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Development Of Virtual Backbone Scheduling Technique For Faster Data Collection In Wireless Sensor Networks

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Abstract:

The past two decades have witnessed the boom of Wireless Sensor Networks (WSNs) and a key technology for various applications that involve long-term and low-cost monitoring, such as Battlefield Reconnaissance, Building Inspection, Security Surveillance and etc. In most WSNs, the battery is the sole energy source of the sensor node. Sensor nodes are expected to work on batteries for several months to a few years without replenishing. Thus, energy efficiency becomes a critical issue in WSNs. The ultimate goal of a sensor network is often to deliver the sensing data from all sensors to a sink node and then conduct further analysis at the sink node. Thus, data collection is one of the most important common services used in sensor network applications. In the existing techniques, different approaches have been used to realistic simulation models under the many-to-one communication paradigm known as convergecast. In the TDMA scheduling technique, it consider time scheduling on a single frequency channel with the aim of minimizing the number of time slots required (schedule length) to complete a converge cast. By using this scheduling mechanism, the data collection is higher than previous mechanisms. However, from our experimental results, this Project Work is realized that the TDMA Scheduler unable to collect data from large Sensor Networks. This is the major identified problem. To address this issue, this paper proposed an efficient Virtual Backbone Scheduling (VBS) Technique. From our experimental results, it is observed that the proposed work improves the performance of Wireless Sensor Networks interms of Network Error Rate, Sensor's Lifetime, Communication Cost and Scheduling Time as compared with existing technique. It is also observed that the proposed work improves the performance of Data Collection Process, which saves Battery Life Time and the Scheduling Time.

Key words:*Wireless Sensor Networks (WSNs), Time Division Multiple Access, Virtual Backbone Scheduling, Convergecast.*

1.Introduction

In wireless Sensor network applications, the data can be collected from a set of sensor nodes to common base station over a tree-based routing topology is a basic operation in wireless sensor networks (WSNs). Time Division Multiple Access (TDMA) is better fit for faster data collection. TDMA scheduling [1] Algorithms and prove that they do achieve the lower bound of data collection time once interference is eliminated.

Wireless sensor nodes use batteries as the sole energy. For efficient use of energy, the data collection which is performed by the sensor nodes can increase their speed of data collection. For Faster Data collection we have to improve the life time of sensor nodes battery. For improving the speed of data access the Virtual Backbone scheduling algorithm can be used [2]. To improve the faster data collection, we need sophisticated mechanisms to be introduced to improve the performance of Wireless Sensor Networks. In the Sensor nodes functional components , the radio consumes a major portion of the energy. Various techniques are proposed to minimize its energy consumption. We focus on Backbone Scheduling (BS), which is dynamically turns off the radio of the sensor nodes to save energy. VBS schedules multiple overlapped backbones so that the network energy consumption is evenly distributed among all sensor nodes. In this way, the energy of the entire sensor nodes in the network is fully utilized which in turn prolongs the network lifetime

2. Related Work

Fast data collection with the goal to minimize the schedule length for aggregated convergecast. Convergecast is the collection of data from a set of sensor nodes toward a common sink using tree-based routing topology[1], is a basic operation in wireless sensor networks[4]. In the TDMA scheduling technique, it consider time scheduling on a single frequency channel with the aim of minimizing the number of time slots required (schedule length) to complete a converge cast. Virtual Backbone Scheduling (VBS)[2], a novel algorithm that enables fine-grained sleepscheduling.VBS schedules multiple overlapped backbones so that the network energy consumption is evenly distributed among all sensor nodes. In this scheduling VBS , is a set of backbones which will work sequentially[6] in each round. Formally, The Backbone Scheduling consists of two constraints. They are Connectivity Energy constraints[6]. It uses Virtual Scheduling Graph (VSG)-Based Approximation Algorithm. In ad hoc networks dynamic addressing [3] technique can enable the scalable routing Process. It can provide initial design of a

routing layer based on dynamic addressing, and it can analyze its performance[5],. Sleep–wake scheduling is an effective mechanism to improve the lifetime of these energy-constrained wireless sensor networks[7] .It consumes more time to reduce this by using Anycast Mechanism[8].

3.Proposed System Architecture For Vbs Technique

In this Paper the following architecture diagram represents the data collection process.

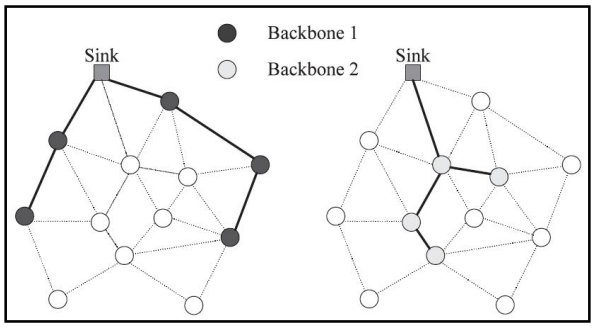

Figure1.1: Data collection by edge nodes

Figure1.2: Inner nodes at sleeping stage

In this Fig.1.1 represents the path of data transfer by edge nodes. At that time Fig.1.2 represents the intermediate nodes are in sleeping state .It will increase the life time of the sensor nodes.

4. Proposed Algorithms

In this paper we have used two types of algorithm i.e Virtual Backbone Scheduling (VBS) and Tree Based Routing Technique.

4.1.VSG-Based Algorithm

We transform the MLBS problem in a WSN into an MCDS problem in its VSG. In the VSG algorithm uses the Marking Process (MP) for constructing the CDS. More details of the MP are in the online supplementary file of this paper. The VSG rules are applied after each iteration to preserve the correspondence between the original graph and the modified VSG.

4.2.Tree Based Routing Technique

By using Tree Based Routing Technique it achieves aggregated convergecast the schedule length is minimized. The Raw Data convergecast has less throughput it can be over come by Tree Based Routing Technique, it consist of aggregated convergecast which will having high throughput.

5.Implementation And Results

In our implementation process we used the reconfigurable emulator for execution .Implementation window having the form with the labels like Number of Nodes, Node ID, State, Range, Elapsed Nodes, Forced Nodes and buttons such as launch, set, start, report, graph, Exit.

5.1.Node State

The Form Node ID Label is used to choose various nodes ID which node we need to select its state. In the state label it consist of various states like,

- Active
- Transceive
- Transmit

5.2.Execution

The Enhance Check Box that can represent whether the execution is Default type of execution or Enhanced Type of execution .Figure 7 that represents default type of execution. Here we could not select the enhanced type check box. For execution we can select the start button once we select the start button the execution process will start. While, processing the battery source can be reduced depends on the state of the Sensor node which is mentioned above such as transmit, receive, transceive and active. For this processing the transceive node could elapsed earlier after elapsed the work can be transmitted to active or idle node. After completing the execution process each elapsed node work could transmitted to forced node is shown in Fig. 2.

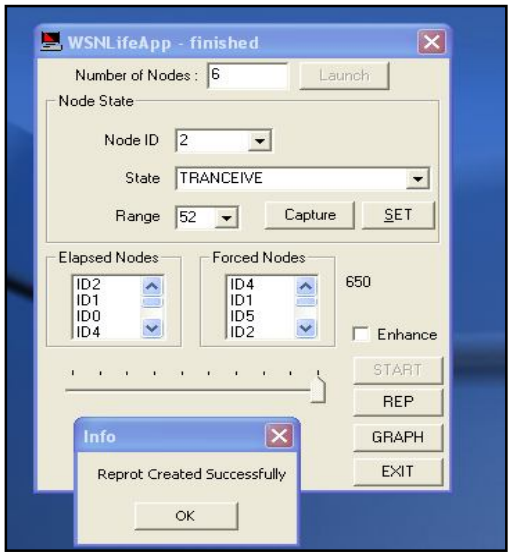

Figure 2: Report Creation

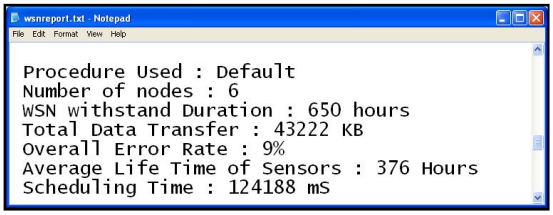

Figure 3: Default Report

5.3.Report

After completing the execution, the report can be generated for Default procedure. The report can be shown in the Fig. 3.It contains number of nodes, Wireless sensor Networks(WSNs) withstand Duration in hours, Total Data Transfer in KB, Overall Error Rate in Percentage(%), Average Life Time of Sensors in hours, Scheduling Time in ms.

5.4.Enhanced Network

For Enhanced procedure we can choose the same number of nodes, states, range, which can be used in Default procedure. For this Enhanced it is our proposed system which is base on Virtual Backbone Scheduling (VBS) and Tree Based Routing Algorithms. For this procedure in the design form we have to select the enhance check box and execute the procedure.

The enhanced procedure report can be shown in the Fig. 4, which contains the same parameter as default report .

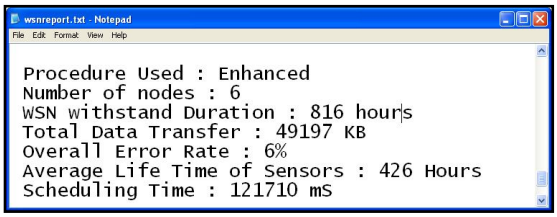

Figure 4: Enhanced Report

6.Performance Analysis

The result comparisons with existing and proposed graph representations are shown as following sections.

6.1.Network Error

The network error comparison is shown in Fig. 5. It shows that the Enhanced Network Error Rate (5%) which is less than the Default Network Error Rate (12%).It represent the performance get increased in Enhanced Procedure.

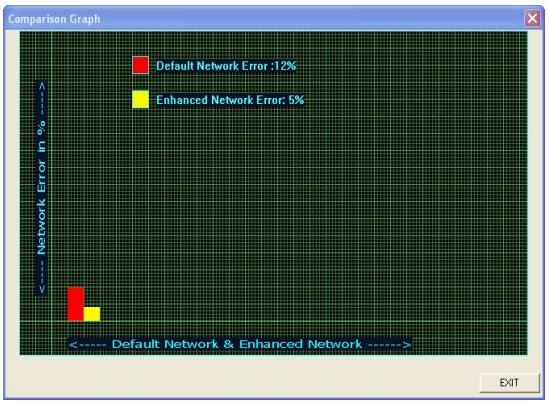

Figure 5: Network Error Comparison

6.2.Life Time

The Life Time of Sensor nodes comparison is shown in Fig. 6. It Shows that the Enhanced Life Time (417 Hours) which is greater than the Default Life Time (360 Hours).It represent the performance get increased in Enhanced Procedure.

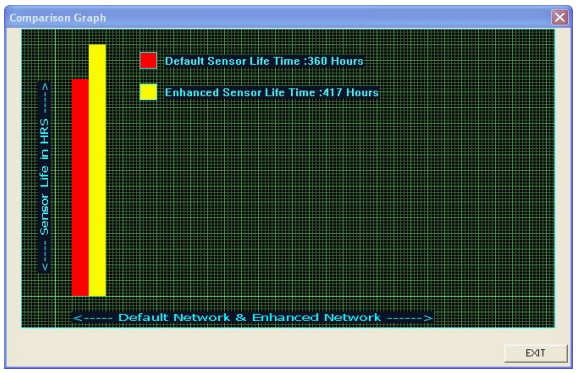

Figure 6: Sensor Life Time Comparison

6.3.Scheduling Time

The Scheduling Time comparison is shown in Fig. 7. It Shows that the Enhanced Scheduling Time (121647 ms) which is less than the Default Scheduling Time (125787 ms) It represent the performance get increased in Enhanced Procedure.

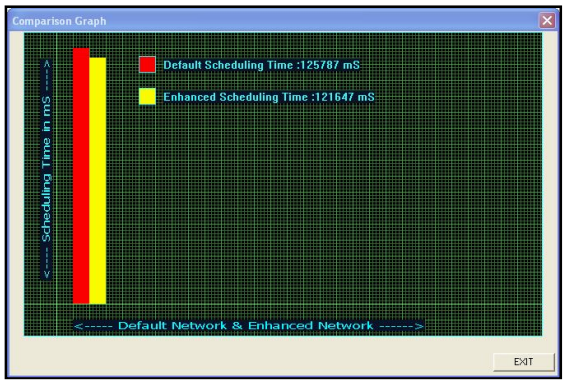

Figure 7: Scheduling Time Comparison

7.Conclusion And Future Work

We have developed and Implemented Virtual Backbone Scheduling with Tree Based Routing for Faster Data collection in Wireless Sensor Networks. From our experimental results, it is observed that the proposed work improves the performance of Wireless Sensor Networks in terms of Network Error Rate, Sensor's Lifetime, Communication Cost and Scheduling Time as compared with existing technique. It is also observed that the proposed work improves the performance of Data Collection Process, which saves battery life time and the scheduling time. However, it is revealed that this work couldn't support very well for larger Sensor Networks. This is one of the identified issues of our

work. This issue could be solved if we are implementing Cluster based Parallel Technique, which is the future work .

8.Reference

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