International Journal of Technology and Engineering System (IJTES)
Vol 7. No.1 2015 Pp. 86-88
©gopalax Journals, Singapore
available at : www.ijcns.com
ISSN: 0976-1345

ENERGY-EFFICIENT ROUTING FOR POWER UTILIZATION IN MANET USING RESIDUAL ENERGY

[1]G.BALAMURUGAN [2]M.SHANMUGASUNDARAM [3]V.LOKESH
[1, 2, 3] M.Tech., Student,
Department of Computer Science & Engineering,
Manakula Vinayagar Institute of Technology,
Pondicherry University, Pondicherry, INDIA.

ABSTRACT:
Power consumption in Mobile adhoc networks plays a vital role for routing in Hop-by-Hop communication. Packets which are transferred from source to destination using routing mechanism consume more power for communication. The performance of nodes in form of energy consumption is critical issue in MANET. To avoid more power consumption and also to increase, the energy efficient in routing mechanism using Residual Energy, we propose an energy aware routing called reliable minimum energy cost routing (RMECR) and reliable minimum energy routing (RMER). These two protocols are used to address the issues in MANET like energy efficient, reliability and also find the routes for minimizing the total energy required for end-to-end packet traversal.
Index Terms—MANET, Energy-aware routing, hop-by-hop, reliability.

INTRODUCTION:

ENERGY-EFFICIENT routing is an effective mechanism for minimizing the energy cost of data transmission and communication in wireless Mobile ad hoc networks. Normally, routes are exposed considering the power consumed for end-to-end (E2E) packet traversal [1, 2]. On the other hand, this should not result in finding less reliable routes in the network. Energy-efficient routing in Mobile ad hoc networks is neither complete nor efficient without the apprehension of reliability of links and residual energy of nodes. Finding reliable routes can improvise quality of the service. Whereas, concerning the residual energy of nodes as fact in routing can avoid nodes from being

overused and can finally lead to an increase in the operational lifetime of the network. Various routing algorithms have been employed for increasing the energy-efficiency, reliability [3,4,5]. This paper considers energy-efficiency, reliability in wireless Mobile ad hoc networks.
We propose an energy-aware routing mechanism, called reliable minimum energy cost routing (RMECR). RMECR which finds energy-efficient and reliable routes that increases the operational lifetime of the network. In the proposed RMECR, we concern an in-depth view and detailed analytical model of the energy consumption of nodes in MANET. RMECR is projected for networks with hop-by-hop (HBH) retransmissions provide the layer link reliability, and also E2E retransmissions with E2E reliability. HBH retransmission is maintained by the medium access control (MAC) layer (more precisely know as the data link layer) to increase reliability of packet transmission over wireless links. Nevertheless, some other MAC protocols such as CSMA and MACA may not support HBH retransmissions. In such a case, E2E retransmission can be used for ensuring E2E reliability.

We consider the impact of restricted number of transmission attempts on the energy cost of routes in Hop-By-Hop systems. We concern the limitation into account, a shortest-path routing algorithm like Dijkstra's algorithm which has been treated as a solution for the problem of minimum energy routing in wireless Mobile ad hoc networks but it does not provide an optimal solution [6,7,8]. Because, it is a heuristic solution, and it can be used as an optimal solution only if the number of

retransmissions on each link is large enough to ensure complete reliability of links.

We consider the impact of acknowledgment packets on energy cost of routes in both HBH and E2E systems. By considering this; we show that in the E2E the energy consumption cost of packet transmission from a source node to an intermediate node depends on both upstream and downstream links of that intermediate node[8,9,11]. Ignoring the impact of acknowledgement packets means that we disregard the impact of downstream links on the energy cost [10,12]. We consider energy consumption of processing elements of transceivers. As mentioned earlier, under estimating the energy consumption of transceivers can severely harm reliability and energy-efficiency of routes. A detailed concerning toward various aspects of the energy consumption of nodes makes our work realistic and thus closer to practical implementations.

ENERGY-AWARE RELIABLE ROUTING

Our aim is to find reliable routes in MANET which minimize the energy cost for E2E packet traversal. To this end, reliability and energy consumption cost of routes must be considered in the route selection. The fact is that energy consumption cost of a route is related to its reliability. If routes are less reliable in the network, the probability of packet retransmission increases. Thus, a larger amount of energy consumption will be carried as per packet due to retransmissions of the packet in the network. By using two different ways of computing the energy consumption cost of routes, we propose two sets of energy-aware reliable routing algorithms for Hop-By-Hop and End2End systems. They are called reliable minimum energy cost routing (RMECR) and reliable minimum energy routing (RMER). In RMER, energy consumption cost of a path for E2E packet traversal is the expected amount of energy consumed by all nodes to transfer the packet to the destination node. In RMECR, the energy consumption cost of a path is the predictable by the battery cost of nodes along the path to transfer a packet from the source to the destination. The minimum energy cost path (MECP) between a source node and a destination node is a path which minimizes the expected energy cost for E2E traversal of a packet between the two nodes in a multi-hop network.

RELIABLE ROUTING ALGORITHMS FOR ENERGY-AWARE IN THE HBH SYSTEM

Proposal of RMER and RMECR algorithms for networks supporting HBH retransmissions. Analyzing the energy consumption cost of a path for transferring a packet to its destination. Considering the impact of restricted retransmissions over each link, the size of data and ACK packets, and the reliability of each E2E paths is the added to the value of our design. Based on this in-depth analysis, in we design a generic routing algorithm for finding MECP between every two nodes of the network.
Design of Energy Cost of a Path.

The energy consumption cost of a path in the network is analyzed in four steps:

1. Analyzing the expected cost for transmission of data and ACK packets,
2. $$E\left[n_{u,v}(L_d)\right] = \frac{1-(1-p_{u,v}(L_d)p_{v,u}(L_h))^{Q_u}}{p_{u,v}(L_d)p_{v,u}(L_h)}.$$
3. Analyzing the expected energy consumption cost of a link concerning the energy cost of retransmissions,
4. $$a_{u,v}(L_d) = E[n_{u,v}(L_d)]\varepsilon_{u,v}(L_d) + E[m_{v,u}(L_h)]\omega_{u,v}(L_h),$$
5. Analyzing the End2End reliability of a path in network,
$$\begin{aligned} R_{u,v}(L_d) &= 1 - \Pr\{\text{packet lost after } Q_u \text{ transmissions}\} \\ &= 1 - \left[1 - p_{u,v}(L_d)\right]^{Q_u}. \end{aligned}$$
6. Formulating the energy consumption cost of a path taking into account the energy cost of links and E2E reliability of the path.
$$C\left(\mathcal{P}(n_1, n_{h+1})\right) = \sum_{i=1}^{h} \left[R_{n_i}(L_d)e_{n_i,n_{i+1}}(L_d)\right],$$

This in-depth view of the energy consumption cost lays the foundation for designing RMER and RMECR algorithms for the HBH System.

RELIABLE ROUTING ALGORITHMS FOR ENERGY-AWARE IN THE E2E SYSTEM

Design of RMER and RMECR algorithms for networks supporting E2E retransmissions. Similar to the HBH system, we first examine the energy cost of a path in the network for transferring a packet to its destination. Here, we also consider the impact of E2EACKs, which is missing. Then a generic routing algorithm is designed for finding MECP in the E2E system.
Proposal of a Routing Algorithm for Finding MECP

$$\begin{cases} \mathcal{C}((\mathcal{P}(s,v)) = \mathcal{C}_1(\mathcal{P}(s,v)) + \mathcal{C}_2(\mathcal{P}(s,v)) \\ \mathcal{C}_1(\mathcal{P}(s,v)) = \frac{1}{p_{u,v}(L_d)p_{v,u}(L_e)} \left(\mathcal{C}_1(\mathcal{P}(s,u)) + \frac{e_{u,v}(L_d)}{R(\mathcal{P}^{'}(u,s),L_e)}\right) \\ \mathcal{C}_2(\mathcal{P}(s,v)) = \mathcal{C}_2(\mathcal{P}(s,u)) + \frac{e_{u,v}(L_e)}{R(\mathcal{P}^{'}(v,s),L_e)} \\ R(\mathcal{P}^{'}(v,s),L_e) = p_{v,u}(L_e) \times R(\mathcal{P}^{'}(u,s),L_e), \end{cases}$$

CONCLUSION

We analyzed energy-aware routing in mobile ad hoc networks such as, reliable minimum energy cost routing (RMECR). RMECR can increase the operational lifetime of the network using energy-efficient and reliable routes. RMER finds routes minimizing the energy consumed for packet traversal. Furthermore, we observed that RMECR finds routes that their energy-efficiency and reliability are almost similar to that of routes discovered by RMER.

REFERENCES

[1] D.S.J. De Couto, D. Aguayo, J. Bicket, and R. Morris, "A High-Throughput Path Metric for Multi-Hop Wireless Routing," Proc.ACM MobiCom, pp. 134-146, 2003.

[2] S. Singh and C. Raghavendra, "PAMAS—Power Aware Multi-Access Protocol with Signalling for Ad Hoc Networks," ACM Computer Comm. Rev., vol. 28, pp. 5-26, 1999.

[3] J. Gomez, A.T. Campbell, M. Naghshineh, and C. Bisdikian,"PARO: Supporting Dynamic Power Controlled Routing in Wireless Ad Hoc Networks," Wireless Networks, vol. 9, no. 5,pp. 443-460, 2003.

[4] S. Banerjee and A. Misra, "Minimum Energy Paths for Reliable Communication in Multi-Hop Wireless Networks," Proc. ACM MobiHoc, pp. 146-156, June 2002.

[5] Q. Dong, S. Banerjee, M. Adler, and A. Misra, "Minimum Energy Reliable Paths Using Unreliable Wireless Links," Proc. ACM MobiHoc, pp. 449-459, May 2005.

[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] X. Li, H. Chen, Y. Shu, X. Chu, and Y.-W. Wu, "Energy Efficient Routing with Unreliable Links in Wireless Networks," Proc. IEEE Int'l Conf. Mobile Adhoc and Sensor Systems (MASS '06), pp. 160-169,2006.

[8] S. Singh, M. Woo, and C.S. Raghavendra, "Power-Aware Routing in Mobile Ad Hoc Networks," Proc. ACM MobiCom, Oct. 1998.[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] D. Kim, J.J.G. Luna Aceves, K. Obraczka, J. Carlos Cano, and P.Manzoni, "Routing Mechanisms for Mobile Ad Hoc Networks Based on the Energy Drain Rate," IEEE Trans. Mobile Computing,vol. 2, no. 2, pp. 161-173, Apr.-June 2003.

[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. Nagy, A. El-Kadi, and M. Mikhail, "Swarm Congestion and Power Aware Routing Protocol for Manets," Proc. Sixth Ann.Comm. Networks and Services Research Conf., May 2008.