Evaluator 1

Earth Science Ontology Portal

The Earth Science Ontology Portal (ESIP Portal) repurposes the open source NCBO Virtual Appliance software, which provides the functionality available in the NCBO Bioportal from version 4.15. ESIP Portal consists of a web-based UI and an API that allows users to interact with ontologies through textual and visual layouts for creating mappings between classes, recommending ontologies and their classes for a block of text, and annotating text with classes through both interfaces. Users can also register with the application for adding and managing ontologies in the system through the web-based UI. The layout of the UI is intuitive and it's clear as a new user where to navigate to find the desired functionality in most cases. However, a number of issues arose when interacting with the UI, outlined below, that if addressed would improve the utility of the tool. The API was also intuitive and performant for the given use cases and serves as a useful resource to the community. My overall impression of the Earth Science Ontology Portal is that it is a well-designed tool and a valuable resource to the community in its present state, but it could be improved for a tighter user experience given some minor server-side configuration tweaks and some documentation improvements.

Use Case #1: Use of Semantics within Search Engines

	The ontology portal has an API via which the ACME system can submit the term to be matched.	**The ontology portal can semantically match terms received as input to terms in the ontologies stored there.**	**The ontology portal can return a set of matching terms to the requesting application.**
ESIP Portal	YES	YES	YES

The ESIP Portal provides an API at which a user can perform term searches across ontologies and receive relevant matches to the search query in JSON or XML formats. The API is well documented at http://data.bioontology.org/documentation, and is suitable for use as part of improving search results by discovering similar terms at the portal through the API. The results are flush with useful information providing information about the Ontology, the class that matched the search term, and a class definition, if provided by the ontology. The structure of the response is a little complex, and would be nice for this use case to have more information about a matches parents and children without having to walk and resolve the paths: links.parents, links.descendants, links.mapping, etc. It seems to me, that unless a search engine was targeting specific ontologies that it trusted, one would have to walk through more information about an unknown ontology o determine whether a match was sufficiently relevant for use. That

doesn't seem performant for real-time search engine queries. If real-time searches were a requirement, I think more information about a match might make this service more functional in a real world scenario.

Also, we noticed a few issues that could be addressed to improve the service.

1. By default, the API sends content as JSON-LD, which is nice to provide some semantics as to the structure of the response. However, I noticed the Content-Type header wasn't set to 'application/ld+json', but rather 'application/json'.
2. As part of the JSON-LD response, the contextual links provided such as http://data.bioontology.org/metadata/OntologySubmission respond with 401 errors because they require a BioPortal API key. It would be helpful if the JSON-LD context URIs were resolvable, but this might be a configuration issue?
3. At first, accessing the API was not working as documented, so I submitted a Github issue (https://github.com/ESIPFed/Semantic-Portal/issues/6) asking for help. But after using the Annotator API link from the web-based UI, I noticed its URL included a port number 8080. I tried the port number on the term match API, and it worked. I suggested in the Github issue that the documentation be updated, and it was 4 days later.
4. Despite registering for an API key, I noticed that an API key isn't always necessary, and it was unclear if that was intentional.
   Ex: http://semanticportal.esipfed.org:8080/search?q=sea%20water

Use Case #2: Browsing a Portal for a Relevant Ontology

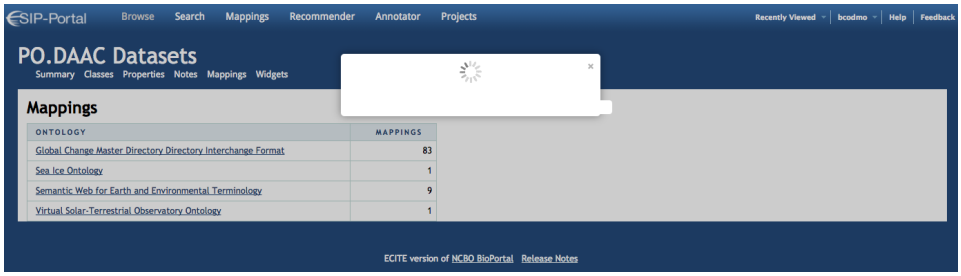
	The ontology portal provides the capability of searching across all of the ontologies it stores.	**There is a user interface and/or api that accepts a search term as input and returns appropriate results.**	**There are links among related concepts within an ontology.**
ESIP Portal	YES	YES	YES

The web-based UI of the ESIP Portal provides all the features of the API with a nice level of advanced search capabilities for finding ontologies and classes in the repository. From the Browse page, a number of Classes from different ontologies are returned showing one hit for each ontology which is nice for condensing the result set and allowing a user to scan across all matches. A show/hide feature for each result lets the user see other Class matches within that ontology. There is a nice fine tuning of the search that can be performed such as excluding/including obsoleted classes and ontology views. When viewing an ontology, a user can view the classes, or all properties, visualize the relationships between all classes, and discover mappings between ontology classes. The hierarchical navigation for browsing classes and properties is a nice feature for helping a user understand the structure and organization of the terms.

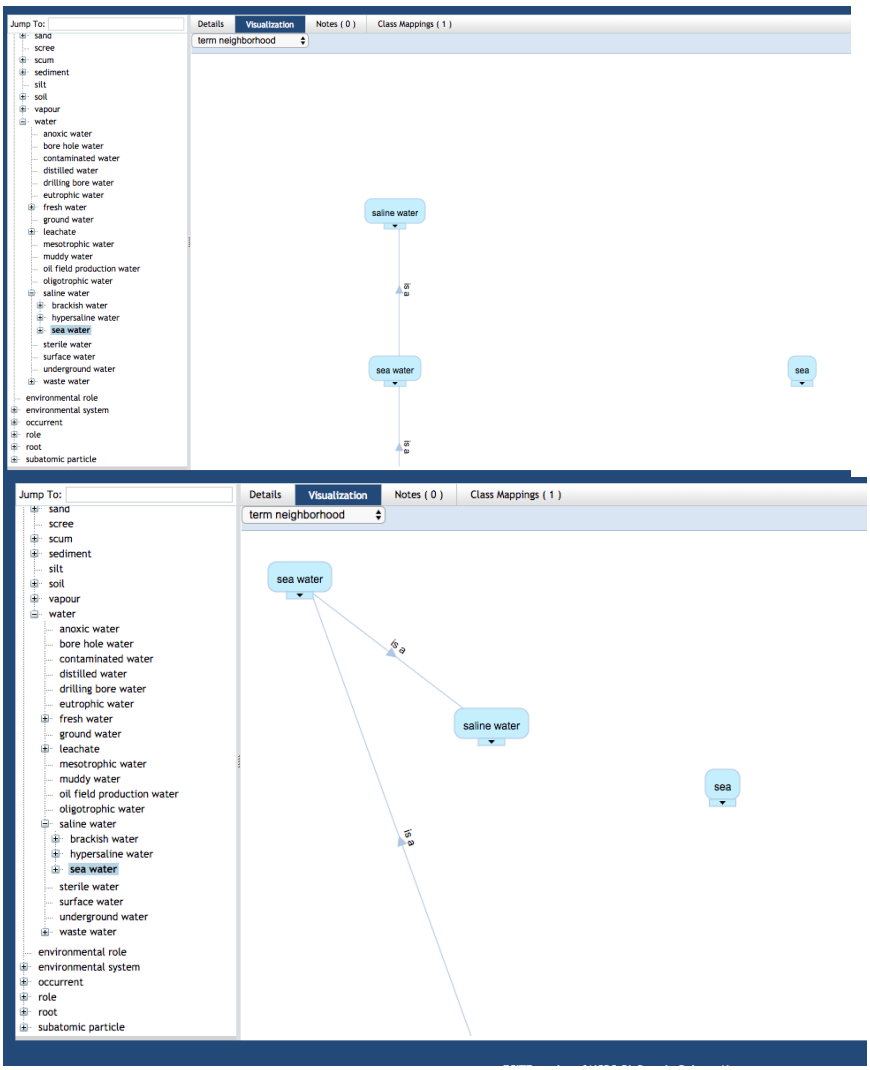
I noticed a few UI issues that came up while browsing that could be addressed:

1. Knowing that SWEET has a class called 'SeaWater', I was surprised it wasn't returned when searching for the phrase 'sea water'. But, could this be because there is no comment or definition on the class containing either word 'sea' or 'water' to return it as a hit? I'm not certain whether this issue is with the data or the repository's search functionality.

2. Looking at PO.DAAC Datasets ontology, I clicked Mappings, then Sea Ice Ontology, and the UI spins. Looking at the browser console, a 500 Internal Server Error occurred trying to access: /mappings/show/PODS?target=http://ec2-52-23-64-194.compute-1.amazonaws.com:8080/ontologies/SEAICE&height=600&width=800



3. Visualizing a Class in an ontology, sometimes the relationships get hidden and are unusable. I can't reach the term below the fold even if i drag connections up higher in viewable area.



Recommendation for both Repositories

Research has shown that when an ontology provides a set of competency questions that it seeks to answer, it is easier for potential adopters to understand the concepts within the ontology preventing misunderstandings and misuse. It would be great if both repositories could add a place for ontology managers to provide the competency questions the ontology seeks to address. For more information on competency questions for ontologies, see the following papers:

Ren, Y., Parvizi, A., Mellish, C., Pan, J. Z., van Deemter, K., & Stevens, R. (2014). Towards Competency Question-Driven Ontology Authoring. Lecture Notes in Computer Science. Springer International Publishing. https://doi.org/10.1007/978-3-319-07443-6_50

Bezerra, C., Freitas, F., & Santana, F. (2013, November). Evaluating Ontologies with Competency Questions. 2013 IEEE/WIC/ACM International Joint Conferences on Web

Intelligence (WI) and Intelligent Agent Technologies (IAT). IEEE. https://doi.org/10.1109/wi-iat.2013.199

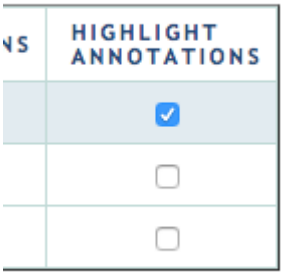
Use Case #3: Annotating Text

	The ontology portal includes an annotation tool.	The annotation tool has a UI and/or API that enables users to access the annotation tool.	The annotation tool is able to accept text as input either by uploading a document or by entering text directly.	The annotation tool is able to identify terms in the text that match ontology concepts.
ESIP Portal	YES	YES	YES	YES

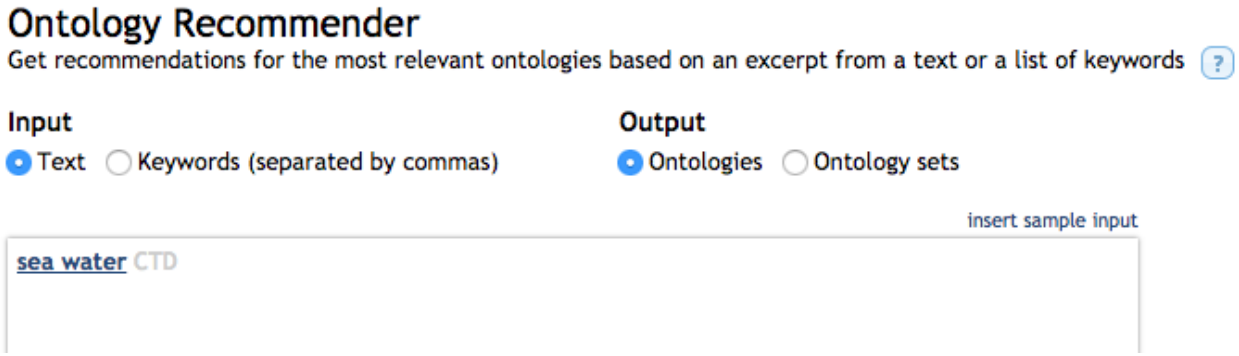
	The annotation tool is able to display the extracted terms along with the concepts/ontologies to which they could be mapped.	The annotation tool is able to accept input from users accepting or rejecting suggested matches.	The annotation tool is able to mark up a text document with appropriate hyperlinks.
ESIP Portal	YES	NO	YES, but the hyperlinks don't resolve.

The ESIP Portal has two separate areas that combined address the annotation use case - the Annotator and Recommender UIs and API endpoints. From the Annotator service, a user can provide a block of free text, and set any number of filters for obtaining a relevant matched class. The service provides a deep set of filters and switches including the number of levels down from a match the result set should provide. This is incredibly valuable for understanding where a match is coming from for ontologies that have hierarchical classes. The result set also includes what words in the free text block caused the resulting class to be returned.

The Recommender service lets a user provide a block of free text or a set of keywords and a number of threshold values for fine tuning the recommendations returned. For each piece of text or keyword, where a match was found, the Recommender returns the Class, which ontology it belongs to and its score for how well it matched. It also provides a checkbox for each result called 'Highlight Annotation',



which when checked for a matching class, highlights the text or keyword in the form input field, and turns it into a clickable link - annotating the user text with HTML.

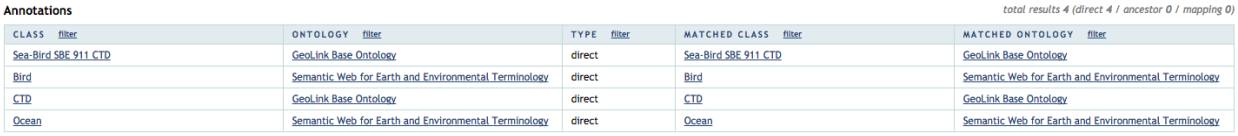


So, it seems like the two services might be mislabeled. The Annotation service recommends classes and doesn't annotate the text, and the Recommender makes recommendations with scoring, but it also annotates the user's input. At first, I almost reported that Step 7 of the use case was not available from ESIP Portal, but on closer inspection of the Recommender, I realized that in fact it does mostly fulfill the requirements. The API endpoints for both of these services work well and specify the granule of text that triggered a match, but don't offer back annotated text with a hyperlink.

A couple of UI issues surfaced, which if fixed, I think will help improve the usefulness of the annotations from the Recommender, and improve the context of matches from the Annotator.

1. From the Annotator, the first initial search displays a 'Context' column (see picture below) that tells the user which text granules matches the corresponding Class in the result.

But , re-executing the search, this column disappears from the display.



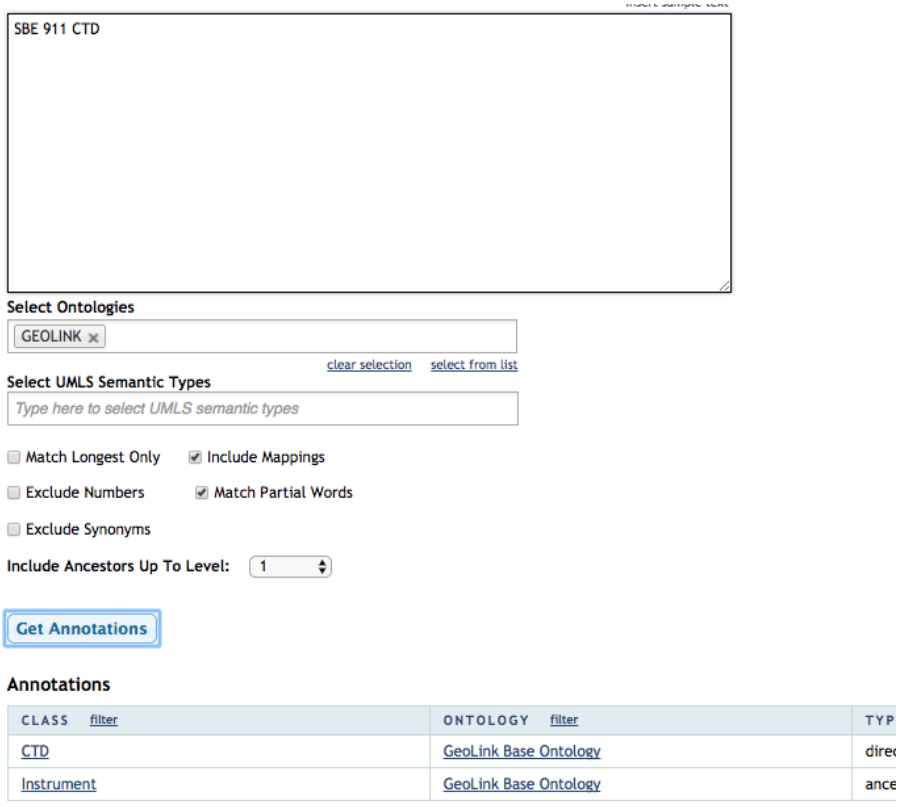
Annotations

total results 4 (direct 4 / ancestor 0 / mapping 0)

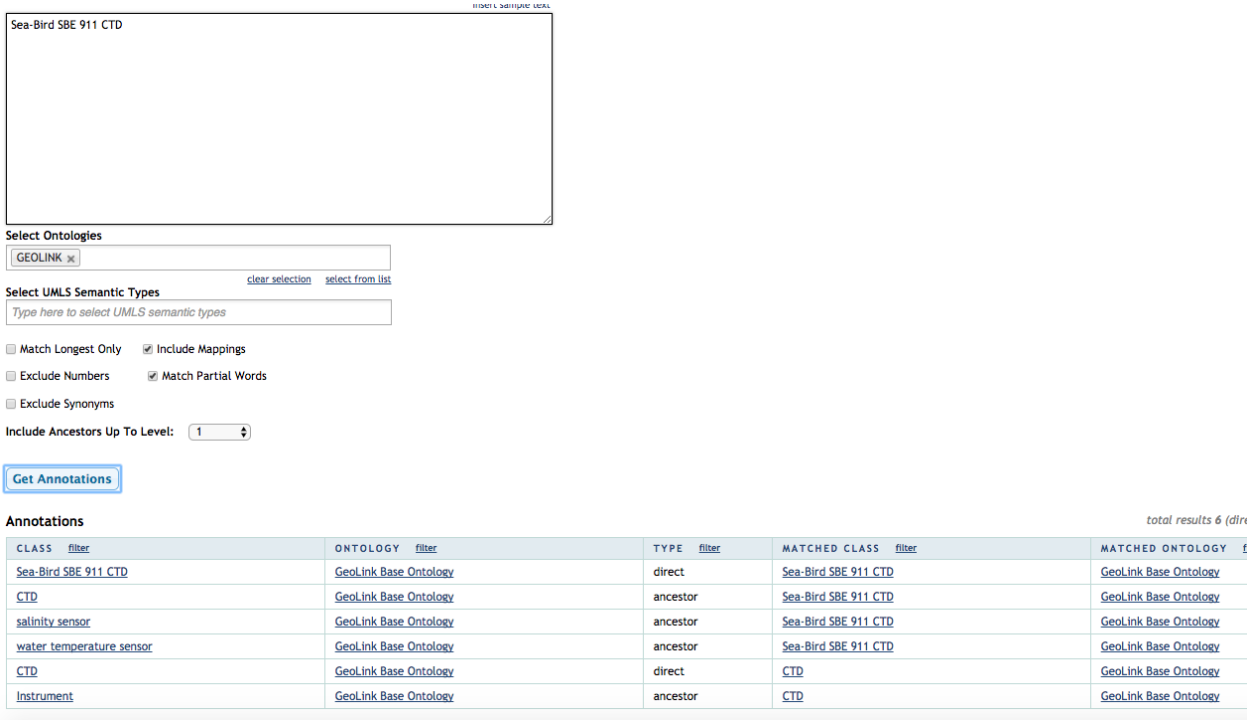
CLASS filter	ONTOLOGY filter	TYPE filter	MATCHED CLASS filter	MATCHED ONTOLOGY filter
Sea-Bird SBE 911 CTD	GeoLink Base Ontology	direct	Sea-Bird SBE 911 CTD	GeoLink Base Ontology
Bird	Semantic Web for Earth and Environmental Terminology	direct	Bird	Semantic Web for Earth and Environmental Terminology
CTD	GeoLink Base Ontology	direct	CTD	GeoLink Base Ontology
Ocean	Semantic Web for Earth and Environmental Terminology	direct	Ocean	Semantic Web for Earth and Environmental Terminology

This column seems critical to a user trying to understand why a class is being put forth as a match. The Annotator API service still provides this context to the user as: $result.['annotations'][x]['text']

2. An explanation of how the annotator works, would be helpful. Knowing that the GeoLink ontology has a class for a Sea-Bird SBE 911 CTD instrument, I began a search with 'Sea-Bird SBE 911' that returned zero results. Stripping that down to 'SBE 911 CTD' returns two results, but not the specific class I was targeting

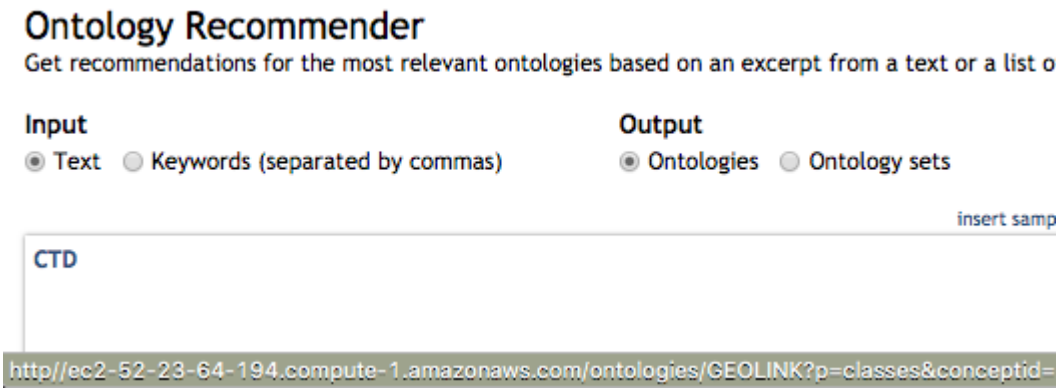


but 'Sea-Bird SBE 911 CTD' nets the class I'm looking for.



I'm curious why the exact string is needed to hit on this class, and that the text isn't chunked (or the ontology class isn't chunked) to hit a match in this case.

3. The Recommender, as mentioned above, annotates the user input with a link to the class that is best matched for the selected result. However, these links don't resolve, and it looks like URL is missing the colon in the HTTP scheme. In the screenshot below, the URL is: **http//ec2-52-23-64-194.compute-1.amazonaws.com**/ontologies/GEOLINK?p=classes&conceptid=http%3A%2F%2Fvocab.nerc.ac.uk%2Fcollection%2FL05%2Fcurrent%2F130%2F instead of **http://ec2-52-23-64-194.compute-1.amazonaws.com**/ontologies/GEOLINK?p=classes&conceptid=http%3A%2F%2Fvocab.nerc.ac.uk%2Fcollection%2FL05%2Fcurrent%2F130%2F



This may just be a configuration fix as the API endpoint (http://semanticportal.esipfed.org:8080/recommender) provides the correct URL for

the annotation.

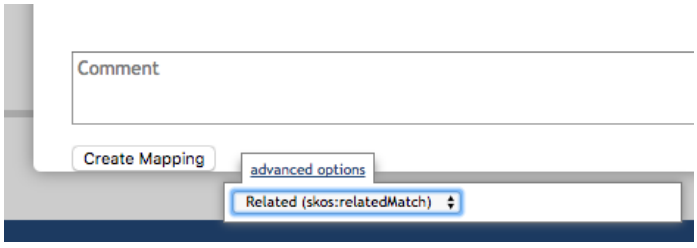
Use Case #4: Editing, Extending and Releasing New Versions of an Existing Ontology

	There is a user authentication system.	A UI and/or API that enables users to upload ontology files (in a variety of formats?)	A UI that allows users to view an existing ontology.	A UI that allows users to edit an existing ontology.	A version control system.
ESIP Portal	YES	YES	YES	YES	YES

The ESIP Portal makes adding an ontology fairly easy and provides some nice features for formatting such as where the tool should look for ontology names, synonyms, author information and descriptions. It allows the owner to specify the version identifier as free text, provides a few values form a controlled vocabulary for ontology status, and provide other metadata fields to help describe the ontology. Some access controls for who can view/edit the ontology exist, and some more description about them would be nice. Currently, a user can select from an ontology being: Public, Private or Licensed. We can assume what Public is, Private might be that only assigned viewers and editors can see it in the UI and APIs, but I'm not sure what setting an ontology to 'Licensed' does. I created a new user, and added a Private ontology setting my original account as a viewer, and this feature worked as expected - the ontology was only accessible through the UI and APIs to those accounts. Other nice features were being able to download a diff between versions of an ontology.

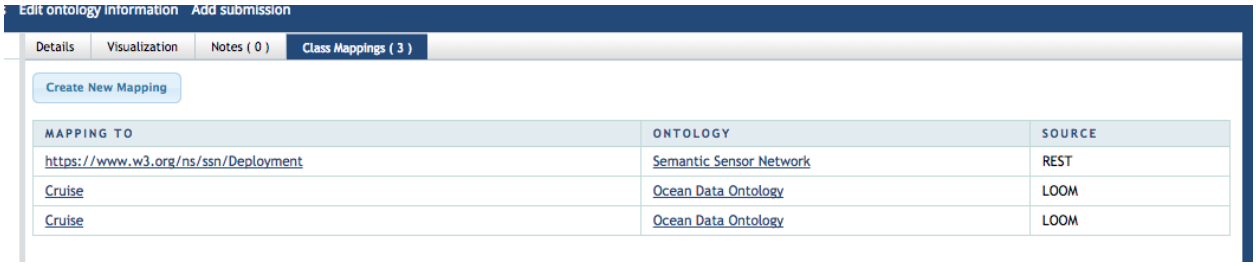
In the course of working through the use case, a couple of things didn't work properly with the UI, and I have some suggestions for functionality that might be added in the future:

1. When trying to create mappings between ontology classes, one of the most important aspects of the mapping is the relationship represented by the mapping - is it an exact match, close match, broader or narrower in definition? While the ESIP Portal provides this field, it's unfortunately hidden in the advanced options modal tab.



Interacting with the tab, shows a drop-down which, when you click on in the Chrome browser, doesn't open up. To get this to work, I had to right-click on the drop-down or use TAB and arrow keys to select different mapping.

2. It would be nice to see more provenance information about created mappings. Form the UI, you see the mapped class, the ontology of that mapped class and column called 'Source'. The values of this column seem strange with values like 'REST' and 'LOOM'. It's be helpful for this to be clickable for more information. From searching online, I discovered that LOOM stands for Lexical OWL Ontology Matcher, and it seems these are automatically generated having an ontology newly loaded into the repository. But how it matched and the context for the match would be helpful. Also, here it would be helpful to know which matches were created by another user, like the 'REST' mapping in the picture below.

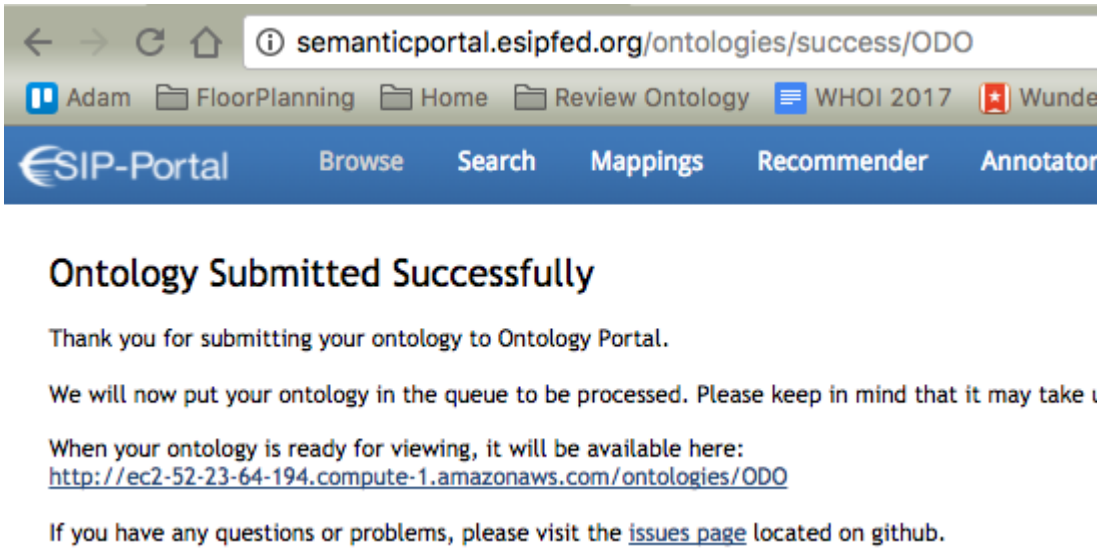


This seems to be a UI problem as the API provides this level of detail. From there, can see that REST is a type of user mapping.


```
  source: "REST",
- classes: [
    + { … },
    + { … }
  ],
- process: {
      id: http://ec2-52-23-64-194.compute-1.amazonaws.com:8080/metadata/mapping_processes/-bcodmo-fa3434a0-197d-0135-4001-0e8272a61ef5,
      name: "REST Mapping",
      creator: http://ec2-52-23-64-194.compute-1.amazonaws.com:8080/users/bcodmo,
      source: null,
      relation: http://www.w3.org/2004/02/skos/core#relatedMatch,
      source_contact_info: null,
      source_name: null,
      comment: "Cruise is a type of Deployment",
      date: "2017-05-12T20:17:42+00:00"
  },
  @id: http://ec2-52-23-64-194.compute-1.amazonaws.com:8080/rest_backup_mappings/fa4346f0-197d-0135-4002-0e8272a61ef5,
  @type: http://data.bioontology.org/metadata/Mapping
```


3. After successfully adding an ontology at http://semanticportal.esipfed.org/ontologies/success/ODO, the resulting display shows a link with a different domain than semanticportal.esipfed.org. Clicking this URL, shows the same UI, but now the domain name is changed as you navigate around in Amazon

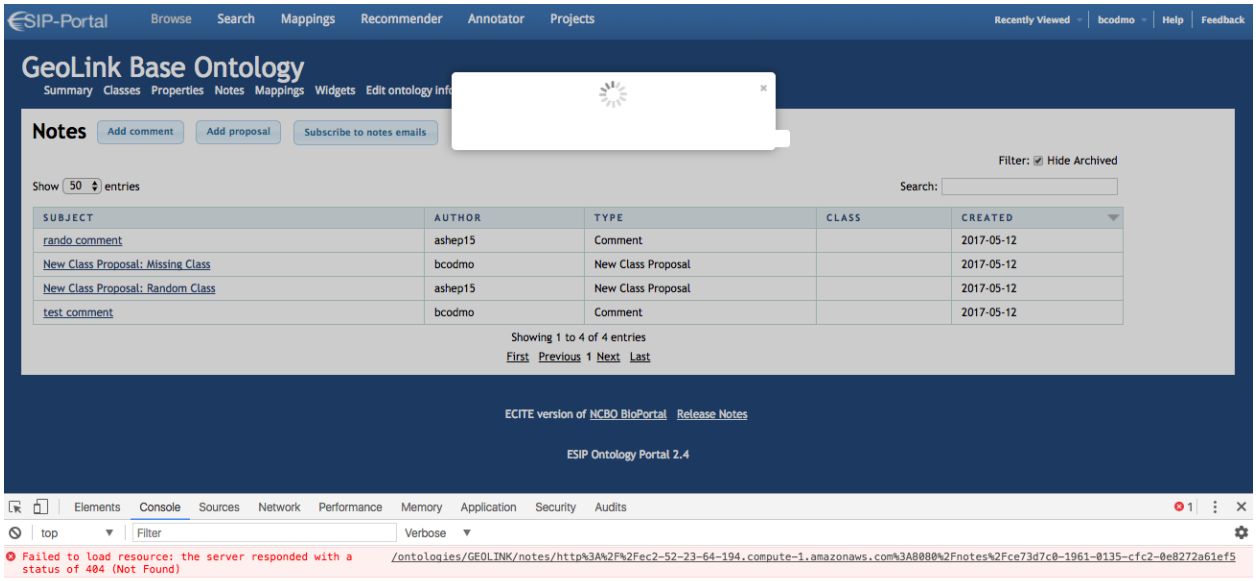
AWS space. This also might just be a server-side configuration issue.



4. When viewing an ontologies properties, I noticed the hierarchical navigation not listing for my small ontology. Inspecting the browser console, I noticed an error related to loading the ontologies properties. From http://semanticportal.esipfed.org/ontologies/PTO?p=properties , I see the CORS error below:

It looks like the leading of ontology properties is trying to access the Amazon AWS domain space causing CORS issues. To fix, the web server could simply add a 'Access-Control-Allow-Origin' response header, or maybe config option as mentioned above.

5. You can make notes or comments on classes and properties; but viewing the notes/comments seems broken as it spins for a while and the browser JS console shows an error msg of 404 (Not Found).



Evaluator 2

Summary:

The ESIP-Portal is a repository of ontologies related to the Earth Sciences that is web based, and accessible both without login for limited functionality, and with login for more complete functionality. The ESIP-Portal's primary purpose is to make existing Earth Science related ontologies more widely known and available by offering browse, basic and advanced search, mapping, recommender and annotator services for the ontologies within the registry. It's also possible to find projects that are using the registry's ontologies. It is based on an instance of BioPortal.

In general, the ESIP Portal has a web interface for users who are not as familiar with semantic technologies, but may have less power "under the hood", fewer existing capabilities in terms of functionality related to the 4 use cases offered, and less potential for long term sustainability in terms of sysadmin, developer, and user interface enhancement support.

Use Case #1: Use of Semantics within Search Engine

a. Ability to complete workflow tasks

The web interface (http://semanticportal.esipfed.org/) provides a term search that is easily identified (i.e., the right hand box labeled *Search resources*). Immediately upon entry of a term (*sensor* in the test), the interface provides a dropdown listing of potential matches from within a variety of ontologies. Pressing the *Search* button, and opening the *Advance Resource Search* URL both produced the same error: *We're sorry but something has gone wrong. We have been notified of this error*.

The corresponding API is well documented (https://github.com/ESIPFed/Semantic-Portal/blob/master/api_examples/classes_search.py) with straightforward code examples. (Some tinkering would be required if a developer were not familiar with Python, but the steps required are clearly demonstrated and would be easily transferrable to other languages).

Usability

- Web interface seems straightforward, although error messages noted above precluded testing more than the simple input of a term with resulting drop-down list of potential matches
- API provided straightforward access to results.

Quality and clarity of documentation

Both the web interface and API were user friendly with simple, easily understood intent, instructions, and results.

Ontology ingest capability

Not tested … not part of the Workflow & underlying Requirements

Portal access

Both the web interface and API provided straightforward access.

Quality and usability of the portal's display.

- The web interface provided simple, easily understood intent, instructions, and results.
- The API returned results that could be parsed as needed by a developer to provide a useful interface to the portal's content.

Search-capabilities

Given the workflow's requirement to search a term, both the web interface and API served to provide the expected results.

Errors

The web interface provided no useful explanation of the problems that were encountered, just a simple statement that something was wrong and "we" are aware there was an error.

The API is dependent on getting protocols, parms, and sequence of events sorted out according to the error analysis capabilities of the chosen programing environment. No error feedback from the portal itself was encountered during the test.

API support

The API's clarity of purpose and simple, straight forward implementation examples demonstrates the value of basing such interfaces on extant, long-running technologies where the vagaries of user's levels of expertise plus confusion about the purpose and executing of the API have been sorted out over time against a large number of users and use cases.

Maintainability

See API Support above and Recommendation section below.

Overall impressions

Both the web interface and API exhibit traits that use a known, long-running, stable underlying technology (BioPortal). The usability and straight-forward nature of both interfaces demonstrates how work can focus on objectives for access to the portal's content rather than devoting significant resources to getting the underlying nuts and bolts to work (rewarding as such innovative development efforts can be).

Use Case #2: Browsing a Portal for a Relevant Ontology

Ability to complete workflow tasks:

All tasks could be completed for this use case.

Usability:

- For this use case, the portal seemed reasonably usable. While the documentation was terse, and rather confusing in terms of what should be done to search for keywords, the simple search resulted in useful information, and understandable navigation to the information that would be helpful, i.e., (which ontologies contained similar or related terms.
- The fact that different descriptive information was displayed from one ontology to another was frustrating, but presumably, that is a function of the lack of standardization in the field for describing an ontological class.
- The mapping of terms function from one ontology to another seems very useful and direct, when it exists. It is not at all clear how the researcher in this use case would add to the mappings, if interested as the documentation at the top level (dropdown button from the welcome screen and a mappings search result) does not given one the option. Only within a given ontology and within the "Class Mappings" display is the option to "Create New Mapping" available. This destination is very deep within the structure of the ontology and would be very difficult to find from the top of navigation chain were one interested in doing that.

Quality & clarity of documentation:

The documentation for this portal is quite sparse, especially for the non-semantic savvy searcher. Definitions, examples, and tips for this kind of searcher would be very important to the success of the portal for this use case.

Ontology Ingest capability: n.a. for this use case

Portal access:

- For this use case, it was not necessary to sign in to the portal, so access was quite simple and easy.
- Several of the times when trying to use the portal, however, the response times and functionality seemed to be quite slow and/or compromised which definitely would affect the more impatient user. Testing this system under load might well be advisable.

Quality & usability of the portal's display:

- The Welcome page to the portal was simple with a succinct description about what could be done within the portal. For this use case, it seemed fairly straightforward to just enter the keyword term suggested although the distinction between the Search all ontologies option and the Search resources options are unclear.
- The areas of information on the Welcome page that could be provided (Ontology visits, Statistics, Latest Notes, Latest Mappings) would be interesting to help assess the breadth of use and coverage of the portal. Not all of the categories contained information, however, so it was unclear what some of the terms referred to or what the source of the information would be, e.g., Statistics – Resources Indexed, or Ontology Visits. For example would the visits measured refer to all of the ontologies? It wasn't possible to request the number of visits for a specific ontology, and the "More" link did

not return any information either or link to any further explanation or definitions.

- Many of the features provided either didn't work or didn't work well:
    - The search options worked well when searching for key words at the Welcome page level, and at the level immediately under the dropdown Search button at the top of the Welcome page. At other levels, a search for key words garnered no response (see the Search capabilities section for further specifics.
    - Using the Jump to options either received no response at all, or spun with a "loading" message appearing on the screen. Perhaps this was simply a problem at a particular time, as it did work the next day when tried again.
    - It was not possible to get back to the Search results page without opening a new tab in the browser as the browser Back key did not work (using Google Chrome), and message returned spun endlessly as "loading". The Back button did work to return to the search results the next day when tried again, so perhaps this was a temporary problem.

Search capabilities:

- At the initial home page , there were 3 options for searching: "Search all ontologies", "Find an ontology", and "Search resources". At this level, it was unclear what the difference was between the Search All Ontologies field and the Search Resources field, especially as the latter did not seem to work when searched.
    - When inputting the search term for "sea water", there were some suggestions for terms after the term "sea" had been entered, but those suggestions disappeared once the space key and the start of the next word ("water") was entered. Inputting the full two word term returned only an error screen which said that something had gone wrong and "we" were notified.
    - Also the assistance with the term prompting help did not consistently occur in the 2 – 3 times the search was attempted.
    - The Advanced Resource Search did not work either and returned the same error message as mentioned above.
- In general, the searching process seems quite slow to return results.
- Top level search from dropdown menu was easy to insert terms and get a response back from the term suggested by the use case; other terms also returned search results from different ontologies, so that worked well.
- When no search results came back, it wasn't clear why, e.g., was punctuation needed, such as single or double quotes around the terms? Not clear what is being searched when entering terms.
- When going to the "advanced options" for search:
    - A non-semantic searcher may not have any idea what the options for inclusion in the search mean, e.g., "Property values", "Obsolete classes", "Ontology views"; definitions or examples would be helpful for both this searcher as well as a semantic technologies savvy searcher since it isn't until the "details" link is clicked that all of the descriptors for the keyword / class appear, and reveal what the term means in this portal context.
    - No definitions were provided on the screen and a click on the help button (the

"?"), only took one to the (meager) general help screen, and from there to the API Documentation for search, so not helpful for the non-developer / non-semantic geek.

- Unclear what "Categories" refers to from the advanced search page
- Choosing an ontology in which to search a specific term worked:
  - the reference to the number of other uses of the search term submitted within the requested ontology was helpful, as well as the opportunity to go straight to the details.
  - The details page itself was stark, and it _may_ be unclear to a non-semantic searcher what to do with the information in the details view although the existence of a hyperlink to the class of which the searched term is a subclass is somewhat helpful, albeit misleading. Seems like the first step to take would be to go to the information for the searched term itself which is present, but not hyperlinked. Failing the searched term's ID being hyperlinked, a brief suggestion about using that ID in a separate search would be more helpful. This still would mean that the searcher would have to go to yet another search screen, risking navigational confusion.
  - Having the option to list all of the ontologies is helpful at this point, although on that list, it is again unclear what the "Groups" and the "Categories" options would give you. Is this for sorting? Nothing happens when either are clicked, so not clear what this is for. Some documentation (using a hover button?), definition, or example would be helpful.
  - The "clear selection" button is also helpful here.
- The visualization options were quite unsatisfactory:
  - As it was somewhat clear what the options mean (i.e., "path to root", "term neighborhood", and "mappings neighborhood" – which didn't seem to return a response, btw) to a person who knows ontologies, and would be probably be even less understandable to a non-semantic researcher. A link to an example in the Help documentation would be useful.
  - Another problem with the visualization options was the size of the window for the visualization – very small, so difficult to see the terms on a big monitor, so a laptop or tablet might be worse.
  - The response time was quite slow.

<u>Errors:</u>

- There were many times within the 3 – 4 separate occasions when testing this portal that errors seemed to occur within the portal itself, as evidenced by a churning message about "loading". (See more about these problems in the discussion of searching and quality / clarity of documentation.)
- At other times, a message was returned which noted that the error had been noted by the system developers which was more helpful.
- The navigation of the structure can be quite confusing with several deadends, and no

hint as to what was done wrong. (See the discussion of "Mapping" under the Usability section above.

API support:

An API search for the keywords associated with this use case was not done, so n.a.

Maintainability:

See API Support above and Recommendation section below.

Overall impression:

- The ESIP Portal worked well for this use case as it was fairly straightforward to do a simple keyword search and get back results that could be assessed quickly and easily.
- If the searcher needed or wanted to use the advanced search options to find terms to match a concept or keyword, more effort would be required, and probably, less successful as both the advanced search functionality and definition / documentation related to those kinds of efforts are barriers as described above.

Use Case #3: Annotating Text

Ability to complete workflow tasks:

Tasks could be completed up to step 7, but none after that.

Usability:

- ***If*** this portal has the capability to fulfill all the requirements of this use case, it is not at all clear how to do this.
    - The first part of the use case, up to step 7 was fairly easy to accomplish with the exception that there seemed to be no way to upload a document unless "upload" meant cutting and pasting copied text or entering text.
    - Once text was entered, and one elected to "Get Annotations", the results were very confusing and not explained at all. (NOTE: The all ontologies option was chosen rather than a selected ontology.
        - What is the difference between the Class & Ontology columns vs. the Matched Class & Matched Ontology columns? Why are both necessary since they seem to refer to the same class in the same ontology?
        - What does one do with this information? The returned results do not represent annotations in any semantic technology (or general semantic) understanding of that term. If one goes to the classes in the ontologies returned, it's possible to find the definition or description of the class (if present) and ascertain whether it is the same or similar term to the ones included in the text, but there is no way to "indicate" whether the term in the text should be "annotated" with the concept from the chosen ontology, or whether a hyperlink is / can be inserted into the text (steps #8 and #9 of the workflow for this use case).

    - If the desired path to accomplish step 8 of the workflow is to go to the ontology chosen and insert a “comment” under the “Notes” tab which seemed to be the only way to add any information, a) this does not accomplish the desired tasks since it doesn’t insert anything into the text submitted in the Annotator processing box, and b) the terms “notes”, “comments”, and “annotation” seem to be used interchangeably which is both confusing and incorrect since “annotation” as a specific definition as a property within most ontology creation / editing tools.
- Also, the methods for filtering the text under the Annotator dropdown screen are not defined, so it’s not clear how one would use them, e.g., “Match Longest Only”: match longest *what?*
- This tool would be useful for identifying classes that match concepts entered, but would seem to be much for efficient and productive to enter specific keywords or short, pithy phrases than much text, such as an abstract to a publication. If that is the case, the

Quality & clarity of documentation:

- Very sparse, unclear and lacking in examples on the Annotator tool pages.
- There is no or very little discussion in the Help text for the portal.
- Linking to the technical documentation for the API and then to the Annotator section would do little to help Professor Brown in this use case.

Ontology Ingest capability: n.a.

Portal access: no problems assuming the existence of an account

Quality & usability of the portal’s display:

- See above comments under the Usability section.
- The lack of definitions, and especially the use of 3 different terms for similar(?) results is very confusing, i.e., “annotation”, “notes”, “comments”.
- One suspects that Professor Brown would have long since assigned the task of adding technical definitions for terms and links to existing ontological terms to some hapless graduate student who would either use the keyword search function, or have the time to go through each of the redundant classes.

Search capabilities:

- For this use case, the Annotator tool seems to have few useful options for filtering full text such as automatically or selectively identifying and filtering out stop words or characters, including constructions such as hyphens between words (e.g., sea-ice), etc.
- Short phrase or keyword searching seems to be much more efficient and productive in terms of assessing the results.

Errors:

Assuming this tool could accomplish the full requirements of this use case, the chance for error on the part of the user is quite high as the workflow associated with steps is not clear, and there are few clues as to change one’s input or understanding of the results to correct the errors.

API support: n.a. for the professor in this use case.

Maintainability:

See API Support above and Recommendation section below.

Overall impression:

- Useful tool, but not for this full use case as it does not meet the requirements, specifically #s 6 and 7.
- Very poorly documented.

Use Case #4: Editing, Extending and Releasing New Versions of An Existing Ontology

Ability to complete workflow tasks:

While it was possible to upload an ontology to this portal, it was not possible to see it as the URL did not ever resolve to a view of the ontology during the evaluation timeframe. Also, there did not seem to be a way to edit, extend or release new versions of other ontologies in the portal except by proposing changes to classes, properties, etc. Even that capability was hard to find in the interface, and once found, very difficult to verify (couldn't find it again).

Usability:

Quality & clarity of documentation:

Ontology Ingest capability:

Portal access:

Quality & usability of the portal's display:

Search capabilities:

Errors:

API support:

Maintainability:

Overall impression:

Not well designed for ongoing ontology maintenance and support.

Evaluator 3

Summary

ESIP Portal is a lightly customized version of the Bioportal, which has been an important resource for the life-science community for more than 10 years. Bioportal has previously been customized for Agroportal and possibly in other domains that I'm not aware of.

It is a mature product, with a good search capability, and some useful text-oriented tools on top (recommender and annotator). The user interface is somewhat dated, but the functionality is rich - it has been tested over many years by a relatively large and demanding community. Its origins pre-date the formalization of OWL by W3C, so it supports some previous ontology formalizations, in particular OBO which has been important in the life-sciences community, though is little used elsewhere. Some of the user functionality appears to follow OBO, such as 'groups' and 'obsolete branches'. The scope of Bioportal appears to be limited to class-based ontologies, which excludes semantic resources based on 'individuals' such as SKOS-based vocabularies, which are heavily used in some earth science communities so this appears to be a significant technical limitation. The UI does not provide many clues about the underlying technical implementation. However, the ESIP Portal does not appear to support the full range of serializations in use (missing Turtle and JSON-LD for download - which are the most popular current formats, the latter likely to be critical going forward). I note that Agroportal and Bioportal appear to provide more support, so maybe ESIP Portal uses an earlier version of the software. There is a faceted browse, though the facets are not useful over the current population of content.

The ESIP deployment of the portal is a bit buggy, compared with Bioportal or Agroportal. Some minor annoyances around user-management, submissions, editing and updating submissions, stray characters in the HTML formatting. Error messages are cryptic or non-existent. I couldn't find any general guidelines on preparing an ontology for submission. Links from the recommender results failed. I was also unable to use the API - I got http 500 errors consistently. So I was also unable to test the HTTP content negotiation.

The ESIP Portal currently has a mixture of ontologies registered, including some from the OBO Foundry, a few from W3C, and a variety of submissions from the ESIP community. However, there clearly needs to be better validation on ingest - the SWEET ontology appears to have >20 classes with the name 'ErrorN' according to the browse tree, for example.

Detailed comments arising from use-case evaluation

Use of semantics within search engines

The search capability in both repositories is limited to partial string text matching. Thus neither appears to address the specific scenario described in the use case, which is to deliver a

ranked list of results. Where the use case is to ‘semantically match’ terms, then this is actually limited to matching strings in either the resource URI or within the value of one of its labels.

The ESIP Portal only appears to support searching over Classes and optionally Properties, not individuals (e.g. SKOS Concepts). However, I was unable to get the API to work, so only used the form-based UI for testing. I had consistent http 500 errors using the API (over several weeks).

Browsing for a relevant ontology

Ontology browsing is effective in both repositories. The ESIP Portal UI is dated, though the instant view of ontology statistics is a nice feature.

In practice the use case specified in the instructions is a variation on the searching use-case already discussed. ESIP Portal is limited to Classes and Properties. This is the biggest limitation in ESIP Portal

Annotating text

This specific function is supported by ESIP Portal.

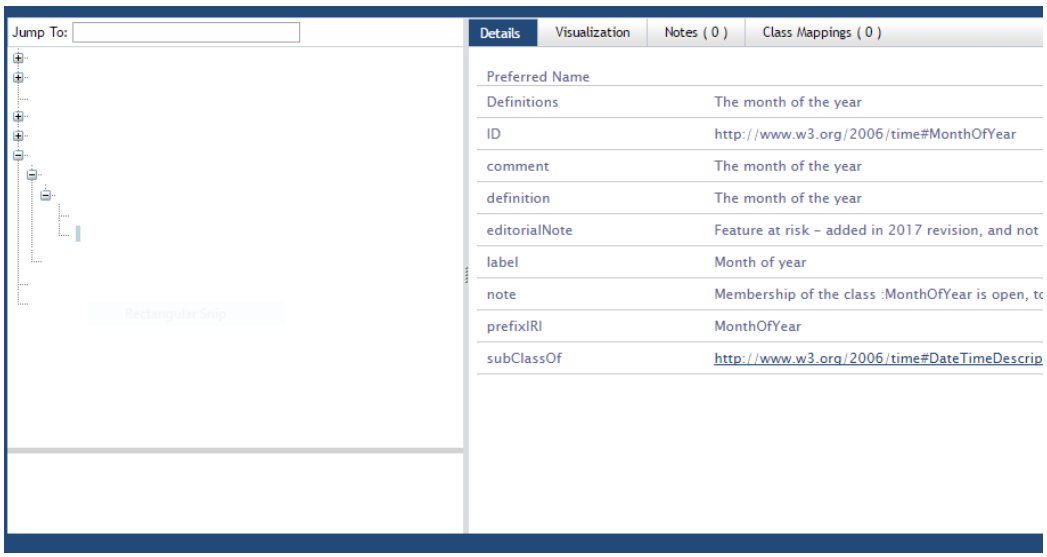
I was able to follow the workflow items 1-7, though items 8, 9 are not supported - selecting the best annotations and moving them into your text has to be done using other tools. Again, I worked through the ESIP Portal UI, not the API.

However, the results of the annotation were rather disappointing. On a paragraph of text containing a number of science domain specific words, the annotator failed to pick many of them out, even though I know the terms are present in some of the ontologies. Clearly more work needed on the algorithm (word2vec?).

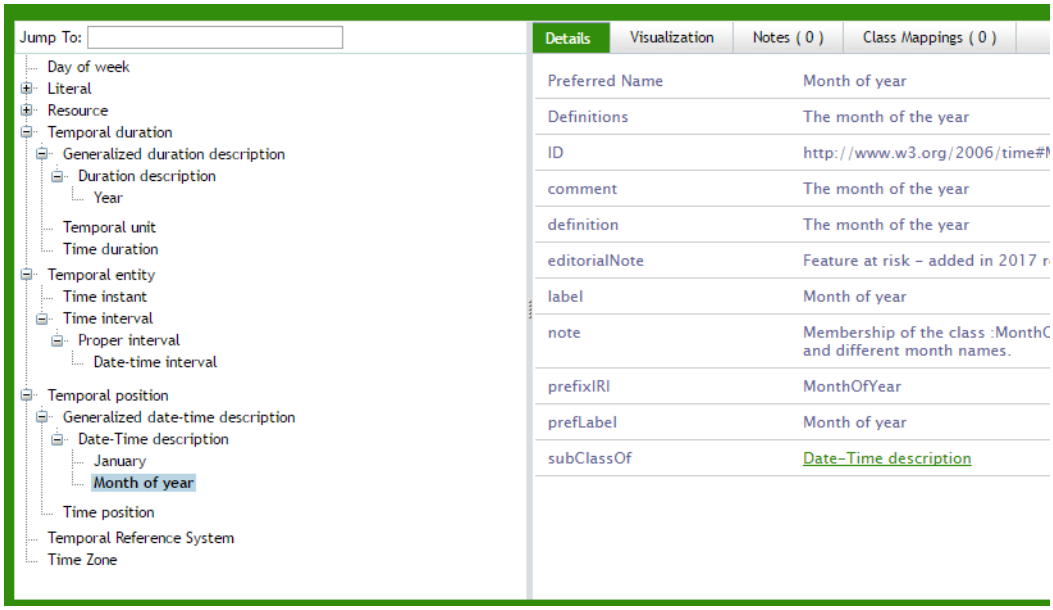
Editing/extending/releasing new versions

I was able to add multiple ontologies. However, this was far from pain-free. And because of the occasionally flakey behaviour of the ESIP Portal I repeated my testing using an account on Agroportal.

Using ESIP Portal, uploading one ontology led to some buggy behaviour. The class tree showed no labels, and the properties tree did not render at all.



However, in Agroportal everything worked as expected (after a delay for 'analysis' of the ontology after loading), so this appears to be a local configuration problem which could be overcome with a little more work.



Editing/extending ontologies in both platforms is supported by uploading a replacement for the whole ontology.

"Releasing" a version of an ontology is supported in both portals by changing the viewing restrictions/visibility from private/owner to public. Both repositories also have a separate 'status' flag - though the values for these are different and do not appear to correspond to any external enumeration of values.

Appendix: Response

The evaluators have done an excellent and thorough job of reviewing the ESIP Semantic Portal with regard to the specified Use Cases and we appreciate the opportunity to respond to their comments. We note that they disagree on some essential points however, like the support for APIs and JSON LD serialization. Evaluator 1 was able to make use of the APIs for all 4 use cases (search, browsing, annotating, versioning), and noted that, in the case of mappings, the API provided more information than the GUI. Evaluator 1 also noted the APIs' usefulness, ease of use, documentation, intuitiveness, and quick turn-around on questions. Evaluator 2 seems to have tried only the API for search (it worked). Evaluator 3 tried it unsuccessfully. Evaluator 3's comment on the missing serializations (JSON-LD) being important for the Earth Science community is also disproved by Evaluator 1 who reports that an API returns this format.

Regarding sustainability, we note that a large team at Stanford University currently led by John Graybeal has developed and is continuing to develop new features in BioPortal, the technology the Semantic Portal is based on, for over 10 years. A new release of the Virtual Appliance upon which our portal is based (release 2015) is expected for August 2017 and will incorporate the fixes described below. We are working closely with the Stanford team to ensure that the results of the ESIP evaluation are included in the new release.

For an ontology portal to be provided, adapted to the community needs, and maintained successfully, ESIP must devote continuous resources including for a system software maintainer (such as a computer science student) and a dedicated or virtual (cloud) server (e.g., ECITE).

Our plans rely on continuing to make use of the open-source BioPortal software and adapt it to the needs of the Earth Science community including the needs described below. The improvements and fixes that we need to make to our adaptation will be done by tracking and applying the improvements and fixes made to the BioPortal software release on GitHub. This will require the continual support by ESIP of a student who can track and apply software updates.

In our next version, we will make the following changes specific to the suggestions from each evaluator.

Response to Evaluator 1

Lines 57-63 (Use Case 1): We will change the header appropriately for search results that are returned in JSON-LD when using the API. Additional information useful for context of a match is available with the browse option. We will look for ways to incorporate this under the Search option.

Lines 88-102 (Use Case 2): The UI problems with the syntax of search terms have been fixed in the BioPortal software and the fixes will be propagated to our Portal in its next release.

Lines 106-121: The suggestion to add ontology metadata in the form of “competency questions” that a submitted ontology is intended to address is excellent. We thank the reviewer for it, we will propagate the comment to the Stanford team and will make this addition in our next release.

Line 126 (Use Case 3): We will fix the error in the hyperlinks returned by the Annotation Tool.

Lines 163-166: We will improve the documentation of the Annotator Tool.

Lines 172-180: We will fix the error in the format of the returned URL.

Lines 204-211 and 213-221 (Use Case 4): We will improve the display by the UI of returned mapping information.

Lines 231-235: There are mistakes in our configuration of the Virtual Appliance from BioPortal, which we will fix in our next release.

Lines 237-249: We will apply the fixes already made for the latest BioPortal software to our release.

Response to Evaluator 2

Lines 260-263 (Executive Summary): The summary evaluation seems inconsistent since 1) it is mostly disproved by this evaluator’s own evaluation in terms of the use cases; 2) there are conjectures and unsubstantiated claims, from the evaluator’s own admission; 3) potential for long-term sustainability is a comment about ESIP support for portal technology – not the technology itself. The evaluation exercise is supposed to address exactly this criticism by deciding which portal ESIP can throw resources at; and 4) this evaluation appears incomplete, as only the search API was used and many self-references are made that point to nothing. This incomplete evaluation does not support their judgment calls of less functionality.

Lines 266-271 (Use Case 1): The error in the Advanced Search capability of the UI will be corrected in the next release, as it has already been corrected in the base BioPortal software.

Lines 318-322 and 335-337 (Use Case 2): The documentation will be improved as suggested.

Lines 302 and 446: Use Cases 1 and 2: The evaluator seems to have attempted to use only the API for search, and did so successfully.

Lines: 307, 436-439, 448, 518, 520: Evaluation 2 keeps referring back to itself (see above, see below, see discussion). However, these references point to no previous concrete comments or suggestions.

Lines 372-424: Errors in the performance of the Search capabilities will be addressed in the next release, as they have been fixed in the BioPortal software.

Lines 425-434: The Visualization capabilities will be addressed as they are addressed in BioPortal.

Lines 460-517 (Use Case 3): The suggestions for improvement of the Annotation tool involve fixing configuration errors and expanding and clarifying the documentation. We will address both of these aspects.

Lines 527-532 (Use Case 4): The problem identified in the evaluation of Use Case 4 involves the slow parsing of a new ontology. There can be many reasons for the slow parsing of an ontology, including the performance of ECITE resources allocated to the task at the time of parsing. We do not control these resources and this makes it difficult to diagnose root causes of performance issues.

Lines 529-532: Extending/editing/versioning an ontology: as noted by Evaluator 3 (L 622), both portals accomplish this by uploading new versions of an ontology. The Semantic Portal ensures that the newest version of an ontology is most visible, and is available in more serialization formats than older ones.

Line 543: the Semantic Portal is not an ontology editing tool. Support and maintenance of ontology versioning is accomplished by the ability to edit ontology metadata.

Response to Evaluator 3

Lines 554-555: Contrary to what Evaluator 3 says, OBO is in use in the environmental science community as evidenced by the DataONE ESCO (Ecosystem Ontology) efforts showcased at the upcoming ESIP Summer meeting 2017. ESCO is striving to maintain compatibility with OBO. OBO is important for interdisciplinary research such as in ecology where life and environmental sciences meet.

Lines 567-572: Most of the errors that were identified by Evaluator #3 will be addressed in the release of a new Bioportal Virtual Appliance scheduled for August 2017.

Lines 570-572 and 587-588: The APIs work and are well-documented in several places as demonstrated by Evaluator 1 for all of them and Evaluator 2 for the first use case.

Lines 574-577: The errors noted are inherent in SWEET, and are not errors in the Portal. If the submitted ontology parses in Protégé it will parse in the Semantic Portal. Community engagement is needed for cleaning up SWEET and underway in ESIP.

Lines 586-589 and 594-596 (Use Case 2): The ESIP Semantic Portal does not store instance data, as in SKOS. Specifically, it stores

- Ontologies, not the data the ontologies describe
- Metadata, not data
- Generally, RDFS, not RDF

Protégé can handle a file containing both a single ontology and its instance data, but if that file is submitted to the portal, the instance data is simply ignored. Thus, functionality is available only for classes and properties.

(DataONE, Research Data Alliance, and the numerous data repositories listed under re3data.org are the efforts that target the accessible storage of data.)

Lines 04-607 (Use Case 3): The Annotation capability will be improved in the next version. Line Pouchard has been experimenting with word2vec in another project, and can easily adapt the technology to the Semantic Portal Annotation engine if the capability is desired by the community.

Lines 609-614 (Use Case 2): The patches that have already been made to the BioPortal software for adding and extending ontologies will be applied to our next version to correct the “buggy” behavior that was noted.