pysbol2 Documentation

Release 2.3.0

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Contents

pySBOL is a SWIG-Python wrapper around libSBOL, a module for reading, writing, and constructing genetic designs according to the standardized specifications of the Synthetic Biology Open Language (SBOL).

CHAPTER 1

Introduction

pySBOL provides Python interfaces and their implementation for Synthetic Biology Open Language (SBOL). The current version of pySBOL implements SBOL Core Specification 2.1.0. The library provides an API to work with SBOL objects, the functionality to read GenBank, FASTA, and SBOL version 1 and 2 documents as XML/RDF files, to write GenBank, FASTA, and SBOL version 1 and 2 documents, and to validate the correctness of SBOL 2 documents. This is a Python binding for C/C++ based libSBOL. Currently, pySBOL supports Python version 2.7 and 3.6 only. pySBOL is made freely available under the Apache 2.0 license.

To install, go to Installation Page.

- The current snapshot of pySBOL is available on GitHub.
- Any problems or feature requests for pySBOL should be reported on the GitHub issue tracker.
- An overview of pySBOL can be found here.
- For further information about the pySBOL library, its implementation, or its usage, please feel free to contact the libSBOL team.

pySBOL is brought to you by Bryan Bartley, Kiri Choi, and SBOL Developers.

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CHAPTER 2

Installation

Currently, we support Python 2.7 and Python 3.6 for both 32 bit and 64 bit architecture. Python by default comes with package manager. Follow the steps below to install pySBOL. If you have Windows, and would like to try our Windows binary installers, check Using Installer for Windows section.

2.1 Using Pip

pySBOL is available for Windows and Mac OSX via PyPI, which is the simplest method to obtain pySBOL. To install pySBOL using pip, run following line on console:

```
pip install pysbol
```

If you encounter permission errors on Mac OSX, you may install pysbol to your user site-packages directory as follows:

```
pip install pysbol --user
```

Or alternatively, you may install as a super-user:

```
sudo -H pip install pysbol
```

To update pySBOL using pip, run:

```
pip install -U pysbol
```

2.2 Using Python

1 - Download the source code of latest release here and extract it. If you would like to try out our latest snapshot, use git and type following command in the console or terminal which will clone the source under pysbol folder.

```
git clone https://github.com/SynBioDex/pysbol.git
```

2 - Open your console or terminal. Go to package's root directory and Run the installer script by using the following command line. This will install pySBOL2 to the Python release associated with the console or terminal you are using.

```
python setup.py install
```

If you are having problems, make sure your console/terminal is associated with the right Python environment you wish to use.

3 - Test the pySBOL by importing it in Python.

```
import sbol
```

If you have trouble importing the module with the setup script, check to see if there are multiple Python installations on your machine and also check the output of the setup script to see which version of Python is the install target. You can also test the module locally from inside the Mac_OSX/sbol or Win_32/sbol folders.

2.3 Using Installer for Windows

We provide binary installers for Windows users only. Simply download the installers and execute it to install it. Installer will look for your local Python distributions.

Be sure to use the installers with the same Python version and architecture with the one installed in your local machine!

2.4 For Linux Users

Currently, Linux users should build pySBOL from source through libSBOL. Go to libSBOL installation page and follow the instructions for Debian/Ubuntu.

CHAPTER 3

Testing pySBOL

pySBOL comes with a testing function to check the integrity of the library. To run the tester, simply execute the following command.

```
import sbol
sbol.testSBOL()
```

The output tells you whether certain test has been passed or not.

```
testAddComponentDefinition (sbol.unit_tests.TestComponentDefinitions) ... ok
testCDDisplayId (sbol.unit_tests.TestComponentDefinitions) ... ok
testRemoveComponentDefinition (sbol.unit_tests.TestComponentDefinitions) ... ok
testAddSeqence (sbol.unit_tests.TestSequences) ... ok
testRemoveSequence (sbol.unit_tests.TestSequences) ... ok
testSeqDisplayId (sbol.unit_tests.TestSequences) ... ok
testSequenceElement (sbol.unit_tests.TestSequences) ... ok
testDiscard (sbol.unit_tests.TestMemory) ... ok
```

CHAPTER 4

Getting Started with SBOL

This beginner's guide introduces the basic principles of pySBOL for new users. Most of the examples discussed in this guide are excerpted from the example script. The objective of this documentation is to familiarize users with the basic patterns of the API. For more comprehensive documentation about the API, refer to documentation about specific classes and methods.

The class structure and data model for the API is based on the Synthetic Biology Open Language. For more detail about the SBOL standard, visit sbolstandard.org or refer to the specification document. This document provides diagrams and description of all the standard classes and properties that comprise SBOL.

4.1 Creating an SBOL Document

In a previous era, engineers might sit at a drafting board and draft a design by hand. The engineer's drafting sheet in pySBOL is called a Document. The Document serves as a container, initially empty, for SBOL data objects which represent elements of a biological design. Usually the first step is to construct a Document in which to put your objects. All file I/O operations are performed on the Document. The `read` and `write` methods are used for reading and writing files in SBOL format.

```
>>> doc = Document()
>>> doc.read('crispr_example.xml')
>>> doc.write('crispr_example_out.xml')
```

Reading a Document will wipe any existing contents clean before import. However, you can import objects from multiple files into a single Document object using Document.append(). This can be advantageous when you want to integrate multiple objects from different files into a single design. This kind of data integration is an important and useful feature of SBOL.

A Document may contain different types of SBOL objects, including ComponentDefinitions, ModuleDefinitions, Sequences, and Models. These objects are collectively referred to as TopLevel objects because they can be referenced directly from a Document. The total count of objects contained in a Document is determined using the `len` function. To view an inventory of objects contained in the Document, simply `print` it.

```
>>> len(doc)
31
>>> print(doc)
Attachment.....................0
Collection.....................0
CombinatorialDerivation.......0
ComponentDefinition...........25
Implementation................0
Model.........................0
ModuleDefinition..............2
Sequence......................4
Analysis......................0
Build.........................0
Design........................0
SampleRoster..................0
Test..........................0
Activity......................0
Agent.........................0
Plan..........................0
Annotation Objects............0
---
Total.........................31
```

Each SBOL object in a Document is uniquely identified by a special string of characters called a Uniform Resource Identifier (URI). A URI is used as a key to retrieve objects from the Document. To see the identities of objects in a Document, iterate over them using a Python iterator.

```
>>> for obj in doc:
...     print(obj)
...
http://sbols.org/CRISPR_Example/mKate_seq/1.0.0
http://sbols.org/CRISPR_Example/gRNA_b_nc/1.0.0
http://sbols.org/CRISPR_Example/mKate_cds/1.0.0
.
.
```

These objects are sorted into object stores based on the type of object. For example to view `ComponentDefinition` objects specifically, iterate through the *Document.componentDefinitions* store:

Similarly, you can iterate through Document.moduleDefinitions, Document.sequences, Document.models, or any top level object. The last type of object, Annotation Objects is a special case which will be discussed later.

These URIs are said to be **sbol-compliant**. An sbol-compliant URI consists of a scheme, a namespace, a local identifier (also called a `displayId`), and a version number. In this tutorial, we use URIs of the type `http://sbols.org/CRISPR_Example/my_obj/1.0.0.0`, where the scheme is indicated by `http://`, the namespace is `http://sbols.org/CRISPR_Example`, the local identifier is `my_object`, and the version is `1.0.0`. SBOL-compliant URIs enable shortcuts that make the pySBOL API easier to use and are enabled by default. However, users are not required to use sbol-compliant URIs if they don't want to, and this option can be turned off.

Based on our inspection of objects contained in the Document above, we can see that these objects were all created in the namespace `http://sbols.org/CRISPR_Example`. Thus, in order to take advantage of SBOL-compliant URIs, we set an environment variable that configures this namespace as the default. In addition we set some other configuration options.

```
>>> setHomespace('http://sbols.org/CRISPR_Example')
```

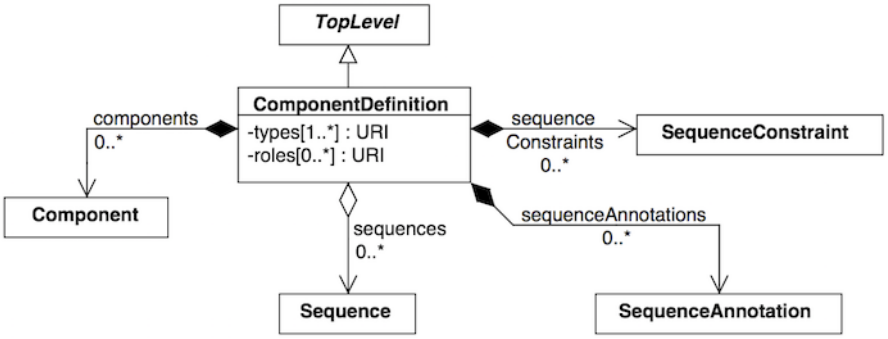
Setting the Homespace has several advantages. It simplifies object creation and retrieval from Documents. In addition, it serves as a way for a user to claim ownership of new objects. Generally users will want to specify a Homespace that

corresponds to their organization's web domain.

4.2 Creating SBOL Data Objects

Biological designs can be described with SBOL data objects, including both structural and functional features. The principle classes for describing the structure and primary sequence of a design are ComponentDefinitions, Components, Sequences, and SequenceAnnotations. The principle classes for describing the function of a design are ModuleDefinitions, Modules, Interactions, and Participations. Other classes such as Design, Build, Test, Analysis, Activity, and Plan are used for managing workflows.

In the official SBOL specification document, classes and their properties are represented as box diagrams. Each box represents an SBOL class and its attributes. Following is an example of the diagram for the ComponentDefinition class which will be referred to in later sections. These class diagrams follow conventions of the Unified Modeling Language.



As introduced in the previous section, SBOL objects are identified by a uniform resource identifier (URI). When a new object is constructed, the user must assign a unique identity. The identity is ALWAYS the first argument supplied to the constructor of an SBOL object. Depending on which configuration options for pySBOL are specified, different algorithms are applied to form the complete URI of the object. The following examples illustrate these different configuration options.

The first set of configuration options demonstrates 'open-world' mode, which means that URIs are explicitly specified in full by the user, and the user is free to use whatever convention or conventions they want to form URIs. Open-world configuration can be useful sometimes when integrating data objects derived from multiple files or web resources, because it makes no assumptions about the format of URIs.

```
>>> setHomespace('')
>>> Config.setOption('sbol_compliant_uris', False)
>>> Config.setOption('sbol_typed_uris', False)
>>> crispr_template = ModuleDefinition('http://sbols.org/CRISPR_Example/CRISPR_
↪Template')
>>> print(crispr_template)
http://sbols.org/CRISPR_Example/CRISPR_Template
```

The second set of configuration options demonstrates use of a default namespace for constructing URIs. The advantage of this approach is simply that it reduces repetitive typing. Instead of typing the full namespace for a URI every time an object is created, the user simply specifies the local identifier. The local identifier is appended to the namespace. This is a handy shortcut especially when working interactively in the Python interpreter.

```
>>> setHomespace('http://sbols.org/CRISPR_Example/')
>>> Config.setOption('sbol_compliant_uris', False)
```

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```
>>> Config.setOption('sbol_typed_uris', False)
>>> crispr_template = ModuleDefinition('CRISPR_Template')
>>> print(crispr_template)
http://sbols.org/CRISPR_Example/CRISPR_Template
```

The third set of configuration options demonstrates SBOL-compliant mode. In this example, a version number is appended to the end of the URI. Additionally, when operating in SBOL-compliant mode, the URIs of child objects are algorithmically constructed according to automated rules (not shown here).

```
>>> setHomespace('http://sbols.org/CRISPR_Example/')
>>> Config.setOption('sbol_compliant_uris', True)
>>> Config.setOption('sbol_typed_uris', False)
>>> crispr_template = ModuleDefinition('CRISPR_Template')
>>> print(crispr_template)
http://sbols.org/CRISPR_Example/CRISPR_Template/1.0.0
```

The final example demonstrates typed URIs. When this option is enabled, the type of SBOL object is included in the URI. Typed URIs are useful because sometimes the user may want to re-use the same local identifier for multiple objects. Without typed URIs this may lead to collisions between non-unique URIs. This option is enabled by default, but the example file CRISPR_example.py does not use typed URIs, so for all the examples in this guide this option is assumed to be disabled.

```
>>> setHomespace('http://sbols.org/CRISPR_Example/')
>>> Config.setOption('sbol_compliant_uris', True)
>>> Config.setOption('sbol_typed_uris', True)
>>> crispr_template_md = ModuleDefinition('CRISPR_Template')
>>> print(crispr_template)
http://sbols.org/CRISPR_Example/ModuleDefinition/CRISPR_Template/1.0.0
>>> crispr_template_cd = ComponentDefinition('CRISPR_Template')
http://sbols.org/CRISPR_Example/ComponentDefinition/CRISPR_Template/1.0.0
```

Constructors for SBOL objects follow a fairly predictable pattern. The first argument is ALWAYS the identity of the object. Other arguments may follow, depending on in the SBOL class has required attributes. Attributes are required if the specification says they are. In a UML diagram, required fields are indicated as properties with a cardinality of 1 or more. For example, a ComponentDefinition (see the UML diagram above) has only one required field, `types`, which specifies one or more molecular types for a component. Required fields SHOULD be specified when calling a constructor. If they are not, they will be assigned default values. The following creates a protein component. If the BioPAX term for protein were not specified, then the constructor would create a ComponentDefinition of type BIOPAX_DNA by default.

```
>>> cas9 = ComponentDefinition('Cas9', BIOPAX_PROTEIN)  # Constructs a protein␣
↪component
>>> target_promoter = ComponentDefinition('target_promoter')  # Constructs a DNA␣
↪component by default
```

4.3 Using Ontology Terms for Attribute Values

Notice the `ComponentDefinition.types` attribute is specified using a predefined constant. The `ComponentDefinition.types` property is one of many SBOL attributes that uses ontology terms as property values. The `ComponentDefinition.types` property uses the *BioPax ontology <https://bioportal.bioontology.org/ontologies/BP/?p=classes&conceptid=root>* to be specific. Ontologies are standardized, machine-readable vocabularies that categorize concepts within a domain of scientific study. The SBOL 2.0 standard unifies many different ontologies into a high-level, object-oriented model.

Ontology terms also take the form of Uniform Resource Identifiers. Many commonly used ontological terms are built-in to pySBOL as predefined constants. If an ontology term is not provided as a built-in constant, its URI can often be found by using an ontology browser tool online. Browse Sequence Ontology terms here <http://www.sequenceontology.org/browser/obob.cgi> ‘ and ‘Systems Biology Ontology terms here. While the SBOL specification often recommends particular ontologies and terms to be used for certain attributes, in many cases these are not rigid requirements. The advantage of using a recommended term is that it ensures your data can be interpreted or visualized by other applications that support SBOL. However in many cases an application developer may want to develop their own ontologies to support custom applications within their domain.

The following example illustrates how the URIs for ontology terms can be easily constructed, assuming they are not already part of pySBOL's built-in ontology constants.

```
>>> SO_ENGINEERED_FUSION_GENE = SO + '0000288'  # Sequence Ontology term
>>> SO_ENGINEERED_FUSION_GENE
'http://identifiers.org/so/SO:0000288'
>>> SBO_DNA_REPLICATION = SBO + '0000204'  # Systems Biology Ontology term
>>> SBO_DNA_REPLICATION
'http://identifiers.org/biomodels.sbo/SBO:0000204'
```

4.4 Adding and Getting Objects from a Document

In some cases a developer may want to use SBOL objects as intermediate data structures in a computational biology workflow. In this case the user is free to manipulate objects independently of a Document. However, if the user wishes to write out a file with all the information contained in their object, they must first add it to the Document. This is done using `add` methods. The names of these methods follow a simple pattern, simply “add” followed by the type of object.

```
>>> doc.addModuleDefinition(crispr_template)
>>> doc.addComponentDefinition(cas9)
```

Objects can be retrieved from a Document by using `get` methods. These methods ALWAYS take the object's full URI as an argument.

```
>>> crispr_template = doc.getModuleDefinition('http://sbols.org/CRISPR_Example/CRISPR_
↪Template/1.0.0')
>>> cas9 = doc.getComponentDefinition('http://sbols.org/CRISPR_Example/cas9_generic/1.
↪0.0')
```

When working interactively in a Python environment, typing long form URIs can be tedious. Operating in SBOL-compliant mode allows the user an alternative means to retrieve objects from a Document using local identifiers.

```
>>> Config.setOption('sbol_compliant_uris', True)
>>> Config.setOption('sbol_typed_uris', False)
>>> crispr_template = doc.moduleDefinitions['CRISPR_Template']
>>> cas9 = doc.componentDefinitions['cas9_generic']
```

4.5 Getting, Setting, and Editing Attributes

The attributes of an SBOL object can be accessed like other Python class objects, with a few special considerations. For example, to get the values of the `displayId` and `identity` properties of any object :

Note that `displayId` gives only the shorthand, local identifier for the object, while the `identity` property gives the full URI.

The attributes above return singleton values. Some attributes, like `ComponentDefinition.roles` and `ComponentDefinition.types` support multiple values. Generally these attributes have plural names. If an attribute supports multiple values, then it will return a list. If the attribute has not been assigned any values, it will return an empty list.

```
>>> cas9.types
['http://www.biopax.org/release/biopax-level3.owl#Protein']
>>> cas9.roles
[]
```

Setting an attribute follows the ordinary convention for assigning attribute values:

```
>>> crispr_template.description = 'This is an abstract, template module'
```

To set multiple values:

```
>>> plasmid = ComponentDefinition('pBB1', BIOPAX_DNA, '1.0.0')
>>> plasmid.roles = [ SO_PLASMID, SO_CIRCULAR ]
```

Although properties such as `types` and `roles` behave like Python lists in some ways, beware that list operations like `append` and `extend` do not work directly on these kind of attributes, due to the nature of the C++ bindings. If you need to append values to an attribute, use the following idiom:

```
>>> plasmid.roles = [ SO_PLASMID ]
>>> plasmid.roles = plasmid.roles + [ SO_CIRCULAR ]
```

To clear all values from an attribute, set to None:

```
>>> plasmid.roles = None
```

4.6 Creating, Adding and Getting Child Objects

Some SBOL objects can be composed into hierarchical parent-child relationships. In the specification diagrams, these relationships are indicated by black diamond arrows. In the UML diagram above, the black diamond indicates that ComponentDefinitions are parents of SequenceAnnotations. Properties of this type can be modified using the add method and passing the child object as the argument.

```
>>> point_mutation = SequenceAnnotation('PointMutation')
>>> target_promoter.sequenceAnnotations.add(point_mutation)
```

Alternatively, the create method captures the construction and addition of the SequenceAnnotation in a single function call. The create method ALWAYS takes one argument–the URI of the new object. All other values are initialized with default values. You can change these values after object creation, however.

```
>>> target_promoter.sequenceAnnotations.create('PointMutation')
```

Conversely, to obtain a Python reference to the SequenceAnnotation from its identity:

```
>>> point_mutation = target_promoter.sequenceAnnotations.get('PointMutation')
```

Or equivalently:

```
>>> point_mutation = target_promoter.sequenceAnnotations['PointMutation']
```

4.7 Creating and Editing Reference Properties

Some SBOL objects point to other objects by way of URI references. For example, ComponentDefinitions point to their corresponding Sequences by way of a URI reference. These kind of properties correspond to white diamond arrows in UML diagrams, as shown in the figure above. Attributes of this type contain the URI of the related object.

```
>>> eyfp_gene = ComponentDefinition('EYFPGene', BIOPAX_DNA)
>>> seq = Sequence('EYFPSequence', 'atgnnntaa', SBOL_ENCODING_IUPAC)
>>> eyfp_gene.sequence = seq
>>> print (eyfp_gene.sequence)
'http://sbols.org/Sequence/EYFPSequence/1.0.0'
```

Note that assigning the `seq` object to the `eyfp_gene.sequence` actually results in assignment of the object's URI. An equivalent assignment is as follows:

```
>>> eyfp_gene.sequence = seq.identity
>>> print (eyfp_gene.sequence)
'http://sbols.org/Sequence/EYFPSequence/1.0.0'
```

4.8 Iterating and Indexing List Properties

Some properties can contain multiple values or objects. Additional values can be specified with the add method. In addition you may iterate over lists of objects or values.

```
# Iterate through objects (black diamond properties in UML)
for p in cas9_complex_formation.participations:
    print(p)
    print(p.roles)

# Iterate through references (white diamond properties in UML)
for role in reaction_participant.roles:
    print(role)
```

Numerical indexing of lists works as well:

```
for i_p in range(0, len(cas9_complex_formation.participations)):
    print(cas9_complex_formation.participations[i_p])
```

4.9 Searching a Document

To see if an object with a given URI is already contained in a Document or other parent object, use the `find` method. Note that `find` function returns the target object cast to its base type which is `SBOLObject`, the generic base class for all SBOL objects. The actual SBOL type of this object, however is `ComponentDefinition`. If necessary the base class can be downcast using the `cast` method.

```
>>> obj = doc.find('http://sbols.org/CRISPR_Example/mKate_gene/1.0.0')
>>> obj
SBOLObject
>>> parseClassName(obj.type)
'ComponentDefinition'
>>> cd = obj.cast(ComponentDefinition)
```

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```
>>> cd
ComponentDefinition
```

The `find` method is probably more useful as a boolean conditional when the user wants to automatically construct URIs for objects and needs to check if the URI is unique or not. If the object is found, `find` returns an object reference (True), and if the object is not found, it returns None (False). The following code snippet demonstrates a function that automatically generates ComponentDefinitions.

```
def createNextComponentDefinition(doc, local_id):
    i_cdef = 0
    cdef_uri = getHomespace() + '/%s_%d/1.0.0' %(local_id, i_cdef)
    while doc.find(cdef_uri):
        i_cdef += 1
        cdef_uri = getHomespace() + '/%s_%d/1.0.0' %(local_id, i_cdef)
    doc.componentDefinitions.create('%s_%d' %(local_id, i_cdef))
```

4.10 Copying Documents and Objects

Copying a `Document` can result in a few different ends, depending on the user's goal. The first option is to create a simple clone of the original `Document`. This is shown below in which the user is assumed to have already created a `Document` with a single `ComponentDefinition`. After copying, the object in the `Document` clone has the same identity as the object in the original `Document`.

```
>>> for o in doc:
...     print o
...
http://examples.org/ComponentDefinition/cd/1
>>> doc2 = doc.copy()
>>> for o in doc2:
...     print o
...
http://examples.org/ComponentDefinition/cd/1
```

More commonly a user wants to import objects from the target Document into their Homespace. In this case, the user can specify a target namespace for import. Objects in the original `Document` that belong to the target namespace are copied into the user's Homespace. Contrast the example above with the following.

```
>>> setHomespace('http://sys-bio.org')
>>> doc2 = doc.copy('http://examples.org')
>>> for o in doc:
...     print o
...
http://examples.org/ComponentDefinition/cd/1
>>> for o in doc2:
...     print o
...
http://sys-bio.org/ComponentDefinition/cd/1
```

In the examples above, the `copy` method returns a new `Document`. However, it is possible to integrate the result of multiple `copy` operations into an existing `Document`.

```
>>> for o in doc1:
       print o
```

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```
http://examples.org/ComponentDefinition/cd1/1
>>> for o in doc2:
     print o
...
http://examples.org/ComponentDefinition/cd2/1
>>> doc1.copy('http://examples.org', doc3)
Document
>>> doc2.copy('http://examples.org', doc3)
Document
>>> for o in doc3:
...     print o
...
http://examples.org/ComponentDefinition/cd2/1
http://examples.org/ComponentDefinition/cd1/1
```

4.11 Converting To and From Other Sequence Formats

It is possible to convert SBOL to and from other common sequence formats. Conversion is performed by calling the online converter tool , so an internet connection is required. Currently the supported formats are *SBOL2*, *SBOL1*, *FASTA*, *GenBank*, and *GFF3*. The following example illustrates how to import and export to these different formats. Note that conversion can be lossy.

```
>>> doc.exportToFormat('GenBank', 'crispr_example_out.gb')
>>> doc.importFromFormat('GenBank', 'crispr_example_out.gb')
```

4.12 Creating Biological Designs

This concludes the basic methods for manipulating SBOL data structures. Now that you're familiar with these basic methods, you are ready to learn about libSBOL's high-level design interface for synthetic biology. See SBOL Examples.

CHAPTER 5

Biological Parts Repositories

5.1 Re-using Genetic Parts From Online Repositories

In today's modern technological society, a variety of interesting technologies can be assembled from "off-the-shelf" components, including cars, computers, and airplanes. Synthetic biology is inspired by a similar idea. Synthetic biologists aim to program new biological functions into organisms by assembling genetic code from off-the-shelf DNA sequences. PySBOL puts an inventory of biological parts at your fingertips.

For example, the iGEM Registry of Standard Biological Parts is an online resource that many synthetic biologists are familiar with. The Registry is an online database that catalogs a vast inventory of genetic parts, mostly contributed by students in the iGEM competition. These parts are now available in SBOL format in the SynBioHub knowledgebase, hosted by Newcastle University. The code example below demonstrates how a programmer can access these data.

The following code example shows how to pull data about biological components from the SynBioHub repository. In order to pull a part, simply locate the web address of that part by browsing the SynBioHub repository online. Alternatively, pySBOL also supports programmatic querying of SynBioHub (see below).

The interface with the SynBioHub repository is represented by a `PartShop` object. The following code retrieves parts corresponding to promoter, coding sequence (CDS), ribosome binding site (RBS), and transcriptional terminator. These parts are imported into a `Document` object, which must be initialized first. See Getting Started with SBOL for more about creating `Documents`. A Uniform Resource Identifier (URI) is used to retrieve objects from the `PartShop`, similar to how URIs are used to retrieve objects from a `Document`

```
>>> igem = PartShop('https://synbiohub.org')
>>> igem.pull('https://synbiohub.org/public/igem/BBa_R0010/1', doc)
```

Typing full URIs can be tedious. Therefore the `PartShop` interface provides a shortcut for retrieving objects. It will automatically construct a URI from the `PartShop` namespace and the part's `displayId`. Constrast the above with the following.

```
>>> igem = PartShop('https://synbiohub.org/public/igem')
>>> igem.pull('BBa_B0032', doc)
>>> igem.pull('BBa_E0040', doc)
>>> igem.pull('BBa_B0012', doc)
```

The `pull` operation will retrieve `ComponentDefinitions` and their associated `Sequence` objects. Note that the objects are copied into the user's Homespace:

```
>>> for obj in doc:
...     print obj
...
http://examples.org/Sequence/BBa_R0010_sequence/1
http://examples.org/Sequence/BBa_B0012_sequence/1
http://examples.org/ComponentDefinition/BBa_E0040/1
http://examples.org/ComponentDefinition/BBa_B0012/1
http://examples.org/Sequence/BBa_E0040_sequence/1
http://examples.org/Activity/igem2sbol/1
http://examples.org/ComponentDefinition/BBa_R0010/1
http://examples.org/ComponentDefinition/BBa_B0032/1
http://examples.org/Sequence/BBa_B0032_sequence/1
```

5.2 Searching Part Repos

PySBOL supports three kinds of searches: a **general search**, an **exact search**, and an **advanced search**.

The following query conducts a **general search** which scans through *identity*, *name*, *description*, and *displayId* properties for a match to the search text, including partial, case-insensitive matches to substrings of the property value. Search results are returned as a *SearchResponse* object.

```
records = igem.search('plasmid')
```

By default, the general search looks only for `ComponentDefinitions`, and only returns 25 records at a time in order to prevent server overload. The search above is equivalent to the one below, which explicitly specifies which kind of SBOL object to search for, an offset of 0 (explained below), and a limit of 25 records.

```
records = igem.search('plasmid', SBOL_COMPONENT_DEFINITION, 0, 25)
```

Of course, these parameters can be changed to search for different type of SBOL objects or to return more records. For example, some searches may match a large number of objects, more than the specified limit allows. In this case, it is possible to specify an offset and to retrieve additional records in successive requests. The total number of objects in the repository matching the search criteria can be found using the searchCount method, which has the same call signature as the search method. It is a good idea to put a small delay between successive requests to prevent server overload. The following example demonstrates how to do this. The 100 millisecond delay is implemented using cross-platform C++11 headers chrono and thread. As of the writing of this documentation, this call retrieves 391 records.

```
import time

records = SearchResponse()
search_term = 'plasmid'
limit = 25
total_hits = igem.searchCount(search_term)
for offset in range(0, total_hits, limit):
    records.extend( igem.search(search_term, SBOL_COMPONENT_DEFINITION, offset,␣
↪limit) )
    time.sleep(0.1)
```

A `SearchResponse` object is returned by a query and contains multiple records. Each record contains basic data, including identity, displayId, name, and description fields. *It is very important to realize however that the search does not retrieve the complete ComponentDefinition!* In order to retrieve the full object, the user must call `pull` while specifying the target object's identity.

Records in a `SearchResponse` can be accessed using iterators or numeric indices. The interface for each record behaves exactly like any other SBOL object:

```
for record in records:
    print( record.identity.get() )
```

The preceding examples concern **general searches**, which scan through an object's metadata for partial matches to the search term. In contrast, the **exact search** explicitly specifies which property of an object to search, and the value of that property must exactly match the search term. The following **exact search** will search for `ComponentDefinitions` with a role of promoter:

records = igem.search(SO_PROMOTER, SBOL_COMPONENT_DEFINITION, SBOL_ROLES, 0, 25); .. end

Finally, the **advanced search** allows the user to configure a search with multiple criteria by constructing a `SearchQuery` object. The following query looks for promoters that have an additional annotation indicating that the promoter is regulated (as opposed to constitutive):

```
q = SearchQuery();
q['objectType'].set(SBOL_COMPONENT_DEFINITION);
q['limit'].set(25);
q['offset'].set(0);
q['role'].set(SO_PROMOTER);
q['role'].add('http://wiki.synbiohub.org/wiki/Terms/igem#partType/Regulatory');
total_hits = igem.searchCount(q);
records = igem.search(q);
```

5.3 Submitting Designs to a Repo

Users can submit their SBOL data directly to a `PartShop` using the pySBOL API. This is important, so that synthetic biologists may reuse the data and build off each other's work. Submitting to a repository is also important for reproducing published scientific work. The synthetic biology journal ACS Synthetic Biology now encourages authors to submit SBOL data about their genetically engineered DNA to a repository like SynBioHub. In order to submit to a `PartShop` remotely, the user must first vist the appropriate website and register. Once the user has established an account, they can then log in remotely using pySBOL.

```
>>> igem.login('johndoe@example.org', password)
```

Upon submission of a `Document` to SynBioHub, the `Document` will be converted to a `Collection`. Therefore, the `Document` requires that the `displayId`, `name`, and `description` properties are set prior to submission.

```
>>> doc.displayId = 'my_collection'
>>> doc.name = 'my collection'
>>> doc.description = 'a description of your collection'
>>> igem.submit(doc)
```

Once uploaded, a new URI for the `Collection` is generated. This URI follows the pattern `<PART SHOP URI>/<USER NAME>/<DOCUMENT DISPLAYID>_collection`. Other `TopLevel` objects in the `Document` are also mapped to new URIs. These URIs follow the pattern `<PART SHOP URI>/<USER NAME>/<SBOL TYPE>_<DISPLAYID>`.

After submission, it is possible to attach other types of data files to SBOL objects. This requires the new URI of the target object and a path to the local file on the user's machine.

```
>>> igem.attachFile('<PART SHOP URI>/<USER NAME>/<SBOL TYPE>_<DISPLAYID>', '<PATH TO␣
↪LOCAL FILE>')
```

Likewise, it is possible to download a file attachment.

```
>>> igem.downloadAttachment('<PART SHOP URI>/<USER NAME>/<SBOL TYPE>_<DISPLAYID>', '
↪<PATH TO WRITE>')
```

CHAPTER 6

Computer-aided Design for Synthetic Biology

See Full Example Code for full example code.

6.1 Design Abstraction

An advantage of the SBOL data format over GenBank is the ability to represent DNA as abstract components without specifying an exact sequence. An **abstract design** can be used as a template, with sequence information filled in later. In SBOL, a ComponentDefinition represents a biological component whose general function is known while its sequence is currently either unknown or unspecified. The intended function of the component is specified using a descriptive term from the Sequence Ontology (SO), a standard vocabulary for describing genetic parts. As the following example shows, some common SO terms are built in to PySBOL as pre-defined constants (see constants.h). This code example defines the new component as a gene by setting its *roles* property to the SO term for *gene*. Other terms may be found by browsing the Sequence Ontology online.

```
# Construct an abstract design for a gene
gene = ComponentDefinition('gene_example')
gene.roles = SO_GENE
```

Design abstraction is an important engineering principle for synthetic biology. Abstraction enables the engineer to think at a high-level about functional characteristics of a system while hiding low-level physical details. For example, in electronics, abstract schematics are used to describe the function of a circuit, while hiding the physical details of how a printed circuit board is laid out. Computer-aided design (CAD) programs allow the engineer to easily switch back and forth between abstract and physical representations of a circuit. In the same spirit, PySBOL enables a CAD approach for designing genetic constructs and other forms of synthetic biology.

6.2 Hierarchical DNA Assembly

PySBOL also includes methods for assembling biological components (also referred to as biological parts in the synthetic biology literature) into **abstraction hierarchies**. Abstraction hierarchies are important from an engineering perspective because they allow engineers to assemble complicated systems from more basic components. Abstraction

hierarchies are also important from a biological perspective, because DNA sequences and biological structures in general exhibit hierarchical organization, from the genome, to operons, to genes, to lower level genetic operators. The following code assembles an abstraction hierarchy that describes a gene cassette. Note that subcomponents must belong to a *Document* in order to be assembled, so a *Document* is passed as a parameter.

The gene cassette below is composed of genetic subcomponents including a promoter, ribosome binding site (RBS), coding sequence (CDS), and transcriptional terminator, expressed in SBOL Visual schematic glyphs. The next example demonstrates how an abstract design for this gene is assembled from its subcomponents.

```
gene.assemblePrimaryStructure([ r0010, b0032, e0040, b0012 ], doc)
```

After creating an abstraction hierarchy, it is then possible to iterate through an object's primary structure of components:

```
for component_definition in gene.getPrimaryStructure()):
    print (component_definition.identity)
```

This returns a list of *ComponentDefinitions* arranged in their primary sequence. Occasionally it is also helpful to get *Components* arranged in their primary sequence as well. Note that the example below produces the same output as the example above, and may be helpful for understanding the relationship between *Components* and *ComponentDefinitions*.

```
for component in gene.components:
    print (component.definition)
```

6.3 Editing a Primary Structure

Given an abstract representation of a primary structure as above, it is possible to modify it by inserting and deleting *Components*. The following example deletes the R0010 promoter and replaces it with the R0011 promoter

```
primary_structure = gene.getPrimaryStructureComponents()
b0032_component = primary_structure[1]
gene.deleteUpstreamComponent(b0032_component)

r0011 = ComponentDefinition('r0011')
r0011.roles = SO_CDS
gene.insertUpstreamComponent(b0032_component, r0011)
```

6.4 Sequence Assembly

A **complete design** adds explicit sequence information to the components in a **template design** or **abstraction hierarchy**. In order to complete a design, *Sequence* objects must first be created and associated with the promoter, CDS, RBS, terminator subcomponents. In contrast to the ComponentDefinition.assemble() method, which assembles a template design, the *ComponentDefinition.compile* method recursively generates the complete sequence of a hierarchical design from the sequence of its subcomponents. Compiling a DNA sequence is analogous to a programmer compiling their code. In order to *compile* a *ComponentDefinition*, you must first assemble a template design from *ComponentDefinitions*, as described in the previous section.

```
target_sequence = gene.compile()
```

The *compile* method returns the target sequence as a string. In addition, it creates a new *Sequence* object and assigns the target sequence to its *elements* property

6.5 Genome Integration

In some cases, it may be useful to represent integration of vectors / transposons into genomes. The *integrateAtBaseCoordinate* method supports integration operations and produces a parsimonious representation of primary structure that is useful for manipulating large constructs. The following example demonstrates integration of the *gene* construct from the examples above into a *wild_type_genome*, thus generating the *integrated_genome*.

```
integrated_genome = ComponentDefinition('integrated_genome')
integrated_genome.sequence = Sequence('integrated_genome_sequence')
wild_type_genome = ComponentDefinition('wild_type_genome')
wild_type_genome.sequence = Sequence('wild_type_genome_sequence')
wild_type_genome.sequence.elements = 'gggggggggg'
integrated_genome.integrateAtBaseCoordinate(wild_type_genome, gene, 5)
integrated_genome.compile()  # Calculate sequence of the integrated genome
```

6.6 Full Example Code

Full example code is provided below, which will create a file called "gene_cassette.xml"

```
from sbol import *

setHomespace('http://sys-bio.org')
doc = Document()

gene = ComponentDefinition('gene_example')
r0010 = ComponentDefinition('R0010')
b0032 = ComponentDefinition('B0032')
e0040 = ComponentDefinition('E0040')
b0012 = ComponentDefinition('B0012')

r0010.roles = SO_PROMOTER
b0032.roles = SO_CDS
e0040.roles = SO_RBS
b0012.roles = SO_TERMINATOR

doc.addComponentDefinition(gene)
doc.addComponentDefinition([ r0010, b0032, e0040, b0012 ])

gene.assemblePrimaryStructure([ r0010, b0032, e0040, b0012 ])

first = gene.getFirstComponent()
print(first.identity)
last = gene.getLastComponent()
print(last.identity)

r0010.sequence = Sequence('R0010', 'ggctgca')
b0032.sequence = Sequence('B0032', 'aattatataaa')
e0040.sequence = Sequence('E0040', "atgtaa")
b0012.sequence = Sequence('B0012', 'attcga')

target_sequence = gene.compile()
print(gene.sequence.elements)

result = doc.write('gene_cassette.xml')
print(result)
```

CHAPTER 7

Design-Build-Test-Learn Workflows

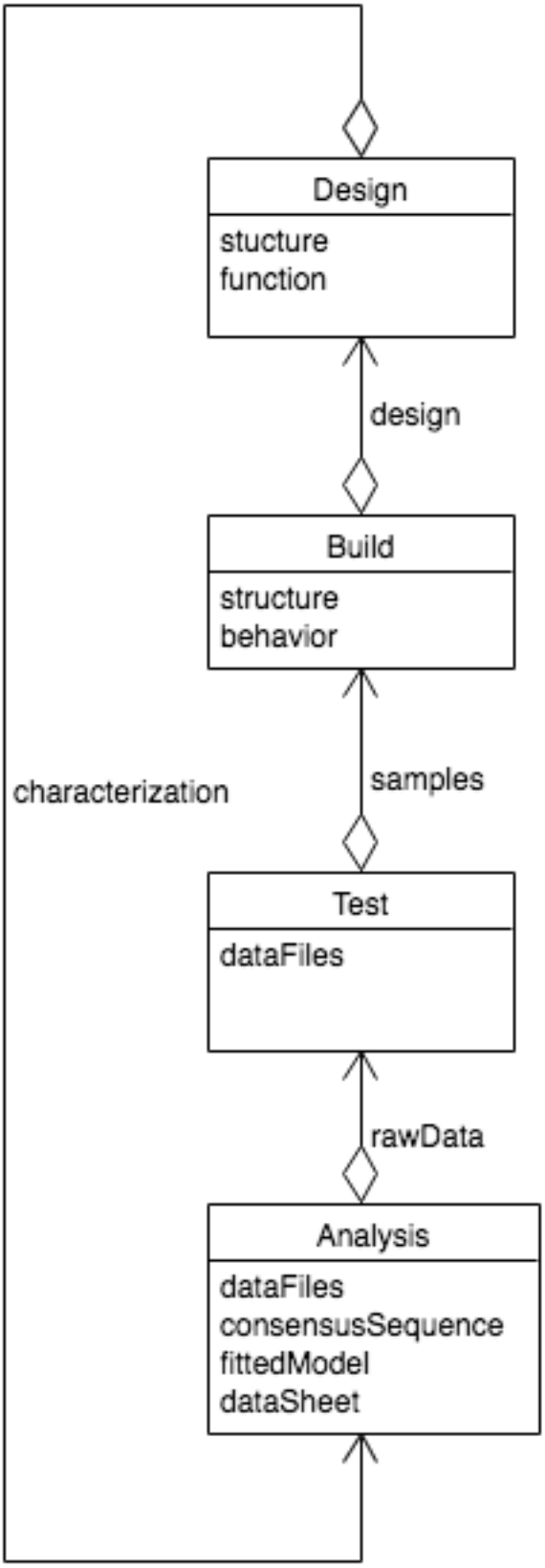
PySBOL can be used to manage computational and experimental workflows for synthetic biology. The API is based on the design-build-test-learn (DBTL) method for engineering problem solving. These workflows involve the following types of objects:

- A `Design` is a conceptual representation of a biological system that a synthetic biologist intends to implement in the lab. A `Design` may describe both structural composition or the intended function of a biological system. In more traditional engineering terms, a `Design` is analogous to a draft or blueprint, but is a purely digital representation
- A `Build` describes an actual, physical sample in the laboratory. A DNA construct is the most common example of a `Build` in synthetic biology, but the definition can be extended to represent any kind of physical sample, including cells and reagents. A `Build` may be linked to a laboratory information management system using SBOL.
- A `Test` is a wrapper for experimental data files that are produced as a result of an experimental measurement on a `Build`. As a matter of scientific integrity, unaltered experimental data should and must be preserved. A `Test` object provides a link to those data.
- An `Analysis` is a wrapper for experimental data that has been processed or transformed. Common data transformations include subtracting background signal ("blanking"), log transformations, and model-fitting.

Note that these pySBOL classes are not part of the core SBOL standard, but are abstractions provided by the pySBOL interface for the convenience of the user. However, they map closely to the SBOL data model.

In order to organize and track data as a workflow proceeds, a user can create objects and link them together using `Activity` objects. An `Activity` uses certain types of objects as inputs and generates new objects. For example, under the DBTL formalization a `Design` is used to generate a `Build`. This implies that a digital blueprint for a biological system has been realized as a real construct the laboratory. If an experimental measurement is performed subsequently, via an experiment `Activity`, a `Test` object is generated. A `Test` performs measurement on `Builds`. Finally an `Analysis` may use the raw experimental data represented by a `Test` object. Thus, objects are created in a logical order that conforms to the DBTL formalism. This pattern is represented in the UML class diagram below.

An `Activity` is executed by an `Agent` which may be a person, a piece of software, or laboratory robotics. The `Agent` executes a `Plan` which may be a laboratory protocol written in natural language or a set of automated instructions. The classes `Activity`, `Agent`, and `Plan` are all defined according the Provenance Ontology (PROV-O). The

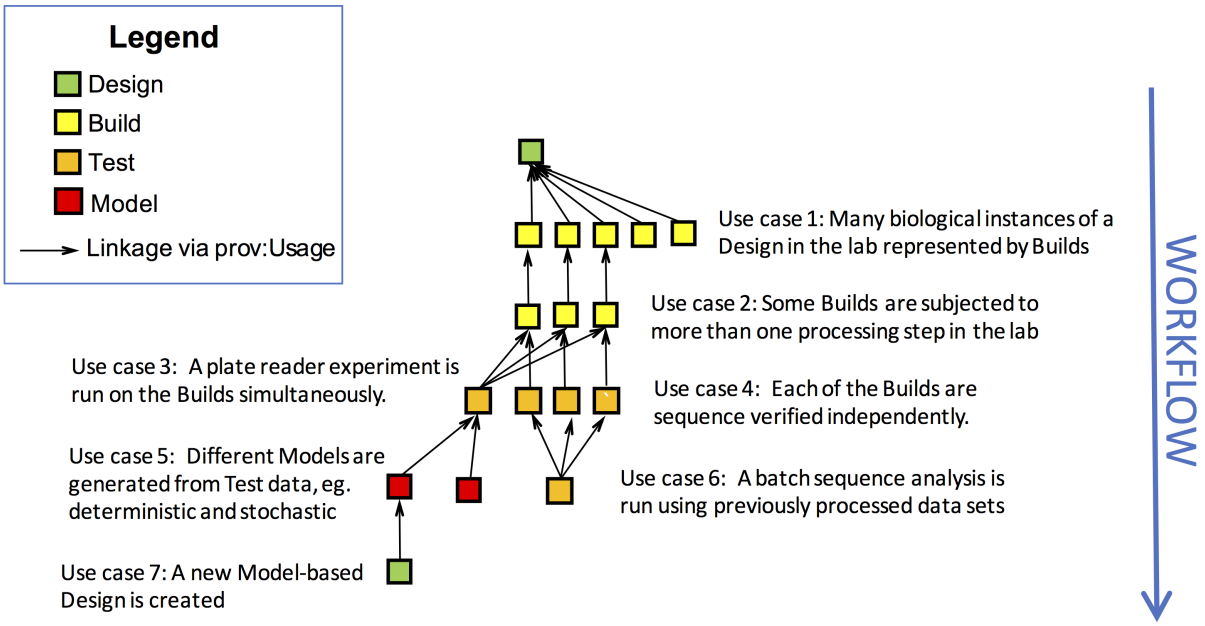

Design
stucture
function
design
Build
structure
behavior
samples
characterization
Test
dataFiles
rawData
Analysis
dataFiles
consensusSequence
fittedModel
dataSheet

pySBOL API provides the `Design`, `Build`, `Test`, and `Analysis` classes to simplify workflow representation. However, it is also possible to use the API to construct PROV-O workflows that conform to other patterns.

The usage pattern described above can be summarized as follows: An `Activity` may use one or more objects of type X to generate one or more objects of type Y that come next in the DBTL workflow. Additionally DBTL workflows can be cyclic. An `Analysis` may generate a `Design`. In this pattern, the `Analysis` represents a specification or prediction that is assumed to be true about the `Design` since it has been previously experimentally verified. Such a pattern is called a DBTL cycle.

The DBTL cycle is a generalized, iterative framework for engineering problem-solving—something like a scientific method for engineers. In the context of synthetic biology, the DBTL cycle may include processes such as pulling data about biological parts from online databases, assembling new genetic programs from DNA sequences, synthesizing and assembling DNA, performing quality control, measurement and model-based characterization of a DNA part's encoded behavior, submitting characterized parts to inventories, and publishing data sheets. Ideally, each cycle generates new knowledge that feeds back into new cycles in the form of alternative approaches, reformulated problems, or forward specifications for future designs.

In addition to the logical workflow order described above, other simple workflow patterns are allowed as well. An `Activity` that generates an object of type X may use other objects also of type X as inputs. For example a laboratory construct may go through sequential stages of processing before the target `Build` is complete. Examples are enzymatic treatment, DNA purification, and transformation. At each stage, a `Build` uses a prior `Build`. Therefore `Builds` may use prior `Builds` as well as `Designs`.



Branching and intersecting workflows are other common patterns of usage. For example, an intersecting workflow occurs when a construct is assembled out of multiple physical components, such as occurs when a Gibson assembly uses multiple DNA samples. Multiple `Build` inputs are used to generate the new `Build`. Another kind of intersecting workflow occurs when an experimental `Test` is performed on multiple `Build` samples. Conversely, branching patterns may also occur. For example, a branching workflow occurs when transformation of a single Gibson reaction mixture generates multiple clones, each of which may be subjected to their own unique history of subsequent testing and analysis.

```
from sbol import *
```

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```
doc=Document()
setHomespace('https://sys-bio.org')

doc = Document()

workflow_step_1 = Activity('build_1')
workflow_step_2 = Activity('build_2')
workflow_step_3 = Activity('build_3')
workflow_step_4 = Activity('build_4')
workflow_step_5 = Activity('build_5')
workflow_step_6 = Activity('test_1')
workflow_step_7 = Activity('analysis_1')

workflow_step_1.plan = Plan('PCR_protocol_part1')
workflow_step_2.plan = Plan('PCR_protocol_part2')
workflow_step_3.plan = Plan('PCR_protocol_part3')
workflow_step_4.plan = Plan('gibson_assembly')
workflow_step_5.plan = Plan('transformation')
workflow_step_6.plan = Plan('promoter_characterization')
workflow_step_7.plan = Plan('parameter_optimization')

setHomespace('')
Config.setOption('sbol_compliant_uris', False)  # Temporarily disable auto-
↪construction of URIs

workflow_step_1.agent = Agent('mailto:jdoe@sbols.org')
workflow_step_2.agent = workflow_step_1.agent
workflow_step_3.agent = workflow_step_1.agent
workflow_step_4.agent = workflow_step_1.agent
workflow_step_5.agent = workflow_step_1.agent
workflow_step_6.agent = Agent('http://sys-bio.org/plate_reader_1')
workflow_step_7.agent = Agent('http://tellurium.analogmachine.org')

Config.setOption('sbol_compliant_uris', True)
setHomespace('https://sys-bio.org')

doc.addActivity([workflow_step_1, workflow_step_2, workflow_step_3, workflow_step_4,␣
↪workflow_step_5, workflow_step_6, workflow_step_7])


target = Design('target')
part1 = workflow_step_1.generateBuild('part1', target)
part2 = workflow_step_2.generateBuild('part2', target)
part3 = workflow_step_3.generateBuild('part3', target)
gibson_mix = workflow_step_4.generateBuild('gibson_mix', target, [part1, part2,␣
↪part3])
clones = workflow_step_5.generateBuild(['clone1', 'clone2', 'clone3'], target, gibson_
↪mix)
experiment1 = workflow_step_6.generateTest('experiment1', clones)
analysis1 = workflow_step_7.generateAnalysis('analysis1', experiment1)

response = doc.write('dbtl.xml')
print(response)
```

CHAPTER 8

API

class Activity(**args*)

A generated Entity is linked through a wasGeneratedBy relationship to an Activity, which is used to describe how different Agents and other entities were used. An Activity is linked through a qualifiedAssociation to Associations, to describe the role of agents, and is linked through qualifiedUsage to Usages to describe the role of other entities used as part of the activity. Moreover, each Activity includes optional startedAtTime and endedAtTime properties. When using Activity to capture how an entity was derived, it is expected that any additional information needed will be attached as annotations. This may include software settings or textual notes. Activities can also be linked together using the wasInformedBy relationship to provide dependency without explicitly specifying start and end times.

- *startedAtTime* : *DateTimeProperty*
- ***endedAtTime*** [*DateTimeProperty*] The endedAtTime property is OPTIONAL and contains a dateTime (see section Section 12.7) value, indicating when the activity ended.
- ***wasInformedBy*** [*ReferencedObject*] The wasInformedBy property is OPTIONAL and contains a URI of another activity.
- ***associations*** [*OwnedObject*< *Association* >] The qualifiedAssociation property is OPTIONAL and MAY contain a set of URIs that refers to Association.
- ***usages*** [*OwnedObject*< *Usage* >] The qualifiedUsage property is OPTIONAL and MAY contain a set of URIs that refers to Usage objects.
- ***agent*** [*OwnedObject*< *Agent* >] An Agent object may be specified here, and it will be synced with the Association::agent property.
- ***plan*** [*OwnedObject*< *Plan* >] A Plan object may be specified here, and it will be synced with the Association::plan property.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/provo.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

generateAnalysis(*uris*, *test_usages*, *analysis_usages=None*)
Generate one or more Analysis objects.

- ***uris*** [] One or more identifiers for the new Analysis object(s). If the *sbol_compliant_uris* option configuration is enabled, then the user should specify simple identifiers for the objects. Otherwise the user must provide full URIs each consisting of a scheme, namespace, and identifier.
- ***test_usages*** [] A singleton Test object, list of Test objects, or None. Test usages represent raw experimental data used to generate an Analysis.
- ***analysis_usages*** [] A singleton Analysis object, list of Analysis objects, or None. Analysis usages represent other analyses that the user wants to integrate into a single data set or data sheet.

A singleton Analysis or list of Analyses depending on whether the user specifies a single URI or list of URIs.

generateBuild(*uris*, *design_usages*, *build_usages=None*)
Generate one or more Build objects

- ***uris*** [] One or more identifiers for the new Build object(s). If the *sbol_compliant_uris* option configuration is enabled, then the user should specify simple identifiers for the objects. Otherwise the user must provide full URIs each consisting of a scheme, namespace, and identifier.
- ***design_usages*** [] A singleton Design object, list of Design objects, or None. Design usages represent the engineer's intent or "blueprint" for the Build target.
- ***build_usages*** [] A singleton Build object, list of Build objects, or None. Build usages represent physical components, such as laboratory samples, that are assembled into the target Build.

A singleton Build or list of Builds depending on whether the user specifies a single URI or list of URIs.

generateDesign(*uris*, *analysis_usages*, *design_usages=None*)
Generate one or more Design objects

- ***uris*** [] One or more identifiers for the new Design object(s). If the *sbol_compliant_uris* option configuration is enabled, then the user should specify simple identifiers for the objects. Otherwise the user must provide full URIs each consisting of a scheme, namespace, and identifier.
- ***analysis_usages*** [] A singleton Analysis object, list of Analysis objects, or None. Analysis usages represent a prediction or forward-specification of the new Design's intended structure or function.
- ***design_usages*** [] A singleton Design object, list of Design objects, or None. Design usages may represent previous Designs that are being tranformed or composed into the new Design.

A singleton Design or list of Designs depending on whether the user specifies a single URI or list of URIs.

generateTest(*uris*, *build_usages*, *test_usages=None*)
Generate one or more Test objects

- ***uris*** [] One or more identifiers for the new Test object(s). If the *sbol_compliant_uris* option configuration is enabled, then the user should specify simple identifiers for the objects. Otherwise the user must provide full URIs each consisting of a scheme, namespace, and identifier.
- ***build_usages*** [] A singleton Build object, list of Build objects, or None. Build usages represent samples or analytes used in an experimental measurement.
- ***test_usages*** [] A singleton Test object, list of Test objects, or None. Test usages represent other measurements or raw data that the user wants to integrate into a single data set.

A singleton Test or list of Tests depending on whether the user specifies a single URI or list of URIs.

class ActivityProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Agent(**args*)
Examples of agents are person, organisation or software. These agents should be annotated with additional information, such as software version, needed to be able to run the same software again.

- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its

String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/provo.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class AgentProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class AliasedOwnedFunctionalComponent(*property_owner*, *sbol_uri*, *alias_uri*, *lower_bound*, *upper_bound*, *validation_rules*)

- *alias* : *rdf_type*
- *python_iter* : *std::vector< std::string >::iterator*

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

create(*uri*)
create(uri) -> SBOLClass &

define(*definition_object*)
define(definition_object) -> SBOLClass &

get(**args*)
get(uri="") -> SBOLClass &

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class Analysis(**args*)

- ***rawData*** [*ReferencedObject*] A reference to a Test object which contains the raw data for an Analysis.
- ***dataFiles*** [*ReferencedObject*] References to file Attachments which contain experimental data sets.
- ***dataSheet*** [*ReferencedObject*] A reference to a datasheet file.
- ***consensusSequence*** [*OwnedObject*< *Sequence* >] A sequence object that represents a consensus sequence from DNA sequencing data.
- ***fittedModel*** [*OwnedObject*< *Model* >] A Model derived from fitting an experimental data set.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name

properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.

- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

copy(**args*)
copy(ns="", version="") -> SBOLClass &

reportAmbiguity()

'**reportAmbiguity() -> std::unordered_map< std::string, std::tuple< int, int,** float > >'

reportCoverage()

'**reportCoverage() -> std::unordered_map< std::string, std::tuple< int, int,** float > >'

reportError()

'**reportError() -> std::unordered_map< std::string, std::tuple< int, int, float >** >'

reportIdentity()

'**reportIdentity() -> std::unordered_map< std::string, std::tuple< int, int,** float > >'

verifyTarget(*consensus_sequence*)
verifyTarget(consensus_sequence)

Compare a consensus Sequence to the target Sequence.

class AnalysisProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Association(**args*)
An Association is linked to an Agent through the agent relationship. The Association includes the hadRole property to qualify the role of the Agent in the Activity.

- ***agent*** [*ReferencedObject*] The agent property is REQUIRED and MUST contain a URI that refers to an Agent object.
- ***roles*** [*URIProperty*] The hadRole property is REQUIRED and MUST contain a URI that refers to a particular term describing the usage of the agent.
- ***plan*** [*ReferencedObject*] The hadPlan property is OPTIONAL and contains a URI that refers to a Plan.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/provo.h

class AssociationProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Attachment(**args*)

The Attachment class is a general container for data files, especially experimental data files. Attachment is a TopLevel object, and any other TopLevel object can refer to a list of attachments.

- ***source*** [*URIProperty*] The source is a link to the external file and is REQUIRED.
- *format* : *URIProperty*
- *size* : *IntProperty*
- *hash* : *TextProperty*
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its

String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/attachment.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class AttachmentProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Build(**args*)
A Build is a realization of a Design. For practical purposes, a Build can represent a biological clone, a plasmid, or other laboratory sample. For a given Design, there may be multiple Builds realized in the lab. A Build represents the second step in libSBOL's formalized Design-Build-Test-Analyze workflow.

- ***design*** [*ReferencedObject*] A reference to a Design object which represents the intended structure and function for this Build.
- ***structure*** [*OwnedObject*< *ComponentDefinition* >] The experimentally verified structure of the construct as verified by DNA sequencing or other analysis.
- ***behavior*** [*OwnedObject*< *ModuleDefinition* >] The observed behavior of the constructed system.
- *sysbio_type* : *URIProperty*
- *_structure* : *ReferencedObject*

- *_behavior* : *ReferencedObject*
- *built* : *URIProperty*
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/dbtl.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class BuildProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Collection(**args*)

The Collection class is a class that groups together a set of TopLevel objects that have something in common.

Some examples of Collection objects: . Results of a query to find all ComponentDefinition objects in a repository that function as promoters . A set of ModuleDefinition objects representing a library of genetic logic gates. . A ModuleDefinition for a complexdesign, and all of the ModuleDefinition, ComponentDefinition, Sequence, and Model objects used to provide its full specification.

- ***members*** [*URIProperty*] The members property of a Collection is OPTIONAL and MAY contain a set of URI references to zero or more TopLevel objects.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/collection.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class CollectionProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class CombinatorialDerivation(**args*)
A ComponentDeriviation specifies the composition of a combinatorial design or variant library for common use cases in synthetic biology, such as tuning the performance of a genetic circuit or biosynthetic pathway through combinatorial DNA assembly and screening.

- ***strategy*** [*URIProperty*] The *strategy* property is OPTIONAL and has a data type of URI.

  Table 1 provides a list of REQUIRED strategy URIs. If the *strategy* property is not empty, then it MUST contain a URI from Table 1. This property recommends how many *ComponentDefinition* objects a user SHOULD derive from the *template ComponentDefinition*. Strategy URI

  Description

  http://sbols.org/v2#enumerate

  A user SHOULD derive all *ComponentDefinition* objects with a unique substructure as specified by the *Component* objects contained by the *template ComponentDefinition* and the *VariableComponent* objects contained by the *CombinatorialDerivation*.

  http://sbols.org/v2#sample

  A user SHOULD derive a subset of all *ComponentDefinition* objects with a unique substructure as specified by the *Component* objects contained by the *template ComponentDefinition* and the *VariableComponent* objects contained by the *CombinatorialDerivation*. The manner in which this subset is chosen is for the user to decide.

- ***masterTemplate*** [*ReferencedObject*] The *master* property is REQUIRED and MUST contain a URI that refers to a ComponentDefinition. This ComponentDefinition is expected to serve as a template for the derivation of new ComponentDefinition objects. Consequently, its components property SHOULD contain one or more Component objects that describe its substructure (referred to hereafter as template Component objects), and its sequenceConstraints property MAY also contain one or more SequenceConstraint objects that constrain this substructure.

- ***variableComponents*** [*OwnedObject< VariableComponent >*] VariableComponent objects denote the choices available when deriving the library of variants specified by a CombinatorialDerivation.

- *attachments* : *ReferencedObject*

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/combinatorialderivation.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class CombinatorialDerivationProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Component(**args*)
The Component class is used to compose ComponentDefinition objects into a structural hierarchy. For example, the ComponentDefinition of a gene could contain four Component objects: a promoter, RBS, CDS, and terminator. In turn, the ComponentDefinition of the promoter Component could contain Component objects defined as various operator sites.

- ***roles*** [*URIProperty*] The expected purpose and function of a genetic part are described by the roles property of ComponentDefinition.

  However, the same building block might be used for a different purpose in an actual design. In other words, purpose and function are sometimes determined by context. The roles property comprises an OPTIONAL set of zero or more role URIs describing the purpose or potential function of this Components included sub-ComponentDefinition in the context of its parent ComponentDefinition. If provided, these role URIs MUST identify terms from appropriate ontologies. Roles are not restricted to describing biological function; they may annotate a Components function in any domain for which an ontology exists. It is RECOMMENDED that these role URIs identify terms that are compatible with the type properties of both this Components parent ComponentDefinition and its included sub-ComponentDefinition. For example, a role of a Component which belongs to a ComponentDefinition of type DNA and includes a sub-ComponentDefinition of type DNA might refer to terms from the Sequence Ontology. See documentation for ComponentDefinition for a table of recommended ontology terms for roles.

- ***roleIntegration*** [*URIProperty*] A roleIntegration specifies the relationship between a Component instances own set of roles and the set of roles on the included sub- ComponentDefinition.

  The roleIntegration property has a data type of URI. A Component instance with zero roles MAY OPTIONALLY specify a roleIntegration. A Component instance with one or more roles MUST specify a roleIntegration from the table below If zero Component roles are given and no Component roleIntegration is given, then http://sbols.org/v2#mergeRoles is assumed. It is RECOMMENDED to specify a set of Component roles only if the integrated result set of roles would differ from the set of roles belonging to this Components included sub-ComponentDefinition. roleIntegration URI

  Description

  http://sbols.org/v2#overrideRoles

  In the context of this Component, ignore any roles given for the included sub-ComponentDefinition.

  Instead use only the set of zero or more roles given for this Component.

  http://sbols.org/v2#mergeRoles

  Use the union of the two sets: both the set of zero or more roles given for this Component as well

  as the set of zero or more roles given for the included sub- ComponentDefinition.

- ***definition*** [*ReferencedObject*] The definition property is a REQUIRED URI that refers to the ComponentDefinition of the ComponentInstance.

  As described in the previous section, this ComponentDefinition effectively provides information about the types and roles of the ComponentInstance. The definition property MUST NOT refer to the same ComponentDefinition as the one that contains the ComponentInstance. Furthermore, ComponentInstance objects MUST NOT form a cyclical chain of references via their definition properties and the ComponentDefinition objects that contain them. For example, consider the ComponentInstance objects A and B and the ComponentDefinition objects X and Y . The reference chain X contains A, A isdefinedby Y, Y contains B, and B isdefinedby X iscyclical.

- ***access*** [*URIProperty*] The access property is a REQUIRED URI that indicates whether the ComponentInstance can be referred to remotely by a MapsTo.

  The value of the access property MUST be one of the following URIs. Access URI

  Description

  http://sbols.org/v2#public

  The ComponentInstance MAY be referred to by remote MapsTo objects

  http://sbols.org/v2#private

  The ComponentInstance MAY be referred to by remote MapsTo objects

- ***mapsTos*** [*OwnedObject*< *MapsTo* >] The mapsTos property is OPTIONAL and MAY contain a set of MapsTo objects that refer to and link together ComponentInstance objects (both Component objects and FunctionalComponent objects) within a larger design.

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/component.h

class ComponentDefinition(**args*)

The ComponentDefinition class represents the structural entities of a biological design.

The primary usage of this class is to represent structural entities with designed sequences, such as DNA, RNA, and proteins, but it can also be used to represent any other entity that is part of a design, such as small molecules, proteins, and complexes

- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that specifies the category of biochemical or physical entity (for example DNA, protein, or small molecule) that a ComponentDefinition object abstracts for the purpose of engineering design.

  The types property of every ComponentDefinition MUST contain one or more URIs that MUST identify terms from appropriate ontologies, such as the BioPAX ontology or the ontology of Chemical Entities of Biological Interest. See the table below for examples. Type

  URI for BioPAX Term

  LibSBOL symbol

  DNA

  http://www.biopax.org/release/biopax-level3.owl#DnaRegion

  BIOPAX_DNA

RNA

http://www.biopax.org/release/biopax-level3.owl#RnaRegion

BIOPAX_RNA

Protein

http://www.biopax.org/release/biopax-level3.owl#Protein

BIOPAX_PROTEIN

Small Molecule

http://www.biopax.org/release/biopax-level3.owl#SmallMolecule

BIOPAX_SMALL_MOLECULE

Complex

http://www.biopax.org/release/biopax-level3.owl#Complex

BIOPAX_COMPLEX

- ***roles*** [*URIProperty*] The roles property is an OPTIONAL set of URIs that clarifies the potential function of the entity represented by a ComponentDefinition in a biochemical or physical context.

  The roles property of a ComponentDefinition MAY contain one or more URIs that MUST identify terms from ontologies that are consistent with the types property of the ComponentDefinition. For example, the roles property of a DNA or RNA ComponentDefinition could contain URIs identifying terms from the Sequence Ontology (SO). See the table below for common examples Role

  URI for Sequence Ontology Term

  LibSBOL symbol

  Miscellaneous

  http://identifiers.org/so/SO:0000001

  SO_MISC

  Promoter

  http://identifiers.org/so/SO:0000167

  SO_PROMOTER

  RBS

  http://identifiers.org/so/SO:0000139

  SO_RBS

  CDS

  http://identifiers.org/so/SO:0000316

  SO_CDS

  Terminator

  http://identifiers.org/so/SO:0000141

  SO_TERMINATOR

  Gene

  http://identifiers.org/so/SO:0000704

Operator

http://identifiers.org/so/SO:0000057

Engineered Gene

http://identifiers.org/so/SO:0000280

mRNA

http://identifiers.org/so/SO:0000234

Effector

http://identifiers.org/chebi/CHEBI:35224

- ***components*** [*OwnedObject< Component >*] The components property is OPTIONAL and MAY specify a set of Component objects that are contained by the ComponentDefinition. The components properties of ComponentDefinition objects can be used to construct a hierarchy of Component and ComponentDefinition objects. If a ComponentDefinition in such a hierarchy refers to one or more Sequence objects, and there exist ComponentDefinition objects lower in the hierarchy that refer to Sequence objects with the same encoding, then the elements properties of these Sequence objects SHOULD be consistent with each other, such that well-defined mappings exist from the lower level elements to the higher level elements. This mapping is also subject to any restrictions on the positions of the Component objects in the hierarchy that are imposed by the SequenceAnnotation or SequenceConstraint objects contained by the ComponentDefinition objects in the hierarchy. The set of relations between Component and ComponentDefinition objects is strictly acyclic.
- ***sequences*** [*ReferencedObject*] The sequences property is OPTIONAL and MAY include a URI that refer to a Sequence object. The referenced object defines the primary structure of the ComponentDefinition.
- *sequence* : *OwnedObject< Sequence >*
- ***sequenceAnnotations*** [*OwnedObject< SequenceAnnotation >*] The sequenceAnnotations property is OPTIONAL and MAY contain a set of SequenceAnnotation objects. Each SequenceAnnotation specifies and describes a potentially discontiguous region on the Sequence objects referred to by the ComponentDefinition.
- ***sequenceConstraints*** [*OwnedObject< SequenceConstraint >*] The sequenceConstraints property is OPTIONAL and MAY contain a set of SequenceConstraint objects. These objects describe any restrictions on the relative, sequence-based positions and/or orientations of the Component objects contained by the ComponentDefinition. For example, the ComponentDefinition of a gene might specify that the position of its promoter Component precedes that of its CDS Component. This is particularly useful when a ComponentDefinition lacks a Sequence and therefore cannot specify the precise, sequence-based positions of its Component objects using SequenceAnnotation objects.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This

convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/componentdefinition.h

addDownstreamFlank(*target*, *elements*)
addDownstreamFlank(target, elements)

This may be a useful method when building up SBOL representations of natural DNA sequences.

For example it is often necessary to specify components that are assumed to have no meaningful role in the design, but are nevertheless important to fill in regions of sequence. This method autoconstructs a ComponentDefinition and Sequence object to create an arbitrary flanking sequence around design Components. The new ComponentDefinition will have Sequence Ontology type of flanking_sequence.

- ***target*** [] The new flanking sequence will be placed downstream of the target
- ***elements*** [] The primary sequence elements will be assigned to the autoconstructed Sequence object. The encoding is inferred

addUpstreamFlank(*target*, *elements*)
addUpstreamFlank(target, elements)

This may be a useful method when building up SBOL representations of natural DNA sequences.

For example it is often necessary to specify components that are assumed to have no meaningful role in the design, but are nevertheless important to fill in regions of sequence. This method autoconstructs a ComponentDefinition and Sequence object to create an arbitrary flanking sequence around design Components. The new ComponentDefinition will have Sequence Ontology type of flanking_region or SO:0000239

- ***target*** [] The new flanking sequence will be placed upstream of the target

- ***elements*** [] The primary sequence elements will be assigned to the autoconstructed Sequence object. The encoding is inferred

assemble(**args*)
assemble(list_of_uris, assembly_standard="")

Assembles ComponentDefinitions into an abstraction hierarchy.

The resulting data structure is a partial design, still lacking a primary structure or explicit sequence. To form a primary structure out of the ComponentDefinitions, call linearize after calling assemble. To fully realize the target sequence, use Sequence::assemble().

- ***list_of_uris*** [] A list of URIs for the constituent ComponentDefinitions, or displayIds if using SBOL-compliant URIs
- ***assembly_standard*** [] An optional argument such as IGEM_STANDARD_ASSEMBLY that affects how components are composed and the final target sequence

assemblePrimaryStructure(**args*)
assemblePrimaryStructure(primary_structure, doc, assembly_standard="")

Assembles ComponentDefinition into a linear primary structure.

The resulting data structure is a partial design, still lacking an explicit sequence. To fully realize the target sequence, use Sequence::assemble().

- ***list_of_components*** [] A list of subcomponents that will compose this ComponentDefinition
- ***doc*** [] The Document to which the assembled ComponentDefinitions will be added
- ***assembly_standard*** [] An optional argument such as IGEM_STANDARD_ASSEMBLY that affects how components are composed and the final target sequence

build()
build() -> ComponentDefinition &

compile()
compile() -> std::string

Compiles an abstraction hierarchy of ComponentDefinitions into a nucleotide sequence. If no Sequence object is associated with this ComponentDefinition, one will be automatically instantiated.

copy(**args*)
copy(ns="", version="") -> SBOLClass &

disassemble(*range_start=1*)
disassemble(range_start=1)

Instantiates a Component for every SequenceAnnotation. When converting from a flat GenBank file to a flat SBOL file, the result is a ComponentDefinition with SequenceAnnotations. This method will convert the flat SBOL file into hierarchical SBOL.

getDownstreamComponent(*current_component*)
getDownstreamComponent(current_component) -> Component &

Get the downstream Component.

The downstream component

getFirstComponent()
getFirstComponent() -> Component &

Gets the first Component in a linear sequence.

The first component in sequential order

getInSequentialOrder()
*getInSequentialOrder() -> std::vector< Component * >*

Orders this ComponentDefinition's member Components into a linear arrangement based on Sequence Constraints.

Primary sequence structure

getLastComponent()
getLastComponent() -> Component &

Gets the last Component in a linear sequence.

The last component in sequential order

getPrimaryStructure()
*getPrimaryStructure() -> std::vector< ComponentDefinition * >*

Get the primary sequence of a design in terms of its sequentially ordered Components.

getUpstreamComponent(*current_component*)
getUpstreamComponent(current_component) -> Component &

Get the upstream Component.

The upstream component

hasDownstreamComponent(*current_component*)
hasDownstreamComponent(current_component) -> int

Checks if the specified Component has a Component downstream in linear arrangement on the DNA strand.

Checks that the appropriate SequenceConstraint exists.

- ***current_component*** [] A Component in this ComponentDefinition

1 if found, 0 if not

hasUpstreamComponent(*current_component*)
hasUpstreamComponent(current_component) -> int

Checks if the specified Component has a Component upstream in linear arrangement on the DNA strand.

Checks that the appropriate SequenceConstraint exists.

- ***current_component*** [] A Component in this ComponentDefinition

1 if found, 0 if not

insertDownstream(*target*, *insert*)
insertDownstream(target, insert)

Insert a Component downstream of another in a primary sequence, shifting any adjacent Components dowstream as well.

- ***target*** [] The target Component will be upstream of the insert Component after this operation.
- ***insert*** [] The insert Component is inserted downstream of the target Component.

insertUpstream(*target*, *insert*)
insertUpstream(target, insert)

Insert a Component upstream of another in a primary sequence, shifting any adjacent Components upstream as well.

- ***target*** [] The target Component will be downstream of the insert Component after this operation.
- ***insert*** [] The insert Component is inserted upstream of the target Component.

isComplete(**args*)
isComplete() -> bool

Recursively verifies that the parent Document contains a ComponentDefinition and Sequence for each and every ComponentDefinition in the abstraction hierarchy.

If a ComponentDefinition is not complete, some objects are missing from the Document or externally linked. Diagnose with isComplete(std::string &msg)

true if the abstraction hierarchy is complete, false otherwise.

isRegular(**args*)
isRegular() -> bool

Recursively checks if this ComponentDefinition defines a SequenceAnnotation and Range for every Sequence.

Regularity is more stringent than completeness. A design must be complete to be regular. If the Component is irregular, diagnose with isRegular(std::string &msg)

true if the abstraction hierarchy is regular, false otherwise.

linearize(**args*)
linearize(list_of_uris)

participate(*species*)
participate(species)

A convenience method that assigns a component to participate in a biochemical reaction.

Behind the scenes, it auto-constructs a FunctionalComponent for this ComponentDefinition and assigns it to a Participation

- ***species*** [] A Participation object (ie, participant species in a biochemical Interaction).

updateSequence(**args*)
updateSequence(composite_sequence="") -> std::string

Assemble a parent ComponentDefinition's Sequence from its subcomponent Sequences.

- ***composite_sequence*** [] A recursive parameter, use default value

The assembled parent sequence

class ComponentDefinitionProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class ComponentInstance(**args*, ***kwargs*)

- ***definition*** [*ReferencedObject*] The definition property is a REQUIRED URI that refers to the ComponentDefinition of the ComponentInstance.

  As described in the previous section, this ComponentDefinition effectively provides information about the types and roles of the ComponentInstance. The definition property MUST NOT refer to the same ComponentDefinition as the one that contains the ComponentInstance. Furthermore, ComponentInstance objects MUST NOT form a cyclical chain of references via their definition properties and the ComponentDefinition objects that contain them. For example, consider the ComponentInstance objects A and B and the ComponentDefinition objects X and Y . The reference chain X contains A, A isdefinedby Y, Y contains B, and B isdefinedby X iscyclical.

- ***access*** [*URIProperty*] The access property is a REQUIRED URI that indicates whether the ComponentInstance can be referred to remotely by a MapsTo.

  The value of the access property MUST be one of the following URIs. Access URI

  Description

http://sbols.org/v2#public

The ComponentInstance MAY be referred to by remote MapsTo objects

http://sbols.org/v2#private

The ComponentInstance MAY be referred to by remote MapsTo objects

- ***mapsTos*** [*OwnedObject< MapsTo >*] The mapsTos property is OPTIONAL and MAY contain a set of MapsTo objects that refer to and link together ComponentInstance objects (both Component objects and FunctionalComponent objects) within a larger design.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

class ComponentProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Config
A class which contains global configuration variables for the libSBOL environment. Intended to be used like a static class, configuration variables are accessed through the Config::setOptions and Config::getOptions methods.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/config.h

static getOption(*option*)
getOption(option) -> std::string

Get current option value for online validation and conversion.

- ***option*** [] The option key

static setOption(**args*)
setOption(option, value)

Config_getOption(*option*)
getOption(option) -> std::string

Get current option value for online validation and conversion.

- ***option*** [] The option key

Config_setOption(**args*)
setOption(option, value)

class Cut(**args*)
The Cut class specifies a location between two coordinates of a Sequence's elements. class Cut : public Location.

- ***at*** [*IntProperty*] This property specifies the location between this nucleotide coordinate (or other sequence element) and the nucleotide coordinate immediately following it. When equal to zero, the specified region is immediately before the first nucleotide or character in the elements.
- ***orientation*** [*URIProperty*] The orientation indicates how a region of double-stranded DNA represented by the parent SequenceAnnotation and its associated Component are oriented.

  The orientation may be one of the following values. By default it is set to SBOL_ORIENTATION_INLINE. Orientation URI

  libSBOL Symbol

  http://sbols.org/v2#inline

  SBOL_ORIENTATION_INLINE

  http://sbols.org/v2#reverseComplement

  SBOL_ORIENTATION_REVERSE_COMPLEMENT
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This

convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/location.h

class DateTimeProperty(**args*)

Contains a DateTime string following XML Schema.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

stampTime()

stampTime() -> std::string

Set this property with the current time.

class Design(**args*)

This class represents a biological Design. A Design is a conceptual representation of a biological system that a synthetic biologist intends to build. A Design is the first object created in libSBOL's formalized Design-Build-Test-Analysis workflow.

- ***structure*** [*OwnedObject< ComponentDefinition >*] The target biological structure for synthesis or other molecular assembly.
- ***function*** [*OwnedObject< ModuleDefinition >*] The intended function and predicted behavior of the Design object.
- ***characterization*** [*ReferencedObject*] A reference to an Analysis or multiple Analysis objects that contain characterization data, previously verified experimental knowledge, or explanatory models that inform a Design.

- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/dbtl.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class DesignProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Document(**args*)
Read and write SBOL using a Document class. The Document is a container for Components, Modules, and all other SBOLObjects.

- *designs* : *OwnedObject< Design >*

- *builds* : *OwnedObject< Build >*
- *tests* : *OwnedObject< Test >*
- *analyses* : *OwnedObject< Analysis >*
- *componentDefinitions* : *OwnedObject< ComponentDefinition >*
- *moduleDefinitions* : *OwnedObject< ModuleDefinition >*
- *models* : *OwnedObject< Model >*
- *sequences* : *OwnedObject< Sequence >*
- *collections* : *OwnedObject< Collection >*
- *activities* : *OwnedObject< Activity >*
- *plans* : *OwnedObject< Plan >*
- *agents* : *OwnedObject< Agent >*
- *attachments* : *OwnedObject< Attachment >*
- *combinatorialderivations* : *OwnedObject< CombinatorialDerivation >*
- *implementations* : *OwnedObject< Implementation >*
- *sampleRosters* : *OwnedObject< SampleRoster >*
- *citations* : *URIProperty*
- *keywords* : *URIProperty*
- *python_iter* : *iterator*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.

- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/document.h

addComponentDefinition(**args*)
addComponentDefinition(sbol_obj)

addModel(**args*)
addModel(sbol_obj)

addModuleDefinition(**args*)
addModuleDefinition(sbol_obj)

addNamespace(**args*)
addNamespace(ns, prefix)

Add a new namespace to this Document.

- ***ns*** [] The namespace, eg. http://sbols.org/v2#
- ***prefix*** [] The namespace prefix, eg. sbol

addSequence(**args*)
addSequence(sbol_obj)

append(*filename*)
append(filename)

Read an RDF/XML file and attach the SBOL objects to this Document.

New objects will be added to the existing contents of the Document

- ***filename*** [] The full name of the file you want to read (including file extension)

copy(**args*)
copy(ns="", version="") -> SBOLClass &

countTriples()
countTriples() -> int

end()
end() -> iterator

find(*uri*)
*find(uri) -> SBOLObject **

Search recursively for an SBOLObject in this Document that matches the uri.

- ***uri*** [] The identity of the object to search for

A pointer to the SBOLObject, or NULL if an object with this identity doesn't exist

find_property(*uri*)
*find_property(uri) -> SBOLObject **

Search this object recursively to see if it contains a member property with the given RDF type.

- ***uri*** [] The RDF type of the property to search for.

A pointer to the object that contains a member property with the specified RDF type, NULL otherwise

find_reference(*uri*)
*find_reference(uri) -> std::vector< SBOLObject * >*

Search this object recursively to see if it contains a member property with the given RDF type and indicated property value.

- ***uri*** [] A URI, either an ontology term or an object reference, to search for

A vector containing all objects found that contain the URI in a property value

generate(*world*, *sbol_serializer*, *sbol_buffer*, *sbol_buffer_len*, *ios*, *base_uri*)
generate() -> SBOLClass &

getActivity(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getAgent(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getAnalysis(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getAttachment(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getBuild(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getCollection(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getCombinatorialDerivation(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getComponentDefinition(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getDesign(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getExperiment(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getExperimentalData(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve

- ***SBOLClass*** [] The type of SBOL object

getImplementation(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getModel(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getModuleDefinition(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getNamespaces()
getNamespaces() -> std::vector< std::string >

A vector of namespaces Get namespaces contained in this Document

getPlan(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getSampleRoster(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getSequence(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

getTest(*uri*)
get(uri) -> SBOLClass &

Retrieve an object from the Document.

- ***uri*** [] The identity of the SBOL object you want to retrieve
- ***SBOLClass*** [] The type of SBOL object

query_repository(*command*)
query_repository(command) -> std::string

read(*filename*)
read(filename)

Read an RDF/XML file and attach the SBOL objects to this Document.

Existing contents of the Document will be wiped.

- ***filename*** [] The full name of the file you want to read (including file extension)

readString(**args*)
readString(sbol)

Convert text in SBOL into data objects.

- ***sbol*** [] A string formatted in SBOL

request_comparison(*diff_file*)
request_comparison(diff_file) -> std::string

Perform comparison on Documents using the online validation tool.

This is for cross-validation of SBOL documents with libSBOLj. Document comparison can also be performed using the built-in compare method.

The comparison results

request_validation(*sbol*)
request_validation(sbol) -> std::string

search_metadata(*role*, *type*, *name*, *collection*)
search_metadata(role, type, name, collection) -> std::string

summary()
summary() -> std::string

Get a summary of objects in the Document, including SBOL core object and custom annotation objects.

validate()
validate() -> std::string

Run validation on this Document via the online validation tool.

A string containing a message with the validation results

author: KC

write(*filename*)
write(filename) -> std::string

Serialize all objects in this Document to an RDF/XML file.

- ***filename*** [] The full name of the file you want to write (including file extension)

A string with the validation results, or empty string if validation is disabled

writeString()
writeString() -> std::string

Convert data objects in this Document into textual SBOL.

class EnzymeCatalysisInteraction(**args*)

- *enzyme* : *AliasedProperty< FunctionalComponent >*
- *substrates* : *AliasedProperty< FunctionalComponent >*
- *products* : *AliasedProperty< FunctionalComponent >*
- *cofactors* : *AliasedProperty< FunctionalComponent >*
- *sideproducts* : *AliasedProperty< FunctionalComponent >*
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

  URI for SBO Term

  LibSBOL symbol

  Biochemical Reaction

  http://identifiers.org/biomodels.sbo/SBO:0000176

  SBO_BIOCHEMICAL_REACTION

  Inhibition

  http://identifiers.org/biomodels.sbo/SBO:0000169

  SBO_INHIBITION

  Stimulation

  http://identifiers.org/biomodels.sbo/SBO:0000170

  SBO_STIMULATION

  Genetic Production

  http://identifiers.org/biomodels.sbo/SBO:0000589

  SBO_GENETIC_PRODUCTION

  Non-Covalent Binding

  http://identifiers.org/biomodels.sbo/SBO:0000177

  SBO_NONCOVALENT_BINDING

  Degradation

  http://identifiers.org/biomodels.sbo/SBO:0000179

  SBO_DEGRADATION

  Control

  http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject< Participation >*] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

class Experiment(**args*)

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class ExperimentProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class ExperimentalData(**args*)

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class ExperimentalDataProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

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add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
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Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class FloatProperty(**args*)
FloatProperty objects are used to contain floats.

They can be used as member objects inside custom SBOL Extension classes.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

get()
get() -> double

Get the float value.

An integer

getAll()
getAll() -> std::vector< double >

class FunctionalComponent(**args*)
The FunctionalComponent class is used to specify the functional usage of a ComponentDefinition inside a ModuleDefinition. The ModuleDefinition describes how the that describes how the FunctionalComponent interacts with others and summarizes their aggregate function.

- ***direction*** [*URIProperty*] Each FunctionalComponent MUST specify via the direction property whether it serves as an input, output, both, or neither for its parent ModuleDefinition object.

  The value for this property MUST be one of the URIs given in the table below. Direction URI

  Description

  LibSBOL Symbol

  http://sbols.org/v2#in

  Indicates that the FunctionalComponent is an input.

  SBOL_DIRECTION_IN

  http://sbols.org/v2#out

  Indicates that the FunctionalComponent is an output.

  SBOL_DIRECTION_OUT

  http://sbols.org/v2#inout

  Indicates that the FunctionalComponent is both an input and output

  SBOL_DIRECTION_IN_OUT

  http://sbols.org/v2#none

  Indicates that the FunctionalComponent is neither an input or output.

SBOL_DIRECTION_NONE

- ***definition*** [*ReferencedObject*] The definition property is a REQUIRED URI that refers to the ComponentDefinition of the ComponentInstance.

  As described in the previous section, this ComponentDefinition effectively provides information about the types and roles of the ComponentInstance. The definition property MUST NOT refer to the same ComponentDefinition as the one that contains the ComponentInstance. Furthermore, ComponentInstance objects MUST NOT form a cyclical chain of references via their definition properties and the ComponentDefinition objects that contain them. For example, consider the ComponentInstance objects A and B and the ComponentDefinition objects X and Y . The reference chain X contains A, A isdefinedby Y, Y contains B, and B isdefinedby X iscyclical.

- ***access*** [*URIProperty*] The access property is a REQUIRED URI that indicates whether the ComponentInstance can be referred to remotely by a MapsTo.

  The value of the access property MUST be one of the following URIs. Access URI

  Description

  http://sbols.org/v2#public

  The ComponentInstance MAY be referred to by remote MapsTo objects

  http://sbols.org/v2#private

  The ComponentInstance MAY be referred to by remote MapsTo objects

- ***mapsTos*** [*OwnedObject*< *MapsTo* >] The mapsTos property is OPTIONAL and MAY contain a set of MapsTo objects that refer to and link together ComponentInstance objects (both Component objects and FunctionalComponent objects) within a larger design.

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.

- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/component.h

connect(*interface_component*)
connect(interface_component)

This method connects module inputs and outputs.

This convenience method auto-constructs a MapsTo object. See Biosystem Design for an example

- ***interface_component*** [] An input or output component from another ModuleDefinition that corresponds with this component.

isMasked()
isMasked() -> int

Used to tell if a FunctionalComponent is linked to an equivalent FunctionalComponent in another ModuleDefinition.

1 if the FunctionalComponent has been over-rided by another FunctionalComponent, 0 if it hasn't.

mask(*masked_component*)
mask(masked_component)

This method is used to state that FunctionalComponents in separate ModuleDefinitions are functionally equivalent.

Using this method will override the FunctionalComponent in the argument with the FunctionalComponent calling the method. This is useful for overriding a generic, template component with an explicitly defined component. This convenience method auto-constructs a MapsTo object. See Biosystem Design for an example

- ***masked_component*** [] The FunctionalComponent that is being masked (over-ridden)

override(*masked_component*)
override(masked_component)

This method is used to state that FunctionalComponents in separate ModuleDefinitions are functionally equivalent.

Using this method will override the FunctionalComponent in the argument with the FunctionalComponent calling the method. This is useful for overriding a generic, template component with an explicitly defined component. This convenience method auto-constructs a MapsTo object. See Biosystem Design for an example

- ***masked_component*** [] The FunctionalComponent that is being masked (over-ridden)

class FunctionalComponentProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)

copy(target_property)

Copy property values to a target object's property fields.

find(*query*)

find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()

getLowerBound() -> char

getOwner()

getOwner() -> SBOLObject &

getTypeURI()

getTypeURI() -> rdf_type

getUpperBound()

getUpperBound() -> char

remove(*index=0*)

remove(index=0)

Remove a property value.

set(**args*)

set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)

validate(arg=NULL)

write()
write()

class GeneProductionInteraction(*uri*, *gene*, *product*)

- *gene* : *AliasedProperty*< *FunctionalComponent* >
- *product* : *AliasedProperty*< *FunctionalComponent* >
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

  URI for SBO Term

  LibSBOL symbol

  Biochemical Reaction

  http://identifiers.org/biomodels.sbo/SBO:0000176

  SBO_BIOCHEMICAL_REACTION

  Inhibition

  http://identifiers.org/biomodels.sbo/SBO:0000169

  SBO_INHIBITION

  Stimulation

  http://identifiers.org/biomodels.sbo/SBO:0000170

  SBO_STIMULATION

  Genetic Production

  http://identifiers.org/biomodels.sbo/SBO:0000589

  SBO_GENETIC_PRODUCTION

  Non-Covalent Binding

  http://identifiers.org/biomodels.sbo/SBO:0000177

  SBO_NONCOVALENT_BINDING

  Degradation

  http://identifiers.org/biomodels.sbo/SBO:0000179

  SBO_DEGRADATION

  Control

  http://identifiers.org/biomodels.sbo/SBO:0000168

  SBO_CONTROL

- ***participations*** [*OwnedObject*< *Participation* >] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer

might want to specify that an Interaction will exist, even if its participants have not yet been determined.

- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

class GenericLocation(**args*)

the GenericLocation class is included as a starting point for specifying regions on Sequence objects with encoding properties other than IUPAC and potentially nonlinear structure. This class can also be used to set the orientation of a SequenceAnnotation and any associated Component when their parent ComponentDefinition is a partial design that lacks a Sequence.

- ***orientation*** [*URIProperty*] The orientation indicates how a region of double-stranded DNA represented by the parent SequenceAnnotation and its associated Component are oriented.

The orientation may be one of the following values. By default it is set to SBOL_ORIENTATION_INLINE. Orientation URI

libSBOL Symbol

http://sbols.org/v2#inline

SBOL_ORIENTATION_INLINE

http://sbols.org/v2#reverseComplement

SBOL_ORIENTATION_REVERSE_COMPLEMENT

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
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- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
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- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
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C++ includes: /Users/bbartley/Dev/git/libSBOL/source/location.h

class Identified(**args*)

All SBOL-defined classes are directly or indirectly derived from the Identified abstract class.

An Identified object is identified using a Uniform Resource Identifier (URI), a unique string that identifies and refers to a specific object in an SBOL document or in an online resource such as a DNA repository.

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
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- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
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C++ includes: /Users/bbartley/Dev/git/libSBOL/source/identified.h

class Implementation(**args*)

An Implementation represents a real, physical instance of a synthetic biological construct which may be associated with a laboratory sample. An Implementation may be linked back to its original design (either a ModuleDefinition or ComponentDefinition) using the wasDerivedFrom property inherited from the Identified superclass.

- *built* : *URIProperty*
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/implementation.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class ImplementationProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class IntProperty(**args*)
IntProperty objects are used to contain integers.

They can be used as member objects inside custom SBOL Extension classes.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

get()
get() -> int

Get the integer value.

An integer

getAll()
getAll() -> std::vector< int >

class Interaction(**args*)
The Interaction class provides more detailed descriptionof how the FunctionalComponents are intended to work together. For example, this class can be used to represent different forms of genetic regulation (e.g., transcriptional activation or repression), processes from the central dogma of biology (e.g. transcription and translation), and other basic molecular interactions (e.g., non-covalent binding or enzymatic phosphorylation).

- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

  URI for SBO Term

  LibSBOL symbol

  Biochemical Reaction

  http://identifiers.org/biomodels.sbo/SBO:0000176

  SBO_BIOCHEMICAL_REACTION

  Inhibition

  http://identifiers.org/biomodels.sbo/SBO:0000169

  SBO_INHIBITION

  Stimulation

  http://identifiers.org/biomodels.sbo/SBO:0000170

  SBO_STIMULATION

  Genetic Production

  http://identifiers.org/biomodels.sbo/SBO:0000589

  SBO_GENETIC_PRODUCTION

  Non-Covalent Binding

  http://identifiers.org/biomodels.sbo/SBO:0000177

  SBO_NONCOVALENT_BINDING

  Degradation

  http://identifiers.org/biomodels.sbo/SBO:0000179

SBO_DEGRADATION

Control

http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject< Participation >*] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within

this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/interaction.h

class InteractionProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)

copy(target_property)

Copy property values to a target object's property fields.

find(*query*)

find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()

getLowerBound() -> char

getOwner()

getOwner() -> SBOLObject &

getTypeURI()

getTypeURI() -> rdf_type

getUpperBound()

getUpperBound() -> char

remove(*index=0*)

remove(index=0)

Remove a property value.

set(**args*)

set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Location(**args*)
The Location class specifies the strand orientation of a Component and can be further extended by the Range, Cut, and GenericLocation classes.

- ***orientation*** [*URIProperty*] The orientation indicates how a region of double-stranded DNA represented by the parent SequenceAnnotation and its associated Component are oriented.

  The orientation may be one of the following values. By default it is set to SBOL_ORIENTATION_INLINE. Orientation URI

  libSBOL Symbol

  http://sbols.org/v2#inline

  SBOL_ORIENTATION_INLINE

  http://sbols.org/v2#reverseComplement

  SBOL_ORIENTATION_REVERSE_COMPLEMENT

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.

- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name

properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.

- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/location.h

class LocationProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)

copy(target_property)

Copy property values to a target object's property fields.

find(*query*)

find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()

getLowerBound() -> char

getOwner()

getOwner() -> SBOLObject &

getTypeURI()

getTypeURI() -> rdf_type

getUpperBound()

getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class MapsTo(**args*)
The purpose of the MapsTo class is to make identity relationships between different ComponentInstances in functional and structural hierarchies more clear. For example, a MapsTo object may be used to connect outputs and inputs between different low-level ModuleDefinitions contained in a higher level Module Definition. A MapsTo object may also be used to override a generic Component in a low-level ModuleDefinition with an explicit Component in a high-level ModuleDefinition, for example mapping a generic gene to an explicit component with a name and sequence.

- ***refinement*** [*URIProperty*] Each MapsTo object MUST specify the relationship between its local and remote ComponentInstance objects using one of the REQUIRED refinement URIs provided in the table below.

  Refinement URI

  libSBOL Symbol

  Description

  http://sbols.org/v2#useRemote

  SBOL_REFINEMENT_USE_REMOTE

  All references to the local ComponentInstance MUST dereference to the remote ComponentInstance instead.

  http://sbols.org/v2#useLocal

  SBOL_REFINEMENT_USE_LOCAL

  In the context of the ComponentDefinition or ModuleDefinition that contains the owner of the MapsTo, all references to the remote ComponentInstance MUST dereference to the local ComponentInstance instead.

  http://sbols.org/v2#verifyIdentical

  SBOL_REFINEMENT_VERIFY_IDENTICAL

  The definition properties of the local and remoteComponentInstance objects MUST refer to the same ComponentDefinition.

  http://sbols.org/v2#merge

  SBOL_REFINEMENT_MERGE_DESCRIPTION

In the context of the ComponentDefinition or ModuleDefinition that contains the owner of the MapsTo, all references to the local ComponentInstance or the remote ComponentInstance MUST dereference to both objects.

- ***local*** [*ReferencedObject*] The identity of the lower level ComponentInstance.
- ***remote*** [*ReferencedObject*] The identity of the higher level ComponentInstance.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/mapsto.h

class MapsToProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Measurement(**args*)

class MeasurementProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)

copy(target_property)

Copy property values to a target object's property fields.

find(*query*)

find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()

getLowerBound() -> char

getOwner()

getOwner() -> SBOLObject &

getTypeURI()

getTypeURI() -> rdf_type

getUpperBound()

getUpperBound() -> char

remove(*index=0*)

remove(index=0)

Remove a property value.

set(**args*)

set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Model(**args*)
The purpose of the Model class is to serve as a placeholder for an external computational model and provide additional meta-data to enable better reasoning about the contents of this model.

In this way, there is minimal duplication of standardization efforts and users of SBOL can formalize the function of a ModuleDefinition in the language of their choice.

- ***source*** [*URIProperty*] The source property is REQUIRED and MUST contain a URI reference to the source file for a model.
- ***language*** [*URIProperty*] The language property is REQUIRED and MUST contain a URI that specifies the language in which the model is implemented.

  It is RECOMMENDED that this URI refer to a term from the EMBRACE Data and Methods (EDAM) ontology. The Table below provides a list of terms from this ontology and their URIs. If the language property of a Model is well- described by one these terms, then it MUST contain the URI for this term as its value. Model Language

  URI for EDAM Term

  libSBOL Symbol

  SBML

  http://identifiers.org/edam/format_2585

  EDAM_SBML

  CellML

  http://identifiers.org/edam/format_3240

  EDAM_CELLML

  BioPAX

  http://identifiers.org/edam/format_3156

  EDAM_BIOPAX
- ***framework*** [*URIProperty*] Model Language

  URI for SBO Term

  libSBOL Symbol

  Continuous

  http://identifiers.org/biomodels.sbo/SBO:0000062

  SBO_CONTINUOUS

  Discrete

  http://identifiers.org/biomodels.sbo/SBO:0000063

  SBO_DISCRETE
- *attachments* : *ReferencedObject*

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/model.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class ModelProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Module(**args*)
The Module class represents a submodule of a ModuleDefinition within a hierarchical design.

- ***definition*** [*ReferencedObject*] The definition property is a REQUIRED URI that refers to the ModuleDefinition for the Module.

- ***mapsTos*** [*OwnedObject< MapsTo >*] The mapsTos property is an OPTIONAL set of MapsTo objects that refer to and link ComponentInstance objects together within the heterarchy of Module, ModuleDefinition, ComponentInstance, and ComponentDefinition objects.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/module.h

class ModuleDefinition(**args*)

The ModuleDefinition class represents a grouping of structural and functional entities in a biological design. The primary usage of this class is to assert the molecular interactions and abstract function of its child entities.

- ***roles*** [*URIProperty*] The roles property is an OPTIONAL set of URIs that clarifies the intended function of a ModuleDefinition. These URIs might identify descriptive biological roles, such as metabolic pathway and signaling cascade, but they can also identify identify logical roles, such as inverter or

AND gate, or other abstract roles for describing the function of design. Interpretation of the meaning of such roles currently depends on the software tools that read and write them.

- ***modules*** [*OwnedObject< Module >*] The modules property is OPTIONAL and MAY specify a set of Module objects contained by the ModuleDefinition. While the ModuleDefinition class is analogous to a specification sheet for a system of interacting biological elements, the Module class represents the occurrence of a particular subsystem within the system. Hence, this class allows a system design to include multiple instances of a subsystem, all defined by reference to the same ModuleDefinition. For example, consider the ModuleDefinition for a network of two-input repressor devices in which the particular repressors have not been chosen yet. This ModuleDefinition could contain multiple Module objects that refer to the same ModuleDefinition of an abstract two- input repressor device. Note that the set of relations between Module and ModuleDefinition objects is strictly acyclic.
- ***interactions*** [*OwnedObject< Interaction >*] The interactions property is OPTIONAL and MAY specify a set of Interaction objects within the ModuleDefinition. The Interaction class provides an abstract, machine-readable representation of entity behavior within a ModuleDefinition. Each Interaction contains Participation objects that indicate the roles of the FunctionalComponent objects involved in the Interaction.
- ***functionalComponents*** [*OwnedObject< FunctionalComponent >*] The functionalComponents property is OPTIONAL and MAY specify a set of FunctionalComponent objects contained by the ModuleDefinition. Just as a Module represents an instance of a subsystem in the overall system represented by a ModuleDefinition, a FunctionalComponent represents an instance of a structural entity (represented by a ComponentDefinition) in the system. This concept allows a ModuleDefinition to assert different interactions for separate copies of the same structural entity if needed. For example, a ModuleDefinition might contain multiple FunctionalComponent objects that refer to the same promoter ComponentDefinition, but assert different interactions for these promoter copies based on their separate positions in another ComponentDefinition that represents the structure of the entire system.
- ***models*** [*ReferencedObject*] The models property is OPTIONAL and MAY specify a set of URI references to Model objects. Model objects are placeholders that link ModuleDefinition objects to computational models of any format. A ModuleDefinition object can link to more than one Model since each might encode system behavior in a different way or at a different level of detail.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own

wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/moduledefinition.h

assemble(**args*)
assemble(list_of_modules)

Assemble a high-level ModuleDefinition from lower-level submodules.

Autoconstructs Module objects in the process.

- ***list_of_modules*** [] A list of pointers to the submodule ModuleDefinitions

connect(*output*, *input*)
connect(output, input)

Connects the output of a sub-Module with the input of another sub-Module.

Auto-constructs MapsTo objects.

- ***output*** [] A FunctionalComponent configured as a Module output (see setOutput)
- ***input*** [] A FunctionalComponent configured as a Module input (see setInput)

copy(**args*)
copy(ns="", version="") -> SBOLClass &

override(*highlevel*, *lowlevel*)
override(highlevel, lowlevel)

Overrides a low-level component in an abstract sub-Module with a high-level component in a parent ModuleDefinition, for example when overriding an abstract template Module with explicit components.

- ***highlevel*** [] A high-level FunctionalComponent
- ***lowlevel*** [] A low-level FunctionalComponent in a nested sub-Module

setInput(**args*)
setInput(input)

Configures a FunctionalComponent as an input for a Module.

Useful for bottom-up assembly of Modules and sub-Modules

- ***input*** [] The FunctionalComponent that will be configured

setOutput(**args*)
setOutput(output)

Configures a FunctionalComponent as an output for a Module.

Useful for bottom-up assembly of Modules and sub-Modules.

- ***output*** [] The FunctionalComponent that will be configured

class ModuleDefinitionProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class ModuleProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class OwnedActivity(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values

specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedAgent(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedAnalysis(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedAssociation(**args*)

A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()

clear()

Remove all children objects from the parent and destroy them.

create(*uri*)

create(uri) -> Test &

createCut(*uri*)

create(uri) -> Test &

createGenericLocation(*uri*)

create(uri) -> Test &

createRange(*uri*)

create(uri) -> Test &

define(*definition_object*)

define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedAttachment(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedBuild(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedCollection(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedCombinatorialDerivation(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created

- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedComponent(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedComponentDefinition(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove (**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set (*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedDesign(**args*)

A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()

clear()

Remove all children objects from the parent and destroy them.

create(*uri*)

create(uri) -> Test &

createCut(*uri*)

create(uri) -> Test &

createGenericLocation(*uri*)

create(uri) -> Test &

createRange(*uri*)

create(uri) -> Test &

define(*definition_object*)

define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedExperiment(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values

specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedExperimentalData(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedFunctionalComponent(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedImplementation(**args*)

A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()

clear()

Remove all children objects from the parent and destroy them.

create(*uri*)

create(uri) -> Test &

createCut(*uri*)

create(uri) -> Test &

createGenericLocation(*uri*)

create(uri) -> Test &

createRange(*uri*)

create(uri) -> Test &

define(*definition_object*)

define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created

- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedInteraction(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)

get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()

*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)

get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)

get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedLocation(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedMapsTo(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedMeasurement(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created

- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedModel(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedModule(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange (**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove (**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set (*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedModuleDefinition(**args*)

A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()

clear()

Remove all children objects from the parent and destroy them.

create(*uri*)

create(uri) -> Test &

createCut(*uri*)

create(uri) -> Test &

createGenericLocation(*uri*)

create(uri) -> Test &

createRange(*uri*)

create(uri) -> Test &

define(*definition_object*)

define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedParticipation(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values

specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedPlan(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedSampleRoster(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedSequence(**args*)

A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()

clear()

Remove all children objects from the parent and destroy them.

create(*uri*)

create(uri) -> Test &

createCut(*uri*)

create(uri) -> Test &

createGenericLocation(*uri*)

create(uri) -> Test &

createRange(*uri*)

create(uri) -> Test &

define(*definition_object*)

define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created

- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)

find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.

- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedSequenceAnnotation(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedSequenceConstraint(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object

- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedTest(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedUsage(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created

- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class OwnedVariableComponent(**args*)
A container property that contains child objects.

Creates a composition out of two or more classes. In the SBOL specification, compositional relationships are indicated in class diagrams by arrows with black diamonds. A compositional relationship means that deleting the parent object will delete the child objects, and adding the parent object to a Document will also add the child object. Owned objects are stored in arbitrary order.

- ***SBOLClass*** [] The type of child SBOL object contained by this Property
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(*sbol_obj*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

clear()
clear()

Remove all children objects from the parent and destroy them.

create(*uri*)
create(uri) -> Test &

createCut(*uri*)
create(uri) -> Test &

createGenericLocation(*uri*)
create(uri) -> Test &

createRange(*uri*)
create(uri) -> Test &

define(*definition_object*)
define(definition_object) -> SBOLClass &

Autoconstructs a child object and attaches it to the parent object.

Additionally, it sets the definition property of the child object, for example, in the case of creating Components, FunctionalComponents, and Modules. The new object will be constructed with default values specified in the constructor for this type of object. If SBOLCompliance is enabled, the child object's identity will be constructed using the supplied displayId argument. Otherwise, the user should supply a full URI.

- ***SBOLClass*** [] The type of SBOL object that will be created
- ***definition_object*** [] The returned object will reference the definition_object in its definition property.

A reference to the child object check uniqueness of URI in Document

find(*uri*)
find(uri) -> bool

- ***uri*** [] The full uniform resource identifier of the object to search for in this property

A boolean indicating whether found or not

get(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getAll()
*getAll() -> std::vector< SBOLClass * >*

Get all the objects contained in the property.

A vector of pointers to the objects

getCut(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getGenericLocation(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

getRange(**args*)
get(uri="") -> SBOLSubClass &

Get the child object.

- ***SBOLClass*** [] The type of the child object
- ***SBOLSubClass*** [] A derived class of SBOLClass. Use this type specialization when adding multiple types of SBOLObjects to a container.
- ***uri*** [] The specific URI for a child object if this OwnedObject property contains multiple objects,

A reference to the child object Returns a child object from the OwnedObject property. If no URI is specified, the first object in this OwnedObject property is returned.

remove(**args*)
remove(index=0)

Remove an object from the list of objects and destroy it.

- ***index*** [] A numerical index for the object.

set(*sbol_obj*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

class PartShop(**args*)
A class which provides an API front-end for online bioparts repositories.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/partshop.h

addSynBioHubAnnotations(*doc*)
addSynBioHubAnnotations(doc)

attachFile(*topleveluri*, *filename*)
attachFile(topleveluri, filename)

Upload and attach a file to a TopLevel object in a PartShop.

- ***top_level_uri*** [] The identity of the object to which the file will be attached
- ***file_name*** [] A path to the file attachment

countCollection()
count() -> int

Return the count of objects contained in a PartShop.

- ***SBOLClass*** [] The type of SBOL object, usually a ComponentDefinition

countComponentDefinition()
count() -> int

Return the count of objects contained in a PartShop.

- ***SBOLClass*** [] The type of SBOL object, usually a ComponentDefinition

downloadAttachment(**args*)
downloadAttachment(attachment_uri, path=".")

Download a file attached to a TopLevel object in an online repository.

- ***attachment_uri*** [] The full URI of the attached object
- ***path*** [] The target path to which the file will be downloaded

getURL()
getURL() -> std::string

Returns the network address of the PartShop.

The URL of the online repository

login(**args*)
login(email, password="")

In order to submit to a PartShop, you must login first.

Register on SynBioHub to obtain account credentials.

- ***email*** [] The email associated with the user's SynBioHub account
- ***password*** [] The user's password

pull(**args*)
pull(uri, doc, recursive)

pullCollection(*uri*, *doc*, *recursive=True*)
pull(uri, doc, recursive)

pullComponentDefinition(*uri*, *doc*, *recursive=True*)
pull(uri, doc, recursive)

pullSequence(*uri*, *doc*, *recursive=True*)
pull(uri, doc, recursive)

search(**args*)
search(q) -> SearchResponse &

Perform an ADVANCED search using a SearchQuery object.

- ***search_query*** [] A map of string key-value pairs. Keys are objectType, sbolTag, collection, dcterms:tag, namespace/tag, offset, limit.

Search metadata A vector of maps with key-value pairs.

searchCount(**args*)
searchCount(q) -> int

Returns the number of search records matching the given criteria for an ADVANCED search.

- ***search_query*** [] A map of string key-value pairs. See SearchQuery for required and optional criteria.

An integer count.

searchRootCollections()
searchRootCollections() -> std::string

Returns all Collections that are not members of any other Collections.

- ***doc*** [] A Document to add the Collections to

searchSubCollections(*uri*)
searchSubCollections(uri) -> std::string

Returns all Collections that are members of the Collection specified by its URI.

- ***uri*** [] The URI of a Collection of Collections
- ***doc*** [] A Document to add the subcollections to

submit(**args*)
submit(doc, collection="", overwrite=0) -> std::string

Submit an SBOL Document to SynBioHub.

- ***doc*** [] The Document to submit
- ***collection*** [] The URI of an SBOL Collection to which the Document contents will be uploaded
- ***overwrite*** [] An integer code: 0(default) - do not overwrite, 1 - overwrite, 2 - merge

class Participation(**args*)
Each Participation represents how a particular FunctionalComponent behaves in its parent Interaction.

- ***roles*** [*URIProperty*] The roles property is an OPTIONAL set of URIs that describes the behavior of a Participation (and by extension its referenced FunctionalComponent) in the context of its parent Interaction.

  The roles property MAY contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the participant role branch of the SBO. The table below provides a list of possible SBO terms for the roles property and their corresponding URIs. Role

  Systems Biology Ontology Term

  LibSBOL Symbol

  Inhibitor

  http://identifiers.org/biomodels.sbo/SBO:0000020

  SBO_INHIBITOR

  Stimulator

  http://identifiers.org/biomodels.sbo/SBO:0000459

  SBO_STIMULATOR

  Reactant

  http://identifiers.org/biomodels.sbo/SBO:0000010

  SBO_REACTANT

  Product

  http://identifiers.org/biomodels.sbo/SBO:0000011

SBO_PRODUCT

Ligand

http://identifiers.org/biomodels.sbo/SBO:0000280

SBO_LIGAND

Non-covalent Complex

http://identifiers.org/biomodels.sbo/SBO:0000253

SBO_NONCOVALENT_COMPLEX

If a Participation is well described by one of the terms from this table then its roles property MUST contain the URI that identifies this term. Lastly, if the roles property of a Participation contains multiple URIs, then they MUST identify non-conflicting terms. For example, the SBO terms stimulator and inhibitor would conflict.

- ***participant*** [*ReferencedObject*] The participant property MUST specify precisely one FunctionalComponent object that plays the designated role in its parent Interaction object.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.

- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/participation.h

define(**args*)
define(species, role="")

class ParticipationProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Plan(**args*)
Examples of agents are person, organisation or software. These agents should be annotated with additional information, such as software version, needed to be able to run the same software again.

- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.

- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/provo.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class PlanProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class Range(**args*)
A Range object specifies a region via discrete, inclusive start and end positions that correspond to indices for characters in the elements String of a Sequence. Note that the index of the first location is 1, as is typical practice in biology, rather than 0, as is typical practice in computer science.

- ***start*** [*IntProperty*] Specifies the inclusive starting position of a sequence region. It must be 1 or greater.
- ***end*** [*IntProperty*] Specifies the inclusive end position of a sequence region. It must be equal to or greater than the start.
- ***orientation*** [*URIProperty*] The orientation indicates how a region of double-stranded DNA represented by the parent SequenceAnnotation and its associated Component are oriented.

  The orientation may be one of the following values. By default it is set to SBOL_ORIENTATION_INLINE. Orientation URI

  libSBOL Symbol

  http://sbols.org/v2#inline

  SBOL_ORIENTATION_INLINE

  http://sbols.org/v2#reverseComplement

  SBOL_ORIENTATION_REVERSE_COMPLEMENT
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version

of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/location.h

adjoins(*comparand*)
adjoins(comparand) -> int

Indicate if these Ranges represent adjacent intervals.

Another Range object

1 if these Ranges adjoin or border each other, 0 if they are separated by an intervening Range

contains(*comparand*)
contains(comparand) -> int

Calculates how many bases of the comparand are contained by this Range.

Another Range object

The number of bases which are contained (equivalent to the length of the comparand), or 0 if it is not contained.

follows(*comparand*)
follows(comparand) -> int

Calculates how many bases separate these Ranges Another Range object.

The number of bases by which this Range follows the comparand, or 0 if it does not follow

length()
length() -> int

Returns the length of a Range.

overlaps(*comparand*)
overlaps(comparand) -> int

Calculates how many bases separate this Range from the comparand.

Another Range object

The number of bases by which the Ranges overlap. If they overlap, this is always a positive number regardless of direction. If they do not overlap, returns zero

precedes(*comparand*)
precedes(comparand) -> int

Calculates how many bases separate these Ranges Another Range object.

The number of bases by which this Range precedes the comparand, or 0 if it does not precede

class ReferencedObject(**args*)
A reference to another SBOL object Contains a Uniform Resource Identifier (URI) that refers to an an associated object.

The object it points to may be another resource in this Document or an external reference, for example to an object in an external repository or database. In the SBOL specification, association by reference is indicated in class diagrams by arrows with open (white) diamonds.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

add(**args*)
add(obj)

Append a URI reference of an object to the property store.

- ***The*** [] referenced object

addReference(*uri*)
addReference(uri)

create(*uri*)
create(uri) -> std::string

Creates a new SBOL object corresponding to the RDF type specified in the Property definition.

Creates another SBOL object derived from TopLevel and adds it to the Document.

- ***uri*** [] A Uniform Resource Identifier (URI) for the new object, or a displayId if operating in SBOL-compliant mode (library default)

The full URI of the created object

- ***uri*** [] In "open world" mode, this is a full URI and the same as the returned URI. If the default namespace for libSBOL has been configured, then this argument should simply be a local identifier. If SBOL-compliance is enabled, this argument should be the intended displayId of the new object. A full URI is automatically generated and returned.

The full URI of the created object.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

setReference(*uri*)
setReference(uri)

class SBOLObject(**args*)
An SBOLObject converts a C++ class data structure into an RDF triple store and contains methods for serializing and parsing RDF triples.

- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/object.h

addPropertyValue(*property_uri*, *val*)
addPropertyValue(property_uri, val)

Append a value to a user-defined annotation property.

Either a literal or URI value

apply(*callback_fn*, *user_data*)
apply(callback_fn, user_data)

cast(*python_class*)
cast() -> SBOLClass &

compare(*comparand*)
compare(comparand) -> int

Compare two SBOL objects or Documents.

The behavior is currently undefined for objects with custom annotations or extension classes.

- ***comparand*** [] A pointer to the object being compared to this one.

1 if the objects are identical, 0 if they are different

find(*uri*)
*find(uri) -> SBOLObject **

Search this object recursively to see if an object or any child object with URI already exists.

- ***uri*** [] The URI to search for.

A pointer to theobject with this URI if it exists, NULL otherwise

find_property(*uri*)
*find_property(uri) -> SBOLObject **

Search this object recursively to see if it contains a member property with the given RDF type.

- ***uri*** [] The RDF type of the property to search for.

A pointer to the object that contains a member property with the specified RDF type, NULL otherwise

find_property_value(**args*)
*find_property_value(uri, value, matches={}) -> std::vector< SBOLObject * >*

Search this object recursively to see if it contains a member property with the given RDF type and indicated property value.

- ***uri*** [] The RDF type of the property to search for.
- ***value*** [] The property value to match

A vector containing all objects found that contain a member property with the specified RDF type

find_reference(*uri*)
*find_reference(uri) -> std::vector< SBOLObject * >*

Search this object recursively to see if it contains a member property with the given RDF type and indicated property value.

- ***uri*** [] A URI, either an ontology term or an object reference, to search for

A vector containing all objects found that contain the URI in a property value

getAnnotation(*property_uri*)
getAnnotation(property_uri) -> std::string

Get the value of a custom annotation property by its URI.

Synonymous with getPropertyValue

- ***property_uri*** [] The URI for the property

The value of the property or SBOL_ERROR_NOT_FOUND

getClassName(*type*)
getClassName(type) -> std::string

Parses a local class name from the RDF-type of this SBOL Object

getProperties()
getProperties() -> std::vector< std::string >

Gets URIs for all properties contained by this object.

This includes SBOL core properties as well as custom annotations. Use this to find custom extension data in an SBOL file.

A vector of URIs that identify the properties contained in this object

getPropertyValue(*property_uri*)
getPropertyValue(property_uri) -> std::string

Get the value of a custom annotation property by its URI.

- ***property_uri*** [] The URI for the property

The value of the property or SBOL_ERROR_NOT_FOUND

getPropertyValues(*property_uri*)
getPropertyValues(property_uri) -> std::vector< std::string >

Get all values of a custom annotation property by its URI.

- ***property_uri*** [] The URI for the property

A vector of property values or SBOL_ERROR_NOT_FOUND

getTypeURI()
getTypeURI() -> rdf_type

The uniform resource identifier that describes the RDF-type of this SBOL Object

setAnnotation(*property_uri*, *val*)
setAnnotation(property_uri, val)

Set the value for a user-defined annotation property.

Synonymous with setPropertyValue If the value is a URI, it should be surrounded by angle brackets, else it will be interpreted as a literal value

setPropertyValue(*property_uri*, *val*)
setPropertyValue(property_uri, val)

Set and overwrite the value for a user-defined annotation property.

Either a literal or URI value

update_uri()
update_uri()

class SampleRoster(**args*)
A SampleRoster is a container used to group Builds that are included in an experiment together. A SampleRoster can be used to generate a Test in a Design- Build-Test-Learn workflow.

- ***samples*** [*ReferencedObject*] References to Builds which were tested in an experiment.
- ***members*** [*URIProperty*] The members property of a Collection is OPTIONAL and MAY contain a set of URI references to zero or more TopLevel objects.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within

this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/dbtl.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class SampleRosterProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class SearchQuery(**args*)
A SearchQuery object is used to configure advanced searches for bioparts in a PartShop. Advanced searches are useful for matching values across multiple fields, or to specify multiple values in a single field.

- ***objectType*** [*URIProperty*] Set this property to indicate the type of SBOL object to search for. Set to SBOL_COMPONENT_DEFINITION by default.
- ***limit*** [*IntProperty*] Set this property to specify the total number of records to retrieve from a search request. By default 25 records are retrieved.
- ***offset*** [*IntProperty*] When the number of search hits exceeds the limit, the offset property can be used to retrieve more records.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.

- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/partshop.h

class SearchResponse

A SearchResponse is a container of search records returned by a search request.

- *records* : *std::vector< sbol::Identified *>*
- *python_iter* : *std::vector< Identified * >::iterator*
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
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- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.

- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/partshop.h

end()
end() -> iterator

extend(*response*)
extend(response)

Adds more search records to an existing SearchResponse.

- ***response*** [] A SearchResponse object

class Sequence(**args*)
The primary structure (eg, nucleotide or amino acid sequence) of a ComponentDefinition object.

- ***elements*** [*TextProperty*] The elements property is a REQUIRED String of characters that represents the constituents of a biological or chemical molecule. For example, these characters could represent the nucleotide bases of a molecule of DNA, the amino acid residues of a protein, or the atoms and chemical bonds of a small molecule.
- ***encoding*** [*URIProperty*] The encoding property is REQUIRED and has a data type of URI.

  This property MUST indicate how the elements property of a Sequence MUST be formed and interpreted. For example, the elements property of a Sequence with an IUPAC DNA encoding property MUST contain characters that represent nucleotide bases, such as a, t, c, and g. The elements property of a Sequence with a Simplified Molecular-Input Line-Entry System (SMILES) encoding, on the other hand, MUST contain characters that represent atoms and chemical bonds, such as C, N, O, and =. It is RECOMMENDED that the encoding property contains a URI from the table below. The terms in the table are organized by the type of ComponentDefinition that typically refer to a Sequence with such an encoding. When the encoding of a Sequence is well described by one of the URIs in the table, it MUST contain that URI. ComponentDefinition type

  Encoding

  libSBOL Symbol

  URI

  DNA, RNA

  IUPAC DNA, RNA

  SBOL_ENCODING_IUPAC

  http://www.chem.qmul.ac.uk/iubmb/misc/naseq.html

  Protein

  IUPAC Protein

  SBOL_ENCODING_IUPAC_PROTEIN

  http://www.chem.qmul.ac.uk/iupac/AminoAcid/

  Small Molecule

  SMILES

SBOL_ENCODING_SMILES

http://www.opensmiles.org/opensmiles.html

- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/sequence.h

assemble(**args*)

assemble(composite_sequence="") -> std::string

Calculates the complete sequence of a high-level Component from the sequence of its subcomponents.

Pior to assembling the the complete sequence, you must assemble a template design by calling ComponentDefinition::assemble for the ComponentDefinition that references this Sequence.

- ***composite_sequence*** [] Typically no value for the composite sequence should be specified by the user. This parameter is used to hold the composite sequence as it is passed to function calls at a higher-level of the recursion stack.

compile()
compile() -> std::string

Synonomous with Sequence::assemble. Calculates the complete sequence of a high- level Component from the sequence of its subcomponents. Prior to assembling the the complete sequence, you must assemble a template design by calling ComponentDefinition::assemble for the ComponentDefinition that references this Sequence.

copy(**args*)
copy(ns="", version="") -> SBOLClass &

length()
length() -> int

The length of the primary sequence in the elements property

synthesize(*clone_id*)
synthesize(clone_id) -> ComponentDefinition &

- ***clone_id*** [] A URI for the build, or displayId if working in SBOLCompliant mode.

class SequenceAnnotation(**args*)
The SequenceAnnotation class describes one or more regions of interest on the Sequence objects referred to by its parent ComponentDefinition. In addition, SequenceAnnotation objects can describe the substructure of their parent ComponentDefinition through association with the Component objects contained by this ComponentDefinition.

- ***component*** [*ReferencedObject*] The component property is OPTIONAL and has a data type of URI. This URI MUST refer to a Component that is contained by the same parent ComponentDefinition that contains the SequenceAnnotation. In this way, the properties of the SequenceAnnotation, such as its description and locations, are associated with part of the substructure of its parent ComponentDefinition.
- ***locations*** [*OwnedObject< Location >*] The locations property is a REQUIRED set of one or more Location objects that indicate which elements of a Sequence are described by the SequenceAnnotation.

  Allowing multiple Location objects on a single SequenceAnnotation is intended to enable representation of discontinuous regions (for example, a Component encoded across a set of exons with interspersed introns). As such, the Location objects of a single SequenceAnnotation SHOULD NOT specify overlapping regions, since it is not clear what this would mean. There is no such concern with different SequenceAnnotation objects, however, which can freely overlap in Location (for example, specifying overlapping linkers for sequence assembly).
- ***roles*** [*URIProperty*] Alternatively to describing substructure, a SequenceAnnotation can be utilized to identify a feature, such as a GenBank feature, of a specified Sequence.

  In this use case, the SequenceAnnotation MUST NOT have a component property, but instead it would have a roles property. The roles property comprises an OPTIONAL set of zero or more URIs describing the specified sequence feature being annotated. If provided, these role URIs MUST identify terms from appropriate ontologies. Roles are not restricted to describing biological function; they may annotate Sequences function in any domain for which an ontology exists. It is RECOMMENDED that these role URIs identify terms that are compatible with the type properties of this SequenceAnnotations parent ComponentDefinition. For example, a role of a SequenceAnnotation which belongs to a ComponentDefinition of type DNA might refer to terms from the Sequence Ontology. See documentation for ComponentDefinition for a table of recommended ontology terms.

- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/sequenceannotation.h

contains(**args*)
*contains(comparand_list) -> std::vector< SequenceAnnotation * >*

extract(*start_reference=1*)
extract(start_reference=1) -> ComponentDefinition &

Convert a SequenceAnnotation to a subcomponent.

A ComponentDefinition representing the subcomponent

follows(**args*)
*follows(comparand_list) -> std::vector< SequenceAnnotation * >*

length()
length() -> int

The length of a SequenceAnnotation in base coordinates.

overlaps(**args*)
*overlaps(comparand_list) -> std::vector< SequenceAnnotation * >*

precedes(**args*)
*precedes(comparand_list) -> std::vector< SequenceAnnotation * >*

class SequenceAnnotationProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class SequenceConstraint(**args*)
The SequenceConstraint class can be used to assert restrictions on the relative, sequence-based positions of pairs of Component objects contained by the same parent ComponentDefinition. The primary purpose of this class is to enable the specification of partially designed ComponentDefinition objects, for which the precise positions or orientations of their contained Component objects are not yet fully determined.

- ***subject*** [*ReferencedObject*] The subject property is REQUIRED and MUST contain a URI that refers to a Component contained by the same parent ComponentDefinition that contains the SequenceConstraint.
- ***object*** [*ReferencedObject*] The object property is REQUIRED and MUST contain a URI that refers to a Component contained by the same parent ComponentDefinition that contains the SequenceConstraint. This Component MUST NOT be the same Component that the SequenceConstraint refers to via its subject property.
- ***restriction*** [*URIProperty*] The restriction property is REQUIRED and has a data type of URI.

  This property MUST indicate the type of structural restriction on the relative, sequence-based positions or orientations of the subject and object Component objects. The URI value of this property SHOULD come from the RECOMMENDED URIs in the following table. libSBOL Symbol

  Description

  SBOL_RESTRICTION_PRECEDES

  The position of the subject Component MUST precede that of the object Component.

  If each one is associated with a SequenceAnnotation, then the

  SequenceAnnotation associated with the subject Component MUST specify a region that starts before the region specified by the SequenceAnnotation associated with the object Component.

  SBOL_RESTRICTION_SAME_ORIENTATION_AS

  The subject and object Component objects MUST have the same orientation. If each one is associated with a SequenceAnnotation, then the orientation URIs of the Location objects of the first SequenceAnnotation MUST be among those of the second SequenceAnnotation, and vice versa.

  SBOL_RESTRICTION_OPPOSITE_ORIENTATION_AS

  The subject and object Component objects MUST have opposite orientations. If each one is associated with a SequenceAnnotation, then the orientation URIs of the Location objects of one SequenceAnnotation MUST NOT be among those of the other SequenceAnnotation.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable,

but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
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C++ includes: /Users/bbartley/Dev/git/libSBOL/source/sequenceconstraint.h

class SequenceConstraintProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class SequenceProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.

- *python_iter* : *std::vector< std::string >::iterator*

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- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class SmallMoleculeActivationInteraction(*uri*, *ligand*, *transcription_factor*)

- *ligand* : *AliasedProperty< FunctionalComponent >*
- *transcriptionFactor* : *AliasedProperty< FunctionalComponent >*
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

URI for SBO Term

LibSBOL symbol

Biochemical Reaction

http://identifiers.org/biomodels.sbo/SBO:0000176

SBO_BIOCHEMICAL_REACTION

Inhibition

http://identifiers.org/biomodels.sbo/SBO:0000169

SBO_INHIBITION

Stimulation

http://identifiers.org/biomodels.sbo/SBO:0000170

SBO_STIMULATION

Genetic Production

http://identifiers.org/biomodels.sbo/SBO:0000589

SBO_GENETIC_PRODUCTION

Non-Covalent Binding

http://identifiers.org/biomodels.sbo/SBO:0000177

SBO_NONCOVALENT_BINDING

Degradation

http://identifiers.org/biomodels.sbo/SBO:0000179

SBO_DEGRADATION

Control

http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject*< *Participation* >] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject*< *FunctionalComponent* >
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

class SmallMoleculeInhibitionInteraction(*uri*, *ligand*, *transcription_factor*)

- *ligand* : *AliasedProperty*< *FunctionalComponent* >
- *transcriptionFactor* : *AliasedProperty*< *FunctionalComponent* >
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

  URI for SBO Term

  LibSBOL symbol

  Biochemical Reaction

  http://identifiers.org/biomodels.sbo/SBO:0000176

  SBO_BIOCHEMICAL_REACTION

  Inhibition

http://identifiers.org/biomodels.sbo/SBO:0000169

SBO_INHIBITION

Stimulation

http://identifiers.org/biomodels.sbo/SBO:0000170

SBO_STIMULATION

Genetic Production

http://identifiers.org/biomodels.sbo/SBO:0000589

SBO_GENETIC_PRODUCTION

Non-Covalent Binding

http://identifiers.org/biomodels.sbo/SBO:0000177

SBO_NONCOVALENT_BINDING

Degradation

http://identifiers.org/biomodels.sbo/SBO:0000179

SBO_DEGRADATION

Control

http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject< Participation >*] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
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wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
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class Test(**args*)

A Test is a container for experimental data. A Test is the product of the third step of libSBOL's formalized Design-Build-Test-Analyze workflow.

- ***samples*** [*ReferencedObject*] References to Builds which were tested in the experiment.
- ***dataFiles*** [*ReferencedObject*] References to file Attachments which contain experimental data sets.
- ***members*** [*URIProperty*] The members property of a Collection is OPTIONAL and MAY contain a set of URI references to zero or more TopLevel objects.
- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
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and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
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C++ includes: /Users/bbartley/Dev/git/libSBOL/source/dbtl.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

class TestProperty(**args*)
Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)
add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class TextProperty(**args*)
TextProperty objects are used to contain string literals.

They can be used as member objects inside custom SBOL Extension classes.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

get()
get() -> std::string

Basic getter for all SBOL literal properties.

A string literal

getAll()
getAll() -> std::vector< std::string >

class TopLevel(**args*)
All SBOL classes derived from TopLevel appear as top level nodes in the RDF/XML document tree and SBOL files. An abstract class.

- *attachments* : *ReferencedObject*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable,

but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/toplevel.h

copy(**args*)
copy(ns="", version="") -> SBOLClass &

initialize(*uri*)
initialize(uri)

class TranscriptionalActivationInteraction(*uri*, *activator*, *target_promoter*)

- *activator* : *AliasedProperty*< *FunctionalComponent* >
- *targetPromoter* : *AliasedProperty*< *FunctionalComponent* >
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

URI for SBO Term

LibSBOL symbol

Biochemical Reaction

http://identifiers.org/biomodels.sbo/SBO:0000176

SBO_BIOCHEMICAL_REACTION

Inhibition

http://identifiers.org/biomodels.sbo/SBO:0000169

SBO_INHIBITION

Stimulation

http://identifiers.org/biomodels.sbo/SBO:0000170

SBO_STIMULATION

Genetic Production

http://identifiers.org/biomodels.sbo/SBO:0000589

SBO_GENETIC_PRODUCTION

Non-Covalent Binding

http://identifiers.org/biomodels.sbo/SBO:0000177

SBO_NONCOVALENT_BINDING

Degradation

http://identifiers.org/biomodels.sbo/SBO:0000179

SBO_DEGRADATION

Control

http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject< Participation >*] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.

- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

class TranscriptionalRepressionInteraction(*uri*, *repressor*, *target_promoter*)

- *repressor* : *AliasedProperty*< *FunctionalComponent* >
- *targetPromoter* : *AliasedProperty*< *FunctionalComponent* >
- ***types*** [*URIProperty*] The types property is a REQUIRED set of URIs that describes the behavior represented by an Interaction.

  The types property MUST contain one or more URIs that MUST identify terms from appropriate ontologies. It is RECOMMENDED that at least one of the URIs contained by the types property refer to a term from the occurring entity branch of the Systems Biology Ontology (SBO). (See http://www.ebi.ac.uk/sbo/main/) The following table provides a list of possible SBO terms for the types property and their corresponding URIs. Type

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SBO_STIMULATION

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http://identifiers.org/biomodels.sbo/SBO:0000589

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http://identifiers.org/biomodels.sbo/SBO:0000179

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http://identifiers.org/biomodels.sbo/SBO:0000168

SBO_CONTROL

- ***participations*** [*OwnedObject< Participation >*] The participations property is an OPTIONAL and MAY contain a set of Participation objects, each of which identifies the roles that its referenced FunctionalComponent plays in the Interaction. Even though an Interaction generally contains at least one Participation, the case of zero Participation objects is allowed because it is plausible that a designer might want to specify that an Interaction will exist, even if its participants have not yet been determined.
- *functionalComponents* : *OwnedObject< FunctionalComponent >*
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.
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wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.

- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
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class URIProperty(**args*)

A URIProperty may contain a restricted type of string that conforms to the specification for a Uniform Resource Identifier (URI), typically consisting of a namespace authority followed by an identifier.

A URIProperty often contains a reference to an SBOL object or may contain an ontology term.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

get()

get() -> std::string

Get first URI.

A string of characters used to identify a resource

getAll()

getAll() -> std::vector< std::string >

class Usage(**args*)

How different entities are used in an Activity is specified with the Usage class, which is linked from an Activity through the qualifiedUsage relationship. A Usage is then linked to an Entity through the Entitys URI and the role of this entity is qualified with the hadRole property. When the wasDerivedFrom property is used together with the full provenance described here, the entity pointed at by the wasDerivedFrom property MUST be included in a Usage.

- ***entity*** [*URIProperty*] The entity property is REQUIRED and MUST contain a URI which MAY refer to an SBOL Identified object.
- ***roles*** [*URIProperty*] The hadRole property is REQUIRED and MAY contain a URI that refers to a particular term describing the usage of an entity referenced by the entity property.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.

- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
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- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/provo.h

class UsageProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)
addValidationRule(rule)

clear()
clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class VariableComponent(**args*)
The VariableComponent class can be used to specify a choice of ComponentDefinition objects for any new Component derived from a template Component in the template ComponentDefinition. This specification is made using the class properties variable, variants, variantCollections, and variantDerivations. While the variants, variantCollections, and variantDerivations properties are OPTIONAL, at least one of them MUST NOT be empty.

- ***variable*** [*ReferencedObject*] The variable property is REQUIRED and MUST contain a URI that refers to a template *Component* in the template *ComponentDefinition*. If the wasDerivedFrom property of a Component refers to this template Component, then the definition property of the derived Component MUST refer to one of the ComponentDefinition objects referred to by the variants property of the VariableComponent. If not, then this definition property MUST either (1) refer to one of the ComponentDefinition objects from a Collection referred to by the variantCollections property of the

VariableComponent, or (2) refer to a ComponentDefinition derived from a CombinatorialDerivation referred to by the variantDerivations property of the VariableComponent.

- ***repeat*** [*URIProperty*] The *repeat* property is REQUIRED and has a data type of URI.

  This property specifies how many *Component* objects can be derived from the template *Component* during the derivation of a new *ComponentDefinition*. The URI value of this property MUST come from the REQUIRED *operator* URIs provided in the table below Operator URI

  Description

  http://sbols.org/v2#zeroOrOne

  No more than one *Component* in the derived *ComponentDefinition* SHOULD have a *wasDerivedFrom* property that refers to the template *Component*.

  http://sbols.org/v2#one

  Exactly one *Component* in the derived *ComponentDefinition* SHOULD have a *wasDerivedFrom* property that refers to the template *Component*.

  http://sbols.org/v2#zeroOrMore

  Any number of *Component* objects in the derived *ComponentDefinition* MAY have *wasDerivedFrom* properties that refer to the template *Component*.

  http://sbols.org/v2#oneOrMore

  At least one *Component* in the derived *ComponentDefinition* SHOULD have a *wasDerivedFrom* property that refers to the template *Component*.

- ***variants*** [*ReferencedObject*] The variants property is OPTIONAL and MAY contain zero or more URIs that each refer to a ComponentDefinition. This property specifies individual ComponentDefinition objects to serve as options when deriving a new Component from the template Component.
- ***variantCollections*** [*ReferencedObject*] The variantCollections property is OPTIONAL and MAY contain zero or more URIs that each refer to a Collection. The members property of each Collection referred to in this way MUST NOT be empty and MUST refer only to ComponentDefinition objects. This property enables the convenient specification of existing groups of ComponentDefinition objects to serve as options when deriving a new Component from the template Component.
- ***variantDerivations*** [*ReferencedObject*] The variantDerivations property is OPTIONAL and MAY contain zero or more URIs that each refer to a CombinatorialDerivation. This property enables the convenient specification of ComponentDefinition objects derived in accordance with another CombinatorialDerivation to serve as options when deriving a new Component from the template Component. The variantDerivations property of a VariableComponent MUST NOT refer to the CombinatorialDerivation that contains this VariableComponent (no cyclic derivations are allowed.
- ***persistentIdentity*** [*URIProperty*] The persistentIdentity property is OPTIONAL and has a data type of URI. This URI serves to uniquely refer to a set of SBOL objects that are different versions of each other. An Identified object MUST be referred to using either its identity URI or its persistentIdentity URI.
- ***displayId*** [*TextProperty*] The displayId property is an OPTIONAL identifier with a data type of String. This property is intended to be an intermediate between name and identity that is machine-readable, but more human-readable than the full URI of an identity. If the displayId property is used, then its String value SHOULD be locally unique (global uniqueness is not necessary) and MUST be composed of only alphanumeric or underscore characters and MUST NOT begin with a digit.
- ***version*** [*VersionProperty*] If the version property is used, then it is RECOMMENDED that version numbering follow the conventions of semantic versioning, particularly as implemented by Maven. This

convention represents versions as sequences of numbers and qualifiers that are separated by the characters . and - and are compared in lexicographical order (for example, 1 < 1.3.1 < 2.0-beta). For a full explanation, see the linked resources.

- ***wasDerivedFrom*** [*URIProperty*] The wasDerivedFrom property is OPTIONAL and has a data type of URI. An SBOL object with this property refers to another SBOL object or non-SBOL resource from which this object was derived. If the wasDerivedFrom property of an SBOL object A that refers to an SBOL object B has an identical persistentIdentity, and both A and B have a version, then the version of B MUST precede that of A. In addition, an SBOL object MUST NOT refer to itself via its own wasDerivedFrom property or form a cyclical chain of references via its wasDerivedFrom property and those of other SBOL objects. For example, the reference chain A was derived from B and B was derived from A is cyclical.
- ***wasGeneratedBy*** [*ReferencedObject*] An Activity which generated this ComponentDefinition, eg., a design process like codon-optimization or a construction process like Gibson Assembly.
- ***name*** [*TextProperty*] The name property is OPTIONAL and has a data type of String. This property is intended to be displayed to a human when visualizing an Identified object. If an Identified object lacks a name, then software tools SHOULD instead display the objects displayId or identity. It is RECOMMENDED that software tools give users the ability to switch perspectives between name properties that are human-readable and displayId properties that are less human-readable, but are more likely to be unique.
- ***description*** [*TextProperty*] The description property is OPTIONAL and has a data type of String. This property is intended to contain a more thorough text description of an Identified object.
- ***identity*** [*URIProperty*] The identity property is REQUIRED by all Identified objects and has a data type of URI. A given Identified objects identity URI MUST be globally unique among all other identity URIs. The identity of a compliant SBOL object MUST begin with a URI prefix that maps to a domain over which the user has control. Namely, the user can guarantee uniqueness of identities within this domain. For other best practices regarding URIs see Section 11.2 of the SBOL specification doucment.

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/combinatorialderivation.h

class VariableComponentProperty(**args*)

Member properties of all SBOL objects are defined using a Property object.

The Property class provides a generic interface for accessing SBOL objects. At a low level, the Property class converts SBOL data structures into RDF triples.

- ***The*** [] SBOL specification currently supports string, URI, and integer literal values.
- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/property.h

add(*new_value*)

add(new_value)

Appends the new value to a list of values, for properties that allow it.

- ***new_value*** [] A new string which will be added to a list of values.

addValidationRule(**args*)

addValidationRule(rule)

clear()

clear()

Clear all property values.

copy(*target_property*)
copy(target_property)

Copy property values to a target object's property fields.

find(*query*)
find(query) -> bool

Check if a value in this property matches the query.

getLowerBound()
getLowerBound() -> char

getOwner()
getOwner() -> SBOLObject &

getTypeURI()
getTypeURI() -> rdf_type

getUpperBound()
getUpperBound() -> char

remove(*index=0*)
remove(index=0)

Remove a property value.

set(**args*)
set(new_value)

Basic setter for SBOL IntProperty, but can be used with TextProperty as well.

- ***new_value*** [] A new integer value for the property, which is converted to a raw string during serialization.

validate(*arg=None*)
validate(arg=NULL)

write()
write()

class VersionProperty(*property_owner*, *type_uri*, *lower_bound*, *upper_bound*, *initial_value*)
Contains a version number for an SBOL object.

The VersionProperty follows Maven versioning semantics and includes a major, minor, and patch version number.

- *python_iter* : *std::vector< std::string >::iterator*

C++ includes: /Users/bbartley/Dev/git/libSBOL/source/properties.h

decrementMajor()
decrementMajor()

Decrement major version.

decrementMinor()
decrementMinor()

Decrement major version.

decrementPatch()
decrementPatch()

Decrement major version.

incrementMajor()
incrementMajor()

Increment major version.

incrementMinor()
incrementMinor()

Increment minor version.

incrementPatch()
incrementPatch()

Increment patch version.

major()
major() -> int

Get major version.

The major version as an integer Splits the version string by a delimiter and returns the major version number

minor()
minor() -> int

Get minor version.

The minor version as an integer Splits the version string by a delimiter and returns the minor version number

patch()
patch() -> int

Get patch version.

The patch version as an integer Splits the version string by a delimiter and returns the patch version

getFileFormat()
getFileFormat() -> std::string SBOL_DECLSPEC

Returns currently accepted file format.

getHomespace()
getHomespace() -> SBOL_DECLSPEC std::string

Get the current default namespace for autocreation of URIs when a new SBOL object is created.

hasHomespace()
hasHomespace() -> SBOL_DECLSPEC int

Checks if a valid default namespace has been defined.

is_alphanumeric_or_underscore(*c*)
is_alphanumeric_or_underscore(c) -> bool

is_not_alphanumeric_or_underscore(*c*)
is_not_alphanumeric_or_underscore(c) -> bool

libsbol_rule_1(*sbol_obj*, *arg*)
libsbol_rule_1(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_10(*sbol_obj*, *arg*)
libsbol_rule_10(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_11 (*sbol_obj*, *arg*)
libsbol_rule_11(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_12 (*sbol_obj*, *arg*)
libsbol_rule_12(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_13 (*sbol_obj*, *arg*)
libsbol_rule_13(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_14 (*sbol_obj*, *arg*)
libsbol_rule_14(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_15 (*sbol_obj*, *arg*)
libsbol_rule_15(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_16 (*sbol_obj*, *arg*)
libsbol_rule_16(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_17 (*sbol_obj*, *arg*)
libsbol_rule_17(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_18 (*sbol_obj*, *arg*)
libsbol_rule_18(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_19 (*sbol_obj*, *arg*)
libsbol_rule_19(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_2 (*sbol_obj*, *arg*)
libsbol_rule_2(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_20 (*sbol_obj*, *arg*)
libsbol_rule_20(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_21 (*sbol_obj*, *arg*)
libsbol_rule_21(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_22 (*sbol_obj*, *arg*)
libsbol_rule_22(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_24 (*sbol_obj*, *arg*)
libsbol_rule_24(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_3 (*sbol_obj*, *arg*)
libsbol_rule_3(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_4 (*sbol_obj*, *arg*)
libsbol_rule_4(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_5 (*sbol_obj*, *arg*)
libsbol_rule_5(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_6 (*sbol_obj*, *arg*)
libsbol_rule_6(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_7 (*sbol_obj*, *arg*)
libsbol_rule_7(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_8 (*sbol_obj*, *arg*)
libsbol_rule_8(sbol_obj, arg) -> SBOL_DECLSPEC void

libsbol_rule_9 (*sbol_obj*, *arg*)
libsbol_rule_9(sbol_obj, arg) -> SBOL_DECLSPEC void

sbolRule10101(*sbol_obj*, *arg*)
sbolRule10101(sbol_obj, arg) -> SBOL_DECLSPEC void

sbolRule10102(*sbol_obj*, *arg*)
sbolRule10102(sbol_obj, arg) -> SBOL_DECLSPEC void

sbol_rule_10202(*sbol_obj*, *arg*)
sbol_rule_10202(sbol_obj, arg) -> SBOL_DECLSPEC void

sbol_rule_10204(*sbol_obj*, *arg*)
sbol_rule_10204(sbol_obj, arg) -> SBOL_DECLSPEC void

setFileFormat(*file_format*)
setFileFormat(file_format) -> SBOL_DECLSPEC void

Sets file format to use.

setHomespace(*ns*)
setHomespace(ns) -> SBOL_DECLSPEC void

Global methods.

Set the default namespace for autocreation of URIs when a new SBOL object is created

testRoundTrip()
Function to run test suite for pySBOL

testSBOL()
Function to test pySBOL API

CHAPTER 9

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