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PERFORMANCE ANALYSIS OF ANT BASED ROUTING APPROACH IN MOBILE AD HOC NETWORK

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Abstract:

In this paper study and present the performance of ant colony based routing algorithms in mobile ad hoc networks. In data networks the addressing of data traffic between pairs of source to destination nodes by using routing. The routing task is performed by routers, which update their routing tables by means of an algorithm specially designed for this purpose. Antnet is a software agent based routing algorithm this algorithm developed by M. Dorigo and G.Di Caro that is influenced by the unsophisticated and individual ants emergent behaviour. Ants (nothing but software agents) in antnet are used to collect traffic information and to update the probabilistic distance vector routing table entries. One of the major problems with antnet is called stagnation and adaptability. This occurs, when the network freezes and consequently the routing algorithm gets trapped in the local optima and is therefore unable to find new improved paths. The first routing algorithms addressed data in a network minimizing any costs function, like physical distance, delay and routing over head etc. The carried out the simulation using ns-2 and find find out the various performance metrics like as PDF, Average Delay and routing overhead with varying simulation time.

Key Words: MANET, AntNet, Performance Metrics & NS-2

1. Introduction:

A Mobile Ad-Hoc Network is a collection of wireless mobile nodes forming a temporary network without using any type of fixed access points, infrastructure, or centralized administration. Routing means the act of moving information across an internet work from a source to destination. The biggest challenge in this kind of networks is to find a path between the communication end points. In this paper we present a new routing algorithm for mobile, multi-hop ad-hoc networks. The protocol is based on Ant colony algorithms are a hybrid multihop routing and consider the ability of simple ants to solve complex problems by cooperation wireless physical medium. The introduced routing protocol is well adaptive, efficient and scalable. The main goal in the design of

The protocol is to reduce the overhead for routing. It refer to the protocol as the Ant Colony Optimization Routing. Whenever a routing algorithm is developed, it should address the need of improving the quality of service (QoS) requirements, these requirements ranges from throughput, less overhead, packet loss, security etc. This paper focus on designing a nature inspired routing algorithm called the Mobile AntNet for Mobile Ad hoc network. Much of the previous implementations of this algorithm have been revolving around the fixed networks and improving the QoS for fixed networks. The AntNet algorithm was implemented in mobile ad hoc network using NS-2 simulator, the implemented algorithm was compared with other traditional routing algorithms in terms of node transmission range, node mobility, number of nodes and node failure. Multiple simulations were performed to obtain a statistical output by varying the different simulation parameters and graphs were plotted against three important performance metrics: PDF, routing overhead and end-to-end delay in the sections of results.

The rest of the paper begins with performance analysis of multi-path routing under wormhole attack. Because the results show that multi-path routing is vulnerable to wormhole attack, a statistical multipath aodv analysis proposed in Section 3 and extensive simulations are carried out to evaluate the effectiveness of the proposed scheme. And section 9 display the simulation graph with discussion and last section discussed about conclusion and future work.

2. Antnet Based Routing Algorithm:

Routing is the process of finding a path from a source to destination among randomly distributed routers the broadcasting is inevitable and a common operation in ad-hoc network. It consists of diffusing a message from a source node to all the nodes in the network. Broadcast can be used to diffuse information to the whole network. It is also used for route discovery protocols in ad-hoc networks. This research work using AntNet Routing protocol for data transfer and multihop transfer. AntNet was the first algorithm ACO for routing in packet-switched networks. This Algorithms based on ACO. The AntNet [10] for adaptive routing algorithms was proposed by Gianni di Caro and Marco Dorigo. The design of this algorithms has been the inspired by ant colonies and, more generally, by the notion of stigmergy. AntNet is an algorithm to adapt the best effort routing in IP networks [6-9]. AntNet's design is based on ant colony optimization Real ants have been shown to be able to find shortest paths using a stochastic decision policy based only on local information represented by the pheromone trail deposited by other ants. Ant Colony Optimization (ACO). ACO studies the behavior of ants in a colony and mimics this behavior in software. The Artificial agents, i.e. software ants, gradually construct paths in this graph.ACO has been applied to many domains, e.g. the Traveling Salesmen Problem, manufacturing control systems, etc.ACO itself is a met heuristic. When combined with an actual problem area, it can lead to several heuristics. AntNet is a result of the application of ACO on the problem of Internet routing. Intelligent agents, ants for short, are sent over the network. They communicate indirectly by information they leave behind in the routers on their path. Over time, this information leads to optimal routing paths between the routers in the network [8-11].

3. Related Works:

Antnet Routing Algorithm is an agent based routing algorithm that is influenced from the real ant's behaviour. In Antnet ants explores the network to find the optimal paths from the randomly selected source destination pairs. Moreover, while exploring the network ants update the probabilistic routing tables and construct a statistical model of the nodes local traffic. Ants make use of these tables to communicate with each other. The algorithm uses two types of ants namely, forward ants and backward ants to collect network statistics and to update the routing table. In each node there are two types of queues, low priority and high priority. The data packets and the forward ants use low priority queues, whereas the backward ants use the high priority queues. Later forward ants do also use the high priority queues.

- ✓ Forward Ants who gather information about the state of the network, and
- ✓ Backward Ants who use the collected information to adapt the routing tables of routers on their path.

An AntNet router contains a special routing table where each destination is associated to all interfaces and each interface has a certain probability. This probability indicates whether or not it is interesting to follow that link in the current circumstances. The router also contains a statistical model to store the mean and variance values of the trip times to all destinations in the routing table. These are used as reference values [3-5]. On a regular time base, every router sends a Forward Ant with random destination

over the network. The task of the Forward Ants is collecting information about the state of the network. In each router they pass, the elapsed time since the start is stored on an internal stack together with the identifier of the router. Then the next hop is determined. Normally this is based on the probabilities in the routing table. There is however a small chance (exploration probability) that the next hop is randomly chosen. This is necessary to constantly explore the network and to be able to react fast to network changes like link failures or congestion.

To overcome the problem of congestion by using change some energy parameters and change mobility of Ant-Colony Optimization. In the improved version, of ACO, this Ant-Colony Optimization can find more than one optimal outgoing interfaces are identified as compared to only one path, which are supposed to provide higher throughput and will be able to explore new and better paths even if the network topologies gets changed very frequently. This will distribute the traffic of overloaded link to other preferred links. Hence the throughput of the network will be improved and the problem of stagnation will be rectified. In this work enhanced the performance using energy parameters to modified routing approach and gives better results [6-12].

4. Simulation Parameters:

Simulation Parameters is as follows

PARAMETERS	VALUE
Simulator	NS-2
Routing protocol	Antnet, Modefied Antnet
Number of Nodes	40
Area	500mX 500m
Packet size	512byte
Simulation time	100 to 500s
Pause time	10.0
Traffic type	CBR
Mac protocol	Mac/802.11
Speed	10 m/s

5. Performance Matrices:

We report performance metrics for the protocols:

Packet Delivery Ratio (Fraction): It is calculated by dividing the number of packet received by destination through the number packet originated from source**.**

$$PDF = (Pr/Ps)$$

Where Pr is total Packet received and Ps is the total Packet sent.

Average End-To End Delay: It is defined as the time taken for a data packet to be transmitted across an MANET from source to destination.

$$D = (Tr - Ts)$$

Where Tr is receive Time and Ts is sent Time. Normalized Routing Overhead- It can also be defined as the ratio of routed packets to data transmissions in a single simulation. It is the routing overload per unit data delivered successfully to the destination node

6. Simulation Model:

In this mobility model uses the random way point model that Nodes place and move randomly within the field. The author considered the case of continuous mobility (no pauses). To change node mobility, the author varies the simulation time. Simulation environment consists of an area of 500x500, where randomly 40 mobile nodes are placed. A source and a destination are selected randomly. Data sources generate data according to Constant bit rate (CBR) traffic pattern. Source destination pairs are spread

randomly over the network. A packet size of 512 bytes is used. By observing the performance of the network under mobility we can test the stability of design in real time scenario with varying simulation time. Data rate of 2Mbps is used [2- 9].

7. Simulation Results Analysis:

In this section present the simulation results demonstrating the effectiveness of our algorithm. The proposed method has been implemented in NS 2. And the experimental performance analysis is presented. These overall performance metrics show with variation of simulation time.

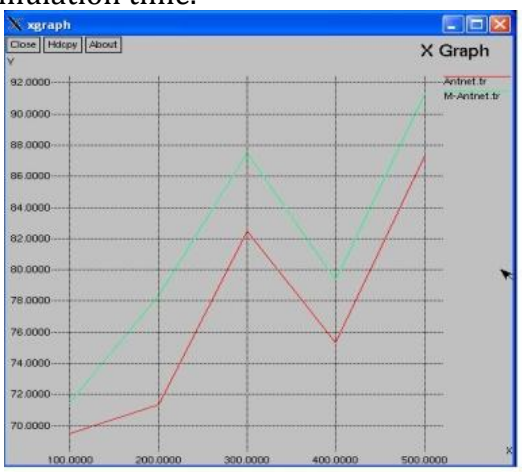

Figure- PDF V/s Simulation time

Figure- NRL V/s simulation time

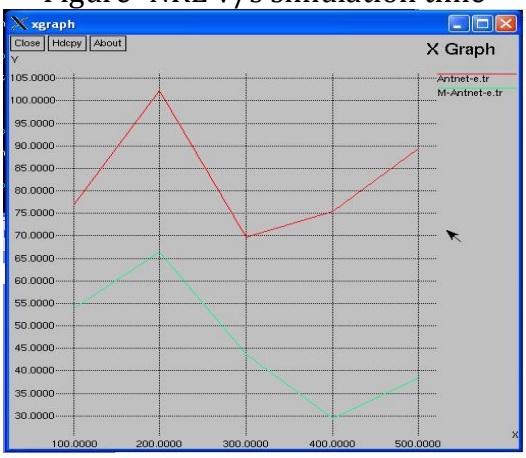

Figure- Average End to End Delay V/s simulation time

In this section display the various performance metrics like as PDF, Network overhead and Average Delay with varying speed. The 40 nodes are sent and received the packets properly. Here, in this packets are transmitted between the source and destination. The average values for each parameter discussed above. We compared its performance with the ACS algorithm. In all experiments, parameters are set to the following values shown in the simulation parameters-axis represents the maximum speed in m/s while Y-axis represents delay. From the 10m/sec to the 50/sec the data transmission takes place. The red line indicates the performance of performance of AntNet and green line indicate the efficient data delivered using existing AntNet routing. The existing AntNet delay is high compare than modified Antnet Algorithm. The Ant-AODV like hybrid routing protocol may provide high connectivity with minimum overhead for processing ant-like agents. The some kind of changes in energy parameters like as gain and receiving and transmitting power of antenna and this changes design a modified algorithm. This design algorithm called modified Antnet based routing schme. The display the performance using X graph.

8. Conclusion:

In this paper present agent based routing protocols in MANETs. Any routing protocols used in MANET share common shortcomings. The method based on the reactive ant-like agents have to wait until the communication routes from the source to the destination have been established This paper present an overview of implemented Antnet and modified antnet based routing approach which they impact variation of metrics. This Paper also provides the comparison of both routing approaches and find out the results using ns-2 in the section of results. Hence author can conclude new modified approach performed better in terms of PDF.

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