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Collaborative Ontology Development and Evolution with WebProtégé and BioPortal

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Stanford University

and the WebProtégé and BioPortal teams

Download Tutorial Slides

- Download:
  - http://tinyurl.com/ICBO2011-WP-BP
- Pages with the following icon are for the record only. We will switch to the demo for these pages:

By the end of the tutorial you will..

- understand how you can develop ontologies collaboratively
- participate in a collaborative ontology development
- know how to custom-tailor WebProtégé user interface for specific projects
- understand when to use WebProtégé and BioPortal in the life-cycle of ontology development
- know how to integrate WebProtégé and BioPortal in a single workflow
- know how to collect feedback on your published ontology from the user community and to provide feedback
- ....

Tutorial Outline

- Lifecycle of collaborative ontology development
- The Stanford ontology tools
- Collaborative development in WebProtégé
  - with hands-on exercises
- Soliciting feedback in BioPortal
  - with hands-on exercises
- Bringing it all together: viewing contributions from BioPortal in WebProtégé and vice versa

Collaborative Ontology Development

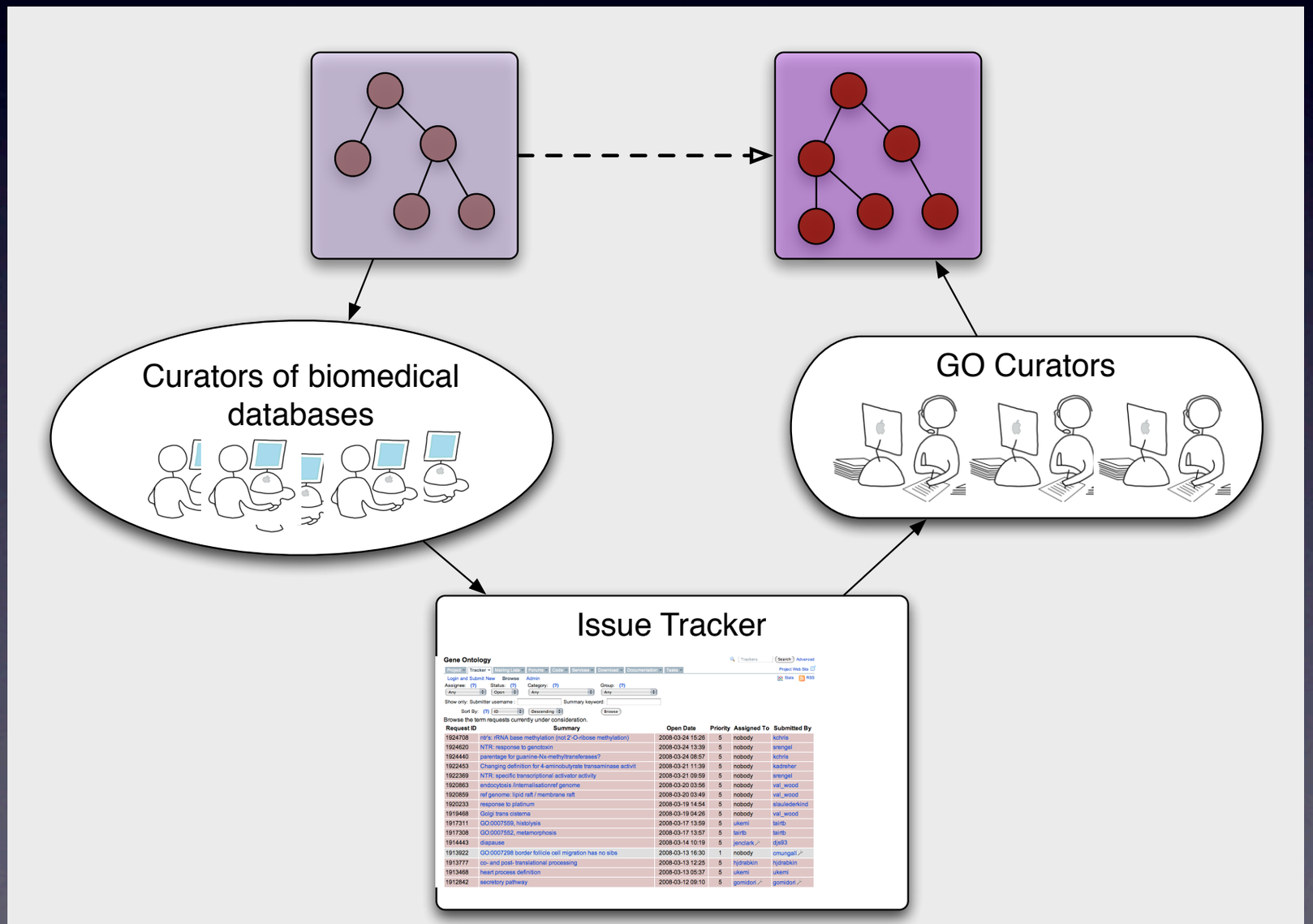
- Collaborative
  - Several users contribute to a single developing ontology
  - There are mechanisms to carry out discussions and to reach consensus
- Ontologies
  - From simple taxonomies
  - To expressive OWL ontologies

Use Cases in Biomedical Domain

- Gene Ontology (GO)
- NCI Thesaurus
- International Classification of Diseases (ICD-11)
- OBI, RadLex

The Gene Ontology

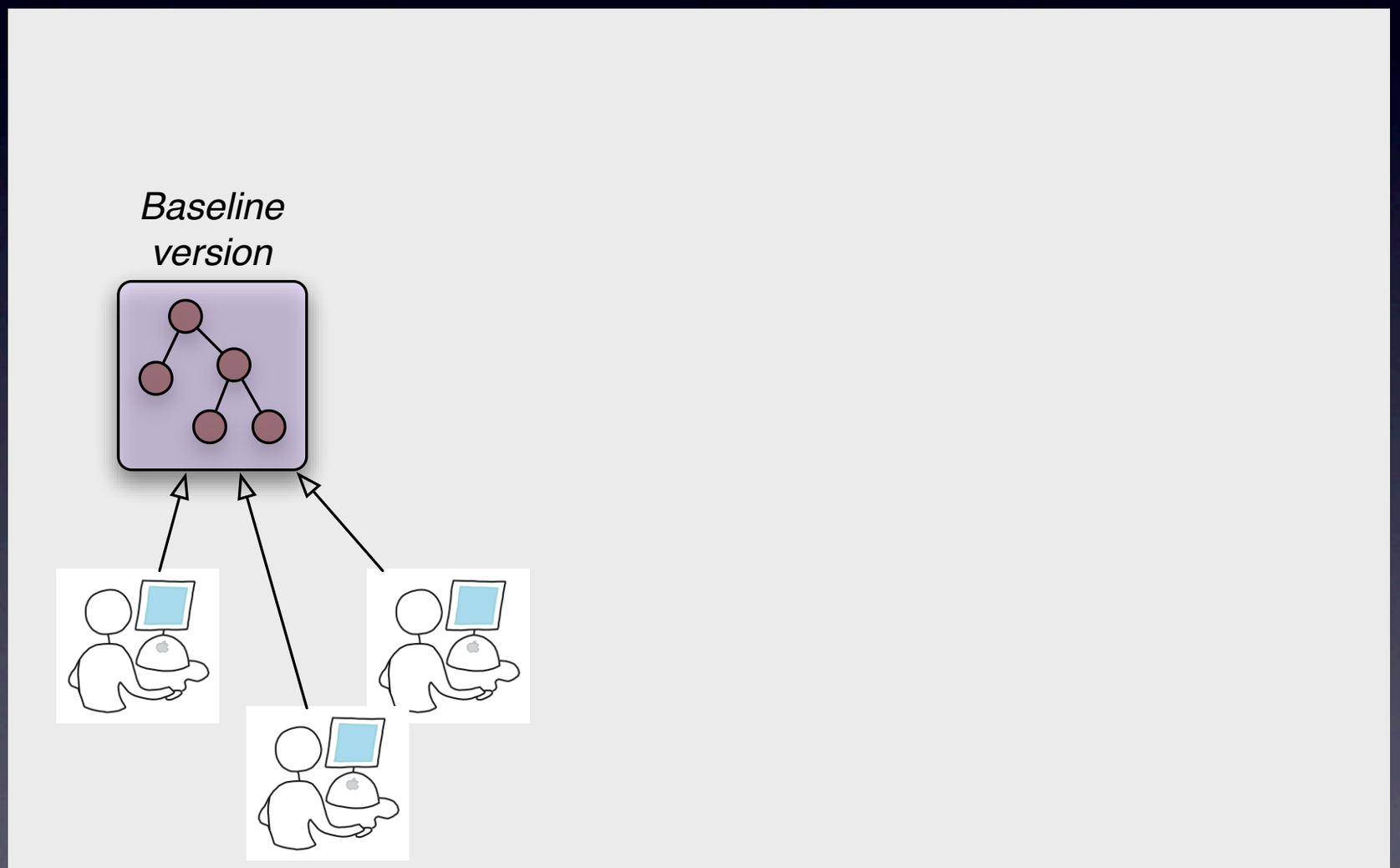
Terminology for consistent description of gene products



- *Small number of full-time curators have access to edit GO*
- *Anyone in the community can submit an issue or request*

The NCI Thesaurus

Reference ontology for cancer biology, translational science, and clinical oncology



- *~20 full-time editors making changes*
- *Changes are immediately visible*
- *1 "lead editor" who approves the changes, and assigns new tasks*

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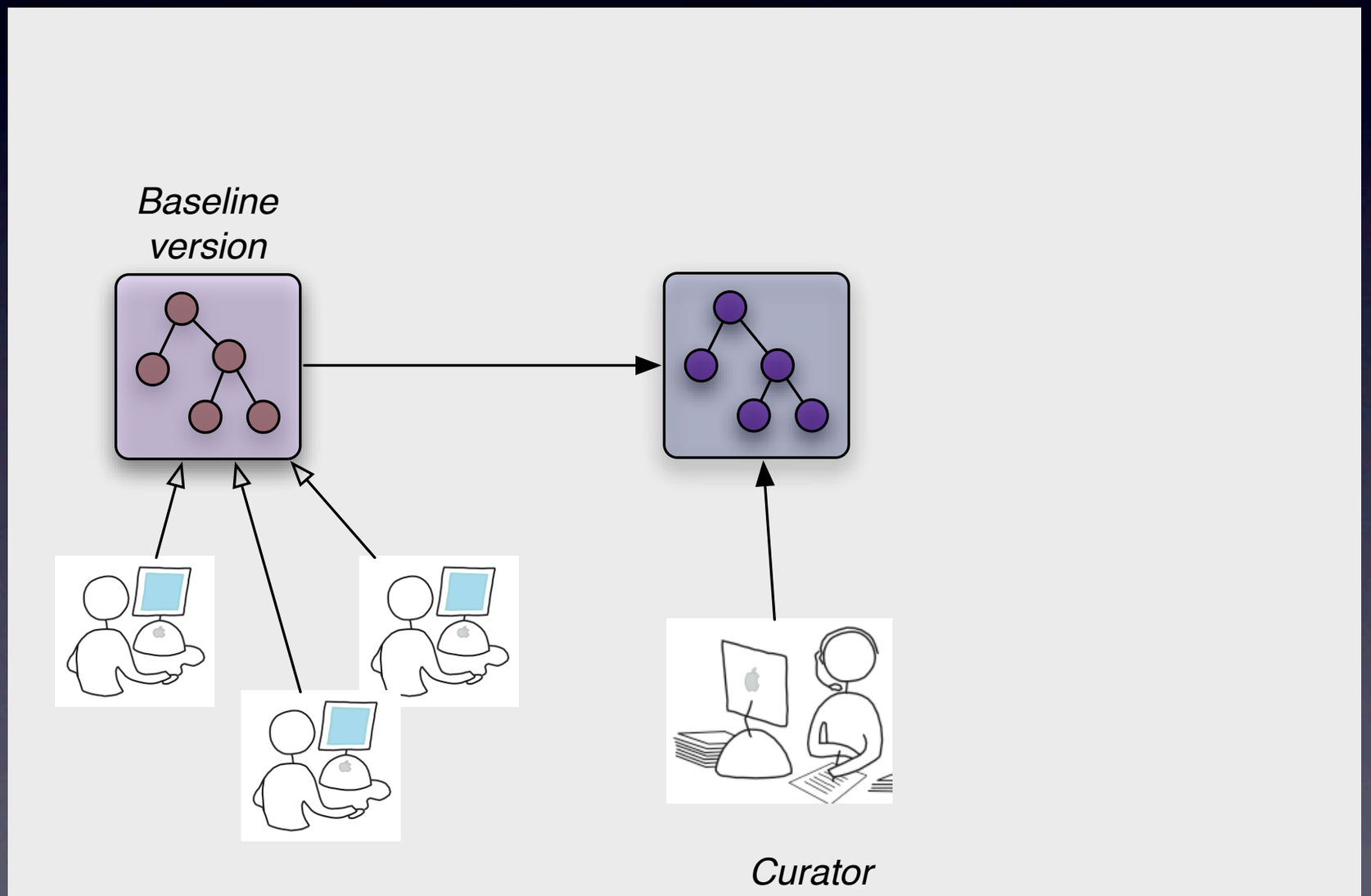

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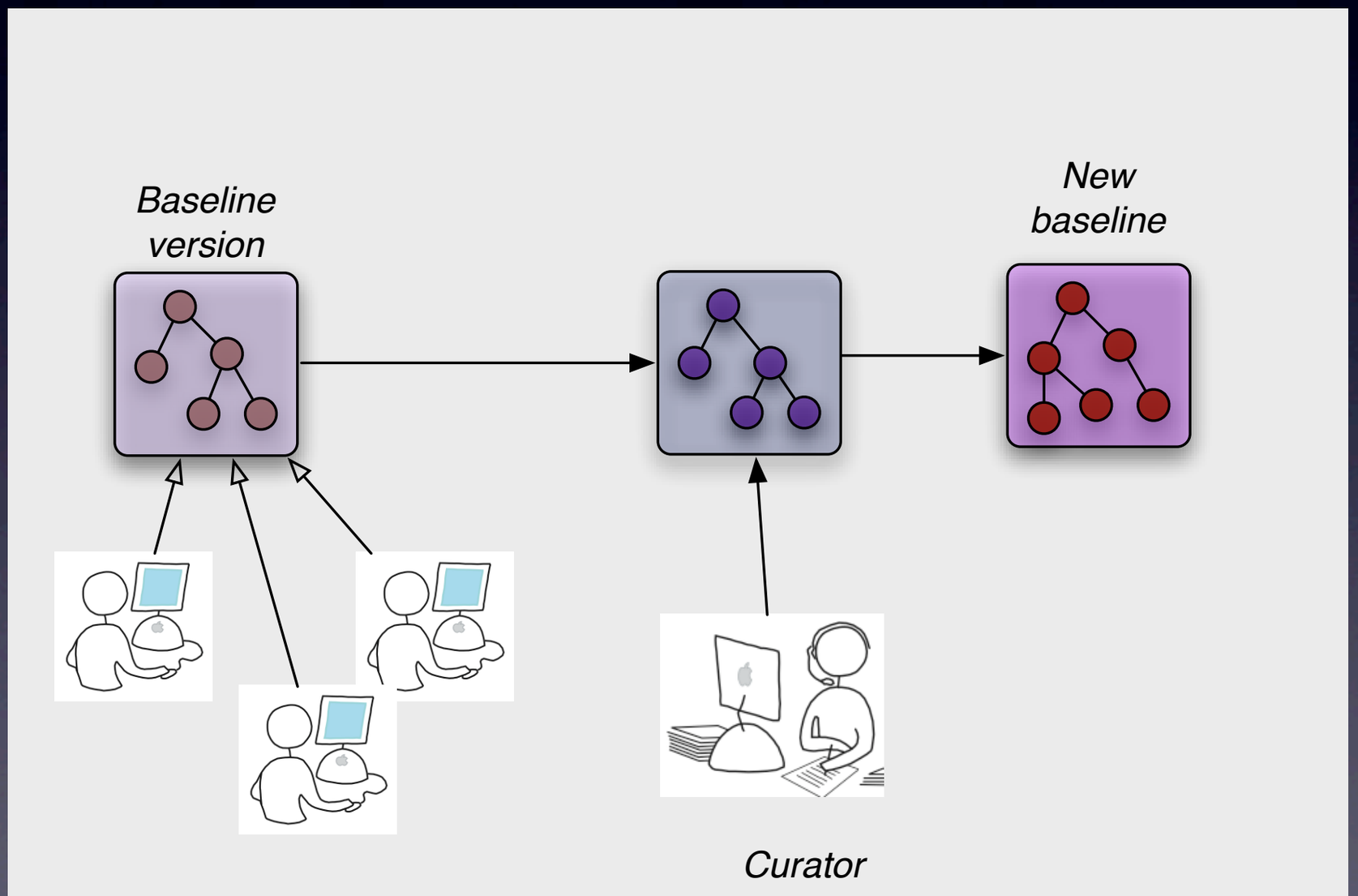

- *~20 full-time editors making changes*
- *Changes are immediately visible*
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Other Biomedical Projects

- OBI, RadLex
  - tightly-knit community of developers (20-30)
  - most actively participate in discussions
  - Small number of editors make changes to the ontology

Dimensions of Collaborative Workflows

- Ontology size
  - *from 100s to 10,000s of concepts*
- Size of the community
  - Contributors (in some form): *from 2-3 to dozens*
  - Editors: *from 1-2 to 20*
- Control mechanisms
  - Variety of roles
  - Gatekeepers, etc.
  - Client-server editing
- Discussion tools
  - mailing lists, message boards
  - face-to-face meetings, telecons
- Synchronization and editing mechanisms
  - CVS, SVN
  - Integrated ontology environments (WebProtégé, BioPortal)

Brief Introduction to Stanford Ontology Tools

- WebProtégé: a web-based collaborative ontology editor
- BioPortal: a community-based ontology repository

What Is Protégé?

- Protégé is an open-source ontology editor
  - developed at Stanford, in collaboration with University of Manchester
  - has more than 175,000 registered users
  - has dozens of plugins for
    - visualization
    - inference
    - import and export
    - natural-language processing
    - ... (things we don't know exist)

WebProtégé

- WebProtégé is an open source light-weight ontology editor for the Web
  - It is a Protégé client
- Main features of WebProtégé:
  - Browsing of ontologies
  - Lightweight ontology editing
  - Custom-tailored knowledge acquisition by domain experts
  - Customizable user interface
  - Extensible: Developers may easily implement their own tabs and portlets

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You are signed out. | Sign In | Send feedback!

Welcome to WebProtégé Demo!

My WebProtégé | OPL

Classes | Edit Class Metadata | Properties | Notes and Discussions | Change History | Search Bioportal

Add content to this tab | Add tab

Classes

Create | Delete | Watch Branch | S

9
9
inuant 6
ependent_continuant
ndependent_continuant 6
material_entity 6
anatomical structure 2
blood 2
cell
erythrocyte
Homo sapiens erythrocyte
hepatocyte
macrophage
cerebrospinal fluid
hepatopancreas
hindgut
intestine
liver
lung

Properties for Homo sapiens erythrocyte

Add property value | Delete property value

Property	Value	Lang
definition	red blood cells of human	
oboInOwl:hasDbXref	FMA:62845	
rdfs:label	Homo sapiens erythrocyte	

Asserted Conditions for Homo sapiens erythrocyte

NECESSARY & SUFFICIENT

erythrocyte

part_of *some* 'Homo sapiens'

NECESSARY

INHERITED

continuant *or* occurrent *[from entity]*

dependent_continuant *or* independent_continuant *or* spatial_region *[from continuant]*

fiat_object_part *or* object *or* object_aggregate *[from material_entity]*

material_entity *or* object_boundary *or* site *[from independent_continuant]*

NCBO BioPortal

- Web accessible repository of ontologies for the biomedical community:
  - http://bioportal.bioontology.org
- Online support for ontology
  - Peer review
  - Notes (comments and discussion)
  - Versioning
  - Mapping
  - Search
  - Resources

Ontology Listing | NCBO BioPortal

http://bioportal.bioontology.org/ontologies

BioPortal | Browse | Search | Projects | Annotate | All Mappings | All Resources

Access all ontologies that are available in BioPortal: You can filter this list by category to display ontologies relevant for a certain domain (try selecting "Anatom
category" menu below). You can also filter ontologies that belong to a certain group such as ontologies from the OBO Foundry, or ontologies from the Cancer Bi
the BioPortal RSS feed to receive alerts for submissions of new ontologies, new versions of ontologies, new notes, and new projects. You can subscribe to feeds fo
page. Add a new biomedical ontology to BioPortal using the Submit New Ontology link.

FILTER BY CATEGORY	All Categories
FILTER BY GROUP	All Groups
FILTER BY TEXT	

Submit New Ontology

ONTOLOGY NAME	VISIBILITY	TERMS	NOTES	REVIEWS	PROJECTS	UPLOADED
ABA Adult Mouse Brain (ABA)	Public	913	0	0	2	08/08/2009
Adverse Event Ontology (AEO)	Public	431	0	0	0	04/13/2011
Adverse Event Reporting ontology (AERO)	Public	252	0	0	1	07/22/2011
African Traditional Medicine (ATMO)	Public	223	2	2	2	06/28/2009
AI/RHEUM (AIR)	Public	681	0	0	0	02/05/2010
Amino Acid (amino-acid)	Public	46	0	0	3	07/02/2010
Amphibian gross anatomy (AAO)	Public	1,603	0	0	3	07/22/2011
Amphibian taxonomy (ATO)	Public	6,135	0	0	1	11/02/2009
Anatomical Entity Ontology (AEO)	Public	137	0	0	0	02/15/2011
Animal natural history and life history (ADW)	Public	360	0	0	0	08/31/2010

BioPortal Library

- 250+ ontologies in OWL, RDFS, Protégé frames, OBO, and RRF
- 5,300,000 terms in the ontologies
- 2,000,000 term-to-term mappings

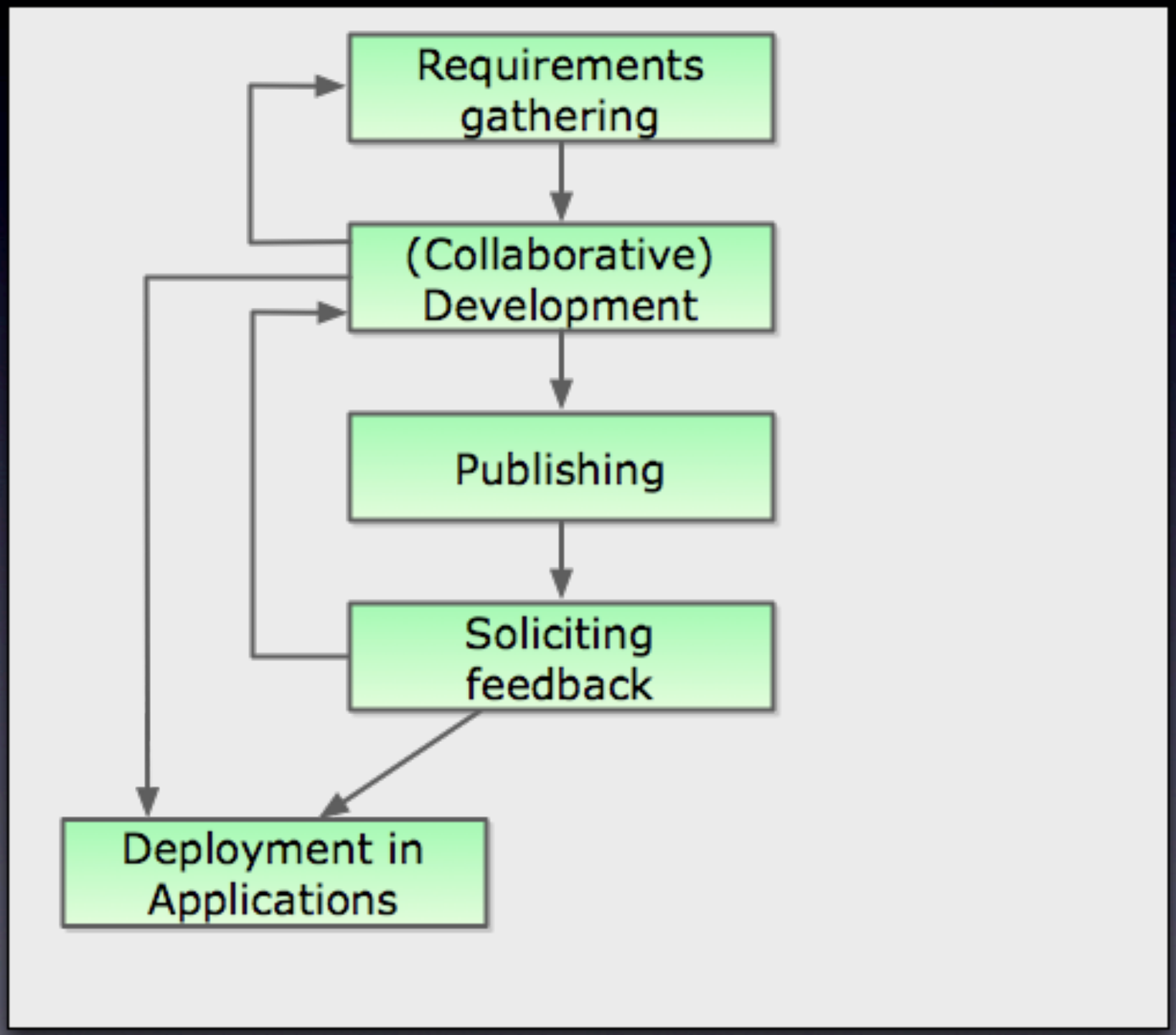
So, you want to develop an ontology....

- ... and have your friends help you
- ... and have the broader user community contribute to your work

Lifecycle of Collaborative Ontology Development

- Develop an ontology collaboratively
  - with several editors contributing to the ontology
  - discussing the ontology internally within the group
- Publish ontology to collect feedback from the user community
- Evolve the ontology based on the feedback

An (Over-Simplified) Ontology Lifecycle



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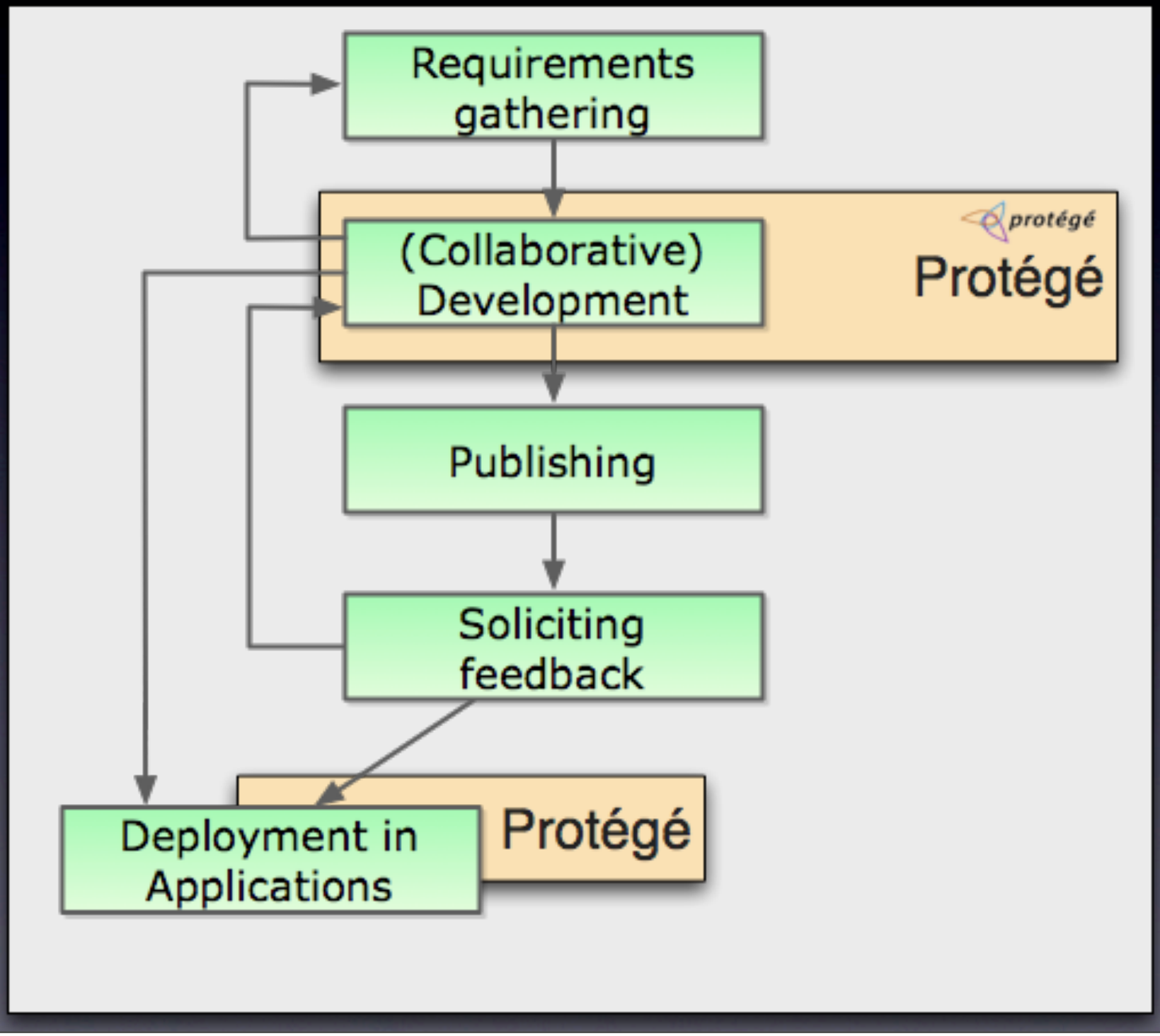

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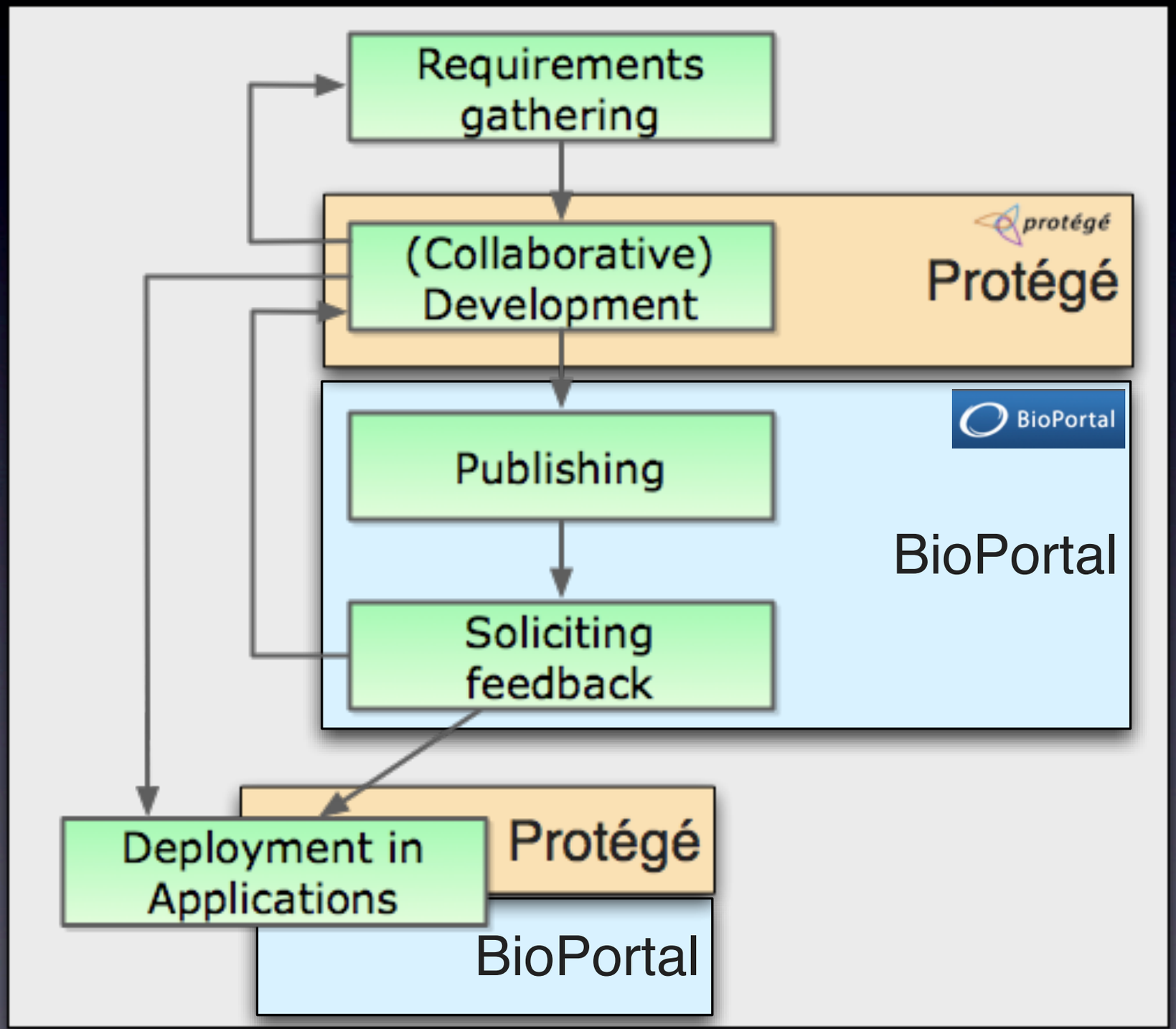
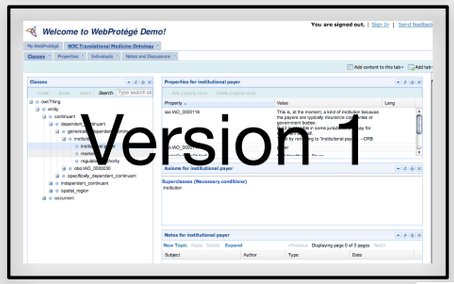
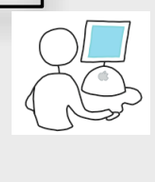


Use Case Scenario

Use Case Scenario

Develop





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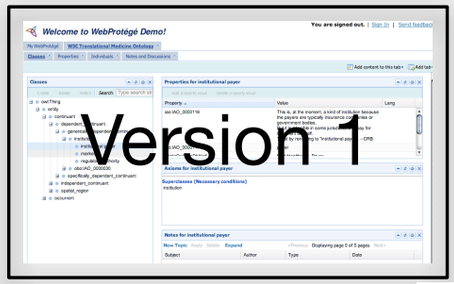
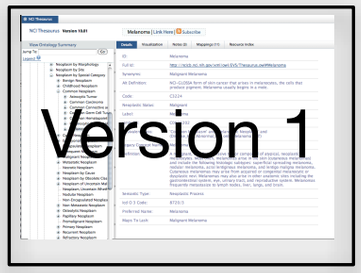


Publish



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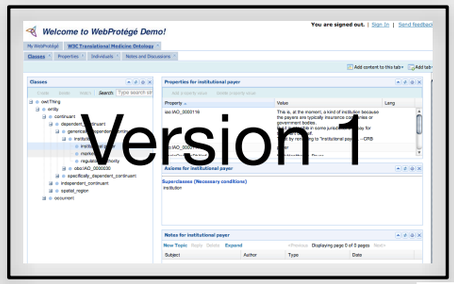

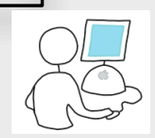

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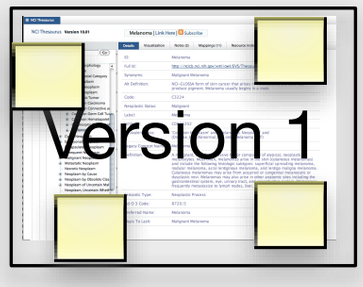

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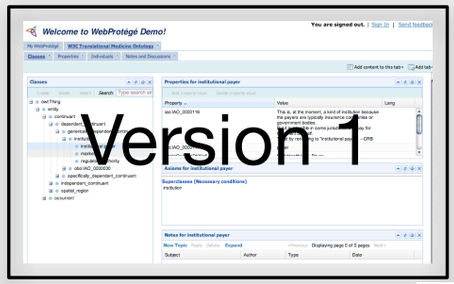

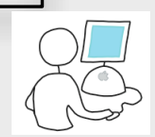

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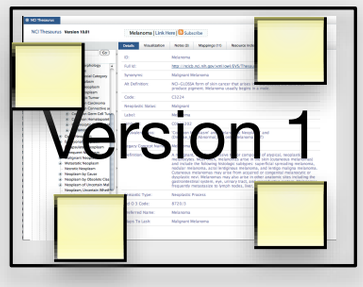

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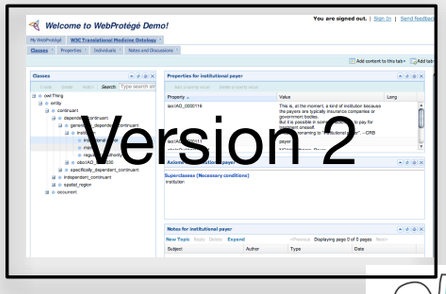

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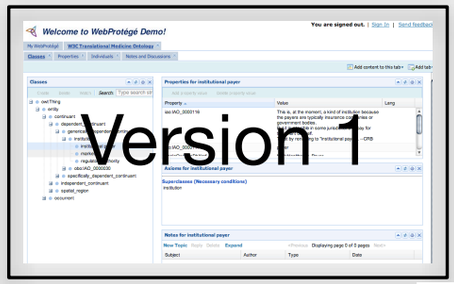

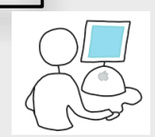

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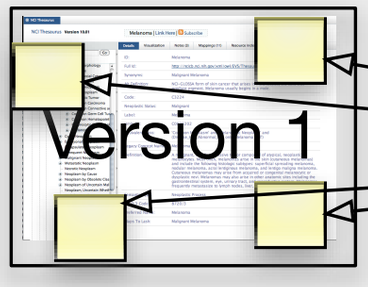

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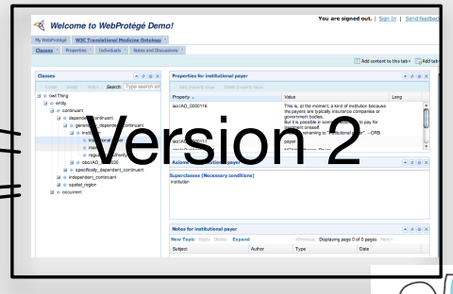

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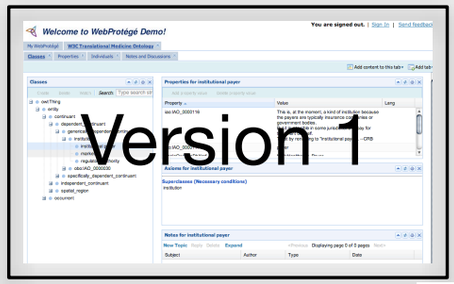

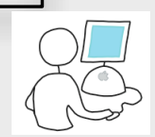

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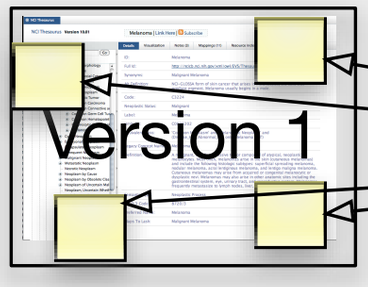

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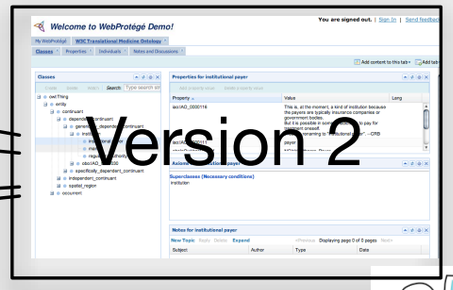

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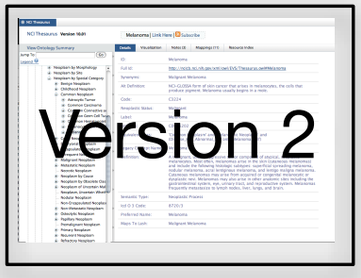


WebProtégé

WebProtégé versus "The Good Old Protégé"

- WebProtégé is another client that you can use to access the Protégé server

You are signed out. | Sign In | Send feedback!

Welcome to WebProtégé Demo!

My WebProtégé | OPL

Classes | Edit Class Metadata | Properties | Notes and Discussions | Change History | Search Bioportal

Add content to this tab | Add tab

Classes

Create | Delete | Watch Branch

- 9
- 9
- inuant 6
- ependent_continuant
- ndependent_continuant 6
- material_entity 6
- anatomical structure 2
  - blood 2
  - cell
    - erythrocyte
      - Homo sapiens erythrocyte
    - hepatocyte
    - macrophage
  - cerebrospinal fluid
  - hepatopancreas
  - hindgut
  - intestine
  - liver
  - lung

Properties for Homo sapiens erythrocyte

Add property value | Delete property value

Property	Value	Lang
definition	red blood cells of human	
ob	A:62845	
rdf	no sapiens erythrocyte	

WebProtégé

Asserted Conditions for Homo sapiens erythrocyte

NECESSARY & SUFFICIENT

erythrocyte

part_of *some* 'Homo sapiens'

NECESSARY

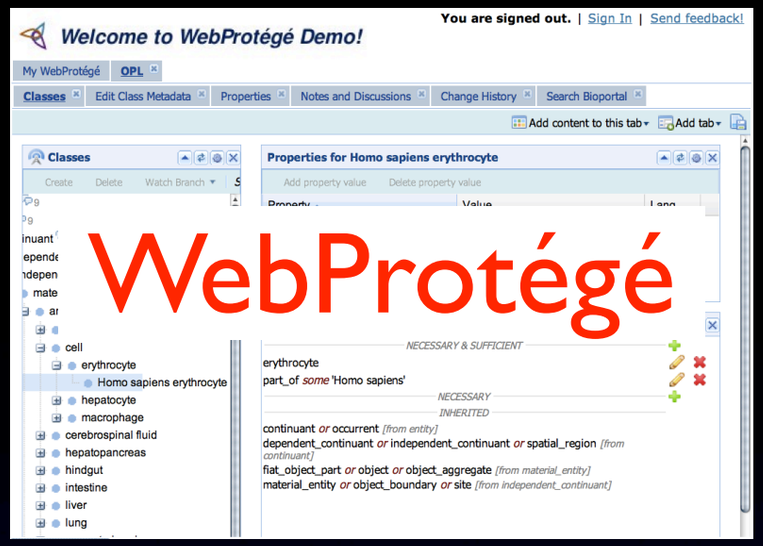
INHERITED

continuant *or* occurrent *[from entity]*

dependent_continuant *or* independent_continuant *or* spatial_region *[from continuant]*

fiat_object_part *or* object *or* object_aggregate *[from material_entity]*

material_entity *or* object_boundary *or* site *[from independent_continuant]*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Add property value
Delete property value
Property
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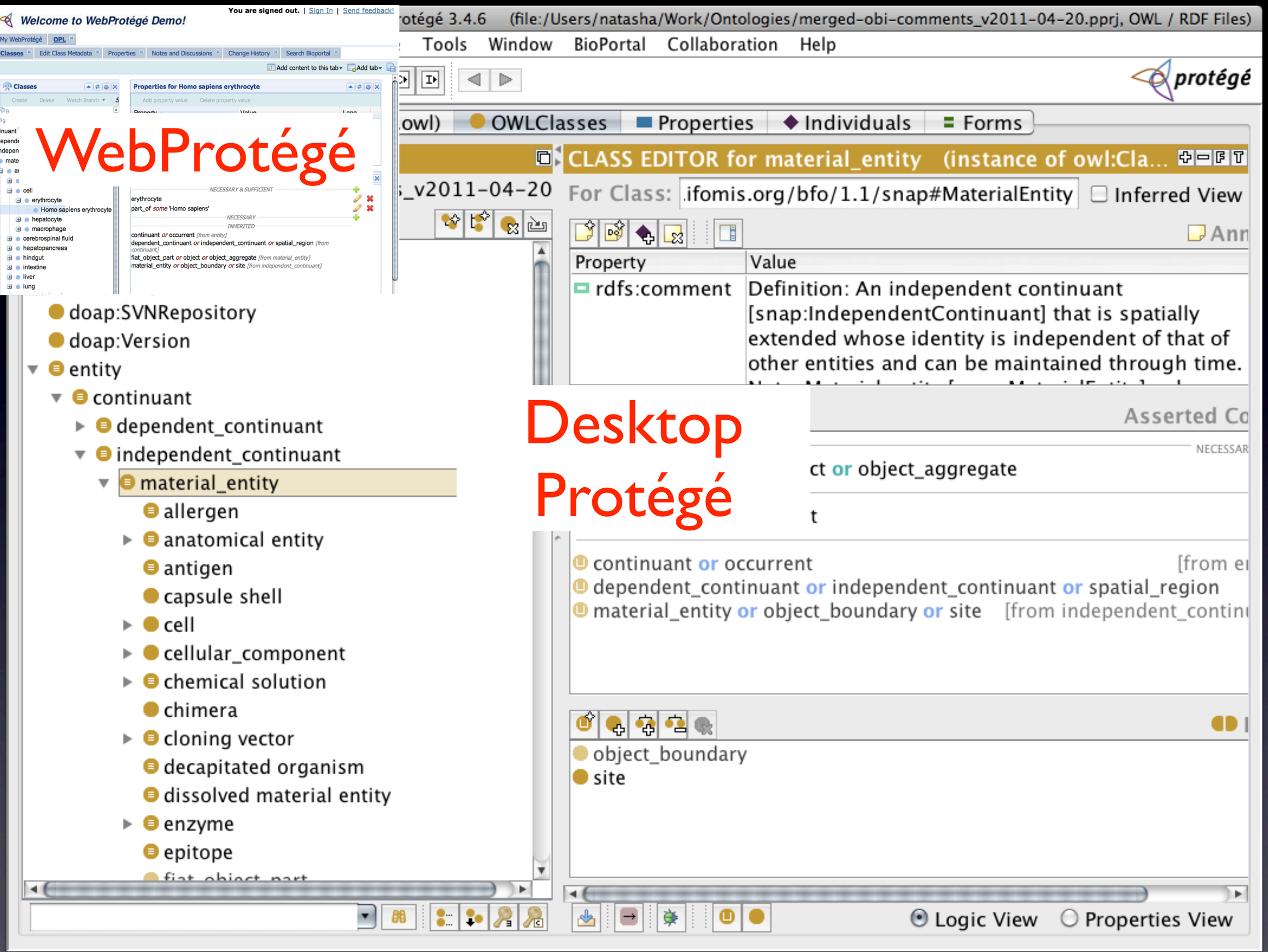
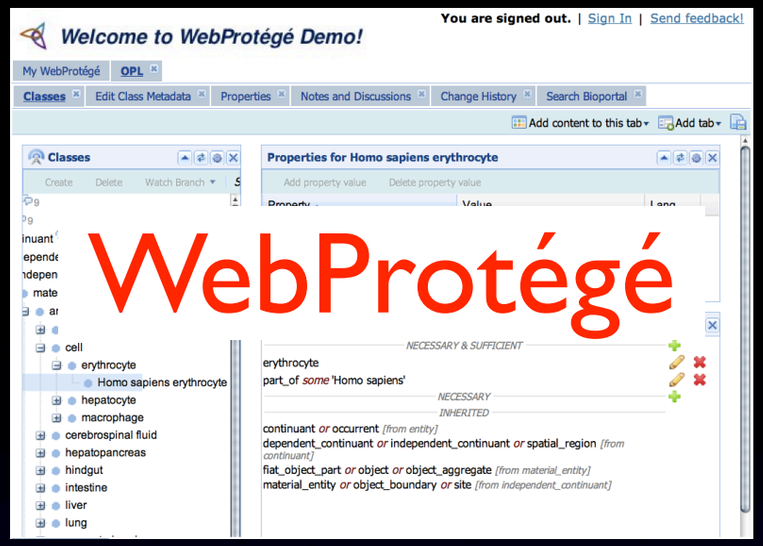
WebProtégé

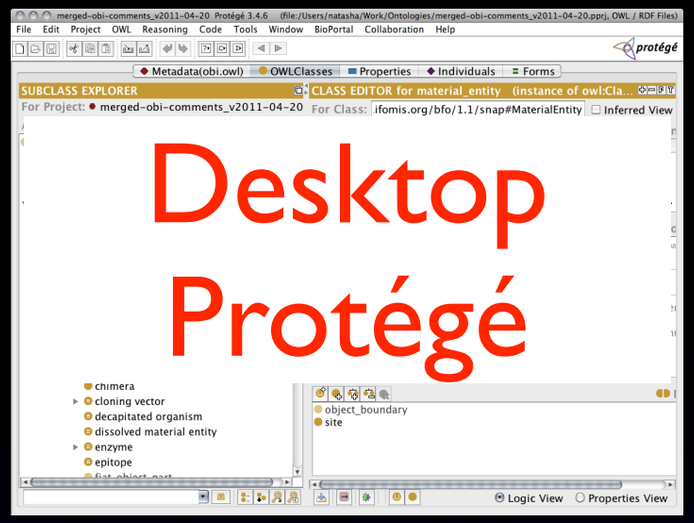
WebProtégé

Desktop Protégé

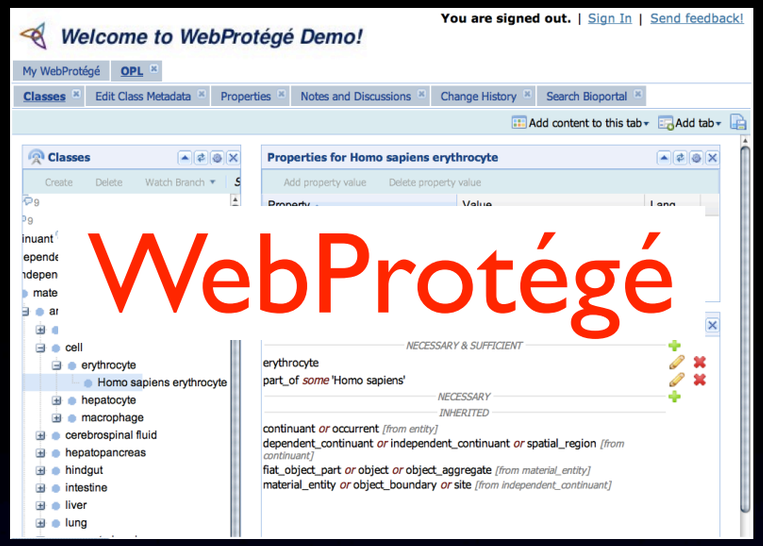




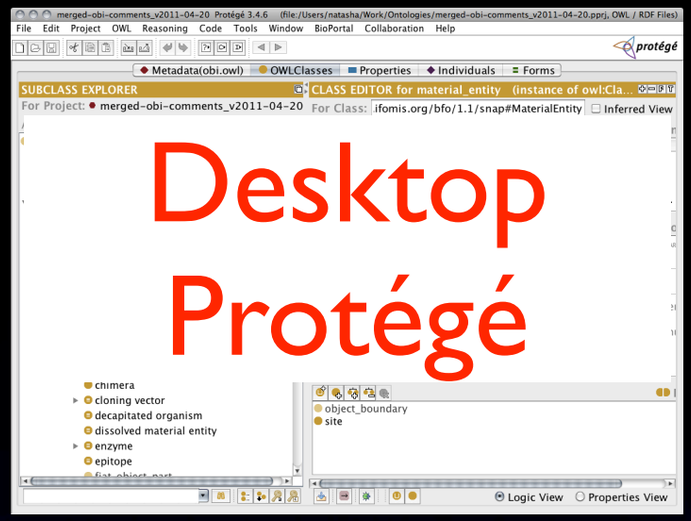
WebProtégé



Desktop Protégé

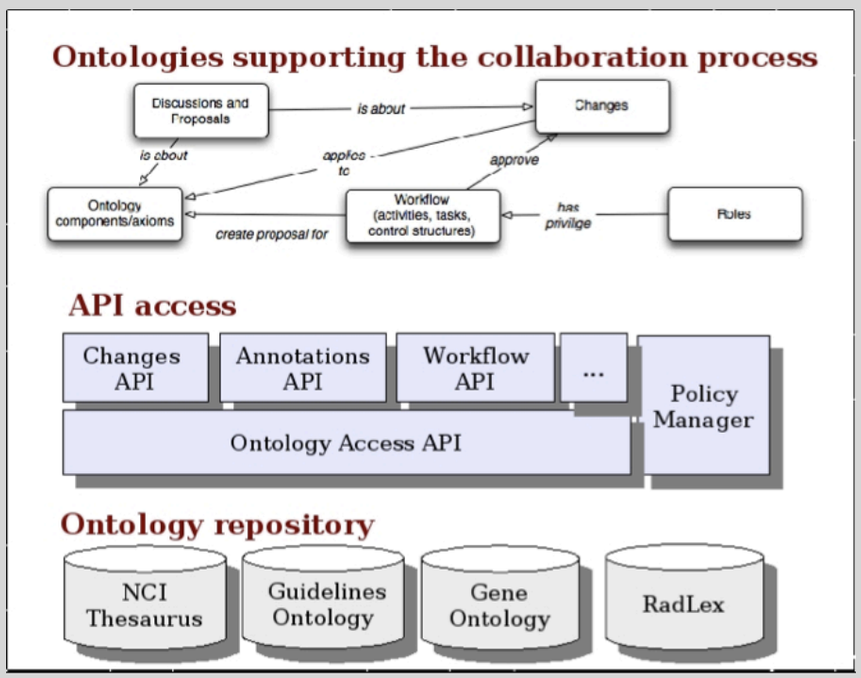


WebProtégé



Desktop Protégé

Protégé Server



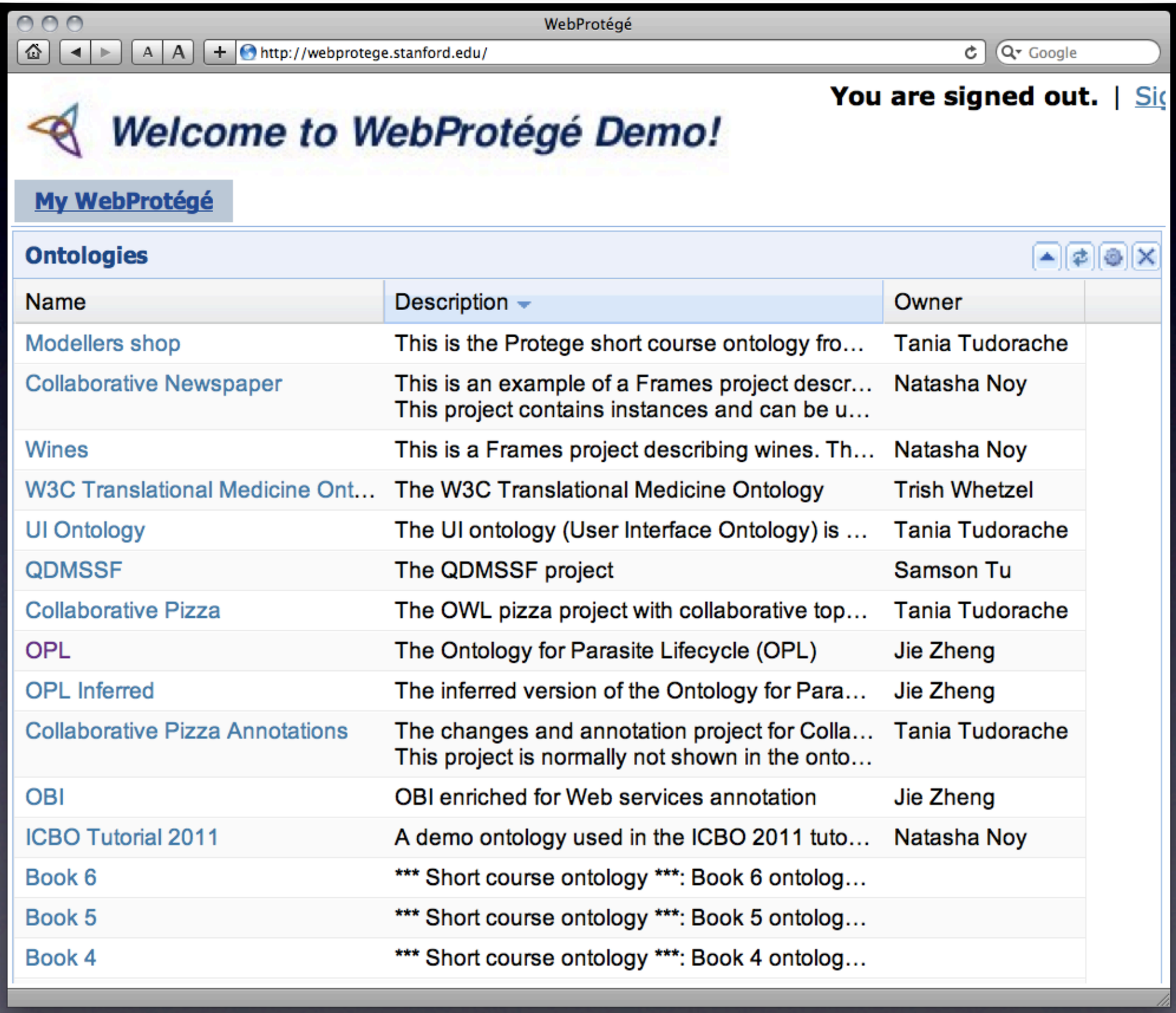
WebProtégé demo

http://webprotege.stanford.edu

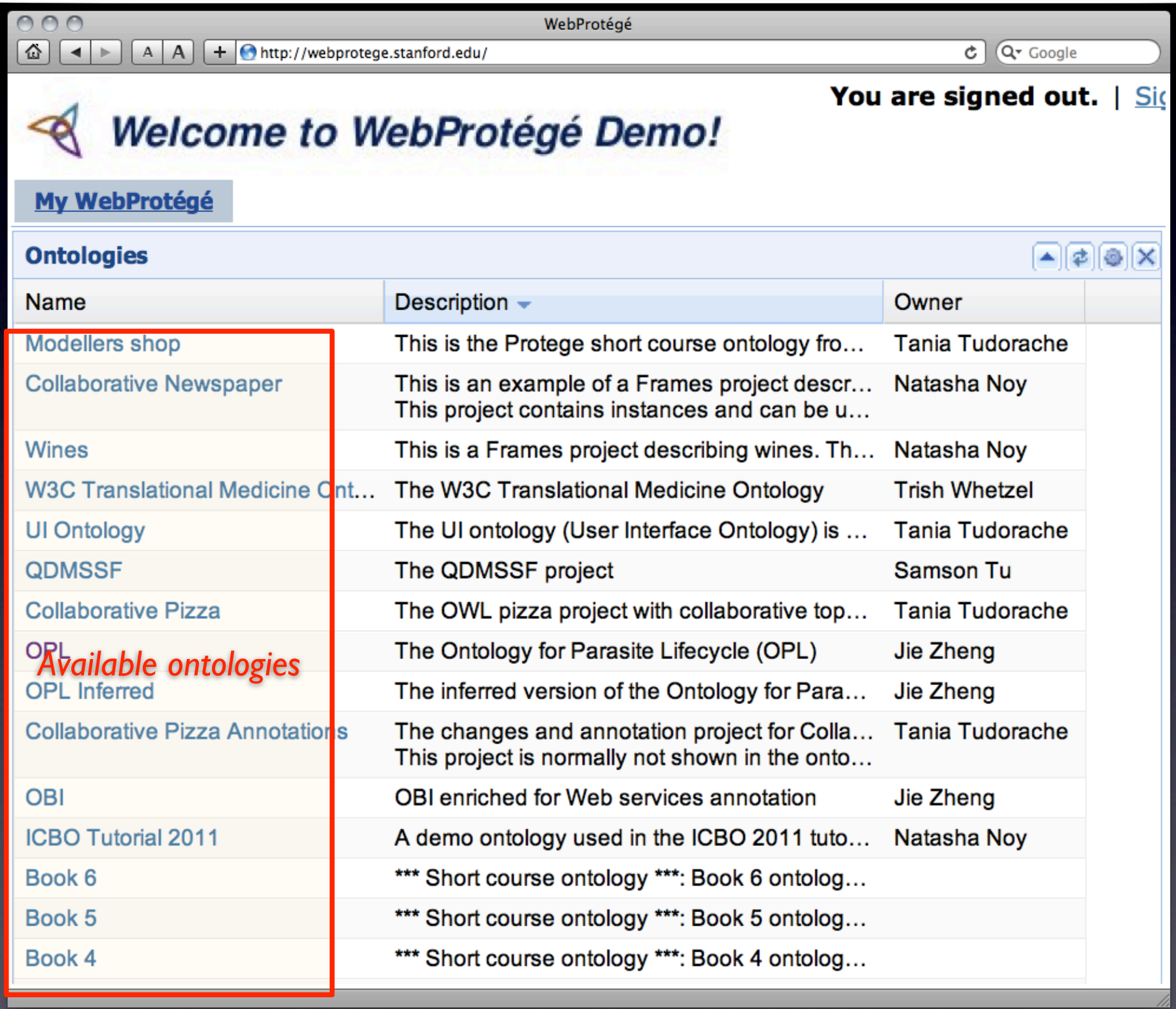
Let's say....

- A friend has invited you to help her develop an ontology
- And she has set it up in WebProtégé
- http://webprotege.stanford.edu

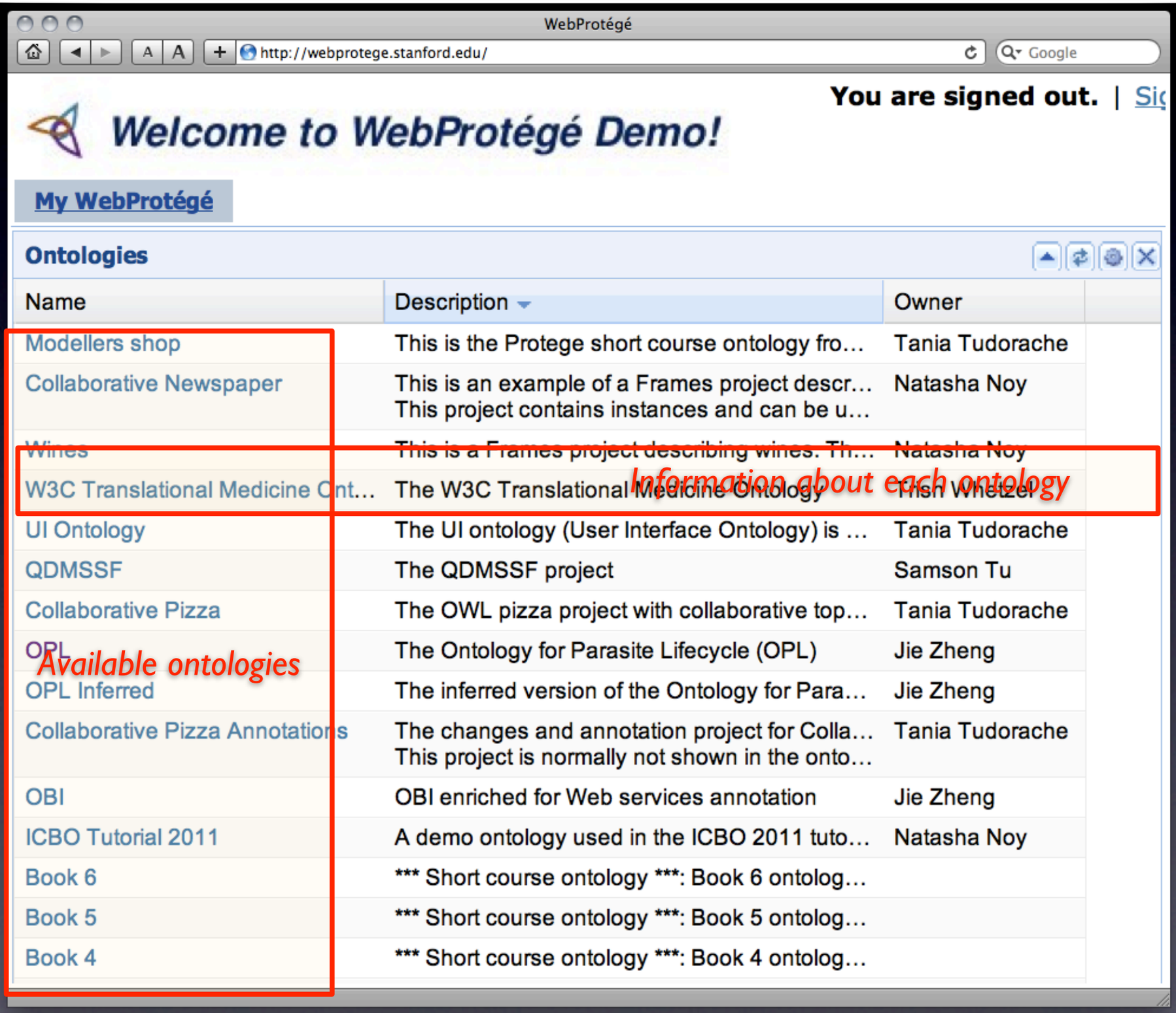
WebProtégé home screen



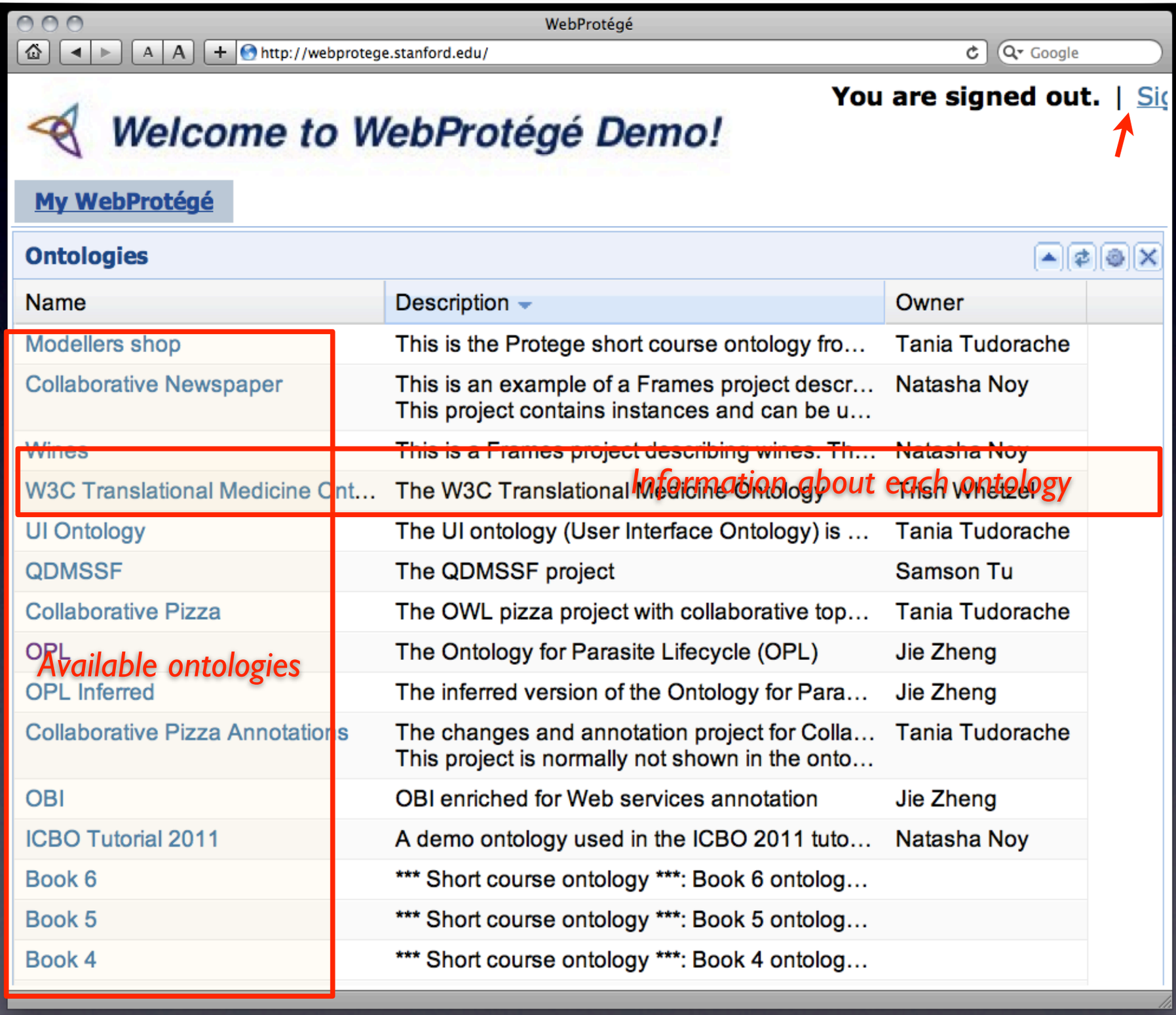
WebProtégé home screen



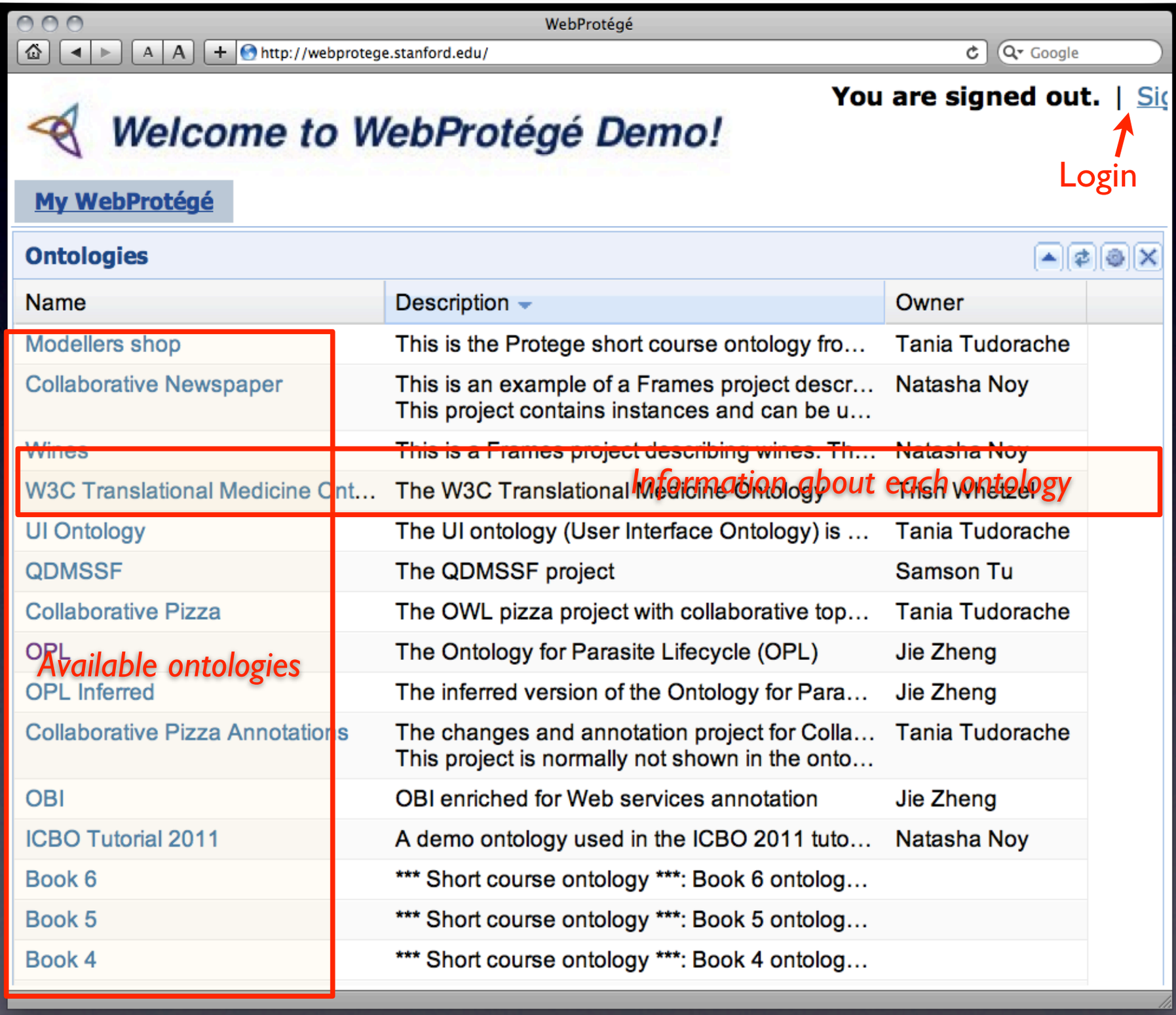
WebProtégé home screen



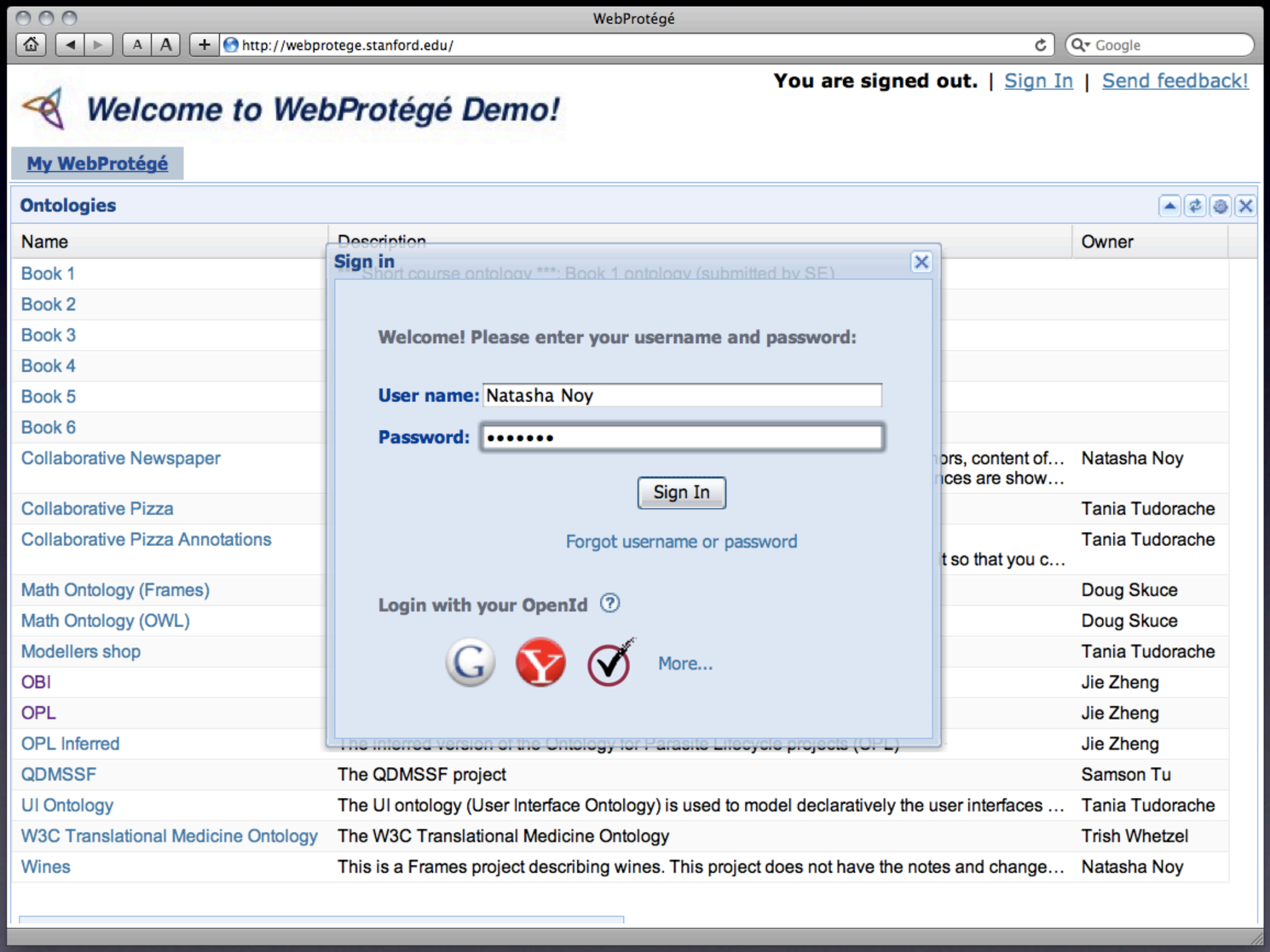
WebProtégé home screen



WebProtégé home screen



Signing In


WebProtégé
http://webprotege.stanford.edu/
Google
You are signed out. | Sign In | Send feedback!
Welcome to WebProtégé Demo!
My WebProtégé
Ontologies
Name
Description
Owner
Book 1
Book 2
Book 3
Book 4
Book 5
Book 6
Collaborative Newspaper
Natasha Noy
Collaborative Pizza
Tania Tudorache
Collaborative Pizza Annotations
Tania Tudorache
Math Ontology (Frames)
Doug Skuce
Math Ontology (OWL)
Doug Skuce
Modellers shop
Tania Tudorache
OBI
Jie Zheng
OPL
Jie Zheng
OPL Inferred
Jie Zheng
QDMSSF
The QDMSSF project
Samson Tu
UI Ontology
The UI ontology (User Interface Ontology) is used to model declaratively the user interfaces …
Tania Tudorache
W3C Translational Medicine Ontology
The W3C Translational Medicine Ontology
Trish Whetzel
Wines
This is a Frames project describing wines. This project does not have the notes and change…
Natasha Noy
Sign in
Welcome! Please enter your username and password:
User name: Natasha Noy
Password:
Sign In
Forgot username or password
Login with your OpenId
More...

Signing in

- If you don't have an account, use "Guest" (Guest1/guest1, Guest2/guest2, ... Guest9/guest9 will work)
- After you sign in, the list of ontologies may change to include the private ontologies

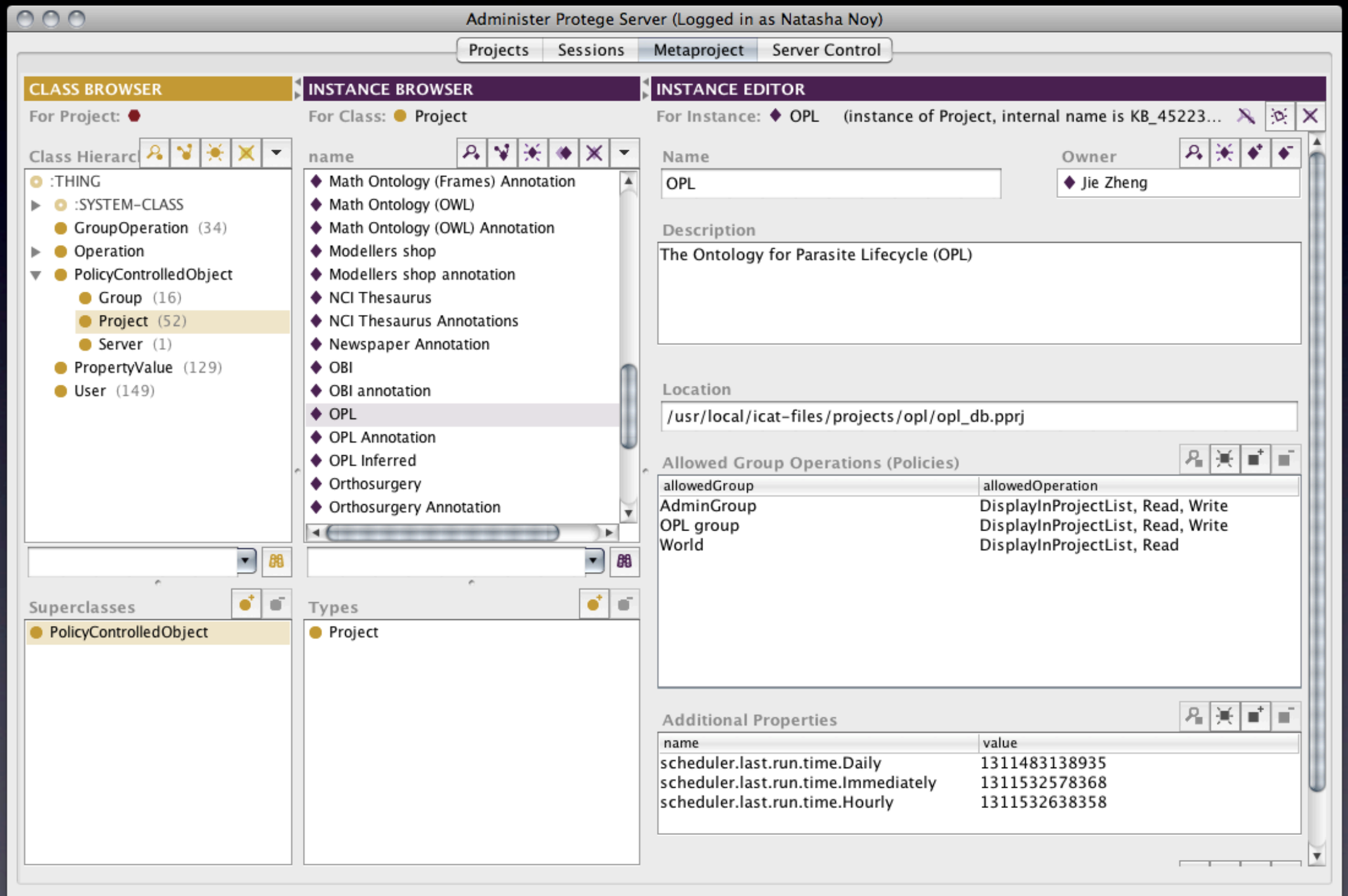
Using WebProtégé to Edit Ontologies

- Setting up a WebProtégé server
  - WebProtégé Administrator's Guide: http://protegewiki.stanford.edu/wiki/WebProtegeAdminGuide
  - Will not cover in today's tutorial
- When installing the server, the administrator defines:
  - ontologies the will be available for editing
  - privileges for users with editing rights (read, write, display in project list, admin, etc.)
  - configuration for the user interface

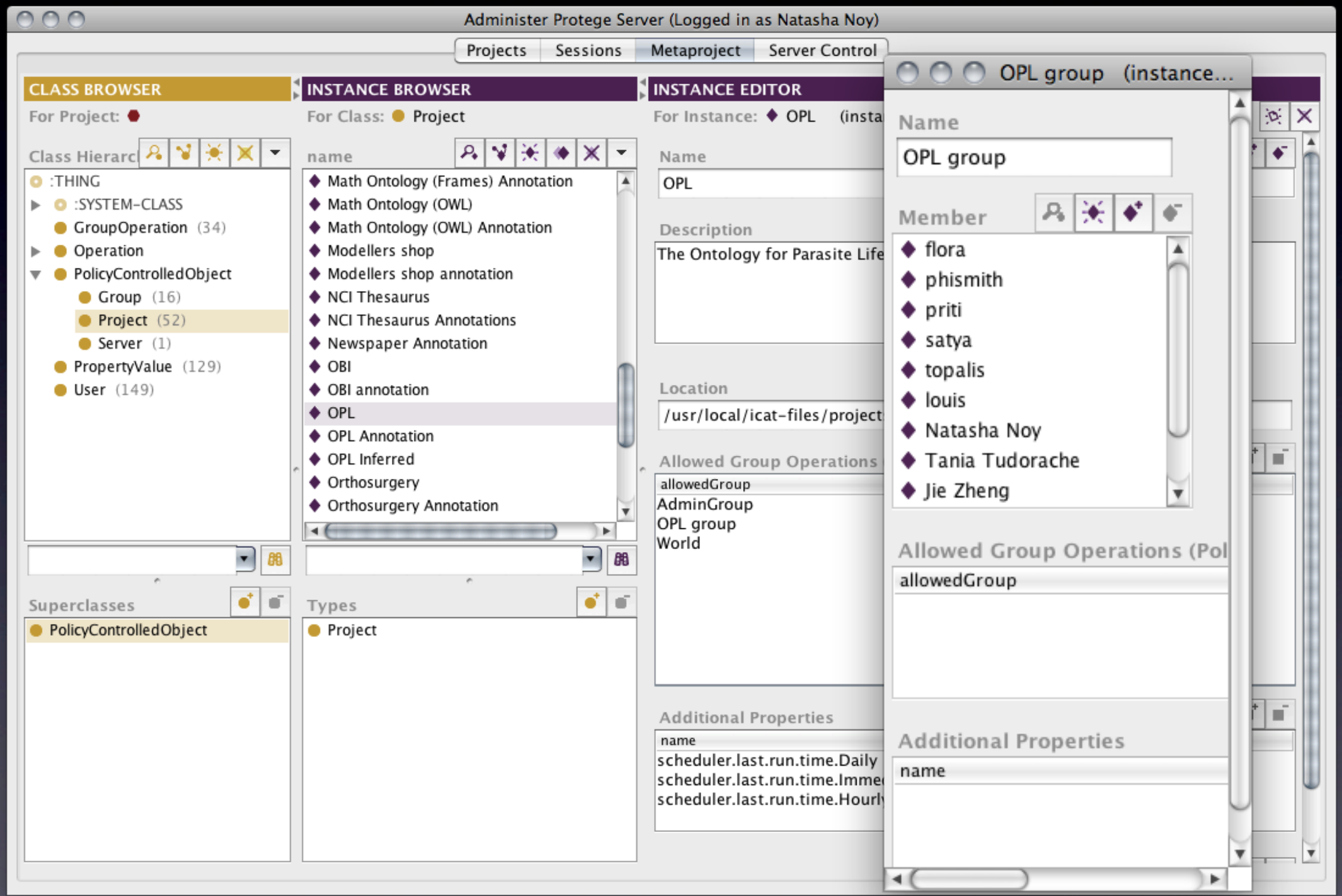
Ontology visibility options

- Each installation of WebProtege is a private ontology library
  - http://webprotege.stanford.edu
- Some ontologies are visible to everyone with a link
  - Could be none, all ontologies may be private
- Server administrator configures which users and groups of users can access non-public ontologies
  - Each user may have read and/or write permission

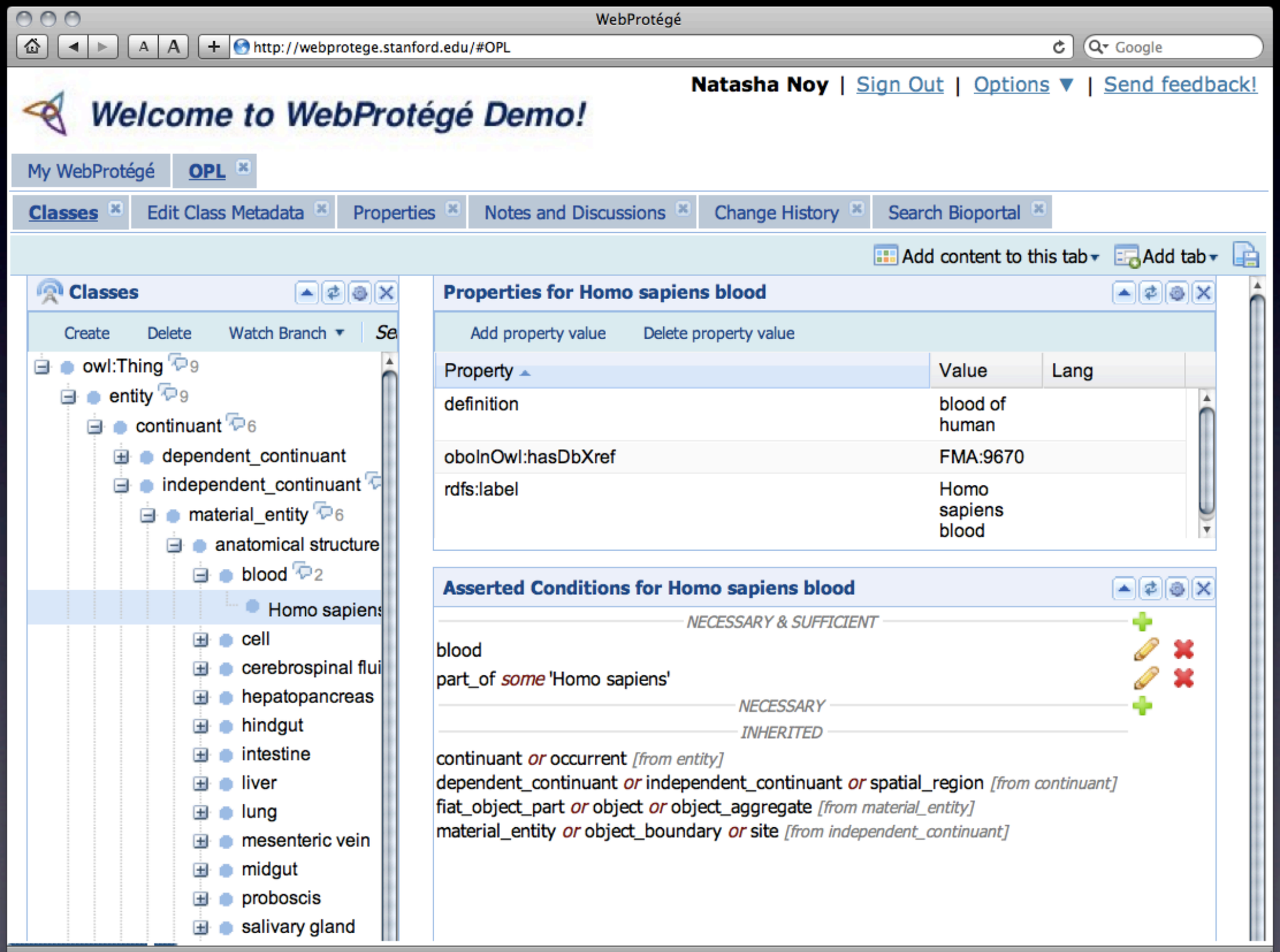
Configuring Permissions



Configuring Permissions



Class Details



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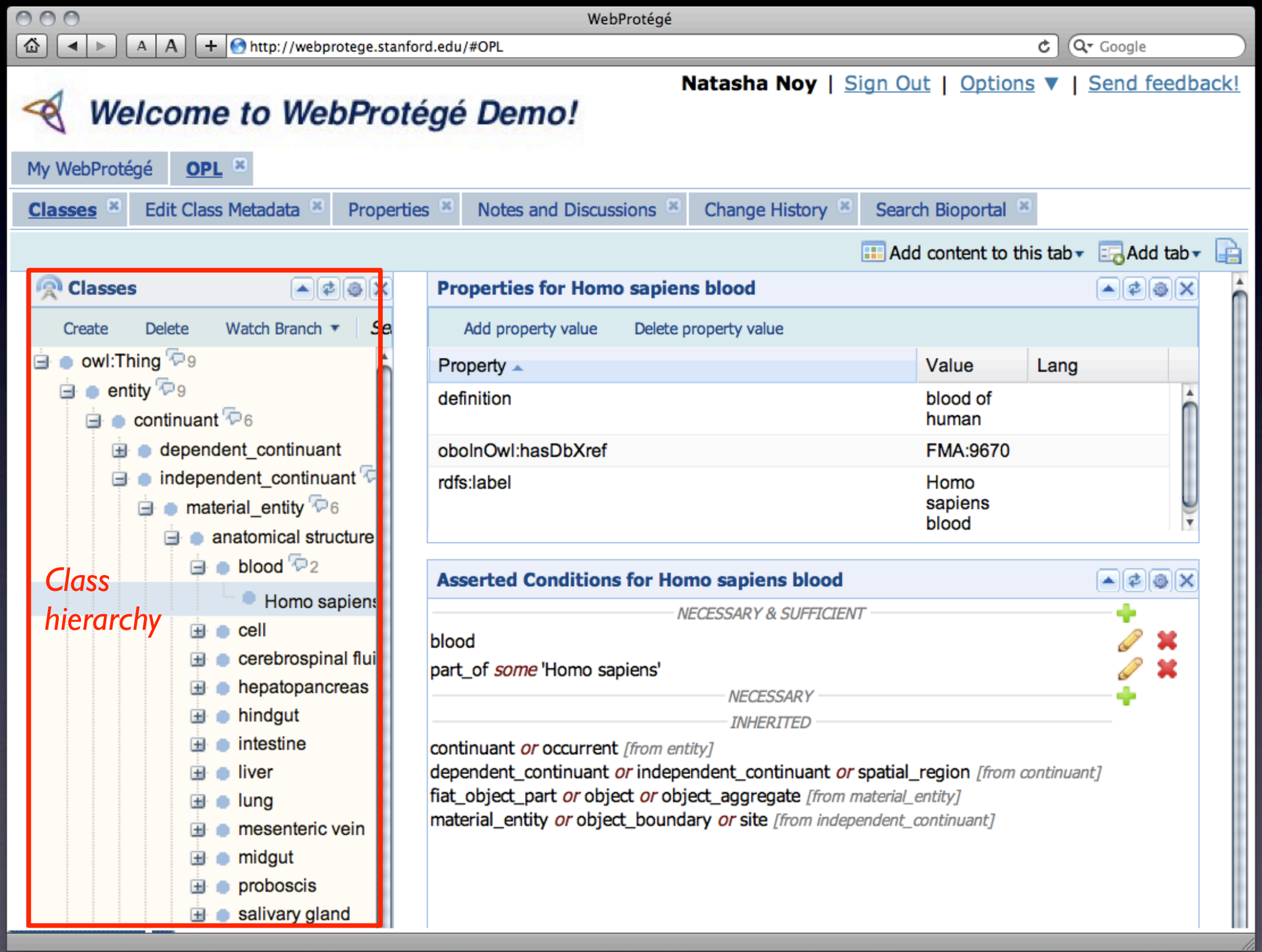

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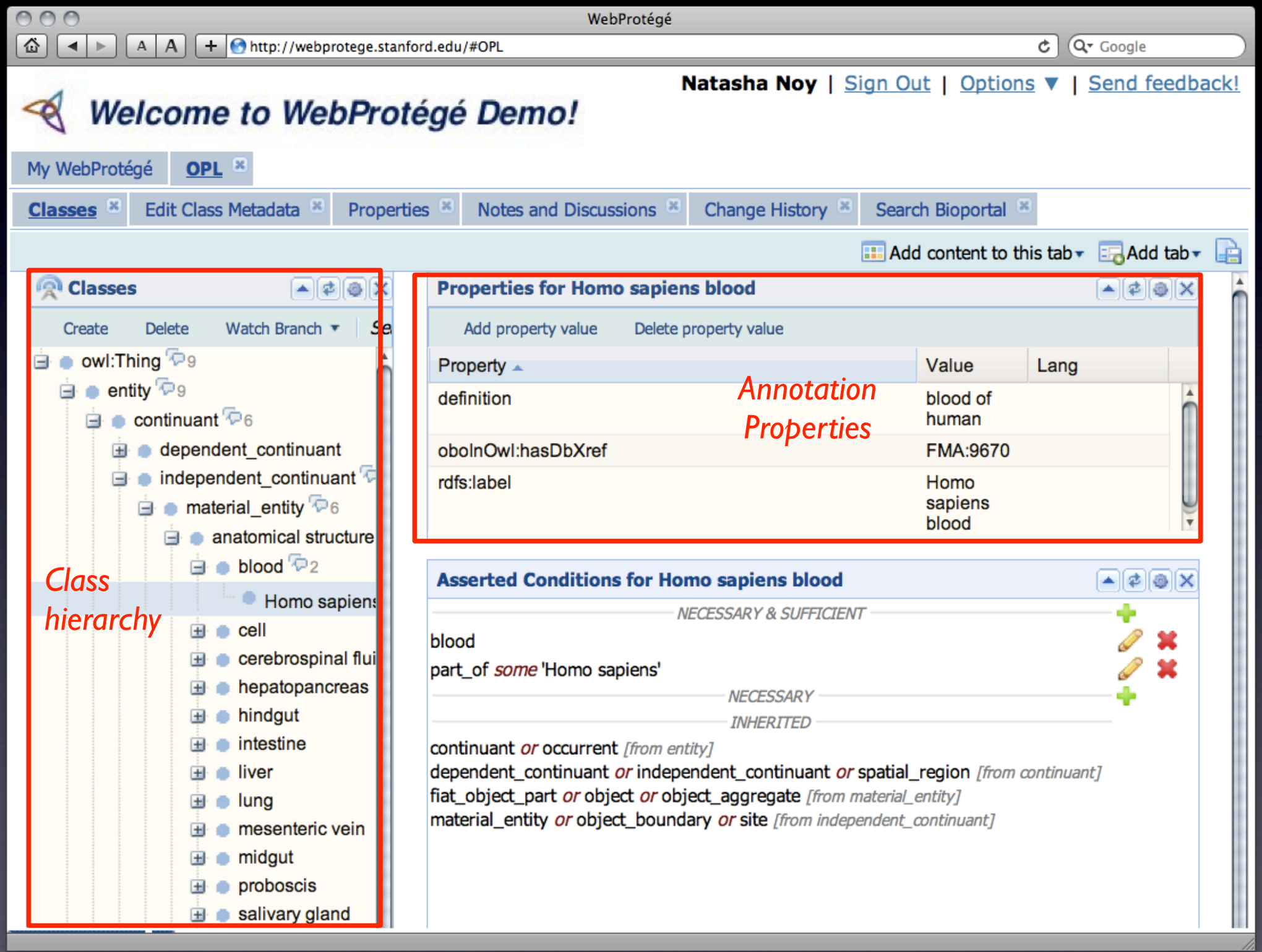
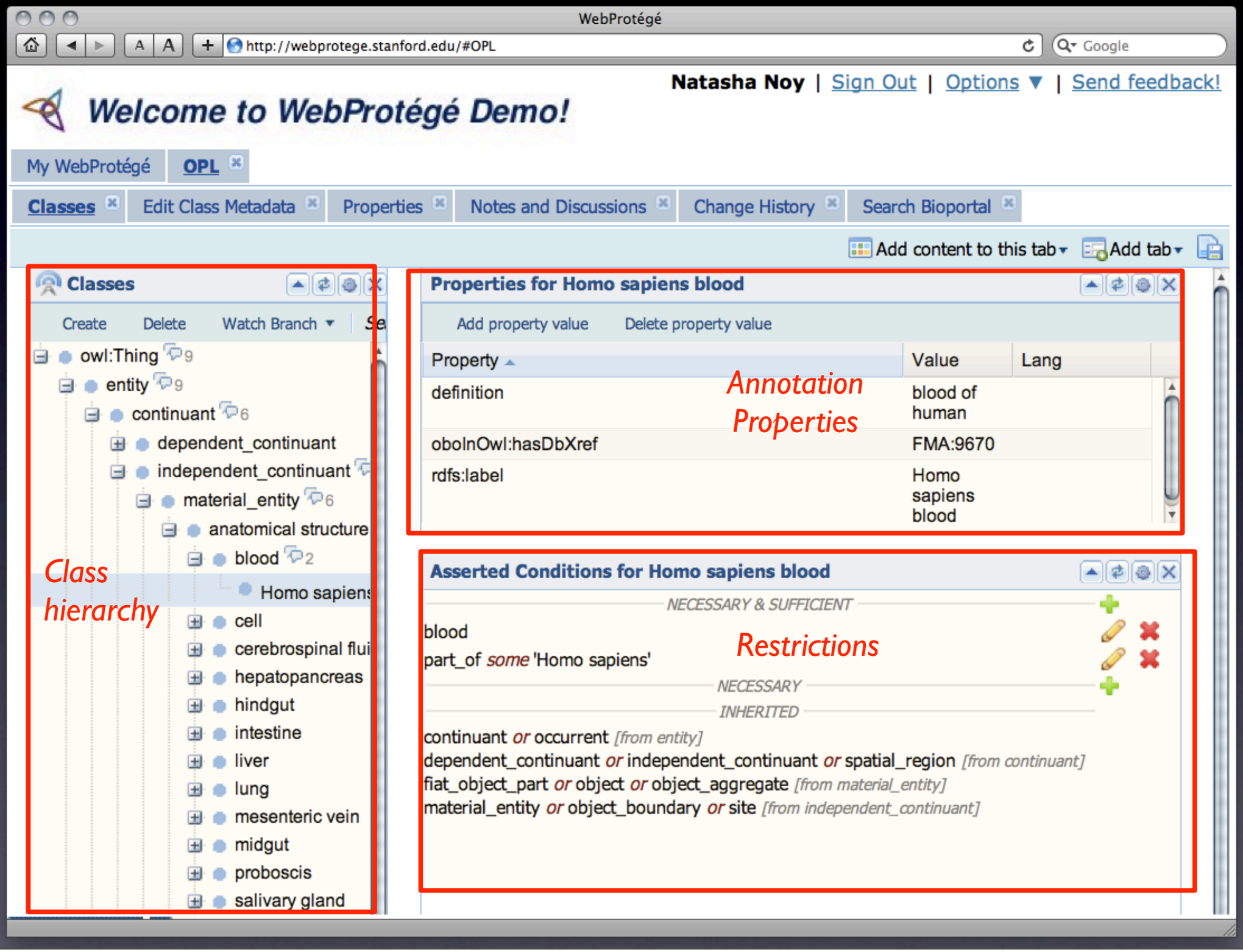
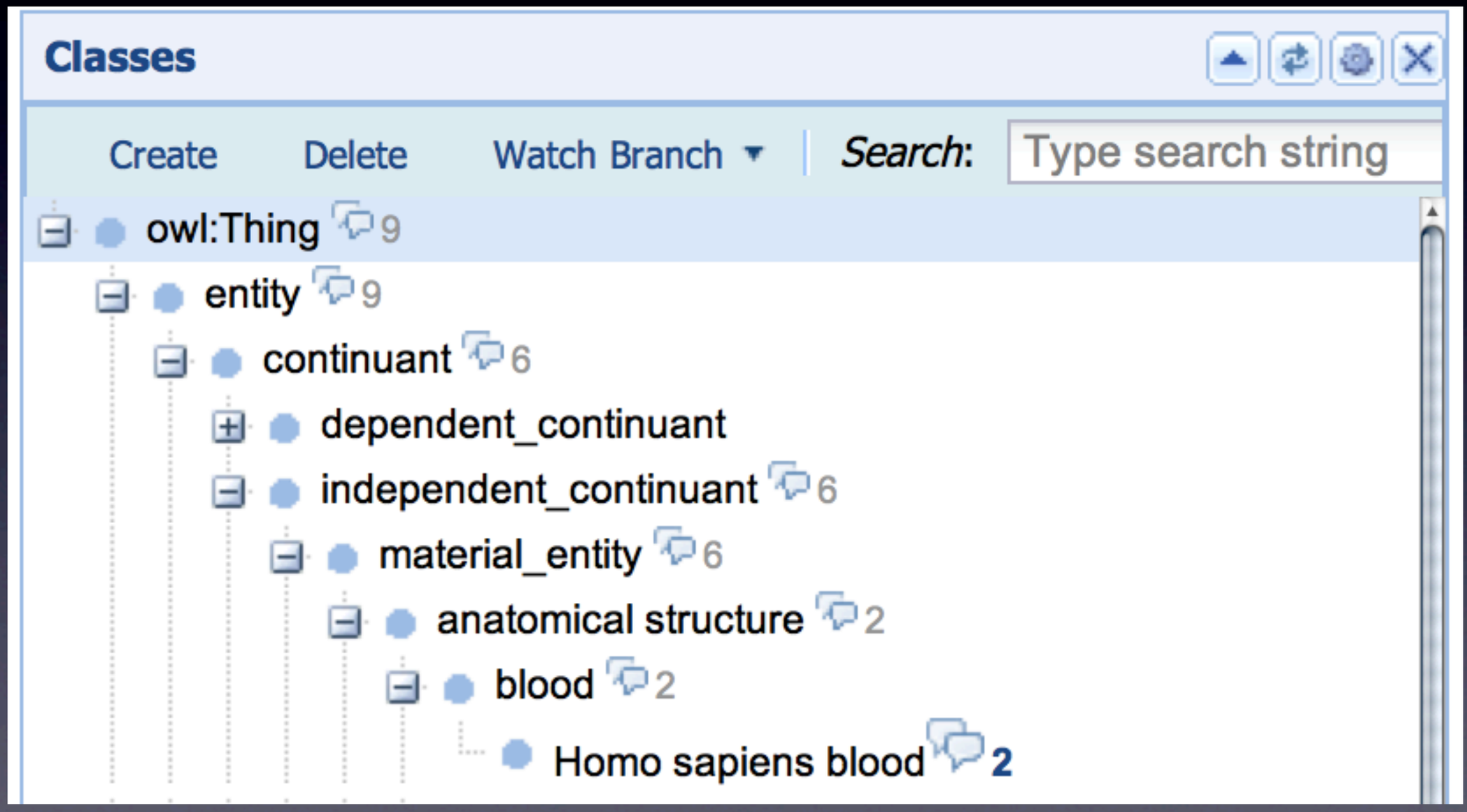


Class Details



Class Hierarchy (More Details)



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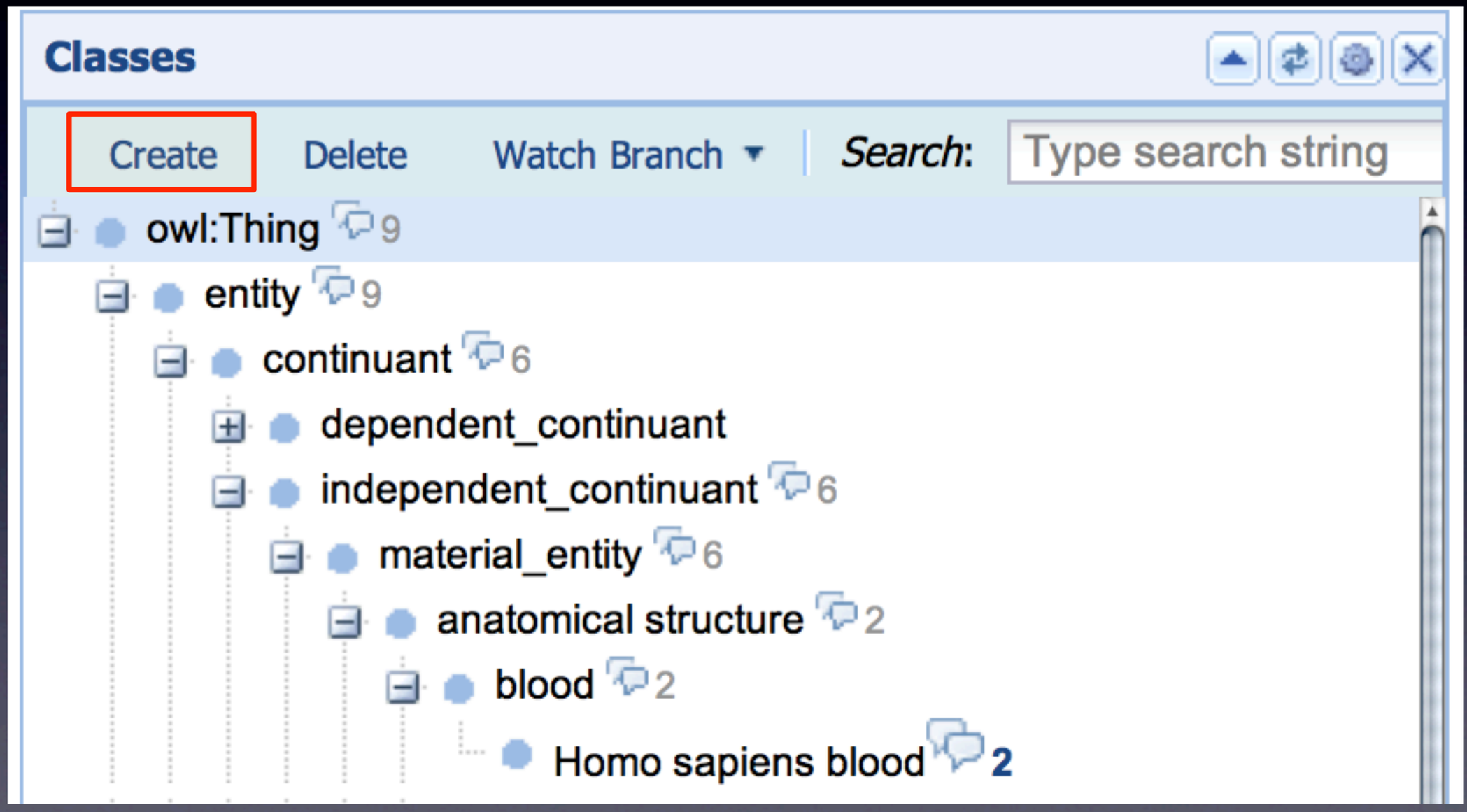

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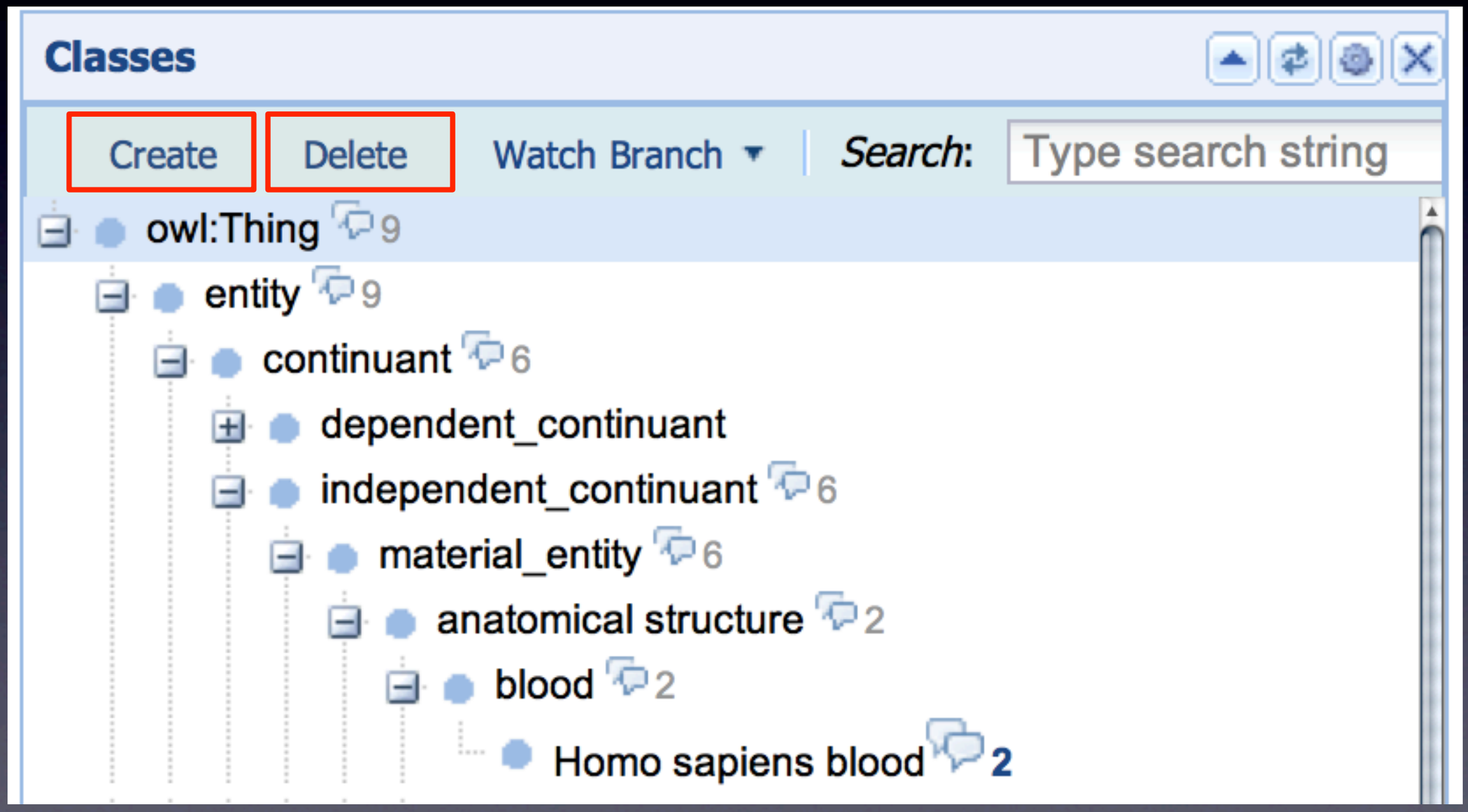

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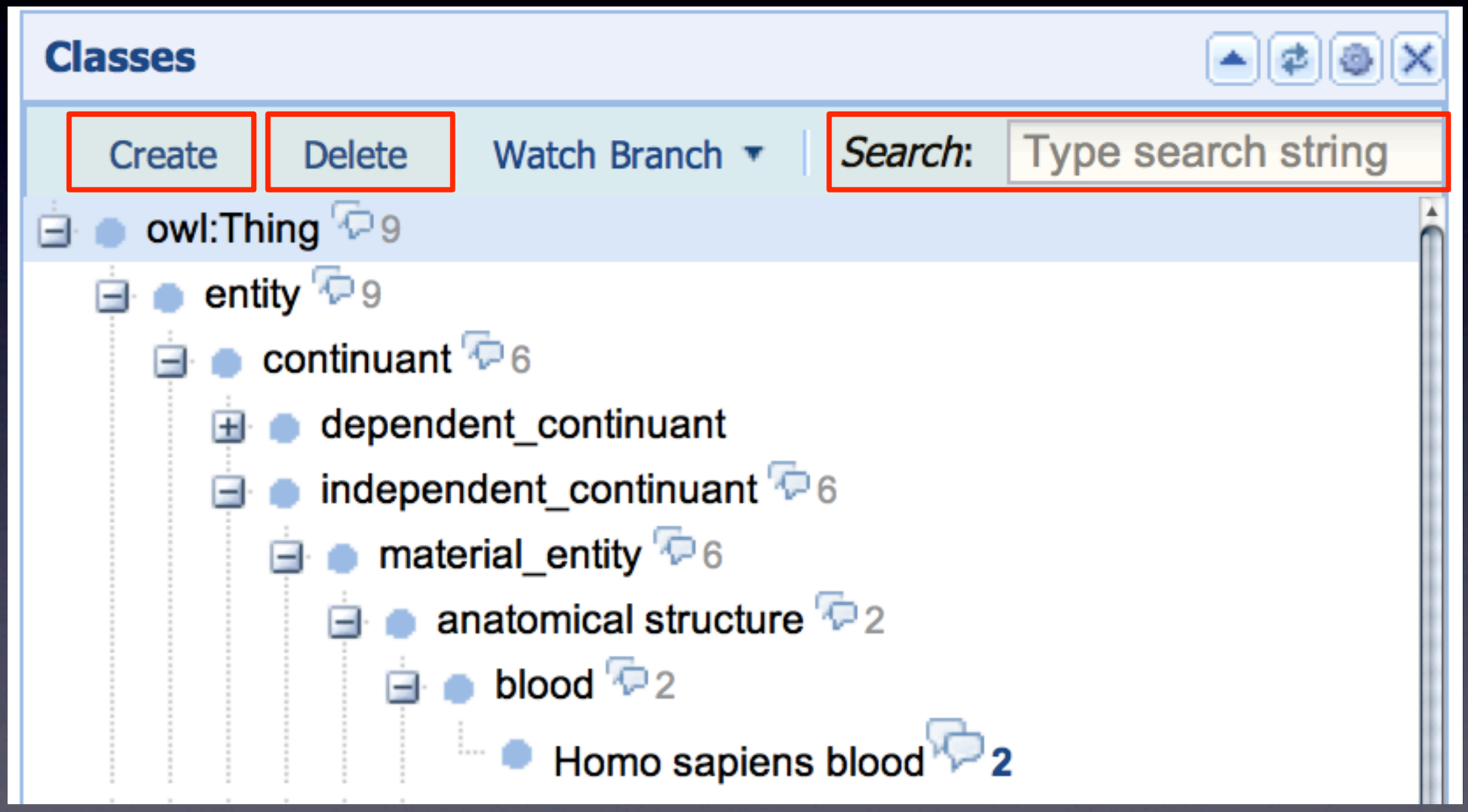

Annotation Properties

Properties for Homo sapiens blood

Add property value Delete property value

Property	Value	Lang
definition	blood of human	
oboInOwl:hasDbXref	FMA:9670	
rdfs:label	Homo sapiens blood	

Annotation Properties

Properties for Homo sapiens blood

Add property value | Delete property value

Property	Value	Lang
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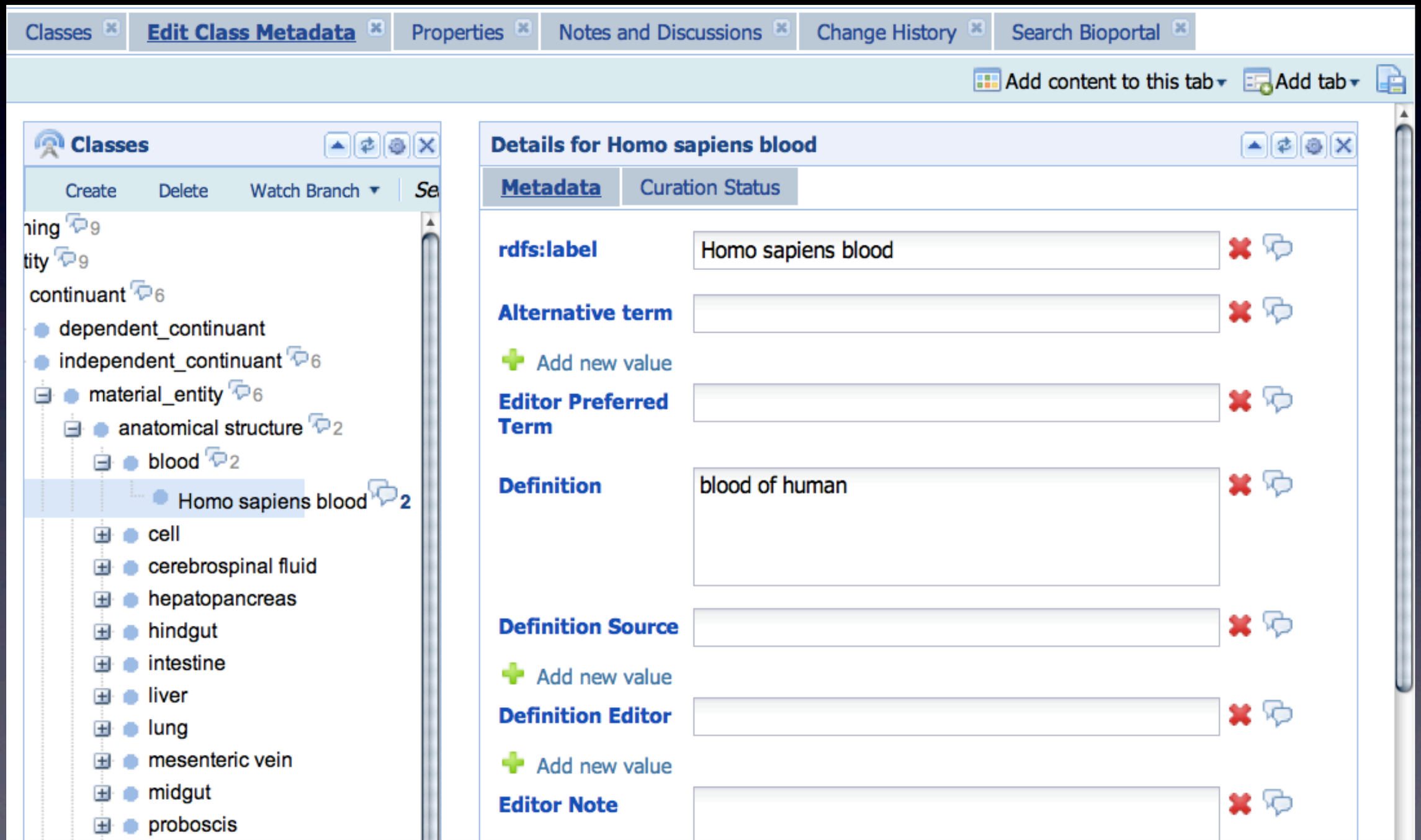
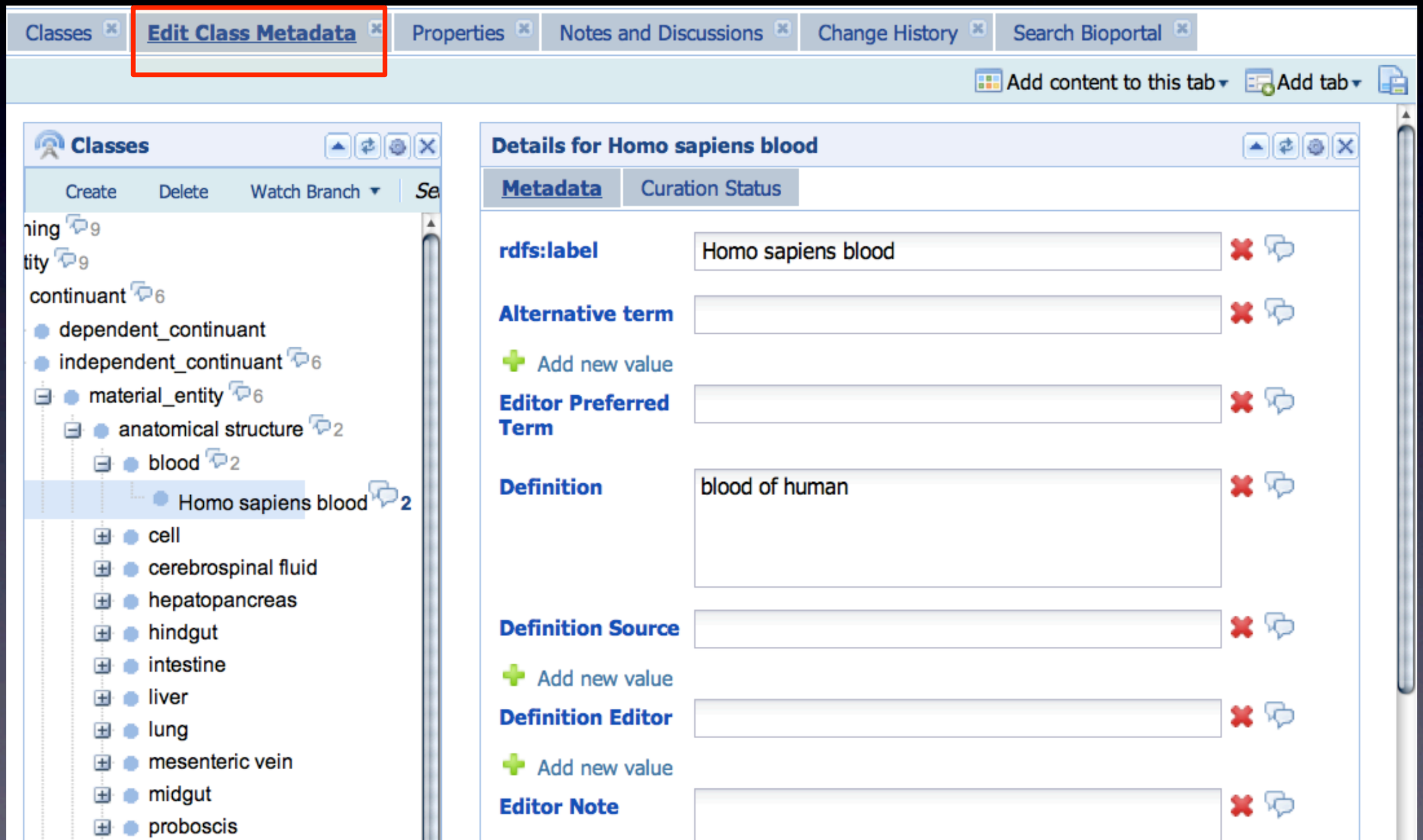
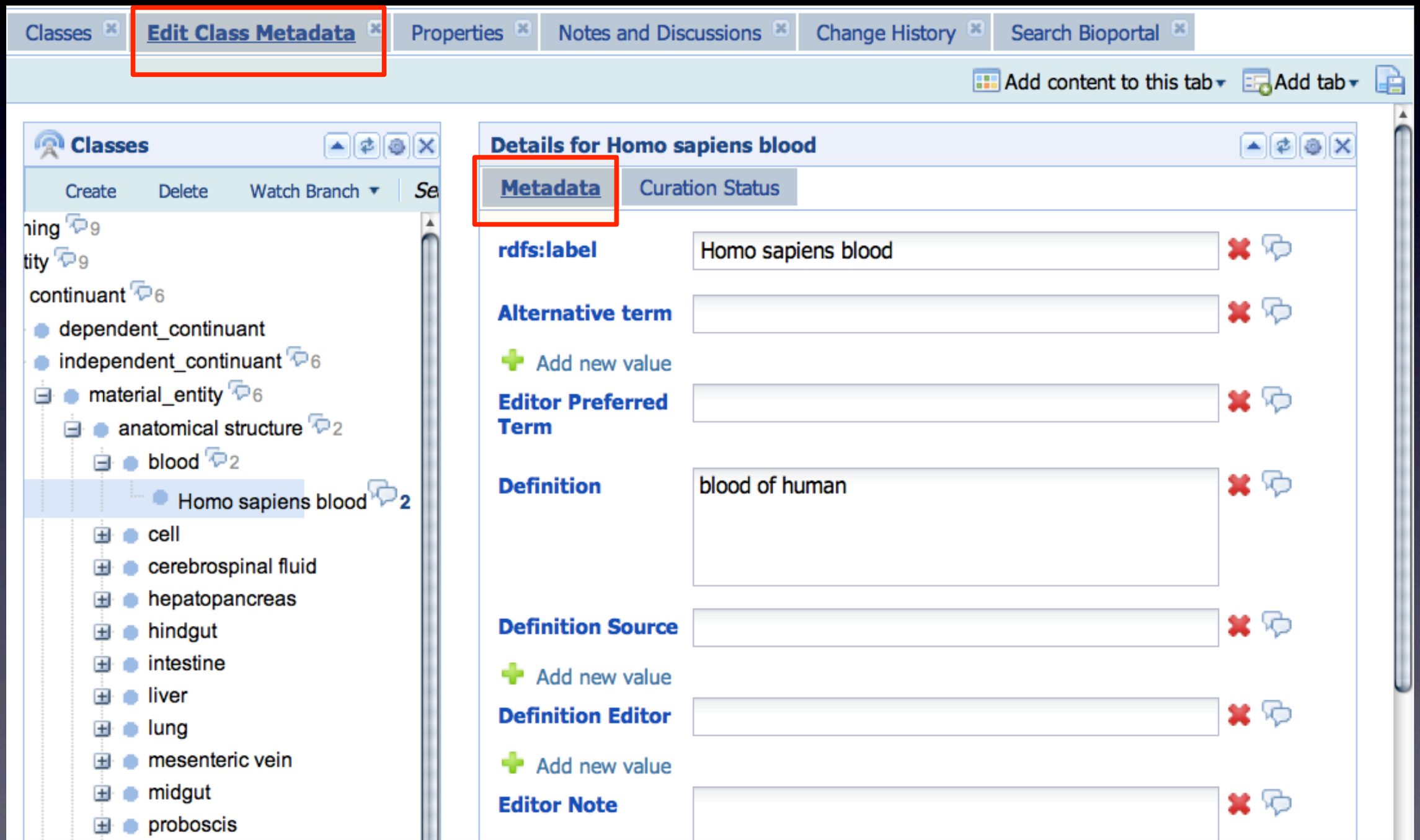
Annotation Properties (another way to look at them)



Annotation Properties (another way to look at them)



Annotation Properties (another way to look at them)



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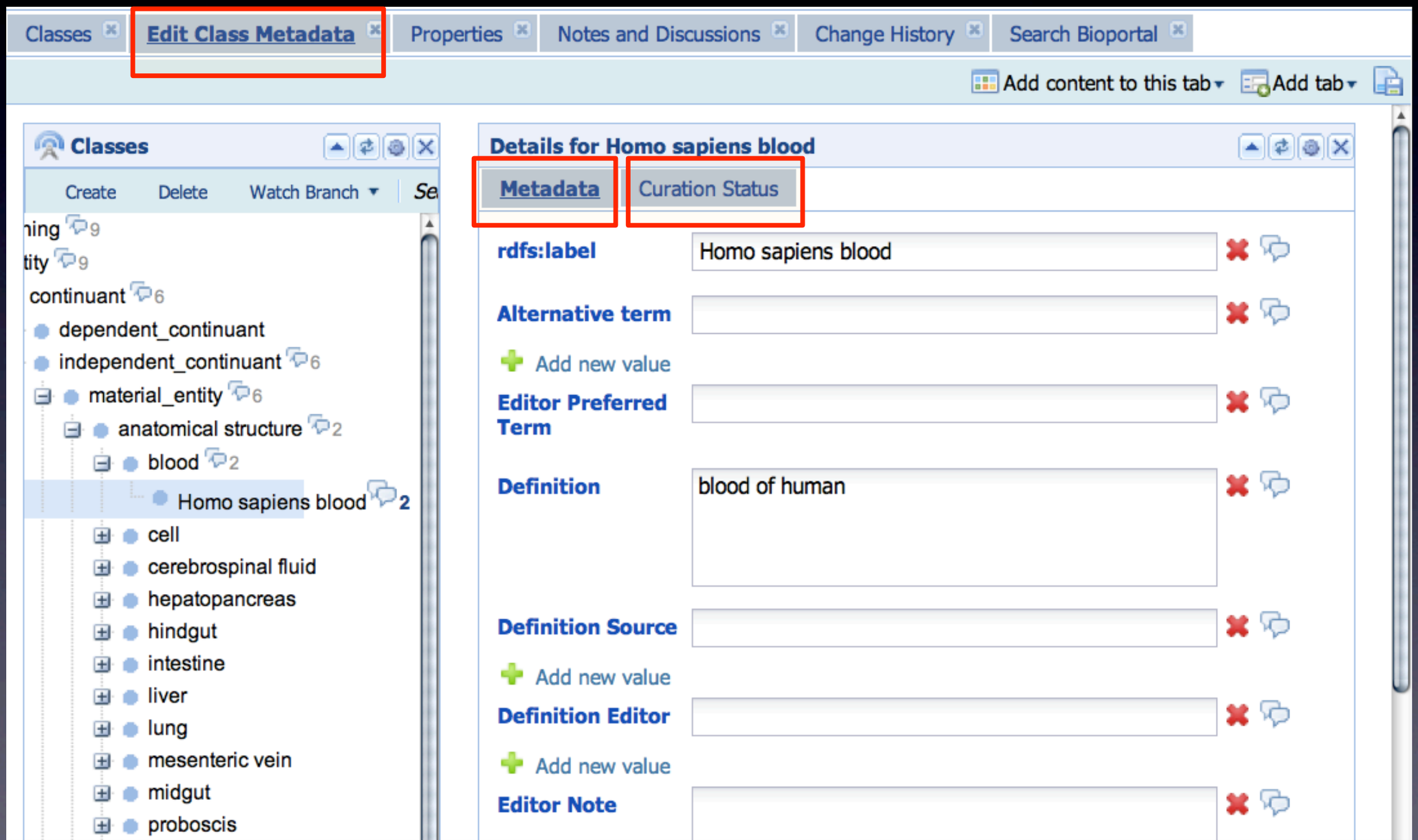
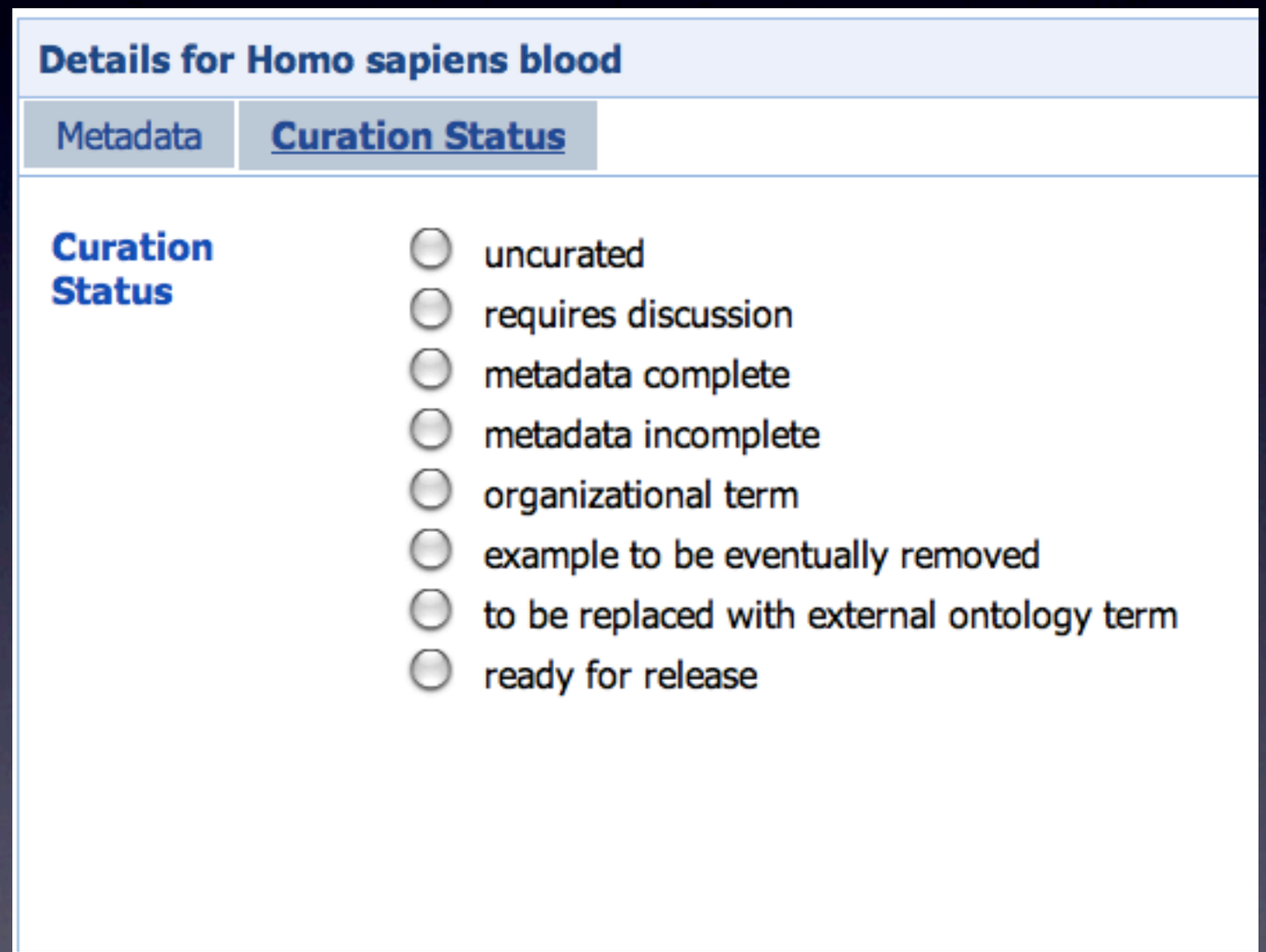


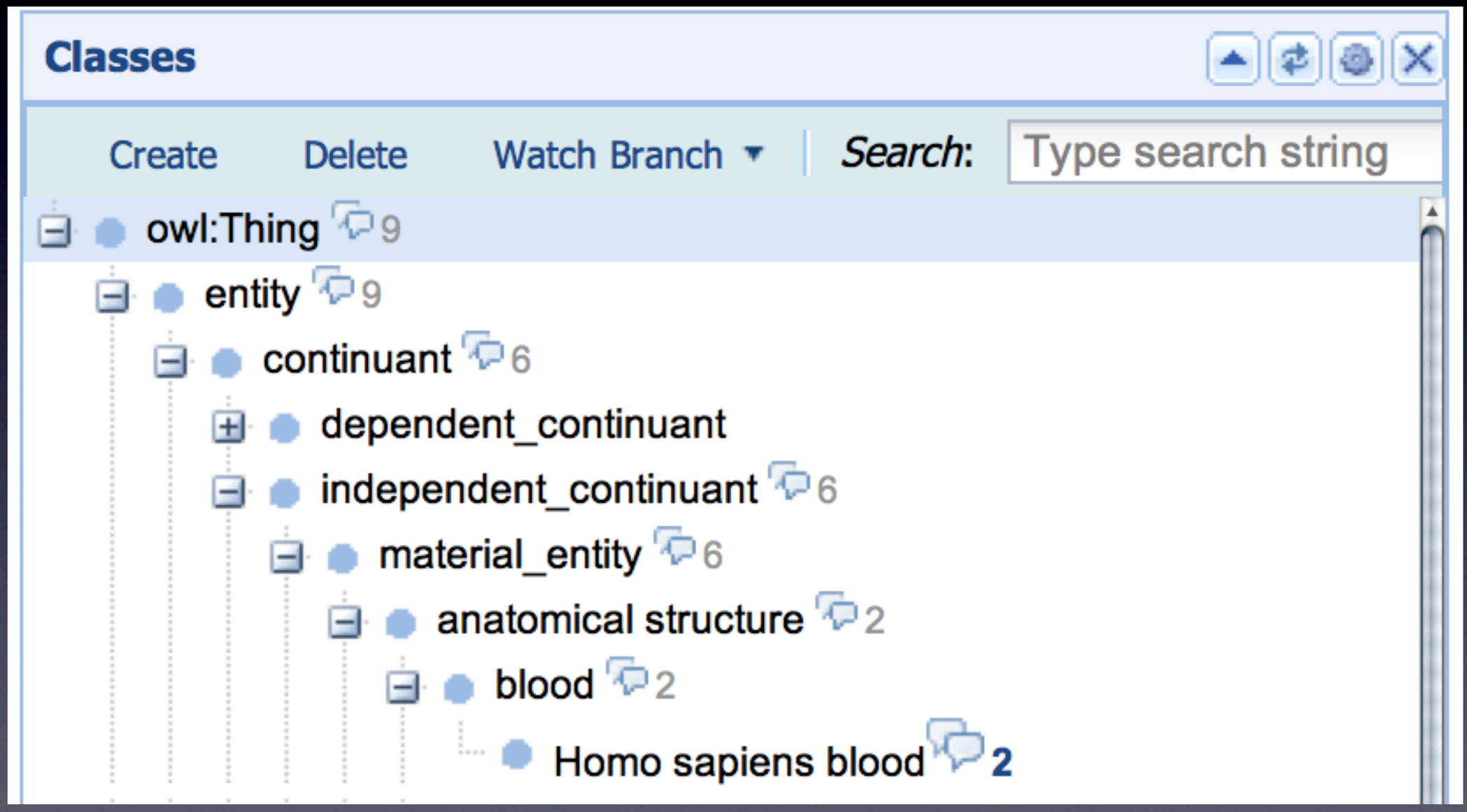
Curation Status



It's not just about editing...

- You can comment on classes and carry out discussions
- Archive notes and requests that you have responded to
- See the change history for a class
- Set up a list of "watched entities"
  - get notified when someone else changes a class
  - get notified when there are any changes in the hierarchy branch that you care about

Class Hierarchy (More Details)



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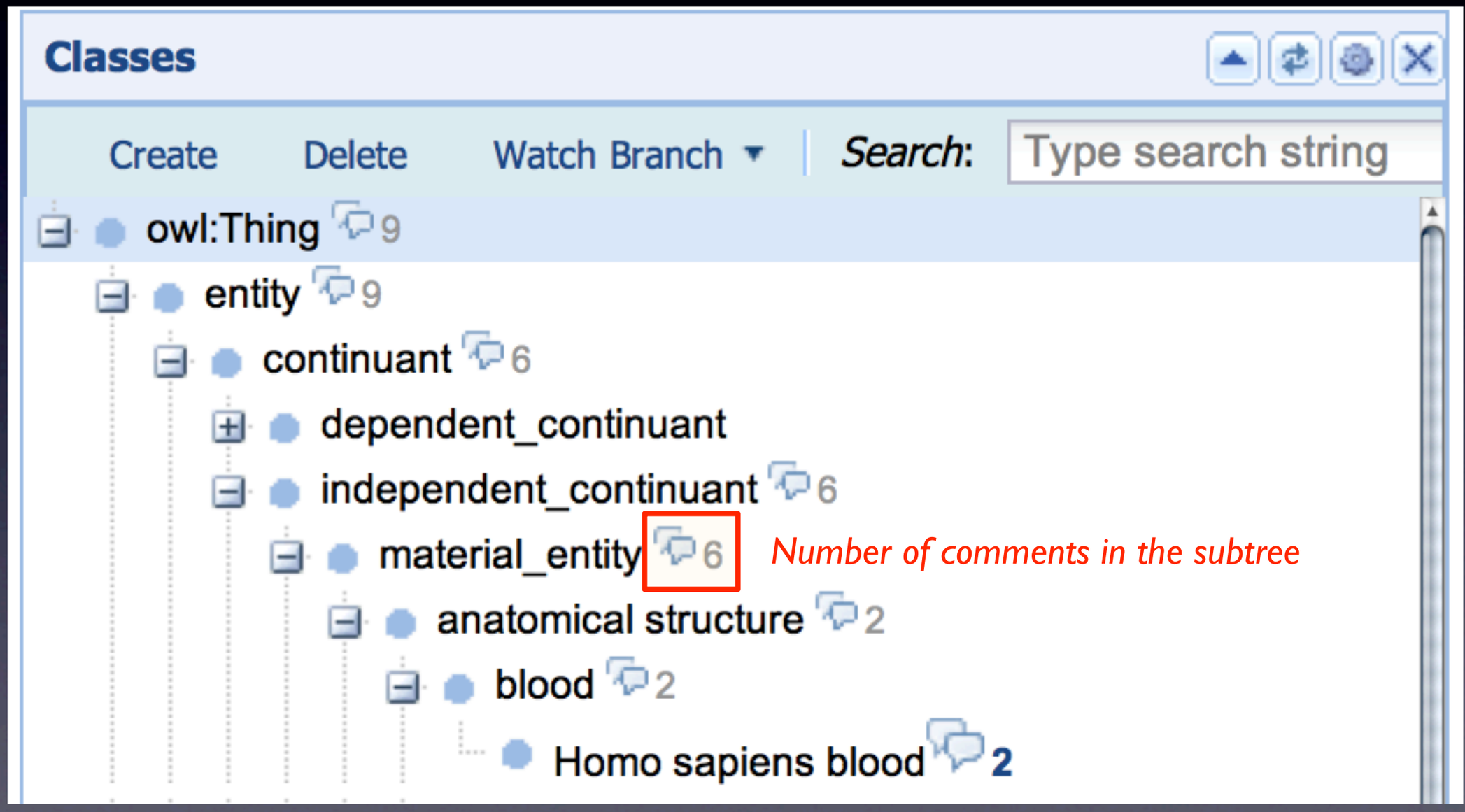
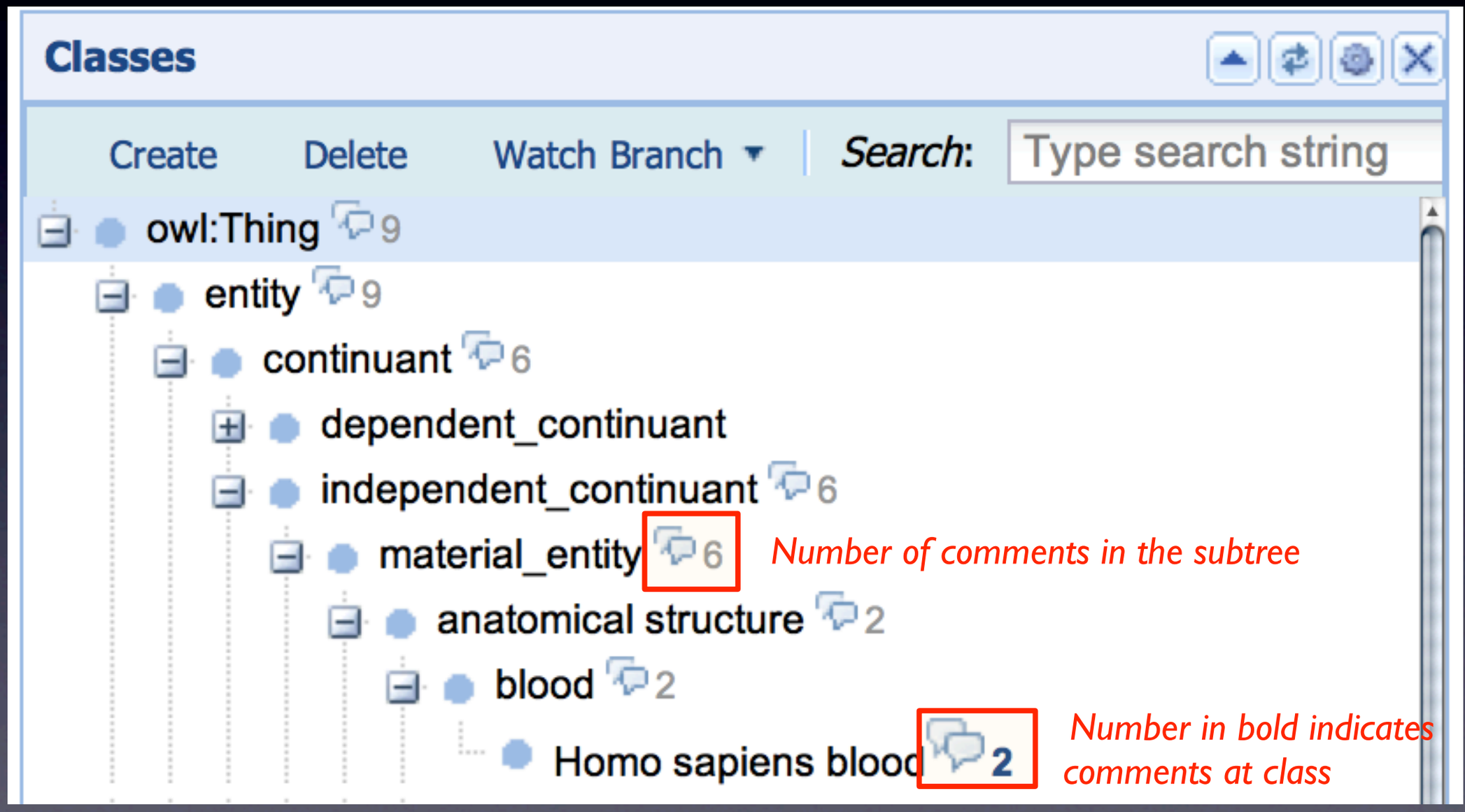
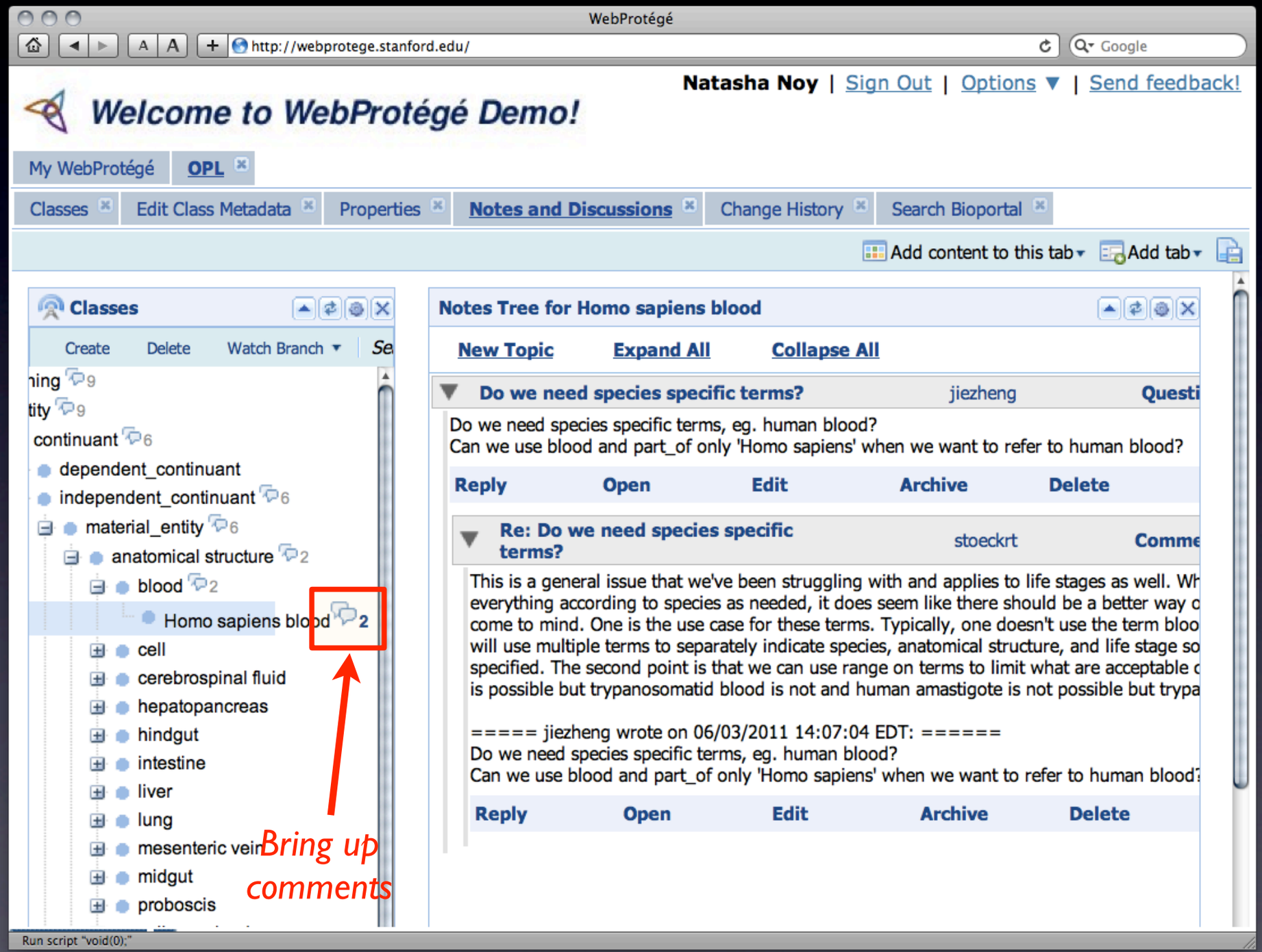


Class Hierarchy (More Details)



Notes And Discussion



Change History

Change history for Homo sapiens blood

Description	Author	Timestamp
Annotation change for obo:OPL_0000117, property: r…	jiezheng	Thu Jun 09 201…
Delete condition has_part only cell from 'Homo sapie…	jiezheng	Thu Jun 09 201…
Set condition at 'Homo sapiens blood' to has_part onl…	jiezheng	Thu Jun 09 201…
Set condition at 'Homo sapiens blood' to has_part so…	jiezheng	Thu Jun 09 201…

Page 1 of 1 Displaying records 1 - 4 of 4

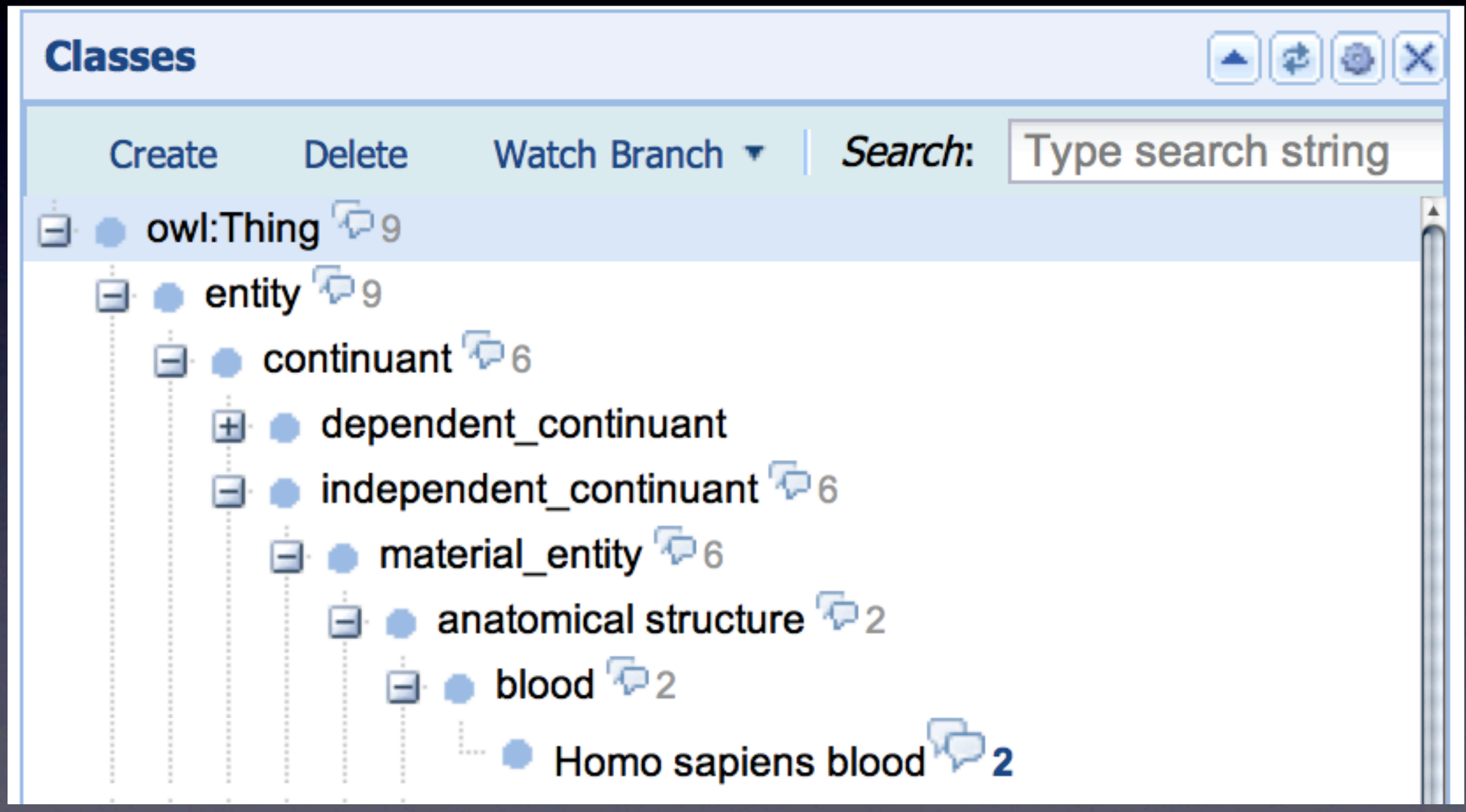
Change Summary for OPL

Recent Activity
Today: (refresh the widget to get the count)
Yesterday: (refresh the widget to get the count)

Change History

Description	Author	Timestamp
Deleted class http://purl.obolibrary.org/obo/opl.owl#probe	Natasha Noy	Fri Jul 22 2011 00:59:20 GMT-0700 (PDT)
Created class probe	Natasha Noy	Fri Jul 22 2011 00:58:48 GMT-0700 (PDT)

Class Hierarchy (More Details)



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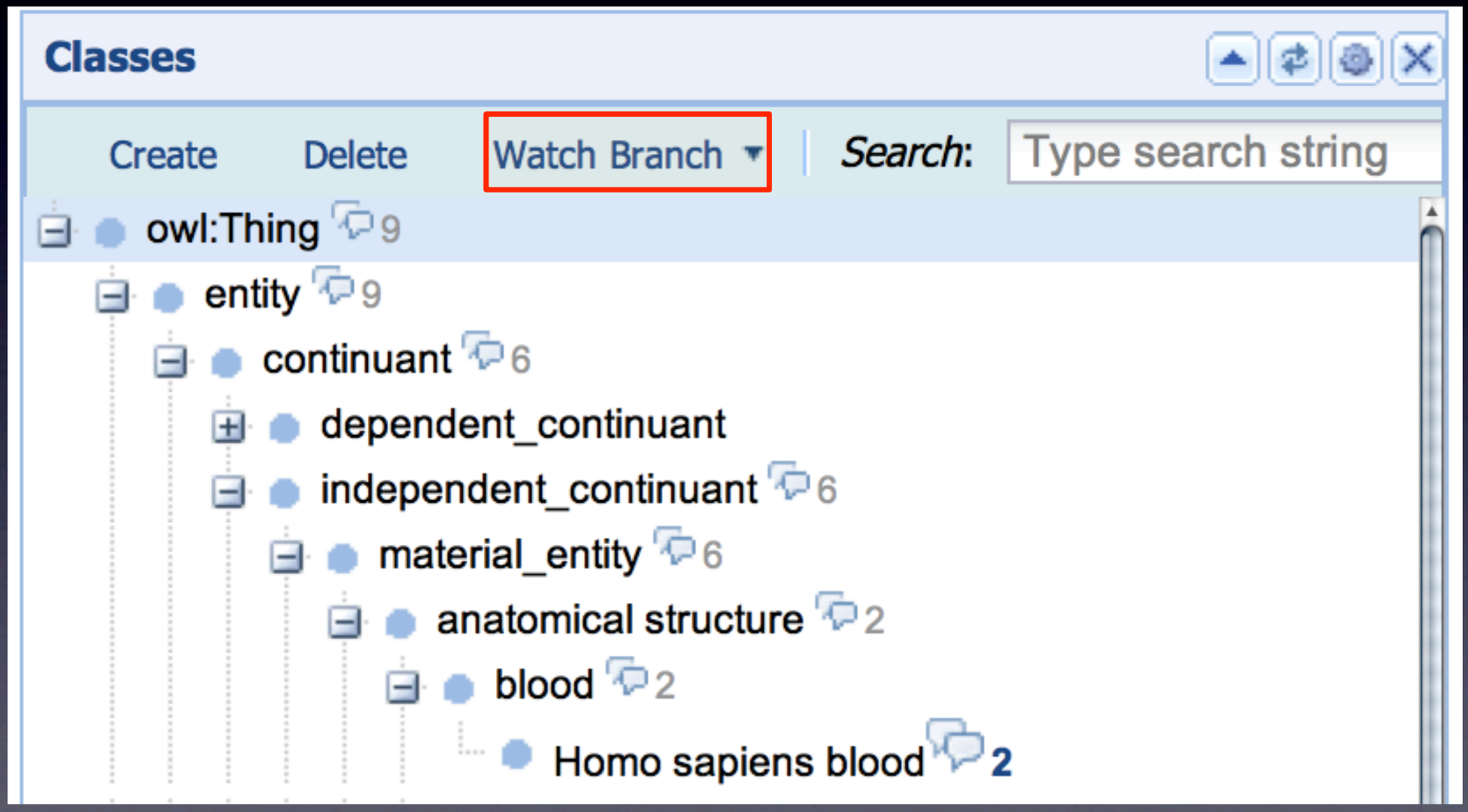
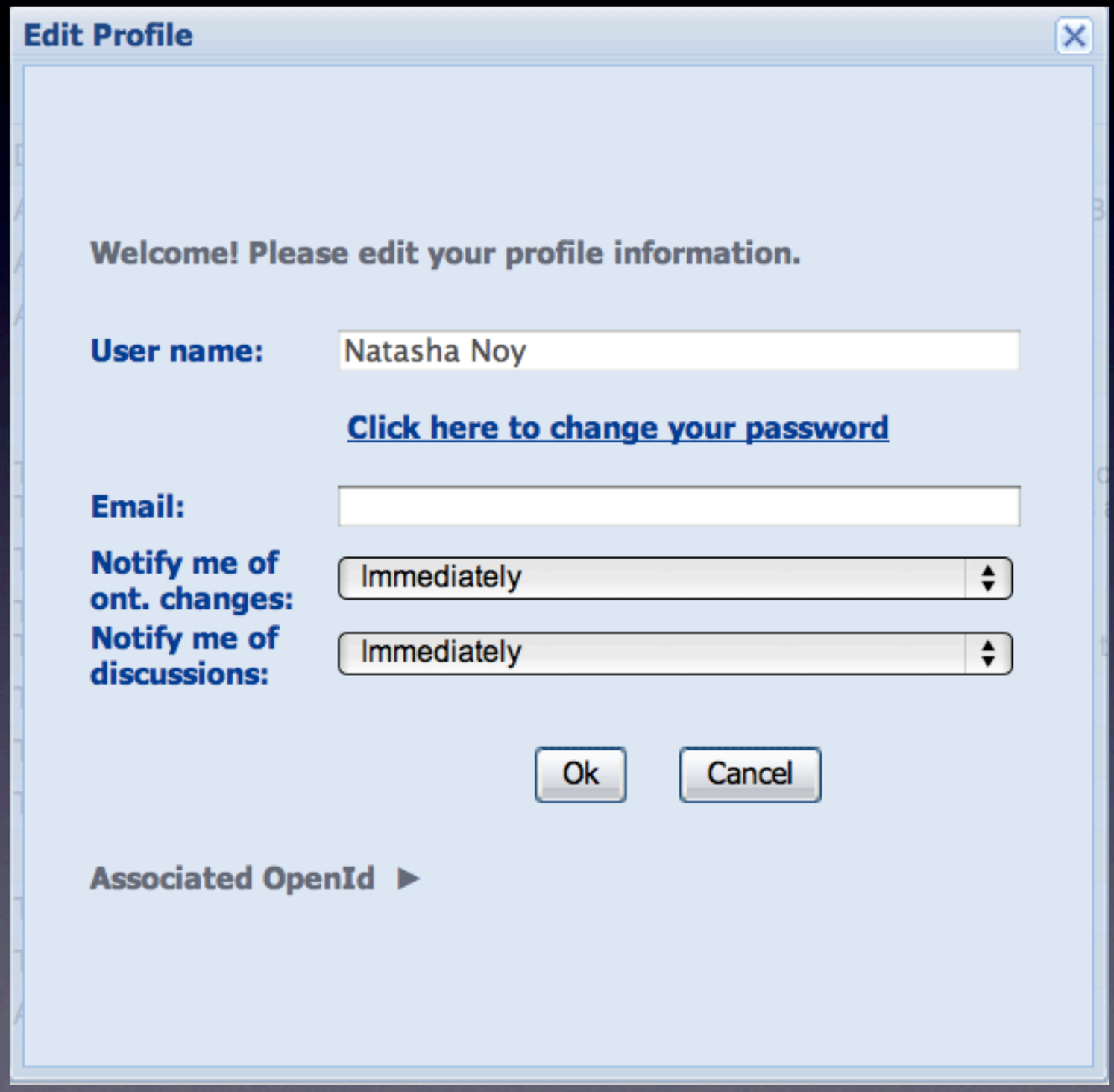


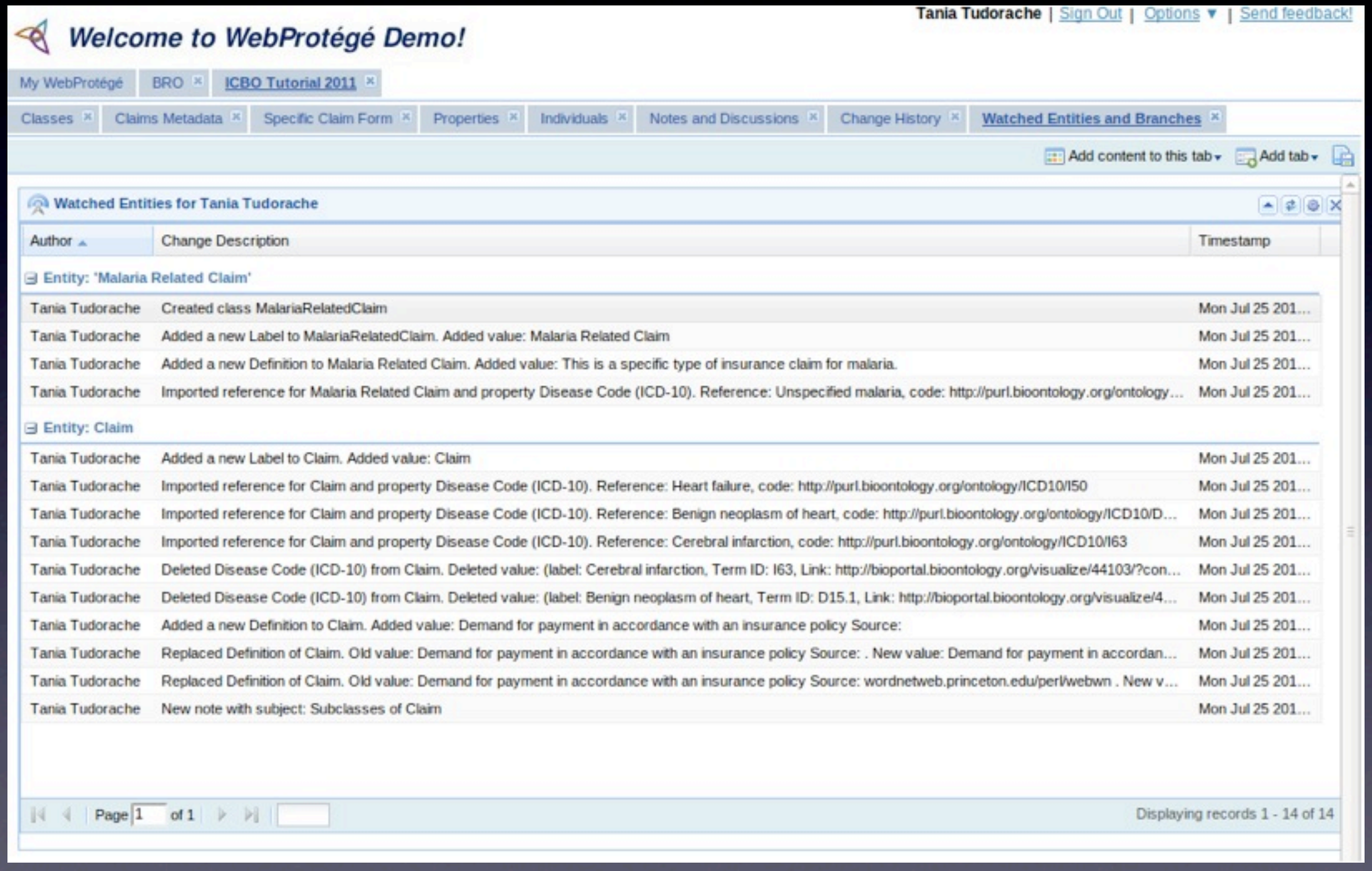
Email Notifications

- You can subscribe to email notifications for changes to your watched entities
  - changes to ontology
  - changes to note
- Different notification intervals

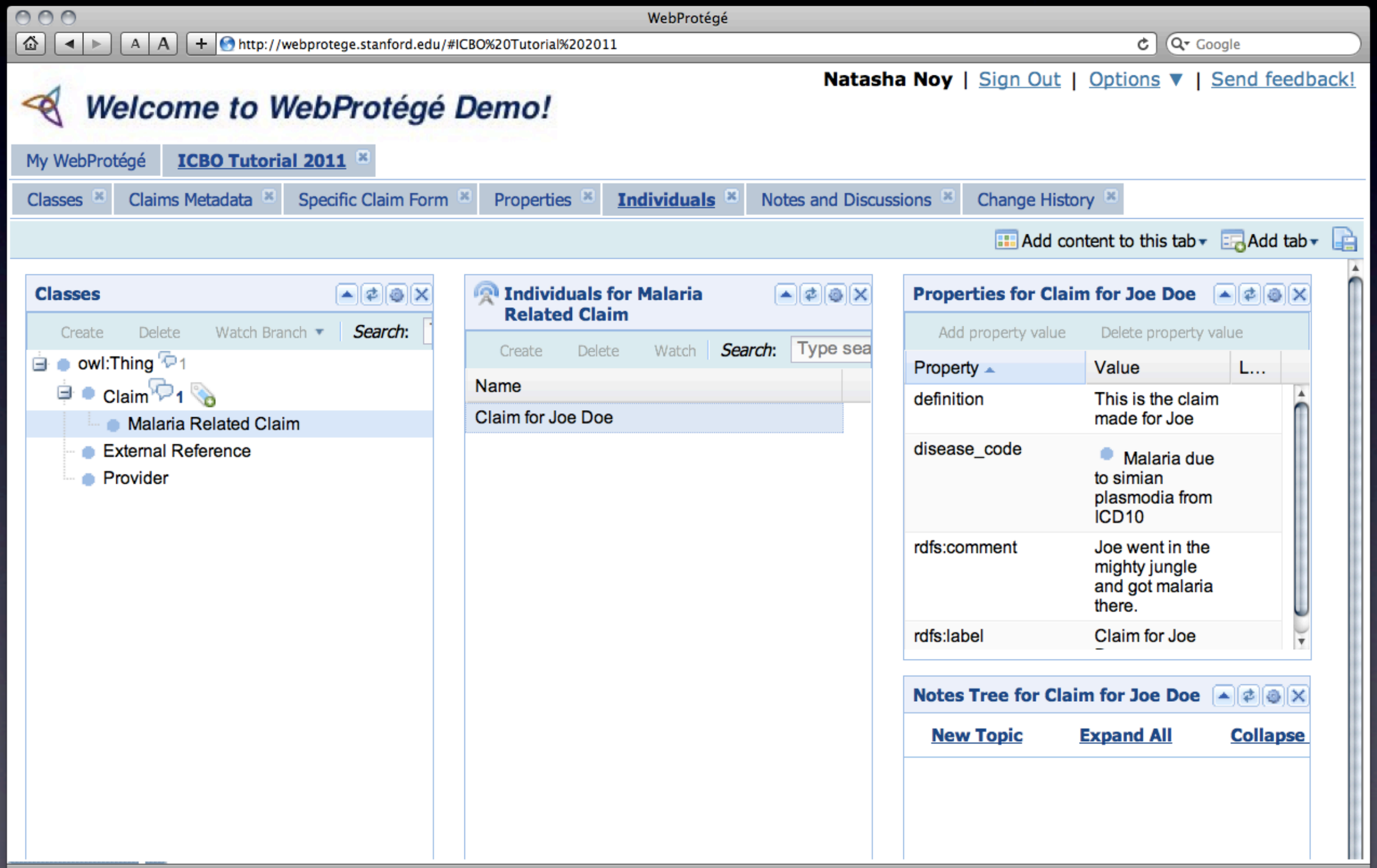
Configuring Email Notifications



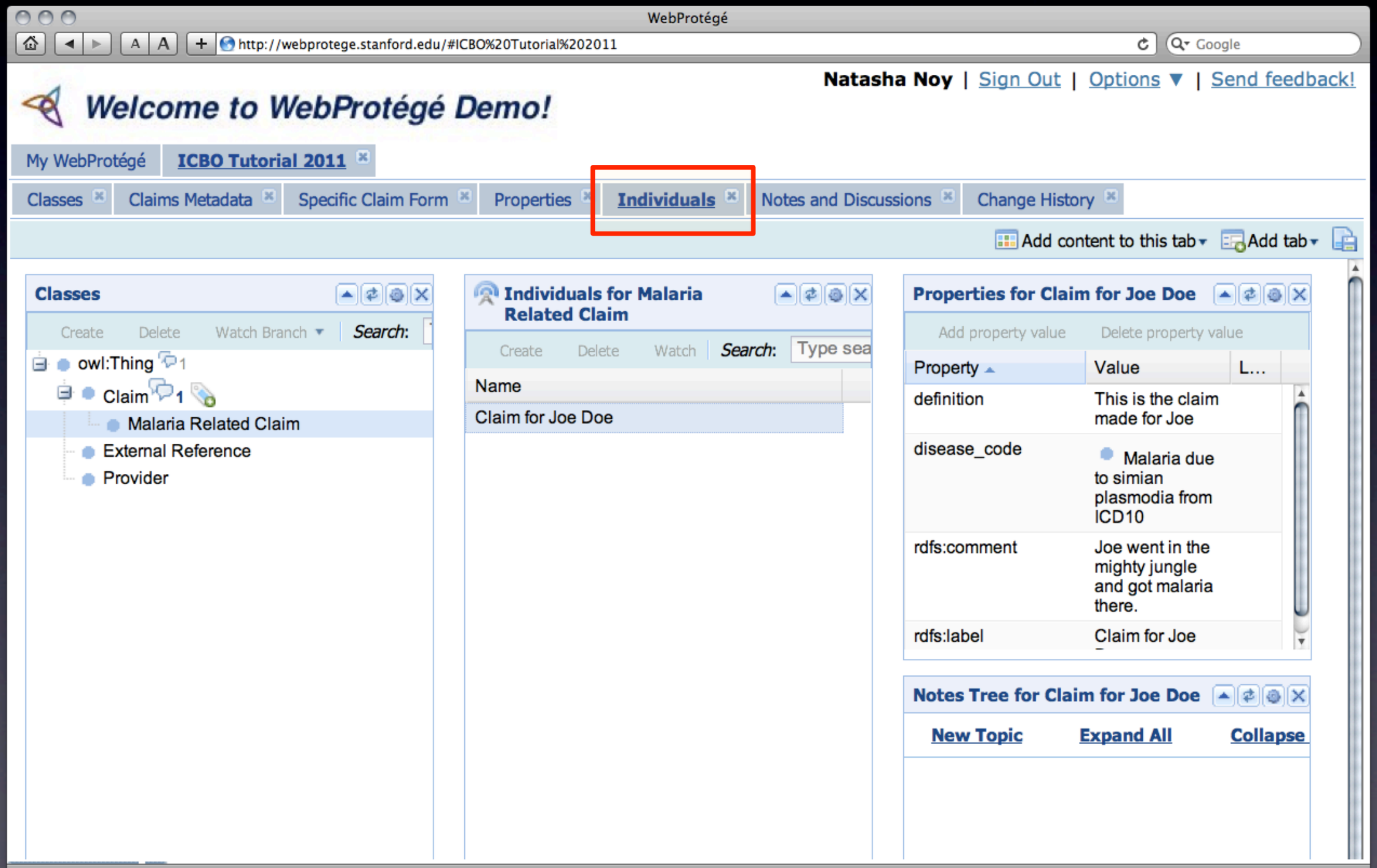
Watched entities



Creating Individuals: Just Like in the Desktop Client



Creating Individuals: Just Like in the Desktop Client



Browsing ontologies in WebProtégé

- View and edit the class hierarchy
- View and edit ontology metadata
- View and edit class definitions
- View and edit comments
- View and edit individuals

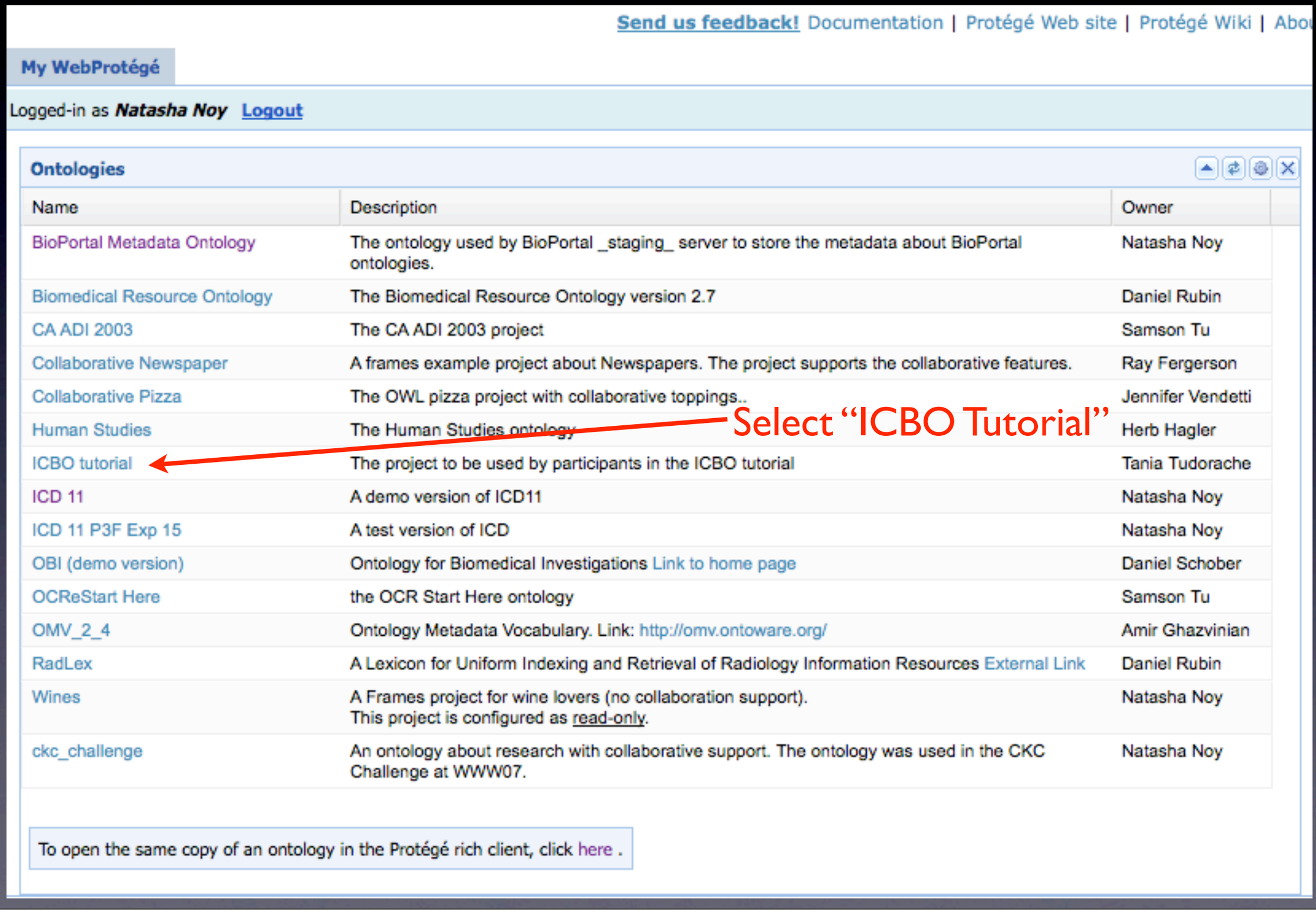
Let's Develop an Ontology!

- http://webprotege.stanford.edu

Hands-on exercise

- We will create a simple ontology collaboratively
- Topic: Health insurance

Select an ontology to edit



Let's develop a simple ontology

- Goal:
  - Develop a simple ontology to represent health insurance information

Initial Terms

- Provider
  - Individual doctor
  - Hospital
  - Clinical practice
- Services
  - Emergency visit
  - Urgent care
- Claim
  - diagnosis
  - comes from ICD-10

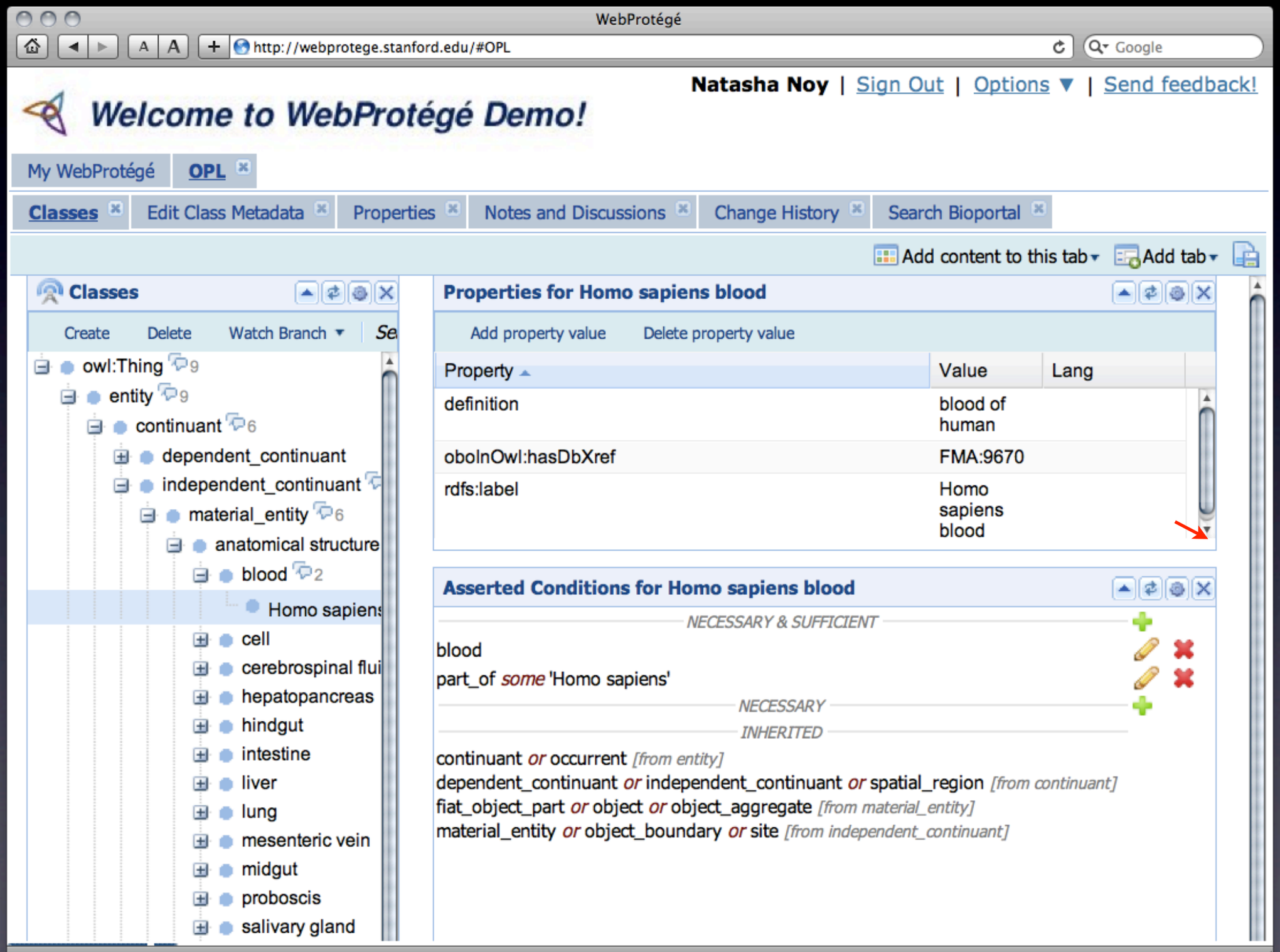
- Hands-on exercise
  - Create classes
  - Edit classes
  - Comment on what others are doing

Custom-Tailoring the Interface

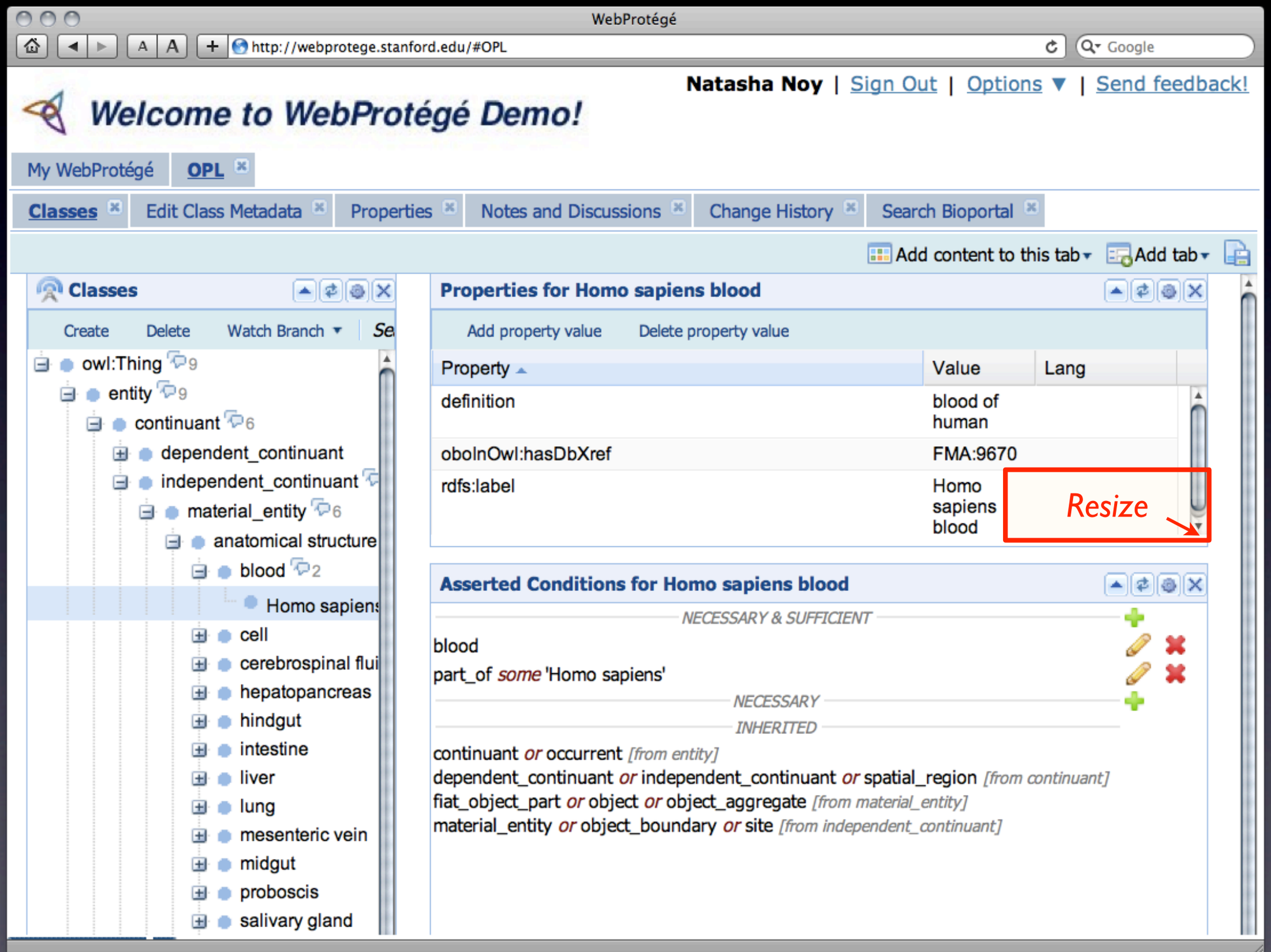
- You can custom-tailor the interface per project and per user of the project
- If you are custom-tailoring in your own browser, WebProtégé saves the configuration as as your preferences for the current ontology

- You can customize
  - the number of tabs
  - the layout and content of each tab
  - the size of each tab component
  - the types of the components on the tab

Class Details



Class Details



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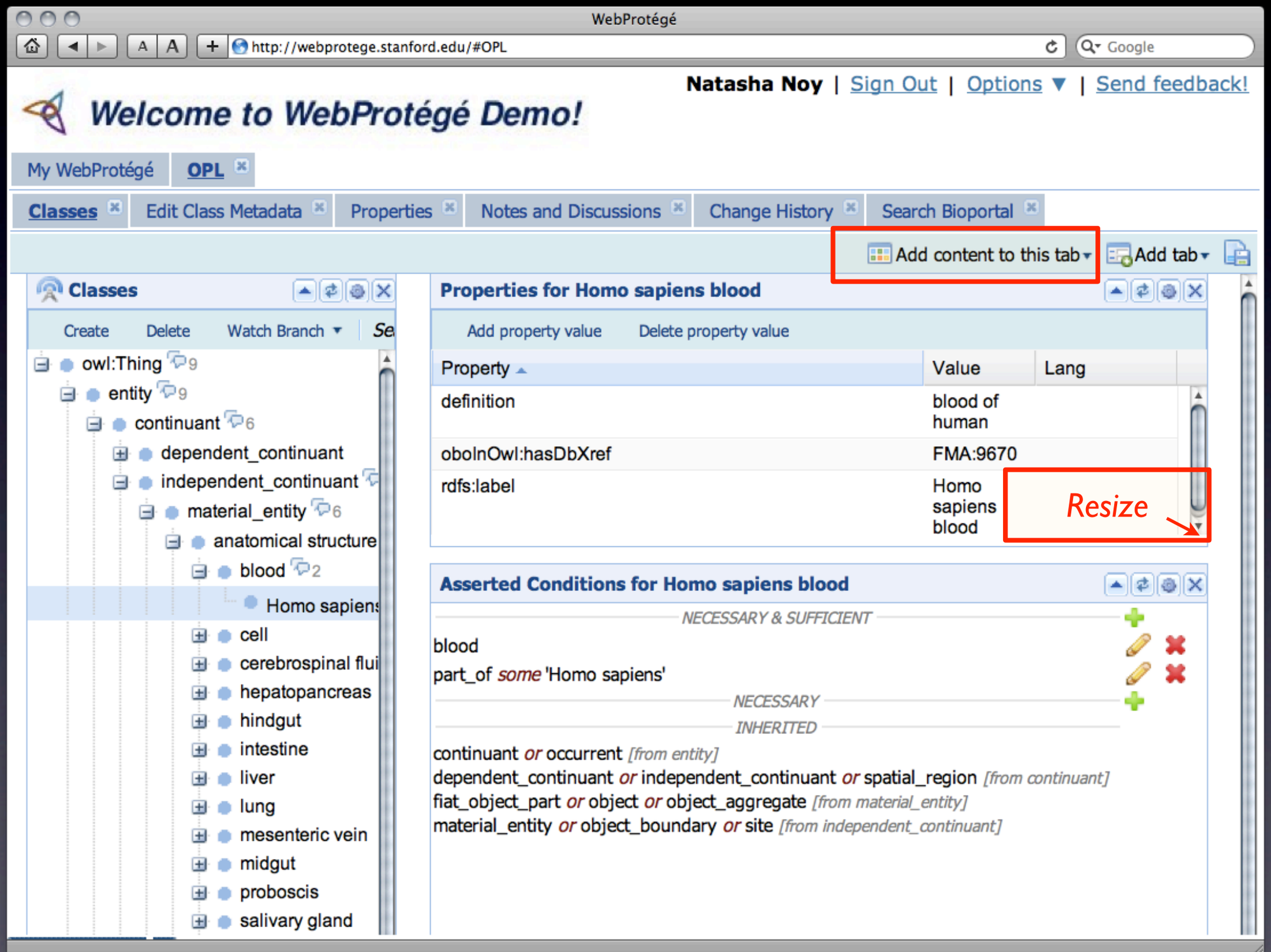

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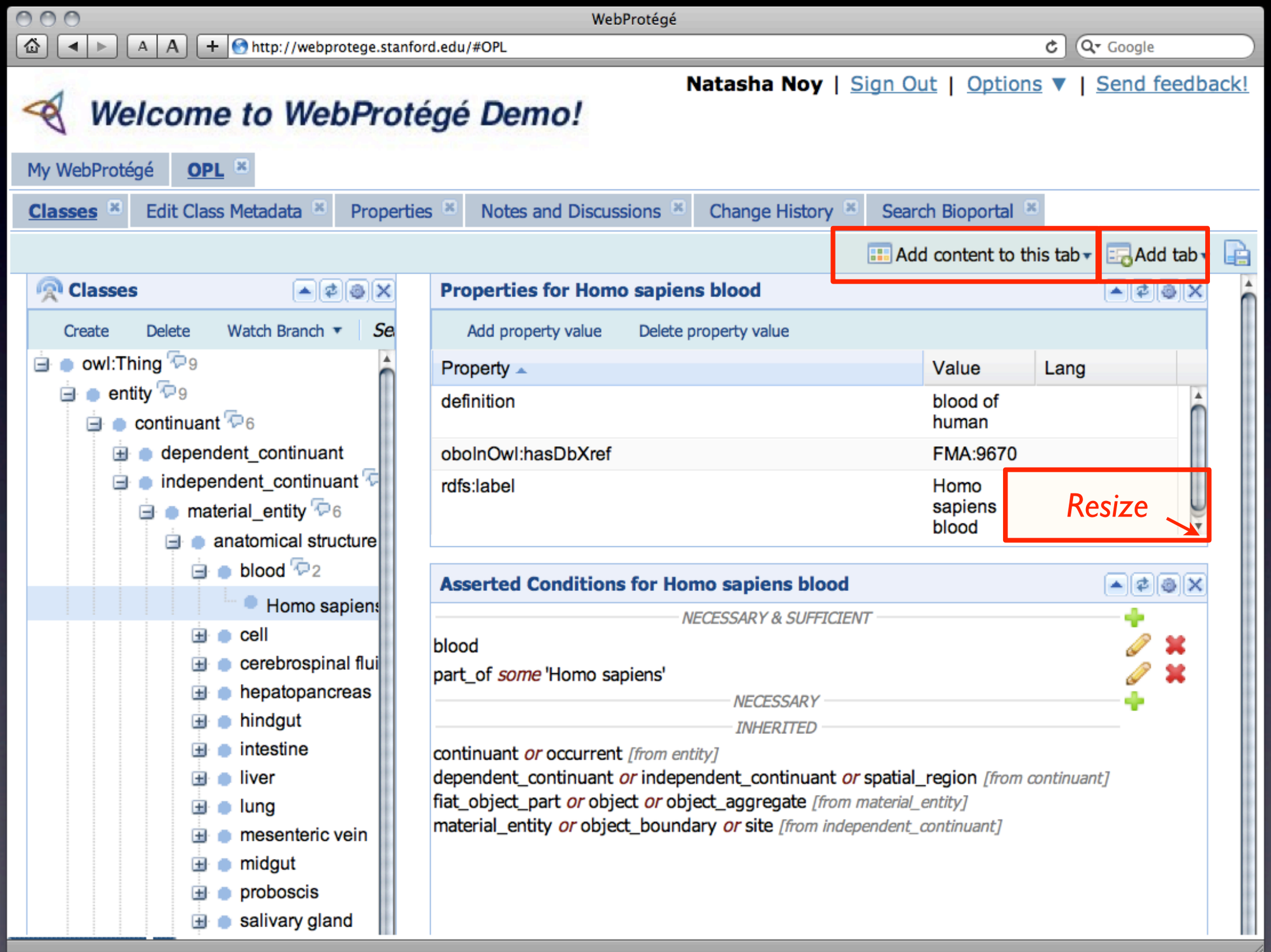

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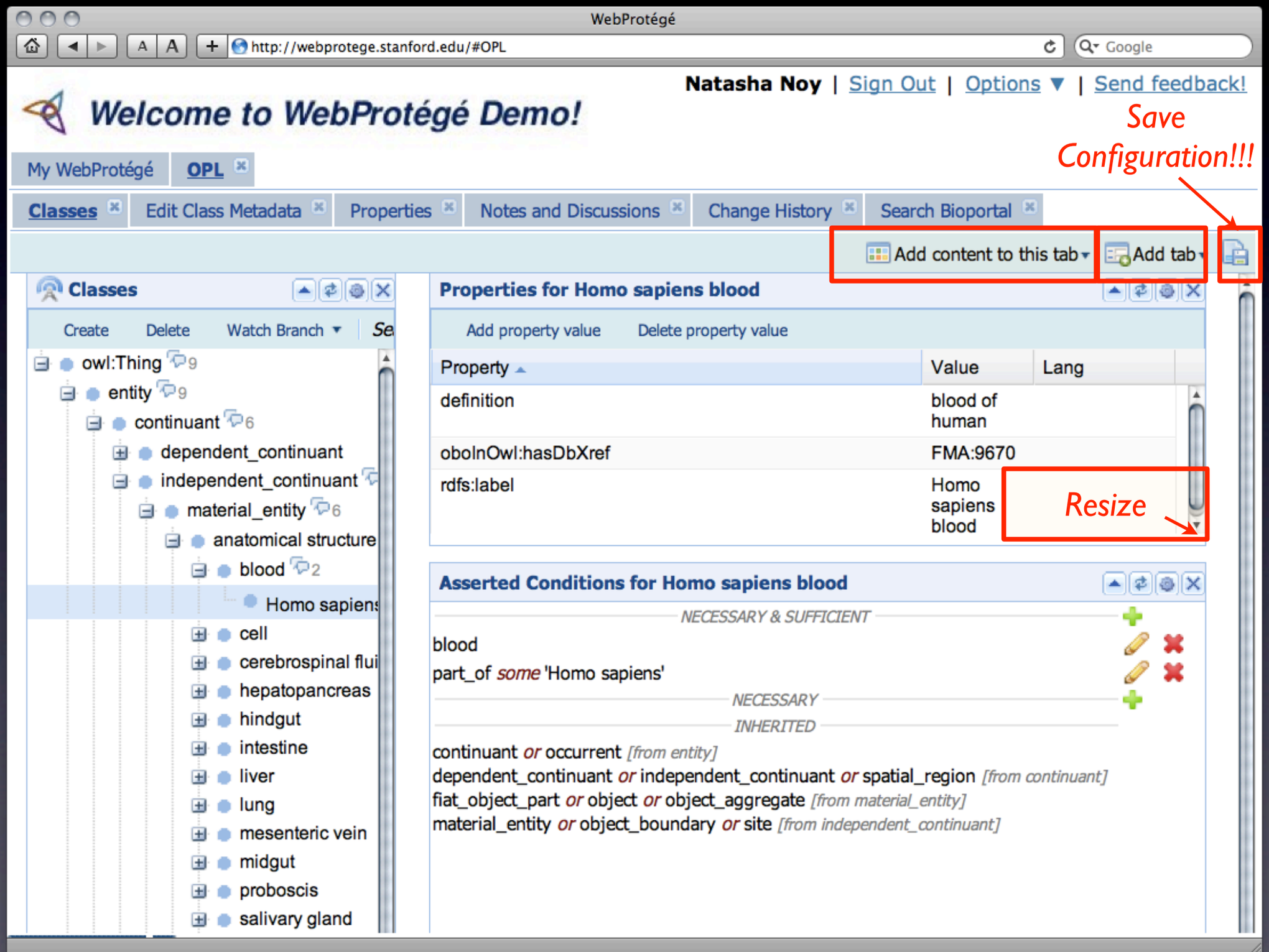
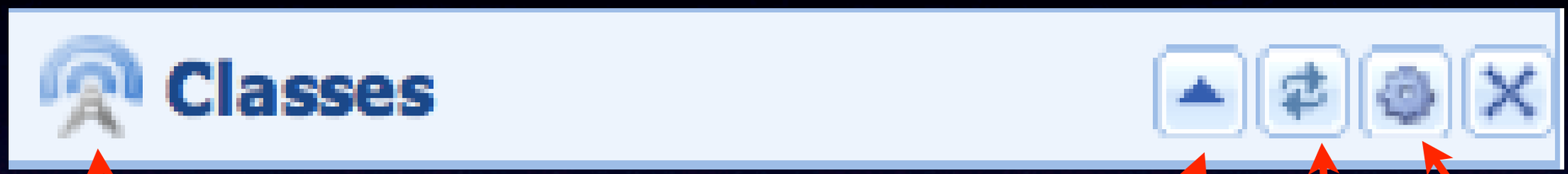


Portlet Toolbar



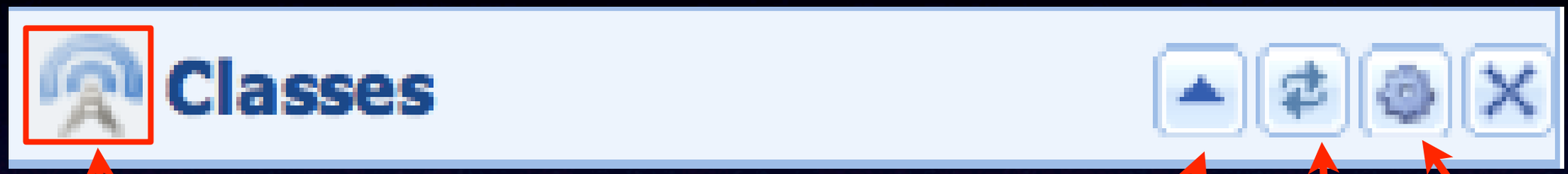
Controlling Portlet (controls selection for the whole tab)

Hide portlet

Refresh portlet (VERY useful)

Configure the portlet; set controlling portlet

Portlet Toolbar



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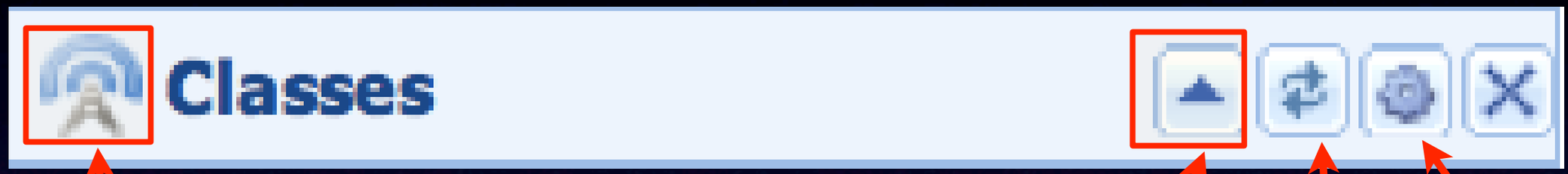

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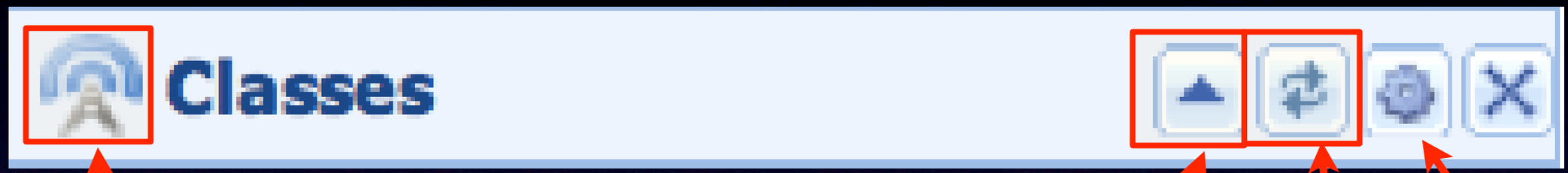

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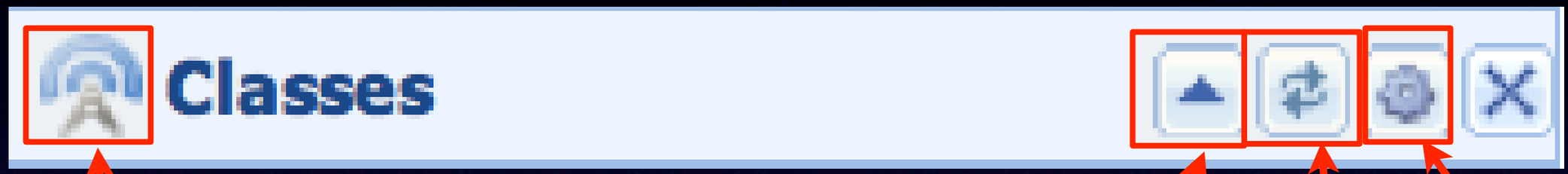

Controlling Portlet (controls selection for the whole tab)

Hide portlet

Refresh portlet (VERY useful)

Configure the portlet; set controlling portlet

Configurations

- More detailed configurations are stored as an XML file on the server
  - Need to edit it directly to fine-tune the project configuration
- Saving the configuration over-writes the project-wide configuration for the specific user

Where Does This Get You?

- Custom knowledge-acquisition interfaces for domain experts
- iCAT: a customization of WebProtégé for the development of the 11th Revision of the International Classification of Diseases (ICD-11)

iCAT ICD Collaborative Authoring Tool

Tania Tudorache | Sign Out | Options ▼ | Send feedback

My ICD | **ICD Content** | Category Notes and Discussions | Reviews | Change History | Manage Hierarchy | Export and Import

ICD Categories

Create | Remove Watch ▼ | *Search:* Type search string

- ICD Categories 1 19832
  - 01 I Certain infectious and parasitic diseases 4 1934
  - 02 II Neoplasms 5 945
  - 03 III Diseases of the blood and blood-forming organs and cert
  - 04 IV Endocrine, nutritional and metabolic diseases 2 22
  - 05 V Mental and behavioural disorders 9 207
  - 06 VI Diseases of the nervous system 1897
  - 07 VII Diseases of the eye and adnexa 9 1090
  - 08 VIII Diseases of the ear and mastoid process 7 371
  - 09 IX Diseases of the circulatory system 4 893
  - 10 X Diseases of the respiratory system 3 406
  - 11 XI Diseases of the digestive system 4 2082
  - 12 XII Diseases of the skin 10 3788
  - 13 XIII Diseases of the musculoskeletal system and connectiv
  - 14 XIV Diseases of the genitourinary system 3 2016

Details for 12 XII Diseases of the skin

Title & Definition | Classification Properties | Terms | Clinical Description | Manifestation Properties | Causal Properties | Temporal Properties | Severity Properties | Functioning Properties | Specific Condition Properties | Treatment | Diagnostic Criteria | ICD 10 Notes and Hints

ICD 10 Code XII

Sorting label 12 XII

ICD Title Diseases of the skin

Fully Specified Name

Short Definition

Text
Diseases of the skin incorporate conditions affecting the epidermis, its appendages (hair, hair follicle, sebaceous glands, apocrine sweat gland apparatus, eccrine sweat gland apparatus and nails), the dermis, the cutaneous vasculature and the subcutaneous tissue (subcutis).

iCAT ICD Collaborative Authoring Tool

Tania Tudorache | Sign Out | Options ▼ | Send feedback!

My ICD | ICD Content | Category Notes and Discussions | Reviews | Change History | Manage Hierarchy | Export and Import

ICD Categories

Create | Remove Watch ▼ | Search: Type search string

- ICD Categories 1 19832
  - 01 I Certain infectious and parasitic diseases 4 1934
  - 02 II Neoplasms 5 945
  - 03 III Diseases of the blood and blood-forming organs and certain
  - 04 IV Endocrine, nutritional and metabolic diseases 2 2274
  - 05 V Mental and behavioural disorders 9 207
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  - 12 XII Diseases of the skin 10 3788
  - 13 XIII Diseases of the musculoskeletal system and connective tis
  - 14 XIV Diseases of the genitourinary system 3 2016
  - 15 XV Pregnancy, childbirth and the puerperium 3 174
  - 16 XVI Certain conditions originating in the perinatal period 3
  - 17 XVII Developmental anomalies 5 3042
  - 18 XVIII Symptoms, signs and abnormal clinical and laboratory find
  - 19 XIX Injury, poisoning and certain other consequences of externa
  - 20 XX External causes of morbidity and mortality 5 308

Details for 12 XII Diseases of the skin

Title & Definition | Classification Properties | Terms | Clinical Description | Manifestation Properties

Causal Properties | Temporal Properties | Severity Properties | Functioning Properties

Specific Condition Properties | Treatment | Diagnostic Criteria | ICD 10 Notes and Hints

Type

- ○ Disease
- ○ Disorder/Syndrome
- ○ Exposure to External Causes
- ○ Injuries
- ○ Sign/Symptom
- ○ Reason for Encounter
- ◉ Unspecified

Use

Linearization	Is part of?	Linearization Parent
01 Morbidity	☑	ICD Categories
02 Mortality	☑	ICD Categories
03 Primary Care	☑	ICD Categories
04 Research	☑	ICD Categories
05 Spec. Adapt: Mental Health	?	Click here to select a parent
06 Spec. Adapt: Dermatology	☑	ICD Categories
07 Spec. Adapt: Musculoskeletal	?	Click here to select a parent
08 Spec. Adapt: Neurology	?	Click here to select a parent

iCAT ICD Collaborative Authoring Tool

ICD Categories

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- ICD Categories 1 19832
  - 01 I Certain infectious and parasitic diseases 4 1934
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Details for 12 XII Diseases of the skin

Title & Definition | Classification Properties | Terms | Clinical Description | Manifestation Properties | Causal Properties | Temporal Properties | Severity Properties | Functioning Properties | Specific Condition Properties | Treatment | Diagnostic Criteria | ICD 10 Notes and Hints

Condition Usually Occurs Only in

- ○ Male
- ○ Female
- ◉ Not Applicable

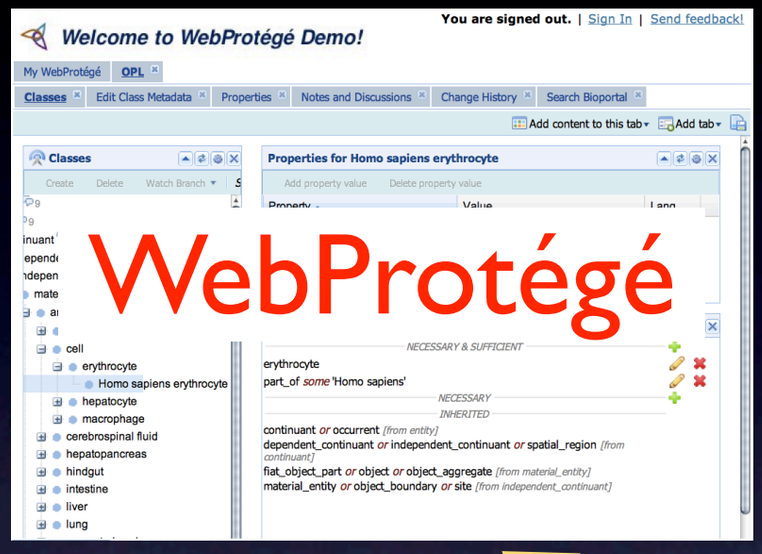
Condition Usually Occurs in Mother during

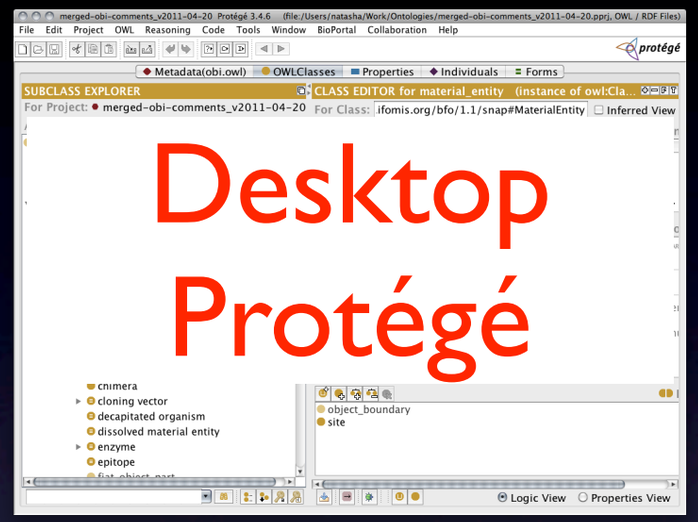
- ☐ Pregnancy (whole)
- ☐ Childbirth
- ☐ Puerperium (birth until 42 days after birth)

Condition Usually Occurs in Child during

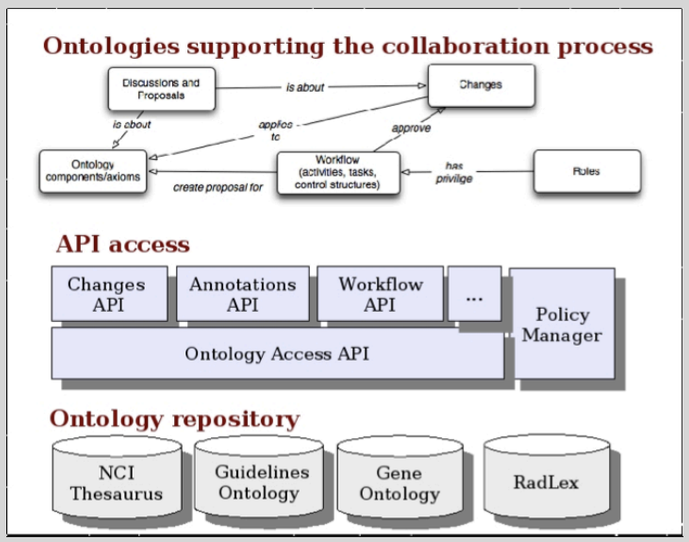
- ☐ Perinatal Period
- ☐ Neonatal Period

Accessing the Ontologies From a Desktop Client

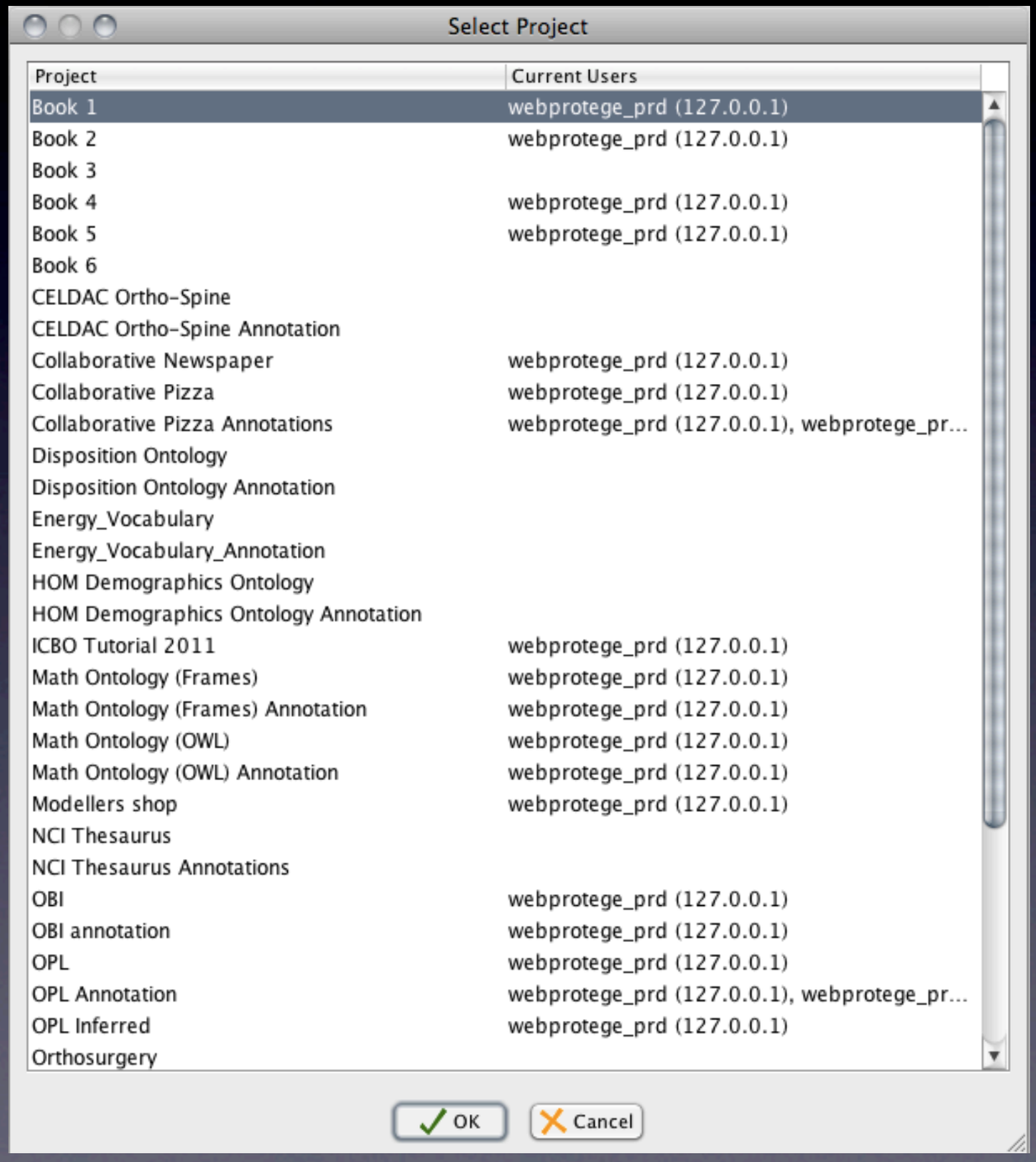




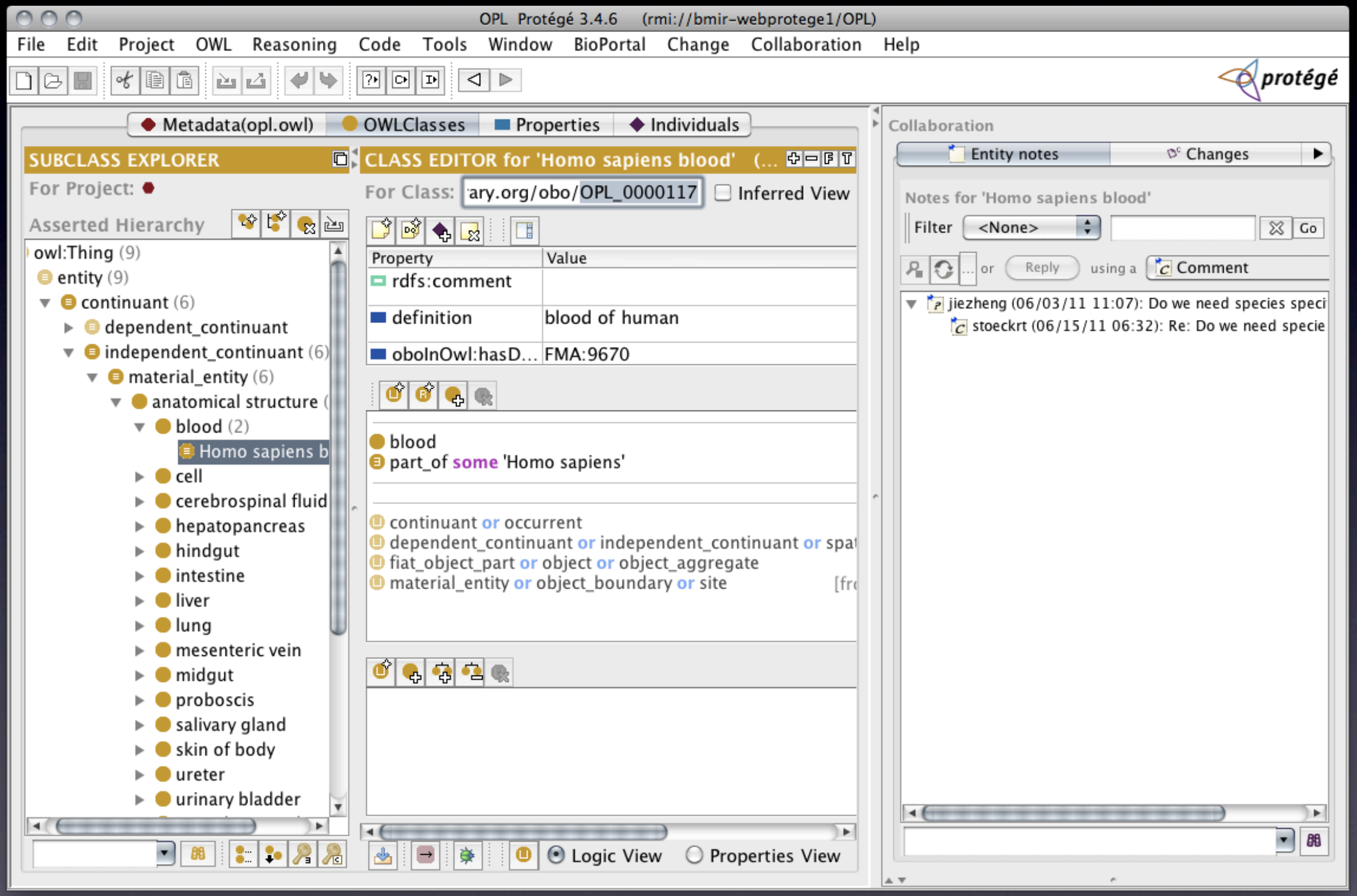
Protégé Server



Same Projects On The Server



Class Details in Desktop Client



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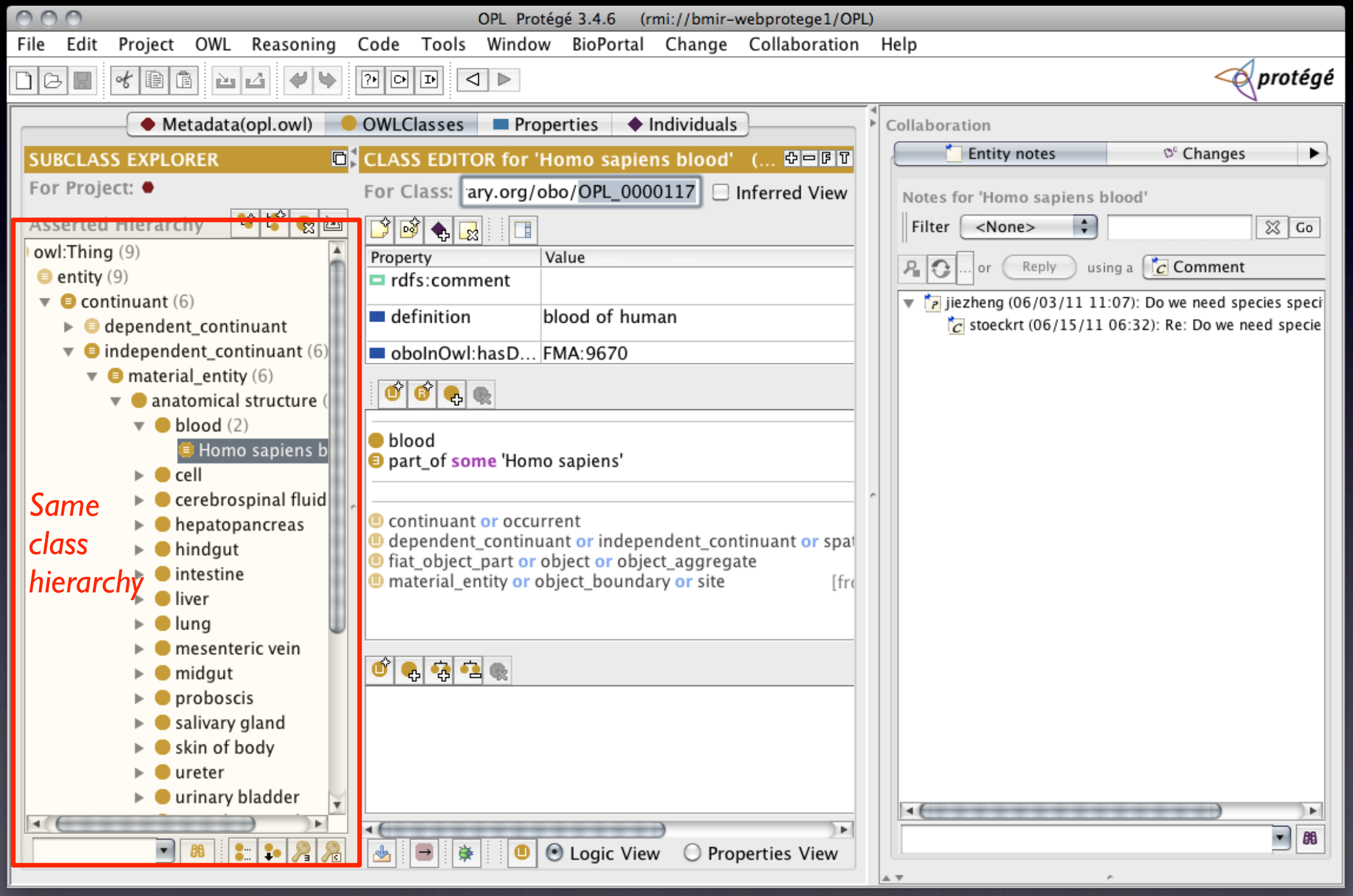
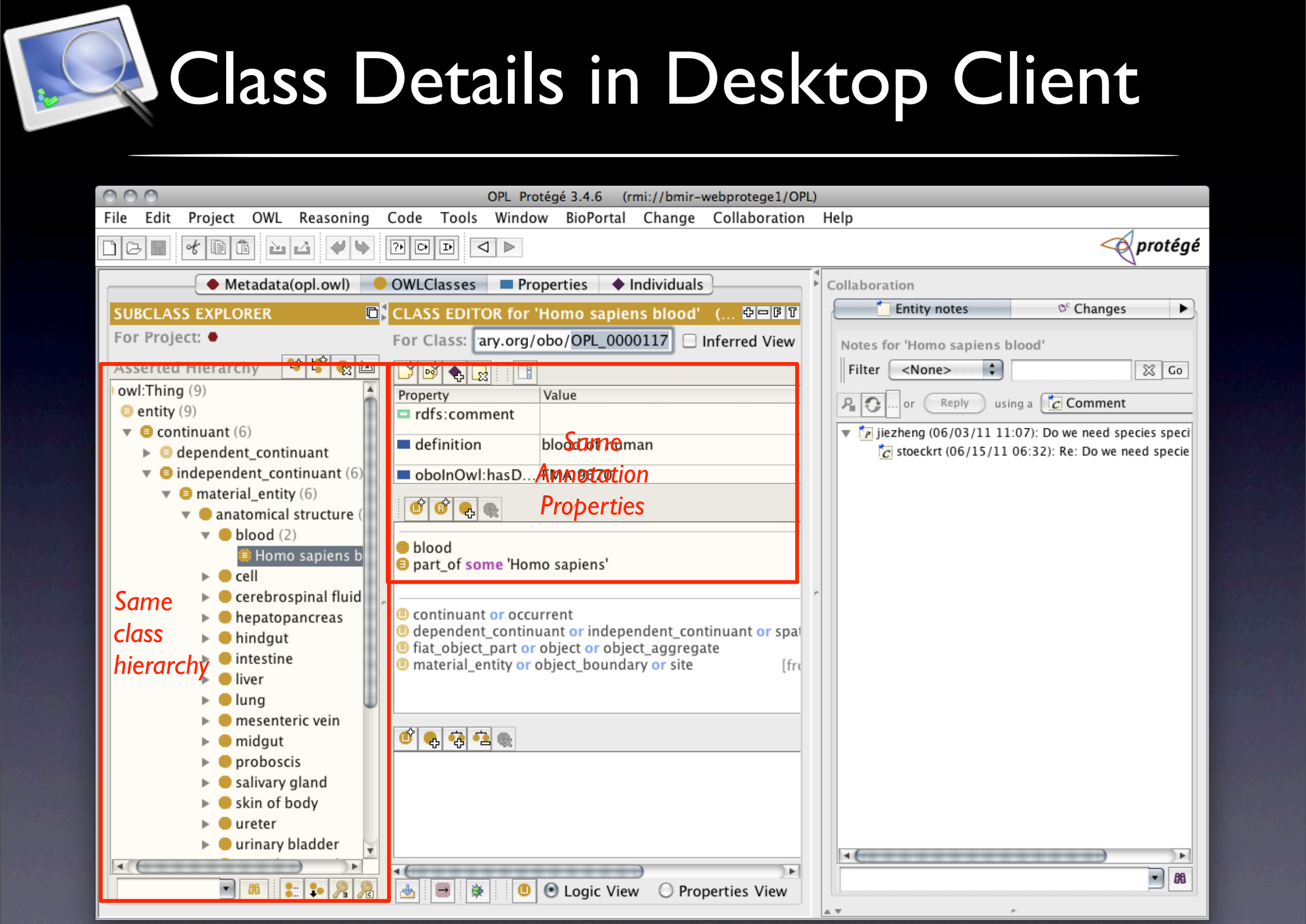
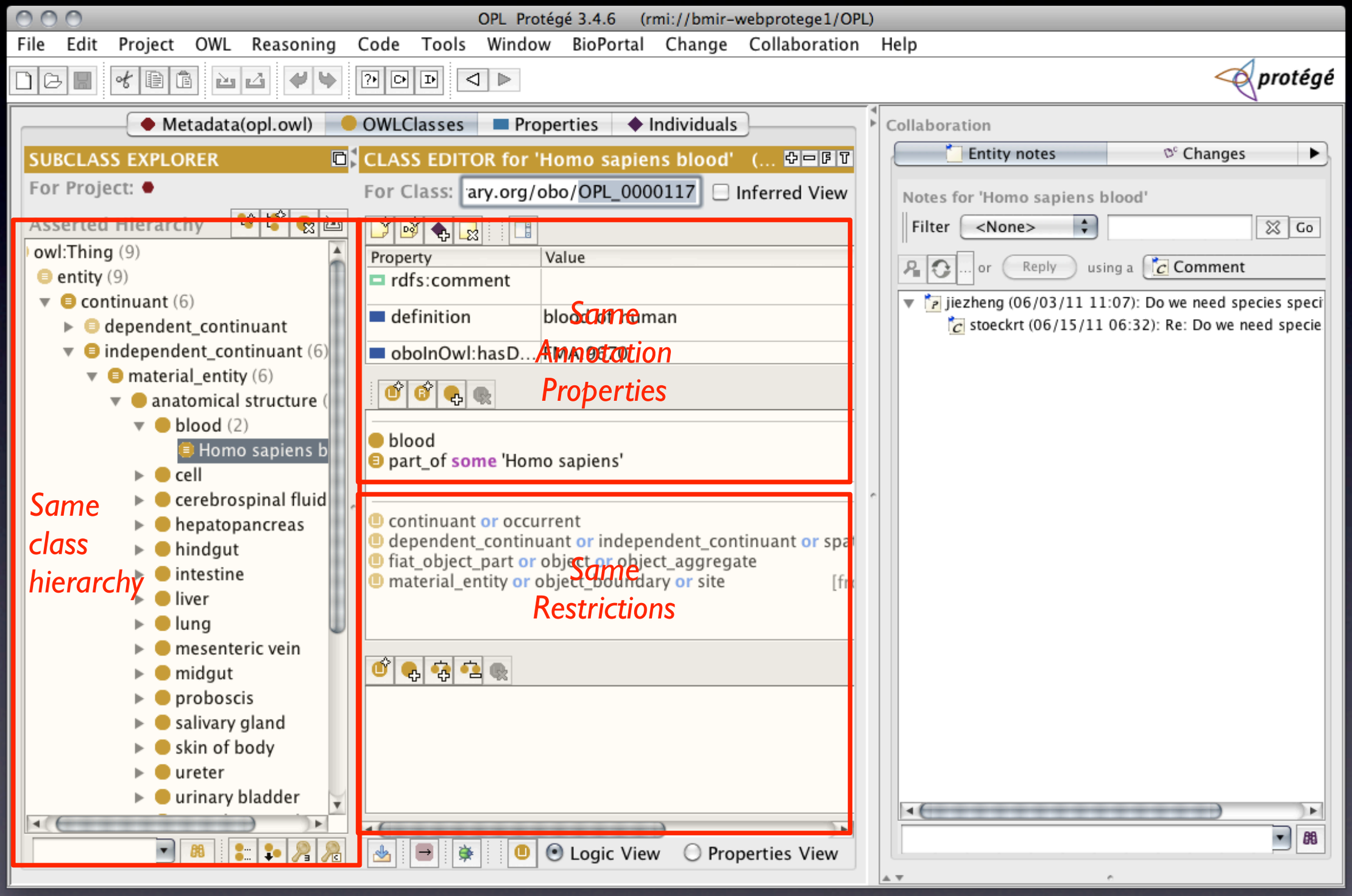


Class Details in Desktop Client



Class Details in Desktop Client



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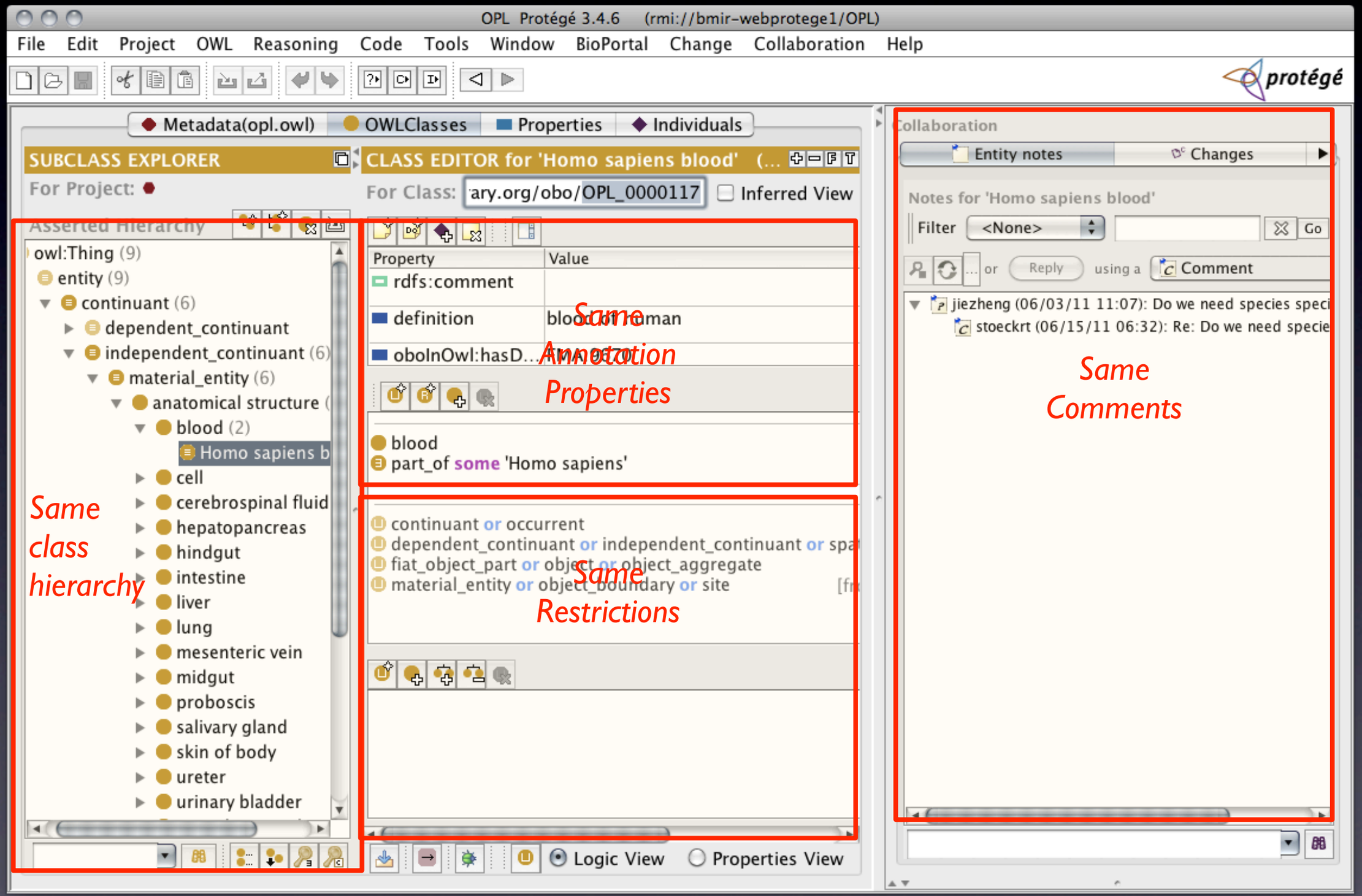


Why Use The Desktop Client?

- Richer user interface
  - some OWL experts may prefer it
  - Familiar user interface
  - You can invoke a classifier only from the desktop client

WebProtégé: Take-Aways

- (Hopefully) easier to use than "good old Protégé"
- Supports collaborations
  - Synchronous editing
  - Notes and discussion
  - Watched entities
  - Change history
- Configurable user interface

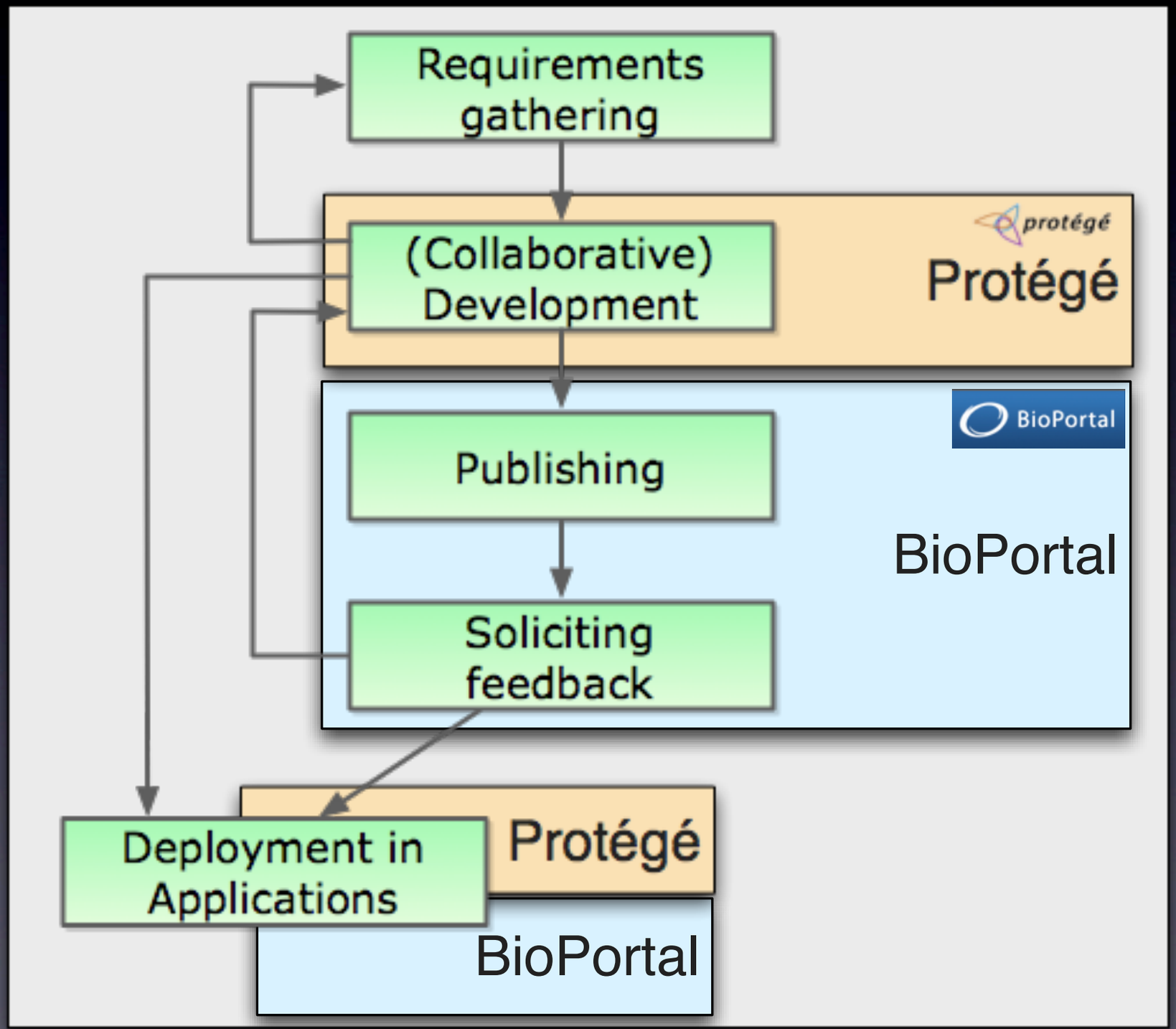
Collaboration Support

- Complete change history
- Discussions in the context of definitions
- Discussions stored and accessible after the ontology is developed to provide provenance information, design rationale, etc.
  - *in the context of the class definitions*
- Support for social mechanisms to reach consensus

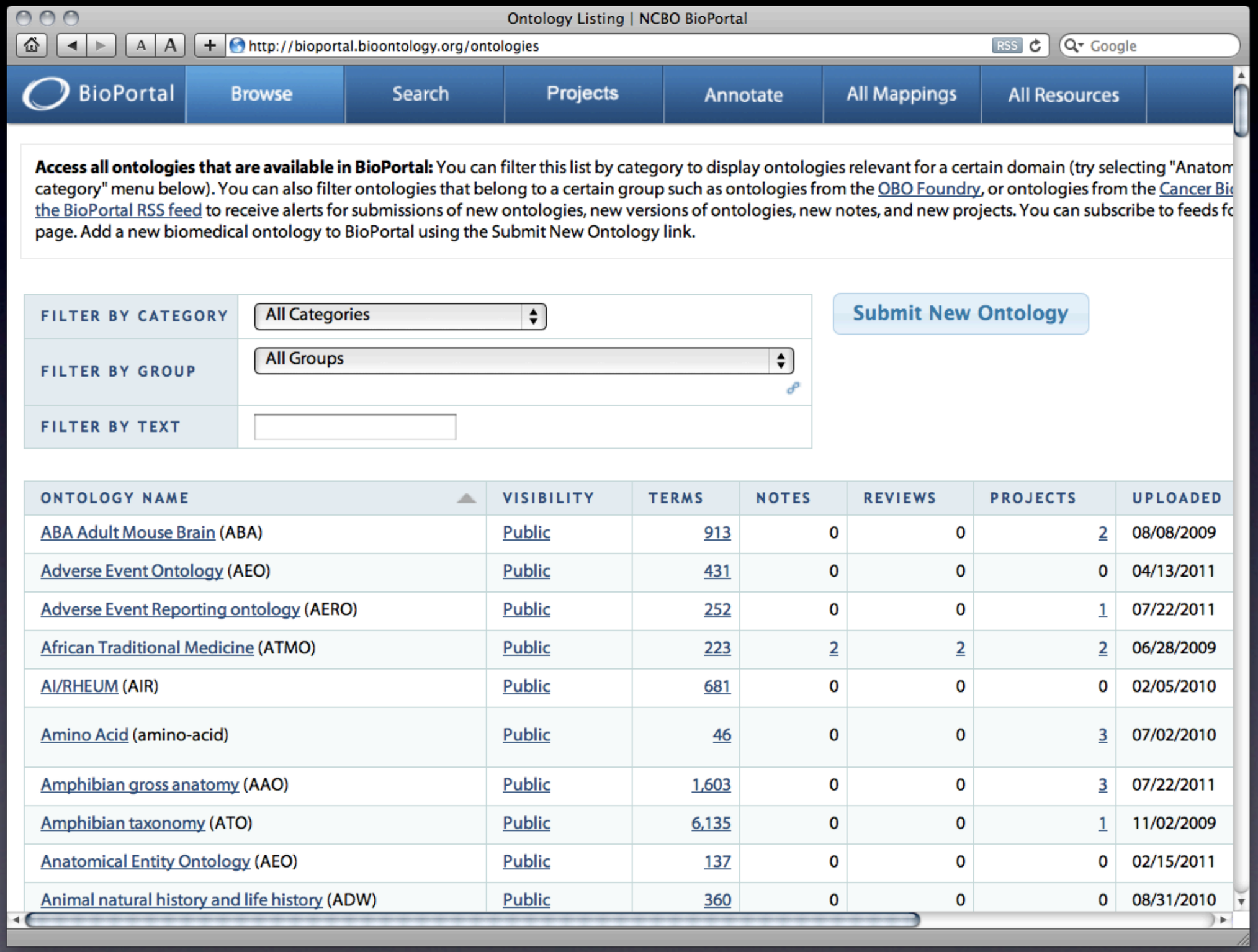
You have developed an ontology.....

- Now what?
- Publish your ontology:
  - to enable others to use it
  - to have a Web link to your ontology
    - or any concept in it
  - to collect feedback form your users
  - to make it accessible to applications via a web service API
- BioPortal: an open community-based repository of biomedical ontologies

An (Over-Simplified) Ontology Lifecycle



BioPortal Ontology Library



BioPortal Ontology Library

Browse the BioPortal ontology library

Ontology Listing | NCBO BioPortal

http://bioportal.bioontology.org/ontologies

BioPortal | Browse | Search | Projects | Annotate | All Mappings | All Resources

Access all ontologies that are available in BioPortal: You can filter this list by category to display ontologies relevant for a certain domain (try selecting "Anatom
category" menu below). You can also filter ontologies that belong to a certain group such as ontologies from the OBO Foundry, or ontologies from the Cancer Bi
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page. Add a new biomedical ontology to BioPortal using the Submit New Ontology link.

FILTER BY CATEGORY: All Categories

FILTER BY GROUP: All Groups

FILTER BY TEXT:

Submit New Ontology

ONTOLOGY NAME	VISIBILITY	TERMS	NOTES	REVIEWS	PROJECTS	UPLOADED
ABA Adult Mouse Brain (ABA)	Public	913	0	0	2	08/08/2009
Adverse Event Ontology (AEO)	Public	431	0	0	0	04/13/2011
Adverse Event Reporting ontology (AERO)	Public	252	0	0	1	07/22/2011
African Traditional Medicine (ATMO)	Public	223	2	2	2	06/28/2009
AI/RHEUM (AIR)	Public	681	0	0	0	02/05/2010
Amino Acid (amino-acid)	Public	46	0	0	3	07/02/2010
Amphibian gross anatomy (AAO)	Public	1,603	0	0	3	07/22/2011
Amphibian taxonomy (ATO)	Public	6,135	0	0	1	11/02/2009
Anatomical Entity Ontology (AEO)	Public	137	0	0	0	02/15/2011
Animal natural history and life history (ADW)	Public	360	0	0	0	08/31/2010

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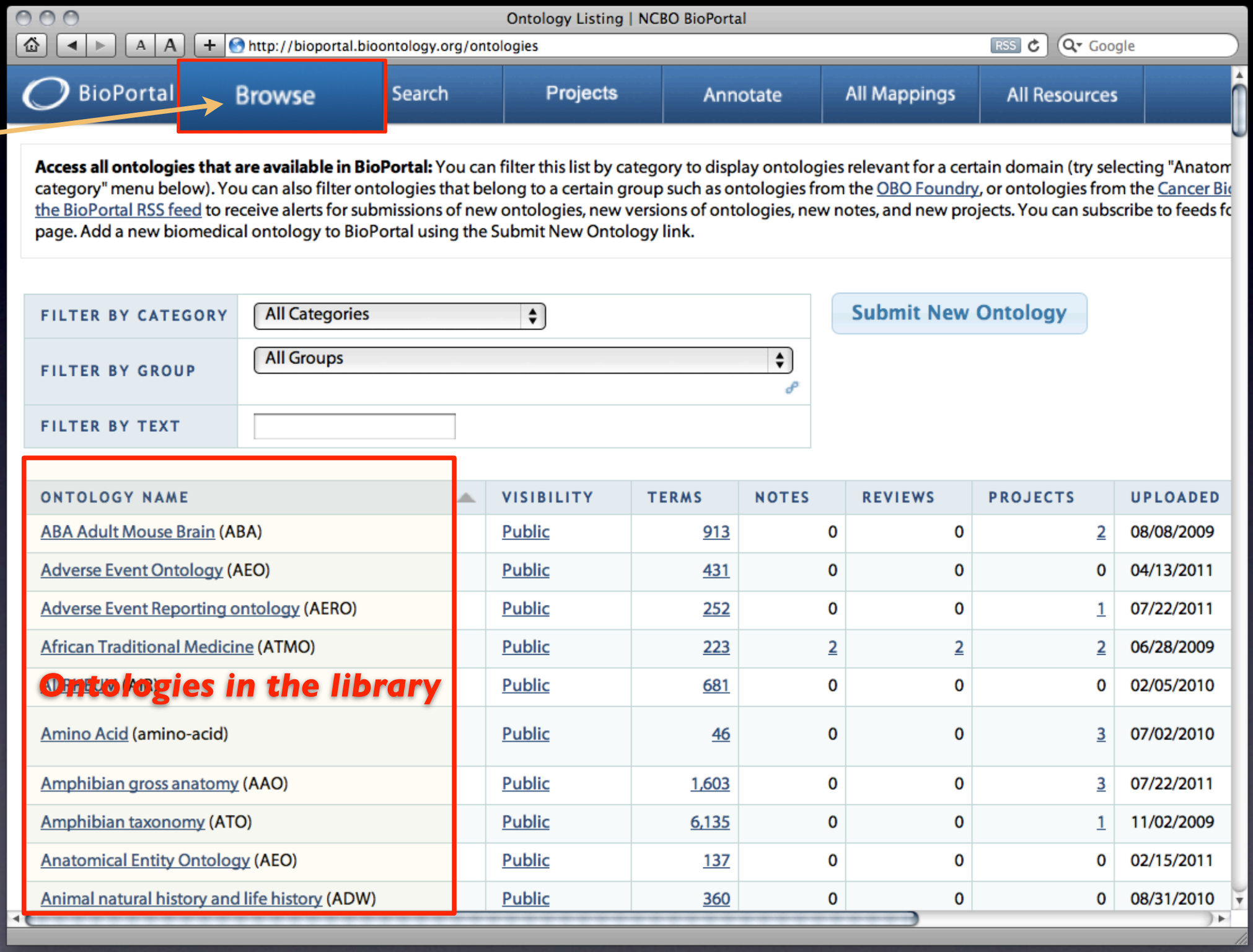

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FILTER BY TEXT:

Submit New Ontology

Details about an ontology

Ontologies in the library

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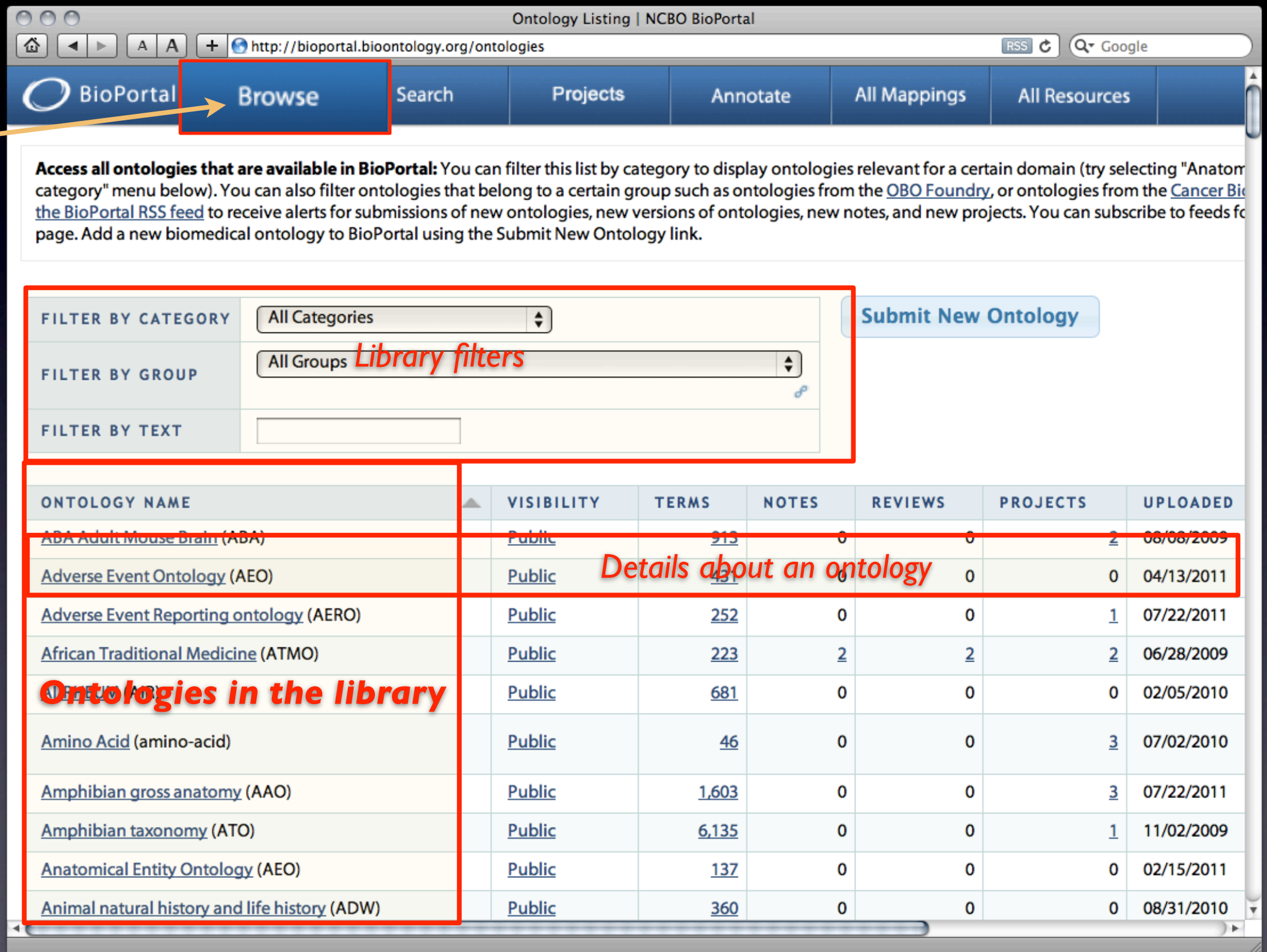
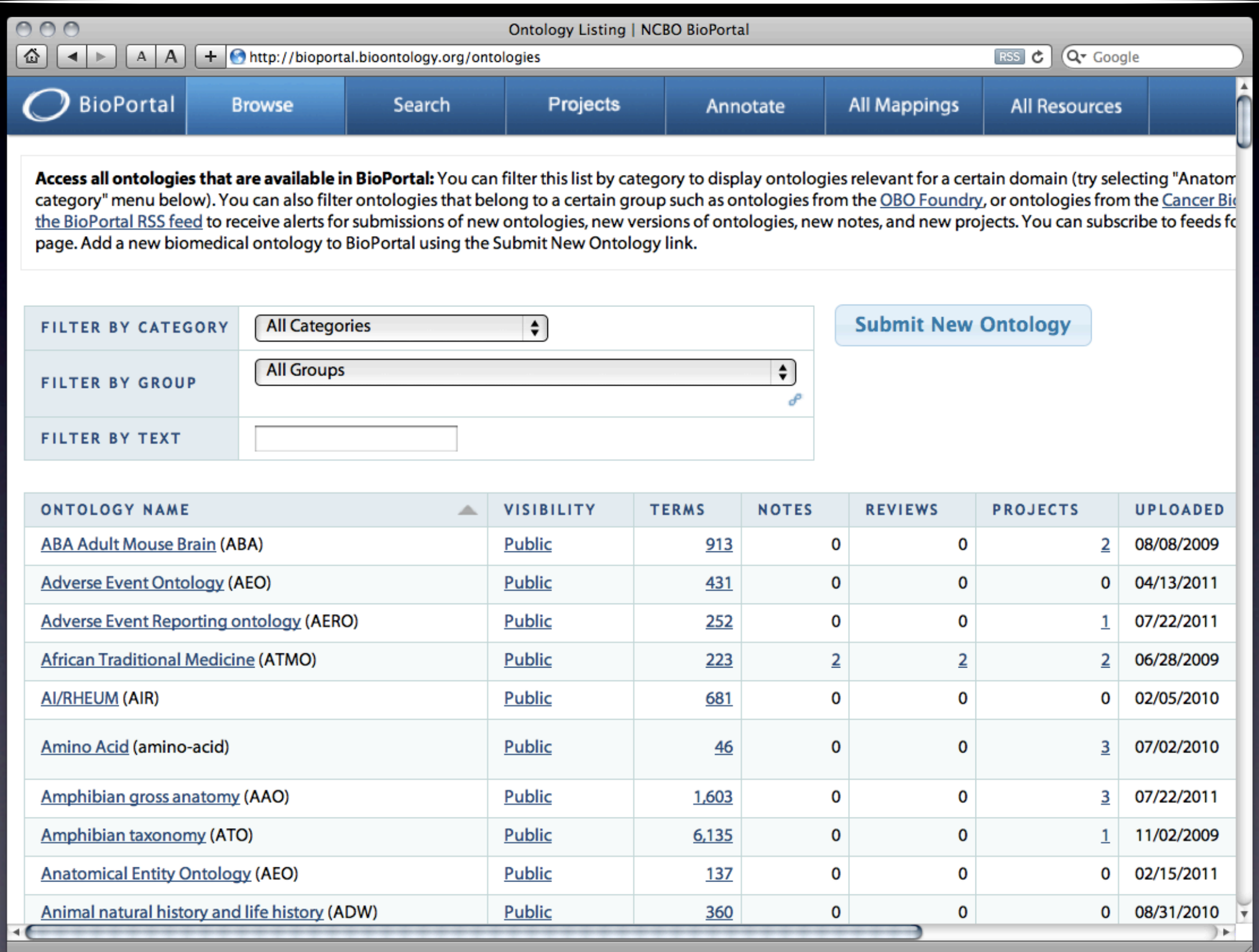


Explore the BioPortal Library



The Ontology Catalog

- Find metadata about the ontologies
  - authors, versions, dates, documentation
- Filter ontologies
  - by category (e.g., anatomy)
  - by group (such as OBO Foundry ontologies)
  - by (part of the) name, type

Hands on exercise

- Explore the BioPortal ontology library: http://bioportal.bioontology.org

Now you want your ontology to appear in the list

- Log in to BioPortal
- Upload your ontology
- Get a link to send to your collaborators or to publish on your web site

Now you want your ontology to appear in the list

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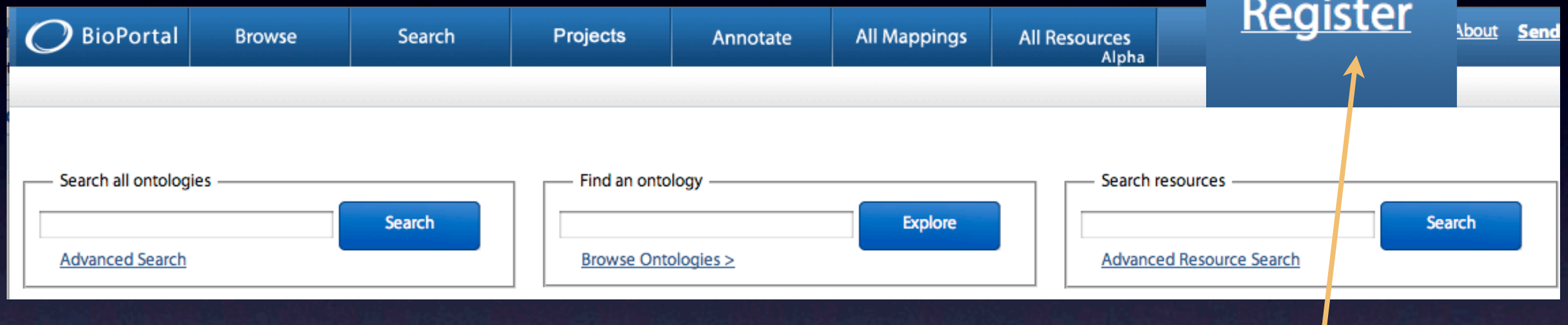
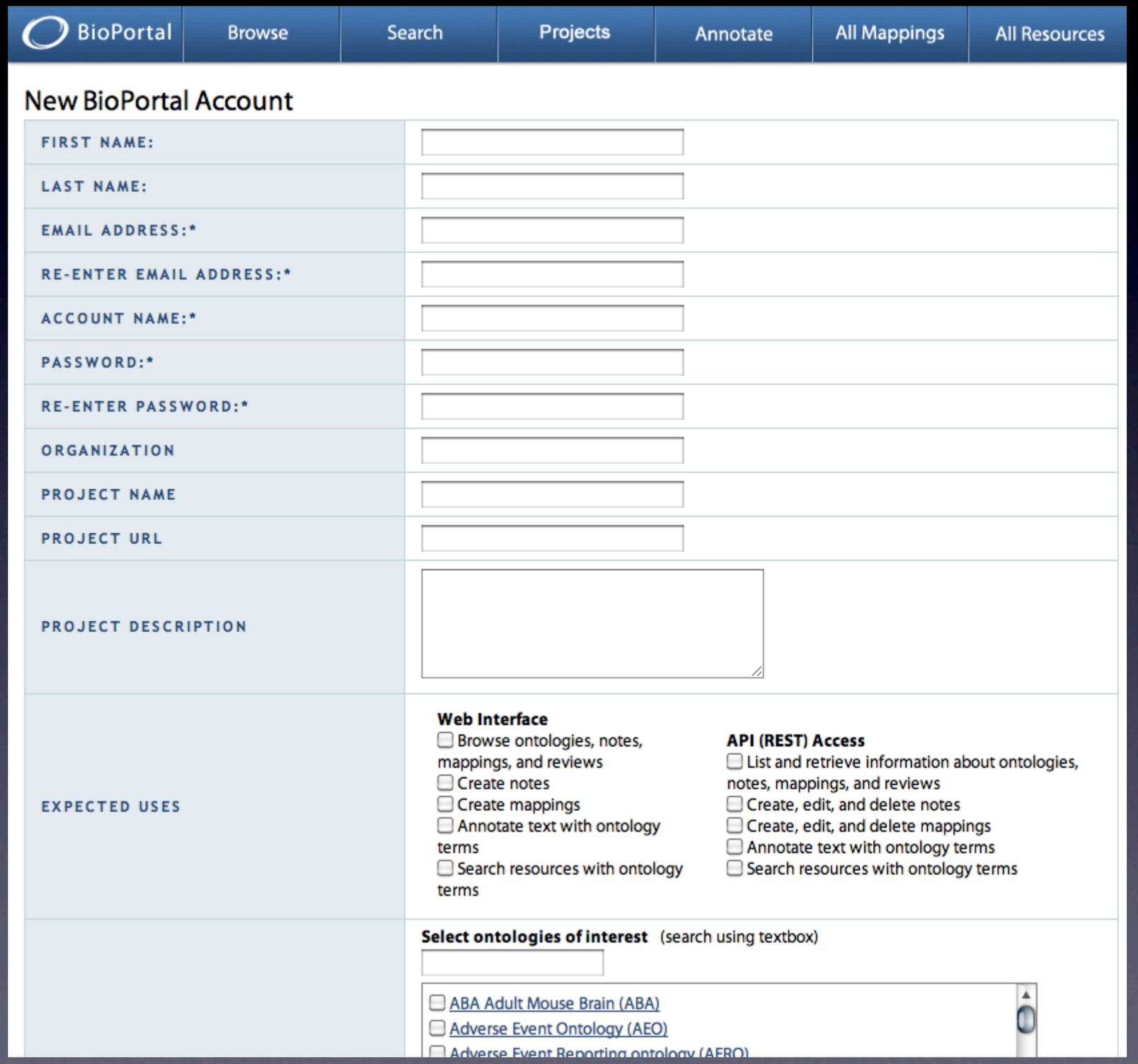
Create a BioPortal account



Click on the "Register" link

New user registration form



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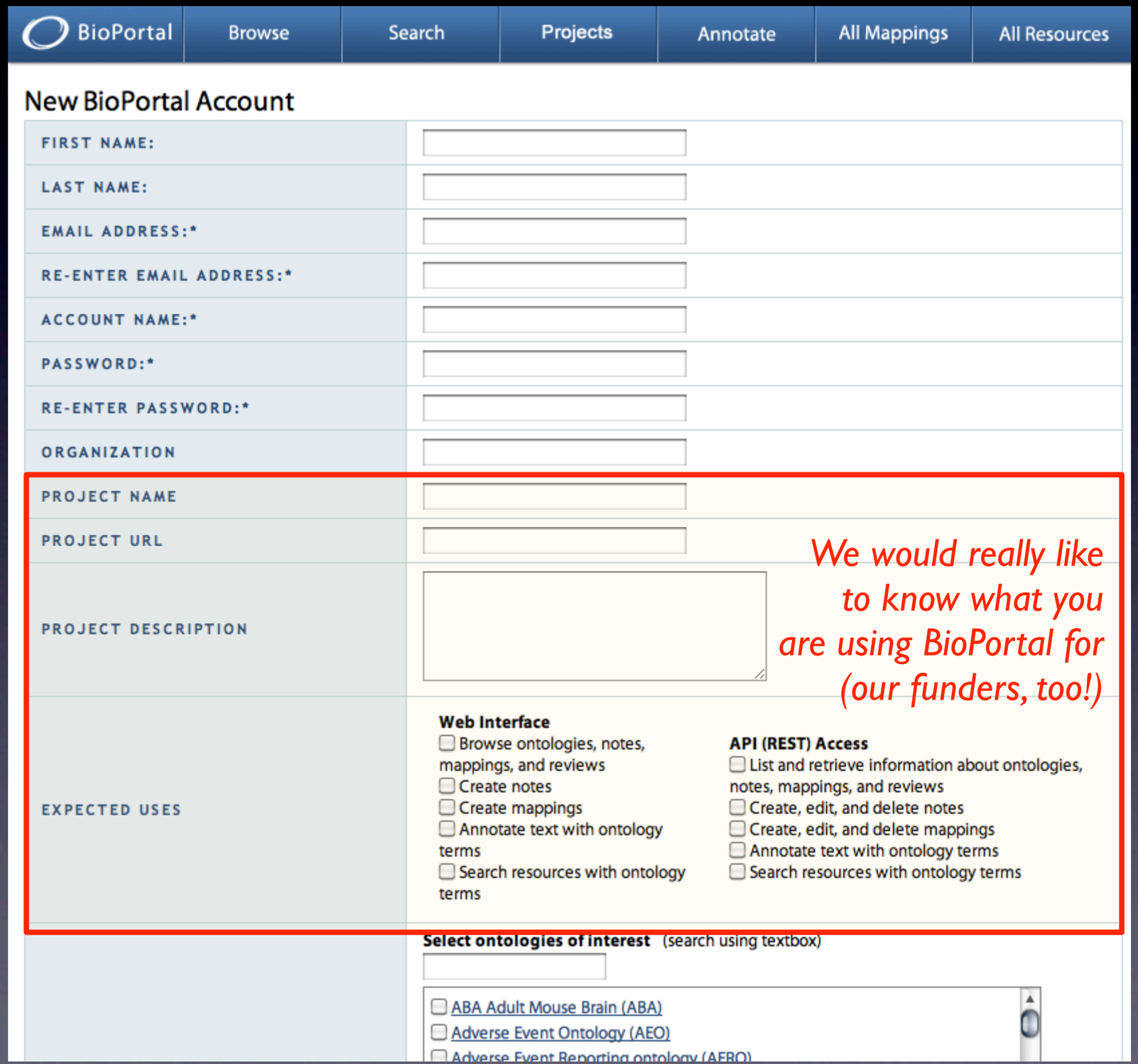
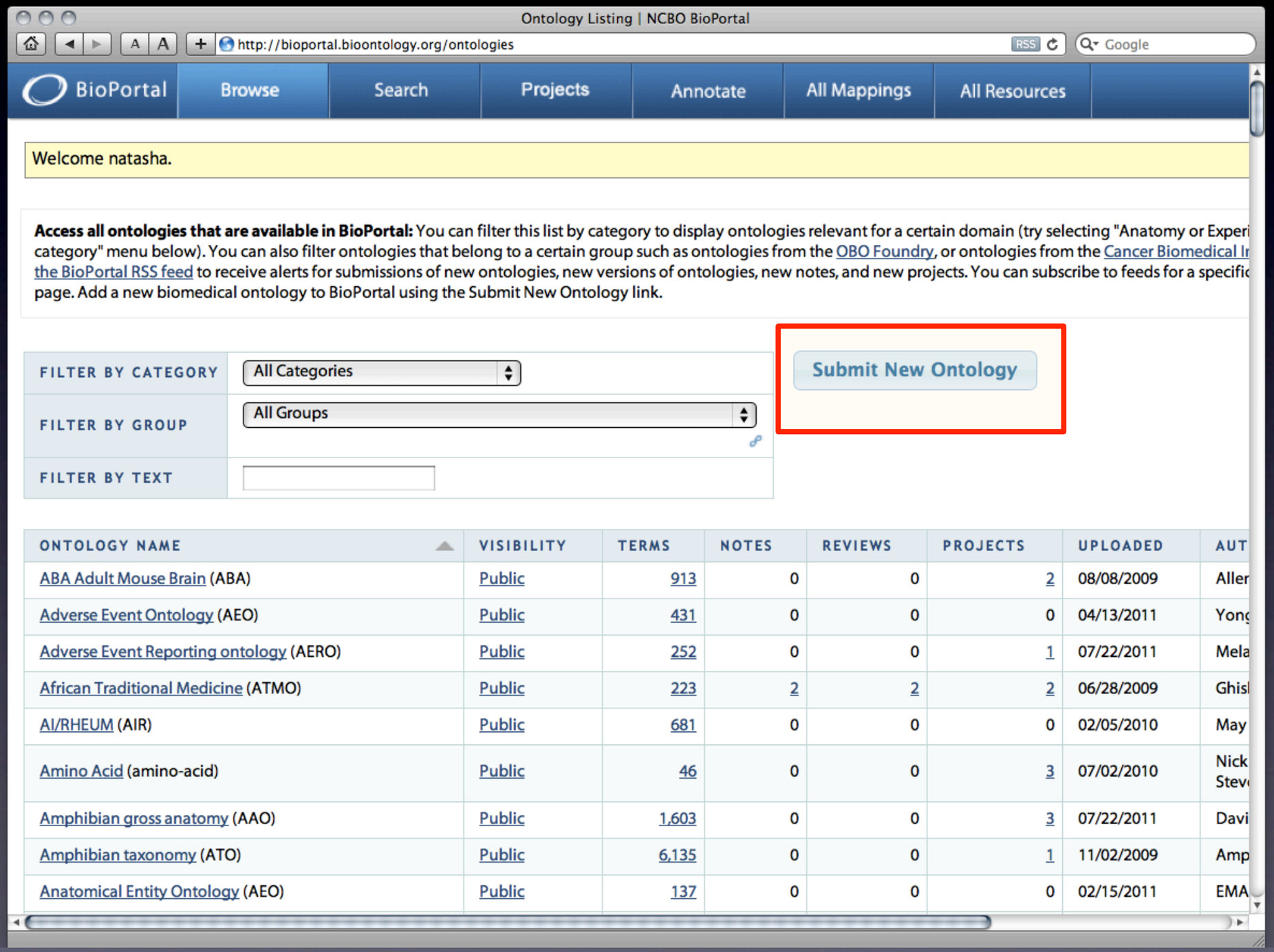


Creating an Account in BioPortal

- When you create an account
  - you can submit new ontologies
  - you can comment on existing ontologies
  - you can create mappings
  - you get an API key to use for REST service calls

Log in to BioPortal



What Ontologies Should/Can Be Submitted?

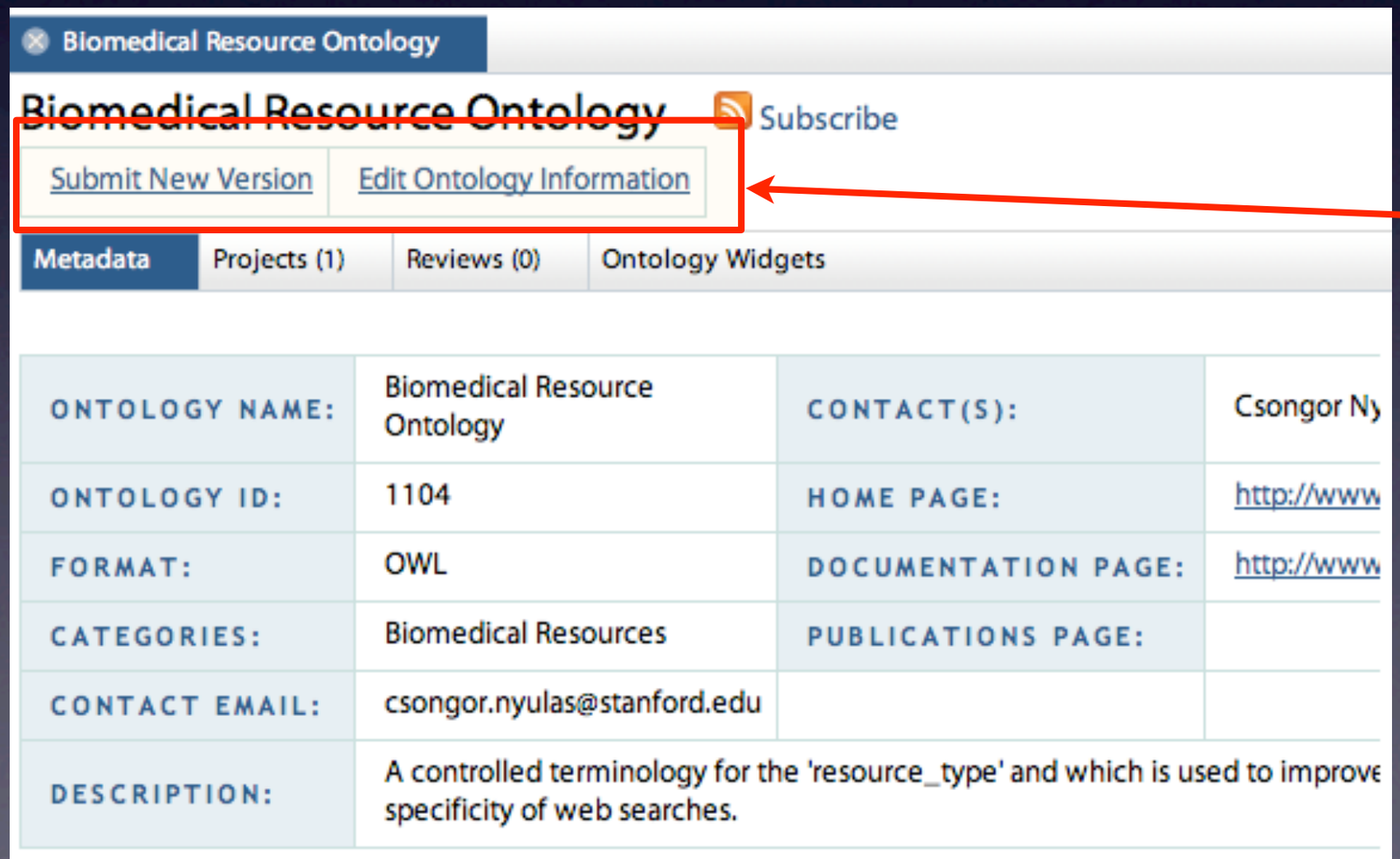
- The ontology needs to be ready for the wider community to see
  - Anyone can browse BioPortal and see your ontology
  - Don't publish "toy ontologies"
- Your published ontology can (and often is) "work in progress"
  - You can publish early versions to collect feedback or to inform community about your work
- Always indicate the maturity status of the ontology in the metadata

What happens next?

- BioPortal parses and indexes your ontology
- While the ontology is parsing, its metadata is available, but the ontology itself is not available for browsing
- Usually takes 1-2 hours before the ontology is fully loaded and indexed

Evolving Your Ontology

- Now you have a new version of your ontology
- If you are the ontology administrator, you can upload the new version

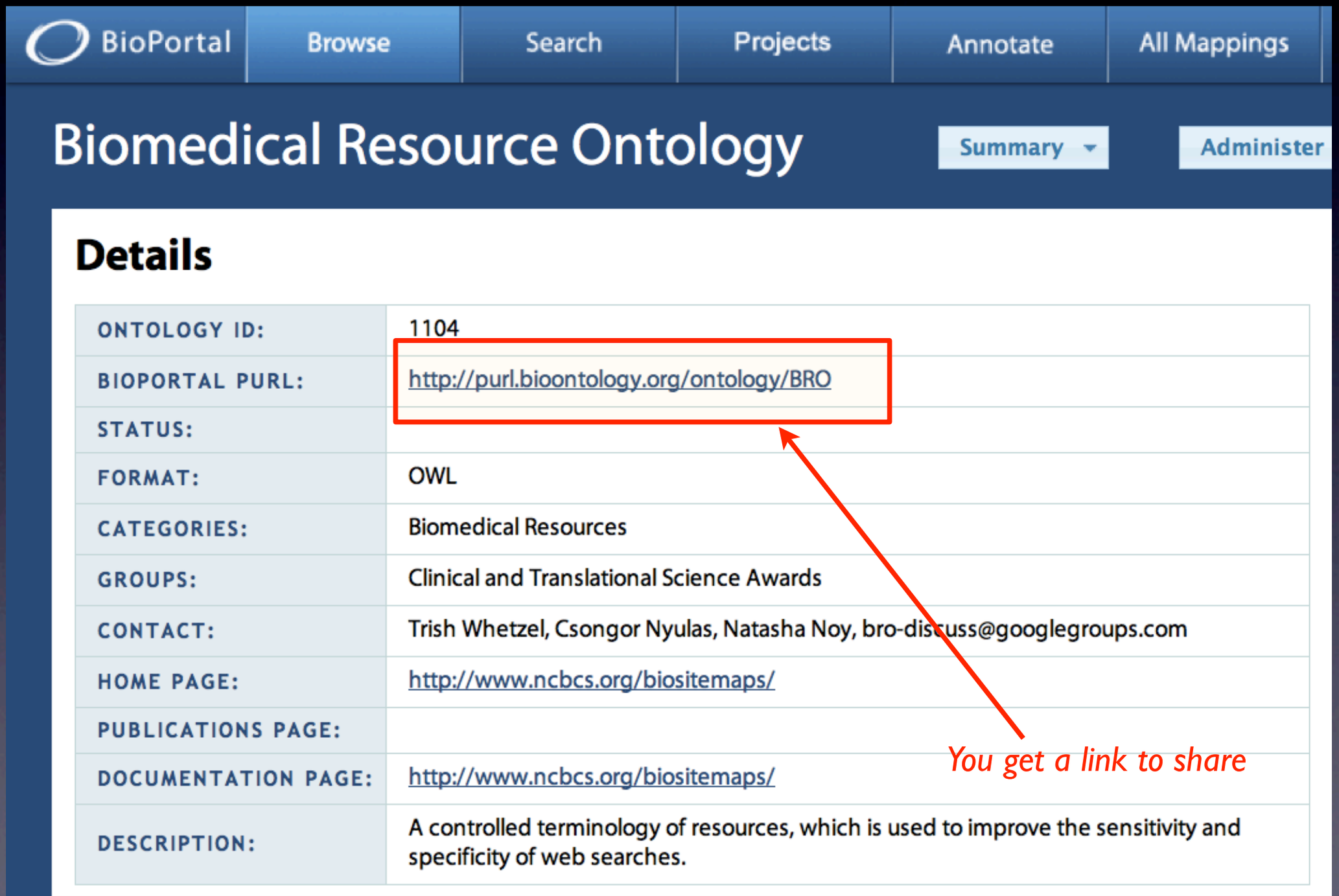


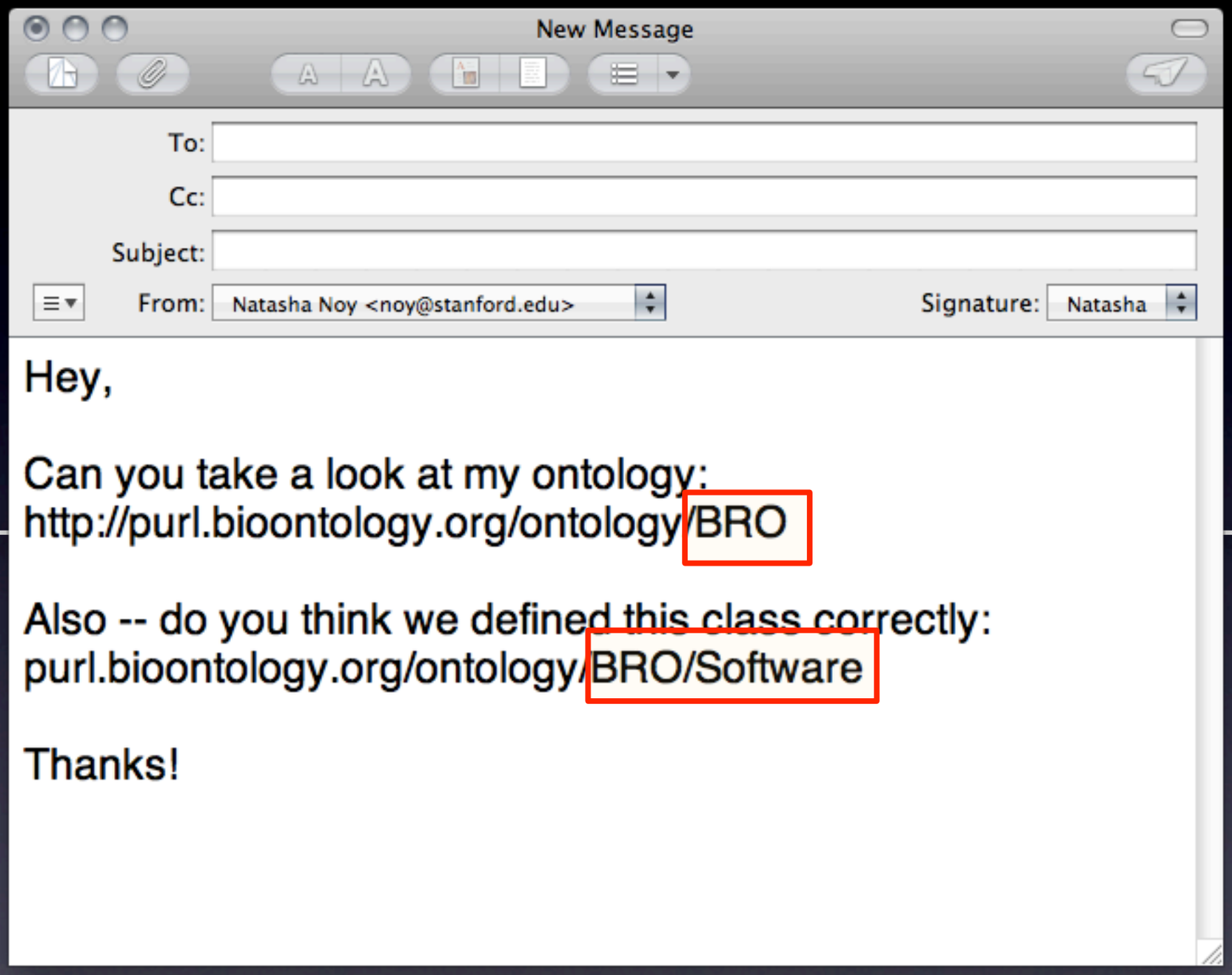
You see these buttons if you are the ontology administrator

What can you do now?

- Tell your friends where your ontology is
  - and ask them to provide feedback
  - give them a link to download your ontology for their use
- Send links to specific classes
- Use REST web service API to access your ontology and any of its components
- Subscribe to updates to your ontology

When you are on the metadata page for your ontology ...

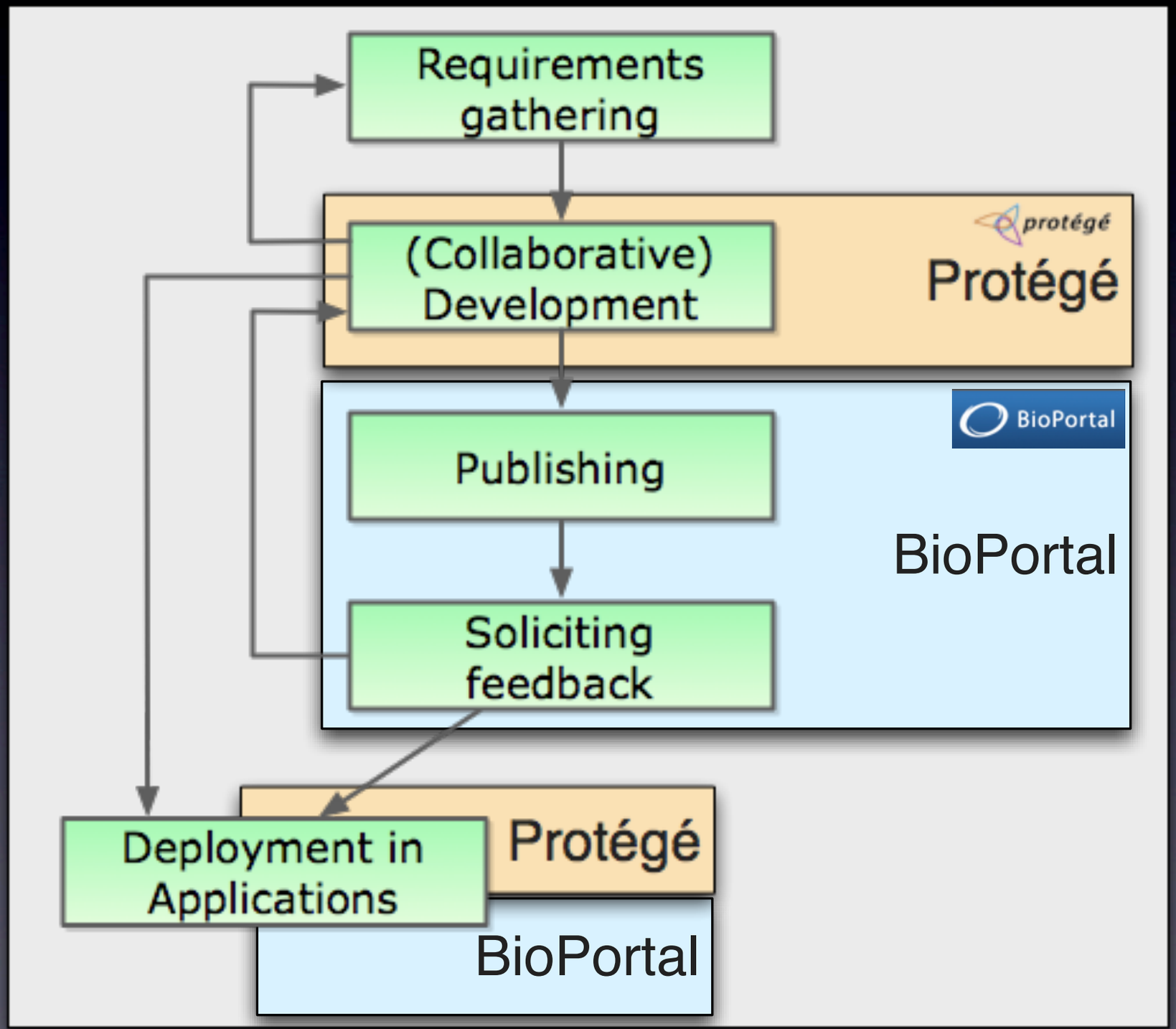



New Message
To:
Cc:
Subject:
From: Natasha Noy <noy@stanford.edu>
Signature: Natasha
Hey,
Can you take a look at my ontology:
http://purl.bioontology.org/ontology/BRO
Also -- do you think we defined this class correctly:
purl.bioontology.org/ontology/BRO/Software
Thanks!

Do you need to send a new link to everyone now?

- The purl.bioontology.org URL resolves to the latest version of the ontology
- You can add a class name to the URL to access the page for the class

An (Over-Simplified) Ontology Lifecycle



Ontology Evaluation

- Ontologies are not like journal articles:
  - It is difficult to judge methodological soundness simply by inspection
  - We may wish to use an ontology even though some portions
    - Are not well designed
    - Make distinctions that are different from those that we might want

Computable ontology metrics

- Logical consistency checking
  - e.g., use a reasoner to determine if an ontology is consistent
- Structural consistency based on meta-properties
- Rules of thumbs and heuristics
- Statistical information
  - number of classes and properties
  - connectedness, fan-out, etc.
  - cycles

Some Ontology Metrics are Subjective

Some Ontology Metrics are Subjective

What is a "good" feature in some setting, can be a "bad" feature in another setting

Some Ontology Metrics are Subjective

What is a "good" feature in some setting, can be a "bad" feature in another setting

Some Ontology Metrics are Subjective

What is a "good" feature in some setting, can be a "bad" feature in another setting

- High level of axiomatization:
  - good if you want to perform reasoning
  - can be bad because of the high computational and cognitive cost if you don't need the axioms

Some Ontology Metrics are Subjective

What is a "good" feature in some setting, can be a "bad" feature in another setting

- High level of axiomatization:
  - good if you want to perform reasoning
  - can be bad because of the high computational and cognitive cost if you don't need the axioms
- Organizing anatomy concepts based primarily on their structure rather than function
  - can be good if you need to understand which organs a wound goes through
  - not appropriate if you need to understand spread of disease

Community-Based Evaluation

Which ontology from the library is appropriate for my task?

Community-Based Evaluation

Which ontology from the library is appropriate for my task?

- The only people who know the answer to these question are
  - (maybe) ontology authors
  - other users of the ontology

Community-Based Evaluation

Which ontology from the library is appropriate for my task?

- The only people who know the answer to these question are
  - (maybe) ontology authors
  - other users of the ontology
- Allow users to provide ratings for ontologies

An Experiment: Community-Based Annotation as Peer Review

- Potentially makes ontology evaluation a democratic process
- Assumes users' application of ontologies will lead to insights not achievable by inspection alone
- Assumes end-users will be motivated to comment on and engage in dialog about ontologies in the repository

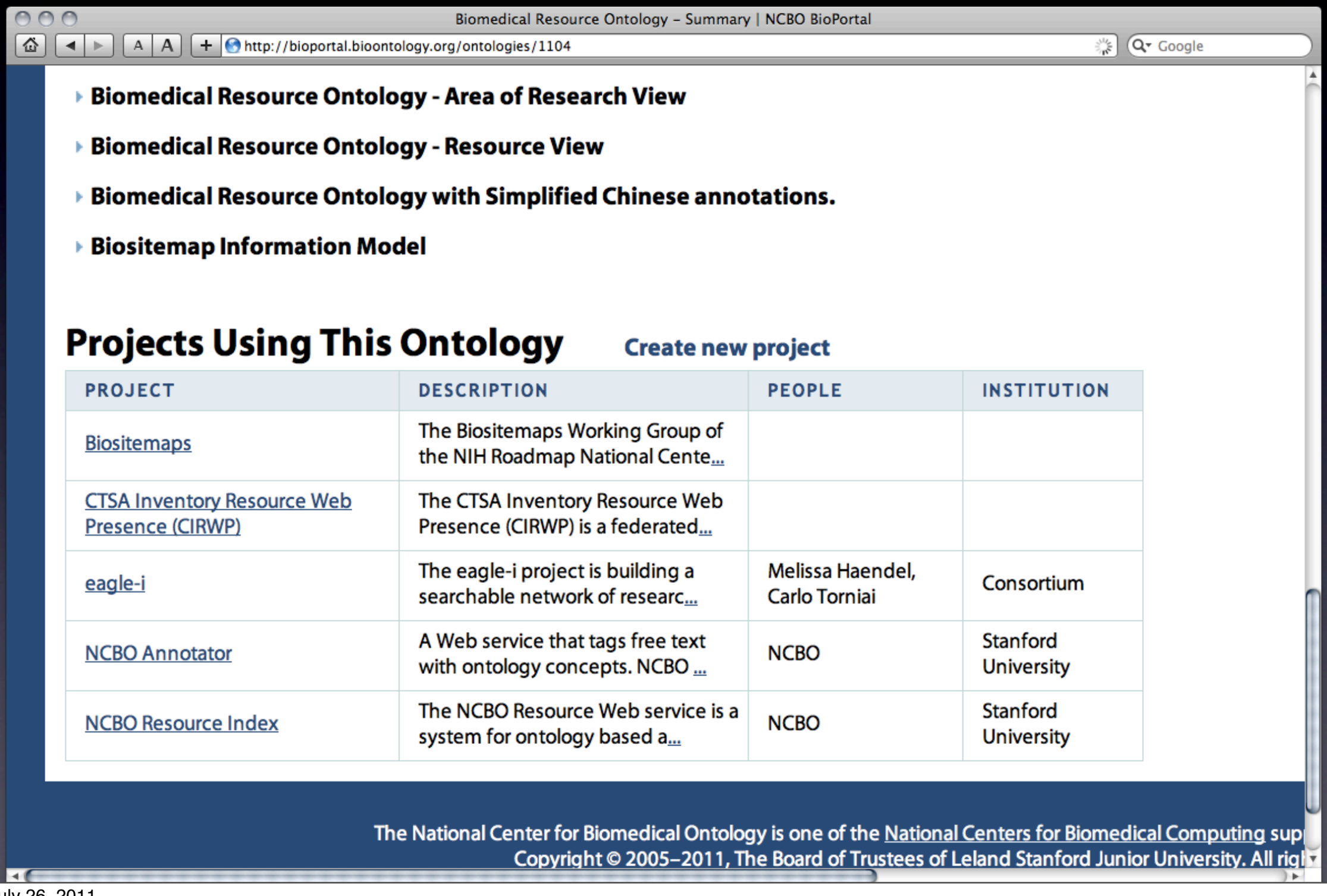
Types Of User Feedback

- Projects that use the ontologies
- Ontology reviews
- Notes on ontologies and term requests

Projects in BioPortal

- Users can describe their ontology-based projects in BioPortal
- Projects are linked to ontologies they are using
- Ontology reviews can be done in the context of projects

Projects appear as part of the ontology metadata



BioPortal | Browse | Search | Projects | Annotate | All Mappings | All Resources Alp

Biomedical Resource Ontology

Add Project

Projects

Protege Edit Project Delete Project

Protégé is a free, open source ontology editor and knowledge-base framework

PEOPLE:	
INSTITUTION:	
HOMEPAGE:	http://protege.stanford.edu

RadLex Edit Project Delete Project

RadLex is a controlled terminology for radiology.

PEOPLE:	
INSTITUTION:	RSNA
HOMEPAGE:	http://radlex.org

OBR Edit Project Delete Project

OBR service is a system for ontology based annotation and indexing of biomedical data; the key functionality of this system is to enable users to locate biomedical data resources related to particular concepts. A set of annotations is generated automatically and presented through integration with BioPortal, enabling researchers to search for biomedical resources associated (annotated) with specific ontology terms. OBR service uses a concept recognizer (currently provided by the National Center for Integrative Biomedical Informatics, University of Michigan) to produce a set of annotations and expand them using ontology is-a relations. The system's indexing workflow processes the text metadata of diverse resource elements such as gene expression data sets, descriptions of radiology images, clinical-trial reports, and PubMed article abstracts to annotate and index them with concepts from appropriate ontologies. Researchers can then search biomedical data sources using ontology concepts.

PEOPLE:	Clement Jonquet
INSTITUTION:	Stanford University

Add Project

Projects

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PEOPLE:	
INSTITUTION:	RSNA
HOMEPAGE:	http://radlex.org

OBR Edit Project Delete Project

OBR service is a system for ontology based annotation and indexing of biomedical data; the key functionality of this system is to enable users to locate biomedical data resources related to particular concepts. A set of annotations is generated automatically and presented through integration with BioPortal, enabling researchers to search for biomedical resources associated (annotated) with specific ontology terms. OBR service uses a concept recognizer (currently provided by the National Center for Integrative Biomedical Informatics, University of Michigan) to produce a set of annotations and expand them using ontology is-a relations. The system's indexing workflow processes the text metadata of diverse resource elements such as gene expression data sets, descriptions of radiology images, clinical-trial reports, and PubMed article abstracts to annotate and index them with concepts from appropriate ontologies. Researchers can then search biomedical data sources using ontology concepts.

PEOPLE:	Clement Jonquet
INSTITUTION:	Stanford University

BioPortal | Browse | Search | **Projects** | nnotate | All Mappings | All Resources Alp

Biomedical Resource Ontology

Add Project

Projects

Protege Edit Project Delete Project

Protégé is a free, open source ontology editor and knowledge-base framework

PEOPLE:	
INSTITUTION:	
HOMEPAGE:	http://protege.stanford.edu

RadLex Edit Project Delete Project

RadLex is a controlled terminology for radiology.

PEOPLE:	
INSTITUTION:	RSNA
HOMEPAGE:	http://radlex.org

OBR Edit Project Delete Project

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PEOPLE:	Clement Jonquet
INSTITUTION:	Stanford University

Use this page to create a new project

Describe Your Project

New project

PROJECT NAME:*	
INSTITUTION:	
PEOPLE:	
HOMEPAGE:*	
DESCRIPTION:*	

Select Ontologies Used

View All | Selected (0) | Unselected

ABA Adult Mouse Brain	African Traditional Medicine	Amino Acid	Amino Acid with Simplified Chinese annotations
Amphibian gross anatomy	Animal natural history and life history	Ascomycete phenotype ontology	Basic Vertebrate Anatomy
Bilateria anatomy	Biological imaging methods	Biomedical Resource Ontology	BioPortal Metadata
BioTop	BIRNLex	Bleeding History Phenotype	Breast Cancer Grading Ontology
BRENDA tissue / enzyme source	C. elegans development	C. elegans gross anatomy	C. elegans phenotype

Create

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New project

PROJECT NAME:*	
INSTITUTION:	
PEOPLE:	
HOMEPAGE:*	
DESCRIPTION:*	

Project description

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BRENDA tissue / enzyme source	C. elegans development	C. elegans gross anatomy	C. elegans phenotype

Ontologies that the project uses

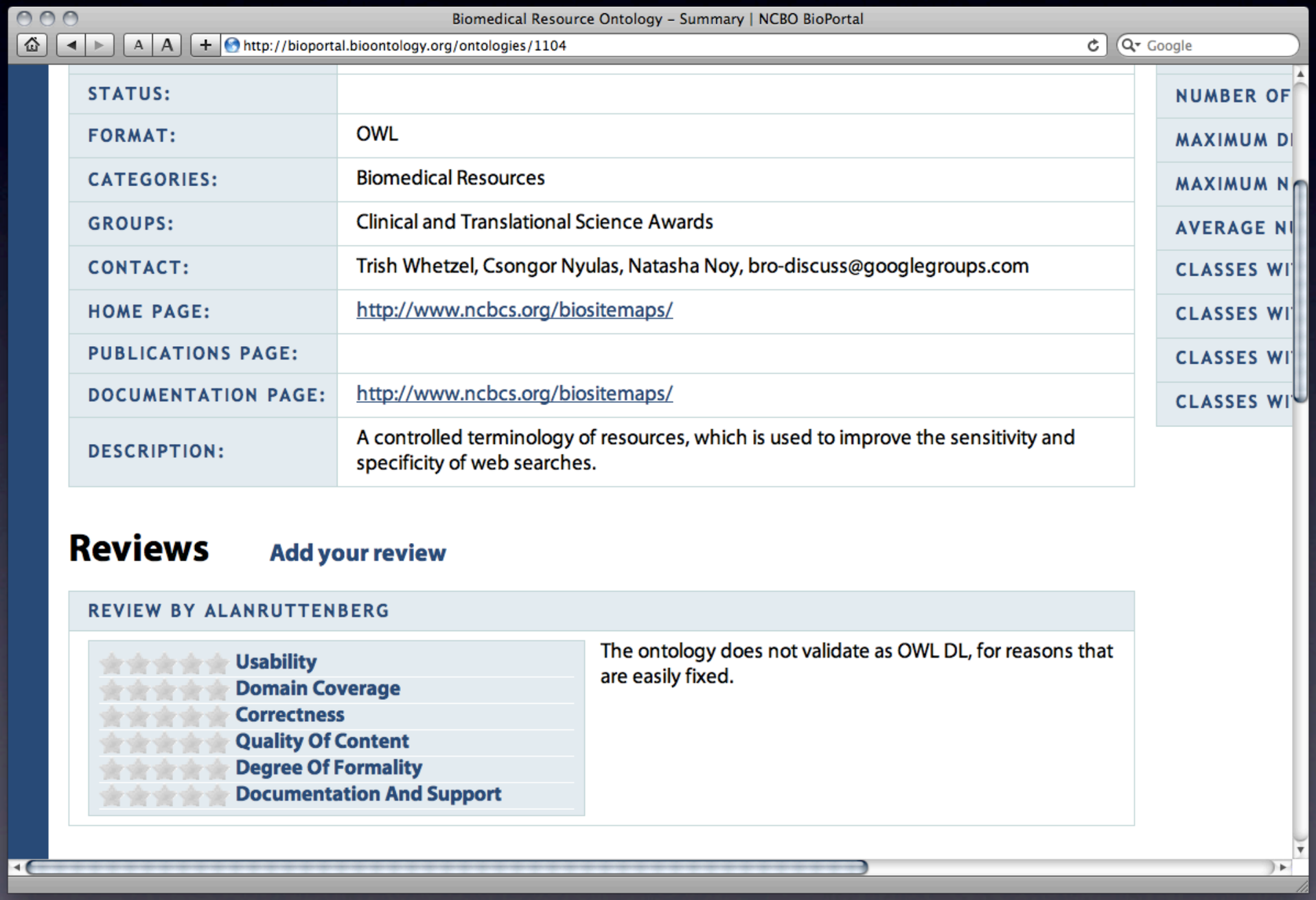
Create

As A Reviewer, You Can Provide:

- General review and rating
- Usage information
  - Which applications have successfully used the ontology?
  - What problems were encountered?
- Coverage
  - Does it cover the domain properly?
  - Are there major gaps?
  - Are some parts developed better than others?
- Concept-specific comments
  - Are there problems with specific concepts?
  - What alternative definitions should be used?

Creating a review

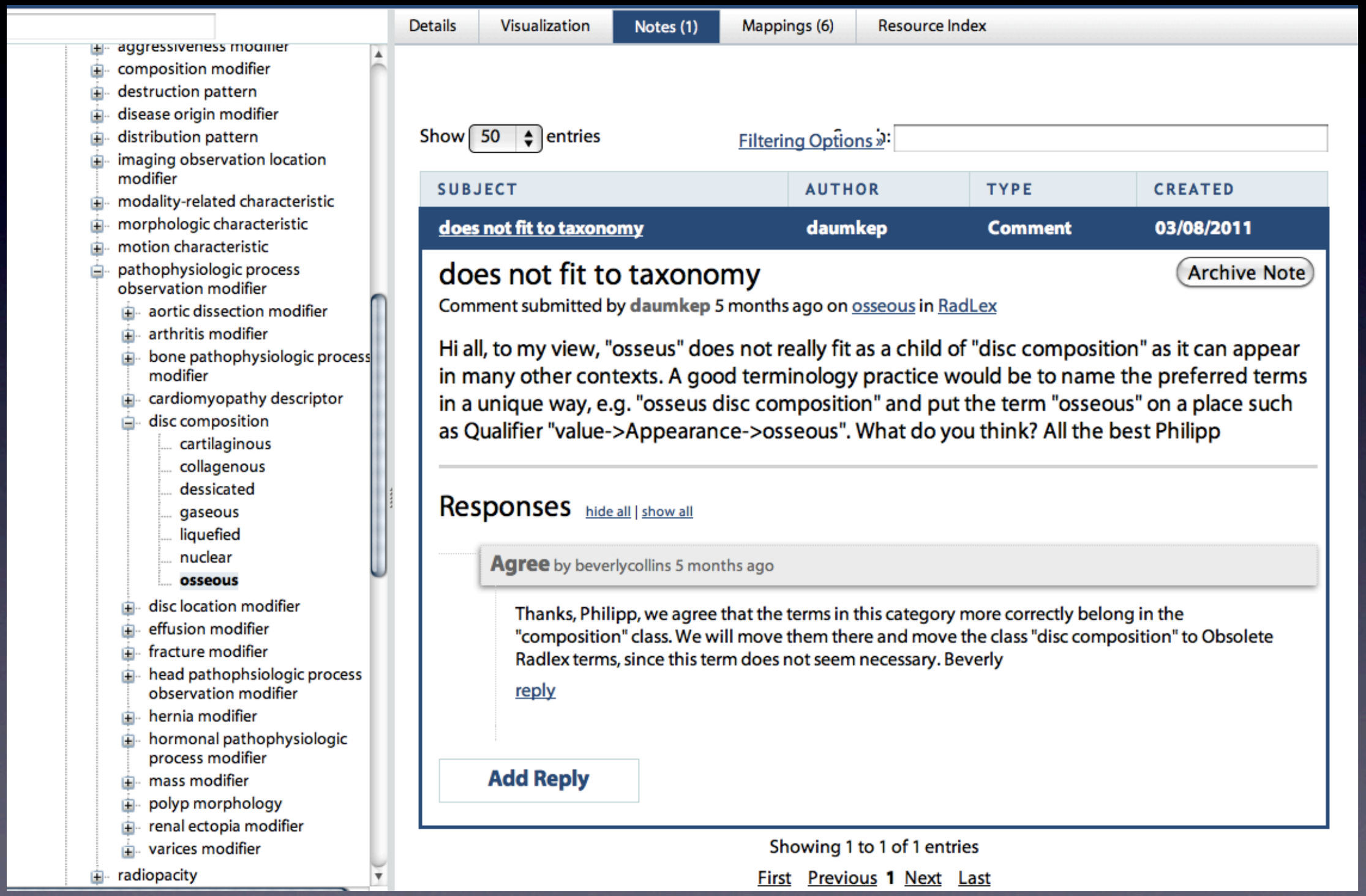
- On the ontology metadata page:



Creating Notes

- discuss class definitions
- suggest changes and corrections
- request new items
- provide additional information about a class (e.g., references, supporting documentation)

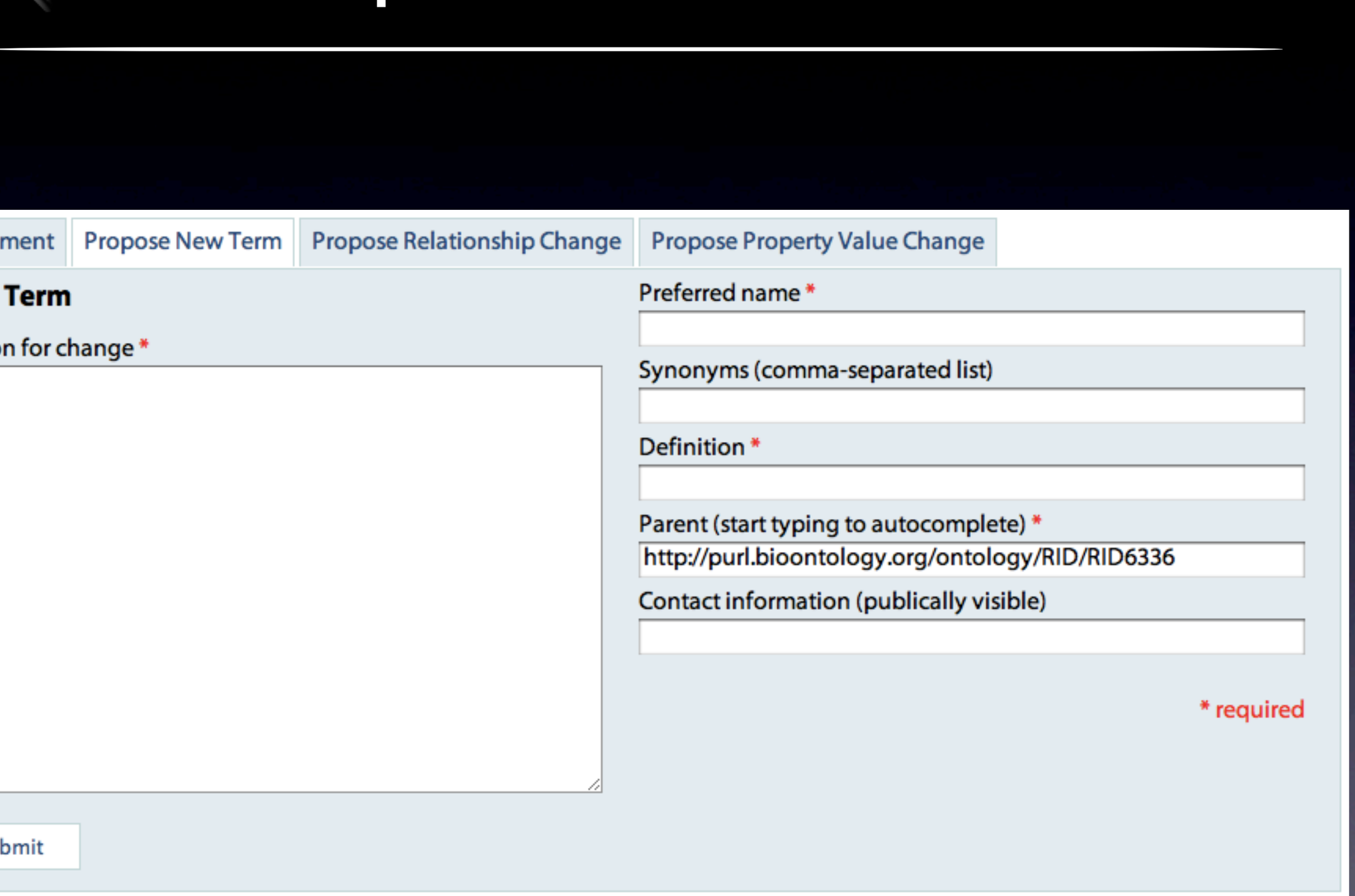
Notes on Classes



Types of Notes

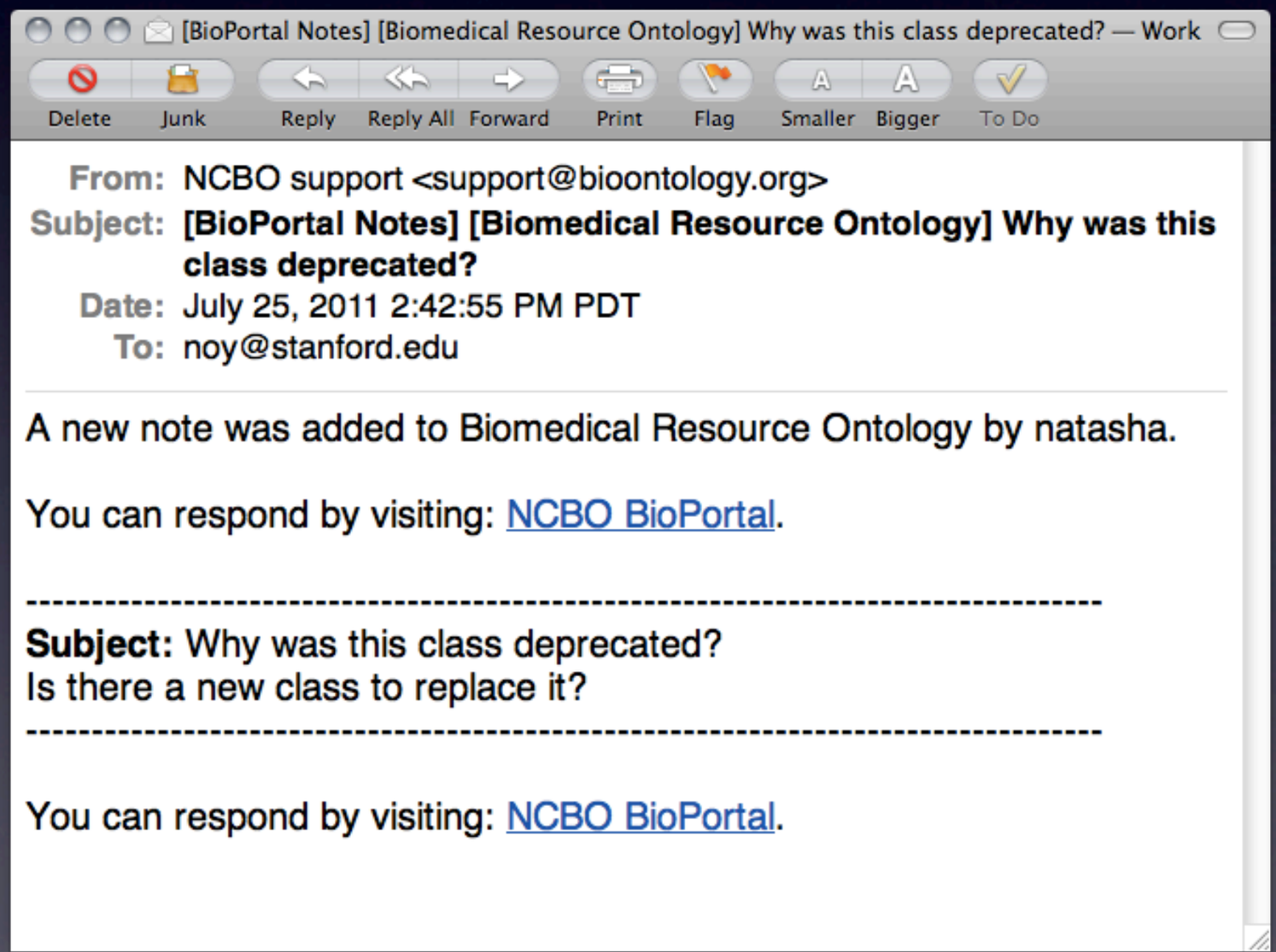
- Comment
- Change proposal
- New term proposal
- New relationship proposal
- New attribute value

All Proposal Are Structured



Email Notification

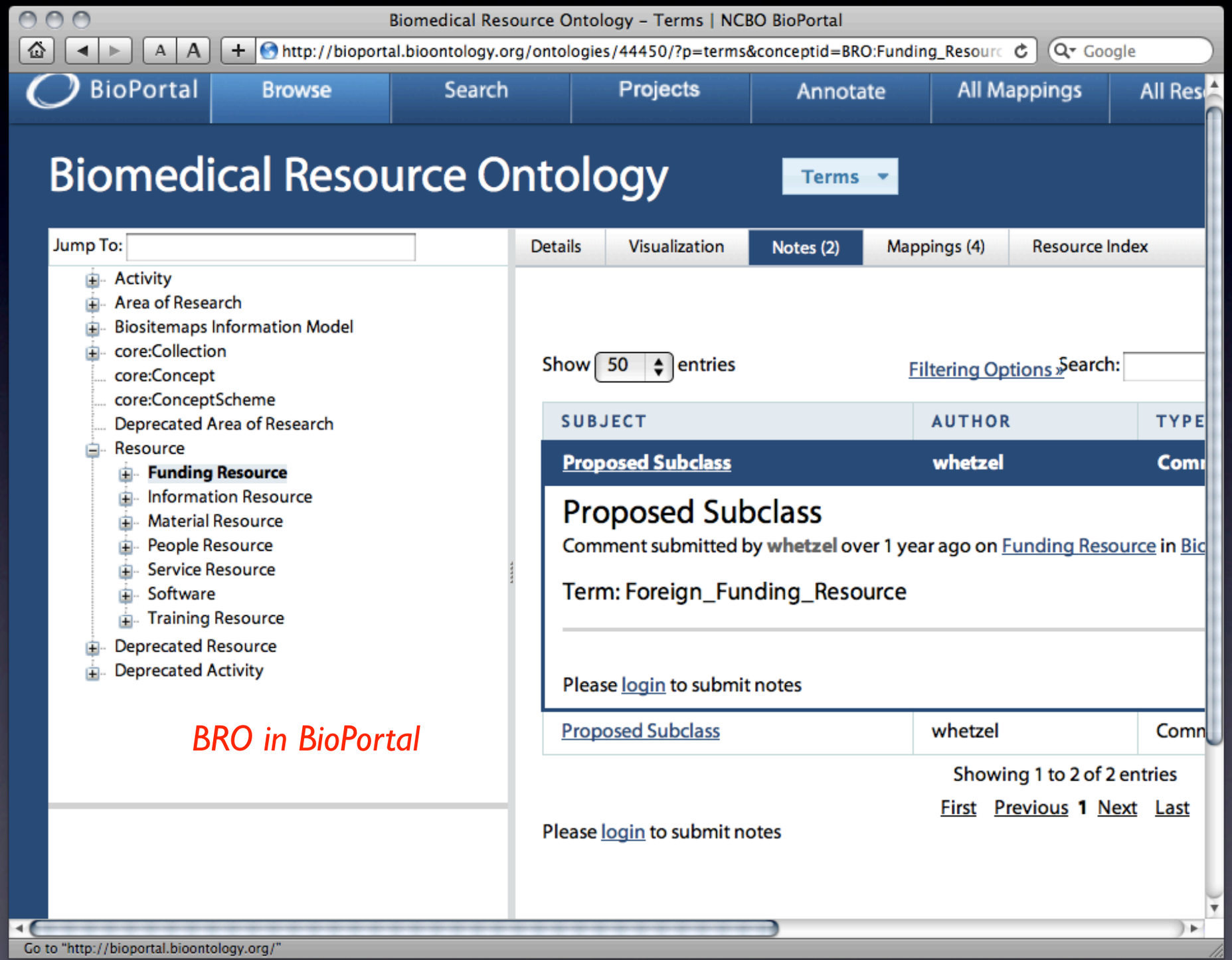
- You can subscribe to be notified when a new note appears for any class in your ontology of interest



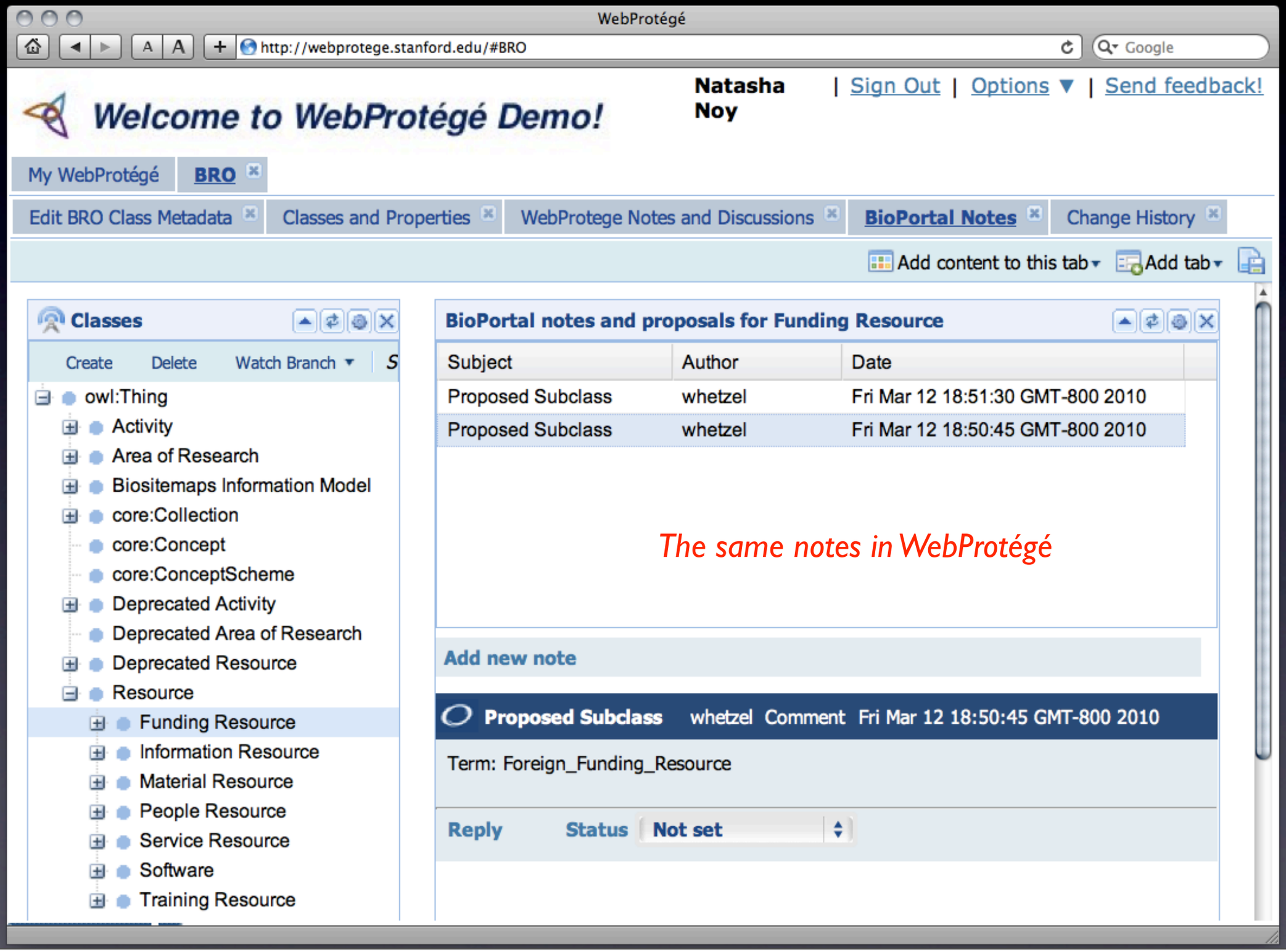
How BioPortal And WebProtégé Talk to Each Other

- View BioPortal Notes in WebProtégé
  - View notes created in BioPortal as you are editing the ontology in WebProtégé
- Add references to BioPortal classes using BioPortal reference widget in WebProtégé
  - Search BioPortal
  - Create a reference to BioPortal in your ontology
- Post notes form WebProtégé to BioPortal
  - The notes will appear on the classes in BioPortal
- Archive notes in WebProtégé to hide them in BioPortal display

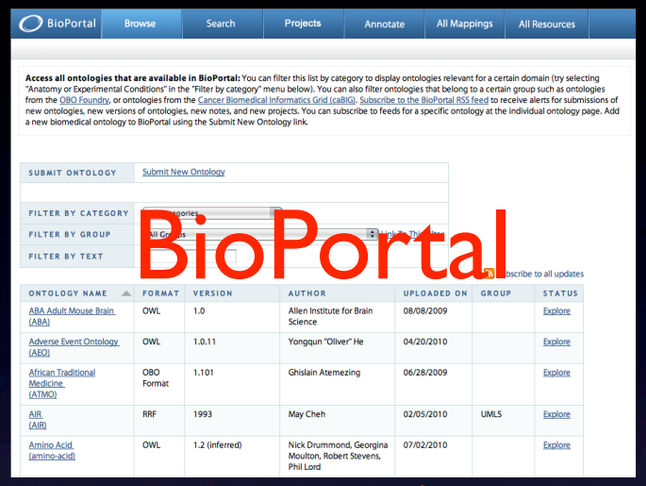
BioPortal Notes in WebProtégé



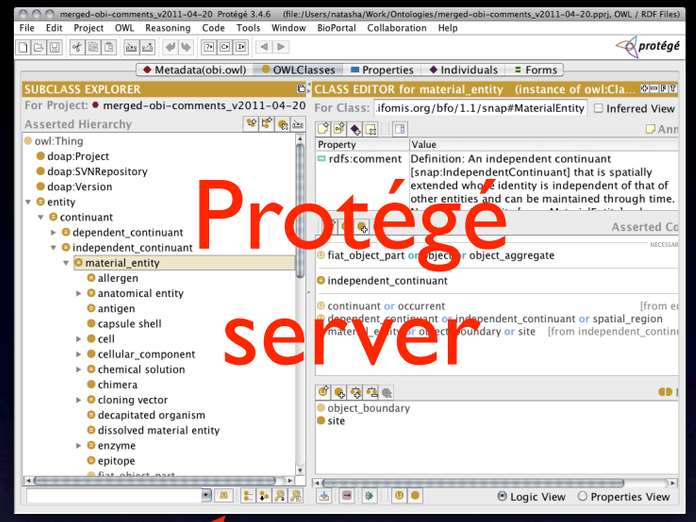
The Same Class In WebProtégé



Sets Of Notes in WebProtégé

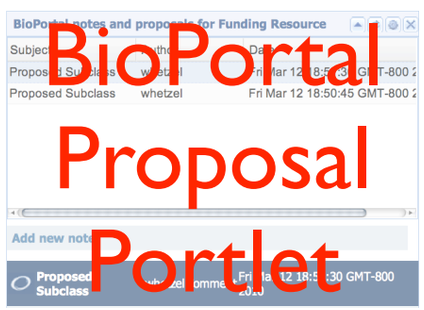


BioPortal

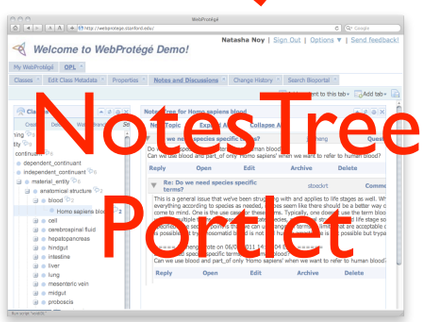


Protégé server

WebProtégé

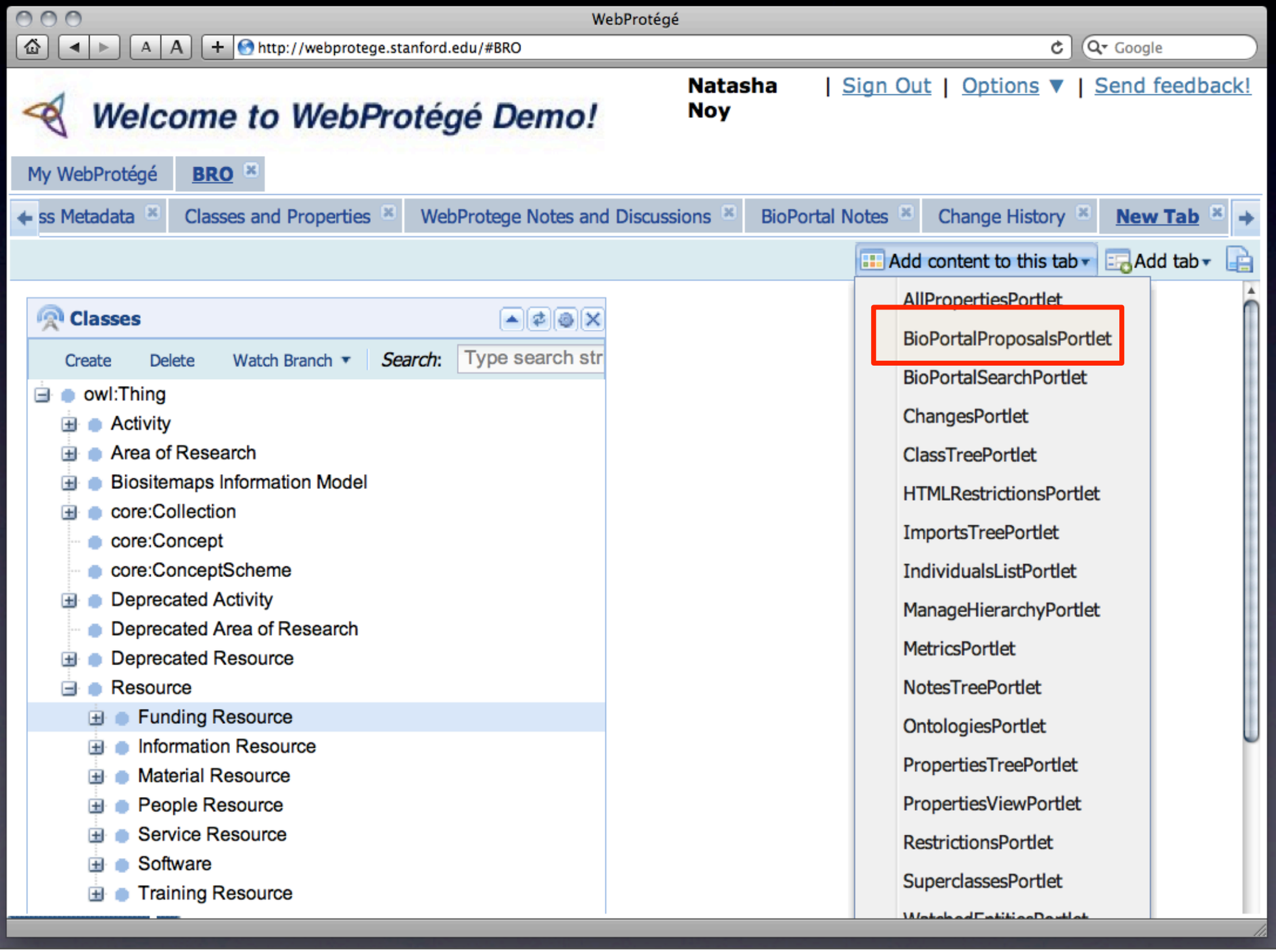


BioPortal Proposal Portlet

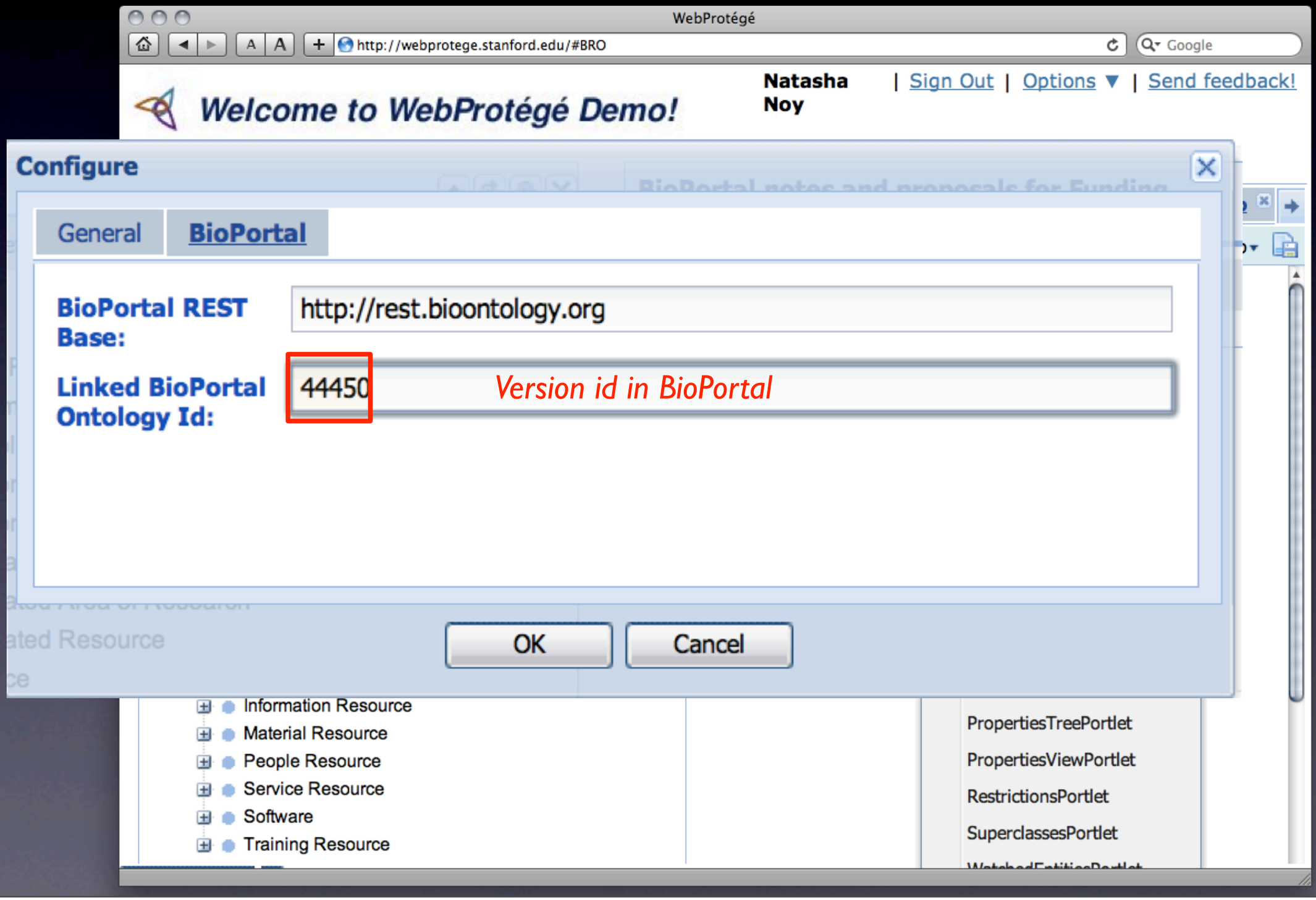


Notes Tree Portlet

BioPortal Proposal Portlet in WebProtégé



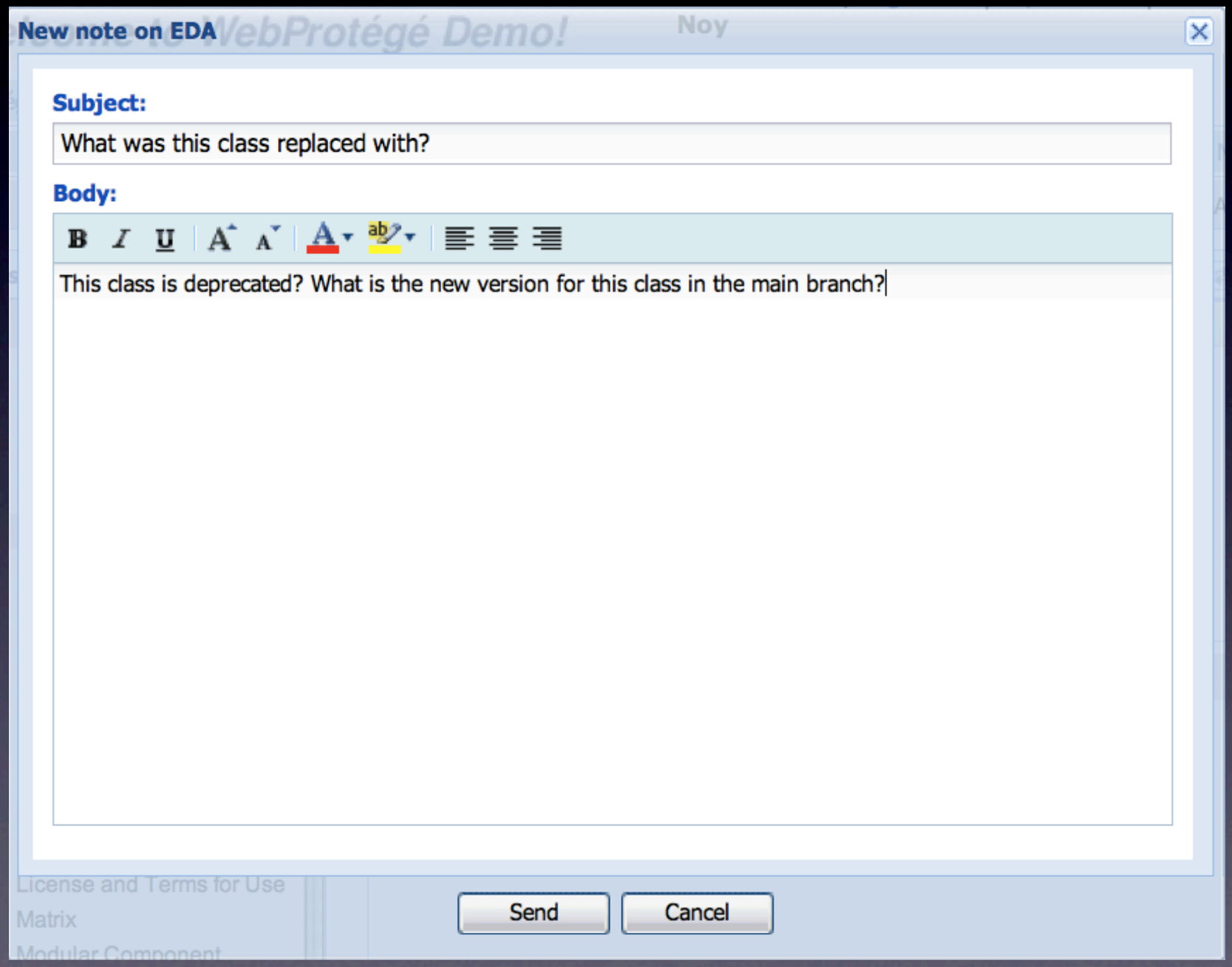
BioPortal Proposal Portlet in WebProtégé



Actions On BioPortal Notes

- View a note
- Reply to a note
  - The reply will be from “WebProtege”
- Create a new note
  - Try creating a note for a deprecated class
  - A note will be from “WebProtege”
- Change the status of the note
  - BioPortal user interface doesn’t reflect the new status at the moment, but the REST services do

Replying to a Note



Reply in BioPortal

Show 50 entries Filtering Options » Search:

SUBJECT	AUTHOR	TYPE	CREATED
Why was this class deprecated?	natasha	Comment	07/25/2011

Why was this class deprecated?

Archive Note

Comment submitted by **natasha** 14 minutes ago on Anatomic Atlas in Biomedical Resource Ontology

Is there a new class to replace it?

Responses

hide all | show all

Re: Why was this class deprecated? by webprotege 2 minutes ago

deprecated because it was too specific or overlapped with definition of Atlas.

On Mon Jul 25 14:42:55 GMT-700 2011, natasha wrote:

Is there a new class to replace it?

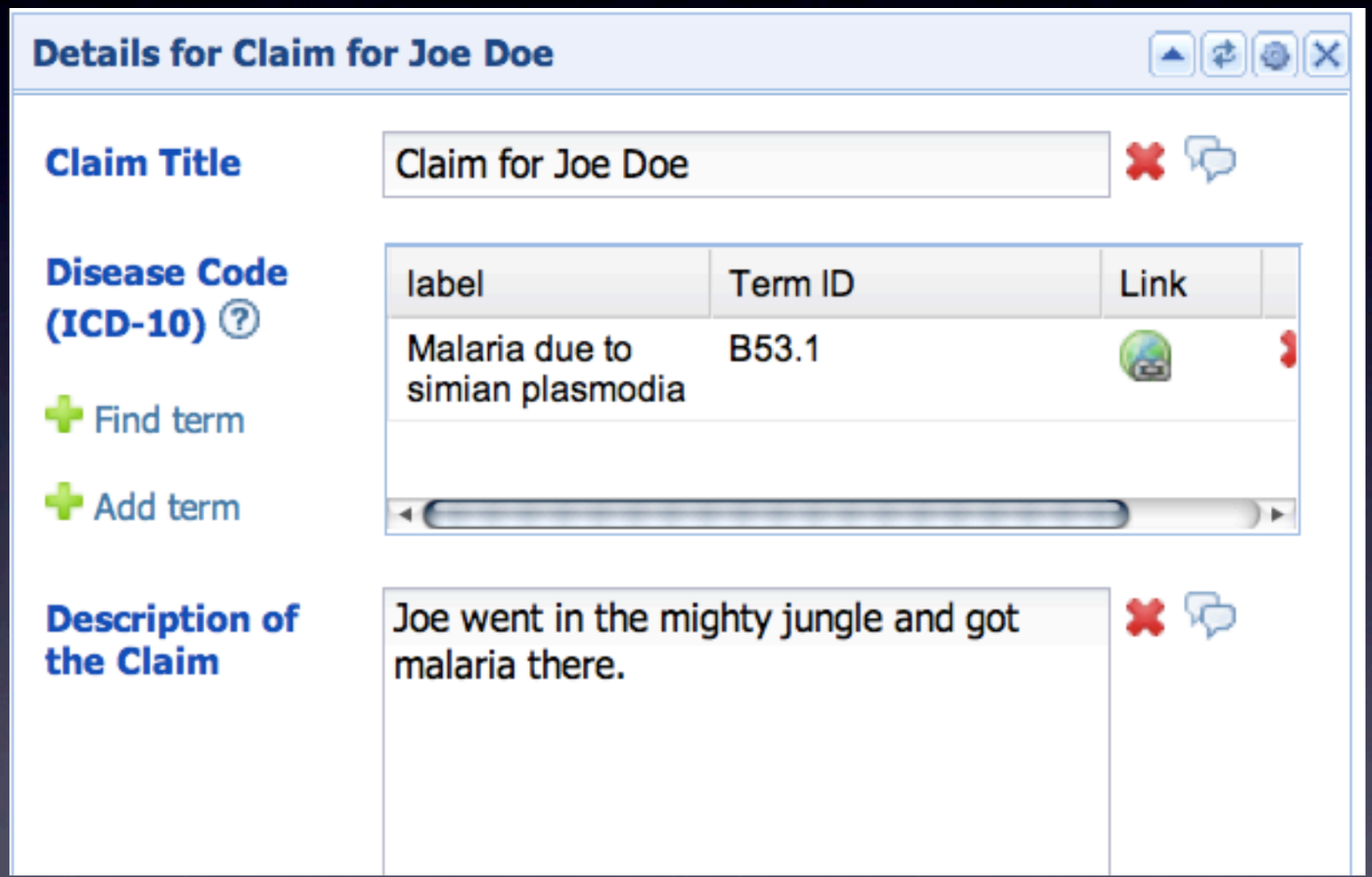
reply

Add Reply

BioPortal Reference Widget

- Allows references to classes in BioPortal
- A property can be configured to link to classes from a specific ontology

Find the Property Value in BioPortal



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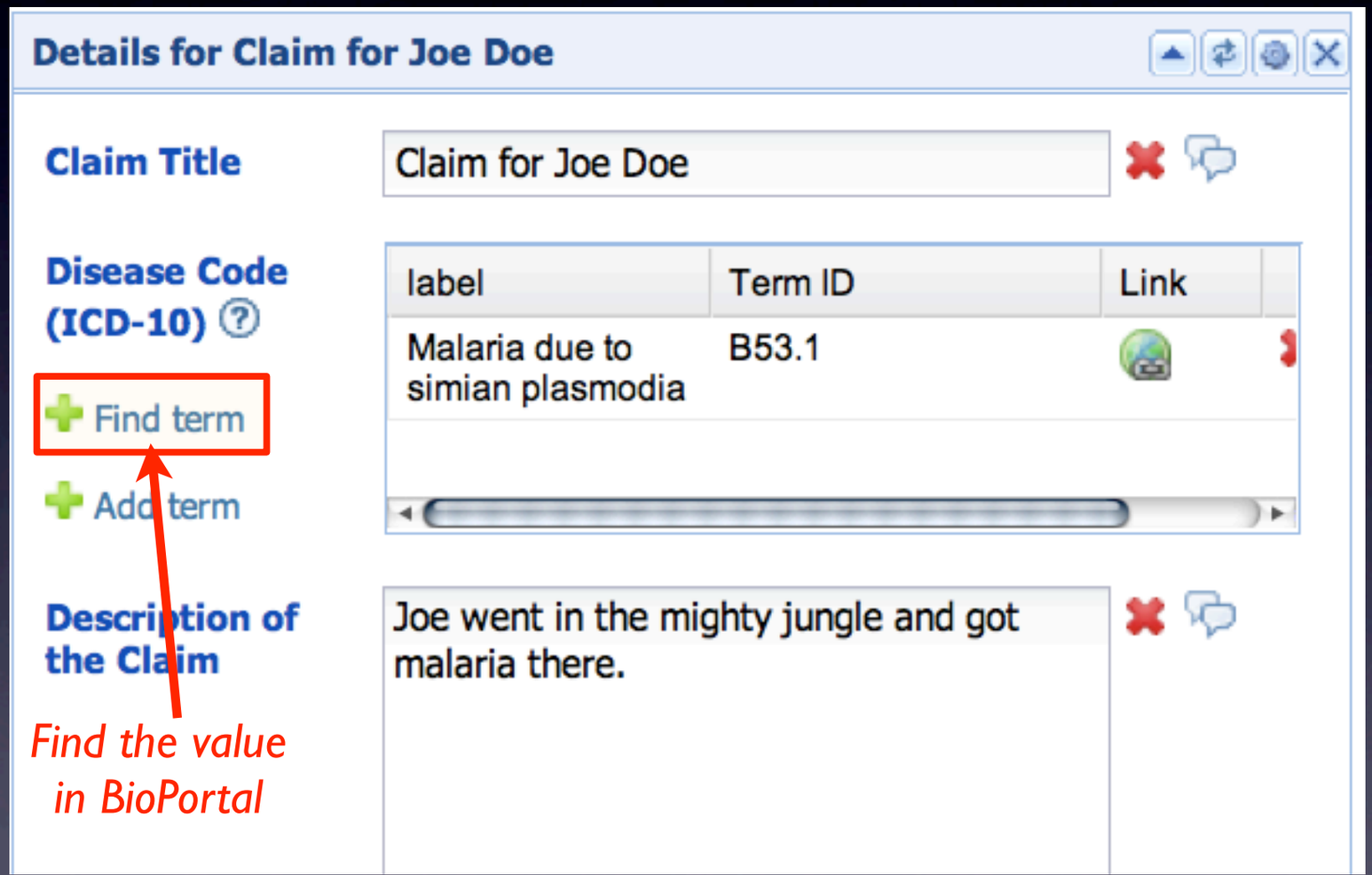

Search BioPortal

BioPortal Search for property Disease Code (ICD-10)

Search for concept: Malaria **Search in BioPortal**

Id	Preferred Name	Found in	Matched content	Ontology	
B54	**Unspecified malaria**		Unspecified malaria	ICD10	Import
B52	**Plasmodium malariae malaria**		Plasmodium malariae malaria	ICD10	Import
B52.0	**Plasmodium malariae malaria with nephropathy**		Plasmodium malariae malaria with nephropathy	ICD10	Import
P37.3	**Congenital falciparum malaria**		Congenital falciparum malaria	ICD10	Import
B53.1	**Malaria due to simian plasmodia**		Malaria due to simian plasmodia	ICD10	Import
P37.4	**Other congenital malaria**		Other congenital malaria	ICD10	Import
B53	**Other parasitologically confirmed malaria**		Other parasitologically confirmed malaria	ICD10	Import
B50	**Plasmodium falciparum malaria**		Plasmodium falciparum malaria	ICD10	Import
B50.9	**Plasmodium falciparum malaria,**		Plasmodium	ICD10	Import

10 / 19 results shown. **Show all search results** **Did not find it. Leave a comment**

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B50.9	**Plasmodium falciparum malaria,**		Plasmodium	ICD10			Import

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Search BioPortal

BioPortal Search for property Disease Code (ICD-10)

Search for concept: Malaria **Search in BioPortal**

Search term

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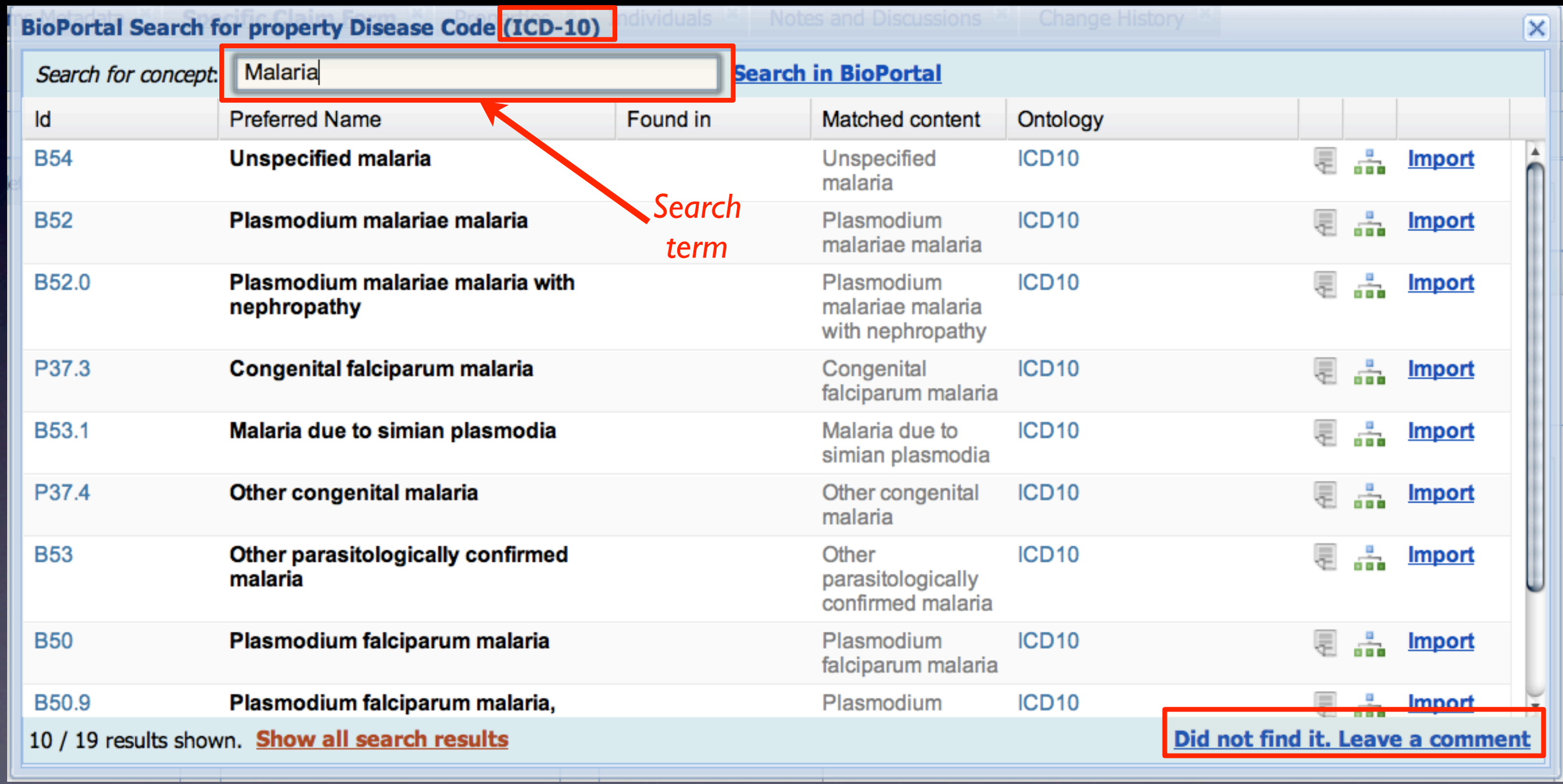

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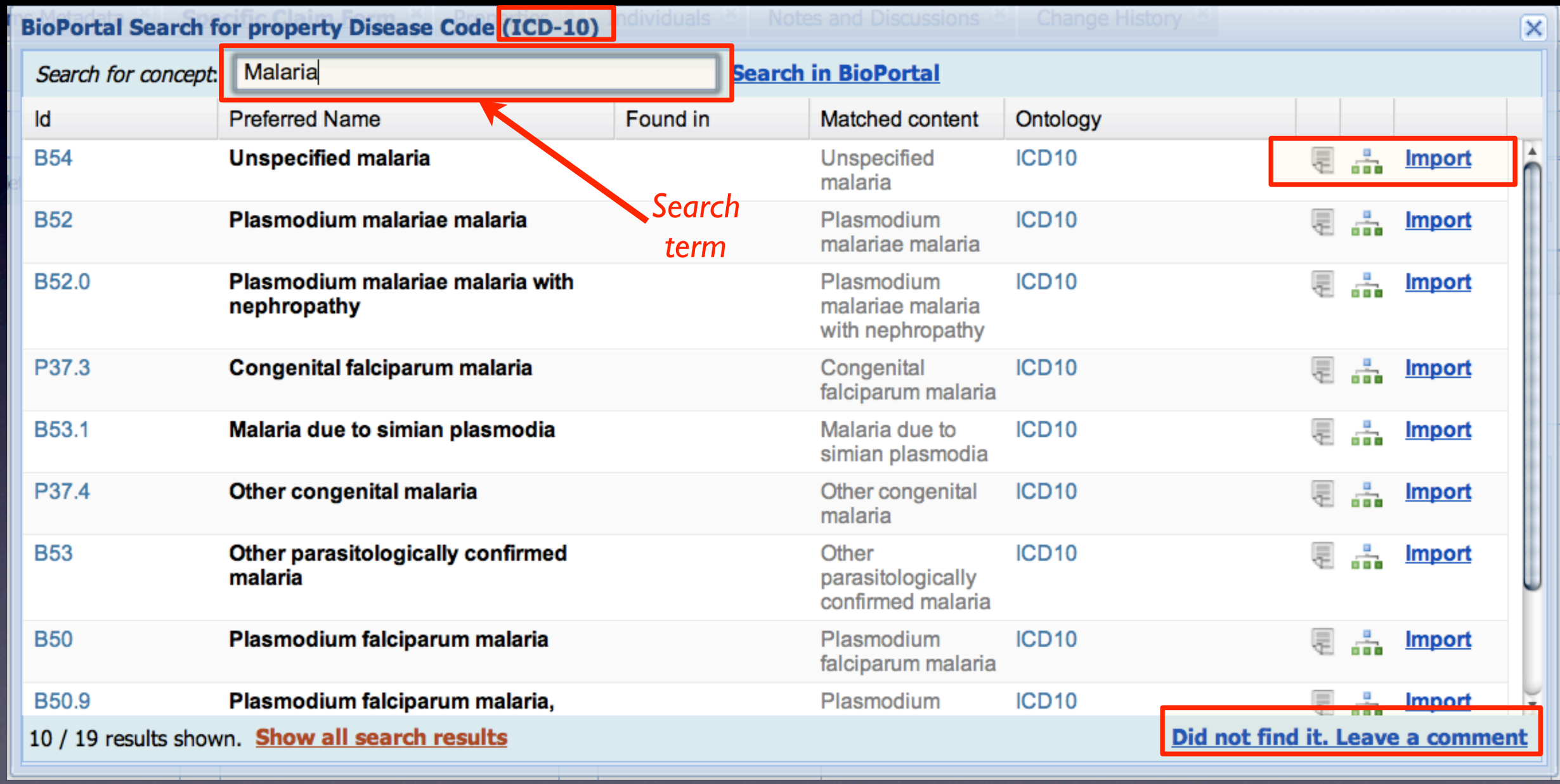


Going Back to The Insurance Ontology

- The disease_code is configured to link to the ICD-9 ontology in BioPortal
- Exercise
  - Create instances of claims
  - Add disease codes

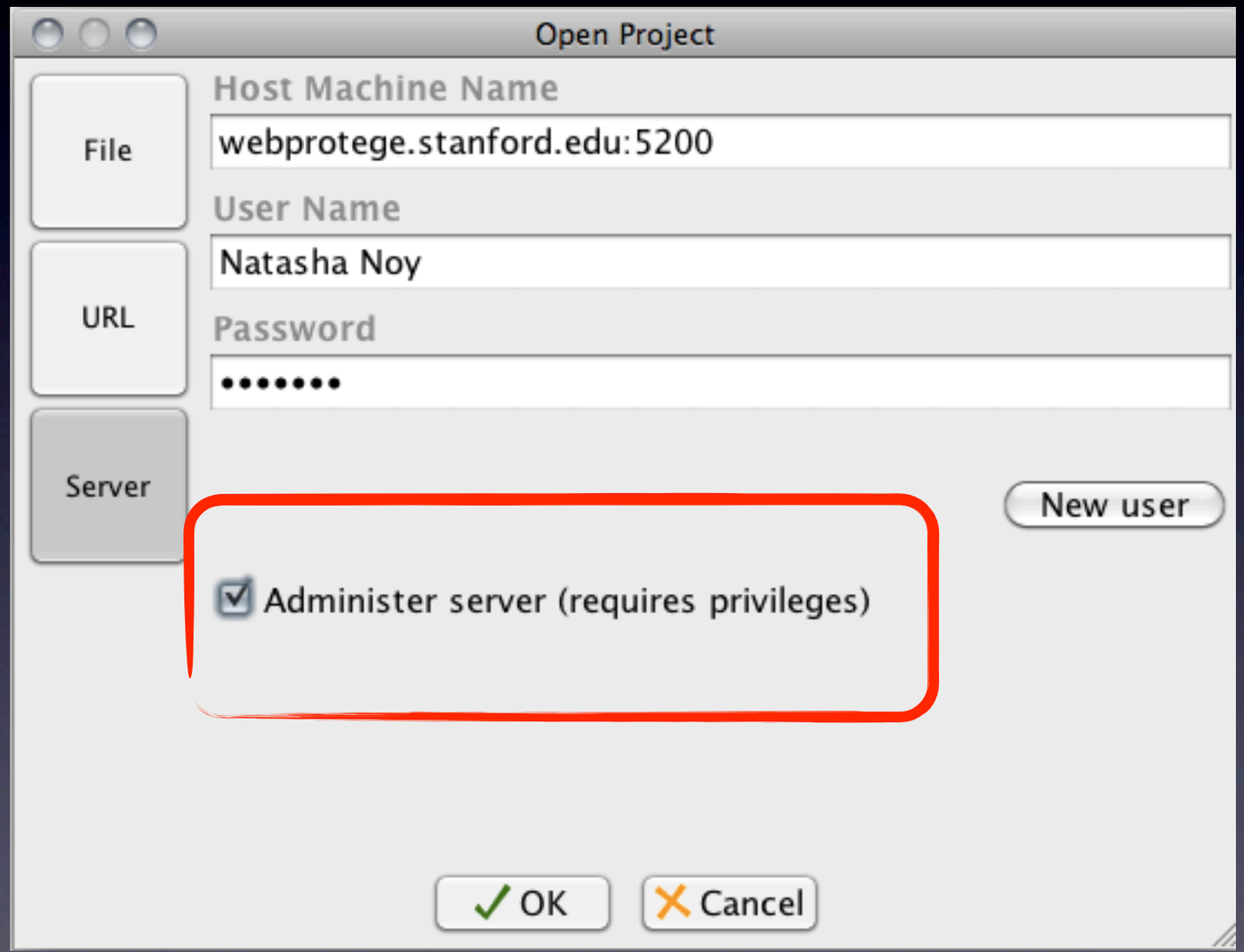
Under The Hood of WebProtégé

- Administering the WebProtégé server
- Changes and Annotation Ontology

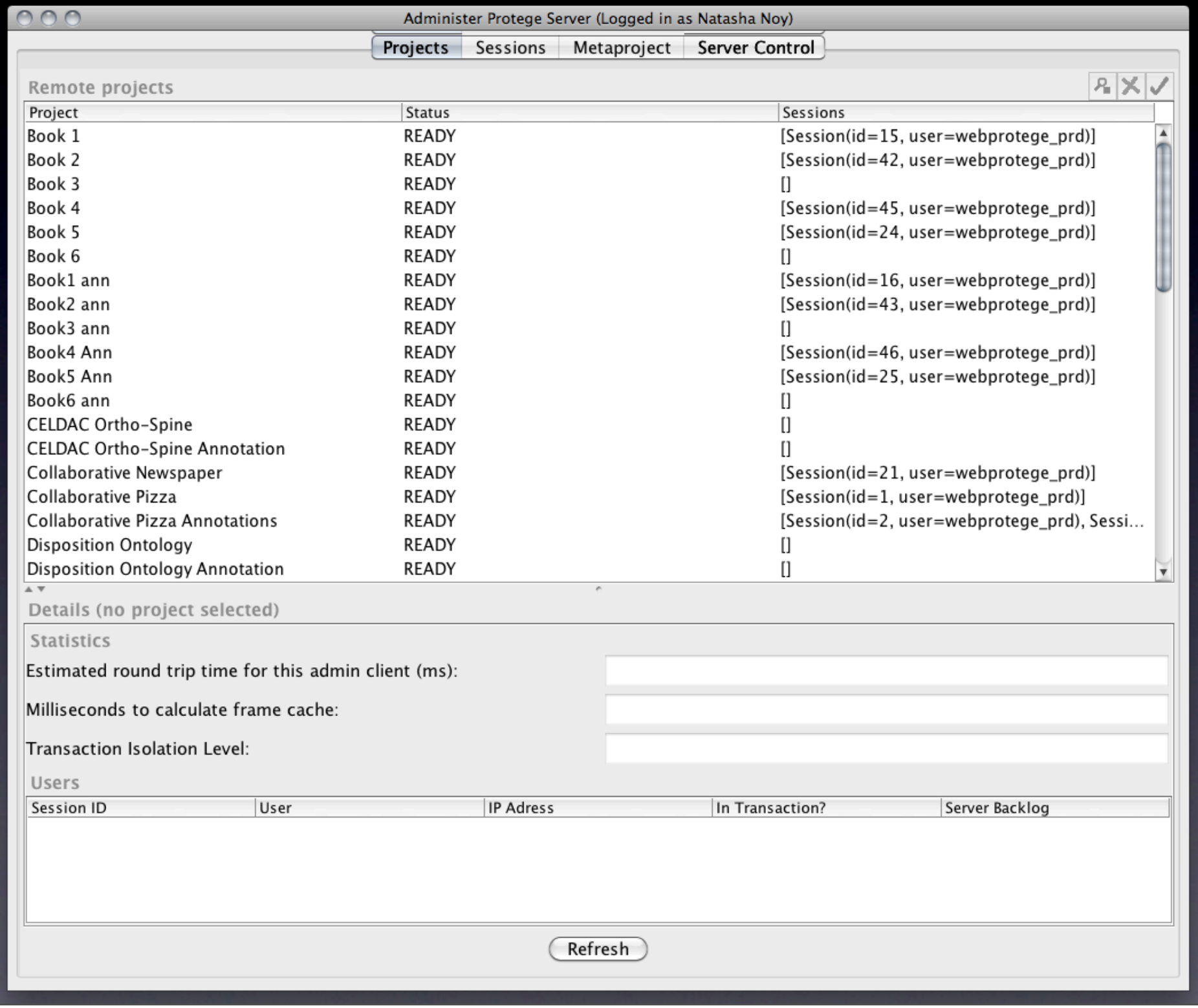
Administering The WebProtégé Server

- An Administrator can
  - Add new projects
  - Set permissions for projects
  - Create new users and add them to groups
  - Temporarily stop access to the project for maintenance

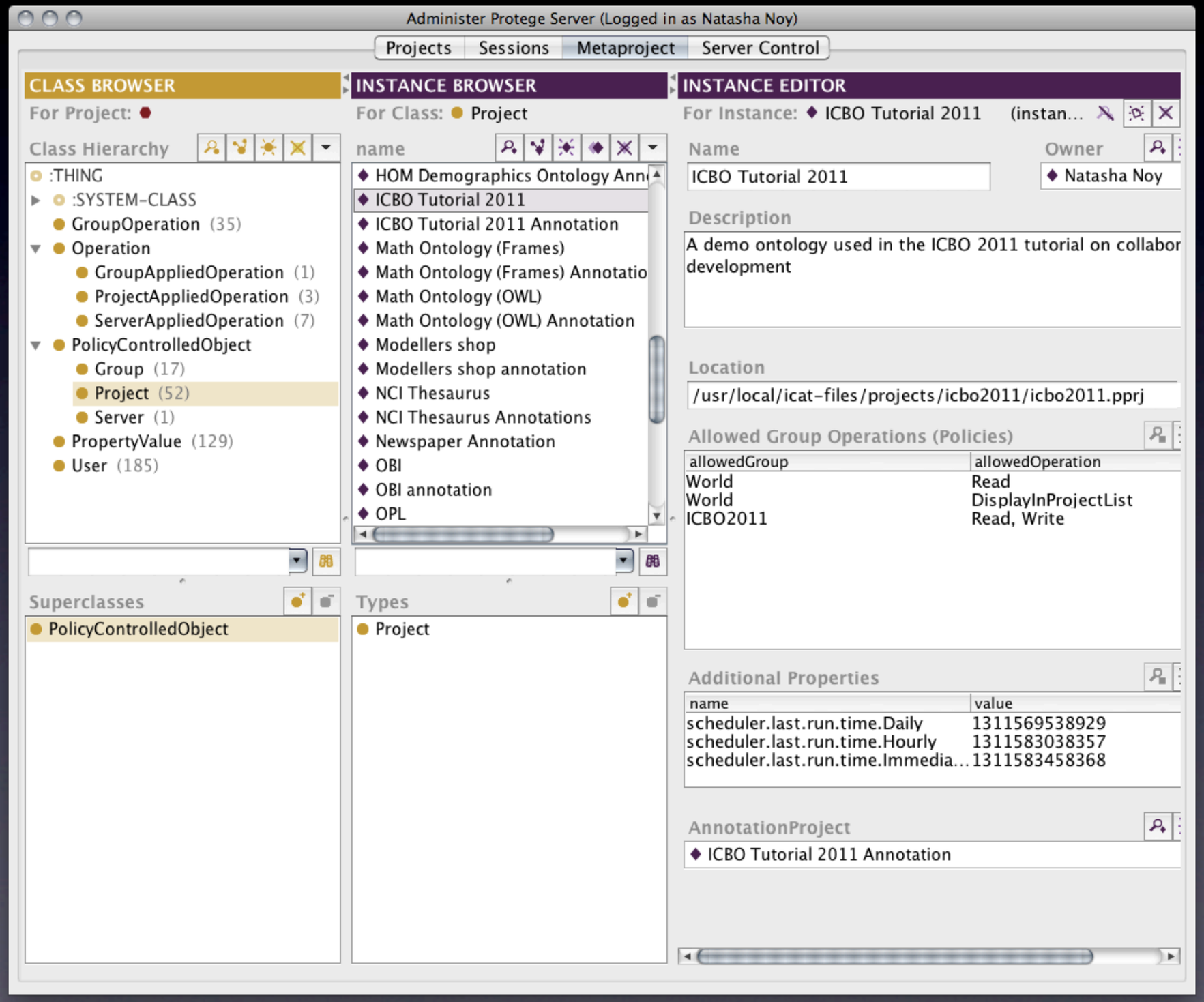
Administering The Server



Admin Screen



The Metaproject: Configuring Permissions



What Have We Learned Today

- Workflow for collaborative ontology development
- WebProtégé
  - Ontology editing
  - Collaboration: comments, discussion
  - User interface configuration
- BioPortal
  - Publishing ontologies
  - Commenting on ontologies
  - Requesting new terms
- Cross-talk between BioPortal and WebProtégé:
  - Components of a single collaborative workflow

Thanks!

- The Protégé Team
  - Tania Tudorache
  - Csongor Nyulas
  - Timothy Redmond
  - Jennifer Vendetti
- The BioPortal Team
  - Paul Alexander
  - Michael Dorf
  - Ray Fergerson
  - Trish Whetzel
  - Pradip Kanjamala
- Mark Musen

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