

ENERGY EFFICIENT ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORK

Mrs. Shifana Begum¹, Anusha Kula², Bhuvaneshwari³, Megha⁴, Pooja⁵

¹ Assistant Professor, Dept. of CSE, SUCET Mukka

^{2,3,4,5} UG students, Dept. of CSE, SUCET Mukka

Abstract:

The energy consumption is the key design criterion for the routing protocols in wireless sensor networks. Routing protocols for wireless sensor networks are responsible for maintaining the routers in the network under some limitations in the battery power. WSN is a collection of large number of small nodes which acts as router also. These nodes carry very limited power sources which is non-rechargeable and replaceable which makes energy consumption significant issues. Energy conservation is very important issue for prolonging the lifetime of the network. In this paper, We have given a survey of routing protocols for wireless sensor network Which works better in the limited resources of sensor nodes.

Keywords: ENERGY EFFICIENT, WIRELESS SENSOR NETWORKS

I. INTRODUCTION

The wireless sensor network gained popularity in recent years due to advancement in wireless communication technology and rapidly developing zone for research. WSN refers to a wireless system of sensor hubs associated through a wireless medium. WSNs have extended throughout the world in recent years. It is defined as network of tiny devices called smart sensors. WSN typically has little or no infrastructure. It consist of few tens to thousands sensor nodes working together to observe a region to obtain data about environment. There are two types of WSNs: structured and unstructured. Unstructured WSN contains impenetrable collection of sensor nodes. In structured WSN, all or some of the sensor nodes are deployed in pre planned manner.

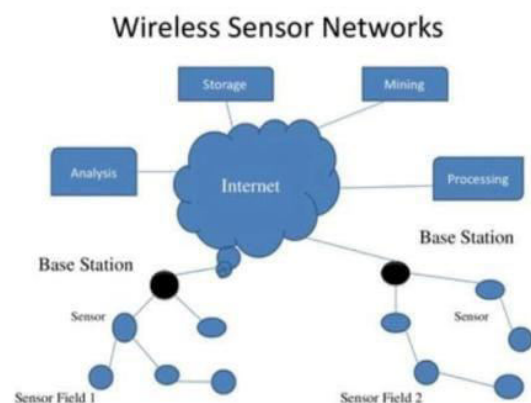
Table 1: Types of WSN

| | |
|-----------------|--|
| Terrestrial WSN | Nodes deployed in pre-planned or ad-hoc manner. As battery power is limited, Solar cells are used |
| Underground WSN | Nodes are deployed underground to determine the underground condition. As energy is main issue, additional sink is required above ground. |
| Underwater WSN | Nodes are deployed underwater. Acoustic waves are used for communication. |
| Multimedia WSN | Nodes equipped with cameras and microphones are deployed in pre-planned manner. High bandwidth demand, high energy consumption, quality of service etc. are the challenges. |
| Mobile WSN | Nodes that can move on their own and having the ability to reposition and organize itself in network. When the nodes are within range of each other than communication has done. |

Small size, low power and the ability of wireless communication make WSNs the ideal solutions for numerous applications such as remote environmental monitoring, medical healthcare monitoring military surveillance, etc.

II. ROUTING IN WSN

Routing strategies are required for transferring data between the sensor nodes and the base station. Routing in WSN is different than traditional IP network routing because it exhibits a number of unique characteristics such as it is unrealistic to build a global addressing scheme for a large number of sensor nodes, secondly has opposed to regular correspondence systems all utilizations of sensor systems require the stream of detected information from numerous sources to specific BS. Different routing techniques are proposed for remote sensor network.



2.1 Energy efficient routing protocols in WSN

Energy efficient of networks is a significant concern in wireless sensor network (WSN) Following are some energy efficient routing protocols.

1. LEACH “Low Energy Adaptive Clustering Hierarchy”

In this type of hierarchical protocol, most of the nodes communicate to cluster heads (C.H) . It consists of two phases: (i). The Setup Phase: in this phase, the clusters are ordered and then Cluster Head(CH) has been selected. The task of CH is to cumulate, wrapping, and forward the information to the base station (Sink) [2]. (ii). The Study State Phase: in the previous state, the nodes and the CH have been organized, but in the second state of “LEACH”, the data is communicated to the base station (Sink).

2. PEGASIS “Power Efficient Gathering in Sensor Information System”

It is a “chain-bases protocol” and an upgrading of the “LEACH”. In “PEGASIS” every node transfers only with a close neighbor to direct and obtain information. It receipts turns communicating to the BS, thus decreasing the quantity of energy consumed per round. The nodes are in this way that a chain should be developed, which can be completed by the sensor nodes along with using an algorithm.

3. TEEN “Threshold sensitive Energy Efficient sensor Network protocol”

The TEEN is a hierarchical protocol designed for the conditions like sudden changes in the sensed attributes such as temperature. For a reactive network, the first developed protocol was TEEN. TEEN is well applicable for time important problems and is likewise quite efficient in terms of saving energy and response time.

4. APTEEN “Adaptive Threshold sensitive Energy Efficient sensor Network”

The “APTEEN” is an expansion of “TEEN” and goals at both taking episodic data gatherings and replying to time-critical events. As soon as the BS formulates the clusters, the C.H transmits the features, the values of threshold and schedule of transmission to all nodes. After that, the C.H performs information accumulation, which has as a consequence to preserve power. The main advantage of “APTEEN” in contrast to “TEEN”, is that nodes utilize a smaller amount power.

5. Directed Diffusion

Directed diffusion is data-centric routing protocol for collecting and publishing the information in WSNs . It has been developed to address the requirement of data flowing from the sink toward the sensors, i.e. when the sink requests particular information from these sensors. Its main objective is extending the network lifetime by realizing essential energy saving.

6. Energy Efficient Sensor Routing(EESR)

EESR is a flat routing algorithm proposed particularly to decrease the power utilization and data latency, and to give scalability in the WSN. Mainly, it consists of Gateway, Base Station Manager Nodes, and Sensor Nodes . Their duties are: Gateway Delivers messages from Manager Nodes or forms other networks to the Base Station, which has extra specification than normal sensor nodes. It sends and receives messages to/from Gateway.

III. ROUTING PROTOCOL

ROUTING PROTOCOL Routing protocols are the set of defined rules used by the routers to communicate between source and destination. Sensor Nodes have some constraints such as restricted transmission range, limited processing, storage capability and energy resources. So to improve the communication after concerning all these issues routing protocols are required. These protocols are responsible for maintaining the routers in the network and reliable multi-hop communication. It is challenging because of unexpected change in node status. There are various category of routing protocols

| Routing protocol | | | |
|-------------------|---------------------|----------------|------------------|
| Network Structure | Communication Model | Topology Based | Reliable Routing |

Fig 1: Various category of routing protocols

1. Network structure

Network structures deals with the way the nodes are connected like in a Hierarchical structure bottom-up approach used for balanced energy structure. It includes flat and Hierarchical routing protocols.

2. Communication model

Communication model is concerning routing that is path for transmission data or packets without focus on structures. It includes query based, coherent and non coherent based routing protocols.

3. Topology based

Topology based protocols mainly concern with the topology of network and finding their location on the basis of their neighbor positions. It includes location based and mobility based routing protocols.

4. Reliable Routing

Reliable Routing protocols focus on energy efficient transmission by using multipath from source to destination. It includes multipath based and QoS based routing protocols

IV. CLUSTERING PROTOCOL

Clustering technique is efficient to decrease the communication as it supports various topologies. In this technique, the cluster head election is main concern as there are thousands of sensor nodes deployed in unorganized manner. The cluster head manages the communication among all its members

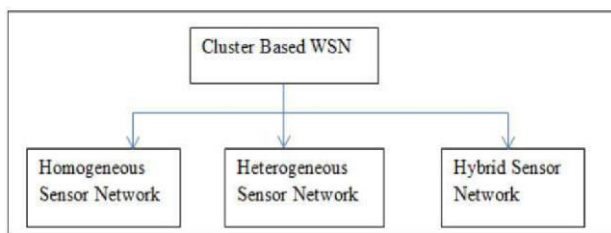


Fig 2: Types of clustering

1. Homogeneous sensor network

Here, all the sensor nodes and base stations are identical in terms of hardware capability and battery power initially. In this network, the static clustering elects cluster heads only once for the entire lifetime of the network. This results in overhead on cluster head LEACH is self organizing clustering protocol which concerns with equalized energy load distribution among sensor nodes. The whole process is divided into multiple groups and group is split into two phases that is setup phase and steady phase.

2. Heterogeneous sensor Network

Collection of different types of sensor nodes having different hardware capabilities and battery power are used. Cluster head is elected on the basis of these criteria. Higher hardware capabilities and more battery power, higher the probability to become CH node. CH node is used to process and send the information whereas low energy nodes performed sensing task. There are various resources on the basis of heterogeneity is considered such as computational heterogeneity, link heterogeneity and energy heterogeneity.

3. Hybrid Sensor Network

In this type of network the sink also contribute to increase the performance of network such as data gathering and assigning the task to node on the basis of their qualities in real time. It includes APTEEN and EEHRP.

V. CONCLUSION

In addition to many application of wireless sensor networks, it is necessary to transmit information appropriately with regards to power utilization and network life span as well as limited resources of such networks. Energy efficient routing protocols have significant and effective roles in wireless sensor networks. In this paper, energy efficient routing protocols were investigated in wireless sensor networks. This paper also explains the various clustering techniques to improve the relay, to resolve the computation complexity and to improve the network lifetime. Integrating WSN with future research for routing protocols.

VI. REFERENCES

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