International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-2, July 2019

Optimal Resource Scheduler for LTE A Based Networks

M. Karpagam, V. R Balaji, D. Prabha

Abstract: Long Term Evolution (LTE) may be a commonplace for prime rate radio transmission for cellular telephone and knowledge terminal. It is a complex technology that provides an accumulated network capability and speed by employing a totally special wireless interface beside the counter work enhancements. In the proposed method we deal with the setback of bandwidth administration in LTE-A systems and suggest valuable and profitable solutions to improve the quality of support in these networks. This paper presents an Optimal Resource Schedule which enhances the system throughput of LTE A based networks.

Index Terms: LTE, Optimal Resource Schedule, Quality of Support, Throughput.

I. INTRODUCTION

Long term evolution (LTE) is a third generation partnership project developed to support ever increasing bandwidth requirement of mobile communications devices. The main objective of LTE is to provide a very high data transfer speed, less delay and to provide enhanced radio access methodology. LTE is considered to carry packet switched data with flawless portability with required level of QoS. LTE network is designed to support data rate of up to 250 Mbps in downlink and up to 70 Mbps in uplink. The access method that is implemented at the physical layer of LTE is OFDMA. LTE is designed to support both half and full duplex TDD. The network is planned in such a way as to support both low speed users moving at a rate of 13km/hr to fast moving subscribers travelling at a speed of 360km/hr. LTE provides seamless connectivity with existing network standards like GSM, UMTS and CDMA. Its capable of providing different Qos for different users and this is made possible by the scheduling that is done in the MAC layer of this protocol. It supports four types of users they are guaranteed bit rate service, non guaranteed bit rate service, and dedicated service and default service. LTE employs SC-FDMA for uplink communication and OFDMA for downlink communication. OFDMA has several advantages like multipath delay spread tolerance and it is resistant to link dispersion but the peaks to average power ratio (PAPR) of OFDMA is greater when compared to SC-FDMA which is employed for uplink communication[1].The disadvantage associated with high PAPR is that the signal has to undergo non linear distortions.

Revised Manuscript Received on 30 July 2019.

***** Correspondence Author

Dr.M.Karpagam*, Electronics and Communication Engineering, Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu, India.

Dr.V.R Balaji Electronics and Communication Engineering, Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu, India.

Dr.D.Prabha Computer Science and Engineering, Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu, India

II. RELATED WORKS

International mobile telecommunications has done nonstop work to maintain the ever increasing data traffic with the help of international mobile telecommunication advanced group. The major task of this group was to develop the standards for mobile networks that demands for high data rate. The tremendous effort put by this group led to the development of LTE. LTE Release 8 is the first fourth generation technology that was designed to make profit. In LTE 8 both uplink and downlink utilized OFDM along with spatial multiplexing in the downlink. The basic idea behind LTE was to distribute the intellect among the base stations so that the amount of time required to setup the connection would be reduced drastically. This has also helped to reduce the handover time. For real time data transmission the handover time is the most important issue because the customers have a propensity to finish the call if the handover process is taking too much time [2]. LTE 9 was later introduced with slight modification over LTE 8 and it was not much popular [3]. The next work that was taken up by 3GPP was LTE-Advanced and it provided better system performance than the LTE Release 8 version [4] which included increased data transmission speed, system throughput, less packet drop and very less delay. Latest LTE version is, LTE Release 10 which is designed to support a wide variety of users with different levels of Qos requirement [5]. LTE provides access to its users so as to maximize the channel utilization[6]. The access is based on time where users can transmit as much as possible during its allocated time slot. The main advantage of sharing the communication pathway among the users instead of having devoted channel is that large number of wireless users can be accommodated in a small bandwidth which results in enhancement of the network features, there by bringing down the communication expenses. However the process of sharing the communication pathway among the users is not very easy as the communication environment continuously changes, due to estimated traffic burden and varied quality of support necessity. Hence an effective method for managing the bandwidth and sharing of the bandwidth among the users is essential for LTE. Bandwidth allocation has to be done in such a way that the existing users should not be affected in the process of allocating resources to current users [7].

III. LTE PARAMETERS

The performance of LTE-A was improved by making slight modification to the existing LTE parameters [8].

- Intra and Inter Band Aggregation.
- MIMO Diversity
- Relaying
- Coordinated Transmission

A. Intra and Inter Band Aggregation

To enhance the bandwidth, LTEA uses Carrier aggregation which results in increased bit rate. The carrier aggregation is done in a such a way that it is compatible with LTE release 8 and 9. Carrier aggregation can be done for time division duplexing as well as frequency division duplexing. The carrier aggregation affects only the media access control protocol and physical layer protocol. It's the responsibility of the media access controller to handle the scheduling issues due to carrier aggregation. Figure 1.shows intra and inter band aggregation.

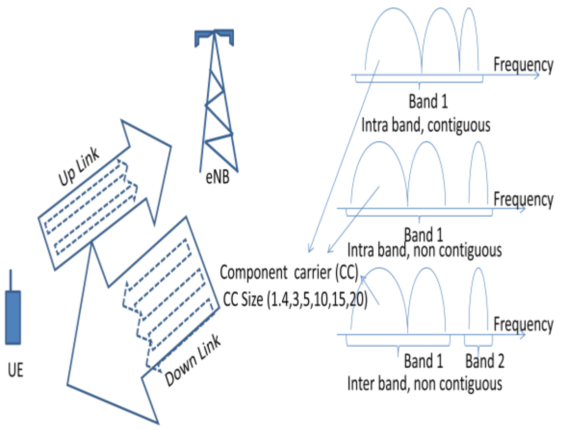

Figure 1 Intra and Inter Band Aggregation

B. MIMO Diversity

MIMO diversity can be employed to enhance the data transmission rate over wireless medium. MIMO diversity can be realized by incorporating multiple transmitting and receiving antennas which transmits data over multiple paths.

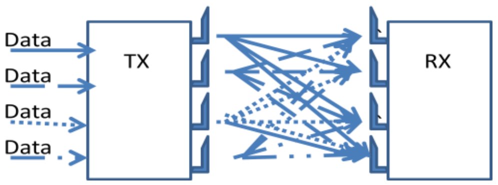

Figure 2 MIMO Diversity

Figure 2 shows MIMO diversity employed in LTE A system. MIMO diversity is also used to reduce the effect of fading.

C. Relaying

Relaying technique used in LTE provides the network with the ability to provide increased capacity and coverage. The Relaying feature is incorporated at the base station which helps to minimize the power consumption.

The Relaying technique helps the LTE network to support variety of users ranging from small cell to large cell user. It is used to provide connectivity to inaccessible area without providing wired link.

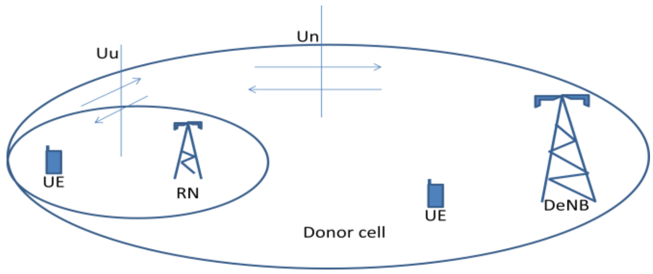

Figure 3 Relaying

D. Coordinated Transmission

CoMP provides better coverage even at the edges of the cell. Coordinated transmission is provided between a large number of transmission node through down link and Coordinated reception is provided between a large number of receiver node through up link.
Figure 3 illustrates coordinated transmission.

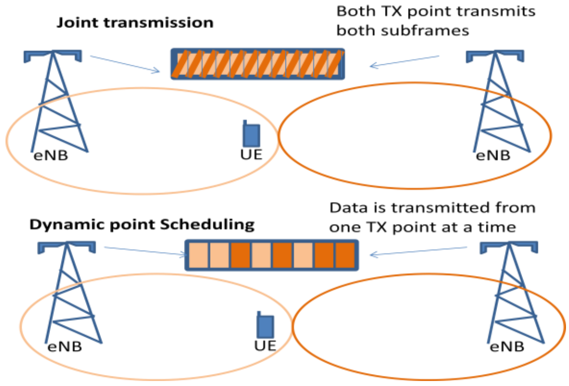

Figure 3 Coordinated Transmission

IV. FACTORS AFFECTING THE SCHEDULING PROCESS

Performance of LTE network can be increased by employing proper scheduling algorithm for data transmission. As the transmission environment is subjected to arbitrary changes, the scheduling algorithm employed at the base station must be able to handle this uncertainty. Based on the buffer status report received from the receiver the conditions of the transmission medium are monitored and appropriate modulation technique is implemented to handle the situation.

Retrieval Number: B2340078219/19©BEIESP
DOI: 10.35940/ijrte.B2340.078219
Journal Website: www.ijrte.org

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

There are quite a lot of events that affect the scheduling process employed at the base station. They are the delay that the packet experiences, nature of the transmission medium, users with different service requirement. A proper scheduling algorithm must take into account these factors

V. PROPOSED WORK

The proposed scheme is based on the setting up of resources in the transport set-up. The proposed scheme is designed to achieve improved system throughput by providing reasonable allocation of wireless resources. This paper explains the scheduling scheme based on the queuing model. Packet scheduling is done by proper slot allocation in OFDMA to accommodate all the service flow within the frame. The algorithm computes the scheduling parameter Sp from the queuing model, when a fresh downlink association for a scrupulous significance K has to be admitted. The calculated value Sp specifies the number of packets waiting to be serviced in the service connection K. Sp takes a value less than one but greater than zero. Sp functions as a multiplicative aspect. For every round, the calculated value of Sp from the proposed algorithm is given as contribution to the method in addition to the Buffer condition information. When the cost of Sp is greater larger numbers of packets are scheduled in a particular frame. A stride wise addition process is followed to increase the value of Sp. This process is repeated up to the algorithm meets the expectation of the QoS necessities of link K. Queuing model calculates the possible amount of data that can be planned for transmission in each frame as well as the amount of data that has not been added to the prior frame. Let F_1 be the contemporary framework that has to receive service. Initially the amounts of dynamic downlink junctions are arranged in sinking fashion depending on the value added parameter $'C'$. Value added parameter $'C'$ is found by multiplying the packet that are failed to be serviced in the previous frame with the amount of data that can be accommodated in one slot.

The algorithm next resolves the amount of data to be accommodated in the present structure for every link. For the link $'S_i'$ the process begins by finding $(K_{si} * q_{si})$ data. The estimation is done by taking into account two features. To calculate the amount of slots the overhead information that has to be transmitted along with the data has to be taken into account and the rate of transmission of the concerned frame. The data information that was not accommodated in the prior frame is added if additional space is available with each frame. Same procedure is carried out for all the connections so as to achieve better performance.

VI. SIMULATION RESULTS

Simulation is done using OPNET tool and the outcome of the algorithm were dumped into MATLAB. We have set the parameters Q = 3, N = 30 and PT = 45 dBm, Cell radius = 1.5 km. The channel that is considered here is multiple path channel with Rayleigh fading.

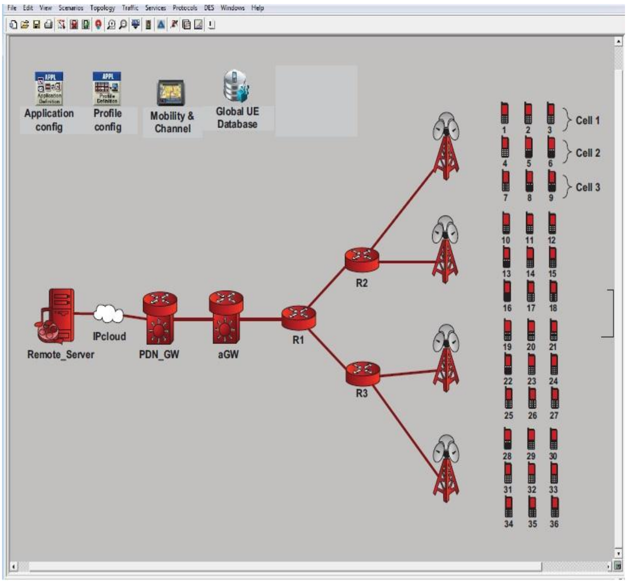

Figure 4. Simulation Model

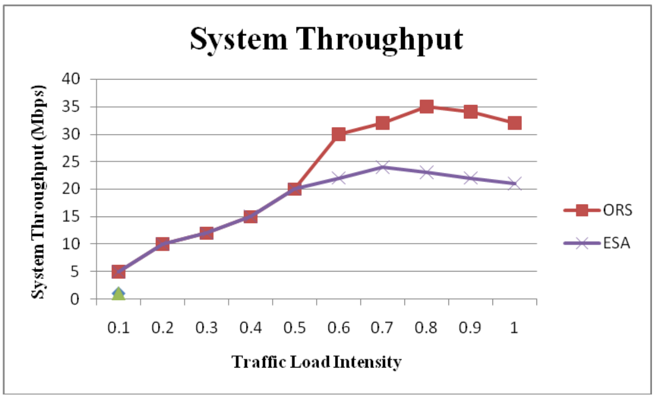

Figure 5 System Throughput

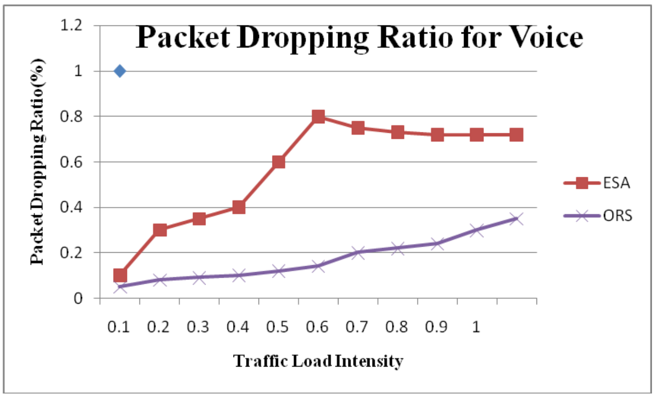

Figure 6 Packet Dropping Ratio for Voice

Figure 5 Shows the comparison of system throughput as a function of Load in Optimal Resource Scheduler (ORS) and Effective Scheduling Algorithm (ESA) [9]. Our proposed algorithm outperforms the ESA. This is because the scheduling of packets in the current frame is based on the estimation of channel condition which is not taken into consideration in ESA algorithm. Figure 6 shows that the packet dropping ratio for voice traffic is less in ORS when compared with ESA algorithm.

Retrieval Number: B2340078219/19©BEIESP
DOI: 10.35940/ijrte.B2340.078219
Journal Website: www.ijrte.org

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

VII. CONCLUSION

Optimal resource scheduler algorithm is presented in this paper where we have also given a detailed review of mechanisms to enhance the network scheduling strategies and minimize the loss of packets, which aims at improving the throughput and packet dropping ratio for voice traffic in LTE network. A simulation result shows the improved behavior of LTE A system with the proposed algorithm.

REFERENCES

1. M. Karpagam, N. Nagarjan, "An effective queuing model based Bandwidth allocation scheme for fair QoS Provisioning in LTE systems",,Journal of Theoretical and Applied Information Technology, Vol 65.No.2, Jul 2017, pp . 504 – 514.
2. Reference on LTE 8 2009, Information. Available from: http://www.4gamericas.org/documents/3GPP_Rel-8_beyond_ 2_12_09 .pdf>.[Feb 2009].
3. Reference on LTE 9 2010, Information available from <http://www.4gamericas.org/.../3GPP_Rel-9Beyond % 20Feb % 202010.pdf>. [Feb2010].
4. LTE advanced 2013, Information. Available from: < https://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced>.[June 2013].
5. Reference on LTE 10 2011, Information. Available from <https://www.etsi.org/deliver/etsi_ts/136400_136499/136411/10.01.00_60/ts_136411v100100p.pdf >. [Feb*2011].*
6. M. Karpagam, N. Nagarjan, "A Smart Scheduling Scheme with Voice Enhancement for Voice Services in LTE", Journal of Theoretical and Applied Information Technology, 2014 vol.65, no.2, pp. 504-514
7. QOs of LTE 2013, Information. Available from: < https://www.netmanias.com/en/post/blog/5933/lte-qos>. *[Jan 31 2013].*
8. LTE-A an overview and future research areas, IEEE 7th International Conference on Wireless and Mobile Computing, Networking and Communications, WiMob 2011, Shanghai, China, October 10-12, 2011
9. M. Karpagam, "An Effective Scheduling Algorithm for QoS Provisioning in LTE network", International Journal of Pure and Applied Mathematics Volume 119 No. 17 2018, pp - 415-420

AUTHORS PROFILE

Dr.M.Karpagam has received her doctrate in the field of wireless communication in April 2015. She is currently working as Professor in the department of Electronics and Communication Engineering, Sri Krishna College of Engineering and Technology, Coimbatore, India. Her areas of interest include Wireless Adhoc Network and Sensor Networks.

Dr.V.R.Balaji has completed his Ph.D from Anna University, Chenni in September 2015. He is currently working as Associate Professor in the department of Electronics and Communication Engineering, Sri Krishna College of Engineering and Technology,Coimbatore, India. His areas of interest include speech signal processing and Image processing

Dr. D. Prabha is an Associate Professor in Department of Computer Science and Engineering at Sri Krishna College of Engineering and Technology, Coimbatore, Tamilnadu, India. She has completed her Under Graduate Studies and Post Graduate Studies in Computer Science and Engineering. She has received her Ph.D in Information and Communication Engineering from Anna University, Chennai in the year 2014. She is presently guiding 8 Ph.D. research scholars registered under Anna University, Chennai. Her research interests include Data Mining, Big Data Analytics and Soft Computing. She has published several papers in premier indexed journals. She is serving as a Reviewer in IEEE Transactions on Cybernetics journal, Springer's International Journal of Machine Learning and Cybernetics Journal and Taylor & Francis's Journal of Experimental & Theoretical Artificial Intelligence.