

# NCI Protege

CD2H Health Open Terminologies Ecosystem  
Community meeting  
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Gilberto Fragoso  
NCI/CBIIT, SI group, EVS

Bob Dionne, Tracy Safran, Itendra Singh

# At a glance . . .

- Brief overview
- Present functionalities & Protégé plugins/tabs

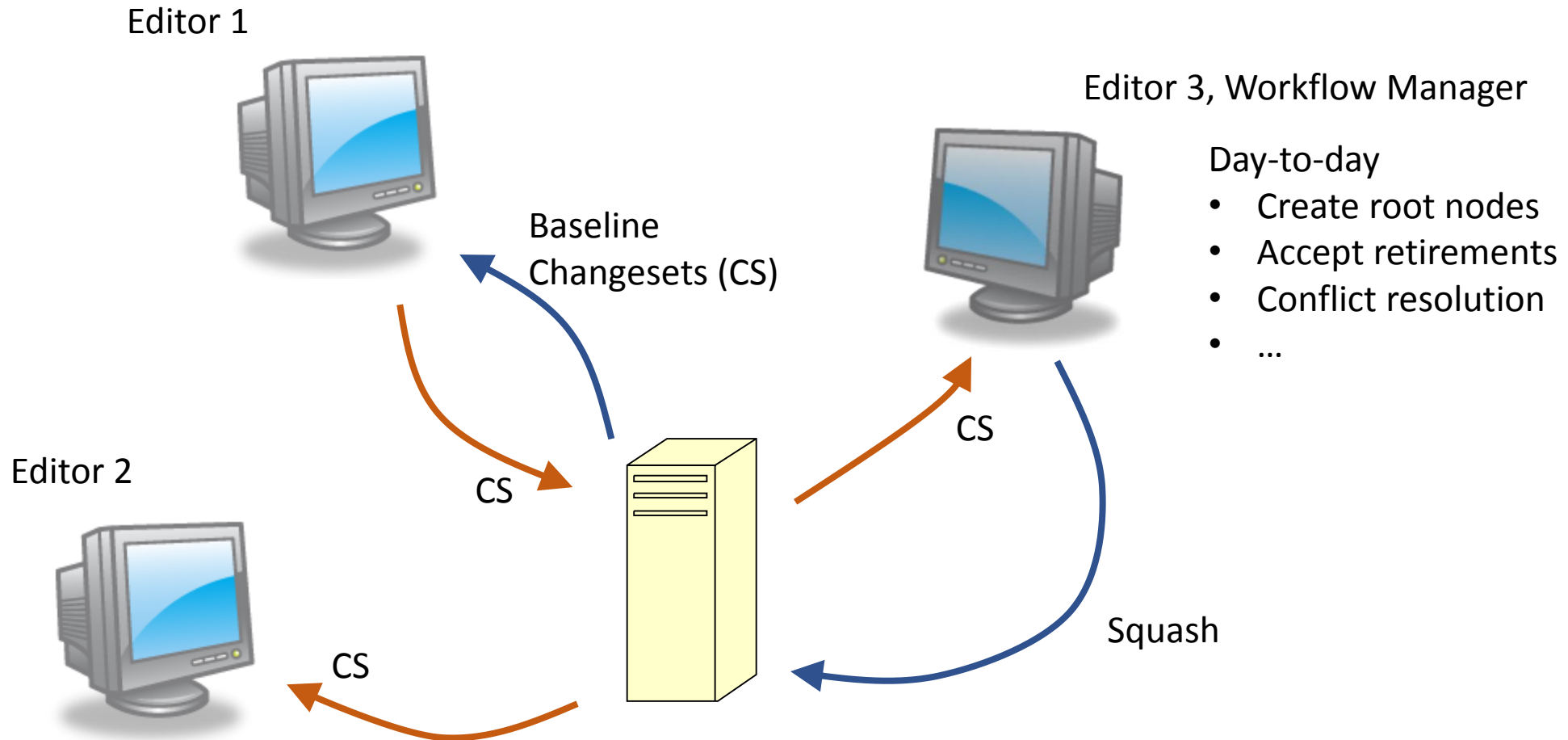
# Overview

- EVS develops the NCI Thesaurus
  - About 20 SMEs in geographically separate locations
    - Often collaborate in real time, one depending on another's edits
  - Some SME-friendly views of the vocabulary, particularly annotations
  - Support complex operations re vocabulary evolution
    - Merge, split, retirement
  - GUI support for complex searches
  - Need to be able to resolve editing conflicts
  - We have restrictions on creation of some entities, e.g. root nodes
    - Access control

# . . . Overview

- Terminology editing software is based on Protege5
  - Much of the initial work was done by Mark Musen's group (Stanford)
- Forked code in github
  - Using OWL API 5, no OSGI
- Client-server only, http/https
- Baseline persisted in OWL binary format
- Edits (changesets) persisted separately in the same binary format until consolidation (squash, new baseline)
- Standard Protege5 plugins as well as Stanford & NCI-developed plugins
  - Modified for OWL API 5

# ... Overview



# Plugins or Tabs

| Type           | Plugin / Tab          | Used for                             | Source                  |
|----------------|-----------------------|--------------------------------------|-------------------------|
| Editing        | Edit Tab              | Day-to-day editing                   | NCI                     |
| Editing        | Entities              | Root nodes, props, datatypes         | Protégé                 |
| Editing        | Inference Results     | Classification                       | Protégé Tab & Views     |
| Query/Report   | Lucene Query          | D2D searching & reports              | Josef Hardi (BMIR)      |
| Query/Report   | SPARQL Query          | QA & reports                         | Protege                 |
| Query/Report   | EVS History           | History reports                      | NCI                     |
| Admin          | Active Ontology       | Date, version (and imports)          | Protege                 |
| Admin          | Revision History      | Conflict resolution, Squash, History | Rafael Goncalvez (BMIR) |
| Admin          | Server Administration | Accounts, Roles, Projects...         | RG                      |
| Infrastructure | Client-server         |                                      | RG, JH                  |
| Infrastructure | OWL Binary            | persistence                          | Matthew Horridge (BMIR) |

# Main Editing GUI – NCI Edit Tab

Multiple subtabs supporting specific operations, e.g. basic editing, merges, retirements

Main editing tab presents annotations, annotated annotations, and class descriptions in separate subtabs.

Annotated annotations are presented in a table view

Supports batch loading and batch editing of concepts

The screenshot displays the NCI Edit Tab GUI. On the left, a navigation hierarchy lists various assessment tools, with 'Computerized Dynamic Posturography Assessment' selected. The right pane shows the 'Complex Properties' subtab for this concept. The 'DEFINITION' table is visible, containing the following data:

| Value  | Definition Source | Definition_Review_Date | Definition_Reviewer_Na... | attribution |
|--|-------------------|------------------------|---------------------------|-------------|
| A mechanical system designed to objectively differentiate between sensory, motor, and central adaptive functional impairments of balance. A subject stands on a platform while wearing a protective harness. The platform has sensors that measure how well the subject maintain their balance as the walls of the booth move and the surface they are standing on moves under their feet. The | NCI               | 2020-05-29             |                           |             |

Below the definition table, the 'FULL\_SYN' table is also visible, containing the following data:

| Value   | Subsource Name | Source Code | Term Type | Term Source |
|---|----------------|-------------|-----------|-------------|
| Moving Platform Posturography                 |                |             | SY        | NCI         |
| Computerized Dynamic Posturography            |                |             | SY        | NCI         |
| Computerized Dynamic Posturography Assessment |                |             | DN        | CTRP        |
| CDP   |                |             | SY        | NCI         |
| Posturography                                 |                |             | SY        | NCI         |

# Main Editing GUI – NCI Edit Tab

Multiple subtabs supporting specific operations, e.g. basic editing, merges, retirements

Main editing tab presents annotations, annotated annotations, and class descriptions in separate subtabs. Annotated annotations are presented in a table view

Supports batch loading and batch editing of concepts

The General & Description subtabs show properties w/o annotations, and the class relations, DL definition

The screenshot displays the NCI Edit Tab GUI. The top navigation pane shows a hierarchy of concepts, with 'Computerized Dynamic Posturography Assessment' selected. The main editing area is divided into several subtabs: 'Complex Properties', 'General', and 'Description'. The 'Complex Properties' subtab is active, showing a table of properties for the selected concept. The 'General' subtab is also visible, showing the class name and its description. The 'Description' subtab is also visible, showing the class relations and DL definition. The 'Complex Properties' subtab is highlighted with a red circle, and the 'Description' subtab is also highlighted with a red circle.

| Value   | Definition Source | Definition_Review_Date | Definition_Reviewer_Na... | attribution |
|---|-------------------|------------------------|---------------------------|-------------|
| A mechanical system designed to objectively differentiate between sensory, motor, and central adaptive functional impairments of balance. A subject stands on a platform while wearing a protective | NCI               | 2020-05-29             | Thomas, Nicole            |             |

Complex Properties: General Description

Annotations (some annotations are hidden) +

label [type: xsd:string]  
Computerized Dynamic Posturography Assessment

Concept\_In\_Subset  
● 'CTRP Intervention Terminology'

Concept\_In\_Subset  
● 'CTRP Terminology'

Contributing\_Source [type: xsd:string]  
CTRP

Display\_Name [type: xsd:string]  
Computerized Dynamic Posturography Assessment

Semantic\_Type [type: xsd:string]  
Intellectual Product

Equivalent To +

SubClass Of +  
● 'Balance Assessment Test'

General class axioms +

SubClass Of (Anonymous Ancestor)

Instances +

Target for Key +

Disjoint With +

Disjoint Union Of +

Save Clear

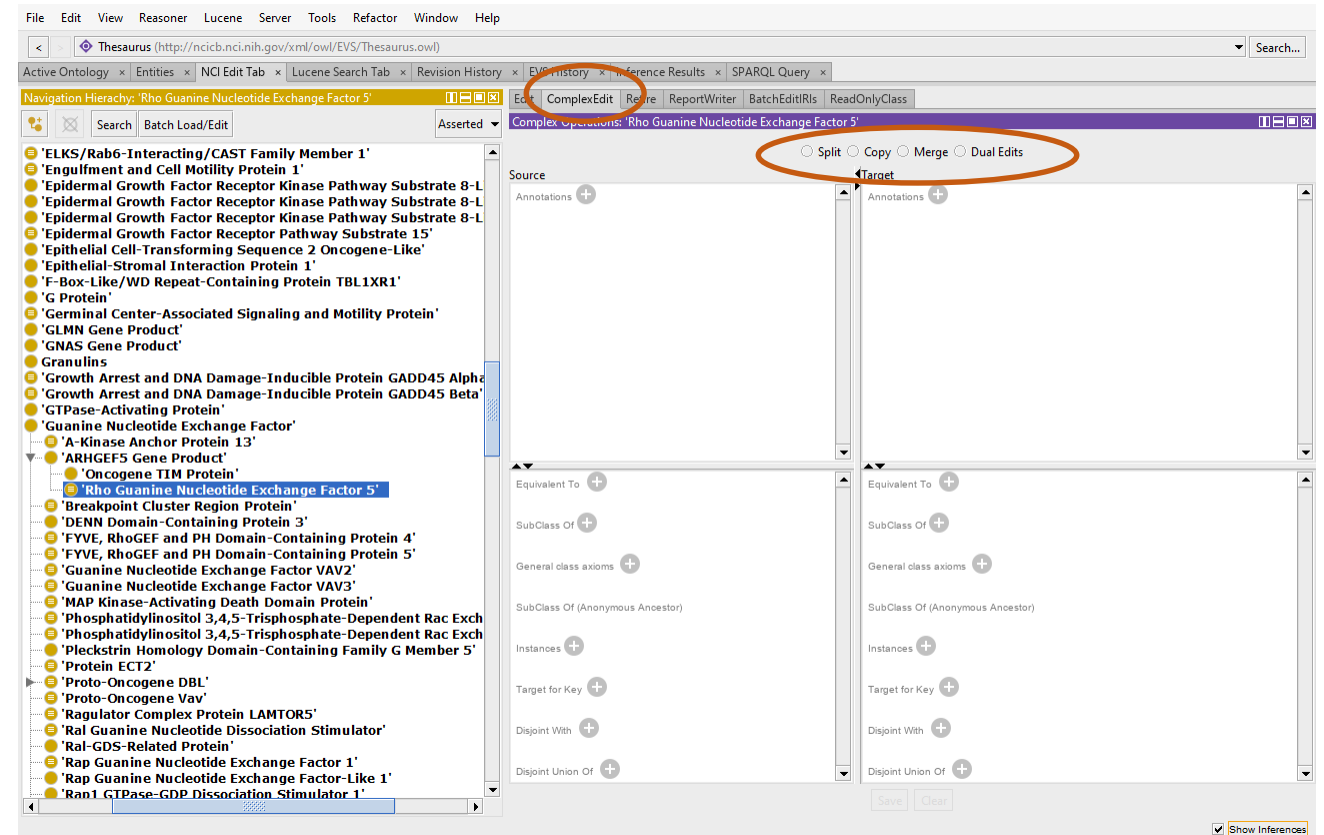
Show Inferences



# Main Editing GUI – complex edits

## Complex edits

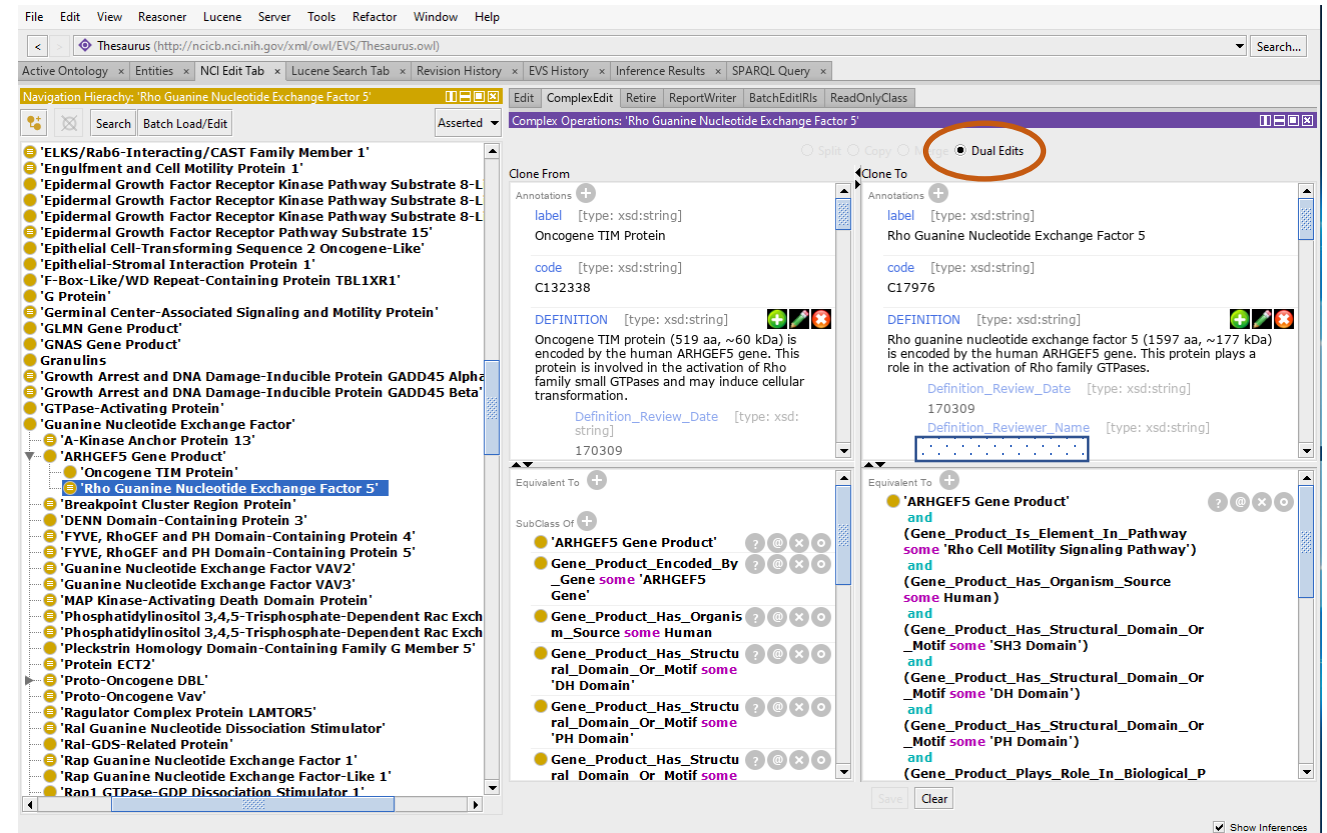
- Concept merge (with history)
- Concept split (with history)
- Concept copy (as Split but no history)
- Dual editing



# Main Editing GUI – complex edits

## Complex edits

- Merge
- Split
- Copy
- Dual editing
  - Use a class as a template for others, copy-and-paste similar information



# Main Editing GUI – retirement

## Retirement

Highlights dependent classes. The relations need to be resolved before the class can be retired. Retirement history is generated

The screenshot displays the Protege software interface for editing an ontology. The main window shows a navigation hierarchy on the left and a detailed view of a class on the right. The class being edited is 'Rho Guanine Nucleotide Exchange Factor 5'. The 'Retirements' tab is active, showing a list of dependent classes that must be resolved before the class can be retired. The dependent classes include:

- 'ELKS/Rab6-Interacting/CAST Family Member 1'
- 'Engulfment and Cell Motility Protein 1'
- 'Epidermal Growth Factor Receptor Kinase Pathway Substrate 8-L'
- 'Epidermal Growth Factor Receptor Kinase Pathway Substrate 8-L'
- 'Epidermal Growth Factor Receptor Kinase Pathway Substrate 8-L'
- 'Epidermal Growth Factor Receptor Pathway Substrate 15'
- 'Epithelial Cell-Transforming Sequence 2 Oncogene-Like'
- 'Epithelial-Stromal Interaction Protein 1'
- 'F-Box-Like/WD Repeat-Containing Protein TBL1XR1'
- 'G Protein'
- 'Germinal Center-Associated Signaling and Motility Protein'
- 'GLMN Gene Product'
- 'GNAS Gene Product'
- 'Granulins'
- 'Growth Arrest and DNA Damage-Inducible Protein GADD45 Alpha'
- 'Growth Arrest and DNA Damage-Inducible Protein GADD45 Beta'
- 'GTPase-Activating Protein'
- 'Guanine Nucleotide Exchange Factor'
- 'A-Kinase Anchor Protein 13'
- 'ARHGEF5 Gene Product'
- 'Oncogene TIM Protein'
- 'Rho Guanine Nucleotide Exchange Factor 5' (highlighted in blue)
- 'Breakpoint Cluster Region Protein'
- 'DENN Domain-Containing Protein 3'
- 'FYVE, RhoGEF and PH Domain-Containing Protein 4'
- 'FYVE, RhoGEF and PH Domain-Containing Protein 5'
- 'Guanine Nucleotide Exchange Factor VAV2'
- 'Guanine Nucleotide Exchange Factor VAV3'
- 'MAP Kinase-Activating Death Domain Protein'
- 'Phosphatidylinositol 3,4,5-Trisphosphate-Dependent Rac Exch'
- 'Phosphatidylinositol 3,4,5-Trisphosphate-Dependent Rac Exch'
- 'Pleckstrin Homology Domain-Containing Family G Member 5'
- 'Protein ECT2'
- 'Proto-Oncogene DBL'
- 'Proto-Oncogene Vav'
- 'Regulator Complex Protein LAMTOR5'
- 'Ral Guanine Nucleotide Dissociation Stimulator'
- 'Ral-GDS-Related Protein'
- 'Rap Guanine Nucleotide Exchange Factor 1'
- 'Rap Guanine Nucleotide Exchange Factor-Like 1'
- 'Ran1 GTPase-GDP Dissociation Stimulator 1'

The right-hand pane shows the class's annotations, including its label, code, and definition. The 'Retirements' tab is circled in orange, and the dependent classes list is also circled in orange. The 'Retire' button is visible at the bottom right of the window.

# Inference Results Tab

Only a subset of inferences are shown in the Classification Results widget

- Inferences that do not recapitulate the asserted information

Also used are the superclass hierarchy widgets, both inferred and asserted

The screenshot displays the 'Inference Results' tab in a web-based ontology editor. The interface includes a menu bar (File, Edit, View, Reasoner, Lucene, Server, Tools, Refactor, Window, Help), a browser address bar (Thesaurus), and several tabs (Active Ontology, Entities, NCI Edit Tab, Lucene Search Tab, Revision History, EVS History, Inference Results, SPARQL Query). The main area is divided into three panels: 'Inferred Navigation Hierarchy: Skin Epithelioid Hemangioma' (left), 'Inferred axioms' (top right), and two 'Superclass hierarchy' widgets (bottom right). The left panel shows a tree of classes, with 'Skin Epithelioid Hemangioma' selected. The 'Inferred axioms' panel is mostly empty, with a large orange oval drawn around it. The 'Superclass hierarchy' widgets show inferred relationships, such as 'Skin Epithelioid Hemangioma' being a subclass of 'Epithelioid Hemangioma' and 'Skin Hemangioma'.

# Lucene Search Tab

Supports complicated searches

- Basic, negated, and nested queries
- contains, exact, starts with, property present, restriction present, others
- AND and OR of the above

The screenshot displays the Lucene Search Tab interface within a web browser. The browser's address bar shows the URL: <http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl>. The interface includes a menu bar (File, Edit, View, Reasoner, Lucene, Server, Tools, Refactor, Window, Help) and a tab bar with the following tabs: NCI Edit Tab, Lucene Search Tab, Active Ontology, Entities, Revision History, Inference Results, EVS History, and SPARQL Query. The main area is titled "Lucene Query:" and contains three query builders: "Add Basic Query", "Add Negated Query", and "Add Nested Query". The first query builder has "Property" set to "label", "Query Type" set to "contains", and "Value" set to "oncogene". The second query builder is a "Nested Query" with "Property" set to "Gene\_Plays\_Role\_In\_Process". The third query builder has "Property" set to "label", "Query Type" set to "contains", and "Value" set to "signal transduction". The results pane on the right shows "22 matches" and lists the following terms: 'Onco gene ABL1', 'Onco gene DBL', 'Onco gene FGR', 'Onco gene FPS-FES', 'Onco gene H-Ras', 'Onco gene K-Ras', 'Onco gene KIT', 'Onco gene LCK', 'Onco gene MET', 'Onco gene N-RAS', 'Onco gene RET', 'Onco gene ROS', 'Onco gene SRC', 'Onco gene TIM', 'Onco gene TRK', 'Onco gene YES-1', 'Onco genes, G-Proteins', 'Onco genes, Growth Factor', 'Onco genes, Protein-Kinase', 'Onco genes, Tyrosine-Kinase', 'RAS Family Oncogene', and 'SRC Family Oncogene'. The interface also includes an "Export" button, a "Filter results" input field, and a "Filter" button. At the bottom, there are "Clear" and "Search" buttons, and a "Show Inferences" checkbox.

# Lucene Search Tab

Supports complicated searches

- Basic, negated, and nested queries
- contains, exact, starts with, property present, restriction present, others
- AND and OR of the above

Export resultsets to tsv/csv

The screenshot displays the Lucene Search Tab interface within a web browser. The browser's address bar shows the URL: <http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl>. The interface includes a menu bar (File, Edit, View, Reasoner, Lucene, Server, Tools, Refactor, Window, Help) and a tab bar with several open tabs: NCI Edit Tab, Lucene Search Tab, Active Ontology, Entities, Revision History, Inference Results, EVS History, and SPARQL Query. The main area is titled "Lucene Query:" and contains a search bar with the query "Export to CSV file". Below the search bar, there are buttons for "Add Basic Query", "Add Negated Query", and "Add Nested Query". The search results are displayed in a list on the right, showing 22 matches. The results include terms like "OncoGene ABL1", "OncoGene DBL", "OncoGene FGR", "OncoGene FPS-FES", "OncoGene H-Ras", "OncoGene K-Ras", "OncoGene KIT", "OncoGene LCK", "OncoGene MET", "OncoGene N-RAS", "OncoGene RET", "OncoGene ROS", and "OncoGene SRC". A dialog box titled "Choose properties to export" is open, showing a list of properties with "DEFINITION" selected. The dialog also includes a filter field with the text "de" and buttons for "OK" and "Cancel". The bottom of the interface features a "Clear" button, radio buttons for "Match All" and "Match Any", a "Search" button, a "Filter" button, and a "Show Inferences" checkbox.

# SPARQL Query Tab

For those occasions when packaged Lucene queries won't do

Used mostly for QA

- Useful queries can be bookmarked (and incorporated into a distribution)

The screenshot shows a web-based SPARQL query editor. The interface includes a menu bar (File, Edit, View, Reasoner, Lucene, Server, Tools, Refactor, Window, Help), a browser address bar, and several tabs. The active tab is 'SPARQL Query'. The main area is divided into three sections: a left sidebar with a list of query templates, a central query editor, and a right sidebar with a query preview. Below these is a table of results and a footer with 'Execute', 'Bookmark', and 'Export' buttons.

**SPARQL query:**

```
count_roles_in_branch
count_roles_primitive_concepts_in_branch
CPTAC
CPTAC_157075
CTRP_Report
Empty_Value_Set
PQCMC
PQCMC_Def
roles_defined_concepts_in_branch
roles_in_branch
roles_primitive_concepts_in_branch
semicolon
semicolonend
specialcharacters
subset_unannotated
Transitive_SubClassOf
UNII
UNII_QA
```

**Query:**

```
prefix nci: <http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#>
select distinct (str(?concept_pt) as ?pt) (str(?concept_code) as ?code)
where
{
  values ?note_value { "CPTAC24July" }
  ?s rdfs:label ?concept_pt;
  nci:NHCO ?concept_code .
  {
    select ?s
    {
      values ?subset { nci:C159328 }
      ?s nci:A8 ?subset .
    }
  }
  filter not exists { ?s nci:P95 ?editor_note . filter regex (str(?editor_note), ?note_value) }
}
order by ?pt
```

| pt   | code    |
|--|---------|
| 12 Months  | C156842 |
| 24 Months  | C156843 |
| 36 Months  | C156844 |
| 48 Months  | C156845 |
| Acute Myeloid Leukemia   | C3171   |
| Additional Surgery for New Loco-Regional Tumor Event Unknown           | C160446 |
| Additional Surgery for New Loco-Regional Tumor Event Was Not Performed | C160445 |
| Additional Surgery for New Loco-Regional Tumor Event Was Performed     | C160444 |
| Additional Surgery for New Metastatic Tumor Event Not Evaluated        | C160745 |
| Additional Surgery for New Metastatic Tumor Event Unknown              | C160447 |
| Additional Surgery for New Metastatic Tumor Event Was Not Performed    | C160449 |
| Additional Surgery for New Metastatic Tumor Event Was Performed        | C160450 |
| Additional Surgery for New Tumor Event Absent                          | C160300 |
| Additional Surgery for New Tumor Event Not Evaluated                   | C162603 |
| Additional Surgery for New Tumor Event Present                         | C160299 |
| Additional Surgery for New Tumor Event Unknown                         | C160302 |

Execute Bookmark Export

Show Inferences

# EVS History Tab

EVS History tracks runtime editing at a high level. Publication history is derived from this history.

Information of interest to the workflow managers

- Who edited what when, going back to time zero

Username  Start Date May 1, 2020 Operation ALL

Code  End Date May 30, 2020

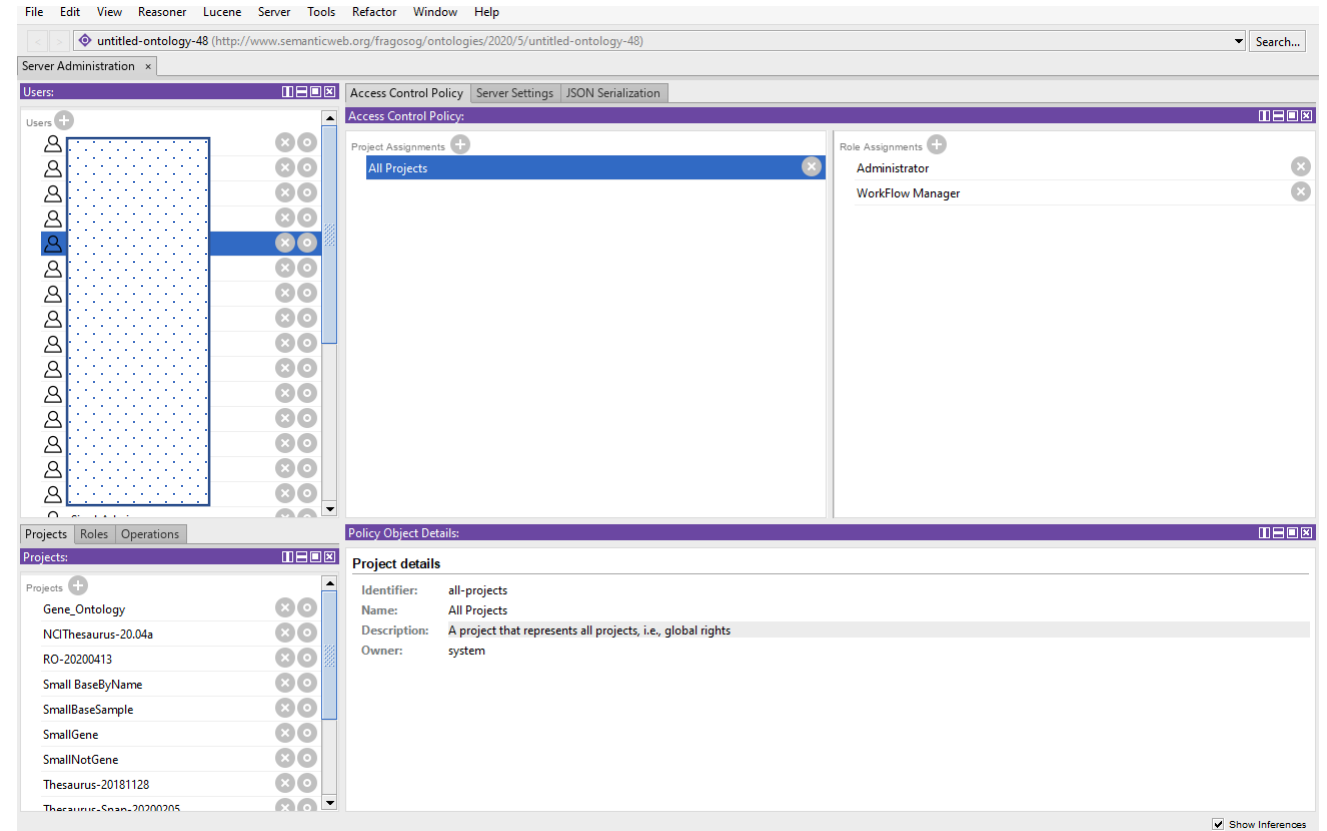
| Date                | User Name | Code    | Name                                      | Operation | Reference |
|---------------------|-----------|---------|---|-----------|-----------|
| 2020-05-01 08:57:18 |           | C171133 | COVID-19 Infection                        | MODIFY    |           |
| 2020-05-01 09:13:05 |           | C171634 | HLA Class I Histocompatibility Antige...  | CREATE    |           |
| 2020-05-01 09:17:50 |           | C171635 | HLA Class I Histocompatibility Antige...  | CREATE    |           |
| 2020-05-01 09:18:00 |           | C62760  | HLA Class I Histocompatibility Antige...  | MODIFY    |           |
| 2020-05-01 09:26:43 |           | C171636 | HLA Class II Histocompatibility Antige... | CREATE    |           |
| 2020-05-01 09:32:13 |           | C171636 | HLA Class II Histocompatibility Antige... | MODIFY    |           |
| 2020-05-01 09:35:06 |           | C171637 | HLA Class II Histocompatibility Antige... | CREATE    |           |
| 2020-05-01 09:50:30 |           | C171133 | COVID-19 Infection                        | MODIFY    |           |
| 2020-05-01 09:50:54 |           | C171133 | COVID-19 Infection                        | MODIFY    |           |
| 2020-05-01 10:12:39 |           | C171638 | CA125 to CEA Ratio Greater than or Eq...  | CREATE    |           |
| 2020-05-01 10:14:01 |           | C171638 | CA125 to CEA Ratio Greater than or Eq...  | MODIFY    |           |
| 2020-05-01 10:35:02 |           | C171639 | CD37 Positive                             | CREATE    |           |
| 2020-05-01 10:37:06 |           | C171640 | SLFN11 Positive                           | CREATE    |           |
| 2020-05-01 13:35:35 |           | C114381 | Telaglenastat                             | MODIFY    |           |
| 2020-05-01 13:37:10 |           | C76483  | Deboxamet                                 | MODIFY    |           |
| 2020-05-01 13:37:25 |           | C76483  | Deboxamet                                 | MODIFY    |           |

Show Inferences



# Server Admin GUI

- Create users
- Create & configure project
  - Vocabulary properties
- Create & Assign roles
  - Modeler
  - Manager
  - Reviewer/Guest
  - Administrator
- Assign permission to projects
- Configure Server



# Admin GUI – Example of Project Configuration

Some properties are required in business rules

- e.g. every concept must have a preferred\_name, an rdfs:label, and a full\_syn where the source is NCI and the term type is Pt.

Some are required in GUI panels

The screenshot displays the Admin GUI interface. The main window is titled 'untitled-ontology-48' and shows a 'Server Administration' tab. A dialog box titled 'Edit Project 'NCIThesaurus-20.04a'' is open, showing a table of configuration properties. The table has two columns: 'Key' and 'Value(s)'. The 'Key' column lists various properties, and the 'Value(s)' column lists their corresponding values. The 'Value(s)' column contains a mix of boolean values (true, false) and URIs pointing to NCI thesaurus resources. The 'Value(s)' column is truncated in many rows, indicated by '...'.

| Key   | Value(s)   |
|---|--|
| classifiable  | true   |
| code_prop   | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#NHCO  |
| complex_properties                                      | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P211, http://ncicb.nci.nih.gov/xml/owl/EVS/Th...  |
| default   | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#default   |
| definition  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P97   |
| deprecated_assoc  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P364  |
| deprecated_child  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P201  |
| deprecated_concept_status                               | Retired_Concept, http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P310                             |
| deprecated_in_assoc                                     | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P365  |
| deprecated_in_role                                      | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P202  |
| deprecated_parent                                       | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P200  |
| deprecated_role   | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P204  |
| design_note   | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P98   |
| editor_note   | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P95   |
| fully_qualified_syn                                     | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P90   |
| http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P211 | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P387, http://ncicb.nci.nih.gov/xml/owl/EVS/Th...  |
| http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P325 | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#Definition_Review_Date, http://ncicb.nci.nih.g... |
| http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P375 | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P393, http://ncicb.nci.nih.gov/xml/owl/EVS/Th...  |
| http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P90  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P385, http://ncicb.nci.nih.gov/xml/owl/EVS/Th...  |
| http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#P97  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#Definition_Review_Date, http://ncicb.nci.nih.g... |
| http://www.geneontology.org/formats/oboInOwl#hasDbXref  | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#xref-source                                       |
| immutable_properties                                    | http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#NHCO, http://ncicb.nci.nih.gov/xml/owl/EVS/T...   |

# Revision History

Mostly used for conflict resolution

Review edits from anyone, e.g. new editors

Multiple ontology changes that occur in one commit show up together in the upper right panel. Any one change can be rejected independently of others

End-of-month publication

- Squash baseline (consolidate changesets)
- Publish concept history

The screenshot displays the Protege software interface, specifically the Revision History panel. The panel shows a list of commits with their dates and authors. A specific commit from May 27, 2020, is highlighted, showing a change to the 'Advanced Follicular Lymphoma' concept. The 'Change Details' panel shows the 'Baseline' and 'New' versions of the concept, with the 'New' version including additional terms. The 'Conflicts (list)' panel shows a conflict between the 'Advanced Follicular Lymphoma' concept and the 'Advanced B-Cell Neoplasm' concept.

| Mode | Date                   | Author | Change Subject               | Type    | Revision ... | Comment | Conflict | Review |
|------|------------------------|--------|------------------------------|---------|--------------|---------|----------|--------|
|      | Wed, May 27 2020 13:30 |        | Advanced Follicular Lymphoma | Logical | 39eed6aa     | EDIT    |          |        |

| Baseline   | New  |
|--|--|
| 'Advanced Follicular Lymphoma' EquivalentTo 'Advanced B-Cell Neoplasm' and 'Advanced Lymphoma' and 'Follicular Lymphoma' | 'Advanced Follicular Lymphoma' EquivalentTo 'Advanced B-Cell Neoplasm' and 'Advanced Non-Hodgkin Lymphoma' and 'Follicular Lymphoma' |

Conflicts (list):

- committing commit 1 b... on May 27 2020 11:34
- 'Advanced Follicular Lymphoma' EquivalentTo 'Advanced B-Cell Neoplasm' and 'Advanced Lymphoma' and 'Follicular Lymphoma'

# What's next in development?

- One major release left, around July of this year but might be later
  - Classifier targeting the NCI
- Expecting O&M phase to begin in September.
  - Minor feature requests
  - Bug fixes

One item of interest to this group would be to make NCI Protégé usable by others who might not have our business rules. Very likely we'd take this up during O&M.

Questions?