

ABSTRACT

The Wireless Sensor Networks (WSN) can be described as a group of connected wireless sensors that collect data from the environment and transmit them to a base station (sink node). Due to the rapid development of sensors in recent years, there has been a growing demand in Wireless Multimedia Sensor Network (WMSN) applications such as video surveillance, traffic monitoring and real time object tracking systems. Health monitoring applications demands reliable communication with low power consumption in Wireless Body Area Networks (WBAN). To fulfill the quality of service prerequisites for multimedia applications, a reliable transport protocol is needed.

One of the principle destinations of the transport layer in wireless sensor networks is congestion control. The characteristics of different wireless sensor network, lead to congestion occurrence that affects the performance of the network. Till now, congestion control procedures depend on identification of congestion and recovery, yet they cannot eliminate or prevent the event of congestion. The protocols for various wireless sensor networks should be designed to preserve desirable characteristics (such as network self-adaptation, scalability, fairness among competing traffic flows, etc) with the resource constrained nature of the underlying network. The protocols should also preserve the delay and bandwidth requirements posed by application.

To maintain the required Quality of Services (QoS) parameters for the specific applications, the important factors and their combinations that causes the occurrences of congestion in wireless environments. A model has to be designed to determine the effect of the factors on the performance metrics of wireless sensor networks, wireless multimedia networks and

wireless body area networks. A framework is needed for the distinct WSN applications to prefer the transport protocols.

Design of experiments is adopted to find the significance of the identified factors and their impact on the performance metrics of the wireless networks. Based on the analysis report of the experimental studies, the network infra-structure through transport protocol design can be suggested. A framework can be designed using the network infra structure that could meet the requirements of transport protocols in wireless sensor network applications. That is based on the specific applications' demand, the transport protocol is suggested to optimize the quality of service and the performance.

In Wireless sensor networks, network density, mobility pattern and transmission rate are selected as the influencing factors. The experiments are conducted for studying the important performance metrics, End to End Delay (EED), Packet Drop Ratio (PDR) and Throughput. The study revealed that the the end to end delay is mostly affected by network density, the Packet Drop Ratio (PDR) is influenced more by mobility pattern and the throughput is mostly affected by traffic rate. It is also evident that all other factors (and the combination of the factors) effect on end to end delay, packet drop ratio and throughput are not significant.

For Wireless multimedia networks, work load, traffic burstiness and routing technique are chosen as the critical factors. The performance metrics, peak signal to noise ratio Packet Delivery Ratio and Delay are considered for the study. Experimental study is performed and it is observed that the quality of the multimedia (in terms of peak signal to noise ratio) is highly influenced by the factor traffic burstiness, the packet delivery ratio is mostly affected by the factor workload and the latency is mostly affected by the factor routing protocol. Also it is proved that the interactions of the factors are not significant in affecting the WMSN application's performance.

Among the several variables affecting the wireless body area networks performance, the three major factors are taken into account. They are: the environment, data rate and number of nodes. Packet Delivery Ratio (PDER), Bit Error Rate (BER) and energy consumption are chosen as the most critical parameters that affects the wireless body area networks. The analysis of experiments is applied to study and analyze the performance metrics. From the results it is identified that the Packet Delivery Ratio (PDR) is highly influenced by the environment factor, Bit Error Rate is mostly affected by the factor data rate and energy consumption is mostly affected by the number of nodes factor. It is examined that all other factors and its combinations' influence on the performance metrics are not significant.

Thus, this work has initiated the new dimension in designing of the transport protocols that suit the specific application demands in evolving and future application in wireless sensor networks.