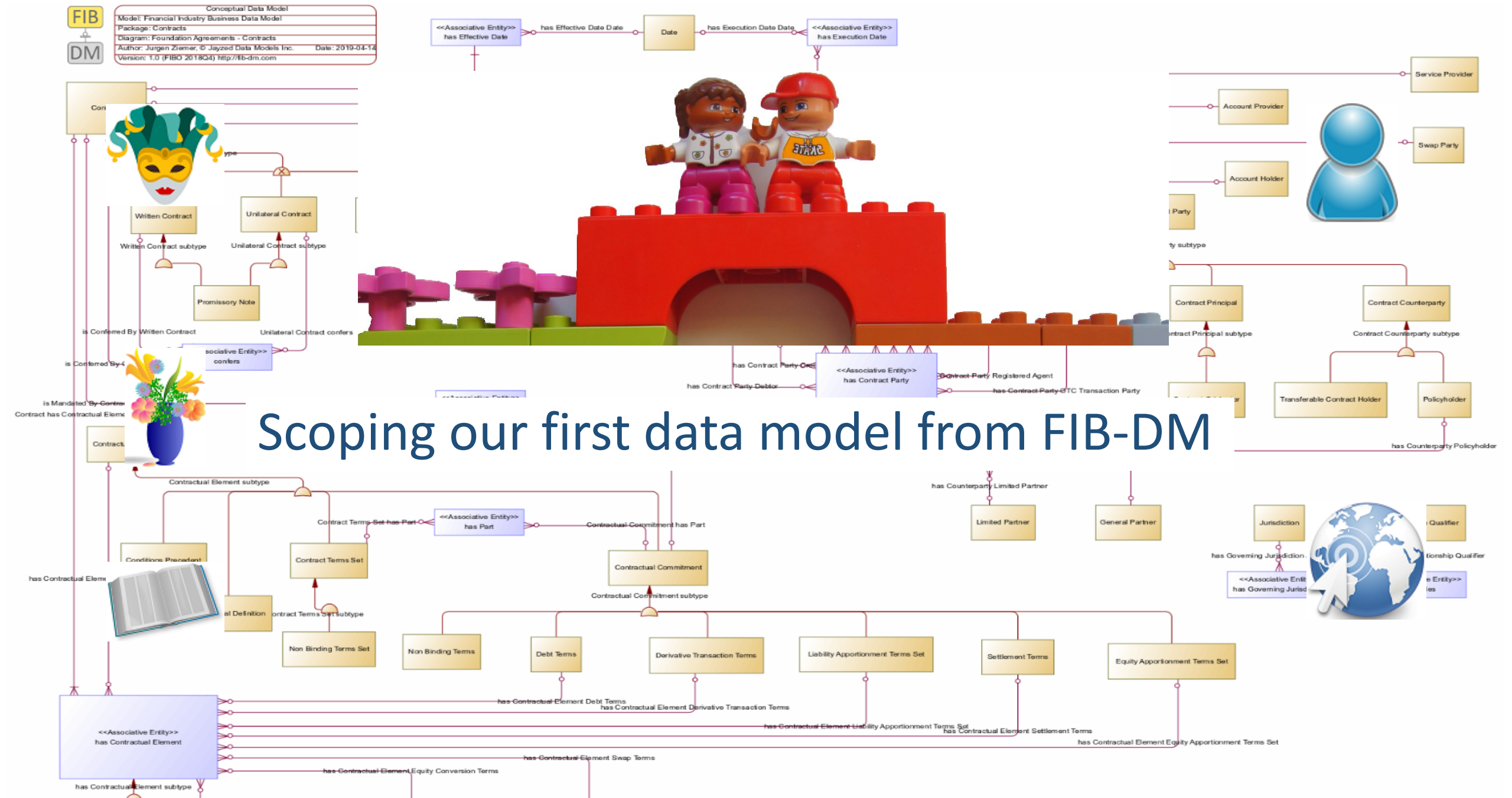
Scoping our first data model from FIB-DM



Audience and content

a) You are a Data Architect or Modeler who downloaded the Financial Industry Business Data Model
b) Your organization has licensed FIB-DM, and you want to understand the design and contents.

This education module is a hands-on exercise. You can follow the steps in PowerDesigner or your modeling tool.

- Example: FDIC Bank Call Report reference data
- We use five of the FIB Fundamental Supertypes to create a concept map.
- Transpose the concept map to a Data Model subject area
- Review the conceptual data model and compare to the ontology graph

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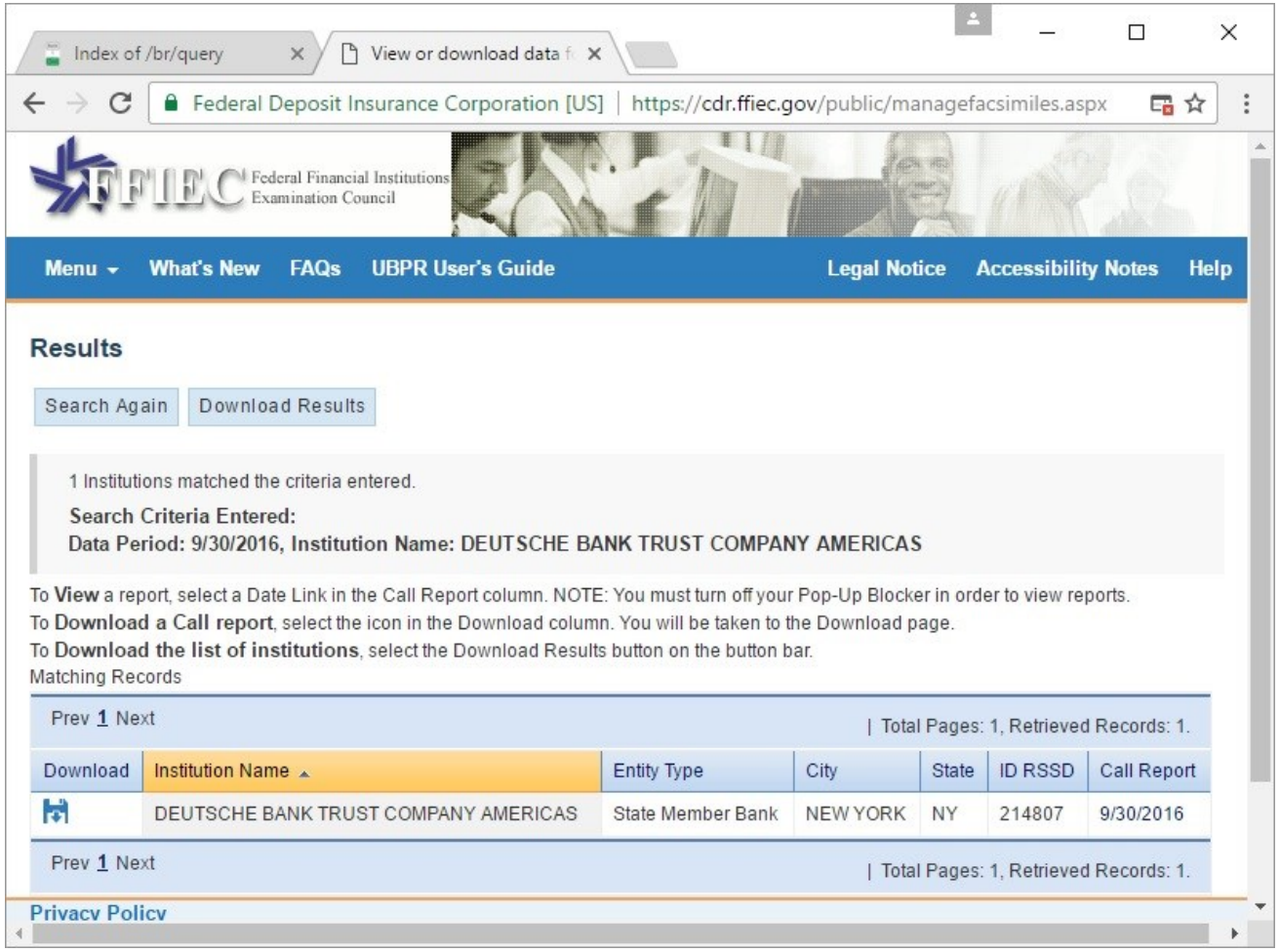
US Bank Call Report

The Federal Deposit Insurance Corporation is a regulator of US Banks.

One of the critical reports to file is the quarterly Consolidated Report of Condition and Income, generally referred to as the call report or RC report.

The Federal Financial Institutions Examination Council (FFIEC) publishes the XBRL taxonomy and bank filings. You can view and download Call Report submissions on the FFIEC website: https://cdr.ffiec.gov/public/



Call Report Schedule ENT – reference data

The example below shows JPMorgan Chase Bank, NA submission with call date, id, data item, value, definition, call schedule, and line number.

	Call Date	Bank RSSD	MDRM #	Value	Last Upda	Short Definition	Call Sc	Line Numbe
91	20160930	852218	RCON9999	20160930	20170123	Reporting date	ENT	1
104	20160930	852218	RSSD9050	628	20170123	FDIC certificate number	ENT	2
119	20160930	852218	RSSD9017	JPMorgan Chase Bank, National Association	20170123	Legal title of bank	ENT	3
121	20160930	852218	RSSD9130	Columbus	20170123	City	ENT	4
122	20160930	852218	RSSD9200	OH	20170123	State abbreviation	ENT	5
123	20160930	852218	RSSD9220	43240	20170123	Zip code	ENT	6
171	20160930	852218	RCON9224	7H6GLXDRUGQFU57RNE97	20170123	Legal Entity Identifier (LEI) (Report only if your institution already has an LEI.)	ENT	7

The Entity Schedule, “ENT” has reference data about the reporting Bank. For this exercise, our data requirements are the Entity schedule data items, plus additional reference data about the FDIC, already in the FIBO.

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A simple diagram of our sample data

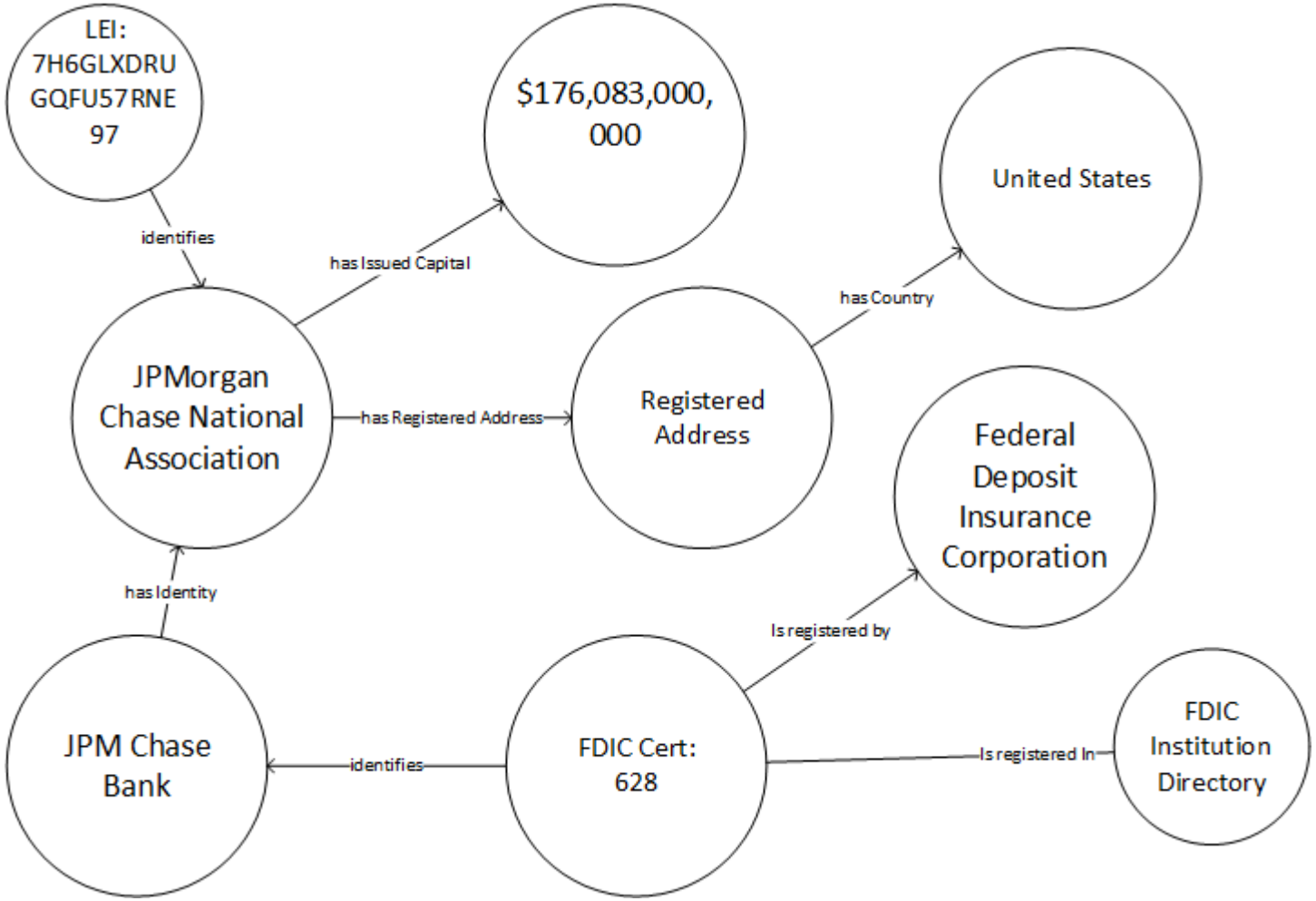
FDIC Certificate 628 identifies JPM Chase as a registered bank.

The Certificate is registered in the FDIC Institution Directory.

The FDIC registers the Certificate, and thus JPMC. JPMC has the identity of JPMC NA, the legal entity. Note the distinction of what JPMC is – a legal entity, and what JPMC does – taking deposits.

The Legal Entity has a registered address with the US as the country.

JPMC NA has a Legal Entity Identifier (LEI). The corporation has $176 billion issued capital.



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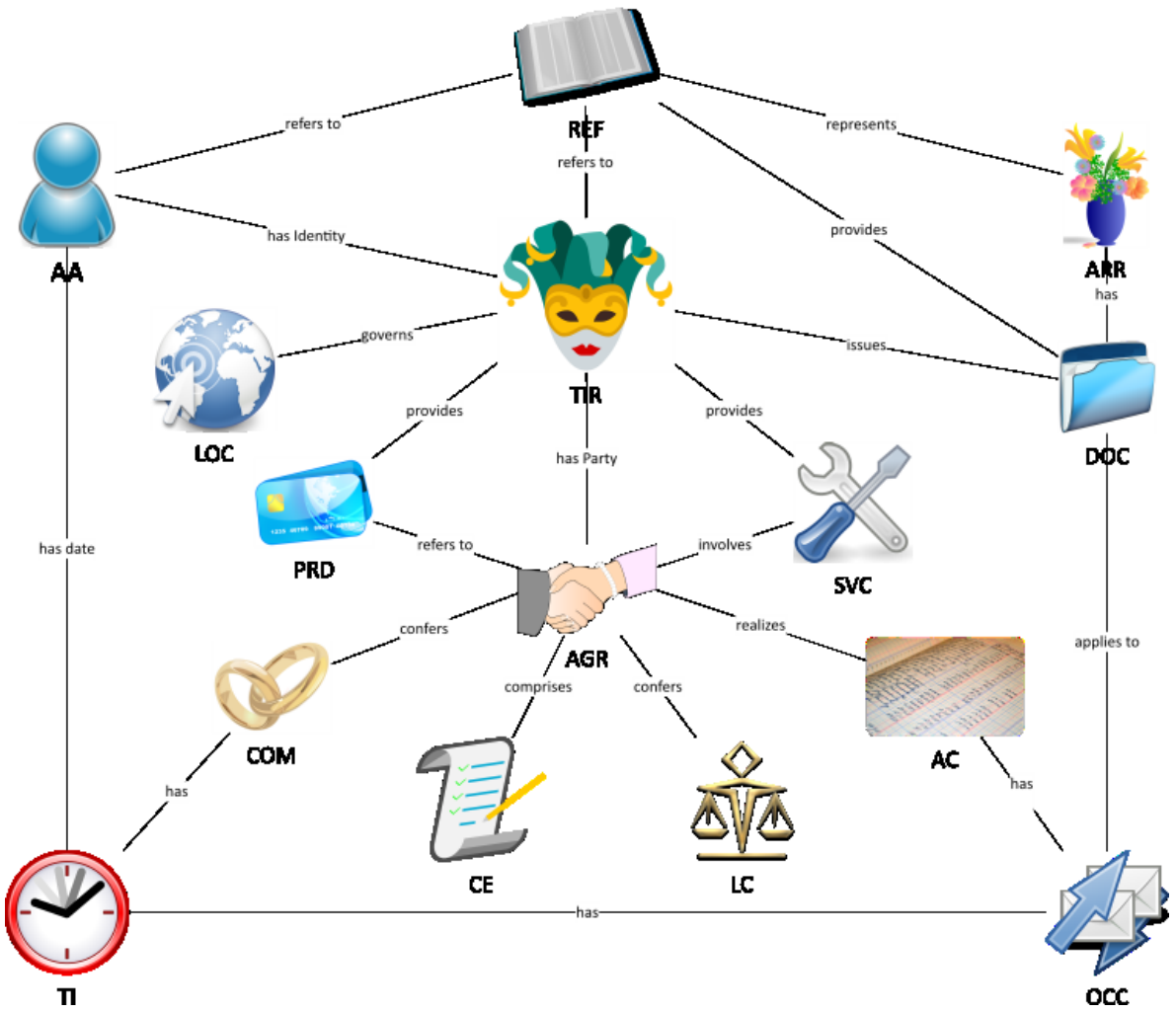
15 Fundamental Business Concepts

In our second step, we conceptualize our sample data items. That means to assign fundamental business concepts and their specializations.

The fifteen concepts most are extensive ultimate supertypes in the Financial Industry Business Data Model. In other words, they have the most subtypes and most relationships.

In the FIBO ontology, the fundamental fifteen concepts are direct subclasses of the Thing.

We use abbreviations and icons as mnemonics to teach the concepts to modelers and business users.



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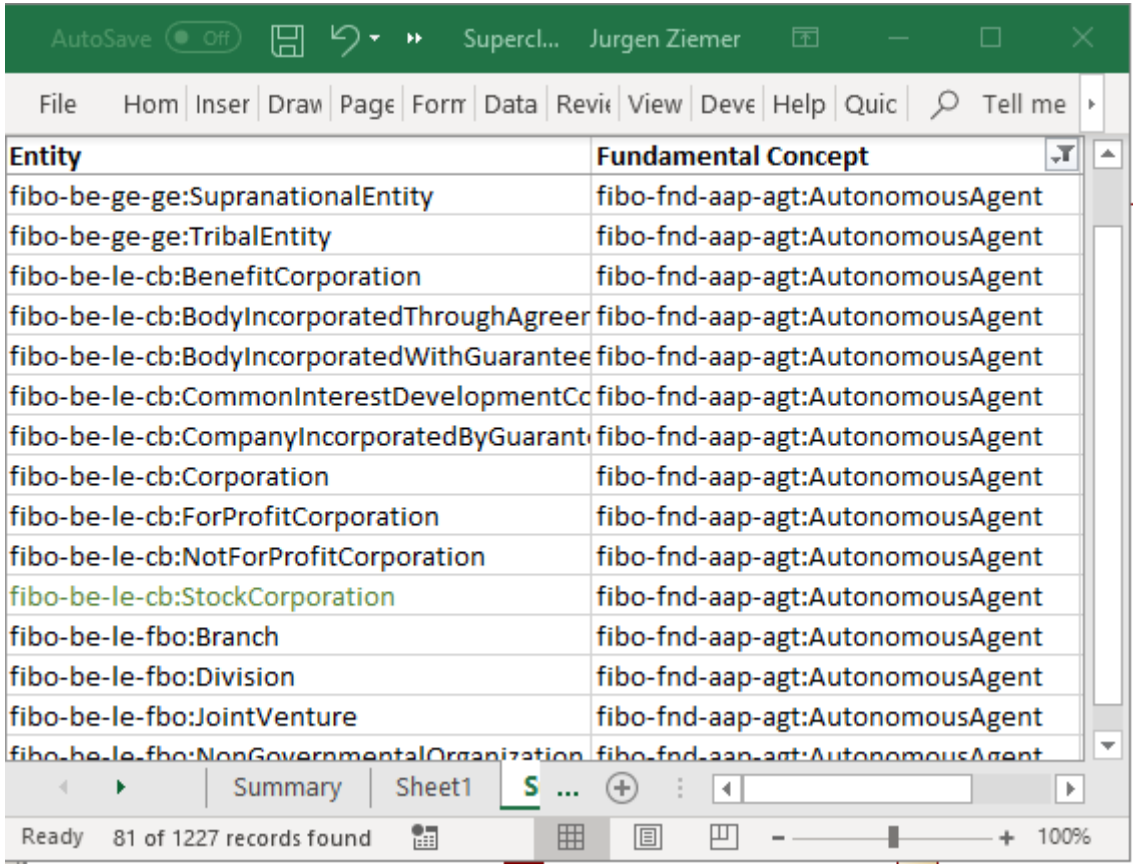
Identifying Entities and Concepts

We can use the modeling tool or the Supertype spreadsheet to research Concept Entities.

For example, to find an Entity for JPMC, the legal entity, we filter by the Fundamental Concept Autonomous Agent and find the Stoch Corporation.



Entity	Fundamental Concept
fibo-be-ge-ge:SupranationalEntity	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-ge-ge:TribalEntity	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:BenefitCorporation	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:BodyIncorporatedThroughAgreer	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:BodyIncorporatedWithGuarantee	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:CommonInterestDevelopmentCc	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:CompanyIncorporatedByGuarant	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:Corporation	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:ForProfitCorporation	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:NotForProfitCorporation	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-cb:StockCorporation	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-fbo:Branch	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-fbo:Division	fibo-fnd-aap-agt:AutonomousAgent
fibo-be-le-fbo:JointVenture	fibo-fnd-aap-agt:AutonomousAgent

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Creating the concept map diagram

FIB-DM has an Entity called *Legal Entity Identifi*er, an exact match for the LEI in the sample. Reference (REF) is the ultimate supertype of Legal Entity Identifier.

Likewise, we have an Entity named *Country* in FIB-DM. The country is a specialization of the fundamental concept of Location(LOC).

The FDIC Certificate Number is another direct match.

The FDIC Institution Directory is a business *Registry*. The entity Registry belongs to the Arrangement (ARR) concept.

The LEI identifies a Legal Entity. In our example, JPMC NA, a *Stock Corporation*, an entity in the FIB-DM. The stock corporation is a subtype of the Autonomous Agent (AA). The concept comprises of Person, Legal Person, Automated System, and Organization.

The FDIC insures and regulates financial institutions that take deposits. *Depository Institution* is an entity in the data model, rolling up to the fundamental concept of the Thing in Role (TIR). The TIR is what the Autonomous does.

The FDIC is the *Registration Authority* who issues the certificate number. The FDIC also has an identity as an Autonomous Agent, but we don't need that detail for our scope.

JPMC's capital is a *Monetary Amount*. The entity holds the number and more descriptive properties, such as the currency and date. Following the supertype hierarchy, we see that the Monetary Amount is a Reference.

The address fields in our schedule are a Registered Address, another subtype of Reference. The Reference functions like an associative entity with a role, linking Country to the Autonomous Agent.

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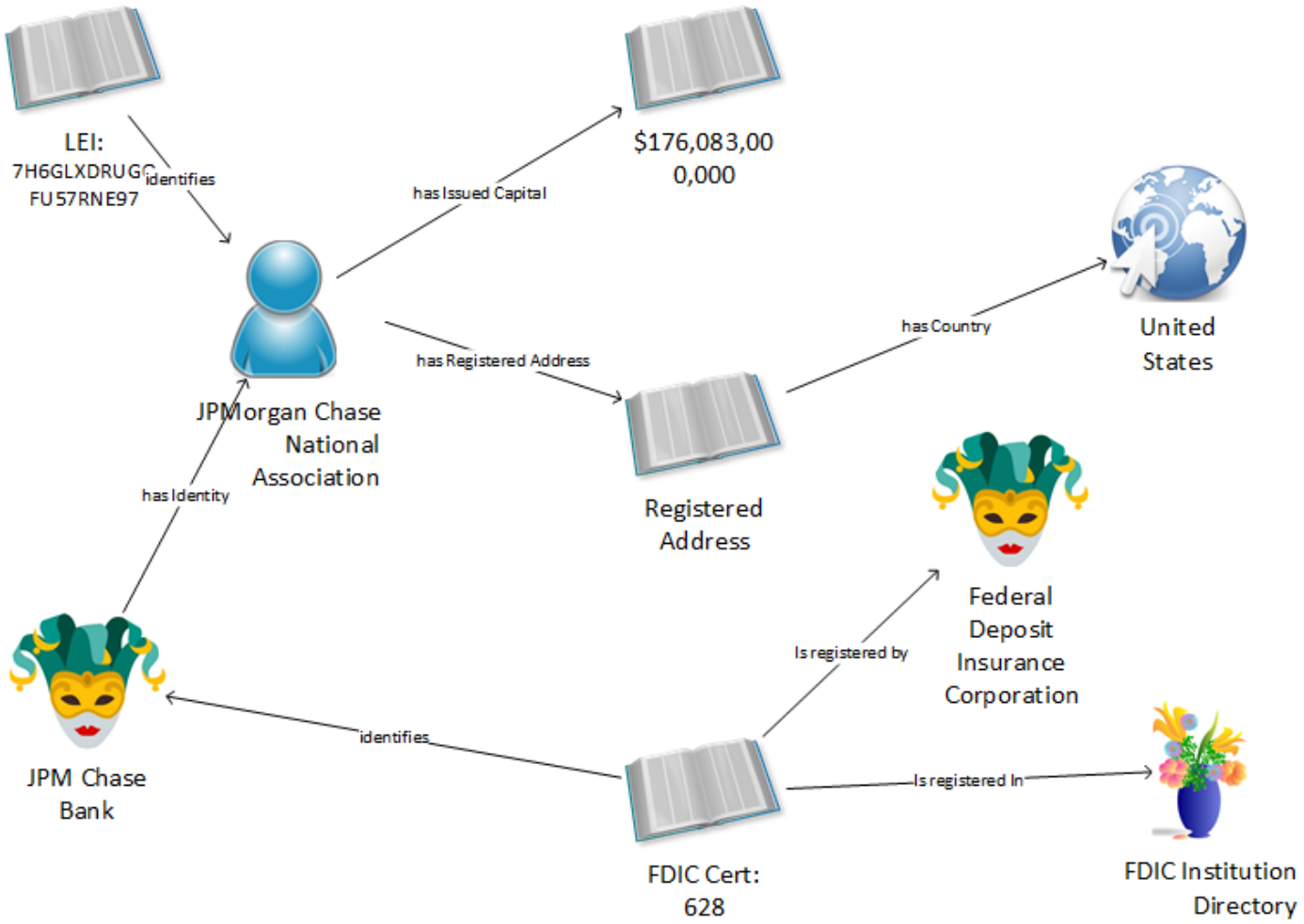
Our sample data as a concept map

A concept map or conceptual diagram is a diagram that depicts suggested relationships between concepts.

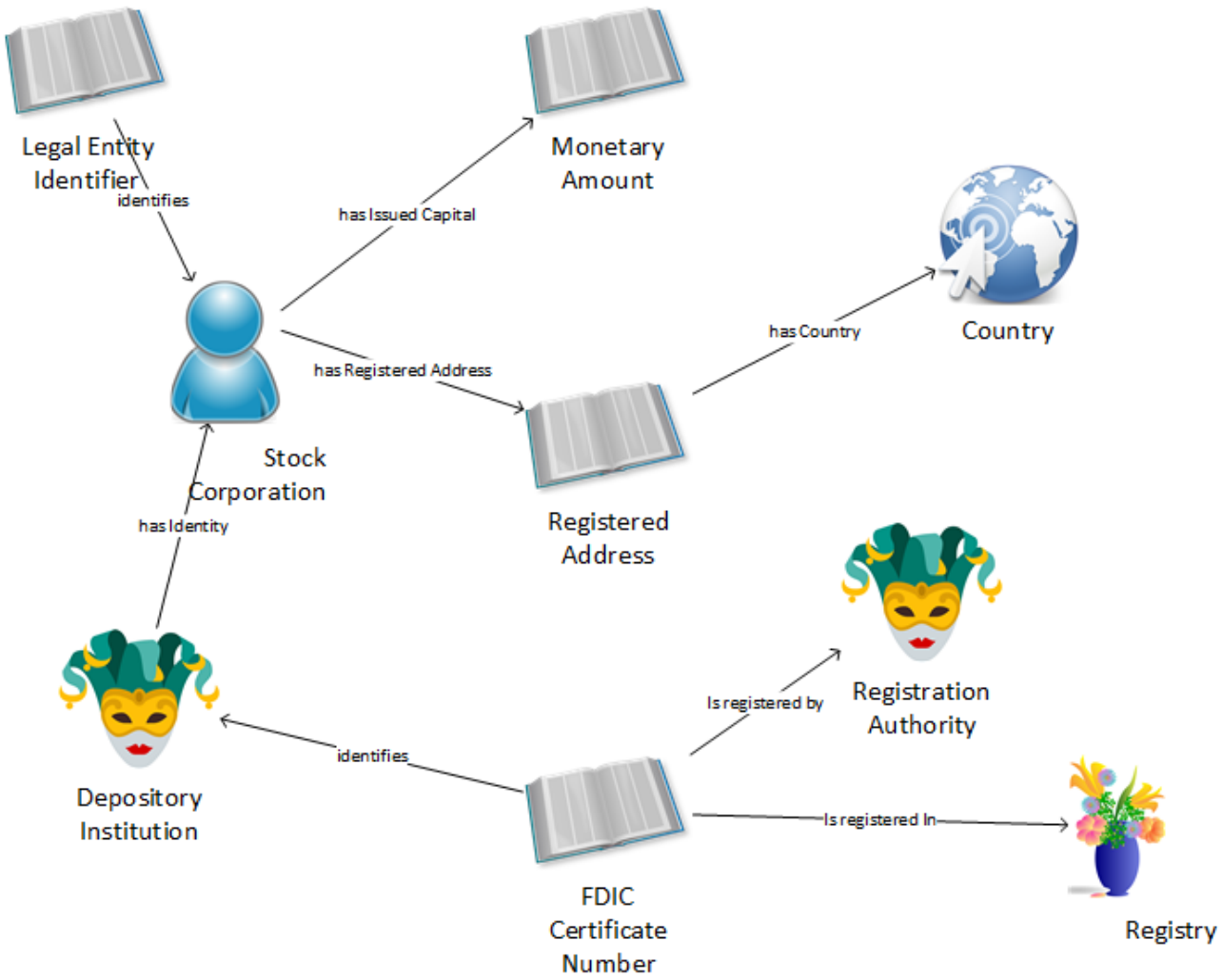
We replace the circles in our sample data diagram with shapes of the Fundamental Business Concepts.



Standardize concept map relations

Similary, we standardize relationships in our concept map. The data modeler suggests FIB-DM associations names that match the related concepts and requirements.

Finally, we replace the sample values with identified FIB-DM entities. Here is our Fundamental Business Concept map for the Call Report Entity Schedule.



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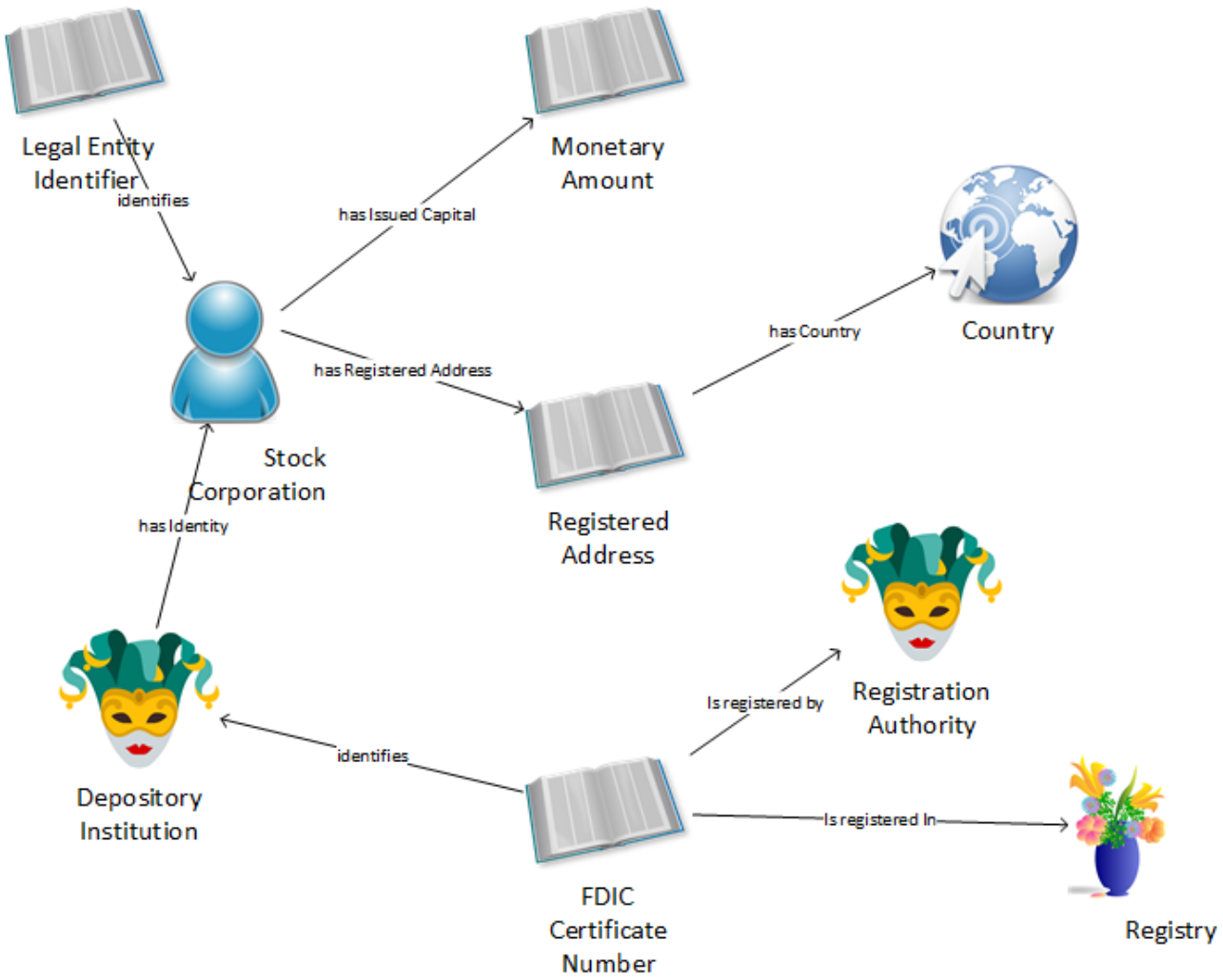
The FIB-DM Concept map

- Easy to understand for non-technical business users.
- The methodology keeps the concept-mapping within the vocabulary and structure of the underlying model.

We can see how the diagram expands.

- The Monetary Amount has additional defining concepts;
- JPMC is a Thing in many more Roles, so is the FDIC;
- we can add other Regulators to the picture, and so on.



From Concept Map to Data Model

1. Populate a new diagram with the identified entities
2. Add supertypes all the way up to the Fundamental Concept
3. Add Associations and Associative entities
4. Generate an LDM or export our FIB-DM subject area model

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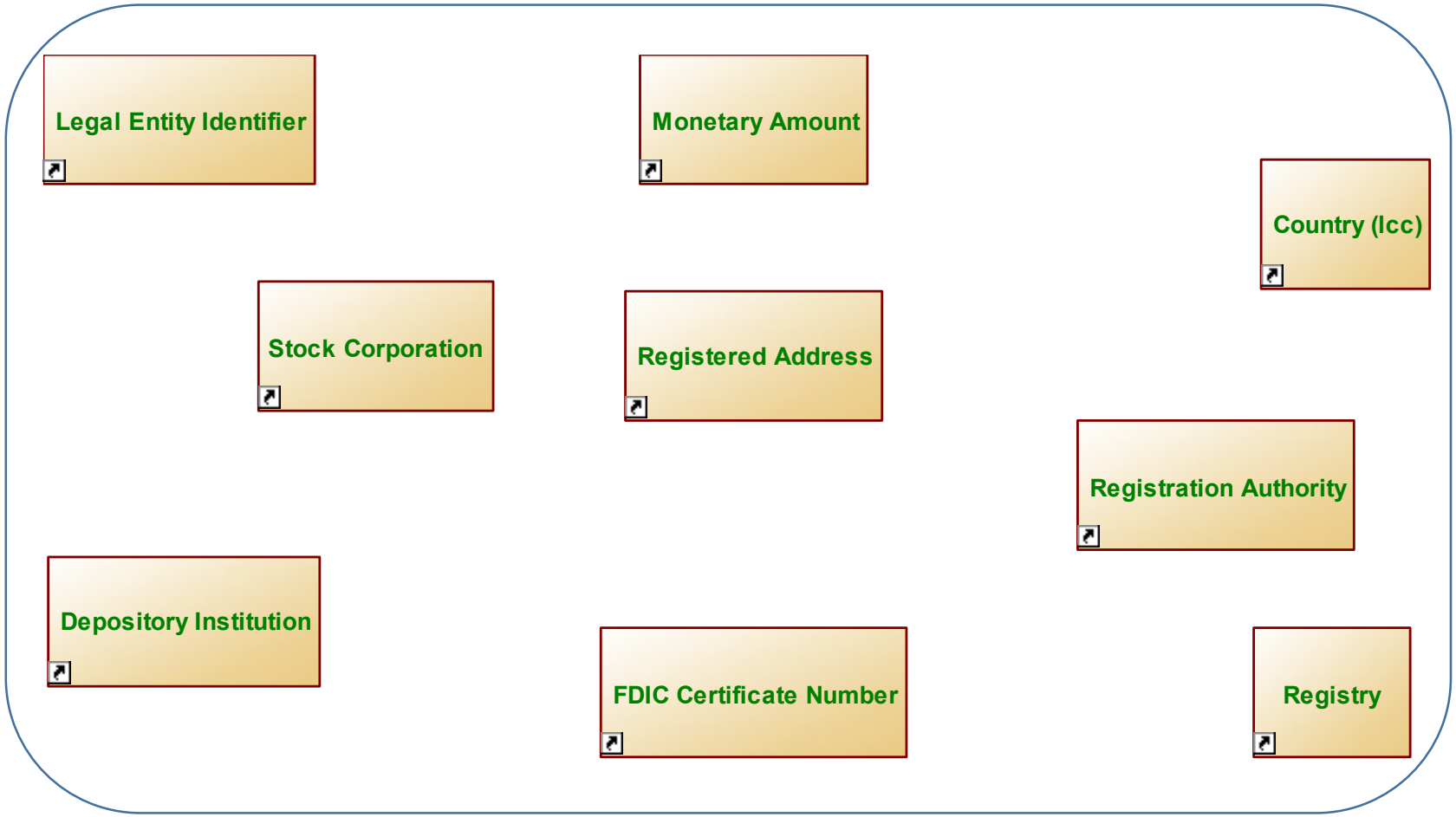
1. Create a new diagram of the nine entities

Open FIB-DM in your data modeling tool. The screenshots and diagrams in this education module are PowerDesigner.

Populate your diagram with the nine entities of the concept map. These are existing FIB-DM entities derived from FIBO classes.

In practice, you may draw the concept map and CDM in parallel. However you want to use the concept map to validate the design with the business.



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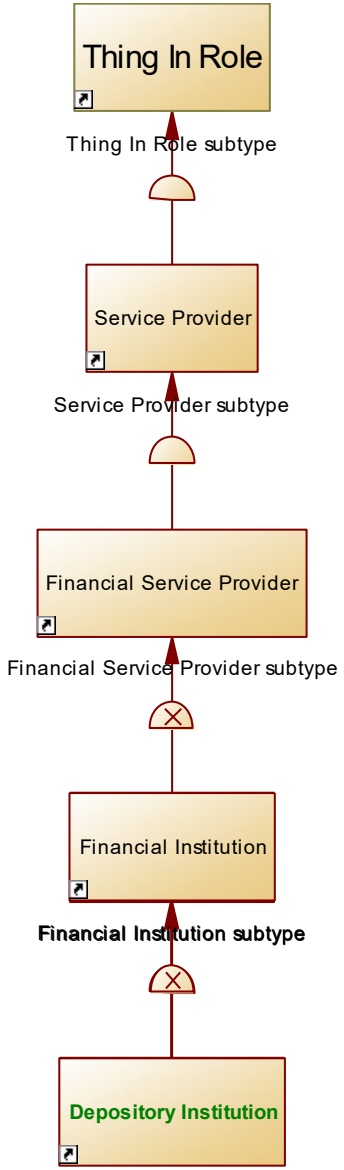
2.1 Adding Depository Institution supertypes to the diagram

2.3 We repeat the process until we arrive at the ultimate supertype, our Fundamental Concept, the Thing in Role.
The Depository Institution is a Financial Institution, which is a Financial Service Provider, which is a Service Provider, a direct subtype of the Thing.

2.2 In PowerDesigner this is a bit cumbersome: We pull up the entity properties dependencies tab; select parents to find Financial Institution subtypes; pull up the inheritance properties; find in the browser, and copy the inheritance as link into the diagram.

2.1 Let's start with the Depository Institution. We use the data modeling tool to navigate to the Inheritance (a.k.a. subtype symbol) and the supertype.



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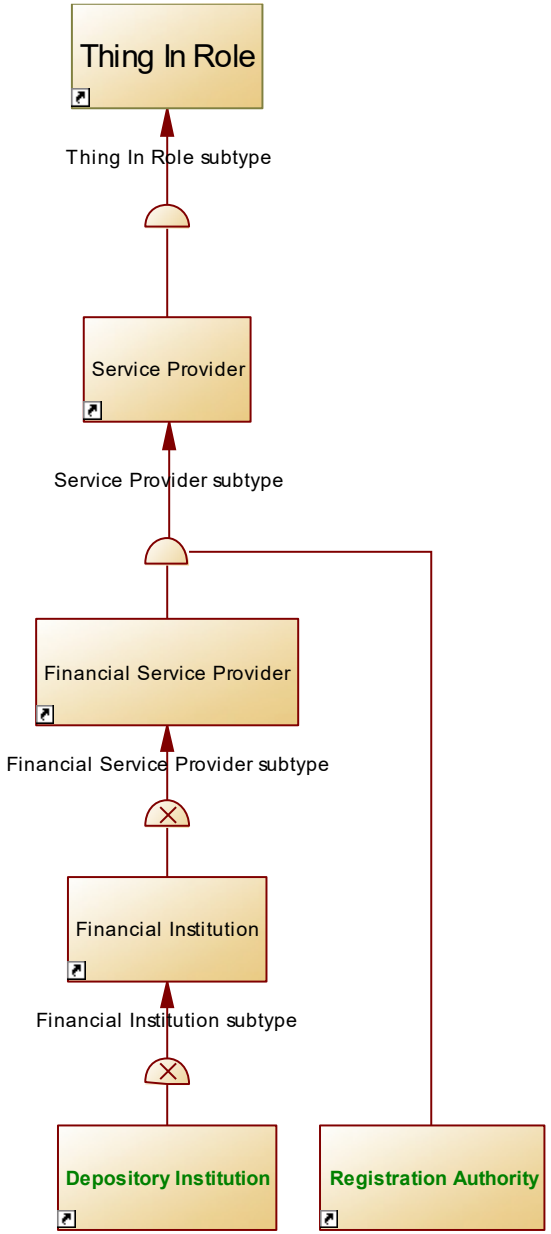
2.3 Adding the Registration Authority supertype

The Registration Authority, our entity for the FDIC and other registrars, is a Service Provider, subtype of the Thing in Role (TIR).



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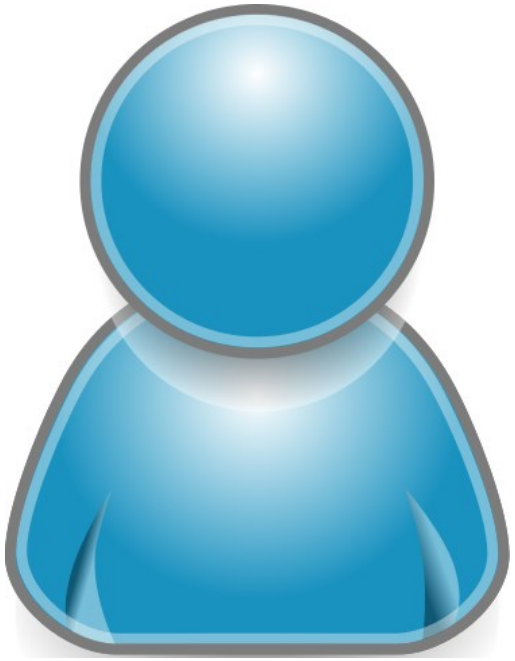
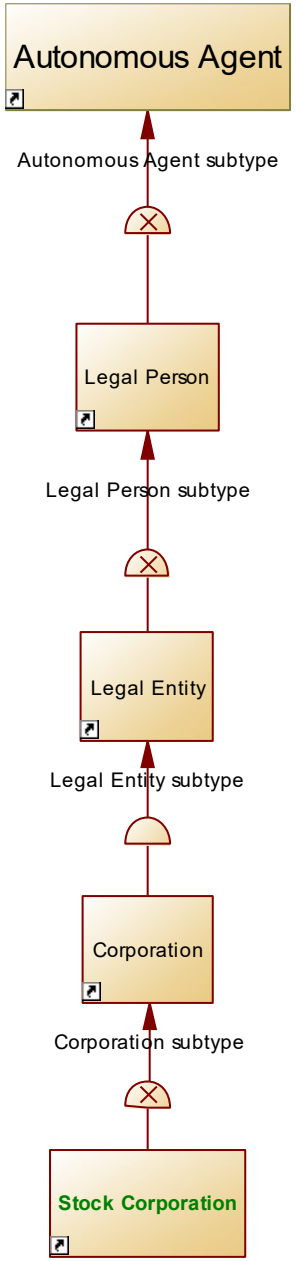
2.4 Stock Corporation rolls up to the Autonomous Agent



The Stock Corporation, our entity for JPMC's Legal Entity, is a Legal Person, a direct subtype of the Autonomous Agent (AA).



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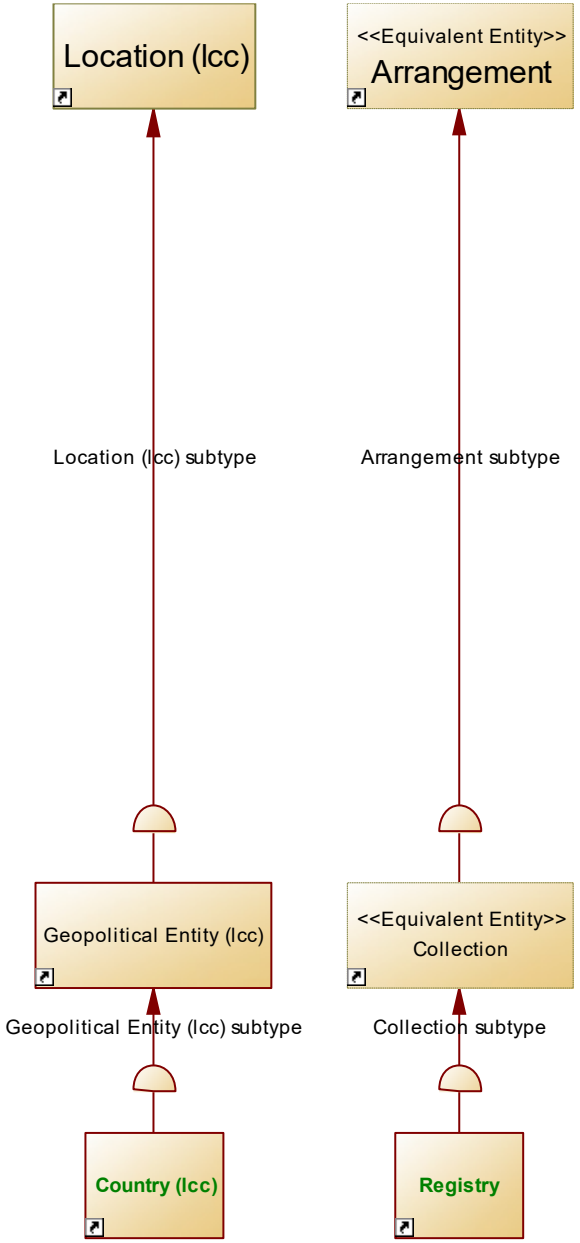
2.5 Country and Registry



The country is a Geopolitical Entity, subtype of the Fundamental Concept of Location (LOC). The Registry is a collection, a subtype of Arrangement (ARR).

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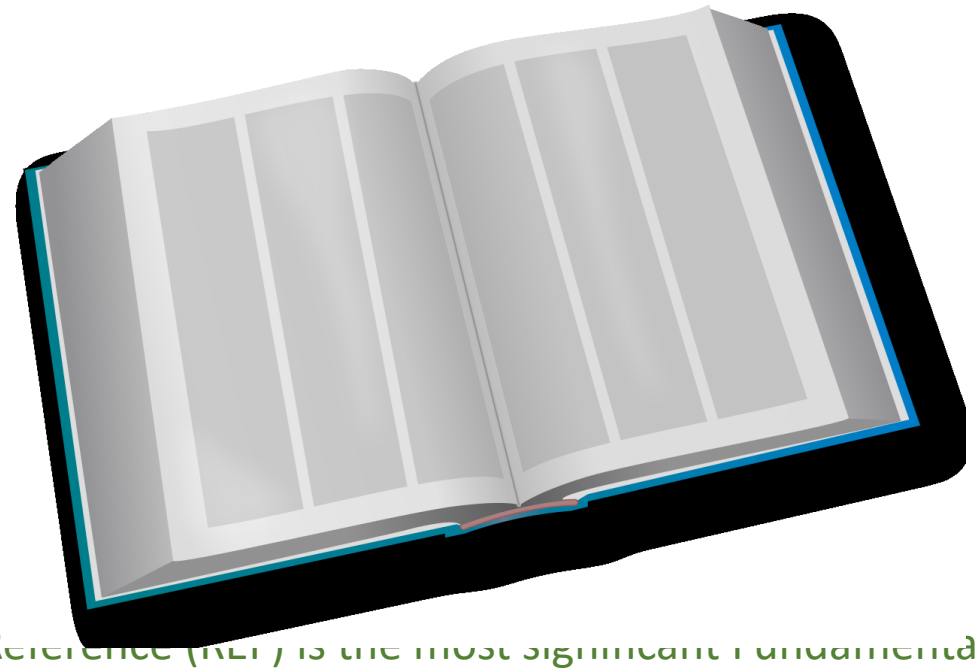
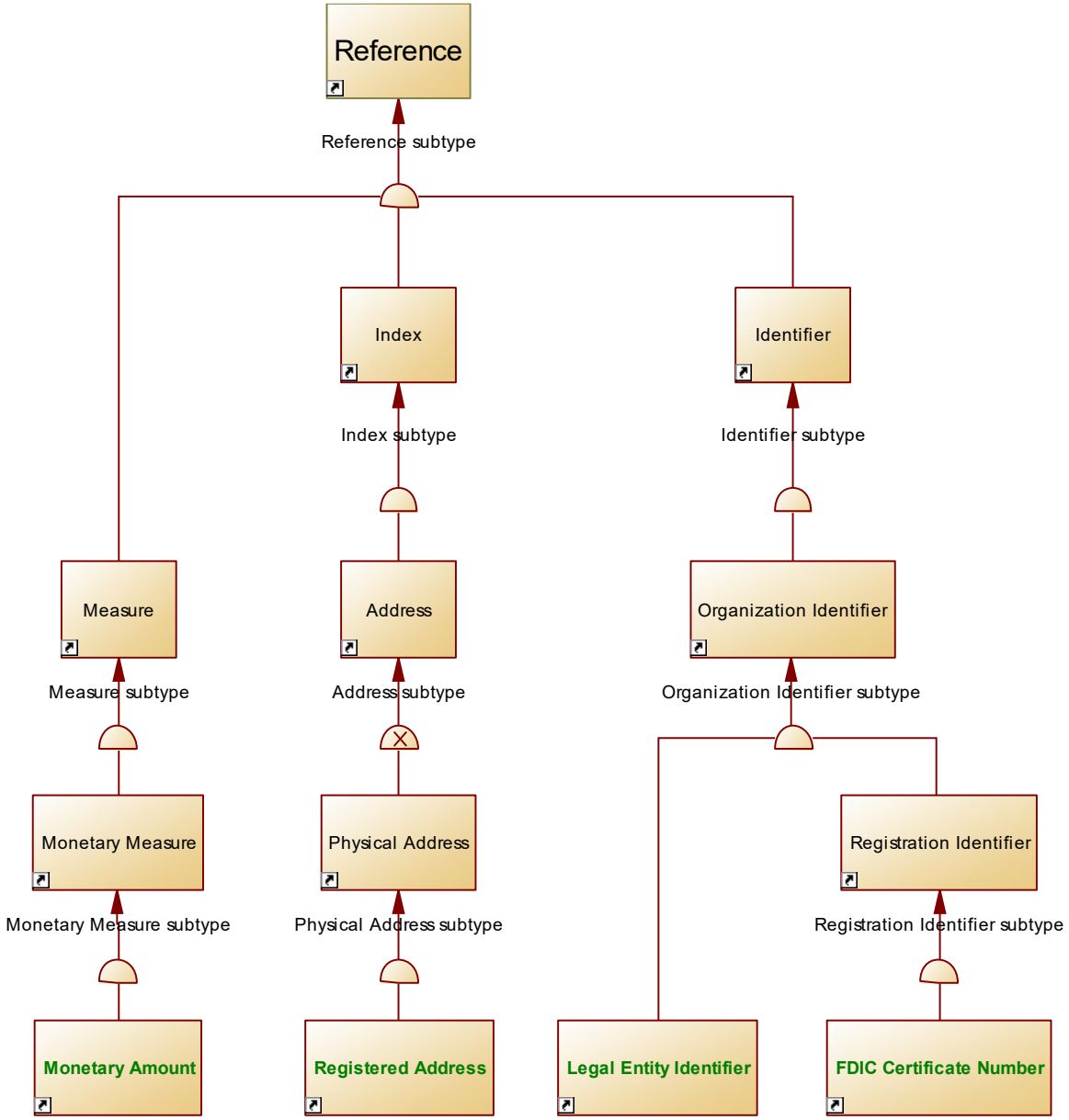
2.6 Reference subtypes



Reference (REF) is the most significant Fundamental Concept in FIB-DM and the FIBO. We see three major branches in the hierarchy.

1. The Monetary Amount is a Measure.
2. The Registered Address is an Address, which in turn is an index.
3. Legal Entity Identifier and the FDIC Certificate Number are both Organization Identifiers



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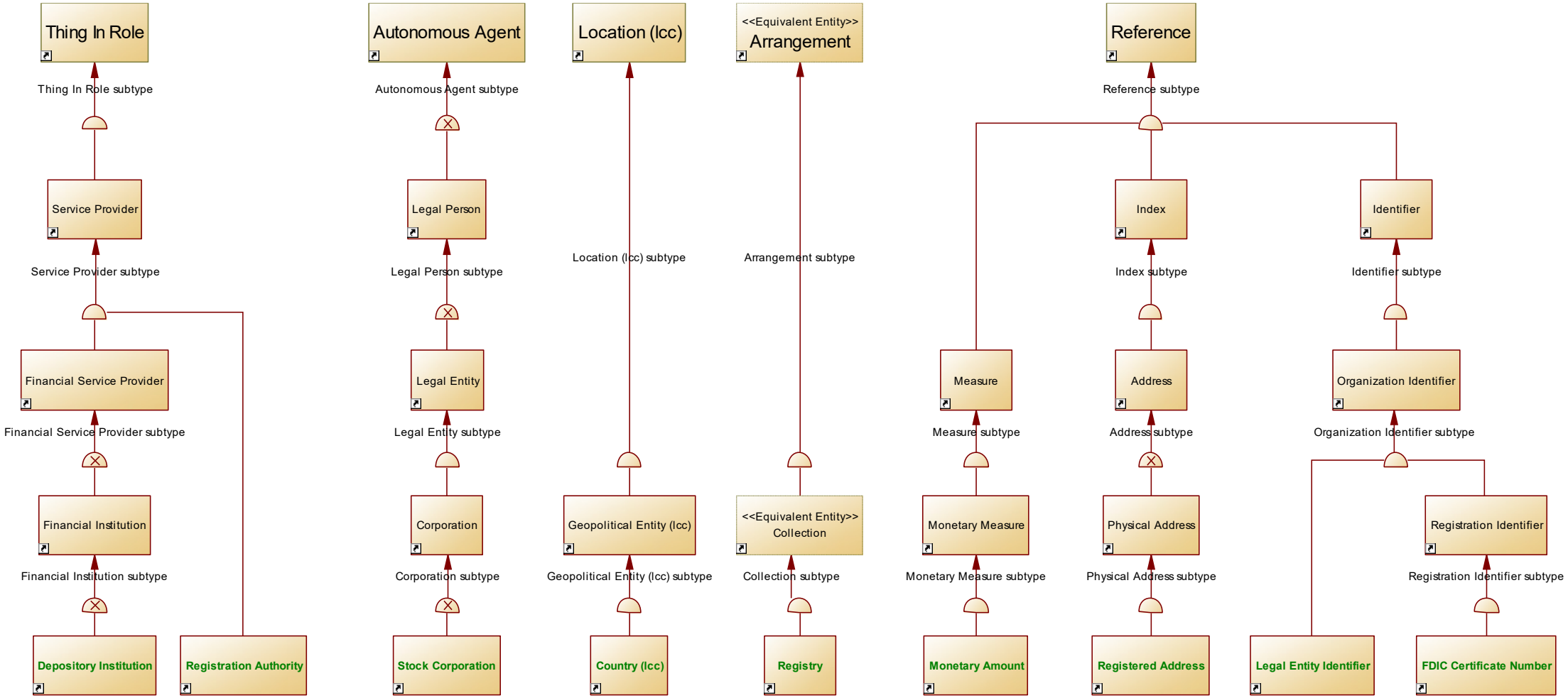
2.7 Our nine Entities and their five Fundamental Concepts.



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3.1 Adding Associations and Associative Entities.

The next step is to connect the entities adding the Association or Associative entity appropriate for the business context.

The Pivot table shows the 15 concepts and the number of participating relationships.

Count of Relationships	Business Concept																
Association Ultimate Supertype	AA	AC	AGR	ARR	CE	COM	DOC	LC	LOC	OCC	PRD	REF	SVC	TI	TIR		Grand Total
fibo-fnd-rel-rel:has		47	5	35	37	1	45	27	9	11	6		109		65	123	520
fibo-fnd-rel-rel:refersTo		7	3	14	73		6	7	5	5	15	3	113	1	3	30	285
fibo-fnd-rel-rel:comprises				16	35		21	4		2	12	2	55			14	161
fibo-fnd-rel-rel:provides			5	1				13	1			2	4	13		49	88
fibo-fnd-rel-rel:hasPart		9			7		4				12		15			3	50
fibo-fnd-rel-rel:governs		7		9			2	1	4	5	2		2			11	43
fibo-fnd-rel-rel:confers		2		12			7	1	18								40
fibo-fnd-rel-rel:holds		1		1	1			1								21	25
fibo-fnd-rel-rel:involves				1			1	1	8		3		1	1		1	17
fibo-fbc-fct-ra:isRegisteredBy				1									8			5	14
fibo-fbc-pas-fpas:relatesTo											8		2				10
Grand Total		73	13	90	153	1	86	55	45	23	58	7	309	15	68	257	1253

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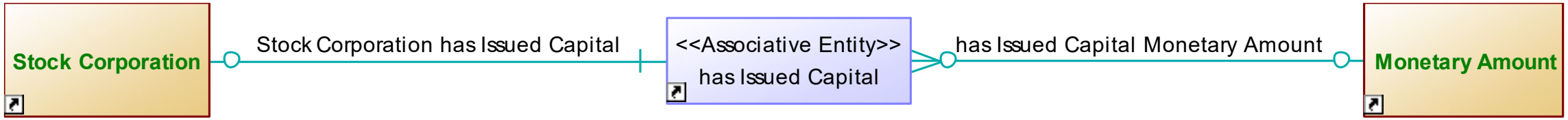
3.2 Finding the right association

The preferred association connects our scoped concept hierarchies at the leaf-level. In other words, the green entities of the concept map.

We use the modeling tool or the Relationships spreadsheet to investigate relationships of the Stock Corporation and find *has Issued Capital*.



A perfect match, the Associative entity has Issued Capital directly relates to the Monetary Amount.

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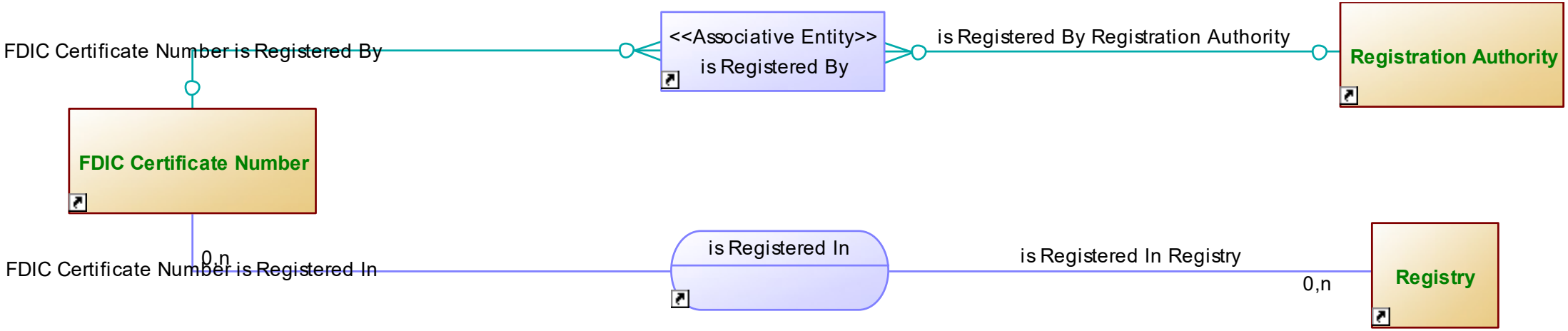
3.2 Associating the FDIC Certificate Number

Another easy match, the associative entity *is Registered By* has relationships to FDIC Certificate Number and the Registration Authority.



The Association *is Registered In* directly connects the FDIC Certificate Number to the Registry.

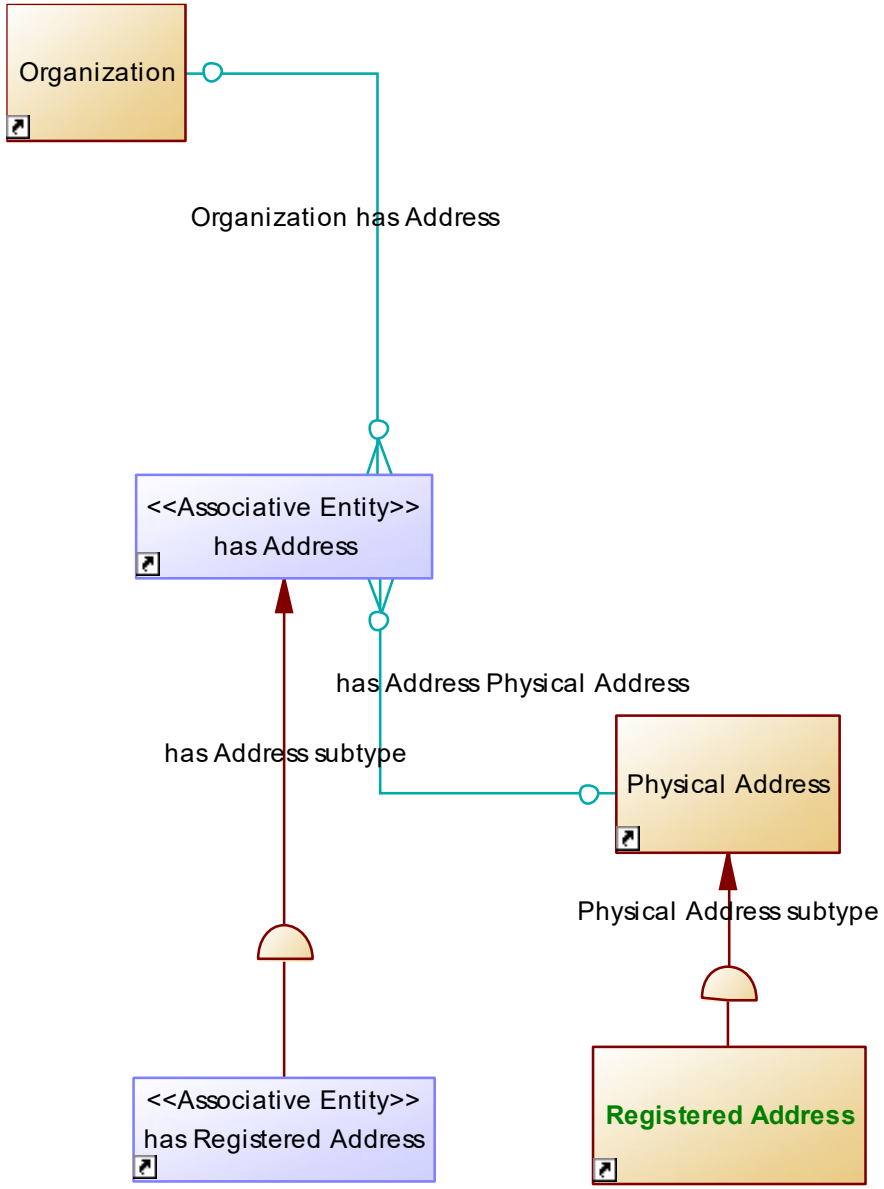
https://fib-dm.com © Jayzed Data Models Inc. 2019

3.3 Registered Address

The *Registered Address* has no matching relationship. So we investigate the supertype Physical Address and find *has Address*. The associative entity has a subtype *has Registered Address*. In other words, the FIBO/FIB-DM relates the entities at the supertype level.

The associative entity has Address relates to the Organization. We pull in the Organization entity.

Note: Organization and Legal Entity are both subtypes of Autonomous Agent. An Organization may incorporate several Legal Entities to facilitate its business. The association *identifies* the legal entities of an organization.



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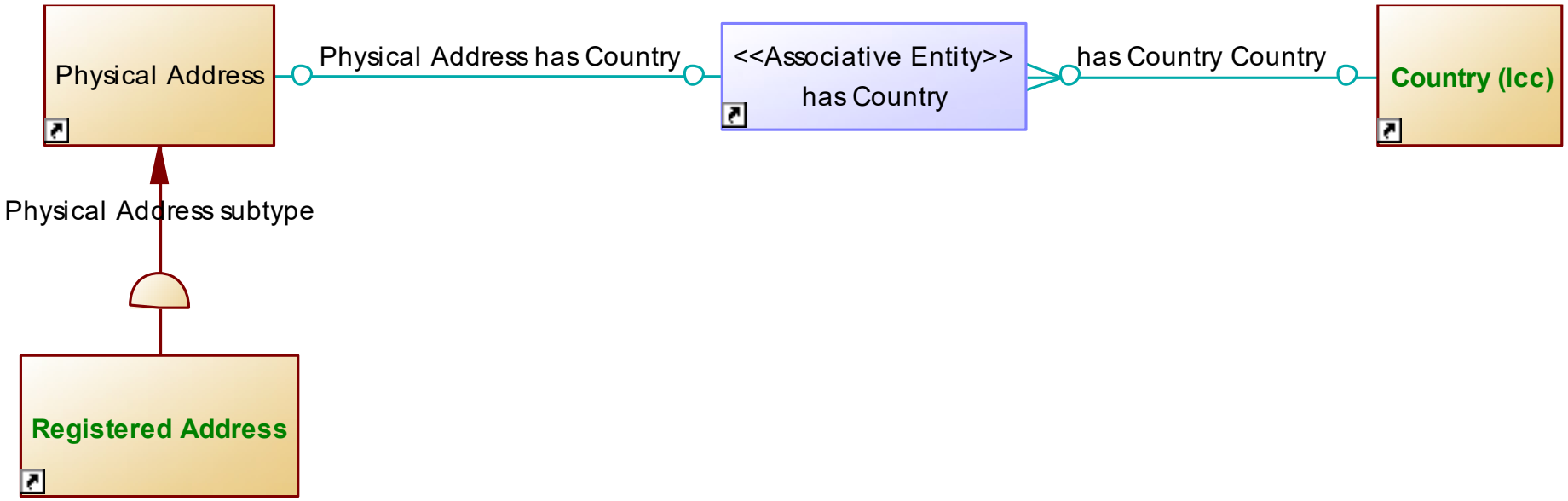
3.4 Registered Address to Country



The Associative Entity *has Country* does not have a relationship to Address. Under the ontology Open World Assumption anything can have a Country.

For the Closed World relational model, we create a relationship from has Country to Physical Address.

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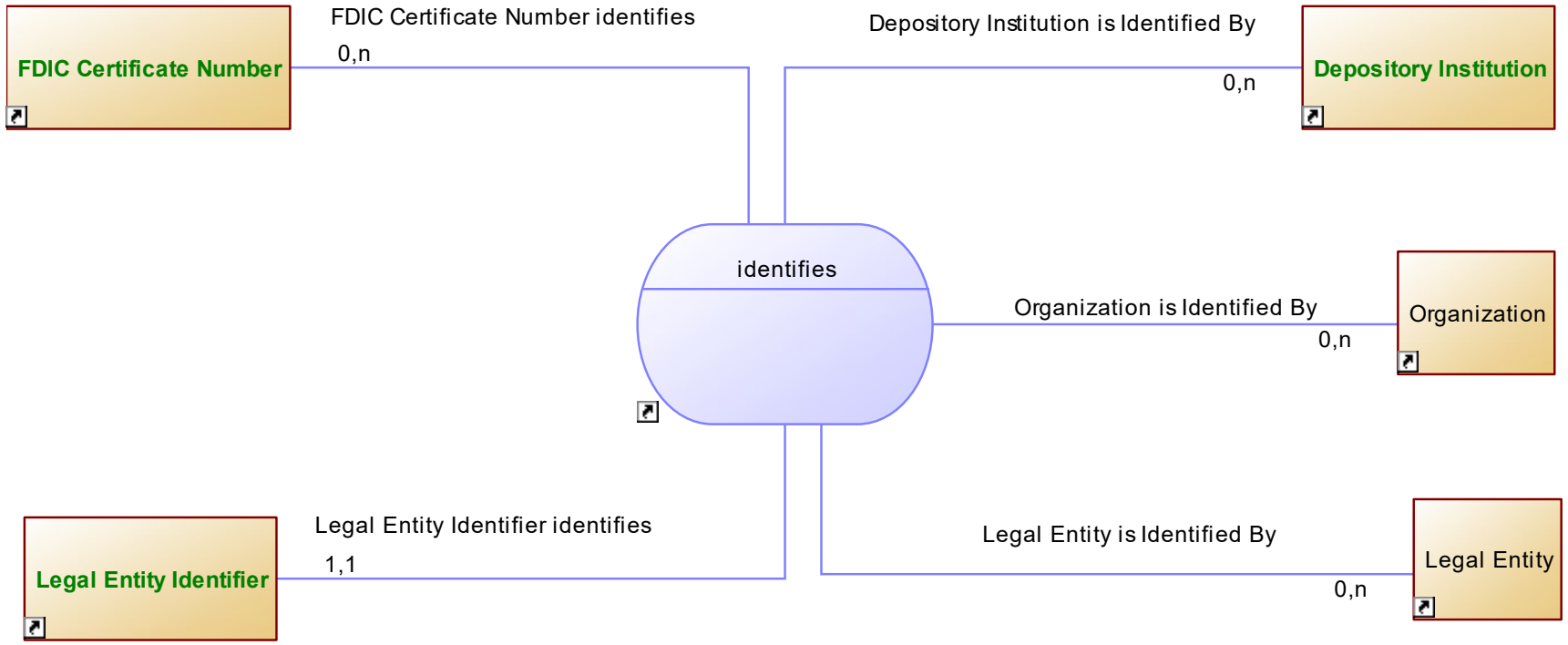
3.5 The *identifies* association completes the model

More than 350 base entities in FIB-DM have an association link to identifies. The association is a major design pattern relating the Fundamental Concepts.

- The FDIC Certificate Number identifies the Depository Institution.
- The Legal Entity Identifier identifies the Legal Entity.
- The Organization is identified by a Legal Entity.



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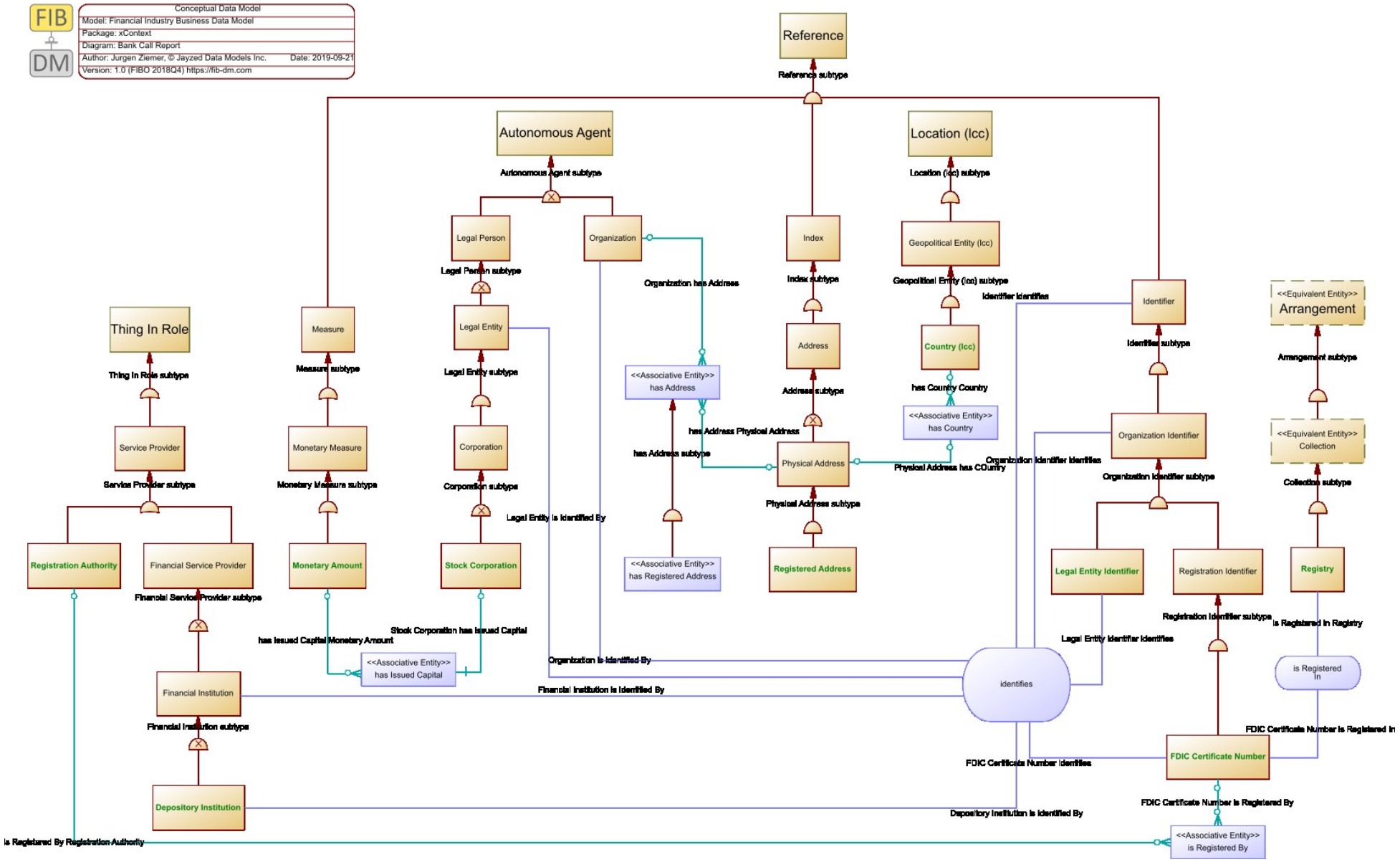
3.6 The complete Call Report conceptual data model



Data Architect

Discussion – do I really need all these entities?

The short answer is no. For a project model, it is perfectly fine to scope only the directly required green entities.

In practice, the following Logical Modeling phase attributes the model. The Logical Data Modeler looks at the full set of required data items and places them as attributes of the entities.

A simple rule:
You can remove any entity in the subtype hierarchy that does not have attributes or relationships.

The FIB-DM is a reference data model. For the data modeler, the Financial Industry Business Data Model provides a rich library of building blocks to accelerate the design process.

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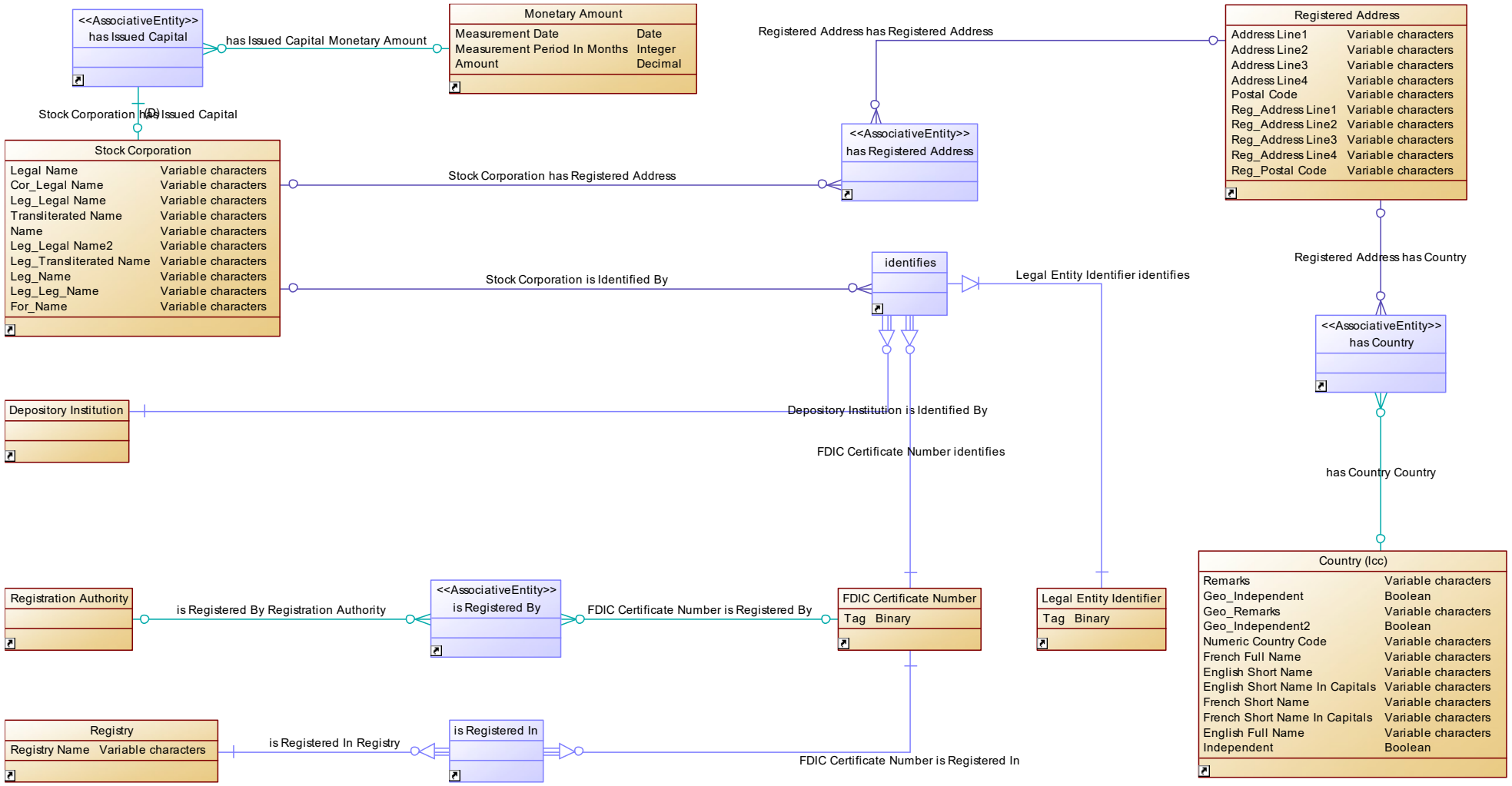
Sample Project Logical Data Model



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LDM denormalization and simplifications

In the sample diagram, the Logical Data Modeler scoped only the nine subtype entities identified in the concept map.
We moved the relationships from associative entities down to the subtype entity. E.g. the logical data modeler created a direct relationship from Stock Corporation to *has Registered Address*.

Next steps:
The modeler reviews the associative entities and those that are not many-to-many with direct relationships. For example, the Registered Address has only one country; we can create a direct has Country relationship from Country to Registered Address.

The multiple-associative entity *identifies* can be resolved into direct relationships between Legal Entity Identifier and Stock Corporation and FDIC Certificate Number and Depository Institution.

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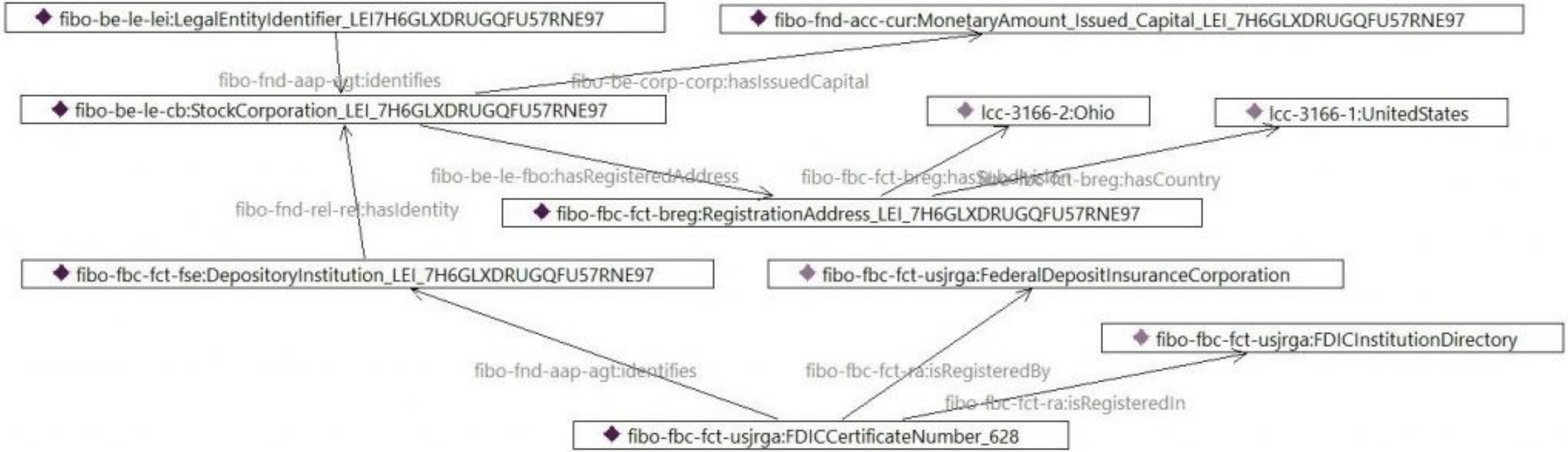
Excursus: Scoping an operational ontology

The 15 Fundamental Business Concepts apply to both the Financial Industry Business Ontology and Data Model. We use the same methodology to create a concept map. With the concept map we can quickly scope a subset of the FIBO to hold the regulatory reference data. The Call Report presentation and the Semantic Compliance article on the Bank Ontology website show the instance graph below.



We recognize the very same design pattern as in the sample data concept map.

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FIB Core DM

open source initiative®

FIBO
Financial Industry Business Ontology

in

SAP POWERDESIGNER

(and other data modeling tools)

https://fib-dm.com/data-model-download/

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