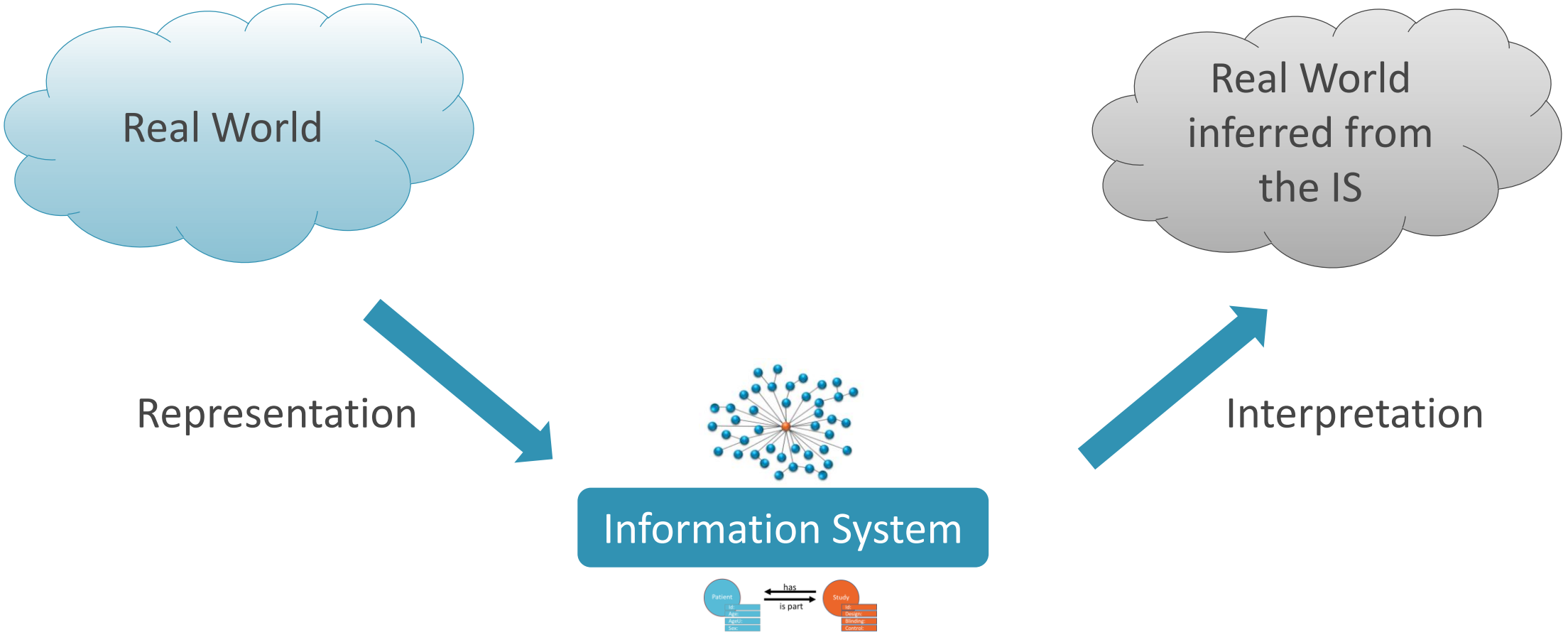
Property graph databases – an alternative to RDF

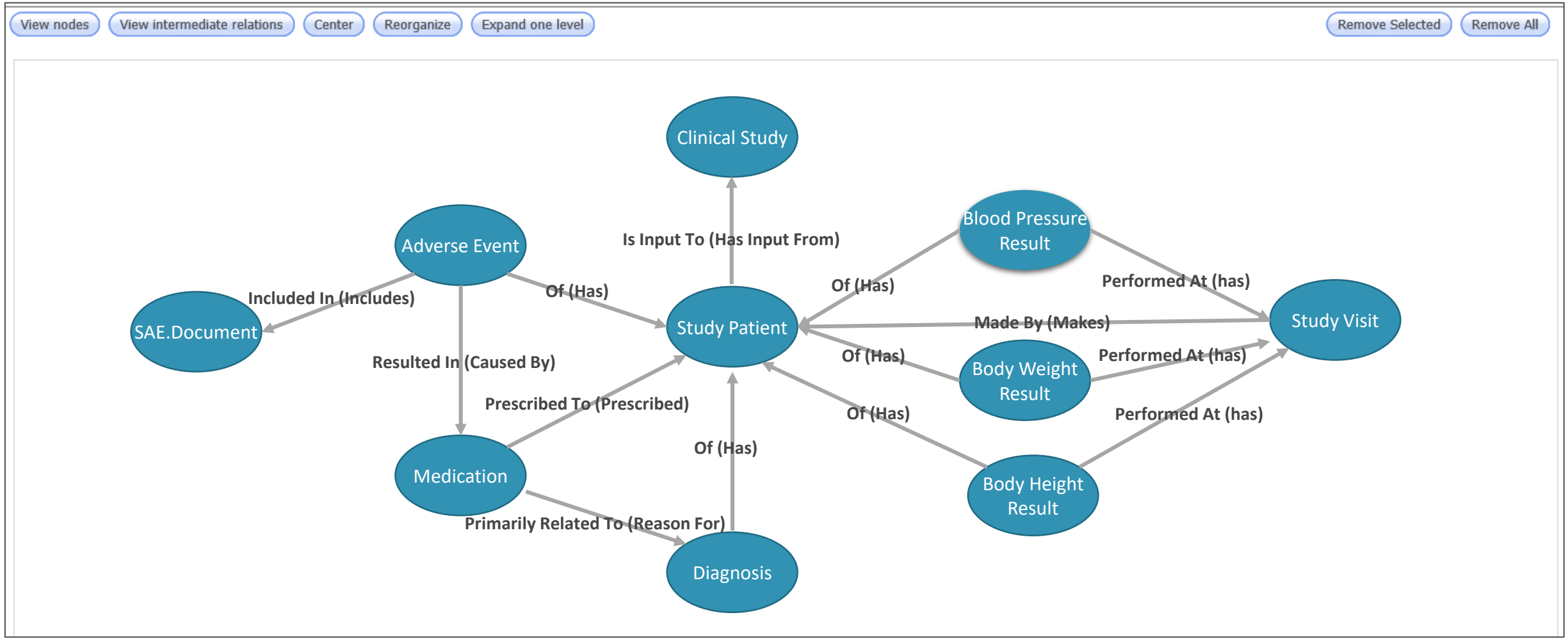
And why we need graph databases in the first place

Capish

IT Systems as Real World Representation



Real World Information Modelling



RDF a short primer - Resource Description Framework

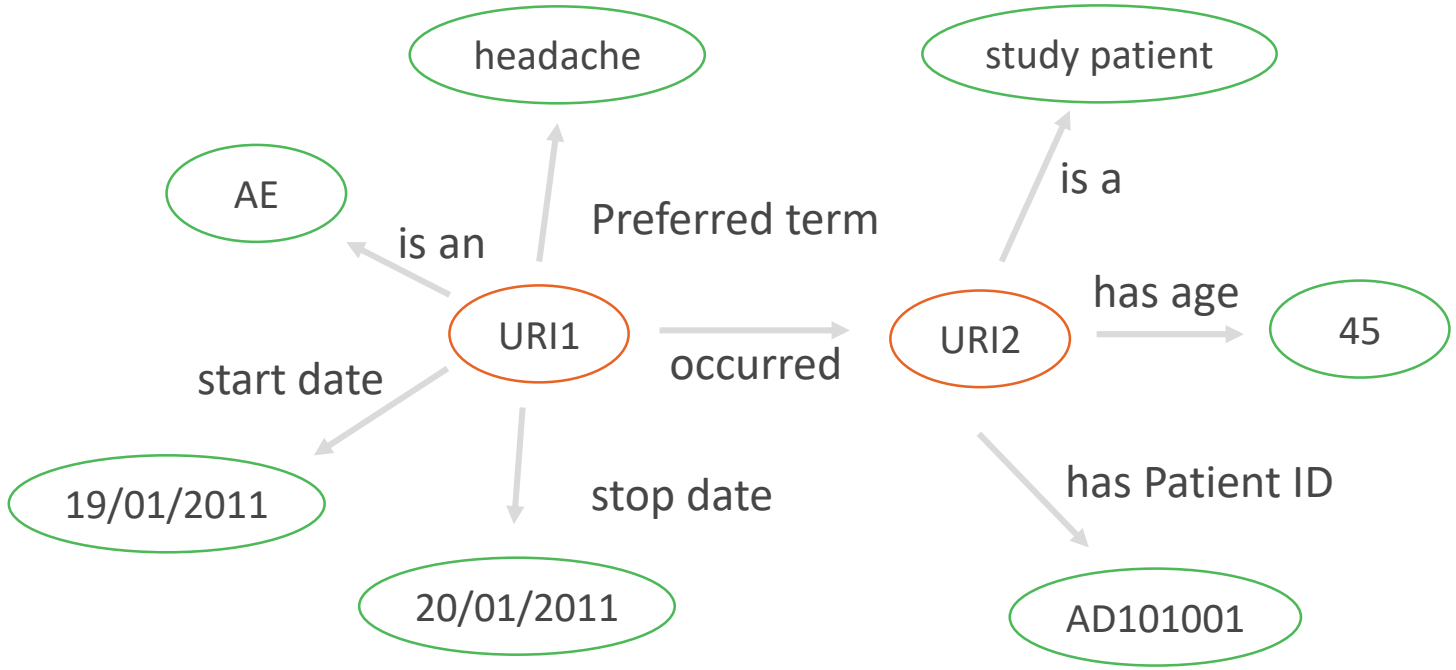
Subject —Predicate→ Object

URI's

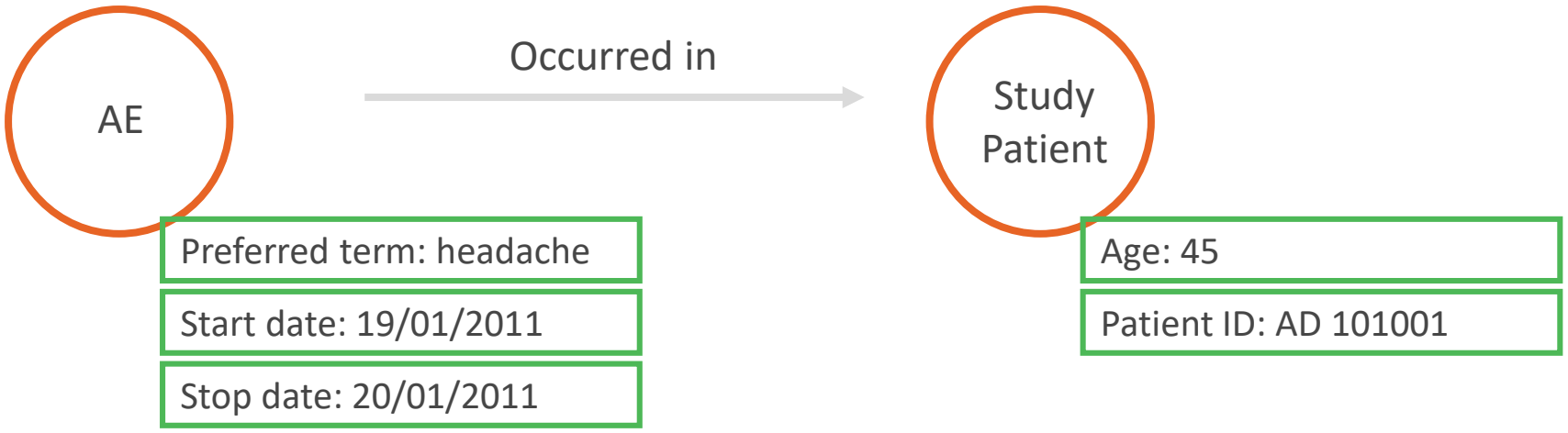
URI's
Literals

URI1: https://exampleCompany.com/clinicaltrialSR00102/uri353675502

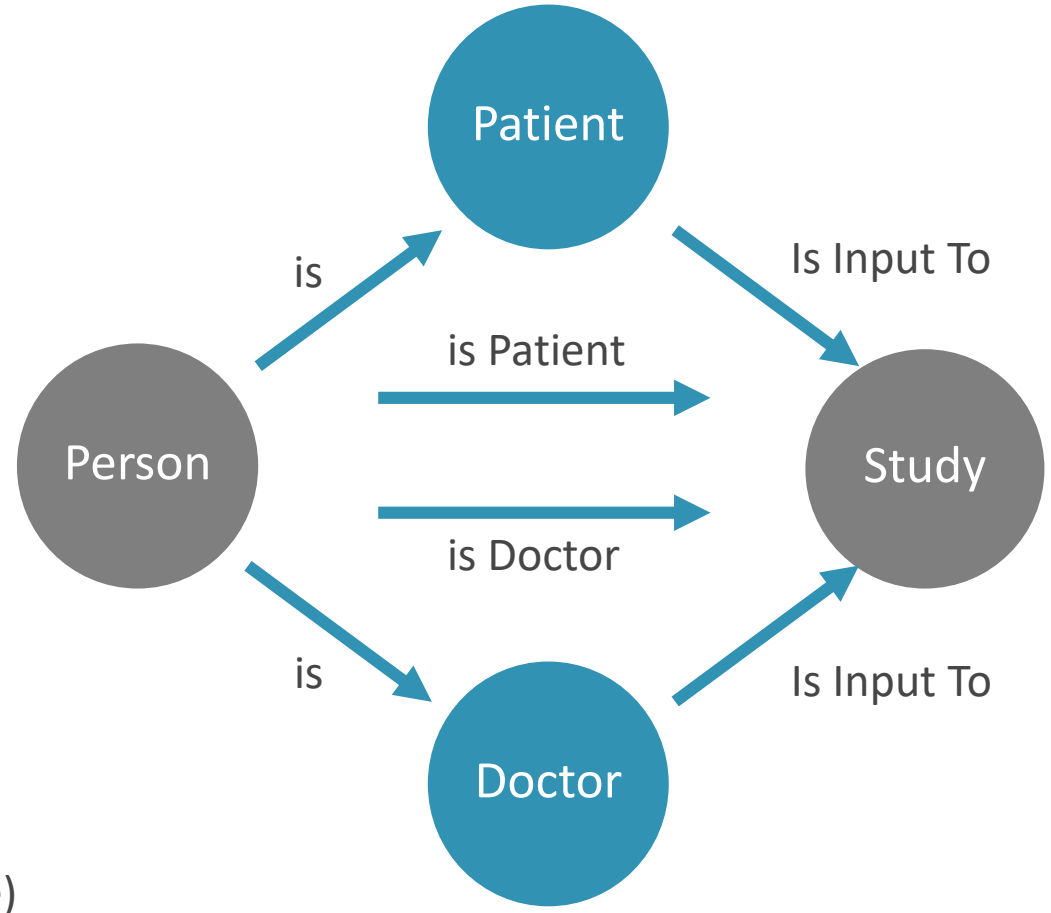
Statements:
URI1 is an Adverse Event
URI1 has preferred term headache
URI1 start date 19/01/2011
URI1 stop date 20/1/2011
URI1 occurred in URI2
URI2 is a study patient
URI2 has age 45
URI2 has Patient ID AD101001



Labelled Property Graph – connected Objects



A word on relationships



Independent object

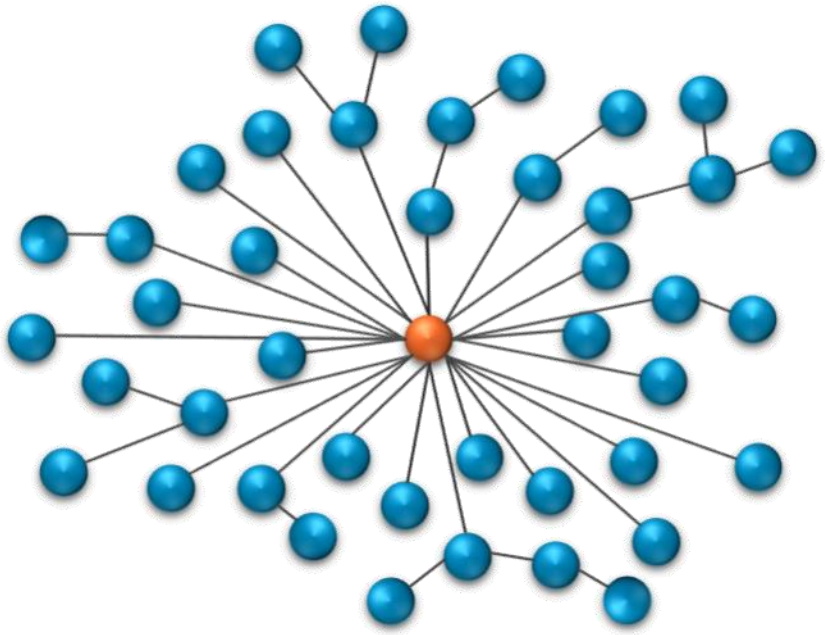
Relationship object (Role)

Ontology-based Information Model

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

Key Elements of an Ontology

- 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)



Property Graphs – Data and Metadata in one Object

Concept: Adverse Event
Domain: 615.580724—dc23
Holon: Adverse Event

Description
Information on an Adverse Event experienced by a Study Patient

- Adverse Event
- Seriousness
- Severity
- Start Date
- Stop Date

Concept: English
Domain: 423—dc23
Field: Severity

Description
Severity/Intensity of an event

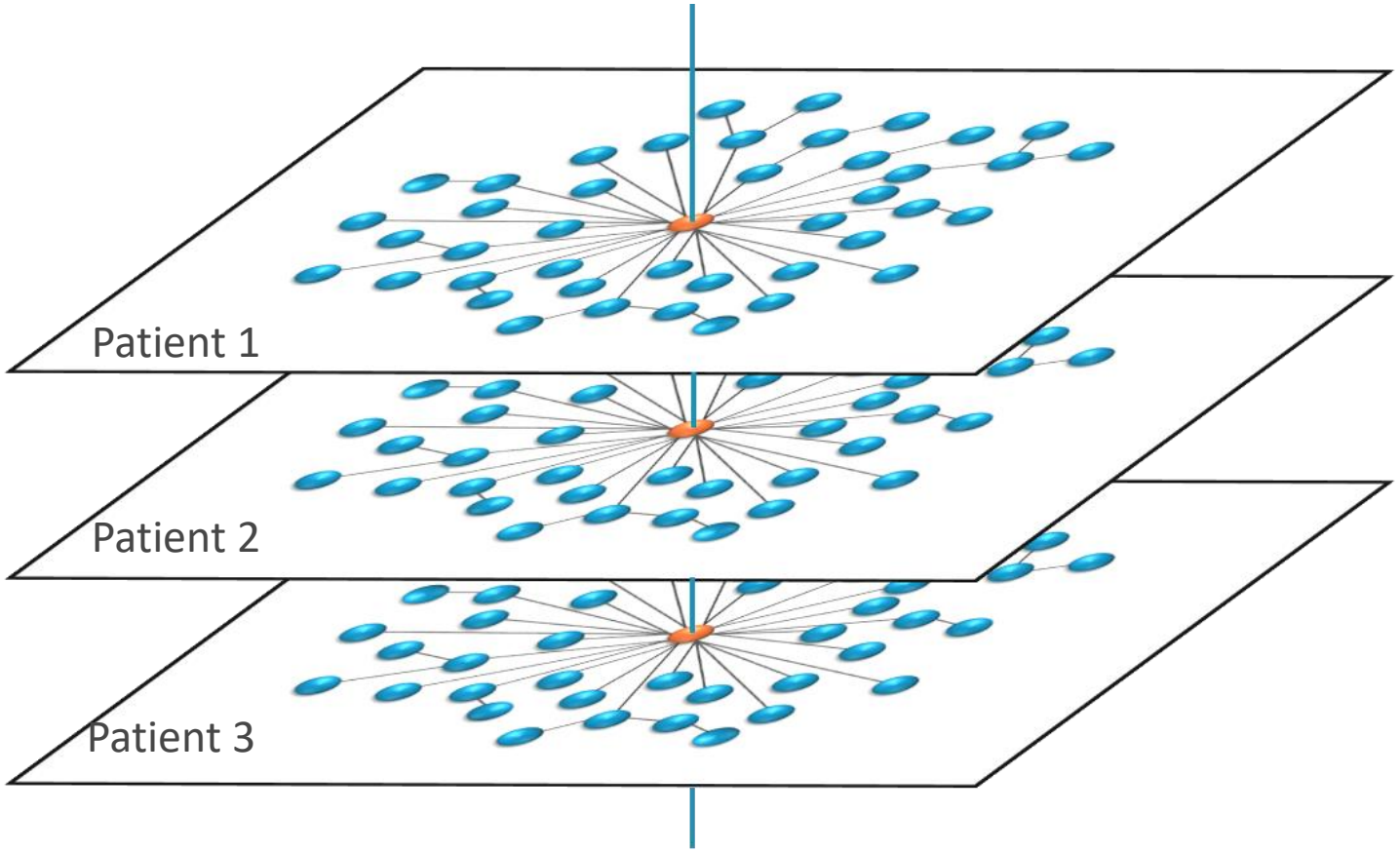
Data Type
String

Content Scale
Ordinal

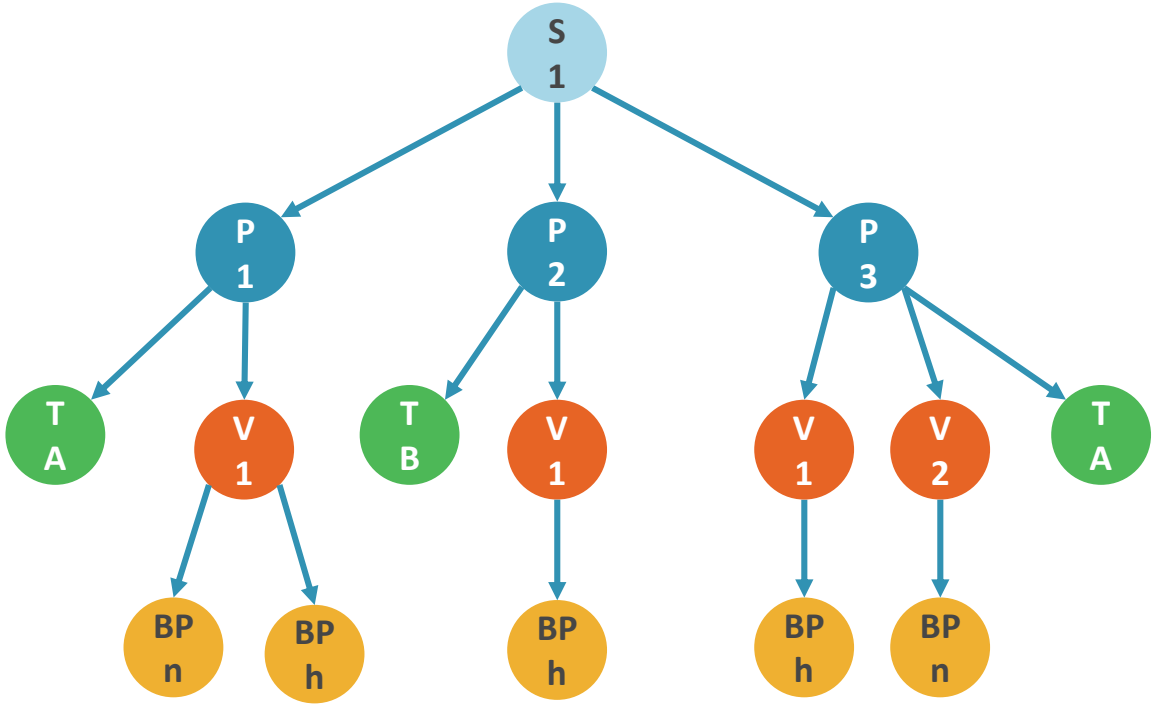
Content List
Mild, Moderate, Severe

615.580724 Experimental Research
615.58 Drug Therapy
615.5 Therapeutics
615 Pharmacology and Therapeutics
61 Medicine & health
6 Technology

Extending the graph



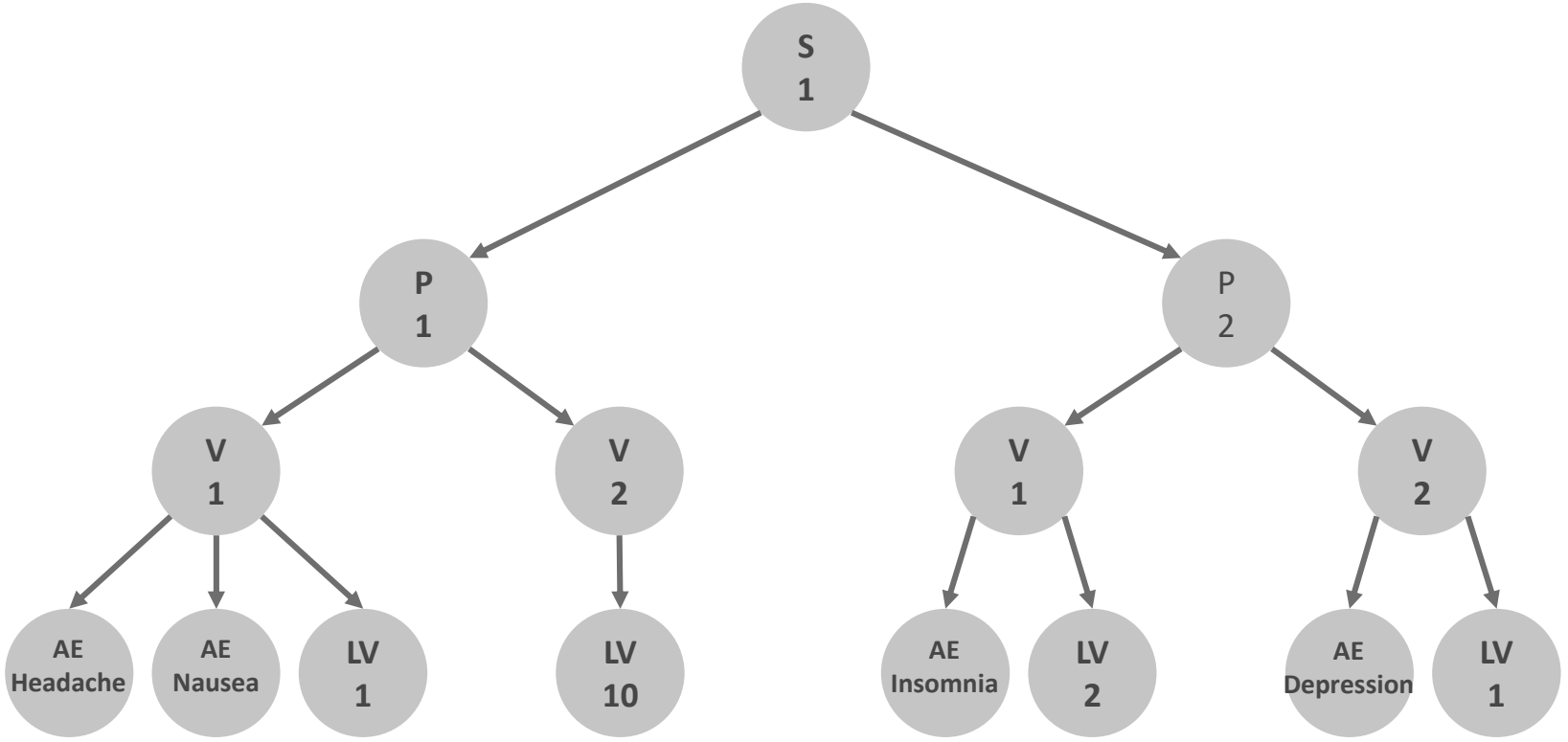
Indices versus graph traversal



- 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

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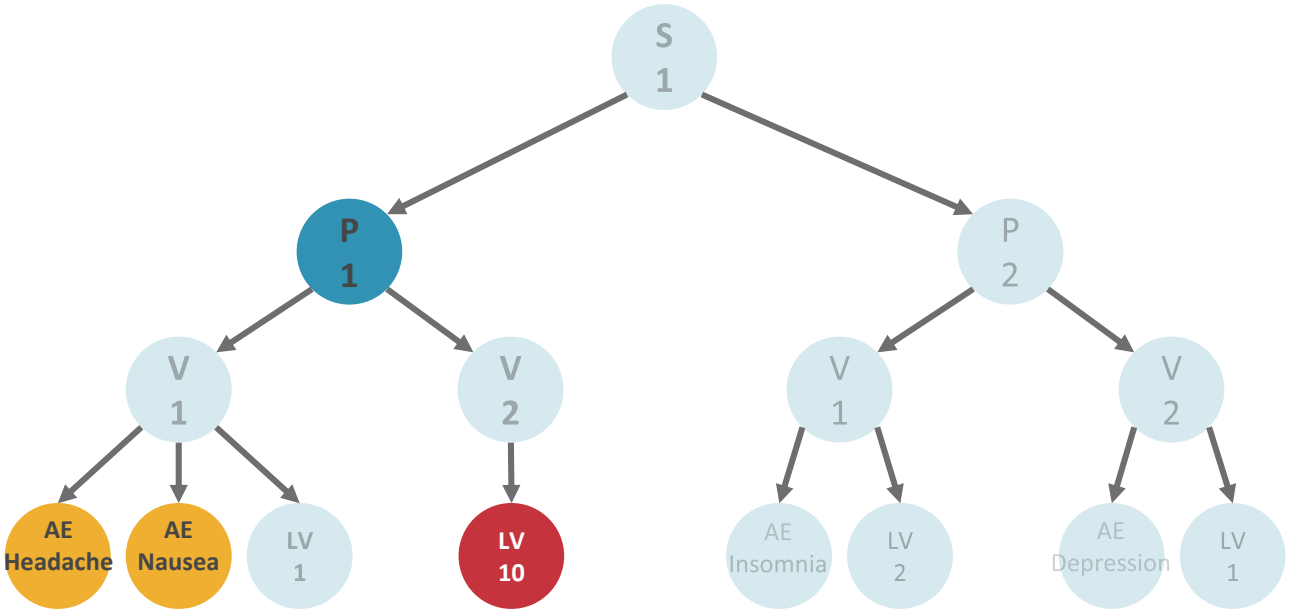
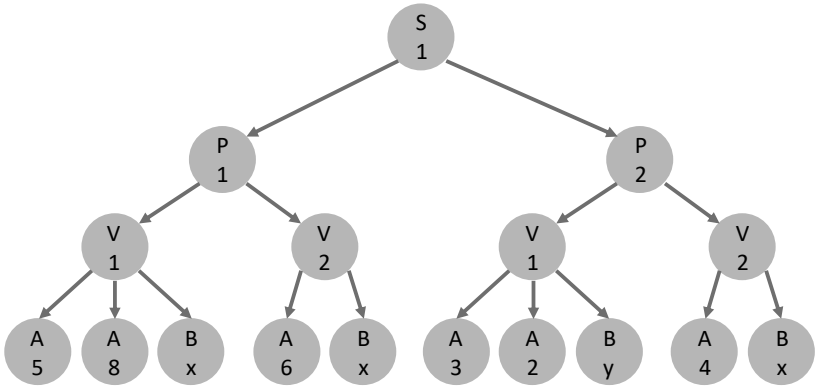


Select data:
Type of Node: "Patient"
With (Type of Node: "Liver Value", Property: "Value > 5")

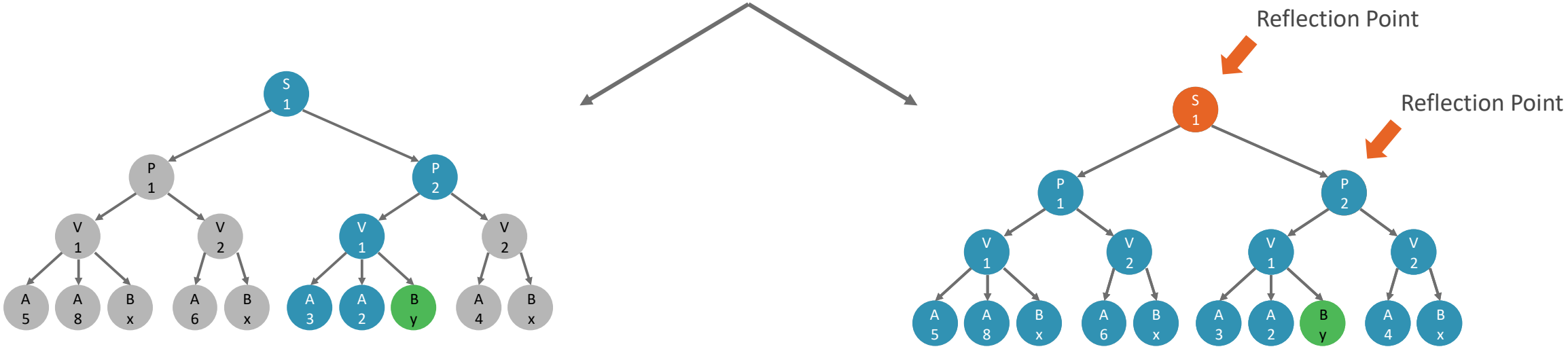
Fetch:
Type of Node:"Adverse Event", property:"Name"

Reflect your data – Building cohorts easily

Without Reflection



With Reflection



Conclusions

- **The conceptual data model translates directly into the graph database model.**
- **Graph databases are flexible and easily expandable.**
- **Metadata can be stored directly as part of the data.**
- **Data can be evaluated in different contexts.**