International Journal For Technological Research In Engineering
Volume 3, Issue 10, June-2016 *ISSN (Online): 2347 - 4718*

REAL TIME SUPPORT AND ENERGY EFFICIENCY IN WSN

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ABSTRACT: The main motive of this research is to study Wireless sensors nodes are made up of small electronic devices which are capable of sensing, computing and transmitting data from harsh physical environments like a surveillance field.. Communication protocols can be designed to make efficient utilization of energy resources of a sensor node and to obtain real time functionality. A set of previously reported routing and MAC (Medium Access Control) layer protocols has abilities to achieve energy efficiency and supports real-time functionality.
Keywords: WSN, LEACH, PEGASIS, SPIN, GAR, GAF, MECN, SAR, SPEED

I. INTRODUCTION

1.1. WIRELESS SENSOR NETWORK

Today, wireless sensor networks are widely used in the commercial and industrial areas such as for e.g. environmental monitoring, habitat monitoring, healthcare, process monitoring and surveillance. For example, in a military area, we can use wireless sensor networks to monitor an activity. If an event is triggered, these sensor nodes sense it and send the information to the base station (called sink) by communicating with other nodes. A Wireless sensor network is composed of tens to thousands of sensor nodes which are densely deployed in a sensor field and have the capability to collect data and route data back to its Base Station(BS) through Cluster Head(CH). Wireless Sensor Network is used in different application now a days [1], such as detecting and tanks on a battlefield, measuring traffic flow on roads, measuring humidity and other factors in fields, tracking in buildings. Sensors nodes consists of sensing unit, processing unit, and power unit. The "many tiny" principle: wireless networks of thousands of inexpensive miniature devices capable of computation, communication and sensing A WSN application there are two types of nodes: source node – the node which actually sense and collect data – and sink node – the node to which the collected data is sent. The sinks can be part of the network or outside the wireless sensor networks. Usually, there is great number of source nodes than sink nodes. Therefore the two disciple sensor network and data mining can be combined. Knowledge from sensor data is important.Clustering of sensory data act as a nucleus job of data mining in Knowledge Discovery in Database.

1.2 CHALLENGES FOR WSN

The purpose of this paper is to find protocols that are energy efficient and support real-time traffic for environments like habitat monitoring or area surveillance. Wireless sensor nodes which are battery operated are used for detecting and collecting information from the areas where there is very little scope for manual handling to recharge or change batteries. These sensing nodes collect the information and pass them on to the network towards the sink for further actions. For a better functioning and a longer lifetime for a sensing node within the network, we need to consider its energy consumption as a major factor of concern.

Node Distribution: Higher-capability mobile robots may be dispatched to gather more accurate temperature or humidity readings Node distribution [placed and gathered data is transmitted through predefined areas. The sensor nodes are distributed over the area of interest randomly thus] in WSNs is either deterministic or self-organizing and application based. The uniformity of the cluster head directly affects the performance of the routing protocol used for this network. In case of deterministic node distribution, the sensor nodes are differently creating an infrastructure in an ad hocmanner. Each sensor node consists of four major components: sensor, processing unit, power unit and transceiver.

Energy Awareness: Every node uses some energy for activities like sensing, processing, storage and transmission. A node in the network should know how much energy will be utilized to perform a new task that is submitted, the amount of energy that is dissipated can vary from high, moderate to low depending upon the type of functionality or activity it has to perform.

Energy efficiency: The sensor nodes in WSNs have minimum energy and they use their energy for communication and sensing, so energy consumption is an important point in WSNs. According to various routing protocols nodes take part in data fusion and expend more energy. In this regard, direct communication is efficient. Since most of the times sensor nodes are distributed randomly, multi-hop routing is preferable.

Synchronization: When sensors nodes in a network ensure that the receiving end can recognize the data that is transmitted at the other end in the exact order it is sent, this is known as synchronization between two nodes where the flow of data and receiving is done at the same rate. The node needs to have same notion of time in order to go to sleep and wake up at the same time.

Control Packet: A packet which is sent before the transmission between two nodes is known as control packet. Control packet contains the number of data bits sent, the address of the destination node and certain flags which can avoid collisions during transmission.

Data Fusion: Data fusion [2] is a process of combining of data from different sources according to some function. This is achieved by signal processing methods. This technique is used by some routing protocols for energy efficiency and data transfer optimization.

II. RELATED STUDY

The current interest in wireless sensor networks has led to the emergence of many application oriented protocols of which LEACH is the most aspiring and widely used protocol [3].LEACH can be described as a combination of a cluster-based architecture and multi-hop routing. The term cluster-based can be explained by the fact that sensors using the LEACH protocol functions are based on cluster heads and cluster members. Multi-hop routing is used for inter-cluster communication with cluster heads and base stations. Simulation results shown in [4] that multi-hop routing consumes less energy when compared to direct transmission.

The key idea in using PEGASIS is that it uses all the nodes to transmit or receive with its neighbour nodes. All the nodes which collect the data fuse it with the data received by the neighbour node and transmit it to the next-nearest neighbour. In this way all the nodes receive and fuse their data, and pass it to the next neighbour in a chain format till they all reach the base station. Every node in the network takes turns as a leader of the chain and the one responsible to transmit the whole fused data collected by the chain of nodes to the base station [5].Only the first node in the chain have nothing to fuse except the data it has during the chain formation, the remaining nodes all have some data to append with the received data from other nodes [5]. The motivation behind developing SPIN is due to the dissemination of data. Dissemination is the process of collecting the observations of the whole set of individual sensors which are deployed in the network, where all sensors are treated as sink nodes. The work assigned to these sensors is to collect the complete view of the environment in the form of data, and enhance a fault-tolerant network structure.

Energy consumption both during computation and communication must be controlled to extend the life time of the sensors within the network. A few drawbacks in the sophisticated protocols like implosion, overlapping and resource blindness have led to the development of SPIN [6]. Sensor networks are usually largely composed of deployed sensor nodes in a vast area which are scattered randomly in order to gather all sorts of data on an event that is triggered. The major disadvantage to these randomly-scattered sensor nodes in a particular application like surveillance is that they are unattended. Because of this energy has become a major issue of concern as the sensor nodes cannot be replaced or replenished at regular intervals.

In Real Time Support and Energy Efficiency in WSN applications like surveillance it would be far better if we know the exact position of the sensors in order to locate particular information of events like tracking movements of armed vehicles during night time or on a foggy day. We need to have an efficient query processing within the network so that we can disseminate a query to a particular region, for which location knowledge is a must. Scalable Location Update Routing Protocol which uses a scheme that has the complete knowledge of the route path i.e. is it has perfect information of the location of all the nodes in the networks using which it destines the packets to reach a particular source or destination in a predescribed path [7]. MECN [8] constructs a minimum energy efficient communication network with the nodes for a wireless sensor network. All the nodes in the network have the knowledge of their neighbouring nodes. MECN constructs a small relay region in the surroundings of the node and starts transmission of data to a particular destination node using the intermediate nodes as relay nodes.

SAR is the first of its kind which concentrates more on the energy efficiency and QoS factors. Creating multiple paths from the nodes to the sink helps in achieving a more energy efficient structure and also maximizes the fault tolerance of the network. The SPEED protocol has different components which control the network adaptation layer to avoid traffic congestions, and route data packets safely through the MAC layer.

When SPEED is evaluated using glmosim [9] it is found that it provides end-to-end delay of packets which is independent of the distance between the source and destination for different congestion levels with a low miss ratio when compared with conventional ad-hoc routing protocols like AOVD [10] and DSR [11], a low and controlled overhead, less energy conserved during communication and high packet delivery ration even in high traffic density. It helps in balancing the traffic load to increase the system lifetime [12]

1) Application API and Packet Format
2) A delay estimation exchange scheme
3) A Non deterministic Geographic Forwarding Algorithm (NGF)
4) A Neighbourhood Feedback Loop (NFL)
5) Backpressure Rerouting
6) Last mile processing

III. CONCLUSION

Some distinct characteristics of WSNs such as large node density, unattended operation mode, high dynamicity and severe resource constraints pose a number of design challenges on sensor data-gathering schemes. Many research activities have been studied on the research issue. Since the fundamental task of WSN is to gather data efficiently with less resource consumption, to address the problem, there are two threads of research to improve the performance of data collecting: optimized data-gathering schemes and mobile collector assisted data-gathering in WSNs. Most data-gathering algorithms aim to prolong lifetime with some optimized schemes. An evaluation is done on all the protocols depending upon their operation using the sensor nodes in the network. Table-I shows the operability of protocols with regard to Latency, Scalability, Mobility and Energy Awareness. Each protocol is also given a paragraph below to motivate the table entries.

Characteristics / *Protocols*	Latency	Scalability	Connectivity Adaptation	Energy Awareness		
				Low	Moderate	High
LEECH	*Low when the network is small*	*High*	*Cluster heads lead the transmission*	*High uses clustering technique to save energy*		
PEGASIS	*High, if network density is high*	*High*	*Single node of the chain is responsible in transmission*	*High it forms chain using nodes to reach the base station*		
SPIN	*Moderate if the network is large*	*Moderate*	*Data shared with interested nodes, to reach sink*	*Moderate, The nodes which have energy resources only take part in transmission*		
GEAR	*Moderate, Checks for drained nodes*	*Moderate*	*Calculates the least cost paths to reach sink*	*Moderate, same path used until new path is calculated*		
GAF	*Moderate, uses limited nodes*	*High*	*One node from the grid is used remaining go to sleep state*	*High, Node use sleep, discovery, awake states*		
MECN	*Moderate, few edges in the relay region*	*Low*	*Relay nodes are used to reach the sink*	*Moderate, constructs sparse graph for every transmission*		
SAR	*Low, Multi path exists*	*Moderate*	*Tree is designed from sink to nodes*	*High, calculates the best path and does not deplete all the nodes in network*		
SPEED	*Low, always tries to reduce congestions*	*Moderate*	*Paths are built using least cost algorithms*	*High, Always uses multiple paths to transmit data,*		

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