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Scheduling Schemes in Dynamic Multilevel Packet Scheduling In WSN

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Abstract*: As focusing on the scheduling schemes, there are many scheduling schemes for multilevel. So the paper is concentrating to compare the scheduling schemes and producing the average waiting time and turnaround time. If it is minimized then the overall performance may shoot up. In this paper comparison is done between three scheduling schemes Enhanced Dynamic Multilevel Packet scheduling (EDMP), Circular Wait Dynamic Multilevel Packet scheduling (CW-DMP) and Starvation-Free Dynamic Multilevel Packet scheduling (SF-DMP). In all the above schemes there are three priority levels say priority level 1(Pr1), priority level 2(Pr2) and priority level 3(Pr3). Pr1 will comprise the real time tasks, Pr2 containing the non real time remote tasks and non real time local tasks are there in Pr3. In each and every scheme, each and every priority level will be using the individual scheduling technique to schedule the tasks. Also the comparison is done based on waiting time and the turnaround time of the task thereby the average waiting time and the average turnaround time are calculated.

***Index Terms*: level, priority, packet, scheme, tasks.**

I. INTRODUCTION

The major problem in road is traffic congestion suggests Sanket Dessai et al.[3] whereas by applying the weighted round robin scheduling. In which they will be using two zones. North and west will be well planned as zone1. Where east and south will be considered as zone2. In each and every zone, magnetic sensor, micro controller and zigbee TX were used. This two zone data will be directed to the master node. In the research UAV-based data communication in wireless sensor networks: Models and strategies[4] they will be focused on the Unmanned Ariel Vehicles which will be by means of the round robin scheduling scheme. Centered on this the vehicles will be disturbing from one cluster to another cluster based on the round robin scheduling scheme. Christel Kimberly Cantillas et al.[5] and S.S.Dash et al.[8] advises multilevel priority queue with round robin scheduling and with dynamic quantum. In which they have implement three priority queues in which they have used various time slices or time quantum for dissimilar priority levels.

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The highest priority queue will be given the highest time slice so that more amounts of data will be send. In round robin based secure-aware packet scheduling in wireless networks,[7] the packets were scheduled by means of the round-robin scheduling and after which the security is controlled by the security level controller and after which the packets were located in the accepted queue or else in the rejected queue.

In Max and Min heap[9] , A pointer-free data structure for union heaps and min-max heaps[11] and Min-Max heaps and generalized priority queues[12] it will be arranging the row in increasing or decreasing order. For min heap the steps followed are as follows:

- Use array to hold the data.
- Root stored in position 1
- For any node in location i,
  - Its left child is in place 2i
  - Its right child is in place 2i+1
  - Its parent is in place i/2.

For max heap the steps to be followed are as follows:

- Create a fresh node at the end of heap.
- Allot new value to the node.
- Associate the value of this child node with its parent.
- If value of parent is less than child then exchange them.
- Replicate the exceeding two steps up to heap property holds.

If the heap has N nodes, the heap has log2⌈(N+1)⌉ levels. When inserting the order of complexity to insert is O(log N). For the input 35 33 42 10 19 27 44 26 31, the min heap and max heap are as follows:

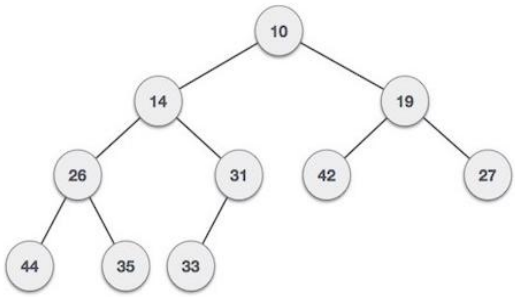

Figure 1: Min heap

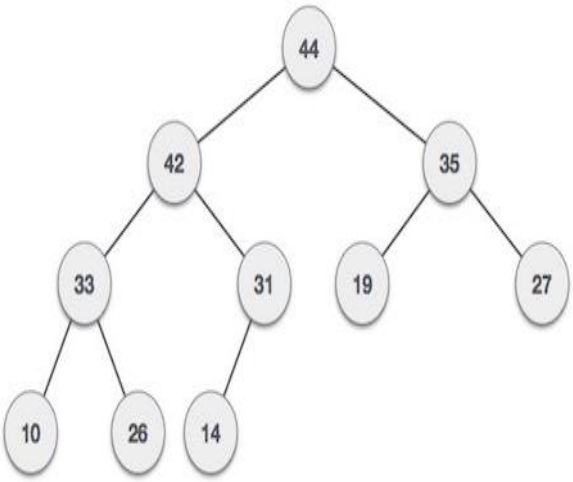

Figure 2: Max heap

II. PROPOSED SCHEMES

In this scheme, centered on the task deadline the packets will be prioritized.

A. EDMP

The overall architecture is depicted in figure 3. First the nodes were exposed to the zone level classification using zone based routing protocol. It is then exposed to node level classification in which based on the hop count of nodes they were categorized from node level1 to node level n. Now in each and every node there was N number of tasks. Now the tasks were characterized according to the priority level as Pr1 (real time tasks), Pr2 (non real-time remote tasks) and Pr3 (non real-time local tasks). Now it is place into the ready queue. Then in ready queue the mean of the burst times of all tasks which are there in the priority level will be designed and that will be the time quantum. After which the modulo value is produced as burst time modulo time slice and based on this calculations the tasks were organized in the ready queue in ascending order using minheap algorithm. And the same were subjected to scheduling using round robin scheduling scheme and the average waiting time and turnaround time were planned.

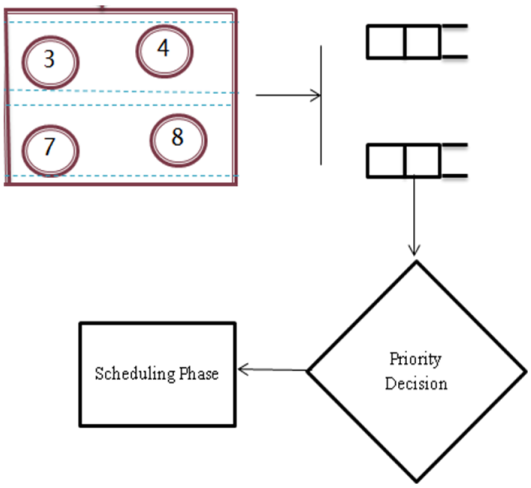

Fig.3: Overall architecture of EDMP

In this scheme the Pr1 tasks will be scheduled using Earliest Deadline First scheduling technique. Pr2 will be scheduled using First Come First Serve scheduling and Pr3 tasks were scheduled using preemptive scheduling.

B. CW-DMP(ROUND ROBIN)

In this scheme[11]-[13] the Pr1 tasks will be scheduled using preemptive Earliest Deadline First scheduling technique. Pr2 will be scheduled using and Pr3 tasks will be scheduled using round robin scheduling technique. The scheduling is explained in the below figure.

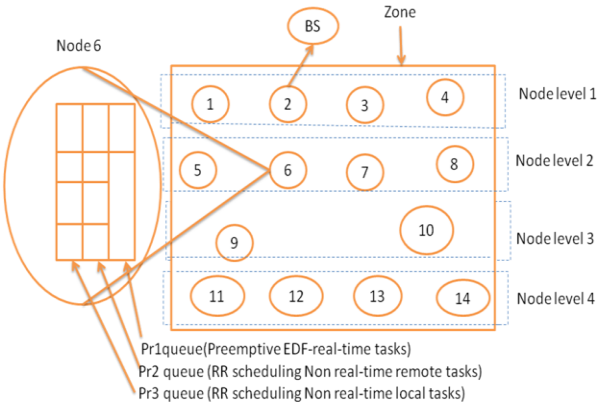

Fig 4: Overall architecture of CW-DMP

C. SF-DMP

In this scheme[14]-[22] the Pr1. Pr2 will be scheduled using and Pr3 tasks were scheduled using round robin scheduling technique. The overall architecture is explained in the following figure.

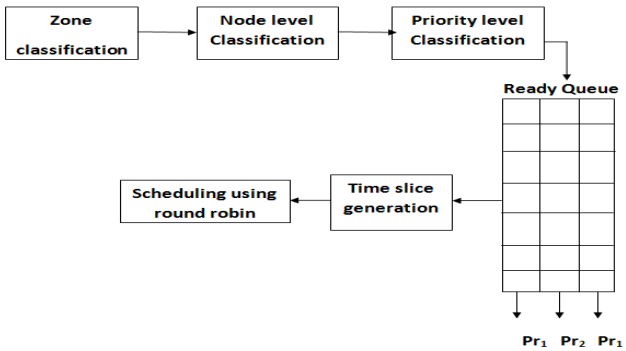

Fig 5: Overall architecture of SF-DMP

III. RESULTS AND DISCUSSIONS

The experimentation is done and executed using C programming language. The comparison is done between the EDMP, CW-DMP and SF-DMP. Each and every task will have the type id which identifies the type of every task. In which type 0 means real time tasks, and type1 and type2 will represent non real time remote and local tasks respectively. In the preceding scheme based on the highest hop count they will be allocating the highest priority. This too will leads to starvation for the tasks which are residing in the lowest hop count.

Table I. Simulation parameters and their values

Parameters	Values
Network Size	100m x 100m
Number of nodes	Maximum 200
Number of zones	4
Number of tasks	10000
Base station position	55m x 101m
Transmission energy consumptions	50 *nJoule/bit*
Energy consumption in free space or air	0.01 *nJoule/bit/m*^{2}
Initial node energy	2 *Joule*
Transmission speed	250 *Kbps*
Propogation speed	198 x 10^6 *meter/sec*
Task priority levels	3
Time Quantum	5
Zone height	20

When matched with the schemes EDMP, round robin(CW-DMP) and SF-DMP, SF-DMP outperforms. Where two are real time tasks having priority 1 and the other two is non real time remote tasks having priority 2 and the other one is the non real-time local tasks. In this assessment EDMP scheme is having the average waiting time as 22.5 milli seconds and average turnaround time as 37.3 milli seconds. The round robin based scheme having 22.6 milli seconds as the average waiting time and 37.2 milli seconds as average turnaround time.

When equated the above two schemes SF-DMP has 14.6 milli seconds average waiting time and 20.8 milli seconds as average turnaround time.

The Gantt chart for the three schemes are shown in figure 6, 7 and 8 for SF-DMP, round robin scheduling and DMP respectively.

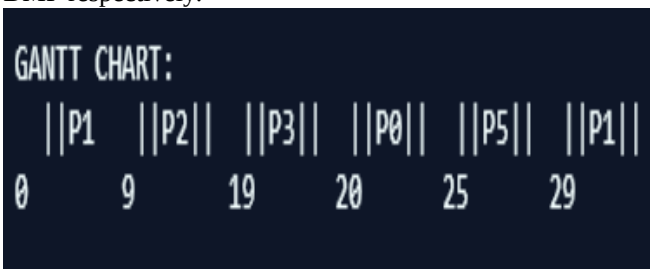

Fig 6: Gantt chart for SF-DMP

Comparing with at about 10 to 10000 tasks the average ρ-values of average waiting time is 2.5milli seconds and the average turnaround time is 9.6 milliseconds.

The gantt chart representing the same evaluations are shown in figure 6, 7 and 8 for SF-DMP, round robin scheduling and DMP respectively.

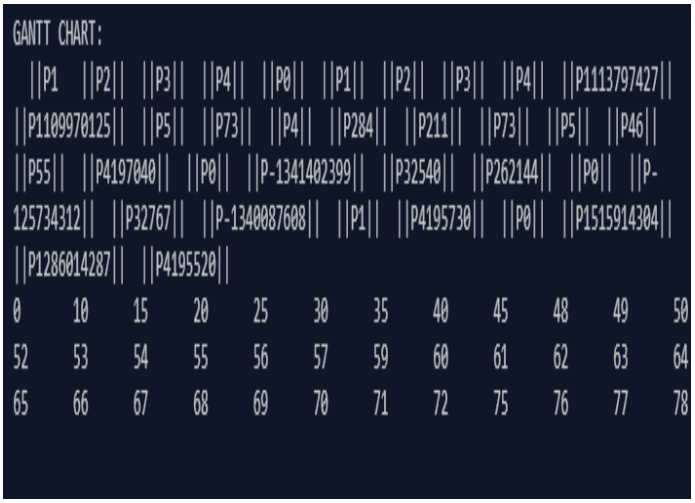

Fig 7: Gantt chart for round robin (CW-DMP)

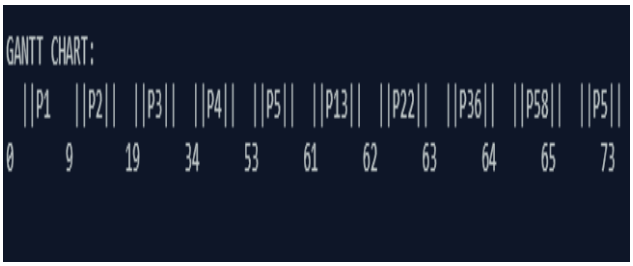

Fig 8: Gantt chart for DMP

In SF-DMP the following calculations are done:

Task[i]. waitingTime: $T_{wt} = T_{TAT} - T_{et}$

Task[i]. TurnaroundTime: $T_{TAT} = Tct - T_{at}$

Table II. Data

Tasks	Burst Time	Arrival time	Modulo Burst time(SF-DMP)	Priority Level
T[1]	9	4	9	1
T[2]	10	5	10	1
T[3]	15	13	1	2
T[4]	19	13	5	2
T[5]	20	7	6	3

Centered on the above data the graph is generated for comparing the waiting time and turnaround time of the DMP, round robin and SF-DMP schemes for the tasks and it is depicted below in figure 9 and 10.

Comparing with at about 10 to 10000 tasks the average ρ-values of average waiting time is 2.5milli seconds and the average turnaround time is 9.6 milliseconds.

Comparing with at about 10 to 10000 tasks the average ρ-values of average waiting time is 2.5milli seconds and the average turnaround time is 9.6 milliseconds. The formula for calculating both the average waiting time and turnaround time are as follows:

Average Waiting time = Task[i]. waitingTime/n

Average Turnaround time = Task[i].TurnaroundTime/n

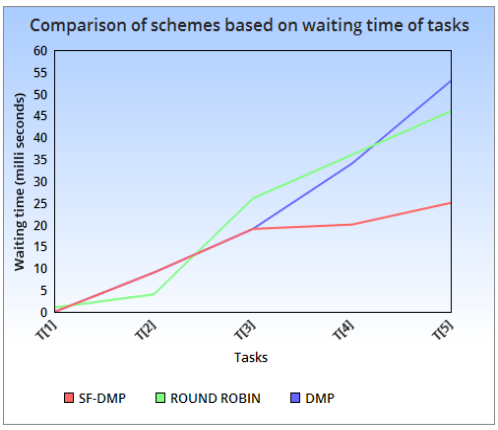

Fig 9: Waiting time of tasks

Comparing with at about 10 to 10000 tasks the average ρ-values of average waiting time is 2.5milli seconds and the average turnaround time is 9.6 milliseconds.

Task[i]. waitingTime: $T_{wt} = T_{TAT} - T_{et}$

Task[i]. TurnaroundTime: $T_{TAT} = Tct - T_{at}$

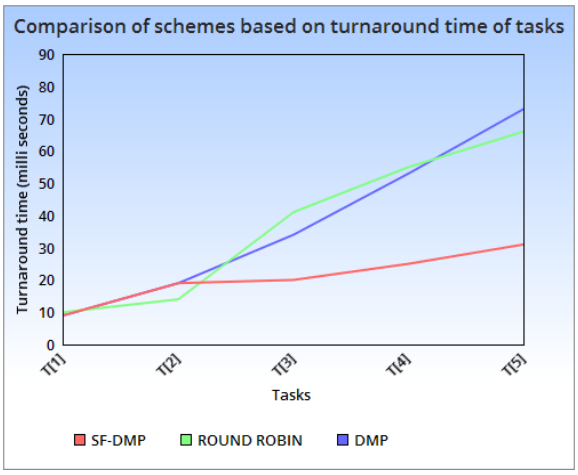

Fig 10: Turnaround time of tasks

The comparison based on average waiting time and turnaround time between DMP scheme and the SF-DMP schemes are depicted in figure 11 and 12 respectively.

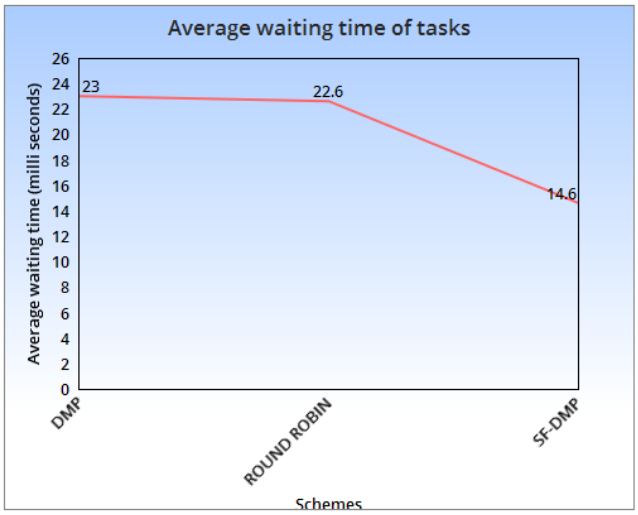

Fig 11: comparison of schemes with average waiting time

In the figure 11 and 12 the comparison of the schemes DMP, round robin and SF-DMP based on the average waiting time as well as average turnaround time was done. Based on the comparison made it is clear that SF-DMP is less than both the DMP and round robin scheduling in both average waiting time and average turnaround time.

Average Waiting time = Task[i]. waitingTime/n

Average Turnaround time = Task[i]. TurnaroundTime/n

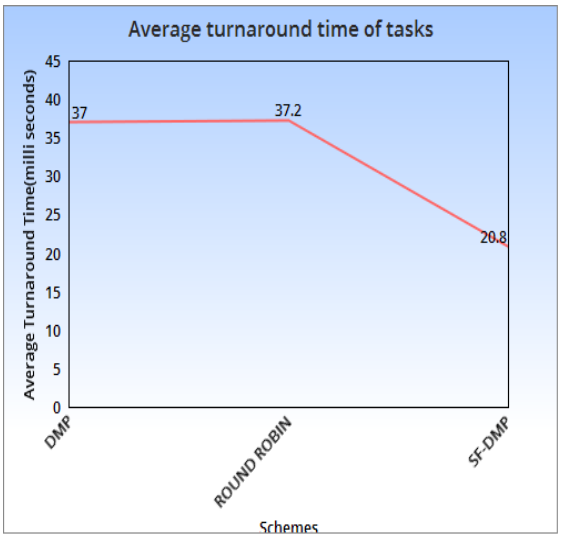

Fig 12: comparison of schemes with average turnaround time

In the above figure 11 and 12 the comparison of the schemes DMP, round robin and SF-DMP based on the average waiting time as well as average turnaround time was done. Based on the comparison made it is clear that SF-DMP is less than both the DMP and round robin scheduling in both average waiting time and average turnaround time.

IV. CONCLUSION

As a conclusion, the evaluation suggests that when compared with EDMP, CW-DMP and SF-DMP, SF-DMP outperforms as it is having less waiting time and turnaround time. Hence the performance of the SFDMP scheme is good when comparing with the other two schemes.

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