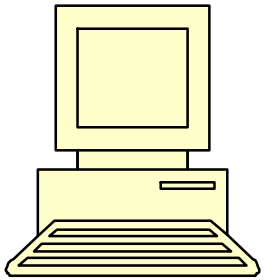
CS155b: E-Commerce

Lecture 8: Feb. 6, 2003

Peer-to-Peer File Sharing and Internet Music

Napster Client-Server Interaction



hello

ack

Client$_1$'s IP address

Names of MP3s on Client$_1$'s Machine

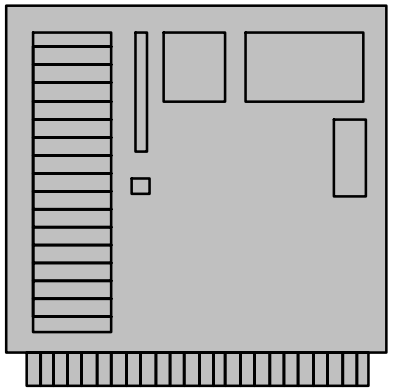
Request

IP address of online user (client$_2$) who has requested file

[repeat]

goodbye

ack



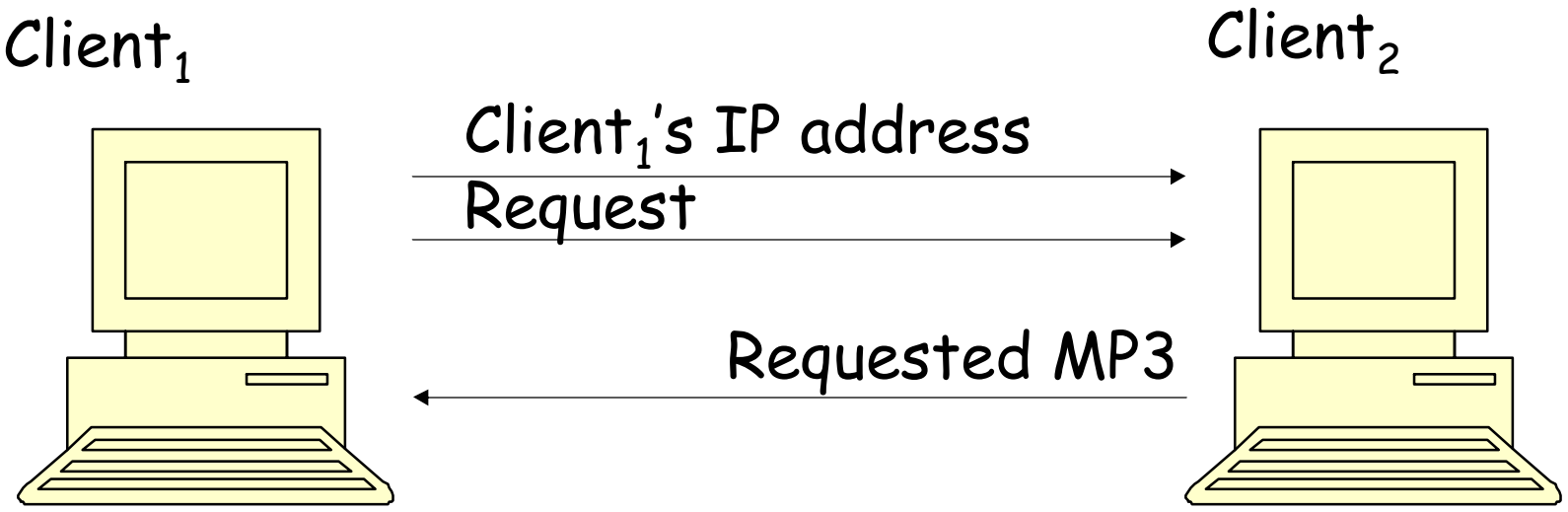
Searches a db of currently online users for one that has previously stored the requested MP3. Adds client$_1$ and its list to db.

Removes client$_1$ and its list from db

Notes on Client-Server Interaction

- Proprietary protocol and db search.
- No MP3 files stored on server.
- Don't need usernames. Could have made the service anonymous.
- No need to save IP addresses between sessions. Many are assigned dynamically.
- Discussion point: Are anonymity and memorylessness threats or opportunities for business?

Napster Client-Client (P2P) Interaction



Note: This part uses "standard Internet protocols," e.g., FTP

Napster History

- 1987: MP3 format developed by Karlheinz Brandenburg of Fraunhofer Gesellschaft. "CD ripping" now feasible.
- 1999: Shawn Fanning develops Napster, believing he has "bypassed" copyright law. Napster has >25M users in its first year.
- Dec., 1999: RIAA sues Napster for "contributory and vicarious" copyright infringement.
- April, 2000: Metallica sues Napster, Yale, Indiana Univ., and USC. (Yale bans the use of Napster within a week.)

Napster History, continued

- July, 2000: US District Judge Patel grants RIAA's request for an injunction. The injunction is temporarily stayed soon thereafter.
- October, 2000: Napster announces a partnership with Bertlesmann AG (one of the "major labels" in the industry whose trade association is suing it!).
- January, 2001: Napster and Bertlesmann say that they will roll out a "subscription service" by "early summer" and will use "DRM technology."

Napster History, continued

- February, 2001: Ninth Circuit upholds lower court's findings that Napster is guilty of contributory and vicarious infringement.
- Summer, 2001: Napster and Bertelsmann fail to roll out subscription service.
- September, 2001: Napster reaches a settlement with music publishers (but not with RIAA record labels). However, CNET.com reports the number of users has "dropped from tens of millions…to almost zero."

Napster, R.I.P. !

Gnutella P2P File Sharing

- "Pure Peer-to-Peer."
- Peers communicate over standard HTTP.
- Goal is "total decentralization." In particular, no Napster-like server that "directs traffic," collects data, and otherwise centralizes control.

"A" Generates a Gnutella Request

- Creates
  - Search String S
  - (Unique) Request ID N
  - Time-to-Live T
- Sends (A, S, N, T) to all of its Gnutella neighbors.

"B" Receives Gnutella Request (A, S, N, T)

- If B has already received request N or T=0, B drops this request and does nothing.
- B looks up S in its local file system and sends (N, Result) to A.
- B sends (B, S, N, T-1) to all of its Gnutella neighbors, and it records the fact that A has made the request N.
- When B receives a response of the form (N, Result) from one of its neighbors, it forwards this response to A.

Gnutella Advantages and Disadvantages

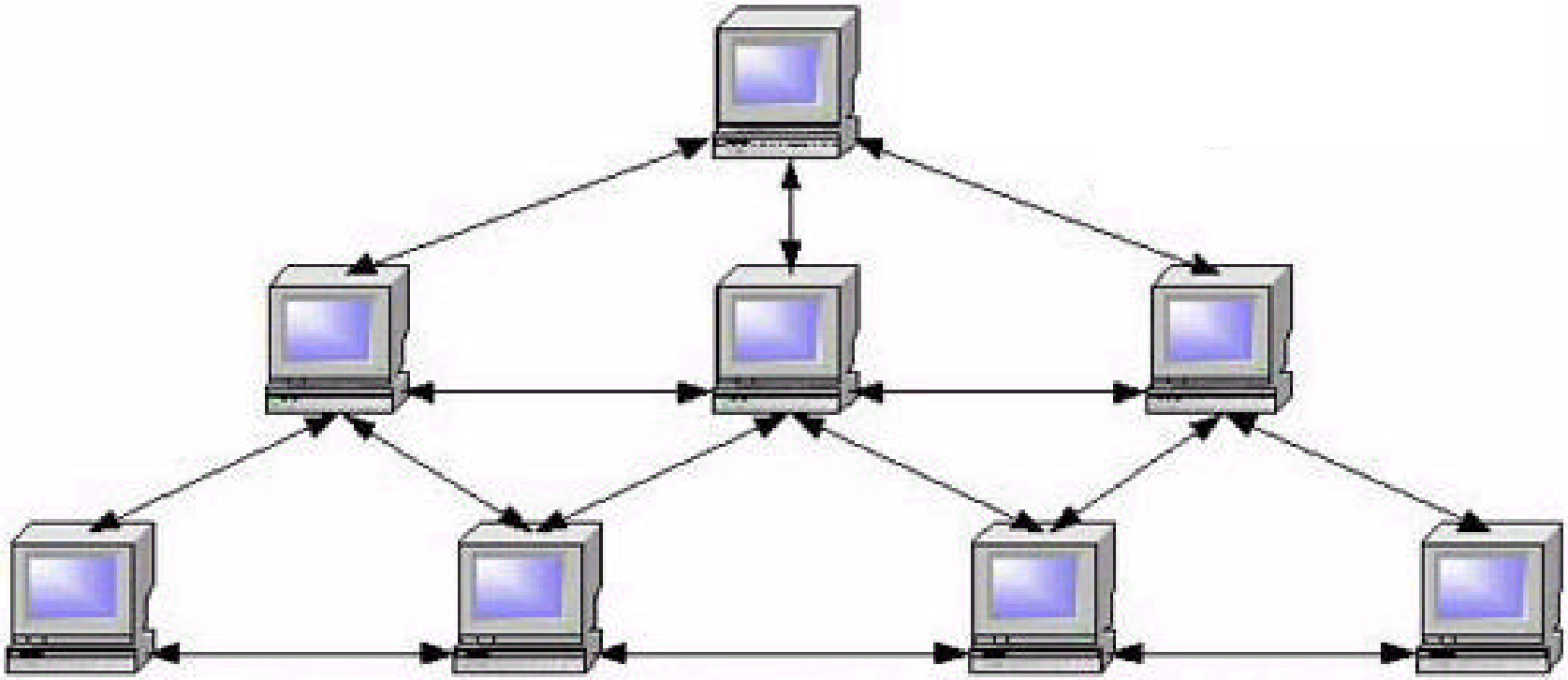
Main Advantage : "Search for S" can be done in many ways, e.g., structured database search, simple text matching, "fuzzy" text matching, etc. "Result" can take many forms.

Main Disadvantage : Inefficiency!

- "Flood" of Requests. If average number of neighbors is C and average TTL is D, each search can cause C^D request messages.
- Natural evolution into many barely-connected subnets, not one "user community."

Other Disadvantage : Request monitoring.

(Comes with standard HTTP.)



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Gnutella History

- Gnutella was written by Justin Frankel, the 21-year-old founder of Nullsoft.
- Nullsoft (maker of WinAmp) posted Gnutella on the Web, March 1999.
- Nullsoft acquired by AOL, June 1999.
- A day later AOL yanked Gnutella, at the bequest of Time Warner.
- People had already downloaded and shared the program.
- Gnutella continues today, run by independent programmers.

Gnutella Clients

- LimeWire
- XoloX
- Morpheus
- Phex
- Shareaza

  … and many others, developed by companies and individuals.

- LimeWire, LLC, is a wholly owned subsidiary of the Lime Group, a "technology incubator" that owns several small, "innovative" companies.

- LimeWire provides a Java-based Gnutella client. This allows the software to run on multiple platforms with a consistent interface.

LimeWire's Business Strategy

- Distribute its software as "the best file-sharing client available."
  - Take advantage of the Gnutella network (> 73000 hosts)
  - Improve and enhance interface
  - Reach more users by supporting multiple platforms
- Give away a free, ad-supported version; sell an ad-free, enhanced version for a small price.
- Charge companies for advertisements and provide partner links on website.

Kazaa

- Kazaa Media Desktop is produced by Sharman Networks, Ltd., "a consortium of private investors with multimedia interests" (see company website). Based in Australia with offices in Europe.
- Kazaa Media Desktop is a Windows file-sharing client available for free download. The application displays an ad banner.
- Design goal: Achieve Napster-like efficiency and avoid Napster-like liability.

Kazaa File Sharing

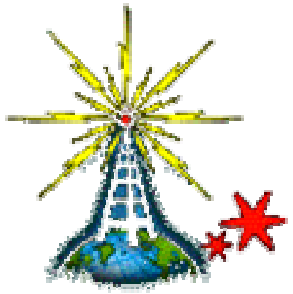
- Peers connect directly to each other; content is distributed and there is no central server.
- Search requests are sent to the "nearest" **supernode**, which tries to locate the content; if it fails, the request is sent to other supernodes.
- Any node running Kazaa with a good Internet connection can become a **supernode**.
  - Other Kazaa users upload lists of shared files to neighboring supernodes.
  - Supernodes facilitate search but do not host content; peers connect directly to download files.
  - Supernode status is controlled by the software based on user settings (permission to become a supernode, bandwidth restrictions, etc.).

Freenet P2P File Sharing

- Works similarly to Gnutella. Exceptions include:
  - Intermediaries store all results. (Diffuses responsibility.)
  - Uses proprietary protocol. (Eliminates HTTP monitorability.)
- Launched by Ian Clarke (Univ.of Edinburgh) in 1997.
- Explicitly anti-censorship, anti-copyright, and pro-anonymity in its goals.
- Less popular and less developed, although certain clients exist (see http://freeweb.sourceforge.net for a FreeNet 0.4 client).

Homework for February 11

Read chapter 5 of the textbook, "Key Management is Trust Management."



Internet Radio and You:

Why New Digital Copyright Legislation Matters

A CPSC 155b Presentation by Kat Kunz

Four things needed to webcast:

- Audio files (.mp3, .wav, etc.)
- Streaming-media software (e.g., shareware, professional software by RealNetworks)
- High-speed Internet connection
- Webcasting server to re-route the stream to the rest of the web

How does a webcast work?

- After a streaming object (e.g., specific song or movie) is selected, it is sent in a continuous stream from its server to the host that requested it.
- The object triggers an audio/video player compatible with the file type.
- The streaming data are stored in a buffer until enough data are collected to play the file.

Intro to Radio Licensing

- What can be licensed, in general?
  - Songwriting
  - Performance
- Analog Radio
  - Only songwriting licenses
  - Blanket fees collected by agencies for composers and publishers
    (e.g., ASCAP, SESAC, BMI)

Licensing Webcast Radio

- The DMCA specifically targets webcasts for new licensing fees.
- It revises the criteria that any webcaster must meet in order to be eligible for this new license.
- It also gives copyright arbitration royalty panels (CARPs) power to set the royalty rates at "fair market value."

  (Executive Summary of the DMCA)

What were these new license fees?

- Performance licenses, in addition to songwriting licenses
- These licenses are owned by record labels, and sought after by the RIAA, a powerful Congressional lobby.
- The licenses are collected by SoundExchange, a new company, rather than the agencies used to collect songwriting license fees.

How were these new rates determined?

- Decided in spring/summer 2002, by a CARP, as per DMCA
- Very few small-business webcasters were involved in the licensing hearings.
- Resulting decision was based on number of 'performances' of a song.
- Webcasters owed .07 cents/.14 cents per song, per 100 listeners, retroactive to 1998 (when the DMCA was passed).

Uproar among small-business webcasters

- Very expensive rates
- Led to silencing of many hobbyists, smaller business webcasters
- Some Congressmen sought involvement in the issue, including Rick Boucher (D-VA) and, surprisingly, Jesse Helms (R-NC)

HR 5469: Small Webcasters Support Act

- Passed by 'lame duck' Congress in November 2002
- Compromise between small-business streamers and record labels
- Exemption for small-business webcasters
- Fees based on percentage of revenue
- Can also represent non-music webcasters (e.g., talk shows)
- Study of effects for House of Reps in '04

The Future of Net Radio?

- Implications of HR 5469
  - Indie / college webcasters
  - Small-business webcasters
  - Big-business webcasters / commercial-radio affiliates
- Freedom of Speech
  - Avoids 'chilling effects'
  - Avoids death knell for new expressive technology

The Future of Net Radio?
cont'd

- Optimistic! For the most part…
- HR 5469 only temporary relief: should the DMCA be revised? Will things really have changed for the review panel next year?
- Future remedies
  - Change in business models of major labels
  - Subscription streams by labels
  - P2P streaming 'net radio'
  - Other…? Your ideas?

Acknowledgments

- Robert Dunne, senior advisor
- Richter Summer Grant:

  Research in D.C. in July
- **Radio and Internet Newsletter, the most comprehensive source for Internet radio news and info** (www.kurthanson.com)