Applying Artificial Neural Networks to Increase WSN Energy Efficiency

Bivas Ranjan Parida, Chandra Kanta Mallick
College of Engineering Bhubaneswar, Biju pattnaik University of Technology, Odisha, India

Abstract:- The Wireless Sensor Network (WSN) can be employed in a variety of organizations; see additional WSN concerns. Sometimes the sensor node's energy consumption is high, and the node dies after a specific amount of time. In this research, the suggested methodologies provide two mechanisms: energy aware distributed clustering (EADC) and energy aware multicast clustering. Using an artificial neural network to determine the most efficient threshold value for assessing sensor node levels. The MD5 technique (Message Digest) is employed to secure the network's chief node. The MD5 algorithm secures transactions by encrypting data from the source and transmitting it to the destination, and the corresponding key is required by the authorized receiver to decode the file at destination. This approach reduces workload, improves node energy efficiency, and secures data transactions.

INTRODUCTION

The wireless sensor network is primarily used to transmit data from source to destination. Wireless sensor networks function based on communication distance, energy, processing capacity, and surrounding environment. Selection When the cluster head is compared to a competitor node in the network, the cluster head role is transferred to another sensor node in order to achieve a better energy consumption balance. The artificial neural network sets a threshold value to maintain the sensor node's energy consumption and selects the chief node based on the output value of the sensor node in the network. If a sensor node has less energy than the threshold value, it will enter sleep mode to maintain energy efficiency in the network. Using a group-based network reduces energy usage and ensures that no sensor node in the network goes dead. The MD5 algorithm is used to safeguard data transactions from source to destination. Encryption and decryption processes are utilized to ensure secure data transactions, generate security keys in all sensor nodes, and secure the chief node in the network.

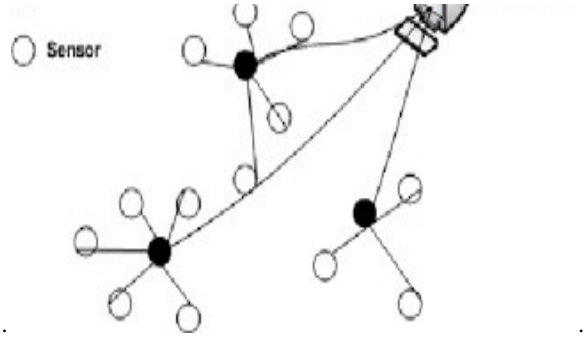

Fig 1:- Cluster Head Selection

I. LITERATURE SURVEY

Analysis of previous paper, wireless sensor network having high energy consumption and more workload between source to destination. Multiple sensor node communication are not managed properly, information cannot be reach properly in the receiver of network because energy level will be reduces for long communication range and node can be dead in specific period of time.

In the previous paper, wireless sensor network having more issues there is battery of sensor node impossible to change in network, time consumption and energy consumption is high. The secure data transaction is not available, third party will be easily hacking the information in the network, more important to concentrate transmission of information between source to destination. The proposed techniques overcomes drawbacks of previous paper, using two mechanisms Energy aware distributed clustering and energy aware multicast clustering for transmitting the packet to destination and MD5 algorithm for secure data transaction.

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II. PROPOSED SYSTEM

The proposed system used EAMC and EADC mechanisms using artificial neural network. Cluster head node is selected in network it will be transmitting the packet into neighbor node with help of Energy aware multicast clustering. Energy aware distributed clustering is distributed packet into all group based network. Using artificial neural network, it will be provides an efficient threshold value and select chief node in network. The node is switch into sleep mode, if identifies node with low energy than threshold value and it will be maintain the energy efficient in all node.

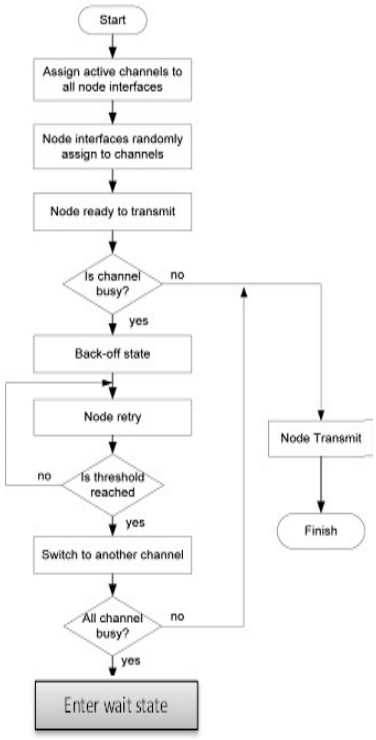

Fig 2:- System Overview Architecture

A. The following modules are present in this paper

- Node construction
- Shortest path calculation
- Chief node selection
- Security in chief node

B. Node construction

In this modules, assign the active node in the network. Two or more sensor node forms group based network and transmitting data from source to destination. Using the proposed mechanisms reduces energy consumption and improving network life time.

C. Shortest path Calculation

In this modules, calculate the shortest path of sensor node between source to base station. Calculation is based on the workload, traffic, distance of cluster head to nearest neighbor node. Using this details to select the shortest path and transmitting the information to destination, it will be reduces time consumption.

D. Chief Node Selection

Using artificial neural network two nodes are selected in network, chief node select depends upon the highest output value and next highest value choose cluster head node. ANN provides the efficient threshold values, node is switch into sleep mode if identifies node lower energy than threshold value and node cannot be dead. Energy will be maintained efficiently in the network.

E. Security in Chief Node

The secure data transaction between source and destination has been implemented in this module. MD5 algorithm is utilized to enable secure data transaction by encrypting data from source and transmitted to destination. In destination respective key is need by authorized receiver to decrypt file. Therefore data transaction is done with minimum energy consumption and attains security while transferring packet

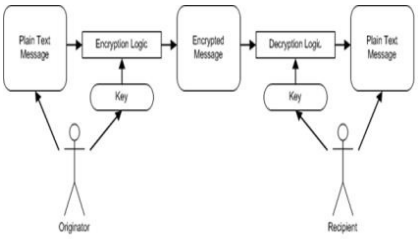

Fig 3:- Securing Chief Node

III. SIMULATION AND RESULTS

The simulations can be performed with NS2 simulator for the Wireless sensor network. The Analysis of energy consumption, throughput performances and end to end delay in the network

Simulation parameters	Value
Network area	800m*600m
Number of nodes	20
Mobility Model	Random way point with 0,50,100,150,200,250,300
Transmission Range	250m
Data packet	Constant with 512 bytes packet size 1packet/s
Simulation Time	300s
Maximum speed	20 m/s

Table 1. Simulation parameters in network

The table 1. shows about the simulation parameter in network such as network area, number of node, transmission range, data packet, simulation time, maximum speed

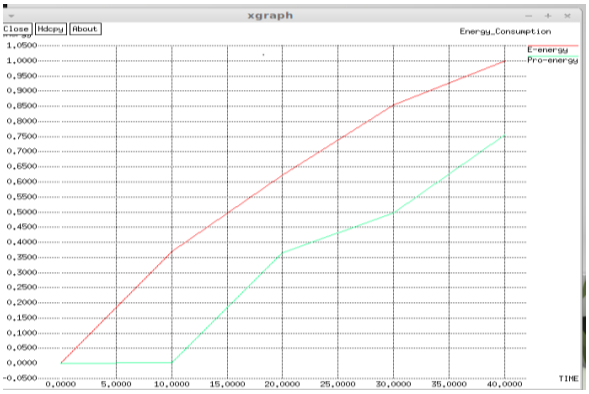

Fig 4:- Analysis of Energy Consumption

The Fig 4 shows the Energy Consumption as function of time, amount of energy consumed by EADC with respect to its competitor protocols x-axis represents as time and y-axis represents as energy, reduces energy consumption in proposed protocol.

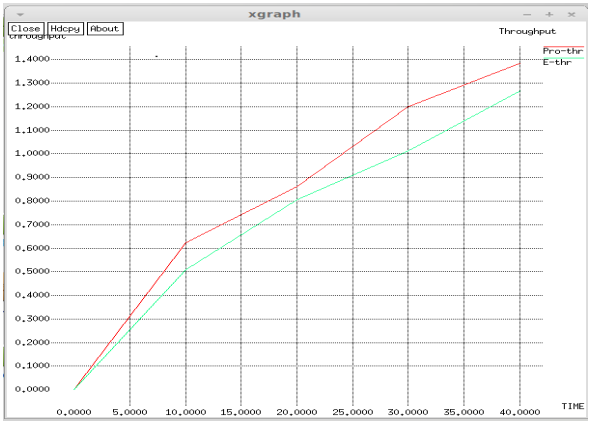

Fig 5:- Analysis of Throughput Performance

The Fig 5 shows the analysis of throughput performance. The x-axis represents as time and y-axis represents as throughput, throughput performance will be increased compare with competitor protocol.

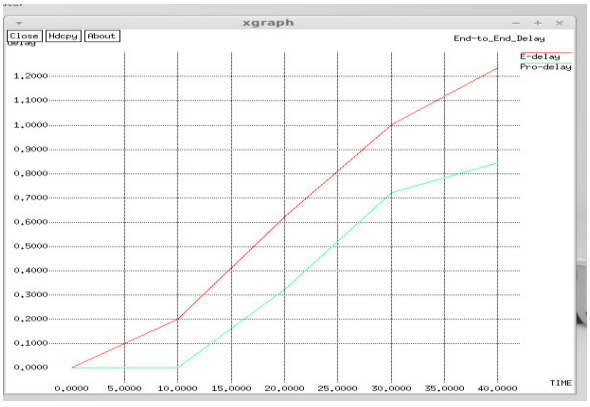

Fig 6:- Analysis of End to End delay

The Fig 6 shows the Analysis of end to end delay. Data is transmitted into number of group in the network, x-axis represents as time and y-axis represents as delay. In the proposed technique reduces end to end delay in the network and data will be transfer to base station.

IV. RESULTS

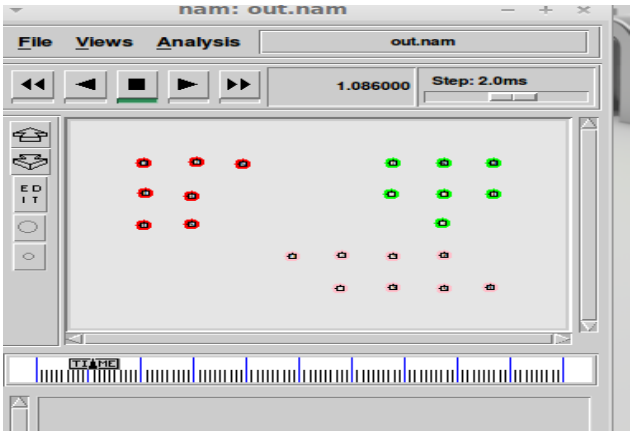

Fig 7:- Node Construction

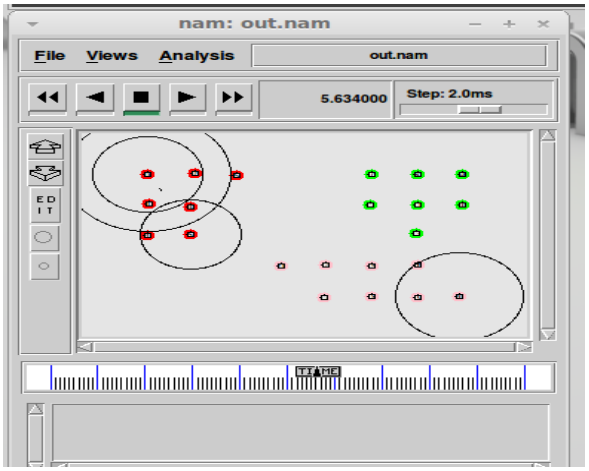

Fig 8:- Find Shortest Path

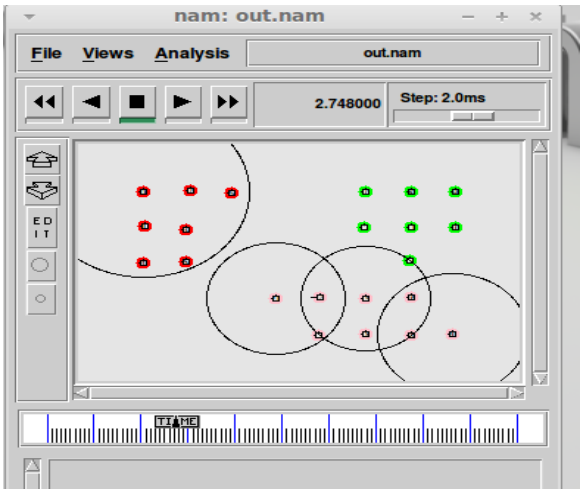

Fig 9:- Distributed Packet to all node

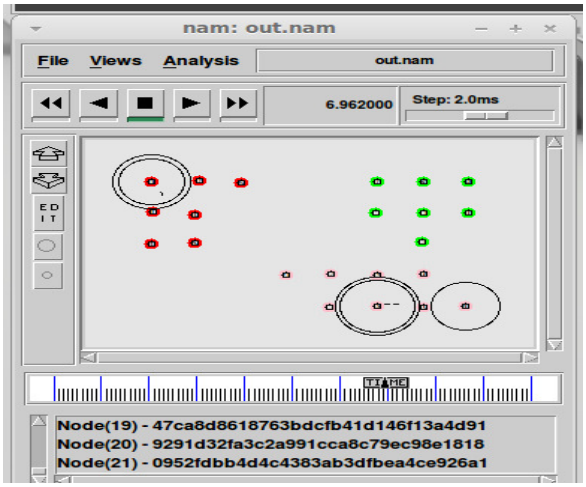

Fig 10:- Data Encryption and Decryption Process

V. CONCLUSION

In this paper, two proposed protocols are employed: energy aware multicast clustering (EAMC) and energy efficient distributed clustering (EADC), with a group-based network used to transmit data from source to destination. The proposed energy-efficient solutions prevent network and sensor node failures over time. The MD5 algorithm is used to safeguard data transactions. In the future, secure chief nodes by applying efficient security algorithms for sending packets from source to destination.

REFERENCES

[1]. Mehmood, A., Lloret, J., Noman, M., & Song, H. (2015). Improvementof the Wireless Sensor Network Lifetime using LEACH with Vice Cluster Head.Adhoc& Sensor Wireless Networks, 28.

[2]. Mehmood, A., Lloret, J., &Sendra, S. (2016). A secure and low-energyzone-based wireless sensor networks routing protocol for pollut ion monitoring. Wireless Communications and Mobile Computing, 16(17), 2869-2883.

[3]. Mehmood, A., Umar, M. M., & Song, H. (2016). ICMDS: Secure intercluster multiple-key distribution scheme for wireless sensor networks.

[4]. A. Kumar, V. Kumar, N. Chand, Energy Efficient Clustering and ClusterHead Rotation Scheme for Wireless Sensor Networks. Int. J. of Advanced Computer Science and Applications, Vol. 3, No. 5 (2011): 129-136.

[5]. Li, C., Ye, M., Chen, G., & Wu, J. (2005, November). An energyefficient unequal clustering mechanism for wireless sensor networks.In IEEE International Conference on Mobile Ad-hoc and Sensor Systems Conference, 2005.(pp. 8-pp).

[6]. A. Mahmood, S. Khan, S. Bilal, J. Lloret. Energy-efficient multi-level and distance-aware clustering mechanism for WSNs, Int. J. of Communication Systems, Vol. 28, Issue 5 (2015): 972-989.

[7]. Garcia, M., Sendra, S., Lloret, J., &Canovas, A. (2013). Saving energyand improving communications using cooperative group-based wireless sensor networks. Telecommunication Systems, 52(4), 2489-2502.

[8]. Klaoudatou, E., Konstantinou, E., Kambourakis, G., &Gritzalis, S. (2011). A survey on cluster-based group key agreement protocols for WSNs. IEEE Communications Surveys & Tutorials, 13(3), 429-442.