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Network Life Time Prolonged Energy Efficient Routing In Adhoc Networks

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Abstract – Energy aware routing algorithms called Reliable Minimum Energy Cost Routing and Reliable Minimum Energy Routing (RMER) are proposed for wireless adhoc networks. RMECR defines the requirements of adhoc networks like energy-efficiency, reliability, reliability and prolonging the network lifetime. It consider energy consumption and the remaining battery energy of the nodes. RMER finds routes minimizing the total energy required for end to end packet traversal. RMECR and RMER both ensure reliability using hop by hop or end to end packet retransmission. Energy consumed by processing elements of transceivers, limited no of transmission allowed per packet, packet size, the impact of acknowledgement packet are considered in wireless adhoc network.

Index Terms - Energy-aware routing, battery-aware routing, end-to-end and hop-by-hop retransmission, reliability, wireless ad hoc network

1. INTRODUCTION

Routes are discovered considering the energy consumed for end-to-end (E2E) packet traversal. In order to ensure reliability of links we should choose a path which contains higher battery power of the node otherwise consider the residual energy of the node. Quality of service can be increased by finding reliable routes. The residual energy of the node is found to denote whether that node can be used for transmission or not. Although different algorithm are proposed for aiming reliability, energy-efficiency and to increase the lifetime of the networks (e.g., [3], [9], [12]).This does not ensure quality of links to the maximum level because if reliable path is chosen for transmission of data in wireless networks leads to overusing of same node. Generally energy efficient routing is very effective mechanism for reducing energy cost in adhoc networks

2. RELATED WORKS

There has been much algorithm proposedconsideringthe reliability of nodes for unexpected transmission count ETX is calculated to find reliable route which consists of links acquiring less number of retransmission. This method do not minimize the energy consumption for E2E data traversal. Considering higher priority of nodes leads to overusing of same nodes so soon it gets expires for eg consider a node which is near to the destination, a node which is close to the destination will be frequently used to forward the packet on behalf of other nodes so soon this node will fall quickly.

The next category includes algorithm that finds energy-efficient routes. Some of the algorithm addresses energy-efficiency and reliability but they do not consider the remaining battery powder of the nodes to avoid overuse of nodes (eg,[2],[10],[11]). Energy efficient algorithm proposed have a disadvantage to discover energy efficient route, they do not consider the actual energy consumption of the nodes (eg, [6],[7]). They consider only the output power of the amplifier neglecting the energy consumed by processing elements of transmitter and receivers (eg [1],[4]). Many algorithms have been proposed by finding routes consisting of nodes with a higher level of battery power in order to extend the network lifetime (eg [5],[8]) .The major drawback is that they do not concentrate on reliability and energy-efficiency. The routes discovered by these

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algorithm is neither reliable nor energy efficient path leads to more energy consumption.

3. PROPOSED WORK

In our work we combine the energy efficiency, reliability and prolonging the network lifetime for packet traversal in wireless adhoc networks. Reliable minimum energy cost routing (RMECR) consider the energy consumption and the remaining battery energy of the nodes. Reliable minimum energy routing (RMER) find routes minimizing the total energy required for end to end packet traversal. Both these algorithm ensure reliability using hop by hop or end to end transmission. MAC layer support HBH retransmission to increase reliability.

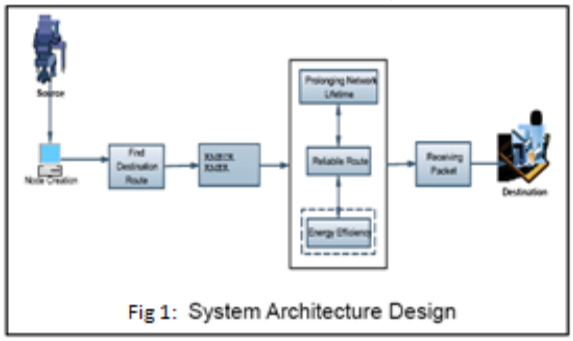

Fig 1: System Architecture Design

We address three important problem of energy efficiency. 1) Limited no of transmission on energy cost of the routes. The retransmission occurs after the expiration timer. Duration of the time is long enough to prevent unnecessary retransmission. 2) Considering the impact of acknowledgement packet on energy cost of routes. In HBH system, a lost packet is retransmitted by the sender to ensure link level reliability and acknowledgement is transmitted by the receiver to the sender. If sender does not receive the ACK either due to packet or its ACK lost or corrupted, the sender retransmit the packet. This is allowed till maximum no of transmission attempt is reached. 3) Considering the energy consumption of processing elements. In this work we consider the energy consumed by the transmission circuit and energy consumed by the power amplifier for data transmission over the air.

4. SYSTEM IMPLEMENTATION

4.1 Creation of Network formation

Create a set of neighbors, represented by a Graph G(W,IE) where W is the set of nodes (vertes) and IE is the link (Edges).Nodes are assumed to be battery powered.pu,v(x) is the packet delivery ratio PDR of u,vfor packet size x.r be the date rate at the physical layer in bits. εu,v(x) denote energy consumed for transmitting a per bit of a packet and is denoted by

$$\in_{u,v}(x) = \left(A_u + \frac{P_{u,v}}{k_u} \right) \frac{x}{r} \quad (1)$$

Let Au represents the power required to run the processing circuit of the transmitter node u. Pu,vbe the transmission power of node u to node v.

ωu,v(x) denote energy consumed for receiving a per bit of a packet

$$\omega_{u,v}(x) = \left(\frac{B_u}{r} \right) x \quad (2)$$

Let Bu be the power required to run the receiver circuit of the wireless interface.

4.2 Energy-Aware Reliable Routing Algorithm in HBH System

In HBH system, a lost packet is retransmitted again to ensure link level reliability.If the destination does not receive the acknowledgement due to packet or its Ack lost or corrupted the sender retransmit uptoQutimes.E[nu,v(Ld)] is the expected number of times u need to transmit a packet of length Ld

$$E[n_{u,v}(L_d)] = \frac{1-(1-p_{u,v}(L_d)p_{u,v(}L_h))^{Q_u}}{p_{u,v}(L_d)p_{v,u}(L_h)} \quad (3)$$

E[mu,v(Lh)] is the expected number of Ack of length Lhfor a data packet

$$E[m_{u,v}(L_h)] = \sum_{i=0}^{Q_u} i \Pr\{m_{u,v}(L_h)\} = L \quad (4)$$

au,v(Ld) is the total energy consumed by the transmitting node u. εu,v(Ld) is the energy consumed by u during a single transmission of a packet. ωu,v(Lh) is the energy consumed by u during a single reception of the ACK.

$$a_{u,v}(L_d) = E[n_{u,v}(L_d)] \in_{u,v}(L_d) + E[m_{u,v}(L_h)] \omega_{u,v}(L_h) \quad (5)$$

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bu,v(Ld) is the total energy consumed by the receiving node. εu,v(Lh) is the energy consumed by u during a single transmission of a ACK. ωu,v(Ld) is the energy consumed by u for receiving a single data packet.

$$b_{u,v}(L_d) = E[n_{u,v}(L_d)]\omega_{u,v}(L_d) + E[m_{u,v}(L_h)]\in_{u,v}(L_h) \quad (6)$$

Let $C(P(n_1, n_{h+1}))$ be the expected energy cost to route a data packet along the path.Energy cost of a route is calculated using

$$C(P(n_1, n_{h+1})) = \sum_{i=1}^{h}[R_{n_i}(L_d)e_{n_i, n_{i+1}}(L_d)] \quad (7)$$

4.3Energy-Aware Reliable Routing Algorithm in E2E System

Np(Ld) is the expected number of times that a data packet length Ld is transmitted from source to destination.

$$N_p(L_d) = \frac{1}{R_{n_{h+1}}(L_d)R'_{n_1}(L_e)} \quad (8)$$

Mp(Le) is the expected number of times that a E2E Ack of length Leis transmitted by the destination to source node.

$$M_P(L_e) = \frac{1}{R'n_1(L_e)} \quad (9)$$

Np(Ld) and Mp(Le) is similar to E[nu,v(Ld)] and E[mu,v(Lh)] in () and ().

Expected energy cost of a path in E2E system during single transmission from a source to the destination multiplied by expected number of times that the source retransmit a packet

$$C(P(n_1, n_{h+1})) = N_P(L_d)\sum_{i=1}^{h}[R_{n_i}(L_d)e_{n_i}, e_{n_{i+1}}(L_d)] + M_P(L_e)\sum_{i=1}^{h}[R'_{n_i}(L_e)e_{n_{i+1}}, n_i(L_e)] \quad (9)$$

whereeu,v(L),L ϵ {Ld,Le} is the energy cost of packet transmission over a link in the E2E system.

5. RESULT AND ANALYSIS

Let us compare the performance of RMECR and RMER.

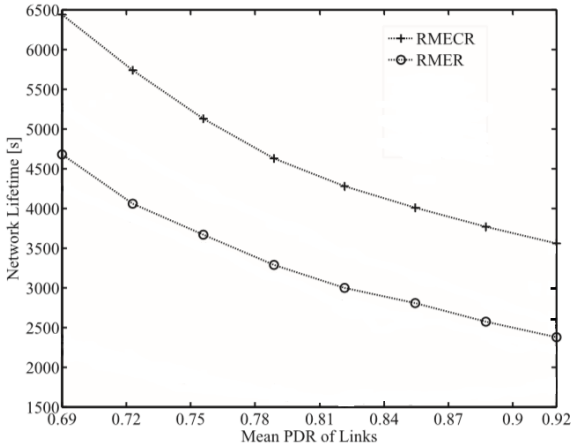

Fig 2: Avg no of packets delivered to destination before node failure occurs

Fig 2 clearly shows that RMECR can significantly delay the first node delay compared to RMER. This shows the ability of RMECR to avoid node being overused, which in turn increase the network lifetime.

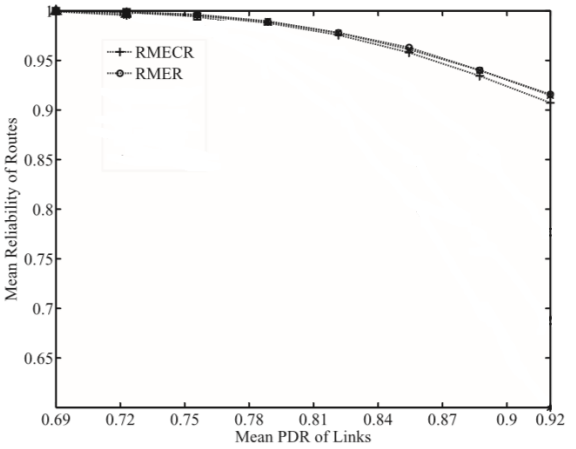

Fig 3: Average E2E Reliabilty of selected nodes

Fig 3 shows that RMER is similar to RMECR to find more reliable routes.

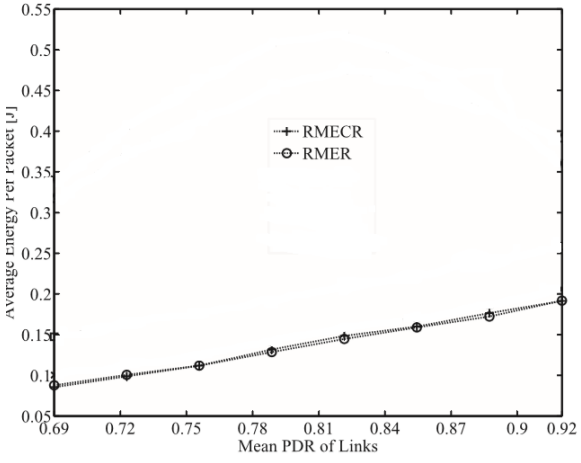

Fig 4: Avg energy consumed to route packet from a source node to destination node

Fig 4 shows that similar to RMER, RMCER is able to find energy efficient routes which consume less amount of energy to route a packet from source to destination. RMECR increase the operational lifetime of the network by finding more reliable and energy efficient routes.

6. CONCLUSION

RMECR and RMER is used to find reliable routes which minimize energy cost for E2E packet traversal.Energy cost of a route is related to reliability i.e) If routes are less reliable the probability of packet retransmission increases. Thus larger amount of energy will be consumed.In RMECR battery cost of nodesis the expectedenergy cost of a path to transfer a packet from source to destination.In RMER the amount of energy consumed by all nodes to transfer the packet from source to destination is the anticipated energy cost of a path.

REFERENCES

[1] M. Senel, K. Chintalapudi, D. Lal, A. Keshavarzian, and E. Coyle, "A Kalman Filter Based Link Quality Estimation Scheme for Wireless Sensor Networks," Proc. IEEE Global Telecomm. Conf. (GlobeCom '07), pp. 875-880, Nov. 2007.

[2] Q. Wang, M. Hempstead, and W. Yang, "A Realistic Power Consumption Model for Wireless Sensor Network Devices," Proc. Third Ann. IEEE Comm. Soc. Sensor and Ad Hoc Comm. and Networks (SECON '06), pp. 286-295, Sept. 2006.

[3] A. Misra and S. Banerjee, "MRPC: Maximizing Network Lifetime for Reliable Routing in Wireless Environments," Proc. IEEE Wireless Comm. and Networking Conf. (WCNC '02), pp. 800-806, 2002.

[4] C. Perkins, P. Bhagwat: Highly dynamic Destination-Sequenced Distance-Vector routing (DSDV) for mobile computers. Proceedings of ACM SIGCOMM, August 1994.

[5] K. Fall, K. Varadhan: The ns Manual (formerly ns Notes and Documentation). The VINT Project, A Collaboration between researchers at UC Berkeley, LBL, USC/ISI and Xerox PARC.

[6] X.-Y. Li, Y. Wang, H. Chen, X. Chu, Y. Wu, and Y. Qi, "Reliable and Energy-Efficient Routing for Static Wireless Ad Hoc Net- works with Unreliable Links," IEEE Trans. Parallel and Distributed Systems, vol. 20, no. 10, pp. 1408-1421, Oct. 2009.

[7] A. El Gamal, C. Nair, B. Prabhakar, E. Uysal-Biyikoglu, and S. Zahedi. Energy-effcient Scheduling of Packet Transmissions over Wireless Networks. In Proceedings of IEEE Infocom, June 2002

[8]Dinesh RatanGautam,SanjeevSharma,SantoshSahu," Enhanced Transmission Power Control Mechanism based on RSSI for MANET" International Journal of Computer Applications (0975 – 8887) Volume 28– No.1, August 2011 25.

[9] C. Toh, "Maximum Battery Life Routing to Support Ubiquitous Mobile Computing in Wireless Ad Hoc Networks," IEEE Comm. Magazine, vol. 39, no. 6, pp. 138-147, June 2001.

[10] Woesner H, Ebert J-P, Schlager M, Wolisz A. Power-Saving Mechanisms in Emerging Standards for Wireless LANs: The MAC Level Perspective. IEEE Personal Communications 1998; 5(3): 40-48

[11] J.-H. Chang and L. Tassiulas, "Maximum Lifetime Routing in Wireless Sensor Networks," IEEE/ACM Trans. Networking, vol. 12, no. 4, pp. 609-619, Aug. 2004.

[12] A. Michail and A. Ephremides, "A distributed routing algorithm for supporting connection-oriented service in wireless networks with time-varying connectivity," in Proceedings Third IEEE Symposium on Com- puters and Communications, ISCC'98, Athens, Greece, June 1998, pp. 587–591.