

Research Article

# Enhance the Lifetime of Wireless Sensor Network using the Concept of Local and Global Query

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## Abstract

Wireless Sensor Networks consists of large number of sensor nodes. The sensor nodes are basically the battery powered devices. These devices are used to communicate with each other. The devices use the wireless medium to communicate. The sensor nodes are consumed the energy during the each data transmission. In our work the main aim of the WSN is to reduce the power consumption of sensor nodes. For this purpose caching is used, by the use of caching the power consumption in the WSN will be minimized. in the caching technique, sink is located inside the sensing region. It is used to send the queries to sensor nodes. The sensor nodes collect the data about various queries and send back to sink. To make data access faster it utilizes the benefits of caching because in WSN sensor nodes consume less power during processing as compare to data transmission. This paper is based on caching, it present global cluster cooperation schema for wireless sensor networks. Caching can reduce overall network traffic and energy consumption in WSN. In this paper uni casting technique is used because sink node stores the location of cache node and direct link is established between sink and cache node. Hence it improves the lifetime of sensor node's batteries.

**Keywords:** WSN, Sensor nodes, energy consumption, Caching, Multi sink.

## 1. Introduction

A wireless network is the collection of mobile nodes without the requirement of any centralized access point. Now a days, wireless networking is used for the commercial uses and it becomes the newly trend to adapt the wireless networks. There are the many applications for the wireless networks as it lies in the military, tactical and other security sensitive operations. Secure routing is an important issue in the routing applications. The wireless network uses the communication protocols and it uses the air through the operation of the communication protocols (Tarique Haider *et al.*, 2009). In the WSN, sink is used to inject the queries into the sensor field and sensor nodes are use to sense the event which is occurred in the field and give respond to that query. Sensor node consists of four units they are sensing unit, processing unit, Transceiver unit and power management unit. In the WSN Analog to digital converter is used. The sensor nodes are produced the analog signals hence these signals are converted to digital signals by the use of ADC. After that the digital signal is result in the form of processing unit. The processing unit is use to assign the sensing tasks to the various nodes. The processing unit is generally the small storage unit. It is used to manage the various tasks that are helpful in producing the sensor nodes. The transceiver unit is helpful in connect the nodes to the network. The other component of the sensor node is power unit (Naveen

Chauhan *et al.*, 2012). The power unit is helpful in saving the power consumption in the network.

The sensor nodes communicate through a wireless medium like radio frequencies, infrared or any other medium, which is having no wired connection. Node gathers the data and transfer to sink.

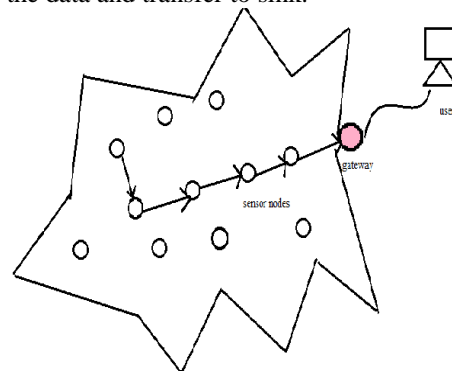


Fig 1: Wireless sensor network

The sink may connect to the outside world through internet. Sink collects the data from the source node and transfer to the user who requested the data. The sink may also be an individual user who needs the desired information.

The main drawback of the wireless sensor network is the battery lifetime of the network. When the data transmission is occur in the network, the battery power is consumed. So, in this type of network, we should focus on the optimized energy consumption.

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The caching technique is used for this purpose. In the caching technique, it is a technique which provides faster data access in any computing system. It also stores data to be needed in future. Clustering is also used for load balancing and to reduce traffic from network. Clustering consist groups of sensor nodes. Every cluster consist cluster head which controls all other sensor nodes.

## 2. Related Work

For the energy optimization in the WSN, many techniques are used. One of the techniques that is used for the WSN is the routing. Routing is used for efficient utilization of energy. With the help of routing the best path from source to sink is chosen which helps to reduce the traffic from network and increase the overall lifetime of network (Tarique Haider *et al*, 2009).

WSN is the network, in which the nodes are densely deployed. In the WSN the nodes are uniformly distributed in the sensing field. A mobile sink is injected here, which is used for Query packets and routed to the specific area moving through the sensing field. Then the corresponding Response packet is returned to the mobile sink via multi-hop communication. Due to the mobility of the sink, the Query and Response should have different routes which reduce the collision and traffic and power consumption (Yimin Chen *et al*, 2008).

Wireless sensor networks consist of large number of sensor nodes which collects the information from different environmental phenomena and sending to the base station which is called Sink. The sensors are having some faults like maintaining the network in proper functionality. In this paper, the proposed method is used to enhance the lifetime of Wireless Sensor Network. For this purpose we use the concept of local and global query for recovering lost packets.

Due to the limited energy resource, energy efficient operation of sensor nodes is a key issue in wireless sensor networks. In proposed scheme for wireless sensor networks, it involves the reduction of the energy consumption and also it increases the life of the network as much as possible. For this the energy awareness is very important in every aspect either in case of design or operation. Hence it ensures that the energy awareness is helpful in communicate sensor nodes throughout the whole network. It ensures sharing of data among various nodes reduces the number of communications over the wireless channels and thus enhances the overall lifetime of a wireless sensor network (Narottam Chand *et al*, 2012).

For improving WSN's energy efficiency that already uses an energy efficient data routing protocol the proposed improvements are ,data negotiation in which active sensor sends its sensed data only when the data changes, development of data change expectancy in which a sensor develops the expectancy of when its sensed data might change, and data vanishing, duplicate sensed data from multiple sensors are discarded while routed to the base station(Md Ashiqur Rahman *et al*, 2008).

The battery resource of the sensor nodes should be managed efficiently, to increase network lifetime in wireless sensor networks, multiple sink nodes should be

deployed with time constraint that states the minimum required operational time for the sensor network which increases the manageability and reduce the energy consumption of each node (E. Ilker Oyman *et al*, 2004).

Large numbers of queries are issued by sinks to fetch the data about events and need caching to improve its data retrieval capability. To overcome limited storage of a sensor node, the proposed work uses the local and global query is used. it helps to enhance the network lifetime(T.P. Sharma *et al*, 2008).

It injects the query into the Network and sensor nodes responds to the query and the traffic depends on number of queries generated per mean time(Ms Manisha Rana *et al*, 2012) .

## 3. Performance of WSN using Local and Global Query

In Wireless Sensor Network sensor node having information about query then it replies to sink otherwise it floods the query to the other nodes.

The sensor node will reply to the sink node through some routing protocol. A sensor node also combines number of replies to a single response which saves the number of packets to send back to the sink node. If the wireless sensor network consists of multiple sinks and two different users generates same query in to network for such a scene each sink will choose its own path to the source node which increase the traffic into the network and consume more power. But sensor network has limited battery power. So for handling such issues we use queries. Two types of Query techniques are used here

- Local
- Global

In WSN, it is used to store event information into sensor node. Query techniques can be improving the energy efficiency in Wireless Sensor Networks. Retrieving data directly from source node consume large amount of power and it can be reduced by using query optimization techniques(Naveen Chauhan *et al*, 2012). It also reduces unnecessary load from the network.

In the WSN, we choose any node which is near to sink and use it to store information. This node is known as Immediate Dissemination Node (IDN) and the node who sense the data is called source Dissemination Node (SDN) and all the other nodes in path between IDN and SDN are called Dissemination Nodes (DN). The query optimization is reduces inter-node transmission and delay in fetching the data items.

After that it passes data to its Immediate Dissemination Node (IDN) and When IDNs local memory is full, it utilizes one of its neighbor nodes memories and when it full it moves to next node from the memory zone of IDN. There is an associated TTL (Time to Live) value with each data item which discards the corrupted data packets. So by using query optimization information is stored near to the sink which decrease unnecessary traffic from the sensor network and increase its battery lifetime.

For enhancing the energy levels in WSN nodes by saving energy using concept of multi sink scenario. We will use Wi-max to communicate in between two Sink nodes to pass its data. Local query are those which is

generated within the TTL (time to live) period of the data taken by any randomly selected source and placed in cache layer nearby the sink to use in future.

If query generated by any source and that source is very much far away from first sink but nearby second sink then we will use the concept of global query, here second sink will take data through valid routing algorithm and will pass same data to first sink using Wi Max concept and also saves data in its caching layer too for future use. Hence, energy consumption can be reduced.

#### 4. Results

Here to show enhancement we did two implementations in which one is having energy loss problem and the another is having our proposed schema. The comparison is done on the basis of throughput and energy parameters and the results are shown below:

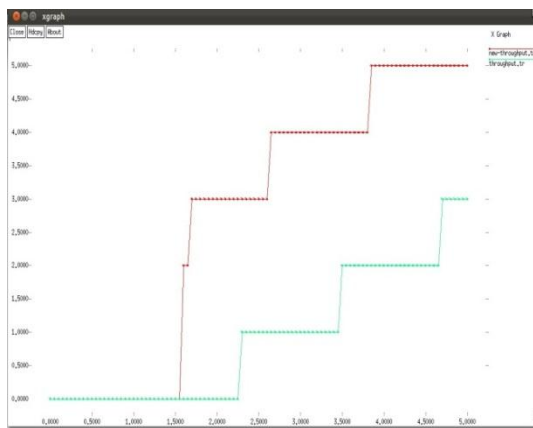


Fig 2: Throughput Graph

This graph represents the throughput comparison between both scenarios. Here green curve shows the throughput for old scheme and red curve shows throughput for our new proposed schema.

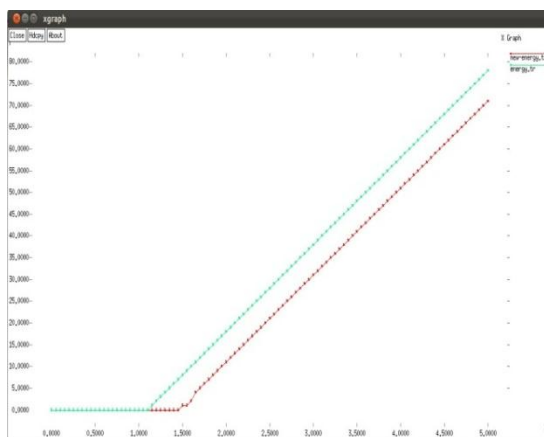


Fig 3: Energy graph

This graph represents the energy consumption comparison between both scenarios. Here green curve shows the energy consumed in previous scheme and red curve shows energy consumed in our proposed scheme and it's clear from graph that in new proposed scenario consumes less energy as compare to previous one in same time and for same transmission.

#### Conclusions

In this paper, we have discussed the local and global query optimization techniques that use to improve the performance of the Wireless Sensor Networks. By query optimization technique, we can balance the load to all nodes in network and can make WSN energy efficient. The proposed works is shown to perform well if applied practically in real world scenario under particular situations by the means of proper simulations. These schemes store the event information near to the sink node and reduce the traffic from the network and extend the battery lifetime of the nodes.

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