Performance Analysis of Packet Scheduling Algorithms for Long Term Evolution (LTE)

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by

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged with the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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ABSTRACT

The third generation partnership project long term evolution (3GPP LTE) system is proposed as a new radio access technology in order to support high-speed data and multimedia traffic. The 3GPP LTE system has a flat radio access network architecture consisting of only one node, known as eNodeB, between user and core network. All radio resource management (RRM) functions are performed at the eNodeB. As one of the essential RRM functions, packet scheduling is responsible for the intelligent allocation of radio resources for active users. Since there is a diversity of the traffic types in wireless systems, active users may have different Quality of Service (QoS) requirements. In order to satisfy various QoS requirements and efficiently utilize the radio resources, a packet scheduler adopts a specific packet scheduling algorithm when making decisions. Several packet scheduling algorithms have been proposed in the literature.

The objective of this thesis is to evaluate the performance of the well-known and some recently proposed packet scheduling algorithms and identify the suitability of these algorithms in the downlink LTE system. The performance evaluation of packet scheduling algorithms based on both computer simulation and theoretical analysis is provided in this thesis.

The performance of packet scheduling algorithms is evaluated in three scenarios including 100% RT scenario, 100% NRT scenario and 50% RT and 50% NRT scenario under the downlink LTE simulation environment. The simulation results for well-known packet scheduling algorithms show that Maximum-Largest Weighted Delay First (M-LWDF) outperforms other algorithms in the 100% RT scenario, while Exponential/Proportional Fair (EXP/PF) is comparatively more suitable in the 50% RT and 50% NRT scenario. In the 100% NRT scenario, Proportional Fair (PF) and Maximum Rate (Max-Rate) achieve a good throughput and resource block (RB) utilization performance while Round Robin (RR) has the best fairness performance. Additionally, two recently proposed algorithms are evaluated and can be considered as the packet scheduling candidates. The simulation results show that Sun Qiaoyun's Algorithm is more appropriate than Jeongsik Park's Algorithm for the downlink LTE supporting the real-time traffic.

The mathematical model for performance evaluation of the packet scheduling algorithms in the downlink LTE system is discussed in this thesis. The theoretical delay analysis for OFDMA system and the theoretical throughput analysis of PF algorithm is studied and validated in detail. This thesis moves further to theoretical performance analysis of M-LWDF and obtains the analytical result of the expected throughput of M-LWDF.