



Aalto University  
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# Ontology Engineering

## How to develop an ontology?

CS-E4410 Semantic Web

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# Learning Objectives



- Get a general idea on how ontologies are developed
  - A process in seven steps
- Learn how an ontology editor (Protégé) is used
  - Videos for creating an ontology in practice

# An Ontology Editor: Protégé



The screenshot displays the Protégé ontology editor interface. The browser address bar shows the URL: `http://www.co-ode.org/ontologies/pizza/pizza.owl`. The main menu includes `File`, `Edit`, `Reasoner`, `Tools`, `Refactor`, `Tabs`, `View`, `Window`, and `Help`. The toolbar contains icons for navigation and editing. The main window is divided into several panes:

- Active Ontology:** Shows the current ontology being edited.
- Entities:** The selected entity is `PizzaTopping`.
- Class Annotations:** Displays annotations for the selected class, including a `label` property with the value `CoberturaDaPizza@pt`.
- Class Description:** Shows the class description for `PizzaTopping`, including its superclass (`Food`) and disjoint classes (`PizzaBase`, `Pizza`, and `IceCream`).
- Asserted Class Hierarchy:** A tree view showing the hierarchy of classes, with `PizzaTopping` selected. The hierarchy includes `Thing`, `DomainConcept`, `Country`, `Food`, `PizzaTopping`, and various subclasses like `CheeseTopping`, `FishTopping`, `FruitTopping`, `HerbSpiceTopping`, `MeatTopping`, `NutTopping`, `SauceTopping`, `SpicyTopping`, `VegetableTopping`, and `VegetarianTopping`.
- Object Properties:** A list of object properties including `hasCountryOfOrigin`, `hasIngredient`, `hasSpiciness`, and `isIngredientOf`.

# Seven-step Process of Creating an Ontology



## Step 1: Determine the domain and scope of the ontology

- What is the domain that the ontology will cover?
- For what we are going to use the ontology?
- For what types of questions the information in the ontology should provide answers?
- Who will use and maintain the ontology?

## Step 2. Consider reusing existing ontologies

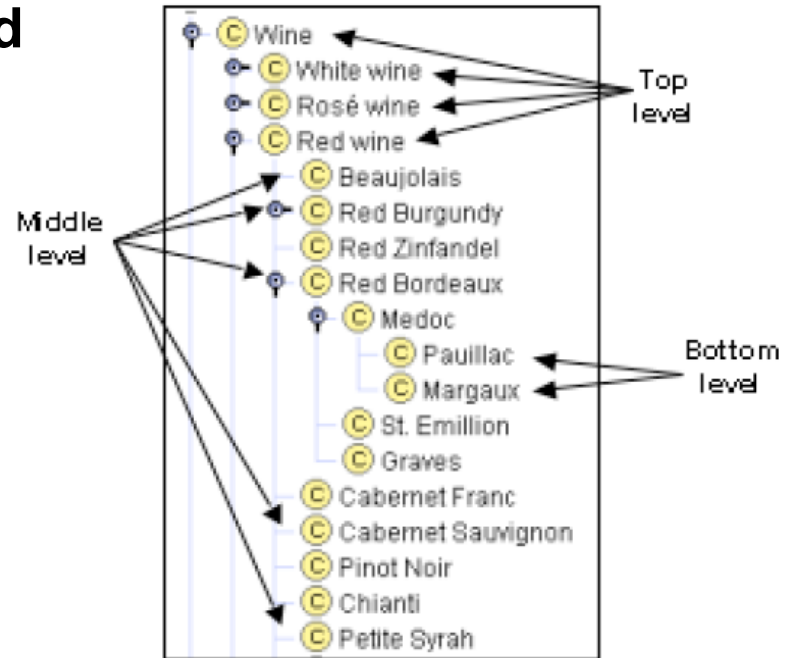
- E.g., ontology repositories: <http://onki.fi>, <http://finto.fi>

## Step 3. Enumerate important terms in the ontology



## Step 4. Define the classes and the class hierarchy

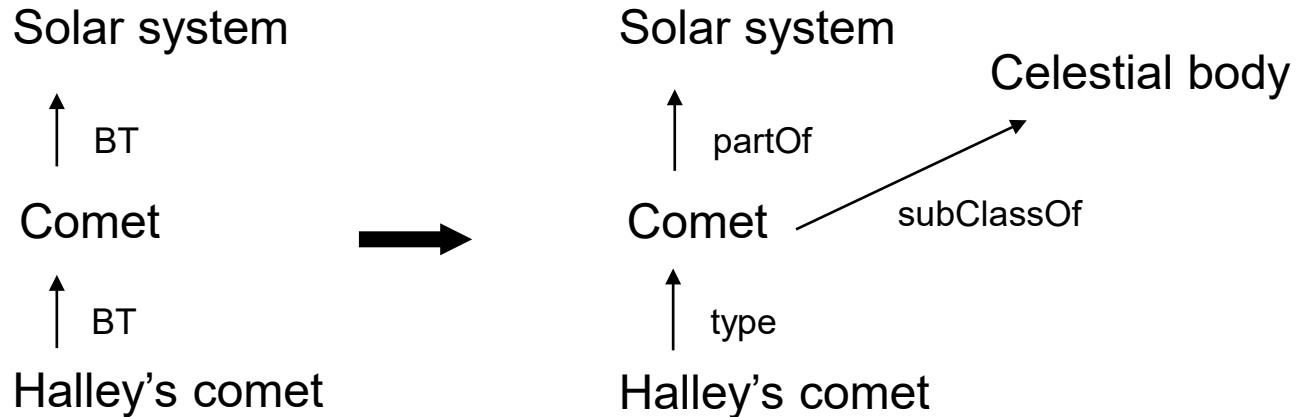
- Top-down
- Bottom-up
- Mixed approach





## The most important principle in constructing the class hierarchy

- If a class A is a superclass of class B, then every instance of B is also an instance of A





## **Step 5. Define the Properties of classes**

- Object properties and data properties
- To be inherited by the instances

## **Step 6. Define the Properties**

- Domain and range
  - E.g., the producer of a wine must be a winery
  - Value type: string, number, Boolean, Enumerated, Instance
- Cardinality
- Relational properties of properties
- Property hierarchy

## **Step 7. Create Instances (= populate the ontology with data)**

- Choose a class
- Create an instance
- Fill in property values

# More Information on Ontology Engineering



- A good starting point:
  - *Natasha Noy, Deborah McGuinness: Ontology Development 101: A Guide to Developing Your First Ontology. Stanford University, 2001.*
- A good textbook
  - D. Allemang, J. Hendler: *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL (2<sup>nd</sup> ed.)*, 2011  
<https://www.amazon.com/Semantic-Web-Working-Ontologist-Effective/dp/0123859654>
- More advanced theoretical concerns
  - *DOLCE and OntoClean*  
<http://www.springerlink.com/content/5p86jk323xotjktc/fulltext.pdf>



# Watch Protégé Tutorials in Short Videos

By Nouredin Sadawi

[A Simple Protege Tutorial 1: Intro](#)

[A Simple Protege Tutorial 2: Creating the Ontology Classes ...](#)

[A Simple Protege Tutorial 3: Adding Object Properties](#)

[A Simple Protege Tutorial 4: Adding Data Properties](#)

[A Simple Protege Tutorial 5: Adding Individuals](#)

... more parts follow automatically 6, 7, 8, 9