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Performance Evaluation of Dynamic Guard Channels Assignment with Queue and Prioritized Schemes

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***Abstract*— It has been said that dynamic guard channel (DGC) assignment scheme based on traffic intensities averages QoS and performs better than the prioritized guard channel assignment scheme with queue (QPGC) during traffic congestion. This work has extended the investigation to DGC with queue (QDGC) and carried out its comparison with other call traffic channel assignment schemes. Mathematical analysis of the models was done using Markov chain and simulation was carried out in MATLAB. When traffic arrival rates were symmetric, the QPGC had the lower call blocking probability than the QDGC but became the same when the system was congested. However, the performance of the two queuing schemes was the same when handover call traffic was more than new calls traffic.**

Keywords—call blocking probability; handover queue; Markov chain; quality of service

I. INTRODUCTION

Queue system can be classified into any of two broad categories which are finite and infinite queues. A finite queue has a limited number of queuing positions which is more realistic while an infinite queue has unlimited number of queuing positions that is unrealistic. Generally, a queue is associated with a service discipline such as first come first serve (FCFS). A priority based queue assigns high priority to handover (HO) calls resulting in a waiting time. A single queue was used in [1] for prioritized processing of HO requests without guard channels and the level of performance was observed the same in both cases.

Handover data calls are buffered if there are no free channels available rather than rejecting them. In an investigation using threshold-based, effect of thresholds on buffer size and application of the proposed method on blocking probabilities were carried out with each class of traffic having its own threshold different from the other class. The HO data calls were preempted and their channels were allocated to handover voice calls for service. Handover data calls were buffered after preemption because they are not delay sensitive. This reduced the handover voice call blocking probability as buffer size increases. In addition, it was mentioned that from cellular perspective, that the main call-level service parameters are new call blocking probability and handover call blocking probability [2]. Queuing of handover calls can be a better option of assigning priority to handoff calls [1].

It was mentioned that the quality of service (QoS) assessment of call traffics can be based on their blocking or dropping probability [3], [4]. [5] worked on prioritized HO to reduce HO failure and maintained that two important parameters for calculating HO processes are forced termination probability and blocking probability. It was also said that a HO is ideal if the blocking probability is maintained while the force termination probability is reduced. However, QoS tradeoff holds because queuing of originating new calls decreases the blocking probability of new calls while increasing the call dropping probability at the cell site whereas, the reverse holds when handover calls are queued, the call dropping probability decreases to zero giving a drop free system while the blocking probability is increased [6], [7].

The authors in [8] presented a literature study of their proposed work intended to develop a mathematical model for CAC in a congested multimedia wireless network using Markov chain analysis and a ticket scheduling algorithm (a probabilistic scheduling algorithm). A simulation study of the model was carried out using C++ programming approach and development of a system prototype using Java. They proposed call blocking probability, handover call dropping probability as performance metrics and are to investigate the effect of buffer size on handoff calls. Nonetheless, the analytical and simulation approach proposed by the authors is quite acceptable in scientific research community but the efficiency

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