INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 3 (2018) PAGES 3586 - 3590
RECEIVED : 15.04.2018 PUBLISHED : 20.05.2018
May 20, 2018

Achieving Maximum energy efficiency minimizing in MANET

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Abstract:

Mobile Ad hoc NETwork (MANET) plays a major role in providing effective communication services for infrastructure less application through efficient routing. For this reason, many energy efficient routing algorithms are being developed as a promising solution. However, while developing efficient routing, redundant rebroadcasting poses significant problems. Therefore, effective routing without any redundant rebroadcasting is inherently necessary whenever a user transmits the packet on the channel. In this work to attain effective routing mechanism in Mobile Ad hoc NETwork without any redundant rebroadcasting, a method called, Probabilistic and Link based Energy Efficient Routing (PLEER) is presented. The Probabilistic Re- broadcasting mechanism in PLEER method reduces high channel contention causing redundant and average energy per packet by combining both neighbor coverage and probabilistic methods. The PLEER method therefore selects the best path in a network while transmitting the packet reducing the average energy per packet and end to end delay. Link based Energy Efficient Routing provides less redundant rebroadcast by means of avoiding network collision and contention which in turn increase the packet delivery ratio and network lifetime. Simulation results demonstrate that compared to other energy efficient routing, PLEER is an efficient method for reducing the average energy per packet and end to end delay in MANET. Extensive simulations show that PLEER outperforms other existing scheme in terms of successful data delivery and improve network lifetime in various scenarios.

Keywords - Mobile Ad hoc Network, Routing, Probabilistic Re-broadcasting, Routing overhead, Packet delivery ratio.

1. INTRODUCTION

In MANET, every mobile node works as both a transmitter and a receiver via bidirectional wireless links which does not require a fixed network infrastructure. Efficient designing of a routing protocol is one of the most required tasks in Mobile Ad Hoc Networks. Reliable Minimum Energy Cost Routing (RMECR) [1] identified an efficient routing by reducing the total energy required for end-to-end packet traversal using expected transmission count of data. Optimization of energy consumption was made in [3] by applying Maximum Independent Set (MIS) resulting in minimum congestion even for sparse networks. As a result of various research works, MANET are possessing several good and effective routing protocols. Store Carry and Forward (SCF) [4] was investigated to provide a tradeoff between energy and delay in order to achieve

maximum energy savings. However, the computational cost increased with the increase in redundancy. In [5] to reduce redundancy, global network information was used by applying adaptive forwarding strategy. This in turn resulted in the improvement of cost related to data delivery with respect to the destination nodes. In this work, we have introduced a Probabilistic and Link based Energy Efficient Routing method. Here, the mobile nodes calculate their forwarding probability for respective data packet based on the rebroadcast probability mechanism in a dynamic manner. This calculation is performed using exponential function which depends on neighbor coverage and the probabilistic method.

2. RELATED WORK

In this section, we discuss related work on energy efficient routing mechanisms in MANET. Multi-hop propagation of data packets is a promising technique for improving routing efficiency and increasing the network lifetime of the nodes in the network. In [9], multi-hop beaconing forwarding strategies were applied to minimize the rate of collision and therefore improve the packet delivery ratio in Vehicular Ad Hoc Network (VANET). One of the most critical issues for Internet Service Providers (ISPs) is the consumption of the substantial power.

Fig.1.Mobile Adhoc Network

It has been reported that the Information and Communication Technology consumes 2% to 10% of the world total electricity consumption. With the objective of reducing the power, energy efficient routing based on hop-by-hop based on multipath choice mechanism resulting in significant saving of multiple types of sensors. an energy efficient spectrum sensing based on the Markov model was designed in Cognitive Radio Sensor Network (CRSN). With the Markov model-based mathematical modeling, energy consumption during routing was reduced. However, network lifetime remained unsolved. To address the issues related to network lifetime, entralized Energy Efficient Distance (CEED) based routing protocol was designed to not only improve the network lifetime but also to increase the stabilityperiod.

3. PROPOSED SYSTEM

Once probabilistic rebroadcasting has been designed, an energy efficient routing has to be provided to improve the packet delivery ratio. The PLEER uses Link based Energy Efficient Routing mechanism with

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energy cost as the link metric and search for the path with minimum total transmission cost between the source node and the destination node in a continuous manner. The link estimation algorithm as given above searches for the energy efficient route based on the link metrics (i.e. total energy cost). The minimum total energy cost between the neighbouring nodes is selected as the route for transmitting the packets. Therefore, the PLEER method provides less redundant rebroadcast by means of link estimation which in turn increases the packet delivery ratio and network lifetime. The packet delivery ratio returned over RMECR decreases gradually as the number of packets gets increased. Due to the increase in the mobility rate, frequent changes occur in the topology, minimizing the network lifetime and henceforth increases the link failure rates. Packets may be dropped due to higher rate of frequent link failure in all the methods. Our proposed PLEER method outperforms the existing RMECR and achieves better performance because of choosing the minimum total transmission cost between the source and destination node. This in turn avoids the overhead for propagating control packets, which significantly minimizes the packet dropping rate over a long period of time. Therefore the packet delivery ratio using PLEER method is improved by 6.94% compared to RMECR. Broadcasting is done via flooding, and waits for a route reply (RREP). An intermediate node receiving a RREQ packet set a reverse route entry to the source in its rout table. Reverse route entry consists of: Source IP address, Source seq. number, number of hops to source node, IP address of node from which RREQ was received. When the destination node receives a RREQ, it also generates a RREP. The RREP is routed back to the source via the reverse path. As the RREP reaches to source, a forward route to the destination established.

4. ANALYSIS

In the Proposed route request packet by adding some new variables, like data size, unstable nodes count, sum of neighbors and sum of buffered packets. A node is able to calculate its residual battery energy. The paths with stable nodes will be selected and the node's stability will be checked before it broadcast route request with the condition that it should not change certain rate of its neighbors in specific time.

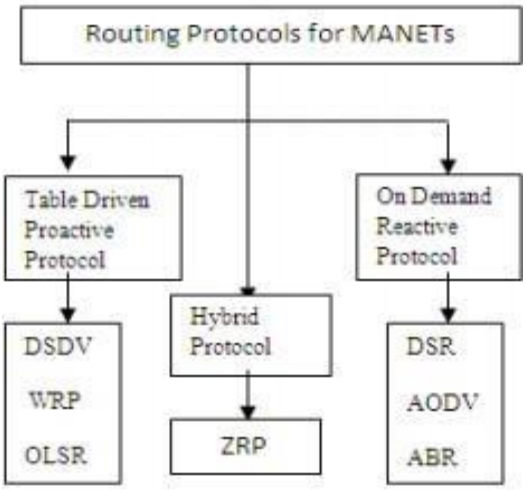

Fig.2.Different protocols

A node can broadcast the request packet only if it has more lifetime than the required time to send the packet. This way the nodes that have less energy are prevented from participation and the paths which have less unstable nodes, nodes with fewer neighbors and buffered packets are selected. The result shows that the proposed algorithm consumes lower energy and sends less number of request packets. In the proposed an energy efficient algorithm, which is used for AODV. They used HELLO massages of AODV to calculate the difference between transmitting power and receiving power and which gives the value of propagation loss, slightly modified the original 32-bits destination sequence number field to a new 32-bit value, obtained from the source battery function in RREQ. The formatted HELLO RREP by reserving a field of (9 bits) for power loss level with 8 bit long length. This field is a power loss for specific link. As source is having all the information so it is easy to calculate the power loss by subtracting the received power from the transmitting power. The proposed an adaptive low battery alert mechanism to overcome the overuse of the firstly established route. They used 50% or 40% of the new battery capacity. The result shows that this algorithm can improve network lifetime in both static and mobile networks.

CONCLUSION

In this paper, we presented a Probabilistic and Link based Energy Efficient Routing (PLEER) for MANET and also proposed a Probabilistic Re- broadcasting for consistent efficient routing. In PLEER, routing is performed and data packets are forwarded to the neighbor node based on the neighbor coverage and probabilistic methods with dynamically computed probability called as rebroadcast probability. The rebroadcast probability function is calculated based on the exponential function. Finally, a link based energy efficient routing is investigated via link-based energy table. The performance of the PLEER has been compared against RMECR. Simulation results showed that PLEER method performs better than other representative energy efficient routing in terms of energy per packet, network lifetime, packet delivery ratio, and average end to end delay.

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