Architecture of Peer-to-Peer Systems

Peer-to-peer (P2P) computing or networking is a distributed application architecture that partitions tasks or workloads between peers. Peers are equally privileged, equipotent participants in the application. They are said to form a peer-to-peer network of nodes. It has been hailed as a promising technology that will reconstruct the architecture of distributed computing (or even that of the Internet).

A peer-to-peer network is designed around the notion of equal *peer* nodes simultaneously functioning as both "clients" and "servers" to the other nodes on the network. This model of network arrangement differs from the client–server model where communication is usually to and from a central server.

Centralized P2P Systems

Centralized P2P systems beautifully mix the features of both centralized (e.g., client-server) and decentralized architectures. Like a client-server system, there are one or more central servers, which help peers to locate their desired resources or act as task scheduler to coordinate actions among them.

Decentralized P2P Systems

In a *decentralized P2P system*, peers have equal rights and responsibilities. Each peer has only a partial view of the P2P network and offers data/services that may be relevant to only some queries/peers. As such, locating peers offering services/data quickly is a critical and challenging issue.

Hybrid P2P Systems

Hybrid models are a combination of peer-to-peer and client-server models. A common hybrid model is to have a central server that helps peers find each other. Spotify was an example of a hybrid model. There are a variety of hybrid models, all of which make trade-offs between the centralized functionality provided by a structured server/client network and the node equality afforded by the pure peer-to-peer unstructured networks.