

# Abstract

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Due to the explosive growth of the multimedia internet applications and dramatic increase in mobile wireless access, there is a significant demand for multimedia services over wireless networks. Furthermore, it is expected that popular content is streamed not just to a single user, but to multiple users attempting to access the same content at the same time. Thus, 3GPP has introduced a new point-to-multipoint (pt-M) optional service under the acronym of Multimedia Broadcast Multicast Service (MBMS) in Release 6, targeting at simultaneous distribution of multimedia content to many mobiles within a serving area. With the aim to provide a seamless - anytime, anywhere -wireless communication in Wideband Code Division Multiple Access- Universal Mobile Telecommunication Systems (WCDMA-UMTS), a satellite component has also been identified. Some aspects of these problems have been considered in this thesis. Some new modifications for MAC protocol namely, Fair Resource Allocation based on Buffer Length (FRABL) and Queuing of Requests at Base Station (QRBS) to improve the QoS for various traffic classes have been proposed and analysed. We have explored the feasibility of a modified max-min fairness algorithm to receive the enhanced performance of an integrated resource allocation scheme with the help of call admission control and a new packet scheduling algorithm for UMTS. We have studied High Speed Downlink Packet Access (HSDPA) performance under existing packet scheduling algorithms and also a modified packet scheduling algorithm is proposed along with analysis results. New algorithms for resource allocation on MBMS and packet scheduling have been analysed for their application to UMTS. Further these are extended to Satellite UMTS applications as well. A throughput improvement of 7% is observed for FRABL over standard MAC, while an improvement of 18 % in throughput for the case of QRBL is exhibited. The proposed packet scheduling scheme for HSDPA exhibits 10% increase in throughput over existing packet schedulers. The HSDPA when used for MBMS transmission gives 7.8 % increase in throughput as compared to that of Forward Access Channel (FACH) used for MBMS. The delay reduction of 5 seconds is achieved by using HSDPA in place of FACH.

**Key Words** – WCDMA UMTS, MAC protocol, Resource allocation, Packet scheduling, HSDPA, MBMS, S-UMTS