# Abridged Energy Utilization in Wireless Networks through Efficient Scheduling Mechanism

**S Priyamohana, S Veluchamy, C Suresh Kumar**

***Abstract*—Wireless devices that constitute an infrastructure-less network, do not have a continuous power supply. Their mobility capability also reduces the chances of connecting to electric power. Thus, given that the communication interface card of a wireless device consumes a significant portion of battery energy, reduction of the transmission power consumption is one of the most significant issues in modern wireless communication networks. In wireless environments, the channel conditions are time variant. The radio channel experiences both stochastic small scale fading (SCF) because of multipath and large-scale fading because of shadowing. The main objective is to design a transmission schedule that maximizes battery lifetime and providing the quality of service (QoS), in particular meeting the data rate and packet delay constraints of real-time data users, is one of the requirements in emerging Wireless network links. A Multilevel queue scheduling is used for situations in which processes are easily separated into several groups. For example, a general division is prepared between foreground (interactive) processes and background processes. These two types of processes contain different response-time requirements and so may have different scheduling needs. It is very helpful for shared memory harms. It partitions the ready queue into several separate queues. It is used to improve the energy consumption. Here use three different scheduling algorithms for wireless links. A simulation result shows that better performance compare than other scheduling mechanisms.**

***Index Terms*— Channel Awareness, Energy Efficiency, deadline constrains, Multi-level Queue Scheduler, real time, Non real time, QoS.**

## I. Introduction

A wireless sensor network is a group of specialized transducer with a communication infrastructure intended to monitor and record conditions at different locations. A sensor network consists of several detection stations called sensor nodes, which is small, lightweight and portable. The power for each sensor node is derived from a battery. Each node consists of processing capability, may contain multiple types of memory like program, data and flash memories have a RF transceiver, have a power source, and accommade a array of sensors and actuators. The great evaluation of wireless networks and data services and the demand for small scale devices with low capability constraints (e.g., sensors) have resulted in the necessity for effective network resource management. It holds the promise of ubiquitous access to information. This promise has led to the widespread deployment of wireless based voice and data services exemplified by cellular networks and wireless local area networks.

Dedicated channel voice transmission has already become a widespread and mature technology. Packet switched networks are being considered for heterogeneous data efficiently use the resources of the wireless channel. Wireless LANs and personal area networks, where packetization is more suited to the bursty nature of the data, are being developed and deployed more recently; ad-hoc networks and networks of distributed sensors are being designed utilizing the robustness and asynchronous nature of transmission in packet networks. In a sensor network, the sensor may not be charged once their energy is drained; hence the lifetime of the network depends critically on energy

The full potential of wireless networks is limited by their dependence on energy sources with finite capacity. For example, cell phones and laptops need to recharged every now and then from power outlets. In sensor networks deployed in inhospitable terrain, it is often impossible to recharge dead batteries and the network is rendered useless when the nodes run out of energy. It follows that the greater the energy capacity of the battery, the longer the run time of a wireless devices on the other hand, the shrinking form factor of wireless devices dictates that batteries be small in size and light weight thus limited their energy capacity. This problem is exacerbated by the fact that advances in battery technology have not kept pace with progress in digital integration technology.

## II. PERIVIOUS WORK

The bursty transmission system transmits the data bit stream as packet. By transmitting a data as a packet that improves the band width of the communication medium. It involves the optimal offline schedule. The optimal offline schedule used for deadline constraints. It uses combination of two ideas that improve the transmission efficiently.1. Channel coding can be used to conserve energy by transmitting at reduced power levels over longer durations.2. Electro-mechanisms in batteries allow them to recover

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energy during idle periods. By combining these two ideas we achieve,

i) Extended transmission duration.
ii) Battery recovery during idle conditions.

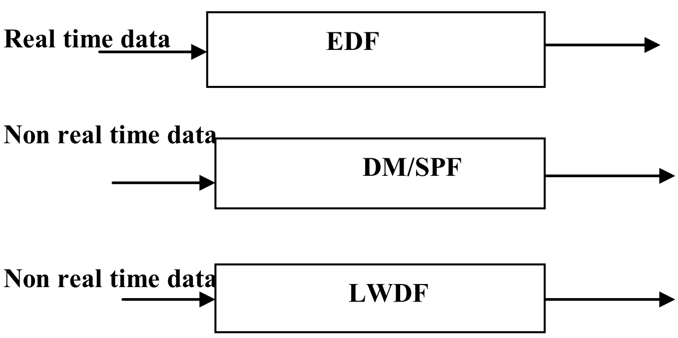
It also transmit the data depends on the channel condition that also improve the Energy Efficient transmission. This system also considers the dead line constraint. Bursty packet transmissions interspersed with idle periods extend battery life. The device which uses this algorithm saves energy by transmitting in bursts and recovering in the idle periods.

### A. Problem setup

Algorithms are available to reduce the energy consumption but they are not giving any preference (priority) to the real time data. They are not improving the Quality of Service (QoS).Hence; there is a need of algorithm to improve the Quality of service and schedules first the real time data. Quality of service not be determined as much as possible. Here we used Rayleigh fading it is used for non LoS (line of sight only).So from this, did not able to achieve the best energy consumption. Then computational complexity is high.

## III. PROPOSED WORK

Multilevel queue scheduling is used for situations in which processes are easily separated into several groups. It means, a general separation is made between foreground (interactive) processes and background processes. These two methods of processes include different response-time requirements and so may have different scheduling algorithm needs. It is very helpful for shared memory harms. It partitions the ready queue into several separate queues. That means Queues in multilevel queue scheduling algorithms. Additionally, these algorithms are not dynamic to the altering requirements of WSN (Wireless Sensor Network) applications since their scheduling policies are predetermined. In each node, except those at the last level of the virtual hierarchy in the zone based topology of WSN (Wireless Sensor Network), has three levels of priority queues. Real-time data packet is located into the highest-priority queue and can preempt data packets in other queues. Non-real-time packet is located into two other queues based on a certain threshold of their estimated processing time**.** It is used to improve the energy consumption. It may improve the perceived Quality of Service (Qos) by delivering real-time data fast. It is a energy efficient scheduling technique. It consumes less power. If a node completes its task before the expiration of its allocated time slot, then it goes to sleep mode by turning its radio off for the sake of energy efficiency. Here no data aggregation.




### A. Packet scheduling

Packet scheduling refers to the decision process used to select which packets should be serviced or dropped. Dropping of packets will be based on network characteristics such as bandwidth, packet arrival rate, time limit of packet and packet size. Scheduling will be done in scheduler.

A scheduler will find it difficult to handle all the packets coming in if the packet rate is high, but the bandwidth is also small or the packet size is high. Hence the scheduler will choose certain packets based on different algorithms. Packet scheduling is mainly applied to guarantee quality of service, improve transmission rate in wireless networks.

### B. Dead line constrains

Dead line constrains need to resourcefully schedule a set of incoming packets so that every packet can be transferred to its destination earlier than its deadline. If here is no such schedules exist, next there is requiring getting one that allows a maximum number of packets to meet their deadlines. Packet scheduling schemes can be classified based on the deadline of arrival of data packets to the base station. First Come First Served. Most presented wireless sensors networks applications uses First Come First Served schedulers that process data in the order of their arrival times at the ready queue. Basically, there is a single queue of ready processes. Relative significance of jobs calculated only by arrival time. The execution of the FCFS policy is simply managed with a First in First out queue. When the process is ready it enters the ready queue, its Process Control Block is linked on to the end of the queue. In First Come First supply, data that arrive belatedly to the intermediary nodes of the system from the distant leaf nodes require a lot of time to be delivered to base station but data from nearby neighboring nodes take less time to be processed at the intermediary nodes. Here, many data packets appear late and thus, these packets experience long waiting times

### C. Real-time data priority1 queue

The real time data are filled in Priority1 queue. Each & every packets in the Priority1 Queue are processed in a EDF manner. Real-time data denote information with the purpose of delivered immediately after collection. Here is no delay in the timeliness of the information provided. Real-time data is frequently used for navigation. Dynamic data denotes information that is asynchronously changed as further updates to the information become available. The reverse of this is importunate data, which is data that is rarely accessed and not probable to be customized. Dynamic data is also dissimilar from streaming data, in that there is no constant stream of information. Fairly, updates may come at any time, with period of indolence in between.

### D. Non real time data priority2 queue

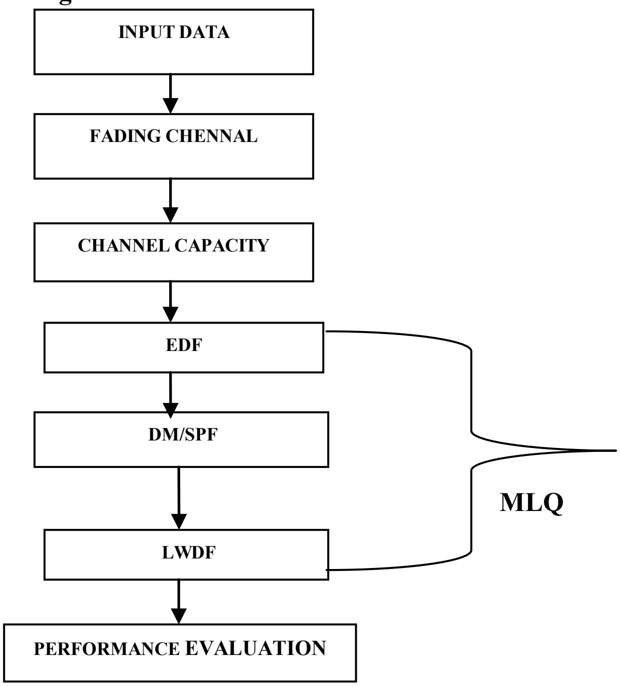
The non real time data are filled in Priority2 queue. Each & every packets in the Priority2 Queue are processed in a DM manner. Non Real-time data denotes information that is delivered depends upon the shortest deadline rate after collection. There is some delay in the timeliness of the information provided. it is similar to rate monotonic scheduling algorithm.

*E. Non real time prority3 queue*

The non real time data are filled in Priority3 queue. Each & every packets in the Priority 3 Queue are processed in a LWDF manner. Non Real-time data denotes information that is delivered depends upon the high delay time after collection. There is some delay in the timeliness of the information provided.

**Flow diagram**




*F. Data Signal*

The purpose of a network is to transmit information from one processor to another. To do this, you first have to make a decision how to encode the data to be sent, in other words its processor demonstration. This will vary according to the type of data, which could be audio data, text data and video data. Data representation can be divided into two types, Digital data which means that the information is encoded as a set of binary values, in other words a sequence of 0s and 1s Analogue data which means that the data will be represented by the deviation in a continuous physical capacity.

*G. Fading Channel*

In wireless communications, fading is variation of the attenuation disturbing a signal over certain transmission media. The fading may differ with time, geographical point or broadcasting frequency. A fading channel is a communication channel comprising fading. Fading may either be due to multipath propagation, or because of shadowing.

Fading models for the division of the attenuation are Rayleigh or Rician fading. Rayleigh fading is a arithmetical model for the result of a propagation environment on a broadcasting signal, such as with the purpose of used by wireless devices. Rayleigh fading models imagine that the magnitude of a signal that has passed through such a communication medium (also called a communications channel) will vary arbitrarily, or fade, according to a Rayleigh distribution the radial part of the sum of two uncorrelated Gaussian random variables. Rayleigh fading is viewed as a rational model for troposphere and ionospheric signal broadcast as well as the result of heavily built-up urban environments on radio signals. Rayleigh fading is most valid when there is no dominant propagation beside a line of sight between the transmitter and receiver

*H. Channel Capacity*

The channel capacity is a measure of the maximum amount of information that can be transmitted over a channel and received with a negligible probability of error at the receiver. At the input of a communication scheme, separate source symbols are map into a sequence of channel symbols. The channels symbols are then transmitted/conveyed through a wireless channel that by natures random. In addition, random noise is added to the channel symbols. In general, it is possible that two different input sequences may give rise to the similar output sequence, because different input sequences to be confusable at the output. To avoid this situation, a non-confusable subset of input sequences must be chosen so that with a high probability, there is only one input sequence causing a exacting output.

Let $e(t)$ be the energy required to transmit a bit for duration $t$ .Since channel capacity theorem,

$$C = W1/2\log_2(1+P/N) \quad (1)$$

where $C$ is the optimal capacity, given an average power constraint $P$ and noise power $N$. If one assumes the use of a capacity achieving code, the number of transmissions required to transmit 1 bit is given by,

$$S = 1/C \quad (2)$$

Assuming one transmission takes 1 unit of time, the energy required to transmit 1 bit is then given by,

$$e(t) = tP \quad (3)$$

$$= tN(2^{2/t} - 1) \quad (4)$$

*I. Algorithm Description*

**Earliest Deadline First (EDF) algorithm**

Dynamic algorithms assign priorities at runtime, based on execution parameters of packets. Dynamic scheduling can be either with static priority or dynamic priority. The most important dynamic scheduling with dynamic priority algorithm is Earliest Deadline First (EDF) algorithm.

**EDF Algorithm**:

The priority of each packet is decided based on the value of its deadline. The job with nearest deadline is given highest priority and it is designed for execution. This method is easy and proved to be best when the system is preemptive, here loaded and there is only one Scheduler.

**Deadline-monotonic scheduling (DM)**

All tasks have deadlines less than or equal to their minimum inter-arrival times (or periods).All tasks have worst-case execution times (WCET) that are less than or equal to their deadlines. All tasks are independent and so do not block each other's execution (for example by accessing mutually exclusive shared resources).No task voluntarily suspends itself. There is some point in time, referred to as a grave immediate, where every one of the tasks becomes ready to execute at the same time. Scheduling overheads (switching from one task to another) are zero. All tasks have zero release jitter (the time from the task arriving to it becoming ready to execute).

**Largest weighted delay first scheduling (LWDF)**

The LWDF discipline is a non preemptive, work conserving discipline that always chooses for service the longest waiting (i.e., head-of-the-line) customer of the flow which has the maximal weighted delay. In case of a tie, by convention the LWDF discipline chooses the class with the highest index.

**Performance Evaluation**

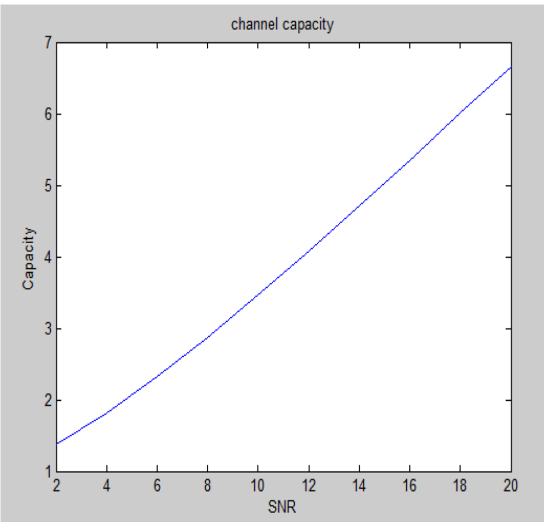
In this paper, introduced a Multilevel Queue Schedule to reduce the energy consumption. A simulation result shows that our new schedule technique consumes less power and prolonging the battery life time. Here also compared our results with other scheduling algorithm like Energy efficient opportunistic scheduling and optimal offline scheduling, the result shows that our scheduling algorithm consumes less power than Energy efficient opportunistic scheduler and optimal offline scheduler.

**Table I: Comparison of other scheduling algorithm with proposed Algorithm**

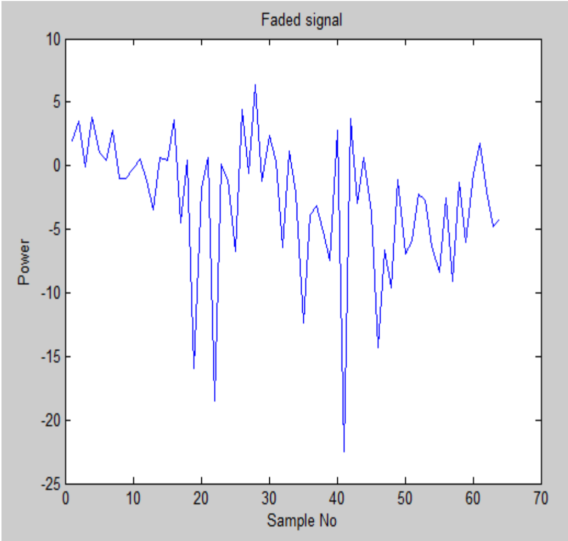
| S.No. | Algorithms | Average Power Consumption (mW) |
|---|---|---|
| 1 | EEOTS-1 | 2.18 |
| 2 | EEOTS-2 | 3.05 |
| 3 | Optimal Offline Schedule | 1.2 |
| 4 | Multi Level Queue | 0.8 |

## IV. RESULT AND DISCUSSION

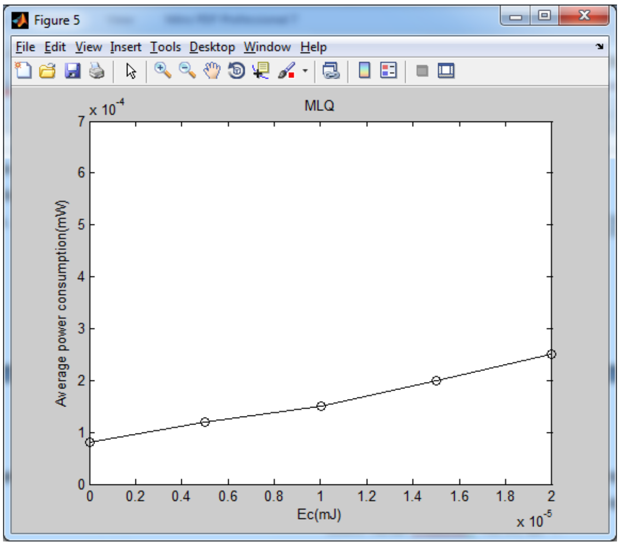
**Channel Capacity**



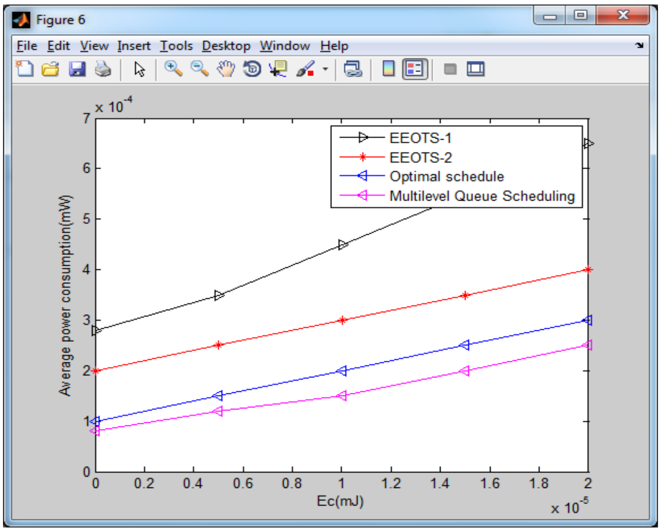

**Fade Power**




**Multilevel queue Policy**




**Compared to the Existing Algorithm**



## V. CONCLUSION

One of the key concerns in modern wireless networks is the design of energy-efficient transmission policies. This paper presented a new multilevel queue scheduler that minimizes the energy consumption in wireless networks, where limited battery lifetime constitutes a bottleneck. Based on the different scheduling mechanism to improve the energy consumption. Here achieve an Energy Efficient transmission compared to other algorithms. And each algorithms aims at different QoS parameters such as maximizing fairness and minimizing end to end delay, maximizing throughput and successful packet transmission.

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