

Routing Protocols

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Abstract— Wireless sensor are scarce resource so therefore Various Algorithms are there which are described in this paper. This paper contains algorithms which are location based ,hierarchical, data centric etc.

Index Terms— Cluster Head, Wireless Network.

I. INTRODUCTION

A sensor network is defined as composition of a large number of low cost, low power multi functional sensor nodes which are highly distributed . These nodes which are very small in size consist of sensing, data processing and communicating components. The position of these tiny nodes need not be absolute, this not only gives random placement but also means that protocols of sensor network and its algorithms must possess self organizing abilities in inaccessible areas. However nodes are constrained in energy supply and bandwidth, one of the most important constraints on sensor nodes are the low power consumption requirement. These constraints combined with a specific deployment of large number of nodes have posed various challenges to the design and management of networks .These challenges necessitates energy awareness at all layers of networking protocol stack. The issues related to physical and link layers generally common for all kind of sensor applications, therefore the research on these areas has been focused on system level power awareness such as radio communication hardware, and energy aware MAC protocols. At the network layer, the main aim is to find ways of energy –efficient route setup and reliable relaying of data from sensor nodes to the sink so that lifetime of the network is maximized. Sensor nodes carries irreplaceable power source.

Many protocol and algorithms have been proposed for traditional wireless hoc networking techniques. The main focus of sensor network protocol is primarily on power conservation.

II. LOCATION BASED PROTOCOLS

The knowledge of Location of nodes is significant in wireless sensor network and many routing protocols find distance between two sensor nodes and so that the energy consumption required by those nodes is estimated.

Geographic Adaptive Fidelity :-in this protocol the sensors have three states. In sleep state the node turns off its radio to conserve energy. In discovery the sensor node sends discovery message to learn about the sensors in the same grid. In the active state periodically the discovery message are send

inorder to inform the equivalent sensor about its state.

Bounded Vornoi Greedy Forwarding:- In the Vornoi diagram the sensors should be aware about their geographical positions. In Vornoi the next hops are one whose distance to destination is closest. The sensors which are eligible as next hops are the ones whose Vornoi regions are traversed by the line segment joining the source and destination. The data dissemination path between source and destination will make use of same chain of nodes. So the battery gets depleted as same set of node will be used every time. So energy is not taken as metric here.

Geographical Random Forwarding: In this all nodes are aware of their physical locations and location of the sink. When source node has sensed the data. Location. And if the channel is free to avoid collision, RTS message is send by the source sensor node to all its active neighbor node. Message contains location of sensor and that of sink. Note the coverage area facing the sink called as forwarding area is split into set of N_p regions of different priorities such that all points in the region with a higher priority are closer to sink than any point in a region with low priority. When nodes in neighboring side receive the RTS then they assess their priority to destination. Source waits for CTS from the node located in high priority region.

Geographic and Energy Aware Routing: In this GPS system is used for location awareness and that sensors are aware of their current locations and aware of residual energy of their neighbours and therefore selection of node is done and the packet is routed to the destination.

Coordination of Power Saving with Routing : SPAN is a routing protocol as its goal is to reduce energy consumption of the nodes. Although SPAN does not require that sensors know their location information, it runs well with a geographic forwarding protocol. When used with a geographic forwarding protocol, Span's election rule requires each sensor to advertise its status its neighbors and its coordinators. Furthermode when it receives a packet, a coordinator forwards the packet to a neighboring coordinator if any, which is the closest to the destination or to a non-coordinator that is closer to destination.

Trajectory based forwarding: In this source specify the trajectory and not path by hop basis. By the location specified the hop will make a greedy decision to a node which is near to the trajectory specified by the source node. It is unaffected by the mobility of sensor nodes. TBF is also used for multipath routing by specifying another trajectory. TBF can be used for implementing network functions such as flooding etc.

Minimum Energy Communication Network (MECN): In this protocol the sensor knows their location and a network is formulated by the sensor in randomly deployed sensors so that only minimum energy is consumed. Optimal tree is created which contains paths which consumes less power and

the tree is rooted at the sink. Graphs are there which itself contains which represents low power and cost which are associated is less one due to optimal paths from each sensor to sink.

Small Minimum- Energy Communication Network (SMECN): SMECN is a routing protocol where minimal graph is characterized with minimum energy property. In this for any pair of sensors there is a minimum energy path between them in the graph. In this a neighbor discovery message is transmitted to discover neighbor with initial power. As analytically the neighbours are calculated. Then a discovery message is transmitted with initial power p and checking is done that theoretically subset of sensor are equivalent to the discovery of neighbours by the discovery message. Then p power is used for communicating with immediate neighbours.

III. DATA CENTRIC PROTOCOLS

In this when the data is sent from source to destination then intermediate node performs some sort of aggregation to send the data of multiple sources to the sink node. There is power savings between the data transmission between multiple sources and sink.

Sensor Protocols For Information by Negotiation:-SPIN protocol computes energy for computing, sending and, receiving of packets. The data is send by first carrying out negotiation. There are two protocols are there one is SPIN-1 and SPIN-2.

SPIN-1 works with the transmission of data through point to point communication. SPIN-2 takes into consideration the residual energy of the sensors..

A. Directed Diffusion:

In directed diffusion sensing task is described by list of attribute value pairs. Sink specifies the low data rate for the incoming event and sink reinforce one sensor to send events with high data rate by resending the original interest message with a small interval. Likewise, if a neighboring sensor receives this interest message and finds that the sender's interest has a higher data rate than before, and this data rate is higher than that of any existing gradient, it will reinforce one or more of its neighbors.

B. Rumor Routing:

Rumour routing is concept based on agent which is based on long lived packet which is transmitted through the network and sensors are informed about the events learned during network traverse. Agents contains event list that contains event distance information and each entry of event list is the event and no. of hops that event is to that of currently visited sensor. Event update done by agent to maintain shortest distance to that of event. Event list of agent is synchronized with the event list of sensor.

C. Cougar:

The Cougar provides user and application program with declarative queries specified by the source sensor. There is query layer in the Cougar and sensor are associated with query proxy layer between application layer and network layer. Cougar use database and faces challenges and

completely distributed approaches need to be modified.

D. Active Query Forwarding in Sensor Networks (ACQUIRE):

ACQUIRE query (i.e., interest for named data) consists of several sub queries for which several simple responses are provided by several relevant sensors. Each sub-query is answered by some sensors on the path using a localized update mechanism. Unlike other query techniques, ACQUIRE allows the querier to inject a complex query into the network..

E. Energy-Aware Data-Centric Routing (EAD):

In this protocol broadcast tree spanning all sensor rooted node. the broadcast tree approximates optimal tree with minimum no. of leaves thus reducing the size of backbone formed by active sensors. The gateway plays the role of sink node whereas each node acts as data source and event source.

IV. HIERARCHICAL PROTOCOLS

Clustering is energy efficient protocol for the transmitting the sensed data to destination. The network is divided into several cluster of sensors and each cluster is managed by the node called as cluster head. Movement is from one node to another and between cluster heads.

A. (LEACH):

LEACH was proposed to reduce energy consumption. Direct communication is used to send data directly to base station by cluster head or sensors. LEACH is based on an aggregation for reducing the size of data. LEACH divides the a network into several cluster of sensors.. LEACH goes for rotation of Clusterhead and every sensor in cluster is given a chance to act as Cluster Head. Energy consumption between cluster head and sensor in cluster is reduced and also many of sensors are turned off.

B. Power-Efficient Gathering in Sensor Information Systems (PEGASIS):

PEGASIS is an power Efficient gathering sensor extension of the LEACH protocol, and forms a chain of nodes formed from greedy approach and in this one sensor will transmit data to the sink. The data is gathered and moves from node to node, aggregated and eventually sent to the base station. When a sensor fails then again greedy algorithm is used to form chain by bypassing failed sensor node and randomly chosen sensor will transmit data to sink node.

C. Hybrid, Energy-Efficient Distributed Clustering (HEED)

HEED HEED extends the basic scheme of LEECH by using residual energy, node density and node degree as a parameter for cluster selection. HEED was proposed with four primary and leaf nodes radio is turned off and all others are active nodes. Gateway node is

The clustering process within a constant number of iterations, (iii) minimizing control overhead, and (iv) producing well-distributed CHs and compact clusters. Two clustering parameters are used for periodically selecting CH. The first one is the residual energy of sensors and second

one is intra-cluster communication cost as a function of cluster density and node degree.

D. Threshold Sensitive Energy Efficient Sensor Network Protocol (TEEN)

It is a hierarchical protocol which groups the sensors into cluster and with each led by ClusterHead. The sensor reports their data to clusterhead and clusterhead sends data to higher level CH until data reaches to sink. In this closer sensors form cluster and this process remained till the base station is not reached.

E. Adaptive Periodic Threshold Sensitive Energy Efficient Sensor Network Protocol (APTEEN):

APTEEN goes in collecting reports periodically and reacting to time critical events. (LEACH) and reacting to time-critical events (TEEN). APTEEN is hybrid clustering protocol where sensed data go to the CH and change in their data is reacted and informed to the CH. APTEEN supports three different query types namely (i) historical query, to analyze past data values, (ii) one-time query, to take a snapshot view of the network; and (iii) persistent queries, to monitor an event for a period of time.

F. Energy Efficient Homogenous Clustering Algorithm for Wireless Sensor Network

It is proposed homogeneous clustering algorithm saves power and prolongs network life. With the homogeneous distribution of nodes in cluster span of the network is increased. A new cluster head is selected on the residual energy of existing sensor, holdback value and nearest node distance of node. The homogeneous algorithm makes sure that every node is either a cluster head or a member of one of the clusters in the wireless sensor network. Further, in the proposed protocol, only cluster heads broadcast cluster formation goals namely (i) prolonging the network lifetime (ii) terminating the every node. Hence, it prolongs the life of the sensor networks.

V. MOBILITY-BASED PROTOCOLS

Sink mobility requires energy efficient protocol that guarantee data delivery from source sensor to mobile sensor.

A. Joint Mobility and Routing Protocol:

A static sink suffers from depletion of powers from sensor heavily loaded with data and transmit to static sink. And the sensor nearby to that of sink are used as relay for data transmission to mobile sink. All sensors co-operated in this. By applying the shortest path routing strategy the load among the relay sensor is reduced if the sink moves in trajectory of concentric circles.

B. Data MULES Based Protocol: .

It is a three-tier architecture based on mobile entities, called mobile ubiquitous LAN extensions (MULE). The MULEs architecture has three main layers. The bottom layer contains static wireless sensors that sensed data from environment. The top layer includes WAN connected devices access point/central repositories and access point communicate with central repositories and dataware house repositories to analyse data and synchronize data and

acknowledgement is sent to the reliable data transmission sent by MULE. The middle layer has mobile entities (MULEs) that move in the sensor field and collect sensed data from the source sensors when in proximity deliver them to those access points when in closerange.

C. Scalable Energy-Efficient Asynchronous Dissemination (SEAD):

SEAD It contains three main components namely data dissemination tree construction, data dissemination and maintain linkage to mobile sensors. It is self-organizing protocol. Source sensor reports its sensed data to multiple mobile sinks. Every source sensor builds its data dissemination tree rooted at itself and all the dissemination trees for all the source sensors are message and not

D. Dynamic Proxy Tree-Based Data Dissemination:

A tree is maintained for connecting a source sensor to multiple sinks that are interested in the source. This helps the source disseminate its data directly to those mobile sinks. Some stationary sensors and several mobile hosts, called sinks are there in network. Targets search for data from specific sensors called as source and some sensor they tries to detect the targets. Sometimes due to target mobility the source change and the sensor near target becomes source. Each source is represented by a stationary source proxy and every target is represented by a stationary target proxy. These proxies change as the source change and target moves.

VI. MULTIPATH-BASED PROTOCOLS

Two routing paradigms: are there for transmitting data between source and destination sensor are:- single-path routing and multipath routing. In single-path routing, each sensor sends data to destination by the shortest path. In multipath routing, each source finds k shortest paths to sink and divide the load evenly between these paths.

A. Disjoint Paths:

It is a multipath routing protocol in which some alternate paths are formed which does not contain any sensor node in common in all paths. Disjoint paths are independent paths. There is a primary path which is desirable for routing. The sink determine neighbours which will provide quality of data to it with minimum delay.

B. Braided Paths:

It is partially disjoint path and not completely disjoint. In this from each node the best path from source to sink path is selected that does not contain that node is computed. Those alternate path are called as idealized braided multipath and the links on the alternate path are on or close geographically to that of primary path. Primary path is computed in this.

C. N-to-1 Multipath Discovery:

It is based on the flooding originated from the sink and is composed of two phases, namely, branch aware flooding and constructed separately phase.. Both phases use the same routing messages whose format is given by {mtype, mid, nid, bid, cst, path}, where mtype refers to the type of a message.

VII. HETEROGENEITY-BASED PROTOCOLS

In heterogeneity sensor network architecture, there are two types of sensors namely line powered which has no energy constraint and the battery powered sensors. Battery powered sensors have limited lifetime which uses their energy efficiently by minimizing the use of message communication and computation.

A. Information-Driven Sensor Query (IDSQ):

IDSQ In this heterogeneous sensors are used for maximizing information gain and reducing detection latency and energy consumption for target detection through dynamic sensor querying and data routing. It requires sensor communication which requires power. So in order to reduce power some subset of active sensor which contain useful information are involved and which sends information to some sensors. In IDSQ protocol, first step is to select a sensor as leader from the cluster of sensors. This leader will be responsible for selecting optimal sensors based on some information utility measure.

B. Cluster-Head Relay Routing (CHR):

CHR It uses two types of sensor to form heterogeneous network with one sink a large number of low end sensors denoted by L and small number of powerful high end sensor denoted by H sensors. L and H sensor are uniformly and randomly distributed CHR partition the network into groups of clusters where L sensors forms clusters which are led by H sensors. Data fusion is carried out in H sensors. L sensors are short range sensor and H are long range sensors. Data sent by L sensor is sent to H sensor and from there to other H sensor in another and this repeats till the data is reached to destination or sink.

VIII. QoS-BASED PROTOCOLS

In addition to minimizing energy consumption, it is *multipath extension of flooding* (or fault tolerance in routing in WSNs).

A. Sequential Assignment Routing (SAR):

It is a routing protocol which uses QoS in routing decisions. Routing decision in SAR is dependent on three factors: energy resources, QoS on each path, and the priority level of each packet. If topology changes due to path failure path recomputation is needed. Simulation results showed that SAR offers less power consumption than the minimum-energy metric algorithm, which focuses only the energy consumption of each packet without considering its priority.

FUTURE WORK

There is still lot of scope is there and new protocol will likely to come in future.

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