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Performance Engineering and Traffic Engineering for Multimedia Applications in the Internet and in Mobile Networks

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Performance Engineering' of computer and communication networks, among others, comprises practices, methods and tools which can be applied in order to design, implement and operate networks and their applications in such a way that given performance and Quality-of-Service (QoS) requirements are fulfilled. 'Traffic Engineering' for networks – in its broader sense – comprises formal specification, measurement, modeling, characterization and manipulation (routing, traffic shaping, etc) as well as the generating of traffic loads in networks. Performance engineering and traffic engineering are particularly relevant in the context of the Internet and of mobile networks, more so, if those networks are used for real-time communications.

The talk summarizes the long-term experiences in traffic and performance engineering within the Telecommunications and Computer Networks Division at Hamburg University. In particular, emphasis will be given to our recent research results related to measurement-based load characterization of audio and video streams, to formal load specification and analytical modeling of load transformations (stochastic load transformations as they are currently studied within the DFG project LUPUS) as well as to the elaboration of two powerful performance and traffic engineering tools: a distributed load generator for multimedia traffic in service-integrated networks and a network emulator to reflect the packet delay and loss behavior of, possibly interconnected, computer and communication networks.
A case study will be presented to illustrate the broad applicability of our load generator (UniLoG) and network emulator (NetEmu) prototypes. These experiments will also show that valid QoS-related studies for distributed real-time applications can be flexibly supported by a combined usage of both, the network emulator and the load generator tool. With our approach the strict separation between network-oriented and application-oriented performance studies is no longer required – an important step towards a realistic QoS evaluation from an end-user's point of view.