Gridella

An open and efficient Gnutella-compatible Peer-to-Peer System based on the P-Grid approach

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Problem Statement

- Centralized Systems
  - examples: Napster, FastTrack (KaZaA, Grokster)
  - central server(s)
  - closed protocols

- Decentralized Systems
  - example: Gnutella (Morpheus, BearShare)
  - high network traffic ("broadcast" search)
  - no structured search (string comparison)
  - free-riding
Gridella’s Goals

- Proof-of-concept implementation
  - compatibility with Gnutella, but more efficient distributed data storage and search strategy
  - reduction of network traffic
  - support for multiple communication protocols
- a smooth migration path to a fully Gridella based infrastructure
- Gridella uses an open XML-based protocol
P-Grid Properties

- completely decentralized (P2P)
- all interactions are strictly local
- robust against failures of nodes
- all peers serve as entry points for search
- probabilistic estimates for the success of search requests
- scales gracefully in the total number of nodes and data items (search: O(log n))
P-Grid Construction

1.)

2.)

3.)

Mappings:

A-HA.mp3 ⇒ ‘000’
Abba.bmp ⇒ ‘000’
Baum.jpg ⇒ ‘000’
Bobby.jpg ⇒ ‘001’
Doors.gif ⇒ ‘010’
Police.mp3 ⇒ ‘101’
Spears.mp3 ⇒ ‘110’
Sting.avi ⇒ ‘110’
Data Access Structure

virtual binary search tree

search for “Police.mp3”
(Police.mp3 \(\Rightarrow\) ’101’)

query(6, 101)
query(4, 101)
query(5, 101)

Stores data with key prefix 00
Stores data with key prefix 01
Stores data with key prefix 10
Stores data with key prefix 11
Gridella Application GUI

Gridella 1.0 - The File Sharing Application (Gnutella & P-Grid Network)

Keyword(s): Madonna Rain
Search

min. file size of: 3000 kB

- Cranberries (3)
- Dido (273)
- "The Corrs" Unplugged (4)
- James Bond (133)
- A-HA (1203)

Qo5 Filename Type Size Host

Dido - Here With Me.mp3 [urn:sha1:TVTF4B7DAPI7QSB57OMHH... mp3 4,855 MB 10.0.0.3
Firewall
Dido - Here With Me.mp3 [160 Kbps 44 kHz 4:14]urn:sha1:676... mp3 4,855 MB 64.5.230.136
Firewall
Dido - Here With Me.mp3 [160 Kbps 44 kHz 4:14]urn:sha1:CPC... mp3 4,855 MB 129.132.68.141
Busy
Dido -01-Here With Me.mp3 [urn:sha1:6ZI6Si35YT2HAAKVC... mp3 4,855 MB 65.188.69.221
(Dido)-Here with Me.mp3
Ready
Faithless feat. dido - one step too far.mp3 [urn:sha1:y3Q0CP7G... mp3 4,882 MB 24.58.72.212
Ready
Faithless feat. dido - one step too far.mp3 [urn:sha1:STKH3JAYJ... mp3 4,882 MB 24.161.167.118
Ready
Faithless feat. dido - one step too far.mp3 [128 Kbps 44 kHz 5:1... mp3 4,882 MB 64.5.230.136
Ready
(Faithless)-One Step Too Far ft. Dido.mp3
Ready
Dido - One Step Too Far faithless feat dido.mp3
Ready
Dido - Thank you.MP3
Ready
DIDO-Roswell Song.mp3 [urn:sha1:ROZF6LPU5VGNQ568IZ7PK... mp3 5,014 MB 172.155.86.251
Firewall
Dido - Here With Me.mp3 [urn:sha1:K77L4MV5O6AE25FLXHADR... mp3 5,016 MB 24.108.0.64
Firewall
Dido - Here With Me (Remix) - (Enya like).mp3 [urn:sha1:O1VQAQG... mp3 5,018 MB 215.189.161.108
Ready

Results filtered
Conclusions

- **Achievements**
  - implementation in Java
  - XML-based protocol
  - support for dynamic IP addresses
  - software release under GNU GPL this month (www.p-grid.org)

- **Validation**
  - Gnutella compatibility tests
  - P-Grid construction and search

- **Open Issues**
  - support for firewalled peers
Related Work

- **Freenet**: file sharing application
  - similar approach (use of search keys)
  - nodes replicate routed data
- **Quad**: a Query/Advertise system
  - separation of clients and servers
- **OceanStore**: a distributed, fault-tolerant, secure storage infrastructure
  - designed as "private" data storage system
  - no support for search algorithms or data sharing