A Supervisory Enhancement of Packet Sinking and Immoral Stating Attacks in Heterogeneous Wireless Sensor Networks (HWSNs)

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Abstract: In this research system proposed an 'A supervisory Enhancement of Packet dropping and bad Mouthing Attacks in Heterogeneous Wireless Sensor Networks (HWSNs)', utilizing multipath routing in the incidence of defective and malicious nodes. Most existing routing protocols consider homogeneous sensor networks, i.e., all sensor nodes have the same capabilities in terms of communication, computation, energy support), etc. A Packet dropping and modification are common attacks that can be launched by an enemy to interrupt communication in wireless multi-hop sensor networks. The goal of our work is formulation and planning for controlling the packet dropping and bad mouthing attacks, each with different implications to energy, Security and reliability, and investigates intrusion detection and multipath routing based tolerance protocols to react on attacks. Because we all known about wireless sensor network (WSN) is a large collection of sensor nodes with limited power supply and constrained computational capability. Due to the restricted communication range and high density of sensor nodes, packet forwardingin sensor networks is usually performed through multi-hop data transmission. Therefore, routing in wireless sensor networks has been considered an important field of research over the past decade. There is no infrastructure, so wireless links are unreliable, susceptible to various attacks and have to meet strict energy is saving and load balancing. We can identify the Packet Droppers and Packet Modifiers using algorithms and packet marks. The Performance is represented using detection graphs, rate of working and assigning unique keys to all nodes, encryption-decryption at the base end as well as at router. The Proposed structure provides an in effective mechanism for catching packet droppers and modifiers.

Keywords- *Encryption-Decryption, Packet Dropping & Bad Mouthing Attacks in HWSN, Security in Wireless Sensor Network, Energy Consumption, Multipath Routing, Node Transaction Algorithm,RSA Algorithm,*

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"Redundancy Management of Multipath Routing for Intrusion Tolerance in Heterogeneous Wireless Sensor Networks".

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I. INTRODUCTION

A remote system is any sort of PC system that utilizations remote information associations for interfacing system hubs. Remote information transfers systems are for the most part actualized and managed utilizing radio correspondence. Numerous wireless sensor networks (WSNs) are conveyed in an unattended domain in which vitality renewal is troublesome if not outlandish. A remote system is any sort of PC system that utilizations remote information associations for interfacing system hubs. Remote systems administration is a strategy by which homes, information transfers systems and endeavour (business) establishments keep away from the immoderate procedure of bringing links into a building, or as an association between different hardware areas [1]. Remote information transfers systems are for the most part executed and managed utilizing radio correspondence. This usage happens at the physical level (layer) of the OSI model system structure [2]. Heterogeneous Wireless Networks is made out of a substantial number of minimal effort gadgets disseminated over a geographic zone. Sensor hubs have constrained preparing abilities; in this manner improved convention engineering ought to be composed to make interchanges basic and productive. Also, more often than not the force supply unit depends on a vitality restricted battery. Because of restricted assets, a WSN must not just fulfill the application particular QoS necessities, for example, unwavering quality, convenience and security, additionally minimize vitality utilization to drag out the framework valuable lifetime. In any case, no earlier work exists to consider the exchange off within the sight of malevolent assailants. In a remote sensor system, sensor hubs screen the earth, distinguish occasions of interest, and produce information and team up in sending the information towards a sink, which could be a door, base station, stockpiling hub, or questioning client. A sensor system is frequently conveyed in an unattended and disagreeable environment to perform the checking and information gathering undertakings. When it is sent in such a situation, it unlucky deficiencies physical security and is liable to hub bargain. In the wake of trading off one or numerous sensor hubs, an adversary may dispatch different assaults [1] to disturb the in-system correspondence. Among these assaults, two regular ones are dropping parcels and altering bundles, i.e., bargained hubs drop or change the bundles that they should forward. Security is significant for remote sensor systems conveyed in unfriendly situations. The bundle droppers and parcel modifiers might be arbitrary. Distinguishing such assaults is extremely troublesome and in some cases incomprehensible. In this paper the distinguishing proof and separating of bundle droppers and parcel modifier hubs is done utilizing parcel checks and positioning calculations. The execution is measured utilizing location rate and false positive likelihood. The outcomes show that the proposed plan gives a powerful system to recognizing bargained hub.

II. PROBLEM STATEMENT

A Review on Security, Energy & Congestion based issues in multipath routing for Wireless Sensor Network. The Simplicity in Wireless Sensor Network with resource constrained nodes makes them extremely vulnerable to variety of attacks. In a Wireless sensor networks sensor nodes monitor the environment, detect events of interest, produce data and collaborate in forwarding the data towards to a sink, which could be a gateway, base station or storage node. Securing the Wireless Sensor Networks need to make the network support all security properties: confidentiality, integrity, authenticity and availability. A sensor network is often deployed in an unattended and hostile environment to perform the monitoring and data collection tasks. When it is deployed in such an environment, it lacks physical protection and is subject to node compromise. After compromising one or multiple sensor nodes, an adversary may launch various attacks to disrupt the in-network communication. Among these attacks, two common ones are dropping packets and modifying packets, i.e. compromised nodes drop or modify the packets that they are supposed to forward. We expect sensor networks to consist of hundreds or thousands of sensor nodes as in Figure1.

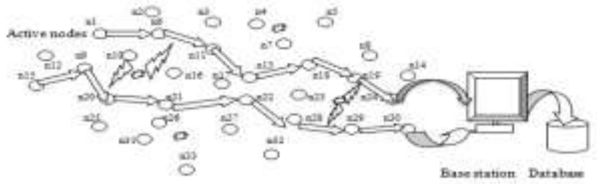

Fig: Architertural model of Packet Dropping and Bad Mouthing Attacks in HWSN

⇨	Reliable Path
○	Active Sensor Nodes
✹	Intruders
⚡	Jammers
1) n1-n6-n11-n13-n18-n19-n24-Base station 2) n15-n9-n20-n21-n22-n28-n29-n30-Base station	Transaction Path

Each node represents a potential point of attack, making it impractical to monitor and protect each individual sensor from either physical or logical attack. The networks may be dispersed over a large area, further exposing them to attackers who capture and reprogram individual sensor nodes. Attackers can also obtain their own commodity sensor nodes and induce the network to accept them as legitimate nodes, or they can claim multiple identities for an altered node. Once in control of a few nodes inside the network, the adversary can then mount a variety of attacks. Packet dropping is nothing but a bad node drops all or some of the packets that are supposed to be forwarded. It may also drop the data generated by itself for some malicious purpose such as blaming innocent nodes. This paper proposes a scheme to catch both packet droppers and modifiers. At first routing tree is established using directed acyclic graph DAG. Data is transmitted along the tree structure toward the sink. A packet sender or forwarder adds a small number of extra bits, which is called packet marks, are designed such that the sink can obtain the dropping ratio associated with every sensor node. Node Transaction Algorithm to identify nodes that are droppers/modifiers for sure or are suspicious droppers/ modifiers [1]. When sensor data is transmitted along the tree structure towards the sink, each packet sender or forwarder adds a small number of extra bits, which is called packet marks, to the packet. The format of the small packet marks is deliberately designed such that the sink can obtain very useful information from the marks. Specifically, based on the packet marks, the sink can figure out the dropping rate associated with every sensor node, and then run our proposed Node Transaction algorithm to identify nodes that are dropper's modifiers for sure or are suspicious droppers/modifiers. As the tree structure dynamically changes every certain time interval, behaviours of sensor nodes can be observed in a large variety of scenarios.

III. PREVIOUS WORK

Over the past few years, many protocols exploring the trade-off between energy consumption and QoS gain particularly in reliability in HWSNs have been proposed. In[19], the optimal communication range and communication mode were derived to maximize the HWSN lifetime. In [20], the authors devised intra-cluster scheduling and inter-cluster multi-hop routing schemes to maximize the network lifetime. They considered a hierarchal HWSN with CH nodes having larger energy and processing capabilities than normal SNs. The solution is formulated as an optimization problem to balance energy consumption across all nodes with their roles. In either work cited above, no consideration was given to the existence of malicious nodes. In [21], the authors considered a two-tier HWSN with the objective of maximizing network lifetime while fulfilling power management and coverage objectives. They determined the optimal density ratio of the two tier's nodes to maximize the system lifetime. Relative to [21] our work also considers heterogeneous nodes with different densities and capabilities. However, our work considers the presence of malicious nodes and explores the trade-off between energy consumption vs. QoS gain in both security and reliability to maximize the system life time. In the context of secure multipath routing for intrusion tolerance, [22] provides an excellent survey in this topic. In[15] the authors considered a multipath routing protocol to tolerate black hole and selective forwarding attacks. The basic idea is to use overhearing to avoid sending packets to malicious nodes. In [14] the authors considered a disjoint multipath routing protocol to tolerate intrusion using multiple disjoint paths in WSNs. Our work also uses multipath routing to tolerate intrusion. However, we specifically consider energy being consumed for intrusion detection, and both CHs and SNscan be compromised for lifetime maximization. In [23] a randomized dispersive multipath routing protocol is proposed to avoid black holes. The randomized multipath routes are dispersive to avoid the black hole and to enhance the probability of at least k out of n shares based on coding theory can reach the receiver. The approach, however, does not consider intrusion detection to detect compromised nodes. Relative to [23] our work also uses multipath routing to circumvent black hole attacks for intrusion tolerance.

Also, we consider interruption recognition to recognize and oust bargained hubs and in addition the best rate to conjure interruption location to best exchange off vitality utilization versus security and dependability increase to expand the framework lifetime. In the course of recent years, various conventions have been proposed to identify interruption in WSNs. [7, 11] give brilliant studies of the subject. In [10], a decentralized tenet based interruption identification framework is proposed by which screen hubs are in charge of observing neighbouring hubs. The screen hubs apply predefined principles to gather messages and raise cautions if the quantity of disappointments surpasses limit esteem. Our host IDS basically tails this methodology, with the blemishes of the host IDS described by a false positive likelihood and a false negative likelihood. In [10], notwithstanding, no thought is given about knocking assaults by traded off screen hubs themselves, so if a screen hub is vindictive, it can rapidly contaminate others. In [8], a shared methodology is proposed for interruption discovery where the choices in view of a greater part voting of observing hubs. Their work, in any case, does not consider vitality utilization issues connected with conveyed IDS, nor the issue of augmenting the WSN lifetime while fulfilling QoS necessities unreliability, dependability and auspiciousness. Our voting-based IDS approach stretches out from [9] with contemplations given to the exchange off between vitality misfortune versus security and unwavering quality increase because of business of the voting-based IDS with the objective to drag out the framework lifetime. All in all there are two methodologies by which vitality proficient IDS can be executed in WSNs. One approach particularly appropriate to level WSNs is for a transitional hub to criticism noxiousness and vitality status of its neighbour hubs to the sender hub (e.g., the source or sink hub) who can then use the learning to course parcels to evade hubs with unsatisfactory vindictiveness or vitality status [17].Another approach which we embrace in this paper is to utilize nearby host-based IDS for vitality preservation (with SNs checking neighbour SNs and CHs observing neighbour CHs only),coupled with voting to adapt to hub arrangement for executing IDS capacities. Vitality productivity is accomplished by applying the ideal discovery interim to perform IDS capacities. Our answer considers the ideal IDS location interim that can best adjust interruption precision versus vitality utilization because of interruption location exercises, to augment the framework lifetime. Contrasted and existing works refered to over, our work is unmistakable in that we consider excess administration for both interruption/adaptation to internal failure through multipath directing and interruption location through voting-based IDS outline to amplify the framework lifetime of a HWSN within the sight of inconsistent and malevolent hubs.

IV. PROBLEM ANALYSIS

The single way directing procedure chooses a solitary way which can be utilized for transmitting its activity towards the sink hub. In spite of the fact that course revelation through single way directing methodology can be performed with least computational multifaceted nature and asset usage, the restricted limit of a solitary way very decreases the achievable system throughput. Keeping in mind the end goal to adapt to the confinements of single way directing procedures, another sort of steering methodology, which is known as the Multipath directing methodology has gotten to be as a promising strategy in remote sensor systems which empowers to develop a few ways from individual sensor hubs towards the destination which can be used simultaneously. Then again, every source hub can utilize stand out way for information transmission and switch to another way upon hub or connection disappointments. The last one is for the most part utilized for adaptation to non-critical failure purposes, and this is known as option way steering.

In WSN [8], each spatially dispersed sensor hub speaks with each other to forward their detected data to a focal preparing unit/sink or do some nearby coordination. The sensor hubs either shape a level system topology where sensor hubs likewise go about as switches and exchange information to a sink through multihop steering, or a various levelled system topology where all the more intense settled or portable transfers are utilized to gather and course the sensor information to a sink. The perfect remote sensor system is charged to be versatile, adaptation to internal failure, little power utilization, savvy and programming programmable, productive, capable of quick information procurement, dependable and precise over long haul, minimal effort and required no genuine upkeep.

4.1 DESIGN CHALLENGES: This section lists down the main aspects involved in the design challenges in wireless sensor networks [7]:

Limited Energy Capacity: Energy poses a big challenge for the network designers since sensor nodes are Battery powered, they have limited energy capacity. Consequently the routing protocols designed for sensors should be as energy efficient as possible to extend their lifetime.

Coverage: A sensor's view of the environment is limited both in range and in accuracy it can only cover a limited physical Area of the environment. Hence, area coverage is also an important design parameter in WSNs.

Limited Hardware Resources: Sensors can perform only limited computational functionalities due to their limited processing and storage capacities. These hardware constraints present many challenges in software development and network protocol design for sensor networks.

Node Deployment: Topological deployment of the sensors in WSNs is application dependent and finally affects the performance of the routing protocol. The sensors nodes are scattered randomly create an infrastructure in an ad hoc manner. In that infrastructure, the position of the sink or the cluster-head is also crucial in terms of energy efficiency and performance. Network Characteristics and Unreliable Environment.

Data Aggregation: In WSN the redundancy of data generated from sensor nodes is a key concern.Similar packets from multiple nodes can be aggregated to reduce the extra overhead due to number of the transmissions. Many proposed routing protocols are using data aggregation technique to achieve energy efficiency and data transfer optimization.

Fault Tolerance: If many nodes fail, routing protocols must accommodate formation of new links and routes to the base stations. This may require actively adjusting transmit powers and signalling rates on the existing links to reduce energy consumption, or rerouting packets through regions of the network where more energy is available.

Scalability: Scalability is important in WSN as the network size can grow rapidly. So the routing protocols should be designed to work consistently, keeping in consideration that sensors may not necessarily have the same capabilities in terms of energy, processing, sensing, and particularly communication.

Quality of Service (Qos): In some applications, data should be delivered within a certain period of time from the moment it is sensed otherwise the data will be useless. Therefore bounded latency for data delivery is another condition for time constrained applications.

V. METHODOLOGY

5.1 Secure Multipath Routing Protocols in Wireless Sensor

Networks Till date many routing protocols have been proposed for wireless sensor networks, but only few of them consider the problem of security [4] and most of them are developed without any security concern. So in this section we focus at selected multipath routing protocols in order to cope with the various attacks. For avoiding intruders attacks in HWSN various methods and algorithms are implemented out of that Professor Hamid Al-Hamadi and Professor Ing-Ray Chen: Plan to explore more extensive malicious attacks in addition to packet dropping and bad mouthing attacks using algorithm for dynamic redundancy management of multipath routing. The objective of dynamic redundancy management is to dynamically identify and apply the best redundancy level in terms of path redundancy and source redundancy, as well as the best intrusion detection settings in terms of the number of voters and the intrusion invocation interval to maximize in response to environment changes to input parameters including SN/CH node density of SN/CH radio range and SN/CH capture rate. Our algorithm for dynamic redundancy management of multipath routing is distributed in nature. For managing multipath routing for intrusion tolerance to maximize the system lifetime. They specify control actions taken by individual SNs and CHs in response to dynamically changing environments.

5.1.1 Network Assumptions: We assume that a typical deployment of sensor network, as where a large number of sensor nodes are deployed in a two dimensional area. Each sensor node generates sensing data periodically and all these nodes collaborate to forward packets that contain the data hop by hop towards a sink. The sink is located at some place

within the network. We assume that all sensor nodes and the sink are time synchronized, which is required by many applications. The sink is aware of the network topology, which can be achieved by requiring nodes to report their neighbouring nodes soon after deployment. B. Security Assumptions and Attack Model We assume that the network sink is trustworthy and free of compromise, but regular sensor nodes can be compromised. Compromised nodes may or may not collude with each other. A compromised node can launch the following two attacks:
[1] Packet dropping: A compromised node drops all or some of the packets that it is supposed to forward. It may also drop the data generated by itself for some malicious purpose such as accusing innocent nodes.
[2] Packet modification: A compromised node modifies all or some of the packets that it is supposed to forward. It may also modify the data it generates to protect itself from being identified or to accuse other nodes.

5.1.2 Congestion Analysis

In mode N_0, the different sources transmit data with a fixed rate using only one path without any congestion control. Intermediate nodes, when overloaded, drop packets and hence the number of dropped packets is the largest compared to the other modes. Mode 1 gives the best performances is due to the fact that the sources distribute their flows on all available paths from the beginning hence reducing the probability of overloaded queues. However, it is observed that mode 3 tries to balance the load of a congested path on the other paths does not succeed in reducing the drop rate when compared to a simpler approach such as mode 2, at least for small network size.

Advantage: Load repartition does improve congestion control by reducing the packet drop probability.

Limitation: Flooding technique is used for multipath configuration thus causing some overhead.

VI. PROPOSED SOLUTION

For proposed system formulating solution for packets droppers and modifiers using algorithms and various techniques like

1. Manually assign secrete key to every node when n/w initialization.

2. Calculating data transmission time and Encryption time of nodes at first transaction.

3. Selection of reliable path after packets forwarding is done on the basis of transmission time and encryption.

4. Decryption done only at the end of base station.

5. Base station verifies the secrete keys of nodes from data comes.

6. When packets are successfully received, Base station sends Acknowledgement to source.

7. Keep reliable path in the index table for future processing.

8. Plot the reliable path graph.

6.1 NODE TRANSACTION ALGORITHM (PROPOSED)

1. Network initialization phase [SN,R,BS]

2. Input: Tree Tif (A=>T) are connected then assign secrete keys (S_k) to all nodeselse show. Message ("check connectivity");

3. Select the path for storing packet

4. Node 'n' sense data [Select the data want to send]

5. For each leaf noden in T find parent node until the sink node categorize the nodes.

6. Input: packet<0:10|n>;

7. Calculate trans Time of neighbouring nodes

   tstart = packet arrival+0;

   tend = tstart - Convert.ToDouble(DateTime.Now.Millisecond) / 1000;

   transTime[transTimeIndex] = (Convert.ToDouble(DateTime.Now.Millisecond) - tstart2) / 1000;

8. Compare transTimeif transTime N_i<N_j; then select node $N_i$and send packet to node

9. if Success Attempt =true; then encrypt

10. Repeat step 7

11. If Success Attempt =true; thendecrypt data and send to sink

12. if N. mark =”S_k”; then Set nodes from A to Tis reliable and secure path.

13. The sink can still decrypt the packet to find out the actual content

14. If Success Attempt=true; then record sequence

15. Plot graph with respective their transTimevalues and node selection

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16. Else path is bad and drops the packet.

6.1.1 RSA ALGORITHM for

Encryption and Decryption

- If block size=1 bit then $2^1 <= n <= 2^{i+1}$ encryption and decryption are of following form for simple plain text M and Cipher text C

G=M mod n;

M= C^d mod n;

M= $(M^C)^d$ mod n;

M=M^{cd}mod n;

- Both sender and receiver must know the value of n.
- The sender knows the values of e and only the receiver knows the value of d.
- Thus, this a public keys encryption algorithm with a public key of PU={e,n} and private key of PR={d,n}.

6.1.2 RSA ALGORITHM FOR:

a) Key Generation:

i. Select p,q, | p and q are both are the prime numbers such that $p \neq q$;

ii. Calculate $n = p \times q$;

iii. Calculate ø(n)= (p-1)(q-1);

iv. Select integer

v. g(d(ø(n),e))=1 and 1<e<ø(n);

vi. Calculate d such that $d = e^{-1}$ mod ø(n);

vii. Public key, PU={e,n};

viii. Private Key, PR={d,n};

b) Encryption:

i. Plain text: m<n;

ii. Cipher text: c;

c) Decryption:

i. Cipher text c;

ii. Plain text: M= c^d mod n;

Note 1:

i. ø(n)=> Euler's totient function

ii. ø(n)= ø(pq);

iii. ø(n) = ø(p) ø(q);

iv. ø(n)= (p-1) (q-1);

Note 2:

Relationship between c and d is expressed as:

i. ed(mod ø(n))=1;

ii. ed=1mod ø(n);

iii. $d = e^{-1}$ mod ø(n);

VII. RESULTANALYSIS/IMPLEMENTATION

Acording to our proposed solution,the solution is formulated by assisgning unique secrete public keys to every sensor nodes for the data encryption and data transfer. In below diagram first column shows the keys of all nodes. Second column shows real data and last colume shows the ecrypted data for the security perpose. For the node selection NODE TRASACTION ALGORITHM is invoked and it calculate the trans Time of every neighboring nodes. Compare transTime, if transTime of Ni<Nj; then select node Ni and then send packet to node shows in foolwing fig2:

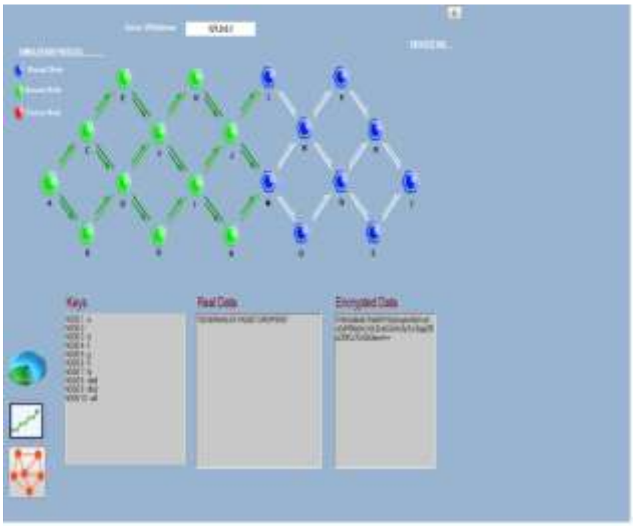

Fig2: Data Transaction Diagram

In the following fig3,it shows the sending and receiving phenomenon of packetswhich avoids the dropping and bad mouthing attacks in Heterogeneous Wireless Sensor Network Data Encryption using public key at every node but data Decryption done only at Base Station and stored in database.

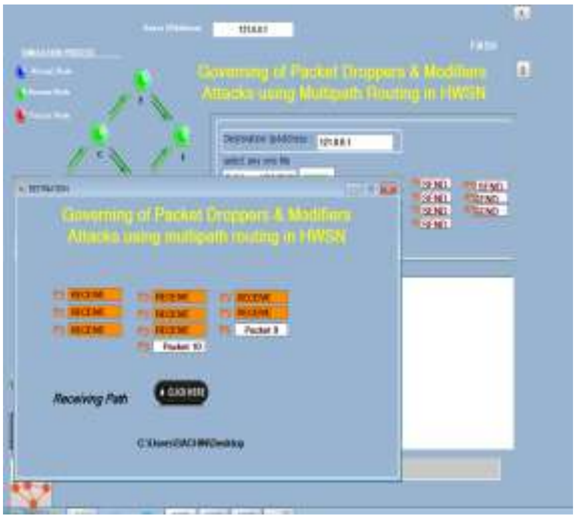
Governing of Packet Droppers & Modifiers Attacks using Multipath Routing in HWSN
Governing of Packet Droppers & Modifiers Attacks using multipath routing in HWSN
RECEIVE
Packet 9
Packet 10
Receiving Path

Fig3: Encrypt/Decrypt Data Receiving

After data successfully transmit it stored in database and reliable path is mapped for the future used and keep it as reliable path shows in fig4.

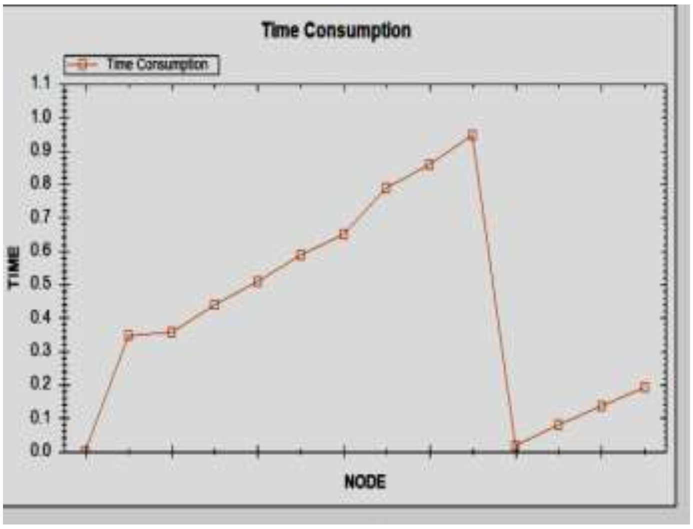

Fig4: Reliable Path

CONCLUSION

There are many security solutions that have been proposed but no standard security mechanism can provide overall security for wireless sensor network. Designing a secure WSN needs proper mapping of security solutions with different security aspects .In time to come, we must be ready to accept many more unique design of WSN, more sophisticated attacks and their preventions. Energy resource limitations are of priority concern in sensor network. Distributing the loads to nodes significantly impacts the system lifetime. There the sensor nodes are mostly stationary thus research can be done by assuming sink and source as mobile and results can be improved by multiple sink nodes. Congestion is an essential problem in WSN that leads to packet loss, transmission latency and has impact on energy efficiency and therefore must be efficiently controlled. So through this survey it is concluded that congestion control is a matter of great concern and should be dealt effectively such as QOS, Energy efficiency is necessary.

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