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# Power Efficient and Minimize Delay in WSN using DMP Scheme

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***Abstract***: Scheduling the different types of packets, such as real time and non-real time data packets at sensor nodes in WSN is very important in reducing end-to-end data transmission delay. There are several schemes such as FCFS, DMP Scheme. But these have high processing overhead and long end-to-end data transmission delay. To overcome these drawbacks the Dead packet Removing and Less Lifetime scheduling scheme is proposed. Scheme is proposed. The proposed scheme will reduce the end-to-end data transmission delay and will give better performance characteristics in power saving.

***Keywords*** *-Wireless sensor network; Real-time and Non-real-time packet Scheduling; data waiting time; FCFS; DMP Scheme; Lifetime packet scheduling; Dead packet removing;*

## I. INTRODUCTION

In order to emphasis the ultimate requirement of WSN applications, energy consumptions and transmission delay is main concern. A real time packet needs to send min time delay to corresponding base station .it is proposed to be place in first priority queue. According to the requirement of Applications the emergency events needs to be delivered to before the expiry of the deadline by this way an application could be successful. Existing packet scheduling mechanisms like preemptive, non preemptive priority algorithms possess high processing overhead and results in starvation of real time as well as non real time packets in both the mechanisms. First come first served (FCFS) schedules the data packets according to the order of their arrival time leads to increased delay for reaching the base station . in FCFS many data packets arrive late to base station and long waiting times. Real time packets are have higher priority and processed with minimum possible delay. Real time packets can preempt lower priority than non real time packets while transmitting, so Non-real time packets are given lower priority it can be processed using FCFS. The main aim of choosing two queues which are (i) for enhancing the transmission of real time packets (ii) non real time packets are larger than real time packets, so they are provided with three queues. The same distance between the two nodes from the other nodes then that will be called the two nodes are in hop distance.

## II. TERMINOLOGIES AND MODULES

### Topology Formation:

Scheme assumes that nodes are virtually organized as hierarchical structure. Nodes that are in the same level which is considered as same hop distance from the base station (BS). Nodes in zones that are one hop and two hops away from the BS are considered to be at level 1 and level 2, respectively. Whole structure divides in zone. Zone also divides in Small Square Data are transmitted from the lowest level nodes to BS through the nodes of intermediate levels

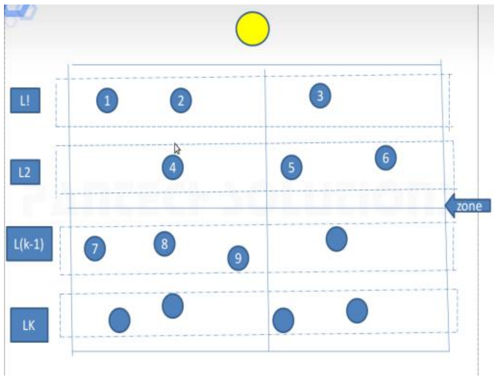


Fig1: Topology Formation

### Priorities and Queues:

Three queues in Sensor node According to priorities tasks are scheduling in queues (pr1, pr2, pr3).Real-time and emergency data should have the highest priority the priority of non-real-time data packets is assigned based on the sensed location (i.e., remote or local) and the size of the data.According to level given priorities, lowest level given first priority.In case of two same priority data packets the smaller sized data packets are given the higher priority.

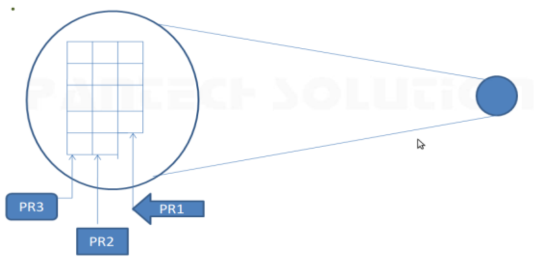


Fig 2: Queues

### TDMA:

Data packets of nodes at different levels are processed using the Time- Division Multiplexing Access (TDMA) scheme. Every level has given fixed time slot If that time is greater than the time calculated for PR1 queue then all Pr1 packet will proceed as FCFS whatever time remain that's use for PR2 queue and Pr3 queue in between this if any higher priority calculated time is greater than total remain time then higher priority queue task send as FCFS no lower priority task send.

### Pre-emption and Non – pre-emption:

If pr1 queue is empty then it will send pr2 queue packet unless until remaining time less than total pr2 proc time. If pr3 packet comes means it pre-empted pr2. At the time execution of pr3 if highest priority packet come it save the context of pr3 and given priority to that packet again process pr3..

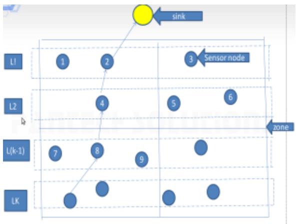

Fig 3: Preemption & Non Preemption scheduling

## III. DYNAMIC MULTILEVEL PRIORITY SCHEME

Data packets at different nodes are processed using Time Division Multiplexing Access (TDMA). Data packets can be either real or non real time packets. Data from the lowest node will reach the base station through several intermediate modes. Real-time data should avoid intermediate nodes from aggregation, since these types of packets must be delivered with minimum possible delay

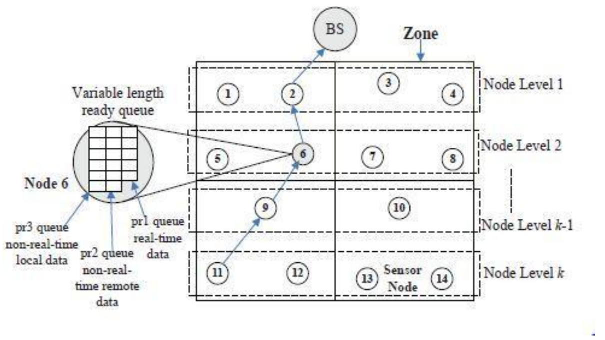


Fig4: Dynamic multilevel priority scheme

If a node is processing a non real time data and it receives a real-time data, then it preempts the non-real time data giving to the real time packets. Each node has three queues in which real-time packets and placed in highest priority queue , non real-time packets that are received from remote node will be in second highest priority , non real time local data are at the lowest level, proposes DMP scheme is detailed in figure4. Properties are assigned in terms by giving preferences there is reduction average waiting time and simultaneously balances the delay. Since non real-time packets occurs frequently length of the highest priority is small than other queues. In DMP scheme, nodes that are treated as different levels based on the hop counts from the base station. All the data packets are of same size. If packets from the same level are to be processed then smaller task will be processed first. Two same priority packets ate at the ready queue then packet from the lowest level will be given highest priority.

Timeslots at each level are flexible. They are evaluated based on the data sensing period, data transmission rate and speed of the CPU. Timeslots are increased as the levels progress through base station. In particular level if there is any emergency data , the time required to transmit that data will be short and will not increase at upper levels too Because there is data aggregation is not available. So the Remaining time is used to process data packets at other queues. This leads to the improvement of Quality of Service (QOS) by delivering the emergency data is very faster. For energy efficiency, when a node completes to process before the expiry of the timeslot then it is activated to sleep mode.

Moreover, when there is no real-time data packet to be sent property 3(pr3) tasks can preempt the priority2 (pr2) tasks if the packet has more waiting time. The memory used for three queues is dynamically allocated and the size of the highest priority queue is usually smaller than the other two queues.

## IV. PERFORMANCE ANALYSIS

### END TO END DELAY:

a) Real Time Priority1 Queue Data:

A node which is placed at the level $l_K$ say x transmits a real-time data to the base station through ($l_k$-1) intermediate levels. When this data reaches the upper level node say w in which a non real time data is being processed. So the data delivery at wsn is preempted to sending the real time data. The end to end delay for sending the real time data satisfies equation 1.

$$delay_{pr1} \geq lk \times \left(\frac{delaypr1}{sp} + pr1_{proc}(t)\right) \times \frac{d}{sp} + (i_k \times t_o)$$

Transmission time which is required $t_c$ place a node into the medium from a node is where $\frac{d}{sp}$ time to transmit data form the source to destination. D is the distance from the source node to base station. Sp denotes the propagation speed over the wireless medium.

b) Non Real Time Priority 2 Queue data

In addition to transmission delay of the real time priority data packet, transmission time of pr2 is included which is equal to $\frac{delaypr1}{sp}$. if the real time tasks are completed before the expiry of the timeslot the pr2 task can be processed for remaining time.

$$delay_{pr1} \geq lk \times \left(\frac{delaypr1}{sp} + \frac{delaypr2}{sp} + pr1_{proc}(t) + pr2_{proc}(t)\right) \times \frac{d}{sp} + (i_k \times t_o)$$

overhead in terms of context switching and queuing system $t_o$

c) Non Real Time Priority 2 Queue Data

when the real-time tasks are not available then pr2 task can be preempted by pr3 tasks. This is applicable for α consecutive timeslots there is no task at the pr1 queue but there are tasks available at the pr2 queue then the end-to-end delay for processing pr3 tasks will be exceeding.

$$\boldsymbol{\alpha \times t(k) + l_k \times \left(\frac{delaypr3}{sp} + pr3_{proc}(t)\right) \times \frac{d}{sp} + (i_k \times t_o)}$$

(ii) AVERAGE WAITING TIME

Assuming that real-time and emergency tasks rarely occur and require a very short time to get processed $pr_1(t)$ is less than the timeslot. All the $n_1$ tasks in the pr1 queue complete processing tasks in the $pr_2$ and $pr_3$ queues are processed in the remaining timeslots.

$$\text{Average waiting time } pr_1(t) \quad \frac{\sum_{i1=1}^{n1=1} \sum_{m=1}^{i1} pr1m(t)}{n1}$$

If pr2 tasks are not preempted by pr1 tasks and can be completed within the same timeslot for the processing pr1 tasks, the average waiting time for pr2 tasks can be expressed

Average waiting time $pr_2(t) = \dfrac{\sum_{i2=1}^{n2=1}\sum_{m=1}^{i2} pr2m(t)}{n2}$

The lowest level nodes only have the pr1 and pr2 queues, pr2 tasks are not preempted by pr3 tasks at the lowest level. Let us assume that the pr3 tasks require $\psi$ timeslots to complete their tasks and during these timeslots the pr3 tasks are preempted by pr1 tasks for $\sum_{m=1}^{\psi} \gamma m$ period. The average waiting time for pr3 tasks at a node, average waiting time pr3 exceeds.

Average waiting time $pr_3(t) \geq$

$$\sum_{j31}^{n31}\sum_{m=1}^{n31} pr3m(t) + \sum_{j32=n31+1}^{n32}\sum_{m=1}^{n31} pr3m(t) + \ldots\ldots\ldots\ldots\ldots\ldots$$

$$\ldots\ldots\ldots\ldots\ldots + \sum_{j3,\psi=1=n(3,\psi-2)+1}^{n32}\sum_{m=1}^{j3,\psi-1} pr3m(t) + (\psi \times \tau) +$$

$$\sum_{m=1}^{\psi} \gamma m + (\alpha \times \sum_{j=1}^{k} t(j))$$

## V. DEAD PACKET REMOVAL & LIFE PACKET SCHEDULING

In Dead packet removing the node can check whether expire packets are buffered or not, if buffered then node deletes dead packet. In Lifetime packet scheduling the node can check the packets lifetime and it sends the buffered packet to BS. According to queuing delay, node can drop packet in intelligent manner. Due to this operation for reduce buffering delay and improve the power saving. The Packet Delivery Fraction (PDF) is defines how many packets sent to Base Station in Particular Time

## VI. RESULT

The performance of the proposed DMP packet scheduling scheme is evaluated, comparing it against the FCFS. The comparison is made in terms of average packet waiting time and end-to-end transmission delay of data. The proposed DMP task scheduling scheme allows different types of data packets to be processed based on their properties. Since real-time and emergency data should be processed with the minimum end-t-end delay, they are processed with the highest priority and can preempt tasks with lower priorities located in the other queues. Every individual task has a separate ID and real time task will preside over the first task. To give importance to the non real time tasks and avoid massive delay, power saving method is proposed.

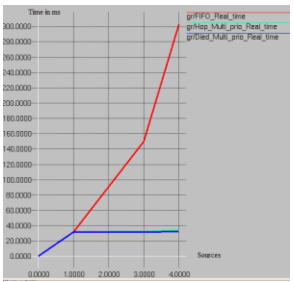

Fig5: Real time packet scheduling

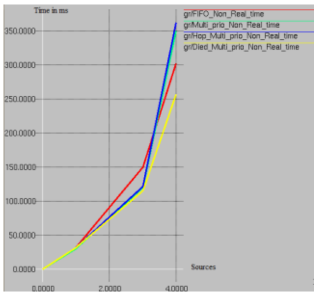

Fig 6: Non Realtime Packet Scheduling

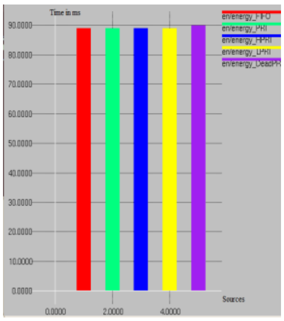

Fig 7: Energy Saving Comparison

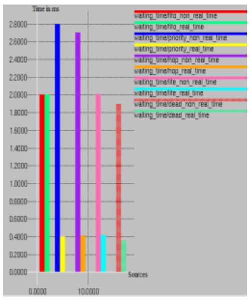

Fig 8: Delay Comparison

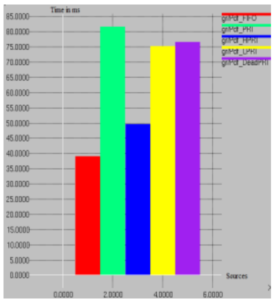

Fig 9: Packet Delivery Fraction

## CONCLUSION

The proposed DMP task scheduling is accompanied for the increased demand for WSN-based solutions that efficiency support real-time emergency application and ensure them minimum average waiting time and end-to-end delay, thus the comparison between DMP scheme and existing scheduling algorithms are made, Dynamic multilevel priority scheduling scheme out forms the rest of its competitors, Dead packet Removing and Less Lifetime packet scheduling is suggested to overcome the non real time tasks in waiting time

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