

Design and Simulation Analysis of MAC Layer Protocol with QoS Support for a Wireless Multimedia Sensor Network



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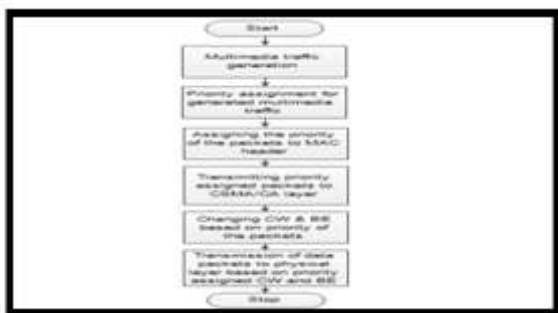
Keywords: WMSNs, CSMA/CA, IEEE802.15.4, Contention Window, Back-off Exponent

Abstract:

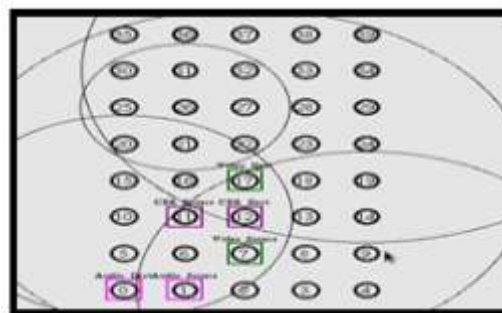
Wireless Multimedia Sensor Networks (WMSNs) are distributed systems of wirelessly networked devices which allow exchange of video and audio streams, still images, and scalar sensor data. The adoption of WMSNs for applications such as health care, industrial monitoring and security management in military applications has brought forward a challenge of fulfilling the Quality of Service (QoS) requirements for these applications. Providing QoS support for WMSNs is a challenge due to highly resource constrained nature of sensor nodes, unreliable wireless links, limited bandwidth and limited energy of sensor nodes. Therefore, use of WMSNs for transmitting multimedia traffic requires predefined level of QoS for high quality performance. In this thesis, a QoS aware MAC protocol is designed and developed for WMSNs in NS2.34.

In the proposed protocol, multimedia traffic such as audio, video and data traffic are transmitted based on application priority. A priority based back-off mechanism is implemented wherein the values of Contention Window (CW) and Back-off Exponent (BE) are decided according to the priority of the multimedia data. Performance of the proposed protocol is studied in terms of Packet Delivery Ratio (PDR), throughput, delay and energy through simulations and compared with existing IEEE 802.15.4 based Carrier Sense Multiple Access/ Collision Avoidance (CSMA/CA) medium access mechanism.

The developed QoS aware MAC protocol is tested and validated successfully through various test cases. From the simulation results it is observed that the proposed MAC protocol for WMSNs performance better than the existing CSMA/CA mechanism in terms of PDR, throughput, delay and node energy. Therefore, the quality of experience is better with the proposed protocol when compared to existing protocol in WMSNs.



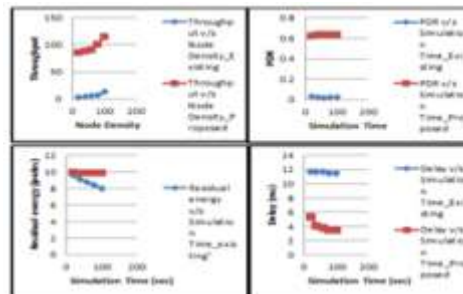
Flow diagram of protocol implementation



Network topology setup



Priority based traffic transmission



Graphical analysis of performance metrics