# Ontology

An ontology is a formal definition of a body of knowledge. Essentially is a data model that represents our knowledge about the world. It's important to define a ontology language for agents to cooperate effectively since it fixes of terms used by them.

The most typical form of ontology used in building agents involves a structural component. Essentially a taxonomy of class and subclass relations coupled with the relationships between these things.

An example of different ontologies would be when British English and American English refer to the same elements with different names, such as "aubergine" and "eggplant" being the same thing.

▼ Components of ontology

- Classes (ovals): collections of things with similar properties

- Instances (boxes): Specific examples of classes

- Relationships (arrows): Link classes with classes and instances (eg: "is-a")

- Properties: Attributes associated with classes

- Subclasses and instances inherit properties from (super)classes
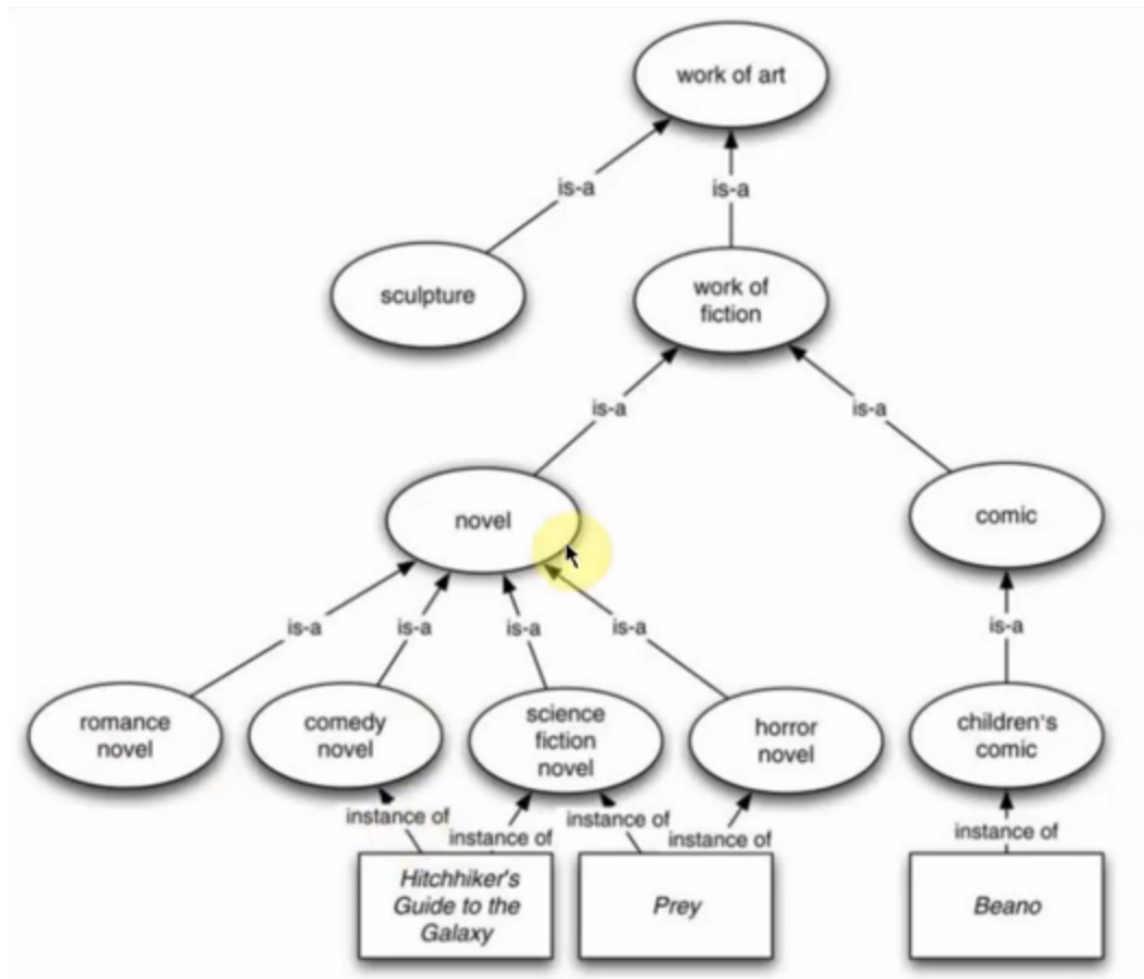
▼ Example

• Alice: "Did you read **Prey**?"

• Bob: "No, what is it?"

• Alice: "It is a **novel; a science fiction novel.** In fact, it's a bit of **horror** too!
It is about multi agent systems going haywire."

• Alice assumes that bob knows:
  • what a "*novel*" is,
  • what "*science fiction*" is and
  • what "*horror*" is.

• She defines a **new term** "*Prey*" in terms of ones that Bob **already knows**.

Can be represented with
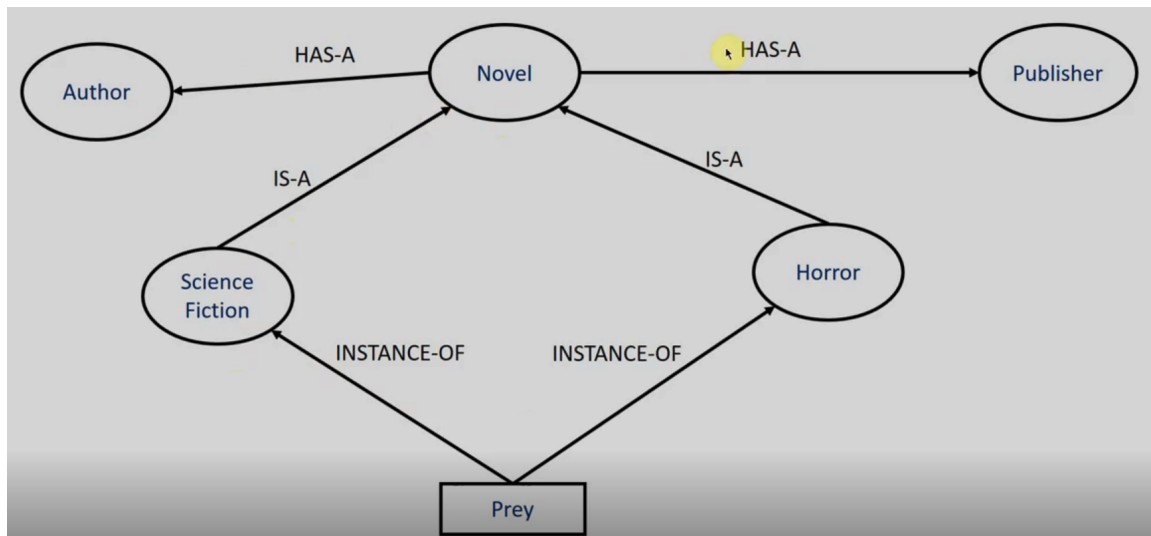
▼ Levels of Detail

Ontologies exist for all levels of knowledge
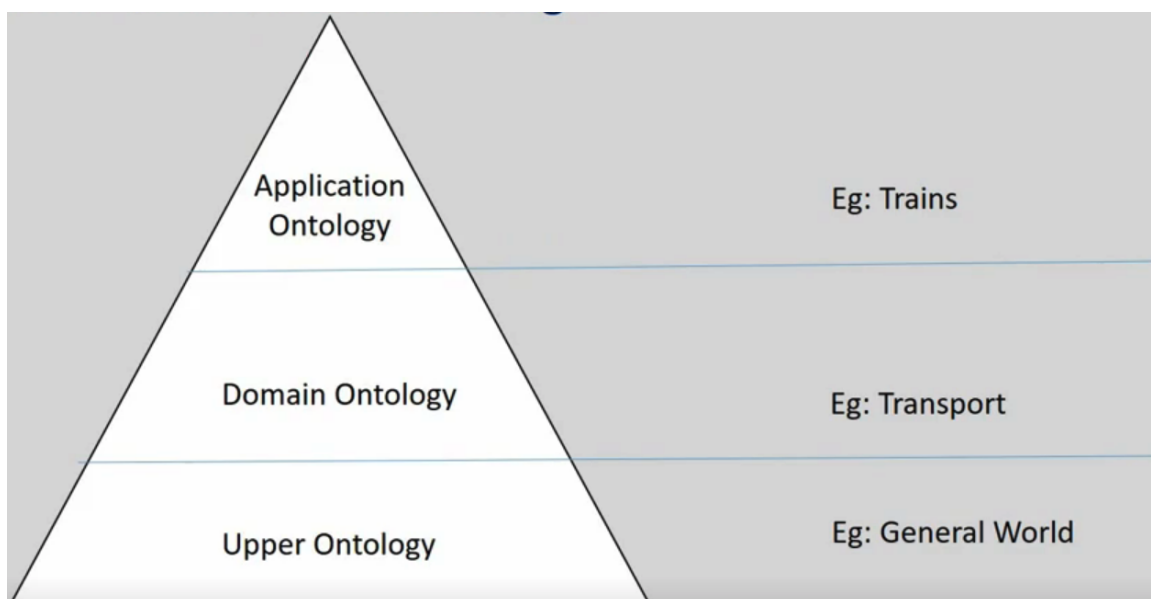
This allows for greater reusability since multiple agents may want the same domain ontology (maybe agents related to transport but not necessarily to trains). Ontologies become more reusable and general the wider they are in the above pyramid.

▼ Web Ontology Language

In order to share ontologies between agents we can use one of multiple languages. One of them is OWL. This uses a specific markup in order to write an ontology that can be shared in files.

It's family of knowledge representation languages for authoring ontologies.

The Web Ontology Language(OWL) is a family of knowledge representation languages for authoring ontologies.

```
<owlx:Class owlx:name="Winery" owlx:complete="false" />
<owlx:Class owlx:name="Region" owlx:complete="false" />
<owlx:Class owlx:name="ConsumableThing" owlx:complete="false" />

<owlx:Class owlx:name="PotableLiquid" owlx:complete="false">
  <owlx:Class owlx:name="#ConsumableThing" />
</owlx:Class>

<owlx:ObjectProperty owlx:name="hasBankAccount">
  <owlx:domain>
    <owlx:UnionOf>
      <owlx:Class owlx:name="#Person" />
      <owlx:Class owlx:name="#Corporation" />
    </owlx:UnionOf>
  </owlx:domain>
</owlx:ObjectProperty>
```

```
1.  Ontology(
2.      Class(WorkOfArt partial owl:Thing)
3.      Class(Sculpture partial WorkOfArt)
4.      Class(WorkOfFiction partial WorkOfArt)
5.      Class(Novel partial WorkOfFiction)
6.      Class(Comic partial WorkOfFiction)
7.      Class(RomanceNovel partial Novel)
8.      Class(ComedyNovel partial Novel)
9.      Class(ScienceFictionNovel partial Novel)
10.     Class(HorrorNovel partial Novel)
11.     Class(ChildrensComic partial Comic)
12.     DisjointClasses(Sculpture WorkOfFiction)
13.     ObjectProperty(author
14.         domain(Novel) range(String))
15.     ObjectProperty(content
16.         domain(Novel) range(String))
17.     Individual("Hitchhiker's Guide to the Galaxy"
18.         type(ScienceFictionNovel)
19.         value(author "Douglas Adams")
20.         value(content "Far out in the uncharted
21.         backwaters of the unfashionable end of
22.         the Western Spiral Arm of the Galaxy..."))
23.     Individual("Prey"
24.         type(intersectionOf(HorrorNovel ScienceFictionNovel))
25.         value(author "Michael Crichton")
26.         value(content "Things never turn out
27.         the way you think they will...."))
28.     Individual("Beano"
29.         type(ChildrensComic))
30.     DifferentIndividuals(
31.         "Hitchhiker's Guide to the Galaxy"
32.         "Prey")
33.)
```