Comparative Performance Analysis of Packet Scheduling Schemes for Wireless Sensor Network

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By

Amany Morsey Ahmed El-Kelany

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Alexandria University

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Abstract

The Wireless Sensor Network (WSN) is a wireless network consisting of ten to thousand small nodes with sensing, computing and wireless communication capabilities. WSN are generally used to monitor activities and report events, such as fire, overheating etc. in a specific area or environment. Wireless sensor networks (WSNs) are widely considered as one of the most important technologies. WSN has provided a small and low cost sensor node with the capability of sensing various types of environmental phenomena and wireless communication. In most WSN applications, sensor nodes are deployed in ad hoc fashion without engineered. Once deployed sensor nodes are expected to autonomously organize themselves into wireless medium. It consists of protocols and algorithm with self-organizing capabilities. It routs data back to the Base Station (BS). Data transmission is usually a multi-hop from node to node towards the BS. Sensor nodes are limited in power, computational and communication bandwidth.

In general, the WSN deals with several design issues like routing protocols and the data aggregation to minimize the energy consumption of sensor network, data transmission delay, packet scheduling at sensor nodes is highly significant as it makes sure with delivery of different types of data packets based on their priority and evenhandedness with a minimum latency. For example, data sensed for real-time applications have higher priority than data sensed for non-real-time applications.

Scheduling data packets at sensor nodes, interchangeably used as task scheduling. It is significantly important since it determines the data transmissions order based on different factors such as data size, transmission deadline, and data priority. For instance, data sensed for real-time applications have higher priority than data sensed for non-real-time applications. Packet scheduling is very useful for heterogeneous wireless sensor networks containing different types of sensors that sense different types of data.

Most of the existing packet scheduling mechanisms of the wireless sensor networks use First Come First Served (FCFS), non-preemptive priority and preemptive priority scheduling algorithms. These algorithms have high processing overhead and also long end-to-end data transmission delay. In FCFS concept the data packet which is entering the node first goes out first from the node, and the packet which enters last leaves at last. But in FCFS scheduling of real time data packets coming to the node have to wait for a long-time period. In non-preemptive priority scheduling algorithm, there is starvation of real time data packets because once the packet enters the running state, it is not allowed to remove until it is completed, so there is starvation of real time data packets. On the other hand, in preemptive priority scheduling, lower-priority data packets can be placed into starvation for continuous arrival of higher-priority packets but in WSNs sensed data have to reach the BS within specific time

period or before the expiration of deadline also real time data should be deliver to BS with minimum end-to-end delay.

Objective of this work is to perform a comparative analysis between each two packet scheduling schemes in wireless sensor networks based on same factors such that most of the previous work depends on comparing packet scheduling schemes based on different factor whenever they compare FCFS and the non-preemptive priority calculating end-to-end delay and average waiting time. In this thesis, the comparative performance analysis is done. with many performance metrics such as packet delay, throughput, energy consumption and network lifetime using JSIM. In this study, the benefits and limitations of the packet scheduling schemes and its impact on technology and applications were discussed.