Peer to peer networking

The general idea

- Peer-to-peer networks allow a community of users to pool resources
- Decentralized
- Self-organizing
- Scalable
- Often anonymous
Implementation

- Generally implemented as an overlay network among the peer nodes

Conceptual

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Actual

Example: Gnutella

- Early peer-to-peer organization designed for sharing MP3 files
- Organization: every peer is connected to one or more other Gnutella peers
Locating an object in Gnutella

1. User sends QUERY (object_ID, Query_ID, TTL) for the object to all of its neighbors
2. Neighbor floods the QUERY. If neighbor has the object, it replies with a QUERY_RESPONSE (IP addr +port)
   Else
   Forwards QUERY to each of its neighbors (other than the one it came from)
3. QUERY_RESPONSE is forwarded to the neighbor that sent the QUERY (note that original user is anonymous)
4. Eventually, either the object is found and QUERY_RESPONSE returned to the user, or TTL expires
5. User obtains object directly from the node that generated the QUERY_RESPONSE

Controlling flooding

- TTL ensures QUERY will die out
- QUERY_ID (“QID”) allows nodes to check to see if they have seen this QUERY previously
Joining a Gnutella network

• To join, a new node must know at least one node already in the overlay and that node must allow it to join
• QUERY RESPONSEs allow the new node to learn about other nodes in the overlay
• Can also PING to check present status

Some issues in Peer-to-peer networks

• Scalability (e.g., Gnutella flooding not particularly scalable)
• Minimizing the search for an object (e.g., structure the overlay so that search time is bounded)
• Controlling the load on the physical network
The papers

- Venkat Gadde:
  - "When peer-to-peer comes face-to-face" deals with the problems of doing peer-to-peer processing in mobile ad-hoc networks

- Mike Jones:
  - "Federated peer-to-peer network game architecture" discusses a hierarchical per-to-peer architecture for gaming