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Review paper on Cluster Based Caching Technique for Wireless Sensor Networks with multi-sink

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Abstract: *Wireless Sensor Networks (WSN) consists of large number of sensor nodes. The sensor nodes are battery powered devices, they communicate over a wireless medium and consumes energy during data transmission. The main task in WSN is to reduce power consumption of sensor nodes. It is possible by caching the data to minimize power consumption in WSN. In caching, sink is located inside the sensing region and it sends the queries to sensor nodes. Sensor nodes collect the data about queries and send back to sink. Cooperative caching reduces the situations like non availability of data, energy consumption, by storing the event information in the cache memory of nodes. 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 (GCCS) for wireless sensor networks. Caching can reduce overall network traffic and energy consumption in WSN. In this paper unicasting 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: *WSNs, Sensor nodes, Cooperative Caching, Multi-sink*

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1. INTRODUCTION

Wireless sensor network consists of number of sensor nodes which are deployed in the region of interest. Sink is used to inject 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, Tran-receiver unit and power management unit. Sensor unit consists sensor which is used to sense the changes in the environment, processing unit consists ADC which convert analog signal to digital signal and storage, and transreceiver unit consists transmitter which is used to transfer the data to next node. These three units are connected with power unit. All the sensor nodes are battery driven devices so the power management unit is very important issue in the wireless sensor 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 as sink.

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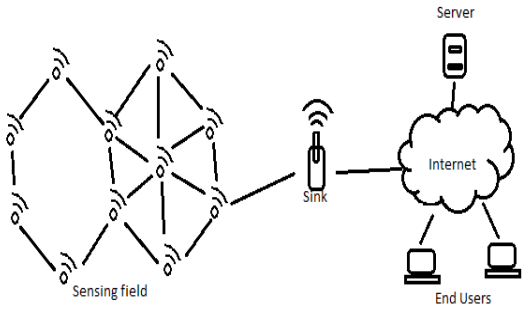

Figure 1: Wireless sensor network

The sink may connect to the outside world through internet. Sink collects the data from SN, and transfer to the user who requested the data. The sink may also be an individual user who needs the desired information. The main problem in WSN is limited battery life of sensor nodes. Data transmissions consume battery power so any optimization in these networks should focus on optimizing energy consumption. Caching 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 in WSN for load balancing and to reduce traffic from network. Clustering consists groups of sensor nodes. Every cluster consists cluster head which controls all other sensor nodes.

2. RELATED WORK

Many techniques have been explored for the optimization of energy usage in wireless sensor networks. Routing is one of these areas in which attempts for efficient utilization of energy have been made. With the help of efficient routing the best path from source to sink is chosen which reduce the traffic from network and increase the overall lifetime of network [1].

In WSN sensor nodes deployed densely and uniformly in the sensing field, a mobile sink injected Query packet by the mobile sink 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 [2].

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 for recovering lost packets by caching data in some of network nodes which is a combination of Extended NAC and Active Caching (AC) methods and we call it New Active Caching (NAC) [3].

Due to the limited energy resource, energy efficient operation of sensor nodes is a key issue in wireless sensor networks. In proposed cooperative caching scheme for wireless sensor networks, one-hop neighbors of a sensor node form a cooperative cache zone and share the cached data with each other. 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 [4].

For improving WSN's energy efficiency that already uses an energy efficient data routing protocol the proposed improvements are (i) data negotiation in which active sensor sends its sensed data only when the data changes, (ii) development of data change

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expectancy in which a sensor develops the expectancy of when its sensed data might change, and (iii) data vanishing, duplicate sensed data from multiple sensors are discarded while routed to the base station [5]. 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 [6].

Large number of queries is 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 dual radio based data dissemination (DRDD) approach in which a cooperative caching scheme is used which exploits cooperation among few sensor nodes to form large cumulative cache. Dissemination nodes on data/query path form cache zones around them using low power radio mode and nodes in CAZ cooperate among themselves and with dissemination node to realize much larger cumulative cache and hence conserves energy in cumulative cache management [7].

3. PERFORMANCE OF WSN WITH CACHING

In Wireless Sensor Network sink 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 [8]. If sensor node having information about query then it replies to sink otherwise it floods the query to the other nodes.

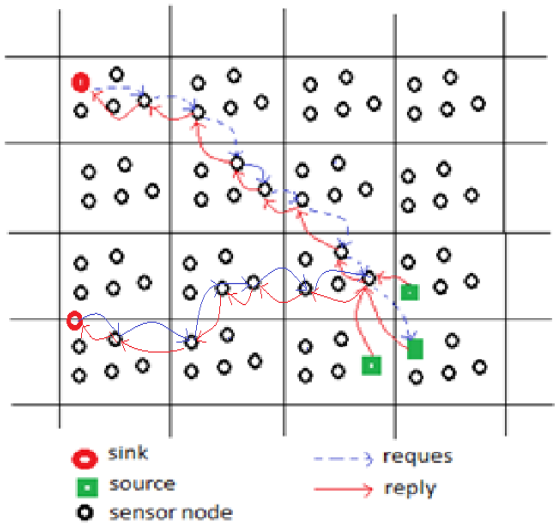

Figure 2: Sink request and source reply process

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 caching. Caching is a technique which is used to store the information temporary. In WSN, it is used to store event information into sensor node. Cache 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 caching [9]. It also reduces unnecessary load from the network.

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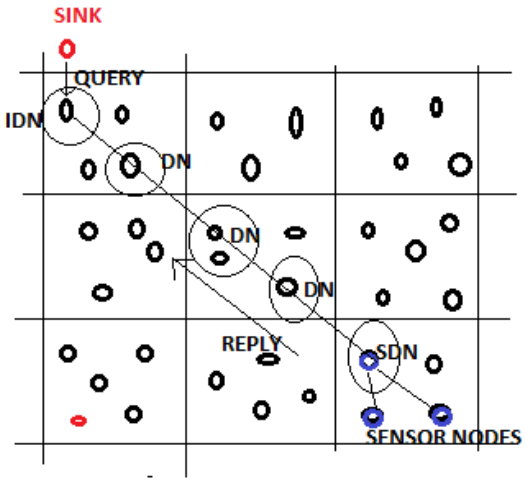

Figure 3: Path setup in sensor field

Sensor nodes have limited storage capacity so it use cooperative caching scheme to store the information. In cooperative caching, a node can use its nearby node's memory to store information which is called cumulative caching. In caching 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). Cooperative caching reduces inter-node transmission and delay in fetching the data items. Sink caches the data items in its local cache until it's memory became full. After that it passes data to its Immediate Dissemination Node (IDN) and When IDNs local cache is full it utilizes one of its neighbor nodes memories and when it full it moves to next node from the cache 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 cooperative caching information is stored near to the sink which decrease unnecessary traffic from the sensor network and increase its battery lifetime.

4. CONCLUSIONS

In this paper, we have discussed the Global Cooperative Caching techniques that use to improve the performance of the Wireless Sensor Networks. By caching, 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.

References

[1] Tarique Haider and Mariam Yusuf Hamdard Institute of Information Technology, Hamdard University Karachi, Pakistan "A Fuzzy Approach to Energy Optimized Routing for Wireless Sensor Networks" Vol. 6, No. 2, April 2009.

[2] Yimin Chen and Long Cheng Department of Electrical Engineering Stanford University "Query-Based Data Collection in Wireless Sensor Networks with Mobile Sinks" vol. 51, pp. 159–206,2008.

[3] Amir Shiri, Shahram Babaie, Javad Hasan-zadeh "New Active Caching Method to Guarantee Desired Communication Reliability in Wireless Sensor Networks" J. Basic. Appl. Sci. Res., 2(5)4880-4885, 2012.

[4] Narottam Chand, "Cooperative Data Caching in WSN" World Academy of Science, Engineering and Technology 63 2012.

[5] Md Ashiqur Rahman and Sajid Hussain, Jodrey

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School of Computer Science Acadia University "Effective Caching in Wireless Sensor Network".

[6] E. Ilker Oyman and Cem Ersoy Computer Engineering Department, Bogazici University, Istanbul, Turkey "Multiple Sink Network Design Problem in Large Scale Wireless Sensor Networks".

[7] T.P. Sharma, R.C. Joshi, Manoj Misra Indian Institute of Technology, Roorkee, India. IEEE 2008.

[8] Ms Manisha Rana, Senior Lecturer Gurpreet Kaur Chandigarh College of Engineering, Landran, and Punjab "IMPROVED CIRCULAR CACHING BASED ON WSN WITH MULTISINK" ISSN 2250-3552

[9] Naveen Chauhan, L.K. Awasthi Senior Member IEEE, Narottam Chand Member IEEE "Cluster Based Efficient Caching Technique for Wireless Sensor Networks" International Conference on Latest Computational Technologies (ICLCT'2012) March 17-18, 2012 Bangkok.