# LibSBGN Current Status and Future Plans

Tobias Czauderna, Martijn van Iersel

COMBINE 2011, Heidelberg

Background Context & Motivation

# WHY LIBSBGN?

# Many tools support SBGN

- Arcadia
- Athena
- BiNoM
- BioModels Database
- BioPAX
- BioUML
- ByoDyn
- CellDesigner
- Dunnart
- Edinburgh Pathway Editor
- JWS Online
- Mayday
- Netbuilder (Apostrophe)
- PANTHER
- PathVisio
- PathwayLab
- Reactome
- Vanted
- VISIBIOweb
- … 19 tools (and still counting)

See http://sbgn.org/SBGN_Software

# The problem with SBGN tools

- **No interchange of maps**
- **No reuse** of **code**
  - Useful features (e.g. validation, layout) are scattered across tools, and code is duplicated.

# Solution? LibSBGN

- Goals
  - Improve Interoperability
  - Encourage code re-use
  - Help development of SBGN compliant tools

# Solution? LibSBGN



**LibSBGN consists of 2 parts**

- **Exchange format**: **SBGN-ML**
  - XML Schema based
  - express semantics, relationships and geometry
- **Software library: LibSBGN**
  - Java and C++
  - key features: reading, writing, validation, conversion and layout

# Why SBGN-ML?

| | |
|---|---|
| PNG / SVG | you lose biological network |
| BioPAX | you lose the layout |
| GML / GraphML | not standard |
| SBML-Layout | you lose SBGN semantics |

Development Methods & Infrastructure

# HOW IT'S DONE

# Community project

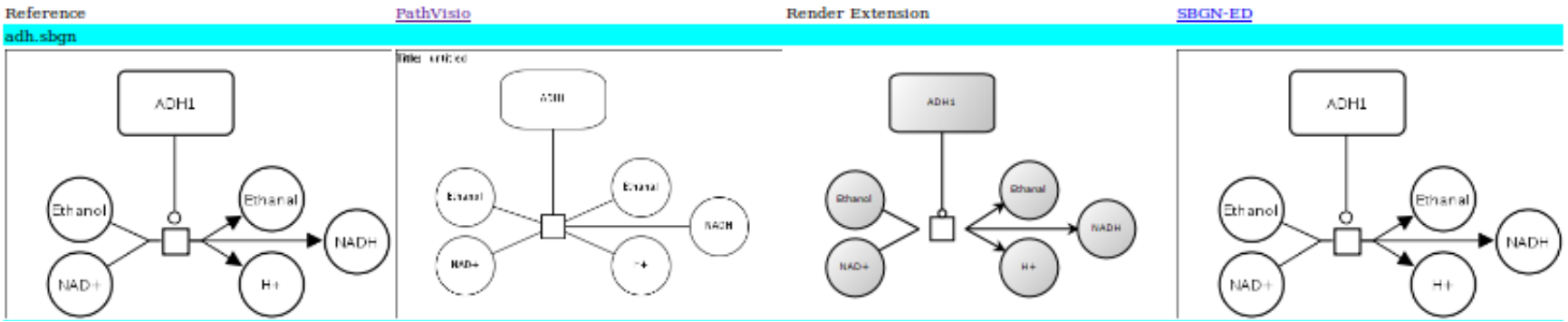
- Mirit Aladjem (MIM)
- Frank Bergmann (SBML Layout)
- Michael Blinov (BioNetGen)
- Sarah Boyd (Dunnart)
- Tobias Czauderna (VANTED)
- Emek Demir (Pathway Commons)
- Ugur Dogrusoz (Patika)
- Akira Funahashi (CellDesigner)
- Hiroaki Kitano (CellDesigner)
- Nicolas Le Novère (BioModels Database)
- Augustin Luna (MIM)
- Yukiko Matsuoka (CellDesigner)
- Huaiyu Mi (PANTHER Pathway)
- Stuart Moodie (EPE)
- Falk Schreiber (VANTED)
- Anatoly Sorokin (EPE)
- Martijn van Iersel (PathVisio)
- Martina Kutmon (PathVisio)
- Alice Villéger (Arcadia)
- Gael Jalowicki (Biomodels)

# Organization

- **Mailing list**: sbgn-libsbgn@lists.sourceforge.net
- **Monthly online meetings**
  - **minutes** and **announcement** on mailing list
  - on **EVO**: http://evo.caltech.edu
- SourceForge project: http://libsbgn.sourceforge.net
  - **Wiki**: documentation, road map, “how to”, useful links, …
  - **Tracker**: “to do” list (bugs and missing features)
  - **SVN** repository: test suite, specs, XSD, validation rules
- Quality control
  - **Rendering comparison** pipeline http://libsbgn.sourceforge.net/rendering_comparison

# Development infrastructure

- **Test suite**: test cases (so far):
  - 25 for PD
  - 17 for ER
  - 8 for AF
  - SBGN map in PNG format
  - corresponding SBGN-ML file
- Rendering comparison pipeline



Current Status

# WHERE WE ARE

# SBGN-ML Roadmap

- **Milestone 1 released (Jan. 2011)**
  - Only support for SBGN PD
  - Only high-level graphics specification
  - Basic validation using XML Schema
- **Milestone 2 (planned for Oct. 2011)**
  - Implement semantics for all 3 languages: SBGN PD, ER and AF
  - Extra validation using Schematron
  - Third-party extensibility
- **Milestone 3**
  - Complete graphical specification
  - Submaps…
- **Milestone 4**
  - Linking, MIRIAM compatibility, …

# What is new (since Harmony)

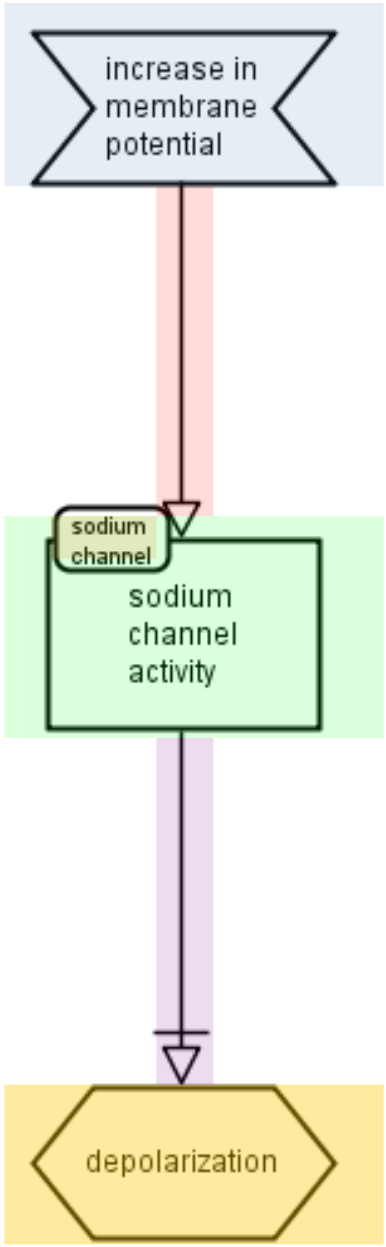
- More test cases
- Schematron rulesets
- Third-party extensibility
- AF support
- compartmentRef and compartmentOrder
- Id’s for Arcs are compulsory
- Arcgroups

# Brief SBGN-ML overview

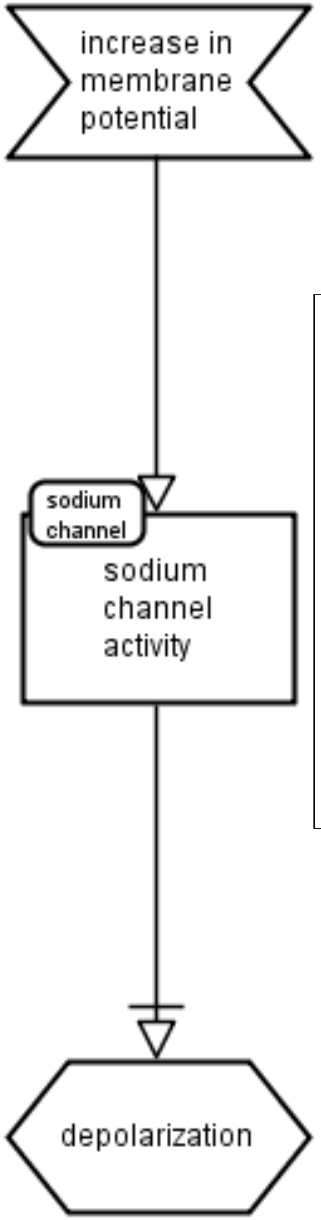
- Main requirements
  - **Easy to draw** (explicit coordinates)
  - **Easy to interpret** (network and semantics)

- Top level: **Map** element
- Most important elements: **Glyph** and **Arc**
  - “class” attribute determines semantics, e.g. “macromolecule”

- Glyph geometry: **bounding box** only
- Arcs **refer to glyph** or glyph ports (network connectivity)




```
<?xml version="1.0" encoding="UTF-8"?>
<sbgn xmlns="http://sbgn.org/libsbgn/0.2">
    <map language="activity flow">

        <glyph class="perturbation" id="g1">
            <label text="increase in&#xA;membrane&#xA;potential"/>
            <bbox x="30" y="30" w="120" h="60"/>
        </glyph>

        <glyph class="biological activity" id="g2">
            <label text="sodium&#xA;channel&#xA;activity"/>
            <bbox x="36" y="232" w="108" h="75"/>
            <glyph class="unit of information" id="g2.1">
                <label text="sodium&#xA;channel"/>
                <entity name="macromolecule"/>
                <bbox x="39" y="219" w="46" h="26"/>
            </glyph>
        </glyph>

        <glyph class="phenotype" id="g3">
            <label text="depolarization"/>
            <bbox x="30" y="450" w="120" h="60"/>
        </glyph>

        <arc class="positive influence" source="g1" target="g2" id="a1">
            <start x="90" y="90" />
            <end x="90" y="232" />
        </arc>

        <arc class="necessary stimulation" source="g2" target="g3" id="a2">
            <start x="90" y="307" />
            <end x="90" y="450" />
        </arc>

    </map>
</sbgn>
```

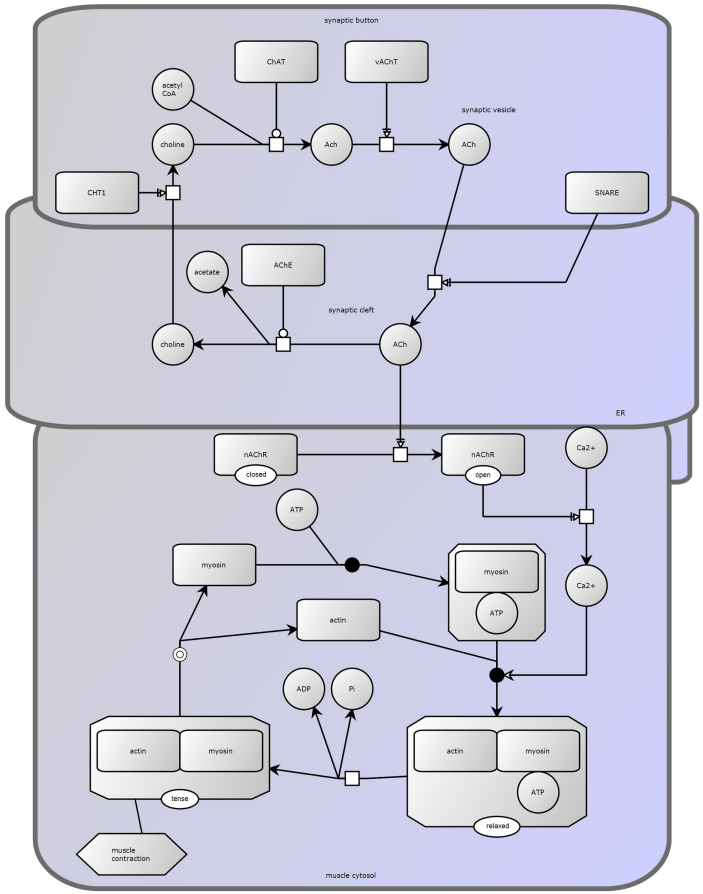


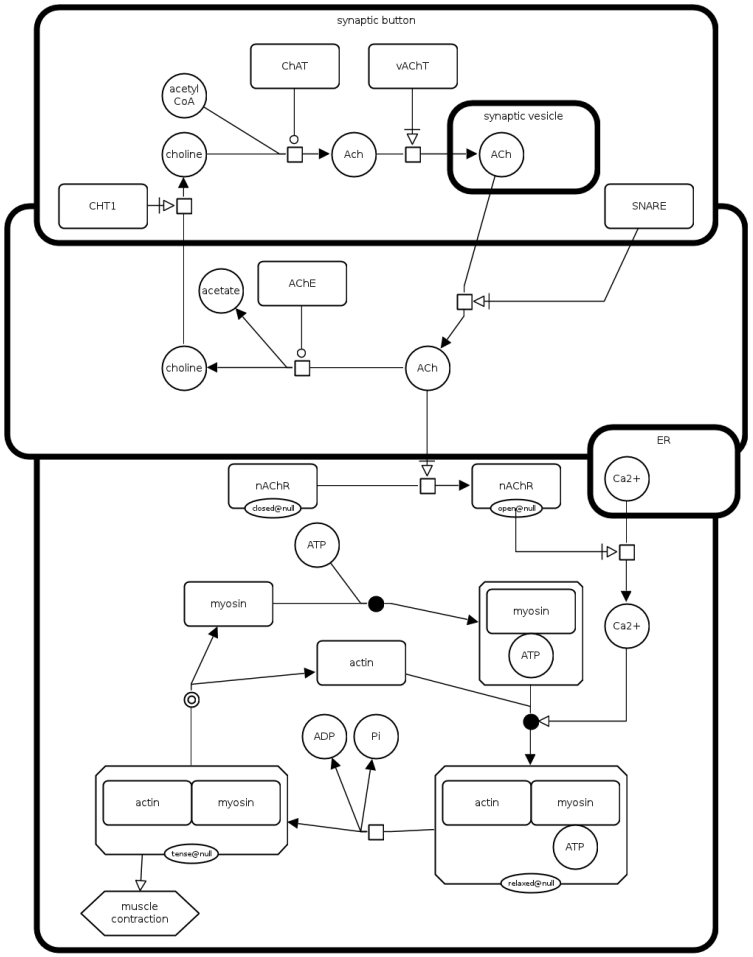

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <sbgn xmlns="http://sbgn.org/libsbgn/0.2">
3      <map language="activity flow">
4
5          <glyph class="perturbation" id="g1">
6              <label text="increase in&#xA;membrane&#xA;potential"/>
7              <bbox x="30" y="30" w="120" h="60"/>
8          </glyph>
```

```
<glyph class="biological activity" id="g2">
    <label text="sodium&#xA;channel&#xA;activity"/>
    <bbox x="36" y="232" w="108" h="75"/>
    <glyph class="unit of information" id="g2.1">
        <label text="sodium&#xA;channel"/>
        <entity name="macromolecule"/>
        <bbox x="39" y="219" w="46" h="26"/>
    </glyph>
</glyph>
```

```
27             <end x="90" y="232" />
28         </arc>
29
30         <arc class="necessary stimulation" source="g2" target="g3" id="a2">
31             <start x="90" y="307" />
32             <end x="90" y="450" />
33         </arc>
34
35     </map>
36 </sbgn>
```

# compartmentOrder & compartmentRef



# Extensions



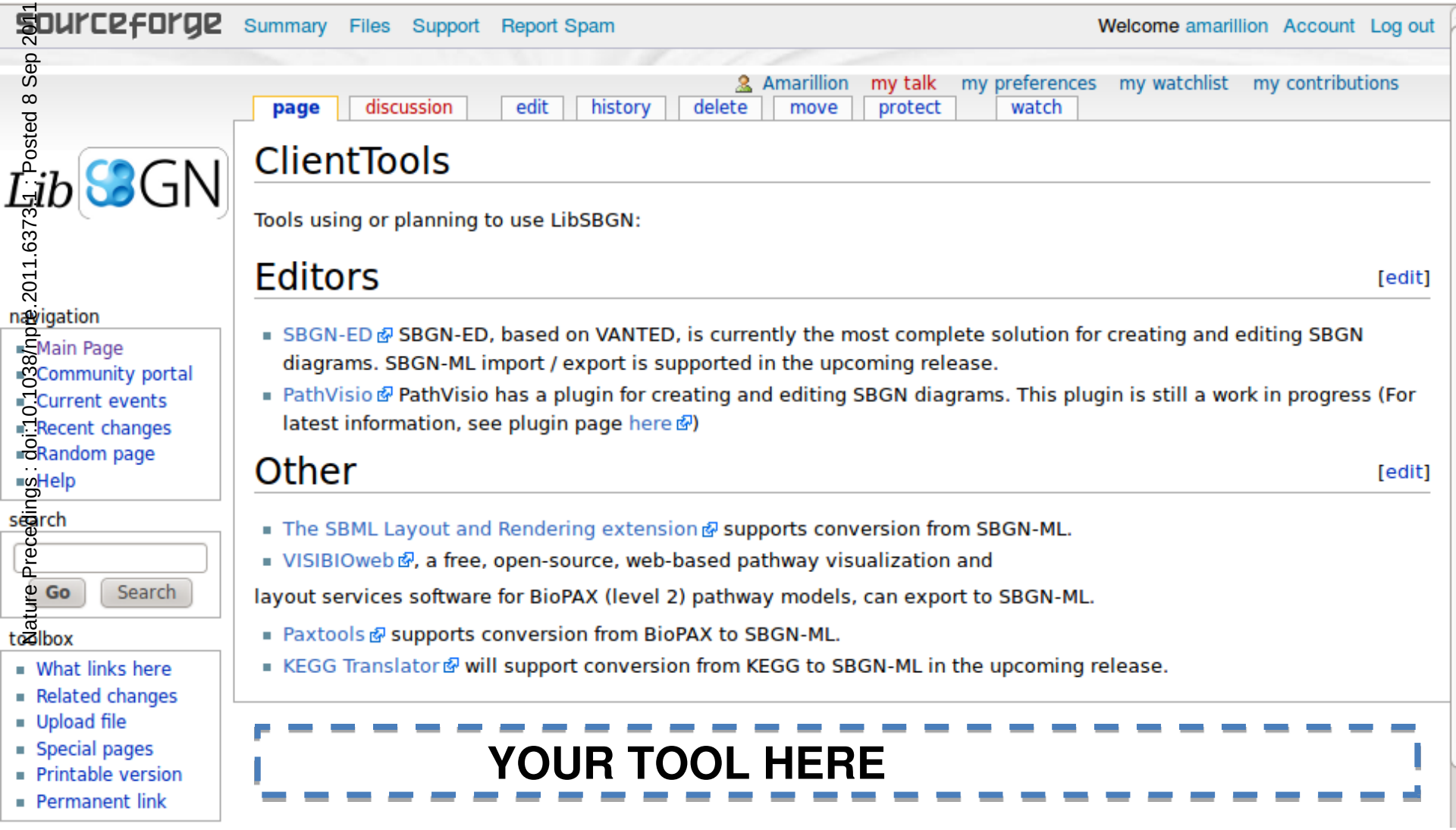
```
<map language="process description">
    <extension>
        <renderInformation id="example" programName="SBML Layout"
            programVersion="3.0"
            xmlns="http://projects.eml.org/bcb/sbml/render/level2">

            <listOfColorDefinitions>
                <colorDefinition id="yelloComp" value="#ffffccff" />
                ...
            </listOfColorDefinitions>
            ...
        </renderInformation>
    </extension>
```

Future Plans

# WHAT NEXT?

# Software support

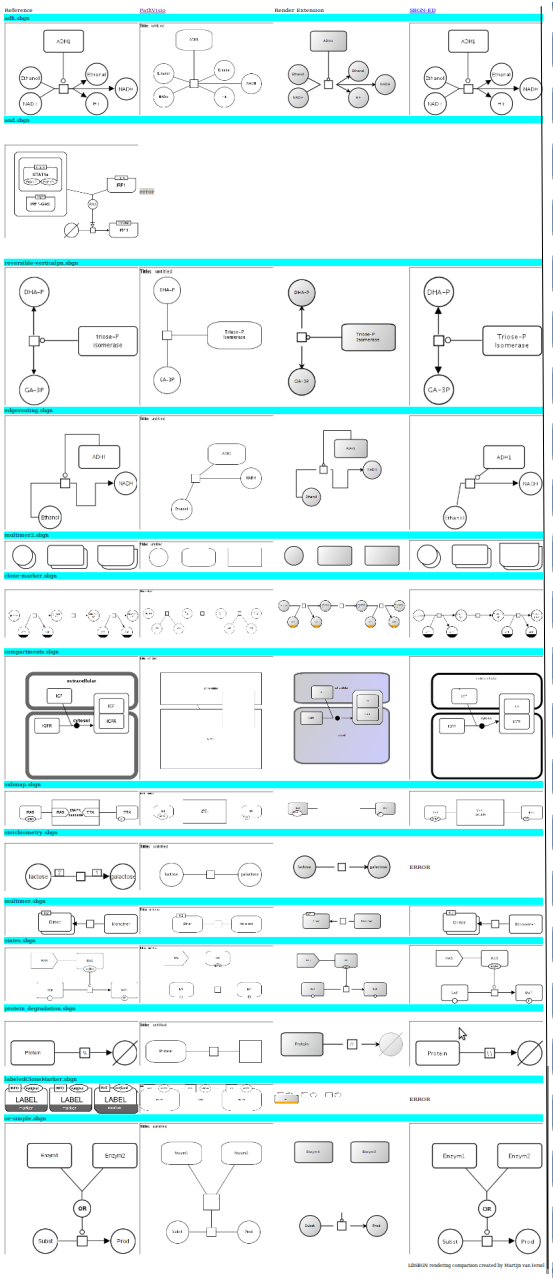




# Software support

- Conversion SBGN-ML -> PNG

1. PathVisio (Martijn van Iersel)
2. SBGN-ED (Tobias Czauderna)
3. SBML Layout (Frank Bergmann)



YOUR TOOL HERE

# What's next

- Release (Soon - October 2011)
- More detailed graphics
  - Roundness of rounded rectangles
  - Arrow-glyph size
  - Line thickness
  - …
- Better handling of submaps

# THANK YOU

- To everyone involved so far: **GOOD JOB TEAM**
- To **all developers supporting SBGN** (or planning to):

  feel free to join the club!

  – Use the **library** and support the **schema**
  – Take part in online discussions
  – **Contribute content** to the SourceForge project

http://libsbgn.sourceforge.net