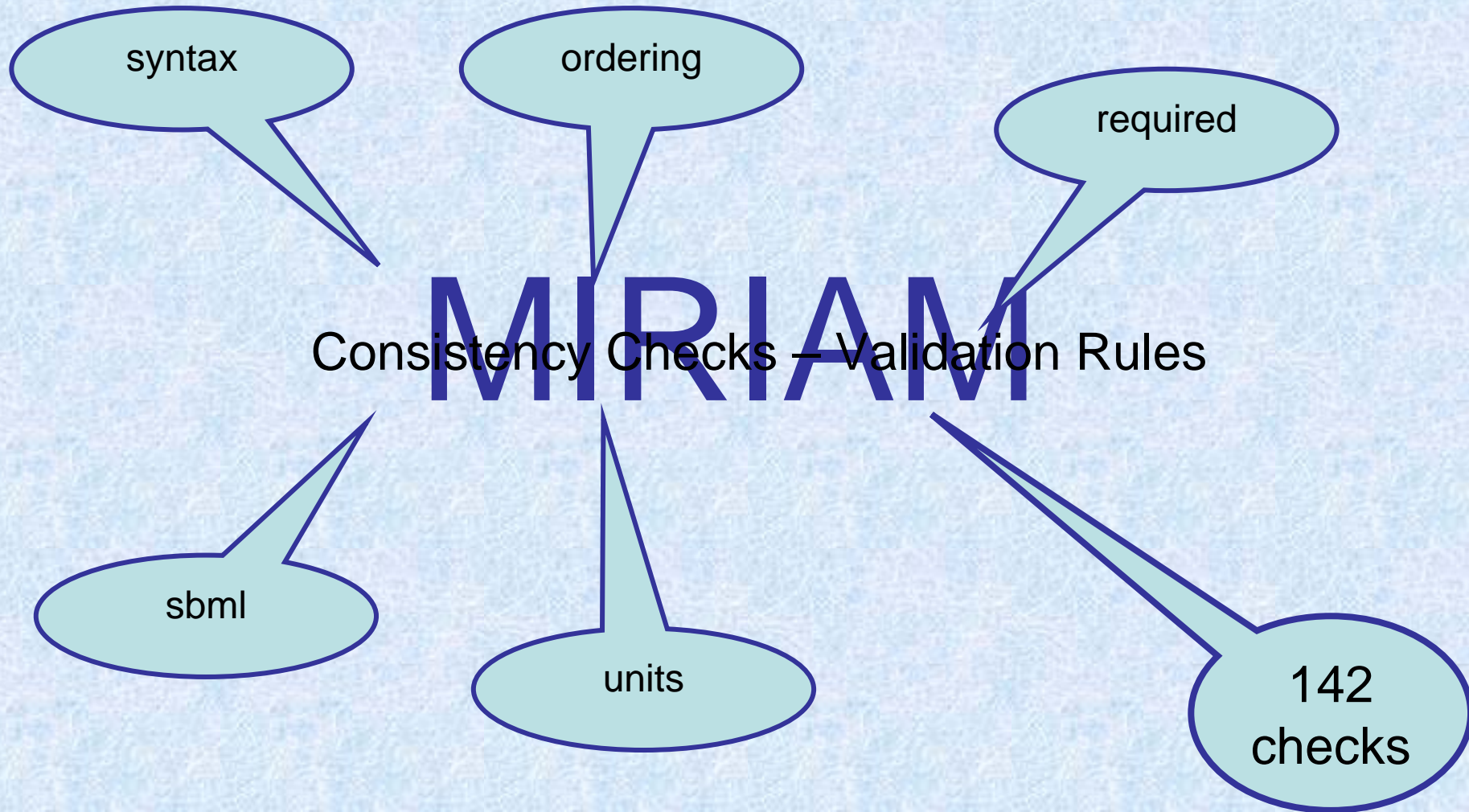


libSBML interface to SBO and MIRIAM

Sarah Keating

The model must comply with the encoding standard.

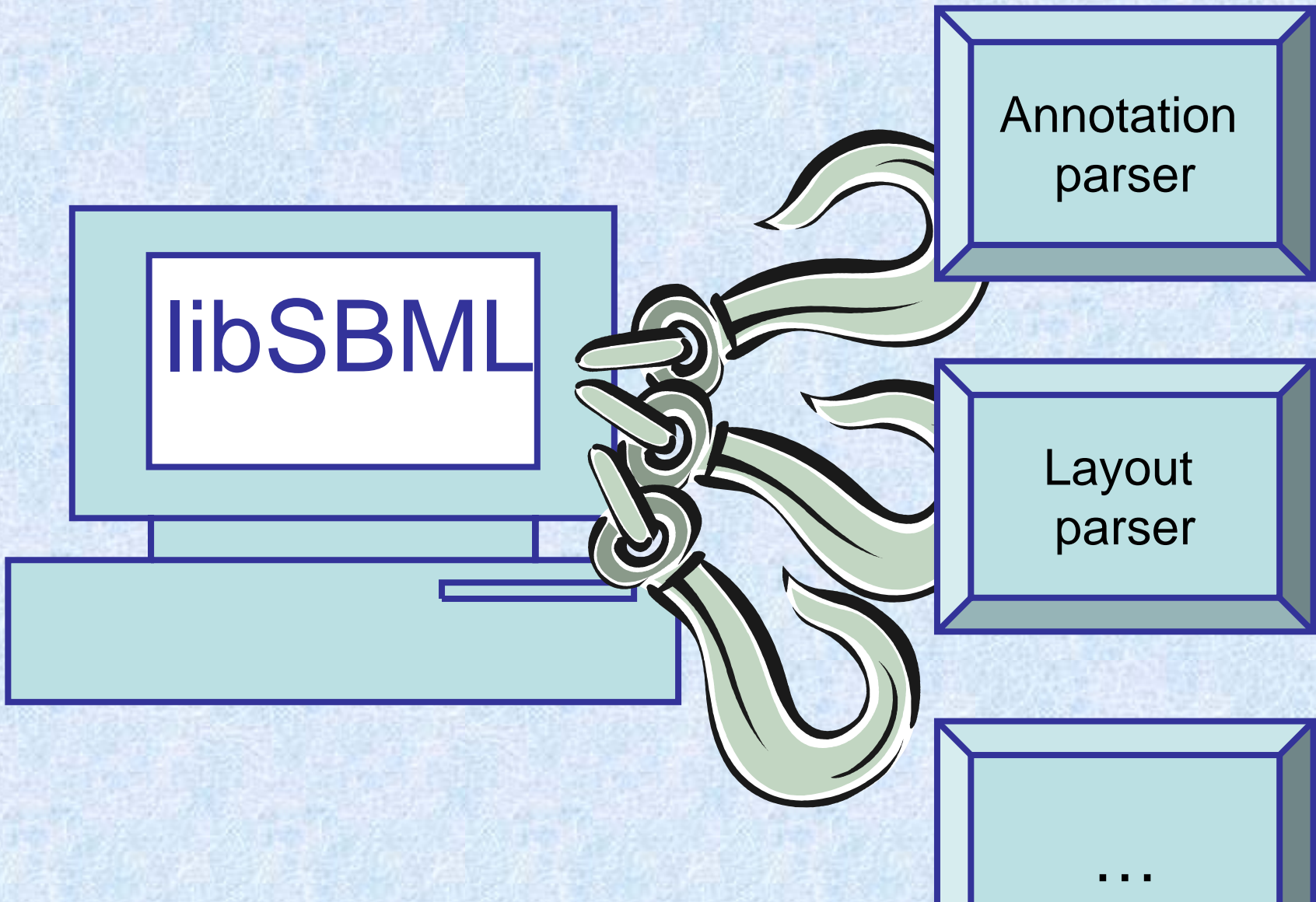


External resource annotation

Object model for annotations

CVTerm
term.add
term.add
Species.

```
<species id="calcium_calmodulin" metaid="cacam">
  <annotation>
    <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
      xmlns:bqbiol="http://biomodels.net/biology-qualifiers/" >
      <rdf:Description rdf:about="#cacam">
        <bqbiol:hasVersion>
          <rdf:Bag
            <rdf:li rdf:resource="http://www.uniprot.org/#Q9UQM7"/>
            <rdf:li rdf:resource="http://www.uniprot.org/#Q13554"/>
          </rdf:Bag>
        </bqbiol:hasVersion>
      </rdf:Description>
    </rdf:RDF>
  </annotation>
</species>
```



libSBML

Annotation
parser

Layout
parser

...

Attribution annotation

```
<dc:creator rdf:parseType="Resource">  
  <rdf:Bag>  
    <rdf:li rdf:parseType="Resource">  
      [[  
      +++  
      <vCard:N rdf:parseType="Resource">  
        <vCard:Family>F  
        <vCard:Given>G  
        </vCard:N>  
      +++  
      [<vCard:EMAIL>E
```

Creator

```
{  
  std::string family_name;  
  std::string given_name;  
  ...
```



All classes representing SBML components with attribute sboTerm have following:

```
class KineticLaw
{
    ...
    int getSBOTerm () const;
    ...
    bool isSetSBOTerm () const;
    ...
    void setSBOTerm (int sboTerm);
    ...
    void unsetSBOTerm ();

protected:
    ...
    int mSBOTerm;
};
```

getter/setter
functions

SBO

storage



sboTerm="SBO:0000064"



read string "SBO:0000064"



check string

size = 11

"SBO:"

digits



convert string to an int



mSBOTerm = 64

validation
error

C:\ "c:\libsml\win32\bin\validateSBMLD.exe" 10308-fail-01-01.xml

```
filename: 10308-fail-01-01.xml
file size: 485
read time (ms): 94
error(s): 1
```

1 Error(s):

5: (10308) The value of a sboTerm attribute must have the data type SBOTerm, which is a string consisting of the characters 'S', 'B', 'O', ':' followed by exactly seven digits. (References: L2U2 Section 3.1.8.)

Press any key to continue

SBO Ontology Browser

SBO::Systems Biology Ontology

+ Refresh tree

sbo

+  [quantitative parameter](#)

+  [modelling framework](#)

+  [mathematical expression](#)

+  [event](#)

 [participant type](#)


 [participant functional type](#)

 [reactant](#)

 [product](#)

 [modifier](#)

 [catalyst](#)

 [inhibitor](#)

 [competitive inhibitor](#)


 [non-competitive inhibitor](#)


 [potentiator](#)


 [messenger RNA](#)

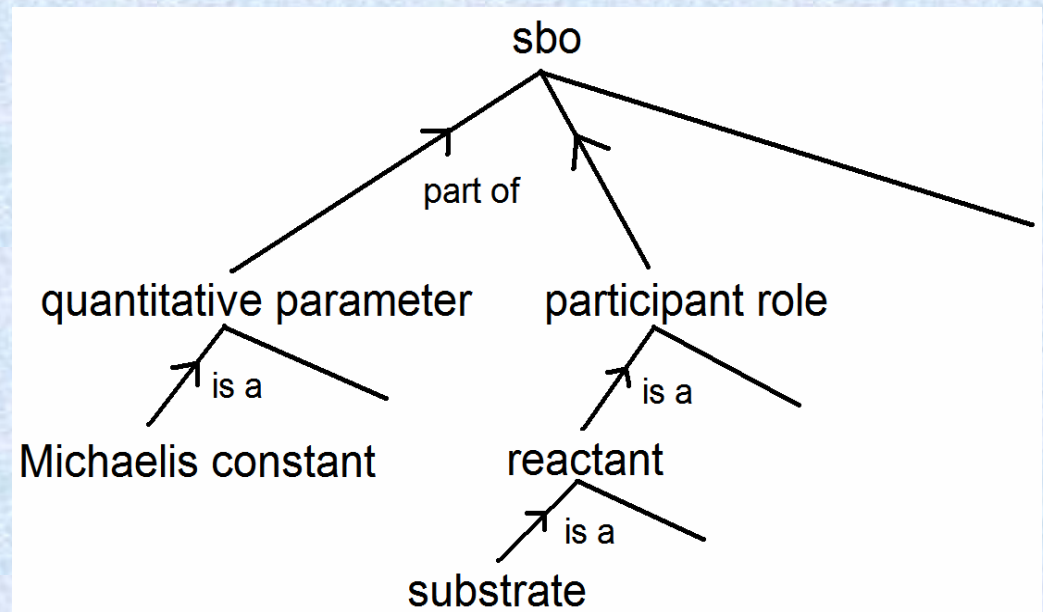
 [functional compartment](#)

+  [participant physical type](#)

 [obsolete participant type](#)

: "is a" relationship

: "part-of" relationship



The value of the sboTerm field on a Model must be an SBO identifier (<http://www.biomodels.net/SBO/>) referring to a modeling framework defined in SBO (i.e., terms derived from SBO:0000004, “modeling framework”). (References: L2V2 Section 4.2.1.)

The value of the sboTerm field on a KineticLaw must be an SBO identifier (<http://www.biomodels.net/SBO/>) referring rate law defined in SBO (i.e., terms derived from SBO:0000001, “rate law”). (References: L2V2 Section 4.13.5.)



Web Services

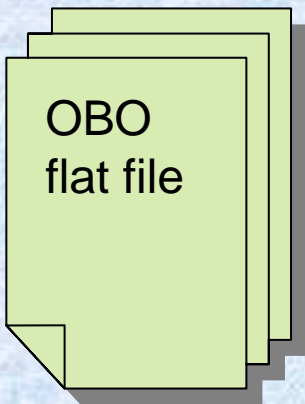
Hard code tree

```
/* create a map of parent-child sbo terms */
```

```
typedef multimap<int, int>          ParentMap;
```

```
typedef ParentMap::const_iterator  ParentIter;
```

```
typedef pair<ParentIter, ParentIter> ParentRange;
```

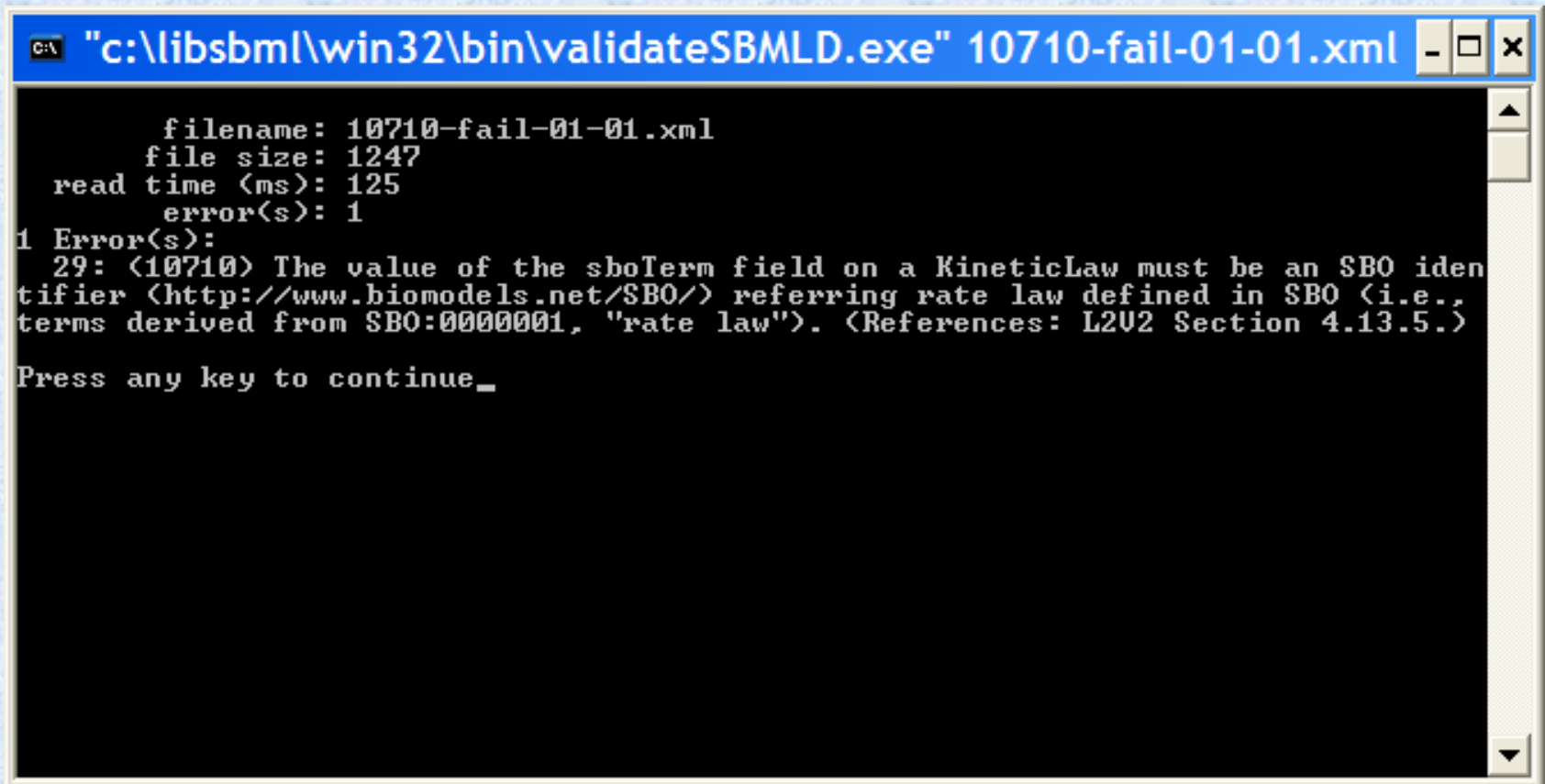


```
void  
SBML::populateSBOTree()  
{  
    mParent.insert( make_pair( 1, 64) );  
    mParent.insert( make_pair( 3, 235) );  
    mParent.insert( make_pair( 5, 64) );  
    ...  
}
```

isModellingFramework(Model->getSBOTerm())

isRateLaw(KineticLaw->getSBOTerm())

...



```
C:\ "c:\libsblml\win32\bin\validateSBMLD.exe" 10710-fail-01-01.xml

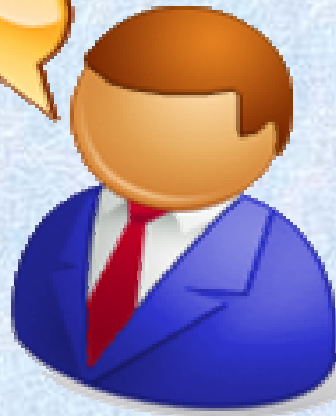
      filename: 10710-fail-01-01.xml
      file size: 1247
      read time (ms): 125
      error(s): 1
1 Error(s):
 29: (10710) The value of the sboTerm field on a KineticLaw must be an SBO identifier (http://www.biomodels.net/SBO/) referring rate law defined in SBO (i.e., terms derived from SBO:00000001, "rate law"). (References: L2U2 Section 4.13.5.)
Press any key to continue_
```

What next ??

interface to
"libSBO"

add / substitute
MathML ?

?????



When ??



POSSIBLE