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Energy Optimization Model for Wireless Ad-hoc Network

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Abstract— Energy optimization is the main requirements of wireless ad-hoc network that consumes less energy to give optimum performance under limited bandwidth and low battery power of each node. Network life time is the main issues in ad-hoc network. In this paper, first investigate and analyze the impact of receiving energy on nodes remaining energy in networks. Analysis and simulation results show that changing receiving energy affects the network life time.

Keywords— Ad-hoc, Network, Power, Energy, battery

I. INTRODUCTION

Power consumption is one of the most important design criteria for ad-hoc networks as batteries provide limited working capacity to the mobile nodes. Power consumption control in ad-hoc networks is a more difficult problem due to non availability of access point and low battery power in network. Battery power of a node is a precious resource that must be used efficiently in order to avoid early termination of a node or a network. Thus, energy management is an important issue in such networks. Efficient battery management, transmission power management are the major means of increasing the life of a node. Power consumption depends on the medium access layer and protocol from physical to transport layers, which selects the minimum amount of transmission energy required to exchange messages between any pair of neighbouring nodes. Power failure of a mobile node not only affects the node itself but also its ability to forward packets on behalf of others and hence affects the overall network lifetime. In this paper, propose ad-hoc on-demand distance vector algorithm with power consumption control to maximize the network lifetime by minimizing the power consumption during the source to destination route establishment. In path discovery mechanism source broadcast a route request packet (RREQ) to its neighbours, who in turn broadcast it to their neighbours and so on to know the required packet by individual nodes. This process continues until the packet reaches on Intermediate node or destination node itself. The reverse path for the route reply (RREP) packet is constructed by node according to their table Information, the node from which the first copy of RREQ arrival. If source moves then it can reinitiate route discovery to the destination. If an Intermediate node moves, a link failure notification is issued upstream. Protocol maintains routes for as long as the route is active. The current paper describes related work, proposed energy management, results and conclusion.

II. RELATED WORK

Tseng et al. have presented power saving protocol, which supports low-power sleep mode to operate across multiple hops [1]. Lee et al. have focused on joint opportunistic power scheduling and end-to-end rate power consumption control scheme to save power for wireless ad-hoc network [2].Dong et al. have described that dynamic selection of the nodes to consume less power and the network never fails [3]. Ebert et al. have proposed new scheme which is based on reducing transmission power to save power [4]. Wu et al. have proposed power consumption control protocol, which uses one control channel and multiple data channels [5]. Tseng et al. have explained about power level at which nodes in transmission range can receive and decode packet correctly [6]. Song et al. have presented the minimal achievable broadcast energy consumption scheme to save energy in network [7]. Jang et al. have stated that joint power scheduling and rate control algorithm is used to increase the life time of network [8]. Abusalah et al. stated that ad-hoc networks have to meet the requirements like confidentiality, integrity, authentication, non-repudiation and availability [9]. Wu et al. have explained that adaptive searching range routing algorithm is used to reduce power consumption by adjusting the link distance in the routes [10].

III. PROPOSED ENERGY MANAGEMENT MODEL

Energy management is required to determine energy consumption of nodes in a mobile ad-hoc network. Ad-hoc on demand distant vector protocol is used for routing between source and destination. Route Request (RREQ), Route Reply (RREP) and Route Error (RRER) messages are used for route discovery and maintenance in network. Link distance is adjusted according to the transmission power and remaining energy. A node broadcasts RRER packets when a link to the next hop is broken. Node's energy management mode is decided by the control header of medium access control layer data units. The state switching functions are shown in fig.1. Mobile node has two mode of operation like active mode or power-save mode. In active mode, a node is awake and may receive data at any time. In power-save mode, a node is

sleeping most of the time and wakes up periodically to check for pending messages. Controls messages like route reply messages are used to switch to active mode. RREPs are collected by the source node and start a timer as shown in Fig.1 Protocol adjusts transmission power for per-hop and selects the feasible routes based on remaining energy and transmission power of nodes so as to improve the overall performance of network.

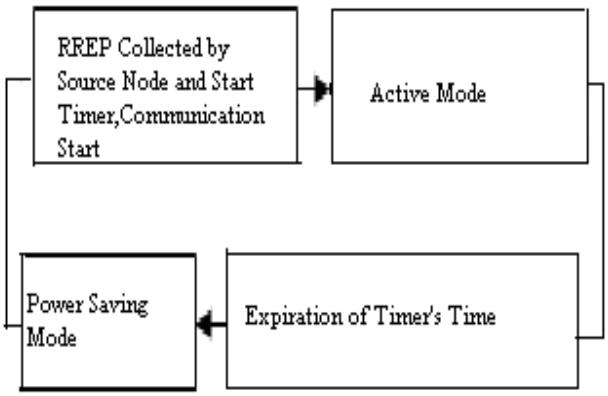

Fig.1 Energy Management Model

Transmission power Ptx, receive power Prx, and remaining energy of node Re are added in RREQ. Node is able to estimate the link attenuation with the knowledge of Ptx and Prx.

Result: In this simulation, mobile nodes move in 900 meter x 900 meter region for 100 seconds simulation time. Initial locations and movements of the nodes are obtained using the random waypoint model. All nodes have the same transmission range of 250 meters. Energy management model has main parameters like sleep power, transition power and transition time.

Receiving Energy and Remaining Energy: Relation between receiving energy and remaining energy is observed with both simulation results are given below:-

In this set of simulation, nodes remaining energy is determined by energy consumed in receiving data. Simulation results for receiving energy and remaining energy are shown in fig2.It is observed that receiving energy is used to control the remaining energy of nodes and increase the life time of network.

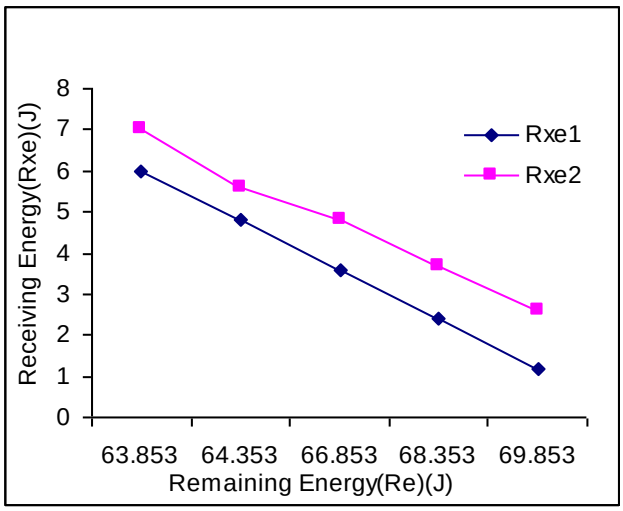

Fig.2 Receiving energy vs. remaining energy

It is also observed from proposed (Rxe2), receiving energy is decreasing as remaining energy increases in network. It is easy for network operator to know the status of remaining energy and receiving energy at any time. Energy management model concept is helpful in design and development of wireless ad-hoc network.

IV. CONCLUSION

In this paper, energy optimization model is proposed to estimate the remaining energy due to energy consumption in receiving. Equivalent simulator parameters have been used as inputs to achieve good generalization capability for network. The results from this scheme may use in prediction of the remaining energy of nodes within the range of the training set and control energy consumption in wireless ad-hoc network.

REFERENCES

[1] Tseng, Y., C., Hsu, C., S., Hsieh, T., Y., "Power Saving Protocols for IEEE 802.11-Based Multi-Hop Ad-Hoc Networks," Computer Networks, Elsevier Science Pub.,vol. 43,issue3,pp.317-337,2003.

[2] Lee, Won, Jang, Ravi, R., Mazumdar, "Joint Opportunistic Power Scheduling and End-to- End Rate Control for Wireless Ad-Hoc Networks. IEEE transaction on vehicular technology, vol56,issue2, pp.801-809,2007.

[3] Wu, Z., Dong, X., J., Cui, L., "A grid-based energy aware node-disjoint multipath routing algorithm for MANETs," Proc. International Conference on Natural Computation, pp. 244-248,2007.

[4] Ebert, J., P., Stremmel, B., Wiederhold, E., Wolisz, A., "An Energy-efficient Power Control Approach for WLANs," Journal of Communications and Networks,vol.2, issue3, pp.197-206,2000.

[5] Wu, S., L., Tseng, Y., C., Lin, C., Y., Sheu., J., P., "A Multi-Channel MAC Protocol with Power Control for Multi-Hop Mobile Ad Hoc Networks," The Computer Journal, vol.45,issue1, pp.101-110,2002.

[6] Wu, S., L., Tseng, Y., C., Lin, C., Y., Sheu., J., P., "Intelligent Medium Access for Mobile Ad-Hoc Networks with Busy Tones and Power Control," IEEE Journal on Selected Areas in Communications, vol.18,issue 9, 1647-1657,2000.

[7] Song, Liang, Dimitrios, Hatzinakos, "Broadcasting Energy Efficiency Limits in Wireless Networks," IEEE transaction on wireless communications, vol.7,issue7, pp.2502-2511,2008.

[8] Lee, Won, Jang, Ravi, R., Mazumdar, ".Joint Opportunistic Power Scheduling and End-to-End Rate Control for Wireless Ad-Hoc Networks," IEEE transaction on vehicular technology, vol.56,issue2, 801-809,2007.

[9] Abusalah, Loay, Khokhar, Ashfaq, Guizani, Mohsen, "A Survey of Secure Mobile Ad-Hoc Routing Protocols," IEEE communications surveys & tutorials,vol.10,issue4, 78-93,2008.

[10] Wu, Xiaoxin, Gang, Ding, Zhu, Wen wu, "Load-Based Route Discovery Through Searching Range Adaptation for MANET Throughput Improvement," IEEE transaction on vehicular technology, vol.58, 2055-2066,year 2008.

