Reflectometric analysis of transmission line networks

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Nowadays, wired telecommunication still represents the major part of the installed communication networks. However, the wiring, the structure and the performance of the network are often only poorly understood. Resolving this lack in knowledge forms the cornerstone to modern cost-efficient network management. One way to achieve this is by using single ended line testing, as the line end is often not, or only difficultly, accessible.

The question that is answered in this PhD is whether it is possible to identify the physical structure of a network using such single ended line measurements. This is especially of concern for xDSL applications, as for each individual user, the speed and quality of his internet connection highly depend on the make-up of his telephone line (e.g. the line length). First, we show from a theoretical perspective that the physical network structure is not always identifiable from single ended line measurements. Secondly, we determine the practical issues that complicate the identification for telephone lines. Finally, several processing techniques to facilitate the identification are proposed.

Another limiting factor for the speed of xDSL applications is the interference of different DSL services operating in the same binder. A new approach is presented to detect if, and over which distance, two telephone lines are located in the same binder.

Finally, the same testing principles are applied in a completely different domain, namely assessing the proper operation of sensors networks. A dedicated prototype was developed for power plants, and implemented with success, indicating that the techniques applied in this PhD are applicable in a broader area than solely xDSL applications.