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# A SECURE AND EFFICIENT PROTOCOL FOR BALANCING THE ENERGY CONSUMPTION AND INCREASING NETWORK LIFETIME

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***Abstract:*** ***In multi-hop wireless sensor networks, we are having two major issues like lifetime optimization and security. Here, we proposed a new secure and efficient cost-aware secure routing protocol to overcome the issues with two adjustable parameters. One is energy balance control and probability-based random walking. Then determine that the energy usage is not according to the uniform energy deployment for the particular network topology. Because of that point, life time of the sensor network will be reduced heavily. To overcome these problems, we proposed an effective non-uniform energy deployment strategy to analyze the lifetime and message delivery ratio under the same resources and security requirement. Also provides an effective security study on the proposed routing protocol. For this non-uniform energy availability, we can show that we can increase the lifetime and the total number of messages which can deliver under the same hypothesis. Also, we provided sleep awake algorithms for achieving an effective message delivery ratio while securing the network from routing blocking attacks.***
***Keywords: wsns, multi-hop, security, lifetime, messages.***

## I. INTRODUCTION

A wireless Sensor community (WSN) contains thousands or hundreds and hundreds of sensor nodes and a small number of data collection devices. The sensor nodes have the type of low-cost, low-vigor, small-measurement instruments, and are designed to carry out a variety of sensing functions, together with environmental monitoring, military surveillance, hearth detection, animal monitoring, and many others. The sensor nodes collect the expertise of interest in the neighborhood and then forward the sensed information over a wi-fi medium to a far off knowledge assortment gadget (sink), where it is fused and analyzed to be able to determine the worldwide status of the sensed discipline. The elemental structure of wireless Sensor Networks is proven in figure 1.1.In lots of WSN purposes, the sensor nodes are required to understand their locations with a high measure of precision, equivalent to the tracking of items, wooded area fire detection, and many others. For example, in wooded area hearth tracking, the relocating perimeter of the hearth can only be traced if the locations of the sensors are effectively identified. For this reason, many sensor localization ways have been proposed for WSNs. Generally speaking, these approaches will also be classified as either variety-centered or range-free. In variety-founded schemes, the sensor locations are calculated from the node-to-node distances or inter-node angles. Conversely, in variety-frees chemes, the sensor areas are decided by using radio connectivity constraint. Variety centered schemes are ordinarily more accurate than range-free schemes. Nonetheless, they require the usage of infrared, X-ray or ultrasound approaches to calculating the inter-node distance and/or attitude, and are for that reason each extra elaborate and higher priced than variety-free schemes.

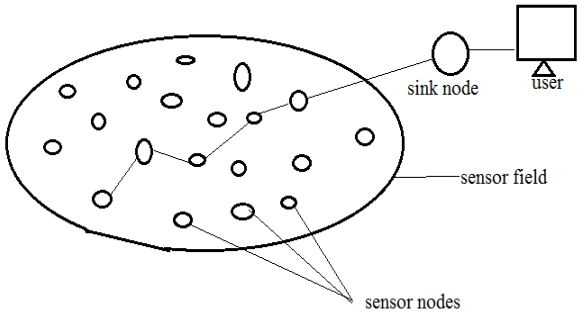


Fig 1.1. Basic structure of WSN

A key characteristic of such networks is that each and every the network includes a big quantity of untethered and unattended sensor nodes. These nodes, as a rule, have very restrained and non-replenish able vigor assets, which makes vigor a foremost design dilemma for these networks. Routing is another very difficult design obstacle for WSNs. An appropriately designed routing protocol must not most effective be certain excessive message supply ratio and low vigor consumption for message supply, but additionally stability the complete sensor community Energy consumption, and thereby lengthen the sensor network lifetime. In unique, in the wi-fi sensor area, any individual with a proper wireless receiver can display and intercept the sensor network communications. The adversaries could use high-priced radio transceivers, robust work stations and interact with the community from a distance due to the fact that they don't seem to be limited to utilizing sensor community hardware. It is viable for the adversaries to perform jamming and routing hint back attacks. Stimulated by means of the fact that WSNs routing is most of the time geography based, we endorse a geography-established secure and efficient useful resource aware relaxed routing (RCS) protocol for WSNs without relying on flooding. RCS makes it possible for messages to be transmitted using two routing procedures, random strolling, and deterministic routing, within the same framework. The distribution of those two techniques is determined by way of the detailed protection

requirements. This situation is analogous to offering US Mail through USPS: express mails rate more than ordinary mails; nonetheless, mail scan also be delivered faster. The protocol also supplies an at ease message delivery alternative to maximize the message delivery ratio underneath adversarial assaults. Additionally, we also give quantitative comfortable analysis on the proposed routing protocol founded on the standards proposed.

## II. RELATED WORK

In Geographic and energy aware routing (gear), the sink node disseminates requests with geographic attributes to the target region as a substitute for using flooding. Every node forwards messages to its neighboring nodes headquartered on estimated cost and studying rate. Supply-location privacy is furnished via broadcasting that mixes valid messages with dummy messages. The transmission of dummy messages not most effective consumes the massive quantity of sensor vigor, but additionally raises the community collisions and decreases the packet supply ratio. In phantom routing protocol, every message is routed from the actual source to a phantom source along a designed directed walk by means of both sector founded the method or hop-founded approach. The direction/sector understanding is saved in the header of the message. On this way, the phantom supply can be away from the actual source. Alas, once the message is captured on the random stroll direction, the adversaries are capable of getting the course/sector knowledge saved in the header of the message. Routing is a challenging mission in WSNs due to the restricted resources. Geographic routing has been commonly considered as one of the crucial promising tactics for WSNs. Geographic routing protocols make use of the geographic area understanding to route knowledge packets hop-with the aid of-hop from the supply to the destination. The supply chooses the instantaneous neighboring node to forward the message established on both the direction and the gap. The distance between the neighboring nodes can also be estimated or got by way of signal strengths or using GPS equipment's. The relative region understanding of neighbor nodes can also be exchanged between neighboring nodes. In a geographic adaptive fidelity (GAF) routing scheme was proposed for sensor networks equipped with low power GPS receivers. In GAF, the community area is divided into fixed measurement virtual grids. In each grid, only one node is chosen as the lively node, even as the others will sleep for a interval to save vigor. The sensor for-wards the messages established on greedy geographic routing method. A query established geographic and energy aware routing (apparatus)was proposed. In equipment, the sink node disseminates requests with geographic attributes to the goal region as a substitute of utilizing flooding. Every node forwards messages to its neighboring nodes based on estimated rate and finding out cost. The estimated rate considers both the space to the destination and the remainder vigor of the sensor nodes. Whilst the learning rate provides the updating know-how to handle the neighborhood minimal hind rance. At the same time geographic routing algorithms have the advantages that each and every node simplest wishes to preserve its neighbouring knowledge, and provide a higher effectivity and a greater scalability for huge scale WSNs, these algorithms could attain their local minimum, which can influence in useless finish or loops. To clear up the neighborhood minimum concern, some variants of these general routing algorithms have been proposed, together with GEDIR, MFR and compass routing algorithm. The supply ratio may also be expanded if each node is conscious of its two-hop neighbours. There are a few papers discussed combining grasping and face routing to clear up the neighborhood minimum concern. The common concept is to set the regional topology of the network as a planar graph, after which the relay nodes attempt to forward message along one or in all probability a series of adjoining faces towards the vacation spot. Lifetime is an additional field that has been widely studied in WSNs. In a routing scheme was proposed to find the sub-most beneficial direction that may extend the lifetime of the WSNs rather of constantly deciding upon the lowest power path. In the proposed scheme, multiple routing paths are about ahead via a reactive protocol corresponding to AODV or directed diffusion. Then, the routing scheme will select a route based on a probabilistic system according to the remaining vigor. In Chang and Tassels assumed that the transmitter power level can also be adjusted in keeping with the distance between the transmitter and the receiver. Routing used to be formulated as a linear programming drawback of neighboring node resolution to maximize the network existence-time. Then Zhang and Shen investigated the unbalanced power consumption for uniformly deployed data gathering sensor networks. In this paper, the network is split into multiple corona zones and every node can perform information aggregation. A localized zone based routing scheme was proposed to stability energy consumption amongst nodes inside each and every corona. In formulated the integrated design of route choice, visitors load allocation, and sleep scheduling to maximize the network lifetime. Situated on the notion of opportunistic routing, developed a routing metric to address each hyperlink reliability and node residual vigor. The sensor node computes the most desirable metric value in a localized discipline to acquire each reliability and lifetime maximization. Additionally, publicity of routing expertise presents huge security threats to sensor networks. With the aid of acquisition of the area and routing knowledge, the adversaries may be capable of hinting back to the source node with no trouble. To clear up this main issue, several schemes had been proposed to pro-vide supply-area privacy via at ease routing protocol design. In source location privacy is provided via broadcasting that mixes valid messages with dummy messages. The fundamental inspiration is that every node needs to transmit messages regularly. Every time there's no legitimate message to transmit, the node transmits dummy messages. The transmission of dummy messages now not simplest consumes the gigantic quantity of sensor energy, but additionally raises the web-work collisions and decreases the packet supply ratio. In phantom routing protocol, each message is routed from the actual source to a phantom source

alongside a designed directed stroll through both sector-centered processor hop-based strategy. The direction/sector knowledge is stored within the header of the message. Then each forwarder on the random stroll direction forwards this message to a random neighbor established on the course/sector determined by means of the source node. In this way, the phantom source will also be far away from the specific supply. Alas, once the message is captured on the random stroll path, the adversaries are competent to get the path/sector understanding stored in the header of the message. Hence, exposure of the path decreases the complexity for adversaries to hint again to the precise message supply within the magnitude of 2h. We developed a two-section routing algorithm to furnish each content confidentiality and source-vicinity privacy. The message is first transmitted to a randomly chosen intermediate node in the sensor domain earlier than the message is being forwarded to a network mixing ring the place the messages from different guidelines are blended. Then the message is forwarded from the ring to the sink node. We developed standards to quantitatively measure source location understanding leakage for routing-situated schemes by way of source-area disclosure index (SDI) and source location space index (SSI). To the quality of our abilities, none of these schemes have considered privacy from a cost aware stand point.

## III. FRAMEWORK

We endorse a comfortable and efficient cost aware at ease Routing (CASER) protocol that can tackle power steadiness and routing safety at the same time in WSNs. In CASER a routing protocol, each and every sensor node wishes to keep the energy levels of its instant adjacent neighboring grids additionally to their relative places. Utilizing this knowledge, each sensor node can create various filters headquartered on the expected design alternate off between protection and effectiveness. The quantitative security evaluation demonstrates the proposed algorithm can look after the supply area expertise from the adversaries. In this project, we will be able to focus on two routing approaches for message forwarding: shortest course message forwarding, and relaxed message forwarding by means of random going for walks to create a routing course unpredictability for source privacy and jamming prevention.

Advantages

1. Reduce the energy consumption
2. Provide the more secure for packet and also routing
3. Increase the message delivery ratio
4. Reduce the time delay

### *A. Network Partition*

The network is evenly divided into small grids. Each grid has a relative vicinity situated on the grid know-how. The node in each grid with the best power stage is selected as the top node or message forwarding. In addition, each node within the grid will keep its own at tributes, together with vicinity information closing energy degree of its grid, as well as the attributes of its adjoining neighboring grids. The understanding maintained by means of each and everysensor node will be up-to-date periodically. We count on that the sensor nodes in its direct neighboring grids are all within its direct communique range. We also anticipate that the entire community is thoroughly connected by way of multi-hop communications. Furthermore, via the maintained energy levels of its adjoining neighboring grids, it can be used to observe and filter out the compromised nodes for lively routing choice.

### *B. Shortest Path Routing*

The shortest direction routing also called deterministic routing, in this routing, the subsequent hop grid is chosen from the neighbor grid list founded on the relative locations of the grid. The grid that's closest to the sink node is selected for message forwarding and in addition, we are considered vigor level of the chosen node. The chosen nodes have the easiest energy stage in comparison with other node's power levels. On this routing, we're making use of cryptographic system for message security. The deterministic shortest route routing guarantees that the messages are dispatched from the source node to the sink node.

### *C. Secure Message Forwarding*

This routing is also referred to as random walking, in this routing, the following hop grid randomly chosen from neighbor grid list for message forwarding. The routing route becomes extra dynamic and unpredictable. On this way, it's more complicated for the adversary to capture the message or to jam the traffic. For that reason, the supply ratio will also be increased in a antagonistic atmosphere. Utilizing this routing we are able to restrict the jamming.

### *D. Procedure*

- Setup the simulation parameters
- Create the nodes.
- Set the communication variety for all nodes
- in finding the neighbor node for all of the nodes
- decide upon the neighbor node based on thecommunique range
- Then calculate the distance from one node one other
- Make the cluster formation
- First, we need to evenly divide the community subject andcalculate the power level for all different nodes
- select the perfect energy node as a cluster head
- then opt for the cluster participants
- Cluster head collects the know-how from cluster Contributors
- Subsequently, cluster head transmits accrued expertise to the sink.

The network is evenly divided into small grids. Each the grid has a relative vicinity established on the grid expertise. The node in each and every grid with the very best energy level is selected as the head node for message forwarding. In addition, every node in the grid will maintain its possess at tributes, together with area information, last energy level of

its grid, as good as the attributes of its adjacent neighboring grids. The information maintained via every sensor node will likely be updated periodically. We expect that the sensor nodes in its direct neighboring grids are all inside its direct communication range. We additionally assume that the whole community is wholly connected through multi-hop communications. At the same time maximizing message source place privateness and minimizing site visitors jamming for communications between the source and the vacation spot nodes, we are able to optimize the sensor community lifetime through balanced energy consumption for the duration of the sensor community. Furthermore, the maintained power phases of its adjacent neighboring grids can be used to realize and filter out the compromised nodes for lively routing choice.

*E. CASER steps*

Step 1: find the neighbor grid for all grid

Step 2: Compute the traditional ultimate power of adjoining neighbor grid,

$$\varepsilon_a(A) = \frac{1}{|N_A|}\sum_{i \in N_A} \varepsilon\eta_i \qquad (1)$$

Step 4: select the head node centered on the perfect power degree for packet transmission

$$N_A^a = \{i \in N_A | \varepsilon\eta_i \geq a\varepsilon_a(A)\} \qquad (2)$$

Step 4: decide upon the routing form

Step 5: choose the random number γ € [0, 1]

Step 6: If γ > β, the node will ship the message by way of the shortest course, which is deterministic routing

Step 7: or else transmit the packet by means of the randomly selected neighboring grid, which is random stroll routing.

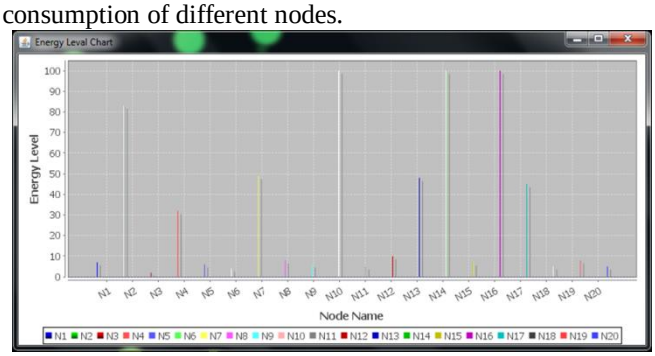
## IV. EXPERIMENTAL RESULTS

In the below table we can observe that different energy levels of different nodes. In the table we can observe that some nodes are having energy level as 100. And some nodes are having different then 100. Means here 100 is the initial energy level for nodes. Whatever the nodes we used in transmission those nodes energy levels will be decreased and remaining are at 100 only.

View Energy Level

| Node ID | Direction | Energy Level | Generated Data | Decrypted Data |
|---|---|---|---|---|
| N1 | Upper | 100.0 | MC4w | 0.0 |
| N2 | Upper | 100.0 | MC4w | 0.0 |
| N3 | Upper | 41.0 | MC4w | 0.0 |
| N4 | Upper | 100.0 | MC4w | 0.0 |
| N5 | Upper | 100.0 | MC4w | 0.0 |
| N6 | Backward | 100.0 | MjkuMA== | 29.0 |
| N7 | Backward | 100.0 | MC4w | 0.0 |
| N8 | Backward | 81.0 | MC4w | 0.0 |
| N9 | Backward | 100.0 | MC4w | 0.0 |
| N10 | Backward | 100.0 | MC4w | 0.0 |
| N11 | Forward | 100.0 | MC4w | 0.0 |
| N12 | Forward | 40.0 | MC4w | 0.0 |
| N13 | Forward | 100.0 | MC4w | 0.0 |
| N14 | Forward | 100.0 | MC4w | 0.0 |
| N15 | Forward | 100.0 | MC4w | 0.0 |
| N16 | Downward | 100.0 | MC4w | 0.0 |
| N17 | Downward | 100.0 | MC4w | 0.0 |
| N18 | Downward | 100.0 | MC4w | 0.0 |
| N19 | Downward | 34.0 | MC4w | 0.0 |
| N20 | Downward | 100.0 | MC4w | 0.0 |

Below graph is the pictorial representation for energy consumption. That indicating different levels of energy consumption of different nodes.




## V. CONCLUSION

Here, we proposed a cost aware secure and efficient routing protocol for WSNs which is much useful in energy consumption which leads to the increasing to the network life time. This protocol has the efficiency to support different routing strategies which used to message forwarding which leads to extend the network lifetime. Also this protocol is much useful for increasing the routing security. We also proposed a non-uniform energy deployment scheme which increases the network lifetime. In experimental results section we shown that which node's energy used and which node's energy doesn't used. So by these results we may understand that how the protocol is going to work for balancing the energy consumption and increases the network lifetime.

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