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Improving the Communication Energy Efficiency Using Power Cognizant Bond State Routing Protocol for MANET

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ABSTRACT: Wireless Network devices, especially ad hoc Networks are typically battery-powered. The goal of this proposed work is to extend network lifetime by improving energy utilization in MANET routing. MANET is group of mobile nodes that form a network independently of any centralized administration. In MANET, power aware is challenge issue to improve the communication energy efficiency at individual nodes. A new power aware routing protocol (EPAR) Efficient Power Aware Routing is used. This protocol increases the network lifetime of MANET. EPAR identifies the residual battery power and also the expected energy spent in reliably forwarding data packets over a specific link. EPAR selects the path based on remaining battery power of each nodes. Three ad hoc networks routing protocols (EPAR, MTPR, and OLSR) are evaluated in this proposed work.

KEYWORDS: MANET, EPAR, MTPR, DSR, OLSR.

I.INTRODUCTION

A mobile ad hoc network (MANET), sometimes called a mobile mesh network, is ad hoc networks plays an inevitable role in the evolution of future wireless technologies. Mobile wireless devices with network interfaces based on infra-structure and infrastructure-less mobile networks will become an essential part of future computing environment. Wireless local area network based on IEEE 802.11 technology is the most common infra-structure mobile network. A MANET is a continuously self-organizing, infrastructure-less network of mobile devices connected wires. MANET is an infrastructure-less multi hop network where each node communicates with other nodes directly or indirectly through intermediate nodes. All nodes in a MANET basically function as mobile routers participating in some routing protocol required for deciding and maintaining the routes and are rapidly deployable wireless networks. Due to these facts they are highly suitable for applications involving fast outdoor downloading, communications in regions with no wireless infrastructure, emergencies and natural disasters and military operations.
Routing is one of the key issues in MANETs due to their highly dynamic and distributed nature. In particular, energy efficient r outing may be the most important design criteria for MANETs since mobile nodes will be powered by batteries with limited capacity. Power failure of a mobile node affects the ability to forward packets on behalf of others and thus the overall network lifetime. Communication has become very important for exchanging information between people from, to anywhere at any time. MANET is group of mobile nodes that form a network independently of any centralized administration. Since those mobile devices are battery operated and extending the battery lifetime has become an important aim. As each mobile node in a MANETs performs the routing function for establishing communication among different mobile nodes the ''death'' of even a few of the nodes due to power exhaustion might cause disconnect of services in the entire MANETs.

Packet transmission consumes the majority of a mobile device's power. However, packet reception also consumes a sizeable amount of energy. Thus, concentrating on minimizing the output power does not necessarily lead to minimum energy consumption. Output power should be adaptive to channel conditions since reduction of transmitter output power results in a reduction of the instantaneous power needs, but a lower transmit power might result in a higher bit error rate (BER) in bad channel conditions. A high BER leads to retransmissions, which counteract the energy

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conservation process. Thus, to reduce power consumption, a simple power control mechanism should be working. After overcoming these challenges, determining the minimal operational power requirement for each node in the network increases the network's lifetime.

Energy consumption depends on the network load and number of mobile nodes in the network. Number of nodes increases, the probability of the number of conflict also increases, leading to higher energy consumption. Thus, analyzing energy expenditure in a network card requires the study of power usage in the transmit, send, idle, and sleep modes.

II. RELATED WORK

Routing Mechanisms for Mobile Ad Hoc Networks Based on the Energy Drain Rate, This paper proposed the drain rate, to forecast the lifetime of nodes based on the current traffic conditions[17]. This metric is combined with the value of the remaining battery capacity to determine which nodes can be part of an active route.
This paper proposed a new route selection mechanism for MANET routing protocols, which we call the Minimum Drain Rate (MDR) and the Conditional Minimum Drain Rate (CMDR). MDR extends nodal battery life and the duration of paths. CMDR also minimizes the total transmission energy consumed per packet. But all the existing work has several drawbacks such as it is more time consuming and couldn't able to find the new route once if node get shutdown since it does not support multicasting.

QoS based power aware routing protocol (Q-PAR) selects an energy stable QoS constrained end to end path [1],[2]. The selected route satisfies the bandwidth constraint of the application. The protocol Q-PAR consist of two phases. Route discovery is the first phase. The bandwidth and energy constraints are built in into the DSR route discovery mechanism. In the event of link failure, a repair mechanism is invoked to search for an energy stable alternate path locally, in the second phase.
An ad-hoc network of wireless static nodes is rapidly deployed, sensor-based and monitoring system [10]. Information can be generated in certain nodes and needs to reach a set of designated gateway nodes. Each node adjust its power within a certain range that determines the set of possible one hop away neighbors. Traffic forwarded through multiple hops. The nodes have limited initial amounts of energy. Energy consumed at different rates depending on the power level and the intended receiver.

III. EXISTING SYSTEM

Most of the previous work on routing in wireless ad-hoc networks deals with the problem of finding and maintaining correct routes to the destination during mobility and changing topology. Existing approach for energy efficient routing is known as Minimum Transmission Power Routing (MTPR).This mechanism calculates the total energy consumed for forward the information along the route .MTPR reduces the overall transmission power consumed per packet, but it does not directly affect the lifetime of each node. In Existing the Shortest path algorithm also used. MTPR has few disadvantages. MTPR concentrates only on minimum energy consumption path. It does not focus the individual nodes life time and remaining battery power .In existing DSR protocol can be used for forwarding data packets. The various drawbacks of DSR are DSR does not support multicasting and route maintenance mechanism of that protocol does not locally repair a broken link. It does not maintain routing table.

IV.PROPOSED SYSTEM

This paper introduces the Optimized Link State Routing (OLSR) protocol for mobile ad-hoc networks. The protocol is an optimization of the link state algorithm. The main concept used in the protocol is that of multi point relays (MPRs). The MPR set is selected such that it covers all nodes that are two hops away. The node N which is selected as a multi point relay by its neighbors It periodically announces the information about who has selected as an MPR. The message is received and processed by all the neighbors of N, but only the neighbors who are in N's MPR set retransmit it. All nodes are informed of a subset of all links between the MPR and MPR selectors in the network. For route calculation, each node calculates its routing table using a "shortest hop path algorithm" based on the partial network topology it

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learned.MPR selection is the key point in OLSR. he proposed heuristic for MPR selection is to iteratively select a 1-hop neighbor which reaches the maximum number of uncovered 2-hop neighbors as MPR. If there is a tie, the one with higher degree (more neighbors) is chosen.

Pro-active routing – OLSR

The Optimized Link-State Routing protocol contains three main modules:

- Neighbor discovery/link sensing
- Forwarding data packet(Multi Point Relaying)
- Link-State messaging and route maintenance

Link and neighbor sensing

Neighbors and links are detected by HELLO messages. All nodes transmit HELLO messages on a given interval. These contain all heard-of neighbors grouped by status A simplified neighbor detection scenario:

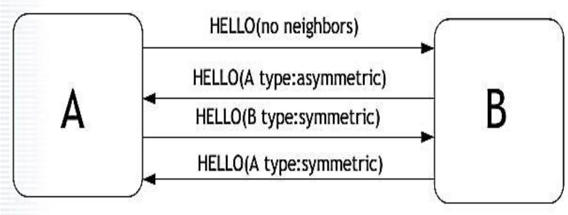

FIGURE 1. Link and neighbor sensing

Multipoint Relaying

Reduce the number of duplicate retransmissions while forwarding a broadcast packet. Restricts the set of nodes retransmitting a packet from all nodes (regular flooding) to a subset of all nodes. The size of this subset depends on the topology of the network.

Multipoint Relay selection

All nodes selects and maintains their own MPRs. Rule: “For all 2 hop neighbors n there must exista MPR m so that n can be contacted via m.”

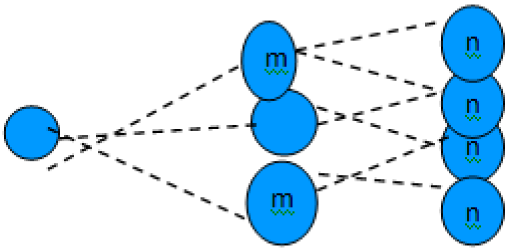

FIGURE 2. Multipoint Relay Selection

Forwarding of traffic

All nodes registers and maintains their MPR selectors. Rule: “If OLSR-packet is received from a MPR selector, then all messages contained in that packets are to be forwarded if TTL > 0.”This goes for both known and unknown message types

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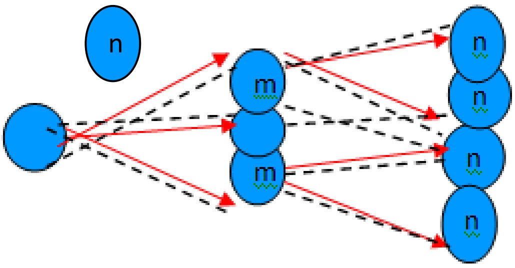

FIGURE 3.Forwarding of Traffic

V.SIMULATION SETUP AND RESULTS

Simulations were conducted using Network Simulator. Simulated network consisted of 50- 20 nodes randomly scattered in a 1500x1500m area at the beginning of the simulation. The tool setdest was used to produce mobility scenarios.

Nodes within wireless range of the transmitter and nodes within wireless range of the receiver that are not the destination must discard received packets. The cost of discarding traffic depends on the MAC implementation. For The 802.11 MAC, nodes that over hear the transmitter hear the RTS message, while nodes in the destination range hear a CTS message and an ACK message.

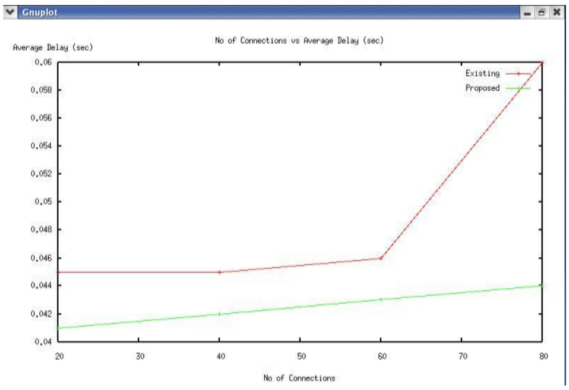

FIGURE 4. Average Delay Reduction /Sec

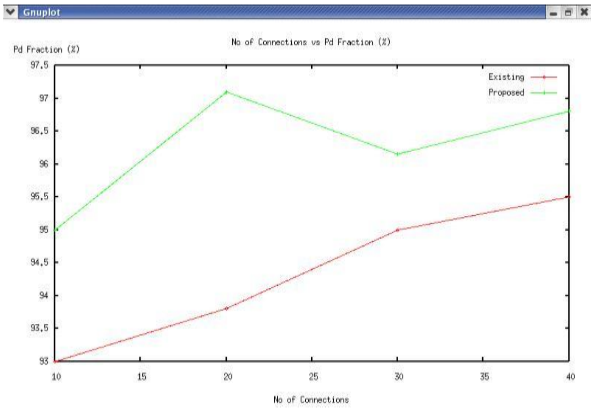

FIGURE 5. Packet Delivery Ratio

Fig.4 shows the average number of packets sent and received f o r DSR and OLSR in the low- content ion scenario. Average end- to- end delay is slightly increased in OLSR over DSR. In general, we observe a modest improvement in the network lifetime with DSR and OLSR in low and high contention scenarios. An increase in the number of packets delivered to the application is also observed. The longer the network lives the more packets can be delivered to the application. Delay times, however, have mixed results. In DSR we see an increase in end-to-end delay times due to power-aware protocol overhead. OLSR on the other hand, shows a decrease in end-to-end delay for reasons mentioned earlier.

Fig.5 shows average percentage of packets delivered for the protocols. The figure shows an average of 93% of packets delivered for DSR and EPAR, while an average percentage of packets delivered of 96% for DSR and OLSR. This

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section investigates the high percentage packet-drop rate observed in the low-contention scenarios. To understand the problem, we setup simulations for low-contention stationary and low-speed coordinated movement networks. In all simulations we limited the energy per node to 2000 Joules and reduced the offered load in the network. By increasing the special distance between the flows and reducing the traffic rate in half we managed to obtain, on average, less than 10 % drop rate for the above scenarios. This shows that our initial low-contention scenario might be considered medium-contention instead of low- contention.

VI. CONCLUSION AND FUTURE ENHANCEMENT

In this paper, we propose a simple power- aware r outing technique that takes advantage of the ability of wireless network adapters to dynamically change their transmission power, as well as ability of the wireless devices to ascertain their remaining battery power. This information is used to create a table of what we term reluctance values at each node. Devices share reluctance values and use them to determine how to route packets. We presented an original solution called EPAR which is basically an improvement on OLSR. This study has evaluated two link aware ad hoc routing protocols consideration network lifetime and packet delivery ratio. Overall, the findings show that the energy consumption and throughput in small size networks did not reveal any significant differences. Our current simulation model is based on static and mobile network snapshots. We are currently adding our heuristics to an OLSR simulation based on NS2. We will explore the impact of node movement and bandwidth change. The optimal energy aware algorithms will be run under these conditions to evaluate their performance under dynamic topology and link bandwidth changes. Also, in the current simulations, we not only compare the performance of the algorithms, but also show their advantages and limits with respect to costs – the overhead each algorithm generates. This research presented improvements achieved by our proposed power-aware scheme in existing reactive and proactive routing protocols. The power-aware scheme can be further studied and analyzed. Therefore we suggest the following future studies.

Apply the proposed power-aware scheme to a hybrid protocol and compare and contrast performance to that for reactive and proactive protocols. Our work considered a simple mobility model, specifically, random waypoint. Considering more complex mobility models can help us understand the limits of our power-aware scheme.

REFERENCES

[1] V. Rishiwal, S. Verma, and S. K. Bajpai, ``QoS based power aware routing in MANETs," Int. J. Comput. Theory Eng., vol. 1, no. 1, pp. 47_54, 2009.
[2] C. Huang, ``On-demand location-aided QoS routing in ad hoc networks," in Proc. IEEE Int. Conf. Parallel Process., Montreal, QC, Canada, Aug. 2004, pp. 502_509.
[3] W.-H. Lio, Y.-C. Tseng, and K.-P. Shih, ``A TDMA-based band-width reservation protocol for QoS outing in a wireless mobile ad hoc network," in Proc. IEEE Int. Conf. Commun., vol. 5. 2002, pp. 3186_3190.
[4] J. Punde, N. Pissinou, and K. Makki, ``On quality of service routing in ad-hoc networks," in Proc. 28th Annu. IEEE Conf. Local Area Netw.,Oct. 2003, pp. 276_278.
[5] P.-J. Wan, G. Calinescu, X. Li, and O. Frieder, ``Minimum-energy broad-cast routing in static ad hoc wireless networks," in Proc. IEEE INFOCOM,Apr. 2001, pp. 1162_1171.
[6] S.-L. Wu, Y.-C. Tseng, and J.-P. Sheu, ``Intelligent medium access for mobile ad hoc networks with busy tones and power control," IEEE J. Sel.Areas Commun., vol. 18, no. 9, pp. 1647_1657, Sep. 2000.
[7] S. Muthuramalingam, R. RajaRam, K. Pethaperumal, and V. K. Devi,``A dynamic clustering algorithm for MANETs by modifying weighted clustering algorithm with mobility prediction," Int. J. Comput. Elect. Eng.,
vol. 2, no. 4, pp. 709_714, 2010.
[8] A. H. Hussein, A. O. Abu Salem, and S. Yousef, ``A _exible weighted clustering algorithm based on battery power for mobile ad hoc networks,"in Proc. IEEE Int. Symp. Ind. Electron., Jun./Jul. 2008, pp. 2102_2107.
[9] S. Gupta, C. K. Nagpal, M. Kaur, and B. Bhushan, ``Impact of variable transmission range on MANET performance," Int. J. Ad Hoc, Sensor Ubiquitous Comput., vol. 2, no. 4, pp. 59_66, 2011.
[10] S. Shankar, B. Sivakumar, G. Varaprasad, and G. Jayanthi, ``Study of routing protocols for minimizing energy consumption using minimum hop strategy in MANETs," Int. J. Comput. Commun. Netw. Res., vol. 1. no. 3, pp. 10_21, 2012.
[11] P. Goyal, V. Parmar, and R. Rishi, ``MANET: Vulnerabilities, challenges, attacks, application," Int. J. Comput. Eng. Manag., vol. 11, pp. 32_37, Jan. 2011.
[12] S. Shakkottai, T. S. Rappaport, and P. C. Karlsson, ``Cross-layer design for wireless networks," IEEE Commun. Mag., vol. 41, no. 10, pp. 74_49, Oct. 2003.
[13] V. Srivastava and M. Motani, ``Cross-layer design: A survey and the road ahead," IEEE Commun. Mag., vol. 43, no. 12, pp. 112_119, Dec. 2005.

[14] S. Mishra, I. Woungang, and S. C. Misra, ``Energy ef_ciency in ad hoc networks,'' Int. J. Ad Hoc, Sensor Ubiquitous Comput., vol. 2, no. 1, pp. 139_145, 2011.
[15] C. Poongodi and A. M. Natarajan, ``Optimized replication strategy for intermittently connected mobile networks,'' Int. J. Business Data Commun. Netw., vol. 8, no. 1, pp. 1_3, 2012.
[16] S. Shankar, B. Sivakumar, and G. Varaprasad, ``Implementing a new algorithm for analysis of protocol effciency using stability and delay tradeoff
in MANET,'' Int. J. Comput. Technol., vol. 2. no. 3, pp. 11_17, 2001.
[17] D. Kim, J. J. Garcia-Luna-Aceves, K. Obraczka, J.-C. Cano, and P. Manzoni, ``Routing mechanisms for mobile ad hoc networks based on the energy drain rate,'' IEEE Trans. Mobile Comput., vol. 2, no. 2, pp. 161_173, Apr./Jun. 2006.
[18] M. Izuan and M. Saad ``Performance analysis of random-based mobility models in MANET routing protocol,'' Eur. J. Sci. Res., vol. 32, no. 4, pp. 444_454, 2009.