ABSTRACT

In the modern telecommunications, there is a development of wide range of innovative technologies. Among them, Third Generation (3G) mobile telecommunications is the predominant generation of standards for mobile devices and mobile telecommunication services. Long Term Evolution (LTE) networks aim to provide integrated services like multimedia services, voice and data through the mobile devices. To handle the heavy user requirements in the mobility management process, the new mechanisms are evolved to meet the challenges next to the Quality of Service (QoS). In an active mobility based environment integrated services, there is a need to have a proper resource provisioning mechanism to provide a high level of QoS.

Call admission control is an efficient resource provisioning strategy for the limited number of resources in the network. It satisfies the QoS requirements based on the quality policies to maximize the resource utilization. Due to the high speed of user’s mobility, call dropping probability is always high and hence the call rejection rate is very high. A key challenge of call admission control scheme is providing efficient resource utilization and guaranteed the QoS for all types of calls. The parameters like dynamic bandwidth, channel quality, preferences of the admission call request, handoff, priority and QoS in traffic are least
considered in the existing call admission process. The major part of this research work is to ensure the efficient resource utilization and efficient QoS to all user requests. The Adaptive Load Balancing based Call Admission Control (ALBCAC) framework is developed to support different classes of traffic and provides efficient load balancing to enhance the consistency of resource utilization. QoS requirements are analyzed for each traffic class by assigning the threshold value. The threshold value changes dynamically as per the current load of the system. The main feature of this proposed work is to reduce the call blocking probability and increase the performance of call admission process.

To simplify the context of resource allocation in the high density dynamic environment, bandwidth adaptation technique is employed for resource acquisition. The proposed Dynamic Bandwidth Adaptation Call Admission Control (DBACAC) approach reduces the call dropping probability while ensuring QoS demands. The Dynamic Bandwidth Adaptation (DBA) approach is used to maximize the overall system utilization while keeping the blocking rates low. DBA algorithm is used in two phases, when a call arrives and when a call ends. The DBA approach helps in predicting the user behavior and allocate the resources in advance. The DBACAC techniques don’t provide differentiation between the new call and the handoff call and also video traffic is not considered.
To overcome these issues the DBACAC is further redefined and modified as per the traffic based QoS policies. These modifications can be accommodated by call classification, channel state estimation and call admission. The Channel State Based Call admission Control (CSBCAC) is deployed to overcome drawbacks of DBACAC. Initially, call requests are classified into New Call (NC) request and Hand off Call (HC) request and the types of services are classified as VoIP and video.

Prioritization is based on the HC over NC and Voice over Internet Protocol(VoIP) over video type. Then the channel is estimated as good or bad channel based upon the Received Signal Strength (RSS) value. The non-VoIP users and the non-real time users allocate resource blocks using the channel condition based marginal utility function. When there are no sufficient resources to allocate, it allocates the resources of bad channel users there by degrading their service. With the aim of ensuring the QoS and to reduce the performance degradation in call admission process, the Utility Based Scheduling Call Admission Control (UBSCAC) process is developed. To improve the performance of UBSCAC, the call admission process is further optimized by using Bacterial Foraging Algorithm (BFA) based optimization. The foraging behavior of bacteria is considered as user call requests in the call admission process and the available resources are considered as gradients of the chemicals in the environment.
The information processing strategy and the quality policies are defined as the perception of food and the motivation to move in the environment. The utility function of each call request is evaluated based on the RSS value, throughput of the network and set of subscribers participated in the call admission process.

In order to prove the theoretical findings of this research work, the Network Simulator 2.33 (NS2 2.33) with LTE patches is used to simulate the environment. The numerical simulation results of the call admission process show the performance enhancement, load balancing and optimization using the bacterial foraging optimization. The QoS parameters like bandwidth utilization, throughput, fairness and delay for real time and non real call request are evaluated based on Constant Bit Rate (CBR), Variable Bit Rate (VBR), video and VoIP. The proposed research work concentrates on the design and development of call admission control frameworks for the improvement of QoS in 3GPP LTE networks. Based on the results and discussion, it is understood that the QoS parameters like bandwidth utilization, throughput, fairness and delay are improved. This research work will be much more helpful to meet challenges of global future generation communication networks.