

# Collaborative Ontology Development Using the Webulous Architecture and Google App

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**Abstract.** Authoring bio-ontologies is a task that traditionally requires contributions from both a domain expert and an ontology engineer. That many domain experts are not also experts in ontology design or in languages as the Web Ontology Language (OWL) is a significant bottleneck in the development process, especially as requests typically outnumber the bandwidth of a single ontology developer, which impacts both ontology development and the ability to semantically describe data typically seen in the Semantic Web. We present the Webulous architecture, a server-client application for developing ontologies based on customisable client interfaces. We also describe the Webulous Google App, a client to Webulous that allows collaborative, online editing of Google Spreadsheets. These spreadsheets can be pre-populated with parts of ontologies loaded from resources such as BioPortal and can be rapidly turned into new ontology terms using behind the scene templates which automatically axiomatise cells in a row to create rich and consistent ontology classes.

## 1 Introduction

Like most data resources, ontologies are rarely complete, and healthy ontologies are continually growing as the state of knowledge progresses. One of the ways in which ontologies grow is through the submission of external requests from users of ontologies. Typically, authoring these ontologies is a task performed by trained experts, familiar with ontology development practices and the complexities of languages such as OWL. OWL ontologies can be developed with dedicated ontology authoring tools such as Protégé<sup>1</sup>. This can be a barrier to a domain expert in contributing to ontologies and additionally represents a major bottleneck to ontology authoring. In addition, ontologies which represent a particular domain are often seen as consensus models. Such consensus is ideally formed by a number of domain experts collaboratively constructing an ontology. Tools such as Web Protégé<sup>2</sup> allow ontology experts to collaboratively develop online, however, this again represents a barrier to a non-ontology expert in contributing to content. A solution which allows construction of ontologies alongside the direct contribution of numerous experts is required.

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<sup>1</sup> <http://protege.stanford.edu/>

<sup>2</sup> <http://webprotege.stanford.edu/>

## 2 Webulous and the Webulous Google App

We have developed the Webulous framework and the accompanying Webulous Google App to tackle some of the issues associated with collaborative editing and engaging domain experts who are not ontology developers. Webulous has a server backend that acts as a hub for serving up template spreadsheets, receiving content once a spreadsheet is submitted and for creating new ontology classes or enriching existing classes for addition to an ontology.

The Webulous Google App is a spreadsheet Add On which can enable ontology editing using a Google Spreadsheet online and collaboratively with others. Cells in the spreadsheet can be prepopulated with suggestions from parts of an existing ontology to help editors, for instance all subclasses of the class ‘cancer’ for a column called ‘cancer type’. Once a spreadsheet is complete, it can be submitted and programmatically turned into new classes using a server side design pattern. This create axioms based on the column, for the instance above column B ‘cancer type’ which may be axiomatised as ‘has\_disease some <column\_B>’ in OWL where column\_B is the class entered into a cell.

Webulous has the following primary features:

- Connect to the Webulous server using Webulous Google Spreadsheet Add On
- Share and collaborate on the spreadsheet with others
- Can restrict columns of the Webulous Add On to particular parts of an existing ontology (e.g. all subclasses of disease or human anatomical regions)
- Search BioPortal for a class and add into the spreadsheet as you create a term
- Create custom client using the Webulous API

### 2.1 Availability

The Webulous Service for submitting EFO terms is available at <http://www.ebi.ac.uk/efo/webulous> The Webulous Google App is available at <https://chrome.google.com/webstore/detail/webulous/noieiladpjihajkdgipcmmnjcgplo> and the Webulous source code for installing your own service is available at <https://github.com/EBISPOT/webulous>

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