

Graph Data Representation – the FAIRest of Them All

Dr Peter Tormay

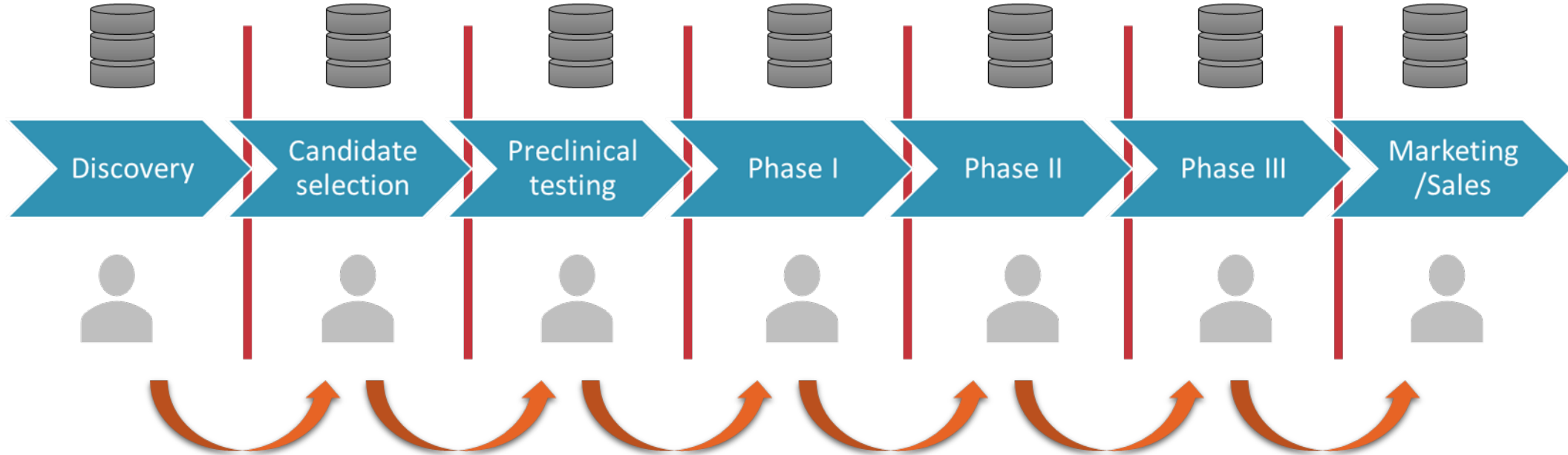
Eva Kelty

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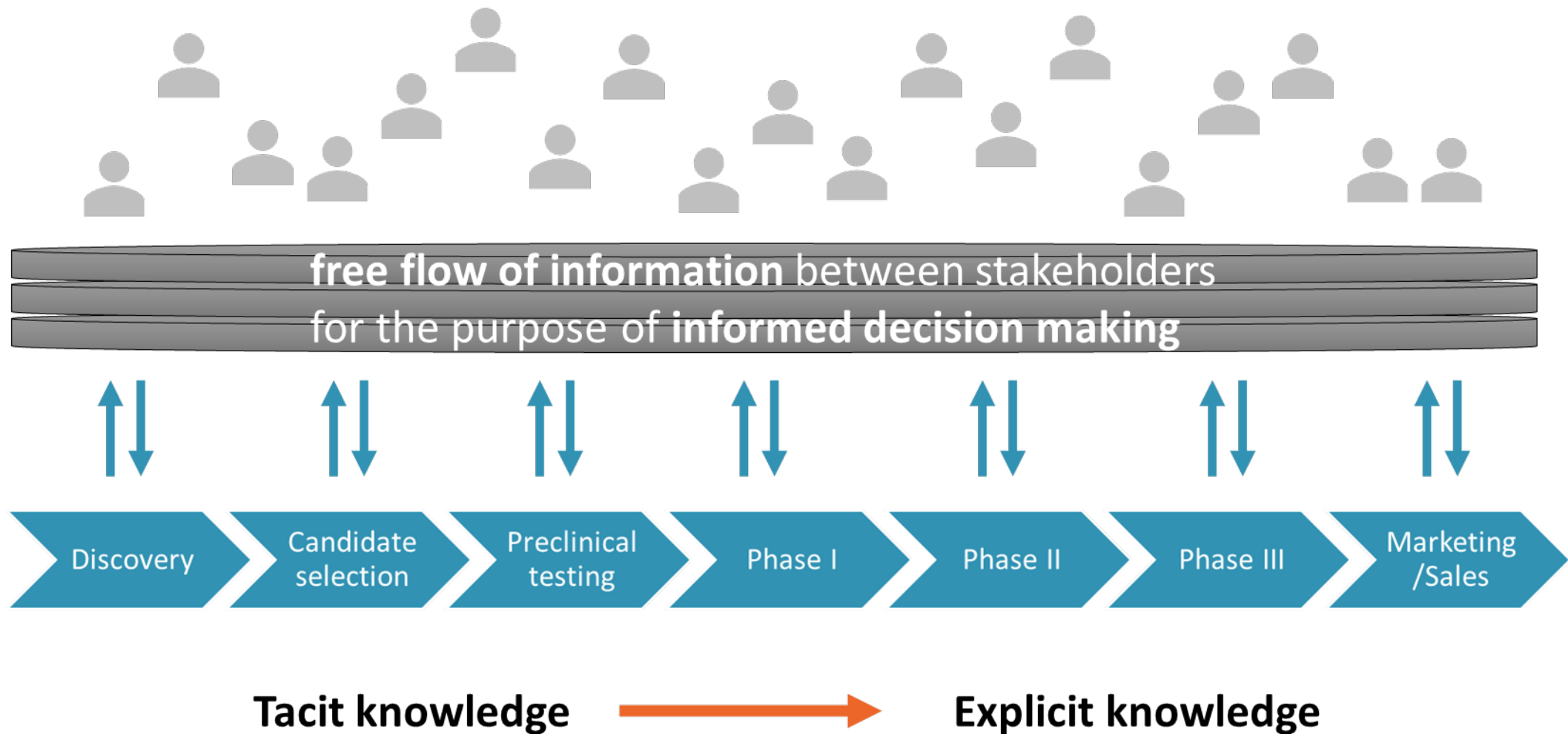
DS1

A Changing Paradigm

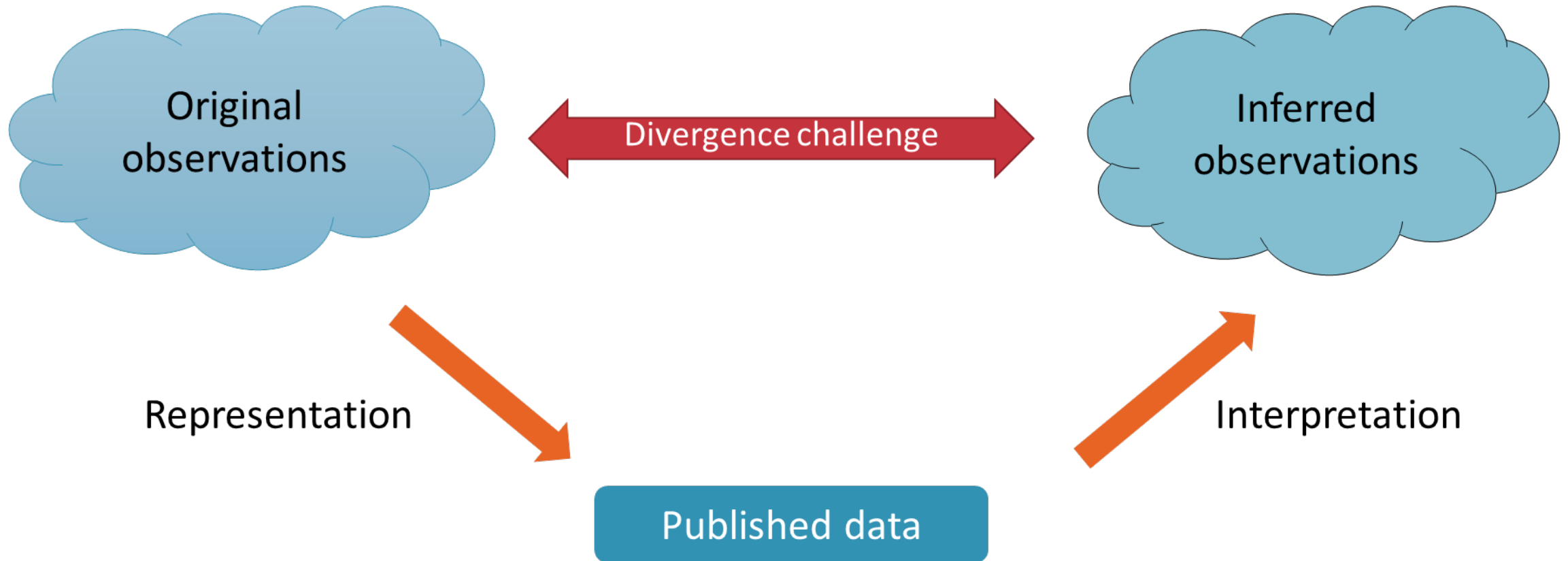
free flow of information between stakeholders
for the purpose of **informed decision making**



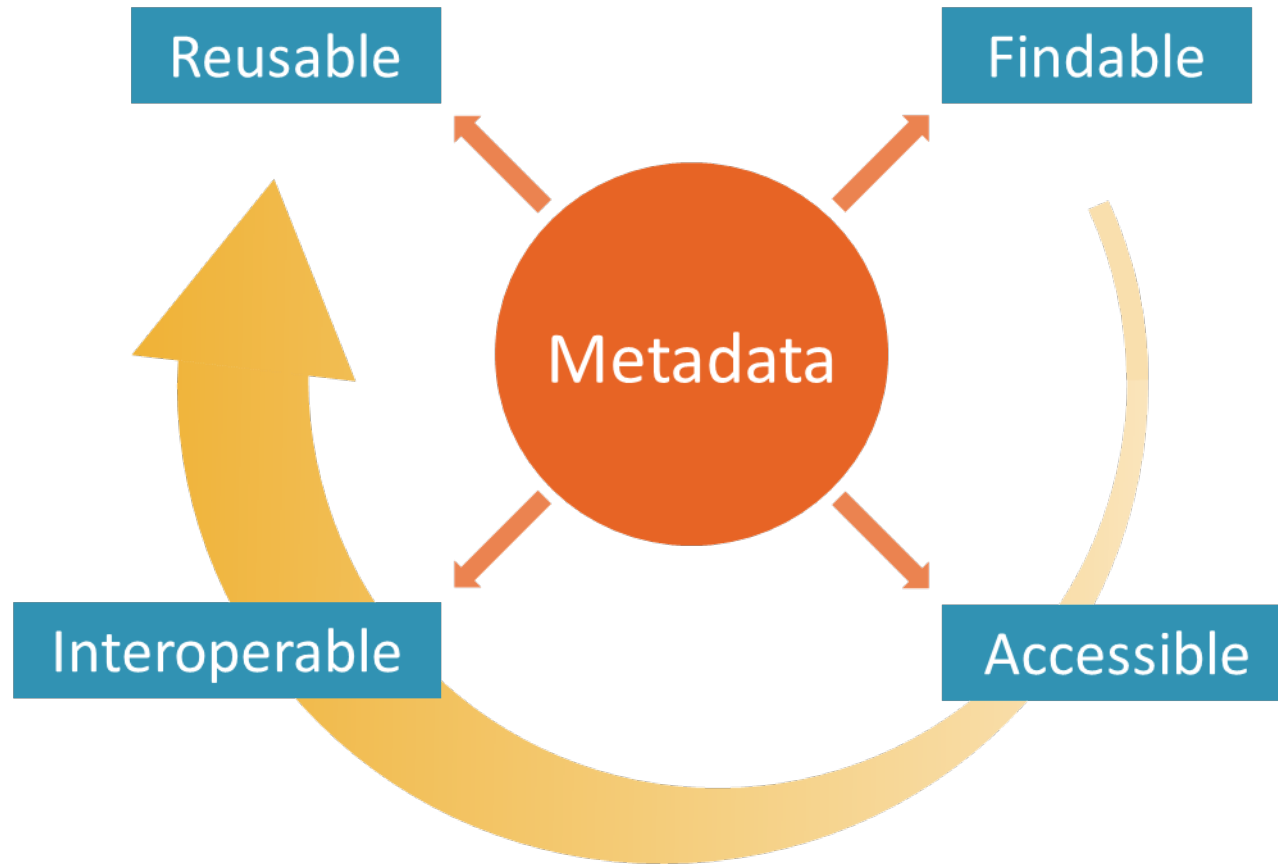
A Changing Paradigm



Reuse of Data

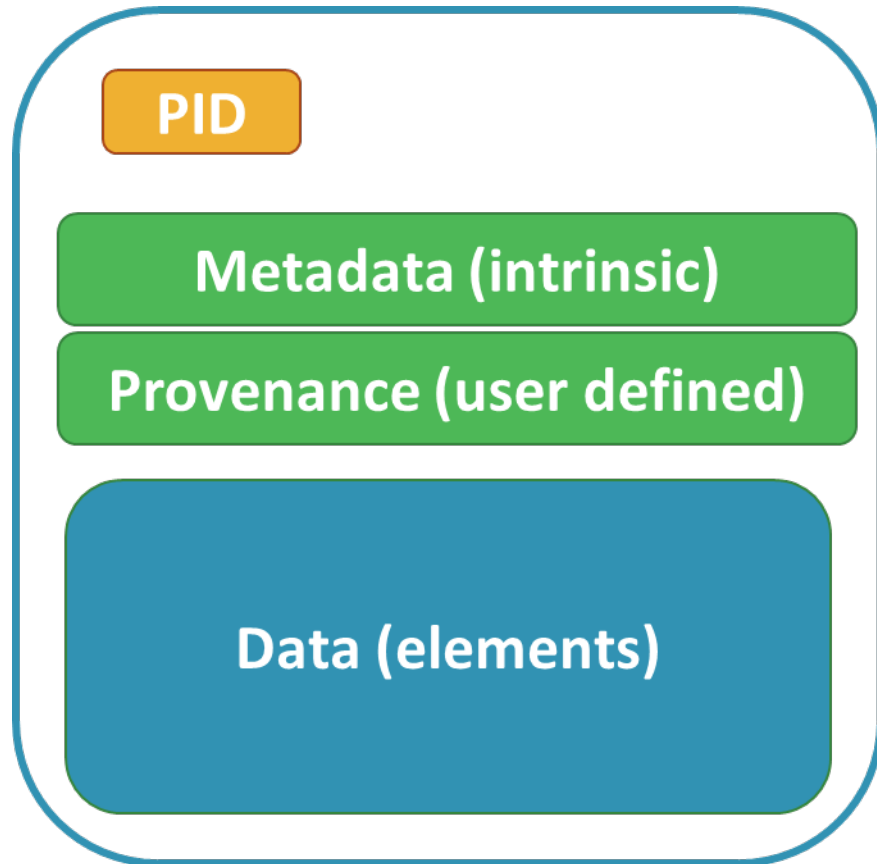


FAIR Data Principles



- Meant for humans and machines
- Not a specification => no information on technical implementation

Concepts and Data Objects



Concept = Unit of thought

Mental representation of a physical entity

e.g.

- Concept of a bridge
- Concept of a study patient

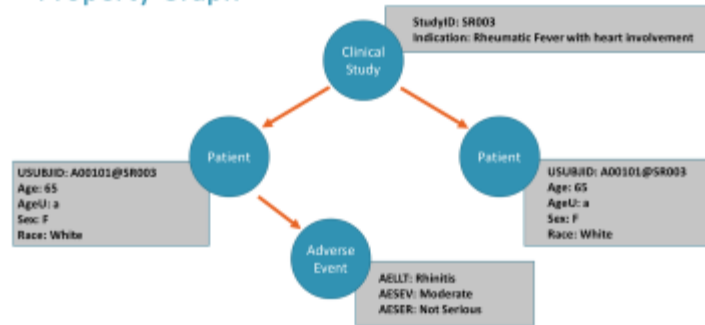
From Relational to Graph Data Representation

Relational Database

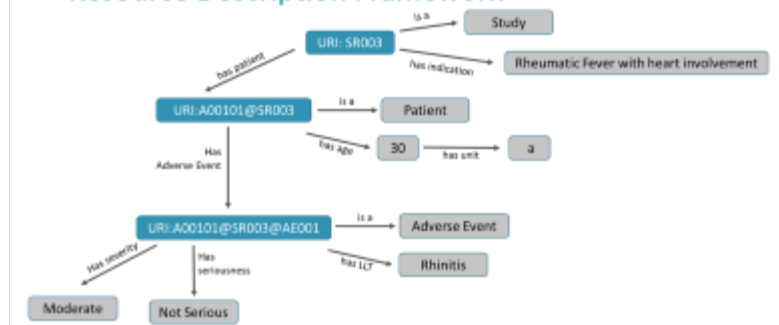
Patient						Study	
USUBID	STUDYID	AGE	AGEU	SEX	RACE	STUDYID	Indication
A00101@SR003	SR003	65	a	F	White	SR003	Rheumatic fever with heart involvement
A00101@SR003	SR003	70	a	M	Black	SR004	Rheumatic fever with heart involvement
A00101@SR004	SR004	80	a	M	Asian		
A00102@SR004	SR004	80	a	M	White		

Adverse Event			
USUBID	AEILL	AESEV	AESEV
A00101@SR003	Rhinitis	Moderate	Not Serious
A00101@SR003	Pyrexia	Moderate	Not Serious

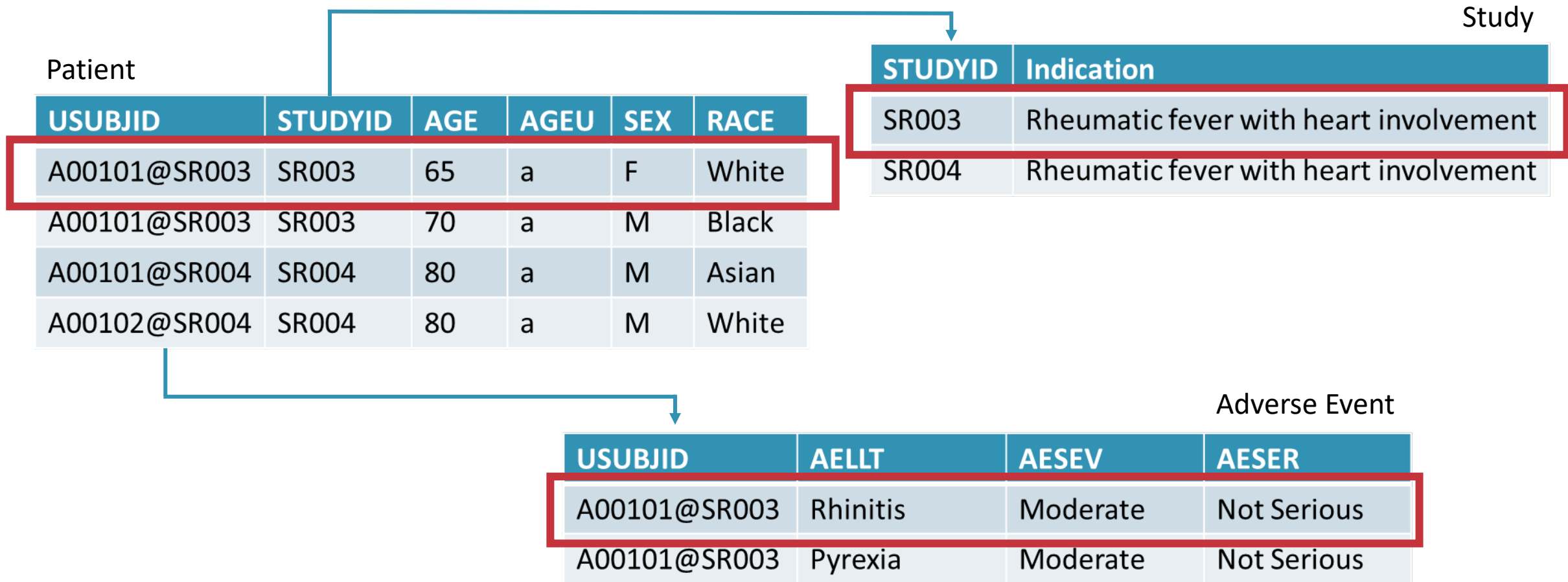
Property Graph



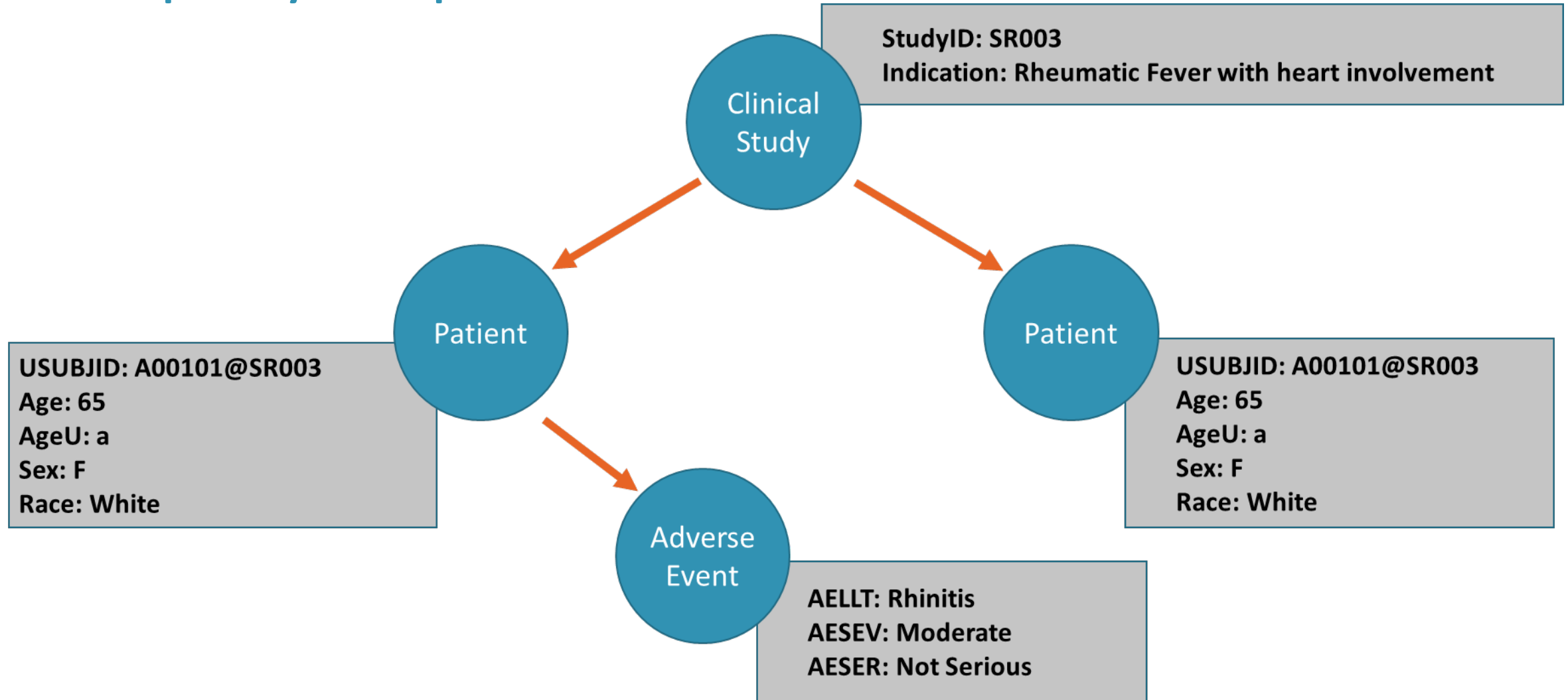
Resource Description Framework



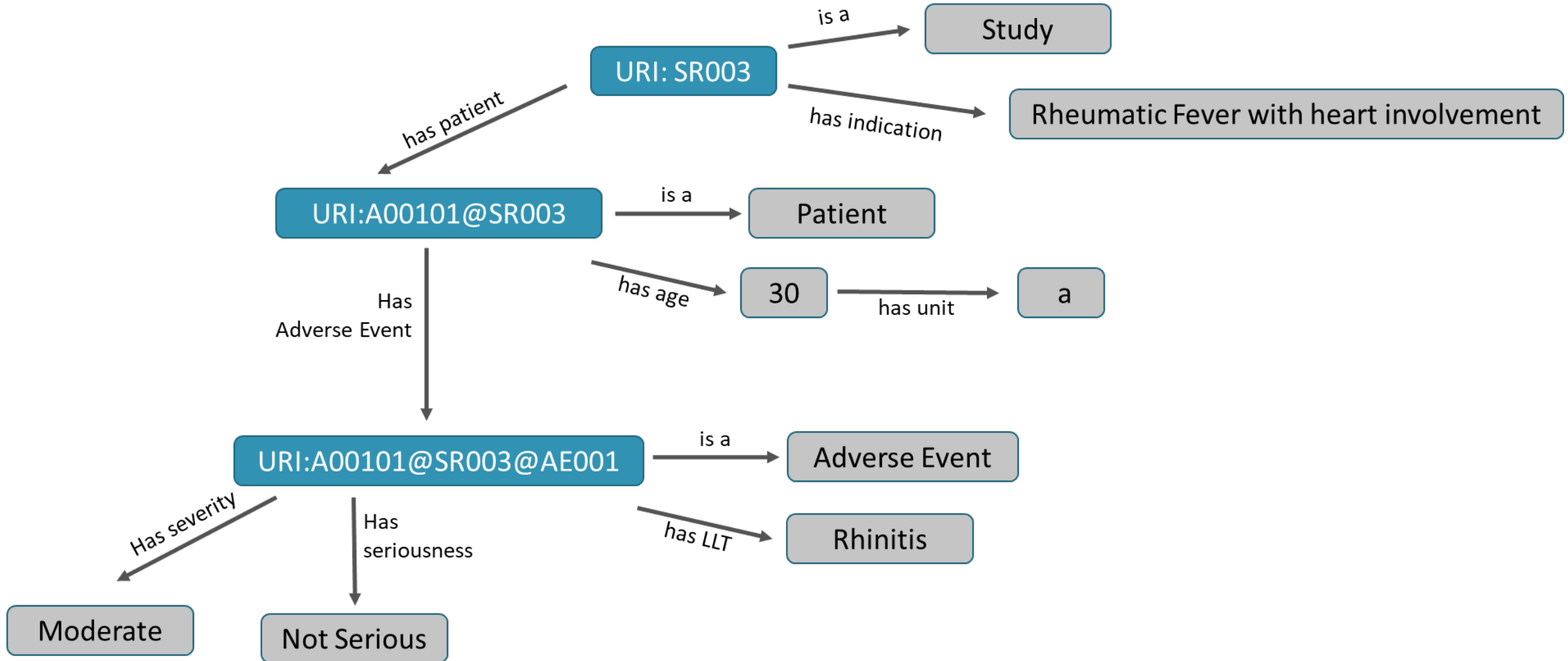
Relational Database



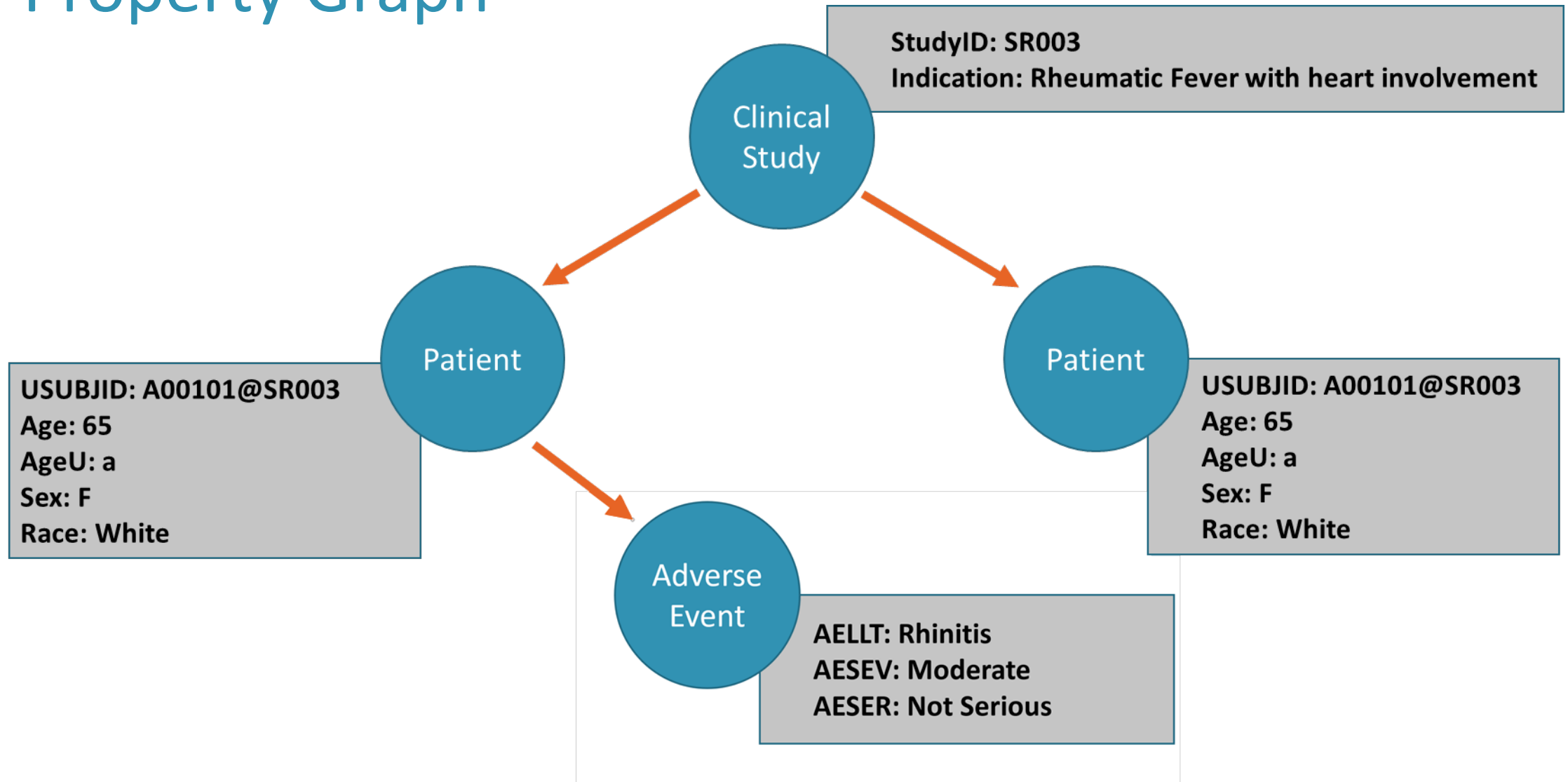
Property Graph



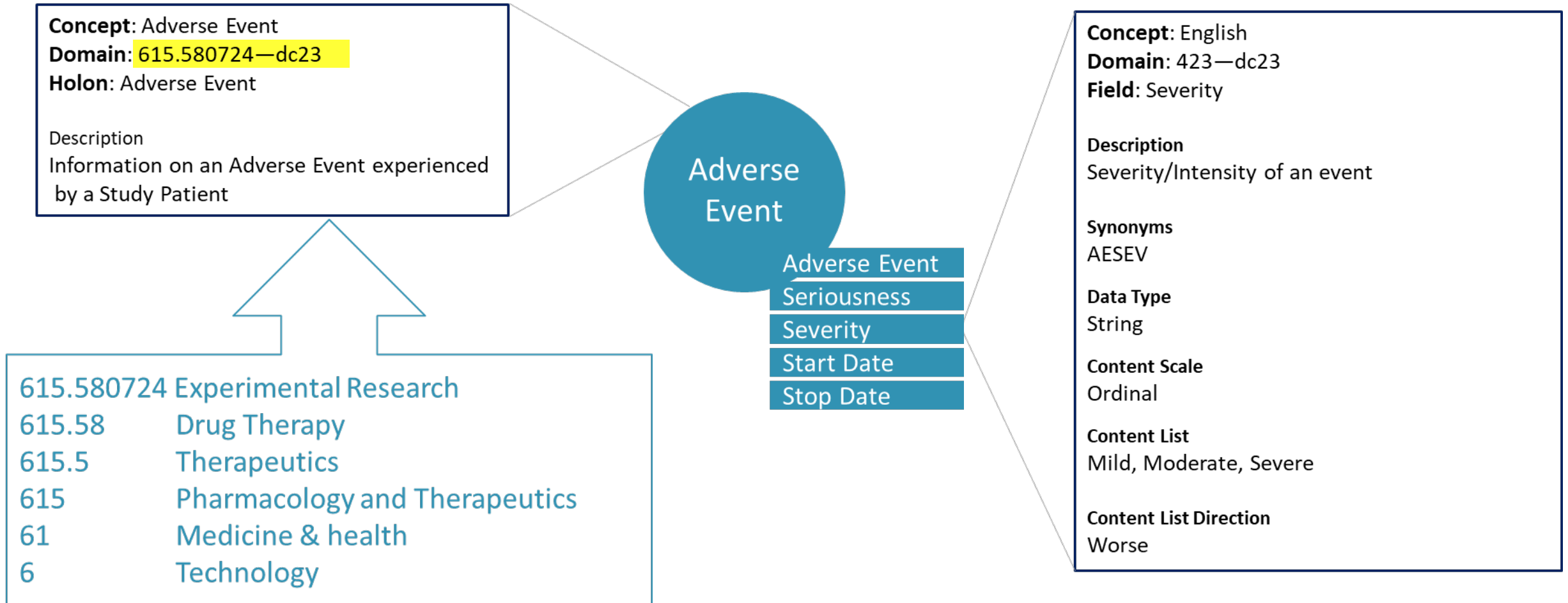
Resource Description Framework



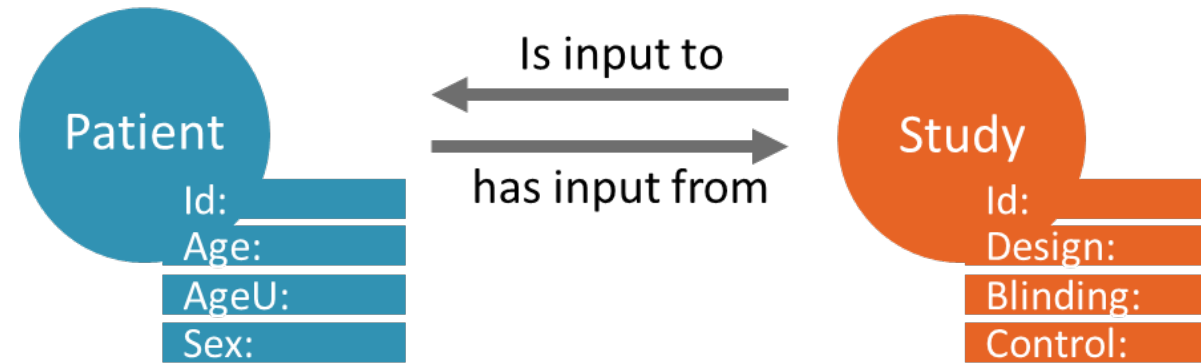
Property Graph



Holons – Data and Metadata



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 in the real world

Information 

AE – Severity

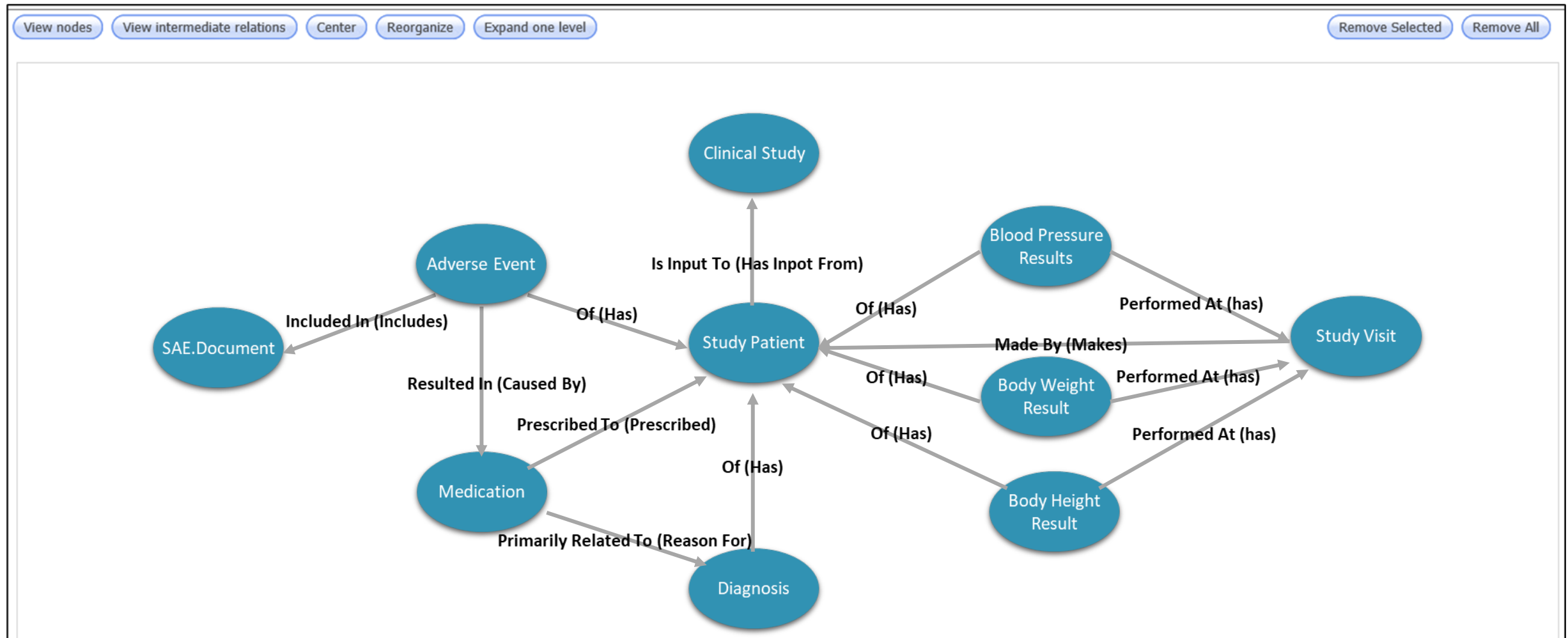
--- Field Information ---

Field Name: Severity
Description: Severity/Intensity of an event
Content: list: Mild; Moderate; Severe
Data Type: String
Content Scale: Ordinal
Concept: English
Domain: 423--dc23
Domain Specification: 423 Dictionaries of standard English

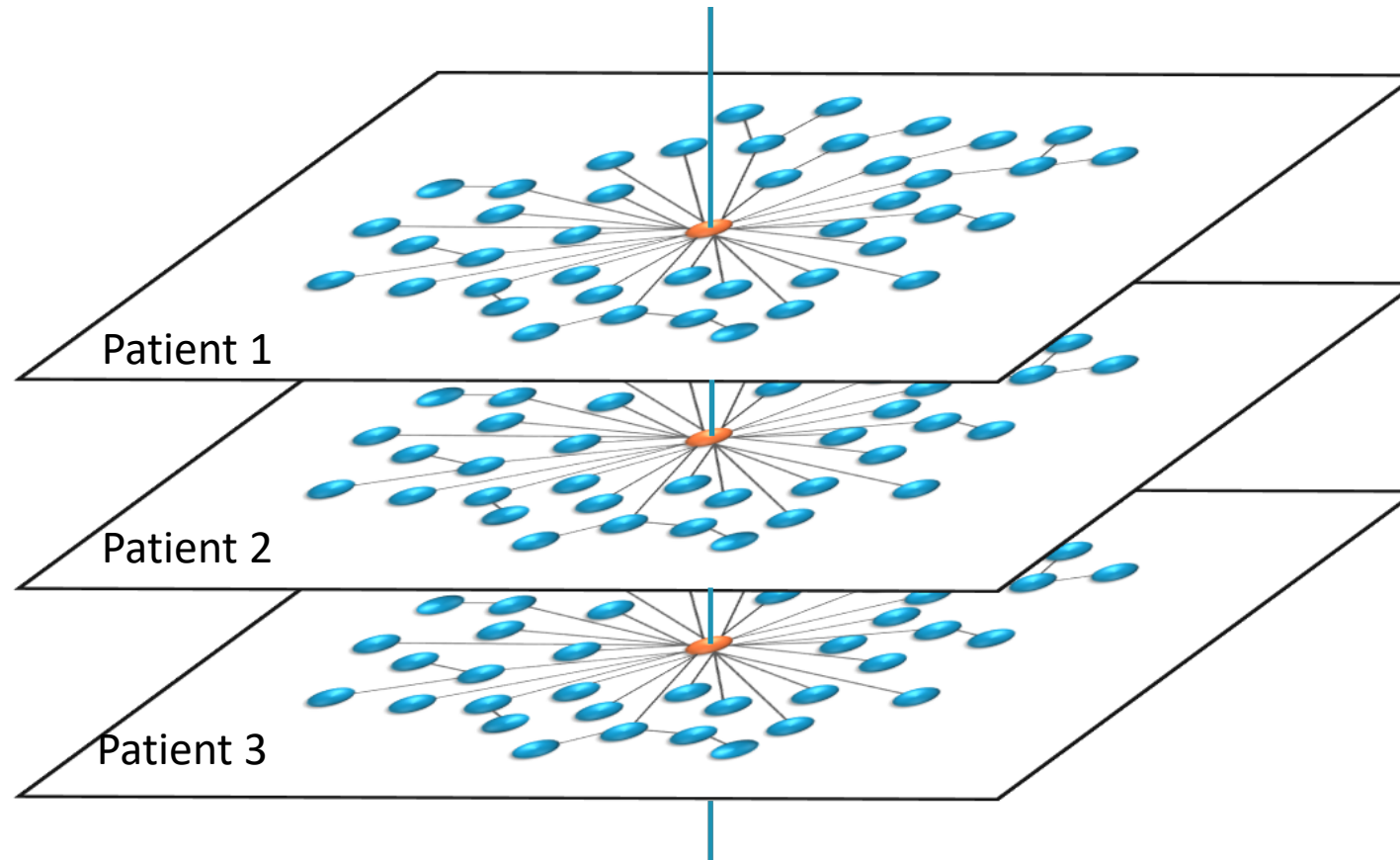
--- Holon Information ---

Holon Type: Adverse Event
Holon Concept: Adverse Event
Holon Domain: 615.580724--dc23
Holon Domain Specification: 0724 Experimental research & 615.58 Drug therapy

Ontological data model – intuitive modelling

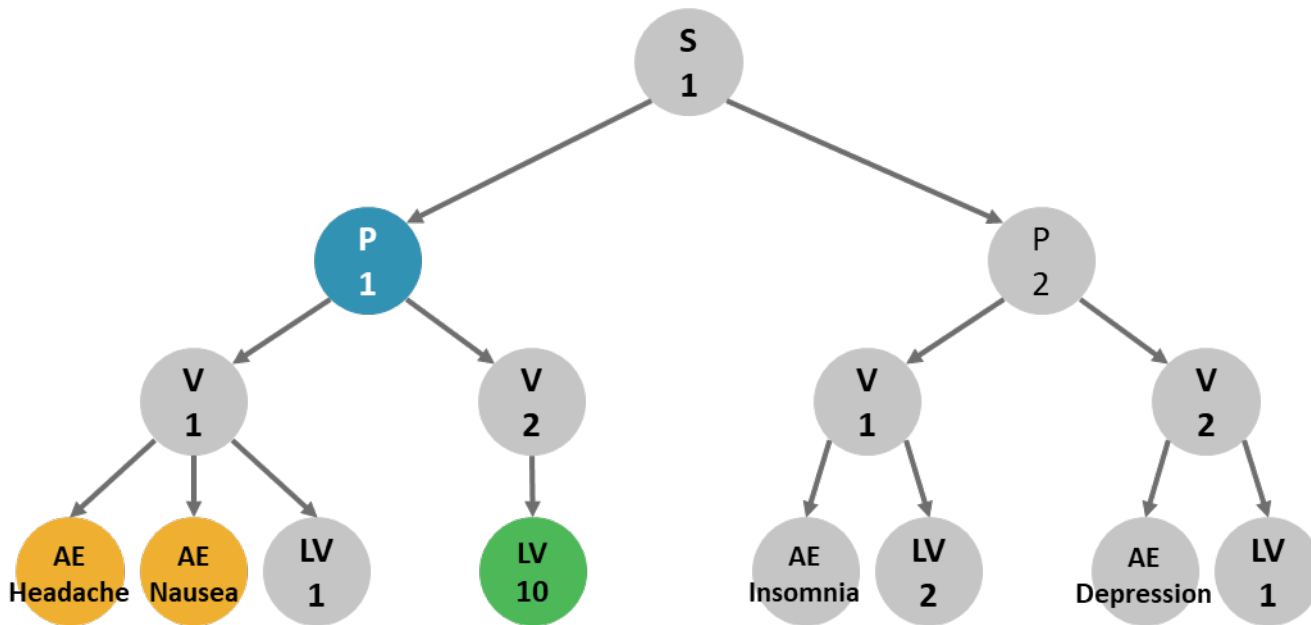


Ontology vs Instances



Graph Database Query

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



Select data:

Type of Node: "Patient"

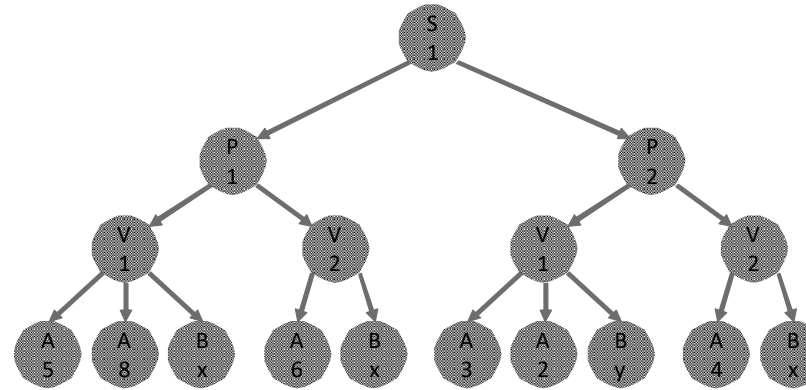
With (Type of Node: "Liver Value", Property: "Value > 5")

Fetch:

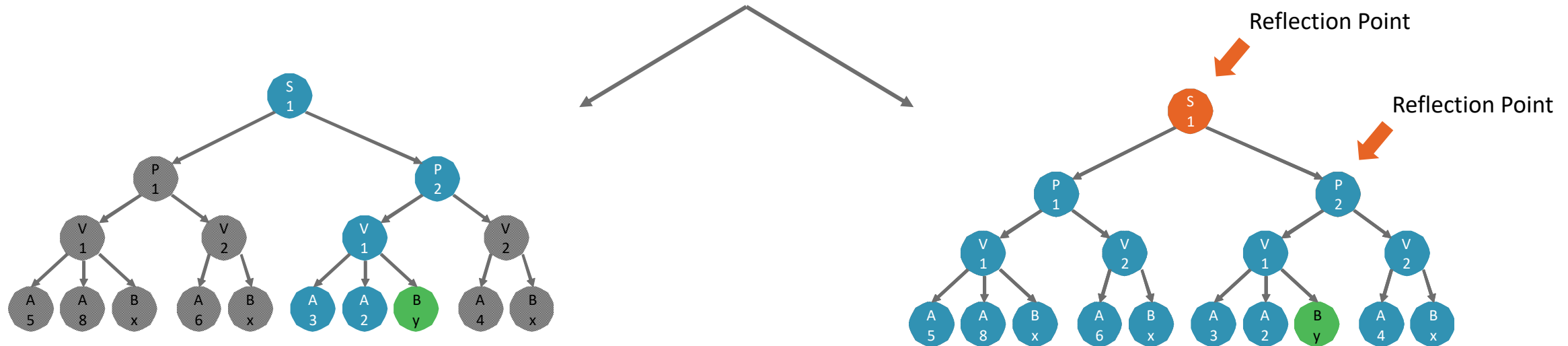
Type of Node: "Adverse Event", property: "Name"

Reflect your Data – Accessing Data Easily

Without
Reflection

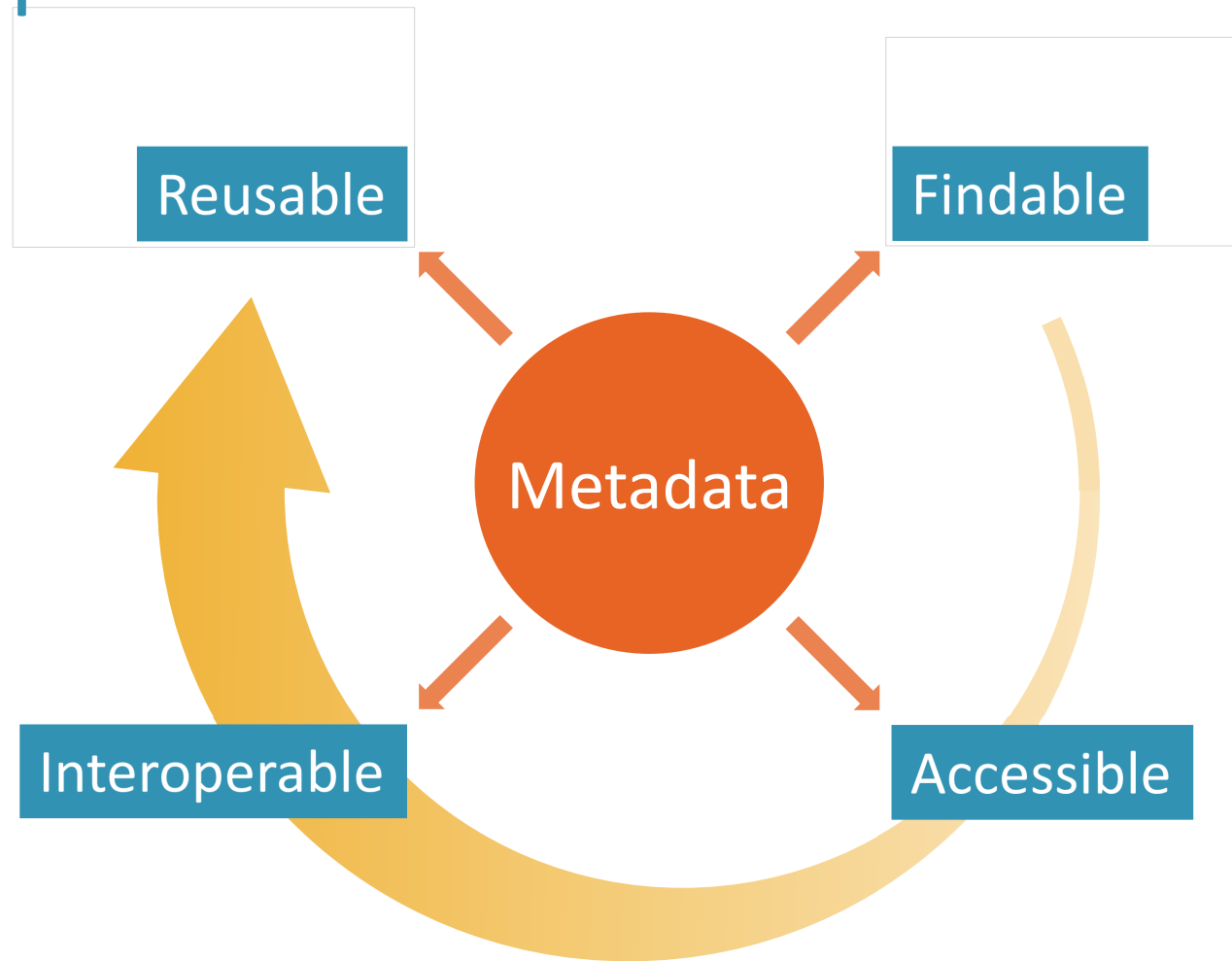


With
Reflection



Querying with Reflective Logic

Summary – Graph Data Representation and FAIR Data Principles



Findable

Property graph databases are organised in data objects (nodes) and relationships (edges) that are uniquely identifiable

Accessible

Graph databases have an internal structure underpinned by an ontological data model providing a formal framework that is de facto self describing

Interoperable

Rich metadata can be stored together with data using terminologies and controlled vocabularies

Reusable

Realistic representation of data and its context allows effective reuse



Thank you

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