Toward a Graphical Notation for OWL 2

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Ontology Definition Metamodel (ODM)

∞ **Object Management Group standard for model driven ontology development**

∞ **Family of metamodels & profiles enabling model interchange & ontology development in UML 2**

∞ **Includes**

- 5 platform independent metamodels, 4 normative

- UML Profiles for RDF/S, OWL, & Topic Maps

- Informative Mappings

- Flexible conformance options, with CL, TM optional

- Available at http://www.omg.org/spec/ODM/1.0/
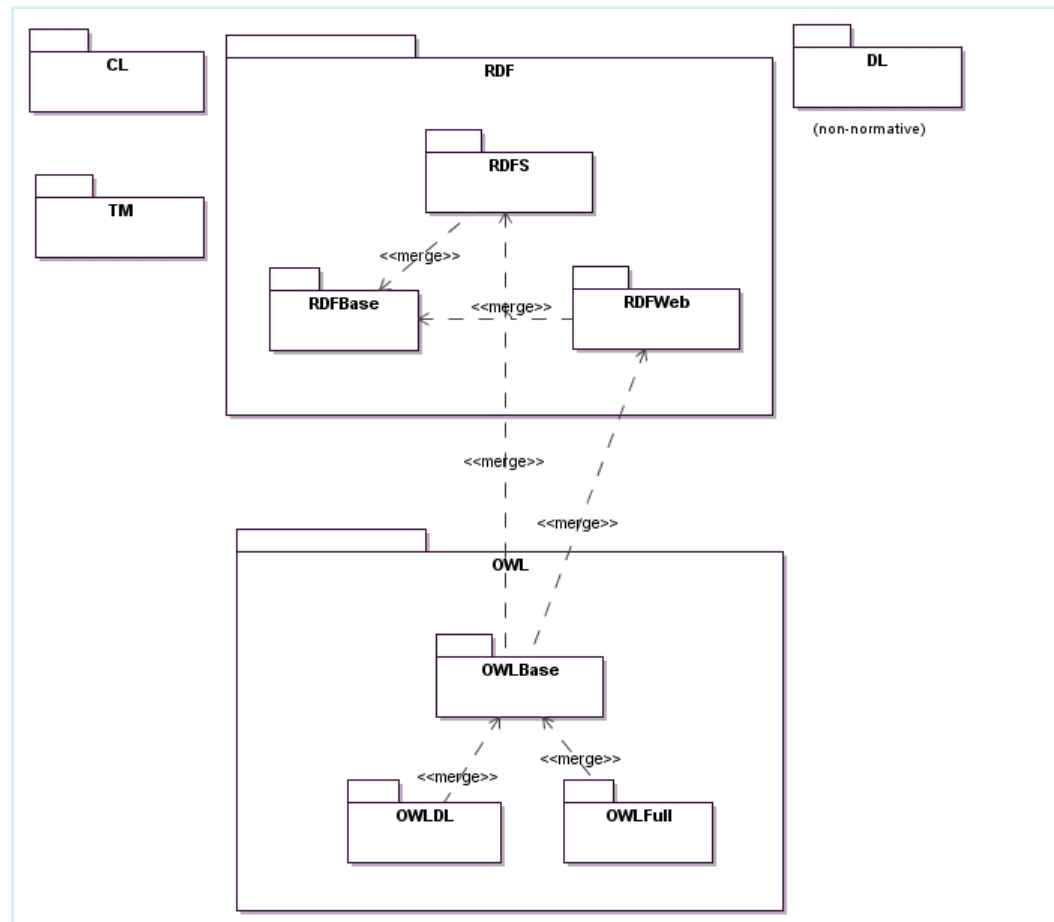
Motivation

- ∞ To provide a standard graphical notation to enhance communication of OWL to others
- ∞ To enable ontology-based information models to be integral parts of an information-centric system architecture that:
  - Incorporates coherent and integrated sets of vocabularies, ontologies, and "gold standard" data models, developed & maintained independently from other aspects of a system
  - Increases platform independence as well as interoperability across services, processes, and other applications
  - Achieves limited breakage and rework as applications and services evolve, reducing maintenance costs
  - Improves software, process, and service quality (through shared information services, vocabularies, and other artifacts that are logically consistent – internally and with one another)
  - Improves opportunity for new capabilities & increasing automation in search, complex event and other transaction processing, transformation services, adaptive & predictive capabilities, etc.

The UML Profiles for RDF & OWL

∞ Intended to be highly intuitive for UML users

∞ Reuse UML constructs when they have the same semantics as OWL

∞ Define customized stereotypes of existing UML constructs to make them consistent with RDF and OWL semantics

∞ Use standard UML 2 notation

∞ When suitable UML constructs do not already exist, define additional combinations of stereotyped UML constructs to provide usable forms of notation for RDF and OWL semantics

∞ Utilize a model library to refer to defined sets of foundation elements (such as standard data types and property values)

Key Features of the RDF Profile

∞ `rdfs:Resource` **is modeled as UML::InstanceSpecification**

∞ `rdf:Property` **is modeled by a combination of UML::Property, UML::Association, and UML::AssociationClass**

∞ **Graphs, named graphs, and documents are all modeled as UML::Package**

OWL Classes & Restrictions
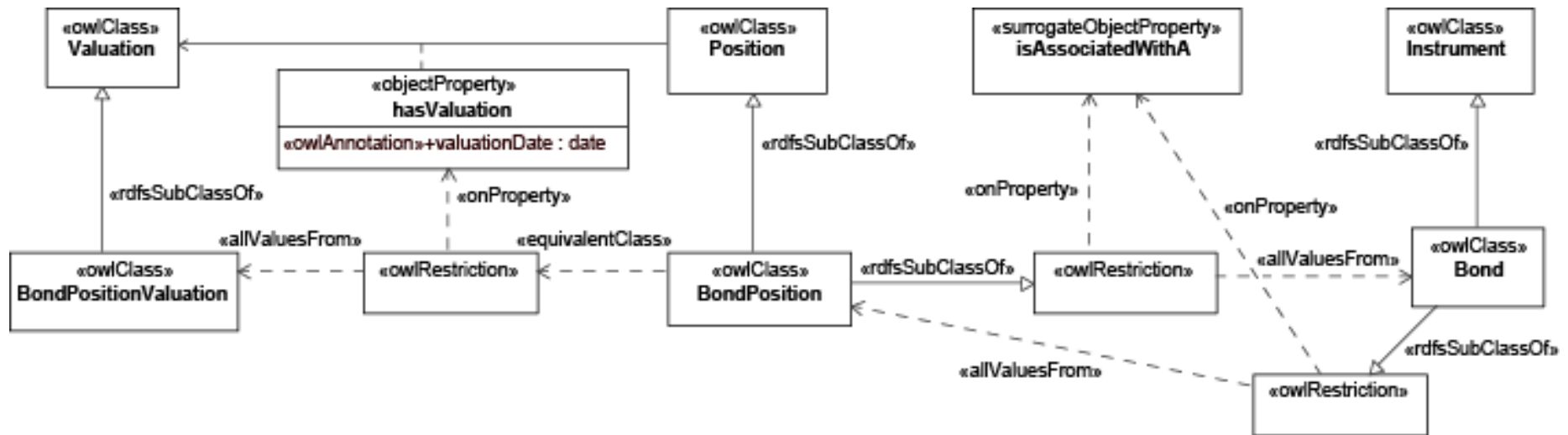
- ∞ Notation for OWL classes, using stereotyped UML::Class, and object properties, using stereotyped UML::AssociationClass is familiar to UML modelers

- ∞ Faithful notation for restrictions requires distinguishing necessary from necessary & sufficient membership, which is less intuitive to UMLers

- ∞ Latest thinking in the ODM Revision Task Force (RTF) for property notation includes the use of surrogates – to allow us to depict AssociationClasses in a "standalone" mode, without dragging unnecessary detail onto every diagram
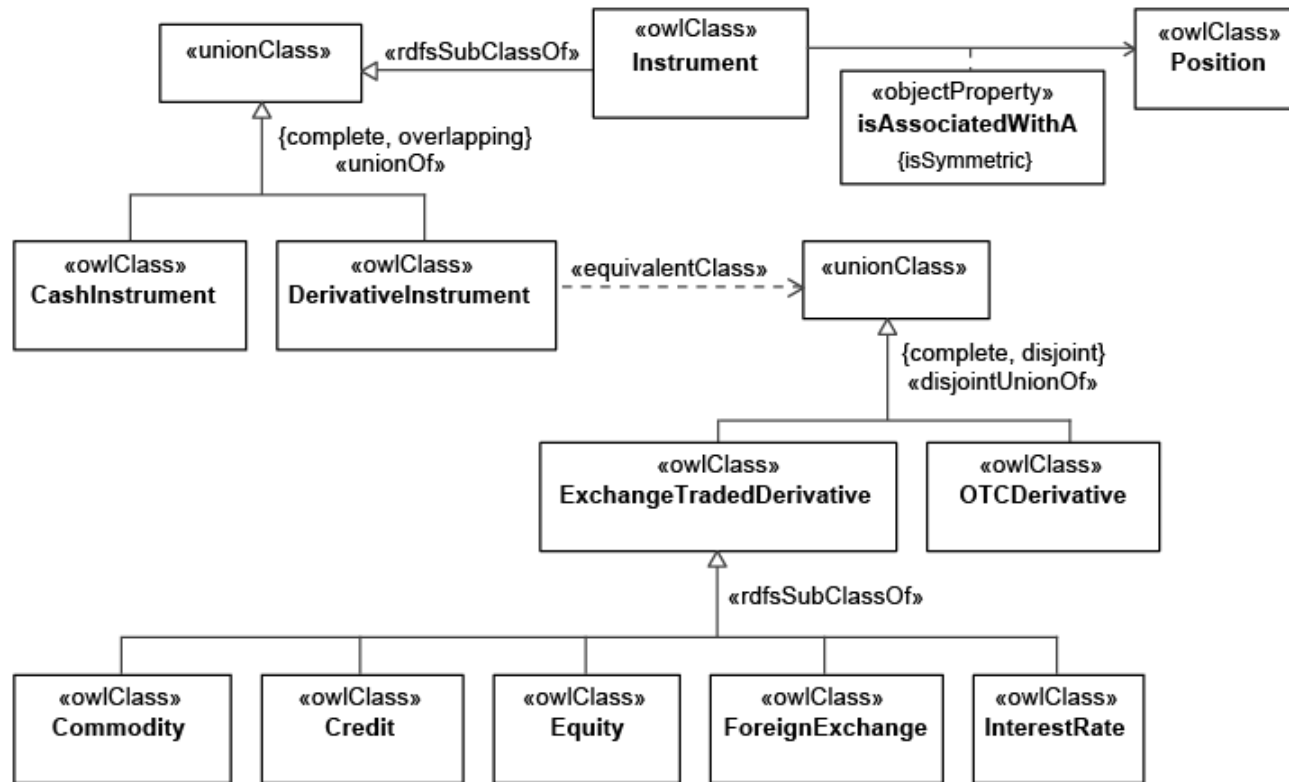
Surrogate Property Notation
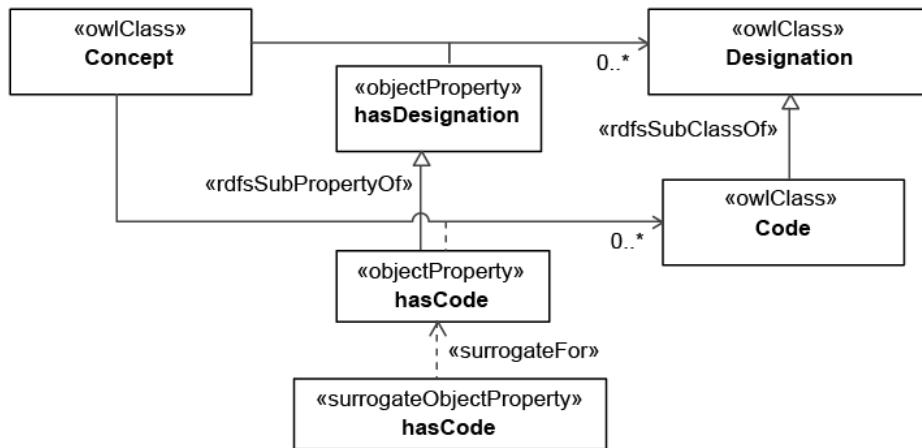
Surrogates

∞ **must have a base property defined via a traditional association or association class**

∞ **provide a flexible alternative for reuse in property hierarchies, complex restrictions, and property chain diagrams**
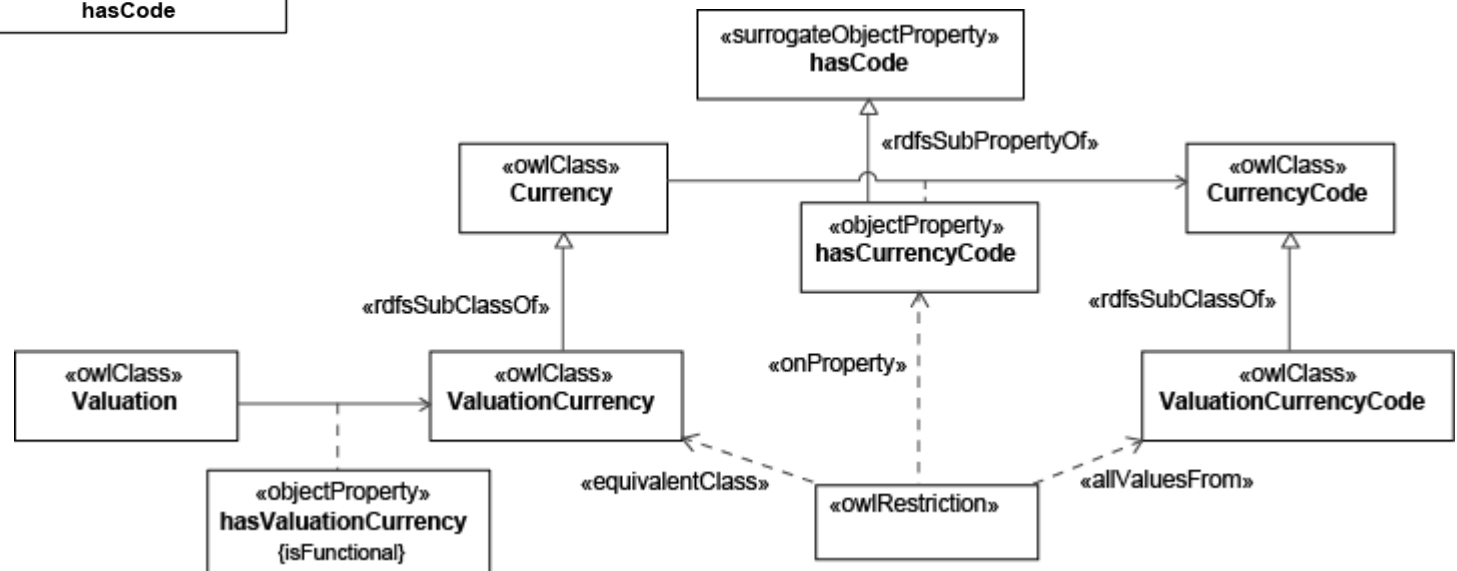
OWL 2 Disjoint Union

- ∞ UML inherently supports generalization sets that are complete or incomplete, overlapping or disjoint

- ∞ Shortcuts, such as collapsing a named class with the anonymous unionClass, when equivalence is intended, are under consideration

Next Steps

- ∞ RTF is eliminating usability issues with the OWL 1 profile, expanding test cases, ensuring OWL 2 compatibility

- ∞ Support for OWL 2 is in work

- ∞ Publication of the ODM 1.1 revision in mid-2010

- ∞ Planned mappings to
  - Information Management Metamodel (forthcoming) – to IMM metamodels for XML Schema and Entity-Relationship diagramming
  - SoaML specification for Service Oriented Architectures – including an ODM-based ontology for OMG business process representations (BPMN) & next-generation service description
  - Production Rule Representation (PRR) specification, – a subset of the Rule Interchange Format
  - OMG and ISO standards for systems engineering and product data modeling, including SysML and ISO STEP

Emerging Development Projects

- ∞ Eclipse ATL Project includes an ODM component for translation between UML and OWL – see http://www.eclipse.org/m2m/atl/usecases/ODMImplementation/

- ∞ IBM Integrated Ontology Development Toolkit – for storage, manipulation, query, and inference of ontologies and corresponding instances, http://www.alphaworks.ibm.com/tech/semanticstk

- ∞ Sourceforge Common Logic Project – Java and ODM-based libraries for support of ISO Common Logic, including RDF/RDFS/OWL interoperability, at https://sourceforge.net/projects/common-logic

- ∞ New ODM Eclipse Project Planned
  - Sandpiper will be a primary contributor, donating metamodels and profiles, EMF XMI, Java APIs generated from metamodel
  - Additional participants / supporters are welcome