# THE INFORMATION COMPANY

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**Sandeepan Banerjee, Omar Alonso, Mark Drake, Meeten Bhavsar**
Oracle Server Technologies

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# Toward an Information Grid

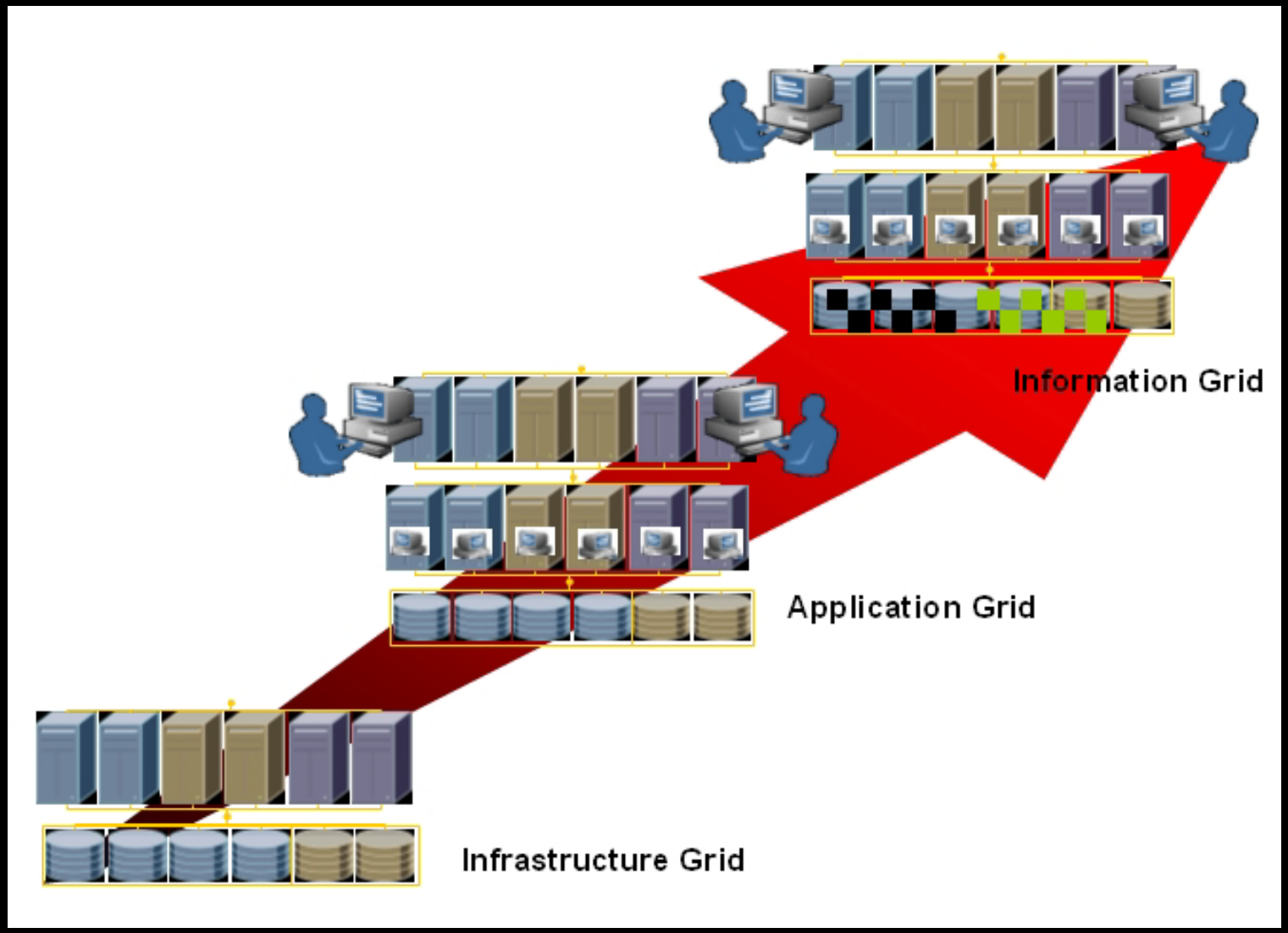
# The Information Grid

- Imagine a web of data
- Readable by machines
  - Search, Aggregate, Relate, Transform, Report On, Mine Data – automatically
- Comprehensible by humans
  - Analyze and Visualize easily
- Scalable
  - Machines are cheap, and the price is dropping
  - Network is now faster than disk
- Flexible
  - Move data around without breaking the apps

# Virtualization and Convergence

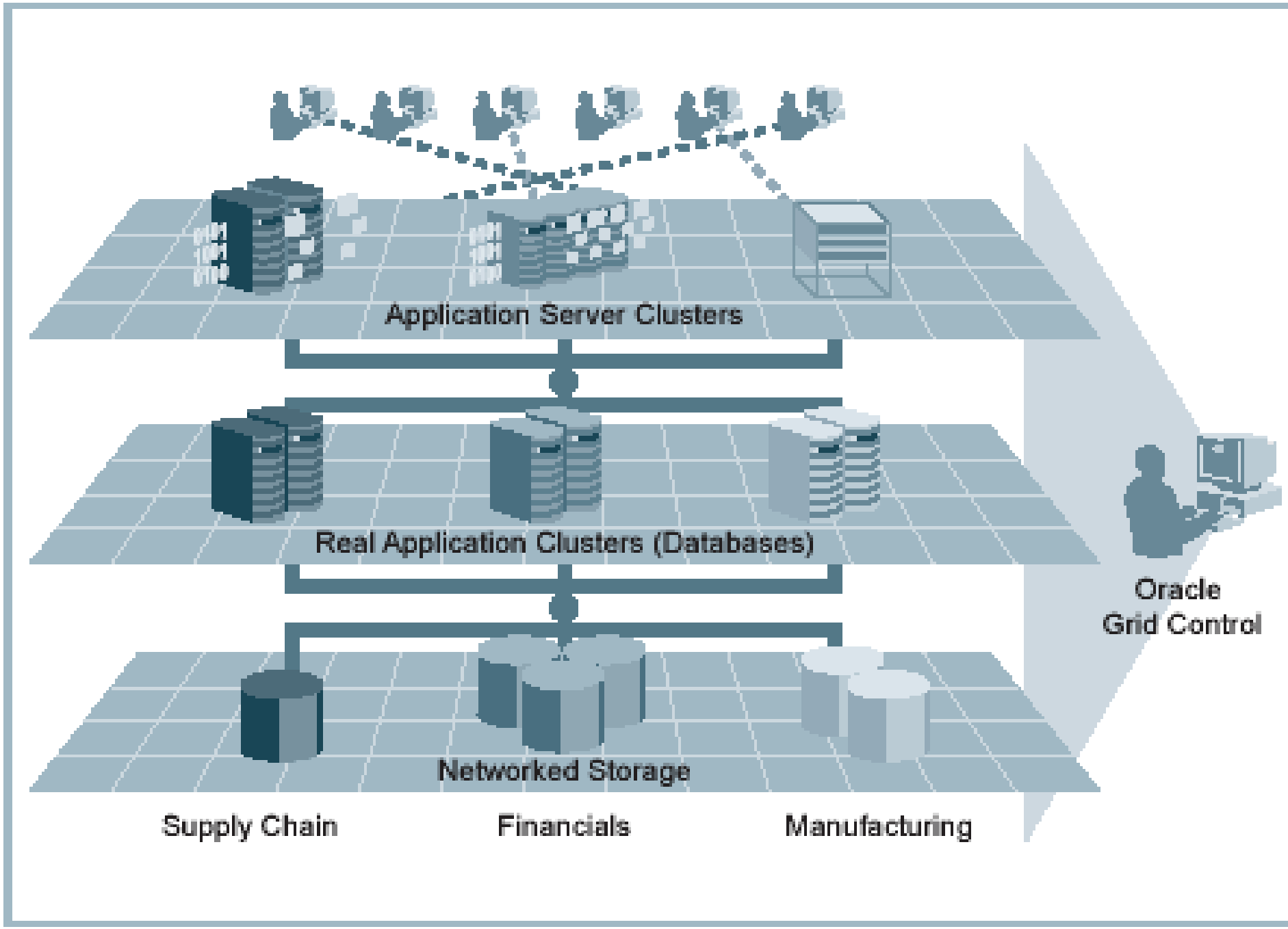
- Virtualization is a framework for dividing up the resources of an organization into multiple execution environments
- Convergence seeks to bring together the management of all your data assets.
- The Information Grid combines the benefits of Virtualization and Convergence.

# Evolution of the Information Grid



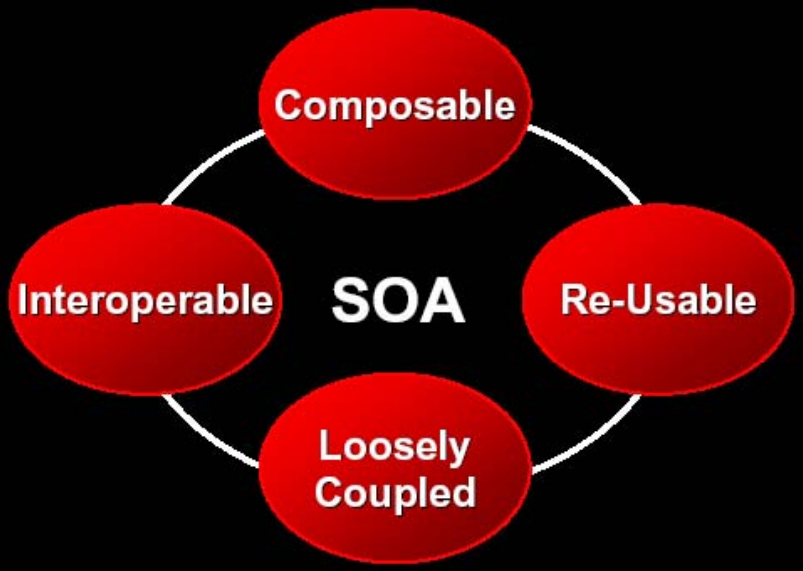
# Infrastructure, Application and Information Grids

- Infrastructure Grid: Provisioning and failover
  - Virtualize coupling between processors, storage and running programs
  - Converge management
- Application Grid: SOA and Business Process Management
  - Virtualize coupling between client and server portions of a program
  - Converge delivery mechanisms and orchestrate
- Information Grid: Repository, Metadata, Search, Semantic Crawlers, Inferencing and Visualization
  - Virtualize coupling between data and applications
  - Converge seamless access to all kinds of data

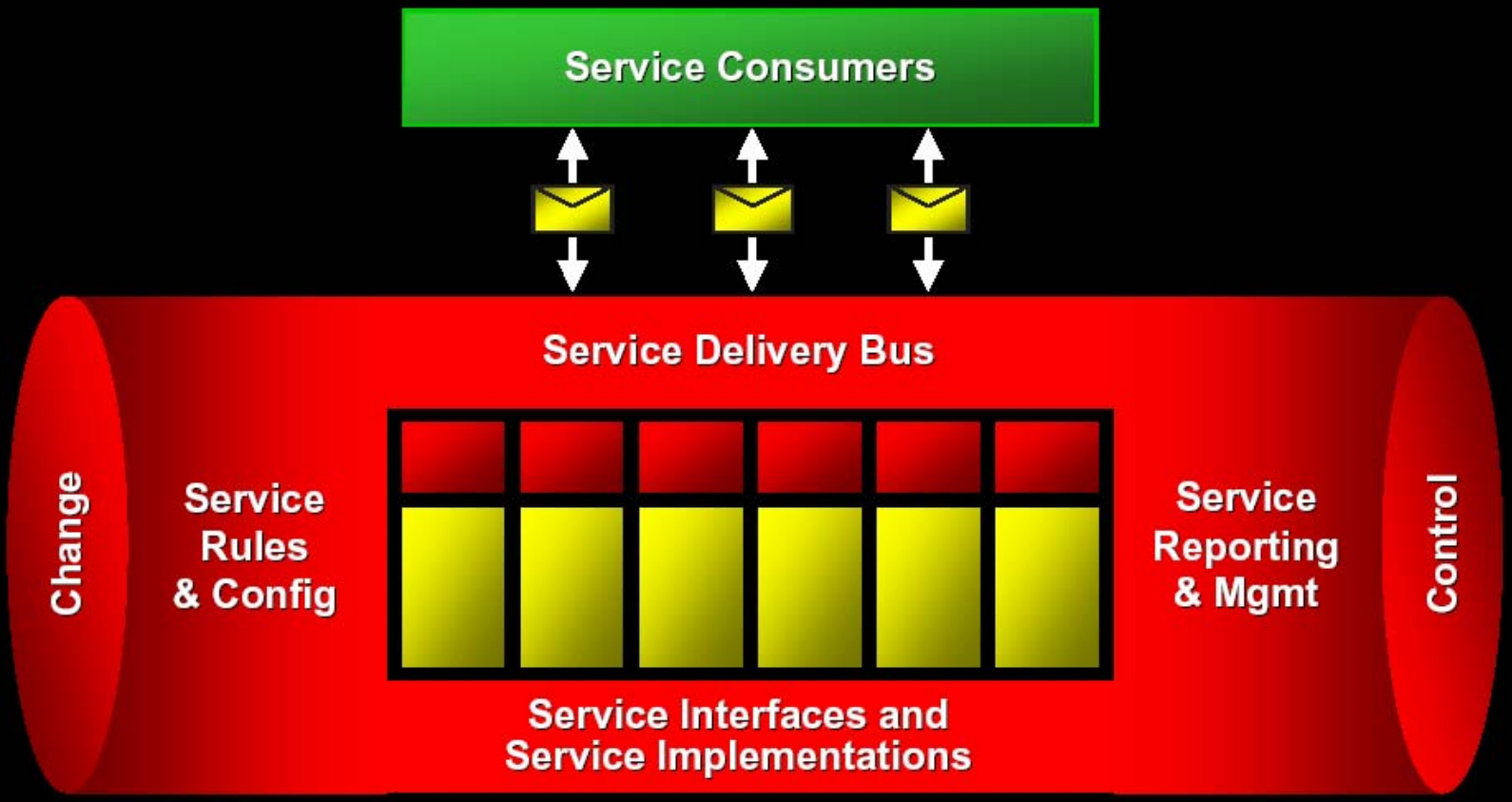

Application Server Clusters
Real Application Clusters (Databases)
Networked Storage
Supply Chain
Financials
Manufacturing
Oracle
Grid Control

# Application Grid

- Service-Oriented Architectures
  - IT infrastructure for request-reply applications
  - Application functions are modularized and presented as services
  - Services are loosely coupled
  - Interfaces are independent of implementation

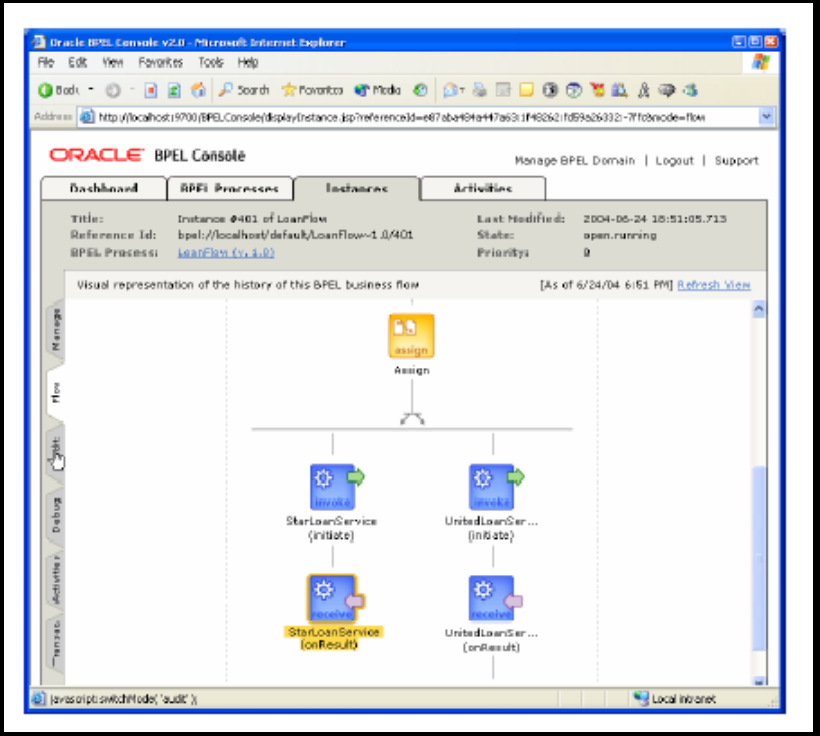


# Why SOA?


Service Consumers
Service Delivery Bus
Change
Service
Rules
& Config
Service
Reporting
& Mgmt
Control
Service Interfaces and
Service Implementations

# Business Process Management

- BPEL is emerging as the standard for assembling a set of discrete services into an end-to-end process flow
- Allows you to port business processes stored in one system to another by defining open standards-based interfaces



# The Missing Layer

- The flexibility of a Grid cannot be realized
  - If application modules are too tightly coupled to data
    - If the creation or discovery of new kinds of data needs continuous UI or application code changes
  - If we cannot make more data machine readable
  - If we cannot provide seamless access to all kinds of data
  - If we cannot relate information across different sources, or analyze heterogeneous information

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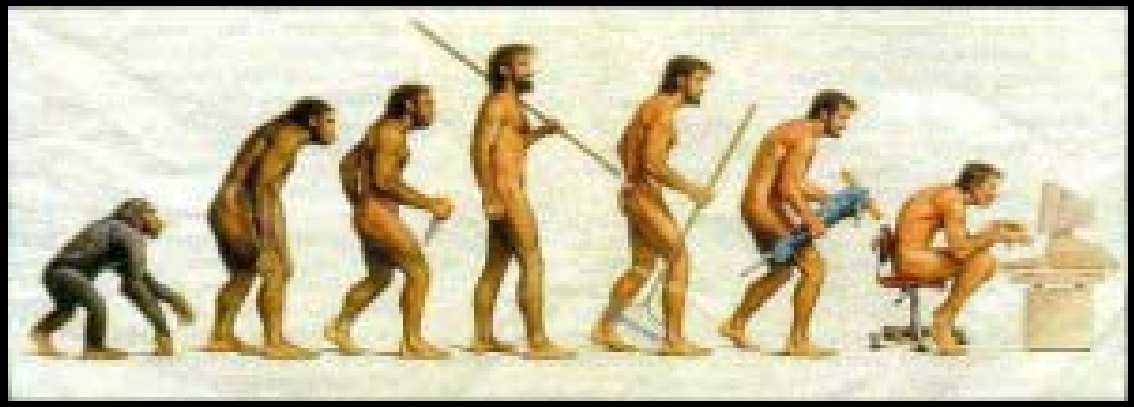
D E M O N S T R A T I O N

# The Information Grid



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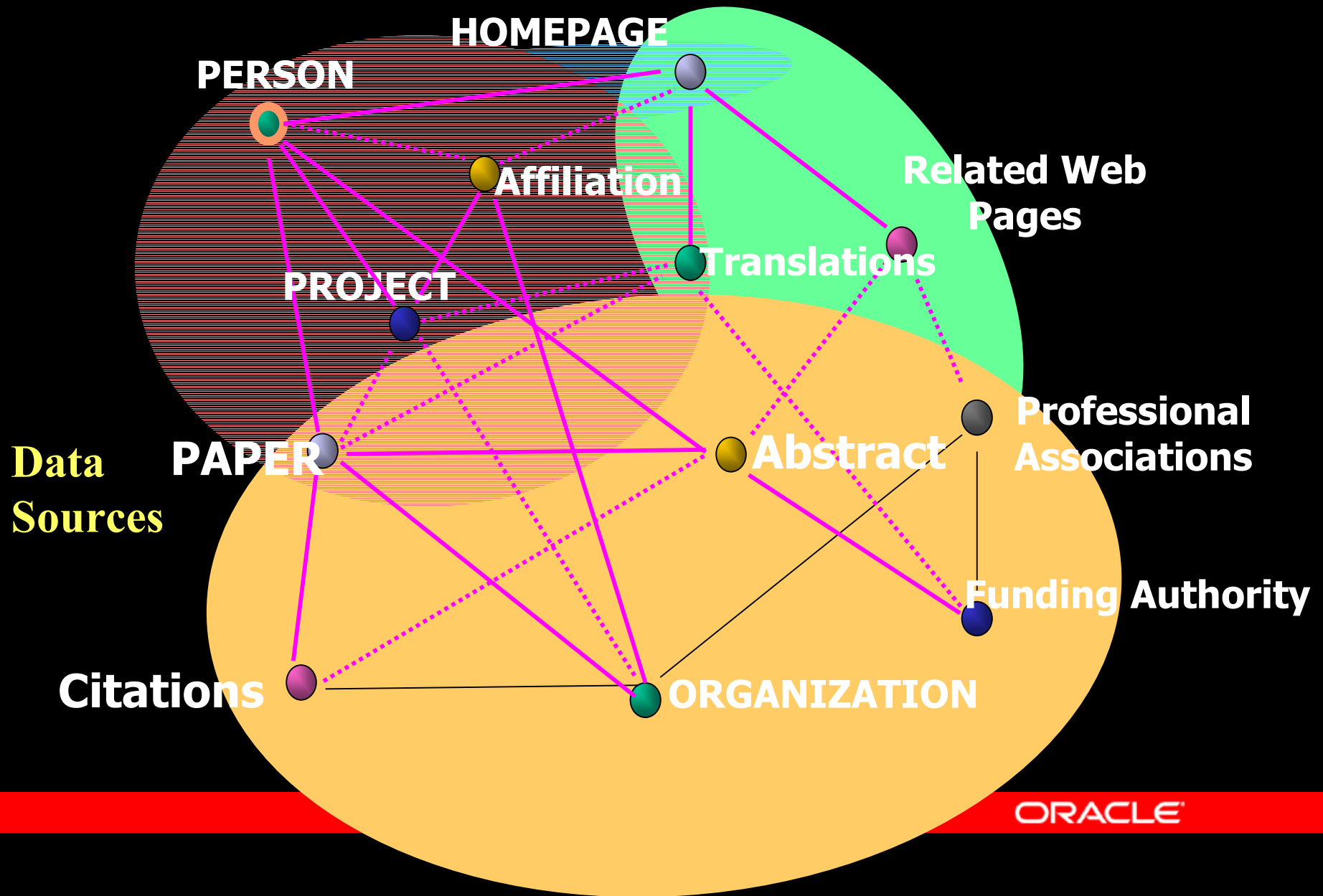
# Semantic Aggregation



# Relating Information

- Search provides random access to data across sources
- Taxonomic classification provides dynamic categories which can be used to navigate better
- Ontologies help describe and relate information across sources
  - Better Decisions

# What we will see

- Load the DBLP ontology and data into the Oracle XML DB Repository
  - Combine with Search, Clustering and Information Visualization for a rich, semantic search
  - Dynamic drill down into arbitrary structure across different sources and search for values, independent of location
- Focused semantic crawling to extract specific information from the web
  - Find pages on WWW that discuss DBLP researchers
  - Moving metadata on this information into XML DB
- Relating focused crawl information with other DBLP data
  - Inferencing of Home Pages
  - Building and Viewing Social Networks of Researchers

# RDF

- A framework for describing and interchanging metadata
  - **A Resource** is anything that can have a URI – e.g. http://www.oracle.com/technology/tech/xml/xquery/pdf/xquery10gr2v2.pdf
  - A **Property** is a Resource that has a name e.g. Author, Title, Type
  - A **Statement** consists of the combination of a Resource, a Property, and a Value

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<Title> XML Query (XQuery)Support in Oracle Database 10g Release 2
</Title>
<Author>Sandeepan Banerjee</Author>
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# Ontologies

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</owl:Class>

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</owl:Class>

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<owl:Class rdf:about="#PhD Thesis" />
</owl:unionOf>
</owl:Class>
```

# DBLP

- The DBLP server provides bibliographic information on major computer science journals and conference proceedings
- Initially the server was focused on **Data Base systems and Logic Programming**, now it is gradually being expanded toward other fields of computer science, so as to become a **Digital Bibliography & Library Project**
- Started in the 1980s, now 660k articles (Aug 2005)
- http://dblp.uni-trier.de/

Mozilla Firefox

File Edit View Go Bookmarks Tools Help

file:///C:/Omar/dblp/dblp-20041101.xml

Account Request | CRM Tickets | My Oracle | Network Request | Software

This XML file does not appear to have any style information associated with it. The document tree is shown below.


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  - <owl:Ontology rdf:about="">
      <owl:versionInfo>$Id: dblp.owl 375 2004-10-26 20:56:48Z aharth $</owl:versionInfo>
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    - <dc:description>
        DBLP Bibliography Collection converted from its original XML format to RDF/OWL.
      </dc:description>
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    </owl:Class>
  - <owl:Class rdf:about="#Document">
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    </owl:Class>
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emacs@OALONSO-LAP1

File Edit Options Buffers Tools Help

```
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<year>1991</year>
<school>University of Sydney, Basser Department of Computer Science</school>
</rdf:Description>



<rdf:Description><key>phd/Smolka89</key><mdate>2002-01-03</mdate><rdf:type rdf:r
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<author>Gert Smolka</author>
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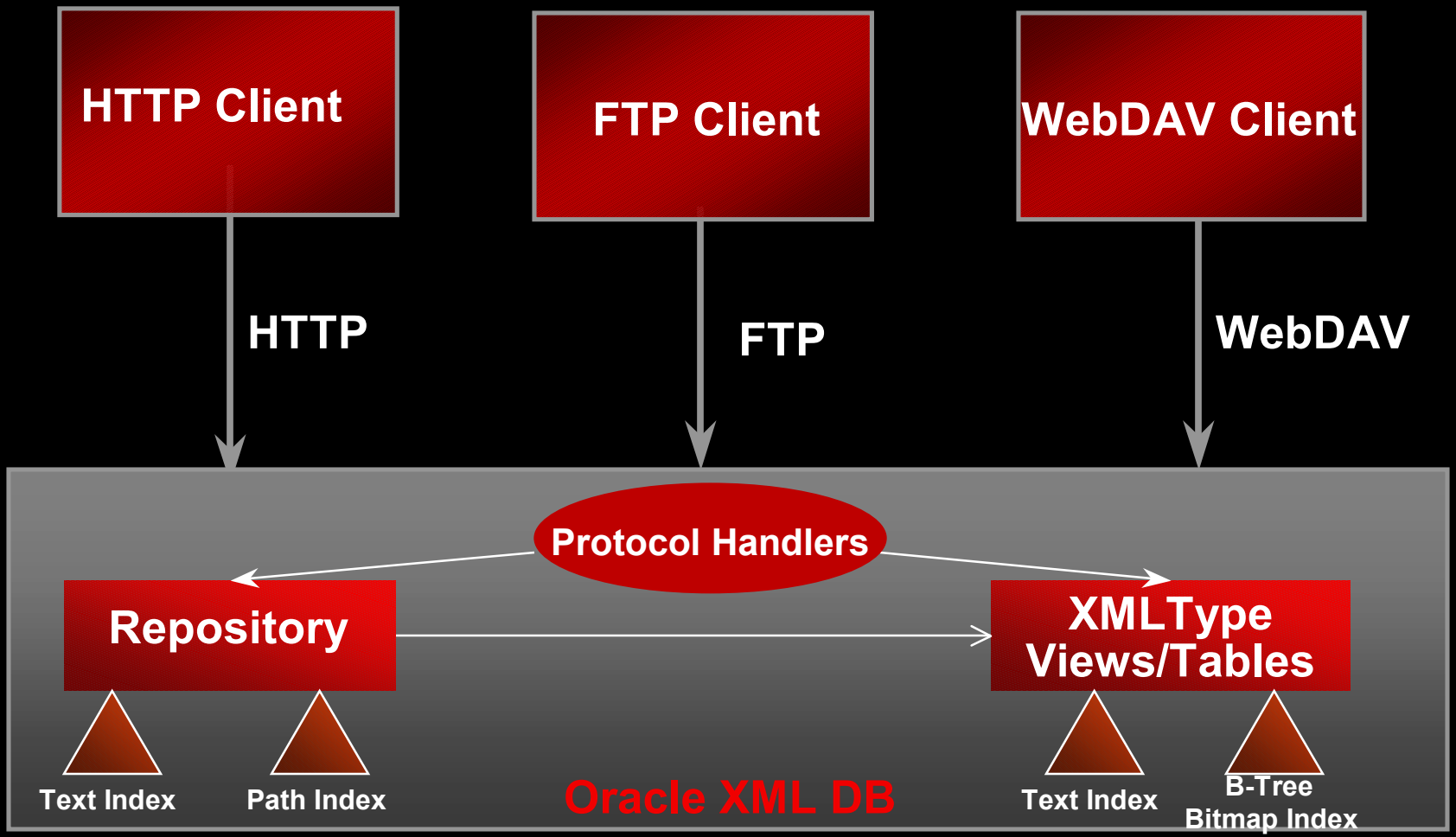
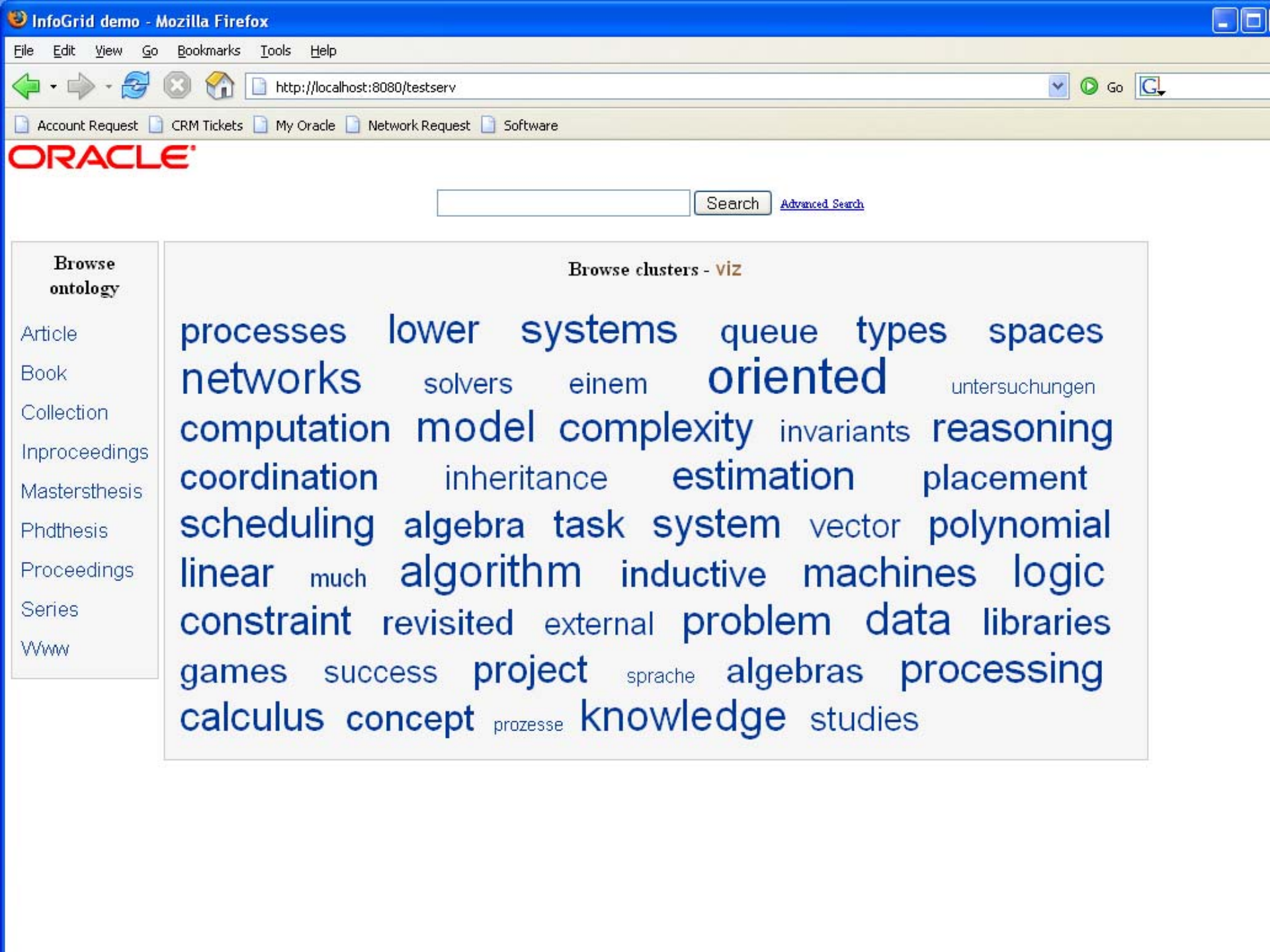
# XML DB Repository



# Location Transparency

- Implementation of common protocols creates transparency between repositories
  - See files via a HTTP-server as Text/HTML
  - See a database as a filesystem via WebDAV
  - See an application as a RSS feed
  - …
- Move data between these repositories without breaking applications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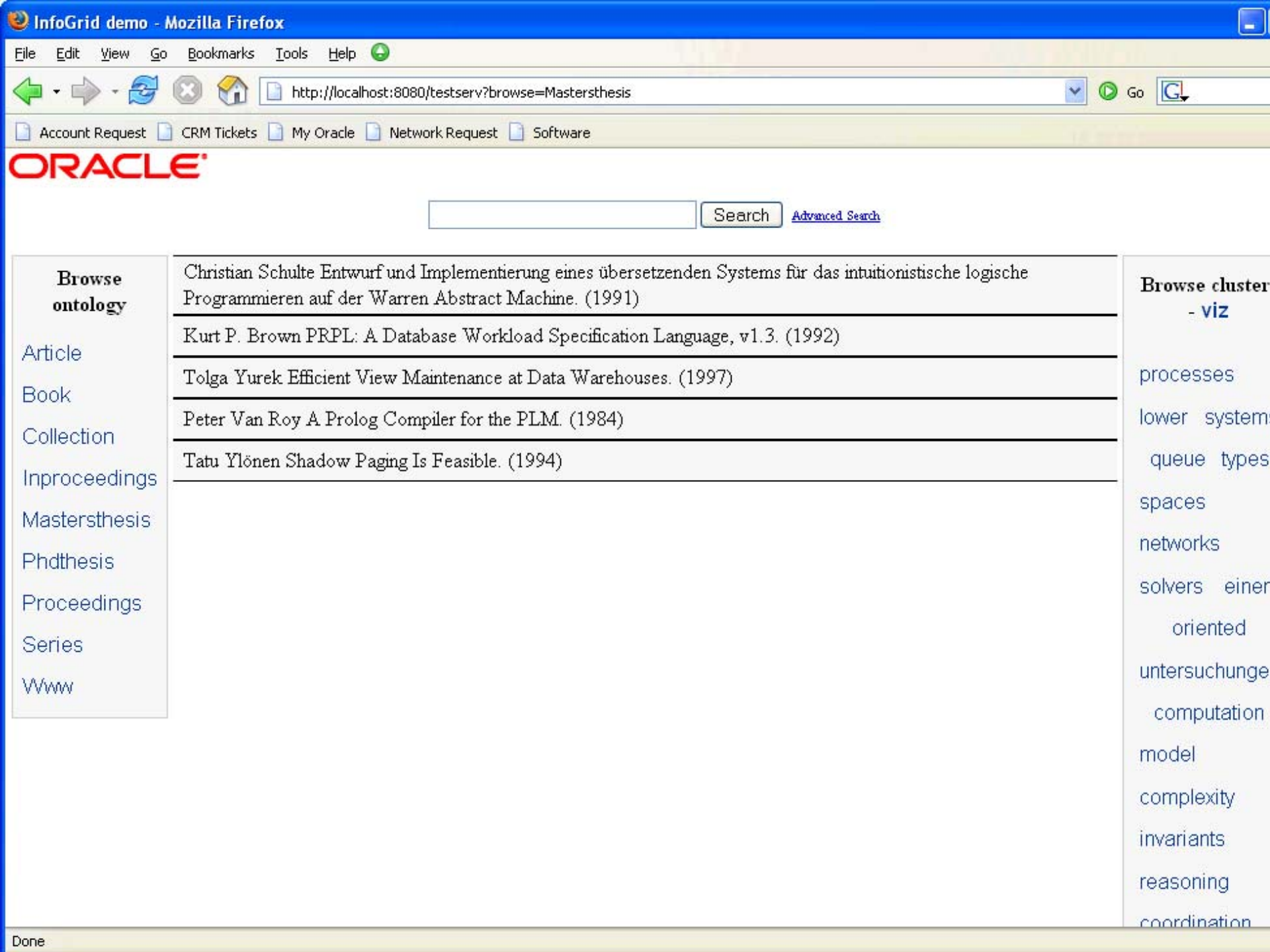
InfoGrid demo - Mozilla Firefox
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Christian Schulte Entwurf und Implementierung eines übersetzenden Systems für das intuitionistische logische Programmieren auf der Warren Abstract Machine. (1991)
Kurt P. Brown PRPL: A Database Workload Specification Language, v1.3. (1992)
Tolga Yurek Efficient View Maintenance at Data Warehouses. (1997)
Peter Van Roy A Prolog Compiler for the PLM. (1984)
Tatu Ylönen Shadow Paging Is Feasible. (1994)
Browse cluster - viz
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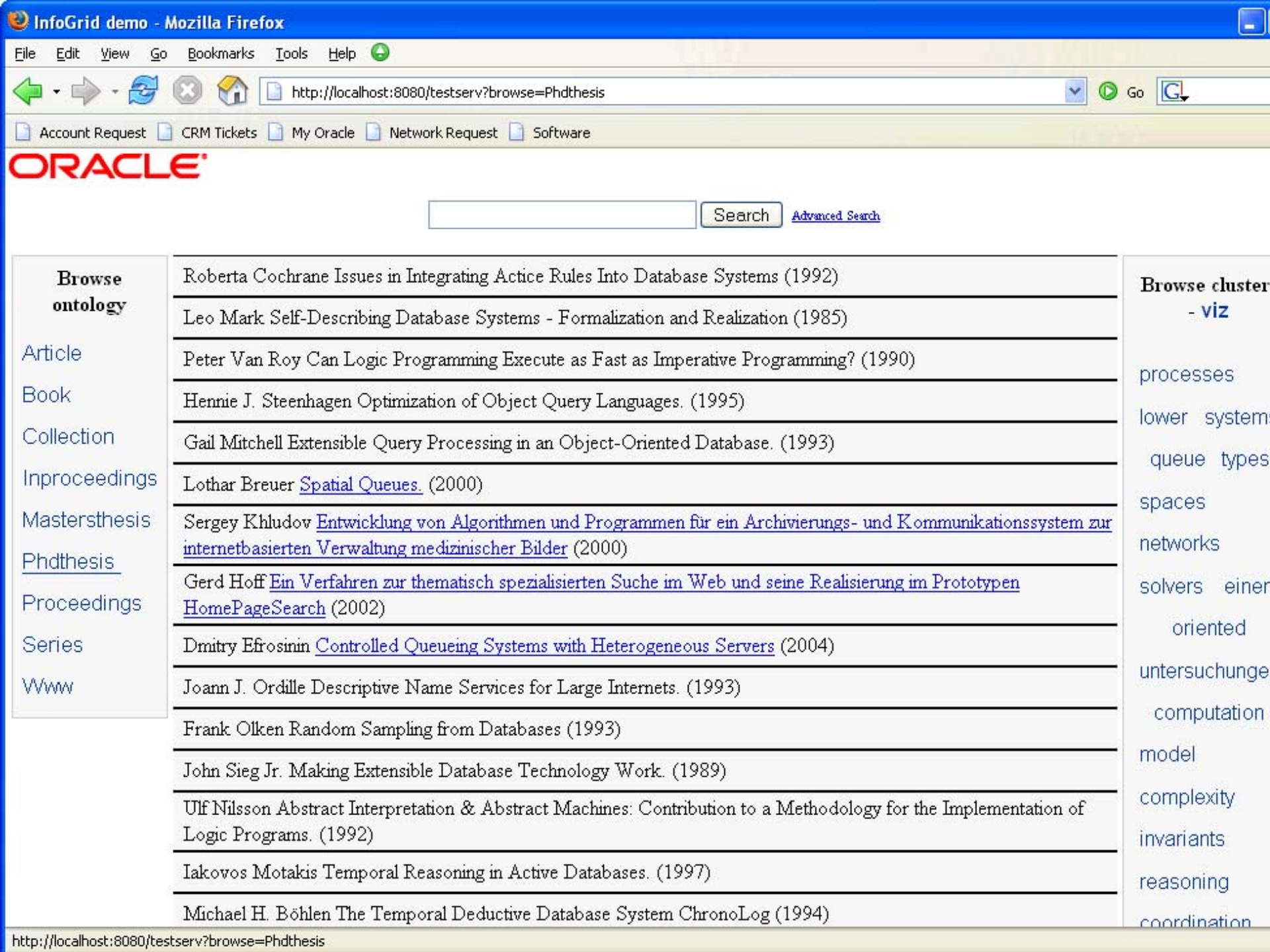
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Roberta Cochrane Issues in Integrating Actice Rules Into Database Systems (1992)
Leo Mark Self-Describing Database Systems - Formalization and Realization (1985)
Peter Van Roy Can Logic Programming Execute as Fast as Imperative Programming? (1990)
Hennie J. Steenhagen Optimization of Object Query Languages. (1995)
Gail Mitchell Extensible Query Processing in an Object-Oriented Database. (1993)
Lothar Breuer Spatial Queues. (2000)
Sergey Khludov Entwicklung von Algorithmen und Programmen für ein Archivierungs- und Kommunikationssystem zur internetbasierten Verwaltung medizinischer Bilder (2000)
Gerd Hoff Ein Verfahren zur thematisch spezialisierten Suche im Web und seine Realisierung im Prototypen HomePageSearch (2002)
Dmitry Efrosinin Controlled Queueing Systems with Heterogeneous Servers (2004)
Joann J. Ordille Descriptive Name Services for Large Internets. (1993)
Frank Olken Random Sampling from Databases (1993)
John Sieg Jr. Making Extensible Database Technology Work. (1989)
Ulf Nilsson Abstract Interpretation & Abstract Machines: Contribution to a Methodology for the Implementation of Logic Programs. (1992)
Iakovos Motakis Temporal Reasoning in Active Databases. (1997)
Michael H. Böhlen The Temporal Deductive Database System ChronoLog (1994)
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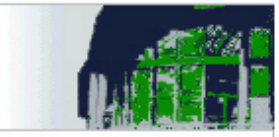






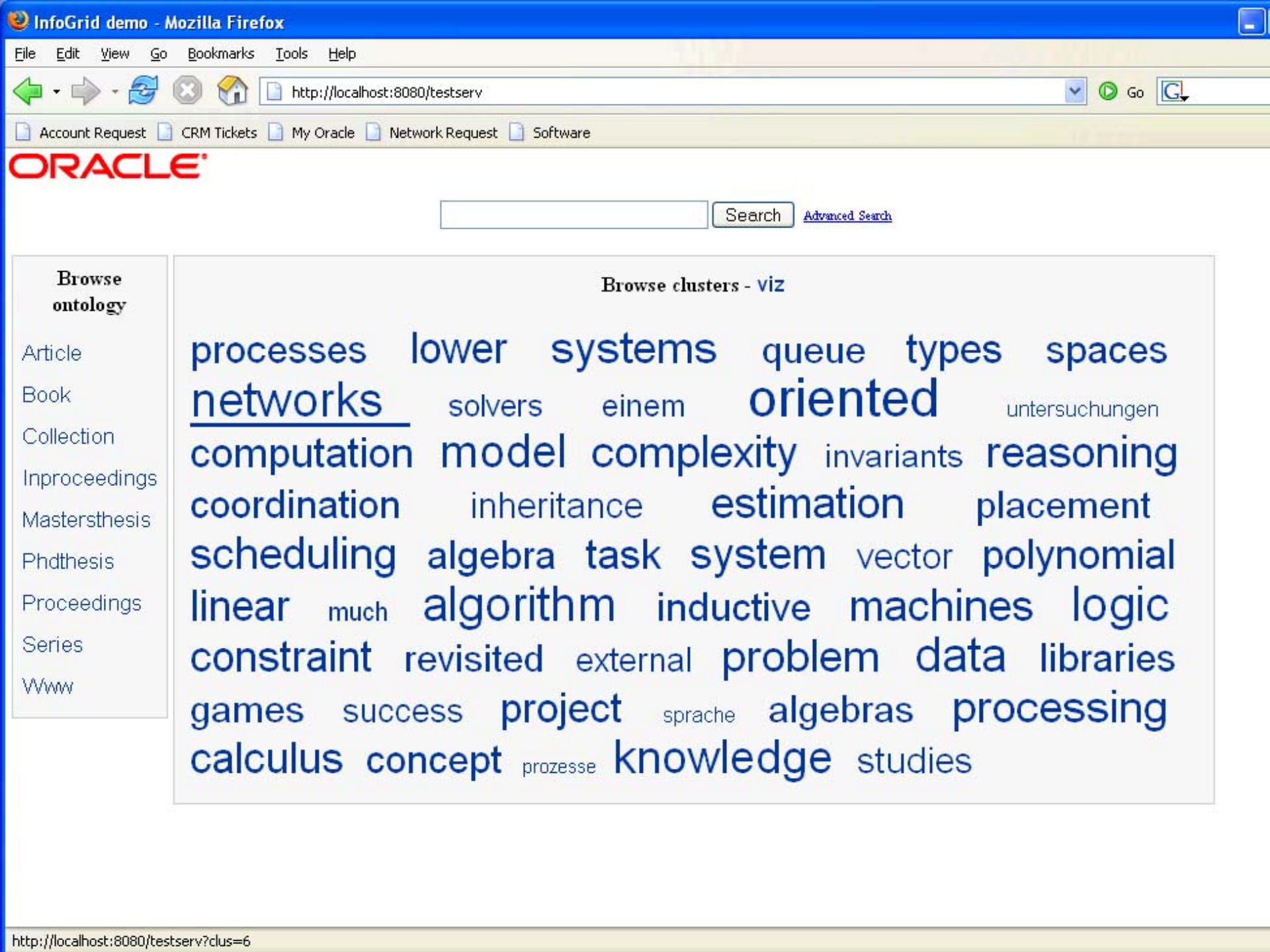
**Breuer, Lothar**

## Spatial Queues

pdf-Format: Dokument 1.pdf (621 KB) | Dokument 2.pdf (5 KB) | Dokument 3.pdf (5 KB)

## Kurzfassung in englisch

In the present thesis, a theoretical framework for the analysis of spatial queues is developed. Spatial queues are a generalization of the classical concept of queues as they provide the possibility of assigning properties to the users. These properties may influence the queueing process, but may also be of interest for themselves. As a field of application, mobile communication networks are modeled by spatial queues in order to demonstrate the advantage of including user properties into the queueing model. In this application, the property of main interest is the user's position in the network. After a short introduction, the second chapter contains an examination of the class of Markov-additive jump processes, including expressions for the transition probabilities and the expectation as well as laws of large numbers. Chapter 3 contains the definition and analysis of the central concept of spatial Markovian arrival processes (shortly: SMAPs) as a special case of Markov-additive jump processes, but also as a natural generalization from the well-known concept of BMAPs. In chapters 4 and 5, SMAPs serve as arrival streams for the analyzed periodic SMAP/M/c/c and SMAP/G/infinity queues, respectively. These types of queues find application as models or planning tools for mobile communication networks. The analysis of these queues involves new methods such that even for the special cases of BMAP inputs (i.e. non-spatial queues) new results are obtained. In chapter 6, a procedure for statistical parameter estimation is proposed along with its numerical results. The thesis is concluded by an appendix which collects necessary results from the theories of Markov jump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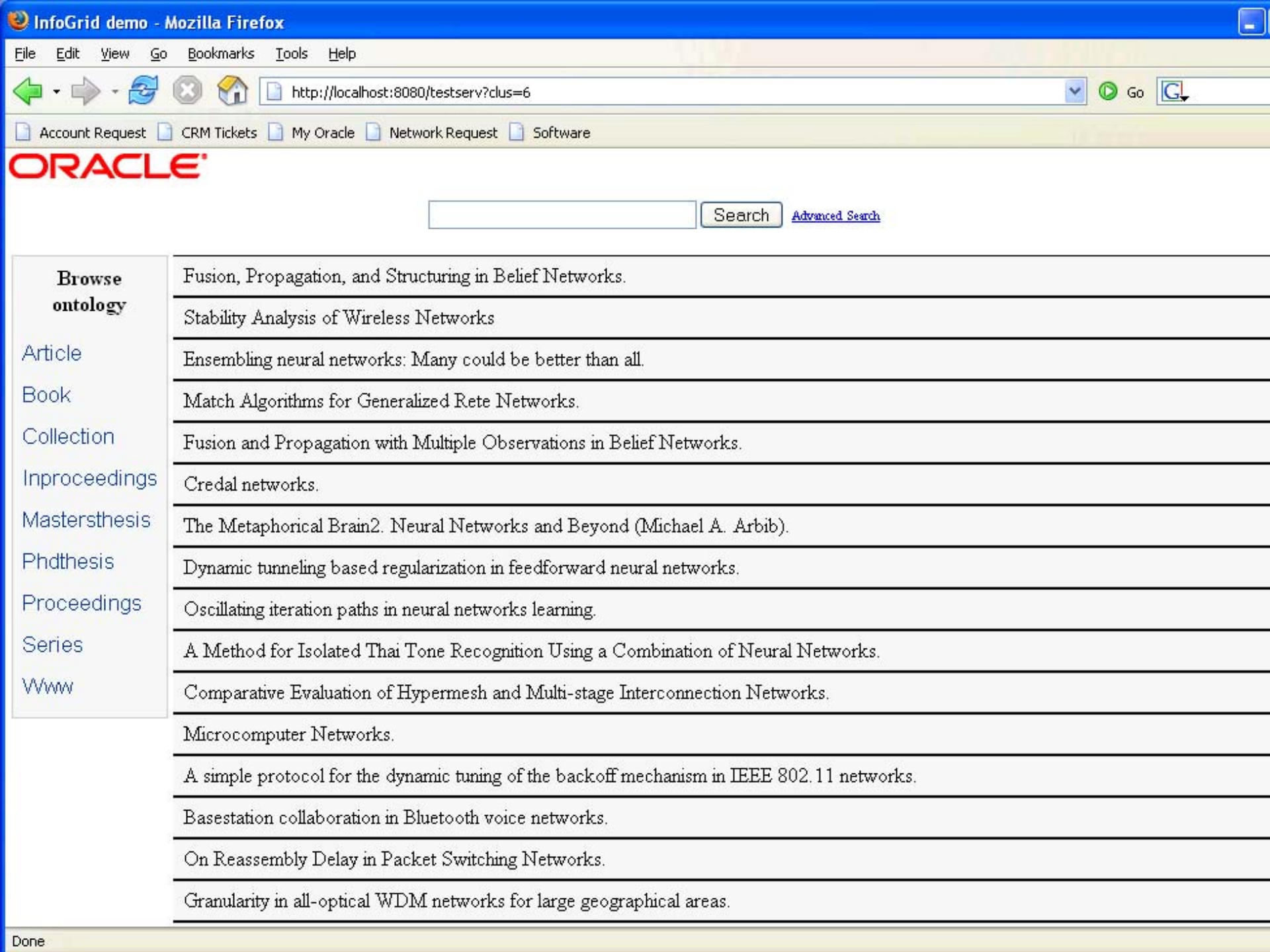
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Fusion, Propagation, and Structuring in Belief Networks.
Stability Analysis of Wireless Networks
Ensembling neural networks: Many could be better than all.
Match Algorithms for Generalized Rete Networks.
Fusion and Propagation with Multiple Observations in Belief Networks.
Credal networks.
The Metaphorical Brain2. Neural Networks and Beyond (Michael A. Arbib).
Dynamic tunneling based regularization in feedforward neural networks.
Oscillating iteration paths in neural networks learning.
A Method for Isolated Thai Tone Recognition Using a Combination of Neural Networks.
Comparative Evaluation of Hypermesh and Multi-stage Interconnection Networks.
Microcomputer Networks.
A simple protocol for the dynamic tuning of the backoff mechanism in IEEE 802.11 networks.
Basestation collaboration in Bluetooth voice networks.
On Reassembly Delay in Packet Switching Networks.
Granularity in all-optical WDM networks for large geographical areas.
Done

# Visualization

- A picture is worth a 1,000 words
  - In addition to pre-query refinement, enable post-query refinement through a visualization of results
  - Visual maps display what information is available in your documents, and how it is related and organized
- Quickly assimilate information
- Discovery
  - See patterns, leading causes, interconnections between documents, how documents are accessed.

InfoGrid demo - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

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Account Request | CRM Tickets | My Oracle | Network Request | Software

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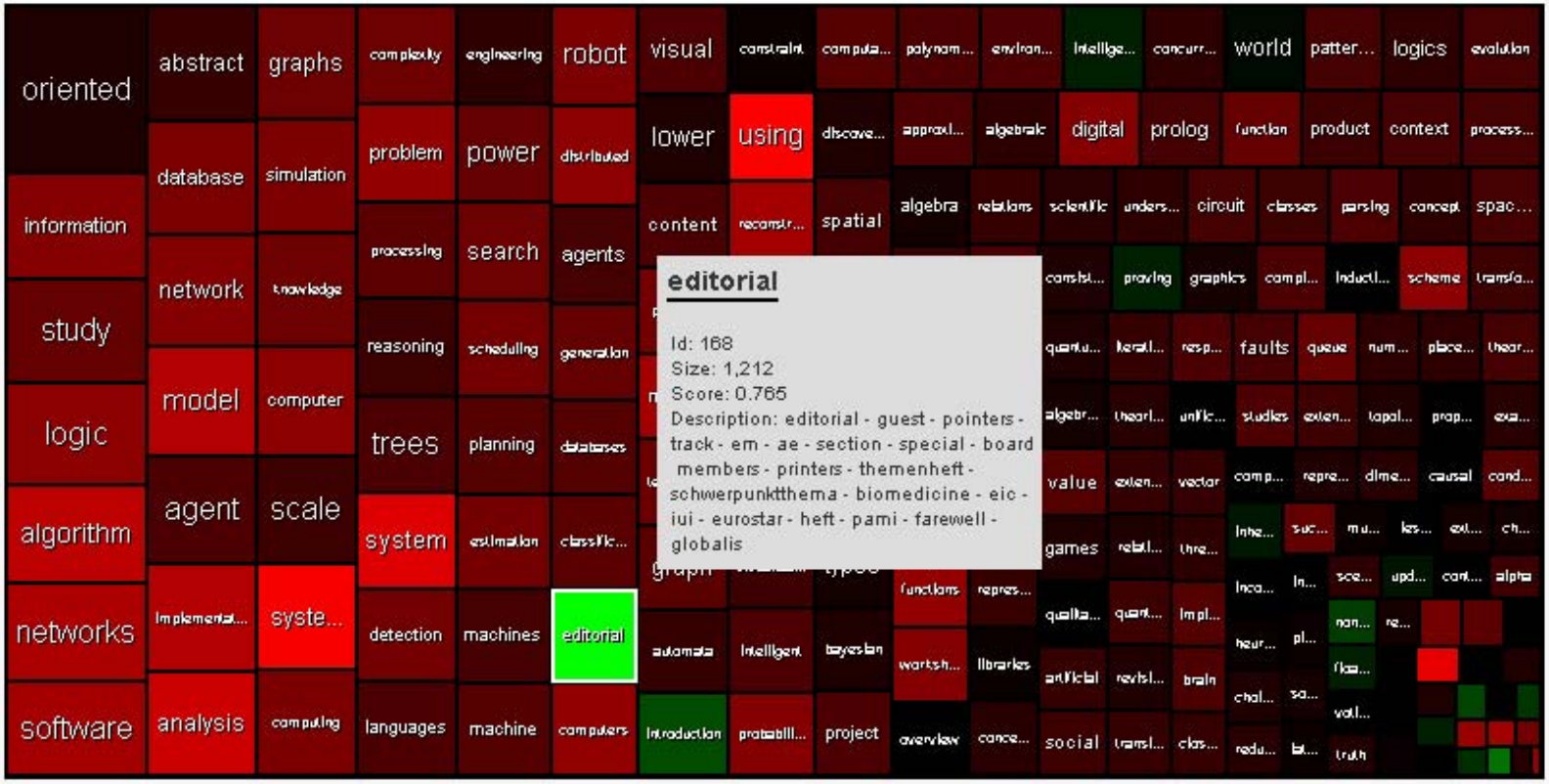
Search | Advanced Search

**Browse ontology**

- Article
- Book
- Collection
- Inproceedings
- Mastersthesis
- Phdthesis
- Proceedings
- Series
- Www

## Browse clusters - text

Size: Size | Color: Score | Label: Label

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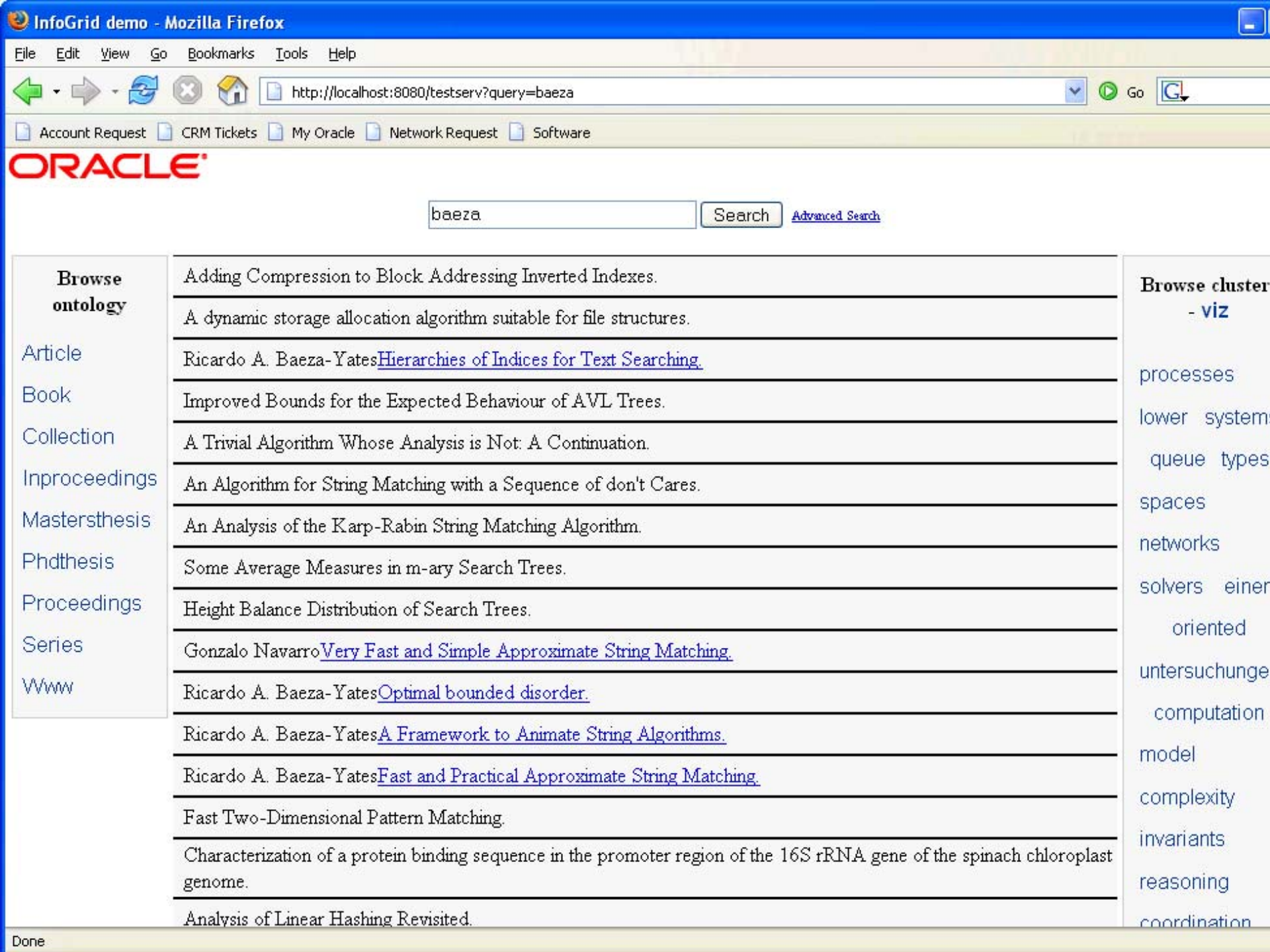
InfoGrid demo - Mozilla Firefox
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Adding Compression to Block Addressing Inverted Indexes.
A dynamic storage allocation algorithm suitable for file structures.
Ricardo A. Baeza-YatesHierarchies of Indices for Text Searching.
Improved Bounds for the Expected Behaviour of AVL Trees.
A Trivial Algorithm Whose Analysis is Not: A Continuation.
An Algorithm for String Matching with a Sequence of don't Cares.
An Analysis of the Karp-Rabin String Matching Algorithm.
Some Average Measures in m-ary Search Trees.
Height Balance Distribution of Search Trees.
Gonzalo NavarroVery Fast and Simple Approximate String Matching.
Ricardo A. Baeza-YatesOptimal bounded disorder.
Ricardo A. Baeza-YatesA Framework to Animate String Algorithms.
Ricardo A. Baeza-YatesFast and Practical Approximate String Matching.
Fast Two-Dimensional Pattern Matching.
Characterization of a protein binding sequence in the promoter region of the 16S rRNA gene of the spinach chloroplast genome.
Analysis of Linear Hashing Revisited.
Browse cluster - viz
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Done

Information Systems
Volume 21, Issue 6 , September 1996, Pages 497-514

doi:10.1016/0306-4379(96)00025-7 Cite or Link Using DOI




# Hierarchies of indices for text searching*1

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[b] Departamento de Ciência da Computação Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

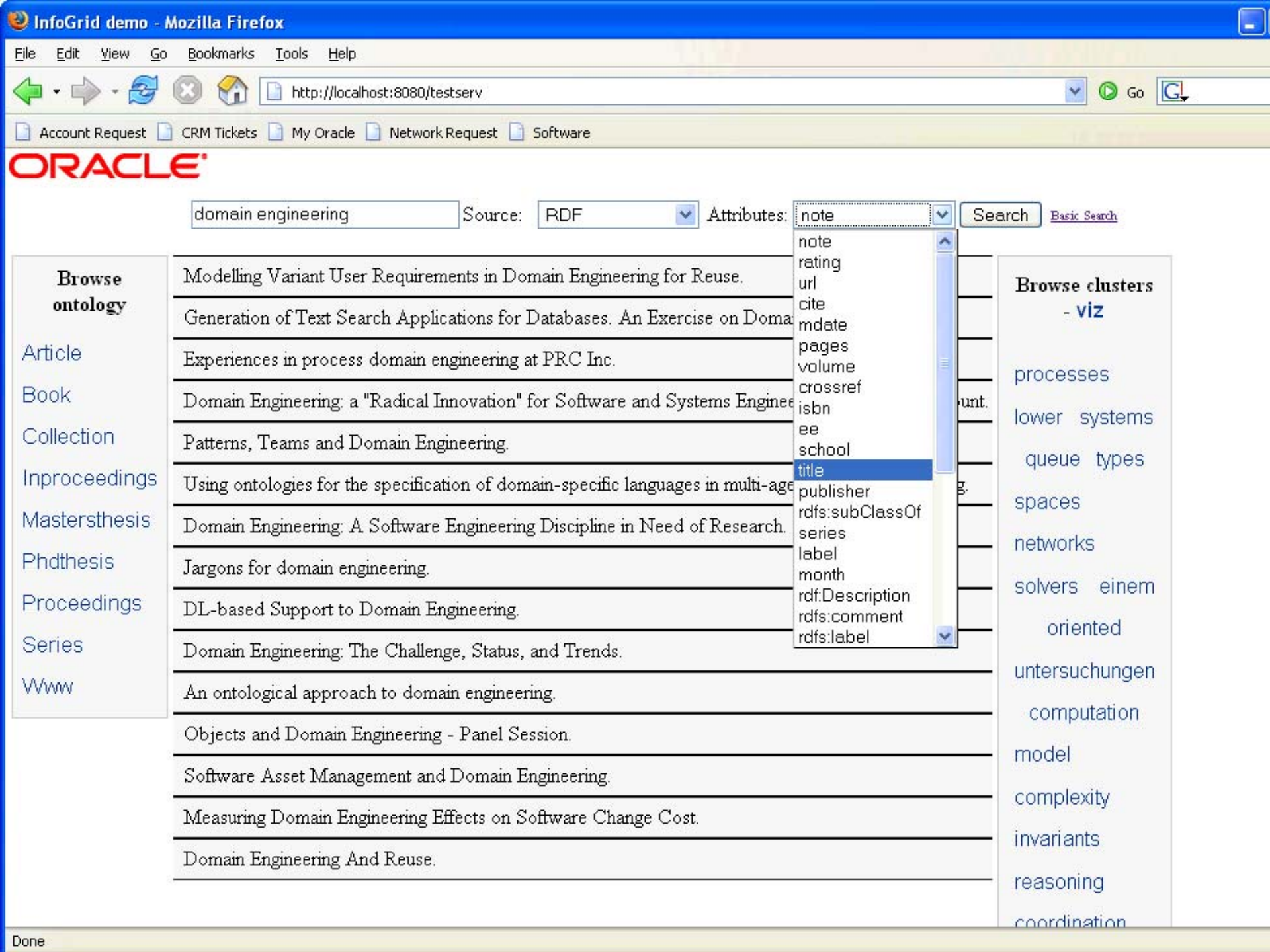
Received 17 August 1994; revised 2 August 1996. Available online 11 June 1999.

## Abstract

We present an efficient implementation of a recently known index for text databases, when the database is stored on secondary storage devices such as magnetic or optical disks. The implementation is built on top of a new and simple index for texts called pat array (or suffix array).

# AJAX

- Asynchronous Javascript And XML is a development technique for creating interactive web applications using a combination of:
  - HTML (or XHTML) and CSS for presenting information
  - The Document Object Model manipulated through Javascript to dynamically display and interact with the information presented
  - The XMLHttpRequest object to exchange data asynchronously with the web server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Modelling Variant User Requirements in Domain Engineering for Reuse.
Generation of Text Search Applications for Databases. An Exercise on Doma
Experiences in process domain engineering at PRC Inc.
Domain Engineering: a "Radical Innovation" for Software and Systems Enginee
Patterns, Teams and Domain Engineering.
Using ontologies for the specification of domain-specific languages in multi-age
Domain Engineering: A Software Engineering Discipline in Need of Research.
Jargons for domain engineering.
DL-based Support to Domain Engineering.
Domain Engineering: The Challenge, Status, and Trends.
An ontological approach to domain engineering.
Objects and Domain Engineering - Panel Session.
Software Asset Management and Domain Engineering.
Measuring Domain Engineering Effects on Software Change Cost.
Domain Engineering And Reuse.
Browse clusters - viz
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solvers einem
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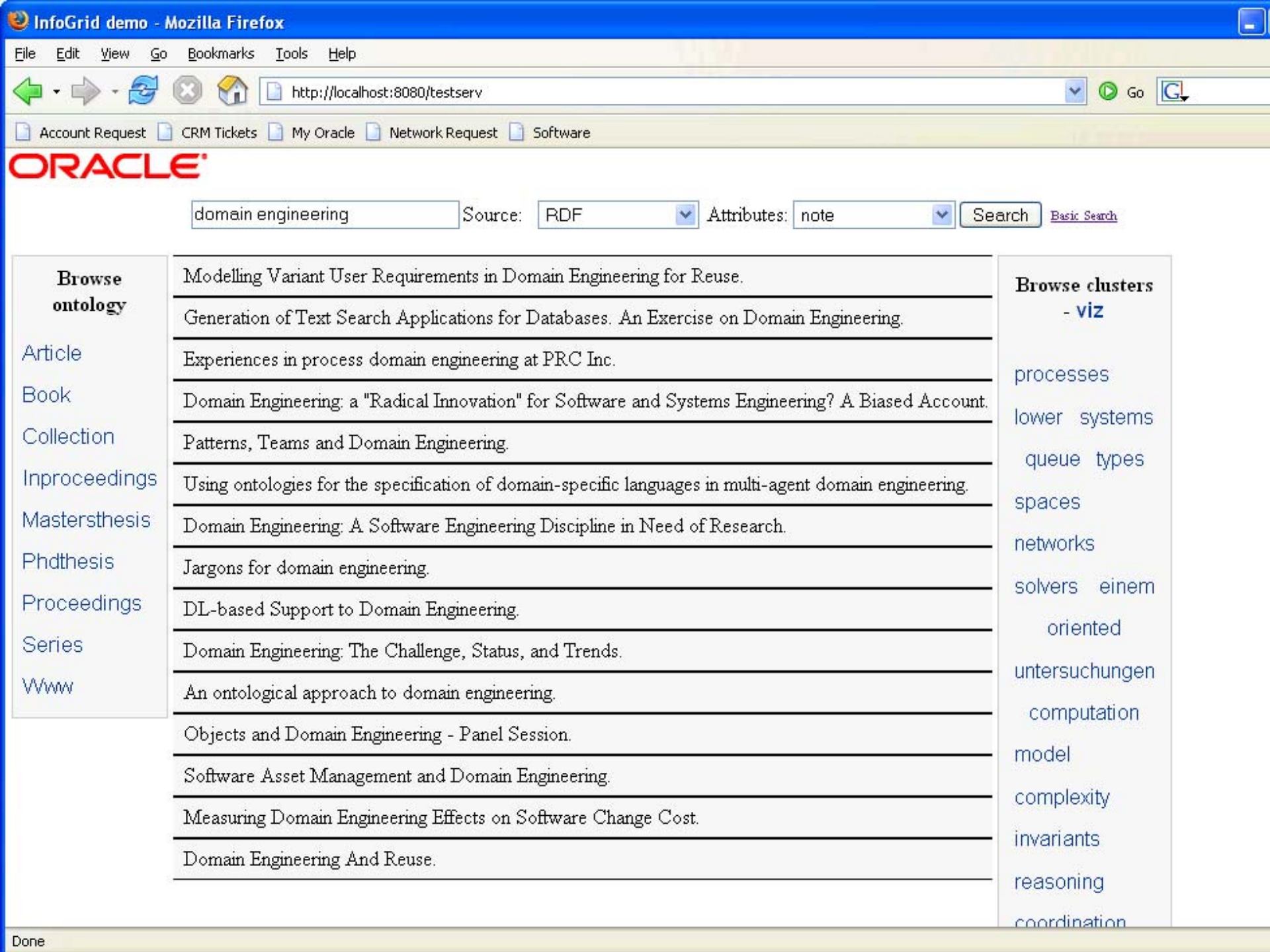
untersuchungen
computation
model
complexity
invariants
reasoning
Done


InfoGrid demo - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://localhost:8080/testserv
Go
Account Request
CRM Tickets
My Oracle
Network Request
Software
ORACLE
domain engineering
Source: RDF
Attributes: note
Search
Basic Search
Browse ontology
Article
Book
Collection
Inproceedings
Mastersthesis
Phdthesis
Proceedings
Series
Www
Modelling Variant User Requirements in Domain Engineering for Reuse.
Generation of Text Search Applications for Databases. An Exercise on Domain Engineering.
Experiences in process domain engineering at PRC Inc.
Domain Engineering: a "Radical Innovation" for Software and Systems Engineering? A Biased Account.
Patterns, Teams and Domain Engineering.
Using ontologies for the specification of domain-specific languages in multi-agent domain engineering.
Domain Engineering: A Software Engineering Discipline in Need of Research.
Jargons for domain engineering.
DL-based Support to Domain Engineering.
Domain Engineering: The Challenge, Status, and Trends.
An ontological approach to domain engineering.
Objects and Domain Engineering - Panel Session.
Software Asset Management and Domain Engineering.
Measuring Domain Engineering Effects on Software Change Cost.
Domain Engineering And Reuse.
Browse clusters - viz
processes
lower systems
queue types
spaces
networks
solvers einem
oriented
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complexity
invariants
reasoning
coordination
Done

# What we will see

- Load the DBLP ontology and data into the Oracle XML DB Repository
  - Combine with Search, Clustering and Information Visualization for a rich, semantic search
  - Dynamic drill down into arbitrary structure across different sources and search for values, independent of location
- Focused semantic crawling to extract specific information from the web
  - Find pages on WWW that discuss DBLP researchers
  - Moving metadata on this information into XML DB
- Relating focused crawl information with other DBLP data
  - Inferencing of Home Pages
  - Building and Viewing Social Networks of Researchers

# Inference-Based Retrieval

- The content of Web resources is in most part opaque to computers
  - Browsers display them and search engines locate words within them, but the level of "understanding" of the content is limited.
- A search engine, for example, might know that a resource contained the textual string “Alonso" but not that it was a representation of a *Person*, and that some *Persons* have *home-pages*, where a *home-page* is an URL that returns HTML.
- By enabling richer representation such as this, RDF makes it possible to express queries that go beyond simple text-matching.

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Loading from database ...

baeza Source: Home pages Attributes: Search Basic Search

**Browse ontology**

- Article
- Book
- Collection
- Inproceedings
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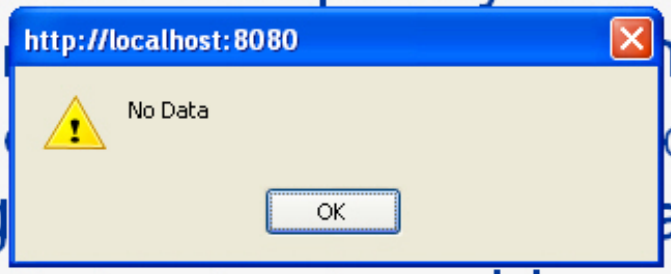
- Phdthesis
- Proceedings
- Series
- Www

**Browse clusters** - viz

processes lower systems queue types spaces networks solvers einem oriented untersuchungen computation model complexity invariants reasoning coordination placement scheduling polynomial linear much logic constraint revisited external problem data libraries games success project sprache algebras processing calculus concept prozesse knowledge studies



# Focused Crawler Configuration

Mozilla Firefox

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file:///C:/Omar/dblp/home_pages/hp1.xml

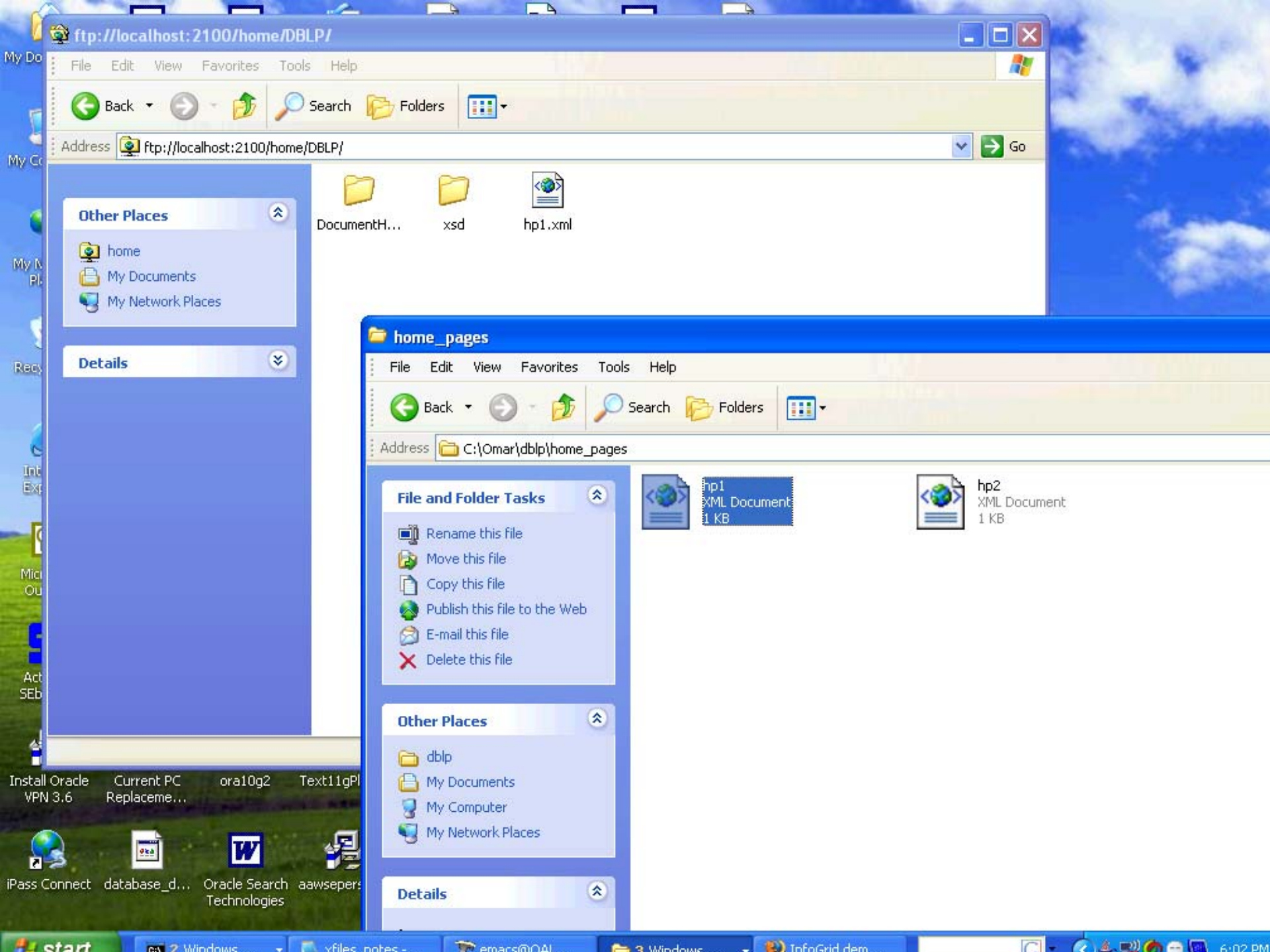
Go

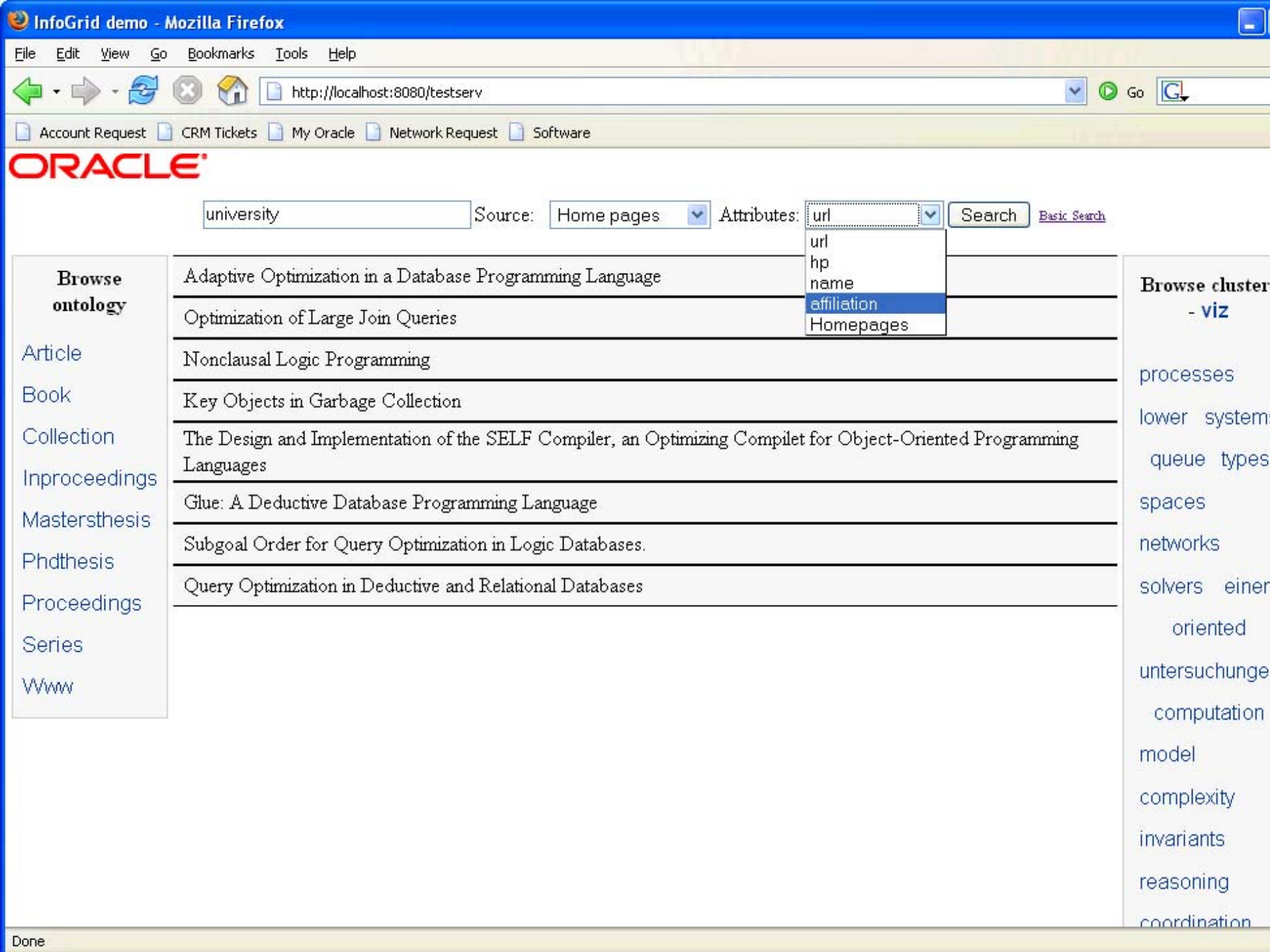
Account Request CRM Tickets My Oracle Network Request Software

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <Homepages xsi:noNamespaceSchemaLocation="Homepages.xsd">
  - <hp>
      <name>Ricardo Baeza</name>
      <affiliation>University of Chile</affiliation>
      <url>http://www.dcc.uchile.cl/~rbaeza</url>
    </hp>
  </Homepages>
```

Done


ftp://localhost:2100/home/DBLP/
File Edit View Favorites Tools Help
Back Search Folders
Address ftp://localhost:2100/home/DBLP/
Go
Other Places
home
My Documents
My Network Places
Details
DocumentH...
xsd
hp1.xml
home_pages
File Edit View Favorites Tools Help
Back Search Folders
Address C:\Omar\dblp\home_pages
File and Folder Tasks
Rename this file
Move this file
Copy this file
Publish this file to the Web
E-mail this file
Delete this file
Other Places
dblp
My Documents
My Computer
My Network Places
Details
hp1
XML Document
1 KB
hp2
XML Document
1 KB
Install Oracle VPN 3.6
Current PC Replaceme...
ora10g2
Text11gPl
iPass Connect
database_d...
Oracle Search Technologies
aawsepers
start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university
Source:
Home pages
Attributes:
url
Search
Basic Search
url
hp
name
affiliation
Homepages
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Www
Adaptive Optimization in a Database Programming Language
Optimization of Large Join Queries
Nonclausal Logic Programming
Key Objects in Garbage Collection
The Design and Implementation of the SELF Compiler, an Optimizing Compilet for Object-Oriented Programming Languages
Glue: A Deductive Database Programming Language
Subgoal Order for Query Optimization in Logic Databases.
Query Optimization in Deductive and Relational Databases
Browse cluster - viz
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Account Request | CRM Tickets | My Oracle | Network Request | Software

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baeza-yates Search Advanced Search

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## Browse clusters - text

Social network


Applet prefuse/ForceApplet2 started

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Search Advanced Search

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## Browse clusters - text

Social network


Applet prefuse/ForceApplet2 started


QUESTIONS
ANSWERS


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