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Network Supporting Multilayered Quality of Service Routing in Wireless sensor network: Enhancing better QoS in WSNs

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Abstract— Wireless Sensor Network (WSN) comprise of group of tiny sensor nodes that are deployed for collaborative missions such as environmental monitoring, target tracking and surveillance. In this paper we just stress in to Providing QoS in such network mean that set of service requirements to be met by network while transporting a packet stream from source to destination. We look at some of the existing QoS mechanisms, node localization, controlled mobility and data aggregation. We also discuss some problems to provide the QoS, and we then identify some key performance metrics for WSN QoS and outline some mechanisms to achieve QoS in the sensor network. Finally we meet the framework to enhance QoS in wireless sensor network.

Keywords— **Wireless Sensor Networks, Quality of Service, Node Localization, Controlled Mobility, Data Aggregation.**

I. Introduction

Wireless sensor network (WSN) are consist of the large number of sensor nodes and densely deployed. Sensor networks may consist of many different types of sensor, which are able to monitor a wide variety of ambient conditions. The sensor nodes are usually scattered in a sensor field as shown in fig 1. Here the detected nodes, which collect the data and routed back to the sink and the end users. Data are routed back to the end user through multihop infrastructure less architecture through the sink as shown in fig 1. Here the sink may communicate with the task manager, to execute the task through the internet.

Here the multilayer network which contains homogeneous/heterogeneous distributed processing nodes. To support the execution to get the complete service this provides the good Quality of Service (QoS).

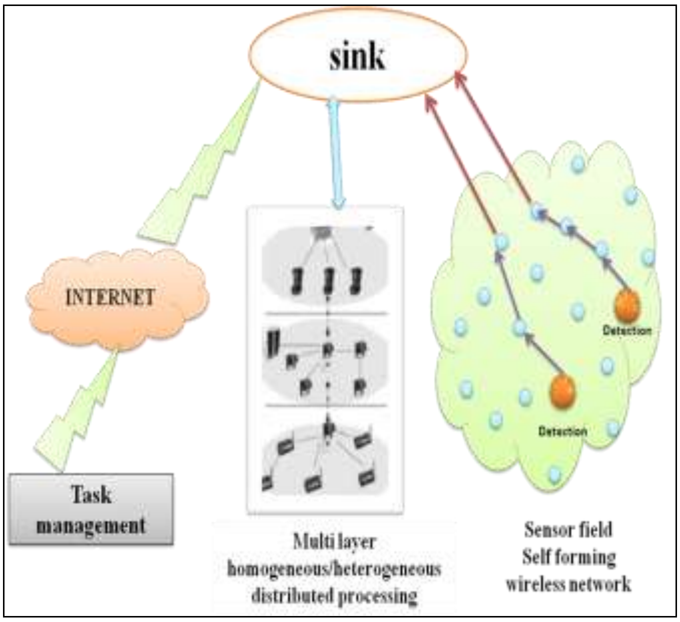

Fig 1: The Architecture of WSN

So get the better solution we used some sensor networks protocol stack which shown in fig 2. The protocol stack used by the sink and all sensor nodes are shown in fig. This protocol stack combines the power and routing awareness, integrates the data with networking protocols, and communicates internally to get the cooperative efforts of sensor nodes [1].

The protocol stack which consist of the Application layer, transport layer, network layer, data link layer, physical layer, power management plane, mobility management plane and task management plane.

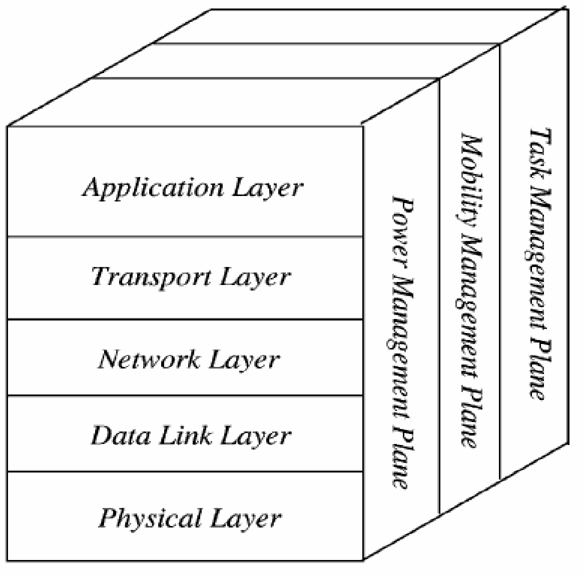

Fig 2: Multilayered Networks Protocol Stack

In this paper, we first take a look at the various QoS mechanisms that exist today, and present an overview of the challenges and issues that exist in the deployment of wireless sensor networks. We then look at the how QoS can be achieved in these networks - which are characterized by multi-hop communications, dynamic environments and limited resources [1]. The rest of this paper is organized as follows: The next section describes the related work and the motivation for QoS provisioning in wsn. Details the multi-faceted challenges Involved when considering QoS support in wireless sensor networks.

II. Related work and motivation

Here in this section we look out toward the task to carry out in the work. However the majority of work is related to the sensor network to provide the quality of service in wireless sensor network. The QoS of any particular network can generally be considered to be its ability to deliver a guaranteed level of service to its users and/or application. QoS Provisioning in WSNs includes Wireless sensor networks have been envisioned for a wide range of applications, some of which may involve the collection of sensitive or critical data.
Hence the main aim of this paper is to overcome from the problems occurred at monolithic layers and providing better quality of service in wireless sensor network (WSN).

QoS provisioning in WSN

In this section we look out for QoS provisioning in wireless network. As we know that the wireless sensor network are used in wide range of different application and have some demand to provide the QoS in WSN. On a framework and/or general guidelines on how QoS can be achieved in WSN. This motivates the need for more research work and efforts in QoS provisioning in WSN.

III. Mechanisms to Achieve QoS In Wsn

In this section we describe some mechanisms that have been proposed in the literature, which allow WSN to achieve QoS.

1) Node localization:

Localization provides an alternative mechanism of finding the physical locations of the sensor nodes in the network instead of making use of internet. It usually involves two phases : (i) ranging, which is the distance estimation of the node from the sink or other nodes in the network using techniques such as signal strength, angle of- arrival (AoA), etc; and (ii) iterative multilateration, which makes use of the range measurements from the previous phase to calculate a new location estimate. Hence, localization increases spatial accuracy.

Localization in sensor networks can be defined as identification of sensor node's position For any wireless sensor network, the accuracy of its localization technique is highly desired. Localization is the issue of locating the geometrical position of the sensor node in the network. Localization problem is an estimation of position of wireless sensor nodes and to coordinate with one another.

A RSSI-based centralized localization technique: The advantage of this scheme is that it is a practical, self organizing scheme that allows addressing any outdoor environments. The limitation of this scheme is that the scheme is power consuming because it requires extensive generation and need to forward much information to the central unit.

RSSI algorithm:
Beacon package contains:
j: sender's node ID
Φ: senders estimated position
R: RSSI value of the package

Step 1: poll a neighbouring node, and extract its estimated position.

$$\Phi_j = \Phi;$$

Step 2**:** poll the node 10 times and compute the average RSSI value.

R_j =0;
For i=1; i<=10; i++
Poll node j;
$R_j = R_j$ +R;
End
$R_j = R_j$ /10;

Step 3: Determine the distance

D_j =R to D(R_j);

Step 4: go to step 1 if there are other neighbouring nodes

Therefore, the network localization problem, namely, the problem of determining the positions of nodes in a network, has attraction of many engineering field and have been researched for many years. The device whose location is to be estimated is called localization node, and the network entity with known location is called localization base station. Wireless sensor network consists of a large set of inexpensive sensor nodes with wireless communication interface. Graph shows simulated position after applying the required approach and displays the exact position of nodes.

These sensor nodes have limited processing and computing resources. Thus, algorithms designed for wireless sensor networks need to be both memory and energy efficient. In most of the algorithms for wireless sensor network, it is assumed that the sensor nodes are aware of their locations and also about the locations of their nearby neighbors.

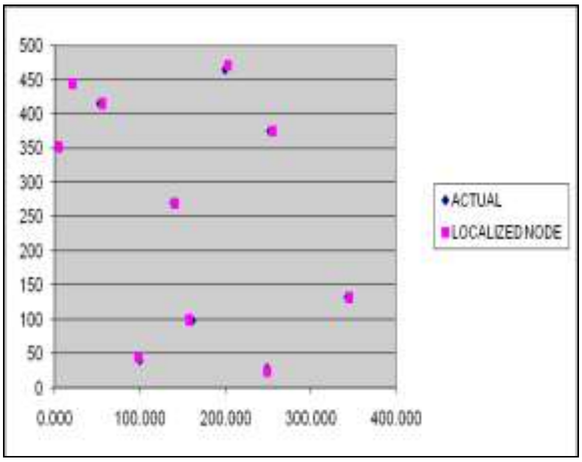

Fig 3: Location Of Nodes

The above graph which shows location of actual nodes vs localized node after applying RSSI algorithm.the slight alteration between actual node and localized node is seen clear in above graph. Its clear from graph that localization of nodes can be done easily by calculating the energy efficiency using RSSI algorithm.

2) Controlled mobility :
Here in this approach the deployment of nodes is carried out to check the availability. Here the optimization of topology of network for better system performance, possibility with the aid of nodes. As such the , resulting network topology is usually not optimized for the protocols which are designed for the network.

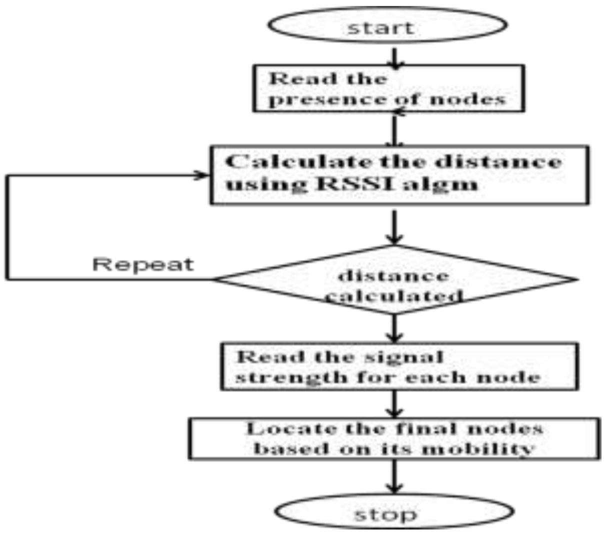

Fig 3: Flow for Controlled Mobility

Here the deployment can be done using the distance calculation of node with its neighbour node. Then the locating that node by using its mobility to active participation next work alloted. Hence the distance is calculated using RSSI algorithm which is shown above.

3) Data aggregation:

Here in this approach, data coming from the different sources is combined into a single data packet. Data aggregation is a process of aggregating the sensor data using aggregation approaches [11]. The general data aggregation algorithm works as shown in figure.

QMCE Algorithm:

Step 1: Procedure **Merge** (S_k , R, p)
Step 2: n_k=the number of S_k's child nodes;
Step 3: **for** j=1 to n_k **do**
Step 4: D_k[0, j] =0; $\sigma_{k,j}$=0;
Step 5: **end for**
Step 6: $E_k[0]=\min_{1\le j\le n_k}\{E_{k,j}[0]\}$;
Step 7: **for** i=1 to R/p **do**
Step 8: **for all** j=1 to n_k **do**
Step 9: D_k[i, j] = D_k[i-1,j];
Step 10: **end for**
Step 11: v =arg $\max_{1\le j\le n_k}\{E_{k,j}[\frac{\sigma_{k,j}}{p}+1]\}$;
Step 12: $\sigma_{k,v}=\sigma_{k,v}+$ p; $D_k[i,v]=D_k[i,v]+p$;
Step13: E_k[[i] = min $\{E_k[i-1]$,
$E_{k,v}\left[\frac{\sigma_{k,v}}{p}\right], H(k,i)\}$;
Step14: **end for**

We propose to develop an effective data aggregation technique which includes multiple sinks in WSN. For determining the routing structure towards the sinks, we use the Link Reversal Algorithm. The main objective of this proposed algorithm is to construct and maintain links to multiple sinks to seamlessly aggregate data.

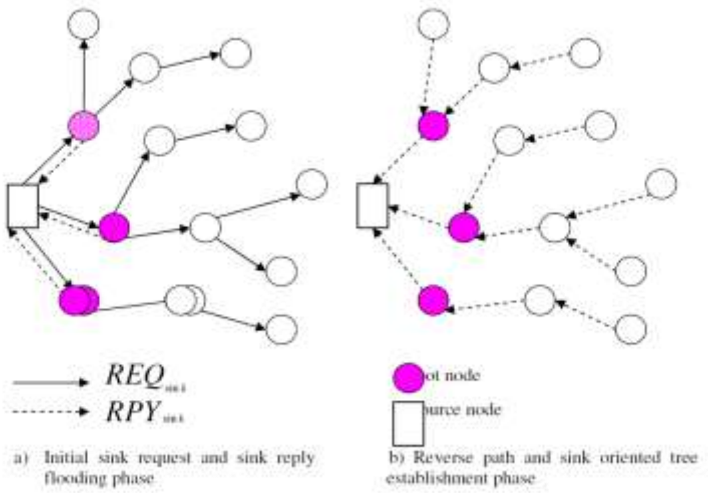

Fig 4: Tree Construction for Multiple Sinks

We propose to develop an effective data aggregation technique which includes multiple sinks in WSN. For determining the routing structure towards the sinks, the main objective of this proposed algorithm is to construct and maintain links to multiple sinks to seamlessly aggregate data [11][14]. A REQsin k message is flooded periodically by the sink node to the sensor nodes. The request Message, REQ sin k includes information like Sink ID, Timestamps, Period, Max_Height, Hops and Root ID [14]. Based on the density of deployment of the sensor nodes, the field period is fixed. During this period, the REQ sin k message is flooded. The nodes that are at one hop distance from the sink are called as root nodes. The connection or the disconnection status of the sink with its descendent nodes is dependent on the root node. By performing "computation" on data en route to the sink, we can reduce the amount of data traffic in the network, Increases energy efficiency as well as scalability.

Simulation Result:

1) Nodes vs. delay

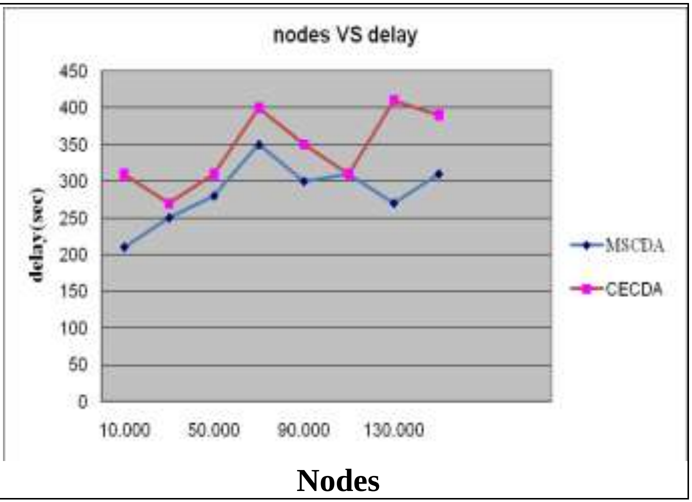

Fig 5: Nodes Vs Delay

Graph gives the average end-to-end delay when the number of nodes is increased. From the figure, it can be seen that the average end-to-end delay of the proposed MSC DA technique is less when compared with CECDA. Multiple Sink based Compressive Data Aggregation (MSCDA) technique is compared with our previous Cost Effective Compressive Data Aggregation CECDA.

2) Nodes vs. energy

The simulation graph fig 6 shows results of energy consumption when the number of nodes is increased. Compressing the data during data aggregation reduces the number of data packets to be aggregated at the aggregator nodes.

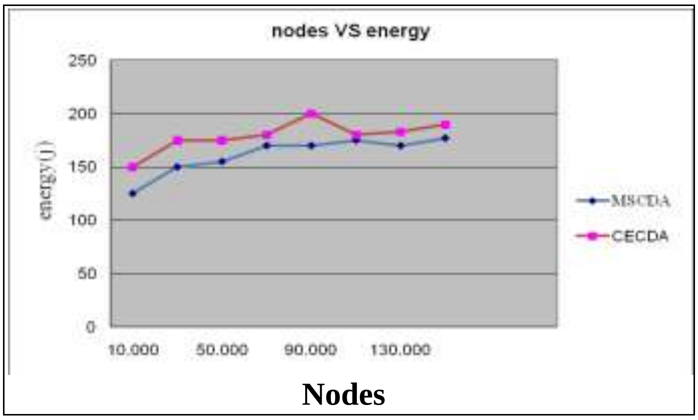

Fig 6: Nodes Vs Energy

Hence the total energy consumption involved in the aggregation process will also be reduced. From the results, we can see that MSCDA technique has less energy consumption when compared with CECDA, since it has the energy efficient tree.

IV. Conclusion and Future Work

While many diverse applications have been envisioned for use in wireless sensor networks, there are still many issues that need to be worked on before Quality of Service can be supported in these networks. In this paper, we have looked at the existing mechanisms to provide QoS in different networks and also examined some of the constraints in WSNs which makes it difficult to provision for QoS. We have also proposed WISER – a framework which aims to enhance QoS in Wireless Sensor Networks. WISER is made up of a few different Network components; however, it is not quintessential for the wireless sensor network to implement all the modules in the framework. Only certain components in the framework can be implemented, depending on the specific application requirements. In addition, as sensor Network are typically application-specific, we have attempted to make WISER as generic as possible by not Putting constraints on the different protocols that have to be used for each component.

As part of future work, we will verify the correctness and completeness of WSN in provisioning for QoS in wireless sensor networks and providing QOS by implementing approaches QoS in WSN is application-specific different applications will have varying QoS requirements QoS provisioning in WSNs is not easy multi-layer problem , also involves task management, power management and mobility management, can make use of existing techniques in MANETs and/or Internet QoS metrics different from that of the Internet or MANETs, network lifetime (energy efficiency), coverage, location accuracy, fault tolerance, Need to explore different ways of QoS provisioning in WSNs.

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