

Introduction to SBOL Visual

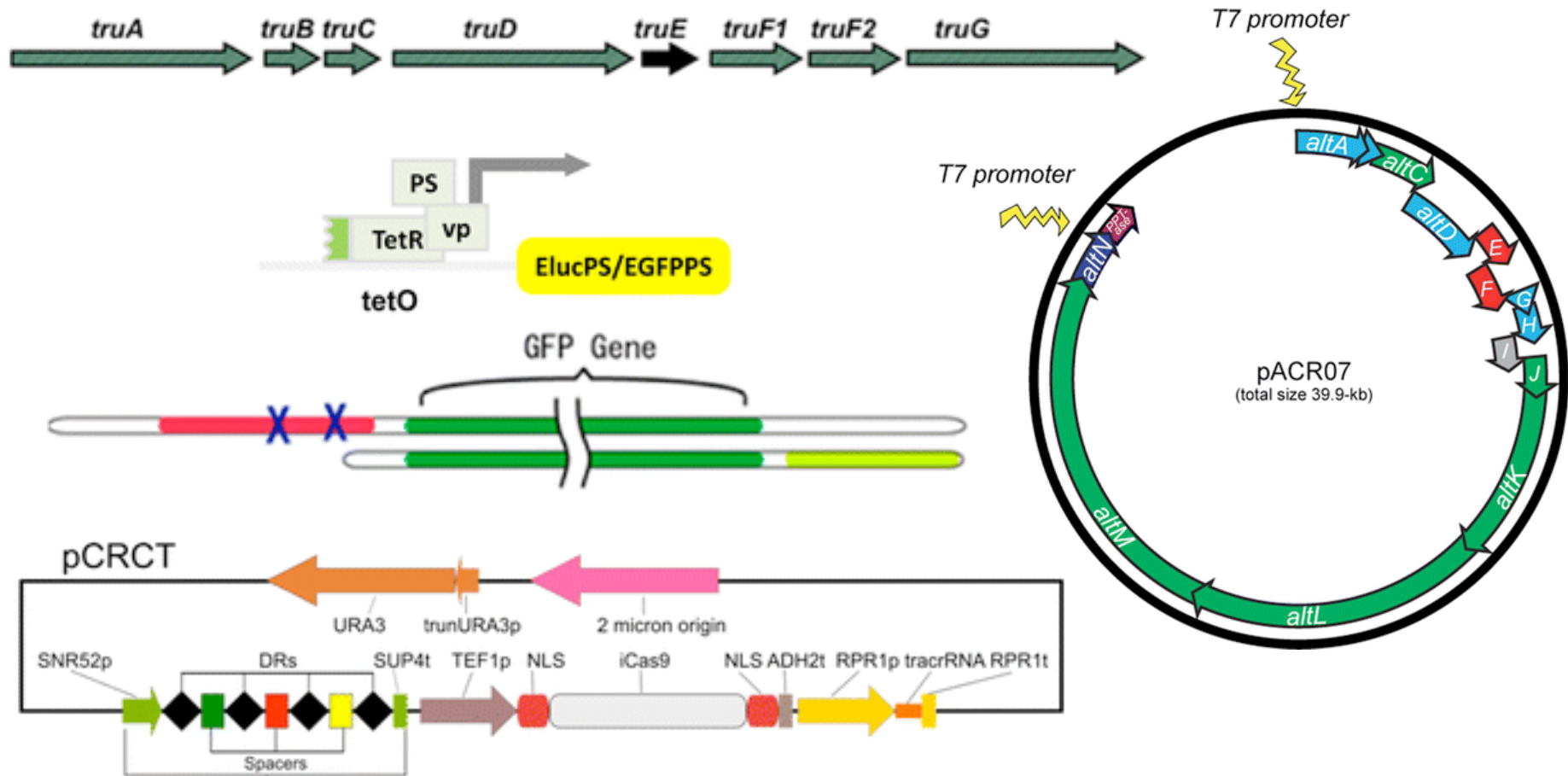
SBOL Visual Community

Last revised: September 2016

Problem: Communicating Gene Constructs



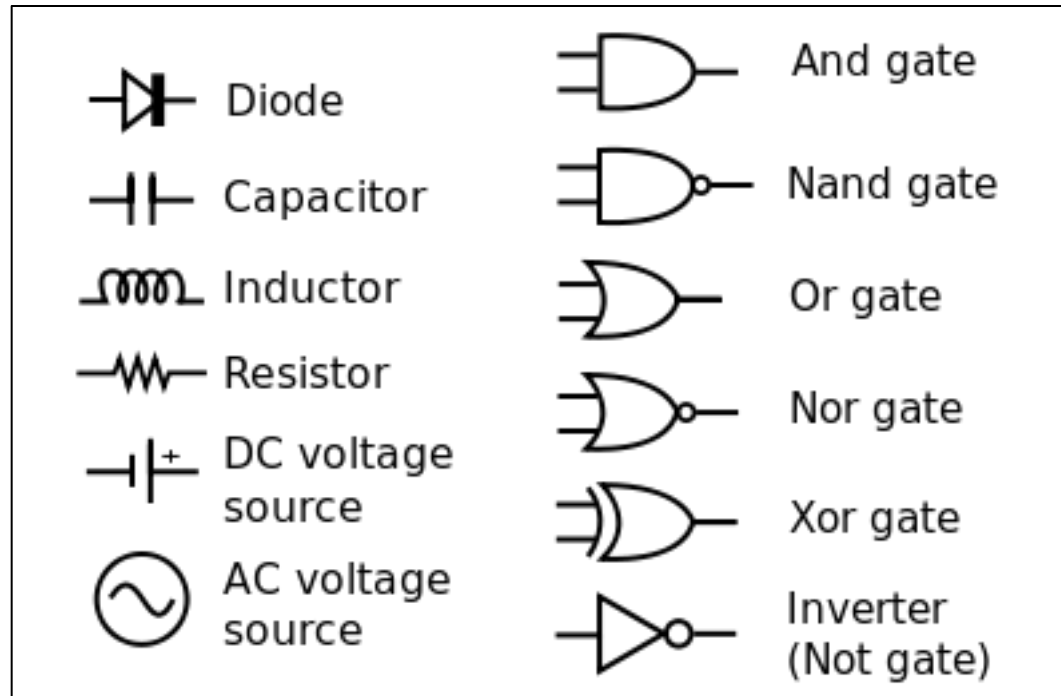
Construct diagrams from some recent ACS Syn.Bio. papers:



Well, they're sort of similar...

Standards simplify communication

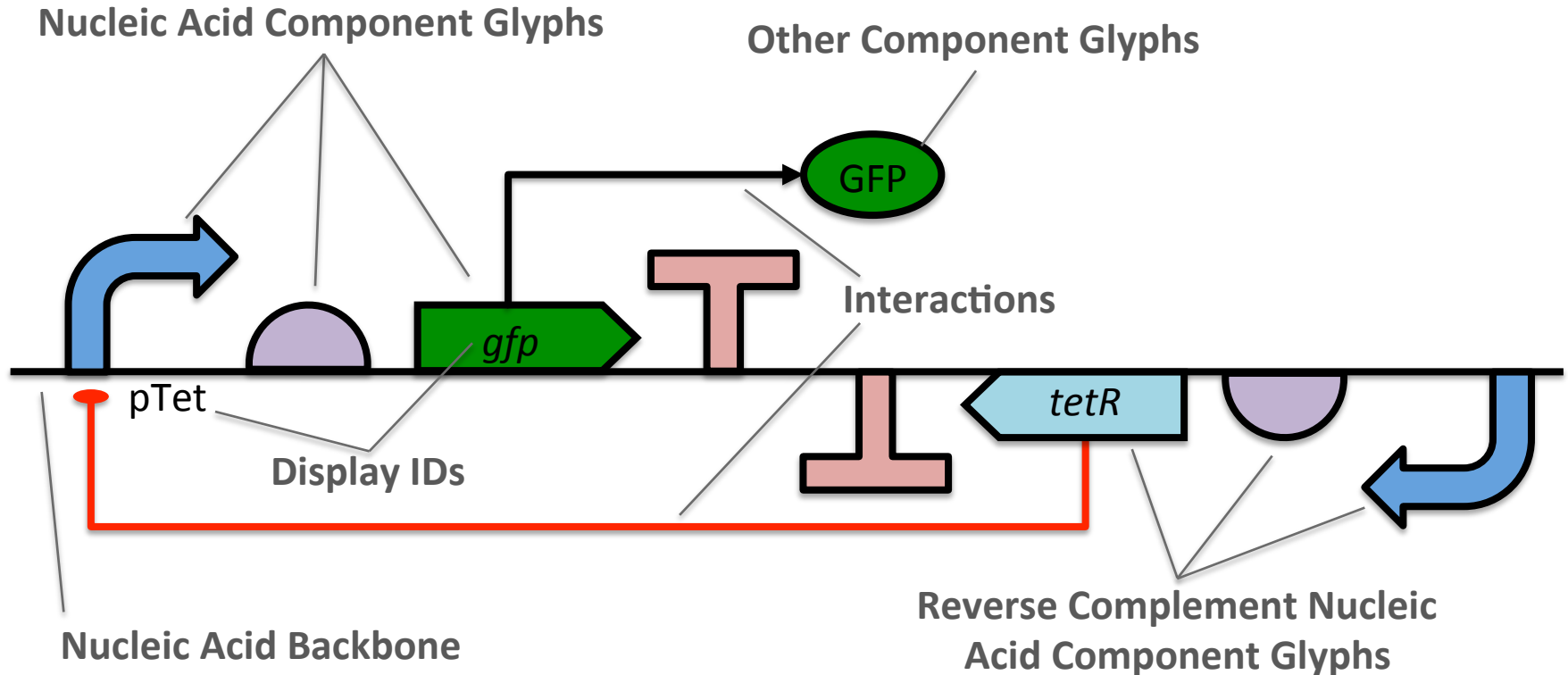
Inspiration: Standard Electronic Symbols:



... and many others in IEEE Std. 91/91a; IEEE Std. 315

What is the equivalent for synthetic biology?

Elements of SBOL Visual:



Synthetic Biology Open Language - Visual

Community standards in development since 2008






















SBOL Visual 1.0: BBF RFC #93 [doi: 1721.1/78249](https://doi.org/10.17211/78249)

SBOL Visual 2.0: <https://github.com/SynBioDex/SBOL-visual>

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Current SBOLv Symbols:

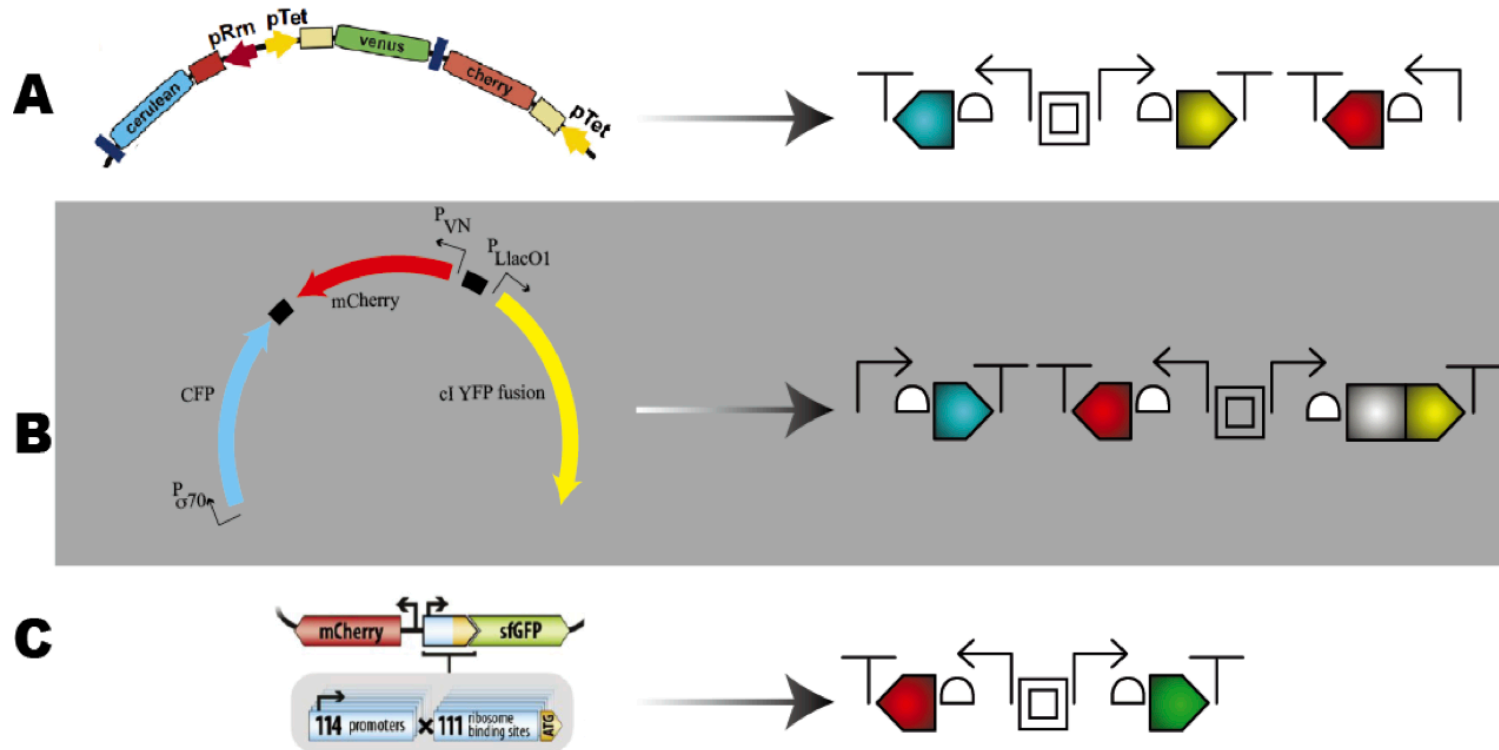


 promoter	 primer binding site
 cds	 restriction site
 ribosome entry site	 blunt restriction site
 terminator	 5' sticky restriction site
 operator	 3' sticky restriction site
 insulator	 5' overhang
 ribonuclease site	 3' overhang
 rna stability element	 assembly scar
 protease site	 signature
 protein stability element	 user defined
 origin of replication	

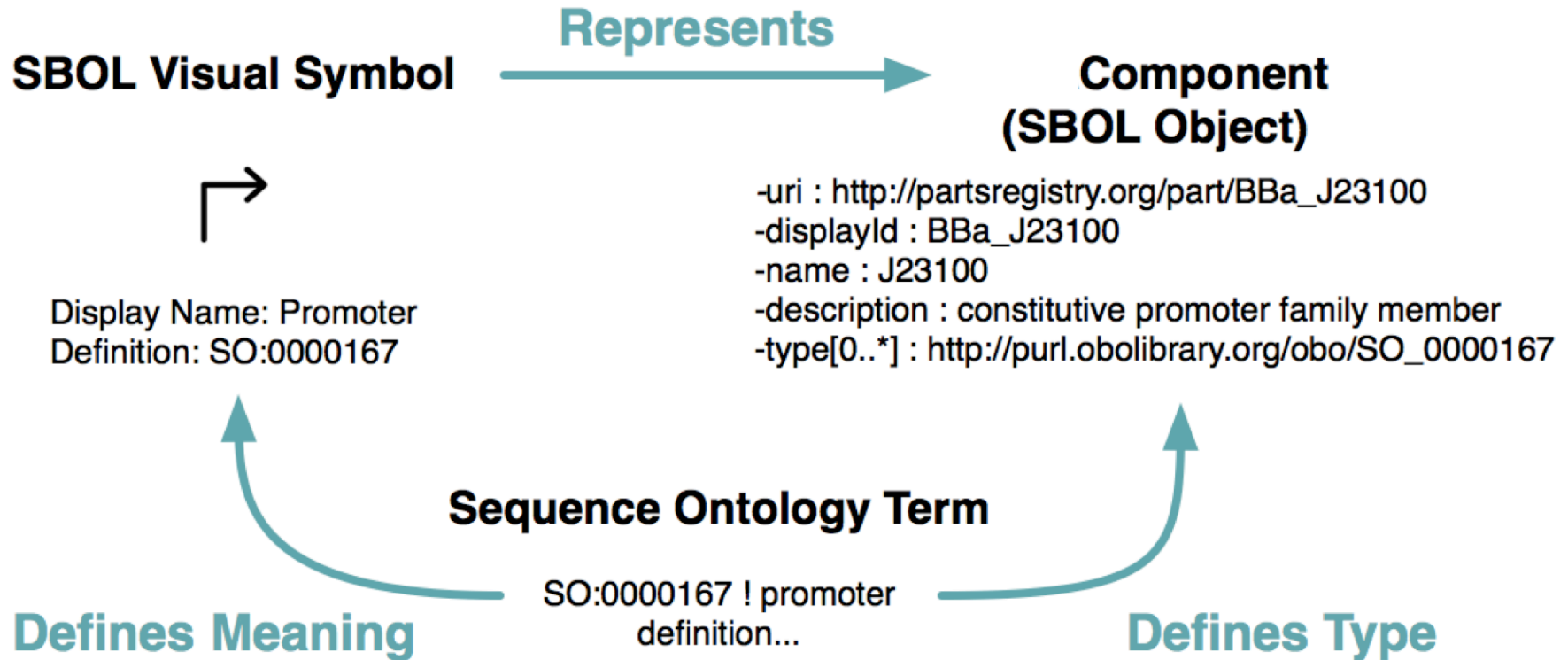
New symbols, variants added by community consensus

Standardized styles aid comparison

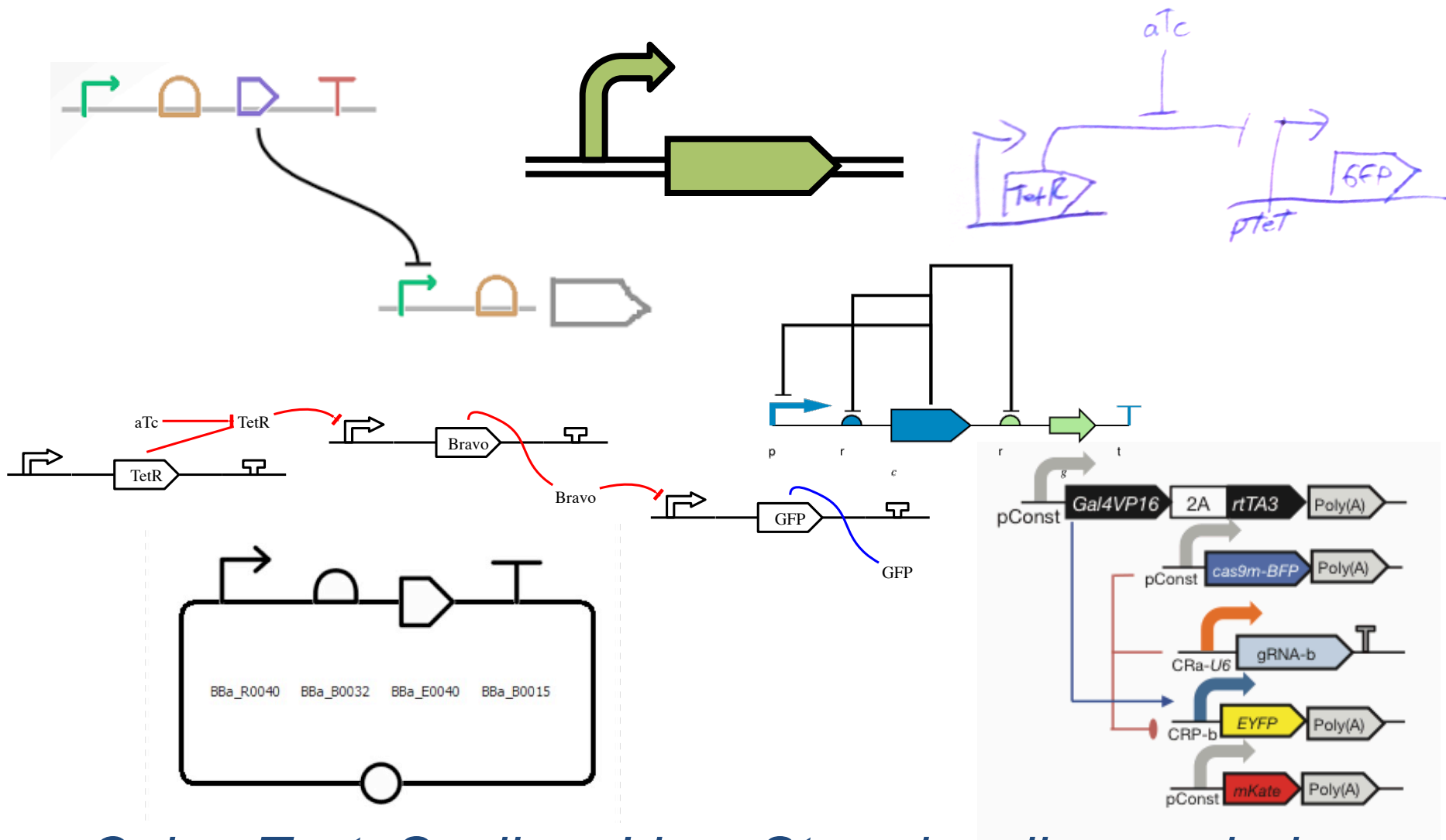
- Three similar circuits are easier to compare with consistent symbology



Backing by Formal Semantics



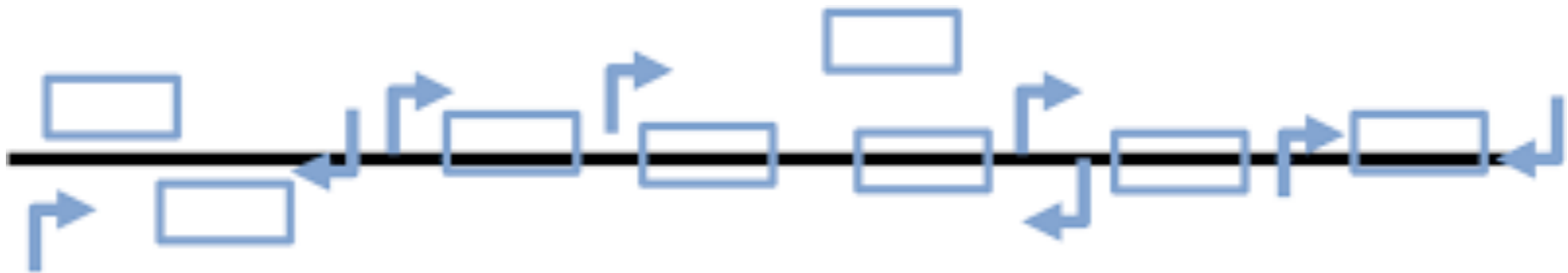
Flexibility of Style



Color, Text, Scaling, Line, Strands: all your choice

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Is anything prohibited?

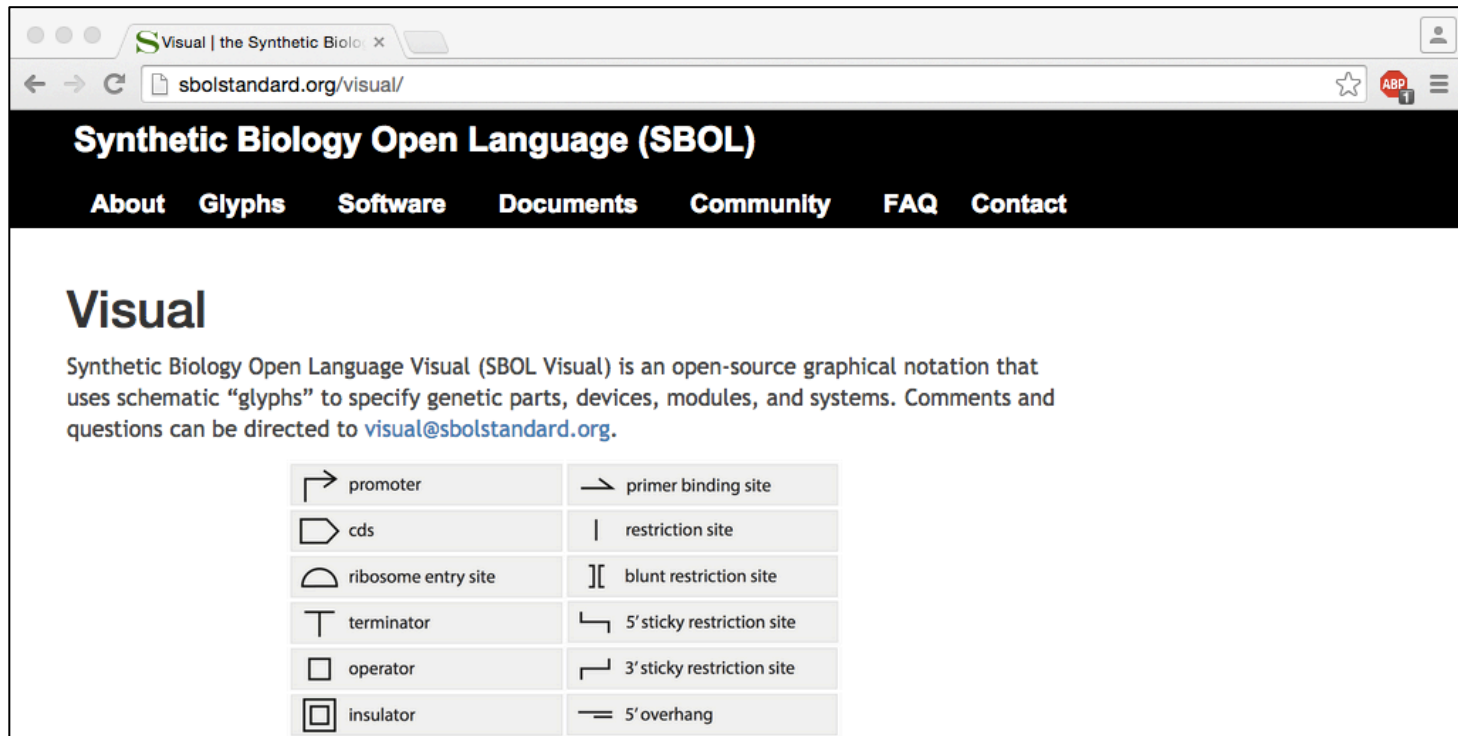














Yes.

Making SBOL Visual Diagrams

- Using your favorite graphics editor:
 - Many icons can be drawn directly
 - Icons available from: <http://sbolstandard.org/visual/>
- Specialized visualization tools:
 - Pigeon: <http://pigeoncad.org/>
 - VisBOL: <http://visbol.org/design/>
 - GraphViz: <http://www.graphviz.org/>
 - DNAPlotLib: <https://github.com/VoigtLab/dnaplotlib>

- Use the symbols in your papers & talks
- Contribute opinions, use cases, new symbols

A screenshot of a web browser displaying the SBOL Visual website. The browser's address bar shows 'sbolstandard.org/visual/'. The page has a black header with the title 'Synthetic Biology Open Language (SBOL)' and a navigation menu with links: 'About', 'Glyphs', 'Software', 'Documents', 'Community', 'FAQ', and 'Contact'. Below the header, the section is titled 'Visual'. A paragraph describes SBOL Visual as an open-source graphical notation using schematic 'glyphs' for genetic parts, devices, modules, and systems, with contact information 'visual@sbolstandard.org'. Below the text is a table of glyphs.

 promoter	 primer binding site
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 insulator	 5' overhang

- Community is open for anyone to join

Tool examples

- VisBOL: generate SBOL Visual figures from genetic design files
- <http://visbol.org/>
- SBOLDesigner: visually draw SBOL designs and produce sequence designs
- <http://www.async.ece.utah.edu/SBOLDesigner>