

Financial Industry Business Ontology Foundations

FTF – Final

OMG Document Number: dtc/2014-12-04

Standard document URL: <http://www.omg.org/spec/FIBO/1.0>

Normative Machine Consumable File(s):

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This OMG document replaces the submission document (finance/2013-09-02, Alpha). It is an OMG Adopted Beta specification and is currently in the finalization phase. Comments on the content of this document are welcome, and should be directed to issues@omg.org by February 28, 2014.

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Preface

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- **Data Distribution Services**
- **Specialized CORBA**

IDL/Language Mapping Specifications

Modeling and Metadata Specifications

- **UML, MOF, CWM, XMI**
- **UML Profile**

Modernization Specifications

Platform Independent Model (PIM), Platform Specific Model (PSM), Interface Specifications

- **CORBAServices**
- **CORBAFacilities**

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Certain OMG specifications are also available as ISO standards. Please consult <http://www.iso.org>

Typographical Conventions

The type styles shown below are used in this document to distinguish programming statements from ordinary English. However, these conventions are not used in tables or section headings where no distinction is necessary.

Times/Times New Roman - 10 pt.: Standard body text

Helvetica/Arial - 10 pt. Bold: OMG Interface Definition Language (OMG IDL) and syntax elements.

Courier/Courier New - 10 pt. Bold: Programming language elements.

Helvetica/Arial - 10 pt: Exceptions

NOTE: Terms that appear in italics are defined in the glossary. Italic text also represents the name of a document, specification, or other publication.

1 Scope

1.1 Overview

This specification is part of a family of specifications called the Financial Industry Business Ontology (FIBO).

FIBO is a modularized formal model of the concepts represented by finance industry terms as used in official financial organization documents such as contracts, product/service specifications and governance and regulatory compliance documents. This is referred to as a *Business Conceptual Model* as distinct from models or descriptions of data or IT implementations.

The scope of *finance industry* encompasses a broad range of organizations that manage money, including credit unions, banks, credit card companies, insurance companies, consumer finance companies, stock brokerages, investment funds and some government sponsored enterprises.

This particular specification defines the **Foundations** module of FIBO: a set of business concepts which are intended to support the financial industry terms semantics presented in other FIBO specifications.

Foundations is itself segmented into a number of models or ontologies.

The FIBO Foundations models define general concepts that are not unique to the financial industry, but needed to help define the financial concepts. FIBO Foundations therefore includes a number of basic legal, contractual and organizational concepts, among others. Concepts which are available in other industry standards are not included, but in some cases a “Proxy” concept is included for reference, for example for address and country concepts. The rationale for including these is two-fold:

- Concepts in the financial industry are generally specializations of more general, non-financial concepts such as contracts, commitments, transactions, organizations and so on, These are included in FIBO Foundations so that specializations of them may be defined in other FIBO specifications;
- Properties of financial industry concepts frequently need to be framed in terms of relationships to non-financial concepts such as countries, jurisdictions, addresses and the like. These are included in FIBO Foundations so that properties in other FIBO specifications may make reference to them.

FIBO concepts are documented using two forms of definition:

1. a structured ontology specification of the concept, and its relationships to others, represented using the Web Ontology Language (OWL).
2. natural language definitions which represent the concepts in natural language using the vocabulary of the finance industry.

This specification covers both the content of the models, and the underlying architecture employed for producing and presenting the model.

A number of informative annexes are provided to assist potential users with adoption and implementation of this and other FIBO specifications.

1.2 Applications and Uses of FIBO

One of the key benefits of FIBO with respect to data, message or reasoning metamodels is that it can provide a semantic anchor firmly rooted in the concepts as understood and used by people in the finance industry. FIBO enables the creation of logical data models such that those logical models derive their formal semantics from FIBO.

FIBO supports the derivation of ontologies to support semantic reasoning and querying applications. Since FIBO itself is framed using the formal constructs of the OWL language, such operational ontologies may be derived directly from the FIBO conceptual ontologies, with adaptation as necessary to support any application specific constraints.

FIBO allows disambiguation of new and existing regulation. To the extent that regulatory requirements reference the formal concepts in FIBO, terms referred to in these regulatory requirements, or in reports that are mandated, would be semantically unambiguous.

One important goal of FIBO is for the formal business definitions to be used in legal documents such as contracts, terms and conditions of sales and payment, IP protection, compliance reports; and to underpin less formal language used in advertising and customer-facing websites.

The business terms and definitions in this specification may be used as a reference model to which firms would tie their own proprietary models (semantic models or ontologies); and also as a catalog for all of the relevant data models.

1.3 How FIBO is Different from Operational Ontologies

Intended Audiences: *Technical modellers, data architects*

An ontology, regardless of how it is to be used, sets out formally a representation of items in a real-world domain of discourse. There are two distinct uses to which this applies:

- A business ontology (business conceptual model) as described in this specification – this uses the full expressive power of the chosen notation to formally define items in the domain of discourse, without taking application technical constraints into account
- An operational ontology is constrained to operate within the parameters of a specific semantic application. Typically, this will contain a sub-set of the constructs in the business conceptual ontology, and that sub-set will typically comprise a decidable ontology.

It is necessarily the case that when something is to be used in an application, there will be technical constraints imposed upon that application. This is just as true when the application includes an ontology, as for other technologies.

The technical constraints that may apply to an operational ontology, necessarily do not apply to a business conceptual ontology. That is, the existence of some technical constraint in the application domain should not in any way influence the way in which business facts are formally captured and modeled in a business conceptual ontology.

1.4 How FIBO is Different from Data Models

FIBO can be distinguished from document/message/data/reasoning schemas of all kinds.

- FIBO models things in the real or planned world of the finance industry.
- FIBO will only contain instances of its own concepts under the specific conditions listed below. With these exceptions, FIBO contains only concepts - even if those concepts have just single instances in the real or planned world of finance.
 - Instances which are needed in order to define properties which refer to them;
 - Classes of thing which are defined extensionally; and
 - Examples
- FIBO is not any kind of a data, message or reasoning model, although it adds great value to these. It does not model document/message/data content or schemas optimized for reasoning.

FIBO will not include concepts about the structure of content, messages, information or data, even if that data is in turn about the finance industry.

The FIBO model, is referred to here as a "Business Conceptual Model", corresponding to Level 2 of the Zachman Framework for Information Architecture.

The distinctions between the scope of the FIBO model, and that of both logical and physical models, are further described in Annex C.

1.5 Definitions

The human readable definitions have been constructed by and with the input of business subject matter experts.

Many definitions have been derived from definitions of data elements corresponding to those terms in industry data or messaging standards. These have been adapted where necessary to ensure that they are descriptive of the thing or fact itself and not of data elements for data about those things or facts, and have then been reviewed by industry subject

matter experts to ensure that such adaptation accurately captures the sense of the business concept. In cases where the definition in a data or message standard was incomplete, context-specific or tautologous, a fresh definition was framed by the industry subject matter experts who participated in these reviews, or a third party definition was proposed and adopted.

1.5.1. Definitions Policy

In some cases, definitions have been obtained from third party sources. The policy for arriving at definitions for the FIBO industry terms was as follows (and remains so for future iterations and extensions):

1. In the absence of a definition endorsed by the subject matter experts for a term, "Barrons DICTIONARY OF FINANCE AND INVESTMENT TERMS, 8th Edition John Downes and Jordan Elliot Goodman" shall be used.
2. If a term and its acceptable definition is not in the Barrons Dictionary, then <http://www.investopedia.com/dictionary/> shall be the authoritative source, subject to licensing requirements being met.
3. If a term and its acceptable definition is not in either the Barrons Dictionary or the investopedia dictionary, then <http://www.bankersalmanac.com/addcon/dictionary/> shall be the authoritative source.
4. If a term has no acceptable definition in these Financial Industry sources or does not exist in these Financial Industry sources then <http://www.merriam-webster.com> shall be the authoritative source.
5. When there is a conflict with the definition of a Financial Industry term with the same term in another Industry, the Financial Industry definition will be used within FIBO.

In all cases the source from which the definition was obtained, or from which it was adapted, is recorded in annotation metadata for that concept.

2 Conformance

2.1 Overview

This clause defines conformance points for the following types of artifacts:

- Technical applications of FIBO such as logical data models, XML schemas, operational ontologies, code, and other technical artifacts
- Extensions of FIBO
- Representations of FIBO for business consumption
 - o In diagrams
 - o In spreadsheets or tables

Conformance of technical applications of FIBO is the most important conformance point, because it addresses the core issue of what it means to conform to the ontologies that FIBO defines. In comparison, conformance of extensions and representations, while still important, are somewhat secondary concerns.

Note that in addition to conformant applications, there are a number of scenarios in which someone may make use of the FIBO ontologies as a business conceptual model while applying their own design to meet their requirements. It is not possible to define specific conformance points for each of the possible ways in which one may legitimately develop a conventional database application or an operational OWL ontology that would be a good application. The non-normative annex [Annex E] describes a number of acceptable model architectures which may adequately reflect the material in FIBO Foundations and any of the other FIBO specifications.

2.2 Conformant Technical Applications of Model Content

Technical applications of FIBO content are logical data models, XML schemas, operational ontologies, code artifacts, and other technical artifacts that purport to conform to FIBO.

2.2.1 Assessing Model Conformance

Given that a technical application includes a set of information elements some of which correspond to the concepts in FIBO, then the application is FIBO Model Conformant if and only if:

- At least one of those information elements corresponds to a concept in the FIBO ontology for which conformance is claimed
- The application does not permit actual data to exist which would not be valid set of instances of those corresponding FIBO concepts: in other words if the data is represented as a set of individuals of the corresponding FIBO concepts then they will constitute a valid FIBO model with no contradictions

It is permissible for the information elements to have additional information or to be more constrained than those in FIBO.

2.2.1.1 Full FIBO Foundations Model Conformance

If a technical application is FIBO Model Conformant with the complete set of FIBO Foundations ontologies, then the application satisfies Full FIBO Model Conformance.

2.2.1.2 FIBO Ontology Model Conformance

If a technical application is FIBO Model Conformant with a particular FIBO Foundations ontology, then the application satisfies FIBO Ontology Conformance for that particular ontology. There is thus a separate compliance point for each ontology in Clause 10.

2.2.2 Assessing FIBO ODM Conformance

An extension of FIBO is FIBO ODM conformant if it is expressed in ODM (the OMG Ontology Definition Metamodel) and also restricts itself to using only the sub-set of ODM modeling constructs defined in the Architecture clause of this specification (8)

If the technical application is not an OWL ontology, then by definition the application is not FIBO ODM Conformant.

2.3 Conformant Extensions of FIBO Content

This definition of conformance points applies both to extension of the model content for use locally and to the preparation for submission of new model content for FIBO itself. The following conformance points may be asserted for each ontology that extends FIBO itself:

- FIBO-Full Extension in ODM: Satisfies FIBO Extension Conformance (see below) and FIBO ODM Conformance
- FIBO-Full Extension in OWL: Satisfies FIBO Extension Conformance (see below) and OWL2 Conformance

In turn, for FIBO Extension Conformance an ontology must satisfy FIBO Model Conformance (see 2.3.1) and the rules in the following three sub-clauses related to labeling, model consistency and relationship to subject matter.

2.3.1 Labeling

Business-facing labels shall be provided for all named model constructs. These labels must conform to the following formal requirements:

- Labels shall use normal English expression including spaces and punctuation, using lowercase except for proper nouns.
- Labels shall represent a plain English name (in US English spelling) which is that most commonly used by the finance industry.
- Labels do not need to be unique across the model.

- At least one business-facing label shall be present which is not in the form of, or contain, acronyms (including business acronyms) except where these are the only means by which the concept may be referred in the business domain (for example "CDO Squared").

2.3.2 Model Consistency

Reasoning is the mechanism by which the logical assertions made in an ontology and related knowledge base are evaluated by an inference engine. A logical assertion is simply an explicit statement that declares that a certain premise is true. Such assertions, taken together, form a logical theory, and a consistent theory is one that does not contain any logical contradictions. This means that there is at least one interpretation of the theory in which all of the axioms contained therein are provably true. The logical assertions expressed in the FIBO Foundations ontologies have been checked using multiple inference engines, designed specifically to support OWL 2, for internal logical consistency (*i.e.*, for consistency within that single ontology), and for logical consistency with imports closure (meaning, consistency including all axioms in any imported ontology in addition to those in the single ontology in question).

In order for any extension to FIBO to be conformant, it must be verified as being logically consistent (internally and with respect to imports) in addition to syntactically correct according to the OWL specifications. Examples of reasoning engines that can be used to verify logical consistency of an OWL 2 ontology are discussed in an article on Wikipedia¹. Members of the OMG Ontology Special Interest Group (ontology@omg.org) can also make recommendations for tooling that might assist FIBO users in verifying their extensions.

In addition to being logically consistent, a conformant FIBO extension must be a conservative extension of each FIBO ontology that it imports *i.e.* the extension must not prove new logical assertions about the concepts defined in the imported ontologies. More formally, any logical assertion regarding concepts drawn exclusively from the vocabulary of an imported FIBO ontology is provable in a conformant extension if and only if it is provable within the imported ontology. This condition ensures that conformant FIBO extensions use the concepts defined in the imported FIBO ontologies without changing their meanings by narrowing or constraining them and supports composability of conformant FIBO extensions. As for logical consistency, reasoners can be used to verify that an OWL2 ontology is a conservative extension of an imported ontology but in general it is a more difficult problem so reasoners will take longer to determine this. Pragmatic guidelines like prohibiting restrictions on imported concepts can help ensure that extensions are conservative but in general it is possible to restrict imported concepts indirectly in subtle ways and so a reasoner should be used to verify conformance.

2.3.3 Relationship to Subject Matter

In any extension to FIBO model content each model element which is a class, an object property or a datatype property shall correspond to some item in the real world. No model element shall refer to some technical construct such as a database field, internal identifier, database key and the like.

An exception is made for information constructs which are themselves important and publicly shared parts of the business domain, such as publicly issued identifiers, security identifiers, ratings codes and the like. In each such case, there shall be some formally identified scheme in which the code in question is defined.

A suitable test for types of "Information" to be considered real is whether that information is publicly shared or, if private, made available across the business supply chain. Examples include Legal Entity Identifier, securities prospectuses, published indices, interest rates.

2.4 Conformant Business Presentation of Model Content

There are two conformance points for presentation of FIBO content:

- FIBO Business Diagram
- FIBO Business Table

¹ http://en.wikipedia.org/wiki/Semantic_reasoner

Any tool which asserts support for one or other or both of business presentation conformance points must be able to import the available FIBO content in at least one of the available serialization formats (UML XMI, ODM XMI or OWL), and produce diagrams and/or tables which conform with the requirements defined for the conformance point.

2.4.1 General Requirements

It is a requirement of this specification that content of the models is made available to people in the business domain in one or more of a set of diagrams and tables which are described in this specification.

A presentation of FIBO model content is not a conformant FIBO Business Presentation (i.e. a conformant FIBO Business Diagram or a conformant FIBO Business Table) if the only means for the reader to view the model's terms, definitions and relationships is one which requires some formal understanding of some model language such as UML or OWL, beyond the knowledge conveyed by the annexes to this specification. For the avoidance of doubt, a non-conformant business presentation is any format which contains symbols, whether diagrammatic or textual, which have a meaning other than the meaning which a reasonably educated but non-technical person would ascribe to those items

2.4.2 Business Diagram Conformance

OWL features such as restrictions on properties or classes, where these are present in the model content, shall be rendered in some way that communicates their business intent without reference to the way in which the OWL syntax represents these constructions.

OWL constructs shall be represented by simple constructs which do not require specialist technical training, such as boxes, arrows and lines.

All notation on all diagrams shall only represent features of OWL, except where this is clearly identified as additional annotation (intended to enhance an understanding of the business content of the model and not part of the model itself).

In diagrams generated from OWL tools or other non UML based tooling, no features shall be present which do not represent some feature of OWL except where these are clearly identified as visual decorations intended to enhance an understanding of the business content of the model.

If UML Generalization notation is used, this shall be laid out with the "arrowhead" pointing vertically upwards, in either the vertical tree style or direct style of routing. Generalization relationships may also be represented using more intuitive, non UML notations, in which case this requirement shall not apply.

2.4.3 Business Table Conformance

This sub clause concerns two kinds of tabular presentations: Basic Table and Extended Table. Conformant FIBO Business Tables may be rendered as spreadsheets or as textual documents in a tabular layout.

2.4.3.1 Basic Table

A conformant FIBO Business Table using the "Basic" tabular format shall show only the following entries:

- Term (preferred label for concept)
 - Classes and properties may be in the same column or different columns
- Definition
- Synonym

These shall be labeled as such.

This table shall only show those constructs from the FIBO model content which represent meaningful business concepts, and not the additional constructs which deal with the set theoretic logic of the model. That is, the basic table shall show only (differentiating between them):

- Class

- Relationship Property
- Simple Property

2.4.3.2 Extended Table

A conformant FIBO Business Table using the Extended Tabular format shall conform with the following requirements:

The extended table shall have column entries for each of the basic model features, as follows:

- Term
- Definition
- Synonym
- Range of Simple Properties (titled as "Simple Type")
- Range of Relationship Properties (titled as "Related Thing")
- Property type
- Super (class or property) (can be labeled as "Parent")
- Disjoints (labeled "mutually exclusive")
- Additional metadata may or may not be shown, at the discretion of the modeler and as appropriate to the intended usage (for example, review notes annotations).

The following model constructs shall be included in the Extended Table reports, in or near the following order:

- Class
- Union Relationships
 - labeled "In Union" when reported for members of the union
 - labeled "Union Of" when reported as the relationships from the Union Class
- Relationship Property
- Simple Property
- Union Class
- Individuals
 - 'typeOf' relationships from Individual to Class (labeled "type of")
- Annotations – there are no specific requirements for how these are presented.

Object Properties and Datatype Properties shall only be included once in all reports across the model, and this shall be for the class which is the domain of that property.

The intention of these requirements is that the report shows each type of fact, once only and in a logical order.

3 References

3.1 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

Reference	Description
[Dublin Core]	DCMI Metadata Terms, Issued 2013-06-14 by the Dublin Core Metadata Initiative. Available at http://www.dublincore.org/documents/dcmi-terms/ .
[ISO 1087]	ISO 1087-1:2000 Terminology — Vocabulary — Part 1: Theory and application
[MOF Core]	Meta Object Facility (MOF™) Core, v2.4.1. OMG Available Specification, formal/2011-08-07. Available at http://www.omg.org/spec/MOF/2.4.1/ .
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, v2.4.1. OMG Available Specification, formal/2011-08-09. Available at http://www.omg.org/spec/XMI/2.4.1/ .
[ODM 1.0]	Ontology Definition Metamodel (ODM), v1.0. Available Specification, formal/2009-05-01. Available at http://www.omg.org/spec/ODM/1.0/ .
[ODM 1.1]	Convenience Specification for the Ontology Definition Metamodel (ODM), v1.1, available from the ODM 1.1 RTF.
[OMG AB Specification Metadata]	OMG Architecture Board recommendations for specification of ontology metadata, Available at http://www.omg.org/techprocess/ab/SpecificationMetadata/
[OWL 2]	OWL 2 Web Ontology Language Quick Reference Guide (Second Edition), W3C Recommendation 11 December 2012. Available at http://www.w3.org/TR/2012/REC-owl2-quick-reference-20121211/ .
[RDF 1.1]	RDF 1.1 Concepts and Abstract Syntax, W3C Last Call Working Draft. Latest version Available at http://www.w3.org/TR/2013/WD-rdf11-concepts-20130723/
[RDF Concepts]	Resource Description Framework (RDF): Concepts and Abstract Syntax. Graham Klyne and Jeremy J. Carroll, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http://www.w3.org/TR/rdf-concepts/ .
[RDF Schema]	RDF Vocabulary Description Language 1.0: RDF Schema. Dan Brickley and R.V. Guha, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http://www.w3.org/TR/rdf-schema/ .
[SKOS]	SKOS Simple Knowledge Organization System Reference, W3C Recommendation 18 August 2009. Available at http://www.w3.org/TR/2009/REC-skos-reference-20090818/ .
[UML2]	Unified Modeling Language™ (UML®), version 2.4.1. OMG Specification, formal/2011-08-06. Available at http://www.omg.org/spec/UML/2.4.1/ .
[Unicode]	<i>The Unicode Standard, Version 3</i> , The Unicode Consortium, Addison-Wesley, 2000. ISBN 0-201-61633-5, as updated from time to time by the publication of new versions. (See http://www.unicode.org/unicode/standard/versions/ for the latest version and additional information on versions of the standard and of the Unicode Character Database).
[UTF-8]	RFC 3629: UTF-8, a transformation format of ISO 10646. F. Yergeau. IETF, No-

Reference	Description
	vember 2003, http://www.ietf.org/rfc/rfc3629.txt
[W3C Datatypes in RDF and OWL]	XML Schema Datatypes in RDF and OWL, W3C Working Group Note 14 March 2006, Available at http://www.w3.org/TR/2006/NOTE-swbp-xsch-datatypes-20060314/ .
[XML Schema Datatypes]	XML Schema Part 2: Datatypes. W3C Recommendation 02 May 2000. Latest version is available at http://www.w3.org/TR/xmlschema-2/ .

3.2 Non Normative References

The following informative documents are referenced throughout this text or in parts of the Annexes:

Reference	Description
[DOLCE]	A. Gangemi, N. Guarino, C. Masolo, A. Oltramari, and L. Schneider. Sweetening ontologies with DOLCE. In Proceedings of EKAW, Siguenza, Spain, 2002.
[ISO Common Logic]	Information Technology - Common Logic ISO/IEC 24707:2007 http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39175
[Knowledge Representation]	<i>Knowledge Representation: Logical, Philosophical and Computational Foundations</i> , Sowa, John F., Brooks/Cole. 2000
[Model Theory]	<i>Mathematical Logic: An Introduction to Model Theory</i> , Lightstone, A. H., New York: Plenum Press, 1978, H. B. Enderton (ed).
[OMV]	Ontology Metadata Vocabulary (OMV) - http://omv2.sourceforge.net/ (a standard giving metadata for ontology-level information)
[C S Peirce]	<i>A Comprehensive Bibliography and Index of the Published Works of Charles Sanders Peirce, with a Bibliography of Secondary Studies</i> , Ketner, K. L. et al., Johnson Associates (Greenwich, Connecticut): 1977
[W3C Organization Ontology]	W3C Organization Ontology. Available at: http://www.w3.org/TR/vocab-org/
[Zachman]	Zachman Framework http://www.zachman.com/

3.3 Changes to Adopted OMG Specifications

This specification does not change or replace any OMG specifications. It does, however, depend on pending changes to the Ontology Definition Metamodel (ODM), in support of OWL 2 and RDF 1.1.

4 Terms and Definitions

For the purposes of this specification, the following terms and definitions apply.

Content

Definition: Subject matter or meta-content.

Business conceptual model

Definition: A model which represents and only represents business subject matter without reference to the design of any solution or data model representation.

Business publication

Definition: Representation of a subject matter view in a form that is understandable and usable by business users.

Example: Text document, web page, audio recording, interactive search dialog

Business subject matter

Definition: Subject matter that defines and describes the kinds of people (and the roles they play), organizations and other things that an enterprise has to deal with in the course of its operational business, regardless of how this content is presented to the people in the organization (e.g. in text documents, web pages, audio broadcasts).

Example: Business concepts, such as: *OTC derivative, business day*

Example: Relationships between business concepts, such as: *swap transaction has ISDA confirmation*

Example: Constraints, such as: Each ISDA confirmation is of exactly one swap transaction

Example: Descriptions, such as: ISDA is the largest trade organization of participants in the OTC derivatives market.

Example: Business processes (defined in terms of the business concepts), such as:
If a Disputing Party reasonably disputes the Value of any transfer of Eligible Credit Support, then the Disputing Party will notify the other party not later than the close of business on the Local Business Day following.

Note: Business subject matter is mainly about kinds of thing, but may include individuals, in three roles: (1) as one-of-a-kind things referenced in the subject matter, such as *ISDA, Dodd-Frank Act, EC Treaty*; (2) As types defined by enumeration, such as the currencies in which a trading business maintains accounts; (3) in examples.

Note: Business subject matter is usually scoped by area of business jurisdiction (or something similar), such as, say, derivatives trading. The business subject matter is about the business of derivatives trading.

Other areas of responsibility in the enterprise have different subject matter. For example, the IS department's subject matter includes information models of things in the operational business (including derivatives trading). The finance department's subject matter includes financial models of things in the operational business.

From the derivatives trading perspective (the relevant parts of) these information and financial models would be considered meta-content.

Business subject matter view

Definition: Subset of business subject matter that is intended to be presented in some business publication.

Example: Concept definitions; relationship definitions with constraints.

Extension

Definition: The membership of some class of thing. This is distinct from its intension, that is the properties intrinsic to that class of thing. In applying the intension of some class to some collection of individuals, one arrives at the extension of that class for that collection.

Extensional

Definition: Logic explicable solely in terms of extensions; ignoring differences of meaning that do not affect the extension.

Extensional Definition of Class Membership

Definition: The definition of membership of a class by direct articulation of those members (that is, by articulation of the Extension of that class.

Intension

Definition: The properties intrinsic to some class of thing.

Intensional

Definition: Logic (of a predicate) incapable of explanation solely in terms of the set of objects to which it is applicable; requiring explanation in terms of meaning or understanding.

Intensional Definition of Class Membership

Definition: The definition of membership of a class according to properties intrinsic to members of that class.

Meta-content

Definition: Information about subject matter

Example: Control information, such as: date and author of last update, external source, owner

Example: Connection of subject matter items to content outside the subject matter scope, such as data model elements that correspond to them (and point to the storage of instance data).

Model-Theoretic Conformance

Definition: The manner in which some model conforms with some theory about what it is intended to model and how it is intended to model it.

Ontology

Definition: A formalization of a conceptualization. For the purposes of this specification the formalization is in OWL, using ODM as a means to render this, and the conceptualization is that of business subject matter.

Operational Ontology

Definition: An ontology which is intended for use within some application.

Subject matter

Definition: Information about things in the universe of discourse; the essential facts, data, or ideas that constitute the basis of spoken, written, or artistic expression or representation; often :

the substance as distinguished from the form especially of an artistic or literary production.

Taxonomy

Definition: A set of terms which stand in some classification relation to one another.

Terminology

Definition: The overall disposition of ontologies of concepts and vocabularies of terms, in relation to one another.

Vocabulary

Definition: A set of words, each giving one or more formal definitions which apply to a meaningful concept that is referred to by that word.

5 Symbols and Abbreviations

5.1 Symbols

There are no symbols introduced by this specification.

5.2 Abbreviations

The following abbreviations are used throughout this specification:

- OWL – Web Ontology Language
- ODM – Ontology Definition Metamodel
- RDF – Resource Definition Framework
- SME – Subject Matter Expert
- UML – Unified Modeling Language
- URI – Uniform Resource Identifier
- URL – Uniform Resource Locator
- XMI – XML Metadata Interchange
- XML – eXtensible Markup Language

Additional symbols and abbreviations that are used only in annexes to this specification are given in those annexes.

6 Additional Information

6.1 How to Read this Specification

6.1.1 Audiences

This specification has the following audiences:

- The standards community
- The finance industry business community
- The regulatory community
- Technical architects
- Semantic Modelers

Each clause opens with a statement identifying the intended audience for that clause. The language in that clause is then framed appropriately for readers from that audience. Where “Intended Audience” is not stated the material in that clause is intended to be comprehensible to all general readers.

6.1.1.1 Standards Community

This audience is intended to be able to follow and validate the way in which this specification sets out the arrangements for the production and maintenance of model content, and the production of business facing reports and diagrams representing parts of that content.

6.1.1.2 The Finance Industry Business Community

As noted in the clause on conformance (2) this specification includes detailed requirements for the production of diagrams and reports that are intended for consumption by business subject matter experts. This specification also contains material addressed at this audience, this being an informative annex on “Interpreting Model Content”. This audience is not intended to read and understand the remaining parts of this specification.

6.1.1.3 The Regulatory Community

As for Finance Industry Business Community.

6.1.1.4 Technical Architects

These include but are not limited to:

- Tooling vendors and developers
- Other content providers / enriched content providers
- Business Analysts – anyone who use the model on site, whether they are a modeler, a metadata analyst, etc.
- Technology Management

The bulk of the “Architecture” clause is intended to be read and understood by these audiences and by the ‘Semantic Modelers’ audience.

6.1.1.5 Semantic Modelers

Much of the material in this specification is intended to be read and understood by semantic modelers. This includes the ‘Conformance’ clause (2), the ‘Architecture’ clause (8) and the non normative Annex D on implementing and extending this model and proposing new model content.

The Semantic modeler audience is not the same as the technical audience, although some individuals may possess skills in both. clauses of this specification which are written for a semantic modeling audience do not require any training in any formal technology in order to understand and act upon their contents. These clauses do require a clear understanding

of semantics and formal logic. It is not necessarily the case that technical readers are expected to be able to read and understand all aspects of the semantic modeling material. It should also be noted that some terms which have specific meanings in one or more technology environments, may have different (or often only subtly different) meanings to the semantic modeling audience. Where both semantics and technical audiences are intended to read a clause, care has been taken to try to use all of the applicable terms and qualify words which have multiple different usages to these audiences.

6.2 Acknowledgements

The following organization submitted this specification:

- Enterprise Data Management Council

The following companies have provided significant expertise and resources in the development of its content and architecture:

- Adaptive Inc.
- Australia and New Zealand Banking Group
- AVOX/DTCC
- Bank of America
- Barclays Capital
- BBH
- Bloomberg
- Business Semantics
- CIBC
- Citigroup Inc.
- Credit Suisse Group AG
- CUSIP
- The Federal National Mortgage Association (Fannie Mae)
- David Frankel Consulting
- FacetApp
- Fidelity
- GoldenSource Corporation
- HSBC Holdings plc
- JPMorgan Chase & Co.
- The Manufacturers Life Insurance Company
- Michigan State University
- Model Driven Solutions
- Model Systems
- Morgan Stanley
- MphasiS
- National Australia Bank
- No Magic
- Nomos Software

- Nordea Bank
- Oakland University
- OntoAge
- OpenFinance
- PricewaterhouseCoopers LLP
- Revelytix
- Sallie Mae
- SAP
- Semantic Arts
- State Street
- Sungard
- SWIFT
- Tahoe Blue
- Thematix Partners LLC
- Thomson Reuters
- UBS AG
- University of British Columbia
- University College Cork
- Wells Fargo
- Wizdom Systems, Inc.

6.3 Interpreting the Business Model Content

Intended Audiences: *Business Subject Matter experts*

6.3.1 Introduction

The model content is intended by read and understood by business domain experts with knowledge of business entities and legal concepts. It requires no knowledge of modeling theory, technical modeling languages, technology development or data modeling.

The following knowledge is required to interpret the model content:

- Set theory
- Logic
- Business (commerce, law, finance)

6.3.2 The Model

6.3.2.1 What the Model Contains

The model described in this specification contains elements called 'Things', Simple Properties about those things in the form of unstructured information, and Relationship Properties in the form of relationships between one 'Thing' and another. Things, Simple Properties and Relationship Properties all have as a minimum the definition for the term that they represent, plus additional information on usage, review history, sources of terms and definitions and so forth.

6.3.2.2 Model Views

Whereas the information given in this specification conveys all of the model content, the diagrams and tables that are created for a business audience will not show all of this information, but only a sub-set. This sub clause describes those formats and views, and is to be read by a business audience to understand what those views show. This sub clause contains no technical language about OWL or other modeling constructs but uses the plain English alternative terms for those concepts.

The content of the model is rendered in two basic forms: visual information in the form of diagrams, and textual information in the form of tables. The diagrams are available in varying levels of detail and are created to show different sets of terms and relationships across or within sections of the model. The textual information is created as web based tabular reports and as spreadsheets. These contain basic information of term, definition and synonym and in some cases will contain additional information about the types of thing or the types of information to which facts in the model refer. Business tables and spreadsheets do not show relationships between relationships as such information would be difficult to visualize in the tabular format.

Diagrams and tables reflect the information retained in the underlying model repository directly. For example, if two 'Thing' elements have a relationship between them and they appear on the same diagram, the relationship between them will always appear.

6.3.2.3 Business Diagrams

Business diagrams reflect any set of terms in the model, within or across sections of the content. These may be rendered with varying levels of detail. Diagrams created during reviews of the subject matter will typically contain a greater range of terms than diagrams created for presentation to the wider community of potential users.

6.3.3 Interpretation

The model conveys 'Things' and 'Facts'. Facts are in two forms:

- 'Simple Properties': these are a statement about something which is framed in terms of some simple type of information, such as textual entries, yes/no answers, dates, numbers and selections of textual information
- 'Relationship Properties': these are a statement about something which is framed in terms of something else, that other thing also being framed as a kind of 'Thing'.

In addition, there are relationships which represent additional set theory concepts, notably logical unions, mutual exclusivity.

Each 'Thing' also has a 'Parent' relationship, with the sense of 'is a', shown as an upward point arrow on the diagrams. This relationship indicates that the thing from the non-arrowed end is "a kind of" the thing at the end with the arrow.

These concepts are described in the sub clauses which follow.

6.3.3.1 Thing

A Thing is a set theory construct. This is shown on the diagrams as a box with a name. On some diagrams, additional textual entries in the box show the Simple Properties about that thing.

A Thing is defined as the set of individuals which are defined according the facts (properties) given for that kind of thing. Membership of the set is defined in the sense that any individual in the world of which the stated facts are true or applicable, is a member of that set. In terms of logical theory, these sets are defined intensionally. It is also possible to define a set explicitly as a list of its members (in logical theoretic terms, an extensional definition) but this is not used in practice in the model.

6.3.3.2 Inheritance: the Parent 'is a' relationship

Each Thing in the model has one or more parent Things. The relationship between the Thing and its parent may be interpreted as an 'is a' form of relationship, meaning that the thing of which the parent relationship is shown is a kind of the thing to which the arrow in the Parent relationship is pointing.

This relationship formally indicates that the thing that has the Parent, inherits all of the facts about that parent. In addition, this relationship is transitive, meaning that the parent relationships of the parent are passed on to the child term. For example, if a share is a security and a security is a transferable contract then a share is a transferable contract.

The relationships of this type create a formal inheritance structure called a Taxonomy. Taxonomies in this sense may be single inheritance (as is often seen in technical model designs) or multiple inheritance. In the FIBO models these are multiple inheritance, meaning that types of thing (such as types of contract) may be classified in more than one way. So for example an interest rate swap is both a swap and an interest rate derivative.

As an example of multiple inheritance, one might say that in terms of the Linnaeus Taxonomy of Species, a whale is a mammal, while one may also create a set of taxonomic classifications based on habitat, in terms of which a whale may also be a marine animal.

On a technical note, the Parent relationship is functionally identical to the relationship known as 'Generalization' in the UML modeling language.

6.3.3.3 Simple Properties

Simple Properties are assertions about things in a class, which may be framed in terms of some simple type of information.

Types of information about which Simple Properties are asserted are:

- Text
- Date
- Number
- Whole number
- Yes/no answer
- Selection of textual descriptors

To a technical person these may easily be identified with what are called 'datatypes'. However these represent the types of information not data as such. A special case is the selection of possible answers - this refers to a list of entries (see Selection Lists).

6.3.3.4 Relationship Properties

A Relationship Property is defined as a fact about something which is framed in terms of a relationship to some other thing.

These are indicated on the diagrams as a blue arrowed line. Some diagrams additionally show a box attached to this blue line; this is used to indicate relationships between those Relationship Properties, which are shown as lines between those boxes.

Relationship Properties are of the form subject-relationship-object where the subject is the Thing from which the line is drawn and the object is the thing to which the blue arrow points.

The label on the line is the verb itself, while the attached box indicates the full name of the Relationship Property. Relationship Properties are unique across the model and each belongs to one Thing only.

There are additional pieces of information about these Relationship Properties, such as whether they are symmetric, transitive and so on. The use and interpretation of these refinements to Relationship Properties are beyond the scope of this explanatory sub clause.

6.3.3.5 Logical Unions

Logical unions indicate that any individual which is a member of any of the classes of 'Thing' of which the union is a union, are members of that union.

The Union is shown as a box on the diagrams, similar to the boxes used for classes of 'Thing' but without the coloring given for archetypes (no Union has an archetype), that is these have the default gold box appearance of an OWL Class.

Membership of the union is indicated by a purple relationship similar in appearance to the Parent / 'is a' relationship. The Union (set) shown at the top of the arrow is thereby indicated as being a logical union of all the sets indicated as classes of Thing at the bottom of the purple arrows.

Relationship Properties may refer to unions in the same way that they refer to other classes of Thing.

6.3.3.6 Mutually Exclusive sets

Given that each thing is a set of potential members defined by their properties (facts), it is possible for any one thing in the world to be defined as being a member of more than one set, if the properties asserted for one set are not related to the properties asserted for another set.

Where membership of one set necessarily precludes membership of another set (that is, where a set is defined such as to specifically exclude members of another set), this is shown by a red line on the diagrams, labeled 'mutually exclusive'.

Where classes of 'Thing' are not indicated as being mutually exclusive (or have parents which belong to classes of Thing which are mutually exclusive), then any individual in the domain of discourse (the world) may belong to both sets.

This is formally known as a 'disjoint' relationship.

6.3.3.7 Relationship Properties hierarchies

Relationship Properties are themselves disposed in a hierarchy similar to that given for the classes of 'Thing'. These are indicated on more advanced diagrams by a green upward pointing line in the same style as the Parent relationship line. The Relationship Property to which the arrow points represents a more general meaning, of which the Relationship Property at the bottom of the relationship represents a narrower definition of the same meaning.

The narrowing of these meanings frequently occurs in conjunction with the narrowing of the meanings of classes of 'Thing' in the taxonomy. For example, types of bond are classified (a narrowing or specialization of the meaning of 'bond') according to, among other things, a narrowing of the relationship 'issued by' with the latter relationships being distinguished from one another by the nature of the kind of party which is the issuer.

This is formally known as a "sub property of" relationship.

6.3.3.8 Inverse relationships

These are only shown on diagrams that show the Relationship Properties with their boxes, i.e. diagrams that show relationships between relationships.

Relationship Properties in the model are all one-directional, by virtue of their being framed as 'subject-verb-object' triples. In the business domain, meaningful terms and definitions may exist in either direction between one class of thing and another (for example, a bank has a customer versus a person has an account at the bank).

These are indicated as a red dotted arrowed line between one relationship and the relationship to which it is the inverse.

In theoretical terms, this relationship only applies between relationships which are known as 'functional' relationships. An explanation of this is beyond the scope of this sub clause.

6.3.3.9 Selection Lists

A list of possible entries for a simple type is displayed as a box on the diagrams, with a list of the possible entries. These are displayed as text, and generally refer to lists of possible textual values for the Simple Property.

It should be noted that these do not or should not represent lists of kinds of 'Thing' - those would be represented as a taxonomy of actual things. This is an important difference between this and a data model, since many data models have similar selection lists, called 'enumerations' in the data modeling world, which may represent kinds of thing or classifications of the thing which has these as a property.

6.3.3.10 Selections of Things

This is a class or set of things of which the members are explicitly listed (in theoretical terms, an extensional definition of the class).

These are not used at present in the model but are provided for in the modeling notation.

7 Introduction

7.1.1 Reading this Standard

Technical audiences (in both conventional and semantic technology) are directed at the “Architecture” clause (8).

Business audiences (financial industry participants, regulators and others) are directed at the sub clause on interpreting model content (6.3) and the model content itself in Clause 10.

The business content defined in this standard is intended to be presented both in a business-facing format and in a complete, technical format. The latter is intended for consumption by technical and standards audiences only. This specification defines the content of the standard and the ways in which it is to be presented to business readers.

7.2 Usage Scenarios

Intended Audiences: *Technical implementers (conventional and semantic technology); technology management*

The model defined in this specification is intended for use as a business conceptual model.

The uses envisaged for the model are as follows:

- Model driven development
 - Of database schemas
 - Of message schemas
 - Of common messaging across a business unit or organization
- Semantic Technology development
- Integration of systems and/or data feeds

In addition, the model may be extended locally to extend the scope of what is modeled, prior to using such local extensions in any of the above usage scenarios.

7.2.1 Model Driven Development

Model Driven Development refers to the top down development of technical artifacts starting with a high level, business view of the requirements (for programs) or the data semantics (for data).

The model defined in this specification is intended to be situated within any model driven development framework, as a conceptual model and potentially extended locally with additional concepts. This is the case whether the development is for databases, messages or a combination of the two.

Analysis of the model and metadata provided may enable the automation or partial automation of the production of logical data models, or at least of a candidate starting point for the development of the logical data model prior to the addition of keys and other database requirements.

The model described and presented within this specification supports multiple inheritance between classes, whereas most logical data models would be developed using a single inheritance taxonomy (as this is often a constraint on the logical or physical models development). This model will contain metadata which defines, for multiple inheritance taxonomies, Such information can be interrogated to extract from the model a suitable single inheritance taxonomy appropriate to the requirements of the development.

If this model is used within a UML tool, users may create formal mappings between logical data model constructs and the semantics corresponding to these in the FIBO model content. This simplifies the validation and verification of technical data model artifacts.

7.2.2 Semantic Technology Development

As part of this specification, model content is made available in the Web Ontology Language (OWL) format, which is the format used in semantic technology applications.

However, semantic technology developers should be aware that the physical and technical constraints, which rightly apply to semantic technology applications, have not been imposed, since its primary purpose is to serve as a conceptual model at the business level.

Similarly, it should be noted that in defining the formal meanings of terms in the business domain, most of those meanings are “grounded” with reference to legal constructs, accounting constructs and so on. This may or may not correspond to instance data in the application. Typically a semantic technology application, like any other application, will operate on actual data.

There is therefore a distinct difference between the terms defined in this model to satisfy the requirements of a business conceptual model, and the terms required or to be found in an ontology that would be used in a semantic technology application.

Semantic Technology developers will therefore need to extract from the model content, some suitable and decidable subset of that content.

This specification does not detail exactly how to derive decidable sub-sets of the content, such as OWL-DL. It is left to the semantic technology developer to make the necessary transformations.

Some of the metadata provided with this model may assist in this.

7.2.3 Integration of systems and/or data feeds

The simplest application of this conceptual model is to simply use the terms as a common point of reference when comparing terms within different logical or physical data models. This would be of value for example when integrating different systems.

Many systems may not have a formally stated ontology for the data elements that they use, or the database schema may be considered to be the only record of the meanings of the terms therein. Typically, whenever two or more systems need to be integrated, there is a time consuming and almost open ended “mapping” exercise in which the meanings of each of the terms in each of the databases or message schemas involved in the integration, are guessed and perhaps written down.

In reality, even when the intended meanings of the elements in each database and message schema are known, there is not an easy one-to-one mapping between one system and another. This is typically the result of good design: the more the designs have made use of reusable common data structures, the more efficient that design is, but correspondingly the less explicit is the semantics of the terms.

In an integration project that brings together data elements from more than two systems or data feeds, the number of mappings that need to be carried out between one system or feed and another is a geometrical function of the number of such data sources and feeds. In order to have a mapping exercise which is only arithmetically related to the number of data sources and feeds, it is necessary to have a single “hub” of terms which are able to be used as a common point of reference between each of the data models.

While this can often be achieved using a single data model, in practice the limitations on data models (such as single inheritance taxonomies in many cases, though not all) mean that no one model can be found against which all terms in all data models and feeds may be cross referenced. The model presented as part of this specification, being a semantic model, contains full definitions of the meaningful concepts which may be referred to by any of the data elements in the data sources or feeds that need to be integrated, as long as this model may be extended locally to cover areas of scope which are not part of the current specification.

8 Architecture

Intended Audience: Technical, including Enterprise and Information Architects, Implementers.

This clause provides an overview of the ontology architecture and modeling strategies used to develop the Foundations ontology.

- Usage and restriction of the Ontology Definition Metamodel (ODM) standard
- Notional architecture and intended use of the Foundations ontologies
- Application and adaptation of semantic modeling techniques and notations for business presentation.

The technical content, including diagrams, incorporated in Clause 10 of this specification, was generated from the same models used to generate the RDF/XML serialized OWL, further ensuring correctness and completeness of the specification itself.

8.1 Ontology Definition Metamodel (ODM) Usage and Adaptations

8.1.1 Introduction

The model content is developed and maintained using the Unified Modeling Language as a modeling tool framework, but with all model content built using the formal constructs of the Web Ontology Language (OWL). This is achieved using the OMG's Ontology Definition Metamodel (ODM) specification.

The Ontology Definition Metamodel (ODM) specification provides a means to represent OWL constructs using UML tools. This is achieved using UML's extension capability called 'profiles' for OWL and for RDF Schema. The ODM UML Profiles define a number of stereotypes which apply to standard UML metaclasses and may be used to represent OWL constructs in a consistent and meaningful way. The FIBO specifications use an explicit subset of ODM as detailed in Table 8.1 below. This subset eliminates some of the flexibility that ODM provides in exchange for consistency in terms of the graphical notation.

8.1.2 ODM Constructs Usage

Table 8.1 shows the RDF, RDF Schema and OWL model constructs, the names of the ODM stereotypes and their corresponding UML base classes. Where many stereotypes are listed, the base classes apply in order.

Full details of these stereotypes and how they are used are given in the ODM Specification.

Table 8.1. ODM Constructs Usage

Construct	Stereotype	UML Base Class or Element
RDF/RDF Schema Constructs		
Vocabulary Reference	references	Dependency
Namespace Definition	namespaceDefinition	InstanceSpecification
Datatype	rdfsDatatype	Class
Instance type relationship (rdf:type)	rdfType	Dependency
Literal Data	literal	InstanceSpecification, LiteralString
URI/IRI	IRI	InstanceSpecification

Construct	Stereotype	UML Base Class or Element
Simple Property	fact, predicate	InstanceSpecification, Dependency
Sub-class	subClassOf	Generalization
Sub-property	subPropertyOf	Generalization
rdf:about	about	Generalization, Dependency
Cross reference	seeAlso	Dependency
Comment	comment	Dependency
Label	label	tagged value, Dependency
Is Defined By	isDefinedBy	Dependency
OWL Constructs		
OWL Ontology	owlOntology	Package
OWL Import	owlImports	Dependency
Class	owlClass	Class
Complement	ComplementClass, ComplementDatatype, complementOf	Class, DataType, Dependency
Data range	DataRange	DataType
Enumeration (selection list)	EnumerationClass, DataEnumeration, oneOf	Class, DataType, Dependency
Intersection	IntersectionClass, IntersectionDatatype, intersectionOf	Class, DataType, Generalization
Union	UnionClass, UnionDatatype, unionOf, disjointUnionOf	Class, DataType, Generalization, Generalization
Restrictions		
Value Restrictions	owlRestriction, onProperty, allValuesFrom, someValuesFrom, hasValue	Class, Dependency, Dependency, Dependency, Dependency
Number Restrictions on Classes	owlRestriction, onProperty, cardinality, minCardinality, maxCardinality, onClass	Class, Dependency, tagged value, tagged value, tagged value, Dependency
Number Restrictions on Data ranges	owlRestriction, onProperty, cardinality,	Class, Dependency, tagged value, tagged value, tagged value, Dependency

Construct	Stereotype	UML Base Class or Element
	minCardinality, maxCardinality, onDataRange	
Datatype Restrictions	DatatypeRestriction, onDatatype, langRange, length, maxExclusive, minExclusive, maxInclusive, minInclusive, maxLength, minLength, pattern	Class, Dependency, tagged value, tagged value, tagged value, tagged value, tagged value, tagged value, tagged value, tagged value, tagged value
Object Property	objectProperty	AssociationClass
Datatype Property	datatypeProperty	AssociationClass
Annotation Property	annotationProperty	AssociationClass
Disjoint relation	disjointWith	Dependency
Equivalent Class	equivalentClass	Dependency
Inverse relationship	inverseOf	Dependency
Named Individual	NamedIndividual	InstanceSpecification
Same As	sameAs	Dependency
Different From	differentFrom	Dependency
Annotation instance	annotationFact	Dependency

8.2 Ontology Architecture and Namespaces

The ontology architecture for FIBO is designed to facilitate reuse and ontology evolution to the degree possible. It is also designed to facilitate mapping to other standards, in particular, to financial industry domain standards, such as FpML (Financial Products Mark-up Language²). There are countless standards used for financial reporting, many of which are complex and lengthy, with overlap and jurisdiction-specific semantics. An approach to the foundational terminology that provides very high-level, abstract conceptual knowledge designed to facilitate mapping is an important design goal of FIBO Foundations.

Proxy concepts for Goal, Objective, Address, and Country, for example, that are included in the Foundations with little embellishment, are designed to provide hooks for mapping to the OMG's Business Motivation Model, ISO standards for Country code representations, US Publication 28 and other national postal addressing standards, and so forth. The basic building blocks for the Foundations Ontology are shown in Figure 8.1, below.

As shown in the diagram, the Foundations ontologies are divided up into a number of *modules*. For example, the Utilities module includes: a general purpose BusinessTypes.owl ontology, a general Relations.owl ontology, and an AnnotationVocabulary.owl ontology, that captures FIBO-specific annotations.

The Foundations modules will ultimately depend on (1) Basic Terminology and Ontology Metadata (in light gray in the figure), and (2) a number of external modules, representing concepts for Natural Language, Geopolitical Entities (for

² See <http://www.fpml.org/>.

example ISO 3166 Country codes, regional and municipal designations), Postal Addressing (from standards such as US Publication 28), and concepts defining dates, times, calendars, and schedules. A sample set of these anticipated external resources are given in the dark gray layer in the figure.

In this initial version, the Foundations standard reuses metadata definitions, as highlighted in Figure 8.1 in the Basic Terminology and Ontology Metadata layer, from:

- The Dublin Core Metadata Terms Standard
- The W3C Simple Knowledge Organization System (SKOS)
- The OMG Architecture Board’s Specification Metadata Recommendation

SKOS and the OMG Specification Metadata are explicitly imported, while the Dublin Core is not, due to the fact it is an RDF Vocabulary and only OWL ontologies may be formally imported.



Figure 8.1 Foundations Ontology Architecture

The namespaces and their well-known prefixes corresponding to external elements required for use of FIBO Foundations include the following:

Table 8-2. Prefix and Namespaces for referenced/external vocabularies

Namespace Prefix	Namespace
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs	http://www.w3.org/2000/01/rdf-schema#
owl	http://www.w3.org/2002/07/owl#

Namespace Prefix	Namespace
xsd	http://www.w3.org/2001/XMLSchema#
dct	http://purl.org/dc/terms/
skos	http://www.w3.org/2004/02/skos/core#
sm	http://www.omg.org/techprocess/ab/SpecificationMetadata/

The namespace approach taken for FIBO is based on OMG guidelines and is constructed as follows:

- A standard prefix <http://www.omg.org/spec/>
- The family name, EDMC-FIBO
- The abbreviation for the specification: in this case FND
- The module name
- The ontology name

Note that the URI/IRI strategy for the ontologies in FIBO takes a “slash” rather than “hash” approach, in order to accommodate server-side applications. Though not technically necessary, this specification does mandate namespace prefixes to be used. These are constructed as follows with the components separate by “-“:

- The specification family name *fib*o
- The specification abbreviation: *fnd*
- An abbreviation for the module name
- An abbreviation for the ontology name

The namespaces and prefixes corresponding to FIBO Foundations ontologies are summarized in Table 8-3 for convenience. These are given in alphabetical order, by module, rather than with any intent to show imports relationships.

Table 8-3. Prefix and Namespaces for FIBO Foundations

Namespace Prefix	Namespace
fib o-fnd-acc-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/AboutAccounting/
fib o-fnd-acc-aeq	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/AccountingEquity/
fib o-fnd-acc-cur	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/
fib o-fnd-aap-mod	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/AboutAgentsAndPeople/
fib o-fnd-aap-agt	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/
fib o-fnd-aap-ppl	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/

Namespace Prefix	Namespace
fibonacci-fnd-agr-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/AboutAgreements/
fibonacci-fnd-agr-agr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/
fibonacci-fnd-agr-ctr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/
fibonacci-fnd-arr-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/AboutArrangements/
fibonacci-fnd-arr-arr	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements
fibonacci-fnd-arr-cd	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Codes
fibonacci-fnd-arr-doc	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents
fibonacci-fnd-arr-id	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices
fibonacci-fnd-dt-mod	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/AboutDatesAndTimes/
fibonacci-fnd-dt-bd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/BusinessDates
fibonacci-fnd-dt-fd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates
fibonacci-fnd-dt-oc	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/Occurrences
fibonacci-fnd-gao-mod	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/AboutGoalsAndObjectives/
fibonacci-fnd-gao-gl	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/
fibonacci-fnd-gao-obj	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Objectives/
fibonacci-fnd-law-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Law/AboutLaw/
fibonacci-fnd-law-jur	http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/
fibonacci-fnd-law-lcap	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/
fibonacci-fnd-law-cor	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/
fibonacci-fnd-org-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/AboutOrganizations/
fibonacci-fnd-org-fm	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/

Namespace Prefix	Namespace
fibonacci-org-lg	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/LegitimateOrganizations/
fibonacci-org-org	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/
fibonacci-oac-mod	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/AboutOwnershipAndControl/
fibonacci-oac-ctl	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Control/
fibonacci-oac-oac	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/OwnershipAndControl
fibonacci-oac-own	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Ownership/
fibonacci-pty-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/AboutParties/
fibonacci-pty-pty	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/
fibonacci-pty-rl	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/
fibonacci-plc-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Places/AboutPlaces/
fibonacci-plc-adr	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/
fibonacci-plc-cty	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/
fibonacci-plc-fac	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Facilities
fibonacci-plc-loc	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/
fibonacci-plc-vrt	http://www.omg.org/spec/EDMC-FIBO/FND/Places/VirtualPlaces
fibonacci-rel-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/AboutRelations/
fibonacci-rel-rel	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/
fibonacci-utl-mod	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AboutUtilities/
fibonacci-utl-alx	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics
fibonacci-utl-av	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/
fibonacci-utl-bt	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/

8.3 FIBO-Based Reporting

8.3.1 Business-Facing Approach

There are a number of ways of presenting the ontology to domain experts, and the intent is to standardize two of these.

Diagrammatic Presentation

The FIBO ontologies (model) may be presented to business domain experts in a number of forms, with views that express different levels of detail and different aspects of the model to aid in understanding. Critical requirements for business-facing diagrams include limiting or eliminating technical detail while retaining it in the underlying model, and hiding, to the degree possible:

- stereotype names on diagrams, although English labels and icons may be used where important to express the meaning of a line or box,
- technical tags, such as visibility, and optionally names, on property endpoints,
- empty partitions in boxes representing classes and association classes, and
- the class in an association class representation of an object, data, or annotation property.

This does not preclude the incorporation of diagramming elements to represent fundamental concepts from set theory, first order logic, etc., that are needed to understand the ontology. Other requirements for diagramming style will be forthcoming as the specification achieves broader adoptions.

An example, showing a simplified OWL diagram, is given in Figure 8.2.

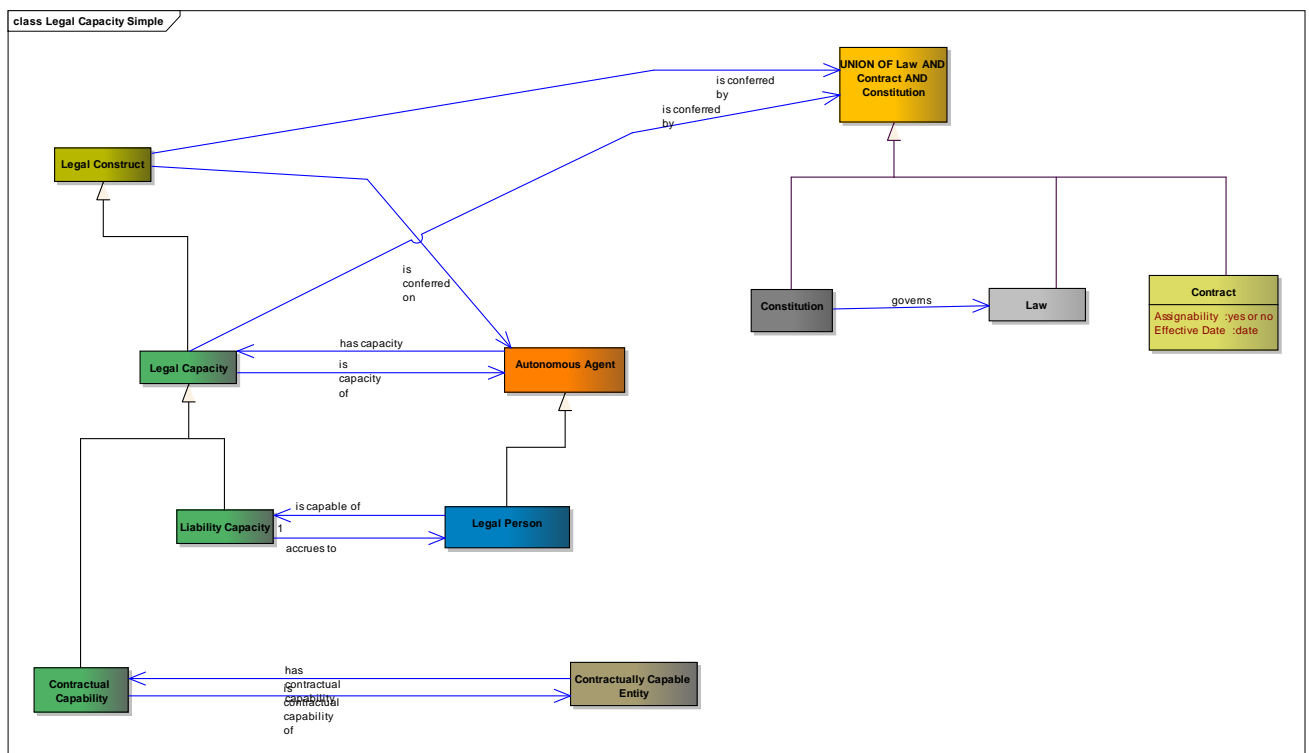


Figure 8.2 Example Business-Facing FIBO Diagram

The strategy for representation for subject matter experts may include use of color to highlight certain lines, in addition to labeling them in English, for example, by using blue lines for object properties, green lines for data properties (if they are not shown using an attribute style, inside the class box), dashed red dependency for disjointness, and so forth.

Tabular or Textual Presentation

In addition to the presentation via diagrams, there is a need to provide business domain experts with a more spreadsheet-like view of the terms, relationships, formal definitions, and other annotations in particular, for review, understanding, and use.

There are two levels of detail that shall be made available in reports. These are the 'Basic' view of Term, Definition and Synonym, and an extended view giving most or all of the same information that is seen in the diagrams. This shall include line entries for each thing and each fact (Relationship Property and Simple Property) as well as the set theory constructs and relationships modeled (unions, parent terms etc.). It is not necessary to show relationships between relationships in these tables, such as sub property hierarchies or property inverses.

The constructs shall be represented with an English language name, including spaces between words rather than camel case; those that are substantially different from their OWL language equivalents include: "Is A" for subclass relationships, "Type" for datatypes, "type of" rather than `rdfType`, "Simple Property" for datatype properties, "Relationship Property" for object properties, and "mutually exclusive" for disjointness relationships. These names are in US English and may be replaced in reports with definitionally equivalent labels in other natural languages and possibly additional terms that may be added to support parallel, collaborative development processes required for FIBO financial product-specific ontologies.

9 Additional Metadata

9.1 Introduction

As discussed in Clause 8, the FIBO Foundations and specifications that depend on it reuse existing metadata standards, including:

- The Dublin Core Metadata Terms Standard
- The W3C Simple Knowledge Organization System (SKOS)
- The OMG Architecture Board's Specification Metadata Recommendation

These metadata definitions are not inherent elements of RDF Schema or OWL, although the standard makes extensive use of `rdfs:label` in particular. This clause of the specification describes the metadata used throughout the standard and provides examples where appropriate for clarification purposes.

9.2 Family and Specification Metadata

The Foundations specification has a set of common metadata which is specified in this sub clause and is given in the specification and version 'About' ontologies as described in the sub-clause on the About ontologies. This information is included regardless of whether the About ontologies are serialized as RDF/XML OWL, UML/XMI with the ODM profiles for RDF and OWL applied, or as ODM XMI.

The use of the "sm" namespace prefix in the abbreviated IRI for the metadata term refers to the Specification Metadata ontology, as described in Table 8-2, above.

Table 9-1. FIBO Foundations Specification Family Metadata

Metadata Term	Value
<code>sm:familyTitle</code>	Financial Industry Business Ontology (FIBO)
<code>sm:familyAbbreviation</code>	FIBO

sm:familyURL	http://www.omg.org/spec/EDMC-FIBO/
sm:familyAbstract	The content that comprises the Financial Industry Business Ontology (FIBO) is documentation, interpretable in formal logic, of the concepts represented by finance industry terms as used in official financial organization documents such as contracts, product/service specifications and governance and regulatory compliance documents.
sm:technologyArea	formal semantics
sm:topicArea	finance
sm:keyword	Financial Industry Business Ontology, FIBO, ontology, vocabulary

Table 9-2. FIBO Foundations Specification Metadata

Metadata Term	Value
sm:specificationTitle	Financial Industry Business Ontology (FIBO) Foundations Specification
sm:specificationAbbreviation	FIBO-FND
sm:specificationURL	http://www.omg.org/spec/EDMC-FIBO/FND/
sm:specificationAbstract	<p>FIBO Foundations is a set of business concepts which are intended to support the financial industry terms semantics presented in other FIBO specifications.</p> <p>The FIBO Foundations models define concepts which are not unique to the financial services industry. From these, financial industry terms in other FIBO specifications may be derived by extension. Terms are also included which may be referred to by properties of things in those specifications. FIBO Foundations therefore includes a number of basic terms about legal, contractual and organizational concepts, among others.</p>
sm:dependsOn	http://www.omg.org/techprocess/ab/SpecificationMetadata/
sm:keyword	Foundational vocabulary

Table 9-3. FIBO Foundations Specification Version Metadata

Metadata Term	Value
sm:thisVersion	1.0
sm:publicationDate	2013-08-26T18:00:00
sm:specificationVersionURL	http://www.omg.org/spec/EDMC-FIBO/FND/1.0/
sm:specificationVersionStatus	Request For Comments (RFC)
skos:historyNote	<p>This version of the FIBO Foundations Specification was revised primarily to reflect comments received at the March 2013 OMG Technical Meeting in Reston and reflected in the Errata discussed at the June 2013 OMG Technical Meeting in Berlin.</p> <p>Revisions to FIBO Foundations are managed per the process outlined in the Policies and Procedures for OMG standards, with the intent to maintain backwards compatibility in the ontologies to the degree possible.</p> <p>The RDF/XML serialized OWL for the Foundations ODM/OWL ontologies have been checked for syntactic errors and logical consistency with Protege 4 (http://protege.stanford.edu/), Hermit 1.3.7 (http://www.hermit-reasoner.com/) and Pellet 2.2 (http://clarkparsia.com/pellet/).</p>
sm:addressForComments	http://www.omg.org/issues/

9.3 Module Metadata

Every module will have unique metadata specific to that module, as given in Clause 10, below. Additionally, every ontology will include curation metadata. Explicit use of the MIT License³ for software (including OWL ontologies, UML models, ODM XMI) is intended to assure users of the ontologies that the ontologies are freely available, for use with attribution, and without warranty. This module metadata is given in the module “About” ontology as described in the sub-clause on the About ontologies.

9.4 Ontology-Level Metadata

Each Foundations ontology has a set of curation and rights metadata which is specified in this sub clause rather than being repeated for each ontology. This information is included regardless of whether the ontology is serialized as RDF/XML OWL, UML/XMI with the ODM profiles for RDF and OWL applied, or as ODM XMI.

³ See <http://opensource.org/licenses/mit-license.php>

Table 9-4. FIBO Foundations Specification Curation and Rights Metadata

Metadata Term	Value
sm:copyright	Copyright (c) 2013–2014 EDM Council, Inc. Copyright (c) 2013–2014 Object Management Group, Inc.
dct:license	http://www.omg.org/techprocess/ab/SpecificationMetadata/MITLicense
sm:responsibleTaskForce	http://fdtf.omg.org/

Finally, each ontology will include ontology-specific metadata, using the OMG Specification Metadata ontology. These details are provided with the individual ontologies in Clause 10.

9.5 The ‘About’ Files

Each FIBO submission is to be accompanied by a set of files containing the metadata for the FIBO Family, the individual FIBO specification and the specifications for each module. This is so that metadata for each of these elements of a FIBO submission do not need to be repeated in each ontology. These are collectively known as “About files”

The About files are:

- About the EDMC-FIBO Family
- About the Specification
- About the specification version
- About each Module

9.5.1 EDM Council FIBO Family About File

This is to be included with each FIBO specification submission. It has the filename AboutTheEDMC-FIBOFamily.rdf and includes the family level metadata described in sub-clause 9.2.

9.5.2 Specification About File

This is unique to each FIBO specification and is named according to the specification 3- or 4-letter abbreviation, for example (for Foundations) AboutFND.rdf

This file includes the specification-level metadata described in sub-clause 9.2.

9.5.3 Specification Version About File

This is unique to each FIBO specification and is named according to the specification 3- or 4-letter abbreviation and its version, for example (for Foundations) AboutFND-1.0.rdf

This file includes the specification version metadata described in sub-clause 9.2.

9.5.4 Module About File

This is unique to each FIBO module and is named according to the module full name, for example (for Foundations): AboutAgreements.rdf

This file includes the module-level metadata described in sub-clause 9.3.

9.6 Ontology Entity-Level Metadata

This sub clause describes the metadata that are applied to each named concept (Class and Property) in the ontologies.

9.6.1 Definitions, Notes, and Labels

Table 9-5. Definitions, Labeling, and Notes

Term Requirement	Term Type	Annotation	Usage Notes
Definition	Definition	skos:definition	Main formal definition of term. Must always be present
Change history	Note	skos:changeNote	Notes indicating why something was modified
General note, editorial comment	Note	skos:editorialNote	The bulk of the “Further Notes” narrative is expressed this way
Examples	Note	skos:example	Examples
Explanatory note	Note	fibou-utl-av:explanatoryNote	Notes providing additional explanation about the concept
Historical note	Note	skos:historyNote	Notes regarding the history of the concept
Note	Note	skos:note	Used when no specific note annotation is appropriate
Scope note	Note	skos:scopeNote	Clarifying information about the scope of the term or concept
Usage note	Note	fibou-utl-av:usageNote	Used to suggest how a particular concept is intended to be used
Preferred Label	Label	skos:prefLabel	Replaces rdfs:label if there is a preferred label for the concept
Alternate Label	Label	skos:altLabel	Alternate label additional to prefLabel. Should be used instead of rdfs:label for alternatives

9.6.2 Synonymous Terms

Synonyms are fundamental to the reporting required for business domain view and review of the ontologies, which, at a basic level, may only require the concept, a label, its formal definition in text form, and any synonyms.

Fundamentally, an ontology, and any extensions derived from it, should contain only a single element defining a given concept, with synonyms captured using the `fibou-utl-av:synonym` annotation property. Within a given ontology, use of separate classes with the same meaning, together with the OWL construct for class equivalence (`equivalentClass`) is not considered best practice. Such an approach may be necessary to align or map ontologies to one another, however, where the same concepts exist in different namespaces. `fibou-utl-av:abbreviation` may be used to specify abbreviations and acronyms associated with concepts as appropriate.

9.6.3 Provenance and Cross-reference Annotation

Where possible, every effort is made in the FIBO ontologies to provide references for the origin of terms and their definitions, including cases where those definitions have been adapted for FIBO usage. While less important for Foundations, any FIBO ontology that includes terminology from a particular standard, such as FpML, ISO 20022, any regulatory publication, and so forth should note it as the source for a given concept or its definition.

Four annotation properties are provided in the FIBO Annotation Vocabulary to facilitate provenance documentation for the terminology and definitions specified in the standard. These are:

- `fibou-tl-av:adaptedFrom` – used where the text in the `skos:definition` is adapted from the definition of the term defined in the range of this property (range can be a string, URI, or `BibliographicCitation`). Note that this initial version of Foundations does not recommend a specific standard for citations. There are a number of ontologies that might be considered for this purpose, and the OMG Specification Metadata provides a class called `BibliographicCitation` that can be used as the range of this annotation and can be mapped to the preferred citation definition for a given application, organization, or repository.
- `fibou-tl-av:definitionOrigin` – used where the text in the `skos:definition` is a direct copy of the definition of the term defined in the range of this property (range can be a string, URI, or `BibliographicCitation`).
- `fibou-tl-av:termOrigin` – which provides the means to document the source of a term, in a standard, in some other document, or by some organization. The range of this property is the document and / or organization from which the term was derived (range can be a string, URI, or `BibliographicCitation`).
- `fibou-tl-av:nameOrigin` – which provides the means to document the name of the original term in the standard, other document or organization referenced via the annotation `fibou-tl-av:termOrigin`

9.6.4 Change Management Annotation

In addition to the version information provided at the specification level for a given FIBO ontology, additional annotations for change management purposes may be appropriate at the concept level. These may include:

- `skos:changeNote`
- `fibou-tl-av:modifiedBy` – identifying the person and/or organization responsible for the change
- `fibou-tl-av:modifiedOn` – identifying the date and time of the change

10. Model Content Reports

Intended Audience: Business Analysts, other business stakeholders

This clause shows the content of the model from a business perspective. Model content is presented both as diagrams and as tables. Readers do not need to be conversant with the Web Ontology Language or other modeling languages in order to be able to interpret what is presented here. However some familiarity with the “set theoretic” interpretation of the model content is required.

This clause has a sub clause for each ontology that is automatically generated from the ODM representation of that ontology, and is designed to be more human-readable than the raw OWL file.

The following Table 10.1 explains the headings used and what these mean in terms of the semantics of the model elements presented.

Table 10-1. Table Guide

NOTE: Not all of these entries are provided in every sub clause.

Heading	Description
Name	The formal name of the model element. This is in the “CamelCase” format.
Type of Thing	The name of the class of “Thing” or, for properties, the class of thing for which that is a property. Note that properties which are intended to be widely used will state “anything” in this column, meaning that it is intended to be a property of “Thing”, the set of which everything is a member.
Property	The name of the property (blank for entries which describe a type of thing).
Definition	The formal written definition of the type of thing or the property.
Synonyms	The or any synonyms which are identified for the concept.
Equivalent To	Identifies a class or property restriction which is the same in meaning
Parent	For types of thing, the type of thing for which it is a sub-type, sharing properties of that thing.
Mutually Exclusive With	Indicates that a type of thing is mutually exclusive with the other type of thing identified

Heading	Description
	in this column. This means that no individual thing may be a member of both sets.
Related Thing Or Type	<p>For relationship properties, the type of thing in terms of which the property is framed or (in subject-predicate-object terms) the object of the property. For example a property like “has jurisdiction” would be framed in terms of the type of thing, which is a jurisdiction.</p> <p>For simple properties, the type of information in terms of which the property is framed (e.g. text, date, yes/no or selection of textual descriptors)</p>
Inverse of Property	Identifies a property which is the opposite or inverse of the one in this line. For example is a customer holds an account, and an account is held by a customer, these properties are the inverse of one another.
Multiples	Indicates where a property may have specific multiples of the item identified as the related thing or simple type. Where properties are reused or refined, this indicates specific limitations on the numbers of the kind of thing identified as the related thing for the reused property.
Concept type	Gives the natural language description of what kind of concept is being reported on in this line of the table, e.g. class (type of thing), Simple Property, Relationship Property and so on.
Explanatory Note	Provides any textual information that has been included about the concept, over and above the formal definition for the concept.
Term Origin	For concepts, which have been included with reference to, some other source (typically an industry standard data model) this column identifies the document, standard or other resource from which the term was derived.
Definition Source	For concepts for which a definition has been taken from some other source this column identifies the document, standard or other resource from which the definition was directly taken.
Adapted From	Where definitions have been taken from other sources but adapted, this column identifies the source of the original definition. This is typically the case when a definition is taken from some technical industry standard, and the description of a data field or message element is re-worded to describe the real world thing to which that element applies.

10.1 Module: Utilities

Table 10-2. Utilities Module Metadata

Metadata Term	Value
sm:moduleName	Utilities
sm:moduleAbbreviation	FIBO-FND-UTL
sm:moduleVersion	1.0
sm:moduleAbstract	Ontologies which provide annotations and business facing datatypes to be used in other ontologies. These ontologies are not expected to be used directly by business stakeholders and are for the definition of material which is used by semantic modelers in Foundations and in other FIBO ontologies.

10.1.1 Ontology: Annotation Vocabulary

This vocabulary provides a set of metadata annotations for use in describing FIBO ontology elements. The annotations extend properties defined in the OMG's Specification Metadata Recommendation, in the Dublin Core Metadata Terms Vocabulary and in the W3C Simple Knowledge Organization System (SKOS) Vocabulary, and have been customized to suit the FIBO specification development process.

Note that any of the original properties provided in Dublin Core and SKOS can be used in addition to the terms provided herein. However, any Dublin Core terms that are not explicitly defined as OWL annotation properties in this ontology or in any of its imports must be so declared in the ontologies that use them.

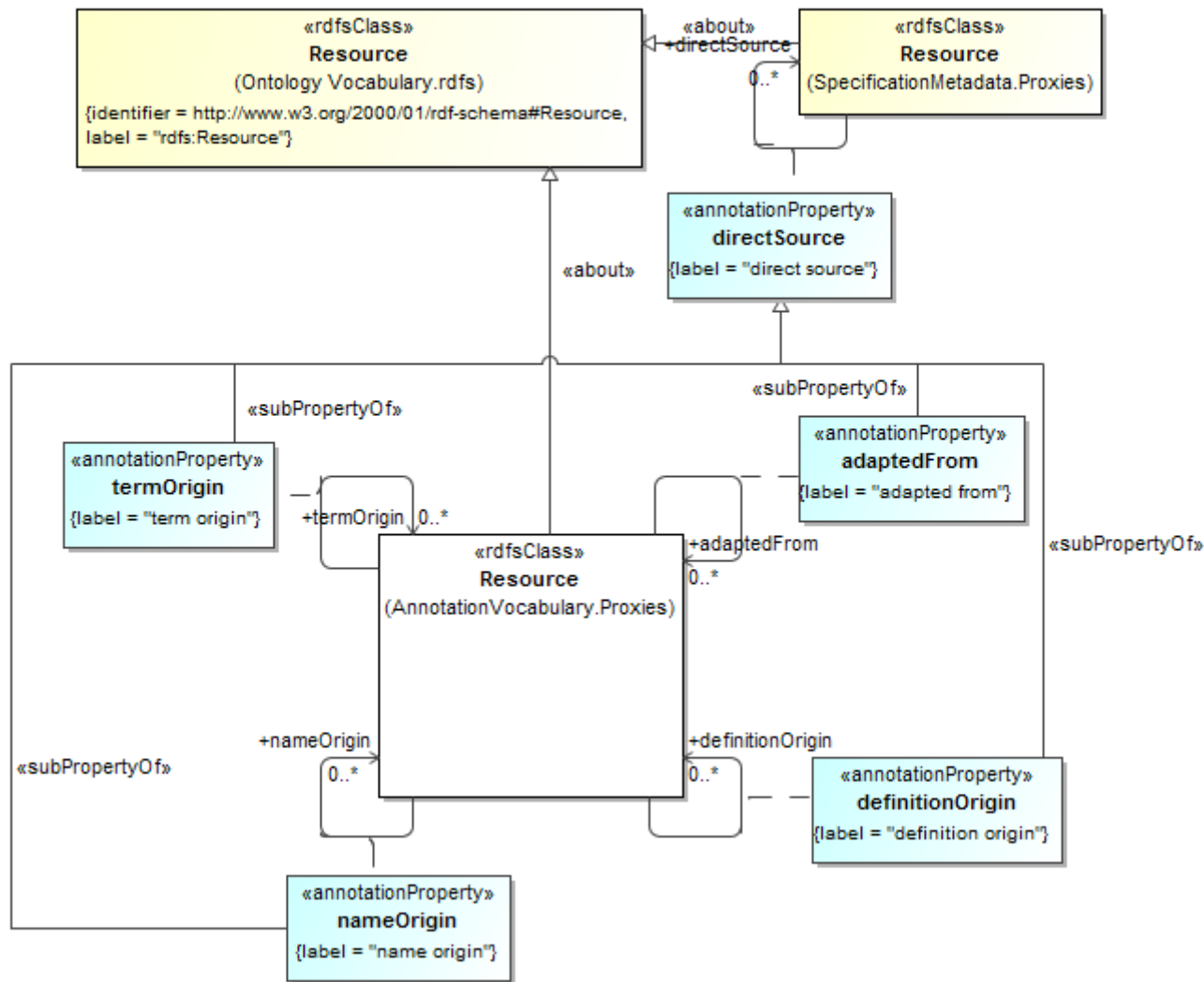


Figure 10.1 Term and Definition Annotations

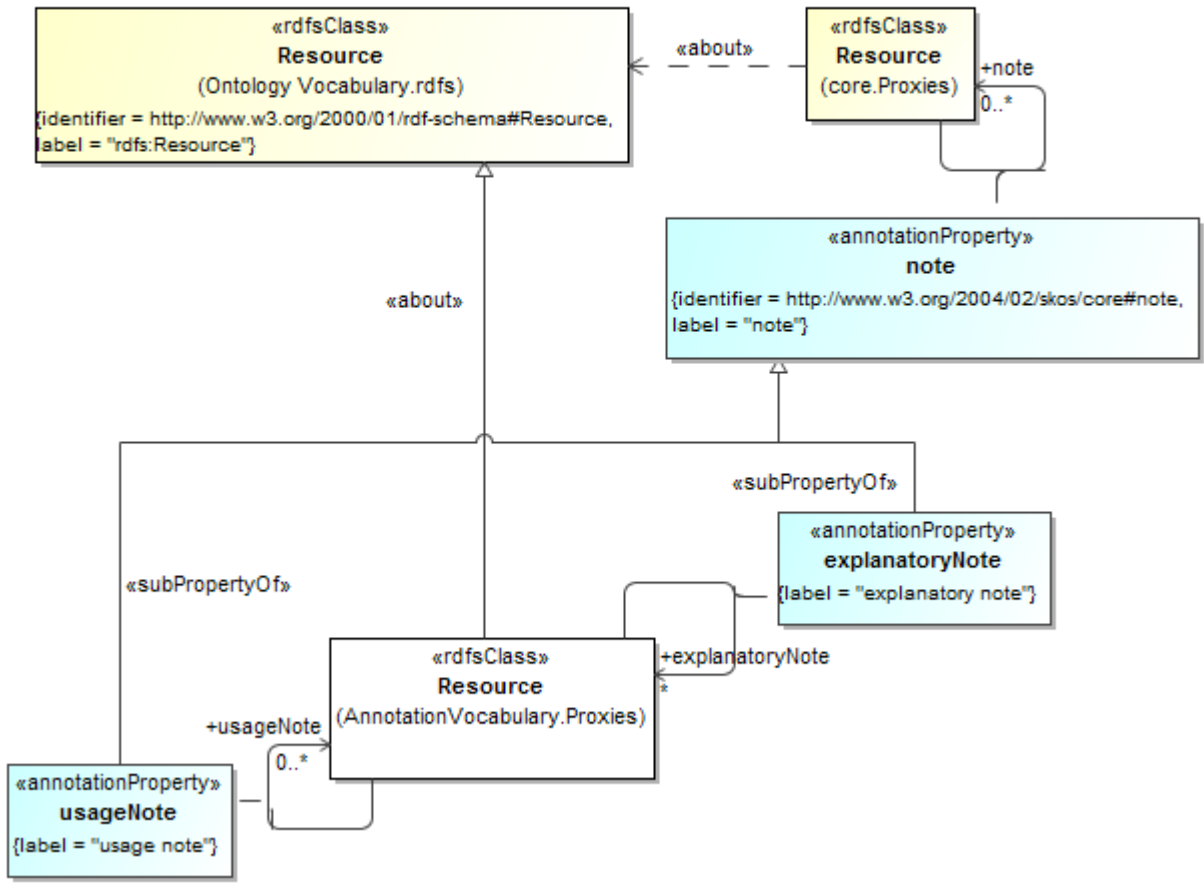


Figure 10.2 Explanatory Annotations

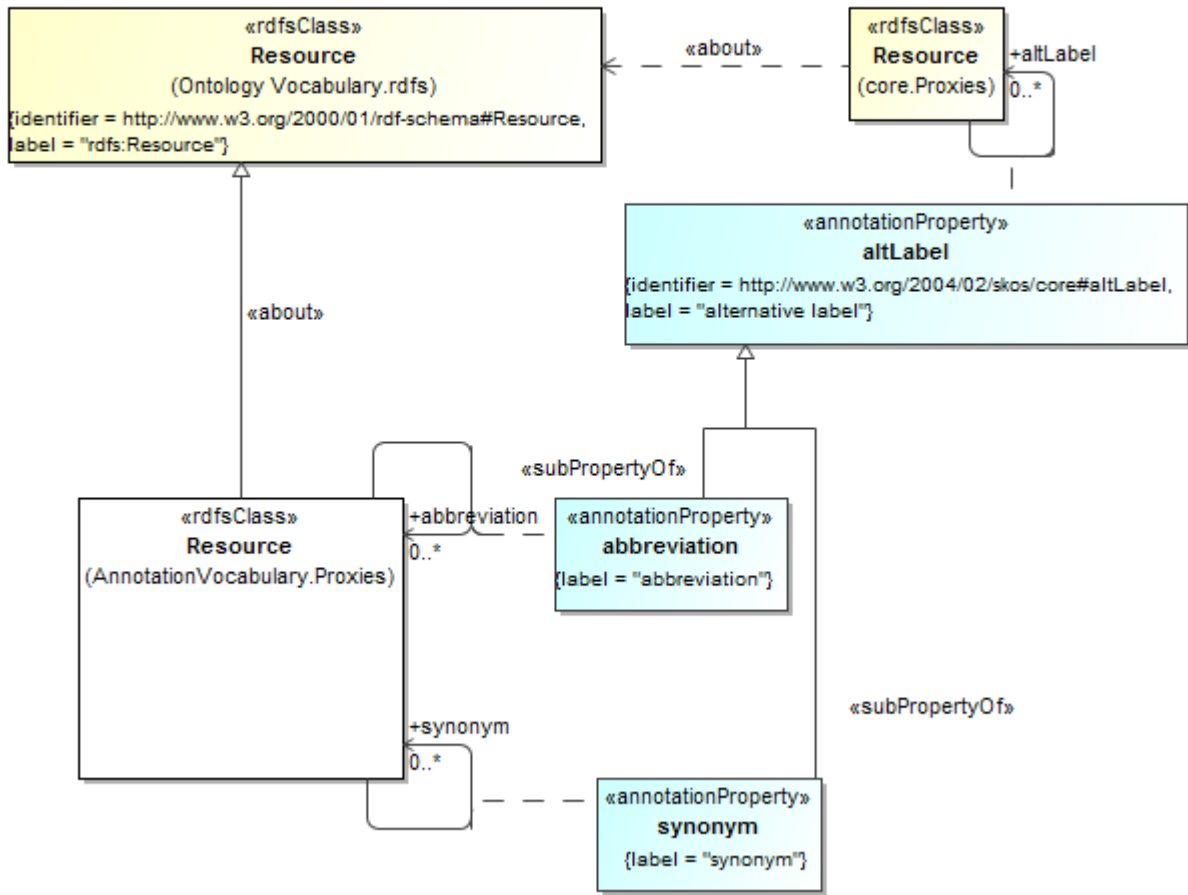


Figure 10.3 Alternate Label Annotations

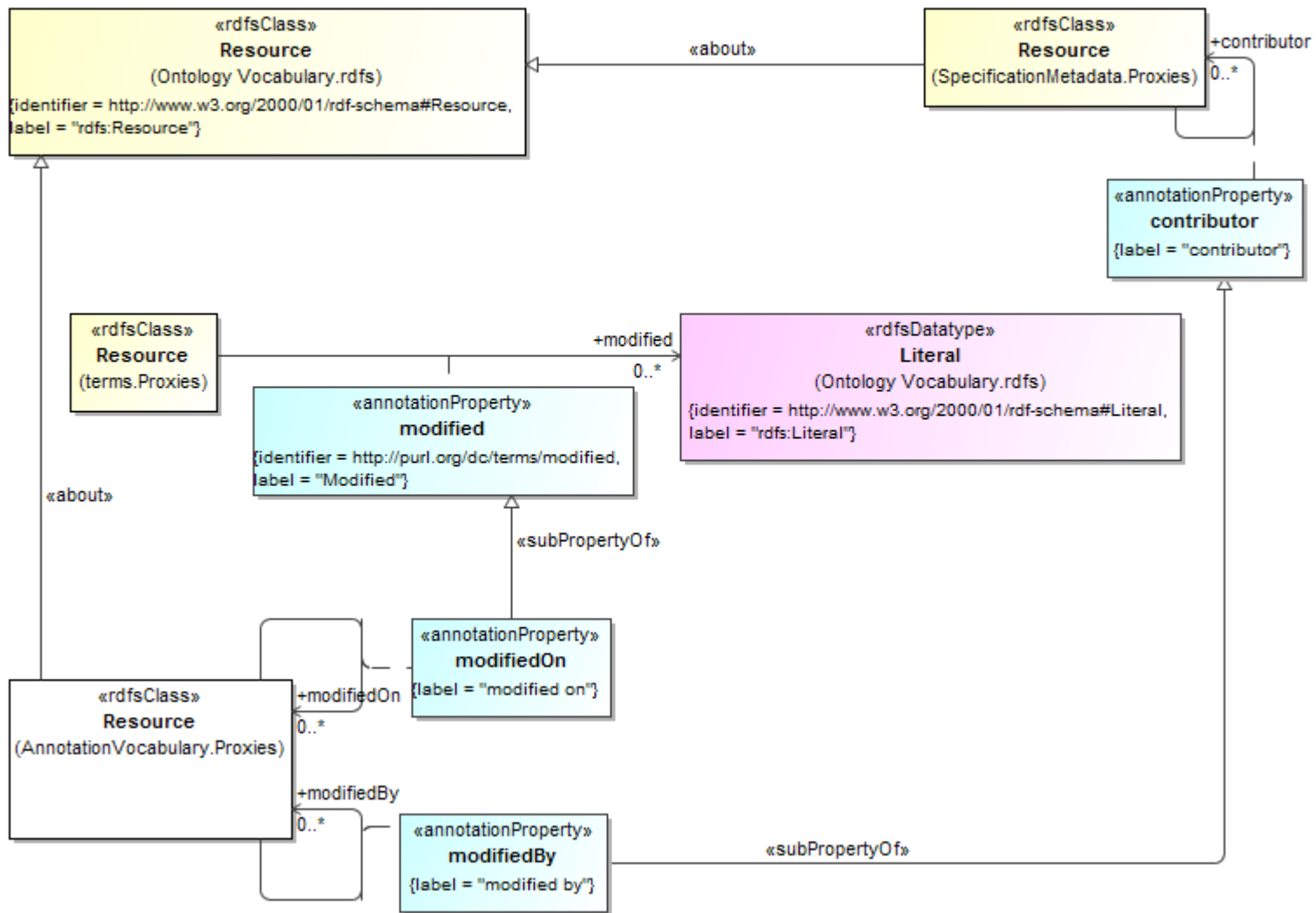


Figure 10.4 Element Change Management Annotations

Table 10-3. Annotation Vocabulary Metadata

Metadata Term	Value
sm:filename	Annotation Vocabulary
sm:fileAbbreviation	fibonacci-fnd-utl-av
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Utilities/AnnotationVocabulary/

Table 10-4. Annotation Vocabulary Details

Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Simple Type	Related Thing	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
resource	directSource	reference used as a primary, direct source for content in developing this specification or model (range can be a string, URI, or BibliographicCitation)					resource		Annotation Property			
resource	termOrigin	Document from which a given term was taken directly; the range for this annotation can be a string (either xsd:string or fibo-fnd-utl-bt:text), URI (either xsd:anyURI or fibo-fnd-utl-bt:uri), or BibliographicCitation		sm:directSource			resource		Annotation Property			
resource	nameOrigin	provides the means to document the name of the original term in the source		sm:directSource			Resource		Annotation Property			

Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Simple Type	Related Thing	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
		referenced via termOrigin; the range for this annotation can be a string (either xsd:string or fibo-fnd-utl-bt:text), URI (either xsd:anyURI or fibo-fnd-utl-bt:uri), or BibliographicCitation										
resource	definitionOrigin	document from which a given definition was taken directly; the range for this annotation can be a string (either xsd:string or fibo-fnd-utl-bt:text), URI (either xsd:anyURI or fibo-fnd-utl-bt:uri), or BibliographicCitation		sm:directSource			Resource		Annotation Property			
resource	adaptedFrom	the document from which a given term (or its definition) was adapted; the range for this annotation can be a string (either xsd:string or fibo-fnd-utl-bt:text), URI (either xsd:anyURI or fibo-fnd-utl-bt:uri), or BibliographicCitation		sm:directSource			resource		Annotation Property			
resource	Modifiedon	identifies the date a model element in the body of an ontology was changed		terms:modified		Literal			Annotation Property			
resource	modifiedBy	identifies the organization or person responsible for making a change to a model element in the body of an ontology		sm:contributor			resource		Annotation Property			
resource	abbreviation	an abbreviation is		core:altLabel			resource		Annotation			ISO 1087-1

Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Simple Type	Related Thing	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
		short form for a particular designation that can be substituted for the primary representation.							Property			Terminology work - Vocabulary
resource	synonym	a synonym is another designation that can be substituted for the primary representation. It is a designation for the same concept.		core:altLabel			resource		Annotation Property			ISO 1087-1 Terminology work - Vocabulary
resource	explanatory-Note	a note that provides additional explanatory information about a given concept		core:note			resource		Annotation Property			
resource	usageNote	a note that provides information about how a given concept is used in the FIBO context		core:note			resource		Annotation Property			

10.1.2 Ontology: Business Facing Types

This ontology provides high level definitions for business facing datatypes for use in other FIBO ontology elements. These types are essentially aliases of existing RDF datatypes, and are provided in order to be able to present datatype properties to a business audience with non technical names, for example yes or no in place of boolean and text in place of string. All datatype properties in the FIBO ontologies are framed in terms of these business-facing types and not in terms of the underlying technically-named datatypes.

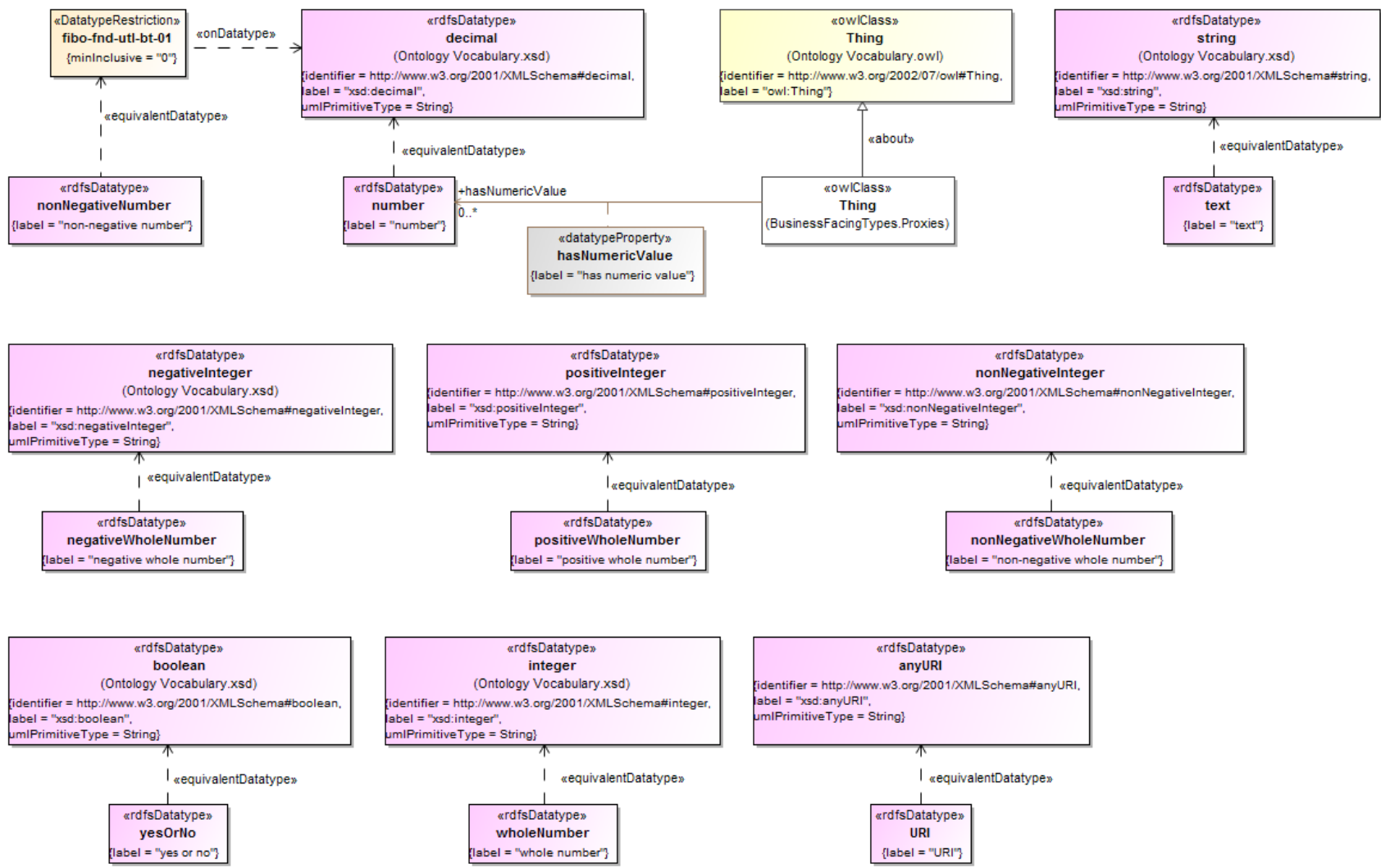


Figure 10.5 General Purpose Business Types

As shown in Figure 10.5, a number of business types are defined for use in other definitions in FIBO. These are provided to facilitate understanding by business subject matter experts, using common language rather than technical nomenclature. Note that a non-negative number is defined using a datatype restriction, fibo-fnd-utl-bt-01, that can be interpreted as saying that a non-negative number is declared to be of type xsd:decimal whose values must be greater than or equal to zero.

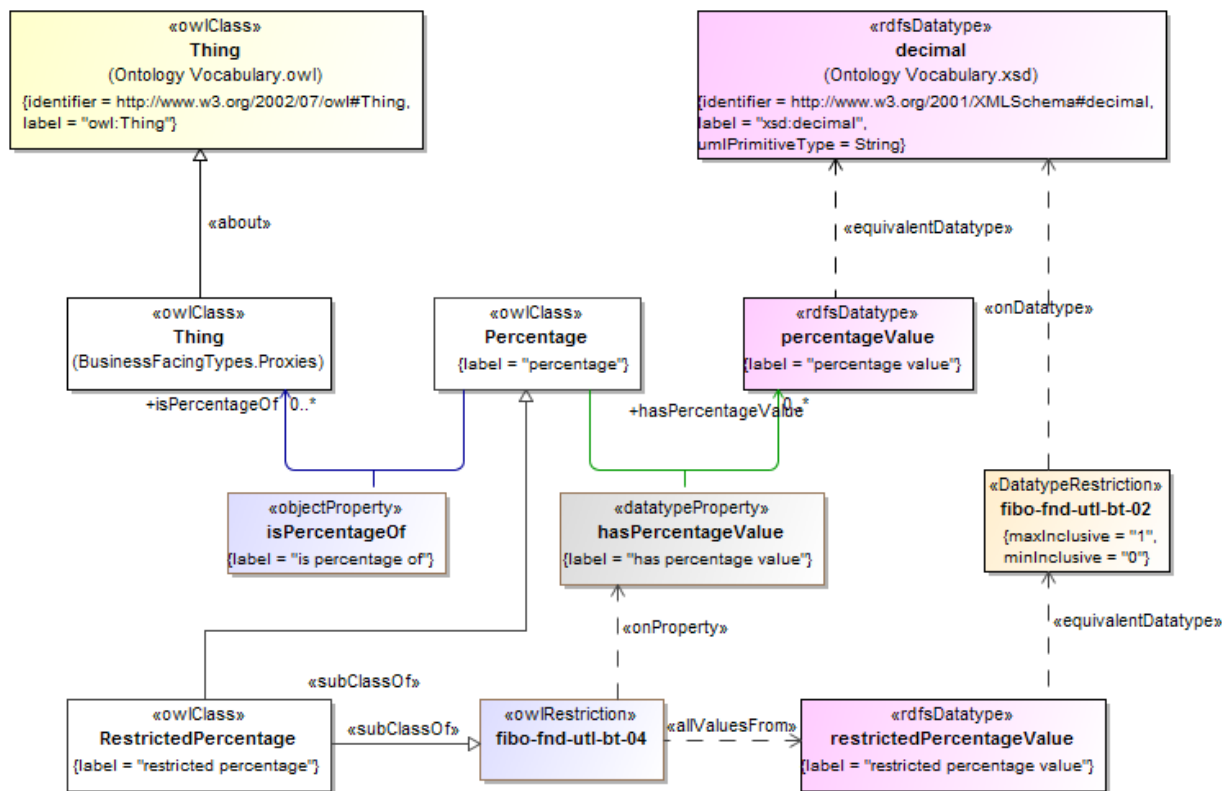


Figure 10.6 Percentage Definitions

Figure 10.6 depicts the definition of two datatypes that can be used in other FIBO definitions for the purposes of specifying percentage values. These include (1) percentage, which is declared as an xsd:decimal (and can be negative), and (2) restricted percentage, which must be an xsd:decimal whose values are restricted (in fibo-fnd-utl-bt-02) to range from zero to one.

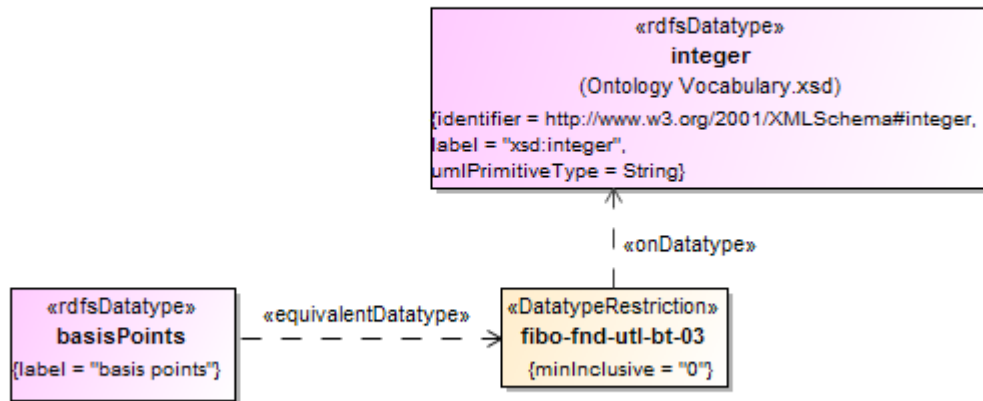


Figure 10.7 Basis Points Definition

Figure 10.7 declares the definition of basis points to be an xsd:integer whose values must be greater than or equal to zero (fibonacci-fnd-utl-bt-03).

Table 10-5. Business-Facing Types Ontology Metadata

Metadata Term	Value
sm:filename	Business Facing Types Ontology
sm:fileAbbreviation	fibonacci-fnd-utl-bt
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/ Utilities/BusinessFacingTypes/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/ Utilities/BusinessFacingTypes/

Metadata Term	Value
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-6. Business Facing Types Definitions

Datatype	Definition	Equivalent Datatype	Concept Type	Definition Source
basisPoints	A basis point is a unit equal to one hundredth of a percentage point, or one part per ten thousand, 1/10000.	fibonacci-fnd-uti-bt-03	Datatype	
negativeWholeNumber		negativeInteger	Datatype	
nonNegativeNumber		fibonacci-fnd-uti-bt-01	Datatype	
nonNegativeWholeNumber		nonNegativeInteger	Datatype	
number	A number is a mathematical object used to count, label, and measure.	decimal	Datatype	
percentageValue	the value of a percentage expressed as a number or ratio as a fraction of 100	decimal	Datatype	
positiveWholeNumber		positiveInteger	Datatype	
restrictedPercentageValue	A type defining a percentage specified as decimal from 0 to 1. A percentage of 5% would be represented as 0.05. The maximum value is 100%, i.e., 1.	fibonacci-fnd-uti-bt-02	Datatype	
text	the contents of an ordinary sequential file readable as textual material without much processing	String	Datatype	
URI	a uniform resource identifier (URI) is a string of characters used to identify a name or a web resource.	anyURI	Datatype	
wholeNumber		integer		
yesOrNo	something which has two states, interpreted as Yes and No in the context in which this is used	boolean		

Table 10-7. Business Facing Types Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Percentage	percentage		a proportion of something expressed as a percentage amount						Class			
hasPercentageValue	percentage	has percentage value	indicates a value expressed as a percentage				Percentage value		Simple Property			
isPercentageOf	percentage	is percentage of	that of which the percentage is a ratio, expressed as a fraction of 100 where 100 represents the whole of that thing or quantity				anything		Relationship Property			
RestrictedPercentage	Restricted percentage		a proportion of something expressed as a percentage amount and not exceeding 100% of that of which it is the percentage		percentage fibo-fnd-utl-bt-04				Class			
fibo-fnd-utl-bt-04	property restriction 04		Set of things with property 'has percentage value' which may only be taken from 'restricted percentage value'						Property Restriction			

10.1.3 Ontology: Analytics

This ontology provides mathematical abstractions for use in other ontologies, including for example the basic components of formulae, parameters and values.

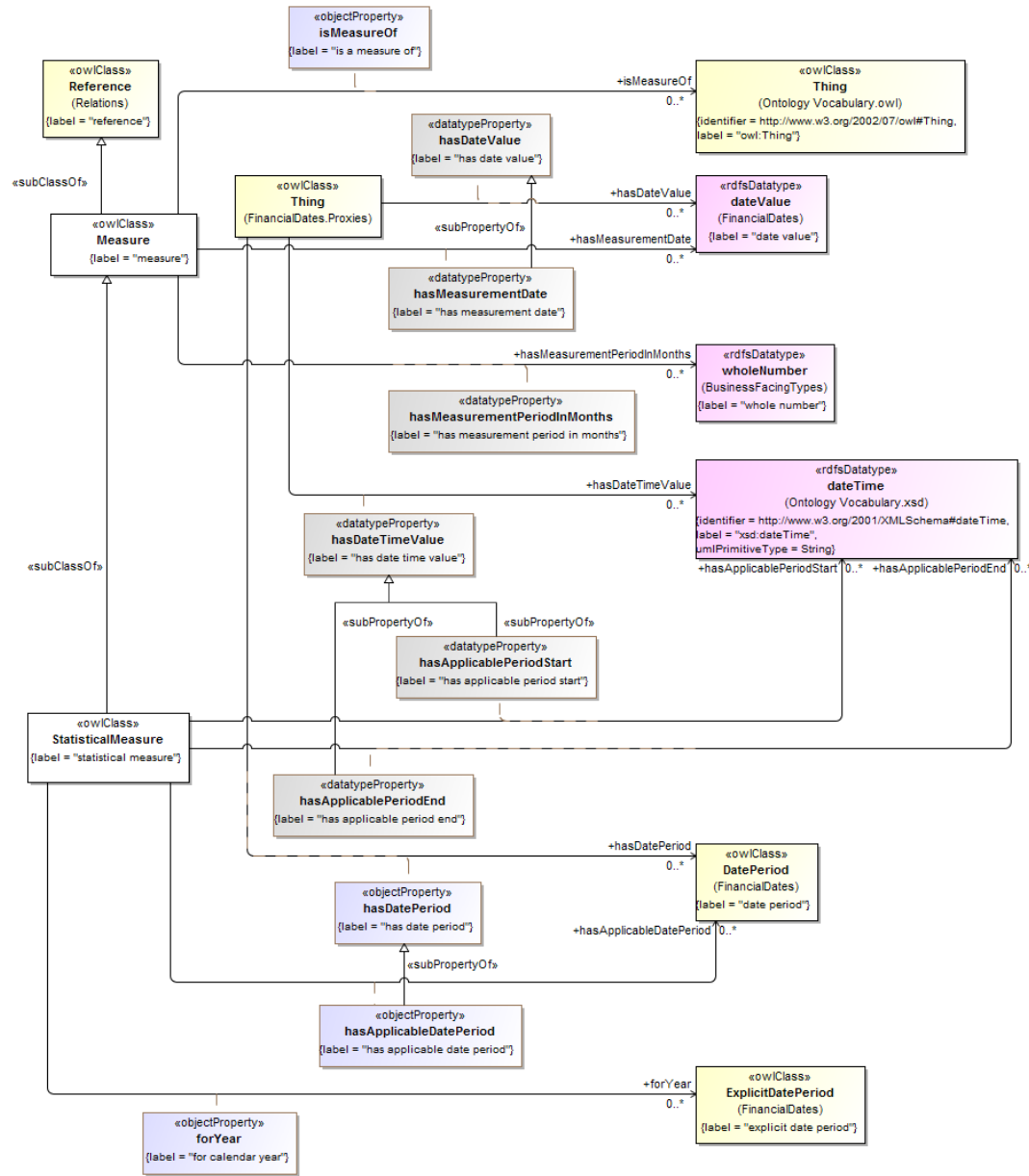


Figure 10.8 Measures Concepts

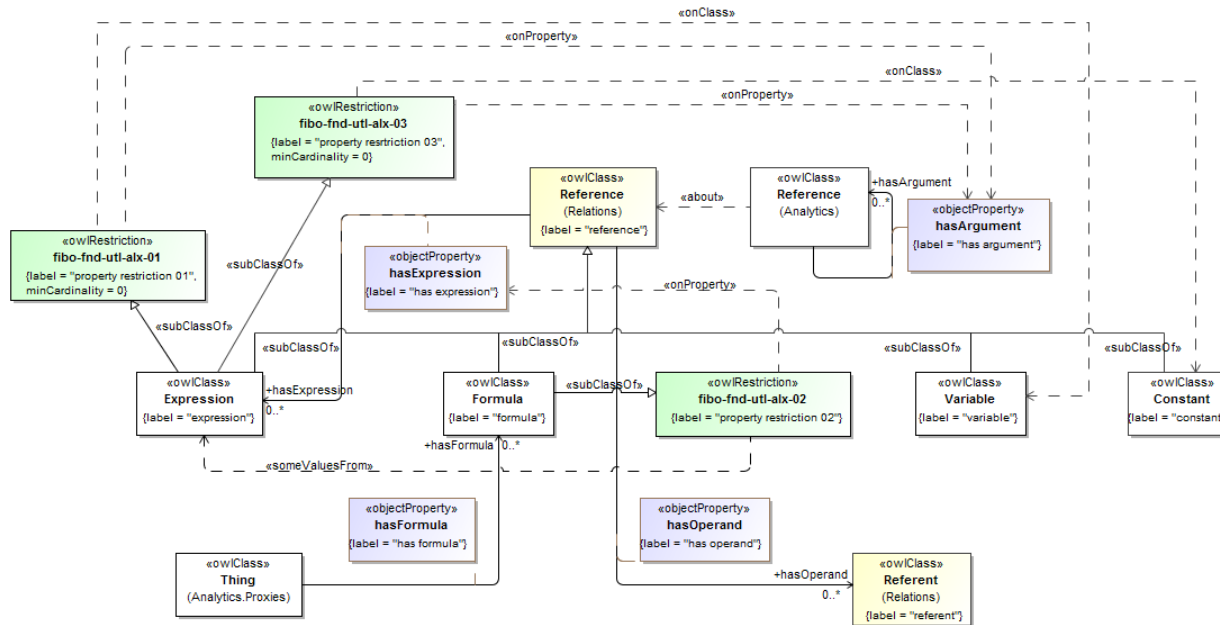


Figure 10.9 Expressions and Formulae

Table 10-8. Analytics Ontology Metadata

Metadata Term	Value
sm:filename	Analytics
sm:fileAbbreviation	fibo-fnd-utl-alk
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Utilities/Analytics/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Metadata Term	Value
	FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/

Table 10-9. Analytics Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Formula	[formula]		a general fact or rule expressed in letters and symbols; may consist of one or more expressions	fibofnd-utl-ax-02								
Class	Measure	[measure]		an amount or degree of something; the dimensions, capacity, or amount of something ascertained by measuring	Reference								
Class	Constant	[constant]		a symbol that represents a constant in a formula or expression	Reference								
Class	Expression	[expression]		a finite combination of symbols that are well-formed according to applicable rules	fibofnd-utl-ax-03								
Class	Variable	[variable]		a symbol that represents a parameter in a formula or expression	Reference								
Class	Statistical Measure	[statistical measure]		A summary (means, mode, total, index, etc.) of the individual quantitative variable values for the statistical units in a specific group	Measure								

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				(study domains).									
Other	fibofnd-utl-alx-02	[property restriction 02]	hasExpression	restriction on the stated property where some values must be taken from the related thing or type			Expression						
Other	fibofnd-utl-alx-03	[property restriction 03]	hasArgument	cardinality restriction on the stated property with values taken from the related thing			Constant						
Other	fibofnd-utl-alx-01	[property restriction 01]	hasArgument	cardinality restriction on the stated property with values taken from the related thing			Variable						
Relationship Property	forYear	statistical measure	for calendar year	a predicate indicating the calendar year for which the statistical measure is applicable			explicit date period						
Relationship Property	hasApplicable-DatePeriod	statistical measure	has applicable date period	a predicate indicating the date period for which the statistical measure is applicable	has date period		date period						
Simple Property	hasApplicablePeriodEnd	statistical measure	has applicable period end	a predicate indicating the end of the period for which the statistical measure is applicable	has date time value		xsd:dateTime						
Simple Property	hasApplicablePeriodStart	statistical measure	has applicable period start	a predicate indicating the start of the period for which the statistical measure is applicable	has date time value		xsd:dateTime						
Relationship Property	hasArgument		has argument	indicates a specific input to a function, formula or expression, also known as	has								

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				an independent variable									
Relationship Property	hasExpression	reference	has expression	indicates a mathematical or other formal expression, which may be part of a formula	has		expression						
Relationship Property	hasFormula		has formula	indicates a concise way of expressing information symbolically, as in a mathematical or chemical formula	has		formula						
Simple Property	hasMeasurementDate	measure	has measurement date	a predicate indicating the date on which the measure was taken	has date value		date value						
Simple Property	hasMeasurementPeriodInMonths	measure	has measurement period in months	a predicate indicating the coverage period for which the measure is applicable expressed in months			whole number						
Relationship Property	hasOperand	reference	has operand	indicates the operand of a mathematical argument, parameter or other similar concept	has		referent						
Relationship Property	isMeasureOf	measure	is a measure of	a predicate indicating the concept being measured	applies to		owl:Thing						

10.2 Module: Relations

Table 10-10. Relations Module Metadata

Metadata Term	Value
<code>sm:moduleN6me</code>	Relations
<code>sm:moduleAbbreviation</code>	FIBO-FND-REL

Metadata Term	Value
sm:moduleVersion	1.0
sm:moduleAbstract	This module contains an ontology defining a number of reusable relationships. These are used, refined or restricted to define relationships among more specific concepts in other FIBO ontologies. Some of these relationships stand in for relationships which are defined in external standards ontologies.

10.2.1 Ontology: Relations

This ontology defines a set of general-purpose relations for use in other FIBO ontology elements. These include a number of properties required for reuse across the foundations and business entities models.

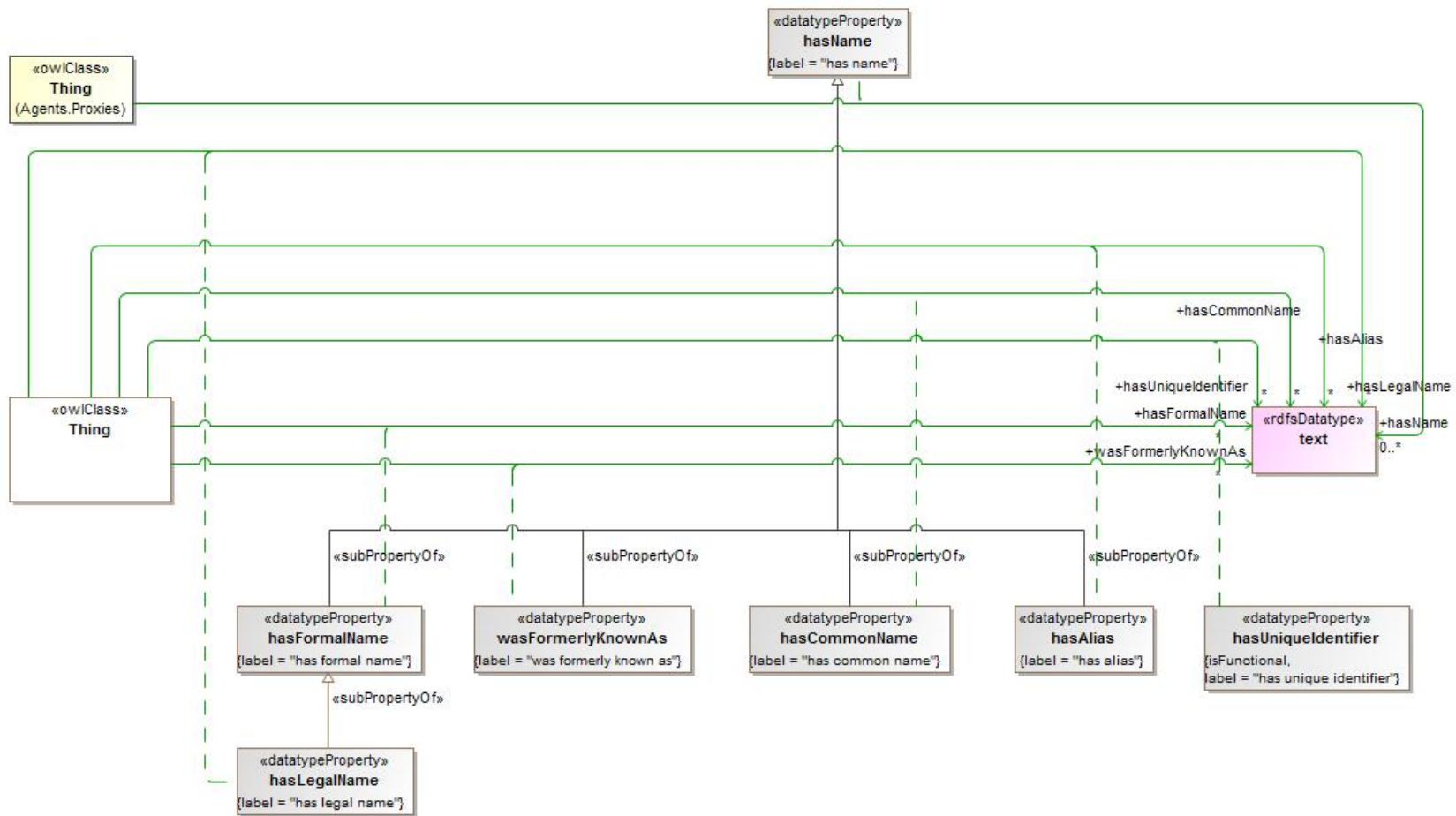


Figure 10.10 Data Properties Textual

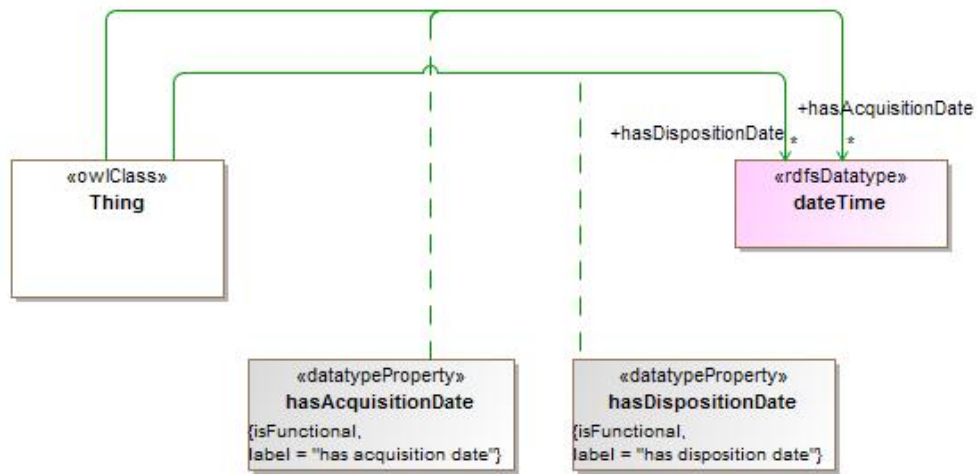


Figure 10.11 Data Properties Numeric

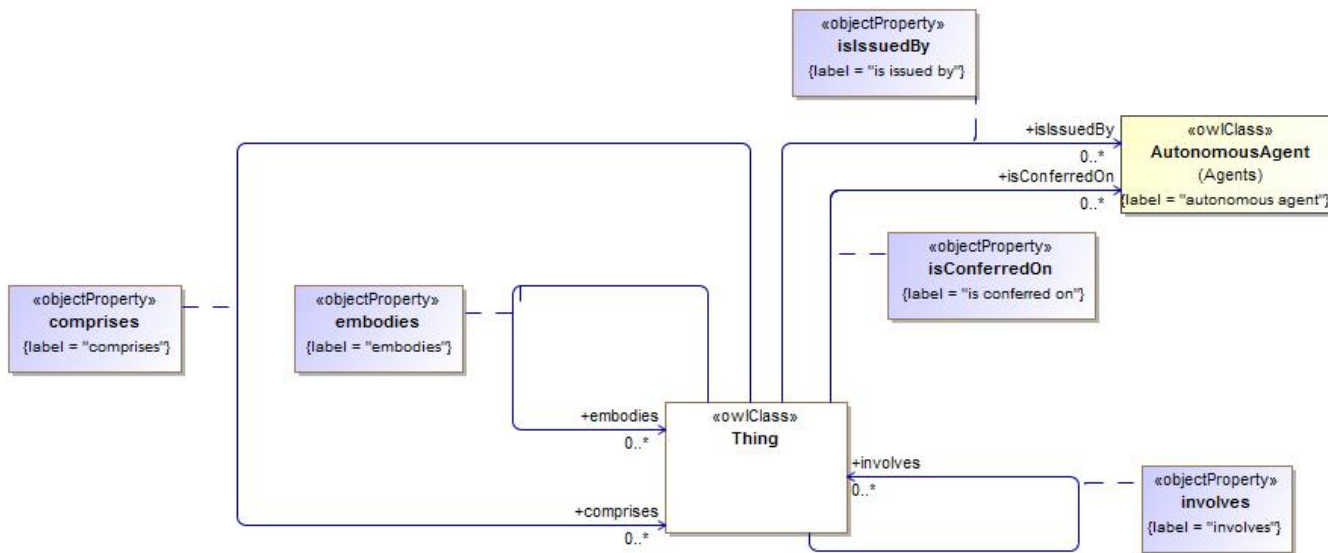


Figure 10.12 Singular Relations

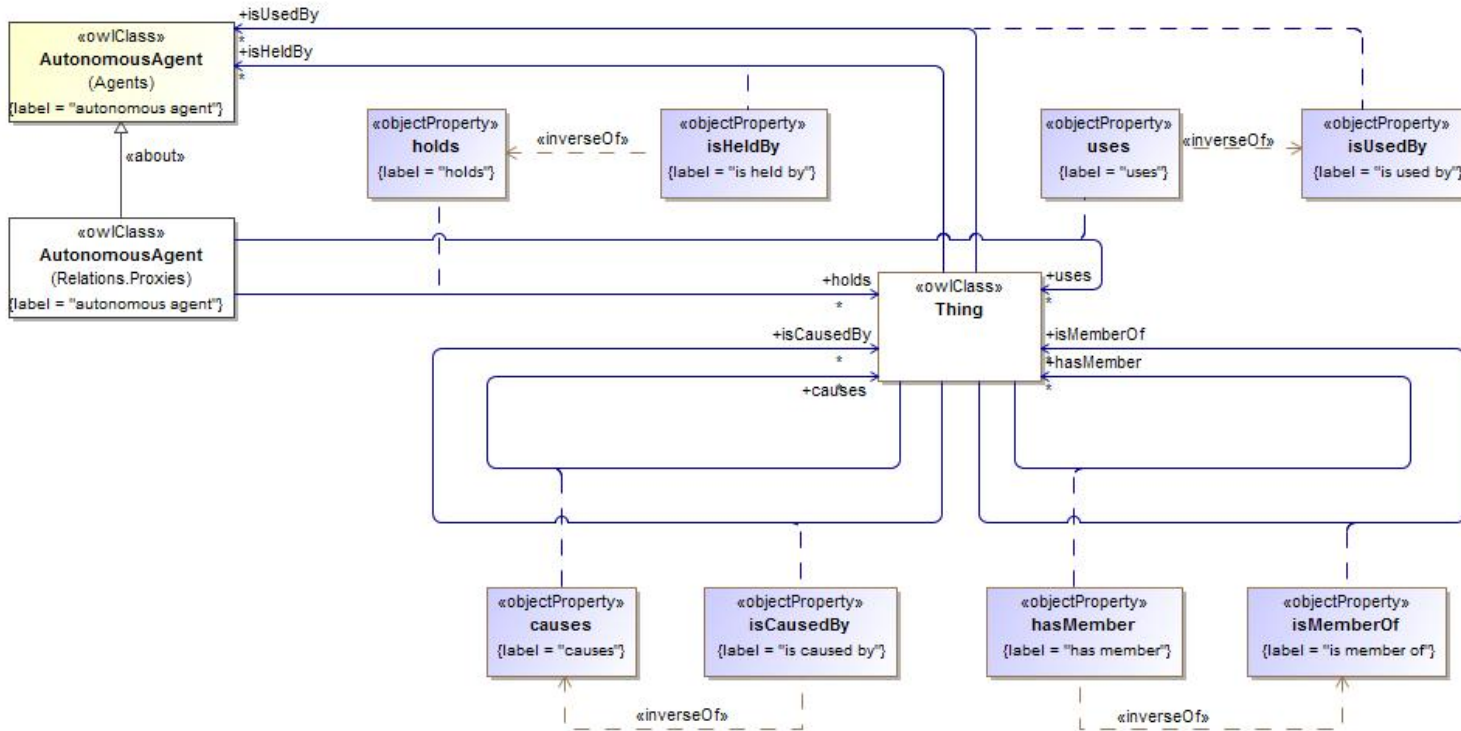


Figure 10.13 Simple Physical Relations

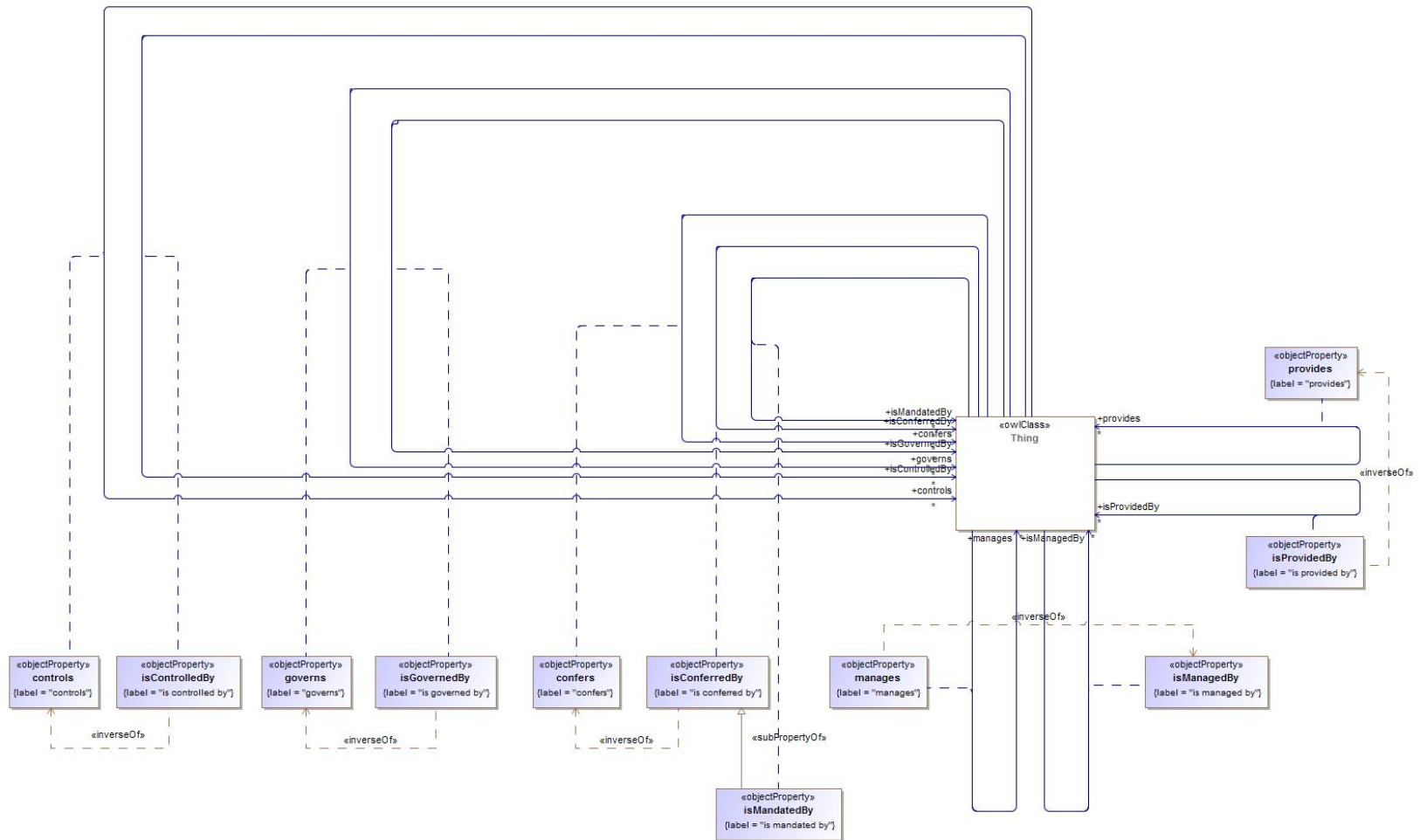


Figure 10.14 Construct Relations

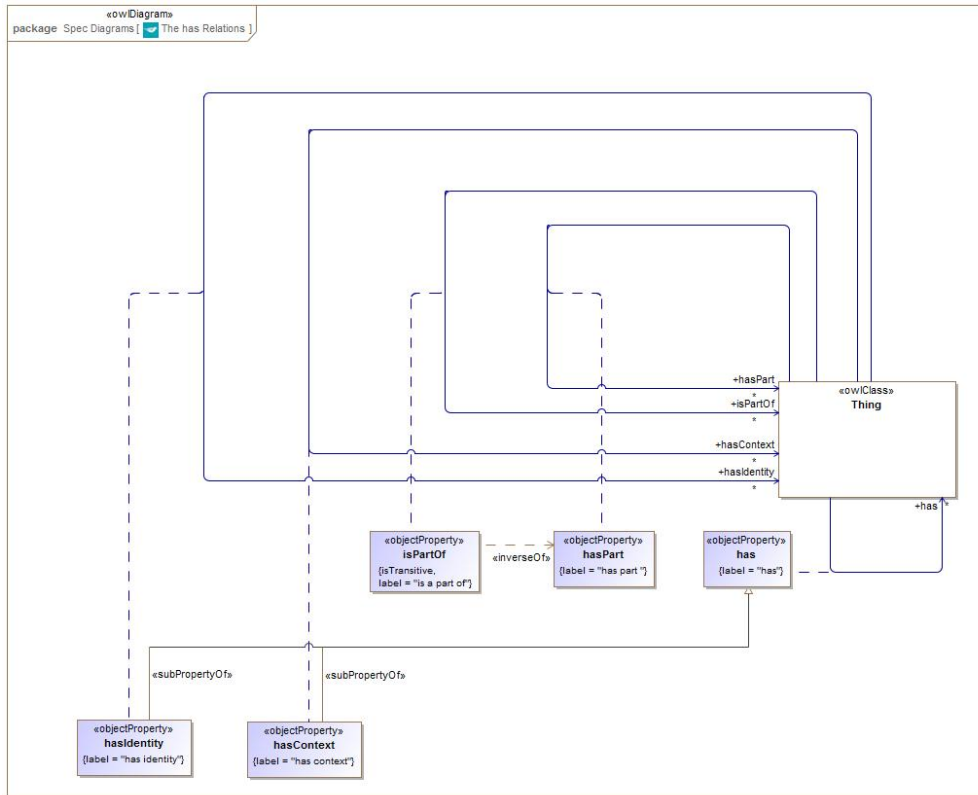


Figure 10.15 The 'has' Relations

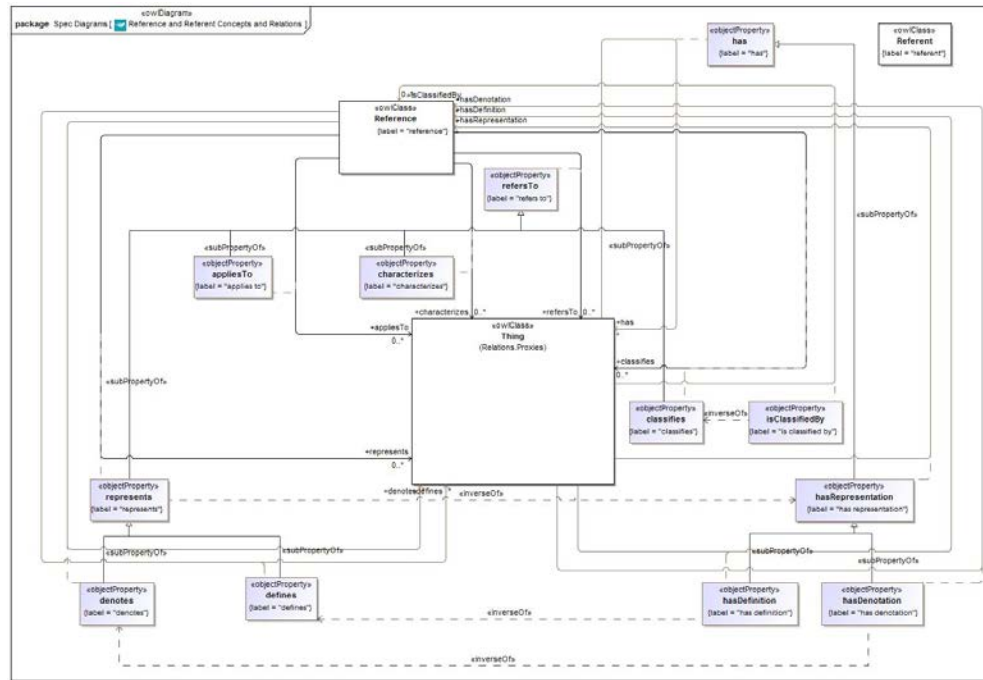


Figure 10.16 Reference and Referent Concepts and Relations

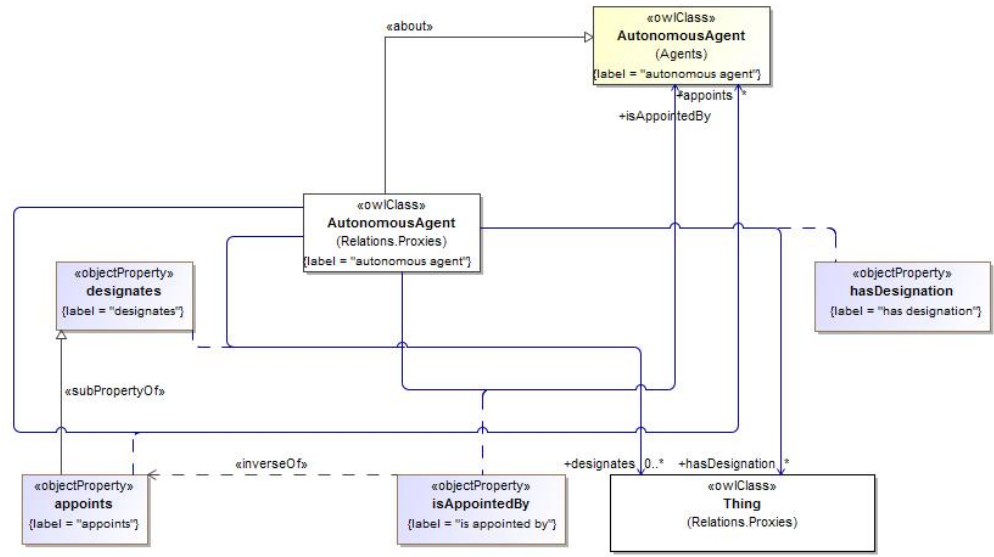


Figure 20.17 Designation and Appointment

Table 10-11. Relations Ontology Metadata

Metadata Term	Value
sm:filename	Relations Ontology
sm:fileAbbreviation	fibonacci-fnd-rel-rel
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Relations/Relations/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/

Metadata Term	Value
	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/

Table 10-12. Relations Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
AutonomousAgent	autonomous agent								Class			
Reference	reference		a concept that refers to (or stands in for) another concept						Class			http://grammar.about.com/od/rs/g/referenceterm.htm
Referent	referent		the concept that another concept stands for or refers to						Class			http://grammar.about.com/od/rs/g/referentterm.htm
appliesTo	reference	applies to	a relation indicating something that is pertinent or relevant to the concept		refers to				Relationship Property			
causes		causes	the relationship between an event (the cause) and a second event (the effect), where the second event is understood as a consequence of the first; also, the relationship between a set of factors (causes) and a phenomenon (the effect)					is caused by	Relationship Property			
characterizes	reference	characterizes	describes the character or quality of		refers to				Relationship Property			
classifies	reference	classifies	arranges in classes; assigns to a category		refers to			is classified by	Relationship Property			Merriam-Webster Dictionary

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
comprises		comprises	includes, especially within a particular scope, is made up of						Relationship Property			
confers		confers	grants or bestows by virtue of some authority					is conferred by	Relationship Property		This property should be read as describing the conferral of some legal power or duty, some commitment or some social construct, and is a property of some social construct such as an agreement or some legal authority. These concepts, which would describe the kind of thing of which this is a property, and the kinds of thing in terms of which this property is framed, are outside the scope of this mode land so are not shown.	Merriam-Webster Online Dictionary
defines	reference	defines	determines or identifies the essential qualities or meaning of, discovers and sets forth the meaning of, fixes or marks the limits of, demarcates		represents			has definition	Relationship Property			
denotes	reference	denotes	represents, calls		repre-			has deno-	Relation-			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			by a distinctive title, term, or expression		sents			tation	ship Property			
designates	autonomous agent	designates	to name something officially or appoint someone to a position officially						Relationship Property			http://www.dictionariescentral.com/definition/designate.html
embodies		embodies	is an expression of, or gives a tangible or visible form to (an idea, quality, or feeling), makes concrete and perceptible						Relationship Property		This property should be interpreted as being the property of a union of concrete things and information constructs, and as referring to some abstract thing or to some mediating thing or both, in the informative ontology of conceptual abstractions.	http://www.merriam-webster.com/dictionary/govern
governs		governs	prevails or has decisive influence over; exercises authority					is governed by	Relationship Property		This property should be read as being the property of a logical union of social construct (in the informative abstractions ontology) and legal person, and as referring to 'thing'.	http://www.merriam-webster.com/dictionary/govern
has		has	indicates that someone (or something) possesses something, as a characteristic,						Relationship Property	As used in FIBO, this definition of has specifically excludes possession in the sense		Encarta Webster's Dictionary of the English Language (2004)

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			attribute, feature, capability, and so forth							of ownership.		
hasAcquisitionDate		has acquisition date	links an asset or owner/controller/cont rollee to the date of acquisition				xsd:date Time		Simple Property			
hasAlias		has alias	Any other name by which an individual or organization is known		has name		text		Simple Property	Added at SME Review, to meet AML requirements		
hasCommonName		has common name	a name by which something is frequently referred, without reference to any formal usage or structure		has name		text		Simple Property			
hasContext		has context	provides a context in which something is defined, expressed, or represented		has				Relationship Property		This property should be read as referring to some context (known as 'mediating thing') in the informative upper ontology which is not included in this model. It should also be read as being the property of some contextually defined thing (known in the informative upper ontology as 'relative thing').	
hasDefinition		has definition	specifies a form of words that conveys the meaning associated with something		has representation		reference	defines	Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
hasDenotation		has denotation	relates a concept (or something else, but typically a concept) to a representation or denotation for that concept		has representation		reference	denotes	Relationship Property			
hasDesignation	autonomous agent	has designation	relates an individual or organization to a position, role, or other designation						Relationship Property			
hasDispositionDate		has disposition date	links something, such as an asset or its owner/controller/controller to the date something was sold, transferred, destroyed, etc.				xsd:date Time		Simple Property			
hasFormalFormal-Name		has formal name	a name by which something is known for some official purpose or context, or which is structured in some way such as to always follow the same format regardless of usage		has name		text		Simple Property			
hasIdentity		has identity	provides a means for identifying something that fills a particular role		has				Relationship Property		This property should be read as being a property of some kind of 'relative thing' as defined externality to this ontology. The property is usually but not exclusively framed with reference to some 'inde-	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											pendent thing' but may take other forms and so should be regarded as having a target of 'thing'.	
hasLegal-Name		has legal name	the name used to refer to a person or organization in legal communications		has formal name		text		Simple Property			
hasMember		has member	relates something, typically a group or organization, to some discrete thing identified as a part (member) of it					is member of	Relationship Property		This property should be read as being the property of a logical union of group and organization (not shown).	
hasRepresentation		has representation	relates a concept to some textual or other symbol which is intended to convey the sense of that concept or to some form of words which sets out the meaning of that concept		has		reference	represents	Relationship Property			
hasUnique Identifier		has unique identifier	has some textual or numeric information which when taken in combination with some associated scheme is unique to the thing and may be used to distinguish it from other things of the same or different type				text		Simple Property		With reference to a given (possibly implicit) set of objects, a unique identifier (UID) is any identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose. The uniqueness	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											requires and is guaranteed by the existence of a scheme associated with the identifier.	
holds	autonomous agent	holds	is the relationship between an individual or organization and something it possesses, or over which it exercises some ownership or control or has at its discretion the ability to dispose of it as it sees fit					is held by	Relationship Property			
involves		involves	(of a situation or event) includes (something) as a necessary part or result						Relationship Property			
isAppointedBy	autonomous agent	is appointed by	indicates the individual or group that has assigned or appointed someone to an office or position				autonomous agent	appoints	Relationship Property			
isCausedBy		is caused by	is the relationship between an event (the effect) and a second event (the cause), where the first event is understood as a consequence of the second; also, the relationship between a set of factors (causes) and a phenomenon (the effect)					causes	Relationship Property			
isClassifiedBy		is classified by	indicates the classification				reference	classifies	Relationship			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			scheme used to classify something						Property			
isConferredBy		is conferred by	a relationship between a right or obligation and the vehicle, such as an agreement or contract, that vests (or confers) said right or obligation					confers	Relationship Property		This property should be read as describing some legal power or duty, some commitment or some social construct being conferred as a result of some social construct such as an agreement or some legal authority. These concepts, which would describe the kind of thing of which this is a property, and the kinds of thing in terms of which this property is framed, are outside the scope of this model and so are not shown.	
isConferredOn		is conferred on	that on which the conferred thing is conferred				autonomous agent		Relationship Property			
isControlledBy		is controlled by	is influenced, managed, or directed by					controls	Relationship Property			
isGovernedBy		is governed by	a relationship between a contract, agreement, jurisdiction, or other legal construct and the regulation, policy,					governs	Relationship Property		This property should be read as being the property of some thing and as referring to a logical union of	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			procedure, or legal person that regulates or oversees (governs) it								social construct (in the informative abstractions ontology) and legal person.	
isHeldBy		is held by	something that is possessed by and at least partially under the control of something which can be used or acted on by the holder, regardless of ownership				autonomous agent	holds	Relationship Property			
isIssuedBy		is issued by	identifies an office or organization responsible for circulating, distributing, or publishing something				autonomous agent		Relationship Property			http://www.thefreedictionary.com/issue
isManagedBy		is managed by	relates something to another thing that has some role in directing its affairs					manages	Relationship Property		The target or range of this property should be read as always being some kind of 'relative thing', that is a thing defined in some context. Generally this will be a 'party in role'. This property is not intended to be used to relate a thing to some independent thing which it is managed by, only to something in the role of being that which manages it.	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
isMandatedBy		is mandated by	relates a responsibility, capacity, or action to that which requires it		is conferred by				Relationship Property		This property should be read as being a property of some social construct as defined in the informative ontology for conceptual abstractions, to some other social construct such as a legal instrument or an agreement.	
isMemberOf		is member of	belonging, either individually or collectively, to a group					has member	Relationship Property		This property should be read as being framed in terms of a logical union of group and organization (not shown).	
isProvidedBy		is provided by	is made available by					provides	Relationship Property		The target or range of this property should be read as always being some kind of 'relative thing', that is a thing defined in some context. Generally this will be a 'party in role'. This property is not intended to be used to relate a thing to some independent thing which it is provided by, only to some-	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											thing in the role of being that which provides it.	
isUsedBy		is used by	relates something to a thing that has the ability to employ or deploy it as appropriate				autonomous agent	uses	Relationship Property			
manages		manages	relates an autonomous agent to something that it directs in some way					is managed by	Relationship Property		This property should be read as always being a property of some kind of 'relative thing', that is a thing defined in some context. Generally this will be a 'party in role'. This property is not intended to be used to relate some independent thing to that which it manages, instead it must only be a property of something in the role of being that which manages some thing.	
provides		provides	makes something available to					is provided by	Relationship Property		This property should be read as always being a property of some kind of 'relative thing', that is a thing defined in some context. Generally this	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											will be a 'party in role'. This property is not intended to be used to relate some independent thing to that which it provides, instead it must only be a property of something in the role of being that which provides some thing.	
refersTo	reference	refers to	the relationship between a reference and the concept it stands for or refers to, i.e., the referent for that reference						Relationship Property			
represents	reference	represents	relates some textual or other symbol or some set of words to some concept that has the sense or meaning the representation is intended to convey		refers to			has representation	Relationship Property			
uses	autonomous agent	uses	relates an autonomous agent to something that it has the ability to employ in some way					is used by	Relationship Property			
wasFormerlyKnownAs		was formerly known as	a name by which something was known in the past		has name		text		Simple Property			
appoints	autonomous	appoints	assigns a job or role to someone,		designates		autonomous	is appointed	Relationship			Free Online Dictionary

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
	agent		selects or designates to fill an office or a position, fixes or sets by authority or by mutual agreement				agent	by	Property			
hasPart		has part	indicates any portion of a thing, regardless of whether the portion itself is attached to the remainder or detached; cognitively salient or arbitrarily demarcated; self-connected or disconnected; homogeneous or gerrymandered; material or immaterial; extended or unextended; spatial or temporal					is a part of	Relationship Property		This property relates a thing to anything which is a proper part of that thing. This is not parthood in the sense of a the role of part which may be played by interchangeable things such as wheels; instead this property relates an independent thing to something which makes up a part of it.	Stanford Encyclopedia of Philosophy at http://plato.stanford.edu/entries/mereology/
isPartOf		is a part of	relates something to a thing that it is some component or portion of, regardless of how that whole-part relationship is manifested, i.e., attached to the remainder or detached; cognitively salient or arbitrarily demarcated; self-connected or disconnected; homogeneous or gerrymandered; material or immaterial					has part	Relationship Property		This property represents what is also known in the literature of 'proper parthood', that is the recursive (transitive) relationship whereby things have parts which have parts and so on. This is distinct from a separate meaning of 'has part' which would	Stanford Encyclopedia of Philosophy at http://plato.stanford.edu/entries/mereology/

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			terial; extended or unextended; spatial or temporal; the most generic part relation, reflexive, asymmetric, and transitive								refer to an item playing the named role of a part such as a nearside front wheel. for the avoidance of doubt, this is not that relationship, and this property applies between independent things and other independent things which may make up their parts.	
controls		controls	exercises authoritative or dominating influence over; directs					is controlled by	Relationship Property			The American Heritage(R) Dictionary of the English Language, Fourth Edition

10.3 Module: Goals and Objectives

Table 10-13. Goals and Objectives Module Metadata

Metadata Term	Value
sm:moduleName	Goals and Objectives
sm:moduleAbbreviation	FIBO-FND-GAO
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies for goals and objectives which may be pursued by people or

Metadata Term	Value
	organizations. Goals form the basis for the definition of an organization, and objectives and related concepts are required for describing business plans.

10.3.1 Ontology: Goals

This ontology defines the concept of a goal, for use in other FIBO ontology elements. Goal is defined in general terms and forms one of the basic properties of organizations.

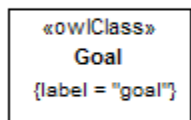


Figure 10.18 Goals Concepts

Table 10-14. Goals Ontology Metadata

Metadata Term	Value
sm:filename	Goals Ontology
sm:fileAbbreviation	fibonacci-fnd-gao-gl

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/GoalsAndObjectives/Goals/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-15. Goals Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
Goal	goal		a goal is a desired result that a person, organization or system envisions or plans, or to which it commits, in order to achieve a desired state						Class		Many people endeavor to reach goals within a finite time by setting deadlines.	http://en.wikipedia.org/wiki/Goal

10.3.2 Ontology: Objectives

This ontology defines the concept of an objective, for use in other FIBO ontology elements. Objectives are defined as being distinct from goals, in that they constitute time limited and measurable targets which some entity may seek to attain in pursuit of its goals.

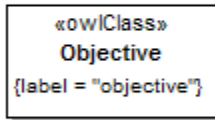


Figure 10.19 Objectives Concepts

Table 10-16. Objectives Ontology Metadata

Metadata Term	Value
sm:filename	Objectives Ontology
sm:fileAbbreviation	fibonacci-fnd-gao-obj
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Objectives/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/GoalsAndObjectives/Objectives/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-17. Objectives Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Objective	objective		a statement of a quantitative, measurable result that a person, organization, or system seeks to attain in order to achieve its goals						Class		This provides an attainable, time-limited, and measurable result that defines strategy and that a person, organization, or system seeks to meet in order to achieve its goals.	Forrester Research

10.4 Module: Parties

Table 10-18. Parties Module Metadata

Metadata Term	Value
sm:moduleName	Parties
sm:moduleAbbreviation	FIBO-FND-PTY
sm:moduleVersion	1.0
sm:moduleAbstract	<p>This module includes ontologies defining concepts that are highly contextual in nature, such as the meaning of a party in a role, an agent playing a role, and so on. Also covers independent roles themselves.</p> <p>The definitions for agents and parties in roles</p>

Metadata Term	Value
	provide general, reusable patterns for talking about agents performing roles in specific contexts. For example the same person in the context of aviation could be a pilot, and in the context of family could be a mother. These pattern will be refined in other FIBO ontologies to define concepts such as issuer, counterparty, underwriter, etc.

10.4.1 Ontology: Parties

This ontology defines the high-level concepts of parties in roles, for use in other FIBO ontology elements. The concept of a party in a role describes some entity defined specifically in terms of some role which it performs in some formal contractual or transactional relationship. The ontology includes one or more basic party in role concepts. The ontology also includes one or more logical combinations of types of autonomous entity which may perform some of the party roles defined elsewhere in this ontology, such as the role of ownership.

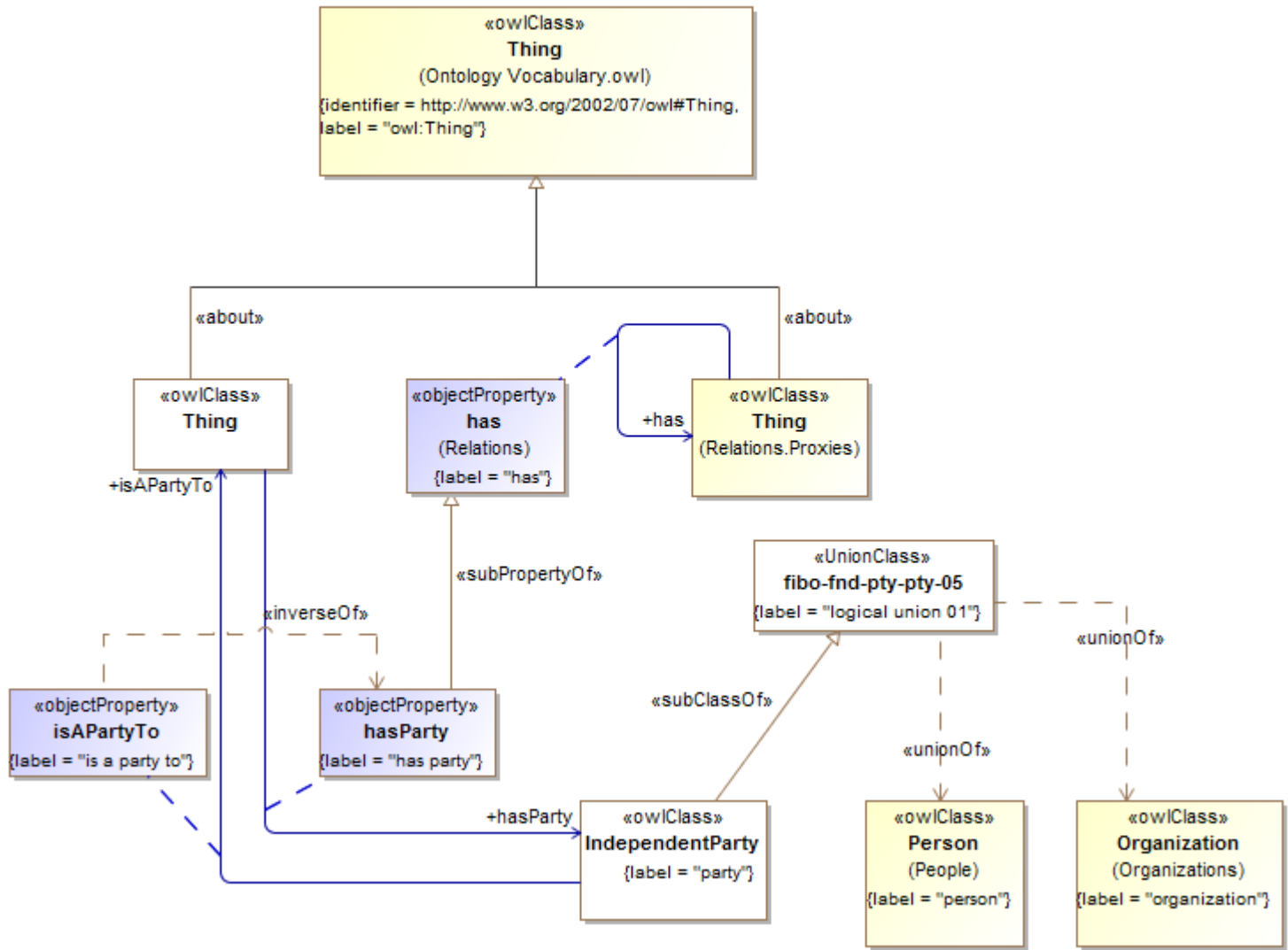


Figure 10.20 Independent Parties

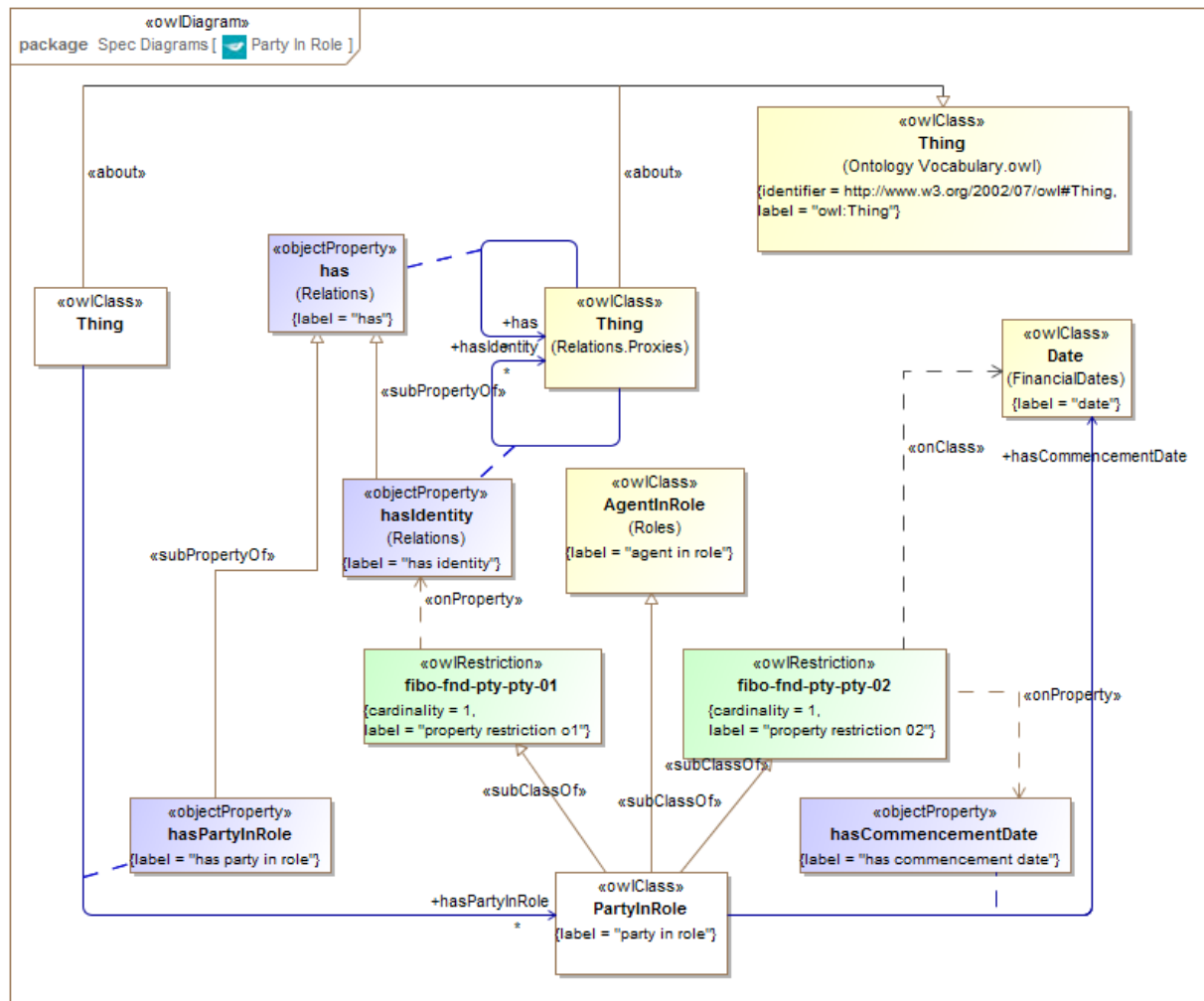


Figure 10.21 Party In Role

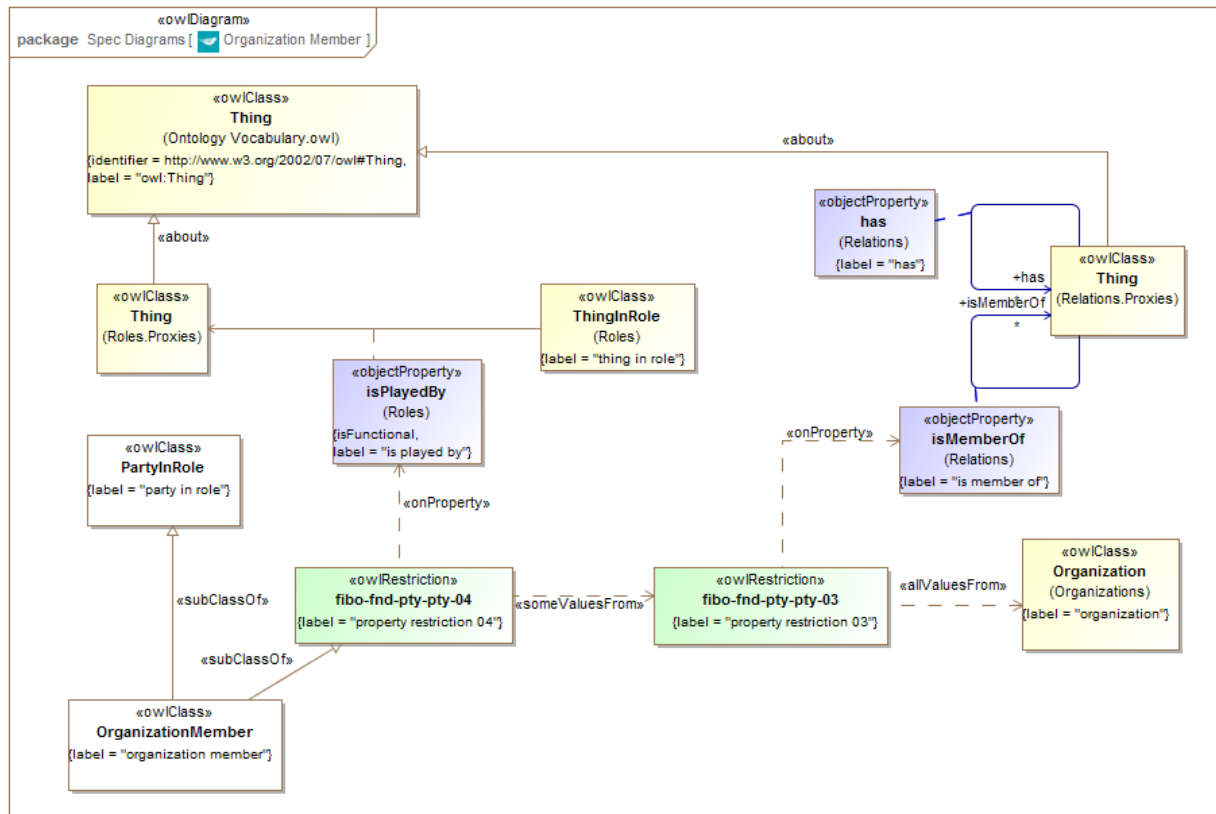


Figure 10.22 Organization Member

Table 10-19. Parties Ontology Metadata

Metadata Term	Value
<code>sm:filename</code>	Parties Ontology
<code>sm:fileAbbreviation</code>	fibo-fnd-pty-pty
<code>OntologyIRI</code>	<code>http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/</code>

Metadata Term	Value
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Parties/Parties/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/

Table 10-20. Parties Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
hasPartyInRole	anything	has party in role	identifies a party acting in a specific role as related to the particular agreement, contract, policy, regulation, or other business relationship		has		party in role		Relationship Property			
hasParty	anything	has party	identifies an independent party associated with an agreement, contract, policy, regulation, or other business arrangement		has		party	is a party to	Relationship Property			
PartyInRole	party in role		a relative concept that ties an independent party to a specific role they are standing in, and in which they play some part, i.e. are party		property restriction 02 agent in role property restriction 01				Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Adapted From
			to.									
fibofnd-pty-pty-01	property restriction 01		Set of things that must have property "has identity" exactly 1 "party"						Property Restriction			
fibofnd-pty-pty-02	property restriction 02		Set of things that must have property "has commencement date" exactly 1 "date"						Property Restriction			
OrganizationMember	organization member		identifies that which has a membership role in some organization		party in role property restriction 04				Class			
fibofnd-pty-pty-04	property restriction 04		Set of things with property "is played by" some "property restriction 03"						Property Restriction			
fibofnd-pty-pty-03	property restriction 03		Set of things with property "is member of" only "organization"						Property Restriction			
IndependentParty	party		anything which is capable of performing any business party role, such as an individual, a corporation, a partnership, an association, a joint-stock company, a business trust, or an unincorporated organization						Class			www.ecfr.gov
isAPartyTo	party	is a party to	identifies an agreement, contract, policy, regulation, or other business transaction that an independent party is associated with				anything	has party	Relationship Property			
hasCommencementDate	party in role	has commencement date	the date a party relationship comes into force				date		Relationship Property			

10.4.2 Ontology: Roles

This ontology defines some high-level concepts of roles for use in other FIBO ontology elements. These concepts include the basic property whereby something

has some role, along with the high-level concept of an agent in a role. The agent in role concept provides the basis for party in role concepts in the PartyRoles ontology and is framed as some entity defined specifically in respect to some role which it performs in some context.

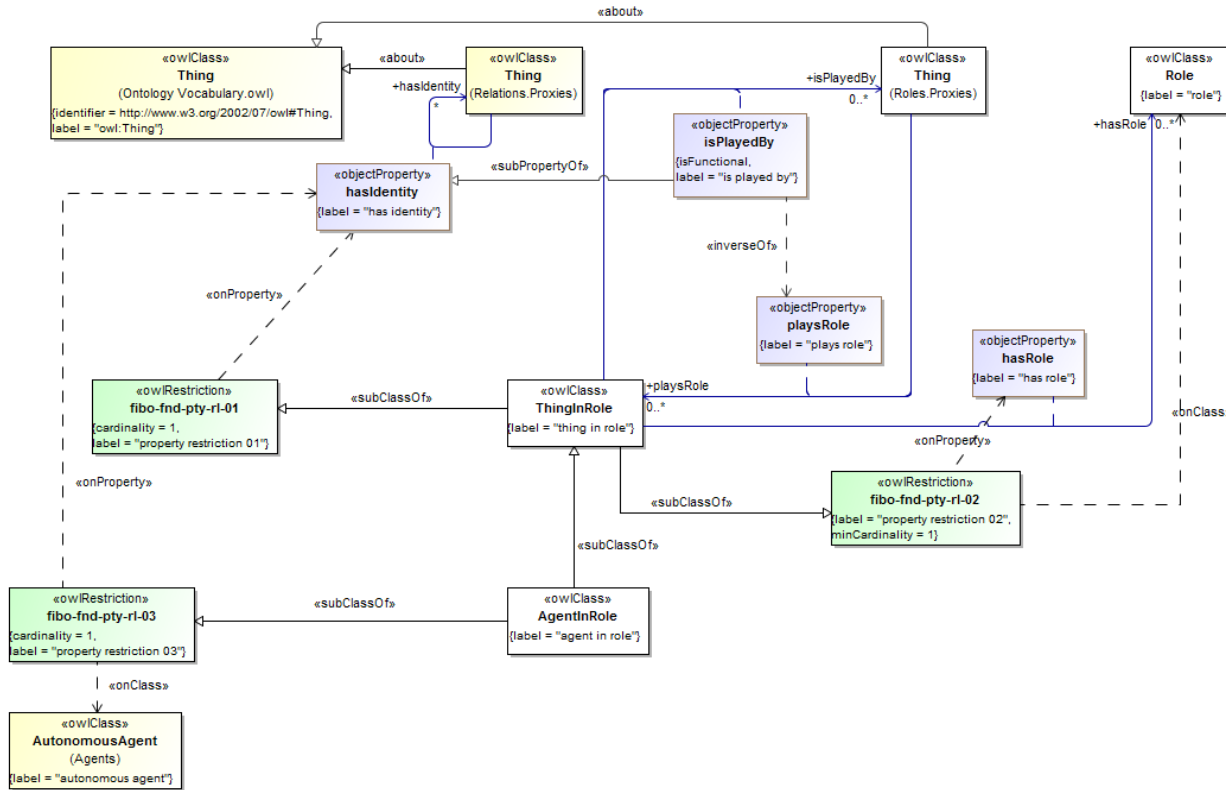


Figure 10.23 Role Definitions

Table 10-21. Roles Ontology Metadata

Metadata Term	Value
sm:filename	Roles Ontology

Metadata Term	Value
sm:fileAbbreviation	fibonacci-fnd-pty-rl
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Parties/Roles/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/

Table 10-22. Roles Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
hasRole	thing in role	has role	provides a means for relating a person, organization, group, or other entity to a role that entity plays in some relationship and context		has		role		Relationship Property			
Role	role		A role is a set of connected behaviors, rights, obligations, beliefs, and norms as conceptualized by actors in the context of some situation.						Class			
AgentIn-Role	agent in role		An agent-in-role is a relative concept that ties an autonomous agent to a role they are playing in a given situa-		property restriction 03 thing in role				Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			tional context.									
ThingIn-Role	thing in role		A thing-in-role is a relative concept that ties some thing to a role it plays in a given situational context.		property restriction 01 property restriction 02				Class			
fibofnd-pty-rl-01	property restriction 01		Set of things that must have property "has identity" exactly 1						Property Restriction			
fibofnd-pty-rl-02	property restriction 02		Set of things that must have property "has role" at least 1 taken from "role"						Property Restriction			
isPlayedBy	thing in role	is played by	indicates the actor (the independent thing) that performs a role.		has identity		Anything	plays role	Relationship Property			
playsRole	Anything	plays role	indicates the role that an actor (independent thing) performs.				thing in role	is played by	Relationship Property			
fibofnd-pty-rl-03	property restriction 03		Set of things that must have property "has identity" exactly 1 taken from "autonomous agent"									

10.5 Module: Arrangements

Table 10-23. Arrangements Module Metadata

Metadata Term	Value
sm:moduleName	Arrangements
sm:moduleAbbreviation	FIBO-FND-ARR
sm:moduleVersion	1.0
sm:moduleAbstract	This module contains ontologies that define abstract concepts, structures and schemata, such as

identifiers and identification schemes, indices and indexing schemes, codes and coding schemes, classification strategies, and quantities.

10.5.1 Ontology: Arrangements

This ontology defines abstract structural concepts, including arrangement and collection, for use in other FIBO ontology elements. These abstract concepts are further refined to support definition of identifiers, codes, quantities, and schemata that organize and classify such identifiers and codes.

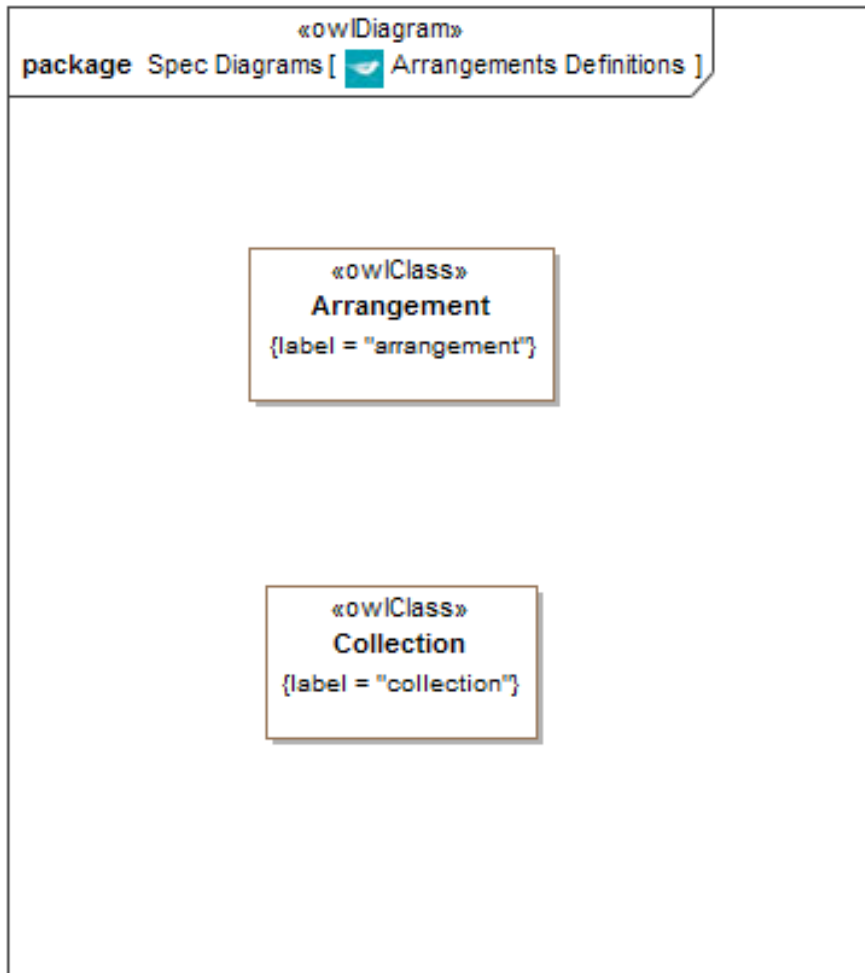


Figure 10.24 Arrangements Concepts

Table 10-24. Arrangements Ontology Metadata

Metadata Term	Value
---------------	-------

sm:filename	Arrangements.rdf
sm:fileAbbreviation	fibo-fnd-arr-arr
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Arrangements/Arrangements/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-25. Arrangements Details

Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Definition Source
Arrangement	arrangement		a structure or means of organizing information such as a schema, numbering system, organization scheme, measurement system, taxonomy, or language for organizing information					Class	
Collection	collection		a grouping of some variable number of things (may be zero) that have some shared significance					Class	

10.5.2 Ontology: Codes

This ontology defines abstract concepts for representation of codes and coding schemes for use in other FIBO ontology elements.

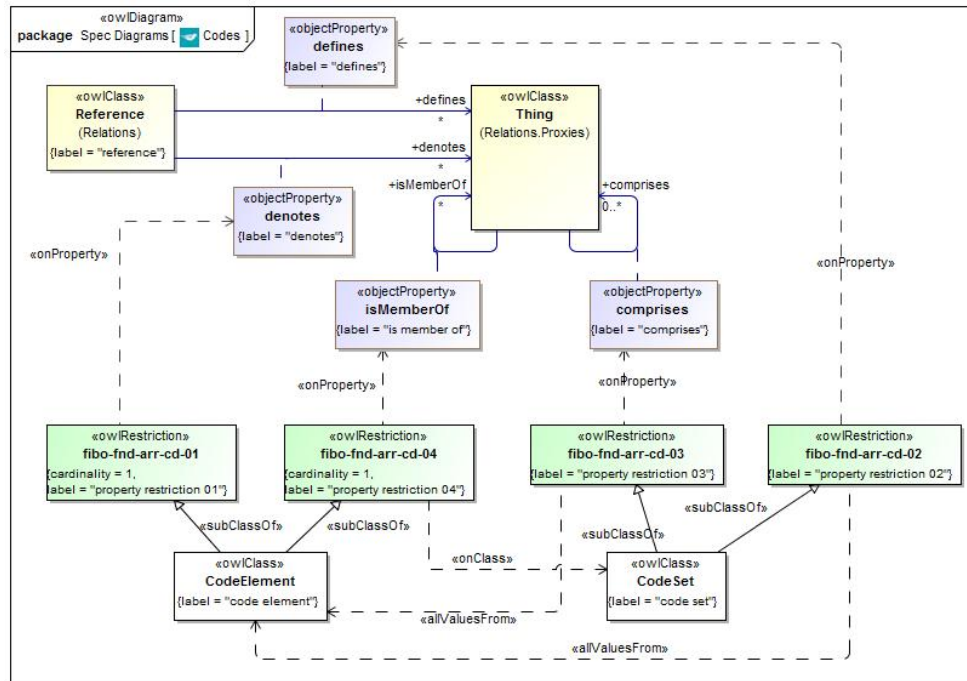


Figure 30.25 Codes

Table 10-26. Codes Ontology Metadata

Metadata Term	Value
<code>sm:filename</code>	Codes
<code>sm:fileAbbreviation</code>	fibonacci-fnd-arr-cd
<code>OntologyIRI</code>	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Codes/
<code>owl:versionIRI</code>	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Arrangements/Codes/
<code>sm:dependsOn</code>	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Metadata Term	Value
	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements/

Table 10-27. Codes Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	CodeElement	[code element]		a sequence of characters, capable of identifying that with which it is associated for some purpose, within a specified context, i.e., a code set, according to a pre-established set of rules	fibofnd-arr-cd-04								
Class	CodeSet	[code set]		A system of valid symbols that substitute for specified values, e.g., alpha, numeric, symbols and/or combinations	fibofnd-arr-cd-03								
Other	fibofnd-arr-cd-03	[property restriction 03]	comprises	restriction on the stated property with all values taken only from the related thing or type			CodeElement						
Other	fibofnd-arr-cd-04	[property restriction 04]	isMemberOf	cardinality restriction on the stated property with values taken from the related thing			CodeSet						
Other	fibofnd-arr-cd-02	[property restriction 02]	defines	restriction on the stated property with all values taken only from the			CodeElement						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				related thing or type									
Other	fibon-fnd-arr-cd-01	[property restriction 01]	denotes										

10.5.3 Ontology: IdentifiersAndIndices

This ontology defines abstract concepts for representation of identifiers, identification schemes, indices and indexing schemes for use in other FIBO ontology elements.

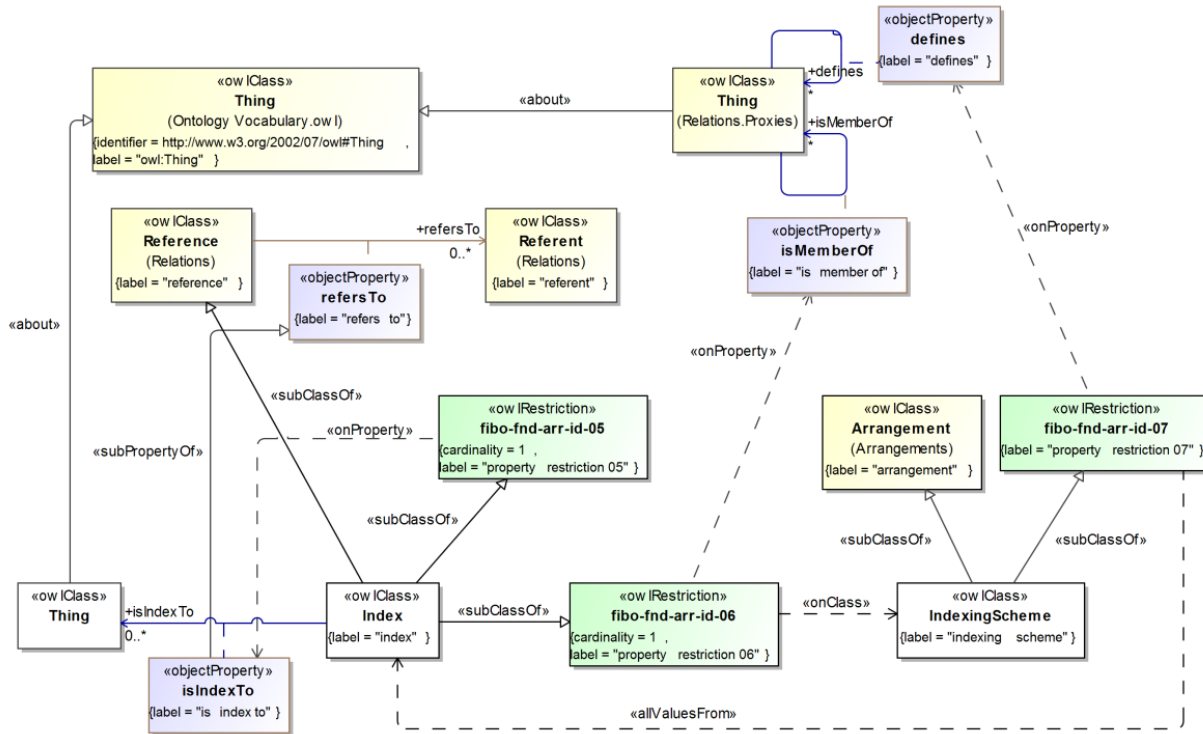


Figure 10.26 Indices and Indexing Schemes

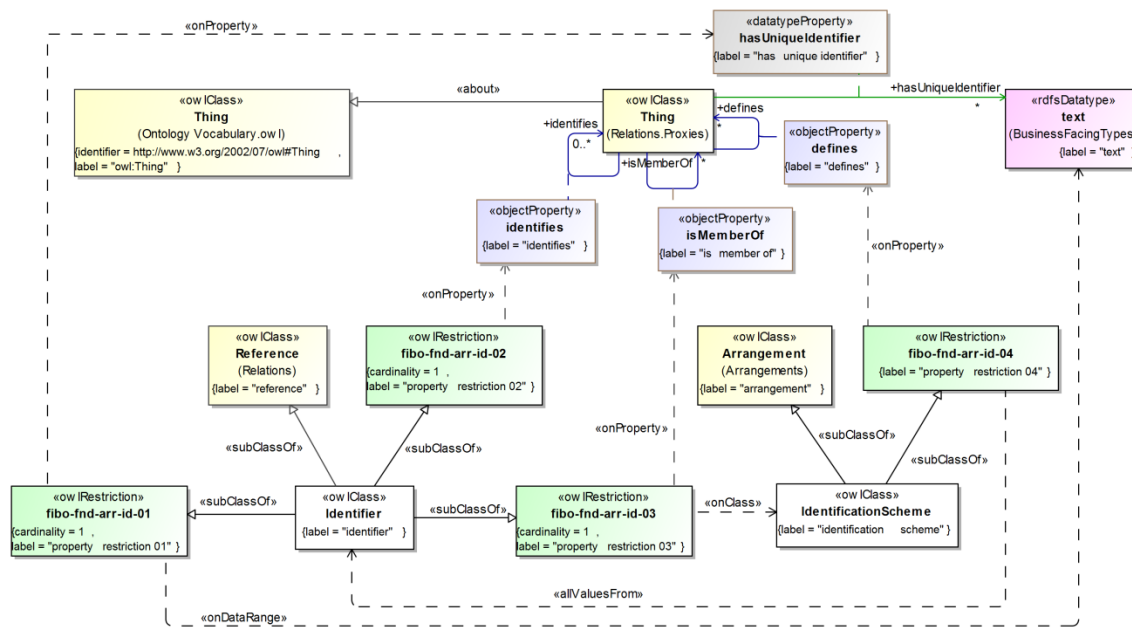


Figure 10.27 Identifiers and Identification Schemes

Table 10-28. IdentifiersAndIndices Ontology Metadata

Metadata Term	Value
sm:filename	IdentifiersAndIndices.rdf
sm:fileAbbreviation	fibo-fnd-arr-id
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Arrangements/IdentifiersAndIndices/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements/

Metadata Term	Value
	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/

Table 10-29. Identifiers And Indices Details

Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Definition Source
IdentificationScheme	identification scheme		system for allocating identifiers to objects	property restriction 04 arrangement				Class	ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15
Identifier	identifier		sequence of characters, capable of uniquely identifying that with which it is associated, within a specified context	property restriction 03 property restriction 02 property restriction 01 reference				Class	ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15
Index	index		an indirect shortcut derived from and pointing into, a greater volume of values, data, information or knowledge	property restriction 05 property restriction 06 arrangement				Class	http://en.wikipedia.org/wiki/Index
IndexingScheme	indexing scheme		system for indexing values, data, information, or knowledge	property restriction 07 reference				Class	
isIndexTo	index	is index to	that to which the index refers	refers to				Relationship Property	
fibo-fnd-arr-id-01	property restriction 01		Set of things that must have property "has unique identifier" exactly 1 taken from "text"					Property Restriction	

Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Definition Source
fibofnd-arr-id-02	property restriction 02		Set of things that must have property "identifies" exactly 1					Property Restriction	
fibofnd-arr-id-03	property restriction 03	isMemberOf	Set of things that must have property "is member of " at least 1 taken from "identification scheme"			identification scheme		Property Restriction	
fibofnd-arr-id-04	property restriction 04		Set of things that must have property "defines" may only be taken from "identifier"					Property Restriction	
fibofnd-arr-id-05	property restriction 05		Set of things that must have property "is index to" exactly 1					Property Restriction	
fibofnd-arr-id-06	property restriction 06	isMemberOf	Set of things that must have property "is member of " exactly 1 taken from "indexing scheme"			indexing scheme		Property Restriction	
fibofnd-arr-id-07	property restriction 07		Set of things that must have property "defines" may only be taken from "index"					Property Restriction	

10.5.4 Ontology: Documents

This ontology defines abstract concepts for representation documents for use in other FIBO ontology elements.

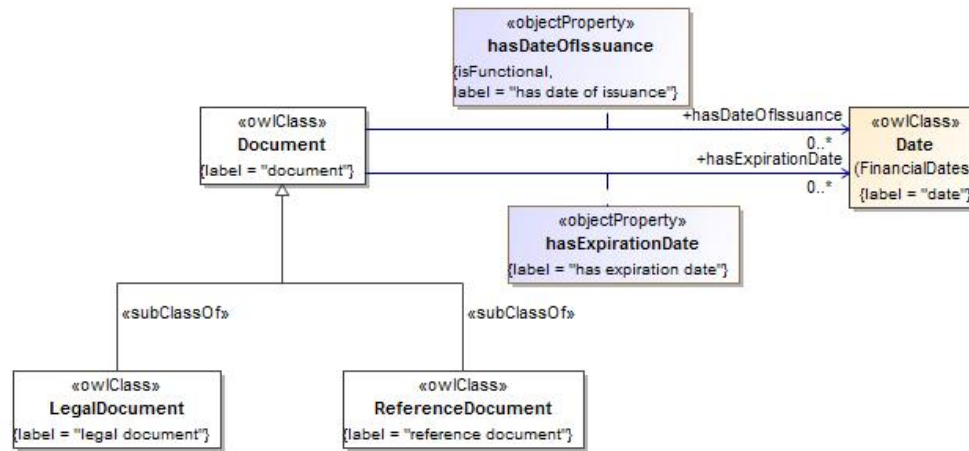


Figure 40.28 Documents Concepts

Table 10-30. Documents Ontology Metadata

Metadata Term	Value
sm:filename	Documents
sm:fileAbbreviation	fibonacci-fnd-arr-doc
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Arrangements/Documents/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/

Table 10-31. Documents Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	LegalDocument	[legal document]		a written or printed paper that bears the original, official, or legal form of something and can be used to furnish decisive evidence or information	Document								
Class	ReferenceDocument	[reference document]		a document that provides pertinent details for consultation about a subject	Document								
Class	Document	[document]		something, such as a recording or a photograph, or a writing that can be used to furnish evidence or information									
Relationship Property	hasDateOfIssuance	document	[has date of issuance]	links something, typically an agreement, contract, or document, with the date it was issued			date						
Relationship Property	hasExpirationDate	document	[has expiration date]	links something, typically an agreement, contract, document, or perishable item, with an expiration date			date						

10.6 Module: Agents and People

Table 10-32. Agents and People Module Metadata

Metadata Term	Value
---------------	-------

Metadata Term	Value
sm:moduleName	Agents and People
sm:moduleAbbreviation	FIBO-FND-AAP
sm:moduleVersion	1.0
sm:moduleAbstract	This module contains ontologies of concepts relating to types of autonomous entity, that is things in the world which are able to determine their own behavior. Includes ontologies for people and for autonomous entities in general.

10.6.1 Ontology: Agents

This ontology defines the concept of autonomous agent for use in other FIBO ontology elements. As defined here, autonomous agent corresponds to what is often referred to as "agent" in software and other systems. It is defined as any entity which is able to act on its own part, and embraces all such things, including people, animals, software agents organizations and all forms of legal persons, although not all of these concepts are elaborated in FIBO as not all are relevant to financial services.

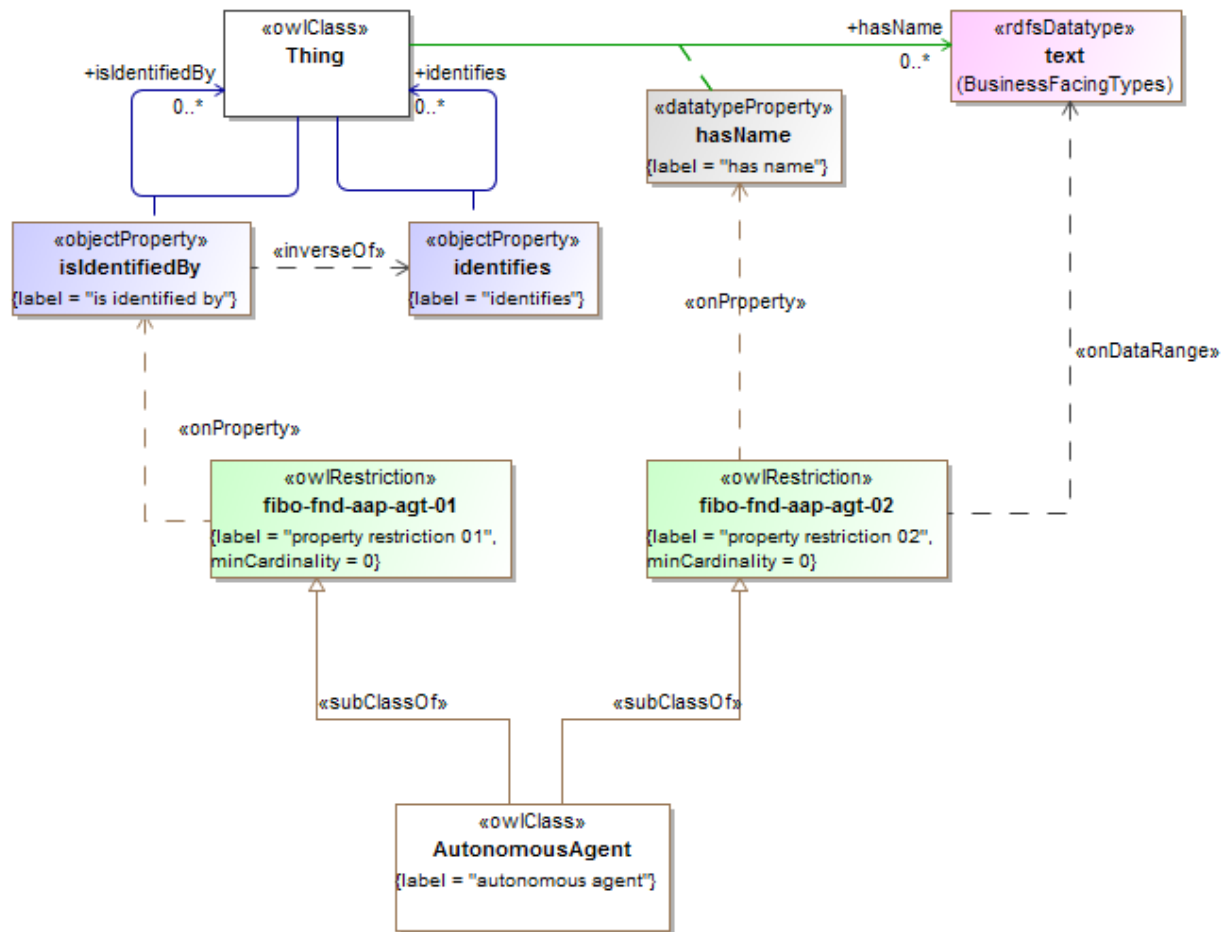


Figure 10.29 Agents Concepts

Table 10-33. Agents Ontology Metadata

Metadata Term	Value
sm:filename	Agents Ontology
sm:fileAbbreviation	fibonacci-fnd-aap-agt
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/AgentsAndPeople/Agents/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/

Table 10-34. Agents Details

Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Definition Source
AutonomousAgent	autonomous agent		An agent is an autonomous individual that can adapt to and interact with its environment.					Class	
fibonacci-fnd-aap-agt-01	property restriction 01							Other	
fibonacci-fnd-aap-agt-02	property restriction 02							Other	
hasName		has name	that by which some thing is known; may apply to anything			text		Simple Property	
identifies		identifies	is the relationship between something and that which provides a unique reference				is identified by	Relationship Property	

Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Definition Source
			for it						
isIdentifiedBy		is identified by	provides a unique identifier for something				identifies	Relationship Property	

10.6.2 Ontology: People

This ontology defines concepts for people and human related terms, for use in other FIBO ontology elements. People as defined here are human persons only. This ontology sets out a number of basic properties that are held by people or are definitive of a small number of specific types of people such as minors or adults. Primary use cases for determining the set of personal information definitions included are the common elements required to (1) open a bank account, (2) identify a sophisticated investor, and (3) establish foreign account ownership for money laundering purposes.

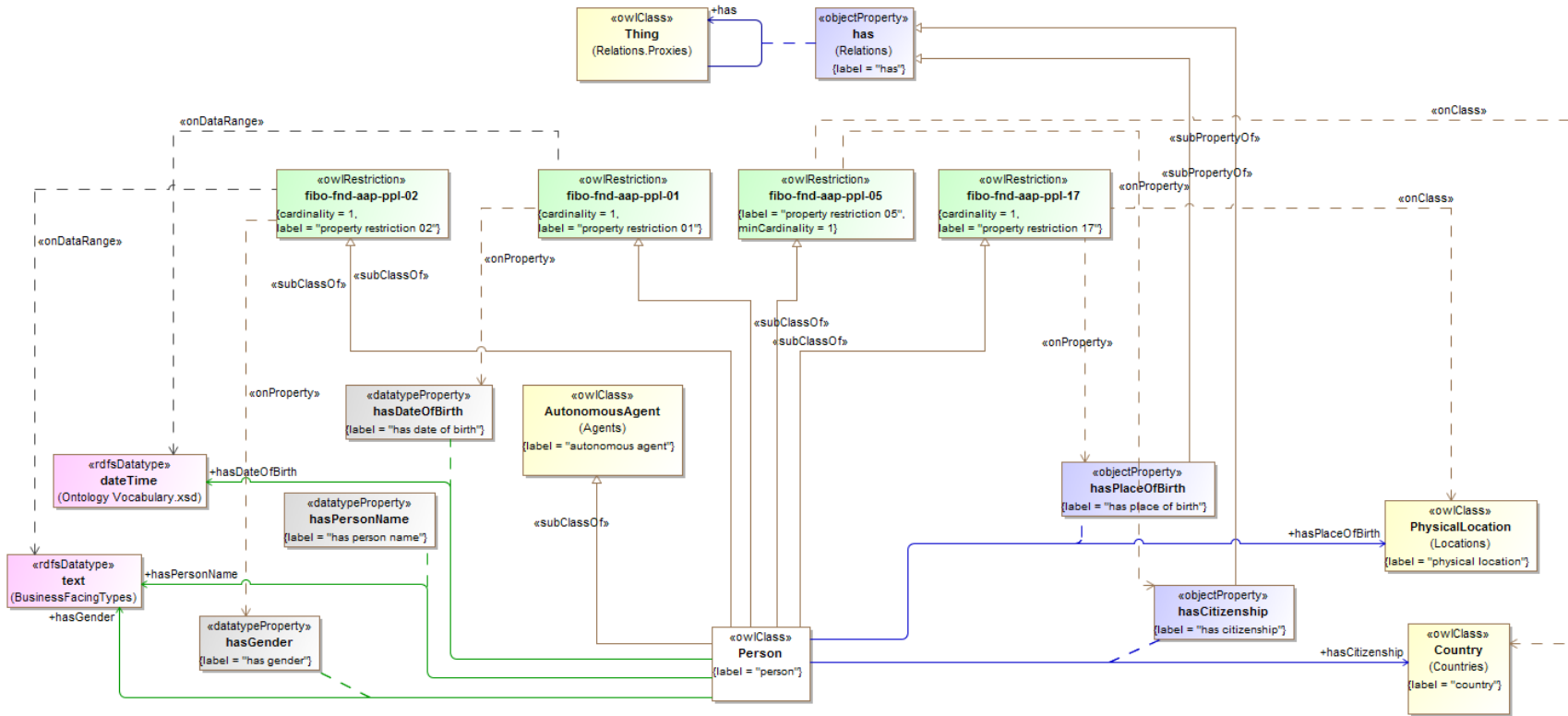


Figure 10.30 Person Fundamentals

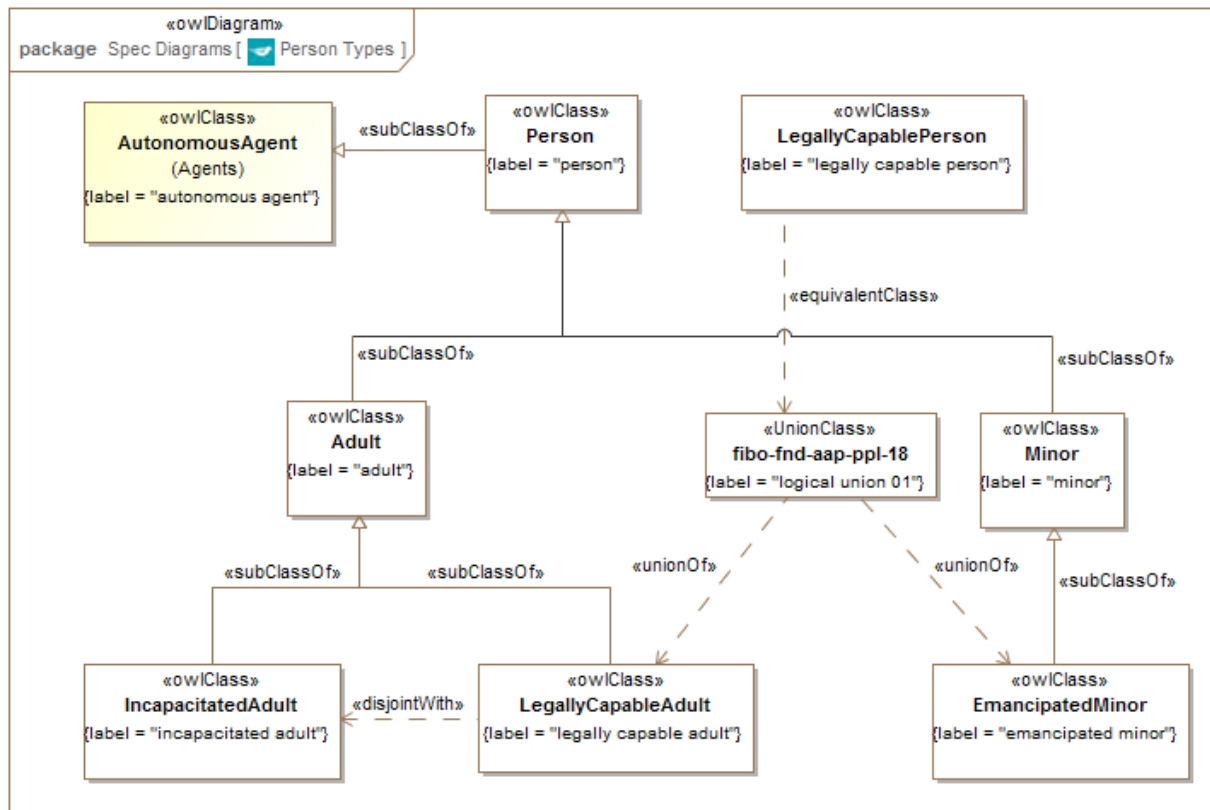


Figure 10.31 Person Types

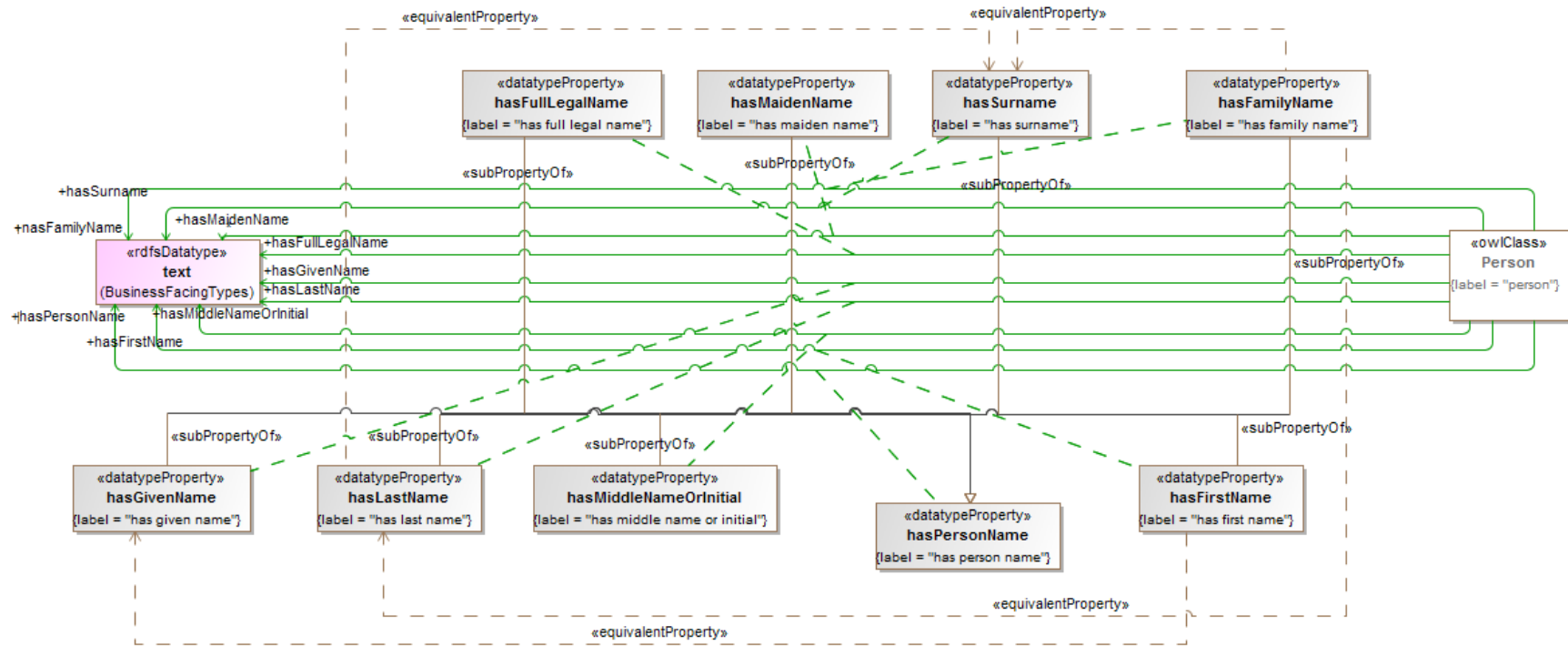


Figure 10.32 People Names

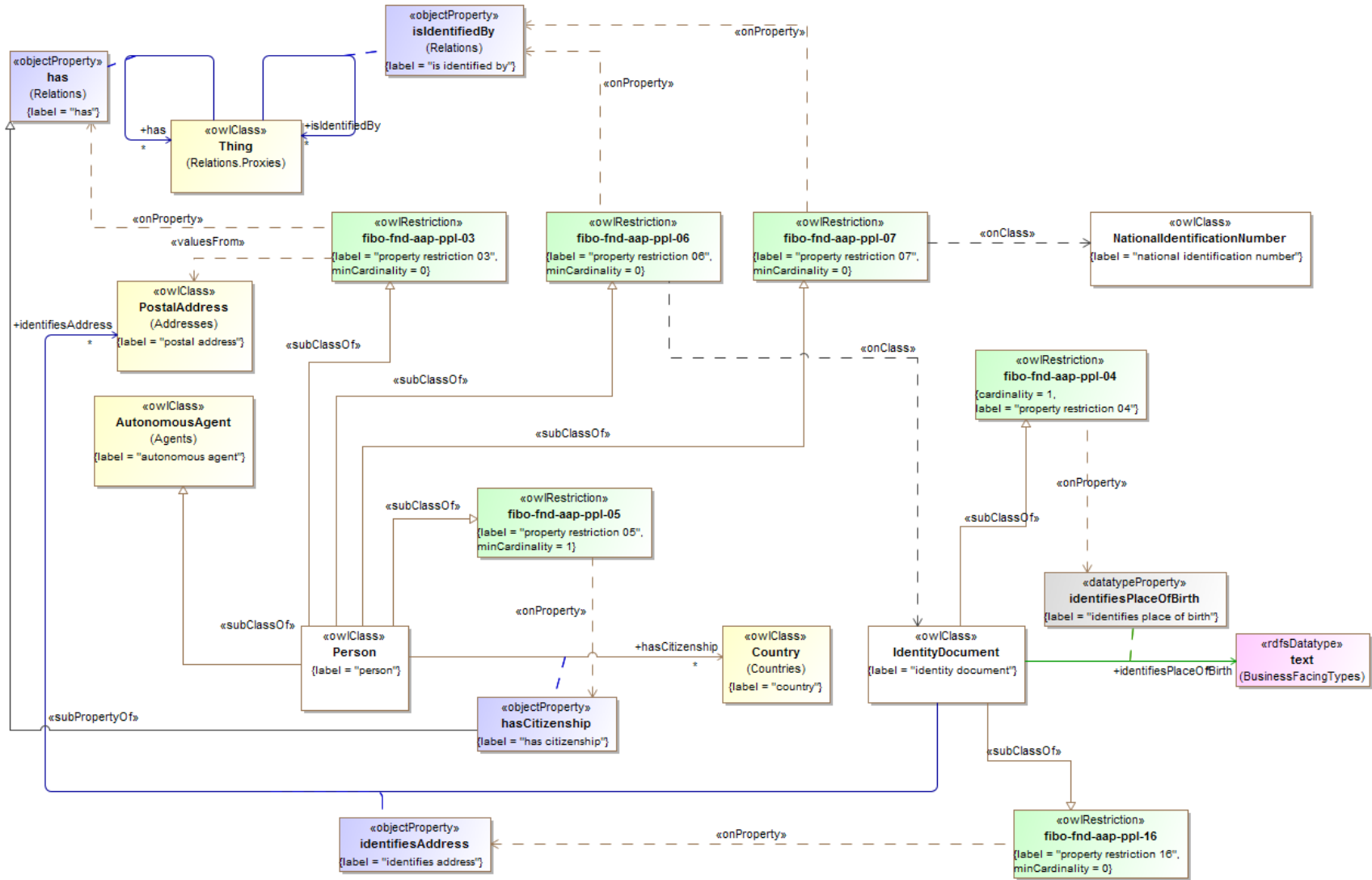


Figure 10.33 People Identification Basics

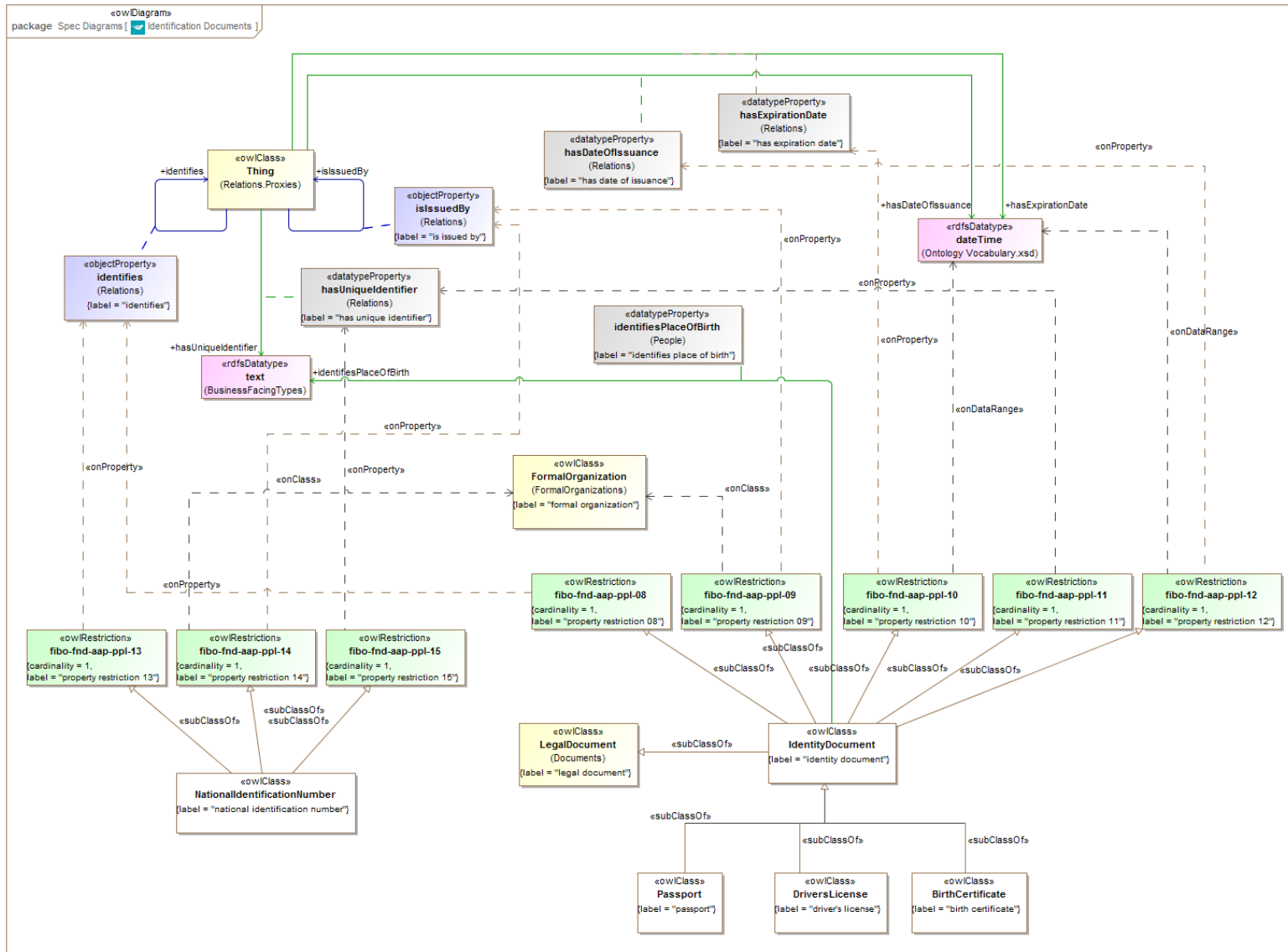


Figure 10.34 Identification Documents

Table 10-35. People Ontology Metadata

Metadata Term	Value
sm:filename	People Ontology
sm:fileAbbreviation	fibo-fnd-aap-ppl
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/AgentsAndPeople/People/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents/ http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/

Table 10-36. People Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Person	Person		A person; any member of the species homo sapiens.		property restriction 05 property restriction 06 property restriction 03 property restriction 02 property restriction 01 property restriction 07 autonomous agent property restriction 17				Class			
fib-fnd-aap-ppl-01	property restriction 01		Set of things that must have property "has date of birth" exactly 1 taken from "dateTime"						Property Restriction			
fib-fnd-aap-ppl-02	property restriction 02		Set of things that must have property "has gender" exactly 1 taken from "gender"						Property Restriction			
fib-fnd-aap-ppl-03	property restriction 03		Set of things that must have property "has" at least 0 taken from "postal address"						Property Restriction			
fib-fnd-aap-ppl-04	property restriction 04		Set of things that must have property "has place of birth" exactly 1 taken from "string"						Property Restriction			
fib-fnd-aap-ppl-05	property restriction 05		Set of things that must have property "has citizenship" at least 1 taken from "country"						Property Restriction			
fib-fnd-aap-ppl-06	property restriction 06		Set of things that must have property "is identified by" at least 0 taken from "identity document"						Property Restriction			
fib-fnd-aap-ppl-	property restriction		Set of things that must have property "is identi-						Property Restriction			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
07	07		fied by" at least 0 taken from "national identification number"									
hasSurname	Person	has surname	the patronymic or family name of a person		has person name		text		Simple Property			
hasPlaceOfBirth	Person	has place of birth	links a person with their place of birth				physical location		Relationship Property			
hasPersonName	Person	has person name	links any sort of name to an individual person		has name		text		Simple Property			
hasMiddleMiddleNameOrInitial	Person	has middle name or initial			has person name		text		Simple Property			
hasMaidenName	Person	has maiden name	the patronymic or family name which a person was born with and which predates any changes of name due to marriage		has person name		text		Simple Property			
hasLastName	Person	has last name	the patronymic or family name of a person		has person name		text		Simple Property			
hasGivenName	Person	has given name	the given name or first name of a person, that is the name chosen for them at birth or changed by them subsequently from the name given at birth		has person name		text		Simple Property			
hasGender	Person	has gender	links a particular gender value with a person				gender		Simple Property			
hasFullLegalName	Person	has full legal name	the legally complete name of a person, as used in formal dealings of a legal or contractual nature		has person name		text		Simple Property			
hasFirstName	Person	has first name	the given name or first name of a person, that is the name chosen for them at birth or changed by them subsequently from the name given at birth		has person name		text		Simple Property			
hasFamilyName	Person	has family name	the patronymic or family name of a person		has person name		text		Simple Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
hasDateOf Birth	Person	has date of birth	links a person with their date of birth				xsd:dateTime		Simple Property			
hasCitizenship	Person	has citizenship	links a person to their country of citizenship		has		country		Relationship Property			
Passport	passport		a document, issued by a national government, which certifies the identity and nationality of its holder for the purpose of international travel.		identity document				Class		The elements of identity contained in all standardized passports include information about the holder, including name, date of birth, gender and place of birth.	https://en.wikipedia.org/wiki/Passport
National-identification-Number	national identification number		a number or text which appears on an identity document issued by a country or jurisdiction.		property restriction 14 property restriction 13 property restriction 15				Class		A national identification number, national identity number, or national insurance number is used by the governments of many countries as a means of tracking their citizens, permanent residents, and temporary residents for the purposes of work, taxation, government benefits, health care, and other governmentally-related functions. The number will appear on an identity document issued by a country. The ways in which such a system is implemented are dependent on the country, but in most cases, a citizen is issued an identification number at birth or when they reach a legal age (typically	http://en.wikipedia.org/wiki/National_identification_number

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											the age of 18). Non-citizens may be issued such numbers when they enter the country, or when granted a temporary or permanent residence permit. Many countries issued such numbers ostensibly for a singular purpose, but over time, they become a de facto national identification number. For example, the United States originally developed its Social Security number system as a means of disbursing Social Security benefits. However, due to function creep, the number has become utilized for other purposes to the point where it is almost essential to have one to, among other things, open a bank account, obtain a credit card, or drive a car.	
fibofnd-aap-ppl-13	property restriction 13		Set of things that must have property "identifies" exactly 1 taken from "person"						Property Restriction			
fibofnd-aap-ppl-14	property restriction 14		Set of things that must have property "is issued by" exactly 1 taken from "formal organization"						Property Restriction			
fibofnd-aap-ppl-15	property restriction 15		Set of things that must have property "has unique identifier" exact-						Property Restriction			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			ly 1 taken from "literal"									
Minor	minor		a person under a certain age, usually the age of majority, which legally demarcates childhood from adulthood		Person				Class		The age depends upon jurisdiction and application, but is generally 18.	https://en.wikipedia.org/wiki/Minor_(law)
IncapacitatedAdult	incapacitated adult		An individual who is over the age of majority in a given jurisdiction but who is legally identified as not having legal capacity, typically as a result of some inherent physical or mental incapacity or as a result of having contracted some illness which temporarily deprives them of such capacity.		adult				Class		Individuals may have an inherent physical condition which prevents them from achieving the normal levels of performance expected from persons of comparable age, or their inability to match current levels of performance may be caused by contracting an illness. Whatever the cause, if the resulting condition is such that individuals cannot care for themselves, or may act in ways that are against their interests, those persons are vulnerable through dependency and require the protection of the state against the risks of abuse or exploitation. Hence, any agreements that were made are voidable, and a court may declare that person a ward of the state and grant power of attorney to an appointed legal guardian.	https://en.wikipedia.org/wiki/Capacity_(law)
IdentityDocu-	identity document		any document which may be used to verify		property restriction 12				Class		If issued in the form of a small, mostly	https://en.w

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
ment			aspects of a person's identity.		property restriction 10 property restriction 11 property restriction 08 property restriction 09 property restriction 04 property restriction 16 legal document						standard-sized card, it is usually called an identity card (IC). Countries which do not have formal identity documents may require informal documents. In the absence of a formal identity document, driving licences can be used in many countries as a method of proof of identity, although some countries do not accept driving licences for identification, often because in those countries they don't expire as documents and can be old and easily forged. Most countries accept passports as a form of identification. Most countries have the rule that foreign citizens need to have their passport or occasionally a national identity card from their country available at any time if they do not have residence permit in the country.	dia.org/wiki/Identification_card
identifies-PlaceOfBirth	identity document	identifies place of birth	identifies the person's place of birth as a textual element				text		Simple Property			
identifiesAddress	Identity document	Identifies address	identifies the person's address as it is recorded in the identity document				postal address		Relationship Property			
fibo-fnd-	property		Set of things that must						Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
aap-ppl-08	restriction 08		have property "identifies" exactly 1 taken from "person"						Restriction			
fibofnd-aap-ppl-09	property restriction 09		Set of things that must have property "is issued by" exactly 1 taken from "formal organization"						Property Restriction			
fibofnd-aap-ppl-10	property restriction 10		Set of things that must have property "has expiration date" exactly 1 taken from "Date"						Property Restriction			
fibofnd-aap-ppl-11	property restriction 11		Set of things that must have property "has unique identifier" exactly 1 taken from "literal"						Property Restriction			
fibofnd-aap-ppl-12	property restriction 12		Set of things that must have property "has date of issuance" exactly 1 taken from "Date"						Property Restriction			
fibofnd-aap-ppl-16	property restriction 16		Set of things that must have property "identifiesAddress" at least 0 taken from "postal address"						Property Restriction			
Emancipated-Minor	emancipated minor		a minor who is allowed to conduct a business or any other occupation on his or her own behalf or for their own account outside the influence of a parent or guardian.		minor				Class		The minor will then have full contractual capacity to conclude contracts with regard to the business. Whether parental consent is needed to achieve emancipated status varies from case to case. In some cases, court permission is necessary. Protocols vary by jurisdiction.	https://en.wikipedia.org/wiki/Emancipated_minor
DriversLicense	driver's license		A driver's license or driving licence is an official document which states that a person may operate a motorized vehicle, such as a motorcycle, car, truck or		identity document				Class			https://en.wikipedia.org/wiki/Non-driver_identification_card#N

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			a bus, on a public roadway.									on-driver_identification_cards
BirthCertificate	birth certificate		either the original document certifying the circumstances of the birth or a certified copy of or representation of the ensuing registration of that birth.		identity document				Class		A birth certificate is a vital record that documents the birth of a child. Depending on the jurisdiction, a record of birth might or might not contain verification of the event by such as a midwife or doctor.	http://en.wikipedia.org/wiki/Birth_certificate
Adult	adult		a person who has attained the age of majority as defined by given jurisdiction		Person				Class		In addition, human adulthood encompasses psychological adult development.	https://en.wikipedia.org/wiki/Adult
fibofnd-aap-ppl-17	property restriction 17		Set of things that must have property "has place of birth" exactly 1 taken from "physical location"						Property Restriction			
LegallyCapableAdult	legally capable adult		a person who has attained the age of majority as defined by given jurisdiction and is allowed to conduct a business or any other occupation on his or her own behalf or for their own account		Adult	Incapacitated adult			Class			
LegallyCapablePerson	legally capable person		a person who is allowed to conduct a business or any other occupation on his or her own behalf or for their own account	logical union 01					Class			
fibofnd-aap-ppl-18	logical union 01			Legally capable person					Union Class			

10.7 Module: Places

Table 10-37. Places Module Metadata

Metadata Term	Value
<code>sm:moduleName</code>	Places
<code>sm:moduleAbbreviation</code>	FIBO-FND-PLC
<code>sm:moduleVersion</code>	1.0
<code>sm:moduleAbstract</code>	This module includes ontologies defining concepts to do with real or virtual places and the addresses to such places. Note that most of these terms are proxies for terms which exist or which are expected to be published in the future in formal ontologies for those concepts (e.g. geophysical, geopolitical, as well as the address components in physical standards like VCard).

10.7.1 Ontology: Locations

This ontology provides a placeholder for use in mapping geographic location-oriented concepts to the appropriate standards.

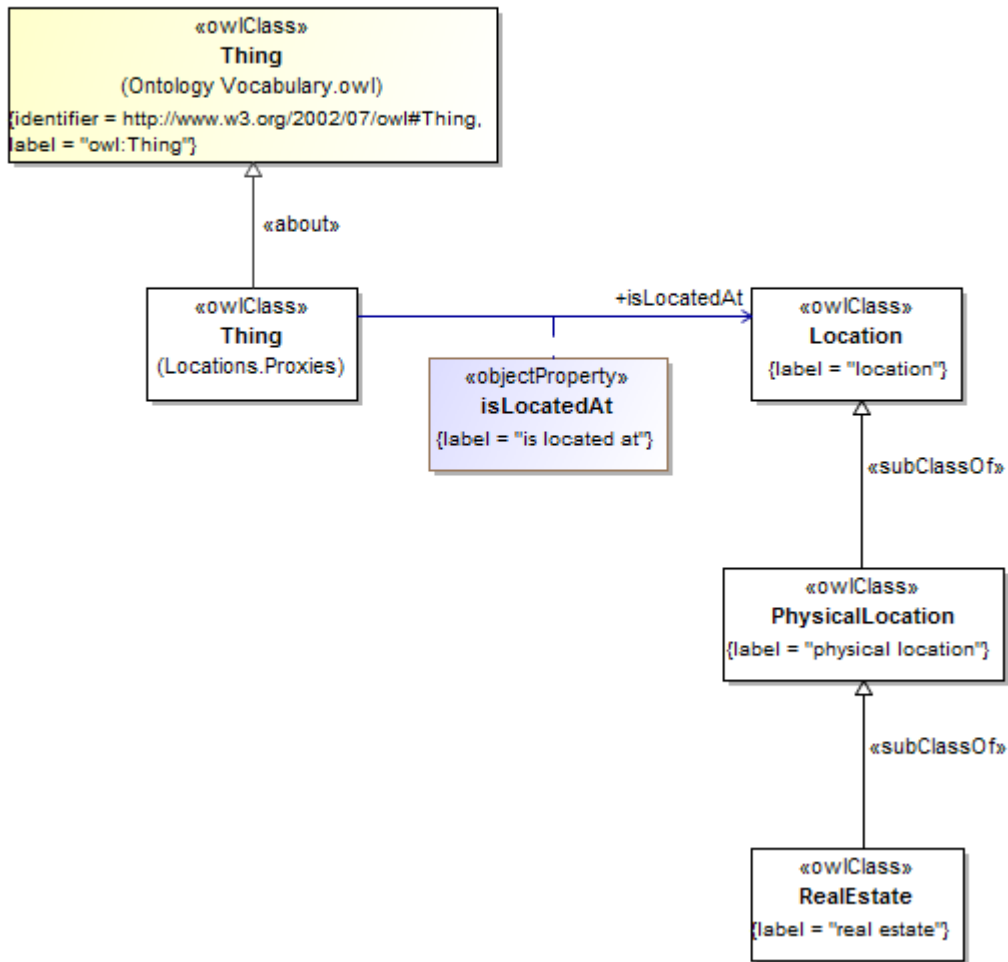


Figure 10.35 Locations Concepts

Table 10-38. Locations Ontology Metadata

Metadata Term	Value
sm:filename	Locations Ontology
sm:fileAbbreviation	fibo-fnd-plc-loc
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Places/Locations/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-39. Locations Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
RealEstate	real estate		Land plus anything permanently fixed to it, including buildings, sheds and other items attached to the structure.		physical location				Class		Although media often refers to the "real estate market" from the perspective of residential living, real estate can be grouped into three broad categories based on its use, namely residential, commercial and industrial. Examples of real estate include	http://www.investopedia.com/terms/r/realstate.asp

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											undeveloped land, houses, condominiums, townhomes, office buildings, retail store buildings and factories.	
Physical-Location	physical location		A location in physical space		location				Class			
Location	location		Anything that can be defined as the answer to a question of the form, Where is...?						Class			

10.7.2 Ontology: Countries

This ontology provides a very high level definition of country related concepts, essentially a placeholder for use in mapping countries and intra-country concepts to the appropriate regional standards or to some as yet undefined global address ontology, for use in other FIBO ontology elements. A minimal set of geopolitical and geophysical terms are included as required for financial risk management and other application use cases, and these are all to be considered as placeholders for suitable standard ontologies for these concepts as these become available. These terms may also be mapped to controlled vocabulary standards such as ISO 3166.

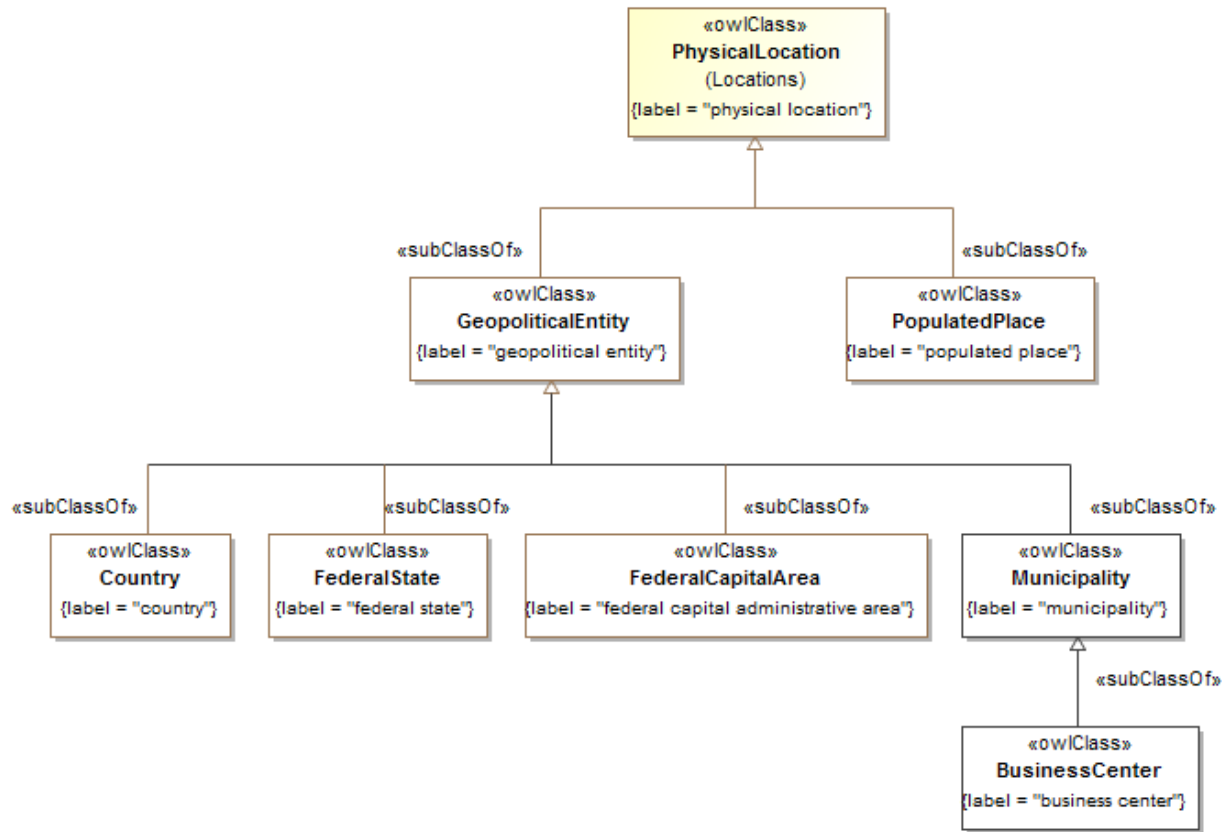


Figure 10.36 Countries Concepts

Table 10-40. Countries Ontology Metadata

Metadata Term	Value
sm:filename	Countries Ontology
sm:fileAbbreviation	fib0-fnd-plc-cty
OntologyIRI	http://www.omg.org/spec/EDMC-

Metadata Term	Value
	FIBO/FND/Places/Countries/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Places/Countries/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/

Table 10-41. Countries Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
PopulatedPlace	populated place		a community in which people live or have lived, without being specific as to size, population or importance		physical location				Class			
GeopoliticalEntity	geopolitical entity		any country, federal province, city or other administrative unit which is both geographical and political in its identity		physical location				Class			
Federal-State	federal state		a self-governing geopolitical unit which forms part of a wider geopolitical unit that is recognized as a country		geopolitical entity				Class		This type of entity, variously referred to as a state, province or canton, has a level of self government including its own legal system and court jurisdiction, but cedes a level of autonomy to the federation of which it forms a part.	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Federal-CapitalArea	federal capital administrative area		The capital administrative region of a country which is a federation, if the physical area of this region does not form a part of any of the states or provinces which make up the federal country.		geopolitical entity				Class			
Country	country		A self-governing geopolitical unit that is recognized as a country by the United Nations		geopolitical entity				Class			
BusinessCenter	business center		a municipality where business is conducted, especially one that is considered a financial center		municipality				Class			FpML Business Center and related codes, see http://www.fpml.org/coding-scheme/business-center-7-14.xml
Municipality	municipality		an urban administrative division having corporate status and usually powers of self-government or jurisdiction		geopolitical entity				Class		A municipality is a general-purpose administrative subdivision, as opposed to a special-purpose district.	http://en.wikipedia.org/wiki/Municipality

10.7.3 Ontology: Addresses

This ontology provides a very high level definition of address, essentially a placeholder for use in mapping addresses to the appropriate regional standards or to some as yet undefined global address ontology, for use in other FIBO ontology elements. A minimal set of address related terms are included as required for financial risk management and other application use cases, and these are all to be considered as placeholders for suitable global address standards as these become available.

Table 10-42. Addresses Ontology Metadata

Metadata Term	Value
sm:filename	Addresses Ontology
sm:fileAbbreviation	fibo-fnd-plc-adr
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Places/Addresses/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/

Table 10-43. Addresses Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
PostalAddress	postal address		a physical and postal address where communications can be addressed, papers served or representatives located for any kind of organization or person		property restriction 02 address				Class	There are existing international and regional standards for defining postal addresses. This is a placeholder for mapping to		

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										regional standards for postal address representation		
fibo-fnd-plc-adr-02	property restriction 02		Set of things that must have property "appliesTo" exactly 1 taken from "physical location"						Property Restriction			
Post-CodeArea	post code area		The physical area uniquely identified by some postal code.		physical location				Class			
Address	address		An index to a location to which communications may be delivered		property restriction 04 property restriction 03				Class	This came from FDTF Address Reviews Aug/Sept 2011. It represents a place holder for mapping to other standards, such as those for email, network, and other electronic addresses as well as physical and mailing addresses.		
AddressingScheme	addressing scheme		a system for allocating addresses to objects		property restriction 01 indexing scheme				Class			
fibo-fnd-plc-adr-01	property restriction 01		Set of things that may only have property "defines" taken from "Address"						Property Restriction			
fibo-fnd-plc-adr-03	property restriction 03		Set of things that must have property "hasDefinition" exactly 1 taken from "AddressingScheme"						Property Restriction			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
fibonacci-fnd-plc-adr-04	property restriction		Set of things that must have property "appliesTp" exactly 1 taken from "location"						Property Restriction			
VirtualAddress	virtual address		an address identifying a virtual, i.e. non-physical location		address				Class			

10.7.4 Ontology: Facilities

This ontology provides scaffolding for use in describing concepts related to facilities, both virtual and physical, including physical sites that provide various facilities.

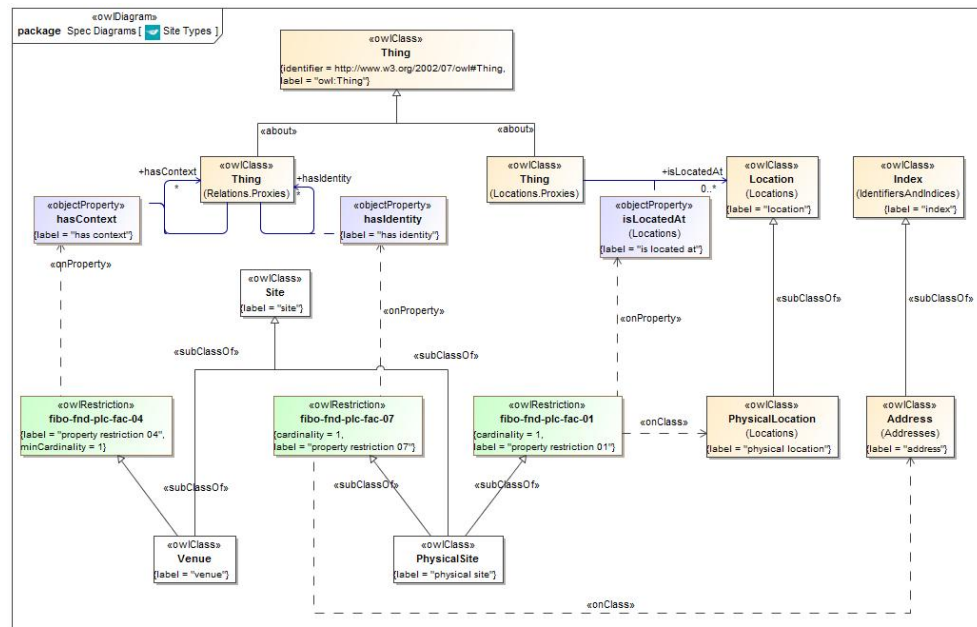


Figure 50.38 Site Types

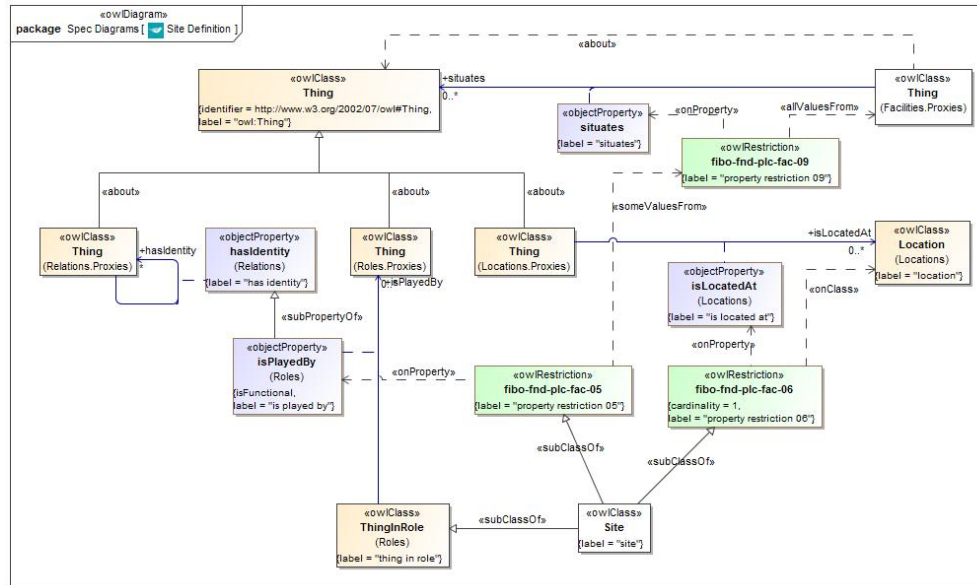


Figure 60.39 Site Definition

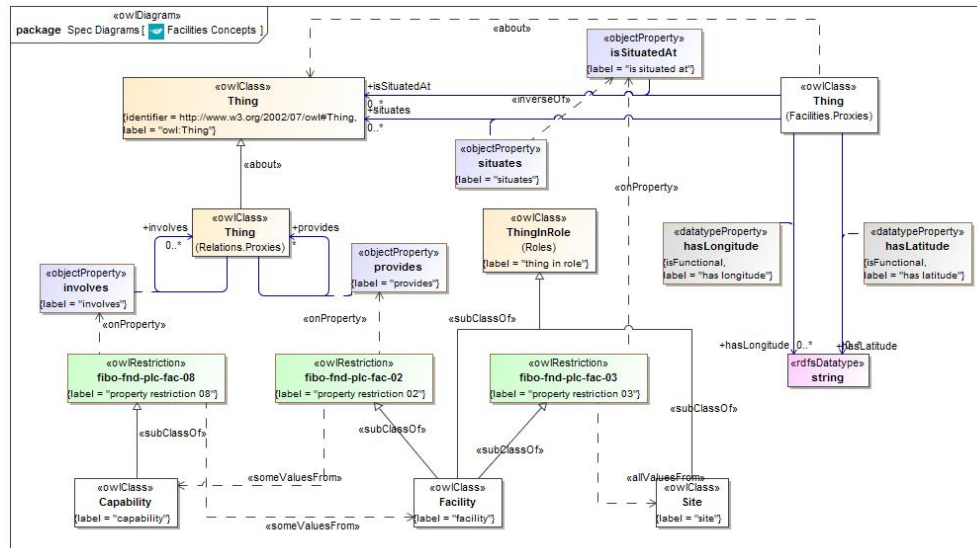


Figure 70.40 Facilities Concepts

Table 10-44. Facilities Ontology Metadata

Metadata Term	Value
sm:filename	Facilities
sm:fileAbbreviation	fibonacci-fnd-plc-fac
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Facilities/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Places/Facilities/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/

Table 10-45. Facilities Concepts

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Facility	[facility]		something that is built, contrived, established, or installed to serve a particular purpose, or make some course of action or operation easier, or provide some capability or service	fibonacci-fnd-plc-fac-03						A facility may be concrete (as in a manufacturing facility) or abstract. Concrete facilities may be permanent, semi-permanent, or temporary structures, providing one or more capa-		

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
											bilities at a given site. A single site may include multiple facilities and a given facility may span multiple sites.		
Class	Venue	[venue]		A place where something happens, described in the context of the event or activity that occurs there	fib0-fnd-plc-fac-04								
Class	Capability	[capability]		A capability represents the ability to perform a particular type of work and may involve people with particular skills and knowledge, intellectual property, defined practices, operating facilities, tools and equipment.	fib0-fnd-plc-fac-08								
Class	PhysicalSite	[physical site]		A physical site is an actual location that situates something, typically a structure or building, archeological dig, landing location for an aircraft or spacecraft, etc. From biology, this could also be the site of a wound, and active site, and so forth. A physical site has certain characteristics that contribute to the context it provides, including area,	fib0-fnd-plc-fac-07								

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				shape, accessibility, and in the case of a geographic site, landforms, soil and ground conditions, climate, and so forth.									
Class	Site	[site]		A site is a place, setting, or context in which something is situated.	fibonacci-fnd-plc-fac-06								
Other	fibonacci-fnd-plc-fac-02	[property restriction 02]	provides	restriction on the stated property where some values must be taken from the related thing or type			Capability						
Other	fibonacci-fnd-plc-fac-07	[property restriction 07]	hasIdentity	cardinality restriction on the stated property with values taken from the related thing			Address						
Other	fibonacci-fnd-plc-fac-03	[property restriction 03]	isSituAtedAt	restriction on the stated property with all values taken only from the related thing or type			Site						
Other	fibonacci-fnd-plc-fac-05	[property restriction 05]	isPlayedBy	restriction on the stated property where some values must be taken from the related thing or type			fibonacci-fnd-plc-fac-09						
Other	fibonacci-fnd-plc-fac-06	[property restriction 06]	isLoCatedAt	cardinality restriction on the stated property with values taken from the related thing			Location						
Other	fibonacci-fnd-plc-fac-09	[property restriction 09]	situates	restriction on the stated property with all values taken only from the related thing or			Thing						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				type									
Other	fibofnd-plc-fac-04	[property restriction 04]	hasContext										
Other	fibofnd-plc-fac-08	[property restriction 08]	involves	restriction on the stated property where some values must be taken from the related thing or type			Facility						
Other	fibofnd-plc-fac-01	[property restriction 01]	isLocatedAt	cardinality restriction on the stated property with values taken from the related thing			Physical-Location						
Simple Property	hasLatitude	anything	[has latitude]	Latitude values indicate the angular distance between the Equator and points north or south of it on the surface of the Earth.			string						
Simple Property	hasLongitude	anything	[has longitude]	Lines of longitude, called meridians, run perpendicular to lines of latitude, and all pass through both poles. Longitude values indicate the angular distance between the Prime Meridian and points east or west of it on the surface of the Earth.			string						
Relationship Property	isSituatingAt	anything	[is situated at]	indicates that something has been positioned, located or placed at some site, or in some setting, situation, or context			anything	situates					
Relation-	situates	anything	[situates]	indicates the place,			anything	isSitu-					

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
ship Property				setting, or context in which something is situated				atedAt					

10.7.5 Ontology: VirtualPlaces

This ontology provides scaffolding for use in describing virtual location-oriented concepts.

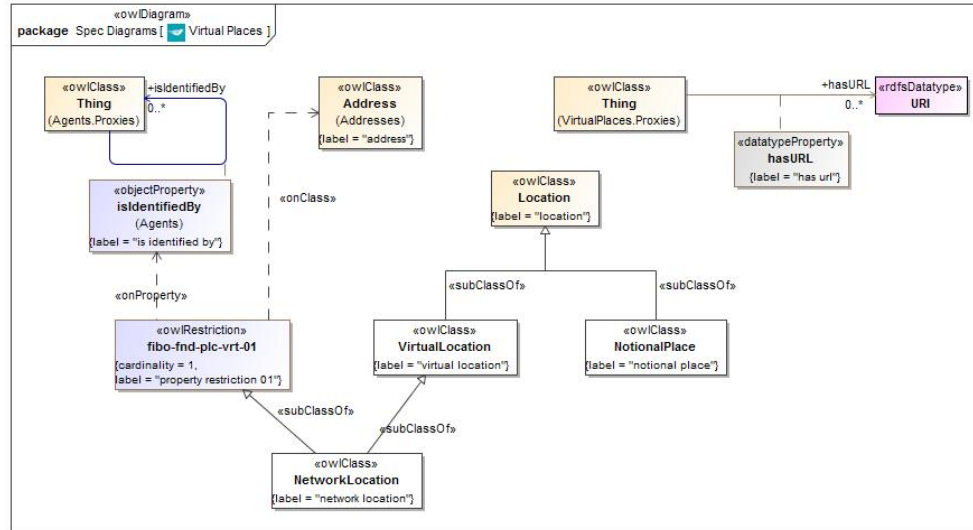


Figure 80.41 Virtual Places

Table 10-46. VirtualPlaces Ontology Metadata

Metadata Term	Value
sm:filename	VirtualPlaces
sm:fileAbbreviation	fibo-fnd-plc-vrt
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Places/VirtualPlaces/

Metadata Term	Value
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Places/VirtualPlaces/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/

Table 10-47. Virtual Places Concepts

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Notional-Place	[notional place]		A place described in terms of some abstract description or as a list of commonly understood concepts such as domestic, Eurozone etc.	Location								
Class	VirtualLocation	[virtual location]		A place which has no physical location.	Location								
Class	Network-Location	[network location]		A network address is location in a telecommunications network that may be identified by a network address (an identifier for a node or interface)	fibofnd-plc-vrt-01 virtual location								
Other	fibofnd-plc-vrt-01	[property restriction]	isIdentifiedBy	cardinality restriction on the			Address						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
		01]		stated property with values taken from the related thing									
Simple Property	hasURL	anything	[has url]				URI						

10.8 Module: Organizations

Table 10-48. Organizations Module Metadata

Metadata Term	Value
sm:moduleName	Organizations
sm:moduleAbbreviation	FIBO-FND-ORG
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes several ontologies defining organizations, features of an organization and different types of organization. These include formal versus informal organizations, legitimate and illicit organizations and so on. They are purposefully underspecified to facilitate mapping to specific organization ontologies, such as the emerging W3C organization and formal organization ontologies, organization from a BMM or BPMN perspective, organization from a records management (RMS) perspective, and so forth.

10.8.1 Ontology: Organizations

This ontology defines high-level concepts for organizations and related terms, for use in other FIBO ontology elements. It is purposefully underspecified to

facilitate mapping to specific organization ontologies, such as the emerging W3C organization ontology, organization from a BMM or BPMN perspective, organization from a records management (RMS) perspective, and so forth.

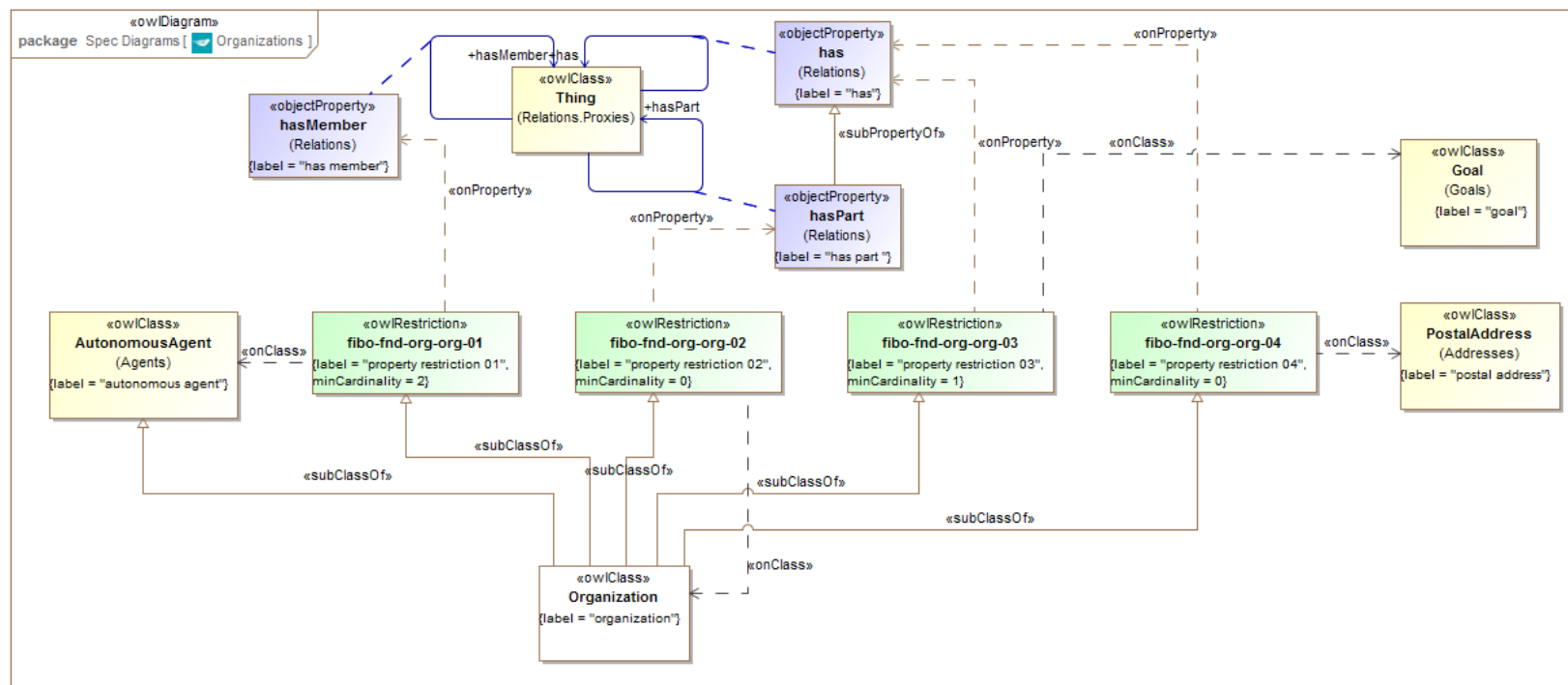


Figure 10.42 Organizations Concepts

Table 10-49. Organizations Ontology Metadata

Metadata Term	Value
sm:filename	Organizations Ontology
sm:fileAbbreviation	fibio-fnd-org-org

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Organizations/Organizations/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/

Table 10-50. Organizations Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Organization	organization		A social unit of people, systematically structured and managed to meet a need or pursue collective goals on a continuing basis.		property restriction 04 autonomous agent property restriction 01 property restriction 03 property restriction 02				Class			http://www.BusinessDictionary.com/
fibofnd-org-org-04	property restriction 04		Set of things that may have property "has" taken from "postal address"						Property Restriction			
fibofnd-org-org-03	property restriction 03		Set of things that must have property "has" at least 1 taken from						Property Restriction			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			"goal"									
fibofnd-org-org-02	property restriction 02		Set of things that have property "has part" may only be taken from "organization"						Property Restriction			
fibofnd-org-org-01	property restriction 01		Set of things that must have property "has member" may only be taken from "autonomous agent"						Property Restriction			

10.8.2 Ontology: Formal Organizations

This ontology defines the high level concept of formal organization for use in other FIBO ontology elements. It is purposefully underspecified to facilitate mapping to other formal organization ontologies, such as the emerging W3C formal organization ontology, or others defined for specific business and financial services standards. The concepts in this ontology extend those in the Organizations ontology.

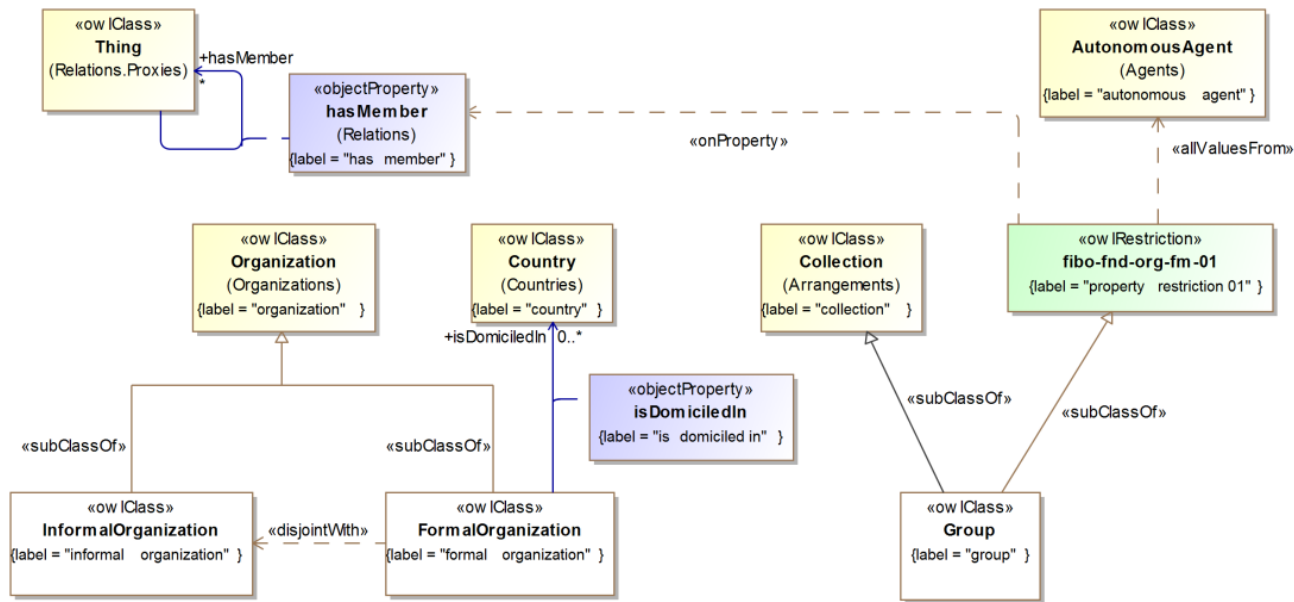


Figure 10.43 Formal Organizations Concepts

Table 10-51. Formal Organizations Ontology Metadata

Metadata Term	Value
sm:filename	Formal Organizations Ontology
sm:fileAbbreviation	fibo-fnd-org-fm
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Organizations/FormalOrganizations/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Metadata Term	Value
	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/

Table 10-52. Formal Organizations Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
InformalOrganization	informal organization		An organization which is not formally constituted in some way.		organization	formal organization			Class			
Group	group		A group of autonomous entities		property restriction 01 collection				Class			
fibofndorgfm01	property restriction 01		Set of things with property "has member" only "autonomous agent"						Property Restriction			
FormalOrganization	formal organization		An Organization that is recognized in some legal jurisdiction, with associated rights and responsibilities. Examples include a Corporation, Charity, Govern-		organization	informal organization			Class	W3C Definition - An Organization which is recognized in the world at large, in particular in legal jurisdictions,		Adapted from W3C Organization Ontology

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			ment or Church.							with associated rights and responsibilities. Examples include a Corporation, Charity, Government or Church.		
isDomiciledIn	formal organization	is domiciled in	the country in which the formal organization is officially domiciled				country		Relationship Property		This would normally be the country corresponding to the jurisdiction in which the formal organization is constituted or incorporated. For some primarily federal countries, the domicile is the country that makes up the federation while the jurisdiction under which the entity is registered (if it is a registered entity) would be that of some state in that federation.	

10.8.3 Ontology: Legitimate Organizations

This ontology defines the concepts of legitimate and illicit organizations for use in other FIBO ontology elements. These distinctions are provided in order to facilitate modeling of concepts relevant to money laundering. Legitimate organizations such as clubs are defined. These, along with the distinctions of formal versus informal organizations, provide the universe of possible kinds of organizations which may perform specific roles such as holding shares, having control of assets of companies and so on.

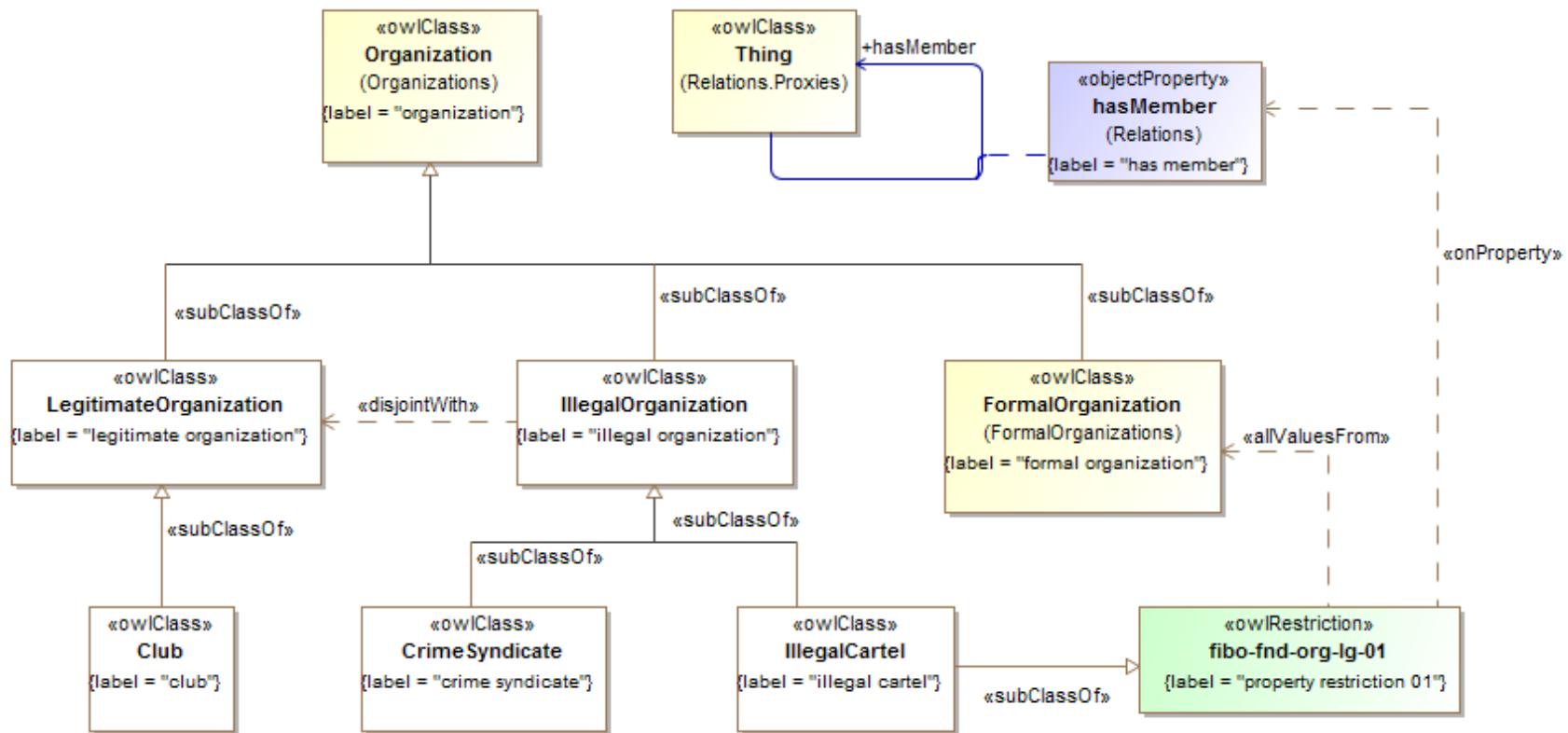


Figure 10.44 Legitimate and Illicit Organizations Concepts

Table 10-53. Legitimate Organizations Ontology Metadata

Metadata Term	Value
sm:filename	Legitimate Organizations Ontology
sm:fileAbbreviation	fibo-fnd-org-lg
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/LegitimateOrganizations/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Organizations/LegitimateOrganizations/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/

Table 10-54. Legitimate and Illicit Organizations Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
LegitimateOrganization	legitimate organization		An organization that exists to serve some lawful purpose		organization	illegal organization			Class			
IllegalOrganization	illegal organization		A kind of organization which has been set up specifically to perform illegal acts or has become such		organization	legitimate organization			Class		This is not to do with performing illicit acts. We can narrow down on a definition for Illicit Organization - one which has been set up specifically to perform illicit acts or has become such. This relates to the purpose of the organization, and the purposes of the entities which control that entity. And the acts which the entity may perform. (definition adopted from the above note, with Illicit changed to Illegal for clarity). Typically, a money laundering entity may perform (will perform) legal acts and is explicitly set up for such, but will also perform illicit acts. The definition of illicit is framed entirely with respect to law and not morality.	
IllegalCartel	illegal cartel		A collection of companies that come together to manipulate the market in some way, e.g. price fixing		property restriction 01 illegal organization				Class			
fibo-fnd-org-01	property restriction 01		Set of things with property "has member" only "formal organization"						Property Restriction			
CrimeSyndicate	crime syndicate		An informal grouping formed for the purposes of organized criminal activities		illegal organization				Class			
Club	club		An informal organization formed to pursue some common interest among its members		legitimate organization				Class			

10.9 Module: Agreements

Table 10-55. Agreements Module Metadata

Metadata Term	Value
sm:moduleName	Agreements
sm:moduleAbbreviation	FIBO-FND-AGR
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies describing agreements between parties and contracts that formalize those agreements. These cover written and verbal contracts, including contracts which may be transferred from one party to another. The latter form the basis for financial securities contracts. The Contracts ontology also describes fundamental properties of contracts such as contractual terms, contract parties and so on, many of which form the basis for more specialized financial industry concepts such as interest payment terms, bond issuers and so on.

10.9.1 Ontology: Agreements

This ontology defines concepts for agreements, for use in other ontology elements. Agreements as defined here are the actual agreements between parties, and this ontology is intended to be referred to in conjunction with the contracts ontology which defines the actual contracts which formalize such agreements. The concepts of agreement and contract are intended to be kept distinct in the FIBO ontologies, that is neither is intended to be regarded as a sub type of the other.

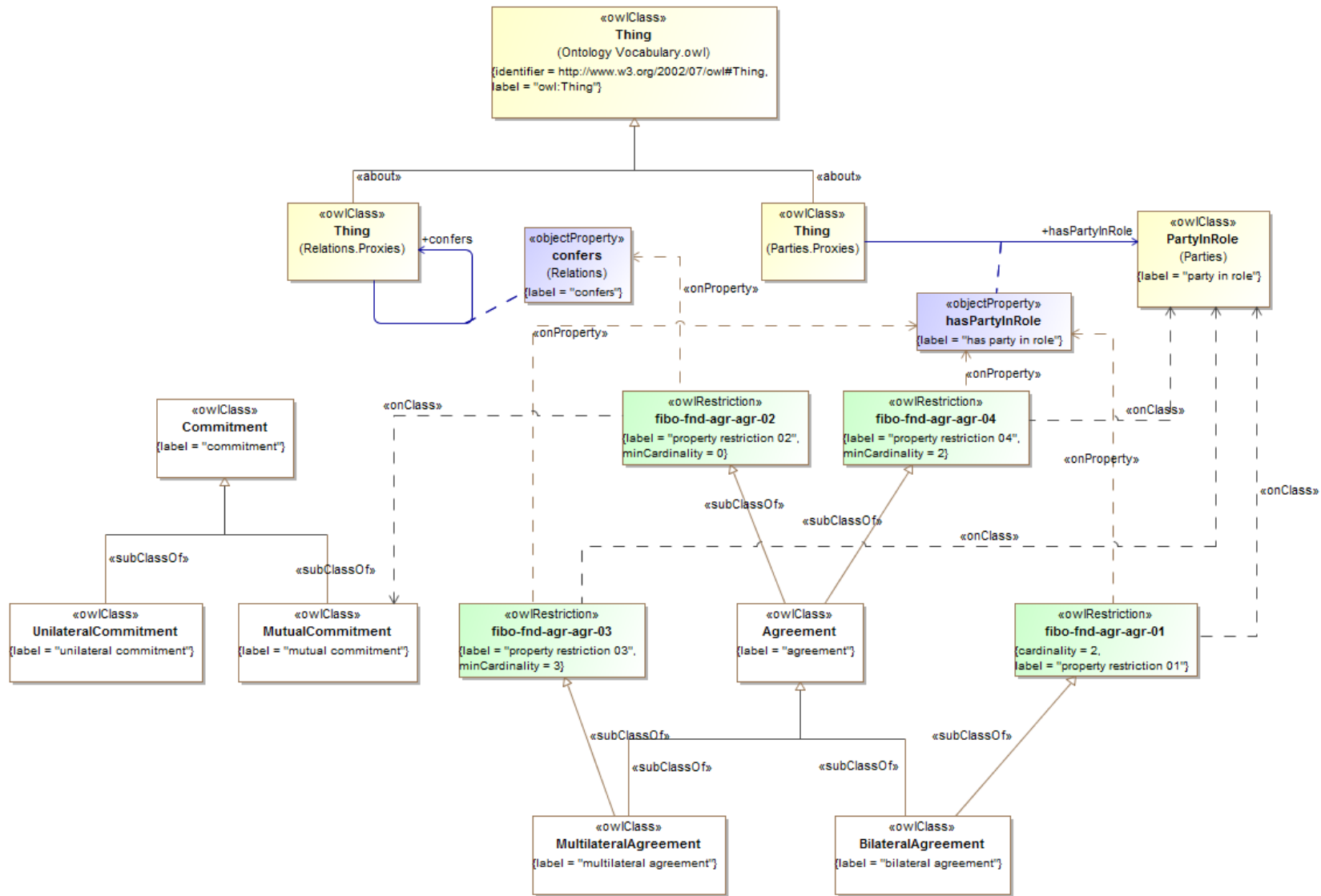


Figure 10.45 Agreements Concepts

Table 10-56. Agreements Ontology Metadata

Metadata Term	Value
sm:filename	Agreements Ontology
sm:fileAbbreviation	fibo-fnd-agr-agr
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Agreements/Agreements/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/

Table 10-57. Agreements Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Unilateral-Commitment	unilateral commitment		A commitment made by one party without reference to the party to which the commitment is made.		commitment				Class			
Mutual-Commitment	mutual commitment		A commitment between two or more parties		commitment				Class			
fibo-fnd-agr-agr-03	property restriction 03		Set of things that must have property "has party in role" at least 3 taken from "party in role"						Property Restriction			
Commitment	commitment		A legal construct which represents the undertaking on the part of some party to act or refrain from acting in some manner.						Class	The undertaking by some party to act or refrain from acting results in an obligation on the part of that party, and usually results in the existence of some corresponding right on the party of some other party, in the event that the commitment is to such party. Thus Obligations and Rights are considered as reciprocal aspects of this Commitment concept.		
CommitmentAtLarge	commitment at large		a commitment made by some party without direct involvement from the potential beneficiaries of that commitment		unilateral commitment				Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
IndividualUnilateral-Commitment	Individual unilateral commitment		a commitment made by some party unilaterally to another specific party		unilateral commitment							
MutualAgreement	mutual agreement		an agreement between two or more specific named parties. The rights and obligations pertaining to either party cannot be transferred to another party without prior agreement		agreement property restriction 05				Class			
fibo-fnd-agr-agr-04	property restriction 04		Set of things that must have property "has party in role" exactly 2 taken from "party in role"						Property Restriction			
Agreement	agreement		A negotiated and usually legally enforceable understanding between two or more legally competent parties.		property restriction 01 property restriction 02				Class		Some mutual undertaking or set of undertakings between two or among several parties. Although a binding contract can (and often does) result from an agreement, an agreement typically documents the give-and-take of a negotiated settlement and a contract specifies the minimum acceptable standard of performance.	http://www.businessdictionary.com/definition/agreement.html

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											An agreement provides language that defines the terms and conditions of a legally binding contract among the identified parties, ordinarily leading to a contract.	
fibo-fnd-agr-agr-01	property restriction 01		Set of things that may have property "confers" taken from "mutual commitment"						Property Restriction			
fibo-fnd-agr-agr-02	property restriction 02	Confers	Set of things that have property "confers" some values must be taken from "commitment"				commitment		Property Restriction			
fibo-fnd-agr-agr-05	property restriction 05	confers	Set of things that have property "confers" some values must be taken from "mutual commitment"				mutual commitment		Property Restriction			

10.9.2 Ontology: Contracts

This ontology defines concepts relating to contracts, for use in other FIBO ontology elements. These include written contracts which are the concrete evidence of agreements between parties, along with verbal contracts. Contracts are further broken down into bilateral and transferable contracts, the latter being the basis for most financial instruments. Properties of contracts are also defined, in particular contractual terms and contract parties. These concepts all form the basis of concepts in the financial services industry, for example interest payment terms are a kind of contract terms set, and security holders are a kind of contract counterparty.

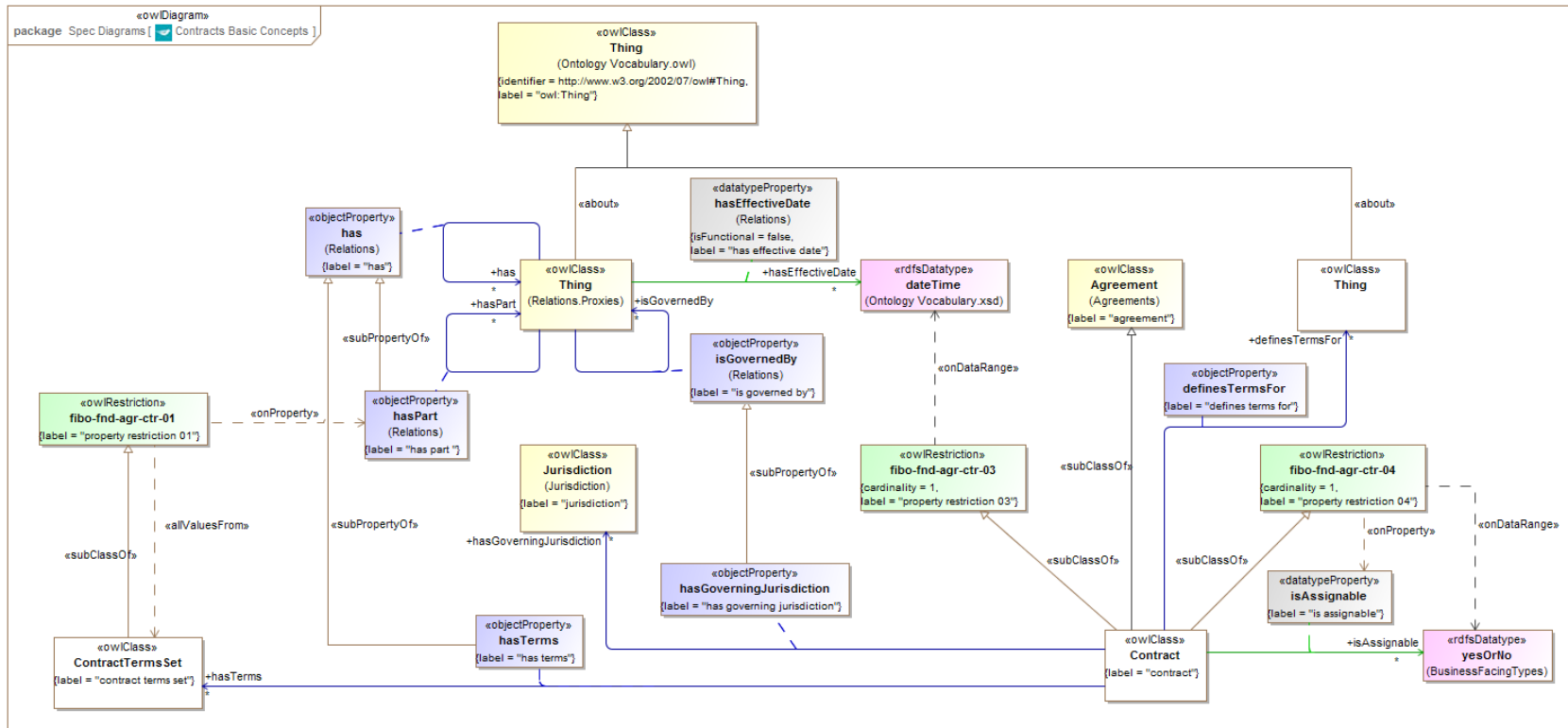


Figure 10.46 Contracts Basic Concepts

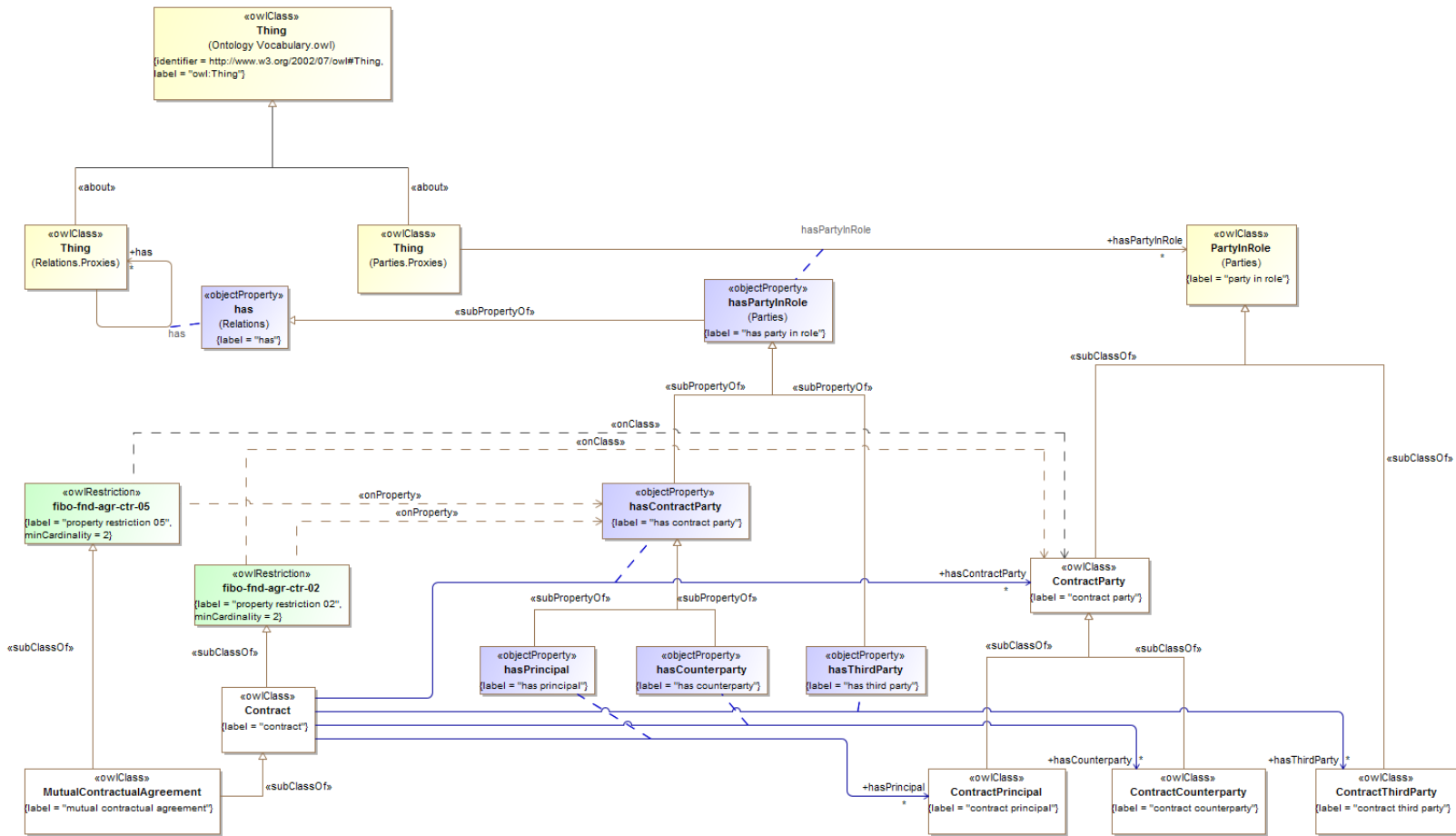


Figure 10.47 Contract Parties

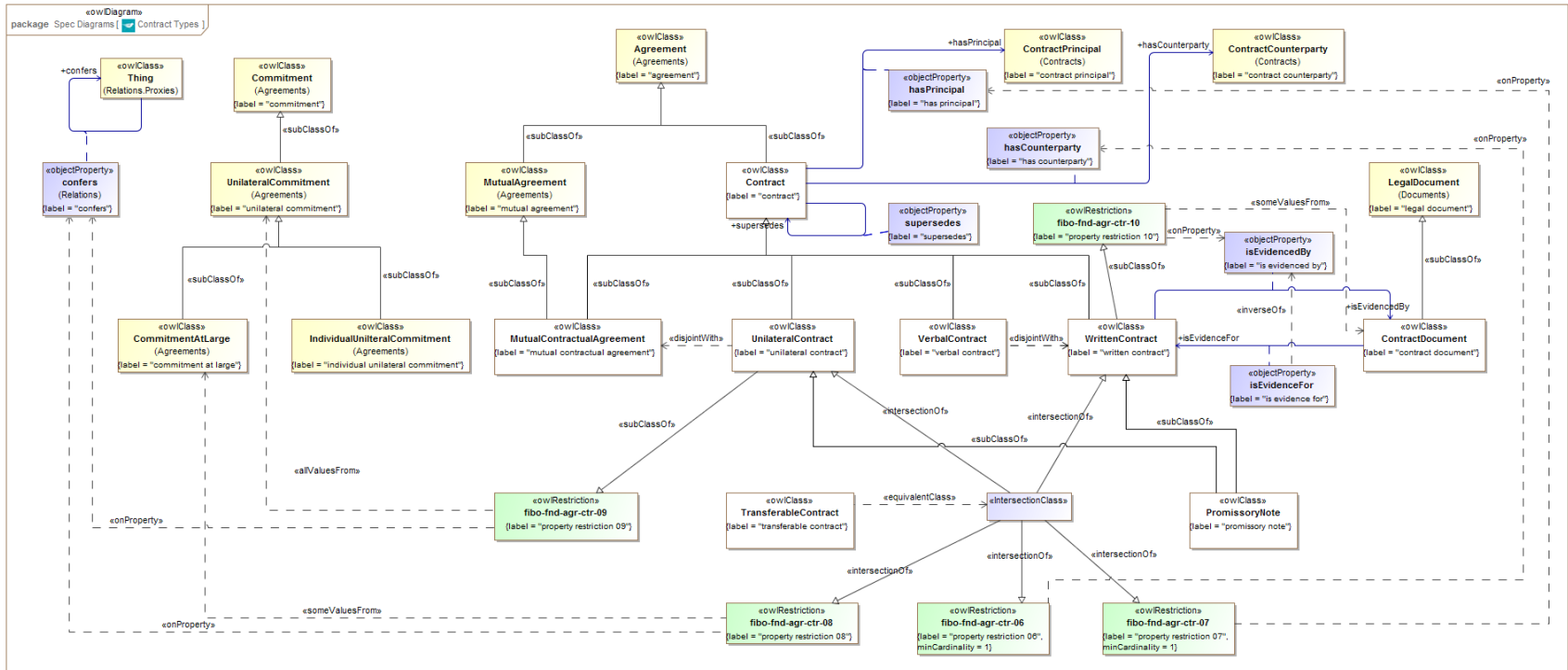


Figure 10.48 Contract Types

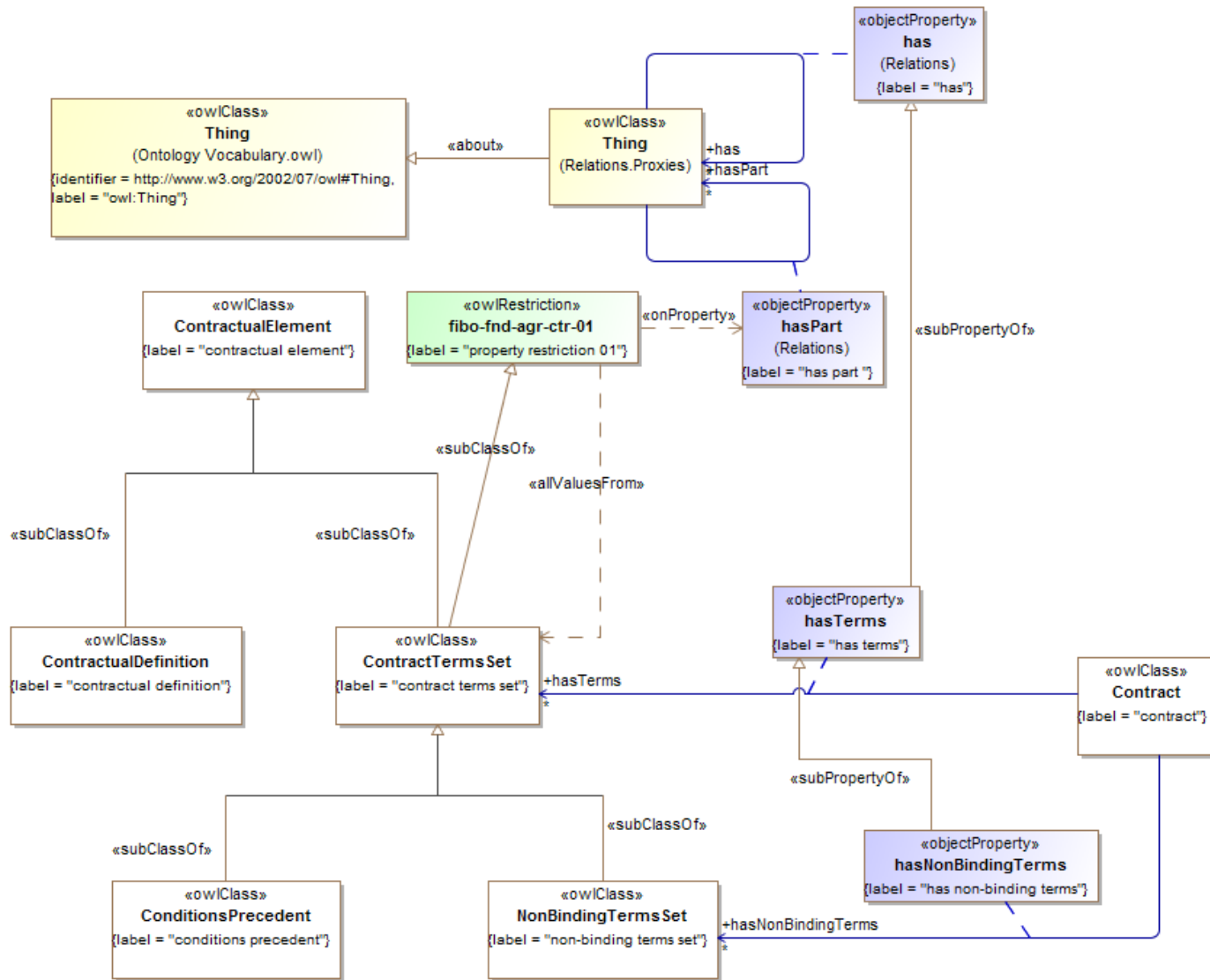


Figure 10.49 Contract Terms and Elements

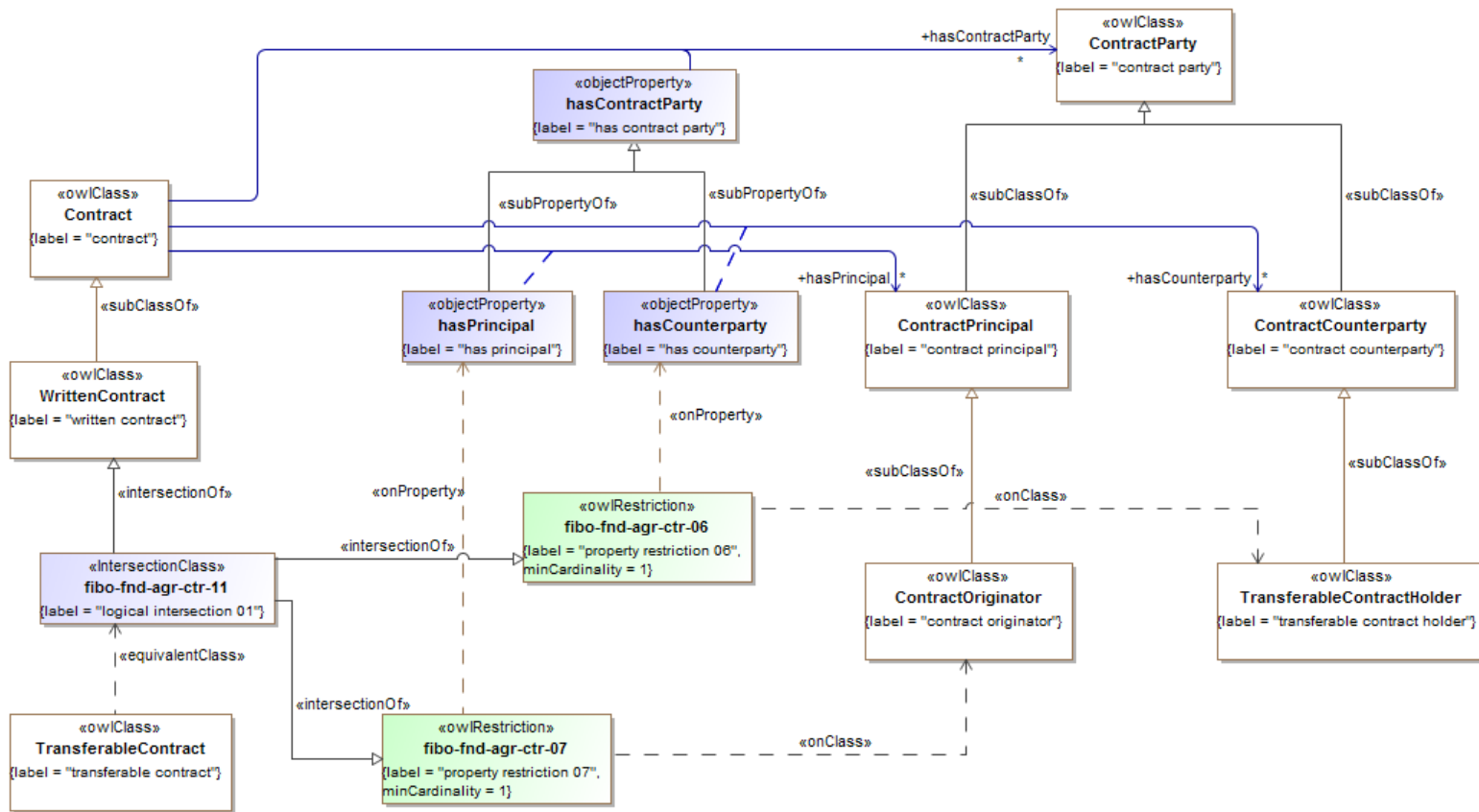


Figure 10:50 Transferable Contract parties

Table 10-58. Contracts Ontology Metadata

Metadata Term	Value
<code>sm:filename</code>	Contracts Ontology
<code>sm:fileAbbreviation</code>	fibo-fnd-agr-ctr

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Agreements/Contracts/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/ http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/

Table 10-59. Contracts Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
isAssignable	contract	is assignable	indicates whether the contract and the rights thereunder may be assigned by one of the signatories to some other party				yes or no		Simple Property	This is believed to be the basis on which transferable contracts such as financial securities and software licenses may be bought	An assignment (Latin cessione) is a term used with similar meanings in the law of contracts and in the law of real estate. In both	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										and sold on some market, and also the basis on which a bilateral contract such as an over the counter derivative may be novated so that a new party becomes one of the parties. There are subtle distinctions between these three concepts which are not yet represented here.	instances, it encompasses the transfer of rights held by one party, the assignor, to another party, the assignee. The details of the assignment determines some additional rights and liabilities (or duties). Typically a third-party is involved in a contract with the assignor, and the contract is in effect transferred to the assignee.	
Written-Contract	written contract		A formal Contract which is written and signed by the parties thereto.		Contract property restriction 10	verbal contract			Class			
supersedes	contract	supersedes	The or any earlier contract which this contract supersedes				contract		Relationship Property			
VerbalContract	verbal contract		A contract which exists as a result of some verbal exchange.		contract	written contract			Class			
TransferableContractHolder	transferable contract holder		The party which holds a transferable contract and enjoys the benefits defined in that contract while they hold it.		contract counterparty				Class	This party may transfer the contract to another party without reference to the issuer, for example by selling it in some marketplace.		
TransferableContract	transferable contract		a contract in which the rights and obligations of one party (the holder)	logical intersection 01					Class	Note that the ability to transfer ownership of		

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			may be transferred to another party, which thereby takes on the same rights and obligations with respect to the other party to the contract.							one side of a contract, and the concept of assignability, are distinct. In one case the contract may be freely traded; in the other case, some legal transfer of rights to a third party takes place, without a change in who are the signatories of a (typically bilateral) contract		
fibo-fnd-agr-ctr-06	property restriction 06		Set of things that must have property "has principal" at least 1 taken from "contract originator"	transferable contract					Property Restriction			
fibo-fnd-agr-ctr-07	property restriction 07		Set of things that must have property "has counterparty" at least 1 taken from "transferable contract holder"						Property Restriction			
PromissoryNote	promissory note		A promissory note is a written, signed, unconditional, and unsecured promise by one party (the maker or promisor) to another (the payee or promisee) that commits the maker to pay a specified sum on demand, or on a fixed or a determinable date.		written contract unilateral contract				Class	Unlike a contract, a Promissory Note does not need to be signed by both parties. It is essentially a promise from one party to the holder, of some good or benefit. Promissory notes would generally be fully fungible. These are modeled as a kind of	Promissory notes (such as bank or currency notes) are negotiable instruments.	http://www.businessdictionary.com/definition/promissory-note.html

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										contract but are essentially a kind of unilateral contract between the issuer and the holder, and some authorities might not see this as a contract at all. Cash is a kind of promissory note, with the issuer being a central bank.		
NonBindingTermsSet	non-binding terms set		Terms which do not have binding legal standing on the Issuer or Holder.		contract terms set				Class			
ContractualElement	contractual element		Anything which relates to contracts.						Class	The concept "contractual element" does not exist in any dictionary I could find. Can we change this to ContractElement? (efk)		
ContractualDefinition	contractual definition		The definition of something in some contract or other legal instrument.		contractual element				Class	These are agreed definitions which are then referred to in terms in contracts or other legal instruments. The concept "contractual definition" does not exist in any dictionary I could find. Can we change this to ContractTermOrDefinition?		

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										(efk)		
ContractThirdParty	contract third party		Someone who may be indirectly involved but is not a principal party to an arrangement, contract, deal, lawsuit, or transaction.		party in role				Class	The concept "contract third party" does not exist in any dictionary I could find, however "third-party" does, and could be used for this purpose. Can we change this to ThirdParty? (efk)		http://www.businessdictionary.com/definition/third-party.html
ContractTermsSet	contract terms set		the terms and conditions that set the rights and obligations of the contracting parties when a contract is awarded or entered into		property restriction 01 contractual element				Class			http://www.businessdictionary.com/definition/conditions-of-contract.html http://www.businessdictionary.com/definition/terms-and-conditions.html
fibo-fnd-agr-ctr-01	property restriction 01		Set of things with property "has part" only "contract terms set"						Property Restriction			
ContractPrincipal	contract principal		the party identified as being the principal or first party to a contract, in the event that the contract distinguishes any party as the principal		contract party				Class		In law, the principal is the party that has the primary responsibility in a liability or obligation, as opposed to an endorser, guarantor, or surety.	http://www.businessdictionary.com/definition/principal.html
ContractOriginator	contract originator		The party which originates the transferable contract and acts as the Principal in that contract regardless of the		contract principal				Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			owner or counterparty.									
ContractCounterparty	contract counterparty		In the event that a contract identifies either party to that contract as being the principal, this is the other party to that contract.		contract party				Class	The parent concept of Contract-Party is the one to use when no participant in the contract is identified as being the principal; where one entity is identified as being the principal to a contract, then the other party or parties to the contract are to be identified as counterparties. Note that the alternative usage of the word 'counterparty', being a given person's opposite number in some contract, is not the concept intended here, and those two concepts are disjoint.	Where no party is identified as the principal to a contract, both or all parties are simply identified as being parties to the contract. That is, the concept 'counterparty' as defined here is specifically in opposition to 'principal'; other usages of the word counterparty exist.	
Contract	contract		a voluntary, deliberate, and legally binding agreement between two or more competent parties		property restriction 04 property restriction 03 property restriction 02 agreement				Class		Contracts are usually written but may be spoken or implied, and generally have to do with employment, sale or lease, or tenancy.	http://www.businessdictionary.com/definition/contract.html
fibo-fnd-agr-ctr-02	property restriction		Set of things that must have property "has						Property Re-			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
	02		party in role" at least 2 taken from "party in role"						striction			
fibo-fnd-agr-ctr-03	property restriction 03		Set of things that must have property "has effective date" exactly 1 taken from "date"						Property Restriction			
fibo-fnd-agr-ctr-04	property restriction 04		Set of things that must have property "is assignable" exactly 1 taken from "yes or no"						Property Restriction			
hasThird-Party	contract	has third party	identifies a party which is not signatory to the party but has some role in the overall context defined by the contract.		has party in role		contract third party		Relationship Property			
hasTerms	contract	has terms	identifies the written terms which define and describe the commitments, rights and obligations of the parties to the contract and set out commonly agreed definitions, calculations and the like, and which form part of the contract		has		contract terms set		Relationship Property		These are generally grouped for convenience as definitions, such as debt repayment terms, and may or may not equate to a formal clause, section, paragraph or other textual construct of the contract.	
hasPrincipal	contract	has principal	identifies the main or principal party to a contract		has contract party		contract principal		Relationship Property			
hasNonBindingTerms	contract	has non-binding terms	refers to terms that are included in the contract but are not considered binding. In other words, a breach of such terms in the future would not be considered to be a breach of the contract.		has terms		non-binding terms set		Relationship Property			
hasGoverningJurisdiction	contract	has governing jurisdiction	the jurisdiction governing the contract, as agreed by all parties		is governed by		jurisdiction		Relationship Property	As modeled, this relationship combines two slightly different	In a written contract this is generally identified, for exam-	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										<p>senses in which a Jurisdiction may be named in some Contract: the jurisdiction under whose laws the contract is deemed to be in force, and the jurisdiction under which the parties agree to submit in the event of any dispute resolution. Scope Note: One thing to tease out is whether "Dispute Resolution" and other forms of "Governing Law" are one and the same thing or not. Dispute Resolution is uncontroversial, the question is whether there are other implications to Governing Law or if it's the same thing. For instance I may undertake to behave as though I were responsible to a particular authority i.e. a particular set of statutes.</p>	<p>ple, as Governing Law, namely the jurisdiction in which any disputes arising from the contract are to be resolved.</p>	
hasCounterparty	contract	has counterparty	identifies a counterparty to a contract		has contract party		contract counter-		Relation-ship			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
							party		Property			
defines Terms For	contract	defines terms for	the contract sets out the terms for the something				anything		Relationship Property			
Conditions Precedent	conditions precedent		Conditions precedent on some obligation. These are conditions which would alter the Obligation as it is otherwise stated.		contract terms set				Class	Introduced for ISDA Master Agreement. It is likely that the Conditions Precedent defined for OTC Derivatives Master Agreements are actually applicable more widely. However, they are defined within the ISDA terms for now. Modeling note / review question: Modeled as a kind of Terms Set, combining terms and conditions. Should consider whether terms and conditions are distinct (Condition would then be a separate archetype).		
Mutual Contractual Agreement	mutual contractual agreement		A contract between two or more specific named parties. The rights and obligations pertaining to either party cannot be transferred to another party without prior written permission or a change to the contract itself.		property restriction 05 contract mutual agreement	unilateral contract			Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Contract Document	contract document		a written document, whether physical or electronic, which sets out the formal terms and conditions of some written contract		legal document				Class			
Unilateral Contract	unilateral contract		a contract in which only one party makes an express promise, or undertakes a performance without first securing a reciprocal agreement from the other party		contract property restriction 09	mutual contractual agreement			Class		In a unilateral, or one-sided, contract, one party, known as the offeror, makes a promise in exchange for an act (or abstention from acting) by another party, known as the offeree. If the offeree acts on the offeror's promise, the offeror is legally obligated to fulfill the contract, but an offeree cannot be forced to act (or not act), because no return promise has been made to the offeror. After an offeree has performed, only one enforceable promise exists, that of the offeror. A unilateral contract differs from a Bilateral Contract, in which the parties exchange mutual promises. Bilateral contracts are	http://legal-dictionary.thefreedictionary.com/Unilateral+contract

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											commonly used in business transactions; a sale of goods is a type of bilateral contract.	
fibo-fnd-agr-ctr-05	property restriction 05		Set of things that must have property "has party in role" exactly 2 taken from "party in role"						Property Restriction			
Contract-Party	contract party		a party to the contract, that is a contractually capable person or organization which is a signatory to the contract, and which grants or concedes certain rights and obligations as defined in the contract		party in role				Class			
hasContractParty	contract	has contract party	has a party which is a signatory to the contract and to which is granted certain rights and obligations as defined in the contract and which concedes certain rights to and imposes certain obligations upon the other party as defined in the contract.		has party in role		contract party		Relationship Property			
isEvidenced By	written contract	is evidenced by	the written contract has some formal written document, whether in physical or electronic form, which evidences and formalizes the terms and conditions of that contract				contract document	is evidence for	Relationship Property			
isEvidenceFor	contract document	is evidence for	the contract document provides formal documentary evidence for and sets out the details				written contract	is evidenced by	Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			of some written contract									
fibo-fnd-agr-ctr-08	property restriction 08	confers					commitment at large		Property Restriction			
fibo-fnd-agr-ctr-09	property restriction 09	confers					unilateral commitment		Property Restriction			
fibo-fnd-agr-ctr-10	property restriction 10		Set of things that must have property "is evidenced by" must be some taken from "contract document"						Property Restriction			
fibo-fnd-agr-ctr-11	logical intersection 01			transferable contract			property restriction 06 property restriction 07 property restriction 08 written contract unilateral contract		Logical intersection			
Thing	anything	has effective date	the date a contract, relationship, or policy comes into force				date		Simple Property			

10.10 Module: Law

Table 10-60. Law Module Metadata

Metadata Term	Value
<code>sm:moduleName</code>	Law

Metadata Term	Value
sm:moduleAbbreviation	FIBO-FND-LAW
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes several ontologies defining legal concepts, including constitutions, laws and jurisdictions. It also includes the definition of legal capacities such as signatory capacity, contractual capability and the like.

10.10.1 Ontology: Legal Core

This ontology defines high-level legal concepts for use in other FIBO ontology elements. These concepts include law and constitution, both of which are framed at a more abstract level than national or state laws and constitutions, so that law forms the basis both for statutes and for company by-laws, and constitution forms the basis both for national or state constitutions and for instruments which are constitutive of incorporated legal entities. This ontology also defines some of the variants of these such as governmental constitutions and ordinances. Other types of law are provided in the Jurisdictions ontology as extensions of concepts in this ontology. Court of Law is also defined here.

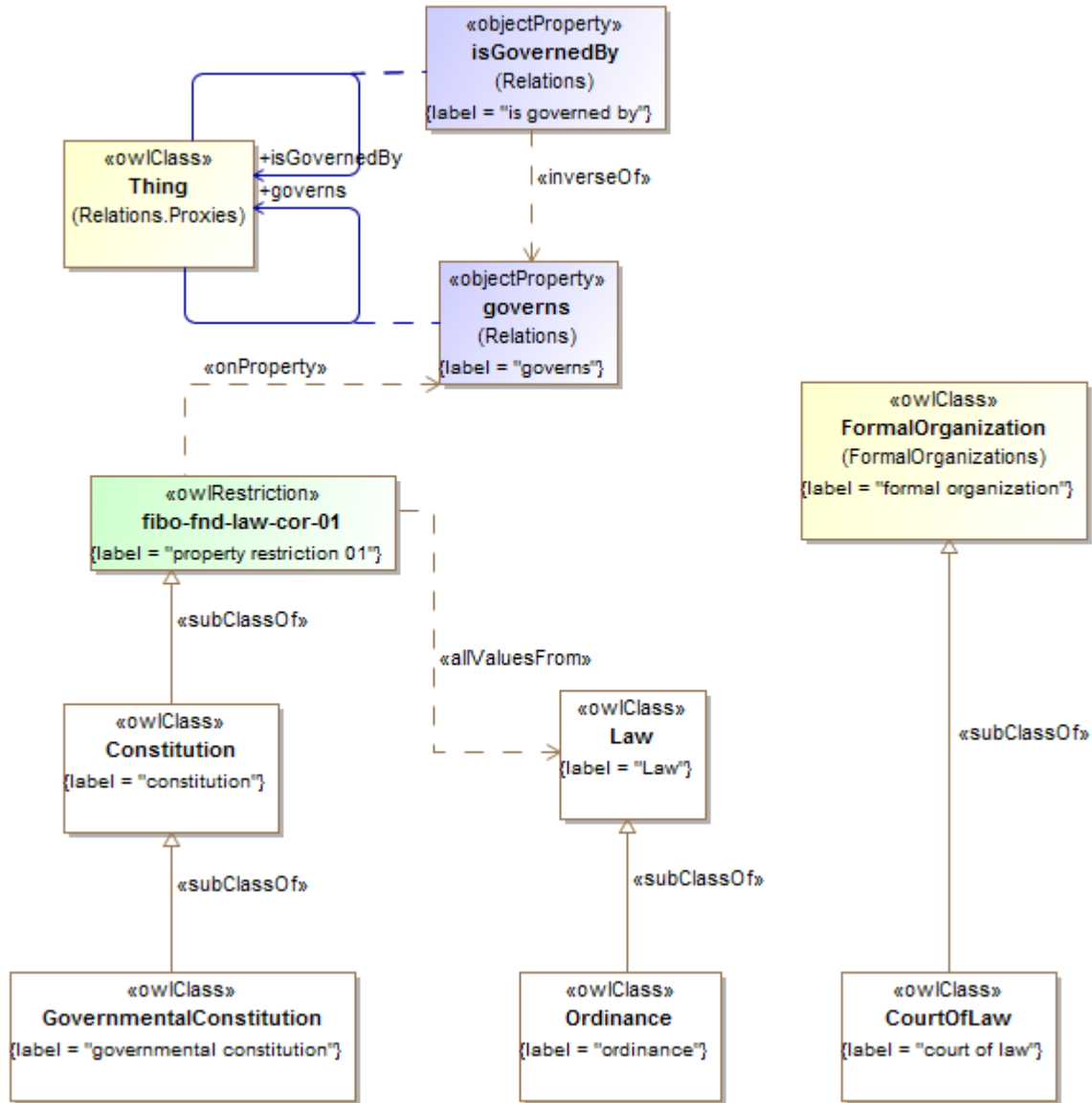


Figure 10.51 Legal Core Concepts
 Financial Industry Business Ontology Foundations Final

Table 10-61. Legal Core Ontology Metadata

Metadata Term	Value
sm:filename	Legal Core Ontology
sm:fileAbbreviation	fibonacci-fnd-law-cor
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Law/LegalCore/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/

Table 10-62. Legal Core Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Ordinance	ordinance		An authoritative rule or law; a decree or command; a public injunction or regulation, such as a city ordinance against excessive horn blowing. (Source: Dictionary.com)		law				Class			
Law	law		a system of rules and guidelines which are enforced through social institutions to govern behavior.						Class	Any law or body of law, which may have force in some context, including nation-	Law is a term which does not have a universally accepted definition. Certain Laws are made	http://en.wikipedia.org/wiki/Law

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										al laws, company bylaws and the like.	by governments, specifically by their legislatures. The formation of laws themselves may be influenced by a constitution (written or unwritten) and the rights encoded therein. The law shapes politics, economics and society in countless ways and serves as a social mediator of relations between people.	
Governmental Constitution	governmental constitution		a set of rules and principles that define the nature and extent of government.		constitution				Class	This defines the framework in which laws are made and in which they have force.	Most constitutions seek to regulate the relationship between institutions of the state, in a basic sense the relationship between the executive, legislature and the judiciary, but also the relationship of institutions within those branches. For example, executive branches can be divided into a head of government, government departments/ministries, executive agencies and a civil service/administration. Most constitutions also attempt to define the relationship between individuals and the	http://en.wikipedia.org/wiki/Constitution#Governmental_constitutions

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											state, and to establish the broad rights of individual citizens. It is thus the most basic law of a territory from which all the other laws and rules are hierarchically derived; in some territories it is in fact called Basic Law.	
CourtOfLaw	court of law		A court of law is a court that hears cases and decides them on the basis of statutes or the common law.		formal organization				Class			Merriam-Webster Online Dictionary
Constitution	constitution		A constitution defines the basic principles and laws of a nation, state, or social group that determine the powers and duties of the government and guarantee certain rights to the people in it.		property restriction 01				Class	This defines the framework in which laws (for a country constitution), rules and regulations (for a party or organization constitution) or contractual commitments are made and in which they have force.		Merriam-Webster Online Dictionary
fibo-fnd-law-cor-01	property restriction 01		Set of things with property "governs" only "law"						Property Restriction			
isInforceIn	law	is in force in	identifies a jurisdiction or similar context in which some law (including by-law, company by-law and state law) has effect				anything	has in force	Relationship Property			
hasInForce	anything	has in force	relates a jurisdiction or situation to a rule, regulation or law (collectively 'law') that is currently in force in that situation or jurisdiction				law	is in force in	Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
constrains	law	constrains	forces, compels, or obliges				autonomous agent	is constrained by	Relationship Property			
isConstrainedBy	autonomous agent	is constrained by	identifies the policy, rule, regulation, contract, or other thing that compels or obliges someone to act in some way				anything	constrains	Relationship Property			

10.10.2 Ontology: Jurisdiction

This ontology defines high level concepts relating to jurisdictions for use in other FIBO ontology elements. This includes a general definition of jurisdiction along with some basic types of jurisdiction, along with the factors which distinguish one type of jurisdiction from another. This ontology also defines basic types of legal system, and extends the basic concept of law which is in the LegalCore ontology.

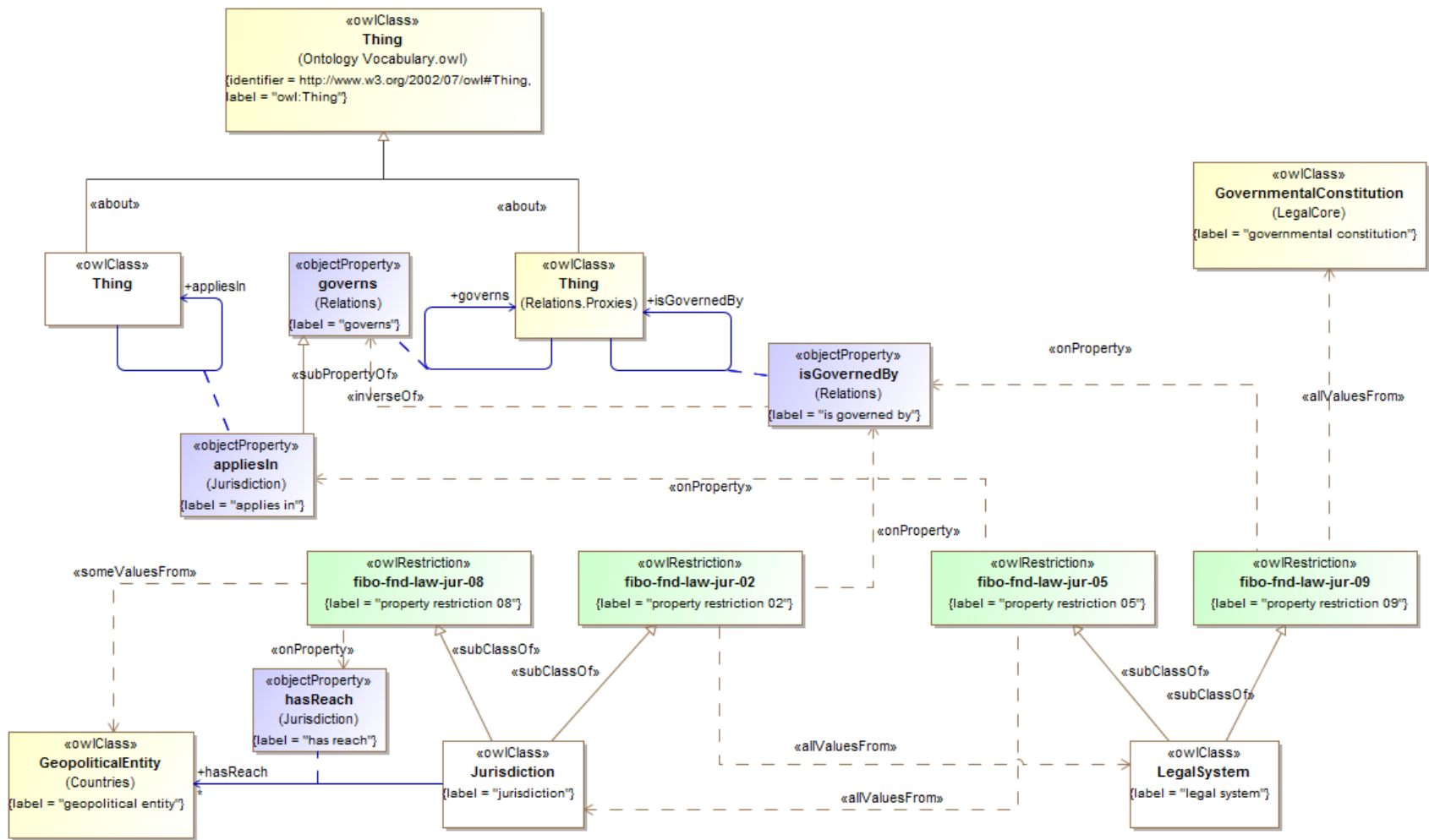


Figure 10.52 Jurisdiction Basic Concepts

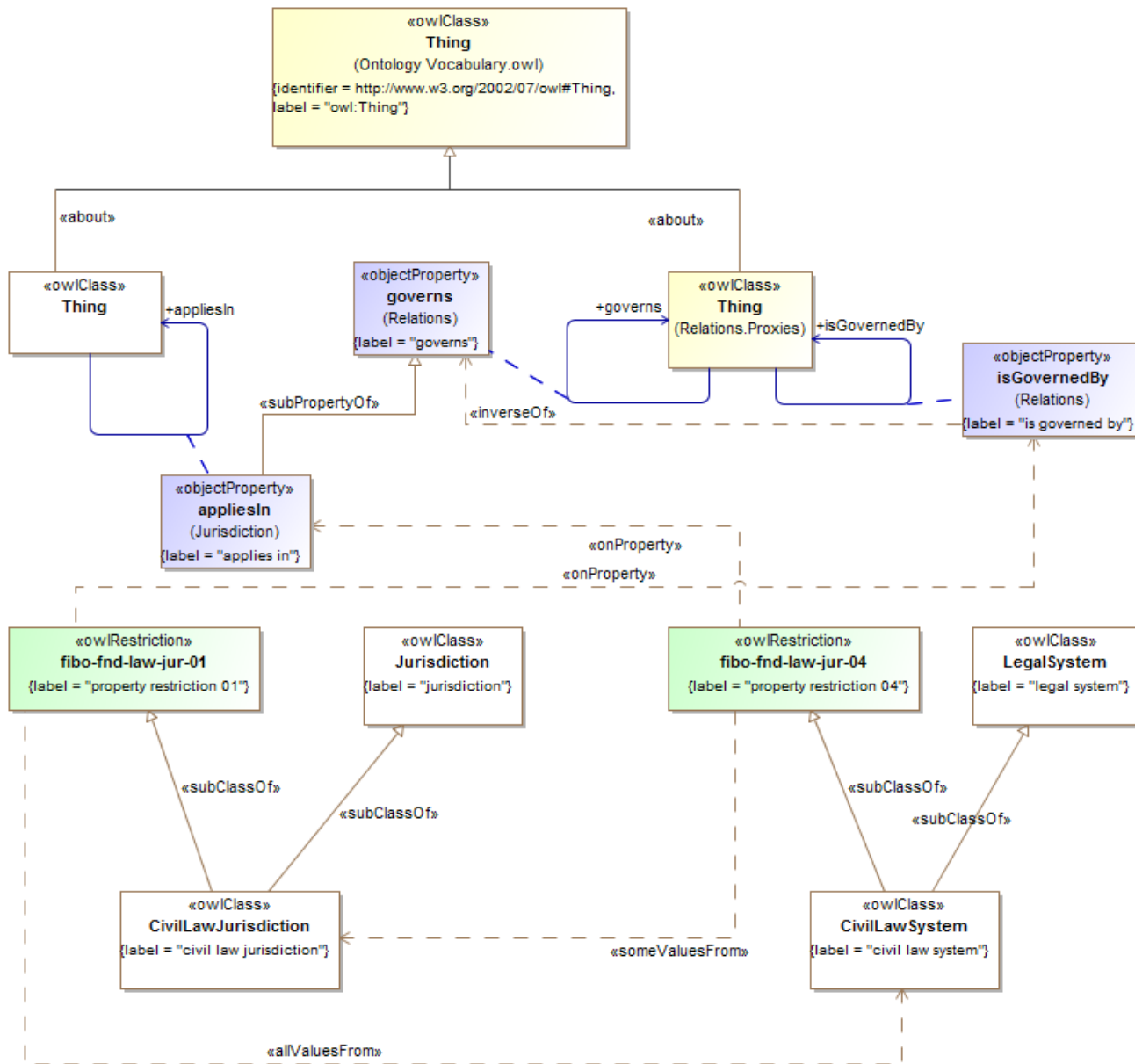


Figure 10.53 Civil Law Jurisdiction

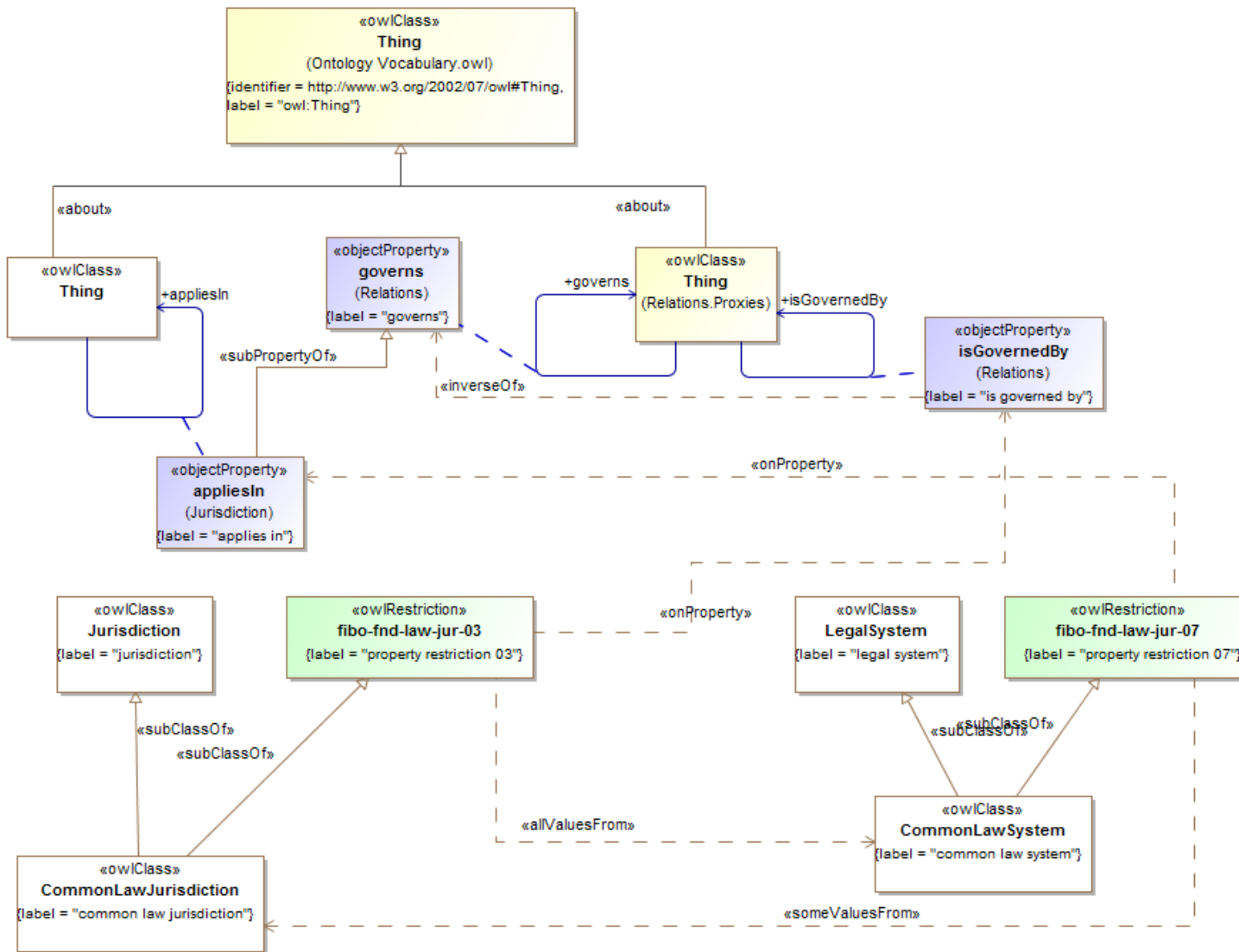


Figure 10.54 Common Law Jurisdiction

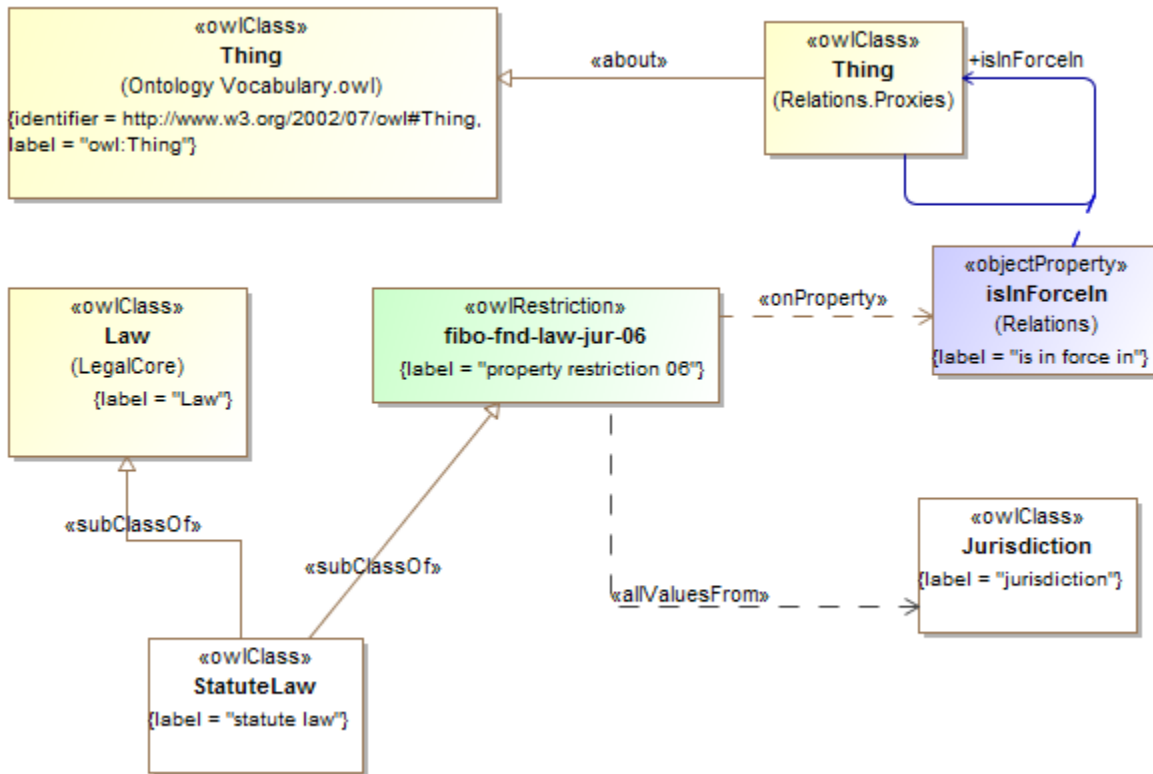


Figure 10.55 Statute Law

Table 10-63. Jurisdiction Ontology Metadata

Metadata Term	Value
sm:filename	Jurisdiction Ontology
sm:fileAbbreviation	fibo-fnd-law-jur

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Law/Jurisdiction/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/

Table 10-64. Jurisdiction Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
appliesIn	Legal system	applies in	indicates the jurisdiction in which a particular legal system applies		governs		jurisdiction		Relationship Property			
StatuteLaw	statute law		written law (as opposed to oral or customary law) set down by a legislature or by a legislator (in the case of an absolute monarchy).		Law property restriction 09				Class		Statutes may originate with national, state legislatures or local municipalities. Statutory laws are subordinate to the higher constitutional laws of the land.	http://en.wikipedia.org/wiki/Statute_law
fibo-fnd-law-jur-09	property restriction 09		Set of things with property "is in force in" only "jurisdiction"						Property Restriction			
LegalSystem	legal system		Legal regimen of a		property restriction 03				Class	This is a Mediating Thing, that is	The contemporary legal systems of the world are	http://www.businessdictionary-

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			country consisting of (1) a written or oral constitution, (2) primary legislation (statutes) enacted by the legislative body established by the constitution, (3) subsidiary legislation (bylaws) made by person or bodies authorized by the primary legislation to do so, (4) customs applied by the courts on the basis of traditional practices, and (5) principles or practices of civil, common, Roman, or other code of law.		property restriction 04					some context in which things have their meaning and existence - in this case, laws and the interpretation thereof by courts.	generally based on one of three basic systems: civil law, common law, and religious law, or combinations of these. However, the legal system of each country is shaped by its unique history and so incorporates individual variations.	ary.com/definition/legal-system.html
fibo-fnd-law-jur-03	property restriction 03		Set of things with property "applies in" only "jurisdiction"						Property Restriction			
fibo-fnd-law-jur-04	property restriction 04		Set of things with property "is governed by" only "governmental constitution"						Property Restriction			
Jurisdiction	jurisdiction		the limits or territory within which authority may be exercised; the power, right, or authority to interpret and apply the law		property restriction 02 property restriction 01				Class			Merriam-Webster Online Dictionary
fibo-fnd-law-jur-01	property restriction 01		Set of things with property "has reach" some "geopolitical entity"						Property Restriction			
fibo-fnd-law-jur-02	property restriction 02		Set of things with property "is governed by" only "legal system"						Property Restriction			
hasReach	jurisdiction	has reach	indicates the geopolitical unit (country, federal province or municipality) or geophysical extent in which the jurisdiction has effect				location		Relationship Property			
Com-	common		Common law, also		legal system				Class		A jurisdiction	http://en.wikipe

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
monLawSystem	law system		known as case law or precedent, is law developed by judges through decisions of courts and similar tribunals		property restriction 06						<p>which is based in Common Law will also have alongside a legislature that passes statutes.</p> <p>By contrast, civil law (codified/continental law) is set on statutes adopted through the legislative/parliamentary process and/or regulations issued by the executive branch on base of the parliamentary statutes. A common law system is a legal system that gives great potential precedential weight to common law, on the principle that it is unfair to treat similar facts differently on different occasions. The body of precedent is called common law and it binds future decisions. In cases where the parties disagree on what the law is, a common law court looks to past precedential decisions of relevant courts. If a similar dispute has been resolved in the past, the</p>	dia.org/wiki/Common_law

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											court is bound to follow the reasoning used in the prior decision (this principle is known as stare decisis). If, however, the court finds that the current dispute is fundamentally distinct from all previous cases (called a matter of first impression), judges have the authority and duty to make law by creating precedent. Thereafter, the new decision becomes precedent, and will bind future courts.	
fibo-fnd-law-jur-06	property restriction 06		Set of things with property "is in force in" some "jurisdiction"						Property Restriction			
CommonLawJurisdiction	common law jurisdiction		a jurisdiction based on common law		property restriction 08 jurisdiction				Class			
fibo-fnd-law-jur-08	property restriction 08		Set of things with property "is governed by" only "common law system"						Property Restriction			
CivilLawSystem	civil law system		a legal system originating in Europe, intellectualized within the framework of late Roman law, and whose most prevalent feature is that its core principles are codified into a referable system which serves as the primary source of law		property restriction 05 legal system				Class		This can be contrasted with common law systems whose intellectual framework comes from judge-made decisional law which gives precedential authority to prior court decisions on the	http://en.wikipedia.org/wiki/Civil_law_(legal_system)

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											principle that it is unfair to treat similar facts differently on different occasions (doctrine of judicial precedent).	
fibo-fnd-law-jur-05	property restriction 05		Set of things with property "applies in" some "civil law jurisdiction"						Property Restriction			
CivilLawJurisdiction	civil law jurisdiction		a civil law jurisdiction		property restriction 07 jurisdiction				Class			
fibo-fnd-law-jur-07	property restriction 07		Set of things with property "is governed by" only "civil law system"						Property Restriction			

10.10.3 Ontology: Legal Capacity

This ontology defines high-level legal concepts, especially those related to legal responsibilities, for use in other FIBO ontology elements. The ontology defines things which are conferred upon some entity by some legal instrument, and elaborates this into a number of specific capacities, responsibilities and powers, each of which forms the basis for many of the concepts used elsewhere in FIBO in defining legal personhood, executive powers and the like.

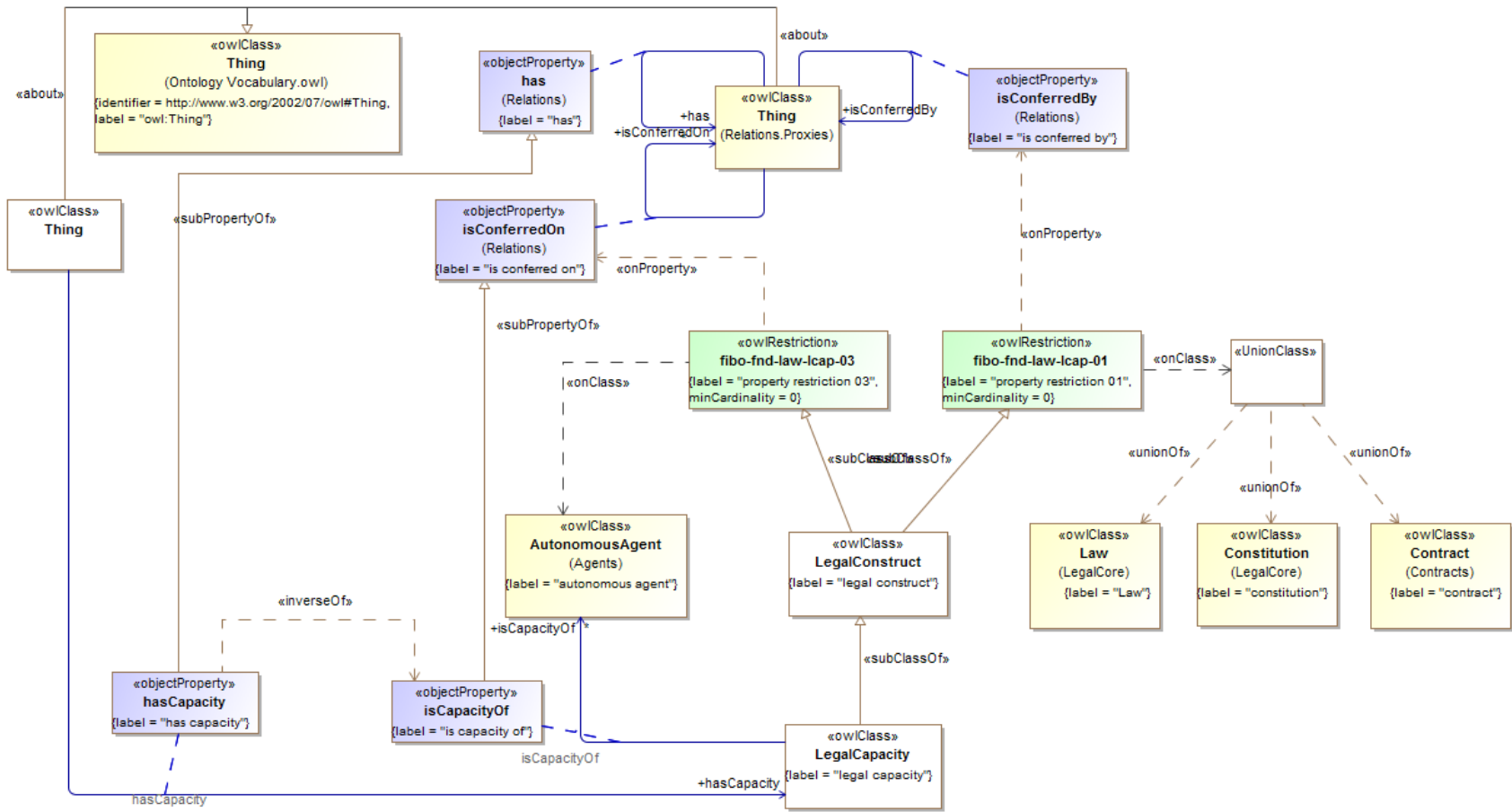


Figure 10.56 Legal Capacity Concepts

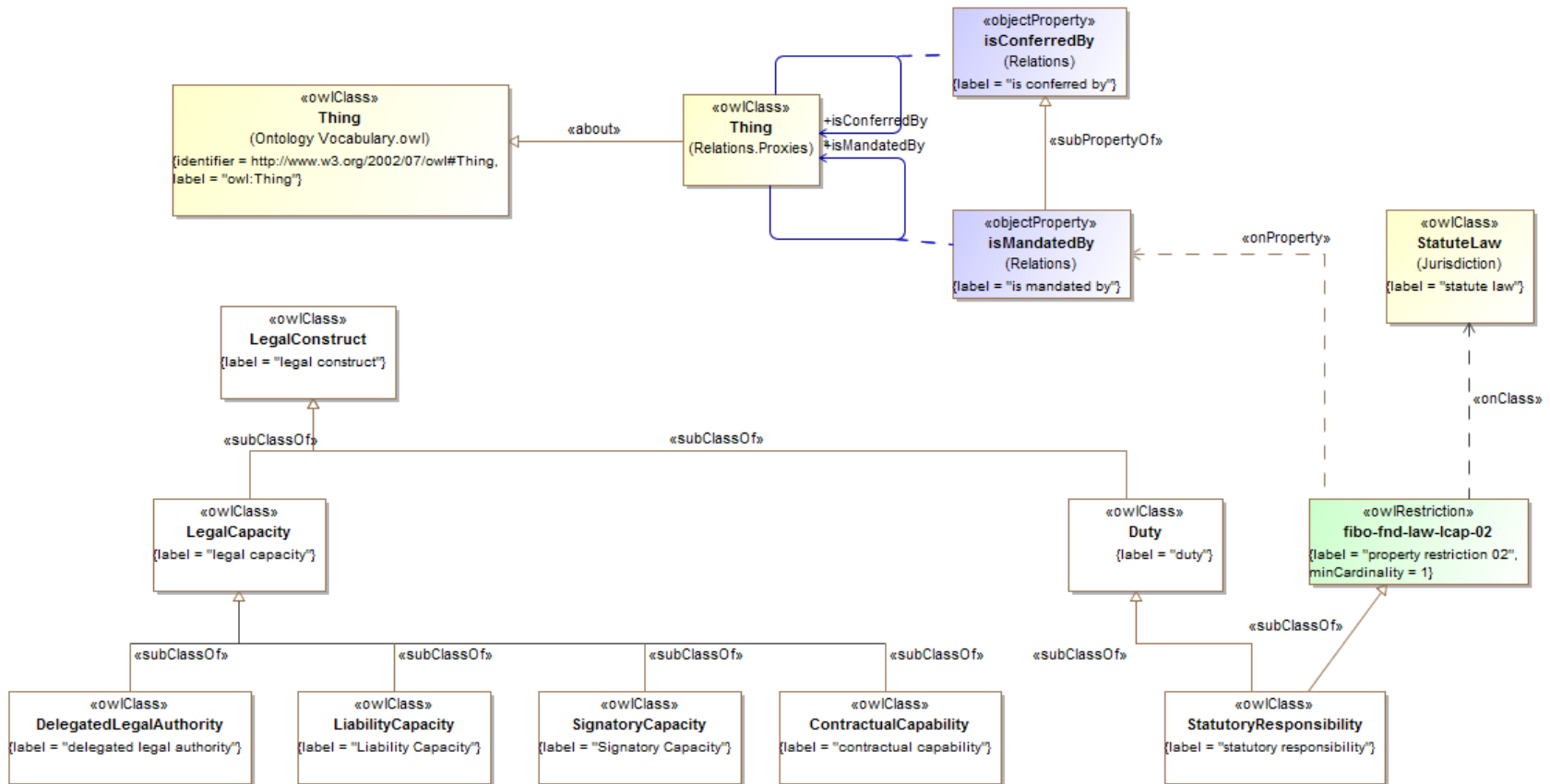


Figure 10.57 Legal Capacity Types

Table 10-65. Legal Capacity Ontology Metadata

Metadata Term	Value
sm:filename	Legal Capacity Ontology

Metadata Term	Value
sm:fileAbbreviation	fibonacci-fnd-law-lcap
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Law/LegalCapacity/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/

Metadata Term	Value
	FIBO/FND/Agreements/Agreements/ http://www.omg.org/spec/EDMC- FIBO/FND/Agreements/Contracts/

Table 10-66. Legal Capacity Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
hasCapacity	Autonomous agent	has capacity	identifies an individual or organization that has some capability to carry out certain actions, or has certain rights or obligations		has		legal capacity	is capacity of	Relationship Property			
StatutoryResponsibility	statutory responsibility		An obligation which is defined under some body of law (statute).		duty property restriction 03				Class			
fibo-fnd-law-lcap-03	property restriction 03		Set of things that must have property "is mandated by" at least 1 taken from "statute law"						Property Restriction			
SignatoryCapacity	Signatory Capacity		The capacity of some natural person to sign agreements on the part of some organization or legal person		legal capacity				Class			
LiabilityCapacity	Liability Capacity		The ability to be sued at law		legal capacity				Class	Note that for the purposes of this model, this is distinct from culpability (the ability to commit criminal acts). That would be a separate and analogous term but with grounding in criminal rather than civil law.		

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
LegalConstruct	legal construct		Something which is conferred by way of law or contract, such as a right.		property restriction 02 property restriction 01				Class	Obligations are an aspect of this category of thing, as are rights.		
fibo-fnd-law-lcap-01	property restriction 01		Set of things that may have property "is conferred on" taken from "autonomous agent"						Property Restriction			
fibo-fnd-law-lcap-02	property restriction 02		Set of things that may have property "is conferred by" taken from "logical union 01"						Property Restriction			
LegalCapacity	legal capacity		The capacity to carry out certain actions or to have certain rights.		legal construct				Class	suggested definition only		
isCapacityOf	legal capacity	is capacity of	identifies an individual or organization on which a given legal capacity has been conferred		is conferred on		autonomous agent	has capacity	Relationship Property			
Duty	duty		Some obligation which exists and is imposed on some individual.		legal construct				Class	This can also be thought of as an obligation - not in the sense in which an obligation and a right are the converse aspects of one another, but in and of itself, independent of the perspective from which it is considered. Examples include statutory obligations, reporting obligations and so on.		
Delegated-LegalAuthority	delegated legal authority		institutionalized and legal power inherent in a particular job, function, or position that is meant to enable its holder to successfully		legal capacity				Class		This is always accompanied by an equal responsibility for one's actions or a	http://www.businessdictionary.com/definition-

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			carry out his or her responsibilities, where such power has been delegated through some formal means								failure to act.	tion/authority.html
ContractualCapability	contractual capability		The capacity to enter into legally binding contracts.		legal capacity				Class	This is the capacity which defines Contractually Capable Entity (sometimes labeled as 'Legal Entity') as distinct from 'Legal Person'. In the latter case the liabilities incurred in the contract accrue also to the Legal Person. In the case of contractual capability, the entity has the authority to enter into contracts, whether or not the liabilities accrue to that same entity (which they do if it is also a Legal Person). For Legal Entities which are not Legal Persons, the liability unwinds to some legal person within the structure of the entity, for example a General Partner or a Trustee.		

10.11 Module: Ownership and Control

Table 10-67. Ownership and Control Module Metadata

Metadata Term	Value
sm:moduleName	Ownership and Control
sm:moduleAbbreviation	FIBO-FND-OAC
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies defining the meanings of ownership, asset and owner, and of types of control such as de jure and de facto control. These form the basis of ownership and control relationship hierarchies as well as what it means to own or to control something.

10.11.1 Ontology: Control

This ontology defines high-level, control-related concepts for use in other FIBO ontology elements. The ontology covers basic concepts around control, along with a distinction between de jure and de facto control, the former being derived with reference to terms in the LegalCapacity ontology.

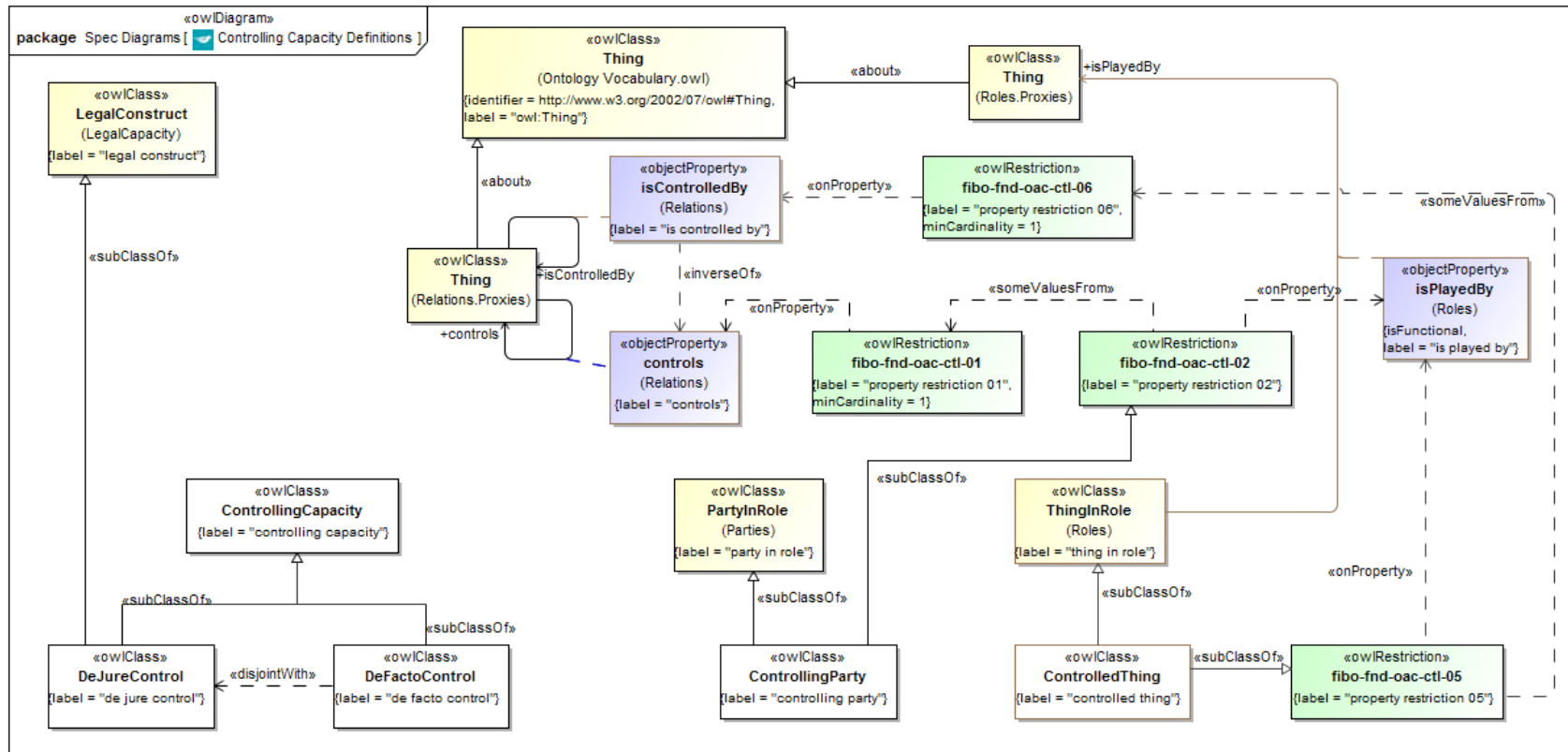


Figure 10.58 Controlling Capacity Definitions

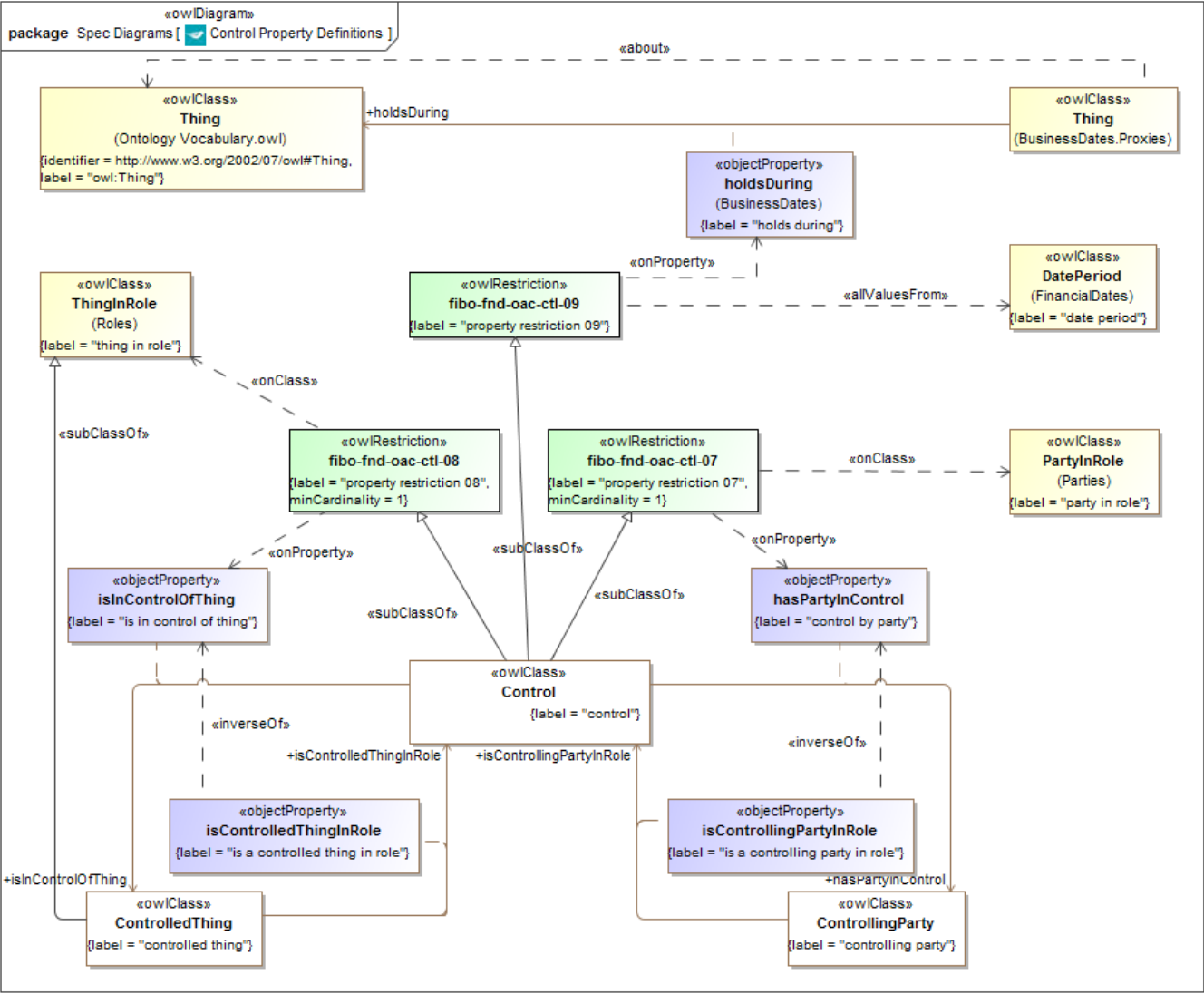


Figure 10.59 Control Property Definitions

Table 10-68. Control Ontology Metadata

Metadata Term	Value
sm:filename	Control Ontology
sm:fileAbbreviation	fibonacci-fnd-oac-ctl
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Control/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/OwnershipAndControl/Control/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/BusinessDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/

Table 10-69. Control Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
DeJureControl	de jure control		control that is formalized in law, or codified in some legal instrument		legal construct control	de facto control			Class			
DeFactoControl	de facto control		control that is understood, due to condition or situation treated as standard or official,		control	de jure control			Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			even if not explicitly stated (or actually standardized)									
ControllingParty	controlling party		Party which exercises some form of control in some context.		property restriction 02 party in role				Class	At this level of abstraction it is not defined whether the control is some degree of controlling interest, or some level of actual control (asserted or calculated) in some entity.		
fibofnd-oac-ctl-02	property restriction 02		Set of things with property "has role" some "property restriction 01"						Property Restriction			
fibofnd-oac-ctl-01	property restriction 01		Set of things that must have property "controls" at least 1						Property Restriction			
ControllingCapacity	Controlling capacity		the possession, direct or indirect, of the power to direct or cause the direction of the thing which is controlled.						Class			
Control	control		the possession by a party, direct or indirect, of the power to direct or cause the direction of the management and policies of a thing, whether through the ownership of voting shares, by contract, or otherwise		property restriction 08 property restriction 07 property restriction 09				Class			
ControlledThing	controlled thing		thing over which some party exercises some form of control in some context		thing in role property restriction 05				Class			
hasPartyInControl	control	control by party	indicates the party in a control relationship where a party controls a thing				controlling party	is a controlling party in	Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
								role				
isInControlOfThing	control	is in control of thing	Indicates the thing in a control relationship where a party controls a thing				controlled thing	is a controlled thing in role	Relationship Property			
isControlledThingInRole	controlled thing	is a controlled thing in role	indicates the context of control in which the thing plays the role of being controlled				control	Is in control of thing	Relationship Property			
isControllingPartyInRole	controlling party	is a controlling party in role	indicates the context of control in which the party plays the role of controlling some thing				control	control by party	Relationship Property			
Restrictions	fibonfd-oac-ctl-05	property restriction 05	Set of things that must have property "is played by" must be some taken from "property restriction 06"									
Restrictions	fibonfd-oac-ctl-06	property restriction 06	Set of things that must have property "is controlled by" at least 1									
Restrictions	fibonfd-oac-ctl-07	property restriction 07	Set of things that must have property "control by party" at least 1 taken from "party in role"									
Restrictions	fibonfd-oac-ctl-08	property restriction 08	Set of things that must have property "control of thing" at least 1 taken from "thing in role"									
Restrictions	fibonfd-oac-ctl-09	property restriction 09	Set of things that must have property "holds during" may only be taken from "date period"									

10.11.2 Ontology: Ownership

This ontology defines high-level, ownership-related concepts for use in other FIBO ontology elements. These include the concept of owner, asset and ownership along with relationships between them whereby an asset is something owned by some owner.

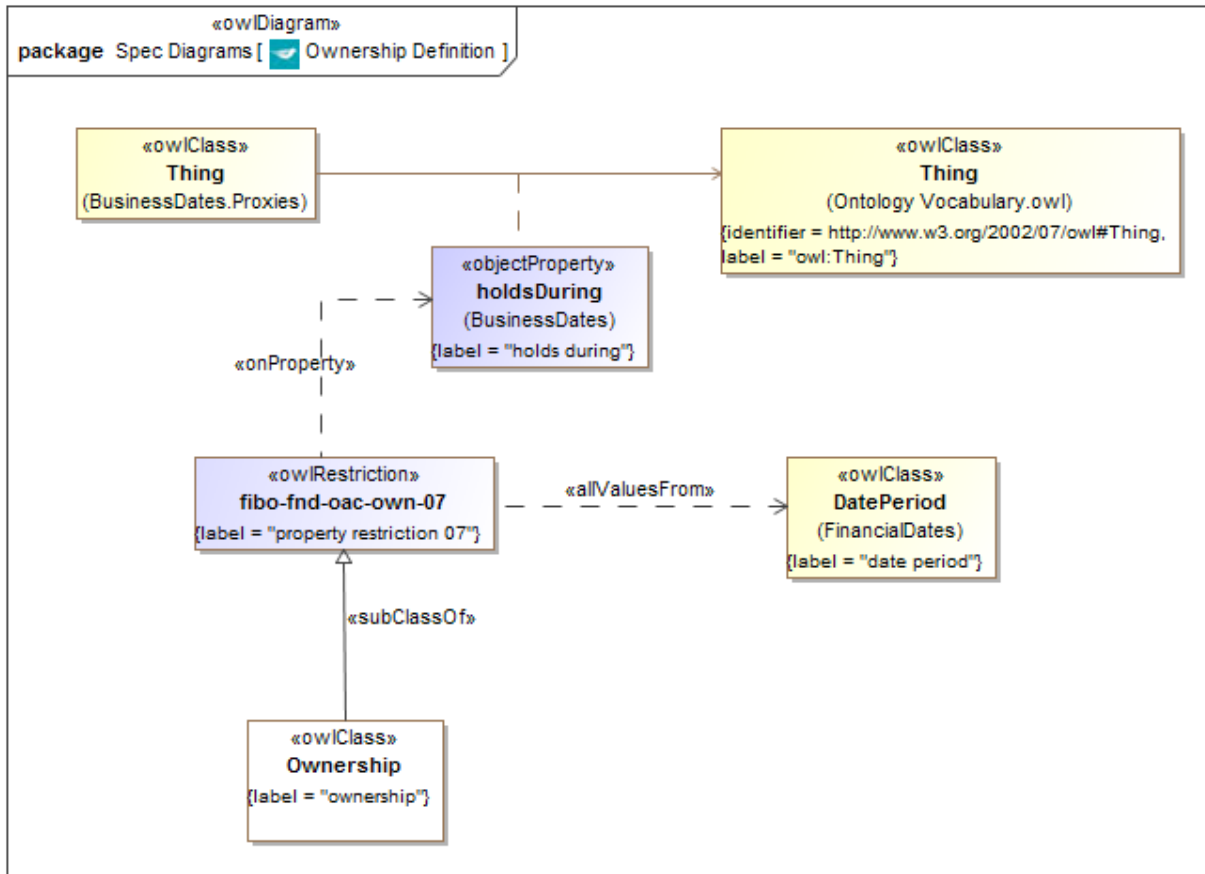


Figure 10.60 Ownership Definition

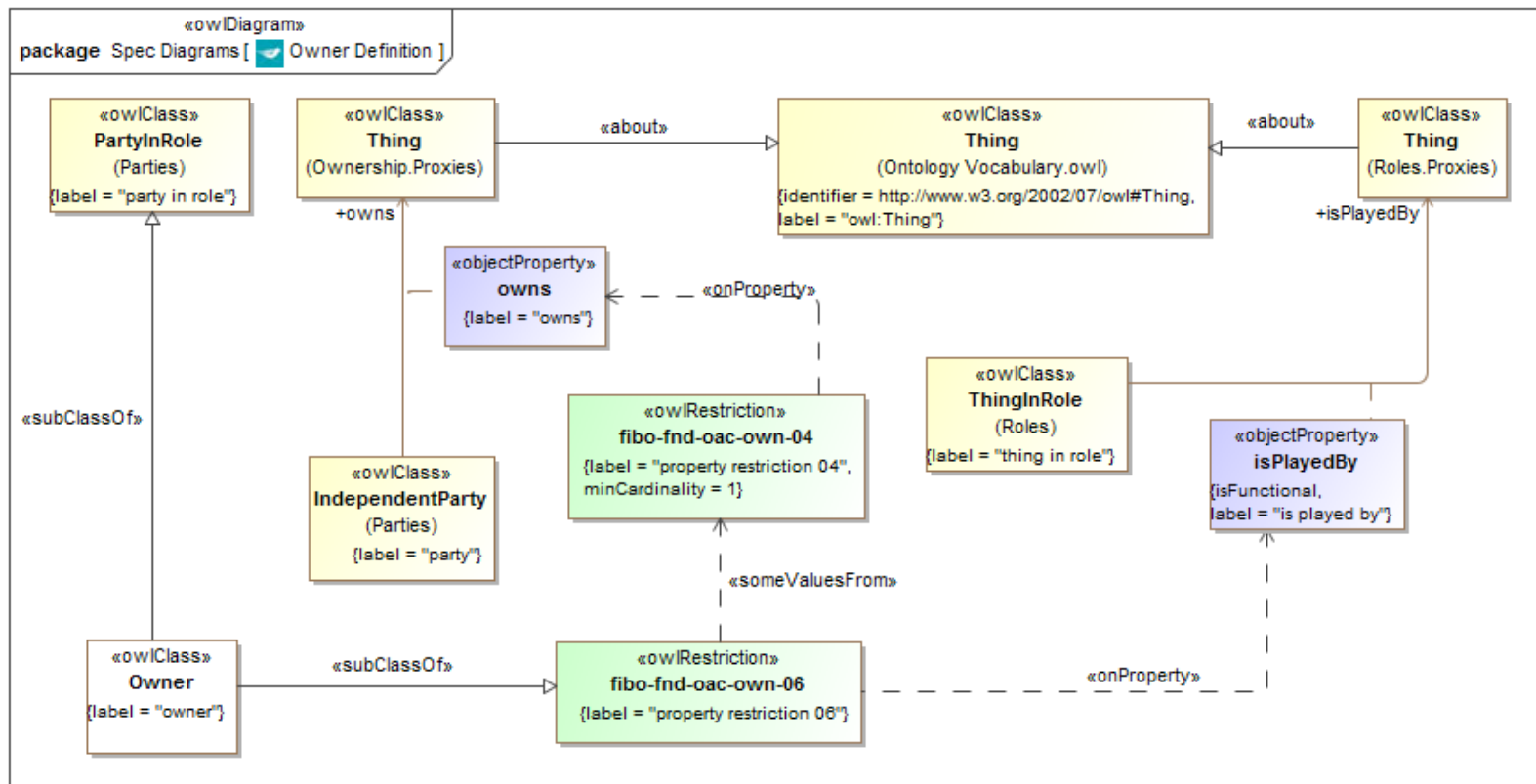


Figure 10.61 Owner Definition

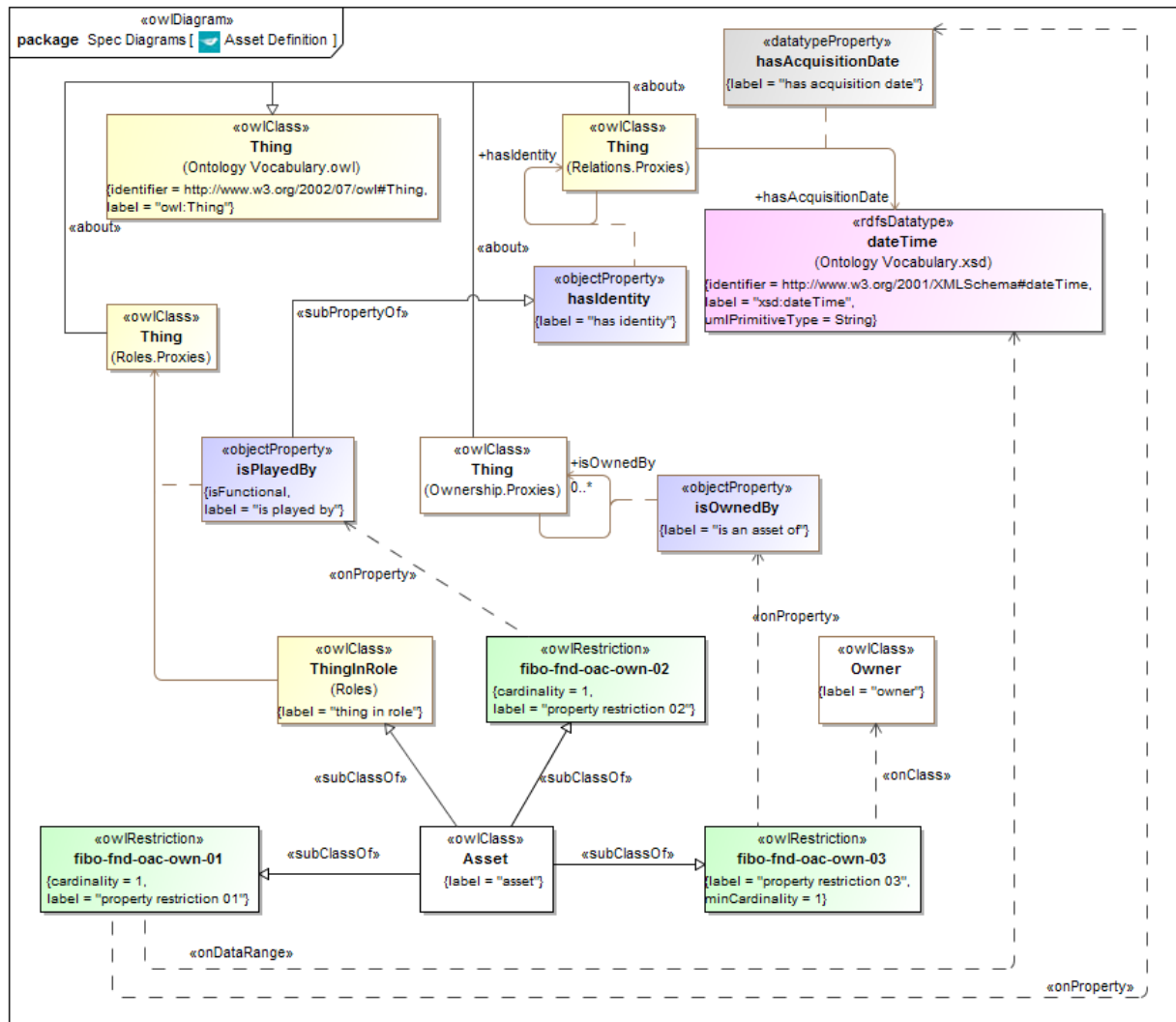


Figure 10.62 Asset Definition

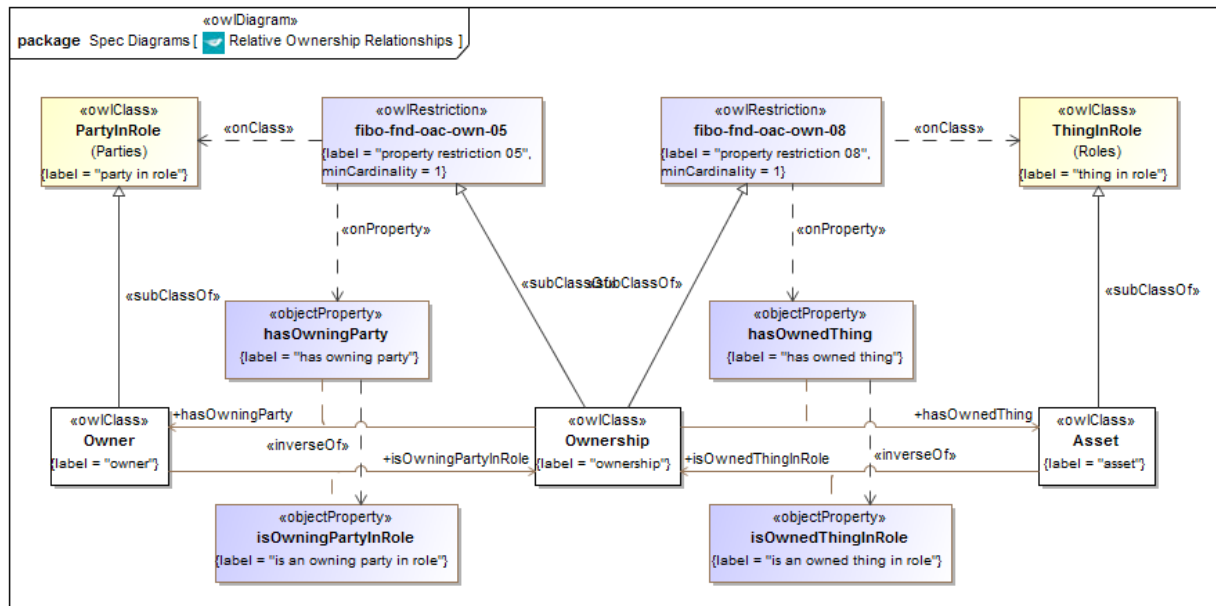


Figure 10.63 Relative Ownership Relations

Table 10-70 Ownership Ontology Metadata

Metadata Term	Value
<code>sm:filename</code>	Ownership Ontology
<code>sm:fileAbbreviation</code>	fibonacci-fnd-oac-own
<code>OntologyIRI</code>	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Ownership/
<code>owl:versionIRI</code>	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/OwnershipAndControl/Ownership/
<code>sm:dependsOn</code>	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Metadata Term	Value
	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/

Table 10-71. Ownership Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
owns	independent party	owns	to have (something) as one's own, possess				anything	is owned by	Relationship Property			
isOwnedBy	asset	is an asset of	identifies the party that owns the asset				owner		Relationship Property			
Ownership	ownership		Ownership is the context in which some Party is said to own some Independent Thing. The Party is defined as such due to its		property restriction 05	property restriction 07			Class			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			being the owning party to that Thing.		property restriction 08							
fibonacci-own-05	property restriction 05		Setoff things that must have property "has owning party" at least 1 taken from "party in role"						Property Restriction			
Owner	owner		A party in the ownership role; one that owns something. The thing owned is an Asset to that Party.		party in role property restriction 06				Class			
fibonacci-own-06	property restriction 06		Set of things with property "has role" some "property restriction 04"						Property Restriction			
fibonacci-own-04	property restriction 04		Set of things that must have property "owns" at least 1						Property Restriction			
Asset	asset		A thing held by some party and having some value.		property restriction 02 property restriction 03 property restriction 01				Class			
fibonacci-own-03	property restriction 03		Set of things that must have property "is asset of" at least 1 taken from "owner"						Property Restriction			
fibonacci-own-02	property restriction 02		Set of things that must have property "is played by" exactly 1				is played by		Property Restriction			
fibonacci-own-01	property restriction 01		Set of things that must have property "has acquisition date" exactly 1 taken from "dateTime"						Property Restriction			
is-OwnedThingInRole	asset	is an owned thing in role	indicates the context of ownership in which the thing plays the role of an asset				ownership	has owned thing	Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
isOwn- ingPartyIn- Role	owner	is an owning party in role	indicates the context of ownership in which the party plays the role of owner				owner- ship	has owning party	Relationship Property			
hasOwn- ingParty	ownership	has own- ing party	indicates the thing in an ownership relationship where a party owns a thing				owner	is an owning party in role	Relationship Property			
has- OwnedThin g	ownership	has own- ed thing	indicates the party in an ownership relationship where a party owns a thing				asset	is an owned thing in role	Relationship Property			
fibo-fnd- oac-own-07	property restriction 07		Set of things that must have property "holdsDuring" all values from "date period"						Property Restriction			
fibo-fnd- oac-own-08	property restriction 08		Setoff things that must have property "has owned thing" at least 1 taken from "thing in role"						Property Restriction			

10.11.3 Ontology: OwnershipAndControl

This ontology defines high-level, ownership-related concepts for use in other FIBO ontology elements. These include the concept of owner, asset and ownership along with relationships between them whereby an asset is some thing owned by some owner.

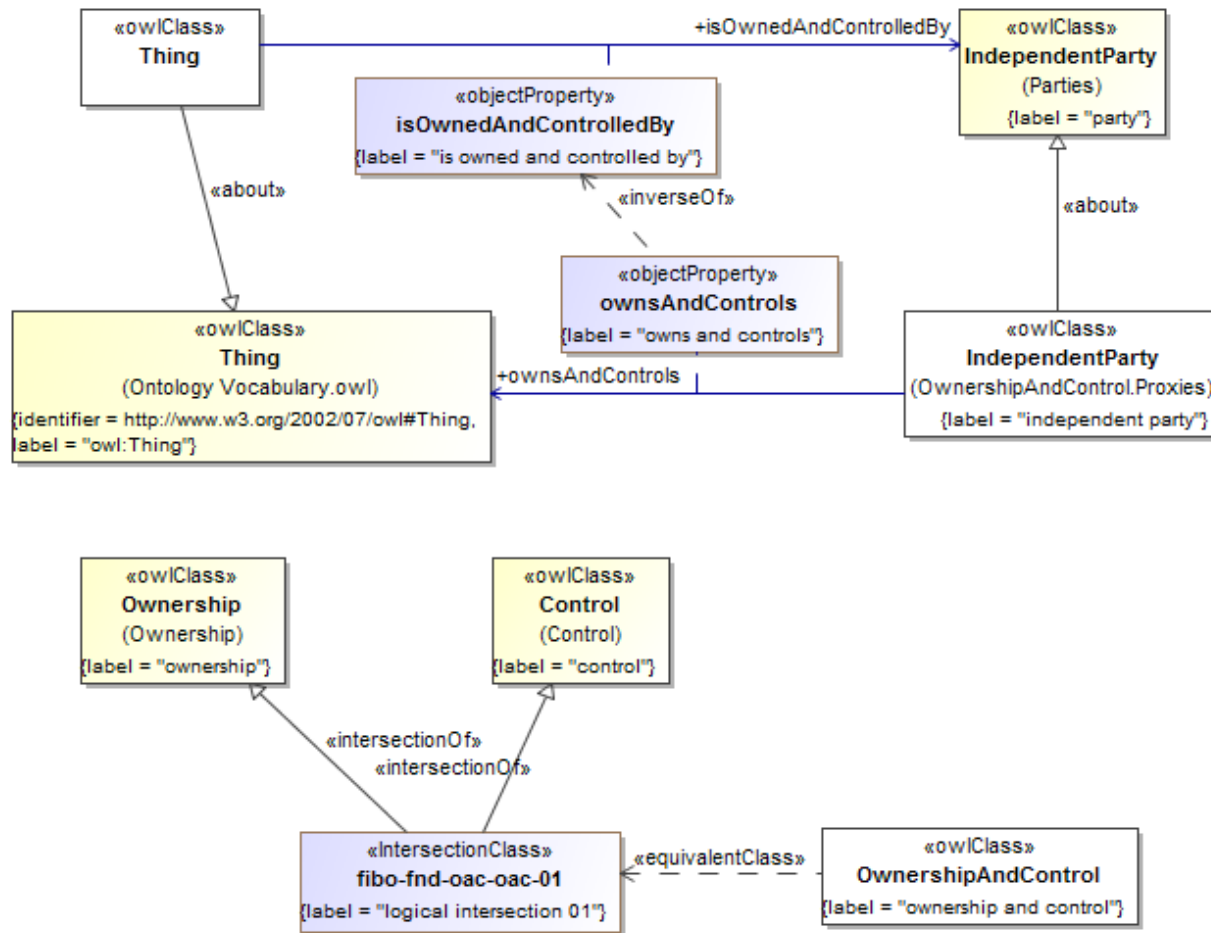


Figure 90.64 Ownership and Control

Table 10-72. OwnershipAndControl Ontology Metadata

Metadata Term	Value
sm:filename	OwnershipAndControl
sm:fileAbbreviation	fibonacci-fnd-oac-oac
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/OwnershipAndControl/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/OwnershipAndControl/OwnershipAndControl/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/

Table 10-73. Ownership and Control Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Independent-Party	[independent party]		Proxy for IndependentParty	Independent-Party								
Class	OwnershipAndControl	[ownership and control]		The intersection of ownership and control reflects the unique case where an Independent Party both owns and controls another Independent Thing.									
Relationship Property	isOwnedAndControlledBy	anything	[is owned and controlled by]	a relationship between some thing and the party that owns, influences, manages and di-			independent party						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				rects it									
Relationship Property	ownsAndControls	independent party	[owns and controls]	directs and exercises authoritative or dominating influence over some thing that is also owned			anything	is- OwnedAndControlledBy		basic rule: if x controls y and x owns y then x owns and controls y SWRL rule: controls(?x, ?y), owns(?x, ?y) -> ownsAndControls(?x, ?y)			
Intersection Class	fibonfnd-oac-oac-01	logical intersection 01						ownership control					

10.12 Module: Accounting

Table 10-74. Accounting Module Metadata

Metadata Term	Value
sm:moduleName	Accounting
sm:moduleAbbreviation	FIBO-FND-ACC
sm:moduleVersion	1.0
sm:moduleAbstract	This module contains ontologies of general accounting concepts including debt, equity, interest and so on, as well as currency amounts.

10.12.1 Ontology: Accounting Equity

This ontology defines equity-related concepts for use in defining other FIBO ontology elements. These are based on basic accounting principles as they relate to equity, debt, assets and liabilities of a firm. Equity forms the basis for ownership of certain forms of corporate body.

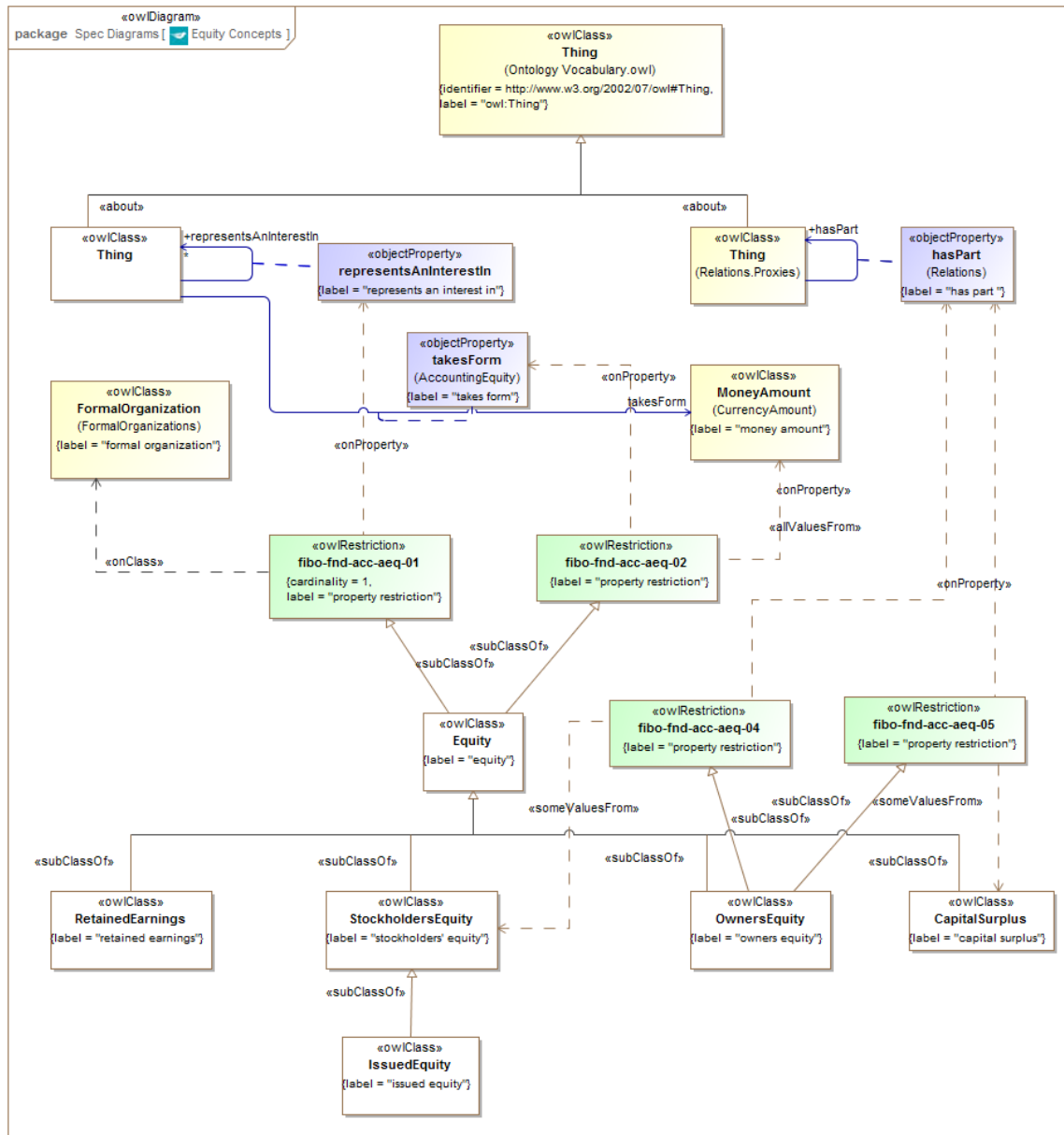


Figure 10.65 Equity Concepts

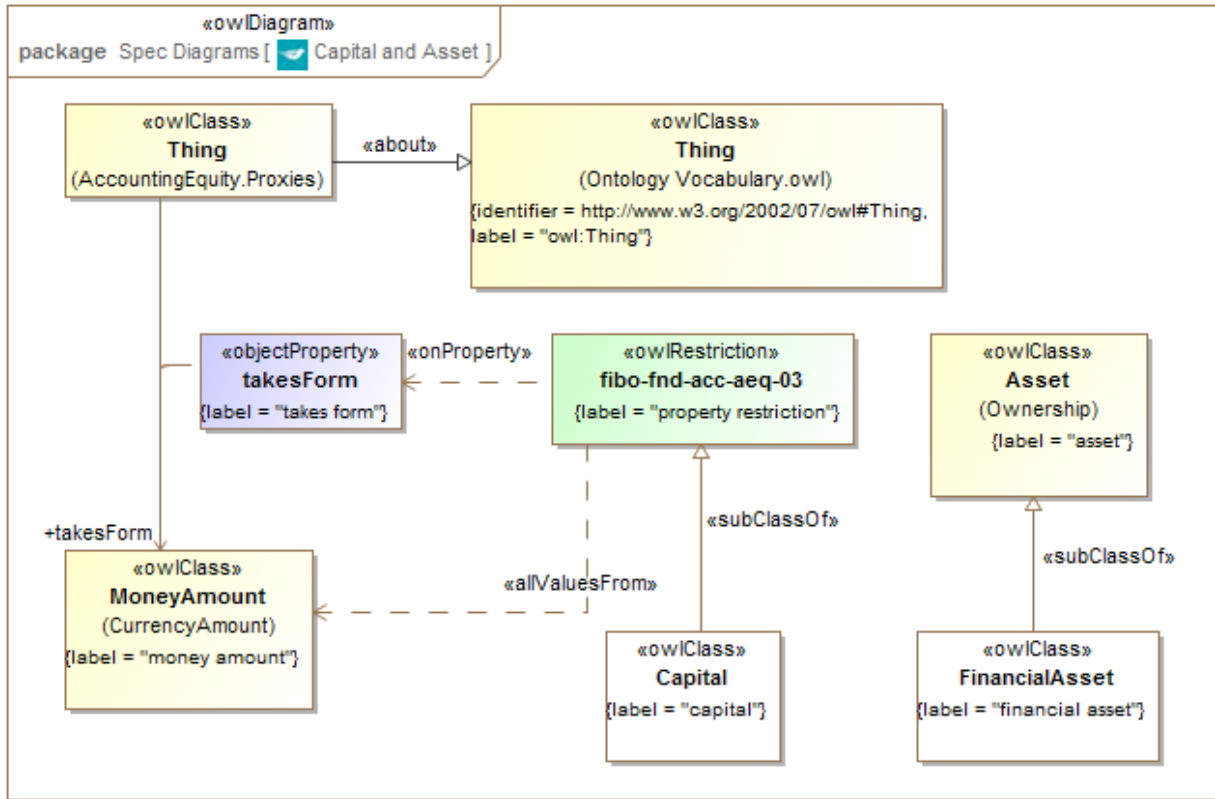


Figure 10.66 Capital and Asset

Table 10-75. Accounting Equity Ontology Metadata

Metadata Term	Value
sm:filename	Accounting Equity Ontology
sm:fileAbbreviation	fibo-fnd-acc-aeq
OntologyIRI	http://www.omg.org/spec/EDMC-

Metadata Term	Value
	FIBO/FND/Accounting/AccountingEquity/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Accounting/AccountingEquity/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/ http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/ http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/ http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/ http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Ownership/ http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/

Table 10-76. Accounting Equity Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
representsAnInterestIn	equity	represents an interest in	Equity always represents an interest in some business organization. This is the organization, company or				anything		Relationship Property			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
			venture in which the holder of the equity has a stake in by virtue of holding that equity									
Stockholder holder-sEquity	stockholders' equity		equity held in a concern by stockholders		equity				Class	When total assets are greater than total liabilities, stockholders have a positive equity (positive book value). Conversely, when total liabilities are greater than total assets, stockholders have a negative stockholders equity (negative book value, also sometimes called stockholders deficit. paid in capital, donated capital, and retained earnings less the liabilities of a corporation (Barron's)		
Re-tainedEarnings	retained earnings		the portion of net income which is retained by the corporation rather than distributed to its owners as dividends.		equity				Class		If the corporation takes a loss, then that loss is retained and called variously retained losses, accumulated losses or accumulated deficit. Retained earnings and losses are cumulative from	http://en.wikipedia.org/wiki/Retained_earnings

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											year to year with losses offsetting earnings.	
OwnersEquity	owners equity		equity owned in some concern as recorded on the books of that concern		property restriction 05 property restriction 04 equity				Class			
fibofndacc-aeq-05	property restriction 05		Set of things with property "has part" some "capital surplus"						Property Restriction			
fibofndacc-aeq-04	property restriction 04		Set of things with property "has part" some "stockholders equity"						Property Restriction			
IssuedEquity	issued equity		externally-held stockholders equity that may be transferred from one party to another		stockholders equity				Class			
FinancialAsset	financial asset		An asset consisting of one or more financial instruments, treated as an asset		asset				Class			
Equity	equity		the value of an ownership interest in property, including shareholders equity in a business		property restriction 01 property restriction 02				Class			http://en.wikipedia.org/wiki/Equity
fibofndacc-aeq-02	property restriction 02		Set of things with property "takes form" only "money amount"						Property Restriction			
fibofndacc-aeq-01	property restriction 01		Set of things that must have property "represents an interest in" exactly 1 taken from "formal organization"						Property Restriction			
CapitalSurplus	capital surplus		Capital surplus is that amount which a firm raises in excess of the par value (nominal value) of the shares (common stock).		equity				Class		Capital surplus is a term that frequently appears as a balance sheet item as a component of shareholders equity.	http://en.wikipedia.org/wiki/Additional_paid_in_capital

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
Capital	capital		financial capital, which represents obligations, and is liquidated as money for trade, and owned by legal entities		property restriction 03				Class		Financial capital is in the form of capital assets, traded in financial markets. Its market value is not based on the historical accumulation of money invested but on the perception by the market of its expected revenues and of the risk entailed.	http://en.wikipedia.org/wiki/Capital_(economics)
fibo-fnd-acc-aeq-03	property restriction 03		Set of things with property "takes form" only "money amount"						Property Restriction			
takesForm		takes form	the form taken by some amount of money defined according to its purpose, such as capital or equity				money amount		Relationship Property			

10.12.2 Ontology: Currency Amount

This ontology defines monetary amount related concepts for use in defining other FIBO ontology elements. There are two distinct kinds of concepts that correspond to money and amounts: a concrete, actual amount of money, and the monetary measure of something denominated in some currency. These are dimensionally the same but whereas "money amount" is defined as an amount of money, "monetary amount" is an abstract monetary measure. This ontology also defines related terms such as currency.

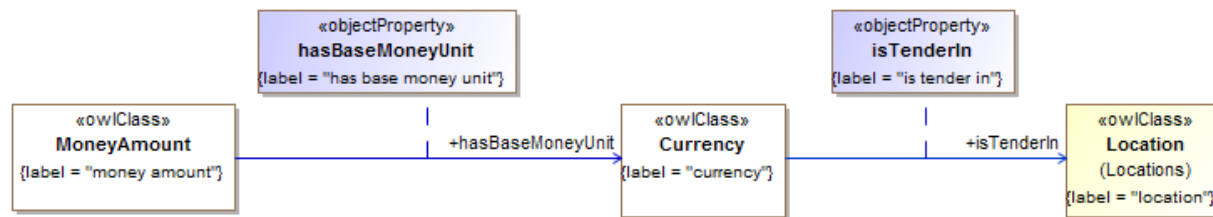


Figure 10.67 Currency Concepts

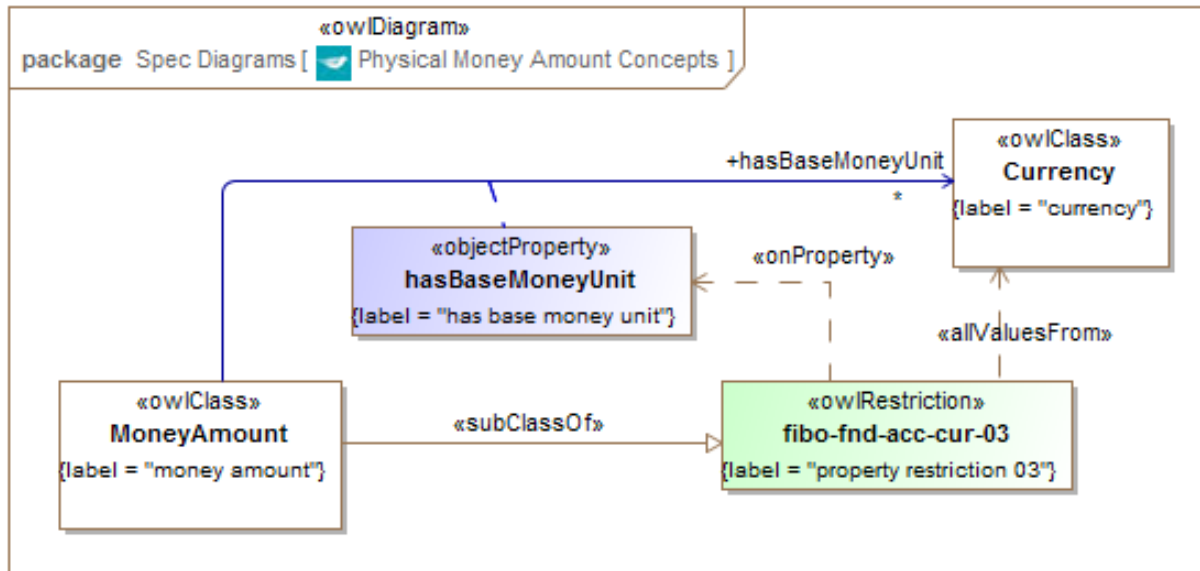


Figure 10.68 Physical Money Amount Concepts

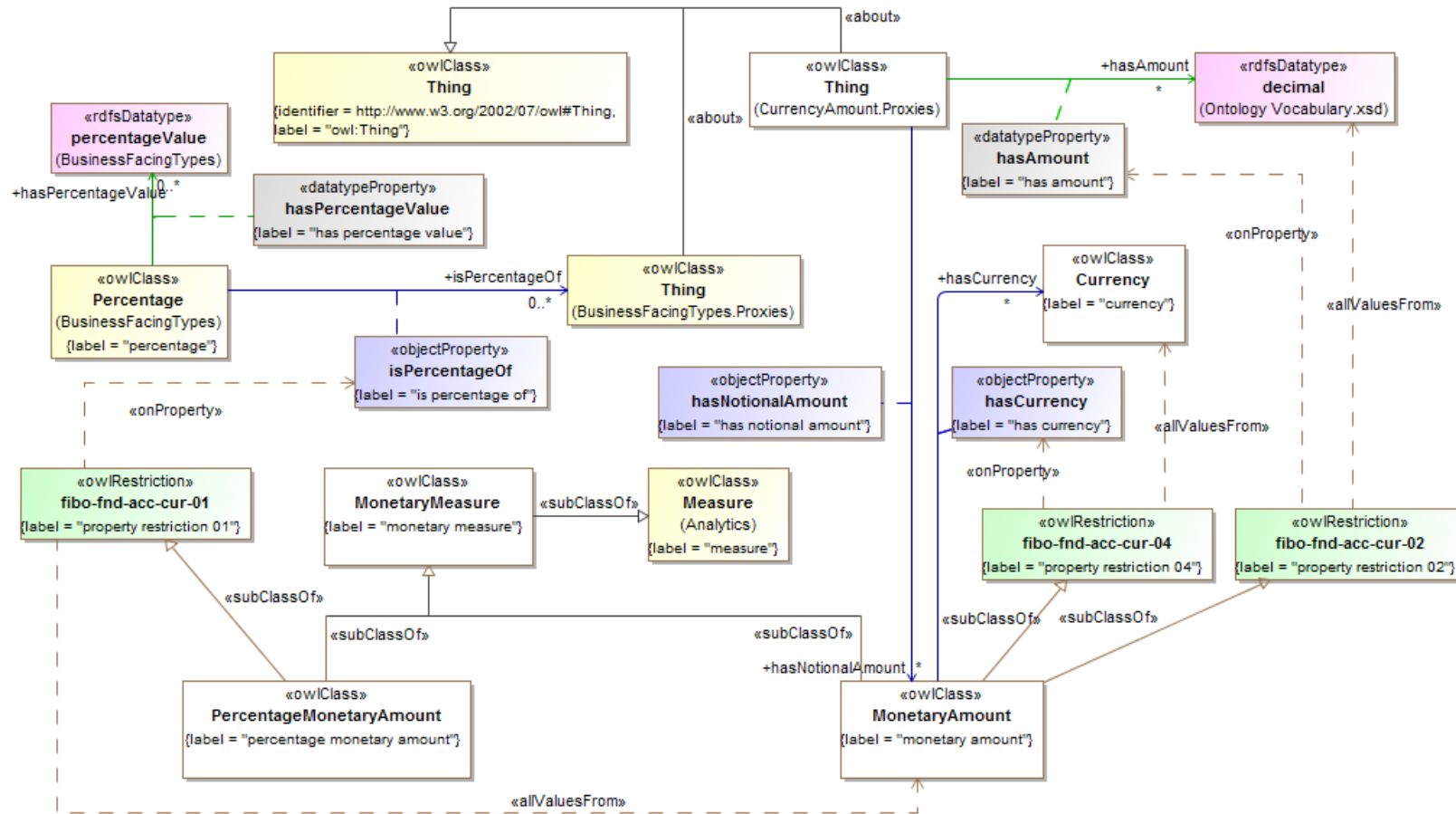


Figure 10.69 Monetary Amounts and Measures

Table 10-77. Currency Amount Ontology Metadata

Metadata Term	Value
sm:filename	Currency Amount Ontology
sm:fileAbbreviation	fibonacci-fnd-acc-cur

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Accounting/CurrencyAmount/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/

Table 10-78. Currency and Amount Details

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
hasNotionalAmount	anything	has notional amount	has a notional value expressed as some monetary amount, that is a number and a currency in which that number is denominated		has		monetary amount		Relationship Property		The domain for this property should be interpreted as being an abstraction which covers various forms of commitment, which may set out the existence of some notional amount of money, speci-	

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
											fied via this property. This is left unspecified for now, so that the property can also be defined directly as being a property of some contractual term which describes that commitment	
hasCurrency	monetary amount	has currency	the currency in which the monetary amount is defined		has		currency		Relationship Property			
hasBase-MoneyUnit	money amount	has base money unit	the currency in which the money amount is denominated		has		currency		Relationship Property			
hasAmount	anything	has amount	a total number or quantity				xsd:decimal		Simple Property	If the term 'Quantity' is added to these ontologies in the future then that must be made the domain of this property – moving the property to Analytics or to Quantities as necessary at that time	The domain for this property should be read as being the term 'Quantity' which is in the informative conceptual ontologies	
PercentageMonetaryAmount	Percentage Monetary Amount		A measure of some amount of money expressed as a percentage of some other amount, some notional amount or some concrete Money Amount.		property restricton 01 monetary measure				Class	This will have a relationship to what it is a percentage of. Alternatively and for some applications of this term, there may be an enumerated list of possible things it is a percentage of.		
fibofndacc-cur-01	property restriction		Set of things with property "is percentage of"						Property Restriction			

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
	01		may only be "monetary amount"									
MoneyAmount	money amount		A sum of money.		property restricton 04				Class	This is an actual sum of money, not the measure of a sum of money in monetary units, although it has the same basic properties (decimal number with a current unit). Update 14 June 2011: Renamed from "Monetary Amount" to "Money Amount" to make this perhaps clearer. This term here should not be the Referenceable Archetype used to denote monetary amounts as a measure. ACTION: Across the model, all references to "Money Amount" (which was called 'Monetary Amount' when these were entered), so be the abstract quantity "Monetary Amount".		
fibo-fnd-acc-cur-04	property restricton 04		Set of things with property "has currency" only "currency"						Property Restriction			
MonetaryMeasure	monetary measure		Some measure of some sum of money.		measure				Class	This may be a measure expressed in terms of decimal plus currency, or it may be a measure expressed in terms of a percentage		

Name	Type Of Thing	Property	Definition	Equivalent to	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Concept Type	Editorial Note	Explanatory Note	Definition Source
										amount with reference to some other monetary amount or to some Money Amount (actual amount of money).		
MonetaryAmount	monetary amount		the measure which is an amount of money specified in monetary units		monetary measure property restricton 02 property restricton 03				Class	This is an abstract concept, not to be confused with a sum of money (Money Amount).		
fibo-fnd-acc-cur-02	property restricton 02		Set of things with property "has amount" only "decimal"						Property Restriction			
fibo-fnd-acc-cur-03	property restricton 03		Set of things with property "has currency" only "currency"						Property Restriction			
Currency	currency		medium of exchange value, defined by reference to the geographical location of the authorities responsible for it						Class			Codes for the representation of currencies and funds, ISO 4217, Sixth edition, 2001-08-15, sub clause 3.1.
isTenderIn	currency	is tender in	A region or country in which the currency is exchangeable for goods and services.				location		Relationship Property		Commonly referred to also as legal tender, however this definition does not hold literally in some countries e.g. Scotland.	

10.13 Module: Dates and Times

Table 10-79. Dates and Times Module Metadata

Metadata Term	Value
sm:moduleName	Dates and Times
sm:moduleAbbreviation	fibonacci-fnd-dt
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies describing date and time concepts which are of specific reference in financial services. These cover foundational date and time concepts in a form usable for financial subject matter ontologies, including occurrences and conventions for business days and the like. The business day convention concepts are to be further extended in specialized ontologies for securities and derivatives, building on the ontologies in this module.

10.13.1 Ontology: FinancialDates

This ontology provides definitions of date and schedule concepts for use in other FIBO ontologies.

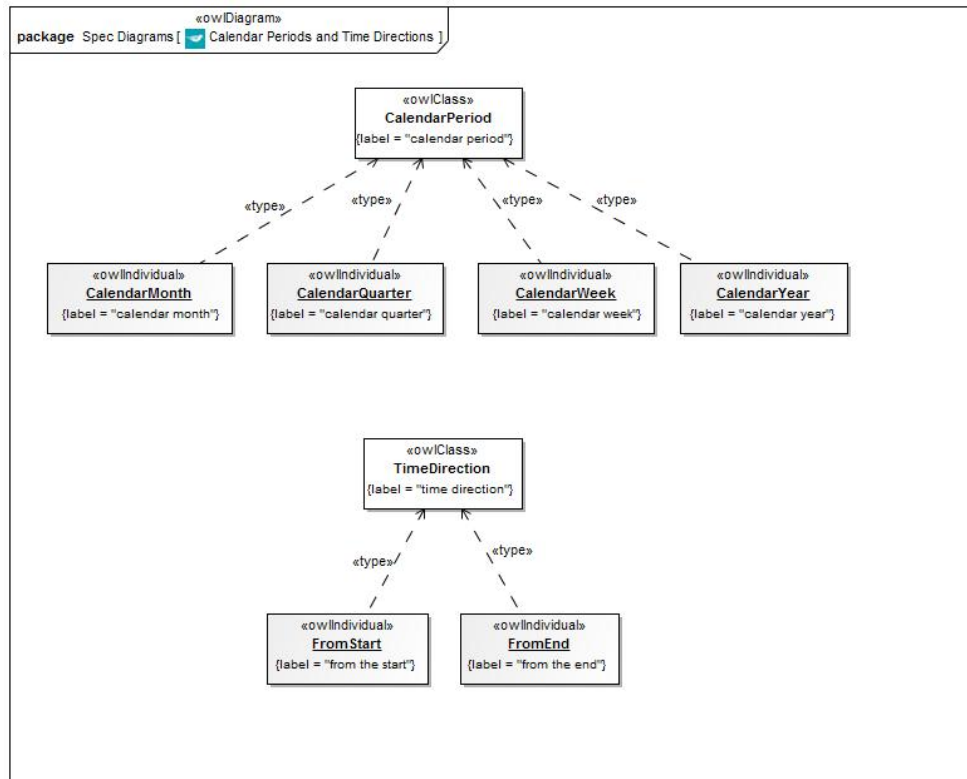


Figure 100.70 Calendar Periods and Time Directions

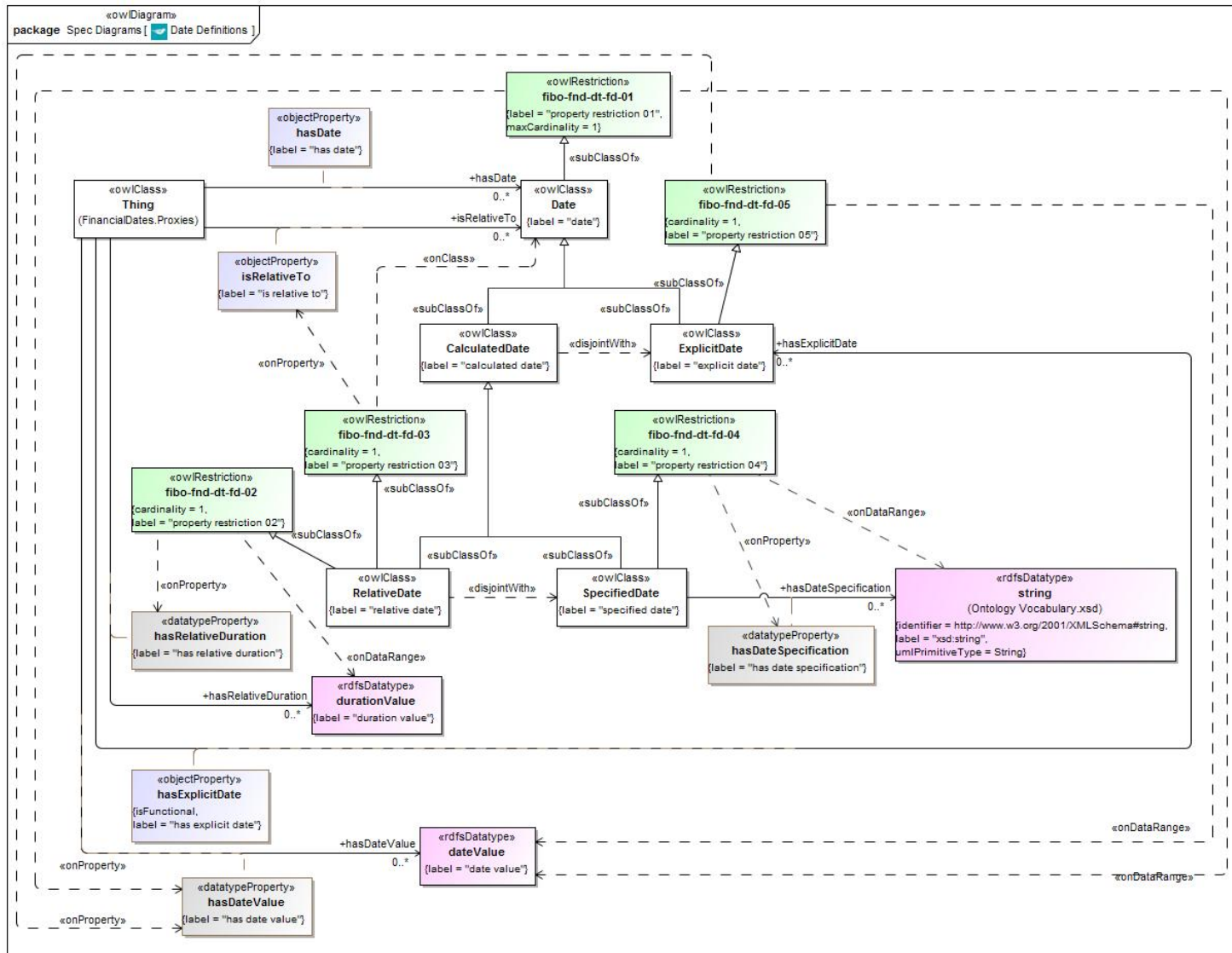


Figure 110.71 Date Definitions

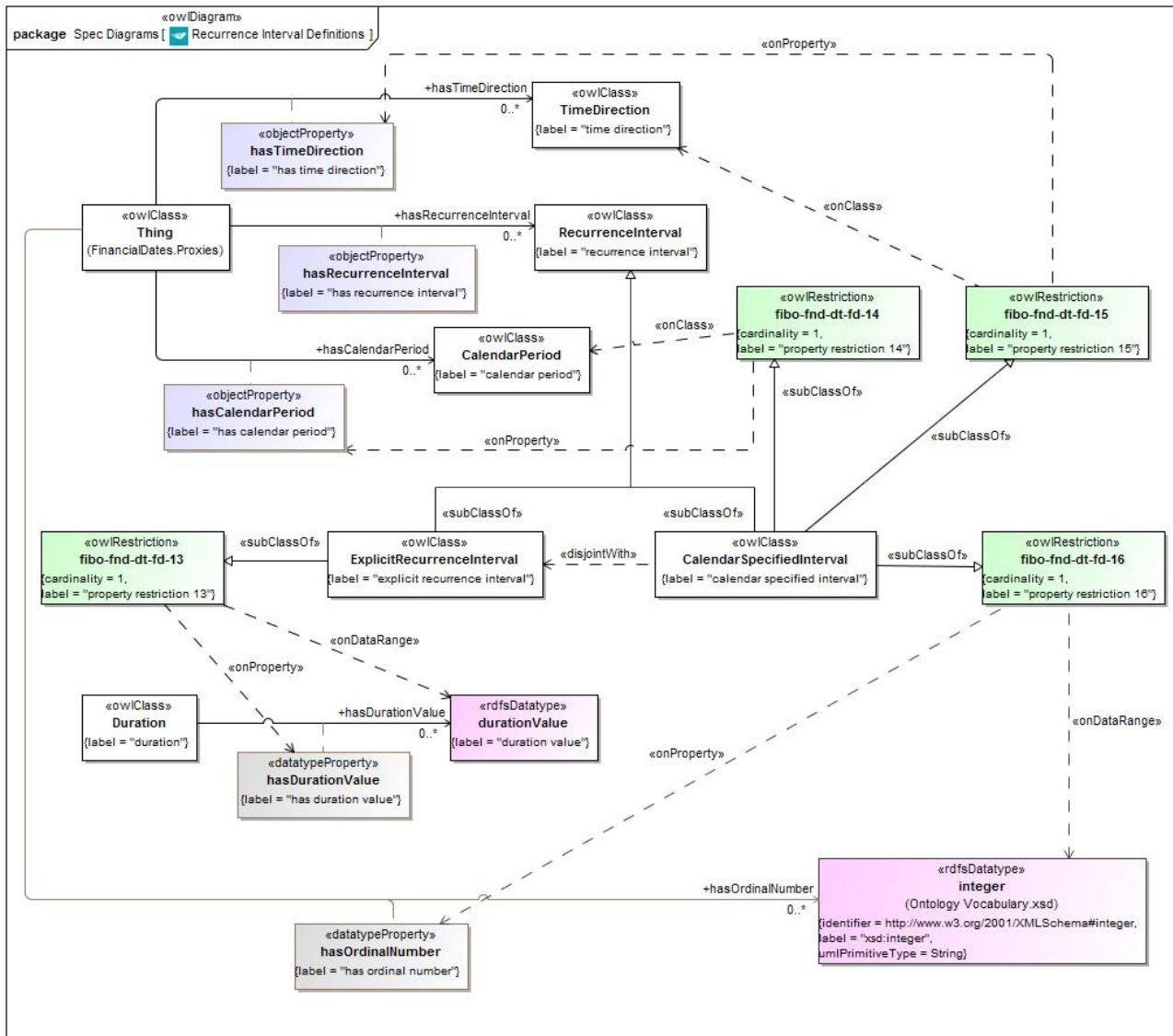


Figure 120.72 Recurrence Interval Definitions

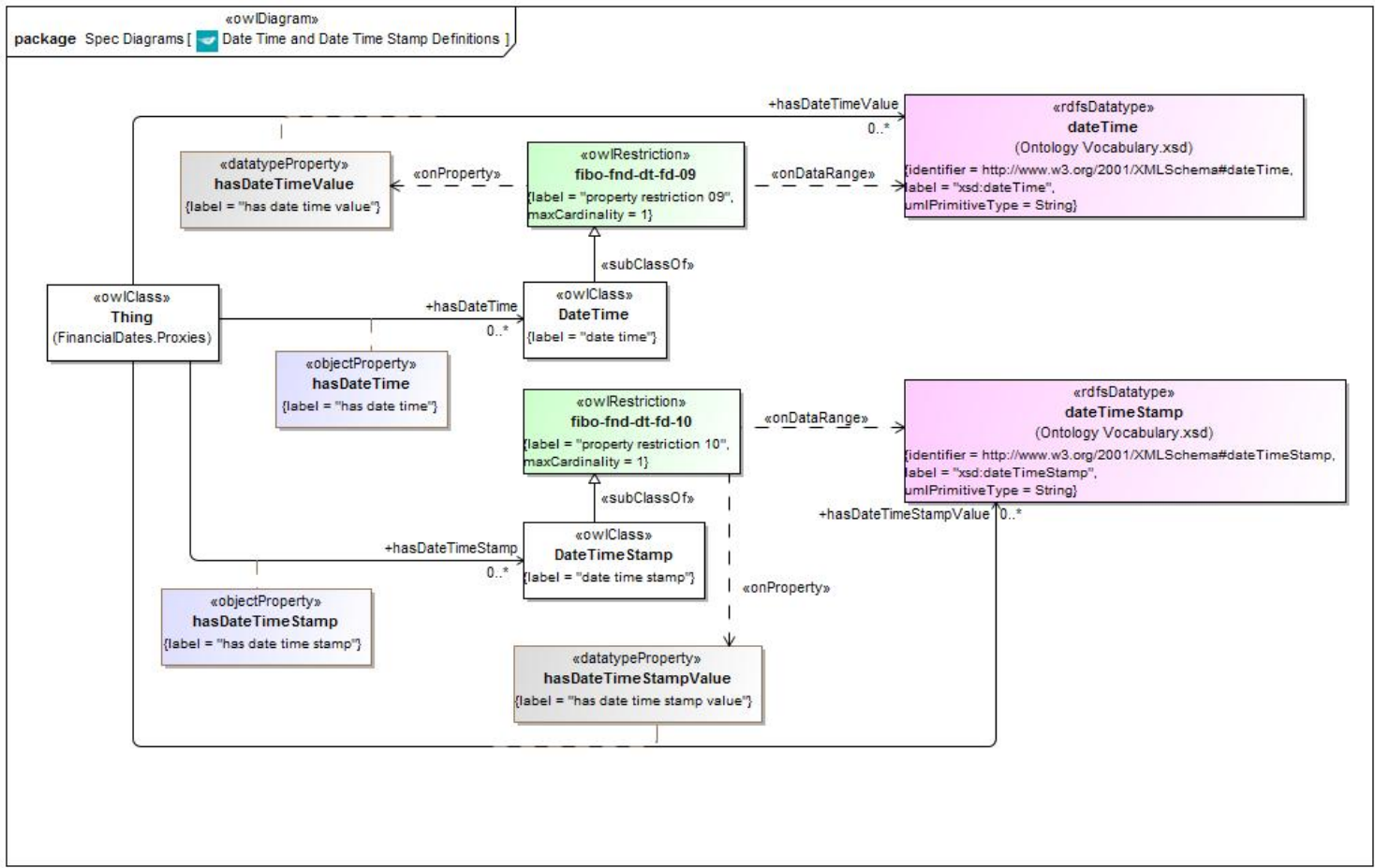


Figure 130.73 Date Time and Date Time Stamp Definitions

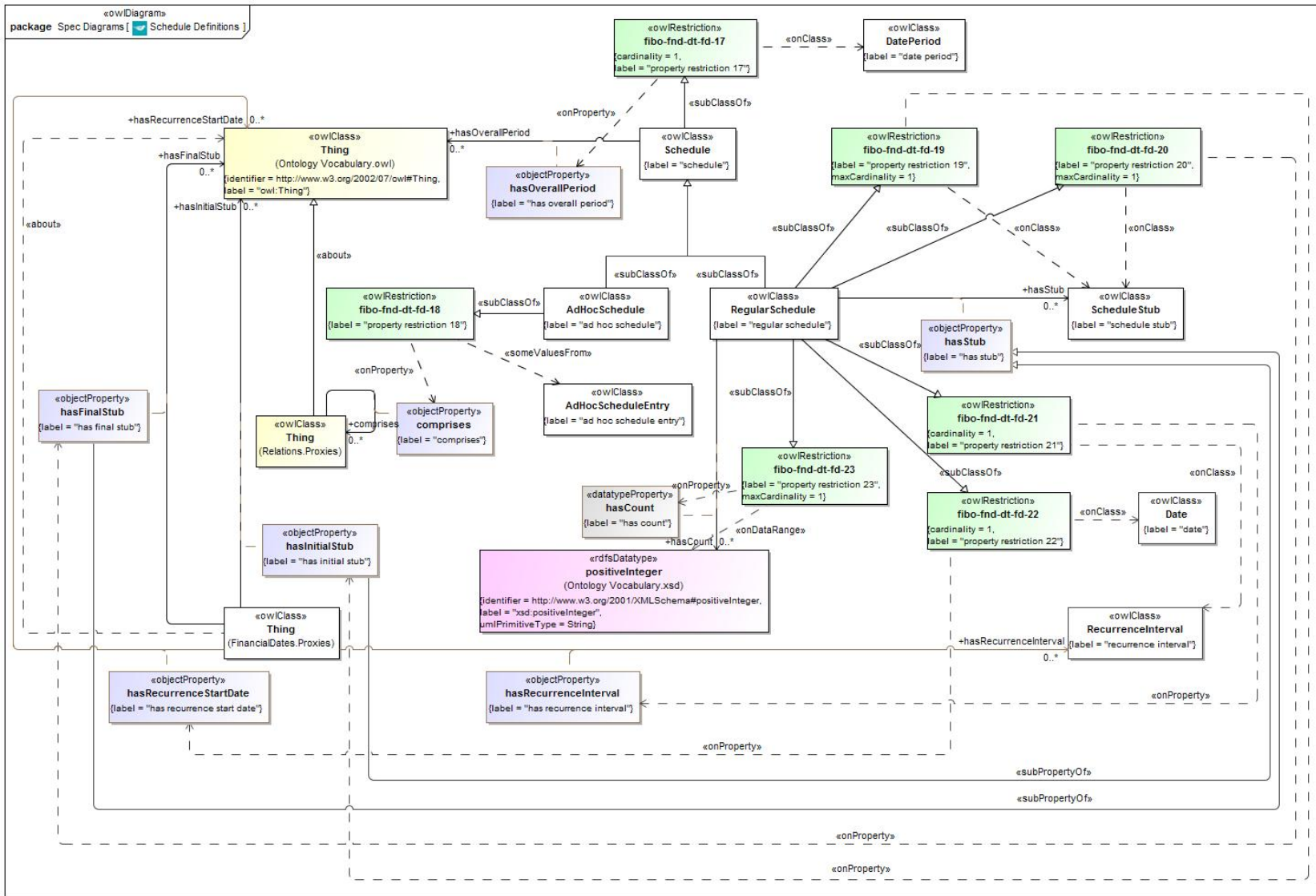


Figure 140.74 Schedule Definitions

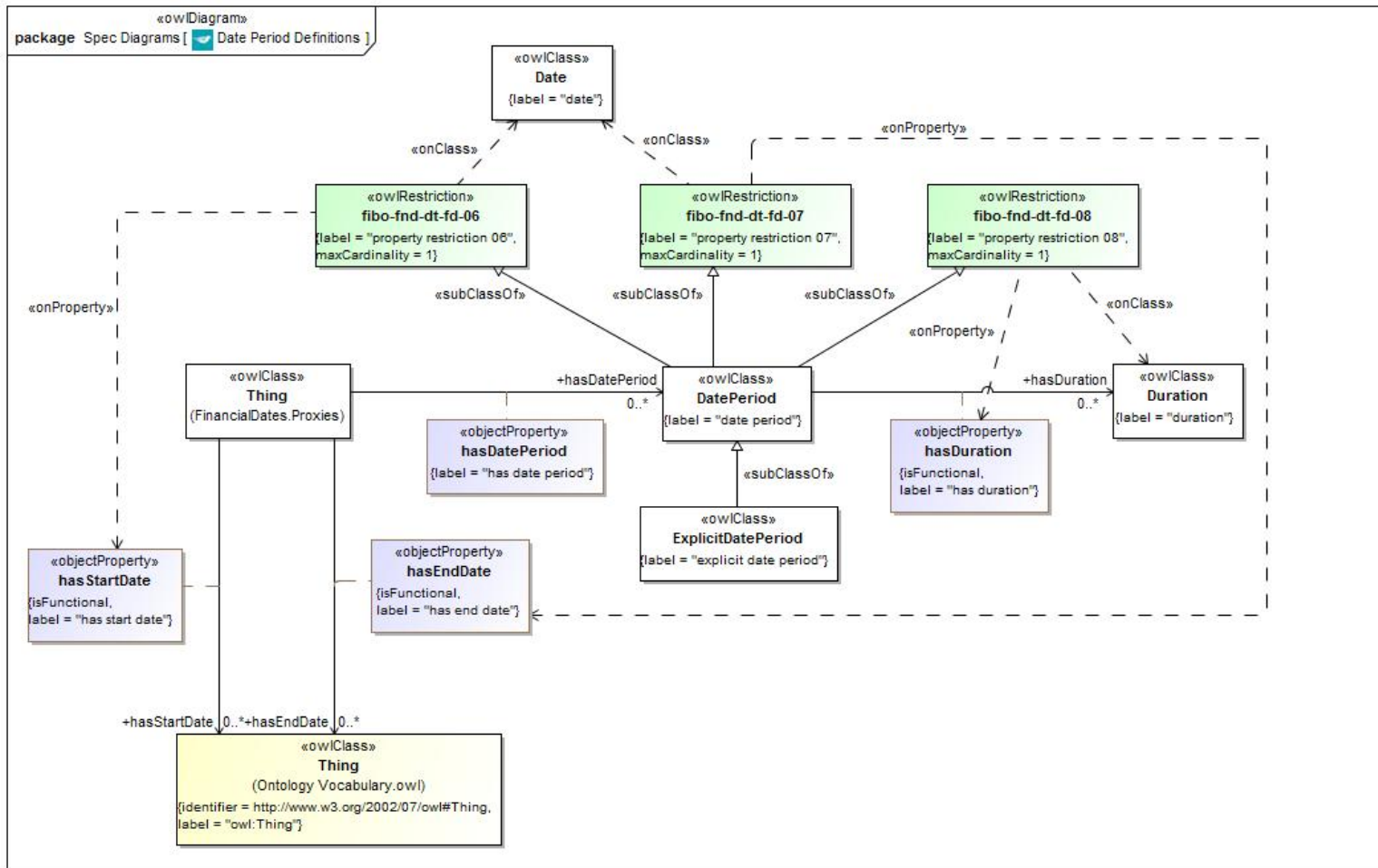


Figure 150.75 Date Period Definitions

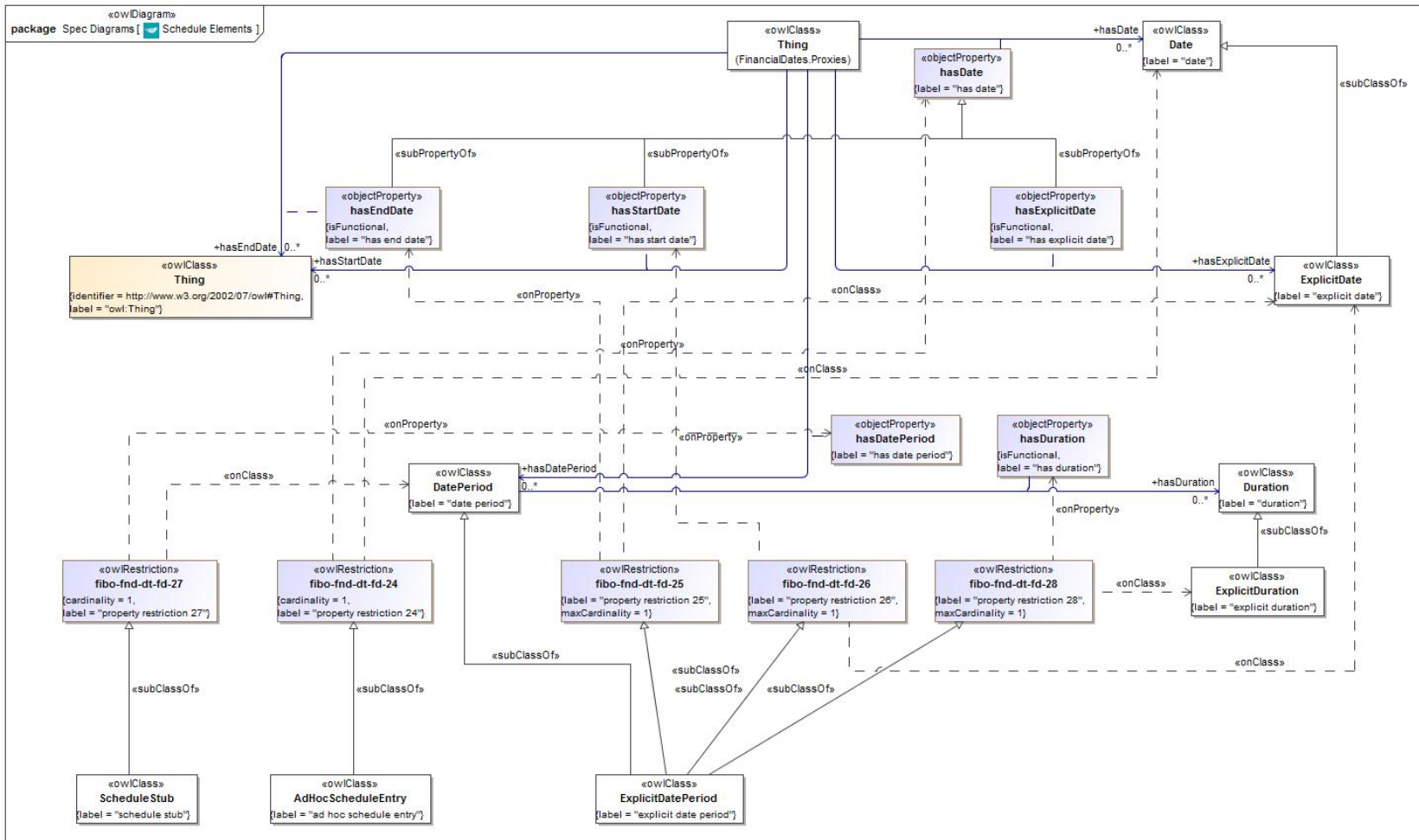


Figure 160.76 Schedule Elements

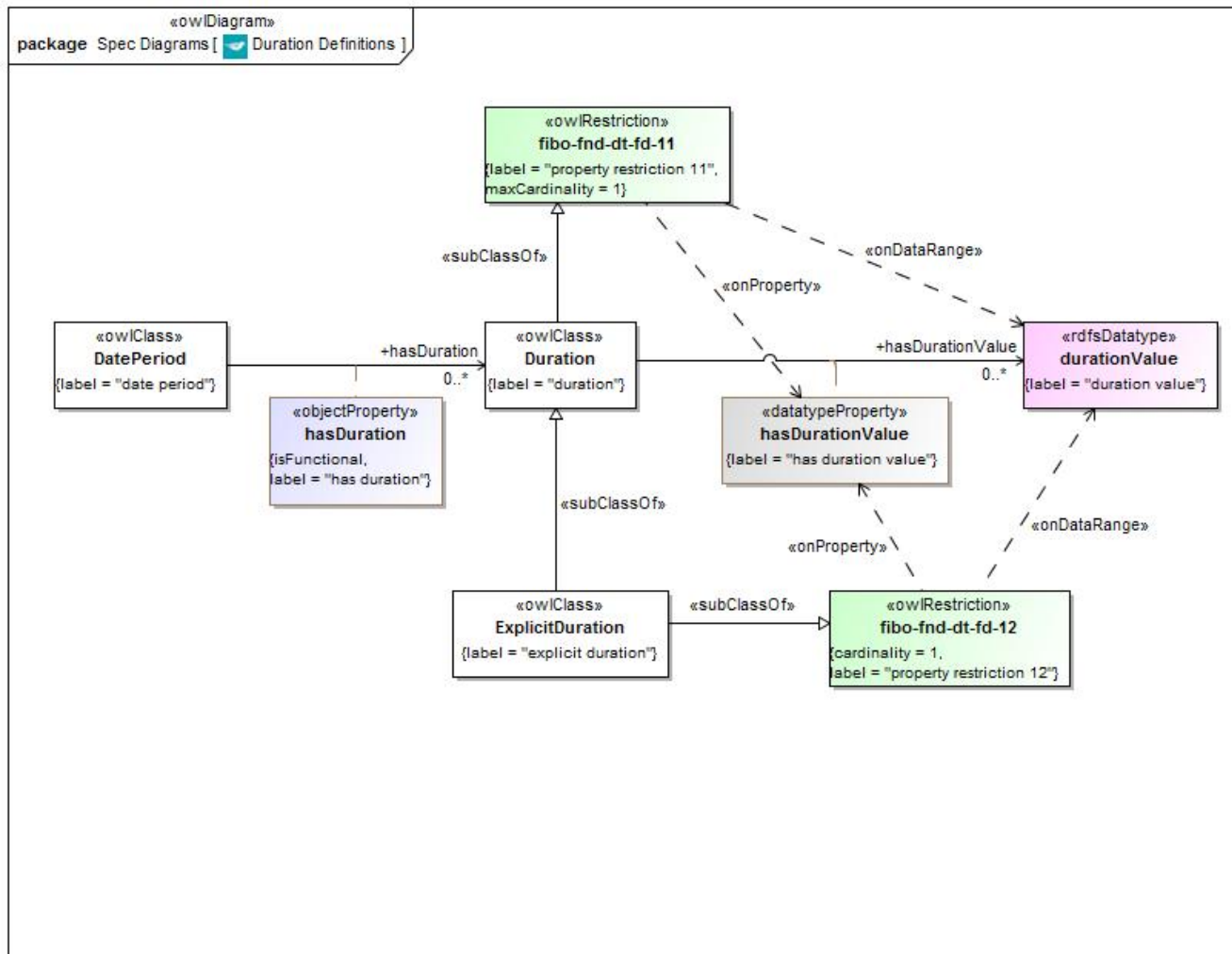


Figure 170.77 Duration Definitions

Table 10-80. FinancialDates Ontology Metadata

Metadata Term	Value
sm:filename	FinancialDates
sm:fileAbbreviation	fibonacci-fnd-dt-fd
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/DatesAndTimes/FinancialDates/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/

Table 10-81. Financial Dates Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Duration	[duration]		An amount of time.	fibonacci-fnd-dt-fd-11								
Class	Regular-Schedule	[regular schedule]		A RegularSchedule is a Schedule that recurs regularly.	fibonacci-fnd-dt-fd-21					The BusinessDates ontology extends 'RegularSchedule' with an optional BusinessDayAdjustment that specifies what should happen if a scheduled date falls on a weekend or a holiday.	A Regular-Schedule is a Schedule defined as a set of Dates that start on a recurrence start date and repeat after each recurrence interval. The size of this set is defined by a count. The "initial		

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
											ScheduleStub" associated with a RegularSchedule identifies any special treatment applied before the recurrence start date. Similarly, a "final ScheduleStub" identifies any special handling at the end of the recurrences. For example, a mortgage loan that is due each calendar month may have an initial payment due before the first calendar month, or a final payment due after the last monthly payment.		
Class	ExplicitDuration	[explicit duration]		A Duration in which the 'hasSettledDuration' property is always set. This class is used when a Duration is guaranteed to be known when it is created.	Duration								
Class	CalendarPeriod	[calendar period]		CalendarPeriod is an enumeration that indicates whether a CalendarSpecifiedDate is figured with respect						The terms "calendar xxx" are intended to reinforce that these are periods on a calendar, not durations.			

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				to a calendar week, a calendar month, a calendar quarter, or a calendar year.						For example, a calendar year always starts on a January 1 and ends on a December 31. The term "calendar year" does not mean the same thing as a duration (an amount of time) of 1 year, nor can a calendar year start on any arbitrary day of a year. For example, a calendar year never starts on September 1. Similar points apply to other kinds of calendar periods, such as "calendar week", "calendar month", and "calendar quarter".			
Class	RecurrenceInterval	[recurrence interval]		A RecurrenceInterval defines the time interval between each element of a RegularSchedule.						The BusinessDates ontology adds a 'BusinessRecurrenceInterval' subclass of RecurrenceInterval that specifies various intervals via an enumeration.			
Class	Date	[date]		A Date identifies a calendar day on some calendar.	fib0-fnd-dt-fd-01								
Class	DateTimeStamp	[date time stamp]		A DateTimeStamp combines a Date, a time, and a time zone.	fib0-fnd-dt-fd-10								
Class	AdHocScheduleEntry	[ad hoc schedule entry]		An AdHocScheduleEntry identifies one Date among multiple AdHocScheduleEn-	fib0-fnd-dt-fd-24								

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				tries that jointly make up an AdHocSchedule.									
Class	ExplicitDate	[explicit date]		An ExplicitDate is a Date in which the "hasDateValue" property is required.	Date								
Class	SpecifiedDate	[specified date]		A SpecifiedDate is a CalculatedDate that is defined by a rule, which is captured as a string by the "hasDateSpecification" property.	fibonacci-fnd-dt-fd-04								
Class	ExplicitDate-Period	[explicit date period]		A DatePeriod where the start date, end date, and duration are all explicit.	fibonacci-fnd-dt-fd-28								
Class	AdHocSchedule	[ad hoc schedule]		An AdHocSchedule is a Schedule that consists of (comprises) AdHocScheduleEntries, each of which specifies a Date. Other ontologies can extend AdHocScheduleEntry to relate the Date to something.	Schedule								
Class	DateTime	[date time]		The combination of a Date and a time, without a time zone.	fibonacci-fnd-dt-fd-09								
Class	DatePeriod	[date period]		A time span over one or more calendar days, defined by at least two of three properties: <ol style="list-style-type: none"> 1. startDate 2. endDate 3. periodDuration If more than one of	fibonacci-fnd-dt-fd-07								

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				these properties is missing, the Date-Period is invalid.									
Class	CalculatedDate	[calculated date]		<p>A CalculatedDate is a Date that is or will be calculated in some way.</p> <p>The 'hasDateValue' property of a CalculatedDate is not set until the Date is calculated. Since the calculation may depend upon future events that may or may not ever happen, the 'hasDateValue' property may never be set.</p>	Date	ExplicitDate				The BusinessDates ontology extends 'CalculatedDate' with an optional BusinessDayAdjustment that specifies what should happen if a CalculatedDate falls on a weekend or a holiday.			
Class	Schedule	[schedule]		A Schedule is a table of Dates.	fibonacci-fundamentals-dates-17						The overall period covers the entire DatePeriod of the Schedule, from the earliest Date to the final Date of the Schedule		
Class	CalendarSpecifiedInterval	[calendar specified interval]		<p>A CalendarSpecifiedInterval is a RecurrenceInterval that it is specified as the nth day of some CalendarPeriod (such as a calendar month), and a TimeDirection (forward from the beginning of the month, or backwards from the end).</p> <p>The nth day is an</p>	fibonacci-fundamentals-dates-15	ExplicitRecurrenceInterval							

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				ordinal number, not a cardinal number. '1' means the first day of the calendar period.									
Class	TimeDirection	[time direction]		<p>TimeDirection is an enumeration class that indicates whether a CalendarSpecifiedDate is figured from the start or the end of a calendar period.</p> <p>The enumeration values of this class are modeled as instances of the class so that instances of CalendarSpecifiedDate can directly reference them.</p>									
Class	ExplicitRecurrenceInterval	[explicit recurrence interval]		An ExplicitRecurrenceInterval defines a RecurrenceInterval via an ExplicitDuration.	fibonacci-fdt-fd-13								
Class	ScheduleStub	[schedule stub]		A ScheduleStub identifies a DatePeriod before the start of the recurring part of a Schedule or after the end of the recurring part, and an associated OccurrenceKind.	fibonacci-fdt-fd-27					The Occurrences ontology extends ScheduleStub to 'comprise' an OccurrenceKind. The meaning is that a schedule stub comprises a date period and an event which is scheduled to occur during that date period; in other words that an Occurrence of the OccurrenceKind should happen during the DatePeriod of the			

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
										ScheduleStub.			
Class	Relative-Date	[relative date]		A RelativeDate is a CalculatedDate that is some Duration before or after another Date. When the 'hasRelativeDuration' property is negative, the RelativeDate is before the 'isRelativeTo' Date; otherwise the RelativeDate is after the 'isRelativeTo' Date.	CalculatedDate	Specified-Date							
Other	fibonfd-dt-fd-02	[property restriction 02]	hasRelative-Duration	cardinality restriction on the stated property with values taken from the related type			duration-Value						
Other	fibonfd-dt-fd-07	[property restriction 07]	hasEndDate	cardinality restriction on the stated property with values taken from the related thing			Date						
Other	fibonfd-dt-fd-24	[property restriction 24]	hasDate	cardinality restriction on the stated property with values taken from the related thing			Date						
Other	fibonfd-dt-fd-04	[property restriction 04]	hasDateSpecification	cardinality restriction on the stated property with values taken from the related type			string						
Other	fibonfd-dt-fd-08	[property restriction 08]	hasDuration	cardinality restriction on the stated property with values taken from the related thing			Duration						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Other	fibonfd-dt-fd-03	[property restriction 03]	isRelativeTo	cardinality restriction on the stated property with values taken from the related thing			Date						
Other	fibonfd-dt-fd-14	[property restriction 14]	hasCalendarPeriod	cardinality restriction on the stated property with values taken from the related thing			CalendarPeriod						
Other	fibonfd-dt-fd-22	[property restriction 22]	hasReurrenceStartDate	cardinality restriction on the stated property with values taken from the related thing			Date						
Other	fibonfd-dt-fd-13	[property restriction 13]	hasDurationValue	cardinality restriction on the stated property with values taken from the related type			durationValue						
Other	fibonfd-dt-fd-17	[property restriction 17]	hasOverallPeriod	cardinality restriction on the stated property with values taken from the related thing			DatePeriod						
Other	fibonfd-dt-fd-01	[property restriction 01]	hasDateValue	cardinality restriction on the stated property with values taken from the related type			dateValue						
Other	fibonfd-dt-fd-12	[property restriction 12]	hasDurationValue	cardinality restriction on the stated property with values taken from the related type			durationValue						
Other	fibonfd-dt-fd-15	[property restriction 15]	hasTimeDirection	cardinality restriction on the stated property with values taken			TimeDirection						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				from the related thing									
Other	fibonacci-fd-09	[property restriction 09]	hasDateTi meValue	cardinality restriction on the stated property with values taken from the related type			dateTime						
Other	fibonacci-fd-19	[property restriction 19]	hasInitialS tub	cardinality restriction on the stated property with values taken from the related thing			ScheduleStub						
Other	fibonacci-fd-06	[property restriction 06]	has- StartDate	cardinality restriction on the stated property with values taken from the related thing			Date						
Other	fibonacci-fd-25	[property restriction 25]	hasEndDa te	cardinality restriction on the stated property with values taken from the related thing			ExplicitDate						
Other	fibonacci-fd-18	[property restriction 18]	comprises	restriction on the stated property where some values must be taken from the related thing or type			AdHocScheduleEntry						
Other	fibonacci-fd-28	[property restriction 28]	hasDura- tion	cardinality restriction on the stated property with values taken from the related thing			ExplicitDuration						
Other	fibonacci-fd-20	[property restriction 20]	hasFinalS- tub	cardinality restriction on the stated property with values taken from the related thing			ScheduleStub						
Other	fibonacci-fd-05	[property restriction	hasDat- eValue	cardinality restriction on the			dateValue						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
		05]		stated property with values taken from the related type									
Other	fibonfd-dt-fd-10	[property restriction 10]	hasDateTimeStampValue	cardinality restriction on the stated property with values taken from the related type			dateTimeStamp						
Other	fibonfd-dt-fd-26	[property restriction 26]	hasStartDate	cardinality restriction on the stated property with values taken from the related thing			ExplicitDate						
Other	fibonfd-dt-fd-16	[property restriction 16]	hasOrdinalNumber	cardinality restriction on the stated property with values taken from the related type			integer						
Other	fibonfd-dt-fd-21	[property restriction 21]	hasRecurrenceInterval	cardinality restriction on the stated property with values taken from the related thing			RecurrenceInterval						
Other	fibonfd-dt-fd-27	[property restriction 27]	hasDatePeriod	cardinality restriction on the stated property with values taken from the related thing			DatePeriod						
Other	fibonfd-dt-fd-11	[property restriction 11]	hasDurationValue	cardinality restriction on the stated property with values taken from the related type			durationValue						
Other	fibonfd-dt-fd-23	[property restriction 23]	hasCount	cardinality restriction on the stated property with values taken from the related type			positiveInteger						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Relationship Property	hasCalendarPeriod		has calendar period	CalendarPeriod identifies a calendar period used in computing a CalendarSpecifiedDate, such as a calendar week, calendar month, calendar quarter, or calendar year.	has		calendar period						
Simple Property	hasCount	regular schedule	has count	The count of the number of entries in a RegularSchedule.			xsd:positiveInteger						
Relationship Property	hasDate		has date		has		date						
Relationship Property	hasDatePeriod		has date period		has		date period						
Simple Property	hasDateSpecification	specified date	has date specification	A rule that specifies how a SpecifiedDate is computed.			xsd:string			The rule is modeled as a simple String because OWL2 provides no way to model the semantics of such a rule.			
Relationship Property	hasDateTime		has date time		has		date time						
Relationship Property	hasDateTimeStamp		has date time stamp		has		date time stamp						
Simple Property	hasDateTimeStampValue		has date time stamp value				xsd:dateTimeStamp						
Simple Property	hasDateTimeValue		has date time value				xsd:dateTime						
Simple Property	hasDateValue		has date value	'hasDateValue' refers to actual date associated with any kind of Date, if the actual date has been established			date value						
Relationship	hasDuration	date period	has duration	the duration of a DatePeriod	has		duration						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Property													
Simple Property	hasDurationValue	duration	has duration value	The amount of a Duration.			duration value						
Relationship Property	hasEndDate		has end date	the ending date of some Schedule or DatePeriod	has date		owl:Thing						
Relationship Property	hasExplicitDate		has explicit date		has date		explicit date						
Relationship Property	hasFinalStub		has final stub	a final stub identifies any special period at the end of a RegularSchedule	has stub		owl:Thing						
Relationship Property	hasInitialStub		has initial stub	An initial stub identifies any special period at the start of a RegularSchedule.	has stub		owl:Thing						
Simple Property	hasOrdinalNumber		has ordinal number	An ordinal number meaning 1st, 2nd, 3rd, etc.			xsd:integer				Negative ordinal numbers mean 1st before, 2nd before, etc.		
Relationship Property	hasOverallPeriod	schedule	has overall period	the DatePeriod that includes all the Dates of a Schedule, including any ScheduleStubs	has date period		owl:Thing						
Relationship Property	hasRecurrenceInterval		has recurrence interval		has		recurrence interval						
Relationship Property	hasRecurrenceStartDate		has recurrence start date	the starting Date of the first recurrence of a RegularSchedule	has start date		owl:Thing						
Simple Property	hasRelativeDuration		has relative duration	The Duration between two Dates.			duration value				A relative duration may be negative.		
Relationship Property	hasStartDate		has start date	the starting Date of something	has date		owl:Thing						
Relationship Property	hasStub	regular schedule	has stub		has		schedule stub						
Relationship	hasTimeDirection		has time	A TimeDirection	has		time						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
ship Property	TimeDirection		direction	indicates whether a CalendarSpecified-Date is figured from the beginning or end of a calendar period.			direction						
Relationship Property	isRelative-To		is relative to	A RelativeDate or RelativeDatePeriod is defined relative to this Date.			date						

10.13.2 Ontology: Occurrences

This ontology extends definitions of date and schedule concepts from the FinancialDates ontology with concepts defining occurrences (i.e., event-related concepts) for use in other FIBO ontologies.

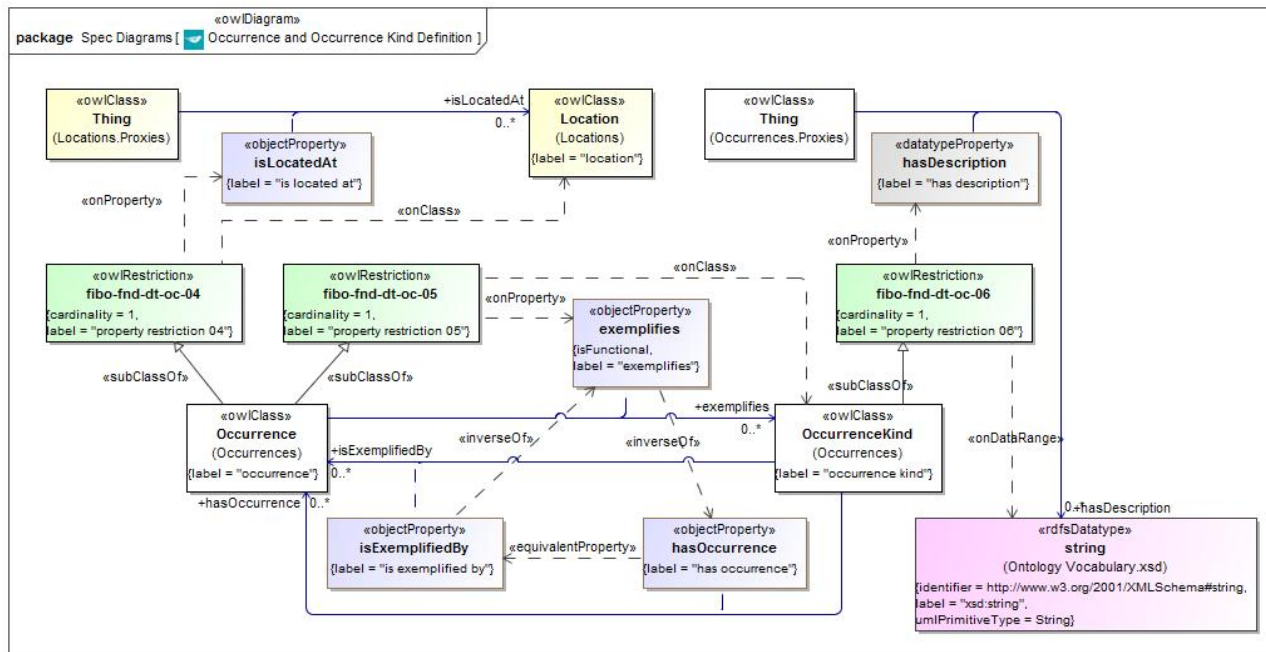


Figure 180.78 Occurrence and Occurrence Kind Definition

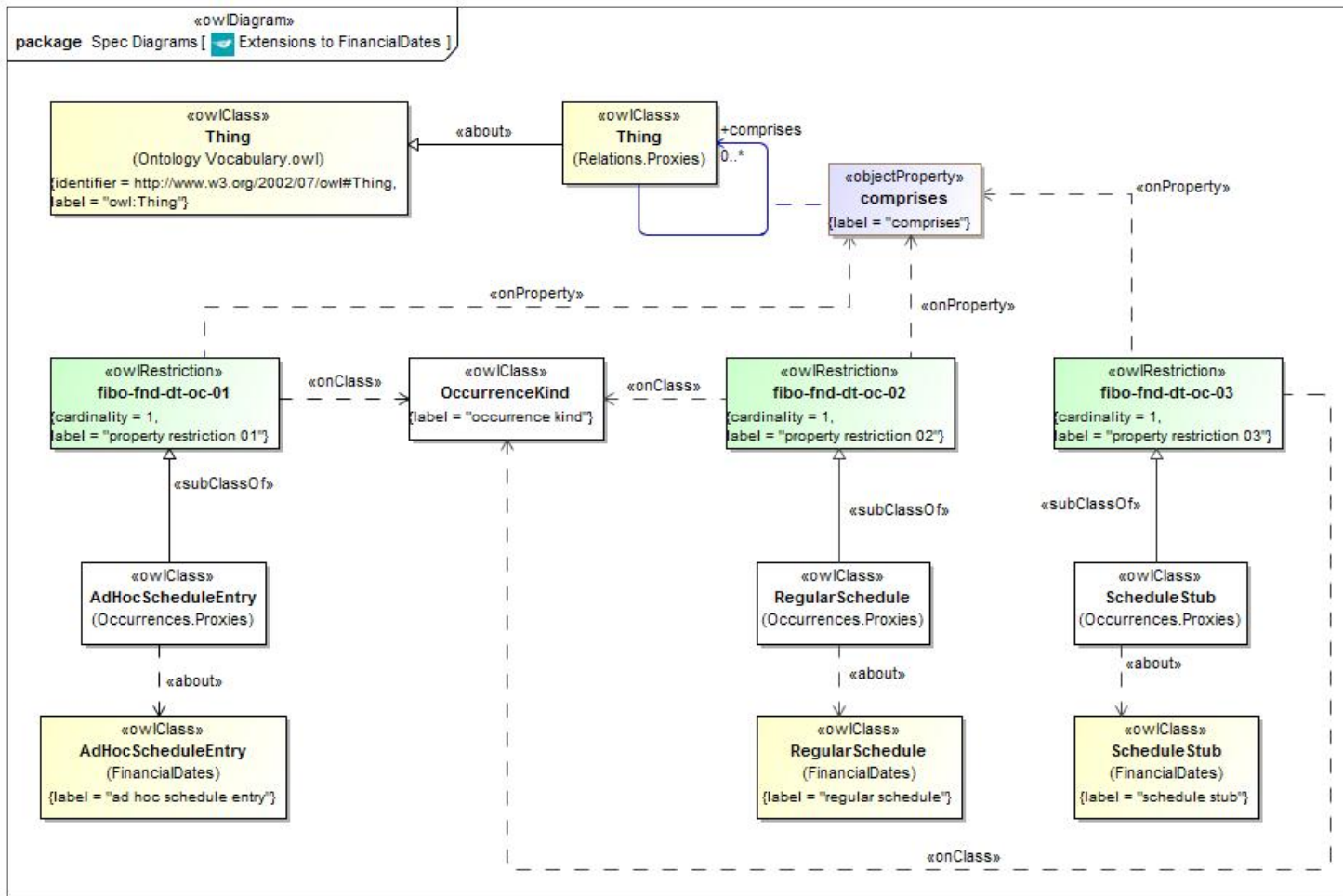


Figure 190.79 Extensions to FinancialDates

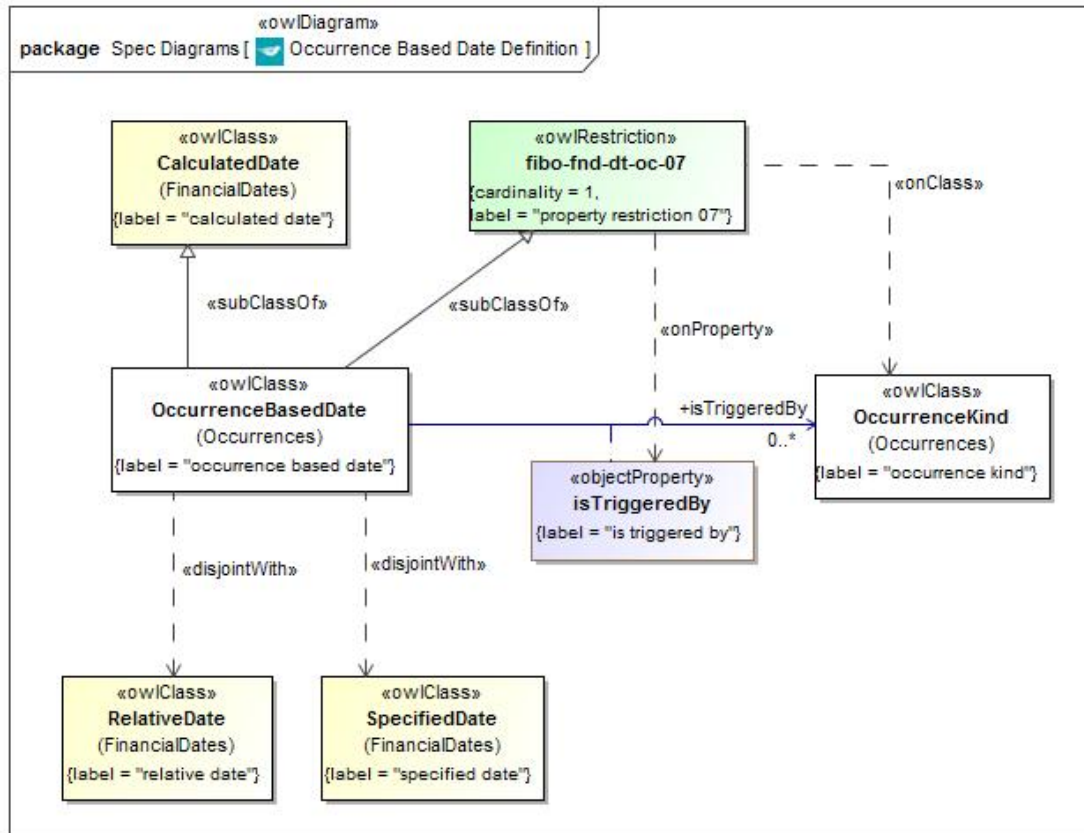


Figure 200.80 Occurrence Based Date Definition

Table 10-82. Occurrences Ontology Metadata

Metadata Term	Value
sm:filename	Occurrences
sm:fileAbbreviation	fibonacci-fnd-dt-oc

Metadata Term	Value
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/Occurrences/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/DatesAndTimes/Occurrences/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/

Table 10-83. Occurrences Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	Occurrence-Based-Date	[occurrence-based date]		An OccurrenceBasedDate is a CalculatedDate that is defined with respect to the Occurrence of some OccurrenceKind. The 'hasDateValue' property of an OccurrenceBasedDate is not set until the Occurrence happens. The 'triggeredBy' property relates an OccurrenceBasedDate to the OccurrenceKind that gives the meaning of the OccurrenceBasedDate.	CalculatedDate	Relative-Date							
Class	Occurrence	[occurrence]		An Occurrence is a happening of an	fibonacci-fnd-dt-oc-04					In order for other ontologies to ac-			

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				OccurrenceKind. Each Occurrence has a DateTimeStamp, which identifies when the Occurrence happened, and a Location (possibly virtual), that identifies where the Occurrence happened.						cept FinancialDates without committing to the particular notions of 'Occurrence' and 'OccurrenceKind' that is modeled here, all aspects of Occurrences are captured in this ontology.			
Class	OccurrenceKind	[occurrence kind]		An OccurrenceKind is a type of event, which has a description. An OccurrenceKind may or may not ever happen, and thus does not have a Date. An OccurrenceKind happens as an Occurrence, which does have a Date.	fibofnddt-oc-06					In order for other ontologies to accept FinancialDates without committing to the particular notions of 'Occurrence' and 'OccurrenceKind' that is modeled here, all aspects of Occurrences are captured in this ontolog			
Other	fibofnddt-oc-01	[property restriction 01]	comprises	cardinality restriction on the stated property with values taken from the related thing			OccurrenceKind						
Other	fibofnddt-oc-02	[property restriction 02]	comprises	cardinality restriction on the stated property with values taken from the related thing			OccurrenceKind						
Other	fibofnddt-oc-03	[property restriction 03]	comprises	cardinality restriction on the stated property with values taken from the related thing			OccurrenceKind						
Other	fibofnddt-oc-06	[property restriction 06]	hasDescription	cardinality restriction on the stated property with values taken			string						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				from the related type									
Other	fibonfdt-oc-04	[property restriction 04]	isLocatedAt	cardinality restriction on the stated property with values taken from the related thing			Location						
Other	fibonfdt-oc-05	[property restriction 05]	exemplifies	cardinality restriction on the stated property with values taken from the related thing			OccurrenceKind						
Other	fibonfdt-oc-07	[property restriction 07]	isTriggeredBy	cardinality restriction on the stated property with values taken from the related thing			OccurrenceKind						
Simple Property	hasDescription	anything	[has description]	a textual description of something			string						
Relationship Property	isTriggeredBy	occurrence based date	[is triggered by]	An Occurrence-BasedDate is triggered by an Occurrence that exemplifies the OccurrenceKind.			OccurrenceKind						
Relationship Property	hasOccurrence	occurrence kind	[has occurrence]	identifies occurrences of a given occurrence kind	has		Occurrence						
Relationship Property	isExemplifiedBy	occurrence kind	[is exemplified by]	identifies examples of a given concept			Occurrence	exemplifies					
Relationship Property	exemplifies	occurrence	[exemplifies]	illustrates by example			OccurrenceKind	hasOccurrence					

10.13.3 Ontology: BusinessDates

This ontology extends definitions of date and schedule concepts from the FinancialDates ontology with concepts defining dates that may be adjusted when they fall on weekends or holidays as defined in a given business center, for use in other FIBO ontologies.

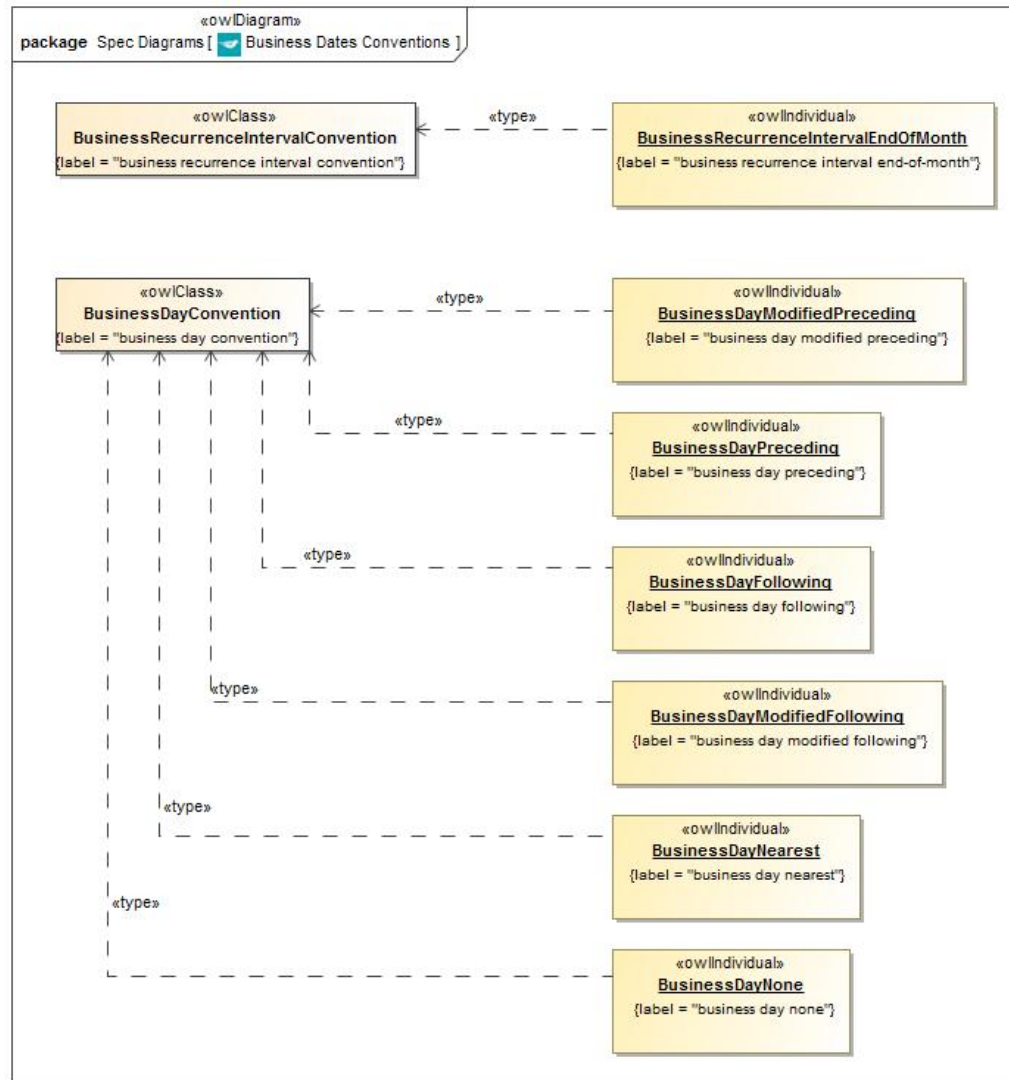


Figure 210.81 Business Dates Conventions

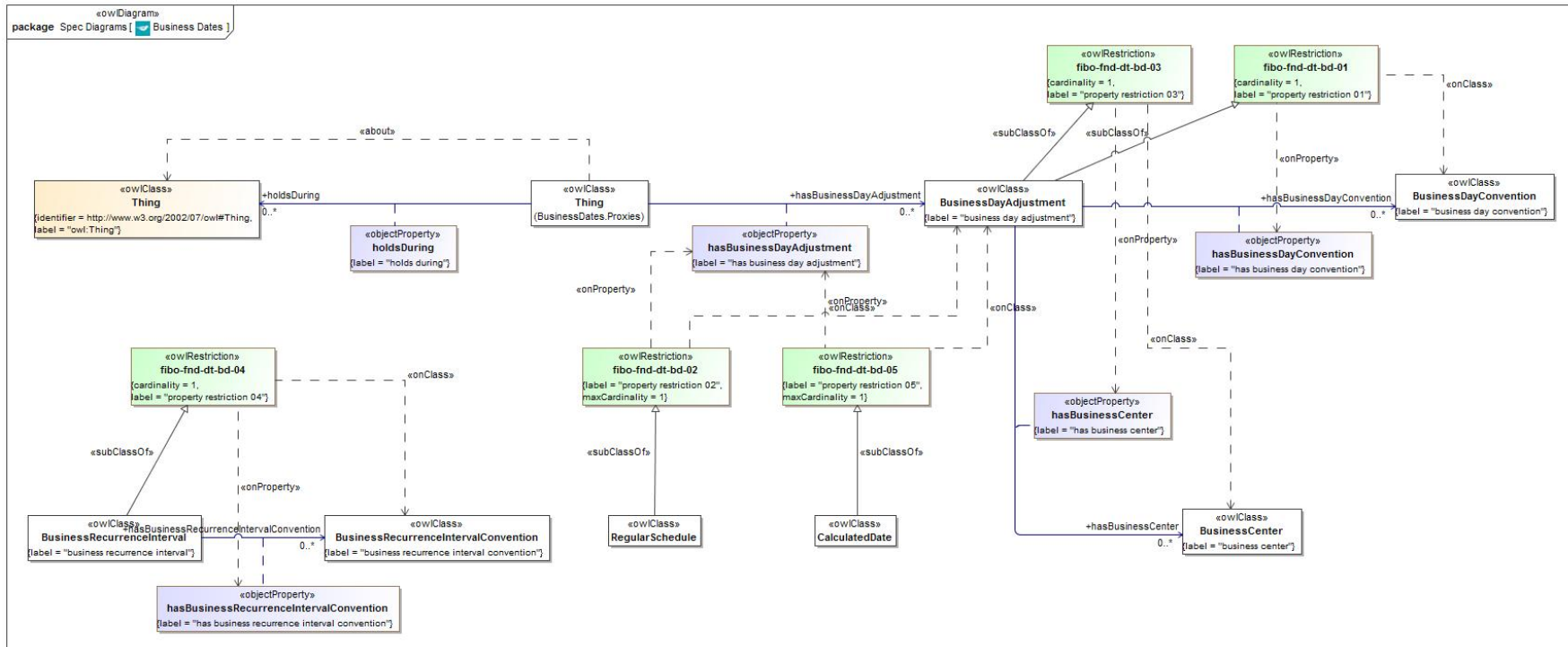


Figure 220.82 Business Dates

Table 10-84. BusinessDates Ontology Metadata

Metadata Term	Value
sm:filename	BusinessDates
sm:fileAbbreviation	fibo-fnd-dt-bd
OntologyIRI	<code>http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/BusinessDates/</code>

Metadata Term	Value
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20141101/DatesAndTimes/BusinessDates/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/

Table 10-85. Business Dates Details

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	BusinessRecurrenceInterval	[business recurrence interval]		A BusinessRecurrenceInterval is a RecurrenceInterval that is specified using a BusinessRecurrenceIntervalConvention.	fibonacci-fnd-dt-bd-04								
Class	BusinessDayConvention	[business day convention]		BusinessDayConvention is an enumeration of the possible ways to handle a Date that falls on a weekend or holiday. BusinessDayTreatment combines a BusinessCenter with a BusinessDayConvention to determine what to do when business is not conducted in a particular business center on a particular calendar day.									

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
Class	BusinessDayAdjustment	[business day adjustment]		A BusinessDayAdjustment uses a BusinessDayConvention to specify what happens when a Date falls on a day that is a weekend or a holiday in some BusinessCenter.	fibofnddtbd03								
Class	BusinessRecurrenceIntervalConvention	[business recurrence interval convention]		BusinessRecurrenceIntervalConvention models various conventions for recurring days, such as "end of month", and "TBill auction date". These conventions are modelled as instances of the BusinessRecurrenceIntervalConvention class.									
Other	fibofnddtbd02	[property restriction 02]	hasBusinessDayAdjustment	cardinality restriction on the stated property with values taken from the related thing			BusinessDayAdjustment						
Other	fibofnddtbd01	[property restriction 01]	hasBusinessDayConvention	cardinality restriction on the stated property with values taken from the related thing			BusinessDayConvention						
Other	fibofnddtbd04	[property restriction 04]	hasBusinessRecurrenceIntervalConvention	cardinality restriction on the stated property with values taken from the related thing			BusinessRecurrenceIntervalConvention						
Other	fibofnddtbd03	[property restriction 03]	hasBusinessCenter	cardinality restriction on the stated property with values taken from the related			BusinessCenter						

Concept Type	Name	Type Of Thing	Property	Definition	Parent	Mutually Exclusive With	Related Thing or Type	Inverse Of Property	Multiples	Editorial Note	Explanatory Note	Term Origin	Definition Source
				thing									
Other	fibo-fnd-dt-bd-05	[property restriction 05]	hasBusinessDayAdjustment	cardinality restriction on the stated property with values taken from the related thing			BusinessDayAdjustment						
Relationship Property	hasBusinessDayConvention	business day adjustment	[has business day convention]	A BusinessDayConvention identifies how a Date should be handled when it falls on a day that is not a business day.	has		business day convention						
Relationship Property	hasBusinessDayAdjustment	anything	[has business day adjustment]		has		business day adjustment						
Relationship Property	holdsDuring	anything	[holds during]	a relationship that states that some condition or state holds during a specified date period	hasDatePeriod		anything						
Relationship Property	hasBusinessCenter	business day adjustment	[has business center]	the location where business is conducted, and hence the business calendar used to adjust dates.	has		business center						
Relationship Property	hasBusinessRecurrenceIntervalConvention	business recurrence interval	[has business recurrence interval convention]		has		business recurrence interval convention						

Annex A: Machine Readable Files Part of This Specification

(normative)

The FIBO ontologies are delivered as (1) RDF/XML serialized OWL (normative and definitive), (2) UML XMI, serialized from UML with the ODM profiles for RDF and OWL applied (normative), (3) ODM XMI, serialized based on the ODM MOF metamodels for RDF and OWL (normative), and (4) Visual Ontology Modeler (VOM) model files, based on the VOM plug-in to MagicDraw (informative). If there are differences between the OWL files, ODM XMI, and UML XMI, the OWL files take precedence, followed by the UML XMI, and finally the ODM XMI.

Regardless of their form, each of the ontologies included in Foundations makes normative reference to the DCMI Dublin Core Metadata Terms⁴, W3C Simple Knowledge Organization System (SKOS) Recommendation⁵, and the OMG Architecture Board's Specification Metadata Recommendation⁶, which are not part of this specification.

The individual RDF/XML files are organized by module (directory), and within a given module, alphabetically by name, as shown in the URI structure for each individual OWL file. These files are UTF-8 conformant XML Schema files that are also OWL 2 compliant, and may be examined using any text editor, XML editor, or RDF or OWL editor. They have been verified for syntactic correctness via the W3C RDF Validator and University of Manchester OWL 2 Validator. They have also been checked for logical consistency using the Pellet OWL 2 reasoner from Clark & Parsia as well as the Hermit OWL 2 reasoner from Oxford University. It is anticipated that the OWL ontologies will be dereference-able, together with technical documentation (HTML) from the OMG site once the specification is adopted.

Note that the ontologies use features of the OWL 2 language and other ODM revisions that will not be available in the Ontology Definition Metamodel (ODM) until the ODM 1.1 specification is published. The ODM RTF has published a convenience document, available to OMG members, that incorporates specification changes required for FIBO that have already been resolved by the working group, and which we anticipate will be available later this year once the report and related specification is published.

⁴ <http://www.dublincore.org/documents/dcmi-terms/>

⁵ <http://www.w3.org/TR/2009/REC-skos-reference-20090818/>

⁶ <http://www.omg.org/techprocess/ab/SpecificationMetadata/>

Annex B: Shared Semantics Treatments

(normative)

B.1 Introduction

Intended Audiences: *Semantic Modelers; Technical architects*

The model content is grounded in terms which come from outside the realm of business entities of financial services. These are maintained in the Foundations ontology. Wherever possible, terms in this annex are cross referenced to terms set out by suitable standards bodies and academic bodies, so that the meanings of these terms are grounded in a broader community of semantics modeling.

Some of these external standards are in the form of formal ontologies, modeled typically but not necessarily in the Web Ontology Language (OWL) and in any case grounded in formal first order logic. In addition, some terms are derived from models which are not formally grounded in first order logic but which in some way or another are identified as meaningful concepts, either by explicit mark-up of the model content, by some separate theory of meaning, or by some statement at the level of the model identifying it as a semantic model. Such models are typically in the Unified Modeling Language (UML) or some other formalism such as that of the eXtensible Business Reporting Language (XBRL).

Some of the models are only referred to in part, for example because the scope of the standard, as identified by its business requirement, is very different to the scope of the concepts in the Foundations ontologies, or because the ontology contains formal axioms or facts which are at odds with Foundations.

This annex describes the range of treatments by which such external standards are cross referenced in the Foundations ontologies. A number of such treatments have been identified, depending on the nature of the standard or vocabulary referred to in FIBO Foundations, the language in which it is framed or the extent to which we are confident of making direct formal reference to it. For example, for some ontologies we wish to make direct, explicit reference, whereas for others we may have less visibility or confidence in the maintenance arrangements of that model's content and so have elected to create a local 'snapshot' of that ontology with its own namespace.

B.2 Shared Semantics Treatments

Case 1: Complete, stable OWL Ontologies

Treatment: If an ODM representation does not already exist as part of the standard, create a surrogate of the ontology using ODM.

Because this is in ODM, it shall have the actual URIs of the external standard. The material in FIBO represents a direct use of that ontology with its original namespace.

Case 2: Ontology Snapshot

If the external ontology is in OWL but we want to make a snapshot of it at a point in time

Treatment:

- Create clone copy of the ontology in our repository
- Allocate a URI which identifies this as a clone (to include the elements of the original URI plus "/fiboclone/")
- Use OWL equivalentClass, to point from an element in the FIBO clone to the corresponding element in that ontology.

When to use snapshot

This is used when for any reason we don't want to reference changes to the external ontology.

Case 3: Partial Snapshot

This treatment is for when the external ontology has a broader or different business requirement and range of concepts, such that we may not wish to refer to or replicate them all.

Treatment: Create a clone of only those the parts of the ontology we wish to refer to.

Otherwise the treatment is the same as for Case 2, except that in place of the URI fragment “/fiboclone”, the fragment “/fibopartialclone” should be used.

Annex C: Logical versus Conceptual Models comparison

(informative)

Intended Audiences: *Technology Management*

C.1 Comparison Table

The principal differences between a logical data model and a semantic model are shown in Table C1.1.

Table C1.1 Model Comparisons

Logical Data Model	Semantic Model
Represents elements in a database design	Should not include design information but is a model of business concepts
Represents data model design components (Classes in OO design; tables in relational database design)	Represents "Things" using set theory concepts
Combines common data structures for reuse and efficiency	No efficiency considerations because it is not a design; reiterates concepts as they apply
Single inheritance hierarchy	Multiple inheritance
May define a number of optional properties of a class, such that the application developer would know whether these apply or not	Defines what facts are applicable to a given type of thing.
Uses enumerations to qualify classes	Enumerates classes ("Things")
Closed World Assumption (CWA)	Open World Assumption (OWA)

These are explained further in the sub clauses which follow.

C.2 Detailed Models Comparison

Design Elements versus Business Concepts

A logical data model represents the design of some data structure such as a database or a message design. This differs from a physical data model in that it is not specific to any one implementation or platform. That is, a logical data model is a kind of "Platform Independent Model" or PIM, as distinct from a "Platform Specific Model" or PSM.

While a logical data model is not specific to any one physical implementation, it does represent some design. That is, the logical data model, like any logical design, represents the results of some design effort by some designer.

A semantic model does not represent any design of any solution, but explicitly represents facts about the problem domain.

If a designer sets out to design something, there should normally be something that they are working from. In the design of software, designers work from formal business requirements statements, such as "Use Case" models or a requirements specification document. For data, the equivalent is a semantic model. That is to say, a designer of a data model should be expected to work from some source of knowledge of the items which are to be catered for in the database or messages for which they are carrying out the design.

Components that are Represented (Classes, Tables or Things)

In order to create a model which represents the logical design of some database or message scheme, the modeler will create a model which represents components of that design. For example, in a relational database they will create a model of database tables, along with relationships between those tables, public and private keys and so on. A logical representation of the design is therefore a representation of database constructs, namely tables, relationships, keys and so forth. The logical data model design is therefore couched in a notation which has formal representations of those elements. This may take the form of an Entity Relationship Model (ERM) or an object oriented model in the form of a Class Model in the UML design notation.

Depending on the model notation chosen by the developer therefore, the model may be an ERM model of data entities and relationships, or a UML class model of classes, associations, composition relationships and so on. These are the items to which elements of the model refer.

By contrast, a semantic model does not represent a logical design, and the things in the semantic model represent instead the real world entities in the business domain itself.

For example, a logical data model for securities may contain a representation of data tables for data about shares, bonds and so on, whereas a semantic model of the securities domain will contain representations of shares and bonds themselves, as kinds of "Thing".

The relationship between a semantic model element and the things it represents is made explicit in the Semantic Web "Web Ontology Language" or OWL notation. In an OWL model, every kind of "Thing" in the model (also known as "Classes") is a set theory construct which defines membership of the set in terms of the properties of its members. All classes in an OWL ontology model are sub-classes of a class known as the "Universal" set, commonly labeled as "Thing". This is the set of which everything is a member. In this way it is made explicit that everything in the model is some thing.

Reuse

It is sensible when carrying out data model design, to identify similar sets of terms and combine these into reusable sets. A semantic model may end up combining common concepts if the concept can be described as a more general, more abstract variant of the kind of thing. However, this is not a requirement for model design - things may be combined according to similarity in the data structures without reference to their meaning.

This is really another aspect of the basic fact that, since a semantic model is not a design, it has no design constraints (note this may not be the case for an individual semantic technology application, where constraints are rightly applied but are very different to those for relational database or message design).

Single versus Multiple Inheritance

A limitation of some (though not all) relational design environments and notations is that the classes would be arranged in a hierarchy of classes. These would be in a single inheritance "tree" i.e. each class has only one parent class of which it is a specialization (ignoring polymorphism for now).

Semantic models more closely reflect the real world dispensation of taxonomies of kinds of thing, namely that a set of classes may be defined according to more than one property. For example, a whale is both a marine animal and a mammal according to two different kinds of classification hierarchy, and an individual whale, being a member of the class of things which are a whale, is classified as both kinds of thing.

This is particularly valuable in modeling of kinds of security for different applications. For example risk management and securities trading performance analysis have different requirements, based on asset types, cash flow behaviors and so on. One application would need to classify things according to one set of requirements. Regulators have different requirements to traders, and even different regulators or different areas of regulatory analysis and systemic risk analysis may dictate different ways in which the universe of instruments may be "sliced" for analysis.

Optionality

In standards, particularly message standards, it is good practice to have a number of properties that may or may not apply to a given category of data element (for example, for a data element for a debt security), and make all of these optional. This is practical: for any debt instrument, not all the properties necessarily apply, but someone wanting to send a message

from one point to another will be able to populate the message with those properties that exist for that security.

This, by definition, does not represent the knowledge that business practitioners may have about what facts necessarily must apply for a given instrument of a given type. In order to provide a message which is complete and correct, the sending party needs to apply knowledge from outside the model, about what facts necessarily apply to a given instrument. This intelligence would typically need to be built into the application that builds the message which is sent according to that schema. The knowledge is not represented in the schema.

At base this is simply another way of saying that the logical design of the message is not a representation of the knowledge about the instrument. Needless to say, this is not a criticism of such a message, it is simply a statement of why the message schema is not a record of the knowledge about the instruments.

Enumerations

A valid and good design approach to different kinds of thing is to provide a single data element which is an enumeration, containing entries for each of a number of entries that distinguish these things.

In a semantic model, each thing in the enumeration is a separate class of "Thing". The presence of enumerations in a model indicates that this is a logical model.

Note that for simplicity it is sometimes the practice to provide an enumeration (of textual strings, or 'literals') in a semantic model. However this is usually a pointer to the need to develop the semantics of the model further.

Open versus Closed World Assumption

FIBO specifications are expressed in OWL, which uses the Open World Assumption.

- Open World Assumption: Absence of evidence is not evidence of absence
- Closed World Assumption: Absence of evidence is evidence of absence

What this means in practice is that facts can be asserted about a thing in a semantic model without consideration to whether these facts are represented by actual data. For example, a fact about any event is that it has a cause, however causes of events need not be known or represented.

On a more detailed level, a semantic model can describe and represent facts about things without those facts being represented as data. Very often the facts, which define the nature of a thing, may not correspond directly to data. For example, many financial instrument types are defined in terms of the legal rights and obligations that they represent to one or other party to the contract. These rights and obligations may correspond indirectly to data elements, but the legal facts themselves may be more abstract, i.e. a fact stated in terms of "has right to" or "commits to" may refer to the abstract concept of a right, while the data may contain details of those rights and obligations, which may be regarded as a sort of signature revealing the existence of those rights and obligations.

This would be true of anything which is defined and classified according to facts which are themselves abstract. This would include most legal concepts.

C.3 Model Partitioning

The FIBO Foundations concepts are partitioned into several non-mutually exclusive categories, in the sense in which the term "partition" is used in the semantic modeling community. These are:

- Independent, Relative and Mediating things
- Concrete and Abstract things
- Continuant and Occurrent things.

Each partition is represented as a class of OWL Thing and as a sub-type of the OWL Thing class, without additional archetype indications.

Terms defined in the model in this specification, and any terms defined in future additions to this specification or in local ontologies derived by extension of this specification, may not have a direct parent class of 'OWL Thing'. All classes of

thing in the model described in this specification are given a parent which is either an archetype class of Thing or has an archetype as an ancestor, and all archetypes are given a parent from each of the three partitions listed above, with the exception of temporal terms which exist in a separate partition to the above.

Users of parts of this model may optionally ignore the above partitions in order to dispose model content under separate partitions of their own.

C.3.1 Independent, Relative and Mediating Things

This set of partitions provides a division into the model according to categories which have been arrived at through a considerable body of philosophical literature, notably that of C. S. Peirce. This partitioning relies on the claim in that literature that all things which can be named and classified fall into one and only one of these categories. This principle is reflected in the model described in this specification.

An independent thing is something which is defined in its own right and without reference to any context. For example, a business entity is an independent thing.

A relative thing is something the definition and meaning of which is specific to some specific context. That which is defined in that context is itself identified as some independent thing, or in some cases some other kind of relative thing, which stands in the role or relationship defined as the relative thing. For example a party to a contract is a relative thing, being itself some independent thing, in this case some business entity.

A mediating thing is the context in which some thing is defined as being some relative thing. For example, the context of contractual relationships, or of the context in which some specific kind of contract is entered into, is the mediating thing in which the business entity is identified as being some contract party. The term 'Mediating Thing' is synonymous with 'context' in the broadest sense of that term.

Relative things always have a relationship of 'identity' with some thing which may stand in the role identified by the relative thing. This is usually but not always some independent thing. In some cases the identity relationship may refer to some other relative thing, for example a securities issuer may be a 'Special Purpose Vehicle' which itself is defined as a kind of relative entity, the identity of which may be a company incorporated by the issue of shares, a limited liability partnership or some other form of legal entity. For this reason, while relative things should normally have an identity relationship to some independent thing, the most general application of this relationship is to the universal class 'Thing'.

C.3.2 Concrete and Abstract Things

This partition simply identifies whether something is a concrete item with weight and mass, or an abstract construct. Many of the concepts formally identified in the financial services industry are by their nature abstract.

Archetypes may only be identified as concrete or abstract if this is necessarily the case for all things of that archetype.

Note that things which have legal standing and which may be either provided on paper or in a dematerialized form are identified in this model as concrete. The intention of the Abstract partition is to define things which by their very nature are abstractions, such as goals.

One important class of abstract things is those things that are made up of information. According to the modeling principals, only things which are real may be represented in this model. This necessarily excludes things like database keys and locally defined identifiers. A common sense test needs to be applied to any kind of information before it is considered to be real and therefore able to be modeled here. Public information constructs such as security identifiers, business entity identifiers, credit ratings and the like pass this test because they are published by some party. In addition, documents and messages and the like which are passed between entities or parties in the course of carrying out some business process are equally real even though they are not published. The test for their reality is passed because information constructs such as documents have some real business, legal or financial import, that is some impact on something which is itself modeled as being part of the real world and not part of the technical design of some data or application.

C.3.3 Continuant and Occurrent Things

This partition segregates things which by their nature have some existence of a period of time, with a beginning and an end to their existence, and things which by their nature occur at a point in time. The precise timescales on which a thing may be said to occur or to have an ongoing existence is itself dependent on the domain being modeled, in this case all concepts relating to business entities and more broadly to the carrying out of business activities in the human world. So for example a human being would be considered on an astronomical scale as an occurrent thing, the difference in granularity in the time scales being determined according to the context in which the ontology is to be used. More precisely, a human being could still be considered as a Continuant Thing, with a human life being the corresponding Occurrent Thing, so in many cases it is reasonable to try to frame definitions of things which are clearly either continuant or occurrent.

For the avoidance of doubt, the partitioning of continuant from occurrent things is not formally represented by any axioms, and is definitional only. This means that terms in this model may be cross referenced to terms in models which use different formal ways of distinguishing continuant from occurrent things, for example what are called four dimensional, three dimensional, and similar modeling arrangements. The partitioning given in the model described in this specification contains no such assertions and is provided to enable the problem domain to be partitioned according to the basic nature of what is defined. This enables the model to contain concepts to do with events, processes, states and the like, though these are not utilized in the business entities semantic model.

Annex D: How to extend FIBO ontologies

(informative)

Intended Audiences: *The intended audience for this Annex is semantic modelers, who are expected to have some familiarity with the basic principles of semantic modeling but not necessarily with the principles specific to FIBO. Basic OWL principles are also reiterated here. This annex is not intended for purely business audiences or purely technical audiences.*

This Annex should be read in conjunction with the clause on Conformance (2).

D.1 Terminology used in this Annex

There are several sets of terminology in use throughout this specification, and the meanings of some terms (such as 'thing') may be different in different specialized usages. Here the intended sense of these words, unless otherwise stated, is the sense used for business communication of the ontology content, and not the sense used in technical modeling or conventional Semantic Web terminology. If a formal definition of a term is not given or referred to via the "Definitions" clause of this specification (4), the normal, English language sense of a word should be assumed, and not that of any technical body of knowledge or community of practice.

The model described in this specification follows the principles of the Web Ontology Language (OWL). This defines the concept of a 'Class' as a set theory construct and is not to be confused with the usage of the word 'Class' in the UML modeling paradigm. In descriptions aimed at business audiences, we usually use the word 'Thing' in place of this, and on the basis that the OWL library class "Thing" is the ultimate parent of all classes in an OWL model (so they are all things). This also precludes having to explain to a business audience the very nuanced distinctions between UML and OWL Classes. The specialized technical usage of the word 'Thing' to refer to an OWL individual is not the sense used in this Annex.

In this Annex, the term 'class' and 'thing' will be used interchangeably to describe the OWL classes as set theory constructs, that is in the natural language (dictionary) sense in which one speaks of classes of thing (for example in the sentence "what class of locomotive is this?" or "what class of animal is a fish?"). This corresponds to the OWL usage of the term but not (or not without some qualification) to the UML usage of the term.

D.2 Overview

D.2.1 Classes of Thing

In OWL and therefore in FIBO models, membership of a class may be defined intensionally by way of properties which define the membership (the extension) of that class, or extensionally by way of listing the members of the set which makes up that class.

In the model described in this specification, all classes are defined intensionally except where extensional models are unavoidable. The modeling notation employed here supports the definition of extensional classes but this is discouraged except for the definition of classes which are necessarily extensional such as days of the week.

D.2.2 Model relationship to Subject Matter

The formal statement by which everything in the model has an ultimate super-class which is the universal set of 'Thing' is the means by which this model is formally identified as being a business conceptual model and not a data model representation.

In order to preserve the integrity of the model as a model of business concepts, all classes which are added to the model must:

1. Be given a superclass (a class with which the new class has a sub-class relationship) from one of the existing classes in the model;
2. Represent something in the business domain itself, and
3. Represent a set of possible members which in all cases would also be members of the set defined by the superclass in (1)

D.2.3 How to Model New Classes

In modeling semantics, it is a requirement to model each new kind of "Thing" (hereafter referred to as 'classes') in the model according to the following two criteria:

- What kind of thing is this?
- What facts distinguish it from other things?

The consequence of addressing these questions is that for each kind (or class) of thing in the domain of discourse (in this case business entities and legal entities), this will be defined in terms of the following question:

"What is the simplest kind of thing that this is one of?"

By defining classes in terms of simpler kinds of thing, future changes will be additive. This benefit only applies if each class in the model is adequately generalized into some more abstract concept.

Failure to adequately generalize classes of "Thing" in the taxonomic hierarchy will have the result that future additions to that part of the taxonomy may prove to be disruptive. When the model is extended in the future to cover additional concepts, if the model components are not adequately abstracted then it will become necessary to break the existing chain of generalization to interpose new terms to support these new concepts. It is therefore important that modelers exercise imagination in this regard.

D.2.4 Declaring Class Disjointness

A disjointness relationship indicates that two classes of thing are mutually exclusive, that is that members of one may not also be members of the other.

Class disjointness refers to the situation whereby the members of one class may not also be members of another class when there is a disjoint relationship between the two. In OWL this relationship uses the 'isDisjoint' construct.

New 'isDisjoint' relationships should be labeled with the natural language label of "mutually exclusive"

Classes may have several separate sets of sub-classes which are mutually disjoint.

Note that disjointness is inherited through sub-class relationships. If a disjoint is misapplied this may cause inconsistencies. Conversely, if there is an inconsistency and disjointness has been correctly applied, then somewhere in the model there is an incorrect statement which would assert that some individual may be a member of more than one mutually disjoint class. The application of disjoint relationships therefore provides a useful diagnostic for subsequent extensions to the model, provided it is implemented correctly.

D.2.5 How to Model New Facts about Things

There are two kinds of "fact" in the model (in formal modeling terms, two kinds of "Property"):

1. Relationship Properties (known in OWL as Object Properties);
2. Simple Properties (known in OWL as Datatype Properties)

These are similar in their intent, in that they assert something about the class of which they are a property, but are shown differently in model diagrams.

Facts (properties) should be presented in the model only at the level of the class to which they apply. If a fact is not always applicable or relevant to the meaning of some concept, it should be applied to one or more sub-types of that class

where it would be applicable. Similarly a property should not be applied to sub-classes where they would not always be true.

As an example, vertebrates are a class of things which are an animal and which have a backbone. It would not be appropriate to model the term "has backbone" as an optional property of all animals. Nor would it be sensible to say, for each class of things which is a vertebrate, that this class of vertebrates also has a backbone.

Note that there is a difference here from data modeling. In a data model it may be more efficient to assign a property to a class, make it optional, and then have some sub-classes which use that property and some which do not. This is appropriate for a data model because such a model is not intended to convey the meanings of those classes; rather, the user of the model has to know which sub-classes would have data for that property and which of them would not. In contrast, the semantic model in FIBO is intended to convey the knowledge that such a user would need to have. For this reason, considerations of efficiency which would be brought to bear on a data model design exercise, should not be considered when extending FIBO models.

Impact on Sub-classes

When adding a new Relationship Property or Simple Property to an existing class, ensure that this fact would be true of all the classes that are sub-classes of this class, and that are sub-classes of their classes and so on. If the meaning asserted by the addition of the new property is not necessarily true of all the descendent classes of thing, then it would not be correct to add it to this class. Instead it should be added to those of the sub-classes to which it does apply (that is, those to which it contributes something of the meaning of what it is to be a member of that class).

If there is a clearly identifiable group of those sub-classes for which the property is applicable, then it is possible that these could be grouped together as a new sub-class with that property. However, the addition of such a class, being as it would be interposed into an existing class hierarchy, should be handled with care - this constitutes a disruptive rather than an additive change, and will have different and more stringent change management requirements.

Adding a Relationship Property

Wherever possible, a Relationship Property should be a specialization of another Relationship Property which is already in the model. When adding the Relationship Property, the RDF construct "subPropertyOf" should be used to assert what is the parent property.

The new property should extend or refine the meaning of the parent property in some way.

It is also allowable to have more than one parent property. This is appropriate in cases where the meaning of one Relationship Property is recognizably derivable from the meanings of two or more other Relationship Properties. This construction should be used sparingly and with care.

Types of Relationship Property

In terms of the OWL language, there are a number of distinctions between kinds of relationship which may be asserted in this model. For example, it is possible to assert that a relationship is symmetric, or that it is 'functional'. Functional relationships are relationships where only one individual of the type that's shown as the range of the property, may be that thing.

In the UML modeling environment, the information about what kind of relationship a given relationship is, is provided by means of tagged values.

At present the terms distinguishing different types of relationship are not widely used in the model. If in doubt, relationships should be added without attempting to populate this information.

When adding a new relationship and making it a sub-property of some existing relationship, modelers should check the parent relationship and any of its parents, to verify whether these are defined as being one of these specialized types of OWL object property. If they are, then the new relationship will also take on this type, so modelers must ensure that this would be correct for the relationship being added.

Adding a Simple Property

Simple Properties may only have a range (the object of the predicate) which is a simple information type or an enumerated data range.

The simple information types may be found in the model sub clause "Business Types". These include concepts such as text, numbers, dates and yes/no answers.

Simple Properties should not have ranges which are technical datatypes (the XML primitive datatype set or the datatypes made available within a UML modeling framework). XML primitive datatypes are allowable in RDF/XML based OWL ontologies, and would be used in an operational ontology derived from these models, but for the purposes of business understanding of the model these are all either given aliases (like 'yes/no' for boolean), or have more detailed types derived from them such as the various kinds of number.

There are no "Complex Types" in FIBO. For presentation purposes in different UML editing environments it is possible to consider rendering certain Relationship Properties (OWL object properties) as if they were simple types, i.e. using the UML "attribute" construct, but this is not formally supported in the sub-set of ODM defined in this specification. If this technique is used, such properties must be formally identified as OWL object properties; datatypes properties may not refer to classes which themselves have properties, such as monetary amounts or dated values.

D.2.6 Inverse Relationships

Whenever two relationships are in an inverse pair, this must be indicated by adding a relationship between those relationships, using the OWL construct 'inverseOf'. This should be labeled with the natural language label of 'inverse'.

Many Relationship Properties about things in the real world come in pairs, where one is the inverse of the other. For example "Account held by Account Holder" and "Account Holder holds Account" are two ways of saying the same thing, from the two perspectives of the Account and the Account Holder.

All relationships in the semantic notation used here and in the Semantic Web are unidirectional, that is they are 'triples' of the form Sub verb Object.

This is different to the way relationships are treated in data modeling. The 'ends' of a relationship in a data modeling format may be considered as being analogous to the separate relationships in a semantic model.

When to add these: Where it is considered relevant in defining the meanings of concepts, Relationship Properties (other than symmetric ones - see 'Types of Relationship Property') may also be given an inverse. It is not a formal requirement to indicate all the inverses that may possibly exist. Such relationships should be present in the model and extensions to the model if the two senses are in common use, if they correspond to a named term for which there is a formal definition in use in the financial industry, or if Relationship Properties that are commonly defined for sub-types of the class that they are a fact about, are commonly specified or referred to in the opposite direction to the one which has already been specified.

For this reason, the addition of new classes of thing in the model, given that these specialize existing things, may sometimes require the addition of the inverse of some existing Relationship Property, which was previously implied but not present as a property in the model.

D.2.7 How and When to Use Enumerations

There are two kinds of enumeration in the modeling notation:

- Enumerated Data Range
- Enumerated Class

Enumerated data ranges look a lot like enumerated datatypes in data models. However, these are used differently and will not usually correspond.

The 'Enumerated Data Range' construct should be used to enumerate possible data literals, that is pieces of text, numbers and so on, any one and only one of which may be the literal value of that datatype property for one instance of that class.

Where a data model enumerations may enumerate types of real thing and are frequently used to "flag" some class to say what kind of thing this is, this arrangement cannot be used in the FIBO semantic model. If a class of thing may be of several types, then these should be modeled as distinct classes, each of them a sub-class of the class of thing that they are all types of.

Where a class is to be defined by enumerating its members (extensional definition of the class), then the class itself should be modeled not as an OWL Class but as an OWL Enumeration Class.

D.2.8 Foundations Concepts Usage

Because it was a requirement that classes of thing be abstracted to their simplest possible types, the modeling already carried out in FIBO necessarily required the creation of a set of classes which, by their nature, are not unique to business entities or financial services terms and definitions.

There is a second scenario in which terms are required which are not unique to financial services. This is when a relationships fact (OWL object property) about some business entity has a relationship to something which is not itself a concept unique to the context of the financial services sector.

The terms which are not unique to the financial services sector are maintained in a separate part of the model repository and are given a separate namespace. These are packaged as the FIBO Foundations ontologies. Use of the appropriate terms in these ontologies is normative for this specification, but in many cases these ontologies are being evolved, improved upon and better aligned with other publicly available standard ontologies and with relevant academic work.

In Semantic Web terms, these are mid level ontologies. These are additionally supplemented by the inclusion of an "Upper Ontology" consisting of three sets of underspecified, high level partitions into which all model content is divided.

When adding new classes or Relationship Properties, modelers should seek out and select concepts from within the Foundations ontologies which represent the terms they need to specialize or refer to. They should also recognize and adequately respect the 'Archetype' of that term, if available. In particular, the ontology partitions under which the required archetype term resides should be inspected and understood, in order not to give rise to inconsistencies in the resultant ontology.

New general terms should not be added without first seeking the appropriate terms in these Foundations ontologies or in some recognized external ontology, which must itself be cross referenced using one of the methods described in Annex C (Shared Semantics Treatments), in order to create the necessary relationships.

D.2.9 Content Creation Summary

In summary, there are two scenarios where classes of thing are needed in any ontology for business entities, for financial securities, loans, derivatives and so on:

- The kind of "Thing" which something is;
- Things which are referred to in facts about things.

The first question will lead the modeler to find a more general class of thing of which to make the new class a sub-class. This should be sought initially in the ontology which is being extended, and after exhausting this, in the appropriate Foundations ontology, which must be inspected and fully understood before implementing the new sub-class ('is a') relationship.

The second question will lead the modeler to seek out the appropriate class of thing to which they need to refer. Often, but not necessarily, this will require the creation of some new class of thing. For example, a new class of 'Interest Payment Terms' might be appropriate in order to define a property of a new class of interest-bearing instrument which is defined by way of unique interest payment terms.

Modelers should look in the first instance for some class of thing which is exactly appropriate to the new relationship. For example, concepts like "Monetary Amount" or "Dated Monetary Amount" may be appropriate targets ("Ranges" in Semantic Web parlance) for more than one Relationship Property about more than one class of thing.

In the absence of such a class, modelers should add a suitable sub-class of some existing class of thing which is broader

in meaning but otherwise identical to the class to which the new Relationship Property is to refer. In the interest payment terms example above, they would add a new sub-type of the class which is 'Interest Payment Terms Set' or perhaps 'Fixed Interest Payment Terms Set' or 'Bond Fixed Interest Payment Terms Set' as appropriate. This should be labeled with a suitably business-facing label which uniquely describes it within that ontology and which as far as possible reflects what is unique about its meaning (note that meanings do not follow from these labels, but that business comprehension of the model follows from their allocation).

Where a term is not available for specialization within the ontology which the modeler is extending, these are to be found in the FIBO Foundations ontologies, which have been created for the purpose of providing such terms. These are ontologies of things which are not specific to financial services. These include legal concepts like contracts, business concepts such as service provision, as well as an extensive set of concepts for times, dates, mathematical constructs, events and activities, and so on.

If a suitable general term cannot be found then it may be necessary to extend one of the FIBO Foundations ontologies. This should be undertaken as a collaborative effort since this term will almost certainly be needed again in the future and by others. Such terms should be defined with formal reference to other, publicly available ontologies (these being defined either in Semantic Web formats or in some presentation, notation of theoretical grounding which makes it unambiguously clear that the terms in question are not part of a data model or other logical design).

D.3 Presentation Considerations

The presentation conformance requirements described in this specification are mainly a consideration for those creating or setting up editing environments in different modeling tools, and are not covered in this Annex. However, in the course of creating extensions to the model content there are a number of considerations which the modeler should keep in mind, as described in this sub clause.

D.3.1 Labeling

All classes, Relationship Properties and Simple Properties should be given natural language labels. These should be rendered with spaces just as normal text is written.

These labels should conform to the following style requirements:

- Classes: Names should be in Upper Sentence Case
 - Abbreviations (if used) should be in their normal upper case rendition e.g. ABC.
 - Small words (of, and etc.) should also be capitalized (this is to enable technical users to compress the names without loss of sense)
- Relationship Properties: Names should take the form Subject predicate Object with the casing as shown
 - Subject and Object to have the full name of the classes themselves except where this is cumbersome
 - The predicate (verb part) of the relationship name should be in all lower case, with spaces
 - If possible, relationship lines (which are displayed in 'simple' diagrams that don't have the boxes that come with the Relationship Properties), should be labeled with only the predicate.
- Simple Properties: Names should be in Upper Sentence Case
- Other types of "Thing" construct (OWL Union Classes, Intersection Classes, Enumerated Classes and Enumerated Data Ranges) should follow the same naming convention as classes.

In addition to the above constructs, which define the terms in the business domain, there are a number of built in constructs which make additional statements, in set theory terms, about the classes and properties. These should be labeled as follows:

- Logical Union relationships: these are rendered using the UML construct of a generalization set (UML "GeneralizationSet"). Such sets have one name. This name should be a natural language label, with spaces and

in lower case. The label should make clear the sense that it is a union relationship defining the logical union of the classes which participate in the generalization set, for example by ending the label with the word 'union'.

- Disjoints (OWL disjointWith): should always have the label "mutually exclusive"
- Inverses of relationships (OWL inverseOf): should always have the label "inverse"

D.3.2 Ontologies

These are implemented using the UML base class of 'Package'. Names for these should be in Upper Sentence Case. Wherever possible short or one word names should be considered.

D.3.3 UML Considerations

UML Diagrams

Diagrams are not transferred from any modeling environment into or out of the model repository. Diagrams are to be created by the modeler for presentation to business domain experts in the area in which they are working, or in the case of new submissions of the model content for future updates, to the wider community, and must be designed to be readable by business domain experts.

UML Notation

No explicitly UML notation should be present on any diagram.

The guiding principle here is one of language: any diagram which includes anything which belongs in or looks as though it belongs in some technical notation, will signal to the business reviewer that this diagram is in a language for which they have had no formal training. No matter how obvious the meaning of a diagram appears to be, the appearance of any technical notation means that it will appear to be something that requires some technical training to parse its meaning.

This means that

- no repurposed punctuation marks may be present on the diagrams. For example:
 - no curly braces and therefore no OCL
 - no guillemets - so stereotype indications must be disabled
 - no plus signs at the ends of relationships or next to attribute names
- UML class partitions that are unused (such as the operations partition) must be made invisible - either by manually resizing the class box until the extra line disappears, or by some other means;
- Exceptions may be made for relationship multiplicities, but the implications of these must be clearly explained to business domain experts who are expected to review the model content
- The Generalization arrowhead is an exception to the above: although this represents a technical notation (Generalization in UML), its meaning is more universal and can be explained to business domain experts ahead of any review. Such explanations must either reference Aristotelian syllogisms or be described in terms of the "is a" relationship with examples from natural taxonomy, depending on the knowledge of the business audience, but should not make reference to UML or words like Generalization or transitivity.
- Namespace indications: in some tools these are indicated with a double colon, which breaks the first rule above. Diagrams with these on may be created and maintained so that maintainers of the content can keep track of what is in what ontology, but these diagrams should not be considered as suitable for general business domain distribution.

Diagram Layout

Modelers should take care to lay out these in a clear and consistent way.

Generalization relationships should be laid out with the "arrowhead" pointing vertically upwards, in either the vertical tree style or direct style of routing. This is because this relationship, while technology neutral (it represents a basic Aristotelian syllogism), has to be explained to business domain experts and should therefore be presented in the same visual layout in which it has been explained, namely to represent taxonomic hierarchies with the most general terms at the top and the most specific at the bottom. These generalization relationships should never be drawn or found pointing downwards or sideways.

Where possible, the physical arrangement of the concepts in a diagram should try to follow the layout of the corresponding concepts in the archetype diagrams for those concepts.

Where large numbers of concepts are found in the same ontology, modelers should try to create separate diagrams which emphasize separate aspects of the subject matter (for example segregating contractual terms from legal obligations, or events from parties).

The relationship sub-property relationships are a particular hazard to creating clear, clean diagrams. However, these should rarely be shown to business domain experts. Where practicable, modelers are encouraged to create, for each separate thematic diagram, a set of three diagrams: one with all the material that needed to be modeled, one without the class component of the Relationship Properties, and one without the Simple Properties (compressing the class glyph as needed to remove the appearance of the attributes partition boundary).

Diagram Notes

Diagrams may also be decorated with informative notes. However, nothing of substance to the model content should be included in these, since these will not be retained when the model is transferred into the model repository or into other modeling environments.

UML Diagram Boundaries

As with notes, these may be included in business diagrams to aid in readability, but these UML boundaries do not form part of the model content and are not retained when the model content is transferred between environments.

UML Packages

UML Packages do not form part of the model, unless the package is stereotyped as an OWL Ontology.

OWL ontology packages may not be nested within other OWL ontology packages.

Modelers may arrange packages as appropriate for the usage to which they intend to put the model, and as part of this they may elect to make hierarchical structures of packages. Packages which are not stereotypes as OWL ontologies may be used for the purposes of such organization. Such packages may only contain other such packages or OWL ontology packages (that is, they should contain no loose classes or other constructs). Such packages do not form part of the model content, and will not be retained when the model content is transferred between environments.

No relationships between packages should be interpreted as, or created to imply, any relationship between ontologies.

All ontology imports must be explicitly modeled using the ODM "owlImports" construct. Each ontology should contain a diagram showing the full set of OWL imports required for that ontology, up to and including the "Lattice" ontology.

Annex E: Creating Applications with FIBO (Informative)

E1. Introduction

This annex contains guidelines on the production of operational applications that take the various FIBO Business Conceptual Ontologies as a point of reference. Such applications include operational OWL ontologies and applications based on conventional data models. The sub clauses below set out the overarching principles for creating such applications, and itemize the things to consider when deriving operational ontologies or logical data models from the content in those FIBO specifications.

E.1.1 Principles

These are the basic principles in order to avoid making assertions which contradict those assertions already made in FIBO:

1. It is not necessary to include all the ancestor classes but disjoints asserted between those ancestor classes must be respected
2. Two classes cannot be introduced into the same logical class hierarchy which have ancestors which are disjoint in FIBO. This is because otherwise it becomes possible to introduce contradictions or data structures which correspond to contradictory or untrue (or absurd) facts about the world.
3. Relationships which have restrictions defined for them (for example functional object properties) may not be extended to have looser multiplicity in logical data models but they may be further restricted.
4. New facts or relationships should not be introduced which directly contradict some fact in the FIBO terms which are used, or in any FIBO terms which are not directly used but which *have a bearing* on the terms which are used.

E.1.2 Operational Ontologies

The following questions are to be considered when creating an operational OWL ontology using terms set out in one or more of the FIBO Business Conceptual Ontologies:

- When to replace an object property with a Boolean
- Shortening the inheritance hierarchy
- Using independent things without relative things
- Redefining Relative Things as Independent Things
 - o This is valid when the context of the application matches the “Mediating Thing” that is the context in which the Relative Thing is defined
 - o Example: Legal Entity is a relative thing but for an application whose scope is constrained to one jurisdiction or LEI issuer, it can be treated as an Independent Thing
- Use of property chains
- Extraction of single-inheritance (monohierarchical) taxonomy
 - o May also be conformant, as a sub-set of the FIBO material
- OWL Restrictions versus rdfsSubPropertyOf relations between multiple object properties.

E.1.3 Conventional Applications

The following questions are to be considered when creating a logical data model using terms set out in one or more of the FIBO Business Conceptual Ontologies:

- Possible architectures
 - o Use of semantically under-specified classes, with enumerations to identify semantics
 - o Other styles –e.g. a direct rendition of the ontology with addition of database keys
- General
 - o Enumerations – don’t have mixed semantics in one enumerated datatype (causes combinational explosions)
 - o Text: when to collapse a chain of properties that end in a text field, with just an attribute that has text as a datatype
 - o Combining pairs of object properties into one association – with the object property names as the labels of the ends of the association
- UML considerations
 - o When to render object properties with a specific archetype, as UML Associations or Generalizations
 - o Multiplicity
- Relative Things
 - o These may be treated as independent classes when the context of the application matches the “Mediating Thing” that is the context in which the Relative Thing is defined
 - o Example: Legal Entity is a relative thing but for an application whose scope is constrained to one jurisdiction or LEI issuer, it can be treated as an Independent Thing
- Localization within a part of the taxonomy
 - o Patterns for taking a starting point within the hierarchy (e.g. MBS versus Bond versus Security), and navigating each of the object properties that apply at that level, navigating downwards (but not upwards) in the taxonomy of things that are the range of the object property, and defining these as the full possible scope of the model
- Extraction via Context
 - o From a given “Mediating Thing”, navigate to each of the “Relative Things” defined in that context, and each of the “Independent Things” that may take on the “identity” property of those relative things – this should result in a set of all and only those things needed for the application