

QoS-AWARE SCHEDULING IN OFDMA SYSTEMS

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In orthogonal frequency division multiple access (OFDMA) networks, the bandwidth is divided into many narrowband subchannels. The task of the resource scheduler is to divide the transmitter power among the different channels and the channels among the different users. Different frequency bands experience different fading, so the power allocation can be opportunistic by allocating more power to good subchannels. This technique is known as water filling. In OFDMA and MC-CDMA (multicarrier code division multiple access) the transmitter utilizes inverse fast Fourier transform (IFFT) operation followed by digital to analogue conversion. Since the different subchannels are formed using digital signal processing, it is possible to dynamically control the utilized spectrum.

The resource allocation problem in OFDM systems has been recently considered in many studies. Almost all of them define the problem as a real time resource allocation problem in which Quality of Service (QoS) requirements are fixed by the application. QoS requirement is defined as achieving a specified data transmission rate and bit error rate (BER) of each user in each transmission.

Our approach in providing requested QoS classes will be through controlling the activity probability of the subcarriers. The activity probability of a subcarrier indicates whether it will be scheduled to transmit data or not. This probability is associated with the target QoS and is increased or decreased in a way that the distance between the actual parameter and its target is minimized. This approach converts the scheduling problem into a control problem. In general the problem of scheduling packets over a fading channel could be viewed as stochastic optimal control problem.

The proposed project is related to Prof. Jäntti's project "Radio Resource Management and Two-Dimensional Spreading in Multicarrier OFCDM Wireless Networks: Downlink Analysis", which is a co-operation project between Control Engineering Laboratory, Helsinki University of Technology, Radio Resource Management & Optimization Laboratory, Yonsei University, Korea and LG-Electronics.