

# SBGN Update

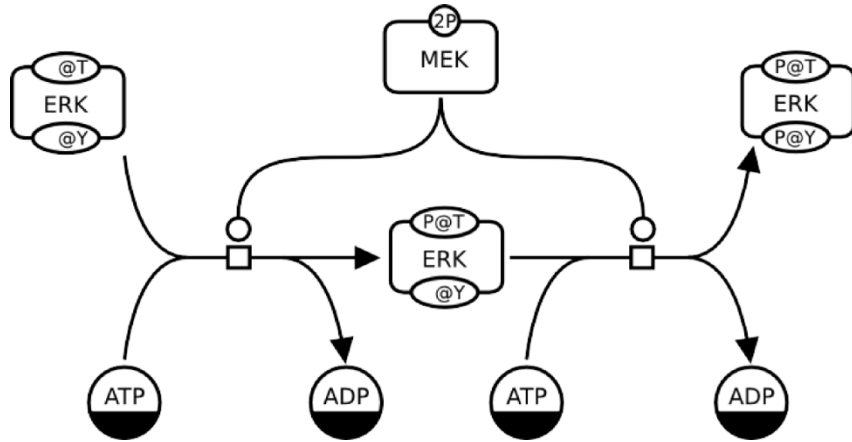


# What is SBGN?

- A way to unambiguously describe biochemical and cellular events in graphs
- Graphical representation of quantitative models, biochemical pathways, at different levels of granularity
- Limited amount of symbols (~30) → Smooth learning curve
- Can be translated into executable models, can graphically represent models (e.g. SBML, BioPAX), but can also exist independently
- Three languages
  - Process Descriptions → one state = one glyph
  - Entity Relationships → one entity = one glyph
  - Activity Flow → conceptual level

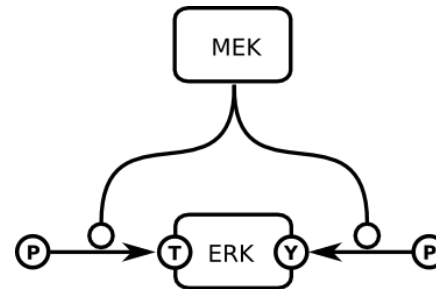
# Three Languages in One

## Process Description maps



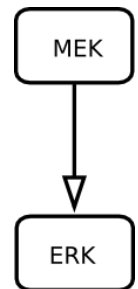
- ▶ Unambiguous
- ▶ Mechanistic
- ▶ Sequential
- ▶ Combinatorial explosion

## Entity Relationships maps



- ▶ Unambiguous
- ▶ Mechanistic
- ▶ Non-Sequential

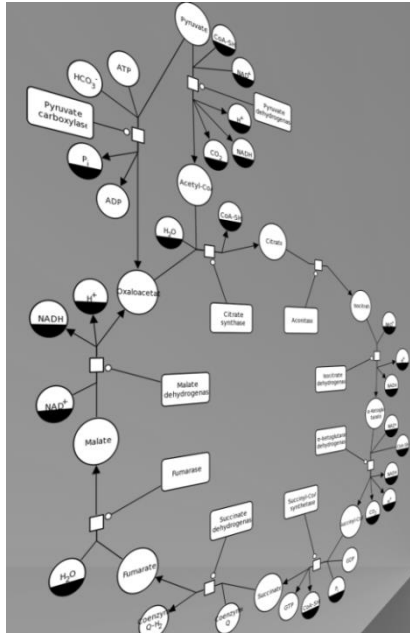
## Activity Flow maps



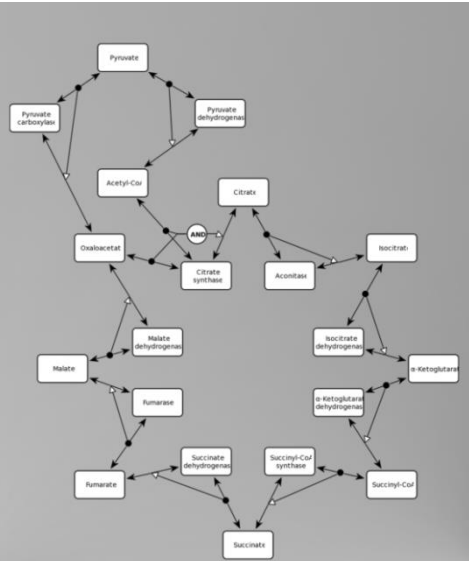
- ▶ Ambiguous
- ▶ Conceptual
- ▶ Sequential

# Three Languages in One

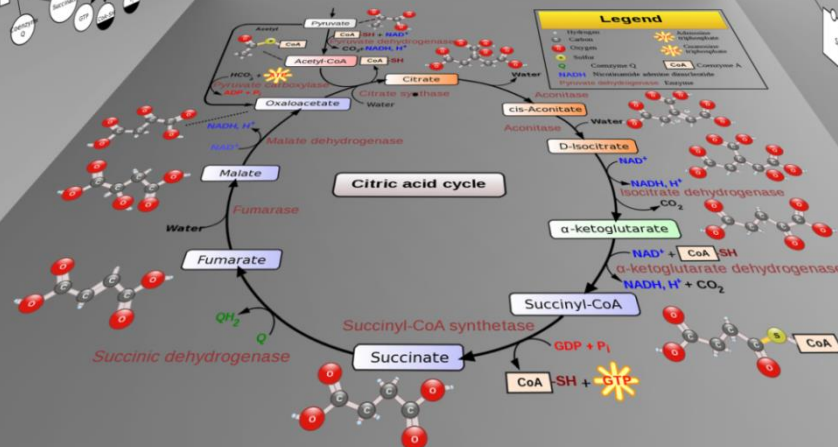
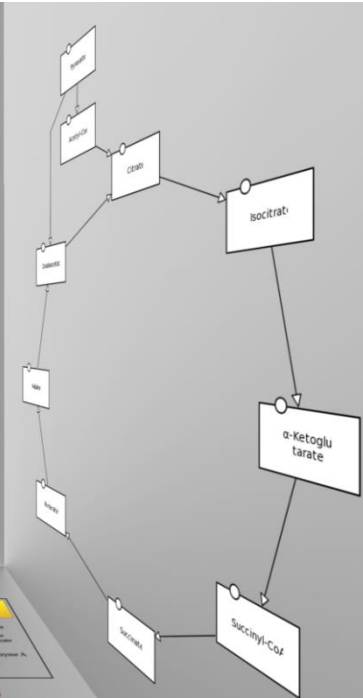
Process Description



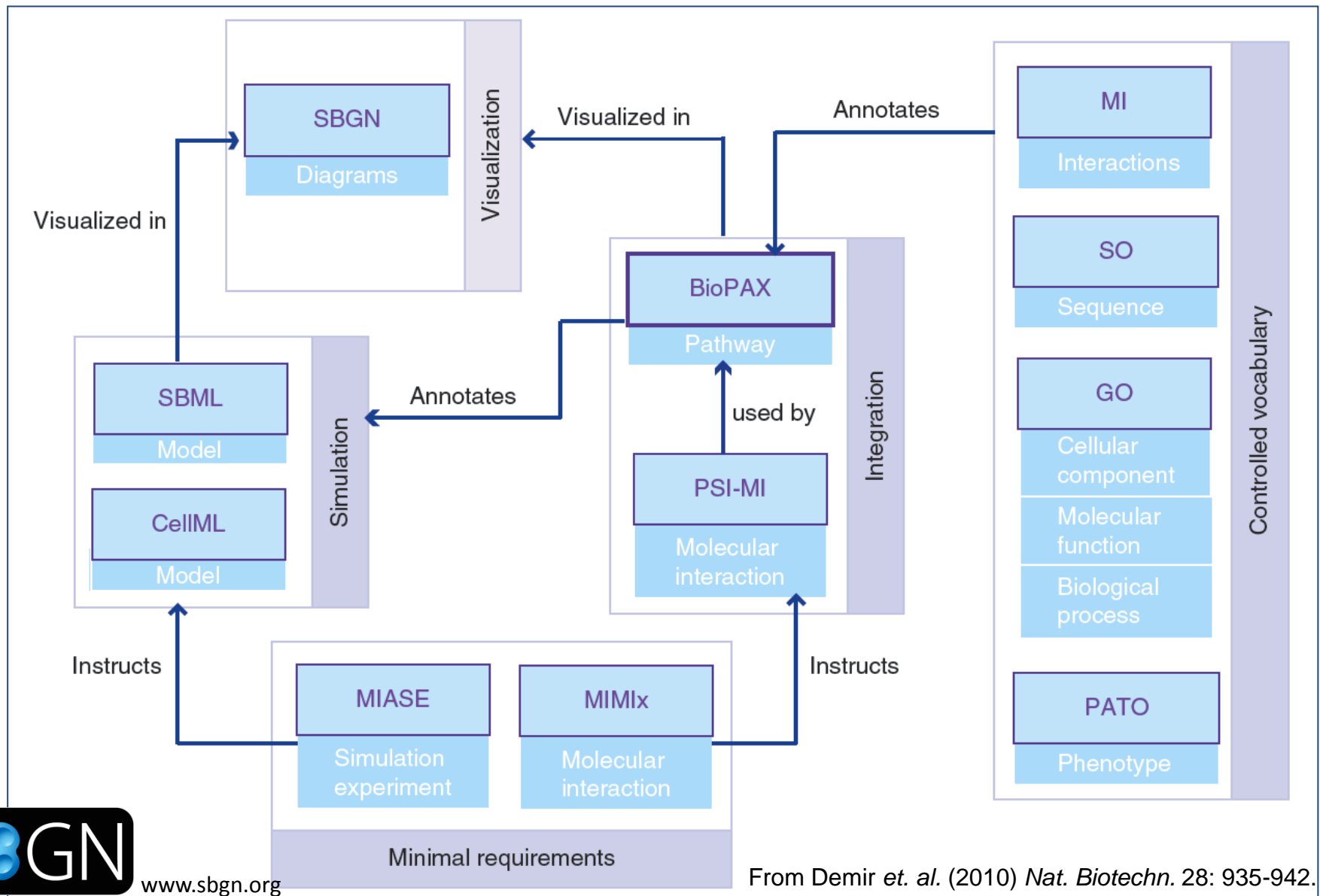
Entity Relationships



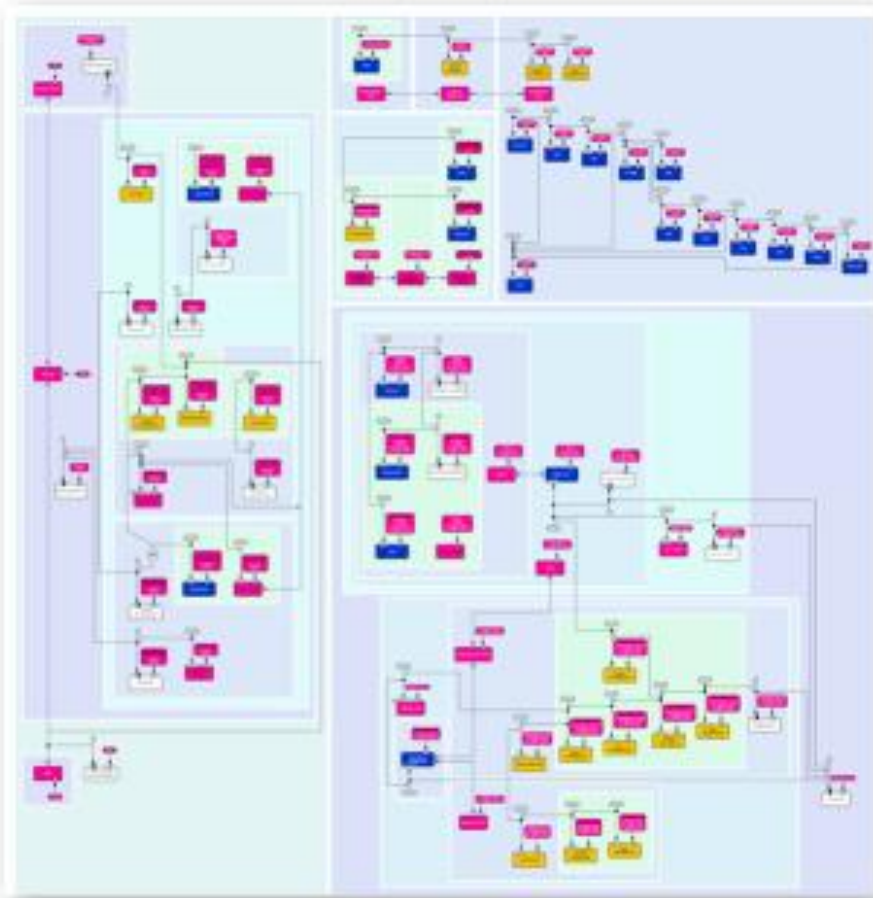
Activity Flow



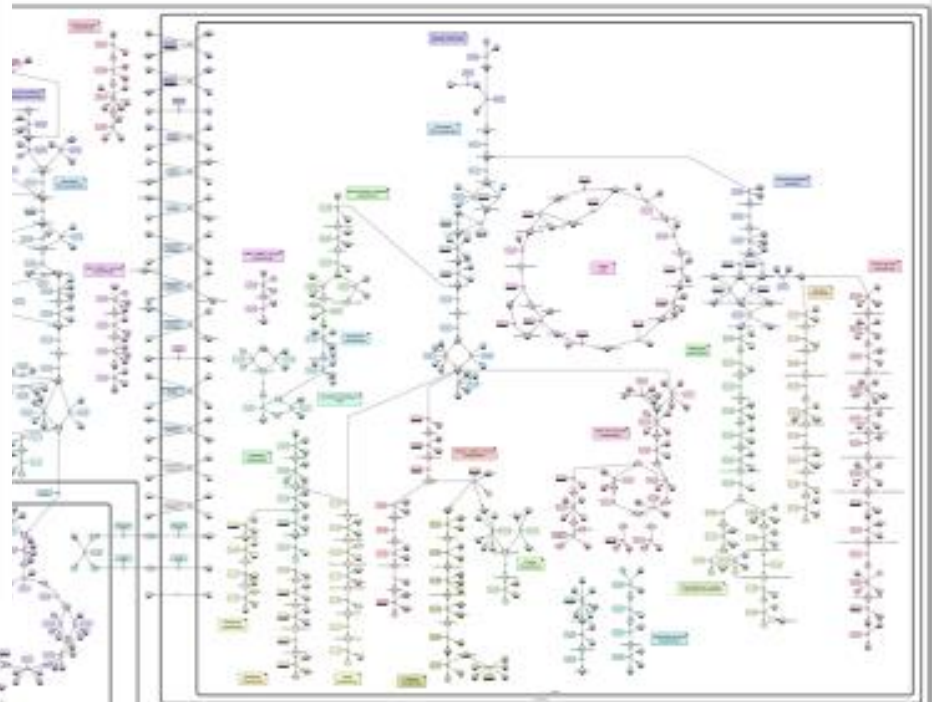
# Connection to other Standards



# Application Examples



Maps from SBGN best map contests

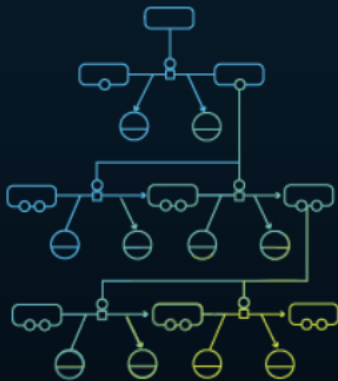


# Web Page

www.sbggn.org



[Home](#) [News](#) [Documents](#) [Software](#) [Community](#) [Events](#) [About](#)



## A Visual Notation for Network Diagrams in Biology

Welcome to the global portal for documentation, news, and other information about the **Systems Biology Graphical Notation (SBGN)** project, an effort to standardize the graphical notation used in maps of biological processes.

### Quick start

[Learn how to use SBGN](#)

[Get involved](#)

### Symbol of the month

[Catalysis \(PD\)](#)



#### SBGN News

( 19 Apr. '13) The SBGN User Survey. We need your help to make SBGN better. Find out more [here](#).



SBGN is the work of many people. It would not have been possible without the generous support of multiple organizations over the years, for which we are very thankful.

# Software

## [edit] Software providing support for SBGN

The following is a list of software packages known to provide (or have started to develop) support for SBGN notations. As the list grows, we envision more sophisticated way of recording support, but we hope this will be useful nevertheless. The webpages and e-mail addresses (remove spaces) were correct at the time of recording.

- [Arcadia](#) - Contact: [alice.villeger@manchester.ac.uk](mailto:alice.villeger@manchester.ac.uk)
- [Athena](#) - Contact: [fbergman@u.washington.edu](mailto:fbergman@u.washington.edu)
- [Biological Connection Markup Language \(BCML\)](#) -

Contact: [duccio.cavaliere@unifi.it](mailto:duccio.cavaliere@unifi.it)

- [Biographer and jSBGN](#) - Contact: [biographer@googlegroups.com](mailto:biographer@googlegroups.com)
- [BiNoM](#) - Contact: [laurence.calzone@curie.fr](mailto:laurence.calzone@curie.fr)
- [BIOCHAM](#) - Contact: [biocham@inria.fr](mailto:biocham@inria.fr)
- [BioModels Database](#) - Contact: [biomodels-net-team@lists.sourceforge.net](mailto:biomodels-net-team@lists.sourceforge.net)
- [BioPAX](#) - Contact: [demir@cbio.mskcc.org](mailto:demir@cbio.mskcc.org)
- [BioUML](#) - Contact: [fedor@developmentontheedge.com](mailto:fedor@developmentontheedge.com)
- [ByoDyn](#)
- [CellDesigner](#) - Version 4.x supports SBGN Process Diagram Level 1. Contact: [info@celldesigner.org](mailto:info@celldesigner.org)
- [CySBGN](#) - A cytoscape plugin. Contact: [emanuel@ebi.ac.uk](mailto:emanuel@ebi.ac.uk)
- [Dunnart](#) - Contact: [Sarah.Boyd@infotech.monash.edu.au](mailto:Sarah.Boyd@infotech.monash.edu.au)
- [Edinburgh Pathway Editor](#) - Contact: [asorokin@inf.ed.ac.uk](mailto:asorokin@inf.ed.ac.uk) or Stuart Moodie: [smoodie@ed.ac.uk](mailto:smoodie@ed.ac.uk)
- [iPathways](#) - Contact: [ghosh@sbi.jp](mailto:ghosh@sbi.jp)
- [IPAVS](#) - Contact: [pradeep@cidms.org](mailto:pradeep@cidms.org)
- [JWS Online](#) - Contact: [jls@sun.ac.za](mailto:jls@sun.ac.za)
- [Mayday](#) - Contact: [battke@informatik.uni-tuebingen.de](mailto:battke@informatik.uni-tuebingen.de)
- [Metacrop](#) - Contact: [schreibe@ipk-gatersleben.de](mailto:schreibe@ipk-gatersleben.de)
- [Netbuilder \(Apostrophe\)](#) - Contact: [k.wegner@herts.ac.uk](mailto:k.wegner@herts.ac.uk)
- [PANTHER](#) - Contact: [mi@ai.sri.com](mailto:mi@ai.sri.com)

TABLE 1 | Comparison of pathway visualization tools that support SBGN notation.

Name	Ref.	Access	Availability	SBGN			SBGN validation	Mapping	Website export
				PD	ER	AF			
SBGN-ED	9	<a href="http://sbgn-ed.org/">http://sbgn-ed.org/</a>	F	✓	✓	✓	✓	✓	✓
BiNoM	7	<a href="http://bioinfo-out.curie.fr/projects/binom/">http://bioinfo-out.curie.fr/projects/binom/</a>	F	✓	—	—	—	—	—
BioUML	—	<a href="http://www.biouml.org/">http://www.biouml.org/</a>	F	✓	—	—	—	—	—
CellDesigner	6	<a href="http://www.celldesigner.org/">http://www.celldesigner.org/</a>	F	✓	—	—	—	✓	—
Edinburgh Pathway Editor (EPE)	12	<a href="http://epe.sourceforge.net/">http://epe.sourceforge.net/</a>	F	✓	✓	✓	—	—	—
PathVisio	8	<a href="http://www.pathvisio.org/">http://www.pathvisio.org/</a>	F	✓	—	—	—	✓	✓
PathwayLab	—	<a href="http://www.innetics.com/">http://www.innetics.com/</a>	C	✓	—	—	—	—	✓
Arcadia	21	<a href="http://arcadiapathways.sourceforge.net/">http://arcadiapathways.sourceforge.net/</a>	F	✓	—	—	—	—	—
Athena	22	<a href="http://athena.codeplex.com/">http://athena.codeplex.com/</a>	F	✓	—	—	—	—	—
BIOCHAM	23	<a href="http://contraintes.inria.fr/BIOCHAM/">http://contraintes.inria.fr/BIOCHAM/</a>	F	✓	—	—	—	—	—
JWS Online	24	<a href="http://jij.biochem.sun.ac.za/help.html">http://jij.biochem.sun.ac.za/help.html</a>	F	✓	—	—	—	—	—
Mayday	25	<a href="http://www-ps.informatik.uni-tuebingen.de/mayday/wp/">http://www-ps.informatik.uni-tuebingen.de/mayday/wp/</a>	F	✓	—	—	—	✓	—
Netbuilder'	26	<a href="http://strc.herts.ac.uk/bio/maria/Apostrophe/">http://strc.herts.ac.uk/bio/maria/Apostrophe/</a>	F	✓	—	—	—	—	—
SBML Layout Library	27	<a href="http://sbmllayout.sf.net/">http://sbmllayout.sf.net/</a>	F	✓	—	—	—	—	—
SubtiPathways	28	<a href="http://subtiwiki.uni-goettingen.de/subtipathways.html">http://subtiwiki.uni-goettingen.de/subtipathways.html</a>	F	✓	—	—	—	—	—
Systems Biology Metabolic Modeling assistant	29	<a href="http://cath.gisum.uma.es:8080/sbmm/">http://cath.gisum.uma.es:8080/sbmm/</a>	F	✓	—	—	—	—	—
VISIBIOweb	30	<a href="http://www.bilkent.edu.tr/~bcbi/pvs.html">http://www.bilkent.edu.tr/~bcbi/pvs.html</a>	F	✓	—	—	—	—	—





# Governance

- Editors



Tobias  
Czauderna



Stuart  
Moodie



Falk  
Schreiber



Anatoly  
Sorokin



Alice  
Villeger

- Scientific committee



# Last meeting



## SBGN 9

*Edinburgh, UK*

29 Apr – 2 May 2013

This workshop was be dedicated to SBGN and it focused on the current SBGN specifications and SBGN's future development.

# Documentation Split

- There was a technical specification only
  - Too technical
  - Focused on tool developers
- It was decided to split documentation into two parts
  - Technical Specification: normative official description of the language
  - User Manual: description of the use of language to teach end users
- User Manual is available for SBGN PD

# Specification Status Update

- First draft of a user manual is available for SBGN PD Level 1 Version 1.3
  - [https://sourceforge.net/p/sbgn/code/HEAD/tree/ProcessDiagram/trunk/UserManual/sbgn\\_PD-level1-user.pdf](https://sourceforge.net/p/sbgn/code/HEAD/tree/ProcessDiagram/trunk/UserManual/sbgn_PD-level1-user.pdf)
- A first draft of SBGN PD Level 1 Version 2 (including user manual) is ready for review
  - [https://sourceforge.net/p/sbgn/code/HEAD/tree/ProcessDiagram/trunk/Specification/sbgn\\_PD-level1.pdf](https://sourceforge.net/p/sbgn/code/HEAD/tree/ProcessDiagram/trunk/Specification/sbgn_PD-level1.pdf)
- A draft of SBGN ER Level 1 Version 2 is available for review
  - [https://sourceforge.net/p/sbgn/code/HEAD/tree/EntityRelationship/trunk/sbgn\\_ER-level1.pdf](https://sourceforge.net/p/sbgn/code/HEAD/tree/EntityRelationship/trunk/sbgn_ER-level1.pdf)
- A draft of SBGN AF Level Version 1.1 is available for review
  - [https://sourceforge.net/p/sbgn/code/HEAD/tree/ActivityFlow/trunk/sbgn\\_AF-level1.pdf](https://sourceforge.net/p/sbgn/code/HEAD/tree/ActivityFlow/trunk/sbgn_AF-level1.pdf)



# Update SBGN PD Specification

# Update SBGN PD Specification

- Level 1 Version 1: Sep 2008
  - Original specification
- Level 1 Version 1.1: Sep 2009
  - Fixed inconsistencies
  - Typos
  - Clarified “ontology” of glyphs
  - Nomenclature changes for consistency with other languages
- Level 1 Version 1.2: Oct 2010
- Level 1 Version 1.3: Feb 2011
  - Minor changes of clarity
  - Document errors
- Level 1 Version 2.0: Q1 2014

# What's in Version 2.0

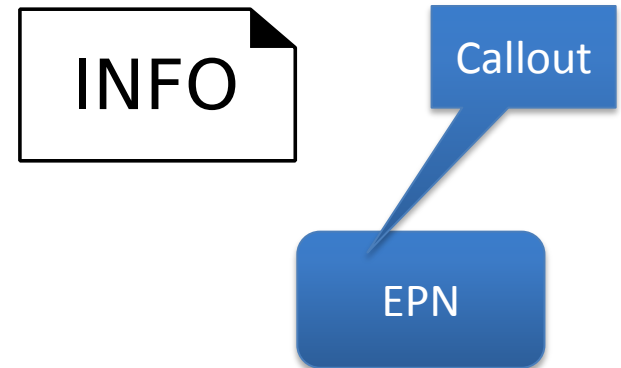
- New/modified Glyphs
- Resolving semantic “issues”
- Enumerated rules
- Improve organisation/clarity of the spec

# Resolved Issues

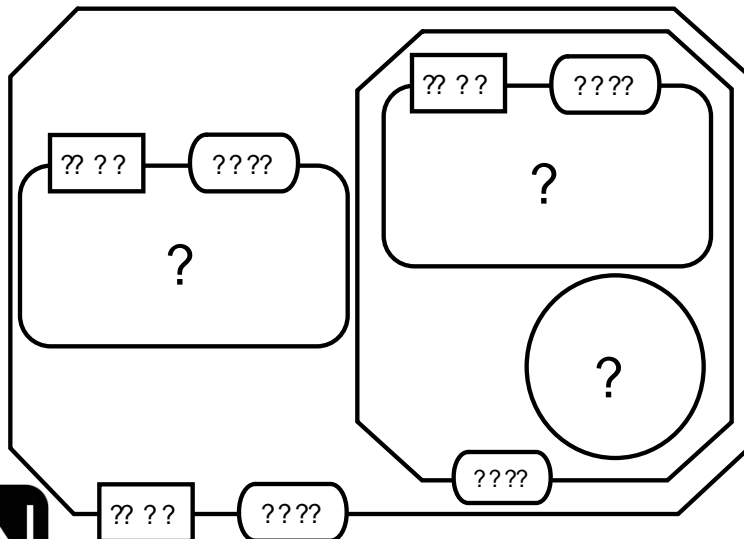
State glyph change



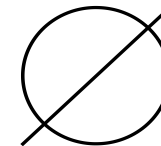
New annotation glyph



Complex subunits are decorators



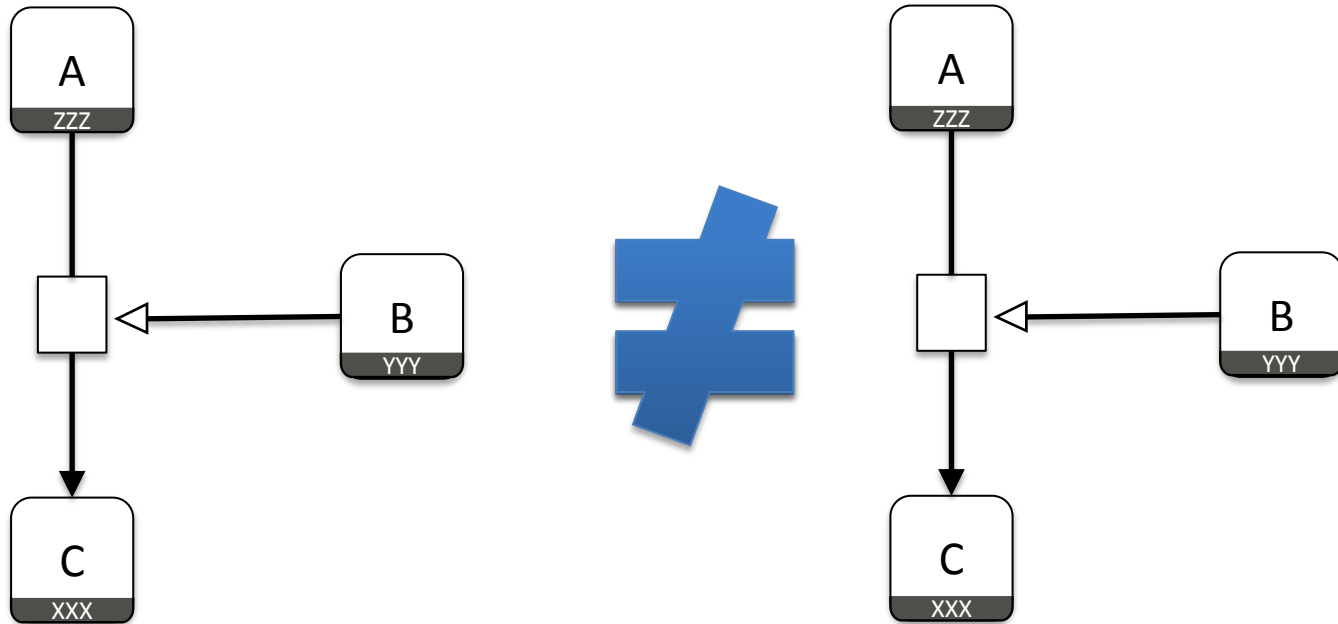
Empty set





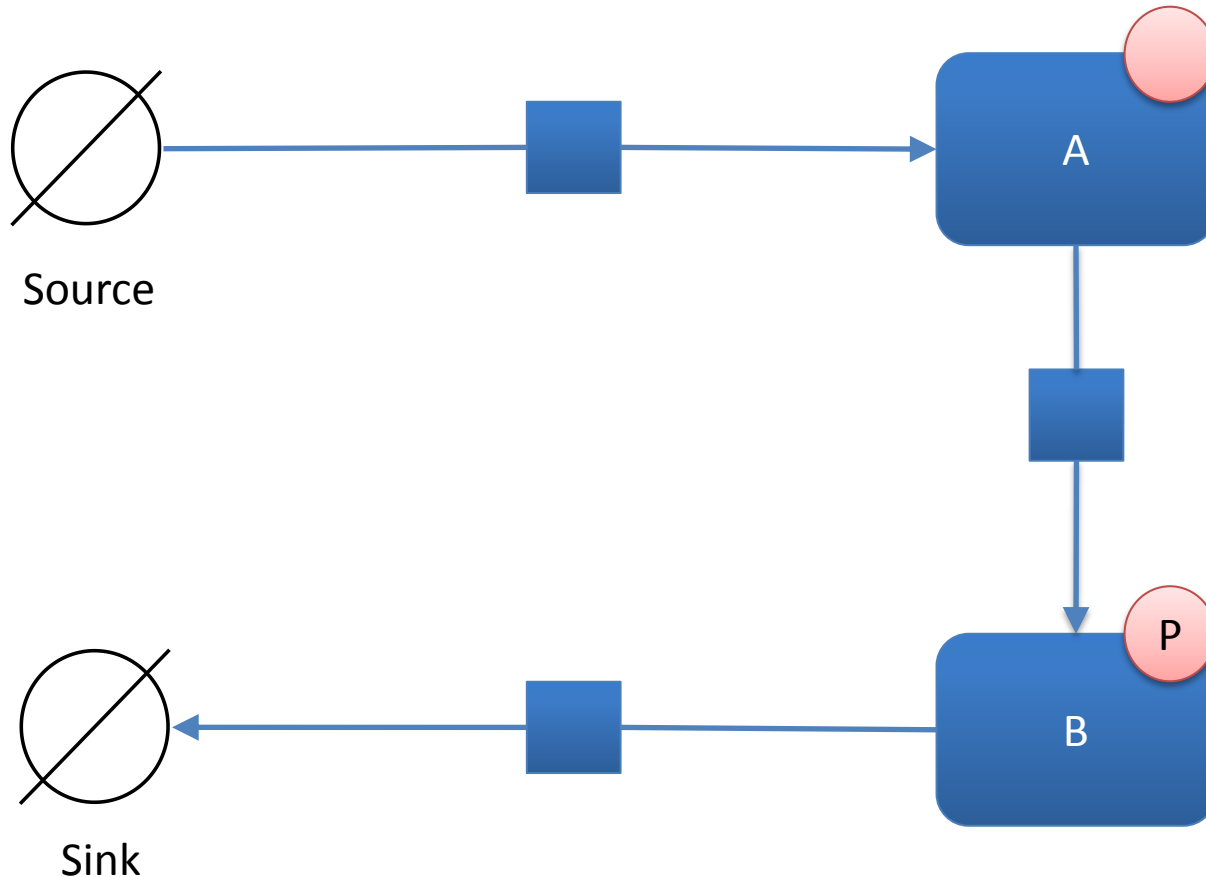
# Level 1 Version 2.0: Semantics

Process Duplication



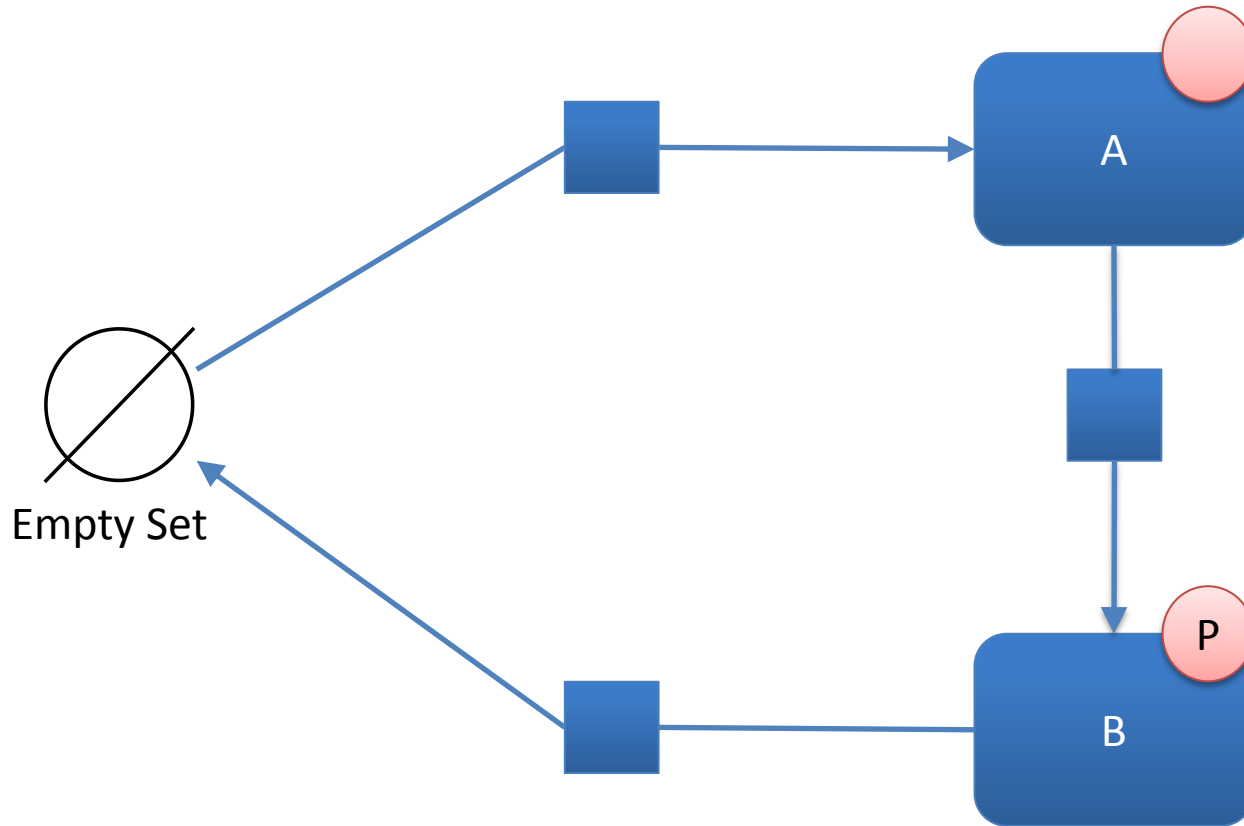
# Level 1 Version 2.0: Semantics

Source and Sink  $\rightarrow$  Empty Set

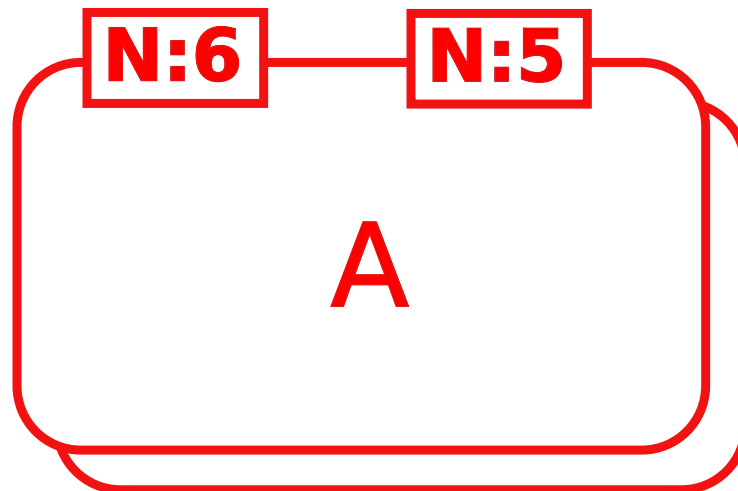
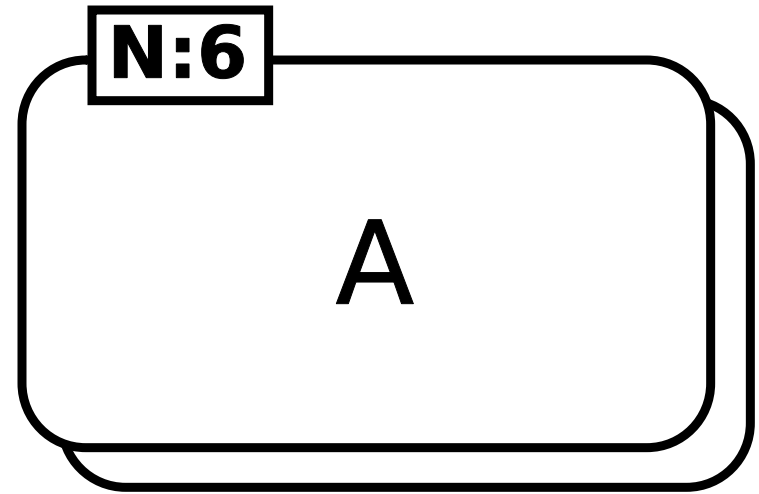
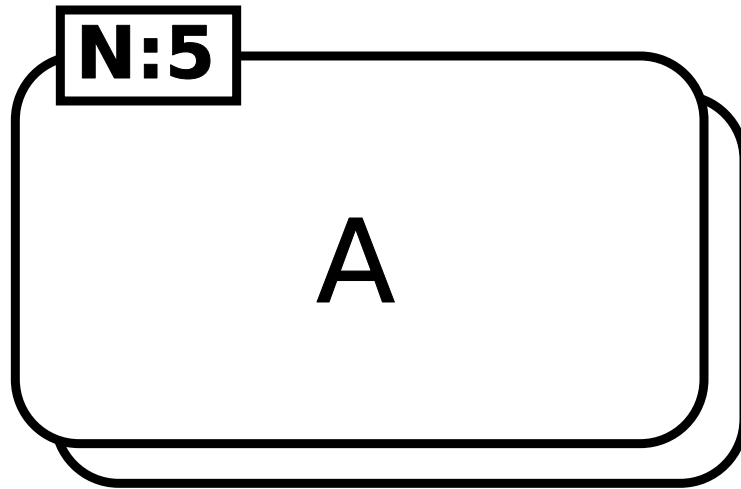


# Level 1 Version 2.0: Semantics

Source and Sink  $\rightarrow$  Empty Set



# Cardinality Glyph

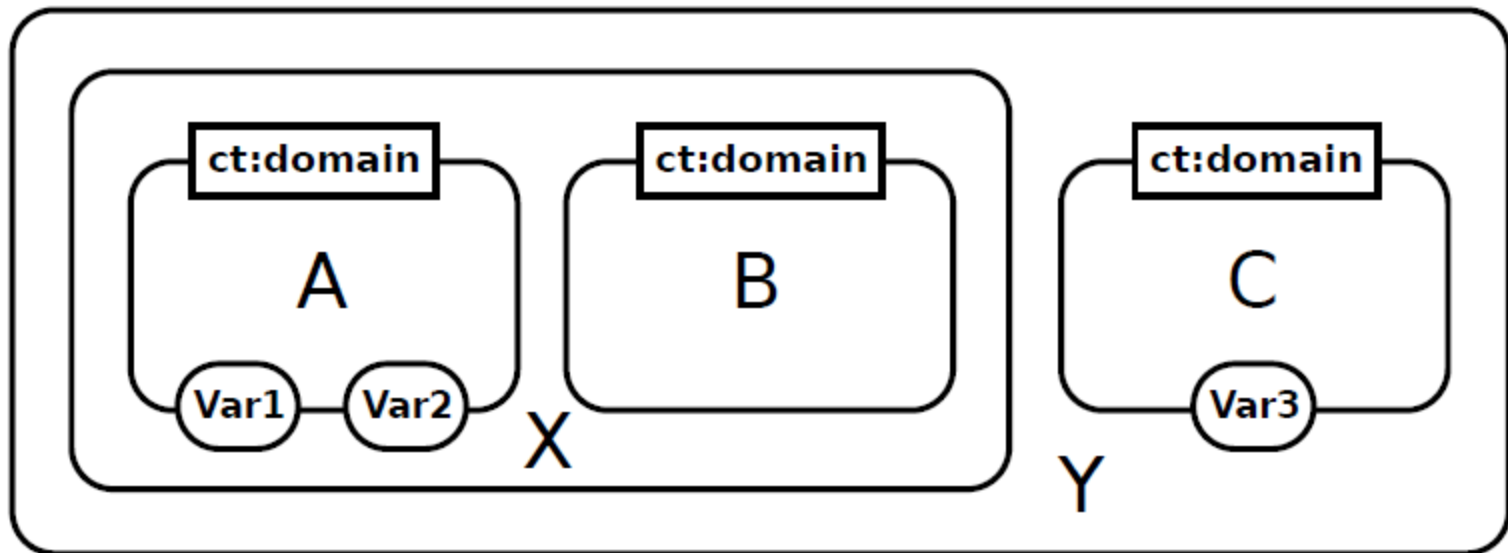


# Road Map for PD

- Level 1 Version 2.0
  - Draft for Review: Q1 2014
  - RFC: 2-3 Weeks
  - Release Q2 2014

# Update SBGN ER Specification

# Entity Nesting



**Figure 2.44:** *The Entity Relationship glyph for domain.*

# Road Map for AF

- Level 1 Version 2.0
  - Draft for Review: Q1 2014
  - RFC: 2-3 Weeks
  - Release Q2 2014



# Update SBGN AF Specification

# AF Phenotype

- HARMONY 2012 - decision about how to deal with phenotype, no objections on mailing list



*The Activity Flow glyph for biological activity - phenotype*

# Road Map for AF

- Level 1 Version 1.1 (or 2.0)
  - Draft for Review: Q1 2014
  - RFC: 2-3 Weeks
  - Release Q2 2014

# Topics This Session

- SBGN survey
- The LEGO project from Gene Ontology - How SBGN can support it
- What is the optimal representation of a generalized metabolic model using SBML and SBGN?
- Identity gates