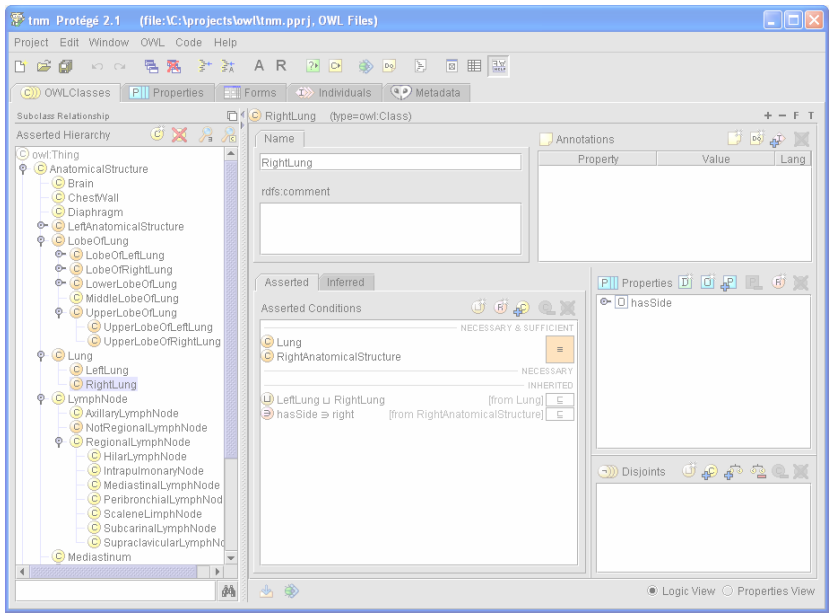
The Protégé OWL Plugin

Holger Knublauch

Stanford University

July 07 2004



Overview

The Semantic Web and OWL

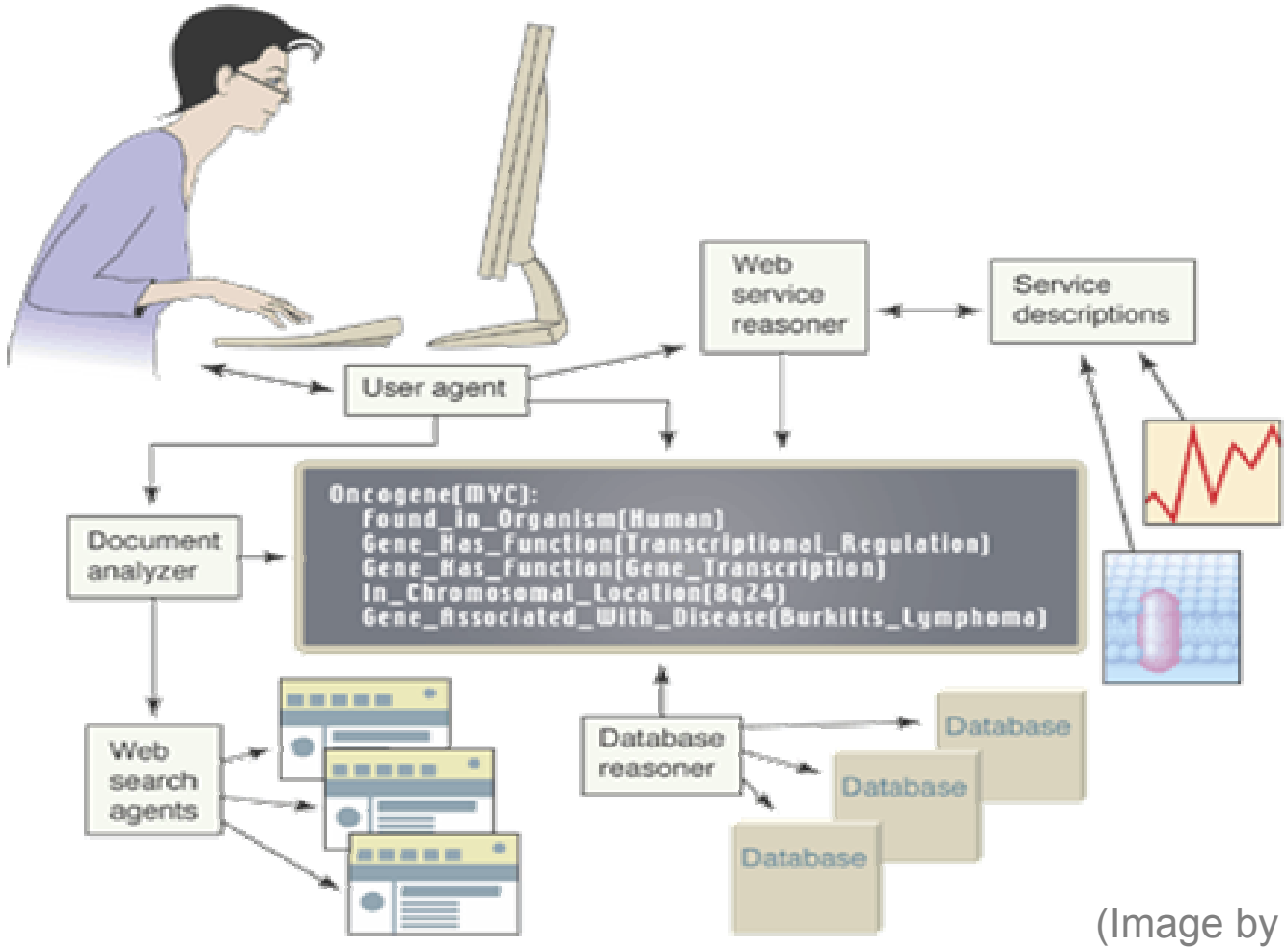
OWL in the Protégé Community

The OWL Plugin

Future Directions

The Semantic Web

Shared ontologies help to exchange data and meaning between web-based services



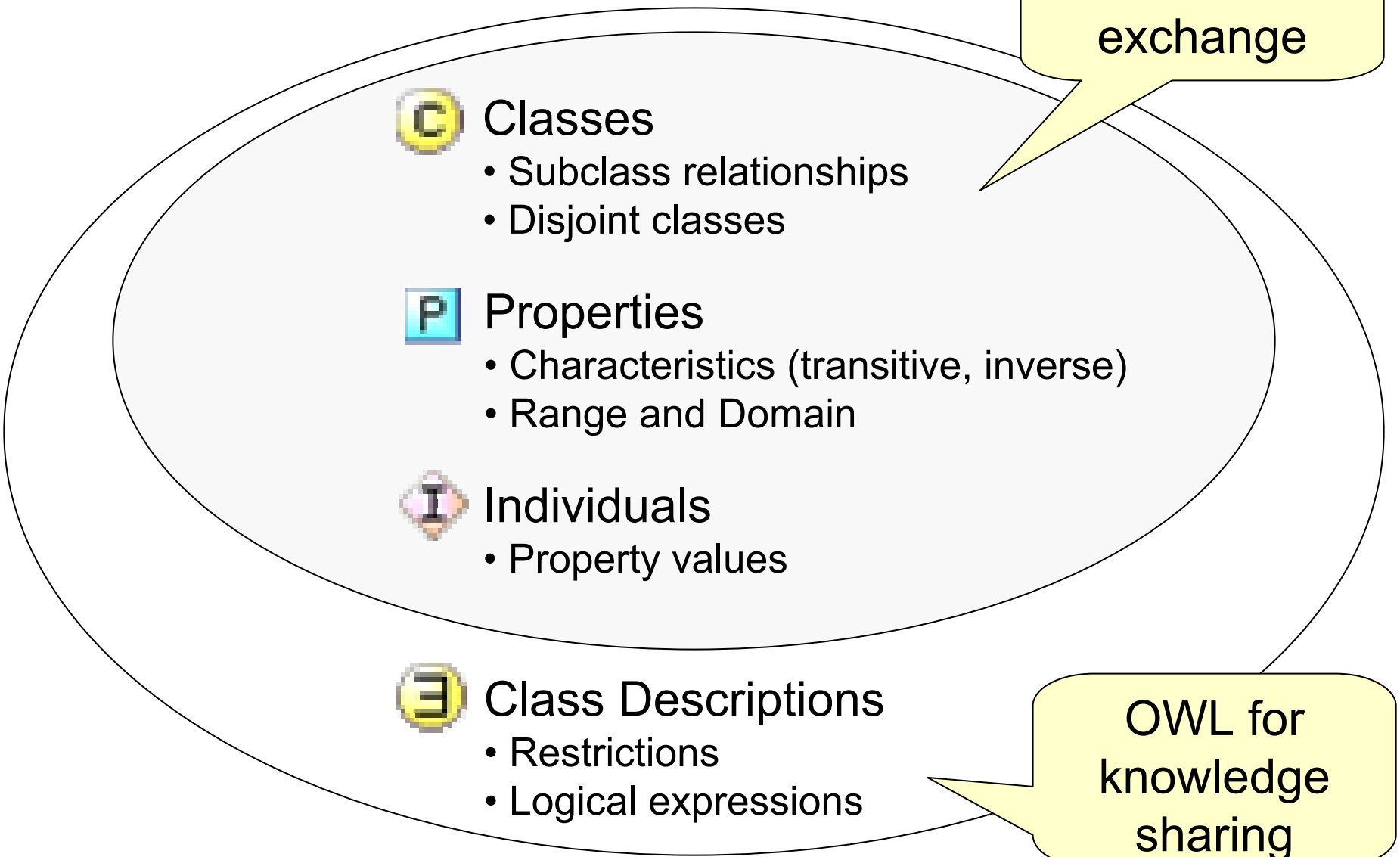
(Image by Jim Hendler)

OWL

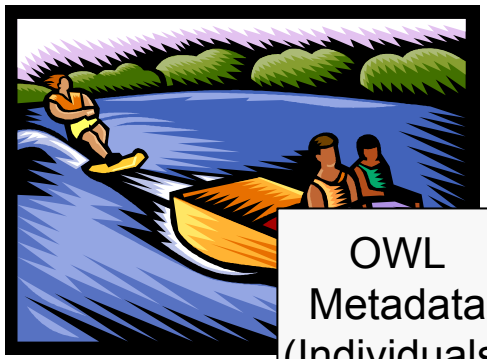
- Web Ontology Language
- Official W3C Standard since Feb 2004

- A Web Language: Based on RDF(S)
- An Ontology Language: Based on logic

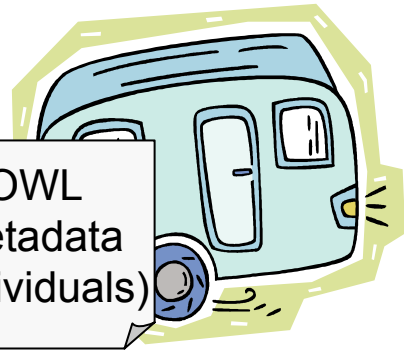
OWL Overview



Example Semantic Web



OWL Metadata (Individuals)



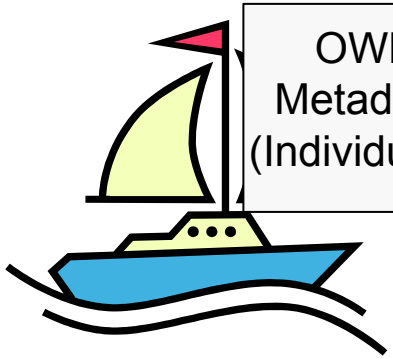
OWL Metadata (Individuals)

Tourism Ontology

Destination

Activity

Accomodation



OWL Metadata (Individuals)

OWL Metadata (Individuals)

Web Services

Description Logics

- Classes can be defined using logical expressions about their members.

Restrictions


allValuesFrom


someValuesFrom


hasValue


minCardinality


maxCardinality


cardinality

Logical Expressions


unionOf


intersectionOf


complementOf

Enumerations

{red green blue}

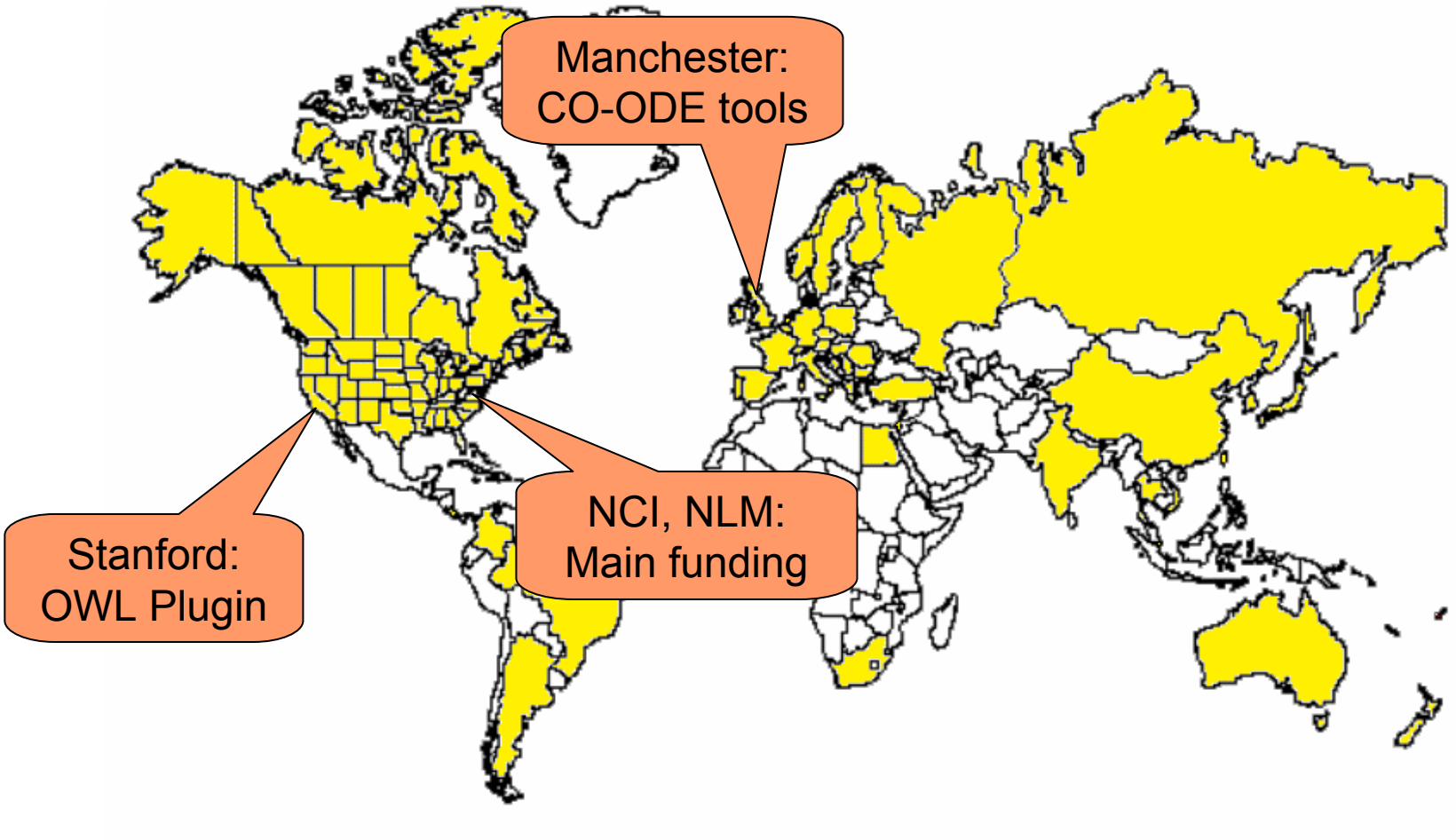
Description Logics Example

- Asserted definitions:
  - "National parks provide hiking trails"
  - "Hiking is a sport"
  - "Those destinations with sporting facilities are backpacker's destinations"
- Automatically inferred:
  - National parks are backpacker's destinations

Class Descriptions: Why?

- Make knowledge sharable with machines
- Make explicit intentions and modeling decisions (comparable to test cases)
- Make sure that individuals fulfill conditions
- Tool-supported reasoning
  - Classification of classes and individuals
  - Consistency Checking

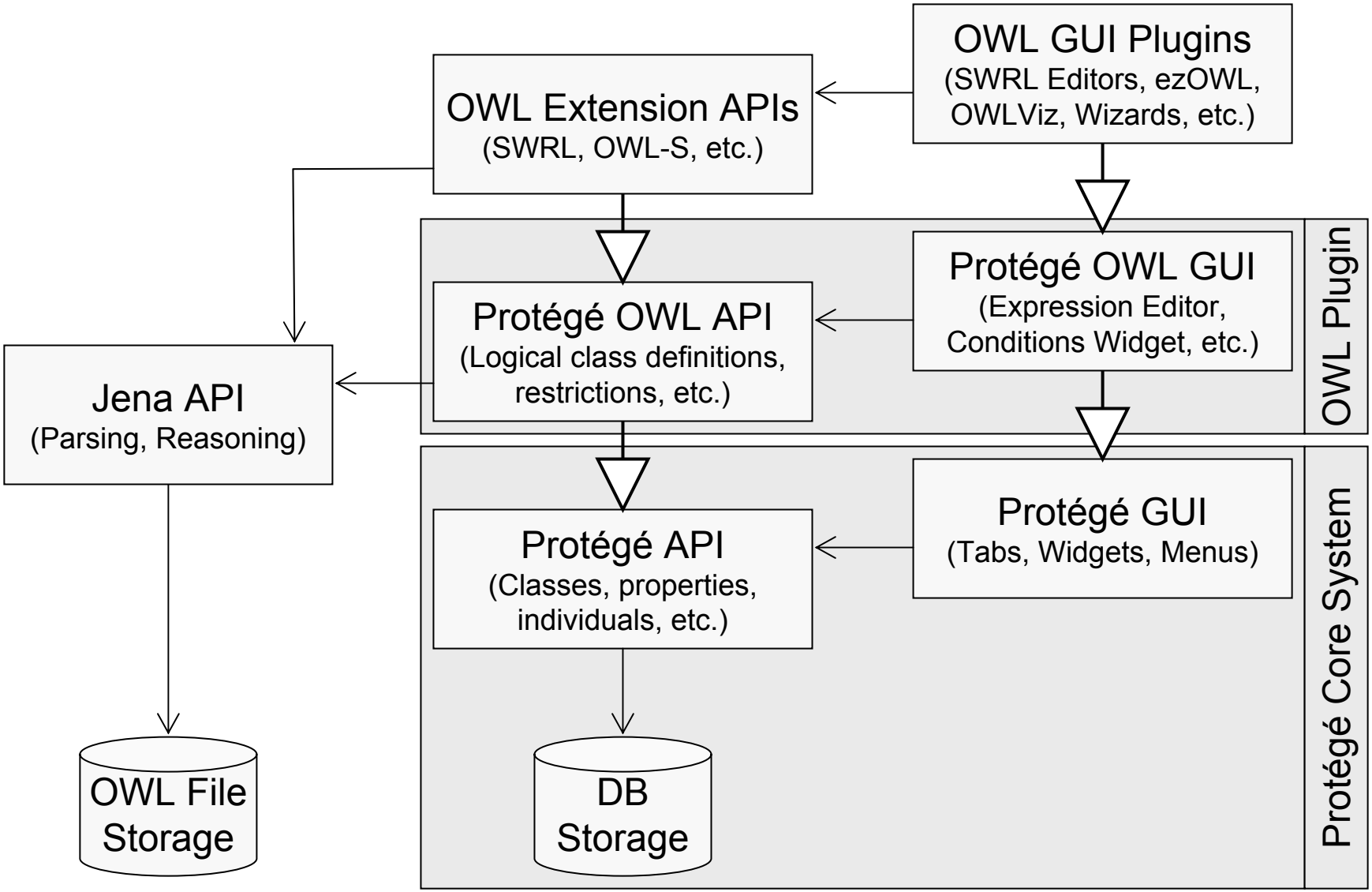
Protégé OWL Community



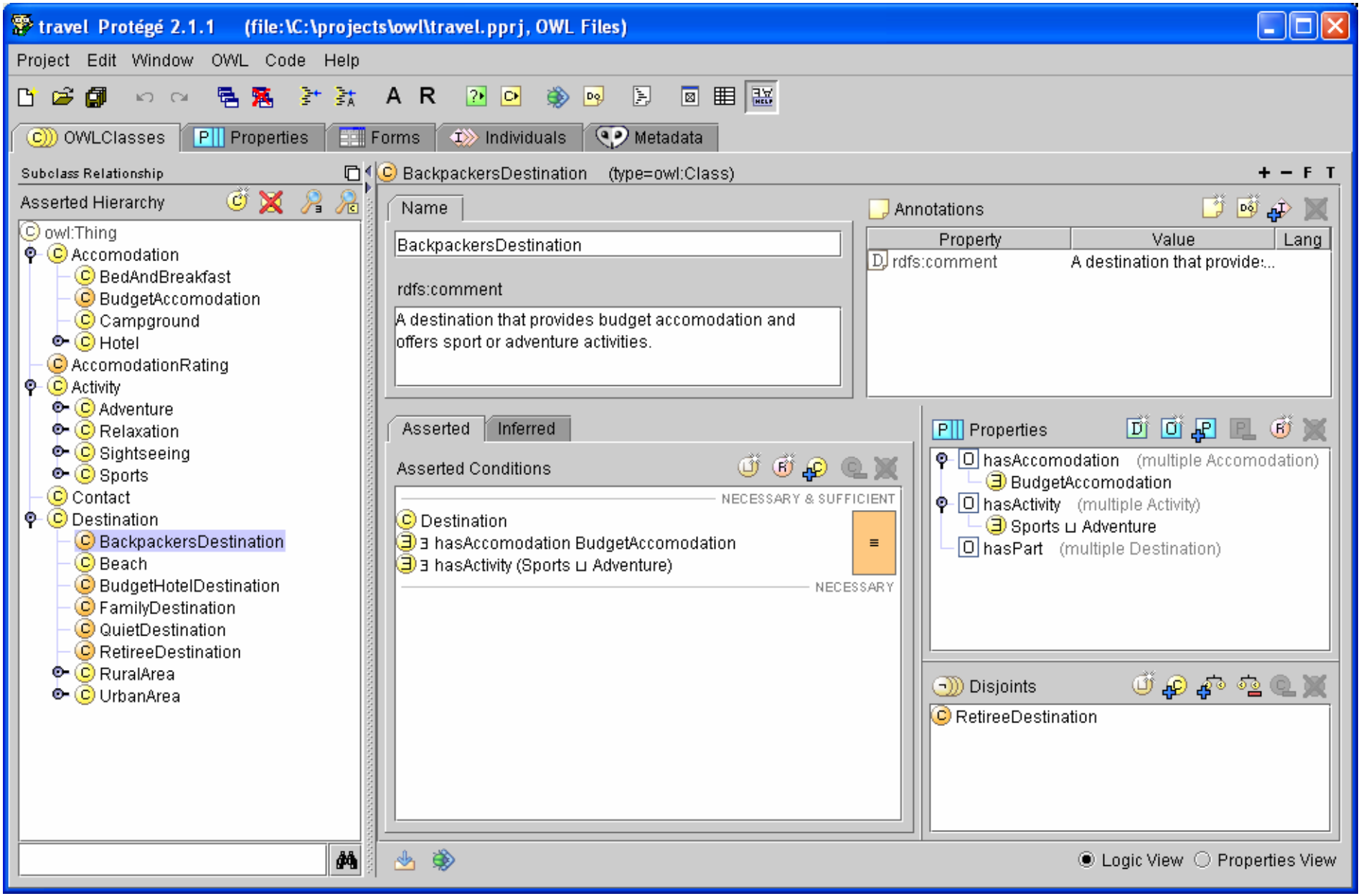
OWL Plugin

- Large Protégé Plugin (>560 classes)
- Extends base system with
  - OWL language capabilities (metamodel, files)
  - Custom-tailored user interface
  - Access to description logic reasoners
  - Code generators etc
- Many features are native to OWL
- Backwards compatible where possible

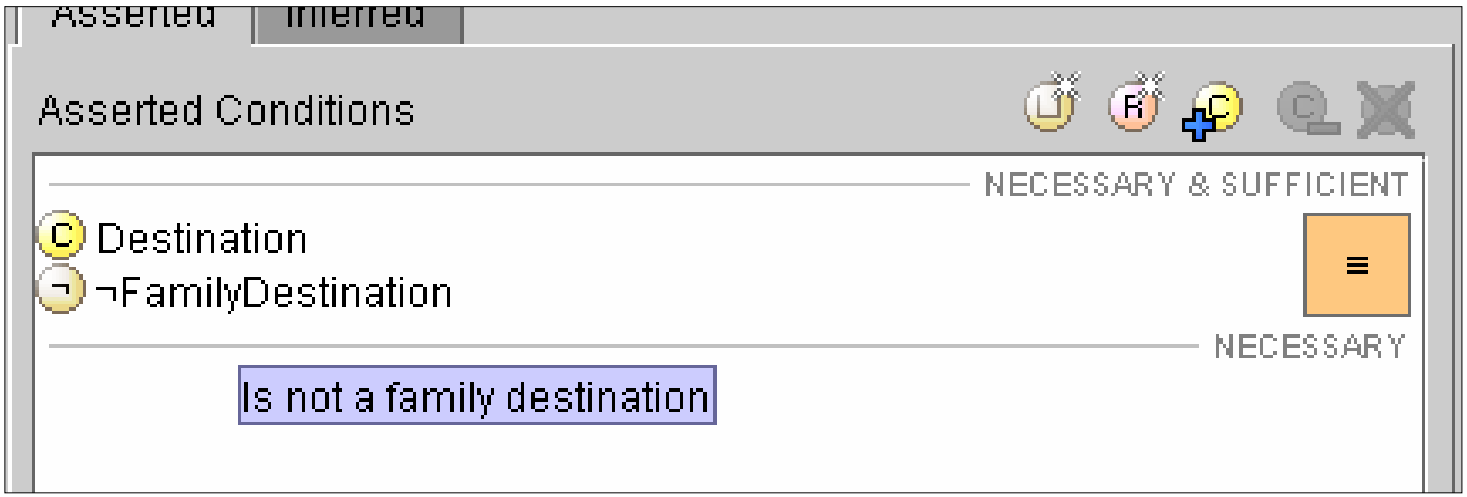
OWL Plugin Architecture



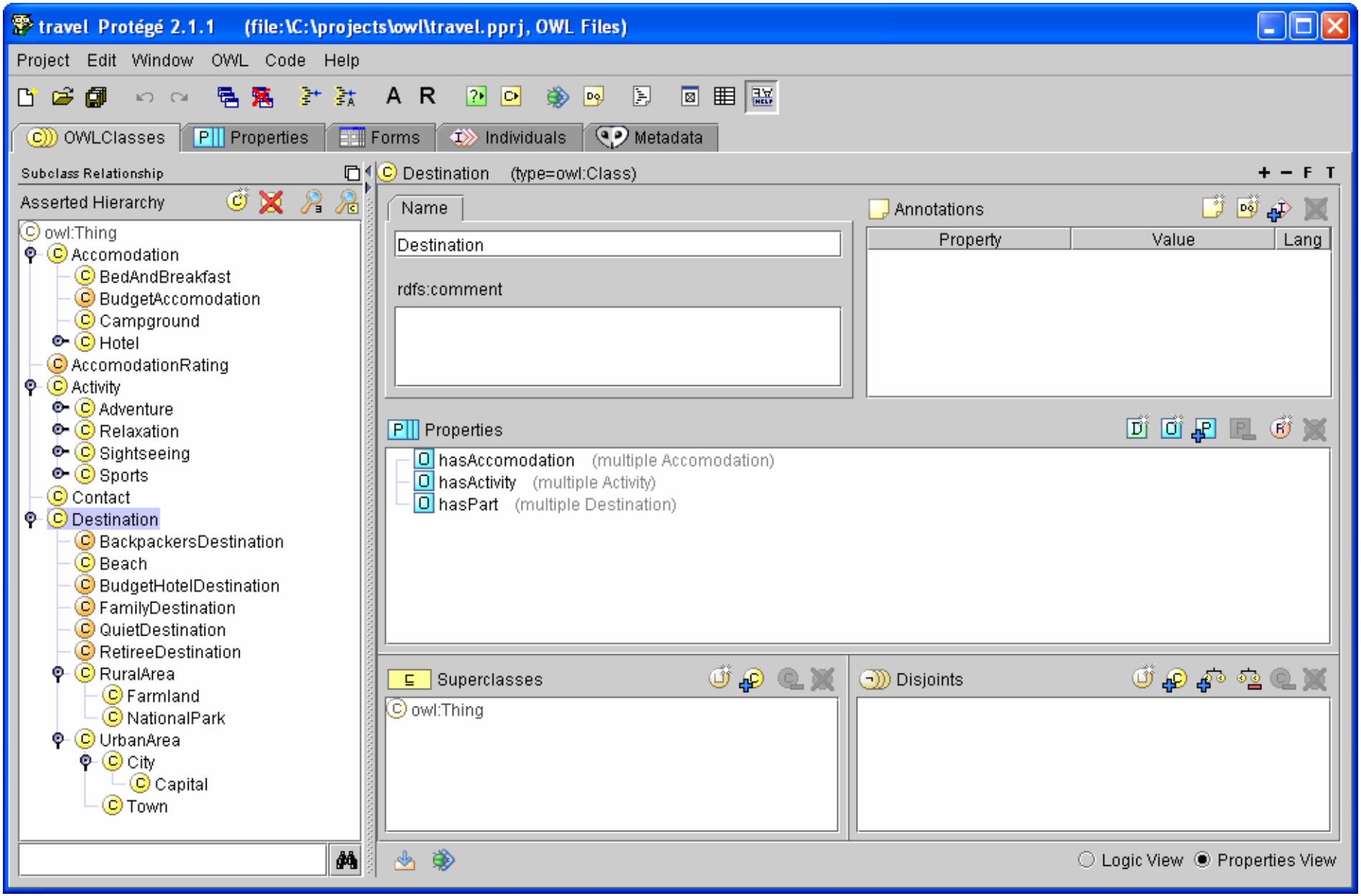
Logic View


travel Protégé 2.1.1 (file:\C:\projects\owl\travel.pprj, OWL Files)
Project Edit Window OWL Code Help
OWLClasses Properties Forms Individuals Metadata
Subclass Relationship
Asserted Hierarchy
owl:Thing
Accomodation
BedAndBreakfast
BudgetAccomodation
Campground
Hotel
AccomodationRating
Activity
Adventure
Relaxation
Sightseeing
Sports
Contact
Destination
BackpackersDestination
Beach
BudgetHotelDestination
FamilyDestination
QuietDestination
RetireeDestination
RuralArea
UrbanArea
BackpackersDestination (type=owl:Class)
Name
BackpackersDestination
rdfs:comment
A destination that provides budget accomodation and offers sport or adventure activities.
Annotations
Property
Value
Lang
rdfs:comment
A destination that provide:...
Asserted
Inferred
Asserted Conditions
NECESSARY & SUFFICIENT
Destination
∃ hasAccomodation BudgetAccomodation
∃ hasActivity (Sports ⊔ Adventure)
≡
NECESSARY
Properties
hasAccomodation (multiple Accomodation)
BudgetAccomodation
hasActivity (multiple Activity)
Sports ⊔ Adventure
hasPart (multiple Destination)
Disjoints
RetireeDestination
Logic View
Properties View

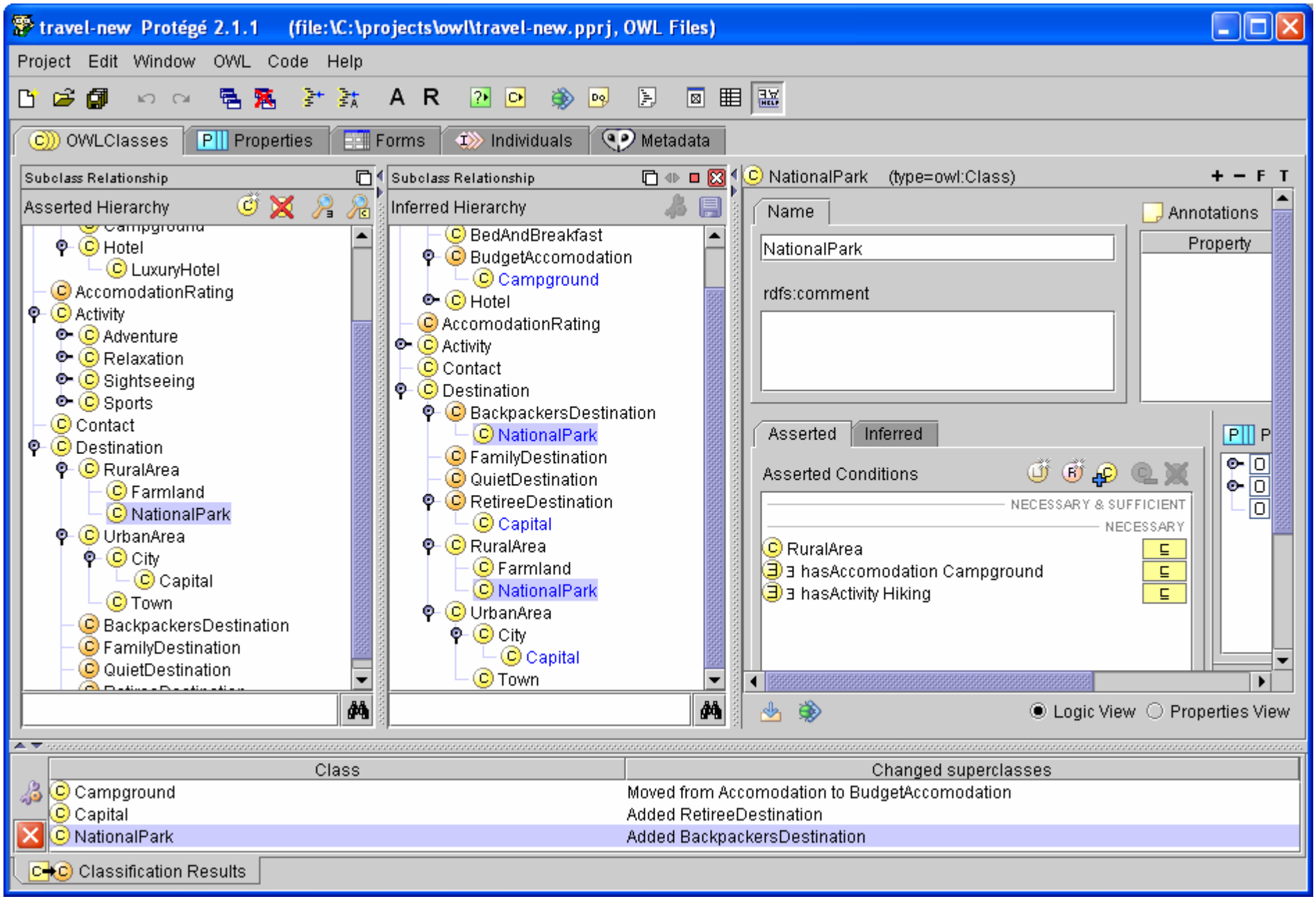
Prose Generation



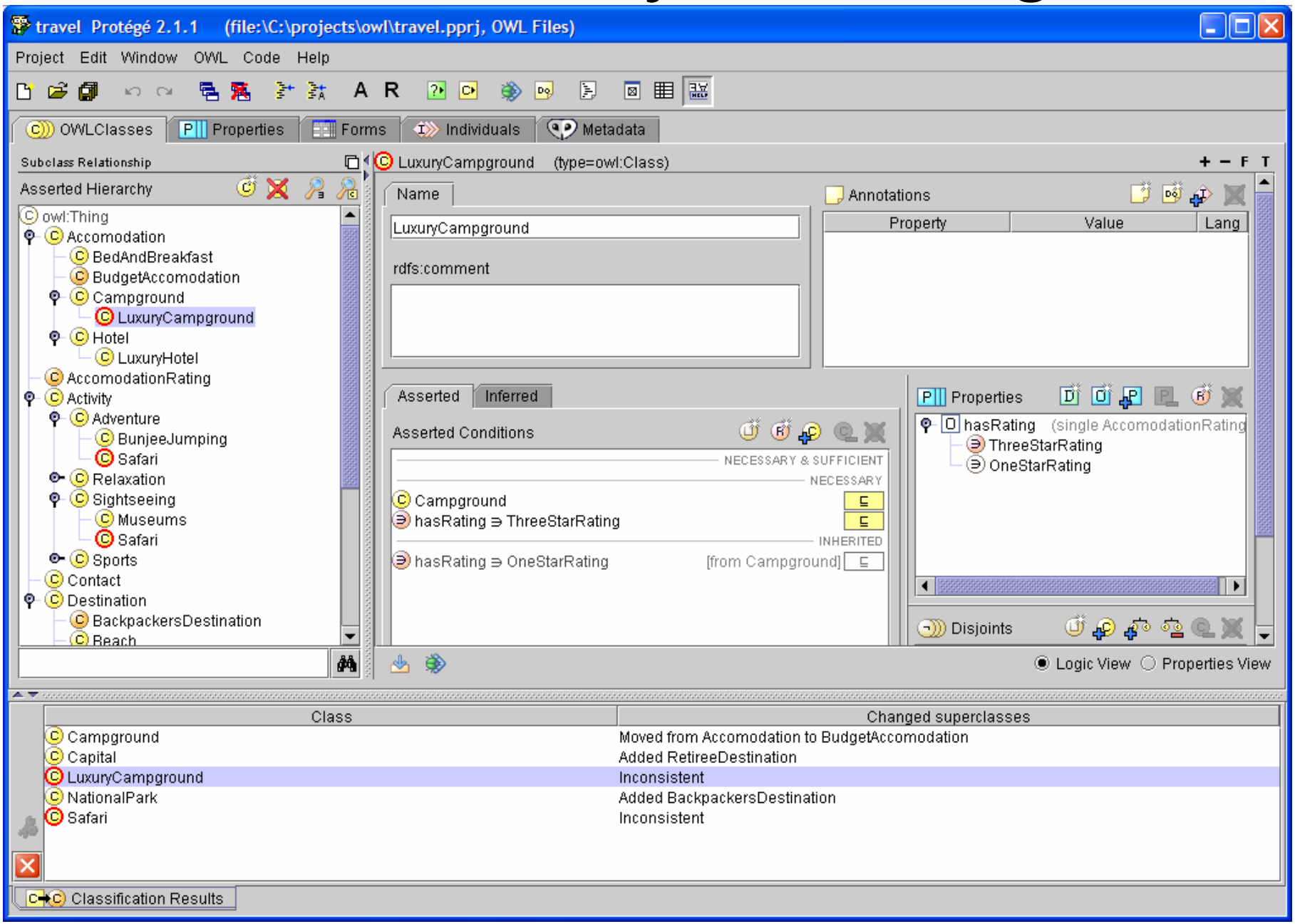
Properties View



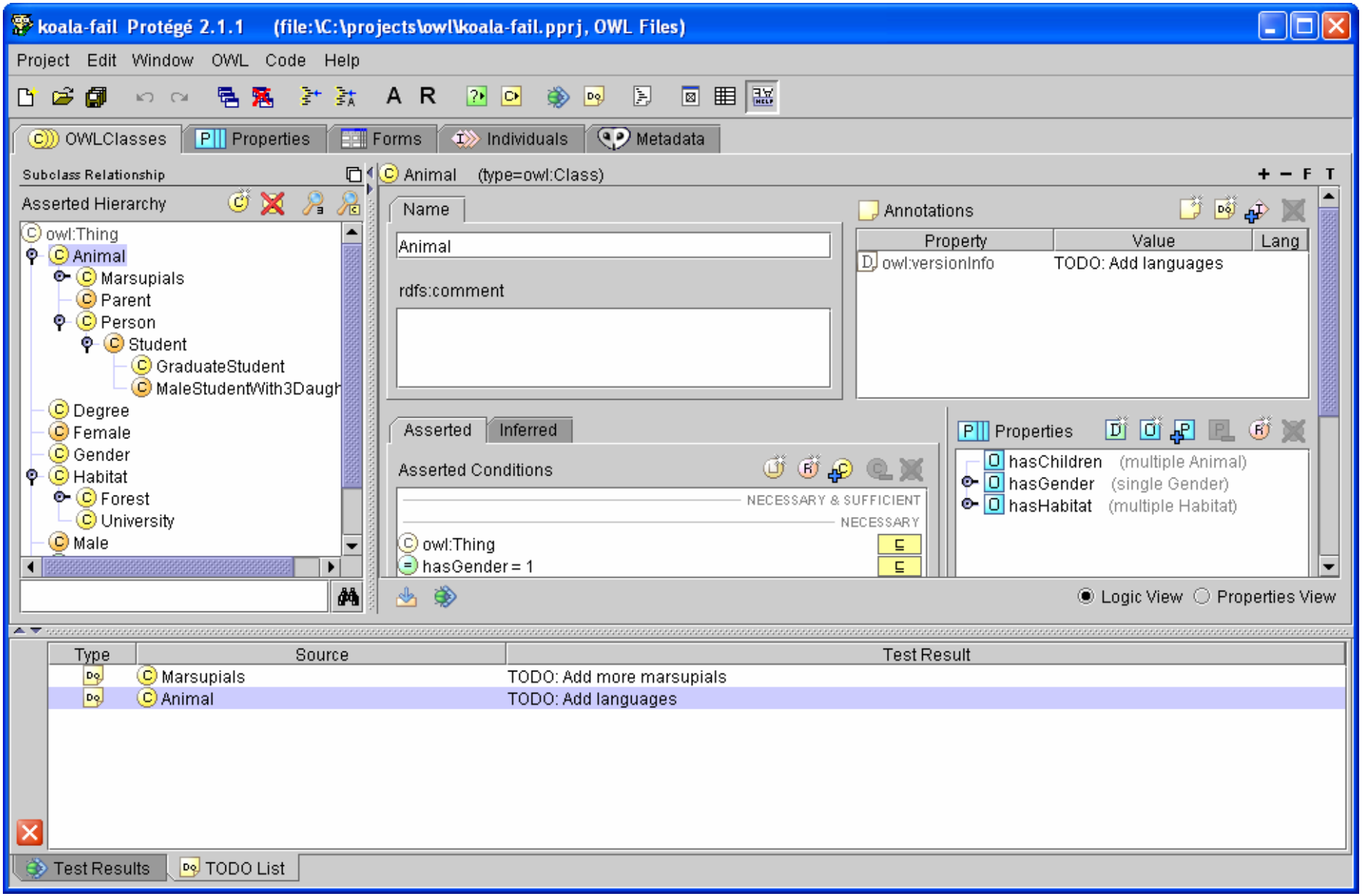
Classification



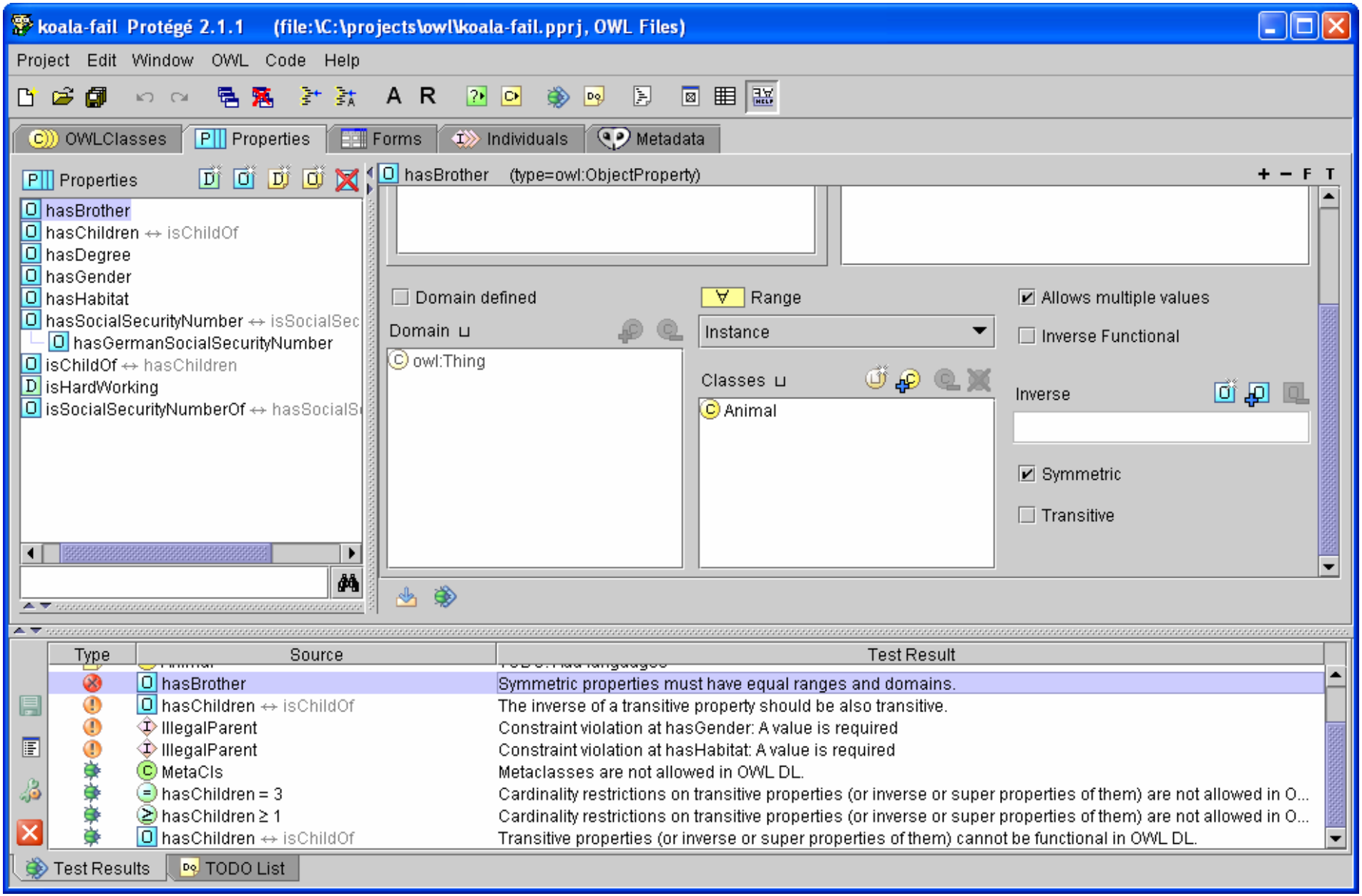
Consistency Checking



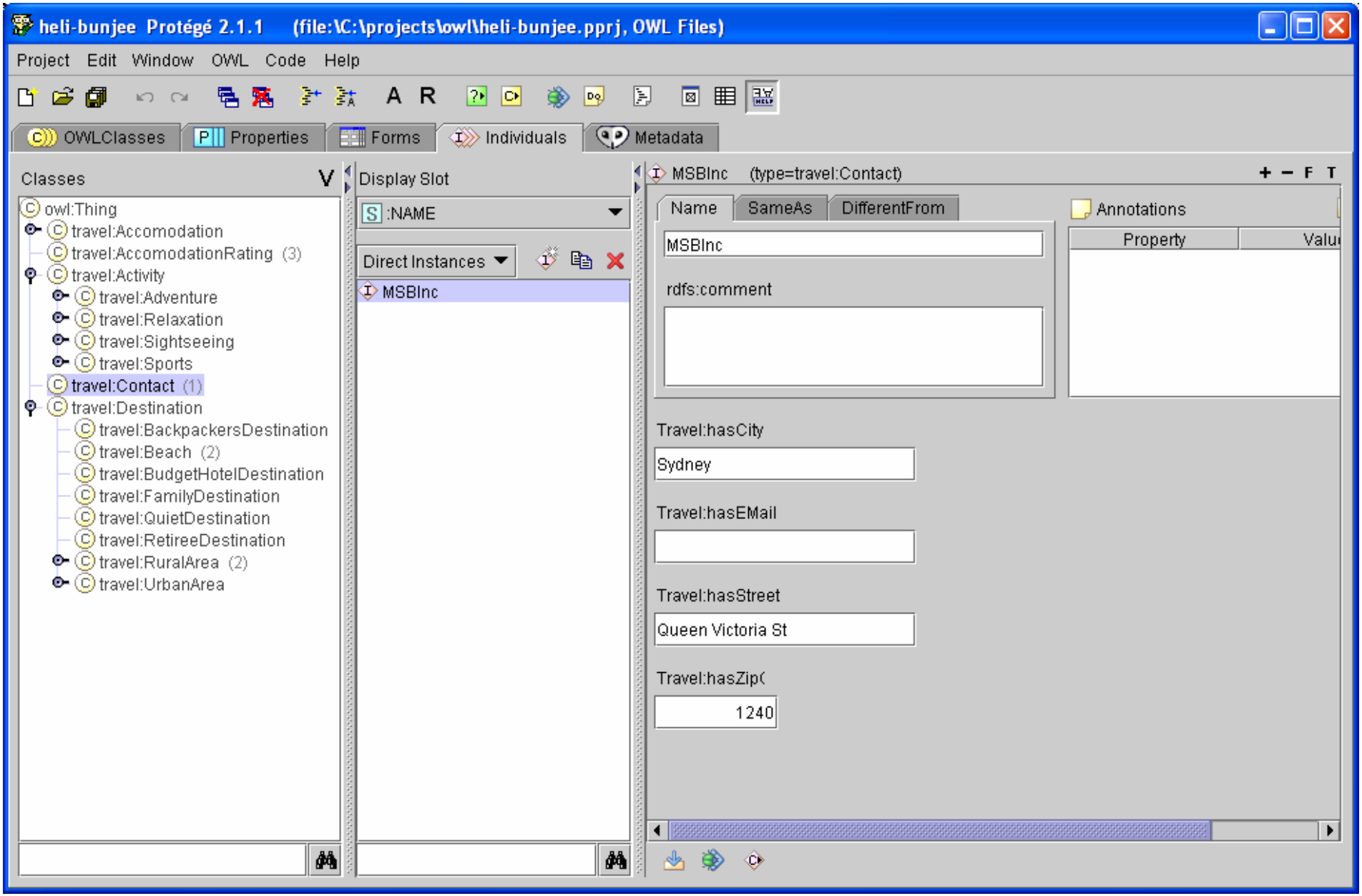
TODO Lists


koala-fail Protégé 2.1.1 (file:\C:\projects\owl\koala-fail.pprj, OWL Files)
Project Edit Window OWL Code Help
OWLClasses Properties Forms Individuals Metadata
Subclass Relationship
Asserted Hierarchy
owl:Thing
Animal
Marsupials
Parent
Person
Student
GraduateStudent
MaleStudentWith3Daugh
Degree
Female
Gender
Habitat
Forest
University
Male
Animal (type=owl:Class)
Name
Animal
rdfs:comment
Annotations
Property
Value
Lang
owl:versionInfo
TODO: Add languages
Asserted
Inferred
Asserted Conditions
NECESSARY & SUFFICIENT
NECESSARY
owl:Thing
hasGender = 1
Properties
hasChildren (multiple Animal)
hasGender (single Gender)
hasHabitat (multiple Habitat)
Logic View
Properties View
Type
Source
Test Result
Marsupials
TODO: Add more marsupials
Animal
TODO: Add languages
Test Results
TODO List

Ontology Tests

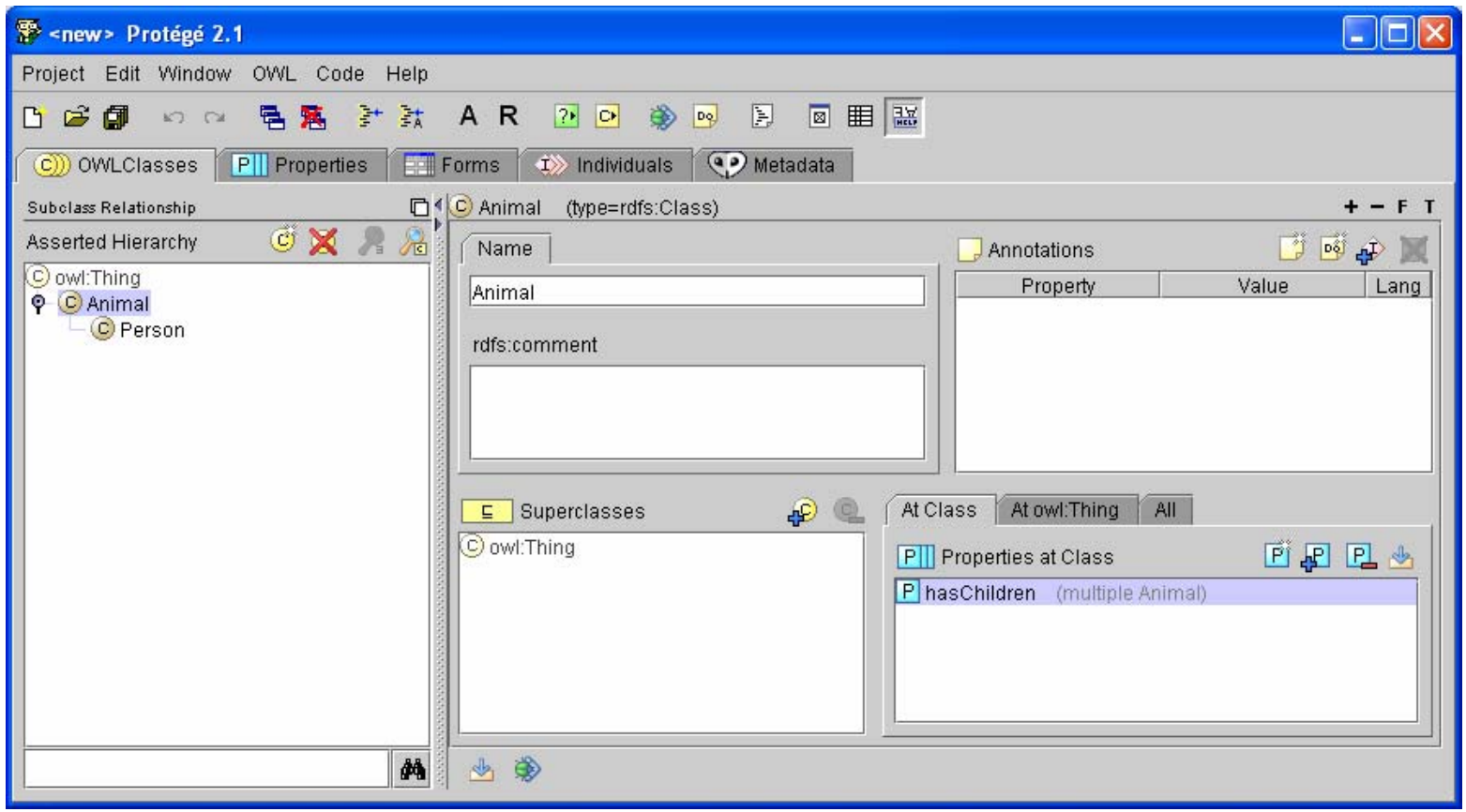


Individuals



RDF(S) Editing

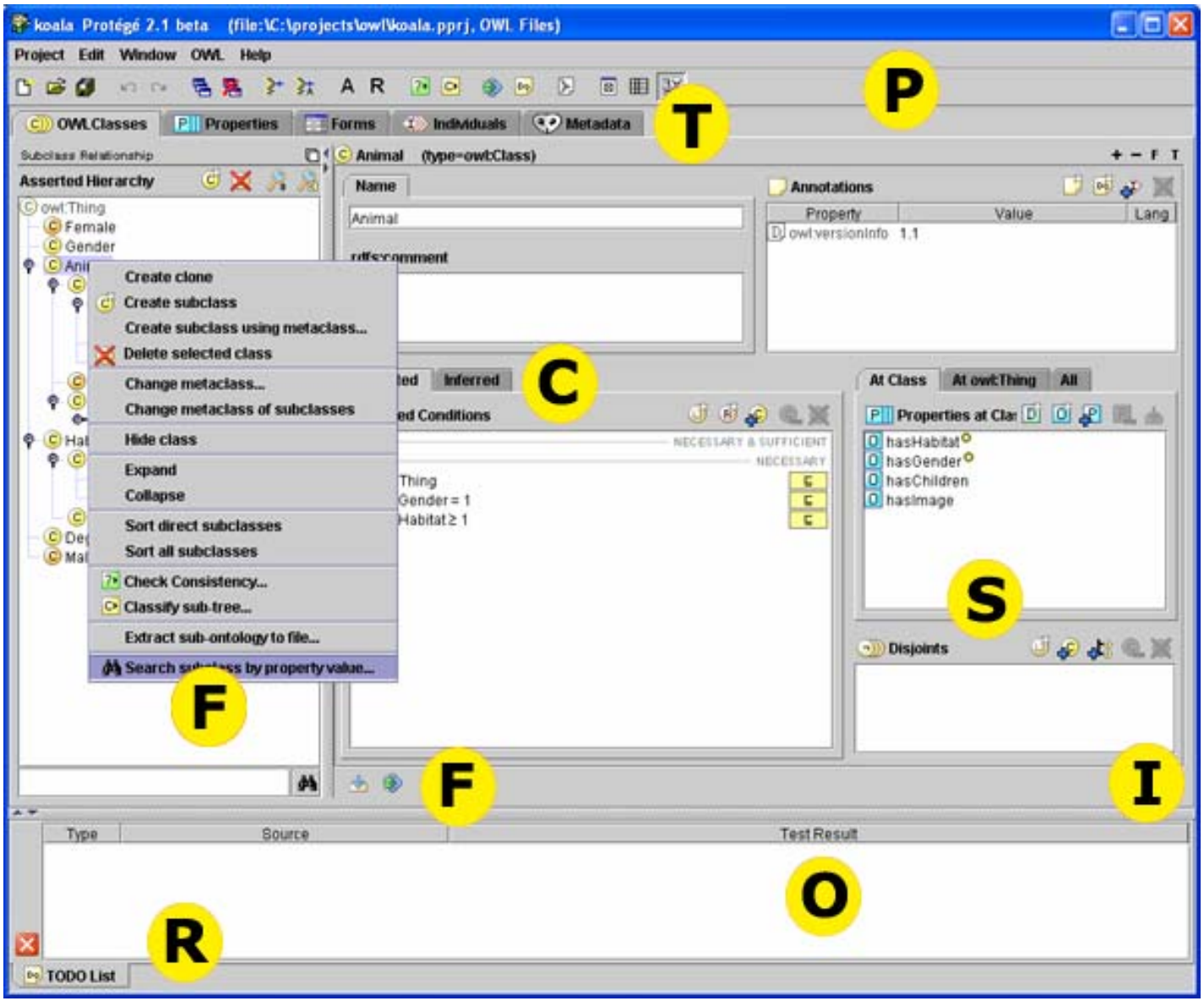
- OWL extends RDF, OWL Plugin can edit RDF
- Select Language Profile RDF(S)



Code Generators

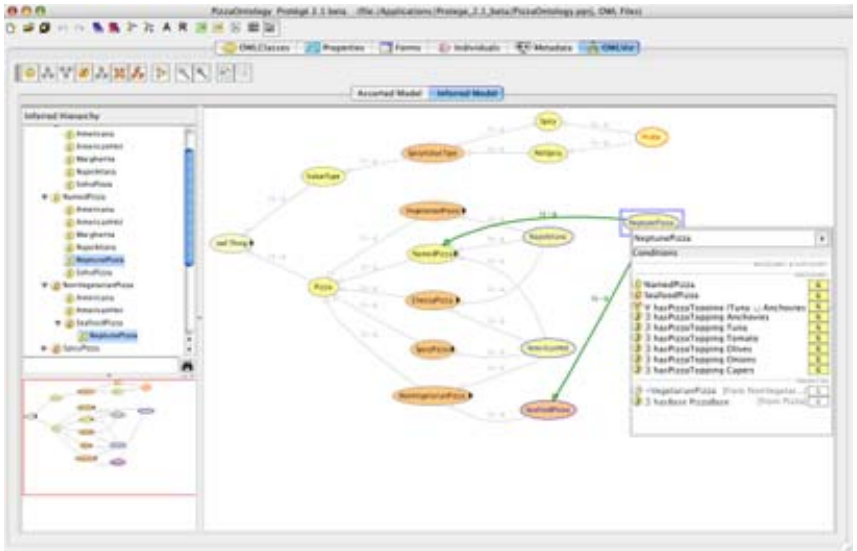
- Create Java classes to easier access OWL ontologies
  - Jena Schema generator
  - Kazuki interfaces
- Better integration into other software development activities

Extending the OWL Plugin

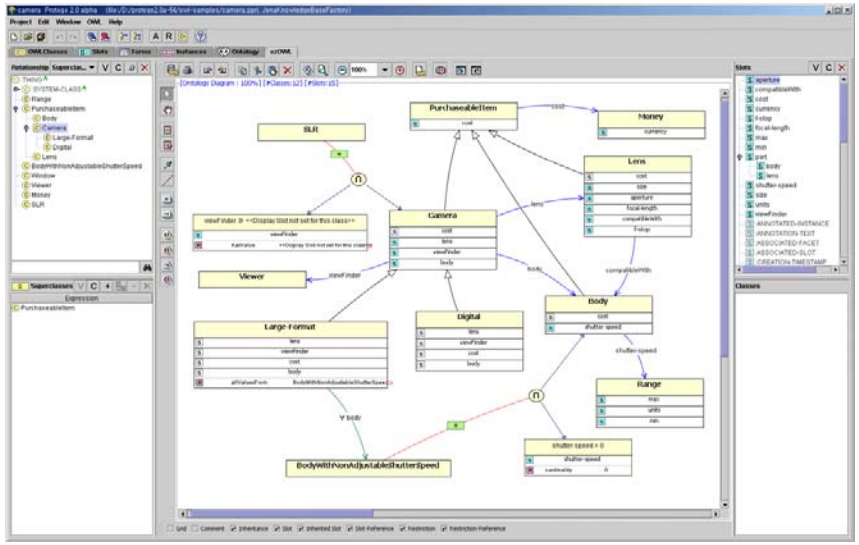


Other OWL Plugins

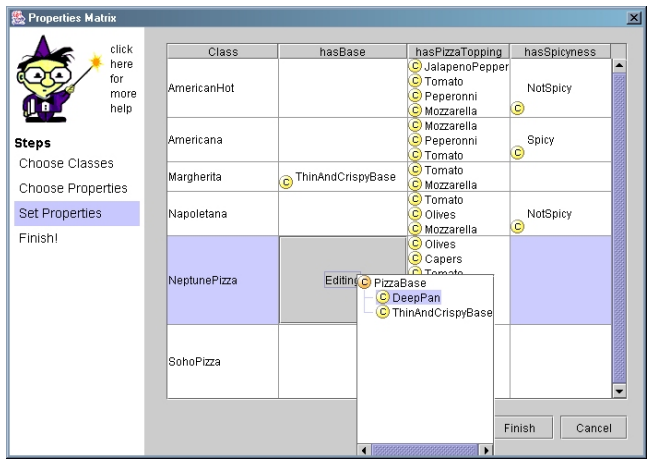
OWLViz (Manchester)



ezOWL (Korea)



OWLWizards (Manchester)

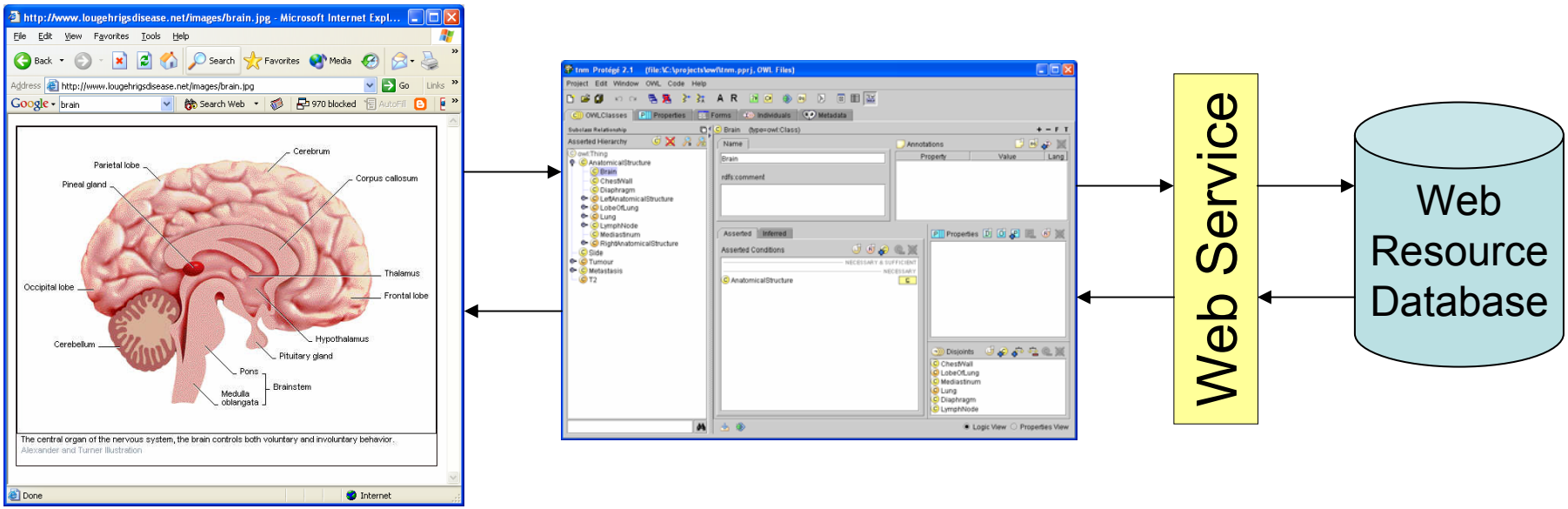


Under Development:

- OWL-S
- SWRL
- Semantic Debugging
- Joseki (Jena Database)

Integrating Web Services

- Arbitrary extensions can benefit from the Protégé infrastructure as a platform



OWL Benefits

- OWL is the W3C ontology standard
- Interoperable with RDF and XML
- Growing community and tool support
- OWL has formal semantics and built-in reasoning support
- Semantics support maintenance of large ontologies / knowledge models

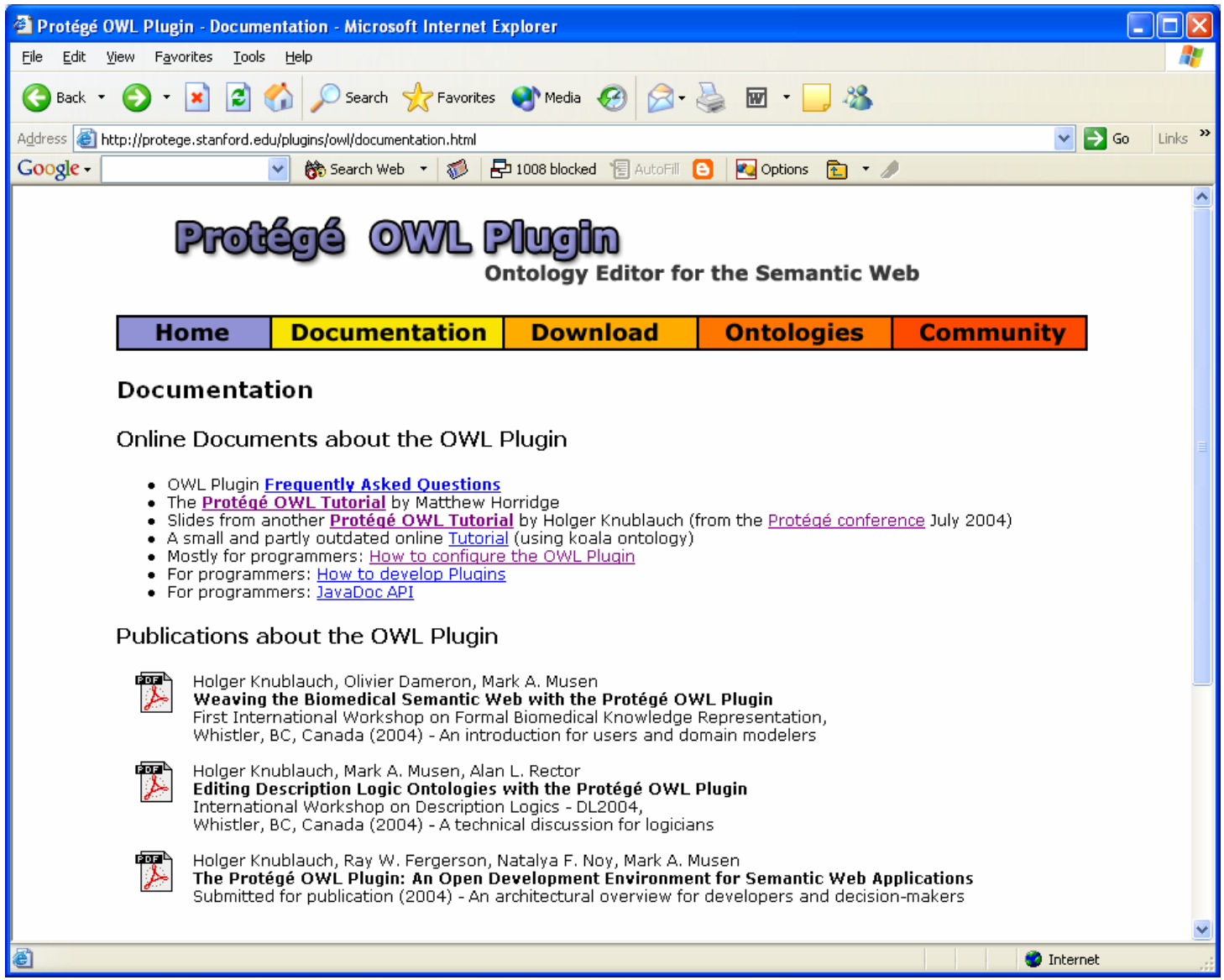
Protégé OWL Benefits

- A de facto standard tool in the OWL world
- Growing number of plugins / adaptations
- Custom-tailored Open-Source API
- Online support
- Robust platform
- Compatibility with Jena
- Scalable (Database backend)

OWL Risks

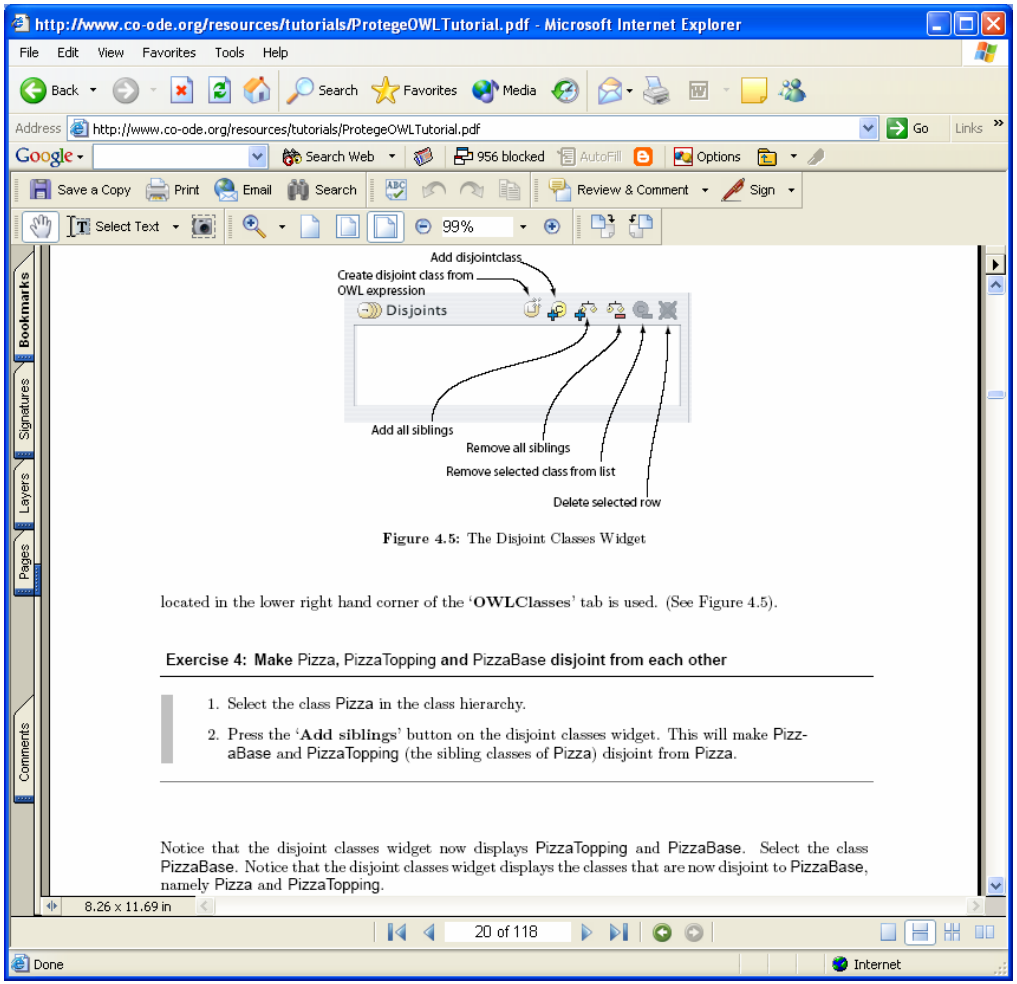
- Steep learning curve
  - Difficult syntax
  - Difficult semantics (→ OWL Tutorial)
- Semantic Web hype /
  Lack of real-world example applications
- Chicken-and-egg problem of Semantic Web

Getting Started



OWL Tutorial (Manchester)

http://www.co-ode.org/resources/



Outlook

- OWL will remain a focus at Stanford
  - Simpler user interface
  - Better Workflow/Versioning support
  - Optimized access to reasoners (RACER)
  - Numeric range restrictions
  - Access to UML/Model Driven Architecture
- More plugins will be available
- Collaborations?