[ICEMESM-18]
DOI: 10.5281/zenodo.1226523

ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

WIRELESS SENSOR NETWORK WITH WMN TOPOLOGY DURING ENVIRONMENTAL MONITORING

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ABSTRACT

With huge demand of industrial exploration and the un ethical results are arises the side effects which will be very harmful for alive animals humans and environments also. Many researchers found that the modern world with industrial growth directly affects our environment and our farming technology. which In the globalization of market and industrial expansion the important global environmental issue is to control the various unhygienic gases like mittens, co2 emission. Currently fast development of the satellite technology and of communication wired and wireless communication like mobile communication becomes very much important to monitor the things where human cannot monitor continuously or reach that area . we developed this wireless technology to overcome this problem. But while configuring number of nodes in network we have to adopted a best topology and with improved parameters. In this research paper I suggest the best topology with performance improving factors. The wireless mesh network (WMN) is most likely adopted wireless access. WMN provides the wireless connectivity through the sensor to the consumer lot economical and much more supple backhaul infrastructure as compared with the wired network solutions. The wireless networking solutions for upcoming future has been adopted by most emerging technology known as wireless mesh network(WMN). Due to the consumption of higher energy in the field of information and communication technology(ICT) industries which will have direct impact on environment i.e. co2 emission, energy efficiency and life of network becomes a important key factor to evaluate the performance of WSN and WMN communication

Keywords: Wireless sensor network(WSN), wireless mesh network(WMN), 802.11 routing protocol, MAC protocols.

I. INTRODUCTION

To implement the new experiment we took the consideration and the results of the different researchers.In era of communication the worldwide consumption of energy is the major concerns experienced by the governments throughout all the nations reason is the environmental pollution footprints and eventual exhaustion[1] the days are not too far that in future that the main conventional energy sources are replace by the non conventional energy sources which will use the sustainable energy just like wind , solar energy and special attention to green networking which is recently attracted.

Networks has been develop and constructed in such a way that their cost and performance has been taken into granted only but as far as energy consumption is concern we have to take the co2 footprint i.e. Carbone footprints[2]

By the application of green networking to the wireless mesh network has been describe in literature very rarely. Wireless mesh network is a new emerging technology has been adopted in green networking for wireless networking solutions. Hence we have to take wireless sensor in wireless mesh networks. The rapid deployment of self configuration makes the WMN appropriate transient demands [3]

The network deployment scenarios such as hard to wired building and disaster recovery process. Therefore wmn is now being a extensively used as coverage extensive prolongation as well as the cost effectiveness and backhaul relaying with IEEE standers which are used in wireless mesh technology. In this survery one important factor which

ISSN 2348 – 8034
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is to be considerd that is the life of wireless mesh network means we have to prolong the life of network by using different clustering.[4]

WMN has capture the interest of academic research and industries it will satisfy both the necessary basic requirements of ISP and wireless users. An open source wireless mesh networking module is one of them[5]
Fig 1 shows the wireless mesh network architecture[6] which consist of different nodes called as mesh points or MP these nodes of one network can communicate with other nodes of other networks which is in mesh.it consist of mesh acess point MAP and mesh point portal MPP. MPP is a gateway to integrate WMN with various existing networks. Such as Wi-Fi or WiMax

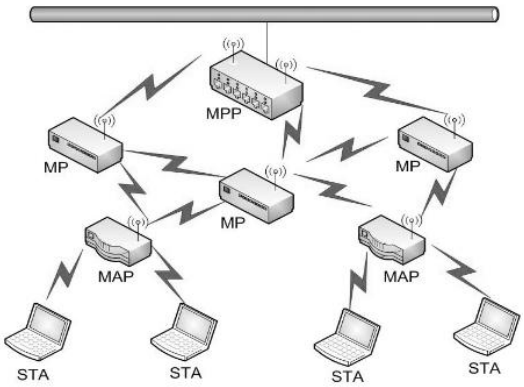

Fig.1.1 Wireless mesh network in WLAN

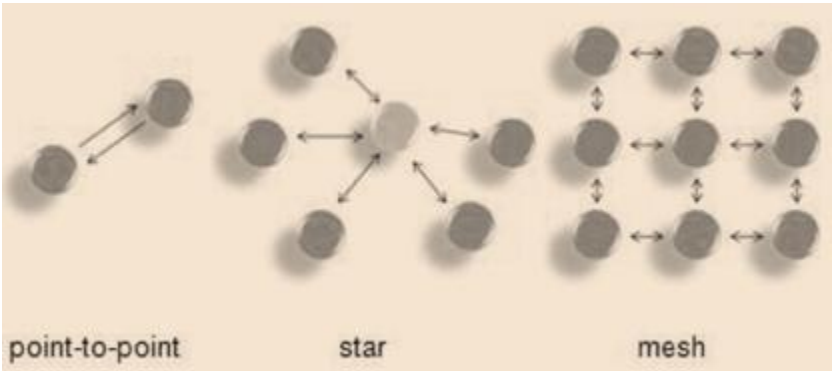

Fig. 1.2 Different topologies of Network

Another wireless moduled has bee proposed by Hsiao Hsien Lin and His Yuan Tsai[5] a wireless module design with open sourse in hardware as well as software hence it will be integrated into sensor for environmental monitoring and it can be used to study the performance of wireless mesh network that experiment can be modify depending upon the different applications. The typical node which is integrated in this module is shown in fig. 2

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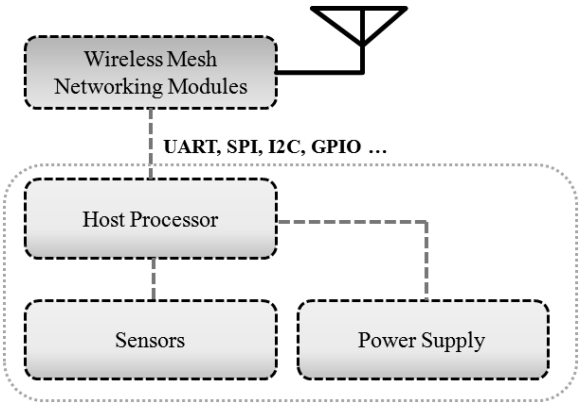

Fig.1.3 Typical sensor node in WMN

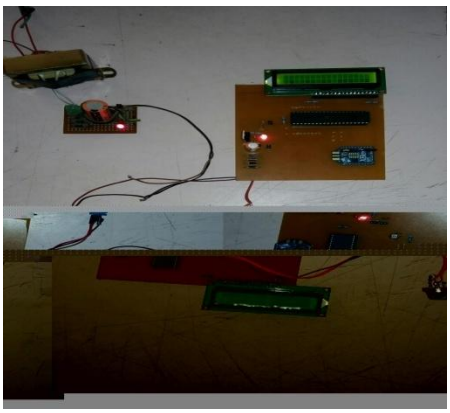

Fig. 1.4 practical sensor node

II. ENERGY CONSERVATION IN NETWORK LAYER

The different layers of the networks are responsible for configuration and data routing and it is generally self configuration network in different topology. Network layer choose the suitable mode for node and determine the most suitable neighbor node for data communication.

The dynamic adjustments for configuration has been done by routing protocols. But while configuring it will required maximum energy in a network.

Routing protocols are divided into three main types table driven demand driven and hybrid routing protocols where table driven routing protocol also called as proactive routing protocols.

In which each node maintain number of table which will have routing information just like updates of node information energy information etc. Demand and route or demand driven routing is also called as reactive routing protocols.

which will create routes just when its desired by the source node of the network[8]. When a node requires a route towards its destination node, it will take initiative route discovery process on the networks. But the combination of both the protocll is called as hybrid routing protocol. This proting protocol combines the advantages of both protocol and recently it is one of the most popular method in wirelesss mesh network [9] network layer structure is given bellow,

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wireless mesh networks share mainy common feature in ad hoc networks which will aproches the energy conservation Hence we make the comparative study survey for different aproches used in wireless mesh network which is given in a table bellow

Protocol	Network	Topology	contribution
CDS	Ad hoc	flat	Used information of neighborhood
SPAN	Ad hoc	Grid	As a co ordinate in transmission
GAF	Ad hoc	Grid	Knowledge of geographic positions
EMM_DSR	Ad hoc	Flat	Selection of short path
MER	Ad hoc	Flat	Node adjustment as per power level
Power aware	Ad hoc	Flat	Replenishment
Pulse	multihop	Tree	Fixed pulse interval
Green clustering	WLAN	Cluster	Central control to make a decision
Ca Det	WLAN	Cluster	Clustering and decision based tree
EAR	All networks	Flat	Engery consumption acount
ETR	WMN	Flat	Switching to node
Green Frame	WMN	Flat	Routing sheduling
CBRP	WMN	cluster	Minimized the flooding trafic

III. METHODOLOGY

Simulation environment

The VINT research group at University of California at Berkeley has developed network simulator NS-2. The Monarch research group at Carnegie Mellon University extended the NS-2 simulator to include wireless scenarios with mobile nodes. The more established ad-hoc routing protocols were implemented in the CMU extension. Subsequent versions of the CMU wireless extension also included energy models, propagation models, mobility models and the underlying MAC layer protocol is defined by IEEE 802.11 standard for the mobile nodes. Random wave point mobility model is used in ns-2

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Network simulator- 2.34

NS-2 is the Network Simulator 2.x that emerged from the VINT project. It can be used to simulate any kind of Internet communication such as providing implementations for IP, TCP (different flavors), UDP, a variety of routing protocols, several QoS mechanisms, and more.

Wireless extensions developed at CMU include mobile nodes and wireless communication with adequate models on layer one and two (radio propagation models, IEEE 802.11 link layer, etc). Some ad hoc routing protocols such as AODV, AGENT and DSDV are implemented in NS-2. The implemented models are generally very detailed, which leads to high complexity in the software itself and in its calculations. NS-2 is written and developed in C++ and TCL [15]. It has an embedded TCL interpreter, such that TCL scripts configures and control the simulator. The mix of C++ and TCL also increases the complexity of the software. This is one of the main drawbacks of NS-2. Despite being open source, the design of NS-2 is a bit complex, making additions or improvements difficult to implement. Given that no clear guidelines are provided, contributions have tended to add code in a haphazard manner to best suit their own purposes at that time, which has resulted in a very complex C++/TCL jumble. In recognition of these drawbacks, there have been efforts to improve the structure and design of NS-2. NS-2 does not provide any statistics, which could be mapped to performance measures. Instead every event produced by the simulation is written to a trace-file. The trace-file can then be processed to extract the desired information. This may appear as a reasonable approach; however, even with

low scale simulation scenarios the trace-files become very large. In addition, the writing of the trace file to disk actually slows down the simulation sometimes. Results obtained by ns 2 (trace files) have to be processed by other tools, e.g. the Network Animator (NAM), a Perl or an Awk script. Still NS-2 is one of the most widely used simulators for mobile ad hoc network and there is also an add-on called NAM (network animator), which provides a way to visualize simulated communications. NAM was designed to operate on a particular kind of trace-file, thus for NAM trace-files are required .

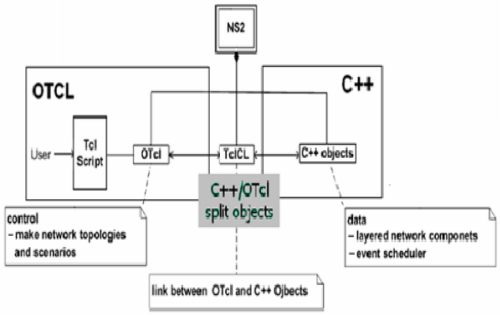

Fig. 3.1: Architecture of NS-2

NS2 is written in the C++ programming language with the Object Tool Common Language (OTCL) as the front-end interpreter

Simulation tools and parameters

To evaluate the performance and energy efficiency of existing routing protocols, the event driven simulator NS-2.34 is used for our simulations. Below is the list of parameters used in this study simulation work. The parameters are chosen on three basic considerations:

- Based on the usage by other researchers, so that the results can be compared.
- Based on the capabilities of the systems used for the simulation. For example, the simulation seems to take much longer time and memory when the nodes in the simulation are increased. So that limits the maximum number of nodes that can be used in this work.
- By considering most of the results to show the effect of the energy challenges.

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The energy model of communication
Transmission power includes both - power required to drive the circuit and the transmission power from antenna. The computation of transmission power from antenna is based on the distance between sender and receiver. Energy can be consumed during processing and communication. The energy consumed during communication is more dominant than the energy consumed during processing. So, the communication system should be energy efficient by optimizing the energy consumption at different states of the communication.

Need for distribution of power consumption among nodes in a cluster
Cluster head receive and transmit more data as compared to nodes in a Custer because it has to collect data from all the nodes in a cluster. Therefore the energy of the CH decreases rapidly compared to cluster member nodes. It means CH will expire early. This will affect the operation of the cluster as it may not be possible to replace or recharge the battery of CH. Therefore to prolong the lifetime of WSN it would be effective to distribute the energy consumption among different nodes in a cluster. This can be achieved by the rotation of cluster head role. In existing protocols such as DEEACH for rotation or selection of CH hot region parameter is used along with the average WSN residual energy. Hot region means the area of high data rates. But the problem is that if a sensor node continues as a CH for longer duration, its battery will expire early. It will lead to expiry of the cluster. Hence in this protocol rotation of CH role as a function of residual energy of CH and other nodes in a cluster is proposed.

Combining power and cost aware metrics
Here, the transmission power and the cluster lifetime are combined in link cost computation and used as a metric. There are several sources of energy consumption in sensor unit:

- Signal sampling and conversion of physical signals to electrical ones,
- Signal conditioning,
- Analog-to-digital conversion.

The energy consumption in this unit is relatively constant, and improvements to their energy efficiency depend on increasing integration and skilled analog circuit design. And it also has been tested that passive sensor such as temperature, seismic, etc, consume negligible energy compared to other components in sensor nodes. So, in the following section, the study will emphasize on the energy consumption of the digital processing unit and radio transceiver unit. Most digital circuits employed in wireless sensor network nodes are typically used in command and control functions, base band signal processing unit and implementation of the protocol stack [32]. The energy consumed in a digital circuit is determined by equation 4.1 i.e. the sum of dynamic and static power dissipation.

$$Pd = Pdyn + P\ stat \qquad 4.1$$

In the hardware of a wireless sensor network, the number of gates undergoing a transition cycle at any one time can be very small, on an average, due to the very low duty cycles supported by their communication protocol.

Evaluation Metrics
The metrics used to evaluate the performance of the new routing protocols are energy consumption by nodes & cluster, sent and received packets by each node, drop out of packets in transmission. To reduce energy consumption it is must to kwon how the energy is consumed by nodes in the cluster in existing protocols. Then to compare the results with exiting protocol it is required to know the energy consumption with proposed protocol. Also to know the number of packets lost during transmission, it is required to observe the number of packets transmitted and then received successfully by destination node.

Energy consumption per successful data delivery
It is denoted by ECSDD. It is the ratio of total network energy consumption to the number of data packets successfully delivered to the sink. The network energy consumption includes all the energy consumptions except MAC layer controls. It can be calculated using equation 4.2.

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$$ECSDD = \sum_{k=1}^{N} (E_{ik} - E_{rk})$$

Total no. of packets received

Where , E_{iK} is initial energy of node k

E_{rK} is remaining energy level of node k at the end of simulation

N is the number of nodes in the network

Packet successfully received by nodes.

During WSN operation the packets successfully received by nodes is analyzed using plot between received packets and time. The results will be generated by NS2 simulation and then tabulated to plot the graph at the end of each round. This will help to know the packets lost and also the reliability of operation.

Network Lifetime (Nl)

This is one of important metrics to evaluate the energy efficiency of the routing protocols with respect to network partition. In wireless ad hoc networks with densely distributed nodes, the death of the first node seldom leads to the total failure of the network. The network is partitioned due to high number of dead nodes. Even after partitioning, end-to-end transmissions may still be feasible in each partition Li argue that network is alive if there exists at least one pair of adjacent nodes working, since they could transmit to one another and keep the network alive. So, NL can be defined in the following ways

- It may be defined as the time taken for K% of the nodes in a network to die.
- The lifetime of the network under a given flow can be the time until the first battery drains out.
- It can also be the time for all nodes in the network to die.

Energy-aware design for wsn

To minimize the energy consumption, many techniques have been developed. In this section, the design of our energy-aware system for wireless sensor network is introduced. The techniques used in EACHS can be classified into the followings:

- Distance based cluster head (CH) selection.
- Data aggregation.
- Even energy distribution by CH rotation.

IV. SIMULATION RESULTS

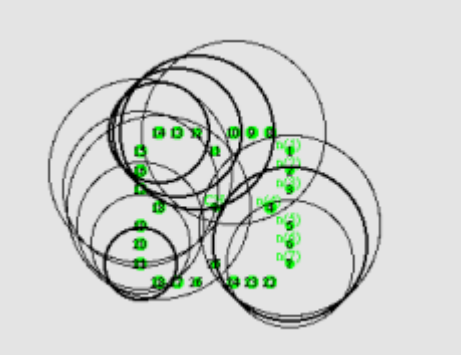

Fig 4.1 Data transmission and reception

[ICEMESM-18]
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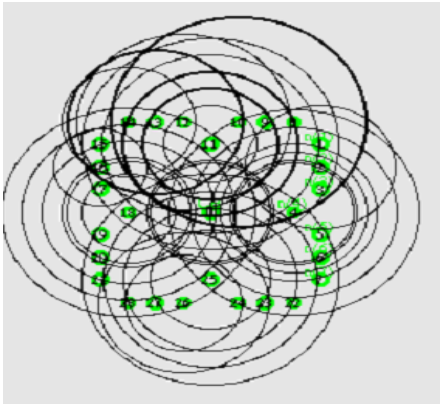

Fig4.2Datatunelling

Table 4.1: Simulation Parameters

Parameters	Normal Scenario
No. of nodes	29
Topographical area	50 x 50 sq. m.
Topology	mesh
Max. inter-node distance	5.5 m
Antenna	Omni directional
Initial energy of node	5.2J
Packet size	400 bytes
Energy consumption per packet	0.268 Mj
Packet Delay	1 ms
Throughput	98.67 %

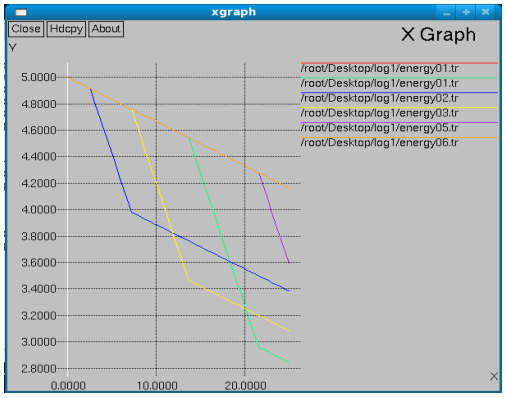

Fig 4.3 Graph Node vs Energy

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DOI: 10.5281/zenodo.1226523
ISSN 2348 – 8034
Impact Factor- 5.070

V. CONCLUSION

Wireless Sensor Network with energy with wireless mesh topology in which the main important factor is that energy consumes by the nodes and the energy statues of cluster head and battery life of cluster head. Because all traffic from the sensor nodes is routed through CH to base station. By varying the cluster head position we can change the cluster size and clustering.When the simulation has been done then it is seen that the cluster head is the main heart component of network. Cluster head has been connected to every node for full duplex communication. Hence energy of cluster head will get finish as compare with other node.By rotating the position of cluster head by comparing the threshold voltage among the cluster nodes and hence WSN. This will prolong the lifetime of the network.For selection of cluster residual energy of node as well as the distance of node for BS can be used as effective parameters of energy aware protocol design.Proposed protocol prolongs the lifetime of the network by about 15% as compared to DEEAC protocol.This is a very simple protocol and can be combined with other cluster based routing protocols for better performance.

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