Summary

This report has been prepared to compile the final findings of Fast Track project (FT2005-22) funded by the deanship of Scientific Research at King Fahd University of Petroleum and Minerals (KFUPM).

The project work intends to characterize and evaluate the radio resource management function and in particular, the scheduling algorithms and quality of service control mechanisms necessary to support the newly emerging services in mobile and wireless integrated services. The study is composed of two major parts. In the part-I, we focused on developing new scheduling algorithms for 3G CDMA networks. On the other hand, part-II has focused on developing new the medium access for wireless local area (WLAN). In both parts, we have surveyed the existing literature for the existing scheduling algorithms, medium access control and QoS control for the targeted networks (i.e. 3G CDMA and WLAN).

For Part-I, the proposed scheduler is power-based scheduler. It is associated with the well known EDF-based scheduler that is known for its minimum delay performance. Several versions have been proposed, namely MinPower EDF, MaxPower EDF, MinPower PEDF, MaxPower PEDF. Extensive simulation runs have been conducted assuming a 19-cell CDMA network layout. The results show an outstanding performance in terms of throughput and packet delay especially for low and moderate loads. More, the loss probability is found to be very low compared to original EDF and PEDF. There is 25% decrease in loss probability compared to EDF and PEDF and there is 70-80%

decrease in packet delay compared to EDF and PEDF. Using Jain's fairness index, we have studied the fairness of each proposal and compared with EDF and PEDF. Finally, the study shows the high sensitivity of scheduling interval.

On the other hand, we propose and evaluate a novel algorithm to enhance the backoff procedure of DCF and provide QoS differentiation. The new algorithm attempts to adaptively control the DCF contention window in order to alleviate congestion through an easy to set parameter referred to as q. In our study, we evaluate the DCF and the new algorithm in a situation that is close to the real world situation. Each station receives frames from upper layers according to a Poisson process and there is no saturation. Simulation results indicate that better throughput and delay figures are obtained using the proposed algorithm. More, the proposed algorithm shows less sensitivity to the number of active nodes especially for low number of active nodes. This feature is very important for WLAN service provider.

These findings shall serve network designers and network operators such as STC alike. Especially with the advent of the privatization move, network operators will be differentiated based on their support for these developed services and the efficiency of their network.

The study started in September 2005 and has been completed in February 2007. Two master theses were produced through out the course of the project. Further, four conference papers were published out of this work and two journal papers are under preparation.