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OPTIMIZATION OF NANO ADHOC ON DEMAND DISTANCE VECTOR ROUTING PROTOCOL IN MANET

[1]T GANESAN, [2]DR N RAJKUMAR

[1]Assosiate Professor, Department of Computer Science and Engineering, E.G.S Pillay Engineering College, Nagapattinam, Tamilnadu, INDIA

[2]Professor, Department of Computer Science and Engineering(PG), Sri Ramakrishna Engineering College, NGGO Colony, Coimbatore, Tamilnadu, INDIA

E-mail: [1]ganesan21@gmail.com, [2]nrk29@rediffmail.com

ABSTRACT

Recent development of mobile adhoc networks , ensembles the nano molecular communication components in order to improve network performance by using transmitter nano machine (TN) and receiver nano machine (RN). The previous model nano adhoc on demand distance vector routing NAODV has the problem higher latency ratio, which claims the lifetime of the network. We propose a new optimized nano adhoc on demand distance vector routing protocol (O-NAODV), which uses the residual energy of mobile nodes while selecting a route. In conventional AODV routing protocol, source node forwards RREQ (Route Request) packet to find out path to the destination node. The packets are forwarded by the intermediate nodes which have lower value of residual energy and lifetime , so that even if a node forwards the route request packet , it cannot forward the route reply RREP packet successfully on the reverse direction towards source node. This makes the source node to rebroadcast the RREQ packet to the destination, which affects the Packet Delivery Ratio (PDR) as well as throughput. Solution to above problem is given in this paper, by Optimized NAODV routing protocol where the node does not forward RREQ unless there is sufficient energy and until the node density in its surrounding exceeds a particular threshold. Optimized NAODV analyzes these node density and residual energy parameters, when implementing routing discovery, and avoid the unnecessary rebroadcasts. We have compared the performance of NAODV with different simulation parameters and the proposed method has produced higher efficient results compare to others with increased throughput.

Keywords: *MANET, AODV, NAODV, O-NAODV*

1. INTRODUCTION

A mobile ad hoc environment (MANET) sometimes called a mobile interconnect network, is a self configuring system of mobile devices linked by wireless links. Each device in a MANET is open to move independently in any direction, and will therefore modify its links to other device regularly. Each most forward traffic dissimilar to its own use and therefore be in router [5]. The major challenge in building a MANET is equipping device to maintain the information necessary to assets route traffic. The impact over network performances of rapid and continuous topology changes due to nodes' mobility, jointly with other constrains (such as difficult propagation environment, existing bandwidth, nodes' computational capability and power utilization) is anyhow still one of the key issues to be faced in MANETs [8]. Nanotechnologies offer variety of applications for battle fields, industrial and biomedical industries. The nano machines are tiny functional components which are capable of performing predefined job in a narrow path [13].

Nanotechnology can be defined as the processing, separation, consolidation and deformation of resources on atomic or molecular scale. A single nano machine has very limited capabilities. The interconnection of nano machines, however, enables to accomplish complex tasks by collaboration of nano machines [4]. The networks of communicating nano machines, i.e., nano networks, are expected to enable very large set of new applications in genetic engineering, health monitoring, military surveillance systems, as well as industrial and environmental applications.

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The nature made nano machines also form nano networks to accomplish the vital functions of the organism. Therefore, in designing nano networks, it is reasonable to inspire by existing biological nano networks. In living organisms, cells communicate in various ways. For example, lymphocytes called B-cells and T-cells constitute immune network to defense the organism against infection [14]. The network infrastructure should be deployed prior to the beginning of the communication process. Several microtubules could be deployed to interconnect one node, i.e., nanomachines, with many others. Molecular motors are used to carry vesicles containing information molecules that are transmitted from the transmitter to the receiver [14].

2. PREVIOUS RESEARCH

Many researchers are working on this problem of quality of service in mobile adhoc networks. The basic QoS parameter of Manet comprise with the kind of routing protocol used. We discuss few of the methods discussed earlier in this problem.

The upcoming generations of wireless communication shall observe a form of faultless integration made up of a variety of platform. Incidentally, wireless mobile ad hoc network (MANET) could be an additional component within the LTE (Long Term Evolution) implementation. It would be transporting various multimedia applications such as voice, video and data with an additional protection feature [1]. It is a well-known fact that pure proactive or reactive protocols are recognized to perform well only in a restricted range of wide operational conditions and network configurations. Since diverse protocols are suited for different regions of the ad hoc network design space, combining them into a solo framework constitutes a useful approach to take advantage of on each protocol's strengths. [2].

A node selects next hop node among its one hop neighbors with "symmetrical", i.e. bidirectional, linkages. Therefore, selecting the direction through neighbor node automatically avoids the troubles linked with data packet transfer over uni-directional links [3]. Being a proactive protocol, path to all destinations within the network are identified and maintained before use. Having the routes available within the regular routing table can be valuable for some systems and network applications as there is no route discovery delay associated with finding a new route. [5]. In order to construct the intra forwarding data base required for routing packets, each node broadcast a exact control message called topology control (TC) message.TC message are forwarded like common broadcast message in the entire network. In neighbor table have all nodes information about its one hop neighbors [6].

In an ad hoc network, mobile nodes communicate with each other using multi-hop wireless links. There is no fixed infrastructure; for instance, there are no base stations. Each node in the network also acts as a router, forwarding data packets for further nodes [7]. Nanomachines are molecular range objects that are capable of performing easy tasks such as actuation and sensing. Nanomachines are categorized into two types [13]. One type is artificially formed nanomachines which mimic the conventional machines and may be made through using the NEMS technology. The other is environment made nanomachines, often referred to as soft nanomachines, which are originated in biological systems (such as molecular motors and receptors). The network of communicating nanomachines is envisaged as nanonetworks that are intended to accomplish difficult tasks such as drug delivery and health monitoring. For the understanding of future nanonetworks, it is important to enlarge novel and efficient communication and networking paradigms [4].

The major objectives of multipath routing protocols are to provide reliable communication and to ensure load balancing as well as to get better quality of service (QoS) of ad hoc and mobile networks. Other goals of multipath routing protocols are to recover delay, to reduce overhead and to maximize network life time. Multiple paths can be used as backing route or be employed simultaneously for similar data transmission [9].

3. PROPOSED APPROACH

The optimized nano adhoc on demand distance vector routing has the following components: Neighbor Discovery, Route Discovery, Optimized route selection, Packet forwarding. The proposed approach shown in fig 1 performs neighbor discovery using hello and topology control message for link state identification. Once it collects acknowledgement for the request sent, it retrieves the location details, speed, density, residual energy parameters using which an optimal path is computed. The optimal path is selected based on

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the weight computed using all the parameters mentioned earlier. We explain each process in detail in the following sections.

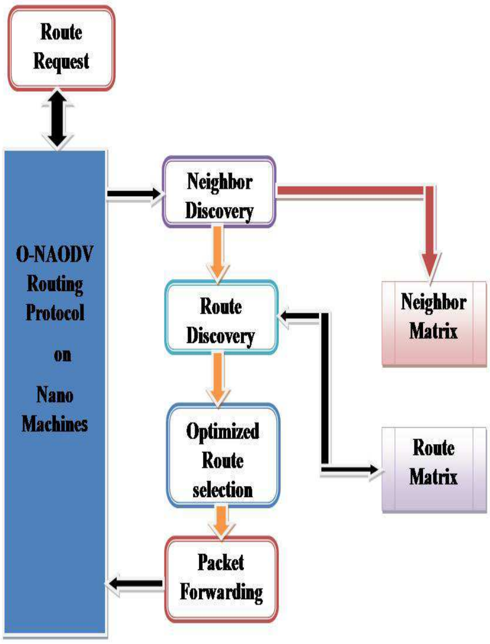

Figure1: Proposed System Architecture.

3.1 Neighbor Discovery

At the neighbor discovery , the proposed method uses Hello messages and Topology control (TC) messages to collect the link state and neighbor nodes. The source node creates a Hello message and broadcast the message throughout the network. The nodes which receives the message, i.e. under the coverage of the source node replies to the hello message by sending an acknowledgement. The source node initialize the broadcast timer and will receive the acknowledgement until the timer gets expired. The node generates an entry for each node which sends acknowledgement to the hello message in its neighbor matrix. The algorithm for Neighbor Discovery is given below.

Step1: start
Step2: initialize Network topology.
Step3: initialize neighbor nano node list Nl.
Step4: create Hello Message.
Step5: broadcast Hello message.
Step6: initialize broadcast timer bt.
    Receive ack until bt->expires.
    Nl(i)=Ack{Node.Energy,Node.speed,
        Node.location}
Step7: stop.

3.2 Route Discovery

The source node generates a nano route request message and broadcast through the network. Upon receiving the request each node verifies its route table for the entry about the destination node , it sends a reply to the source node if it found, otherwise it rebroadcast the request to its neighbor nodes again and waits for the reply. If it gets the reply from some of its neighbor it adds its id with the route and forward towards the source node.

3.3 Optimized Route Selection

The route selection is performed based on various factors of the nodes present in the route matrix. Once the available routes are computed then , from the routes an optimal route is computed based on distance, speed, residual energy , node density. For each route available we compute the factors for the first hop , which determines the frequency of route discovery and retransmission. The node which has less speed , with more residual energy and density will be selected as a forwarding node for the packet to be transmitted. . The algorithm for Optimized Route Selection is given below.

Step1: start
Step2: initialize distance Dist, speed S,
    residual energy E, density D,
    NanoWeight Nw.
Step3: read neighbor matrix N, route matrix
    R.
Step4: for each route R_i from R
    Compute distance
    $Dist = sqrt((Nano_{D(x)}\text{-}Nano_{S(x)})^2 + (Nano_{D(y)}\text{-}Nano_{S(y)})^2)$.
    Compute residual energy
    $E= Nano_E$.
    Compute speed
    $S= Dist_{Nano(R(i))T} - Dist_{Nano(R(i))T-1}$.
    Compute Density
    $D= \Sigma R_{(i)} \times | N |$.
    Nw(i) ={ R(i).Id, Dist, E, S, D}.
    End.
Step5: sort Nw according to Node weight.
Step6: select the node with more weight.
Step 7: stop.

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3.4 Packet Forwarding

The packet forwarding process is performs the supporting operation for the optimized Nano adhoc ondemand distance vector routing process. Once an optimal node is selected then the node just forwards the packet to the selected node which has more nano node weight which implies that it has more energy , density with less speed displacement.

4. EXPERIMENTAL SETUP

The aim of our model is to evaluate the performance of the optimized NAODV in wireless sensor nano networks This model setting is produced in network simulator-2, this simulation to provide maintain for creating a multi hop non wired sensor networks .Network tool using with the C++ and using the Object Tool Command Language like as (OTCL). They creating a approved absent use a MANET surroundings contains of 50 wireless movable nodes more than a model region of 1000 meter x 1000 meter level, space operating for 10 minutes of total time .

Table 1: Simulation Configuration Settings

PARAMETER	VALUE
Simulator	Ns-2
Routing Protocols	O-NAODV
Propagation Model	Two Ray Ground
Number of node	50
MAC Layer	IEEE 802.11
Simulation Time	10 m sec
Average Forwarding Delay	1ms
Simulation Area	1200*1200m
Transmission Range	50-300m
Node Movement Model	Random Way Point
Traffic model	CBR(UDP)
Transfer per Packet	512 Bytes

The 802.11 network in MAC layer methods were worn in this network. The position node in replica transfer abnormally to chance a randomly node portion, so it's casual way with mainly speed starting 0 m/s to 20 m/s. The complimentary freedom broadcast direct unspecified used for the replication. Collection situation records decide to nodes are source or destination. A multiple broadcast member position points to joins the group at the beginning of the reproduction and leftovers as an associate right through entire recreation. The collide of network density is assessed by deploying 30 to 50 nodes over a set square topology area of 1200m X 1200m using 5m/sec node speed and 3 identical source-destination connections. The simulation environment considered is given in table 1.

5. PERFORMANCE ANALYSIS

The most important of O-NAODV routing performance metrics are Packet delivery ratio, End to end delay, energy criterion and Control overhead. The main objective of this paper is to evaluate the routing performance and also to increase the performance ratio of O-NAODV compared to NAODV. The simulation results are given in table 2

5.1 Packet delivery Ratio (PDR)

This is the ratio between the total number of packets successfully received by the destination nodes to the number of packets sent by the source nodes throughout the simulation which is shown in figure 2.

PDR = No of packets received /No off packets sent

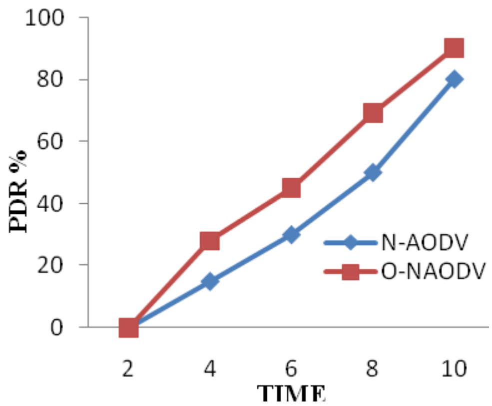

Figure 2: Packet Delivery ratio on network

5.2 End to End Delay (E2E)

The Delay is the time between when a data packets message (CBR data packet) was sent by source and when it was received by the destination is represented in figure 3.

Average end to end delay =

$$\sum (time_{received} - time_{sent})$$

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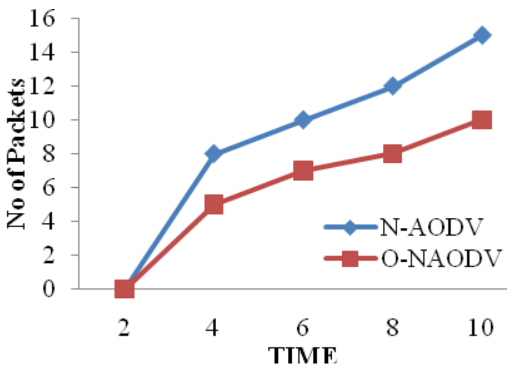

Figure 3: Overall delay on network

5.3 Energy Level

The energy of node is defined as the amount of energy node consumes for the data transmission process is shown in figure 4.

Energy = ((No of data packets * initial energy level of node)-No of data packets)

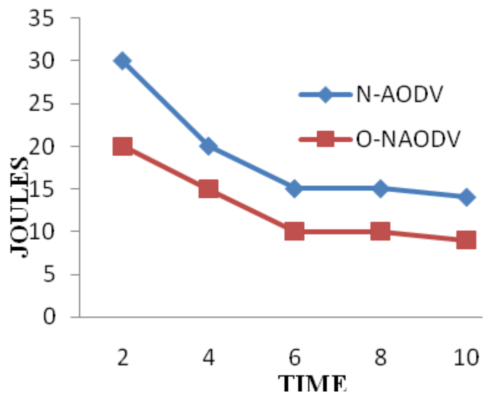

Figure 4: Energy level on network

Table 2: Simulation results

S No	No of nodes	Protocol	Energy Consumption	Avg delay	Pdr
1.	71	AODV	27	30.37	88.6
2.	71	NAODV	22	20.05	95.2
3.	71	O-NAODV	19	15.5	97.0

6. CONCLUSION

In this paper we optimized the performance of our routing algorithm NAODV by considering various parameters. The number of nano nodes in nano network is also a critical parameter for the performance analysis. The increasing number of nano nodes increases the connectivity in the network. Therefore, the message can be delivered to an info station in a lower time using O-NAODV. Furthermore, the system throughput increases with increasing number of nano nodes. This simulation scenario is calculated particularly in the direction of assess the impact of network concentration on the presentation of the network protocols. O-NAODV has a quantity of quantitative metrics used for evaluating the presentation of mesh network .Simulation results show that O-NAODV performs better than NAODV

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