

# Comparison of proposals by Finney and Ginkel and a summary of Finney's proposal

Mike Hucka

*2007-09-09*

# General common areas

- An SBML document can contain lists of models
- Can contain lists of instances of those models
- Can define links between identifiers and components inside submodels
- Can define interfaces (“ports” in Finney’s, “terminals” in Ginkel’s)

## Some different details

	<b>Finney</b>	<b>Ginkel</b>
References to components within models	XLink + novel object structure	dotted notation (“a.b.c”)
Flagging which model is at top	Single enclosing model	isMainModel flag
Parametrization	none?	novel object structures
Referencing external models/ components	XLink	no

# Finney proposal super-brief summary

# Finney approach: base model

```
<?xml version="1.0"?>
<sbml xmlns="http://www.sbml.org/sbml/level3" version="1" level="3">
  <model id="outer">
    <listOfCompartments>
      <compartment id="c" volume="1"/>
    </listOfCompartments>
    <listOfSpecies>
      <species id="S1" initialAmount="10" compartment="compartmentOne">
      <species id="X0" initialAmount="0" compartment="compartmentOne">
    </listOfSpecies>
    <listOfReactions>
      <reaction id="reaction_1" reversible="false">
        <listOfReactants>
          <speciesReference species="X0" stoichiometry="1"/>
        </listOfReactants>
        <listOfProducts>
          <speciesReference species="S1" stoichiometry="1"/>
        </listOfProducts>
        <kineticLaw>
          <math xmlns="http://www.w3.org/1998/Math/MathML">
            <apply>
              <times/>
              <ci> k3 </ci>
              <ci> S1 </ci>
            </apply>
          </math>
        </kineticLaw>
      </reaction>
    </listOfReactions>
  </model>
</sbml>
```

# Finney approach: base model

```
<listOfParameters>
  <parameter id="k3" value="0"/>
</listOfParameters>
</kineticLaw>
</reaction>
</listOfReactions>
<listOfSubmodels>
  <model id="inner">
    <listOfCompartments>
      <compartment id="compartmentTwo" volume="1"/>
    </listOfCompartments>
    <listOfSpecies>
      <species id="S1" ... compartment="compartmentTwo">
      <species id="X0" ... compartment="compartmentTwo">
    </listOfSpecies>
    <listOfReactions>
      <reaction id="reaction_1" reversible="false">
        <listOfReactants>
          <speciesReference species="X0" stoichiometry="1"/>
        </listOfReactants>
        <listOfProducts>
          <speciesReference species="S1" stoichiometry="1"/>
        </listOfProducts>
      </reaction>
    </listOfReactions>
  </model>
</listOfSubModels>
```

# Finney approach: instances

```
<sbml xmlns="http://www.sbml.org/sbml/level3" version="1" level="3">
  <model id="example">
    <listOfCompartments>
      ...
    </listOfCompartments>
    <listOfSpecies>
      ...
    </listOfSpecies>
    <listOfSubmodels>
      ...
    </listOfSubmodels>
    <listOfInstances>
      <instance id="innerA" xlink:type="simple" xlink:href="#xpointer(
sbml/model/listOfSubmodels/model[@id=\"%22inner\"%22])" />
    </listOfInstances>
    <listOfLinks>
      <link>
        <from object="S1" />
        <to object="innerA">
          <subobject object="X0" />
        </to>
      </link>
      <link>
        <from object="compartmentOne" />
        <to object="innerA">
          <subobject object="compartmentTwo" />
        </to>
      </link>
    </listOfLinks>
  </model>
</sbml>
```

# Finney approach: instances

```
<sbml xmlns="http://www.sbml.org/sbml/level3" version="1" level="3">
  <model id="example">
    <listOfCompartments>
      ...
    </listOfCompartments>
    <listOfSpecies>
      ...
    </listOfSpecies>
    <listOfSubmodels>
      ...
    </listOfSubmodels>
    <listOfInstances>
      <instance id="innerA" xlink:type="simple" xlink:href="#xpointer(/
sbml/model/listOfSubmodels/model[@id=\"%22inner\"%22])" />
    </listOfInstances>
    <listOfLinks>
      <link>
        <from object="S1" />
        <to object="innerA">
          <subobject object="X0" />
        </to>
      </link>
      <link>
        <from object="compartmentOne" />
        <to object="innerA">
          <subobject object="compartmentTwo" />
        </to>
      </link>
    </listOfLinks>
  </model>
</sbml>
```

# Finney approach: instances

```
<sbml xmlns="http://www.sbml.org/sbml/level3" version="1" level="3">
  <model id="example">
    <listOfCompartments>
      ...
    </listOfCompartments>
    <listOfSpecies>
      ...
    </listOfSpecies>
    <listOfSubmodels>
      ...
    </listOfSubmodels>
    <listOfInstances>
      <instance id="innerA" xlink:type="simple" xlink:href="#xpointer(
sbml/model/listOfSubmodels/model[@id=\"%22inner\"%22])" />
    </listOfInstances>
    <listOfLinks>
      <link>
        <from object="S1" />
        <to object="innerA">
          <subobject object="X0" />
        </to>
      </link>
      <link>
        <from object="compartmentOne" />
        <to object="innerA">
          <subobject object="compartmentTwo" />
        </to>
      </link>
    </listOfLinks>
  </model>
</sbml>
```

The diagram illustrates the relationships between SBML elements. Red arrows point from the `innerA` instance to the `listOfCompartments`, `listOfSpecies`, and `listOfSubmodels` elements. Blue arrows point from the `innerA` instance to the `x0` subobject and the `compartmentTwo` subobject. Red circles highlight the `S1` object, the `innerA` instance, and the `compartmentOne` object. Blue circles highlight the `x0` subobject and the `compartmentTwo` subobject.

# Finney approach: direct links

```
<sbml xmlns="http://www.sbml.org/sbml/level3" version="1" level="3">
  <model id="outer2">
    <listOfReactions>
      <reaction id="reaction_1" reversible="false">
        <listOfReactants>
          <speciesReference stoichiometry="1">
            <speciesLink object="a">
              <subobject object="f"/>
            </speciesLink>
          </speciesReference>
        </listOfReactants>
        <listOfProducts>
          <speciesReference stoichiometry="1">
            <speciesLink object="b">
              <subobject object="e"/>
            </speciesLink>
          </speciesReference>
        </listOfProducts>
      </reaction>
    </listOfReactions>
  </model>
</sbml>
```

# Finney approach: direct links in MathML expressions

```
<reaction id="reaction_1" reversible="false">
  <listOfReactants>
    <speciesReference stoichiometry="1">
      <speciesLink object="a">
        <subobject object="f"/>
      </speciesLink>
    </speciesReference>
  </listOfReactants>
  <listOfProducts>
    <speciesReference stoichiometry="1">
      <speciesLink object="b">
        <subobject object="e"/>
      </speciesLink>
    </speciesReference>
  </listOfProducts>
  <kineticLaw>
    <math
      <apply>
        <times/>
        <apply>
          <csymbol encoding="SBML"
            definitionURL="http://www.sbml.org/symbols/instanceselector">
            </csymbol>
            <ci>a</ci>
            <ci>f</ci>
          </apply>
        </apply>
      </math>
    </kineticLaw>
  </reaction>
```

# Questions for Andrew

- Why not use `XInclude` for instance references?
- Why not use `XLink` directly for object references?