Chapter 15
Performance Evaluation of LTE Scheduling Techniques for Heterogeneous Traffic and Different Mobility Scenarios

Lukmanhakim Sukeran, Mohamed Hadi Habaebi, Al-Hareth Zyoud, Musse Mohamud Ahmad, Shihab Hameed, Amelia Wong and I.M. Rafiqul

Abstract In this paper five scheduling algorithms were investigated and their performance was evaluated in terms of Fairness Index, Peak Throughput, Average Throughput and Edge Cell User Throughput. A system level MATLAB simulator was used. The simulation takes into account different types of traffic for several mobility scenarios and propagation channel models. Results indicate that the scheduling algorithms showed some quality in certain parameter of evaluation but lack in other terms. While some scheduling algorithm take the moderate path but still be lacking especially in Edge Cell User Throughput necessitating the use of Relays or femtocells.

15.1 Introduction

Evolution of Universal Mobile Telecommunications System (UMTS) has not reached its end even though with the existence of High Speed Packet Access (HSPA). UMTS Long Term Evolution (LTE) has been introduced in 3rd

L. Sukeran · M.H. Habaebi (✉) · A.-H. Zyoud · M.M. Ahmad · S. Hameed · A. Wong · I.M. Rafiqul
Faculty of Engineering, Electrical and Computer Engineering Department, International Islamic University Malaysia (IIUM), 53100 Gombak, Kuala Lumpur, Malaysia
e-mail: habaebi@iium.edu.my; habaebi@gmail.com

A.-H. Zyoud
e-mail: alhmtz@yahoo.com

M.M. Ahmad
e-mail: mussemoh@gmail.com

S. Hameed
e-mail: shihab@iium.edu.my

A. Wong
e-mail: amelia@iium.edu.my

I.M. Rafiqul
e-mail: rafiq@iium.edu.my

H.A. Sulaiman et al. (eds.), *Advanced Computer and Communication Engineering Technology*, Lecture Notes in Electrical Engineering 315,
DOI 10.1007/978-3-319-07674-4_15

Generation Partnership Project (3GPP) Release 8 to guarantee the competitiveness of UMTS for the next coming years. The rapid grow of mobile data usage in the recent years such as gaming, mobile channel TV, and other streaming content have concerned in the (3GPP) leading to motivation on LTE. Therefore the work towards 3rd Generation Partnership Project (3GPP) Long Term Evaluation started in 2004 and the targets of LTE standard were set [1].

Orthogonal Frequency Division Multiplexing (OFDM) has been adopted as the downlink transmission scheme for the 3GPP LTE. OFDM is a multicarrier transmission scheme since it splits up the transmitted high bit-stream signal into different sub-streams and sends these over many different sub-channels [2]. OFDM simply divides the available bandwidth into multiple narrower sub-carries and transmits the data on these carries in parallel streams. Each sub-carrier is modulated using different modulation scheme, e.g. Quadrature Phase Shift Keying (QPSK), Quadrature Amplitude Modulation (QAM), 64QAM and an OFDM symbol is obtained by adding the modulated subcarrier signals [3].

The scheduling algorithm is the radio resource management technique that is used by the base station to manage and control the available radio resources and assign them efficiently to the available users to meet their service requirement. The minimum resources that could be assigned for a user are called Resource Block (RB). RB includes 12 adjacent OFDM subcarriers. The scheduler task is to assign these RBs to the users in the network. Many scheduling algorithms have been proposed in the literature. So far, Different studies have been conducted to investigate the performance of the proposed algorithms for different scenarios using several simulation platforms.

The work in [4] investigated the performance of five scheduling algorithms for video traffic using 3GPP LTE simulator. The results showed that Maximum-Largest Weighted Delay First (M-LWDF) algorithm performs better than other algorithms like Round Robin (RR), Exponential/Proportional Fair (EXP/PF), Maximum Rate (Max-Rate), and Proportional Fair (PF) in terms of throughput, number of users supported and fairness. In [5], a comparison of different scheduling algorithms for downlink channel was performed using NS-3 simulator. Similarly, NS-3 was used in [6] to evaluate the performance of scheduling algorithms for uplink scenarios. Moreover, LTE-Sim [7] was used in [8] to compare the performance of three different scheduling algorithms in video traffic scenarios. Habaebi et al. [9] evaluated three of the most known scheduling algorithms namely, RR, PF and Best Channel Quality Indicator (BCQI) using LTE system level simulator [10]. They found that the BCQI outperforms RR and PF in terms of throughput and Block Error Rate (BLER).

In this paper five types of scheduling are considered which are RR, Proportional Fair Sun (PFS), BCQI, Resource Fair Maximum Throughput (RF) and Max-Min Fairness (MaxMin). System level simulations were carried out to compare and evaluate the previous algorithms. The performance was evaluated in terms of fairness index, peak throughput, average throughput and cell edge throughput.