What is an ontology?

In its strictest definition, an ontology is defined as being a formal naming of concepts, their properties, and relationships within a domain of interest that is revealed through a developed taxonomy.

I consider an ontology very similar to **architecture definition** which, according to TOGAF is a “formal description of a system” and concerns itself with “the structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time.” From the TOGAF definition, applied onto the idea of an ontology, I note that while an ontology deals with conceptual things in everyday life, such as “unicorns”, “magic beans”, or “nature of politics”, an architecture deals with more concrete concepts since these concepts will be found implemented in real systems; nevertheless, architecture also touches on the “concepts”.

What are ontologies useful for?

Since ontologies manifest in taxonomies, I conclude that they are useful when there exists a need to classify or categorise things within a domain. For example, categorising the “security users” as opposed to “general users”. In this way, ontologies are useful as a tool for knowledge sharing and reuse. (Munir and Anjum, 2018).

Ontology specifications

Ontologies can be described in terms of a “language” using, for example, OWL 2 (https://www.w3.org/TR/owl2-syntax/). OWL is a language based on computational logic expressed in a manner that can be utilised by computers. Resource definition framework (RDF) is used to describe the relationships between the ontological concepts and is usually best suited for describing web resources (for example, http://www.omg.org/news/meetings/tc/dc-13/TechicalMeeting#HyattRegencyReston).

Ontologies are defined using one of several specifications for a given domain of discourse. Below are listed a few examples of how useful an ontology is:

Table 1 Domain ontologies

Domain of discourse	Description	Originator
Service-oriented architectures	https://www.opengroup.org/soa/source-book/ontologyv2/p1.htm	TOGAF
Definition of ontology metamodels	https://www.omg.org/spec/ODM/1.1/About-ODM/	OMG
Space domain awareness	https://philpapers.org/archive/COXTSO-9.pdf	Cox et al. (2016)
Aviation		Keller (2016)
Steel production		Dobrev et al. (2008)
Product development		Zhang et al. (2017)
Risk management		Atkinson et al. (2006)

Apply an ontology to the module project

Developing ontologies is a skill I have not practised and so, based on the work by Kendall (2013), I considered how to develop ontologies in UML and in the Protégé tool provided by Stanford university[1]. While conceptually, it is simple to develop a basic ontology, in practice I found this process rather challenging beyond measure and present initial efforts below:

[1] https://protege.stanford.edu/publications/ontology_development/ontology101.pdf

Ontologies are taxonomies

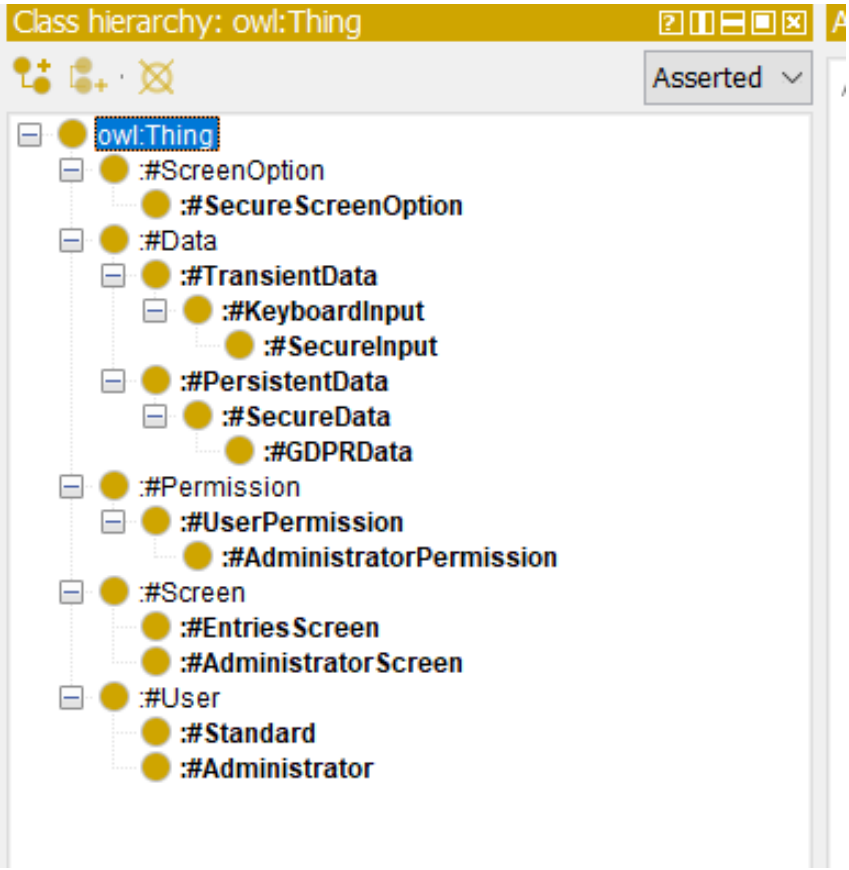


Figure 1 Ontology for team 4 SSD project

Ontologies catalogue properties

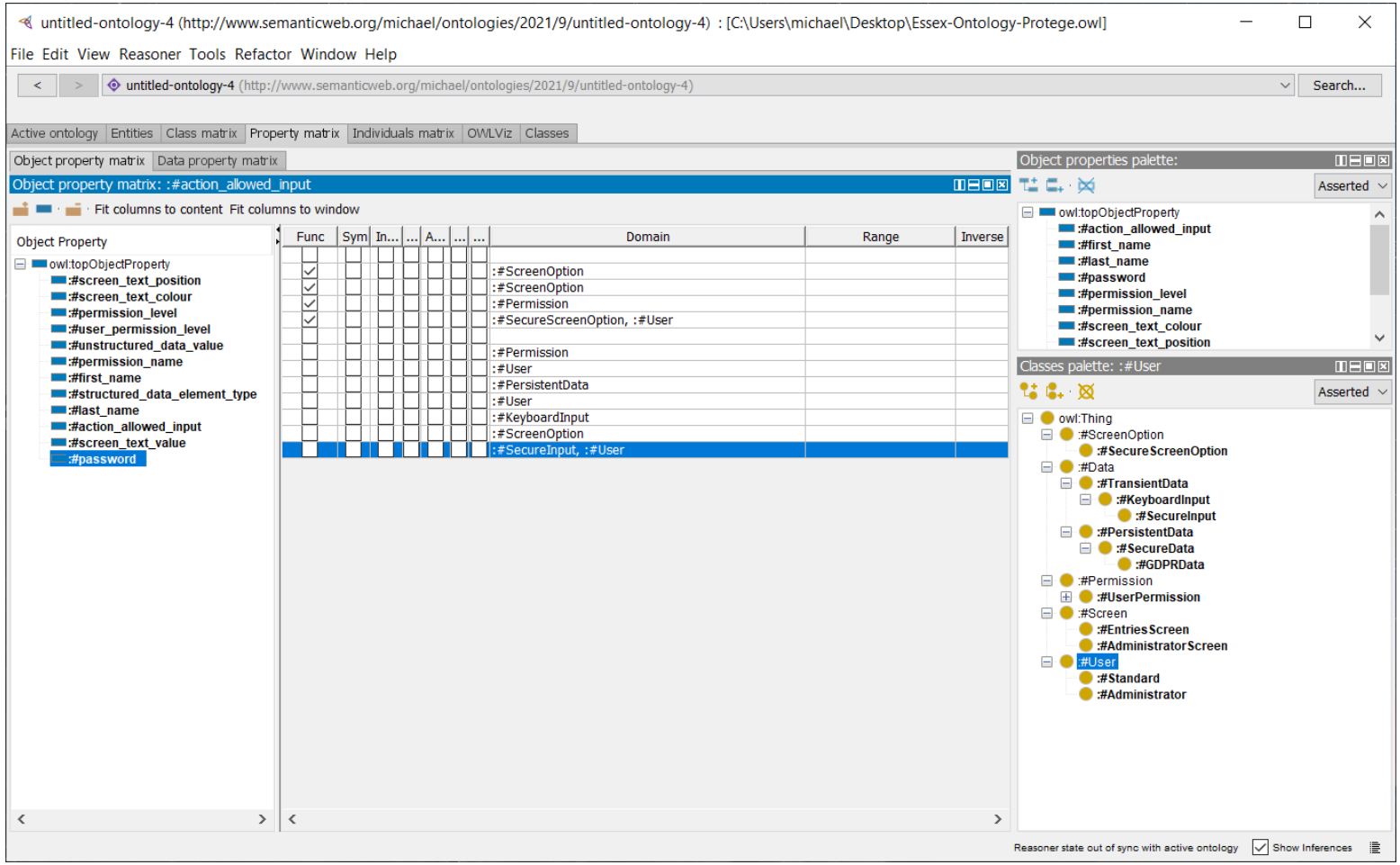
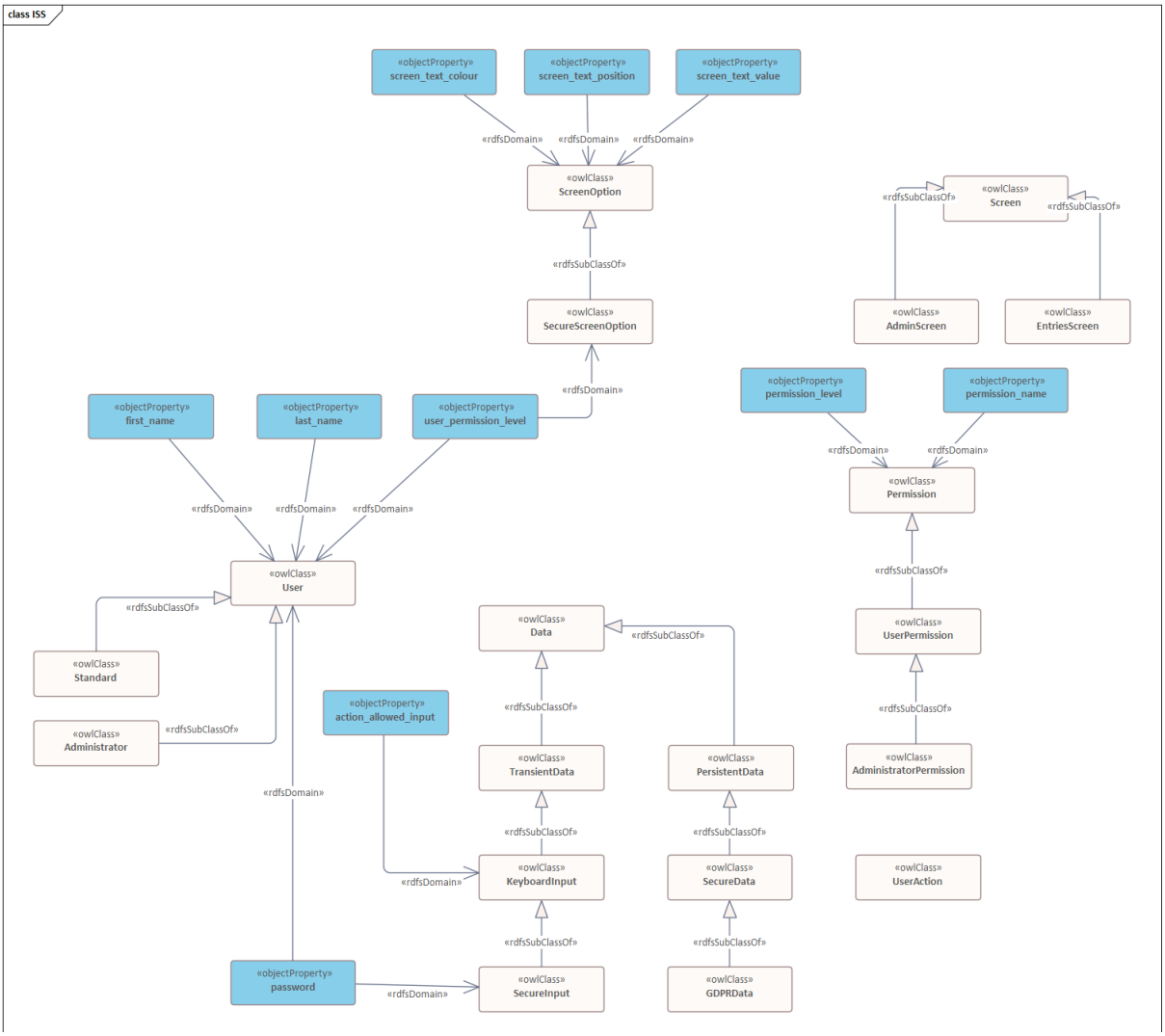


Figure 2 Assigning object properties to classes

Ontologies can be represented visually



The UML diagram above leveraged the Web Ontology Language UML profile because using Protégé's VizGraph plugin has issues representing the ontology.

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