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Efficient Algorithms for Infrastructure Networks

Planning Issues and Economic Impact



Frank Phillipson

Efficient Algorithms for Infrastructure Networks

Frank Phillipson

Currently, electricity and telecommunication network providers operate in a turbulent period. The market is open for competition and customer demand changes dramatically, facing the network providers with a huge challenge.

Information is reaching us more and more digitally. Mobile and fixed telecommunication networks have to deal with this explosive growth of data traffic. For fixed networks this means that the default internet connection via ADSL (up to 8 Megabits per second) is no longer sufficient. The network operators work on the rollout of VDSL, where the fibre connection is brought to the cabinet in the street and a speed of about 100 Mb can be achieved. That may be sufficient for now but this is also not future proof. In addition, they offer Fibre to the Home. The latter roll out is not fast enough. This sketches the huge dilemma for the operators: bring a solution quickly that is not future proof or bring a future proof solution and lose a part of their customers to the competition. In this thesis, a systematic solution for this dilemma is provided.

Electricity network providers have to handle another dilemma. They face an increasing demand due to, e.g., electric cars, and they see their customers partly generate their own electricity. Solar panels are common, but also more and more electricity generating boilers and small wind turbines are placed in residential areas. This production is very variable, while it is depending on sun and wind. For the network managers these trends lead to the challenge how to keep their network in balance. Known solutions are creating their own flexible generation, using (price) incentives to influence the demand of consumers and using smart grids. Next to these solutions there is always the very expensive solution of strengthening and renewing the network cables. In this thesis a solution is studied that is at the tactical level. How many of each type of local generator are needed and where are they placed to minimize transmission losses and the losses by demand-supply mismatch?



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