

Energy-efficient multichannel hybrid MAC protocol for IoT-enabled WBAN systems

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**Abstract**

Internet-of-Things (IoT)-enabled wireless body area networks (WBANs) are resource-constrained in nature (energy, bandwidth, and time-slot resources); hence, their performance in healthcare monitoring often deteriorates as the number of active IoT devices sharing the network increases. Consequently, improving the network efficiency of IoT-enabled WBAN systems is essential for improving healthcare monitoring. Hence, we propose an energy-efficient multichannel hybrid medium access control (MAC) (MC-HYMAC) protocol that combines the benefits of the carrier sense multiple access with collision avoidance (CSMA/CA) and time division multiple access (TDMA) protocols to improve the overall performance of IoT-enabled WBAN systems. We also proposed an adaptive power control scheme, time-slot management scheme, channel utilization mechanism, and dynamic back-off time policy to improve the overall network efficiency. In addition, we applied a finite-state discrete-time Markov model to determine the traffic arrival pattern and analyze the transition states of biomedical devices to facilitate optimal decision-making for enhanced overall performance of the network. Standard metrics, such as energy efficiency, throughput, delay, packet drop ratio, and network lifetime, were used to evaluate and compare the existing MAC protocols.