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Analysis on Lte Downlink Schedulers Algorithms In Open Access Simulation Tool Sns 3 And Lte Sim

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Abstract- Reaching higher throughput has sometimes resulted in unfair allocation to users who are located far from the base station or users who suffer from bad channel conditions. Therefore, a sufficient trade-off between throughput and fairness is essential. The scarce bandwidth, fading radio channels and the QoS requirement of the users, makes resource allocation a demanding issue. Different scheduling approaches have been suggested for different service demands described briefly throughout the thesis. Initially, a comprehensive literature review of existing work on the packet scheduling topic has been accomplished in this thesis to realize the characteristics of packet scheduling and the resource allocation for the wireless network. Many packet scheduling algorithms developed to provide satisfactory QoS for multimedia services in downlink LTE systems. Several algorithms considered in this thesis include time and frequency domain algorithms and their way of approach has been investigated.

Keywords- WSN, QoS, LTE, OFDMA.

I. INTRODUCTION

Mobile cellular systems have evolved rapidly over the last two decades. The report of the International Telecommunication Union (ITU) as shown in Figure 1.1 indicated that by the end of 2014 there were 7 billion mobile cellular subscriptions in the world, of which 3.6 billion were from the Asia-Pacific region. The history of mobile cellular systems focusing on development of the mobile cellular technologies is briefly described here. The First Generation (1G) analogue systems introduced in 1980 were based on circuit-switched and voice communication.

The Frequency Division Multiple Access (FDMA) [2] was used as a multiple access method in 1G. Analogue Mobile Phone System (AMPS) and Nordic Mobile Telephone (NMT) were important 1G system that was introduced in North America, Scandinavia and some European countries. Total Access Communication System (TACS) in Japan under the name of the Japanese Total Access Communication (JTAC) system was a variant of AMPS that was used in the UK, some European countries and Japan in the early 1980's. The main disadvantage of the 1G technology was that it deployed analogue systems which means it was slower, and inefficient for data transmission in terms of spectrum usage and leaded to dropped calls. In the early 1990s, the Second Generation (2G) mobile cellular system based on circuit-switched technology was introduced. Radio signals in 2G and 1G are digital and analogue respectively, where systems use digital signaling for connecting with radio towers.

2G technology uses two different types of multiple access methods: Time Division Multiple Access/ Frequency Division Multiple Access (TDMA/FDMA) and Code Division Multiple Access (CDMA). In addition to digital voice telephony, the introduction of 2G systems resulted in low rate services including mobile fax, voice mail and Short Message Service (SMS). Researchers in the mobile industry have been focused on optimizing interference mitigation proposals and providing a wider range of services. The Global System for Mobile Communications (GSM) was developed in 1987. GSM, Personal Digital Communication (PDC) and cdmaOne are examples of 2G systems.
In GSM Phase 1, the standard SMS was added to voice services. In Phase 2, fax and data services were

added to the GSM specifications [3]. The need for getting higher data rate services resulted in the evolution of 2G networks. General Packet Radio Service (GPRS) was a significant step in the evolution of the GSM networks. GPRS (known as 2.5G) uses packet switched technology unlike GSM which deploys circuit-switched technology.

The growing demand for accessing internet and broadband multimedia services for mobile users and the coherence of mobile and Internet Protocol (IP) based technologies are the major reasons behind the development of Third Generation (3G). The data rate of delivering services and applications in 3G mobile systems is up to and beyond 2Mbit/s.

II.METHODOLOGY

1.RAA (Resource Allocation and Assignment) Algorithm

The RAA (Resource Allocation and Assignment) scheme was proposed for efficient resource allocation with the goal to deploy a trade-off between throughput and fairness. This algorithm consists of two stages: Stage 1 (resource allocation) and Stage 2 (resource assignment). In Stage 1, the numbers of RUs which are allocated to each user are calculated on the basis of transmission requirements in each TTI.

If the total number of allocated RUs is more than the available number of RUs in one TTI, the difference will be removed from the users' allocation list until the allocation number is equal to the available number of RUs. The priority of choosing users for each RU is computed based on the scheduling algorithm in Stage 2. The calculated number of RUs for every user in Stage 1 is assigned to users based on the scheduling algorithm and its priority. The scheduling algorithm is based on transmission needs to maximize the usage of RUs. Figure 1 presents the flow chart of the Resource Allocation and Assignment algorithm.

2. Opportunistic and Delay Sensitive (ODS) Algorithm

In a packet scheduling algorithm consisting of two stages of resource allocation and assignment techniques has been introduced. The algorithm is named as ODS (Opportunistic and Delay Sensitive) algorithm is in this work. The flow chart of this algorithm has been given in Figure 2. The resource allocation of ODS consists of three phases in each interval.

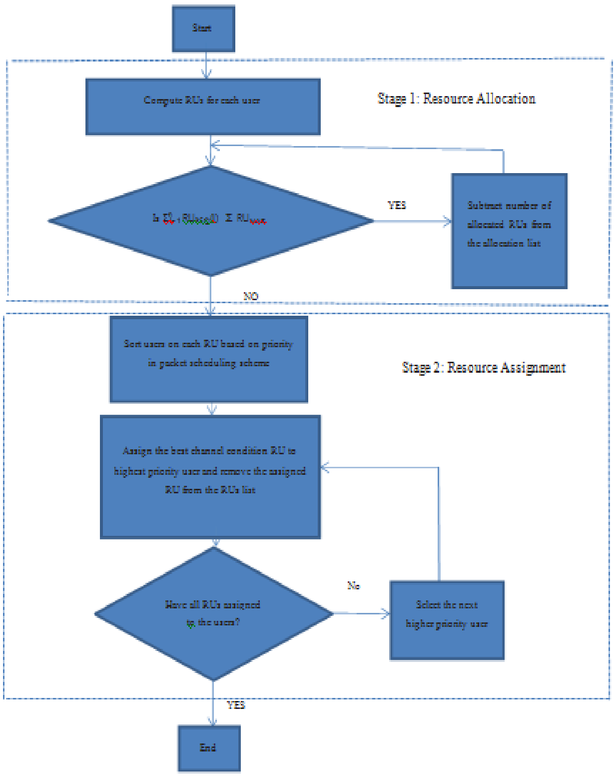

Figure 1 Flow chart of RAA algorithm in each time interval

3. QoS-Oriented Joint Time and Frequency Domain Scheduling

To decrease the complexity of computation and improve the scheduling performance, joint frequency and time domain algorithms have been studied. These algorithms consist of two phases:

- A time domain scheduler prioritizes users to a subset of candidates based on a time domain scheduling algorithm. These are used as an input for the frequency domain scheduler.
- The frequency domain packet scheduler selects the priority of the users on each RRU and allocates the RRU according to the selection.

III.RESULT

In this section, simulation results are analyzed. Figures 3 to 7 are related to the first scenario in which there are no best effort users in the network.

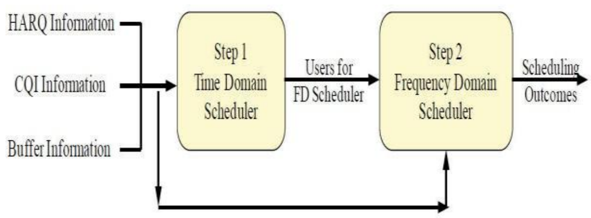

Figure 2 JTFDS scheme Structure.

Figure 3 and Figure 4 show the system throughput graphs for streaming and voice users of the three packet scheduling algorithms. The throughput of streaming users for the LOG-MLWDF algorithm outperforms MDU and MLWDF (as seen in Figure 3), whereas for voice users, MDU has better throughput performance compared to the LOG-MLWDF and MDU methods (as shown in Figure 4.6).

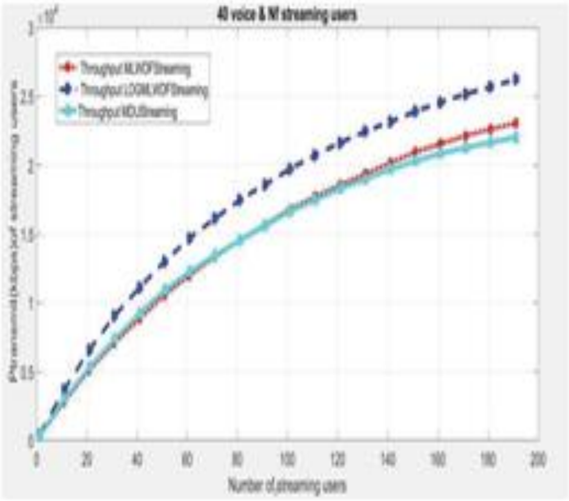

Figure 3 System through put for streaming users vs. number of steaming users

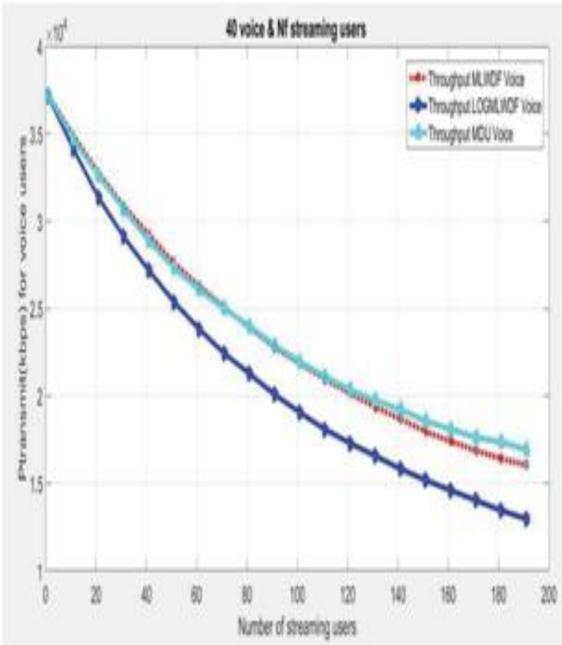

Figure 4 System through put for streaming & voice users vs. number of streaming users.

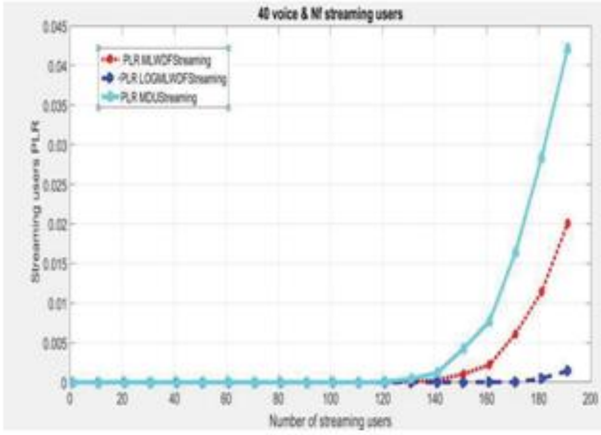

Figure 5 Packet Loss Ratio of streaming users vs. number of streaming users.

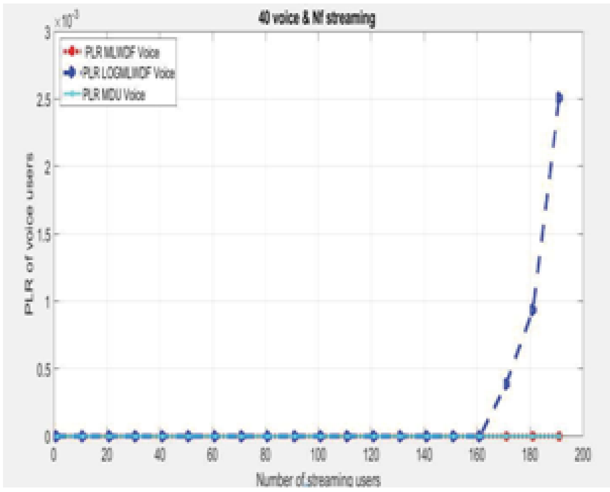

Figure 6 Packet Loss Ratio of voice users vs. number of streaming users.

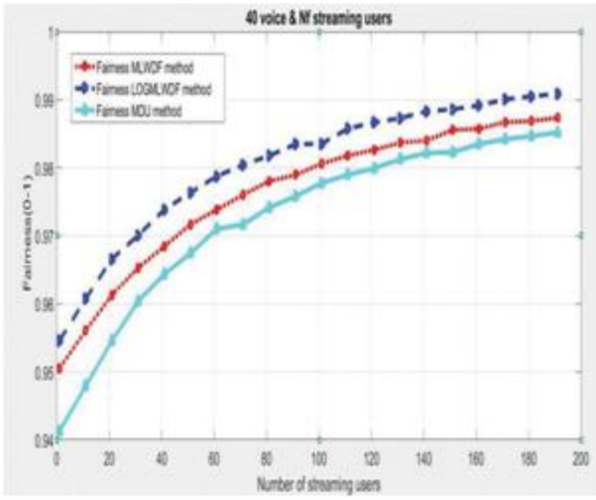

Figure 7 Fairness vs. number of streaming users

IV.CONCLUSION

LOG-MLWDF as the proposed algorithm in LTE in Chapter 4 has been shown to have the better performance in the PLR throughput for streaming users compared to the MDU and MLWDF methods. It has been proved that LOG-MLWDF outperforms MLWDF by 13.8 to 28.7 percentages from the throughput of streaming user aspect. It also significantly improves the PLR performance of MLWDF for streaming users by the range of 93 to100%. The performance improvement in fairness for the LOG-MLWDF method over the MLWDF is within the range of 0.5 to 0.32%. In the second scenario, when we add the best effort users to the network, the results show that the LOG-MLWDF method significantly improves the best effort user's throughput by the range of 155.8% to 253.5% over the MLWDF method. It also decreases the 95th percentile delay of best effort users by the percentage range of 38 to 41 over the MLWDF method.

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