WELLS FARGO

FIBO Operational Ontologies Briefing
for University of Maryland BMGT 499B

FIBO
Financial Industry Business Ontology

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ENTERPRISE DATA MANAGEMENT
EDM COUNCIL

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2008 Global Financial Crisis Stimulated Need for Improved Financial Data Standards

- Financial industry needs better data standards:
  - to ensure there is high data consistency, promote data comparability and facilitate transparency
  - as a prerequisite for effective institutional and macroprudential risk analysis and reporting
- Financial data standards are needed for:
  - identification of legal entities, their jurisdictions and control ownership hierarchies
  - identification of financial contracts and instruments
  - classification and data linkage for aggregation

The Basel Committee ON Banking Supervision

"One of the most significant lessons learned from the global financial crisis that began in 2007 was that banks' information technology (IT) and data architectures were inadequate to support the broad management of financial risks. Many banks lacked the ability to aggregate risk exposures and concentrations quickly and accurately at the bank group level, across business lines and between legal entities. "

Principles for effective risk data aggregation and risk reporting
Basel Committee on Banking Supervision, June 2012

Regulatory Compliance Challenges

Regulatory agencies are now defining rules to respond to Dodd-Frank and Basel risk data requirements for financial institutions

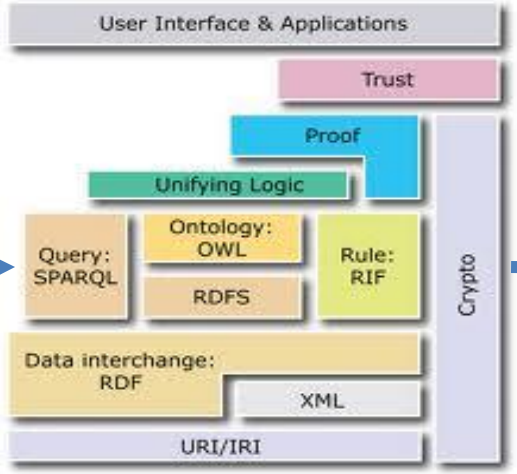
Office for Financial Research (OFR) and Bank of England Statistics and Regulatory Data Division are calling for a common financial model for granular data as a basis for liquidity and stress test reporting

- ✓ *How should the financial industry tackle these risk data aggregation and reporting challenges?*
- ✓ *How should financial data standards be defined?*
- ✓ *What technologies should be employed to fulfill these risk data aggregation and reporting requirements?*

Semantic Web Technology Could be Viewed as a Foundation for Financial Data Standards

The Enterprise Data Management (EDM) Council and the Object Management Group (OMG) believe that semantic web technology

- is an optimum way forward to define financial data standards
- can map to and supplement existing financial data standards
- is a prudent investment to better enable risk data aggregation and analytics
- can be implemented unobtrusively and incrementally with legacy data



W3C Semantic Web Stack

Semantic Financial Data Standards

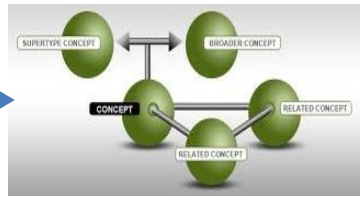
Semantic Web Technology

- ✓ describes concepts and data standards using smart data dictionaries called ontologies
- ✓ *understandable* to both humans and machines
- ✓ provides effective data rollup
- ✓ able to effectively express, link, integrate, classify, and *reason* over data
- ✓ smarter, possibly cheaper, and with faster time to market efficiencies

Ways That Semantics is Highly Promising

Describes business concepts using an advanced data schema called an ***Ontology*** *to* ***maximize*** *understanding and data consistency*

Machine Understanding



Ontology

Human Understanding

Both humans and machines can understand and process the same concepts ….. ensuring data conformity at many levels

Semantic technology uses machine intelligence to reason over data and perform data validation, classification and inferencing

Machine Intelligence

Ontology

More concepts in ontologies, less required costly logic in application programs and faster time to market

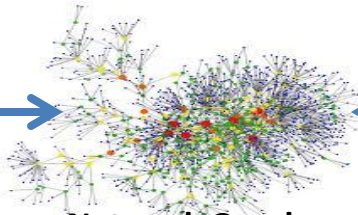
Allows us to rapidly respond to changing business conditions at lower cost

Semantic Database

Change can be deployed extremely fast; no physical database changes required

Insights, discoveries, and certain analytics faster thru semantic linked data and queries

Conventional Data



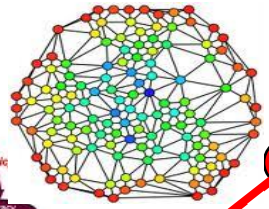
Network Graph

Data can be fetched from disparate silos into network graph structures for smarter and more efficient queries

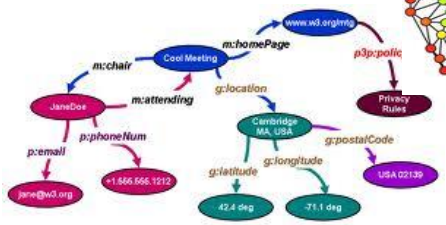
Semantic Technology may be the Next Step in the Evolution of Information Management

From less to more expressive data schemas

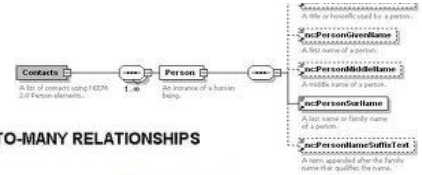
strong semantics

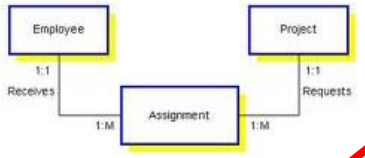


Evolving Semantic Technologies (2013+)



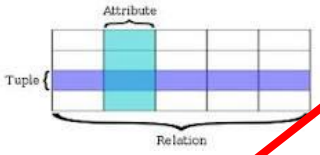
Semantic Web Languages RDF/RDFS/OWL (2004)





XML Schema (2001)

Relational Schema (1976)



XML (1997)

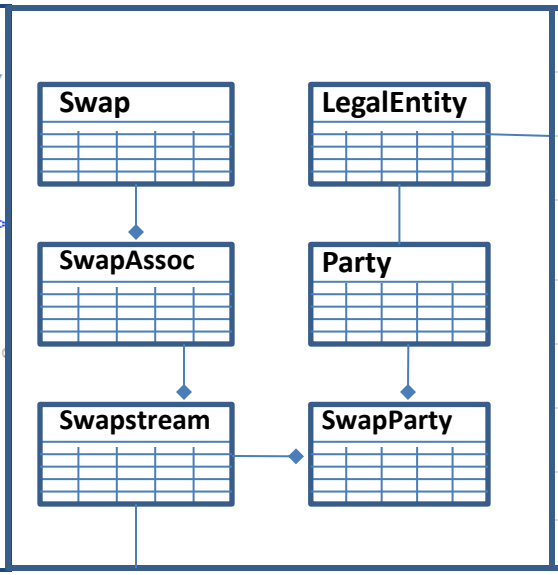
Relational Model (1969)

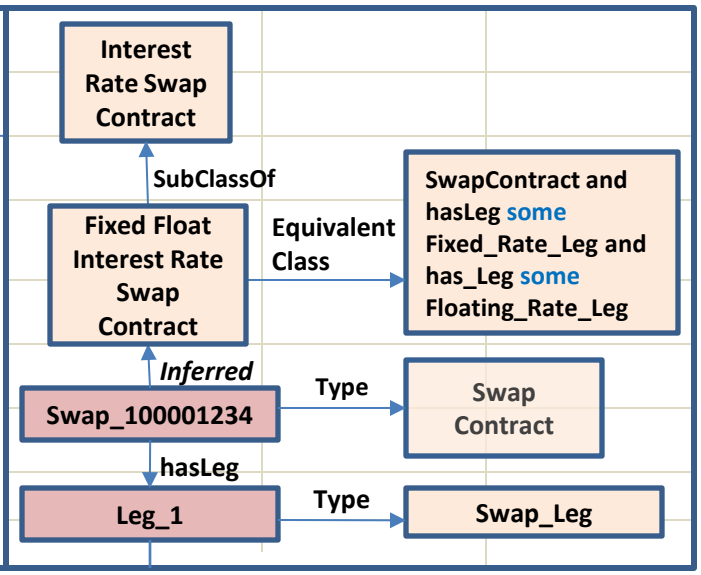
The power of an information management paradigm depends upon the intelligence and expressive power of its underlying conceptual model or schema

weak semantics

*** Ontology Spectrum courtesy of Dr. Leo Obrst, The Mitre Corporation (modified)**

Semantics Bundles Meaning and Concepts within the Data Model





XML

- Lingua franca of web service messaging payloads following W3C standards
- Used to tag data elements with standard labels that conform to a predefined schema
- Forms structured data hierarchies
- Document hierarchy can be queried

- While tags associate data to labels, the *meaning* of the labels is *not* understood by the computer thereby limiting the extent to which the data can be used and referenced

Relational

- Dominant database implementation
- Highly mature software and tools
- Data is physically organized within tables and accessed by matching related columns in different tables that fulfill various conditions

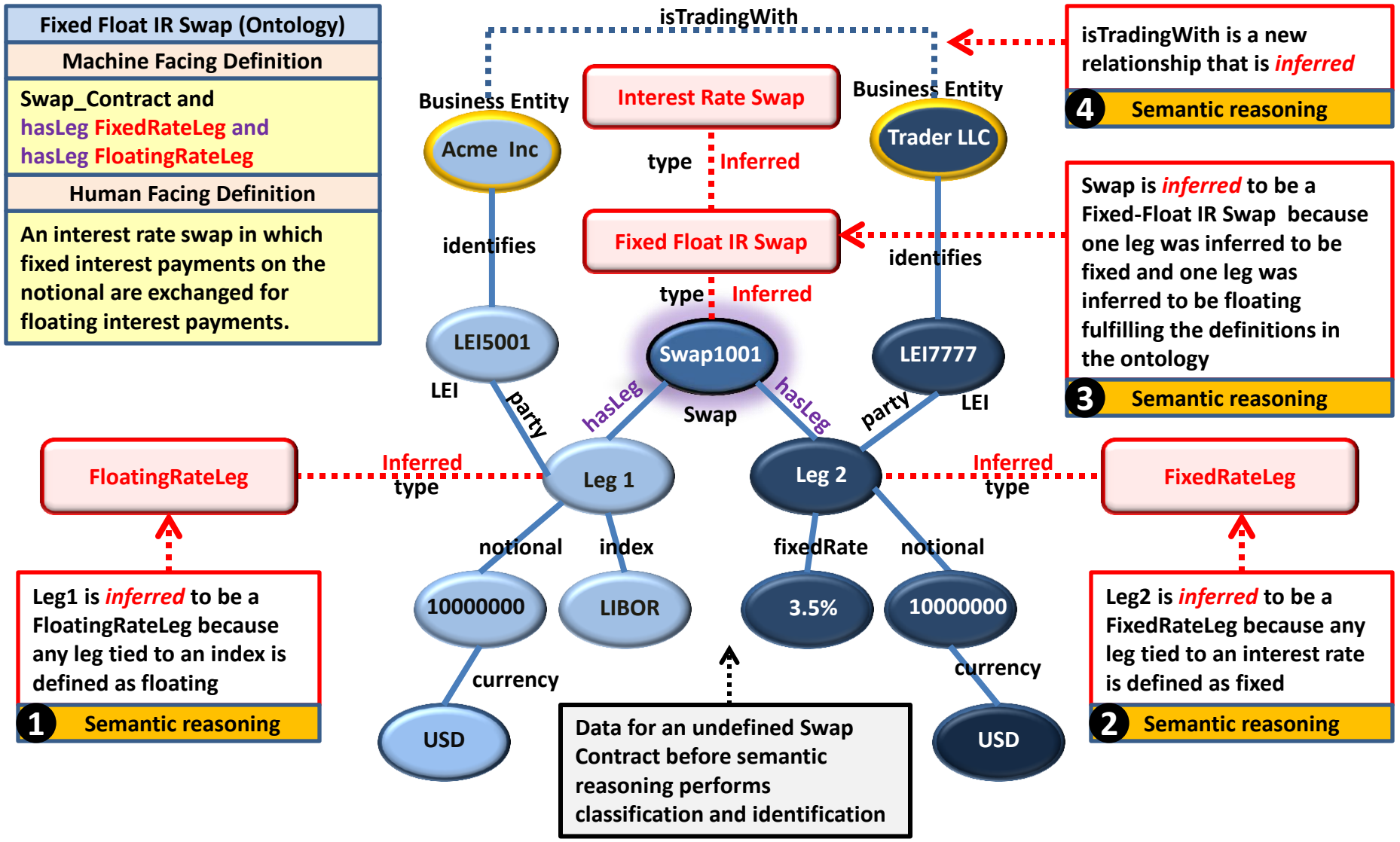
- Design, construction, access, schema change and management are labor, time, and resource intensive
- Often requires application logic

Semantics

- Emerging form of knowledge representation offers highly intelligent form of data organization
- Conceptually describes the meaning of data and its relationships in a way that both people and computers can understand
- Supports classification, reasoning and agility

- Early phase of technology lifecycle
- Small scale cottage vendors (except Oracle, IBM)
- Limited, but growing, set of software and tools due to immaturity of industry

Semantic Processing *Reasons* over Data to Infer New Meanings and Relationships

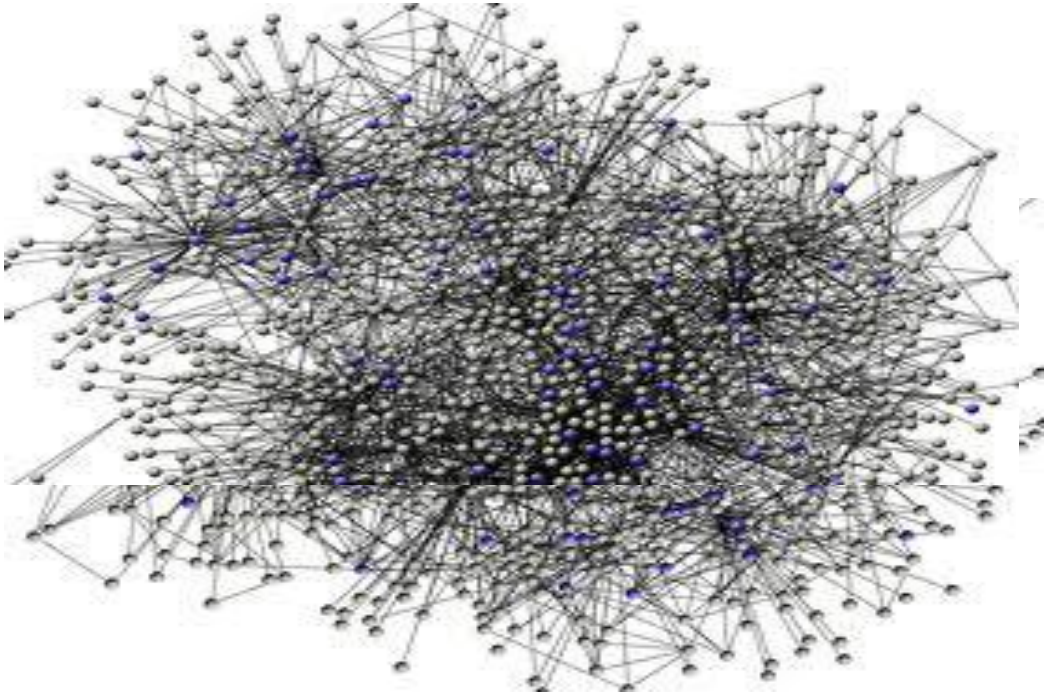


Semantic Web Databases Support Network Graph Data Structures

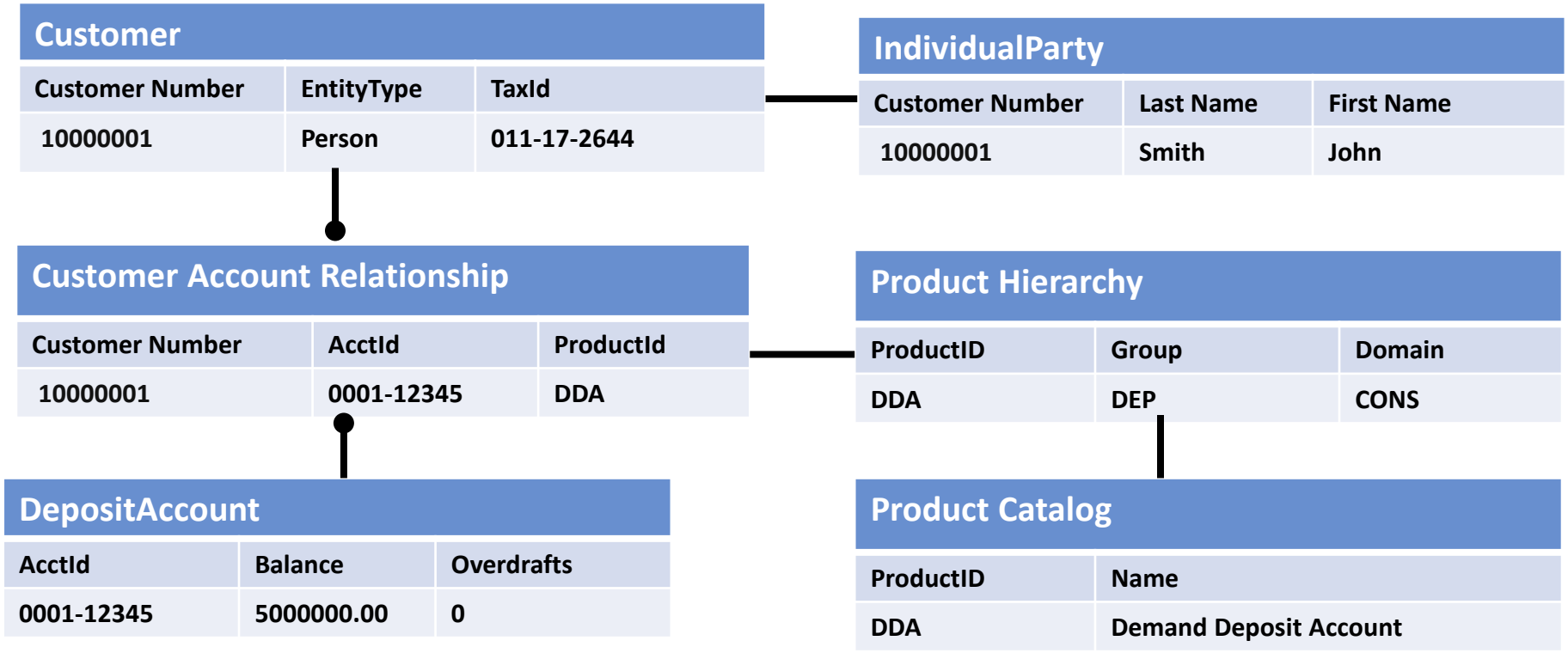
- Known as Triple Stores, RDF Stores, Semantic Graph Databases, "NoSQL" Databases
- Vendor, Free and Open Source
- Supports RDF/OWL and SPARQL (SQL-like query language)
- Extremely minimal DBA effort needed …. ***There are no tables!***

Concepts or data can be added or changed rapidly without incurring the high costs of configuring and managing database objects

Network graphs closely resemble how we envision data in the real world and are foundational structures for data analytics



Contrast to Relational Database Schema

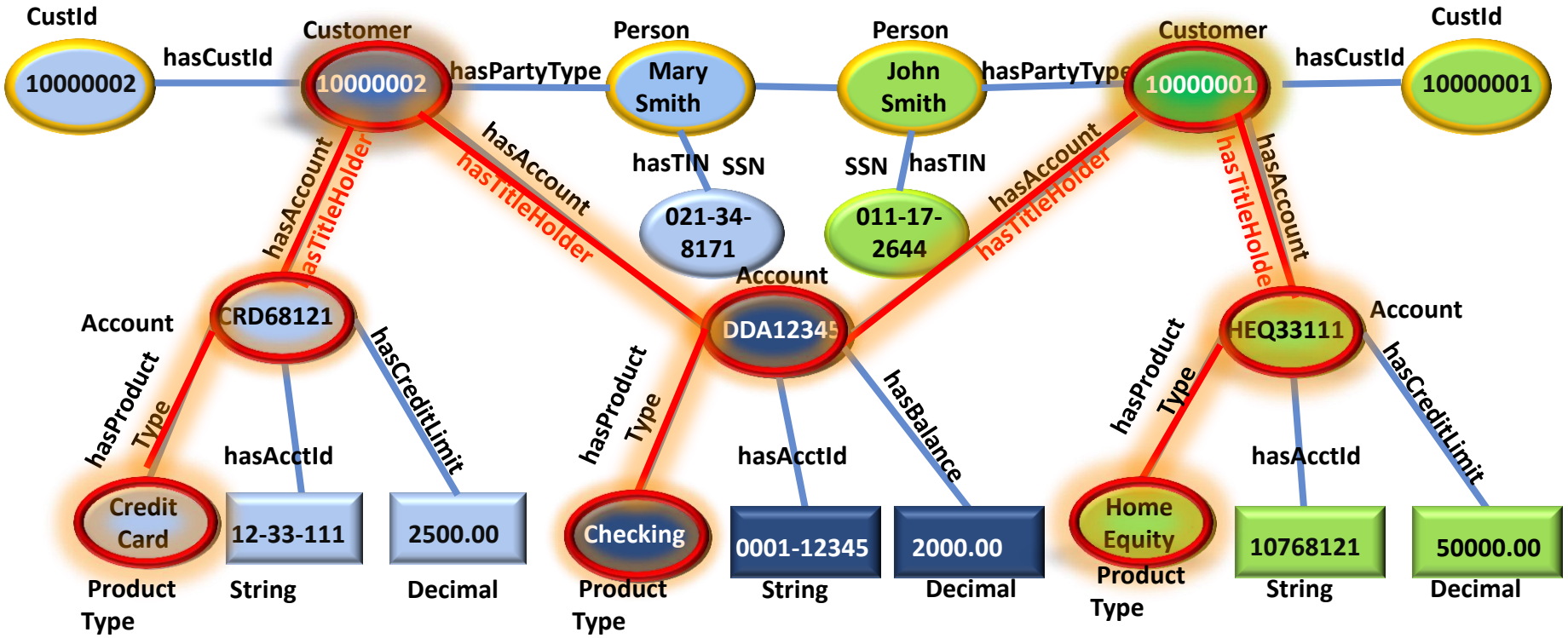


- Tables must be defined and joined to reflect complete information about a subject
- Programmatic logic is often required to associate concepts with data
- Awareness of the physical organization of tables is often helpful
- Tables can be brittle to change

SPARQL: Graph Pattern Matching

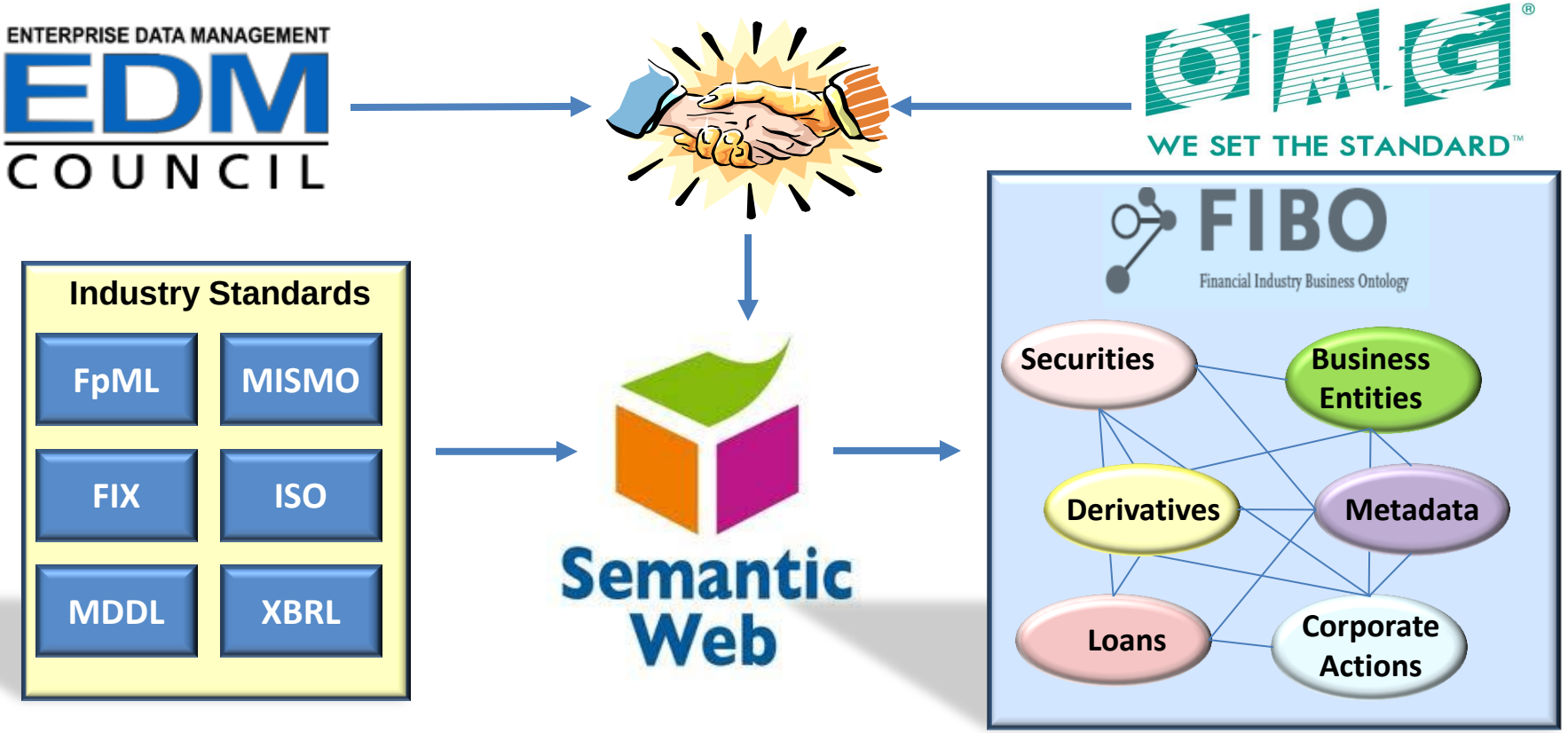
```
SELECT distinct ?customer ?account ?productType
WHERE {
?customer   hasAccount       ?account .
?account    hasProductType   ?productType  }
order by ?customer ?account
```

?customer	?account	?productType
10000001	DDA12345	Checking
10000001	HEQ33111	HomeEquity
10000002	CRD68121	CreditCard
10000002	DDA12345	Checking



The Financial Industry Business Ontology (FIBO)

Collaborative industry initiative to describe financial data standards using *semantics*



Open semantic financial data standards are exchangeable across financial institutions and regulatory authorities for data consistency and transparency

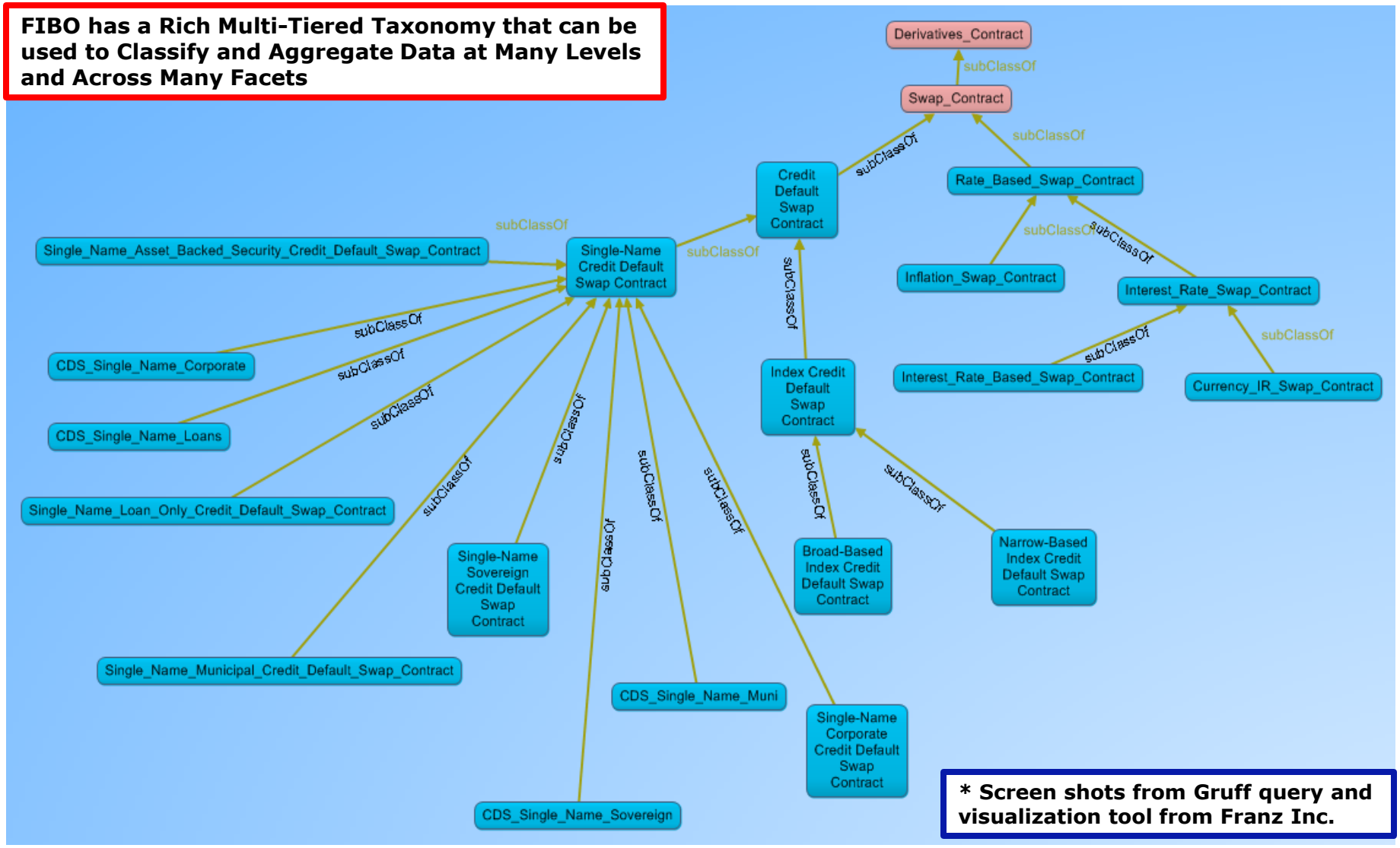
Some Operational Benefits of FIBO

- ✓ **Ensures that all instruments truly conform to the standard definition of the contract.**
  - ➢ Displays meaning of contract to both humans and machines
  - ➢ Flags instruments that are exceptions or do not align
  - ➢ Data rollups and aggregations are based upon the reliability of knowing that the underlying data has been validated for conformity
- ✓ **Provides a rich flexible multi-tiered taxonomy**
  - ➢ An instrument can be classified across multiple facets
  - ➢ Data can be rolled up and aggregated at multiple levels of the taxonomy
- ✓ **Data is linked in a network graph structure that allows for high data diversity and variability of relationships**
  - ➢ Efficient querying and identification of complex relationships
  - ➢ Agile adding and linking of new and changing data relationships
  - ➢ Graph structures lend themselves well to visual representations of data
- ✓ **Metadata annotations are integrated into FIBO and provide standard definitions and useful links to related information**

Visualization of FIBO Derivatives Taxonomy

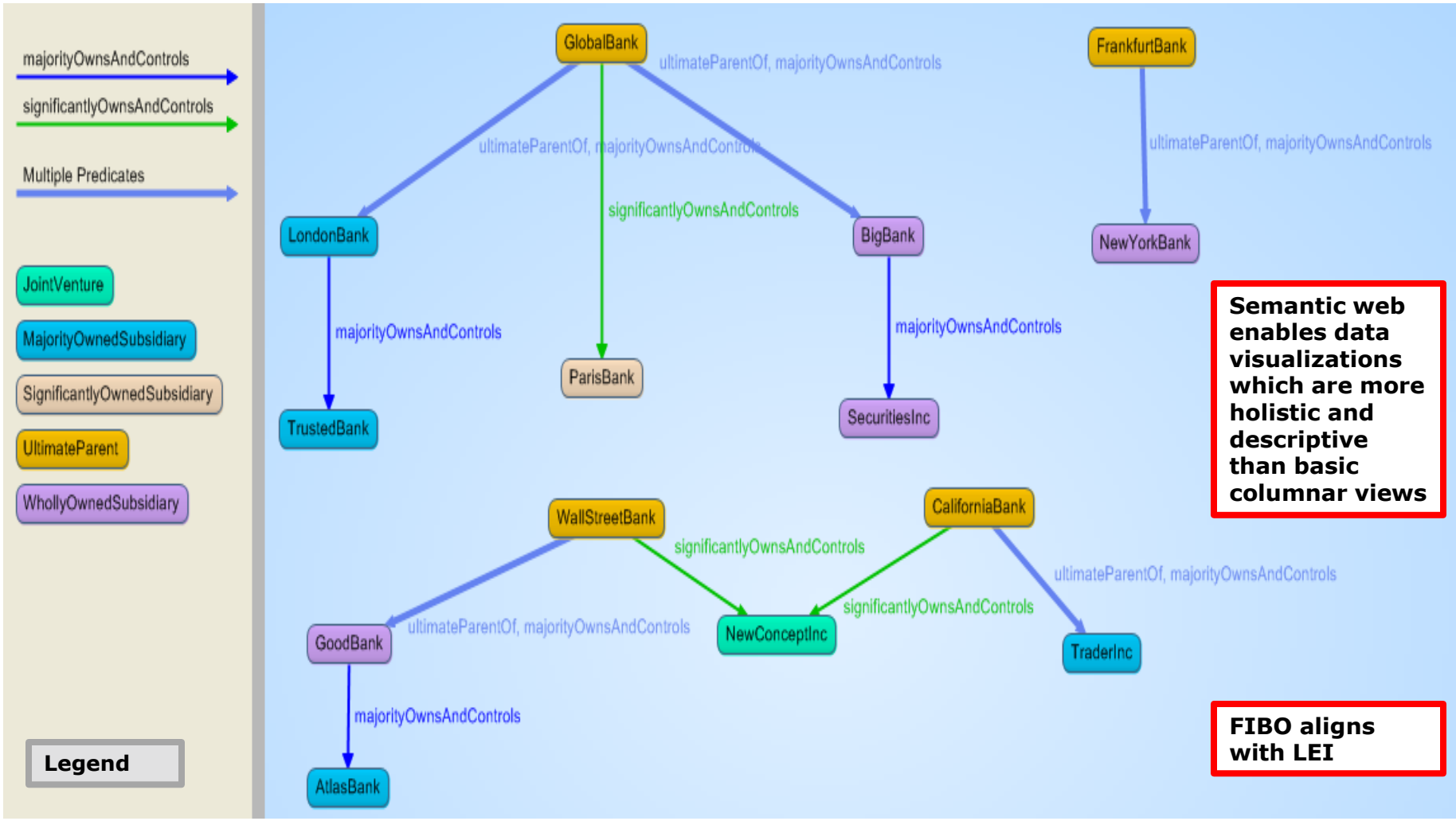
(3 levels shown of multi-level taxonomy)

FIBO has a Rich Multi-Tiered Taxonomy that can be used to Classify and Aggregate Data at Many Levels and Across Many Facets

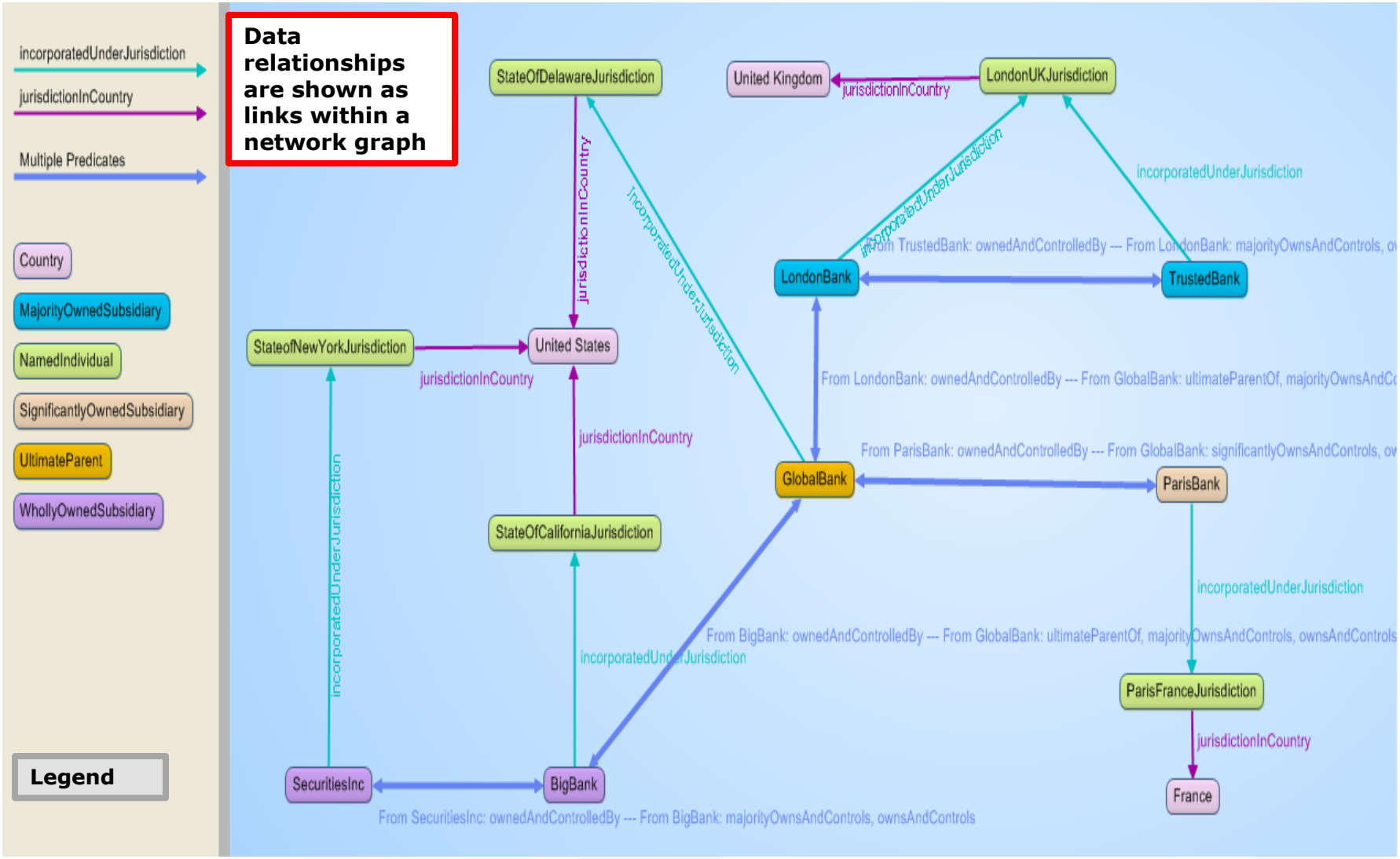


*** Screen shots from Gruff query and visualization tool from Franz Inc.**

Legal Entity Ownership and Control Relationships can be Queried and Displayed



FIBO Describes Business Entities, Legal Jurisdictions and Country Locations



Counterparty Trades, FIBO Classifications, ISDA UPI Codes

FIBO provides an automatic mapping between FIBO named product classes and identifiers and ISDA named product identifiers (or any other linked product taxonomies)

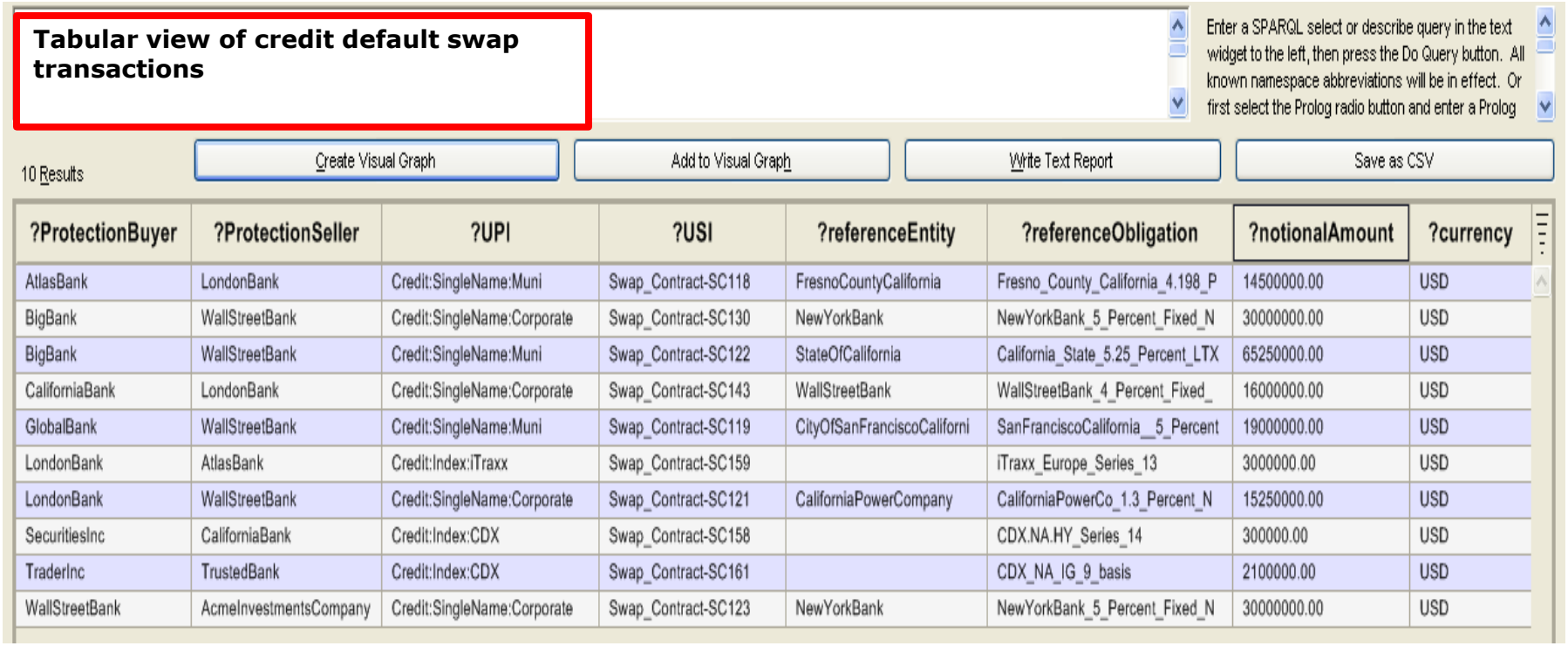
Enter a SPARQL select or describe query in the text widget to the left, then press the Do Query button. A known namespace abbreviations will be in effect. O

40 Results

Create Visual Graph | Add to Visual Graph | Write Text Report | Save as CSV

?entity	? counterparty	?group	?category	?classification	?UPI	?USI	? notionalAmount	?count
AcmeInvestmentsCompany	GoodBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:OIS	Swap_Contract-SC09	10000000.00	United States
AcmeInvestmentsCompany	WallStreetBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC123	30000000.00	United States
AtlasBank	CaliforniaBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:Basis	Swap_Contract-SC01	20000000.00	United States
AtlasBank	CaliforniaBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:Basis	Swap_Contract-SC03	25000000.00	United States
AtlasBank	LondonBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:Index:iTraxx	Swap_Contract-SC159	3000000.00	United States
AtlasBank	LondonBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC118	14500000.00	United States
AtlasBank	TraderInc	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:Inflation	Swap_Contract-SC07	30000000.00	United States
BigBank	WallStreetBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC130	30000000.00	United States
BigBank	WallStreetBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC122	65250000.00	United States
CaliforniaBank	AtlasBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:Basis	Swap_Contract-SC03	25000000.00	United States
CaliforniaBank	AtlasBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:Basis	Swap_Contract-SC01	20000000.00	United States
CaliforniaBank	LondonBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC143	16000000.00	United States
CaliforniaBank	LondonBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:FixedFloat	Swap_Contract-SC06	10000000.00	United States
CaliforniaBank	SecuritiesInc	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:Index:CDX	Swap_Contract-SC158	300000.00	United States
GlobalBank	WallStreetBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC119	19000000.00	United States
GoodBank	AcmeInvestments	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:IRSwap:OIS	Swap_Contract-SC09	10000000.00	United States
GoodBank	LondonBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:CrossCurrency:Bas	Swap_Contract-SC04	30000000.00	United States
GoodBank	LondonBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contrac	InterestRate:CrossCurrency:Fix	Swap_Contract-SC02	25000000.00	United States
LondonBank	AtlasBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:Index:iTraxx	Swap_Contract-SC159	3000000.00	United Kingdom
LondonBank	AtlasBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC118	14500000.00	United Kingdom

Credit Default Swap Transactions

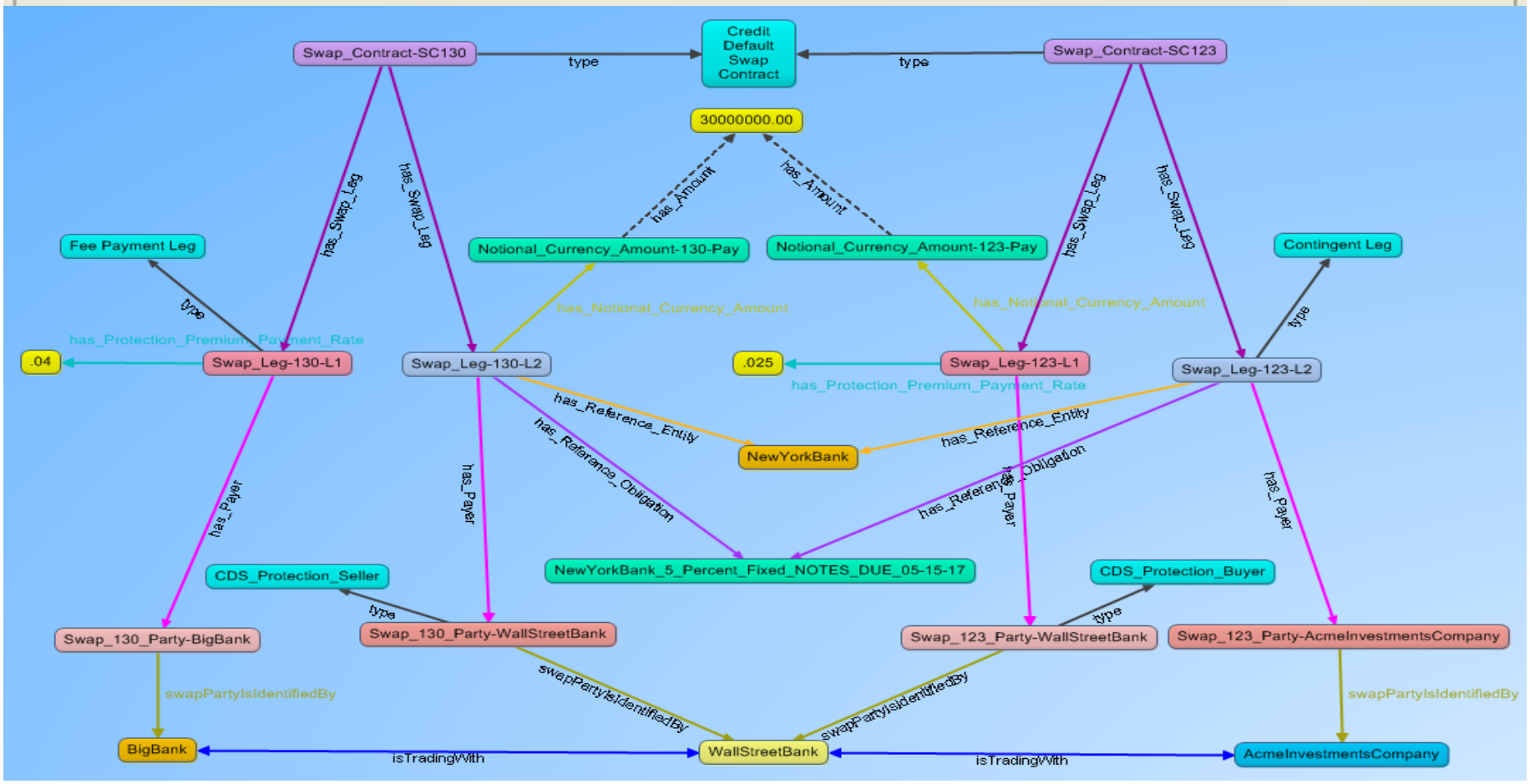


?ProtectionBuyer	?ProtectionSeller	?UPI	?USI	?referenceEntity	?referenceObligation	?notionalAmount	?currency
AtlasBank	LondonBank	Credit:SingleName:Muni	Swap_Contract-SC118	FresnoCountyCalifornia	Fresno_County_California_4.198_P	14500000.00	USD
BigBank	WallStreetBank	Credit:SingleName:Corporate	Swap_Contract-SC130	NewYorkBank	NewYorkBank_5_Percent_Fixed_N	30000000.00	USD
BigBank	WallStreetBank	Credit:SingleName:Muni	Swap_Contract-SC122	StateOfCalifornia	California_State_5.25_Percent_LTX	65250000.00	USD
CaliforniaBank	LondonBank	Credit:SingleName:Corporate	Swap_Contract-SC143	WallStreetBank	WallStreetBank_4_Percent_Fixed_	16000000.00	USD
GlobalBank	WallStreetBank	Credit:SingleName:Muni	Swap_Contract-SC119	CityOfSanFranciscoCalifornia	SanFranciscoCalifornia__5_Percent	19000000.00	USD
LondonBank	AtlasBank	Credit:Index:iTraxx	Swap_Contract-SC159		iTraxx_Europe_Series_13	3000000.00	USD
LondonBank	WallStreetBank	Credit:SingleName:Corporate	Swap_Contract-SC121	CaliforniaPowerCompany	CaliforniaPowerCo_1.3_Percent_N	15250000.00	USD
SecuritiesInc	CaliforniaBank	Credit:Index:CDX	Swap_Contract-SC158		CDX.NA.HY_Series_14	300000.00	USD
TraderInc	TrustedBank	Credit:Index:CDX	Swap_Contract-SC161		CDX_NA_IG_9_basis	2100000.00	USD
WallStreetBank	AcmeInvestmentsCompany	Credit:SingleName:Corporate	Swap_Contract-SC123	NewYorkBank	NewYorkBank_5_Percent_Fixed_N	30000000.00	USD

Anatomy of CDS Netting Chains

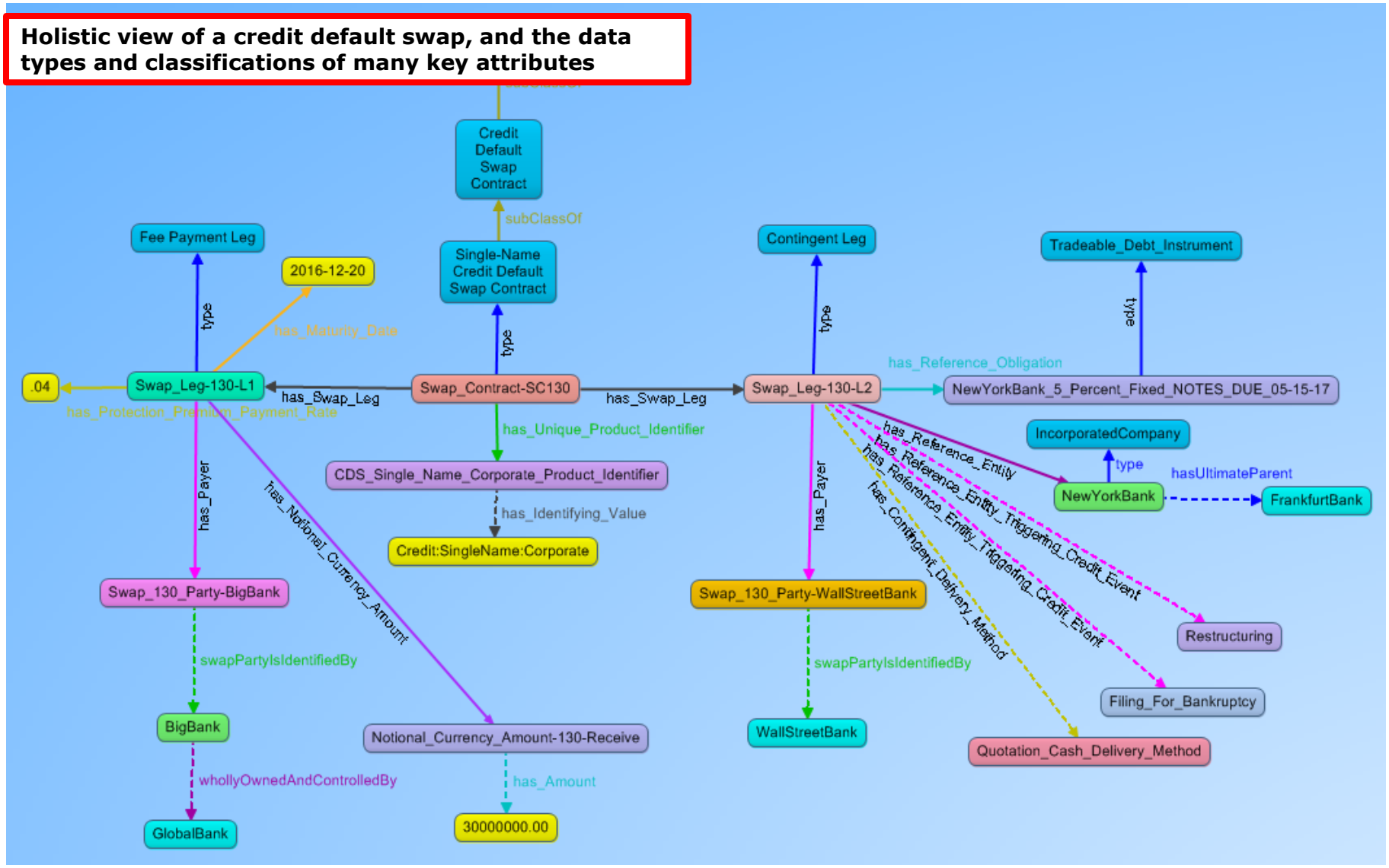
FIBO uses pattern search to identify netting transactions (a CDS protection buyer becomes a CDS protection seller for the same reference entity but also creates a potential scenario for cascading risk)

?ProtectionBuyer	?ProtectionSeller	?referenceEntity	?UPI	?USI	?premium	?referenceObligation	?notionalAmount	
WallStreetBank	AcmeInvestmentsCompan	NewYorkBank	Credit:SingleName:Corporat	Swap_Contract-SC123	.025	NewYorkBank_5_Percent_Fixed_NOTE	30000000.00	USD
BigBank	WallStreetBank	NewYorkBank	Credit:SingleName:Corporat	Swap_Contract-SC130	.04	NewYorkBank_5_Percent_Fixed_NOTE	30000000.00	USD

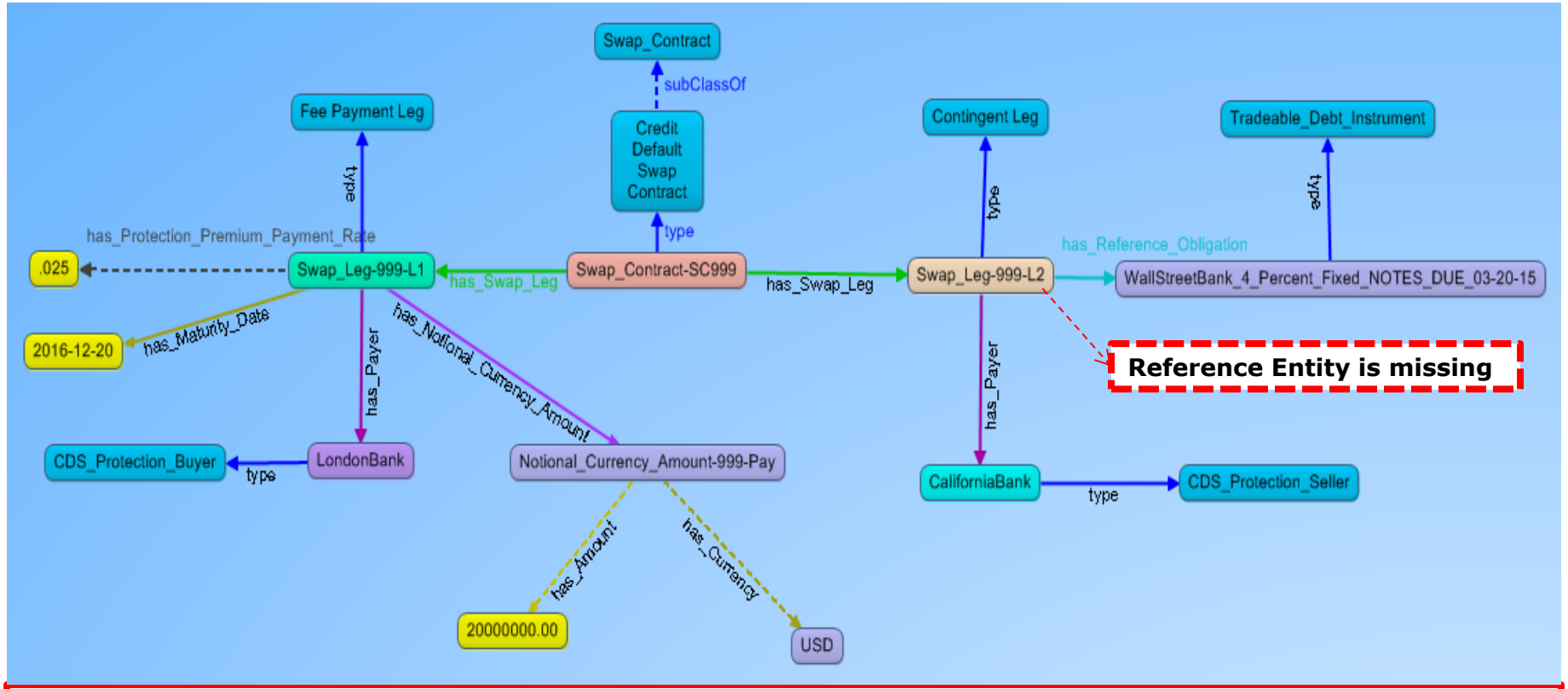


FIBO Identifies Instrument Contractual Terms and Attributes

Holistic view of a credit default swap, and the data types and classifications of many key attributes



FIBO Flags Instruments that Do Not Conform to the Standard Contractual Definitions



- **Example: Reference Entity, a necessary CDS attribute, is missing from this particular CDS**
- **Instrument is flagged by FIBO because it cannot be further classified as a specialization of a Credit Default Swap i.e. (Index CDS or Single Name CDS) indicating misalignment**
- **Instruments that are conformant are fully classified at the most fine grained levels of the FIBO taxonomy and are deemed to be fully aligned with the contractual specification thus enhancing data reliability**

FIBO Identifies Ultimate Parents, their Descendents and Trading Counterparties

This capability allows for the rollup of both positions and exposures of the subsidiaries to the level of the ultimate parent for risk analysis

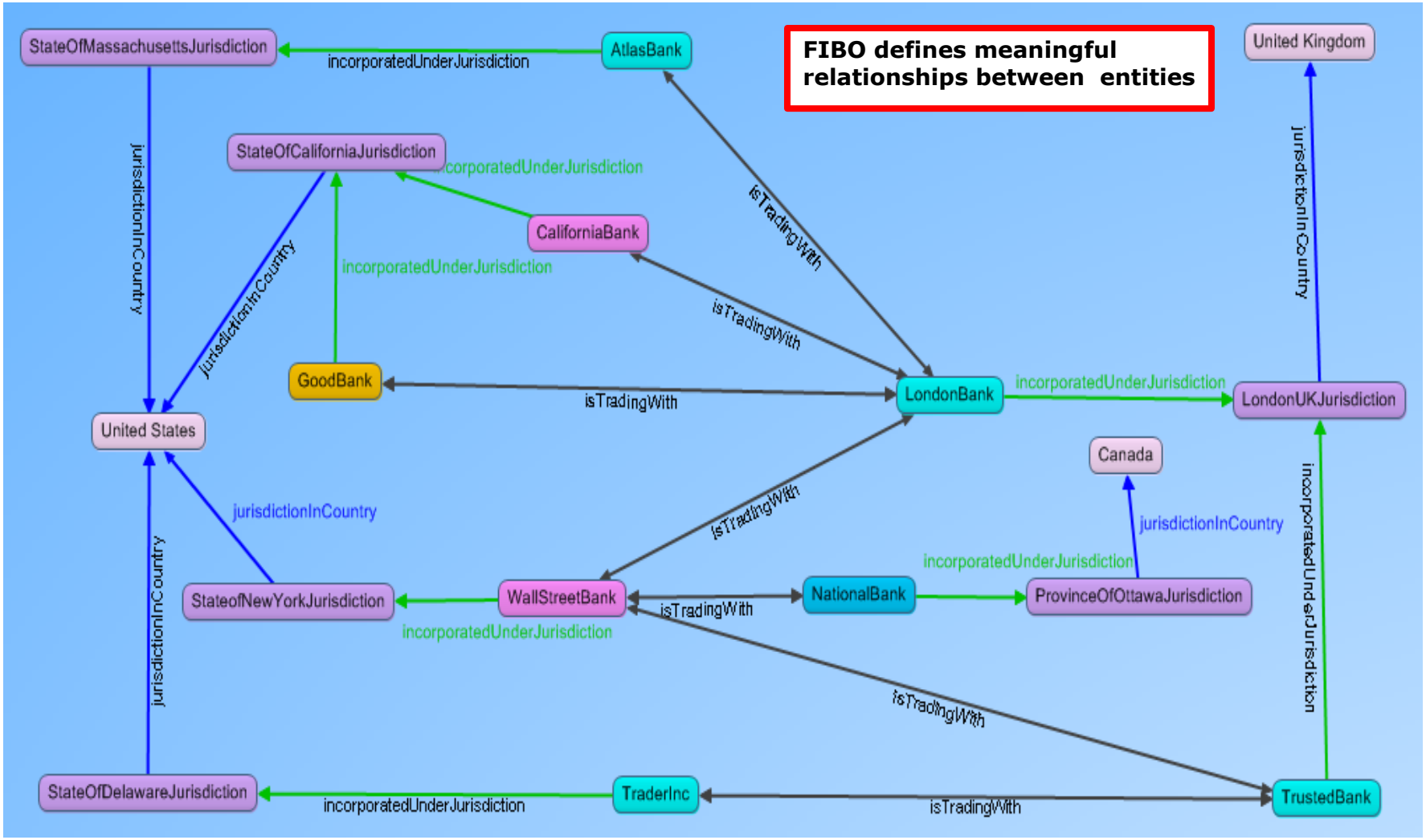
Enter a SPARQL select or describe query in the text widget to the left, then press the Do Query button. All known namespace abbreviations will be in effect. Or

34 Results

Create Visual Graph | Add to Visual Graph | Write Text Report | Save as CSV

?ultimateParent	?descendents	?counterparty	?classification	?UPI	?USI	?notionalAmount	?currency
AcmeInvestmentsCompany		WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC123	30000000.00	USD
AcmeInvestmentsCompany		GoodBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:OIS	Swap_Contract-SC09	10000000.00	USD
CaliforniaBank		LondonBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC143	16000000.00	USD
CaliforniaBank		AtlasBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:Basis	Swap_Contract-SC01	20000000.00	USD
CaliforniaBank		AtlasBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:Basis	Swap_Contract-SC03	25000000.00	EUR
CaliforniaBank		LondonBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	Swap_Contract-SC06	10000000.00	USD
CaliforniaBank	TraderInc	AtlasBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:Inflation	Swap_Contract-SC07	30000000.00	USD
GlobalBank		WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC119	19000000.00	USD
GlobalBank	BigBank	WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC130	30000000.00	USD
GlobalBank	BigBank	WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC122	65250000.00	USD
GlobalBank	LondonBank	WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC121	15250000.00	USD
GlobalBank	LondonBank	CaliforniaBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC143	16000000.00	USD
GlobalBank	LondonBank	AtlasBank	Credit Default Swap Contract	Credit:SingleName:Muni	Swap_Contract-SC118	14500000.00	USD
GlobalBank	LondonBank	GoodBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:Basis	Swap_Contract-SC04	30000000.00	EUR
GlobalBank	LondonBank	GoodBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:FixedFloat	Swap_Contract-SC02	25000000.00	EUR
GlobalBank	LondonBank	CaliforniaBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	Swap_Contract-SC06	10000000.00	USD
GlobalBank	SecuritiesInc	WallStreetBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	Swap_Contract-SC08	20000000.00	USD
GlobalBank	TrustedBank	WallStreetBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:FixedFixed	Swap_Contract-SC05	15000000.00	EUR
NationalBank		WallStreetBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	Swap_Contract-SC10	40000000.00	USD
WallStreetBank		LondonBank	Credit Default Swap Contract	Credit:SingleName:Corporate	Swap_Contract-SC121	15250000.00	USD

FIBO Identifies International Trading Partners via Country of Business Entity Legal Jurisdiction



Rollups of Total Positions by Country

FIBO provides the ability to rollup positions for legal entities within jurisdictions that are domiciled within countries for any desired level of a product taxonomy

5 Results

Create Visual Graph | Add to Visual Graph | Write Te

?country	?classification	?totalPosition
Canada	Interest_Rate_Swap_Contract	40000000.0
United Kingdom	Credit Default Swap Contract	50850000.0
United Kingdom	Interest_Rate_Swap_Contract	80000000.0
United States	Credit Default Swap Contract	195400000.0
United States	Interest_Rate_Swap_Contract	225000000.0

Business Entities and Aggregation by FIBO Swap Contract Classes

FIBO allows rollups of a business entity's total position across trades for particular types of instruments and product classifications

20 Results

Create Visual Graph | Add to Visual Graph | Write Text Report

?entity	?group	?category	?classification	?totalPosition
AcmeInvestmentsCompany	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	30000000.0
AcmeInvestmentsCompany	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	10000000.0
AtlasBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	17500000.0
AtlasBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	75000000.0
BigBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	95250000.0
CaliforniaBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	16300000.0
CaliforniaBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	55000000.0
GlobalBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	19000000.0
GoodBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	65000000.0
LondonBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	48750000.0
LondonBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	65000000.0
NationalBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	40000000.0
SecuritiesInc	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	300000.0
SecuritiesInc	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	20000000.0
TraderInc	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	2100000.0
TraderInc	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	30000000.0
TrustedBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	2100000.0
TrustedBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	15000000.0
WallStreetBank	Swap_Contract	Derivatives_Contract	Credit Default Swap Contract	159500000.0
WallStreetBank	Swap_Contract	Derivatives_Contract	Interest_Rate_Swap_Contract	75000000.0

Business Entities and *Higher* Level Aggregation by FIBO Swap Contract Classes

In this example, FIBO displays rollups for a business entity at the level of all derivatives contracts

12 Results

Create Visual Graph | Add to Visual Graph | Write Text Report

?entity	?group	?category	?totalPosition
AcmeInvestmentsCompany	Swap_Contract	Derivatives_Contract	40000000.0
AtlasBank	Swap_Contract	Derivatives_Contract	92500000.0
BigBank	Swap_Contract	Derivatives_Contract	95250000.0
CaliforniaBank	Swap_Contract	Derivatives_Contract	71300000.0
GlobalBank	Swap_Contract	Derivatives_Contract	19000000.0
GoodBank	Swap_Contract	Derivatives_Contract	65000000.0
LondonBank	Swap_Contract	Derivatives_Contract	113750000.0
NationalBank	Swap_Contract	Derivatives_Contract	40000000.0
SecuritiesInc	Swap_Contract	Derivatives_Contract	20300000.0
TraderInc	Swap_Contract	Derivatives_Contract	32100000.0
TrustedBank	Swap_Contract	Derivatives_Contract	17100000.0
WallStreetBank	Swap_Contract	Derivatives_Contract	234500000.0

Rollup of Ultimate Parents and their Descendents Total Positions for Instruments

FIBO supports the ability to rollup the total positions of an ultimate parent and it's subsidiaries to show aggregate exposure for particular instruments

26 Results

Create Visual Graph | Add to Visual Graph | Write Text Report

?ultimateParent	?classification	?UPI	?totalPosition
AcmeInvestmentsCompany	Credit Default Swap Contract	Credit:SingleName:Corporate	30000000.0
AcmeInvestmentsCompany	Interest_Rate_Swap_Contract	InterestRate:IRSwap:OIS	10000000.0
CaliforniaBank	Credit Default Swap Contract	Credit:Index:CDX	2400000.0
CaliforniaBank	Credit Default Swap Contract	Credit:SingleName:Corporate	16000000.0
CaliforniaBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:Basis	45000000.0
CaliforniaBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	10000000.0
CaliforniaBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:Inflation	30000000.0
GlobalBank	Credit Default Swap Contract	Credit:Index:CDX	2400000.0
GlobalBank	Credit Default Swap Contract	Credit:Index:iTraxx	3000000.0
GlobalBank	Credit Default Swap Contract	Credit:SingleName:Corporate	61250000.0
GlobalBank	Credit Default Swap Contract	Credit:SingleName:Muni	98750000.0
GlobalBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:Basis	30000000.0
GlobalBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:FixedFixed	15000000.0
GlobalBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:FixedFloat	25000000.0
GlobalBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	30000000.0
NationalBank	Interest_Rate_Swap_Contract	InterestRate:IRSwap:FixedFloat	40000000.0
WallStreetBank	Credit Default Swap Contract	Credit:Index:iTraxx	3000000.0
WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Corporate	75250000.0
WallStreetBank	Credit Default Swap Contract	Credit:SingleName:Muni	98750000.0
WallStreetBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:Basis	30000000.0
WallStreetBank	Interest_Rate_Swap_Contract	InterestRate:CrossCurrency:FixedFixed	15000000.0

Rollup of Ultimate Parents and their Descendents Total Swap Positions using FIBO Classes

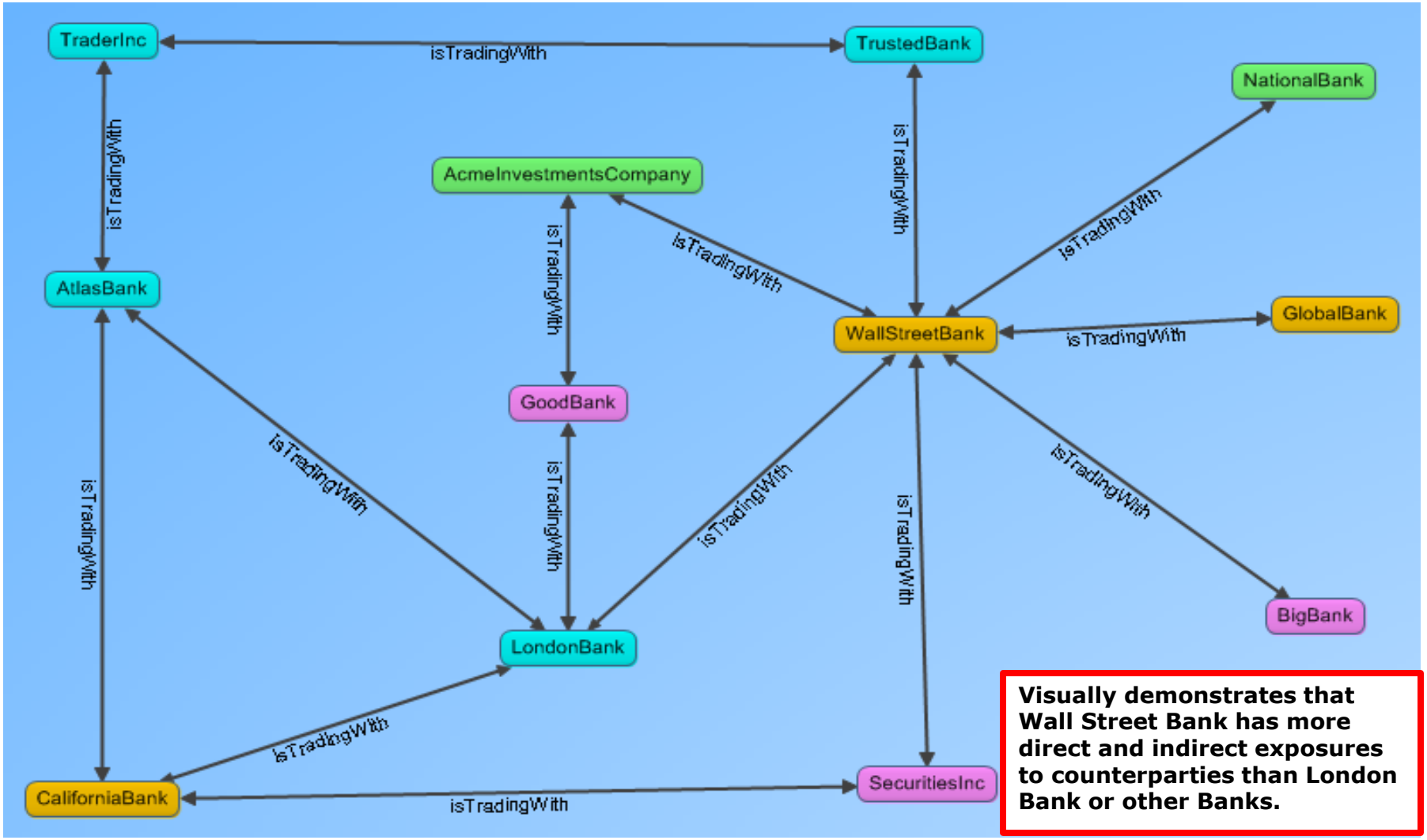
FIBO supports the ability to rollup the total positions of an ultimate parent and it's subsidiaries to show aggregate exposure at increasingly higher levels of the taxonomy

9 Results

Create Visual Graph | Add to Visual Graph | Write Tex

?ultimateParent	?classification	?totalPosition
AcmeInvestmentsCompany	Credit Default Swap Contract	30000000.0
AcmeInvestmentsCompany	Interest_Rate_Swap_Contract	10000000.0
CaliforniaBank	Credit Default Swap Contract	18400000.0
CaliforniaBank	Interest_Rate_Swap_Contract	85000000.0
GlobalBank	Credit Default Swap Contract	165400000.0
GlobalBank	Interest_Rate_Swap_Contract	100000000.0
NationalBank	Interest_Rate_Swap_Contract	40000000.0
WallStreetBank	Credit Default Swap Contract	177000000.0
WallStreetBank	Interest_Rate_Swap_Contract	215000000.0

Visualization of Transitive Exposures Across Counterparties



Visualization of Transitive Exposures across Counterparties with Higher Positions

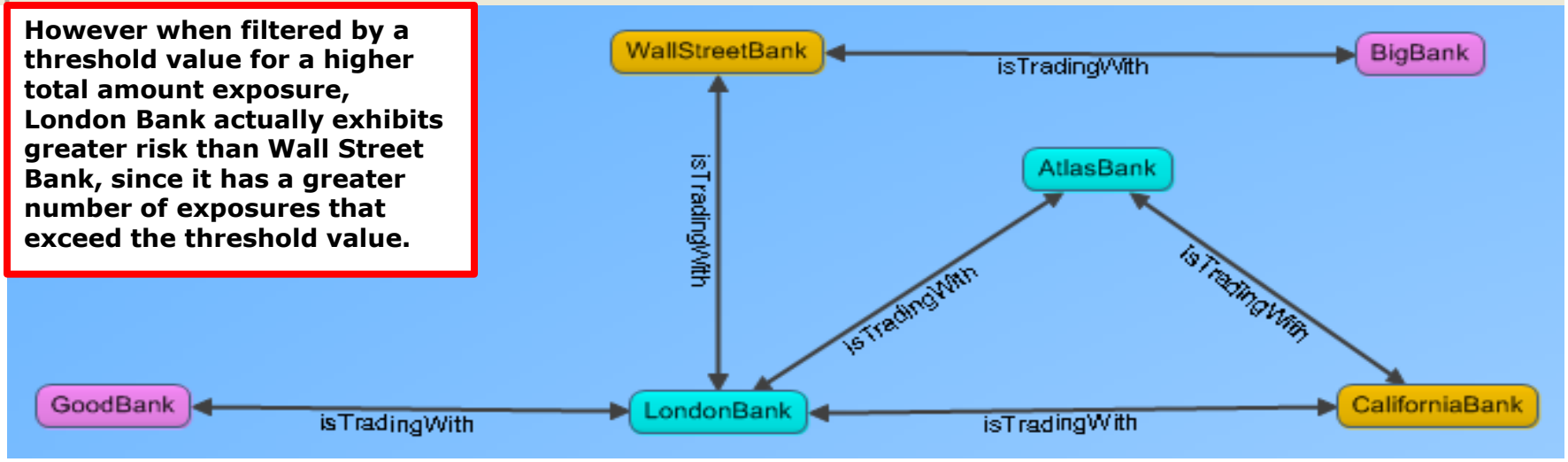
Visualization of trading relationships across counterparties provides a more intuitive and cognitively clear view of transitive exposures

Enter a SPARQ
widget to the l
known names
first select the

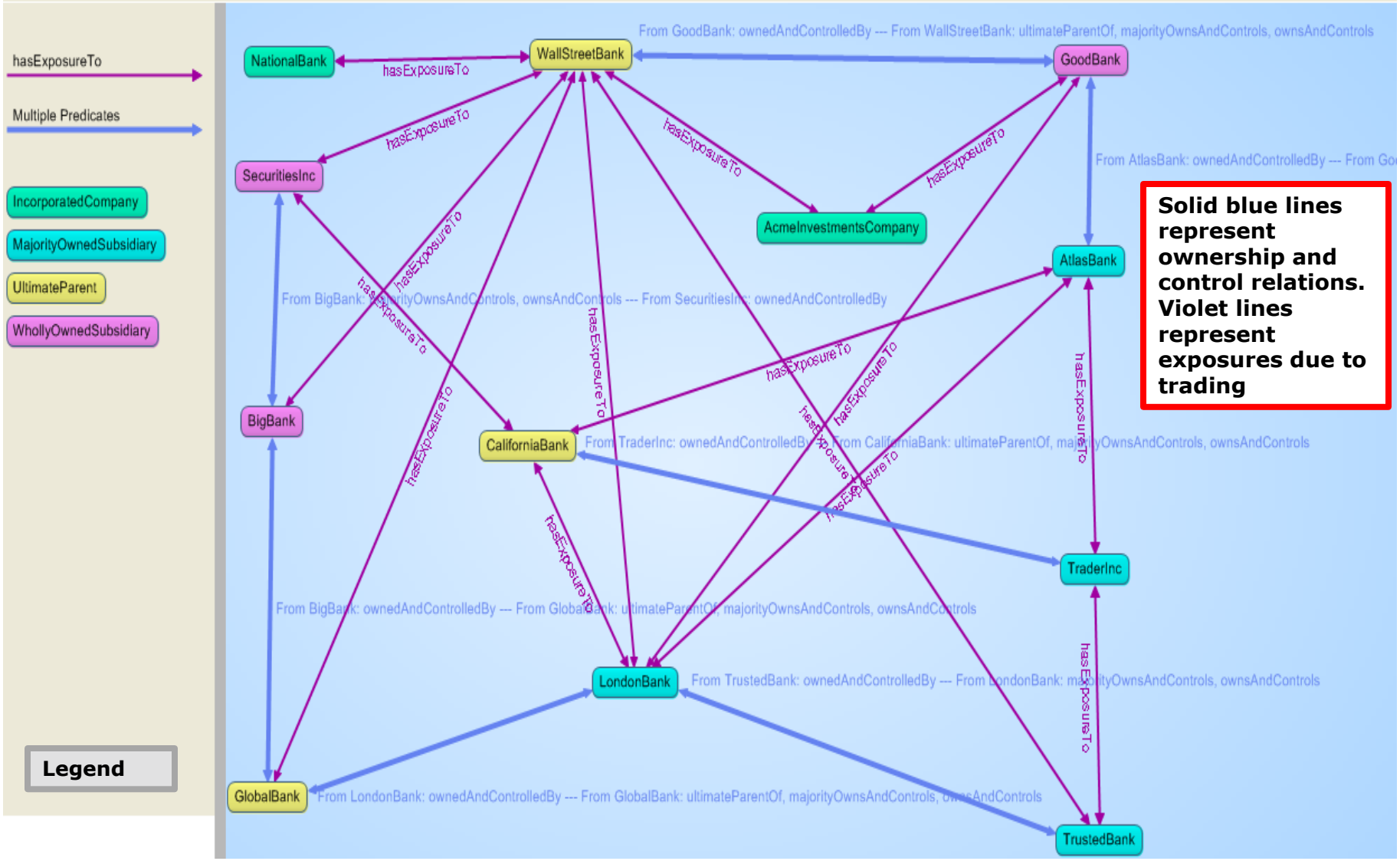
6 Results | Create Visual Graph | Add to Visual Graph | Write Text Report

?entity	?counterparty	?totalPosition
BigBank	WallStreetBank	95250000.0
WallStreetBank	BigBank	95250000.0
GoodBank	LondonBank	55000000.0
LondonBank	GoodBank	55000000.0
AtlasBank	CaliforniaBank	45000000.0
CaliforniaBank	AtlasBank	45000000.0

However when filtered by a threshold value for a higher total amount exposure, London Bank actually exhibits greater risk than Wall Street Bank, since it has a greater number of exposures that exceed the threshold value.



Visualization of Ownership Hierarchies and Exposures to Counterparties



FIBO Metadata Annotations Provide Useful Descriptions and Links to Related Information

Annotations represents supplemental descriptive information that can be linked to the elements within FIBO and can be directly queried. Example of some annotations for 'Interest Rate Swap Contract' and related CFTC information. Provenance, policy, regulations, security constraints, etc. can also be linked.

Enter a SPARQL select or describe query in the text widget to the left, then press the Do Query button. All known namespace abbreviations will be in effect. Or first select the Prolog radio button and enter a Prolog

Save as CSV

?element	?definition	?seeRegulatoryRule	?publishedBy	?seeDocument	?title	?url
Interest_Rate_Swap_Contract	A swap in which the underlying for one or both legs is an interes	CFTC_Rule_17_CFR_Part_45	CFTC	Federal Register / Vol. 77, No. 9 / Friday, January 13, 2012 / Rules a	Swap Data Recordkeeping and Reporting Requirements	http://www.cftc.gov/ucm/groups/publ ic/@lrfederalregister/documents/file/

Definitions for all types of 'Swap Contracts' are retrieved. Annotations eliminate need to define metadata using a separate independent product or repository.

Enter a SPARQL select or describe query in the text widget to the left, then press the Do Query button. All known namespace abbreviations will be in effect. Or first select the Prolog radio button and enter a Prolog

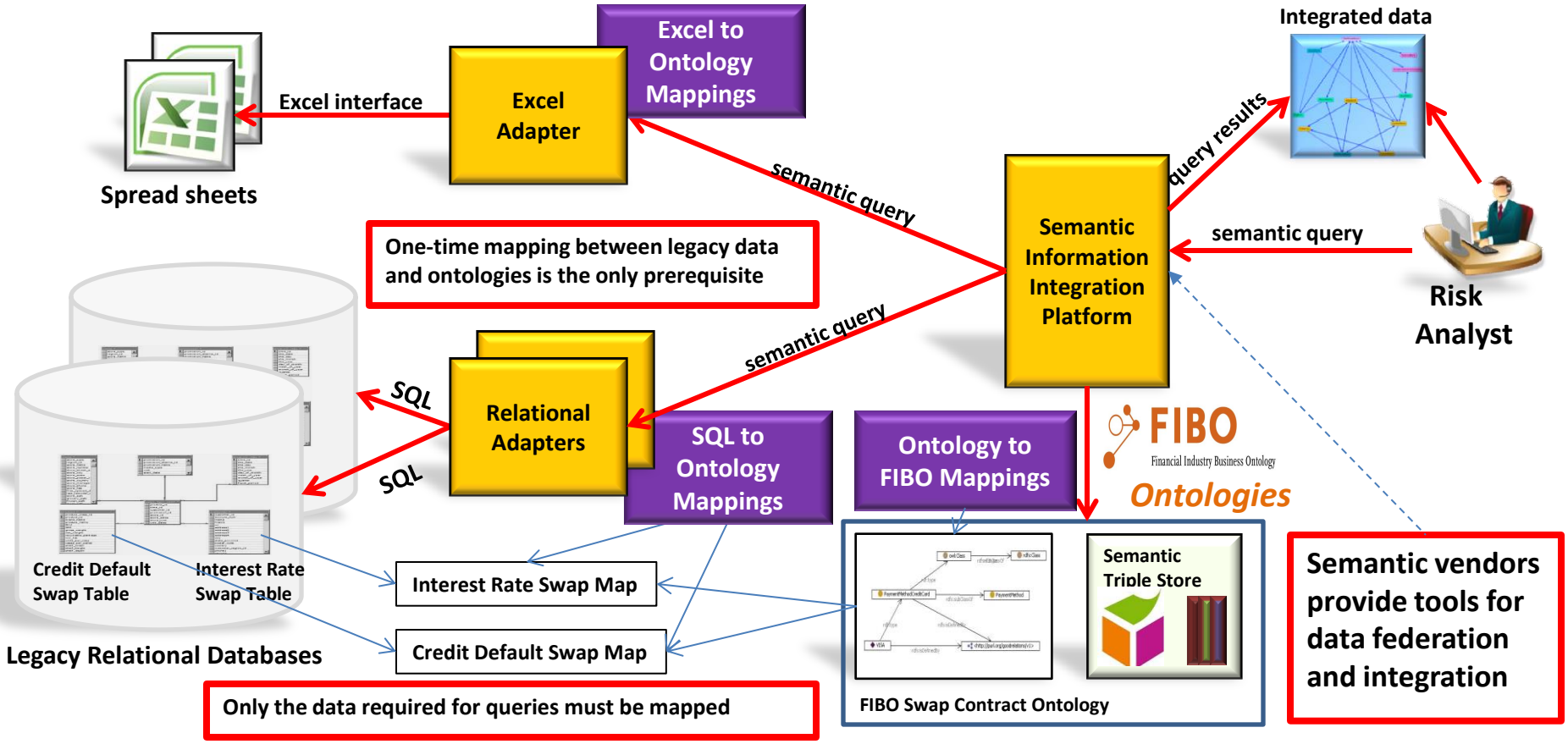
17 Results

Create Visual Graph | Add to Visual Graph | Write Text Report | Save as CSV

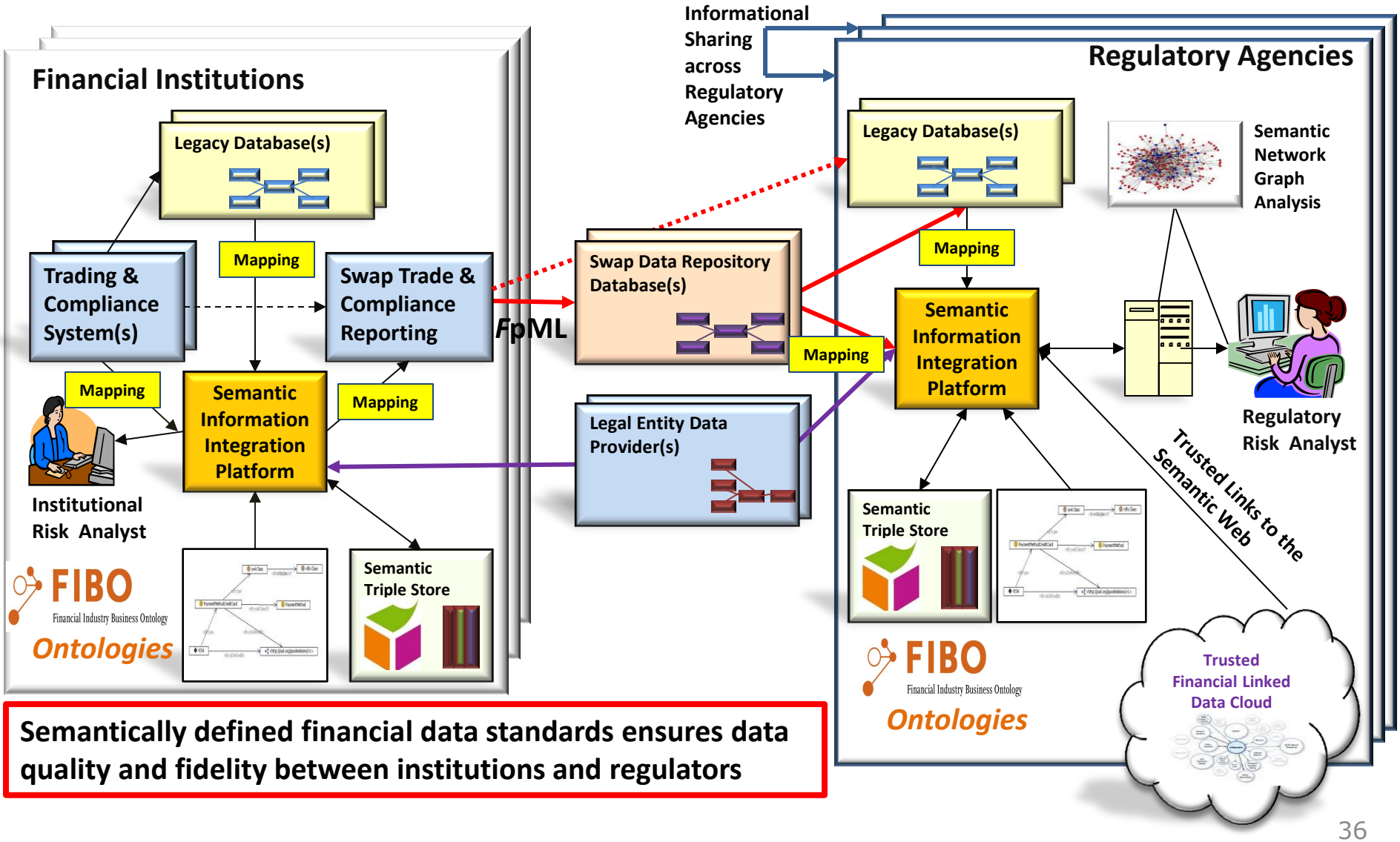
?type	?definition
Contract	A formal agreement between two parties, setting out rights and obligations between those parties.
Credit Default Swap Contract	A credit default swap (CDS) is a financial swap agreement that the seller of the CDS will compensate the buyer in the event of a loan default or other credit event. The buyer of the CDS makes a series of payments (the CDS "fee" or "spread") to the seller and, in exchange, receives a payoff if the loan defaults.
Cross_Currency_IR_Swap_Contract	A swap contract in which the two streams of interest payments are in different currencies.
Derivatives_Contract	An instrument which is derived in some way from some other instrument or other underlying financial asset or measure.
Fixed_Float_IR_Swap_Contract	An interest rate swap in which fixed interest payments on the notional are exchanged for floating interest payments.
Float_Float_IR_Swap_Contract	A swap which exchanges cashflows based on two different interest rates.
Index Credit Default Swap Contract	A credit default swap index is a credit derivative used to hedge credit risk or to take a position on a basket of credit entities. Unlike a credit default swap, which is an over the counter credit derivative, a credit default swap index is a completely standardised credit security and may therefore be more liquid and trade at a smaller bid-offer spread. This means that it can be cheaper to hedge a portfolio of credit default swaps or bonds with a CDS index than it would be to buy many single name CDS to achieve a similar effect. Credit-default swap indexes are benchmarks for protecting investors owning bonds against default, and traders use them to speculate on changes in credit quality
Inflation_IR_Swap	A trade in which two firms exchange interest payments in the same currency, one based on an inflation rate.

Legacy Data can be Processed Semantically Without Requiring Conversion or Migration

Legacy data can be collected from diverse sources, mapped, integrated with FIBO, classified (based upon alignment with business concepts) and then aggregated for query and reporting purposes



Proposed FIBO Architecture for Institutional and Macroprudential Oversight



Semantically defined financial data standards ensures data quality and fidelity between institutions and regulators