

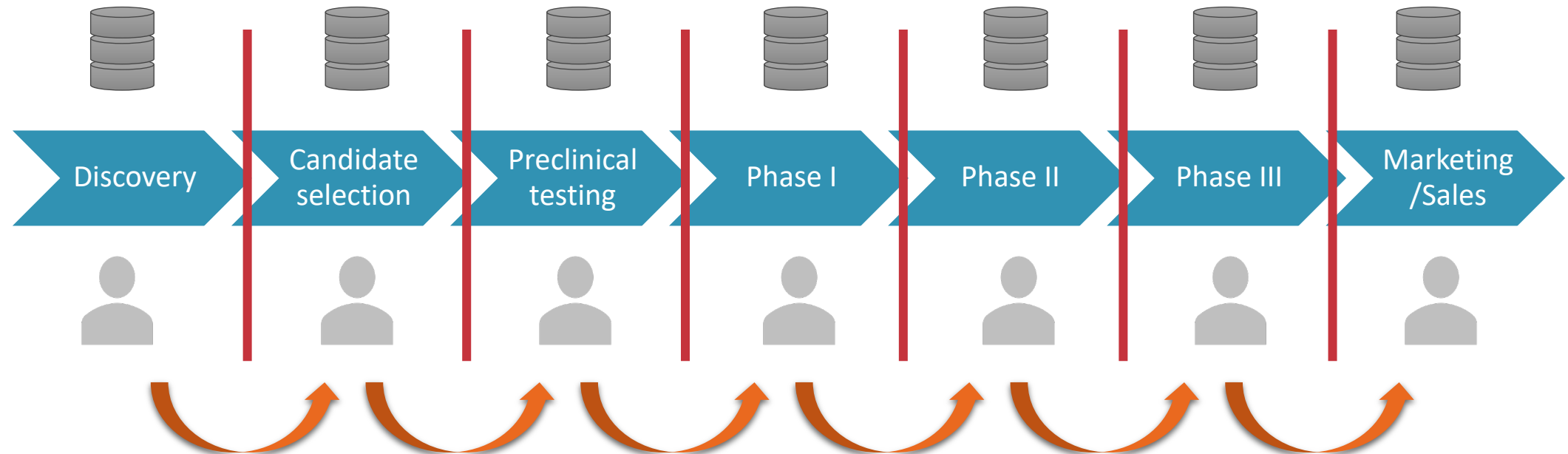
Harness the power of ontologies to build better information platforms

Dr Peter Tormay

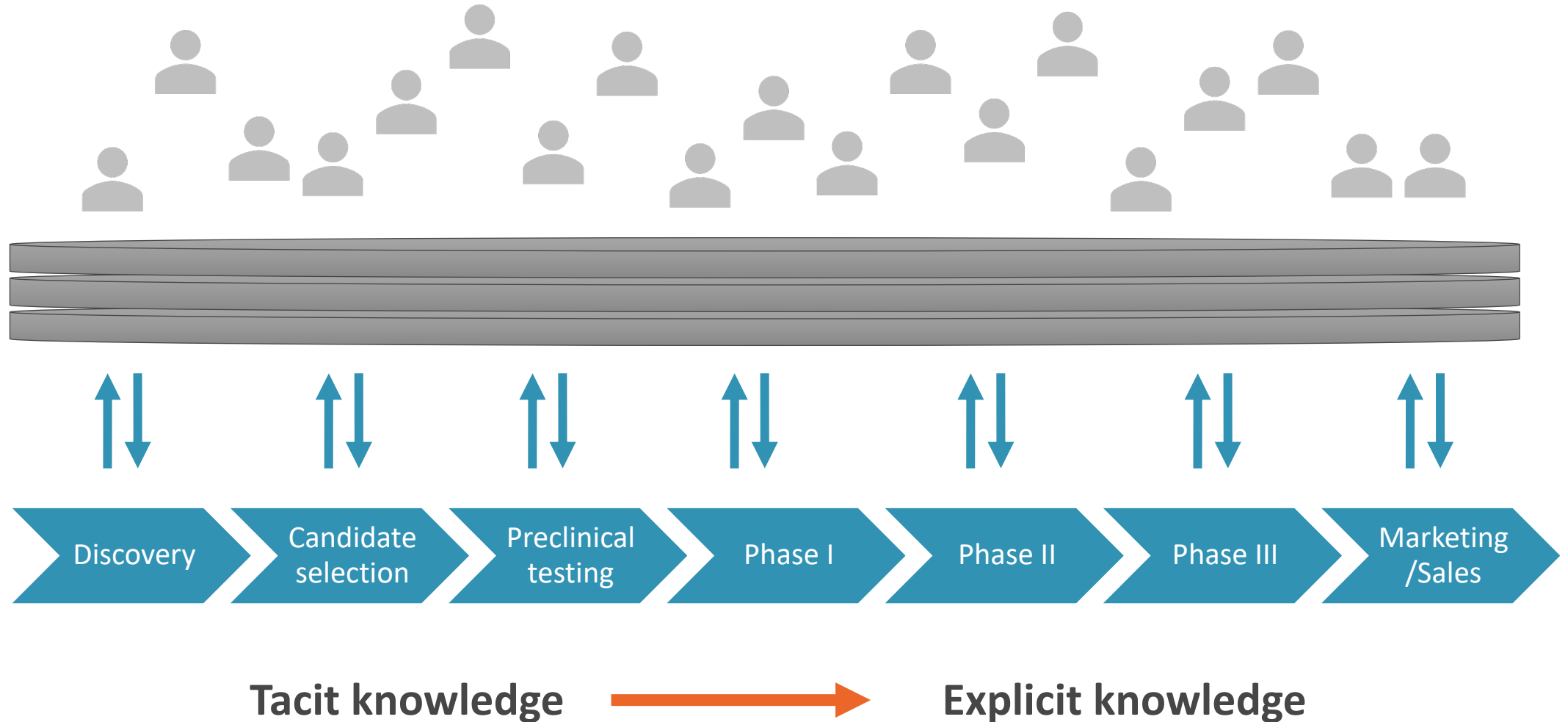
Capish

A Changing Paradigm - Then

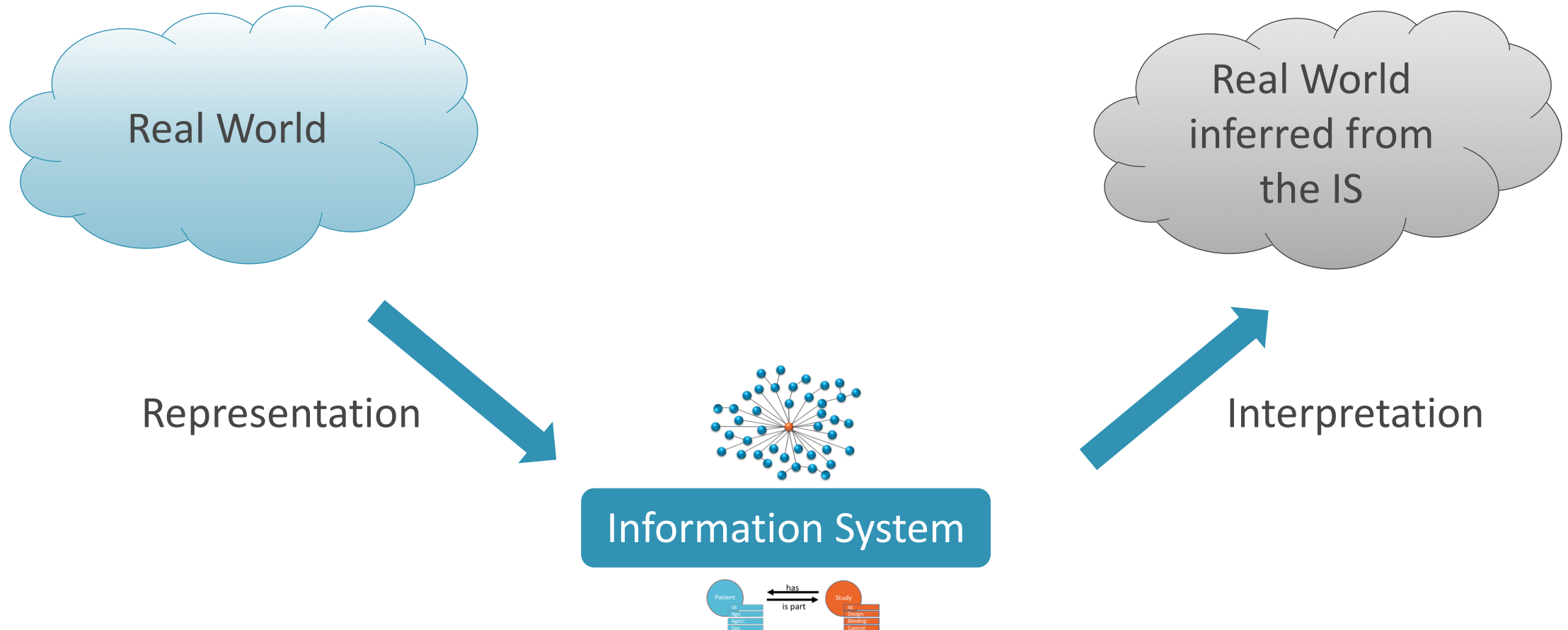
free flow of information between stakeholders
for the purpose of **informed decision making**



A Changing paradigm - Now



IT Systems as Real World Representation

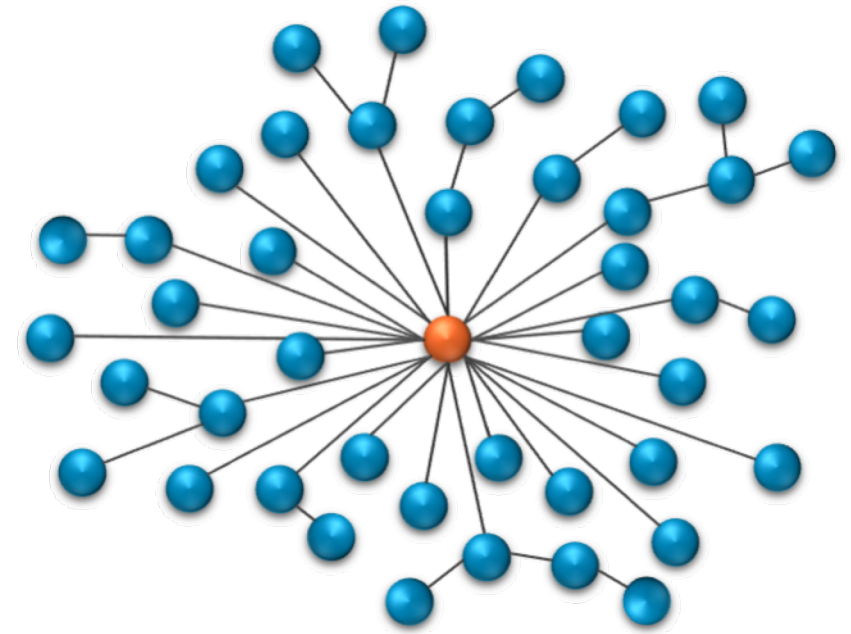


Ontology-based Information Model

Structured representation of a knowledge domain, describing its entities, events and processes and their relationships

Benefits

- To share **common understanding** of the structure of information among people or software agents
- To enable **reuse** of domain knowledge
- To make domain assumptions **explicit**
- To **analyse** domain knowledge



Key Elements of an Ontology-based Information Model

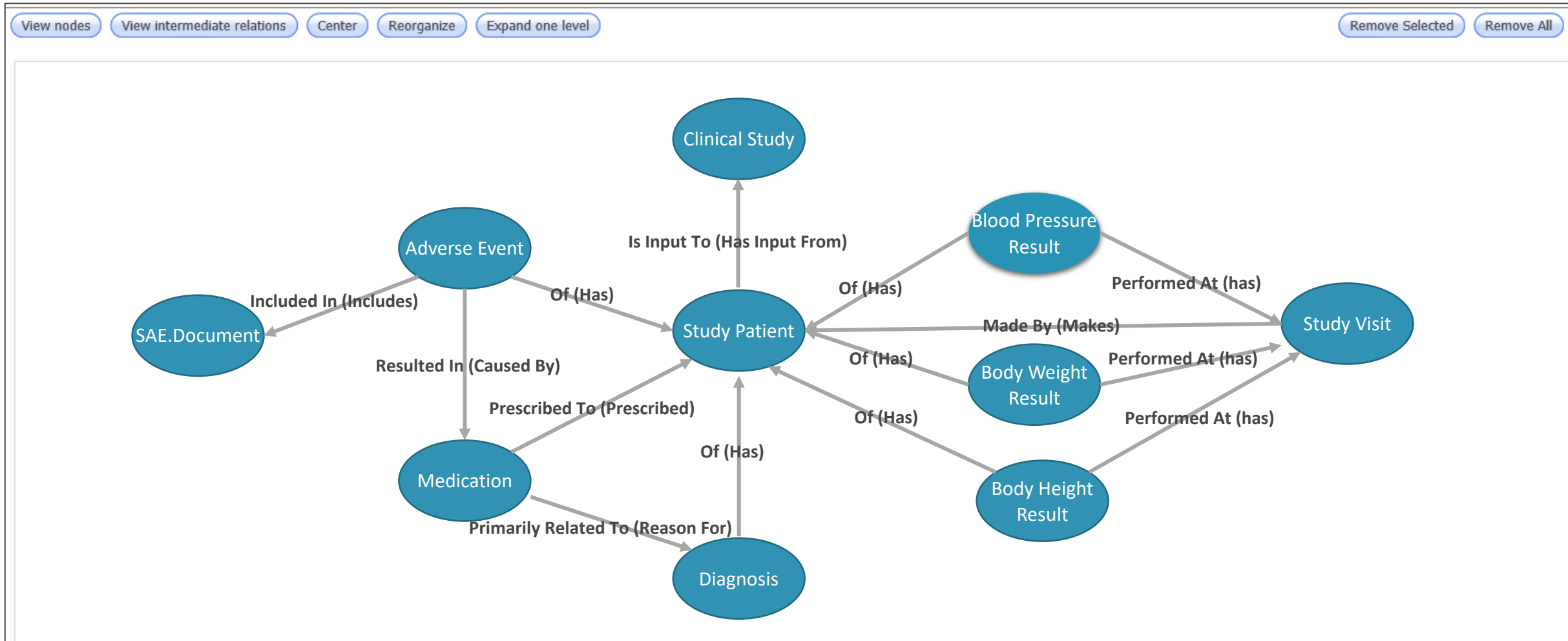
- Concerned with the things themselves
(Generalisation of individual instances)
- Based on a taxonomy
 - hierarchy of things
 - Relationships between things in general
- Underpinned by a terminology (structure and content)

Ontologies in Life Sciences

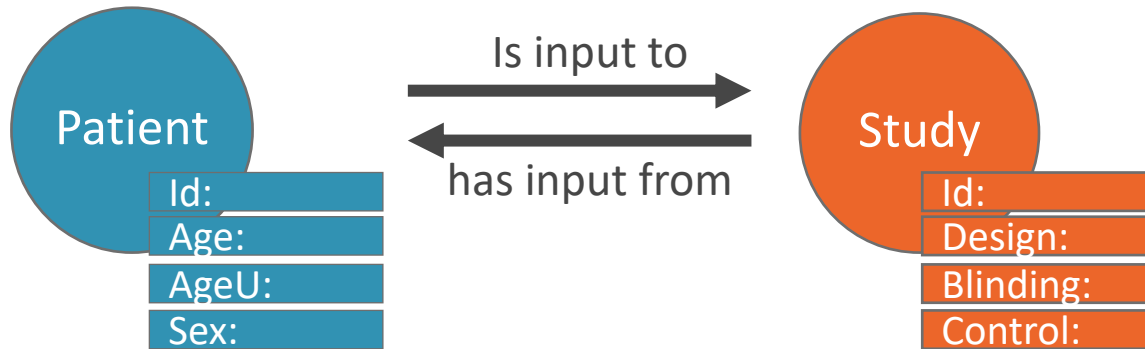
- Snomed CT
 - ICD-09/10
 - MedDRA
- } — Terminologies – Code lists

Concerned with the meaning of labels rather than the entity the labels are describing

Real World Information Modelling



Holons



- A concept that can be interpreted by itself
- Classified according to content
- Contains information
 - Fields, groups and attributes
- Contains relations to other Holons
- Each relation has a specific meaning

Header

```
<o
  holonType= "Body Weight.Results"
  holonConcept="Body Weight"
  dimension="Data"
  domain="616.0754—dc23"
  ontology="(G5.24.1.0).ClinSci.ontology@capish.se"
  usage="Data"
>
<k>
<f>Body Weight.Results Key<v>BodyWeightKey...</v></f>
</k>
```

Message

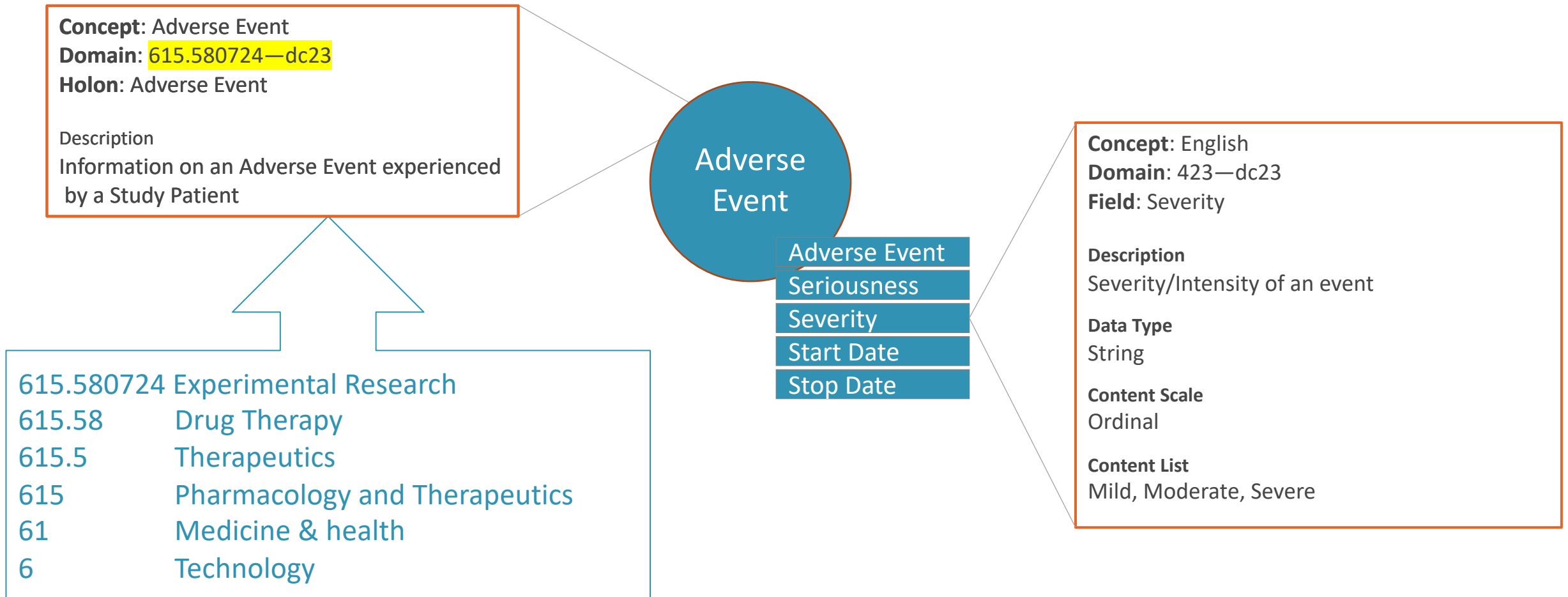
```
<f>Date<v standard="ISO 8610" type="dateTime">2010-01-05</v></f>
<f>Body Weight<v unit="kg">68</v></f>
<f>Body Weight.Original<v unit="pounds">150</v></f>
```

Relation

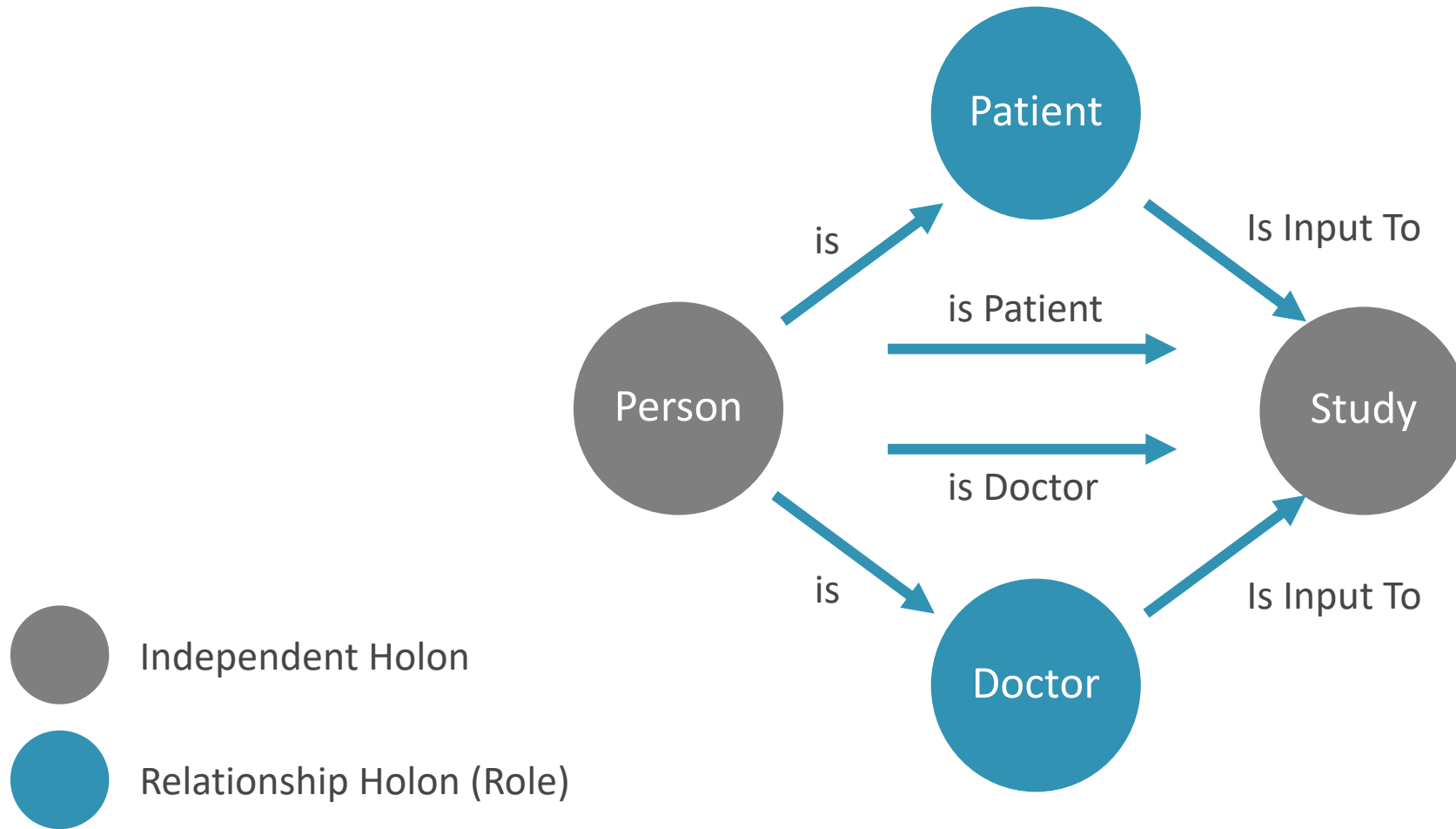
```
<r
  reverse="Has" dimension="Data" holonType="Patient">
Of
<f>Patient Key<v>PatientKey...</v></f>
<r/>

</o>
```

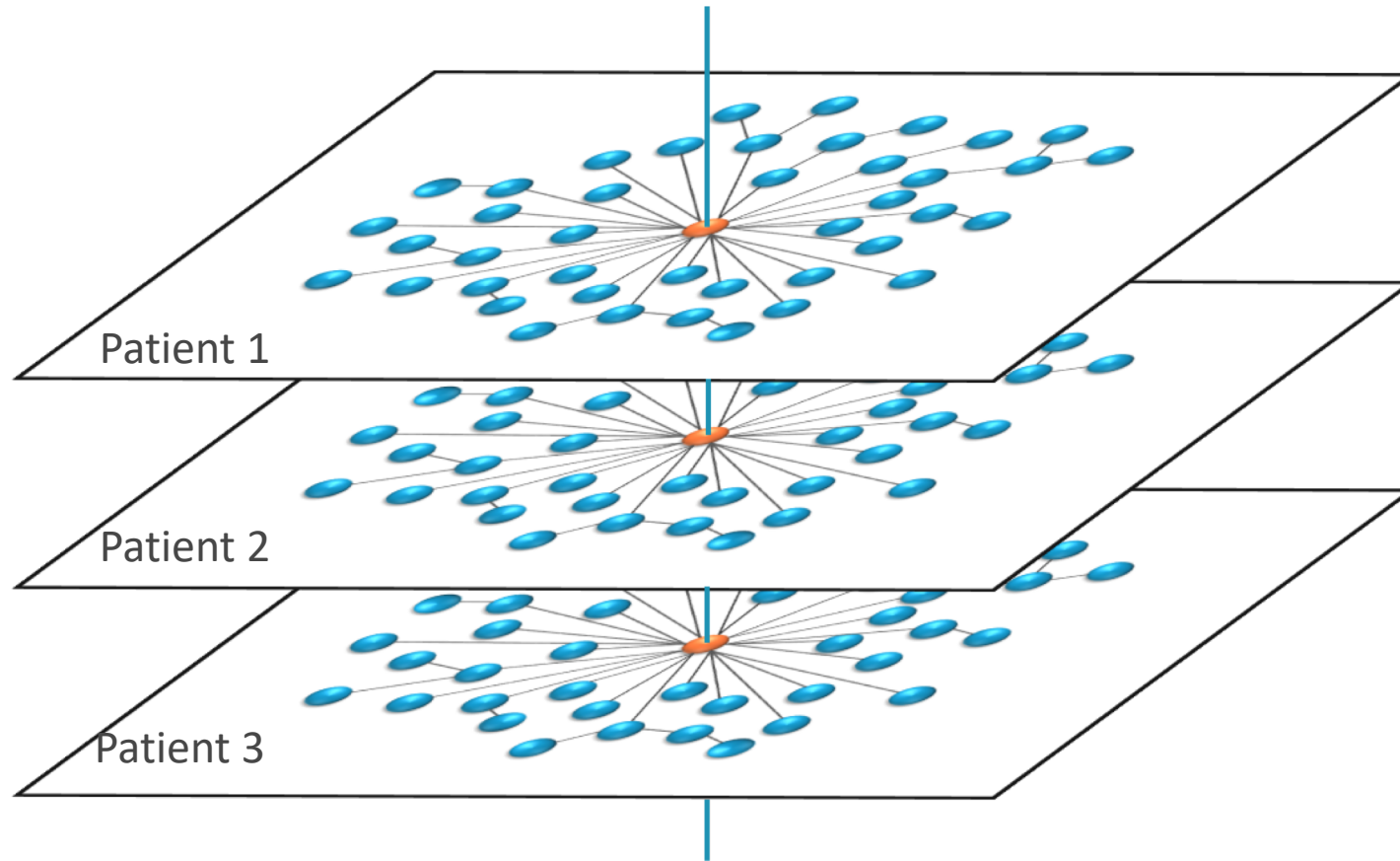
Holons – Data and Metadata



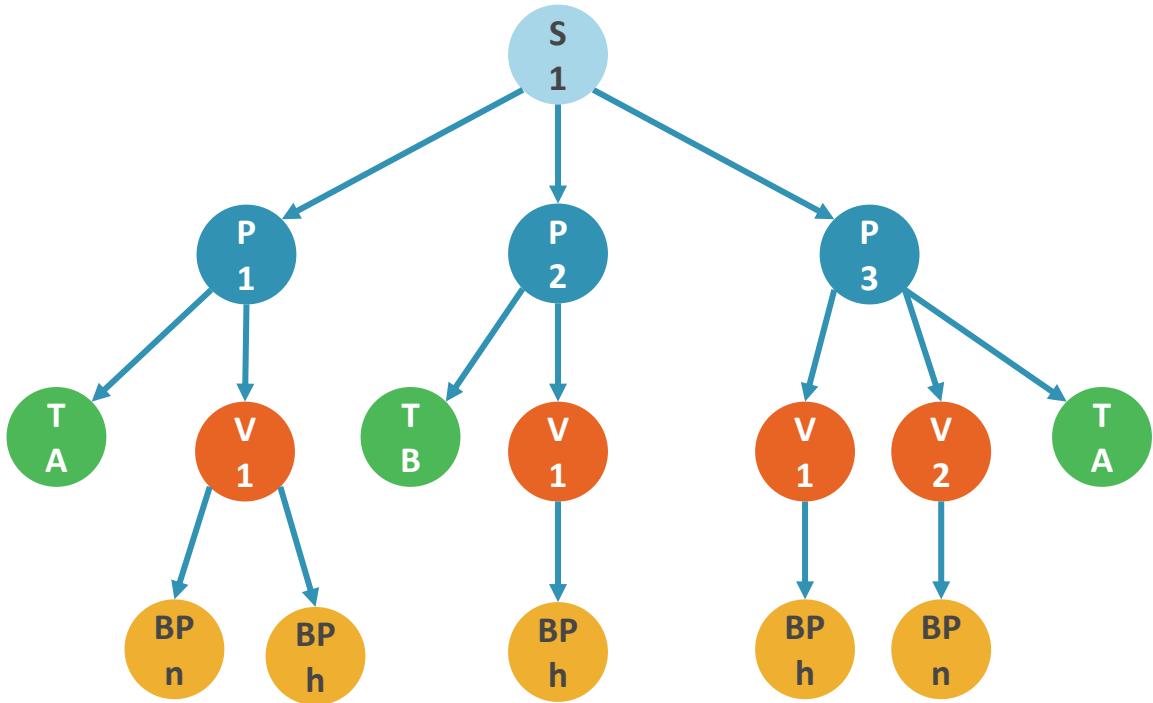
A word on relationships



Ontology vs Instances



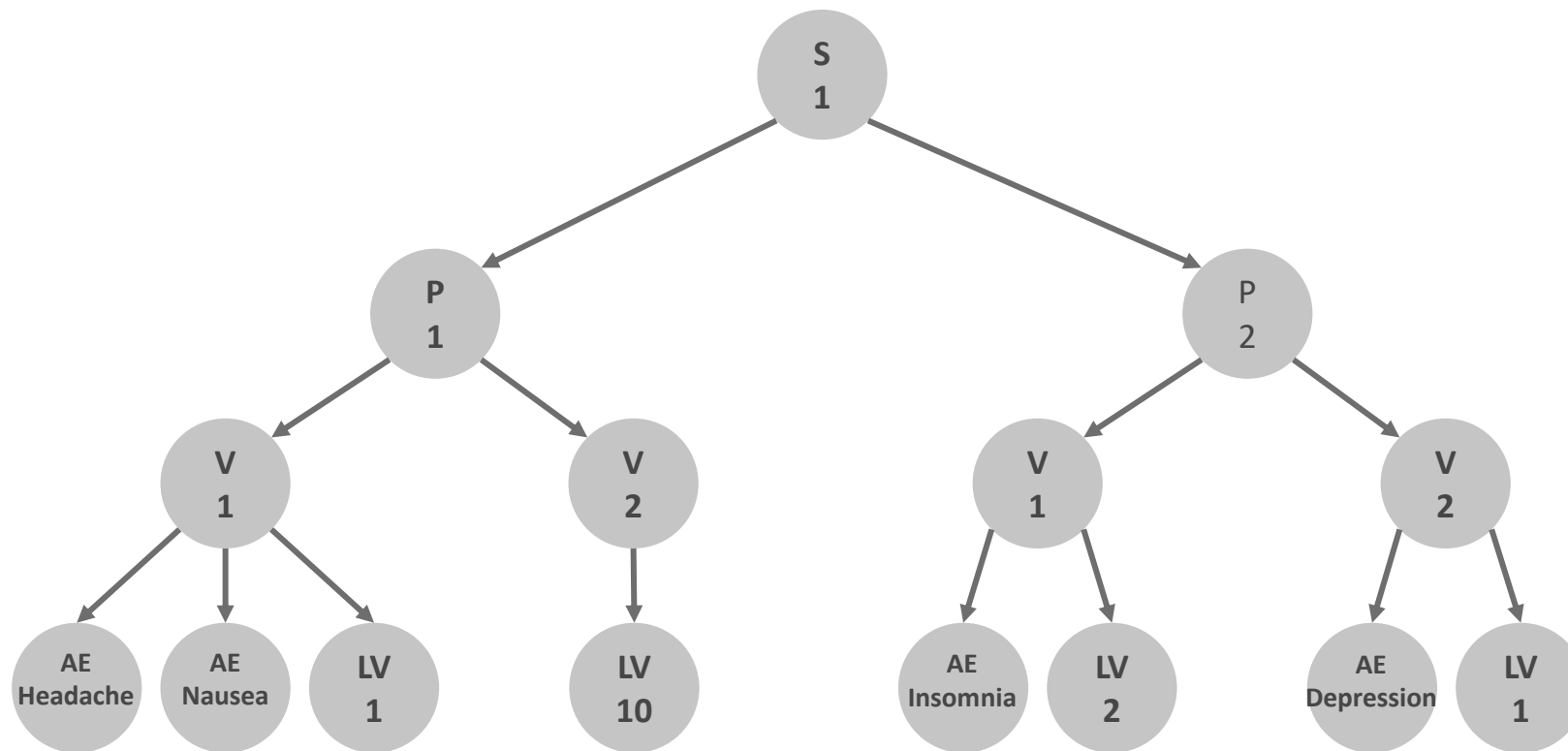
Graph Database Implementation



- individual nodes (identity index)
- node types (node type identity index)
- property values (property index)
- existence of indirect relationships (relation index)

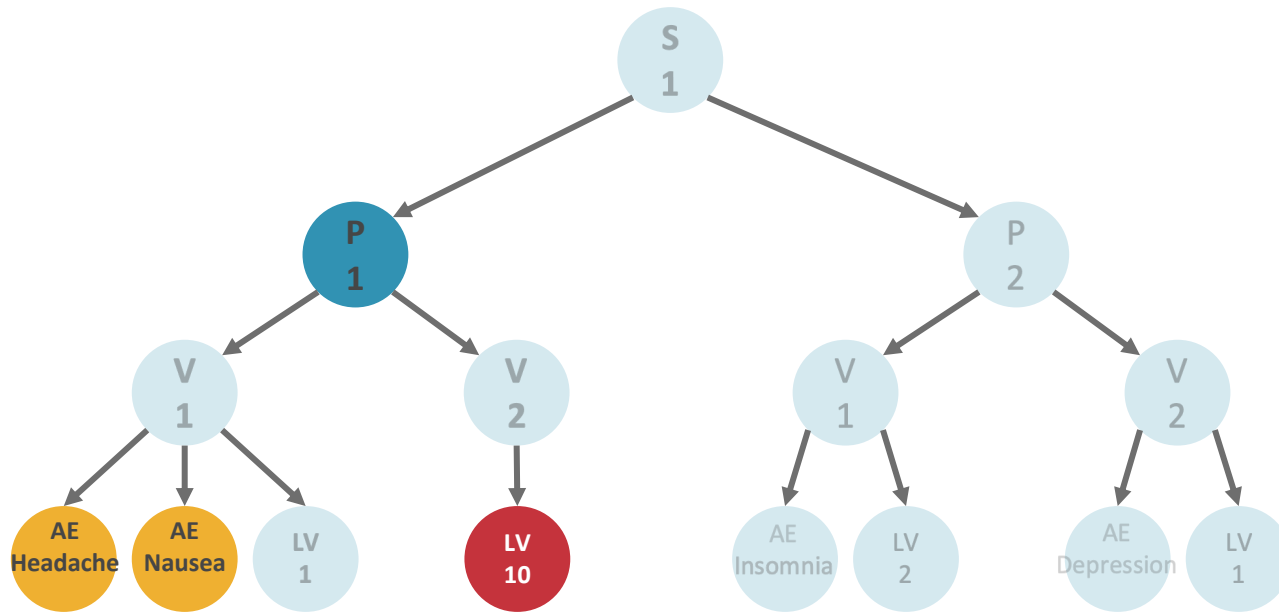
Graph Database Query

What adverse events have been reported for patients with elevated liver values



Graph database query

What adverse events have been reported for patients with elevated liver values



Select data:

Type of Node: "Patient"

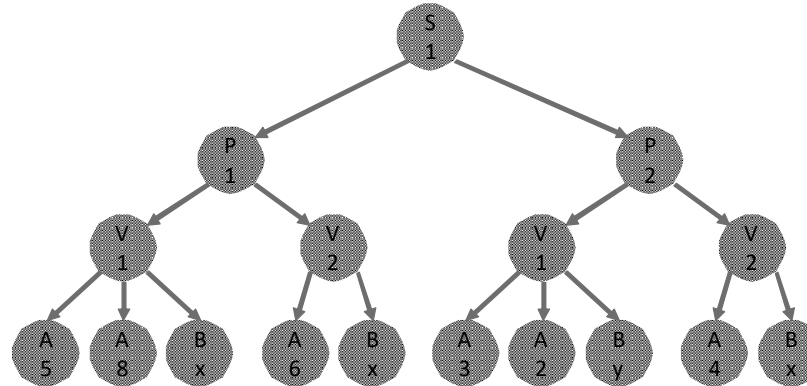
With (Type of Node: "Liver Value", Property: "Value > 5")

Fetch:

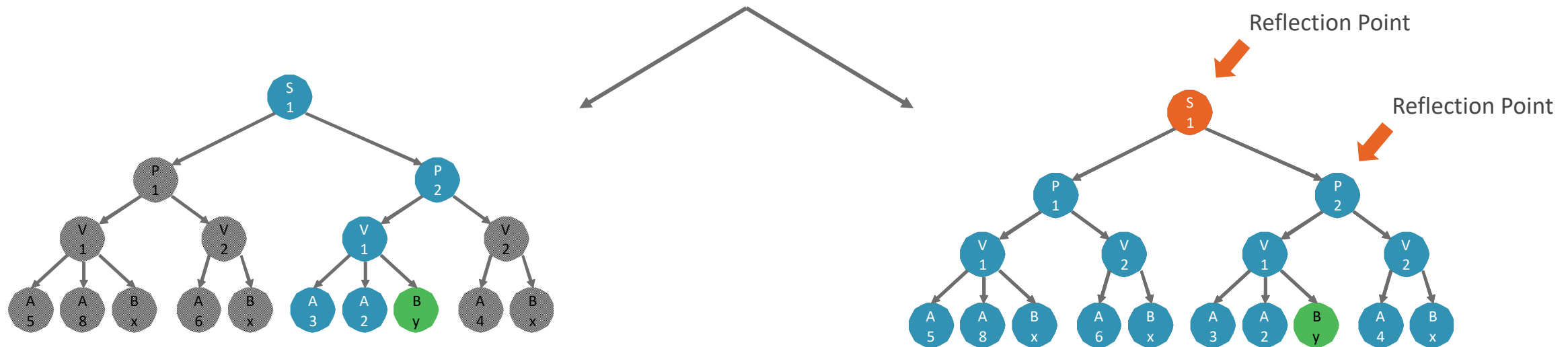
Type of Node: "Adverse Event", property: "Name"

Reflect your data – Building cohorts easily

Without
Reflection

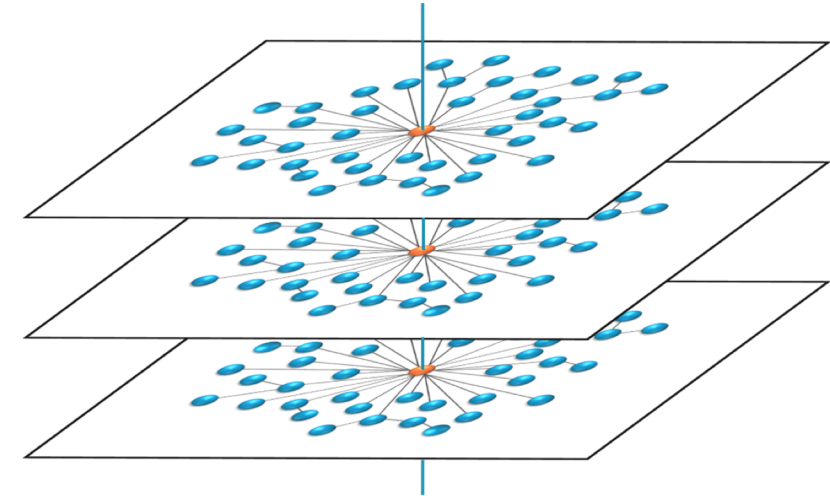


With
Reflection



Conclusions

- Ontologies provide a framework that enables a realistic representation of data and its context
- Ontological entities and relationships can be represented in object based graph databases
- Ontologies allow for data and metadata to be kept together
- Ontology based information models with focus on nodes enable better data structures and search capabilities





Thank you

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