Energy Efficient Using AODV Protocol in WSNs

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Abstract— **The main motive of this research is to study & implement energy-efficient data-gathering mechanisms to detect sensor data irregularities Detection of sensor data irregularities is useful for practical applications as well as for network management, since the patterns detected may be used for both decision making in applications and system performance tuning. According to the literature, unsupervised learning approach has been implemented to generate the normal model as pre-defined data are generally unavailable. Dynamic detection model made using a combination of different data vectors are required to detect time variant anomalies in WSNs.**

Keywords— **WSN, MAT, EEDP, TSPN, ME, MULE, AMS**.

I. INTRODUCTION

A Wireless sensor network is composed of tens to thousands of sensor nodes which are densely deployed in a sensor field and have the capability to collect data and route data back to base station. Wireless Sensor Network is used in number of applications now a days [1], such as detecting and following groups, tanks on a field of operations, evaluating traffic movement on roads, calculating humidity and more factors in fields, tracking manpower in buildings. Sensor nodes are composed of sensing value, power value and processing value. "Many - tiny" principle: wireless networks of thousands of inexpensive miniature devices capable of calculation, interfacing and sensing. In wireless sensor network application there are two types of nodes: source node – the node which actually sense and collect data – and sink node – the node to which the collected data is moved. The sinks are possibly be part of the network or outside the wireless sensor networks. Generally, there are more number of source nodes than sink nodes. In nearly all of the general wireless sensor network applications the sink node does not concern itself with the identification of the source nodes but only about the collected data except in situations where it is required to authenticate the sources.

II. CHALLENGES FOR WSN

The main design goal of wireless sensor networks is to transmit data by increasing the lifetime of the network and by employing energy efficient routing protocols. Based on the applications utilized, some other architectures and structures have been applied in sensor networks. Once more, the performance of a routing protocol depends on the architecture and structure of the network, so the architecture and structure of the network is very important characteristics in wireless sensor network. The structure of the wireless sensor network is affected by many challenging factors which must be overcome before an efficient network can be attained in wireless sensor networks. In the segment below we attempt to report the architectural issues and challenges for WSNs.

Node Distribution: Node distribution [12] in WSNs is either deterministic or self-organizing and application based. The consistency of the node distribution directly affects the performance of the routing protocol used for these networks. When deterministic node distribution occurs, the sensor nodes are complimentary positioned and gathered data is transmitted through pre-decided paths. While in case of, the sensor nodes are spread over the area of interest randomly thus creating an infrastructure in an ad hoc fashion. Every sensor node contains four major components: sensing value, processing value, power unit and transceiver.

Dynamicity: Since the nodes in WSNs may be fixed or changing, variance of the network is a difficult problem. Many of the routing protocols suppose that the sensor nodes and the base stations are fixed *i.e.*, they do not vary, while in the case of dynamic BS or nodes routes from one node to another must be reported periodically within the network so that all nodes can transmit data via the described route. Again based on the application, the sensed event can be varying or fixed. For example, in objective recognition/tracking applications, the event is varying, while in forest monitoring for early fire prevention is an example of a fixed event. Monitoring fixed events works in reactive mode. Whereas in case of varying events work in proactive mode.

Energy efficiency: The sensor nodes in WSNs have limited energy and they use their energy for calculation, interfacing and sensing, so energy consumption is an important problem in wireless sensor networks. According to few routing protocols nodes take part in data fusion and costs additional energy. Since transmission power is corresponding to space doubled, multi-hop routing uses not so much energy than direct interfacing, yet it has some route management overhead. In this view, direct interfacing is better. Since many of the times sensor nodes are distributed randomly, multi-hop routing is preferable.

Scalability: A WSN consists of hundreds to thousands of sensor nodes. Routing protocols should be working with this large number of nodes *i.e.*, these protocols should be able to tackle all of the functionalities of the sensor nodes so that the lifetime of the network can be stable.

Data Fusion: Data fusion [13] is a process of combining of data from different sources according to few function. This is attained by signal processing methods. This technique can be used by few routing protocols for energy efficiency and data transfer optimization.

III. RELATED STUDY

Sensor network performance is degraded by the complex monitoring terrain, multihop, and interference and time-varying property of the wireless channel [1]. To make effective use of the gigantic amount of individual sensor readings, it is essential to equip WSNs with scalable and energy-efficient data-gathering mechanisms. Some distinct characteristics of WSNs, such as large node density, unattended operation mode, high dynamicity and severe resource constraints, pose a number of design challenges on sensor data-gathering schemes. Many research activities have been carried out on the research issue. Since the fundamental task of WSN is to gather data efficiently with less resource consumption, to address the problem, there are two threads of research to improve the performance of data collecting: optimized data-gathering schemes and mobile collector assisted data-gathering in WSNs. For the first thread, most data-gathering algorithms aim to prolong lifetime with some optimized schemes. The balance energy consumption problem was formulated as an optimal transmitting data distribution problem [2] and minimal aggregation time (MAT) problem are formulated as optimal problems. In [3], the construction of a data gathering tree to maximize the network lifetime was studied, and the problem is also shown to be NP-complete. To balance load within each cluster, an even energy dissipation protocol (EEDP) was proposed for efficient cluster-based data-gathering in WSNs. In [7] a new proposal is to gathers data in high-density WSNs in real-time, which determines network topology by hierarchical clustering to avoid radio collision and enables to gather data with minimum data latency from numerous high-density sensor nodes. To address the problem of gathering information in WSNs, the work in [4] took into account the fact that interference can occur at the reception of a message at the receiver sensor. However it assumes the distribution of sources are known. Another way to save energy is to decrease data transmitting with some schemes. A new distributed framework to achieve minimum energy data-gathering was proposed in [4].

The term *Data MULEs* was widely used in the literature since then. In [10], the data collection process with predictable mobility was modelled as a queuing system, and the success of data collection was analyzed based on it. In [7], a mobile data observer, called SenCar, was used as a mobile base-station in the network. It also showed that the design of the travelling tour is critical for SenCar to accomplish data collection jobs successfully. Observing the importance of the travelling tour, a lot of efforts were put into its optimal design [2].

III SIMULATION MODEL

NS-2 simulator is used for performance estimation. The network is a collection of 30 nodes deployed on square area of 800mx800m. Transmission range of every node is 250 metres. In radio propagation model, a two-ray ground reflection model is applied. We will be using the RWP (Random waypoint) mobility model in our simulation . Every node pass with a extreme speed randomly chosen from the interval 5 metre/second and 15 metre/second. Transmission between nodes is modelled by CBR (Constant Bit Rate) congestion across UDP. A source creates packets of 512 bytes with a rate of 5 packets per sec. A complete of 20 connections were produced. They initiate at a time randomly selected from the interval [0s, 100s] and still active until the end of simulation. We consider Random way point mobility (RWP) for moveability. One simulate the network with 30 nodes. As to search the best mobility model we fix the CBR connection and pause time of each node.

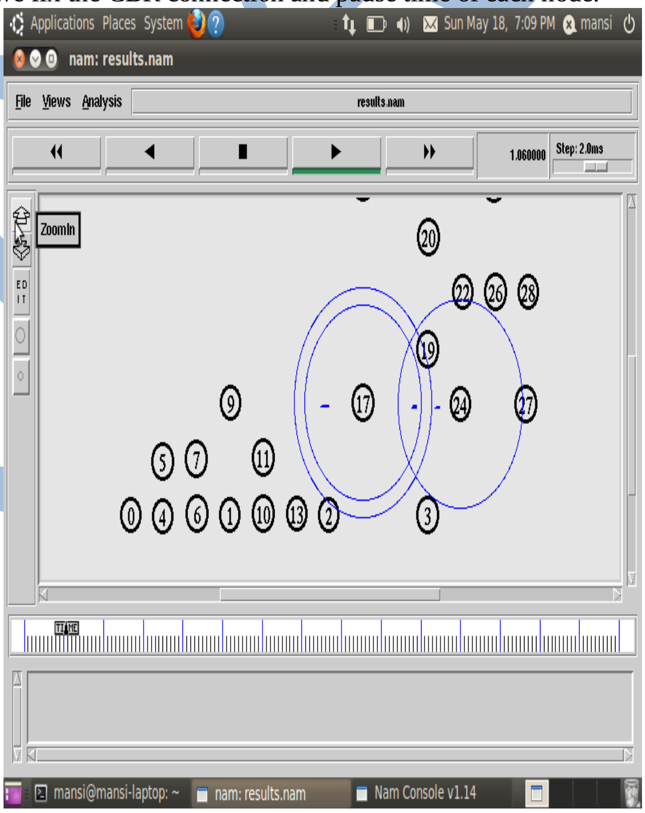

Figure 3.1 Simulation Model

IV RESULTS & ANALYSIS

We have taken total of 30 nodes in our simulation evaluation process as shown in the figure 6.3 below. In the figure it is being observed that in the simulation process every node is working in cooperation with each other to keep the network in transmission. The simulations are taken out for network densities of 30 nodes accordingly. The area considered is 800 metres X 800 metres for fixed nodes and for moving nodes with mobility of 10mps. Simulations are configured for the calculations of the number of packets & energy required at the destination for stationary and nodes with mobility of 10mps accordingly. As the motive of this thesis is to execute energy efficient routing and find a reliable data transmission method for mobile ad hoc networks by AODV.

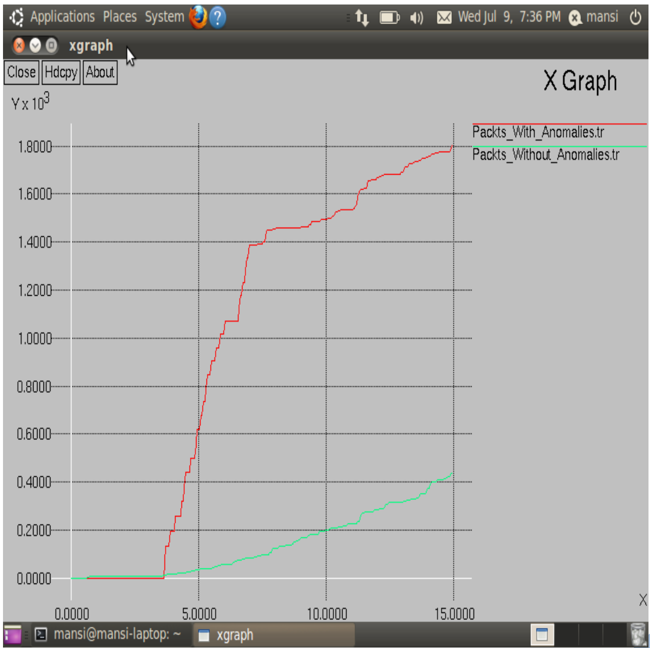

Figure 4.1 Time Vs No. Of Packets

Figure 4.1 Time Vs Energy

V CONCLUSION

Over the last decade, many anomaly detection algorithms have been proposed that differ according to the information used for study, and the skills applied to discover deviations from routine conduct. Having analysis few of the subsist ADS in wireless sensor network, it is difficult that the ADS for wireless sensor network is scattered and thin to lower energy consumption. According to the literature, unsupervised learning approach has been implemented to generate the normal model as predefined data are generally unavailable. Dynamic detection model produced using a combination of different data vectors are required to detect time variant anomalies in WSNs.

- Distributed architecture: Detection is finished in a dispersed way to lower communication overhead.
- Decentralised, Stateless: Individual nodes should perform the anomaly detection independently in the local environment. There is no consolidate hold. This will build the ADS scalable and robust against attacks.
- Unsupervised learning: Unsupervised, unparametric learning is used as it is not easy to determine and obtain the normal predefined data.

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