

## Motivation

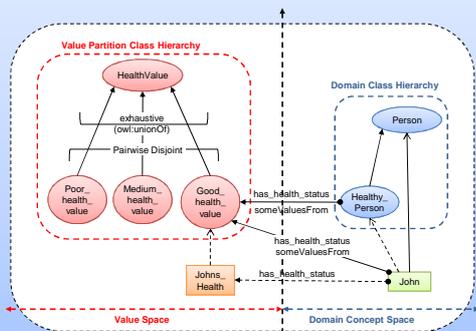
- Certain ontology domain concepts are **difficult to model** due to:
  - The complexity of their **definition**.
  - The number of **roles** that they fulfil in the ontology.
  - The different types of **relationships** they participate in.
- In the context of the **ReSIST Project**, the representation of the **Fault** domain concept has to fulfil a dual role:
  - Classifying occurrences of actual faults in real world systems.
  - Providing a keyword index for: subjects of publications, research interest areas of projects, institutions or people, and support of resilient mechanisms.
- ReSIST Knowledge Base Explorer: [www.rkbexplorer.com/explorer/](http://www.rkbexplorer.com/explorer/)

## Roles of Domain Concepts in ODPs

- **Generic Class Hierarchy (GCH)**: refers to a set of classes organized in any hierarchical structure (e.g. a single class or a set of classes organized in a list, a tree or a directed acyclic graph).
- **Domain Class Hierarchy (DCH)**: refers to any GCH that contains the classes corresponding to the domain concepts that the ontology is intended to represent.
- **Value Class Hierarchy (VCH)**: refers to any GCH that is used to provide anonymous individuals as values to properties for other domain concepts in the ontology.
- **Value Partition Class Hierarchy (VPCH)**: refers to a GCH that: a) is a Value Class Hierarchy and b) conforms to the definition of a value partition.
- **Domain Concept Space (DCS)**: identifies the subset of the ontology model that contains all the classes that belong to a Domain Class Hierarchy.
- **Value Space (VS)**: identifies the subset of the ontology model that contains all the classes that belong to a Value Class Hierarchy or Value Partition Class Hierarchy.

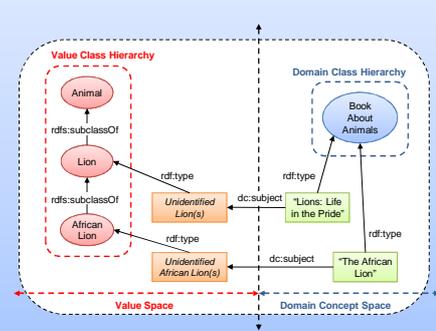
### ODP1: Pattern 2 – Variant 2 in [Rector 2005]

Representing Specified Values in OWL: "value partitions" and "value sets"



### ODP2: Approach 4 in [Noy 2005]

Representing Classes As Property Values on the Semantic Web



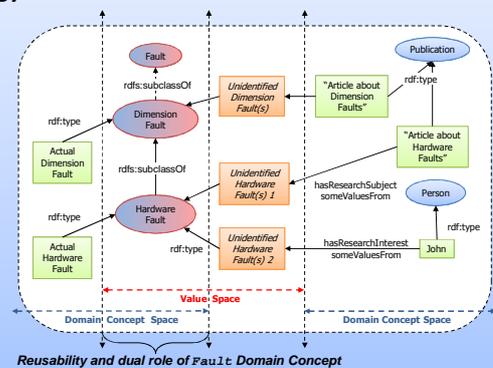
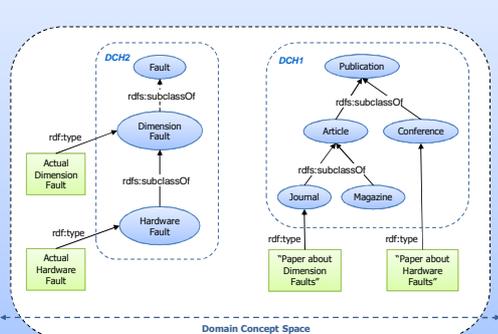
## Similarities between the 2 ODPs examined

- Both use a hierarchy of classes to provide anonymous individuals as property values:
  - In [Rector 2005] the hierarchy is used as a representation of features that describe other concepts in the ontology.
  - In [Noy 2005] the hierarchy is used as a subject index to annotate other domain concepts in the ontology.
- Both keep ontology expressivity within OWL-DL.

## Differences between the 2 ODPs examined

- Regarding the hierarchy of classes:
  - In [Rector 2005] it conforms to the definition of value partition.
  - In [Noy 2005] it could be organized in any hierarchical structure.
- Regarding anonymous individuals:
  - In [Rector 2005] they are of the same type of the other individuals in the class.
  - In [Noy 2005] they are of different type of the other individuals in the class.

## Representation of Fault in the ontology for ReSIST



## Reusability of Domain Concepts in ODPs

- Let us consider a single ontology O1, with two Domain Class Hierarchies DCH1 and DCH2:
  - In the context of [Rector 2005] and [Noy 2005] we can reuse DCH2 as a Value Class Hierarchy for DCH1 in the same ontology O1.
  - In that case DCH2 becomes part of the Value Space in O1 causing both the DCS and the VS in O1 to overlap.

## Conclusions

- The characteristics of **role** and **reusability** presented untangled these two aspects when modelling the **Fault** concept in the ontology for **ReSIST**. **Fault** is represented as a class hierarchy reused to fulfil a **dual role**:
  - The role of a **DCH** to represent instances of actual faults in real world systems.
  - The role of a **VCH** for other domain concepts in the ReSIST ontology (e.g. topics of publications or people's research interests).