Supplementary Information

## Section 1

The schema editor described in this article is packaged with a snapshot of the BioAssay Ontology and imported fragments of other ontologies, which can be downloaded from the GitHub subfolder: https://github.com/cdd/bioassay-template/tree/master/data/bao. These files can be mixed with any number of schema files, each of which contains one template and some number of annotated assays.

To execute SPARQL queries against this content, the Apache Jena/Fuseki project (http://jena.apache.org) is one option. A variation of the following configuration file for a repository can be used to have the server load up read-only bioassay and schema content:

@prefix : <http://base/#> .

@prefix tdb: <http://jena.hpl.hp.com/2008/tdb#> .

@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

@prefix ja: <http://jena.hpl.hp.com/2005/11/Assembler#> .

@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .

@prefix fuseki: <http://jena.apache.org/fuseki#> .

:dataset a ja:RDFDataset .

:service1 a fuseki:Service ;

 #fuseki:dataset :dataset ;

 fuseki:name "bao" ;

 fuseki:serviceQuery "query" , "sparql" ;

 fuseki:serviceReadGraphStore "get" ;

 fuseki:serviceReadWriteGraphStore "data" ;

 fuseki:serviceUpdate "update" ;

 fuseki:serviceUpload "upload" ;

 fuseki:dataset <#bao\_complete> ;

 .

<#bao\_complete> rdf:type ja:RDFDataset ;

 rdfs:label "bao\_complete" ;

 ja:defaultGraph

 [

 a ja:MemoryModel ;

 # all the files that make up the BAO and its dependencies

 ja:content [ja:externalContent <file:../../../bax/data/bao/absence.ttl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_external.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_instrument.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_unit.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/annotations.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_metadata.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_materialentity.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bax\_extensions.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_CHEBI\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_module\_biology.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_method.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bfo-classes-minimal.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_CLO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_module\_properties.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_organization.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bfo.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_DOID\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_module\_vocabularies.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_people.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/core.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_EFO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_ro\_combinator.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_phenotype.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_GO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_assaykit.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_properties.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/IAO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_NCBITaxon\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_assay.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_quality.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/ro.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_PATO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_biology.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_result.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/temporal-intervals.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/BAO2.0\_UBERON\_import.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_computational.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_role.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/UO\_import.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_complete\_bfo\_dev.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_detection.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_ro.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_complete.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_format.owl>];

 ja:content [ja:externalContent

 <file:../../../bax/data/bao/bao\_vocabulary\_screenedentity.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_core.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_function.owl>];

 ja:content [ja:externalContent <file:../../../bax/data/bao/bao\_vocabulary\_software.owl>];

 # user-created content

 ja:content [ja:externalContent <file:../../../bax/data/template/schema.ttl> ] ;

 # ... and any other schema files

 ] ;

 .