



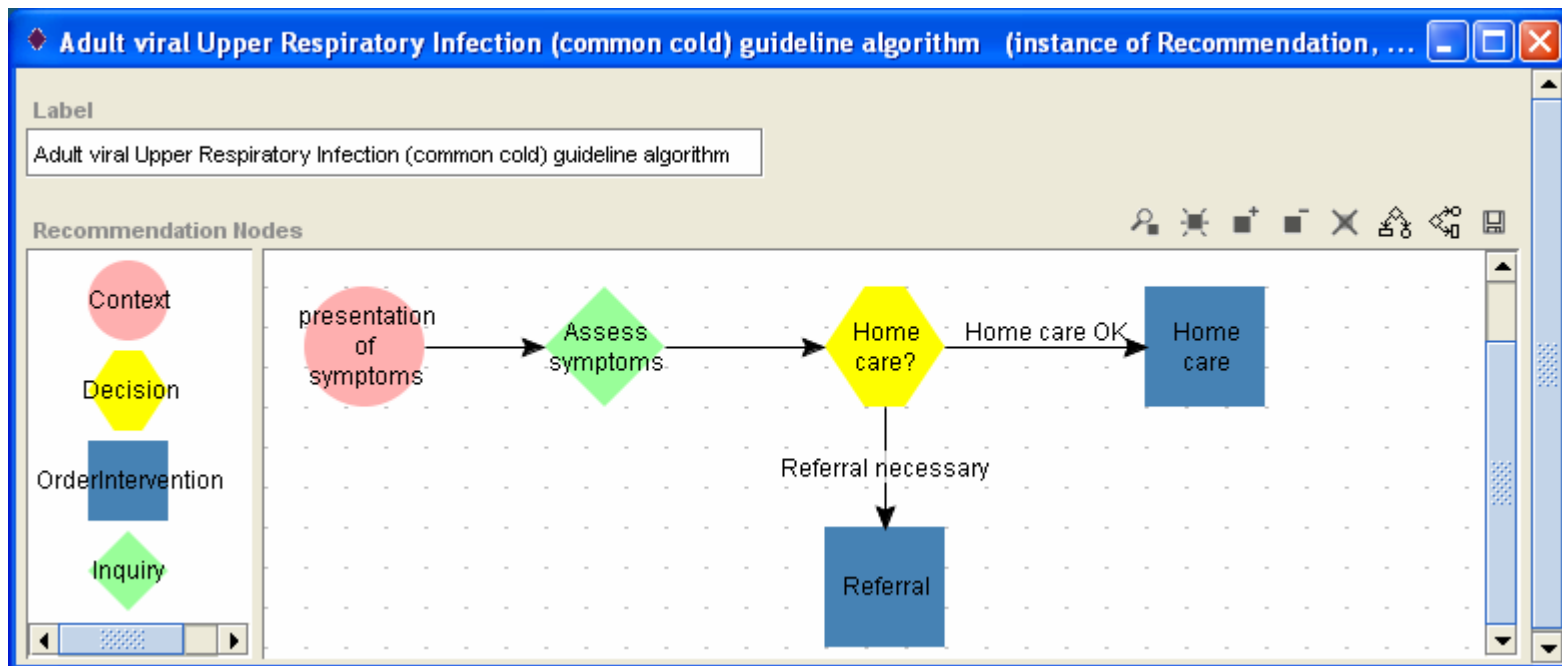
Ontology Visualization

9th International Protégé Conference

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What is the graph widget?

- Allows visual editing of instances and relationships between instances
- Alternative to Protege “Forms” for entering instance data





When is the graph widget appropriate?

- When instances of a slot are connected as values of some slots (e.g. a linked list where one instance is linked to another through a slot relation)
- When instances of a slot are related 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 displays the Protégé 3.2 beta interface. The title bar reads "GraphWidgetExample Protégé 3.2 beta (file: C:\Program Files\Protégé\3.2\Beta\20(build%20324%20-%20full)\examples\g...)". The menu bar includes File, Edit, Project, Window, Tools, and Help. The toolbar contains various icons for file operations and editing. The main interface is divided into several panes:

- CLASS BROWSER:** Shows a class hierarchy for the project "GraphWidgetExample". The classes listed are :THING, :SYSTEM-CLASS, Author, Content, Layout_info, Library, Newspaper, Organization (highlighted), and Person.
- CLASS EDITOR:** Shows the details for the selected "Organization" class. It includes fields for Name (Organization), Role (Concrete), and Documentation. There are also sections for Constraints and Template Slots.
- Template Slots:** A table showing the slot "name" with a cardinality of "single" and a type of "String".

A yellow callout box points to the "Organization" class in the Class Browser, with the text "Select the Organization class".

Name	Cardinality	Type	Other Facets
name	single	String	

Select the Organization class



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

Documentation

Constraints

Role

Concrete ●

Template Slots

Name	Cardinality	Type	Other Facets
organization_chart	multiple	Instance of Employee	
name	single	String	

Create the "organization_chart" slot

Configure organization_chart slot to use graph widget

The screenshot shows the Protégé 3.2 beta interface. The main window title is "GraphWidgetExample Protégé 3.2 beta". The menu bar includes File, Edit, Project, Window, Tools, and Help. The toolbar contains icons for file operations. The interface is divided into several panes:

- FORM BROWSER:** Shows the project "GraphWidgetExample" and a list of forms. The "Organization" form is selected and highlighted.
- FORM EDITOR:** Shows the configuration for the "Organization" class. The "Display Slot" is set to "name" and the "Selected Widget Type" is set to "GraphWidget".
- Organization Chart:** A preview window showing a grid of plus signs (+) representing the graph widget. The title bar of this window is "Organization Chart".

A yellow callout box with the text "Configure organization_chart slot to use graph widget" points to the "Selected Widget Type" dropdown menu in the Form Editor pane.

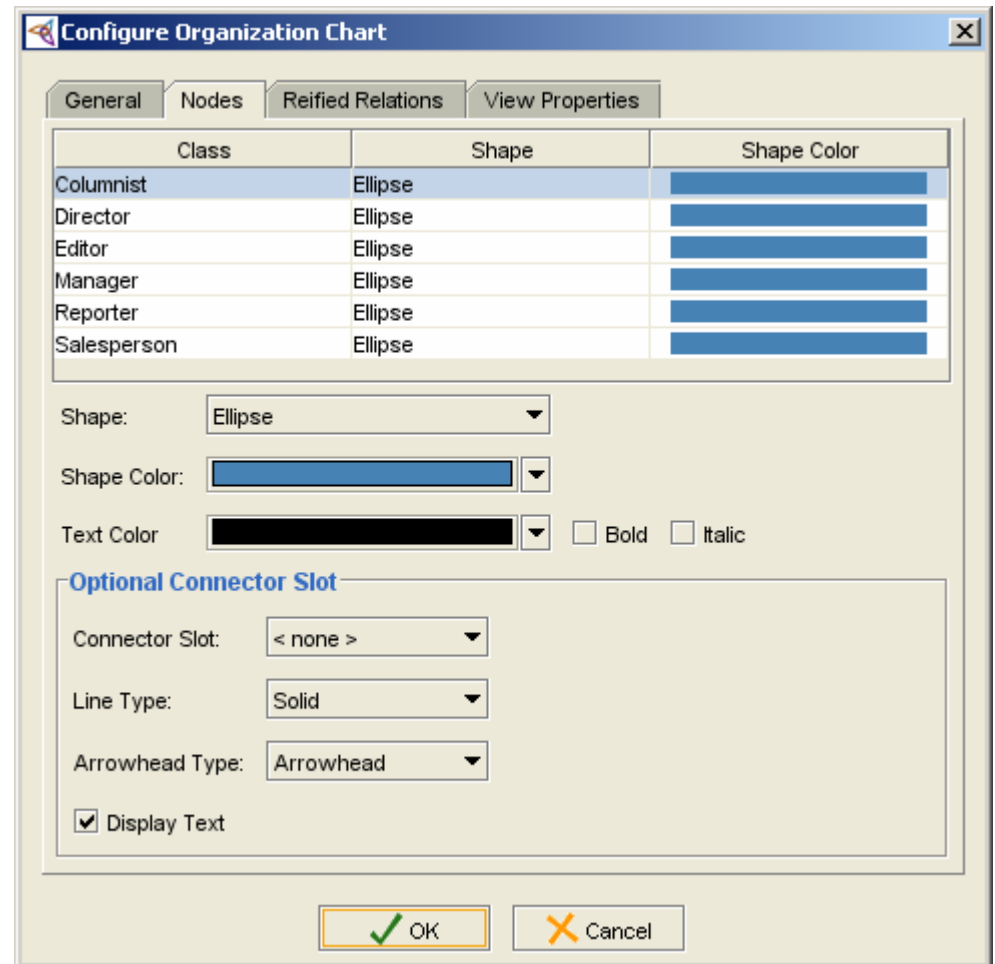


How do I optimize size for the graph widget?

- 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.





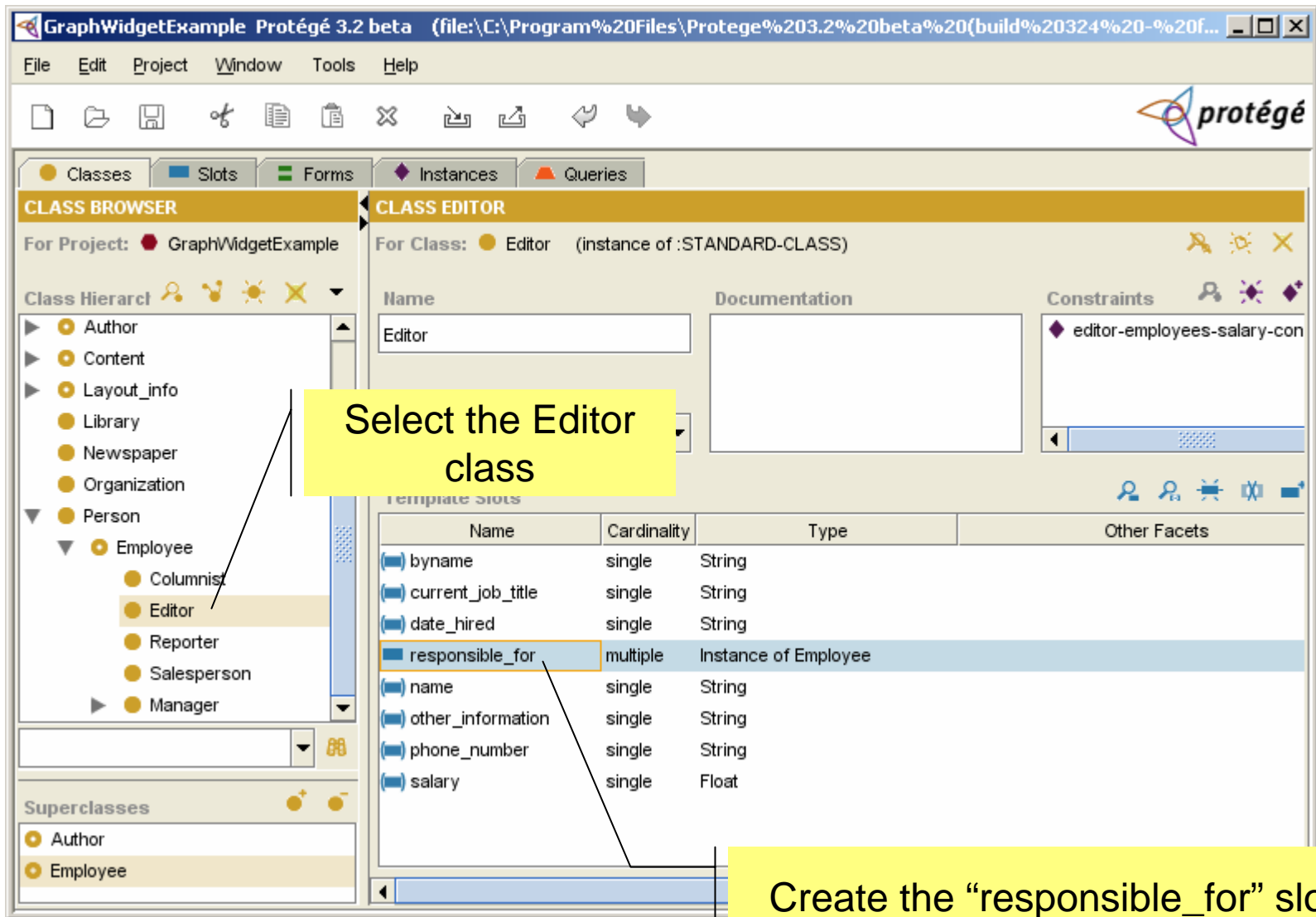
How do I configure node appearance?

- 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

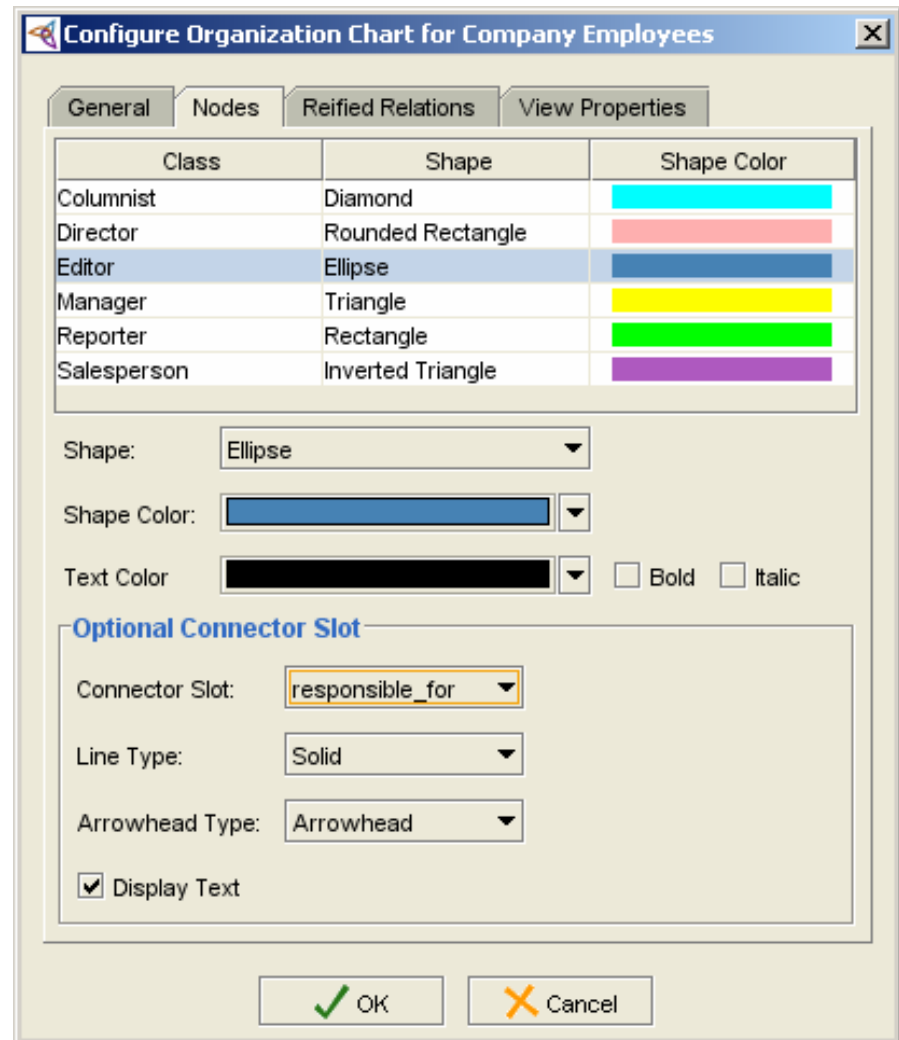


Select the Editor class

Create the "responsible_for" slot (type Instance, cardinality multiple)

Configure simple connectors

- Choose connector slot for Editor class in widget configuration dialog





CLASS BROWSER

For Project: Grap...

Class Hierarchy

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

INSTANCE BROWS...

For Class: Org...

San Jose Mercury

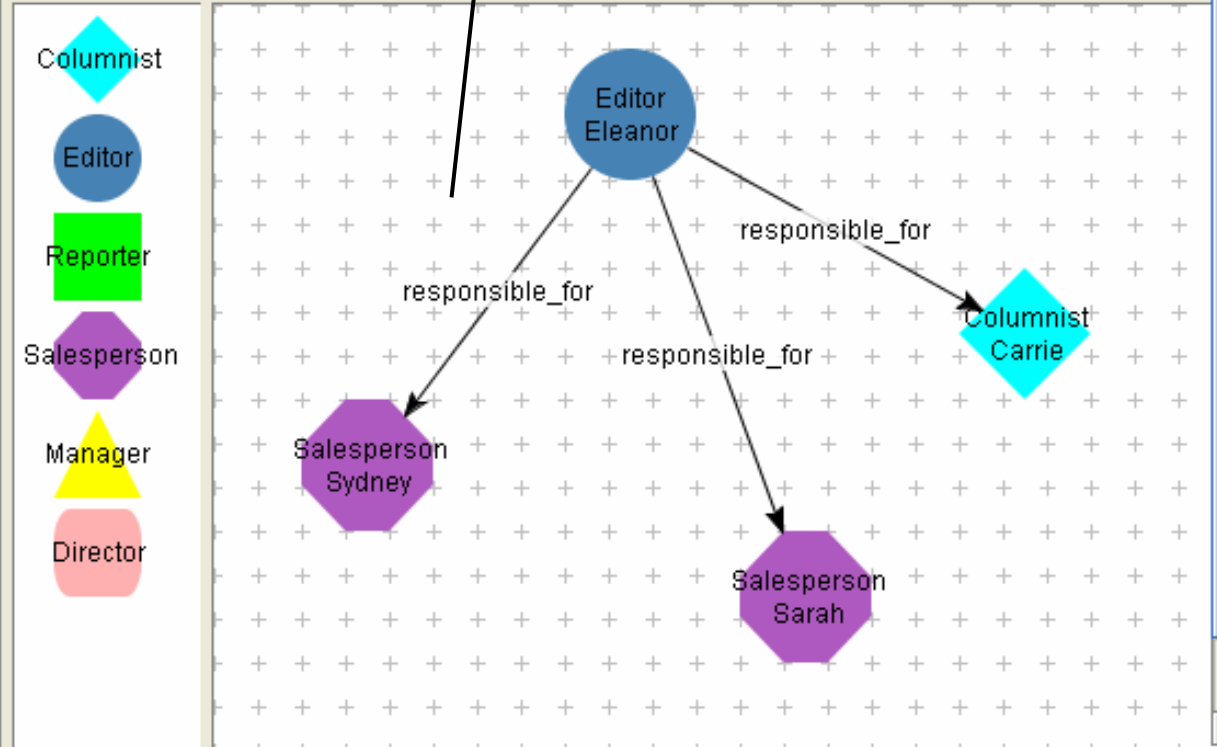
INSTANCE EDITOR

For Instance: San Jose Mercury News (instance)

Name

San Jose Mercury News

Organization Chart for Company Employees



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
 - ▶ ● Author
 - ▶ ● Content
 - ▶ ● Layout_info
 - Library
 - Newspaper
 - Organization
 - ▶ ● Person

Superclasses

- :DIRECTED-BINARY-RELATION

CLASS EDITOR

For Class: ● Mana

Name

Manager Supervision

Role

Concrete ●

Template Slots

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

Subclass
:DIRECTED-BINARY-RELATION to
use reified relations in the graph
widget



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: GraphWidgetExample

Class Hierarchy

- :THING
- SYSTEM-CLASS
 - META-CLASS
 - CONSTRAINT
 - ANNOTATION
 - RELATION
- Author
- Content
- Layout_info
- Library
- Newspaper
- Organization
- Person

Filter and search area

Superclasses

- :THING

CLASS EDITOR

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

Name: Organization

Documentation: [Empty]

Constraints: [Empty]

Role: Concrete

Template Slots

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

Designate a slot to hold instances of reified relations

Configure reified relations

Configure Organization Chart for Company Employees

General Nodes Reified Relations View Properties

Relation Slots: employee_relationships

Class	Line Type	Line Color	Arrowhead Type	Show Browser Text
Manager Supervision Relation	Dashed	Blue	Arrowhead	True

Line Color: Blue

Line Type: Dashed

Arrowhead Type: Arrowhead

Show Browser Text

OK Cancel

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

GraphWidgetExample Protégé 3.2 beta (file:\C:\Program%20Files\Protege%203.2%20beta%20(build%20324%20-%20full)\...

File Edit Project Window Tools Help

Classes Slots Forms Instances Queries

CLASS BROWSER For Project: GraphWid...
Class Hierarchy
:THING
:SYSTEM-CLASS
Author
Content
Layout_info
Library (1)
Newspaper (6)
Organization (2)
Person

INSTANCE BROWSER For Class: Organization
Sacramento Bee
San Jose Mercury News

INSTANCE EDITOR For Instance: Sacramento Bee (instance of Organization, internal name is...)
Name: Sacramento Bee

Organization Chart for Company Employees

The organization chart displays a vertical list of job roles on the left: Columnist (cyan diamond), Editor (blue circle), Reporter (green square), Salesperson (purple hexagon), Manager (yellow triangle), and Director (pink oval). The main area is a grid with a yellow triangle labeled 'Manager Mary' and a green square labeled 'Reporter Ronald'. A blue arrow labeled 'manages' points from the 'Manager Mary' instance to the 'Reporter Ronald' instance. A yellow callout box with a black border points to this arrow, containing the text: 'Reified relation between two instances of the Employee class'.

Types
Organization



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



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: ● GraphWidgetExample

Class Hierarchy

- :THING
- ▼ ○ :SYSTEM-CLASS
 - ▶ ○ :META-CLASS
 - ▶ ○ :CONSTRAINT
 - ▶ ○ :ANNOTATION
 - ▼ ○ :RELATION
 - ▼ ○ :DIRECTED-BINARY-RELATION
 - Manager Supervision Relation (1)
 - Director Supervision Relation (1)
- ▶ ○ Author
- ▶ ○ Content
- ▶ ○ Layout_info
- Library (1)
- Newspaper (6)
- Organization (2)
- ▶ ○ Person

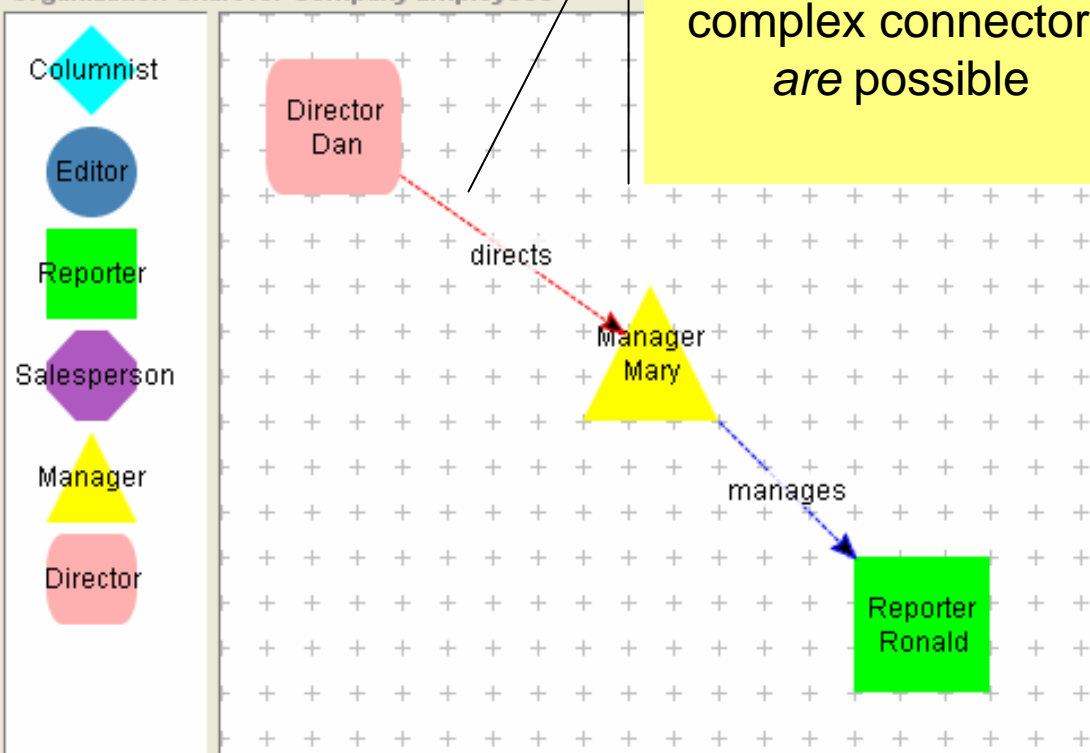
INSTANCE EDITOR

For Instance: ◆ Sacramento Bee (instance of Organization, internal name is Gra... ✂ ✎ ✕

Name

Sacramento Bee

Organization Chart for Company Employees



Multiple types of complex connectors are possible

OntoViz Tab

- Tab plug-ins provide larger scale visualization of ontologies (OntoViz, TGViz, Jambalaya, etc.)
- OntoViz uses Graphviz from AT&T Research (<http://www.graphviz.org>)
- OntoViz is documented on the Protege Wiki:
<http://protege.cim3.net/cgi-bin/wiki.pl?OntoViz>

OntoViz Tab: (helpful key 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

The image shows the Protégé 3.2 beta interface with the OntoViz tab selected. The main window displays the 'Config' panel with various icons for adding classes, instances, and options. A yellow callout box points to the 'add class' button (a circle with a 'C') and another points to the 'Options' button (a square with 'Op'). A third yellow callout box points to the 'Ontoviz Global Options' dialog box, which is open in the bottom right corner. This dialog box has two tabs: 'general' and 'colors'. The 'general' tab is active and contains several checkboxes and dropdown menus for configuring the graph visualization.

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

Use the "Options" button to configure graph

Ontoviz Global Options

- general colors
- save as gif
- show io :STANDARD-CLASS edges
- show system own slots
- slot edges dashed
- show instances only
- 5 maximum depth for slot extension (instances)
- 5 maximum depth for slot extension (classes)
- 5 maximum displayed values per slot
- 5 maximum displayed slots per node

newspaper Protégé 3.2 beta (file:\C:\Pro 20324%\20-full)\examples\...

File Edit Project Window Tools Help

Classes Slots Forms Instances

Config

frame	sub	sup	slx	isx	st	sle	ins	sys
Author	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Person	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Classes

- THING
- :SYSTEM-CLASS
- Author
 - News_Service (2)
 - Columnist (2)
 - Editor (4)
 - Reporter (3)
- Content
- Layout_info
- Library (1)
- Newspaper (6)
- Organization (1)

Click the "Create Graph" button to generate graph

```

classDiagram
    class News_Service {
        contact_person Instance Person
    }
    class Person {
        name String
        other_information String
        phone_number String
    }
    class Employee {
        salary Float
        date_hired String
        current_job_title String
    }
    class Editor {
        sections Instance* Section
        responsible_for Instance* Employee
    }
    class Columnist
    class Reporter
    class Salesperson
    class Reporter

    News_Service --> Person : contact_person
    Person <|-- Employee
    Employee <|-- Editor
    Employee <|-- Salesperson
    Employee <|-- Reporter
    Editor <|-- Columnist
    Editor <|-- Reporter
    Editor --> Employee : responsible_for*
  
```



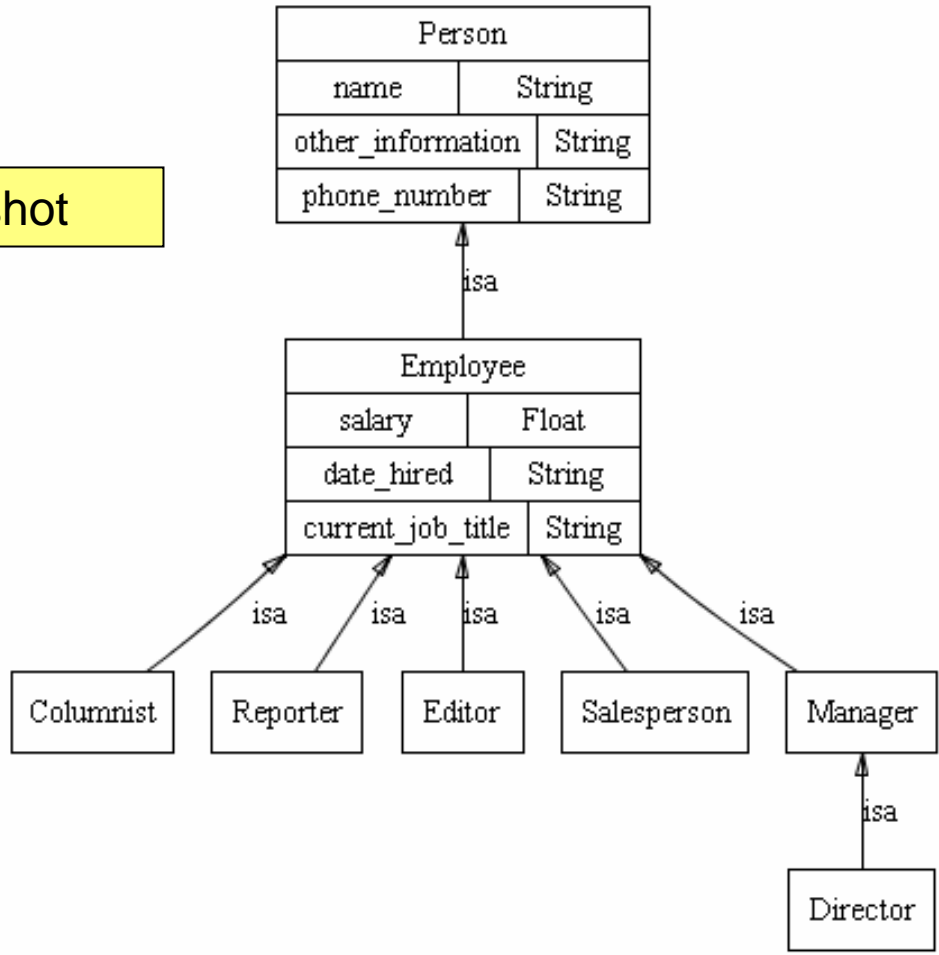
Config

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

OntoViz screenshot

Classes

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





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

PubMedBrowser V1.0 - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.pmbrowser.info/pubmed4.php?start=common+cold

pubmed usin

<-Back Add Node label shows: Title ID Point 3 Lines Back Color: [Color Selection]

Clear Advanced Zoom

The diagram is a radial network graph. At the center is a yellow node labeled "common cold". Ten lines radiate from this central node to ten surrounding white nodes, each containing a research topic. The nodes are arranged in a roughly circular pattern around the center.

- Adverse events in volunteers participating in phase I clinical trials: a
- Trends in antibiotic prescribing for acute respiratory infection in
- A multicultural approach to the patient who has a common cold.
- [Reported practices of antimicrobial use for upper respiratory tract infections]
- Comparative host gene transcription by microarray analysis early after
- IL-10 Gene Expression in Acute Virus-induced Asthma.
- Association of Common Cold with Exacerbations in Pediatric but not Adult
- Studies show echinacea not beneficial.
- Composite type of split cord malformation: two different types at three different
- Video-assisted thoracic surgery for Ewing's sarcoma of the mediastinum in a

Applet com.touchgraph.googlebrowser.GoogleBrowserApplet started

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

The screenshot displays the Protégé software interface for a project named "CommonColdGuideline". The interface includes a menu bar (File, Edit, Project, Window, Help), a toolbar with various icons, and a main workspace. On the left side, there are two panels: "CLASS BROWSER" and "INSTANCE BROWSER".

The "CLASS BROWSER" panel shows the class hierarchy for the project. The root class is ":THING", which has a sub-class ":SYSTEM-CLASS". Under ":SYSTEM-CLASS", there are several classes: "PatientState", "GuidelineModelEntity", "Concept", and "QueryGraph (1)". The "Concept" class is currently selected.

The "INSTANCE BROWSER" panel shows the instances of the selected "Concept" class. It is currently empty.

The main workspace displays a concept graph. The central node is "Concept", which is highlighted in green. It is connected to several other nodes:

- "HomeCare" (connected via "Act")
- "Referral" (connected via "Act")
- "Complications of com..." (connected via "Act")
- "Symptom" (connected via "Act")
- "Fever (LessThan100DegreeAn" (connected via "Act")
- "Cough" (connected via "Act")
- "SoreThroat" (connected via "Act")
- "Symptoms of other illness" (connected via "Act")
- "Asthma" (connected via "Act")
- "ChalantAllergy" (connected via "Act")
- "Smoker" (connected via "Act")
- "coughing" (connected via "Act")

The graph is displayed in a window titled "short%20course\..." with a search bar, radius (2), zoom, and stop buttons.