Resource allocation

We study resource allocation for wireless networks at the physical and access layers (PHY and MAC). Energy efficiency and power consumption are key metrics in most of our studies since they impact the battery andlifespan of devices and the electrical consumption and radiation of the infrastructure [hal-01104190],[AriaudoJASP2012] and [hal-01382276].

We have developed centralized algorithms based on the usage of limited channel state information at the base station or access point to optimize the access to the spectrum (scheduling) and power usage in 4G environments (considering an OFDM or SC-FDMA modulation) [hal-01308719] or in the context of cognitive/secondary users [BagayokoTSP2011]. For 5G, where considering a large number of antennas at the base station (massive MIMO systems) is a key enabling technology, we have designed 1-bit quantized converters to limit the signal dynamics and propose efficient precoders [hal-01558617] and [hal-01704849] in a dirty-RF context.

In static or stochastic wireless environments, we consider game theoretic tools to develop energy-efficient resource allocation algorithms [hal-01382296], [hal-01382285] in multi-user interference networks. In highly dynamic environments such as the Internet of Things (IoT), the devices or users must be autonomous since the exchange of channel state information becomes useless. Distributed and adaptive optimization and learning techniques are then required to overcome the impossibility of coordination. Using the framework of online optimization, we have developed online learning algorithms to allocate devices spectrum and power [hal01382276], [hal-01387046]. These studies also require information theoretic, signal processing and statistical learning tools, to prove the efficiency of the proposed algorithms in terms of regret minimization rate (online algorithms) and convergence to the equilibrium (games).

We have also considered some applications or specific aspects of wireless communications, such as retransmissions or alternative waveforms. In particular, we have addressed Hybrid-Automatic-Resend-reQuest (HARQ) mechanisms to control retransmissions of erroneous packets. We proposed to optimize the trade-off between coding rate and retransmissions given some CSI [hal-01273989], [hal-01633786].

We have considered the issue of information sharing between devices [hal-01308624], for pricing [hal01308774],
for instance in the context of smart grids or environmental monitoring [hal-01276150].