Invited talk (26. Feb. 2009, appr. 16.00 , ca. 45 min.)

Key Issues of Peer-to-Peer Mechanisms as Future Internet Communications

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The decentralization of Internet communication is an increasing trend in the last years. We witnessed the boom peer-to-peer communication paradigm brought in file sharing applications, content distribution like KaZaA and BitTorrent, VoIP application like Skype and video streaming like Joost and Zattoo. The peer-to-peer networks led to an increase of interaction between users for decreased costs as these are build on an infrastructure in which users consume and provide content at the same time. There is a rising need for users to easily communicate, collaborate and share their user-generated content. However, not only the users are interested in better results, but also the Internet service providers are focusing on the mechanisms used. They try to minimize the costs generated by peer-to-peer applications in their networks.

There are many issues and challenges applying to the peer-to-peer paradigm. As peer-to-peer system rely on the sharing of the resources of their participants, the contribution of the peers needs to be guaranteed. The problem of free-riders, participants who consume much more than they share, needs to be eliminated for the sake of an efficient and functional p2p systems. Incentives should be implemented such that it do not apply additional complexity and costs to the system. Talking about QoS in decentralized autonomous (peer-to-peer) systems brings a challenge for a self-optimization not only on peer but also on system level. The distributed, self-organizing Efficiency and Information Management System (EMS) SkyEye.KOM brings an ‘Oracle view’ on peer-to-peer systems. It collects and aggregates information about system components and uses it for analyzing and forecasting the system status using mathematical models. This knowledge can be used by the different functional domains of the peer-to-peer system in order to enable a more efficient resource usage by applying QoS strategies and setting priorities.

Research in the field urges addressing quality properties of peer-to-peer systems. The project QuaP2P focuses on the systematic improvement of the adaptability, efficiency, validity and security of peer-to-peer systems. As a proof of concept, all developed mechanisms and findings are integrated in two new peer-to-peer application areas - a first response system and a collaborative software development environment showing new opportunities of the peer-to-peer paradigm.