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CONGESTION MANAGEMENT IN LONG TERM EVOLUTION USING PRIORITIZED SCHEDULING ALGORITHM

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ABSTRACT

The emergence of a Long Term Evolution (LTE) in a mobile networks environment has triggered high speed and capacity in voice and data services. The subscriber of this network continues to increase in number daily thereby leading to congestion on the scarce resources available for allocation. Several scheduling algorithms has been deployed to manage the scarce Radio Blocks (RBs) in LTE Networks, thus, some were studied. Thereafter, a new prioritized algorithm was designed and simulated using Simulink in MATLAB. The performance of the Proposed New Prioritized Scheduling Algorithm (PNPSA) is evaluated and compared with traditional scheduling algorithms Best CQI and Round Robin (RR) using the LTE metrics of fairness and throughput. The proposed algorithm showed promising statistics in comparison with the Best CQI and Round Robin algorithms in terms of throughput and resource block allocation fairness.

Keywords: Long Term Evolution (LTE) Networks, Scheduling Algorithms, Performance Measures, Radio Blocks (RBs), Congestion.

INTRODUCTION

The Internet users continue to rise in number daily, especially those accessing the Internet through their Smartphone and tablets. More devices are surfacing and are utilizing data service through various applications. According to LiveU White-Paper, the increasing number of Internet users gives rise to congestion since the available radio blocks are not sufficient for the accessing terminals at particular point in time (LiveU, 2014). LTE networks provide tens of megabits of bandwidth and yet are limited and will not solve congestion problem since the content delivery applications are also becoming more and more bandwidth starving. Resay (Resay, 2015) stated that congestion occurs when demand for network resources is greater than network capacity. Analogous situations are highways with too many cars or water supplies with too many users. The topography sometimes impact the performance of cellular connectivity such as hilly and lowlands. Users in the lowlands may sometimes not receive clear signals as users in the hills or near equal height to the base-station.

Congestion is the unavailability of network to the subscriber at the time of making a call or a demand for a service. It is the situation where no free path can be provided for an offered call (Syski, 1986). In other words, when a subscriber cannot obtain a connection to the wanted service immediately, then, congestion occurred (Kuboye, 2010). Generally, the network does not degrades during traffic congestion, it is the applications that are served by the network that do not respond as expected and therefore, the user-experience falls below expectation (Lucente, 2012). Degraded performance can range from slow response to requests for information to loss of data which can manifest itself as distorted video and unintelligible audio. In designing a management algorithm for congestion, the urgency and importance of requests should be greatly considered alongside other important factors. Therefore, the objective of this work is to develop a prioritized scheduling model for congestion management in LTE.

EVOLUTION OF CELLULAR NETWORKS

Cellular networks have evolved from the first generation analog systems (1G), to the 4th generation. LTE and LTE advanced emerged from the 4G family in other to conform and extend generation further. Generally, in cellular networks service coverage area are divided into cells and each cell is served by a base station. The 1st generation cellular network was based on analog systems, and it fulfilled voice communication. It became commercially available in the 1980s and it was characterized with huge telephones, which were usually fixed and so mobility was a problem (Kumar and Rupinder, 2013).

The 2nd generation cellular network popularly referred to as 2G, brought about the digitization of mobile communication systems and with it came the introduction of services such as Short Message Service (SMS) and lower speed data, simultaneous calling and data sending and Multimedia Message Service (MMS). Data communication in the 2G network was possible through the introduction of a service called the GPRS (General Packet Radio Access). The GPRS supports data uplink of up to 170Kbps. Due to further research, scientists were able to enhance the 2G network to provide more capacity and coverage and this led to the introduction of the 2.5G EDGE (Enhance Data rates for GSM Evolution) network. The EDGE initially supported 236Kbps, but some enhanced EDGE networks performs as fast as the UMTS in the third generation network.

The 3rd generation cellular network, 3G, also known as UMTS (Universal Terrestrial Mobile System) used an air interface technology referred to as Wideband Code Division Multiple Access (WCDMA). The 3G network enabled network operators to offer wider range of more advanced services while achieving greater network capacity through improved spectral efficiency. These services include wide-area wireless telephony, video calls and broadband data all in a single mobile environment [6]. The 3G network initially had a bandwidth of 384Kbps. Improvements were made on the 3G network and other enhanced 3G networks were introduces like the HSPA and HSPA+. The HSPA (also known as 3.5G) means High Speed Packet Access, it is the amalgamation of two mobile telephony protocols, High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA), and it has transmission capacity of 14.4Mbps on the downlink and 5.8 on uplink. The major improvements include adaptive modulation and coding, fast scheduling and enhanced air interface. The HSPA+ which is also being marketed as 3.75G and 4G because of its speed is also just an enhancement of 3G. It has a transmission rate between 21-42Mbps and also offered all the 3G services more efficiently.

4G operates on 2 – 8 GHz Frequency Band and 5-20 MHz bandwidth with data rate of 20 Mbps or more. Technologies before 4G separate Circuit and Packet switching whereas 4G uses packet switching for both voice and data. The potential Throughput for 4G ranges from 10 to 300 mbps while Peak Upload and download Rates are estimated to be 50 Mbit/s and 1Gbit/s respectively. The Long-Term Evolution belongs to the family of 4th generation cellular network The Improvements made on the LTE has led to the introduction of the latest cellular network called LTE-advanced. The LTE-advanced has an increased peak data rate of 3Gbps on the downlink and 1.5Gbps on the uplink, it has higher spectral efficiency, improved overall performance and increased number of simultaneous active subscribers (www.3gpp.org/technologies/keywords-acronyms/98-lte).

The main targets of the evolution is to increase data rate, improving spectrum efficiency and coverage, better Quality of Service (QoS) support, lowering device cost, reducing latency, optimizing data packets while supporting multiple radio access (Amokrane, 2011).

LONG TERM EVOLUTION (LTE)

LTE is a specification for cellular 4G standards. It is based on the GSM/EDGE and UMTS/HSPA network technologies to increase the capacity and speed of data connections using a different radio interface together with core network improvements (Kuboye, 2018). LTE network motivations include increasing the capacity and speed of wireless data using newly developed Digital Signal Processing (DSP) techniques and modulations. LTE supports the maximum data rates of 300 Mbps for download and 75 Mbps for upload [9]. LTE supports scalable carrier bandwidths from 1.4 MHz to 20 MHz and supports both Frequency Division Duplex (FDD) and Time Division Duplex (TDD); thus resulted to better performance than 3G [10]. LTE network architecture is designed and simplified to an IP-based system with significant reduction of transfer latency compared to the 3G architecture. It uses Voice over LTE (VoLTE) to handle voice calls in the networks. LTE is the technical path followed to achieve 4G network speeds.

LTE NETWORK ARCHITECTURE

The high-level network architecture of LTE comprises the User Equipment, evolved UMTS Terrestrial Radio Access Network (E-UTRAN) and evolved Packet Core (EPC) as shown in Figure 1. The User Equipment (UE) is the device for accessing the LTE network by the subscribers. It can be a USB modem or a mobile that is LTE compliant. The UE allows the user access to services provided by the LTE network. The Evolved UMTS Terrestrial Radio Access Network (E-UTRAN) has one element called the eNode-B.

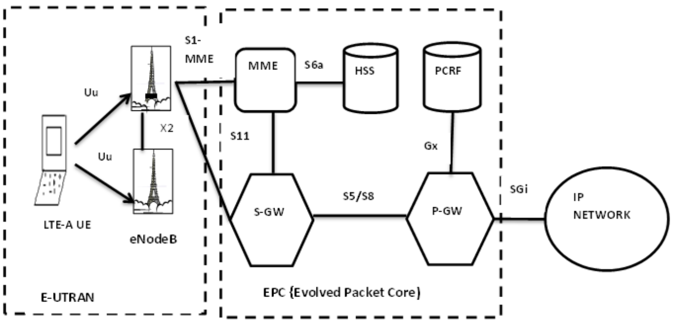

Figure 1: LTE Architecture (Kuboye, 2018)

The first contact of a UE while trying to communicate to the LTE network is the eNode-B. It manages the entire radio resources for a particular area and allocates them to mobiles. User Equipment connects to the eNode-B through a LTE-Uu interface. The Evolved Packet Core (EPC) is the core of the network. The EPC is a flat all-IP-based core network that communicates through 3GPP radio access (UMTS, HSPA, HSPA+, LTE) and non-3GPP radio access such as WiMAX and WLAN. It manages handover procedures within and between both access types. The access flexibility to the EPC makes it attractive to the operators since it enables them use a single core to support different services (Akyildiz et al, 2010).

The architecture of Evolved Packet Core (EPC) is grouped into two planes: the user plane and the control plane. Mobility Management Entity (MME) is the core of the control plane, while serving gateway (S-GW) is that of the user plane. The S1 interface connects the eNodeB to the MME and S-GW as depicted by Figure 2.

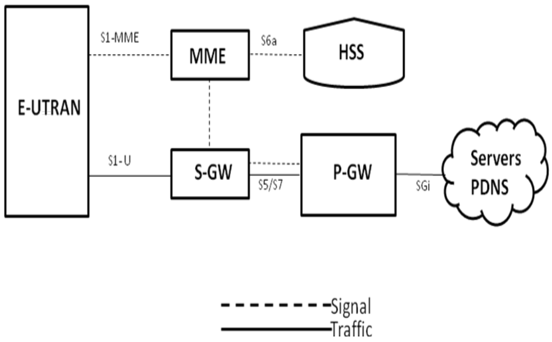

Figure 2: The Evolved Packet Core (EPC)
(http://www.tutorialspoint.com/lte /lte_network_architecture .htm, 2013)

The Home Subscriber Server (HSS) is the central database that contains information about all the subscribers on the network. The serving gateway (S-GW) acts as a router, and forwards data between the base station and the Packet Data Network (PDN) gateway. The PDN Gateway (P-GW) Provides connectivity between the UE and external packet data networks (PDNs). It performs policy enforcement, packet filtering for each user, charging support, lawful Interception, and packet screening. Each packet data network is identified by an Access Point Name (APN) that enables subscriber has access to the network (Fayssal and Marwen, 2014). The MME serves as the termination point for ciphering and integrity protection for Non-Access Stratum (NAS) signaling. Security key management and provision of control plane function for mobility between LTE and other access networks are also handled by MME.

LTE DOWNLINK FRAME STRUCTURE AND RESOURCE BLOCKS

LTE transmission is segmented into frames, each frame consists of 10 subframes and each subframe is further divided into two slots each 0.5ms, making the total time for one frame equivalent to 10ms. Each time slot on the LTE downlink system consists of 7 OFDM symbols. The very flexible spectrum allows LTE system to use different bandwidths ranging from 1.4 MHz to 20 MHz where higher bandwidths are used for higher LTE data rates. The physical resources of the LTE downlink can be illustrated using a frequency-time resource grid as shown in Fig 3.0. A Resource Block (RB) has duration of 0.5msec (one slot) and a bandwidth of 180 kHz (12 subcarriers). It is straightforward to see that each RB has 84 resource elements in the case of normal cyclic prefix and 72 resource elements in the case of extended cyclic prefix (Habaebi et al, 2013)

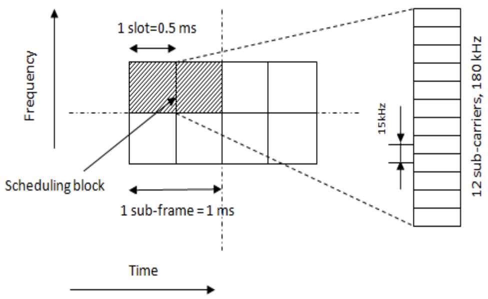

Figure 3: Illustration of a scheduling block in LTE downlink (Mohammed et al, 2013)

TRAFFIC CLASS PRIORITIZATION

Traffic class prioritization is a Quality of Service (QoS) mechanism in which categories of data traffic are assigned priority values according to their Class of Service (CoS) and these values are used by the network scheduler to effectively manage resource usage on the network during congestion periods. It identifies the different classes of data traffic and manages the available resource to effectively handle the traffic demand. The utilized traffic classes are Streaming, Conversational, Background and Interactive classes. Delay sensitivity is the main feature that differentiates these traffic classes. The conversational class encompasses traffic that has high delay sensitivity while the traffic class that has the lowest delay sensitivity belongs to the background class (Dushyanth; 2006).

Real time traffic belongs to either conversational or streaming class. Conversational class traffic includes telephony speech, voice over IP, video conferencing while streaming class traffic are streamed video and audio (Omotoye et al, 2014). Non-real time traffic belongs to either interactive or background class. They are both delay insensitive but require high throughput and less error rate. Interactive class traffic includes web browsing, database retrieval while examples of background traffic are telemetry and e-mailing. The table 1. shows the traffic classes characteristics and some other properties. The table 1 shows the different traffic classes, their characteristics, the priority and examples.

Table 1: Traffic Classes and Characteristics (Omotoye et al, 2014)

Traffic Class	Characteristics	Priority	Examples
Real-time Conversational (T_1)	Delay sensitive, Low latency and Jitter	High	Voice and video calls
Real-time Streaming (T_2)	Limited tolerance to loss, low latency	Medium	Audio and Video streaming
Near Real-time Interactive (T_3)	Error-sensitive, best effort, low packet loss.	Normal	Web Browsing
Non Real-time Background (T_4)	Best effort, loss Tolerant	Low	e-mail and file transfer

Prioritization of service can be carried out by using a different admission technique for each class of service. A strict admission policy can be implemented for class with lower priority. The priority level is used to allocate resources to the classes. A request is rejected if it is discovered that reserved resources for its class are not enough.

SCHEDULING ALGORITHMS

ROUND ROBIN (RR)

Round Robin scheduling is a scheduling scheme that lets users take turns in using the shared resources, without taking the channel conditions at that instant into account, hence, it is referred to as a non-aware scheduling algorithm (Bahreyni and Naeini, 2014). Therefore, it offers great fairness among the users in radio resource assignment, but degrades the system throughput (Habaebi et al, 2013). In Round Robin, each user will be placed in a queue; the algorithm selects the users without considering channel condition. If all the users have been served, the scheduler will start again with the same queue. The major advantage of the round robin algorithm is its simplicity while, the major disadvantage of this algorithm is that, this algorithm does not consider users' CQI feedback, in which it leads to low and unequal throughput.

BEST CHANNEL QUALITY INDICATOR (BEST CQI)

This scheduling algorithm is used for strategy to assign resource blocks to the user with the best radio link conditions. The resource blocks assigned by the Best CQI to the user will have the highest CQI on that resource block; the UE must feedback the Channel Quality Indication (CQI) to the eNodeB to perform the Best CQI (Trivedi and Patel, 2014). A higher CQI value means better channel condition. This scheduling algorithm allocates resources to those users with best channel condition. Users near to the eNodeB get the upper hand in this scheduling algorithm, while users far away from the eNodeB do not get the best resources.

Table 2: CQI table based on distance from Base-station

Distance (m)	MCS Index	CQI
100	28	15
2000	27	13
2400	25	12
2600	23	11
3100	20	10
3500	16	9
4000	14	8
4600	12	7
6000	9	6
7000	7	5

PROPORTIONAL FAIR (PF)

This algorithm allocates more resources to a user with relatively better channel condition. For scheduling users, this algorithm not only considers channel condition but also tries to maintain fairness among the users. It tries to increase the degree of fairness among users by selecting those with the largest relative channel quality (Lakhera and Vineet, 2011). The main goal of this algorithm is achieving a balance between highest cell throughput and fairness. PF algorithm works well than the RR and Best CQI algorithms presented above, but it is not without its own limitations. For instance, when a user moves closer to eNodeB from a far distance, its Signal to Noise Ratio (SNR) will increase constantly. Therefore this user's actual SNR will be always above its average; accordingly, it is very possible that this user will be often scheduled. On the other hand, if a user goes farther than eNodeB, its actual SNR will always be below its average. Therefore the probability of this user for scheduling is very low and it may lead to starving (Bahreyni and Naeini, 2014).

REVIEW OF RELATED WORKS

Meader and Schmid discussed user-plane congestion management which manages congestion at the user side (Maeder and Schmid, 2012). Congestion in mobile networks, congestion scenarios, solution components in congestion management and LTE Quality of Service' features as well as limitations were discussed. The paper explains how the congestion can be detected and signaled and how management policy(s) can be applied. The paper then concludes that congestion management solutions relied on smart mitigation mechanisms which need new metrics to characterize end-user congestion, lightweight signaling of congestion occurrence and location, application and QoE aware traffic management and control loop to react timely on congestion. The implementation of the smart mitigation mechanisms proposed is not discussed in details.

Ahmad et al (2012) proposes a model depending on the iterative server mechanism. In this model, when any client sends a request, the listener will listen to the request and then send notification to the main server about the requested client, and thereafter, instructs the client server to generate a new temporary server for the requested client. The new temporary server set up for this client is referred to as 'iterative server'. The client makes use of this iterative server and once the task has been completed the iterative server is automatically destroyed. By using this technology, network congestion can be avoided. Bahreyni and Naeini (2014) proposes a fairness aware downlink scheduling algorithm which can help manage and reduce congestion in LTE networks. The algorithm assumed that each e-nodeB receives channel feedback information in form of CQI feedback matrix. The matrix size equals to number of UEs by the number of Resource Blocks in each Transmission Time Interval (TTI). This model gives preference to those users which uses less bandwidth than others. Also, it evenly distributes the resources among the users during each TTI.

Kanagasundaram and Kadhar-Nawal (2013) proposed an algorithm for scheduling real time services in LTE networks. This algorithm considers both the resource block allocation and scheduling process. The resource block allocation considers the instantaneous data rate and the average data rate. It will allocate the resources that are required to perform a real time connection. If the resources are busy then, the user connection is scheduled using a lower level scheduler. The scheduler has a timer based on which user connections are updated. In this scheduling period, the available resources are assigned to user. In the proposed method, the approach will allocate the resource to the real-time users using the Resource Block (RB) allocation. In the RB allocation, it will allocate the resources that are required to perform the real-time connection. A time constant is used to update the average rate that is allocated to the users and Q(t) factor is used to support different class of QoS. If the resources are busy then the approach will schedule the user connection using the lower level of the scheduler.

The scheduler has a timer based on this the user connections that are updated. In the scheduling period, the available resources are assigned to the user. The main advantage of this method is that we can assign the reserved RBs to real-time users so that average spectrum efficiency and average cell throughput will be improved and we are using the schedulers to assign the resource to the users more effectively. The disadvantage however, is the issue of priority, this approach does not consider the importance or urgency attached to individual calls and this can lead to wastage of resources and time.

Yifeng and Tan (2009) proposed a congestion management solution specific to the eNode-B. He developed an Active Queue Management (AQM) scheme, for managing traffic in the eNode-B and he developed the corresponding algorithm. He advised that AQMs be implemented at the eNode-B rather than the User Equipment (UE) side because, implementing AQMs at the UE side does not guarantee good performance. The AQMs' targets are to control the queue length in a way to control the queue length of all the user equipments, reduce end-to-end delays and reduce probabilities for buffer overflow or underflow.

Amokrane (2011) proposed the use of Machine Type Communication (MTC) to control congestion over LTE networks. MTC is also referred to as Machine to Machine (M2M). M2M applications are those which involve machines or devices through a network without human intervention. M2M applications can remotely configure machines, collect data from machines, process collected data to make decisions and send notifications in unusual situations. These M2M applications can be used to monitor a network, collect data from the network and then make decisions whether to trigger congestion management solutions and policies.
Makara and Neco (2012) proposed an optimized scheduling approach that exploits multiuser

diversity by considering each user's instantaneous downlink conditions and QoS information when distributing resources. They propose an approach towards the management of resources in the LTE downlink that fully exploits multiuser diversity

THE PROPOSED NEW PRIORITIZED SCHEDULING ALGORITHM

In this proposed new priority based algorithm, traffic is assigned resources based on their classes and priority levels. There is a queue for each traffic type and traffic belonging to a class joins the queue meant for that class. The scheme of the algorithm is explained thus in figure 5chart and depicted diagrammatically in the flowchart in figure 5.

i There is a queue for each traffic class, where Real-time Conversational traffic class with high priority is T_1, Real-time Streaming with medium priority is T_2, Near Real-time Interactive with normal priority is T_3 and Non Real-time Background is T4 as shown in Figure 4. Traffic belonging to a class joins the queue meant for that class. Each queue has a limit that is based on the number of radio blocks available.

ii Set threshold for each traffic class T_1, T_2, T_3 and T_4. A threshold here is the maximum time a user can spend on the network before equal priority user can preempt it in a situation where there is no RB to occupy. The threshold only work for equal priority user since lower priority user will automatically be preempted by higher priority user.

iii. On each queue, request is ordered according to their Channel Quality Indicator. The CQI value at the time of admission of each request is based on the distance of the user equipment from the Base-Station as specified in the table 2.

iv Assign available resource blocks to the traffics demand. The assignment will be based on the priority scheme specified in table 1 above. That is, $T_1 > T_2 > T_3 > T_4$, Traffic of higher priority as defined by the traffic class pre-empts traffics of lower priority or lower traffic class.

v. If the traffic to be serviced by the resource blocks did not see any free RB to use, then, if it is of equal priority with any traffic occupying the RB, then the threshold limit is used to pre-empt old requests in order to admit new ones, that is, pre-empt any old traffic that has reached the set threshold in order to admit a new request into the queue.

vi Move it to the next traffics on the queue (Q_T) for scheduling in the next round.

$T_1 \rightarrow Q_1$, $T_2 \rightarrow Q_2$, $T_3 \rightarrow Q_3$, $T_4 \rightarrow Q_4$

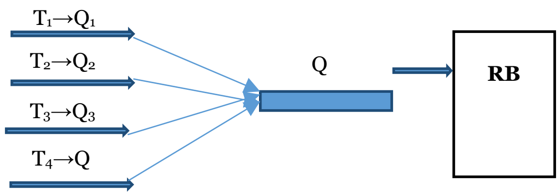

Figure 4: Resource block assignment queue

RESULTS AND ANALYSIS

The proposed new prioritized scheduling algorithm flowchart is shown in Fig 5.0 and is simulated using MATLAB and Simulink. Simulink is a block diagram environment for multi-domain simulation and model-based design (MathWorks, 2015). The Simulink is integrated with MATLAB, enabling users to incorporate MATLAB algorithms into models and export simulation results to MATLAB for further analysis. MATLAB is ideal for the modeling and simulating the LTE network, as well as implement and test the new proposed prioritized algorithms on the LTE network because, it has in-built a service called the LTE System Toolbox. This LTE System Toolbox accelerates LTE algorithm and physical layer development, supports conformance testing and test waveform generation. The data parameter that was used for the simulation are listed in table 3.

Table 3: Simulation Parameters

PARAMETERS	VALUE
Channel Bandwidth	1.4 - 20MHz
Mod Type	2
SNR (dB)	12
Number of RBs (numRBs)	30
Number of SubFrames	Ceil (numRBs/2)
Total users	[6, 5, 8, 7]
Scheduler	PNPSA, Best CQI, Round Robin

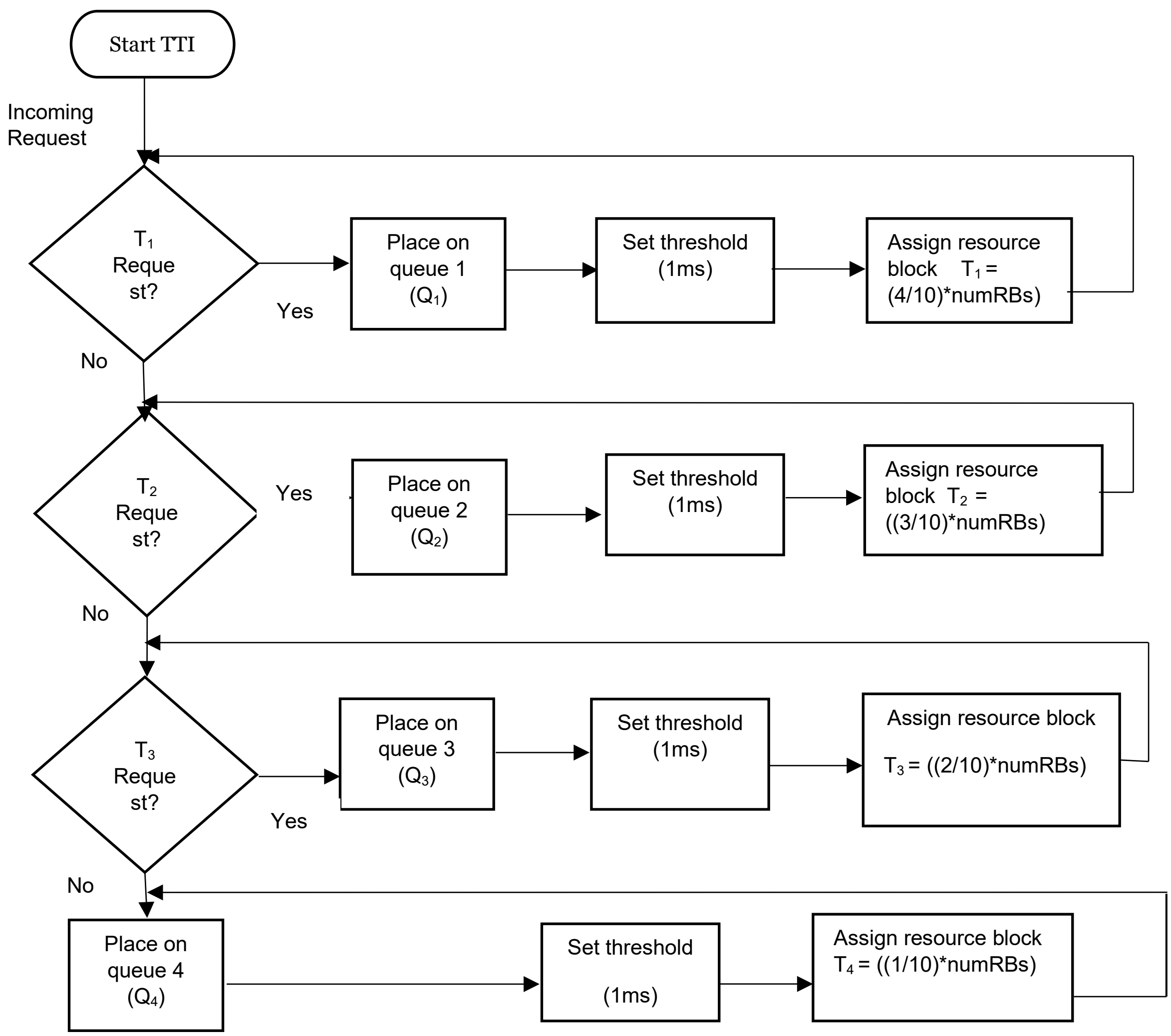

Figure 5: Queue placement for the Proposed New Prioritized Algorithm based on traffic class

RESOURCE BLOCK (RBS) ALLOCATION

Total RBs refers to the sum of the number of resource blocks assigned to the traffic classes from the available resource blocks. Total RBs is represented equation 1.0

$$Total\ RBs = \sum Rt_1 + Rt_2 + Rt_3 + Rt_4 \qquad (1)$$

Where
Rt_1 = number of resource blocks allocated to traffic class 1
Rt_2 = number of resource blocks allocated to traffic class 2
Rt_3 = number of resource blocks allocated to traffic class 3
Rt_4 = number of resource blocks allocated to traffic class 4

The PNPSA has a total of 29 allocated RBs according to the priority attached to the traffic classes such that $T_1 > T_2 > T_3 > T_4$. The Round Robin allocates 30 RBs in all. This algorithm tries to satisfies all traffic classes by allocating almost the same RBS to all traffic classes. It therefore leads to wastage and under-utilization of network resources as user who requires more RBSs are assigned almost the same RBs as user that do not need as much. The starved user stayed too long on the queue and this leads to congestion. The best CQI algorithm allocates RBs based on the channel quality and the total RBs allocated was 30. It allocates resources based on the proximity of the UE to the e-NodeB, regardless of the traffic class the UE request belongs to. As shown in figure 8.0, traffic T_3 with normal priority is assigned the highest RB by the Best CQI algorithm while, traffic T_1 with high priority is assigned the lowest resource block. This ultimately leads to congestion in the network and a serious degradation of service enjoyed by users. The PNPSA performs best among the three algorithms in terms of resource block allocation as seen in figure 8.

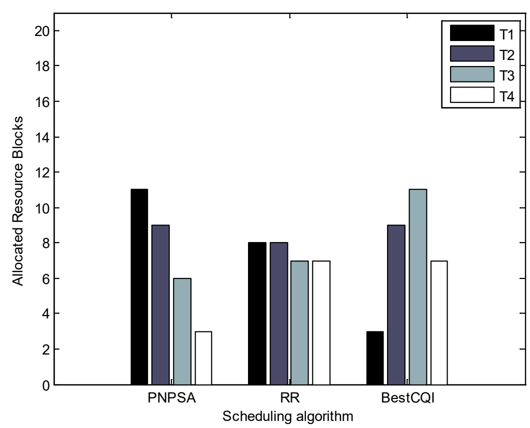

Figure 8: Resource block allocation comparison between the algorithms based on traffic

PROPOSED NEW PRIORITIZED SCHEDULING ALGORITHM (PNPSA)

The performance of the Proposed New Prioritized Scheduling Algorithm (PNPSA) is evaluated and compared with traditional scheduling algorithms Best CQI and Round Robin (RR). Results of Three different algorithms (PSA, Best CQI and Round Robin) using the LTE metrics of fairness and throughput of network.

SYSTEM THROUGHPUT

This is the total number of bits successfully transmitted over the air interface from the UE up to the eNodeB over the total simulation time [26]. Equation 2.0 shows the formula for the throughput.

$$Throughput = \frac{B}{Tsim} \quad (2)$$

where

B = the total amount of received bits and
Tsim = the total simulation time.

The PNPSA has the highest throughput of 20.8055 Mbps compared to Round Robin with 19.7415 Mbps and Best CQI with 0.66386 Mbps. This means that there is high number of successfully transmitted bits over the air interface from the UE up to the eNodeB, and there is less degradation of service. Users' job are done in time and the risk of congestion occurring is minimized. Figure 6.0 shows the throughput for the different scheduling algorithms.

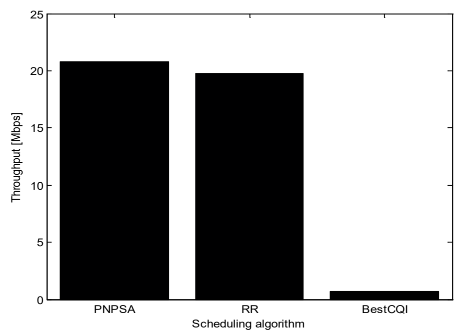

Figure 6.0: throughput comparison between the scheduling algorithms

FAIRNESS

It is the measure of fairness among UEs of the same class, and it used to determine whether UEs are receiving a fair share of LTE system resources. In this case, we are considering whether the traffic classes get allocated fair share of the network resources. This is referred to as allocation fairness. One of the most famous formula for fairness is the Jain's fairness index shown in equation 3.0 (Al-Qahtani and Al-Hassany, 2014). It is given as:

$$f(R_1, R_2, ..., R_k) = \frac{\left[\sum_{k=1}^{K} R_k\right]^2}{k\sum_{k=1}^{K}(R_k)^2} \quad (3)$$

where there are K UEs in the LTE system and R_k is the number of RBs given to UEi.

In terms of allocation fairness to the traffic classes, the allocation fairness index shows that of PNPSA has 0.83433 while Round Robin has 0.77586. Figure 7.0 shows that the PNPSA performs better in terms of fairness to all the traffic classes and followed by Round Robin.

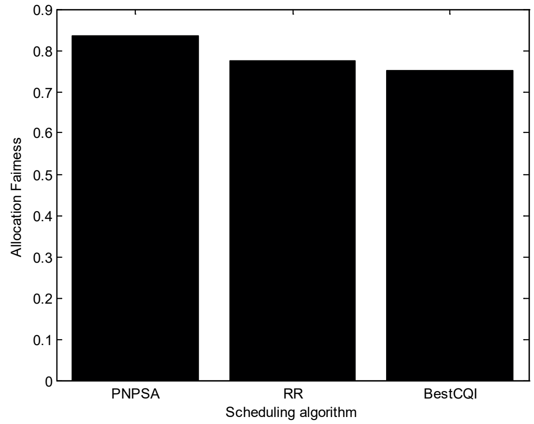

Figure 7.0: Allocation fairness comparison between the scheduling algorithms

CONCLUSION

A Proposed New Prioritized Scheduling Algorithm (PNPSA) for Long Term Evolution (LTE) Network was developed in this work,. User requests were classified into different traffic classes based on the nature of the request and each class was assigned a priority value. The priority is based on the urgency of the requests. The simulations showed that the proposed method performs better than the Round Robin that is popularly used in LTE Networks.

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