Optimizing Faulty Node Removal in Secured Wireless Network with CASER

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Abstract- *A wireless network sensor is believed to perform well if it have a longer lifetime and high security and these two become major issues while designing a multi-hop wireless sensor network with non-replenish able energy resources. This project introduces an efficient technique that helps improving the network lifetime and the security of a multi-hop WSN.*

This novel technique is named as Cost-Aware SEcure Routing (CASER) protocol. The issues that are sort using this proposed technique are energy balance control (EBC) and probabilistic-based random walking. The network lifetime is improved by proportionating the energy consumption to the uniform energy deployment. To solve this problem, an efficient non-uniform energy deployment strategy is proposed to optimize the lifetime and message delivery ratio under the same energy resource and security requirement. Excellent tradeoffs are provided between routing efficiency and energy balance by using proposed technique of CASER. This technique improves the network lifetime to a great extent. Also proposed CASER protocol can achieve a high message delivery ratio while preventing routing traceback attacks.

Keywords- WSN, CASER, EBC, Routing,NS2

I. INTRODUCTION

WSNs are composed of a large number of tiny sensor nodes equipped with limited computing and communication capabilities. Sensor nodes are often deployed in an uncontrolled or even harsh environment and expected to last until their energy drain. Such harsh environments and limited energy in the battery-powered sensor nodes make them prone to faults. In particular, when sensor nodes actively sense and transmit to fulfil the application requirements, they deplete their energy continuously and this increases the failure of sensor nodes.

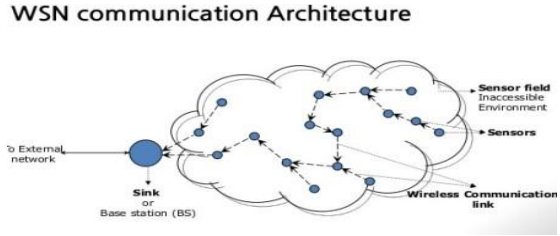


Fig.1 Basic structure of WSN

The basic structure of Wireless Sensor Networks is shown in figure 1.1. The sensor nodes gather the information of interest locally and then forward the sensed information over a wireless medium to a remote data collection device (sink), where it is fused and analysed in order to determine the global status of the sensed area.

Routing is another very challenging design issue for WSNs. A properly designed routing protocol should not only ensure high message delivery ratio and low energy consumption for message delivery, but also balance the entire sensor network energy consumption, and thereby extend the sensor network lifetime.

The sensors serve as wireless data acquisition devices for the more powerful actor nodes that process the sensor readings and put forward an appropriate response a failure of an actor may cause the network to partition into disjoint blocks and would thus violate such a connectivity requirement. The remote setup in which WSANs often serve makes the deployment of additional resources to replace failed actors impractical, and repositioning of nodes becomes the best recovery option.

When a node fails, its neighbors will individually consult their possibly incomplete routing table to decide on the appropriate course of actions and define their role in the recovery if any. If the failed node is critical to the network connectivity, i.e., a node whose failure causes the network to partition into disjoint blocks, the neighbor that belongs to the smallest block reacts. Distributed Actor Recovery Algorithm (DARA) and PArtition Detection and Recovery Algorithm (PADRA) require every node to maintain a list of their multi-hop neighbors and determine the scope of the recovery by checking whether the failed node.

Cost-Aware SEcure Routing (CASER) protocol for WSNs to balance the energy consumption and increase network lifetime. CASER has the flexibility to support multiple routing strategies in message forwarding to extend the lifetime while increasing routing security. Both theoretical analysis and simulation results show that CASER has an excellent routing performance in terms of energy balance and routing path

distribution for routing path security. We also proposed a non-uniform energy deployment scheme to maximize the sensor network lifetime. Our analysis and simulation results show that we can increase the lifetime and the number of messages that can be delivered under the non-uniform energy deployment by more than four time.

II. OBJECTIVES

- To detect the failure nodes and apply the recovery scheme, so that it will be able to create the alternate path and
  forward the packet.
- To have a network which gives assurance of packet and give the node time to regain its so that it will be able to carry further load packets on the network .
- To balance the load, the energy consumption of all sensor grids is balanced which increase the lifetime of the sensor network.

III. CASER

Motivated by the fact that WSNs routing is often geography-based, we propose a geography-based secure and efficient Cost-Aware SEcure routing (CASER) protocol for WSNs without relying on flooding. CASER allows messages to be transmitted using two routing strategies, random walking and deterministic routing, in the same framework. The distribution of these two strategies is determined by the specific security requirements. This scenario is analogous to delivering US Mail through USPS: express mails cost more than regular mails; however, mails can be delivered faster. The protocol also provides a secure message delivery option to maximize the message delivery ratio under adversarial attacks. In addition, we also give quantitative secure analysis on the proposed routing protocol based on the criteria proposed in [1].

CASER protocol has two major advantages: (i) It ensures balanced energy consumption of the entire sensor network so that the lifetime of the WSNs can be maximized. (ii) CASER protocol supports multiple routing strategies based on the routing requirements, including fast/slow message delivery and secure message delivery to prevent routing traceback attacks and malicious traffic jamming attacks.

It can be summarized as:

1) It propose a secure and efficient Cost-Aware Secure Routing (CASER) protocol for WSNs. In this protocol, cost-aware based routing strategies can be applied to address the message delivery requirements.
2) Developed theoretical formulas to estimate the number of routing hops in CASER under varying routing energy balance control (EBC) and security requirements.
3) Quantitatively analyze security of the proposed routing algorithm.
4) It provides an optimal non-uniform energy deployment (noED) strategy for the given sensor networks based on the energy consumption ratio. Our theoretical and simulation results both show that under the same total energy sdeployment, we can increase the lifetime and the number of messages that can be delivered more than four times in the non-uniform energy deployment scenario.
5) Devised a quantitative scheme to balance the energy consumption so that both the sensor network lifetime and the total number of messages that can be delivered are maximized under the same energy deployment (ED).

Flowchart

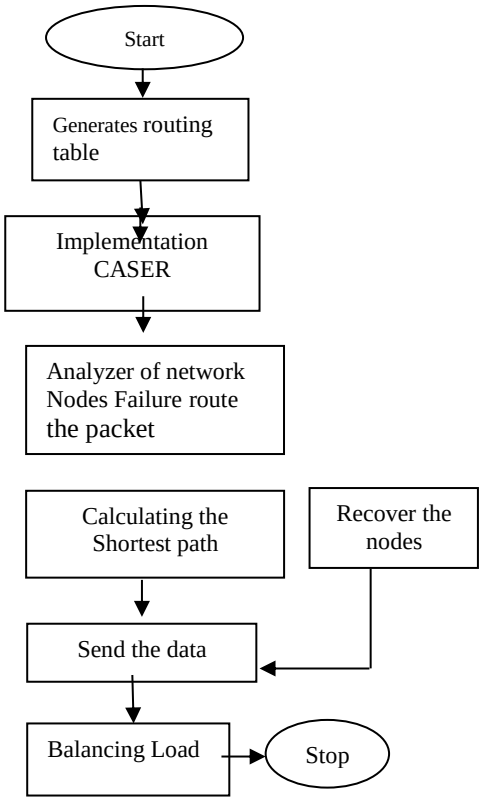


Figure 2 shows the various stages for flow of information.

When process start it maintain the routing table and generate the routing list. As per the implementation of caser it analyze the failure nodes and using shortest routing path send the data and balance the load. It also recover the failed node send the another data from the node.

Energy Balance Control (EBC): To balance the overall sensor network energy consumption in all grids by controlling energy spending from sensor nodes with low energy levels. The source node sends the message to neighboring nodes, then move to the next neighboring node.

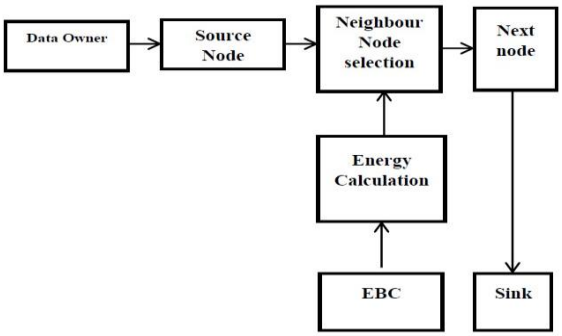


Fig 2: Energy Balance control

IV. DESIGN GOAL

Our design goal can be summarized as follows:

- To maximize the sensor network lifetime, we ensure that the energy consumption of all sensor grids are balanced.
- To achieve a high message delivery ratio, our routing protocol should try to avoid message dropping when an alternative routing path exists.
- The adversaries should not be able to get the source location information by analyzing the traffic pattern.
- The adversaries should not be able to get the source location information if he is only able to monitor a certain area of the WSN and compromise a few sensor nodes.
- Only the sink node is able to identify the source location through the message received. The recovery of the source location from the received message should be very efficient.
- The routing protocol should maximize the probability that the message is being delivered to the sink node when adversaries are only able to jam a few sensor nodes.

V. PROPOSED WORK

We propose a secure and efficient Cost Aware Secure Routing (CASER) protocol that can address energy balance and routing security concurrently in WSNs. In CASER routing protocol, each sensor node needs to maintain the energy levels of its immediate adjacent neighboring grids in addition to their relative locations. Using this information, each sensor node can create varying filters based on the expected design trade off between security and efficiency. The quantitative security analysis demonstrates efficiency. The quantitative security analysis demonstrates information from the adversaries. In this project, we will focus on two routing strategies for message forwarding: shortest path message forwarding, and secure message forwarding through random walking to create routing path unpredictability for source privacy and jamming prevention.

For securing the path, we will used the AES (Advanced Encryption Standard) for sending and receiving data.

VI. EXPERIMENTAL RESULTS

NS2 is an event driven packet level network simulator. Among the available simulators, NS2 is widely used and highly recognized open source network simulators. We conduct the following experiments with ns 2.34 simulator. There are 30 sensor nodes randomly deployed in the communication field. The simulation time is 30ms.

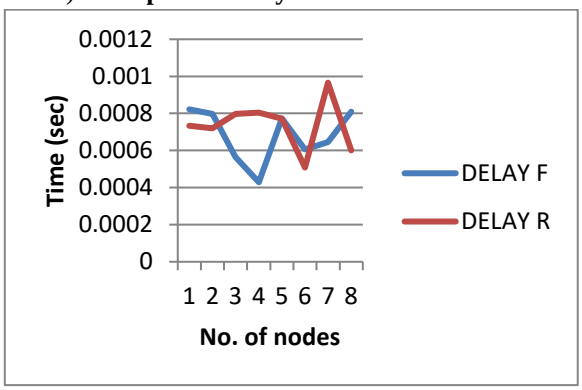
Result analysis and evaluation:

Delay		**PDR**		**TP**	
F	R	F	R	F	R
0.000822	0.000734	97.94	96.66	194	193.31
0.000797	0.00072	93.38	97.14	190.04	190.88
0.000773	0.000771	98.82	98.04	189.91	193.25
0.000605	0.000508	98.83	96.81	183.31	182.47

Table.1 Result Evaluation

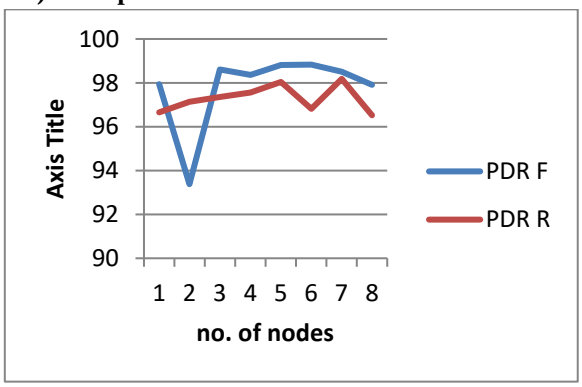
Table 1 containing the some parameters like Delay, PDR (Packet Delivery Ratio), Throughput, etc. Evaluation values shows comparison after fault injection and fault recovered. Wireless sensor network topology of creation of more number of nodes [30 nodes] with default node configurations and packet transmission will be done based on proposed protocol COST AWARE SECURE ROUTING MECHANISM CASER PROTOCOL which is developed in c++ and integrated in to NS2 package and JAMMERS are introduced in the network to check the network performance where as QOS performance metrics like end to end delay, energy spent, packet delivery ratio, throughput values are taken and graphs will be plotted. Here JAMMERS will be detected and prevented so that the network life time, performance will get increased

1) **Graph for Delay:**



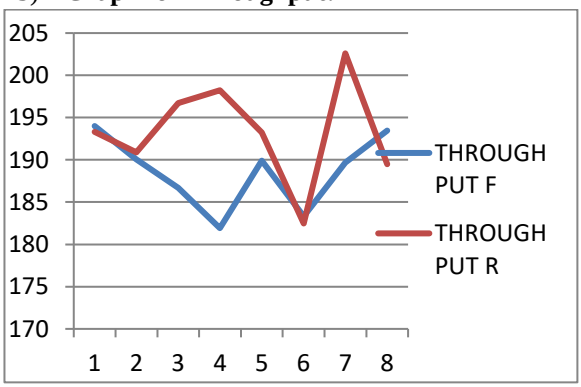
Here it is represented in graphical form how Delay is decreased after applying CASER algorithm. Delay F represents faulty nodes which decreased as compared to Delay R (Fault recovered). Graph is plotted Area of nodes on X-axis Vs Time in sec on Y-axis.

2) Graph for PDR:



It shows packet delivery ratio(PDR). PDRis ratio of received packet by destination to ratio of generated packet by source. As faulty nodes has been recovered so PDR ratio has been increased.

3) **Graph for Throughput:**



Throughput is the amount of data received by destination. Graph shows how throughput increased. Here Throughput F indicates Number of Faulty nodes and Throughput R indicates Number of Faulty Nodes that are Recovered

VII. CONCLUSION

In this paper, we presented a secure and efficient Cost Aware SEcure Routing (CASER) protocol for WSNs to balance the energy consumption and increase network lifetime. CASER has the flexibility to support multiple routing strategies in message forwarding to extend the lifetime while increasing routing security. Both theoretical analysis and simulation results show that CASER has an excellent routing performance in terms of energy balance and routing path distribution for routing path security. We also proposed a non-uniform energy deployment scheme to maximize the sensor network lifetime. Our analysis and simulation results show that we can increase the lifetime and the number of messages that can be delivered under the non-uniform energy deployment by more than four times.

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