The FIBO Journey: An Ontology for Financial Interoperability

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Hypercube Ltd.

Ontology Summit 2026
Interoperability Track – 6 May 2026

The Semantic Shed
Understanding Business Meaning

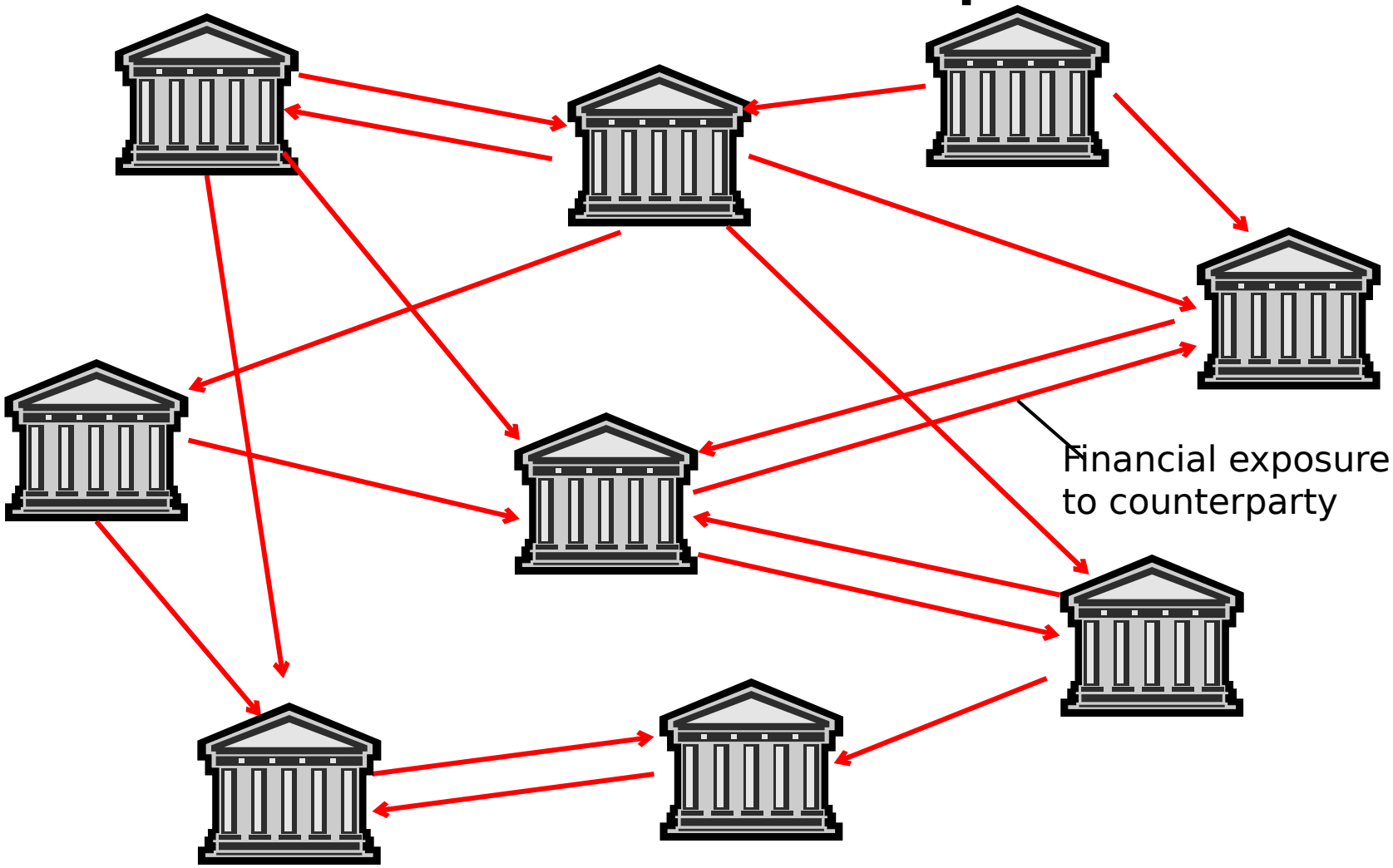
OMG Standards Development Organization
An EDM Association Community
EDM Association

Overview

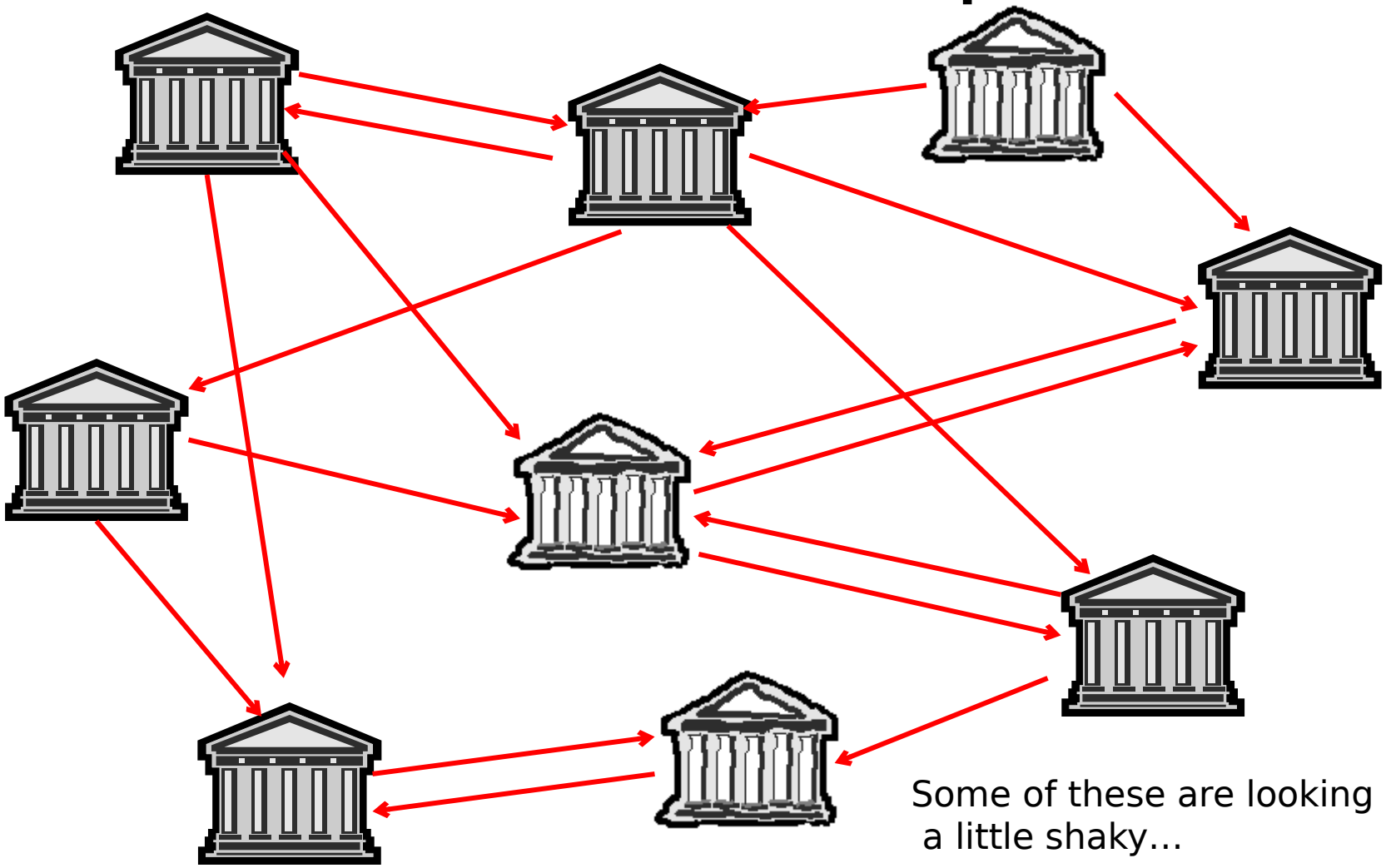
- FIBO: Motivations
- Early development: concepts in finance
- Standardization – Semantic Web implementation
- Lessons learned

Finance Industry Motivations

Network of Financial Exposures

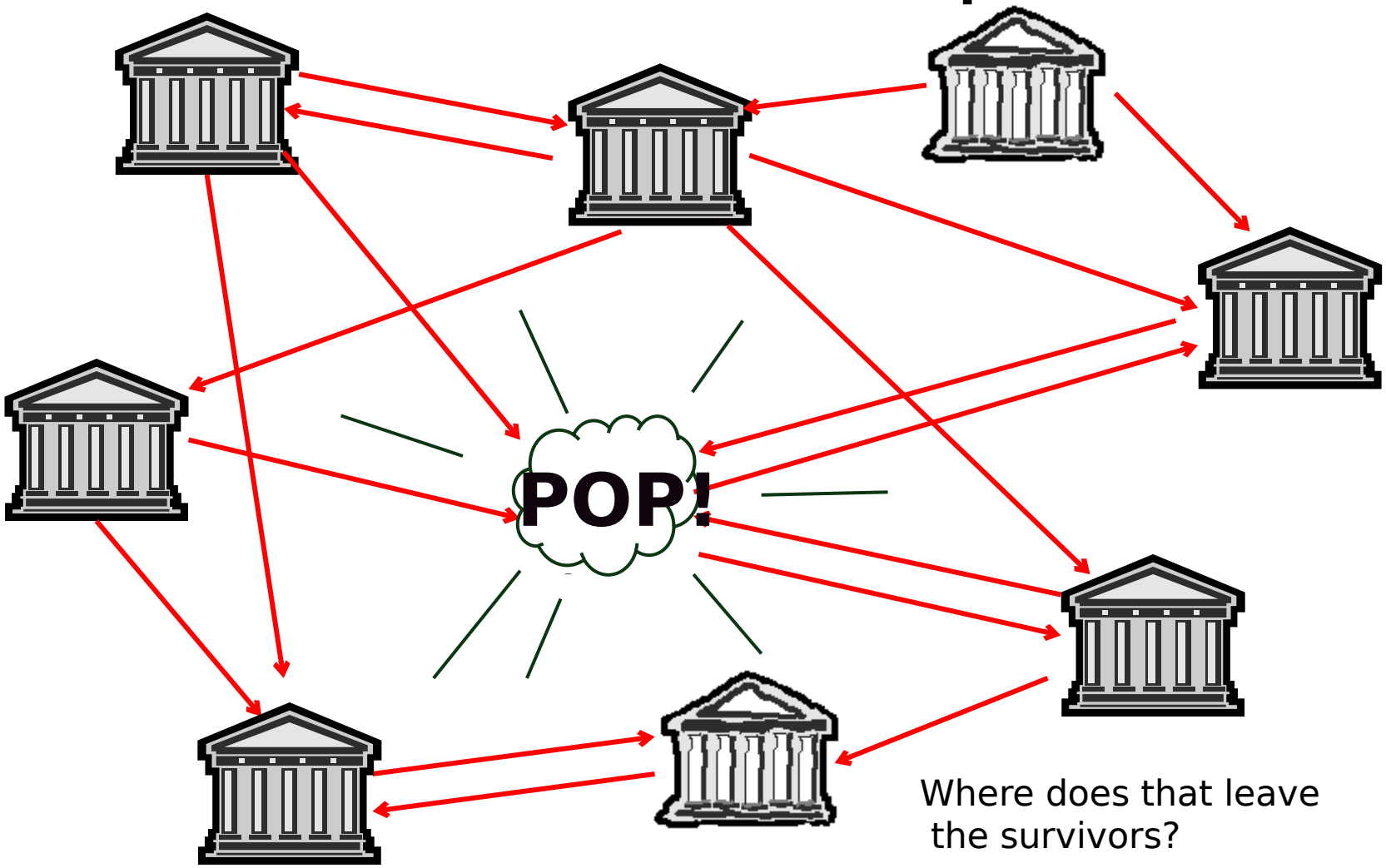


Network of Financial Exposures



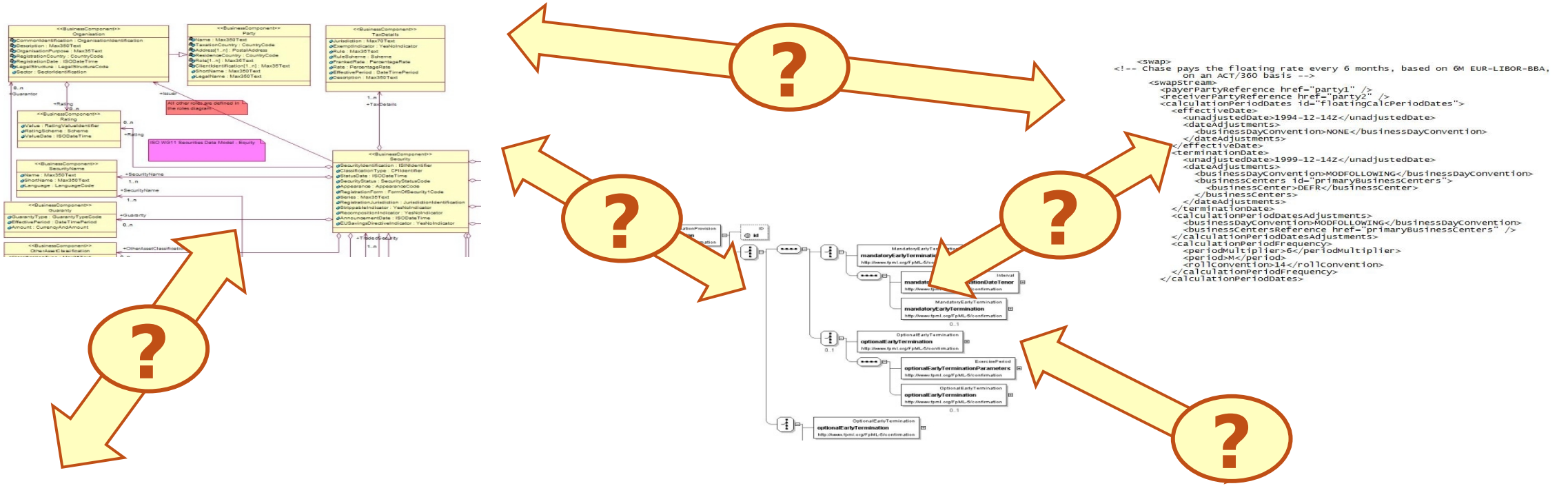
Some of these are looking
a little shaky…

Network of Financial Exposures



Where does that leave the survivors?

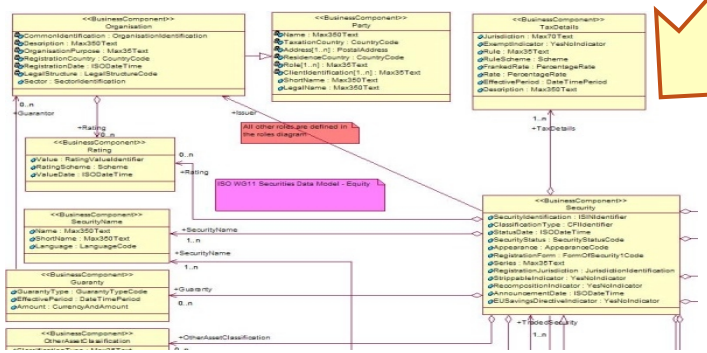
FIBO Motivations

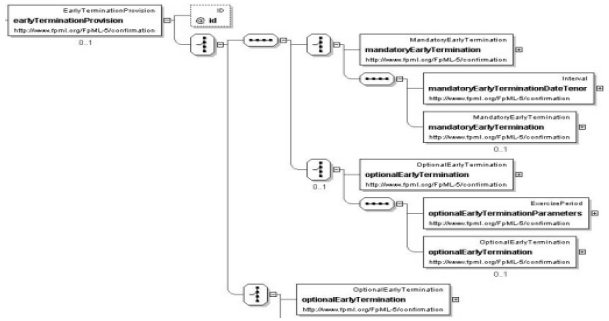


FIBO Motivations

Common ontology

Shared business meanings





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<!-- Chase pays the floating rate every 6 months, based on 6M EUR-LIBOR-BBA,
          on an ACT/360 basis -->
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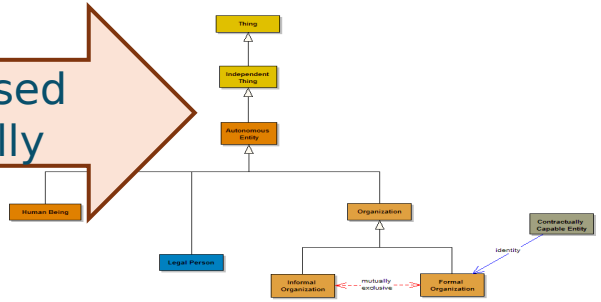
FIBO Motivations

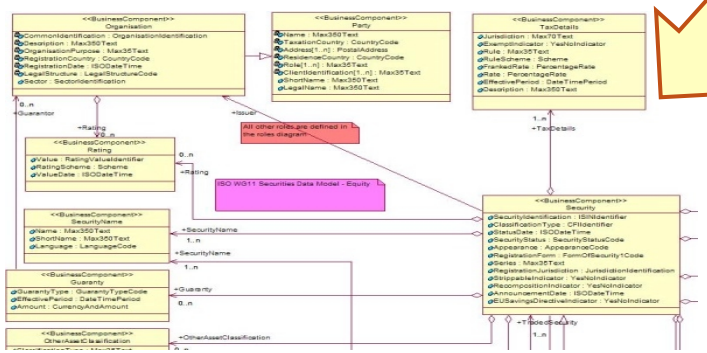
Validated by business

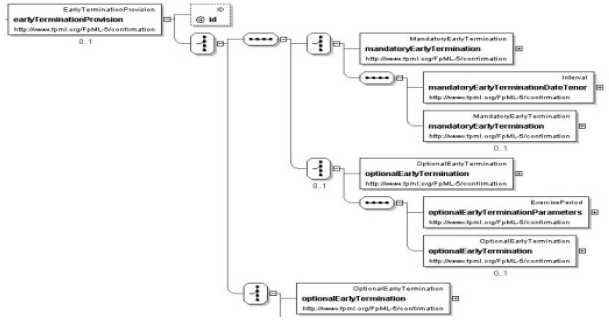
Common ontology

Shared business meanings

Expressed logically







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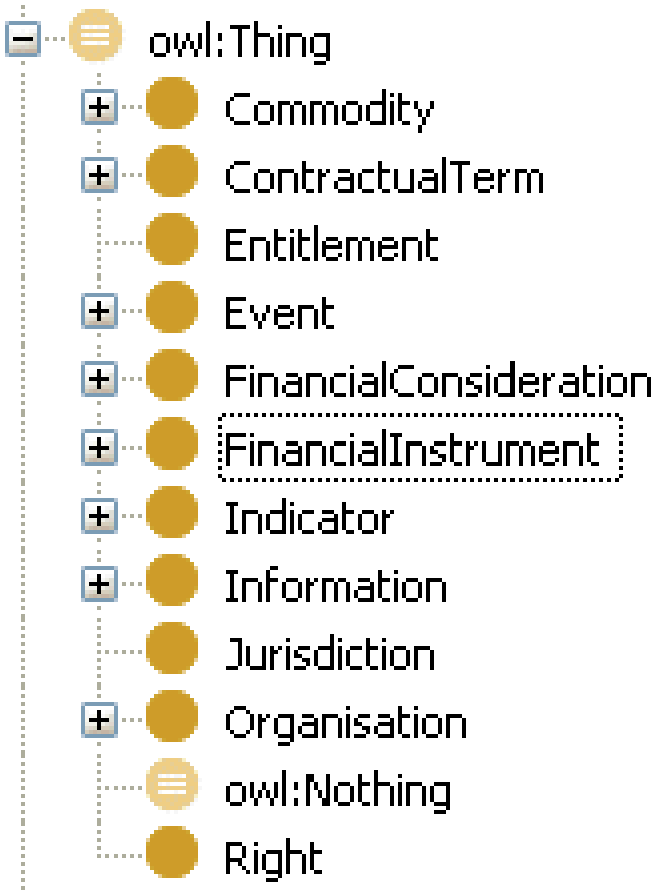
Early Explorations

Possible classes of Thing



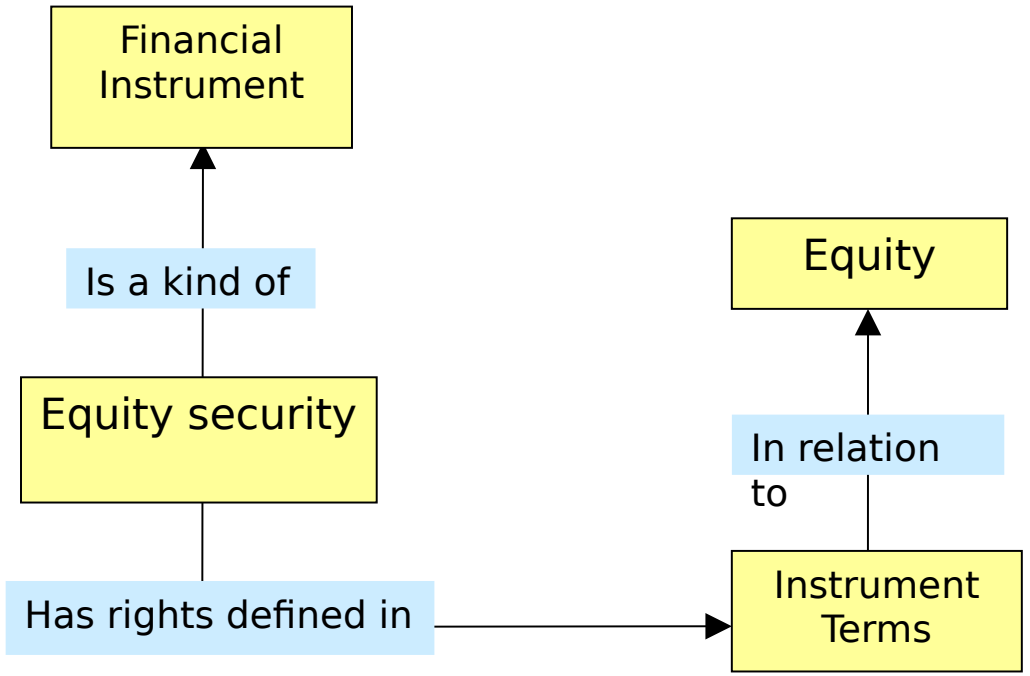
Example “Thing”: Equity

- Real world definition of Equity:

  "*An equity is a financial instrument setting out a number of terms which define rights and benefits to the holder in relation to their holding a portion of the equity within the issuing company*".

What is an Equity?

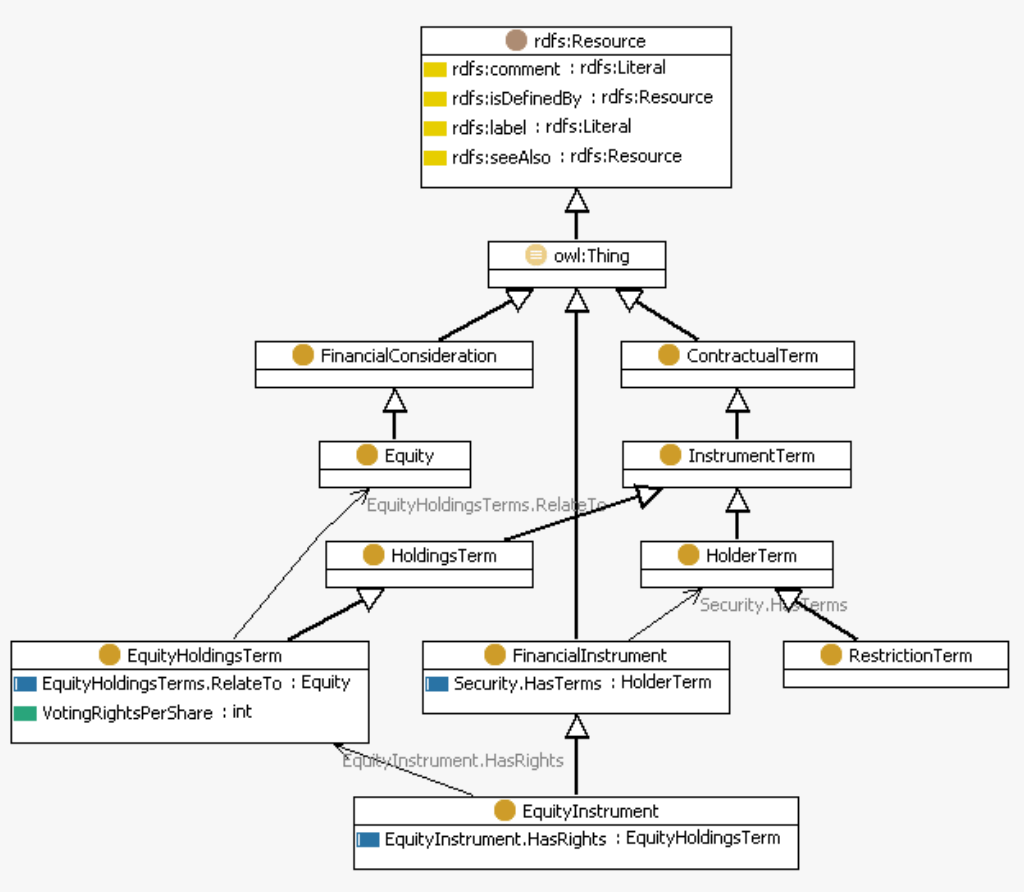
Or to put it another way…



What is an Equity?

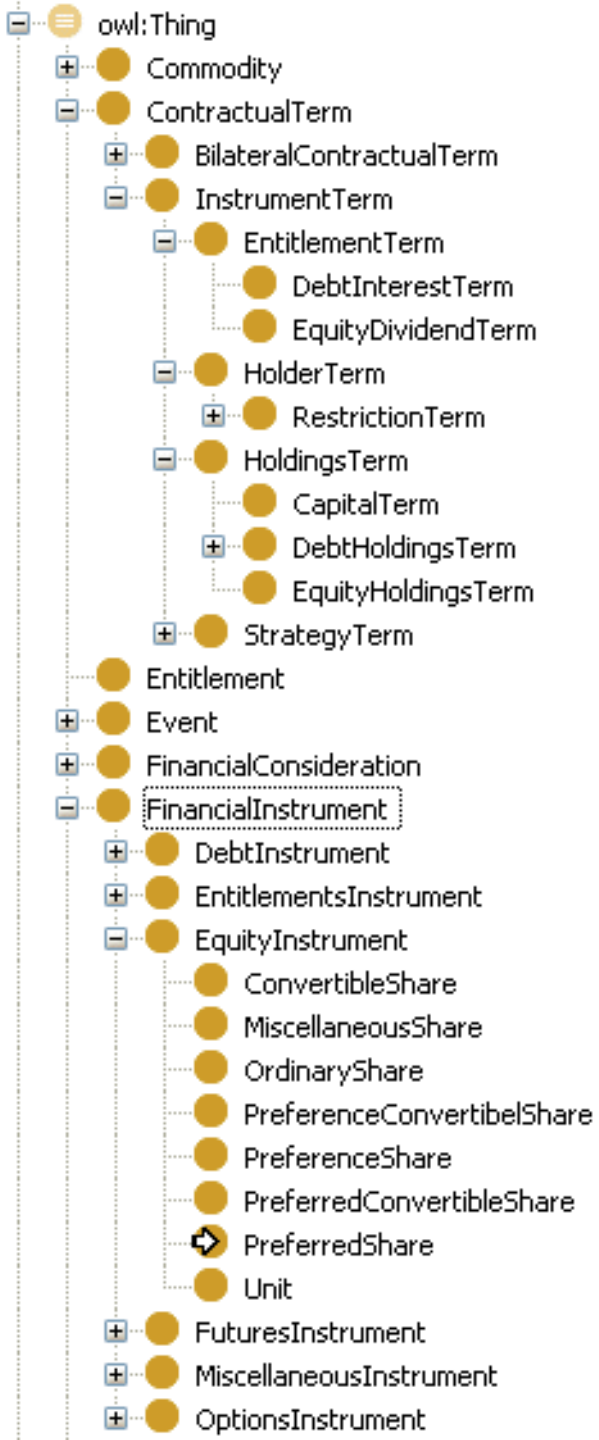
Using OWL to define the classes of real things in the world, and the facts about those things

Modeled in TopBraid Composer



Financial Semantics in OWL

- Pizza approach
  - “Everything is a Thing”
- What about common terms?
  - accounting terms for equity, debt, cashflow
  - Places, time concepts
  - Legal terms (securities are contracts)
- Better partitioning needed



The Semantic Web

- Web Ontology Language
  - Based on Subject-Verb-Object “Triples”
  - Widely used
- Protégé tool
- Experiment: Ingest a logical data model into OWL
  - Result: a logical data model in OWL
- **Syntax is not semantics!**

Developing a Concept Ontology

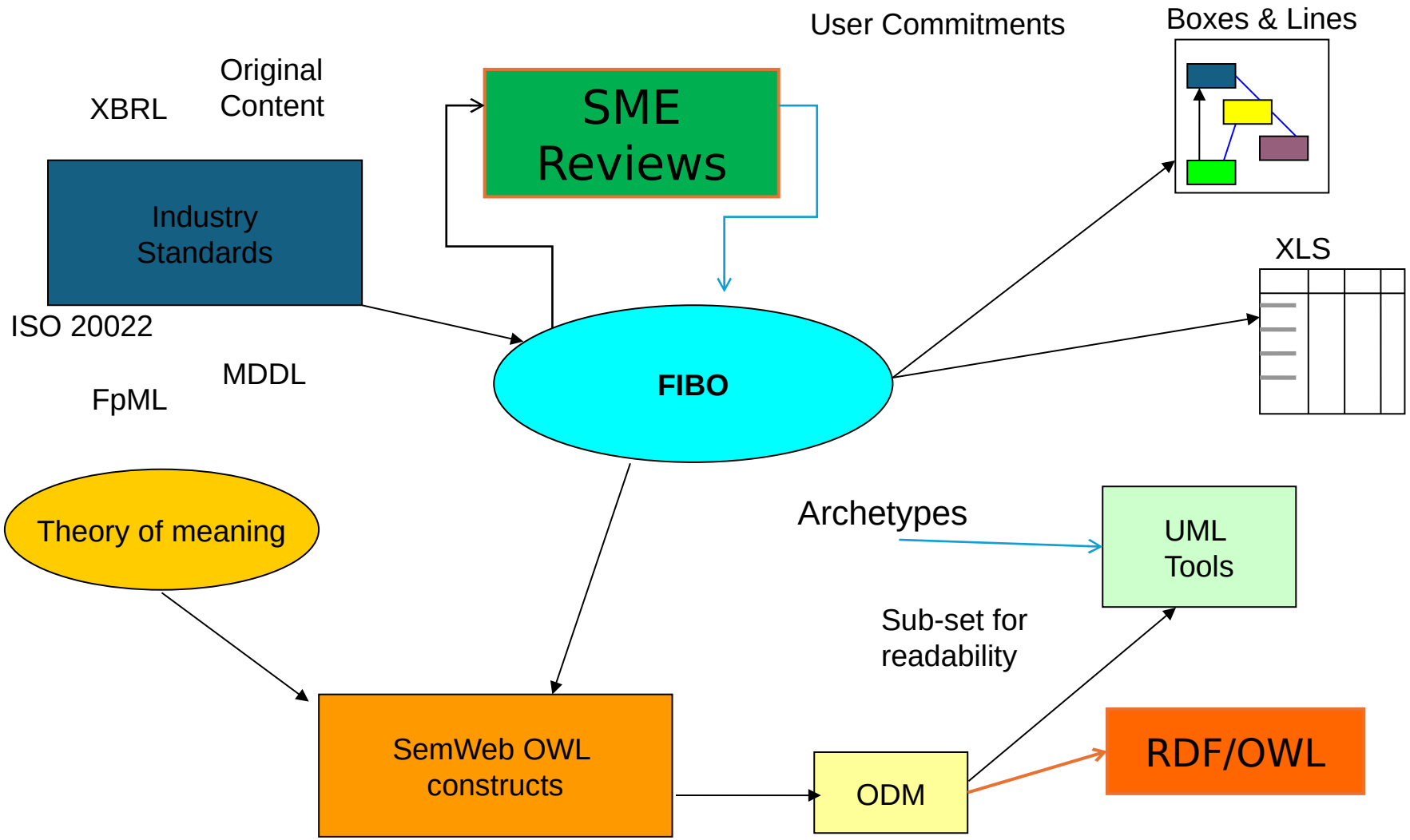
The FIBO Moment

- Previous standardization efforts at message and data levels
- Arguments over terms

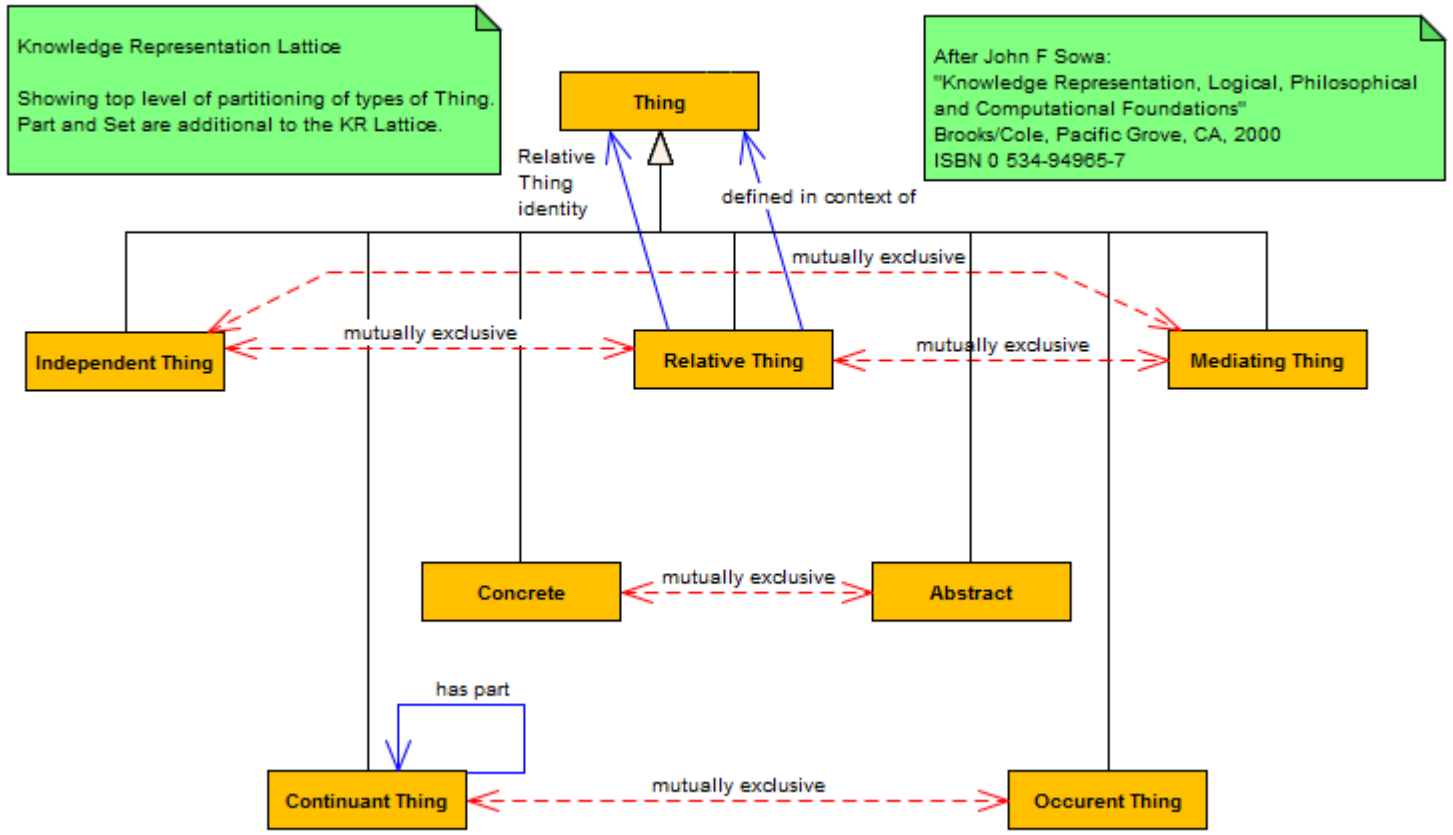
- Atkin: “What if we considered the concepts without worrying about the words people use?”

  - Sudden outbreak of peace!

FIBO Early Development



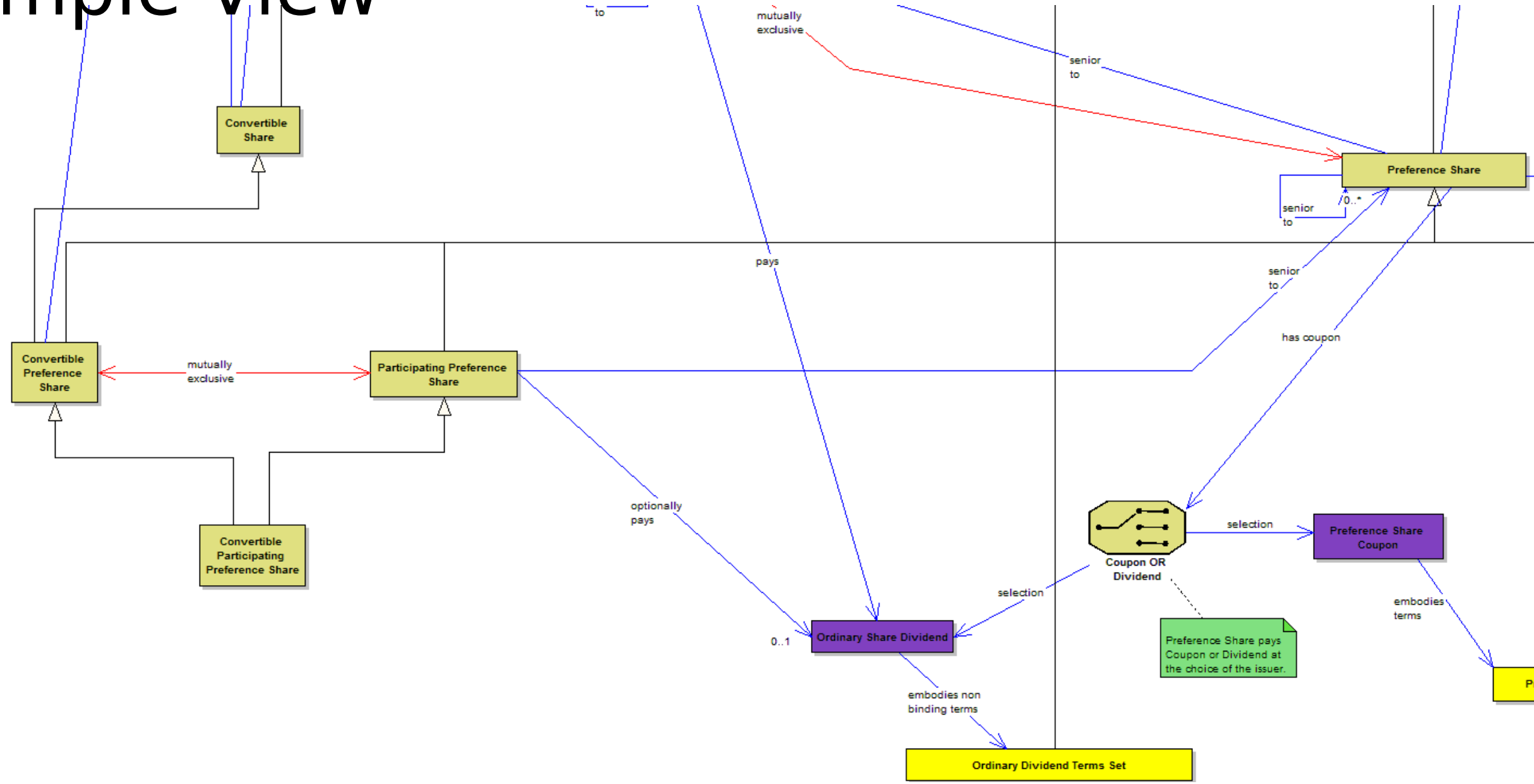
Top Level Ontology: Lattice Layer



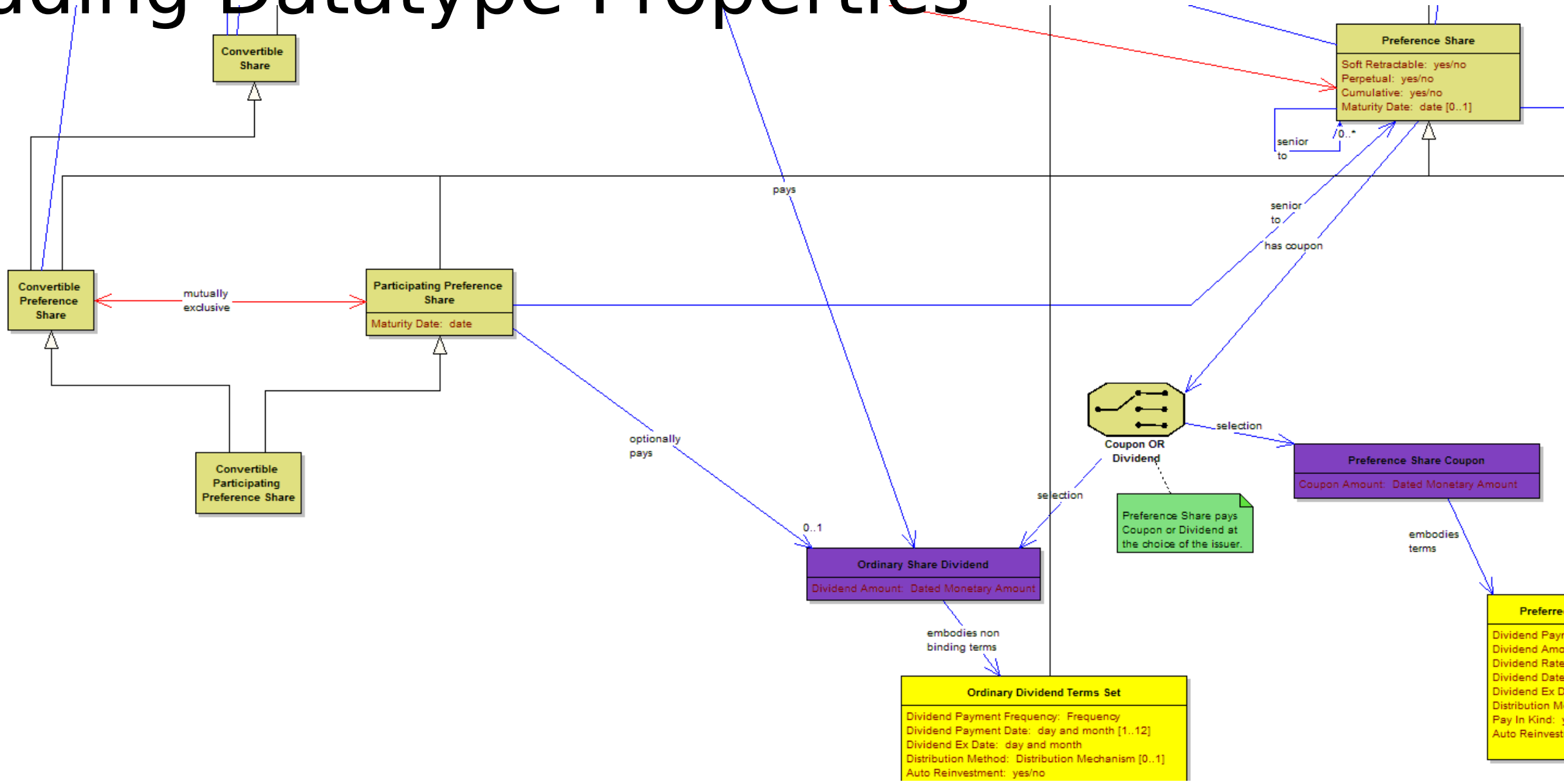
Semantics Repository Views

- Simple
- With datatype properties
- With property to property relationships
- All accompanied by spreadsheet representation of the same constructs

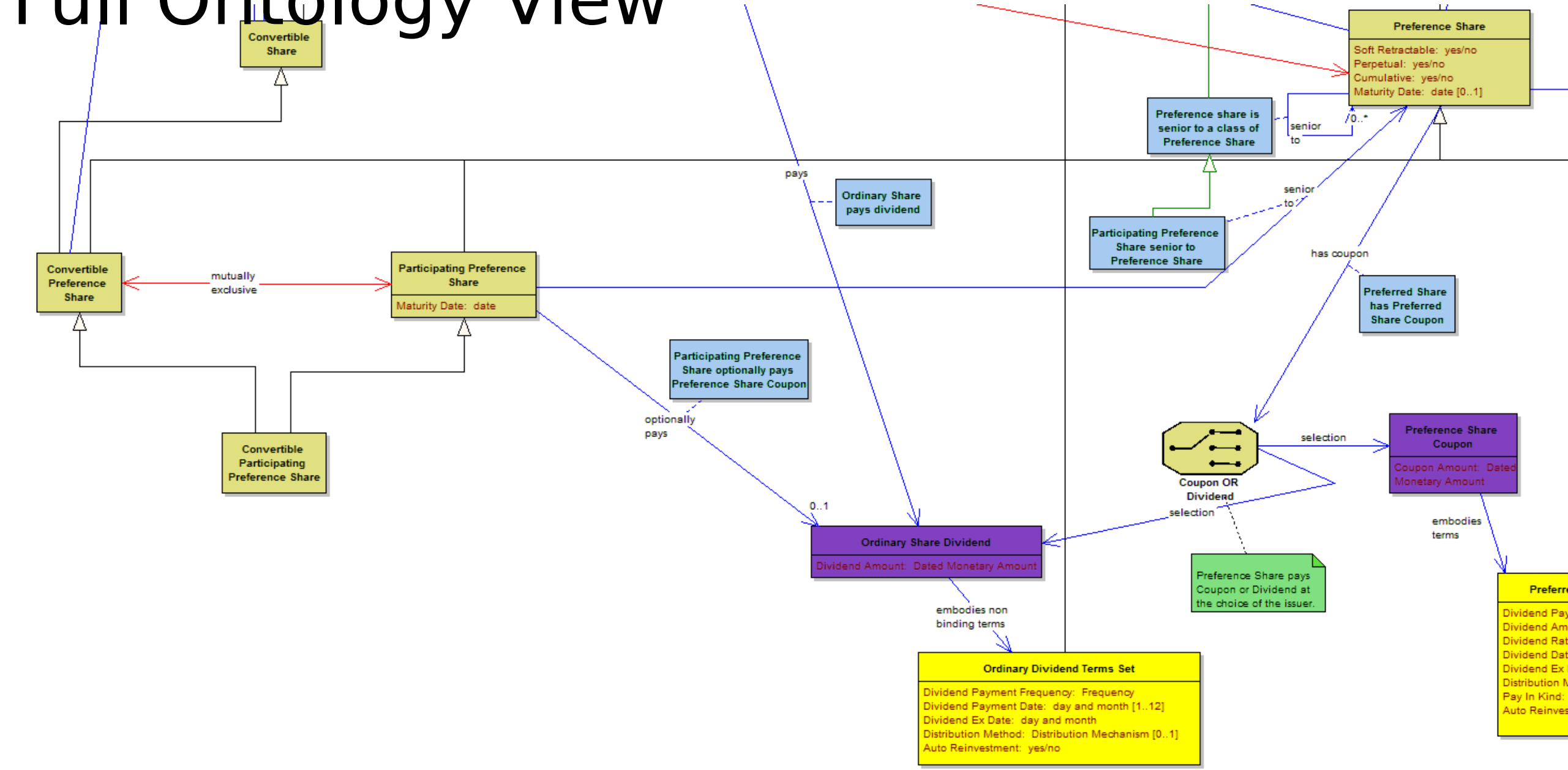
Simple View


to
mutually exclusive
senior to
Convertible Share
Preference Share
senior to
0..*
pays
senior to
has coupon
Convertible Preference Share
mutually exclusive
Participating Preference Share
optionally pays
Convertible Participating Preference Share
selection
Preference Share Coupon
Coupon OR Dividend
selection
embodies terms
0..1
Ordinary Share Dividend
Preference Share pays Coupon or Dividend at the choice of the issuer.
embodies non binding terms
Ordinary Dividend Terms Set

Adding Datatype Properties



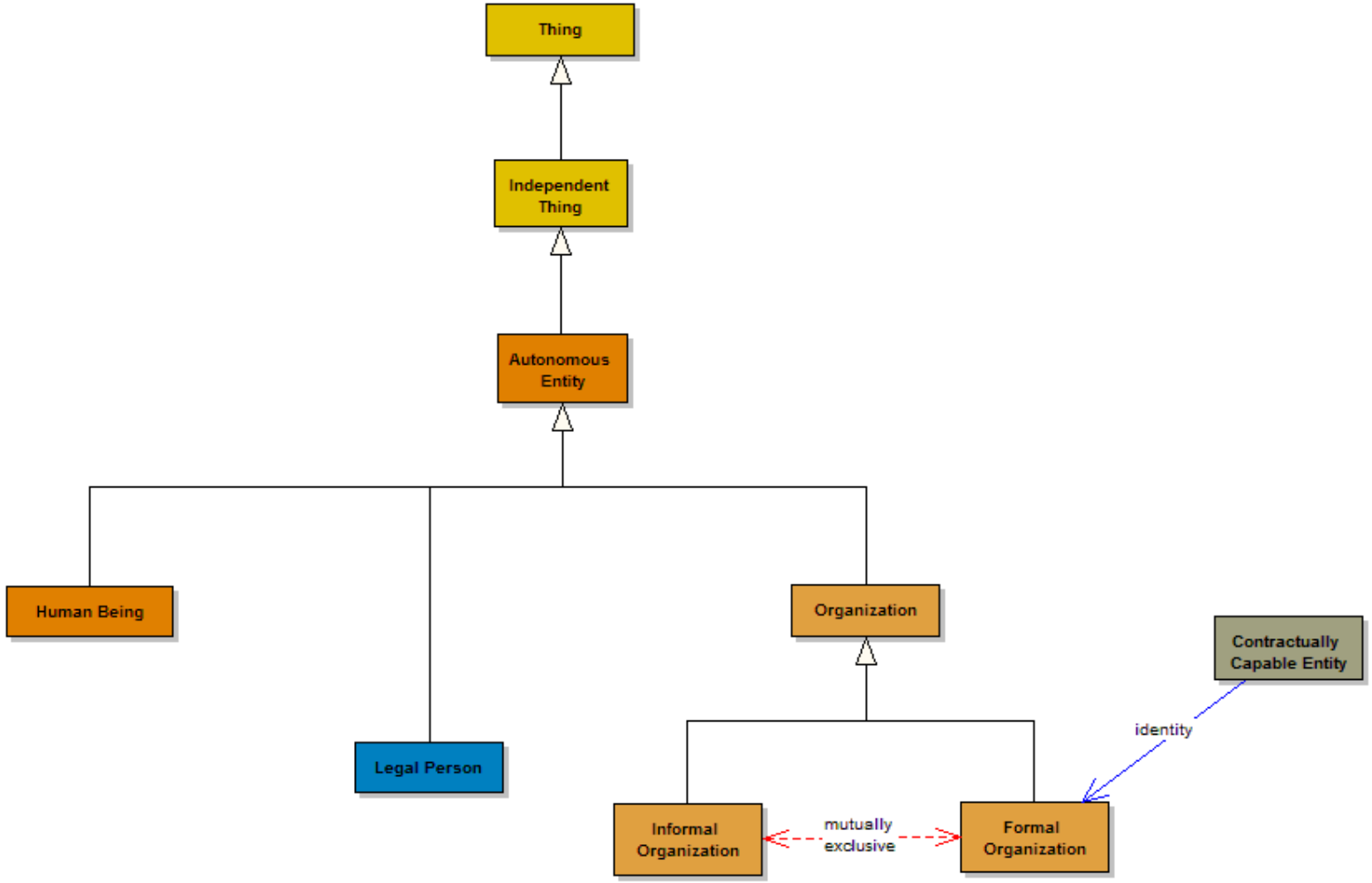
Full Ontology View



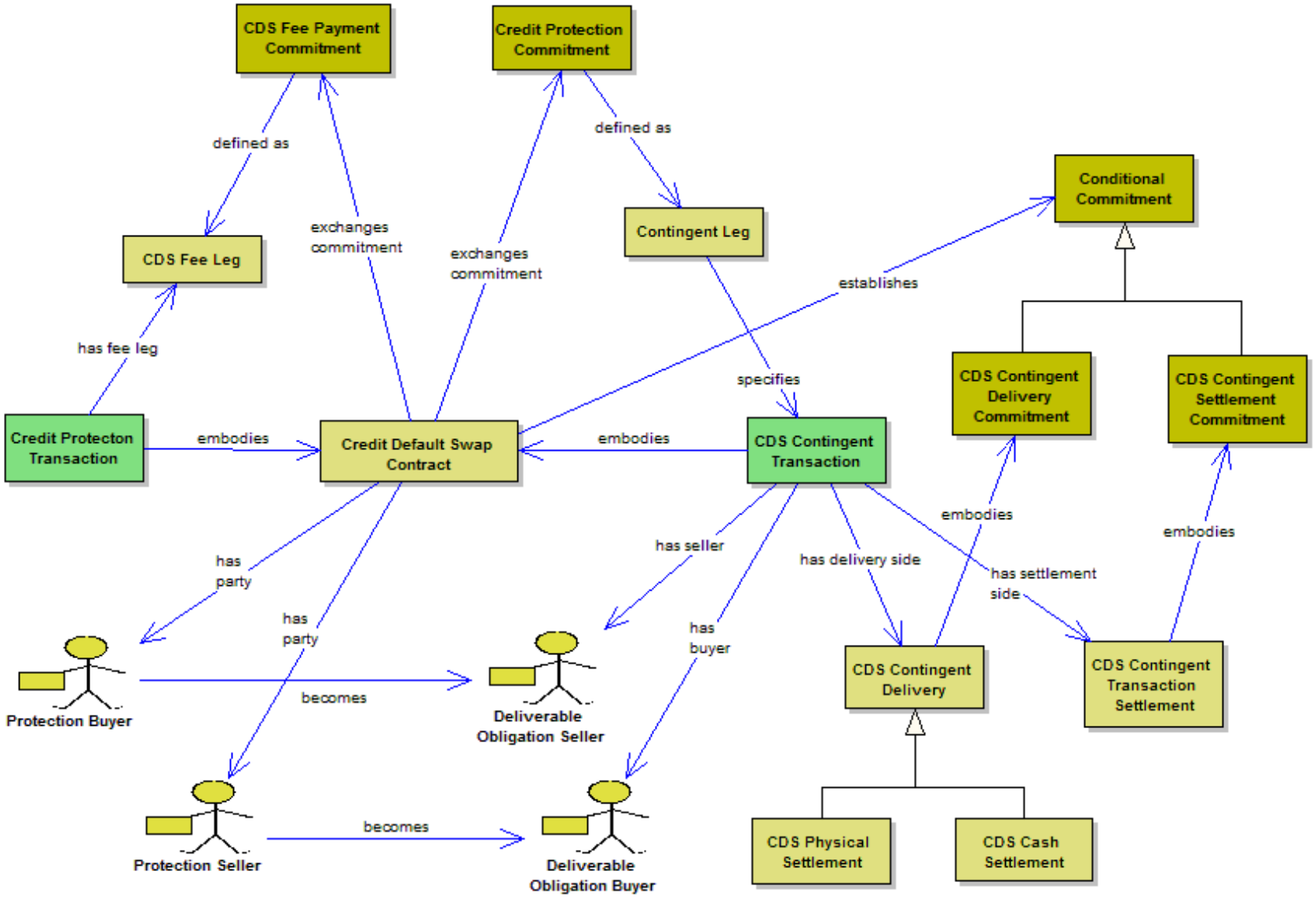
Spreadsheet view

Line	Term type	Term	Definition	Synonym	Simple Type	Related Thing	Multiples	Business Justification
1	Thing	**Company Equity Terms Set**	Terms setting out the equity in a company, including the various kinds of rights, the shares that embody those rights etc.					
2	Parent	Is a				Contract Terms Set		
3	Thing	**Company Legal Form Documentation**	The articles of associations which are defined when a registered company (specifically a company limited by the issue of shares) is set up.	Articles of Incorporation. Company Constitution. Articles of Association.				In some (or all?) Jurisdictions the articles in the company constitution become terms of the contract which is a share in that company.
4	Parent	Is a				Constitution		
5	Relationship fact	sets out	The terms set out in the Company Constitution or Articles of Incorporation. These become contractual terms of the individual classes of share issued by the company, including non binding terms for the payments of dividends.			Company Equity Terms Set		Consensus on model but definition wording not reviewed.
6	Relationship fact	governing law	The Jurisdiction in which the Company Legal Form is defined.			Jurisdiction		
7	Thing	**Convertible Participating Preference Share**	A preference share that can be converted into common shares at a fixed conversion price. Preference or preferred shares entitle a holder to a prior claim on any dividend paid by the company before payment is made on ordinary shares.					
8	Parent	Is a				Convertible Preference Share		
9	Parent	Is a				Participating Preference Share		
10	Thing	**Convertible Preference Share**	A Preferred Share which is convertible into another security.	Convertible Preferred Share.				
11	Parent	Is a				Preference Share		
12	Parent	Is a				Convertible Share		
13	Disjoint	mutually exclusive	Participating Preference Share and Preference Convertible Share are mutually exclusive. This means that a participating preference share may not also be a preference convertible share. It may however be a Participating Preference Convertible Share, which is a type of Participating Preference Share. Either one may however be cumulative or non cumulative.			Participating Preference Share		
14	Relationship fact	convertible into	The security into which the Convertible Preferred Share can be converted. This is always a publicly issued share.			Issued Share		
15	Thing	**Convertible Share**	A Share which is convertible into another security, usually a share in the same company.					
16	Parent	Is a				Issued Share		
17	Relationship fact	has terms	Terms governing the Conversion of a Convertible Share.			Equity Conversion Terms Set		

FIBO Example: Business Entities

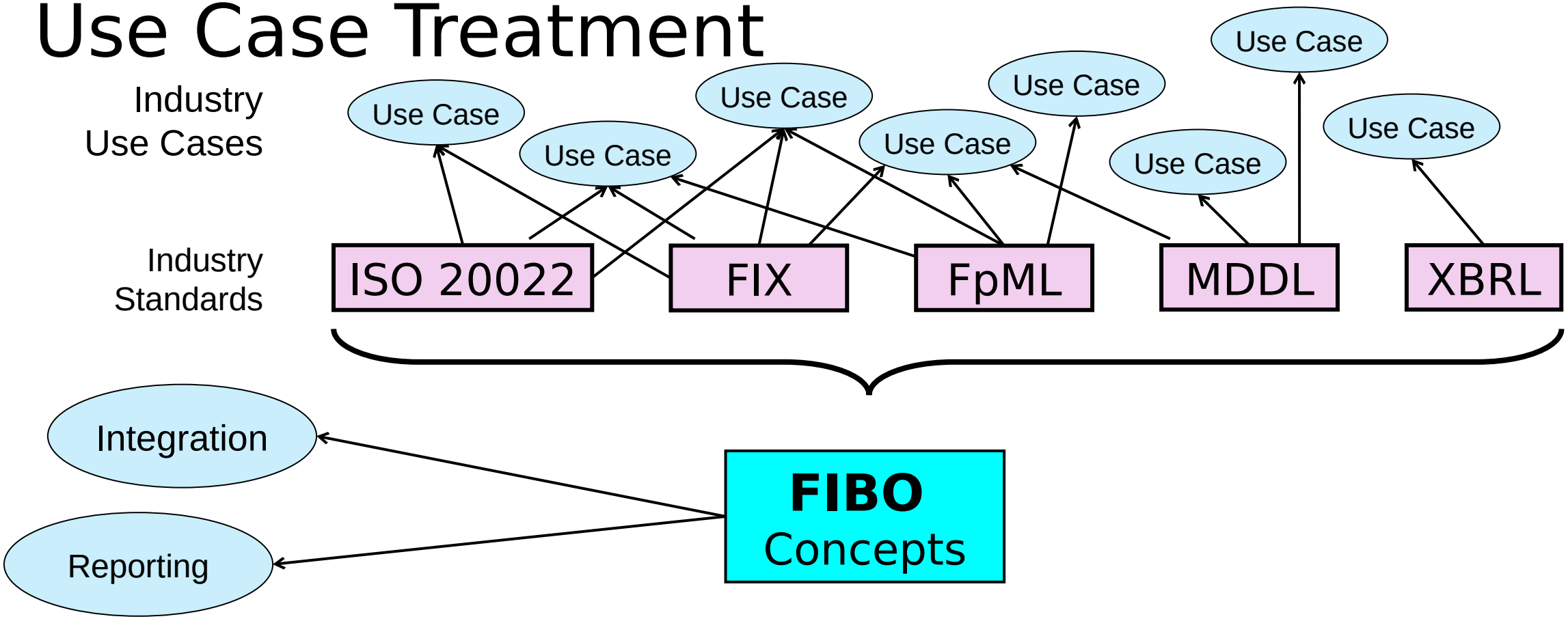


FIBO Example: Credit Default Swap

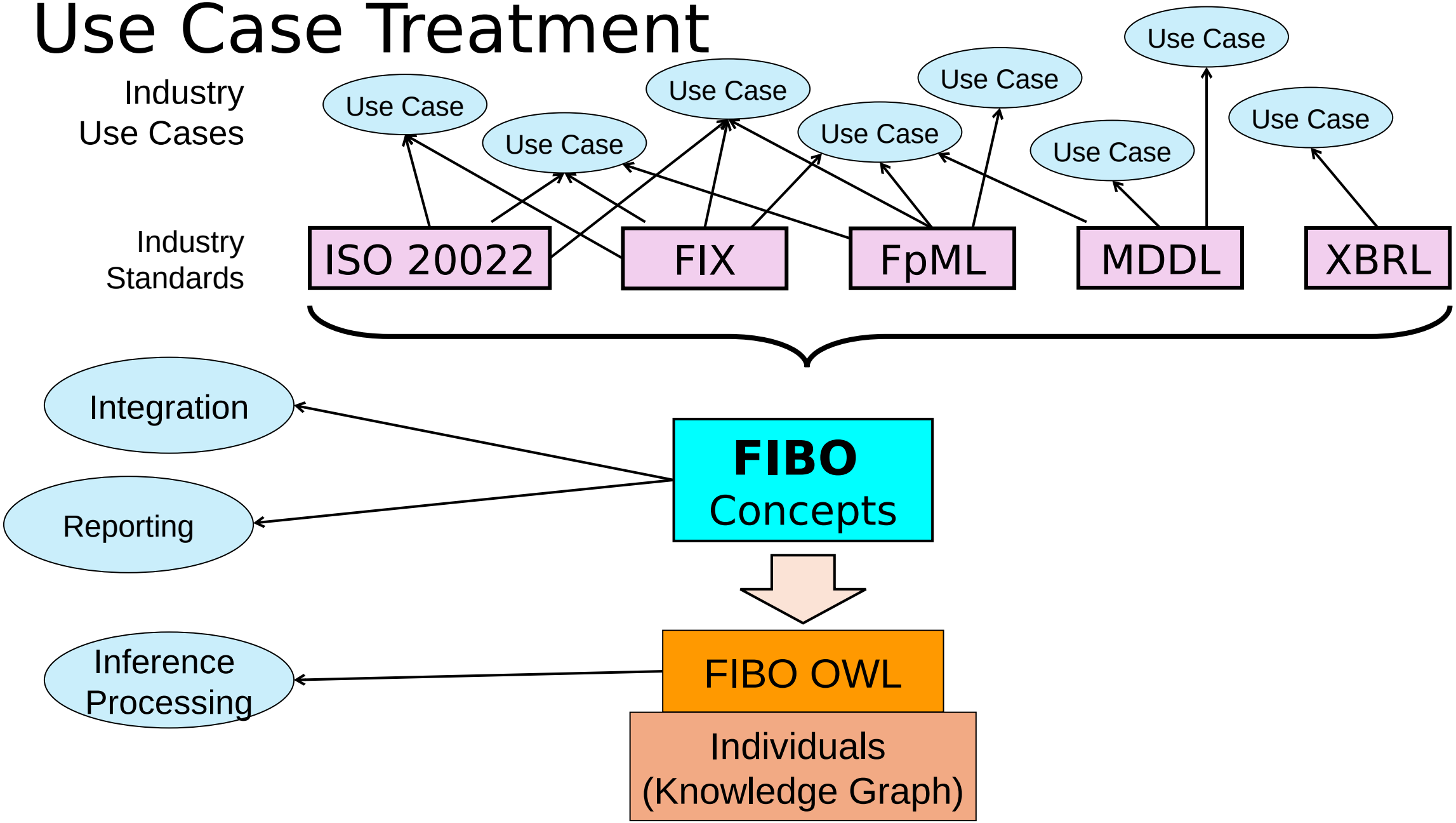


FIBO as an Industry Standard

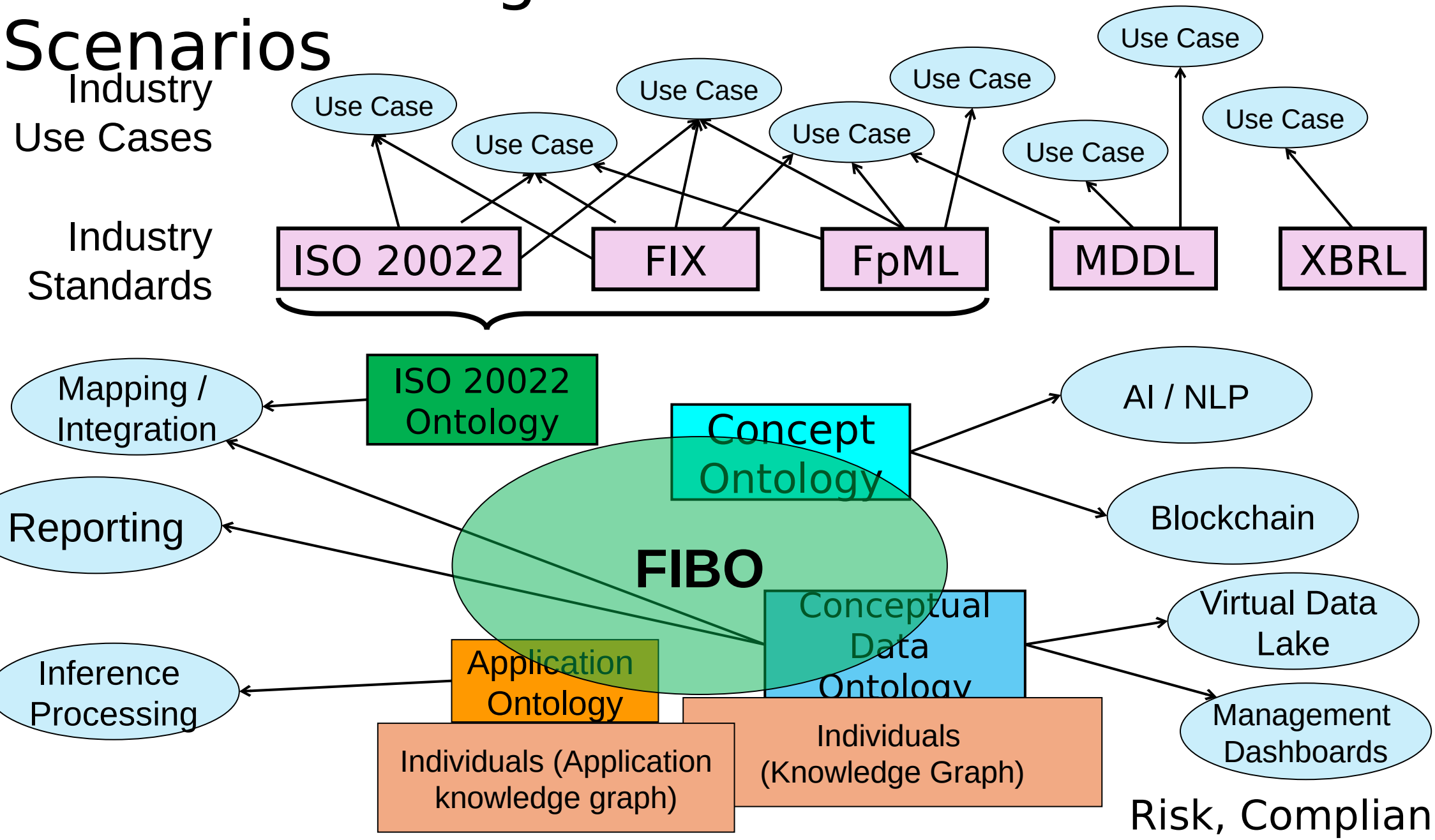
Use Case Treatment



Use Case Treatment



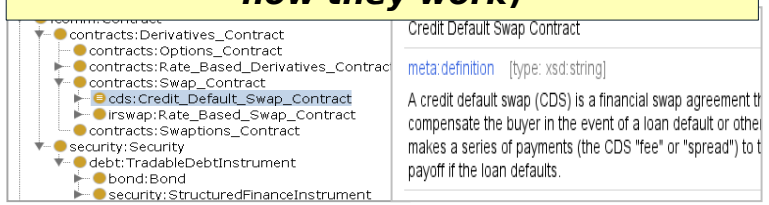
Standards Usage Scenarios



Financial Industry Business Ontology (FIBO)

FIBO is built on state-of-the-art collaboration technology and supported by documented and tested governance

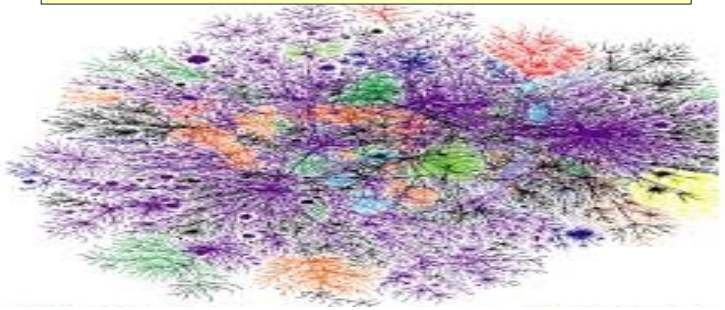
FIBO is a business conceptual model that precisely describes financial instruments, pricing, legal entities and financial processes (*what they are and how they work*)



FIBO facilitates data harmonization across disparate repositories based on legal meaning and contractual obligation

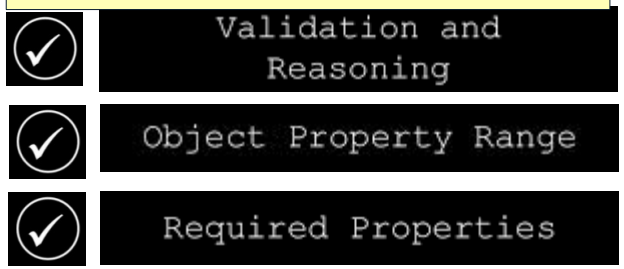
FIBO
Financial Industry Business Ontology

FIBO is expressed in the W3C standard (RDF/OWL) for flexible and scenario-based/inference analysis

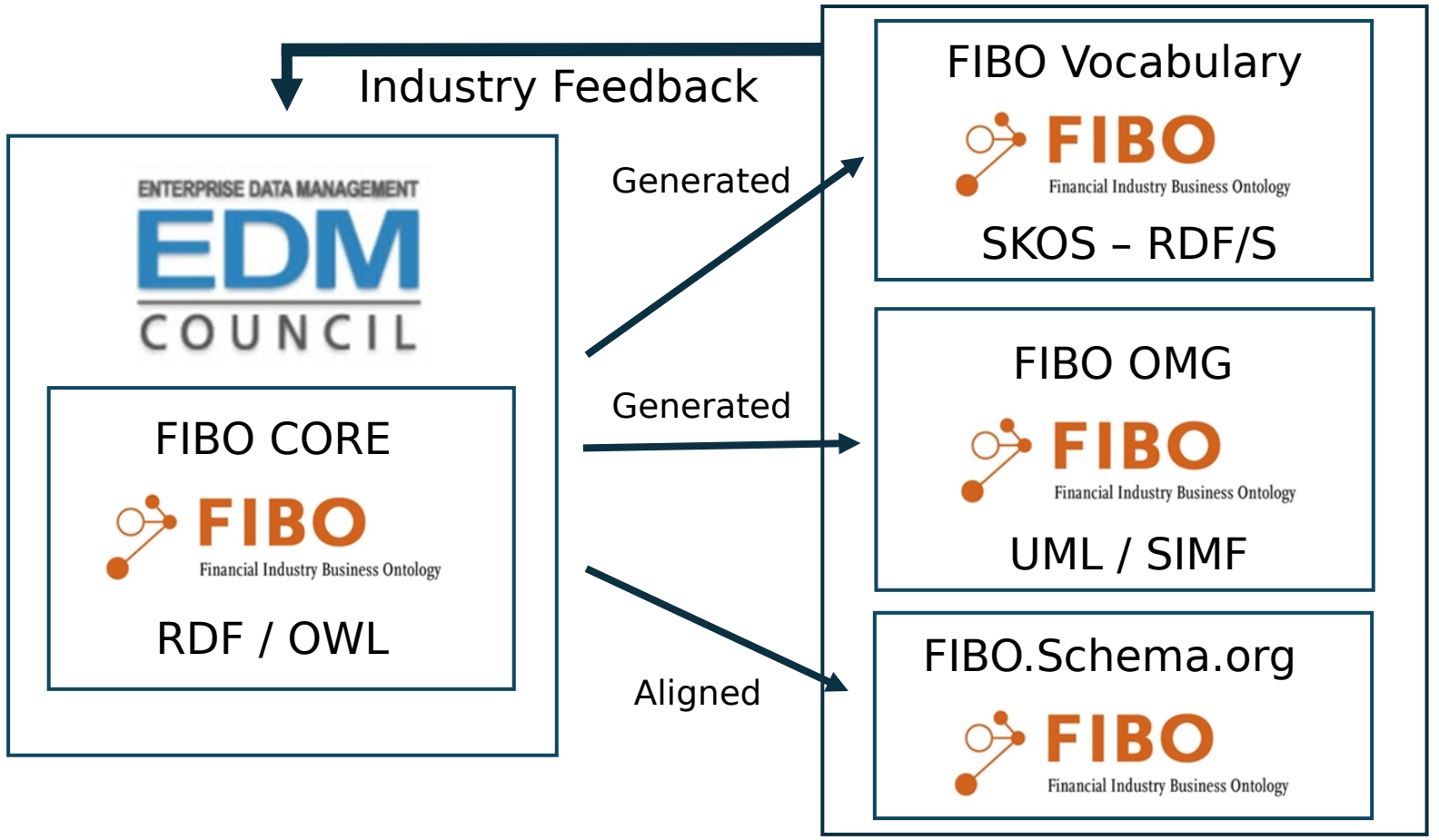


FIBO feeds analytical processes with trusted data and powers smart contracts

FIBO provides structural validation to ensure completeness, consistency and allowable values



FIBO Development & Feedback Ecosystem



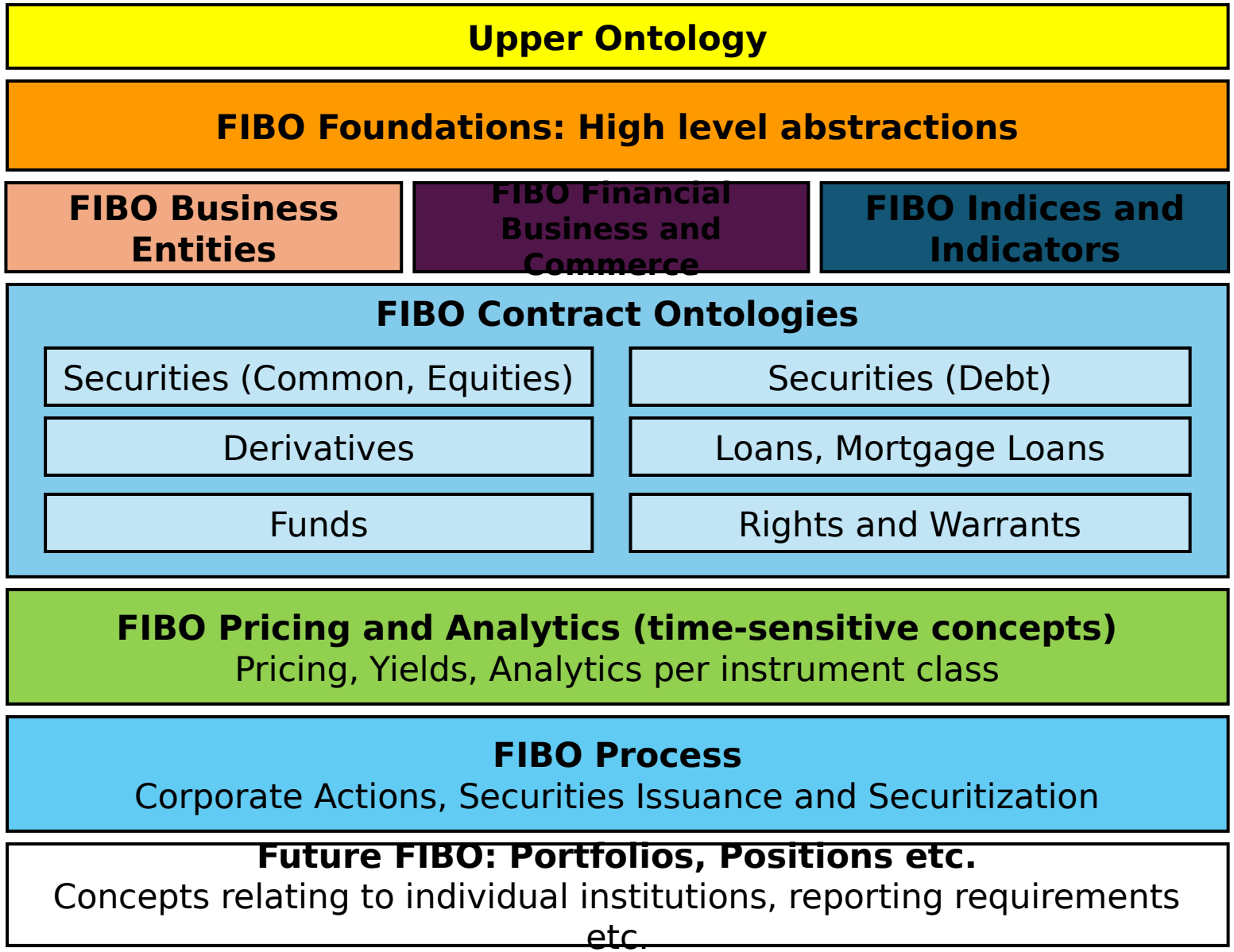
FIBO CORE: RDF / OWL is the system of record for FIBO (everything needed for inference processing)

FIBO Vocabulary: The FIBO business conceptual model expressed in SKOS (everything needed for the unification of data across repositories)

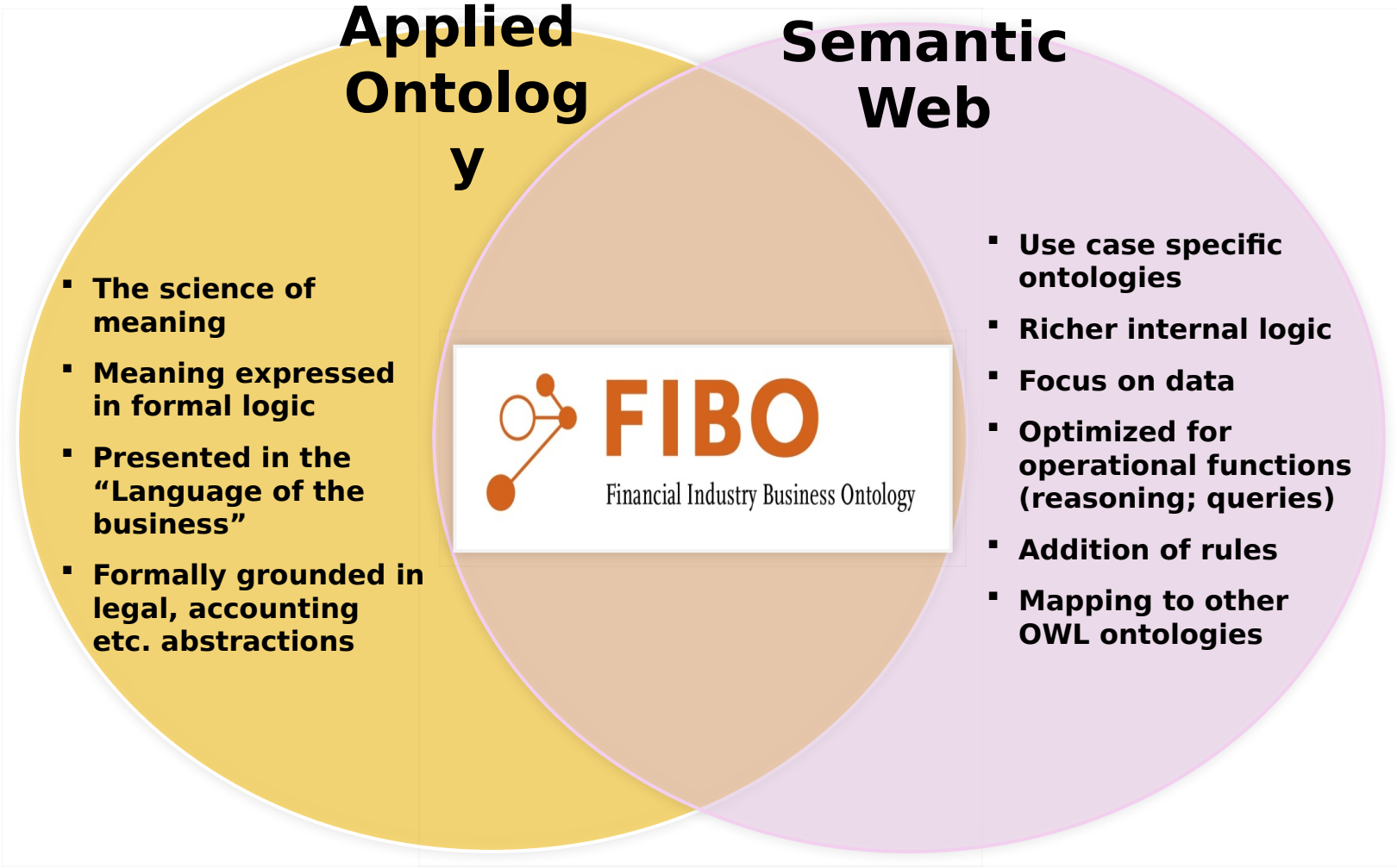
FIBO OMG: Standards partner with EDMC for visualizing FIBO in UML (everything needed for expressing FIBO as diagrams)

FIBO.Schema.org FIBO aligned to the Schema.org community financial data used for mapping existing web pages to FIBO

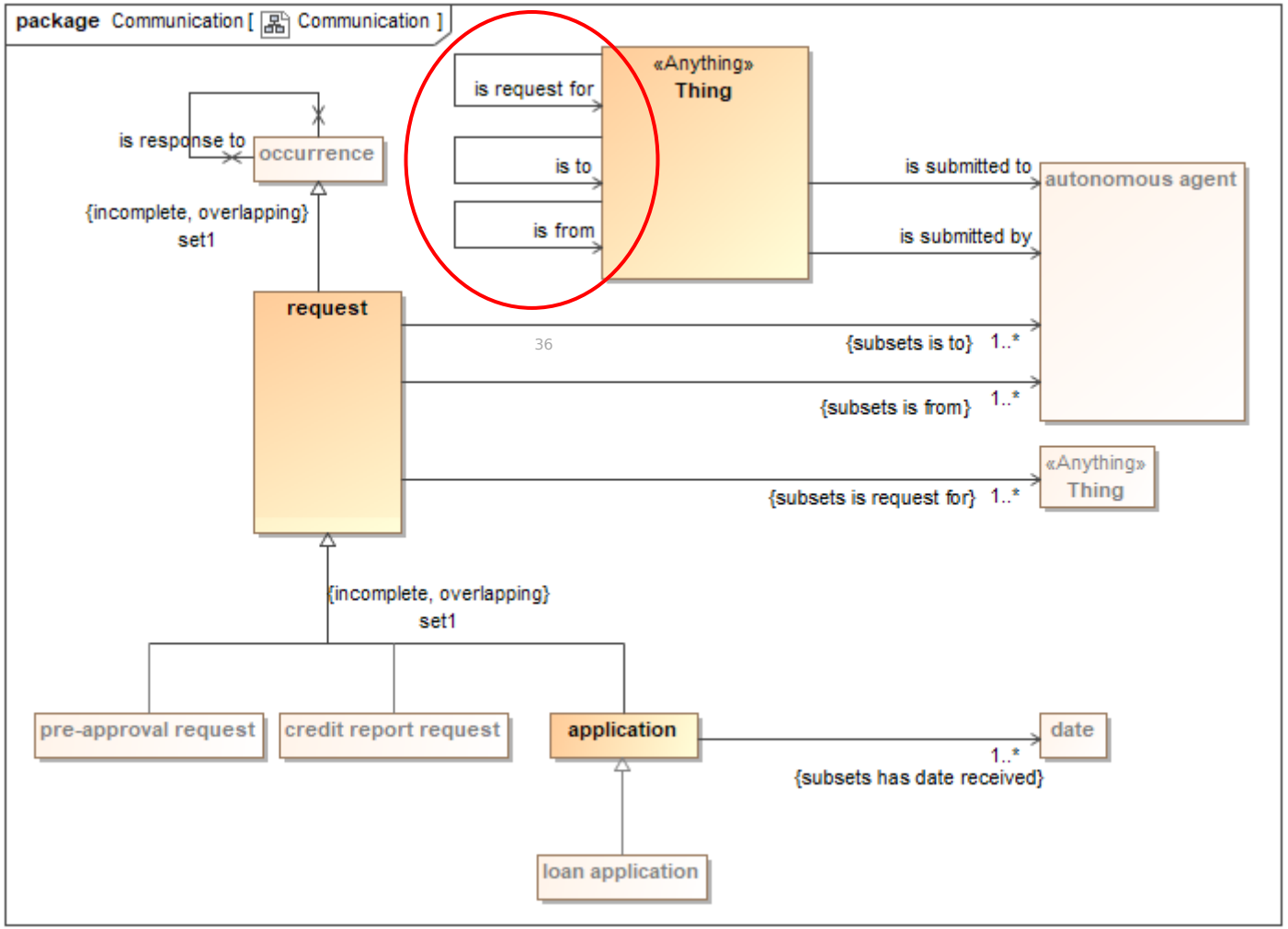
FIBO: Scope and Content



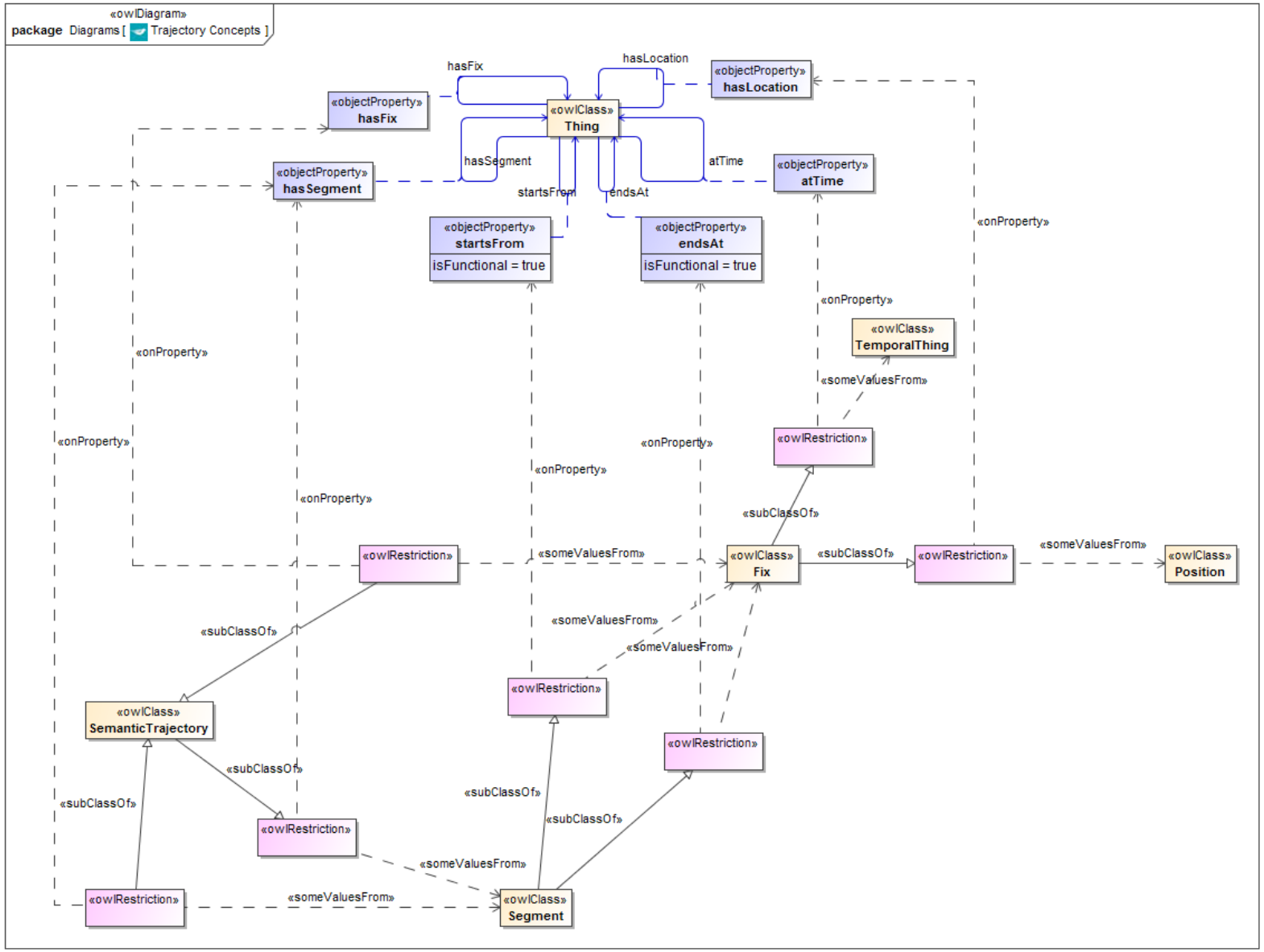
Two Ontological Traditions:



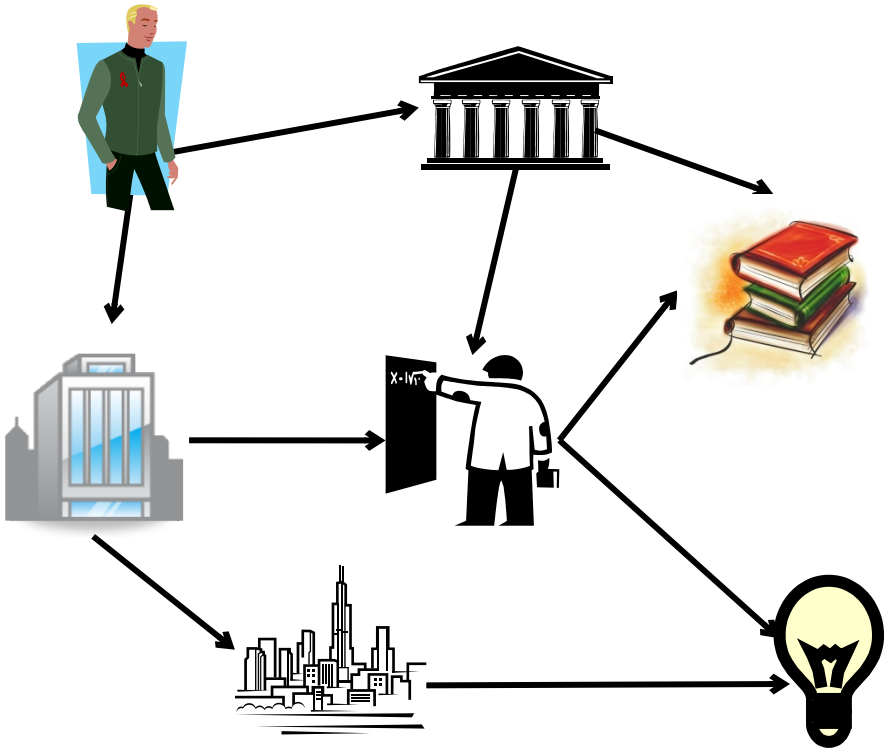
Ontology Styles: Properties with No Domain or Range

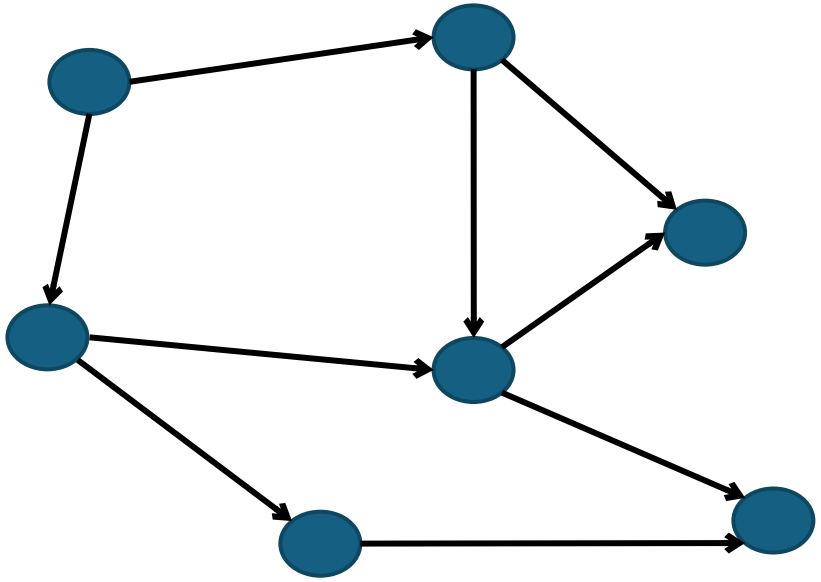


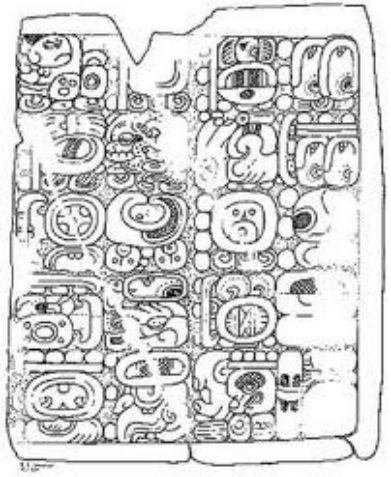
Example: Trajectory Ontology



Internal Correspondence Semantics





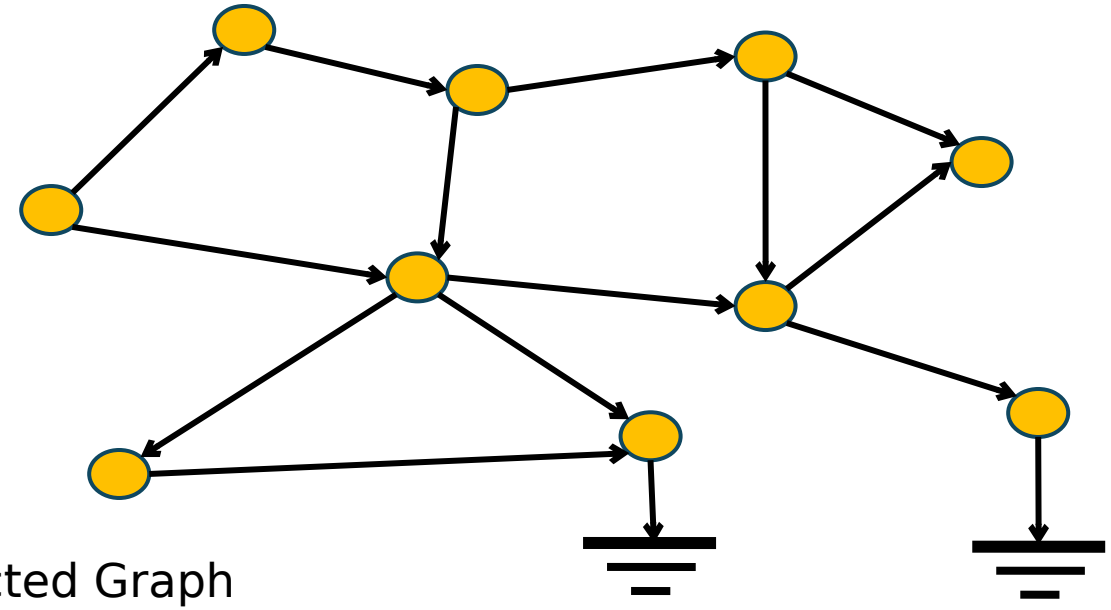


Mayan Language

- Graph has logical relations between elements
- These correspond to the relations between things in reality
- Automated reasoning checks the “deductive closure” of the graph for consistency and completeness

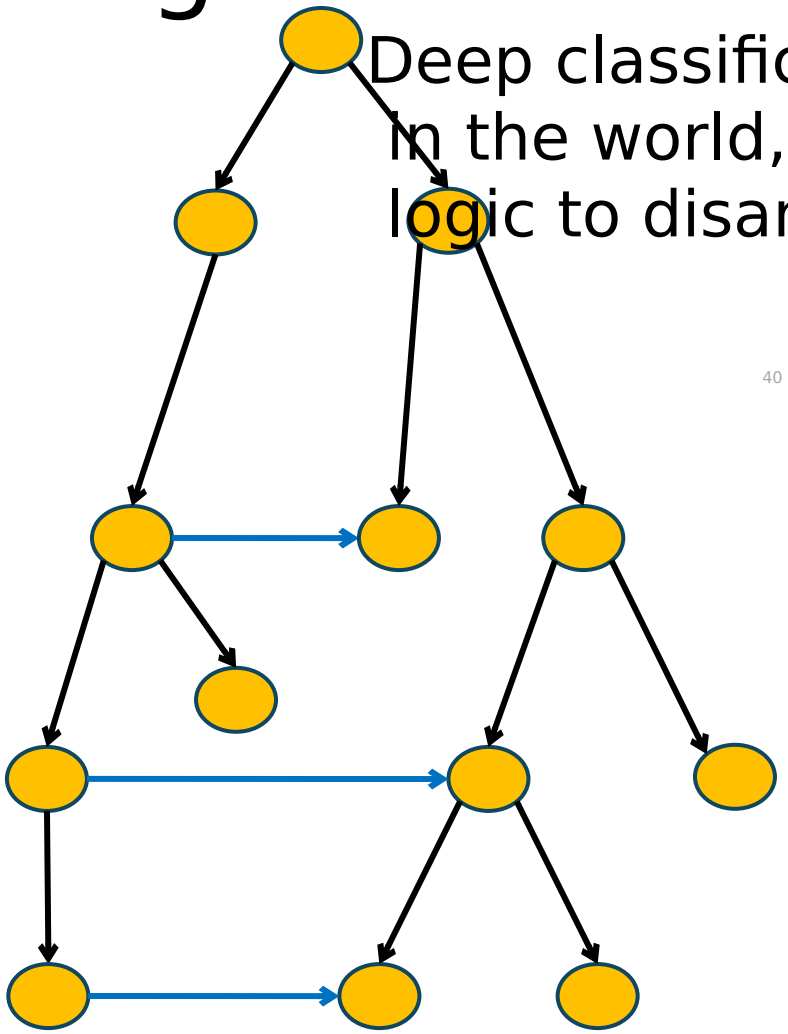
Foundational Semantics

Rosetta Stone



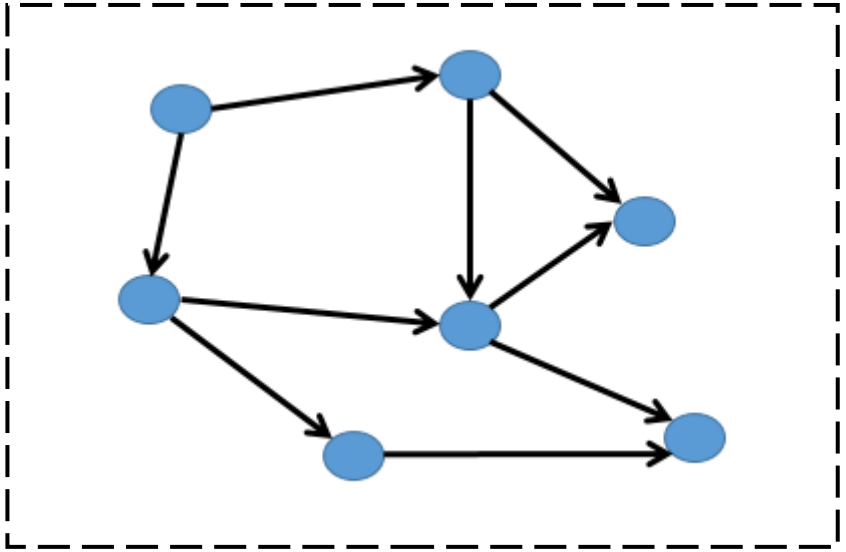
- Directed Graph
- The meaning at each node is a product of its connections to other nodes
- Semantically grounded at certain points in the graph

Foundational v Correspondence Ontologies

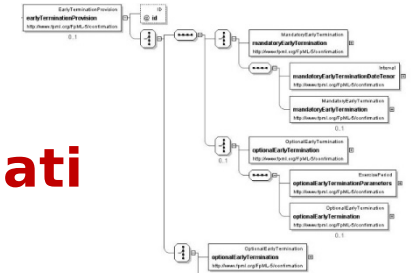


Deep classification hierarchy of types of thing in the world, with relationships and sufficient logic to disambiguate

Self-contained classes, properties and logical statements corresponding to some set of things in the world



Dimensions of a Model



Application

e.g. Messaging Level

MODEL

Formalism

$$\forall x \forall y (P(f(x)) \rightarrow \neg (P(x) \rightarrow Q(f(y), x, z)))$$

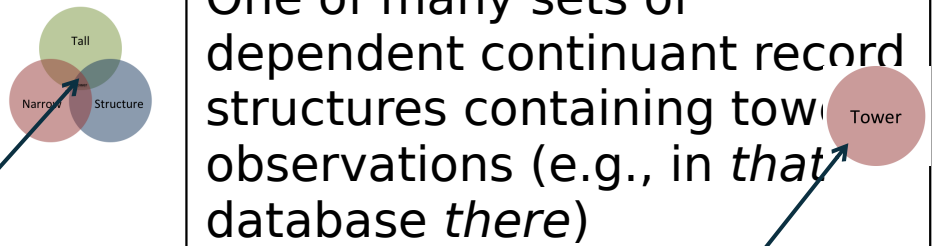
e.g. First Order Logic

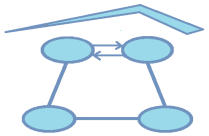
Subject

e.g. Business domain (business process etc.)

Introducing the Data Dimension

	Things	Information
Type	A set specification for a kind of Independent Thing that generalizes *all* towers (e.g., “a tall narrow structure”)	A set specification for a kind of Dependent Continuant that is a record structure containing tower observations (e.g., a “TOWER” table or a “#Tower” class)
Sets	One of many sets of independent things generalize all towers	One of many sets of dependent continuant record structures containing tow observations (e.g., in *that* database *there*)
Member	A member of *zero* or more sets of all towers (E.g., the actual or all the “Eiffel To	A member of one or more sets of record structures containing tower observations (E.g., one that represents the actual Eiffel Tower) “#tower123”





The Semantic Shed
Understanding Business Meaning

McCusker, Luciano and McGuinness

- A three-layer system (Smith et al*) for:
  - things in the world,
  - our ideas of them
  - representations of those ideas
- These give 3 types of ontology:
  - Level 1: the objects, processes, qualities, states, etc. in reality (for example on the side of the patient);
  - Level 2: cognitive representations of this reality on the part of researchers and others;
  - Level 3: concretizations of these cognitive representations in (for example textual or graphical) representational artifacts.

* Smith, B., Kusnierczyk, W., Schober, D., Ceusters, W.: Towards a reference terminology for ontology research and development in the biomedical domain. In: Proceedings of KR-MED. Volume 2006., Citeseer (2006) 57-65

Treatment of McCusker Luciano and McGuinness

- Do not need all three kinds of ontology
- Identifies a clear nature and role for a “Logical” ontology
- This looks like the Semantic Web style of ontology
  - As delivered in formal FIBO Release ontologies

Where does this fit?

Application v Reference Ontology

Application Ontology

- Built to support a particular application use case)
- Reused rather than define terms
- Skeleton structure to support application
- Terms defined refine or create new concepts directly or through new classes based on inference

Reference Ontology

- Used as an authoritative source for concepts
- Used across applications
- Represents the real things
- Grounded in foundationally primitive concepts (upper and cross-domain ontologies)

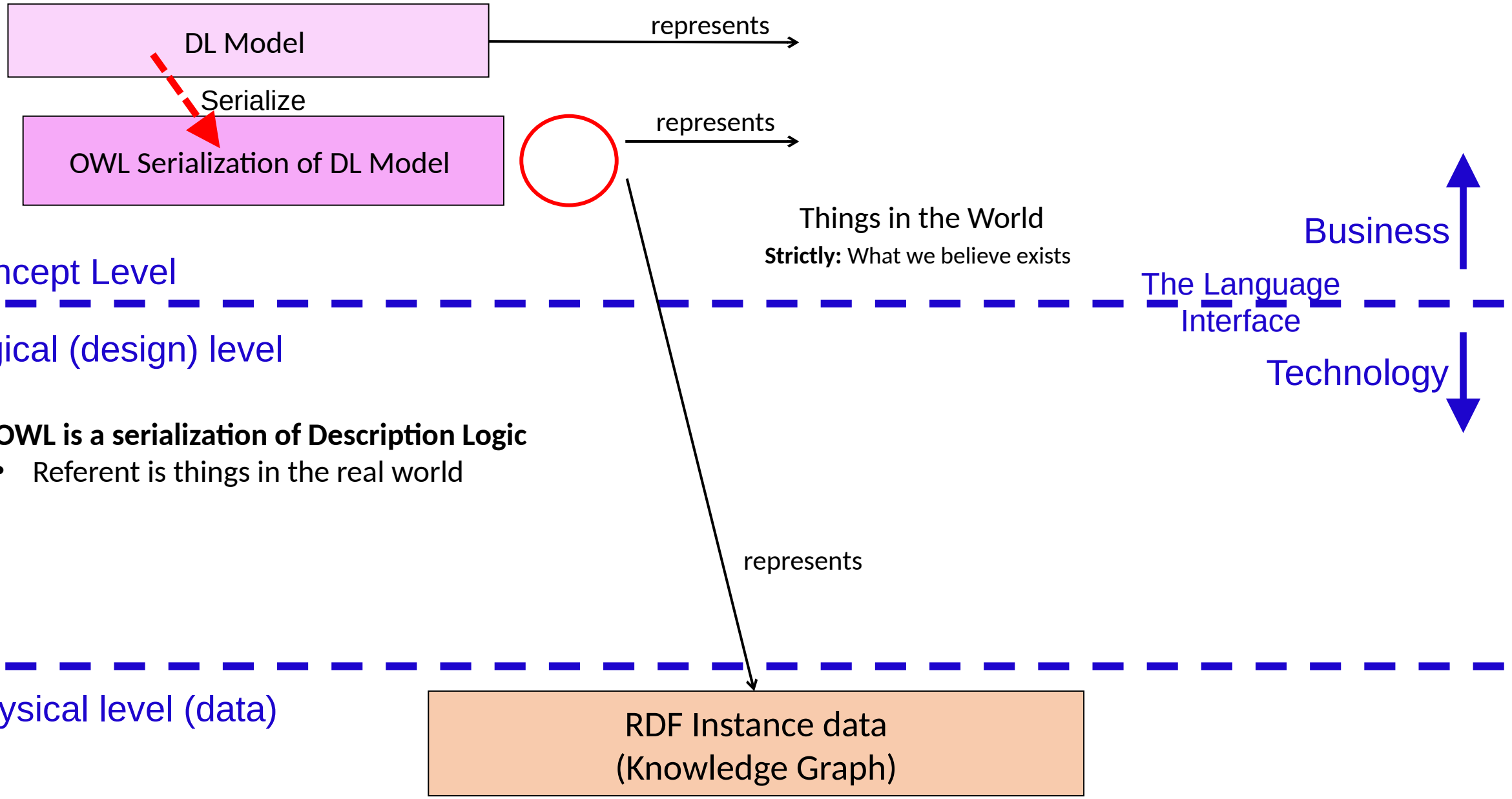
Up to now we have not mentioned computers when we talked to the business SMEs about ontologies

- Meaning is meaning
- What it means to be this or that thing need not have anything to do with data!

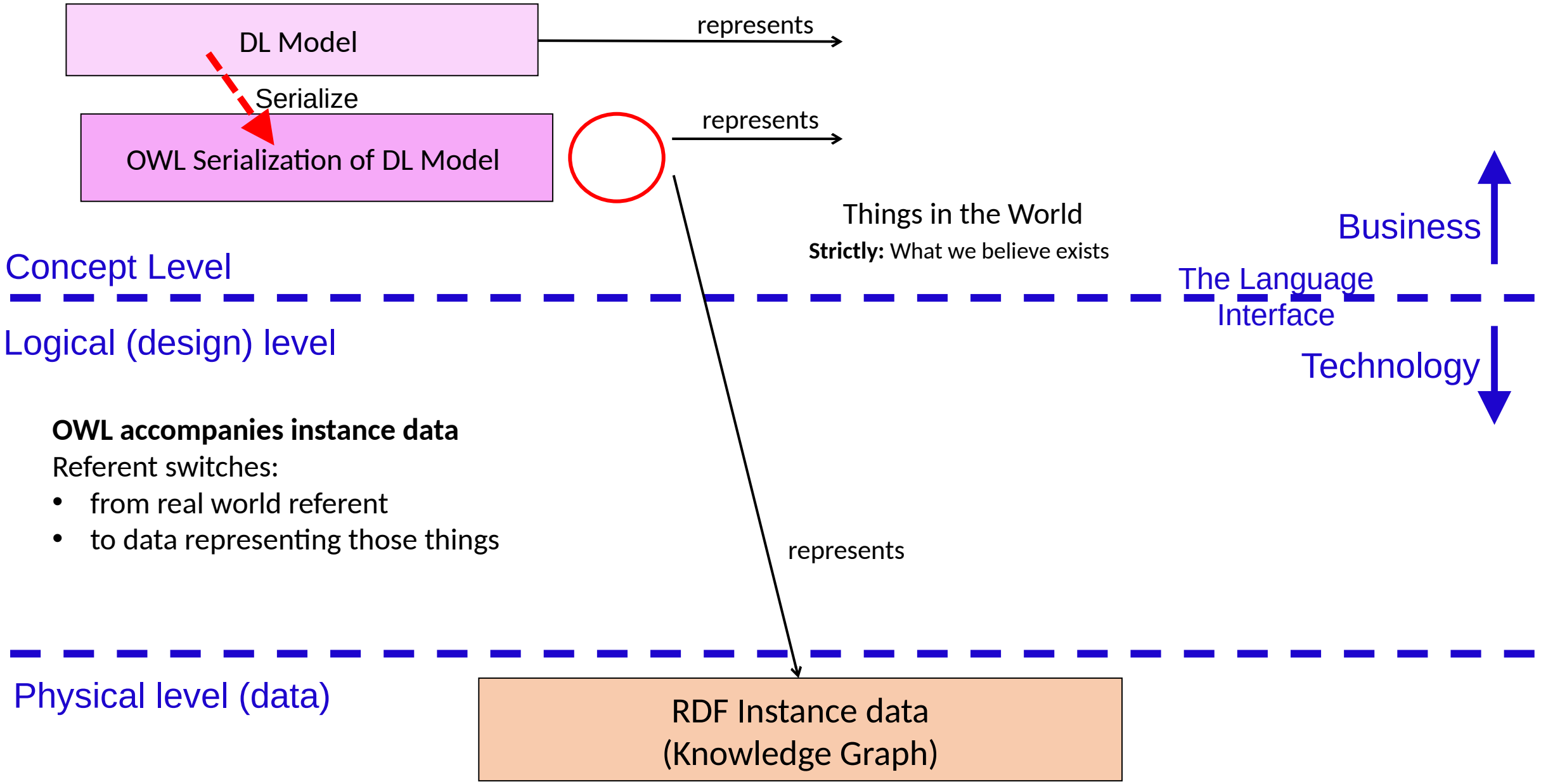
- Social constructs:
  - To be a bank is to have certain capacities
  - Ownership and control are made up of specific capacities and rights

- What about data…

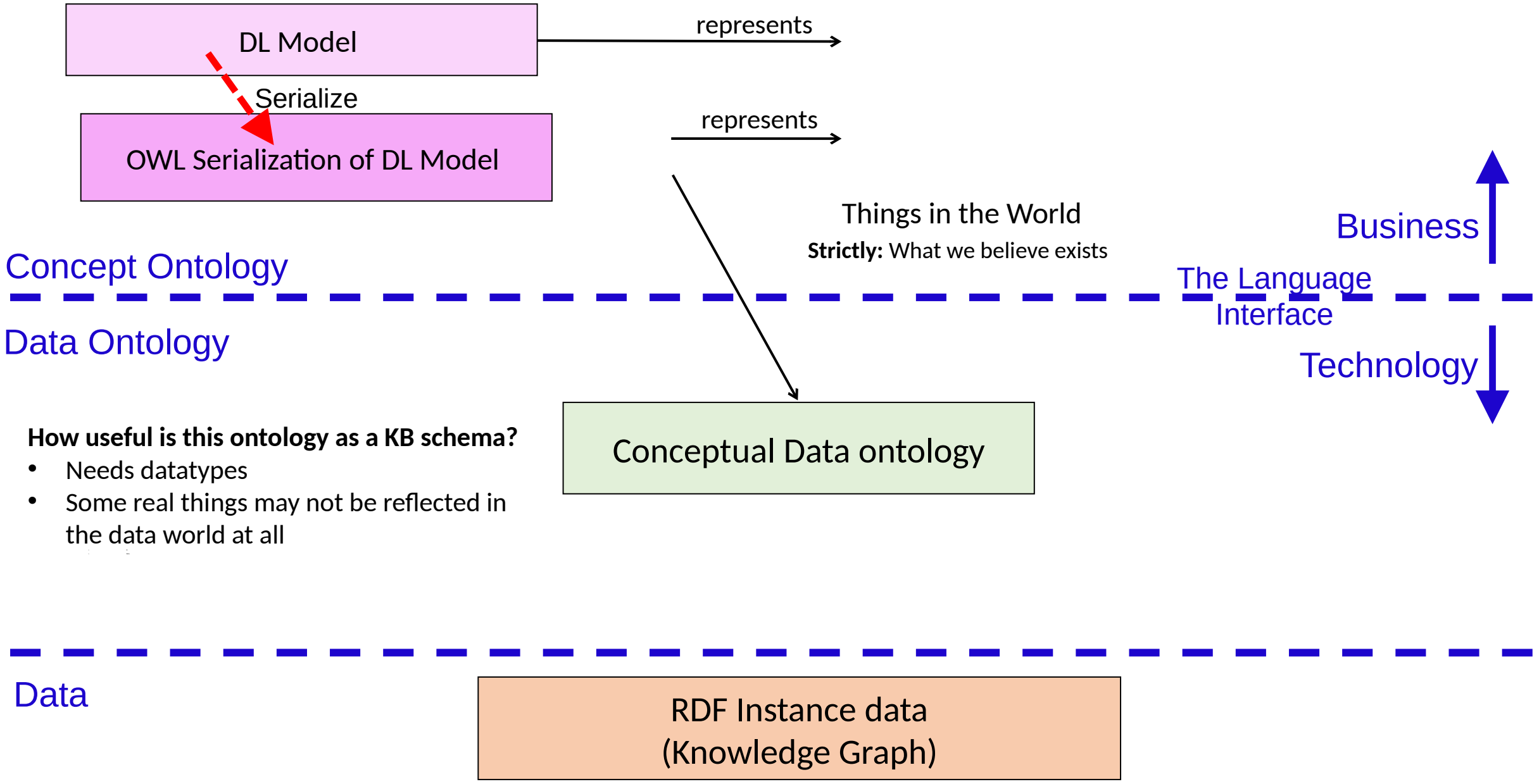
Ontology Referents: Real World



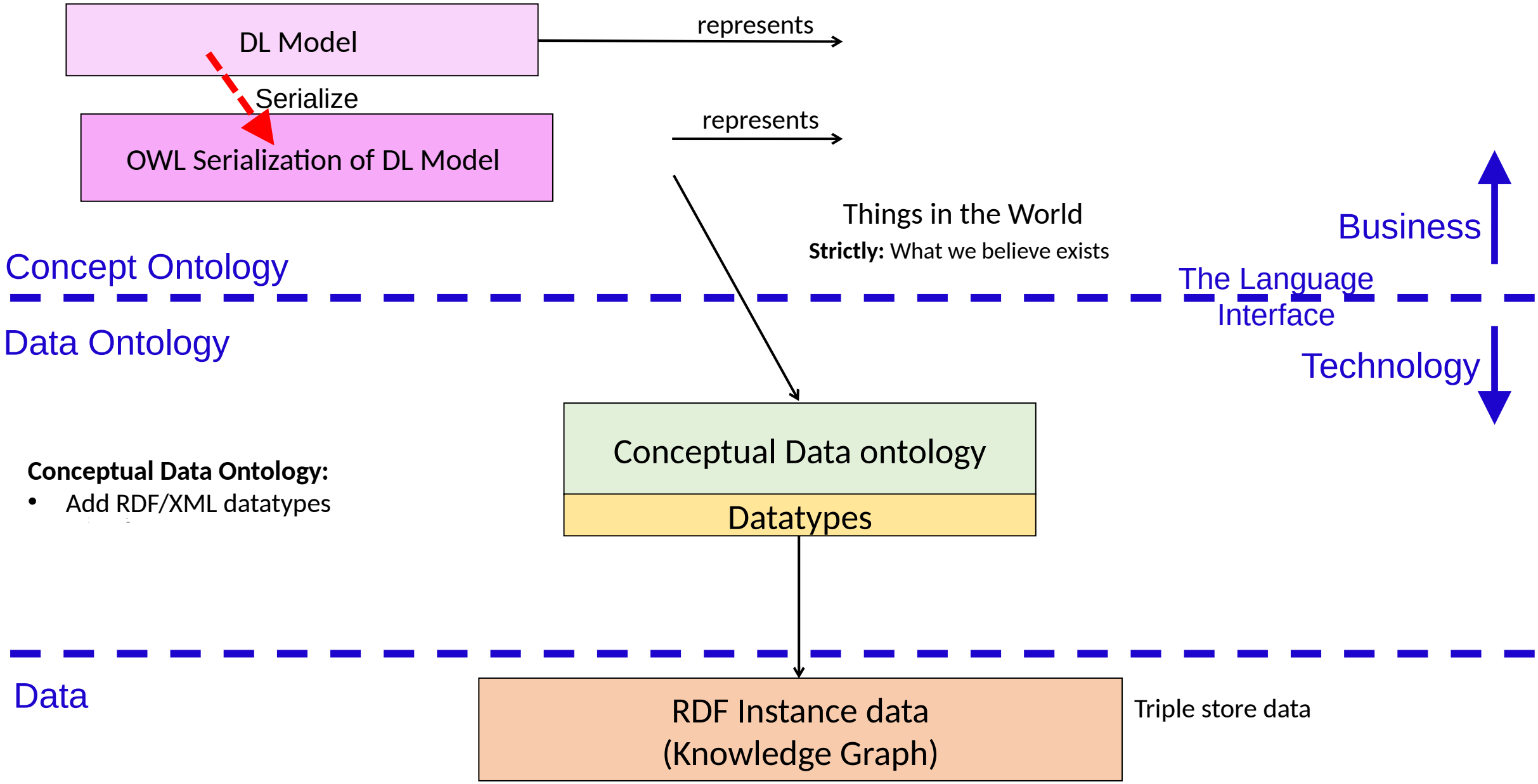
Ontology Referents: RDF Data



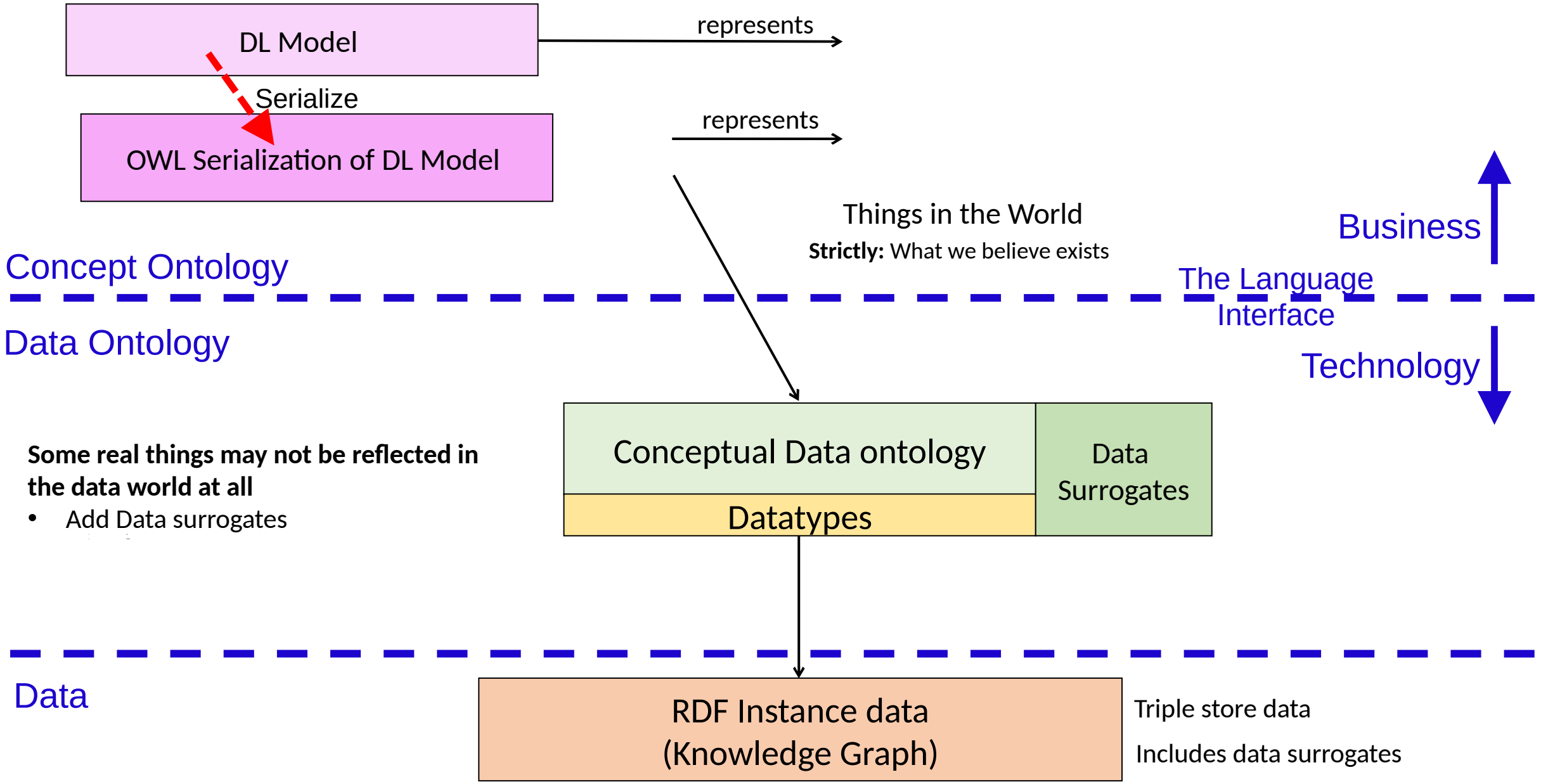
Introduce a Data Ontology



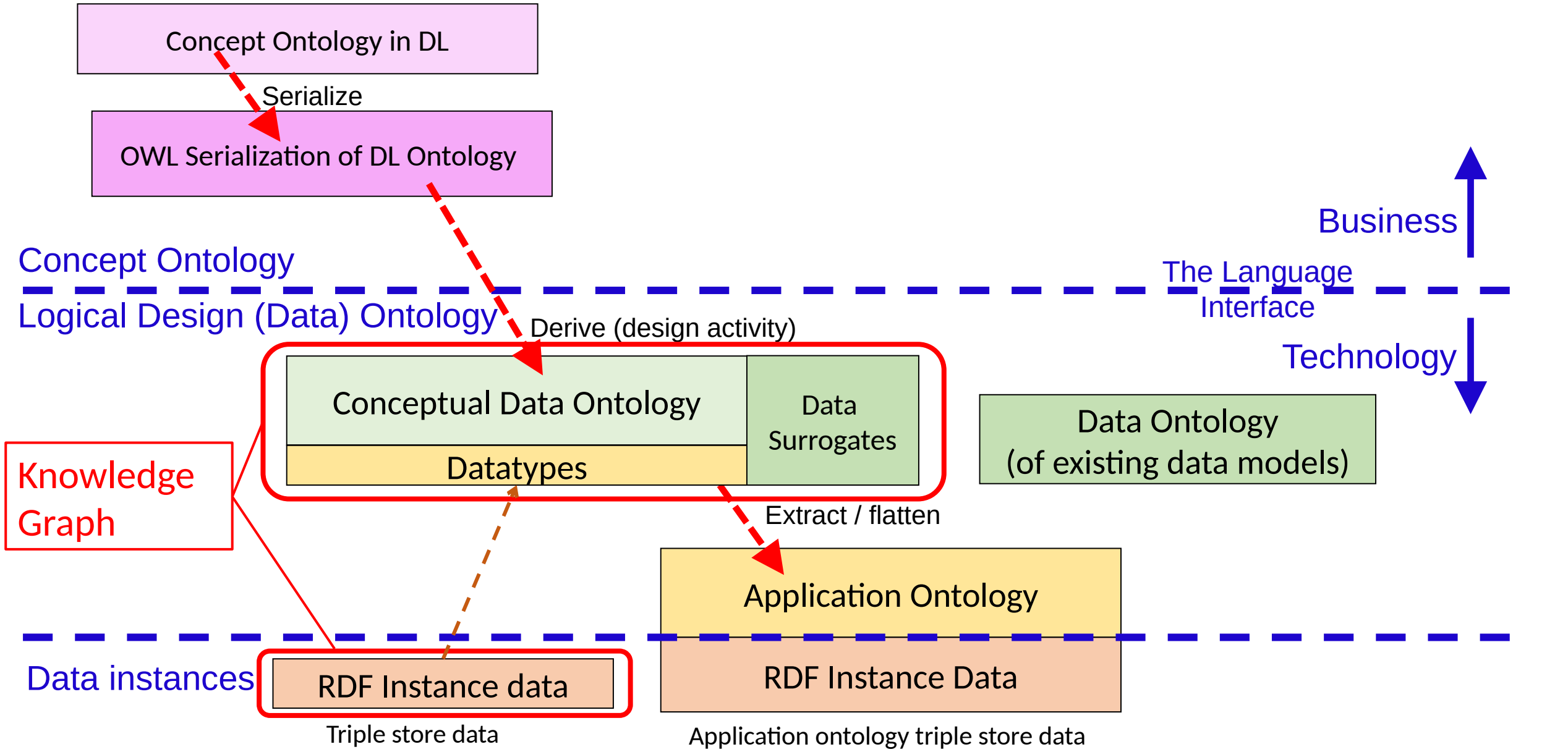
Add Datatypes for RDF Data



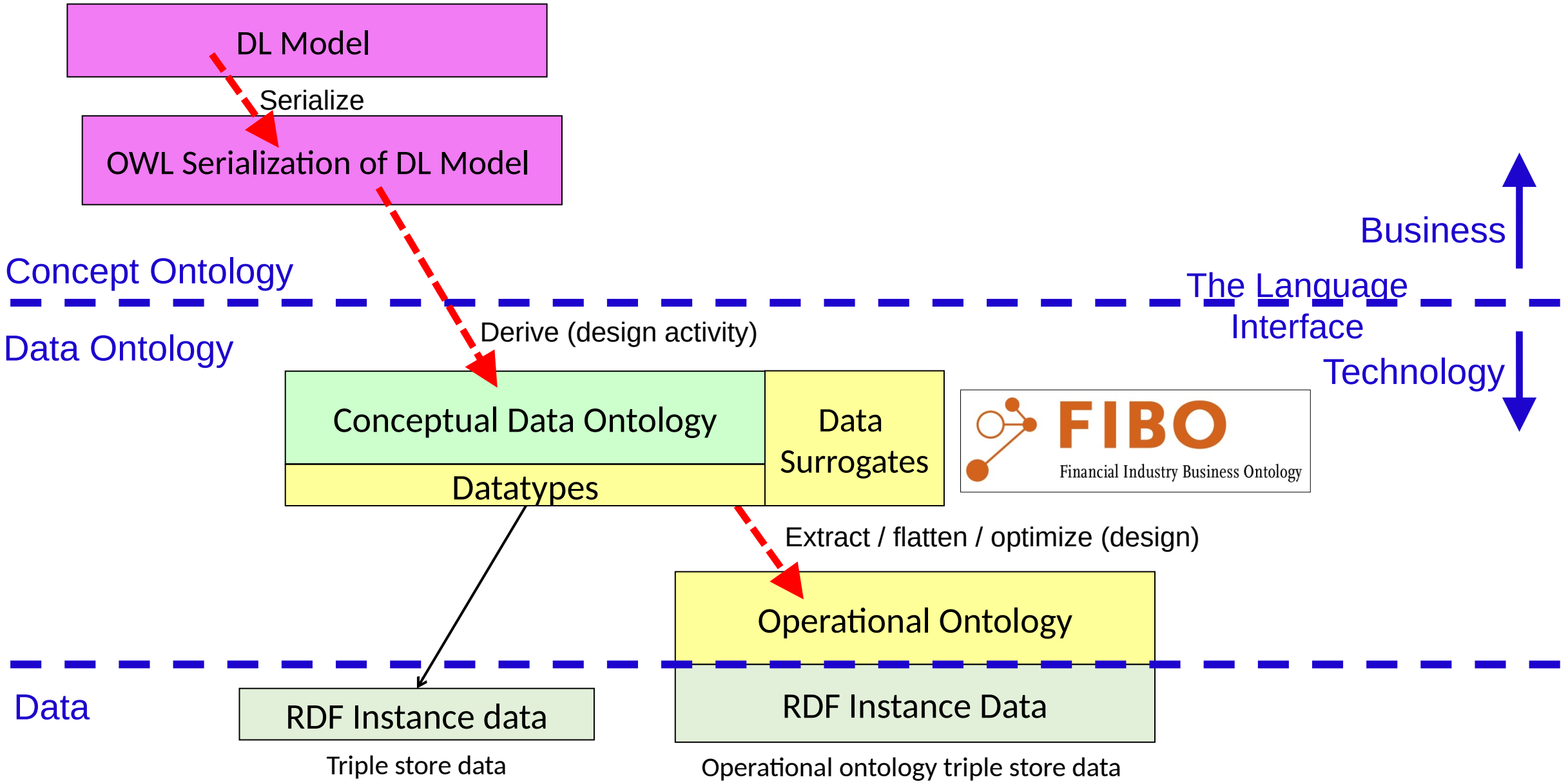
Add Data Surrogates for non-Data Items



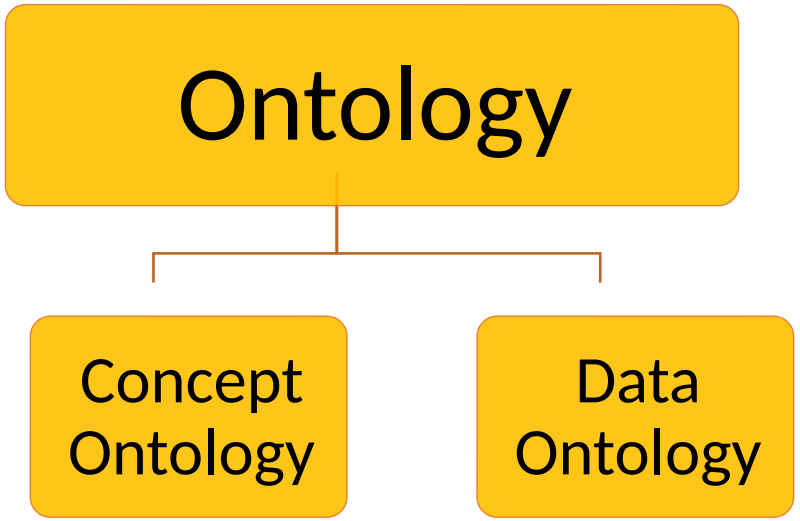
Ontology Styles: Knowledge Graph



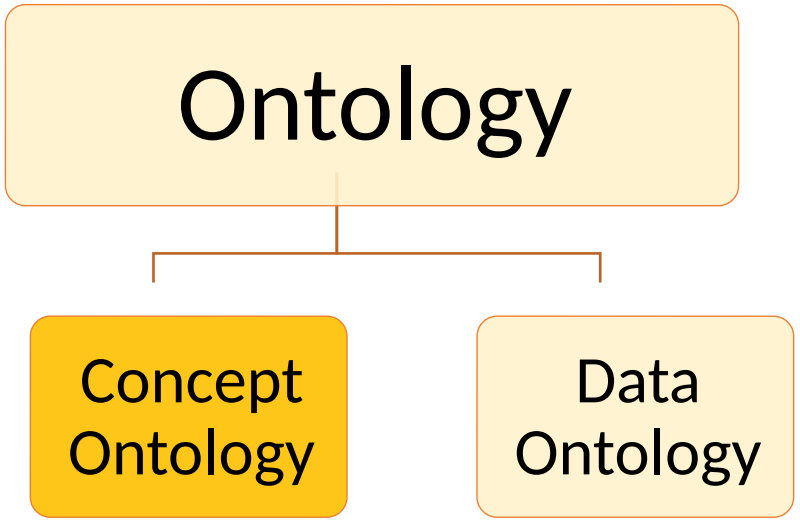
Ontology Types and FIBO



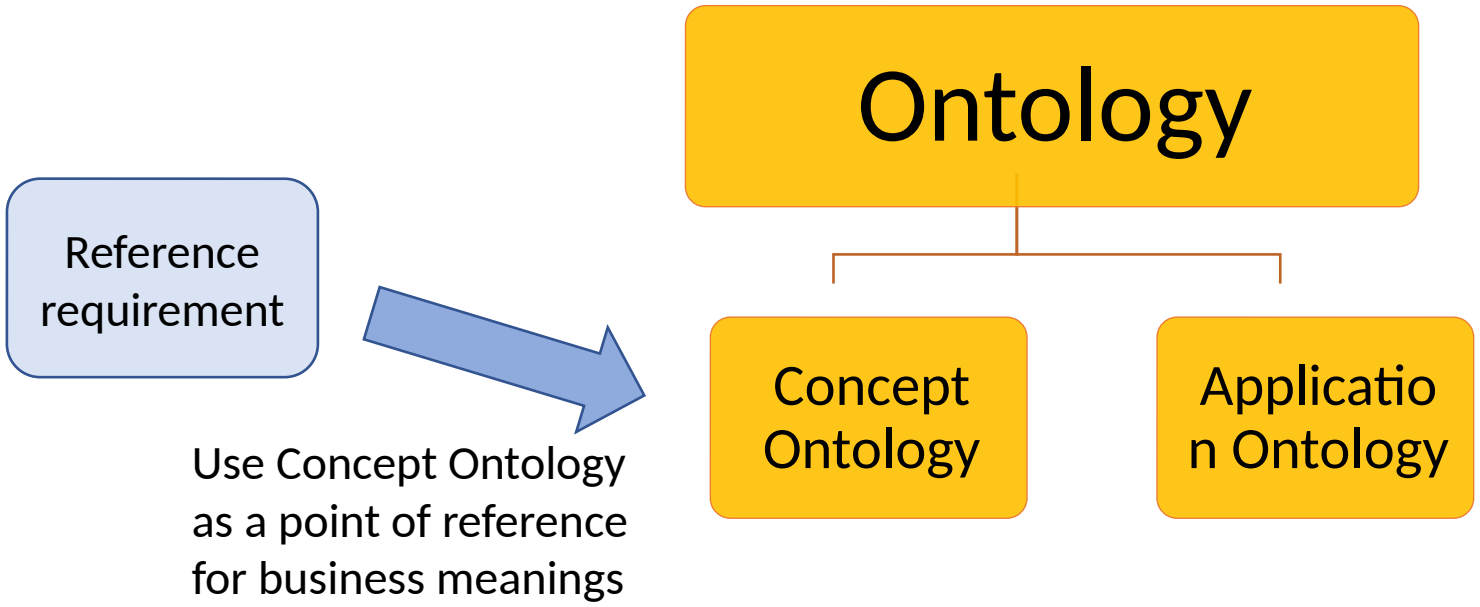
Concepts v Data Ontologies



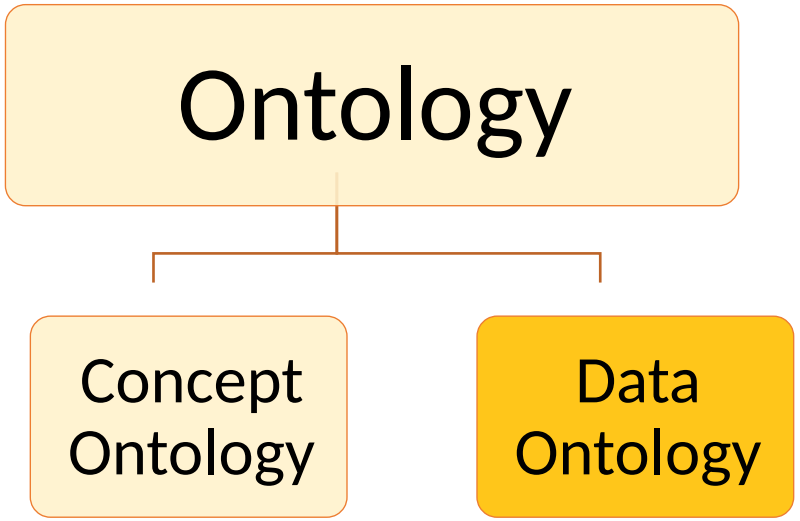
Concept Ontology



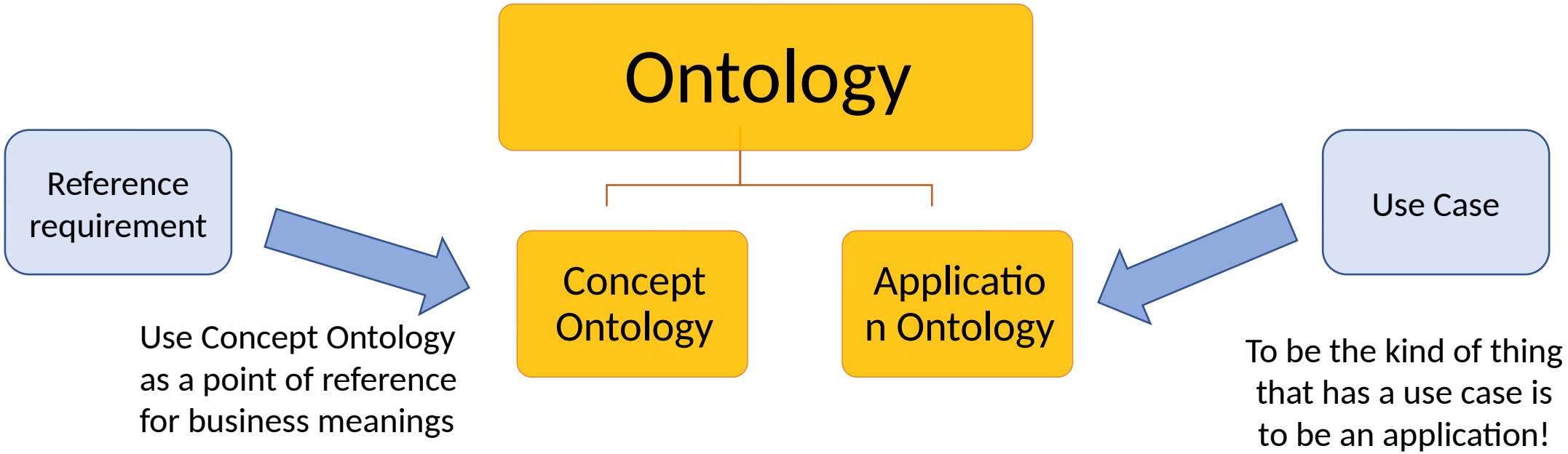
Reference v Application Ontologies



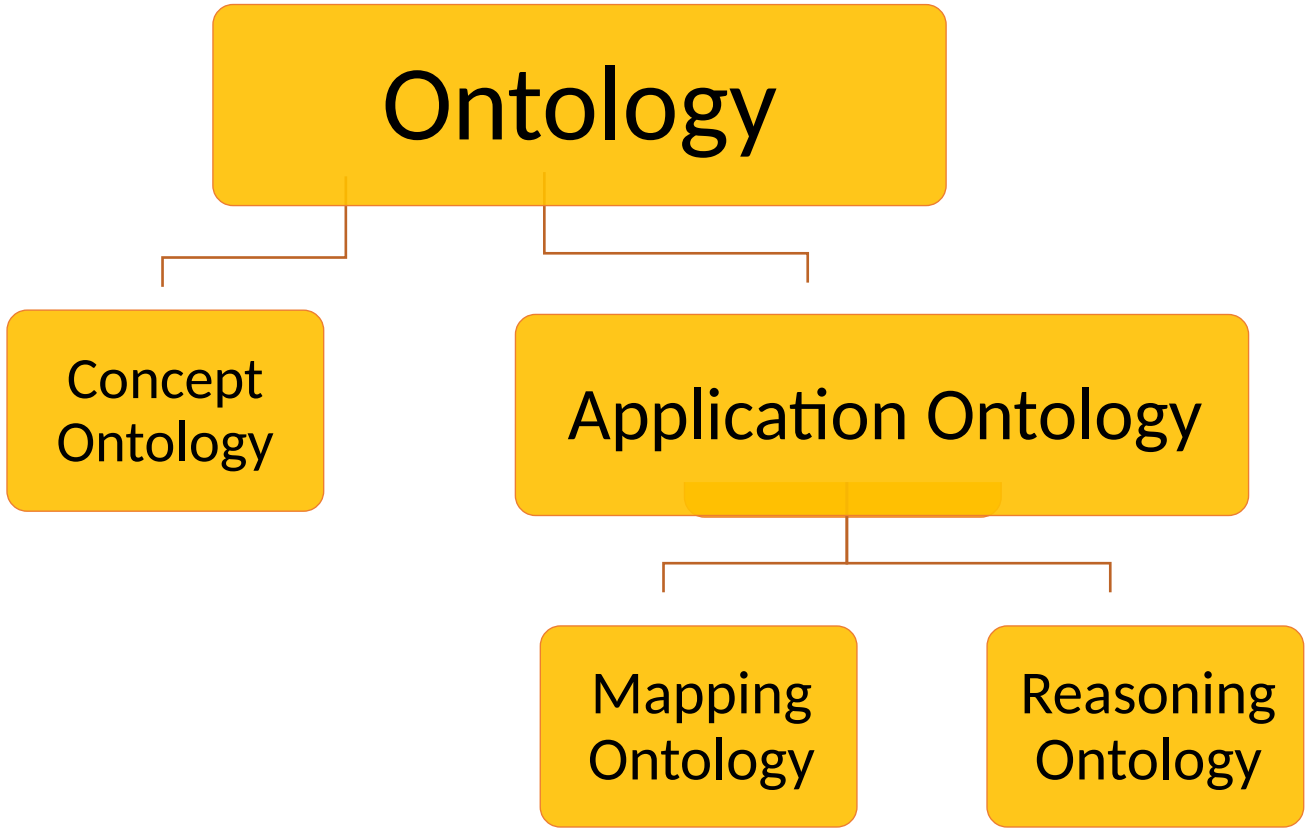
Data Ontology



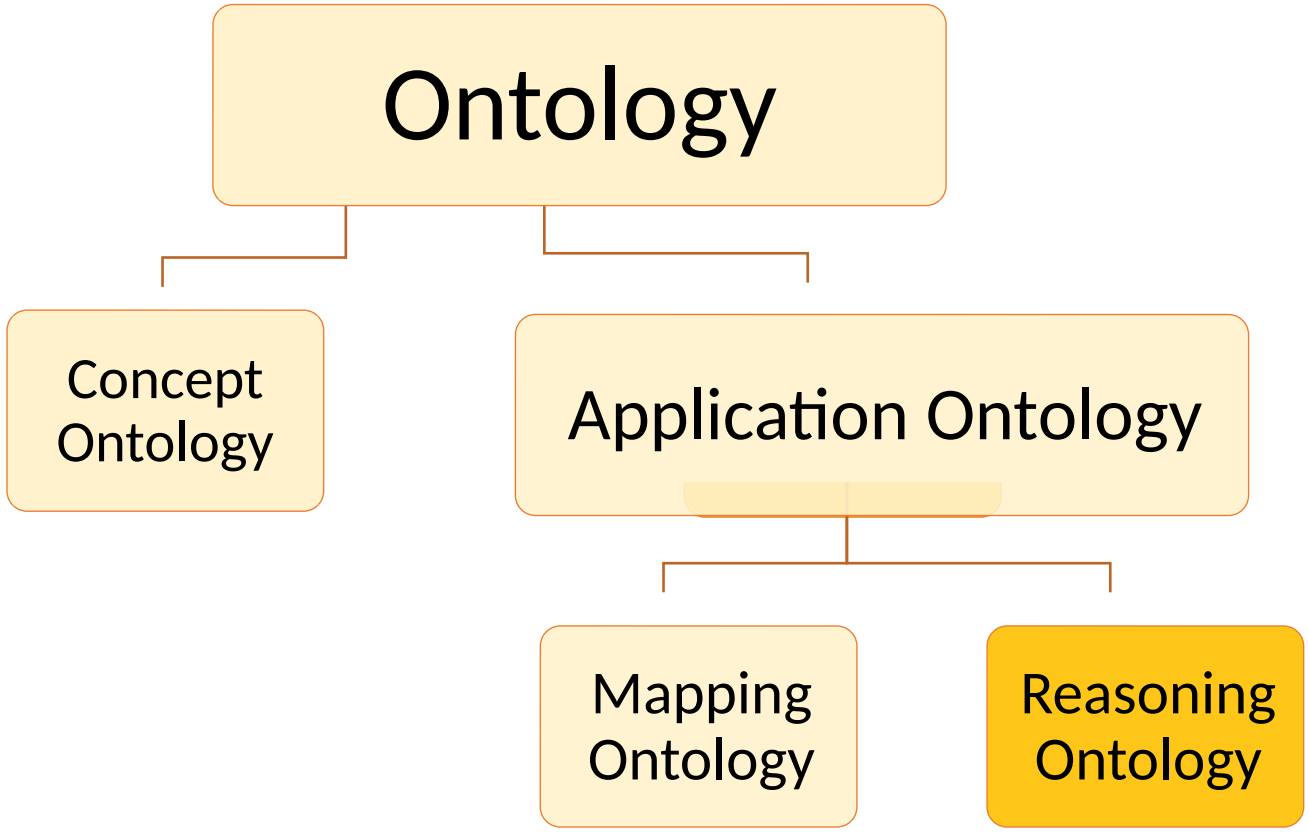
Reference v Application Ontologies



Mapping v Reasoning Ontologies

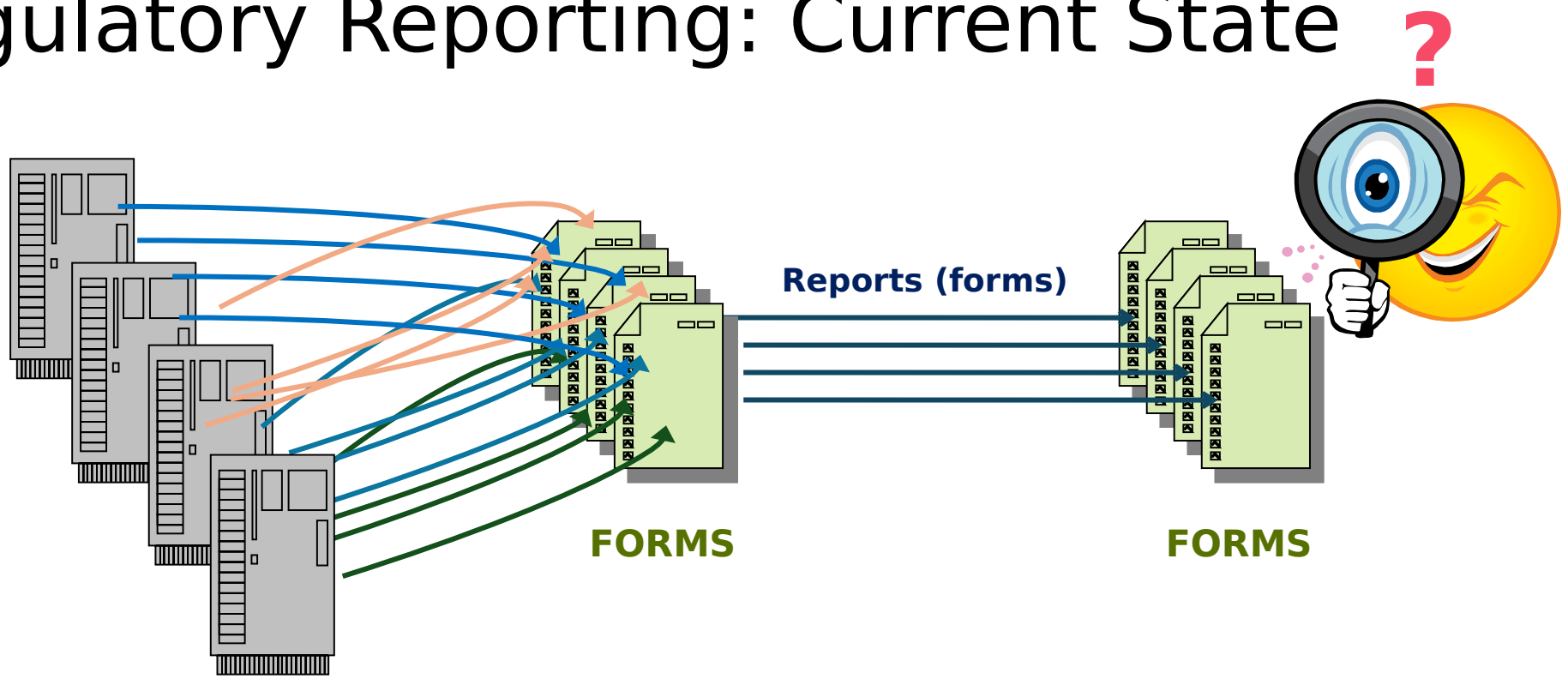


Reasoning / Inference Processing Ontology



Using FIBO:
Interoperability, Reporting, Applications

Regulatory Reporting: Current State



REPORTING ENTITY

Change in Reporting requirements =

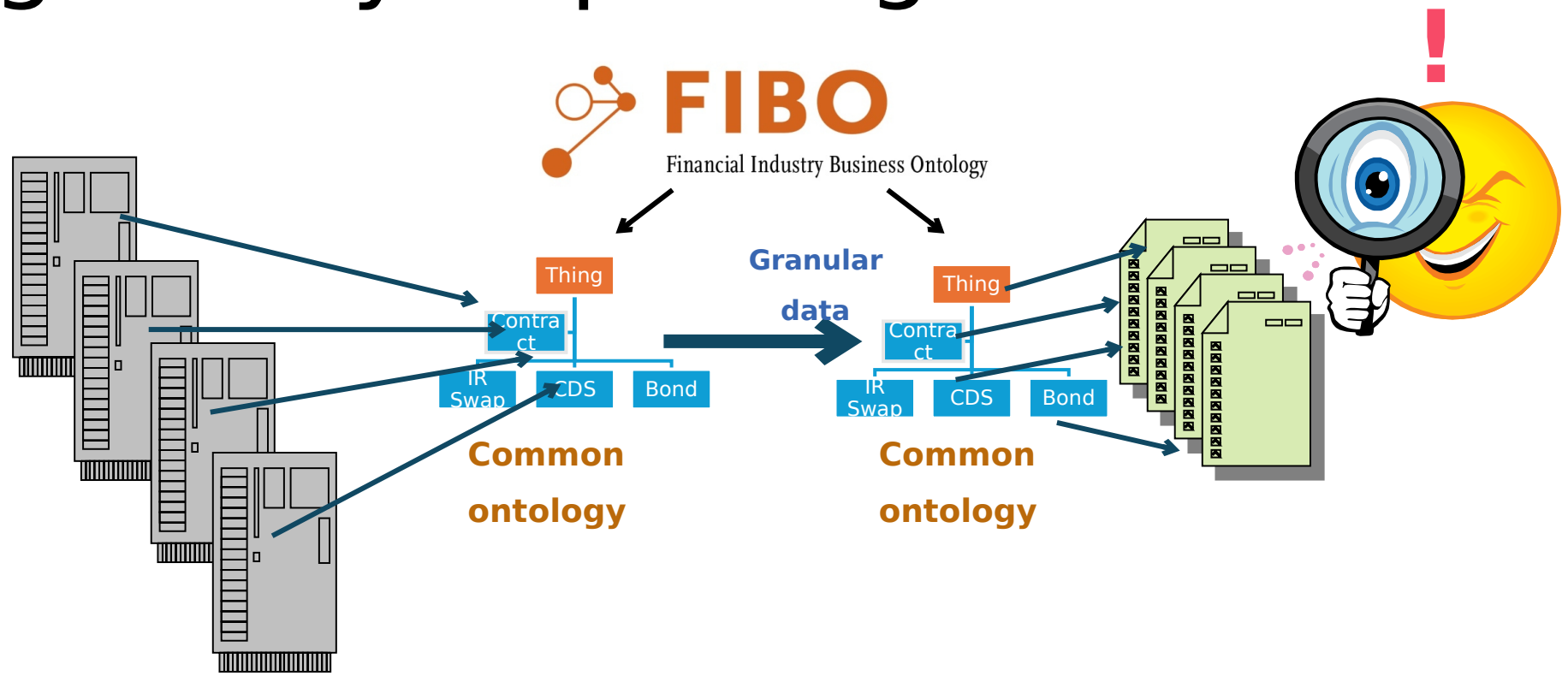
- Redevelopment effort
  - By each reporting entity
  - For each system and form

REGULATORY AUTHORITY

Uncertainty

- Content of the reports
  - Are we comparing like with like?
  - Data quality and provenance

Regulatory Reporting



REPORTING ENTITY

Data is mapped from each system of record into a common ontology

Reported as standardized, granular data

Agnostic to changes in forms

REGULATORY AUTHORITY

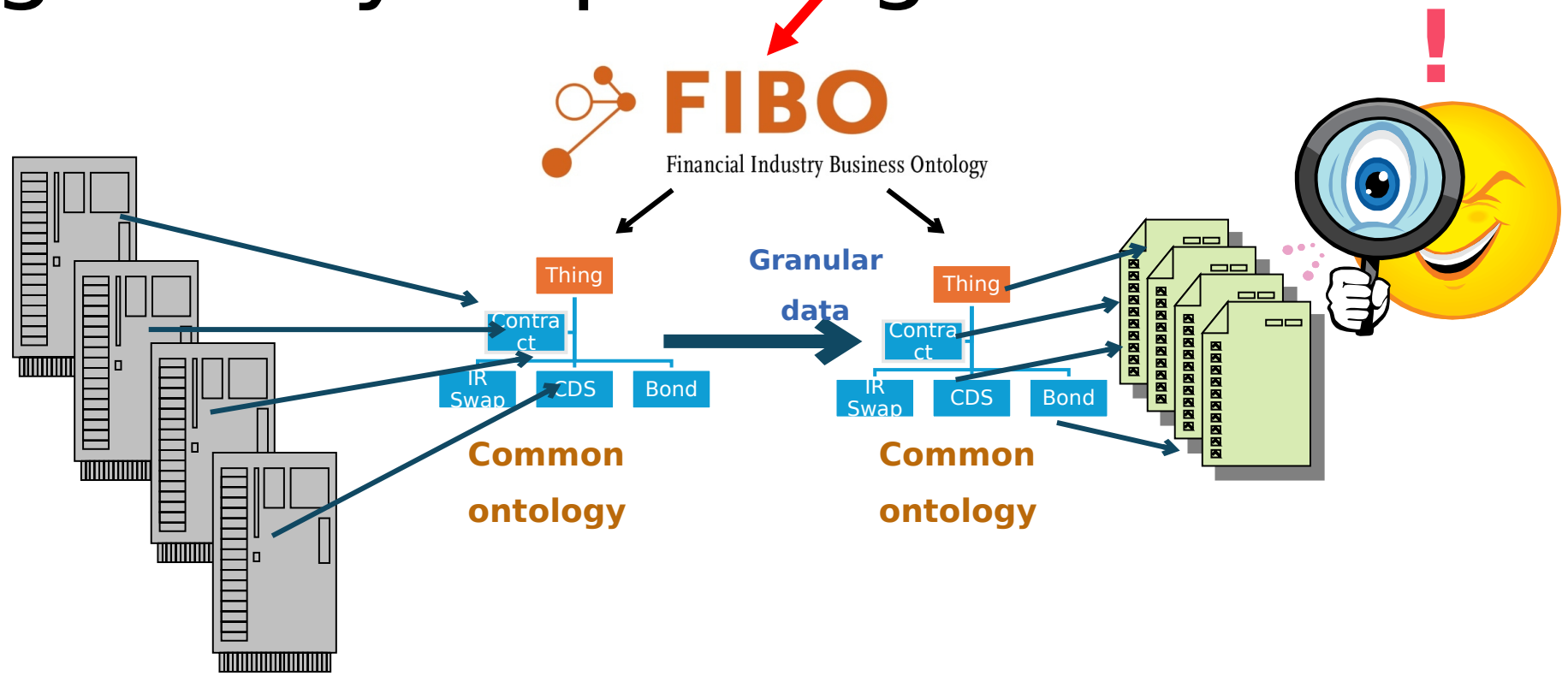
Receives standardized, granular data aligned with standard ontology (FIBO)

Uses semantic queries (SPARQL) to assemble information

Changes to forms need not require re-engineering by reporting entities

Regulatory Reporting

Conceptual Ontology
Foundational semantics



REPORTING ENTITY

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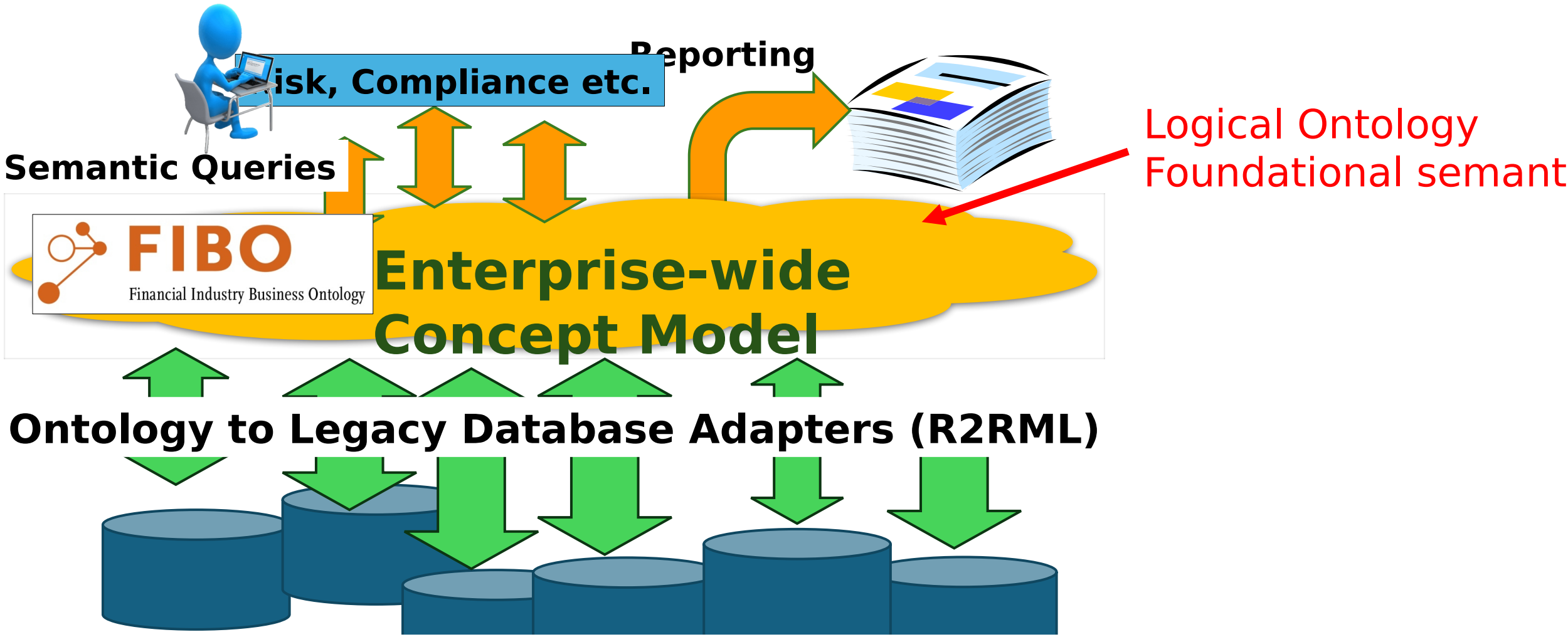
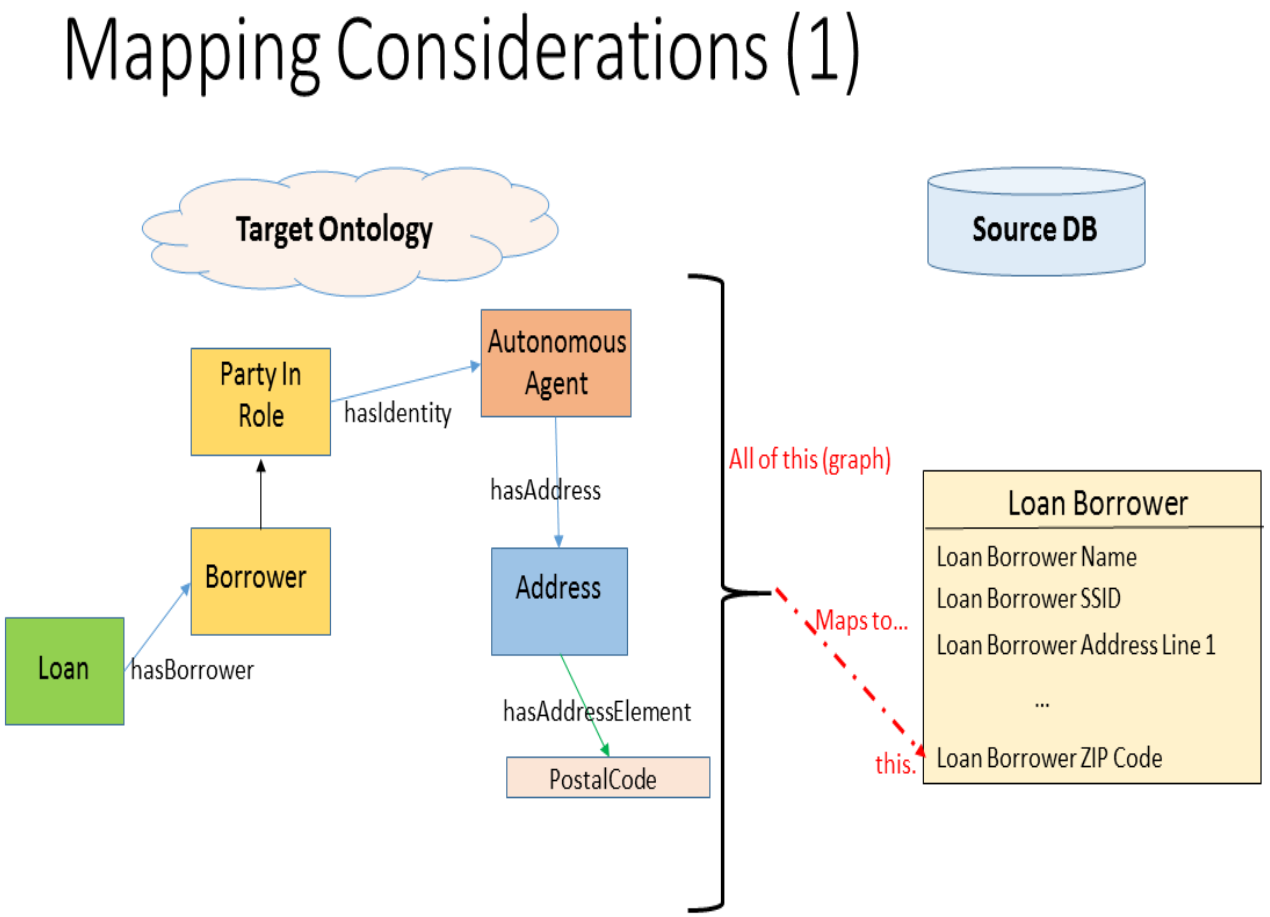
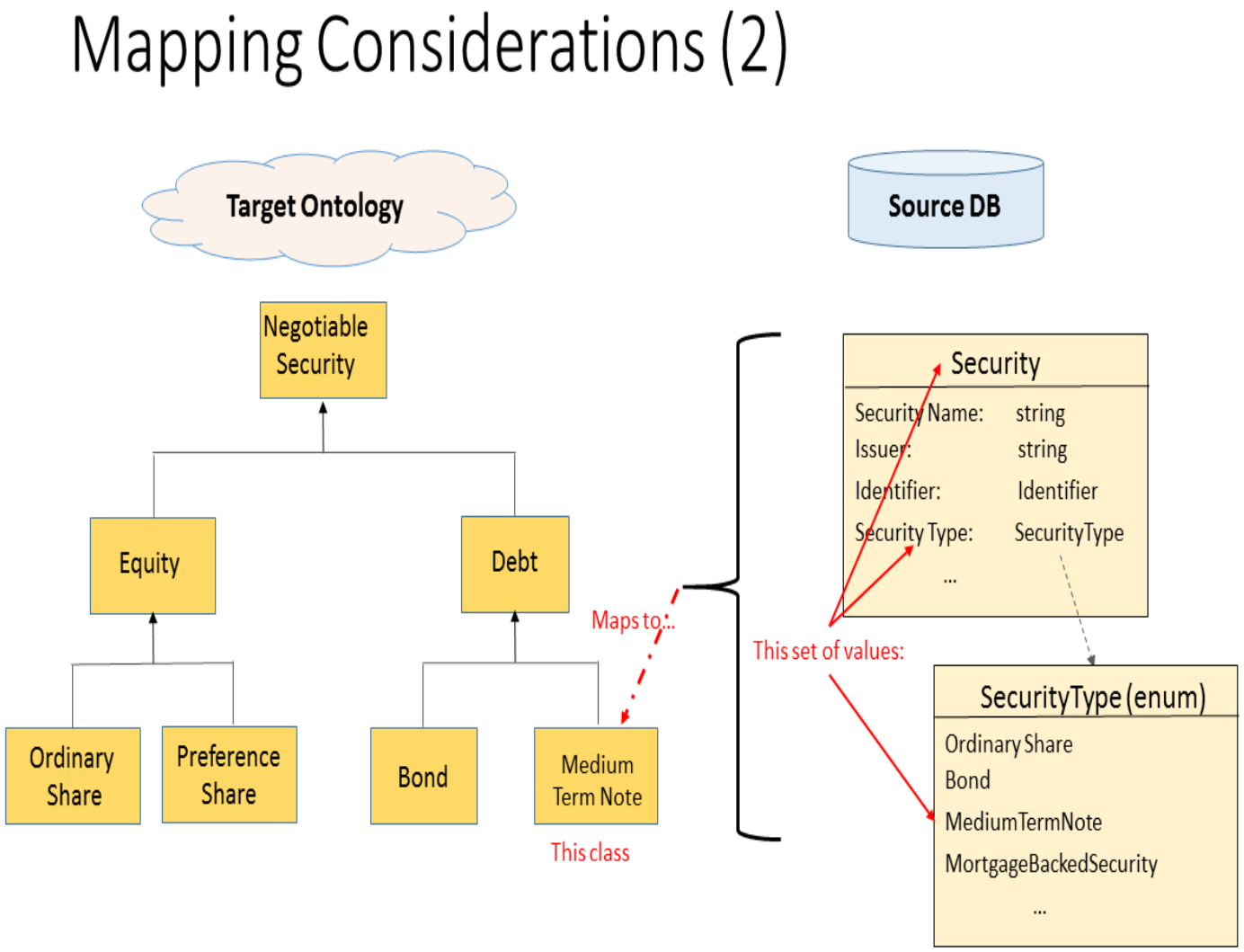
Querying across Legacy Data Sources



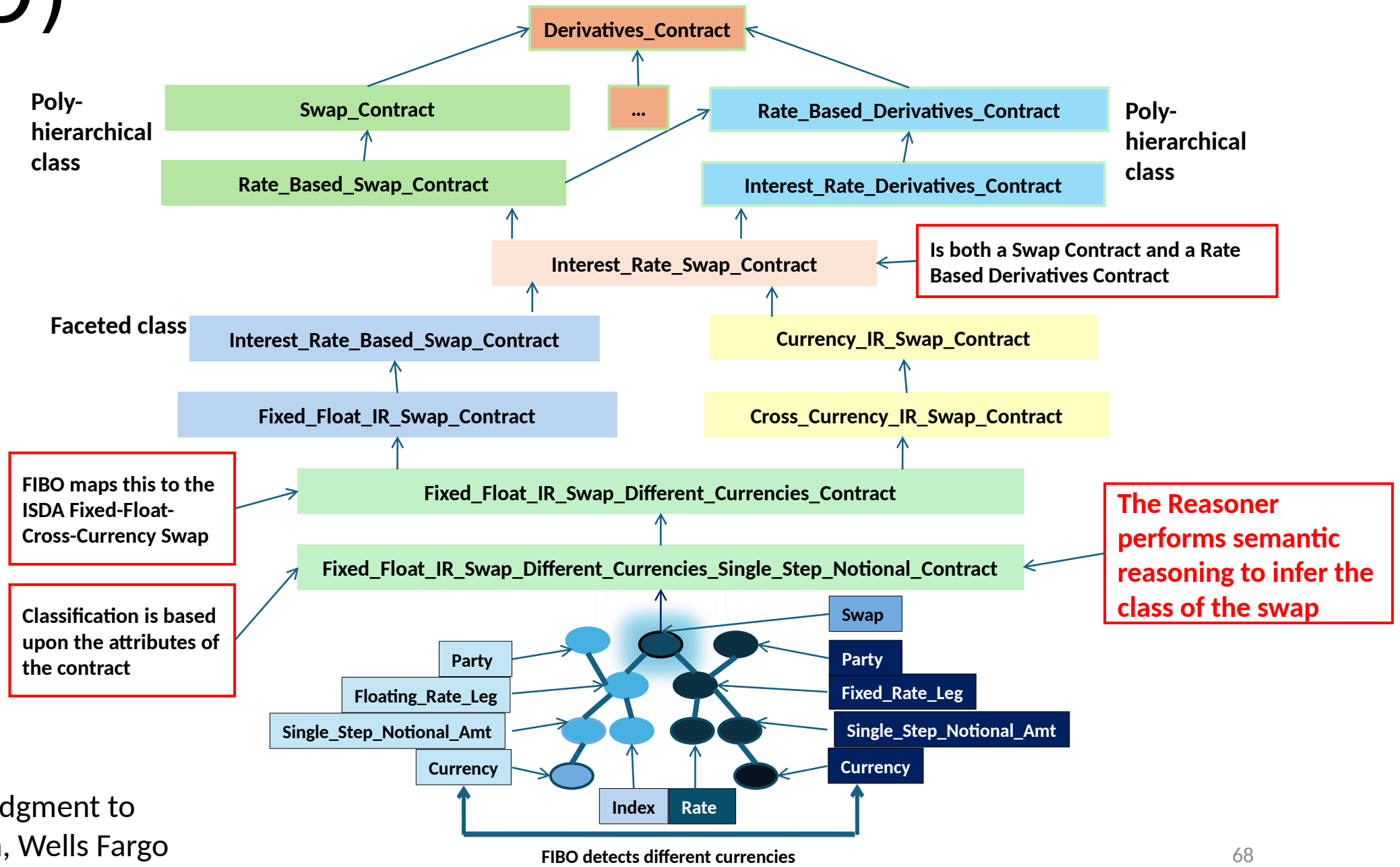
Mapping: Ontology to Data Model



Mapping: Data Model to Ontology



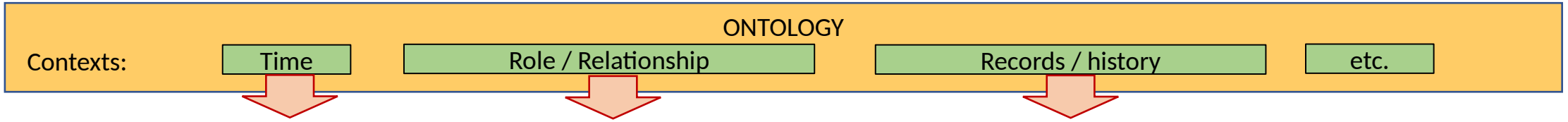
Inference Processing Example (FIBO)



With acknowledgment to David Newman, Wells Fargo

Aligning Business Glossary and Data Elements

Analysis of a representative set of terms in a bank business glossary and accompanying data dictionary. Terms like 'Country' are defined in the context in which they are used, for example country of domicile, risk etc. Meanwhile data elements need the context of class, class hierarchy in data models to determine semantics.



Business concept context

Data element context

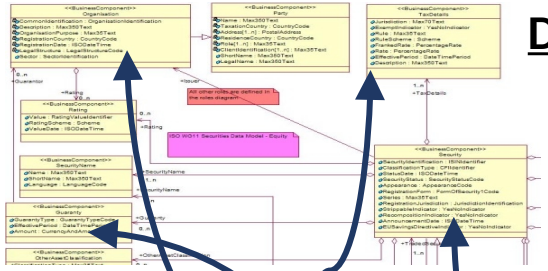
Business Glossary

Customer Information
- Personal Name
- Family Name
- Middle Name
- Honorific

Customer Documentation
- Date of Birth
- Place of Birth
- Country of Citizenship
- Country of Residence

Corporate Customer Information
- Customer Legal Name
- Entity Type
- Date of Incorporation
- Country of Incorporati
- Company Incorporation Number
- Registered Address
- Company Sector Code

trace



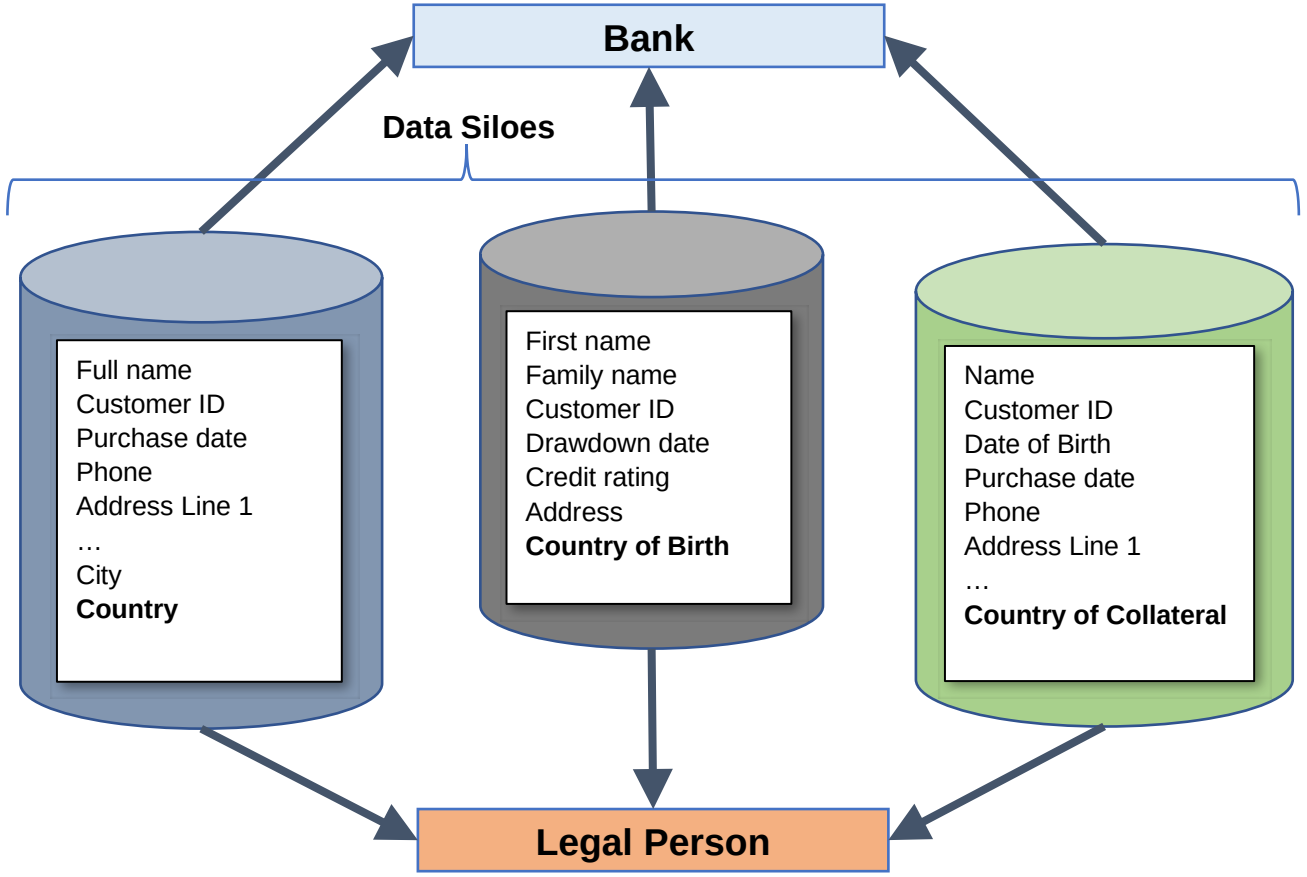
Data Model

Business Glossary Details

Country	A self-governing geopolitical unit that is recognized as a country by the United Nations	Country of Incorporation	This term refers to country in which a corporation is **legally registered for operations**. This term is applicable to corporate entities only.	XYZ: Registered Address Country
		Country of Birth	The country which customer documentation identifies as **country of birth of the customer.** This term refers to individuals only.	PQR: Customer Birth place
		Country of Residence	The **country where the customer declared he / she resides .** This attribute refers to individuals only.	PQR: Customer Domicile Country Code
		Domicile Country	This term refers to the **country where the company operates** for its primary operations. This term is applicable to corporate entities only	XYZ: Customer Domicile Country Code
		Country Code	This is a 2-3 digit standard used to refer to a country, where the code is **applicable to county of birth, county of residence, etc.**	ISO 3166 Country Code
		Country of Risk	This term refers to the **country of risk for a customer's exposure** with the Bank. This may be related to the currency of transaction or to location of a transaction or payee. This is applicable to corporations of individuals.	XYZ: Customer Risk Country Code PQR: Customer Collateral Country Code

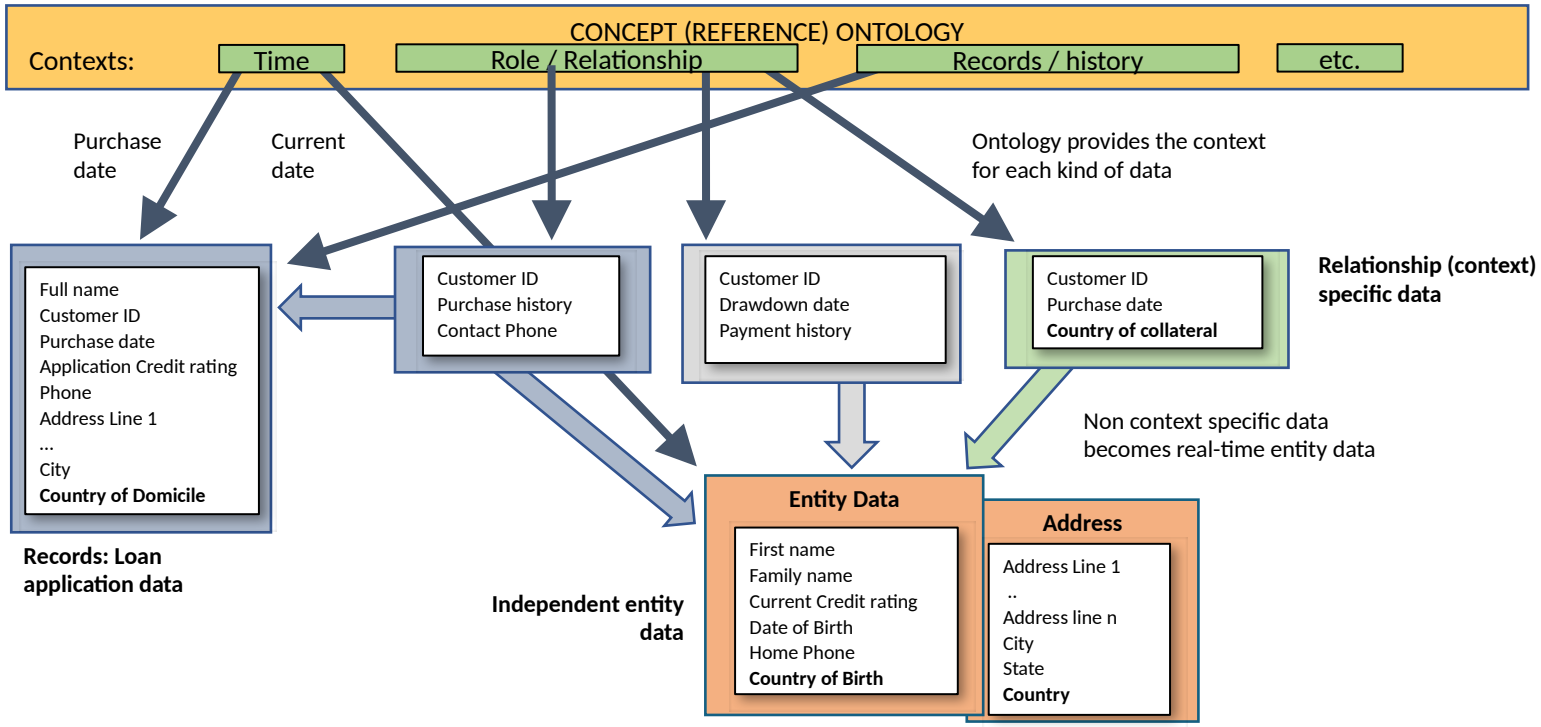
Ontology for Data Refactoring: Before

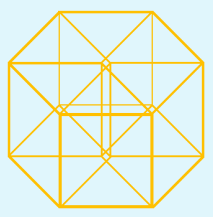
There are various points at which the bank interacts with a given entity or customer



Ontology for Data Refactoring: After

The Ontology makes implicit contexts explicit. It provides contextual semantics, distinguishing concepts specific to relationships, historical records (e.g. loan applications), current information for entities, and others. This is independent of the deployment benefits of semantic technology.





Questions?

- Mike Bennett
  - Director, Hypercube Ltd.

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