Financial Industry Business Ontology – Financial Business and Commerce (FBC)

FTF Beta 1

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This OMG document replaces the submission document (finance/2015-08-02, 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 March 1, 2016.

You may view the pending issues for this specification from the OMG revision issues web page http://www.omg.org/issues/.

The FTF Recommendation and Report for this specification will be published on July 1, 2016. If you are reading this after that date, please download the available specification from the OMG Specifications Catalog.

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Preface

OMG

Founded in 1989, the Object Management Group, Inc. (OMG) is an open membership, not-for-profit computer industry standards consortium that produces and maintains computer industry specifications for interoperable, portable, and reusable enterprise applications in distributed, heterogeneous environments. Membership includes Information Technology vendors, end users, government agencies, and academia.

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OMG Specifications

As noted, OMG specifications address middleware, modeling and vertical domain frameworks. All OMG Specifications are available from the OMG website at:

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Specifications are organized by the following categories:

Business Modeling Specifications

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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**

CORBA Embedded Intelligence Specifications

CORBA Security Specifications

OMG Domain Specifications

Signal and Image Processing Specifications

All of OMG's formal specifications may be downloaded without charge from our website. (Products implementing OMG specifications are available from individual suppliers.) Copies of specifications, available in PostScript and PDF format, may be obtained from the Specifications Catalog cited above or by contacting the Object Management Group, Inc. at:

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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.

Issues

The reader is encouraged to report any technical or editing issues/problems with this specification to http://www.omg.org/report_issue.htm.

1   Scope

The Financial Business and Commerce (FBC) specification provides finance domain-specific bridge concepts required by a number of vertical, topic-oriented FIBO specifications. The requirements driving the content provided herein emerged in discussions between the FIBO Securities & Equities domain specification and Loans domain specification working groups. Both teams need to be able to talk about financial instruments, financial service providers, regulators, key registered identifiers, and other common concepts, and to use these concepts as the basis for integrating the two dependent specifications.

As a consequence, FBC provides a model of finance industry concepts that (1) depend on a combination of material from both the FIBO Foundations (FND) and Business Entities (BE) specifications, and (2) that are common to most financial domain subtopics, including but not limited to the two mentioned above. Coverage includes high-level financial instruments, a deep structure of functional entities including financial services providers (*e.g.*, bank holding companies, brokers, depository institutions, investment companies), entities that regulate those service providers, registration authorities and registries, and jurisdiction-specific service providers, registration authorities, and regulators. These concepts form the backbone for question answering to support KYC ("know your customer"), counterparty exposure, regulatory reporting, and others as a baseline for extension.

1.1   Overview

The Financial Business and Commerce (FBC) 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 communications such as contracts, product/service specifications and governance and regulatory compliance reporting.   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. Many of these entities are defined in the context of *this specification*.

The [Foundations] specification describes the modeling notation which has been employed and the requirements for presentation of this material to domain experts.

1.2   Scope of Financial Industry Business Ontologies: Financial Business and Commerce

1.2.1   How This Specification fits within the FIBO Family

This specification includes ontologies that define financial instruments, functional entities such as banks and regulators, and financial products and services within the framework of the Financial Industry Business Ontology (FIBO). These ontologies have been developed and will be maintained using the methodology presented in the FIBO Foundations [Foundations] specification. It depends on and extends concepts and relationships specified in FIBO Foundations [Foundations] and Business Entities [FIBO BE].

1.2.2   Business Scope

The scope of this specification includes financial instruments (top-level concepts only), financial service providers, registration authorities, regulatory agencies, and a preliminary set of jurisdiction-specific regulators and registries, as well as very high-level concepts for financial products and services.

Establishing common concepts that span multiple financial topic areas is critical to the development of interoperable FIBO domain standards. These include

- general classifications of financial instruments,

- financial service providers including holding companies, depository institutions such as banks and credit unions,

non-depository institutions such as investment and insurance companies,

- regulators, including but not limited to the primary US, EU, and UK regulatory agencies,

- registration authorities and registries for the most common financial services identifiers, such as charter numbers, routing numbers that support check clearing and international and national wire transfers, and other identifiers that assist in counterparty identification.

1.2.3   Relation to Financial Instrument Classification Standards

The concepts defined in the financial instruments ontology are compatible with, and derive some of their definitions from the ISO Classification of Financial Instruments (CFI) standard (ISO 10962).

1.3   Definitions

The human readable definitions associated with every concept, property, and individual defined herein have been developed following guidelines specified in ISO 704 [ISO 704] for construction of definitions, similar to typical Aristotelian styling for definition development. They have been adapted from a number of standard business and financial industry references as well as from the relevant regulations, by a team of business subject matter experts. Source materials for these definitions are referenced to the degree possible. The process by which team development of FIBO content is accomplished has evolved significantly since the original FIBO Foundations [Foundations] RFC submission, and minutes from most of the working group sessions are available from the EDM Council wiki. Contributors from a variety of IT and business backgrounds, from a number of leading institutions and related consultancies have reviewed this material internally as a part of that process. Content was also derived from the original EDM Council Semantics Repository as appropriate.

1.3.1.   Definitions Policy

Although the starting point for many of the FIBO terms throughout the FIBO family of specifications was the ISO 20022 FIBIM model, much of the content contained herein is new, created to fill gaps with respect to common business and commerce terminology. The policy for sourcing definitions and adapting them follows from decisions made for other FIBO specifications, however.

Where definitions for the FIBO industry terms are derived from third party sources, rather than existing standards such as the ISO 10962 CFI standard, the policy for arriving at those definitions is 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, Barron's Dictionary of Finance and Investment Terms, 9th Edition (John Downes and Jordan Elliot Goodman), and the related Dictionary of Banking Terms, 6th Edition (Thomas P. Fitch), and Dictionary of Business and Economics Terms, 5th Edition (Jack P. Friedman), shall be used.

2. If a term and its acceptable definition is not contained in one of the Barron's Dictionaries, 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 Barron's Dictionaries or investopedia, 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 Applications for which Conformance Points Exist

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
  - In diagrams
  - 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.

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.

2.2 Conformance Points

These consist of the generic FIBO conformance points defined in further detail in [Foundations], applied to the specific ontologies in this Specification.

This specification has the following conformance points:

2.2.1 Conformant Technical Applications

- If a technical application is FIBO Model Conformant[†] with the complete set of FIBO FBC ontologies, then the application satisfies *Full FIBO FBC Model Conformance*.

- If a technical application is FIBO Model Conformant with a particular FIBO FBC ontology, then the application satisfies *FIBO FBC Ontology Conformance* for that particular ontology. There is thus a separate conformance point for each ontology in Clauses 9 and 10.

[†] "FIBO Model Conformant" is defined in [Foundations].

2.2.2 Conformant Extensions

- If an ontology is FIBO Extension Conformant[†] for an ontology in FBC, and FIBO ODM Conformant[†], then it satisfies *FIBO FBC Extension in ODM* for that ontology. If this holds for all the ontologies in FBC then it satisfies *FIBO FBC-Full Extension in ODM*

- If an ontology is FIBO Extension Conformant[†] for an ontology in FBC, and FIBO OWL Conformant[†] then it satisfies *FIBO FBC Extension in OWL* for that ontology. If this holds for all the ontologies in FBC then it satisfies *FIBO FBC-Full Extension in OWL*

[†] "FIBO Extension Conformant", "FIBO ODM Conformant" and "FIBO OWL Conformant" are defined in [Foundations].

2.2.3 Conformant Presentation

A rendering of the ontologies in clauses 9 and 10 of this FBC specification is:

- *FIBO FBC Business Diagram Conformant* if it provides coverage of all the ontologies and is FIBO Business Diagram Conformant[†]

- *FIBO FBC Business Table Conformant* if it provides coverage of all the ontologies and is FIBO Business Table Conformant[†]

[†] "FIBO Business Diagram Conformant" and "FIBO Business Table Conformant" are defined in [Foundations].

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/.
[DTV]	The OMG Date Time Vocabulary. Available at http://www.omg.org/spec/DTV/.
[FIBO BE]	Financial Industry Business Ontology (FIBO) – Business Entities (EDMC-FIBO/BE). Available at http://www.omg.org/spec/EDMC-FIBO/BE/, dtc/15-02-20
[Foundations]	Financial Industry Business Ontology (FIBO) – Foundations (EDMC-FIBO/FND). Available at http://www.omg.org/spec/EDMC-FIBO/FND/, dtc/14-12-04
[ISO 704]	ISO 704:2000 Terminology Work – Principles and Methods
[ISO 1087]	ISO 1087-1:2000 Terminology — Vocabulary — Part 1: Theory and application
[MOF Core]	Meta Object Facility (MOF™) Core, v2.5. Available at http://www.omg.org/spec/MOF/2.5/.
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, v2.5. Available at http://www.omg.org/spec/XMI/2.5/.
[ODM]	Ontology Definition Metamodel (ODM), v1.1. Available at http://www.omg.org/spec/ODM/1.1/.
[OMG AB Specification Metadata]	OMG Architecture Board recommendations for specification of ontology metadata, Available at http://www.omg.org/techprocess/ab/SpecificationMetadata.rdf
[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 Concepts]	RDF 1.1 Concepts and Abstract Syntax. Richard Cyganiak, David Wood and Markus Lanthaler, Editors. W3C Recommendation, 25 February 2014. Latest version is available at http://www.w3.org/TR/rdf11-concepts//.
[RDF Schema]	RDF Schema 1.1. Dan Brickley and R.V. Guha, Editors. W3C Recommendation, 25 February 2014. 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 2.5. Available at http://www.omg.org/spec/UML/2.5/.
[Unicode]	*The Unicode Standard, Version 3*, 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, November 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 28 October 2004. 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
[ISO 10962]	ISO 10962:2015 Securities and related financial instruments -- Classification of financial instruments (CFI code)
[DL Handbook]	THE DESCRIPTION LOGIC HANDBOOK: Theory, implementation, and applications. Baader, McGuinness, Nardi, and Patel-Schneider, editors. Cambridge University Press, Cambridge, United Kingdom, 2003.
[FIBIM]	ISO TC68/SC4/WG11 Document N012 version 3

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.

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.

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:

- IRI – Internationalized (Uniform) Resource Identifier

- LEI – Legal Entity Identifier

- 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 Audience

This specification has the following audiences:

- The standards community

- The finance industry business and regulatory community

- Information Technology (IT) architects

- Taxonomists and Ontologists

6.1.1 Standards Community

This audience is intended to be able to follow and validate the way in which this specification documents the models (ontologies) defined herein.

6.1.2 Finance Industry Business and Regulatory Community

As noted in the section on conformance (section 2) this specification defines concepts, relationships among those concepts, logical sentences that refine the meaning of those concepts, and well-known individuals (such as for specific regulatory agencies, central banks, and registries) that instantiate those concepts for use by business subject matter experts. There may be technical details in some of the diagrams, as well as logic expressions in tables that are not targeted at this audience, but the concepts and annotations, including definitions, examples, explanatory notes, and so on, in the tables accompanying the diagrams should be consumable and relevant for this audience.

6.1.3 Information Technology (IT) Architects, Enterprise Architects, and Developers

These include but are not limited to:

- Tool vendors and developers

- Application and content providers / enriched content providers

- Business Analysts – including business analysts in the banking community, business architects, process engineers, metadata and data governance experts, and so forth

- IT and technical management

The bulk of the "Architecture" section is intended to be read and understood by these audiences and by the 'Taxonomists and Ontologists' audience.

6.1.4 Taxonomists and Ontologists

Much of the material in this specification is intended to be read and understood by those responsible for developing taxonomies and ontologies for the business. Such individuals must be familiar with first order logic, description logics, and the W3C family of specifications for the RDF [RDF Concepts] and OWL [OWL 2] languages. They should also be familiar with the Ontology Definition Metamodel [ODM] representation of these languages. The entire specification, including the details relevant to conformance (Section 2) and as well as the architecture and overall approach (Section 8), and especially the content of the ontologies (Section 9) is important for this audience.

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.

- Bloomberg LP

- Citigroup Inc.

- Credit Suisse

- Deutsche Bank

- Fidelity Investments

- Global LEI Foundation / Tahoe Blue Ltd

- Goldman Sachs

- MphasiS

- No Magic

- Nordea Bank AB

- State Street

- Thematix Partners LLC

- Wells Fargo

- Wizdom Systems, Inc.

- Working Ontologist

6.3 Notation

The diagrams included herein are ODM-compliant UML diagrams, in other words, they conform to the UML Profiles for RDF and OWL specified in the OMG's Ontology Definition Metamodel [ODM] Specification. This includes the set of UML stereotypes and graphical notation used in the diagrams provided.

The color scheme employed in these diagrams includes:

- Basic OWL Classes: white for classes defined within the current (local) ontology, amber for classes defined within an imported (referenced) ontology

- OWL Restriction Classes and other Class Expressions (unions, intersection, complements): green

- OWL Object Properties: blue

- OWL Data Properties: dark gray

- OWL Datatypes: pink

- OWL Individuals: light gray

Within the context of this specification (and the FIBO specifications on which it depends), a module is group of ontologies, organized as a subdomain with respect to the FBC namespace and as a folder from a file management perspective. One or more ontologies are contained in each of the three modules in this specification, which include FinancialInstruments, FunctionalEntities, and ProductsAndServices. For each module there is an "about" file, which provides metadata about the module, specified in tabular form. Each of the primary ontologies in a given module is defined as an ODM-compliant UML model as well as in OWL (aside from the "about" file, which is expressed in RDF/XML only). The normative ontology is expressed in ODM XMI (*i.e.*, XMI that conforms to the ODM metamodels for RDF and OWL), ODM UML XMI (*i.e.*, that conforms to the UML Profiles for RDF and OWL in the ODM specification), and in RDF/XML serialized OWL 2.

The notation used to represent description logic expressions (*i.e.*, the expressions in the Parent columns in class tables

containing ontology details) is consistent with the notation defined in the Description Logic Handbook [DL Handbook]. Some of the basics are described in Table 6.1, below. Note that this is not intended to be comprehensive, but includes the primary patterns that are used in the FIBO FBC specification, for property restrictions in particular.

Table 6.1 - Description Logic Expressions Notation

Construct	Description	Notation
Boolean Connectives and Enumeration		
intersection	The intersection of two classes consists of exactly those individuals which are instances of both classes.	$C \cap D$
union	The union of two classes contains every individual which is contained in at least one of these classes.	$C \cup D$
enumeration	An enumeration defines a class by enumerating all its instances.	oneOf $(i_1, i_2, i_3, \ldots i_n)$
Property Restrictions		
universal quantification	Universal quantification is used to describe a class of individuals for which all related individuals must be instances of a given class (*i.e.*, allValuesFrom in OWL).	$\forall R.C$, where R is the relation (property) and C is the class that constrains all values for related individuals
existential quantification	Existential quantification is used to define a class as the set of all individuals that are connected via a particular property to at least one individual which is an instance of a certain class (*i.e.*, someValuesFrom in OWL).	$\exists R.C$, where R is the relation (property) and C is the class that constrains some values of related individuals
individual value	Individual value restrictions are used to describe classes of individuals that are related to one particular individual (*i.e.*, hasValue in OWL).	$\forall R.I$, where R is the relation (property) and I is the individual
exact cardinality	Cardinality (number) restrictions define classes by restricting the cardinality on the sets of fillers for roles (relationships, or properties in OWL). Exact cardinality restrictions restrict the cardinality of possible fillers to exactly the number specified.	$= n\ R$ (for unqualified restrictions) $= n\ R.C$ (for qualified restrictions, i.e., including onClass or on DataRange)
maximum cardinality	Maximum cardinality restrictions restrict the cardinality of possible fillers to at most the number specified (inclusive).	$\leq n\ R$ (for unqualified restrictions) $\leq n\ R.C$ (for qualified restrictions)
minimum cardinality	Minimum cardinality restrictions restrict the cardinality of possible fillers to at least the number specified (inclusive).	$\geq n\ R$ (for unqualified restrictions) $\geq n\ R.C$ (for qualified restrictions)
Class Axioms		
equivalent classes	Two classes are considered equivalent if they contain exactly the same individuals.	$\equiv C$
disjoint classes	Disjointness means that membership in one class specifically excludes membership in another.	$\neg\ C$

Within the tabular representation for restrictions in the tables included herein, the identifiers for the restrictions shown in the diagrams are included parenthetically following the logic expressions. These are not part of the logic, but are included for comparison purposes. The identifiers are named based on the precedent set in the FIBO Foundations [Foundations] specification, which includes the namespace prefix for the ontology followed by a unique number.

Additionally, some restrictions are nested, whereby the content of an embedded (nested) restriction is also included parenthetically. In these cases, all of the identifiers will be included, also parenthetically, following the complete specification of the complex restriction. Note too that in the case of complex restrictions, where there are nested elements in parentheses, the "dot notation" used as a separator between a property and the role filler is replaced with the

embedded parenthetical filler definition. A "role" from a description logic perspective is essentially a property in OWL, and the role "filler" is the class or individual that provides the value for that role in a given axiom (*i.e.* in a restriction or other logic expression).

For the vast majority of the property restrictions specified in FIBO, the restrictions are defined as necessary conditions for class membership, rathe r than sufficient conditions. As a result, the tables assume that necessary conditions is the default and only in cases where a restriction imposes sufficient conditions will that be stated.

6.4   Changes to Adopted OMG Specifications

This specification requires the following changes to the FIBO Foundations [Foundations] Version 1.0 Specification (OMG document number dtc/2014-12-04):

In section 2.2.2.1 replace:

> Full FIBO Model Conformance

By:

> Full FIBO Foundations Model Conformance

In section 2.3 correct the reference from:

> FIBO Model Conformance (see 2.3.1)

To:

> FIBO Model Conformance (see 2.2.1)

In section 2.4.3.1 remove the bullet "Synonym" and add a new sub-bullet under the first bullet "Term":

> o   Synonyms can be in the same column (in parentheses under the preferred label) or a separate column headed Synonyms

In section 2.4.3.2 replace:

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

By:

> The extended table shall encompass each of the basic model features, as follows (they may be covered by separate columns or multiple features may be grouped into a smaller number of columns, distinguished by sub-headings)

In section 2.4.3.2 delete the bullet "Union Relationships" (and sub-bullets) and "Union Class".

In section 2.4.3.2 replace:

> 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.

By:

> Object Properties and Datatype Properties shall be included once in all reports across the model, and this shall be for the ontology which defines that property.

In addition, the changes summarized below, which are primarily additions to existing ontologies in [Foundations] or new ontologies to be added to [Foundations], and specified in more detail in the sub-sections that follow are considered essential for FBC.

- New ontology "ClassificationSchemes", as defined in section 6.4.1, below:
  - o   Located in module "Arrangements"

- o This includes concepts to support classification of financial instruments, for example, using classification schemes such as ISO 10962, but is sufficiently general to support classification schemes of many different forms, based on ISO 11179

- New ontology "QuantitiesAndUnits", as defined in section 6.4.2 and 6.4.3, below:

  - o Located in new module "Quantities"

  - o This includes concepts to support measurement units, systems of quantities, systems of units, quantity values, and so forth, and is logically equivalent to the quantities ontology in the Date Time Vocabulary (DTV) 1.2 specification. It is compatible with the Quantities, Units, Dimensions, and Values work that has been done for SysML as well.

  - o Quantity values are required for representation of commodities, indices, and other measures in FIBO

- Additions to ontology "CurrencyAmount", as defined in section 6.4.4, below:

  - o Located in module "Accounting"

  - o This modification includes the changes to the CurrencyAmount ontology defined herein as well as the addition of *one* subordinate ontology that is not modeled in ODM/UML (containing individuals only for currency codes corresponding to ISO 4127), and is derived from and conforms to ISO 4127

  - o The ontology containing the individual currency codes depends on the emerging Languages, Countries, and Codes (LCC) Specification, under development by the Analysis and Design Platform Task Force (ADPTF). The currency codes are sufficiently general, with minimal dependencies on other FIBO ontologies, such that they can be used broadly across other OMG specifications and by others outside of the OMG once published.

- New ontology "ProductsAndServices", as defined in section 6.4.5 and 6.4.6, below:

  - o Located in new module "ProductsAndServices"

  - o This includes concepts defining client, customer, buyer, seller, product, service, service provider, and related content to support definition of financial products and services, roles played by parties to a trade or other purchase agreement, and so forth, as needed in other FIBO domain specifications.

- New ontology "PaymentsAndSchedules", as defined in section 6.4.7, below:

  - o Located in new module "ProductsAndServices"

  - o This includes concepts defining payer, payee, payment, obligation, payment event, payment schedule and related content to support definition of dividend payment schedules, coupon schedules, loan payment schedules, and so forth, as needed in other FIBO domain specifications.

- Additions to the "LegalCapacity", ontology, as defined in section 6.4.8, below:

  - o Located in module "Law"

  - o This includes the addition of classes such as license, licensee, licensor and related restrictions, for extension in FBC to reflect government-issued licenses such as bank charters

Note that these additions will require revision of Table 8.3 Prefix and Namespaces for FIBO Foundations, to include the namespace declarations given below (see 6.4.9). Table and Figure numbers are relative to the existing [Foundations] specification, and will likely be adjusted during the document editing process for Foundations.

6.4.1 Ontology: Classification Schemes

Add a new ontology to the Arrangements module. This should be incorporated into a new section, section 10.5.2, in the Foundations [Foundations] specification.

Add the following text, tables, and diagrams immediately after the new heading for the ontology:

This ontology defines abstract concepts for representation of classification schemes that themselves are intended to permit the classification of arbitrary concepts into hierarchies (or partial orders) for use in other FIBO ontology elements.

Metadata defining the primary metadata elements for the Classification Schemes ontology are given in Table 10.26, below.

Table 10.26 - Classification Schemes Ontology Metadata

Metadata Term	Value
sm:filename	ClassificationSchemes.rdf
sm:fileAbbreviation	fibo-fnd-arr-cls
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/ Arrangements/ClassificationSchemes/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/ 20150801/Arrangements/ClassificationSchemes/
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/Arrangements/Arrangements/

Figure 10.25 provides an overview of the concepts defined in the Classification Schemes ontology.

Figure 10.25 - Classification Schemes Concepts

Detailed content of the Classification Schemes ontology is provided in Table 10.27, below.

Table 10.27 - Classification Schemes Details

Classes

Name	Annotations	Class Expressions
ClassificationScheme (classification scheme)	<u>Definition</u>: a system for allocating classifiers (elements in a classification scheme) to objects, similar to identifiers in some cases; such classification schemes are intended to permit the classification of arbitrary objects into hierarchies (or partial orders) <u>Explanatory note</u>: A classification scheme may be a taxonomy, a network, an ontology, or any other terminological system. The classification may also be just a list of controlled vocabulary of property words (or terms). The list might be taken from the 'leaf level' of a taxonomy. <u>Adapted from</u>: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	<u>Parent Class</u>: Arrangement <u>Property Restriction</u>: ∀**defines**.**Classifier** (fibo-fnd-arr-cls-01)
Classifier (classifier)	<u>Definition</u>: a standardized classification or delineation for something, per some scheme for such delineation, within a specified context <u>Adapted from</u>: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	<u>Parent Class</u>: Reference <u>Property Restriction</u>: = 1 **isMemberOf**. **ClassificationScheme** (fibo-fnd-arr-cls-04) <u>Property Restriction</u>: = 1 **hasDefinition.ClassificationScheme** (fibo-fnd-arr-cls-02) <u>Restriction</u>: ≥ 1 **classifies** (fibo-fnd-arr-cls-03)
IndustrySectorClassificationScheme (industry sector classification scheme)	<u>Definition</u>: a system for allocating classifiers to organizations by industry sector <u>Example</u>: Examples include the North American Industry Classification System (NAICS), and older Standardized Industry Classification (SIC), which is still used today by the US Securities and Exchange Commission (SEC), developed by government to classify industries, and commercial classification schemes, such as the Global Industry Standard Classification (GICS) developed jointly by Morgan Stanley Capital International (MSCI) and Standard and Poor's, or competing schemes including the Industry Classification Benchmark (ICB) system, maintained by Dow Jones and London's FTSE Group, among others. <u>Adapted from</u>: Barron's Dictionary of Business and Economics Terms, 2012 <u>See Also</u>: http://www.investopedia.com/terms/g/gics.asp	<u>Parent Class</u>: ClassificationScheme
IndustrySectorClassifier (industry sector classifier)	<u>Definition</u>: a standardized classification or delineation for an organization, or possibly for a security representing an interest in a given organization, per some scheme for such delineation, by industry <u>Adapted from</u>: Barron's Dictionary of Business and Economics Terms, 2012	<u>Parent Class</u>: Classifier

6.4.2 Module: Quantities

Add a new module to Foundations called Quantities. This should be incorporated into a new section, section 10.14, at the end of Clause10.

Add the following text and table immediately after the new heading for the module:

Metadata defining the primary metadata elements for the Quantities module are given in Table 10.86, below.

Table 10.86 - Quantities Module Metadata

Metadata Term	Value
sm:moduleName	Quantities
sm:moduleAbbreviation	FIBO-FND-QT
sm:moduleVersion	1.0
sm:moduleAbstract	This module contains ontologies that define concepts related to quantities, units, dimensions, and quantity values.

6.4.3 Ontology: QuantitiesAndUnits

Add a new ontology to the Quantities module. This should be incorporated into a new section, section 10.14.1, in the Quantities module.

Add the following text, tables, and diagrams immediately after the new heading for the ontology:

This ontology provides an initial set of concepts supporting the representation of quantities, units, systems of quantities, and systems of units for use in FIBO. It is compatible with and can be mapped directly to the OMG Date Time Vocabulary (DTV) Quantities Ontology, but has been integrated into FND to provide local coverage of quantities and measurements and eliminate the SBVR mark-up.

Metadata defining the primary metadata elements for the QuantitiesAndUnits ontology are given in Table 10.87, below.

Table 10.87 - QuantitiesAndUnits Ontology Metadata

Metadata Term	Value
sm:filename	QuantitiesAndUnits.rdf
sm:fileAbbreviation	fibo-fnd-qt-qtu
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Quantities/QuantitiesAndUnits/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20150801/Quantities/QuantitiesAndUnits/
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/Arrangements/Arrangements/

Figure 10.83 provides an overview of the concepts defined in the QuantitiesAndUnits ontology. Subsequent diagrams provide more detailed views on several of the concepts, with a focus on the logical restrictions that further define them.
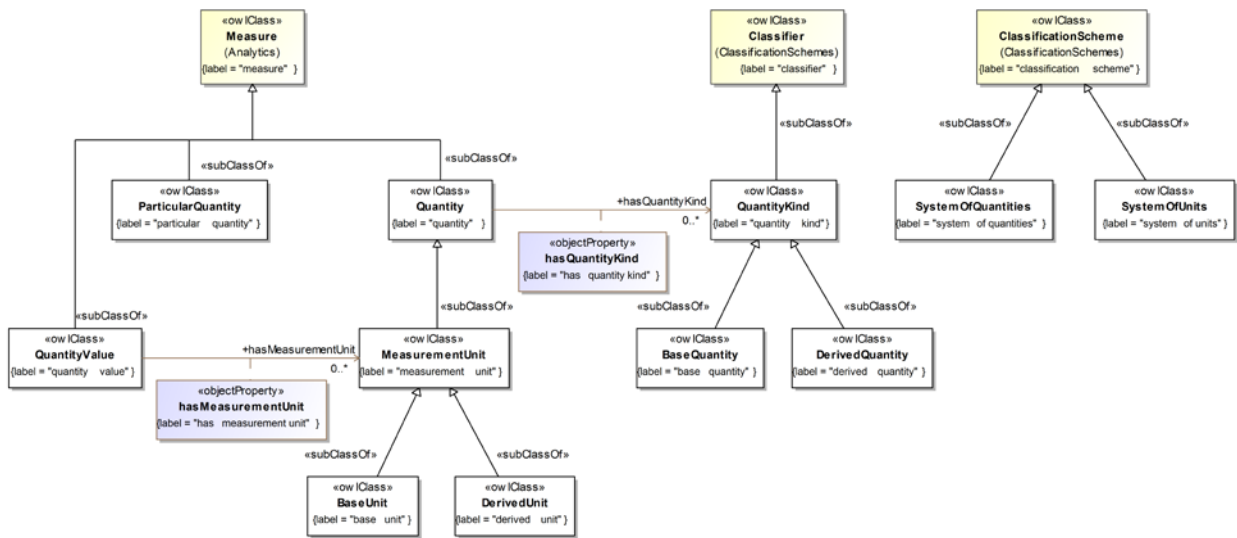
Figure 10.83 - QuantitiesAndUnits Ontology Overview

Figure 10.84 defines quantities in more detail, including the properties and restrictions relevant to the Quantity, MeasurementUnit, BaseUnit, and DerivedUnit classes.
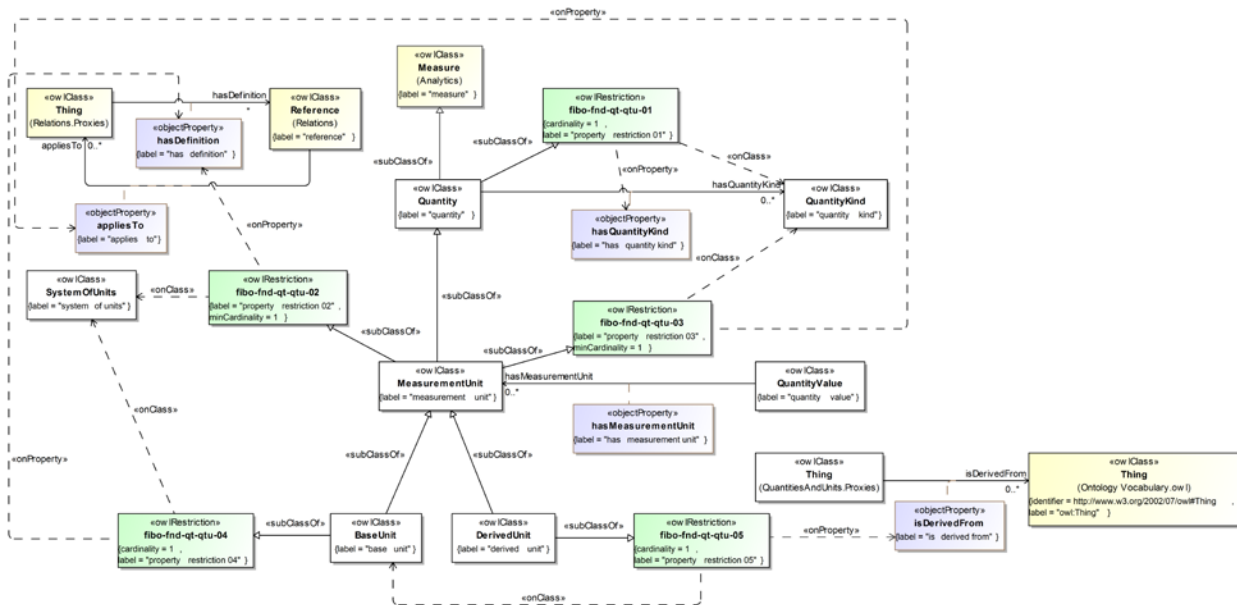
Figure 10.84 - Definitions for Quantities and Measurement Units

Figure 10.85 defines quantity kinds in more detail, including the properties and restrictions relevant to the QuantityKind, BaseQuantity, and DerivedQuantity classes.

Figure 10.85 - Definitions for Quantity Kinds

Figure 10.86 provides the set of definitions relevant to SystemsOfQuantities and SystemsOfUnits.

Figure 10.86 - Definitions for SystemsOfQuantities and SystemsOfUnits

Finally, Figure 10.87 provides the set of definitions characterizing quantity values.

Figure 10.87 - Definitions for Quantity Values

Detailed content of the QuantitiesAndUnits ontology is provided in Table 10.89, below.

Financial Industry Business Ontology – Financial Business and Commerce

Table 10.89 - Quantities and Units Details

Classes

Name	Annotations	Class Expressions
BaseQuantity (base quantity)	Definition: a quantity kind in a conventionally chosen subset of a given system of quantities, where no subset quantity can be expressed in terms of the others Example: The International System of Quantities (ISQ) comprises these base quantities (with their SI base measurement units): length (meter), mass (kilogram), duration (second), electric current (ampere), thermodynamic temperature (kelvin), amount of substance (mole), and luminous intensity (candela). These base quantities are not mutually comparable. All quantities of any one of these kinds are, however, mutually comparable. Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: QuantityKind Property Restriction: = 1 **hasDefinition.SystemOfQuantities** (fibo-fnd-qt-qtu-06)
Base Unit (base unit)	Definition: a measurement unit that is defined by a system of units to be the reference measurement unit for a base quantity Explanatory note: Quantity units that are not base units are derived units. Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: MeasurementUnit Property Restriction: = 1 **hasDefinition.SystemOfUnits** (fibo-fnd-qt-qtu-04)
DerivedQuantity (derived quantity)	Definition: a quantity kind, in a system of quantities, that is not a base quantity of the system but may be defined in terms of base quantities of the system Example: velocity (length/time), mass density (mass/length^3) Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: QuantityKind Property Restriction: = 1 **isDerivedFrom.BaseQuantity** (fibo-fnd-qt-qtu-07)
DerivedUnit (derived unit)	Definition: a measurement unit for a derived quantity Explanatory note: Every derived unit is defined in terms of base units. Example: 1 minute = 60 seconds Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: MeasurementUnit Property Restriction: = 1 **isDerivedFrom.BaseUnit** (fibo-fnd-qt-qtu-05)
MeasurementUnit (measurement unit)	Definition: a quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number Example: week, day, hour, minute, second, kilogram, joule, meter Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: Quantity Property Restriction: ≥ 1 **appliesTo.QuantityKind** (fibo-fnd-qt-qtu-03) Property Restriction: ≥ 1 **hasDefinition.SystemOfUnits** (fibo-fnd-qt-qtu-02)
ParticularQuantity (particular quantity)	Definition: a property that is of an individual thing and is quantifiable as an instance of some quantity kind Explanatory note: A particular quantity is given by a definite description, which identifies the individual thing and the property. Particular quantities are properties of particular things and are generally expressed by a term for the property and a quantity value. Example: The weight of a given person, the mass of the Earth, the speed of light, and the distance between and are said to be 'particular quantities.' Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: Measure

Financial Industry Business Ontology – Financial Business and Commerce

Quantity (quantity)	Definition: a property of a phenomenon, body, or substance, to which a number can be assigned with respect to a reference Explanatory note: A quantity as defined here is said to be a 'scalar' as distinct from a 'vector'. However, a vector or a tensor whose components are quantities is also considered to be a quantity. Example: second, kilogram, joule, meter. These are quantities in a general sense, which is what is meant here by quantity. Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: Measure Property Restriction: = 1 **hasQuantityKind.QuantityKind** (fibo-fnd-qt-qtu-01)
QuantityKind (quantity kind)	Definition: a categorization type for "quantity" that characterizes quantities as being mutually comparable Explanatory note: Every instance of "quantity kind" is also a specialization of "quantity". So the concept "duration" is an instance of "quantity kind" and it is a specialization of "quantity", *i.e.*, it is a classifier of actual quantities. But a given duration (*i.e.*, the duration of something) is an instance of "duration" and thus a "particular quantity" not an instance of "quantity kind". For example, a "year" is not an instance of quantity kind; it is an instance of quantity, but not a category of quantity. Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: Classifier
QuantityValue (quantity value)	Definition: number and measurement unit together giving magnitude of a quantity Explanatory note: The quantity expressed by a quantity value is the quantity whose ratio to the measurement unit is the number. Example: 2 days, 3.5 hours, 150 lb, 45.5 miles Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: Measure Property Restriction: = 1 **hasMeasurementUnit.MeasurementUnit** (fibo-fnd-qt-qtu-15) Property Restriction: = 1 **hasNumericValue.decimal** (fibo-fnd-qt-qtu-14)
SystemOfQuantities (system of quantities)	Definition: set of quantities together with a set of non-contradictory equations relating those quantities Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: ClassificationScheme Property Restriction: ∀ **defines.BaseQuantity** (fibo-fnd-qt-qtu-09) Property Restriction: ∀ **involves.DerivedQuantity** (fibo-fnd-qt-qtu-08)
SystemOfUnits (system of units)	Definition: a set of measurement units associated with a system of quantities, together with a set of rules that assign one measurement unit to be the base unit for each base quantity in the system of quantities and a set of rules for the derivation of other units from the base units Example: The International System of Units (SI) is a system of units. Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Class: ClassificationScheme Property Restriction: = 1 **appliesTo.SystemOfQuantities** (fibo-fnd-qt-qtu-13) Property Restriction: ≥ 1 **defines.MeasurementUnit** (fibo-fnd-qt-qtu-10) Property Restriction: ≥ 1 **defines.BaseUnit** (fibo-fnd-qt-qtu-12) Property Restriction: ≥ 1

		defines.**DerivedUnit** (fibo-fnd-qt-qtu-11)

Properties

Name	Annotations	Property Axioms
hasMeasurementUnit (has measurement unit)	Definition: a quantity value is expressed in terms of a particular measurement unit Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Property: has Domain: QuantityValue Range: MeasurementUnit
hasQuantityKind (has quantity kind)	Definition: a quantity is an instance of the category of quantity that is the quantity kind Example: hour (the duration) is an instance of "duration" - a specific quantity of time. So the quantity kind of "hour" is "duration". Definition origin: http://www.omg.org/spec/DTV/1.1/	Parent Property: has Domain: Quantity Range: QuantityKind
isDerivedFrom (is derived from)	Definition: a derived quantity is derived from a base quantity; a derived unit is derived from a base unit Definition origin: http://www.omg.org/spec/DTV/1.1/	
hasNumericValue (has numeric value)	Definition: a number associated with a quantity value Definition origin: http://www.omg.org/spec/DTV/1.1/	Range: decimal

6.4.4   Ontology: Currency Amount

Revise the existing CurrencyAmount ontology, defined in section 10.12.2, to support definition of the ISO 4217 currency codes and leverage the new QuantitiesAndUnits ontology defined above. The changes described in this section are strictly additions, with no destructive changes, in other words.

6.4.4.1 Additions to section 3.1, Normative References

Add the following to the normative references in the FIBO Foundations [Foundations] Specification:

[ISO 4217a] ISO 4217 Codes for the representation of currencies and funds, Seventh edition, 2008-07-15

[ISO 4217b] ISO 4217 Currency and funds code list, 2014-03-28

6.4.4.2 Currency Amount Ontology Abstract Revisions

Revise the text in the first sentence describing the ontology that immediately follows the 10.12.2 heading to read:

"This ontology defines currency and monetary amount related concepts for use in defining other FIBO ontology elements."

Delete the last sentence in the same paragraph (which reads "This ontology also defines related terms such as currency.").

Add a second paragraph, as follows:

"The definition of currency provided herein is compliant with the definitions given in ISO 4217. ISO 4217 provides universally applicable coded representations of names of currencies and funds, used internationally for financial transaction support. The ontology has been partitioned into 2 parts: (1) the essential concept system describing the standard (this module), and (2) ISO4217-1-CurrencyCodes, which contains all of the individuals specified in ISO 4217."

Revise the file abstract metadata in the body of the ontology to correspond to the above revisions to the text.

6.4.4.3 Currency Amount Ontology Revisions

(a) Replace Figure 10.67, Currency Concepts with the following figure, caption, and text:
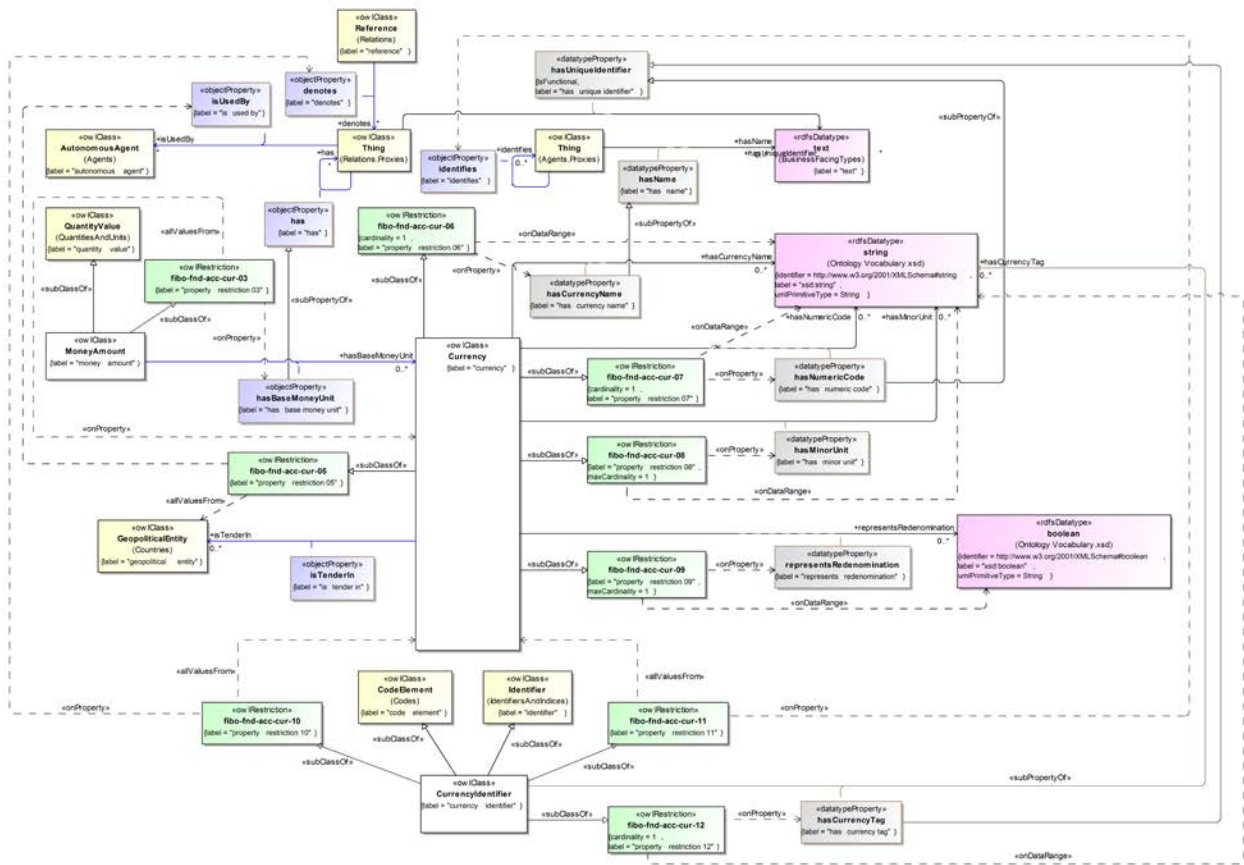
Figure 10.67 - Definitions for Currency and Currency Identifiers

Figure 10.67 provides the complete definition of Currency and CurrencyIdentifier as specified in the ISO 4217 standard. It also depicts a MoneyAmount as a kind of QuantityValue that has a base money unit of Currency.

(b) Delete Figure 10.68, Physical Money Amount Concepts, as the new Figure 10.67 includes that part of the model.

(c) Replace Figure 10.69, Monetary Amounts and Measures with the following figure:

6.4.4.4 Currency Amount Ontology Metadata Revision

(a) Insert the following text below the caption for Figure 10.69 and above Table 10.77:

"Metadata defining the primary metadata elements for the CurrencyAmount ontology are given in Table 10.77, below."

(b) Replace existing Table 10.77 with the following:

Table 10.77 - Currency Amount Ontology Metadata

Metadata Term	Value
sm:filename	CurrencyAmount.rdf
sm:fileAbbreviation	fibo-fnd-acc-cur
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20150801/Accounting/CurrencyAmount/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ 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/Codes/ http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/ http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics/ http://www.omg.org/spec/EDMC-FIBO/FND/Quantities/QuantitiesAndUnits/

6.4.4.5 Currency Amount Ontology Details Revision

(a) Insert the following text below Table 10.77:

"The content of the CurrencyAmount ontology is defined in Table 10.78, below."

(b) Replace Table 10.78 with the following table:

Table 10.78 - Currency Amount Details

Classes

Name	Annotations	Class Expressions
Currency (currency)	<u>Definition</u>: medium of exchange value, defined by reference to the geographical location of the authorities responsible for it <u>Definition origin</u>: Codes for the representation of currencies and funds, ISO 4217, Seventh edition, 2008-07-15, section 3.1.	<u>Property Restriction</u>: = 1 **hasCurrencyName**.**string** (fibo-fnd-acc-cur-06) <u>Property Restriction</u>: = 1 **hasNumericCode**.**string** (fibo-fnd-acc-cur-07) <u>Property Restriction</u>: ≤ 1 **hasMinorUnit**.**string** (fibo-fnd-acc-cur-08) <u>Property Restriction</u>: ≤ 1 **representsRedenomination**.**boolean** (fibo-fnd-acc-cur-09) <u>Property Restriction</u>: ∀ **isUsedBy**.**GeopoliticalEntity** (fibo-fnd-acc-cur-05)
CurrencyIdentifier (currency identifier)	<u>Definition</u>: the trigraph representing the currency or fund <u>Explanatory note</u>: The first (left-most) two characters of the currency identifier provide a code unique to the currency authority to which it is assigned. Wherever practicable, it is derived from the geographical location of the currency authority, as described in ISO 3166. The third (right-most) character of the identifier (alphabetic code) is an indicator, preferably mnemonic, derived from the name of the major currency unit or fund. Where the currency is not associated with a single geographical entity as described in ISO 3166-1, a specially allocated identifier (alpha-2 code) will be used to describe the currency authority. This code will be allocated by the Maintenance Agency from within the user-assigned range of codes XA to XZ specified in 8.1.3 of ISO 3166-1:1997. The character following X will be a mnemonic, where possible, derived from the name of the geographical area concerned. <u>Definition origin</u>: http://www.omg.org/spec/DTV/1.1/	<u>Parent Class</u>: CodeElement <u>Parent Class</u>: Identifier <u>Property Restriction</u>: = 1 **hasCurrencyTag**.**string** (fibo-fnd-acc-cur-12) <u>Property Restriction</u>: ∀ **denotes**.**Currency** (fibo-fnd-acc-cur-10) <u>Property Restriction</u>: ∀ **identifies**.**Currency** (fibo-fnd-acc-cur-11)
MonetaryAmount (monetary amount)	<u>Definition</u>: the measure which is an amount of money specified in monetary units <u>Explanatory note</u>: This is an abstract concept, not to be confused with a sum of money (Money Amount).	<u>Parent Class</u>: MonetaryMeasure <u>Property Restriction</u>: ∀ **hasAmount**.**decimal** (fibo-fnd-acc-cur-02) <u>Property Restriction</u>: ∀ **hasCurrency**.**Currency** (fibo-fnd-acc-cur-04)

MonetaryMeasure (monetary measure)	Definition: some measure of some sum of money	Parent Class: Measure
	Explanatory note: This may be a measure expressed in terms of decimal plus currency, or it may be a measure expressed in terms of a percentage amount with reference to some other monetary amount or to some Money Amount (actual amount of money)..	
MoneyAmount (money amount)	Definition: a sum of money	Parent Class: QuantityValue
	Explanatory note: 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 currency unit).	Property Restriction: ≥ 1 **hasBaseMoneyUnit**.**Currency** (fibo-fnd-acc-cur-03)
PercentageMonetaryAmount (percentage monetary amount)	Definition: a measure of some amount of money expressed as a percentage of some other amount, some notional amount or some concrete money amount	Parent Class: MonetaryMeasure
		Property Restriction: ∀ **isPercentageOf**.**MonetaryAmount** (fibo-fnd-acc-cur-01)
	Explanatory note: 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.	

Properties

Name	Annotations	Property Axioms
hasBaseMoneyUnit (has base money unit)	Definition: the currency in which the money amount is denominated	Parent Property: has
		Domain: MoneyAmount
		Range: Currency
hasCurrency (has currency)	Definition: the currency in which the monetary amount is defined	Parent Property: has
		Domain: MonetaryAmount
		Range: Currency
hasNotionalAmount (has notional amount)	Definition: has a notional value expressed as some monetary amount, that is a number and a currency in which that number is denominated	Parent Property: has
		Range: MonetaryAmount
isTenderIn (is tender in)	Definition: a region or country in which the currency is exchangeable for goods and services	Domain: Currency
		Range: GeopoliticalEntity
	Explanatory note: Commonly referred to also as legal tender, however this definition does not hold literally in some countries e.g. Scotland.	
hasAmount (has amount)	Definition: a total number or quantity	Parent Property: hasNumericValue
		Range: decimal
hasCurrencyName (has currency name)	Definition: provides the full currency name, including diacritical marks	Parent Property: hasName
		Domain: Currency
		Range: string
hasCurrencyTag (has currency tag)	Definition: relates a unique three-character string to the identifier for a currency	Parent Property: hasUniqueIdentifier
		Domain: CurrencyIdentifier
		Range: string
hasMinorUnit (has minor unit)	Definition: relates a code for the minor unit of currency to the currency or fund	Domain: Currency
		Range: string
	Scope note: Requirements sometimes arise for values to be expressed in terms of minor units of currency. When this occurs, it is necessary to know the decimal relationship that exists between the currency concerned and its minor unit.	

	- 0 means that there is no minor unit for the currency; - 1, 2, and 3 signify a ratio of 10 to 1, 100 to 1 and 1000 to 1 respectively.	
hasNumericCode (has numeric code)	Definition: relates a numeric code to the currency or fund Scope note: The numeric currency code is derived, where possible, from the United Nations Standard Country or Area Code. Additional codes to meet special requirements (as described in 5.1.3) and in respect of funds will be allocated as necessary from within the user-assigned range of codes 950 to 998. Funds codes are allocated in descending order commencing at 998.	Domain: Currency Range: string
representsRedenomination (represents redenomination)	Definition: indicates that a currency has been redenominated Scope note: Where a currency is redenominated, the Maintenance Agency shall assign an alpha and a numeric code to the redenominated currency which will enable it to be distinguished from the original denomination of that currency.	Domain: Currency Range: boolean

6.4.5   Module: Products and Services

Add a new module to the Foundations specification called ProductsAndServices. This should be incorporated into a new section, section 10.15, called "Module: Products and Services", at the end of Clause 10.

Add the following text and table immediately after the new heading for the module:

Metadata defining the primary metadata elements for the ProductsAndServices module are given in Table 10.90, below.

Table 10.90 - ProductsAndServices Module Metadata

Metadata Term	Value
sm:moduleName	Products and Services
sm:moduleAbbreviation	FIBO-FND-PAS
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies defining concepts such as buyers, sellers, customers, clients, products and services generally, as well as very high-level relationships between them, for use in other FIBO ontologies.

6.4.6   Ontology: Products and Services

Add a new ontology to the ProductsAndServices module, also called ProductsAndServices. This should be incorporated into a new sub clause, sub clause 10.15.1, in the new Products and Services sub clause of the specification.

Add the following text, tables, and diagrams immediately after the new heading for the ontology:

This ontology defines fundamental concepts for buyers, sellers, clients, customers, products, goods and services for use in other FIBO ontologies.

Metadata defining the primary metadata elements for the ProductsAndServces ontology are given in Table 10.91, below.

Table 10.91 - ProductsAndServices Ontology Metadata

Metadata Term	Value
sm:filename	ProductsAndServices.rdf
sm:fileAbbreviation	fibo-fnd-pas-pas
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/ProductsAndServices/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20150801/ProductsAndServices/ProductsAndServices/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/ http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/ 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/Arrangements/IdentifiersAndIndices/ http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/Occurrences/ 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/Places/Locations/ http://www.omg.org/spec/EDMC-FIBO/FND/Places/Facilities/ http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/ http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/

Figure 10.88 provides an overview of the concepts in the ProductsAndServices ontology. Subsequent diagrams provide more detailed views on several of the concepts, with a focus on the logical restrictions that further define them.
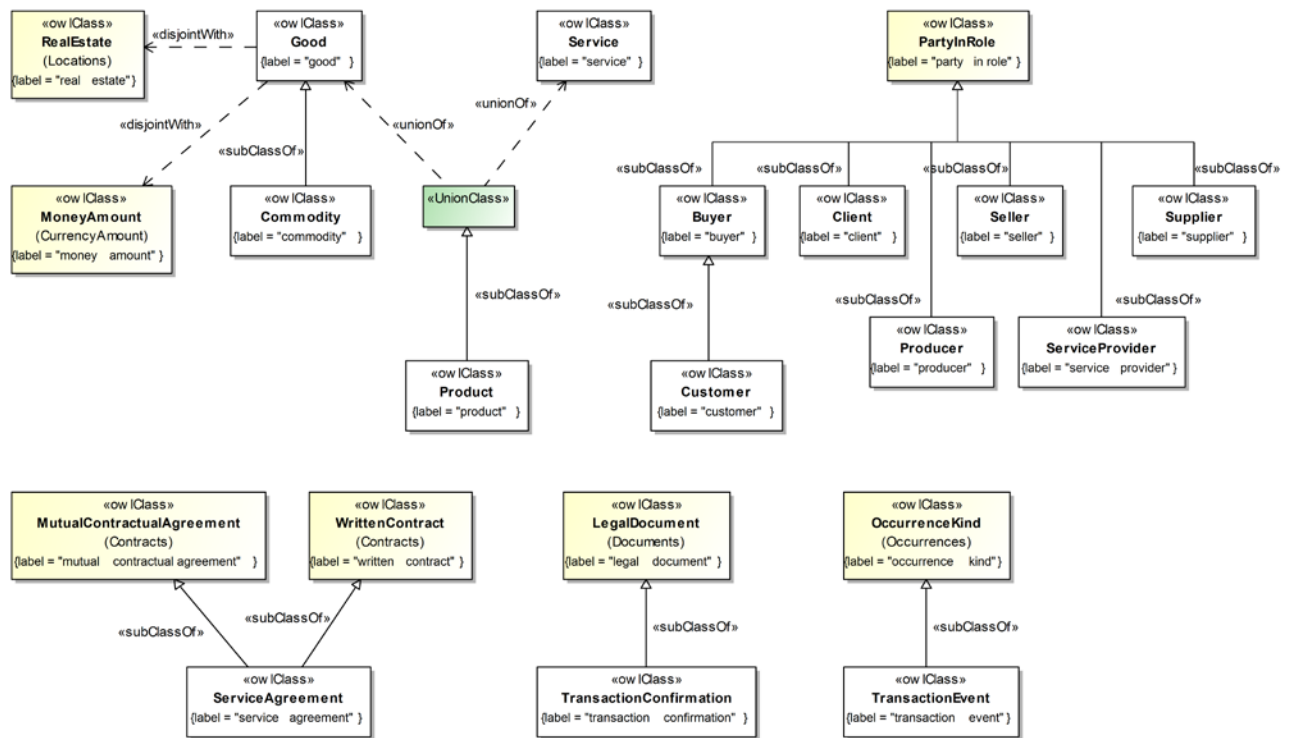
Figure 10.88 - Products and Services Class Hierarchy

Figure 10.89 refines the definition of a product in terms of producers and suppliers.

Financial Industry Business Ontology – Financial Business and Commerce

Figure 10.89 - Definition of Product – Producers and Suppliers
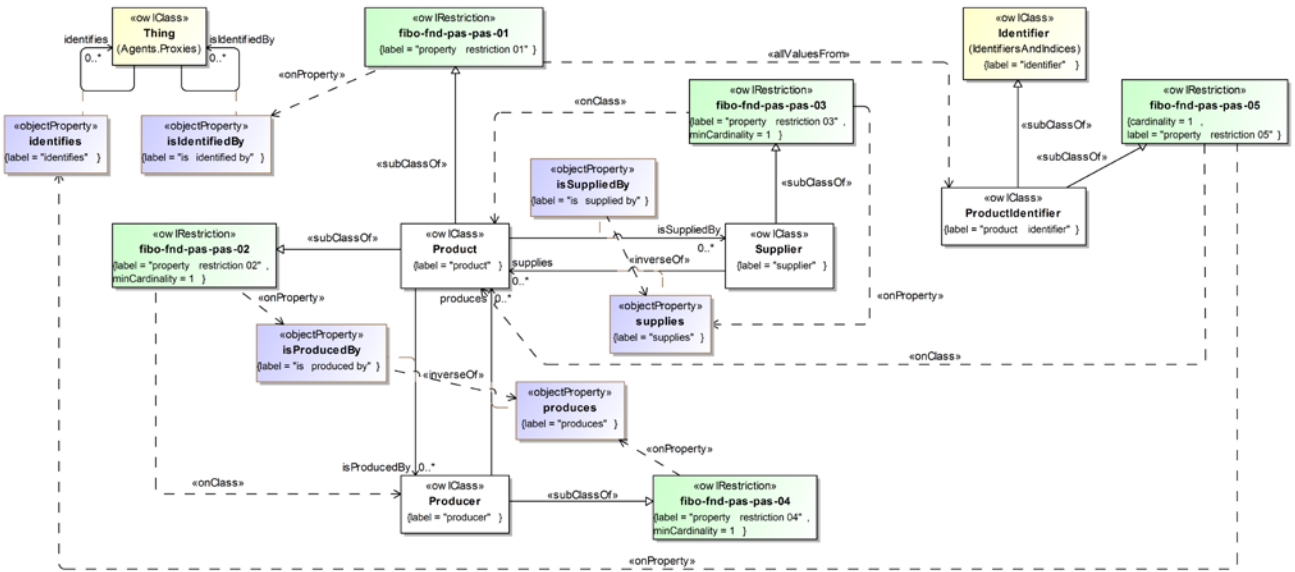
Figure 10.90 refines the definition of a product in terms of buyers and sellers.
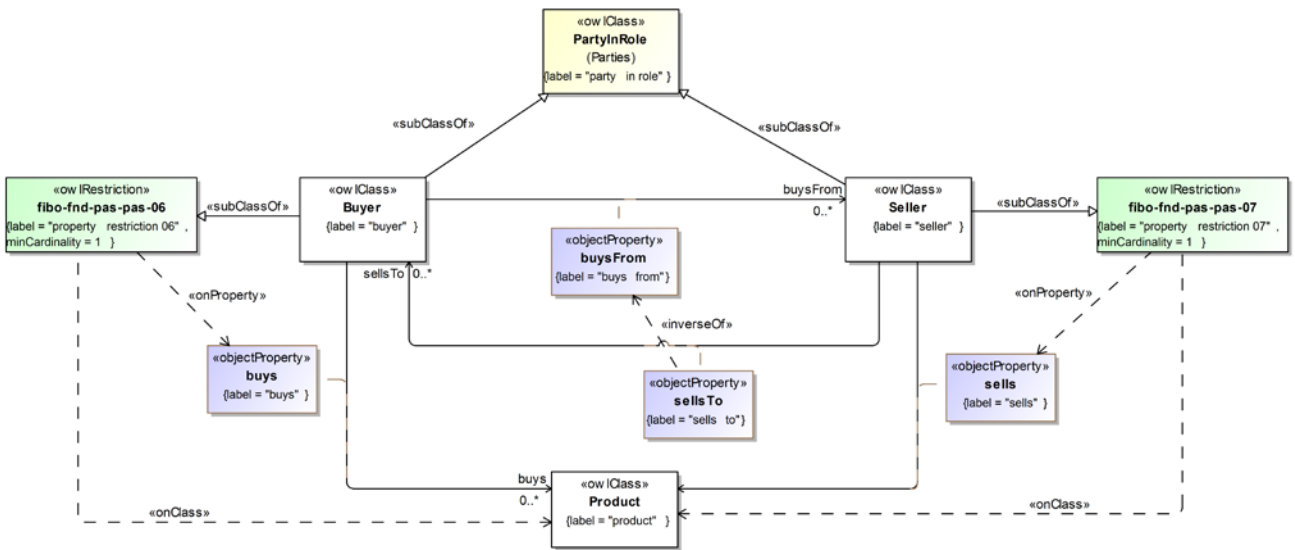

Figure 10.90 - Definitions of Buyer and Seller

Figure 10.91 refines the definition of a service provider.
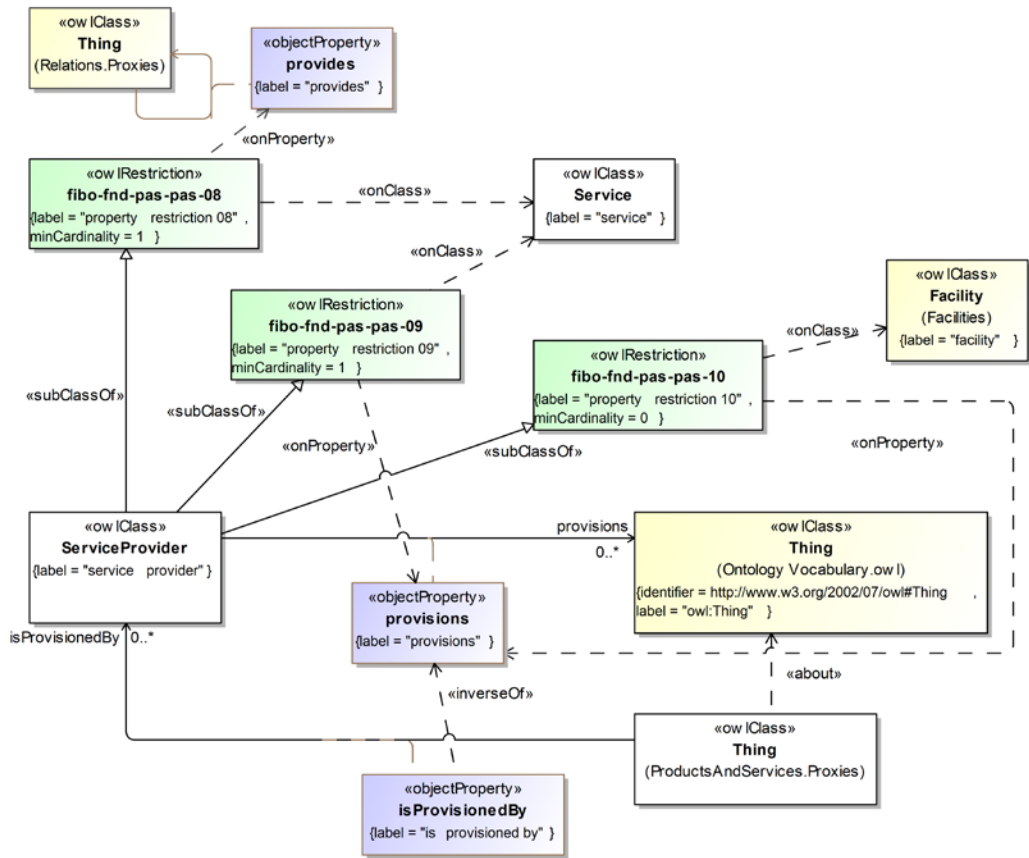
Figure 10.91 - Definition of Service Provider

Figure 10.92 depicts the definition of a service agreement.
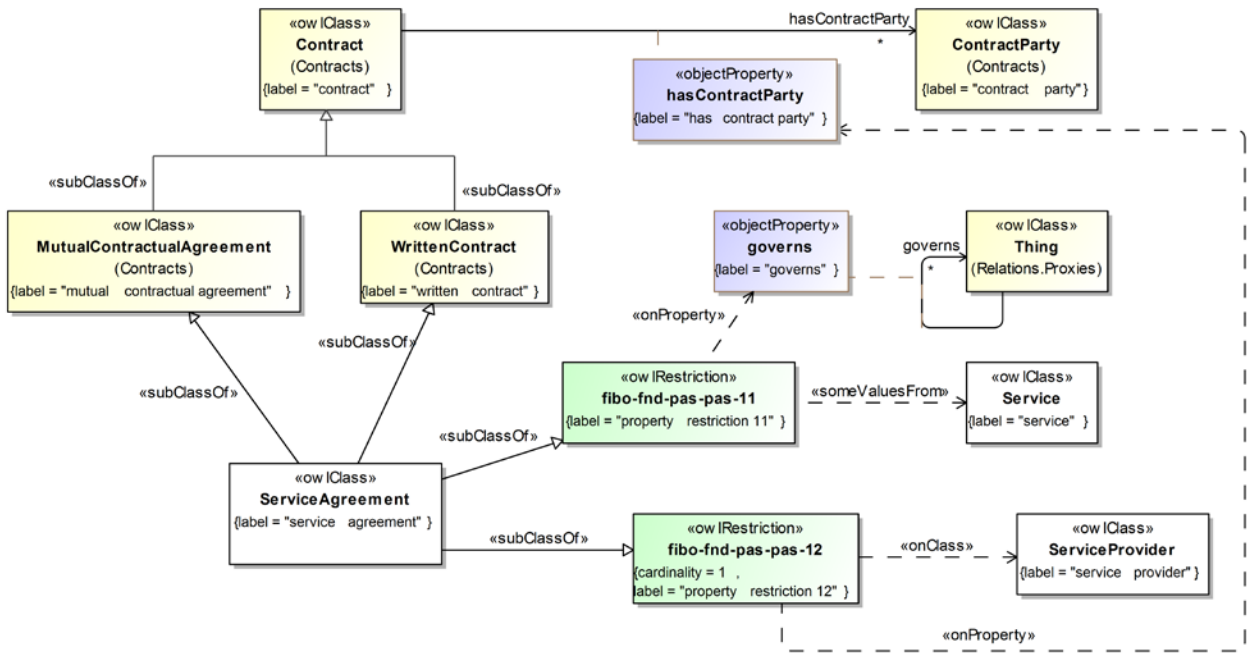
Figure 10.92 - Definition of Service Agreement

Figure 10.93 shows the definition of a customer.
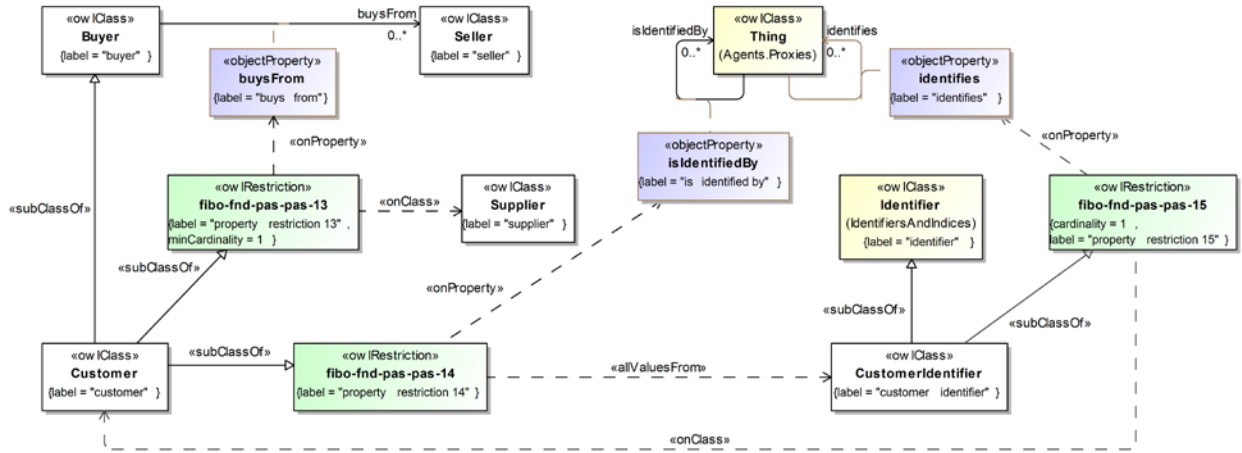
Figure 10.93 - Definition of Customer

Figure 10.94 shows the definition of a client. Note that some parties may be both customers and clients. In the context of many banking products, such as various kinds of accounts, for example, account holders are both clients and customers. The identifiers assigned to clients (and/or customers) may or may not be the same as an account number in such a context. These identifiers are essential to addressing use cases including, but not limited to, "Know Your Customer (KYC)" and, in conjunction with legal entity identifiers (defined in the FIBO Business Entities Specification [FIBO BE]), counterparty identification and risk management.
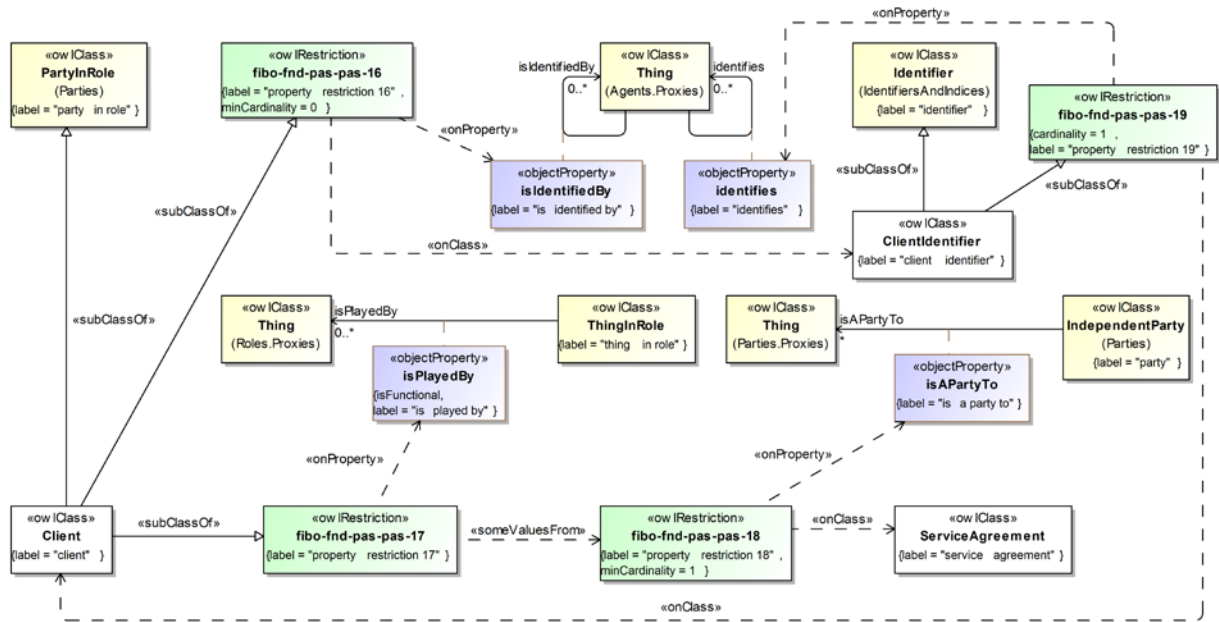
Figure 10.94 - Definition of Client

Figure 10.95 provides definitions of transaction events and transaction confirmations.
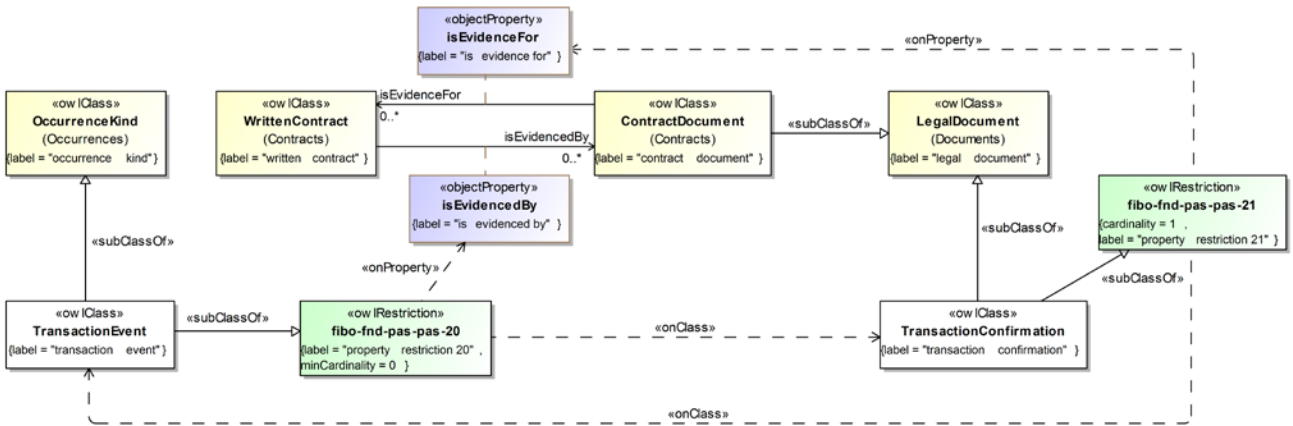
Figure 10.95 - Transaction Events and Confirmations

Finally, Figure 10.96 refines the definition of service.
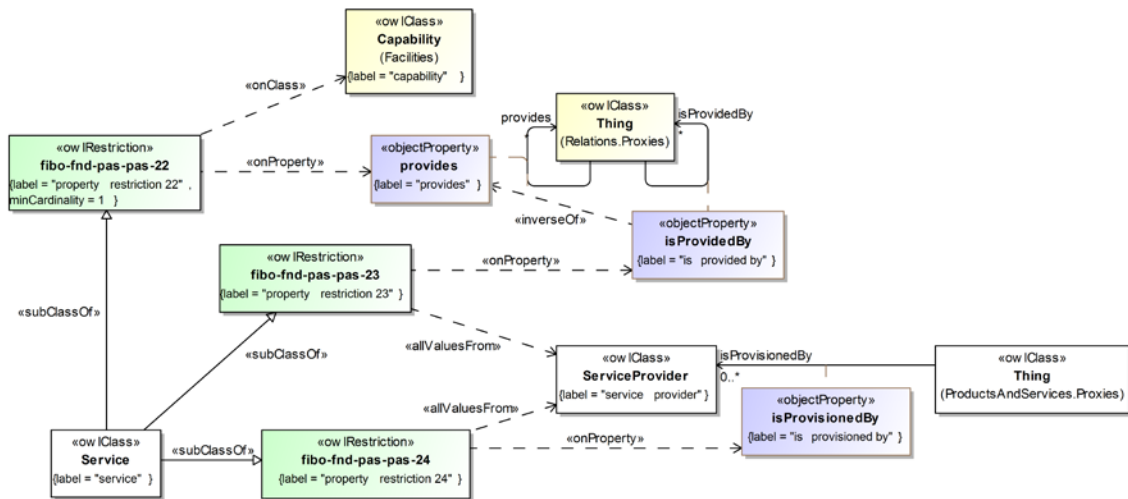
Figure 10.96 - Definition of Service

Detailed content for the Products and Services ontology is provided in Table 10.92, below.

Table 10.92 - Products and Services Ontology Details

Classes

Name	Annotations	Class Expressions
Buyer (buyer, purchaser)	Definition: a party that acquires, or agrees to acquire, ownership (in case of goods), or benefit or usage (in case of services), in exchange for money or other consideration under a contract of sale Adapted from: http://www.businessdictionary.com/definition/buyer.html	Parent Class: PartyInRole Property Restriction: ≥ 1 **buys**.**Product** (fibo-fnd-pas-pas-06)
Client (client)	Definition: a party that acquires, or agrees to acquire, ownership (in case of goods), or benefit or usage (in case of services), in exchange for money or other consideration under a contract of sale Adapted from: http://www.businessdictionary.com/definition/buyer.html	Parent Class: PartyInRole Property Restriction: ≥ 0 **isIdentifiedBy**.**ClientIdentifier** (fibo-fnd-pas-pas-16) Property Restriction: $\exists$ **isPlayedBy** (≥ 1

		isAPartyTo.ServiceAgreement) (fibo-fnd-pas-pas-17, fibo-fnd-pas-pas-18)
ClientIdentifier (client identifier)	<u>Definition</u>: an identifier for a client	<u>Parent Class</u>: Identifier <u>Property Restriction</u>: = 1 **identifies**.**Client** (fibo-fnd-pas-pas-19)
Commodity (commodity)	<u>Definition</u>: a basic good used in commerce that is interchangeable with other commodities of the same type <u>Explanatory note</u>: Commodities are most often used as inputs in the production of other goods or services. The quality of a given commodity may differ slightly, but it is essentially uniform across producers. <u>Adapted from</u>: http://www.investopedia.com/terms/c/commodity.asp	<u>Parent Class</u>: Good
Customer (customer)	<u>Definition</u>: a buyer that receives or consumes products (goods or services) and has the ability to choose between different products and suppliers <u>Adapted from</u>: http://www.businessdictionary.com/definition/customer.html	<u>Parent Class</u>: Buyer <u>Property Restriction</u>: ≥ 1 **buysFrom**.**Supplier** (fibo-fnd-pas-pas-13) <u>Property Restriction</u>: ≥ 0 **isIdentifiedBy**.**CustomerIdentifier** (fibo-fnd-pas-pas-14)
CustomerIdentifier (customer identifier)	<u>Definition</u>: an identifier for a customer	<u>Parent Class</u>: Identifier <u>Property Restriction</u>: = 1 **identifies**.**Customer** (fibo-fnd-pas-pas-15)
Good (good)	<u>Definition</u>: any tangible thing that is not money or real estate <u>Explanatory note</u>: An inherently useful and relatively scarce tangible item produced from agricultural, construction, manufacturing, or mining activities. According to the UN Convention On Contract For The International Sale Of Goods, the term 'good' does not include (1) items bought for personal use, (2) items bought at an auction or foreclosure sale, (3) aircraft or oceangoing vessels. <u>Adapted from</u>: http://www.businessdictionary.com/definition/good.html	<u>Class Axiom</u>: ¬ MoneyAmount <u>Class Axiom</u>: ¬ RealEstate
Producer (producer)	<u>Definition</u>: the manufacturer of a product, also called maker <u>Adapted from</u>: http://www.investorwords.com/3872/producer.html	<u>Parent Class</u>: PartyInRole <u>Property Restriction</u>: ≥ 1 **produces**.**Product** (fibo-fnd-pas-pas-04)
Product (product)	<u>Definition</u>: A commercially distributed good that is (1) tangible property, (2) the output or result of a fabrication, manufacturing, or production process, or (3) something that passes through a distribution channel before being consumed or used. <u>Adapted from</u>: http://www.businessdictionary.com/definition/product.html	<u>Parent Class</u>: Good ∩ Service <u>Property Restriction</u>: ∀ **isIdentifiedBy**.**ProductIdentifier** (fibo-fnd-pas-pas-01) <u>Property Restriction</u>: ≥ 1 **isProducedBy**.**Producer** (fibo-fnd-pas-pas-02)
ProductIdentifier (product identifier)	<u>Definition</u>: an identifier for a product	<u>Parent Class</u>: Identifier <u>Property Restriction</u>: = 1 **identifies**.**Product**

Term	Definition	Class/Restrictions
		(fibo-fnd-pas-pas-05)
Seller (seller, vendor)	Definition: a party that makes, offers or contracts to make a sale to an actual or potential buyer Adapted from: http://www.businessdictionary.com/definition/seller.html	Parent Class: PartyInRole Property Restriction: ≥ 1 **sells**.**Product** (fibo-fnd-pas-pas-07)
Service (service)	Definition: a type of economic activity that is intangible, is not stored and does not result in ownership; a service is consumed at the point of sale Example: Services include intangible products, such as accounting, banking, cleaning, consultancy, education, insurance, expertise, medical treatment, or transportation services. Adapted from: http://www.investorwords.com/6664/service.html Adapted from: http://www.businessdictionary.com/definition/services.html	Property Restriction: ≥ 1 **provides**.**Capability** (fibo-fnd-pas-pas-22) Property Restriction: ∀ **isProvidedBy**.**ServiceProvider** (fibo-fnd-pas-pas-23) Property Restriction: ∀ **isProvisionedBy**.**ServiceProvider** (fibo-fnd-pas-pas-24)
ServiceAgreement (service agreement, service contract)	Definition: a written contract between a client and service provider whereby the service provider supplies some service in the form of time, effort, and/or expertise in exchange for compensation Adapted from: http://www.businessdictionary.com/definition/service-contract.html	Parent Class: MutualContractualAgreement Parent Class: WrittenContract Property Restriction: ∀ **governs**.**Service** (fibo-fnd-pas-pas-11) Property Restriction: = 1 **hasContractParty**.**ServiceProvider** (fibo-fnd-pas-pas-12)
ServiceProvider (service provider)	Definition: a party that provides and typically provisions professional services, such as consulting, financial, legal, real estate, education, communications, storage, or processing services, to other parties, typically defined in a service agreement Adapted from: http://en.wikipedia.org/wiki/Service_provider	Parent Class: PartyInRole Property Restriction: ≥ 1 **provides**.**Service** (fibo-fnd-pas-pas-08) Property Restriction: ≥ 1 **provisions**.**Service** (fibo-fnd-pas-pas-09) Property Restriction: ≥ 0 **iprovisions**.**Facility** (fibo-fnd-pas-pas-10)
Supplier (supplier)	Definition: a party that supplies goods or services Explanatory note: A supplier may be distinguished from a contractor or subcontractor, who commonly adds specialized input to deliverables. Adapted from: http://www.businessdictionary.com/definition/supplier.html	Parent Class: PartyInRole Property Restriction: ≥ 1 **supplies**.**Product** (fibo-fnd-pas-pas-03)
TransactionConfirmation (transaction confirmation)	Definition: written communication from a seller or service provider reciting the relevant details of a transaction Adapted from: Barron's Dictionary of Banking Terms, Sixth Edition, 2012	Parent Class: LegalDocument Property Restriction: = 1 **isEvidenceFor**.**TransactionEvent** (fibo-fnd-pas-pas-21)
TransactionEvent (transaction event)	Definition: any sale, assignment, lease, license, loan, advance, contribution, or other transfer of any interest in or right to use any property (tangible or intangible) or money, however that transaction is effected, and regardless of whether the terms of the transaction are	Parent Class: OccurrenceKind Property Restriction: ≥ 0 **isEvidencedBy**.**TransactionCo**

	formally documented	**nfirmation**
		(fibo-fnd-pas-pas-21)
	Adapted from: Barron's Dictionary of Banking Terms, Sixth Edition, 2012	

Properties

Name	Annotations	Property Axioms
buys (buys)	Definition:	Domain: Buyer Range: Product
buysFrom (buys from)	Definition:	Domain: Buyer Range: Seller
isProducedBy (is produced by)	Definition: identifies the producer that fabricates, manufactures or creates the product through some production process	Parent Property: isProvidedBy Domain: Product Range: Producer Inverse: produces
isProvisionedBy (is provisioned by)	Definition: identifies the service provider that provisions the service or facility	Parent Property: isProvidedBy Range: ServiceProvider Inverse: provisions
isSuppliedBy (is supplied by)	Definition:	Parent Property: provides Domain: Product Range: Supplier Inverse: supplies
produces (produces)	Definition: identifies the product that is fabricated, manufactured or created via some production process	Parent Property: provides Domain: Producer Range: Product
provisions (provisions)	Definition: customizes, provides, or outfits something required for use in delivering a service	Parent Property: provides Domain: ServiceProvider
sells (sells)	Definition:	Domain: Seller Range: Product
sellsTo (sells to)	Definition:	Domain: Seller Range: Buyer
supplies (supplies)	Definition:	Parent Property: provides Domain: Supplier Range: Product

6.4.7 Ontology: Payments and Schedules

Add a new ontology to the ProductsAndServices module, called PaymentsAndSchedules. This should be incorporated into a new sub clause, sub clause 10.15.2, in the new Products and Services sub clause of the specification.

Add the following text, tables, and diagrams immediately after the new heading for the ontology:

This ontology defines basic concepts such as payment, payee, payer, and payment schedule, extending the scheduling concepts from the Dates and Times module, among others.

Metadata defining the primary metadata elements for the PaymentsAndSchedules ontology are given in Table 10.93, below.

Table 10.93 - PaymentsAndSchedules Ontology Metadata

Metadata Term	Value
sm:filename	PaymentsAndSchedules.rdf
sm:fileAbbreviation	fibo-fnd-pas-psch
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/PaymentsAndSchedules/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FND/20150801/ProductsAndServices/PaymentsAndSchedules/
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/Occurrences/ 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/Accounting/CurrencyAmount/ http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/ http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/ http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/ http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/ProductsAndServices/

Figure 10.97 provides an overview of the concepts in the PaymentsAndSchedules ontology. Subsequent diagrams provide more detailed views on several of the concepts, with a focus on the logical restrictions that further define them.
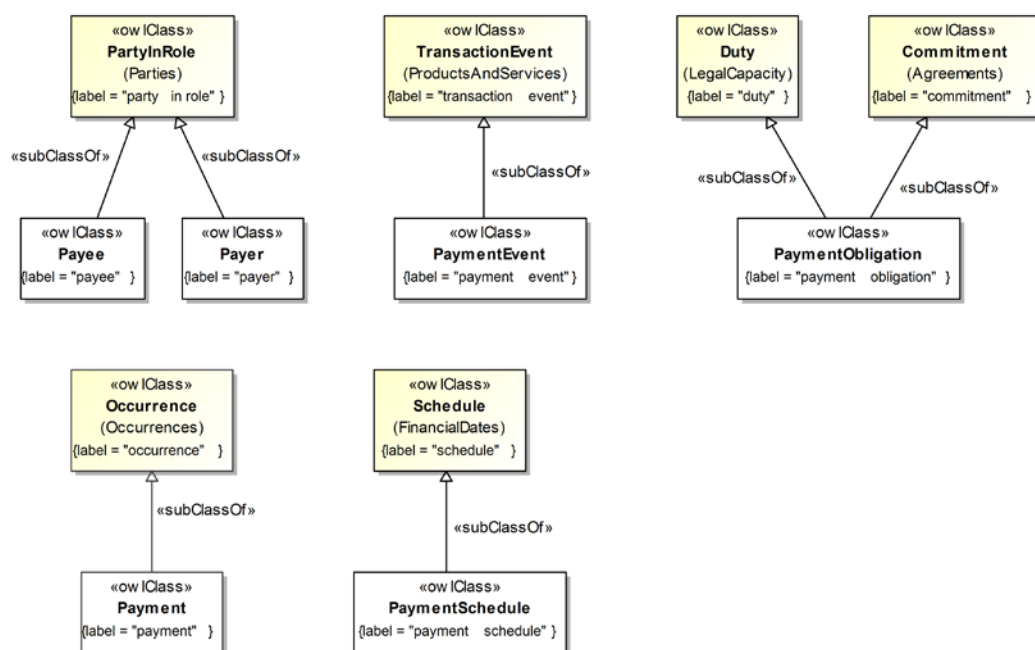
Figure 10.97 - Payments and Schedules Class Hierarchy

Figure 10.98 shows the definition of a Payment.
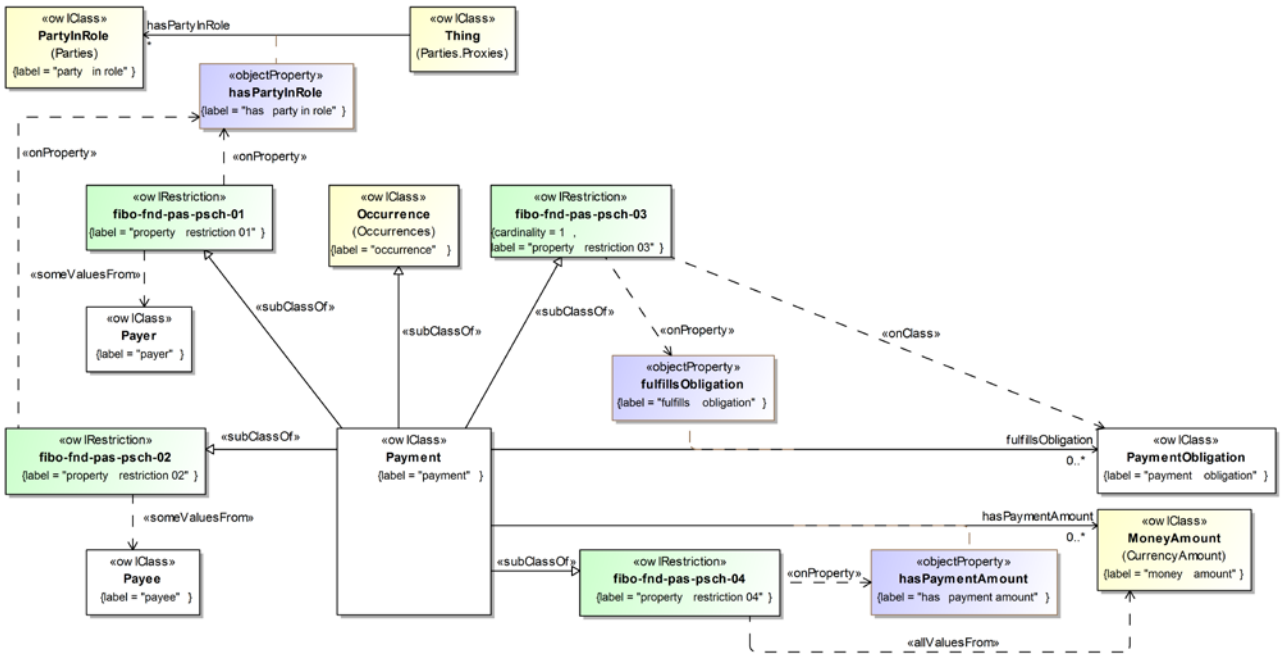
Figure 10.98 - Definition of Payment

Figure 10.99 provides the definition of a Payee.
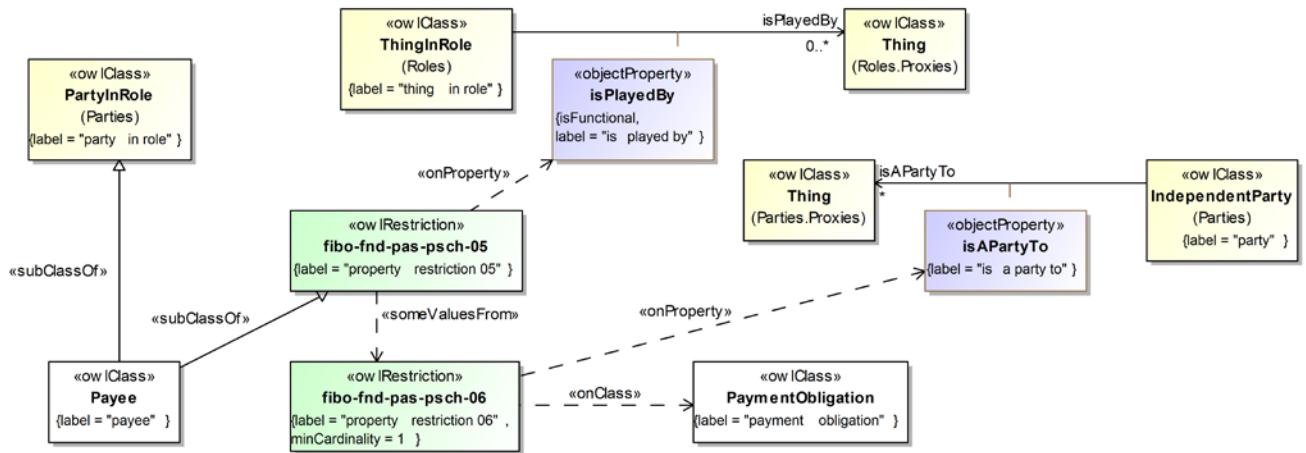
Figure 10.99 - Definition of Payee

Figure 10.100 provides the definition of a Payer.
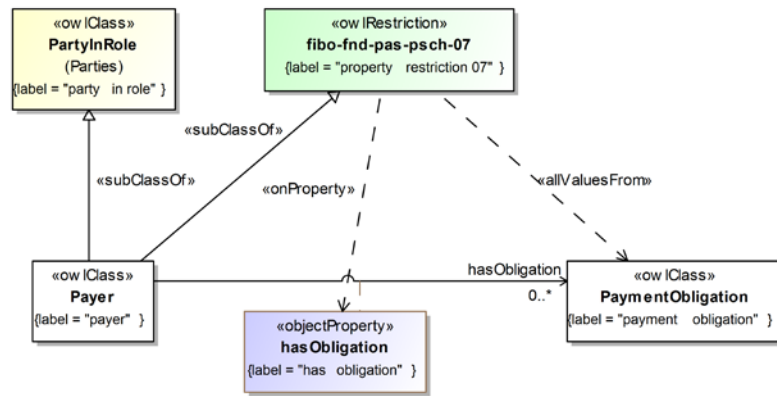
Figure 10.100 - Definition of Payer

Figure 10.101 depicts the definition of a PaymentEvent.
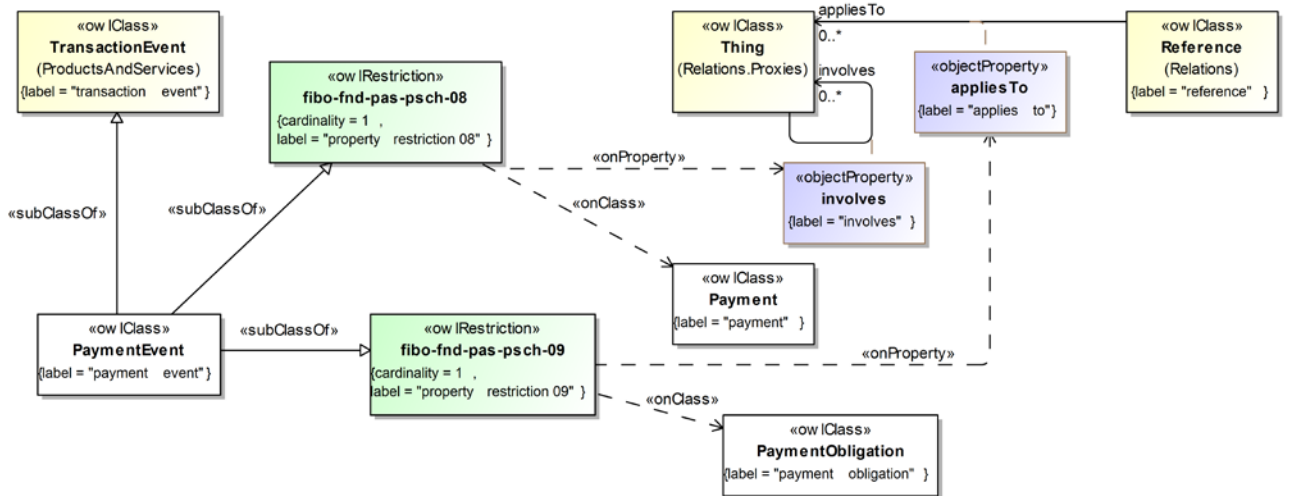
Figure 10.101 - Definition of Payment Event

Figure 10.102 depicts the definition of a PaymentObligation.

Figure 10.102 - Definition of Payment Obligation

Finally, Figure 10.103 depicts the definition of a PaymentSchedule.

Figure 10.103 - Definition of Payment Schedule

Detailed content of the Payments and Schedules ontology is provided in Table 10.94, below.

Table 10.94 - Payments and Schedules Ontology Details

Classes

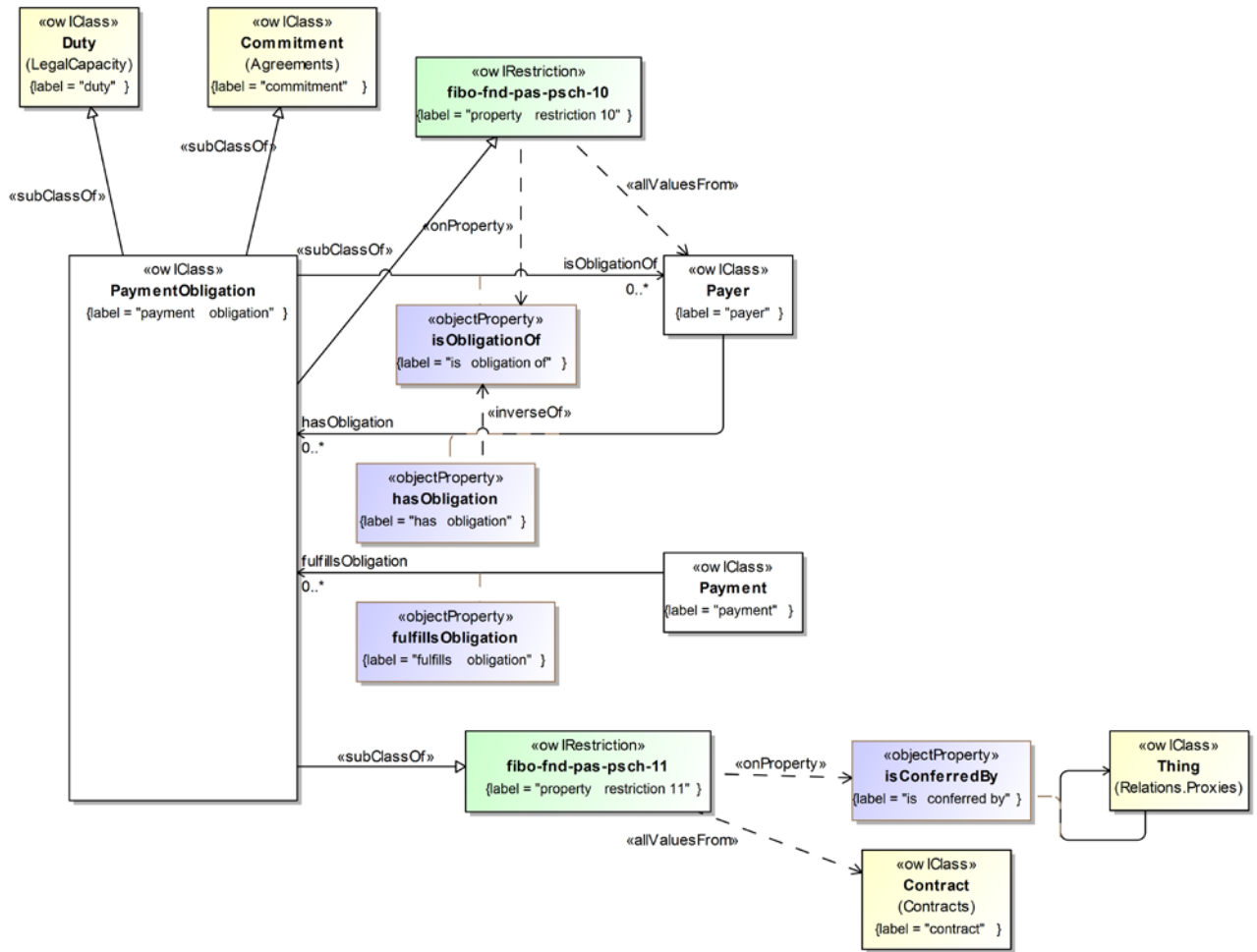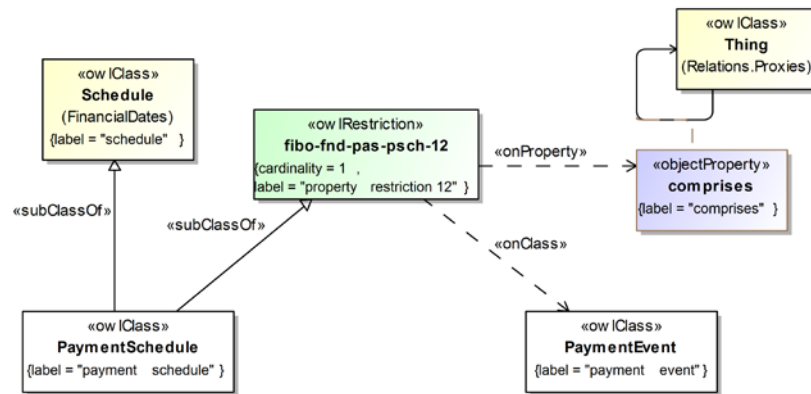| Name	Annotations	Class Expressions
Payee (payee)	Definition: a party to whom a debt should be paid, or to whose order a bill of exchange, note, or check is made payable Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: PartyInRole Property Restriction: ∃ **isPlayedBy** (≥ 1 **isAPartyTo**.**PaymentObligation**) (fibo-fnd-pas-psch-05, fibo-fnd-pas-psch-06)
Payer (payer)	Definition: a party who pays a bill or fees Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: PartyInRole Property Restriction: ∀ **hasObligation**.**PaymentObligation** (fibo-fnd-pas-psch-07)
Payment (payment)	Definition: delivery of money in fulfillment of an obligation, such as to satisfy a claim or debt Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Occurrence Property Restriction: = 1 **fulfillsObligation**.**PaymentObligation** (fibo-fnd-pas-psch-03) Property Restriction: ∃ **hasPartyInRole**.**Payee** (fibo-fnd-pas-psch-02) Property Restriction: ∃ **hasPartyInRole**.**Payer** (fibo-fnd-pas-psch-01) Property Restriction: ∀ **hasPaymentAmount**.**MoneyAmount** (fibo-fnd-pas-psch-04)
PaymentEvent (payment event)	Definition: an event that involves delivery of money in fulfillment of an obligation Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: TransactionEvent Property Restriction: = 1 **appliesTo**.**PaymentObligation** (fibo-fnd-pas-psch-09) Property Restriction: = 1 **involves**.**Payment** (fibo-fnd-pas-psch-08)
PaymentObligation (payment obligation)	Definition: a legally enforceable duty to pay a sum of money, or agree to do something (or not to do something), according to the terms stated in a contract Example: the duty of a borrower to repay a loan, and the legal right of a lender to enforce payment Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Commitment Parent Class: Duty Property Restriction: ∀ **isConferredBy**.**Contract** (fibo-fnd-pas-psch-11) Property Restriction: ∀ **isObligationOf**.**Payer** (fibo-fnd-pas-psch-10)
PaymentSchedule (payment schedule)	Definition: schedule for delivery of money in fulfillment of an obligation, such as a coupon payment schedule, loan payment schedule, interest payment schedule	Parent Class: Schedule Property Restriction: = 1 **comprises**.**PaymentEvent**

	Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	(fibo-fnd-pas-psch-12)

Properties

Name	Annotations	Property Axioms
fulfillsObligation (fulfills obligation)	Definition: satisfies a requirement for payment of some claim, debt, or other obligation	Domain: Payment Range: PaymentObligation
hasObligation (has obligation)	Definition: identifies a duty or obligation that a given party has taken on	Parent Property: has Domain: Payer Range: PaymentObligation Inverse: isObligationOf
hasPaymentAmount (has payment amount)	Definition: specifies the amount of money involved in a payment	Parent Property: has Domain: Payment Range: MoneyAmount
isObligationOf (is obligation of)	Definition: identifies a party that has incurred a given obligation	Parent Property: isConferredOn Domain: PaymentObligation Range: Payer

6.4.8 Ontology: Legal Capacity

Revise the existing LegalCapacity ontology, defined in sub clause 10.10.3, to support definition of License, Licensee and Licensor, as needed to support government-issued licenses in FBC. The changes described in this sub clause are strictly additions, with no destructive changes, in other words.

6.4.8.1 Legal Capacity Ontology Revisions

Replace Figures 10.56, Legal Capacity Concepts and 10.57, Legal Capacity Types with the following figures, captions, and text:
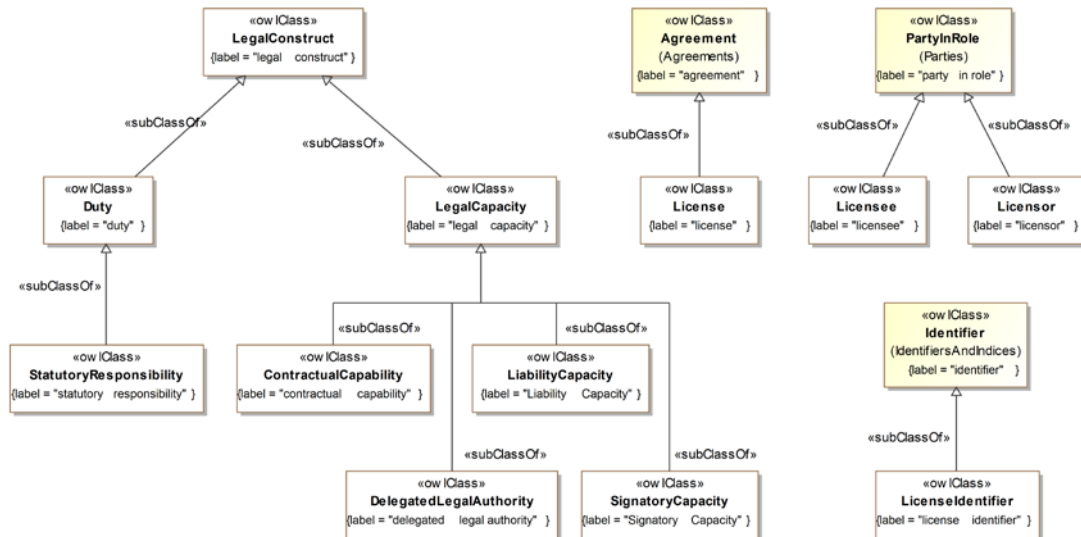
Figure 10.56 - Legal Capacity Class Hierarchy

Figure 10.56 provides an overview of the concepts in the Legal Capacity ontology. Subsequent diagrams provide more detailed views on several of the concepts, with a focus on the logical restrictions that further define them.
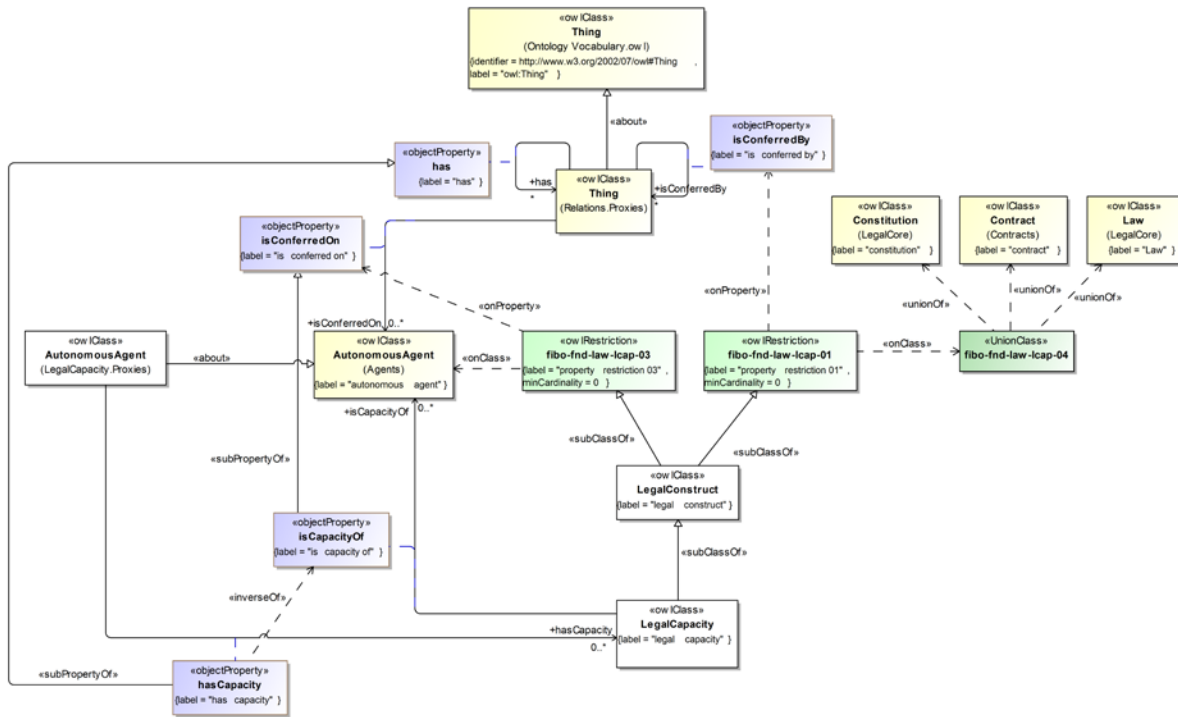
Figure 10.57 - Definition of Legal Capacity

Figure 10.57 defines legal capacity in terms of who that capacity can be conferred on, who has that capacity, and the legal basis for that capacity.
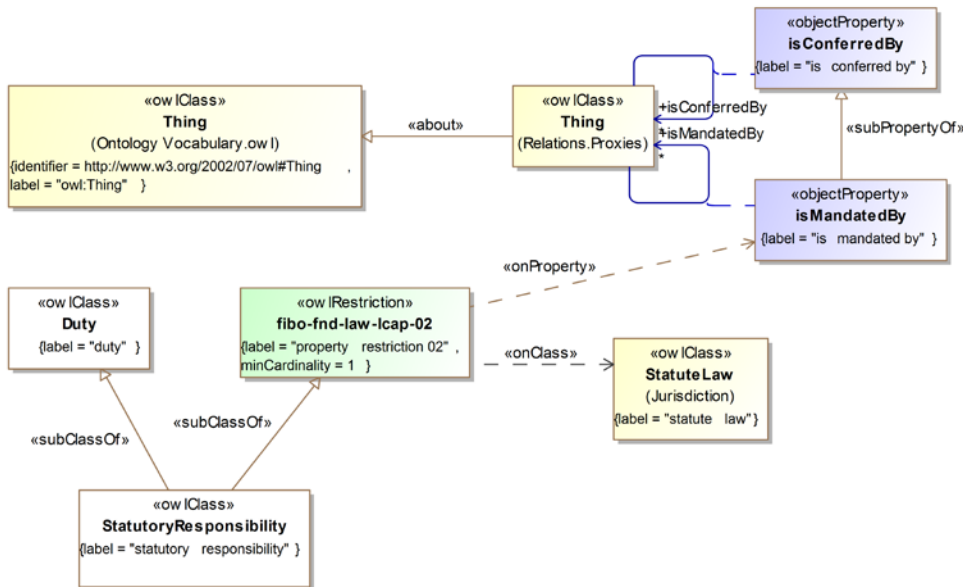
Figure 10.58 - Definition of Statutory Responsibility

Figure 10.58 defines statutory responsibility as something that is mandated by at least one statute (statute law).
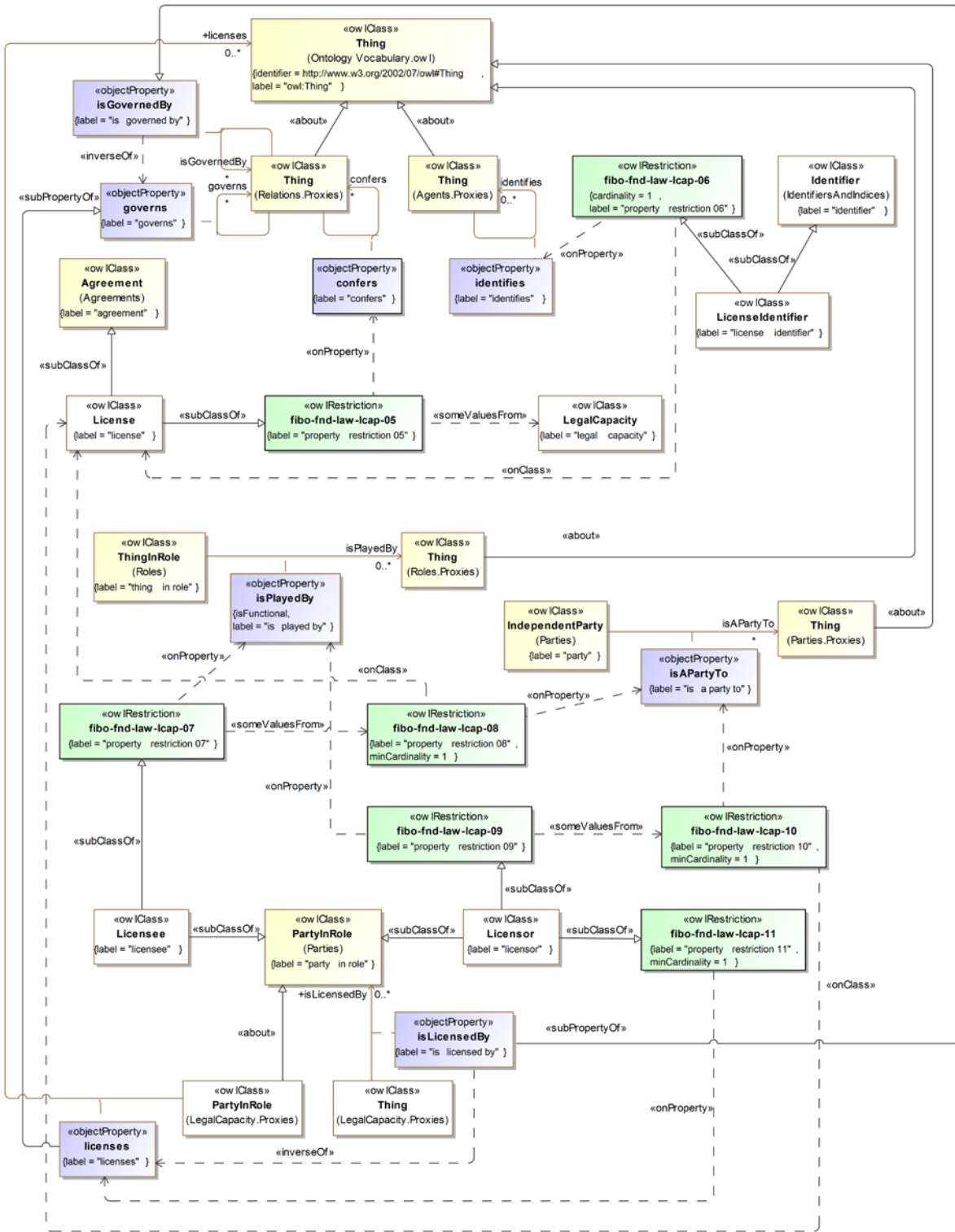
Figure 10.59 - Definition of Licensing

Figure 10.59 provides the definitions for concepts and relationships for basic licensing.

6.4.8.2 Legal Capacity Ontology Metadata Revisions

Revise Table 10.65, Legal Capacity Ontology Metadata, as follows.

(a) Change the owl:versionIRI from http://www.omg.org/spec/EDMC-FIBO/FND/20141101/Law/LegalCapacity/ to http://www.omg.org/spec/EDMC-FIBO/FND/20150801/Law/LegalCapacity/

(b) Add the following URIs to the sm:dependsOn section of the table:

http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices/

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/Agreements/Agreements/

6.4.8.3 Legal Capacity Ontology Details Revisions

Replace Table 10.66, Legal Capacity Details, with the following table.

Table 10.66 - Legal Capacity Details

Classes

| Name	Annotations	Class Expressions
ContractualCapability (contractual capability)	Definition: the capacity to enter into legally binding contracts	Parent Class: LegalCapacity
DelegatedLegalAuthority (delegated legal authority)	Definition: institutionalized and legal power inherent in a particular job, function, or position that is meant to enable its holder to successfully carry out his or her responsibilities, where such power has been delegated through some formal means Editorial note: This is always accompanied by an equal responsibility for one's actions or a failure to act. Scope note: This specifically means the authority to make legally binding commitments.	Parent Class: LegalCapacity
Duty (duty)	Definition: some obligation which exists and is imposed on some individual	Parent Class: LegalConstruct
LegalCapacity (legal capacity)	Definition: the capacity to carry out certain actions or to have certain rights	Parent Class: LegalConstruct
LegalConstruct (legal construct)	Definition: something which is conferred by way of law or contract, such as a right	Property Restriction: ≥ 0 **isConferredOn.AutonomousAgent** (fibo-fnd-law-lcap-03) Property Restriction: ≥ 0 **isConferredBy (Contract $\cup$ Constitution $\cup$ Law**) (fibo-fnd-law-lcap-01, fibo-fnd-law-lcap-04)
LiabilityCapacity (liability capacity)	Definition: the ability to be sued at law	Parent Class: LegalCapacity
License (license)	Definition: grant of permission needed to do something Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Agreement Property Restriction: $\exists$ **confers.LegalCapacity** (fibo-fnd-law-lcap-05)
Licensee (licensee)	Definition: a party to whom a license has been granted Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: PartyInRole Property Restriction: $\exists$ **isPlayedBy** (≥ 1 **isAPartyTo.License**) (fibo-fnd-law-lcap-07, fibo-fnd-law-lcap-08)

LicenseIdentifier (license identifier)	Definition: an identifier associated with a license	Parent Class: Identifier Property Restriction: = 1 **identifies**.**License** (fibo-fnd-law-lcap-06)
Licensor (licensor)	Definition: a party who grants a license Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: PartyInRole Property Restriction: ∃ **isPlayedBy** (≥ 1 **isAPartyTo**.**License**) (fibo-fnd-law-lcap-09, fibo-fnd-law-lcap-10) Property Restriction: ≥ 1 **licenses** (fibo-fnd-law-lcap-11)
SignatoryCapacity (signatory capacity)	Definition: the capacity of some natural person to sign agreements on the part of some organization or legal person	Parent Class: LegalCapacity
StatutoryResponsibility (statutory responsibility)	Definition: an obligation which is defined under some body of law (statute)	Parent Class: Duty Property Restriction: ≥ 1 **isMandatedBy**.**StatuteLaw** (fibo-fnd-law-lcap-02)

Properties

Name	Annotations	Property Axioms
hasCapacity (has capacity)	Definition: identifies an individual or organization that has some capability to carry out certain actions, or has certain rights or obligations	Parent Property: has Domain: AutonomousAgent Range: LegalCapacity Inverse: isCapacityOf
isCapacityOf (is capacity of)	Definition: identifies an individual or organization on which a given legal capacity has been conferred Scope note: This includes capacities specific to duties at law (such as those for corporate officers) as well as the ability or capacity to incur liability.	Parent Property: isConferredOn Domain: LegalCapacity Range: AutonomousAgent
isLicensedBy (is licensed by)	Definition: indicates the regulatory agency that regulates something	Parent Property: isGovernedBy Range: PartyInRole Inverse: licenses
licenses (licenses)	Definition: issues a license required in order to perform some task, provide some service, exercise some privilege, or pursue some line of business or occupation to some party Adapted from: http://www.merriam-webster.com/dictionary/regulate	Parent Property: governs Domain: PartyInRole

6.4.9 Other Changes to the FIBO Foundations 1.0 Specification

In addition to the changes to the conformance clause, as well as the new and revised ontologies described above, there are corresponding revisions needed in the architecture clause of the specification.

(1) Replace figure 8.1, Foundations Ontology Architecture, with the following figure.

(2) Replace the text above Table 8.2 with the following text:

Table 8.2 lists the prefixes and namespaces considered external to FIBO.

(3) Replace Table 8.2 with the following table:

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#
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/
lcc-lr	http://www.omg.org/spec/LCC/Languages/LanguageRepresentation/
lcc-639-1	http://www.omg.org/spec/LCC/Languages/ISO639-1-LanguageCodes/
lcc-cr	http://www.omg.org/spec/LCC/Countries/CountryRepresentation/
lcc-3166-1	http://www.omg.org/spec/LCC/Countries/ISO3166-1-CountryCodes/

(4) Insert the following row in Table 8.3, following the entry for Currency Amount (prefix is fibo-fnd-acc-cur):

fibo-fnd-acc-4217	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/ISO4217-CurrencyCodes/

(5) Insert the following row in Table 8.3, following the entry for Arrangements (prefix is fibo-fnd-arr-arr):

fibo-fnd-arr-cls	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/ClassificationSchemes/

(6) Insert the following rows in Table 8.3, following the entry for VirtualPlaces (prefix is fibo-fnd-plc-vrt):

`fibo-fnd-pas-mod`	`http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/AboutProductsAndServices/`
`fibo-fnd-pas-psch`	`http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/PaymentsAndSchedules/`
`fibo-fnd-pas-pas`	`http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/ProductsAndServices/`
`fibo-fnd-qt-mod`	`http://www.omg.org/spec/EDMC-FIBO/FND/Quantities/AboutQuantities/`
`fibo-fnd-qt-qtu`	`http://www.omg.org/spec/EDMC-FIBO/FND/Quantities/QuantitiesAndUnits/`

7 Introduction

7.1 Specification Overview

As stated in Scope (Clause 1), above, the Financial Business and Commerce (FBC) Specification covers financial domain terminology required for integration of numerous, dependent and topic-specific FIBO specifications to follow. The design methodology, which has evolved to reflect multiple, parallel development teams representing interdependent topic areas has posed a number of interoperability challenges, which led to the need for a set of over-arching yet domain specific concepts that can be used as bridging terms across those topics. One of the most important bridge concepts is 'financial instrument'. The approach FBC takes to defining concepts like 'financial instrument' s to provide just enough scaffolding to support bridging the specifications without overly constraining the definitions, to limit brittleness to the degree possible.

FBC follows the guidance provided with respect to the development of definitions, as outlined in sub clause 1.3. The specification has been developed and maintained using the Unified Modeling Language (UML) as the primary modeling language and notation, specialized via and in compliance with the Ontology Definition Metamodel (ODM) Version 1.1 stereotypes for RDF (the Resource Description Framework) and OWL (the Web Ontology Language). The ontologies that make up the specification, including the revisions to the FIBO Foundations specification given in sub clause 6.4, above, also reflect the metadata recommendations of the OMG Architecture Board, and use the SpecificationMetadata ontology posted on the OMG web site to that end. That recommendation was extended in FIBO Foundations through the AnnotationVocabulary, which is also used extensively herein.

The machine-readable deliverables include ODM-compliant models in the form of XMI files ("ODM XMI", reflecting the ODM metamodels for RDF and OWL), as serialized UML in the form of XMI files ("UML XMI") with the ODM stereotypes applied, and as OWL ontologies serialized in RDF/XML syntax. These deliverables are described further in Annex A.

7.2   Usage Scenarios

A number of scenarios were used to drive the development process and are supported by this specification. These include:

- Provision of formal definitions representing financial instruments, financial service providers, regulators, regis-tries, and financial products and services for reference as business vocabulary content and for use in specifica-tion integration as well as for integration purposes in finance applications
- Counterparty identification based on (1) registration identifiers such as legal entity formation (corporation, LLC, or other business entity) and legal entity identifiers as registered with global LEI registry, or (2) functional entity identifiers such as bank charter, FDIC or other insurance provider certificate numbers, wire transfer routing numbers, etc.
- Applications that depend on identification of legal entities based on who regulates them, based on the services they provide, or based on the kinds of instruments they sell
- KYC – "know your customer" scenarios that require identification of the entities involved in particular transac-tions
- FIBO extensions in domain-specific areas that require these common concepts as "hooks" into the foundational layers of FIBO

8 Architecture

8.1 Overview

The overarching approach to a modular ontology architecture is provided in the FIBO Foundations [Foundations] Specification. The Financial Business and Commerce (FBC) Specification leverages that modular approach and architecture. It extends the Foundations and Business Entities specifications with three additional modules: (1) Financial Instruments, (2) Functional Entities, which extends the Functional Entities module in [FIBO BE], and (3) Products and Services, which extends the Products and Services module in [Foundations].

8.2 Dependencies on Other FIBO Specifications

As mentioned above, FBC extends concepts defined in both the [Foundations] and [FIBO BE] specifications. The Foundations ontologies include legal concepts like contracts, business concepts such as products and service provision, general concepts such as classification schemes, identification schemes, dates and times, etc. FBC also draws extensively on concepts defining legal and functional entities from [FIBO BE] to describe financial service providers, regulators, registration authorities, and so forth.

8.3 "About" FBC Vocabularies

The "about" files for FBC (and for all FIBO specifications) provide content describing FBC and each of the modules, complementing the content in this specification and in some cases duplicating it in the form of RDF/XML metadata. These files are designed to (1) describe the machine-readable content of the specification for people who download that content directly, via content negotiations, and import it into tools that can interpret and display those files, (2) for potential use in tagging the specification document on the OMG site, and (3) to provide a high-level ontology in the case of AboutFBC-1.0.rdf that imports all of the others, including all of FND and BE, to support ease of use.

8.4 Namespace Definitions

The namespaces and prefixes corresponding to external elements required for use in FBC include all of those listed in the FIBO Foundations and Business Entities specifications. Table 8.1 lists the prefixes and namespaces on which FBC depends that are external to FIBO. Table 8.2 provides those required for use of Foundations, while Table 8.3 provides those required for use of the Business Entities specification (repeated here for convenience). The prefixes provided in Tables 8.1, 8.2, 8.3, and in 8.4 are considered normative, and their usage is required in any conformant extension. Note that the Foundations and Business Entities namespaces provided herein do not include the "about" files for those specifications, as they are not required in the imports closure for the FBC ontologies.

Table 8.1 - 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#
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/
lcc-lr	http://www.omg.org/spec/LCC/Languages/LanguageRepresentation/

lcc-639-1	http://www.omg.org/spec/LCC/Languages/ISO639-1-LanguageCodes/
lcc-cr	http://www.omg.org/spec/LCC/Countries/CountryRepresentation/
lcc-3166-1	http://www.omg.org/spec/LCC/Countries/ISO3166-1-CountryCodes/

Table 8.2- Prefix and Namespaces for FIBO Foundations

Namespace Prefix	Namespace
fibo-fnd-acc-aeq	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/AccountingEquity/
fibo-fnd-acc-cur	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/
fibo-fnd-acc-4217	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/ISO4217-CurrencyCodes/
fibo-fnd-aap-agt	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/
fibo-fnd-aap-ppl	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/
fibo-fnd-agr-agr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/
fibo-fnd-agr-ctr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/
fibo-fnd-arr-arr	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements/
fibo-fnd-arr-cls	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/ClassificationSchemes/
fibo-fnd-arr-cd	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Codes/
fibo-fnd-arr-doc	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents/
fibo-fnd-arr-id	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices/
fibo-fnd-dt-bd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/BusinessDates/
fibo-fnd-dt-fd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/
fibo-fnd-dt-oc	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/Occurrences/
fibo-fnd-gao-gl	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/
fibo-fnd-gao-obj	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Objectives/

`fibo-fnd-law-jur`	http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/
`fibo-fnd-law-lcap`	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/
`fibo-fnd-law-cor`	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/
`fibo-fnd-org-fm`	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/
`fibo-fnd-org-lg`	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/LegitimateOrganizations/
`fibo-fnd-org-org`	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/
`fibo-fnd-oac-ctl`	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Control/
`fibo-fnd-oac-own`	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Ownership/
`fibo-fnd-oac-oac`	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/OwnershipAndControl/
`fibo-fnd-pty-pty`	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/
`fibo-fnd-pty-rl`	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/
`fibo-fnd-plc-adr`	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/
`fibo-fnd-plc-cty`	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/
`fibo-fnd-plc-fac`	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Facilities/
`fibo-fnd-plc-loc`	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/
`fibo-fnd-plc-vrt`	http://www.omg.org/spec/EDMC-FIBO/FND/Places/VirtualPlaces/
`fibo-fnd-pas-psch`	http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/PaymentsAndSchedules/
`fibo-fnd-pas-pas`	http://www.omg.org/spec/EDMC-FIBO/FND/ProductsAndServices/ProductsAndServices/
`fibo-fnd-qt-qtu`	http://www.omg.org/spec/EDMC-FIBO/FND/Quantities/QuantitiesAndUnits/
`fibo-fnd-rel-rel`	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/
`fibo-fnd-utl-alx`	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics/

Namespace Prefix	Namespace
fibo-fnd-utl-av	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/
fibo-fnd-utl-bt	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/

Table 8.3 - Prefix and Namespaces for FIBO Business Entities

Namespace Prefix	Namespace
fibo-be-corp-corp	http://www.omg.org/spec/EDMC-FIBO/BE/Corporations/Corporations/
fibo-be-fct-fct	http://www.omg.org/spec/EDMC-FIBO/BE/FunctionalEntities/FunctionalEntities/
fibo-be-fct-pub	http://www.omg.org/spec/EDMC-FIBO/BE/FunctionalEntities/Publishers
fibo-be-le-cb	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/CorporateBodies/
fibo-be-le-fbo	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/FormalBusinessOrganizations/
fibo-be-le-lp	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/LegalPersons/
fibo-be-le-lei	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/LEIEntities/
fibo-be-oac-cpty	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/ControlParties/
fibo-be-oac-cctl	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/CorporateControl/
fibo-be-oac-cown	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/CorporateOwnership/
fibo-be-oac-exec	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/Executives/
fibo-be-oac-opty	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/OwnershipParties/
fibo-be-ptr-ptr	http://www.omg.org/spec/EDMC-FIBO/BE/Partnerships/Partnerships/
fibo-be-tr-tr	http://www.omg.org/spec/EDMC-FIBO/BE/Trusts/Trusts/

As described in the [Foundations] specification, 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 FBC

- 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. Namespace prefixes are constructed as follows with the components separated by "-":

- The specification family name `fibo`

- The specification abbreviation: `fbc`

- An abbreviation for the module name

- An abbreviation for the ontology name

The namespaces and prefixes corresponding to the primary FIBO Financial Business and Commerce (FBC) ontologies are summarized in Table 8.4. These are given by module, and within a module in alphabetical order, rather than with any intent to show imports relationships. The table includes the namespace definitions for the "about" files that are part of the machine-readable deliverables for the specification, but that are not required for imports closure over the primary ontologies.

Table 8.4 - Prefix and Namespaces for FIBO Financial Business and Commerce (FBC)

Namespace Prefix	Namespace
fibo-fbc	http://www.omg.org/spec/EDMC-FIBO/FBC/AboutFBC/
fibo-fbc-1.0	http://www.omg.org/spec/EDMC-FIBO/FBC/1.0/AboutFBC-1.0/
fibo-fbc-fi-mod	http://www.omg.org/spec/EDMC-FIBO/FBC/FinancialInstruments/AboutFinancialInstruments/
fibo-fbc-fi-fi	http://www.omg.org/spec/EDMC-FIBO/FBC/FinancialInstruments/FinancialInstruments/
fibo-fbc-fct-mod	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/AboutFBCFunctionalEntities/
fibo-fbc-fct-breg	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/BusinessRegistries/
fibo-fbc-fct-fse	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/FinancialServicesEntities/
fibo-fbc-fct-mkt	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/Markets/
fibo-fbc-fct-ra	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegistrationAuthorities/
fibo-fbc-fct-rga	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/
fibo-fbc-pas-mod	http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/AboutProductsAndServices/

Namespace Prefix	Namespace
`fibo-fbc-pas-fpas`	`http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/`
`fibo-fbc-pas-caa`	`http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/ClientsAndAccounts/`

The namespaces and prefixes corresponding to the jurisdiction-specific FIBO Financial Business and Commerce (FBC) ontologies, specified in Clause 10, are summarized in Table 8.5. These ontologies are included in sub-folders in the Functional Entities module.

Table 8.5 - Prefix and Namespaces for FIBO Financial Business and Commerce (FBC) Jurisdiction-specific Ontologies

Namespace Prefix	Namespace
`fibo-fbc-fct-usfse`	`http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/USFinancialServicesEntities/`
`fibo-fbc-fct-usjrga`	`http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/USRegulatoryAgencies/`
`fibo-fbc-fct-cafse`	`http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/CAFinancialServicesEntities/`
`fibo-fbc-fct-cajrga`	`http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/CARegulatoryAgencies/`

9 Jurisdiction-Independent Ontologies

9.1 Overview

This clause defines the terms, definitions, relationships, and additional logic specified in the ontologies that make up the jurisdiction-independent content of the Financial Business and Commerce (FBC) specification.

9.2. Module: Financial Instruments

Table 9.1 - Financial Instruments Module Metadata

Metadata Term	Value
sm:moduleName	FinancialInstruments
sm:moduleAbbreviation	FIBO-FBC-FI
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies describing general purpose financial instruments, i.e., agreements, contracts, notes, equities, options, debt instruments, and so forth, some of which may be negotiable.

9.2.1 Ontology: Financial Instruments

This ontology defines the fundamental concepts relevant to financial instruments in general, and for those that are regulated more specifically, such as for equities, options, debt instruments, and so forth, some of which may be negotiable.

Table 9.2 - Financial Instruments Ontology Metadata

Metadata Term	Value
sm:filename	FinancialInstruments.rdf
sm:fileAbbreviation	fibo-fbc-fi-fi
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FinancialInstruments/FinancialInstruments/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FinancialInstruments/FinancialInstruments/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/BusinessRegistries/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/Markets/

Figure 9.1 - Financial Instruments Concept Hierarchy

Figure 9.1 depicts the basic concepts in the ontology, including the primary inheritance hierarchy and disjoint relations. Note that as mentioned in sub clause 6.3, classes shown in white are local to the Financial Instruments ontology, whereas classes shown in amber are imported from elsewhere in FIBO, with the source ontology shown in parentheses under the class name in the class box.

Figure 9.2 - Definition of Financial Instrument

The primary properties of and restrictions on FinancialInstrument are shown in Figure 9.2. Figure 9.3, below, provides the corresponding definition of a financial instrument identifier.
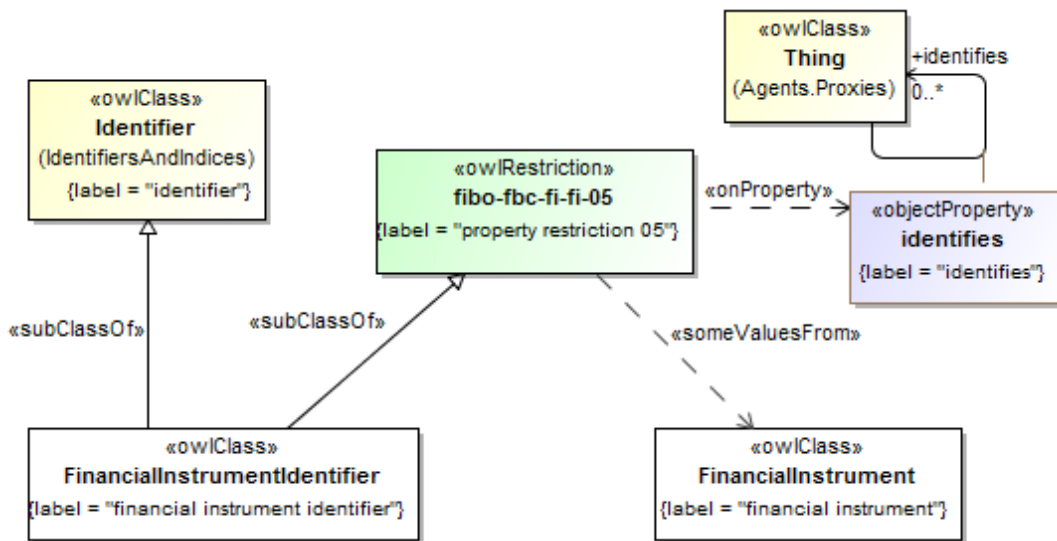
Figure 9.3 - Definition of Financial Instrument Identifier

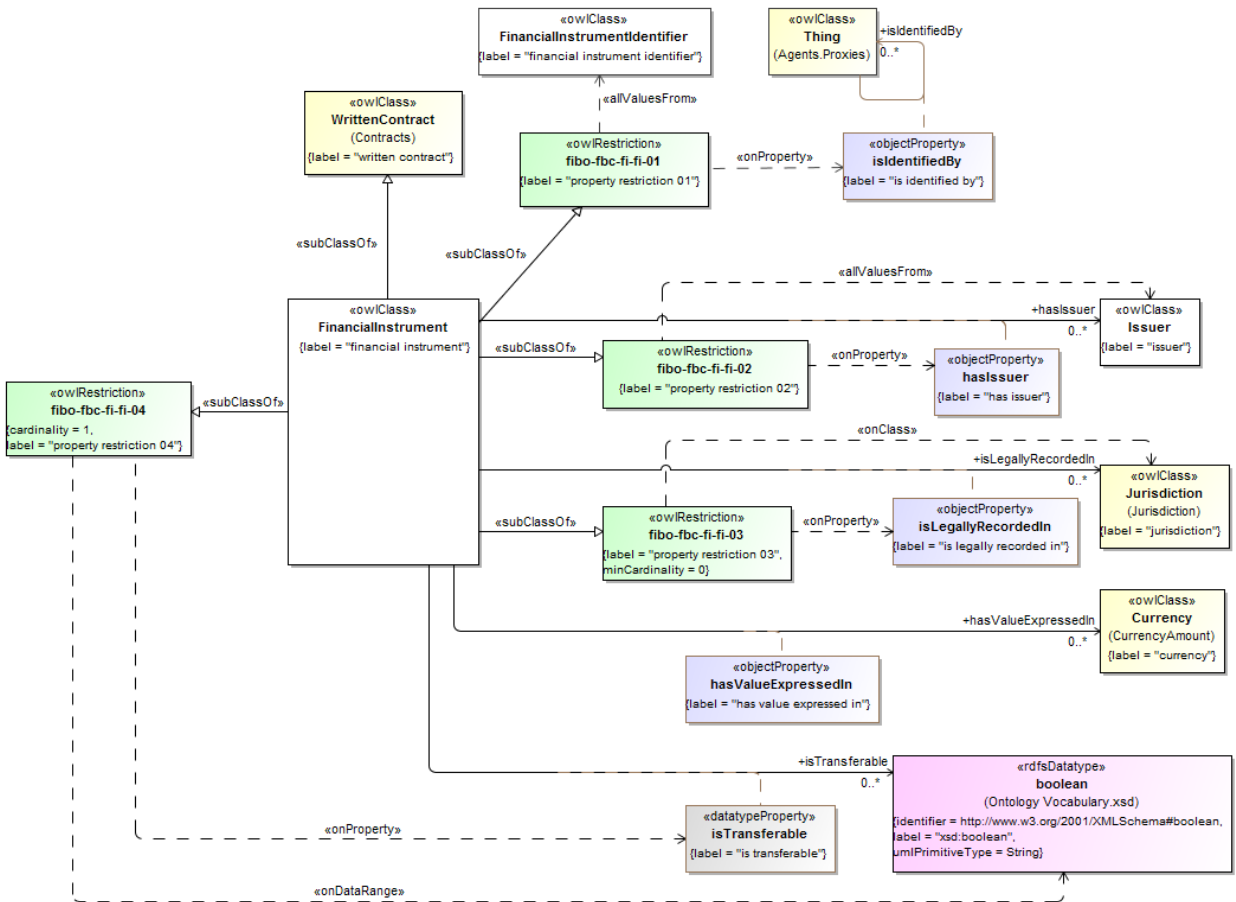The primary restriction on a FinancialInstrumentIdentifier, is that it identifies at least one FinancialInstrument, is shown in Figure 9.3. Note that financial instrument identifier is defined per the definition provided in the OMG's Financial Instrument Global Identifier (FIGI) specification, and that the two identifiers may be used together, or made equivalent to one another, as appropriate for a given application or use case. Figure 9.4, below, provides the definition of a security, which is a kind of financial instrument.

Figure 9.4 - Definition of Security

As shown in Figure 9.4, a Security is a FinancialInstrument that is legally recorded in exactly one Jurisdiction and is transferable. Securities may also be traded in Markets.
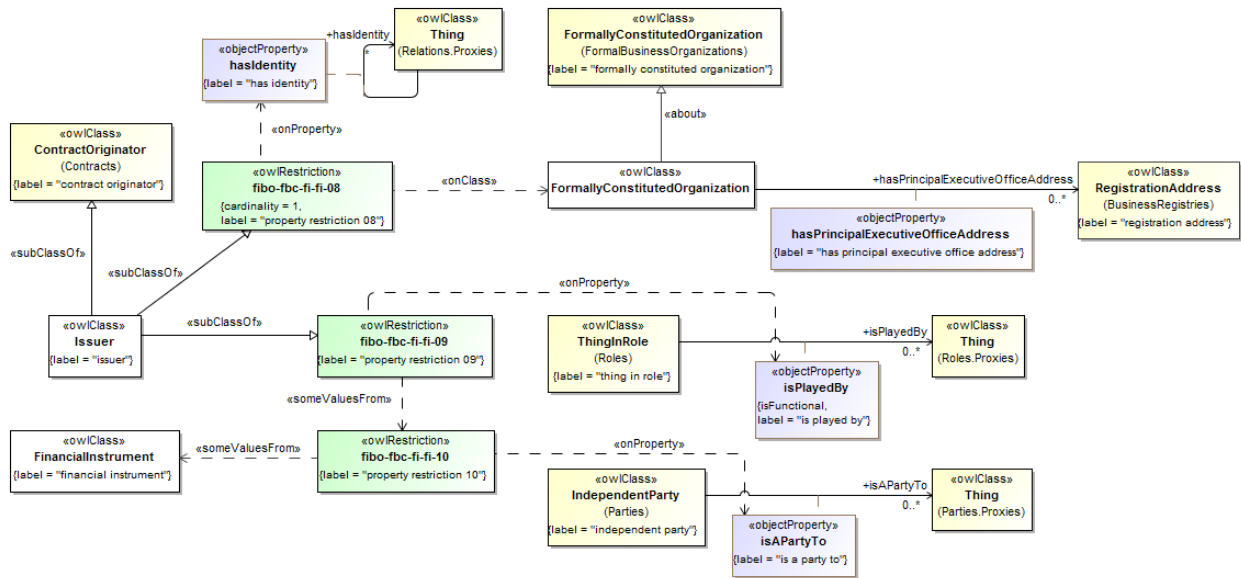
Figure 9.5 - Definition of Issuer

Figure 9.5 provides the definition of an Issuer, which is a ContractOriginator that is a party to a financial instrument.
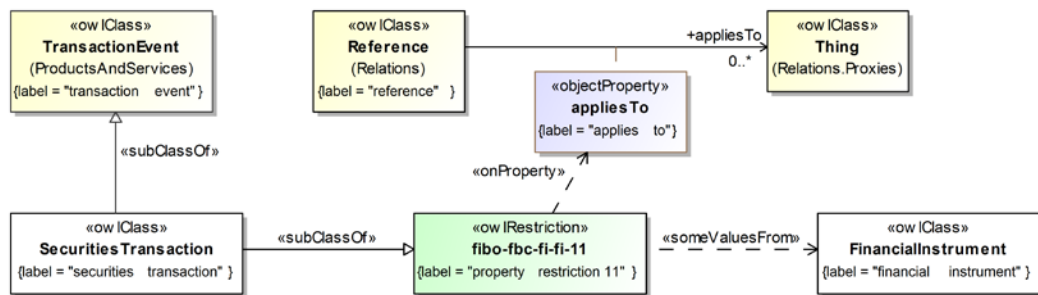
Figure 9.6 - Definition of a Basic Securities Transaction

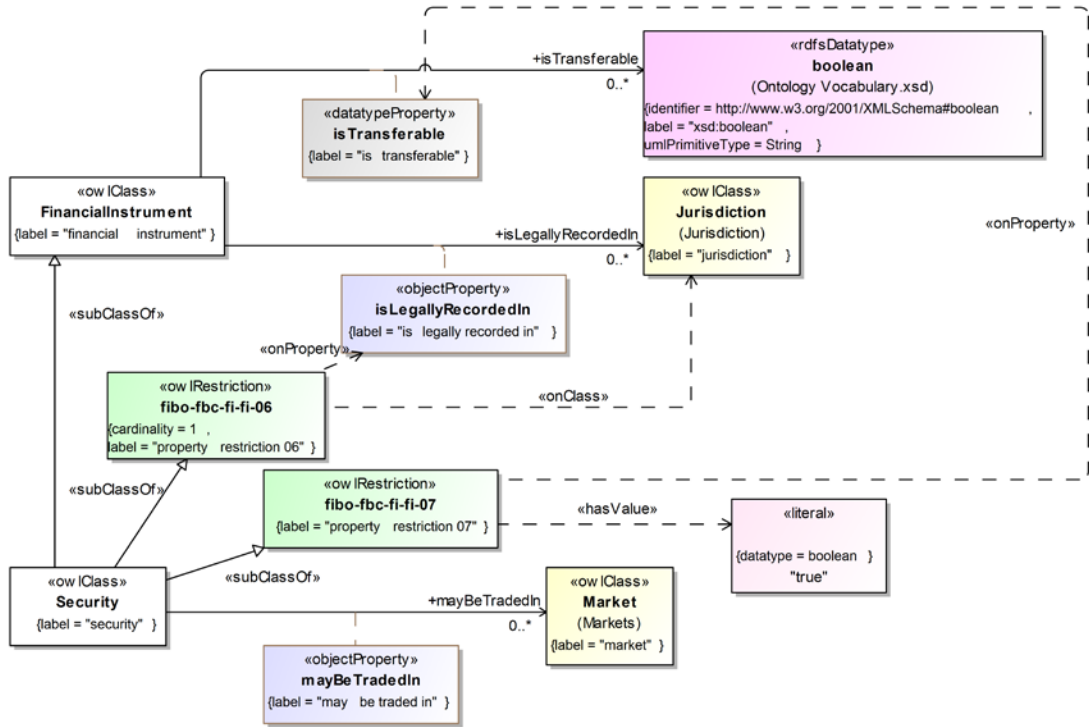As shown in Figure 9.6, a securities transaction applies to a financial instrument. Table 9.3 provides the definitions and other annotations for the Financial Instruments ontology.

Table 9.3 - Financial Instruments Ontology Details

Classes

Name	Annotations	Class Expressions
CashInstrument (cash instrument)	Definition: a financial instrument whose value is ascertained directly by markets and that can be converted into cash quickly with minimal impact on the price received Editorial note: From a modeling perspective in FIBO, these are independent entities; the corresponding relative entity would be liquid asset. Cash instruments are therefore disjoint with derivative instruments, per IASB international accounting guidance. Scope note: Cash instruments can be classified into two subgroups, as securities and other cash instruments such as loans and deposits. Adapted from: http://www.investopedia.com/terms/l/liquidasset.asp	Parent Class: FinancialInstrument

	Adapted from: http://definitions.uslegal.com	
CommodityInstrument (commodity instrument)	Definition: a financial instrument representing an ownership interest in a commodity such as coal, oil, precious metal, livestock, an agricultural product, etc. Definition origin: Citigroup Inc.	Parent Class: FinancialInstrument
CurrencyInstrument (currency instrument)	Definition: a financial instrument used for the purposes of currency trading Example: Example currencies include UK pounds, US dollars, Euro. An example currency instrument is spot currency instrument. Scope note: Each instance of a currency instrument has a one to one relationship with its associated currency. Adapted from: Parameswaran, Sunil. Fundamentals of Financial Instruments: An Introduction to Stocks, Bonds, Foreign Exchange, and Derivatives. John Wiley and Sons (Asia) Pte. Lte., Singapore, 2011.	Parent Class: FinancialInstrument
DebtInstrument (debt instrument)	Definition: a financial instrument evidencing monies owed by the issuer to the holder on terms as specified Adapted from: ISO 10962, Securities and related financial instruments - Classification of Financial Instruments (CFI code), Second edition, 2001-05-01.	Parent Class: FinancialInstrument
DerivativeInstrument (derivative instrument, derivative contract)	Definition: a financial instrument that confers on its owners certain rights or obligations, whose value is derived from one or more underlying assets Example: The three major categories of derivatives are (1) forward and future contracts, (2) options contracts, and (3) swaps. The most common underlying assets include stocks, bonds, commodities, currencies, interest rates and market indexes. Explanatory note: Derivative contracts owe their availability to the existence of markets for an underlying asset or a portfolio of assets on which such agreements are written. The derivative itself is merely a contract between two or more parties. Its value is determined by fluctuations in the underlying asset. Most derivatives are characterized by high leverage. Scope note: Derivatives can be characterized by whether they are exchange-traded or traded over-the-counter (OTC). Adapted from: Parameswaran, Sunil. Fundamentals of Financial Instruments: An Introduction to Stocks, Bonds, Foreign Exchange, and Derivatives. John Wiley and Sons (Asia) Pte. Lte., Singapore, 2011. Adapted from: http://www.investopedia.com/	Parent Class: FinancialInstrument Class Axiom: ¬ CashInstrument
Entitlement (entitlement, right)	Definition: a financial instrument that provides the holder the privilege to subscribe to or to receive specific assets on terms specified Definition origin: ISO 10962, Securities and related financial instruments - Classification of Financial Instruments (CFI code), Second edition, 2001-05-01.	Parent Class: DerivativeInstrument
EquityInstrument (equity instrument)	Definition: a financial instrument representing an ownership interest in an entity or pool of assets Definition origin: ISO 10962, Securities and related financial instruments - Classification of Financial Instruments (CFI code), Second edition, 2001-05-01.	Parent Class: Security

FinancialInstrument (financial instrument)	Definition: a written contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity Explanatory note: A financial instrument can be thought of as a template that defines an arrangement structure that remains to be fleshed out with terms and parameters in order to establish a specific instance of the contract type. Example: Examples of financial instrument categories include: cash, evidence of an ownership interest in an entity, or a contractual right to receive (or deliver) cash, or another financial instrument. Adapted from: http://ec.europa.eu/internal_market/accounting/docs/consolidated/ias32_en.pdf	Parent Class: WrittenContract Property Restriction: ∀ **isIdentifiedBy**.**FinancialInstrumentIdentifier** (fibo-fbc-fi-fi-01) Property Restriction: ∀ **hasIssuer**.**Issuer** (fibo-fbc-fi-fi-02) Property Restriction: ≥ 0 **isLegallyRecordedIn**.**Jurisdiction** (fibo-fbc-fi-fi-03) Property Restriction: = 1 **isTransferable**.**boolean** (fibo-fbc-fi-fi-04)
FinancialInstrumentIdentifier (financial instrument identifier)	Definition: an identifier for a financial instrument Scope note: Identifiers for financial instruments may include an ISIN, Sedol, CUSIP, BBGID, FIGI, or other identifier issued approximately when the instrument itself is issued, and based on the kind of instrument and jurisdiction in which it is issued. Adapted from: OMG Financial Instrument Global Identifier (FIGI) Specification, available at http://www.omg.org/spec/FIGI/.	Parent Class: Identifier Property Restriction: ∃ **identifies**.**FinancialInstrument** (fibo-fbc-fi-fi-05)
Future (future)	Definition: a contract that obligates the buyer to receive and the seller to deliver, in the future, the assets specified at an agreed price Definition origin: ISO 10962, Securities and related financial instruments - Classification of Financial Instruments (CFI code), Second edition, 2001-05-01.	Parent Class: DerivativeInstrument
Issuer (issuer)	Definition: any party who issues (or proposes to issue, in a formal filing) any financial instrument, where a party can be a natural person, company, government, or political subdivision, agency, or instrumentality of a government Explanatory note: With respect to certificates of deposit for securities, voting-trust certificates, or collateral- trust certificates, or with respect to certificates of interest or shares in an unincorporated investment trust not having a board of directors or of the fixed, restricted management, or unit type, the term issuer means the person or persons performing the acts and assuming the duties of depositor or manager pursuant to the provisions of the trust or other agreement or instrument under which such securities are issued; and except that with respect to equipment-trust certificates or like securities, the term issuer means the person by whom the equipment or property is, or is to be, used. Adapted from: Securities Exchange Act of 1934, as amended 12 August 2012	Parent Class: ContractOriginator Property Restriction: ∃ **isPlayedBy** (∃ **isAPartyTo**.**FinancialInstrument**) (fibo-fbc-fi-fi-09, fibo-fbc-fi-fi-10) Property Restriction: = 1 **hasIdentity**.**FormallyConstitutedOrganization** (fibo-fbc-fi-fi-08)
Option (option)	Definition: a contract that grants to the holder either the privilege to purchase or the privilege to sell the assets specified at a predetermined price or formula at or within a time in the future Definition origin: ISO 10962, Securities and related financial instruments - Classification of Financial Instruments (CFI code), Second edition, 2001-05-01.	Parent Class: DerivativeInstrument
SecuritiesTransaction (securities transaction)	Definition: a transaction event that represents the execution of an order to buy or sell a security	Parent Class: TransactionEvent Property Restriction: ∃

	Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	**appliesTo.FinancialInstrument** (fibo-fbc-fi-fi-11)
Security (security, negotiable security)	Definition: a transferable financial instrument that can be bought or sold Explanatory note: A security can be any note, stock, treasury stock, security future, security-based swap, bond, debenture,certificate of interest or participation in any profit-sharing agreement or in any oil, gas, or other mineral royalty or lease, any collateral-trust certificate, preorganization certificate or subscription, transferable share, investment contract, voting-trust certificate, certificate of deposit for a security, any put, call, straddle, option, or privilege on any security, certificate of deposit, or group or index of securities (including any interest therein or based on the value thereof), or any put, call, straddle, option, or privilege entered into on a national securities exchange relating to foreign currency, or in general, any instrument commonly known as a security, or any certificate of interest or participation in, temporary or interim certificate for, receipt for, or warrant or right to subscribe to or purchase, any of the foregoing; but shall not include currency or any note, draft, bill of exchange, or bankers' acceptance which has a maturity at the time of issuance of not exceeding nine months, exclusive of days of grace, or any renewal thereof the maturity of which is likewise limited. Explanatory note: A security may be traded over the counter, or through an exchange, or via some other trading venue such as an electronic trading platform. Adapted from: Securities Exchange Act of 1934, as amended 12 August 2012	Parent Class: FinancialInstrument Property Restriction: ∀ **isTransferable.true** (fibo-fbc-fi-fi-07) Property Restriction: = 1 **isLegallyRecordedIn.Jurisdiction** (fibo-fbc-fi-fi-06)
StandardizedTermsSet (standardized terms set)	Definition: a set of standardized terms, published by some body, and capable of being incorporated into a contract by agreement	Parent Class: ContractTermsSet

Properties

Name	Annotations	Property Axioms
hasIssuer (has issuer)	Definition: relates an instrument to the party that issued it	Parent Property: hasPartyInRole Domain: FinancialInstrument Range: Issuer
hasPrincipalExecutive OfficeAddress (has principal executive office address)	Definition: relates an organization, specifically the issuer of a financial instrument, to its principal executive address, as required for issuance of that instrument	Domain: FormallyConstitutedOrganization Range: RegistrationAddress
hasValueExpressedIn (has value expressed in)	Definition: relates an instrument to the currency its value is typically expressed in Explanatory note: This should be the same currency that was declared at the time of issuance.	Parent Property: has Domain: FinancialInstrument Range: Currency
isLegallyRecordedIn (is legally recorded in)	Definition: jurisdiction (country, county, state, province, city) in which the financial instrument is legally recorded for regulatory and/or tax purposes	Parent Property: hasGoverningJurisdiction Domain: FinancialInstrument Range: Jurisdiction
isTransferable (is transferable)	Definition: specifies whether a particular financial instrument is or is not transferable	Domain: FinancialInstrument Range: boolean

mayBeTradedIn (may be traded in)	<u>Definition</u>: optionally identifies one or more markets in which the security may be traded	<u>Domain</u>*: Security* <u>Range</u>*: Market*

9.3.   Module: FunctionalEntities

Table 9.4 - Functional Entities Module Metadata

Metadata Term	Value
sm:moduleName	FunctionalEntities
sm:moduleAbbreviation	FIBO-FBC-FCT
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies describing entities that are defined according to their function, as opposed to their form. They include service providers such as financial institutions (e.g., banks, investment companies, and insurance companies), government regulatory and registration agencies, as well as entities described in terms of their function in some process, such as clearing houses.

9.3.1   Ontology: Business Registries

This ontology extends the Registration Authorities ontology to define specific kinds of registries, such as business entity registries, registries for identifiers and codes of various sorts, and registries for financial institutions based on jurisdiction, who regulates them, and the services they provide.

Table 9.5 - Business Registries Ontology Metadata

Metadata Term	Value
sm:filename	BusinessRegistries.rdf
sm:fileAbbreviation	fibo-fbc-fct-breg
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/BusinessRegistries/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20150801/FunctionalEntities/BusinessRegistries/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegistrationAuthorities/
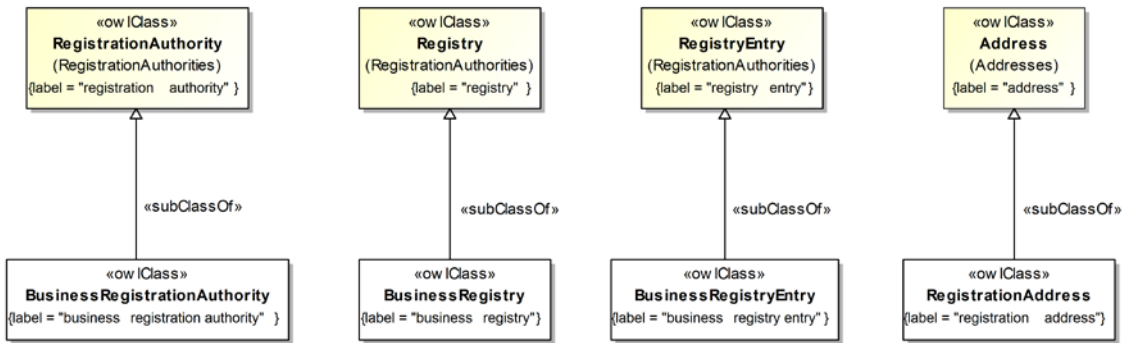
Figure 9.7 - Business Registries Class Hierarchy

Figure 9.7 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy Subsequent figures highlight various aspects of the business registries ontology. Example business registries in the United States include the Securities and Exchange Commission's EDGAR database, as well as various state registries for active businesses that have incorporated in those states. According to their web site, 50% of the active businesses in the U.S. have incorporated in the State of Delaware, and the state maintains a registry of all such businesses.
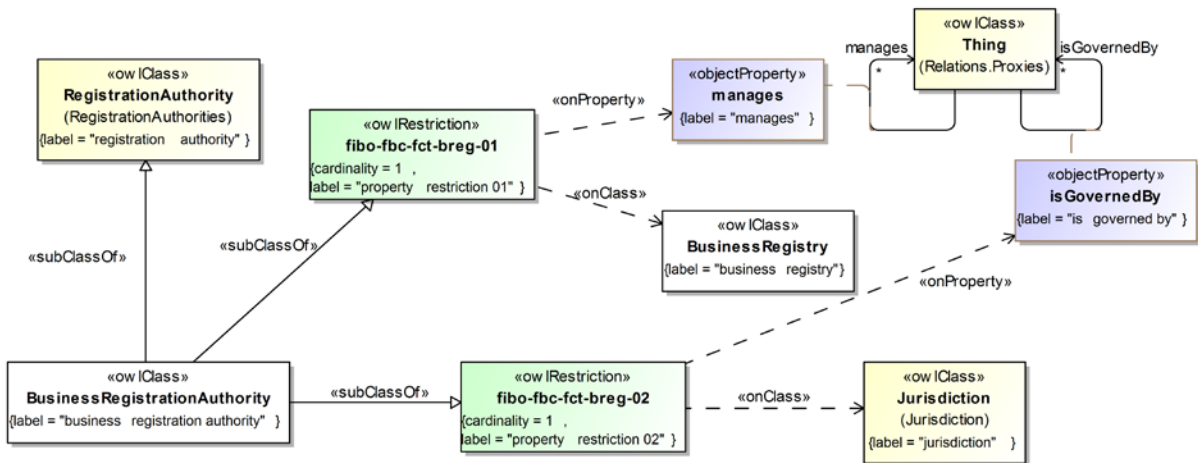
Figure 9.8 - Definition of Business Registration Authority

Figure 9.8 shows how a business registration authority extends the basic definition of a registration authority, by virtue of managing a business registry and being governed by a given jurisdiction.
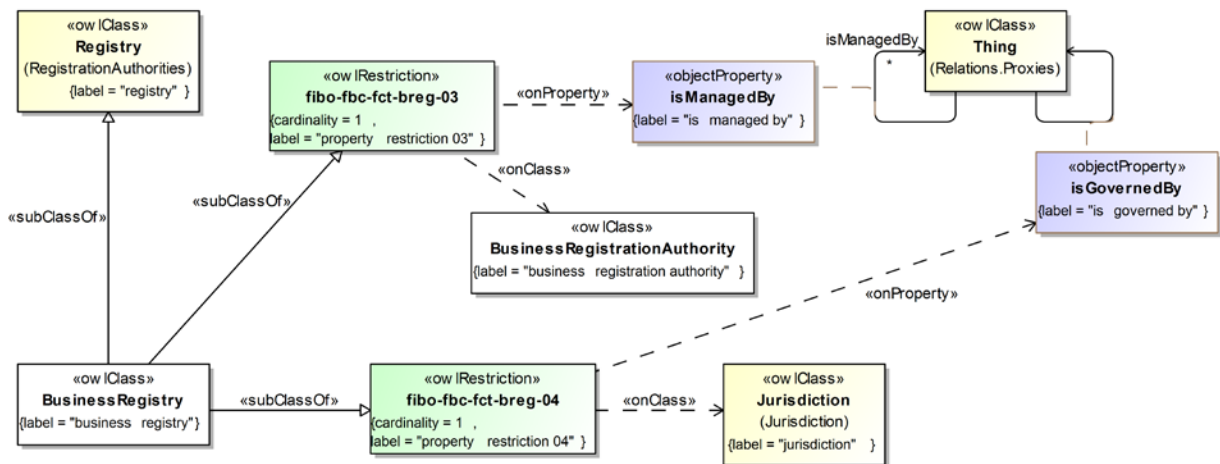
Figure 9.9 - Definition of Business Registry

Financial Industry Business Ontology – Financial Business and Commerce

As shown in Figure 9.9, a business registry extends the basic definition of a registry, in that it is managed by business registration authority and governed by a given jurisdiction.
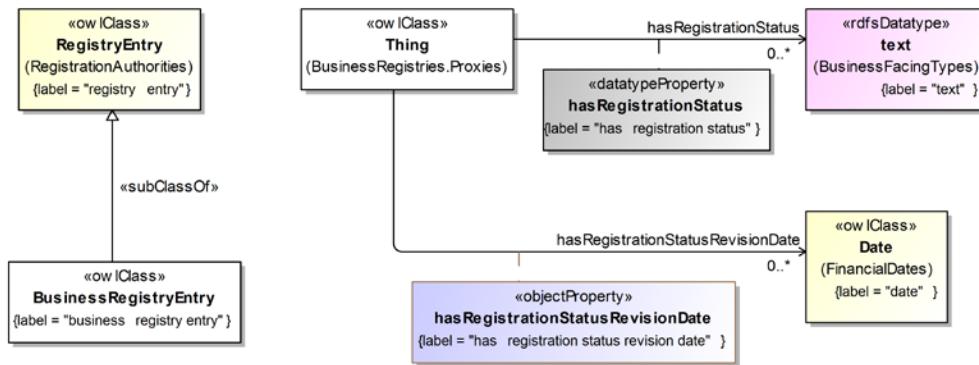
Figure 9.10 - Definition of Business Registry Entry

Figure 9.10 provides the definitions related to a business registry entry.
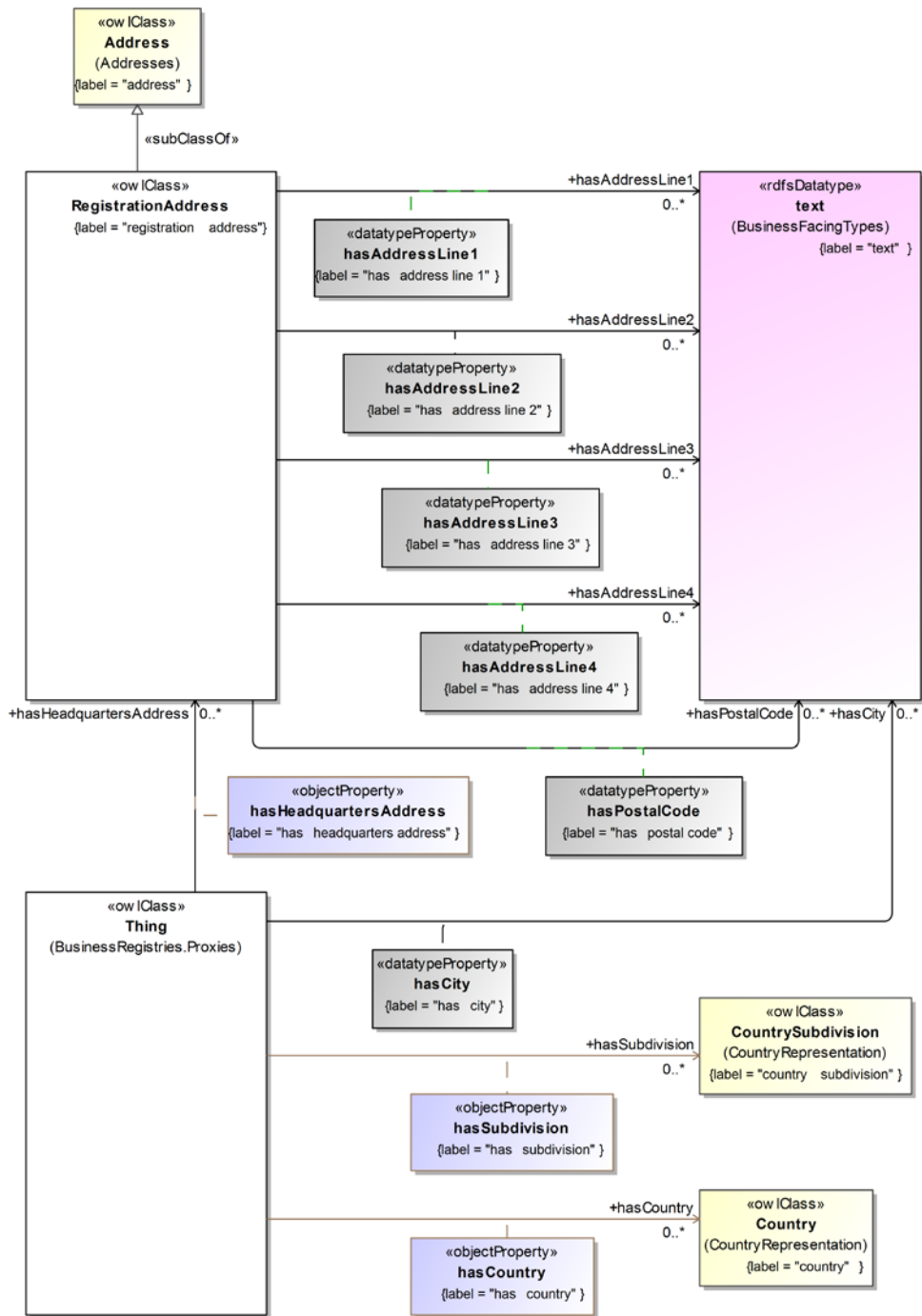
Figure 9.11 - Definition of Legal Registration Address

The definition of a registration address, common to many business and government registries, is provided in Figure 9.11. The properties use the definitions of subdivision (which would typically be a state in the US) and country from the OMG Languages, Countries, and Codes (LCC) specification, and are common to many representations, which led to their definition on `owl:Thing` rather than having a domain specific to the registration address. They are required in banking for representing information about legal entities using the Global Legal Entity Identifier registries as one example, and for many EU, US, and state and local government business registries.

Table 9.6 - Business Registries Ontology Details

Classes

Name	Annotations	Class Expressions
BusinessRegistrationAuthority (business registration authority)	Definition: a governmental registration authority that is responsible for maintaining a registry of business entities for a particular jurisdiction Adapted from: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Parent Class: RegistrationAuthority Property Restriction: ≥ 1 **manages.BusinessRegistry** (fibo-fbc-fct-breg-01) Property Restriction: = 1 **isGovernedBy.Jurisdiction** (fibo-fbc-fct-breg-02)
BusinessRegistry (business registry)	Definition: a registry for registering and maintaining information about business entities for a particular jurisdiction Adapted from: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Parent Class: Registry Property Restriction: = 1 **isManagedBy.BusinessRegistrationAuthority** (fibo-fbc-fct-breg-03) Property Restriction: = 1 **isGovernedBy.Jurisdiction** (fibo-fbc-fct-breg-04)
BusinessRegistryEntry (business registry entry)	Definition: an entry in a business registry	Parent Class: RegistryEntry
RegistrationAddress (registration address)	Definition: an address for a business, such as its legal address, headquarters address, address registered for obtaining a license, and so forth Adapted from: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Parent Class: Address

Properties

Name	Annotations	Property Axioms
hasCountry (has country)	Definition: identifies the country according to ISO 3166-1	Parent Property: has Range: Country
hasHeadquartersAddress (has headquarters address)	Definition: identifies the headquarters address for the registered entity	Parent Property: hasPrimaryAddress Range: RegistrationAddress
hasSubdivision (has subdivision)	Definition: identifies the country subdivision (state, province, region, etc.) according to ISO 3166-2	Parent Property: has Range: CountrySubdivision
hasRegistrationStatusRevisionDate (has registration status revision date)	Definition: the date that the status of a specific registration in the registry was revised	Parent Property: hasDate Range: Date
hasAddressLine1 (has address line 1)	Definition: the first line of the street address Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Domain: RegistrationAddress Range: text
hasAddressLine2 (has address line 2)	Definition: the second line of the street address Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Domain: RegistrationAddress Range: text
hasAddressLine3 (has address line 3)	Definition: the third line of the street address Explanatory note: This element SHALL be omitted if	Domain: RegistrationAddress Range: text

	address line 2 is omitted. Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	
hasAddressLine4 (has address line 4)	Definition: the fourth line of the street address Explanatory note: This element SHALL be omitted if address line 3 is omitted. Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Domain: RegistrationAddress Range: text
hasCity (has city)	Definition: the name of the city Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Range: text
hasPostalCode (has postal code)	Definition: the postal code of this address as specified by the local postal service Definition origin: http://www.leiroc.org/publications/gls/lou_20140620.pdf	Domain: RegistrationAddress Range: text
hasRegistrationStatus (has registration status)	Definition: the status of a specific registration, such as a registered identifier or license	Range: text

9.3.2 Ontology: Financial Services Entities

This ontology defines basic financial service providers, such as holding companies, financial institutions (both depository and non-depository institutions), and clearing houses at a relatively general level. Nuances specific to the institutions located in a specific country are defined in jurisdiction specific dependent ontologies.

Table 9.7 - Financial Services Entities Ontology Metadata

Metadata Term	Value
sm:filename	FinancialServicesEntities.rdf
sm:fileAbbreviation	fibo-fbc-fct-fse
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/FinancialServicesEntities/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FunctionalEntities/FinancialServicesEntities/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/

Figure 9.12 - Top-Level Financial Services Entities Class Hierarchy

Figure 9.12 provides an overview of the most basic concepts in the ontology including the top-level inheritance hierarchy and union defining an investment bank. Subsequent figures highlight various aspects of the financial services entities ontology.
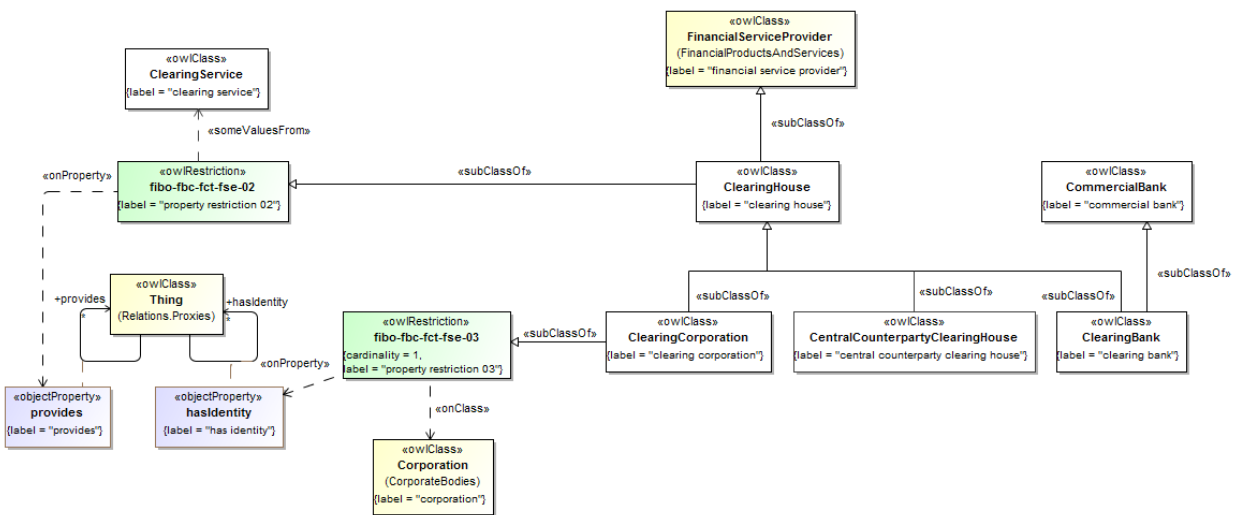
Figure 9.13 - Definition of a Clearing House

Figure 9.13 provides an overview of the definitions for clearing house, clearing bank, clearing corporation, and central counterparty clearing house (CCP).
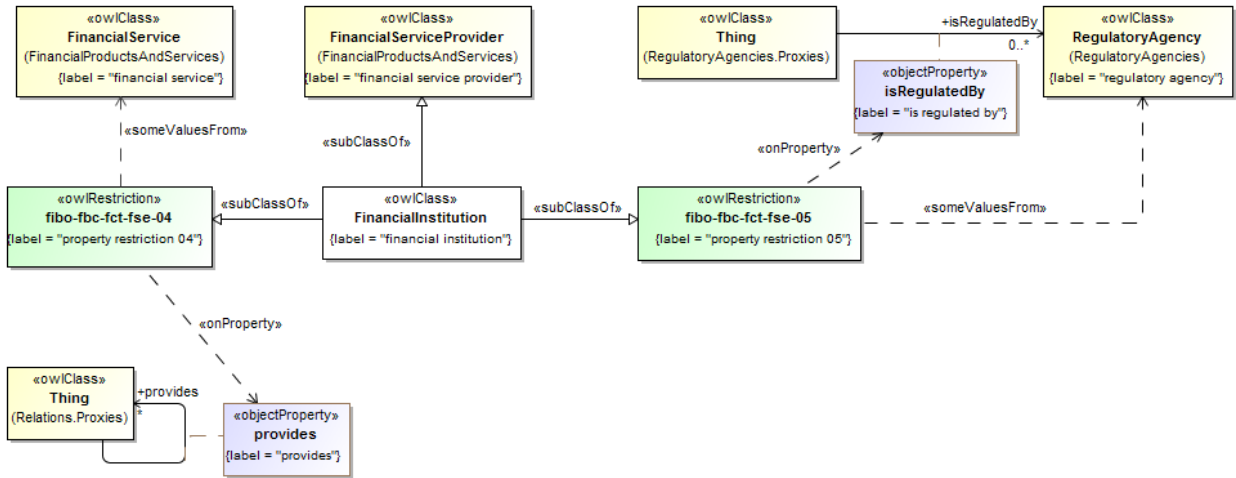
Figure 9.14 - Definition of Financial Institution

Figure 9.14 defines a financial institution as a financial service provider that provides at least one financial service and is regulated by some regulatory agency.
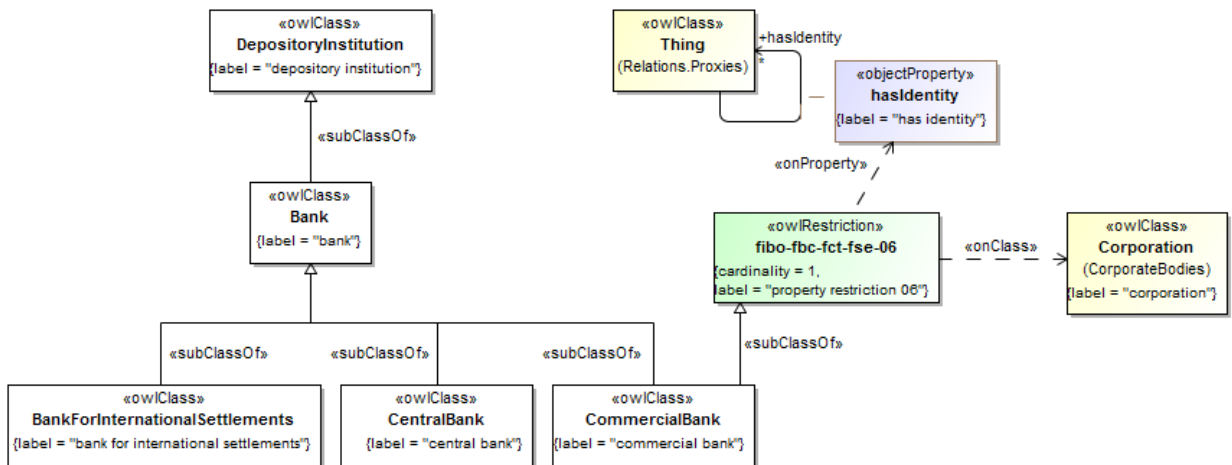
Figure 9.15 - Definition and Class Hierarchy for Banks

Figure 9.15 defines a bank as a kind of depository institution, and a commercial bank in particular as a bank whose identity is that of a corporation.
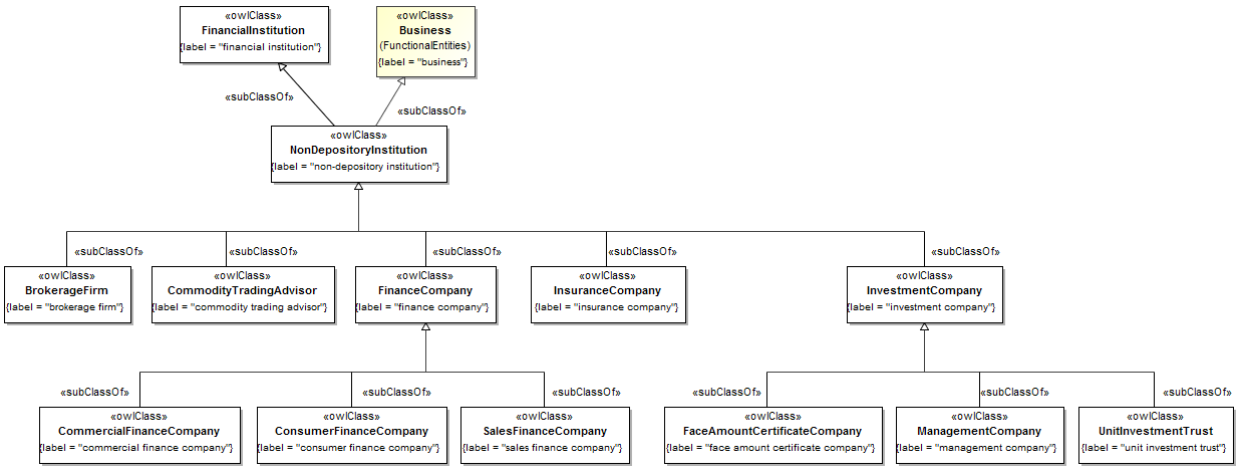
Figure 9.16 - Class Hierarchy for Non-Depository Institutions

Figure 9.16 shows the class hierarchy for non-depository institutions. These kinds of organizations vary in terms of the services they provide, the legal forms they can take, and who regulates them.
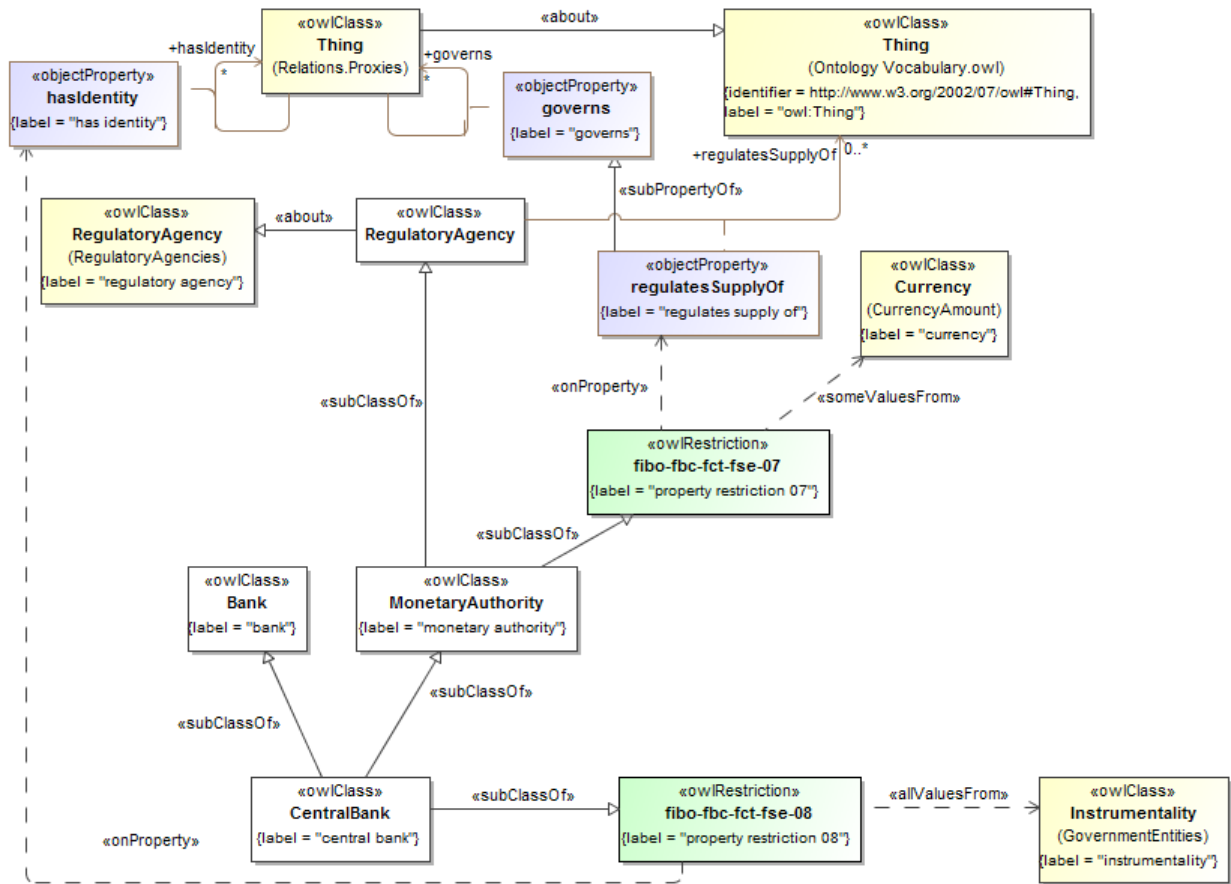
Figure 9.17 - Monetary Authorities and Central Banks

Figure 9.17 defines a monetary authority as a regulatory agency that regulates the supply of currrency in some jurisdiction, and a central bank as both a bank and monetary authority whose identity is that of an instrumentality of some government.
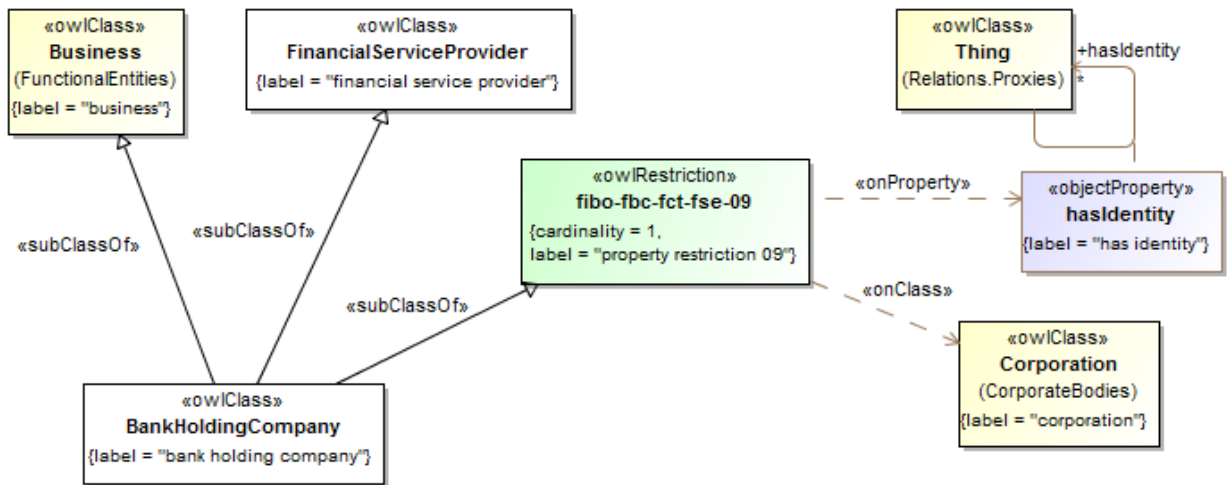
Figure 9.18 - Definition of Bank Holding Company

Figure 9.18 depicts a bank holding company as a business and financial service provider whose identity is that of a corporation.
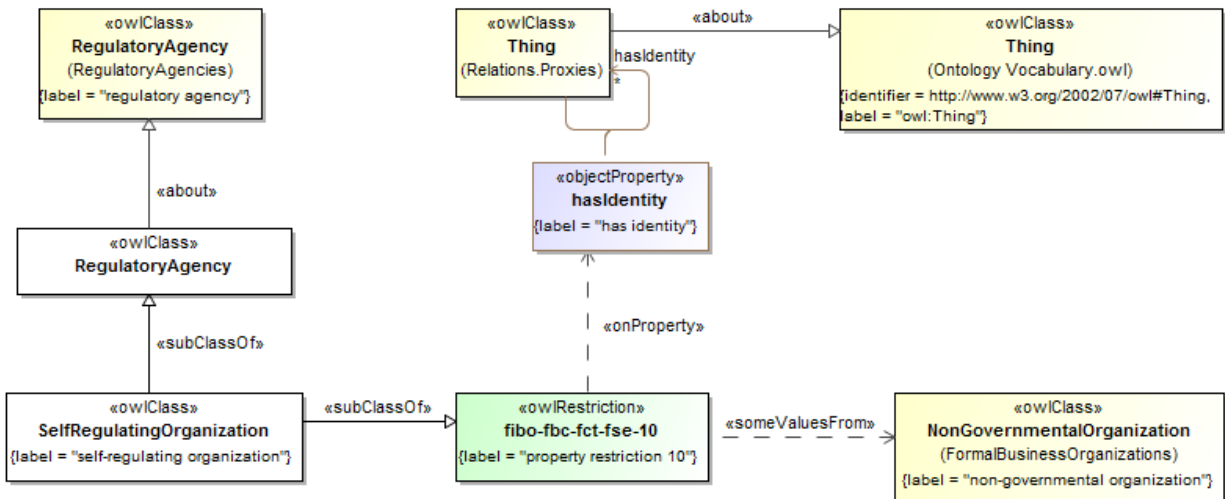
Figure 9.19 - Definition of a Self-Regulating Organization

Figure 9.19 depicts a self-regulating organization as a regulatory agency whose identity is that of a non-governmental organization (NGO).

Table 9.8 provides the detailed definitions and other annotations for the Financial Services Entities ontology.

Table 9.8 - Financial Services Entities Ontology Details

Classes

Name	Annotations	Class Expressions
Bank (bank)	Definition: a depository institution, usually a corporation, that accepts deposits, makes loans, pays checks, and performs related services, for individual members of the public, businesses or other organizations	Parent Class: DepositoryInstitution

	Adapted from: Barron's Dictionary of Banking Terms, Sixth Edition, 2012 Adapted from: As defined in the Federal Deposit Insurance Act, https://www.fdic.gov/regulations/laws/rules/1000-400.html#fdic1000sec.3a See also: https://www.sec.gov/about/laws/ica40.pdf	
BankForInternational Settlements (bank for international settlements)	Definition: an international financial organization that serves central banks in their pursuit of monetary and financial stability, helping to foster international cooperation in those areas and acting as a bank for central banks Definition origin: Office of Financial Research (OFR) Annual Report, 2012, Glossary	Parent Class: Bank
BankHoldingCompany (bank holding company)	Definition: any company that owns and/or has direct or indirect control of one or more banks; BHCs may also own nonbanking subsidiaries such as broker-dealers and asset managers. Explanatory note: A bank holding company may also own another bank holding company, which in turn owns or controls a bank; the company at the top of the ownership chain is called the top holder. Adapted from: Office of Financial Research (OFR) Annual Report, 2012, Glossary	Parent Class: FinancialServiceProvider, Business Property Restriction: = 1 hasIdentity.Corporation (fibo-fbc-fct-fse-09)
BrokerageFirm (brokerage firm)	Definition: a firm in the business of buying and selling securities, operating as both a broker and a dealer, depending on the transaction Explanatory note: The term broker-dealer is used in U.S. securities regulation parlance to describe stock brokerages, because most of them act as both agents and principals. A brokerage acts as a broker (or agent) when it executes orders on behalf of clients, whereas it acts as a dealer (or principal) when it trades for its own account. Definition origin: Office of Financial Research (OFR) Annual Report, 2012, Glossary	Parent Class: NonDepositoryInstitution
CentralBank (central bank)	Definition: a financial institution that is the monetary authority and major regulatory bank for a country (or group of countries) Explanatory note: Its functions include issuing and managing the country's currency, controlling monetary policy and supervising money market operations, managing exchange and gold reserves, acting as lender of last resort to commercial banks, and providing banking services to the government. Central banks are state-controlled but are increasingly being given an independent status to insulate them from partisan politics. Adapted from: http://www.investopedia.com/terms/c/centralbank.asp Adapted from: http://lexicon.ft.com/Term?term=central-bank	Parent Class: MonetaryAuthority, Bank Property Restriction: = 1 hasIdentity.Instrumentality (fibo-fbc-fct-fse-08)
CentralCounterpartyClearingHouse (central counterparty clearing house, CCP)	Definition: a clearing house that helps facilitate trading in derivatives and equities markets Explanatory note: These clearing houses are often operated by the major banks in the country. The house's prime responsibility is to provide efficiency and stability to the financial markets that they operate in. There are two main processes that are carried out by CCPs: clearing and settlement of market transactions. Clearing relates to identifying the obligations of both parties on either side of a transaction. Settlement occurs when the final transfer of securities and funds occur.	Parent Class: ClearingHouse

	CCPs benefit both parties in a transaction because they bear most of the credit risk. If two individuals deal with one another, the buyer bears the credit risk of the seller, and vice versa. When a CCP is used the credit risk that is held against both buyer and seller is coming from the CCP, which in all likelihood is much less than in the previous situation. Adapted from: http://www.investopedia.com/terms/c/ccph.asp See also: http://www.esma.europa.eu/system/files/EACH2.pdf	
ClearingBank (clearing bank)	Definition: a commercial bank that facilitates payment and settlement of financial transactions, such as check clearing or facilitating trades between the sellers and buyers of securities or other financial instruments or contracts Definition origin: Office of Financial Research (OFR) Annual Report, 2012, Glossary	Parent Class: CommercialBank Parent Class: ClearingHouse
ClearingCorporation (clearing corporation)	Definition: a clearing house that is organized as a corporation Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: ClearingHouse Property Restriction: = 1 **hasIdentity.Corporation** (fibo-fbc-fct-fse-03)
ClearingHouse (clearing house)	Definition: a financial service provider that is exchange affiliated and provides clearing services, including the validation, delivery, and settlement of financial transactions, for financial intermediaries Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinancialServiceProvider Property Restriction: ∃ **provides.ClearingService** (fibo-fbc-fct-fse-02)
ClearingService (clearing service)	Definition: a service provided to financial institutions including the validation, delivery, and settlement of financial transactions Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinancialService
CommercialBank (commercial bank)	Definition: a bank that provides services, such as accepting deposits, giving business loans and auto loans, mortgage lending, and basic investment products like savings accounts and certificates of deposit Explanatory note: A commercial bank is a financial institution that is owned by stockholders, operates for a profit, and engages in various lending activities. Explanatory note: The traditional commercial bank is a brick and mortar institution with tellers, safe deposit boxes, vaults and ATMs. However, some commercial banks do not have any physical branches and require consumers to complete all transactions by phone or Internet. In exchange, they generally pay higher interest rates on investments and deposits, and charge lower fees. Definition origin: http://www.investopedia.com/terms/c/commercialbank.asp See also: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: Bank Property Restriction: = 1 **hasIdentity.Corporation** (fibo-fbc-fct-fse-06)
CommercialFinanceCompany (commercial finance company, commercial credit company)	Definition: a finance company that makes loans to manufacturers and wholesalers, secured by accounts receivable, inventories, and equipment Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinanceCompany
CommodityTradingAdvisor (commodity	Definition: an individual or organization that directly or indirectly advises others as to the value or advisability of buying or selling futures	Parent Class: NonDepositoryInstitution

trading advisor, CTA)	contracts or options Explanatory note: Indirect advice includes exercising trading authority over a customer's account. In the U.S., registered CTAs are registered with the Commodities Futures Trading Commission (CFTC) and are generally required to be members of the National Futures Association (NFA). Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	
ConsumerFinanceCompany (consumer finance company, direct loan company, small loan company)	Definition: a finance company that lends to individuals under the small loans laws of the jurisdiction in which they operate Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinanceCompany
DepositoryInstitution (depository institution)	Definition: any financial institution engaged in the business of receiving deposits from the public or other institutions, other than trust funds Adapted from: 12 U.S. Code Section 1813 - Definitions, see, for example, http://www.law.cornell.edu/uscode/text/12/1813 Adapted from: https://www.fdic.gov/regulations/laws/rules/1000-400.html#fdic1000sec.3a	Parent Class: FinancialInstitution
FaceAmountCertificateCompany (face amount certificate company)	Definition: an investment company which is engaged or proposes to engage in the business of issuing face-amount certificates of the installment type, or which has been engaged in such business and has any such certificate outstanding Explanatory note: An investor may enter into a contract with an issuer of a face amount certificate to contract to receive a stated or fixed amount of money (the face amount) at a stated date in the future. In exchange for this future sum, the investor must deposit an agreed lump sum or make scheduled installment payments over time. Face amount certificates are rarely issued these days, as most of the tax advantages that the investment once offered have been lost through changes in the tax laws. Adapted from: Section 4, definition of investment companies, Investment Company Act of 1940 as amended and approved as of 3 January 2012, see https://www.sec.gov/about/laws/ica40.pdf See also: http://www.investopedia.com/study-guide/series-99/chapters-46/chapter-5-investment-companies/introduction-investment-companies/	Parent Class: InvestmentCompany Class Axiom: ¬ ManagementCompany
FinancialInstitution (financial institution, financial intermediary)	Definition: a financial service provider identified as either a government agency or privately owned entity that collects funds from the public and from other institutions, and invests those funds in financial assets, such as loans, securities, bank deposits, and income-generating property Explanatory note: Financial institutions are differentiated by the way they obtain and invest funds. Depository institutions accept public deposits, which are insured by the government against loss, and channel those deposits into lending activities. Non-depository institutions, such as brokerage firms, life insurance companies, pension funds, and investment companies, fund their investment activities directly from financial markets by selling securities to the public or by selling insurance policies, in the case of insurance companies. Adapted from: Barron's Dictionary of Banking Terms, Sixth Edition, 2012	Parent Class: FinancialServiceProvider Property Restriction: ∃ **provides.FinancialService** (fibo-fbc-fct-fse-04) Property Restriction: ∃ **isRegulatedBy.RegulatoryAgency** (fibo-fbc-fct-fse-05)

FinanceCompany (finance company)	Definition: a financial intermediary in the business of making loans to individuals or businesses that obtains its financing from banks, institutions, and other money market sources rather than from deposits Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinancialServiceProvider
InsuranceCompany (insurance company)	Definition: a non-depository institution whose primary and predominant business activity is the writing of insurance or the reinsuring of risks underwritten by insurance companies, and that provides compensation based on the happening of one or more contingencies Explanatory note: In the US, insurance companies are subject to supervision by the insurance commissioner or a similar official or agency of a State; or any receiver or similar official or any liquidating agent for such a company, in his capacity as such. Common forms of insurance include life, property and casualty, and health insurance. In addition to insuring against hazards, many insurance companies also sell investments or investment-like products. The most prevalent investment products offered by insurers are annuities and life insurance policies that also feature investment elements. A number of insurance companies operate brokerage arms that trade securities on behalf of clients. Adapted from: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm Adapted from: https://www.sec.gov/about/laws/ica40.pdf	Parent Class: NonDepositoryInstitution
InvestmentBank (investment bank)	Definition: a financial service provider that performs a variety of services. Investment banks specialize in large and complex financial transactions such as underwriting, acting as an intermediary between a securities issuer and the investing public, facilitating mergers and other corporate reorganizations, and acting as a broker and/or financial adviser for institutional clients. Explanatory note: Major investment banks include Barclays, BofA Merrill Lynch, Warburgs, Goldman Sachs, Deutsche Bank, JP Morgan, Morgan Stanley, Salomon Brothers, UBS, Credit Suisse, Citibank and Lazard. Some investment banks specialize in particular industry sectors. Many investment banks also have retail operations that serve small, individual customers. Adapted from: http://www.investopedia.com/terms/i/investmentbank.asp	Parent Class: FinancialInstitution, Business Parent Class: Bank $\cup$ BrokerageFirm (fibo-fbc-fct-fse-01)
InvestmentCompany (investment company)	Definition: Any issuer which: (a) is or holds itself out as being engaged primarily, or proposes to engage primarily, in the business of investing, reinvesting, or trading in securities; (b) is engaged or proposes to engage in the business of issuing face-amount certificates of the installment type, or has been engaged in such business and has any such certificate outstanding; or (c) is engaged or proposes to engage in the business of investing, reinvesting, owning, holding, or trading in securities, and owns or proposes to acquire investment securities having a value exceeding 40 per centum of the value of such issuer's total assets (exclusive of Government securities and cash items) on an unconsolidated basis. Explanatory note: An investment company is organized as either a corporation or as a trust. Individual investors' money is then pooled together in a single account and used to purchase securities that will have the greatest chance of helping the investment company reach its	Parent Class: NonDepositoryInstitution

	objectives. All investors jointly own the portfolio that is created through these pooled funds, and each investor has an undivided interest in the securities. Explanatory note: In the US, all investment company offerings are subject to the Securities Act of 1933, which requires the investment company to register with the Securities Exchange Commission (SEC) and to give all purchasers a prospectus. Investment companies are also subject to the Investment Company Act of 1940, which sets forth guidelines on how investment companies must operate. Definition origin: Section 3a of the Investment Company Act of 1940 as amended in January, 2012, https://www.sec.gov/about/laws/ica40.pdf See also: http://www.investopedia.com/study-guide/series-99/chapters-46/chapter-5-investment-companies/introduction-investment-companies/	
ManagementCompany (management company)	Definition: Any investment company that sells and manages a portfolio of securities other than a face-amount certificate company or unit investment fund. Explanatory note: Management companies allow investors to pool their capital with that of other investors in order to purchase professionally-managed groups of diversified securities. Definition origin: Section 4, definition of investment companies, Investment Company Act of 1940 as amended and approved as of 3 January 2012, see https://www.sec.gov/about/laws/ica40.pdf	Parent Class: InvestmentCompany Class Axiom: ¬ UnitInvestmentTrust
MonetaryAuthority (monetary authority)	Definition: a regulatory agency that controls the monetary policy, regulation and supply of money in some country or group of countries Example: a central bank, the executive branch of a government, a central bank for several nations, a currency board Adapted from: http://lexicon.ft.com/Term?term=monetary-authority Adapted from: http://www.investordictionary.com/definition/monetary-authority	Parent Class: RegulatoryAgency Property Restriction: ∃ regulatesSupplyOf.Currency (fibo-fbc-fct-fse-07)
NonDepositoryInstituti on (non-depository institution)	Definition: any financial institution that acts as the middleman between two parties in a financial transaction, and that does not provide traditional depository services, such as brokerage firms, insurance companies, investment companies, etc. Adapted from: Barron's Dictionary of Banking Terms, Sixth Edition, 2012	Parent Class: FinancialInstitution, Business
PrincipalUnderwriter (principal underwriter)	Definition: Principal underwriter of or for any investment company other than a closed-end company, or of any security issued by such a company, means any underwriter who as principal purchases from such company, or pursuant to contract has the right (whether absolute or conditional) from time to time to purchase from such company, any such security for distribution, or who as agent for such company sells or has the right to sell any such security to a dealer or to the public or both, but does not include a dealer who purchases from such company through a principal underwriter acting as agent for such company. Principal underwriter of or for a closed-end company or any issuer which is not an investment company, or of any security issued by such a company or issuer, means any underwriter who, in connection with a primary distribution of securities, (a) is in privity of contract with the issuer or an affiliated person of the issuer; (b) acting alone or in concert with one or more other persons, initiates or directs the formation of an underwriting syndicate; or (c) is allowed a rate of gross commission,	Parent Class: Underwriter

	spread, or other profit greater than the rate allowed another underwriter participating in the distribution. Definition origin: Section 3a of the Investment Company Act of 1940 as amended in January, 2012, https://www.sec.gov/about/laws/ica40.pdf	
SalesFinanceCompany (sales finance company, acceptance company)	Definition: a finance company that purchases retail and wholesale paper from automobile and other consumer and commercial goods dealers. Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: FinanceCompany
SavingsAssociation (savings association)	Definition: A savings association is defined as: (a) any Federal savings association, where a Federal savings association means any Federal savings association or Federal savings bank which is chartered under section 1464 of the Federal Deposit Insurance Act; (b) any State savings association, where a State savings association means any building and loan association, savings and loan association, or homestead association; or any cooperative bank (other than a cooperative bank which is a State bank as defined in subsection (a)(2) of the Federal Deposit Insurance Act, which is organized and operating according to the laws of the State (as defined in subsection (a)(3)) in which it is chartered or organized; and (c) any corporation (other than a bank) that the Board of Directors and the Comptroller of the Currency jointly determine to be operating in substantially the same manner as a savings association. Definition origin: https://www.fdic.gov/regulations/laws/rules/1000-400.html#fdic1000sec.3a	Parent Class: DepositoryInstitution
SelfRegulatingOrganization (**self-regulating organization, SRO**)	Definition: a non-governmental organization that has the power to create and exercise some degree of regulatory authority over an industry or profession in some country or group of countries Adapted from: http://www.investopedia.com/terms/s/sro.asp See also: https://en.wikipedia.org/wiki/Self-regulatory_organization	Parent Class: RegulatoryAgency Property Restriction: ∃ hasIdentity.NonGovernmentalOrganization (fibo-fbc-fct-fse-10)
Underwriter (underwriter)	Definition: any person who has purchased from an issuer with a view to, or sells for an issuer in connection with, the distribution of any security, or participates or has a direct or indirect participation in any such undertaking, or participates or has a participation in the direct or indirect underwriting of any such undertaking; but such term shall not include a person whose interest is limited to a commission from an underwriter or dealer not in excess of the usual and customary distributor's or seller's commission Definition origin: Section 3a of the Investment Company Act of 1940 as amended in January, 2012, https://www.sec.gov/about/laws/ica40.pdf	Parent Class: FinancialServiceProvider
UnitInvestmentTrust (unit investment trust, unit investment company)	Definition: an investment company which (a) is organized under a trust indenture, contract of custodianship or agency, or similar instrument, (b) does not have a board of directors, and (c) issues only redeemable securities, each of which represents an undivided interest in a unit of specified securities; but does not include a voting trust Definition origin: Section 4, definition of investment companies, Investment Company Act of 1940 as amended and approved as of 3 January 2012, see https://www.sec.gov/about/laws/ica40.pdf	Parent Class: InvestmentCompany

Properties

Name	Annotations	Property Axioms

hasDateEstablished (has **date established**)	Definition: the date that the financial service provider was established	Parent Property: hasDate Range: Date
hasDateInsured (has **date insured**)	Definition: the date that the financial service provider was first insured for the purposes of protecting client accounts	Parent Property: hasDate Range: Date
regulatesSupplyOf (regulates supply of)	Definition: relates a regulatory agency to something it controls or supervises the availability of in some market by means of rules and regulations Example: The Federal Reserve System, whose banks together comprise the central bank of the United States, supervises banking system and regulates the money supply in the US.	Parent Property: governs Domain: RegulatoryAgency

9.3.3   Ontology: Markets

This ontology defines the fundamental concepts for markets, exchanges, regulated markets, and multilateral trading facilities for use in the development of downstream FIBO domain ontologies that require them.

Table 9.9 - Markets Ontology Metadata

Metadata Term	Value
sm:filename	Markets.rdf
sm:fileAbbreviation	fibo-fbc-fct-mkt
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/Markets/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20150801/FunctionalEntities/Markets/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegistrationAuthorities/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/

Figure 9.20 - Markets Class Hierarchy

Figure 9.20 provides an overview of concepts in the ontology including inheritance hierarchy and disjointness relationships. Subsequent figures highlight various aspects of the markets ontology.
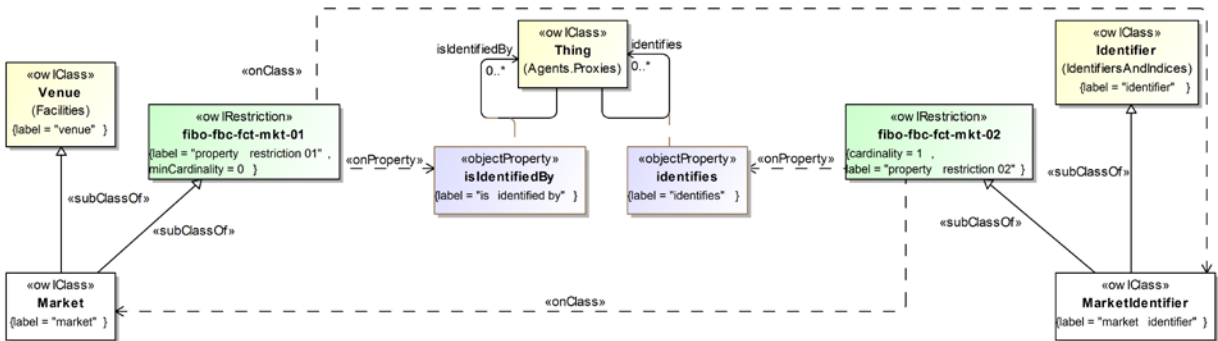
Figure 9.21 - Definition of Market and Market Identifier

Figure 9.21 gives the definition of a market along with that of a market identifier.
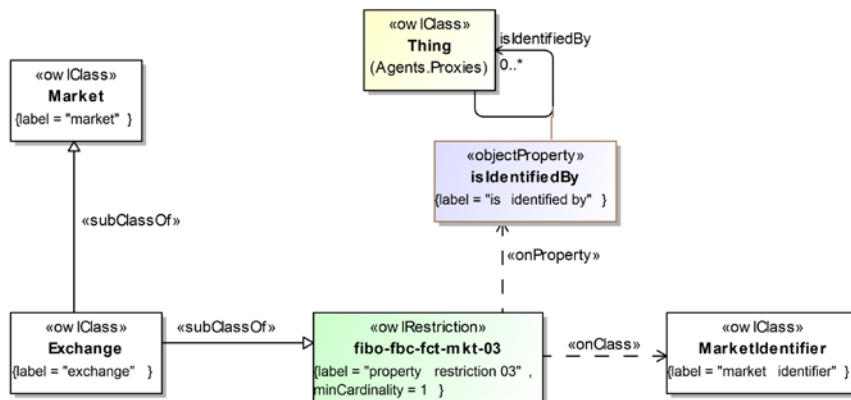
Figure 9.22 - Definition of an Exchange

An exchange is required to have a market identifier, whereas the identifier is optional on the more general definition of a market, as shown in Figure 9.22.
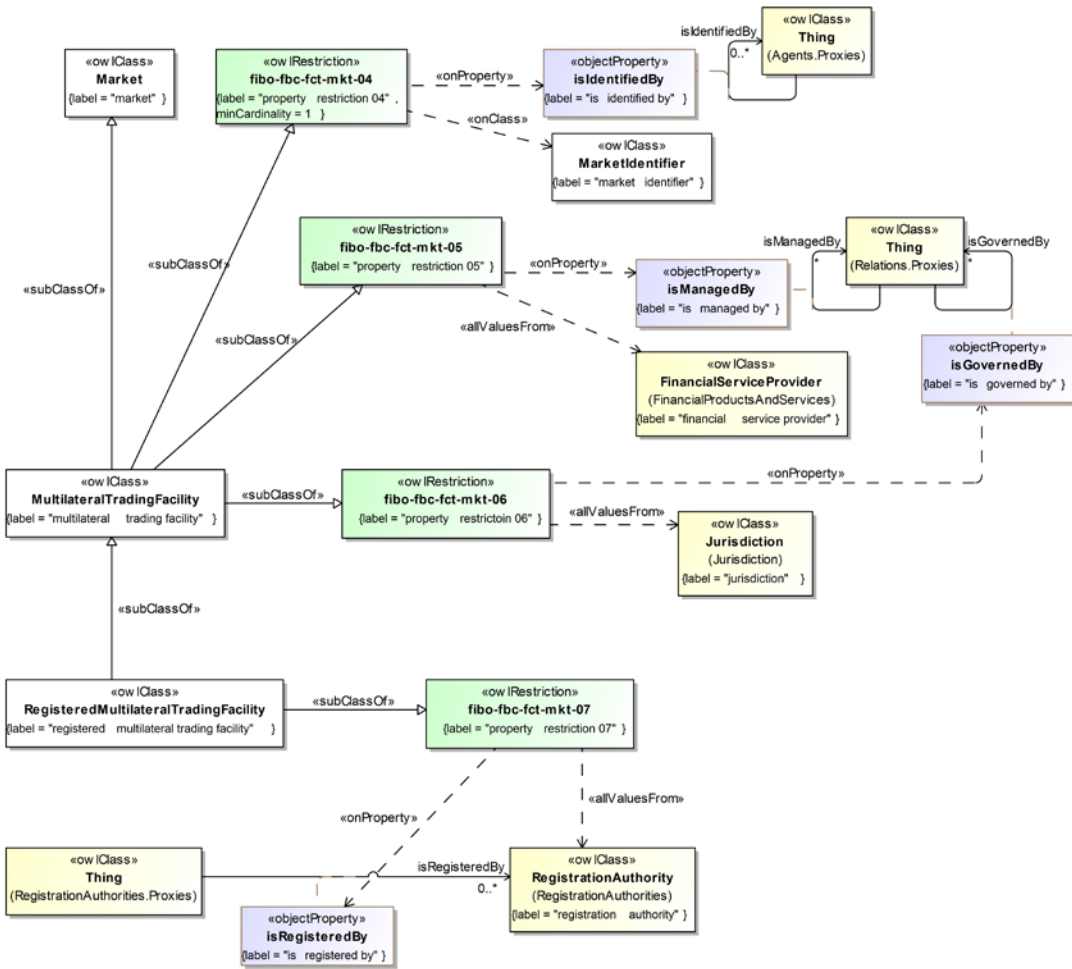
Figure 9.23 - Definition of a Multilateral Trading Facility

A multilateral trading facility has at least one market identifier, is managed by a financial service provider, and is governed by a jurisdiction. A registered multilateral trading facility is also registered with some registration authority, as shown in Figure 9.23.
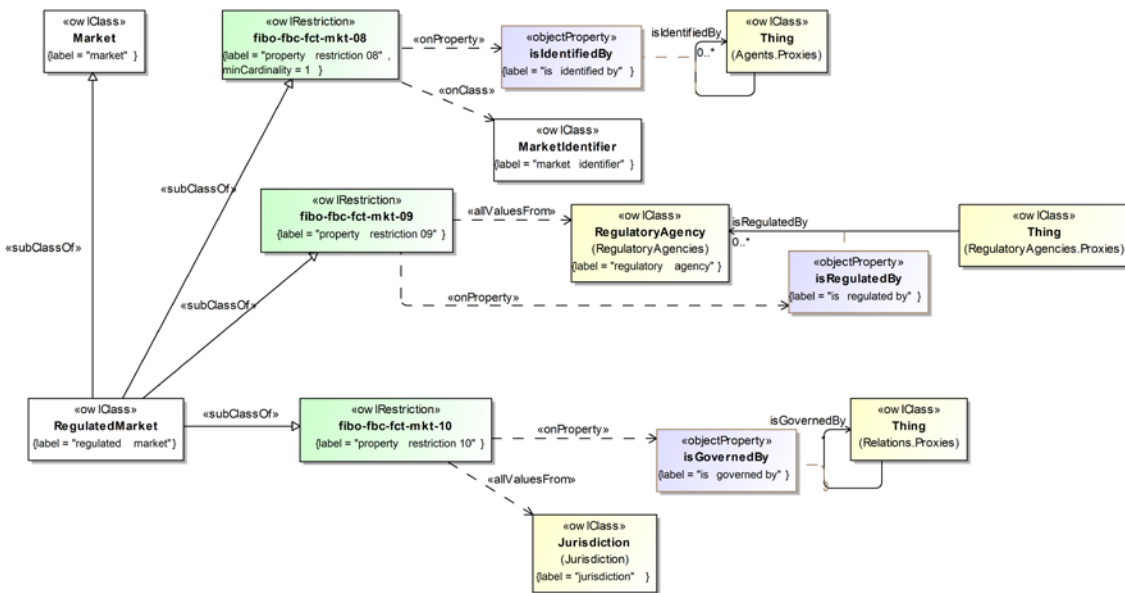
Figure 9.24 - Definition of a Regulated Market

A regulated market has at least one market identifier, is regulated by a regulatory agency, and is governed by a jurisdiction, as shown in Figure 9.24.
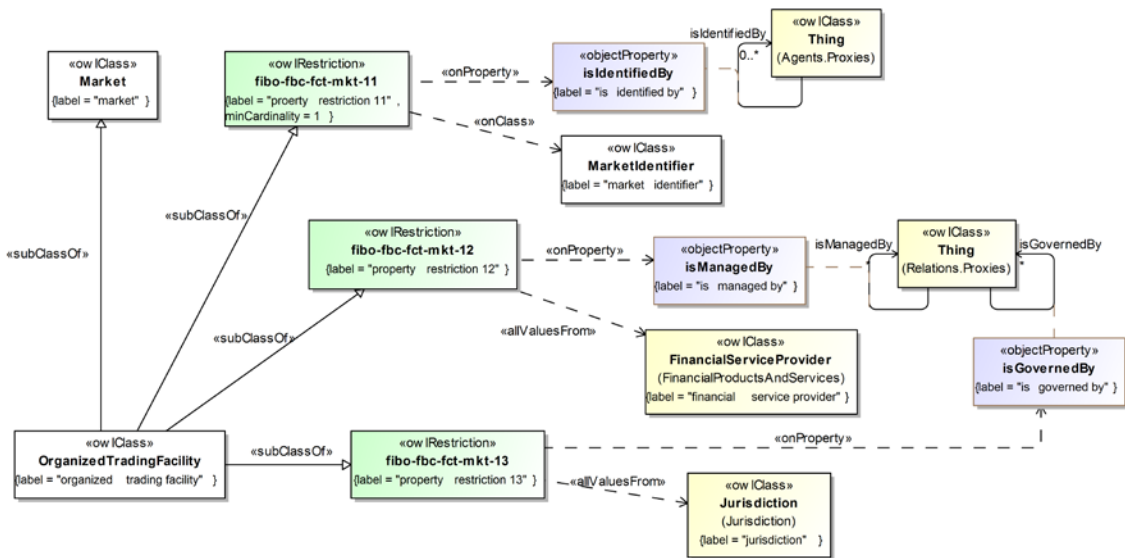
Figure 9.25 - Definition of an Organized Trading Facility

An organized trading facility has at least one market identifier, is managed by a financial service provider, and is governed by a jurisdiction, as shown in Figure 9.25. It is also disjoint with a regulated market and multilateral trading facility.

Table 9.10 provides the detailed definitions and other annotations for the Markets ontology.

Table 9.10 - Markets Ontology Details

Classes

Name	Annotations	Class Expressions
Exchange (exchange)	Definition: any organization, association, or group of persons, whether incorporated or unincorporated, which constitutes, maintains, or	Parent Class: Market

	provides a market place or facilities for bringing together purchasers and sellers of securities or for otherwise performing with respect to securities the functions commonly performed by a stock exchange as that term is generally understood, and includes the market place and the market facilities maintained by such exchange Definition origin: Securities Exchange Act of 1934, as amended 12 August 2012	Property Restriction: ≥ 1 **isIdentifiedBy.MarketIdentifier** (fibo-fbc-fct-mkt-03)
Market (market)	Definition: a market is a venue that allows buyers and sellers of goods, commodities, services, etc. to conduct business, including markets where securities may be traded	Parent Class: Venue Property Restriction: ≥ 0 **isIdentifiedBy.MarketIdentifier** (fibo-fbc-fct-mkt-01)
MarketIdentifier (market identifier, MIC)	Definition: identifier or code allocated to places of trade, *i.e.*, stock exchanges, regulated markets, *e.g.*, Electronic Trading Platforms (ECN), and unregulated markets, *e.g.*, Automated Trading Systems (ATS) Definition origin: ISO 10383, Securities and related financial instruments - Codes for exchanges and market identification (MIC), Third edition, 2012-10-01.	Parent Class: Identifier Property Restriction: = 1 **identifies.Market** (fibo-fbc-fct-mkt-02)
MultilateralTradingFacility (multilateral trading facility, MTF)	Definition: a trading system that facilitates the exchange of financial instruments between multiple parties Explanatory note: Multilateral trading facilities allow eligible contract participants to gather and transfer a variety of securities, especially instruments that may not have an official market. These facilities are often electronic systems controlled by approved market operators or larger investment banks. Traders will usually submit orders electronically, where a matching software engine is used to pair buyers with sellers. Adapted from: http://www.investopedia.com/terms/m/multilateral_trading_facility.asp	Parent Class: Market Property Restriction: ≥ 1 **isIdentifiedBy.MarketIdentifier** (fibo-fbc-fct-mkt-04) Property Restriction: ∀ **isManagedBy.FinancialServiceProvider** (fibo-fbc-fct-mkt-05) Property Restriction: ∀ **isGovernedBy.Jurisdiction** (fibo-fbc-fct-mkt-06)
OrganizedTradingFacility (organized trading facility, OTF)	Definition: a multilateral system which is not an RM or an MTF and in which multiple third-party buying and selling interests in bonds, structured finance products, emission allowances or derivatives are able to interact in the system in a way that results in a contract in accordance with the provisions of Title II of MiFID Explanatory note: Unlike RMs and MTFs, operators of OTFs will have discretion as to how to execute orders, subject to pre-transparency and best execution obligations. Explanatory note: OTFs were introduced by the European Commission as part of MiFID II and are focused on non-equities such as derivatives and cash bond markets. OTFs are intended to be similar in scope to a swap execution facility (SEF), a type of entity created by the Dodd-Frank Act in the U.S. The goal of SEFs and OTFs is to bring transparency and structure to OTC derivatives trading. Adapted from: http://www.marketswiki.com/mwiki/Organized_Trading_Facility	Parent Class: Market Property Restriction: ≥ 1 **isIdentifiedBy.MarketIdentifier** (fibo-fbc-fct-mkt-11) Property Restriction: ∀ **isManagedBy.FinancialServiceProvider** (fibo-fbc-fct-mkt-12) Property Restriction: ∀ **isGovernedBy.Jurisdiction** (fibo-fbc-fct-mkt-13)
RegisteredMultilateralTradingFacility (registered multilateral trading facility)	Definition: a multilateral system operated by an investment firm or market operator, which brings together multiple third-party buying and selling interests in financial instruments in the system, in accordance with non-discretionary rules, in a way that results in a contract in accordance with the provisions of Title II of the MiFID II Adapted from: FpML	Parent Class: MultilateralTradingFacility Property Restriction: ∀ **isRegisteredBy.RegistrationAuthority** (fibo-fbc-fct-mkt-07)

RegulatedMarket (regulated market, RM)	Definition: a medium for the exchange of goods or services over which a government body exerts a level of control. This control may require market participants to comply with environmental standards, product-safety specifications, information disclosure requirements and so on. Explanatory note: In the financial community in the EU, a regulated market is more specifically defined as a multilateral system operated by and/or managed by a market operator, which brings together or facilitates the bringing together of multiple third-party buying and selling interests in financial instruments - in the system and in accordance with its non-discretionary rules - in a way that results in a contract, in respect of the financial instruments admitted to trading under its rules and/or systems, and which is authorised and functions regularly and in accordance with the provisions of Title III of MiFID II. Adapted from: http://www.investopedia.com/terms/r/regulated-market.asp	Parent Class: Market Property Restriction: ≥ 1 **isIdentifiedBy.MarketIdentifier** (fibo-fbc-fct-mkt-08) Property Restriction: ∀ **isRegulatedBy. RegulatoryAgency** (fibo-fbc-fct-mkt-09) Property Restriction: ∀ **isGovernedBy.Jurisdiction** (fibo-fbc-fct-mkt-10)

9.3.4 Ontology: Registration Authorities

This ontology defines concepts for representation of registration authorities, registrars, registration-specific identifiers and related identification schemes, and registration authorities specific to ISO and the financial industry. Examples of financial industry registration authorities in the US include the Federal Deposit Insurance Corporation (FDIC) and the Securities Exchange Commission (SEC).

Table 9.11 - Registration Authorities Ontology Metadata

Metadata Term	Value
sm:filename	RegistrationAuthorities.rdf
sm:fileAbbreviation	fibo-fbc-fct-ra
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegistrationAuthorities/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20150801/FunctionalEntities/RegistrationAuthorities/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/
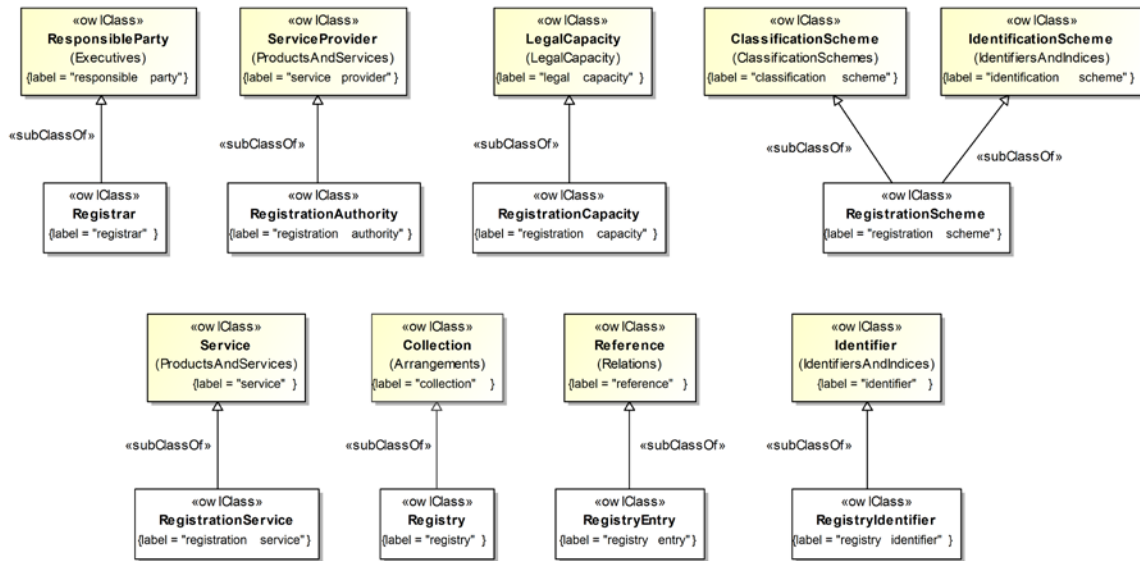
Figure 9.26 - Registration Authorities Class Hierarchy

Figure 9.26 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy Subsequent figures highlight various aspects of the registration authorities ontology. Example international registries include the ISO registry for currency codes. Regional authorities relevant to FIBO include ESMA for European Union MiFID databases of multi-lateral trading facilities and central counterparties as well as legal entity identifier (LEI) registries, and national registries include the National Information Center for financial institutions regulated by the Federal Reserve in the United States, among others.
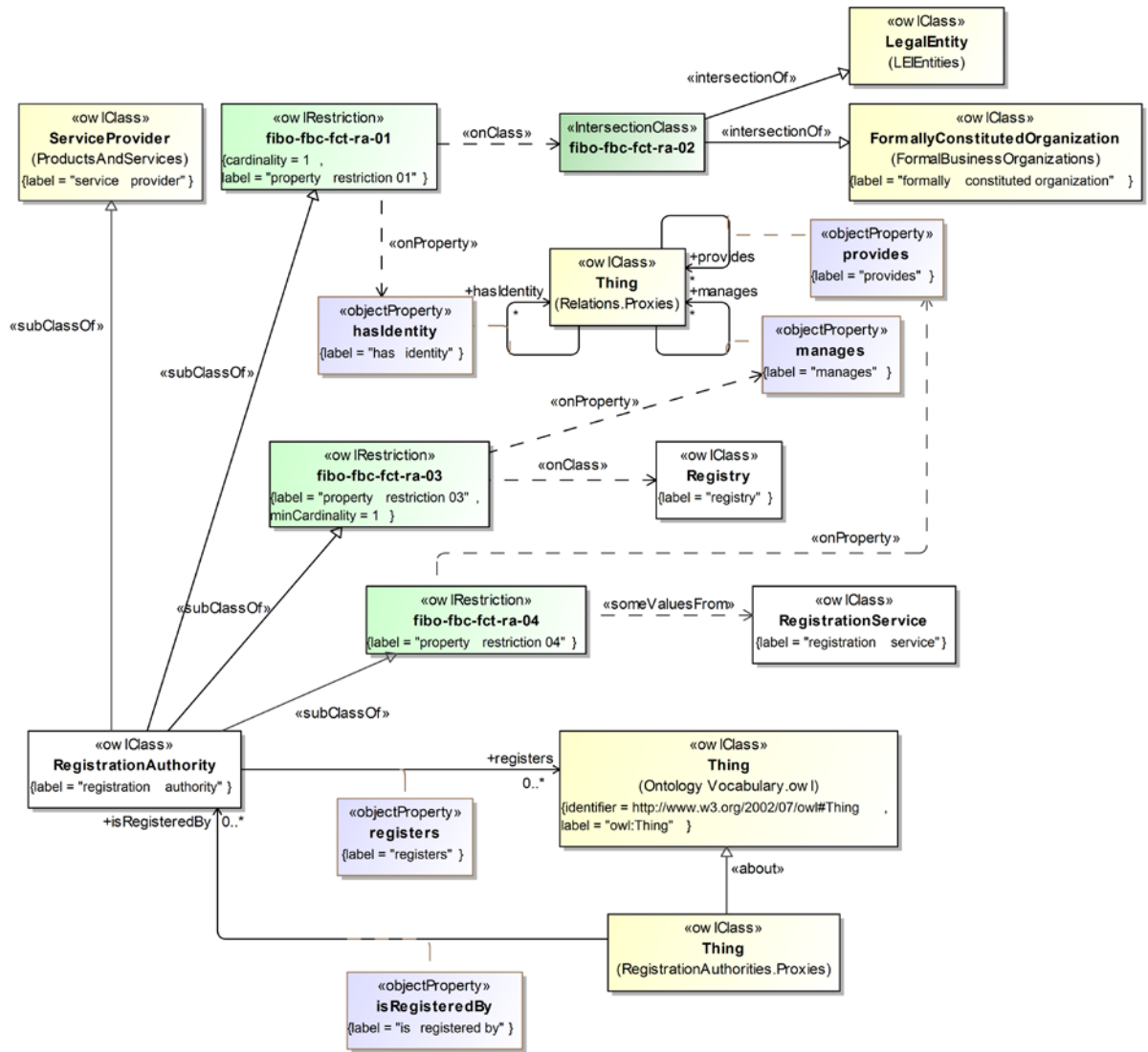
Figure 9.27 - Definition of Registration Authority

Registration authorities provide registration services and manage registries as shown in Figure 9.27.

Figure 9.28 - Definition of Registration Service

Registration services are provided by registration authorities. A registration scheme provides the classification and organizational scheme for a registry, and defines the identification scheme for the relevant identifiers registered, as shown in Figure 9.28.
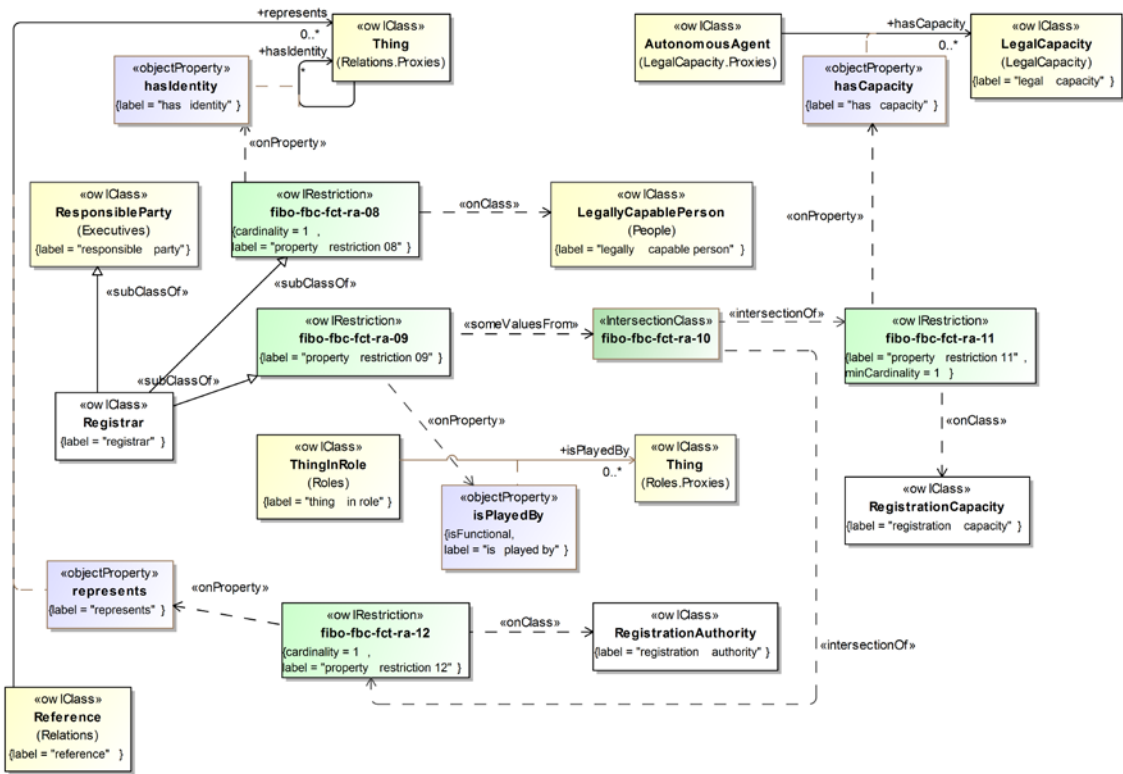
Figure 9.29 - Definition of Registrar

A registrar is a person who represents the registration authority and has the capacity to provide registration services on behalf of the registration authority, as shown in Figure 9.29.
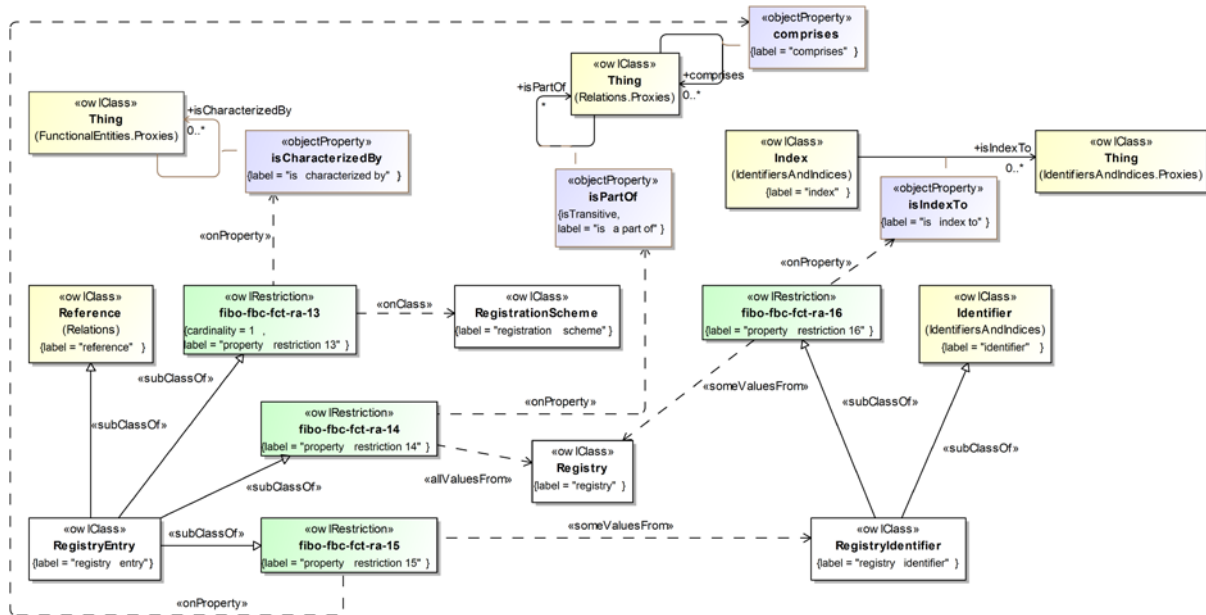
Figure 9.30 - Definition of Registry Entry

Figure 9.30 provides the definition of an entry in a given registry, which includes the registry identifier.
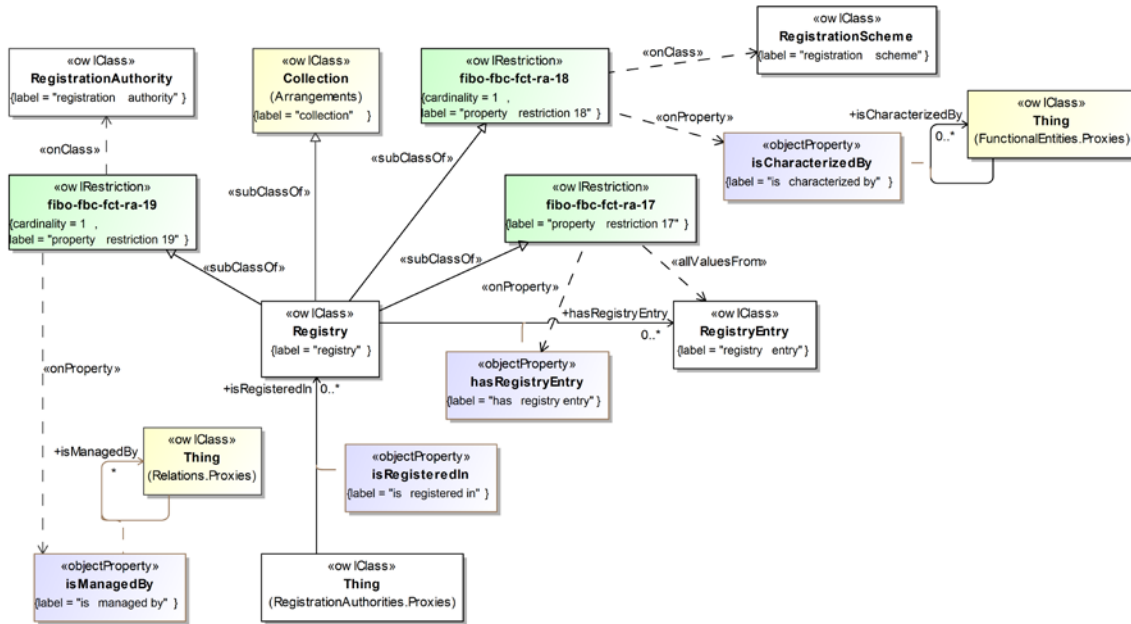
Figure 9.31 - Definition of Registry

Figure 9.31 provides the definition of the registry itself, which consists of registry entries. Table 9.12, below, provides the definitions and other annotations for the Registration Authorities ontology.

Table 9.12 - Registration Authorities Ontology Details

Classes

Name	Annotations	Class Expressions
Registrar (registrar)	Definition: a party that has the capacity to act as a representative of a registration authority to provide registration services, including official record keeping Adapted from: Barron's Dictionary of Business and Economic Terms, Fifth Edition, 2012	Parent Class: ResponsibleParty Property Restriction: = 1 **hasIdentity.LegallyCapablePerson** (fibo-fbc-fct-ra-08) Property Restriction: ∃ **isPlayedBy** ((≥ 1 **hasCapacity.RegistrationCapacity**) ∩ (= 1 **represents.RegistrationAuthority**)) (fibo-fbc-fct-ra-09, fibo-fbc-fct-ra -10, fibo-fbc-fct-ra-11, fibo-fbc-fct-ra-12)
RegistrationAuthority (registration authority, RA)	Definition: a formally constituted organization and legal entity that is responsible for maintaining a registry and provides registration services Adapted from: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	Parent Class: ServiceProvider Property Restriction: = 1 **hasIdentity** (**FormallyConstitutedOrganization** ∩ **LegalEntity**) (fibo-fbc-fct-ra-01, fibo-fbc-fct-ra-02) Property Restriction: ≥ 1 **manages.Registry** (fibo-fbc-fct-ra-03)

		Property Restriction: ∃ **provides**.**RegistrationService** (fibo-fbc-fct-ra-04)
RegistrationCapacity (registration capacity)	Definition: the capacity of some natural person to formally register information in a registry on behalf of some registration authority	Parent Class: LegalCapacity
RegistrationScheme (registration scheme)	Definition: a scheme for organizing information and allocating identifiers to items in a registry Adapted from: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	Parent Class: ClassificationScheme Parent Class: IdentificationScheme Property Restriction: ∃ **characterizes**.**Registry** (fibo-fbc-fct-ra-06) Property Restriction: ∃ **defines**.**RegistryIdentifier** (fibo-fbc-fct-ra-07)
RegistrationService (registration service)	Definition: a service provided to individuals and/or organizations to register items in a registry	Parent Class: Service Property Restriction: ≥ 1 **isProvidedBy**.**RegistrationAuthority** (fibo-fbc-fct-ra-05)
Registry (registry)	Definition: a system, typically an information system, that records the registration of items Adapted from: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	Parent Class: Collection Property Restriction: ∀ **hasRegistryEntry**.**RegistryEntry** (fibo-fbc-fct-ra-17) Property Restriction: = 1 **isCharacterizedBy**.**RegistrationScheme** (fibo-fbc-fct-ra-18) Property Restriction: = 1 **isManagedBy**.**RegistrationAuthority** (fibo-fbc-fct-ra-19)
RegistryEntry (registry entry)	Definition: an entry in a registry that specifies something about the thing that is registered Adapted from: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	Parent Class: Reference Property Restriction: = 1 **isCharacterizedBy**.**RegistrationScheme** (fibo-fbc-fct-ra-13) Property Restriction: ∀ **isPartOf**.**Registry** (fibo-fbc-fct-ra-14) Property Restriction: ∃ **comprises**.**RegistryIdentifier** (fibo-fbc-fct-ra-15)
RegistryIdentifier (registry identifier)	Definition: an identifier associated with an entry in a registry, i.e., one that provides an index to the registry for the identified item Adapted from: ISO/IEC 11179-3 Information technology - Metadata registries (MDR) - Part 3: Registry metamodel and basic attributes, Third edition, 2013-02-15	Parent Class: Identifier Property Restriction: ∃ **isIndexTo**.**Registry** (fibo-fbc- fct-ra-16)

Properties

Name	Annotations	Property Axioms
hasRegistrationDate (has registration date)	<u>Definition</u>:	<u>Parent Property</u>: hasDate <u>Range</u>: Date
hasRegistryEntry (has registry entry)	<u>Definition</u>:	<u>Parent Property</u>: hasPart <u>Domain</u>: Registry <u>Range</u>: RegistryEntry
isRegisteredBy (is registered by)	<u>Definition</u>: indicates the registration authority that registers something	<u>Range</u>: RegistrationAuthority
isRegisteredIn (is registered in)	<u>Definition</u>: indicates the registry that something is registered in	<u>Range</u>: Registry
registers (registers)	<u>Definition</u>: links a registration authority to something it registers	<u>Domain</u>: RegistrationAuthority
specifies (specifies)	<u>Definition</u>: states a fact about something	

9.3.5 Ontology: Regulatory Agencies

This ontology defines general purpose concepts for representation of regulatory agencies, also known as regulatory authorities or regulators. Examples of financial industry regulatory agencies in the US include the Securities Exchange Commission, FINRA, and the FDIC, among others. The SEC and FINRA are both registration authorities and regulatory agencies. The FDIC is a regulatory agency and an insurer, and may be a registration authority for certain state-chartered banks in the US without bank holding companies.

Table 9.13 - Regulatory Agencies Ontology Metadata

Metadata Term	Value
sm:filename	RegulatoryAgencies.rdf
sm:fileAbbreviation	fibo-fbc-fct-rga
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20150801/FunctionalEntities/RegulatoryAgencies/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

Figure 9.32 - Regulatory Agencies Class Hierarchy

Figure 9.32 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy Subsequent figures highlight various aspects of the regulatory agencies ontology. Example regulatory agencies include the European Central Bank (ECB) in the EU, and the Office of the Comptroller of the Currency (OCC), which is part of the U.S. Department of the Treasury in the United States. Example government-issued licenses include bank charters issued by the OCC and various US state banking oversight agencies.
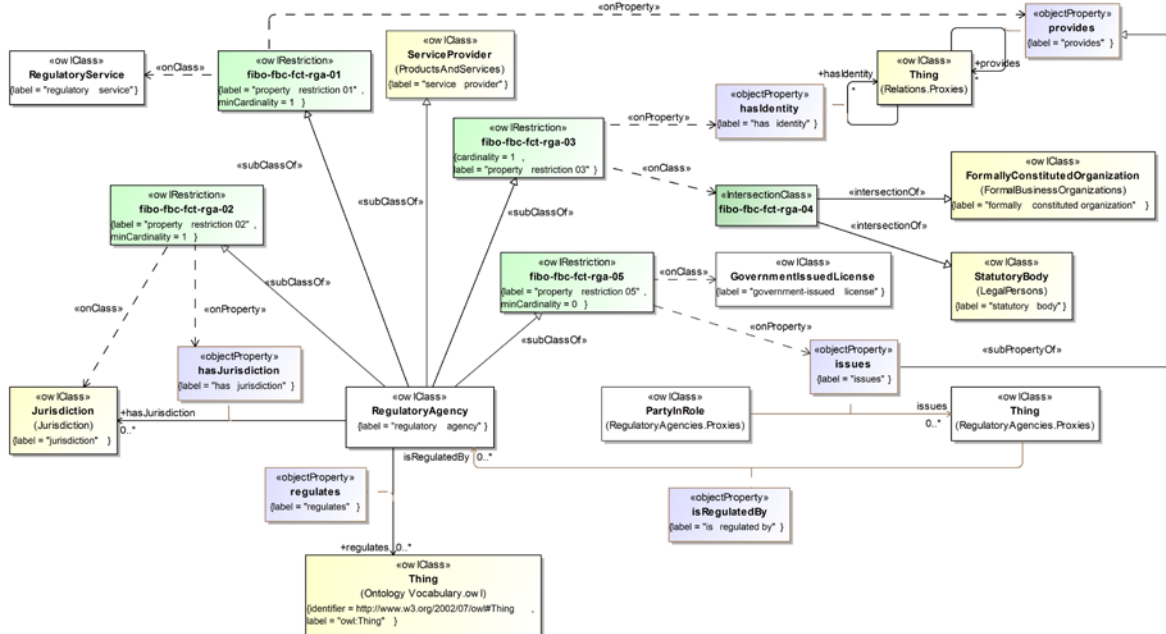
Figure 9.33 - Definition of Regulatory Agency

Figure 9.33 defines a regulatory agency as having the identity of both a formal business organization and a statutory body. It provides at least one regulatory service, has at least one jurisdiction, and may issue government-issued licenses.

Figure 9.34 - Definition of Regulatory Service

A regulatory service is a service that is provided by at least on regulatory agency, as shown in Figure 9.34.

Figure 9.35 - Definition of Examiner

An examiner is a responsible party whose identity is that of a legally capable person, that is played by an individual who represents a regulatory agency and has regulatory capacity, as shown in Figure 9.35.

Figure 9.36 - Definition of Regulation

Figure 9.36 provides the specification for a regulation, which is defined in law, issued by a regulatory agency, identified by an identifier, and that governs 'something'. Examples in financial services include the various banking regulations in the U.S., such as Regulation E, issued by the Federal Reserve, which governs Electronic Funds Transfers (EFT) and provides consumer protection related to EFTs.

Figure 9.37 - Licensing Definitions

Figure 9.37 provides the definitions related to licensing, including those for government-issued licenses. Examples of government-issued licenses include bank charters, among others. Table 9.14, below, provides the definitions and other annotations for the Regulatory Agencies ontology.

Table 9.14 - Regulatory Agencies Ontology Details

Classes

Name	Annotations	Class Expressions
Examiner (examiner)	Definition: a party appointed by, and who has the capacity to act as an official representative of, a regulatory agency to provide examination, review, and other regulatory services Adapted from: Black's Law Dictionary, see http://thelawdictionary.org/examiner	Parent Class: ResponsibleParty Property Restriction: = 1 **hasIdentity**.**LegallyCapablePerson** (fibo-fbc-fct-rga-07) Property Restriction: ∃ **isPlayedBy** ((≥ 1 **hasCapacity**.**RegulatoryCapacity**) ∩ (= 1 **represents**.**RegulatoryAgency**)) (fibo-fbc-fct-rga-08, fibo-fbc-fct-rga -09, fibo-fbc-fct-rga-10, fibo-fbc-fct-rga-11)
GovernmentIssuedLicense (government-issued license)	Definition: grant of permission needed to legally perform some task, provide some service, exercise a certain privilege, or pursue some business or occupation Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: License Parent Class: LegalDocument Property Restriction: ∃ **isIssuedBy**.**RegulatoryAgency** (fibo-fbc-fct-rga-17) Property Restriction: = 1 **isIdentifiedBy**.**LicenseIdentifier** (fibo-fbc-fct-rga-18)
Regulation (regulation)	Definition: a rule used to carry out a law Explanatory note: Many government agencices issue regulations to administer laws. Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: LegalConstruct Property Restriction: ≥ 1 **hasDefinition**.**Law** (fibo-fbc-fct-rga-12) Property Restriction: = 1 **isIdentifiedBy**.**RegulationIdentifier** (fibo-fbc-fct-rga-13) Property Restriction: = 1 **isIssuedBy**.**RegulatoryAgency** (fibo-fbc-fct-rga-14) Property Restriction: ≥ 1 **governs** (fibo-fbc-fct-rga-15)
RegulationIdentifier (regulation identifier)	Definition: an identifier associated with a regulation	Parent Class: Identifier Property Restriction: = 1 **identifies**.**Regulation** (fibo-fbc-fct-rga-16)
RegulatoryAgency (regulatory agency, regulatory authority, regulatory body, regulator)	Definition: a public authority or government agency responsible for exercising autonomous authority over some area of human activity in a regulatory or supervisory capacity Explanatory note: Typically, a regulatory agency is chartered to protect some constituency, (e.g., investors in the financial industry), to ensure the fairness and integrity of some market (e.g., the securities market), and fair and safe business practices among the service providers in that market. Example: See http://www.finra.org/AboutFINRA/ for an example describing a regulatory agency.	Parent Class: ServiceProvider Property Restriction: ≥ 1 **provides**.**RegulatoryService** (fibo-fbc-fct-rga-01) Property Restriction: ≥ 1 **hasJurisdiction**.**Jurisdiction** (fibo-fbc-fct-rga-02) Property Restriction: = 1 **hasIdentity**

		(**FormallyConstitutedOrganiza tion** ∩ **StatutoryBody**) (fibo-fbc-fct-rga-03, fibo-fbc-fct-rga-04) Property Restriction: ≥ 0 **issues.GovernmentIssuedLicen se** (fibo-fbc-fct-rga-05)
	Adapted from: http://www.thefreedictionary.com/regulatory+agency Adapted from: http://en.wikipedia.org/wiki/Regulatory_agency	
RegulatoryCapacity (regulatory capacity)	Definition: the capacity of some natural person to regulate some industry, organization, or product by virtue of some certification program on behalf of some regulatory agency	Parent Class: LegalCapacity
RegulatoryService (regulatory service)	Definition: a service provided by a regulatory agency, which may include, but not be limited to, examination, monitoring, supervision, testing, or other capabilities required to ensure the integrity, fairness, safety, or other capacity of a given industry, organization, or product	Parent Class: Service Property Restriction: ≥ 1 **isProvidedBy.RegulatoryAgen cy** (fibo-fbc-fct-rga-06)

Properties

Name	Annotations	Property Axioms
hasJurisdiction (has jurisdiction)	Definition: indicates the jurisdiction in which the regulatory agency has authority	Parent Property: has Domain: RegulatoryAgency Range: Jurisdiction
issues (issues)	Definition: officially makes something available or gives something to people to be used Adapted from: http://www.merriam-webster.com/dictionary/issue	Parent Property: provides Domain: PartyInRole
isIssuedBy (is issued by)	Definition: indicates the party that issues something	Parent Property: isProvidedBy Range: PartyInRole Inverse: issues
isRegulatedBy (is regulated by)	Definition: indicates the party that has issued a particular license to some other party	Parent Property: isGovernedBy Range: RegulatoryAgency
regulates (regulates)	Definition: governs or directs according to rule or law, typically an industry, organization, or product Adapted from: http://www.merriam-webster.com/dictionary/regulate	Parent Property: governs Domain: RegulatoryAgency

9.4. Module: Products and Services

Table 9.15 - Products and Services Module Metadata

Metadata Term	Value
sm:moduleName	Products and Services
sm:moduleAbbreviation	FIBO-FBC-PAS
sm:moduleVersion	1.0
sm:moduleAbstract	This module extends the Products and Services module in the Foundations (FND) specification, and includes ontologies describing financial products, financial services, financial service providers, product catalogs, and the like, as well as customer/client accounts.

9.4.1 Ontology: Financial Products and Services

This ontology defines concepts that extend the Foundations (FND) Products and Services concepts specifically for the financial industry, including financial product, financial service, and financial service provider.

Table 9.16 - Financial Products and Services Ontology Metadata

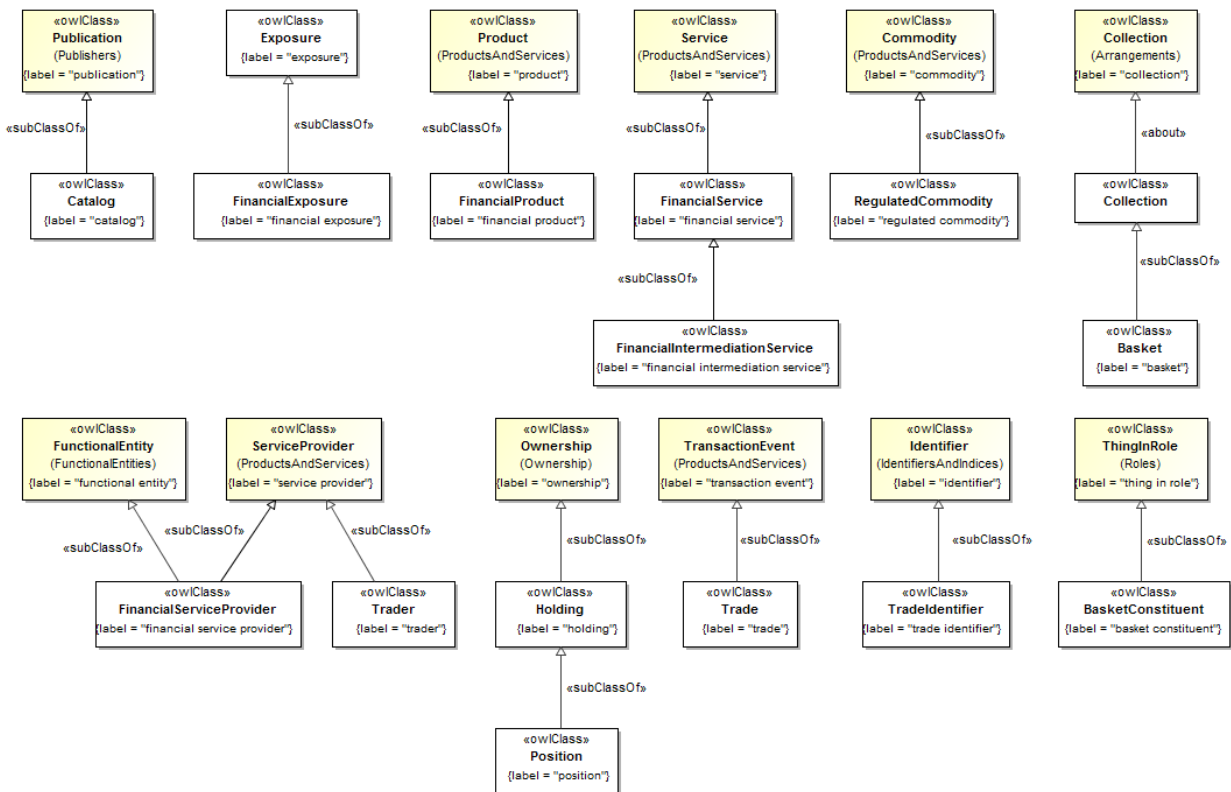| Metadata Term	Value
sm:filename	FinancialProductsAndServices.rdf
sm:fileAbbreviation	fibo-fbc-pas-fpas
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/ProductsAndServices/FinancialProductsAndServices/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/

Figure 9.38 - Financial Products and Services Class Hierarchy

Figure 9.38 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy Subsequent figures highlight various aspects of the financial products and services ontology.

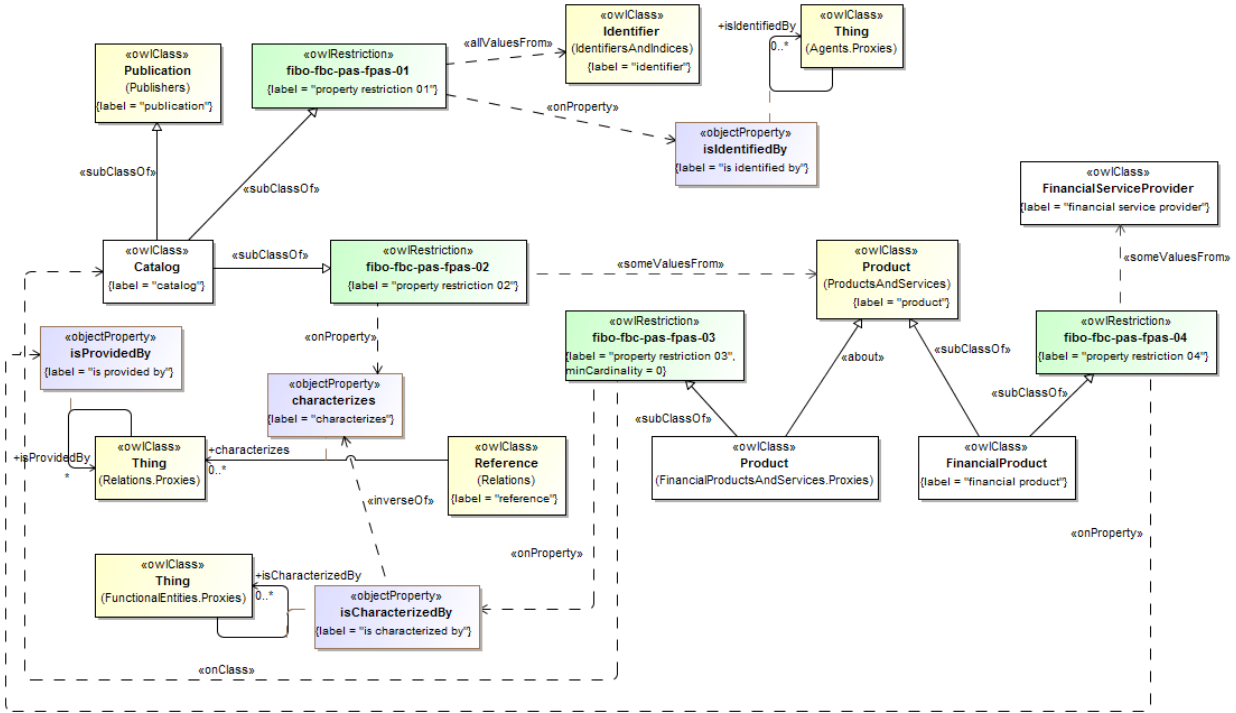Financial Industry Business Ontology – Financial Business and Commerce

Figure 9.39 - Financial Products and Catalogs

Figure 9.39 shows the definition of a catalog, an extension to the definition of product, and the definition of a financial product.
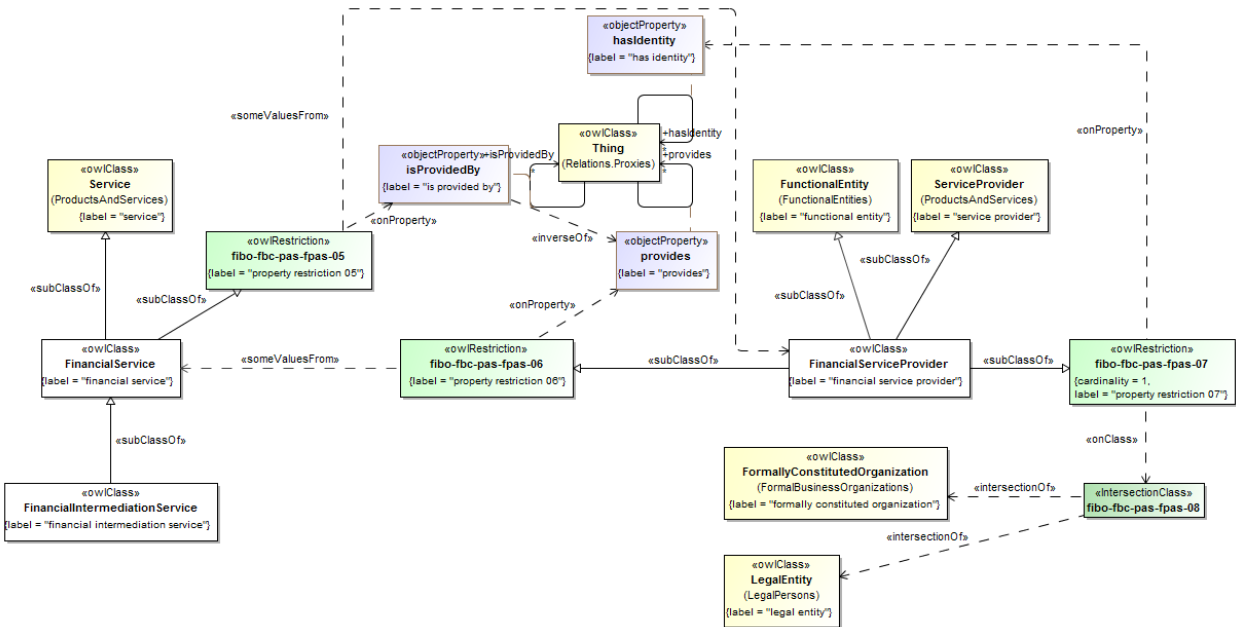
Figure 9.40 - Financial Services and Service Providers

Figure 9.40 shows the definitions for financial services and service providers.
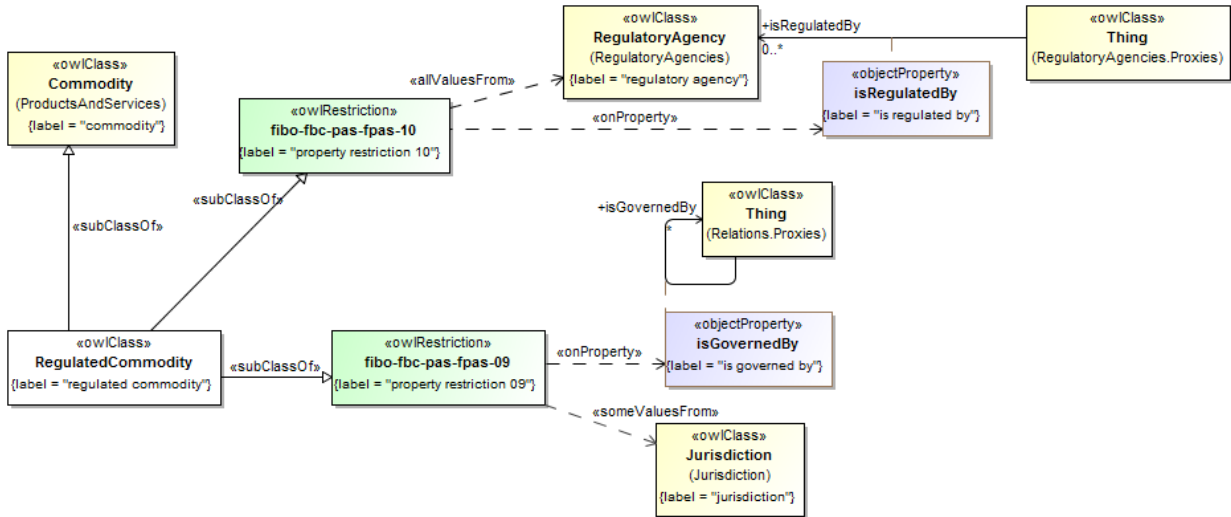
Figure 9.41 - Definition of Regulated Commodity

Figure 9.41 shows how the definition of a basic commodity is extended to represent regulated commodities.
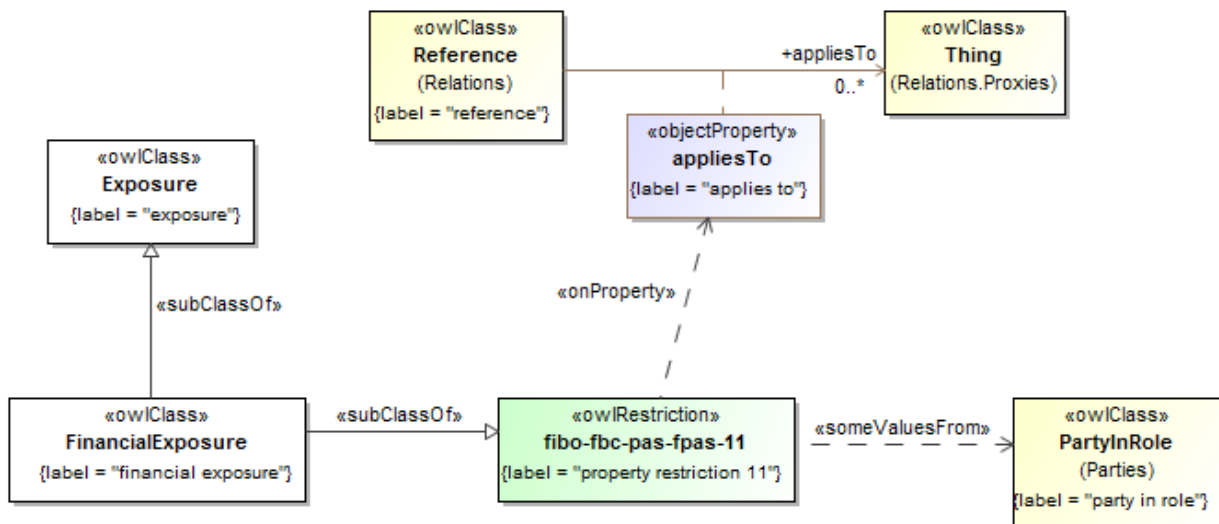
Figure 9.42 Definition of Exposure

Figure 9.42 defines exposure as the extent to which an individual or organization is unprotected and open to damage, danger, risk of suffering a loss, or uncertainty, which could be anything, such as financial exposure, credit exposure, reputational exposure, legal exposure, and so forth, and financial exposure as being specific to some investment with respect to some party.

Figure 9.43 Definition of Holding

Figure 9.43 depicts a holding as an ownership stake in some asset or set of assets, and a position as a holding in a specific asset.

Figure 9.44 Definition of Trade

Figure 9.44 defines a trade as transaction that is embodied in some contract, possibly identified by a trade identifier, possibly facilitated by a trader, and involving a contract, good, or service.

Figure 9.45 - Definition of a Basket

Figure 9.45 defines a basket as a collection that has at least one constituent, and a basket constituent as something playing the role of a constituent of a basket.

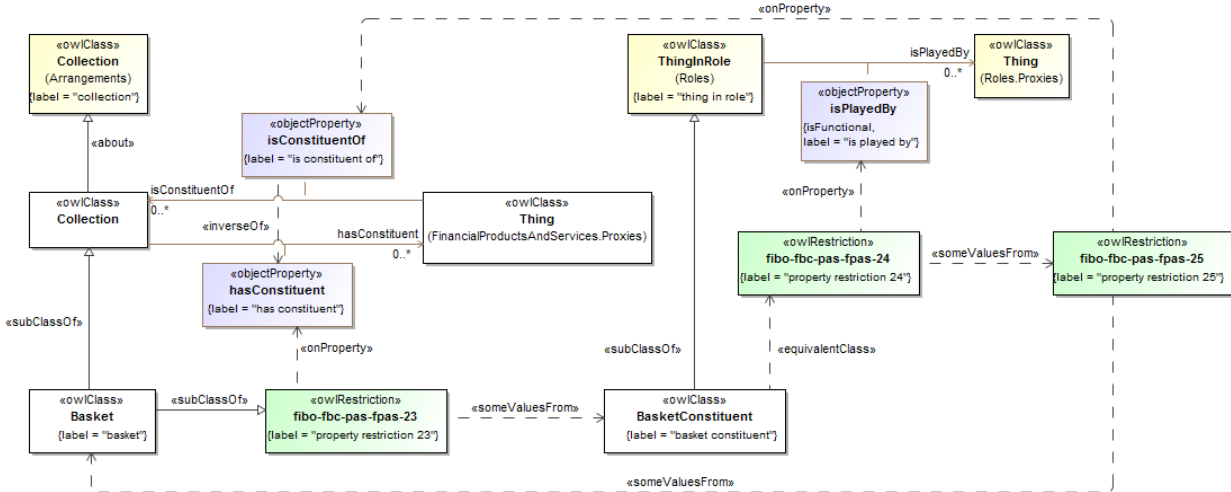The details for the concepts defined in the financial products and services ontology are given in Table 9.17, below.

Table 9.17 - Financial Products and Services Ontology Details

Classes

Name	Annotations	Class Expressions
Basket (basket)	Definition: a collection of goods, services, or other things (e.g., financial contracts) that can be purchased and sold in some marketplace Explanatory note: From a securities perspective, a basket is a collection of products or securities that are designated to mimic the performance of a market. For investors, the market basket is the principal idea behind index funds, which are essentially a broad sample of stocks, bonds or other securities in the market; this provides investors with a benchmark against which to compare their investment returns. Explanatory note: A basket may be associated with a specific market sector, and may be delineated for the purposes of statistical analysis, such as for calculating CPI. According to the US Bureau of Labor Statistics (BLS), with respect to the CPI, a market basket is a package of goods and services that consumers purchase for day-to-day living. The weight of each item is based on the amount of expenditure reported by a sample of households. Adapted from: http://www.investopedia.com/terms/m/market_basket.asp Adapted from: http://www.merriam-webster.com/dictionary/market%20basket	Parent Class: Collection Property Restriction: ∃ hasConstituent.BasketConstituent (fibo-fbc-pas-fpas-23)
BasketConstituent (basket constituent)	Definition: a component of a basket	Parent Class: ThingInRole Property Restriction: ∃ isPlayedBy (∃ isConstituentOf.Basket) (fibo-fbc-pas-fpas-24, fibo-fbc-pas-

		fpas-25)
Catalog (catalog)	Definition: a list of goods and/or services available for sale with their description and possibly prices, published as a printed or electronic document (e-catalog) Adapted from: http://www.businessdictionary.com/definition/catalog.html	Parent Class: Publication Property Restriction: ∀ **isIdentifiedBy**.**Identifier** (fibo-fbc-pas-fpas-01) Property Restriction: ∃ **characterizes**.**Product** (fibo-fbc-pas-fpas-02)
Exposure (exposure)	Definition: the extent to which an individual or organization is unprotected and open to damage, danger, risk of suffering a loss, or uncertainty Example: Examples include financial exposure, credit exposure, legal exposure, credit rating exposure, reputational exposure, and so forth. Adapted from: http://www.businessdictionary.com/definition/exposure.html	
FinancialExposure **(financial exposure)**	Definition: the extent to which an individual or organization is open to risk of suffering a loss in a transaction, or with respect to some investment or set of investments, e.g., some holding; the amount one stands to lose in that transaction or investment Example: Examples in banking include the total amount of unsecured loans, the amount of loans advanced to a single borrower, group, industry, or country, and the probability of loss from devaluation, revaluation, or foreign exchange fluctuations. Adapted from: http://www.businessdictionary.com/definition/exposure.html Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Exposure Property Restriction: ∃ appliesTo.PartyInRole (fibo-fbc-pas-fpas-11)
FinancialIntermediatio nService financial intermediation service)	Definition: any financial service in which a third party (the intermediary) matches lenders and investors with entrepreneurs and other borrowers in need of capital Explanatory note: Often investors and borrowers do not have precisely matching needs, and the intermediary's capital is put at risk to transform the credit risk and maturity of the liabilities to meet the needs of investors. Adapted from: Office of Financial Research (OFR) Annual Report, 2012, Glossary	Parent Class: FinancialService
FinancialProduct (financial product)	Definition: a product provided to consumers and businesses by financial institutions such as banks, insurance companies, brokerage firms, consumer finance companies, and investment companies all of which comprise the financial services industry Adapted from: http://www.investorwords.com/19080/financial_services.html	Parent Class: Product Property Restriction: ∃ **isProvidedBy**.**FinancialService Provider** (fibo-fbc-pas-fpas-04)
FinancialService (financial service)	Definition: a service provided to consumers and businesses by financial institutions such as banks, insurance companies, brokerage firms, consumer finance companies, and investment companies all of which comprise the financial services industry Adapted from: http://www.investorwords.com/19080/financial_services.html	Parent Class: Service Property Restriction: ∃ **isProvidedBy**.**FinancialService Provider** (fibo-fbc-pas-fpas-05)

FinancialServiceProvider (financial service provider)	Definition: a legal entity licensed to provide financial services to consumers and/or businesses Adapted from: http://www.investorwords.com/19080/financial_services.html	Parent Class: Business Parent Class: ServiceProvider Property Restriction: ∃ **provides**.**FinancialService** (fibo-fbc-pas-fpas-06) Property Restriction: = 1 **hasIdentity** (FormalBusinessOrganization ∩ LegalEntity) (fibo-fbc-pas-fpas-07, fibo-fbc-pas-fpas-08)
Holding (holding)	Definition: real or personal property (assets), including but not limited to financial assets, to which one holds title and of which one has possession Explanatory note: Note that a holding may refer to a single asset, such as a piece of real estate, a portfolio of assets, multiple portfolios, and so forth, and is frequently aggregated over multiple assets. Adapted from: http://legal-dictionary.thefreedictionary.com/Holding Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Ownership Property Restriction: ∃ hasOwnedThing.Asset (fibo-fbc-pas-fpas-12)
Position (position)	Definition: an investor's stake, i.e., a holding, in a particular asset (such as an individual security) Explanatory note: A position can be long or short, and it can be in any asset class, such as stocks, bonds, futures, or options. A position can be open (current) or closed (past), but in general use, unless a position is specifically referred to as closed, the assumption is that it references an open position. Adapted from: http://www.investorwords.com/3748/position.html Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Holding Property Restriction: = 1 hasOwnedThing.Asset (fibo-fbc-pas-fpas-13)
Product (*extended*)		about: Product (fibo-fnd-pas-pas) Property Restriction: ≥ 0 **isCharacterizedBy**.**Catalog** (fibo-fbc-pas-fpas-03)
RegulatedCommodity (regulated commodity)	Definition: a commodity under the jurisdiction of the regulatory agency, such as the Commodities Futures Trading Commission (CFTF), which includes any commodity traded in an organized contracts market Explanatory note: The CFTC polices matters of information and disclosure, fair trading practices, registration of firms and individuals, protection of customer funds, record keeping, and maintenance of orderly options and futures markets in the United States. Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Commodity Property Restriction: ∃ **isGovernedBy**.**Jurisdiction** (fibo-fbc-pas-fpas-09) Property Restriction: ∀ **isRegulatedBy**.**RegulatoryAgency** (fibo-fbc-pas-fpas-10)
Trade (trade)	Definition: an agreement between parties participating in a voluntary negotiation and the exchange of goods and/or services for some consideration (e.g., desired goods and services that someone else possesses) Explanatory note: The advent of money as a medium of exchange has allowed trade to be conducted in a manner that is much simpler and	Parent Class: TransactionEvent Property Restriction: ∃ isEmbodiedIn.Contract (fibo-fbc-pas-fpas-14) ≥ 0 isIdentifiedBy.TradeIdentifier

	effective compared to earlier forms of trade, such as bartering. In financial markets, trading also can mean performing a transaction that involves the selling and purchasing of a security. Explanatory note: The seller must deliver the commodity sold to the buyer; the buyer must pay the agreed purchase price, which could be in the form of other goods or services, on the agreed date. Explanatory note: Trading activities typically include (a) regularly underwriting or dealing in securities; interest rate, foreign exchange rate, commodity, equity, and credit derivative contracts; other financial instruments; and other assets for resale, (b) acquiring or taking positions in such items principally for the purpose of selling in the near term or otherwise with the intent to resell in order to profit from short-term price movements, and (c) acquiring or taking positions in such items as an accommodation to customers or for other trading purposes. (Source: Instructions for Preparation of Consolidated Reports of Condition and Income (FFIEC 031 and 041), Schedule RC-D - Trading Assets and Liabilities, 2013. Adapted from: http://www.investopedia.com/terms/trade.asp Adapted from: Deutsche Bank Presentation on the Lifecycle of a Trade, available at http://www.slideshare.net/ahaline/23512555-tradelifecycle	(fibo-fbc-pas-fpas-17) ≥ 0 isFacilitatedBy.Trader (fibo-fbc-pas-fpas-19) ∃ involves (Contract ∩ Good ∩ Service) (fibo-fbc-pas-fpas-15, fibo-fbc-pas-fpas-16)
TradeIdentifier (trade identifier)	Definition: an identifier for a trade	Parent Class: Identifier Property Restriction: = 1 identifies.Trade (fibo-fbc-pas-fpas-18)
Trader (trader)	Definition: an individual or organization or representative thereof that engages in the transfer of financial assets in any financial market on behalf of a client or the financial services provider Adapted from: http://www.investopedia.com/terms/t/trader.asp	Parent Class: ServiceProvider Property Restriction: ∃ facilitates.Trade (fibo-fbc-pas-fpas-20) ∃ isPlayedBy (∃ hasCapacity.ContractualCapability) (fibo-fbc-pas-fpas-21, fibo-fbc-pas-fpas-22)

Properties

Name	Annotations	Property Axioms
facilitates (facilitates)	Definition: provides the context in which an event, a task, a conversation or something else can occur Adapted from: http://www.webster-dictionary.org/definition/facilitate	
hasConstituent (has constituent)	Definition: an essential part, component, or element of some collection or set Adapted from: http://www.merriam-webster.com/dictionary/constituent	Parent Property: hasPart Domain: Collection
isConstituentOf (is constituent of)	Definition: identifies the collection that something is an essential part, component, or element of Adapted from: http://www.merriam-webster.com/dictionary/constituent	Parent Property: isPartOf Range: Collection Property Axiom: inverse of hasConstituent
isEmbodiedIn (is embodied in)	Definition: identifies the representation or tangible form of something in some context Adapted from: http://www.collinsdictionary.com/dictionary/english/embodies	Property Axiom: inverse of embodies

isFacilitatedBy (is facilitated by)	Definition: identifies someone or something that expedites some event, transaction, conversation or something else in some context Adapted from: http://www.webster-dictionary.org/definition/facilitate	Property Axiom: inverse of facilitates

9.4.2   Ontology: Clients and Accounts

This ontology provides basic concepts such as account, account holder, account provider, relationship manager that are commonly used by financial services providers to describe customers and to determine counterparty identities.

Table 9.18 - Clients and Accounts Ontology Metadata

| Metadata Term	Value
sm:filename	ClientsAndAccounts.rdf
sm:fileAbbreviation	fibo-fbc-pas-caa
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/ClientsAndAccounts/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20150801/ProductsAndServices/ClientsAndAccounts/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/
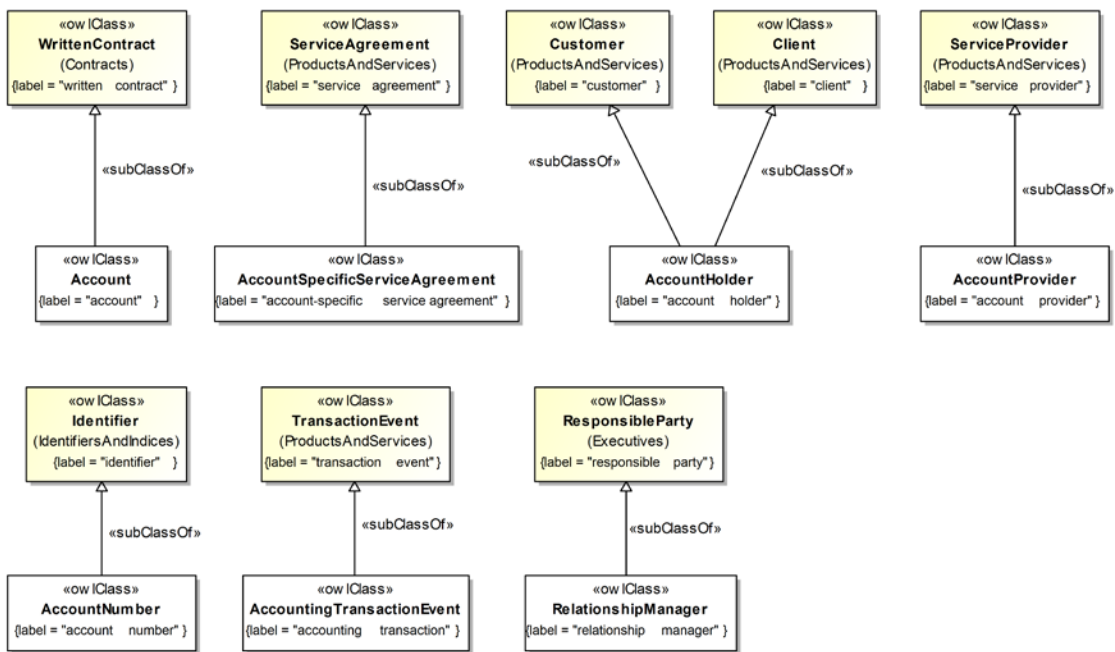
Figure 9.46 - Clients and Accounts Class Hierarchy

Figure 9.46 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy Subsequent figures highlight various aspects of the clients and accounts ontology.
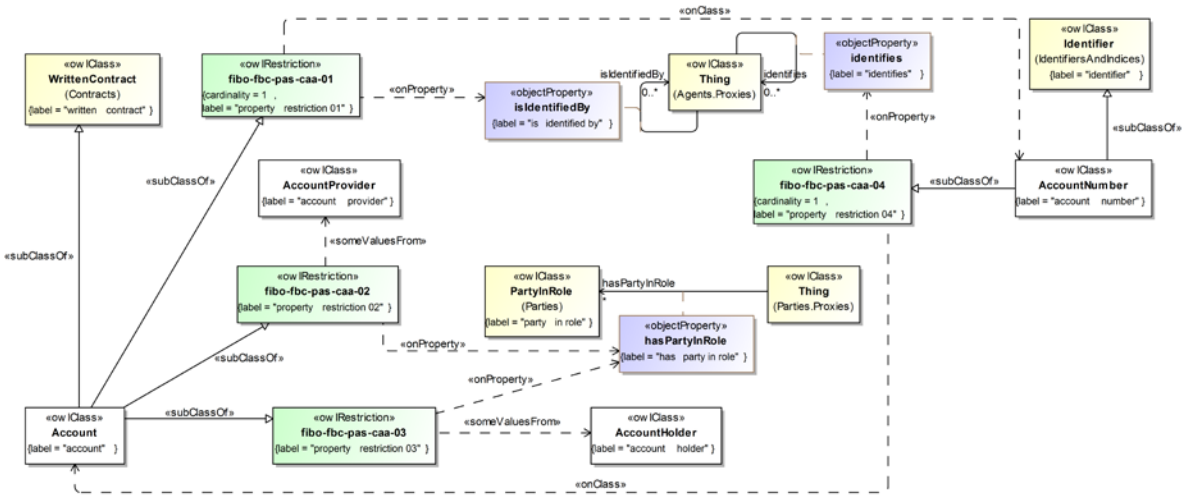
Figure 9.47 - Definition of Account

Figure 9.47 provides the basic definition of an account, which is a written contract identified by an account number that has at least two parties associated with it – the account provider and one or more account holders.

Figure 9.48 - Definitions of Account Holder and Account Provider

Figure 9.48 provides the basic definition of an account holder, which is both a client and a customer, and whose identity is that of a party to an account, and of an account provider, which is a service provider whose identity is that of a party to an account.
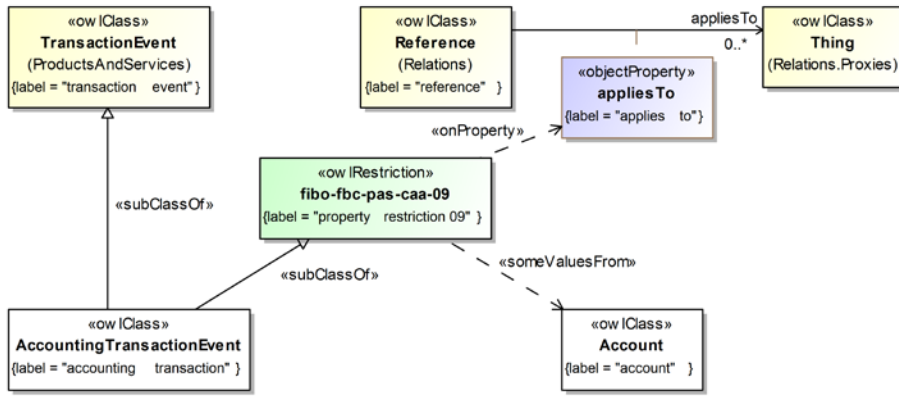
Figure 9.49 - Definition of Accounting Transaction Event
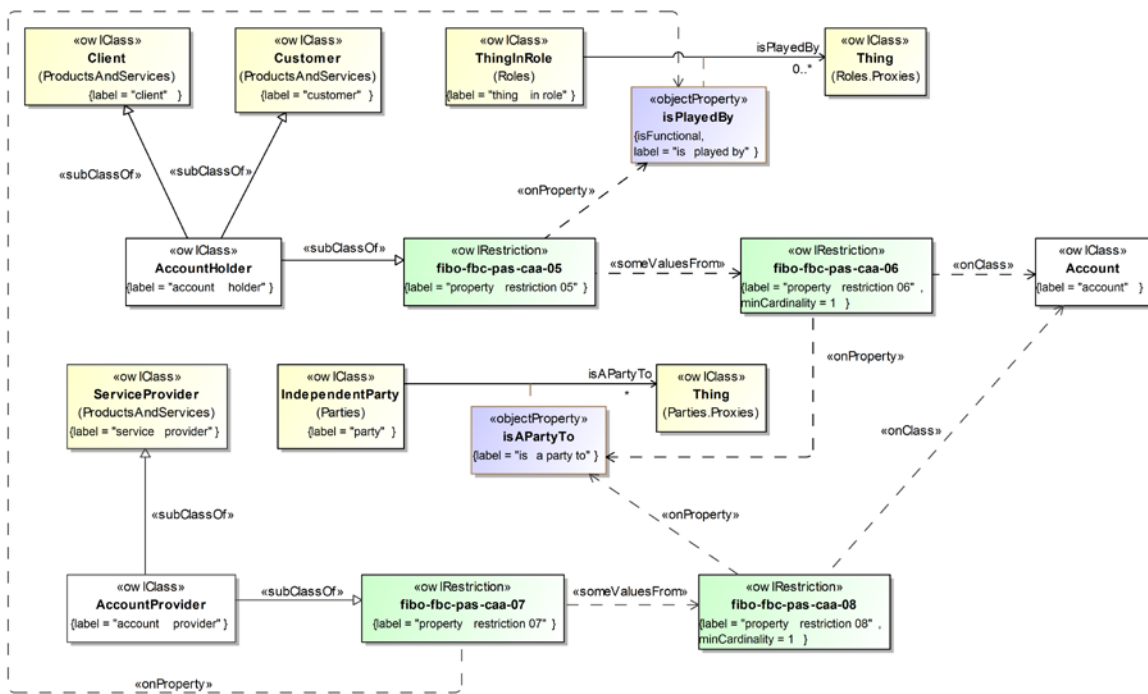
Figure 9.49 provides the definition of an accounting transaction event, which is a transaction event that applies to an account.
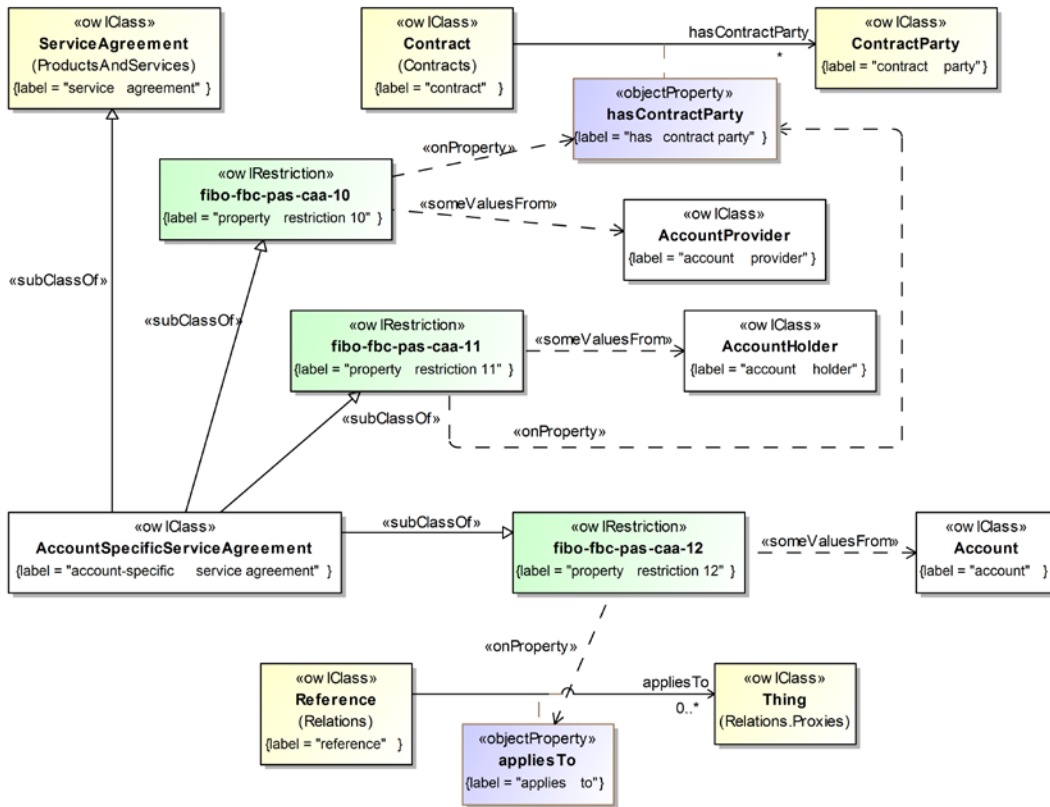
Figure 9.50 - Definition of Account-Specific Service Agreement

As shown in Figure 9.50, an account-specific service agreement has at least one contract party that is an account provider and at least one contract party that is an account holder, and the agreement applies to an account.

Figure 9.51 - Definition of Relationship Manager

As shown in Figure 9.51, a relationship manager is a responsible party that manages an account. The details for the concepts defined in the clients and accounts ontology are given in Table 9.19, below.

Table 9.19 - Clients and Accounts Ontology Details

Classes

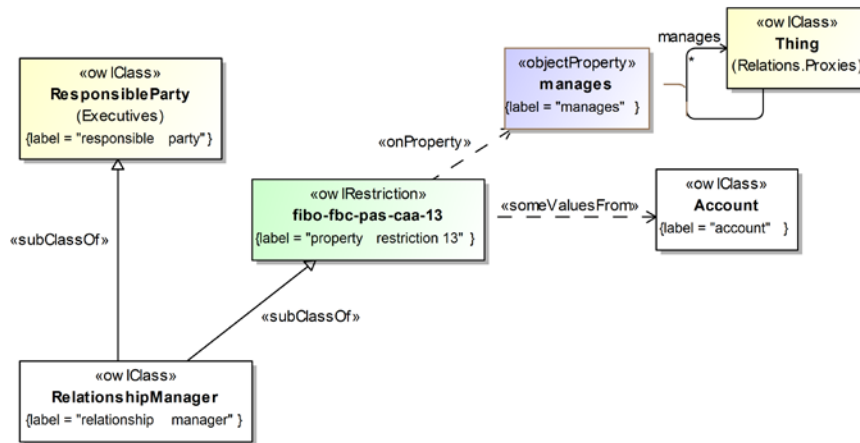| Name	Annotations	Class Expressions
Account (account)	Definition: a contractual relationship between a buyer and a seller under which payment may be made at a later time Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: WrittenContract Property Restriction: = 1 **isIdentifiedBy**.**AccountNumber** (fibo-fbc-pas-caa-01) Property Restriction: ∃ **hasPartyInRole**.**AccountProvider** (fibo-fbc-pas-caa-02) Property Restriction: ∃ **hasPartyInRole**.**AccountHolder** (fibo-fbc-pas-caa-03)
AccountHolder (account holder)	Definition: a party holding an account Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Client Parent Class: Customer Property Restriction: ∃ **isPlayedBy** (≥ 1 **isAPartyTo**.**Account**) (fibo-fbc-pas-caa-05, fibo-fbc-pas-caa-06)
AccountingTransactionEvent (accounting transaction event)	Definition: event or condition recognized by an entry in the books of an account Adapted from: Barron's Dictionary of Finance and Investment Terms, Ninth Edition, 2014	Parent Class: TransactionEvent Property Restriction: ∃ **appliesTo**.**Account** (fibo-fbc-pas-caa-09)
AccountNumber (account number)	Definition: an identifier assigned to each client account for ease in referring to that party's activity Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Identifier Property Restriction: = 1 **identifies**.**Account** (fibo-fbc-pas-caa-04)

AccountProvider (account provider)	<u>Definition</u>: the service provider that provides and services the account	<u>Parent Class</u>: ServiceProvider <u>Property Restriction</u>: ∃ **isPlayedBy** (≥ 1 **isAPartyTo**.**Account**) (fibo-fbc-pas-caa-07, fibo-fbc-pas-caa-08)
AccountSpecificServic eAgreement (account-specific service agreement)	<u>Definition</u>: a service-agreement that is account-specific, applicable in cases where a client holds multiple accounts with differing terms and conditions <u>Explanatory note</u>: Customers of financial service providers frequently hold multiple accounts - brokerage accounts, checking and savings accounts, trust accounts, and so forth - which may have specific terms and conditions associated with them.	<u>Parent Class</u>: ServiceAgreement <u>Property Restriction</u>: ∃ **hasContractParty**.**AccountPro vider** (fibo-fbc-pas-caa-10) <u>Property Restriction</u>: ∃ **hasContractParty**.**AccountHol der** (fibo-fbc-pas-caa-11) <u>Property Restriction</u>: ∃ **appliesTo**.**Account** (fibo-fbc-pas-caa-12)
RelationshipManager (relationship manager)	<u>Definition</u>: a responsible party who manages the client's account (or portfolio of accounts) and oversees their relationship with the service provider	<u>Parent Class</u>: ResponsibleParty <u>Property Restriction</u>: ∃ **manages**.**Account** (fibo-fbc-pas-caa-13)

10 Jurisdiction-Specific Ontologies

10.1 Overview

This clause defines the terms, definitions, relationships, and additional logic specified in the jurisdiction-specific ontologies that make up the Financial Business and Commerce specification. Note that these are provided as starting points, and are not intended to be comprehensive. Having said this, the definitions provided in this clause reflect some of the more important jurisdiction-specific entities identified by contributing subject matter experts (SMEs).

10.2 U.S. Jurisdiction-Specific Ontologies

The ontologies defined herein are managed within the FBC Functional Entities module, in a sub-folder called NorthAmericanEntities.

10.2.1 Ontology: U.S. Financial Services Entities

This ontology extends the primary financial services entities ontology in FBC with additional financial service providers that are specific to the United States.

Table 10.1 - US Financial Services Entities Ontology Metadata

Metadata Term	Value
sm:filename	USFinancialServicesEntities.rdf
sm:fileAbbreviation	fibo-fbc-fct-usfse
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/USFinancialServicesEntities/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FunctionalEntities/NorthAmericanEntities/USFinancialServicesEntities/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/FinancialServicesEntities/

Figure 10.1 - US Financial Services Entities Top-level Class Hierarchy

Figure 10.1 provides an overview of the basic concepts in the ontology including the primary inheritance hierarchy. Note that the primary differentiation between these entities involves (1) the services they provide, (2) who regulates those services, and (3) their legal form. Subsequent figures highlight additional content of the U.S. financial services entities ontology, including additional depository institutions.

Figure 10.2 - U.S. Specific Depository Institutions Class Hierarchy

Figure 10.2 provides the hierarchy of depository institutions that are U.S. specific. Note that restrictions differentiating some of the more important institutions are provided in the U.S. jurisdiction-specific regulatory agencies ontology rather than here, to provide distinctions with respect to who regulates them.

Figure 10.3 - Agreement and Edge Corporations

As shown in Figure 10.3, Agreement and Edge Corporations are identified as corporations by definition.

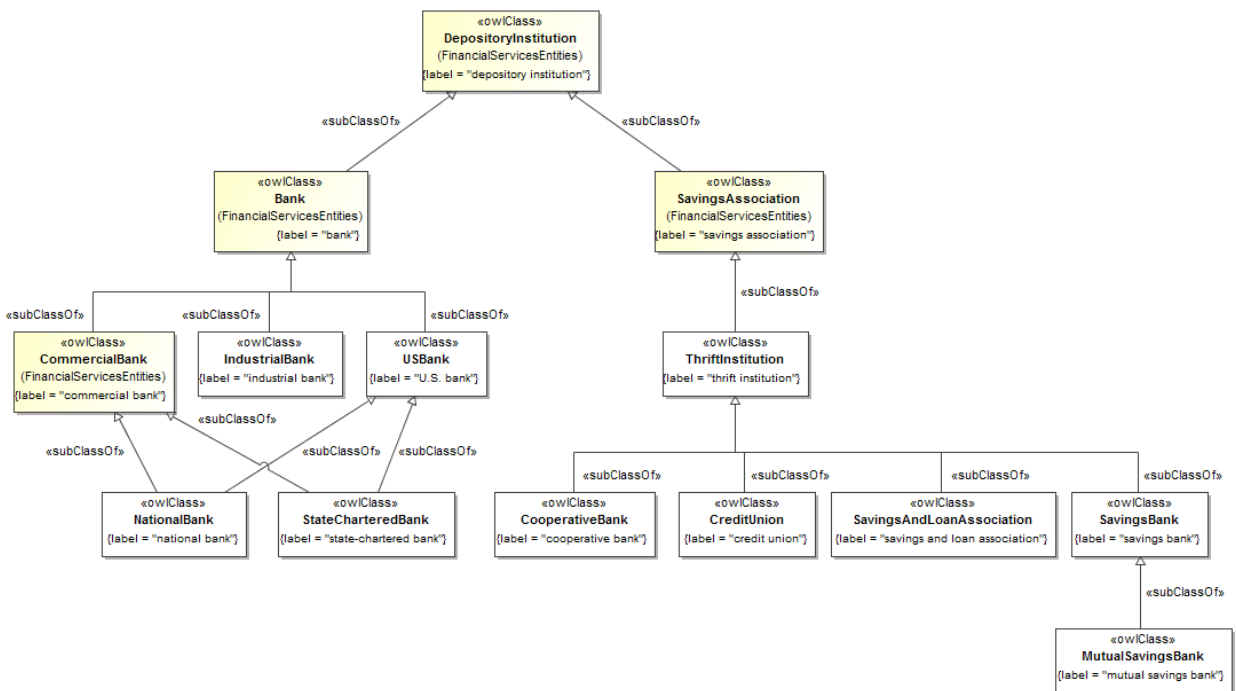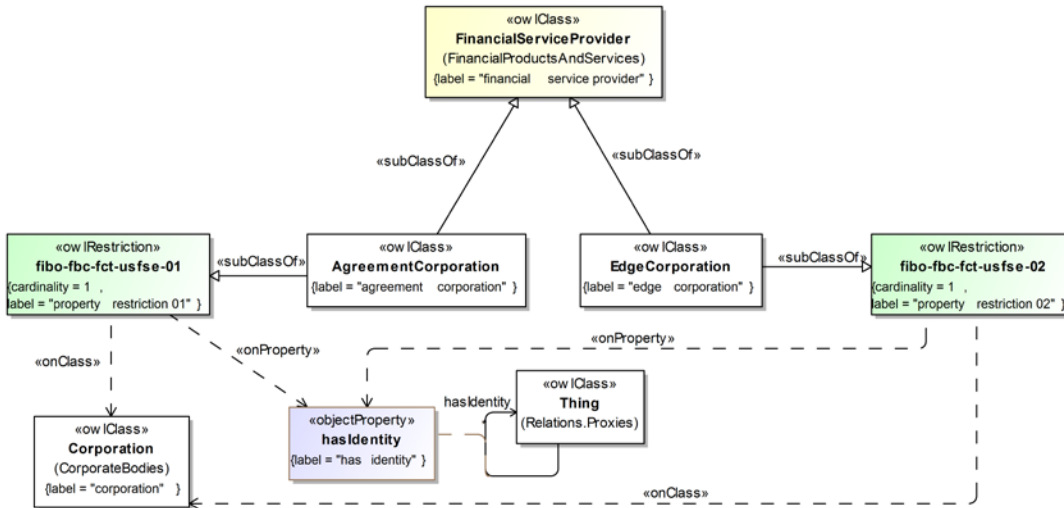The details for the concepts defined in the U.S. jurisdiction-specific financial services entities ontology are given in Table 10.2, below.

Table 10.2 - US Financial Services Entities Ontology Details

Classes

Name	Annotations	Class Expressions
AgreementCorporation (agreement corporation)	Definition: a corporation chartered by a state to engage in international banking, so named because the corporation enters into an 'agreement' with the Fed's Board of Governors that it will limit its activities to those permitted Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: FinancialServiceProvider Property Restriction: = 1 **hasIdentity**.**Corporation** (fibo-fbc-fct-usfse-01)
CooperativeBank (cooperative bank)	Definition: a state-chartered savings association located in Massachusetts, New Hampshire, Rhode Island or Vermont Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: ThriftInstitution
CreditUnion (credit union)	Definition: a cooperative association organized for the purpose of promoting thrift among its members and creating a source of credit for provident or productive purposes Explanatory note: As soon as you deposit funds into a credit union account, you become a partial owner and participate in the union's profitability. Credit unions may be formed by large corporations and organizations for their employees and members. Definition origin: http://www.ncua.gov/Legal/Documents/fcu_act.pdf See also: http://www.investopedia.com/terms/c/creditunion.asp	Parent Class: ThriftInstitution
EdgeCorporation (edge corporation)	Definition: a corporation chartered by the Federal Reserve to engage in international banking and financial operations	Parent Class: FinancialServiceProvider

		Property Restriction: = 1 **hasIdentity**.**Corporation** (fibo-fbc-fct-usfse-01)
FarmCreditSystemInst itution (farm credit system institution)	Definition: any federally-chartered financial institution that is supervised, examined, and regulated by the Farm Credit Administration and operates in accordance with the Farm Credit Act of 1971, as amended, 12 U.S.C. 2001 et seq. All Farm Credit System institutions are federally-chartered instrumentalities of the United States. Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: FinancialInstitution
FinancialHoldingCom pany (financial holding company)	Definition: a financial entity engaged in a broad range of banking-related activities, created by the Gramm-Leach-Bliley Act of 1999 Explanatory note: These activities include: insurance underwriting, securities dealing and underwriting, financial and investment advisory services, merchant banking, issuing or selling securitized interests in bank-eligible assets, and generally engaging in any non-banking activity authorized by the Bank Holding Company Act. The Federal Reserve Board is responsible for supervising the financial condition and activities of financial holding companies. Similarly, any non-bank commercial company that is predominantly engaged in financial activities, earning 85 percent or more of its gross revenues from financial services, may choose to become a financial holding company. These companies are required to sell any non-financial (commercial) businesses within ten years. Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: USBankHoldingCompany
IndustrialBank (industrial bank)	Definition: a limited service financial institution that raises funds by selling certificates called 'investment shares' and by accepting deposits Explanatory note: Often called Morris Plan banks or industrial loan companies, industrial banks are distinguished from commercial loan companies because industrial banks accept deposits in addition to making consumer loans. Industrial banks differ from commercial banks because they do not offer demand deposit (checking) accounts. Industrial banks are not regulated by the Federal Reserve.	Parent Class: Bank
MutualSavingsBank (mutual savings bank)	Definition: a financial institution that accepts deposits primarily from individuals and places a large portion of its funds into mortgage loans Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: SavingsBank
NationalBank (national bank)	Definition: a commercial bank whose charter is approved by the Office of the Comptroller of the Currency (OCC) rather than by a state banking department Explanatory note: National Banks are required to be members of the Federal Reserve System and belong to the Federal Deposit Insurance Corporation. Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: CommercialBank, USBank
NonDepositoryTrustC ompany (non-depository trust company)	Definition: a trust company that accepts and executes trusts, but does not issue currency; non-depository trust companies can either be Federal Reserve Members or Federal Reserve Non-members Definition origin:	Parent Class: NonDepositoryInstitution

	http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	
SavingsAndLoanAssociation (savings and loan association)	Definition: a financial institution that accepts deposits primarily from individuals and channels its funds primarily into residential mortgage loans Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: ThriftInstitution
SavingsAndLoanHoldingCompany (savings and loan holding company)	Definition: a company that directly or indirectly controls a savings association or another savings and loan holding company, and explicitly excludes any company that is also a bank holding company Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: FinancialServiceProvider Class Axiom: ¬ BankHoldingCompany
SavingsBank (savings bank)	Definition: a banking institution organized to encourage thrift by paying interest dividends on savings; savings banks can have state and federal affiliations, for example, State Savings Banks and Federal Savings Banks Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: ThriftInstitution
StateCharteredBank (state-chartered bank)	Definition: a commercial bank whose charter is approved by a state banking department Explanatory note: State-chartered banks may or may not be members of the Federal Reserve System, but typically belong to the Federal Deposit Insurance Corporation, who may be their primary federal regulator for those that are not FRS members. Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: CommercialBank, USBank
ThriftInstitution (thrift institution)	Definition: an organization that primarily accepts savings account deposits and invests most of the proceeds in mortgages; savings banks and savings and loan associations and credit unions are examples of thrift institutions Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: SavingsAssociation
USBank (U.S. bank)	Definition: a bank that is licensed to conduct business in the United States Explanatory note: The Bank Holding Company Act of 1956 defines a bank as any depository financial intermediary that accepts checking accounts (checks) or makes commercial loans, and its deposits are insured by a federal deposit insurance agency. A bank acts as a middleman between suppliers of funds and users of funds, substituting its own credit judgement for that of the ultimate suppliers of funds, collecting those funds from three sources: checking accounts, savings and time deposits; short-term borrowings from other banks; and equity capital. A bank earns money by reinvesting these funds in longer-term assets. Explanatory note: A bank, as specified in the Investment Company Act of 1940, is a financial intermediary that is (a) a depository institution (as defined in section 3 of the Federal Deposit Insurance Act) or a branch or agency of a foreign bank (as such terms are defined in section 1(b) of the International Banking Act of 1978), (b) a member bank of	Parent Class: Bank

	the Federal Reserve System, (c) any other banking institution or trust company, whether incorporated or not, doing business under the laws of any State or of the United States, a substantial portion of the business of which consists of receiving deposits or exercising fiduciary powers similar to those permitted to national banks under the authority of the Comptroller of the Currency, and which is supervised and examined by State or Federal authority having supervision over banks, and which is not operated for the purpose of evading the provisions of this title, and (d) a receiver, conservator, or other liquidating agent of any institution or firm included in clause (a), (b), or (c) of this paragraph. Adapted from: As defined in the Federal Deposit Insurance Act, https://www.fdic.gov/regulations/laws/rules/1000-400.html#fdic1000sec.3a See also: https://www.sec.gov/about/laws/ica40.pdf	
USBankHoldingCompany (U.S. bank holding company)	Definition: a bank holding company that is licensed to conduct business in the United States and is regulated and supervised by the Federal Reserve in accordance with the Bank Holding Company Act of 1956 Explanatory note: According to the FFIEC, a bank holding company is a company that owns and/or controls one or more U.S. banks or one that owns, or has controlling interest in, one or more banks. A bank holding company may also own another bank holding company, which in turn owns or controls a bank; the company at the top of the ownership chain is called the top holder. The Board of Governors is responsible for regulating and supervising bank holding companies, even if the bank owned by the holding company is under the primary supervision of a different federal agency (OCC or FDIC). Definition origin: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: BankHoldingCompany

10.2.2 Ontology: U.S. Regulatory Agencies

This ontology extends the primary regulatory agencies ontology in FBC with additional regulators that are specific to the United States and augments certain U.S. financial services entities based on who regulates them.

Diagrams corresponding to this ontology are not included herein, given the number of individuals represented and complexity in relationships among them. The additional classes required to represent US-specific regulatory agencies are defined in Table 10-4, however. The corresponding machine-readable files are considered to be a normative part of this specification.

Table 10.3 - US Regulatory Agencies Ontology Metadata

Metadata Term	Value
sm:filename	USRegulatoryAgencies.rdf
sm:fileAbbreviation	fibo-fbc-fct-usjrga
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/USRegulatoryAgencies/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FunctionalEntities/NorthAMericanEntities/USRegulatoryAgencies/
sm:dependsOn	http://www.omg.org/spec/LCC/ http://www.omg.org/spec/EDMC-FIBO/FND/

```
http://www.omg.org/spec/EDMC-FIBO/BE/
http://www.omg.org/spec/EDMC-
FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/
http://www.omg.org/spec/EDMC-
FIBO/FBC/FunctionalEntities/BusinessRegistries/
http://www.omg.org/spec/EDMC-
FIBO/FBC/FunctionalEntities/FinancialServicesEntities/
http://www.omg.org/spec/EDMC-
FIBO/FBC/FunctionalEntities/RegistrationAuthorities/
http://www.omg.org/spec/EDMC-
FIBO/FBC/FunctionalEntities/RegulatoryAgencies/
http://www.omg.org/spec/EDMC-
FIBO/FBC/FunctionalEntities/NorthAmericanEntities/USFinancialServi
cesEntities/
```

Detailed definitions and related annotations for the US Regulatory Agencies ontology are provided in Table 10.4, below. Note that the table excludes the definitions for the individuals contained in the ontology, some of which are partially modeled in the diagrams provided above, and which are available in the machine readable files.

Table 10.4 - US Regulatory Agencies Ontology Details

Classes

Name	Annotations	Class Expressions
ABAIINRegistryEntry (ABA IIN registry entry)	Definition: an entry in the ABA IIN registry, a repository of financial institution characteristics collected by the ABA for those institutions to which they issue IINs	Parent Class: RegistryEntry Property Restriction: ∃ **comprises**. **IssuerIdentificationNumber** (fibo-fbc-fct-) Property Restriction: ∀ **isPartOf**.**ABAIINRegistry** (fibo-fbc-fct-) Property Restriction: ∀ **appliesTo**.**FinancialInstitution** (fibo-fbc-fct-)
ABARTNRegistryEntry (ABA RTN registry entry)	Definition: an entry in the ABA RTN registry, a repository of financial institution characteristics collected by the ABA Registrar on behalf of the ABA Definition origin: http://www.accuity.com/aba-registrar/	Parent Class: RegistryEntry Property Restriction: ∃ **comprises**. **RoutingTransitNumber** (fibo-fbc-fct-) Property Restriction: ∀ **isPartOf**.**ABARTNRegistry** (fibo-fbc-fct-) Property Restriction: ∀ **appliesTo**.**FinancialInstitution** (fibo-fbc-fct-)
FDICCertificateNumber (FDIC Certificate Number)	Definition: an identifier issued to a depository institution by the FDIC on approval of that institution's application for insurance Adapted from: http://www.fdic.gov/	Parent Class: RegistryIdentifier Property Restriction: ∀ **isRegisteredBy**. **FederalDepositInsurerAndRegulator** (fibo-fbc-fct-) Property Restriction: ∀ **isRegisteredIn**. **FDICInstitutionDirectory**

		(fibo-fbc-fct-) Property Restriction*: = 1* **identifies**. **DepositoryInstitution** (fibo-fbc-fct-)
FDICRegistryEntry (FDIC registry entry)	Definition: an entry in the FDIC institution directory, a repository of financial institution characteristics collected by the FDIC related to the institutions they insure Definition origin: https://www2.fdic.gov/idasp/main.asp	Parent Class: RegistryEntry Property Restriction*: ∃* **comprises**. **FDICCertificateNumber** (fibo-fbc-fct-) Property Restriction*: ∀* **isPartOf**. **FDICInstitutionDirectory** (fibo-fbc-fct-) Property Restriction*: ∀* **appliesTo**. **DepositoryInstitution** (fibo-fbc-fct-)
FederalReserveDistrict (Federal Reserve district)	Definition: a region of the US identifying the jurisdiction of a Federal Reserve Bank, numbered and named for the city in which that reserve bank is located Explanatory note: The Federal Reserve officially identifies Districts by number and Reserve Bank city. In the 12th District, the Seattle Branch serves Alaska, and the San Francisco Bank serves Hawaii. The System serves commonwealths and territories as follows: the New York Bank serves the Commonwealth of Puerto Rico and the U.S. Virgin Islands; the San Francisco Bank serves American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. The Board of Governors revised the branch boundaries of the System in February 1996. Adapted from: http://federalreserve.gov/otherfrb.htm	Parent Class: Jurisdiction Property Restriction*: = 1* is**IdentifiedBy**. **FederalReserveDistrictIdentifier** (fibo-fbc-fct-)
FederalReserveDistrict Bank (Federal Reserve district bank)	Definition: a Federal Reserve district and member bank, with jurisdiction over a specific region of the US, named for the city in which the reserve bank is located Adapted from: http://federalreserve.gov/	Parent Class: CentralBank, FRSMemberBank Property Restriction*: = 1* **hasJurisdiction**. **FederalReserveDistrict** (fibo-fbc-fct-)
FederalReserveDistrict Identifier (Federal Reserve district identifier)	Definition: an identifier associated with a Federal Reserve district	Parent Class: Identifier Property Restriction*: = 1* **identifies**. **FederalReserveDistrict** (fibo-fbc-fct-)
FinancialHoldingCom pany *(extended)*		About *:* FinancialHoldingCompany Property Restriction*: ∀* **hasPrimaryFederalRegulator**. **FederalReserveBoardAsFunctionalEntity** (fibo-fbc-fct-)
FRSMemberBank (Federal Reserve System (FRS) member bank)	Definition: a Federal Reserve member bank Adapted from: http://federalreserve.gov/	Parent Class: FinancialInstitution Property Restriction*: ∀* **isPartOf**. **FederalReserveRegulatoryAge**

		ncyAndCentralBank (fibo-fbc-fct-)
FRSNonMemberBank (Federal Reserve System (FRS) non-member bank)	Definition: a financial institution that is not a Federal Reserve member bank Adapted from: http://federalreserve.gov/	Parent Class: FinancialInstitution Class Axiom: ¬ FRSMemberBank
FRSStateMemberBank (Federal Reserve System (FRS) state member bank)	Definition: a commercial bank that is state-chartered and a member of the Federal Reserve System Adapted from: http://www.ffiec.gov/nicpubweb/Content/HELP/Institution%20Type%20Description.htm	Parent Class: FRSMemberBank Parent Class: StateCharteredBank
InstitutionType (institution type)	Definition: a classification scheme for financial institutions as defined by the National Information Center (NIC) registry	Parent Class: IndustrySectorClassifier Property Restriction: ∃ **classifies**.**FinancialServiceProvider** (fibo-fbc-fct-) Class Axiom: ≡ (AgreementCorporation ∪ BankHoldingCompany ∪ BrokerageFirm ∪ CommercialBank ∪ CooperativeBank ∪ CreditUnion ∪ EdgeCorporation ∪ FarmCreditSystemInstitution ∪ FinancialHoldingCompany ∪ FRSMemberBank ∪ FRSNonMemberBank ∪ IndustrialBank ∪ InsuranceCompany ∪ NationalBank ∪ NonDepositoryTrustCompany ∪ SavingsBank ∪ SavingsAndLoanAssociation ∪ SavingsAndLoanHoldingCompany ∪ StateCharteredBank)
IssuerIdentificationNumber (issuer identification number, IIN)	Definition: a numbering system that allows a credit, debit, or other card to be identified as having been issued by a particular financial institution Explanatory note: IINs are issued directly by the American Bankers Association (ABA) in the US. The ABA is the Registration Authority (RA) for ISO/IEC 7812, which defines the IIN, in other words. Explanatory note: The issuer identification number (IIN) is a six digit number that is unique to a single card issuer. The number is only used to identify the card issuer, and is not used to identify a particular product, service, or region associated with the card issuer. Adapted from: http://www.investopedia.com/terms/i/issuer-identification-number-iin.asp See also: https://en.wikipedia.org/wiki/ISO/IEC_7812	Parent Class: RegistryIdentifier Property Restriction: ∀ **isRegisteredBy**.**AmericanBankersAssociationRegistrationAuthority** (fibo-fbc-fct-) Property Restriction: ∀ **isRegisteredIn**.**ABAIINRegistry** (fibo-fbc-fct-) Property Restriction: = 1 **identifies**.**FinancialInstitution** (fibo-fbc-fct-)
NationalBank (extended)		Parent Class: FRSMemberBank Property Restriction: ∀ **hasPrimaryFederalRegulator**.**NationalBakingRegulator**

		(fibo-fbc-fct-)
NICRegistryEntry (National Information Center (NIC) registry entry)	Definition: an entry in the the National Information Center (NIC) repository, a repository of financial data and institution characteristics collected by the Federal Reserve System Definition origin: http://www.ffiec.gov/nicpubweb/nicweb/NicHome.aspx	Parent Class: RegistryEntry Property Restriction: ∃ **comprises. ResearchStatisticsSupervision DiscountIdentifier** (fibo-fbc-fct-) Property Restriction: ∃ **isPartOf. NationalInformationCenterRe pository** (fibo-fbc-fct-) Property Restriction: ∀ **appliesTo. FinancialServiceProvide**r (fibo-fbc-fct-) Property Restriction: ∃ **specifies. InstitutionType** (fibo-fbc-fct-)
PrimaryFederalRegula tor (primary federal regulator)	Definition: the primary federal regulator for an institution as defined by the National Information Center (NIC) registry Definition origin: http://www.ffiec.gov/nicpubweb/nicweb/NicHome.aspx	Parent Class: RegulatoryAgency Property Restriction: ≡ ∃ isPlayedBy oneOf (FarmCreditAdministration, FederalDepositInsuranceCorpora tion, FederalHousingFinanceAgency, FederalReserveSystem, NationalCreditUnionAdministrat ion, OfficeOfThriftSupervision)
ResearchStatisticsSupe rvisionDiscountIdentifi er (Research, Statistics, Supervision and Regulation, and Discount and Credit identifier, RSSD ID)	Definition: a unique identifier assigned by the Federal Reserve to financial institutions Adapted from: https://cdr.ffiec.gov/CDR/Public/CDRHelp/FAQs1205.htm#FAQ16 See also: http://www.federalreserve.gov/reportforms/mdrm/pdf/RSSD.PDF	Parent Class: RegistryIdentifier Property Restriction: ∀ **isRegisteredBy. FederalReserveRegulatoryAge ncyAndCentralBank** (fibo-fbc-fct-) Property Restriction: ∀ **isRegisteredIn. NationalInformationCenterRe pository** (fibo-fbc-fct-) Property Restriction: = 1 **identifies. FinancialServiceProvider** (fibo-fbc-fct-)
RoutingTransitNumbe r (routing transit number, RTN)	Definition: a unique nine digit identifier, used in the United States, to identify a banking or other financial institution to clear funds or process checks; the routing transit number, as it appears on a check, specifically denotes the banking institution that holds the account in which funds from the check are to be drawn. Explanatory note: Routing transit numbers are issued by Accuity on behalf of the American Bankers Association (ABA). Explanatory note: The ABA RTN was originally designed to facilitate the sorting, bundling, and shipment of paper checks back to the	Parent Class: RegistryIdentifier Property Restriction: ∀ **isRegisteredBy. AmericanBankersAssociation RTNRegistrationAuthority** (fibo-fbc-fct-) Property Restriction: ∀ **isRegisteredIn. ABARTNRegistry** (fibo-fbc-

		fct-)
	drawer's (check writer's) account. As new payment methods were developed (ACH and Wire), the system was expanded to accommodate these payment methods.	**Property Restriction***: = 1* **identifies.FinancialInstitution** (fibo-fbc-fct-)
	The ABA RTN is necessary for the Federal Reserve Banks to process Fedwire funds transfers, and by the Automated Clearing House to process direct deposits, bill payments, and other such automated transfers.	
	Adapted from: http://www.investopedia.com/terms/r/routing_transit_number.asp	
	See also: http://www.accuity.com/aba-registrar/	

Properties

Name	Annotations	Property Axioms
hasPrimaryFederalRegulator (has primary federal regulator)	Definition: identifies the primary federal regulator for an institution	Parent Property: has Domain*:* FinancialServiceProvider Range*:* PrimaryFederalRegulator

10.3 Canadian Jurisdiction-Specific Ontologies

The ontologies defined herein are managed within the FBC Functional Entities module, in a sub-folder called NorthAmericanEntities.

10.3.1 Ontology: Canadian Financial Services Entities

This ontology extends the primary financial services entities ontology in FBC with additional financial service providers that are specific to Canada.

Note that the ontology is not intended to be exhaustive, but provides a starting point for development of a richer set of financial services entities that serve the Canadian public.

Table 10-5   Canadian Financial Services Entities Ontology Metadata

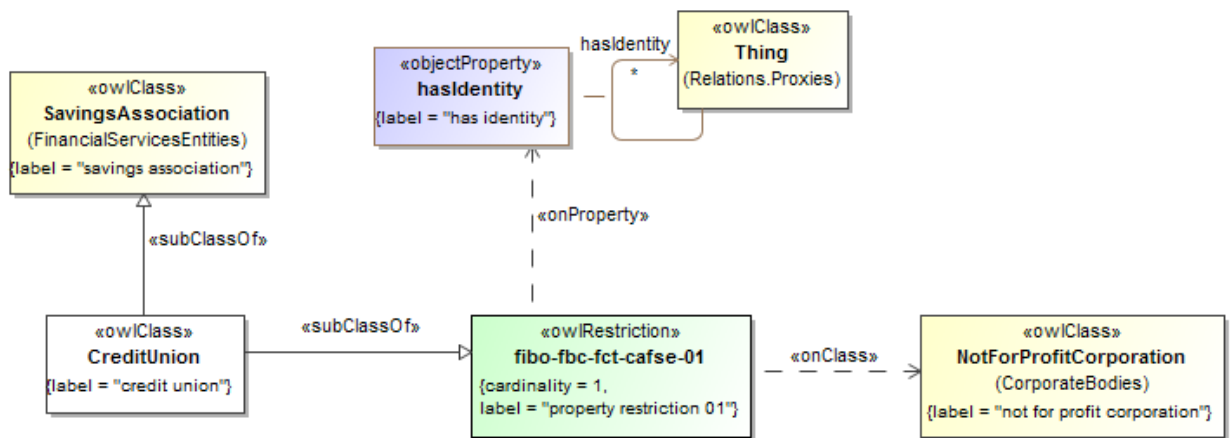| Metadata Term	Value
sm:filename	CAFinancialServicesEntities.rdf
sm:fileAbbreviation	fibo-fbc-fct-cafse
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/CAFinancialServicesEntities/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FunctionalEntities/NorthAmericanEntities/CAFinancialServicesEntities/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ProductsAndServices/FinancialProductsAndServices/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/FinancialServicesEntities/

Figure 10.4 Canadian Financial Services Entities

Figure 10.4 provides an overview of the ontology including the inheritance hierarchy. Note that the primary difference between Canadian and US credit unions is the lack of intervening hierarchy between SavingsAssociation and CreditUnion.

Table 10-6   Canadian Financial Services Entities Ontology Details

Classes

Name	Annotations	Class Expressions
CreditUnion (credit union)	Definition: a not-for-profit financial institution, typically formed by the employees of a company, labor union, or religious group, operated as a cooperative association organized for the purpose of promoting thrift among its members and creating a source of credit for provident or productive purposes Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012 See also: http://www.investopedia.com/terms/c/creditunion.asp	Parent Class: SavingsAssociation Property Restriction: = 1 **hasIdentity.NotForProfitCorporation** (fibo-fbc-fct-cafse-01)

10.3.2 Ontology: Canadian Regulatory Agencies

This ontology extends the primary regulatory agencies ontology in FBC with additional regulators that are specific to Canada.

Note that the ontology is not intended to be exhaustive, but provides a starting point for development of a richer set of regulatory agencies that serve the Canadian public. It contains individuals only, and therefore only the relevant metadata is included, below. The machine readable files associated with the ontology are considered a normative part of this specification, however.

Table 10-7   Canadian Regulatory Agencies Ontology Metadata

Metadata Term	Value
sm:filename	CARegulatoryAgencies.rdf
sm:fileAbbreviation	fibo-fbc-fct-cajrga

OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/CARegulatoryAgencies/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/FBC/20160801/FunctionalEntities/NorthAmericanEntities/CARegulatoryAgencies/
sm:dependsOn	http://www.omg.org/spec/LCC/ http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/FinancialServicesEntities/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegistrationAuthorities/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/RegulatoryAgencies/ http://www.omg.org/spec/EDMC-FIBO/FBC/FunctionalEntities/NorthAmericanEntities/CAFinancialServicesEntities/

Annex A: Deliverables Included with this RFC

(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 (ancillary). 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 Financial Business and Commerce (FBC) makes normative reference to the DCMI Dublin Core Metadata Terms[1], W3C Simple Knowledge Organization System (SKOS) Recommendation[2], and the OMG Architecture Board's Specification Metadata Recommendation[3], which are not part of this specification. Some of the jurisdiction-specific ontologies also reference the OMG's Languages, Countries and Codes (LCC) 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 Complexible (formerly 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.

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[1] http://www.dublincore.org/documents/dcmi-terms/

[2] http://www.w3.org/TR/2009/REC-skos-reference-20090818/

[3] http://www.omg.org/techprocess/ab/SpecificationMetadata/