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Dynamic Routing Protocol for Energy Efficiency Using Gateways in Wireless Sensor Network- A Review

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Abstract
Most significant challenges for Wireless Sensor Networks (WSN) is long-lived sensor nodes and minimization in overall power consumption. Energy efficiency is a key design issue that needs to be enhanced in order to improve the life span of the network. To show the energy level of nodes by heterogeneous and homogeneous. Homogeneous are known as that there are same energy levels of nodes and heterogeneous have different energy level of nodes. This paper proposed a new data forwarding approach which improved the lifetime of wireless sensor network using gateways and gateways reduce the distance between the cluster head and base station in WSNs. Several network layer protocols have been proposed to improve the effective lifetime of a network with a limited energy supply. Here this proposed work using heterogeneous which introducing M-GEAR protocol and it advises gateway based energy efficient routing protocol (M-GEAR) for wireless sensor networks (WSNs).Wireless sensor networks consist of small battery powered devices with limited energy resources. Network topology of WSNs also is changed dynamically by anonymous nodes. Routing protocols play a major role in WSNs for maintaining the routes and for ensuring reliable communication. Dynamic topology of Wireless Sensor Networks (WSNs) introduces very special requirements in routing protocols. The most important feature of a routing protocol, in order to be efficient for WSNs, is the energy consumption and the extension of the network's lifetime.

Keywords
Energy Efficient Protocol, M-GEAR Protocol, Routing, Gateways, Multi Hoping, and Wireless Sensor Network.

I. Introduction

WSNs are consisting of sensor nodes that are connected through wireless media. It consists of spatially distributed sensor nodes, which are interconnected without the use of any wires. WSNs are used to monitor and measure the environmental conditions like temperature, humidity, sound, pollution levels, pressure, and so forth. The energy efficiency is a challenging issue in multimedia communication due to the resource constraints, efficient channel access, and low transmission delay. Energy-efficient routing is a key research area in wireless sensor networks for dynamic topology nature property. Therefore we need to design the effective routing protocols. Various energy-efficient routing protocols have been proposed for WSNs. The energy-efficient routing protocols are based on the node uniformity which is considered to be deployed uniformly in the field. Routing protocols design is based on the network topology which might change dynamically. It must include a set of procedures for a router which is to inform other routers about its directly connected networks, where to receive and process the same information from other routers, and to pass along the information it receives from other routers.

The wireless network is any type of computer network that uses wireless data connections for connecting network nodes. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The basic architecture of wireless sensor network were shown in the figure1. Where see the sensor/ device, coordinator node, end node and router node are connecting to each other and having wireless connection.

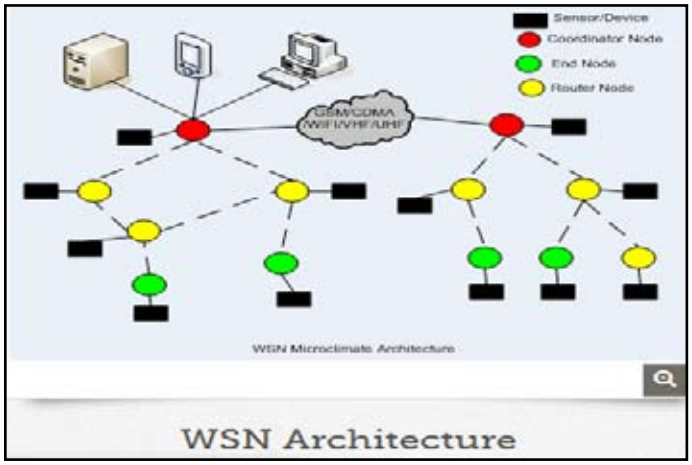

Fig.1: Basic architecture of WSN

II. Routing

It is the process of selecting best paths in a network and in the past, the term routing was also used to mean forwarding network traffic among networks. It performs for many kinds of networks, including the telephone network (circuit switching), electronic data networks(such as the Internet), and transportation networks. In packet switching networks, routing directs packet forwarding (the transit of logically addressed network packets from their source toward their ultimate destination) through intermediate nodes. Intermediate nodes are typically network hardware devices such as routers, bridges, gateways, firewalls, or switches. It is the process where usually directs forwarding on the basis of routing tables which maintain a record of the routes to various network destinations. Constructing the routing tables, which are held in the router's memory, is very important for efficient routing. Most of the routing algorithms use only one network path at a time. The Multipath routing techniques were enable the use of multiple alternative paths. Where Dynamic routing, attempts to solve this problem by constructing routing tables automatically,

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based on information carried by routing protocols, allowing the network to act nearly autonomously in avoiding network failures and blockages.

Examples of Dynamic routing algorithms are the Routing Information Protocol (RIP) and the Open-Shortest-Path-First protocol (OSPF). Dynamic routing dominates the Internet. However, the configuration of the routing protocols often requires a skilled touch; networking technology has not developed to the point of the complete automation of routing.

A. Routing Protocol Basics

Mostly all the dynamic routing protocols are built around an algorithm. Generally, for solving a problem by algorithm using step-by-step procedure. At a minimum, the routing algorithm should, specify the following:

- Procedure for passing reach-ability information about networks to other routers.
- Procedure for receiving reach-ability information from other routers.
- Procedure determining optimal routes which based on the reach-ability information and for recording this information in a route table.
- Procedure for reacting to, compensating for, and advertising topology changes in an internet work.
- Different routing protocols use different, and sometimes multiple, metrics.

Hop Count- A hop count metric simply counts router hops.

Bandwidth- A bandwidth metric choose a higher-bandwidth path over a lower-bandwidth link. However, bandwidth by itself still may not be a good metric.

Load- Load metric will reflects the amount of traffic utilizing the links along with the path. Where the best path is the path with the lowest load. Unlike, hop count and bandwidth, the load on a route changes, and therefore the metric will change.

Delay- It is a measure of time packet which takes to traverse a route. Routing protocol which using delay as a metric would choose the path with the least delay as the best path. There may be many ways to measure delay. Delay may take into account not only the delay of the links along the route but also such factors as router latency and queuing delay. On the other side, the delay of a route may be not measured at all; it may be a sum of static quantities defined for each interface along the path. Each individual delay quantity would be an estimate based on the type of link to which the interface is connected.

Reliability- Reliability measures the link which will fail in some way and either may be variable or fixed.

Cost- This metric can be measured by a network administrator which reflect more or less-preferred routes. Cost may be defined by any link and reflect the arbitrary judgment of the network administrator. This term cost is used as a generic term when speaking of route choices. For example, "RIP chooses the lowest-cost path based on hop count." Another generic term is shortest, as in "RIP chooses the shortest path based on hop count." When used in this context, either lowest-cost (or highest-cost) and shortest (or longest) merely refer to a routing protocol's view of paths based on its specific metrics.

III. M-GEAR Protocol

In this algorithm, each node keeps an estimated cost and a learning cost of reaching the destination through neighbors and estimated cost is a combination of residual energy and distance to destination. The hole occurs when a node doesn't have any closer neighbors to the target. If there are no holes, then the estimated cost will be equal to the estimated cost is equal to the learned cost. Where the learned cost is propagated to one hop back every time a packet reaches to the destination, how so ever that route set up for next packet which will be adjusted.

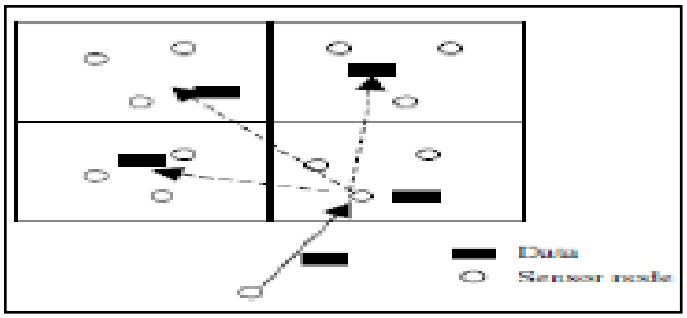

Fig.2: Geographic Forwarding in GEAR

The sensor nodes having too much sensed data for BS to process. Therefore, an automatic method of combining or aggregating the data into a small set of momentous information is required where the process of data aggregation also termed as data fusion. In order to improve network lifetime and throughput, here deploy a gateway node at the center of the network field. Function of gateway node is to collect data from CHs and from nodes near gateway, aggregation and sending to BS. Our results ensure that network lifetime and energy consumption improved with the expense of adding gateway node. Where also adding rechargeable gateway node because of that it is on ground fact that the recharging of gateway node is much cheaper than the price of sensor node.

IV. Related Work

This related work presents an existing works which were related to Wireless Sensor Networks.There are many kinds of cluster which based on the routing protocols that have been proposed for Wireless Sensor Networks. These can be categorized into two types of nodes called Static and Mobile Nodes. The CH is selected from the organized clusters if a random number between 0 and 1 chosen by CH is less than threshold value. In the steady-state phase each non CH node sends data and the time slot allocated to CH .The CH aggregates the data and sends it to the BS. Cluster formation is the initiation in each round where is not energy efficient and also it does not support mobility. Cluster-based Energy-efficient Scheme (CES) for Mobile Wireless Sensor Networks (MWSNs) which relies on weighing k-density, residual energy and mobility parameters for cluster-head election. The CES scheme carries out a periodical cluster head election process after each round. There are different routing protocols already reported for WSN applications but mostly they are for static networks.

V. Conclusion

Here proposed work describe an energy-efficient multi-hop routing protocol using gateway node to maximization the life time wireless sensor network and for the minimize energy consumption of sensor network. It choosing cluster head randomly in M-GEAR protocol causes that the current energy of some cluster heads of cluster are less or their distances to base station are far from the nodes, due to the heavy energy burden the cluster head will soon die and life time of network minimized. To reduce the distance between cluster head and base station we introduce a new method. In this

proposed work gateways as intermediate between the cluster head and base station that reduce the distance. A new multi-hop routing M-GEAR protocol for the heterogeneous wireless sensor networks has been presented and the performance of the system is evaluated to maximization of wireless sensor network, minimize the energy consumption of sensor network. The simulation results reveal that the M-GEAR protocol consumes more energy and the network has shorter lifetime than proposed multi-hop M-GEAR protocol with gateway nodes.

Finally, simulation results indicate that proposed M-GEAR protocol can more efficiently balance energy consumption of an entire sensor network and thus enhance the network lifetime of wireless sensor network. The proposed work is for the heterogeneous network using the gateways as intermediate and we proposed to extend this work for the gateways introduced in 3 dimensions in wireless sensor network. Enhances the energy efficiency of the sensor nodes by selecting optimal path and also provides effective routing that increases network lifetime.

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