DESIGN AND IMPLEMENTATION OF EPAR TO SEARCH AND COMMUNICATE WSN NODES

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ABSTRACT

In a big farm there might be more number of animals, so, it is difficult to monitor each one of them. Because of this, animals are being stolen frequently. In such cases monitoring a livestock is a very necessary issue. The proposed system mainly aims to have the animals in a defined boundary stay connected with central hub. Whenever the animals are stolen, it will be intimated to the central hub through missing acknowledgement. This is done by using WSN nodes with EPAR technology. This technology identifies the node's capacity not only based on residual energy, but also on the expected energy required to transfer the packet to the neighbor node. EPAR chooses the transmission path with the maximum packet capacity at the least residual packet capacity for transmission using a mini-max formulation.

Keywords: Central hub, Channels, EPAR, Pan id, Residual battery power

1. INTRODUCTION

For last few years, Wireless networks have become more popular. Infrastructured and infrastructureless networks are two variations of wireless networks. In the former, centric controllers are used to establish and maintain communications among terminals. Examples are the wireless Local Networks (IEEE 802.11) and cellular networks. The latter is commonly known as wireless ad-hoc network. In such a network, the terminals are organized in an ad-hoc manner, where they can establish connections by themselves and uses multi-hop to communicate with each other. This property makes ad-hoc networks to establish a network instantly even in the disaster areas. Example applications include emergency services, recovery of disaster, wireless sensor networks and home networking.

Now a day, the animals in the farm are easily being stolen especially when huge in numbers. The livestock theft has been increased 40 percentage from the last year over countrywide. This is due to inability to manage a large number of livestock at the same time. The project aims to decrease the theft by continually maintaining the livestock within a defined boundary by frequent requests and acknowledgements. The requests to the distance nodes can be sent through multiple hops. In the existing system, DSR method is used where the node is selected dynamically and the nearest node to the present node is selected to make the next hop.

Our nodes are battery driven. Thus, they suffer from less energy power. Also the livestock are mobile; if cattle are stolen the connection between them is broken. Thus, in such a case the two major reasons of a link breakage are.

• Node dying due to energy exhaustion

• Node moving out of the range when they are being stolen.

The EPAR technique is used to select the node with higher power which has capability to make the next hop to another node. Thus the packet can be reached to the destination safer and the power also consumed efficiently.

II. RELATED WORKS

Most of the past works on routing in ad-hoc networks emphasizes on the problem of discovering and maintaining accurate paths to the destination during changing topology and mobility. Strongly connected network uses shortest path algorithm. However, the route chosen may not be the minimum energy solution because of the possible avoidance of the optimal links during the calculation of the backbone connection network. A dynamic routing algorithm which is used for establishing and maintaining connection-oriented sessions uses the idea of proactive to work with the unpredictable changes in the topology.

2.1 Proactive Energy-Aware Routing

This is table-driven routing protocols. In this, each node tries to maintain consistent [1]–[3] updated routing information to all the other nodes in the network. This can be done if there are any changes in the network where each node updates its routing table and the updates are propagated to its nearby nodes. Hence, this is proactive. If a packet is to be transmitted and if the route is already known, then it can be used instantly. In the case for wired networks, either link-state or distance vector algorithms having a series of all the destinations, the next hop, or the series of hops to each destination is used to construct the routing table.

2.2 Reactive Energy-Aware Routing

It is on-demand driven routing. In this, routes can be found whenever the source node desires them. Discovery of routes and its maintenance are two main procedures: In former approach, [4]–[6] the source sends route-request packets to its nearby nodes, which is then forwarded to their neighbors, and so on. Once
the destination node received the route-request, reply packet to the request is uni-casted back to the source node through the neighbor from which it got the route-request at first. When an in-between node that has a sufficiently updated route, receives the route-request, it stops forwarding and directly sends a route-reply to the source. Once the route is formed, some route maintenance procedure maintains it in the internal data structure of each node called as route-cache until the destination becomes unreachable along the route. Unlike table-driven routing protocols, not all the updated routes are maintained at every node. The examples of on-demand driven protocols are Ad-Hoc On-Demand Distance Vector (AODV) and Dynamic Source Routing (DSR) [7], [18].

2.3 DSR Protocol

Though the dynamic source routing protocol has many benefits [8], [14]; it does have some drawbacks, that limits its performance under certain conditions. Some of the drawbacks of DSR are as follows: Multicasting is not supported by DSR. All the source and destination route address along with the intermediate route address are present in the data packet header in DSR, thereby the throughput is decreased. DSR responds with the route reply packets to route request packets that came through various routes. This maximizes the availability of a number of paths for source but also accumulates the routing packet load. Route entry invalidation or route prioritization mechanisms are not present in current specification of DSR.

2.4 Energy Aware Metrics

Most of the of energy efficient routing protocols [11], [12] tries to minimize energy consumption by the use of energy efficient routing metric, used in computation of routing table instead of the minimum-hop metric. By this way, energy efficiency in its packet forwarding can easily be introduced in a routing protocol. These protocols try either to route data using the path that has increased energy bottleneck, or to decrease the end-to-end transmission energy for the packets. The first method for energy efficient routing is called as Minimum Transmission Power Routing (MTPR) which makes use of a simple energy metric which is represented by the total energy utilized to send the information through the route. Through this, MTPR minimizes the transmission power that is utilized per packet, but the lifetime of each node is not directly affected.

III. DESIGN AND IMPLEMENTATION

The amount of energy consumed by all the packets traversing from source node to destination mode should be minimized i.e. the total amount of energy consumed in the packets when travels from one hop to the next hop should be low.

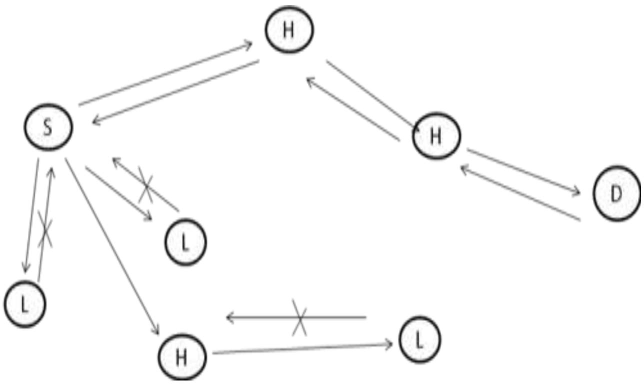
One’s packet energy is calculated by the equation (1)

$$E_c = \sum_{i=1}^{k} T(n_i, n_{i+1}) \qquad (1)$$

where, *ni* to *nk* are nodes in the route while *T* denotes the energy consumed in transmitting and receiving a packet over one hop. Then we find minimum value for Ec. The main objective of EPAR is to minimize the variance in the remaining energy of all the nodes and thereby prolong the network lifetime.

3.1 Route Discovery And Maintenance In Proposed Algorithm

EPAR schemes make routing method to optimize performance of power or energy related evaluation metrics. Therefore the power aware routing schemes are transferable from one underlying routing protocol to another; relative merits and drawback remain valid. There are two routing objectives for minimum total transmission energy .When choosing a path, the DSR implementation chooses the path with the minimum number. The path is then selected by choosing the path with the maximum lowest hop energy values 19, 20 AND 40. The second path with energy values 26, 54,29and88. The battery power for the first and second battery is 19 and 26. Since second path is greater the second path is chosen. EPAR algorithm is an on demand source routing protocol that uses battery lifetime prediction equation. This is with the dynamic topology. This protocol favors the path whose lifetime is maximum.



Consider a route-request to be sent from source to destination. The source will select the high power nodes to make a series of hop. In this case, low power nodes are ignored. By this, the packet will efficiently reach the destination without any loss or delay in the route travelled.

3.2 Data Packet Format In Epar

If for any reason a node chooses to change the transmit power for hoop I, then it must set the Pt value in minimum transmission power the link then the link flag is set. The table shows the data packet format for EPAR. This includes the DSR fields of EPAR.

TABLE 1. Data packet format in modified EPAR.

IP Header	DSR fixed Header	DSR Source Header	DSR source Route Addre ss [1..N]	EPAR Source Route MTP [1…N]	Link Flag	DATA

IV. NETWORK METRICS FOR PROPOSED PROTOCOL PERFORMANCE

4.1 Dropped Packet

From central hub the packets are been transferred to all other nodes to reach the destination. The packets have the source name, destination name, panid value. Depending on this packet from source it goes on to reach the destination. The dropping of packets denotes the missing node.

4.2 Power Consumption

The central hub has the gathered information of all the animals in the boundary. And each animal has its own tag so that each and every thing is been noted. And the overall power is been stored in the central hub. To an end to end transmission added to it the hub with the higher power will be directed so that the data efficiency will be high without any loss of data.

4.3 Network Lifetime

The network lifetime mainly depends on the battery life time of the node. If the battery power is high in all the mobile nodes the network lifetime is increased. Thus network lifetime is the time at which the first node in the network runs out of energy before transmitting the packets, thereby losing some other functionality too.

4.4 Remaining Battery Power

Remaining battery life depends on an unknown mobile node .The number of nodes in the network versus the average remaining battery power is used to analyze the performance of the protocols in terms of power.

Remaining battery work=Initial energy–consumed energy

V. SIMULATION ANALYSIS

The simulated network of our case consists of 100 nodes that are scattered randomly in 11*11 km. The nodes are moving at different speeds ranging between 0 to 120 m/s. Table 2 shows the simulation parameter setting for the protocol evaluation.

Table 2: SIMULATION PARAMETERS

Number of nodes	100
Area size	11*11
Traffic type	CBR
Transmit power	0.5J
Receive power	0.1J
Routing protocols	DSR,EPAR

Fig. 1 shows the lifetime of the network using EPAR and DSR. Gradual increase is been analyzed in the network lifetime between EPAR and DSR. In each type of node the lifetime of EPAR is greater than that of DSR. This analyses is done to determine the time at which a sensor node or a group of sensor node in a network running out of energy. Also it can be said as the time until the first node dies.

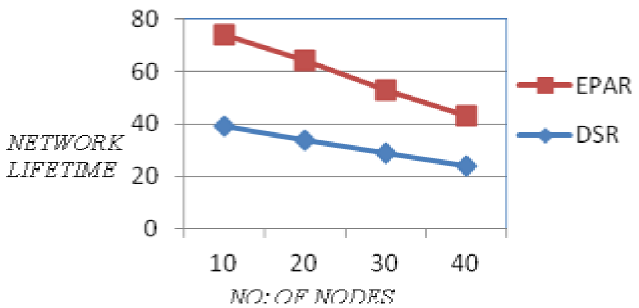


FIGURE 1. Network lifetime versus no: of nodes

Fig .2. show the network latency of EPAR and DSR. The EPAR has the maximum latency of network with the nodes. The time taken for the packet to travel from source to destination is network latency. Thus the networks of EPAR has a longer lifetime than which is running in DSR.

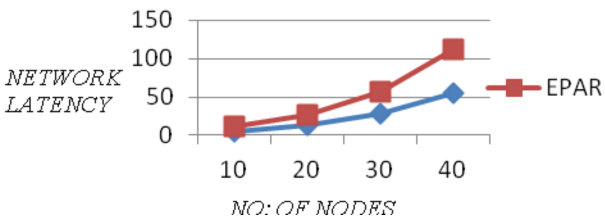


FIGURE 2. Network latency versus no: of nodes

VI. CONCLUSION

This paper deals to prevent the theft of the livestock in the farm. For this, we use a new methodology known as EPAR. This technique has high network lifetime and network latency compared to the traditional method. In this case, only nodes with sufficient energy will respond to the query from the central hub, not by all nodes i.e., data will be carrying forwarded by high power nodes only. If the missing node is the low power node or the query intended for particular node then it would respond for the query made. Hence, it provides high accuracy for searching and communicating the animals through the central hub. The EPAR algorithm that we have used is 65% more efficient than DSR algorithm.

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] 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 bandwidth reservation protocol for QoS outing in a wireless mobile ad hoc network,*'' in Proc. IEEE Int. Conf. Commun., *vol. 5. 2002, pp. 3186–3190. 196 VOLUME 2, NO. 2, JUNE 2014*Shivashankar et al.: Designing Energy Routing Protocol IEEE TRANSACTIONS ON EMERGING TOPICS IN COMPUTING

[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 broadcast 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] 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*.

[9] 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*.

[10] P. Goyal, V. Parmar, and R. Rishi, ''*MANET: Vulnerabilities, challenges, attacks, application*,'' Int. J. Comput. Eng. Manag., *vol. 11, pp. 32–37, Jan. 2011*.

[11] 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*.

[12] S. Mishra, I. Woungang, and S. C. Misra, ''*Energy efficiency in ad hoc networks*,'' Int. J. Ad Hoc, Sensor Ubiquitous Comput., *vol. 2, no. 1, pp. 139–145, 2011*.

[13] 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*.

[14] S. Shankar, B. Sivakumar, and G. Varaprasad, ''*Implementing a new algorithm for analysis of protocol efficiency using stability and delay tradeoff in MANET,*'' Int. J. Comput. Technol., *vol. 2. no. 3, pp. 11–17, 2001*.

[15] 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 Computing., *vol. 2, no. 2, pp. 161–173, Apr./Jun. 2006.*

[16] M. Izuan and M. Saad ''*Performance analysis of random-based mobility models in MANET routing protocol,*'' Eur. J. Sci. Res., *vol. 32, no. 4.*