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Energy Efficient Node Addressing Scheme in Hierarchical Wireless sensor Network.

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Abstract: - Wireless sensor networks are functioning in several applications, including military, medical, environmental and domestic. In all these applications, energy usage is the determining factor in the performance of wire- less sensor networks. As a result, methods of data routing and transferring to the base station are very important because the sensor nodes run on battery power and the energy available for sensors is limited. In this paper we intend to propose a new protocol called Dynamic Energy aware Tree base Node Addressing (DEATBNA). Proposed approach will minimize routing and addressing overhead and energy based tree will result in prolonged lifetime of the network. Finally we will show performance results based on theoretical analysis.

Keywords: Wireless sensor network, DEATBNA, Hierarchical Addressing, sink.

1. INTRODUCTION:

The fabulous development in the electronics technology lead the way to development of micro-electronics thus enabling production of small chips and micro devices. The communication technology is being reformed due the design and development of micro devices and hence enabled the design and development of WSNs with low cost, low energy consumption and high utilization. Let's see the basic node architecture.

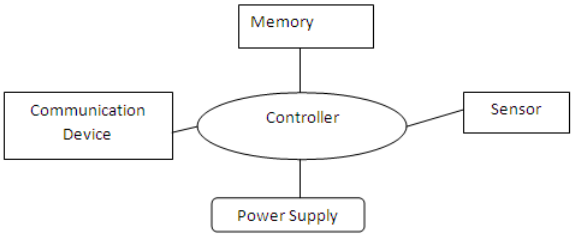

Figure 1. Basic Node Architecture

The 1st definition of WSN is Set of individual nodes that are able to interact with the environment by sensing or controlling physical parameters is called Wireless Sensor Network (WSN). Wireless communication enables the cooperation of the nodes to accomplish better tasks that single nodes could not. Second definition of WSN is a sensor network is an infrastructure comprised of sensing, computing, and communication elements that gives an administrator the capability to instrument, view, and respond to events and phenomena in a specified situation. The administrator typically is a civil, governmental, commercial, or industrial entity. The situation can be the physical world, a biological system, or an information technology framework. There are four essential mechanism in a sensor network 1) an assembly of distributed or localized sensors 2) an interconnecting network 3) a middle point of information .clustering 4) set of computing resources at the middle point to handle data connection, event trending, status querying, and data mining. Due to the scalability and energy efficiency characteristics, researchers projected a lot of routing protocols for cluster based WSNs [2]. In Wireless sensor networks, routing protocols can be separated into two categories: Network Structure and Protocol Operation. Hierarchal routing protocol is one of the categories in their classification of WSN routing protocol based on the Network Structure. In cluster-based routing protocols, network is divided into cluster and each cluster has its own cluster head (CH). Further, CHs are Responsible for relaying of messages from ordinary nodes to the Base Station (BS). CHs can communicate directly with the BS, can be anywhere in the network and change per interval, which also improves network's energy efficiency [2]. But energy is consumed (used) in a sensor nodes for the sensor transducer, sensor microprocessor and at last communication among sensor nodes.

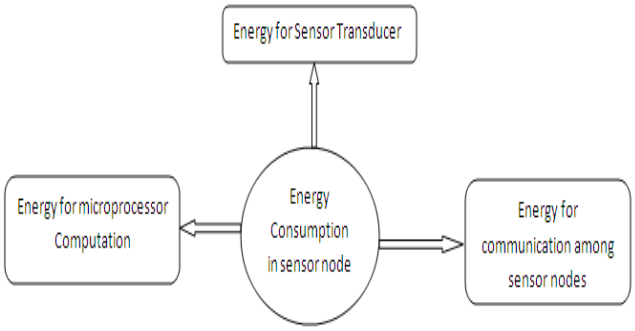

Figure2. Sensor nodes energy consumption

In the WSN AODV is one of the most popular routing algorithm is used .It can build the routing table by flooding the entire network with RREQ control packet .this control packets are costly because all devices are battery powered. They take more power for packet transmission [1].in case of node failure RRER control packets and subsequent RREQ packets are generated to create a new route [1]. In term of control packet the AODV is expensive algorithm. So the new

Hierarchical routing algorithm is used in hierarchical network topology in this mechanic no need of routing table for forwarding the packets. Routing is based on address of the nodes. C skip hierarchical algorithm used by ZigBee. It has fixed number of children fixed allocation restrict the depth that the network can support. In hierarchical node addressing technique has the address overhead problem (duplication) and the link failure due to battery (power).

In this paper, we present an advanced technique that is to propose a new protocol called Dynamic Energy aware Tree base Node Addressing (DEATBNA) in wireless sensor network. The rest of the paper is organized as follows. Section2. Literature Survey, Section 3. Proposed method. Section 4. Mathematical equations section 5.Theoretical improvement in Proposed Algorithm and Analysis in Section 6.Conclusion.

2. LITERATURE SURVEY:

A survey on routing protocols in wireless sensor network is presented in 2004.classification of routing techniques based on network structure .there are three main categories 1.Flat, 2. Hierarchical 3.location based routing protocol .after that protocols are classified into multipath based, query-based, negotiation based and quality of services –based routing [3].The routing protocol uses addresses of nodes to find routing paths and allows nodes to utilize shortcuts[5].

As well as address assignment in Sensor networks can consist of hundreds, thousands, or maybe even millions of nodes, the capacity of an addressing policy to scale well with the network size are of greatest importance. We know that we need to think two separate aspects one is Addresses are assigned to nodes. [4] When the assignment is static, there is no true scaling issue. This condition occurs when the unique node ID, which is allocated previous to deployment, is used as the MAC address. As argued before, spatial reuse of addresses requires a dynamic address assignment protocol. In principle, such a protocol can be centralized or distributed, but only distributed versions scale well. Second is address representation. Network wide unique addresses scale poorly. [4] Spatial reuse dramatically improves the scalability, as it is mainly the local node density and not the network size, which dictates the address size. [4]

In ZigBee, network addresses are assigned to devices by a distributed address assignment scheme. Before forming a network, the coordinator determines the maximum number of children of a router, the maximum number of child routers of a router and the depth of the network .Note that a child of a router can be a router or an end device. The coordinator and routers can each have at most five child routers and at least one child end devices. Devices' addresses are assigned in a top-down manner [5]. For the coordinator, the whole address space is logically partitioned into a blocks. The first blocks are to be assigned to the coordinator's child routers and the last block is reserved for the coordinator's own child end devices. Each router computes a parameter called Cskip to derive the starting addresses of its children's address pools. The Cskip for the coordinator or a router in depth [5]. In our days the WSNs have really extended playing a significant role for the data efficient selection and their delivery. The energy efficiency is a very important issue for the networks in particular for WSNs which are characterized by limited battery capabilities [3]. The complexity and dependence of corporate operations on WSNs need the use of energy-efficient routing techniques and protocols, which will assurance the network connectivity and routing of information with the less required energy. In this paper, we concentrate on the energy efficient protocols that have been developed for WSNs.

3. PROPOSED METHOD

Assuming that all nodes are router-capable devices, we show how to form a Hierarchical WSN (as in Fig. 3.this structure is also called as layered WSN structure. Sink is connected with continuance power supply and it is autonomous .all the sensors are logically connected to each other as shown in fig 3.a sink is announcing the massage it include the information (node Id, available energy, no of hopes)in limited range those sensor are in that range they will response the massage. Hierarchical structure in wireless sensor network shown in fig3. All sensor node are logically connected in hierarchical fashion .in hierarchical network topology every node (except root) has a single parent .now in this structure sink is a root has continuous power supply and other sensor node has a limited battery. In a hierarchical structure of given diagram sink announce (broadcasting) the message Min the limited range those sensor are in range they will receive M from sink ,now in diagram sensor A and B will receive M from sink then A as well as B also broadcast message that is A(M)&B(M) this message will receive in those sensor are in range that is sensor G &H because they are in range G will not receive the A(M) because G is not in As range. Every sensor compare the all message and the will select the path for packet routing.

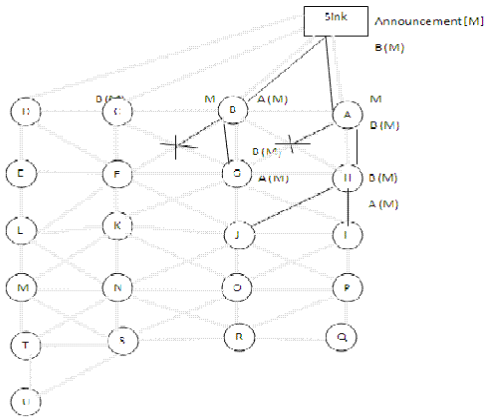

Figure 3. Hierarchical structure of WSN nodes

M=(Node id, Node Energy, Hopes)

B (M) compared with A (M)

B (Energy) ||A (Energy) as well as Number of Hops to the Sink.

B (Energy)> A (Energy)

4. MATHEMATICAL EQUATIONS:

Network is modeled as set of nodes N= {n0, n1, ni , …… nn} using which tree is created with Nc as set of non leaf nodes .height of tree is h Packet going through non leaf node to sink i.e. at height (h-1) in time t,

$$Pt = \sum_{i=0}^{m} Pci + Pr * t$$

Where:
Pci= Packet coming from ith Childs.
Pr= No of Packets /Sec.
m=total no of Childs
If m=2
=2h Pr * t+ Pr * t
= (1+2h) Pr*t.
Energy consumed= (1+2h) Pr*t*Ep. --------- (1)
Where:-
Pr =Number of packets per second
Ep =energy required to send one packet (constant for every packet).
Remaining energy = initial energy – consumed energy
Remaining energy = initial energy – (1+2h) Pr*t*Ep
Where:
Time T= remaining energy <minimum energy
Then network is dead.

In proposed model non leaf node are selected according to energy so probability of becoming non leaf node is Pb is given as

Pb = $(\frac{m}{n})$
Where:
n is total no of nodes.
m is non leaf nodes require to create tree.
Energy consumed = (1+2h) Pr*t*Pb*Ep.
Remaining energy =initial energy - (1+2h) Pr*t*Pb*Ep---------- (2).

Now in this way we will find value of T in both cases to show theoretical improvement in Algorithm

5. THEORETICAL IMPROVEMENT IN PROPOSED ALGORITHM

Assumption:
m=7; non-leaf node.
n=15;
h=3
Ep=1.
Pr=2.
t=1.

Energy consumed= (1+2h) pr*t*Ep, in existing System

Energy consumed= (1+2h) pr*t*Pb*Ep, in existing System

Where Pb = (m/n)
Remaining Energy = Initial Energy (1000J) – Consumed Energy

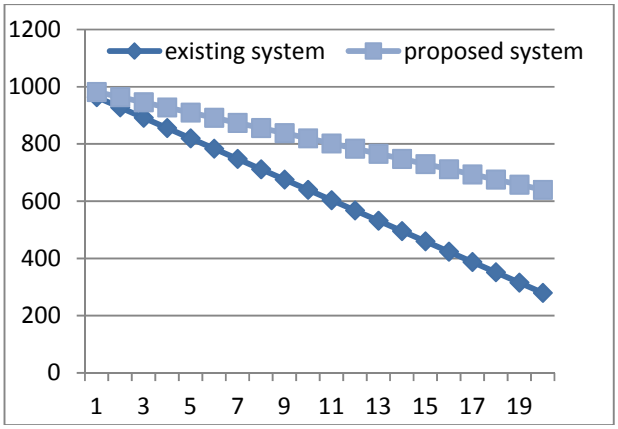

Figure 4. Energy consumption comparison between proposed system and existing system

6. CONCLUSION:-

From literature survey it is clear that energy efficient addressing and routing is must to prolong the network lifetime. Our proposed approach provides balanced used of energy by all nodes in network. Theoretical analysis and result shown that proposed algorithm will increase the network lifetime. Our future work includes implementation of proposed algorithm and comparing results with set of existing routing algorithms

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