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Performance and Analysis of Single Hop WSN with Transmit Only Nodes

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ABSTRACT

The Wireless Sensor Networks are the sensor applied to detect the physical parameters, target tracking, environmental monitoring etc. and transmits the received signal from the sensor to the destination through the wireless network. The WSNs with transmit only nodes are more useful due to its energy consumption and reduced cost. The proposed scheme has a single-hop hybrid WSN cluster architecture which has standard nodes (transceivers) along with transmit only nodes. The scheme also proposes a new MAC layer protocol frame work called Resource estimation for asynchronous transmission (REAT). The REAT framework helps to manage the densely deployed single-hop hybrid cluster in a self-organized fashion. The simulation results shows improvement on delivery rate and throughput also it reduces energy consumption along with minimized drop rate and delay

KEYWORDS : wireless sensor network, transceivers, QoS parameters and single hop

1. INTRODUCTION

A wireless Sensor Networks are the combination of specialized transducers called sensors with network infrastructure for communicating the data to the destination. The wireless sensor network has several number or even thousands of sensor nodes for various physical detections. The sensor nodes are also called as battery powered measurement nodes. The sensor node has transducer for converting the physical parameter into respective electrical signal and to store the converted electrical signal a microcomputer is in-built in the sensor nodes along with a transmitter for transferring the data to a computer or destination. A battery source is kept for sensor nodes to operate the transducer, microcomputer and transmitter.Hence it is called as battery powered measurement nodes. The size of the sensor node may also vary depending upon the application where it is used. The price of the sensor nodes also differs with respect to its size. The WSNs were designed for some military application but due to its size and accuracy it is occupying many applications like health monitoring, weather monitoring, animal tracking etc.

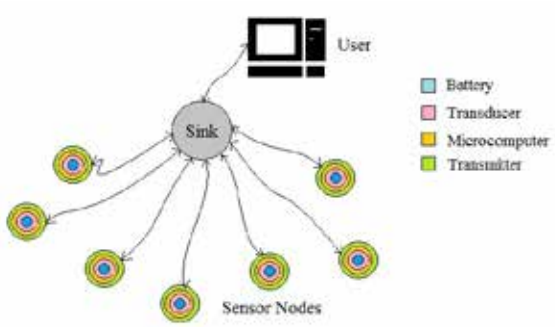

Figure 1. Architecture of WSN

The architecture of WSN is shown in the figure 1. The sink is used here to collect the signals from the sensor nodes to forward it to the user together. The architecture of the WSNs is same as of mobile adhoc network. The major difference is in mobile adhoc networks the node can be moved anywhere for sensing the data but in case of WSNs most of the sensor nodes have fixed line. Apart from that the mobile adhoc networks can have only one sensor node for its operation but the WSNs have multiple number of sensor nodes for sensing the data. Hence the WSNs are used for many multitasking applications.

2. RELATED WORK

Aravinthan and Rout et.al [1,] proposed a network coding based probabilistic routing scheme for wireless sensor network. The network coding based probabilistic routing scheme (NCPR) lighten the broadcast storm problem and it advances the network coding gain. The decoding operation of the proposed method can also do at the in-between nodes with the consideration of information shared by intra-cluster and inter-cluster. It also protects the sensor nodes from link failure. The simulation result demonstrates good performance of coding gain over than flooding scheme.Zhao et.al [10-13] explains about Enabling Multi-Hop Communications through Cross-Layer Design for Hybrid WSNs with Transmit-only Nodes. The suggested methodology explores the ability of building multi-hop communications. Based on the information collected from the underlying MAC layer the suggested M-QoMoR protocol and HPAssist scheme are designed. The simulation analysis shows that the hybrid WSN architecture can effectively help the multi-hop communications during multiple hybrid clusters over than the existing single hybrid WSN clusters.Incel et.al [3] and Joo et.al [4] explains about constrained scheduling in hybrid wireless sensor networks with transmit-only nodes. The proposed hybrid WSN scheme consists of nodes with transmitters and transceivers to develop the demand for localized fine-grained sensing. The simulation analysis shows that the proposed protocol can increase the performance of data delivery probability and QoS differentiation. It also minimizes the energy consumption over than the traditional MAC protocols.Rout et.al and Lim et.al [5-7] suggests providing reliable data services in hybrid wsns with transmit-only nodes. The proposed RH-QoMoR scheme is a strong protocol offers reliable data service along with Enhanced Automatic Resource Estimation for removing the time synchronization. The simulation result demonstrates that the proposed RH-QoMoR scheme gives best performance on high priority nodes with minimizing the energy consumption. It also effective on handling the changes on dynamic work due to loss in the packet.Ibrahim et.al [2] presents an integrated comparison of energy efficient routing protocols in wireless sensor network: A survey. The survey is about the features available in clustering, routing and sensor networks along with energy efficient protocols. It gives a complete comparison chart between the existing energy efficient protocols.

3. EXISTING TECHNIQUE

The QOMOR technique manages internet of things (IoT) for sensing the data through cloud computing. The QOMOR has three layer architecture of application layer, network layer and sensing layer. The application can be selected here for sensing the physical signal by the user. By the help of chosen application the corresponding sensor will senses the data. It is must to choose the application at the right time. It may interrupt some other data signal during its arrival to the user. The network layer plays a role of selecting the required for a particular operation. Depending upon the QoS parameters the network layer selects the network from the available network like cellular, WIFI and WSN. The sensing layer selects the sensor with respect to the application given by the user. It selects the sensor which is able to sense

the work. The QOMOR protocol [9] is a successful protocol in terms of delivery ratio for small scale system using not more than hundred nodes but in case of higher node system the QOMOR protocol gives reduced performance. The data packets are delivered only after some number of unsuccessful delivery which leads to increase in drop rate and wastage of channel capacity.

4. PROPOSED SCHEME

The REAT scheme is established to succeed the working of hybrid WSN by following the MAC layer protocol. It is also done under the single hop transmission range. The proposed scheme architecture consists of CORE stack and FEATURE stack for controlling the standard nodes and transmit only nodes. The standard nodes are high priority (HP) nodes which can be accessed by the sink and the low priority (LP) nodes or transmit only nodes cannot be managed by the sink because of QOMOR development scheme. The initialization phase and the stable phase are the operation phases used in the REAT framework.The core is governing the random changes in the transmission of data by the help of QOMOR element. Transmission rate, delivery probability are the parameters used to calculate the number of transmissions for the system requirement. The LP nodes are kept in sleep mode during the standby state. If there is any change in the sensing data, the LP nodes will wake up for communicating the data to the sink. This action is used to save the energy requirement for keeping the LP nodes in standby condition.

The Asynchronous Resource Estimation (ARE) scheme is acts as an abstraction layer in the core stack components. It states the asynchronous transmission and provides resource estimation under initialization phase to the scheduling methodology. The constrained scheduling scheme is also another component used in the core stack to succeed the transmission of the HP nodes.The node information is collected by the sing from LP and HP nodes during this initialization phase. Hence the phase is also called as preparation phase. The node information is collected for scheduling the stable phase by the sink. The sink will identify the new nodes by its received information from all the nodes. In the initialization phase the sink checks the successful rate of delivery by all the nodes in range. Based on the node information the sink calculates the vacant time slot and it is called as Time Slot Generation Procedure (TSGP). This step may lose one interval T from the next interval T onwards the vacant time is utilized for acknowledgement and confirmation of transmission from HP nodes connected to the sink. At the second step of this phase the HP nodes are waiting for acknowledgement from the sink about the delivery of signals from the nodes. If the acknowledgement is not received then the HP node will add another node which is ready to join in the network.

The stable phase comes after the immediate interval of initialization phase. In this phase the sink prepares the communication for all the HP nodes on interval by its vacant time slots. The HP nodes work depends upon the command schedule prepared by the sink. The LP nodes may still operate on the random transmission on T. The scheduling methods may differ depending upon the application developments.The WSN may get failure because of unexpected node failure, environmental effects and scheduled network adjustment or external signal interference. These problems are identified by the FEATURE stack for guarantee the HP nodes about its performance. To support the network change and packet loss the system manages the vacant time slot. In FEATURE stack the HPA assist is implemented to increase the capability on data delivery of the LP nodes by the help of HP nodes. The energy consumption of the HP nodes is reduced than the LP nodes for certain operation time. The HP assist scheme is developed to reduce the maintenance cost of the system and for improving the performance parameters of the system. If the transmission fails at the sink it will succeed at another location and it will be succeed to the sink at different time. The potential failed LP nodes are identified by inspecting the overlap of communication during current T. The sink then allots active HP nodes for each failed LP nodes. The transmission time and data relay time are attached before transmitting the pull command. According to the received time values the HP node may setups the timer to awake. After receiving the LP data on scheduled time the HP node will immediately wakeup for transmitting the data to the sink. If there is no data from LP node, the HP node will remain SLEEP mode till next interval.

5. RESULTS AND DISCUSSIONS

The proposed REAT scheme is verified by NS2 simulator with the existing QOMOR scheme by various QoS parameters. The number of packets delivered to the destination from the source node is higher than the existing scheme. So it increases the delivery rate of the technique. Due to high delivery rate the dropping rate of the packets are reduced and it results in minimization of the delay. The other factor help to achieve reduced delay is the absence of collision. The successful delivery rate helps the packets from waiting in the channel for long time. So it reduces the channel wastage and improves the speed of operation. As the channel is getting free the number of packets delivered to the sink is also increased with respect to time for achieving improvement on throughput. So the overall performance of the proposed scheme is increased and also because of successful delivery rate and high throughput the system requires only minimum amount of energy for transmission than comparing to the existing scheme.

Figure 2 shows that the transmission between the source and destination. In this source transmit the data to sink within one hop transmission. From the sink data will be delivered to the high priority node using pull command approach.

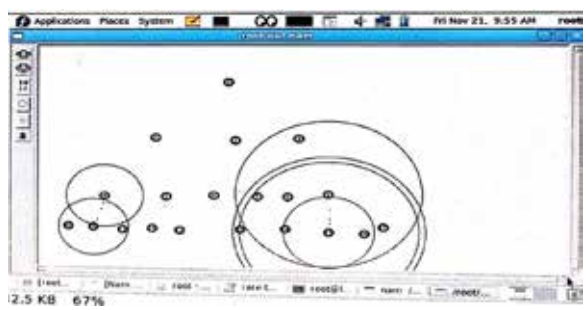

Figure 2. Transmission mode

Packet delivery ratio is obtained by dividing the number of data packets correctly received by the destinations by the number of data packets originated by the sources. Packet delivery ratio is defined as the ratio of packets delivered to the destination to those generated by the source node. Figure 3 shows that the packet delivery ration, proposed approach has higher delivery rate compared to the existing system.

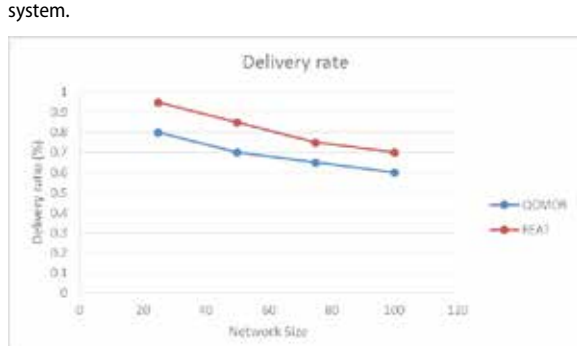

Figure 3. Delivery Rate

Figure 4. Drop Rate

Energy is the amount force needed to move the information from source to destination. Initially energy assigned for each node is 20 joules. After the transmission and the simulation time ends remaining energy is shown in figure 5.

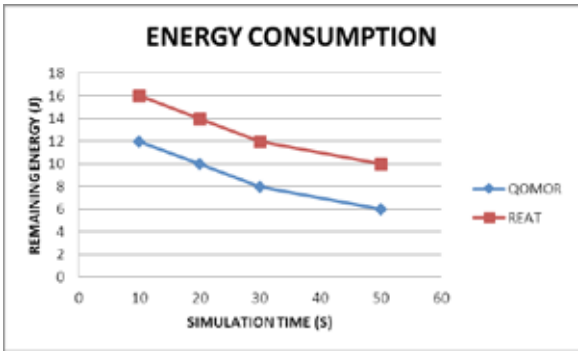

Figure 5. Energy Consumption

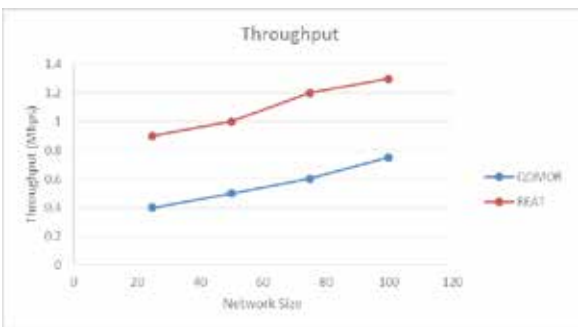

Figure 6. Throughput

Throughput is defined as the ratio of number of packets delivered with respect to time. In this compared to the existing approach, proposed scheme has high throughput shown in figure 6.

6. CONCLUSION

The REAT scheme is a hybrid WSN cluster has transmit only nodes along with standard nodes. The REAT scheme is also an energy efficient scheme and cost effective scheme over the existing WSNs with transceiver nodes. The data delivery capability of both the LP nodes and HP nodes are improved than the other transmit only node WSNs. The hybrid WSN cluster also gives guaranteed performance with reduced energy consumption. The experimental results also shows about the improvement on QoS parameters of the proposed scheme.

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