PeerDB: A P2P-based System for Distributed Data Sharing

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Overview

- Introduction
- BestPeer – a framework for PeerDB
- PeerDB Node Architecture
- PeerDB Relation matching
- PeerDB Query processing
- PeerDB Auto-reconfiguration
- PeerDB Cache management
- PeerDB Performance Study
- Comments
Introduction

1. P2P vs DDBS
   - ad-hoc / stable nodes
   - incomplete / complete answers
   - global shared schema
   - content location
   - coarse / fine granularity
Introduction

2. PeerDB is P2P DDBS
   - Each node is a DBMS
   - No global schema
   - Incomplete answers possible
   - Fine granularity, content searching
BestPeer – a framework for P2P

- LIGLO Servers
- Each node has private & shared data
- Mobile agents & P2P
- Fine granularity
- Share computational power
- Dynamic reconfiguration
PeerDB – Node Architecture
Peer DB – Node Architecture

Data Management System – MySql
Meta-data (keywords) stored in Local Dictionary and Export Dictionary.

DBAgent – for Mobile Agents
Master agent that manages the queries.
Dispatches worker agents to neighboring nodes.
For each relation, meta-data (keywords provided by user) are maintained for relation name and attribute names.

Considering Query Q of form (R,A,C), R is searched against keywords for relation names, and V (A U C) is searched against keywords for attribute names.

\[
\text{Match} (Q,D) = \frac{(\text{wtr} \cdot r) + (\text{wta} \cdot N_{\text{match}} (\text{AUC,T}))}{Wtr + (\text{wta} \cdot N (\text{AUC}))}
\]

Set of relations above a threshold value are considered.
Peer DB – Query Processing

Phase 1 – Relation matching technique is applied and relations returned to the user. User chooses the relations he is interested in.

Phase 2 – Queries directed to the chosen peers and answers returned.
Local Query Processing

Phase 1
Master Agent created to overlook the operation.
Relation matching agents are dispatched (IP & TTL).
Returns relations to user for selection.

Phase 2
Data Retrieval Agent for user selected relations.
Answers returned to the user.
Remote Query Processing

Phase 1
Agent arrives, if new, TTL reduced by 1.
Export dictionary searched & relations returned.
If TTL > 0, more relation matching agents cloned.

Phase 2
Agent formulates SQL query.
Results returned & agent dropped.
Peer DB – Auto-Reconfiguration

Monitoring Statistics
Reconfiguration based on the policy selected by the user.
Relation information, number of answer objects returned.
Temporal Locality using stack.
Peer DB – Cache Management

Caching for a fixed period of time.
LRU replacement policy.
BPID to avoid multiple copies.
Peer DB – Performance Study

Relation Matching Strategy

Set of semantically related C categories.
c keywords in each category.
Created set of relations with 2-5 keywords.
Attributes assigned 2-5 keywords.

SELECT attribute_X FROM relation_i
WHERE attribute_Y = value_1 and
attribute_Z > value_2.
## Peer DB – Performance Study

### Relation Matching Strategy

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Precision</th>
<th>Recall</th>
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</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.33</td>
<td>0.85</td>
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<tr>
<td>0.3</td>
<td>0.36</td>
<td>0.78</td>
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<tr>
<td>0.5</td>
<td>0.50</td>
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<tr>
<td>0.7</td>
<td>1.0</td>
<td>0.28</td>
</tr>
<tr>
<td>0.9</td>
<td>1.0</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Peer DB – Performance Study On PeerDB Performance

Evaluation Methodology

- P2P protocols & reconfiguration.
- Response Time / Rate.
- Quantity & Quality of answers.
Peer DB – Performance Study On PeerDB Performance

Experimental Setup
- 32 PCs, 200MHz, 64M, WIN NT 4.0
- 10,000 objects, 10 KB each, each node holes 1000 object.
- 80% queries directed at 20% of data.
- 15% queries directed at 20% of cold data.
- Average of at least 3 different executions.
Peer DB – Performance Study

Effect of Storage Capacity

Rate of Returning Answers
Peer DB – Performance Study

Number of Answers Returned.
Peer DB – Performance Study

Completion time vs Data Size

Communication Overhead
Peer DB – Comments

Search Engine without a ranking algorithm ???
User selection – scalability ???
What CS ???
