Robust design and optimization of wireless backhaul networks

Wireless backhaul networks have received a lot of attention lately because they are a reliable solution to provide high-speed Internet access in “white areas” (i.e. remote locations), and to deploy operated public and private networks in urban areas. These networks use directional radio links to transport high-speed traffic on long distances. The link capacity (micro-wave) of a wireless backhaul network depends strongly on the environmental conditions and can decrease significantly in case of rain or temperature changes (e.g. fire). As rain usually affects several links simultaneously, we can associate a certain probability, depending on the environment, to the capacities of sets of links, and study in this model optimization problems like routing. The objective is to develop efficient models to solve complex problems arising in the design and optimization of wireless backhaul networks, taking into account environmental and traffic variations.

The candidate will collaborate with team members working on wireless backhaul networks. He will extend existing models done on antenna configuration and routing for the design and optimization of wireless backhaul networks, in order to integrate traffic and environmental condition variations in efficient optimization models.

1. Propose a theoretic framework to model the effects of traffic variations, and define the sets of links affected by a decrease of their capacity in this type of networks.
2. Develop efficient optimization models using robust and stochastic optimization, and chance-constrained programming.
3. Propose new tools for the design and management of the network in this context, in particular for the design of robust networks, in terms of traffic and capacity uncertainty.

Research topics are algorithmic, optimization, operation research, and networks. Moreover, a research study about robust and/or stochastic optimization techniques will have to be done.

Place of work: INRIA Sophia-Antipolis Méditerranée
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