Financial Industry Business Data Model (FIB-DM)

Scoping our first data model from FIB-DM

Education Module

UPDATED for OMG Commons

The Bank Call Report example, using Concept Maps.

An introduction course into the ontology-derived Enterprise Data Model.

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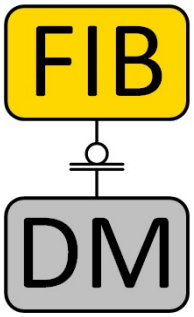
Audience and content

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 eight 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 it to the ontology graph

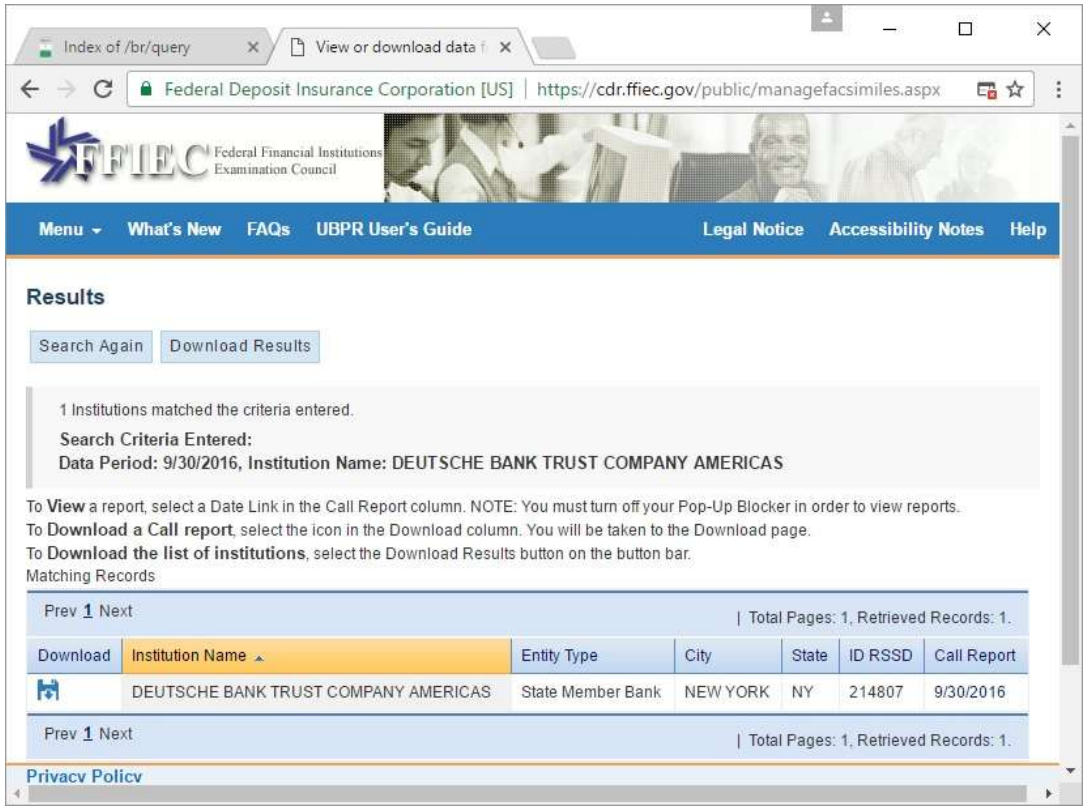
Data Architect

US Bank Call Report

The Federal Deposit Insurance Corporation is a regulator of U.S. banks.

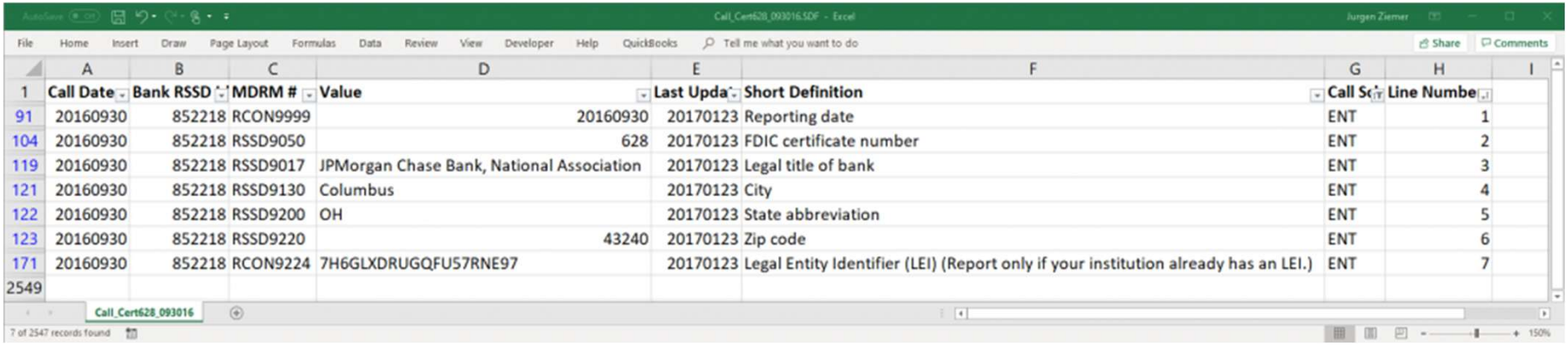
One of the key reports required for filing is the quarterly Consolidated Report of Condition and Income, commonly referred to as the call report or RC report.

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 Entity Schedule (ENT) contains reference data for 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.



	A	B	C	D	E	F	G	H	I
1	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	
2549									

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

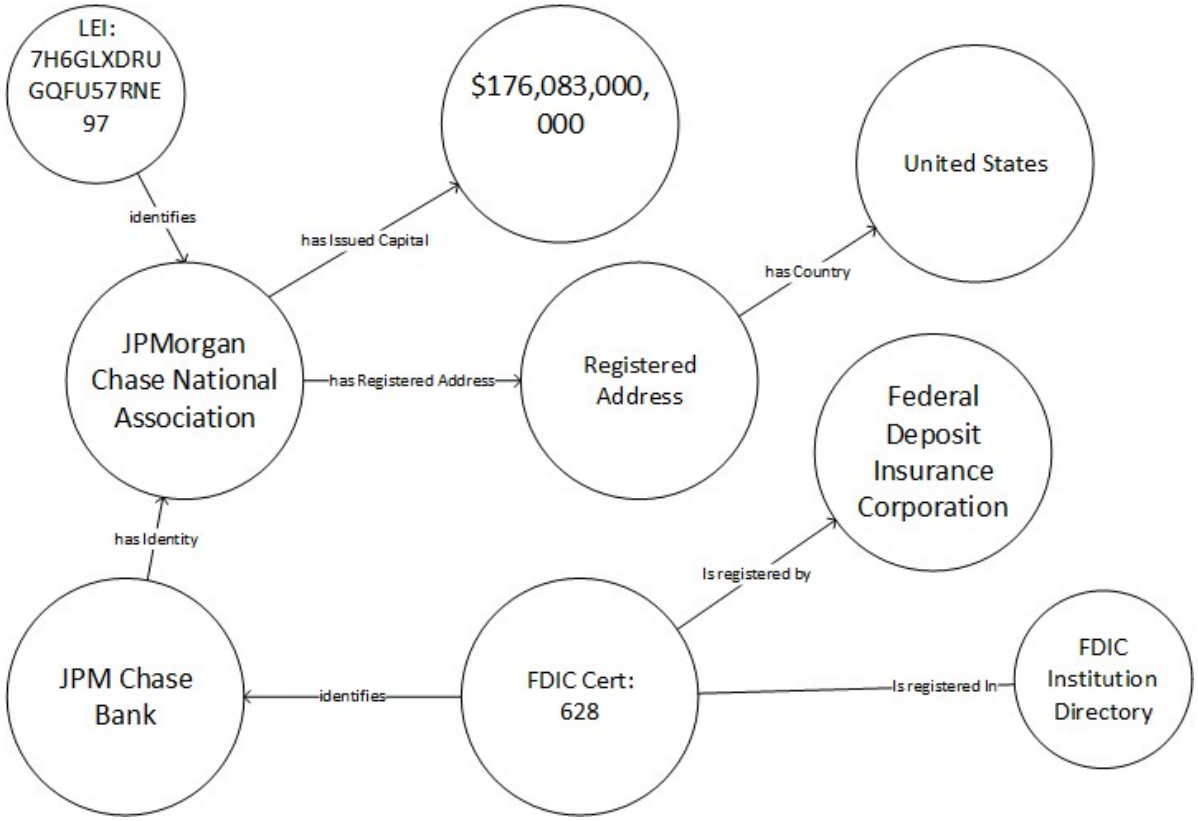
A simple diagram of our sample data

FDIC Certificate 628 identifies JPM Chase as a registered bank. The Certificate is registered in the FDIC Institution Directory.

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

The Legal Entity has a registered address in the US.

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



Data Architect

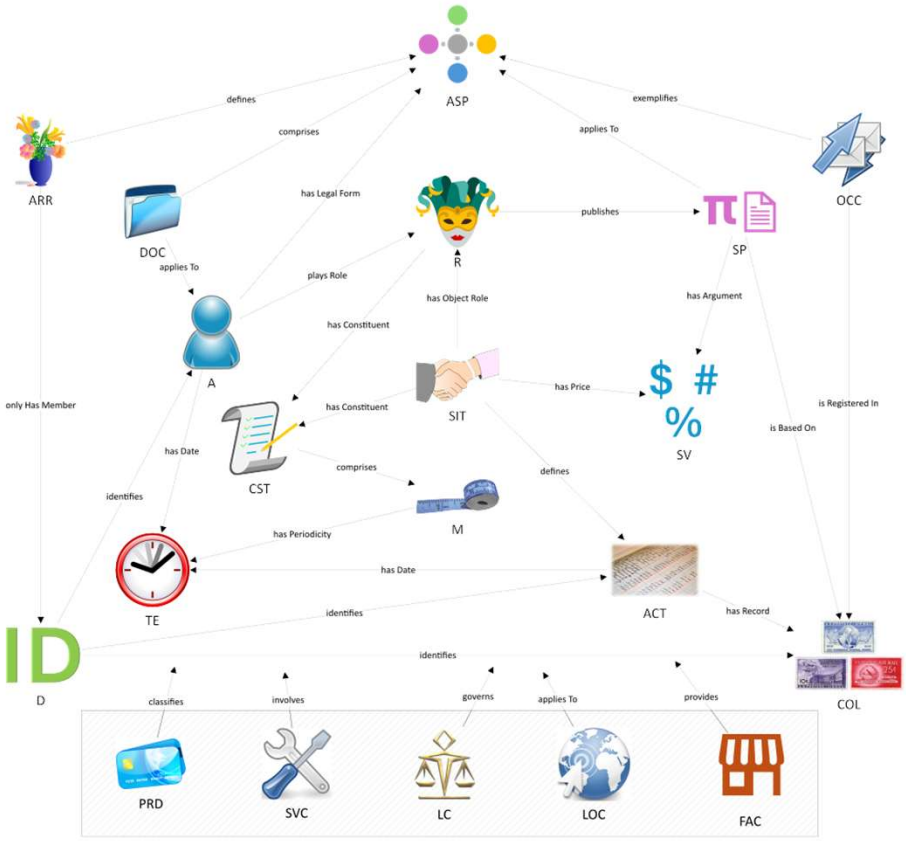
15 Fundamental Business Concepts

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

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

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

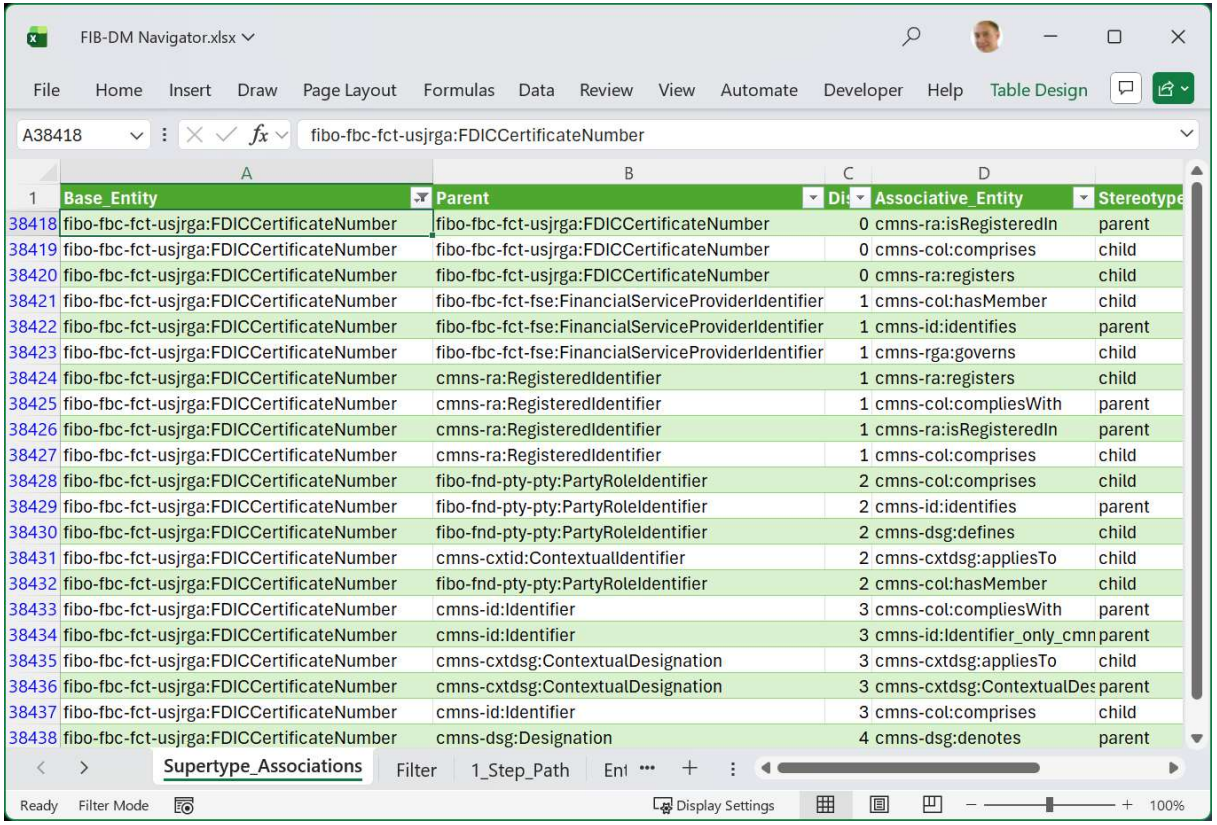
We use abbreviations and icons as mnemonics to teach the concepts to modelers and business users.



Identifying Entities and Concepts

We can use the modelling tool or MS Excel to research Concept Entities.

In this example, we look for supertypes of the FDIC Certificate and their Associations



	Base_Entity	Parent	Di	Associative_Entity	Stereotype
38418	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-usjrga:FDICCertificateNumber	0	cmns-ra:isRegisteredIn	parent
38419	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-usjrga:FDICCertificateNumber	0	cmns-col:comprises	child
38420	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-usjrga:FDICCertificateNumber	0	cmns-ra:registers	child
38421	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-fse:FinancialServiceProviderIdentifier	1	cmns-col:hasMember	child
38422	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-fse:FinancialServiceProviderIdentifier	1	cmns-id:identifies	parent
38423	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fbc-fct-fse:FinancialServiceProviderIdentifier	1	cmns-rga:governs	child
38424	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-ra:RegisteredIdentifier	1	cmns-ra:registers	child
38425	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-ra:RegisteredIdentifier	1	cmns-col:compliesWith	parent
38426	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-ra:RegisteredIdentifier	1	cmns-ra:isRegisteredIn	parent
38427	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-ra:RegisteredIdentifier	1	cmns-col:comprises	child
38428	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fnd-pty-pty:PartyRoleIdentifier	2	cmns-col:comprises	child
38429	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fnd-pty-pty:PartyRoleIdentifier	2	cmns-id:identifies	parent
38430	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fnd-pty-pty:PartyRoleIdentifier	2	cmns-dsg:defines	child
38431	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-cxtid:ContextualIdentifier	2	cmns-cxtdsg:appliesTo	child
38432	fibo-fbc-fct-usjrga:FDICCertificateNumber	fibo-fnd-pty-pty:PartyRoleIdentifier	2	cmns-col:hasMember	child
38433	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-id:Identifier	3	cmns-col:compliesWith	parent
38434	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-id:Identifier	3	cmns-id:Identifier_only_cmn	parent
38435	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-cxtdsg:ContextualDesignation	3	cmns-cxtdsg:appliesTo	child
38436	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-cxtdsg:ContextualDesignation	3	cmns-cxtdsg:ContextualDes	parent
38437	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-id:Identifier	3	cmns-col:comprises	child
38438	fibo-fbc-fct-usjrga:FDICCertificateNumber	cmns-dsg:Designation	4	cmns-dsg:denotes	parent

Data Architect

Creating the concept map diagram

FIB-DM has a *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 Region/Location(LOC).

The FDIC Certificate Number is another direct match.

The FDIC Institution Directory is a *Registry*. The entity Registry belongs to the Collection concept.

The LEI identifies a Legal Person. In our example, JPMC NA, a *Stock Corporation*, is an entity in the FIB-DM. The stock corporation is a subtype of the Agent (A). The concept comprises 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 Role (R).

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

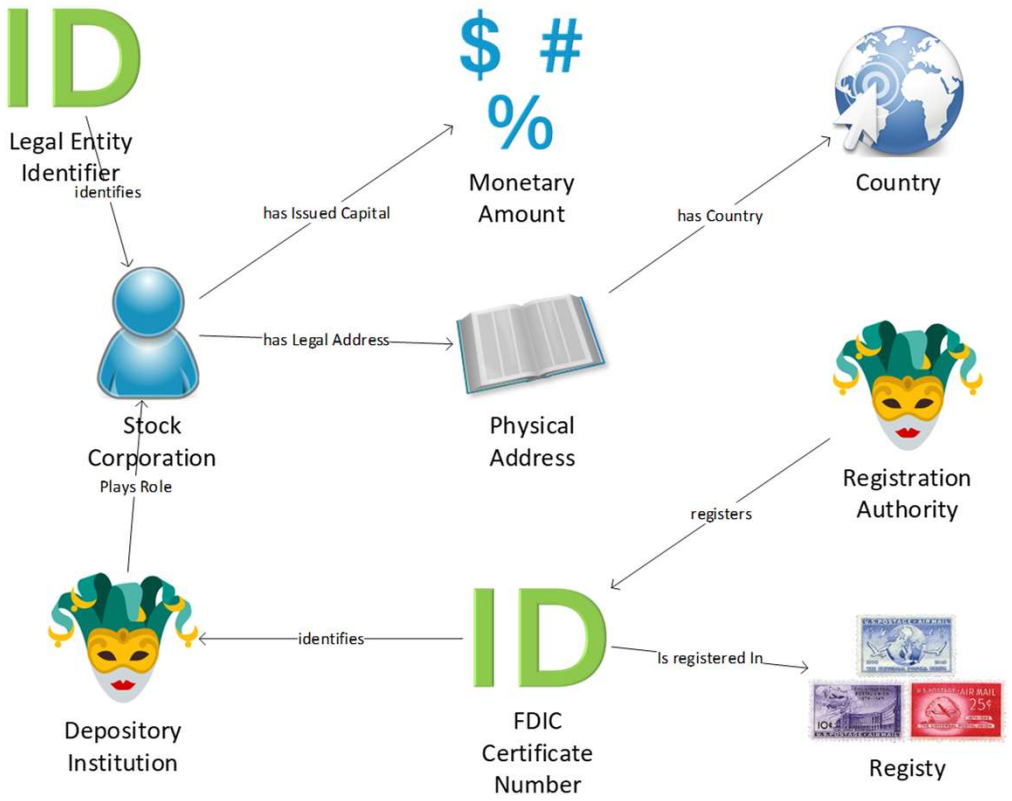
JPMC's capital is a *Balance, a subtype of Monetarey Amout*. The entity holds the number and more descriptive properties, such as the currency and date. Following the supertype hierarchy we see that Monetary Amount is a Scalar Quantity Value.

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.

Our sample data as a concept map

A concept map, or conceptual diagram, depicts suggested relationships among concepts.

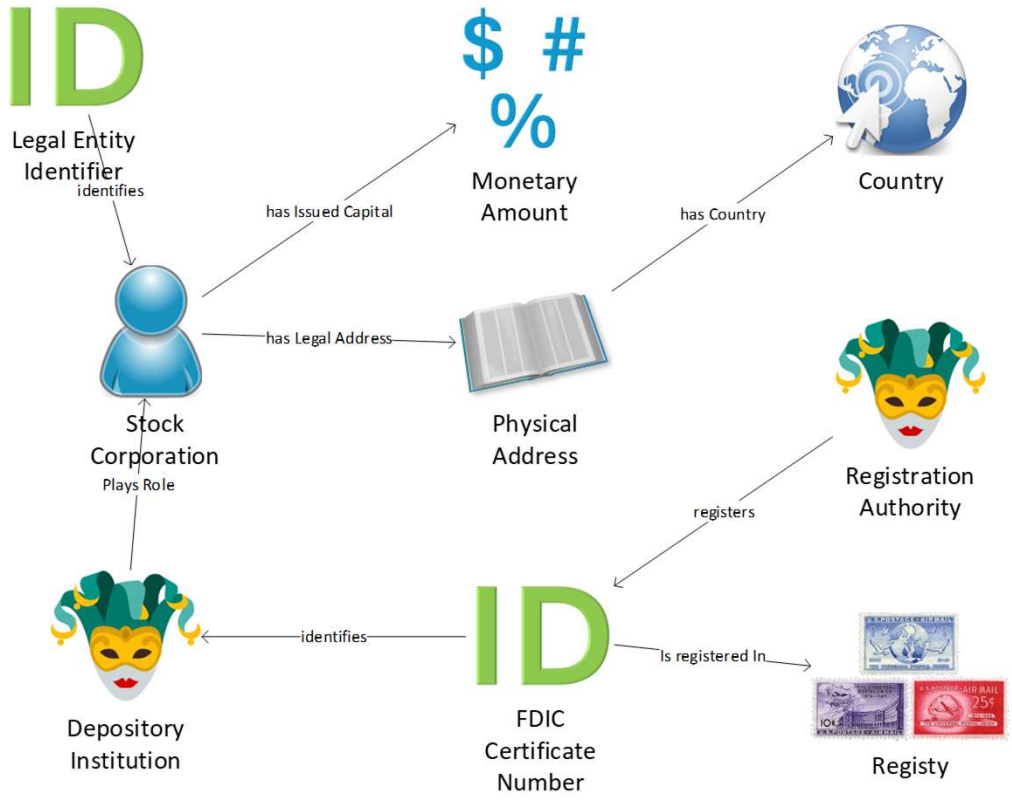
We replace the circles in our sample data diagram with shapes of the Fundamental Business Concepts.



Standardize concept map relations

Similarly, we standardize relationships in our concept map. The data modeler suggests FIB-DM association 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.

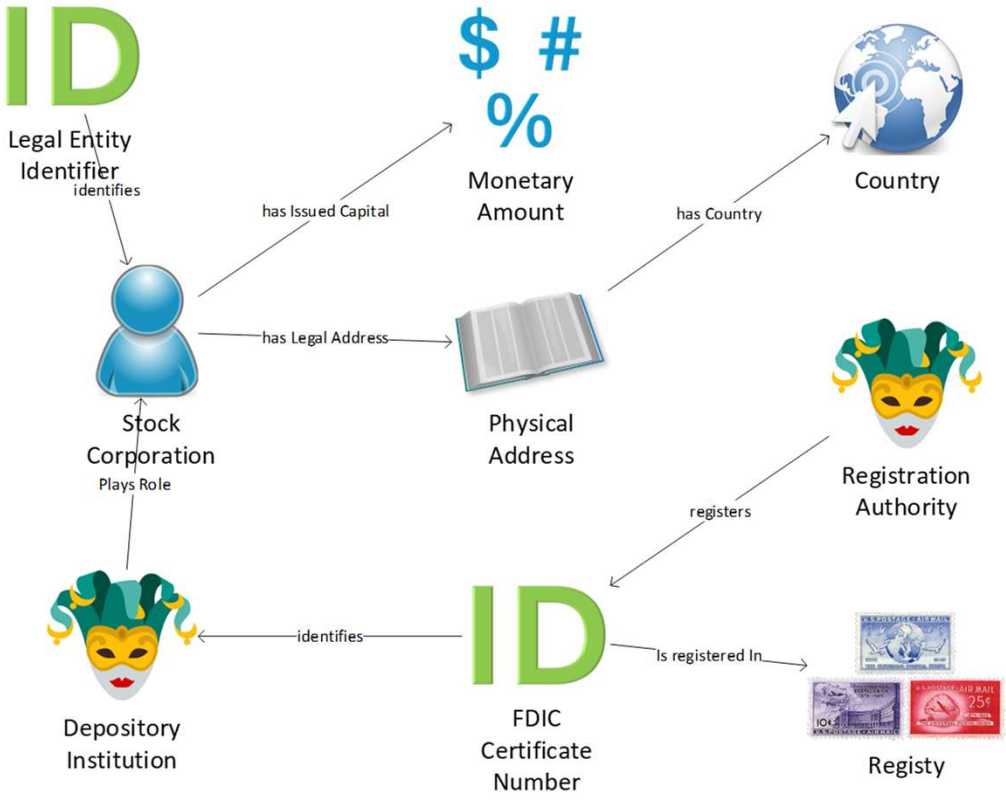


The FIB-DM Concept map

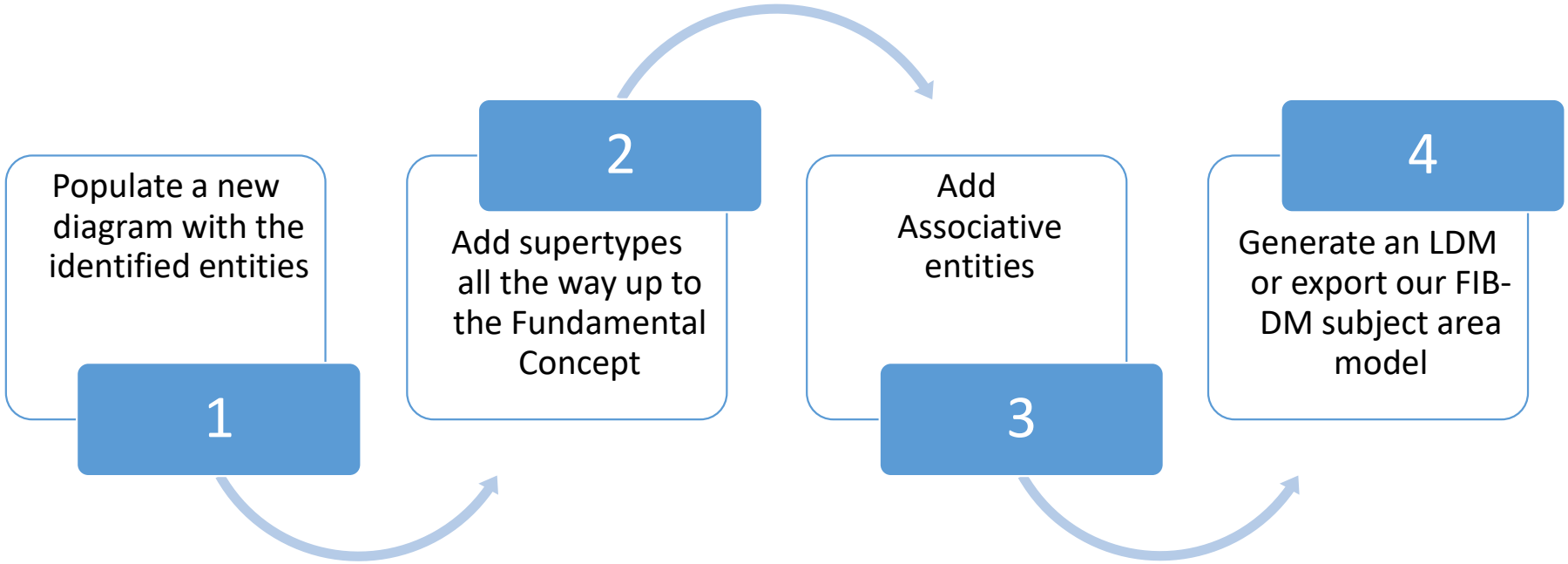
- Easy to understand for non-technical business users.
- The methodology keeps the concept-mapping within the vocabulary and structure of the underlying model.

We can see how the diagram expands.

- The Monetary Amount has more 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

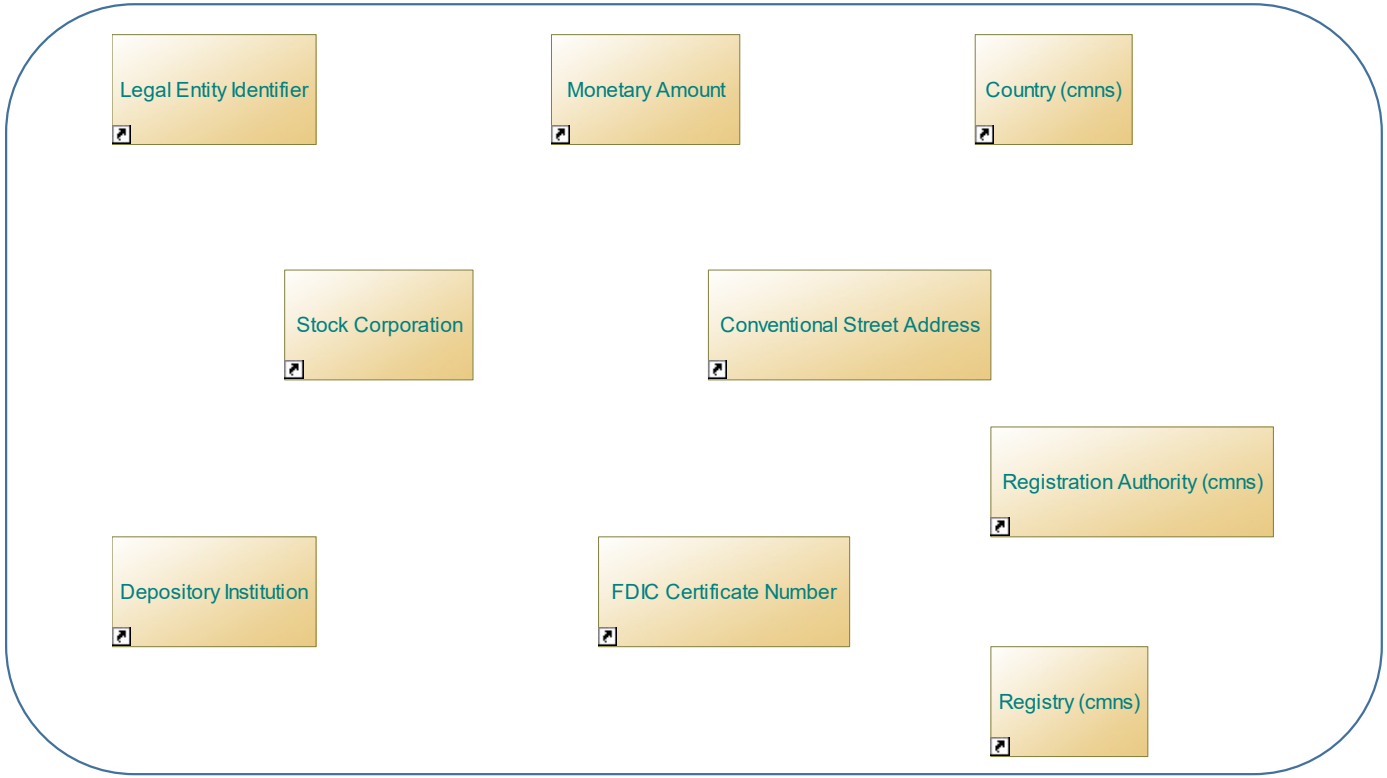


1. Create a new diagram of the nine entities

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.

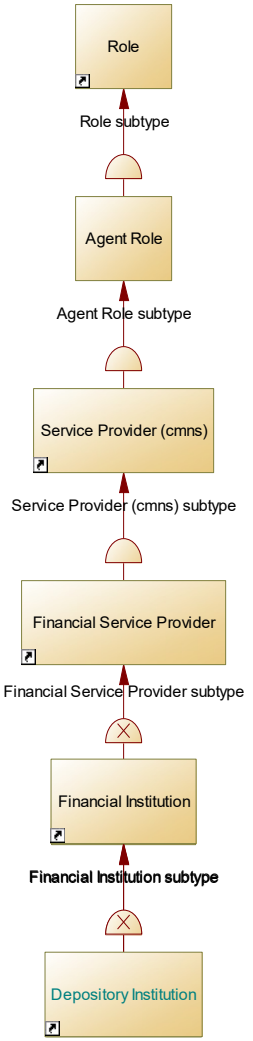


2.1 Adding Depository Institution supertypes to the diagram

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.

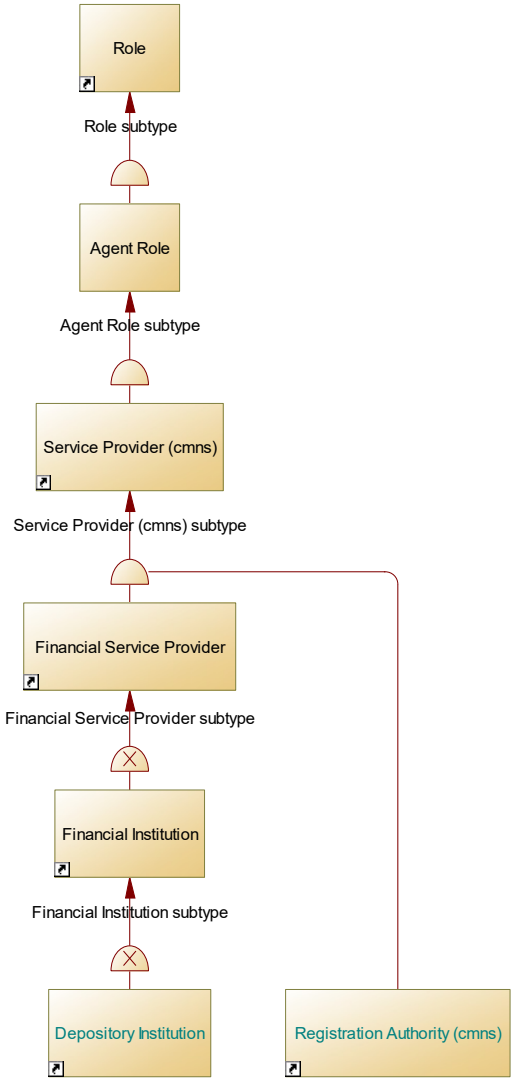
In PowerDesigner, this is a bit cumbersome: we open the entity properties dependencies tab, select the parents to find the Financial Institution subtypes, open the inheritance properties, find the inheritance in the browser, and copy the inheritance as a link into the diagram.

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

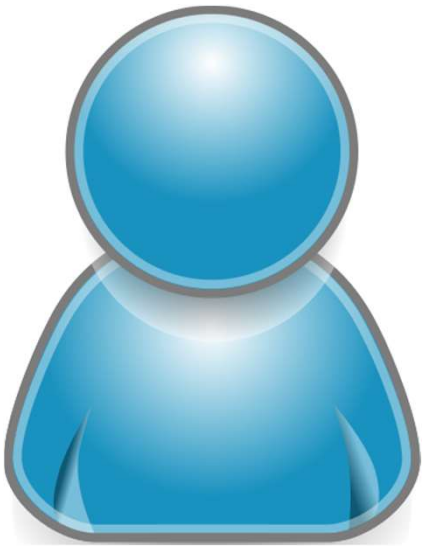


2.2 Adding the Registration Authority supertype

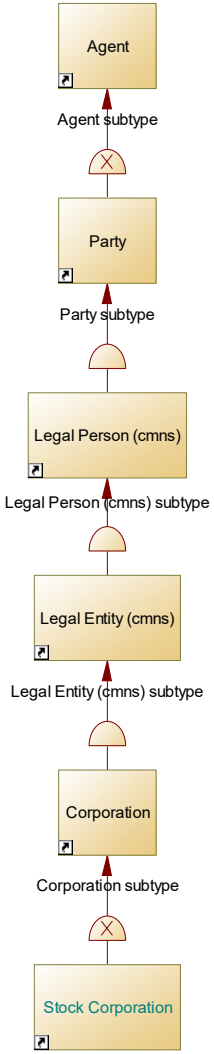
The **Registration Authority**, our entity for the FDIC and other registrars, is also a Service Provider, a subtype of Agent Role, a subtype of the Fundamental Concept of Role (R).



2.3 Stock Corporation rolls up to the Agent

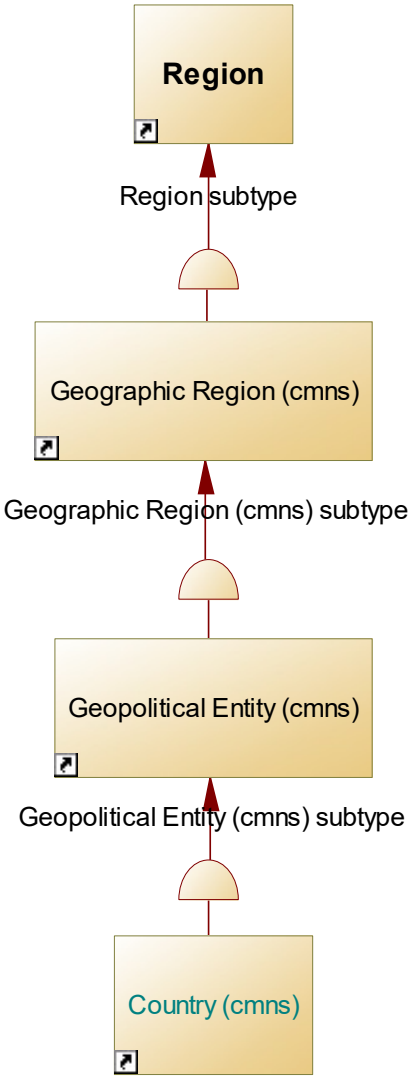


The **Stock Corporation** is a Legal Entity, ultimately a subtype of the Agent (A).



2.4 Country and Registry

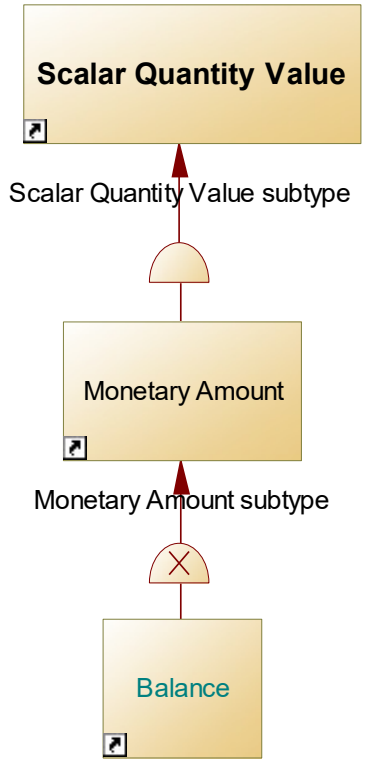
The country is a Geopolitical Entity, a subtype of Geographic Region, and ultimately the Fundamental Concept of Region.



2.5 Balance

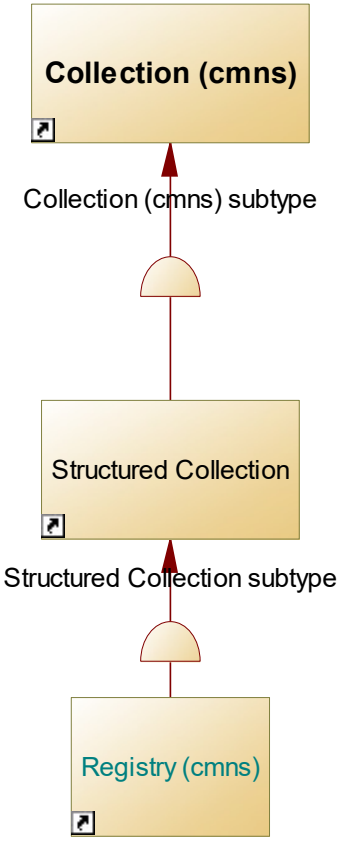
$ #
%

The Issued Capital is on the Balance sheet, and hence a Balance, which is a Monetary Amount subtype of the Scalar Quantity.



2.6 Registry

The Registry is a Structured Collection, a subtype of the OMG Commons concept of Collection.

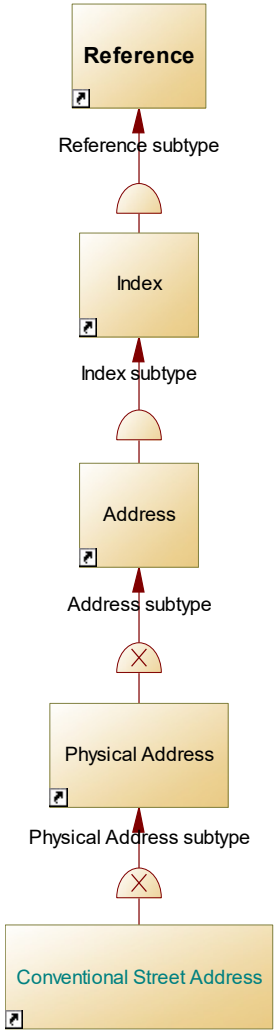


2.7 Reference

The [Conventional] Street Address is a Physical Address.

Addresses are a type of Index under the fundamental concept of Reference.

Identifiers are under the fundamental concept of Designation.

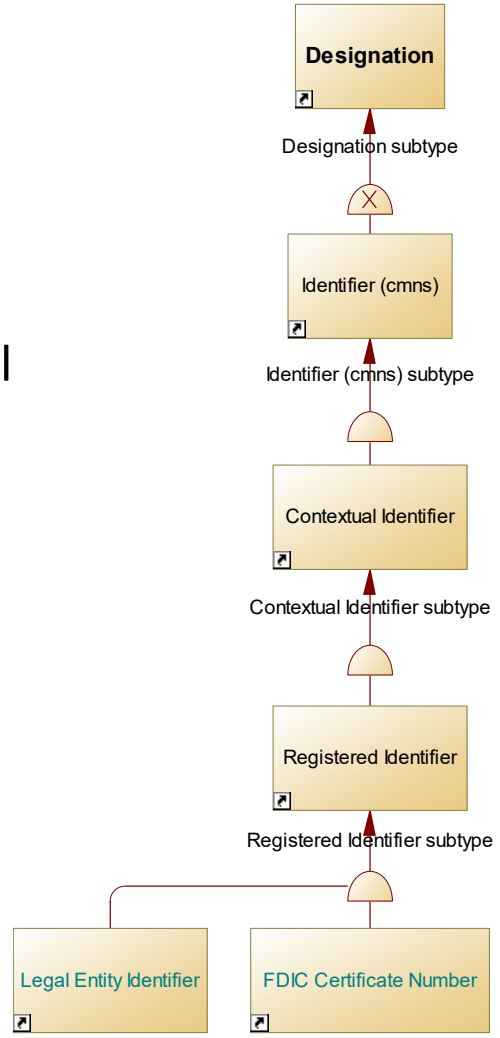


2.8 Designation

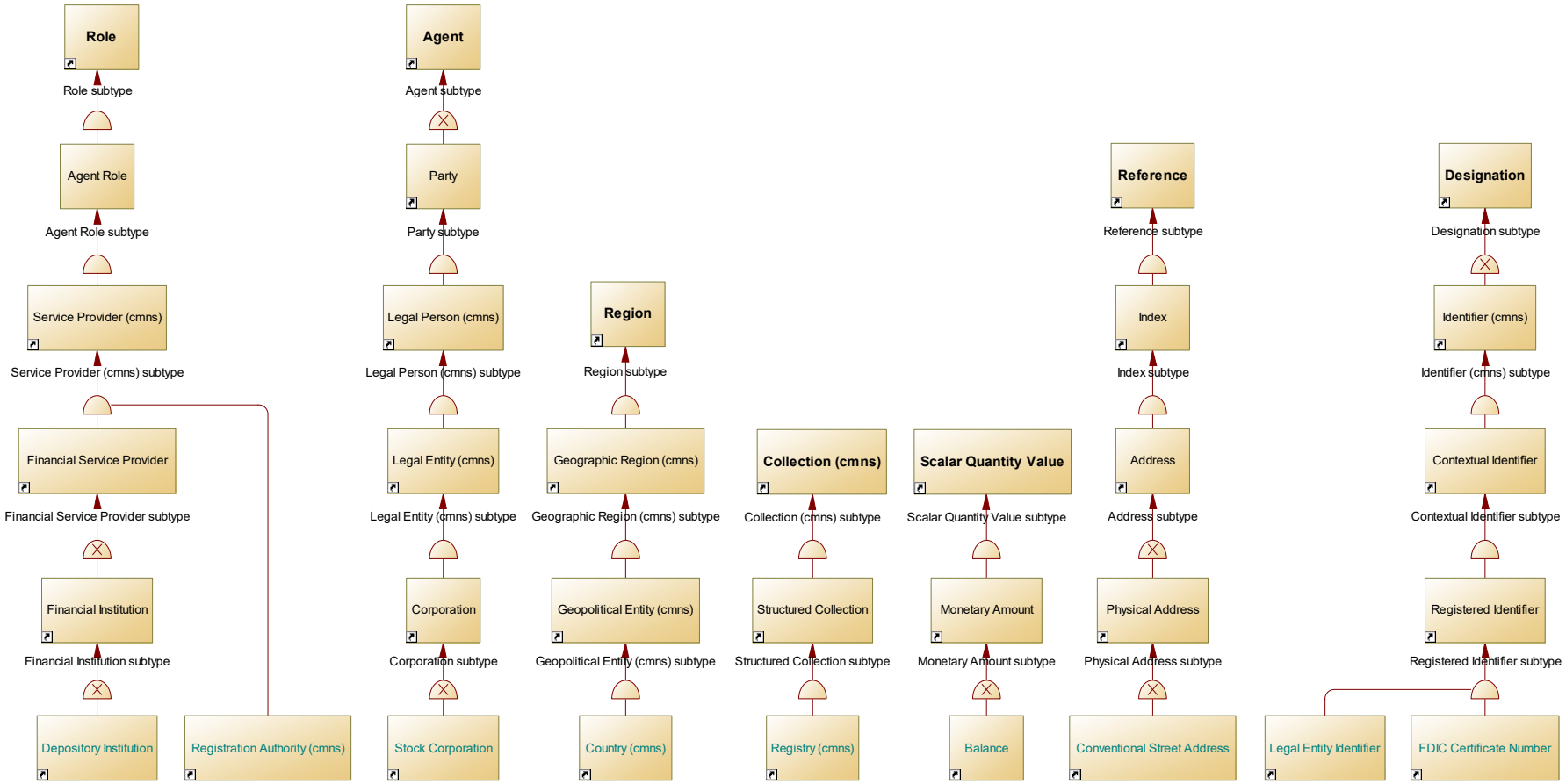
ID

The LEI and FDIC Certificate Number are Registered Identifiers, a subtype of Contextual Identifier.

Identifiers are under the fundamental concept of Designation.



2.9 Our Entities and their Fundamental Concepts.



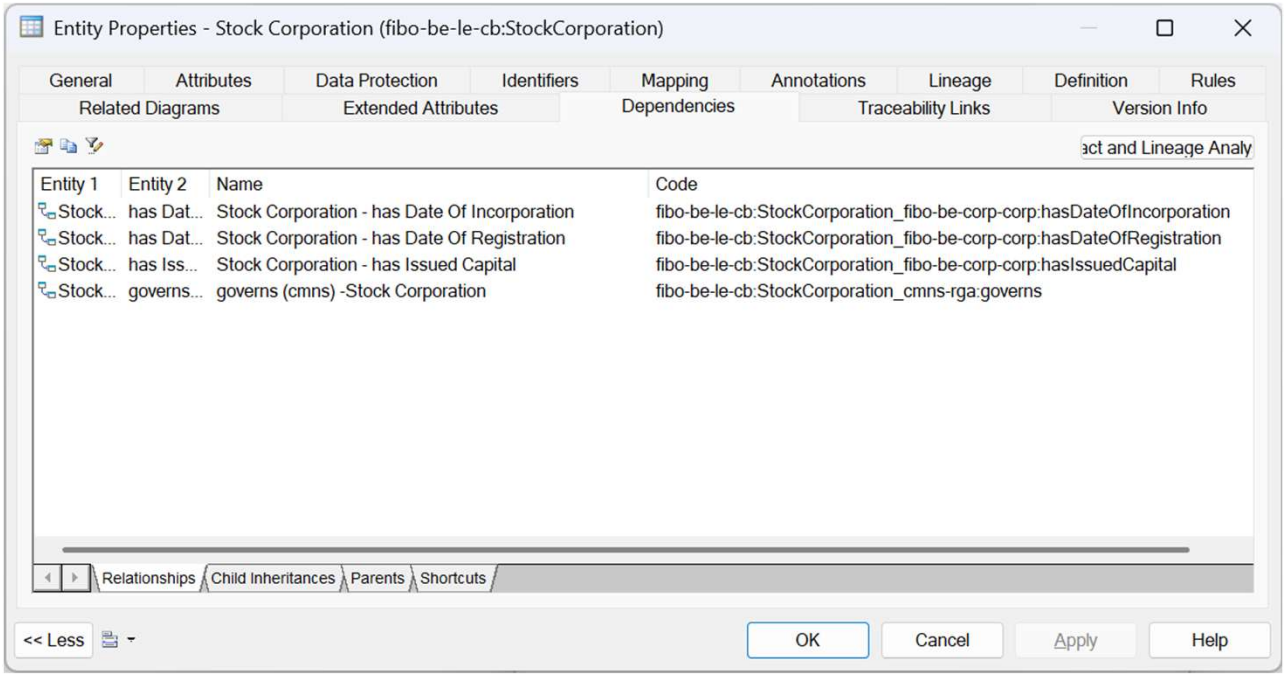
3 Adding Associations and Associative Entities.

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

Finding a matching Association is a challenge, even for experienced FIBO experts.

How does Issued Capital relate to the Stock Corporation?

We can research the entity's relationships in the data modelling tool.

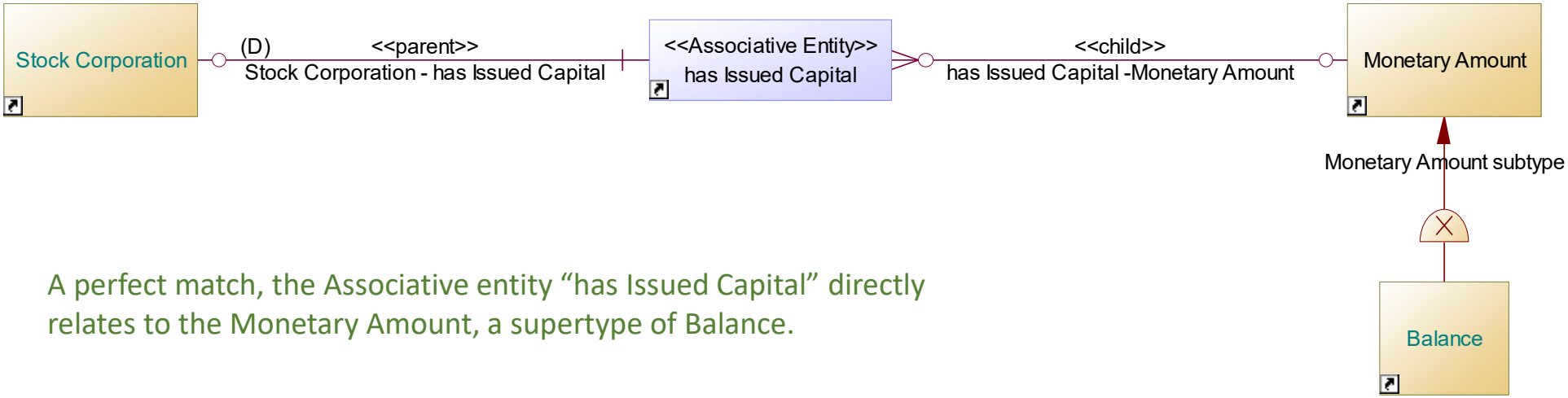


Data Architect

3.1 Stock Corporation - Balance

The preferred association connects our scoped concept hierarchies at the leaf level. In other words the green entities of the concept map. Often, however, supertypes connect the Base Entities.

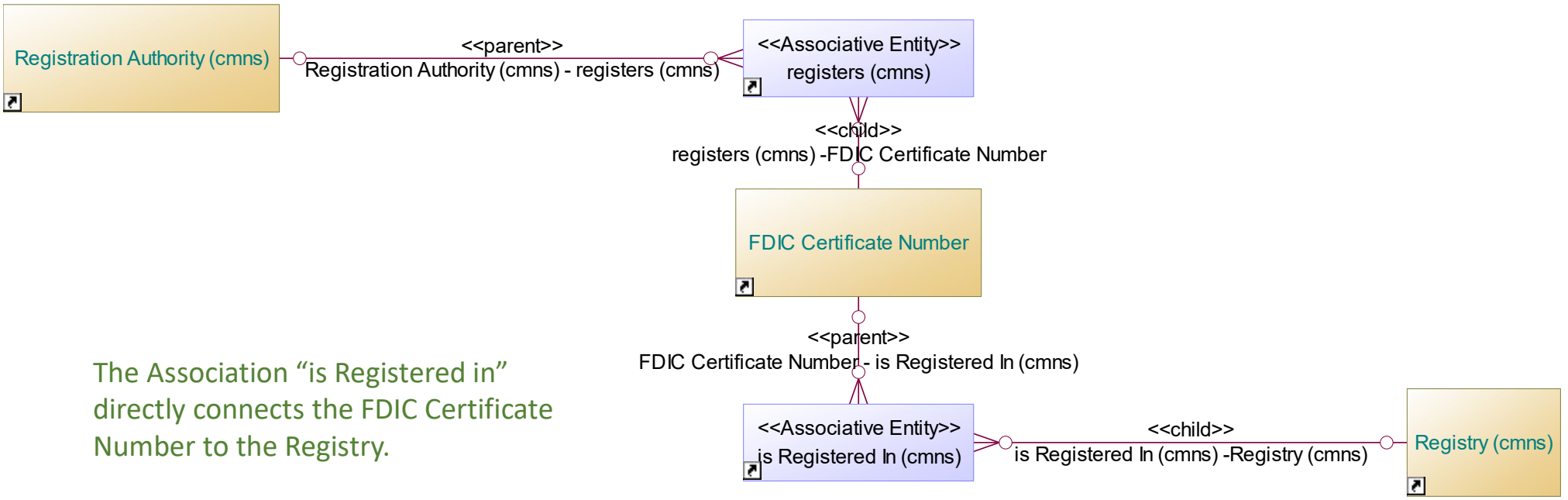
We use the modeling tool or the Relationships spreadsheet to investigate relationships of the Stock Corporation and find *has Issued Capital*.



A perfect match, the Associative entity “has Issued Capital” directly relates to the Monetary Amount, a supertype of Balance.

3.2 Associating the FDIC Certificate Number

Another easy match, the associative entity "*registers*" has relationships to the FDIC Certificate Number and the Registration Authority.



The Association "is Registered in" directly connects the FDIC Certificate Number to the Registry.

3.3 Stock Corporation - Address

The Stock Corporation has no direct Associative Entity relating to an Address.

However, its supertype, Legal Entity "has Legal Address" connects to the Conventional Street Address.

3.4 Address - Country

The Conventional Street Address does not have an Association relating to the Country.

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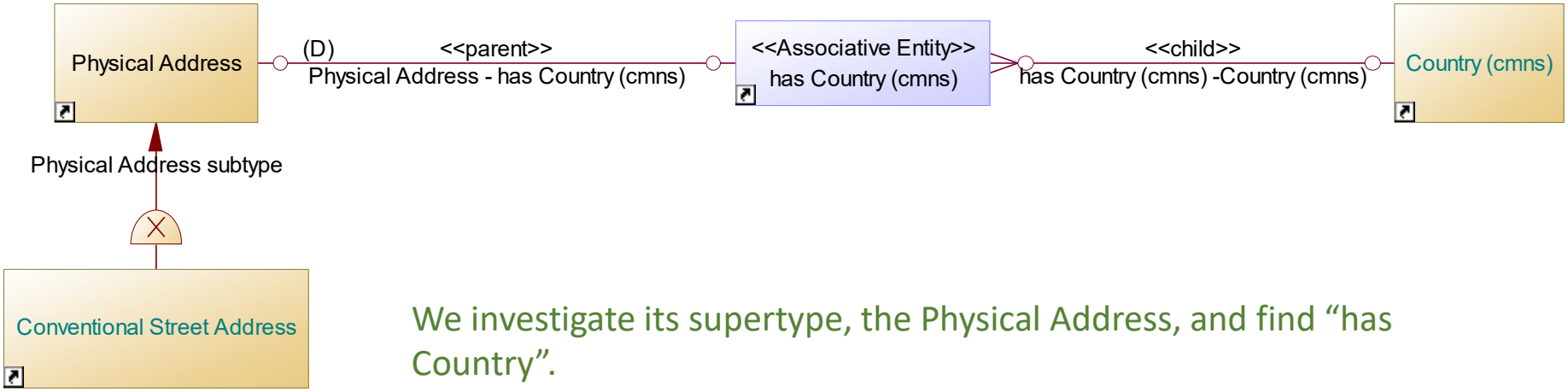
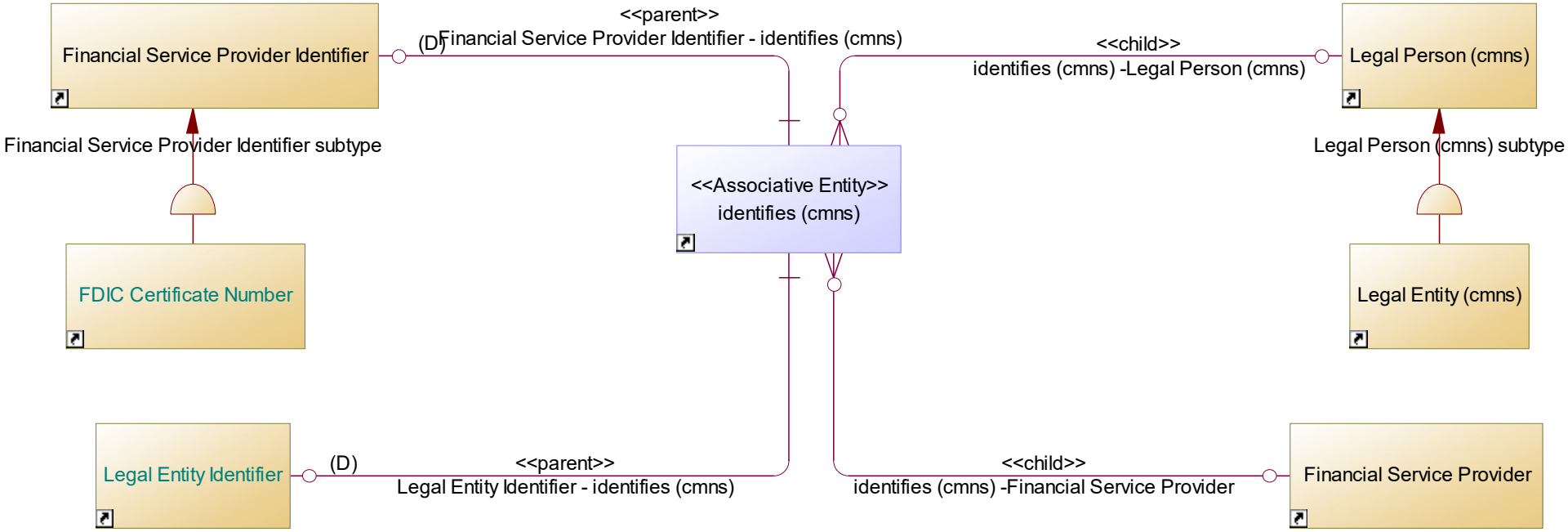


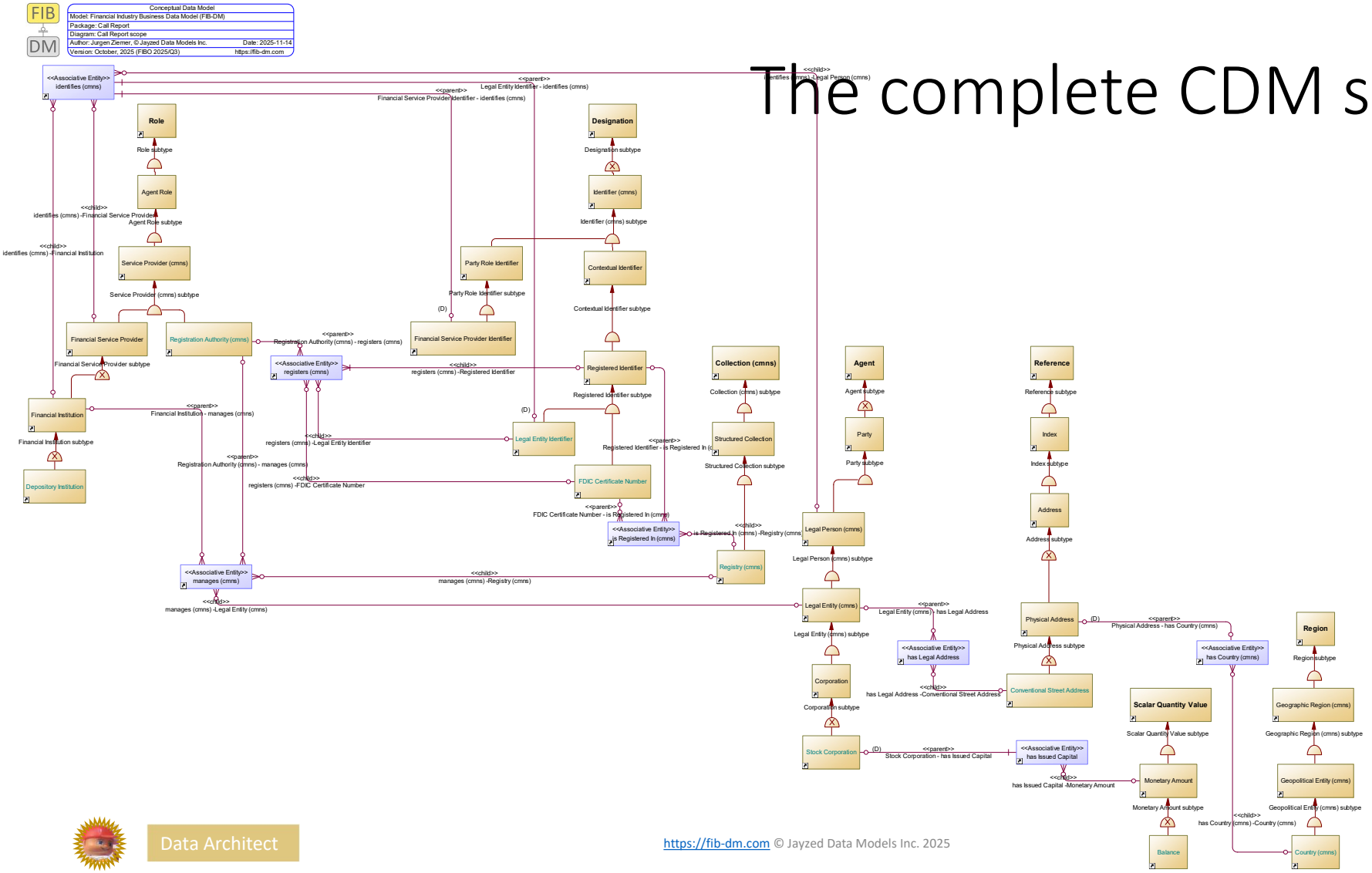
We investigate its supertype, the Physical Address, and find “has Country”.

3.5 The *identifies* association completes the model

- The Financial Service Provider Identifier, the supertype of the FDIC Certificate Number, identifies the Financial Service Provider, supertype of the Depository Institution.
- The Legal Entity Identifier identifies the Legal Person, a supertype of Legal Entity.



The complete CDM scope



Discussion – do I really need all these entities?

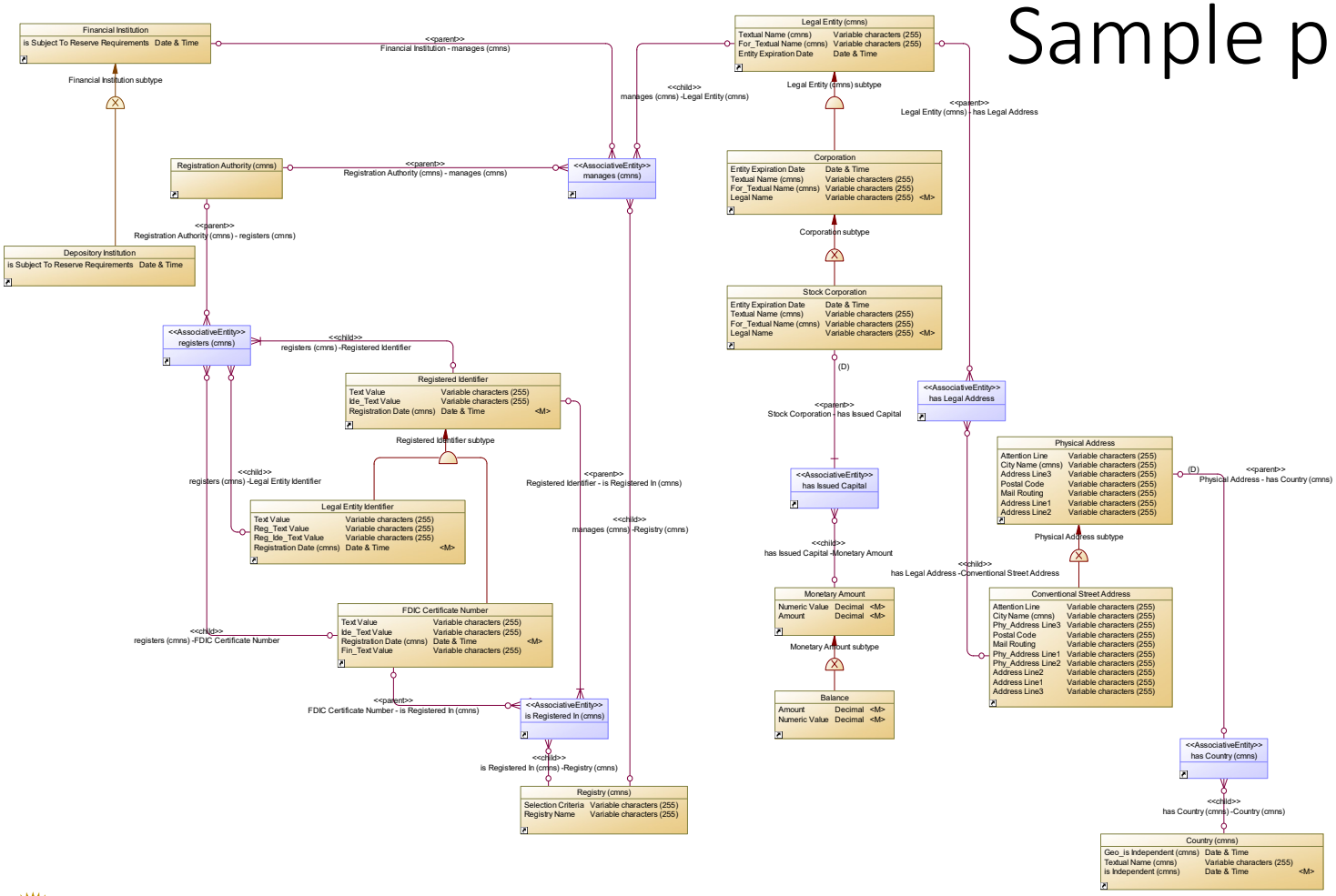
The short answer is no. For a project model it is perfectly fine to scope only the directly required green entities.

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.

Sample project LDM



The diagram shows out-of-the-box attributes derived from FIBO object properties. The data modeler adds more attributes from source systems and data requirements.

LDM denomalization and simplifications

Next steps:
The modeler will review the associative entities and those that are not many-to-many with direct relationships. For example, if the Physical Address has only one country; we can replace the associative entity with a direct relationship.

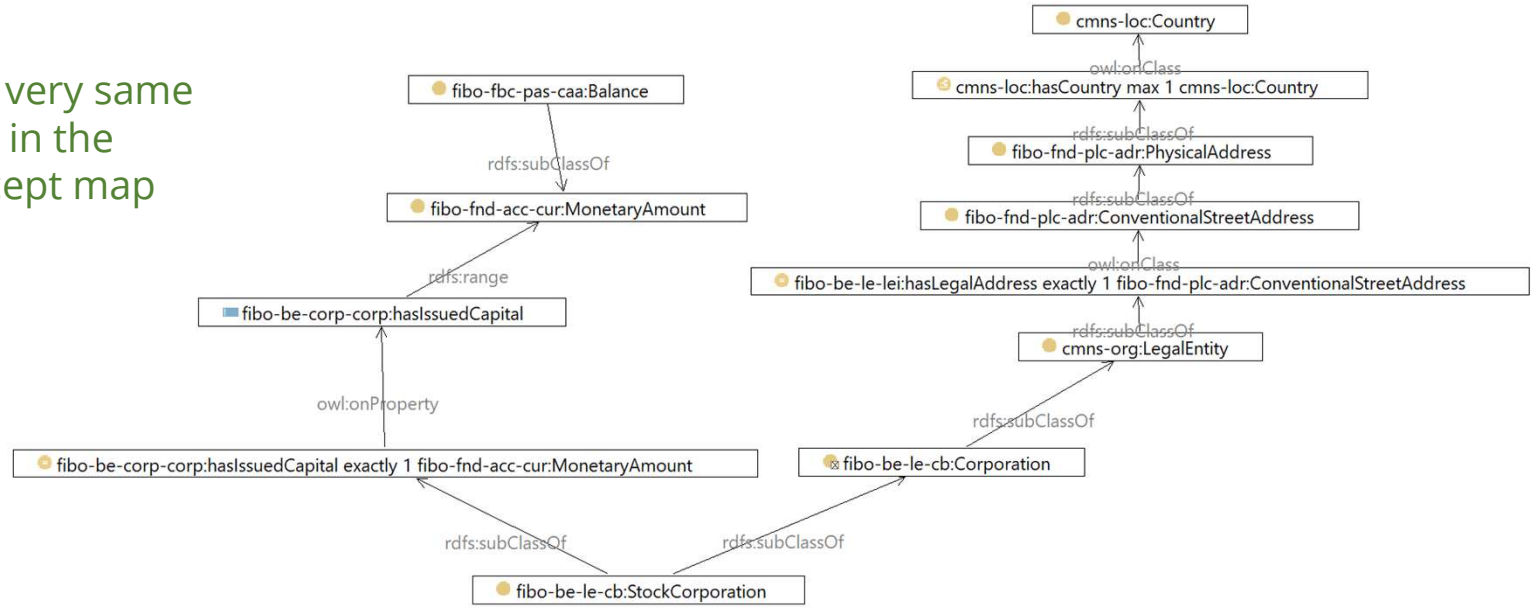
Supertype/subtype relations, such as Physical/Conventional Address, can be configured to roll up or down during Physical Model generation.

It is a Logical/Physical Model decision whether certain Scalar Quantities and Dates should be transformed into plain attributes/columns.

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 the concept map. With the concept map we can easily 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 and data model.




Data Architect

Ontologist

FIB Core DM

open source initiative®

FIBO Financial Industry Business Ontology

in

SAP POWERDESIGNER

(and other data modeling tools)

https://fib-dm.com/

Finance key point