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Research Article

WIRELESS SENSOR NETWORKS AND ITS ROUTING ALGORITHMS

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ABSTRACT

Wireless Sensor Networks are most widely used in todays technology. The characteristics of these sensors are less energy possesing, very low memory and highly lowered processing power. For the purpose of routing in Wireless Sensor Networks many protocols have been designed to overcome the above mentioned characterize of this type of networks. In order to increase the network life-time is made, by special algorithm that takes into the Wireless Sensor Networks main restrictions such as energy and traffic congestion. This algorithm routes the packets through multiple paths available in a Wireless Sensor Network, based on the residual energy available at each node and keeping in mind the traffic through a specific route. The main idea is minimizing the energy consumed for each routing by choosing the node which has more energy than a threshold. This metric avoid unnecessarily overload some nodes and causing them to die prematurely. Multipath routing effectively reduces the frequency of route discovery therefore the need for finding another route is been gradually reduced when the present used route is broken. This paper aims to predict and avoid congestion. Also predicting the traffic reduces the delay time and this ensures queue processing overhead is reduced and hence energy is conserved, network lifetime is increased and packet delivery delay is reduced. Apart from this, when a node is common to different routes it is naturally flooded with packets from different nodes. Because of this the packets arriving late at this node may be dropped, delay of delivery of packets, reliability of delivery is affected, the node will run of energy and eventually die and the total network may come down.

Keywords: Wireless Sensor Networks, Energy aware routing, traffic aware routing, Radio Frequency, Nodes, Data Packets, Sensor Network Field.

INTRODUCTION

A wireless sensor network is a collection of nodes that are been well organized into a group of co-opearting network. Here each node consists of microcontrollers, may contain memory, have a RF transceiver with Omni-directional antenna, and have a power source[1]. They analysis or route the data received from the units attached to them. These networks have applicability in areas like habitat monitoring, medical care, military surveillance or traffic control[2]. Sensor nodes send the occurrence of an event to a sink node. Sink node then transmits the data over internet to the user[3]. The entire area covered by the collection of sensor nodes is called a sensor network field. Power consumption happens in a node when it finds route, sends data, acknowledges the requests or processes data. So using energy maximized protocols is dangerous for Wireless Sensor Networks (WSNs) because of the limitations on the sensor nodes' energy[4]. The routing protocol should be able to optimize the power utilization during transmission of data to the sink node. Sensor nodes can communicate with sink directly but it is always better to make the network adaptable so that when the network size is scaled up it will be easier to augment or decommission nodes at will without worrying too much about the communication between the nodes. This will be very much useful in case of networks in areas which are remote and not friendly for manual intervention[5].

CHARACTERISTICS OF A WSN

IN the past decade, the sensor-specific and service-oriented architectures became one of the important issues for the purpose of detecting, analysing, and managing the environmental information. Due to the vast growth of technology in Micro Electro Mechanical Systems usually called as MEMS, the base Integrated Circuit (IC) and signal Radio Frequency (RF), the network that is Wireless Sensor Network (WSN) has been widely used out in a various variety of surveillance and security applications such as environmental monitoring, smart home facility, natural detecting and ecological tracking, industrial engineering and construction quality control, land sliding prediction, etc. The

WSN is practically deployed to do sense phenomena, the gateway devices (the devices that is been used to connect) to process sensed data, and the back-end server to take actions according to applications of the ubiquitous network. Many studies has induced the routing algorithm and the localization capability of the WSN system for providing the optimal deployment strategy to collect sensor data. Most of algorithms used gives the correct function for this manner by commercial software or middleware and would be eventually implemented and it is been approved by the practical field of measurement. These WSN utilities mostly served relay transportation of identical type data to achieve specific tasks but it is still in lack of a gateway model that can filter diverse sensor data prior to the back-end server. In this detailed study, we designed a very comprehensive WSN gateway model for the purpose of environmental monitoring system that act as a bridge between the tiers of sensor nodes and the back-end server while processing and monitoring various sensed data[6].

ROUTING IN WSNS

Multichip routing is one of the most important requirements for WSN. Because of this, there is a huge amount of work on this topic. Internet and Mobile Adhoc Network routing techniques do not perform well in WSN. In case of internet networks, wired medium is used so it is more reliable and hence packet retransmissions due to error are less. But in WSNs, the error probability is more and hence the routing techniques of internet are not applicable[7].

Routing in WSNs can be divided into three types they are flat-based routing, hierarchical-based routing, and the last is location-based routing depending on the network structure. In case of flat-based routing, all the nodes here are been typically assigned to equal roles. A further classification criterion of the flat based routing is all about the usage of messages: Routing method is generally reffered as a single-path function, if there is only one single occurance of the message in the network at any time. The other strategies involved here can be classified as multi-path routing and partial flooding, depending on messages being forwarded to some neighbours in each routing step.

Multipath routing consists of three components: they are as follows first is route discovery, second is route maintenance and final is traffic allocation. Route discovery is the work of finding a route between two nodes. Route maintenance is to find the broken routes, and then repair them or find a new shortest route in the presence of a route failure. The main work of traffic allocation strategy is to find how the data will be analysed and sent. Then the data is distributed in the network with the available paths.

A. Common issues in WSN

Technically, sensor network nodes are restricted in order to energy supply, capability and communication bandwidth. To increase the lifetime of the available sensor nodes, designing efficient routing protocol is very critical. There are two very important criteria that should be added when designing an routing protocol for WSN. The level of power consumption at each stages should be maintained. The tolerance of different types of failures should be achieved[8].

Apart from this, when a node is common to different routes it is naturally flooded with packets from different nodes. Because of this the packets arriving late at this node may be dropped, delay of delivery of packets, reliability of delivery is affected, the node will run of energy and eventually die and the total network may come down.

These facts necessitate optimal use of energy of a node, routing the data packets is purely depended on the available traffic on all the available routes to destination.

B. Algorithm

The process of Data routing is very very critical in WSNs due to the communications range constraints. Therefore, it is preferable to forward the available packets from the collection area to the base station by multiple hops in order to reduce the SNs' energy consumption. In designing a routing protocol, the energy awareness has to be taken into consideration and checked such that the battery power is been utilized efficiently and correctly in order to increase the lifetime of both nodes and network.

When we avoid the frequent use of some nodes it helps us to stop the partitioning of WSN which reduces its life span. So the above proposed method ensures that the SNs will drain their batteries evenly across the network. The routing results from the adaptation of the conventional routing methods are not appropriate for wireless networks because of the resource limitation and frequently over changing topology. Because of these challenges new techniques must be adopted to cope with them.

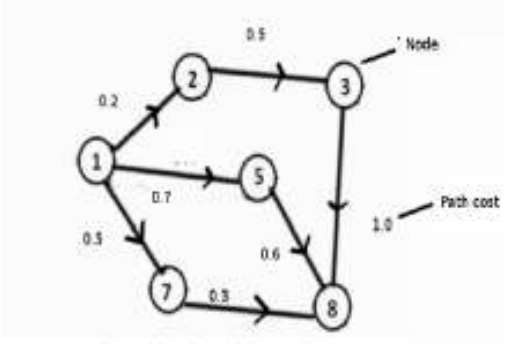

Fig. 1 Path selection based on route costs

Step 1: The sink node initiates the route construction phase by broadcasting route request packet to its neighbouring nodes.

Step 2: A node that receives the route request packet updates its routing table if its residual energy is above the threshold energy value and its hop count is greater than the RCON packet hop count.

Step 3: Then the node rebroadcasts the route request packet to its neighbouring nodes and sink node.

Step 4: The nodes with hop count value is less than the route request packet hop count and sink node discard the route request packet.

Step 5: The nodes hop count value is greater than the received route request packet hop count receive the route request packet.

Step 6:In data transmission phase, the primary path is chosen from the available node disjoint multiple paths between source and destination based on maximum Path Cost (PC).

Step 7: Every node in the path finds its cost. If node cost is low, then the capability of handling the data traffic by that

node is very less because it will have high rate of energy consumption, or lower residual energy.

Step 8: The least value of all the node costs is calculated and is taken as the cost of the path.

Step 9: Primary path is chosen which the maximum path has cost. This path can handle maximum data traffic and is a more reliable path among the node disjoint paths.

Step 10: When a node is flooded with traffic each node checks if it reached the threshold of it queue length. If the queue length is alarmingly high, it sends a broadcast t all other nodes in the vicinity to avoid sending the packets for routing.

Then neighbouring nodes will adjust the route tables. This will bring down the traffic through the affected node. In the Figure 1, there are three paths available from node 1 to node 8. Path 1->2->3->8 has cost 0.2, path 1->5->8 has cost 0.6, and path 1 -> 7 -> 8 has cost 0.3.

Assuming that the congestion is not there in any of the nodes, the path with maximum path cost is chosen which 1 -> 5 -> 8 is. If congestion is there in any other nodes chosen, an alternate path with lesser congestion will be chosen.

C. Assumptions for the algorithm

Network is static. Energy consumption at the receiver and at the unintended receiver nodes that overhear the transmission is not included.

Each sensor node has a fixed transmission range R. Multiple paths are available between the sources and sink node in the network. The source node selects the node-disjoint paths between the source and destination to route the sensed data to the sink node.

All network nodes generate packets periodically with a common constant period, the transmission range and transmission power is always seen to be constant for all transmissions from all nodes, and all nodes have the same initial battery level.

D. Implementing the routing algorithm in NS2

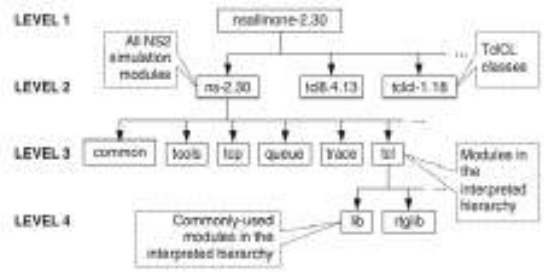

Fig. 2 NS2 directory structure

Figure 2 shows the directory structure and various layers in NS2. The levels show the layering of communication between the different modules of NS2. If we need to change a routing protocol most of the work will be in the Level 3. In the NS2 directory we have to create the directory for our routing and we keep our source files there. Source for the routing algorithm, packet type are the files to be added for the new protocol. Mostly we need to modify or replace the following files if we need to implement a new protocol.

CONCLUSION

The energy, lifetime can be reduced and delay of data packets arrival can be reduced when the algorithm is implemented in the routing agent.

REFERENCES

1. Deepak Ganesan, Ramesh Govindan, Scott Shenker, Deborah Estrin Highly-Resilient, Energy-Efficient Multipath Routing in WirelessSensor Networks Mobile Computing and Communications Review, Volume-1, Number 2.
2. Onur Yilmaz and Kalyan Erciyes Distributed Weighted Node Shortest Path Routing for Wireless SensorNetworks Mobile Computing and Communications Review, Volume -11, Number- 2.
3. Farhana Zabin, Sudip Misra, Isaac Woungang A Power-Aware Routing Scheme for Wireless Sensor Networks 7thWSEAS International Conference on APPLIED COMPUTERSCIENCE, Venice, Italy, November 21-23, 2007.
4. http://www.ns2ultimate.com.
5. http://www.mathcs.emory.edu.
6. Maleq Khan , Gopal Pandurangan , Bharat Bhargava .Energy-Efficient Routing Schemes for Wireless Sensor Networks , Mobile Computing and Communications Review, Volume-10, Number-12.
7. Monica R Mundada, SavanKiran , Shivanand Khobanna, Raja Nahusha Varsha and Seira AnnGeorge1 A Study On Energy Efficient Routing Protocols Inwireless Sensor Networks ,International Journal of Distributed and Parallel Systems(IJDPS) May 2012 Volume-3.
8. Giljae Lee, Jonguk Kong, Minsun Lee, and Okhwan Byeon, A Cluster-Based Energy-Efficient Routing Protocol without LocationInformation for Sensor Networks Giljae Lee, International Journal of Information Processing Systems Volume-1, Number-1.

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