EUNICE 2006 - Tutorial: Peer-to-Peer Networking

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Peer-to-peer (P2P) networking refers to a class of network architectures and applications that employ distributed resources in order to perform routing and networking tasks in a self organizing and decentralized manner. In recent years, P2P traffic has become a major part of IP traffic, and the P2P paradigm has lead to an increased attention in the research community. Consequently, a lot of new P2P protocols have evolved.

In this tutorial we give a general introduction to P2P networking. We define the term "Peer-to-Peer", explain the concept of overlay and self organizing networks, and show impacts and advantages of P2P.

Historically, we divide P2P networks into three main classes: centralized, unstructured and structured P2P networks. We give examples for each class and compare their advantages and disadvantages.

Further, we explain how file sharing, today's most popular P2P application, is performed in each class of P2P networks, and we present popular file sharing applications like eMule and BitTorrent. We also address important file sharing issues like efficient download strategies, traversal of NATs and firewalls, and potential attacks on file sharing systems.

In the last part of our tutorial, we focus on P2P application areas beyond file sharing. Famous examples are Voice-over-P2P (e.g. Skype), content distribution, GRID and distributed computing, and collaboration tools like Groove Virtual Office. Moreover, we put a special focus on P2P networking in mobile, wireless environments, one of today's most interesting application areas of the P2P paradigm.