RacerPro Demos

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RacerPro is . . .

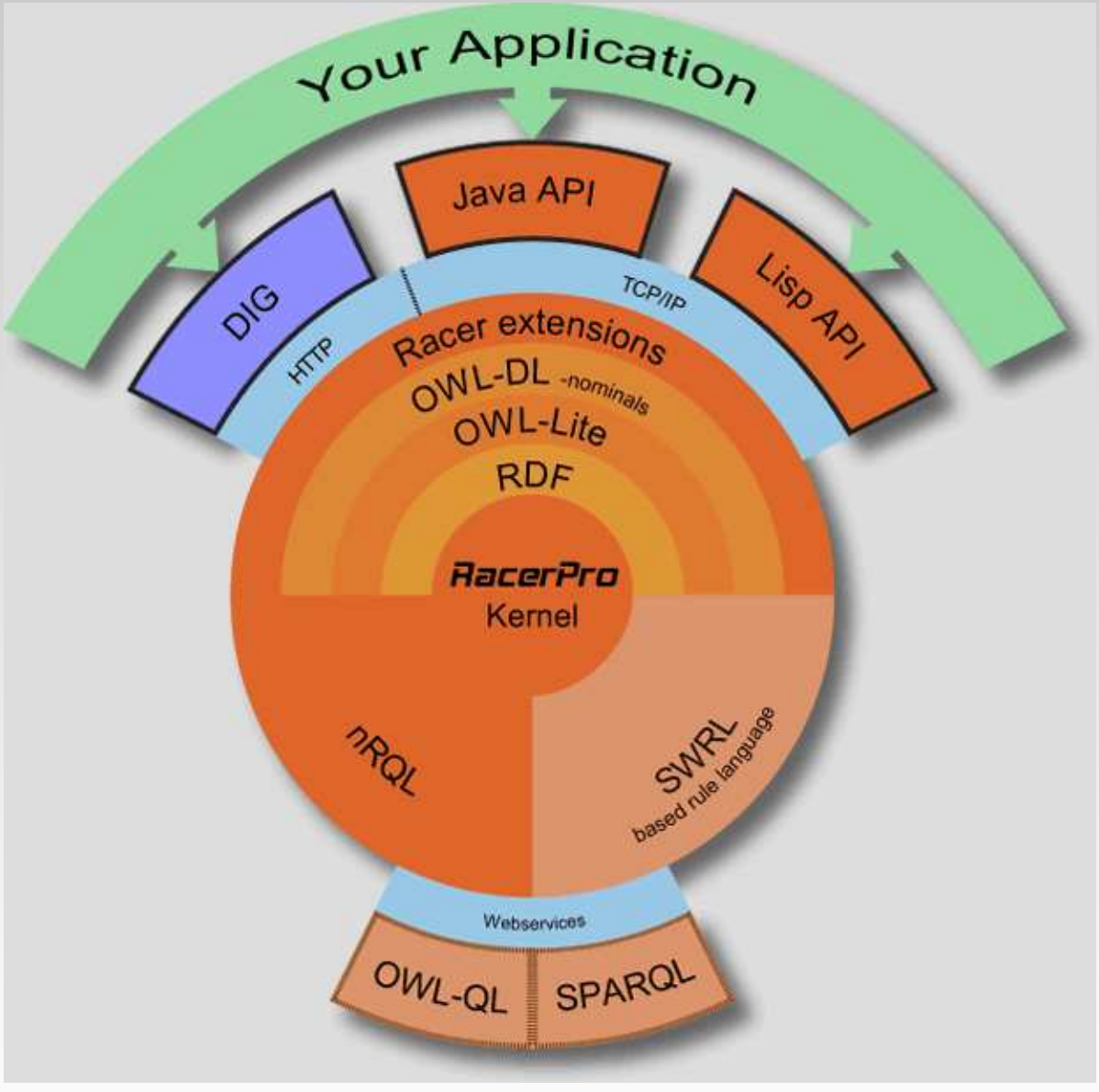
- . . . a Description Logic System for $\mathcal{ALCQHI}_{\mathcal{R}^+}(\mathcal{D}^-)$ (aka $\mathcal{SHIQ}(D^-)$)
  - TBox: Terminological Box, defines domain vocabulary: “A mother is a woman and a parent”
  - Ontology: Formal Specification of a Conceptualization (Gruber)
  - ABox: Assertional Box, “Intelligent Database”, Individuals and Relationships
- Reasoning about descriptions and information
  - “Mother without children” $\Rightarrow$ 
  - “Betty is a female human with a child” $\Rightarrow$ “Betty is a mother”

RacerPro is . . .

- . . . a Semantic Web reasoning engine and repository, supports W3C standards
  - Web Ontology Language
    - OWL Lite
    - OWL DL ($\approx \mathcal{SHOIQ}(Dn)$)
  - Resource Description Framework (RDF)
  - Preliminary support for OWL QL (RacerManager semantic middleware)

    `www.sts-tu-harburg.de/~at.kaya/racerManager`
  - Preliminary support for SWRL
- Expressive query language nRQL
  - ABox query language
  - RDF & OWL query language

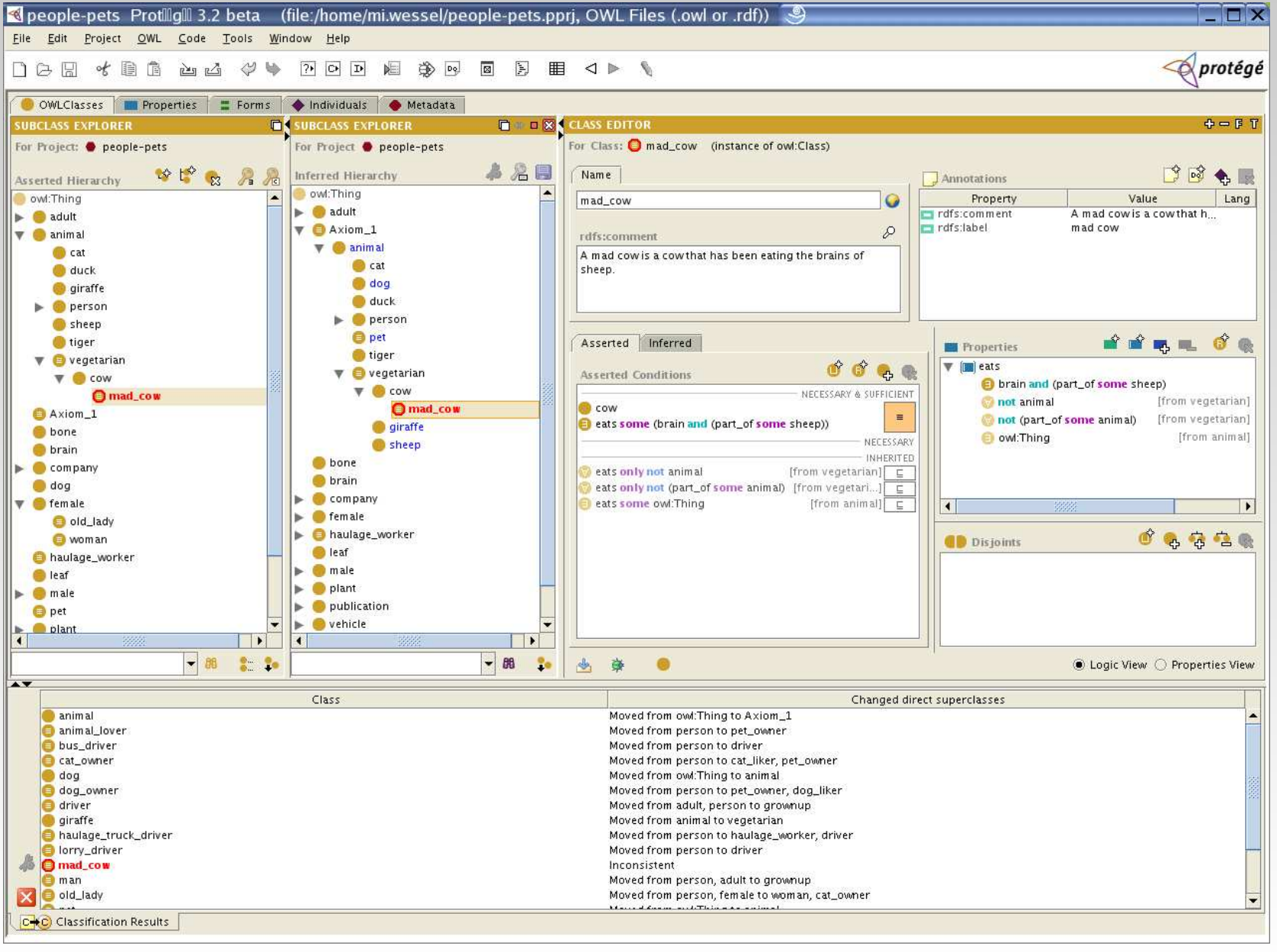
RacerPro: System Overview



OWL Reasoning

- "A vegetarian is defined as an animal that eats no other animals, or parts of animals."
- "Cows are naturally vegetarians"
- "A mad cow is a cow that has been eating the brains of sheep."
- "Sheep are animals."
- $\Rightarrow$ "There are no mad cows!" (inference)
- OWL modeling support with RacerPro:
  - Identification of inconsistent classes during modeling (e.g. "mad cow")
  - Computation of logically implied inheritance relationships ("Taxonomy")

OWL Modeling with Protégé

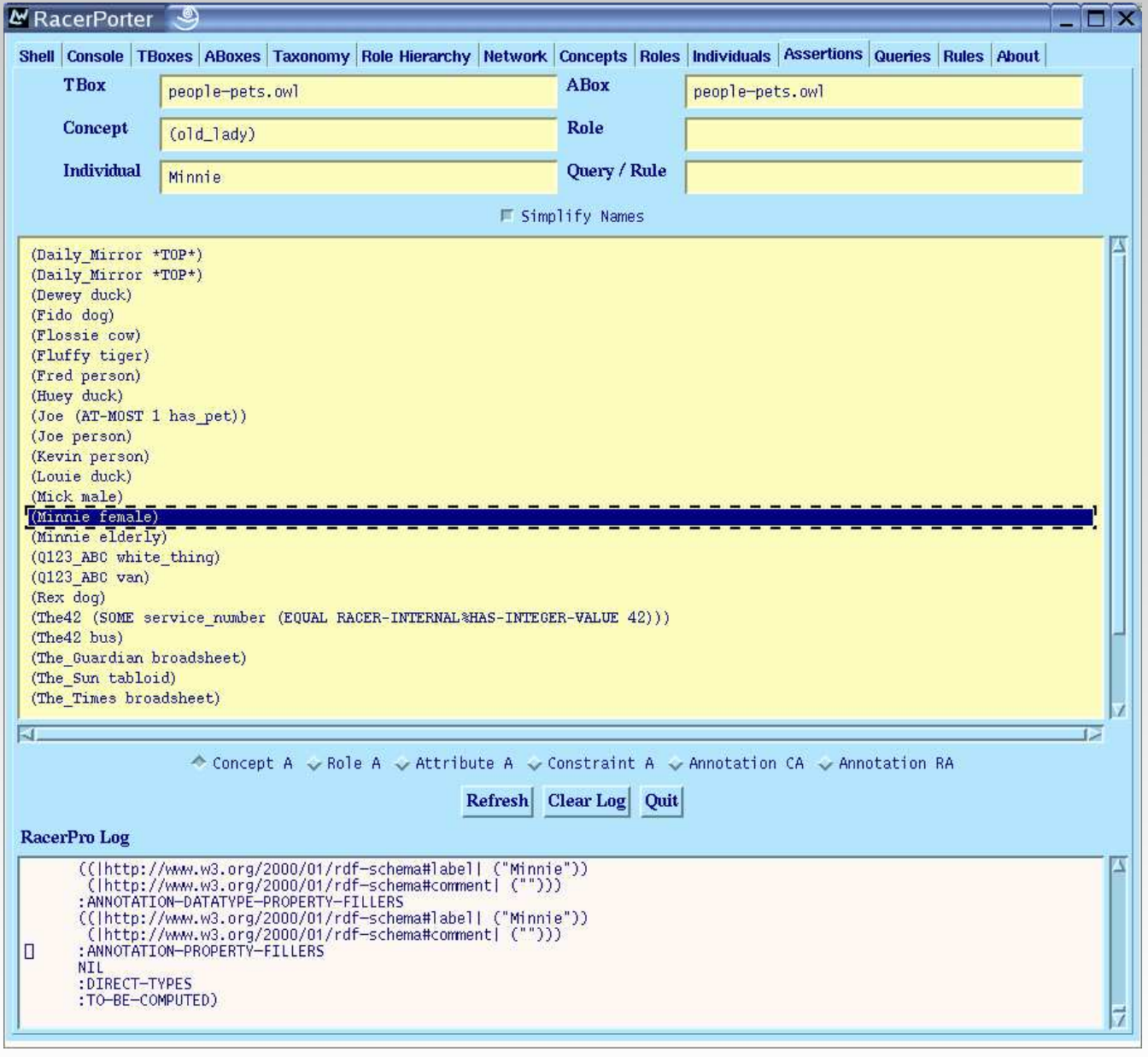


Ontology Based Querying

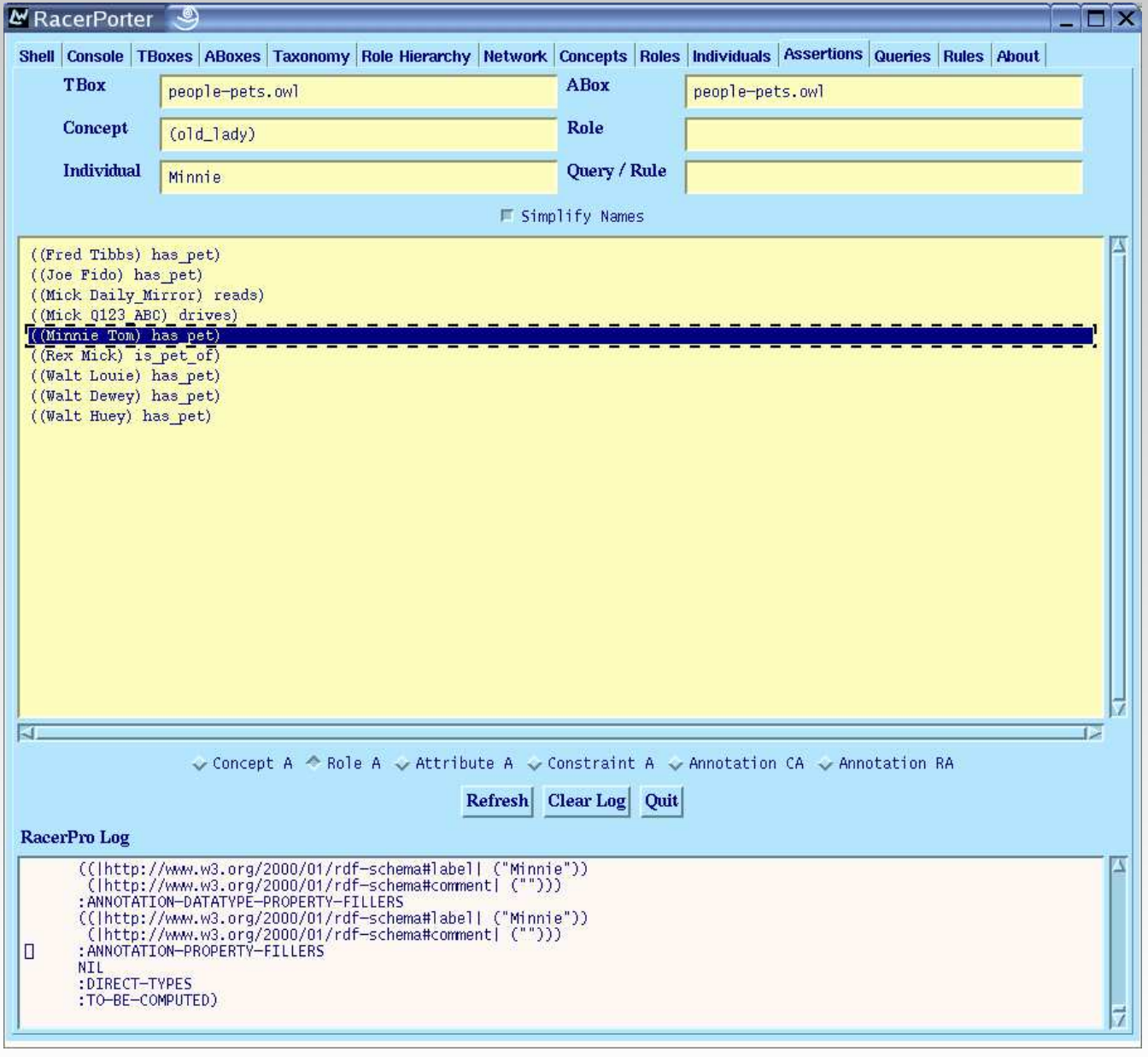
- Benefits: Use domain specific vocabulary for queries
- Detection of inconsistent queries
- Handling of incomplete and unknown information
- Example:
  - “Minnie is known to be elderly and female”
  - $\Rightarrow$ “Minnie is an old lady!” (inference)
  - “Minnie has Tom as a pet”
  - Nothing is known about Tom
  - $\Rightarrow$ “Tom must be a cat, since old ladies are cat lovers!” (inference)

RacerPorter GUI

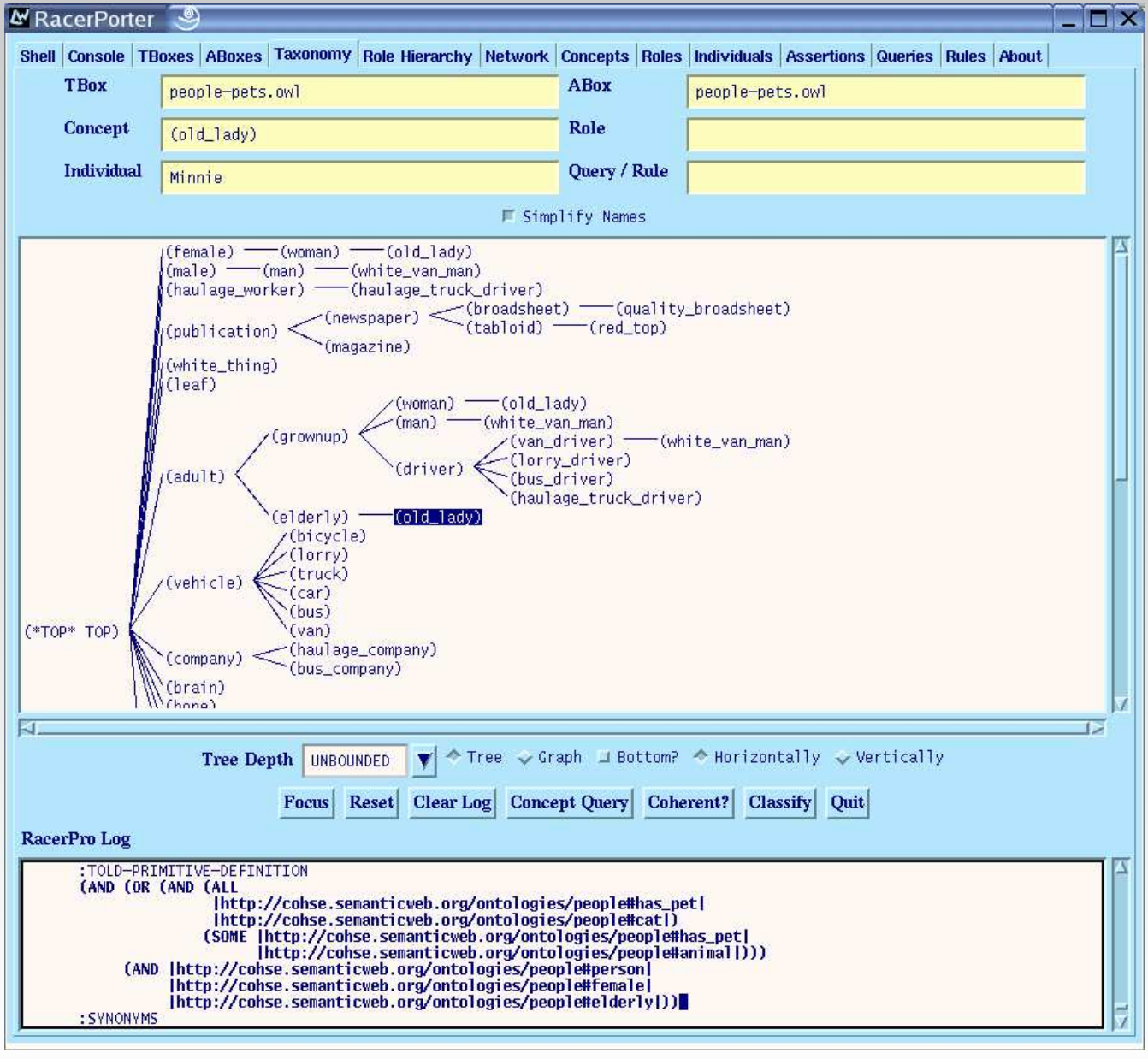
Minnie is elderly and female



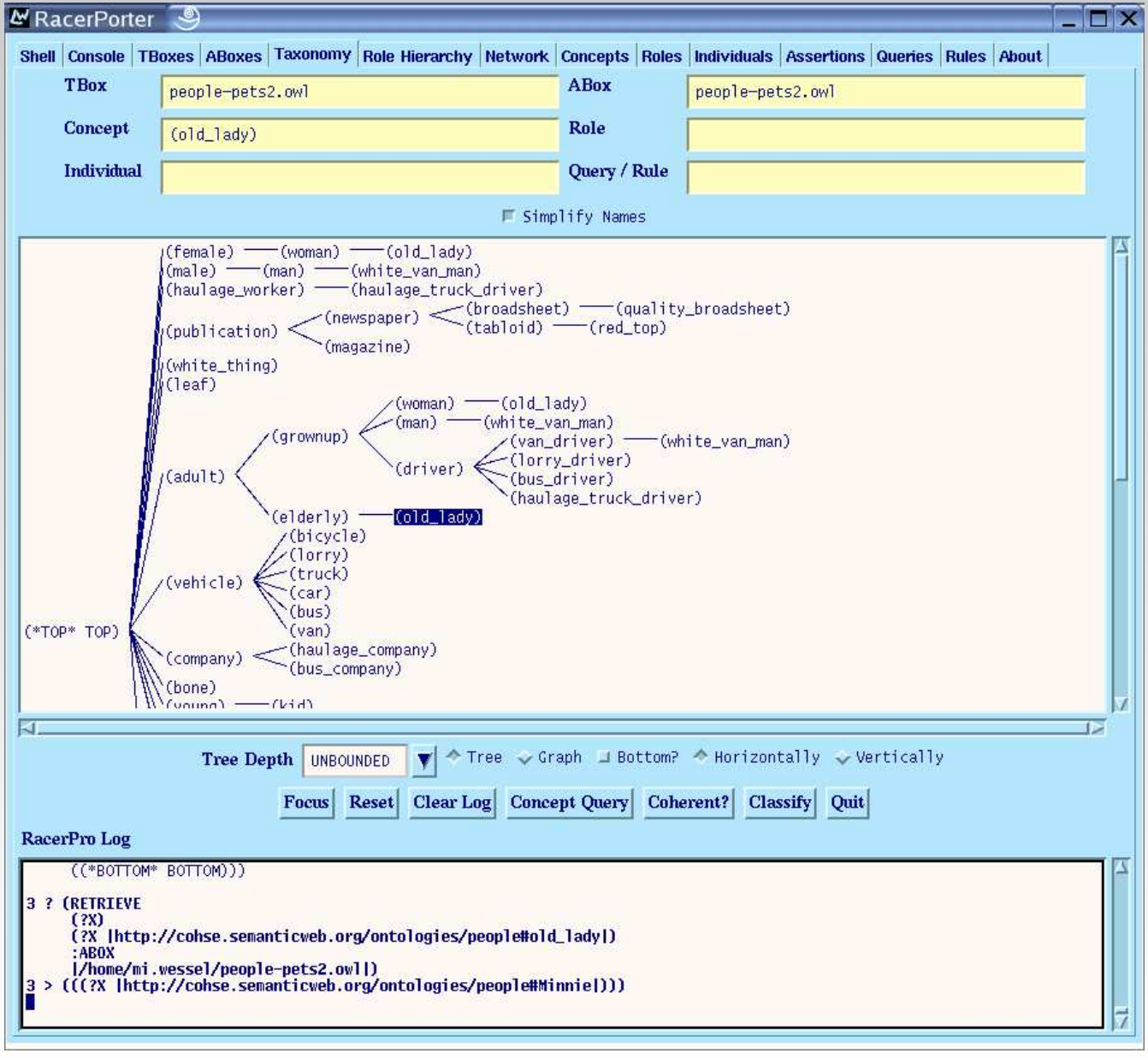
Minnie has Tom as a pet



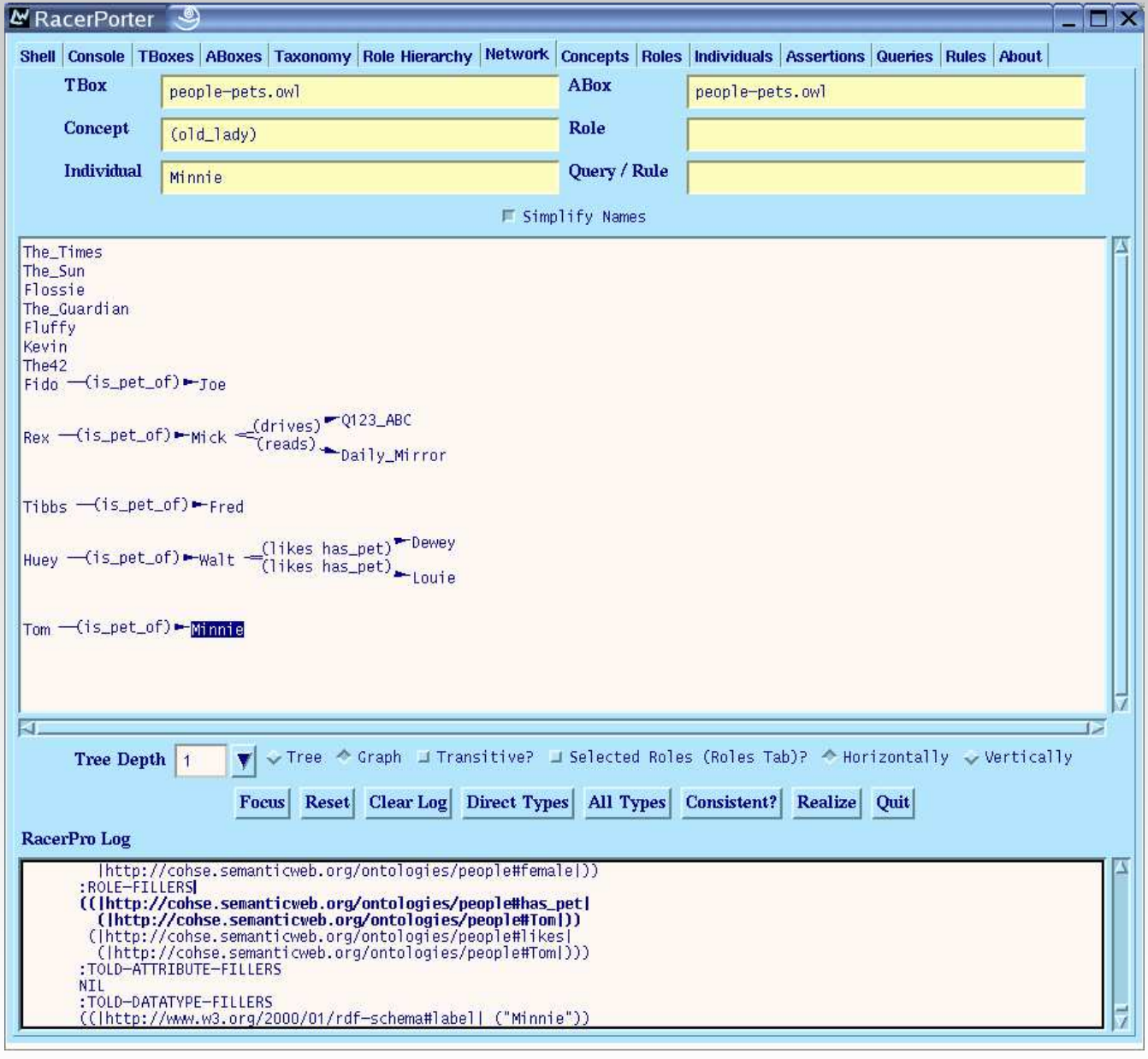
Definition of concept old lady



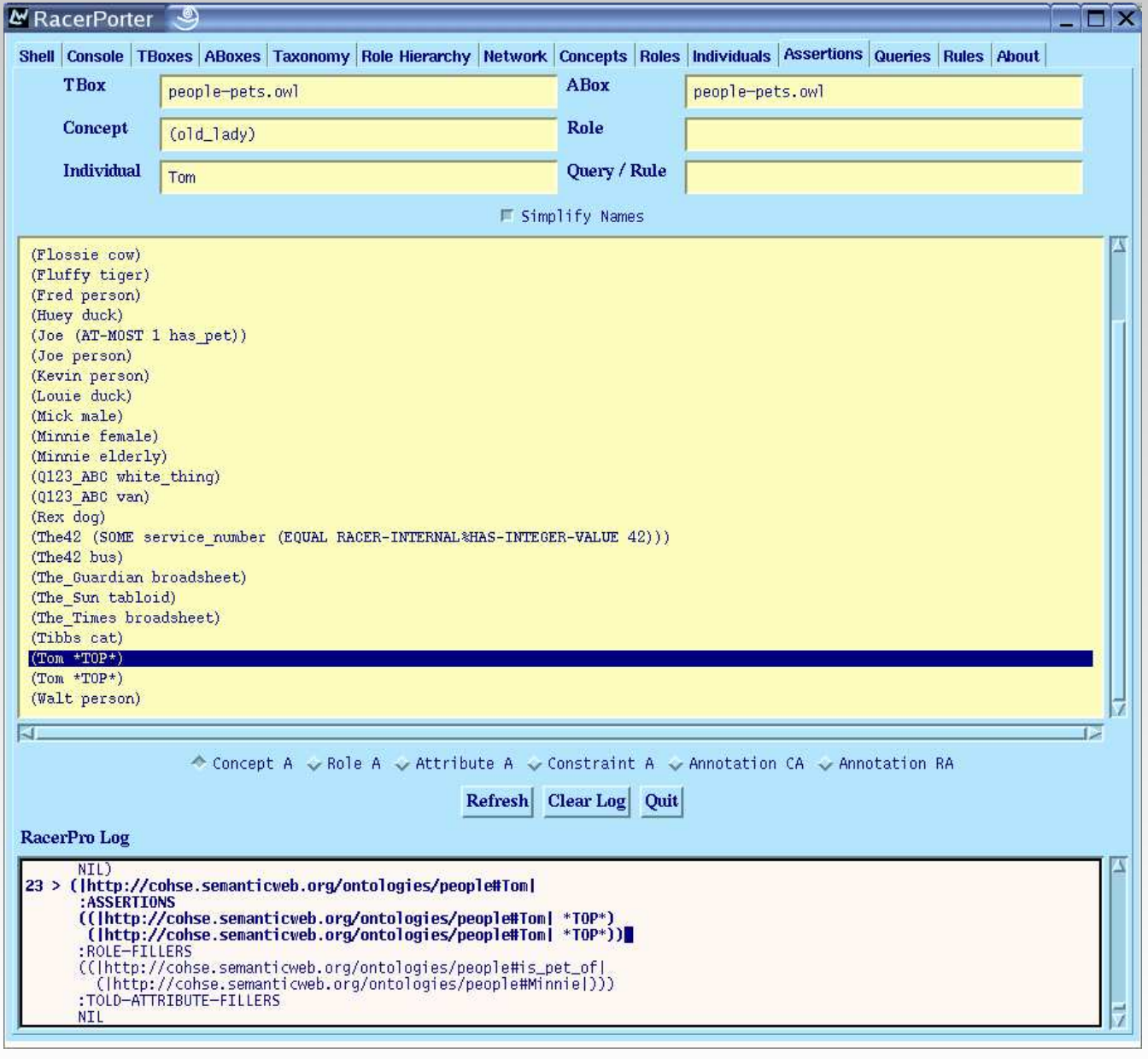
Minnie is an old lady!



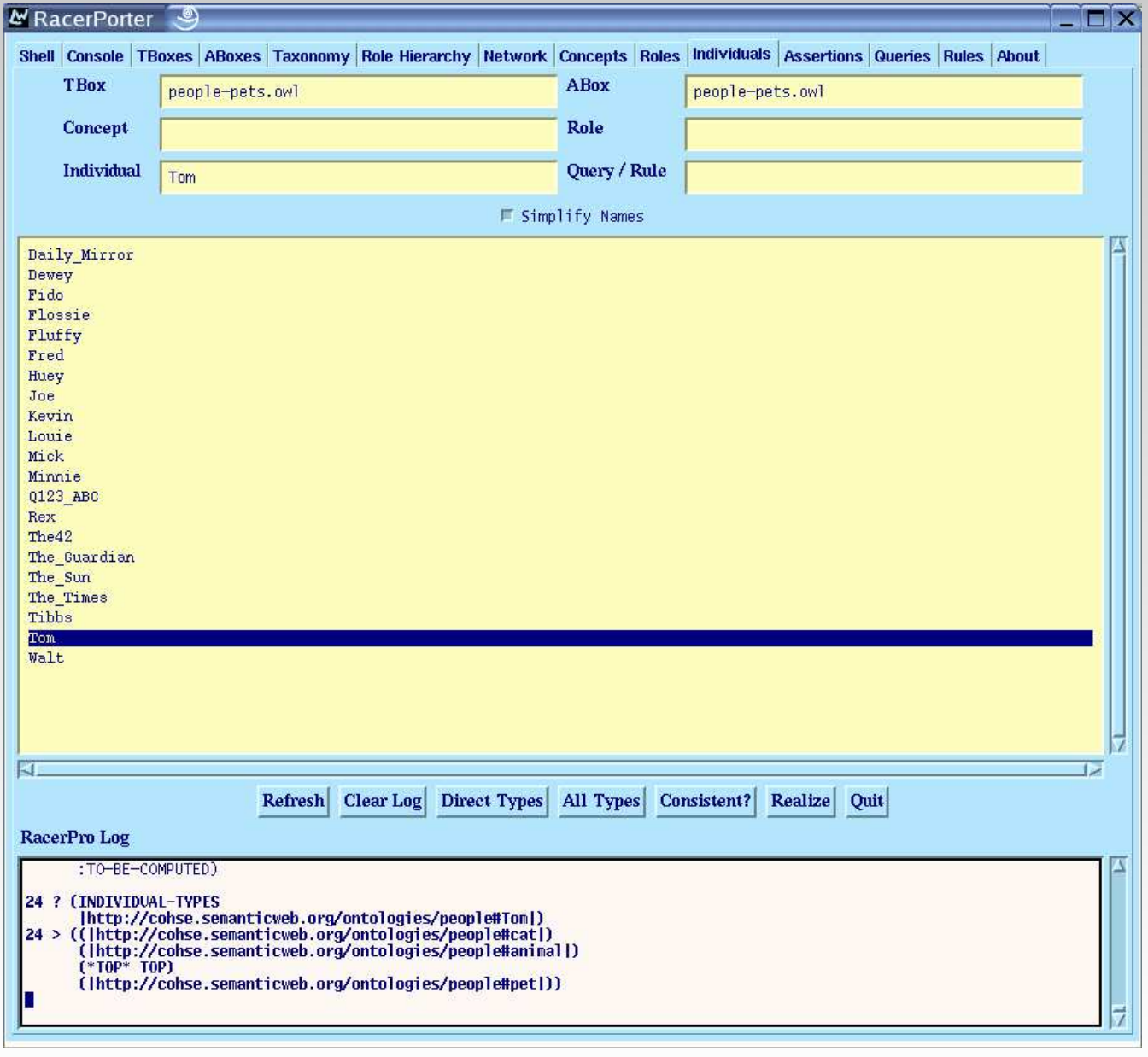
Graphical network display



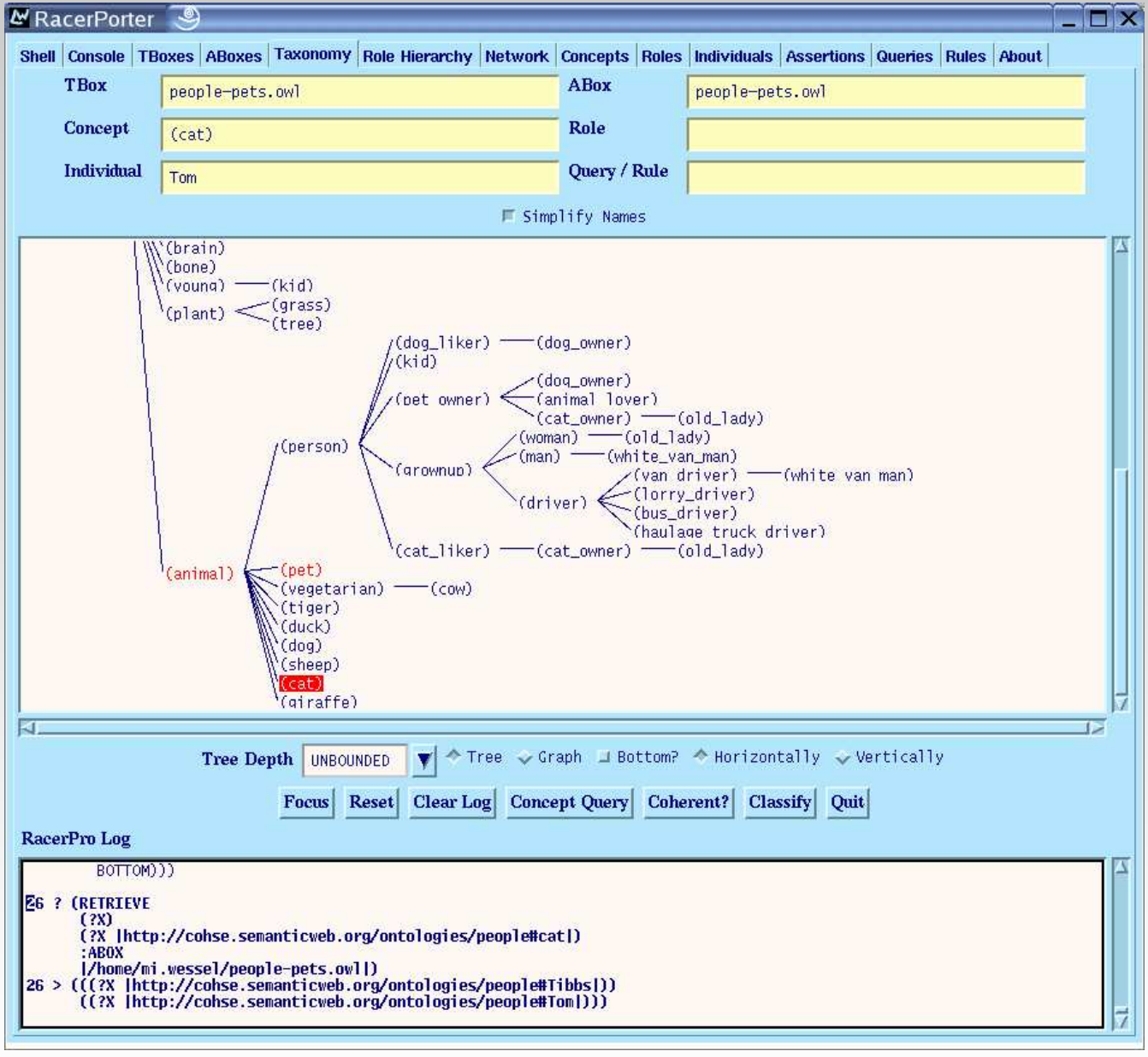
No knowledge concerning Tom



Tom is a cat!


RacerPorter
Shell
Console
TBoxes
ABoxes
Taxonomy
Role Hierarchy
Network
Concepts
Roles
Individuals
Assertions
Queries
Rules
About
TBox
people-pets.owl
ABox
people-pets.owl
Concept
Role
Individual
Tom
Query / Rule
Simplify Names
Daily_Mirror
Dewey
Fido
Flossie
Fluffy
Fred
Huey
Joe
Kevin
Louie
Mick
Minnie
Q123_ABC
Rex
The42
The_Guardian
The_Sun
The_Times
Tibbs
Tom
Walt
Refresh
Clear Log
Direct Types
All Types
Consistent?
Realize
Quit
RacerPro Log
:TO-BE-COMPUTED)
24 ? (INDIVIDUAL-TYPES
|http://cohse.semanticweb.org/ontologies/people#Tom|)
24 > ((|http://cohse.semanticweb.org/ontologies/people#cat|)
(|http://cohse.semanticweb.org/ontologies/people#animal|)
(*TOP* TOP)
(|http://cohse.semanticweb.org/ontologies/people#pet|))

Highlighting “types” of Tom

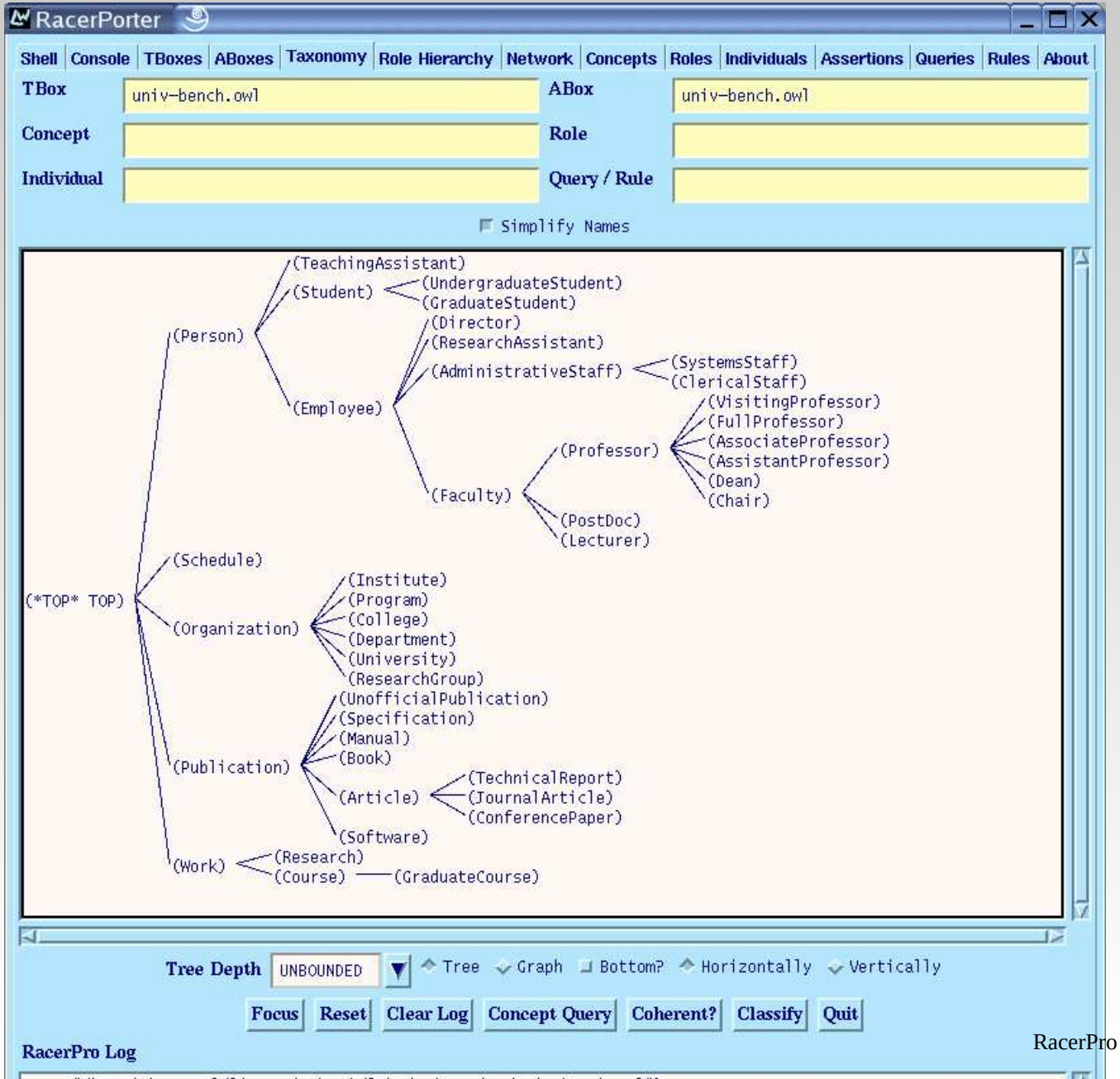


Graphical OWL Querying

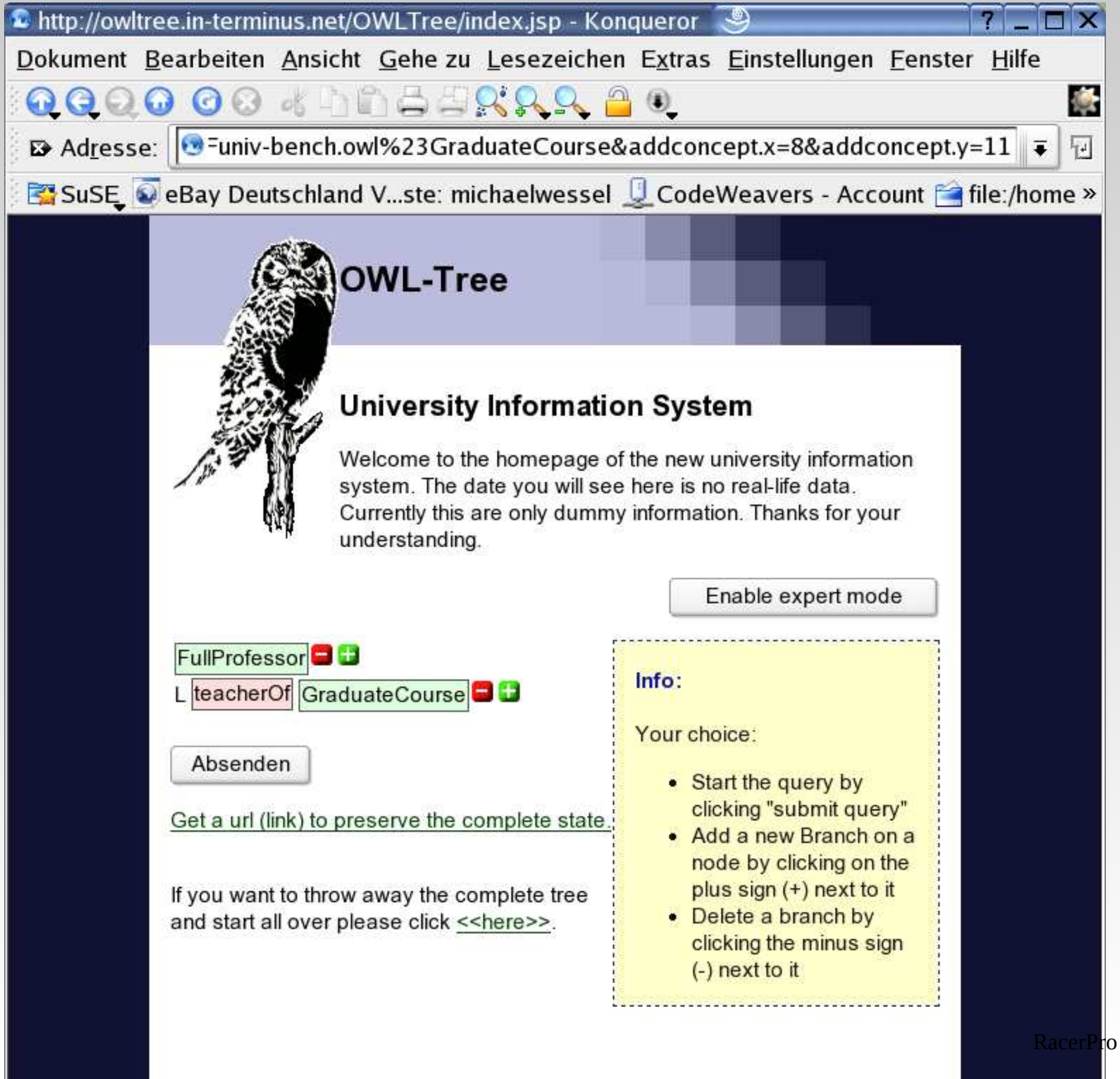
- OWL Tree: Graphical interactive query composition and result browsing
- Background ontology: Lehigh University Benchmark (LUBM) Ontology
- Modeling of a university (classes for professors, courses, students, . . .)
- "Real" web resources → "real" Semantic Web application!
- Queries are translated into nRQL queries, processed by RacerPro w.r.t. the background ontology
- Presentation given by RIKA students (?)

`owltree.in-terminus.net/OWLTree/index.jsp`

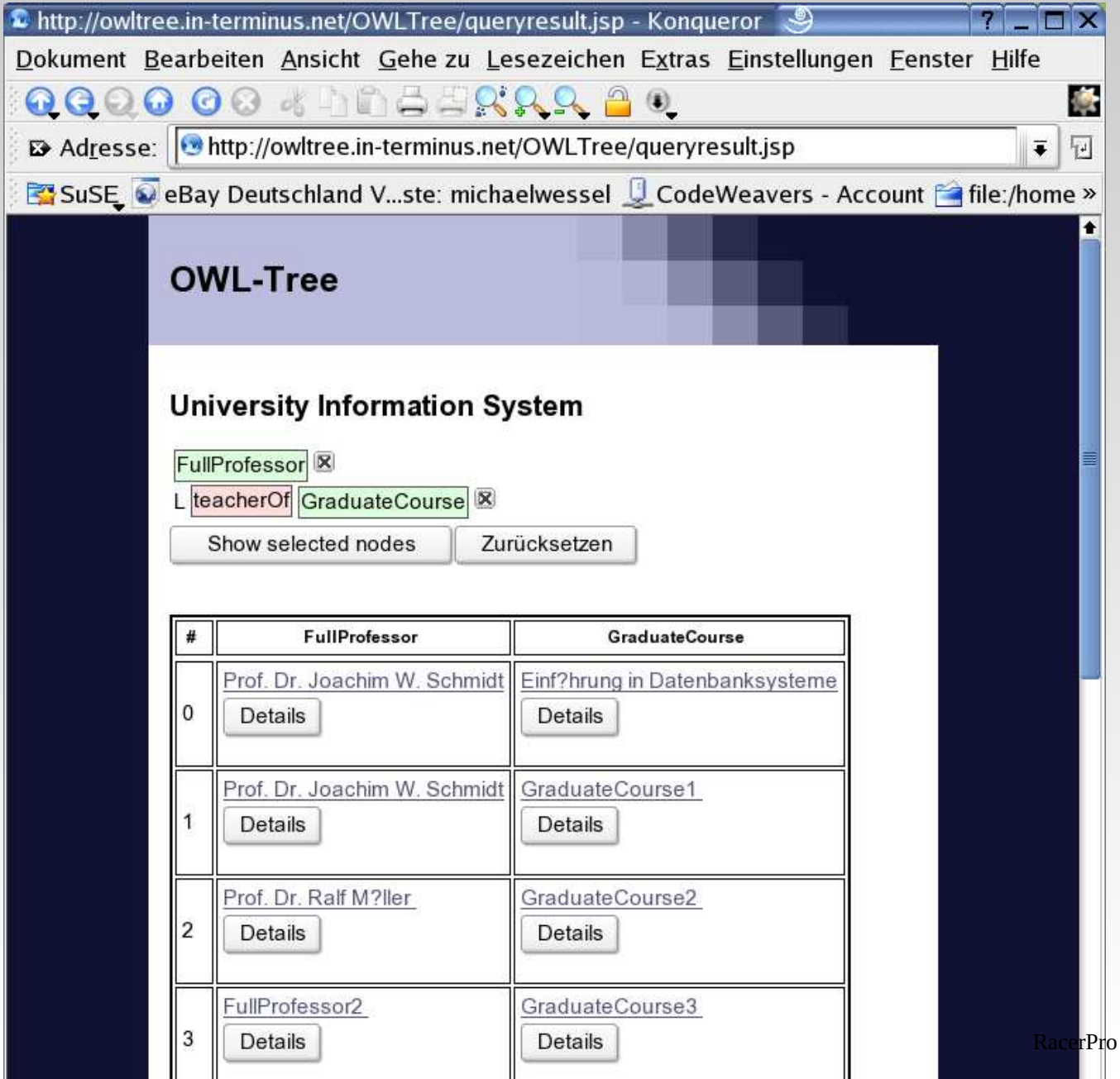
LUBM Background Ontology



Interactive Query Composition



Query Result



Ontology-based GIS

- DLMAPS = Description Logic Maps
- Map Data ©Amt für Geoinformation und Vermessung Hamburg
- DISK (“Digitale Stadtkarte”)
- Uses RacerPro as ontology server and reasoning engine
- Remodeling of “Objektschlüsselkatalog” (geographic categories) as RacerPro ontology
- Representation of map objects in an ABox
- Hybrid representation: additional spatial layer
- Spatio-thematic hybrid queries

`www.sts.tu-harburg.de/~mi.wessel/dlmaps/dlmaps.html`