



# PROPOSED ROUTING PROTOCOL FOR EVENT DRIVEN WSN

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**Abstract:** Wireless Sensor network is a collection of tiny sensor nodes connected through wireless channels and have immense capabilities but are restricted to resources. A huge collection of protocols have been developed for routing purpose but energy efficiency is still a matter of concern. This paper proposes a cluster based routing scheme for event driven wireless sensor network that follows the concept of tree-based protocols. Main focus of proposed protocol is on the selection of appropriate cluster head by considering parameters like residual energy, location of the nodes, etc and to choose a relay node without affecting the network cost. Proposed protocol targets the improved energy efficiency and enhanced network lifetime.

## I. INTRODUCTION

A large collection of sensor nodes connected via wireless medium is referred as Wireless sensor network. The architecture of the Wireless sensor network may have four main components. The components include sensor field, sensor nodes, sink node or base station and end user [4]. Sensor nodes are distributed uniformly over a sensor field and these sensor nodes are loaded with equipments like radio transmitters and receivers, GPS (not in every case), etc. With the help of these transceivers, sensor nodes can interact with each other and send all the sensed data. These sensor nodes sense the data; send it either directly to base station or with the help of intermediate nodes [1]. The main function of base station is collect

the data from all the sources and aggregate the. End user can access the sensed data whenever it is required. The process is known as routing [3]. There are many existing routing protocols with different targets. Some of them focuses on energy efficiency while other have intentions to improve in terms of other parameters like network lifetime, robustness, scalability, load balancing, etc [2]. Although many routing protocols have been developed towards advancement but energy efficiency is still a matter of concern. This offers an opportunity as well as need to optimize sensor network architecture that grants better performance while using minimum amount of resources. The need of optimization of wireless sensor networks makes it challenging and different from conventional network architectures. Wireless sensor network routing protocols have been divided into broad classification but this paper focuses an efficient routing protocol which is tree based and works best for event-driven data delivery model in order to decrease energy consumption and increase network lifetime.

The paper is organized as follows. Section II presents literature survey followed by Section III that proposes the tree based routing protocol for event driven wireless sensor network. Finally, this paper is concluded in Section IV.

## II. LITERATURE SURVEY

Wireless sensor network is enriched with a vast collection of different techniques developed for targeting different issues like network routing, congestion control, MAC protocols, sensor

node hardware, etc with wide applications areas like Military, surveillance, temperature monitoring, home automation, underwater monitoring, internet of things and many more. Several protocols have been developed for routing in wireless sensor networks and broadly divided as Proactive and Reactive protocols [5]. Further these protocols are classified as Operation based, Network structure based and data delivery model based. Wide classification of these protocols is given in Fig. 1. Operation based protocols are considered as the most adaptive in nature. These protocols can further be divided into three categories [6]. *Negotiation based protocols* use available resources and use metadata to negotiate to avoid transmitting redundant data. Some of the examples are VGA [9], SPIN-PP [10], *Multipath based protocols* focuses on selecting alternate paths within sensor nodes and from node to base station. These protocols are considered as most robust in nature and they also provide fault tolerance. Examples include WRP [11]. *QoS based protocols* focuses on improving the Quality of service by targeting issues like reliability, minimum delay, fault tolerance, etc. Examples include MIMO [12]. Network structure based protocols includes Data centric/ flat routing protocols, Hierarchical routing protocols and Location based protocols. In *Data centric protocols*, sink node initiates the communication and sends packets to the nodes of particular region. Once they receive the packet, they reply and send the sensed data. Some examples are TBRPF [13], TORA [14], Gossiping [15], Flooding [16] and ZRP [17]. *Hierarchical routing protocols* focus on creating a hierarchy or levels of sensor nodes. In this, all the neighboring nodes develop a superior-inferior relationship and forward their data in that manner only. Hierarchical protocols can also be categorized as Chain-based, Tree-based, Grid-based and Area-based [7]. Some of the examples are PEGASIS [18], TEEN [19], APTEEN [20], TTDD

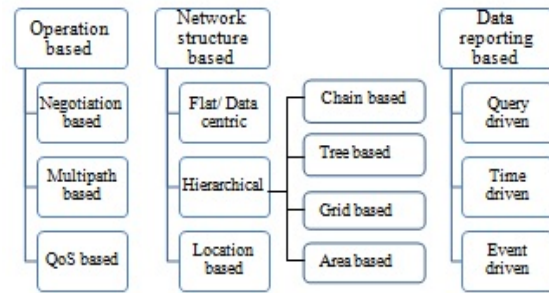


Fig 1 Classification of Routing Protocols in Wireless sensor network

[21], HPAR [22], ELCH [23], LEACH [31], DHAC [26] and DFTBC [32]. Location based protocols use GPS to get the location information of all the sensor nodes. These protocols can estimate the approximate energy consumption on the basis of distance of node from sink node. Examples are DREAM [24], GDSTR [25], etc. Another classification is on the basis of data delivery mode and it includes Query driven, Time driven and Event driven. *Query driven* allows sensor nodes to transmit their data only if it is asked by base station or some other node. Examples are SPIN-PP [10], LEACH [31], etc. In *Time driven* routing protocols, sensor node sends its sensed data periodically to the base station. This sometime deposits a large amount of redundant data at base station. Some of the examples are SOP [27], SPAN [28], etc. *Event driven routing protocols* are considered as the most energy efficient. It allows sensor nodes to send their sensed data only on the detection of any event. They use Flag value to determine whether an event is occurred or not. Some examples are SPIN-PP [10], ESDC [29], [30] and LEACH [31].

These protocols targets different issues but energy efficiency is still a matter of concern. Among all the major categories, tree based routing protocols are proved to be more energy efficient as compared to others. The proposed protocol is a tree based protocol for event driven wireless sensor network.

### III. CLUSTER BASED PROTOCOL FOR EVENT DRIVEN WIRELESS SENSOR NETWORK

This section presents the proposed routing protocol which is cluster based and works best

for event driven wireless sensor network. The protocol follows the technique of tree based protocols by forming a logical tree structure of sensor nodes.

#### A. Purpose of this research

Tree-based protocols are proved to be efficient when it comes to energy consumption and network lifetime. Energy is a critical resource in case of wireless sensor network as the sensor nodes are battery powered. Besides having an extent of efficiency, some flaws exist and these are:

- i. Location of the node is a must parameter along with residual energy that should be included while selecting appropriate cluster head.
- ii. A sensor network must have separate data collectors to aggregate and fuse the data.
- iii. Inclusion of a relay node is quite important to make the network fault tolerant and robust.

#### B. Proposed solution to overcome research gaps.

The proposed protocol is a healthy combination of both cluster based and tree based protocols. All the nodes are divided into different clusters and a logical tree will be created in each cluster for efficient data transmission. To surmount the above mentioned shortcomings, the proposed protocol requires a system model which is almost same for most of the routing protocols that works for same scenario is discussed below.

##### *System Model*

- i. All the sensor nodes are uniformly distributed over sensor field.
- ii. All nodes are fixed and immobile.
- iii. The base station is fixed at the upper side of network.
- iv. Each node has equal processing power for data processing tasks.
- v. The initial energy level of nodes is considered as same and battery cannot be recharged at any point.

##### *Contribution in research by the proposed solutions*

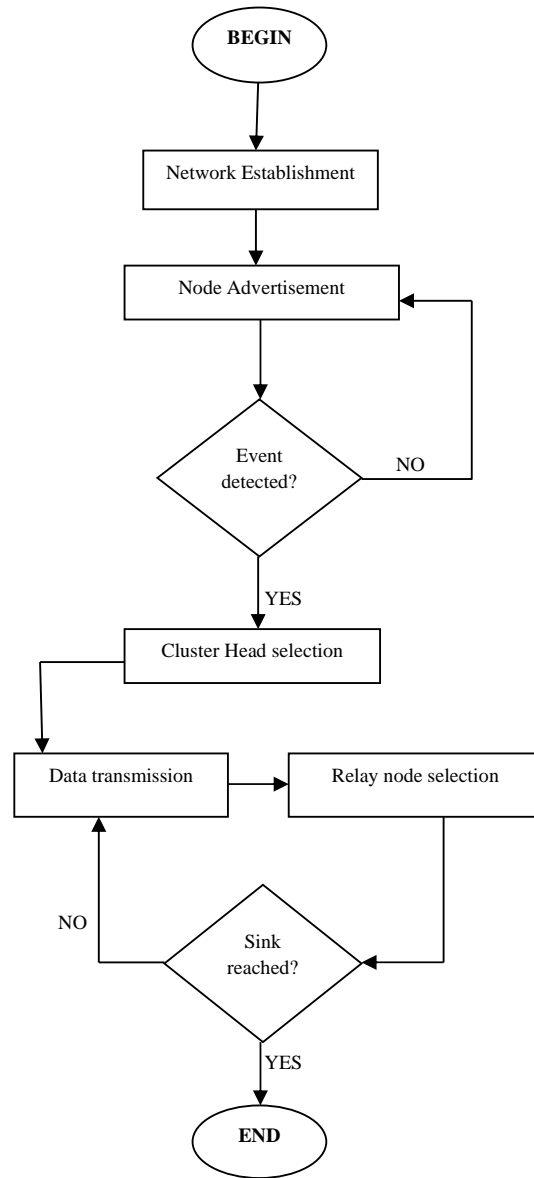
- i. First gap can be resolved by considering distance of all the nodes from sink node. For this purpose, it is not necessary to

equip sensor nodes with GPS system. Node distance can be calculated by counting no. of hops or no. of intermediate nodes between sink node and that particular node. An average of residual energy and distance must be considered instead of taking highest residual energy into account.

- ii. Second gap can be filled by introducing data collector nodes. In wireless sensor field, the function of some nodes must be specifically defined as data collector. These nodes will not perform sensing, they only receive data from neighbor nodes, collect and aggregate them by removing redundancy and forward it to next data collector node.
- iii. The selection of relay node is very important as it can handle the situation if any of the parent node or head node is failed at some point. Relay node is not always needed so a common relay node can be selected for two clusters i.e. A node that lies at the intersection of two clusters with required amount of residual energy and above threshold distance can be selected as the relay node.

The overall working of proposed protocol is shown by the flow chart given below. It includes the steps of protocol. Firstly, the network will be established by deciding the sensor field area, no. of nodes, energy of nodes, etc. After successful deployment of nodes if an event is detected, the cluster formation and selection of cluster head will start. Data transmission will take place and a relay node will be selected to provide alternate route to base station. Relay node is important to handle the condition when cluster head fails. Final step will ensure that the data is successfully transmitted to sink node or not.

C. Flow chart for proposed protocol



**IV. CONCLUSION**

Wireless sensor network consists of copious amount of sensor nodes which are connected through wireless medium. Various protocols have been developed to target different issues of wireless sensor network. Many routing protocols have been developed to enhance the efficiency and network lifetime of wireless sensor network, still there is an opportunity to develop many more as the power is always a matter of concern due to its limited quantity. This paper proposed a cluster based routing protocol for event driven wireless sensor

network that reduces the energy consumption and enhances network lifetime.

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