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QOS Provisoning Scheme for Wireless Ad-hoc Sensor Networks

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Abstract-Ad-Hoc sensor networks usually consist of mobile battery operated computing devices that communicate over the wireless medium. As these devices are battery operated and therefore need to be energy conserving so that the battery life of each individual node can be long-lasting. To maximize the lifetime of an ad hoc WSN, it is essential to prolong each individual node (mobile) life through minimizing the total consumption for each communication (transmission and reception energy) request. Therefore, an efficient energy aware scheme would satisfy the energy consumption rate at each node.

This work presents a power saving technique by suggesting an energy aware scheme for multi-hop ad hoc wireless sensor networks that reduce energy consumption without significantly diminishing the capacity or connectivity of the network. Our work builds on the observation that when a region of a shared-channel wireless network has a sufficient density of nodes, only a small number of them need be "ON" at any time to forward traffic for active connections.

The proposed "QoS Provision Energy aware" scheme is a distributed scheme, where nodes make local decisions on whether to remain in the idle state, or to be in a forwarding backbone as a coordinator. Each node bases its decision on the topology of the network, and the amount of energy needed to communicate with nodes.

A new "QoS Provision Energy aware" for wireless sensor networks is used to reduce the communication overhead, and improve the network lifetime and node energy utilization of the network. Results obtained by a simulation campaign show that the proposed scheme has some important advantages that makes it a valuable candidate to be particularly suitable in environments where fast communication establishment and minimum energy overhead are requested. Also simulation results show the improvement of the network performance, in terms of Throughput, Energy, and Hop Count, through use of the new routing algorithm.

The proposed scheme is simulated in NS2 software (version NS - 2.33). We conducted a complete set of simulations to compare and contrast the performance of energy consumption and network lifetime metrics. Our analysis provides a comparison of the performances between proposed scheme and existing model using AODV protocol. Our simulations show that with a practical energy model, system lifetime of a wireless sensor network with our Energy model is a factor of two better than without. Additionally, the proposed model also improves QoS parameters: communication latency and capacity. The results of our simulation-based analysis are presented in Chapter 5.

Keywords-AODV; Energy Awareness; QoSProvisining

I. INTRODUCTION

1.1 Routing

In computer network routing is the process of transmitting information from a source to destination. For wired networks the two main routing algorithms used First, Distance Vector Routing. Second, link State Routing.

A distance vector routing algorithm is a distributed algorithm that is simple to develop and has low comprehend demands. It means that each router has a way of knowing about its neighbors

Instead of depending on every neighbor to regularly give information about how to get to all the destinations the link state routing algorithm gets a complete picture of the whole network and locally calculates the shortest path from source to every destination.

1.2 Routing in Ad Hoc Networks

In the case of a mobile ad hoc network the topology is changing dynamically. This leads to rapidly changing link states. Some links to get broken while other links are created by other pairs of routers at the same time .

The ad -hoc network is a collection of communication devices or mobile devices (nodes) which communicate with each other through wireless medium without any centralized or fixed infrastructure. The nodes in ad hoc networks can be stationary or mobile, the latter being the most common situation. The absence of the centralized infrastructure implies that the responsibility of the nodes is equal. Therefore, participating nodes in the network need to cooperate in order to establish routes and to forward packets for other nodes. The nodes use routing protocols to establish and maintain the routes. The commonly used standard for ad hoc networks is IEEE802.11b (Wi-Fi) , which is the standard for WLAN

1.3 AODV Description

In AODV [1], the network [2] is silent until a communication is needed. At that point when any network node [3] wants to send the data to another node it needs to broadcast a route request packet for [4] a new connection [5]. Other AODV nodes forward this message, and when the route request message received at Target node then it replies by route reply packet. After the route establishment, communication takes place between the sender and receiver. If any of the link failure occurs in the communication path then route error packet is sent to the source. Unused entries in the routing tables are recycled after a time .

When a link fails, a routing error is passed back to a transmitting node, and the process repeats .

1.4 Energy Awareness:

It is a method to save the the consumed energy in the network which can be used in the further communication to increase the network lifetime

II.PROPOSED ALGORITHM TO SAVE THE ENERGY IN THE NETWORK

Step1: **Initialize the Threshold of the Network**
Step2: Selection of the node in the communication Path
- Broadcasted the route request in the network
- Shortest Route selected.

- Establish Communication path

If (NODE Energy> Threshold energy of the network)
Then "Node is selected"
Else
"Node is rejected on the communication path"
Step 3: Re computation of Path
For all nodes do:
If (NODE Energy <= Threshold energy of network or node moves out of the network range)
"Send minimum energy error towards the source and source starts finding new routes towards the destination".
If (new route set by is having less no of hops than route is selected)
"Power at each node in transmitting and receiving is reduced"
Else
"Previous path followed for the communication or go to Step 2"
End

Description:

Step 1: In the network initially max energy with the help of which we can take the decision that the node in the critical condition or not

Step 2 : AODV builds routes using a route request / route reply query cycle. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network as shown in the figure 3.1. Nodes receiving this packet update their information for the source node and check its energy level if it is greater than the threshold than set up backwards pointers to the source node in the route tables. In addition to the source node's IP address, current sequence number, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is aware. A node receiving the RREQ may send a route reply (RREP) as shown in figure 3.2. If it is either the destination or if it has a route to the destination with a corresponding sequence number greater than or equal to that contained in the RREQ. If this is the case, it unicast a RREP back to the source. Otherwise, it rebroadcasts the RREQ. Nodes keep track of the RREQ's source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it.

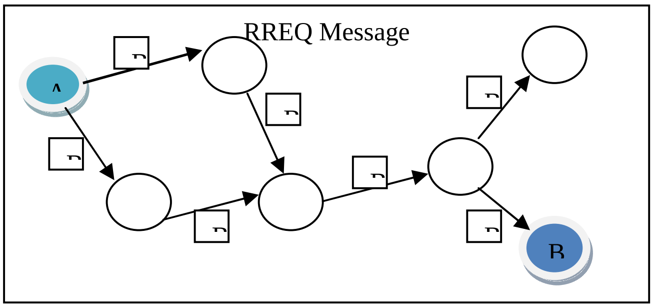


FIG-3.1

Once the source node receives the RREP, it may begin to forward data packets to the destination. If the source later receives a RREP containing a greater sequence number or contains the same sequence number with a smaller hop-count, it may update its routing information for that destination and begin using the best route as shown in the figure 3.2**.**

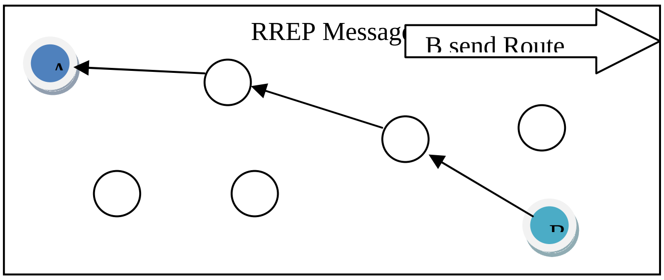


FIG 3.2

Step 3:*Recompute the path* ***IF***

3.1 if the node in the communication move out of the network or link failure occurs than send a rout error to the destination and recomputed the path as shown in fig 3.3

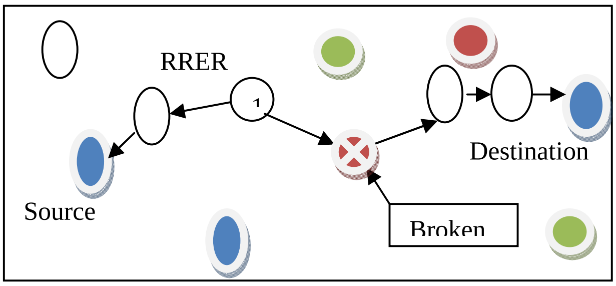


Fig 3.3

As Shown in figure 3.3 when a red node moves out of the network then route error packet send towards the destination and the path is recomputed.

3.2 if node energy then less than the threshold of the network sends route error packets towards the destination and the path is recomputed.

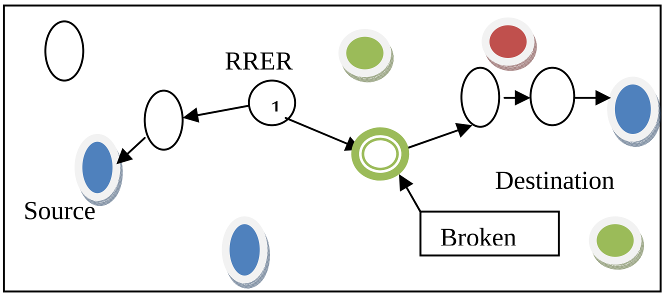


Fig 3.4

As Shown in the figure 3.4 when the energy of the green node is less than the threshold then route Error is sent towards the destination and the path is recomputed

III. Advantage of Addition Route Recomputation:

It may be possible node moves towards the source. So After Recomputation of the path , path is set up less no. Of hopes and energy in the communication are saved for example black is the destination nodes after some time it moves towards the destination as shown in the figures 3.5 and 3.6.

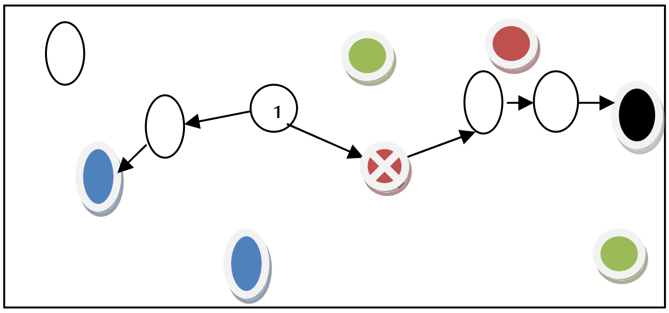


Fig 3.5

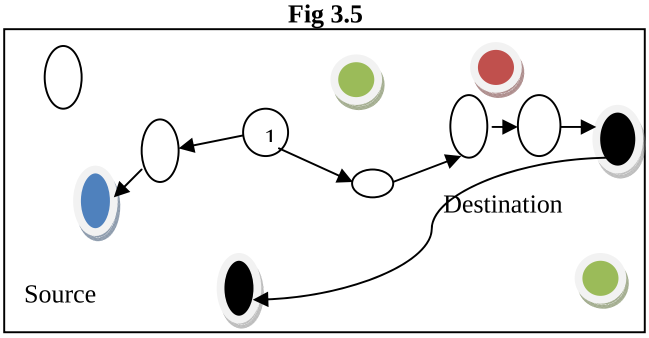


Fig 3.5

IV Simulation Parameter Taken as Input

Parameter	Value
Transmission range	250 m
Wireless Bandwidth	2 Mbits/sec
Simulation time	300s
Environment size	1000m x 1500m
Number of mobile nodes	25
Number of sources	03
Number of receivers	03
Number of connections	06
Traffic type	Constant bit rate (cbr)
Packet rate	5, 10, 20 Packets/sec.
Packet size	512 bytes
Pause time	10.0 sec.
Minimum speed	1m/sec.
Maximum speed	20m/sec.
Routing protocol	AODV
Channel Type	Channel/Wireless Channel
Network Interface (netif)	Phy/WirelessPhy/802_15_4
MAC protocol	Mac/802_15_4
Interface Queue (ifq)	Queue/DropTail/PriQueue
Interface Queue length	100
Initial energy	60
Threshold value for energy	50
Mobility Model	Random way point Model

Table 1.1

V. Simulation and Analysis

In the simulation , parameter taken as input is shown in the table 1.1 and packet delivery ration , End-to-End Delay and Network life time has been analyzed . Description of results is given 4.1 , 4.2 and 4.3

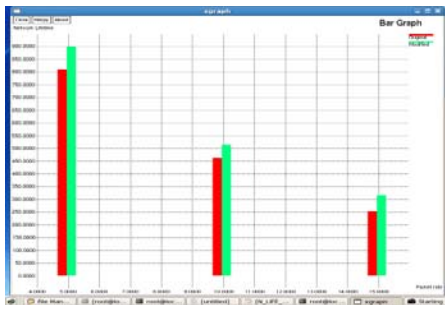
4.1 As shown in the bar graph network is tested on packet rate 5 ,10 and 15 . The energy of the network is consumed less in QoSPSWAN as compared to the basic mechanism.

4.2 As shown in the Xgraph packet deliver ratio of QoSPSWAN is increased as compared to basic mechanism when mobility is 1 , 2 and 4

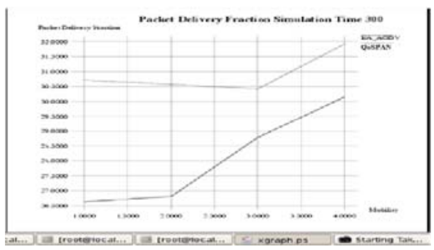
4.3 As shown in Xgraph End-to-End delay is reduced in QoSPSWAN as compared to basic mechanism when mobility is 1 , 2 and 4

Packet Delivery Ratio

End to End Delay



Network Life Time



VI. CONCLUSION AND FUTURE RESEARCH DIRECTION

6.1 CONCLUSION

In the lifetime of a WSN is enhanced using "QoS Provisioning Energy Aware" scheme is practically implemented and analyzed.

It has been shown that the WSN is successfully employed in a real-life application. Our experimental results illustrate that by applying proposed scheme, the lifetime of the network is considerably extended as compared to the other schemes. An experimental study has been performed to compare the impact of different schemes on the network's lifetime

6.2 Future work

While this approach has been focused on small-sized WSNs and intra-cluster power management, further research can be extended to larger-scale networks involving hundreds of nodes. It can be applied to support the real implementation of complete cluster-based protocols, and assists the operation of the clusters during the data transmission phase.

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