

Conventional Hierarchical Routing Protocols in WSN: A Review

Shiva Mehta¹

¹Department of Computer Science, Punjabi University Regional Centre for Information Technology and Management, Mohali, Punjab, India –

160062

shivamehta98@gmail.com

Abstract

Recent advances in remote sensor systems present numerous conventions extraordinarily intended for sensor systems. These conventions plan to lower vitality utilization. Vitality proficiency has vital issue in remote sensor systems. The Wireless Sensor Network (WSN) comprises with little hubs having sensing, reckoning and remote interchanges abilities. WSNs have the constraints, for example, vitality source, memory size and preparing force. Consequently, adding to a vitality productive steering convention is an intrigued exploration part in the network. The value/viability of convention relies upon the situated parameters for a prescribed process. There are three types of sensor systems i.e., flat, hierarchical and flood based routing. Thus, in this paper, a similar investigation of hierarchical routing conventions is shown for WSN.

Key Words: protocol; WSN; hierarchy; organisation; proficiency; routing.

I. INTRODUCTION:

The WSN is generally made out of an extensive accumulation of little self-sufficient gad gets which senses the surrounding environment. Late innovative researches empowers far reaching WSNs in a wide range of utilizations, including savvy war zone, social insurance, environment and natural surroundings observing, h ome computerization, and activity control, and so on [1]. The fundamental undertaking for a sensor network is sensing and gathering information of deployed region, processing and transmitting data to surface station where further processing is done. Notwithstanding, guaranteeing the immediate correspondence among sensor and bas e station may provide an interface for transmittance of messages which consumes a lot of energy giving rise to

degrade the performances of sensor and it get drained very soon. In this manner, the joint effort of hubs to guarantee that removed hubs correspond with the sink is a necessity. Thusly, messages are engendered by middle of the road hubs so a course with numerous connections or bounces to the sink is set up [2-9]. Correspondence construction modelling of remote sensor systems comprises of client, sink, and sensor hub demonstrated in Figure 1. The WSN designing comprises of sensor nodes, a client, and a sink node called base station. The client deploys the sensor forming a network and sensors thus senses the data and forwards it to the sink. A sink teaches sensor hubs to complete errands intrigued by the client, and sensor hubs assemble information. [3].

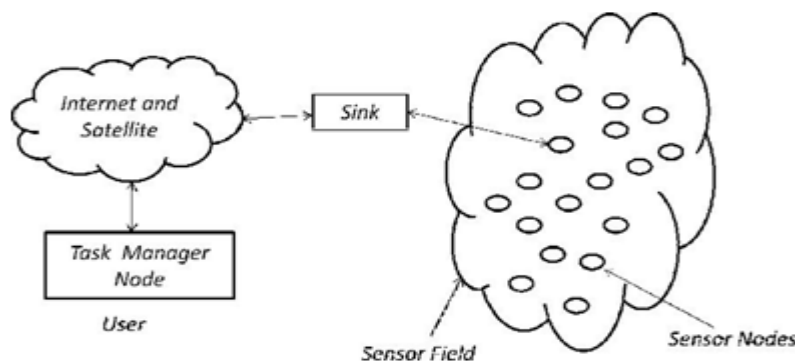


Figure 1 Sensor Network scattered in a Sensor Field

Sensor system applications oblige remote specially appointed systems administration methods. Albeit numerous conventions and calculations have been proposed for customary remote specially appointed systems, they are not appropriate to the one of a kind elements and application-oriented prerequisites of systems. The comparison among Sensor networks and specially appointed systems areas given below:

- Sensor hubs are thickly sent.
- Sensor hubs are inclined to disappointments.
- The topology of a sensor system changes habitually.
- Sensor hubs principally utilize a telecast correspondence ideal model, while most specially appointed systems are in light of end to end interchanges.

- The nodes have constraints of force, computational limits, and memory.
- The nodes might not have worldwide recognizable proof on account of the substantial measure of overhead of data.

The sensor node is comprised of four essential segments, as demonstrated (see Figure 2), detecting, handling, handset, and force units. They might likewise have extra application subordinate parts. The sensor should be capable to sense any physical activity and taking merriment from the assigned environment to be monitored. The sensor must be enriched with various devices that can measure light, temperature, humidity, pressure, velocity, acceleration etc.

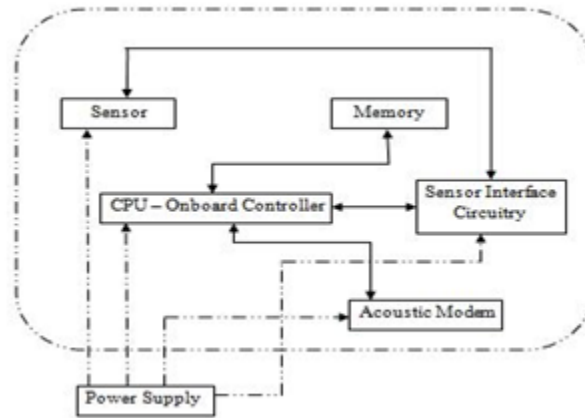


Figure 2: Architecture of a sensor node

The WSN is application oriented and self configuring depending upon the deployed region or environment. The sensors are deployed to gather information of the area which is beyond the reach of human. Steering instruments consider the inalienable elements which makes the application and construction modelling necessities. The errand of discovering and keeping up courses in WSN is nontrivial since vitality limitations and sudden changes due to power loss under various topological deployment schemes [8].

1. ROUTING PROTOCOLS:

There are various directing conventions that are in existence so far [13]. Few are Flat; Hierarchical based while others are Location based routing conventions. Here, in this paper, near investigation of various hierarchical routing conventions is introduced in view of the review of Ref. [8, 10] as indicated in Table 1.

Progressive directing conventions otherwise called group based steering, proposed in remote systems. They are surely understood systems having exceptional

preferences identified with versatility and proficient correspondence. The idea of various leveled steering is additionally used to perform vitality effective vitality proficient directing in WSNs. In a various leveled structural engineering, higher vitality hubs are utilized for transferring data while low vitality hubs are used for performing detection in vicinity of the objective. Thus, it implies that formation of bunches and doling out unique assignments to group heads can extraordinarily add to general framework versatility, lifetime, and vitality productivity. Progressive steering is a productive approach to lower vitality utilization inside of a bunch and by performing information conglomeration and combination keeping in mind the end goal to diminish the quantity while transmitting data to base station (BS) [4][10].

LEACH (LOW ENERGY ADAPTIVE CLUSTERING HIERARCHY):

LEACH is the most commonly and first introduced hierarchical directing methodologies for WSN. Drain [5,8] is a self arranging, versatile bunching convention. It utilizes randomization for disseminating the vitality load among the sensors in the system. Below are the presumptions made in the LEACH convention [10]:

- A. The sensor nodes transmit data with high power to reach to the base station.
- B. Every sensor node has processing energy to bolster distinctive MAC conventions.
- C. The hubs nearer to one another have the same

data.

As per the convention, BS is settled and situated a long way from the nodes and hubs vitality obliged. In the network thus formed there is one sensor called as clustered head (CH) that goes about nearby BS. LEACH arbitrarily pivots high-vitality CH in order to share and gather information among the sensors and the sensors devour battery control similarly. LEACH likewise outperforms information combination, i.e., pressure of information when information is sent from clusters of sensor nodes to BS lessening vitality dispersal and improving framework lifetime.

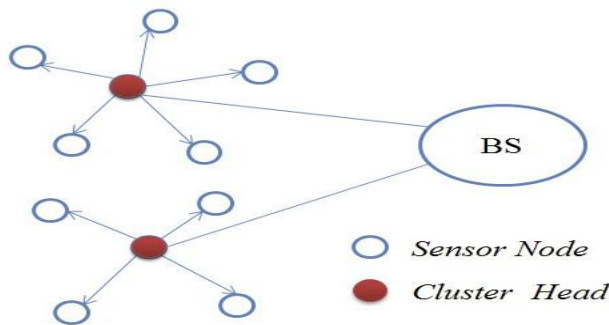


Figure 3: LEACH

TEEN (THRESHOLD SENSITIVE ENERGY EFFICIENT SENSOR NETWORK):

TEEN [6] is a bunch based directing convention and is the comprised of LEACH. This convention exchanges information few often regularly, faculties the environment constantly. The system comprises with basic sensor nodes. Drain procedure utilized as a part of this convention for group arrangement. It has two suspicions:

- A. Base station and sensor nodes have same

introductory vitality.

B. Base station helps in transmitting information to others sensor nodes of network straightforwardly. To start with base process, cluster head are framed far away from base station. And in other level, base station is closer to cluster head. It is focused at responsive systems and is the first convention created for receptive systems. A remote sensor system is indicated in Figure 4.

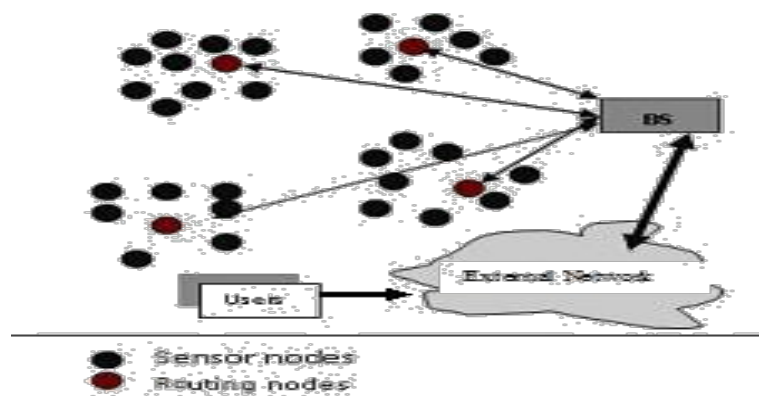


Figure 4: Working in TEEN

A portion of the essential elements of this plan are as per the following:

- A. It is most appropriate to time-basic information detecting applications.
- B. The vitality utilization in this plan can possibly be should not as much as in the proactive system, in light of the fact that information transmission is done less every now and again.
- C. The delicate edge can be fluctuated.
- D. The littler estimation of the delicate edge gives a more exact photo of the system, to the detriment of expanded vitality utilization. Subsequently, the client can control the exchange off between vitality effectiveness and precision.
- E. At each bunch time, the properties are telecast once again thus, the client can transform them as needed.

The principle disadvantage of this plan is that, if the limits are not came to, the hubs will never impart the client won't get any information from the system at all and won't come to know regardless of the fact that every one of the hubs kick the bucket. Along these lines, this convention is not appropriate for applications where the client needs to get information all the time. Other issue that emerges is functional usage would need to guarantee the impacts on clusters.

APTEEN (ADAPTIVE THRESHOLD TEEN):

The APTEEN [6, 10] is the enhanced form of TEEN that empowers dependable observing, examination of the earth. Here, when the cluster heads are chosen, the cluster head at the start telecasts accompanying parameters like attributes, threshold, schedule for sensor node and count time.

In the event that a hub which fails to send information in a required period, it is compelled for forcibly sensing and retransmitting information therefore keeping up vitality utilization. Since it is a half and half convention, it can copy a proactive system or a responsive system

relying upon the number time and limit esteem. One of the confinements of this convention is that keeping in mind the end goal to actualize the edge capacity and check time extra complexity is required.

PEGASIS (POWER EFFICIENT GATHERING SENSOR INFORMATION SYSTEM):

In PEGASIS [7-8] every hub speaks just with a nearby neighbour and alternates the transmission to sink node, hence decreasing for measure of vitality spent. Thus, the methodology disperses vitality stack equitably between hubs in network. Sensor nodes are composed with refined frame of chain utilizing covetous calculation beginning from some hub. On the other side, base station registers the anchor and telecasts it to other remaining sensors. For social occasion information in every round, every hub gets information from one neighbour, wires with its own information, and transmits to the next neighbour on the chain. PEGASIS performs information combination at each hub aside from the end hubs in the chain [10].

This convention spares vitality at different stages. To begin with, in the neighbourhood assembling, the separations that the greater part of the hubs transmit are substantially less contrasted with transmitting to a group head in LEACH. Second, the measure of information for the pioneer to get is at most two messages rather than (20 hubs for each group in LEACH for a 100-hub system). At long last, stand out hub transmits to the BS in every round of correspondence.

2. COMPARISON OF HIERARCHICAL BASED ROUTING OF WSN:

The steering conventions as discussed above are produced for distinctive/specific applications [11]. Here a similar examination of every one of these conventions is been sited by execution taking into account diverse parameters [8-9]. This examination is introduced in Table 1.

Table 1 Comparison of Various Routing Protocols

| Routing Protocol | LEACH | PEGASIS | TEEN | APTEEN |
|----------------------------|--------------|------------------|------------------|--------------|
| Classification | Hierarchical | Hierarchical | Hierarchical | Hierarchical |
| Data Delivery Model | Cluster head | Active Threshold | Active Threshold | Chains based |
| Data Aggregation | Yes | No | Yes | Yes |
| Power Usages | High | Max | High | High |
| Scalability | Good | Good | Good | Good |
| Overhead | High | Low | High | High |
| Network Life Time | Very good | Very good | Very good | Very good |
| Resource Awareness | Yes | Yes | Yes | Yes |
| Mobility | Fixed BS | Fixed BS | Fixed BS | Fixed BS |

3. CONCLUSION:

Essential issues adding to the examination of hierarchical based routing convention in WSNs may be finished up through this paper. The examined conventions are LEACH, TEEN, APTEEN, PEGASIS go under various leveled based directing convention. It disperses the data as expected to any switch that can be come to or get data. In view of this categorisation a similar examination of the convention is displayed. This correlation is taking into account the different parameters of the convention. Each of this convention is intended for a specific application as results a few conventions work for one circumstance while other for different circumstances. Henceforth for future viewpoint of this work may be all around centered around altering any of the above steering conventions such that the changed convention could minimize vitality of the sensor system.

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