Comparison of wireless sensor network Technologies

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ABSTRACT

Wireless Sensor Networks (WSN) is an interconnection of a large number of nodes deployed for monitoring the system by means of measurement of its parameters. Recent research in wireless sensor networks has led to various new protocols which are particularly designed for sensor networks. To design these networks, the factors needed to be considered are the coverage area, mobility, power consumption, communication capabilities etc. In this paper a survey is given regarding the architecture design issues, classification of protocols. The paper explores with research issues for the realization of networks.

Keyword: - Wireless Sensor networks, Adhoc networks, Applications, Design Issues, Routing protocols, Simulator tool.

I.INTRODUCTION

Broadly speaking, a WSN can be described as a network of nodes that cooperatively sense and may maenvironment thus modifying the interaction between person or computers and the surrounding environment. Tsensor network (WSN) consists of spatially distributed self-dependent sensors to track on physical or enconditions such as temperature, pressure, sound, humidity, wind speed and direction, pollution levels and combineand forwarded via multiple hops to a main target location that can use it locally or is connected to other networkgateway. WSN is made up of nodes – varying from a few to several hundreds or even thousands, where connected to one or more sensors. Each sensor network node usually comprises of a radio transceiver along witha microcontroller, an electronic circuit for computing with the sensors and an energy source, mainly a battery.

A. Characteristics of Wireless sensor networks (WSN) Mobility of nodes Ability to resist coarse environmental condition
Communication failures Heterogeneity of nodes
Self-organization and self-healing Power consumption constrains for nodes using battries Scalability with respect to the number of nodes in the network Low-complexity, low cost and size of nodes.

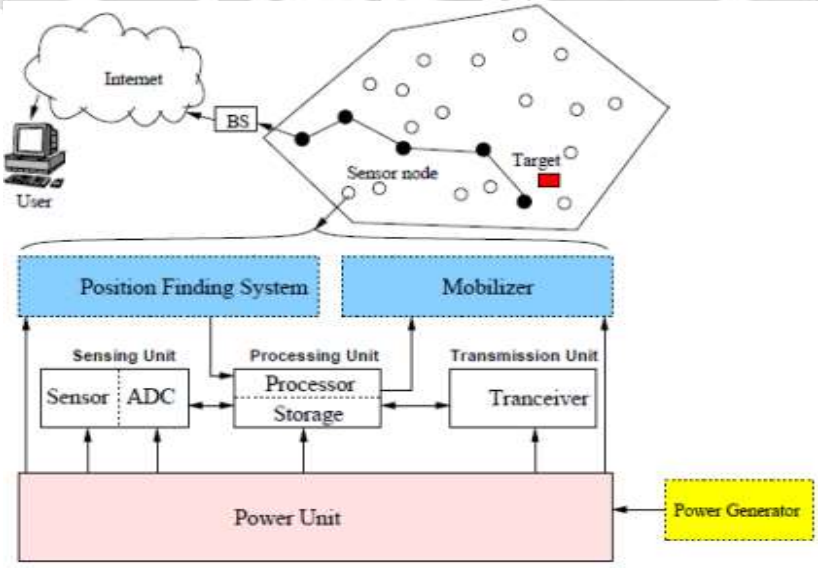

Fig 2: Typical multi-hop wireless sensor network

II. DESIGN CONSEQUENCES AND ROUTING/CONPUTING CHALLENGES IN WSN

The main aim of wireless sensor networks is to carry out data communication while attempting to extend the lifetime ofNetwork and prevent connectivity failure by utilizing appropriate energy management techniques. Routing in WSNs is very challenging due to underlying features that differentiate these networks from other wireless networks (mobile ad hocnetworks or cellular networks).

- Because of large number of nodes in these networks and the priority of overhead of ID maintenance, a globaladdressing scheme cannot be established for the formulation of sensor nodes, thus conventional IP based protocolscannot be employed.
- In comparison to other networks, all applications of sensor networks require the flow of sensed data from multiplesources to a particular BS but this does not prevent the flow of data to be in other forms.
- As sensor nodes are tightly stiffened in terms of energy, processing and storage capacities, therefore, they demandcareful resource management.
- In most of the applications, nodes in WSNs are generally stationary after deployment as compared to otherconventional wireless networks in which nodes are free to move, however resulting in unpredictable and frequenttopological changes. But some applications may permit some sensor nodes to move and change their location.
- Since data collection is normally based on the location, therefore, recognization of position of sensor nodes is veryimportant.
- As the data collected by many sensors in WSNs is based on common physical processes, hence there is a highprobability that this data has some redundancy.

A. Factors affecting the routing process in WSN□ Node deployment□ Energy consumption without losing accuracy□ Fault tolerance□Coverage□Connectivity□ Transmission media□Data aggregation□ Quality of service

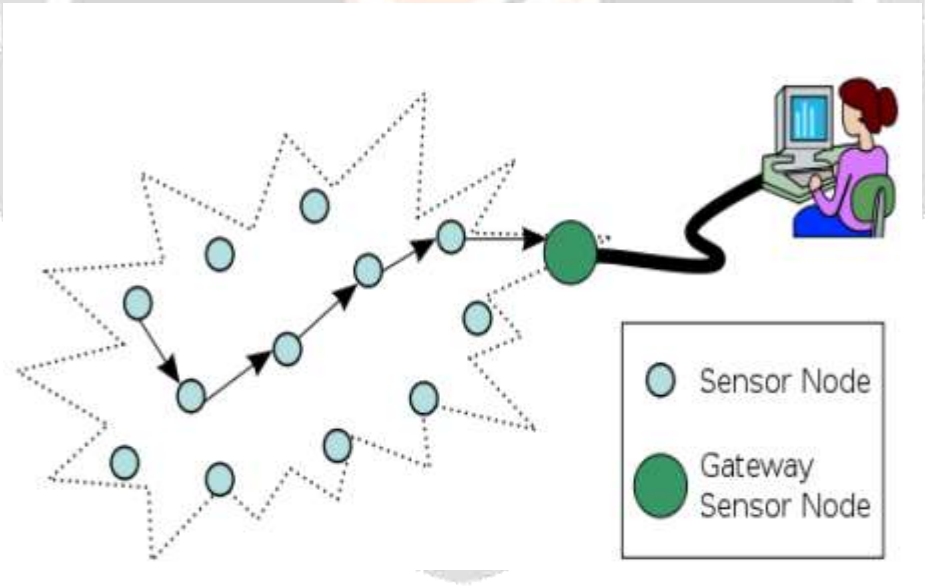

Fig 2. Typical multi-hop wireless sensor network

III. ROUTING STRATEGIES IN WSN

□ Proactive routing strategies: These strategies keep track on routing information of all the available paths even when these paths are not used but this routing strategy does not perform well when the network topologies are dynamically changing.□ Reactive routing strategy: This strategy of routing keeps track of only those routes which are currently in use. But this method may generate a significant amount of traffic when network topology changes frequently due to device mobility or alternating energy conserving sleep cycles.Routing in wireless sensor networks differs from conventional routing in various ways i.e. there is no infrastructure, wireless links

are unreliable, sensor nodes may fail, and routing protocols have to meet strict energy saving requirements. Routing algorithms can be classified as: Topology-based: Routing algorithms that perform an end-to-end message delivery with host-based addressing Position-based: If the destination is given by an ID or if destination is a geographic location itself. Data-centric: Data-centric routing is based on queries that are issued by the sink node to request data. These requests are not addressed to specific sensor nodes, but the sensor nodes that can deliver the requested data will answer the query.

IV.ROUTING ALGOERITHEMS

An Energy Efficient Secure Routing Protocol is developed to efficiently utilizing the energy in a secured manner. The proposed algorithm is used to remove the drawbacks of the previous algorithms and compare it with the already existing centralized hierarchical routing protocol. This algorithm extends the lifetime of the network and consumes less energy. Additionally itdetects the presence of any malicious nodes in the network. The algorithm demonstrates the change of states undergoing in the network and how the energy level of each node changes with time. It shows the number of nodes dead in each round and energyconsumed in each round. The proposed algorithm is asfollows.

A. EESRP Algorithm

1) Phase 1: Initiation Phase

1) Initialize Simulation Parameters.
2) Create 'n' nodes at random locations within the WSN network area and sink at midpoint of the field.
3) Find optimum distance of a node. (Efs and Emp are Transit amplifier types.
do=sqrt(Efs/Emp);
4) Find maximum rows and maximum columns in the network field.
cols= width/do;
rows=height/do; 5)
Define cols*rows clusters in the shape of a grid and find center point of each cluster and assign cluster number on each
node based on its position on field.
6) Repeat steps 7 to 12, rmax times (maximum rounds).

2) Phase 2: CH Selection Phase

7) Find average energy of each cluster.
8) Find node in each cluster having energy greater than average energy and which is at nearest average distance from other
nodes of the cluster. Designate this as a cluster head.
9) Choose a random set of nodes in network to participate in current round. Find sets of all cluster heads of these nodes.
Find cluster heads lying between each of these heads and base station.

3) Phase 3: Attacker Node Detection Phase

10) Send a check packet from each node to its cluster head and then from cluster head to intermediately cluster heads
between itself and base station. The Receiver node send check packet back to receiver.
11) If check packet is not returned then node sends the information of the cluster head being a faulty node to all the
neighbouring nodes in its cluster.

4) Phase 4: Energy Dissipation Phase

12) Reduce Energy of each participating node and participating cluster heads. Check for Nodes with, E<=0. Plot these
nodes as dead nodes.
13) Plot number of nodes dead in each round versus number of rounds.
14) Plot energy dissipated each round to round.

V.COMPARATIVE RESULTS ANALYSIS

A. Performance Evaluation The simulation results are shown in the form of tables and various comparison graphs. The comparison is made between number of nodes and number of rounds. Table 1.2 shows the comparison between the proposed scheme (EESRP) and EECHSscheme. Here number of rounds in which different percentage of node is dead. Here initial energy is taken as 0.05 Joule.

Table 1.1: Showing different parameters of this proposed system(EESRP scheme)

Sensor Network Dimension	100 x 100 sq. mt.
Base Station Location	50,50
Initial Sensor Energy	0.05
Transmission Power(etx)	50x10-9 Joule
Reception Power(erx)	50x10-9 Joule
Sleep Power(efs)	1x10-12 Joule
Amplification Power (EMP)	1.3x10-5 Joule
Data Aggregation Energy (EDA)	5x10-9 Joule
Number of Rounds	500
Number of Nodes	100

Table 1.2: Number of rounds different percentage of Nodes is dead

% age of node dead	EECHS	EESRP
1%	40	46
20%	65	93
50%	106	139
100%	137	170

1) Graph 1: This graph 1.1 shows the comparison between the number of nodes dead in each round both with the existingmsystem and the proposed one. It is clearly seen that the proposed systemshows better result.

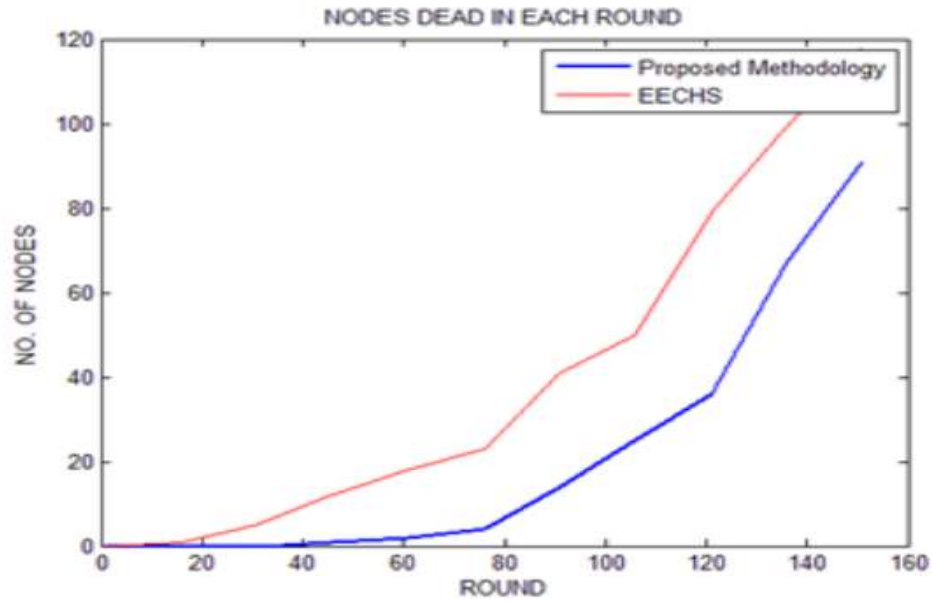

Fig. 3 : Graph 1.1 Comparison of number of nodes dead in each round.

VI. CONCLUSION

In the future, this wide range of application areas will make sensor networks an integral part of our lives. Realization of sensor networks needs to satisfy the constraints introduced by factors such as fault tolerance, scalability, cost, hardware, topology change, environment and power consumption. Since these constraints are highly stringent and specific for sensor networks, new wireless ad - hoc networking techniques are required. Routing in sensor networks has attracted lot of attention in the recent years and introduced unique challenges compared to traditional data routing in wired networks. An interesting issue for routing protocols is the consideration of node mobility. Most of the current protocols assume that the sensor nodes and the sink are stationary. However, there might be situations such as battle environments where the s ink and possibly the sensor need to be mobile. Ne w routing algorithms such as TTDD (Two – Tier Data Dissemination Model for Large-scale Wireless Sensor Networks) are needed in order to handle the overhead of mobility and topology changes in such energy constrained environment. Although many routing protocols have been proposed in WSNs, many issues still exist and there are still many challenges that need to be solved in the sensor networks. The following parts describe some of those issues and challenges: How to effectively utilize the bandwidth and energy for energy application

- To make sensor nodes self- organizing and self- reconfigurable
- To make routing protocols secure in WSNs
- To satisfy dense sensor networks with a large number of nodes.

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