OMG FDTF / EDM Council
Financial Industry Business Ontology
Background

OMG Ontology PSIG • June 23, 2011
Outline

- EDM Council Semantics Repository initiative
  - History, development, principles
- OMG Finance Domain Task Force partnership
  - Proposal for Standard
    - Financial Industry Business Ontology
- FIBO standardization activities
  - Disposition of Standard Proposals
  - ODM alignment
  - Shared Semantics
Semantics Repository History

- Why a Semantics Repository?
- Development of an Industry Ontology
  - Content
  - Presentation
  - Theory of Meaning
  - Implementation
- Scope
- History and Usage
- OMG Partnership – current activities
- Derivatives Proof of Concept project
History: Financial Standards

• Messaging: MDDL
  – XML schema for market data
• ISO 20022 FIBIM (ISO TC68/SC4)
  – Logical Data Model Design via UML profile
• FpML (ISDA)
  – Derivatives message models
• What the industry really needed
Industry Conclusions

• Good design is weak semantics
• Business knowledge gained during reviews is either
  – Lost
  – Buried in meeting minutes
  – Kept in uncontrolled spreadsheets in a variety of structures
• Data Dictionaries try to link business definitions to data elements
  – but data elements are reused across business meanings and usage contexts (good design again)

• Industry conclusion
  – “We need a semantics standard”
A mature technology development process has the following distinct artifacts:

- **Conceptual Model**
  - Business requirements
  - Expressed in technology neutral terms
  - Contains no design information

- **Logical Model**
  - Logical design
  - Expressed in technical terms
  - Independent of specific implementation

- **Physical Model**
  - Physical design
  - Expressed in terms of a specific implementation of that design

For data model and message design, the Conceptual Model is a record of the business semantics.
History

• Three year project sponsored by the Enterprise Data Management Council
• Initial draft material subjected to business subject matter expert reviews
• As of mid 2010, reference data for principal instrument classes is in “Beta”
  – This means it is stable enough to refer to but we expect changes as we come up against real data and real projects
  – Proof of Concept projects and early adopters ongoing
• Dec 2010: Teamed up with OMG Finance domain Task Force to create an RFC proposal for the Repository to become a formal standard
Semantics Repository Mind Map

- **Theory of meaning**
- **Original Content**
  - XBRL
  - ISO 20022
  - MDDL

- **Industry Standards**
  - FpML
  - XBRL
  - ISO 20022
  - MDDL

- **SemWeb OWL constructs**
- **SME Reviews**
- **User Commitments**
  - Boxes & Lines
  - XLS

- **Semantics Repository**
- **Archetypes**
  - EA UML Tool
  - Tweaks for Tool support
  - Enhancements for readability

- **EDM Council**

Confidential
Financial Industry Business Ontology

- XBRL
- ISO 20022
- FpML
- MDDL
- Theory of meaning
- SME Reviews
- User Commitments
- Boxes & Lines
- XLS
- Archetypes
- EA UML Tool
- Tweaks for Tool support
- SemWeb OWL constructs
- ODM
- RDF/OWL
- Original Content
- Industry Standards
- Enhancements for readability
FIBO Content

- XBRL
- Original Content
  - Industry Standards
  - ISO 20022
  - FpML
  - MDDL
- Semantics Repository
  - SME Reviews
- User Commitments
  - Boxes & Lines
  - XLS
  - creates Archetypes for Tool support
  - Tweaks for Tool support
- Theory of meaning
- SemWeb OWL constructs
- ODM
- EA UML Tool
- RDF/OWL
Content

- Initial population of the model derived from the most appropriate standards in each area:
  - ISO 20022 FIBIM
  - MDDL
  - FpML
  - Member firms

- Domain expert reviews introduced considerable new material
  - Structured finance, complex derivatives
FIBO Scope

- Tradable Securities
  - Reference Data terms (Beta)
  - Date and time sensitive terms (Draft)
- Over the Counter Derivatives (Draft)
- Corporate Actions (in process)
- Securities Transactions Processing (to do)
- **NEW:** Loans section
  - Added as part of recent MBS Proof of Concept
- Business Entity / Legal Entity
  - Part of mid level ontology material
FIBO Presentation

Semantics Repository

Industry Standards
- ISO 20022
- FpML
- MDDL

Original Content
- XBRL

SME Reviews

User Commitments

Boxes & Lines

Theory of meaning

SemWeb OWL constructs

Archetypes

Tweaks for Tool support

enhancements for readability

EA UML Tool

RDF/OWL

ODM
Business Presentation

• No “Language”
  – Spreadsheets and/or “boxes and lines”
  – Explainable in logic not tech

• Business must own / review / validate
  – This is a business level, “conceptual” artifact
    • Physical models, logical models, business conceptual model

• Thereby:
  – We created an industry resource that subject matter experts could validate
Semantics Repository

Financial Instruments Semantic Model

- “Is A” relations
- Relationship Fact

Prepared by:

www.hypercube.co.uk
<table>
<thead>
<tr>
<th>Line</th>
<th>Term type</th>
<th>Term</th>
<th>Definition</th>
<th>Synonym</th>
<th>Simple Type</th>
<th>Related Thing</th>
<th>Multiples</th>
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<tbody>
<tr>
<td>66</td>
<td>Thing</td>
<td>Issued Share</td>
<td>A publicly traded security that signifies ownership in a corporation and represents a claim on part of the corporation's assets and earnings.</td>
<td>Publicly Issued Share.</td>
<td></td>
<td></td>
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<td>Parent</td>
<td></td>
<td></td>
<td>Share</td>
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<tr>
<td>68</td>
<td>Parent</td>
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<td>Exchange Traded Security</td>
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<td>69</td>
<td>Union</td>
<td></td>
<td></td>
<td>Equity Instrument</td>
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<td>69</td>
<td>Relationship fact</td>
<td>senior to</td>
<td>The share has a higher seniority than the related share, meaning that it gives the holder a higher claim on the assets of the issuing entity in the event of the winding up of that entity.</td>
<td>Issued Share</td>
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<td>Relationship fact</td>
<td>has holder</td>
<td>A party which holds the publicly issued share.</td>
<td>Public Shareholder</td>
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<td>Relationship fact</td>
<td>confers ownership of</td>
<td>Equity represented by the Publicly Issued Share and owned by the Holder of that share in proportion to the amount of the issue that they hold.</td>
<td>Issued Equity</td>
<td></td>
<td></td>
<td></td>
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<td>Relationship fact</td>
<td>has issuance information</td>
<td>Issuance Information specific to this Equity Instrument</td>
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<td></td>
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<td>Relationship fact</td>
<td>has listing</td>
<td>A listing of the share on an exchange or multilateral trading facility.</td>
<td>Equity Listing</td>
<td></td>
<td></td>
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<tr>
<td>74</td>
<td>Relationship fact</td>
<td>confers</td>
<td>The right of a stockholder to vote on matters of corporate policy as well as on who is to compose the board of directors. Rights can be of junior or senior rank (precedence of ranks).</td>
<td>Voting Right</td>
<td>0..1</td>
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<td>Relationship fact</td>
<td>has price</td>
<td>The price of the share on some exchange at some time.</td>
<td>Share Price</td>
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<td>76</td>
<td>Relationship fact</td>
<td>has priority terms</td>
<td>Terms setting out the priority rights attached to the Issued Share.</td>
<td>Issued Equity Priority Terms</td>
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<td>77</td>
<td>Relationship fact</td>
<td>has status</td>
<td>The status of the shares at a given point in time.</td>
<td>Current Share Status</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>78</td>
<td>Simple fact</td>
<td>Free Float</td>
<td>The total number of shares publicly owned and available for trading. The float is calculated by subtracting restricted shares from outstanding shares.</td>
<td>whole number</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIBO Semantics

- Industry Standards
  - ISO 20022
  - FpML
  - MDDL

- Original Content
  - XBRL

- Theory of meaning

- SemWeb OWL constructs
  - SME Reviews
  - Archetypes
    - Tweaks for Tool support
    - enhancements for readability
  - Semantics Repository

- User Commitments
  - Boxes & Lines
  - XLS

- EA UML Tool
  - RDF/OWL

- ODM
The model consists of:

- Things
  - A Thing is a set theory construct
  - Arranged in a hierarchy called a “Taxonomy”
    - Like taxonomy of species

- Facts
  - Simple facts (names, dates etc.)
    - e.g. “Issue Date” is a date
  - Relationship Facts (relate one thing to another thing)
    - e.g. “Share confers Voting Rights”
    - Things so referenced are also in taxonomic hierarchies

- Other set theory concepts
  - Disjoints, Unions
• Taxonomy: Like Taxonomy of Species
  – Animal v Plant
  – Vertebrate v invertebrate
  – Mammals, fish etc.
• Each thing is defined by what facts distinguish it
• For each new thing:
  – What sort of thing is it?
  – What facts distinguish it from other things?
• If it walks like a duck, swims like a duck and quacks like a duck, it belongs to the set of all things that are a duck
FIBO Implementation

- **Original Content**
  - XBRL
  - ISO 20022
  - FpML
  - MDDL
  - Theory of meaning

- **Semantics Repository**
  - SME Reviews
  - Archetypes
  - Enhancements for readability

- **User Commitments**
  - Boxes & Lines
  - XLS

- **Tools**
  - EA UML Tool
  - RDF/OWL
  - ODM
  - Tweaks for Tool support

- **Theory of meaning**
  - Creates

- **SemWeb OWL constructs**
Current Implementation

- Used early draft of OMG’s Ontology Definition Metamodel (ODM) specification
- Made tweaks to ODM for readability
  - Meeting our commitment to “Boxes and lines” notation
  - Do not want business viewers to see a single repurposed punctuation mark
    - “Keep the philosophy out of sight!”
- Implemented as UML profiles in Sparx Enterprise Architect
  - OWL and RDF toolbars
- Extended with business profiles for common semantic patterns
  - Archetypes
Current Implementation

• Diagrams are saved in a variety of levels of detail and posted to Semantics Repository website
• Reports from EA are converted into spreadsheets and HTML tables
• Both spreadsheets and tables reflect the model content and relationships
• The EA model is also made available (with Sparx free viewer)
• Website is open to all, with facilities for comments
• SME Reviews are carried out via live webcast using the EA tool
Use Cases

• Common business language in the organization
• Integration
  – Hub in a hub and spoke mapping
  – Semantics not data is the best point of reference for terms in different systems, feeds
• Model driven development (MDA)
• Metadata Repositories
• Semantic Web Applications
  – Querying, search etc.
Semantic Web applications

• The use of OWL (via ODM) makes semantic web apps possible
• New Use Case
  – The existing use cases don’t go away
  – The existing model formats, displays, user commitments don’t go away
• Requires generation of OWL models
  – Part of the FIBO work is to enable this
• Business use cases
  – Unlikely to replace their existing data resources
  – This is not a “green field”
  – Likely use is in risk, compliance (internal and external)
What Next?

- Existing arrangement is labor intensive and difficult to maintain
- People are referring to the model but need to see a mature governance process before they depend on it
- Also some industry folks asking for OWL version for Semantic Web applications
- In the long run, we needed a home and a maintenance / hosting facility
- We had always recognized the need to bring the underlying metamodel into line with the latest version of ODM once this had stabilized
• EDM Council partnered with the OMG partnership to develop Semantics Repository as a formal standard submission (RFC)
• Reasons
  – Bring in line with latest ODM spec
  – Benefit from OMG standards process and ecosystem
• Additional Benefits
  – ODM Compliance means canonical OWL can be generated
• Financial Industry Business Ontology will then be adopted by the industry
  – Many of our members are impatient to get their hands on the standard
  – Don’t want to wait for ODM2 and OWL2
What is the FIBO?

• UML based editing environment
  – To be moved to a hosting solution
  – Content should be tool independent

• Business Presentation

• OWL ontologies generated from this
  – Once ODM implemented in full

• Common semantics framework
  – Socializes semantic standards
  – Semantic granularity and precision
Core Commitments

• Business Readability
  – Spreadsheet/tables
  – Diagrams with no UML punctuation
  – Business friendly edit would be a bonus

• Capture meaning as understood by business
  – No limitations per OWL applications
  – Not limited to decidable sub-set
  – Multiple inheritance
    • (different classification facets)

• These do not go away!
Semantic Web Additional Use Cases

• Use of OWL opens up new possibilities
  – Validation of Semantics Repository content
  – Semantic Querying
  – Reasoning

• Business Use Cases
  – Classification of trades e.g. derivatives
  – Risk and exposures

• Populate OWL ontologies with individuals
• Ability to navigate and query across business domains
FIBO RFC Disposition

- Corporate Actions
- Securities Transactions
- Broader Framework: Process, Event, State
- Pricing, Analytics
- Securities and Derivatives Reference Data
- Securitized v non-Securitized
- Assets
- Loans
- Business Entity
- Global Terms (Mid level ontology)
  - Accounting, Geo, Legal etc.
- Core Concepts:
  - Time, Math, places and address etc.
- Ontology Lattice
Joint Workstreams

- **Workstream 1: Content Disposition**
  - What goes in what standard submission
  - Modularity requirements within these

- **Workstream 2: Technical Modell Framework**
  - Metamodel
  - Long term standards integration
    - Rules, Terminology, Process etc.

- **Workstream 3: Shared Semantics**
  - Reuse of well attested semantics standards
  - Commitment to replace mid level ontology terms
  - Semantics Provenance
Financial Industry Business Ontology Status

- Joint workstreams managed by the OMG FDTF and the EDM Council
  - Content and RFC disposition
  - Technical Model Framework (metamodel)
  - Shared Semantics
- Decisions made on how to configure the content as a set of proposed standards
- Promising results in the metamodelling (ODM alignment) works
- Shared Semantics – Namespace etc. ongoing
- Derivatives Proof of Concept (fast track)
- Considering how to formally manage fast changing content and ontology within OMG quality
Technical Modeling Workstream

• Update in line with current ODM
  – ODM 1.0
  – Upcoming ODM RFP
  – OWL2

• Identify what’s left over
  – Anything to propose into ODM?
  – Changes to base types in model
    • Impact analysis on content

• Archetypes
  – Not an OWL construct therefore not in ODM
  – OWL rendition somehow?
Technical Modeling Workstream

• Longer Term Activities
  – Business Rules application
• Terminology, Vocabulary, Ontology
  – Relation to ISO 1087 Terminology
  – Cross reference to SBVR
• Process
  – We have a dumb notation for this
  – Integration with process tools
    • for CAE work etc.
• Common relationship types
• Archetypes mechanization
• Business context markers
  – Can we use BIAN to define ontology sub-sets per application area and extract these?
  – Do we add something to the metamodel for these?
• Extrication of OWL dialect sub-sets
• SKOS, DC – where do you put these terms
• Ecosystem / URI considerations
• Business friendly editing
Shared Semantics Workstream

• Activities / Decision Points
  – Standards selection procedure
  – Grid of candidate standards
  – Disposition
    • Packages, ontologies
  – application to external terms of:
    • Archetypes
    • Lattice
Shared Semantics Activities

• Standards Selection
  – Defined a set of criteria:
    • E.g. standards body, type of semantics

• Grid of standards semantics
  – Will maintain on Wiki
  – Need to determine precedence / policy
• Will do an initial case study in formally referencing these standards:
  – Resource, Events, Agents (REA)
  – XBRL (financial reporting)
• These cover aspects of accounting
• Differ in many of the criteria of interest
  – Semantic format, industry attestation etc.
• Will define mechanics of the process
Derivatives Proof of Concept

• Joint project with the EDMC/OMG FDTF and ISDA
• Demonstrate what can be done with semantic technology
  – As business domain models
  – As Semantic Web applications
• Presentation to regulators June 30
• Using OWL models of the FIBO content developed by Sandpiper
• Show what can be done with reasoners, semantic querying
Findings:
  – Difference between domain model and semantics of message content
  – Use a “Hub and Spoke” arrangement
    • OWL models of FpML content
    • Mapping OWL Ontologies into FIBO hub

Capabilities of different tools

Navigation across business concepts
  – Legal entities, underlying

Demonstration:
  – Exposures to counterparties, parent
Questions?