).Thus are proposed protocol AODV-ACARP give better result.

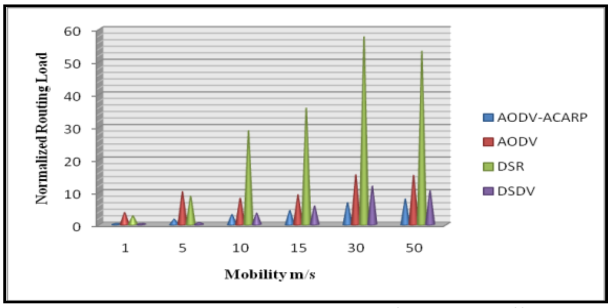

Figure2. Normalized Routing Load for CBR Traffic

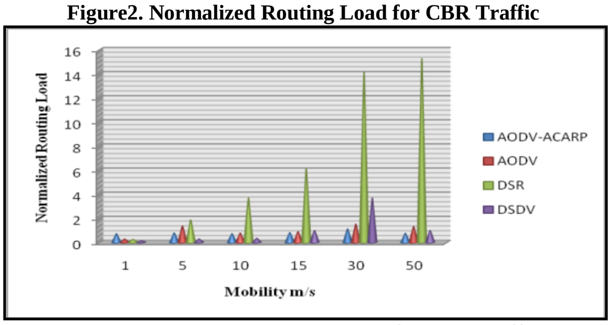

Figure3. Normalized Routing Load for TCP Traffic

7.2 Average End-End-Delay-

In CBR Traffic Average end-to-end Delay of are proposed routing protocols AODV-ACARP is much less as compared to reactive routing protocols (AODV and DSR see figure 3) and pro-active routing protocol (DSDV).

In case TCP traffic still Average end-to-end Delay of AODV-ACARP have delay compared to CBR traffic because of three way handshaking mechanism. But still are proposed protocols less Average end-to-end delay then AODV and also have much less delay then other protocol (such as DSR,DSDV see figure 4).

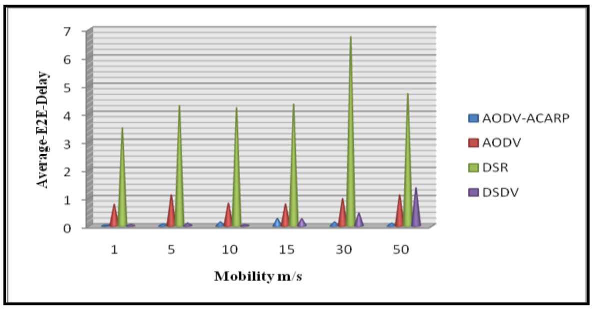

Figure 4. Average End-End-Delay Load for CBR Traffic.

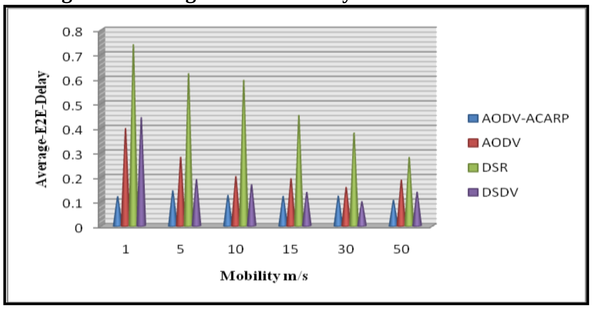

Figure 5. Average End-End-Delay Load for TCP Traffic

7.3 Packet Delivery Fraction-

For CBR Traffic, (see figure 5) our proposed routing protocol AODV-ACARP give 100% packet delivery at mobility 1 m/s, as the mobility increases in highly congested network still our proposed AODV-ACARP give far better packet delivery ratio then AODV and also from other routing protocol (such as DSR,DSDV see figure 5).

But in TCP Traffic our proposed AODV-ACARP give better packet delivery ratio then AODV at all mobility, but at mobility (15 and 50 m/s) give better delivery then DSR and DSDV.

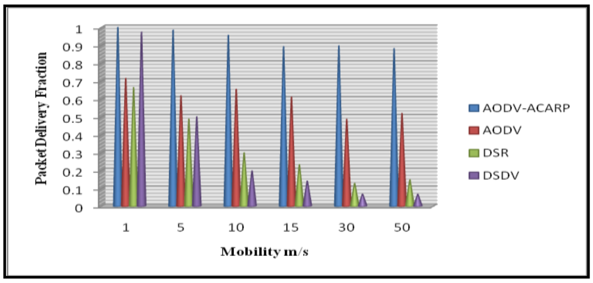

Figure 6. Packet Delivery Fraction for CBR Traffic.

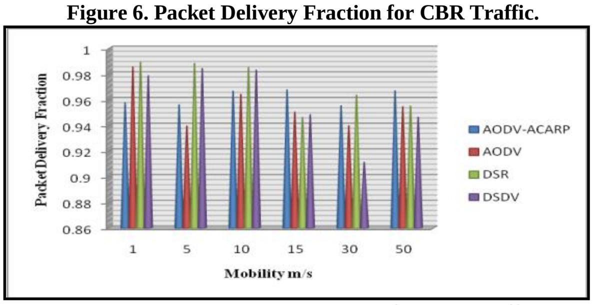

Figure 7. Packet Delivery Fraction for TCP Traffic

8. CONCLUSION

In this paper, we have proposed a reactive Ad hoc on demand distance vector with adaptive channel availability routing protocol(AODV-ACARP) examine the performance differences of other reactive (AODV, DSR) and proactive (DSDV) routing protocol for mobile ad-hoc networks in different mobility.

Thus are simulation result under different CBR and TCP traffic consideration give the assurance of our proposed routing protocol AODV-ACARP give better packet delivery and require less Average end-to-end delay as well as less normalized routing load

In future, different node placement strategy, more sources, additional metrics such as residual energy, sending and receiving throughput may be used.

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