Chapter One

Introduction

1. Introduction

1.1 Preface

Mobile broadband is a reality today and is growing fast. Users demand for services information and services anytime and anywhere has lead to the development of various wireless strategies and devices. Long-Term Evolution (LTE) is the project name of a new, high performance air interface for mobile communication systems. Developed by the Third Generation Partnership Project (3GPP), LTE is the evolution of the Universal Mobile Telecommunication System (UMTS) towards an all-IP broadband network. LTE's evolved radio access technology (the E-UTRA) provides a framework for increasing data rates and overall system capacity reducing latency, and improving spectral efficiency and cell-edge performance. (LTE) system is targeted to efficiently guarantee the quality of service (QoS) of services such as audio/video streaming, gaming and Voice over IP (VoIP).So the system resource allocation should obtain the multiuser diversity gain making full use of the channel condition, and take the quality of service (QoS) of different services into account[1,2].

With the rapid growth of wireless communication systems, the number of wireless users has consequently increased. Therefore, wireless networks should be able to provide guaranteed quality of service (QoS) for different services while maintaining high network utilization. Indeed, when designing wireless networks, it should be understood that these two competing requirements (QoS and network utilization) necessitate an efficient algorithm to obtain a good balance between them. Furthermore, the concurrent transmission by network users causes interference, which may instigate the users to race for limited resources of the wireless network. To cope with these challenges, proper management of available

radio resources is vital in such a heterogeneous wireless network supporting multiple types of applications with various QoS requirements. The wireless network may also have to decline new call/connection if the resources are not available or this new call/connection would violate the network promises. The process of such decision is called call admission control (CAC).

A call admission control (CAC) is considered as one of Radio Resource Management (RRM) techniques. RRM is a set of methods that manage the usage of radio resources and intends to assure QoS and maximize the overall system capacity. In general, RRM can be categorized into the following elements: handoff and mobility management, CAC, load control, channel allocation and reservation, and scheduling [3].

CAC scheme aims at maintaining the delivered QoS to the deferent calls (or users) at the target level and congestion avoidance by limiting the number of ongoing calls in the system. One major challenge in designing a CAC arises due to the fact that the cellular network has to service two major types of calls: new calls and handoff calls. The QoS performances related to these two types of calls are generally measured by new call blocking probability and handoff call dropping probability [4].

1.2 Problem Statement

In the continuous fast world of mobile devices there is always a growing demand for high rate services. Due to the heavy user’s space and limited numbers of resources available; it is infeasible to guarantee all ongoing users' a high QoS. This result in some calls being blocked and lost. It is also more frustrating to lose an ongoing call than to lose a new established call.

1.3 Proposed Solution

Congestion avoidance is the main aim of CAC scheme which limits the number of ongoing connections in the system or denies new connection request. It considers the availability of the resources needed to reserve bandwidth for handoff calls, with the QoS maintenance of already accepted calls in order to decide upon the admission of a call request, and guarantee the required Quality of- Service (QoS) of the new call. The call requests are classified into new call and handoff call, and new calls are classified into voice over IP calls (VoIP) and video calls.

1.4 Methodology

Call Admission Control with Bandwidth Reservation in LTE network was proposed using two bandwidth reservation methods; the static and the adaptive bandwidth reservation methods. Two types of calls where considered; new call and handoff call, and new calls are classified into voice over IP calls. MATLAB R2013a software was used to simulate the performance of the two algorithms.

The static bandwidth reservation method reserve a fixed amount of cell bandwidth for handoff calls, VoIP calls, and video calls. While in the adaptive bandwidth reservation method the thresholds are dynamically adjusted to avoid the waste of reserved bandwidth and maintain the QoS of already admitted connections and prioritize handoff call over new call and prioritize VoIP over video type.

1.5 Thesis Outline

This thesis consists of five chapters as follows:

Chapter 2: Presents the related work in Call Admission Control (CAC) in LTE networks, and defines the general models of (CAC), classification of (CAC), (CAC) approaches, and its advantages.

Chapter 3: Discusses the evolution of mobile communication systems and Long Term Evolution along with a discussion about their network element and architecture, and the definition of Quality of Service (QOS) with Call Admission Control.

Chapter 4: Simulates the Call Admission Control with Bandwidth Reservation using two methods; static and adaptive bandwidth reservation.

Chapter 5: Provides the conclusion and proposes recommendation for future.