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Comparison Study of various WSN Routing Protocols

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ABSTRACT

To *accommodate mobility, node localization, low energy and other issues there are various solutions available in Wireless Sensor Network (WSN)domain. Our study mainly focuses on various protocols available for lees energy utilization and routing. This paper presents both positive and negative aspects of each of the protocols in our own perspective. We have tried to emphasise Data Centric routing. As we get more insight about routing, one can realize the need for routing based on the interests of the source and sink nodes, instead of just destination address based routing.*

I.INTRODUCTION

The main agenda of our survey is to study the behaviour of various protocols available in the Wireless Sensor domain which also includes cloud based WSNs[8] that can contribute to the improvement of overall lifecycle of the Sensor network. Therefore we will discussing about the protocols like- Reactive protocols, Link state routing protocols, proactive protocols ad mainly Data Centric routing protocols. Before understanding the behaviour of these protocols, let us consider the assumptions with which and ideal wireless sensor network will work: (i) Wireless sensor network works on radio links that support mobility.

(ii) Each node talks directly only to its neighbours and within the stipulated range.

(iii) Radio frequency range is defined by disk of radius 'r'.

(iii) The connectivity graph of the nodes can be modelled as a Unit Distance Graph of the nodes[1].

II.RELATED WORK

2.1. Proactive protocols: If we use Proactive protocols like- Distance Vector, it has to broadcast packets to all the nodes of the network, hence consumingmajor chunk of the available energy. Therefore this protocol is not ideally suited for sensor domain.

2.2.Link state routing protocols: When we use Link state type routing protocols, then it will broadcast packets only to its neighbouring nodes. Because of this, they converge slowly. Furthermore in wireless network setting, synchronization issues may arise if it undergoes topology changes due to mobility of nodes[1].

2.3. Fisheye State routing: To overcome the drawbacks of Link state type routing algorithms, one can use Fisheye state routing which actually reduces the Frequency of topology updates to distant parts of the network[12].

2.4. Reacting protocols: Reactive protocols are very much helpful in dynamically constructing the paths. Example: Dynamic Source Routing(DSR) , Adhoc On-Demand Distance Vector protocols, Low Energy Adaptive Clustering Hierarchy(LEACH) [3][4] etc.. These protocols consumes less energy compared to link-state routing protocols.

2.5. Data Centric Routing Protocols:

When we view network as a system from wireless sensor network perspective, for us what really matters is the information held or obtainable by nodes and not the nodes itself. As we know that the nodes are fragile objects that can be destroyed easily and, whatever the information that can be sensed from a node can also be sensed from another neighbouring node. This gives rise to data centric view of the network[2]. where routing decisions are made based on attributes and their relation to attributes of the packet content. Therefore information seekers & information senders are to be matched using the data attributes & not just network addresses. Examples of such attributes may include- a) Node's location

b) Node's type of sensors

c) A certain range of values in a certain type of sensed data.

To support this, we need a network that follow both push-pull model. i.e. a network must be a database that can be queried about the world state(Pull model) and also, an entity that can initiate an action whenever some event of interest is occurred(push model).

2.5.1.Attribute based routing:It is a type of data centric routing protocol. In attribute based routing, it is assumed that data is described using attribute-value pairs that characterize the information that a node holds or seeks. For example, if a node is assigned to look for flowers, based on its sensors readings. A that point, this node may generate an attribute-value event record of the following type:

type=flower //record type

instance=rose //instance of flower

location=[91,201] //location of rose

time=06:34:56 //capture time

Each line in this record is an attribute-value pair. A node seeking information about flowers in a certain region might create an information request record as shown below:

type=flower

instance=rose

rect=[0,200,0,200] //spacial range of interest

Now let us see some techniques aimed at allowing the network to identify which event records and information requests match and maintain communication paths between information source and destination points.

2.5.2. Directed Diffusion:Nodes that request information are called destination nodes and nodes that generate information are called source nodes. Records that indicate a desire for certain types of information viz. flowers are called Interests. Interests are propagated throughout the network, looking for nodes with matching event records.

Key to directed diffusion is the assumption that, interests are persistent [11]. i.e. if a source has relevant information to a destination node, then it is interested in repeated measurements from the source for some period of time. Every interest record contains an interval attribute field, indicating the frequency with which the destination node wishes to receive information from source node. The length of this communication helps the directed diffusion protocols to learn about good paths between source and destination, and amortize the cost of finding these paths over the period of use of the paths.

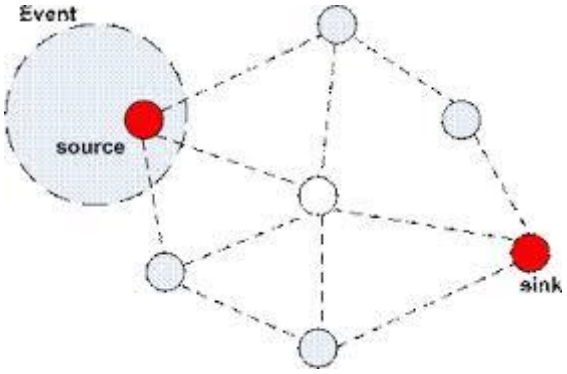

fig.1: The Directed Diffusion algorithm propagates interests from a destination, until an appropriate source is reached[1]

The drawback of this protocol is initial flooding of the network to discover good paths between information sources and information receivers (sink). But in case if the amount of information to be exchanged is small, then the quality of paths doesn't matter. In such cases an very good alternate approach is the Rumour routing[5].

2.5.3. Rumor routing protocol:Rumor routing is an WSN algorithm which uses lowenergy for routing, thus enhancing the network life. The main advantage of this algorithm is that, it is tunableand its efficiency depends on how well we can configure the parameters that are set for one event and query propagation in the network.

Here the routing is based on short hops between communication nodes. The number of short hops should be minimized. The main idea here is to create paths leading to each event when the event occurs. And later to route queries along these paths. To join the path the queries are sent randomly across the network. This algorithm handles node failure better than flooding based ones.

III. CONCLUSION

There are various protocols available in wireless sensor domain to address the routing issues. As we seen in this paper various protocols work well only under certain circumstances. But, as it is more meaningful to have a match making between information seekers and receivers, Data centric routing approaches such as- Attribute routing, Directed diffusion and Rumor routing looks promising as the later can handle node failure issues and overcomes some of the drawbacks of Directed diffusion protocol. Energy efficient Wireless Sensor concept can be further expanded to cloud platforms by making it more adaptive, using virtualization concept[7].

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