# "Improved Call Blocking Probability Reducing Technique Using Auxiliary Stations"

Mrs.Mahalungkar Seema Pankaj
Scholar M.E. Computer
P.C.C.O.E, Pune
mahalungkar.seema@gmail.com

Prof. Santosh S. Sambare
Computer Department
P.C.C.O.E , Pune
ssambare69@gmail.com

Abstract—**In cellular networks, blocking occurs when a base station has no free channel to allocate to a mobile user, blocking can be new call blocking or handoff call blocking. One of the research challenges for cellular systems is the design of improved call admission control scheme which will reduce call blocking probability and improve the quality of service. By using auxiliary stations we can build such a scheme in future for cellular network which will reduce call blocking probability and can easily improve the quality of service.**

*Keywords*—**Cellular system, handoff management, blocking probability, hot-spot cells, auxiliary stations**

## I. INTRODUCTION

A cellular network or mobile network is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. In a cellular network, each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell [10].

When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers (e.g., mobile phones, pagers, etc.) to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission.

In a cellular system, as the distributed mobile transceivers move from cell to cell during an ongoing continuous communication, switching from one cell frequency to a different cell frequency is done electronically without interruption and without a base station operator or manual switching. This is called the handover or handoff. Typically, a new channel is automatically selected for the mobile unit on the new base station which will serve it. The mobile unit then automatically switches from the current channel to the new channel and communication continues [10].

In cellular networks, blocking occurs when a base station has no free channel to allocate to a mobile user. One distinguishes between two kinds of blocking, the first is called new call blocking which refers to blocking of new calls, and the second is called handoff blocking which refers to blocking of ongoing calls due to the mobility of the users.

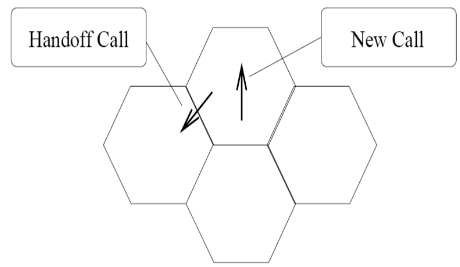


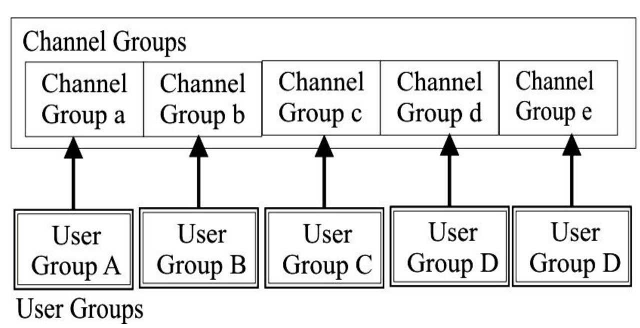

Fig.1. New call and handoff call

Due to unavailability of free channel, incoming new call as well as handoff call will get reject and call blocking probability will increase. This will reduce the quality of service.

To minimize the call blocking probability we are using auxiliary stations (AS) which will be placed in coverage area of base station (BS). Whenever all channels of base station are busy incoming call as well as handoff call will directly connected to AS according to its call duration. When BS has free channel available then connection with AS is removed and get connected with BS. Thus call blocking probability will get minimized and quality of service will increase.

## II. RELATED WORK

By using reservation based channel assignment technique we can reduce call blocking probability as described in [1] as we can see in the fig.2.



Total available channels are divided in five groups. we can assign channel groups to user groups according to call duration. If all the channel from $1^{st}$ channel group are busy then that user can take channel from next channel group in ascending order if channels are available. Here short duration calls will not be blocked due to long duration calls but long duration calls may get blocked.

In hierarchical cellular approach as described in [2] dual-band cellular mobile communication network is considered where each cell i.e. the macro and microcells are served by different base stations that are center excited.

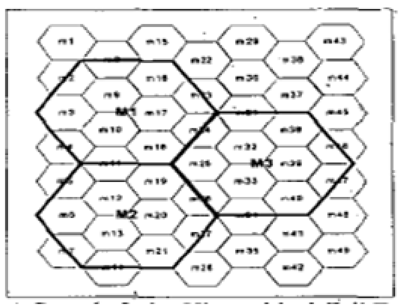



Fig.3 A simple 2 tier Hierarchical cell topology

As shown in fig.3 one macro cell can cover N no. of micro cell and it can make much better special reuse of micro cell frequencies which yields a substantial capacity increase, efficient bandwidth utilization and load balancing.

If the speed of the user is determined to be fast then the call is sent to the macro cell, else if the user were slow then the call would be sent to microcell to be served. When a call is sent to the microcell but the required bandwidth of the call is larger than the available bandwidth, then the call would be forwarded to the macro cell. But problems like call setup and signaling protocol for mobile terminal will become complex in hierarchical cellular network.

For efficient reuse of channels, a channel allocation algorithm for hot-spot cells described in [3] Here hybrid channel allocation (HCA) is discussed which is the combination of fixed channel allocation (FCA) and dynamic channel allocation (DCA)[3]. When a mobile host needs a channel for its call, and all the channels in its fixed set are busy, only then a request from the dynamic set is made where channels are placed in central pool . After the call is over, the channel is returned back to the central pool. A cell becomes a hot spot when bandwidth available in that cell is not enough to sustain the users demand and call will be blocked or dropped[7].HCA will take in consideration traffic intensity in terms of hot-spot signal level of the node. This scheme is simple to implement and offers low overhead. HCA behaves similar to FCA at high traffic and DCA at low traffic. BS needs to check its hot spot level each time when a new request comes and channel from $1^{st}$ group are not available.

Call blocking can be reduced using auxiliary stations as described in [4] . Failure probability can be minimized if the handoff request is served by an Auxiliary Station (AS) closest to the mobile station (MS) when channels of base station (BS) are not free as shown in fig.4.

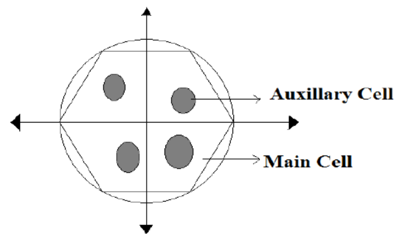



Fig.4. Auxiliary cells and Main cell

The mobile station, being in the AS, will send requests to the BS within fixed time intervals and when it will find free channels are available in BS it will automatically connect with it, rejecting the connection of the AS.

As described in [4] the time interval required for handoff is calculated by dividing the hexagon in to triangles as shown in fig.5. Here it is calculated which the time is considered as a maximum time interval within which MS must request the BS for a free channel at least once.

h- Side of auxiliary cell
a- Side of main cell
L – Minimum distance

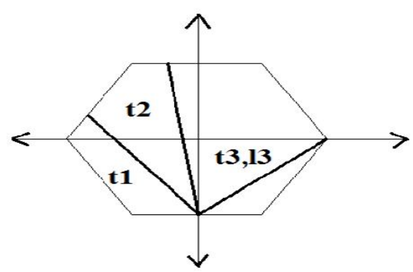



Fig.5 Auxiliary Station

$L^2 = (h/2)^2+h^2+2.h.(h/2) \cos 60o$ -(1)
$L^2=7h^2/4$ -(2)
as $h= a/\sqrt{N}$,
$L^2=7a^2/4N$ -(3)
$L=\sqrt{(7/4N)}\, a$
So, time interval ti = L/ velocity of MS (v)
$ti= \{\sqrt{(7/4N)}\, a\}/v$ -(4)

Existing algorithm using AS's:-discussed in[4] We will calculate the minimum distance L. $L = \sqrt{(7/4N)}\, a$ . We will calculate the minimum time

T that a MS has to stay in an AS to perform handoff. T= {√ (7/4N) a}/v

We will find the time interval t, that a MS stays in an AS (Auxiliary station). *If* $t < T$, handoff is not required. Otherwise handoff is performed by the nearest AS. 1st we have to check the number of free channels(C) in the BS after fixed time intervals. If free channels are not available then handoff job will be continued by the nearest AS. If channels are free then handoff job will be taken over by the BS from the AS.

This process effectively reduces the handoff failure probability. But when one AS's all channel are busy then call will connect to next AS, here transfer time from one AS to other will get increased. Also it may result in handoff failure when all the channels of the nearest AS will be busy. To find the nearest AS one can follow pre-scanning method but that may increase the expenditure. Such limitations can be effectively eliminated using following proposed scheme.

## III. PROPOSED SCHEME

Proposed scheme is the combination of above discussed techniques, where we have used channel reservation, channel allocation; auxiliary stations to reduce call blocking probability.

As we can see in the following fig.6 NCBPR (New call blocking probability reducing) using AS , here three AS are placed in the coverage area of main cell (MC) , also we can see when MS moves from one cell to other cell it sets up the connection with base station . If all channels of the BS are busy then connection request is rejected. To reduce this call blocking probability AS will play main role. Instead of rejecting the connection request, that request is send to the AS for fixed amount of time, in between it has to check availability of the free channels in the BS. If free channels are available then call will connect to BS and remove the connection from AS.

In [4] if all the channels of AS are busy then request will send to next nearest AS till free channel get available with BS. When all the AS are busy then connection request will be rejected. To overcome this, in proposed algorithm we are allocating AS's according to call duration. For long duration call's one AS, for short duration call's one AS, and if both AS are busy and BS is also busy then we have to check RSS(received signal strength) of the MS. If RSS is weak and its registered with foreign cell then terminate that MS connection request from AS. If BS is busy and AS also have free channel available then AS can accept the incoming connection request.

If AS for short duration call and long duration call both are busy and BS is also busy then connection request is handled by reserved AS for some amount of time. Reserved AS is used only when both short and long duration AS's channel are fully utilized.

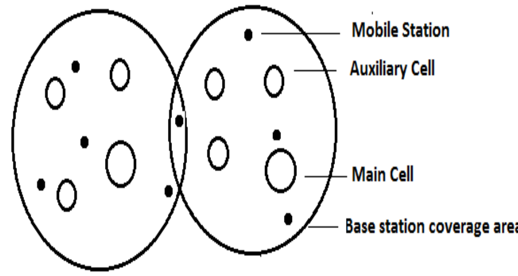



Fig.6. NCBPR using AS

Assume 3 A.S, t –time required by incoming M.S

1. M.S comes under M.C and want to connect with B.S
2. M.S send request to MSC for checking channel availability
3. *If (c! =0)* , then connect to B.S
   Else
   CheckAS () to perform handoff
   a. *If (t<=Ti)* , connect M.S to ASi
   b. Else *if ( t>Ti)* , connect M.S to ASj
4. After fixed time interval check availability of free channels

   *a. If (c!=0)* , connect to B.S and remove connection from A.S
   b. Else
   Check *if (Aux(fully utilised)=yes and B.S(fully utilised)* )
   Check if ( M.S's RSS weak and registered with foreign cell )
   Terminate that M.S connection request from A.S
   Else if (RSS strong)
   Incoming connection request is handled by ASk
5. End

## IV. CONCLUSION

The simplicity and flexibility of the proposed method point to diverse fields of implementation with the help of appropriate improvements and modifications. As the number of AS will increase the possibility of ping pong effect will also increase. Using proposed algorithm we can reduce handoff failure when all the channels of the nearest AS will busy. Also call transfer time was required to move from one auxiliary station to other auxiliary station is totally removed. By using proposed algorithm your call will never get rejected, so call blocking probability is reduced. We can also improve the traffic distribution between AS and BS. We intend to take up this matter in future studies. Proposed method is flawless and effective for practical purposes

## V. REFERENCES

[1] Abhijit Sharma, Deepak kumar “Call Blocking Performance of New Reservation based Channel Assignment Scheme in Cellular” *IJCA Special Issue on “2nd National Conference- Computing, Communication and Sensor Network”* CCSN, 2011

[2] Saravanan Kandasamy, Prihandoko, Borhanuddin Mohd.Ali “New Call Blocking Probability (NCBP) in Improved Adaptive Quality of Service (AdQoS) for Wireless Multimedia Communications using Hierarchical Cellular Approach” 2003.

[3]Rana Ejaz Ahmed , “A Channel Allocation Algorithm for Hot-Spot Cells in Wireless Networks” *journal of advances in information technology, vol. 1, no. 3*, august 2010

[4] Debabrata Sarddar , Shubhajeet Chatterjee “Minimization of Call Blocking Probability using Auxiliary Stations” *International Journal of Computer Applications (0975 – 8887)Volume 25– No.7,* July 2011

[5] Poonam B Bhilare “Seamless handoff in Next Generation Wireless System” *(IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 2 (6)* , 2011

[6] M.L.S.N.S. Lakshmi1 “An insight to call blocking probabilities of Channel assignment schemes” *International Journal of Advances in Engineering & Technology*, May 2012.

[7] Jayshri Joshi, Girish Mundada “A Hybrid Channel Allocation Algorithm to Reduce Call blocking probability using Hot-spot Notification ”

[8] Moshe Sidi and David Starobinski “New call blocking versus handoff blocking in cellular networks ” *Wireless Networks 3* . 1997

[9] Jon M. Peha and Arak Sutivong “Admission Control Algorithms for Cellular Systems” *ACM/Baltzer Wireless Networks,* 1999

[10] http://en.wikipedia.org/wiki/Cellular_network