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OPTIMIZED ENERGY EFFICIENT ROUTING PROTOCOL FOR MANET

M.Maharajan, B.Rajan, P.Subbaiah
Department of Electronics and Communication Engineering,
Agni College of Technology , Thalambur

Abstract : Power reduction is rapidly becoming the key confront for implementing large Mobile Ad-Hoc Networks (MANET). In MANET battery power is still the only source and the routing process consumes a considerable power for the overheads. Therefore minimizing the energy consumed for the routing process plays an important role. In mobile networks, node mobility may cause frequent network topology changes, which are rare in wired networks. There are several techniques such as power save method, power control method and minimum energy routing. This paper is an attempt to combine all these techniques in their respective layers and obtain an optimized routing process. The simulation results are shown by using NS-2 simulator where the energy consumption per node and the lifetime of the network is increased.

Keywords: **MANET, ZRP, GAF**

I.INTRODUCTION

The wireless communication technology which provides low-cost and ease of deployment, powerful wireless transceivers which are widely used in mobile applications. In recent years, mobile networks have involved very rapid interests in recent years because of their improved flexibility and reduced costs. Mobile networks have unique characteristics under which each mobile nodes may cause frequent network topology changes, which are uncommon in wired networks. In difference to the steady link capacity of wired networks, wireless link capacity repeatedly varies because of the impacts from noise, transmission power, receiver sensitivity and interference. In addition to wireless mobile networks have power restrictions, high error rate and bandwidth limitations.

Mobile networks can be broadly classified into two types namely infrastructure networks and mobile ad-hoc networks depending upon their permanent infrastructures. In an infrastructure network, the nodes have fixed connection and the base station is also fixed within their broadcast range. The access points only creates the backbone for an infrastructure network, whereas mobile ad hoc networks are separately self-organized networks and it doesn't have a fixed infrastructure. In a mobile ad-hoc network, the nodes may move randomly and therefore the network may experiences rapid and random topology changes. In addition nodes in a mobile ad hoc network normally have restricted communication ranges and some nodes cannot communicate directly with each other and therefore routing paths in mobile ad hoc networks contain multiple hops and each node in mobile ad-hoc networks has the responsibility to operate as a router.

The decentralized environment of wireless ad-hoc networks makes them appropriate for a range of applications where central nodes can't be depend on and may progress the scalability of wireless ad-hoc networks compared to wireless managed networks, though theoretical and practical limits to the overall capacity of such networks have been identified.

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Ordinary configuration and quick deployment make ad hoc networks suitable for emergency situations like military conflicts and natural disasters.

In the propagation task, a message generated from a source node needs to be distributed to all the other nodes in the network. In this paper, this can be achieved by doing certain changes in the respective layers which leads to the development of protocols for energy-efficient broadcast communications. The organization of the paper is as follows chapter II explains about the literature survey, III explains about the problem statement , IV explains about the proposed model , V explains about the performance and simulations parameters and VI explains about the conclusion and future work.

II. RELATED WORK

[1] Timer based CDS construction by Cheng et al proposed two timer-based CDS protocols namely Single Initiator(SI) and Multi Initiator(MI), that not only create Connected Dominating set(CDS) of competitive size with low overheads but also address the shortcomings of the energy efficiency.SI utilizes timers to distributively construct and maintain CDS in the presence of changes of network topology. Since both protocols use timers to construct the CDS , the convergence time is increased in Timer based CDS protocol.

[2] Extended dominating set based Routing by Wu proposed that each host keeps a list of its neighbours and sends this list to all its neighbours. By repeatedly performing this, each host has 2-hop neighbourhood information; that is, information about its neighbours and neighbours of all its neighbours. Also in this they use proactive routing protocol to illustrate the routing mechanism to find the correct destination. The cost for creating and maintaining a dominating set is unique and are done in a localized way.

[3] Localized Minimum energy by Simplot et al proposed a new protocol that is used where each node requires only the information of its neighbouring nodes and distances between its neighbouring nodes so that it can reduce the power consumption in the network and increases the lifetime of the network. Also in this energy efficient broadcast communication is used to broadcast the message to every node in the network. Also it increases the distance for the transmission to a larger area one also to cover more mobile nodes.
[4] Span - An energy efficient coordination algorithm by Chen et al proposed Span, a power saving method for multi-hop ad-hoc wireless networks that reduces energy consumption. It is a distributed, randomized algorithm where nodes make local decisions on whether to sleep or to join a network. Improvement in system lifetime due to span increases as the ratio of idle to sleep energy consumption and density of the network increases. A protocol for maximizing the lifetime of an ad hoc network by powering off the nodes for as long as possible is called Span was proposed by Benjie Chen et al [4]., this protocol is independent of the routing protocols and Span is able to function without the knowledge of geographic allocation. In addition, the authors believe that a power-save protocol should be able to send packets between any pair of nodes in the network with minimally more delay as compared to every node being awake, as well as having nearly as much of the total capacity as the original network.

Nodes periodically check if they should become a part of this backbone or if they should continue to sleep. Nodes within the backbone are called coordinators and the factors that go into the determination of whether or not to become a coordinator depend on the node's remaining power and the number of pairs it would connect. In order to promote fairness, a node only remains a coordinator

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for a period of time before another node in the network should take its place. When a node withdraws from being a coordinator, it goes back to sleep.

Routing Layer	**AODV**
	SPAN
MAC/PHY	**IEEE 802.11**

Figure 1: Existing Model

In the above Figure, Span is a protocol that operates under the routing layer and above the MAC and physical layers. The routing layer uses information from Span and provides leverages and other power saving features.

[6] Efficient Directional network backbone construction by Dai et al proposed the issues of constructing an energy-efficient virtual area network in mobile and ad-hoc networks for broadcasting applications that is used in directional antennas. In directional antenna, the transmission and reception range is divided into many sectors and each sectors can be switched on for transmission purpose.
[8] An extended Localized algorithm for CDS formation by Lin et al proposed the first distributed approximation algorithm for constructing a Minimum Connected Dominating Set for the unit-disk-graph with a constant approximation ratio and linear message complexity. This algorithm is fully limited to a small area and does not depend on the spanning tree. Thus the preservation of the Connected Dominating Set after changes in topology guarantees the maintenance of the same estimate ratio. In this algorithm every node requires information of its single hop neighbours and only a constant number of two-hop and three-hop neighbours. The message length is O(log n) bits.

III. PROBLEM STATEMENT

IEEE 802.11 ad-hoc power saving mode uses periodic beacons to synchronize nodes in the network. Beacon packet contain timestamps that synchronize nodes clock. A node that receives and acknowledges an advertisement for unicast or broadcast traffic directed to itself for the rest of the beacon period. So Energy consumption is a main thing in MANET and we try to minimize the consumption when the node becomes sleep .

IV. PROPOSED MODEL

In this paper, which consists of modifying all the layers of the traditional work to overcome the shortcomings of energy efficiency. Because of this modifications in each layer the per node energy consumption can be reduced and the network lifetime and effficiency of the network is increased. In the physical layer IEEE 802.11 with Transmission power control and in the Datalink layer Geographic Adaptive Fidelity(GAF) which is used for Power saving mechanism where it takes the nodes to sleep state when it is not used during transmission and in the Network layer Zone Routing Protocol(ZRP) which is a hybrid protocol which uses both proactive and on-demand routing mechanisms. The performance of the proposed algorithm will be simulated on the network simulator tool NS-2. The results obtained will be compared with the parameters like Total network lifetime and per node energy

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consumption. Increase in these parameters will establish the fact that the proposed routing protocol has achieved the objective of the energy efficient routing protocol.

Routing Layer	Hybrid Routing Protocol
Data Link Layer	Location based Power save protocol GAF
PHY/MAC Layer	IEEE 802.11 with Transmission power control

Figure 2: Proposed Block Diagram

In the above figure the diagram shows the modifications in each layer when compared to the previous work.

1. Zone Routing Protocol: The Zone Routing Protocol (ZRP) is a hybrid routing protocol for mobile ad-hoc networks. The hybrid routing protocols are proposed to minimize the control overhead of proactive routing approaches and decrease the latency caused by route search operations in reactive routing approaches.

2.Geographic Adaptive Fidelity(GAF): Geographic adaptive fidelity(GAF) conserves energy by turning off unnecessary nodes in the network without affecting the level of routing fidelity. It finally forms a virtual network for the covered area. Each node uses its Global Positioning System which indicates location to the virtual area. Nodes associated with the identical point on the area are considered equal in terms of the cost of routing. There are three states defined in GAF.

- Discovery State : For determining the neighbours in the area.
- Active State : Reflecting participation in routing.
- Sleep State : When the mobile node is turned off.

V. PERFORMANCE EVALUATION

To measure the energy efficiency , we simulated ZRP with geographic forwarding on the mobile network.

VI. SIMULATION PARAMETERS

Parameters in NS2	Value
Propagation	Two-Ray Ground
MAC Protocol	IEEE 802.11
Data Type	2 Mbps
Traffic	CBR
Number of Flows	5 concurrent flows

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Number of Packets	5 packets/flow
Inter arrival Time	0.25 seconds
Packet size	128-byte
Percentage of mobile nodes	50% or 100%
Number of simulation	100

Table 1: Simulation Parameters in NS2

VI. CONCLUSION AND FUTURE WORK

The proposed work which mainly consists of modification of protocols in each layer by which consecutive amount of energy is consumed when compared with the existing Span protocol and also the lifetime of the network is increased. By modifying all the layers energy consumed for the routing process is reduced which plays a predominant role in routing . There are several techniques such as power save method, power control method and minimum energy routing. With these changes the energy consumed and convergence time can be reduced.

In the future work , the convergence time is reduced by doing further modifications in the routing layer.

REFERENCES

[1]. Xiuzhen Cheng ,C.H.Huang, Wei-Shinn Ku, Kazuya Sakai and Min-Te Sun (2011), “Timer Based CDS Construction in Wireless Ad Hoc Networks”, IEEE Transactions On Mobile Computing, Vol. 10, No. 10.

[2]. J.Wu(2002), “Extended Dominating-Set-Based Routing in Ad Hoc Wireless Networks with Unidirectional Links,” IEEE Trans. Parallel and Distributed Systems, vol. 13, no. 9, pp. 866-881.

[3]. J.Cartigny, D.Simplot, and I.Stojmenovic(2003), “Localized Minimum- Energy Broadcasting in Ad-Hoc Networks,” Proc. IEEE INFOCOM, pp. 2210-2217.

[4]. H.Balakrishnan,B.Chen, K.Jamieson, and R. Morris(2001), “Span: An Energy-Efficient Coordination Algorithm for Topology Maintenance in Ad Hoc Wireless Networks,” Proc. ACM MobiCom.

[5]. F.Dai, M.Gao, I.Stojmenovic and J.Wu(2002), “On Calculating Power-Aware Connected Dominating Sets for Efficient Routing in Ad Hoc Wireless Networks,” J. Comm. and Networks, vol. 4, no. 1,pp. 59-70.

[6]. F.Dai,J.Wu and S.Yang(2008), “Efficient Directional Network Backbone Construction in Mobile Ad Hoc Networks,” IEEE Trans.Parallel and Distributed Systems, vol. 19, no. 12, pp. 1601-1613.

[7]. D.implot-Ryl, I.Stojmenovic, and J.Wu(2005), “Energy-Efficient Backbone Construction, Broadcasting, and Area Coverage in Sensor Networks,” Handbook of Sensor Networks: Algorithms and Architectures, pp. 343-379, Wiley.

[8]. M.Gerla and C.R.Lin(1997), “Adaptive Clustering for Mobile Wireless Networks,” IEEE J. Selected Areas in Comm., vol. 15, no. 7, pp. 1265-1275.

ISSN: 2454-1435 (Print) | 2454-1443 (online)
Volume 3 Issue 4 – www.ijrmmae.in – Pages 60-65

[9]. S.Basagni, M.Mastrogiovanni, A.Panconesi, and C.Petrioli(2006), "Localized Protocols for Ad Hoc Clustering and Backbone Formation: A Performance Comparison," IEEE Trans. Parallel and Distributed Systems, vol. 17, no. 4, pp. 292-306.
[10]. S.Basagni, M.Mastrogiovanni, and C.Petrioli(2004),"A Performance Comparison of Protocols for Clustering and Backbone Formation in Large Scale Ad Hoc Networks," Proc. IEEE Conf. Mobile Ad-Hoc and Sensor Systems, pp. 70-79.
[11]. S.Basagni, M.Mastrogiovanni, and C.Petrioli(2004),"A Performance Comparison of Protocols for Clustering and Backbone Formation in Large Scale Ad Hoc Networks," Proc. IEEE Conf. Mobile Ad-Hoc and Sensor Systems, pp. 70-79.
[12]. K.M.Kim, H.Okada K.Sakai, F.Shen and M.T.Sun(2008),"Multi-Initiator Connected Dominating Set Construction for Mobile Ad-Hoc Networks," Proc. IEEE Int'l Conf. Comm. (ICC), May 2008.
[13]. "IEEE 802.11b Standard," http://standards.ieee.org/getieee802/download/802.11b-1999.pdf, 2011.
[14]. M.T.Sun, T.Lai and D.Zhou(2005), "A Timer-Based Protocol for Connected Dominating Set Construction in IEEE 802.11 Multihop Mobile Ad Hoc Networks," Proc. Int'l Symp. Applications and the Internet (SAINT), pp. 2-8, Jan. 2005.
[15]. "The Network Simulator (ns-2)," http://www.isi.edu/nsnam/ns/,2011.