ENTERPRISE DATA MANAGEMENT

EDM COUNCIL

The Financial Industry Business Ontology

Financial Industry Semantics

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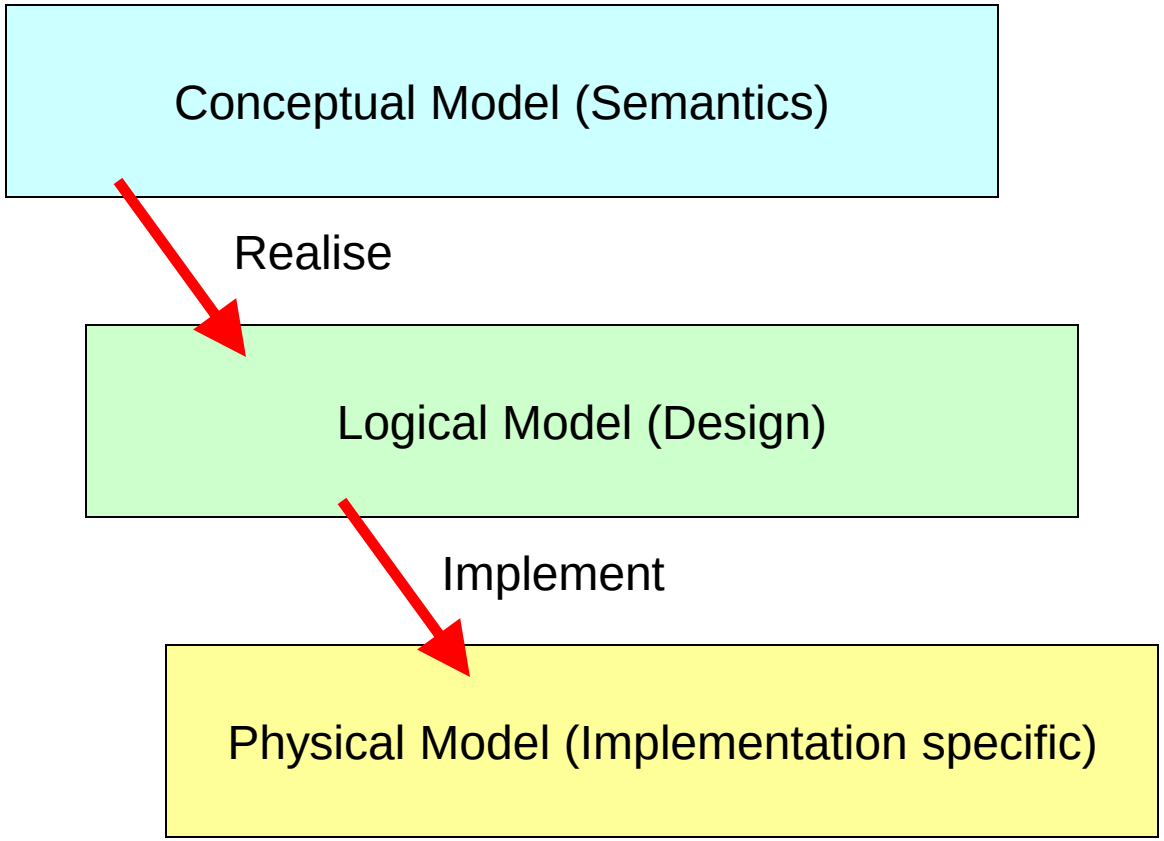
Overview

- Classification – Aaron Loehrlein
- Knowledge representation
- Classification Examples
- The Financial Industry Business Ontology (FIBO)
- From business semantics to an operational ontology – David Newman

Positioning: Conceptual Model for Data



Development Lifecycle for Data

Level (from Zachman)		Data	Function
0	Scope (contextual)	Things relevant to the business	Set of business processes
1	Business Model (conceptual)	Semantic Model	Functional Requirements (Use Case)
2	System Model (logical)	Logical Data Model	Logical Design
3	Technology Model (physical)	Physical Data Model	Physical Design
4	Detailed Representation	Data definition	Program

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Conceptual Model Requirements

- Must be owned and validated by business
  - Manage the “Language interface” between tech and business subject matter experts
  - Everything should be in English
    - No techie terms and casing like “objectProperty”
  - Everything should be reviewable
    - Spreadsheets
    - dialect-free diagrams

Why does this Matter?

- Unambiguous shared meaning is a pre-requisite for many data centric applications (including semantic tech)
- Knowledge representation is not a technology exercise
- Semantics should be validated by business domain experts

Ontology

- "A formal specification of a conceptualization"

- But
  - What formalization?
  - What conceptualization?

  - That defines what sort of ontology

Some Terms

- Taxonomy
  - A structured classification scheme
    - Linnaeus Taxonomy of Species
    - Taxonomy of Financial Instruments
- Ontology
  - Adds formal properties to a taxonomy
  - Describes real world things
- Vocabulary or Lexicon
  - Deals with the words for things

Taxonomy

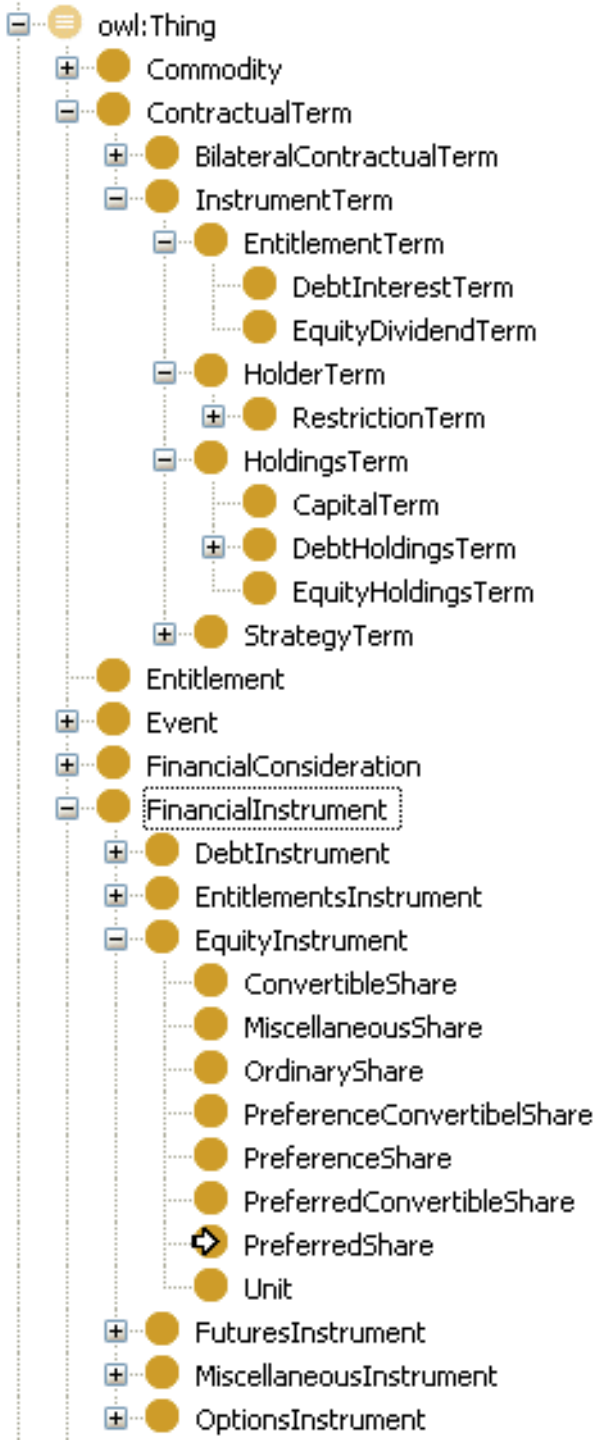
- Taxonomy:
  - system that can be used to group, arrange, and describe items according to meaningful principles, and which provides users with an overview of the domain being organized
    - Lambe (2009)
- A taxonomy uses a classification scheme to arrange the items in the domain of discourse
- A Taxonomy forms the basis for any ontology

Model Theory and Semiotics

- For any model we may ask:
  - What is that to which the model elements correspond?
  - What is the formal grounding of the symbols in the model
- For an ontology:
  - The things to which the model elements refer are real things in the domain of discourse
  - The grounding is formal logic

Possible classes of Thing

- "Everything is a Thing"
  - That is, a set of which something may be a member
- Disposed taxonomically in an "is a" hierarchy



Making it Meaningful

- Putting something into RDF/OWL does not make it meaningful
- So, what is a meaningful model
  - 1. Formal relationship between model and subject matter:
    - “Everything is a Thing”
  - 2. Formal notation grounded in common logic
  - 3. Abstraction of kinds of thing into their simplest possible building blocks
    - Contracts, Parties, Legal Entities etc.

Formal Logic

- Lets us assert the existence of things
- Lets us state, for given things, facts about them
  - These are properties
  - How it looks:

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

- You would not want to present these to business subject matter experts!

Theory of Meaning – in English

- The model consists of:
  - Things
    - A Thing is a set theory construct
    - Arranged in a hierarchy called a “Taxonomy”
      - Like taxonomy of species
  - Facts
    - Simple facts (names, dates etc.)
      - e.g. “Issue Date” is a date
    - Relationship Facts (relate one thing to another thing)
      - e.g. “Share confers Voting Rights”
      - Things so referenced are also in taxonomic hierarchies
  - Other set theory concepts
    - Disjoints, Unions

Developing Business Semantics

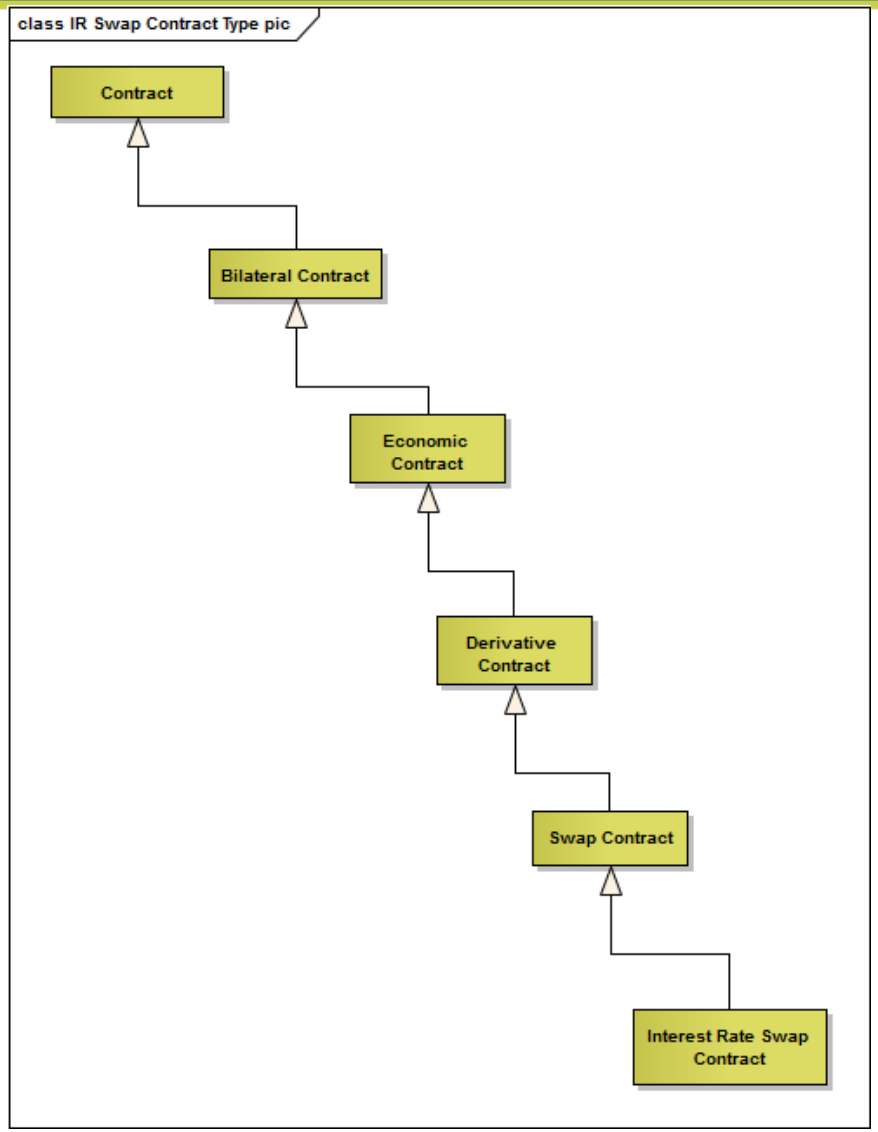
- The OWL language forces us to ask the following questions of a given thing:
  - What sort of thing is it? (taxonomy)
  - What properties distinguish it from other things? (ontology)

- The result is a classification hierarchy of the things we are interested in

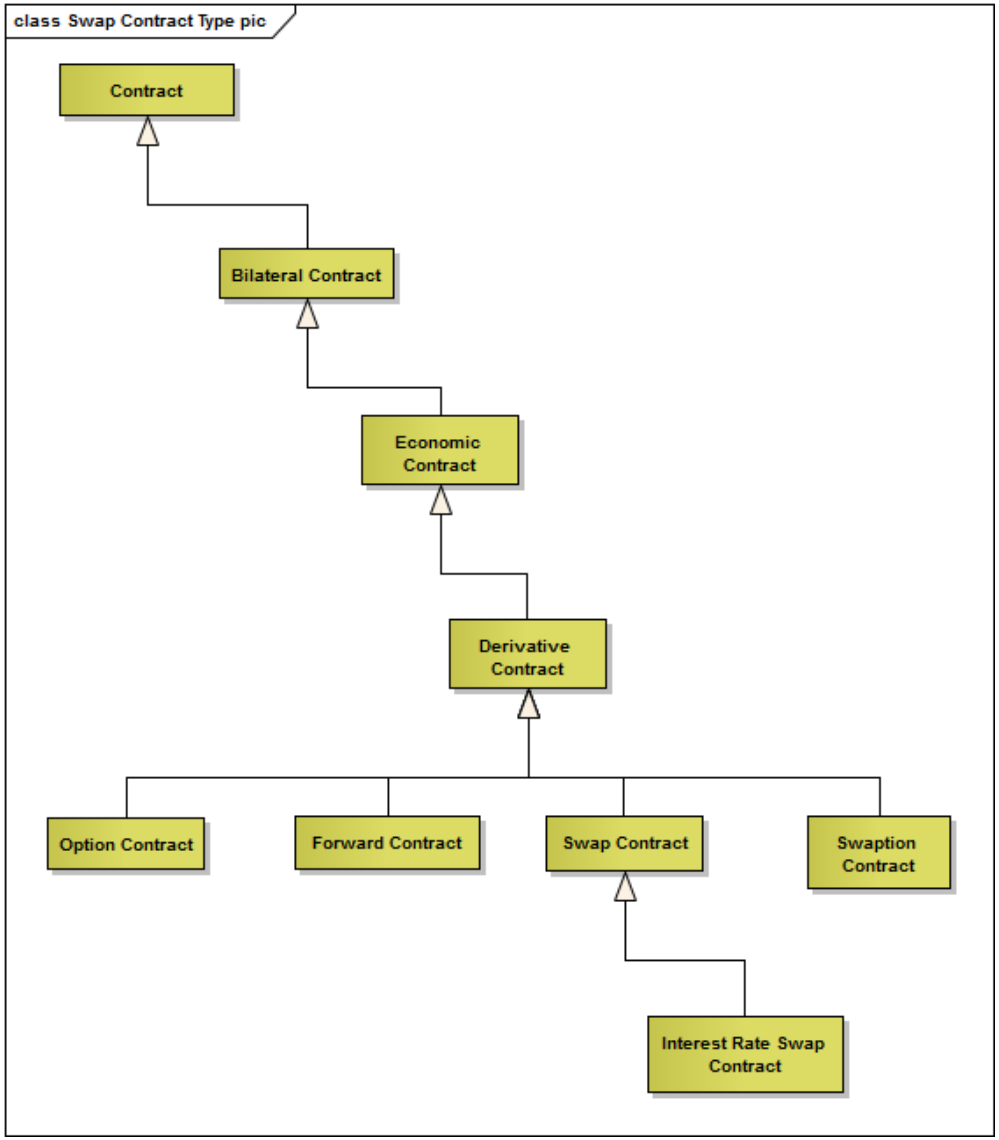
Example: Interest Rate Swap

- What sort of things is this?
  - It's a swap contract
    - Which is a derivative contract
      - Which is an economic contract
        - » Which is a Contract
          - » Which is a thing
  - It's an Interest Rate Derivative contract
    - Which is a derivative contract
      - See above

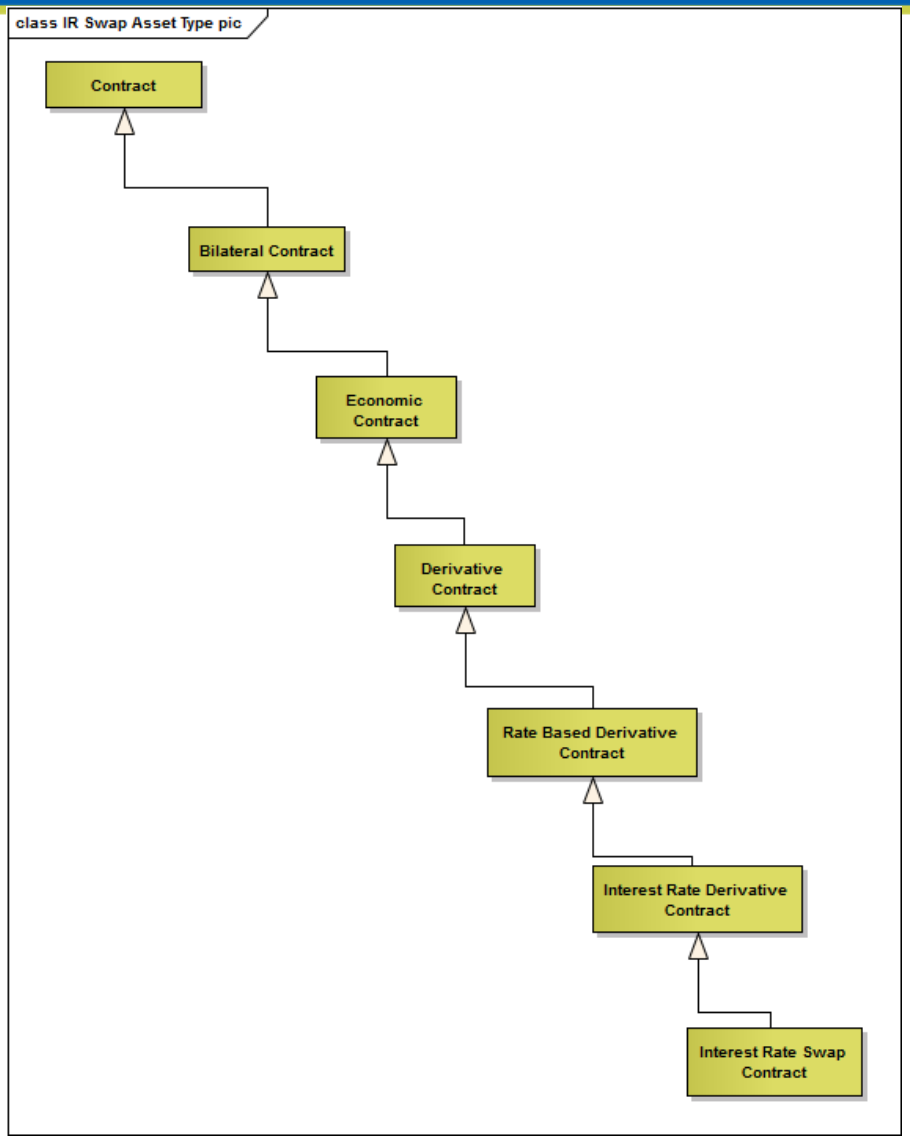
IR Swap – as a type of Swap



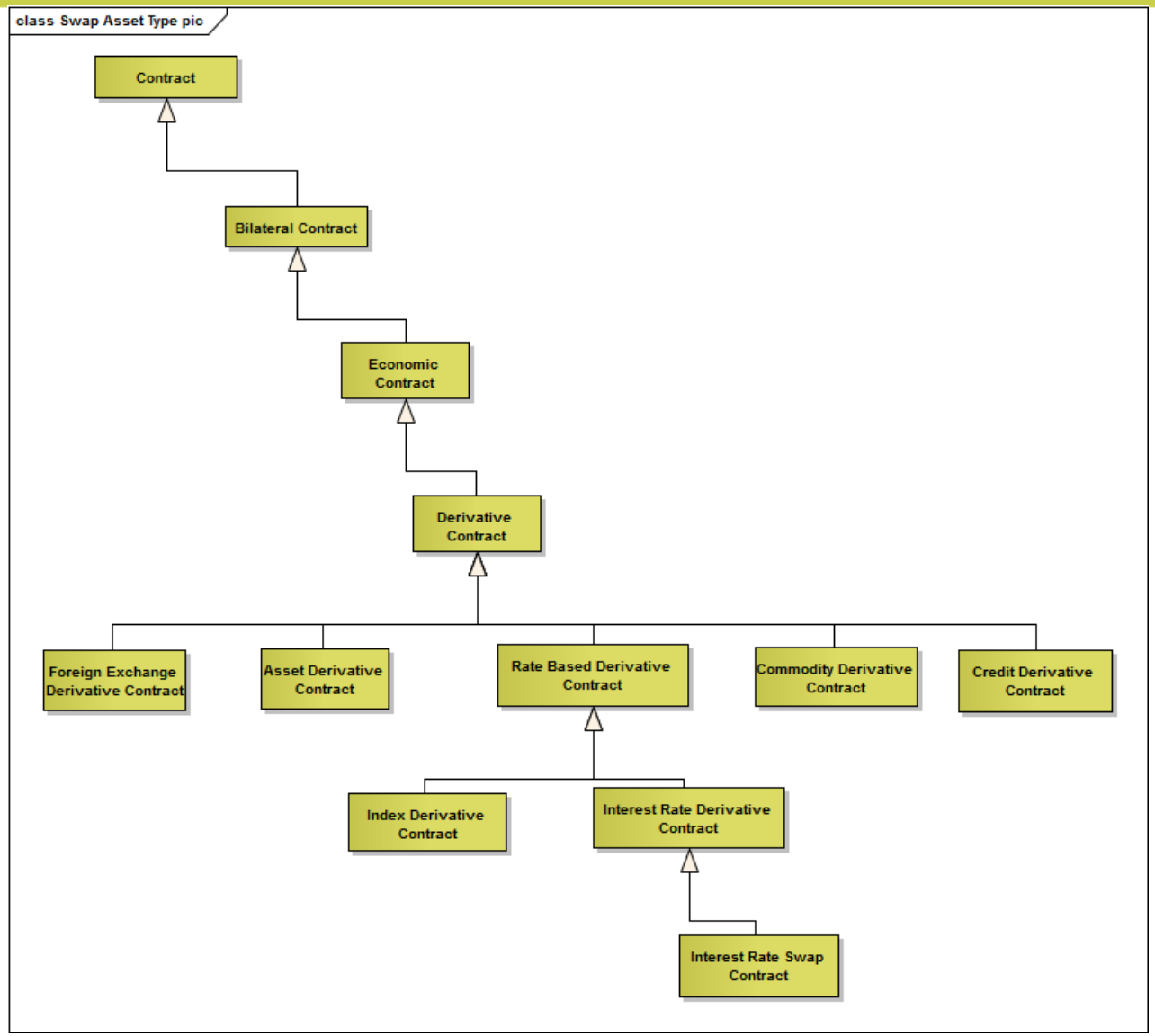
Swaps in Context



IR Swap – as a type of IR Derivative



Interest Rate Derivatives in Context



Classification Facets

- Asking “What kind of Thing is this?” may yield different answers depending on what’s of interest
- These are distinct facets by which the subject matter is classified
  - Example: a whale is both a *mammal* (Linnaeus) and a *marine animal*
- Securities may be classified according to cashflow behaviors (for investors) or according to risk factors (risk and compliance)

From Taxonomy to Ontology

- Ontology: the study of what is
- Ontologies (plural): the real world universe as it is referred to in a computer application
  - Informal: every application has an ontology, whether it's documented or not
  - Formal: uses formal logic in some notation
- Semantic Web
  - Uses a formalism which can be reasoned over

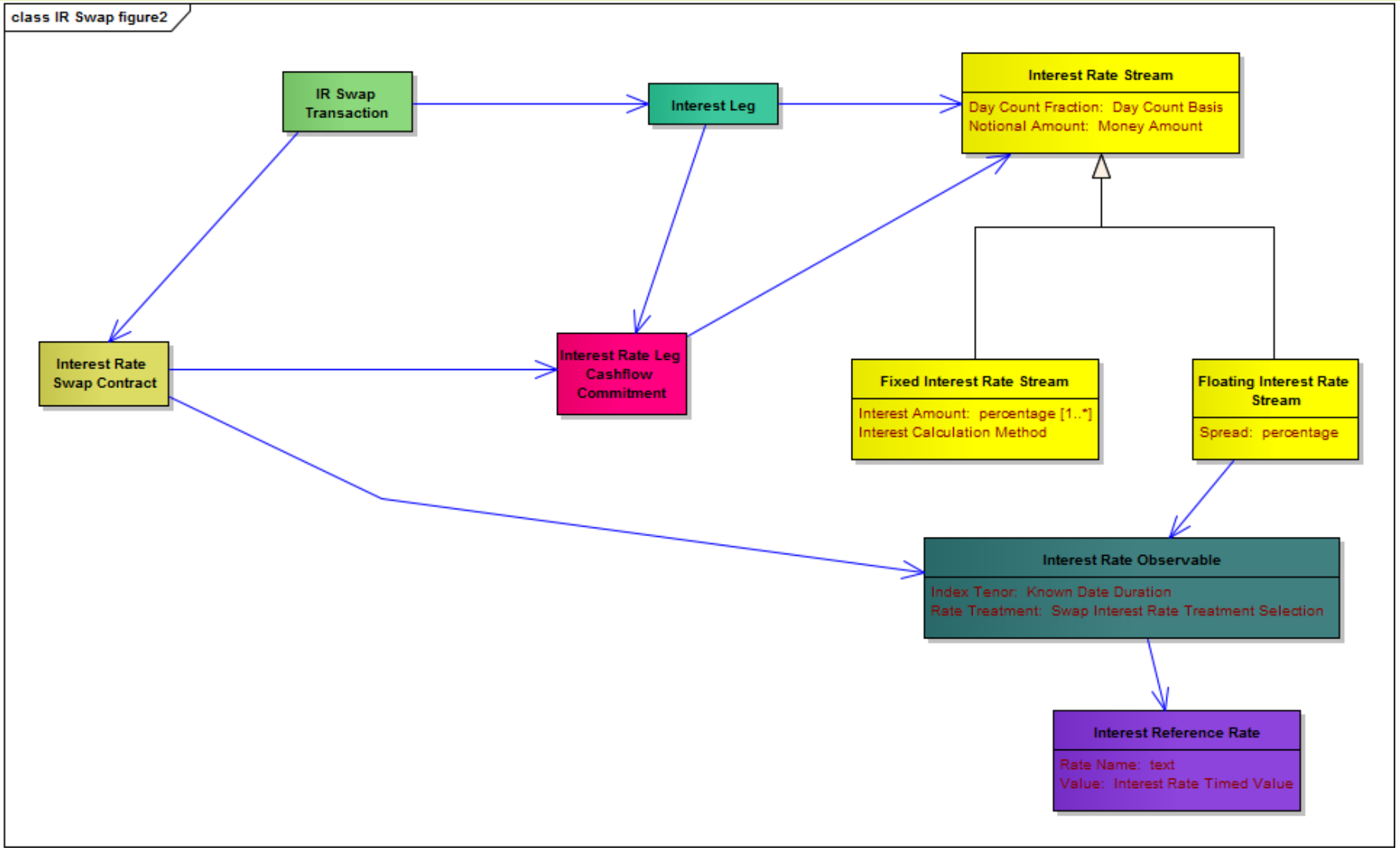
Ontology

- Adds properties
  - Assertions about what it means to be a member of a given class
  - What is it about this thing which distinguishes it from other things?

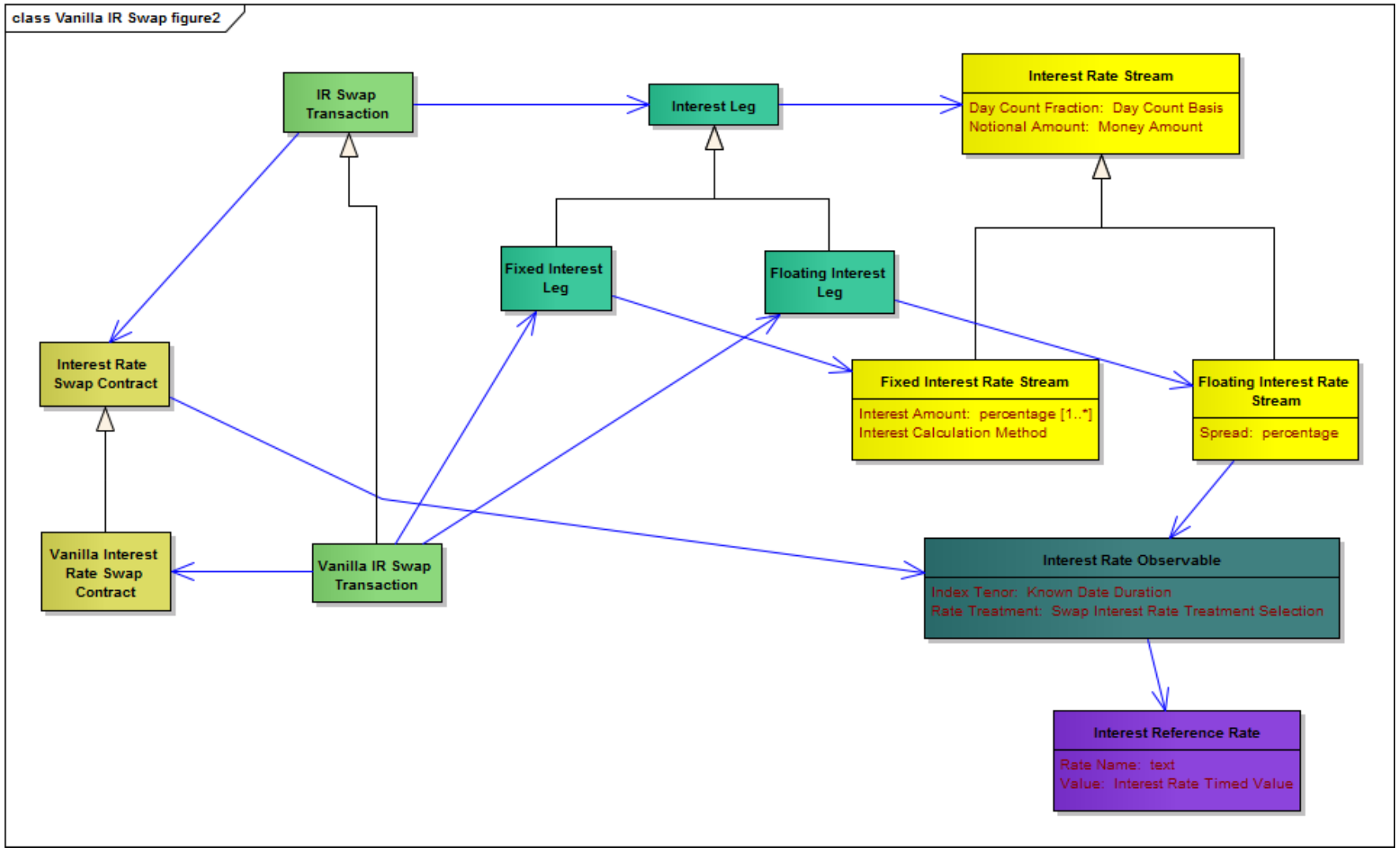
Interest Rate Swap

- A swap is a contract and a transaction in which two parties agree to exchange cashflows
  - The *Contract* underpins a *Transaction*
  - A *Transaction* consists of two *Events*
    - In a Swap, the *Events* are called *Legs*
  - Each transaction *Event* embodies a *Commitment*
    - In the case of a swap leg, a commitment to make some cashflow payment over time
  - Each *Commitment* is expressed in some *Contractual Terms*

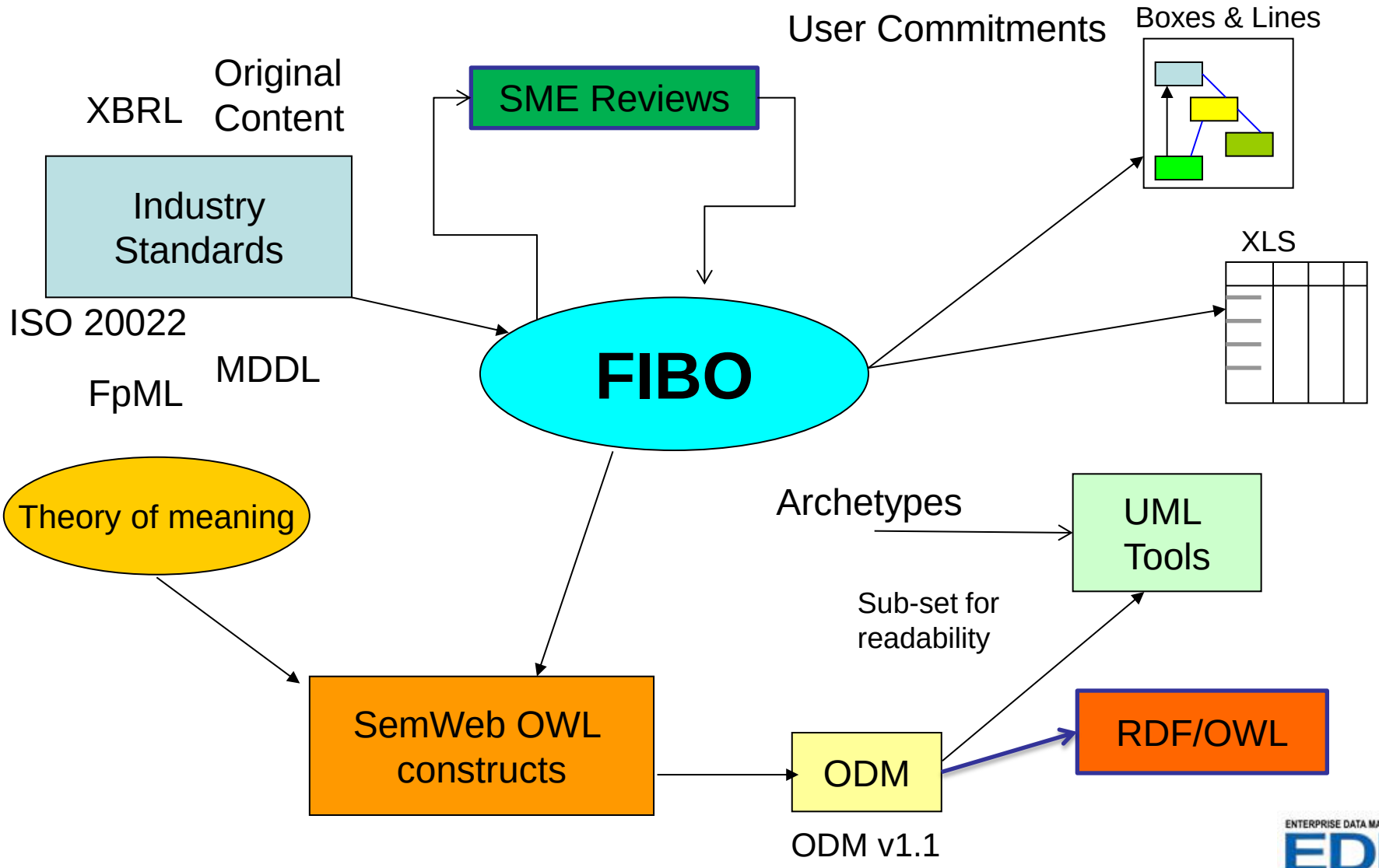
IR Swap Ontology



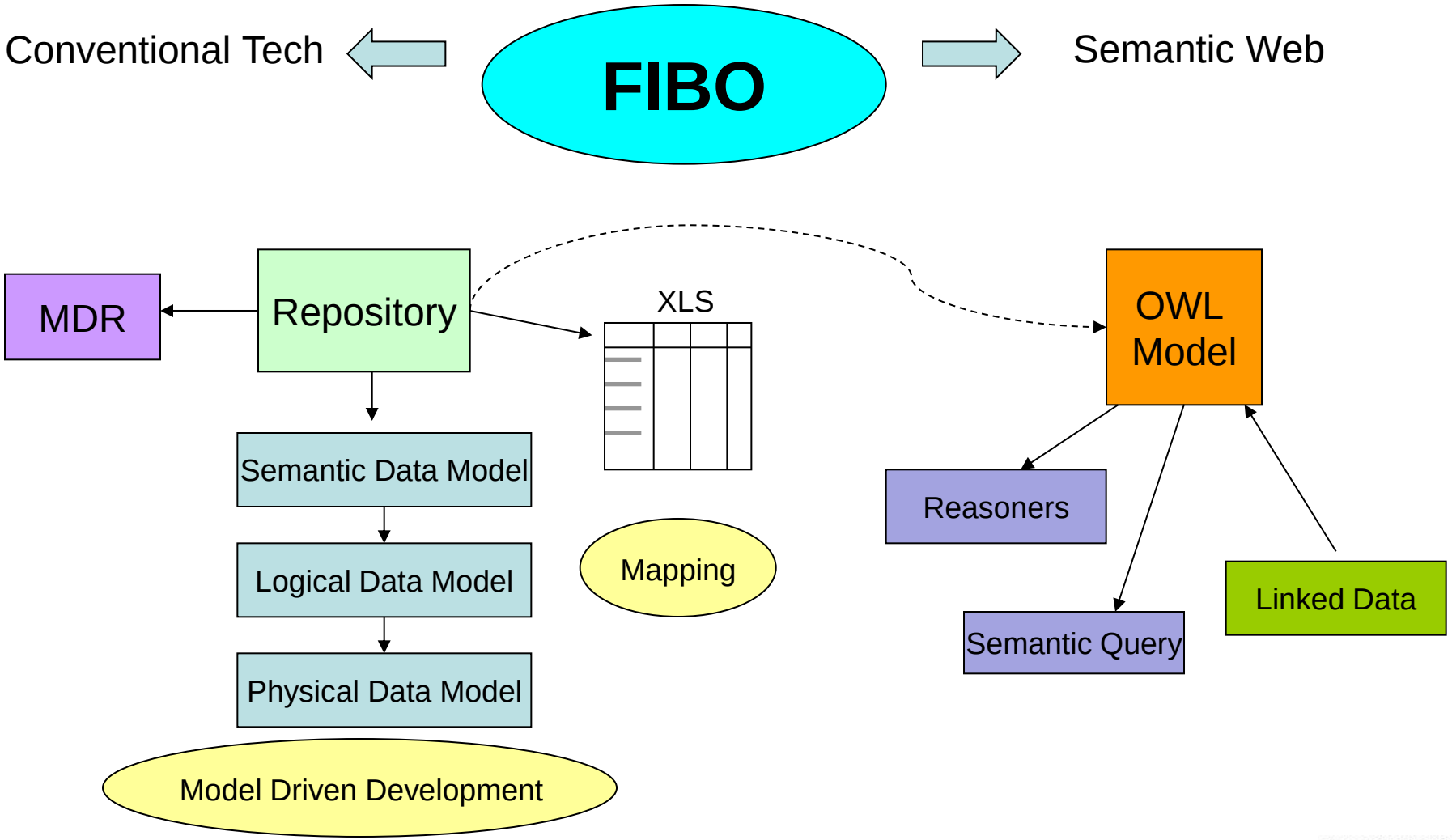
Vanilla IR Swap Ontology



Financial Industry Business Ontology



FIBO Applications



FIBO Applications

- As a common reference point
  - Mapping, integration
  - Replaces ad hoc spreadsheets with a formal project deliverable
  - Extend locally for concepts within the firm
- Model Driven Development
  - Position as “Business conceptual model”
  - Manage the “language interface” between Business and IT
- Semantic Technology applications
  - Implemented across conventional data stores
  - New application infrastructures (Triple stores)

Conceptual and Operational Ontology

- Conceptual Ontology
  - Includes concepts like rights, obligations
    - Meaning is grounded in law
  - Does not care if it is decidable or how long it takes to reason over it
- Operational Ontology
  - Must conform with the stated technical constraints
    - Reasoning
    - Decidability
  - Combines
    - ontology (classes) with
    - “individuals” (instance data in triple store format)
- How to get from one to the other?

How to get from one to the other

- Select a single classification facet
- Collapse the taxonomy above the domain
- Ignore terms which do not correspond to data
  - Rights and obligations
  - Policies, strategies, goals
- Identify those terms which correspond to instance data
  - For most rights and obligations, some data signature is likely to be present
- Use property chaining in the conceptual ontology to relate several more abstract but meaningful properties, with one concrete and data-focused property which can be processed.

Main Take-away Points

- An ontology extends a taxonomy which is organized according to some classification principles
- An ontology is not another sort of data model
- Syntax is not semantics!
- Ways to leverage FIBO
  - Common semantics in conventional tech
  - Semantic Technology applications
  - Others e.g. big data, agent based programming
- Regulators and the industry are paying attention!