



INOH Database

A Manually Curated Pathway Database

<http://www.inoh.org>



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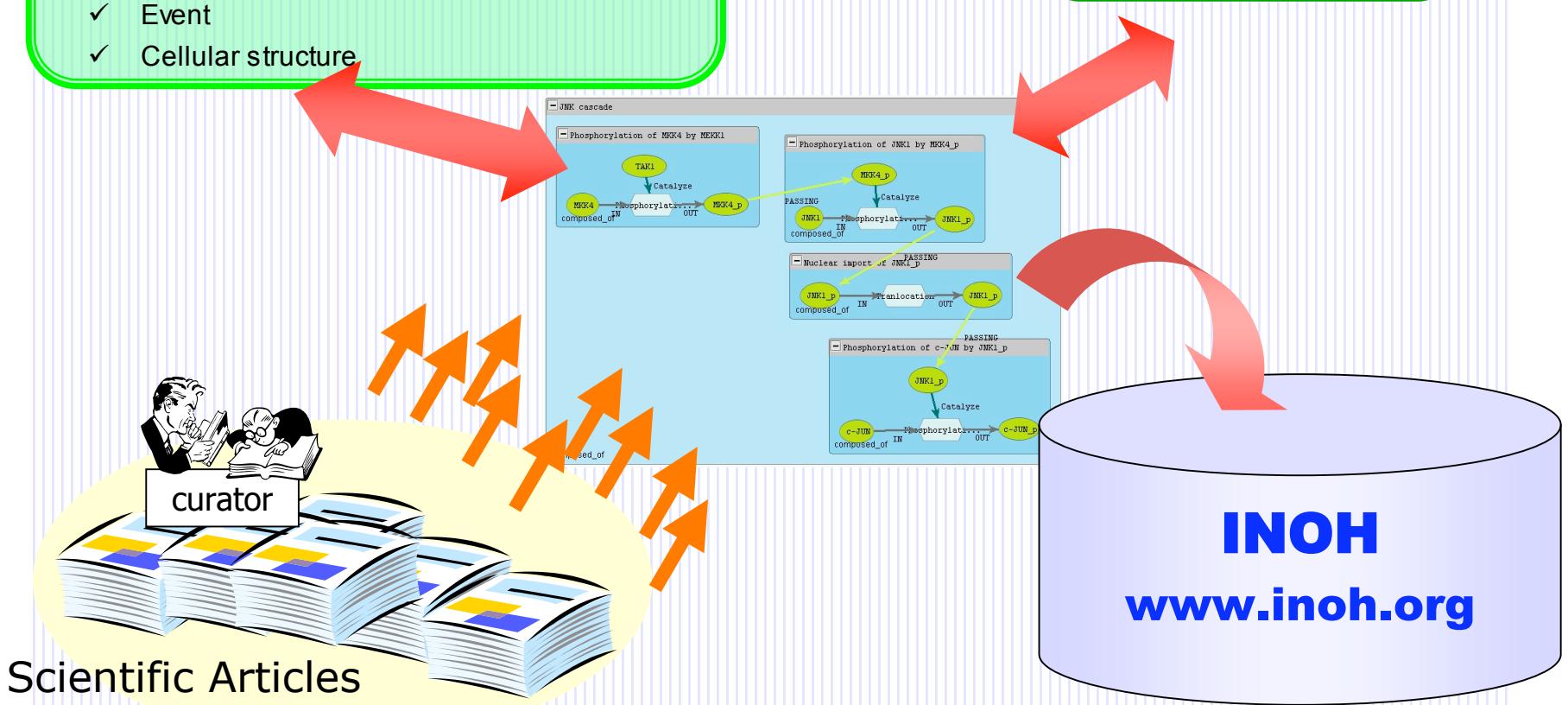
INOH DB Project

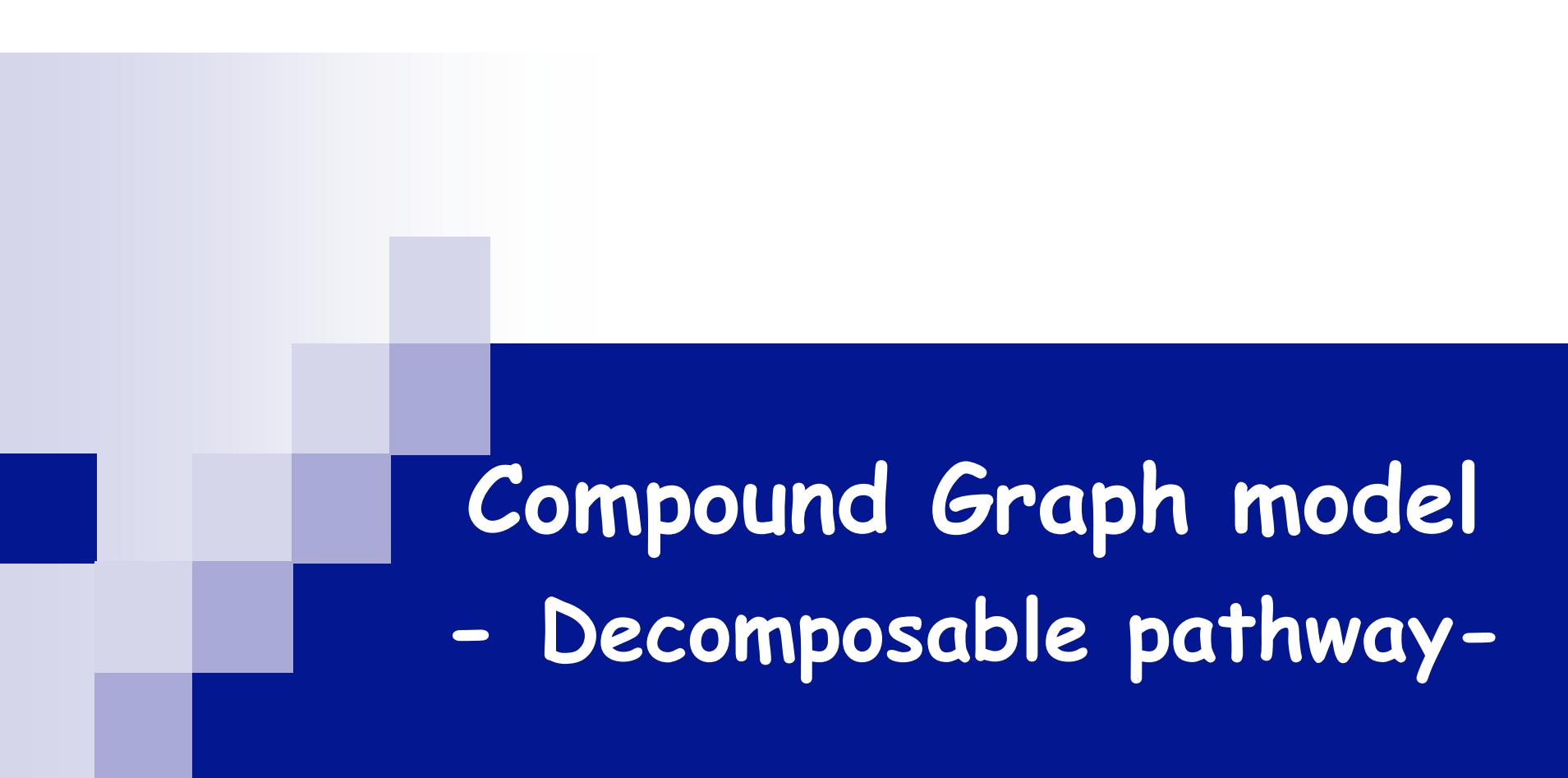
INOH: Higher order Knowledge System

Ontology for pathways

- ✓ MoleculeRole
- ✓ Process
- ✓ Event
- ✓ Cellular structure

Compound-Graph representation model

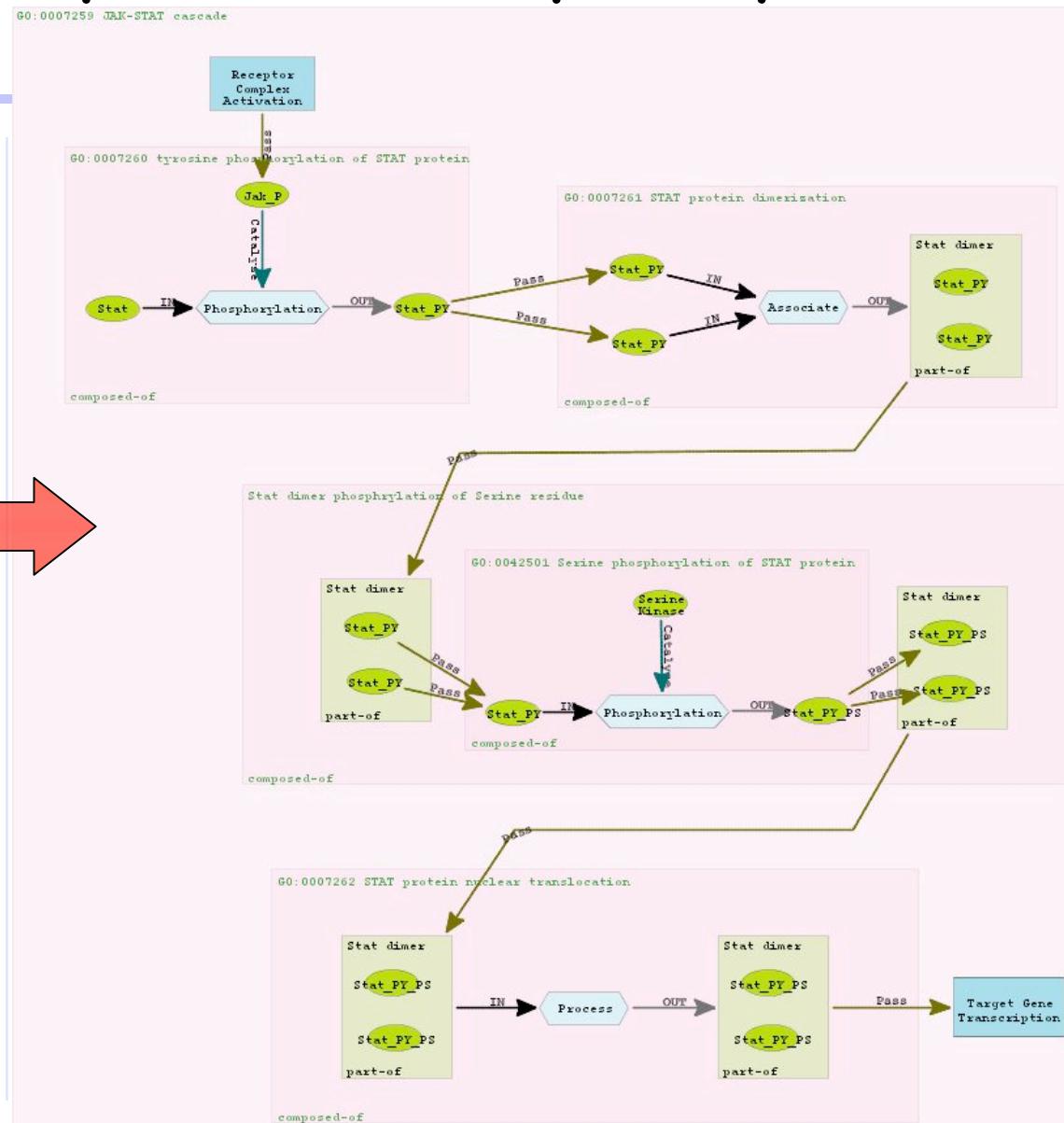
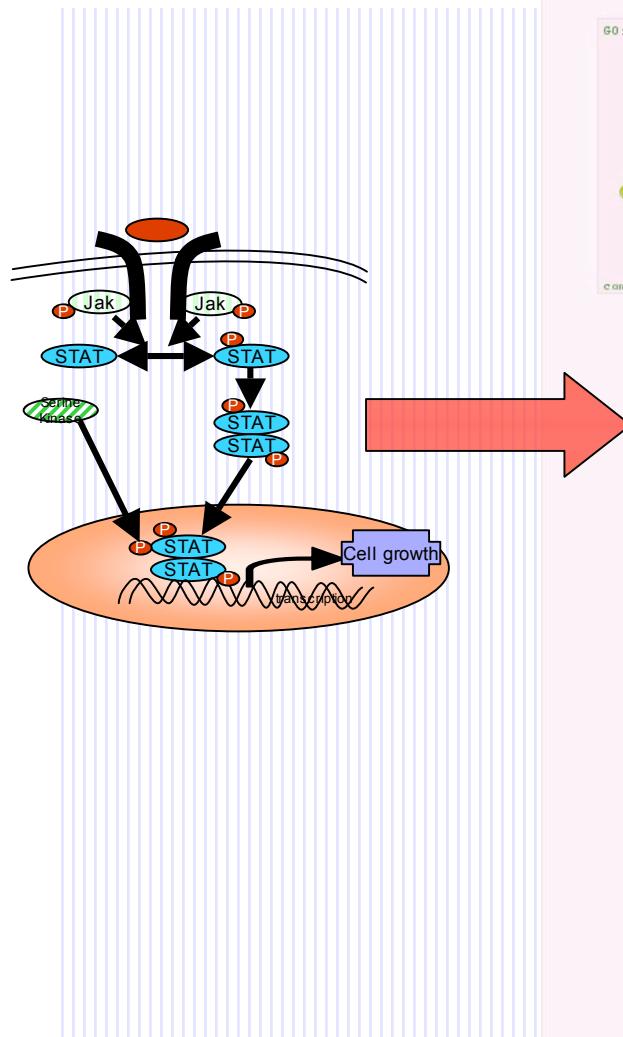




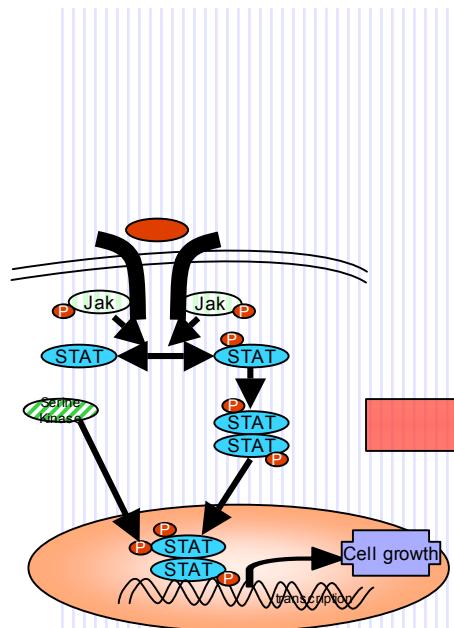
Compound Graph model

- Decomposable pathway -

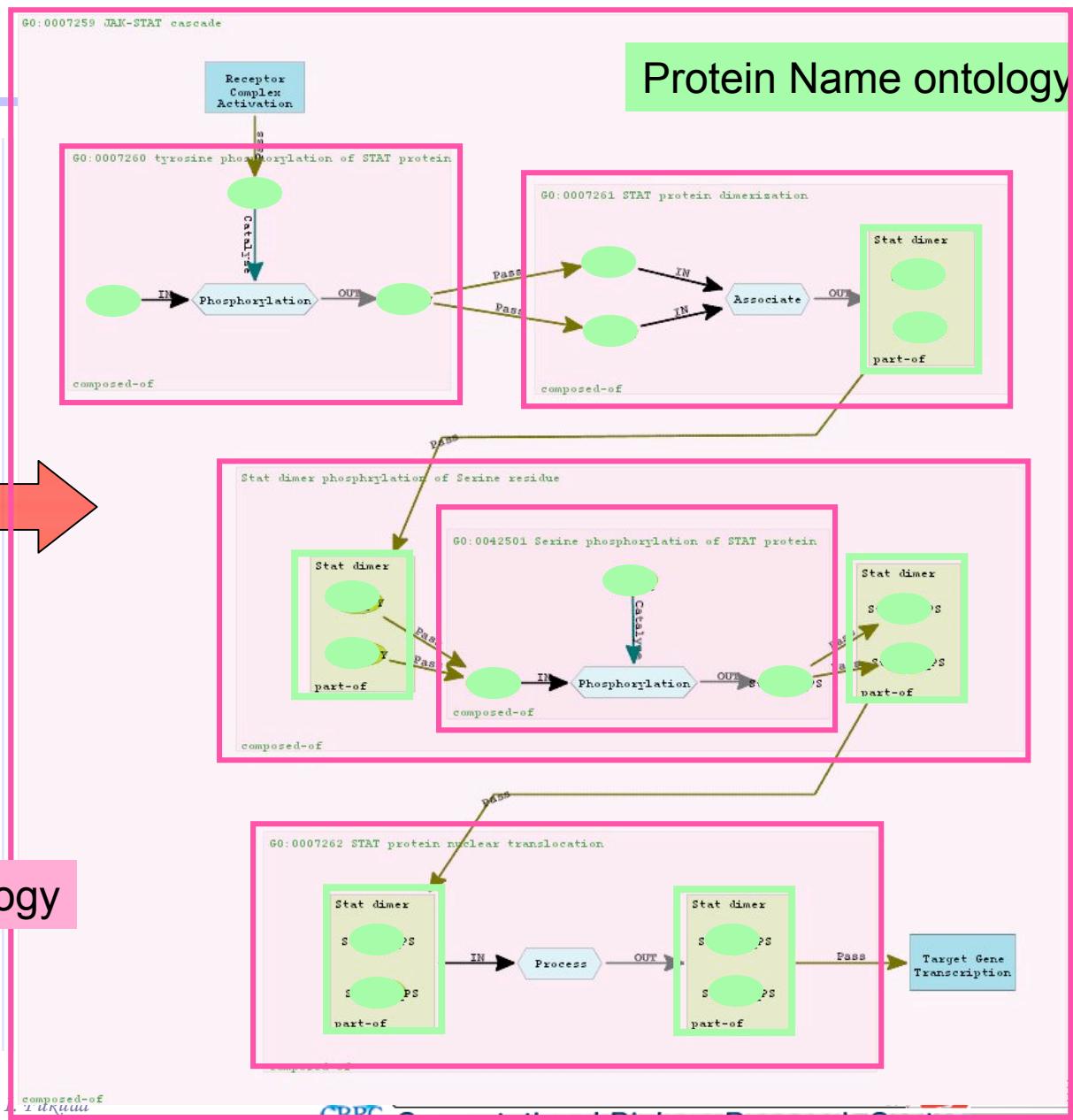
Compound graph representation of pathways



Pathway annotation



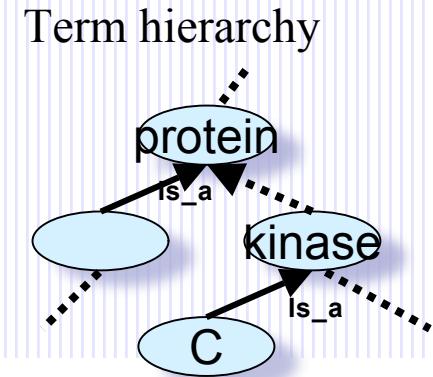
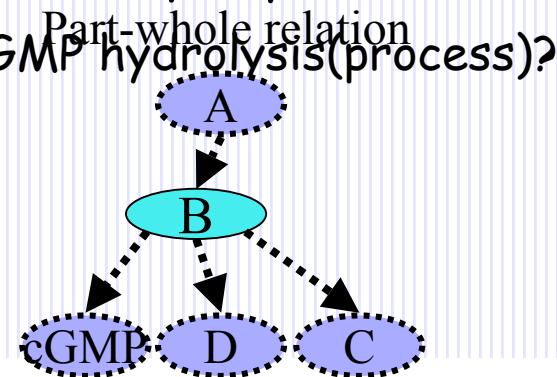
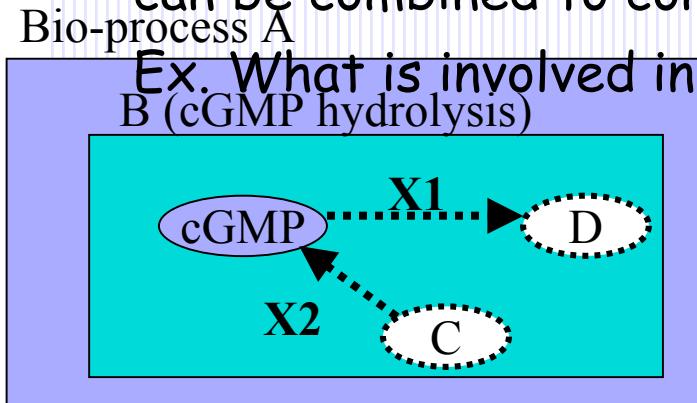
Bioprocess ontology

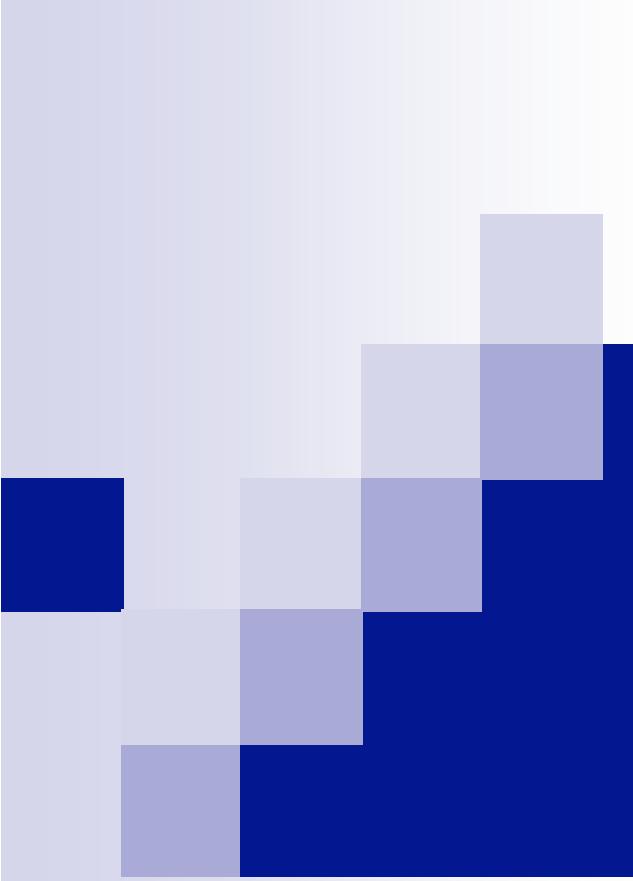


Compound Graph + Ontology

- With ontologies
 - Users can specify the meaning of the query string
 - The system can expand the query based on the ontologies
- With compound graph representation
 - Node attributes
 - Edge attributes
 - Part-whole relations of sub-pathways

can be combined to conduct a query



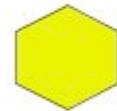


INOH pathway data - some examples -

INOH symbols (nodes)



Protein node



Chemical substance node



Molecular Complex node



DNA node



RNA node



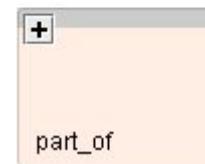
Terminal node



Protein Complex Compound node

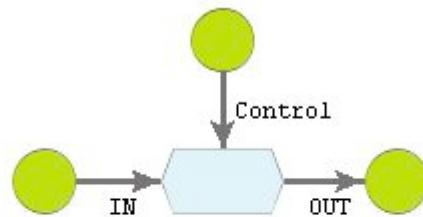


Event Compound node

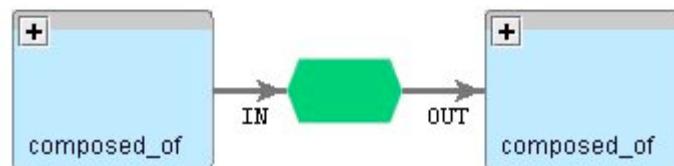


DNA Compound node

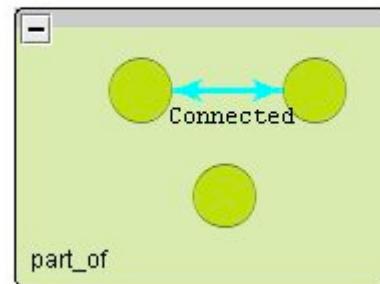
INOH symbols (edges)



IN/OUT/Control edge (for interactions)

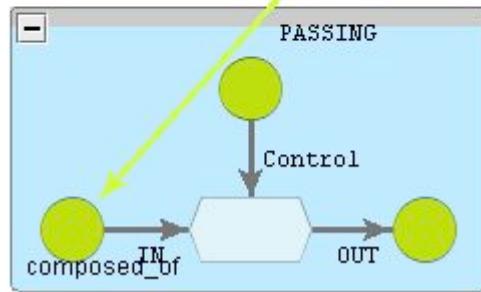
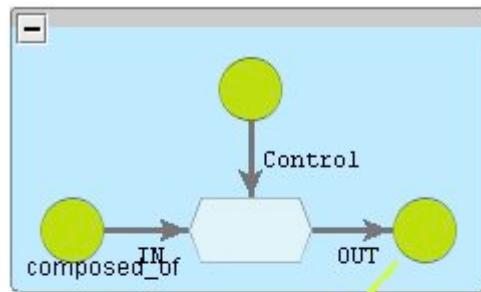


IN/OUT edge (for Event Relation)



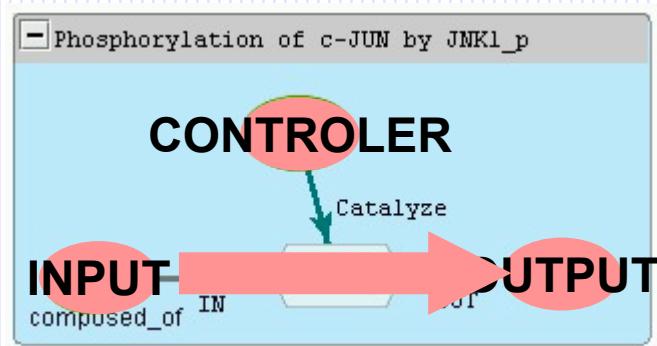
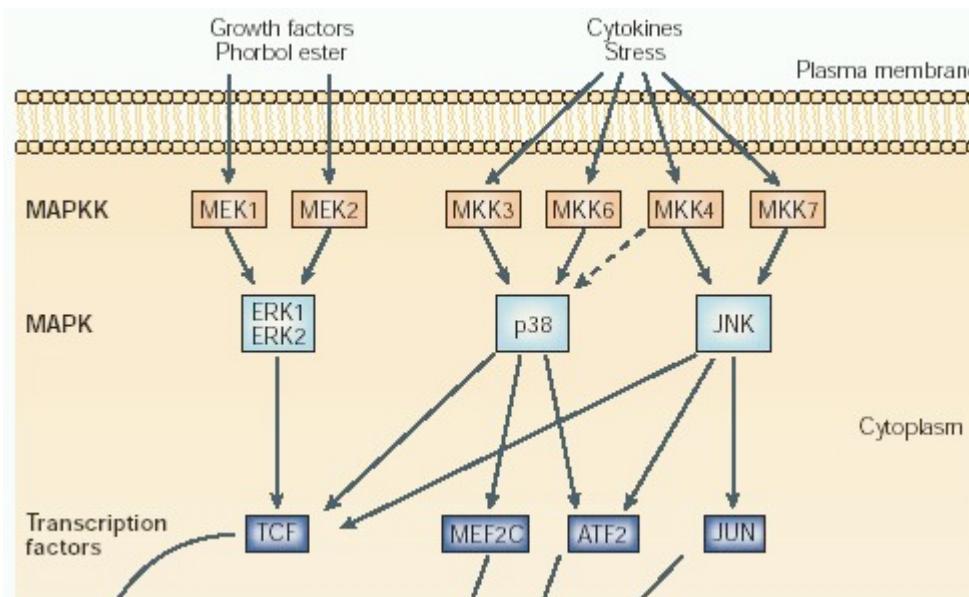
Connected edge (for additional annotation)

INOH symbols (edges)



PASSING edge (for Event flow)

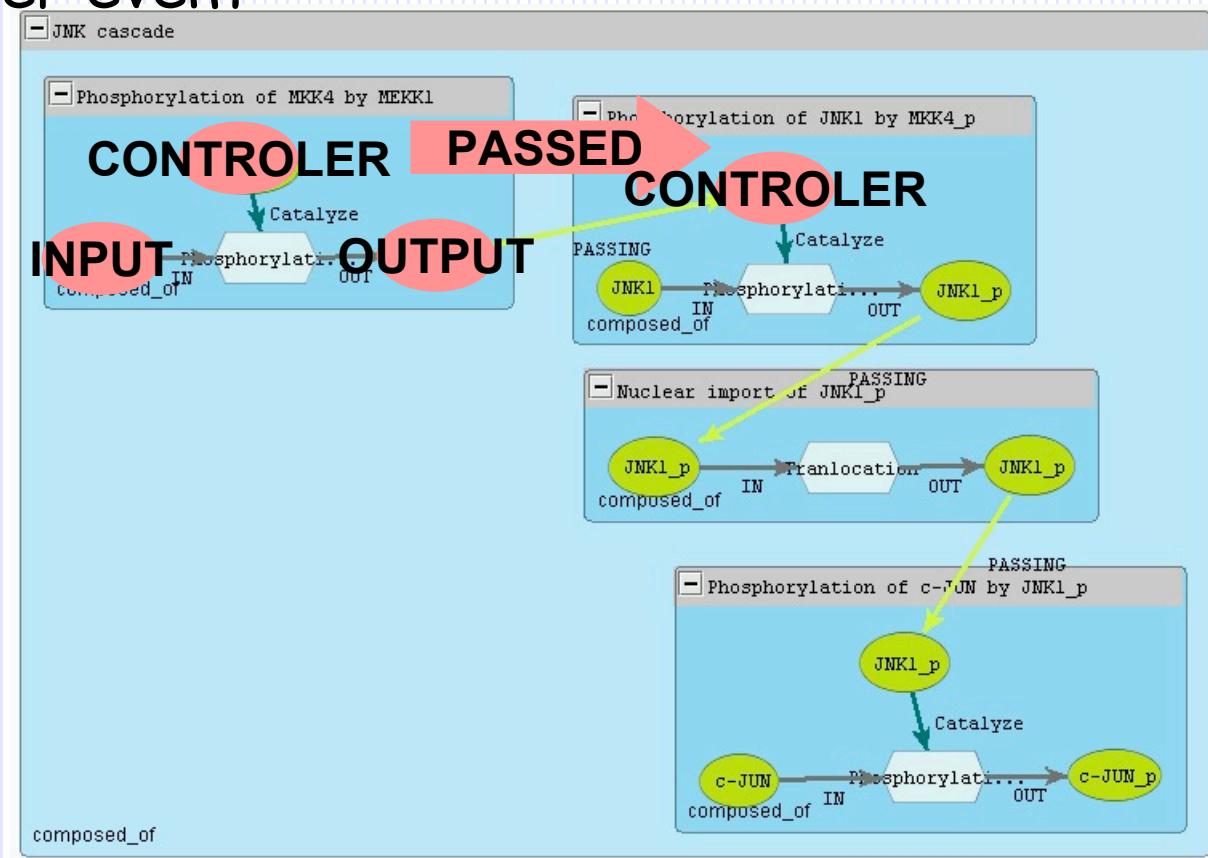
Pathway is a Biological process



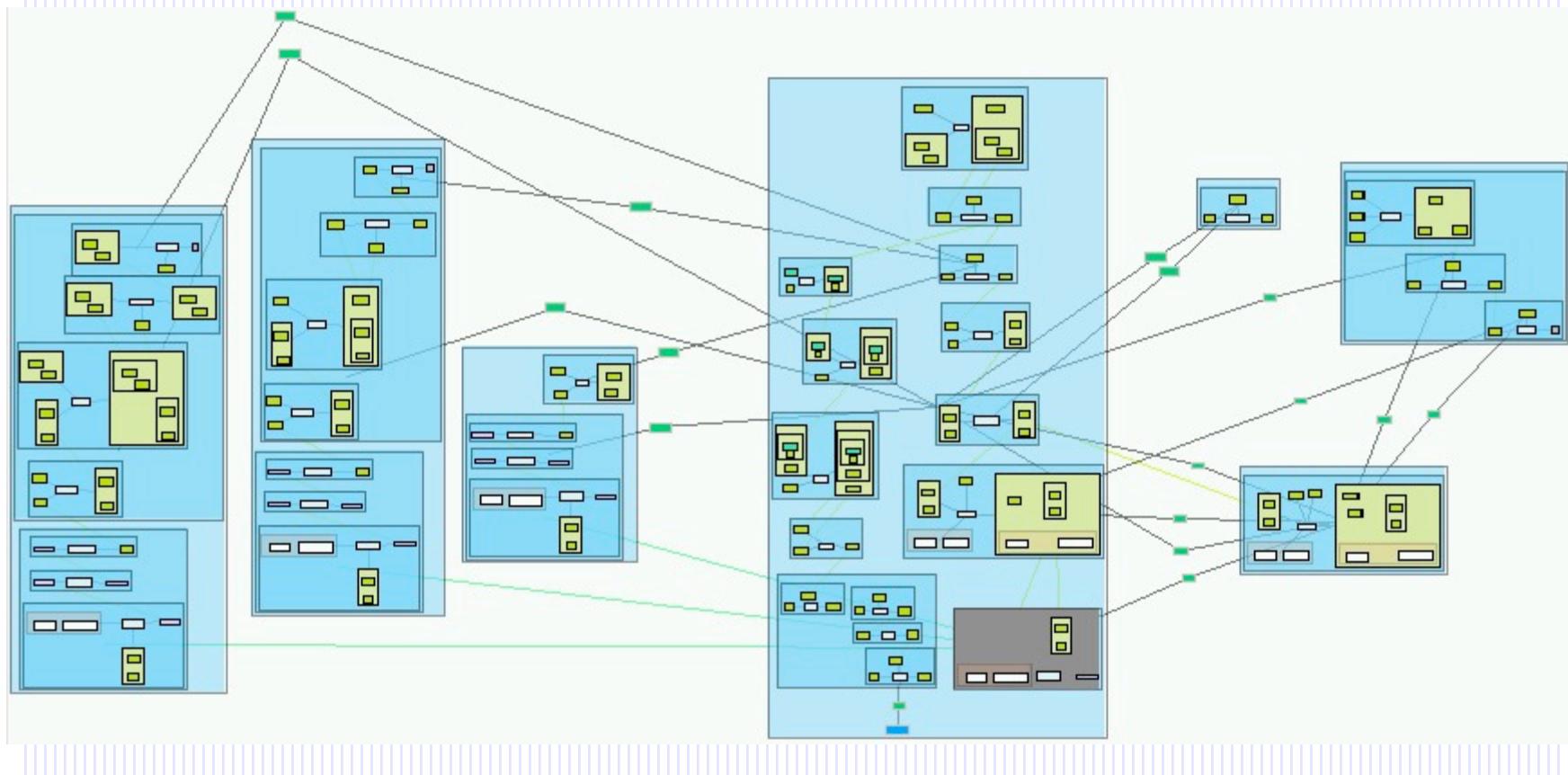
- A biological process is called an "Event"
- A pathway is an event.
- A simple event consists from
 - INPUT
 - OUTPUT
 - CONTROLLER
 - CONVERTER
- An event may consists from multiple events (superevent)

Events and Super Events

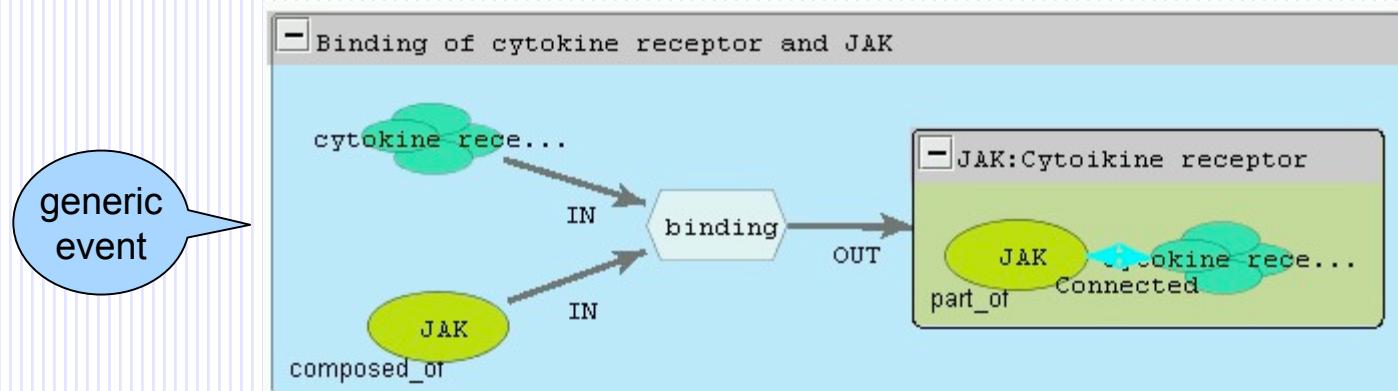
- A process can be constructed from multiple events to form a super event



The entire pathway of TGF- β _super_family_signaling_pathway

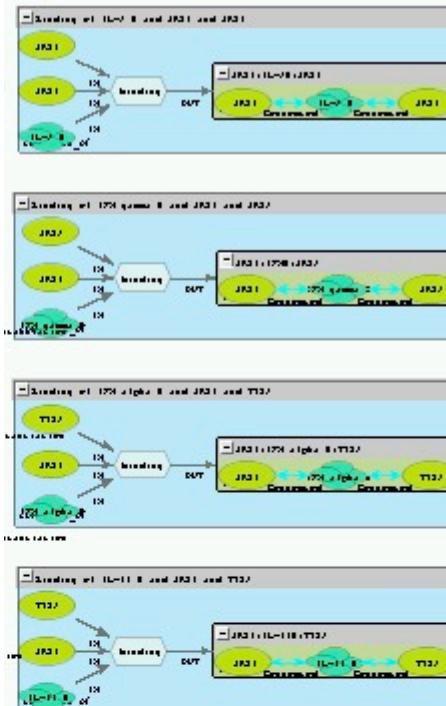
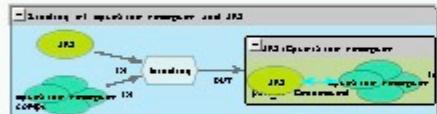


A “generic event” with “generic physical entities”

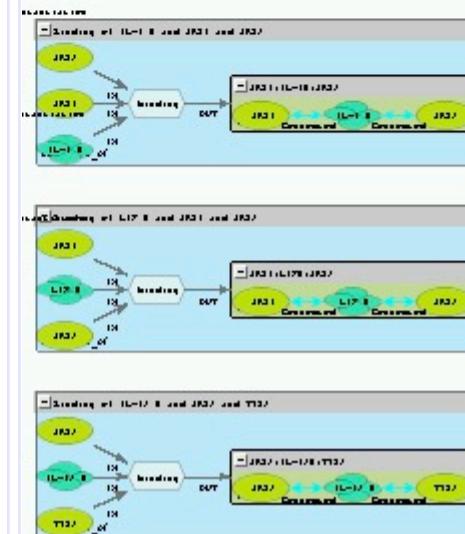


Generic event vs. concrete event molecular variations (MV)

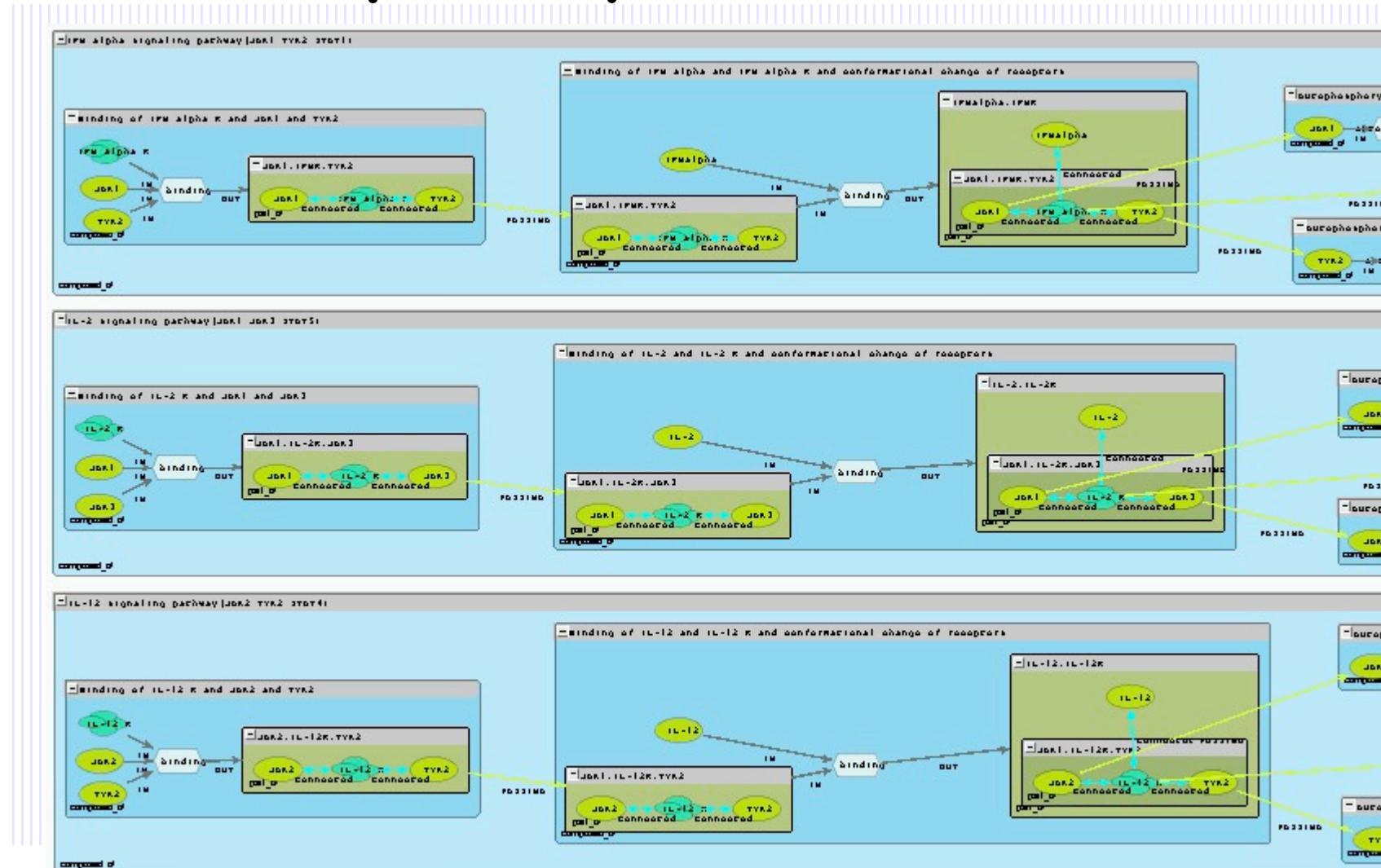
generic event



concrete event

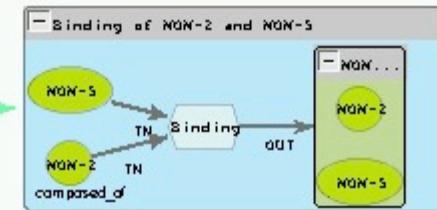
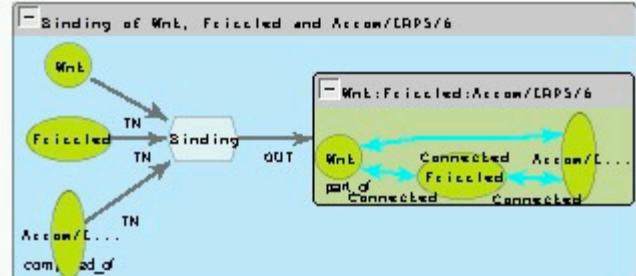


Different MV events may participate in different pathways

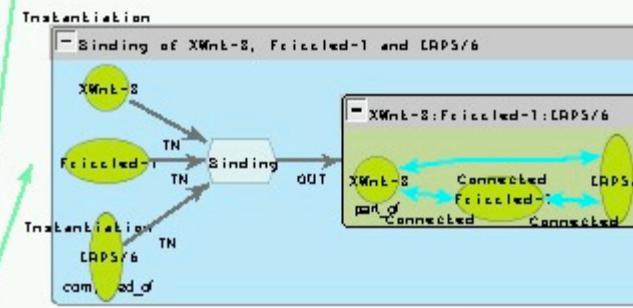


Orthologous events

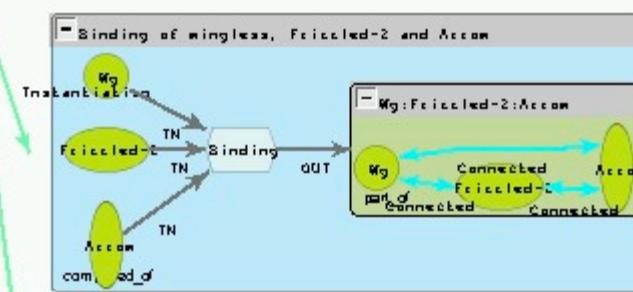
Canonical



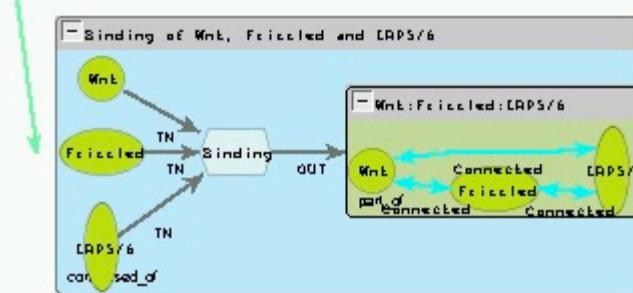
C.elegans



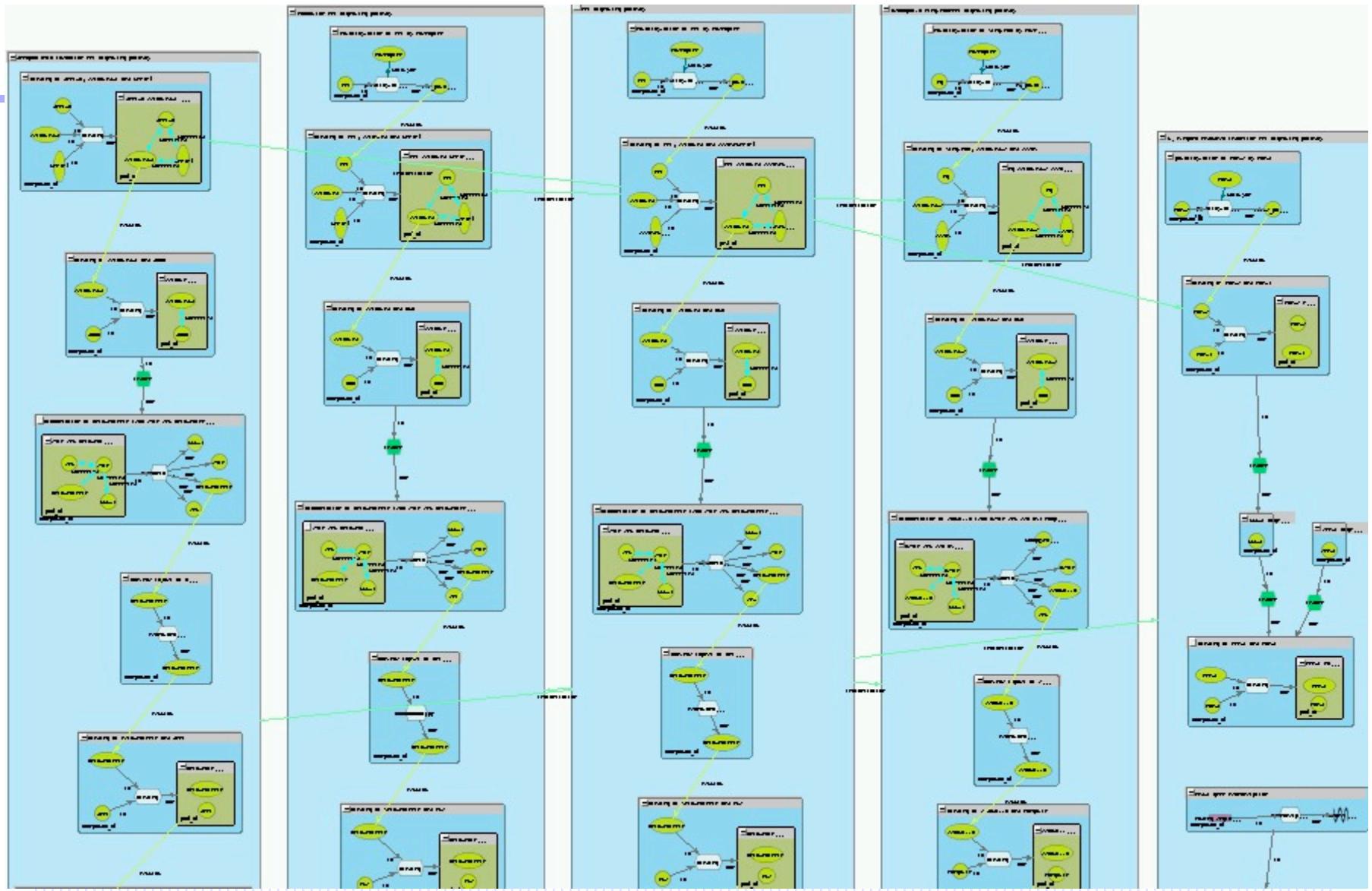
Xenopus



Drosophila

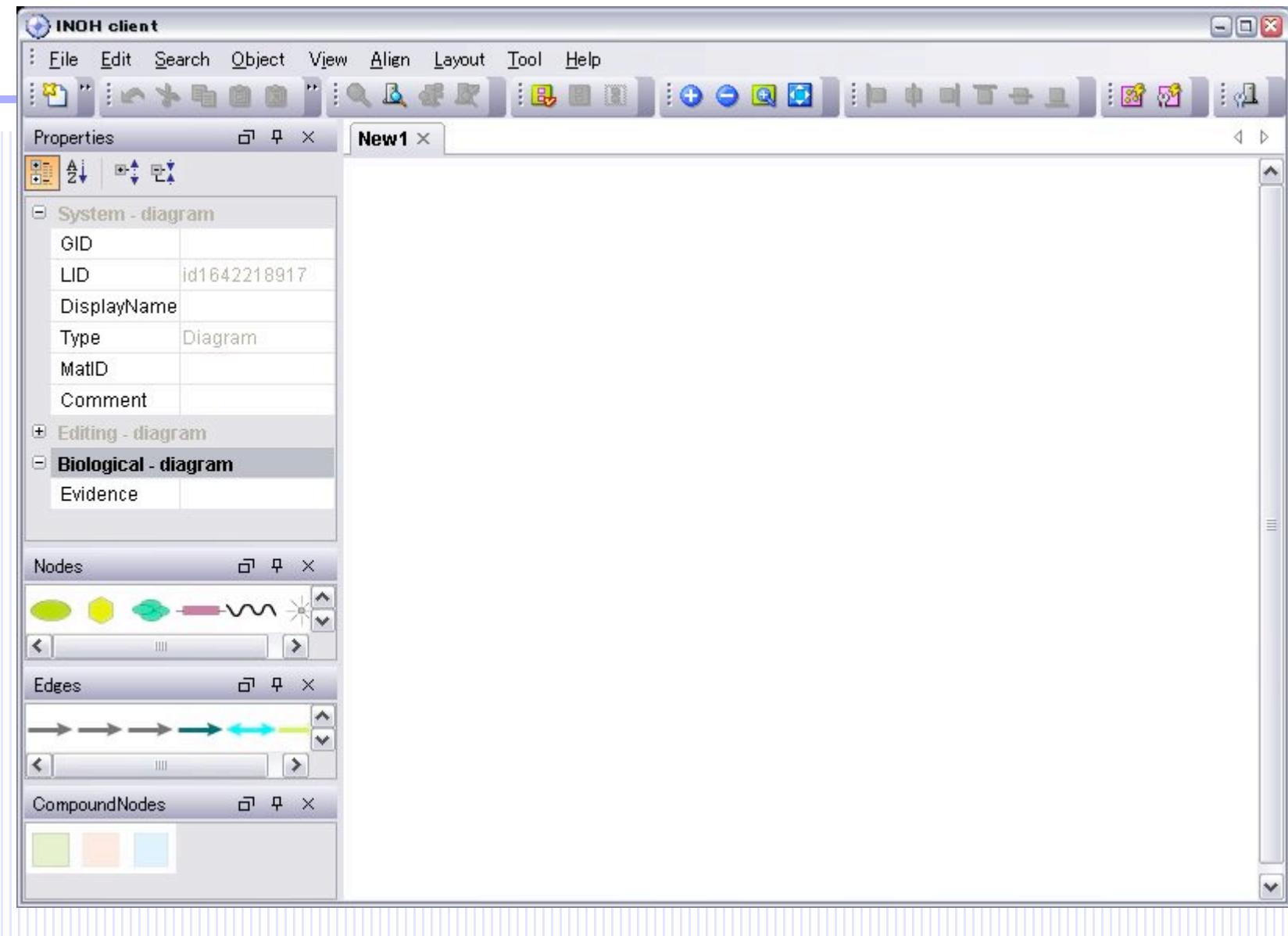


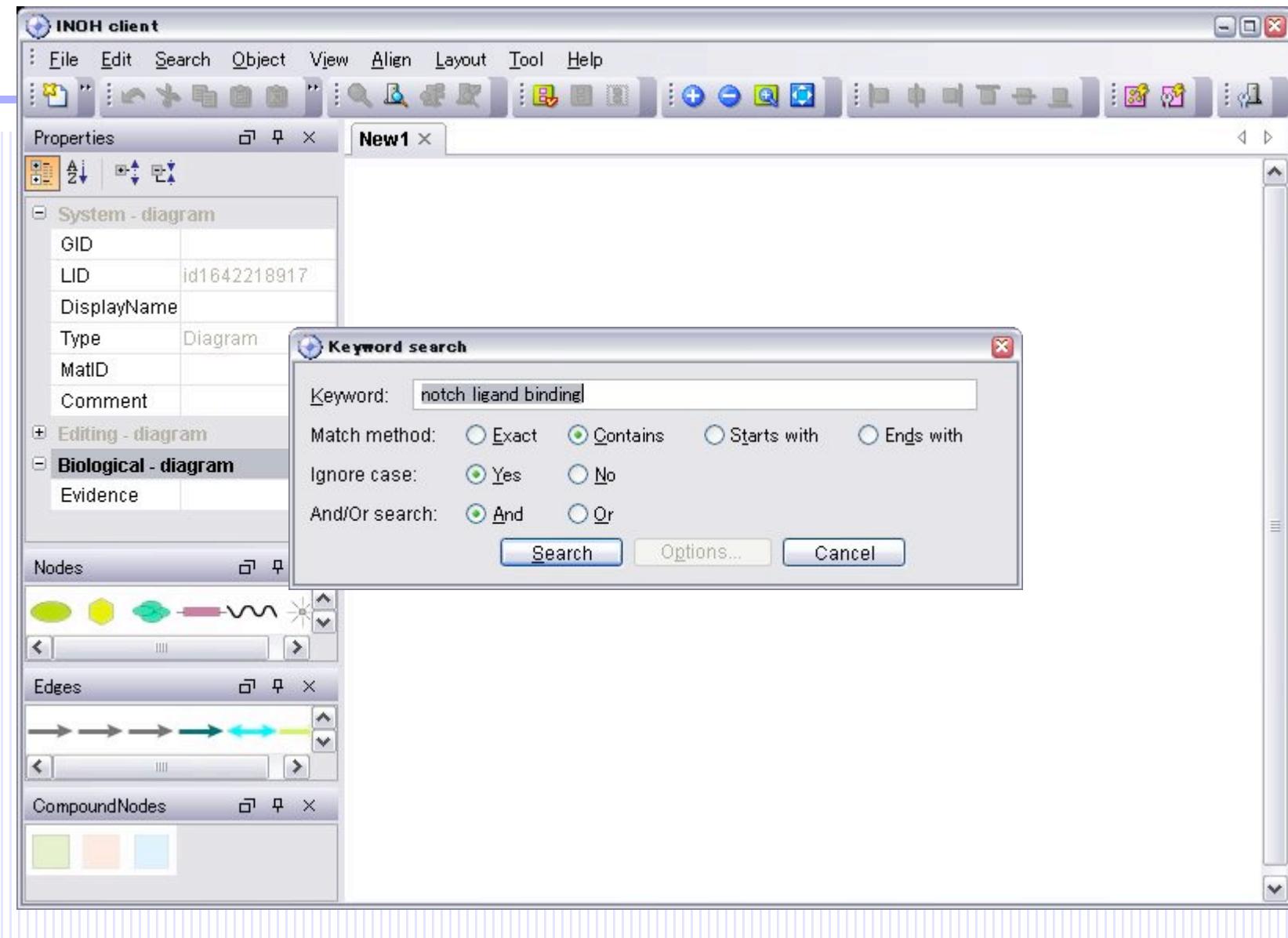
Mammal

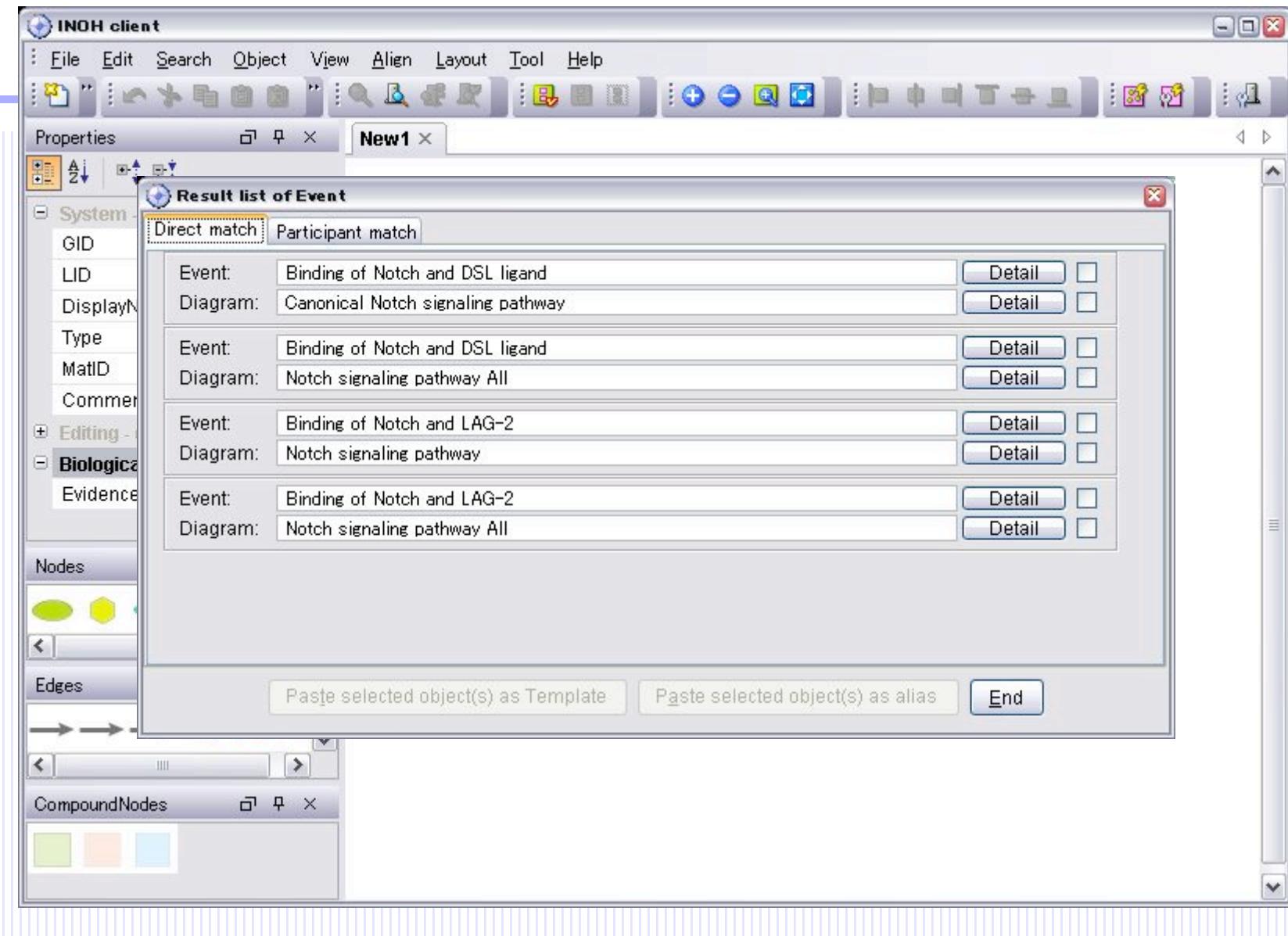


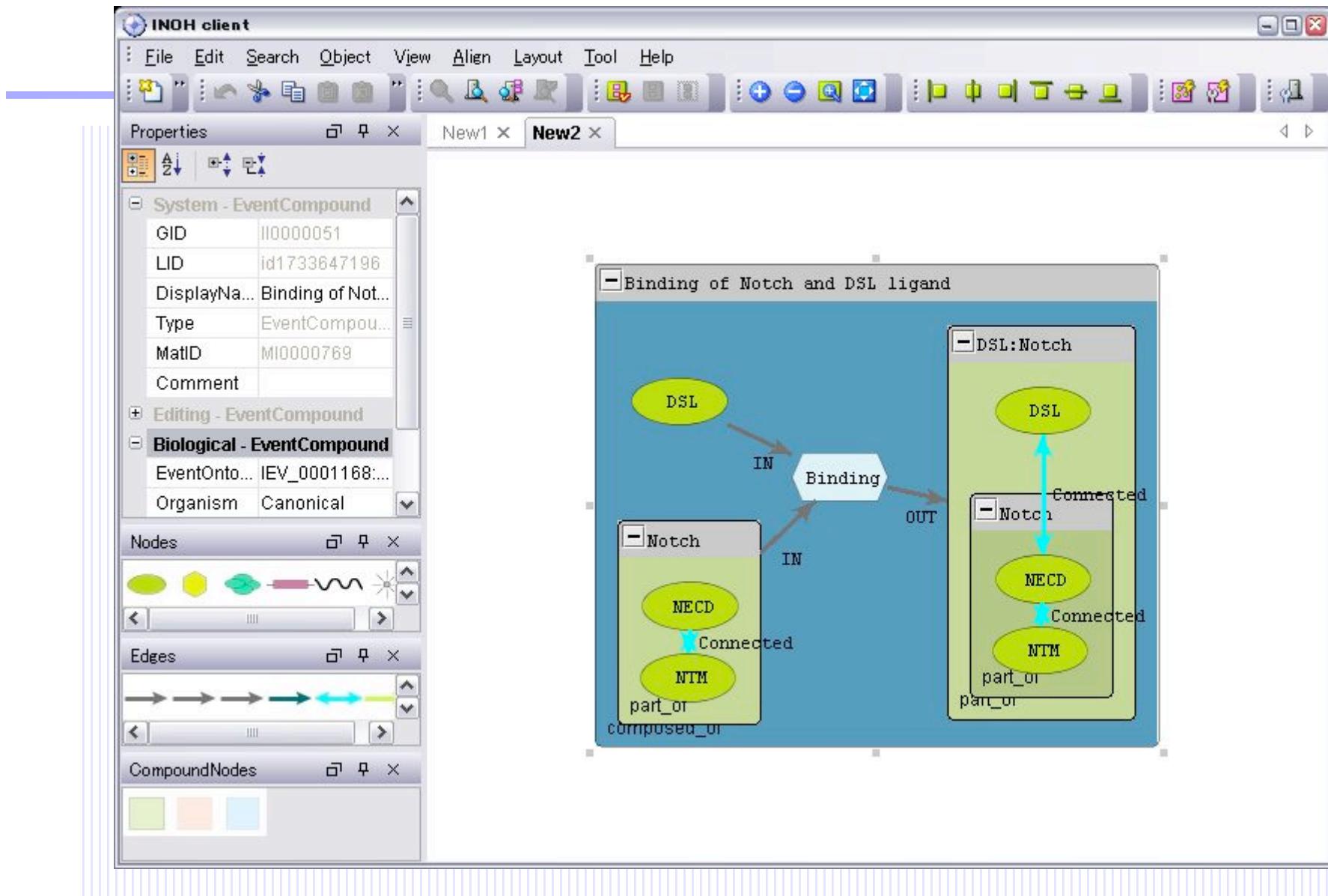


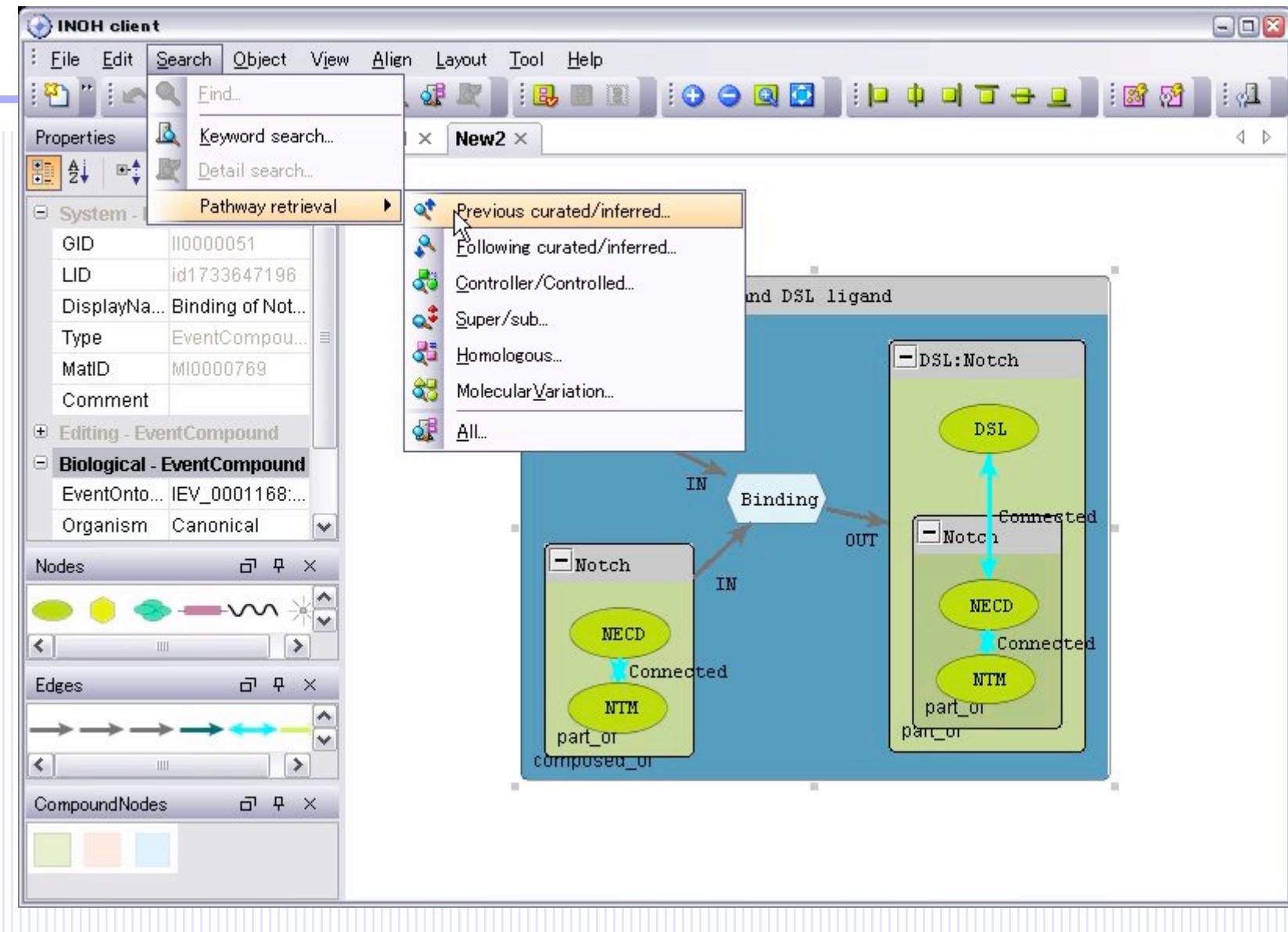
IONH Client











Retrieved objects (II0000051:id1733647196:MI0000769)

Previous events | Following events | Control events | Super/Sub events | Homologous events | Molecular variation

Previous events(Curated)

Event:	Translocation of Notch from the Golgi to the cell membrane	Detail	<input type="checkbox"/>
Diagram:	Canonical Notch signaling pathway	Detail	<input type="checkbox"/>

Event:	Translocation of Notch from the Golgi to the cell membrane	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway All	Detail	<input type="checkbox"/>

Previous events(Inferred)

Event:	Cleavage of precursor Notch by Furin and formation of heterodimer (S1 cleavage)	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway	Detail	<input type="checkbox"/>

Event:	Cleavage of precursor Notch by Furin and formation of heterodimer (S1 cleavage)	Detail	<input type="checkbox"/>
Diagram:	Canonical Notch signaling pathway	Detail	<input type="checkbox"/>

Event:	Cleavage of precursor Notch by Furin and formation of heterodimer (S1 cleavage)	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway All	Detail	<input type="checkbox"/>

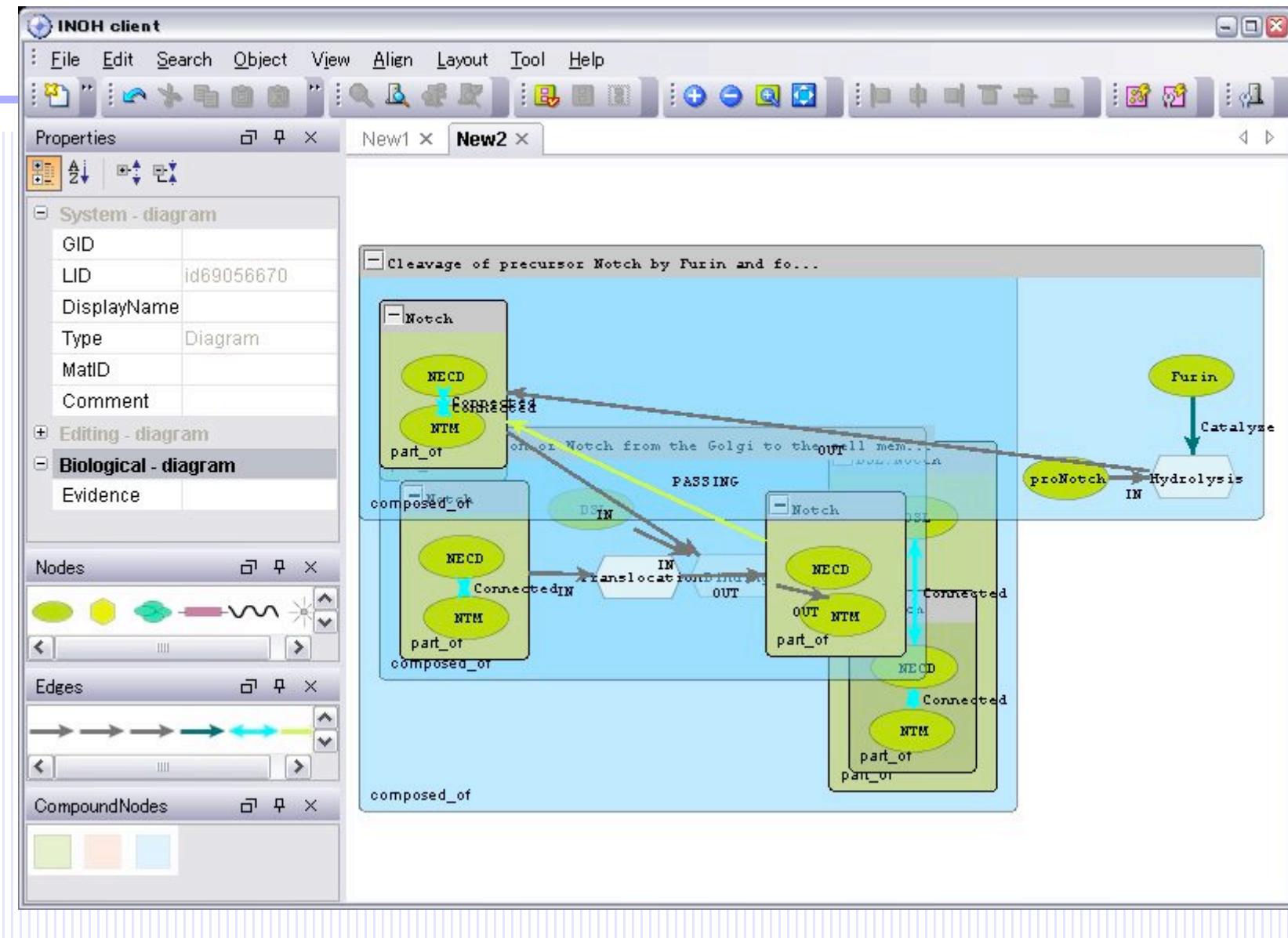
Event:	Cleavage of precursor Notch by Furin and formation of heterodimer (S1 cleavage)	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway All	Detail	<input type="checkbox"/>

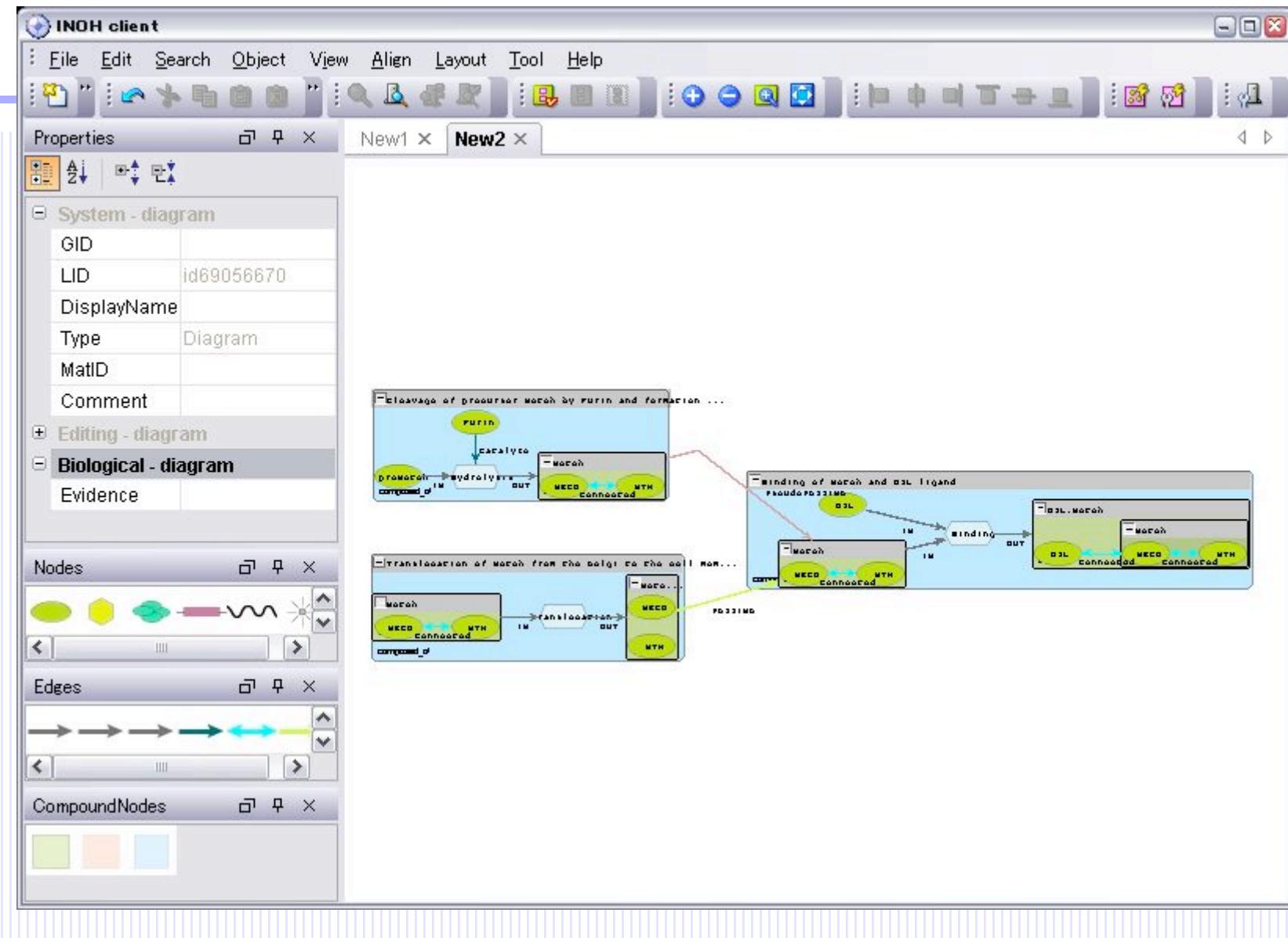
Event:	Translocation of Notch from the Golgi to the cell membrane	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway	Detail	<input type="checkbox"/>

Event:	Translocation of Notch from the Golgi to the cell membrane	Detail	<input type="checkbox"/>
Diagram:	Canonical Notch signaling pathway	Detail	<input type="checkbox"/>

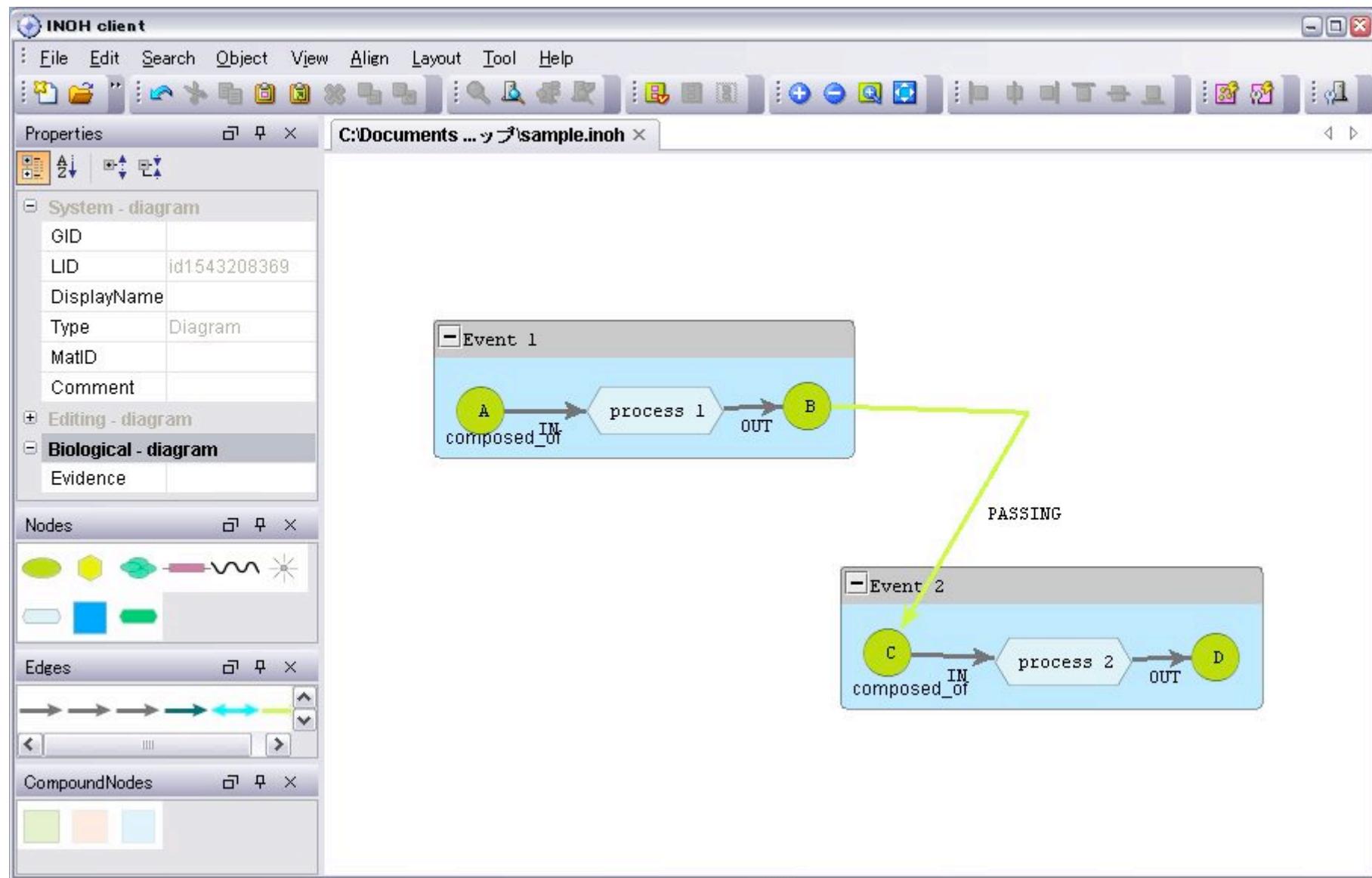
Event:	Translocation of Notch from the Golgi to the cell membrane	Detail	<input type="checkbox"/>
Diagram:	Notch signaling pathway All	Detail	<input type="checkbox"/>

Paste selected object(s) as Template | Paste selected object(s) as alias | **End**





Data format sample



Data format sample

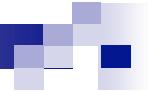
■ Graphics tag in a protein-node

```
<node GID="" LID="id1668303372" MatID="" PreMatID="" Type="Protein">
  <attributeGroup>
    <attributeList Name="System">...</attributeList>
    <attributeList Name="Biological">...</attributeList>
  </attributeGroup>
  <graphics Font="DialogInput" FontSize="12" Height="32.0" Width="32.0" XPoint="126.0" YPoint="242.0"/>
  <hierarchy>
    <parentNodePtr GID="" LID="id421434446"/>
  </hierarchy>
</node>
```

Data format sample

■ Graphics, layout tag in an Event-node

```
<node GID="" LID="id421434446" MatID="" PreMatID="" Type="EventCompound">
  <attributeGroup>
    <attributeList Name="System">...</attributeList>
    <attributeList Name="Editing">...</attributeList>
    <attributeList Name="Biological">...</attributeList>
  </attributeGroup>
  <graphics Font="DialogInput" FontSize="12" Height="91.0" Width="278.0" XPoint="234.0"
  YPoint="227.5"/>
  <layout>
    <attribute Name="TYPE" Value="NODE"/>
    <attribute Name="AUTO_LAYOUT" Value="GLOBAL"/>
    <attribute Name="LAYOUTER" Value="INHERIT"/>
    <attribute Name="ORIENTATION" Value="INHERIT"/>
    <attribute Name="EDGE_ROUTING" Value="SIMPLE"/>
  </layout>
  <hierarchy>
    <childNodePtr GID="" LID="id1668303372"/>
    ...
    <childEdgePtr GID="" LID="id1918267299"/>
    ...
    <parentNodePtr GID="" LID="id1543208369"/>
  </hierarchy>
</node>
```



Data format sample

■ Graphics, layout tag in an edge

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<edge GID="" LID="id1918267299" MatID="" PreMatID="" Type="PASSING">
  <attributeGroup>
    <attributeList Name="System">...</attributeList>
    <attributeList Name="Editing">...</attributeList>
    <attributeList Name="Biological">...</attributeList>
  </attributeGroup>
  <graphics Font="DialogInput" FontSize="12">
    <bend>
      <point XPoint="488.0" YPoint="243.0"/>
    </bend>
  </graphics>
  <layout>
    <attribute Name="TYPE" Value="EDGE"/>
    <attribute Name="AUTO_LAYOUT" Value="ON"/>
    <attribute Name="DIRECTION" Value="USE_DIRECTION"/>
    <attribute Name="ROUTING" Value="INHERIT"/>
    <attribute Name="TYPE_OF_EDGE" Value="USE_DEFAULT"/>
  </layout>
  <source GID="" LID="id319499152"/>
  <target GID="" LID="id314490499"/>
</edge>
```

INOH database team

Toshihisa Takagi, Univ. of Tokyo (PI)

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Satoko Yamamoto, JST (MolRol Ontology Editor, curator)

Yuki Yamagata, JST (curator)

Noriko Sakai, JST (curator)

Yuki Nakanishi, Intec W&G (curator)

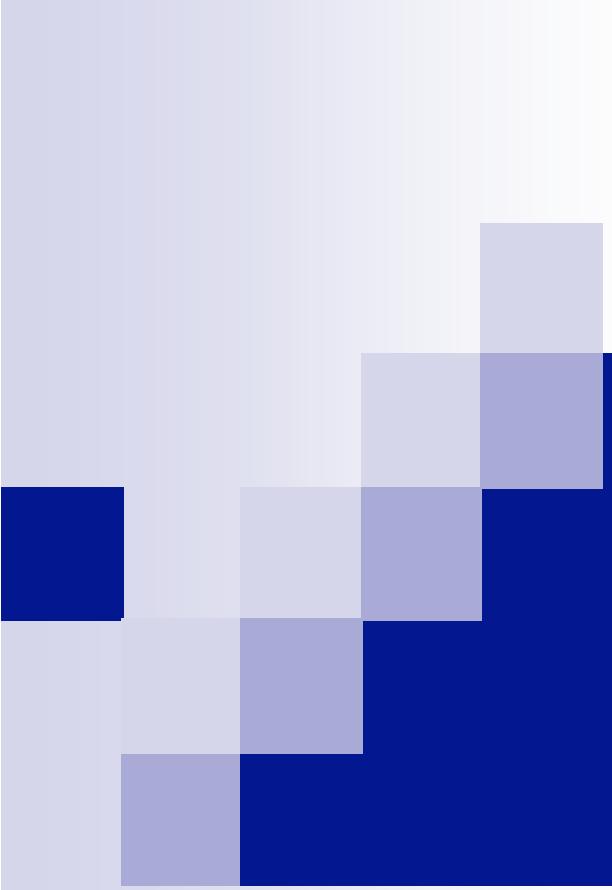
Funding

BIRD, JST

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National Institute of Advanced Industrial Science and Technology
Computational Biology Research Center



Thanks!!!

<http://www.inoh.org>