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Review on Data Dissemination over Wireless Sensor Networks

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Abstract: **Wireless Sensor Networks (WSN) consists of large number 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's possible to minimize power consumption in WSN by reducing data dissemination. In WSN sink 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 utilize the benefits of caching because in WSN sensor nodes consume less power during processing as compare to data transmission.**

This paper propose a data dissemination protocol for periodic data updates in wireless sensor networks, which attempts to save energy through data delivery path sharing among multiple sinks that have common interests. Hence it improved the lifetime of sensor node's batteries.

Keywords: **WSNs, Sensor nodes, Data Dissemination, Caching, Multisink.**

I. INTRODUCTION

The wireless sensor network consists of large number of sensor nodes spread over the specific area where we want to sense the environment conditions like temperature, pressure, motion etc. The wireless sensor nodes consist of the power management module, sensor, processor and transreceiver. Sink is used to inject queries in to sensor field and sensor nodes are use to sense the event which is occurred in to field and give responds of that query.

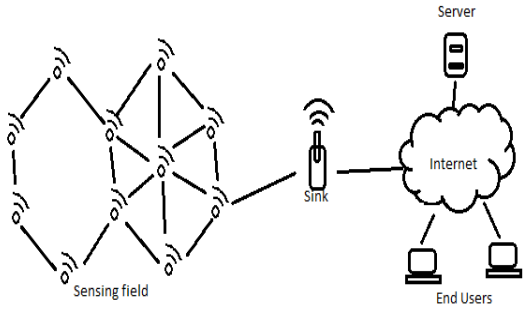

Fig 1: Wireless sensor network

The data collected by the sensor nodes are send to the sink, sink is the like the base station which broadcast the data collected by the sensor nodes to the internet. Sensor node consists of four units which are as sensing unit, processing unit, Transreceiver 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.

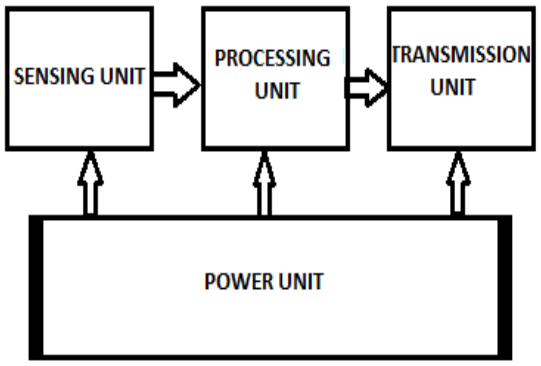

Fig 2: Architecture of sensor node

As, shown in the figure power management module interact with the processor, sensing unit and with the Timing sync module. The sensor nodes communicate with the sink through the radio waves without use of any wires. If the node is not able to communicate with other through direct link, i.e. they are out of coverage area of each other, the data can be send to the other node by using the nodes in between them. 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 are 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. The sink may connect to the outside world through internet. Sink collects the data from SN, and transfer to the user who requested it. 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. For communication the network is flooded with the route request packets by the source node, every node responded back to the source node with route reply packet .The source node select the shortest path ,shortest path means the path which is having the minimum number of hops. When the shortest path is selected between source node and the base station, the selected path is fixed throughout the life time of the sensor node.

In the Proposed technique named as grid-based Coordinated Routed .This technique is based on the assumption that all the fully charged nodes are deployed in the environment and grid square clustering is done. In the grid square clustering square type grid is formed and four sensor nodes are there in a grid .The cluster head is chosen randomly among the four nodes. The cluster head will not changed until the cluster head node will get collapsed. The cluster heads are responsible for transmitting the data to the sink. The cluster heads collect data from the nodes which are involved in the grid and cluster head transmit the collected data to the sink. If the cluster head and sink are not in the versinity of each other then the cluster heads in between the cluster head, which want to transmit the data and sink are responsible for data routing. The grid square clustering is done and cluster heads are chosen randomly. The sources nodes wants to transmit data to the sink. First the source node flood the network with route request packets .When the clusters heads receive the route request packets ,it respond with the route reply packets. When the source nodes receives the route reply packets it select the best route on the basis of hope count .The path with the minimum hop count is select as the best route for data transmission. The selected path is fixed until the nodes involved in the data routing get collapsed. When the cluster head is busy is routing and transmitting the data the other nodes of the cluster will gone to the sleep state[9].The grid-based coordinating approach will also do load balancing

.When the load is equally balanced among all the nodes the energy consumption will also reduced.

II. 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 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 collected information from different environmental phenomena and sending 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 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 increase the manageability and reduce the energy consumption of each node [6].

III. ROUTING PROTOCOLS

In this section, we briefly overview four popular routing protocols for wireless sensor networks.

MultiHop Router: MultiHop Router is used for shortest path-first algorithm with a single destination The main module consists of MultiHopEngineM and MultiHopLEPSM, which are connected to TinyOS system components such as Queued Send, GenericCommPromiscuous, TimerC, and other components. It provides the application interfaces such as Send, Receive, Intercept, and Snoop for user application.

Tiny AODV: it's version of AODV (Ad hoc On-Demand Distance Vector) designed specifically for wireless sensor network. it find route only when it is needed. Three main components for TinyAODV are

AODV Core, AODV PacketForwarder, and SingleHopManager. The main routing functions are provided by AODV_Core and AODV_Packet Forwarder. Single Hop Manager provides interfaces such as SendMsg, ReceiveMsg, Payload and others.

GF: GF (Greedy Forwarding) is a geographic routing protocol. The packet is transmitted to the neighbor of the sender that is closest to the destination. A beacon message is broadcasted every five seconds. The neighboring nodes receive the beacon message and then add the sender node id and related information to the routing table. If the neighbors have not received the beacon message for a period of time, then the entry in the table will be removed. This ensures that only the freshest neighbors with good links are used to forward packets to the destination. GF consists of two main modules NeighborList and GFForwarder, NeighborList builds the routing table, and GFForwarder forwards the packet from source to destination.

GF-RSSI: GF-RSSI (Greedy Forwarding with Received Signal Strength indication) uses signal strength as one of the link estimator. If the sender finds a neighbor node closest to the destination and the signal strength from that neighbor is above a certain threshold, then it will forward that data to that node. Otherwise, the sender will search for another neighbor, who has a better link quality indication. GF-RSSI was designed to overcome a drawback of GF. The drawback comes from the routing algorithm: GF always chooses next hop based on shortest path to destination. In special situations such as in densely-populated network or indoor network, the greedy algorithm often performs poorly because communication paths frequently become unreliable due to interference by neighboring communications. Therefore, the shortest path is not the best choice in that situation.

IV. DATA DISSEMINATION FOR CACHING IN WSN

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 [7]. If sensor node having information about query then it replies to sink otherwise it floods the query to the other nodes.

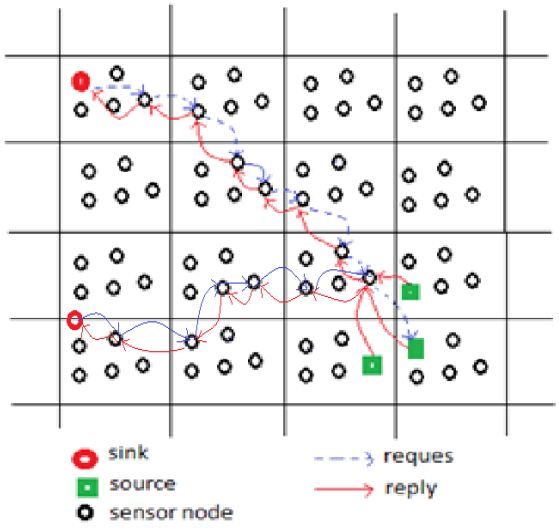

Fig 3: Sink request and source reply process

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 use to temporary store the information. In WSN it's 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 [8]. It also reduces unnecessary load from the network.

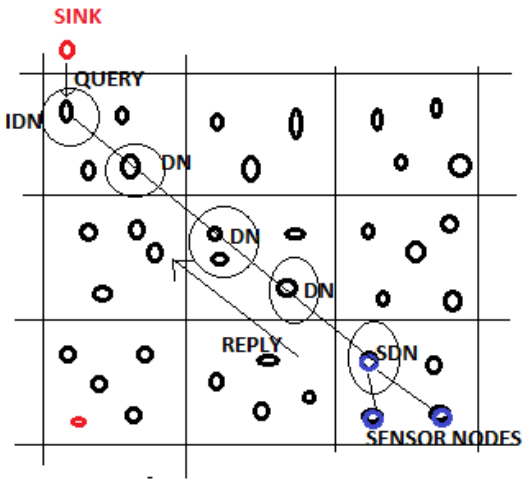

Fig 4: Path setup in sensor field

Sensor nodes have limited storage capacity so it use cooperative caching schema 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). And the flow of information from one node to another node is called data dissemination. 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.

V. CONCLUSION

In this paper, we have discussed the data dissemination techniques that use to improve the performance of the Wireless Sensor Networks. 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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