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Reduce Handoff Call Drop Rate in Mobile Communication Networks a Survey

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Abstract: ***In wireless communication networks handoff is used to provide the communication everywhere to moving user. Many researchers proposed various handoff algorithm to reduce call drop rate. These algorithms have many disadvantages like increase call block probability, limits the number of connections, increase load and complexity in the networks. This paper discusses about various handoff algorithm to reduce the call drop rate***.
Keywords: Handoff, Quality of Service, Call Admission Control, Bandwidth Reservation, Hybrid Channel Allocation.

I. INTRODUCTION

In cellular communication networks communication area is divided into small cells. Each cell has a basestation that provides services to the terminals in that cell. A frequency band or channel should be allocated to terminals when communications take place. When a terminal goes from one channel to another while communication is in process, strength of the signal gets deteriorated and this creates problem in communication. To overcome this problem handoff process is used. Handoff is a process of transferring an ongoing call from one channel to another without any interruption to user communication.Handoff is basically used to reduce the call drop rate.Dropped calls are the calls that end due to the technical reason before actual conversation finish, due to whichperformance goes down. Rate of this type of the call is called call drop rate. There are various techniques to reduce call drop rate. Rest of the paper is organized as follow: Second section of paper discussed about handoff resources and call drop rate. Various handoff schemes are analyzed in third section of paper. Then in fourth section limitation of techniques are given.

II. HANDOFF RESOURCES

In wireless networks, various resources used are frequency channels, transmission power, code channels, battery energy and number of transmission resources. In handoff process resource management help in reducing call drop rate and maintain quality of service during and after the handoff. Handoff related resource management include admission control, bandwidth reservation and power control [1].

In admission control new calls and ongoing calls are treated differently. Ongoing calls are given higher priority than new calls. This technique helps to keep the system from being overloaded. Various methods and techniques are used for this purpose.

In wireless networks bandwidth is the most precious and important resource. In bandwidth reservation technique some portion of bandwidth is used only for handoff call only.

Power control is an important requirement in every mobile system not only due to spectrum and resource allocation but also due to battery life and safety reasons. Power control is used to achieve the required carrier to interference ratio to reduce the overall call drop rate.

In wireless networks major problem is dropping of calls without user intention. Dropped calls are the calls that end due to the technical reason before actual conversation finish, due to which performance goes down. Rate of this type of the call is called call drop rate. In simple networks rate of this type of the call is very low, but in the cellular networks rate of this type of the call is very high [17]. Problems that arise due to call drop rate are failed handover or failed call reselection attempt.

III. HANDOFF SCHEMES

Reason for handoff failure is that if adjacent cell does not have enough channel to complete the handoff request, the call is dropped. An important issue from user point of view is termination of ongoing call is less desirable than blocking of new call. Therefore, it is necessary to use some mechanism to reduce force termination. For this purpose, various algorithm is proposed by researcher like Bandwidth reservation, Call admission control, dynamic rate handoff algorithm based on LBS (location based information) information, Hybrid channel allocation algorithm, Adaptive resource reservation, Handoff queuing, Channel transferred handoff scheme and Subrating scheme.

A. Call Admission control: [2]

In this scheme when a new call arrives in networks it is decided whether this call is served or not. Decision is based on estimation and if calls are higher than the predefined threshold level then some calls are restricted (blocked) irrespective of whether channel is available or not to decrease the probability of handover calls. It limits the number of connection to reduce the congestion in the networks. Basically CAC techniques are divided into two categories static admission control and adaptive admission control. In static techniques one is FCFS (First Come First Serve) method. In this when a call arrives and there is enough bandwidth to serve it then channel is allocated to the call. This is an easiest approach but it does not support priority in calls There is an another method which divides the networks into small cells and there is a restriction in admitting new calls, if the call satisfy some predefined condition only then call is admitted this provide better results than FCFS method. In order to achieve a higher revenue over long time there is a need of considering the future status of the network resources and the pattern of future arrival requests. In adaptive admission control technique, a priority mechanism is established to handle differentiatetraffic load on network and maximize the bandwidth utilization and reduce the handover among the base stations. In adaptive CAC a new call is admitted in the network until its output level is satisfy a predefined level.

The key parameters in CAC is bandwidth, average service time, call arrival rate, price, the ratio of new call load and handoff call load and the traffic on the networks. benefits of CAC are efficient utilization of radio resources, stability of networks, increase operator's revenue and satisfaction of users.

B. Bandwidth reservation

scheme reserves some fixed or predefined portion of bandwidth for handoff calls only. In this way call drop rate is reduced and increase the network performance, decrease the total carried traffic. Researchers proposed various methods for reserving bandwidth like clustering scheme, max-min fairness, support vector machine. Basically all the reservation techniques are divided into fixed bandwidth reservation and dynamic bandwidth reservation[3]. In fixed channel allocation a fixed portion of channel is allocated to the handoff calls whereas in dynamic allocation techniques the portion reserved for handoff calls is updated according to traffic load and networks resources.[4]proposed a method to reserve some bandwidth in the destination cell and neighboring cell at same time.[5] suggested a clustering scheme to reserve resources for handoff. In this scheme resources are reserved by exchanging information of movement and pattern by neighboring cell. [6] proposed a method based on max-min fairness protocol to reserve resources to increase quality of service. In this technique user is subjected to significant bandwidth reservation fluctuation.[7]proposed an adaptive resource scheme for multimedia handoff in fourth generation communication system. Amount of reserved bandwidth is determined by support vector regression and swarm intelligence techniques. In predictive Schemes of bandwidth reservation [8] base transceiver station predicts the mobile station path by measuring the current position and orientation of mobile station. And it sends a channel reservation request to the next cell, when mobile station is within a certain distance (threshold) from next cell. This technique was enhanced [9] by taking threshold based upon time instead upon distance of mobile station to next cell.

C. Hybrid channel allocation

In wireless networks before a mobile user communicate to another user it must be allocated a channel. There are various channel assignment techniques. First is fixed channel allocation [10] cells are assigned channel according to some reuse pattern to obtain desire network quality. In this scheme channels are permanently allocated to the cell. Because of that network do not adapt changing network load and user distribution to reduce this problem dynamic channel allocation allocation scheme is introduced in this approach all the available channels are kept in a pool. And when a cell request channels are allocated to that cell. This scheme provides flexibility and traffic adaptively. It is highly complex. FCA is more efficient than DCA when network is highly loaded. To overcome these deficiency Hybrid channel allocation scheme is introduced. HCA is designed by combining fixed channel allocation and dynamic channel allocation. In HCA all the available channels are divided into two sets: Fixed set and dynamic sets. In fixed set channel available are assigned to the cell using FCA approach and dynamic sets are used only when all the channels allocated to the cell are in use and there is requirement of new channel then channels are assigned from dynamic set.

D. Queuing of handoff calls [11]

to reduce the call drop rate this scheme maintains a queue. When all the channels are allocated and a handoff request arrives then this call request is added to handoff queue. When a channel becomes free, a call from handoff queue is given that channel. A new

call request is served only when handoff queue is empty. In this way handoff queue increases the quality of service. It can be implemented with or without guard channel scheme. [12] proposed a timer based method to implement handoff queuing scheme. When any channel become free base station started a timer. If a handoff request done in that time interval, then channel is assigned to the handoff call. Otherwise channel is assigned based up arrival order of call. Another strategy for implementation of handoff queuing is Measurement based prioritization scheme. In this approach priority to the calls are given based on power level of the call. The call having the power level nearer to the threshold is given higher priority than other calls. This provide better result than FCFS method. [13] described the queuing scheme using guard channel. Base station maintains two queues one for handoff call and another for new calls. Some guard channels are reserved for handoff calls only. When a new call request arrives and free channel is not available then channel from the reserved section is assigned to the new call. This decreases the call blocking probability but slightly increases the call drop probability.

E. Channel transferred handoff scheme: [14]

This approach uses the phenomena that if there is no free channel available to allocate to handoff call then channel from neighboring cell is transferred. For this purpose, two approaches are used: channel carrying approach and channel borrowing approach CCA selects its current channel to carry it in the destination cell. In CBA if cell has utilized all the cell then it can borrow channel from neighboring cell to accommodate new calls. Channel can be borrowed from adjacent cell. A free channel is selected using a search algorithm. Borrowed channel is return the neighboring cell when it became free.

F. Genetic handoff schemes: [14]

This strategy uses genetic algorithms in order to provide cells to handoff calls. Local state based call admission double –threshold policies are used to assign channel to requesting calls. The basetransceiver keeps the track of state information of cells and make decision based on tracked information this method provide better control policy then other methods.

G. Intelligent assisted handover [15]

To increase QoS in VoIP networks, a new architecture is proposed that can change workload dynamically among intelligent agent under congestion. IAs are used according to user requirement and server's requirement. User intelligent agent work authentication on behalf of users. UIA can interact with other UIA in the same network or remain bounded to a particular host. UIA reduce handover delay in wireless network. Server intelligent agent configured to act as proxy server or authenticate UIAs locally. To provide fast services to the network users SIAs can take information from cache memory which is integrated in repository of AAA server. For providing enhanced service adaptive intelligent agent are introduced. An IA can act as a user in order to take services from server. And can also play the role of server when it has to distribute information to other users. Adaptive intelligent agent configures its profile according to information gathered on current condition of network. Adaptive intelligent agent can share network resources, reduce signal overhead and maintain load balance in order to increase network performance.

H. Dynamic rate handoff algorithm based on LBSinformation [16]

In location based services key of improvement is that mobile terminal sends its mobile terminal location information to the mobile switching center, MSC searches mobile terminal location near the most relevant information in database and sends it back to the mobile terminal. This scheme dynamically reserves channel and resources from neighbor cells by using location information, signal intensity change vector and variable bit rate vector into consideration.

I. Sub rating scheme [14]

In this scheme to accept more handoff calls reduce the bandwidth of existing calls so that more calls can be accommodated to an overloaded system. This approach works better in congested networks.

IV. CONCLUSION

After reading various research papers it is concluded that there are many limitations associated with handoff schemes despite of its advantages. The guard channel scheme reserves some fixed or adaptively changing number of channels for handoff calls only. The remaining channels are used by new and handoff calls. So, the handoff calls are better served and forced termination probability is decreased. But scheme increases the call blocking probability. The CAC admission control scheme refers to the task of deciding whether new calls are admitted into the network or not. In this schemes CAC the arrival of new calls is estimated and if they are

higher than the predefined threshold level then some calls are restricted irrespective of whether channel is available or not to decrease the probability of handover calls but it limits the number of call connections in the network in order to reduce congestion. Hybrid Handoff Schemes are combinations of guard channel, handoff queuing, channel transferred, genetic and sub Rating schemes. It combines different prioritization policies to reduce blocking probability and to improve the channel utilization but increase the storage and computation load on the system. Queuing of calls is a method to decrease the probability of force termination of a call due to lack of available channels. It is possible due to the fact that there is a finite time interval between received signal level drops below the handoff threshold and the time the call is terminated due to insufficient signal level. Delay time and size of the queue is determined from the traffic pattern of a particular service area. but queuing does not guarantee a zero probability of force termination, since large delay will cause the received signal level to drop below the minimum required level to maintain communication hence load to force termination.

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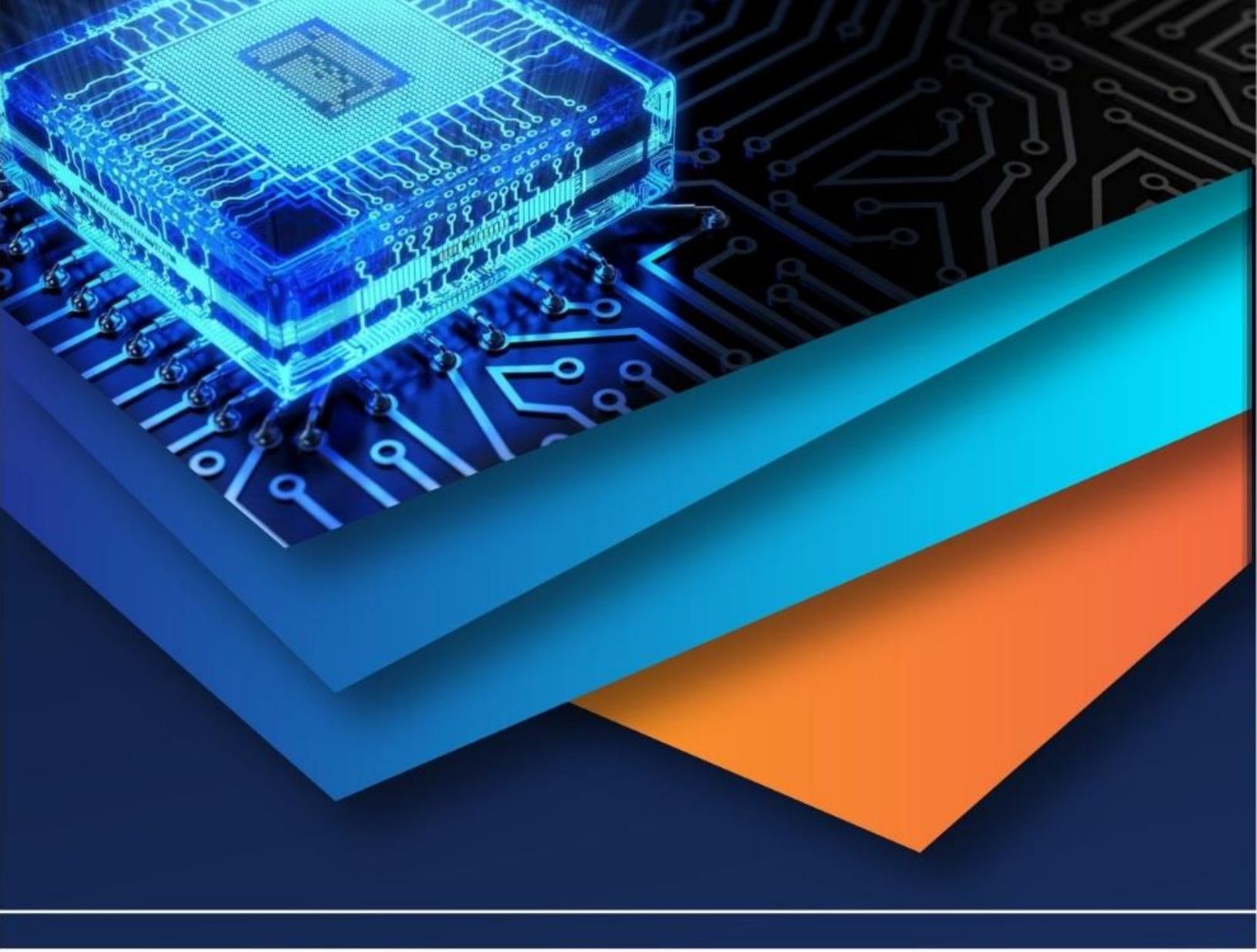

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