
User Documentation

Release 2.0.1

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This is the user documentation for the [OpenBEL Framework](#), release 2.0.1, last updated January 29, 2015.

The OpenBEL Framework is an open-platform technology specifically designed to overcome many of the challenges associated with capturing, integrating, and storing biological knowledge within an organization, and sharing the knowledge across the organization and between business partners.

GitHub: <https://github.com/OpenBEL/openbel-framework#readme>

BEL Portal: <http://openbel.org>

Selventa: <http://www.selventa.com/>

The OpenBEL Framework is licensed under version 3 of the [GNU Lesser General Public License](#); see the page on [GitHub](#) for more details.

Contents:

Overview

Getting Started

2.1 Visualizing a Knowledge Network

1. Download Cytoscape (2.8) at cytoscape.org
2. Install KAM Navigator Cytoscape plugin by following the [installation guide](#)
3. Connect the KAM Navigator to the public demo server
 - Set the Webservice Location (WSDL URL) to: <http://demo.openbel.org/openbel-ws/belframework.wsdl>
4. Load up our example Knowledge Networks
 - Select your target Knowledge Network
 - [Explore](#) the KAM Navigator plugin

For further information go to the KAM Navigator [user manual](#)

3.1 Building Custom Namespaces

This tutorial walks through the steps required to build a custom namespace and integrate it into your OpenBEL Framework.

View tutorial at: [Building Custom Namespaces](#)

Contents:

3.1.1 Building Custom Namespaces

Sections

- *Definition* defines the importance of a namespace. A format template is also given.
- *Field Format* defines the format of each field.
- *Understanding Entity Encoding* explores entity encoding to enforce functional semantics in BEL.
- *Quick Start Steps* defines the steps to build and integrate the namespace with your OpenBEL Framework instance.

Definition

A namespace defines a catalog of biological entities useful within the BEL language. Namespace files end in the *.belns* extension. The file can be optionally compressed with *gzip*, but it must use the *.belns.gz* extension.

The namespace allows a user to track their own vocabularies or reconstitute existing vocabularies like EntrezGene or SwissProt. The file consists of two parts:

- Header
 - Contains Namespace section that captures the namespace definition and where it applies.
 - Contains Author section capturing who is responsible for creating the namespace.
 - Contains Citation section that captures the external vocabulary this namespace is based on.
 - Contains Process section that determines how the namespace file is processed by the OpenBEL Framework.
- Values

- The Values section contains all biological entities in value/encoding pairs. The value and encoding is delimited by the namespace’s DelimiterString. Each pair is separated by a newline.
- Entity encodings allow you to enforce BEL function semantics on a per-entity basis. Jump to [Understanding Entity Encoding](#).
- Format
 - * [ENTITY][DelimiterString][ENCODING]
 - * Examples
 - AKT1|GRP
 - Abdominal Pain|O
 - difenoxin hydrochloridelA
 - * Supports UTF-8 encoded entities.

File Format

The following is the structure of a namespace file:

```
[Namespace]
Keyword=KEYWORD (aka regex: \w+)
NameString=STRING
DomainString=STRING
SpeciesString=STRING
DescriptionString=STRING
VersionString=STRING
CreatedDateTime=ISO8601 DATE/TIME
QueryValueURL=URL

[Author]
NameString=STRING
CopyrightString=STRING
ContactInfoString=STRING

[Citation]
NameString=STRING
DescriptionString=STRING
PublishedVersionString=STRING
PublishedDate=ISO8601 DATE
ReferenceURL=URL

[Processing]
CaseSensitiveFlag=no|yes
DelimiterString=STRING
CacheableFlag=yes

[Values]
# Single-line comment
{ [ENTITY] [DelimiterString] [ENCODING]
```

Each field name ends with the type information for it.

- KEYWORD
 - Represents a string containing **Word Characters** only, max length of 8.
 - Preferred namespace prefix when used in BEL language.

- String
 - Represents a user-defined, UTF-8 encoded string (represented as a Java string).
- Date
 - Represents a date in [ISO 8601](#) format.
- DateTime
 - Represents a date/time in [ISO 8601](#) format.
- URL
 - Represents a valid parsable URL.
- Flag
 - Represents a boolean using the values “no” (false) and “yes” (true).

Field Format

Block	Field	Description	Re- quired
Names- pace	Keyword	Preferred BEL Keyword, Word Characters , max length of 8	Yes
Names- pace	NamespaceString	Namespace name, UTF-8 encoded string	Yes
Names- pace	DomainString	One of : “BiologicalProcess”, “Chemical”, “Gene and Gene Products”, “Other”	Yes
Names- pace	SpeciesString	Comma-separated list of species taxonomy ids	No
Names- pace	DescriptionString	Namespace description, UTF-8 encoded string	No
Names- pace	VersionString	Namespace version, UTF-8 encoded string	No
Names- pace	CreatedDateTime	Namespace publish timestamp, ISO 8601 Date/Time	Yes
Names- pace	QueryValueURL	HTTP URL to query for details on namespace values (must be valid URL)	No
Author	NamespaceString	Namespace’s authors, UTF-8 encoded string	Yes
Author	CopyrightString	Namespace’s copyright/license information, UTF-8 encoded string	No
Author	ContactInfoString	Namespace author’s contact info, UTF-8 encoded string	No
Citation	CitationNameString	Citation name, UTF-8 encoded string	Yes
Citation	DescriptionString	Citation description, UTF-8 encoded string	No
Citation	PublishedVersion-String	Citation version, UTF-8 encoded string	No
Citation	PublishedDate	Citation publish timestamp, ISO 8601 Date	No
Citation	ReferenceURL	URL to more citation information (must be valid URL)	No
Process- ing	CaseSensistiveFlag (unused)	no for case-insensitive lookup, yes for case-sensitive lookup	No
Process- ing	DelimiterString	User-defined delimiter string that splits namespace value from encoding	Yes
Process- ing	CacheableFlag (unused)	no to never cache namespace, yes to always cache	No

Understanding Entity Encoding

The entity encoding allows the OpenBEL Framework to enforce functional semantics when processing BEL documents. The biological entities can define a set of encoding flags that indicate which functions apply to this entity. For example whether an entity produces a protein or not.

The valid encoding values are:

Encoding Value	Valid BEL Functions
B	bp(), path()
O	path()
R	r(), m()
M	m()
P	p()
G	g()
A	a(), r(), m(), p(), g(), complex()
C	complex()

An example would be the HGNC Gene Symbol **GK4P**. It can code for a gene and rna abundance, but not a protein. To capture these semantics we would add the **GK4P** biological entity to the namespace like:

```
GK4P | GR
```

Quick Start Steps

The quick-start to building and integrating your namespace with the OpenBEL Framework.

1. Grab the example template from the *File Format* section.
2. Customize the field values.
3. Build your biological entity values with proper encodings.
4. Deploy your namespace to a local (file) or remote (http / https) location. For file URL format consult [File URI Scheme](#).
5. Record the URL for this namespace for later. This uniquely identified your namespace.
6. Retrieve the stock resource index from the URL: <http://resource.belframework.org/belframework/1.0/index.xml>
7. Update the resource index with your namespace entry. Use it's URL retrieved in step 5.
8. Store the customized resource index locally using a local file URL. For file URL format consult [File URI Scheme](#).
9. Open the OpenBEL Framework config/belframework.cfg configuration file and change the 'resource_index_url' to this file URL.
10. Start using your namespace URL in BEL Documents!