International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-2, December 2019

Energy Efficient Secured Ring Based Clustering Protocol for WSN

Krithika S, Santhosh Kumar SVN

Abstract: ***WSN is a gathering of small autonomous nodes that are used to function the Natural Phenomenon. The sensed events are transmitted to the base station for processing the system. Given the Resource Constrained Nature of WSN, Optimizing the energy during Routing process is a major concern. In this Paper, a Novel Ring Based Clustering Routing Protocol(RBCRP) is proposed, where it can provides the energy efficient clustering to sensor nodes. By doing so the sensor nodes it reduces number of retransmission of data items. Moreover, the proposed protocol provides efficient Routing, where it discovers the optimal path. The proposed protocol is implemented in NS3 simulator. The simulator results justifies that, proposed protocol improves Energy efficiency, Reduces delay and Increases packet delivery Ratio. Simulate Results faster viability of the proposed Scheme.***

Keywords: Ring Based Protocol, Efficient Routing , Optimization, Packet delivery ratio.

I. INTRODUCTION

WSN is gathering of small nodes that are used to send the information to Base Station (BS) for processing. The Self-organizing is the node can connect with network irrespective of how many nodes that are failed. The important feature of WSN is in network processing. The sensed Nodes of WSN are Resource constraint devices, optimization of Energy during the operations of WSN is a major concern. In WSN, when the nodes are deployed in the sensing domain, the Reduant transmission of data is done by multiple sensor nodes for multiple times. By doing so, there exist significant overhead in both computation and communication which ultimately leads to the disruption in the network. In order to overcome this issue, In this paper, a novel Ring Based Clustering protocol is proposed which clusters the deployed nodes in the sensing domain. In Ring based clustering protocol, the Cluster Head are elected based on hop distance, residual energy. In the proposed protocol the only CH are given privilege to transmit the data to other CH from the correspondent

CH the data are transmitted to be cluster nodes. The advantages of the proposed protocol is the transmission and retransmission of data has been reduced considerably.

Revised Manuscript Received on December 30, 2019.
***** Correspondence Author
Santhosh Kumar SVN*, School of Information Engineering and Technology, VIT University, Vellore, India, santhoshkumar.svn@vit.ac.in
S.krithika, School of Information Technology and Engineering, VIT University, Vellore, India, krithikareddy2598@gmail.com

Moreover the proposed protocol can able to provide the dynamic routing even after the frequent topology changes.

II. LITERATURE SURVEY

There are various techniques that has been proposed by various authors for energy efficient cluster based secured Routing in WSN.

Preetkamal Singp, et.al [1] have proposed many small distributed sensor nodes which is able to provide reliable environment. For data communication between the nodes and sink, various routing algorithms are used. LEACH Protocol used to optimize energy, of the node to enhance the Nodes life time. Limitations are the security is not consider in their design.

Ruchi Mehta, et.al[2], has analyzed sensor hub present within network. Protective organization in sensor network can be divided into smaller groups called as cluster. Clustering process includes grouping nodes into clusters and electron of cluster communicate head. The CH sends aggregated data received from its nodes and send it to BS.

An energy –efficient heterogeneous Ring Clustering (E2HRC) [3] routing protocol has been proposed with maintenance methods and corresponding routing algorithms. The results show that E2HRC routing protocol provides efficient balance of WSN energy consumption and optimizing in both node energy consumption and the number of control messages.

Dananjayan P, et.al [4] has proposed a scheme of many nodes which where the nodes to collect the data from the respective sensing in domain. The challenges their scheme are to set functioning into groups of sensor on secured network. The propose system has two routing algorithm namely, MIMO routing scheme and SPRA heterogeneous sensor network. Proposed scheme minimize the energy consumption and optimizing the life time of sensor node. The SPRA for heterogeneous sensor network verify the energy consumption delay and delivery ratio.

Sachin Chodavadiya, et.al [5] have compared the different routing protocol based on support, stability and overlapping. The energy efficient approach has their advantage and proposed system used routing approach for WSN using the clustering approach and tree based approach. Clustering approach is used to improve the life time of network. Tree based approach is used for routing the data over the network.

The system compared different energy efficient protocols. Limitations are security is not considered in the design.

Rajesh Chaudhary, Dr. Sonia Vatta et.al [6] has proposed with the system where sensor information is collected forward via multiple hops relaying to sink. The system routes the data using Hierarchical routing protocol. The advantages are reduce in energy transmission consumption and improve the receiving data.

Anamika, Ashok Kumar, et.al [7] have analyzed that WSN become very prominent in have an enormous and very beneficial uses across a wide range of medical, industrial, scientific, battlefield awareness and environmental applications. The Sensor nodes can vary in number from a few to thousands accordingly to the WSN application, where each sensor node is connected to one other sensor's. Sensor networks are used for guarding and in surveillance borders from intruding the restricted regions, smuggling, nuclear or chemical attack detection in military applications.

R.SeethaLakshmi, et.al[8] have analyzed the recent growth of high speed distributed system which provide the ways for improving resource. The system used ring topology in which the ring network is elegant and also broadcast network. In ring network data is quickly transmitted and has very fast rate. The current system has high performance computing system that are capable of running large scale parallel application with more nodes. The main function of the system is to address the issue of reliability analysis which is performed in ring network. The cluster increase or improve their available.

Parminder Kaur, Mrs. Mamta Katiyar et.al[9] has proposed the inter function of protocol by their data collection and transfer. The function is chain leader and transmit data to reduce the consuming of energy and also function of network. The Chiron protocol improve consuming energy, transmit of collected data in wireless sensor network to make the protocol more valuable chain based protocol.

Reenkamal Kaur Gill, et.al [10] has proposed the individuality of sensor nodes in which the network must possess self configuration capabilities in their position. Most of the system uses the routing protocol for proposed WSN. The known hierarchical protocol like Leach and Pegasis. These are used to less the consuming of energy and aggregate collected information to lower transmission to Base station.

Emad Alnawafaet, et.al[11] have analyzed two techniques which are DMR and SMR. He used two types of data routing such as inter-cluster routing and intra-cluster routing. Finally, he analyzed that DMR is better in providing high performance with low consumption of energy by comparing with other all techniques.

III. PROPOSED SYSTEM ARCHITECTURE

Figure 1 gives the architecture of the proposed system. In system initialization phase Public key and private key are generated. A ring based Clustering phase for the clustering of Nodes are performed.

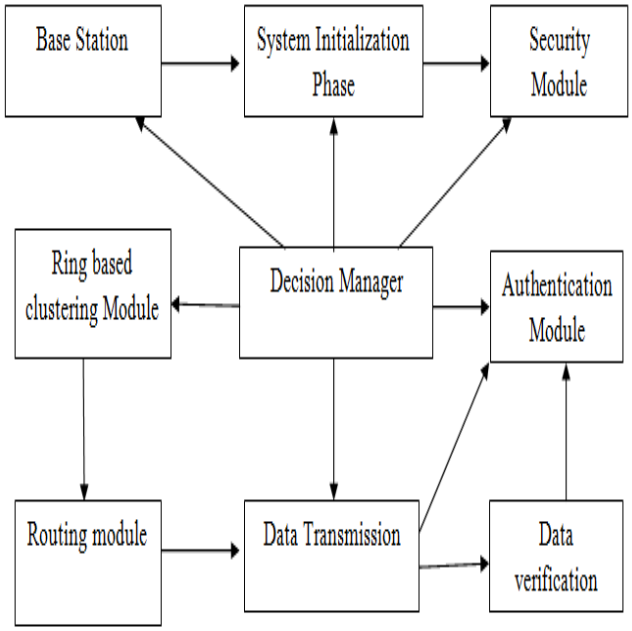

Figure 1

The main task of the ring based clustering is to prolong the function, optimizing by consuming the times of the nodes. Decision manager is the controller of the entire nodes of system. Decision manager performs the clustering and routing and the authentication takes decision too. The Nodes in WSN consists of low-energy, where they are deployed in sensing domain. The transmitted data is send to sensor nodes and verify the data using the authentication key to ensure security of the system.

IV. PRPOSED SYSTEM

The proposed system consists of four Modules: System initialization phase, Cluster formation phase, Data transmission phase and finally Data Verification phase.
The detailed explanation of the above phases are explained as follow:

A) System Initialization Phase:

In system initialization phase, the first step is to generate the key pairs namely public key and private key for the generation of key pairs the group based DSA algorithm along with discrete logarithmic problem is used in the proposed system to ensure security of the protocol. The steps for generation of public key and private key is given as follows:

Step 1: Choose random bit prime number p, q
$\in z^{*}n^{2}$

Step 2: Choose the random integer x, y $\in z^{*}q$

Step 3: Calculate $g= x^{p}\ y^{q} \bmod p$

Step 4: Compute $y=g^{x.p} \bmod q$

Step 5: Compute Public key

$$PUK = p^{x.g}\ q^{y.p} \bmod q$$

Step 6: Compute Private Key

$$PRK = p^{(g.p)}q^{(x-1)} \bmod pq$$

B) Clustering formation Phase:

In clustering formation phase, base station forms a cluster by considering hop distance and residual energy. The nodes which have high energy and less hop distance from the base station is considered as CH for each corresponding CH, the cluster are formed. Only the CH are given privileges to communicate with base station. The steps followed in the clustering formation is given in the Algorithm 1

Algorithm 1

1. Let C be the group of sensor nodes deployed in sensing domain
2. T ⟶ Threshold Value
3. CH_N ⟶ is the number of Nodes joins the cluster head.

Start

Step 1: For every, (C) Nodes belong the sensing domain
// cluster head electron phase
Step 2: Calculate (C) ⟶ (Residual-Energy, hop-distance, Degree- of connectivity)
Step 3: If(RE, hop-distance, Degree- of connectivity) <=T_1, then select C ⟶ Cluster head node until
else,
Repeat step 2 until C^1 = = Empty()
End for
End if
For every ⟶ (CA) present in the network
Do
Step 4: CH ⟶ Advertises (Id, Request-join) to all the nodes present within its range.
Step 5: CH ⟶ wait(Random-time t)
C ⟶ Checks(hop-distance, Residual-Energy) of Requested- CH.
Step 6: Calculate priority _ level (C).
Step 7: If (Priority _ level (C) is with the range of Requested - CH
then
Step 8: C ⟶ Accept join - Request (CH)
else
C ⟶ checks (Nearest priority (CH))
End for
End if

C) Data transmission phase:

The optimal routing path for the data is transmission to interest of nodes is done by using Leach protocol. In proposed system the group of nodes which have been transmitting the data and selected by interest node identification will be transmitted in this phase.

$$D_T = h(P_UK \parallel D_P)$$

where,
D_T = data Transmission, h = Hash function, P_UK = Public Key, D_P = Data Packets

D) Data verification phase: Data verification phase is used to transfer and verify the data. The Routing is done and the data is transmitted by the decision manager and the data that has been transferred is verified using data verification. In this phase the proposed system is Authentication Security module of the system. Several data can be transmitted through this system so to detect the system security is used.
The merge formation for the data verification is

$$D_V = h(P_RK \parallel D_P)$$

where,
D_V = Data Verification, h = hash function , P_RK = private key, D_P = Data packets

V. EXPERIMENTAL SETUP AND SIMULATION PARAMETERS

Table 1 has describes parameter used for simulation for the proposed system. The proposed system is implemented using NS2 simulator.

Table 1. Simulation Parameters

Network simulator	NS2
Simulation area	1000*1000
Density of nodes	200-250
Transmission range	50-100m
Environment	Urban
Node initial energy	20J
Simulation duration	80 minutes
Packet delivery size	50 - 500 bytes

V. RESULTS AND DISCUSSIONS

A. Node Energy Consumption

The graph shows that proposed system is compared with other existing protocols. In Figure 2, the proposed protocol has better Energy consumption, Because proposed protocol provides clustering Nodes using ring based approach and transmit the data with intelligent routing. By doing so, the proposed protocol is able to reduce the redundant transmission.

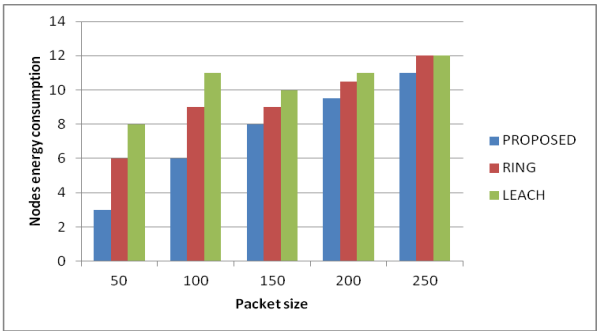

Figure 2 Node Energy consumption

B. Node Life time

Figure 3 make nodes function according to the proposed system then it compares with the other existing protocol. This protocol identifies the malicious nodes and removes it from the routing path. By means of Intelligent secured routing, Moreover the proposed protocol reduces the packet drop. By identifying the Malicious nodes and reducing their input.

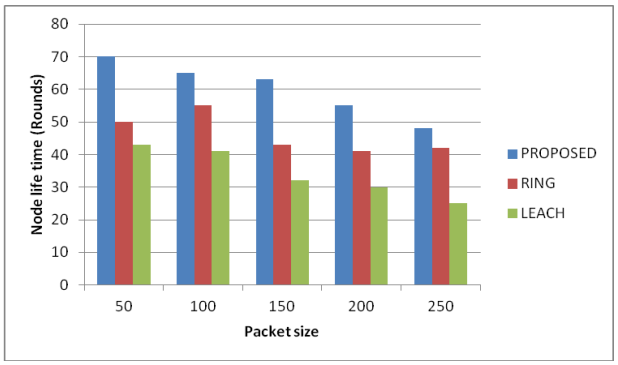

Figure 3 Node life time

C. Packet delivery ratio

Figure 4 provides the ratio of the delivery packets for the proposed system then it compares with the other existing protocol. The packet delivery ratio of the proposed protocol is good then other existing protocol because security of the proposed protocol has strong defense against malicious nodes and prevent them dropping of packets.

.

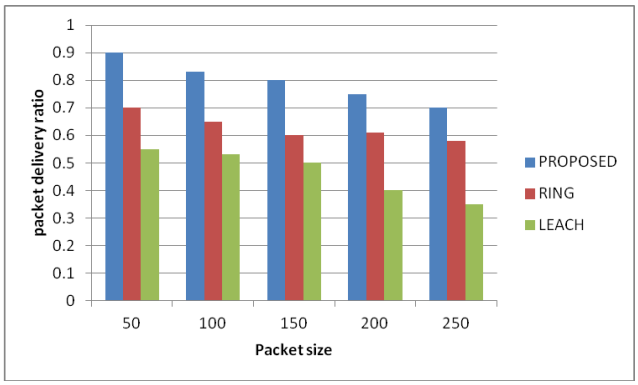

Figure 4 Packet delivery ratio

VI. CONCLUSION AND FUTURE WORK

In the proposed system, a novel secured ring based clustering protocol has been proposed to provide security during data delivery. The proposed protocol is implemented using NS2 simulator. The simulation results justifies that the proposed protocol has provides better quality of services and optimization of energy and ensure security during data transmission. The future work of the proposed protocol is to approach ring based clustering for better Nodes.

REFERNCE

1. Preetkamal singp, Dr. OP Gupta (2014). A Review on Energy Efficient Clustering Based WSNs
Protocols *International Journal of Advanced Research in Computer Science and Software Engineering*, 7(5), pp.828-832.
2. Mehta, R. and Bhukra, S. (2017). Heterogeneous Enhanced Energy Efficient Protocol with Static Clustering in WSN- Research Paper. *International Journal of Advanced Research in Computer Science and Software Engineering*, 7(5), pp.828-832.
3. P, D., P, S. and J, V. (2011). Energy Efficient and Secured Cluster Based Routing Protocol for Wireless Sensor Networks. *https://www.researchgate.net/publication/221913180*.
4. Chodavadiya, S. and Parmar, V. (2015). A Survey: Energy Efficient Approach in WSN. *International Journal of Engineering Development and Research*.
5. Chaudhary, R. and Vatta, D. (2014). Review Paper on Energy-Efficient Protocols in Wireless Sensor Networks. *IOSR Journal of Engineering (IOSRJEN)*.
6. kumar, a., mandoria, h. and pandey, b. (2016). study and comparison of distributed energy efficient clustering protocols in wireless. *i-manager's journal on wireless communication networks,*.
7. seethalakshmi, r. and ravichandran, k. (2011). reliability analysis of ring, agent and cluster based distributed systems. *journal of theoretical and applied information technology*.
8. Kaur, P. and Katiyar, M. (2012). Improved Chain Based Routing Protocol for WSN. *International Journal of Advanced Research in Computer Science and Software Engineering*.
9. Kaur Gill, R., Chawla, P. and Sachdev, M. (2014). Study of LEACH Routing Protocol for Wireless Sensor Networks. *International Conference on Communication, Computing & Systems (ICCCS–2014)*.
10. Alnawafa, E. and Marghescu, I. (2019). *: New energy efficient multi-hop routing techniques for wireless sensor networks: static and dynamic techniques*.
11. Singh, P. and Gupta, D. (2014). A Review on Energy Efficient Clustering Based WSNs Protocols. *International Journal of Engineering Research & Technology (IJERT)*.

AUTHORS PROFILE

S. V. N. Santhosh Kumar, is an Assistant Professor in VIT-Vellore Campus, India. He works in the areas of security and data dissemination in wireless sensor networks. His areas of interests include Wireless Sensor Networks, Internet of Things, Mobile Computing. He received his B.E. degree in Computer Science and Engineering and M.E. degree in Software Engineering and Ph.D. from Anna University, Chennai, India in the years 2011, 2013 and 2017

Krithika S, is currently perusing Master of Software Engineering in School of Information Science and Technology, VIT University, Vellore, India. Her areas of interest are Wireless Sensor Networks and Data mining