



KDI ● **Knowledge and Data Integration**

Protégé

W8.L15.M5.T15.2.1

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Ontology and Protégé

- “An ontology is a formal, explicit specification of a shared conceptualization”
-by Gruber (1993) and modified by Studer et. al (1998)
- Ontologies are used to capture knowledge about some domain of interest. An ontology describes the concepts in the domain and also the relationships that hold between those concepts
- Like OWL, Protégé makes it possible to describe concepts but it also provides new facilities.
- Protégé [1], [2] is a free, open-source ontology editor and framework for building intelligent systems. It was developed by the Stanford Center for Biomedical Informatics Research at the Stanford University School of Medicine.

Ontology and Protégé

- OWL ontologies have similar components to Protégé frame based ontologies.
- An OWL ontology consists of Individuals, Properties, and Classes.

NOTE: We require Protégé for formally defining the SKG [L4] in OWL format, in the formal modeling phase of iTelos methodology (in consultation and alignment with the informal L4 schema consolidated in the informal modeling phase).

Individuals

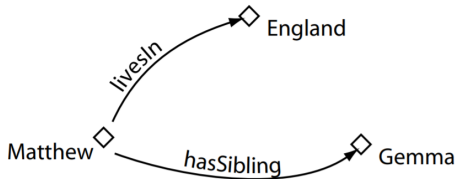
Individuals, represent objects in the domain in which we are interested (Also known as the domain of discourse (D')).



Properties

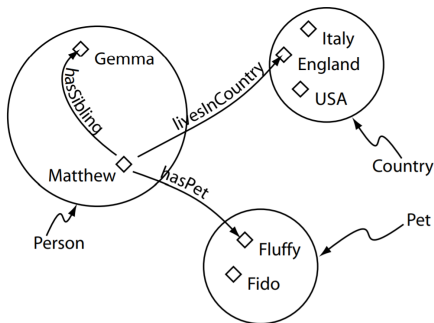
Properties are binary relations on individuals - i.e. properties link two individuals together.

For example, the property `hasSibling` might link the individual Matthew to the individual Gemma, or the property `livesIn` might link the individual Matthew to the individual England.



Classes

OWL classes are interpreted as sets that contain individuals. They are described using formal (mathematical) descriptions that state precisely the requirements for membership of the class.



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Protégé Desktop Interface (Active Ontology Tab)

The screenshot displays the Protégé Desktop Interface with the 'Active ontology' tab selected. The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Mastro, Ontop, Help), a browser-like address bar showing the ontology URI, and a toolbar. The main workspace is divided into several panes:

- Ontology header:** Shows the ontology IRI (`http://www.co-ode.org/ontologies/pizza`) and the ontology version IRI (`http://www.co-ode.org/ontologies/pizza/2.0.0`).
- Annotations:** Lists annotations for the `pizza` class, including `rdfs:label` (type: `xsd:string`), `dc:title` (language: `en`), and `dc:description` (language: `en`). The description is: "An ontology about pizzas and their toppings." Below this, a note states: "This is an example ontology that contains all constructs required for the various versions of the Pizza Tutorial run by Manchester University (see <http://owl.cs.manchester.ac.uk/publications/talks-and-tutorials/protg-owl-tutorial>)." There is also a `dcterms:license` annotation.
- Ontology metrics:** A table showing various metrics for the ontology.
- Ontology imports:** A section for 'Direct Imports' and 'Indirect Imports'.

Metric	Count
Axiom	801
Logical axiom count	322
Declaration axioms count	120
Class count	100
Object property count	8
Data property count	0
Individual count	5
Annotation Property count	12
Class axioms	
SubClassOf	259
EquivalentClasses	15
DisjointClasses	14

At the bottom right, there is a status bar with the text: "To use the reasoner click Reasoner > Start reasoner" and a checked checkbox for "Show Inferences".

WebProtégé Interface

WebProtégé - Chromium

webprotege.stanford.edu | ListColl+Home

Sign In Help Sign up for account

WebProtégé

Home

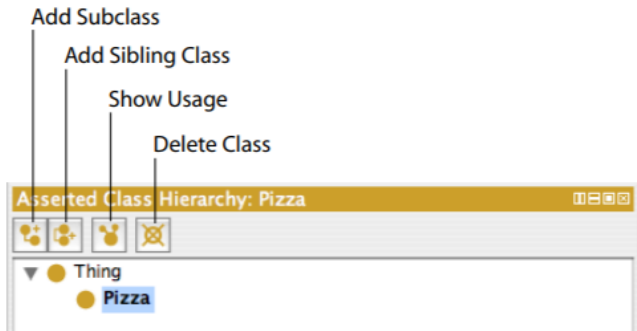
Create Project Upload Project

Project Name	Description	Owner	Download
Aero	An ontology about commercial aviation	M Horridge	Download
Agricultural Technology ontology	Agricultural Technology ontology	soonho	Download
Anatomia	Ontología sobre Anatomía desarrollada en la asignatura Ingeniería de Sistemas de Información, Máster en Ing. Informática, Universidad Carlos III de Madrid. Autores: Miguel Carvajal, Vicente Domínguez y Alexandra Tiemblo	Walabi42	Download
Area	The heirarchy of class place with subclasses like country, state and city along with its properties accompanied by domain and ranges	nishant	Download
ArRange	Un robot qui range ma chambre http://drange.zz.mu/world/	fada	Download
Behaim Globe 1492	A visual ontology for the Behaim globe of 1492	goerz	Download
BibFrame	The BIBFRAME Model is a conceptual/practical model that balances the needs of those recording detailed bibliographic description, the needs of those describing other cultural materials, and those who do not require such a detailed level of description. BIBFRAME Initiative is the foundation for the future of bibliographic description that happens on the web and in the networked world. It is designed to integrate with and engage in the wider information community and still serve the very specific needs of libraries.	Bania	Download
Bioinformatics Web Services ontology	The Bioinformatics Web Services ontology (OBWS) is an ontology that extends the Ontology for Biomedical Investigations (OBI) to build an Ontology that supports consistent annotation of Bioinformatics Web services.	jiezhen	Download
BJJ - Brazilian Jiu Jitsu	An Ontology describing the various techniques, positions and related terminology around the Brazilian Jiu Jitsu martial art.	akoszc	Download
Chicken Anatomy		Natasha Noy	Download
CIDOC CRM	The Erlangen CRMOWL implementation of the CIDOC Conceptual Reference Model	mcharno	Download
Commercial	A commercial ontology focused on business management.	aparedes	Download
Complex Objects	Examples of complex objects using classes from FRBR and predicates from the Fedora relationship ontology	Youn Noh	Download
Computer Gallery	This project was created for study purposes	erginkarakoc	Download
Concepts	Test test test	sergey	Download

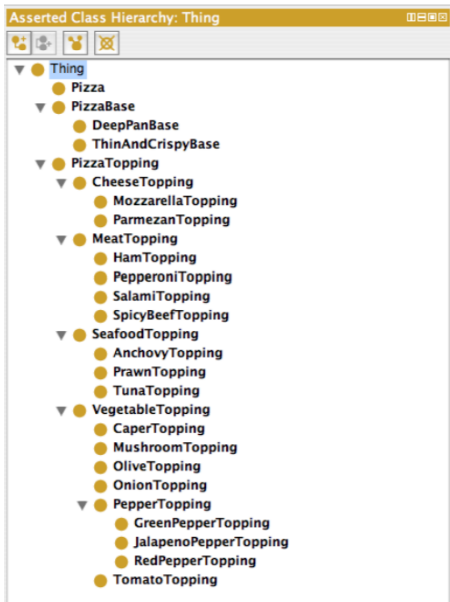
1-89 of 89

WebProtégé is developed by the Protégé team in the [Biomedical Informatics Research Group \(BIRG\)](#) at Stanford University, California, USA. The work is supported by Grant GM023316 from the National Institute of General Medical Sciences at the United States National Institute of Health. [Privacy Policy](#) [Terms of Use](#)

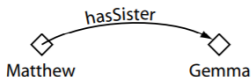
The Class Hierarchy Pane



Class Hierarchy



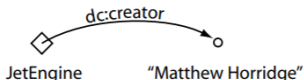
OWL Properties



An object property linking the individual Matthew to the individual Gemma



A datatype property linking the individual Matthew to the data literal '25', which has a type of an xsd:integer.



An annotation property, linking the class 'JetEngine' to the data literal (string) "Matthew Horridge".

Object Properties

The screenshot displays the Protégé ontology editor interface. The top navigation bar includes tabs for 'Annotation properties', 'Datatypes', 'Individuals', 'Classes', 'Object properties', and 'Data properties'. The 'Object properties' tab is active, showing the 'hasBase' property selected. The left sidebar shows a tree view of the ontology hierarchy, with 'hasBase' highlighted under 'hasIngredient'. The main workspace is divided into three panels:

- Annotations:** A panel titled 'Annotations: hasBase' with a sub-panel 'Annotations +'. It is currently empty.
- Characteristics:** A panel titled 'Characteristics: hasBase' containing a list of property characteristics with checkboxes:
 - Functional
 - Inverse functions
 - Transitive
 - Symmetric
 - Asymmetric
 - Reflexive
 - Irreflexive
- Description:** A panel titled 'Description: hasBase' showing the property's domain and range:
 - Equivalent To:** +
 - SubProperty Of:** + hasIngredient
 - Inverse Of:** + isBaseOf
 - Domains (intersection):** + Pizza
 - Ranges (intersection):** +

At the bottom right, there is a status bar with the text 'To use the reasoner click Reasoner > Start reasoner' and a checked checkbox for 'Show Inferences'.

Data Properties

The screenshot displays the Protégé interface for configuring a data property named 'address'. The left sidebar shows a tree view of the ontology, with 'address' selected under 'owl:topDataProperty'. The main area is divided into several panes:

- Annotation properties:** Includes 'Classes', 'Object properties', and 'Data properties'. 'Data properties' is selected.
- Annotations:** Shows the URI for the property: `http://www.semanticweb.org/subhashis/ontologies/2016/4/untitled-ontology-156#ad`. It includes an 'Annotations' section with:
 - `rdfs:comment` [language: en]: "An identification of the fixed location of property by means of a structured composition of geographic names and identifiers."
 - `rdfs:isDefinedBy` [type: xsd:anyURI]: <http://inspire.ec.europa.eu/featureconcept/Address>
- Characteristics:** Shows the 'address' property with a 'Description' section containing:
 - Functional
 - Equivalent To +
 - SubProperty Of +
 - Domains (intersection) +
 - Ranges +
 - Disjoint With +

Annotation Properties

The screenshot displays the Protégé interface for editing the `dc:description` property. The top navigation bar includes tabs for 'Annotation properties', 'Datatypes', 'Individuals', 'Classes', 'Object properties', and 'Data properties'. The 'Annotations' tab is active, showing the URI `http://purl.org/dc/elements/1.1/description`. On the left, a tree view lists various properties, with `dc:description` selected. The main area shows the 'Annotations' section, which is currently empty, and the 'Domains (intersection)', 'Range (intersection)', and 'Superproperties' sections, each with a plus sign to expand.

Annotation property hierarchy: `dc:description`

- `dc:description`
- `dc:title`
- `dcterms:contributor`
- `dcterms:license`
- `dcterms:provenance`
- `owl:backwardCompatibleWith`
- `owl:deprecated`
- `owl:incompatibleWith`
- `owl:priorVersion`
- `owl:versionInfo`
- `rdfs:comment`
- `rdfs:isDefinedBy`
- `rdfs:label`
- `rdfs:seeAlso`
- `skos:altLabel`
- `skos:definition`
- `skos:prefLabel`

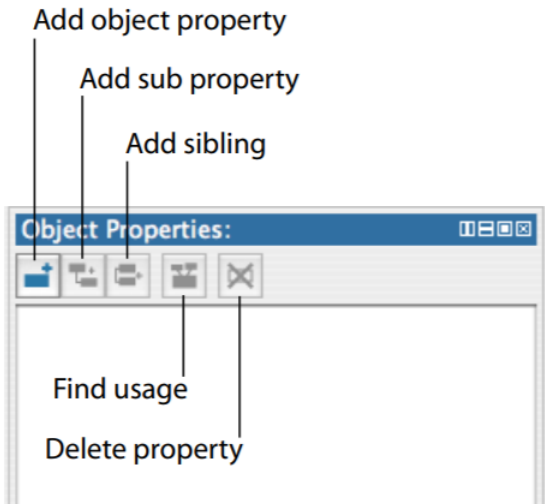
Annotations **+**

Domains (intersection) **+**

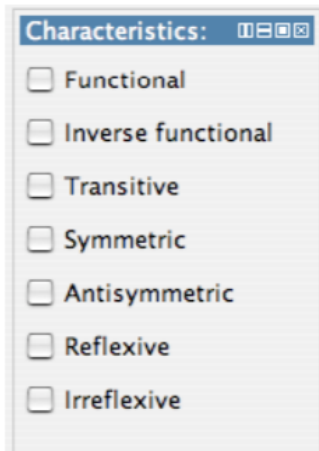
Range (intersection) **+**

Superproperties **+**

Property Creation Buttons



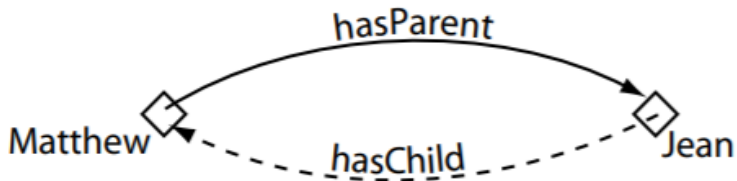
Property Characteristics Views



A screenshot of a software dialog box titled "Characteristics:". The dialog box has a blue header bar with the title and standard window control icons (minimize, maximize, close). Below the header, there is a list of seven property characteristics, each preceded by an unchecked checkbox:

- Functional
- Inverse functional
- Transitive
- Symmetric
- Antisymmetric
- Reflexive
- Irreflexive

Inverse Property

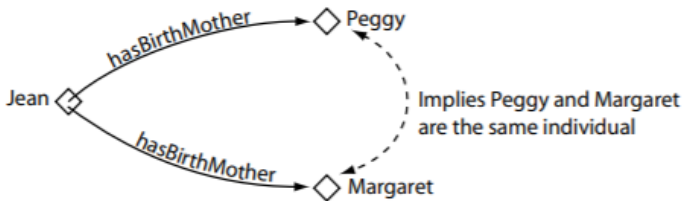


Inverse Property View

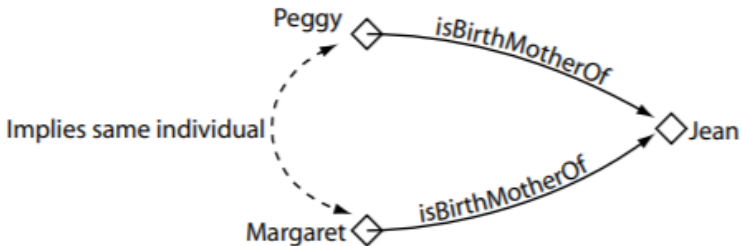
The screenshot displays the 'Inverse Property View' for the property 'isToppingOf'. The window title is 'Description: isToppingOf'. The view is organized into several expandable sections, each with a plus sign icon:

- Domains (intersection) +
- Ranges (intersection) +
- Equivalent object properties +
- Super properties +
- isIngredientOf** (highlighted in a light green bar with close and refresh icons)
- Inverse properties +
- hasTopping** (highlighted in a light green bar with close and refresh icons)
- Disjoint properties +
- Property chains +

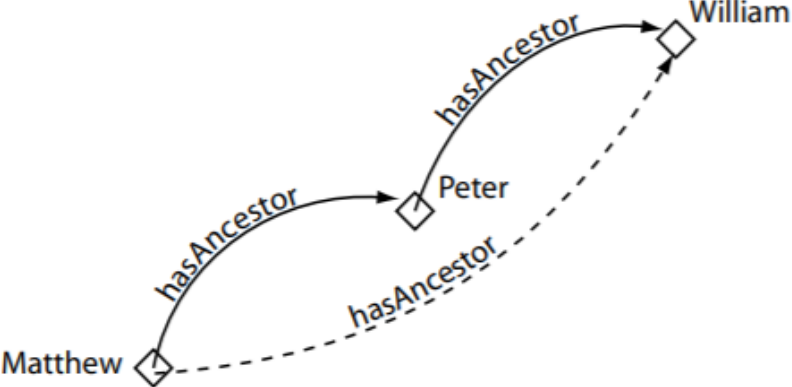
Functional Property



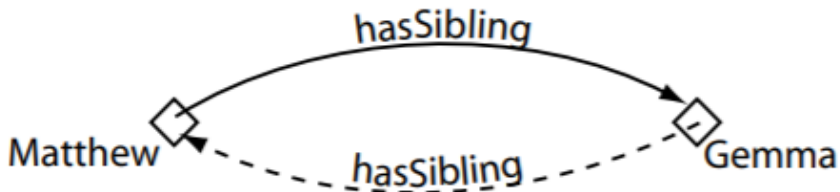
Inverse Functional Property



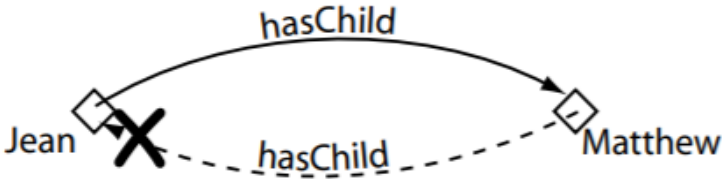
Transitive Property



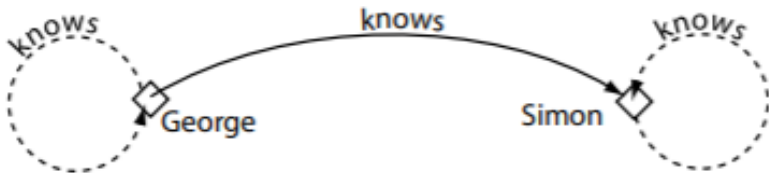
Symmetric Property



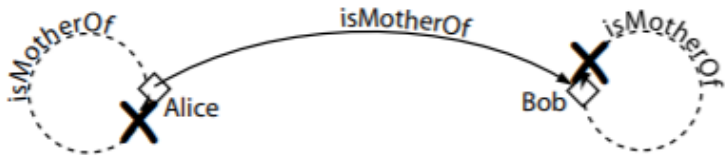
Asymmetric Property



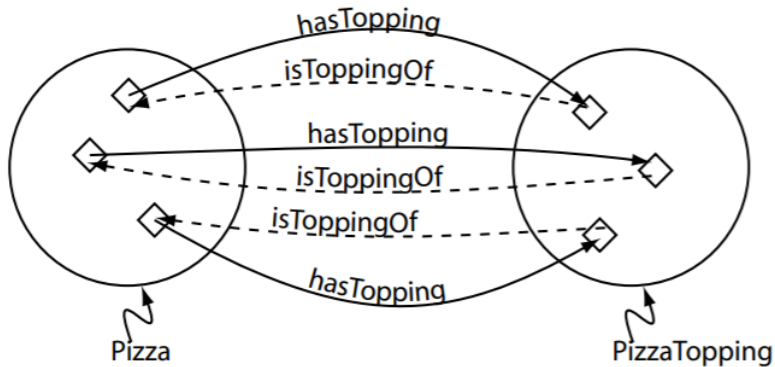
Reflexive Property



Irreflexive Property



Property Domains and Ranges



Existential and Universal (Property) Restrictions

- Existential restrictions describe classes of individuals that participate in at least one relationship along a specified property to individuals that are members of a specified class. For example, `hasTopping some MozzarellaTopping`
- Universal restrictions describe classes of individuals that for a given property only have relationships along this property to individuals that are members of a specified class. For example, `hasTopping only VegetableTopping`

Class Description View

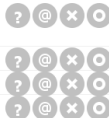
description: Margherita



Equivalent To

SubClass Of

- has Topping **only**
(MozzarellaTopping **or** TomatoTopping)
- has Topping **some** MozzarellaTopping
- has Topping **some** TomatoTopping
- NamedPizza



General class axioms

SubClass Of (Anonymous Ancestor)

- hasBase **some** PizzaBase

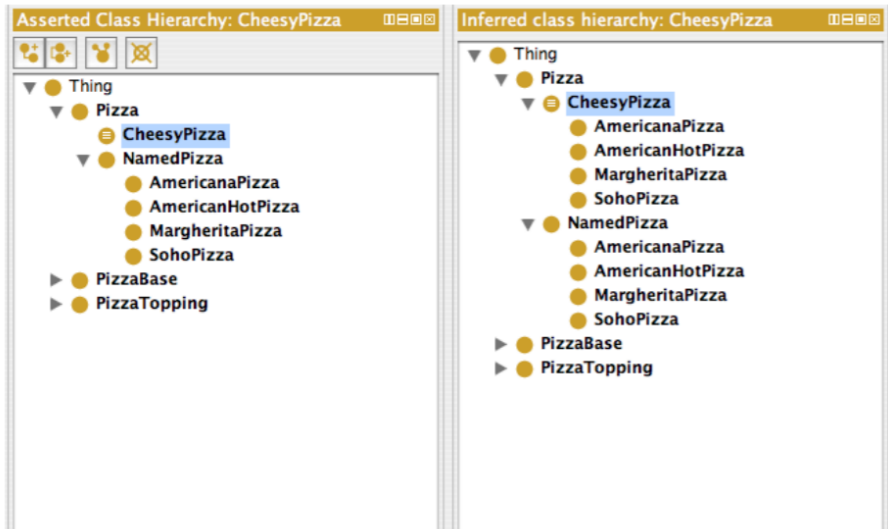


Inconsistency

The screenshot displays the Protégé interface for an ontology. The left pane shows a class hierarchy where **CheesyVegetableTopping** is highlighted. The right pane shows the class's properties and axioms:

- Annotations:** `rdfs:label` [language: en] **CheesyVegetableTopping** and `rdfs:label` [language: pt] **CoberturaDeQueijoComVegetais**.
- Equivalent To:** **owl:Nothing** (highlighted in yellow, indicating an inconsistency).
- SubClass Of:** **CheeseTopping** and **VegetableTopping**.
- General class axioms:** SubClass Of (Anonymous Ancestor).
- Instances:** (empty list).
- Target for Key:** (empty list).

Automated Classification



References

Exploration of the following references is highly encouraged:-

- [Protégé 5 Documentation](#)
- [Protégé Tutorial \(Manchester\)](#)
- [Protégé Wiki](#)



KDI : Knowledge and Data Integration



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