

From pre-planned to self-organizing and green wireless networks

Abstract: In the last couple of decades wireless access networks, and cellular system in particular, have rapidly pervaded everyday life. The number of mobile subscribers worldwide overcame the number of fixed lines in 2002 and it is now more than triple. This rapid change required enormous investments by mobile operators that have deployed full coverage networks in most countries (including development countries). Obviously the need to minimize installation and operation costs of wireless access networks has stimulated the research community to develop design tools based on optimization technologies for supporting planning and management decisions of mobile operators. These include radio planning tools for the deployment of new networks or the expansion of existing ones, as well as tools for network management like those for frequency and resource assignment.

Even if now mobile phone services are available basically worldwide, the effort to deploy wireless access networks is still continuing and a new wave of change is expected with the diffusion of broadband mobile Internet access of new generation systems. Two main issues must be addressed in the next years. On one side the increasing energy consumption of wireless networks asks for energy aware design and management tools. On the other side, the increased complexity of wireless technologies, the larger number of access stations required, and the difficulties to get reliable estimates of signal propagation in real environments ask for new distributed algorithms for network optimization. We expect that next generation wireless networks are able to self-configure and self-optimize, as well as to reduce energy consumption based on traffic loads.

In this keynote we overview the new challenges arising in optimizing design and management of new generation wireless network highlighting the research and application opportunities for optimization researchers and practitioners.