Peer-to-Peer networking in heterogeneous, mobile environments

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An increasing number of applications in the Internet are provided through Peer-to-Peer (P2P) technologies. These applications are not only concentrating around classical file sharing, but include telephony services and collaborative work as well. However, P2P technology is regarded as being disruptive for traditional fixed and mobile operators. Nevertheless, it can also be considered as an opportunity for new ways of networking for service provisioning. First, P2P concepts allow a more efficient usage of existing platform resources through relying on existing infrastructure including even the customer equipment and thus provide a low cost service platform. Second, P2P technology brings new business opportunities through extending the service portfolio to user provided services and to ubiquitous environments. Whereas existing P2P systems are focused towards a broadband fixed network Internet characterized by homogeneous desktop PCs, new challenges emerge for the application of P2P technologies in the real networked world. Especially mobile networks, which are considered to be an integral part of the next generation Internet, pose new requirements regarding signalling overhead, churn, network capacity and terminal capabilities. This presentation describes a new P2P overlay network that not only compensates heterogeneity based on a hierarchical networking approach, but even takes advantage of it to support an efficient information exchange. This P2P system consists of a DHT-based core overlay network interconnecting high capability super peers that interface to low resource leaf peers. Based on analytical evaluation and simulations the efficiency of this architecture as well as its optimal design is presented. This system constitutes a basic building block for an overlay networking infrastructure supporting the lookup and distribution of distributed resources in heterogeneous networks. Further building blocks address reliability, scalability, controllability, bootstrapping as core building blocks, and further application-specific components such as reputation management and complex query handling. An outlook on P2P based future generation networking concludes the talk.