Improving Prioritized Handover Performance for Mobile WiMAX by Dynamic Guard Channel Allocation and RSS Quality Factor

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Abstract—**In cellular communication, guard channel has been used to provide priority to ongoing call traffic crossing cell boundaries in handover process but the major concern is that most guard channel allocation scheme are fixed channels. System congestion problems arising from traffic pattern in the real world is another major concern relating to fixed allocation of guard channels let alone the huge traffic that will emanate from user mobility in the envisaged converged traffic of 4G networks. Hence, dynamic guard channel (DGC) allocation based on traffic intensity or channel utilization of each traffic type was used in this research and it reduced the new call blocking probability better than the fixed prioritized guard channel (PGC) and non-prioritized channel allocation scheme. Its performance in terms of call dropping probability reduction is comparable with the PGC and slightly better off at poor signal condition. It was revealed that DGC averaged QoS better than the existing channel assignment schemes. An investigation into the RSS quality factor (QF) proposed also, showed that at high quality RSS the blocking and dropping probability of the traffic were reduced for the Mobile WiMAX wireless technology network with mobile assisted handover.**

Keywords—Mobile WiMAX, RSS QF, Call dropping probability, Call blocking probability, Dynamic guard channel

I. INTRODUCTION

In channel assignment schemes, a central pool for free channels are kept so that when a request arrives, the free channels are assigned to service the request and when a busy channel is released, it becomes free and it is added to the pool again. The information about free channels are periodically sent from BSS to MSC through their forward control channel (FCCH) and are kept by the BSS and the MSC. The three categories of channel assignment schemes are fixed channel allocation (FCA), dynamic channel allocation (DCA) and hybrid channel allocation (HCA). The capacity of fixed channels is permanent and cannot be changed by interaction of systems parameters except by manual adjustment. When all the channels are busy then arriving requests are blocked. Channels can also be allocated dynamically on demand from class of traffic/calls. The pool of free channels can be centralized or distributed. Selection of free channels from the pool may take into consideration some wireless communication QoS characteristics which bother on reuse distance in a cluster to minimize carrier to noise interference and maximize spectrum utilization. Also, free channels are released from the pool to improve on call blocking and dropping probabilities. The HCA combines the features of the FCA and DCA [1].

It has been established that handover calls are given priority over new originating calls which is also, a way of providing quality of service (QoS) in a cellular system. The guard channels are implemented to serve this purpose. Another approach of providing priority is by queuing of handover calls. It helps to prevent an ongoing call from being lost when handover process is in progress while crossing its cell boundary. So, the handover calls are buffered pending the allocation of channels to them at the new BS [2]. Fixed guard channel scheme is simple to implement but may lack efficiency for its poor flexibility. It will only give priority to the handover traffic without consideration for any other. Fixed guard channel was used by [3], [4], [5] and [6] so, they have to vary the size of guard channel manually. Whereas, the number of guard channels in a cell is time varying when the allocation is done dynamically because it is determined by the network conditions at that instant. It provides higher QoS than the fixed guard channel that is an averaged QoS on all types of call. However, some dynamic channel allocation schemes designed previously have design complexities and increased memory usage or have processing load requirements to cope with [7].