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Energy Aware AODV: A modified Algorithm

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ABSTRACT: Ad-Hoc On-Demand Distance vector Routing Protocol (AODV) is a Reactive Mobile Ad-Hoc Network (MANET) protocol which is used for routing packets from source to destination. Multiple instances have been made to analyse its effectiveness and modify it in such a way that it functions more efficiently. In this paper, we put forward a modified AODV algorithm, such that it drops the nodes with zero energy out of the routing mechanism, and give our results and analysis.

I. INTRODUCTION

Ad Hoc on Demand Distance Vector (AODV) routing protocol is a reactive protocol, that is, it establishes the connection with a node when required. It is required for wireless networks where nodes have to be linked when needed. It is based on route discovery and maintenance where sequence number is used to check if the routing table is updated or not. [1] It begins by broadcasting the route request packets (RREQ) from the source node to the neighbours. The neighbours further broadcasts the packet if they do not have information about the destination. Due to this, multiple copies of route request packet might be delivered to a single node for which unique id is assigned to the route request packet. Only one packet of a single route message would be held by a node. The nodes which have information about the destination respond with a reply packet (RREP) to the source node through the same path they received RREQ. This path from source to destination is called reverse path. Network latency is quite high as most routes are formed on demand. [2]

Since the RREQ packets are sent on demand, each node has to maintain broadcast id and sequence number for each node. Broadcast id is incremented each time when source needs to send packet to the destination. The RREQ packet contains :-

- destination address
- destination sequence
- source address
- source sequence
- hop count [3]

Each node has to maintain a routing table which contains the following fields.

- Number of hops
- Next hop
- Destination address
- Neighbours
- Timer
- Sequence number [4]

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Paper[5] gives an idea of the performance of protocols DSDV, AODV and DSR based on metrics such as throughput, packet delivery ratio and average end-to-end delay by using the NS-2 simulator(50,75 and 100 nodes) but we focus on the performance of AODV routing protocol

Throughput is ratio of the total amount of data that reaches a receiver from a sender to the time it takes for the receiver to get the last packet. As read in the paper, the throughput value of AODV slowly increases at firstand maintains its value when time increases even if the number of nodes are increased from 50 to 100.

Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted by a trafficsource and the number of packets received by a traffic sink. It measures the loss rate as seen bytransport protocols. The paper tells us that packet delivery ratio shows both the completeness and correctness of the routing protocol and AODV has the highest PDR value, thus it being the most reliable.Average End-to-End delay is the average time that a packet takes to traverse the network. It is found that as AODV routing protocol needs to find route by on demand, End-to-End delay is higher than other protocols.Thus, when the network load is low, AODV performs better in case of packet delivery ratio but it performs poorly in terms of End-to-End delay and throughput.

Paper[6] explains the performance of protocol AODV by using threeperformance metrics: packet delivery ratio, average end to end delay and routing overhead based on NS-2 simulation of 50 nodes. AODV is seen to have a packet delivery ratio of 97% to 99% at the start of the simulation i.e. at pause time 0 and reaches 100% when pause time is 200. The routing overhead of AODV is found to vary a lot and is unstable. It decreases sharply with increase in pause time from 0 to 100, then increases for a bit and then again decreases. The average end to end delay of AODV is also found to be high.

Paper[7] provides performance analysis of AODV routing protocol based on performance metrics: Packet Delivery Fraction (Pdf), End to end delay and Normalized routing load while varying number of nodes, speed and pausing time. AODV is found to have a higher routing load that doesn't vary much with increase in the number of nodes. AODV has the minimal end to end delay as it has only one route per destination in its routing table. The packet delivery fraction of AODV is analysed to be low as compared to other protocols.

This paper proposes a modified AODV algorithm that works by taking into account the energy and routing accordingly, avoiding nodes with zero energy.

II. IMPLEMENTATION OF MODIFIED AODV

A. Pseudocode

1) If A (source) wants to send data to B (destination) then
2) AODV ( ) finds a route between A and B
3) For (each node between A and B)
4) Record energy of each node by Energy Model & Manage the routing table with an additional parameter node energy
5) When any node receives a packet
6) If (Node Energy >nil)
7) Forward the packet to next hop
8) Else
9) Drop the packet and exclude that node from the routing table and call the AODV again

B. Explanation

A step-wise explanation:

- In TCL file-We have added energy model to the code. We have provided initial energies to all the nodes. We have also set the energy consumption in sending packets, receiving packets and being idle.
- In AODV.h file – We have declared the variables that we will use in aodv.cc to record a node's position and energy.

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- In AODV.cc file – We initialize the variables that we declared in aodv.h. The node position and energies are recorded each time a packet is forwarded.

These modifications lead to a new optimized routing protocol. The results are given in further sections.

C.SIMULATION

Table 2.1 Preconditions of Simulation

Parameter	**Value**
Channel Type	Channel/WirelessChannel
Radio-Propagation Model	Propagation/TwoRayGround
Network Interface Type	Phy/WirelessPhy
MAC Type	Mac/802_11
Interface Queue Type	Queue/DropTail/PriQueue
Link Layer Type	LL
Antenna Model	Antenna/OmniAntenna
Max Packet in IFQ	50
Number of Mobile Nodes	8
X Dimension of Topography	500
Y Dimension of Topography	400
Time of Simulation End	200
Initial Energy in Joules	10

Fig. 2.1 Screenshot 1 of Network Animator Simulation

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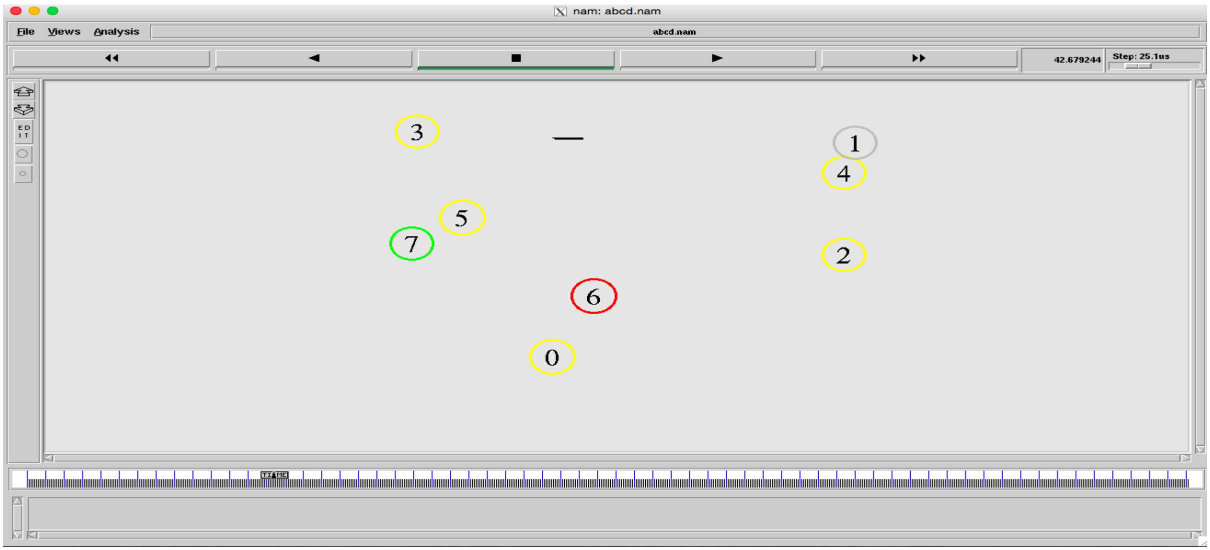

Fig. 2.2 Screenshot 2 of Network Animator Simulation

III . RESULTS

The algorithm proposed in this paper gave the following results:

Table 3.1 Modified AODV Results

Parameter	Result(30 sec)	Result(60 sec)	Result(90 sec)	Result(120 sec)
Generated Packets	4820	2928	14793	16307
Received Packets	4800	2885	14773	16271
Packet Delivery Ratio	99.5851	98.5314	99.8648	99.7792
Total Dropped Packets	3	13	18	8
Average End-to-End Delay	71.0971ms	193.961 ms	56.3501 ms	85.2554 ms
Throughput	680.32 kbps	680.30 kbps	680.04 kbps	560.90 kbps

IV. COMPARISON WITH AODV

Original AODV has following results:

Table 4.1 Original AODV Results

Parameter	Result(30 sec)	Result(60 sec)	Result(90 sec)	Result(120 sec)
Generated Packets	1504	3288	14798	10702
Received Packets	1484	3268	14778	10567
Packet Delivery Ratio	98.6702	99.3917	99.8648	98.7386
Total Dropped Packets	4	9	17	55
Average End-to-End Delay	177.395 ms	197.023 ms	64.4346 ms	76.3191 ms
Throughput	227.32 kbps	227.49 kbps	680.99 kbps	366.36 kbps

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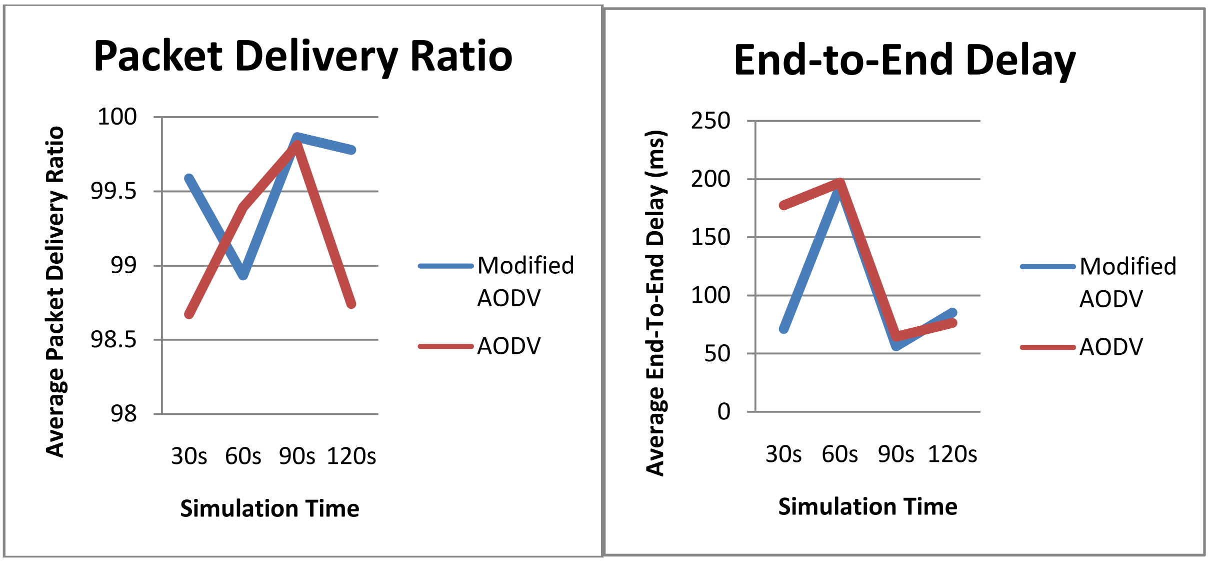

Fig. 4.1 Comparison graphs wrt. Packet Delivery Ratio and End-to-End Delay

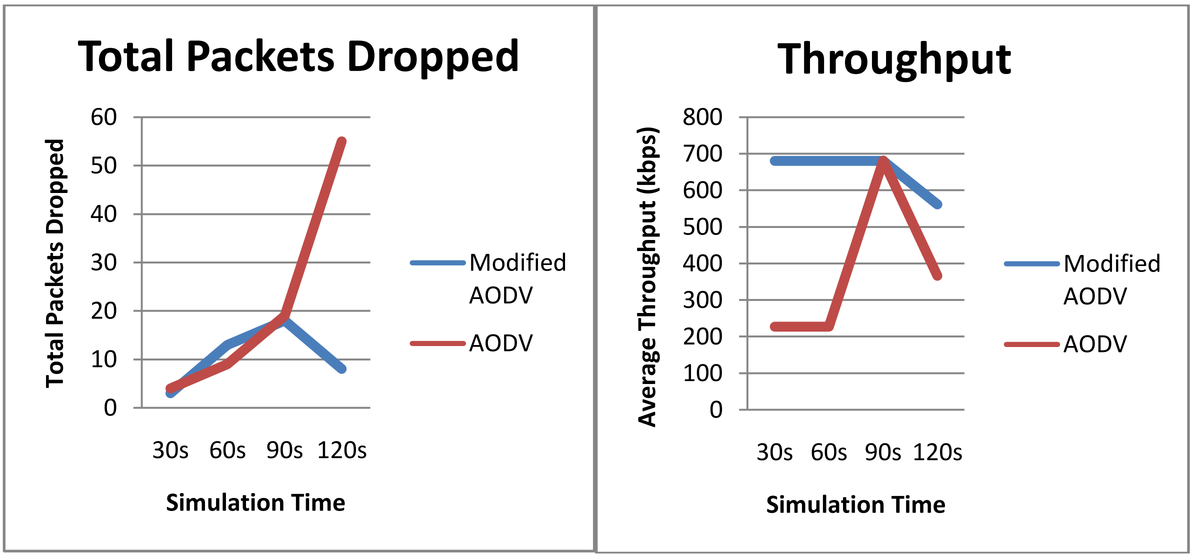

Fig 4.2 Comparison graphs wrt. Total Packets Dropped and Throughput

V. CONCLUSION

The proposed modified AODV Algorithm given forward in this paper shows better results than the original AODV, with marked improvement is packet delivery ratio, throughput and end-to-end delay.

VI. RELATED WORK

The algorithm can be further modified in such a way that it outperforms other efficient MANET protocols. It can also be analysed for various attacks such as grey hole and wormhole attacks.

REFERENCES

[1] Mina VajedKhiavi, ShahramJamali, SajjadJahanbakhshGudakahriz, Performance Comparison of AODV, DSDV, DSR and TORA Routing Protocols in MANETs

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 3, Issue 4 , April 2016

[2] S H Manjula, C N Abhilash , Shaila K, K R Venugopal, L M Patnaik, Performance of AODV Routing Protocol using Group and Entity Mobility Models in Wireless Sensor Networks
[3] Prof. B.N. Jagdale, Prof.PragatiPatil, Prof. P. Lahane, Prof. D. Javale, Analysis and Comparison of Distance Vector, DSDV and AODV Protocol of MANET
[4] Charles E Perkins, Elizabeth M Royer, Ad_hocOn_Demand Distance Vector Routing
[5] P. Manickam, T. Guru Baskar, M.Girija, Dr.D.Manimegalai, Performancecomparisonsofrouting protocols in mobile Ad-Hoc networks
[6] Aasthakohli, Sukhbir , A Review paper on Routing Protocol Comparison
[7] AmithKhandakar , Step by Step Procedural Comparison of DSR, AODV and DSDVRouting protocol