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QUALITY OF SERVICE AND ENERGY EFFICIENT AWARE (QEEA) SCHEDULING ALGORITHM FOR LONG TERM EVOLUTION (LTE) NETWORK

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ABSTRACT

The growing demands for wireless communication services pose new challenges in the coming generation of cellular networks design. In Third Generation Partnership Project (3GPP) Long Term Evolution (LTE) networks, ever-higher data rate and energy efficiency (EE) are required to meet the increasing demands in cellular traffic. High data rates can be achieved, however, it requires high level of energy consumption which needs to be controlled especially in this era of green communication trends. The energy consumption of cellular networks worldwide has become a major obstacle to the continued future development of mobile data services, considering that the number of mobile phone users worldwide has already surpassed 4 billion and as the near exponential increase of data traffic carried over mobile networks continues, mobile network operators are faced with rapidly increasing energy costs and regulatory pressures to reduce their carbon footprint to operate more "green" networks. Hence, efficient solutions are necessary to optimize EE and at the same time achieve high data rates to meet green LTE requirements. This thesis proposed an efficient algorithm, namely, the Quality of Service (QoS) and Energy Efficient Aware (QEEA). The goal of QEEA is to achieve maximum throughput and improve the EE by using low transmitted power (43 dBm) which is the lowest power setting according to the 3GPP LTE specifications. This algorithm considers the head of line (HOL) delay, achievable throughput, past average throughput and transmitted power. Basically, the QEEA is based on the Time Domain (TD) and Frequency Domain (FD) scheduling where it is dependent on the QoS requirements to allocate resources. The proposed algorithm is compared against other scheduling algorithms, namely, the Channel and QoS Aware (CQA), Priority Set Scheduler (PSS), Proportional Fair (PF), Maximum Throughput (MT) and Blind Average Throughput (BAT). The simulation process was conducted using Network Simulator-3 (NS-3) and the performance of these packet scheduling algorithms were evaluated based on the performance metrics of throughput, delay, packet loss ratio (PLR), energy consumption rate (ECR), and EE for the voice over IP (VoIP), video and File Transfer Protocol (FTP) applications. The results showed that the QEEA algorithm outperformed the other algorithms as it could achieve up to 18% of maximum throughput, 27% reduction in ECR, and 36% improvement in EE in terms of radius ranging from 200 m to 1000 m. In terms of number of users in the cell, the algorithm could achieve up to 240% of maximum throughput, 61% reduction in ECR and 150% improvement in EE. Thus, it can be concluded that QEEA algorithm is the most energy efficient and the best candidate for provisioning the QoS for the real time (RT) and non-real time (NRT) applications.

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