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Energy Efficient Routing InWireless Sensor Networks Using Residual Energy of Nodes

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Abstract:-Wireless sensor networks are one of the emerging technologies. The basic elements of the network are sensor nodes, which are battery powered. The lifetime of the network is purely based on the battery backup of the node. One of the challenging issues of wireless sensor networks is enhancement of the lifetime of the network. In this paper we have proposed an energy efficient routing technique based on the residual energy of the node which was implanted using NS2 simulator. The results were compared with existing conventional AODVprotocols and the performance of proposed algorithm are better than the existing protocols.
Keywords-AODV, Energy Efficiency , Wireless Sensor Networks, Routing Protocols

I. INTRODUCTION:

Wireless sensor networks is adistributed network that consists group of sensor devices which gather the knowledge from physical or environmental conditions and monitor them in base station through wireless
links. Wireless sensor networks is same as wireless ethernet which consists of multiple nodes which transmit the data among them. The energy usage of sensors must be reduced as a result of in most cases sensors are battery powered . So, we turn off the sensors when they aren't in use. every node in wireless sensor networks is connected to sensor. the price of sensor nodes are variable depending on its functionality. The topology of the WSNs are simple star network, Tree network and sophisticated multi-hop wireless mesh network. The propagation technique between the hops of the network are routing or flooding.

A sensor could be a device that sense the physical or environmental conditions, like pressure, heat, light, etc. The output of the detector is usually AN electrical signal that's transmitted to a controller for further processing.

Each sensor node has several parts: a radio transceiver with an interior Antenna or connection to an external antenna, a microcontroller, An electronic circuit for interfacing with the sensors and an energy source.

The rest of the paper is organized as follows. Section II presents Literature Survey. Proposed algorithm is explained in section III. Graphical presentation is given in section IV. Concluding remarks are given in section V.

1.1 Sensor node:

A sensor node is a node in every sensor network that may perform some process, gathering sensory information and communicating with another connected nodes within the network.

1.1.1 Controller:

The controller performs tasks, processes data and controls the functionality of alternative parts within the device node

1.1.2 Transceiver:

The functionality of transmitter and receiver are combined into one device referred to as a transceiver. Transceivers typically lackdistinctiveidentifiers.Theoperational states are transmission, receive idle, and sleep.

1.1.3 Routing:

Routing is that the method of choosing best paths in network. In packets witching networks, routing directs packet forwarding (the transit of logically address network packets from the source toward the final destination) through intermediate nodes. Intermediate nodes are sometimes network hardware devices like routers, bridges, gateways, firewalls, or switches.

II. LITERATURE SURVEY:

In Recent years, several protocols are introduced for the advancement of wireless sensor networks. In article [1] [2] and [23] authors proposed that Ad-hoc-on-demand distance vector routing and dynamic source routing produce routes between nodes only on demand that decreases the network traffic. Zhu et.al has developed the concept of energy efficiency in wireless sensor networks. The energy consumption by the data packets, management packets and retransmission are taken into thought and verified by simulations that their models can provide the higher actual

energy consumption than existing model [3]. Paper [4] is that the improvement of AODV routing protocol. The aim of this work is to choose on energy efficient methods by using less power in sleep mode than the idle mode. It reduces power usage and will increase the performance.
In [5] Youssef, Moustafa A., Mohamed F. Younis, and Khaled A. Arisha presents aconstrained shortest-path energy-aware routing algorithm for wireless sensor networks. This routing protocol tries to reduce the energy consumption and improves end to finish delay and throughput. The new algorithm is predicated on strained shortest-path algorithm. Chandra et.al has introduced Anonymous gossip: Improving multicast reliability in mobile ad-hoc networks [6]. This work improves packet delivery of multicast routing protocols and reduces the quantity of packets received by alternative nodes. The protocol is split into 2 halves: within the initial part, any protocol is employed to multicast a message to the cluster and within the second half, the gossip protocol tries to recover lost messages. The proposed gossip protocol is known as Anonymous Gossip (AG) since nodes need not know the opposite cluster members for gossip to achieve success.
Reference [7] provides ExOR: timeserving multi-hop routing protocol for wireless networks that will increase the throughput of large unicast in multi-hop wireless networks when compared with traditional routing. Ye, Wei, John Heidemann, and Deborah Estrin [8] proposed S-MAC, a MAC protocol designed for wireless sensor networks. It reduces energy consumption and competition latency. It supports self-configuration. In paper [9], Ghaffari, Ali proposed new energy efficient routing protocol (EERP) for wireless sensor networks using A* algorithm. It finds the perfect path about the minimum hop count, residual energy, packet reception rate and free buffer.

III. PROPOSED ALGORITHM:

We already have the traditional AODV algorithmic program that in the main considers on minimum hop count for choosing a best route from source to destination, however it doesn't specialise in the energy efficiency. Our proposedwork mainly focuses on the remaining available energy. The assignment ofprobability to every node within the network can be done based on residual energy. The intermediate nodes are assigned with some probability according to their remaining battery capability. All the routes are assigned with some probability then the possibilities of every route get summed up. The route that has the best probability is chosen which resembles that the info from the source can reach the destination without any node failure due to battery of that node.

3.1 Proposed Algorithm

STEP 1:If route from source to destination is not available, the source node starts the process by forwarding Route Request (RREQ) packets to its neighbours within the node's range.
STEP 2:If route to destination is accessible then the source node forwards the RREQ packets to destination node using the already existing route.
STEP 3: The intermediate node will first extract the residual battery for that node.
STEP 4: It will check whether the intermediate node's battery capacity is greater or less than that of the network's average battery capacity.
STEP 5: Now, there are two cases:
1) If the intermediate node's remaining battery capacity is greater than the network's average battery capacity, the node sends the RREQ packets with some probability assigned according to the remaining battery capacity of that intermediate node.
2) If the intermediate node's remaining battery capacity is less than the network's average battery capacity, probability values assigned to that intermediate node are nearly half of the probability assigned in the first case.
STEP 6:We must add up the probabilities in each route.
STEP 7: Choose the best route which is having the highest probability in terms of battery capacity.

3.2 Implementation

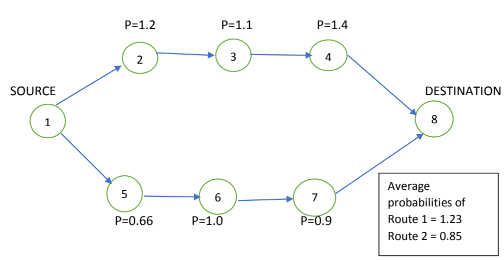

Figure 1: Probability analysis

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3.2.1 Source and Destination Nodes Initialization:

All sink nodes are coloured to blue which shows that the simulation has been started. Source node has been initialized with the label as source. In the above figure, we can see that node 1 is initialized as source node through which packets will be transferred. The node 8 is assigned with destination label. The data packets must transfer from source to destination through the route which is selected in terms of battery capacity and probability.

3.2.2 Probability Allocation:

There are two possible routes from source to destination i.e. route 1: 1-2-3-4-8,route 2: 1-5-6-7-8. The nodes in the route are assigned with probability accordingto thenode's remaining battery capacity. Route 1 has been assigned with the probabilityto the nodes 17, 10 and 8 as 1.2, 1.1 and 1.4 respectively. Route 2 has been assigned with probability to the nodes 4, 14 and 22 as 0.66, 1.0 and 0.9 respectively.

3.2.3 Route Discovery:

The route request packets are transferred from source node to neighbouring nodes i.e. node 1 will forward the route request (RREQ) packets to node 2 and 5. Again node 2 and node 5 will forward the route request (RREQ) packets to its neighbouring nodes. The process continues until the destination node is found. The route reply(RREP) packets are used for getting back to source node so that the transmission can be done from the source node. Reverse path is selected for data transmission.

3.2.4 Route Selection:

Among these two routes, we should calculate the average probability of each route in which we have to select the route which has more probability may often get selected for data transmission. Here the route 1: 1-2-3-4-8 is selected because it has highest value of forwarding probability.

IV. GRAPHICAL REPRESENTATION:

We analysed results of PEER with the traditional AODV. We have implemented and simulated our proposed protocol PEER in Ns2 Network Simulator to check the performance of all the routing protocols. Performance is evaluated on the metrics of packet delivery ratio, routing overhead and throughput.

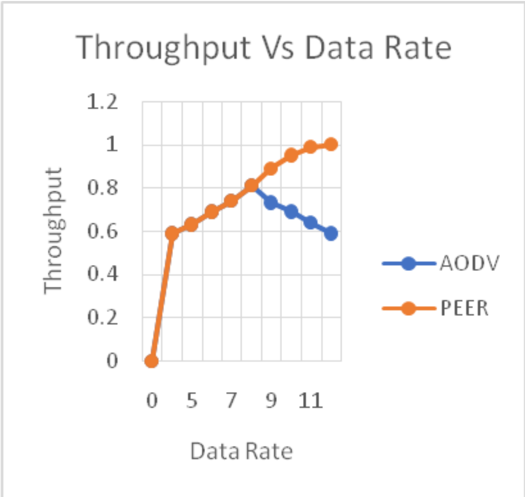

Figure 2:Scaling graph of Throughput and data rate

From the above graph,we can see that AODV will almost give the same throughput as PEERup to some point. After the data rate reaches a certain point AODV gets saturated but our proposed algorithm performs well.

V. CONCLUSION:

Energy Efficiency is one of the major challenges in wireless sensor networks. As the nodes are battery supported and not possible to recharge within the middle of transmission. If the node fails, then the sender should restart the transmission. The proposed algorithm has shown improved throughput compared with AODV and enhanced the life time of the network. The future scope of the work is to consider the other parameters like delay, battery capacity, size and cost of the network.

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