Volume 4, Issue 5, May 2014 ISSN: 2277 128X

International Journal of Advanced Research in Computer Science and Software Engineering

Research Paper

Available online at: www.ijarcsse.com

Application of 802.15.4 in Wireless Sensor Network

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Abstract— To predict the lifetime of wireless sensor networks before their installation is an important concern. ZigBee is an emerging worldwide standard for wireless personal area network based on the IEEE 802.15.4-2003 standard for Low-Rate Wireless Personal Area Networks (LRWPANs). The IEEE 802.15.4 standard is specifically meant to support long battery life time. We are particularly interested in finding out useful metrics to design reliably sensor networks. The main reason being that given the intricacies in the physical structure of a coal mine, only low power WSN nodes can produce accurate surveillance and accident detection data. In our propose a novel routing protocol for avoid routing failure and power aware process.

Keywords— ZigBee,LRWPAN,WSN,IEEE 802.15.4,PAN

I. INTRODUCTION

Wireless Sensor Networks (WSNs) consist of a large number of small and low cost sensor nodes powered by small batteries and equipped with various sensing devices. Usually, for many applications, once a WSN is deployed, probably in an inhospitable terrain, it is expected to gather the required data for quite some time, say for years. Since each sensor node has limited energy, these nodes are usually put to sleep to conserve energy, and this helps to prolong the network lifetime. There are two major approaches to sleep scheduling of sensor nodes, viz. (i) random (ii) synchronized. Any sleep scheduling scheme has to ensure that data can always be routed from source to sink. In this paper, we propose a novel approach for sleep scheduling of sensor nodes using a tree and an energy aware routing protocol which is integrated with the proposed sleep scheduling scheme. The tree is rooted at the sink node. The internal nodes of the tree remain awake and the leaf nodes are made to sleep. This provides an assured path from any node to the sink node.

The tree is periodically reconstructed considering the remaining energy of each node with a view to balance energy consumption of nodes, and removes any failed nodes from the tree. The proposed approach also considerably reduces average energy consumption rate of each node as we are able to put more number of nodes to sleep in comparison to other approaches. Additional fault-tolerance is provided by keeping two paths from each node towards the sink. Extensive simulation studies of the proposed routing protocol has been carried out using Castalia simulator, and its performance has been compared with that of a routing protocol, called GSP, which incorporates sleep scheduling using random approach. The simulation results show that the proposed approach has longer network lifetime in comparison to that provided by GSP, and the energy consumption of nodes is also balanced.

II. EXISTING SYSTEM

In our existing system, we implement the Zigbee based MAC protocol with on demand routing and evaluate network performance in a sensor network. The battery life time requirement is essential in order to avoid the necessity of frequent battery changes. Using a ZigBee device with conservative power consumption is both adequate and desirable. But stranded Zigbee was an energy efficient but is not a safety routing easily affected a link failure.

III.PROPOSED SYSTEM

In our proposed system, ZigBee provides self-organized, multihop, and reliable mesh networking with long battery lifetime. Two different device types can participate in an LR-WPAN network: a full-function device (FFD) and a reduced-function device (RFD). The FFD can operate in three modes serving as a PAN coordinator, a coordinator, or a device. The IEEE 802.15.4 is a new standard defined for LS-WPAN (LS-Link state) which provides a low cost and very less complicated solution. We use on link state routing protocol for safety routing in sensor network on Zigbee process IEEE 802.15.4.

Preprocessing:

A) *Construction of the Broadcast Tree (BTC)*

Each node in the WSN stores the *ID*s of two parent nodes along with the associated least cost of the paths to the sink through them. The nodes which are directly reachable from the sink have both the parent nodes set to sink node. Besides, each node also stores its node *ID*, its remaining energy, the cost to be added to a path to sink that passes through this node. The broadcast tree construction of the routing protocol consists of two phases. In the first phase, the sink node broadcast an advertisement message *ADV1*. Upon receipt of *ADV1* message, each node of the WSN executes the algorithm given in the procedure *BTC-phase1*, and set its first parent field so that the path to the sink node through it has least cost. Upon completion of the first phase, the Sink broadcast a second advertisement message *ADV2*. Upon receipt of *ADV2* message, each node of the WSN executes the algorithm given in the procedure *BTC-phase2*, and set its second parent field so that the path to the sink node through it has the second least cost. The advertisement messages *ADV1* and *ADV2* broadcasted by node *j* have the following parameters.

ADV 1 = (Nj ,CFj,1, PFj,1), ADV 2 = (Nj ,CFj,1)

The algorithm to construct the initial tree is given in the procedure *BTC-phase1* which performs its task as follows. At the beginning of first period, each node except the sink node sets its both cost fields to ∞ and parent node fields to -1, but at the beginning of subsequent periods, each node only sets its both cost field to ∞ and no change is made to the parent node fields. The sink node sets its both cost fields to 0 and set its parent node fields to its own *ID*. At the beginning of this phase, sink node broadcasts an *ADV1* message to all its neighbors. When a node receives an *ADV1* message, it does not broadcast its own *ADV1* message to its neighbor immediately. Before sending the *ADV1* message to its neighbors, the following steps are executed.

1. When a node receives the first *ADV1* message, it sets back off timer.

2. If the first *ADV1* message comes from the sink node, then the node stores the sink node *ID* in two parent node fields, and computes the new cost by adding

Reciprocal of its remaining energy to the received cost, and stores the new cost in two cost fields. If the first *ADV1* message comes from any other node, then the

Node compares the new cost with the existing cost stored in the first cost field. If the new cost is less than the existing cost, then the new cost value is stored in two cost fields of the node and received node *ID* is stored in two parent node fields.

3. Upon reception of any further *ADV1* message from other neighbors, it computes the new cost in the same way as in *step* 2. If the node has already stored the sink

Node *ID* in its parent node field, then it will discard the *ADV1* message, otherwise, it compares this new cost with the existing cost stored in its first cost field and updates its cost fields and parent node fields as in *step*2.

Once the back off timer expires, the node broadcasts *ADV1* message that contains its own *ID*, the value stored in the first cost field, and the parent node *ID* stored in the first parent node field. After broadcasting *ADV1* message, if a node receives any *ADV1* message from any other node, then the node compares its own *ID* with the parent node *ID* stored in the received broadcast message. If its own *ID* is equal to the parent node *ID* in received *ADV1* message the node declares itself as an internal node. If a node does not receive any *ADV1* message where its own *ID* is equal to the parent node *ID* stored in the broadcast message, then the node declares itself as a leaf node.

B) *Transmission of Data from Source to Sink*

When an event occurs at an internal node, data will be transmitted to a parent node in the tree. If an event occurs at a leaf node, the node will wake up and transmit data and again go to sleep till next event or next period whichever is earlier.

IV. IMPLEMENTATION MODULE

MODULE 1:

Base file for creation of nodes and transfer of packets.

MODULE 2:

Topology of wireless networks with more no of nodes , transmission of packets between the nodes is done using NORMAL AODV protocol parameters such as end to end delay,throughput,packet delivery ratio, energy spentis calculated and the output is shown using graphs.

MODULE 3:

Topology of wireless networks with more no of nodes, transmission of packets between the nodes is done usingDOS attack is implemented and the network performance is degraded. Parameters such as end to end delay, throughput, packet delivery ratio, energy spent is calculated and the output is shown using graphs.

MODULE 4:

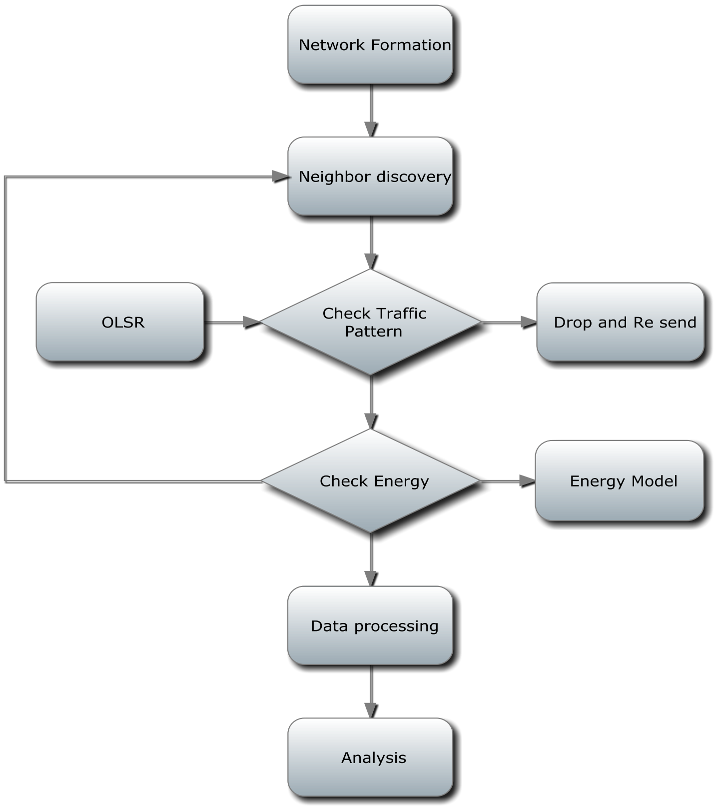
Topology of wireless networks with more no of nodes , transmission of packets between the nodes is done using PROPOSED Energy Aware Routing Protocol with Sleep Scheduling is Developed [as protocol in NS2 package using C++] to avoid attack and to improve the network performance. Parameters such as end to end delay, throughput,packet delivery ratio,energy spent is calculated and the output is shown using graphs.

MODULE 5:

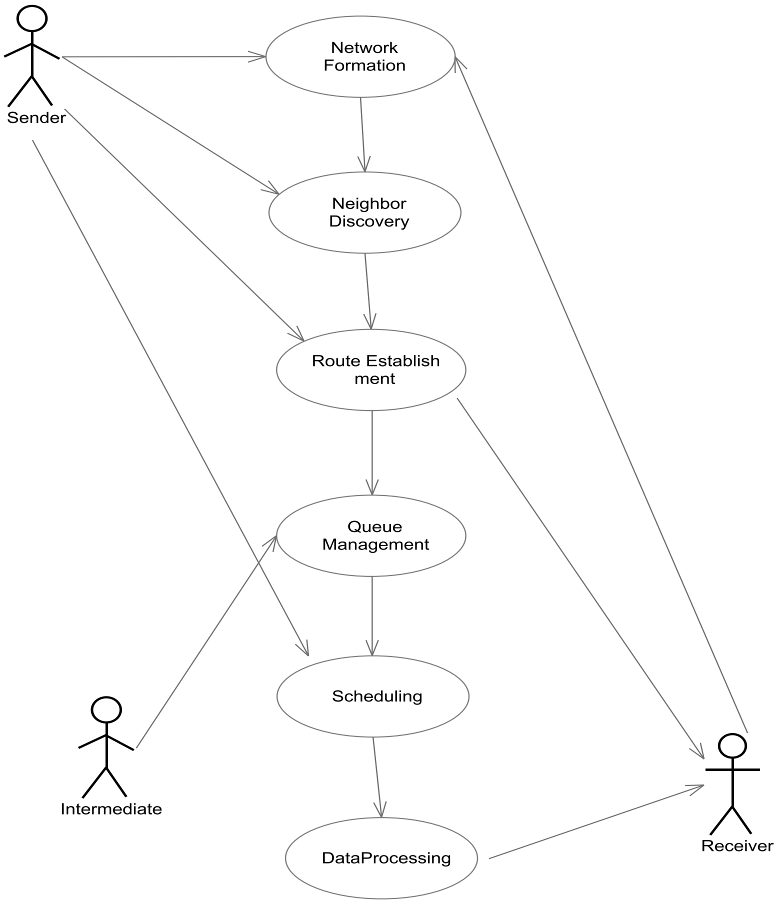
Comparison between AODV, Attack and Proposed Protocol is done. The output is shown using graph.

V. SYSTEM DESIGN

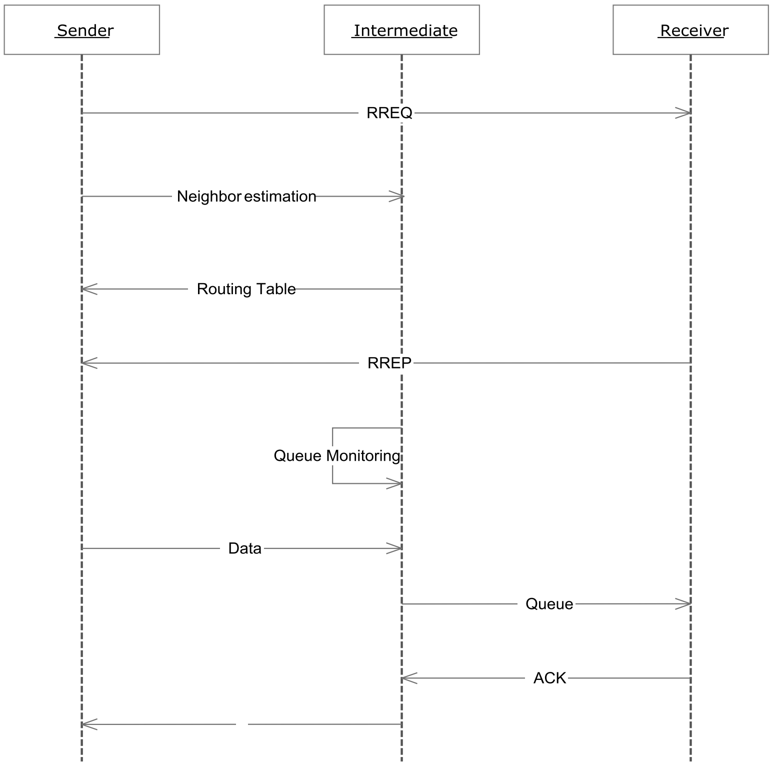
1. Flow Diagram



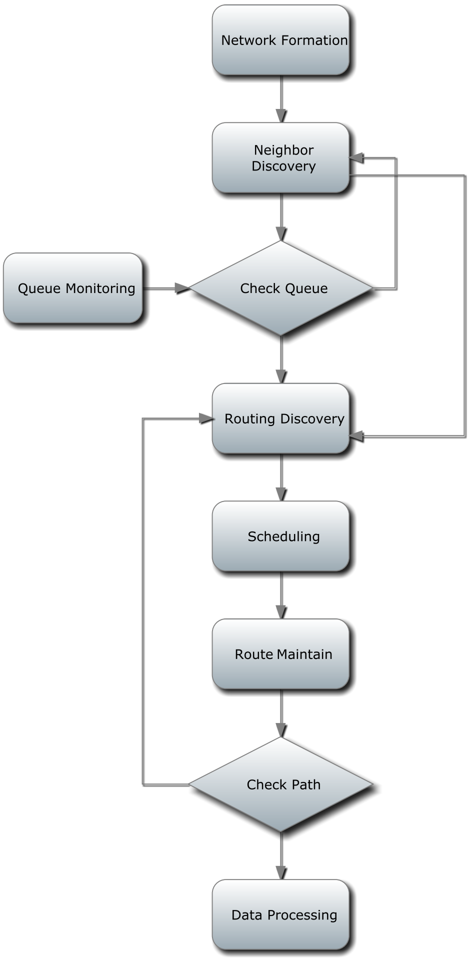
2. Use Case Diagram



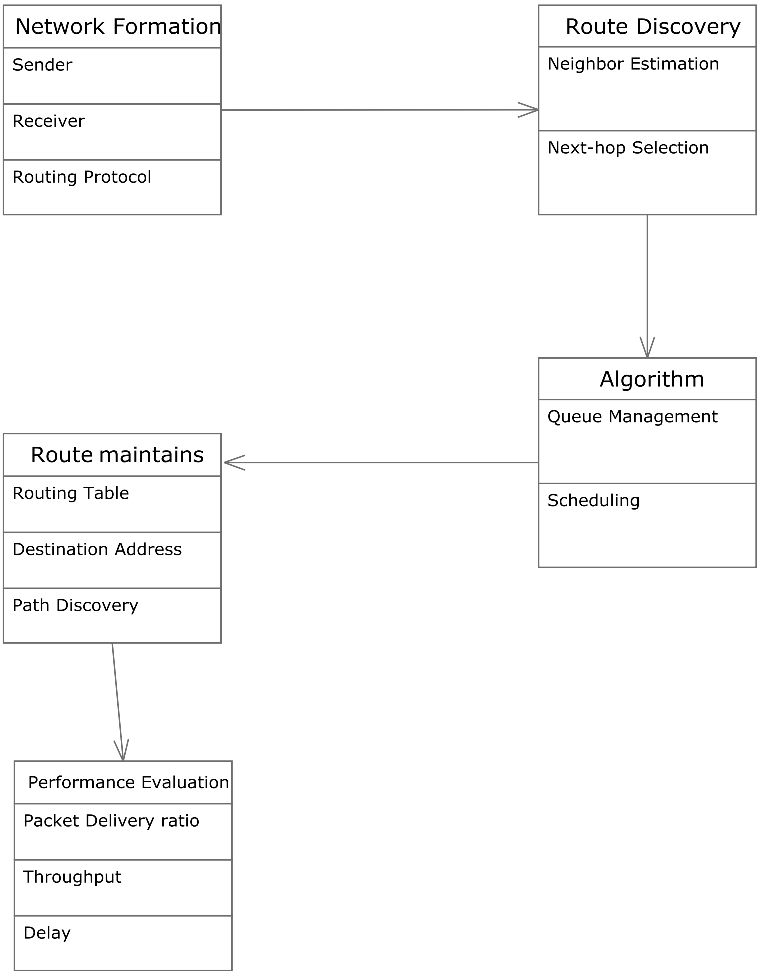
3. Sequence Diagram



4. Data Flow Diagram



5. Class Diagram



VI. CONCLUSIONS

Future work includes adaptively adjusting the period of tree reconstruction depending on the input data rate with a view to further increase the network lifetime**.**

ACKNOWLEDGMENT

I would like to express my heartfelt gratitude to my guide Prof. Amit R. Sarkar who acted as a source of inspiration in all spheres of my dissertation phase & necessarily providing all resources along with a great platform to accomplish my target. I am also thankful to Sir for his constant valuable guidance and encouragement during the course period. Besides his entire busy schedule Sir always gave me enough time to discuss and sort out my queries. With whatever little progress I made, Sir appreciated and constantly guided me towards the next optimum level in the dissertation phase. Apart from technical skills, Sir also introduced professional skills in me.

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