LibSBGN
Current Status and Future Plans
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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
WHERE WE ARE

Current Status
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)
increase in membrane potential

sodium channel

sodium channel activity

depolarization

<jsxml 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 membrane potential"/>
        <bbox x="30" y="30" w="120" h="60"/>
      </glyph>  
      <glyph class="biological activity" id="g2">  
        <label text="sodium channel activity"/>  
        <bbox x="36" y="232" w="108" h="75"/>
        <glyph class="unit of information" id="g2.1">  
          <label text="sodium channel"/>  
          <entity name="macromolecule"/>
          <bbox x="39" y="219" w="46" h="26"/>
        </glyph>  
      </glyph>  
      <arc class="necessary stimulation" source="g2" target="g3" id="a2">  
        <start x="90" y="232"/>  
        <end x="90" y="450"/>
      </arc>  
    </map>  
  </sbgn>
compartmentOrder & compartmentRef
Extensions

```xml
<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="#ffffffcfcff" />
          ...
      </listOfColorDefinitions>
      ...
    </renderInformation>
  </extension>
</map>
```
Future Plans

WHAT NEXT?
Software support

ClientTools

Tools using or planning to use LibSBGN:

Editors

- **SBGN-ED**<sup>①</sup> SBGN-ED, based on VANTED, is currently the most complete solution for creating and editing SBGN diagrams. SBGN-ML import / export is supported in the upcoming release.
- **PathVisio**<sup>②</sup> PathVisio has a plugin for creating and editing SBGN diagrams. This plugin is still a work in progress (for latest information, see plugin page here<sup>③</sup>)

Other

- **The SBML Layout and Rendering extension**<sup>④</sup> supports conversion from SBGN-ML.
- **VISIBIOweb**, a free, open-source, web-based pathway visualization and layout services software for BioPAX (level 2) pathway models, can export to SBGN-ML.
- **Paxtools**<sup>⑤</sup> supports conversion from BioPAX to SBGN-ML.
- **KEGG Translator**<sup>⑥</sup> will support conversion from KEGG to SBGN-ML in the upcoming release.
Software support

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