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# A fairness-based preemption algorithm for LTE-Advanced

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One of the radio resource management (RRM) functionalities in LTE systems, call admission control (CAC) is employed to control the number of LTE bearer requests in order to maintain the quality of service (QoS) of the admitted bearers. However, no quality guarantee can be provided due to the inherently dynamic nature of wireless communication. For example, during congestion periods when several communications experience poor channel quality or high mobility, it is highly possible that the network cannot maintain its bearers' QoS requirements. Thus, preemption schemes may be employed to alleviate the situation. As a result, resource preemption mechanism and its fairness are prominent issues as they may directly affect applications' QoS in the higher layers, as well as other network attributes such as generated revenue. In general, preemption is unavoidable in two circumstances, namely, to manage the resources among bearers when the network is overloaded as a congestion control mechanism, or, to allocate a high-priority bearer request while sufficient resources are not available.

In this study, we propose a preemption technique by which each an established bearer may be preempted according to its priority as well as the amount of extra allocated resources compared to its basic data rate. We define the contribution of each bearer in the preemption through a contribution metric with tuning parameters which is presented in the form of Cobb-Douglas production function. We compare the fairness of the proposed scheme with a traditional preemption scheme by means of two well-known fairness indices, i.e. Jain's index and min-max index. We also discuss its effect on bearers' blocking and dropping probability and the total generated revenue.

Through a simulation approach, we conclude substantial improvements in preemption fairness when compared to the traditional approach. We discuss that the proposed scheme does not affect the main performance measurements of the network, i.e. the bearers' blocking and dropping probabilities due to congestion. We also show that the preemption contribution metric can be effectively used by the service providers to vary the total generated revenue.