The Enhancement of DSDV with ACO Approach Technique

Harmeet Kaur[1] Maninder Singh[2]
[1]M. Tech Student [2]Lecturer
[1,2]Department of Electronics and Communication Engineering
[1,2]Haryana Engineering College, Jagadhri

Abstract— Mobile Ad hoc Networks (MANETs) are accumulation of mobile nodes they are dynamically forming a temporary network without the guide of any infrastructure and centralized control. All the routing data are managed by node itself. Routing in MANET depends upon intermediate nodes. Main source of power for nodes are batteries in the MANETs. Nodes consume power mainly because of transmission of packets and receiving of packets and mobility etc. If a mobile node fails due to failure of power, then this will not only affects the node but additionally its capacity to forward packets on behalf of others and hence overall network lifetime. The mobile nodes are powered by batteries, so to replace or recharge them is not possible. In this paper we proposed DSDV-ACO which consumes less energy and give better throughput as compare to DSDV. Here we used the concept of MBCR (Minimum Battery Cost Routing) which uses the nodes which have sufficient energy to expand the lifetime of the network.

Key words: MANET, ACO, DSDV, Routing, Phromone trails, NS2

I. INTRODUCTION

A. *Mobile Ad Hoc Networks (MANET)*

The Mobile ad hoc networks are the network which contains nodes without framework. The network over radio connections are created because of the self-organization of the mobile nodes. Particular routing protocols are required for setting up routes among the nodes. The variation between the wireless characteristics and nature of network topology is because of the high mobility of ad hoc networks. Mobile ad hoc network can be installed effectively anyplace and at whatever time. Military situation,

Disaster relief and discovery is a portion of the use MANETs. Remotely coordinating and information spread services are gathering related applications of the MANETs.

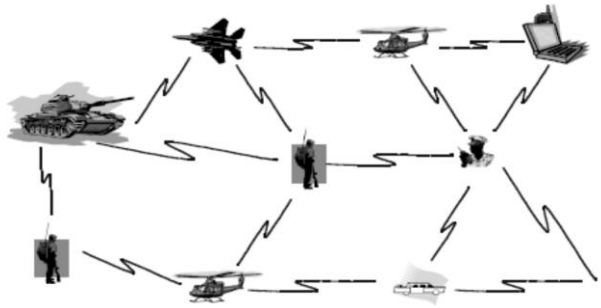

Fig. 1: Basic structure of MANET

As appeared in the figure the wireless node might be physically a man, a vehicle, or a plane, computer, mobile and ought to have the capacity to enable wireless communication among them.

B. *MANET Routing Protocol*

MANETs have protocols which are grouped into three classifications: (1) table driven or proactive protocol (eg. DSDV) which keeps up to date data of nodes for fixed interval of time.

(2) On demand or reactive routing protocols (eg. ad hoc on demand vector routing protocol) build up routes according to requirement. (3) Hybrid protocol (eg. ZRP) are combination of reactive and proactive routing protocol.

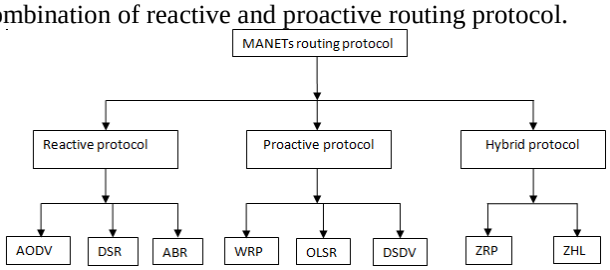

Fig. 2: Basic routing protocols of MANET

Numerous protocols have been composed according to applications. It is important to plan a scalable, efficient and adaptive protocol which can settle in critical situations. The main targets of designing new protocol are to discover a way from source to destination fulfilling user's requirement.

C. *Ant Colony Optimization (ACO)*

The essential thought of the ant colony optimization Meta heuristic is taken from the food searching behavior of real ants. Figure demonstrates a situation with two routes from the nest to the food. At the interaction, the main ants randomly select next branch. And the route below is shorter than the upper route; the ants which take this way will reach the food place first.

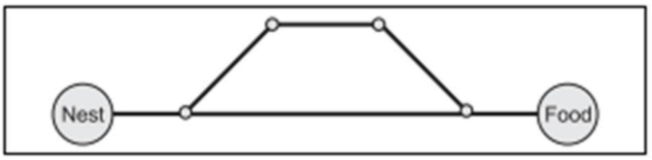

Fig. 3: All Ants Take the Shortest Path after an Initial Searching time

On their way back to nest, the ants again need to choose a path. After some time the intensity of pheromone on the shorter path will be higher than on longer path, because the ants using the shorter way will expand the pheromone concentration speedier. The shortest way will along these lines be recognized and all ants will just use this one. This behavior of the ants can be utilized to find shortest path in the networks. Particularly, the dynamic component of this technique permits a high adaptation to changes in mobile ad hoc network topology, since in these networks the presence of connections are not ensured and link changes happen all the time.

D. *Destination Sequenced Distance Vector (DSDV)*

This algorithm uses the routing table like a Distance vector however each routing table entry is labeled with sequence number, created by destination. To keep up consistency among routing tables in a dynamically differing topology,

updates are transmitted periodically. Every mobile station advertizes its own routing table to its present neighbors. Routing data is promoted by broadcasting or multicasting. Packets are transmitted between the nodes utilizing routing tables stored at every node. Each routing table records every single accessible destination and the number of hops to every destination. For every destination, a node knows which of its neighbors leads to the shortest way to the destination. The route-update messages demonstrate which nodes are available from every node and the number of hops to contact them. The hop count is the separation between two nodes.

Data broadcast by every mobile computer will contains

1) New sequence number
2) Destination IP address
3) Number of hops required to achieve the destination
4) Sequence number of data received with respect to that destination

II. LITERATURE SURVEY

R. Asokan et. al (2008) This paper proposes a QoS empowered Temporally Ordered Routing Algorithm (TORA) protocol utilizing Ant Colony Optimization (ACO) called AntTORA. ACO method is utilized as a part of this protocol to optimize different QoS routing metrics like postponement, jitter and energy. Ant like operators is utilized as a part of this algorithm to find and keep up ways with the predetermined QoS requirements. The execution of TORA and AntTORA are analyzed using NS 2. AntTORA delivers better performance over TORA in the terms of end-to-end delay, jitter, energy and throughput.

Yong Min Kim et. al (2011) An ACO based energy saving routing in this letter proposes an A-ESR for the energy efficient networks. The A-ESR algorithm firstly re-formulates energy utilization minimized network (EMN) issue, which is NP-finished, into more straight forward one by utilizing the idea of traffic centrality. After this, it takes care of the re-formulates issue by (a) letting flow to self-rulingly be collected on some particular heavy-loaded links and (b) exchanging off the other light-loaded connections. The results demonstrate that An ESR algorithm can show signs of quick execution than past works.

S. Soundararajan et. al (2012) Keeping in mind the end goal to beat the issues an effective multi-way routing protocols ABMRLBCC (Ant Based Multi-path Routing for Load Balancing and Congestion Control) taking into account Ant Colony Optimization is proposed. The multipath routing algorithm sets up way just when it is required toward the start of an information session. The forward ants are propelled by the source to discover multiple ways to the destination and in reverse ants give back the source to set up the ways. A reactive way is set up by forward ant which gives routing data of a node. The best way for every ant is chosen based upon the (1) number of hops and (2) travel time. The proposed plan has been experimented with NS2 and results demonstrate that the proposed approach output as far as better packet delivery ratio and less end-to-end delay.

Rajanigandha Metri et. al (2012) Mobile ad hoc network makes accessible different ways for information transmission, however it is important to pick most effective way and give better Quality of Service (QoS). Because of successive development and arrangement of element associations in MANET, it is trying to keep up nature of administration. This QoS is assessed utilizing execution grids, for example, end to end delay, data transfer capacity, throughput, likelihood of packet loss, delay change (jitter) and so on. Another protocol QoS enabled ACO based multipath routing protocol (QAMR) is proposed taking into account an ant colony optimization algorithm which gives conceivable way out of different ways for information transmission. This algorithm is versatile, scalable and effective. The execution is assessed by looking at QAMR protocol and AODV protocol utilizing network simulator.

Tarun Varshney et. al (2014) The target of this paper is at depicting an upgraded technique to set up an ideal way between couples of nodes and detect the misbehaved (selfish, inadequate) nodes in MANET. This enhances the execution of routing protocols on the grounds that in greater part of the poor performing organizes; the misbehaving nodes are the real cause. To locate an ideal way between an arrangement of nodes, DSR protocol has been sent (using the NS2 simulator) followed by the use of Genetic Algorithm in recognizing the selfish nodes. Since misbehaving node(s) are effectively identified, it demonstrates that the proposed methodology is ideal and efficiently enhances the execution of DSR protocol essentially. However, sometimes the routes discovered by GA are not a definitive best routes consequently to doubly guarantee the greatest optimality in the route discovered, ACO (Ant Colony Optimization) has been utilized.

Saptarshi Banerjee et. al (2015) In this paper the author presented reactive power-balanced routing algorithm for mobile and multi-hop ad-hoc networks. The protocol depends on swarm intelligence and particularly on the ant colony based meta-heuristic. These approaches attempt to map the solution capacity of swarms to numerical and engineering issues. The proposed routing protocol is exceptionally versatile, effective and adaptable. The primary objective in the configuration of the protocol is to diminish the overhead to route. Our simulation results demonstrate that the proposed routing protocol is essentially different from the existing protocols.

Ravinder Kaur et. al (2016) In the proposed work the focus is given under the most optimized way to send information from source node to the destination node. The optimization is finished by considering over the energy of the nodes, pheromone levels of the ways and the Euclidean separation of the ways. This paper characterizes execution of enhanced ACO and examination of its execution with ACO routing algorithms is done regarding packet delivery proportion, energy level and throughput. Execution of our algorithm in comparison of ACO is better.

III. PROPOSED WORK

A. Problem Formulation

The overall lifetime of the whole ad hoc network can be expanded by enhancing the power consumption balance among the nodes and connection of network. In most existing protocols, a mobile node may consume all its energy to take part in the operation without considering the remaining energy.

The Energy Efficient Routing Algorithms are not just to minimize the total energy consumption of route however to increase the lifetime of the network. In Ad hoc networks mobile nodes are by restricted limit batteries. Power disappointment of a mobile node affects not only the node as well as its capacity to forward packets and in this way overall network lifetime. In Ad hoc network the energy consumption is done in two states. At the point when nodes are transmitting or receiving packets called in active state and when a mobile node stays sit without moving yet listens to wireless medium for any possible communication requests from different nodes called inactive state. In both states the nodes consume some amount of energy. In active state the energy consumption is more than inactive state.

B. Proposed Work

We analyze Minimum Battery Cost Routing (MBCR) to develop Energy Efficient Power Aware Destination Sequenced Distance Vector(DSDV). To overcome this node's residual power, we can use cost metric in route selection. To do this, we need some optimization, so we will use ant colony optimization technique (ACO). ACO is a type of Swarm Intelligence which will be used to find the correct path to send the packets from source to destination. The ants use the routing tables to define which path to the destination they choose giving higher probability to links with higher pheromone values.

C. Simulation Parameters

The simulation results presented in this paper has been obtained using the NS2 simulator version NS-2.34.

Channel	Wireless
Antenna	Omni Antenna
Number of Nodes	50
Network Area	1100*1100
Initial Energy	100
Propagation	Radio propagation model
Routing Protocol	DSDV

Table 1: simulation parameters

IV. RESULTS AND ANALYSIS

This chapter focuses on the result and its analysis based on the simulation performed in NS-2.34 simulator. To compare the performance of DSDV and DSDV-ACO, consider the performance metrics of the network lifetime and the throughput.

The following graph shows the results:

1) Total packets sent: The total number of sent packets in case of with ACO system is 1101 and in case of without ACO are 1135 and the following graph shows the comparison of both cases.

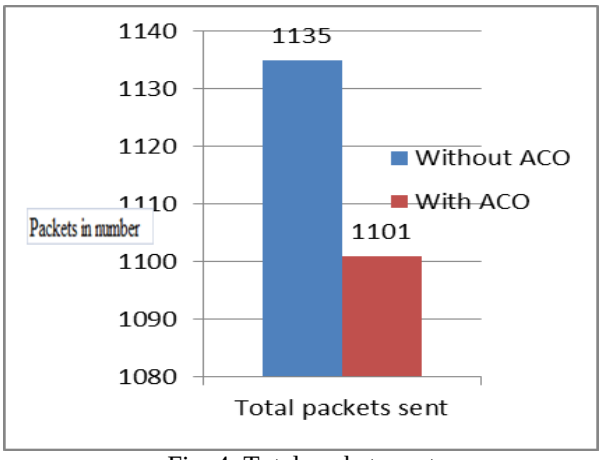

Fig. 4: Total packets sent

2) Total packets received: The total number of received packets in case of with ACO system is 1085 and in case of without ACO are 1118 and the following graph shows the comparison of both cases.

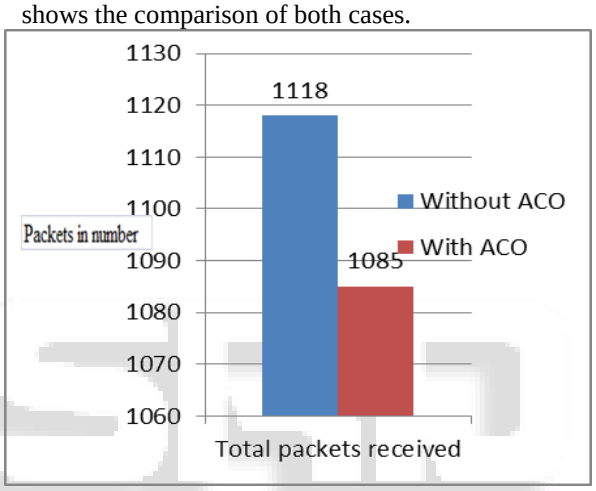

Fig. 5: Total packets received

3) Total packets dropped: Packets drop means packets lost during transmission here the following graph shows the comparison of total packets dropped in case of with ACO and without ACO.

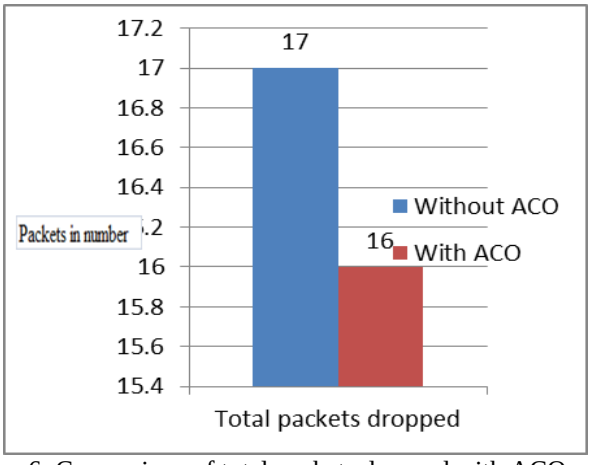

Fig. 6: Comparison of total packets dropped with ACO and without ACO

4) Average delay: Delay would be time taken by the packets to transverse from the source to the destination. The following graph shows the average delay in case of with ACO system is 0.2117 that is less than without ACO.

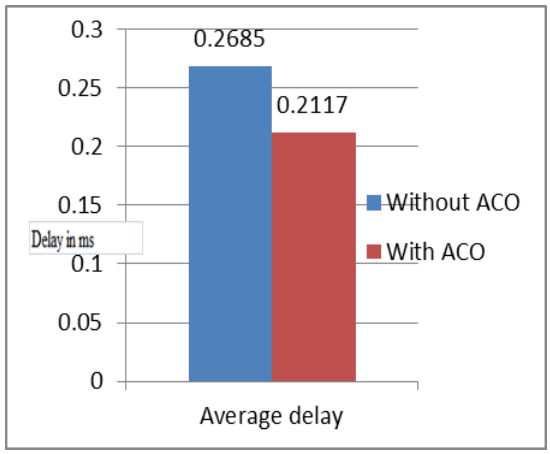

Fig. 7: Comparison of Average delay in packets with ACO and without ACO

5) Throughput: Throughput is a measure of how much the date rate (bits every second) created by the application or a framework can handle in a given measure of time. The following graph shows the throughput in case of with ACO system is 336873 that is more than without ACO.

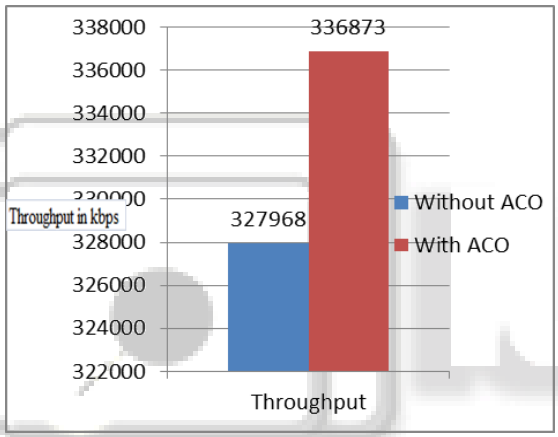

Fig. 8: Comparison of Throughput with ACO and without ACO

6) Energy: Every single cell phone will get their energy from batteries, which is a rare asset. Thusly the energy preservation assumes an important part in wireless networks. This important resource must be utilized effectively. A standout amongst the most essential framework outline criteria for optimization might be energy preservation. In other form the energy is total number of energy consumed for packets transmitted and packet receiving during the simulation.

	Node energy consumed without ACO	Node energy consumed with ACO
Total consumed energy	8.6705	8.39799
Total remaining energy	91.3295	91.602

Table 2: Total energy consumed without ACO and with ACO

1) Comparison of Node Energy Consumed Of DSDV and DSDV-ACO

The below graph shows that the total energy consumed by nodes without ACO technique and with ACO technique.

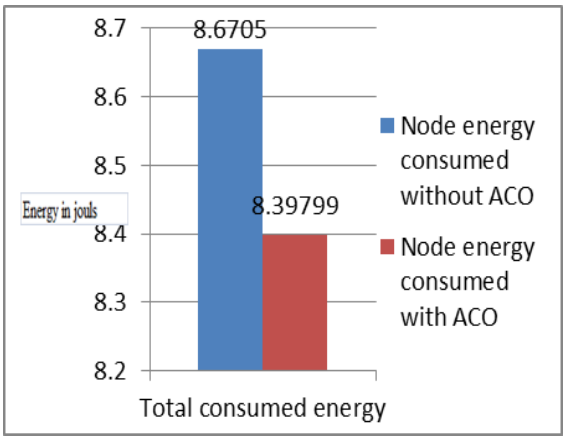

Fig. 9: comparison of total energy consumed by the node with ACO and without ACO

The above graph shows that the comparison of total energy consumed by the node with ACO technique and without ACO technique. This reflects the lifetime of the network. For better performance of the network the energy consumption must be less. The initial energy 100 Joules was supplied to the nodes in the network. The remaining energy in case of without ACO was found to be 91.3295 Joules and that in case of proposed work was found to be 91.602 Joules.

V. Conclusion

DSDV is a suitable routing protocol for managing the energy usage in MANETs. In addition, DSDV is self-built and the self-configured optimization algorithm that matches characteristics of MANETs. The algorithm has the capacity to continuously check for better paths in network with controlled overheads, which make the algorithm more appropriate for network. Simulation results demonstrate that the ability of the algorithm to find the optimum solution and to accomplish fair energy usage distribution. The network lifetime is expanded as the battery of node is additionally considered for path computation. The ACO technique used during the route discovery phase optimizes path selection. The best path gets selected by deposition of pheromone chemical on that link. It has been found that (ACO) algorithms can give better results. Simulation results demonstrate that the proposed DSDV-ACO provides reliable and power efficient routing by attaining high throughput and low energy consumption compared to DSDV protocol.

References

[1] Young-Min Kim, Student Member, IEEE, Eun-Jung Lee, and Hong-Shik Park, Member, IEEE, "Ant Colony Optimization Based Energy Saving Routing for Energy-Efficient Networks" , IEEE communications letters, VOL. 15, NO. 7, JULY 2011.

[2] S. Soundararajan , R. S. Bhuvaneswaran, "Ant Based Multi-path Routing for Load Balancing and Congestion Control in MANETs", Velammal Institute of Technology, Chennai 601204, India, Journal of Information & Computational Science 9: 12 (2012), ISSN 3365–3377.

[3] Rajanigandha Metri and Sujata Agrawal, "Performance Evaluation of ACO Algorithm Based Multirouting

Protocol to Improve QoS", International Journal of Science and Research (IJSR), ISSN (Online): 2319-7064, Impact Factor (2012): 3.358, Volume 3 Issue 8, August 2014.

[4] R. Asokan & A. M. Natarajan, "Performance analysis of Quality of Service enabled temporally ordered routing algorithm using Ant Colony Optimization in Mobile Ad Hoc Networks", Electronics and Communication Engineering Department, Kongu Engineering College, Perundurai, Erode, Tamilnadu, India, Advances in Engineering Science Sect. C (2), April-June 2008, PP 11-18.

[5] Ravinder Kaur and Surekha Rani, "Improving Lifetime of the MANETs using Enhanced Ant Colony Optimization", Department of ECE, LCET Ludhiana, Punjab, India, ISSN: 2321- 3361 © 2016 IJESC.

[6] Saptarshi Banerjee, Arnab Majumdar and Himadri Nath Saha, Modified Ant Colony Optimization (ACO) Based Routing Protocol for MANET, West Bengal, India, 978-1-4799-6908-1/15/$31.00 ©2015 IEEE.

[7] Tarun Varshney, Aishwary Katiyar and Pankaj Sharma, "Performance Improvement of MANET under DSR Protocol using Swarm Optimization", Department of Information technology ABES Engineering College Ghaziabad, India, 978-1-4799-2900-9/14/$31.00 ©2014 IEEE.

