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Literature Survey on Energy Consumption Control for Wireless Mobile Ad-hoc Network

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Abstract: ***Energy consumption control in wireless ad-hoc networks is a more difficult problem due to non availability of access point in network. A node can be both a data source and a router that forwards data for other nodes. There is no centralized entity such as an access point to control and maintain the power control mode of each node in the network. There are number of challenges offered by mobile ad-hoc network environment like limited power, route failure, synchronization, security etc. Nodes in the mobile ad-hoc network environment have limited battery power. Extra amount of energy is needed by router to forward and to relay packets. In this paper, literature survey is carried out on energy consumption issues for wireless ad-hoc network.***

Keywords: ***Transmission, Ad-hoc, Mobile, Energy***

1. Introduction

Mobile ad-hoc networks are based on a set of nodes which randomly communicate with each other over a wireless medium. These networks are without infrastructure and have multiple hops over wireless links. Wireless hosts are powered by batteries, which provide energy for a limited period. To conserve energy, power consumption control scheme is used to reduce energy consumption by varying the transmission power. Power consumption control in ad-hoc networks have been the focus of extensive research due to low energy capacity of network. Power consumption also 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. Transmission power consumption control includes important parameter like energy consumption. Transmission causes interference in the surrounding region due to shared nature of the wireless channel. Signal interference is reduced by reducing the transmission range, or the power level in network. Low-power level is increasing the relaying load on a node. Several medium access control protocols have been developed for wireless environments such as carrier sense multiple access, multiple access with collision avoidance IEEE802.11 and IEEE 802.11e.These MAC protocols are based on multiple design choices and utilize distinct medium access mechanisms. Modified ad-hoc on-demand distance vector algorithm is improved model of other ad-hoc algorithm.

This algorithm minimizes the number of broadcast and control energy consumption by creating routes on-demand. 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.

Energy saving is done in two different ways: First is power saving and second is power control. Power saving means to reduce power consumption and Power control means to adjust transmission power of mobile nodes. Power control problems in wireless ad-hoc networks have become more complex due to its architecture. Mobile ad-hoc network functions are affected by the transmission power of node. Power control reduce data retransmission probability with a good assignment of transmission power, each transmitter guarantees its transmission in a low number of attempts and reduces its interference on other nodes. Mobile ad-hoc network communication is made through space. Space transmission range is proportional to transmission power. Simultaneous transmissions in space are inversely proportional to average transmission range of nodes in a network. Energy consumption in mobile ad-hoc network reduced by reducing transmission power and reducing retransmission count. Efficient broadcast route discovery strategies that could reduce the number of retransmitting nodes of a broadcast message. These strategies can be grouped into four families: probability based, counter-based, area-based and neighbor-knowledge based methods: (i) Probability-based method: When a node receives a broadcast message for the first time, the node rebroadcasts the message with a certain probability. If the message received is already seen, then the node drops the message irrespective of whether or not the node retransmitted the message when it received the first time. (ii) Counter-based method: When a node receives a broadcast message for the first time, it waits for a certain time before retransmitting the message. During this broadcast-wait-time, the node maintains a counter to keep track of the number

of redundant broadcast messages received from some of its other neighbors. If this counter value exceeds a threshold within the broadcast-wait-time, then the node decides to drop the message. Otherwise, the node retransmits the message. (iii) Area-based method: A broadcasting node includes its location information in the message header. The receiver node calculates the additional coverage area that would be obtained if the message were to be rebroadcast. If the additional coverage area is less than a threshold value, all future receptions of the same message will be dropped. Otherwise, the node starts a broadcast-wait-timer. Redundant broadcast messages received during this broadcast-wait-time are also cached. After the timer expires, the node considers all the cached messages and recalculates the additional coverage area if it were to rebroadcast the particular message. If the additional obtainable coverage area is less than a threshold value, the cached messages are dropped. Otherwise, the message is rebroadcast.

2. Literature Survey of Energy Consumption

A mobile ad-hoc network is an autonomous collection of mobile nodes that communicate over bandwidth constrained wireless links. Ad-hoc network is operated with battery. Energy consumption control is serious problem in mobile ad-hoc network. Literature review focus on energy saving by route discovery, Energy saving by transmission power, Energy Saving by transmission range and energy saving by energy management model

2.1Energy saving by route discovery

Charles et al. have described reactive protocol to find a short route to the destination [1]. J. Jun et al. have explained that capacity of a wireless link may be degraded over time due to multi-path fading, noise and signal interference [2]. Tseng et al. have presented power saving protocol, which supports low-power sleep mode to operate across multiple hops [3]. Sungwon et al. have described that diffusive behaviour of mobile nodes should be correctly captured and taken into account for the design and comparison study of network protocols [4]. Toh has mentioned that simulation environment may used to analyze the power consumption control in mobile ad-hoc networks [5]. Krishnamurthy et al. have described throughput-oriented based transmission power control schemes to use per-packet power consumption control [6].

It is observed from literature survey that mobile ad-hoc network arbitrarily motion of nodes results in unpredictable and frequent topology changes. Additionally, since nodes in a mobile ad hoc network normally have limited transmission ranges, nodes cannot communicate directly with each other. Hence, routing paths in mobile ad-hoc networks contain multiple hops, and each node in mobile ad hoc networks has the responsibility to act as a router. Because of the importance of routing protocols in dynamic multi-hop networks, a lot of mobile ad hoc network routing protocols have been proposed in the last few years.

Energy saving by transmission power

C. Tuduce et al. have described that distributed power control scheme is used to save transmitter power per bit in data transmission [7]. 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 [8].Charya et al. have described that dynamic selection of the nodes consumes less power and the network never fails [9]. Chunhua et al. have stated that novel constrained entropy-based multi path routing algorithm is used to reduce the number of route reconstruction so as to provide quality of service guarantee and save power in the ad-hoc network [10]. Ebert et al. have proposed new scheme which is based on reducing transmission power to save power [11]. Rodoplu et al. have described power consumption control scheme, which is used for the purpose of energy saving in large network [12]. Wu et al. have proposed power consumption control protocol, which uses one control channel and multiple data channels [13].

It is observed from this survey that high transmission power on a link may improve the quality, throughput on that link and increase the levels of interference on other links. A decrease in the transmission power can have the opposite effects. Practically from experimental data, identify three interference scenarios: a) the overlapping case, where the aggregate throughput is achievable with two overlapping links. Aggregate throughput is not affected by power control, b) the hidden terminal case, where proper power control can primarily improve fairness and, c) the potentially disjoint case, where proper power control can enable simultaneous transmissions and thus improve throughput. Quality of signal transmission is also maintained by power control in a network. In the overlapping case, power control does not increase the maximum achievable throughput. In the hidden terminal case, power control improves the throughput.

2.2 Energy saving by transmission range

Tseng et al. have explained about power level at which nodes in transmission range can receive and decode packet correctly [14]. Dan Avidor et al. have proposed the distribution of the transmit power of individual nodes under different topology control algorithms to save power in network [15]. Song et al. have presented the minimal achievable broadcast energy consumption scheme to save energy in network [16]. Jang et al. have stated that joint power scheduling and rate control algorithm is used to increase the life time of network [17]. Mumtaz et al. have described about quality of service and power control by using node disjoint multi path routing [18]. Abusalah et al. stated that ad-hoc networks have to meet the requirements like confidentiality, integrity, authentication, non-repudiation and availability [20]. 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 [21].

It is observed from survey that radio transmission range as a system parameter affects the energy consumption economy of wireless ad-hoc networks.

On the one hand, a large transmission range increases the expected progress of a data packet toward its final destination at the expense of a higher energy consumption per transmission. On the other hand, a short transmission range consumes less per transmission energy, but requires a larger number of hops for a data packet to reach its destination.

2.3 Energy saving by energy management model

Zhu et al. have compared and verified result of energy management models with simulator [22]. Huang et al. have presented distributed power control algorithms for both single channel and multi channel wireless networks [23]. Wang et al. have developed an energy management model, in which routing

function dealt with both MAC layer and network layer. It could not determine the remaining energy of node for network lifetime [24]. Nyayate et al. have proposed protocol, which is used the concept of bounded wait state to reduce power consumption and at the same time improve the fairness in the network. The overall network connectivity depends on the battery life [25]. Vijay et al. have described position based routing, in which node mobility and position error also affects the network performance [26]. Kumar et al have stated that optimized link state routing protocol is efficient for large and dense networks [27]. Chaba et al. have explained that performance of on demand distance vector protocol with packet delivery ratio is better than other protocol [28].

This section describes the some of the existed research on the remaining energy of nodes and network lifetime in the mobile ad-hoc networks. Previous researchers have ignored power consumption control problem in the mobile ad-hoc networks.

It is observed from literature review that On-demand power management frame work is not effective for large size network due to dynamic configuration of network. Powers saving algorithms are not effective in case of high speed dynamic network. Ad-hoc medium access layer can not maintain quality of service with low transmission power. Multiple input multiple output communication system could not maintain lifetime of network. Network efficiency could not improved by using routing algorithm. Power control is not maintained by power saving.

3. Conclusion

In this paper, literature survey carried out the study, which need to be addressed in an attempt to promote energy consumption control for wireless mobile ad-hoc network. We have studied current energy saving techniques used at different levels. Energy saving at routing protocols level is much easier as compared to energy saving at mobile nodes. Each of these techniques saves some energy of mobile device and if we use these different techniques in a combined in a manner it saves lot of energy and increase the lifetime of network

4. Reference

[1] Charles E, Perkins, Elizabeth M, "Ad-hoc On-Demand Distance Vector Routing",Proc.2nd IEEE Workshop on Mobile Computing Systems and Applications,pp. 90-100,1999.

[2] Jun J, Sichitiu ML, "The Nominal Capacity of Wireless Mesh Networks", IEEE Wireless Communications,vol.10,pp.8-14,2003.

[3] Tseng YC., Hsu CS., Hsieh TY, "Power Saving Protocols for IEEE 802.11-Based Multi-Hop Ad-Hoc Networks", Computer Networks.Elsevier Science Pub.,vol.43,pp.317-337,2003.

[4] Kim Sungwon, Lee Ho Chul, Young Do Eun., "Super Diffusive Behaviour of Mobile Nodes and Its Impact on Routing Protocol Performance.IEEE Transactions on Mobile Computing,vol.9,pp.288-304,2010.

[5] Toh CK:Ad-hoc mobile wireless networks: protocol and systems, Englewood Cliffs: Prentice Hall,2002.

[6] Mohapatra, P., Krishnamurthy, "S.Ad-Hoc Networks, technologies and Protocols", Springer Science Business Media, 2005.

[7] Tuduce C, Zurich ETH, Gross TA, "Mobility Model Based on WLAN Traces and Its Validation.", Proc. IEEE INFOCOM,,pp.664-674,2005

[8] Lee JW, Mazumdar RR, Shroff NB, "Joint Opportunistic Power Scheduling and End-to End Rate Control for Wireless Ad-hoc Networks",IEEE Transactions on Vehicular Technology,vol.56,,pp.801-809**,2007.**

[9] 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.

[10] Chunhua, Xia., "A Kind of Novel Constrained Multipath Routing Algorithm in Mobile Ad Hoc Networks", Proc. International Conference on Computational Intelligence and Software Engineering,pp.1-3,2009.

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

[12] Rodoplu V, Meng TH, "Minimum Energy MobileWireless Networks", EEE Journal on selected areas in communications, Vol.17,pp.1333-1344,1999.

[13]Wu SL, Tseng YC, Lin CY:Sheu JP, "A Multi-Channel MAC Protocol with Power Control for Multi-Hop Mobile Ad Hoc Networks".The ComputerJournal,vol.45,pp.101-110,2002.

[14]Wu SL., Tseng YC, Lin CY, Sheu JP, "Intelligent Medium Access for Mobile Ad-Hoc Networks with Busy Tones and Power Control", IEEE Journal on Selected Areas in Communications,vol.18,pp.1647-1657,2000.

[15] Avidor, Dan,Sayandev, Mukherjee, Furuzan, Atay, Onat, "Transmit Power Distribution of Wireless Ad-hoc Networks with Topology Control", IEEE Transaction on wireless communication, vol.7,pp.1111-1116,2008.

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

[17] 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 ,pp.801-809,2007.

[18] Mumtaz, Shahid, Gamerio,Alitio, "New Protocol for QoS Routing in Mobile Ad-Hoc Networks", International Journal of Communication Networksand Information Security,vol3,pp.59-64,2009.

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

[20] 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,,pp.2055-2066,2008

[21] Zhu, Jinhua, Qiao, Chunming, Wang, Xin, "On Accurate Energy Consumption Models for Wireless Ad-Hoc Networks", IEEE transaction on wireless communication,vol.5,pp.3077-3086,2006.

[22] Huang, Jianwei, Randall A, Berry,"Distributed Interference Compensation for Wireless Networks," IEEE Journal of selected areas in communications,vol.24,pp.1074-1084,2006.

[23] Wu, Xiaoxin, Gang, Ding, Zhu, Wenwu, "Load-Based Route Discovery Through Searching Range Adaptation for MANET Throughput Improvement", IEEE Transactions on vehicular technology,vol.58, pp.2055-2066,2009.

[24]Wang,Yu,"Studyon Energy Conservation in MANET.Journal of Networks,vol.5,pp.708-715,2010.
[25] Nyayate M., Singh YN,, "Dynamic Safe Transmit Power MAC protocol in Wireless Adhoc MAC protocol., Proc. IEEE Conference TENCON,pp.179-183,2011
[26] Vijaya I.,Mishra PB, Dash AR, Rath AK., "Influence of Routing Protocols in Performance of Wireless Mobile Adhoc Network", Proc. Second IEEE International Conference on Emerging Applications of Information Technology,pp.340-344,2011.
[27] Kumar H, Arora H, Singla RK, "Simulation analysis of optimized link state routing protocol in wireless sensor networks", Proc. IEEE International Conference on Emerging Trends in Networks and Computer Communications (ETNCC), pp.192-194,2011.
[28] Chaba Y, Singh Y, Joon M., "Simulation Based Performance Analysis of On-Demand Routing Protocols in MANETs",Proc.Second International Conference on Computer Modeling and Simulation, pp.80-83,2010.