Oracle Spatial and Graph Support for Protégé 5.2

February 2019

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About

Protégé Desktop 5 (referred to herein as Protégé) is a graphical tool, created by Stanford University, for viewing and editing ontologies. Before using the plugin support, you must download and install Protégé Desktop 5.

For information about Protégé Desktop, including links to documentation and download instructions, see http://protege.stanford.edu/products.php - desktop-protege.

The plugin support for Protégé Desktop (referred to herein as Oracle Plug-in) enables you to use Protégé to view and edit ontologies stored in an Oracle database. Installing the plugin adds an Oracle menu to the Protégé menu bar. One can use the items under the Oracle menu to perform RDF Semantic Graph operations on the ontology or ontologies of interest.

Requirements

- Oracle JDK8 or higher
- Oracle Database 12c Release 1 (12.1.0.1 or higher)
- Protégé Desktop 5.2 (using Oracle JDK8 or greater)

Changes in Oracle Spatial & Graph Protégé 5.2 Plug-in

The following are changes in Oracle Spatial & Graph Support for Protégé Desktop 5.2

New Features

- Support to RDF private networks (from Database 19c)
- Enhance in some database RDF metadata queries

Installing Oracle Plug-in on Windows

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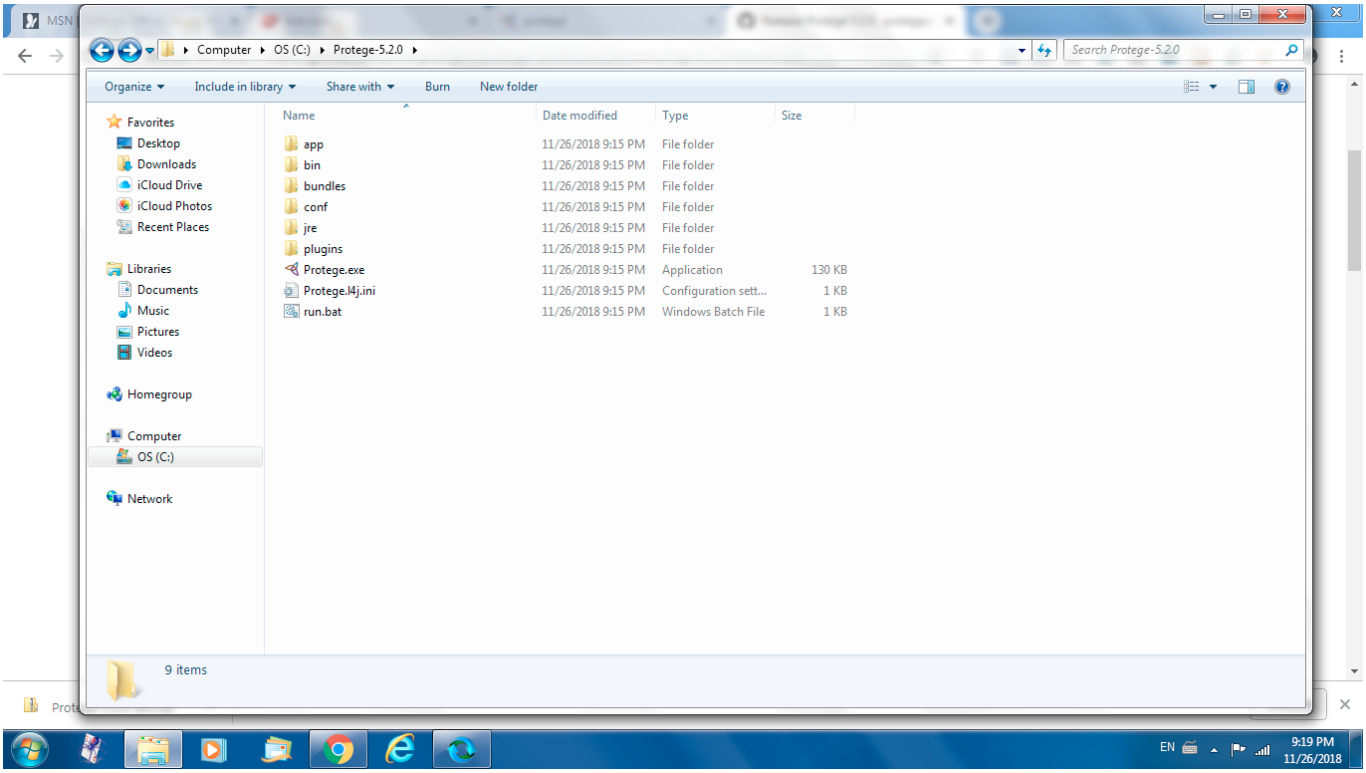
Objective

This document describes how to install Protégé Desktop 5.2, enable the Oracle plug-in support, and use the plug-in.

Installing Protégé

Assume Protégé 5 zip file is available on your local disk, you just need to extract it into the desired location, by default Protégé will run with a bundle JRE environment. Make sure to extract Protégé into a location where the current user has read/write permissions.



Windows Protégé Zip

Installing Protégé on Other Operating Systems

Follow the instructions for installing Protégé in your desired operating system, which are located in the Documentation link on the download page for Protégé Desktop 5.

JDK 8 or later is required.

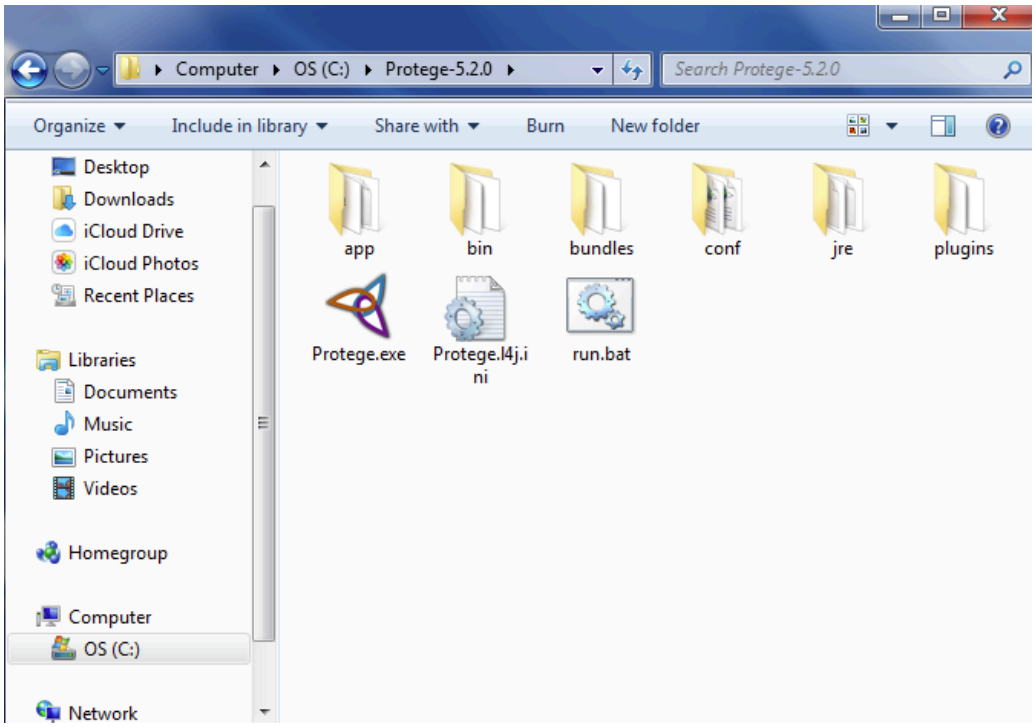
Enabling the Oracle Plug-in

Downloading the Jar Files

The plug-in Jar files can be downloaded from Oracle's Support Website My Oracle Support (support.oracle.com).

Adding the JAR file to Protégé

Once downloaded, the jar file must be included in the plugins folder inside the Protégé installation. The files in the installation directory look like following

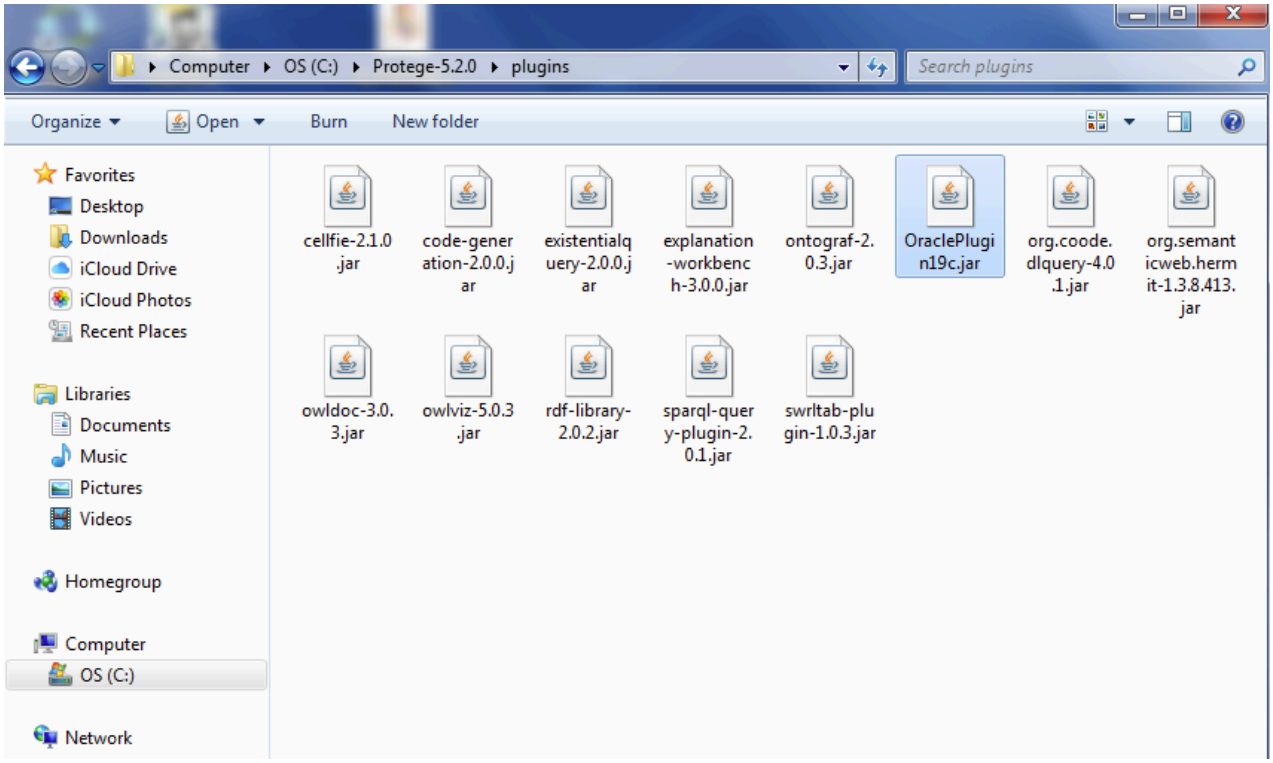


Protégé for Windows Installation Directory

The following jar must be added

OraclePlugin19c.jar (Compatible with all database versions from 12c (12.1.0.1 and higher)

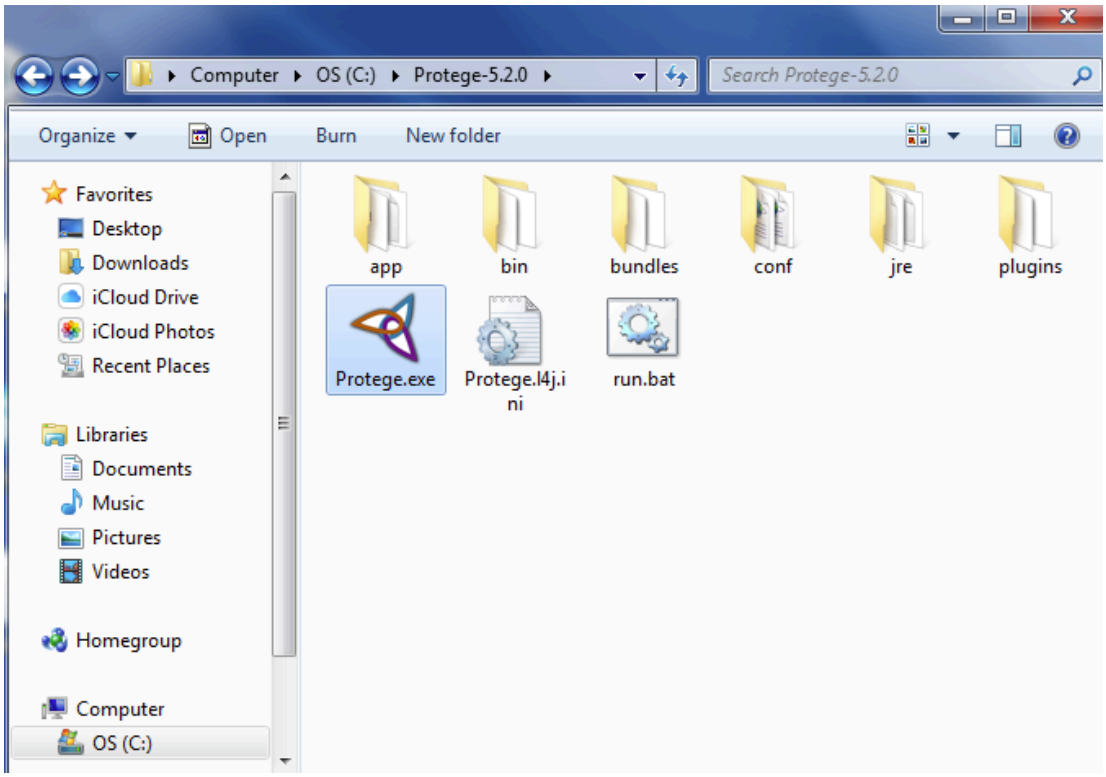
Inside the folder plugins you will find all the plug-ins that Protégé uses, and to enable a plug-in you just need to copy the JAR file here and start the app. The folder for the plug-ins looks like the following:



Protégé plugins folder

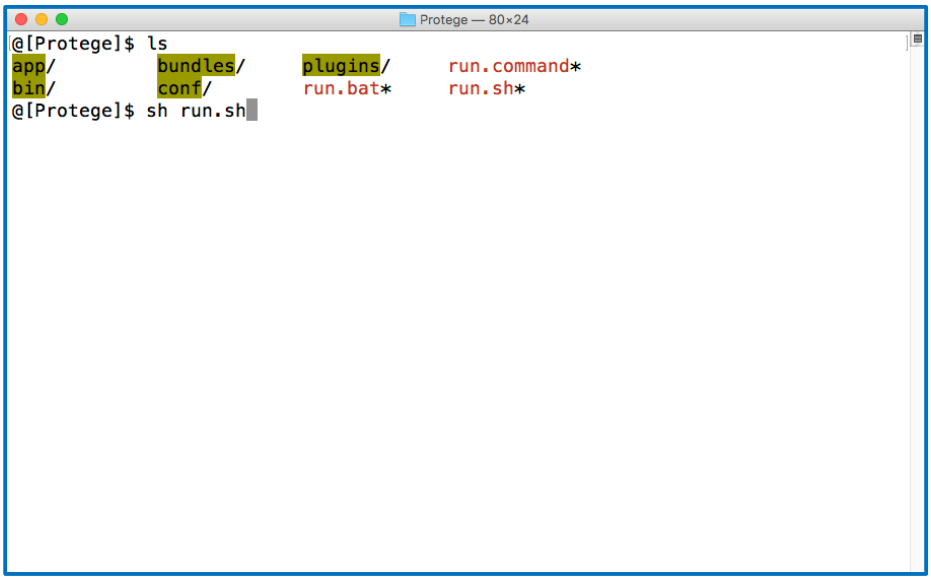
Executing Protégé on Windows

On Windows 7 and higher, Protégé has an executable file, which is located inside the Protégé installation directory.



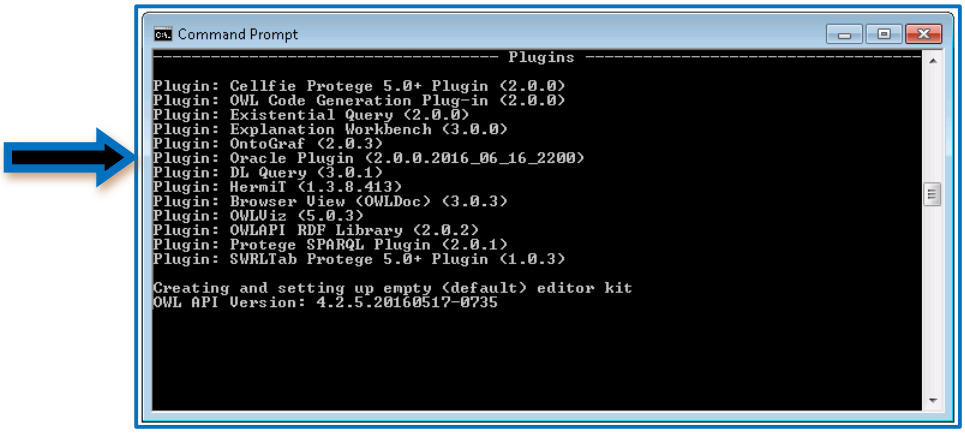
Executing Protégé on Linux Systems

For Linux systems, the start script, run.sh, is in the Protégé installation directory. To run this script, type sh run.sh using a terminal window as shown below.



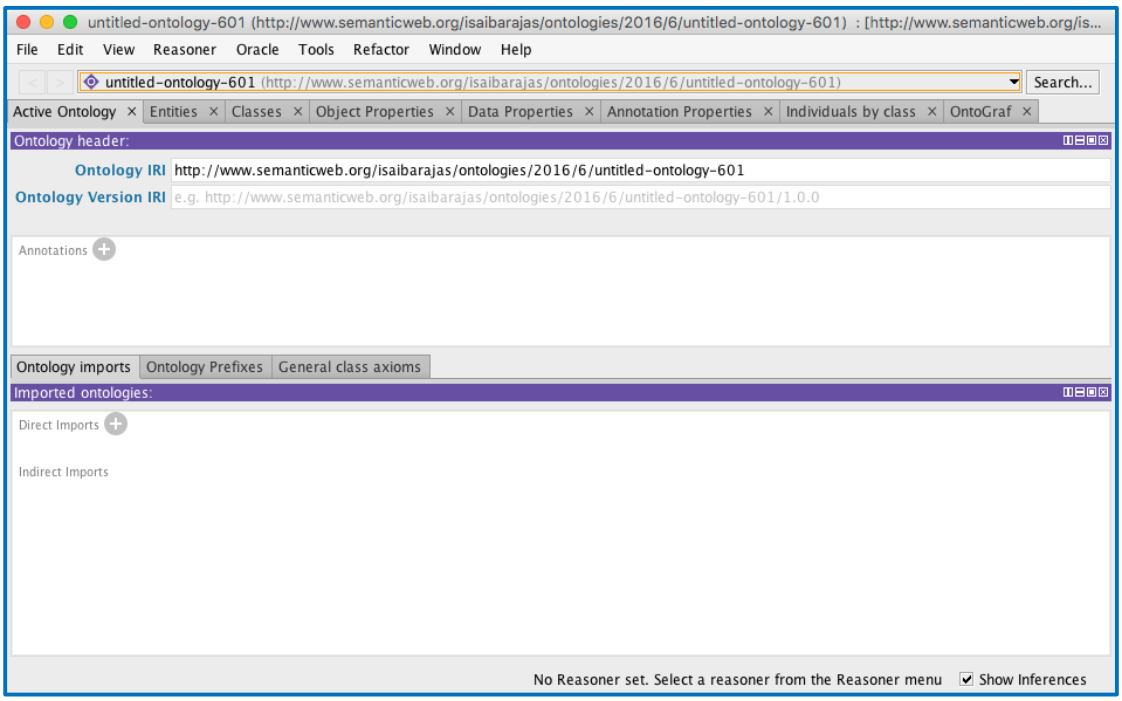
Verifying the Plug-in Installation

Once started, you will see information about your platform and a list showing which plug-ins are enabled. If the Oracle plug-in were successfully installed in Protégé, the list of plug-ins would include Oracle Plugin as shown below.



Once the Protégé application is displayed, the Oracle plug-in will add Oracle to the menu bar.

At this point, the plug-in is ready for use.



Protégé 5 running with Oracle plugin enabled

How to Disable Fact++ Plug-in

When running Protégé, you may encounter the following message about missing libraries or platforms not supported:

In this case, you must delete or remove the uk.ac.manchester.cs.owl.factplusplus.jar file inside the plugins folder and restart Protégé.

OpenJDK Warning

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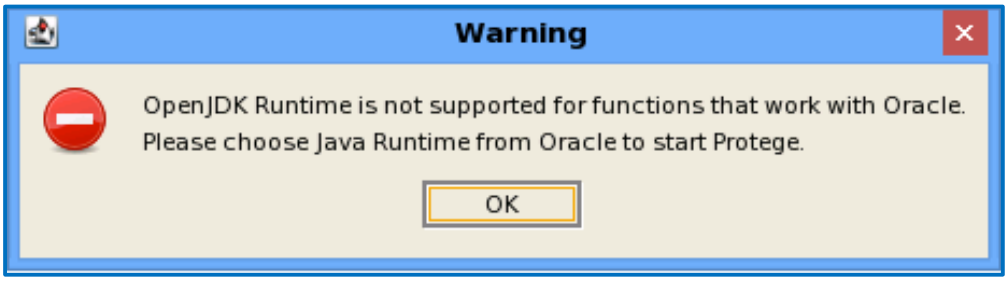
Install Java Runtime from Oracle

When running Protégé, you may encounter the following message about OpenJDK Runtime not supported:



In this case, you must install a Java Runtime from https://**java**.com/download and set the JAVA_HOME variable to point to the newly installed Java Runtime before you restart Protégé.

OWL API Updater

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Objective

This section describes how to enable the OWL Imports from Oracle Database feature, which permits the use of database redirects for the owl:import axiom.

Web Ontology Language

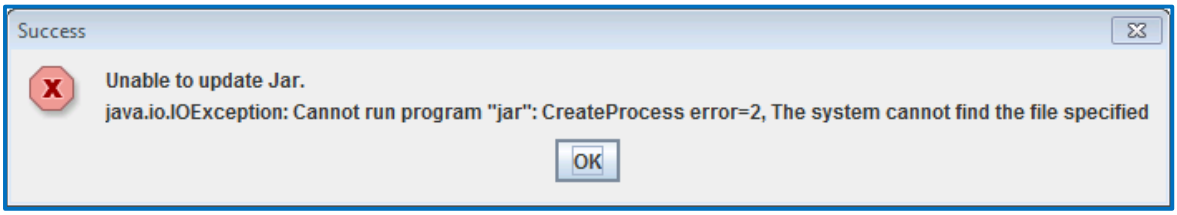
The OWL 2 Web Ontology Language, informally OWL 2, is an ontology language for the Semantic Web with formally defined meaning. OWL 2 ontologies provide classes, properties, individuals, and data values stored as Semantic Web documents.

OWL API Updater

To update the OWL API to support Oracle Database import statements you will need to run the OWLUpdater application by double clicking the JAR or typing the following command:
java –jar OWLUpdater.jar
The application UI will guide you through the update process in which one can select the location of the owlapi-osgidistribution.jar (located in the bundles folder in the Protégé directory). As part of the update process, one can choose to make a backup of the original JAR.
You need JDK8 or greater installed to use this application.

Error Messages

When running the OWLUpdater app you may encounter a series of error, below their explanation and how to fix the most common ones.



Example Error Displayed by the OWLUpdater app

1) **Cannot run program "jar"**

   If you encounter this error, it means that either the JDK is not correctly set on the classpath of the OS environment, or you do not have Java Developer Kit 8 or greater installed. To fix this problem, make sure JDK8 is installed and configured properly.

2) **Cannot rename file "owlapi-osgidistribution.jar"**

   If the OWL API cannot be renamed it means that the JAR has restricted permissions or that it is in a directory where the OWLUpdater app cannot read/write to that JAR. You can copy the OWL API to a directory where the user has read/write permissions to update and latter request the system administrator to copy the updated JAR.

3) **Cannot find class “driver.class”**

This happens when running a version of Java, which is not compatible with the OWLUpdate. Make sure you have Oracle JDK8 or greater installed and correctly configured for your system.

Using the Oracle Plug-in

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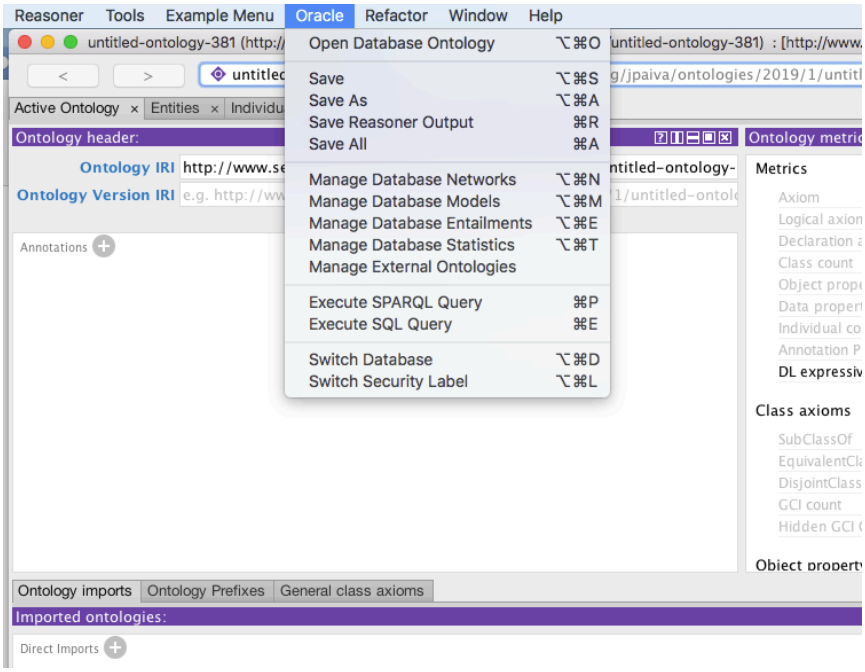
The Oracle plug-in adds a menu tab with a set of options to Protégé.



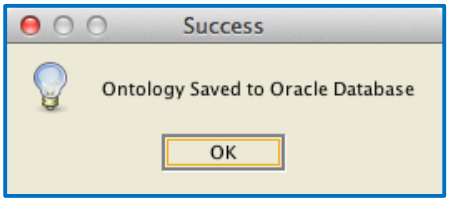
Oracle Plug-in Menu

The main application of Protégé will include a menu with the options Open Database Ontology, Save, Save As, Save Reasoner Output, Save All, Manage Database Networks, Manage Database Models, Manage Database Entailments, Manage Database Statistics, Manage External Ontologies, Execute SPARQL Query, Execute SQL Query, Switch Database and Switch Secutiry Label.

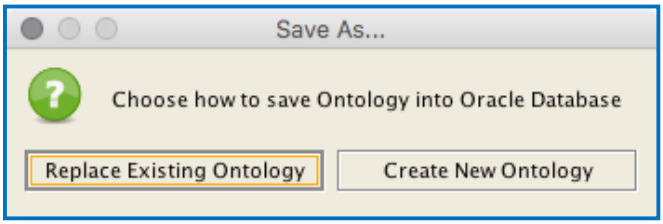
When an ontology is loaded, the *Save* option will make an incremental edit saving in the database, whereas the Save As option will replace the ontology or create a new one.

After choosing Save or Save As, a message window will pop up explaining if the ontology was saved or if there was an error, as shown below.

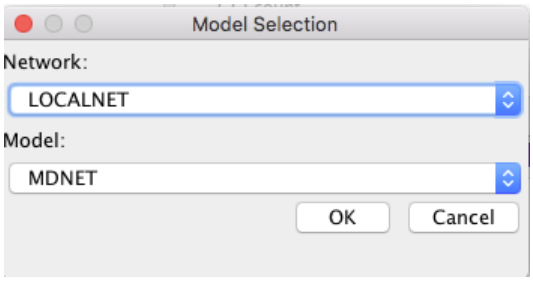
The message may be delayed depending on the size of your ontology, configuration of Oracle Database and network speed.



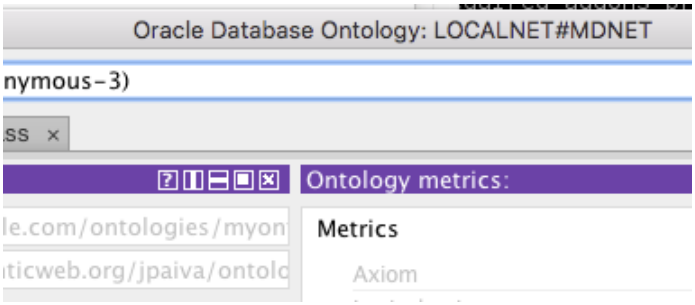
The Save As option displays a menu to choose between overwriting an existing ontology and creating a new one in the database.



When using the Open Database Ontology option, a dialog will display all the ontologies that the current user can load from the database. From 19c the ontology can be on a specific private network, so the this dialog give a chance to select the network and then its model. After selecting and loading an ontology, the main application will show the name of the ontology in the window title bar.

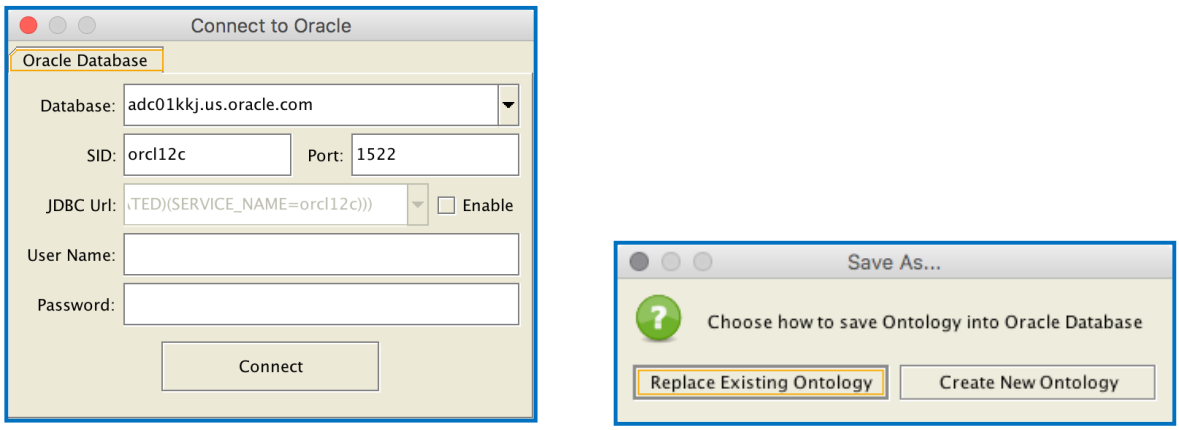


Loading Ontology Dialog



Ontology Name on the Top Border

The first time you try to save the ontology you created, the database connection dialog is displayed so that you can establish a database connection. Once a database connection is successfully established, the Save and Save As options allow you to replace an existing ontology or create a new ontology, as shown below.

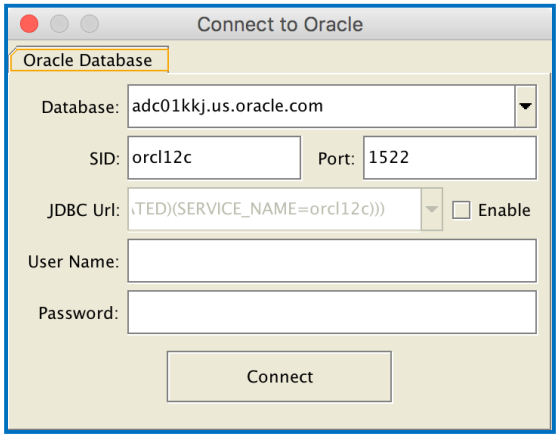


First Time Saving Dialogs – When Saving a Protégé Ontology to the Database

Connecting to a Database

From the Oracle Plugin menu choose Switch Database, which enables you to input the database connection information.

The following illustrations show tabs for connections to an Oracle database:



After inputting the required information to connect to an Oracle database, ontologies can be loaded using the Open Database Ontology option. A dialog with all available ontologies for the current users will be displayed so that you can choose which ontology to read from and load into Protégé.

After choosing the ontology, the load time will vary depending on your network connection speed and the size of the model.

Using Protégé

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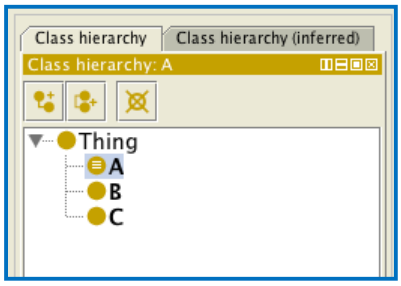
Protégé is a visual editor for the Web Ontology Language. The main application is tab-based with options to edit Classes, Object Properties, Data Properties, Individuals, and Annotations.

The Oracle plug-in provides compatibility with the database by providing conversion between Triples and OWL APIs for Protégé to be able to exchange information with it.

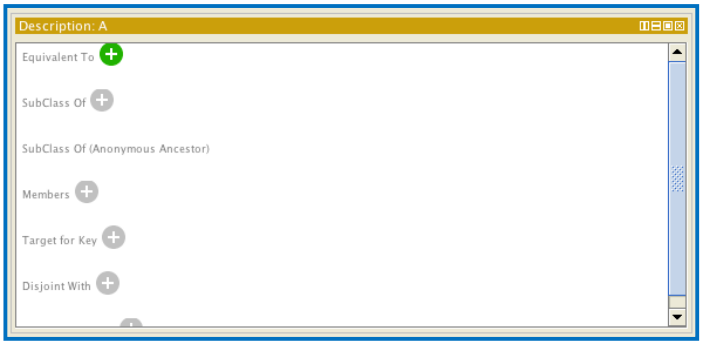
Editing Classes

Once the main application is loaded, the classes can be edited in the Classes tab. All classes are a subclass of Thing (owl:Thing) and are selected for editing in the Class hierarchy as shown below.

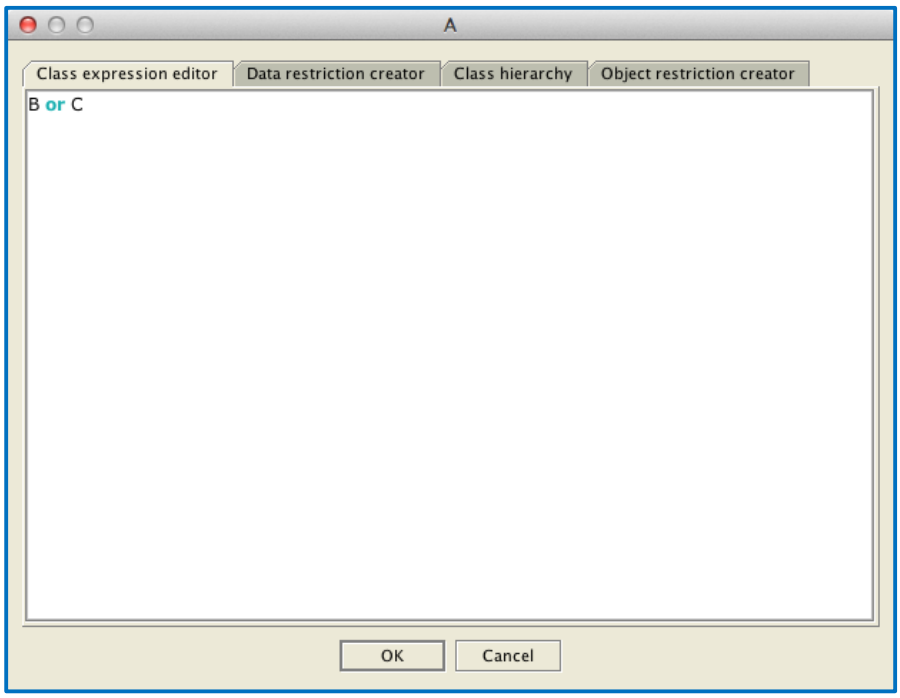


Here you have the options to add a subclass or sibling class or to remove one. Once a Class is added, you can select it to add annotations and descriptions of it.

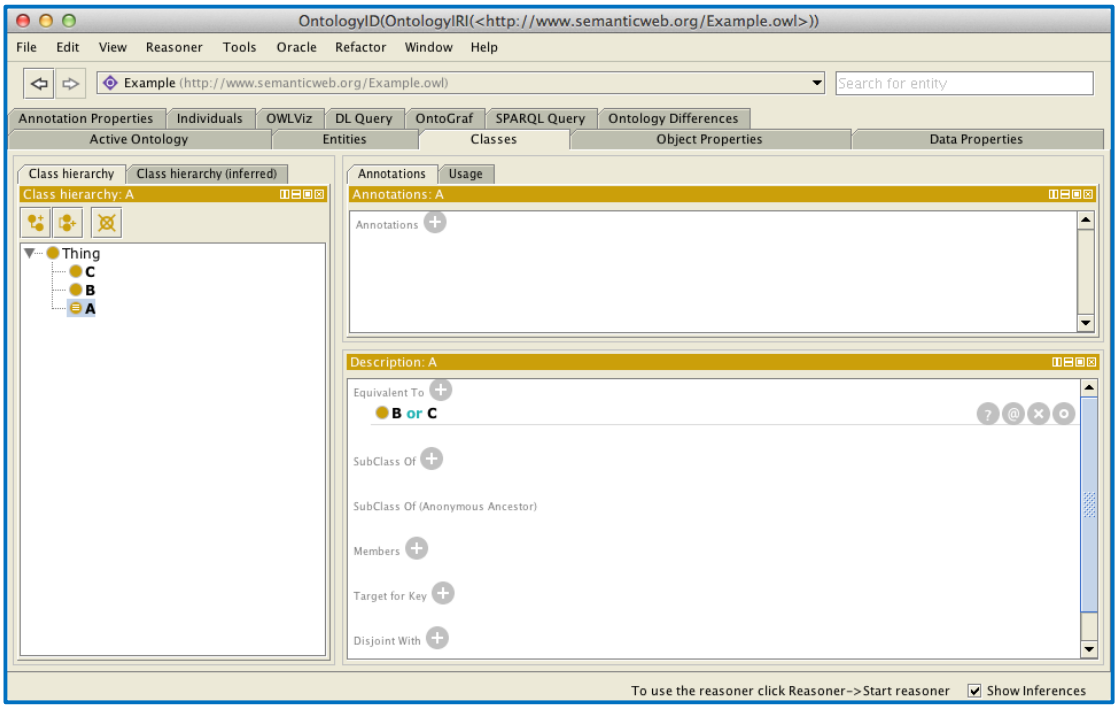
The following is an example of how to add a union.



From the Description Panel, Press the Plus Sign next to Equivalent To for class "A"



In the Class Expression Editor, Type "B or C"

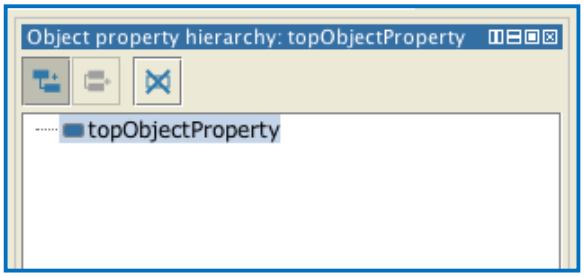


The Equivalence Will Be Displayed When Selecting The Class "A"

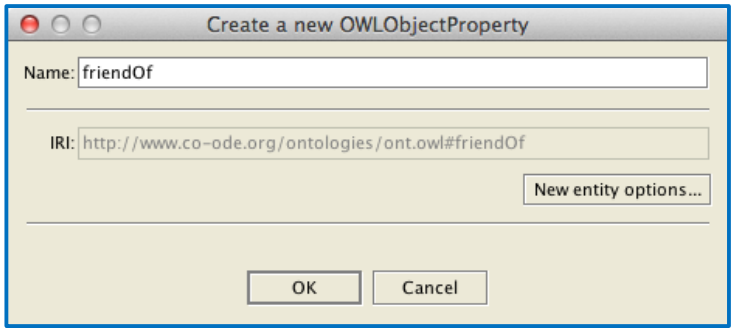
Editing Object Properties

Object properties are edited in the Object Properties tab; as with the classes tab, you will have a hierarchy with topObjectProperty as the root of all object properties.

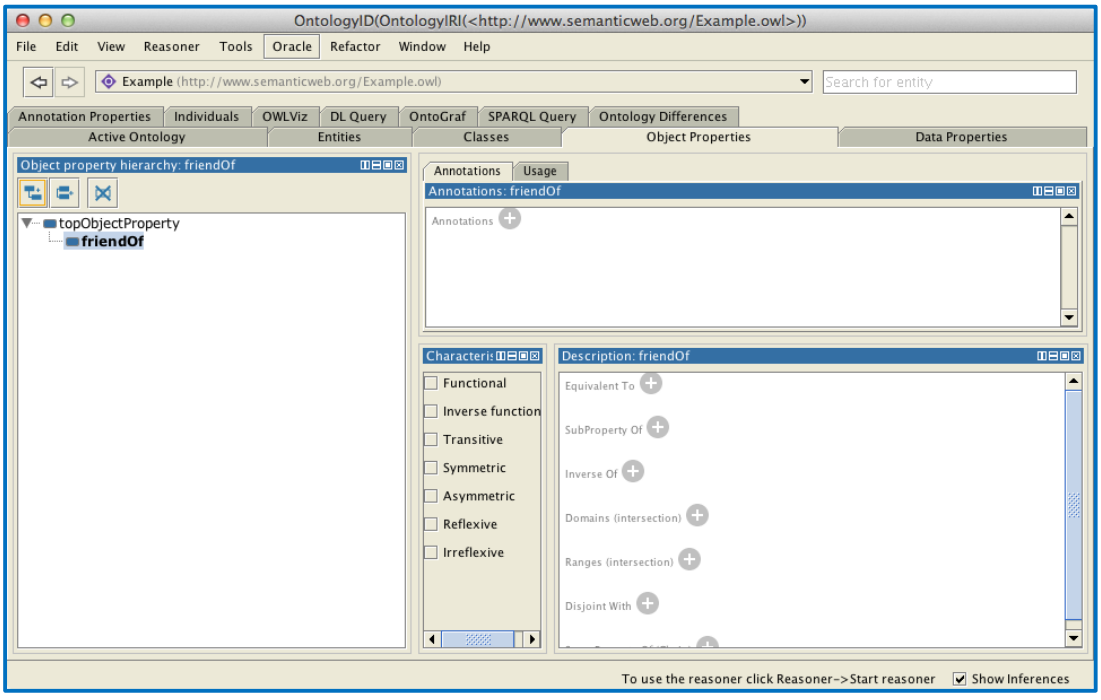
The following is an example of adding an object property.



From the Hierarchy Panel, Select the "topObjectProperty" and Then Press "Add sub property"



A Dialog Allows Us to Input the Desired Name for the Object Property

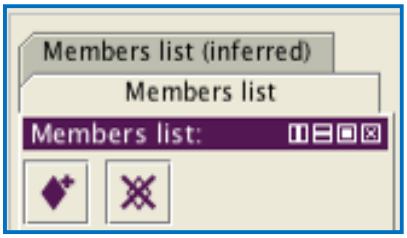


Once the Object Property is Added, We Can Edit the Description/Characteristics/Annotations

Editing Individuals

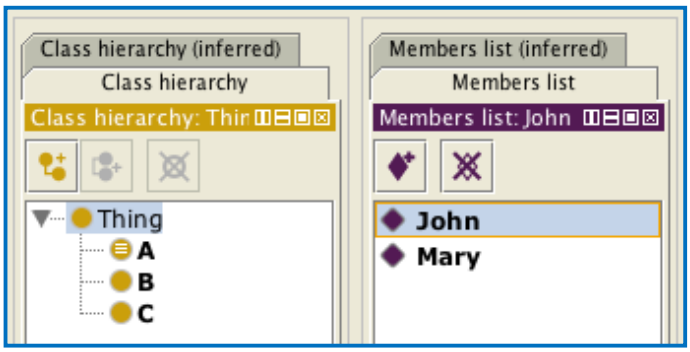
The Individuals tab differs from the rest of the tabs by adding a hierarchy for classes and a members list for the individuals. Individuals can belong to a particular class or be part of the Thing class. Once a class

is selected, you can add/remove individuals from the members by using the Add/Delete buttons as shown below.

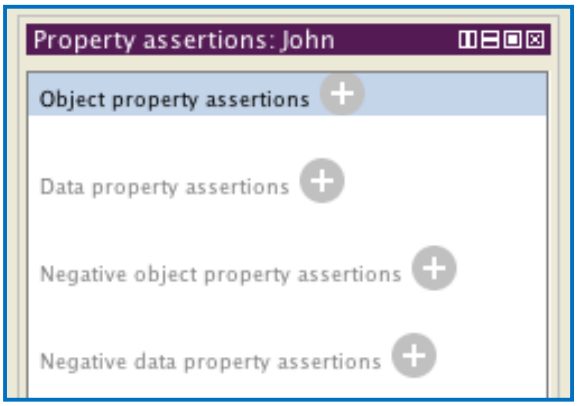


Once an individual is added, you can choose it from the members and edit its description, assertions and annotations.

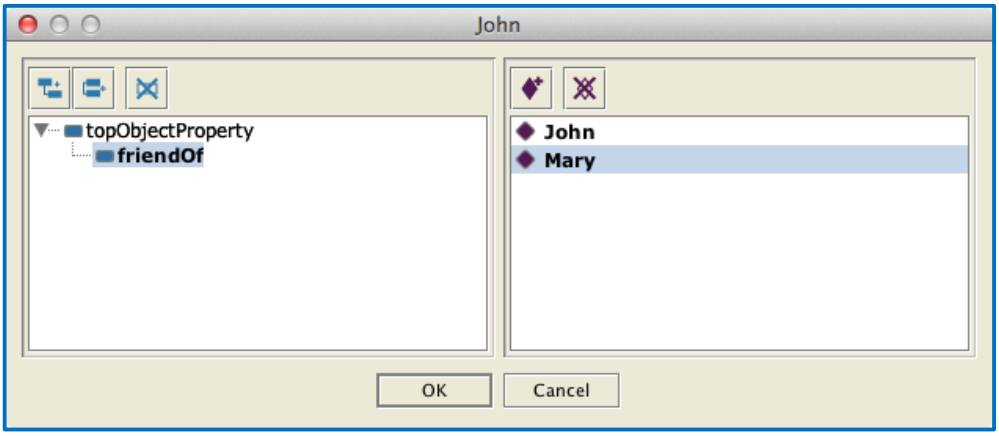
The following is an example of individuals with Object Property Assertions.



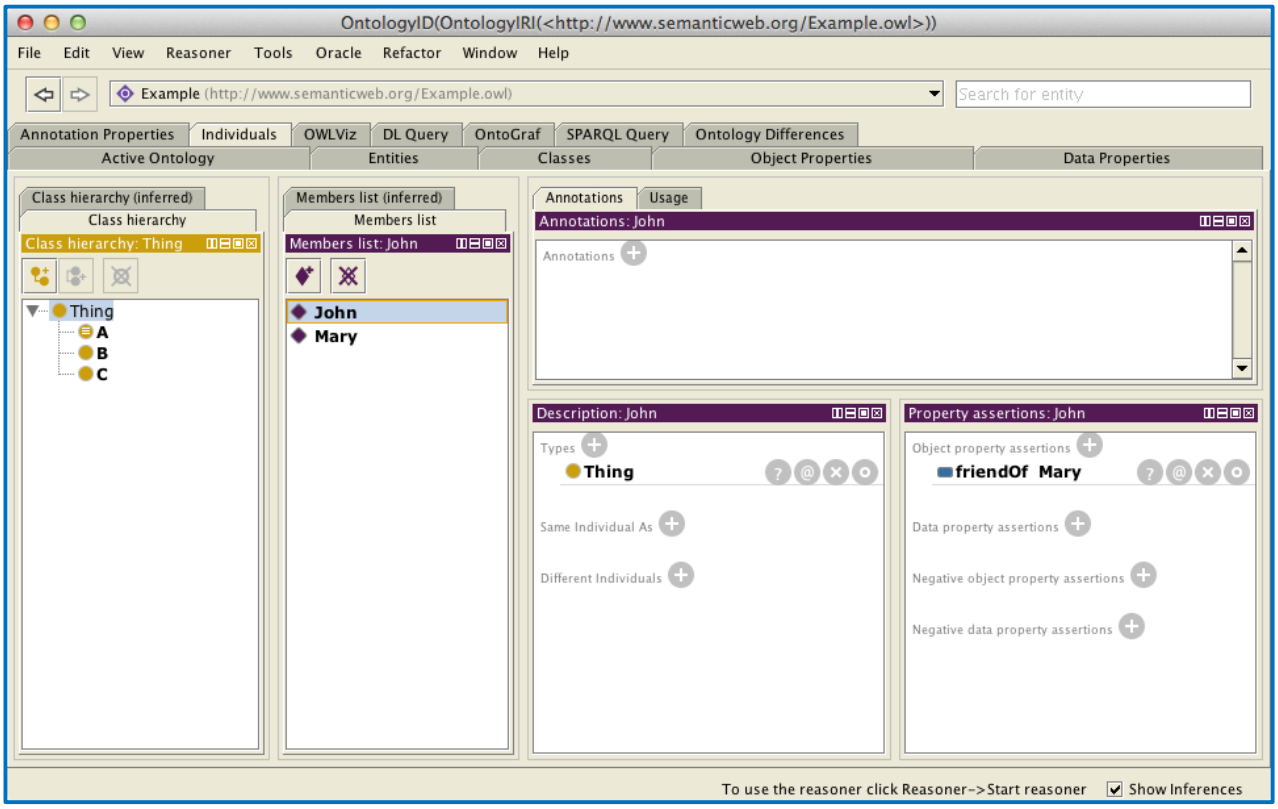
First Add Two Individuals to the Thing Class



On the Property Assertions of One of the Individuals, Press "Object property assertions"



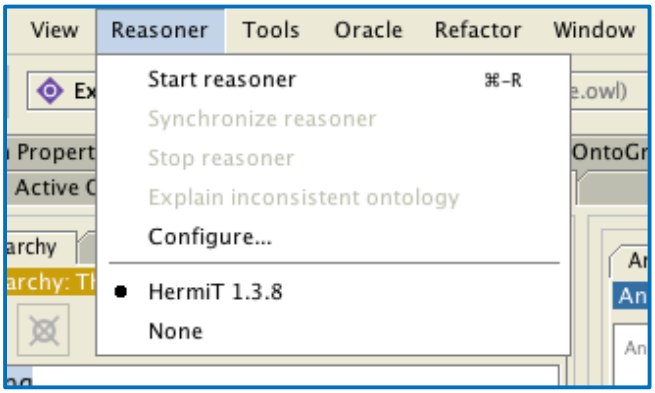
An Editor Lets You Choose an "Object Property" and "Individual" to Create the Assertion



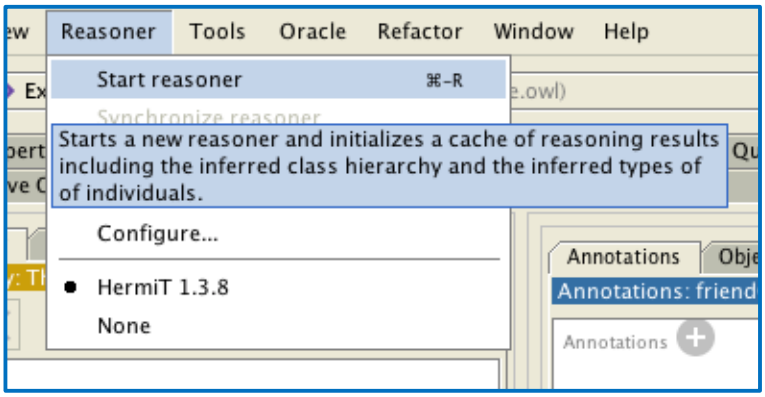
Once Selected, the Object Property Assertion Will be Displayed in the Assertion Panel

Starting a Reasoner

Protégé comes bundled with HermiT and Fact. To start, you must select a reasoner from the Reasoner menu.

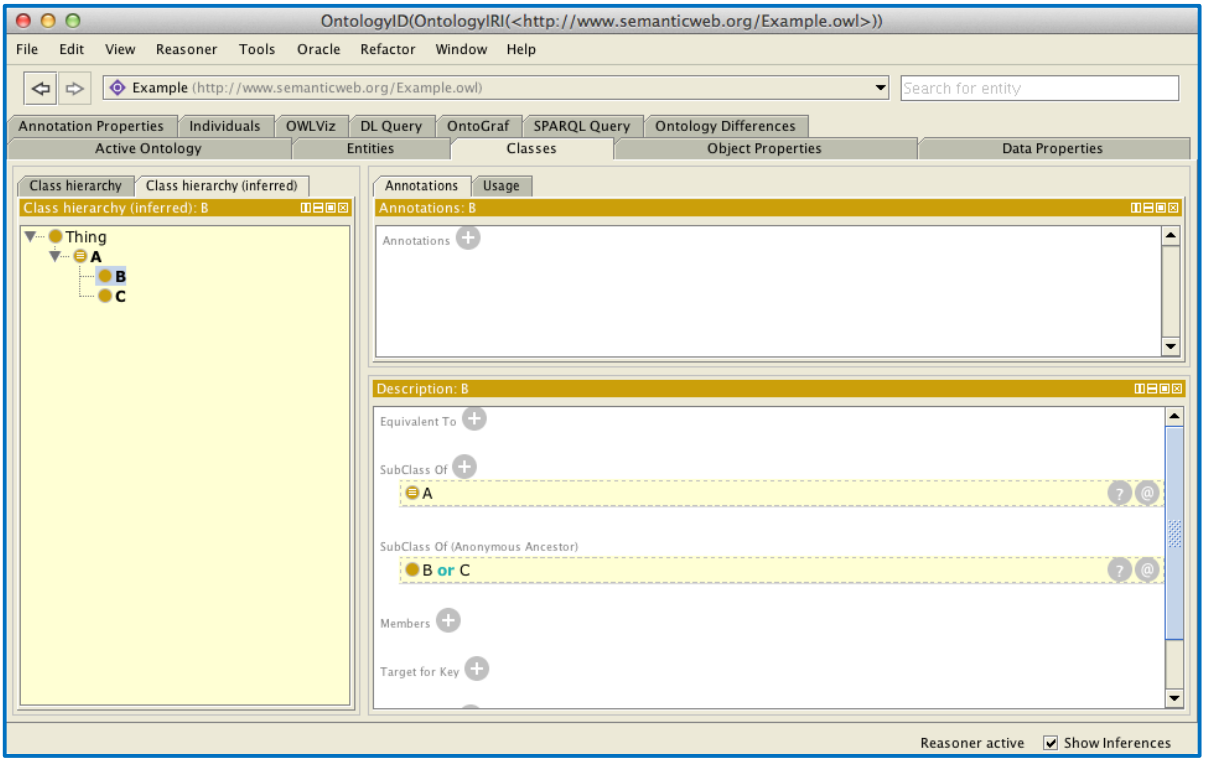


After selecting the reasoner, you can initiate the inferencing on the ontology by selecting the Start reasoner option from the Reasoner menu as shown below.



After the process is completed, the inferred classes and individuals will appear as a highlighted element in each of the description panels of their corresponding types. These items cannot be edited, and you can easily access them by selecting the inferred class hierarchy and members list.

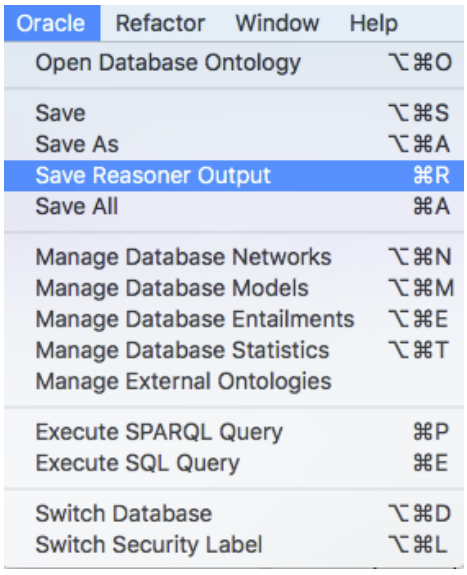
Note that the Oracle plug-in will not save the inferred elements in the database.



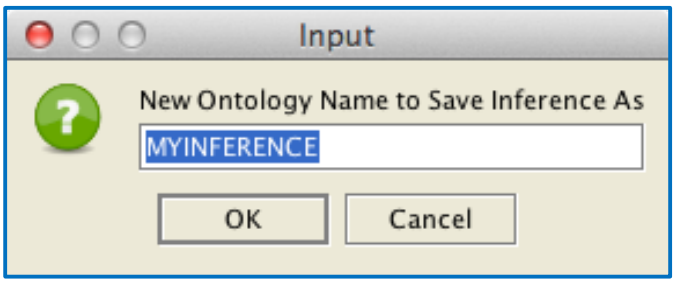
Saving Inferred Ontology

To save the inferred ontology, you must select Save Reasoner Output from the Oracle menu.

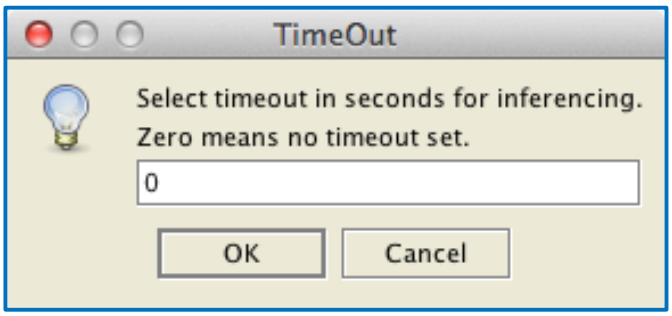
You must start a reasoner first to save the inference.



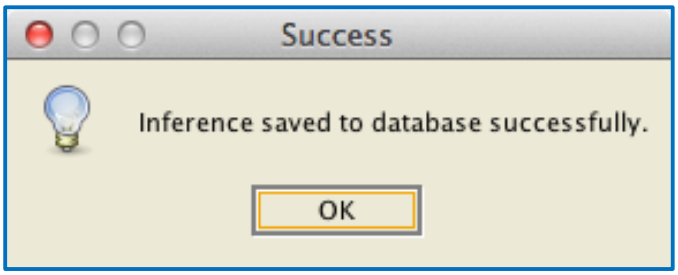
You will be asked to input a name to save the inference as a new ontology into the database.



The process of inferencing is resource-intensive, and can sometimes take a long time to complete, depend on complexity. Before processing the inference, you will be asked to provide a timeout in seconds for the inference process to stop trying to complete the inference when this time is reached (setting the timeout to zero means there is no time limit).

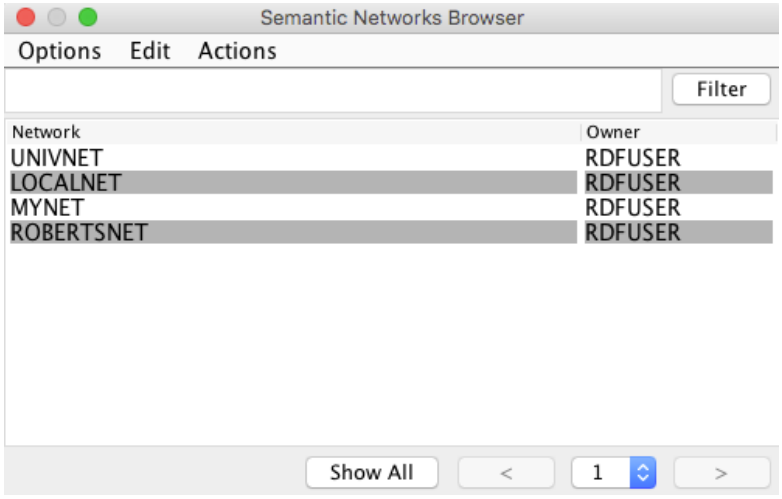


Once the inference process reaches its timeout or completes, a message dialog will be displayed, giving feedback about the operation, such as follows:



If the inference does not complete in the allocated time, the process may be retired with increased timeout.

To manage RDF Semantic Graph networks, click Oracle > Manage Database Networks. This option applies just from database 19c to allow user to create private networks. For previous versions, a dialog with warning message is displayed, if this menu option is clicked.



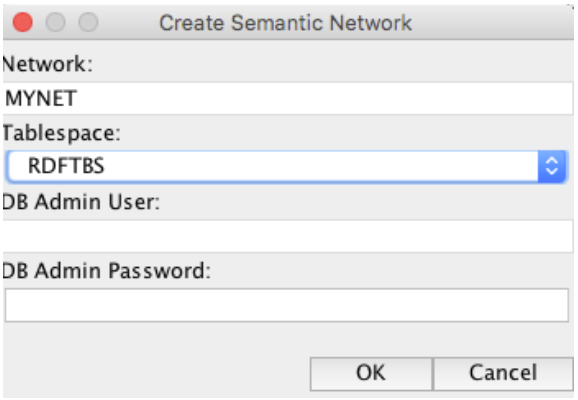
The Semantic Network Browser has a row for each private network, with the following information about each network: Network, Owner (schema). You can specify a string to Filter the displayed results, and you can click Show All to show all the networks.

The Semantic Network Browser has the following menus and menu items:

- **Options menu**:
  - **Update**: Updates the display based on the current metadata and data.
  - **Pagination**: Specifies the maximum results to be displayed per page.
- **Edit menu**:
  - **Copy**: Copies the text from the selected row or rows to the system clipboard.
  - **Copy All**: Copies the text from all rows to the system clipboard.
- **Actions menu**:
  - **Create Network**: Creates a private semantic network on current schema. From 19.3c versions, this option does not require DBA role on current connection.
  -
  - **Drop Network**: Drops (deletes) the selected network. To select the network, click in its row. When prompted, confirm that you want to delete the selected network. From 19.3 c database version, this option does not require DBA role on current connection.

Creating Semantic Networks

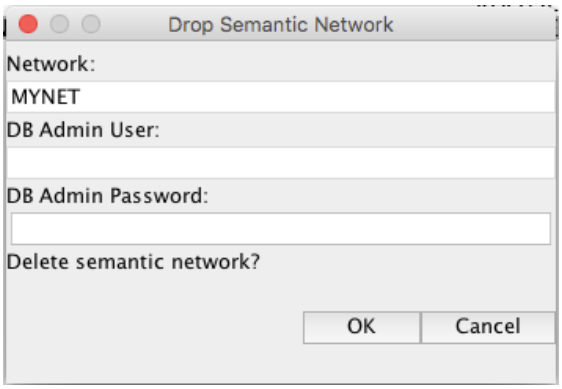
To create a network, you must select Create Network from the Actions menu. From 19.3c database versions, the dialog will not show the DB credential UI fields, as the owner of the connection has privilege to create a semantic network on its own schema.



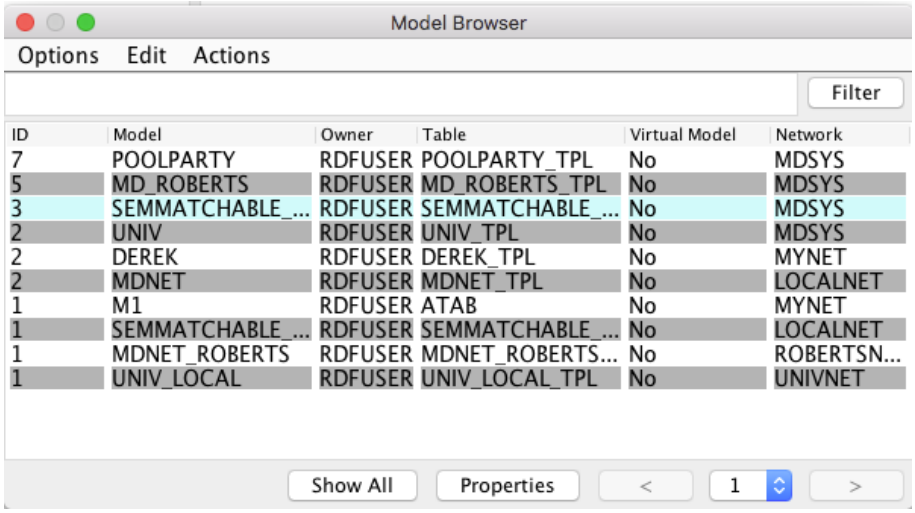
Semantic network creation

Deleting Semantic Networks

To delete a network, you must select a network row first, and then Drop Network from the Actions menu. From 19.3c database versions, the dialog will not show the DB credential UI fields, as the owner of the connection has privilege to create a semantic network on its own schema.



To manage RDF Semantic Graph models and virtual models (a 'model' can be considered analogous to Protégé 'ontology'), and to bulk load RDF data into the database, click Oracle > Manage Database Models.



The Model Browser has a row for each model in the associated database connection, with the following information about each model: Model ID, Model Name, Owner (schema), Name of the RDF application table, and whether it is a Virtual Model. You can specify a string to Filter the displayed results, and you can click Show All to show all the models.

The Model Browser has the following menus and menu items:

- **Options menu**:
  - **Update**: Updates the display based on the current metadata and data.
  - **Pagination**: Specifies the maximum results to be displayed per page.
- **Edit menu**:
  - **Copy**: Copies the text from the selected row or rows to the system clipboard.
  - **Copy All**: Copies the text from all rows to the system clipboard.
- **Actions menu**:
  - **Create Model**: Creates a model that is not a virtual model. If you click **Advanced**, you can specify the tablespace and whether to use basic compression, in addition to the model name. After the model is created, it appears in the Model Browser display.
  -
  - **Drop Model**: Drops (deletes) the selected model. To select the model, click in its row. When prompted, confirm that you want to delete the selected ontology.

    For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.DROP_SEM_MODEL procedure.
  - **Empty Model**: Truncates the selected model by deleting the data from its RDF application table but not the table itself. To select the model, click in its row. When prompted, confirm that you want to truncate the selected ontology.

For an Oracle database, this action is implemented using the SQL statement TRUNCATE TABLE, which is described in *Oracle Database SQL Language Reference*.

- **Rename Model**: Renames the selected model (not a virtual model). To select the model, click in its row. When prompted, specify the new name for the selected ontology.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.RENAME_MODEL procedure.

-

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.CREATE_SEM_MODEL procedure.

- **Swap Model**: Swaps (exchanges) the names of two existing models. the selected model (not a virtual model). To select the model, click in its row. When prompted, specify the model to swap.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.SWAP_NAMES procedure.

-

- **Create Virtual Model**: Creates a virtual model. Specify the models and rulebases to be used in creating the virtual model. After clicking **Create VM**, specify the new name for the new virtual model. After the virtual model is created, it appears in the Model Browser display.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.CREATE_VIRTUAL_MODEL procedure.

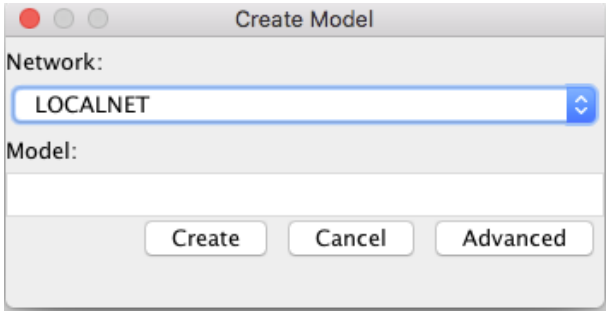
- **Remove Virtual Model**: Drops (deletes) the selected virtual model. To select the virtual model, click in its row. When prompted, confirm that you want to delete the selected virtual model.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.DROP_VIRTUAL_MODEL procedure.

- **Load RDF Data**: Loads RDF data into the selected model. To select the model, click in its row. Select the tab for desired main option: Load Files; Load All Files from Directory; Split, Save & Load; or Save & Load. (The available fields depend on the option selected.)

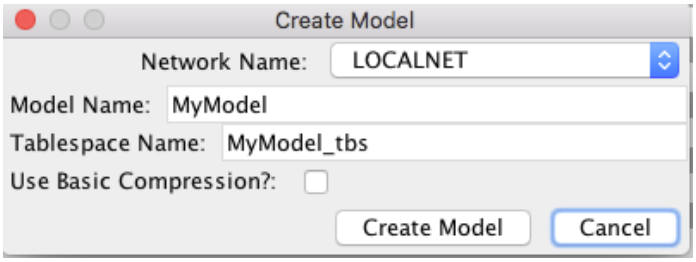
Creating Models

To create a model, you must select Create Model from the Actions menu.



Model creation.

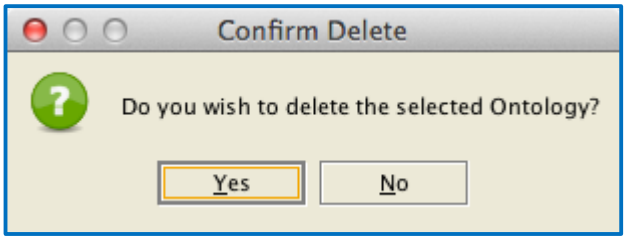
You will be asked to input a name to save the model into the database.
You will also be given the choice to specify the advanced options.



Advanced model creation.

Deleting Models

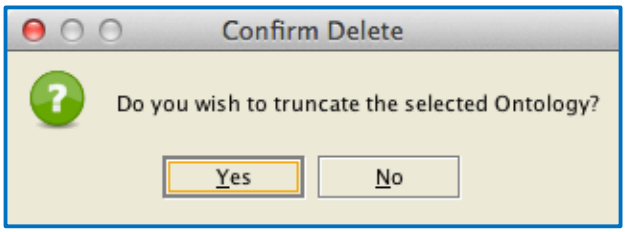
To delete a model, you must select Drop Model from the Actions menu.



You will be asked to confirm before deleting the selected model.

Emptying Models

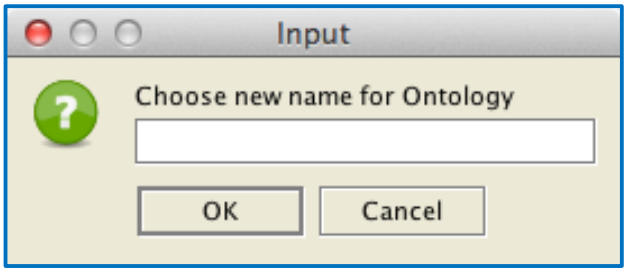
To empty a model, you must select Empty Model from the Actions menu.



You will be asked to confirm before truncating the selected model.

Renaming Models

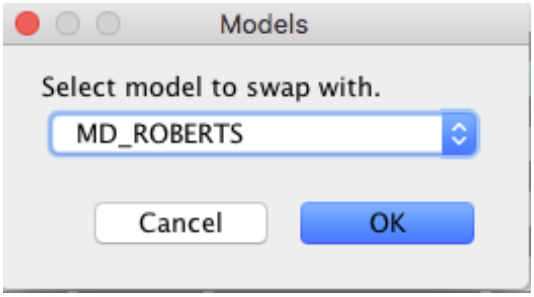
To rename a model, you must select Rename Model from the Actions menu.



You will be asked a new name to rename the model.

Swapping Models

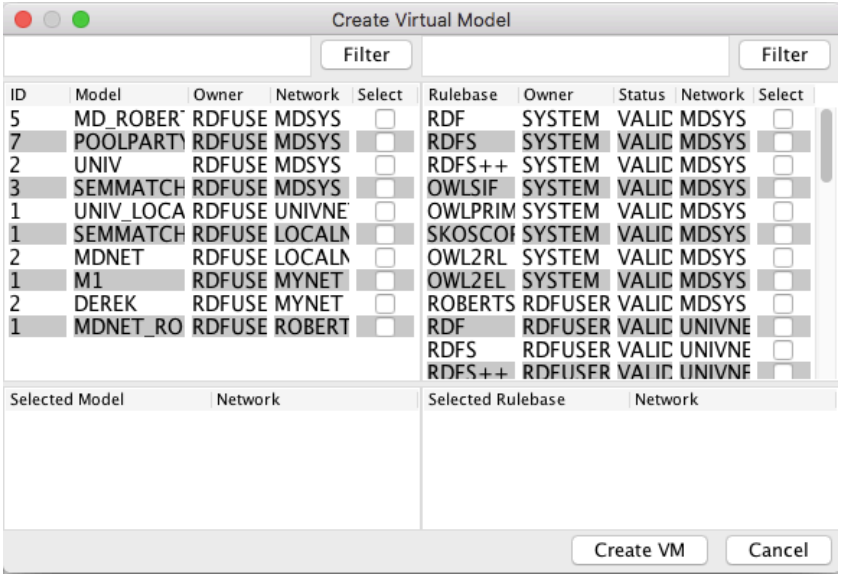
To swap a model name, you must select Swap Model from the Actions menu.



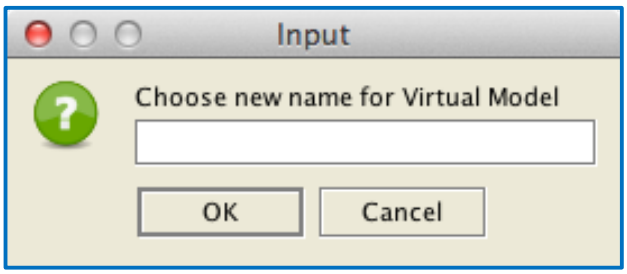
You will be asked to select the model name to swap.

Creating Virtual Models

To create a virtual model, you must select Create Virtual Model from the Actions menu.



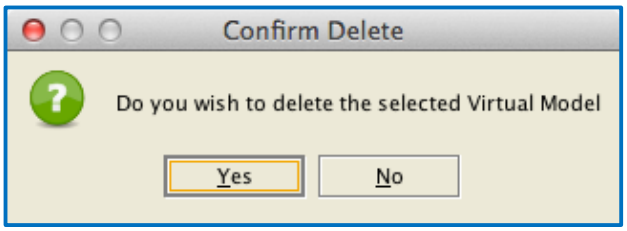
You will be shown a list of all available models and rulebase, which the current user has access to.
To create the virtual model, you must choose the desired models and rulebase by selecting their respective checkbox. Selected elements will be displayed in a list below. For private networks (from 19c), models and rulebases must belong to same network.
Regular expressions are supported for the filter.



Once you click Create, you will be asked to input a name to save the entailment into the database.

Delete Virtual Models

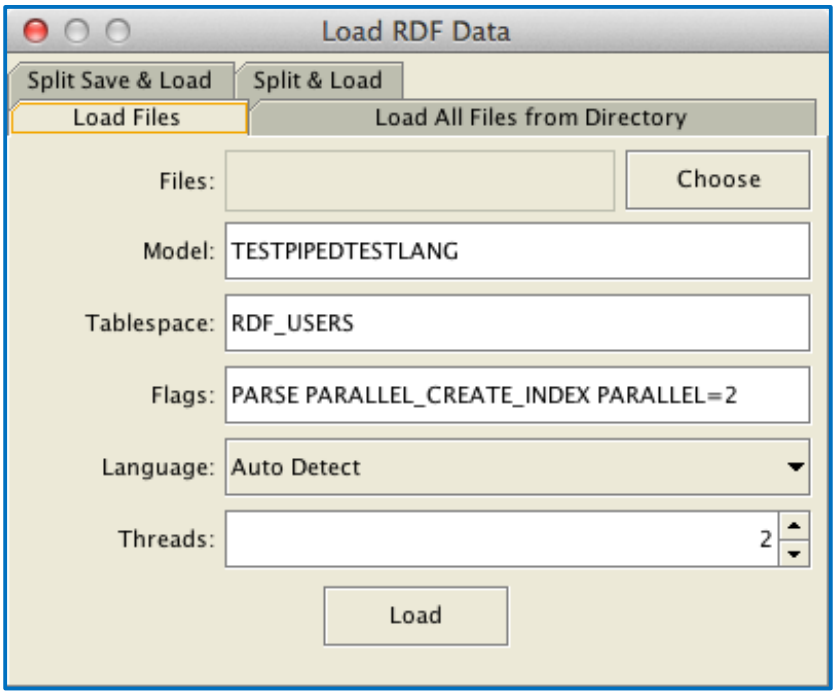
To delete a virtual model, you must select Remove Virtual Model from the Actions menu.



You will be asked to confirm before deleting the selected virtual model.

Loading RDF Data

To load RDF data into a model, you must select Load RDF Data from the Actions menu.



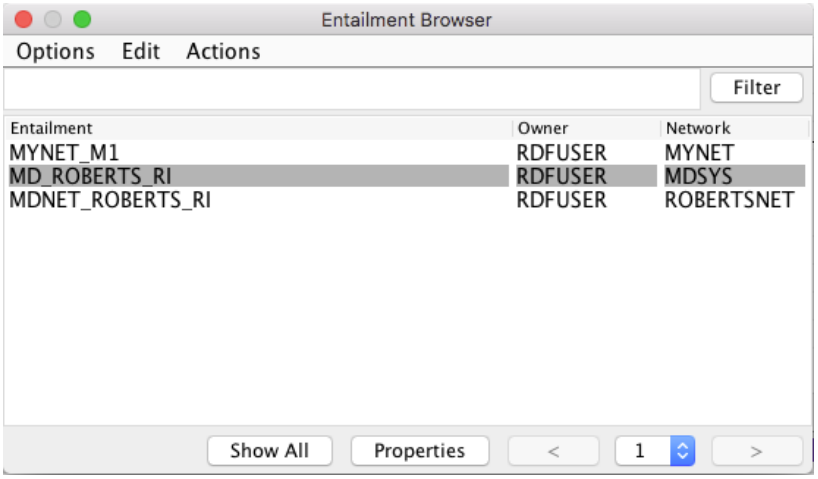
The loader allows the user to *Load Files*, *Load All Files from Directory*, *Split Save & Load,* and *Split & Load*. The user can choose the option that best fit the loading needs and will be displayed a series of options to improve the loading which allows flags, language selection, and threads.

Zip and GZip compressed files are supported.

The loader supports the following formats:

N-Triple, N-Quad, RDF/XML, OWL/XML, OWL, OWL Manchester, OBBO, KRRS2, TTL and Turtle.

The auto select option will try all supported formats to load the Ontology.



The Entailment Browser has a row for each entailment in the associated database connection, with the following information about each entailment: Entailment Name and Owner (schema). You can specify a string to Filter the displayed results, and you can click Show All to show all the entailments.

The Entailment Browser has the following menus and menu items:

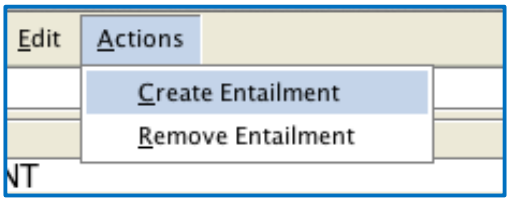
- **Options menu**:
  - **Update**: Updates the display based on the current metadata and data.
  - **Pagination**: Specifies the maximum results to be displayed per page.
- **Edit menu**:
  - **Copy**: Copies the text from the selected row or rows to the system clipboard.
  - **Copy All**: Copies the text from all rows to the system clipboard.
- **Actions menu**:
  - **Create Entailment**: Creates an entailment. Specify the models and rulebases to be used in creating the entailment. After clicking **Create**, specify the name for the new entailment, and optionally click **Advanced** for advanced options. After the entailment is created, it appears in the Entailment Browser display.

    For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.CREATE_ENTAILMENT procedure.
  - **Remove Entailment Model**: Deletes the selected entailment. To select the entailment, click in its row. When prompted, confirm that you want to delete the selected entailment.

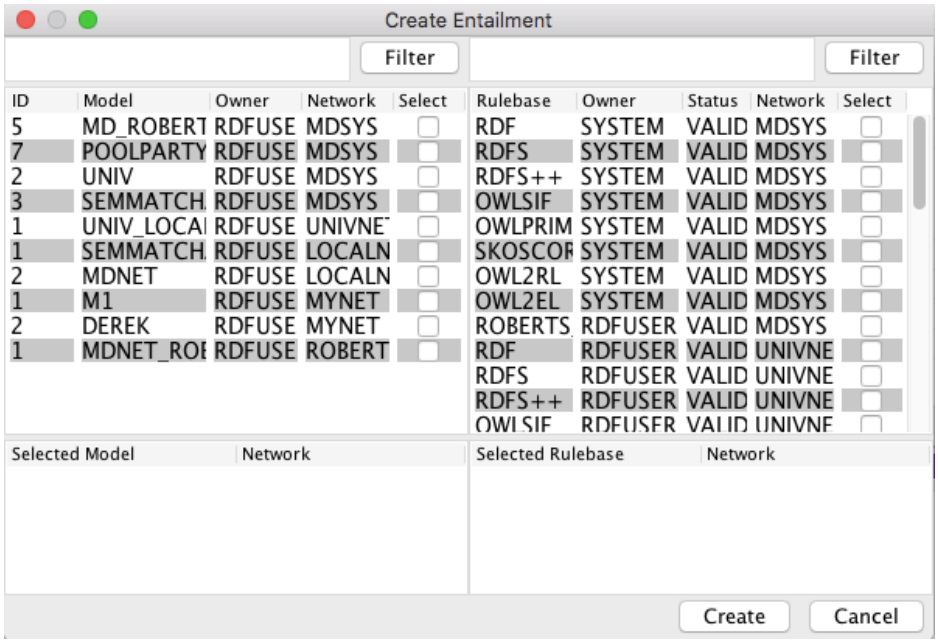
    For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.DROP_ENTAILMENT procedure.

Creating Entailments

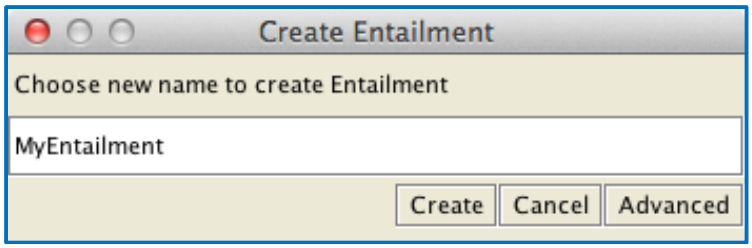
To create an entailment, you must select Create Entailment from the Actions menu.



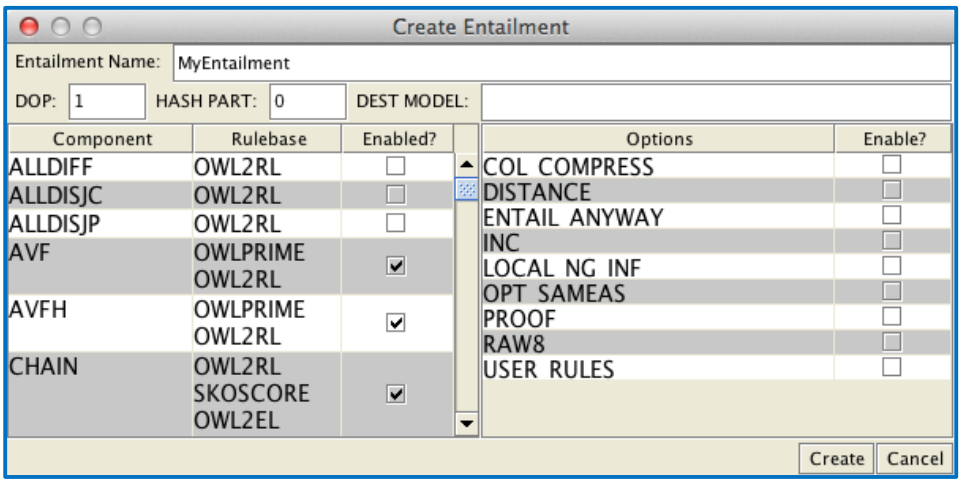
You will be shown a list of all available models and rulebase, which the current user has access to.
To create the entailment, you must choose the desire models and rulebase by selecting their respective checkbox. Selected elements will be displayed in a list below. For private networks (from 19c), models and rulebases must belong to same network.
Regular expressions are supported for the filter.



Once you click Create, you will be asked to input a name to save the entailment into the database.
You will also be given the choice to specify the advanced options.



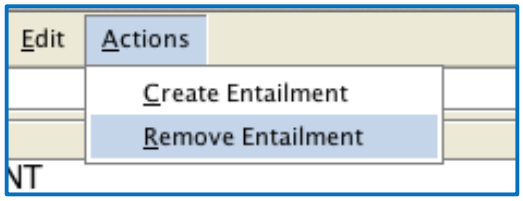
Entailment creation.



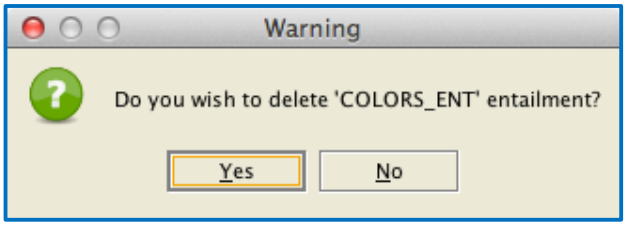
Advanced entailment creation.

Deleting Entailments

To delete an entailment, you must select Remove Entailment from the Actions menu.



You will be asked to confirm before deleting the selected entailment.



Database Statistics

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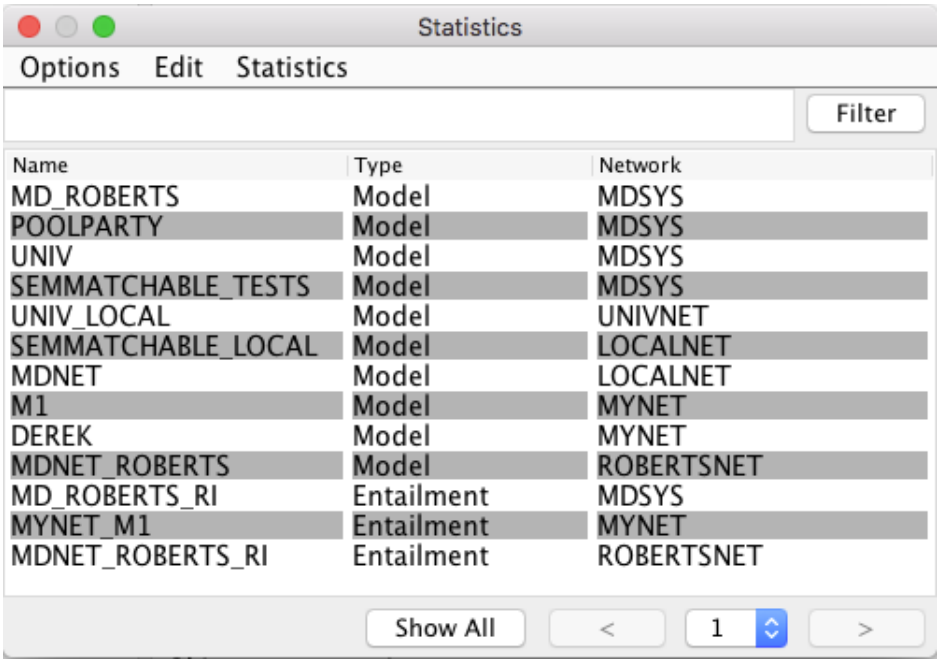
Oracle Spatial and Graph

To manage database statistics, click Oracle > Manage Database Statistics.



The Statistics Browser has a row for each model and entailment in the associated database connection, with the following information about each model/entailment: Name, Type. You can specify a string to Filter the displayed results, and you can click Show All to show all the models/entailments.

The Statistics Browser has the following menus and menu items:

- **Options menu**:
  - **Update**: Updates the display based on the current metadata and data.
  - **Pagination**: Specifies the maximum results to be displayed per page.
- **Edit menu**:
  - **Copy**: Copies the text from the selected row or rows to the system clipboard.
  - **Copy All**: Copies the text from all rows to the system clipboard.
- **Actions menu**:
  - **Create Stats Table**: Create a table to gather the database statistics.
  - **Choose Stats Table**: Select the statistics table to import / exports stats.
  - **Analyze**: Collects optimizer statistics for a specified model or entailment.

    For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.ANALYZE_MODEL / SEM_APIS.ANALYZE _ENTAILMENT procedure.

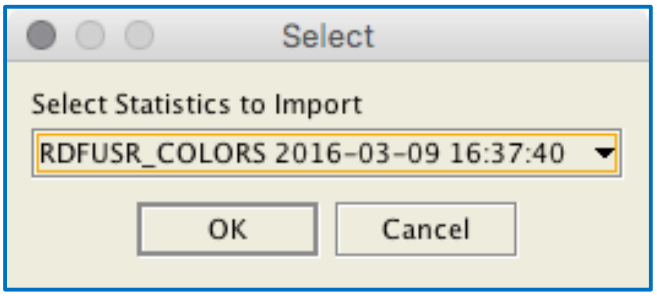
- **Delete Stat**: Drops (deletes) the stats for the selected model / entailment. To select the model / entailment, click in its row. When prompted, confirm that you want to delete the statistics.
- **Export Stats**: Exports statistics for a specified model / entailment and stores them in the user statistics table.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.EXPORT_MODEL_STATS / SEM_APIS.EXPORT_ENTAILMENT_STATS procedure.
- **Import Stats**: Retrieves statistics for a model / entailment from a user statistics table and stores them in the dictionary.

  For an Oracle database, this action is implemented using the PL/SQL SEM_APIS.IMPORT_MODEL_STATS / SEM_APIS.IMPORT_ENTAILMENT_STATS procedure.

Importing Statistics

To import statistics, you must select Import Stats from the Actions menu.

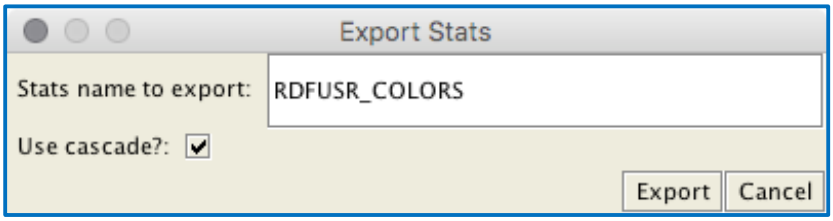


You will be asked to choose the statistics to import. You will be displayed the name and date of the exported statistics to import.

Once selected the statistics will be imported.

Exporting Statistics

To export statistics, you must choose Export Stats from the Actions menu.



You need to select a model/entailment first, once selected you will be asked a name to export the statistics and a checkbox to use cascade.

Once exported an information dialog will inform if the export was successful.

Specifying cascade also exports all index statistics associated with the model / entailment.

External Ontology Repository

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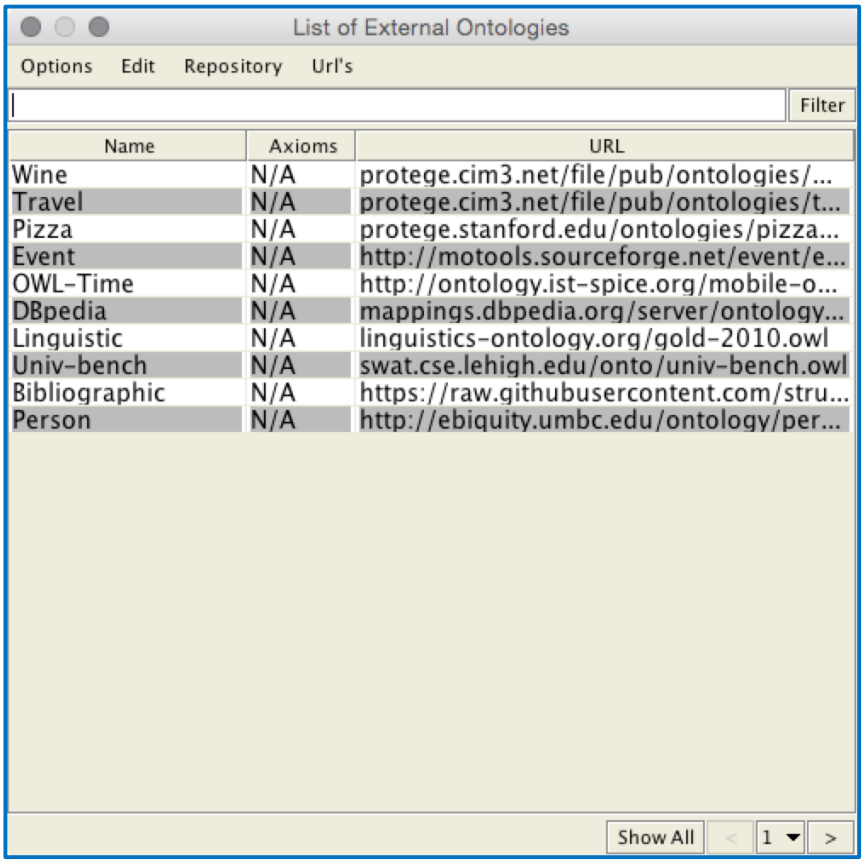
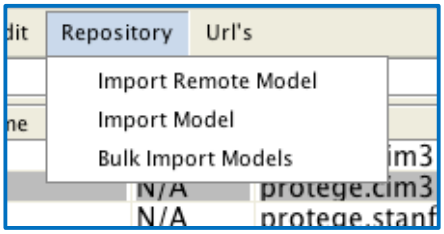
Oracle Spatial and Graph

The list of external ontologies serves as an ontology repository and is provided as a means for a user to discover and explore/study existing third-party ontologies. This list can be edited by the user and it is integrated with the bulk loader. One can easily load one or multiple ontologies from the list to a semantic model in the database. Note that the URL values may have changed, and then not be the current one available. On Options menu, a proxy settings menu item is available if proxy parameters are needed to access external resources.



To import an ontology from the list, choose Import Model from the Repository menu.

The ontologies referenced by the list above are created and hosted by third parties; please make sure that you have the proper license before downloading and using them.


dit
Repository
Url's
Import Remote Model
Import Model
Bulk Import Models
ne
im3
N/A
protege.cim3
N/A
protege.stanf

Handling owl:imports of Ontologies Stored in Oracle

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Oracle Spatial and Graph

OWL allows import of the contents of entire ontologies in other ontologies with owl:imports assertion(s).

Protégé supports owl:imports of ontologies stored in a file system or ones that can be accessed through a valid URL.

The Oracle plugin allows you to import ontologies stored in Oracle Database.

To reference (owl:imports) an ontology from Oracle Database, you must generate the XML catalog, load the catalog, specify the ontology name and data source by creating a redirect, and importing the database ontology.

Importing an Ontology

To import Ontologies from Oracle Database, you must load the XML Catalog generated by Protégé and manually specify the Ontology ID and its Datasource.

Creating the XML Catalog

Start Protégé from scratch and save the current ontology into a directory on your local file system without making changes to the temporal ontology, then open the saved ontology into the current editor.

After reloading the saved ontology, a catalog file will be generated in the directory where the ontology was saved.

XML Catalog Structure

The XML catalog file contains the redirects of ontologies which have an ontology IRI that is not the same as its physical location or the data source identifier. Below is an example catalog file.

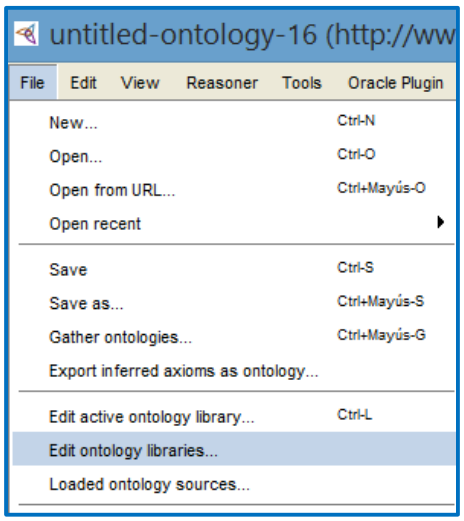
```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<catalog prefer="public" xmlns="urn:oasis:names:tc:entity:xmlns:xml:catalog">
   <uri id="User Edited Redirect" name="urn:N1" uri="jndi-name:oracle-database:N1DS:N1"/>
</catalog>
```

You can manually add an entry in the catalog by using the following format

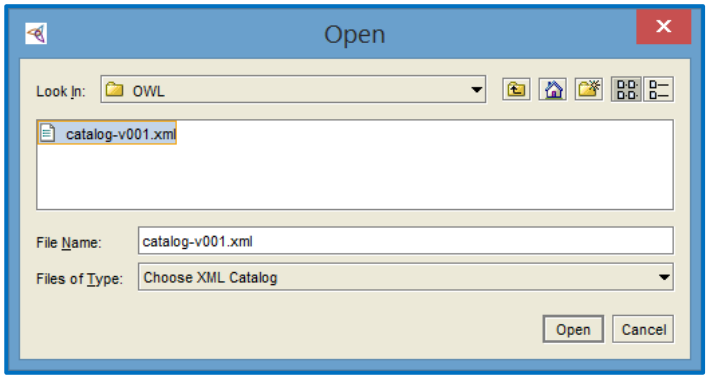
<uri id=”User Edited Redirect” name="[Ontology IRI]" uri="[physical location or data source]"/>

Loading the XML Catalog

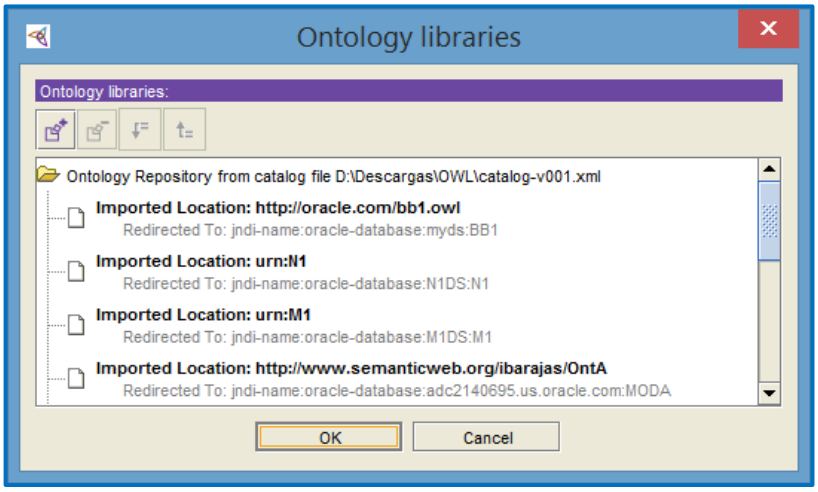
Once you have loaded an Ontology, you can import one or multiple ontologies from the database by selecting Edit ontology libraries option from the File menu.



Select the catalog-v001.xml file, which contains the redirects from ontology IDs to physical locations or Data Sources.

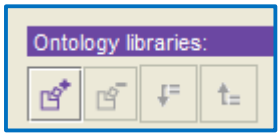


After the catalog is loaded you will see the Ontology libraries containing the catalog locations and all the redirects.



Adding an Oracle Database Ontology Data Source Redirect

You can add a redirect by opening the Ontology Library from the Edit Active Ontology Library option from the *File* menu, and click the *Add Redirect* button.

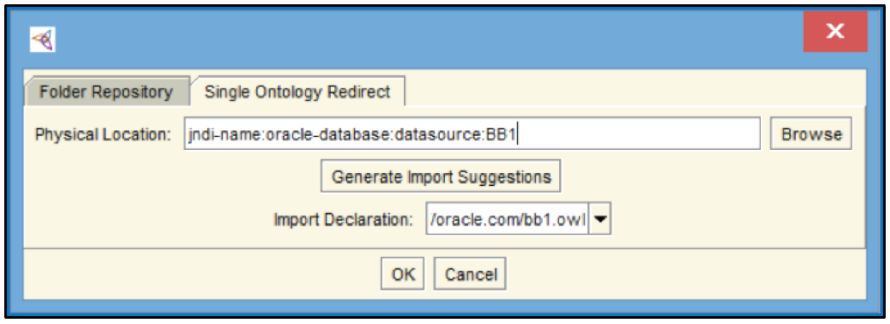


Add Redirect Button

The redirect needs to use the Ontology IRI as the Import Declaration and a Data Source syntax as follows:

Note that when adding a new entry to the catalog, there is a known issue in which you must switch focus between the text areas for the OK button to be enabled.

jndi-name:oracle-database:[Data Source Name]:[Oracle Database Model Name]

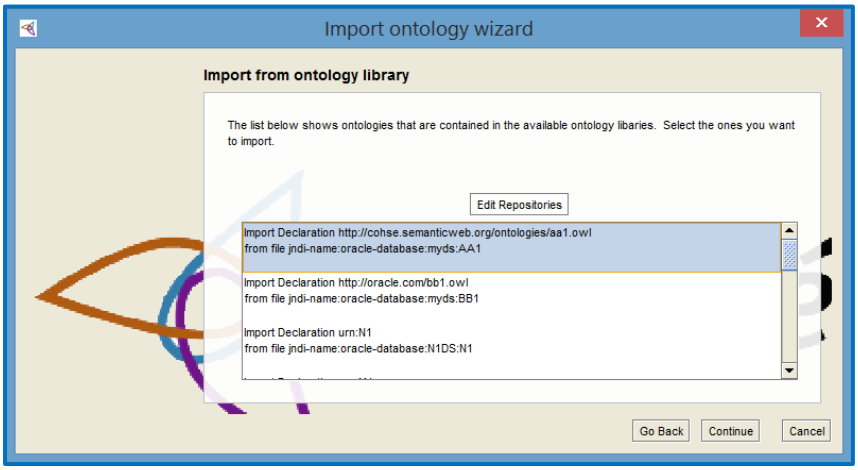


Data Source Syntax to redirect an ontology to a model stored in Oracle Database

Importing a Database Ontology

Use the Import Wizard, located in the Ontology imports tab and choose Import an ontology that is contained in one of the ontology libraries, as shown below

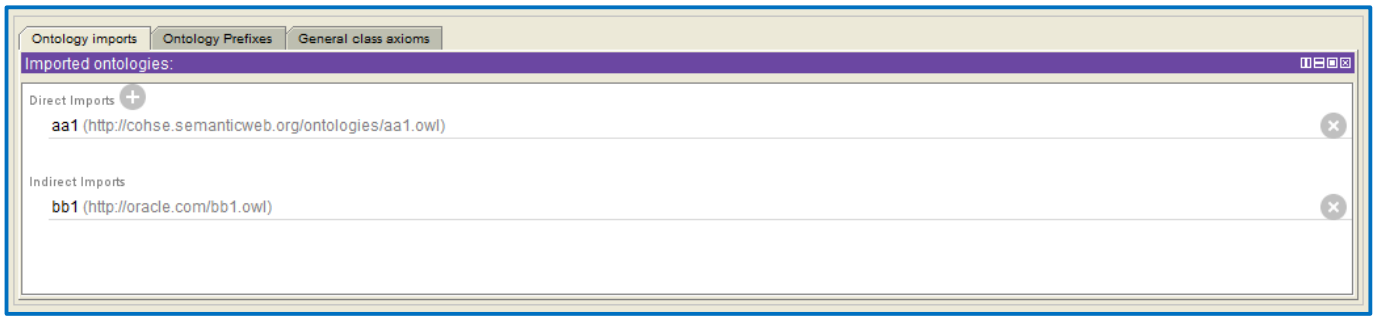
Select the ontology to import and Protégé will verify the import.



After the import has been verified, click Finish to complete the import.

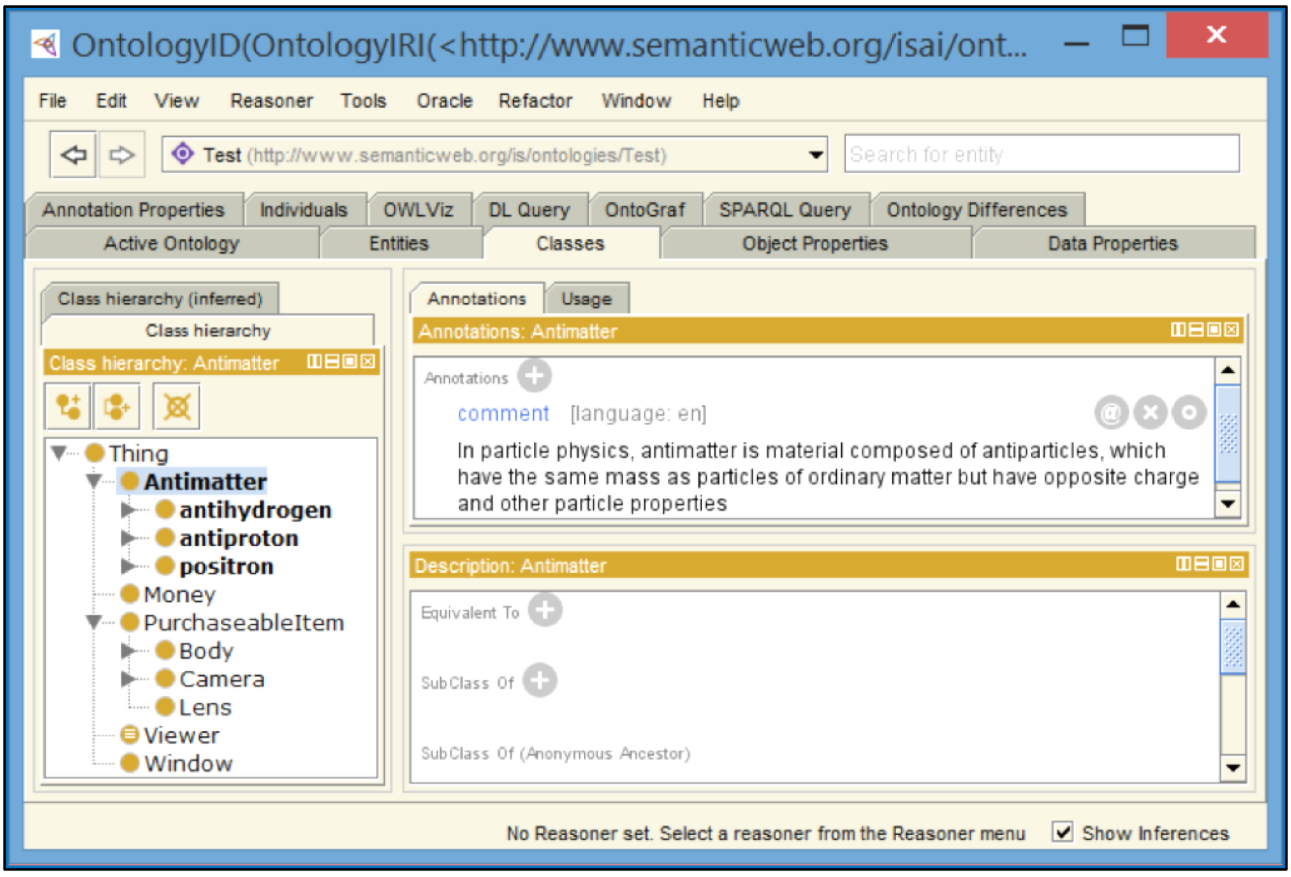
Once the ontology is imported, the Ontology imports tab will display the name of the imported ontology, and all indirect imports if applicable.

Imported ontologies from Oracle Database will ask the users to input the connection information for the data source specified in the ontology redirect.



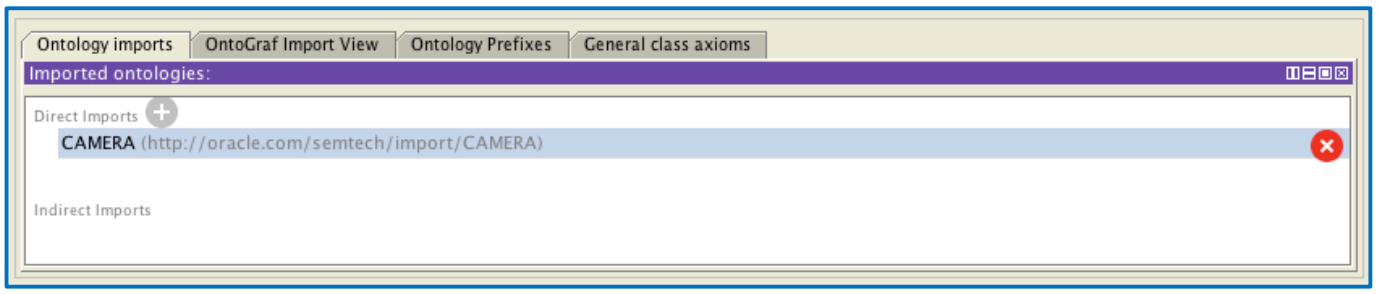
"Ontology imports" tab located under the "Active Ontology" tab

The imported ontologies elements will be displayed using light fonts and the elements belonging to the ontology will be displayed using bold fonts, as shown below.



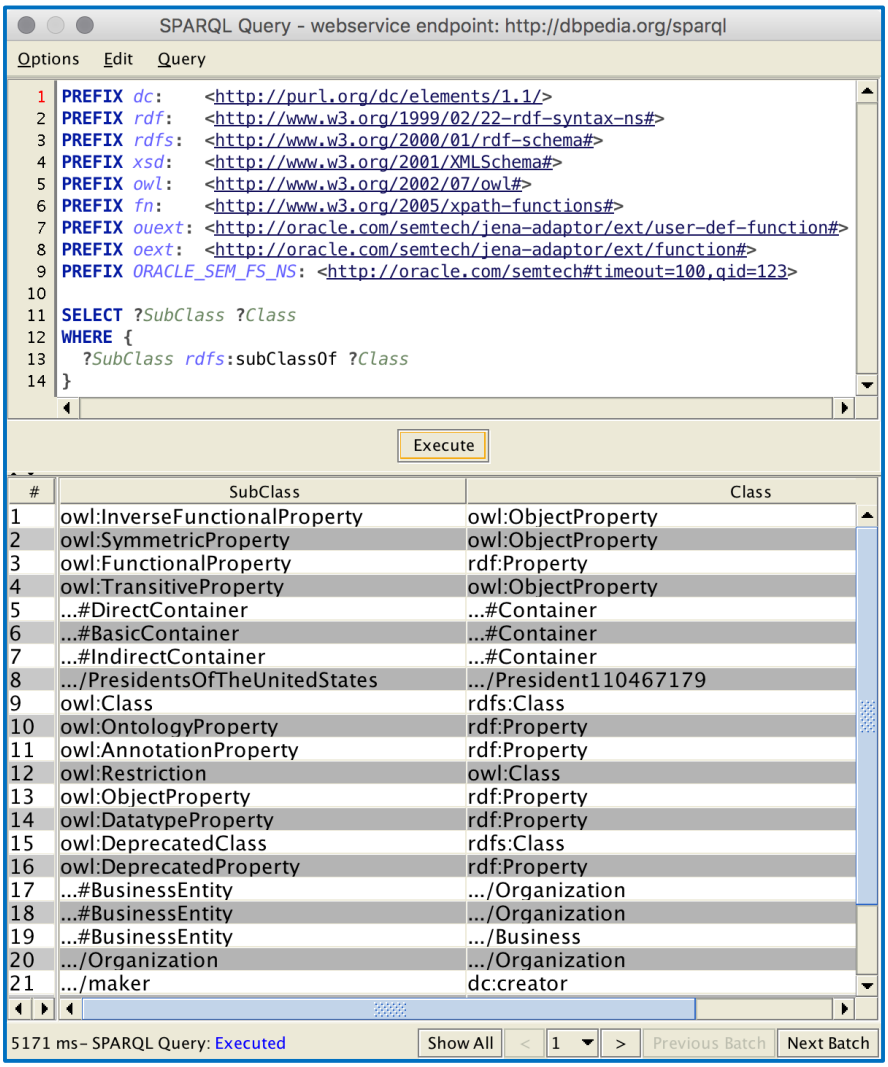
Removing an Imported Ontology

To remove an imported Ontology, click the X icon, located to the right of the ontology on the Ontology Imports tab.



The SPARQL Query option allows one to RDF and OWL data stored in an Oracle Database and SPARQL Endpoints. To start the SPARQL Query option, click Oracle > Execute SPARQL Query.

You can also use the CTRL + ENTER key combination to execute a query.



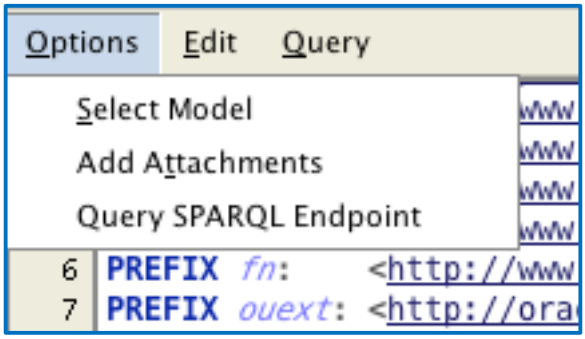
SPARQL Query has the following menus and items:

- **Options menu**:
  - **Select Model**: Select a model to query.
  - **Attachments**: Select attachments for a semantic model (Models and rulebases).

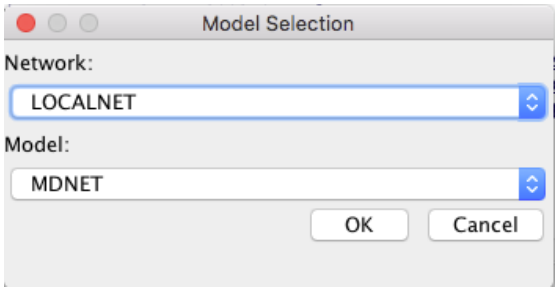
- **Edit menu**:
  - **Copy**: Copy the text from the selected elements to the system clipboard.
  - **Copy All**: Copy the text from all result rows to the system clipboard.
  - **Paste**: Paste content from the system clipboard into the query input area.
  - **Undo**: Undo the last change.
  - **Redo**: Redo the last change.
- **Query menu**:
  - **Execute**: Execute the current query.
  - **Execute from file**: Execute a query stored in a file.
  - **Example Query**: Use an example query as an input.
  - **Previous Query**: Use the previous successfully executed query as the current input.
  - **Next Query**: Use the next successfully executed query as the current input.

Selecting Database Models

To select a model, choose Select Model from the Options menu.



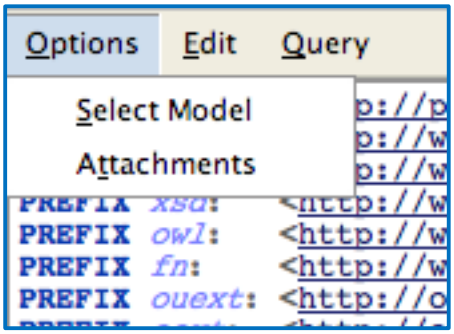
A dialog will display all the ontologies from the database available to the current user. After selecting and loading an ontology, the name of the ontology will be displayed in the window title bar.



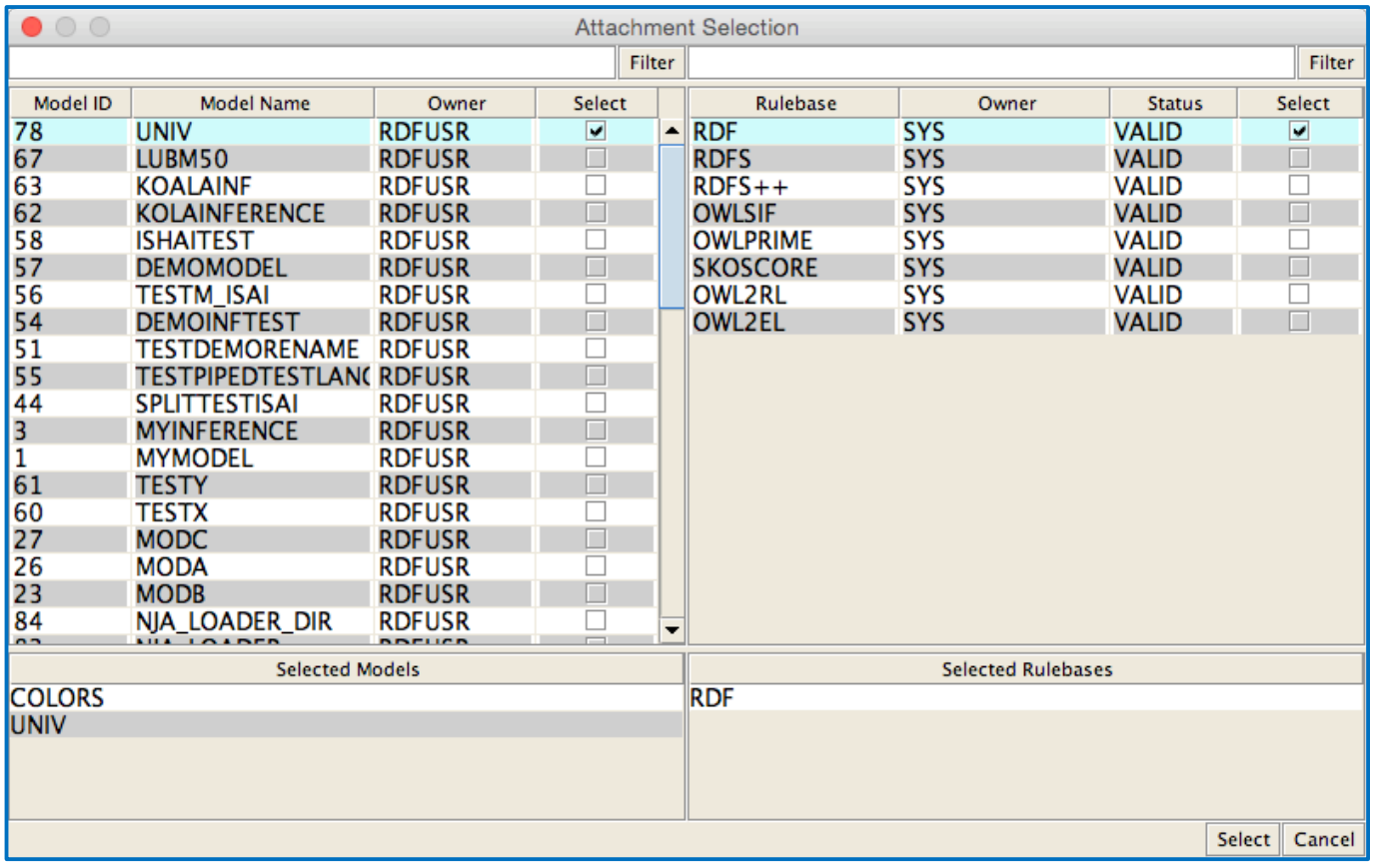
Once a model has been selected, one can start executing SPARQL queries.

Selecting Database Attachments

To select attachments, choose Attachments from the Options menu. Note that *attachments are only supported for Oracle Database.*

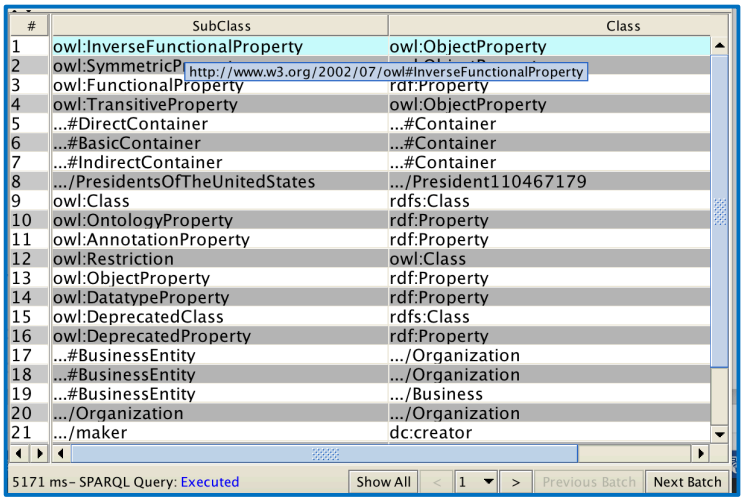


A list of available models and rulebases will be presented on the screen.
To set the attachments, choose the desired model(s) and rulebase(s) using the provided checkbox column. Selected elements will be displayed in the panel below. Click Select button to complete attachment selection.
Note that regular expressions are supported to filter model names and rulebase names.



Navigating Through Results

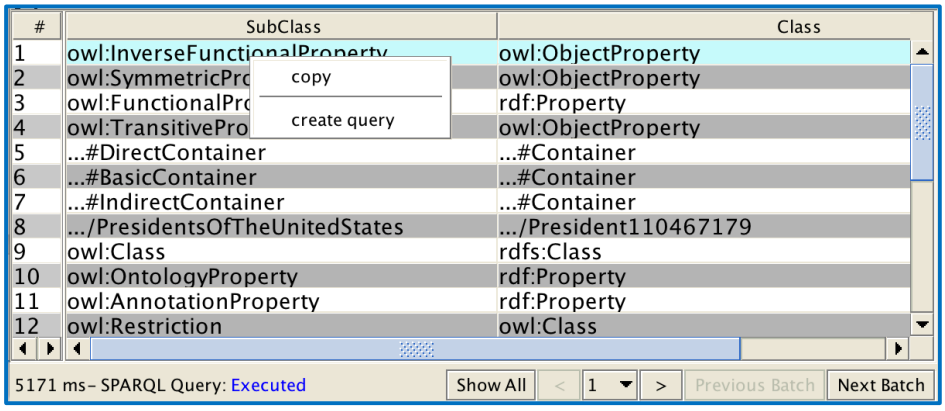
After a query is executed the results will be shown in a table. Long URLs will be shortened for readability. To display the full URI one can hover the mouse over it and the complete URI will be displayed in a tooltip.



Results are shown in batches with a batch size of 250. To navigate query results, use the Next Batch and Previous Batch buttons. A complete batch can be displayed by clicking the Show All button.

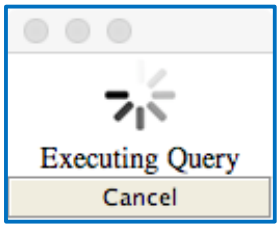
Generating Query

To find detailed information on a particular URI shown in the table, one can right click on the URI, select "create query", and a SPARQL query will be generated and placed in the text input area automatically.



Cancel a Long Running Query

To terminate a long-running SPARQL query, just click on the Cancel button under the Executing Query progress animation.



The query will also be terminated on the database side using a query ID (QID) mechanism. This query ID can also be manually set:

```
PREFIX ORACLE_SEM_FS_NS: <http://example.com/semtech#qid=8761>
```

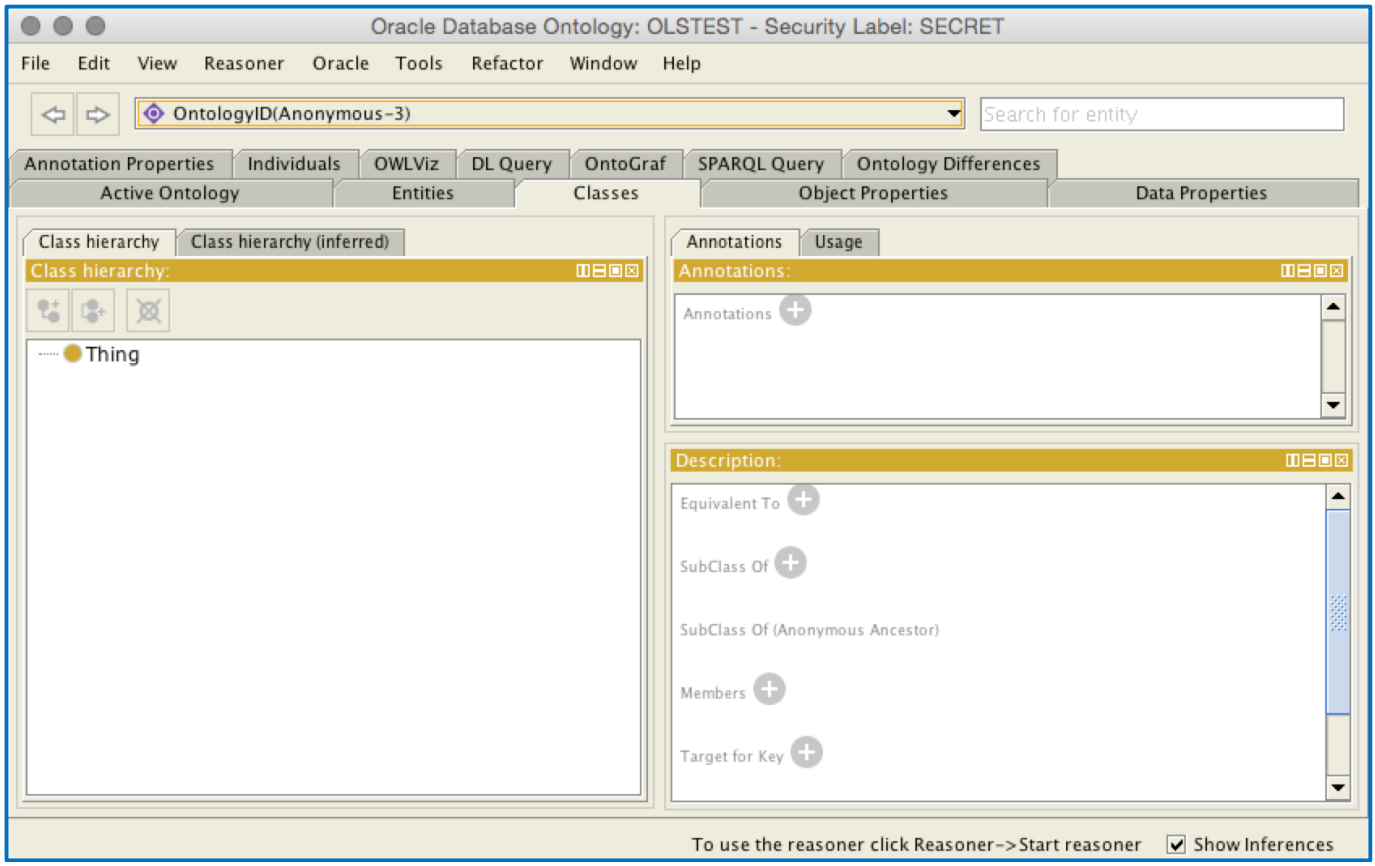
The QID attribute value is a long integer type. If the user does not specify a QID in the query, an automatically generated query ID will be assigned to the current SPARQL query.

Oracle Label Security for RDF

www.oracle.com

Oracle Spatial and Graph

Oracle Label Security (OLS) for RDF data allows sensitivity labels to be associated with individual triples stored in an RDF model. For each query, access to explicit triples is granted by comparing their labels with the user's session labels. Furthermore, Protégé support allows the edition of models/editing models with OLS-enabled and switching between available labels.
Note OLS is automatically detected when enabled.



When a user's security label is detected, its name will be displayed beside the model name as shown above. To use security labels in Protégé, you must first enable Oracle Label Security (OLS) for RDF as instructed in the Spatial and Graph RDF Semantic Graph Developer's Guide.

Changing Security Label

To switch between security labels, choose Switch Security Label from the Options menu. Available security labels will be presented in a drop-down list. Switching between security labels will cause a follow-up read operation to access only a subset of the ontology.

Executing SQL Queries in Oracle Database

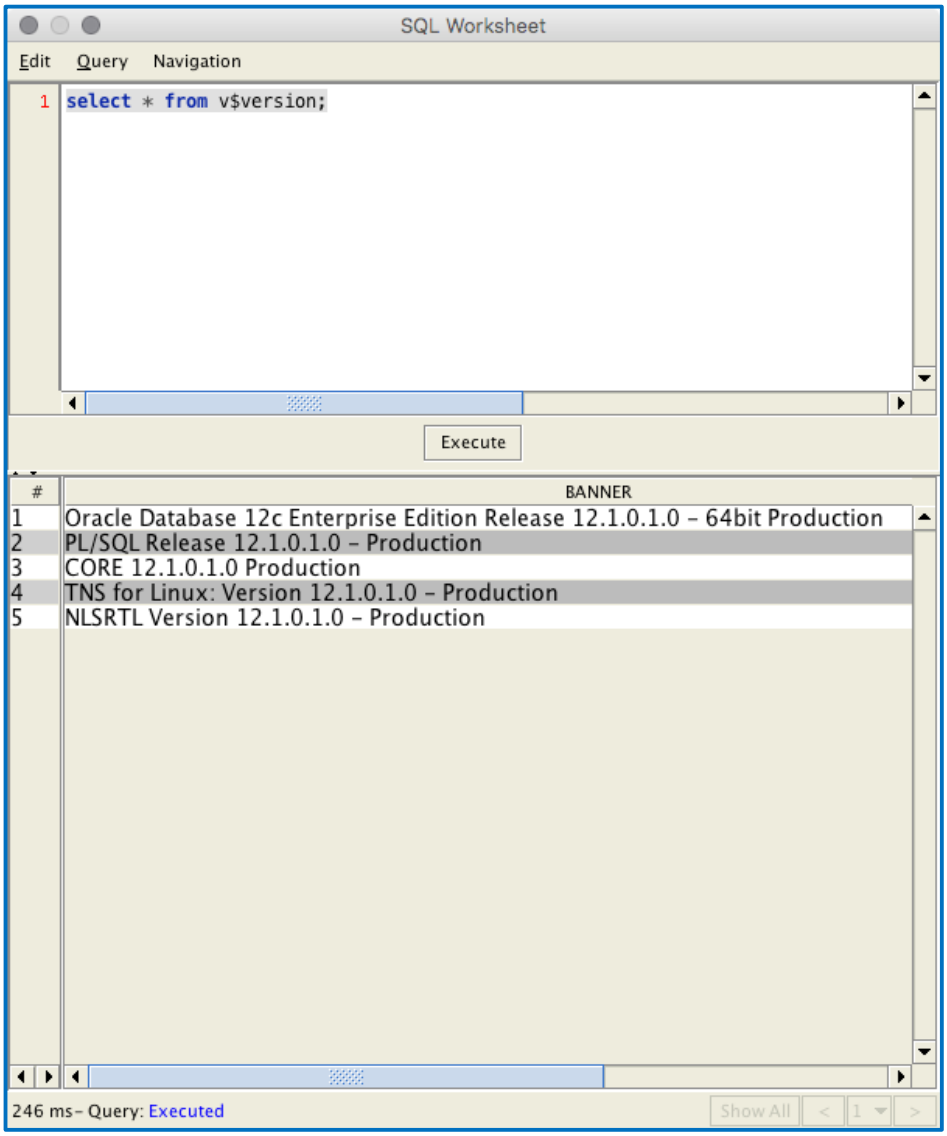
www.oracle.com

Oracle Spatial and Graph

SQL Worksheet allows the user to run DDLs, DMLs, and SQL query statements from Protégé's UI. SQL Worksheet also supports PL/SQL, Oracle Text Indexing, and native RDF Semantic Graph features.

To execute a query, click the Execute button and the SQL statement (or PL/SQL block) will be sent to Oracle Database for execution. One can also highlight the SQL statement to execute (or a PL/SQL block) and then click Execute.

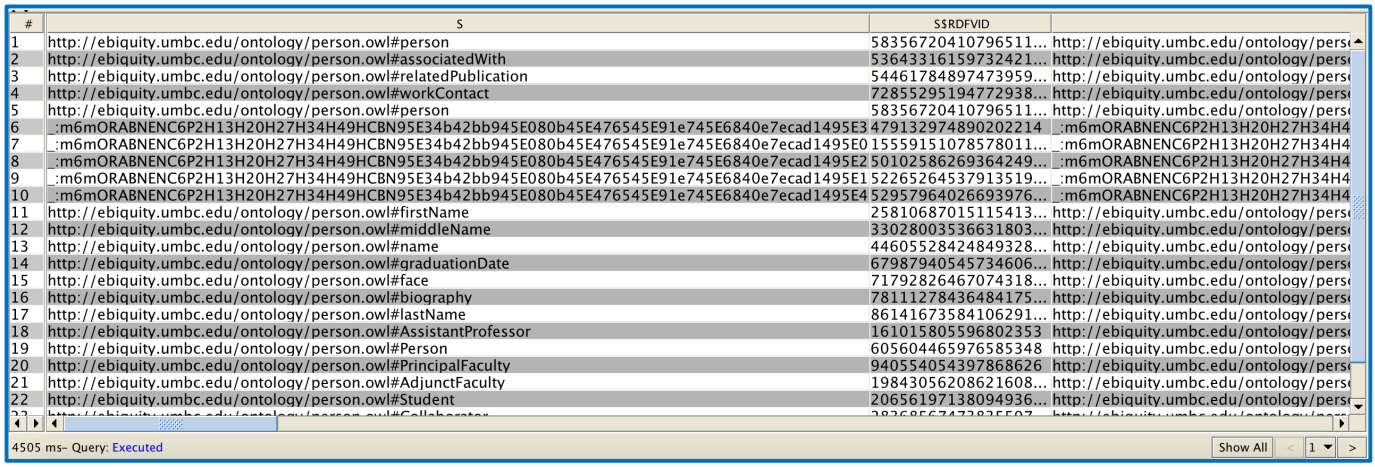
For convenience, the CTRL + ENTER key combination is also available to run a query.



Navigating Through Results

After a SQL query is executed, the results will be displayed in a table. Users can easily navigate through the results with the built-in pagination function.

Results' column size can be resized manually.

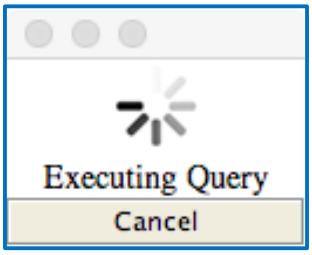


#	S	S$RDFVID	
1	http://ebiquity.umbc.edu/ontology/person.owl#person	58356720410796511...	http://ebiquity.umbc.edu/ontology/pers
2	http://ebiquity.umbc.edu/ontology/person.owl#associatedWith	53643316159732421...	http://ebiquity.umbc.edu/ontology/pers
3	http://ebiquity.umbc.edu/ontology/person.owl#relatedPublication	54461784897473959...	http://ebiquity.umbc.edu/ontology/pers
4	http://ebiquity.umbc.edu/ontology/person.owl#workContact	72855295194772938...	http://ebiquity.umbc.edu/ontology/pers
5	http://ebiquity.umbc.edu/ontology/person.owl#person	58356720410796511...	http://ebiquity.umbc.edu/ontology/pers
6	_:m6mORABNENC6P2H13H20H27H34H49HCBN95E34b42bb945E080b45E476545E91e745E6840e7ecad1495E3	479132974890202214	_:m6mORABNENC6P2H13H20H27H34H4
7	_:m6mORABNENC6P2H13H20H27H34H49HCBN95E34b42bb945E080b45E476545E91e745E6840e7ecad1495E0	15559151078578011...	_:m6mORABNENC6P2H13H20H27H34H4
8	_:m6mORABNENC6P2H13H20H27H34H49HCBN95E34b42bb945E080b45E476545E91e745E6840e7ecad1495E2	50102586269364249...	_:m6mORABNENC6P2H13H20H27H34H4
9	_:m6mORABNENC6P2H13H20H27H34H49HCBN95E34b42bb945E080b45E476545E91e745E6840e7ecad1495E1	52265264537913519...	_:m6mORABNENC6P2H13H20H27H34H4
10	_:m6mORABNENC6P2H13H20H27H34H49HCBN95E34b42bb945E080b45E476545E91e745E6840e7ecad1495E4	52957964026693976...	_:m6mORABNENC6P2H13H20H27H34H4
11	http://ebiquity.umbc.edu/ontology/person.owl#firstName	25810687015115413...	http://ebiquity.umbc.edu/ontology/pers
12	http://ebiquity.umbc.edu/ontology/person.owl#middleName	33028003536631803...	http://ebiquity.umbc.edu/ontology/pers
13	http://ebiquity.umbc.edu/ontology/person.owl#name	44605528424849328...	http://ebiquity.umbc.edu/ontology/pers
14	http://ebiquity.umbc.edu/ontology/person.owl#graduationDate	67987940545734606...	http://ebiquity.umbc.edu/ontology/pers
15	http://ebiquity.umbc.edu/ontology/person.owl#face	71792826467074318...	http://ebiquity.umbc.edu/ontology/pers
16	http://ebiquity.umbc.edu/ontology/person.owl#biography	78111278436484175...	http://ebiquity.umbc.edu/ontology/pers
17	http://ebiquity.umbc.edu/ontology/person.owl#lastName	86141673584106291...	http://ebiquity.umbc.edu/ontology/pers
18	http://ebiquity.umbc.edu/ontology/person.owl#AssistantProfessor	161015805596802353	http://ebiquity.umbc.edu/ontology/pers
19	http://ebiquity.umbc.edu/ontology/person.owl#Person	605604465976585348	http://ebiquity.umbc.edu/ontology/pers
20	http://ebiquity.umbc.edu/ontology/person.owl#PrincipalFaculty	940554054397868626	http://ebiquity.umbc.edu/ontology/pers
21	http://ebiquity.umbc.edu/ontology/person.owl#AdjunctFaculty	198430562086216 08...	http://ebiquity.umbc.edu/ontology/pers
22	http://ebiquity.umbc.edu/ontology/person.owl#Student	20656197138094936...	http://ebiquity.umbc.edu/ontology/pers

4505 ms- Query: Executed Show All 1

Cancel a Long Running Query

To terminate a long-running SQL query, click on the Cancel button as shown below.



Supported Commands

The SQL Worksheet supports several commands that provide extra functionality. Note that all SQL commands must end with a semicolon, and all PL/SQL blocks must be terminated by a "/".

- Table Creation
  - e.g. create table mytable(i int);
- Commit
  - Commits the pending changes.
  - e.g.: **commit;**

- Rollback
  - Rolls back the pending changes.
  - e.g.: **rollback;**
- Describe/Desc
  - Provides a description of the specified table.
  - e.g.: **describe mytable;**
- Execute/Exec
  - Executes a stored procedure.
  - e.g.: **exec sem_apis.analyze_model('travel');**
- Set serveroutput
  - This setting controls whether SQL Worksheet prints the output generated by the DBMS_OUTPUT package from PL/SQL procedures.
  - e.g.: **set serveroutput on;**
- Alter Session
  - Use the **ALTER SESSION** statement to change the settings of the current session.
  - e.g.: **alter session force parallel query parallel 4;**

Oracle Spatial and Graph Support for Protégé - Oracle Spatial & Graph

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