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Role of Artificial intelligence in MANET

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***Abstract*- An adhoc network consists of wireless mobile nodes forming a temporary network without any infrastructure or centralized administration. Mobile Adhoc Networks (MANET) are self-organizing and self-configuring multihop wireless networks where the constituents of the network changes dynamically due to mobile nodes. The node in the network not only acts as hosts but also as routers that route data from/to source/destination node in the network. Each device in a MANET is free to move independently in any direction which results in change of its links to other devices frequently. Each must forward traffic unrelated to its own use and therefore be a router. Routing in MANET has been a challenging task ever since the wireless networks came into existence. The major reason for this is the dynamic nature of network topology due to node mobility. A number of protocols have been developed for accomplishing this task. Routing is the process of selecting paths in a network along which to send network traffic. In this paper, we have presented role of artificial intelligence in MANET by simulation study and comparison of the performance between two categories of routing protocols, table-driven (Proactive) and on-demand (Reactive) routing and swarm intelligence based routing protocol which is based on the Ant Colony Optimization (ACO) framework, First example of routing protocol is DSDV (Destination Sequenced Distance-Vector) from the Proactive family and the second example is AODV (Ad Hoc On-Demand Distance Vector) from the Reactive family and the third protocol taken under consideration is based on ACO. All the protocols were simulated by using NS-2 (network simulator-2) package. After analysing the results in the form of graph we analysed that swarm intelligence which is part of artificial intelligence plays an important role in improving the performance of routing protocols in MANET.**

***Index Terms*- MANET, Adhoc, AODV, DSDV, ANT Colony Optimization, NS-2.**

I. INTRODUCTION

An adhoc routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile adhoc network. In adhoc networks, nodes first discovers various routes and then finally finds the optimal path. Knowledge-based or Artificial Intelligence techniques are used increasingly as alternatives to more classical techniques to routing protocols. [7], [8] The techniques of AI are case-based reasoning, rule-based systems, artificial neural networks, fuzzy models, genetic algorithms, cellular automata, multi-agent systems, swarm intelligence, reinforcement learning and hybrid systems. Swarm Intelligence (SI) [1], [2] is an artificial intelligence technique based around on the study of collective behavior in decentralized, self-organized systems. The expression "swarm intelligence" was introduced by Beni & Wang in 1989, in the context of cellular robotic systems.

II. ANT COLONY OPTIMIZATION FOR ROUTING

ACO routing algorithms are based on the behavior of ants in nature to solve the problem of routing in communication networks. [3] It is based on the fact that certain types of ants (e.g. the family of Argentine ants Linepithema Humile) use a volatile chemical substance called pheromone to find the shortest path between their nest and food source. Ants traveling between the nest and the food source leave traces of pheromone as they move. They also follow the path with high pheromone intensity. Since shorter paths can be completed faster, they receive higher levels of pheromone earlier, attracting more ants, which in turn led to more pheromone. This process allows the colony as a whole to follow the shortest path. [12] As the main aim of routing is to find the shortest paths among various available paths. Routing was one of the early application areas of ACO. Early work on ACO routing includes the Ant-Based Control algorithm (ABC) [4] for circuit-switched wired networks and the AntNet algorithm [5] for packetswitched wired networks. Over the years, many variations and improvements of these algorithms have been proposed, as well as applications to different kinds of network [6]. The main idea behind all of these algorithms is that nodes in the network periodically and asynchronously send out artificial ants named as forward ants towards possible destination nodes of data. These ants are small control packets, which have the task to find a path towards their destination and gather information about it. Artificial ants follow and drop pheromone like ants in nature. [9], [10] The quantity of pheromone is entered in the routing tables of various nodes and is maintained locally by all the nodes of the network. They indicate the relative quality of

different routes from the current node towards possible destination nodes. [11]

III. MOBILITY SIMULATION ENVIRONMENT

We have used network simulator ns2.34 for simulation which is used widely and freely downloadable. We simulated three network routing protocols, DSDV from proactive family, AODV from reactive family and another protocol utilizing Ant Colony Optimization Technique. [11] The following parameters are taken under consideration to examine the role of artificial intelligence.

Packet Delivery Ratio: Packet Delivery Ratio in this simulation is defined as the ratio between the number of packets sent by constant bit sources (CBR) and number of packets received by CBR sink at destination.

Average End-to-End Delay: Time taken for the packets to reach the destination

Simulation Time: The time for which simulations will be run i.e. time between the starting of simulation and when the simulation ends.

Network size: - It determines the number of nodes and size of area that nodes are moving within. Network size basically determines the connectivity. Fewer nodes in the same area mean fewer neighbors to send request to, but also smaller probability of collision.

Number of nodes: This is constant during the simulation. We used 5, 10, 15, 20, 25 nodes for simulations.

IV. SIMULATION RESULT AND OBSERVATION

In this section we present our simulation efforts to evaluate and observations that compare the performance in terms of end to end delay and packet delivery fraction of the three protocols by varying the number of nodes in the simulation environment having constant bit rate.

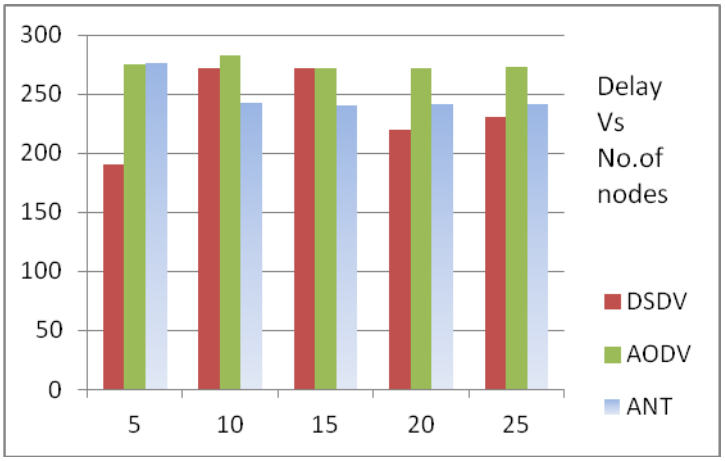

Fig.1 Comparison of end to end delay

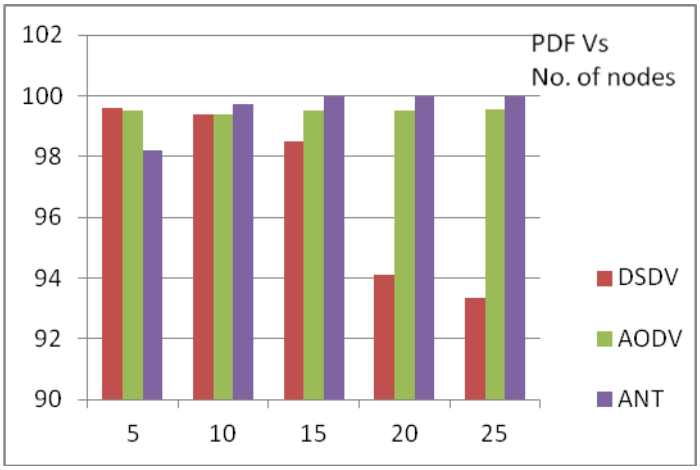

Fig.2 Comparison of Packet Delivery Fraction (PDF)

V. CONCLUSION

It has been found that as the complexity of a network increases i.e. with increase in the number of nodes, the routing protocol utilizing ant colony optimization technique proved to be efficient. The ant based routing protocol possess low delay and high packet delivery ratio as compare to AODV. If delay is main criteria in application than DSDV can be the best option. But if reliability and throughput are main parameters for selection then AODV and Ant based routing protocol gives

better results compared to others because its packet delivery ratio is best among others in case of large number of nodes.

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