Peer to Peer Applications: Napster, Gnutella

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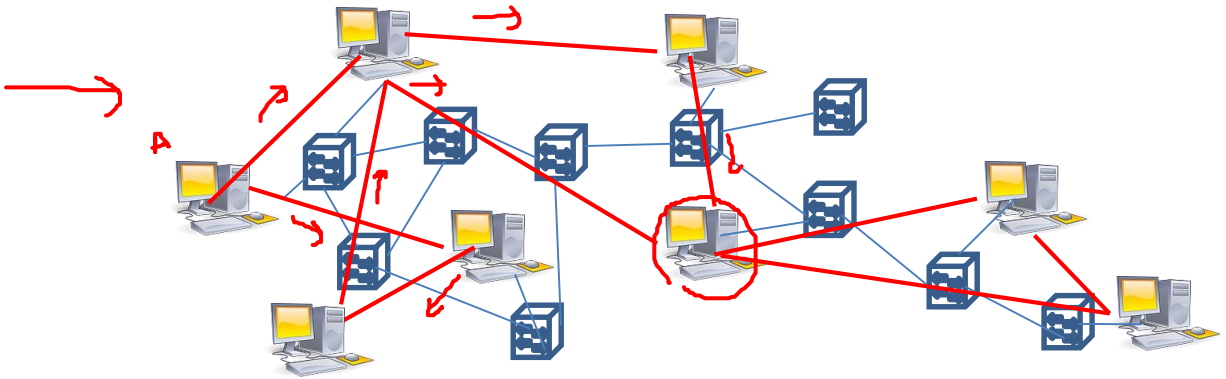
Gnutella

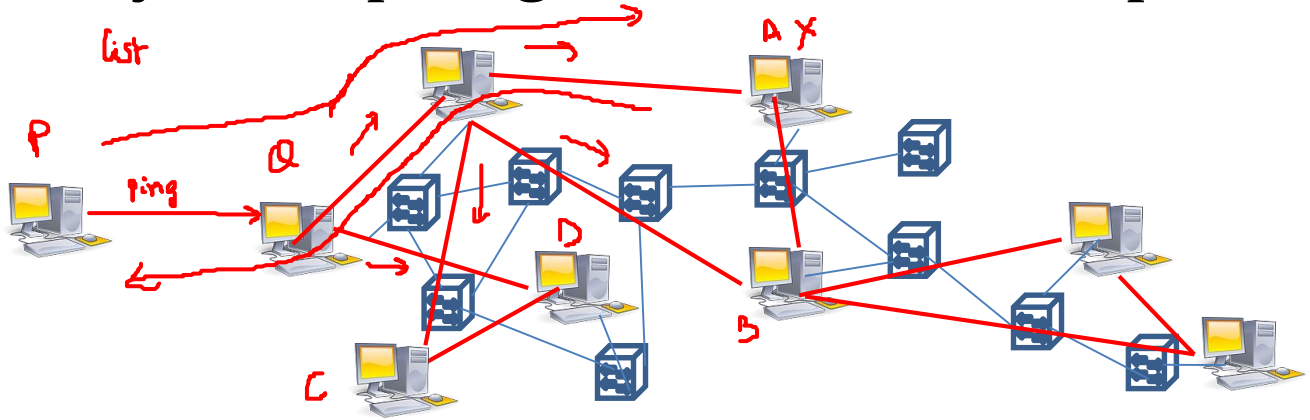
- Basic Idea: Eliminate central server; peers form an overlay network
  - Peers search and fetch themselves
  - Search performed via flooding the overlay



Join

- To join the overlay network, new peer P needs to find some other peers to connect to
  - Use a bootstrap node to get IP address/port info of existing Gnutella nodes
- P attempts to connect with peers on the list using TCP until it succeeds (say it connects to Q)
- P sends a "Ping" message to Q; Q floods it into the overlay (TTL restricted)

- All peers receiving Ping message respond with Pong message
  - Pong messages sent over reverse path
- P receives many Pong messages. It can select a subset and setup additional TCP connections
- Peers ping periodically to keep neighbour list fresh in spite of churn



Publish

- No Need to support

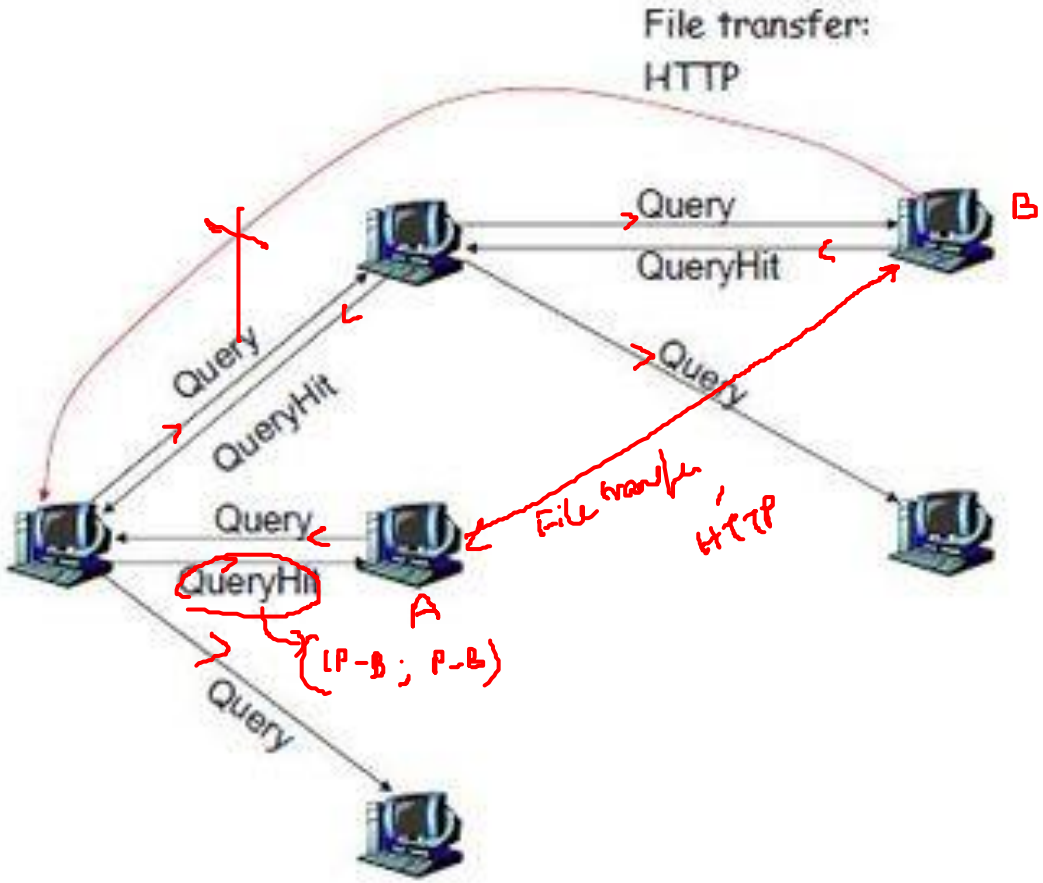
Search

- Based on query flooding
  - Query messages are flooded in the overlay (much like ping messages) over the existing TCP connections
  - TTL restricted (limited scope flooding) and forwarded only once
- Successful hit (QueryHit) sent on reverse path (much like pong messages)
  - QueryHit contains info (IP-addr, port, speed) of responder

Fetch

- Searcher can choose “best” QueryHit responder and download file directly

- File download based on HTTP
  - HTTP is a widely used standard


File transfer:
HTTP
Query
QueryHit
B
Query
QueryHit
Query
Query
QueryHit
A
Query
File transfer, HTTP
(IP-B ; P-B)

Discussion

- Pros:
  - Fully distributed (cost of search/processing shared by peers)
  - Difficult to pull the plug
- Cons:
  - Flooding can cause excessive traffic
  - Unreliable search due to limited scope flooding and network churn
  - No mechanism to handle freeloaders

Summary

- Looked at two P2P systems: Napster and Gnutella
- Napster employs a centralized server to facilitate search while Gnutella is fully distributed and employs flooding
- Each system has its own set of pros and cons
- Both faced legal hurdles. Napster fully shut down while Gnutella lost popularity