Convergecasting in Wireless Sensor Network Through ALBA-P Protocol

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***Abstract*— In an Ad Hoc Wireless Sensor Networks System, at some situations the packets may be discarded because of dead ends in the networks and also connectivity holes in the networks. To solve this problem many solutions are implemented, but in those system the energy efficiency is less and the percentage of delivery of packets in 'dead end' is also less. In some times the existed solutions were fail to deliver packets because of localization error. To overcome the problem this project is implementing. Using ALBA Algorithm and Priority Mechanism will solve the existing problem. Together ALBA Algorithm and Priority Mechanism is known as "ALBA-P". The Adaptive Load "Balancing Algorithm (ALBA) is a solution for multihop wireless routers problems. By comparing other algorithms like GeRaF and IRIS the ALBA algorithm have a good efficiency, effectiveness, and mainly less energy consumption. With this ALBA algorithm and Priority Mechanism is used to deal dead end nodes. It helps the dead end node to send packets to 'sink' by making route using Priority method. Because of Priority Mechanism the failure of packets delivery in 'dead end' is decreased. It follows 'Hop-by-Hop' forwarding then follows the rules established by ALBA.**

***Index Terms*— connectivity holes, ALBA Algorithm, Priority Mechanism, Multihop, Hop-by-Hop.**

1. INTRODUCTION

In wireless Sensor Networks even in a fully connected topology there may be an exist nodes called 'dead end' in this node guaranteed packet delivery to the 'sink' is not possible at sometimes due to localization errors and connectivity holes. So to eliminate the drawbacks, this project presents an Adaptive Load Balancing Algorithm (ALBA) and Priority Mechanism to solve the problem of 'dead end' packet delivery in Wireless Sensor Networks, and also to increase the efficiency, effectiveness and decrease the energy consumption. In Wireless Sensor Networks different methodologies is used to overcome the dead end nodes packet delivery, but still those methodology fail sometimes dude to localization errors.

In a common communication method different typed of algorithm is used like GeRaF [1], IRIS [2] to obtain efficiency, effectiveness. But comparing with ALBA algorithm the efficiency, effectiveness, reliability is Increased and mainly it reduces energy consumption.

As Together ALBA Algorithm and Priority Mechanism called "ALBA-P".

ALBA-P works in any topology, without topology planarization. ALBA-P significantly outperforms in connectivity holes especially in critical traffic conditions and low density networks. ALBA features the cross layer integration of geographic routing. Priority Mechanism allows to effectively route packets to 'sink'. It does not require topology planner and it able to give guarantee of packet delivery. Network simulator 2 tool is used to simulation and demonstrate the performance of ALABA-P.

2. RELATED WORK

Wireless Sensor Network is a fast growing and exciting research area that has attracted considerable research attention in the recent past. This has been fuelled by the recent tremendous technological advances in the development of low cost sensor devices equipped with wireless network interface. Sensor networks find applications spanning several domains including military, medical, industrial, and home networks [3].

ALBA-R, a protocol for Convergecasting in wireless sensor networks, here ALBA-R is using RAINBOW Mechanism to avoid the localization error and dead end. ALBA-R is integrated with ALBA algorithm and RAINBOW Mechanism. This "Convergecasting in Wireless Sensor Network Through ALBA-P Protocol" paper is based on 'ALBA-R: Load balancing Geographic Routing around Connectivity Holes in Wireless Sensor Networks' [4].

Packet delivery guarantees are usually based on making the network topology graph planar, and on the use of face routing. In face routing system network graph planner holds main role to achieve guaranteed packed delivery because the graph planner have a details of the nodes, which makes the connection intelligential way [5].

Planarization does not work well in the presence of localization errors and realistic radio propagation effect. Because of localization error the communicating nodes fail to get the information of its correspondent nodes, this leads the packet to discard. So to overcome this face routing was introduced [6].

GeRaF (Geographic Random Forwarding) algorithm is geographic based and topology based convergecasting. GeRaF algorithm is one of the cross layer protocols based on geographic greedy forwarding. Packets transmission is taken place with the help of geographic routing [1]. IRIS performs convergecasting based on hop count metric and on a local cost function. IRIS is also based on cross layer protocol [2].

Guarantee packets delivery by using RAINBOW Mechanism with rotational sweep, dead end handling is mentioned in this concept. But compare to ALBA-R in this concept rotational sweep suffer a packet loss ranging 2 to 19 percent, and this results in less effectiveness [7].

3. ALBA (Adaptive Load Balancing Algorithm)

ALBA Algorithm is used in wireless networks for better performance. ALBA achieves the best performance in terms of all investigated metrics like packet delivery ratio, per packet energy consumption, and end-to-end latency. It scales to increasing traffic much better than the other protocols like GeRaF and IRIS, because of the effectiveness of the QPI-based and GPI-based selection scheme in balancing the traffic among relays, of its low overhead, and its being able to aggregate packets into burst. However, traffic is fairly shared by the nodes.

The nodes have a two states that is active and passive. In active state nodes will respond to the packets transmission but in passive state the node is in completely sleep state, it won't response to any packets at some fixed time [4].

The passive state is use to save power. Initially sink or source send the RTS (Request to send) in this time the nodes which is in active state those nodes will response to the sink. The active nodes will send CTS (Clear to send) as an acknowledgement to the sink. Then the sink will respond to the node and starts the transmission.

In ALBA the transmission take place using QPI (Queuing Priority Index), because to avoid the collision and to make simpler route to packet transmission. consider if suppose many nodes are respond to the sink (source) node, so in that case instead of sending packets to all responded nodes, the sink calculate the QPI values of the responded nodes, then it will select the best and smaller QPI value. Until the destination, each and every stage sink node make a simpler route by the help of QPI, and starts the packed transmission. This solves the problem of unnecessary nodes to be active in that packet transmission.

If the sink node get the same QPI value for different nodes while calculation then, GPI (Geographic Priority Index) is used to solve the problem. GPI is having a unique numbers assigned for each nodes, so the sink considers and make route using nearer node first by getting the node's GPI information and using this route the sink transmits packets.

4. PRIORITY MECHANISM

This section is to describe the Priority Mechanism used with ALBA Algorithm to solve the problem of dead end and connectivity holes. The basic idea is to giving Priority to the nodes, and form the route according to the priorities of the nodes, then packets are transmits using 'hop-by-hop' forwarding method and ALBA algorithm. At initial condition all the nods are in 0^{th} priority, due to the busy node the transmission may not occur correctly. So there may be packet drop and they won't reach destination, to avoid this, the previous node which is connected to the connectivity hole or busy node which get incremented from 0 to 1, let consider that node as 'N1' then the network consider the N1 node which's priority having 1 to transmits first by selecting other node or by making the busy node to respond N1. After finishing the packet transmissoin the nodes priority will come to initial state again.

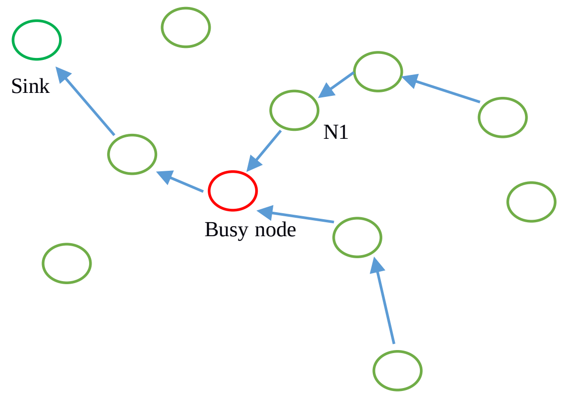

Figure shows the simple transmission with Priority Mechanism.

5. SIMULATION USING NS-2

For Simulation, Network Simulator 2 (NS-2) has been used because of its Simplicity and Availability. NS-2 simulator is a discrete event Simulator targeted at networking research. Ns-2 Provides supports for TCP (Transfer Control Protocol), UDP (user Datagram Protocol), routing and Multicast protocols over local and satellite and wired and wireless networks.

We consider following evaluation metrics.

- Throughput: it is the rate of successful messages delivery over a communication channel
- Latency: it is a time interval between the simulation and response from a more general point of view, as a time delay between the cause and effect of some physical in the system being observed
- Data transmission cost: it is measured as the total number of data transmissions for an end-to-end delivery per packet.

- Control message cost: it is defined as the total number of control message transmissions (such as RTS, CTS and ACK) for sending a single packet to the destination.

6. ALGORITHM

Step 1: Initially all the nodes are in Zeroth Position.
Step 2: Nodes will move to the random positions.
Step 3: Calculate QPI. And if same QPI is exists in different
Nodes then only consider step 4 if not jump to step5.
Step 4: Find GPI.
Step 5: Initially all the nodes priority are 0,
Step 6: Transmission starts according to the ALB Algorithm
Step 7: When node is sending a data, if the receiving node is Busy it will wait up to N number of attempts, after node will switch to priority 1,
Step 8: step7 repeats till the end of the transmission.
Step 9: Finally Load balancing and solving problem around
a connectivity hole is achieved.
Step 10: Finally graphs are taken as output.

8. SIMULATION RESULT

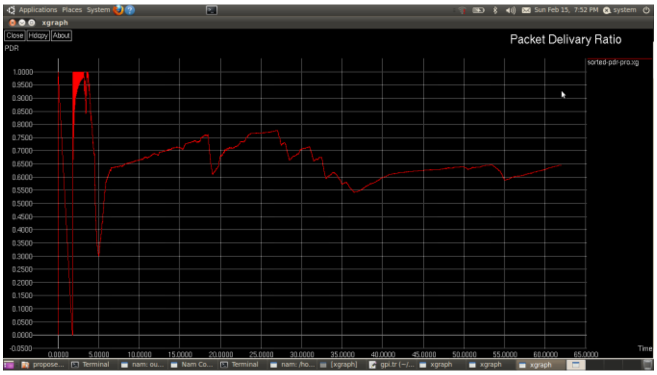

Figure shows the packet delivery ratio

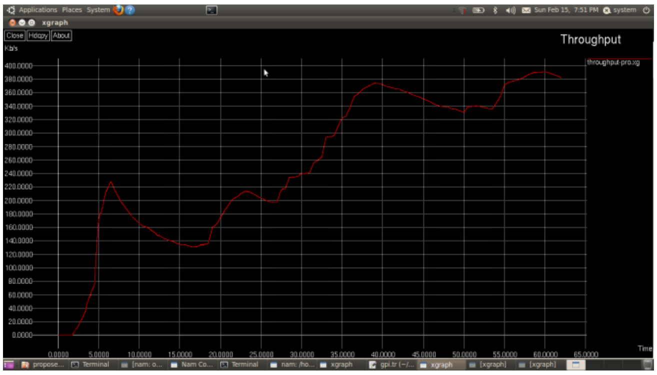

Figure shows the Throughput

9. CONCLUSION

In Wireless Sensor Networks sometimes the packet will discarded, this will overcome by using ALBA-P. Comparatively to IRIS and GeRaF. ALBA-P provides a good efficiency, low energy consumption, and good latency. The localization error is reduces in ALBA-P because of this, the dead end problem will solve and connectivity holes are enormously reduced. It easily routes around connectivity holes and it achieves efficient relay selection. ALBA relies on a cross-layer relay selection mechanism favouring nodes that can forward traffic more effectively and reliably, depending on traffic and link quality. Priority Mechanism is shown to guarantee packet delivery under arbitrary localization errors and it shows more robust way of handling dead end. ALBA-P an energy efficient protocol with remarkable limited latency and throughput, which makes it suitable to real world applications

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