



Cluster Based Multipath Tree Routing in ZigBee Wireless Network

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Abstract— ZigBee wireless network are ad-hoc network comprised mainly of small number of nodes with limited resources, and it is a rapidly emerging as a technology for large-scale, low-cost, low-power and reliable of different application of interest like smart domestic appliances, building automation etc. In different applications the network size get increase with nodes and routers which will increase the network size, due large number of device connection using zigbee tree routing and shortcut tree routing degrade the network performacnce, routing overhead, network delay and many more parameter. Cluster based multipath routing has been proposed for these networks for overcoming routing overhead, low memory consumption, end-to-end delay and provide detour routing path. In this paper, we concluded and compared the results cluster based routing and existing routing in networks consisting of nodes and cluster head.

Keywords— Cluster based ZigBee network, routing

I. INTRODUCTION

A Wireless network consist of thousands of nodes which is working in an unattended environment with restricted computational and sensing capabilities. ZigBee Wireless network consist of data which is directly communicate with source and destination. Transmission of data from source and destination are possible using single hop and multi hop communication. when the size of network is increased then single hop communication is not possible multi hop communication can be used to transmit the sensed data among all the network nodes. In network the independent devices which is transmittes gathered information to the sink node using multi hop communication.

Cluster based multipath routing has been proposed for these networks for overcoming routing overhead, low memory consumption, end-to-end delay and provide detour routing path. In this paper, we simulated the comparative results between the problems of routing in cluster based routing with existing network protocols. Here the routing issue is concerned while sending the packet or data information to node through cluster-based ZigBee network. Clustering is useful for many application that involve scalability to hundreds or thousands of nodes. Scalability in this environment must implies for load balancing, efficient resource consumption and data aggregation. Clustering can be very efficient in one-to-many, many-to-one, one-to-any, or one-to-all communication. By using cluster head, communication and data aggregation can be done. cluster head collects all the data from nodes and then transmit to the base station. A lot of parameters can be used for electing the node as a cluster head such as locality, mobility, battery, throughput, etc. During the selection process, one cluster head per cluster must be selected because single cluster consist of multiple cluster can give rise to cluster information, quality of service and routing

II. RELATED WORK

Here some of dissimilar approaches have been carried out for feasible ZigBee wireless network i.e. ZigBee tree routing and shortcut tree routing, in which routing performance and overhead for the network traffic load parameter has been compared.

ZTR is designed for resource constrained ZigBee devices to choose multihop routing path without any route discovery procedure, and it works based on hierarchical block addressing scheme. ZigBee specification has defined the direct transmission rule that allows a coordinator or a router to transmit a packet directly to the destination without decision of the routing protocol. In addition to the detour path problem, ZTR has thraffic concentration problem due to limited tree links. Since all the packets pass through only tree links, especially around the root node, severe congestion and collision of packets are concentrated on the limited tree links. This symptom becomes worse and worse as the number of packets increases, and it finally causes the degradation of the packet delivery ratio, end-to-end latency, and other network performances.

Some of these matrices:

Hop delay: The transaction time of passing a packet to a one-hop neighbor, including time of all necessary processing, back off as well as transmission, and averaged over all successful end-to-end transmissions within a simulation run.

Packet delivery ratio: The ratio of packets successfully received to packet transmission.

Optimal path length: It is the ratio of total forwarding times to the total number of received packets.

Average end to end delay: This is the difference between sending time of a packet and receiving time of a packet. This includes all possible delays caused by buffering during route discovery latency.

Packet loss (%): Packet loss is the failure of one or more transmitted packets to arrive at their destination.

In Shortcut Tree Routing algorithm solves the two problems of the ZTR by using 1-hop neighbor information. The STR algorithm basically follows ZTR, but chooses one of neighbor nodes as the next hop node when the remaining tree hops to the destination can be reduced. STR computes the remaining tree hops from the nexthop node to the destination for all the neighbor nodes, and selects the next hop node to transmit a packet to the destination D2.

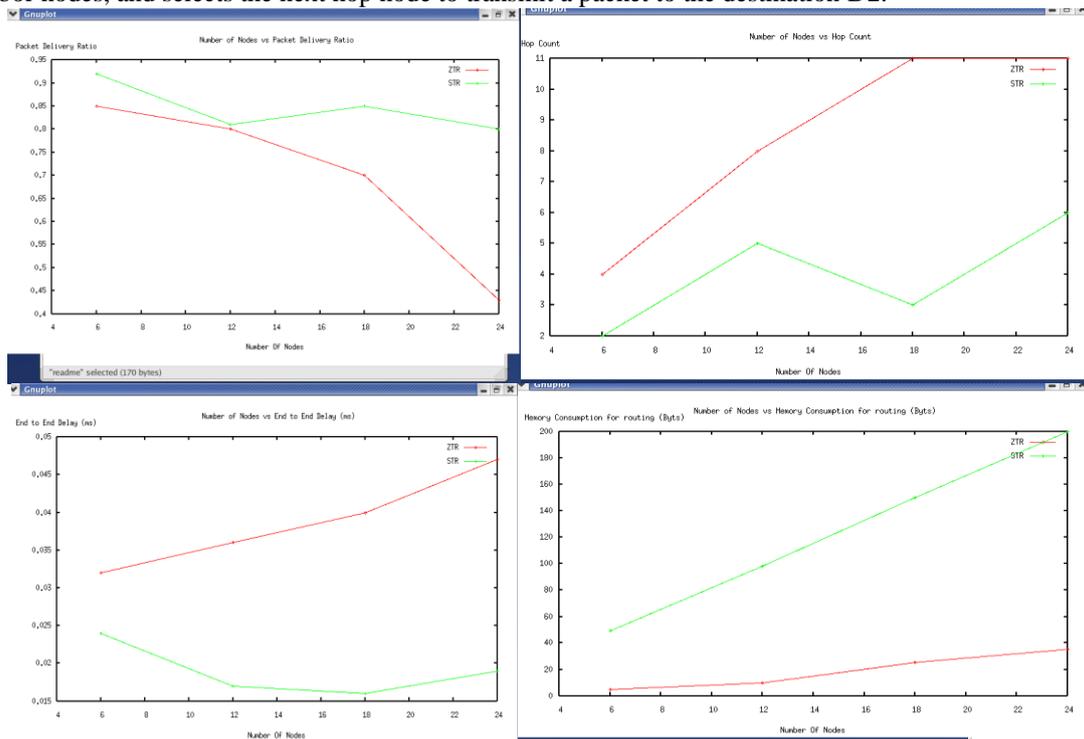


Fig. 1 Routing performance and overhead for the network traffic load i. Packet deliver ratio ii. Hop count iii. End to end delay iv. Memory consumption

III. PROPOSED SYSTEM

Cluster based routing algorithm are used to increased energy efficiency in wireless sensor network .when data transmitted or received by the nodes in the network ,then data crash and blocking will be occurred. clustering technique can assist in dropping useful energy consumption . Clustering is useful for many application that involve scalability to hundreds or thousands of nodes. Scalability in this environment must implies for load balancing, efficient resource consumption and data aggregation. Clustering can be very efficient in one-to many, many-to-one, one-to-any, or one-to-allcommunication.

In sensor node clustering, the fundamental process is to select a set of cluster head from the set of nodes in the network. By using cluster head, communication and data aggregation can be done. cluster head collects all the data from nodes and then transmit to the base station. A lot of parameters can be used for electing the node as a cluster head such as locality, mobility, battery, throughput, etc. during the selection process, one cluster head per cluster must be selected because single cluster consist of multiple cluster can give rise to cluster information, quality of service and routing

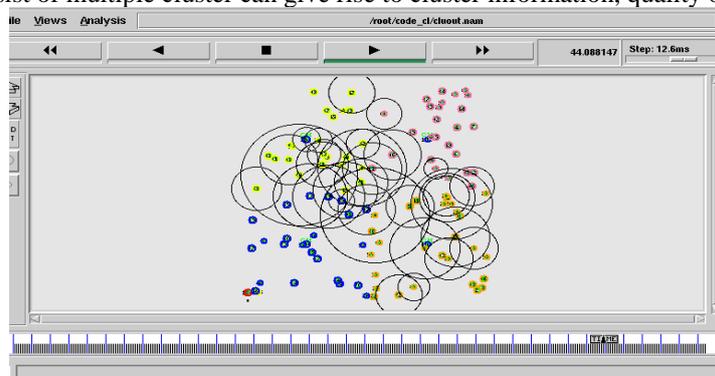


Fig 2 Cluster Based Routing

IV. PERFORMANCE EVOLUTION

In this section, we evaluate the performance of our proposed system using Network simulator 2. In simulation we assume that cluster head are predefined and cluster node are static in nature. In this paper, we consider the performance of routing path and overhead. We compare ZTR and STR(existing system) with cluster based routing (proposed system) on the bases of number of selfish node vs average dropped packet, false positive rate and number of nodes vs packet delivery ratio, average latency.

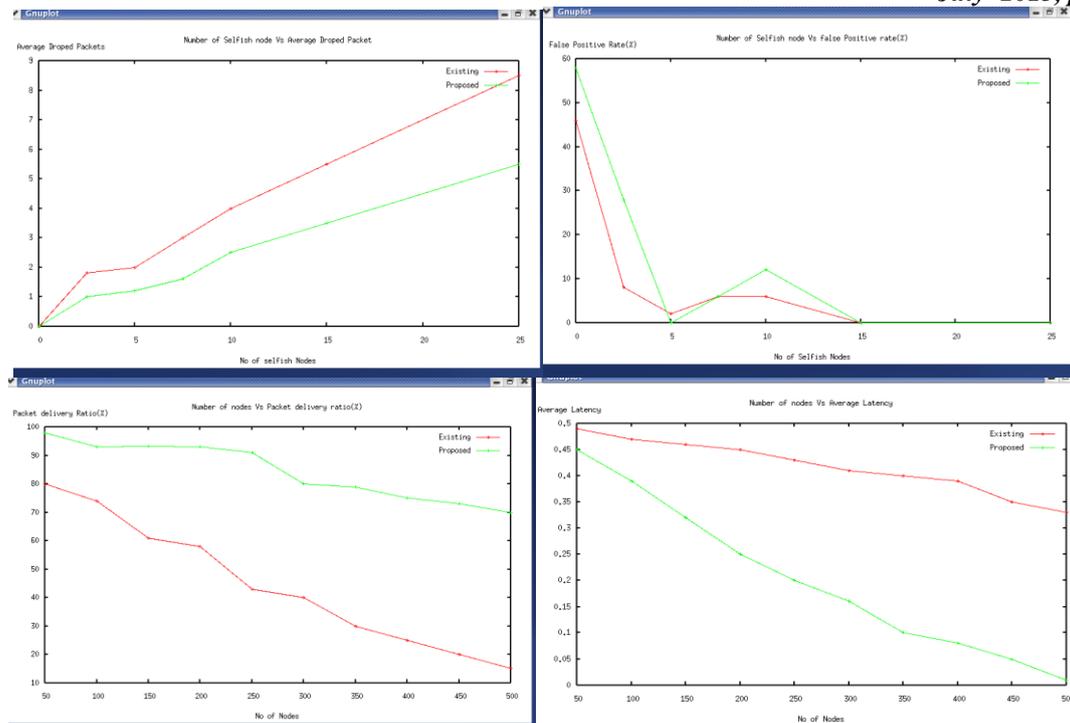


Fig.3 Performace evolution between existing and proposed system(i) average dropped packet (ii) false positive rate (iii) packet delivery ratio (iv)average latency.

III. CONCLUSION

In this paper, we proposed the new cluster based routing zigbee wireless network to extend the network routing performance and simulation results are compared with the existing routing algorithms ZTR and STR. The proposed system consist of many number of node which forms a cluster with cluster heads. The results from simulations show that cluster based systems are more efficient in terms of both packet delivery ratio and the network lifetime . it minimize the overhead of control packets and efficient utilization of nodes and implements a cluster based routing for Zigbee wireless network.

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