

Ontology Visualization

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What is the graph widget?

- Allows visual editing of instances and relationships between instances
- Alternative to Protege's "Forms" for entering instance data



When is the graph widget appropriate?

- When instances are connected through slot values (e.g., a linked list).
- When instances connected by instances of the “:*DIRECTED-BINARY-RELATION*” system class.



When is the graph widget appropriate?

- Speeds knowledge acquisition in ontologies with heavily interconnected concepts.
- Helps convey meaning and organization of acquired knowledge.
- Data that resembles process diagrams, flow charts, organizational charts.

Open the "GraphWidgetExample" project

The screenshot shows the Protégé 3.3 interface with the 'GraphWidgetExample' project open. The 'CLASS BROWSER' on the left displays a class hierarchy starting from ':THING'. The 'Organization' class is selected and highlighted. The 'CLASS EDITOR' on the right shows the details for the 'Organization' class, including its name, role, and template slots.

CLASS BROWSER

For Project: GraphWidgetExample

Class Hierarchy

- :THING
 - :SYSTEM-CLASS
 - Author
 - Content
 - Layout_info
 - Library
 - Newspaper
 - Organization**
 - Person

CLASS EDITOR

For Class: Organization (instance of :STANDARD-CLASS)

Name: Organization

Role: Concrete

Documentation:

Constraints:

Template Slots

Name	Cardinality	Type	Other Facets
employee_relationships	multiple	Instance of Manager Supervision Relation	
name	single	String	
organization_chart	multiple	Instance of Employee	

Superclasses

- :THING

Select the
"Organization" class



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: ● GraphWidgetExample

Class Hierarchy

- :THING
- ▶ ● :SYSTEM-CLASS
- ▶ ● Author
- ▶ ● Content
- ▶ ● Layout_info
- Library
- Newspaper
- Organization
- ▶ ● Person

Superclasses

● :THING

CLASS EDITOR

For Class: ● Organization (instance of :STANDARD-CLASS)

Name

Organization

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Constraints

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Concrete ●

Template Slots

Name	Cardinality	Type	Other Facets
employee_relationships	multiple	Instance of Manager Supervision Relation	
name	single	String	
organization_chart	multiple	Instance of Employee	

Notice the
"organization_chart" slot,
which is the slot that we will
configure to use the graph
widget



FORM BROWSER

For Project: ● GraphWidgetExample

Forms

- :THING
- ▶ ■ :SYSTEM-CLASS
- ▶ ■ Author
- ▶ ■ Content
- ▶ ■ Layout_info
- ▶ ■ Library
- ▶ ■ Newspaper
- ▶ ■ Organization
- ▶ ■ Person

FORM EDITOR

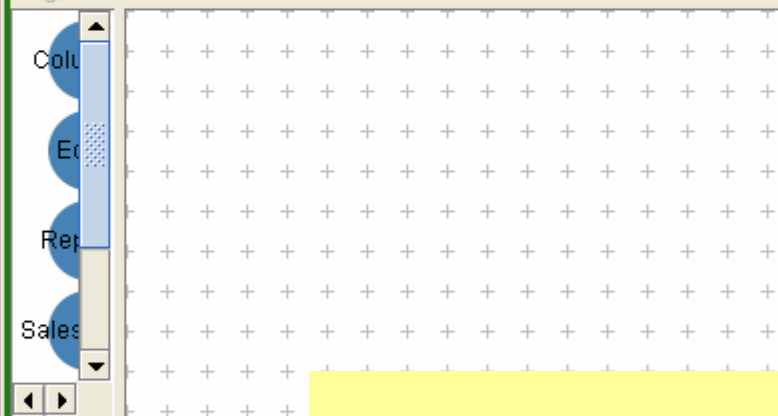
For Class: ● Organization

Display Slot: ■ name

ed Widget Type: GraphWidget

Name

Organization Chart



Configure the
"organization_chart" slot
to use the graph widget

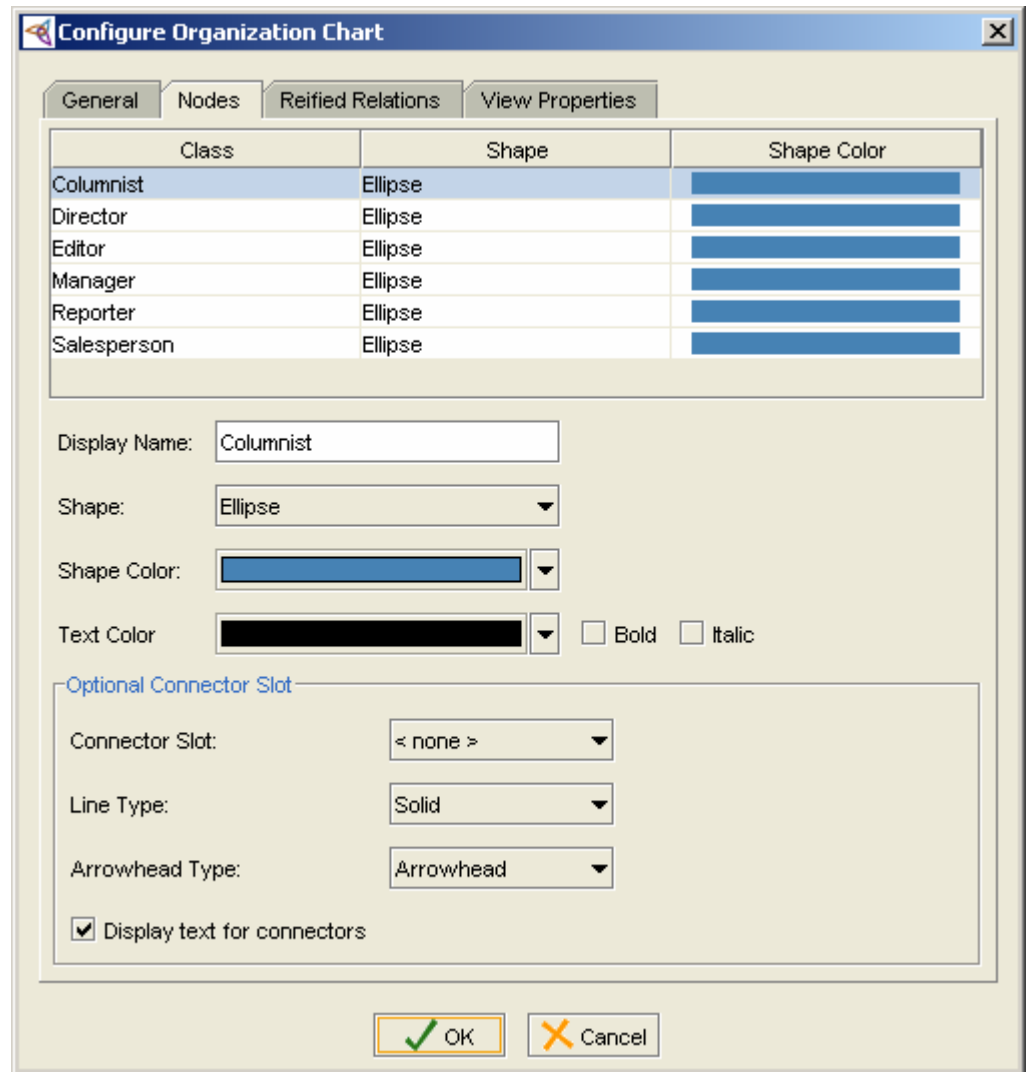


How do I optimize size for the graph widget?

- Double-click on the Form background (anywhere without a widget)
- Use the Layout tab to fill horizontal and vertical space

How do I configure node appearance?

- Double-click on the organization_chart slot to bring up the widget configuration dialog.



The image shows a 'Configure Organization Chart' dialog box with four tabs: General, Nodes, Reified Relations, and View Properties. The 'Nodes' tab is active, displaying a table of node configurations. Below the table are fields for 'Display Name', 'Shape', 'Shape Color', and 'Text Color', along with checkboxes for 'Bold' and 'Italic'. An 'Optional Connector Slot' section contains dropdowns for 'Connector Slot', 'Line Type', and 'Arrowhead Type', and a checked checkbox for 'Display text for connectors'. At the bottom are 'OK' and 'Cancel' buttons.

Class	Shape	Shape Color
Columnist	Ellipse	Blue
Director	Ellipse	Blue
Editor	Ellipse	Blue
Manager	Ellipse	Blue
Reporter	Ellipse	Blue
Salesperson	Ellipse	Blue

Display Name:

Shape:

Shape Color:

Text Color: ☐ Bold ☐ Italic

Optional Connector Slot

Connector Slot:

Line Type:

Arrowhead Type:

☒ Display text for connectors



How do I configure node appearance?

- Use the “General” tab to change the label or tooltip for the “organization_chart” slot.
- Use the “Nodes” tab to assign shapes, colors, and text properties to nodes.



Configure simple connectors

- Graph widget has two connector types, one of which is a “simple connector”
- Simple connectors have no underlying instances



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: ● GraphWidgetExample

Class Hierarchy

- :THING
- ▶ ● :SYSTEM-CLASS
- ▶ ● Author
- ▶ ● Content
- ▶ ● Layout_info
- ▶ ● Library
- ▶ ● Newspaper
- ▶ ● Organization
- ▼ ● Person
 - ▼ ● Employee
 - Columnist
 - Editor
 - Reporter
 - Salesperson
 - ▶ ● Manager

Superclasses

- Author
- Employee

CLASS EDITOR

For Class: ● Editor (instance of :STANDARD-CLASS)

Name

Editor

Documentation

Constraints

◆ editor-employees-salary-constraint

Template Slots

Name	Cardinality	Type	Other Facets
byname	single	String	
current_job_title	single	String	
date_hired	single	String	
name	single	String	
other_information	single	String	
phone_number	single	String	
responsible_for	multiple	Instance of Employee	
salary	single	Float	

Select the Editor class

Notice the "responsible_for" slot, which will be the simple connector

Configure simple connectors

- Choose connector slot for Editor class in widget configuration dialog

Configure Organization Chart

General Nodes Reified Relations View Properties

Class	Shape	Shape Color
Columnist	Ellipse	Blue
Director	Hexagon	Red
Editor	Inverted Triangle	Green
Manager	Pentagon	Yellow
Reporter	Rounded Rectangle	Pink
Salesperson	Rectangle	Grey

Display Name:

Shape:

Shape Color:

Text Color: ☐ Bold ☐ Italic

Optional Connector Slot

Connector Slot:

Line Type:

Arrowhead Type:

☒ Display text for connectors



CLASS BROWSER

For Project: ● GraphWi...

Class Hierarchy

- :THING
- ▶ ● :SYSTEM-CLASS
- ▶ ● Author
- ▶ ● Content
- ▶ ● Layout_info
- ▶ ● Library (1)
- ▶ ● Newspaper (6)
- ▶ ● Organization (2)
- ▶ ● Person

INSTANCE BROWSER

For Class: ● Organization

name

- ◆ Hungarian Quarterly
- ◆ San Jose Mercury News

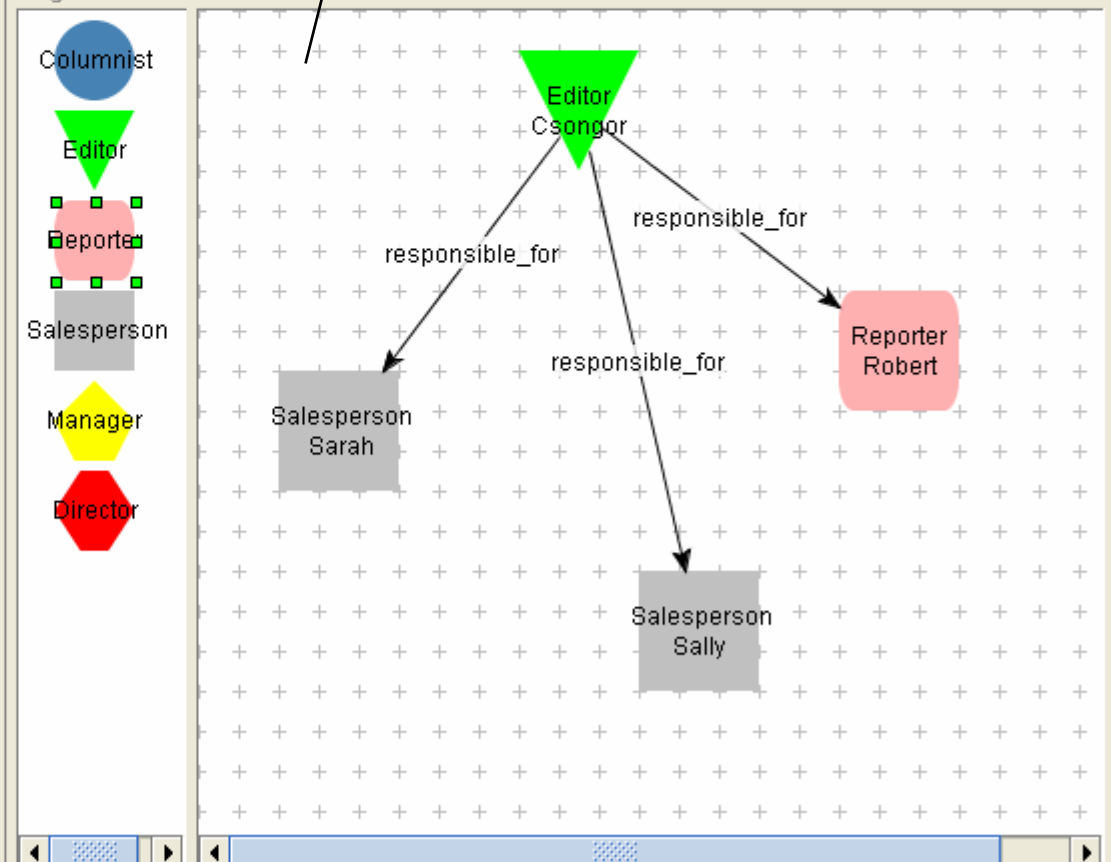
INSTANCE EDITOR

For Instance: ◆ Hungarian Quarterly (instance o

Name

Hungarian Quarterly

Organization Chart



Drag and drop nodes to create instances of employees – draw connectors to fill in slot values



Graph widget UI tips

- Click on node labels to drag nodes
- Nodes are resizable
- Double-click node labels to rename
- Right-click connectors to insert points
- Automatic layout provided
- Save graph as image



Graph widget UI tips

- The graph widget only allows you to draw *valid* connectors between nodes
- You *can* add pre-existing instances to the graph widget



Configure reified relations

- Reified relations are the second connector type offered by the graph widget
- Allows storage of additional information about a relationship between two nodes



CLASS BROWSER

For Project: ● GraphWidgetExample

Class Hierarchy

- :THING
 - ▼ ● :SYSTEM-CLASS
 - ▶ ● :META-CLASS
 - ▶ ● :CONSTRAINT
 - ▶ ● :ANNOTATION
 - ▼ ● :RELATION
 - ▼ ● :DIRECTED-BINARY-RELATION
 - Manager Supervision Relation
 - Director Supervision Relation
 - ▶ ● Author
 - ▶ ● Content
 - ▶ ● Layout_info
 - Library
 - Newspaper
 - Organization
 - ▶ ● Person

Superclasses

- :DIRECTED-BINARY-RELATION

CLASS EDITOR

For Class: ● Manager S

Name

Manager Supervision Rel

Role

Concrete ●

Template Slots

Name	Cardinality	Type	Other Facets
name	single	String	
quality	single	Symbol	allowed-values={good,ok,poor}
supervision type	single	Symbol	allowed-values={administrative,editorial}
(c) :FROM	required single	Instance of Manager	
(c) :TO	required single	Instance of Employee	

Notice subclasses of the :DIRECTED-BINARY-RELATION class, which will be our reified relations in the graph widget



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: ● GraphWidgetExample

Class Hierarchy

- :THING
- ▶ ● :SYSTEM-CLASS
- ▶ ● Author
- ▶ ● Content
- ▶ ● Layout_info
- Library
- Newspaper
- Organization
- ▶ ● Person

Search:

Superclasses

- :THING

CLASS EDITOR

For Class: ● Organization (instance of :STANDARD-CLASS)

Name

Organization

Documentation

Constraints

Role

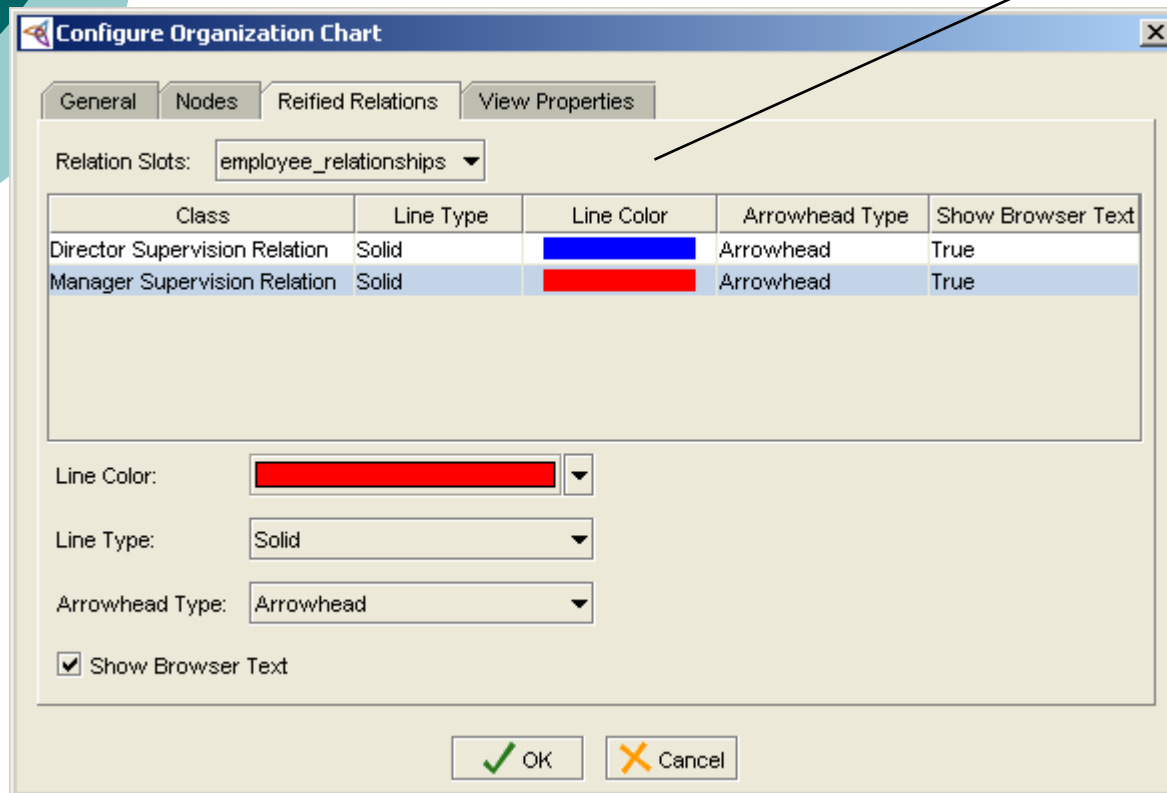
Concrete ●

Template Slots

Name	Cardinality	Type	Other Facets
employee_relationships	multiple	Instance of Manager Supervision Relation	
name	single	String	
organization_chart	multiple	Instance of Employee	

Notice the slot that has been designated to hold instances of reified relations

Configure reified relations



Configure Organization Chart

General Nodes Reified Relations View Properties

Relation Slots: employee_relationships

Class	Line Type	Line Color	Arrowhead Type	Show Browser Text
Director Supervision Relation	Solid	Blue	Arrowhead	True
Manager Supervision Relation	Solid	Red	Arrowhead	True

Line Color:

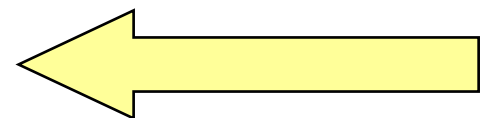
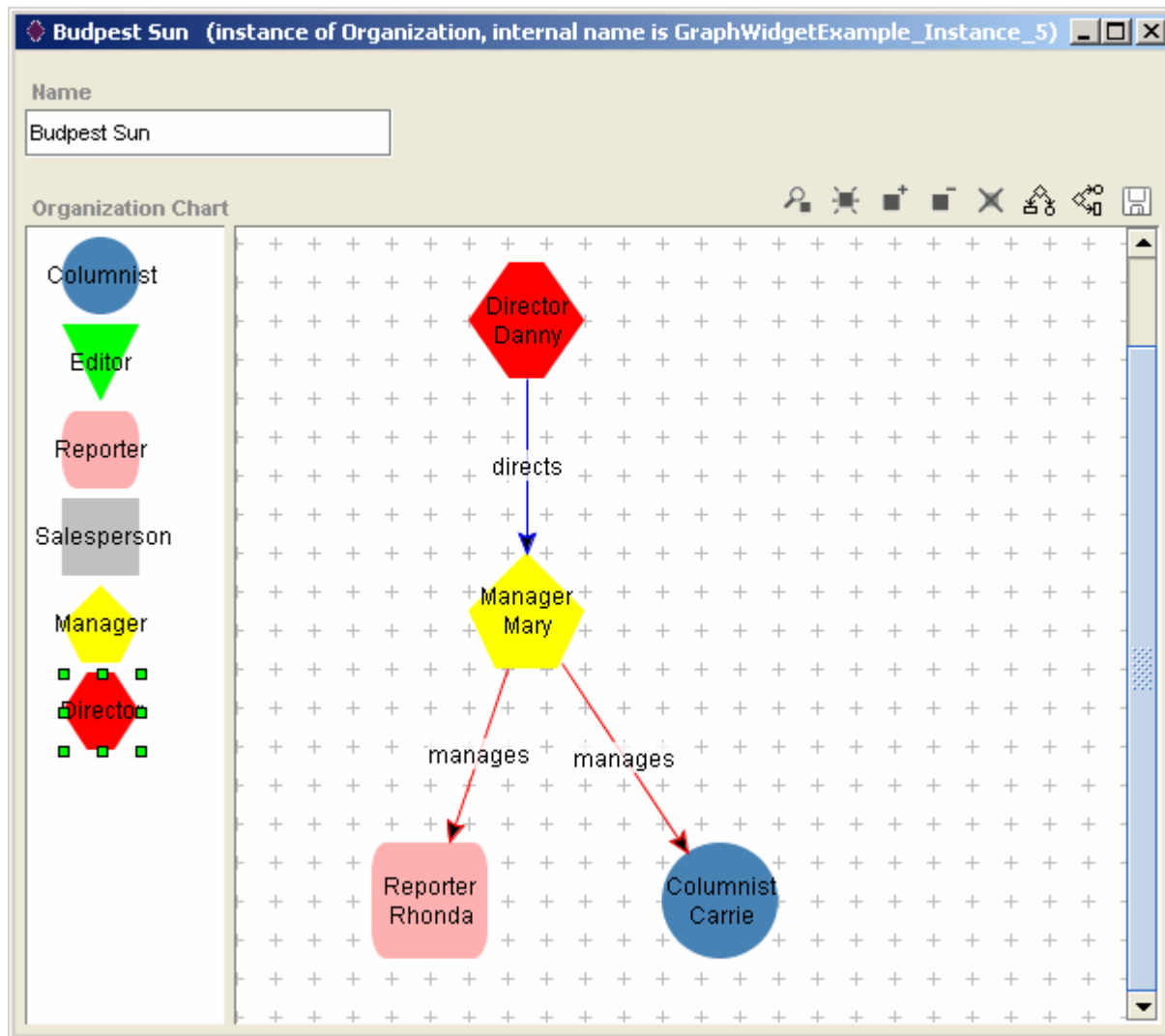
Line Type: Solid

Arrowhead Type: Arrowhead

☒ Show Browser Text

OK Cancel

Use the reified relations tab to configure the relation slot, line types, colors, arrowheads, etc.



Example of reified relations between instances of the Employee class



Graph widget UI Tips

- Double-click on complex links to bring up instance forms
- Designate display slots for subclasses of
:DIRECTED-BINARY-RELATION to enable editing of connector labels



Larger scale visualization

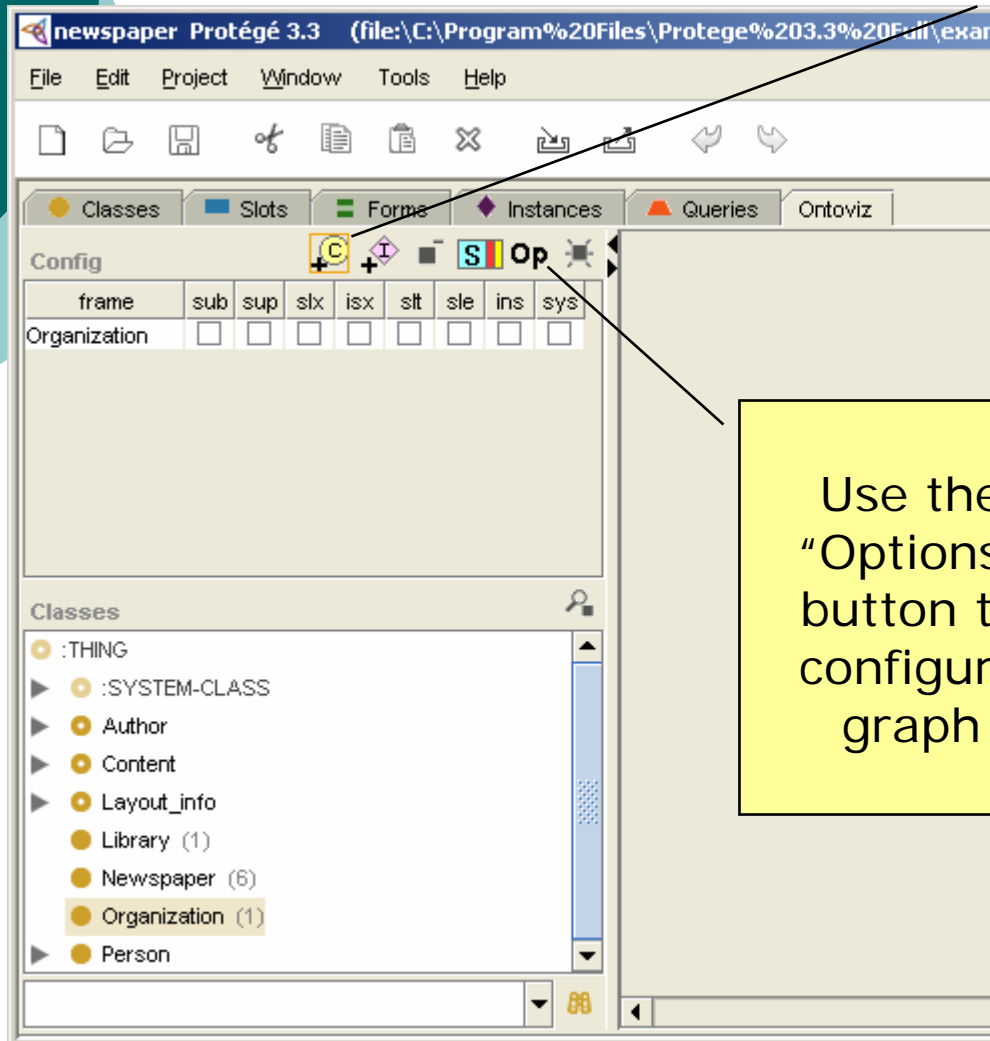
- OntoViz Tab – visualize ontologies with GraphViz
- OWLViz Tab – Visualize OWL ontologies with GraphViz
- Jambalaya – visualize ontologies with SHriMP (Simple Hierarchical Multi-Perspective)
- TGViz – visualize ontologies with TouchGraph



OntoViz Tab: helper documentation for tab abbreviations...

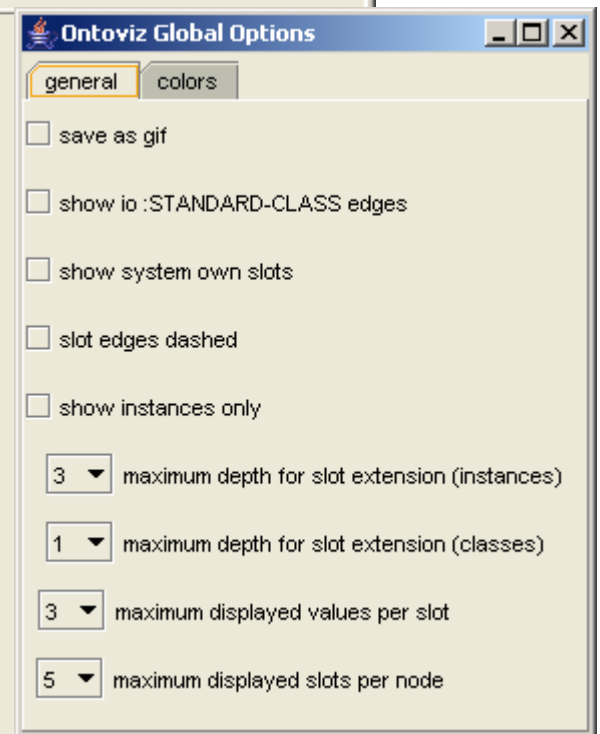
- sub = subclass closure
- sup = superclass closure
- slx = slot extension
- isx = inverse slot extension
- slt = slots
- sle = slot edges
- ins = instances
- sys = system frames

OntoViz Tab



Use the
"add class" button to choose
a class to graph

Use the
"Options"
button to
configure
graph



newspaper Protégé 3.3 (file:\C:\Program%20Files\Protégé\Protégé Files (.pont and .pin...)

File Edit Project Window Tools TGVizTab Help

Classes Slots Forms Instances TGVizTab Ontoviz

Config

frame	sub	sup	slx	isx	slt	sle	ins	sys
Organization	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Classes

- THING
 - SYSTEM-CLASS
 - Author
 - Content
 - Layout_info
 - Library (1)
 - Newspaper (6)
 - Organization (1)
 - Person
 - Employee
 - Columnist (2)
 - Editor (4)
 - Reporter (3)
 - Salesperson (1)
 - Manager (3)

Click the "Create Graph" button to generate graph

Organization		
name	String	
employees	Instance*	Employee
employee_relationships	Instance*	Manager Supervision Relation

employees* employee_relationships*

Employee		
salary	Float	
date_hired	String	
current_job_title	String	

Manager Supervision Relation		
quality	Symbol	good
		ok
		poor
name		String
supervision_type	Symbol	administrative
		editorial



Demo: OWLViz Tab

- Designed specifically for use with the Protégé-OWL editor.
- Allows comparison of asserted and inferred class hierarchy.
 - Computed changes to hierarchy are clearly visible.
 - Inconsistent concepts are shown in red.



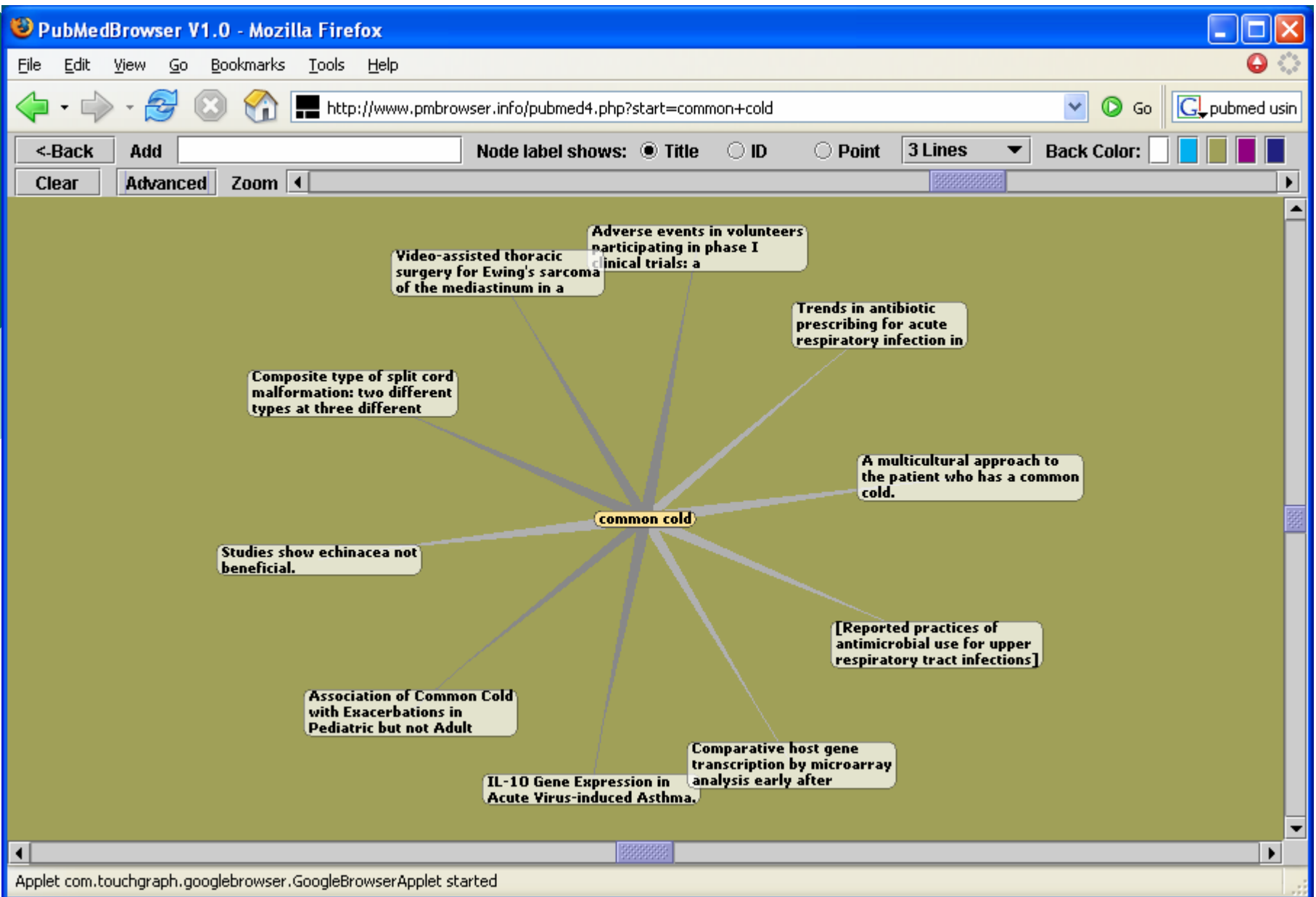
Demo: Jambalaya Tab

- Uses SHriMP (Simple Hierarchical Multi-Perspective)
- SHriMP is designed to help people browse complex information spaces
- Upside: very feature rich
- Downside: bigger learning curve than other tools
- Documentation/tutorials:
<http://www.thechiselgroup.org/jambalaya>



TGViz Tab

- Utilizes TouchGraph (renders networks as interactive graphs)
- TouchGraph uses “Spring Layout”
- PubMed uses TouchGraph to visualize graphs of related documents in medical libraries



Use the "add class" and "add instance" buttons to add items – click the "create graph" button to graph

newspaper Protégé 3.3

File Edit Project Window Tools TGVizTab

Classes Slots Instances Queries TGVizTab Ontoviz

Setting

frame

Organization

CLASS BROWSER

For Project: newspaper

Class Hierarchy

- :SYSTEM-CLASS
- Author
- Content
- Layout_info
- Library (1)
- Newspaper (6)
- Organization (1)
- Person

INSTANCE BROWSER

For Class: Organization

name

- San Jose Mercury News

Search Radius 2 Zoom Stop

Manager¹ Columnist¹

Reporter¹ Editor² Employee

Person¹ Salesperson

Advertisement⁴

Organization

Manager Supervision Relat

Library

Article³ Newspaper² Prototype Newspaper² Billing_Chart¹