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Call Admission Control Schemes in LTE Networks: A Survey

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Abstract- Long Term Evolution (LTE) network standard defines requirements to guarantee Quality of Service (QoS) for diverse applications such as VoIP, video and web browsing according to the Third Generation Partnership Project (3GPP) specifications. The Radio Resource Management (RRM) techniques such as Call Admission Control Schemes play an important role in providing such guarantees. Consequently, several schemes have been proposed to manage resources while ensuring QoS to wireless applications. This paper presents a survey of Call Admission Control (CAC) Schemes. These algorithms are classified into CAC with Pre-emption, Resource Reservation (RR), Resource Degradation (RD), Delay Awareness (DA) or Channel Awareness (CA). The operational procedure, strengths and weaknesses of each scheme are discussed. The comparative analysis of these schemes is also presented. The analysis provides an insight on open research issues for future research.

Keywords – *LTE Networks, Call Admission Control, Radio Resource Management, QoS.*

1. Introduction

The growing demand in network applications such as VoIP, Video, Web browsing e. t. c with different Quality of Service (QoS) requirements pose a great challenge to the wireless networks. Report according to Cisco indicates that the demand of network applications has grown exponentially and will continue to increase by 1000 times in the next five years [1].The 3GPP introduced the LTE networks as one of the solution to the challenge. The network provides higher data rate, low latency, scalable bandwidth, mobility and extended coverage.

The LTE network adopts Orthogonal Frequency Division Multiple Access (OFDMA) for downlink transmissions. It adopts a scalable radio resource bandwidth of 1.4 MHz to 20 MHz. This radio resource bandwidth is divided into equal sub-channels of 180 KHz each in frequency domain and a Transmission Time Interval (TTI) of 1ms each in time domain. A TTI comprises of two time slots of 0.5 ms each. Thus, a radio resource in time/frequency domain across one time slot in time domain and one sub-channel in frequency domain is termed a Resource Block (RB). A RB is the smallest unit of radio resource that can be allocated to a User Equipment (UE) for data transmission [2].

To ensure QoS for diverse network applications in LTE networks, Radio Resource Management (RRM) such as CAC schemes is of great importance. CAC schemes admit or block call requests(new or handoff) and maintain required QoS while circumventing possible congestions [3] ; hence the scheme is highly needed. Therefore, several schemes have been proposed to manage call requests while ensuring QoS to wireless application [6-25].

In this paper, a survey of the CAC schemes is presented. The schemes are classified into CAC with Pre-emption, Resource Reservation (RR), Resource Degradation (RD), Delay Awareness (DA) or Channel Awareness (CA). The operational procedures, strengths and weaknesses of each scheme are highlighted. The comparative analysis of these schemes is also discussed in order to provide open research issues for future direction. The remainder of the paper is organized as follows: Section 2, presents an overview of LTE system. Section 3, describes a survey of the CAC schemes and comparative analysis. Finally, Section 4 concludes the paper.

2. Overview of the LTE networks

The LTE network was designed to surpass the attributes of 3G networks [2].It targets doubling the spectral efficiency; improving on the bit rate of cell edge users compared to the earlier networks [4]. Table1. shows a summary of the main LTE performance targets.

Table 1:Main LTE Performance Targets [3] .

Performance Metric	Target
Peak Data Rate	• Downlink: 100 Mbps • Uplink: 50 Mbps
Spectral Efficiency	• 2 - 4 times better than 3G systems
Cell-Edge Bit-Rate	• Increased whilst maintaining same site locations as deployed today
Mobility	• Optimized for low mobility up to 15 km/h • High performance for speed up to 120 km/h • Maintaining connection up to 350 km/h
Scalable Bandwidth	• From 1.4 to 20 MHz
RRM	• Enhanced support for end-to-end QoS • Efficient transmission and operation of higher layer protocols
Service Support	• Efficient support of several services (e.g., web-browsing, FTP, video-streaming, VoIP) • VoIP should be supported with at least a good quality as voice traffic over the UMTS network

The LTE network is built on a flat architecture called the Service Architecture Evolution shown in Figure 1.The figure consists of the radio access network and the Evolved Packet Core (EPC). The EPC provides the overall control of the UE and establishment of the bearer [5] which consists of Mobility Management Entity (MME), Serving Gateway (SGW), and Packet Data Network Gateway (PGW). The MME controls handover within LTE, user mobility, and UEs paging as well as tracking procedures on connection establishment. The SGW performs routing and forwarding of user data packets between LTE nodes as well as handover management between the LTE and other 3GPP technologies. The PGW connects the LTE network with other IP networks around the globe and provides the UEs access to the internet [2].The radio access network known as the Evolved-Universal Terrestrial Radio Access Network (E-UTRAN) performs all radio related functions [6] ,which comprises of the eNB and the UE. The UE represents the different types of devices used by the users while the eNB performs radio resource management (RRM) functions along with control procedures for the radio interface such as packet scheduling, CAC etc.

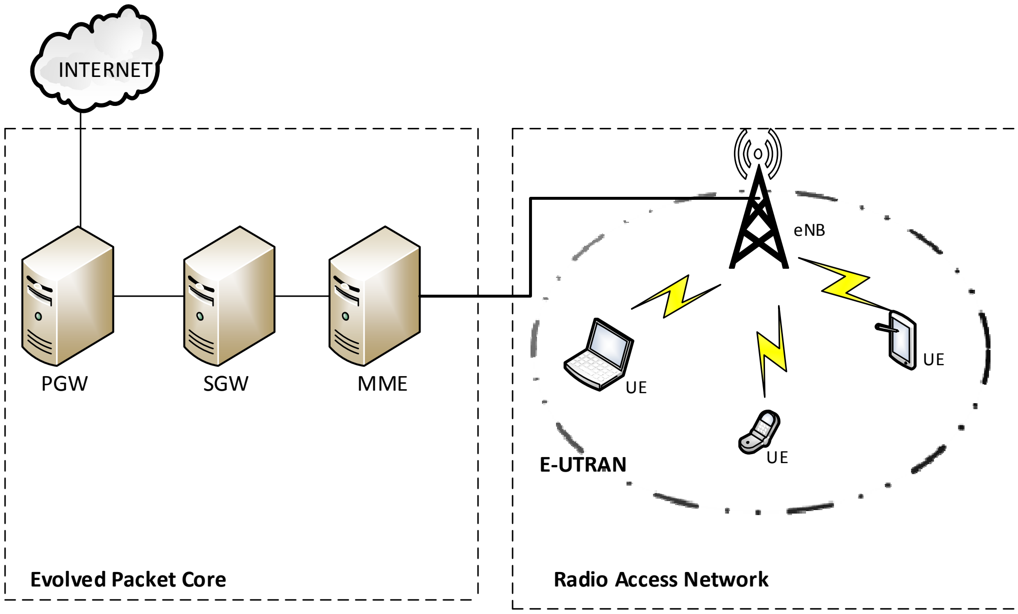

Fig. 1: The Service Architecture Evolution of LTE Network.

The LTE's QoS structure is conceived to grant an end-to-end QoS support [6]. Towards this objective, the LTE permits flow differentiation based on the QoS requirements. These QoS requirements are managed by radio bearers which are classified into two: default and dedicated. The default bearer which corresponds to non-Guaranteed Bit Rate (non-GBR) is created at the beginning of every connection. It does not grant bit rate guarantees and remains until the end of the connection. The dedicated bearer which represents either GBR or non-GBR is created every time a new service is issued [4]. Every bearer has an associated QoS class identifiers (QCI) shown in Table 2.

Table 2: Standardized QoS Class Identifiers (QCI) for LTE [5].

QCI	Resource Type	Priority	Packet Delay Budget (ms)	Packet Loss Rate	Example Service
1	GBR	2	100	10^{-2}	Conversational voice
2	GBR	4	150	10^{-3}	Conversational video (live streaming)
3	GBR	5	300	10^{-6}	Non-Conversational video (buffered streaming)
4	GBR	3	50	10^{-3}	Real time gaming
5	Non-GBR	1	100	10^{-6}	IMS signaling
6	Non-GBR	7	100	10^{-3}	Voice, video (live streaming), interactive gaming
7	Non-GBR	6	300	10^{-6}	Video (buffered streaming)
8	Non-GBR	8	300	10^{-6}	TCP based (e.g., WWW, e-

9	Non-GBR	9	300	10^{-6}	mail), chat, FTP, P2P file Sharing

The LTE physical layer employs OFDMA and SC-FDMA as the radio spectrum access method in the downlink and uplink, respectively. Both OFDMA and SC-FDMA permit multiple access by allocating sub-carriers to every user. The OFDMA utilizes the sub-carriers within the whole spectrum; it offers high scalability and robustness as well as simple equalization to prevent time-frequency selective nature of radio channel fading. The SC-FDMA exploits only the adjacent sub-carriers; it is employed at the uplink to improve power efficiency of user equipment since they are mostly battery dependent [4].

In LTE network the radio resources are shared to users in a time/frequency domain as shown in Figure 2. The time domain is divided into frames; every frame is made up of 10 successive TTIs and each TTI lasts for 1ms. In addition, every TTI consists of two time slots with duration of 0.5ms. In the frequency domain, the entire bandwidth is partitioned in to sub-channels of 180KHz each. Therefore, a time/frequency radio resource ranging across one time slots in the time domain and one sub-channel in frequency domain is known as a resource block (RB). A RB is the minimum radio resource unit that can be allocated to user equipment for data transmission.

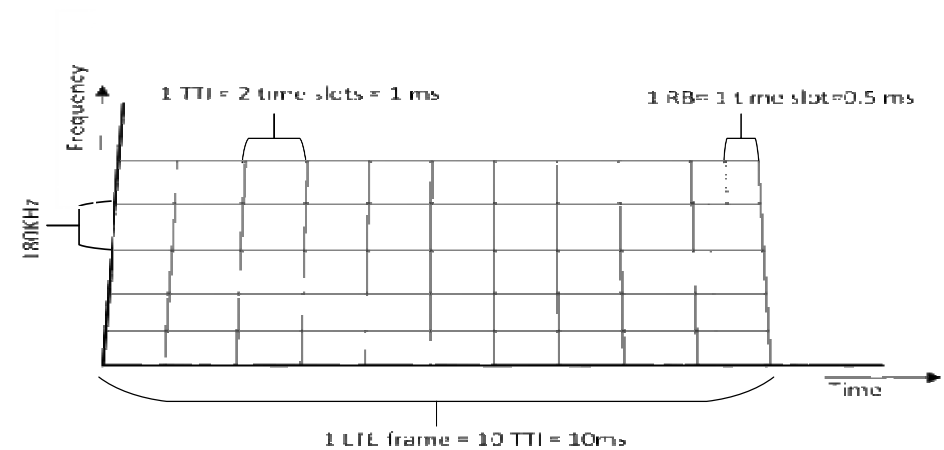

Fig.2: Radio Resources in Time/Frequency Domain.

3. Call Admission Control Schemes

CAC schemes generally control the number of users in the LTE network and must be designed to guarantee the QoS requirements for both incoming and ongoing calls. It denotes the process of making a decision on a call request (new call or handover call) based on the available resources. The schemes are reviewed as follows:

In [7],a novel resource allocation scheme is proposed to retain throughput of mobile users during mobility. The scheme divides the coverage area into concentric regions R1, R2 and R3 where each region uses a fixed Adaptive Modulation and Coding (AMC) scheme. It reserves resources for new calls and RT calls in migration by limiting number of calls. The remaining resources are fairly shared among NRT calls. The scheme ensures each mobile user accepted by the system maintains its throughput. However, it increases blocking and dropping probabilities when the number of limited calls are high.

In [8], a Preemption and Congestion Control scheme is proposed to reduce call blocking and dropping. The scheme first arranges the bearers according to priority. Then, the bearers with the lowest priorities are fully preempted one at a time by employing load reduction technique to obtain target resources. The scheme significantly improves the dropping and blocking probabilities but is unfair because lower priorities bearers may be fully preempted while others are still over-provisioned.

In [9] a fairness-based preemption scheme is proposed to provide fairness to lowest priority bearers. The scheme operates in two stages: partial and full. In partial preemption, the scheme adopts a form of Cobb-Douglas production function by utilizing factors a and b as tuning factors to achieve a contributing metric (target load) which represent the priorities and extra allocated resources, respectively. While in full preemption, the preempt able calls are fully preempted one by one from the lowest to highest until the target load is obtained. The scheme improves fairness on the lowest priority bearers but wastes resources due to unused preempted resources.

In [10], An Efficient Call Admission Control Scheme is proposed to improve resource utilization and decrease the dropping probability. The scheme classifies calls into HC and NC .The scheme accept HCs based on latency and resource blocks availability. While NCs are also accepted based on latency and resource blocks availability and if the length of HC queues (*lengHC)* is less than the threshold size of its queue *(ρ_HC)*. The scheme performs well in terms of dropping probabilities and resource utilization ratio. However, the NCs suffer an increase in NCBP when threshold size of HC queue *(ρ_HC)* is large.

In [11] a Delay Aware and User Categorizations Adaptive Resource Reservation-based Call Admission Control (DA-UCARR- CAC) is proposed to increase the network's resource utilization. The DA-UCARR- CAC classifies users into Gold and Silver and flows to RT and NRT, which translates to four types of bearers namely: Golden users with real-time flows (G-RT), Silver users with real-time flows (S-RT), Golden users with non-real time flows (G-NRT) and Silver users with non-real time flows (S-NRT) bearers and reserves virtually predefined RBs for each class. It accepts request if the resources required are less than the available RBs otherwise it admits the requests into a queue if resources are in sufficient. The queued requests are accepted according to their computed AP when RBs are available. The scheme utilizes available RBs, delay tolerance, user categorization and flow type to compute the AP of a request. The scheme achieves a better balance between system utilization and QoS provisioning but calls with highest AP experience a high blocking probability.

In [12], a Hybrid Call Admission Control (HCAC) Scheme is proposed to reduce the handoff dropping probability. The HCAC employs the resource block strategy to allocate resources based on call type. The scheme determines the maximum number of RBs required (RBmax), minimum number of RBs required (RBmin) , number of required RBs (RBreq) and tolerable maximum delay (Dmax_i). The new and handoff RT calls are accepted based on RBreq and its latency otherwise the calls are rejected if they exceed Dmax_i. Similarly, the new NRT call is accepted based on its RBreq while the handoff NRT is accepted based on its RBmin else the call is rejected if it exceeds its Dmax_i. The scheme reduces the call dropping probability. However, it has a high new call blocking probability under large number of users.

In [13], a Connection Admission Control and RBs reservation scheme is proposed to reduce call dropping probability. The scheme employs RB reservation algorithm to allocate the maximum number of RBs to all calls when possible. And if the cell is over-loaded, some of the calls in the cell might receive RBs lower than the requested RBs .It degrades NC with largest allocated resources allocated resources and lower priority (NRT) calls to minimum RB required to admit HC when resources are insufficient. Similarly, the scheme admits NC which has not exceeds its latency by degrading NRT calls. The scheme rejects both HC and NC if resources obtained from degradation are insufficient. The scheme reduces handoff dropping probability, maintains low new call blocking probabilities and ensures efficient resource utilization. However, the scheme unfair due to NRT call degradation.

In [14], a Fair Intelligent Admission Control scheme (FIAC) is proposed to ensure fair bandwidth allocation among different priority classes and among the flows at the same priority level. The LTE-FIAC scheme employs complete sharing to share the common pool of available resources to multiclass users. It uses virtual portioning to differentiate among multiclass users. It utilizes a stepwise degradation technique to degrade calls of lower priority to GBR using the Allocation and Retention Priority (ARP) index when resources are insufficient. The scheme achieves a lower call blocking probability and guarantees fair share of bandwidth. However, the scheme increases blocking probability. In addition, it may experience QoS degradation during call when channel fluctuate.

In [15], a call admission control with reservation scheme is proposed to avoid call QoS degradation. The scheme considers two types of traffic namely narrow band and wide band applications. It reserves extra needed resources at the time of admission to maintain call QoS in case of channel condition change due to mobility. The scheme enhances QoS but wastes resources when the reserved resources are unused.

In [16], a Downlink Call Admission Control scheme with Look-Ahead Calls is proposed to handle advance resource utilization. The scheme classifies requests into new immediate calls, handoff calls and advance calls. It first accepts a new immediate call if the sum of the new call and the aggregated ongoing calls are below the new call capacity threshold, otherwise the call is rejected. Then it accepts the handoff calls if the sum of the handoff calls and the ongoing calls are below the handoff calls threshold, otherwise the calls are queued. Whenever an occupied sub channel is released, the first handoff call in queue is admitted to the network. If more than one handoff call is waiting in the queue, the handoff calls are served in according to FIFO discipline. Finally, the scheme uses a control factor called book-ahead time to identify the advanced calls. A minimum book-ahead time differentiates new immediate calls from advanced calls while calls above the maximum book-ahead time are rejected. It accepts new advanced call if the sum of the new advanced call and the total advanced calls are below the advanced call threshold; otherwise the new advanced call is rejected. In addition, calls above the maximum book-ahead time are rejected. The scheme utilizes resources efficiently but experiences an increasing call blocking probability under high offered load.

In [17] an extensive dynamic bandwidth adaption CAC is proposed to reduce call dropping and ensure QoS. The scheme employs a load balancing technique to prioritize HCs over NCs. It uses a Dynamic Bandwidth Adaptation (DBA) to predict the resources to reserve based on calls behavior history. The DBA utilizes arrival and departure to arrange NRT calls descending order and assign more resources to RT users to ensure system utilization and user satisfaction respectively. The scheme degrades ongoing NRT call to serve the RT new and handoff calls when resources are insufficient. The scheme achieves a low new call blocking probability, reduces call dropping and improves resource utilization but is unfair to NRT calls due to degradation.

In [18], an Adaptive Connection Admission Control is proposed for heterogeneous services. The scheme adaptively adjust transmission guard interval according to the QoS requirements to give high priority to RT call approaching deadline. It assigns resources to RT call based on QoS. The scheme accepts NRT calls in the absence of handover calls and in presence of low network load. The scheme maintains a low call blocking ratio of the ongoing connections of different classes under small number of users. However, the scheme is unfair because NRT calls may be degraded during temporary overload to admit handover calls.

In [19] a Priority-Scaled (PS) Preemption Handling Scheme is proposed to ensure fairness to low priority preempt able active bearers (LP PABs). The scheme computes the amount of resource needed by reconfiguring all LP PABs to minimum QoS (*R-Min*) or by total preemption of all LP PABs (*R-Total*). The scheme executes Priority-Scaled (PS) Minimum QoS Preemption Algorithm (PS-MQPA) if R-Min can satisfy a request and runs Total Preemption Algorithm (TPA) if R-Min is insufficient but R-Total can satisfy the request. It rejects a request if R-Total is insufficient. The PS preemption handling scheme reduces the dropping of LP PABs. However, the LP PABs suffers high dropping rate due to preemption under large number of higher priority requests

In [20], a CAC algorithm for high speed vehicular communication systems is proposed to reduce call blocking and call dropping. The scheme employs throughput estimation to compute the required resources by users. It accepts a call when the requested resources are equal or less than the available resources. Otherwise the call is rejected when the required resources are greater than the available resources. Then, the scheme reserves the available resources for subsequent call. The subsequent call is accepted if the required resources are less than or equal to the total available resources (reserved resources and available resources) else the call is rejected. The scheme decreases the call dropping and call blocking probabilities but it has poor resource utilization because the reserved resources may not be fully used.

In [21], Resource Estimated Call Admission Control (RECAC) is proposed to guarantee QoS. The RECAC utilizes the type of service request, modulation and coding schemes (MCS) and physical resource block (PRB) usage of the ongoing calls to estimate the PRBs requirement to a call request. It accepts a call when the total number of available PRBs is greater than the requested PRBs else a call is rejected. The scheme maximizes resource utilization and guarantees QoS. However, the scheme has a higher call dropping probability due to insufficient resources required by modulation and coding schemes (MCS) at the call request time.

In [22], an Adaptive call admission control is proposed to reduce call dropping and guarantee QoS. The scheme employs an adaptive resource reservation algorithm that gives a threshold resources block for each service class. The thresholds are dynamically tune based on the cell state and level of the blocking calls type to prioritize between different classes of service. The scheme admits HCs then NCs. and put NCs in a queue when resources are insufficient. It serves NCs based on their latency. In addition, the scheme degrades NCs with largest allocated bandwidth greater than their minimum required resources and the lowest priority NRT to their minimum required resources under insufficient resources in order to accept HC. The scheme decreases HCDP and provides QoS for HCs but fail to guarantee QoS for NCs [9].

In [23],a Delay-Aware CAC (DACAC) is proposed to provide QoS for different services. The DACAC employs a moving window average method to calculate two thresholds (TH1 and TH2) using the packet delay information and PRB utilization. The scheme accepts a call when its service arrival time is less than or equal to TH1 and rejects the call when the service arrival time is greater than or equal to TH2.Similarly, when the service arrival time is greater than TH1 and less than TH2, the scheme accepts the call if the call is a HC and rejects it if the call is NC to prevent network congestion. The DACAC scheme guarantees QoS for various types of services. However, the scheme experiences high new call blocking probability and poor resource utilization due to call rejection to prevent network congestion.

In [24], an adaptive CAC scheme based on higher order Markov chains was proposed to handle call blocking probability. The scheme formulates the resource allocation problem as a Markov chain model and uses the PRB allocation algorithm to adjust the allocation of resources. It dynamically reserves resources for HCs based on traffic condition and uses remaining resources to accept all calls. The scheme degrades low priority calls when the system is overloaded to admit more calls. The scheme decreases call blocking probability for each class of traffic and ensures network resource utilization. However, it is unfair to calls with low priority due to degradation employed.

In [25], a utility based scheduling and CAC scheme (UBSCAC) is proposed to allocate resources based on utility function. The UBSCAC scheme classifies calls as RT and NRT and estimates channel quality based on RSS. It computes utility function according to channel condition when allocating resources. The scheme admits RT and NRT calls based on traffic density and tolerance limit, respectively. It degrades resources of calls with bad channel to admit more calls. The scheme decreases HCDP and improves resource utilization but unfair to calls with bad channel condition.

In [26], an Adaptive Call Admission Control with Bandwidth Reservation scheme is proposed to avoid starvation of user traffic and enhance resource utilization. The scheme introduces an adaptive threshold value, which is dynamically adjusted according to the traffic intensity. It also employs degradation mode to admit more users into a network when resources are insufficient. The scheme prevents starvation of low priority calls and improves efficient resource utilization. However, it waste network resources due to fixed degradation mechanism applied. In addition, the scheme has poor QoS to delay sensitive applications because it uses only bandwidth in admitting connections into a network.

In [27] a flexible Call Admission Control with preemption (FCAC_P) scheme is proposed to support multimedia services. The FCAC_P scheme estimates the channel condition using the received signal strength (RSS). It classifies calls into NRT and RT and further divides RT to HC and NC if the ratio between the reserved resources and the total number of PRBs called the occupation ratio of the bandwidth (*OR_BW*) is above a threshold *th_RT_NC*. The scheme accepts RT calls with good channel conditions if the resources are sufficient and the OR_BW is below *th_RT_NC*. The HCs are accepted automatically because of its high priority while the NCs are also accepted but with a blocking rate probability called *BRnc_rt*. The scheme also considers RT calls with bad channel condition. It accepts the bad channel calls if the OR_BW is below the threshold *th_RT_BC* else the RT calls are rejected. The NRT calls are accepted if resources are sufficient and *OR_BW* is below a defined threshold *th_NRT* and blocked with a probability called blocking rate for NRT calls (*BR_nrt*) if OR_BW is above *th_NRT*. Otherwise, the NRT calls are rejected. The scheme preempts NRT calls not more than once to favor RT HC; it cancels the preemption when resources obtained from the preemption are insufficient for the RT calls. The FCAC_P scheme provides high number of accepted users with higher priorities while providing high system throughput. However, the scheme wastes resources when preemption is cancelled and resources are not utilized. It also has a high NCBP due to preemption and when *BRnc_rt* is high.

Table 3: CAC schemes with type, strengths and weaknesses

S/No	CAC SCHEME	CAC TYPE	STRENGTH	WEAKNESS
1	Novel Resource Allocation Scheme [7].	CAC with RR	Maintains throughput.	Increases blocking and dropping probabilities.
2	Preemption and Congestion Control scheme [8].	CAC with Pre-emption	Reduces dropping and Improves blocking probabilities	Unfair to lower priorities bearers.

3	Fairness-based preemption scheme [9].	CAC with Pre-emption	Improves fairness on the lowest priority bearers	Wastes resources.
4	Efficient Call Admission Control Scheme [10].	CAC with DA	Performs well in terms of dropping probabilities and resource utilization ratio.	New Calls suffer an increase in NCBP.
5	DA-UCARR- CAC [11].	CAC with RR and DA	Achieves a better balance between system utilization and QoS provisioning	Calls with highest AP experience a high blocking probability.
6	HCAC [12].	CAC with DA	Reduces call dropping probability.	High new call blocking probability.
7	Connection Admission Control and RBs reservation scheme [13]	CAC with RR,RD and DA	Reduces handoff dropping probability, maintains low new call blocking probabilities and ensures efficient resource utilization.	Suffers an increase in blocking probabilities.
8	FIAC [14]	CAC with RD	Achieves a lower call blocking probability and guarantees fair share of bandwidth.	Experience an increase in blocking probabilities and QoS degradation during call when channel fluctuations.
9	Call Admission Control with reservation scheme [15].	CAC with RR	Enhances QoS	Wastes resources.
10	Downlink Call Admission Control scheme with Look-Ahead Calls [16].		Utilizes resources efficiently	Experiences an increasing call blocking probability.
11	Extensive dynamic bandwidth adaption CAC [17].	CAC with RR	Achieves a low new call blocking probability, reduces call dropping and improves resource utilization	Unfair to NRT calls.
12	Adaptive Connection Admission Control [18].	CAC with RD	Maintains a low call blocking ratio of the ongoing connections of different classes under small number of users.	Unfair to NRT calls.
13	Priority-Scaled (PS) Preemption Handling Scheme [19].	CAC with Pre-emption	Reduces the dropping of LP PABs.	LP PABs suffers high dropping rate.
14	CAC algorithm for high speed vehicular communication systems [20].	CAC with RR	Decreases the call dropping and call blocking probabilities	Poor resource utilization.
15	RECAC [21].	CAC with CA	Maximizes resource utilization and guarantees QoS.	Higher call dropping probability .
16	Adaptive call admission control [22].	CAC with RR,RD and DA	Decreases HCDP and provides QoS for HCs	Fail to guarantee QoS for NCs
17	DACAC [23].	CAC with DA	Guarantees QoS for various types of services.	Experiences high new call blocking probability and poor resource utilization.
18	Adaptive CAC scheme [24].	CAC with RR and RD	Decrease call blocking probability and ensures network resource utilization.	Unfair to calls with low priority.
19	UBSCAC [25].	CAC with CA	Decreases HCDP and improves resource utilization	Unfair to calls with bad channel condition.
20	Adaptive Call Admission Control with Bandwidth Reservation [26]	CAC with RR and RD	Prevents starvation of low priority calls and improves efficient resource utilization.	Waste network resources and poor QoS
21	FCAC_P [27].	CAC with RR and CA	Provides high number of accepted users with higher priorities while providing high system throughput.	Wastes resources.

3.1 Comparative analysis

Table 3. presents the comparative analysis of the various CAC schemes in terms of type, strength and weaknesses. The schemes are classified into CAC with Resource Reservation (RR), Resource Degradation (RD), Pre-emption, Delay Awareness (DA) and Channel Awareness (CA). The CAC schemes aims at reducing handover call dropping probabilities and new calls blocking probabilities as well as ensuring resource utilization and providing QoS. However, CAC with RR,RD and Pre-emption are unfair to NRT and lower priority calls due to reservation, degradation or pre-emption mechanisms applied and also have poor resource utilization when resources obtained from reservation, degradation or preemption are unused. Similarly, CAC with DA suffers poor resources utilization and may fail to guarantee QoS for new calls, the CAC with CA wastes resources when calls with bad channels are admitted.

Furthermore, majority of the schemes prioritize handover calls over new calls hence an increase in new call blocking probability will be experienced.

4. Conclusion

In this paper, we presented a survey of CAC schemes proposed in recent literature, aiming at admitting call requests into the LTE network based on available resources. The schemes are classified into CAC with Resource Reservation (RR) , Resource Degradation (RD) ,Pre-emption ,Delay Awareness (DA) and Channel Awareness (CA).The way each scheme operates as well as the advantages and the disadvantages are also discussed. Furthermore, comparative analysis has been provided. The analysis indicates that the majority of the schemes have poor resource utilization because resources are not fully used. Also the analysis shows new calls experience high call blocking probability due to prioritization used.

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