Peer-to-Peer Networking

Exercises for lecture P2P Systems

Task 1: search and replication in unstructured P2P networks

Content sharing, or file sharing, is the most common P2P system type currently. Most of them are unstructured networks, like Gnutella, Kazaa and Freenet. In unstructured networks searching cannot be based on any global knowledge of the network.

A good starting point to read (provided on the exercise page): Qin Lv et al., *Search and Replication in Unstructured Peer-to-Peer Networks*.[1]

a) Explain and compare the following search techniques:
   - Flooding-based query algorithm
   - Expanding ring
   - Random walk and multiple random walk

b) Explain the following scalability issues related to searching in unstructured P2P networks:
   - Adaptive termination
   - Message duplication
   - Granularity of the coverage

c) Explain how replication affects to search efficiency? Also, explain:
   - “owner replication”
   - “path replication”

Task 2: P2P application design

Your task is to design a discussion forum based on P2P principles. A traditional web-based forum offers a shared space for online community to exchange information and collaborate. Forum functionalities involve creating new discussion threads, adding new posts to existing threads, replying to existing posts and naturally viewing posts and threads. The system may also require usage policies for regulating access and operations (e.g., only registered users can post new messages).

The old client-server model would use a relational database server and HTTP server as a front-end. The problem is, how to ensure scalability and fault-tolerance as more and more users and content are added to the system. Create your own approach that applies P2P principles, such as decentralisation and sharing resources. Write 1-2 pages description, using figures is recommended.

References:

[1] Lv, Q., Cao, P., Cohen, E., Li, K., and Shenker, S. 2002. Search and replication in unstructured peer-to-peer networks. In Proceedings of the 16th international Conference on Supercomputing (New York, New York, USA, June 22 - 26, 2002). ICS '02. ACM Press, New York, NY, 84-95. DOI= http://doi.acm.org/10.1145/514191.514206