QoS Aware MIMO Based CAC Approach for Wireless Mobile Networks

Satyasrikanth Palle, Shivashankar

Abstract- Notwithstanding remote neighbourhood wireless local area networks (WLANs), the most generally utilized remote systems administration innovation is portable cell systems. With the relocation of basic applications to information systems and the development of sight and sound applications, for example, advanced sound/video and interactive media diversions, IEEE 802.11 's achievement is basically subject to its capacity to give Quality of Service (QoS). A lot of research has concentrated on the hardware of Wireless Mobile Networks with QoS bolster highlights. Concentrating on customer Quality of Service (QoS), we propose an effective Call Admission Control (CAC) calculation that control affirmation of brings in joint effort between the understandings for remote versatile systems. The CAC is subjected to the variable rate of transfer speed, the determination network service, the practical allocation of the sub-channel and the probability of blocking calls. The proposed algorithm offers special treatment for high-demand calls, for example delicate transfer calls saving a little transfer speed by using energy, number of customers (stack) and to decrease handoff disappointments. Furthermore, the coating is used to improve the QoS. Incoming calls (new and transfer) are allowed / denied access to the system by the CAC in the light of predefined criteria, taking into account the stacking conditions of the system. Subsequently, this paper presents a well-executable CAC algorithm that greatly improves the QoS.

Index terms: Call Admission Control, flag quality Quality of Service, Wireless Network,

I. INTRODUCTION

Future remote correspondence frameworks face the key test of giving high-information remote access at high calibre of administration. Different information various yield remote innovation seems to meet these prerequisites by offering expanded otherworldly proficiency through spatial multiplexing addition and improving connection dependability because of radio wire decent variety gain. Despite the fact that there are still a great deal of open research issues in the field of remote Multiple Input Multiple Output (MIMO), both from a hypothetical and equipment execution perspective, the innovation has achieved a phase where it tends to be viewed as prepared for use in viable frameworks.

Revised Manuscript Received on June 05, 2019

Satyasrikanth Palle, Department of Electronics and Communication Engineering, Sri Venkateshwara College of Engineering, Bangalore, India.
Shivashankar , Department of Electronics and Communication Engineering, Sri Venkateshwara College of Engineering, Bangalore, India

With the growth of computing techniques, a great deal of intrigue has been developed in an advanced cellular framework that ensured a high capacity and a high quality level at reduced costs. Mobile cellular communication has probably passed through four generations of development [1].

Analog cellular systems are part of the first generation in which voice is the main service. Second-generation cellular systems use digital technologies to deliver improved QoS including voice and limited data with larger system capacity and lower costs.

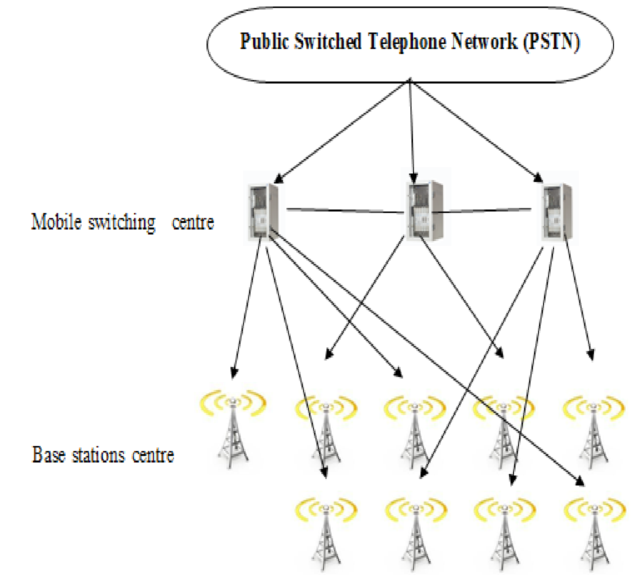

Figure 1: Architecture of Cellular Network

The rapid development of the cellular networkshown inf Figure 1.1 is organized by a number of advanced technologies and requires the presentation of a promising innovation from the Long Term Evolution (LTE) of the Third Generation Partnership Project (3GPP). LTE uses multi-body multi-access technologies in orthogonal frequency (OFDMA) and multi-input multi-output (MU-MIMO) to increase customer information, provide a broad territorial scope and improve the efficiency of another world [1]. In order to achieve these specific objectives, there are incredible testing problems in relation to compliance with the requirements of QoS and reducing the obstruction of the organization. With a specific final objective to solve the above problems, a successful Radio Resource Management (RRM) is necessary.

CAC is one of core procedures of RRM. CAC conspires to accept a new call or handoff call in the system while controlling the QoS of current calls without any call drop being corrupted. The handoff call refers to the method of exchanging a continuous call or

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

an information session that starts with a single channel and then the next one in a telephone arrangement without changing the QoS requirements [2]. In order to meet the customer's QoS prerequisites, the CAC scheme orchestrates the handoff call to the system with the possibility of an accessible data transmission. Subsequently, some transmission capacity measurements are saved to approach the handoff call and relegate exceptional calls to new ones. A viable CAC scheme should simultaneously allow for efficient use of organized resources and a brilliant QoS for guaranteed customers.

The main reason for using CAC scheme is to ensure the following QoS parameters:

- **Signal Quality:** This parameter is fundamental to ensure the signal quality in interface restricted system, there CAC plan concedes clients just on the off chance that it can keep up a base signal quality to concede the clients
- **Call Dropping Probability:** For an obvious truth that the call dropping is more irritating to the client than the call blocking, CAC plan or system is utilized in remote system to control the handoff disappointment probability.
- **Packet-level parameters:** When the service dedicated to packet provided by wireless network, network overloading can result in excessive packet delay and/or the delay jitter. The network or customer level throughput level can be roped to unbearable levels as well. CAC should therefore be used to limit the network level to ensure QoS parameters at the packet level(packet delay, delay jitter, and throughput).
- **Transmission Rate:** In wireless networks offering data services, CAC schemes are used to guarantee a minimum rate of transmission. In telephony networks, the use of CAC to ensure a minimum transmission rate was extensively studied.

In perspective on the pattern towards the advancement of remote portable correspondence, the heterogeneous system coordinated by cell system and LTE-A extends the systems administration model as well as gives clients fantastic administrations consistently and puts by presenting short-go radio correspondence. The extension of sight and sound administration, nonetheless, calls for higher information rates, better QoS framework execution, and improved transmission innovation to address client issues. To tackle these issues, cell system is a competitor innovation. The LTE-A which embraces cell system can help have a major effect in upgrading client experience. With respect to asset the board, the IEEE802.11ad and LTE incorporated system framework.

Thinking of the versatility of improved distance matching, the heterogeneous system incorporated by cellular network and LTE-A, makes the management of demonstration systems and provides customers with fantastic QoS when and where, presenting short-range radio correspondence. In any case, the extension of the advantages of interactive media requires a greater information speed, a better execution of the QoS system and a better transmission innovation to satisfy the customer's prerequisites. Cellular network is a competitive innovation to solve these problems In this research article, design a CAC for MIMO system as the design of CAC improves the QoS.

This work is organized as follows. The Section II describes the Related work in the field of Cellular Network. Section III, describes the proposed methodology for QoS Aware MIMO based Wireless Cellular Network. Section IV presents Simulations and discussions. Finally, the Section V concludes the work.

II. RELATED WORKS

Future telecommunication systems (for example, remote senior systems) mean coordinated management, for example multimedia through modest low-control versatile processing devices on wireless infrastructure [3]. Since the interest in multimedia has grown inexorably in recent years, wireless multimedia systems have been an extremely dynamic research region.

The work in [4] proposed a deviation acquisition plan in which the Best Effort Traffic (BET) makes data transmission is maintained for high-demand calls. In this approach, with the ultimate goal of this document, we call [4] the plan based on the reserve. The reservation-based plan used the display and divination forms for its CAC diagram. In any case, the demonstration of people and the estimation of the parameters of the key framework are inefficient for the remote system, due to the hunger of customer traffic

In [5] author proposed another handover plan to diminish the interference time that happens when an arriving portable client re-interfaces from large scale cell to little cell or from little cell to full scale cell areas. Another control component for call confirmation is being created to modify edges amid the motioning of the handoff demand. Markov chain method is utilized to play out the handoff activity to break down the normal for the call blocking likelihood and afterward settle on the handoff endorsement for different supporter demands. Numerical outcomes demonstrate that the proposed confirmation control instrument is fit for limiting the probability of considers obstructing without giving up the utilization of assets and lessening the quantity of administration intrusions that happen amid client re-associations.

Authors in [6] have proposed a two-level LTE/LTE-Advanced systems channel getting plan for CAC. The upside of this plan is exhibited by the reenactment yield with the proposed plan performing superior to anything the regular plan as far as the probability of call blocking and utilization of assets while an irrelevant drop in execution is seen as far as the probability of call drop.

In [7] authors introduced the utilization of channel Degree-of-Freedom (DoF) as a handover rule in the cell co-channel system to improve framework limit and administration quality (QoS). By building up a tree-based handoff conspire with the DoF as the choice measure, the creators present a DoF-based handoff plot for the co-channel MIMO organize. Contrasted with the RSSI conspire, it is seen that the proposed plan is especially gainful to edge clients. Likewise, a joint methodology was created to adjust to close far divert in the system that consolidates both RSSI and DoF criteria in the handoff plot. The proposed plan is contrasted just and the handoff plans dependent on the RSSI and the total rate. The reenactment results demonstrate that framework limit profits by the obstruction cognizant handoff plot, particularly for clients of the cell edge.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

The remote portable frames for the elderly are regularly referred to as frames for the transmission of terrestrial media in Universal Mobile Telecommunications System (UMTS). The UMTS frame Works hopes to coordinate all types of versatile exchanges, including land, satellite and internal correspondences. Therefore, UMTS should help different distinctive air interfaces [1]. One of the main air interfaces for this frame work is referred to as access to the Wideband Code Division Multiple Access (WCDMA), which is the subject of this document. WCDMA depends on the conspiracy of CDMA with which several customers are relegated to the active radio using extended range strategies. Although all clients transmit in normal data transfer capacity, unique clients are isolated from each other using orthogonal codes. In the possibility that the aggregate vitality of all customers whatever may be the given limit Signal to Noise Ratio (SNR) or viability per bit for data transfer capacity), the frame work cannot guarantee more customers [2-3]. Here we focus on the MIMO framework to construct the frame boundary.

In [8] the authors have examined the impact of vertical collection on heterogeneous systems. The block deviation approach knew the problem of blocking the system in situations of group versatility. The approach uses two learning calculations to reach the hash balance point in a stochastic circumstance. The calculation of the CAC for cellular systems with immediate and dynamic verification of the implementation of QoS is proposed in [9]. The calculation is intended to meet the QoS prerequisites by evaluating the deferral detail of the framework and the remaining yield is calculated in view of the total cumulative performance. Get efficient use of resources. In a pioneering CAC is introduced for remote broadband psychological systems. The plan consisting of a structure and a rationalization system are planned considering the interest of each organization specialized in cognitive subscribers [10].

III. METHODOLOGY

As per the recent developments carried out based on control of the confirmation survey in QoS perspective, we have proposed that, in each type the administration is divided into plots as a double layer to decide the composition of the administration to provide resources to customers. Later, when other customer or handoff customer arrived, the revenue control system will be started and the asset allocation calculation is evoked. In addition, the amount of energy reserved will be calculated.

With the start of improving the customer's normal QoS, changing input classes forcefully and making the designation of resources with the aim of limiting the transmission power of the base station to achieve the ideal exchange between the needs and the resources of the system.

Reserve more assets for administration or crisis management with a great need for access, by adopting these input methodologies, it is less demanding for the high-need management to obtain the assigned matching asset at a specific time, while the benefit of the low-need is limited to a certain extent, with the goal that the different types of administration of interactive media are provided differently.

3.1.Assignment of power by the dynamic access classification based on priority

A critical approach for improving the normal QoS of the system framework is the designation of resources on demand. Given that multichannel distribution is a key element of asset allocation, from the customer's point of view, surely everyone would like to get the required amount of correspondence as expected and each of the administrations has a better quality. From the administrator's point of view, it is normal that all clients that can expect according to the circumstances can access the system at the same time and after different QoS adapts to the different types of administration. In this way, the passion of the two clients and administrators should be regulated during the time spent on the part of the assets. In other words, with limited postal resources, not only is the QoS benefit guaranteed at all levels, but also the greater number of customers who can access the system.

3.2 Assets reserves in consideration of the priority of access.

Expecting that the required measure of power held in the cell is PRs, which includes energyEnergy savings for the customer caused by its versatility and the power of PR_{block} for the customer caused by the organization of the obstruction, there will be $PRs = PR_{move} + PR_{block}$. Since the need to insert a *client_handoff* (PR_{move})due to its versatility is greater than that of the client of caused by obstruction (PR_{block}), there will be $PR_{move} > PR_{block}$. Furthermore, the handover client caused by the block can use the energy near PR_{block} to transmit the benefit.

1. **PR for handoff user caused by its mobility**

Because of the client's arbitrary versatility, the variety of request to carry the mobile is hard to predict. The current supplied to the client i $(1 \leq i \leq M)$ from the base station is $PR^{curent}{}_{i}$and the quantity of designated subcarrier is Ni. When the customer moves to the edge of the cell, the energy measure required to keep the amount of sub channel and MCS unchanged is $PR^{boundary}{}_{i}$. Since the client's separation from the edge is greater, the probability of reaching the limit is smaller and the ratio of $PR^{curent}{}_{i}$ and $PR^{boundary}{}_{i}$reflect customer area data to a certain extent, so the power held by client i can be reported as

$$PR^{move}{}_{i} = (PR^{boundary}{}_{i} - PR^{curent}{}_{i}) * PR^{curent}{}_{i} \quad (1)$$

Assuming there are m1 handoff users caused by its mobility, therefore, the total amount of power that should be reserved for these users is

$$PR^{move}_{i} = \propto \sum_{i=1}^{m1} PR^{move}{}_{i} \quad (2)$$

Where α (α ≥ 0) is the PR factor of handoff user caused by its mobility in the cell. Since the call interruption probability as well as network blocking probability will increase with the number of users does, so the trade-off between new call blocking probability and the interruption probability of handoff call caused by its mobility can be adjusted via adjusting the size of α.

2. **PR for handoff user caused by blocking.**

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

As the handoff client caused by blocking happens on account of poor channel condition, we can think its balance strategy is dependably that at the most minimal request Rmin. Accepting the normal rate prerequisite is N, subsequently the current required channel of handoff client caused by blocking (C_{block}) is

$$C_{block} = {}^{N}/_{(R_{\min})} * B_0 \quad (3)$$

3. Time slot of Reservation :

It is the time required to reserve the traffic slot during communication. At the moment we decide if the traffic v needs a reservation of profit or loss, the need for management of the unit time is defined as *Dv* and the transmission speed of the information of the relevant setting conspires for *Cv*, so that

$$\frac{C_v}{D_v} / Avg_{uC_u}\left(\frac{C_v}{D_v}\right) < \varepsilon \quad (4)$$

Where ε indicates the factor that controls the amount of traffic flow. In the case where ε is very consistent, many traffic flows can be transmitted at the same time in the frame, in general, the amount of traffic flows that can be stacked is limited. Cv = 0 implies that the administration is blocked. From an administrative value point of view, if the channel's activity pool is not executed, the benefit for the client obstructed by the IEEE802.11ad system will have a large amount of channel resources, which causes the disappointment of another call and later, the constant Quality of Experience (QoE)will not be reached. By saving the energy resource, granting permission to previously access another call and reducing the need to re-request customers blocked by the organization, it is possible to determine the consistent QoE. Subsequently, the maintenance of channel resources can improve the decency of entry to the benefit of the customer. The following algorithm describe the working of proposed work in detail.

The Algorithm:

Step 1: Compute the total power consumed by Mobile node PRs = $PR_{move} + PR_{block}$

Step 2: If $PR_{move} > PR_{block}$ then *execute client_handoff*
Else client_handoff = 0

Step 3 *:* Compute the power held by *each node* *is* based on node mobility

$$PR^{move}{}_i = (PR^{boundary}{}_i - PR^{curent}{}_i) * PR^{curent}{}_i$$

Step 4: Calculate the total power reserved for the total number of users (m1)

$$PR^{move}_i = \propto \sum_{i=1}^{m1} PR^{move}{}_i$$

Where $\propto$ *is PR Factor*

Step 5 : Compute $C_{block} = {}^{N}/_{(R_{\min})} * B_0$

Step 6 : Compute Time slot of reservation for resource allocation $\frac{C_v}{D_v} / Avg_{uC_u}\left(\frac{C_v}{D_v}\right) < \varepsilon$

Step 7 : Repeat step1 to step 6 for all other nodes in the network communication range

IV. SIMULATIONS & DISCUSSIONS

The development of Call Admission Control for cellular network for MIMO is carried out. The process includes the resource reservation based on the priority of calls. The resource reservation includes 4 sub-processes. They are

- Power reservation caused by its mobility for handoff user
- Power reservation caused by blocking for handoff user
- Time slot of reservation
- Triggering and terminating the strategy for admission control.

The simulation environment has been demonstrated by considering the total number of nodes in the network shown below.

Table 1.1: Simulation Environment

Parameter	Value
Number of Nodes in Network	500
Width of Area Over which network should be employed	500 mts
Length of Area Over which network should be employed	500 mts
Effective Aperture of Antenna	5
Gain of Antenna	5dB

Different cellular nodes were generated using MATLab7.01 and established communication among the nodes in the MATLab environment. weare able to transfer voice data also using flooding techniques, and working on Data call and Video calls. The results are shown in Figure 4.1 to 4.3.

The results presented here shows how the nodes are deployed in the cellular network and how the active communication takes place between the nodes, the results are simulated using MATLab.

The Fig 4.1 depicts the cellular node deployment in the given area (500 x 500). In this area random node deployment has been initiated by using Omni directional Antenna which gives the number of nodes that can communicate with each other under its communication range.

By using the Flooding technique we are able communicate among all the nodes successfully as shown in Fig 4.2. We also can observe that the nodes broadcast the signal from the source node to its destination through its neighbouring nodes, until it reaches the destination.

The Fig 4.3a to 4.3d explains the active communication using Omni directional Antenna form one cellular node to another cellular node as shown in Fig 4.3a.It is observed that flooding technique and omni directional antenna we are able to communicate among the nodes using the shortest path from one cellular zone to another cellular zone represented as in circular pattern similarly we have considered different source and destination located in different zones and illustration of the nodes communicated is shown in Fig 4.3b to 4.3d.

The simulation results shows successful establishment of communication between two wireless cellular networks

V. CONCLUSION

In this research article, we performed the Call Admission Control (CAC) for the Wireless Cellular Network. We present procedures for controlling the acceptance of the call for remote systems. When the normal waiting times of the channel for new calls and the passage of deliveries are unique, the CAC is an imperative measure in the CDMA framework to guarantee the nature of the administration for contributions. In remote systems, visual and sound activity will have different QoS requirements. At that point, an uplink call admission control algorithm is shown based on organized performance for a WCDMA cell frame with consumed consumption control. To provide the need for delicate transfer calls, the proposed calculation takes into account the alignment procedures and the possibility of "soft channel protection", which has held back a small part of the telephone stack for the most needed calls. As a result, the results show that the proposed work presents an effective call admission control strategy that has improved the QoS in the remote system to obtain numerous data and various performance frameworks.

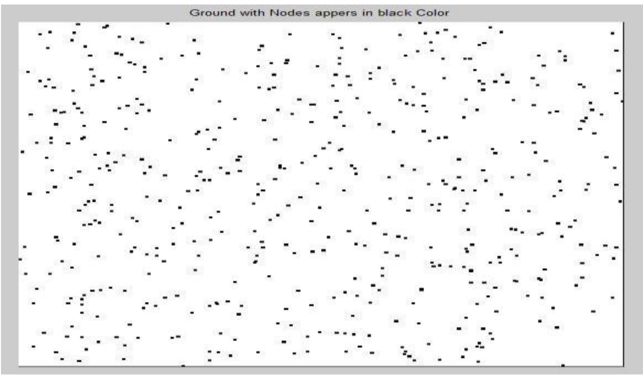

Figure 4.1: Deployment of Cellular Mobile Nodes

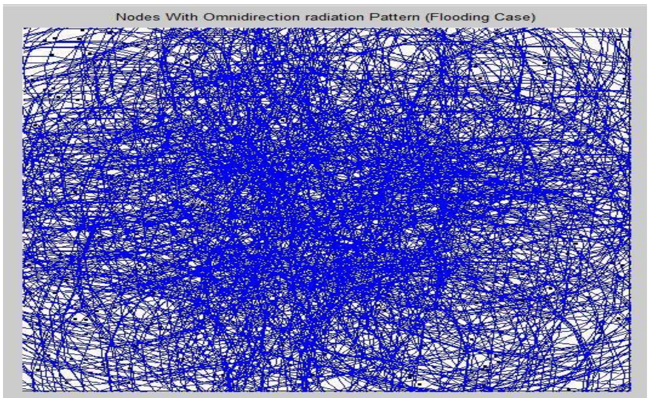

Figure 4.2: Omni directional Node Communication

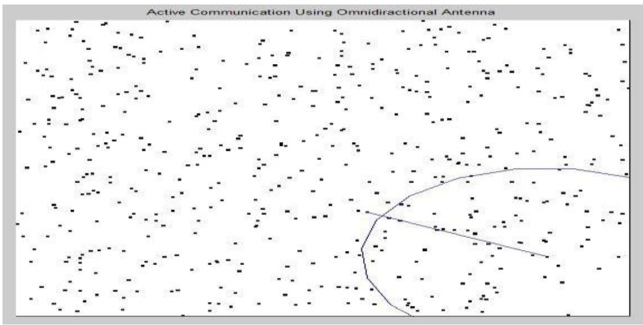

Figure 4.3a: Active Communication using Omni directional Antenna form one Cellular Node to Another Cellular Node

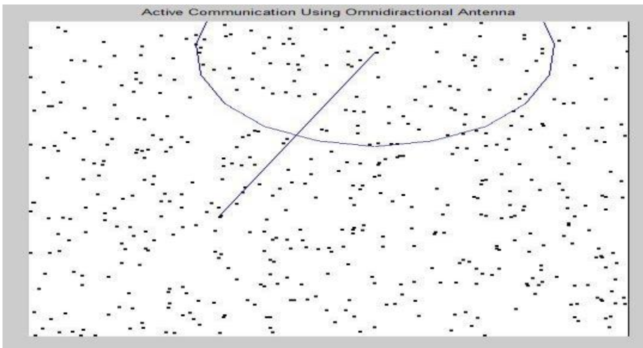

Figure 4.3b: Active Communication using Omni directional Antenna form one Cellular Node to Another Cellular Node

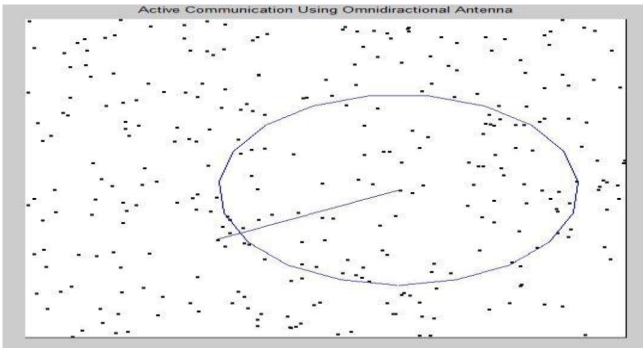

Figure 4.3c: Active Communication using Omni directional Antenna form one Cellular Node to Another Cellular Node

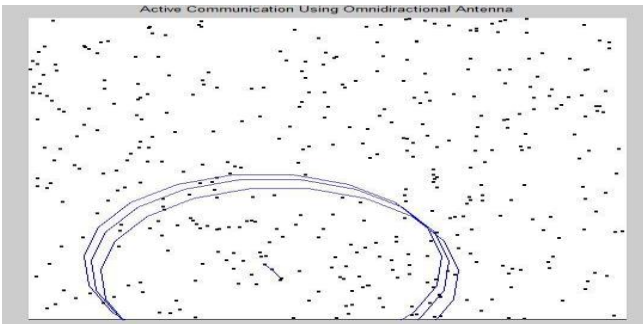

Figure 4.3d: Active Communication using Omni directional Antenna form one Cellular Node to Another Cellular Node

REFERENCES

1. J.-Z. Sun, J. Sauvola, and D. Howie, "Features in future: 4G visions from a technical perspective," in Proc. IEEE GLOBECOM'01, vol. 6, San

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

Antonio, USA, Nov. 2001, pp. 3533–3537.
2. U. Varshney and R. Jain, “Issues in emerging 4G wireless networks,” IEEE Computer, vol. 34, no. 6, pp. 94–96, June 2001.
3. M. Shafi, A. Hashimoto, M. Umehira, S. Ogose, and T. Murase, “Wireless communications in the twenty-first century: A perspective,” Proc. IEEE, vol. 85, no. 10, pp. 1622–1638, 1997.
4. T. Zahariadis and D. Kazakos, “(R)evolution toward 4G mobile communication systems,” IEEE Wireless Communications Magazine, vol. 10, no. 4, pp. 6–7, Aug. 2003.
5. S. Al-Rubaye, A. Al-Dulaimi, J. Cosmas and A. Anpalagan, "Call Admission Control for Non-Standalone 5G Ultra-Dense Networks," in *IEEE Communications Letters*, vol. 22, no. 5, pp. 1058-1061, May 2018
6. Omitola, O.O. and Srivastava, V.M., 2017, January. A channel borrowing CAC scheme in two-tier LTE/LTE-Advance networks. In *Advanced Computing and Communication Systems (ICACCS), 2017 4th International Conference on* (pp. 1-5). IEEE.
7. Lin, W.C. and Wu, J.M., 2018, September. Interference Aware Handoff with Interference Alignment for Cellular MIMO Networks. In 2018 IEEE 29th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC) (pp. 1-5). IEEE.
8. C. Chang, C. J. Chang, and K. R. Lo, “Analysis of a hierarchical cellular system with reneging and dropping for waiting new calls and handoff calls,” IEEE Trans. Veh. Technol., vol. 48, no. 4, pp. 1080–1091, 1999.
9. D. E. Everitt, “Traffic engineering of the radio interface for cellular mobile networks,” Proc. IEEE, vol. 82, no. 9, pp. 1371–1382, 1994.
10. M. D. Kulavaratharasah and A. H. Aghvami, “Tele traffic performance evaluation of micro cellular personal communication networks (PCN’s) with prioritized handoff procedures,” IEEE Trans.Veh. Technol., vol. 48, no. 1, pp. 137–152, 1999.

AUTHORS PROFILE

Mr,SatyasrikanthPalle, is currently working as Assistant Professor in Department of Electronics & Communication Engineering, Sri Venkateshwara College of Engineering, Bangalore and currently pursuing PhD .

Dr.Shivashankaris currently working as Professor & Head in the Department of Electronics & Communication Engineering, Sri Venkateshwara College of Engineering, Bangalore 562157, Karnataka

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication