International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 24 Issue 5 – APRIL 2017.

NACRP: An Environmental Monitoring System Using Task Management and Data Advertisement Protocol in Wireless Sensor Network

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***Abstract---* Wireless sensor network is an effective approach for a wide variety of applications such as environmental monitoring, scientific exploration, and target tracking. Structural health monitoring systems are implemented to monitor their operations and health status. HEAL method for Structural Health Monitoring can be used in bridges and railway tracks. Black hole detection and Healing used to detect the abnormalities around the sensor location and system connectivity issues which affects system performance. It searches the nodes that reaches the threshold level in clusters. Before it gets failed a set of back up sensor is replaced at these nodes. It is also an efficient scheme for restoring the network connectivity in partitioned Wireless Sensor Networks. When two sensors is about to fail at the same time the system heals it by electing the backup sensor by itself. This paper focuses on detecting misbehaving nodes using server. Using Geographic routing protocol (localizability-aided localization (LAL)) data are retrieved securely from the current location and send dynamically to the server.**

***Index terms-* Wireless sensor networks, black hole, connectivity, threshold level, backup sensors, misbehaving nodes, iTrust, routing protocol, probabilistic, forwarding, Abstract.**

I. INTRODUCTION

DURING past decades WSNs have witnessed a relentless research activity to leverage the deployment of low cost, easy to maintain and energy efficient solutions to monitor natural phenomena and men made activities. Recently, the surge of packet data traffic over the cellular network has leveraged IoT and Machine-Type Communications, thus making sensors part of an omnipresent communication network [1]. Standardization bodies started several activities on WSN technology and the IEEE 802.15.4 and its subsequent amendments at both PHY and Medium Access Control (MAC) layers is one exemplary case of such ongoing effort [5].

Network connectivity is an important topic

[2] discusses the applicability of stochastic geometry. The stochastic geometry deals with The IEEE 802.15.4k standard defines PHY and MAC layers specifications to support Low Energy Critical Infrastructure Monitoring (LECIM) networks. The standard supports simultaneous operation of at least 8 co-located orthogonal networks, with a transfer rate up to 40kbits/s, minimum 1000 end points per AP and reliable operations in dramatically changing environments [3]. Channel time is organized in super frames, with each divided in several sub beacon intervals (BIs) plus an optional inactive period delimited by the transmission of beacon frames transmitted by the AP. Beacons carry out general network information, as well as time synchronization for networked devices. The transmission of a beacon is followed by a Contention Access Period (CAP) and a Contention Free Period (CFP). During the CAP, carrier sense multiple access with collision avoidance (CSMA-CA) is used to transmit command frames for association and resource reservations inside the CFP. The CFP is TDMA based and is divided into guaranteed time slots (GTSs). During one GTS, only one sensor is allowed to communicate with the AP.

Wireless Sensor Networks were initially utilized as a part of military missions. They are presently sent in an extensive variety of common applications as a sensor is getting to be distinctly littler and generation expenses are littler. The primary disadvantage is the vitality imperative as it appears to be illogical to change or energize the battery. A few applications require a conclusion to-end dependable information transport with clog control to accomplish a proposed execution, particularly amid overwhelming movement. It gives a review of remote sensor systems innovation. A few research works including sensor organize applications, segments, solid transport conventions, and clog control plans are compressed and looked at in changed areas. [10].

Frequently, the area of the hubs in the system can be displayed as arbitrary, diverse procedures in light of stochastic geometry and the hypothesis of irregular geometric charts including point handle hypothesis, permeation hypothesis, and probabilistic combinatorics have prompted to come about on the availability, the limit, the blackout likelihood, and other: basic cut-off points of remote systems[3].

The reminder of this paper is organized as follows; Section II deals with the literature survey for this paper. Section III deals with the existing system or existing methodology. Section IV deals with proposed methodology and its impending terms. Section V shows the numerical results and comparisons between the exiting methods and proposed method. Section VI we deal the output of the system. Section VII deals with our future work. Section VIII deals with the conclusion of the paper.

II. EXISTING SYSTEM

NACRP (neighbour associated connectivity routing protocol) is a protocol to automatically restore connectivity in an STP-WSN when obstructions clutter the communication link between sensors and the AP. The contribution of the work is twofold: i) it provides a clean slate solution to the problem of connectivity and ii) it investigates connectivity and the tradeoffs that arise from the adoption of the NACRP in the STP-WSN, relying on stochastic geometry and in particular on Poisson Point Processes(PPPs).

Figure 1 shows the initial condition before the occurrence of the problem. It says about the position of the nodes and their access nodes. The location of the nodes are informed to each other through broadcasting (fig 2).

Initially before using NACRP, the message transferred from the source destination is not reched perfectely. Only 30% of the message or data is delivered. The server does not contain the information about the location when the node position is changed. This leads to more loss of message packets. Thus NARCP is used to improve the quality of message packet transfer. This NACRP does making the nodes into regions of different size having its own cluster heads (fig 3). In this the message which needs to be transferred is send to the main sever then send to the related cluster heads and transferred to the declared destination.

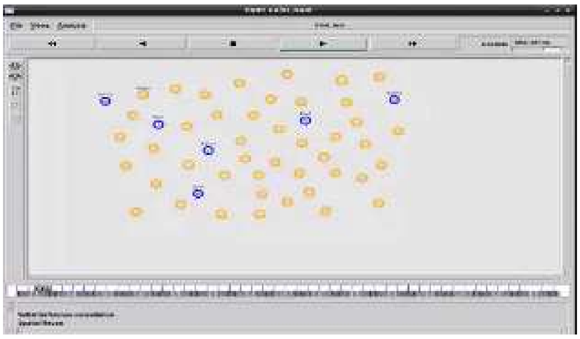


Fig1.Initial node position.

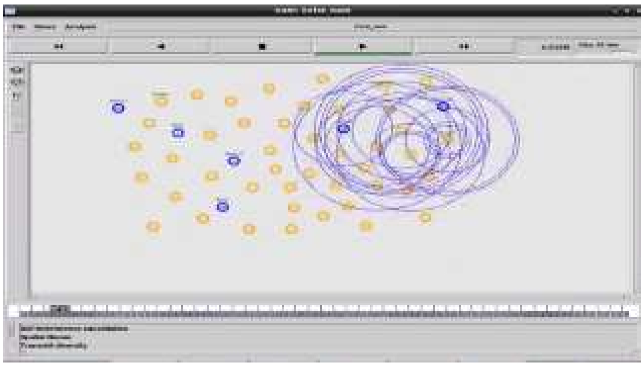


Fig 2 messages are brodasteded.

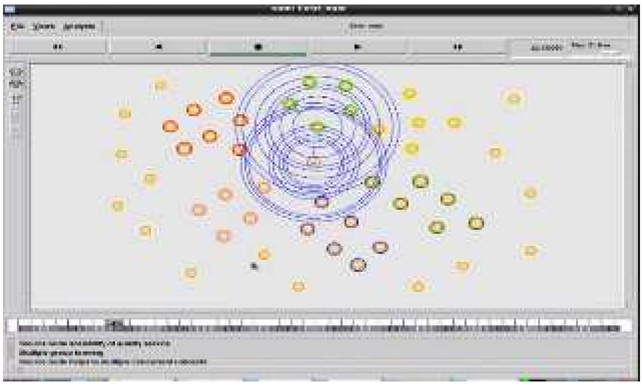


Fig 3 region formation with cluster heads in the region.

III. PROPOSED SYSTEM

Depending upon network structure, routing protocols in WSNs can be divided into two categories.

1. Flat routing
2. Hierarchical routing.

In a flat topology, all nodes perform the similar tasks and have the similar functionalities in the network. Data or information transmission is done hop by hop using the flooding. The typical flat routings in WSNs include Flooding and Gossiping, Sensor Protocols for Information via Negotiation (SPIN), Directed Diffusion (DD), Greedy Perimeter Stateless Routing (GPSR), Trajectory Based Forwarding (TBF), Energy-Aware Routing (EAR), Gradient- Based Routing (GBR), Sequential Assignment Routing (SAR).In small-scale networks flat routing protocols are relatively effective. However, in large-scale networks it is undesirable because resources are limited, but every sensor node generates more data processing and bandwidth usage.

In a hierarchical topology, nodes perform various tasks in WSNs and are organized into many clusters according to specific parameters. Each cluster comprises a head referred to as cluster head (CH) and other member nodes (MNs) and the CHs can be organized into further levels. In general, nodes with higher energy act as CH and perform the work of processing the data and information transmission, while nodes with minimum energy act as MNs and perform the work of information sensing.

A. *Proposed Method:*

We propose a fine-grained approach, localizability-aided localization (LAL), which basically consists of three phases:

1. Node localizability testing,
2. Structure analysis, and
3. Network adjustment .

LAL triggers a single round adjustment, after which some popular localization methods can be successfully carried out.

1) *Node Localizability Testing*

We analyse the limitation of previous works and propose a novel concept of node localizability. By deriving the necessary and sufficient conditions for node localizability, it is possible to analyse how many nodes one can expect to locate in sparsely or moderately connected networks. To validate this design, we implement our solution on a real-world system and the experimental results show that node localizability provides useful guidelines for network deployment and other location- based services. In recent years, several approaches have been proposed for in-network localization, in which some special nodes (called beacons or seeds) know their global locations and the rest determine their locations by measuring the Euclidean distances to their neighbours. The first major challenge for studying node localizability is to identify uniquely localizable nodes. Following the results for network localizability, an obvious solution is to find a localizable sub graph from the distance graph, and identify all the nodes in the sub graph localizable. Unfortunately, such a straightforward attempt misses some localizable nodes and wrongly identifies them as non-localizable. We can answer the fundamental questions on localization: which node is indeed localizable in a network. Our designs not only excel previous ones theoretically, but also achieve a decent performance for practical uses.

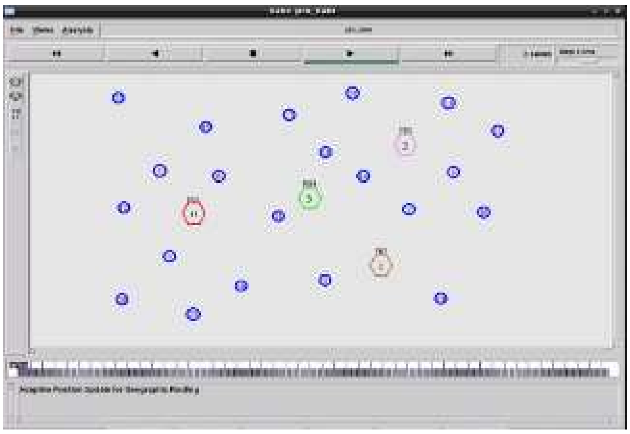


fig 4 election of beacon heads.

2) *Structure Analysis:*

Structure analysis is the analysis of the structure of nodes in the region. Typical network studies in sociology involve the circulation of questionnaires, asking respondents to detail their interactions with others. One can then use the responses to reconstruct a network in which vertices represent individuals and edges the interactions between them. Typical social network studies address issues of centrality (which individuals are best connected to others or have most influence) and connectivity (whether and how individuals are connected to one another through the network). In the aims to create models of networks that can help us to understand the meaning of these properties—how they came to be as they are, and how they interact with one another. Third, it aims to predict what the behaviour of networked systems will be on the basis of measured structural properties and the local rules governing individual vertices. How for example will network structure affect traffic on the Internet, or the performance of a Web search engine, or the dynamics of social or biological systems? As we will see, the scientific community has, by drawing on ideas from a broad variety of disciplines, made an excellent start on the first two of these aims, the characterization and modelling of network structure.

3) *Network Adjustment:*

As the proliferation of wireless and mobile devices continues, a wide range of context-aware applications are deployed, including smart space, modern logistics and so on. In these applications, location information is the basis of other services, such as geographic routing, boundary detection, and network coverage control. In some other applications, such as military surveillance and environment monitoring, sensed data without location information are almost useless. Localization in wireless ad hoc and sensor networks is the problem in which every node determines its own location. In this work, we focus on 2D in- network localization in which some special nodes (called beacons or anchors) know their global locations and the rest determine their Euclidean coordinates by measuring the Euclidean distances to their neighbours. Due to hardware or software deployment constraints, a network can be partially localizable given distance measurements and locations of beacons, that is to say, some nodes have unique locations while others do not. To locate non localizable nodes, the existing solutions mainly focus on how to tune network settings. But in our proposed method, first attempt is to deploy additional nodes or beacons in application fields. Such incremental deployment increases node density and creates abundant inter-node distance constraints, thus, enhancing localizability. However, the attempt lacks feasibility, since the additional nodes should be placed in the vicinity of non-localizable nodes, whose locations are just unknown. Using mobile nodes (e.g., beacons) is another choice. The controlled motion of beacons provides thorough information for localization, but also incurs adjustment delay and controlling overheads.

4) Greedy Perimeter Stateless Routing Protocol (GPSR):

We present Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless datagram networks that uses the positions of routers and a packet's destination to make packet forwarding decisions. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbours in the network topology. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region. By keeping state only about the local topology, GPSR scales better in per-router state than shortest-path and ad-hoc routing protocols as the number of network destinations increases. A community of ad hoc network researchers has proposed,

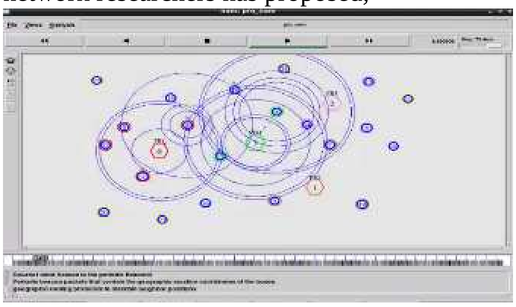


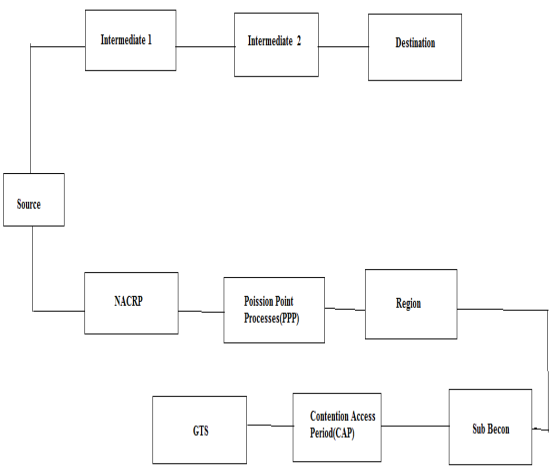
Fig 5 transfer of message from the source to destination

implemented, and measured a variety of routing algorithms for such networks. The observation that topology changes more rapidly on a mobile, wireless network than on wired networks, where the use of Distance Vector (DV), Link State (LS), and Path Vector routing algorithms is well established, motivates this body of work. The two dominant factors in the scaling of a routing algorithm are:

The rate of change of the topology.

The number of routers in the routing domain.

Both factors affect the message complexity of DV and LS routing algorithms: intuitively, pushing current state globally costs packets proportional to the product of the rate of state change and number of destinations for the updated state



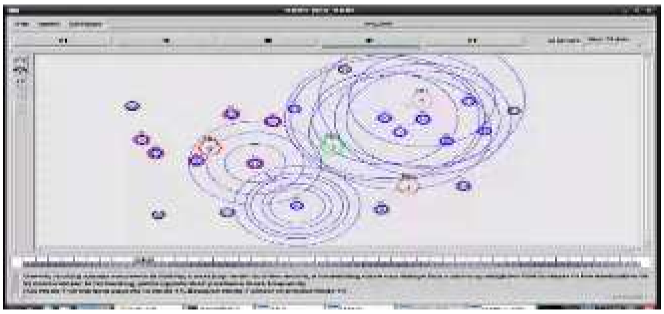


Fig 6 unlocalised nodes are used in the message transfer.

5) Greedy Forwarding

As alluded to in the introduction, under GPSR, packets are marked by their originator with their destinations' locations. As a result, a forwarding node can make a locally optimal, greedy choice in choosing a packet's next hop. Specifically, if a node knows its radio neighbour's positions, the locally optimal choice of next hop is the neighbour geographically closest to the packet's destination. Forwarding in this regime follows successively closer geographic hops, until the destination is reached. To support fine-grained manipulation, we decompose a distance graph into two-connected components. These components are organized in a tree structure and the one containing beacons is the root. Adjustments are conducted along tree edges from the root to leaves. Through vertex augmentation, LAL converts all non-localizable in one round. Assume that packet sources can determine the locations of packet destinations, to mark packets they originate with their destination's location. Thus, we assume a location registration and lookup service that maps node addresses to locations. In the following sections, we describe the algorithms that comprise GPSR, measure and analyse GPSR's performance and behaviour in simulated mobile networks.

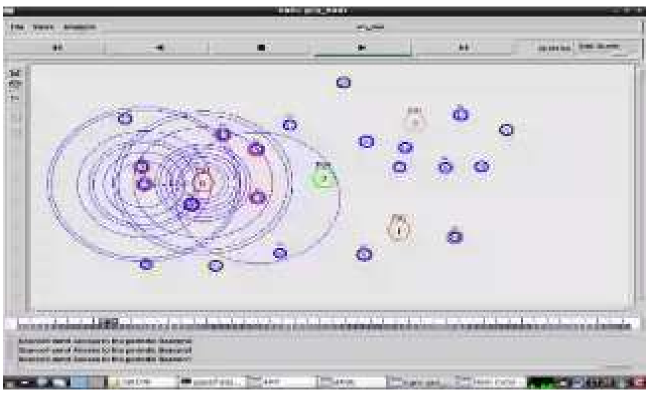


fig 7 shows the forwarding technic used to transfer message.

B. ARCHITECTURE DIAGRAM:

The system has both the source and destination. The source connected to destination via intermediate nodes which involves in the connectivity of both source and destination. The data regarding the inputs are stored in the server. The path is also stored in the server for communication purpose. Whenever the intermediate is not functioning well or properly, new path had to be created to replace the old path and the path should only contain well-functioning intermediates. The routing of the path is done by NACRP protocol which uses poison point process as stochastic geometry for relocating the nodes or intermediates. Thus the system separates them into group of regions or cluster with each having its own cluster head the message ore only passed through the cluster head and it is also made to passes through the nearest idle nodes.

IV. NUMERICAL RESULTS AND CONCLUSION

We compare the existing system and proposed system parameter such as

A. *Delay ratio:*

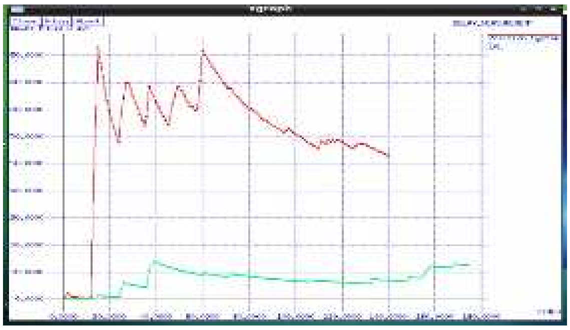


Fig 7 the delay ratio graph

The delay much reduced compared to the existing network.

B. *Totallosses:*

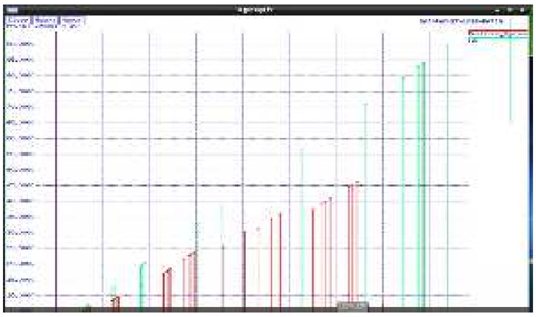


Fig8 the lossofpackects frequency graph.

The frequency of the occurrence of loss of packets in the tanfeer of message is much reduced.

C. *Throughput Workload:*

Fig 9 the throughput graph

The throughput workload is much reduced for each nodes.

D. *Channel measurement:*

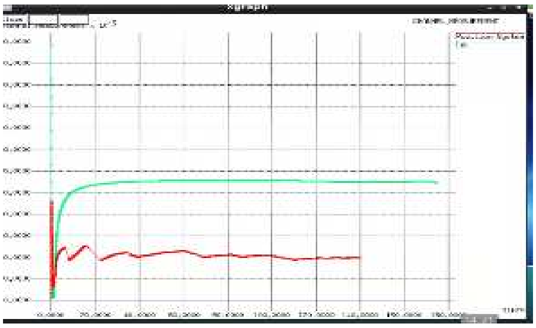


Fig 10 shows the acessof channels

The channel measurement is constant throughout the transmission.

E. *Protocol frequency:*

The protocol frequency of usage is also made constant and linear.

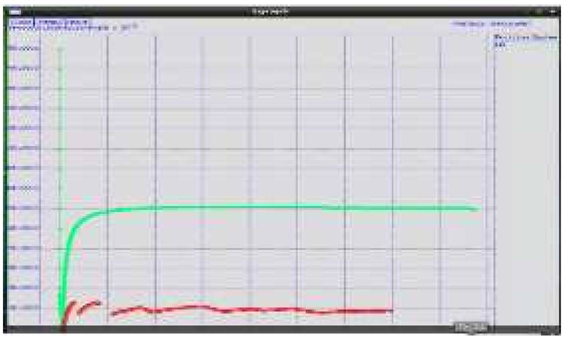


Fig 11 shows the usage of protocol and its efficiency .

F. *Source frequency:*

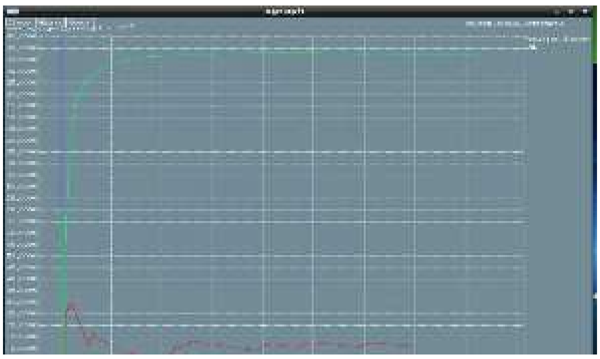


Fig 11 the source frequency graph.

The source frequency is high when compared to existing methodology.

G. DES frequency:

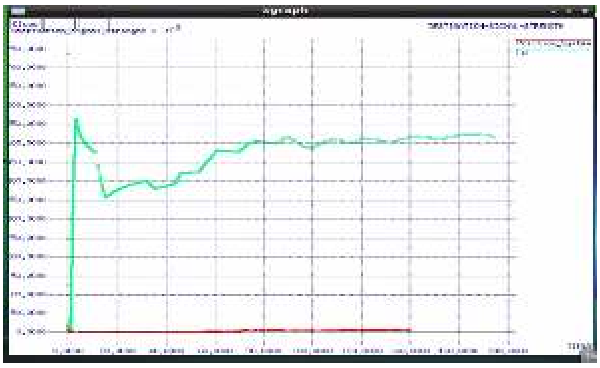


Fig 12 the destination reaching efficiency.

The destination frequency of the product is made high.

V. OUTPUT DISPLAY

Fig 13 the output screen

VI. CONCLUSION

Structural health monitoring systems are implemented to monitor their operations and health status. Black hole detection and Healing are used to detect the abnormalities around the sensor location and system connectivity issues which affects system performance. The nodes which reaches the threshold level in cluster are searched,before it gets failed a set of back up sensors are replaced at these nodes. It restores the network connectivity in partitioned Wireless Sensor Networks. When two sensors is about to fail at the same time the system heals it by electing the backup sensor by itself. Using Geographic routing protocol (localizability-aided localization (LAL)) data are retrieved securely from the current location and send dynamically to the server.

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