

# Energy-Efficient Urgent Packet Forwarding Mechanism

Achyut Shankar<sup>#1</sup>, T Manoranjitham<sup>\*2</sup>

<sup>#</sup>M.Tech Computer Science student, SRM University, Kattankulathur, Tamilnadu, India  
<sup>\*</sup>Associate professor, computer science dept, SRM University, Kattankulathur, Tamilnadu, India

**Abstract--** A fast transmission mechanism of urgent information is essential for establishing a wireless sensor network infrastructure for a safe and secure living environment. Some messages can be more urgent than others due to critical values of the sensed data. Such messages may be required to be delivered within a specified deadline and increased delay in message delivery may not be tolerated in those cases.

In this paper, a forwarding method is proposed for transmitting those urgent messages in wireless sensor network. This method includes three things .Firstly, Priority scheduling which will differentiate incoming packets. Secondly, elimination of expired packets for reducing buffer overhead. Thirdly, Emergency wake-up method (for sleep node) for the node which is in sleep mode. We verified our proposed mechanism through simulation experiments and showed that it drastically improved the latency of the urgent information transmission.

**Index words :** urgent message, wireless sensor network, priority scheduling, sleep/awake mode

## I.INTRODUCTION

A wireless sensor network consists of one or multiple data center (called sink node) and many low-cost and low-powered sensor devices (called sensor nodes). Each sensor node has the ability of sensing data, processing data, and communicating with others via radio transceivers. The data sink, equipped with a database system, sends queries or control commands to sensor nodes and collects information from sensors. The communication between the sink and sensor nodes relies on the relay by intermediate sensor nodes. In such a Wireless Sensor Network, both urgent and non-urgent information, such as a fire alarm and humidity data, go through the same network and they apparently should not be handled equally. The urgent information has to be carried through the Sensor Network with higher reliability and lower delay than other non-urgent information. It means that a Wireless Sensor Network must be capable of differentiating and prioritizing packets according to requests from the application layer depending on their urgency and importance. For reducing delay and buffer overhead elimination of expired packet is also necessary. Again, in order to minimize the energy consumption of sensor nodes, a sleep/wakeup protocol is offered, in which each sensor node manages its state independently. The active mode is also called the working state, in which the data frames are transmitted normally. The sleep mode includes two stages: the sleep stage and the listening stage. In the sleep stage, the sensor node will turn

off the wireless communication module so data frames are not received or sent. If data frames are detected in the listening stage, the sensor node will enter into the active mode, i.e., the system will switch to the active mode. Otherwise the sensor node will return back to the sleep stage. In the proposed system it is assumed that the nodes maintain this sleep/active mode. So for urgent message the sleep node should be handled differently.

The basic operation is as follows. A sensor node which has detected an emergency event emits a packet tagged as an "emergency packet". On receiving an emergency packet, nodes along the path from the origin of the emergency packet to the Base Station suspend their sleeping schedule and broadcast the packet. At the same time, by hearing the flooded emergency packet, the surrounding nodes which are not involved in forwarding the emergency packet suppress the transmission of normal packets in order to avoid collisions in Medium Access Control (MAC) layer.

The rest of the paper is organized as follows. In Section II, we briefly review our previous related work on the urgent message forwarding scheme for sensor networks. Then, the detailed description of the proposed mechanism in III. Section IV gives the details of simulation experiments and results. Finally we conclude the paper in Section V.

## II. RELATED WORKS

Speed [1] is another real time protocol developed for WSN. Speed and RAP are based on geographic forwarding and are soft real time solutions. But both Speed and RAP does not use multipath routing. A Survey of transport protocols for wireless sensor network [2] presents a survey of transport protocols for Wireless Sensor Networks (WSNs) and highlights the basic design criteria and challenges of transport protocols which include energy-efficiency, quality of service, reliability, and congestion control. But multipath routing scenarios are not considered. In Priority based Congestion Control Protocol (PCCP) [3] a node priority based control mechanism has been proposed for WSN. PCCP prioritizes both source and transit traffic but has limitation in handling multiple sensed data within a node A fast and reliable transmission mechanism for urgent information in a WSN in which all sensor data are periodically collected at the Base Station. Although we assume a specific data gathering mechanism [4], [5]In this paper a fast and reliable transmission and retransmission technique is presented through sleep and awake mode. In [6] a priority scheduling scheme is used which is included in the proposed system.

### III. PROPOSED SYSTEM

#### A. Packet Prioritization

Priority identification means identifies the input sensor data and find out the priority of the data. The priority is based on data, if real time data occurs, it considered as high priority, if non real time data occurs, it considered as next high priority and if local data occurs, it considered as next high priority.

#### B. Number of queue

Each node has three queues. Data packets are placed into the different queues according to their priorities. Each queue is assigned for priority based on the coming tasks. The first level queue can store the real time (priority I) task, the second level queue can store the non real time (priority II) task and the third level queue can store the local (priority III) task.

#### C. Packet scheduling

In the proposed scheme, scheduling has two phases:

- (i) allocating tasks among different queues
- (ii) scheduling packets in each queue.

In the above fig 1, the scheduling process is shown. First the data is classified whether is real or non real data packets, according to that it is prioritized and finally placed in the queue for processing.

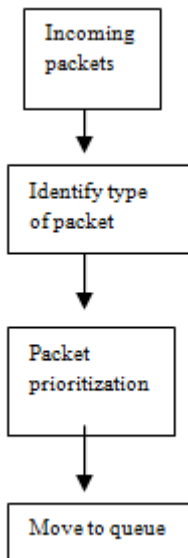


Fig 1: Packet scheduling in queues

#### D. Elimination of expired packets

Every packet will have a generation time and a fixed expiry time. Now, a packet is processed in the buffer. So if the expired packets are eliminated then the processing time can be reduced and it decreases the buffer overhead and also conserves energy. For this purpose elimination of dead scheme is proposed.

#### E. Transition of modes

A sensor node maintains sleep /awake mode in the network for conserving energy. A sensor node periodically wakes up and sends data. This is called NORMAL State. When a sensor node detects an emergency packet sending situation, it enters moves into the SUPPRESSED state. In this state node should suppress emitting normal packets and preferably selects emergency packets first. Then it move into the EMG\_SEND(emergency send) state and transmits emergency packet .But if the node which is in sleep mode, receives an emergency packet which need to be forwarded, moves into the EMG\_FORWARD(emergency forward)state. It suspends the sleep schedule and received emergency packets are send immediately. After that again it goes in sleep mode if it's sleep time is not over.

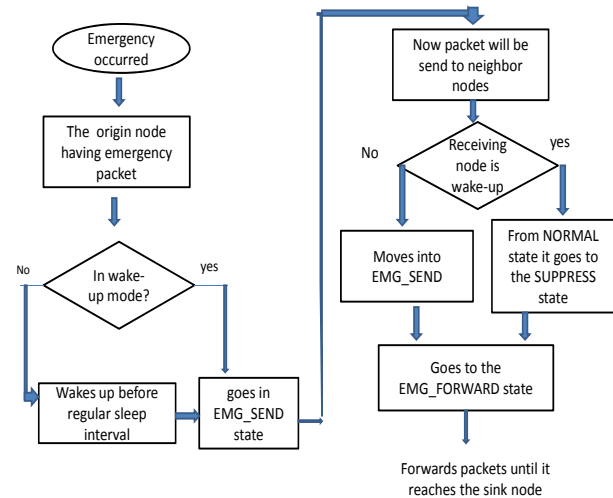


Fig 2: Flowchart for transition of mode

### IV. SIMULATION RESULTS

The simulation is carried out in NS2.

parameter	value
Area of simulation	400*400
Network density	10
Physical/mac layer protocol	802.11
Traffic type	CBR
Packet size	400

Table I: Simulation parameters

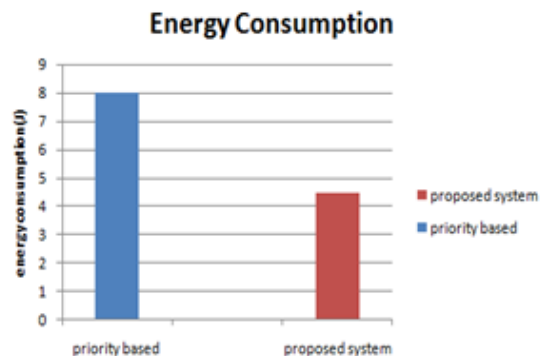


Fig 3: Energy consumption

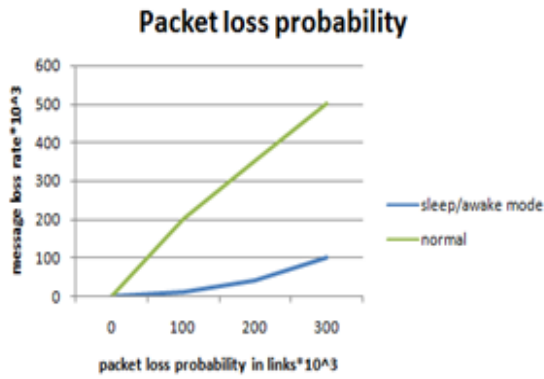


Fig 4: Packet loss probability

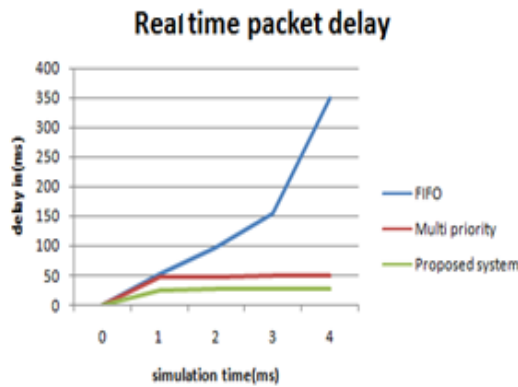


Fig 5: Real time packet delay

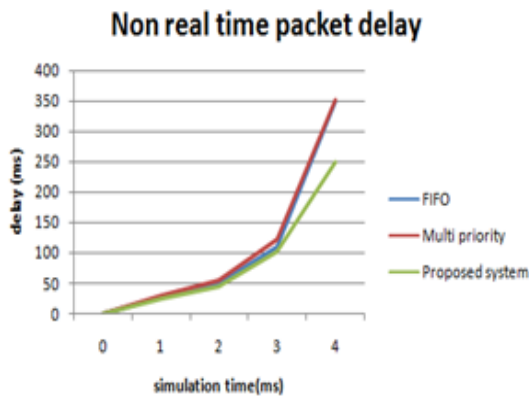


Fig 6: Non real time packet delay

Proposed system is conserving more energy than the priority scheduling scheme (fig 3) and packet loss is also reduced through the emergency wake up scheme (fig 4). The overall packet delay for both real and non real data packets is also reduced (fig 5).

**V. CONCLUSION**

Here it is shown that energy conservation is less in the proposed system. After applying the transition of mode concept the packet loss probability is also decreased. Finally the packet delay is less in this proposed system for both real and non real time packets. So this system is efficient for urgent packet sending.

**ACKNOWLEDGEMENT**

I would like to thank my guide, T.Manoranjitham and my friends for giving me valuable suggestions for the research work and also it's my pleasure to thank SRM University for providing me the good infrastructure.

**REFERENCES**

- [1] T. He, J. A. Stankovic C. Lu and T. F. Abdelzaher, "Speed: A stateless protocol for real-time communication in sensor networks," presented at the IEEE International Conference on Distributed Computing Systems (ICDCS), Dallas, Rhode Island ,USA, May 2003.  
C. Wang, B. Li, K. Sohraby Grant M. Daneshmand and Y. Hu, "A Survey of Transport Protocols for Wireless Sensor Networks ," IEEE Network, vol. 20 no.3 ,pp. 34-40, June 2006.
- [2] C. Wang, B. Li, K. Sohraby, M. Daneshmand and Y. Hu, "PCCP: Upstream Congestion Control in Wireless Sensor Networks Through Cross-Layer Optimization," IEEE Journal on Selected Areas in Communications Vol.25, No.4, May 2007.
- [3] N. Wakamiya and M. Murata, "Scalable and robust scheme for data gathering in sensor networks," in Proc. of the International Workshop on Biologically Inspired Approaches to Advanced Information Technology (Bio-ADIT 2004), Lausanne, Switzerland, Jan. 2004, pp. 412-427.
- [4] "A Fast and Reliable Transmission Mechanism of Urgent Information in Sensor Networks",Tetsuya Kawai, Naoki Wakamiya, and Masayuki Murata Graduate School of Information Science and Technology Osaka University, Osaka, Japan
- [5] "Efficient dynamic multilevel priority task scheduling for wireless sensor networks"K.Indumathi et al,International Journal of Computer Science and Mobile Computing, Vol.3 Issue.1, January-2014, pg. 210-217