MSC BASED CHANNEL RESERVATION SCHEME BASED ON QUEUING THEORY

D.Komathi[*1], G.Sujatha[*2]

PG-Scholar in Appied electronics, Department of ECE , Arunai Engineering College, Tiruvannamalai , Tamilnadu, India

Assistant Professor, Department of ECE , Arunai Engineering College, Tiruvannamalai , Tamilnadu, India

.

Abstract

As the cell radius decreases, the Quality of Service degrades and results in high Handoff dropping rate. In mobile communication networks, the radius of the cell becomes smaller so as to utilize the limited channel efficiently. A new channel reservation scheme based on queuing theory which reserves channels in the neighboring cells for expected handoffs where the handoff variables arise as Poisson distribution In order to handle this issue, a novel reservation based approach is proposed. The proposed approach reserves channels in the neighboring cells for expected Handoffs. Queuing theory will be used in order to differentiate the real hand off initialization and fake unwanted initializations. The priorities for spectrum allocation will be done at hand off triggering time. The simulation results reveal that the proposed scheme reduces the dropping probability of handoff calls and guarantees QoS

Keywords: Channel reservation, Handoff, Call dropping, QoS

I.INTRODUCTION

With increasing demands for mobile multimedia services such as video, audio, and data, next-generation wireless networks are expected to provide quality of service (QoS) for such multimedia applications to users on the move. Since the multimedia services have inherently different traffic characteristics, the QoS requirements always differs for bandwidth, delay, and connection

dropping probabilities. It is the responsibility of the network to fairly and efficiently allocate network resources among different users to satisfy such differentiated QoS requirements for each type of service. In recent years, due to increase in mobile velocity and scarce radio spectra, allocation of suitable bandwidth is difficult for mobile devices before handoff to the appropriate cell. Mobile devices may come through performance degradations because of the handoff frequencies that are affected by progressive increase in cell size. As the user mobility is variable, prediction of appropriate cell for handoff become complex.

The rapid advance in wireless and mobile communications field provides many new and improved services to their customers. While the analog services has been supported by first generation mobile service, the next generation (i.e) second generation is meant for providing digital voice which is a kind of digital service and low rate circuit switched data services. The third-generation (3G) systems were aimed at providing multimedia mobile services and achieving a maximum bit rate of 2 Mb/s .

The migration of 3G networks has already begun and researchers are thinking how 3G networks will evolve to fourth-generation (4G) systems where the mobile technologies will be integrated to provide the useful services. In the present generation of mobile communications networks (third generation (3G), beyond third generation (B3G), and fourth generation (4G), it is necessary for the network to provide wide range of services such as multimedia application that includes real time applications providing quality of service with required level. The communication services should be provided without any interruption at anytime and anywhere which is a big dream and challenge in the communication industry. It is expected that in the future we will reach the point where the number of worldwide wireless subscribers will be higher than the number of wire line subscribers.

One of the basic limitations of the wireless mobile networks is the scarcity of the available bandwidth. There are two basic characteristics of the wireless mobile networks that are important to manage the available radio resources: mobility of the users and the limited communications

bandwidth. Since the users are mobile the communication at different location and also during motion, the communication service is provided by mobility. The user is supposed to have the service at any location covered by the serving network. The totally free mobility is the ultimate goal from the users perspective. From the service provider perspective, the mobility of the users can cause a significant overhead in the management of available bandwidth. Because of the mobility of the users, it is required in the mobile communication environment to reserve the bandwidth for the served users in the neighbor cells to ensure the continuity of the calls without interruption while the user is moving from one location to another.

Two main reasons that affect the available bandwidths are the increasing number of mobile users and the high bandwidth required by the new multimedia services (video, images, audio, data ... etc.). The main duty of mobile network is to have better control of admission of the new calls (this is known as the call admission control problem), and also to reserve bandwidth in neighboring cell to maintain the existing call

without dropping (this is known as the resource reservation problem) and to provide the service without interruption for a large number of customers. This makes the problem of call admission control (CAC) and Resource Reservation (RR). A new solution to solve the problem of CAC and RR is proposed

Handoff:

Handoff is the process of transferring ongoing call from one cell to another cell as the user moves through the coverage of the cellular system. Handoff occurs when the signal strength of call reduces below the threshold level. Handoff is initiated by base station.
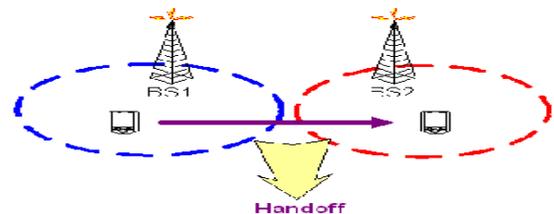

FIG 1:HANDOFF

II. RELATED WORK

Resource management is very crucial problem in wireless network due to the scarcity of resource availability. So this problem must be handled carefully[7]. There

are many works have been carried out to tackle this problem. Three techniques used to solve this problem for FDMA based networks[3]. They are Fixed Channel Allocation(FCA), Dynamic Channel Allocation(DCA), Hybrid Channel Allocation(HCA). In FCA the available frequency band is divided into fixed size and allocated to cells for use. In DCA the resource is utilized based on the application. HCA is combination of FCA and DCA. There are several techniques used to handle handoff problem

Usually the handoff problem can be overcome by allocating priority to the handoff calls. So the handoff call which has higher priority must be given importance.[9] Usually higher priority will not be awarded for the data calls when ongoing voice call is present. Handoff calls are given more priority than new calls. This issue can be overcome by priority allocation.

Another technique is guard channel concept[4]. Here the fraction of total available channel is dedicated for handoff calls. Queuing of handoff calls can also be done to solve handoff management problem. Recently techniques have been introduced

so as to maintain required QOS by proper reservation and utilization of channel[11]. The very difficult performance is proper maintenance of number of guard channel.

There are some works in which a fixed number of guard channels will be allocated. While in some other cases the guard channels will be allocated dynamically based on the arrival of the handoff calls. Also the channels are allocated for the handoff calls based on mobility prediction. So the mobility of the node determines the allocation of the channel[10]. The new dynamically adaptive channel reservation scheme is a technique in which the channels allocated for handoff calls can also be used to handle the new calls. This algorithm is useful for predicting the location of the mobile terminal.

There are also several channel assignment algorithm namely classic algorithm, macro algorithm. For handoff management we have idle-mode, bonus-based algorithm and idle-bonus algorithms[5].

In order to optimize the handoff between the heterogeneous network a

unique technique is used which is known as the Media Independent Handover(MIH).

III. PROPOSED SCHEME

In the proposed scheme, for the expected handoff, a channel will be allocated in the neighboring cells. In order to reduce call dropping and call blocking careful allocation of resources should be done. Here a queuing system is been used so as to carryout bulk handoff. Also the queuing theory is used for delay estimation. So by using queuing theory effective channel reservation and handoff management can be achieved.

Here the channel reservation is made by Mobile Switching Centre. MSC plays important role in handling handoff. So whenever the signal strength of the call reduces it is the duty of MSC to switch over the call from one cell to another cell.

The input to the queue arises as poison variable. The queuing system used here is single server single queue system.

The spectral efficiency of the system is very important factor. So here first effective spectral efficiency is achieved.
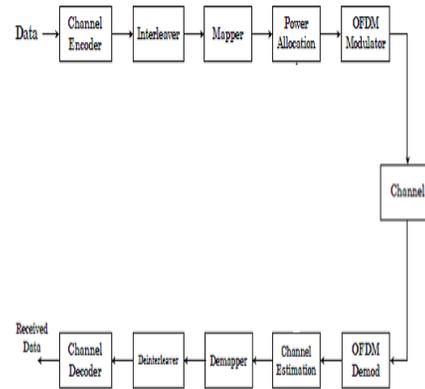

FIG 2: TRANSMISSION OF DATA

So here, first the communication system is been established based on the wimax standard and then the signal is transmitted.

Channel encoder:

First, the signal is given to the channel encoder. Here the redundant bits are added. So here the noise caused during transmission will be recovered at the receiver. Reed-solomon code is used for encoding.

Interleaver:

Then the encoded signal is passed to interleaver. Here the bits are shuffled and then transmitted. Hence, this reduces the bit error rate.

Mapper:

Mapper performs the function of modulation

Power allocation:

The power is allocated for the sub carrier signals

OFDM modulator:

OFDM modulator is used because of high data rate. The sub carrier signals are orthogonally placed there by preventing overlapping of signals. Then each subcarrier signal is modulated.

The signal is transmitted by MIMO technique. The number of sub carrier signals is then fixed. Number of symbols in frames is also allocated. The cyclic prefix is used to prevent interference in the OFDM modulation.

Space time block code is used for transmission. It is a technique in which multiple copies of original stream is transmitted. Due to the obstacles present the signals transmitted undergoes reflection resulting in reduction of strength of the transmitted signal. The receiver picks up the signal copy that is least affected by error.

The input serial data stream is formatted into the word size required for transmission, e.g. 2 bits/word for QPSK, and shifted into a parallel format. The data is then transmitted in parallel by assigning each data word to one carrier in the transmission.

Thus the data is coded, interleaved and modulated. A scheme is used for the transmission of signal which is been modulated and tha scheme is referred to alamouti scheme. At the receiver side the signal is demodulated, demapped, deinterleaved and decoded to get the original signal.
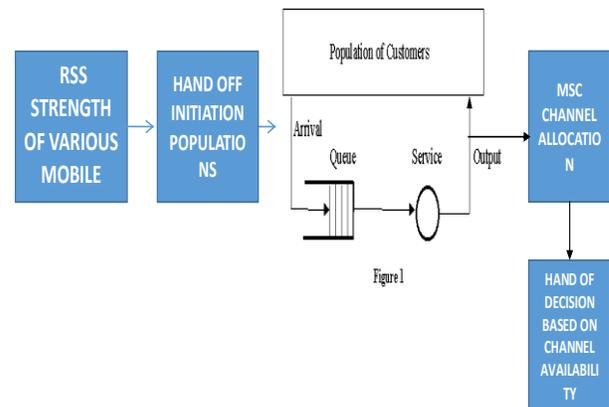

FIG 3:SYSTEM BLOCK DIAGRAM
RECEIVED SIGNAL STRENGTH

The RSS is the important factor in handoff phenomenon. Because, handoff

occurs based on the received signal strength. If the RSS of particular node goes below the threshold level, the handoff must be initiated. Here RSS is calculated based on the BER.

HANDOFF INITIALIZATION

As soon as the RSS of the node reduces handoff is to be initialized. Or else it will lead to call dropping. Also handoff initialization should be done at correct time. If initialization is done prior it will lead to false handoff initialization and if it is done with delay of some time period it will lead to call dropping or call failure.

MOBILE SWITCHING CENTRE

In this scheme the Base Station (BS) and the Mobile Switching Centre (MSC) analyses a call when it is expected to handover to another cell. Based on the frequency of the call mobility, the BS and MSC reserves Channels in the neighboring cells for expected Handoff. This reduces the dropping of ongoing call due to channel unavailability.

In this scheme, the Mobile Switching Center (MSC) is responsible for the overall handoff decision

QUEUING

Thus after reserving the channel in the neighboring cell, the handoff call is to be served. In spite of serving the call immediately the node is put in the queue. The queue may contain several other calls. But the handoff call for which the channel is reserved is given higher priority. That is, this handoff call is made as the first input in the queuing system.

This is done because, if this handoff call is placed as last or intermediate input of queuing system, it will take several minutes to serve the handoff call, as the calls in the beginning of the queue must be served first. So in order to overcome this problem, this handoff call must be given as first input to queuing system.

HANDOFF DECISION

Thus the handoff call in the queue enters the reserved channel and by this handoff occurs. After the first call in the queue is been served, then the second call in the queue enters into its reserved channel thereby reducing the call dropping probability. This will enhance the overall performance.

In case if the queuing theory is not been used, the calls cannot be queued. If the

channel is not reserved for handoff call, it will immediately lead to call failure reducing the overall performance. Because of the queue, even though the channel is not reserved it can wait in the queue for sometime until it gets channel for handoff. Thus this increases overall system performance.
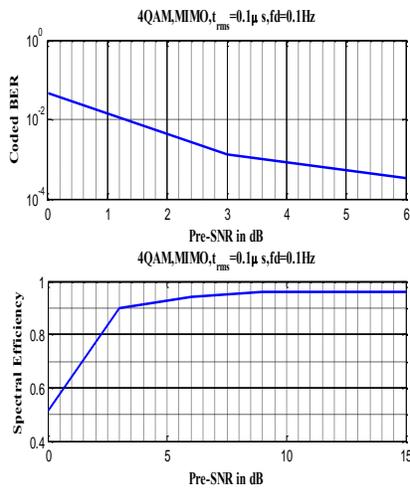
IV.EXPERIMENTAL RESULT

FIG 4: SPECTRAL EFFICIENCY AND BER

The above graph shows the bit error rate of the communication system under various channel conditions described by SNR values. At 6db the BER reaches 10e-4, which is very appreciable least value.

Anyhow this performance will vary if the mobile node is in movement with some velocity. But as per the theoretical approach, the BER will decay in the form of exponential curve which is well proved in the output.

The next figure shows how the spectrum is utilized effectively. Spectral efficiency of 0.98 is achieved at after 6db of channel SNR. So, from the graph is understood that channel conditions should be good in order to utilize the available spectrum effectively; otherwise the spectrum allotted will be of no use.

FIG 5: INCREASE IN THROUGHPUT

IJMTARC

It is seen from the above graph that the throughput of the system increases with the channel reservation scheme. Hence call dropping and call failure probability decreases.
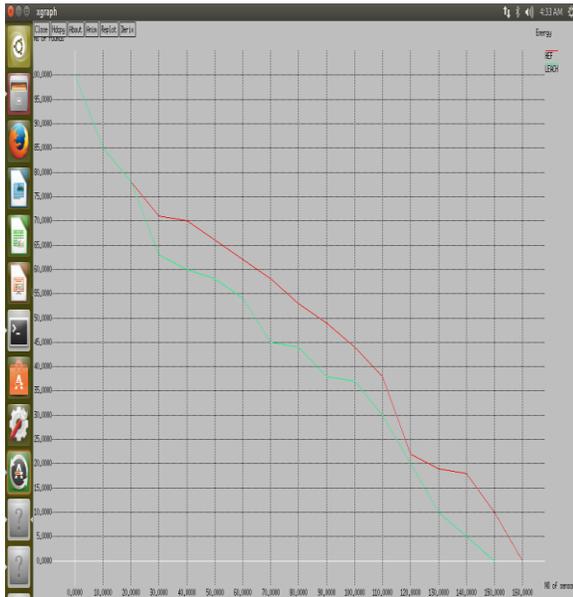

FIG 6: DECREASE IN DELAY

The above graph shows that the delay decreases. The delay here decreases as queuing theory is used.

V. CONCLUSION

Thus the call dropping probability is reduced with the help of queuing mechanism. The simulation results reveal that the proposed scheme reduces the dropping probability of handoff calls and guarantees QoS. The proposed scheme does not intend to increase the overall throughput in channel allocation but it outperforms the existing methods in handoff dropping rate. Considering the fact that the handoff calls should be given higher priority than the new originating calls, the QoS is guaranteed in the proposed scheme. Hence, there is a tradeoff.

REFERENCES

[1]Alagu.S and Meyyappan.T, "A Novel Channel Reservation Scheme for handling Handoffs in Wireless Mobile Networks" IEEE Conference 2013.

[2] Alagu.S and Meyyappan.T, "A Novel Handoff Decision Algorithm inCall Admission Control Strategy to utilize the Scarce Spectrum in Wireless Mobile Nework ", International Journal of Wireless & Mobile Networks (IJWMN) Vol. 4, No. 6, December 2012.

[3] Alagu.S and Meyyappan.T, "Analysis of Algorithms for Handling Handoffs in Wireless Mobile Networks", International Journal of P2P Network Trends and Technology- Vol1Issue2, 2011.

[4] Alagu S and Meyyappan T, "Analysis of Handoff Schemes in Wireless Mobile

Network", IJCES International Journal of Computer Engineering Science, Vol1 Issue2, Nov. 2011.

[5] Asd Malak Z. Habeib, Hussein A. Elsayed, Salwa H. Elramly and Magdy M. Ibrahim, "Heterogenous Networks Handover Decision Triggering Algorithm Based on Measurements Messages Transfer using IP Option Header", The Seventh International Conference on Wireless and Mobile Communications – ICWMC 2011.

[6] A. Iera, A. Molinaro and S. Marano, "Handoff Management with Mobility Estimation in Hierarchical Systems", IEEE Transactions on Vehicular Technology, vol. 51, Sept. 2002.

[7] Kishore S Trivedi et.al "Analytical Modeling of Handoffs in Wireless cellular networks", Elsevier Information Sciences, 2002.

[8] V. S. Kolate, G. I. Patil, A. S. Bhide, "Call Admission Control Schemes and Handoff Prioritization in 3G Wireless Mobile Networks", International Journal of Engineering and Innovative Technology (IJEIT) Vol1, Issue3, March 2012.

[9] Nasser, N., Hasswa, A. and Hassanein, "Handoffs in Fourth Generation Heterogeneous Networks", IEEE Communications Magazine, vol. 44, pp. 96-103, 2006.

[10] Nasif Ekiz, Tara Salih, Sibel Kucukoner and Kemal Fidanboylu, "An overview of Handoff techniques in Cellular Networks", World Academy of Science, Engineering and Technology, 6 2005.

[11] Qing-an-Zeng and Dharma P.Agarwal, "Handbook of Wireless Networks and Mobile Computing", John wiley & sons, Inc., 2002.

[12] I.Ramani and S.Savage. SyncScan "Practical fast handoff for 802.11 Infrastructure Networks", Proceedings of IEEE INFOCOM, March 2005.

[13] Rami Tawil, Jaques Demergian, Guy Pujolle, "A Trusted Handoff Decision Scheme for the Next Generation Wireless Networks", IJCSNS International Journal of Computer Science and Network Security, vOL.8 No.6, June 2008.

[14] F. Siddiqui and S. Zeadally, "Mobility Management across Hybrid Wireless Networks: Trends and Challenges", Computer Communications, vol. 29, no. 9, pp. 1363–1385, May 2006.

[15] Yi Zhang and Derong Liu, "An Adaptive Algorithm for Call Admission Control in Wireless Networks", IEEE 2001.

[16] Yoo, S.-J.,et al., "Analysis of fast handover mechanisms for hierarchical mobile IPv6 network mobility", Wireless Personal Communications, vol 48(2), pp. 215-238, 2009.

[17] M. M. Zonoozi and P. Dassanayake, User Mobility Modeling and Characterization of Mobility Patterns, IEEE J. Select. Areas Commun., vol. 15, pp. 1239–1252, Sept.1997.