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Research paper

Prioritized scheduling scheme for critical and non-critical information packets

K. Aanandha Saravanan[1] *, Dr. P. Suresh[2]

[1] *Research Scholar, Veltech Rangarajan Dr. Sagunthala R&D institute of Science and Technology*
[2] *Associate Professor, Veltech Rangarajan Dr. Sagunthala R&D institute of Science and Technology*
**Corresponding author E-mail: anandecedept@gmail.com*

Abstract

The process of energy saving mechanisms is been utilized by proper planning to transmit both critical clip and non-real infor-mation by reading overheads there by reducing throughput and bandwidth in large scale critical clip networks. The existing bundle sched-uling my-thologies used were based on the First -in First-out (FIFO) manner in such cases the critical information at particular instant cannot be processed quickly but proposed system is designed in such a way it consists of three tier precedence structure .the critical in-formation bundles are placed in the higher status prioritizing queue and processed immediately and sent to the destination node where oth-er information bundles are given less precedence on the basis of position for non critical information bundles. The proposed scheme, ener-gy efficient in reducing the number of transmission by using merger technique. The lowest precedence bundles are processed after the higher precedence bundles. The proposed algorithm proves its uniqueness based on end -to-end delay than Energy efficient wake up scheduling MAC (EEWS) and Traffic Adaptive MAC protocol (TAMAC)

Keywords: *Cluster; Priority Scheduling; Critical; and Non-Critical*

1. Introduction

The advancement of tiny motes is available in plenty to monitor the sensing element, collect the useful information and communicate to the neared node through multi hop dimension. Several areas of application may include various critical clip environmental monitoring, hospital management forest fire detection, cracker fire monitoring, military surveillance [1]-[6]. The foremost operation is the periodically information collection, reported my sensors to the sink node [7]-[10]. The latency of information collection becomes predominates nowadays.

Many research studies have undergone efficient collection of information in WSN with proper information scheduling mechanism. The process of information aggregation uses constant number of information allowed form a bundle removing redundancy so the life span can be improved to maximum extend. [11], [13]. Proper scheduling with minimum latency along with collision free model along with precedence bundles is proposed. The back bone of the network is formed by information aggregation because it is necessary to balance the load among all nodes.

Battery supply forms the majority source in all sensors in wireless networks. These batteries could not be recharged or replaced when the charge is fully discharged due to this problem the energy efficiencies of the nodes come into major play. In order to improve the energy balance in an efficient manner scheduling of events of nodes to improve the life span of the network so that the energy dissipation will be less. The process of scheduling can have critical and non-critical information bundles, our basic idea is to save the balance potential dissipation. Information aggregation reduces both transmission delay and energy consumption. The bundle scheduling takes care of delivery of information bundles based on fairness and precedence. Critical clip bundles have highest precedence than non-critical clip bundles. Most of the scheduling schemes are based on the First in first out schemes. These schemes do not take into account of throughput, dynamically changing traffic and energy dissipation. We introduce precedence-based scheduling intrigue made at three levels, critical clip bundles have the highest precedence, non-critical clip remote bundles have given intermediate precedence and non-critical clip local bundles are given the lowest precedence. The critical clip bundles which as highest precedence are not available in the queue, it utilizes the non-real-interval bundles which are intermediate bundles for transmission and lower precedence bundles are then processed for transmission. so that the bundle form a hierarchical platform in virtual fashion.

2. Related work

The Author Lee [12] utilizes anti colony optimization scheme to solve the energy problem using realistic approach in heterogeneous network. To solve the energy problem, it utilizes the probability node model. Yingshu Li [13] proposed the aggregation of information with utilization of collision free transmission of bundles. This process minimizes latency using greedy mechanism and additive factor instead of using multiplication factor which has produced a significant improvement in updating the scheduling bundles update using adaptive techniques.

Nasser [14] have presented a multilevel precedence model that dynamically schedules the bundles hierarchically in virtual fashion that each node enters the queue which adapts zone topology. The critical clip bundle can enter to other queues and given the higher status of precedence and non –critical bundles operates on certainty of brink limit to enter the queue. Leaf node does not take information from others, so that this scheme performs better than other conventional methods

Dimitris [15] have presented a scheme which does not reduce the size of the bundles during information aggregation. this technique maximizes the bundle size by gathering the incoming information bundles that are stored in buffer register until the maximum size is achieved. Energy dissipation by reducing the transmission and the redundant information require for overhead this scheme also proves that the scheme has improve by 56% in terms of bundle loss and energy consumption. Xiao Hua [16] have presented two scheduling schemes-based routing tree model that can produce collision free mechanism to aggregate the information. This algorithm reduces the delay, which can be employed in randomly deployed environmental zone.

3. Problem statement

Scheduling of bundle is the foremost important task for transmission of information to the sink node in there might be some situations where the bundles may be transmitted in critical clip and non-critical clip. The scheme of mechanism used for avoiding congestion is by scheduling or planning play a vital role to improve not only to save remaining intensity efficiently but also to increase the network efficiency, it is also the factor of collision should also be considered right from the cluster head to the sink node through various hops.

4. Proposed work

We propose an effective scheduling scheme to save energy and to process the information to the sink node through various hops to the sink using TDMA technology, so the slots are assigned to different nodes and at various levels. In this proposed methodology three level hierarchy precedence structure in which the highest precedence is given to the critical clip bundles, the intermediate precedence is provided to non-critical clip bundles of remote node and the lowest precedence is used for non-critical clip bundles at local level.

Three Tier Architecture The effective scheduling methodology uses a three-tire pattern were the precedence bundles are organized. The information bundles in the scheme are crossed with the help of TDMA methodology. The proposed scheme uses three precedence levels like highest precedence, intermediate precedence and the lowest precedence. Critical clip or critical interval bundle are reserved using first in first out manner. These bundles are given higher status of precedence. The non-critical clip bundles are processed as intermediate precedence queue that comes from the becon nodes and enter into intermediate precedence levels. The non-critical clip bundles at leaf level go to the lowest precedence phase. The buffer may vary in accordance with the requirement of the application. Initialization of the scheduling scheme may have overhead due resource allocation in the sensor network .The size of the initialization scheme may have smaller queue size than non-empty precedence bundles .The emergency task are handled by the highest precedence will have less number of preemption at the same interval the bundles arriving from the lower node are placed in intermediate queue and they are processed after certain interval of intervalat the same interval the lower precedence bundles are arriving the queue will not the processed when there is an frequent arrival of critical interval precedence bundles. The critical interval bundles are divided in to two parts having precedence level identity and node identity. For an instance if two bundles are at same level, the bundle with small dimension will be given the higher status precedence and two precedence bundles appear in the same progression at the moment, the information bundles that are generated by the leaf level is preferred to avoid throughput. A beacon senses environmental conditions, the sent information bundles are organized in any one of the precedence levels.

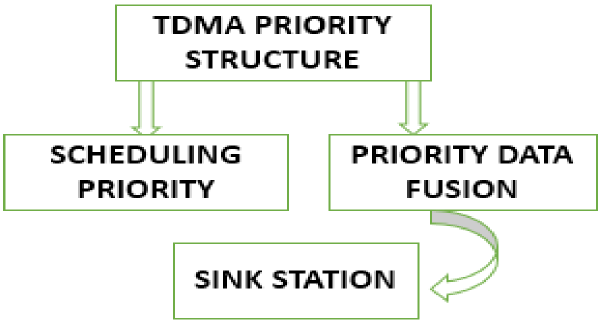

Fig. 1: Three-Tier Architecture Model.

The phase diagram of the note illustrates different transition phases. A node enters into sleep mode when it as no function. In the generous phase where the information bundles are sensed by the beacon and it will create a new information level value for transmission. The receiver phase works when the existing information bundles are merged. The send phase occurs when the size of the bundle reaches the maximum.

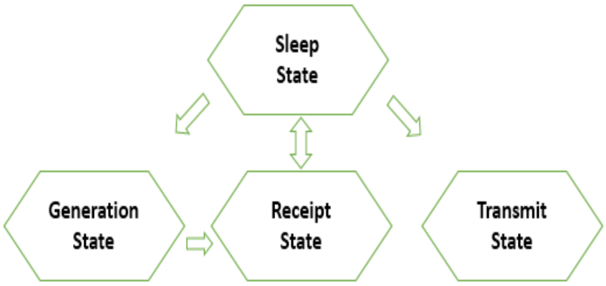

Fig. 2: Phase Process of Nodes.

TDMA methodology

Using interval slots with adaptable length using TDMA scheme since local level nodes have fewer task compared to remote node and upper level nodes. The local level node task has lower component value interval slot when compared with higher level interval slots. There some situation where the critical clip and critical interval event are not sent through intermediate level because it should be transmitted to the sink node without delay or with some minimum delay. Therefore, interval slots for highest precedence critical clip bundles are short. The sink node sends the broadcast message to the cluster head seeking for useful information.

Information Conflate Methodology

The knowledge of information conflate is applied in overlapping path in routing persist of information bundles from the aggregative nodes to the sink nodes. The information bundles from the different levels can be merged before forwarding it to the sink node. The proposed algorithm works on the following steps 1.The beacon authenticates whether it is destination or not, if it is the destination node the bundle is directly send else it merges the information bundles with non-critical clip information bundles.2.If the merge bundle length is zero then initiate sleep clip interval copy the merged bundle with the bundle received else verify the combined size of merged and received bundle is greater than that of the maximum length of the received bundle ,then split into information values .The information values are merged one by one until the bundles reaches the maximum length .When the sleep interval is expired the fused bundles are send to the higher status.

Packet Scheduling

When the information bundle is received at the node it checks whether the bundle is critical clip bundle, if it so the information bundle is inserted in to high precedence queue. Otherwise check whether the node is leafage node then insert the information bundle in intermediate precedence queue else insert the information bundle in lowest precedence queue assuming the information bundles are from the local node. Assume T represents the allocated interval slot and T1 denotes the remaining interval after sensing interval of the node. If the processing interval of the critical clip bundle [PT1] is less than T1 then the remaining interval is used to process the non-critical clip bundles at intermediate precedence queue, if the remaining interval is still more, then the lower precedence bundles are utilized. If highest precedence progression is empty the intermediate precedence task is utilized for µ1 consecutive interval slot for processing information bundles and µ2 interval slot are allocated for lowest precedence information bundles.

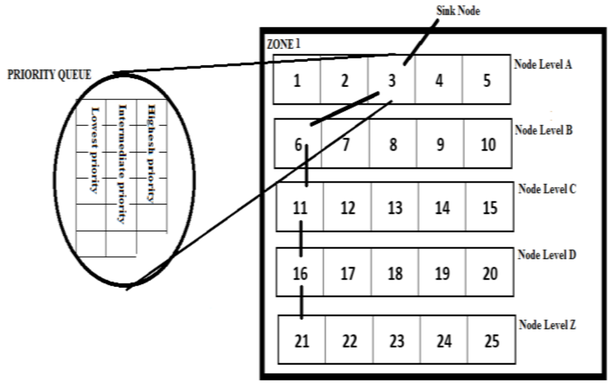

Fig. 3: Three Tier Precedence Queue Bundle Scheduling.

Throughput

The throughput is calculated using transmission delay and propagation delay. The Transmission delay is defined as the ratio of size of the information bundle to information transmission speed which the interval taken to node to transmit the information bundle. The critical clip information is placed in highest precedence queue. End-to-end delay for one event in highest precedence queue without information aggregation and merger is greater than or equal to

$$Delay_{HP} \geq E_i \cdot \left(\frac{PKS_{HP}}{T_s} + PT_{HP}(t)\right) + \frac{D}{P_s} + (E_i + OH) \tag{1}$$

Where E_i -No of events, PKS_{HP} -Bundle size of information in highest precedence, T_s -Transmission speed, $PT_{HP}(t)$ - Processing intervalfor highest precedence bundles, D -Distance between source node to the destination node, P_s -propagation speed and OH -Required overhead.

The throughput with information aggregation and merger with highest precedence is greater than or equal to

$$Delay_{HP} \geq E_i \cdot \left(\frac{PKS_{HP}}{T_s} + \frac{PKS_{IP}}{T_s} + PT_{HP}(t) + PT_{IP}(t)\right) + \frac{D}{P_s} + (E_i + OH) \tag{2}$$

Where PKS_{IP} - bundle size of Intermediate precedence bundle and $PT_{IP}(t)$ -processing intervalof intermediate bundle

The non-critical clip bundles at lowest precedence by local node are added when there are no bundles in the highest precedence queue but there are bundles in intermediate and lowest precedence queue. throughput for this instance can be represented by

$$Delay \geq \alpha * T_i + E_i \cdot \left(\frac{PKS_{LP}}{T_s} + PT_{LP}(t)\right) + \frac{D}{P_s} + (E_i + OH) \tag{3}$$

Where α - consecutive interval slot when there is no bundle at highest precedence queue, T_i -length of the interval slot, PKS_{LP} -bundle size of the lowest precedence bundle $PT_{LP}(t)$ -processing interval of the lowest precedence bundle.

5. Simulation analytic

The intended methodology is simulated using different parameters such as bundle size is 150 bytes having overhead for head with 6 bytes, information size is fixed as 4 bytes, sleeping interval is fixed as 500ms Queue size, bundle precedence using NS2 as listed in the table 1.

Table 1: Simulation Parameters

Parameter	Value
Nodes	450
Area	500*500
Transmission Range	240m
Simulation Time	100 Sec
Bundle size	150
Initial Energy	25 J
Transmission Power	0.606 J
Reception Power	0.410 J

The result proves that the proposed algorithm withstand throughput of bundles of real interval information bundles based on no of nodes as shown in the figure 5.1 than Energy Efficient Wakeup scheduling MAC protocol (EEWS) and Traffic Adaptive MAC protocol (TAMAC) as the number of nodes are decreases the delay also decreases Figure 5.2 shows the end-to-end delay and No of levels also shows that the proposed system provides shorter throughput than other algorithms as shown in the graph. Figure 5.3 shows Throughput for real and non-critical clip bundles combing high precedence and intermediate precedence bundles using merger technique and scheduling algorithm, the proposed algorithm proves its stability. The figure 5.4 shows the throughput based on the number of levels, show bundles reach the sink node with a minimum delay in the proposed three tier precedence structure.

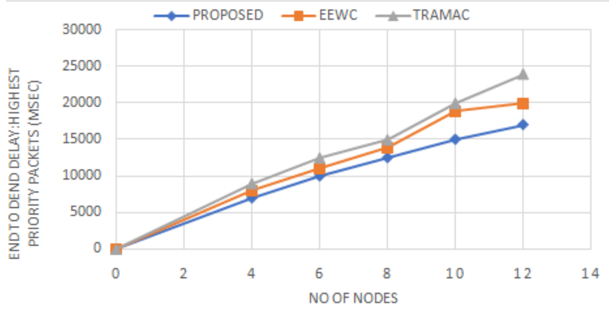

Fig. 4: End-to End Delay of Critical Clip Bundles Based on Nodes

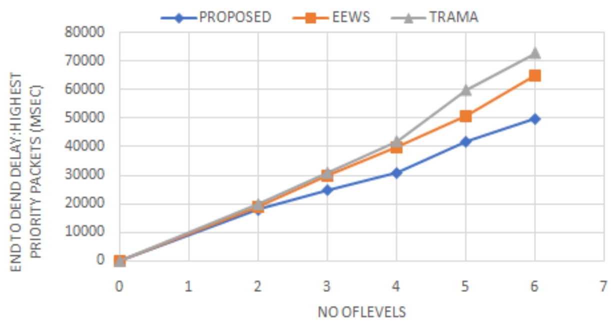

Fig. 5: End-to End Delay of Critical Clip Bundles Based on Levels.

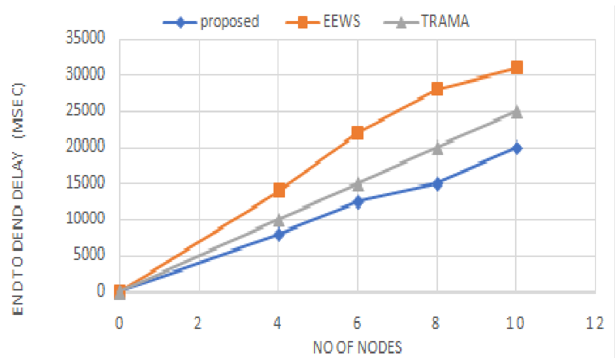

Fig. 6: End-to End Delay of Real and Non-Real Interval Bundles Based on Nodes.

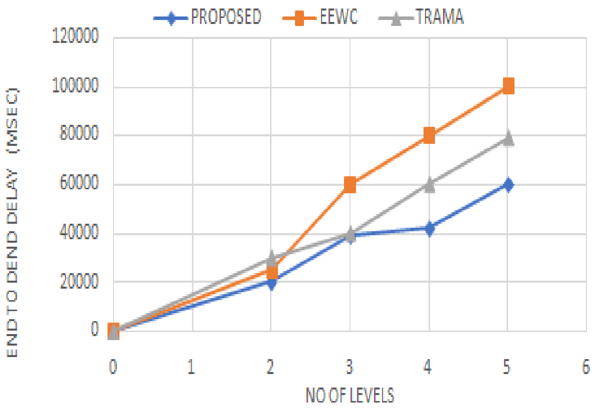

Fig. 7: End-to End Delay of Real and Non-Real Interval Bundles Based on Levels.

6. Conclusion

The proposed three tier precedence bundle scheduling scheme for larger scale networks applied for both critical and non-critical clip bundles. The proposed scheduler adapts itself based on the precedence levels which can change based the application requirement proving interval slots for sleep node thereby saving energy and also the reducing the number of transmission by providing combiner technique so that lower class bundles are meagered with intermediate class bundles when the highest precedence queue is empty. The proposed scheme not only saves energy but also minimizes throughput when compared with EEWS and TAMAC algorithms both in handling critical bundles and non-critical bundles as shown the simulation analysis

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