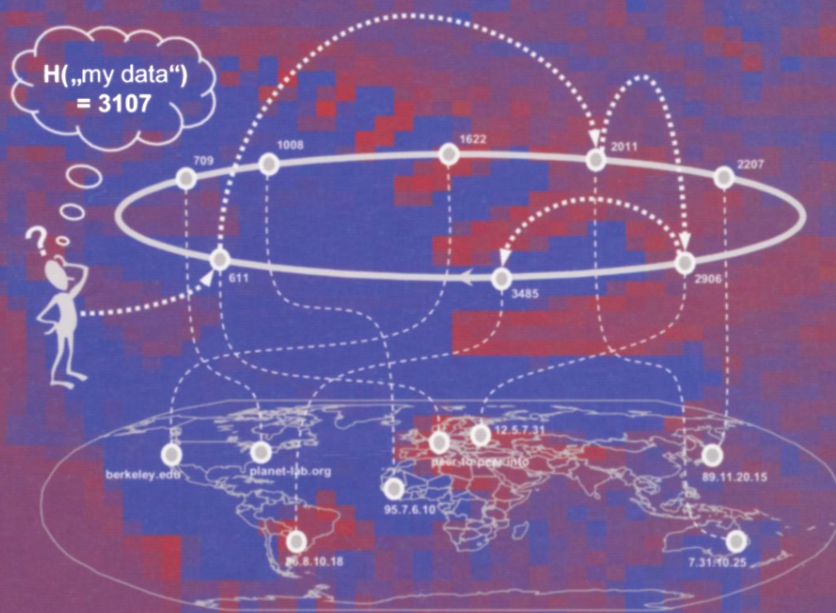


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Peer-to-Peer Systems and Applications

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5. First and Second Generation of Peer-to-Peer Systems

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5.1 General Characteristics of Early Peer-to-Peer Systems

Peer-to-Peer (P2P) networks appeared roughly around the year 2000 when a broadband Internet infrastructure (even at the network edge) became widely available. Other than traditional networks Peer-to-Peer networks do not rely on a specific infrastructure offering transport services. Instead they form “overlay structures” focusing on content allocation and distribution based on TCP or HTTP connections. Whereas in a standard Client-Server configuration content is stored and provided only via some central server(s), Peer-to-Peer networks are highly decentralized and locate a desired content at some participating peer and provide the corresponding IP address of that peer to the searching peer. The download of that content is then initiated using a separate connection, often using HTTP. Thus, the high load usually resulting for a central server and its surrounding network is avoided leading to a more even distribution of load on the underlying physical network. On the other hand, such networks are typically subject to frequent changes because peers join and leave the network without any central control.

While some legal aspects of Peer-to-Peer networks are still heavily contended between the entertainment industry and some user groups, we focus on the technical aspects of this approach. In the last years, several Peer-to-Peer technologies were developed. Figure 5.1 provides an overview of current Peer-to-Peer technologies and compares them to the conventional Client-Server model.

As shown in Figure 5.1, in a Client-Server system the server is the only provider of service or content, e.g. a web server or a calendar server. The peers (clients) in this context only request content or service from the server, the IP address of which is assumed to be available to the peers. Content in this context may be an MP3-compressed audio file, the profile of a person a user wants to establish a call to or context information, e.g. where the next taxi can be found. The clients do not provide any service or content to run this system. Thus generally the clients are lower performance systems and the server is a high performance system. This does not exclude that a server may be set up as a server farm with one specified entry point for the clients, which redirects the clients to different computers to share the load.

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