Development of Simulation Model for Optimization of Power Consumption in Wireless Ad-hoc Network

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Abstract—**Power consumption control protocols are used to reduce nodes' energy consumption in wireless ad-hoc network. Node controls the pattern of its neighbors by independently adjusting it's transmit power. Transmit power of individual nodes are used to estimate the life time of battery. Energy efficiency is an important design consideration for these networks. In this paper, developed transmission power consumption control based simulation model by the use of proposed algorithm. Transmit range of a node cannot fall below the length of the longest incoming edge entering the node. Transmission power and range of receiver and destination node is monitor and control by algorithm before transmission of data in communication network.**

Keywords- Power; Control; Algorithm; Transmission; Ad-hoc; Network

I. INTRODUCTION

Wireless ad-hoc networks are self organizing and adaptive to any change in topology and other parameters. The nodes are free to move in arbitrary direction with any arbitrary speed. With no fixed routers, nodes work as routers in the network. Node has to keep track of topological changes in network in order to choose the shortest path to any destination. Ad-hoc can be characterized as having a dynamic, multi hop, and constantly changing topology. However, the success of wireless mobile ad-hoc networks will depend significantly on controlling access to a wireless physical layer having relatively low bandwidth links. Medium access control protocol and mechanisms will play a central role in the success of mobile ad-hoc network. Each medium access control protocol is based on multiple design choices and utilizes distinct medium access mechanisms. Transmission power control is a critical issue in the design and performance of wireless ad-hoc networks. Design of packet radios and protocols for wireless ad hoc networks is primarily based on common range transmission control. For example, the design of routing and protocols for wireless ad-hoc networks use common-range maximum transmission power. In this paper, we take an alternative approach and make a case for selective transmission control. Some topology control algorithms involve a process in which each node independently reduces its transmission power as long as the pattern of its direct (i.e., one-hop) a neighbor satisfies a certain criterion. In a mobile network, this pattern changes in time, and the transmit power must therefore be adjusted periodically. Spectral is of great importance to increasing demand for wireless services. Multiple input multiple output communication systems are used for radio spectrum efficiently while power control will improve energy efficiency. It is important that power allocation be managed effectively by identifying ways to use less power while maintaining a certain quality of service. The type of power control used can also impact the connectivity and performance of the network layer. Choosing a higher transmission power increases the connectivity of the network. Routing protocols can take advantage of fully connected networks to provide multiple routes for a given source-destination pair in cases where some nodes or links fail. However, this goal is achieved at the expense of reducing network capacity and energy-savings. This paper describes related work, proposed model and algorithm, simulation result and concludes the paper.

II. RELATED WORK

Kannan, T. et al. have described that optimized link state routing protocol is an optimization of the classical link state protocol, which is used to reduce power consumption and improve performance metrics like packet delivery ratio, packet loss and delay [1]. Sungwon Kim et al. have studied that existing models can produce varying degrees of super diffusive behavior and generate only a limited range of diffusive properties or cannot be conveniently used to produce different degrees of diffusive property in practice[2]. Premalatha, J et al. have examined the effects of two different MAC protocols, IEEE 802.11and IEEE802.11e with AODV and DSR of routing algorithms.IEEE802.11uses distributed coordination function where IEEE802.11e uses enhanced distributed coordination function. In both cases DSR algorithm increases the packet loss which in turn affects the throughput and packet delivery ratio. The reason is analyzed and suggests the suitable mechanisms implemented in each layer to enhance quality of service parameters [3].Chunhung Richard Lin et al. have proposed a bandwidth routing protocol for quality-of-service support in a multi-hop mobile network. [4]. Nitnaware, D et al. have described protocol that works on current energy status of each node and gossip technique. Energy consumption and overhead is reduced up to 30%-40% with CBR traffic and 10%-25% with pareto traffic without affecting the delivery ratio [5]. Tomar, G.S. at al. have proposed an algorithm to overcome flooding problem in the network and reduces the routing Packet overhead. The algorithm was incorporated in the AODV algorithm and simulated in the identical environment it has improved throughput in the network [6]. Gupta et al. described that power control affects the connectivity of the resulting network. By a connected network, we mean a network in which any node has a potential route of physical links to reach any intended receiver node. A high transmission power increases the connectivity of the network by increasing the number of direct links seen by each node, but this is at the expense of reducing network capacity [7]. Ramanathan et al. have proposed an algorithm for mobile networks designed to minimize the transmit energy of each node, while preserving connectivity. It involves letting each node control the number of its neighbors by adjusting transmit power [8]. L. Li et al. have describe that the transmit range of a node (node i) is large enough to have a direct link to all the nodes that have direct link to node i [9]. T. Nieberg et al. have described that transmit power of each node is reduced, as long as each possible sector of width $\alpha = 5\pi/6$ around each node contains at least one neighbor, and the sequence counter is maintained [10].

III. PROPOSED TRANSMISSION POWER CONSUMPTION MODEL

We have assumed that each node knows the locations of all its neighbors and the location of the destination node. Based on this assumption, transmission strategy can be designed as follows.

First Step: The source node S transmits a packet to the destination node D directly, if D is located within distance r from S.

Second Step: When the destination node D is outside the transmission range of the source node S, the packet is sent to the neighbor that is closer in distance to the destination node D than the source node S, and that is closest to the destination D among all neighbors.

Third Step: Since the source node S knows the locations of all neighbor nodes and the destination node, it will not send out the packet when there does not exist any neighbor satisfying condition given in Step 2, and will postpone the transmission until such a neighbor appears.

Selection of transmission power influences energy consumption and network connectivity and active time of node.

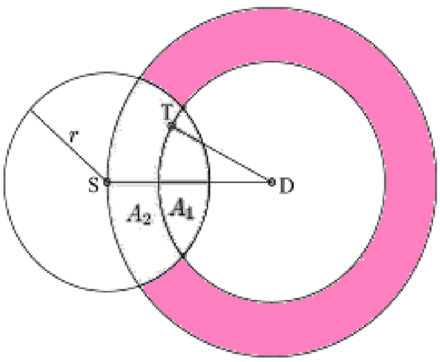

Fig.1. Link flow of source(S) and destination (D) node

Transmit power level is controlled carefully to reduce energy consumption.

From the Proposed relationship between transmission power (mw) and remaining energy (Joules) of node, It is clear that remaining energy Re is directly proportional to transmission power of node in network. we may find node's remaining energy for any value of transmission power for network.

Algorithm is explained step by step:-

Step1. Initialize the nodes (set the node parameters)

Step2. Check the availability of routes in route table

Step3. If routes are available then used for route discovery and maintenance.

Step4. Source node transfer control message to destination node

Step5. Check the status of nodes with transmission range.

Step6. If source node is ready then receiving node send back ready signal otherwise route maintenance and activated route repairs. Check alternate route is available in nearby transmission range. If yes go to next step Otherwise activate global route repair

Step7. Find out whether node is destination node if yes then transmit begin other go to Step5.

Step8. Confirm the status of Transmission if successful then exit otherwise go to step2

Algorithm describes how packets transfer from a source to a destination. If a route to destination does not exist in the intermediate nodes, a route repair mechanism is activated by enabling the sender to initiate a broadcast for possible routes to the destination.

IV. SIMULATION

A. *Simulation Parameters and Result*

The measuring of the energy consumption and behavior of a node in an ad-hoc network requires a transmission power range model. The evaluation of energy consumption is particularly important in ad-hoc environment. Simulator is used to simulate our proposed technique. In the simulation, mobile nodes move in 800 meter x 800 meter region for 100 seconds simulation time. Initial locations and movements of the nodes are obtained using the random waypoint model of NS2. It is assumed that each node moves independently with the same average speed. All nodes have the same transmission range of 250 meters. Network of twenty five nodes is used. Simulation parameters like speed 2m/s, initial energy1000J, transmission power 100 to 500mw and receiver power 50 to 250mw, transition time 0.005ms. Model has main parameters like sleep power, transition power and transition time.

C. *Remaining energy for transmission power*

Node remaining energy is decreasing as transmission power is increased. Proposed transmission power technique result re2 results are better than exiting re1 transmission power technique.

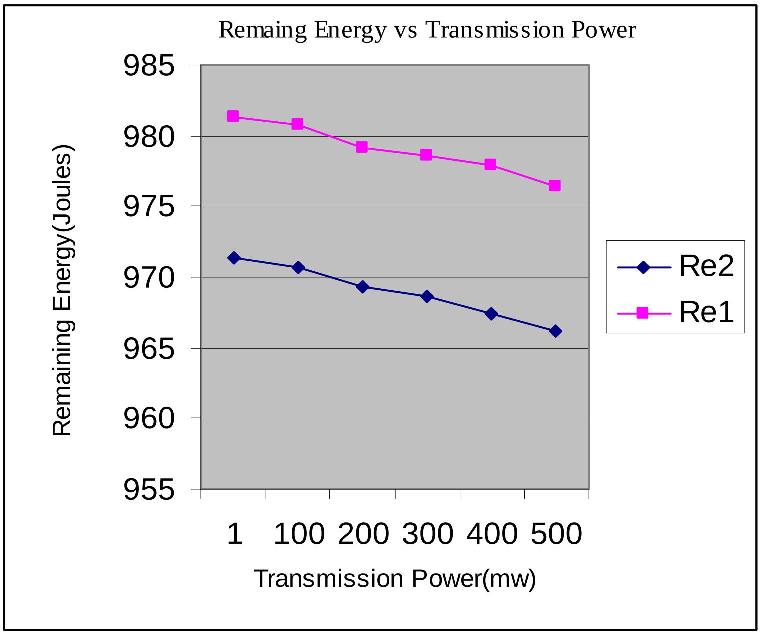

Fig.1.Relationship between transmission power and node's reaming energy

It is observed from the graph that transmission power is directly effect the power consumption of nodes in a network. Nodes life is based on remaining energy of nodes.

B. *Throughput for Transmission Power*

Throughput is directly depends on network load and transmission power. Node route discovery time is large. Nodes are active for large time.

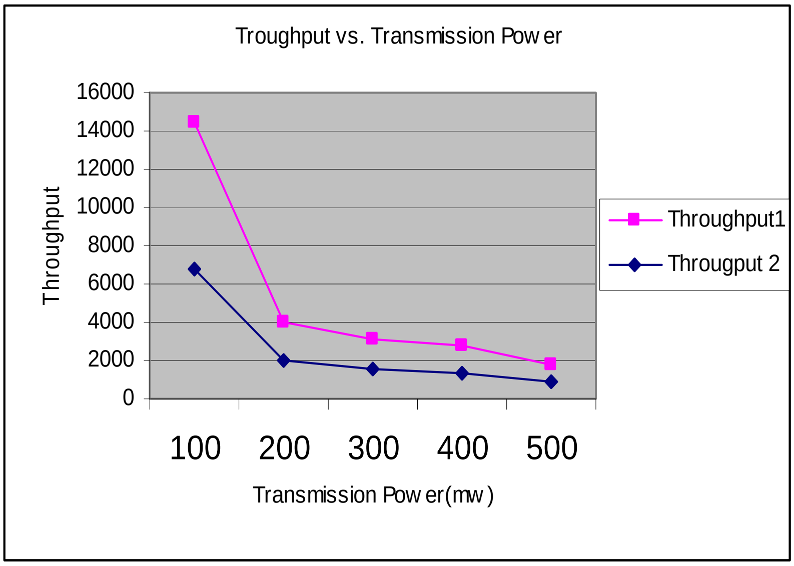

Fig.2. Throughput for Network Load

Network performance is depends on throughput. Transmission power control may improve throughput. It is observed from the graph that throughput2 (proposed) depends on transmission power .Throughput2 is better than old throughput1.

CONCLUSION

In this paper, proposed a power consumption control based transmission range model. By simulation results, the projected technique provides most proficient power consumption controls.

Algorithm is proposed based on transmission power to increase the life time of network. It is seen that with the implementation of proposed algorithm, ad-hoc networks can improve their vital parameters, such as power consumption, throughput. Node life is increased with less power consumption.

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