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Sharing Knowledge Across the Earth Model Workflow

99th OGC Technical Committee – 3D Geoscience borehole ad-hoc meeting

Dublin, Ireland

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On behalf of Energistics Consortium

22 June 2016

Agenda

- RESQML at large
- What is RESQML
- What is transfered
- The status today

RESQML SIG Members

- BP
- Chevron
- Computer Modeling Group
- Dynamic Graphics
- Emerson/Roxar
- ExxonMobil
- F2I-Consulting
- Geosiris
- Halliburton
- IFP Energies nouvelles
- Infosys
- Paradigm
- Petrolink
- Schlumberger
- Saudi Aramco
- Shell
- Statoil
- Texas A&M
- Total
- UFRGS

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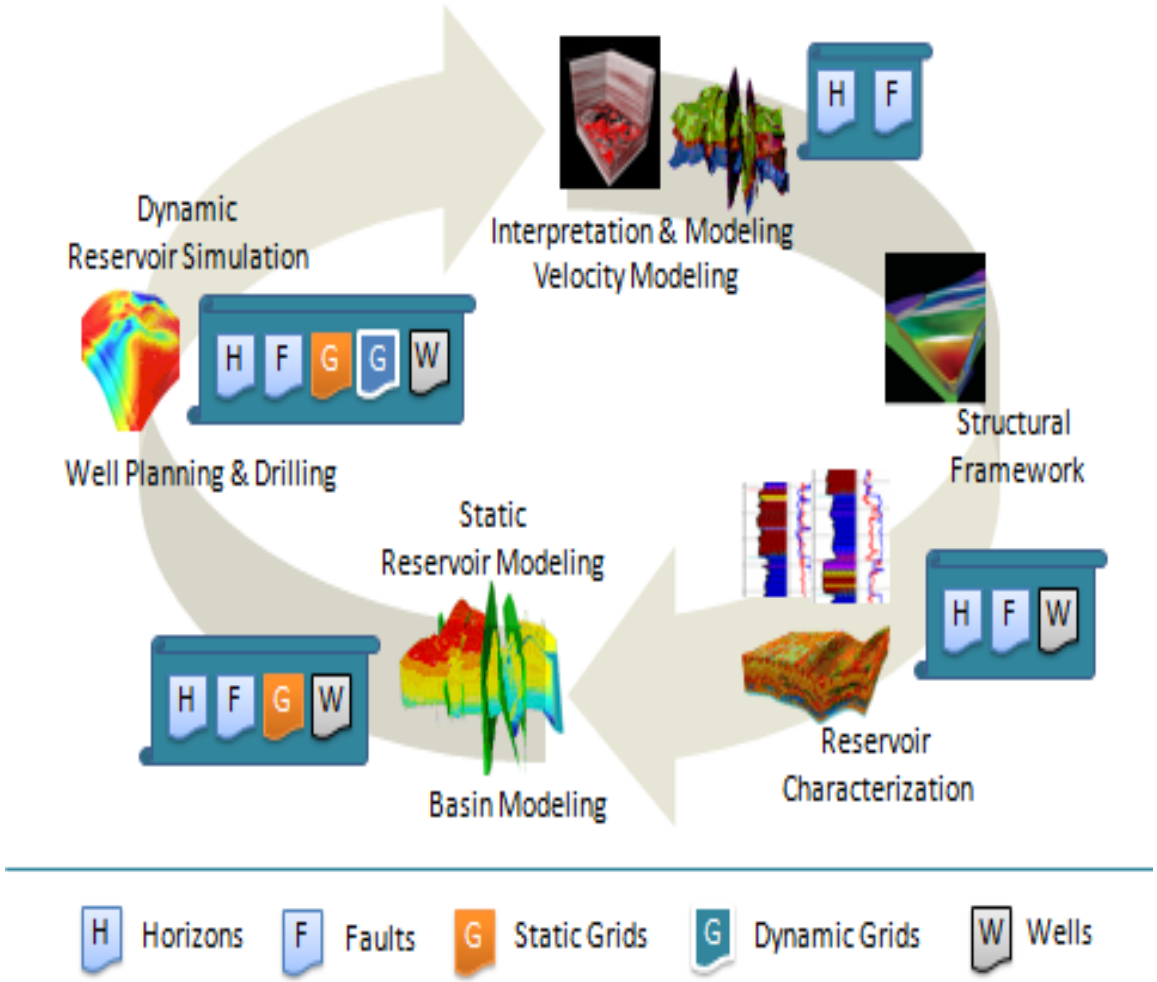
RESQML V2+ workflows and usage



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RESQML V2 scope

INFRASTUCTURE AND WORKFLOWS

- Activity Modeling (new!)
- Large model workflows
- Packaging specification using Energistics OPC allowing partial transfers
- And Now Interoperabity using ETP (new!).

STRUCTURE

- Structural/Stratigraphic Organization and Frameworks, Rock Fluid Organizations
- Geo-chronological cross reference table and contacts

3D GRIDS

- Seismic Cube / 2D Sections handling
- Corner Point + Unstructured + Radial Grids + LGR
- Relationships with Structural/Stratigraphic Framework

WELLS

- WITSML objects, including:
- Trajectories, Markers, logs
- RESQML Specific Wellbore (borehole) management."

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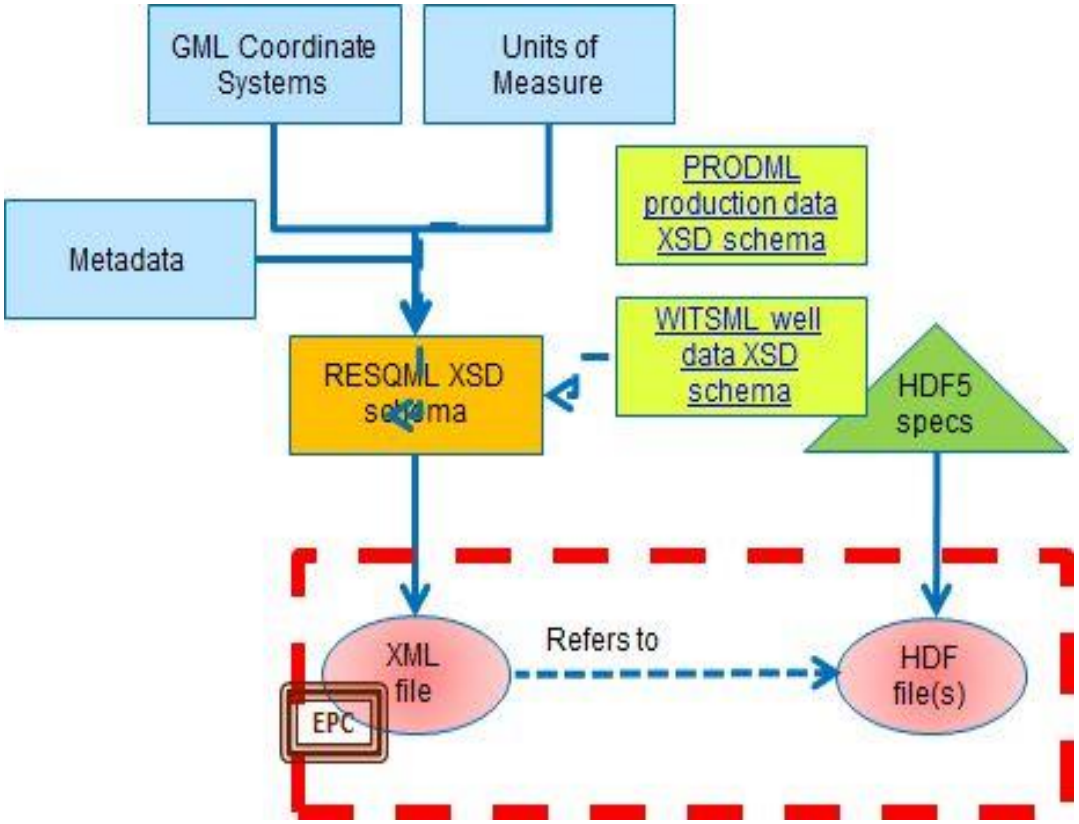
What is RESQML?

- RESQML is predominantly concerned with representing models of the earth
- RESQML is an XML based standard for data exchange coupled with the HDF5 standard for large array data
- It is a replacement of the previous RESCUE data exchange standard for reservoir and earth models
  - Geoscientists and Engineers needed a more robust way to share & use reservoir and earth models across the subsurface portfolio



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EPC File: ZIP following the OPC convention

A container able to associate data Objects by their relationships

RESQML EPC allows

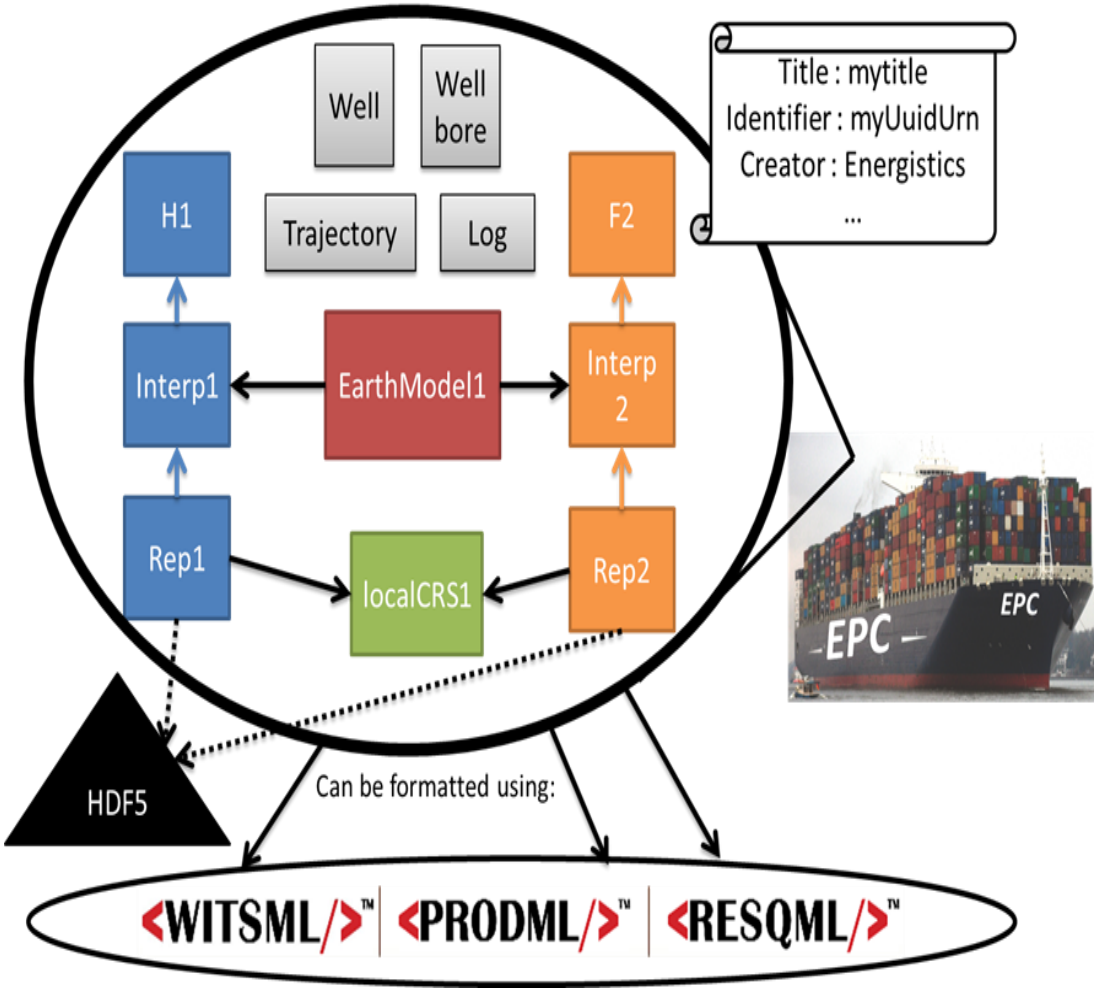
- Partial model transfers
- Flexible workflows
- Relationships consistency
- Uncertainty management

Common architecture

- Platform for collaboration

Technical description

- “Zip” for Energistics



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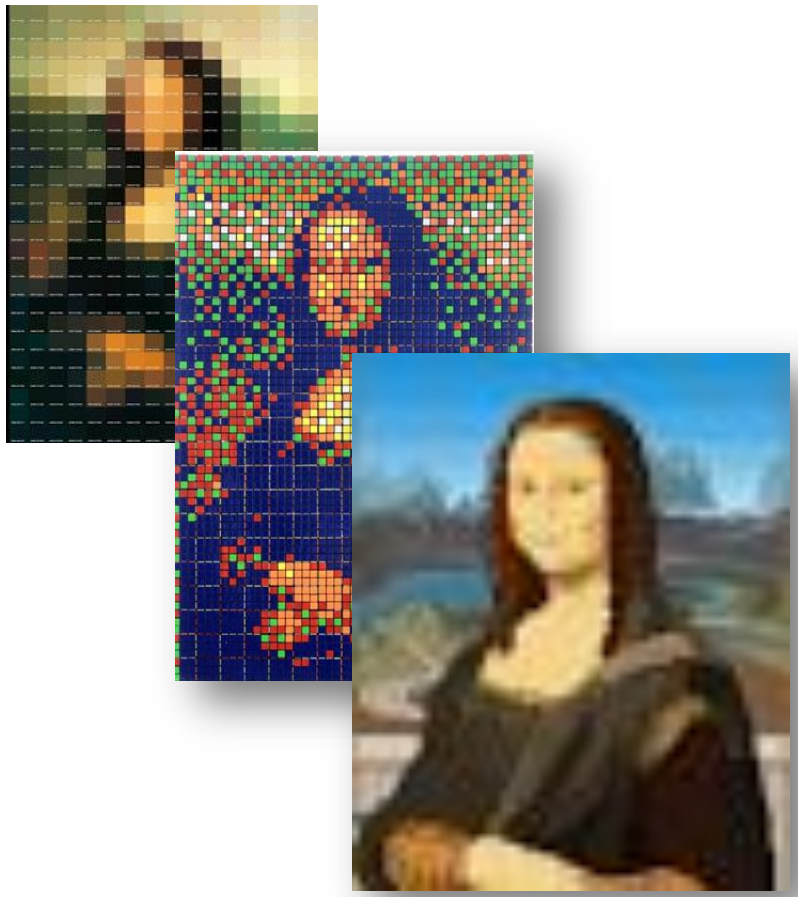
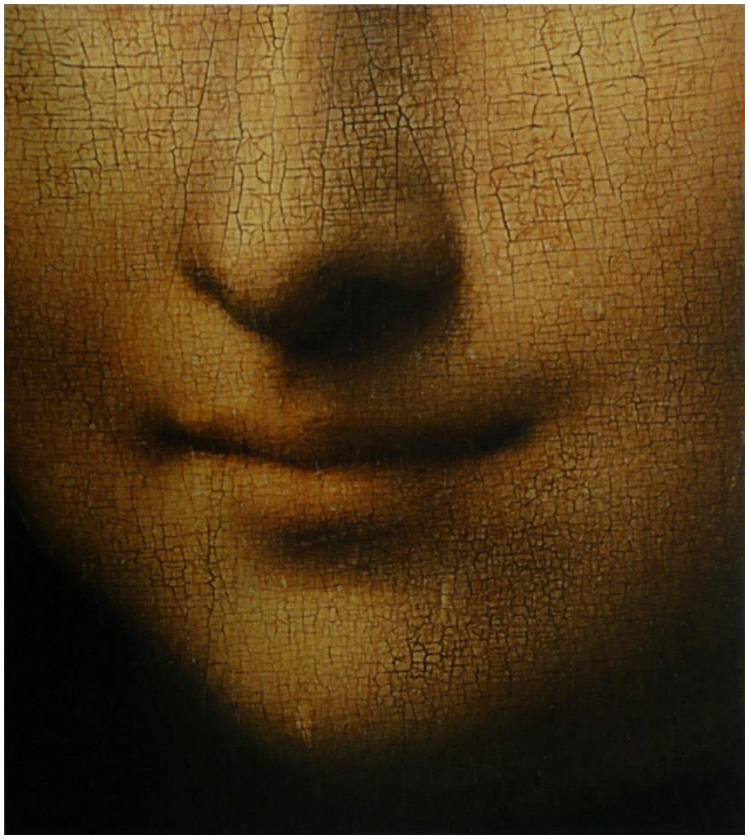
Infrastructure and Workflows: Modular Documents

- Improve consistency of the reservoir models
- Reduce geosciences study cycles
- Audit trail of reservoir development decisions





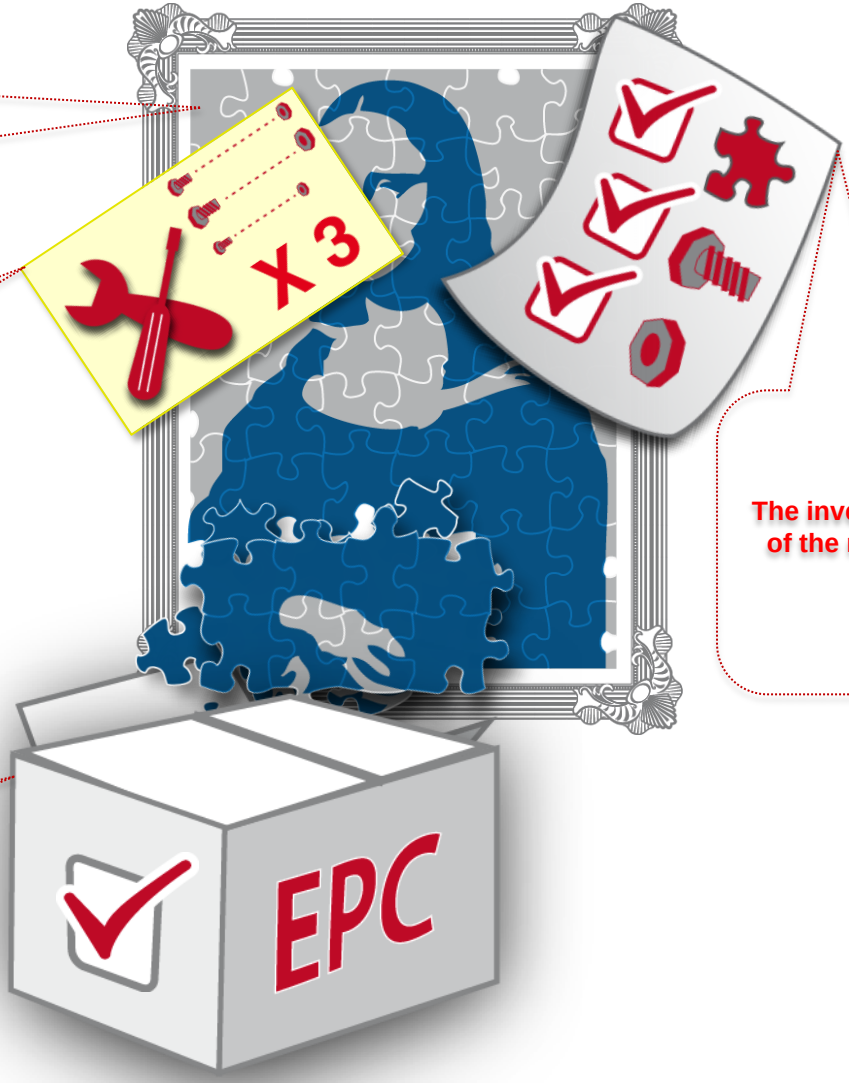
Infrastructure and Workflows: EPC: Energistics Packaging Convention

The model interpretation and representation

The relationships that connect the pieces together

The inventory of all the parts of the model that are to be reworked

The container of the partial extraction



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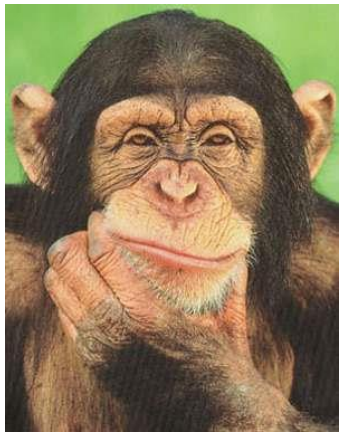
Organization:

Structuring the knowledge with RESQML V2: Step 1

Feature:

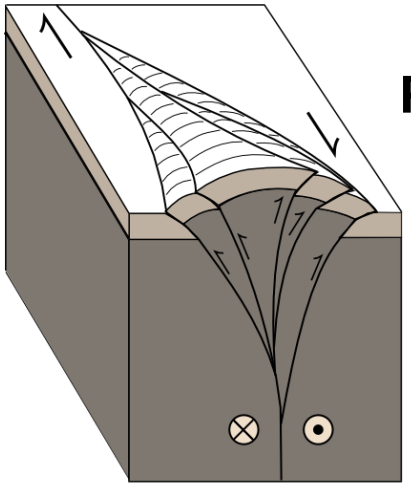
A feature corresponds to a subsurface phenomena. Features may be geological (boundaries & volumes) or technical (frontiers).



Interpretation:

An interpretation is a single consistent description of a feature.

A feature may have one or more Interpretations.



Positive Flower

Representation:

A representation is a digital expression of a line, surface, or volume that corresponds to a given interpretation.

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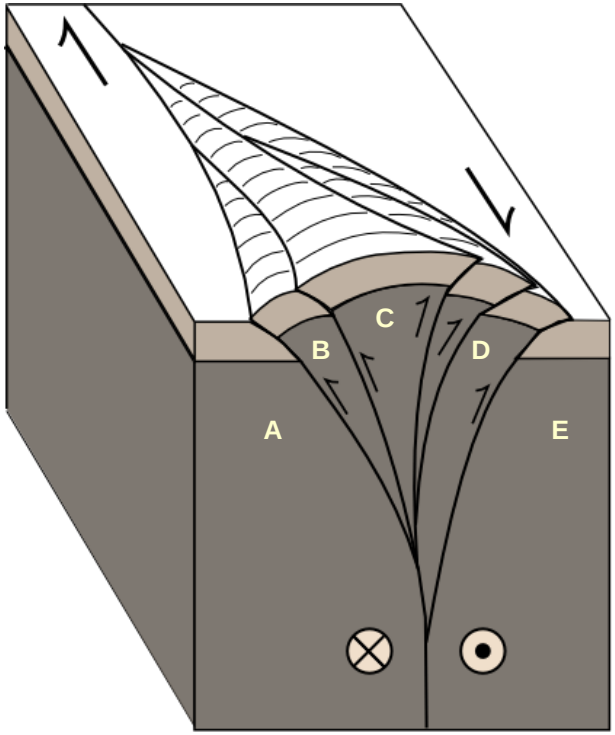
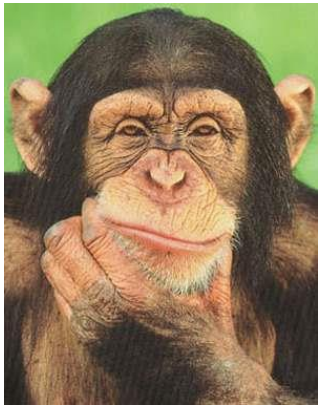
Structuring the knowledge with RESQML V2: Step 2

Relationships ➡ Organizations



Relationship between faults

These faults rejoin in a specific geometric pattern



Relative position of geological layers

We can define a closed trap and specific reservoir components

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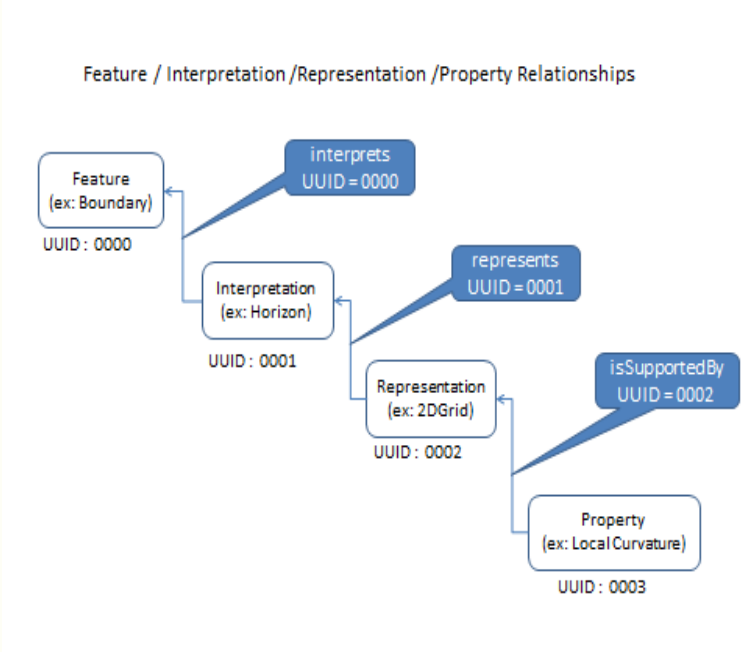
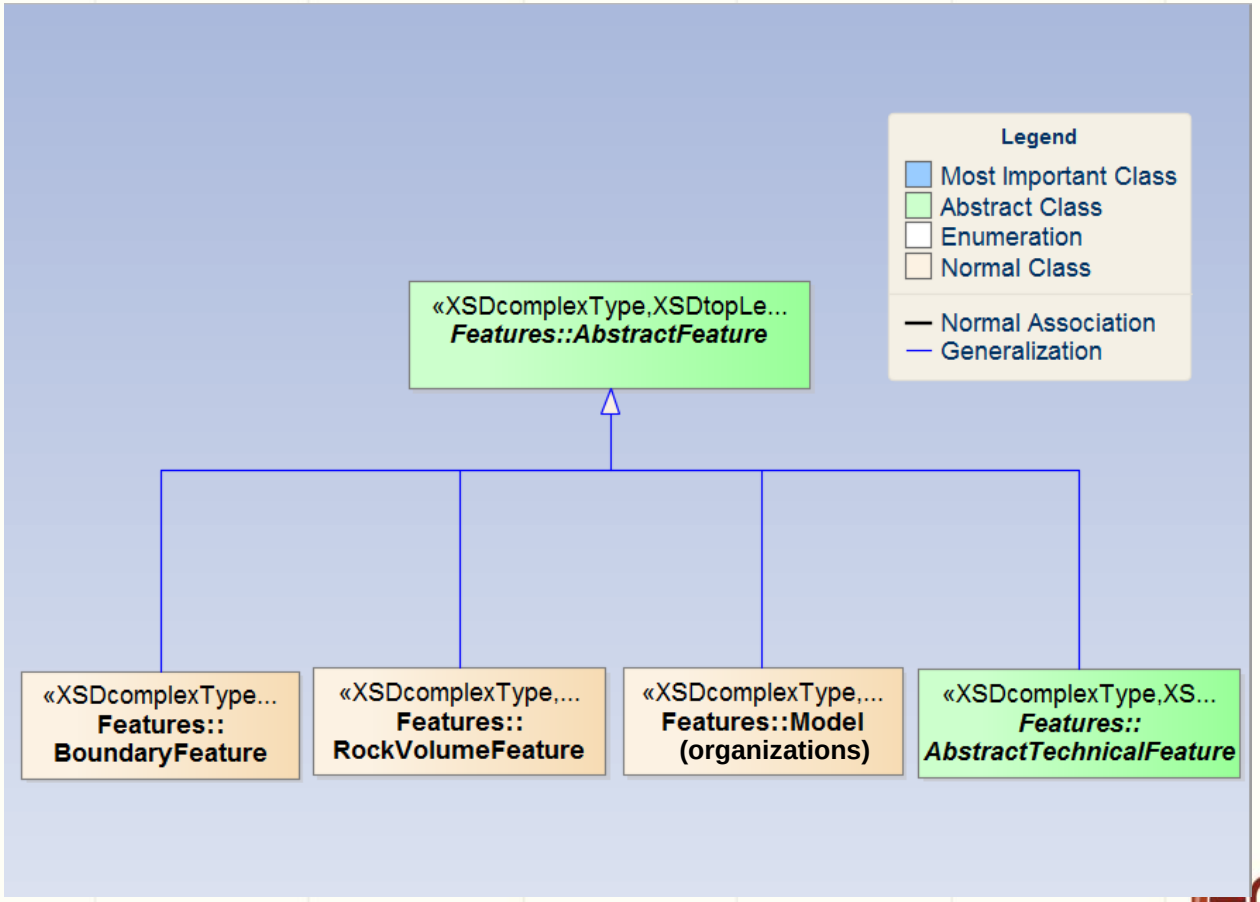
Knowledge Hierarchy: Why

- Properties: geometry or property to latch on to a representation
- Representations (the topology) : the same horizon exists in different representations
  - Triangulated mesh, gridded surface, point cloud
- Interpretations: the same horizon may exist in different interpretations
  - High/low pick, interpreted on different vintage, interpreted by different user
- Feature: a boundary feature begins existence with its definition



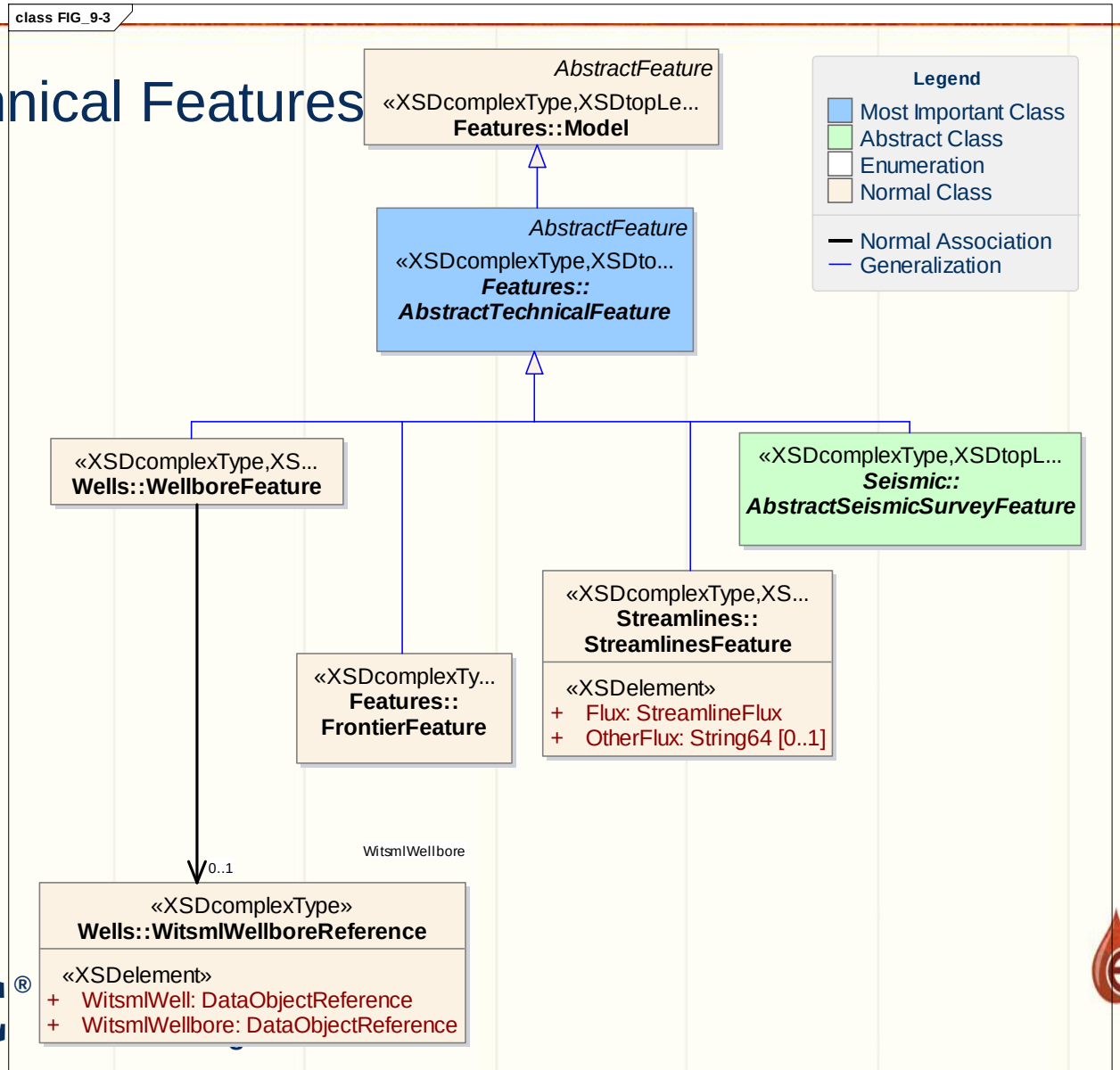
What is transfered

- Features (geologic and technical) :



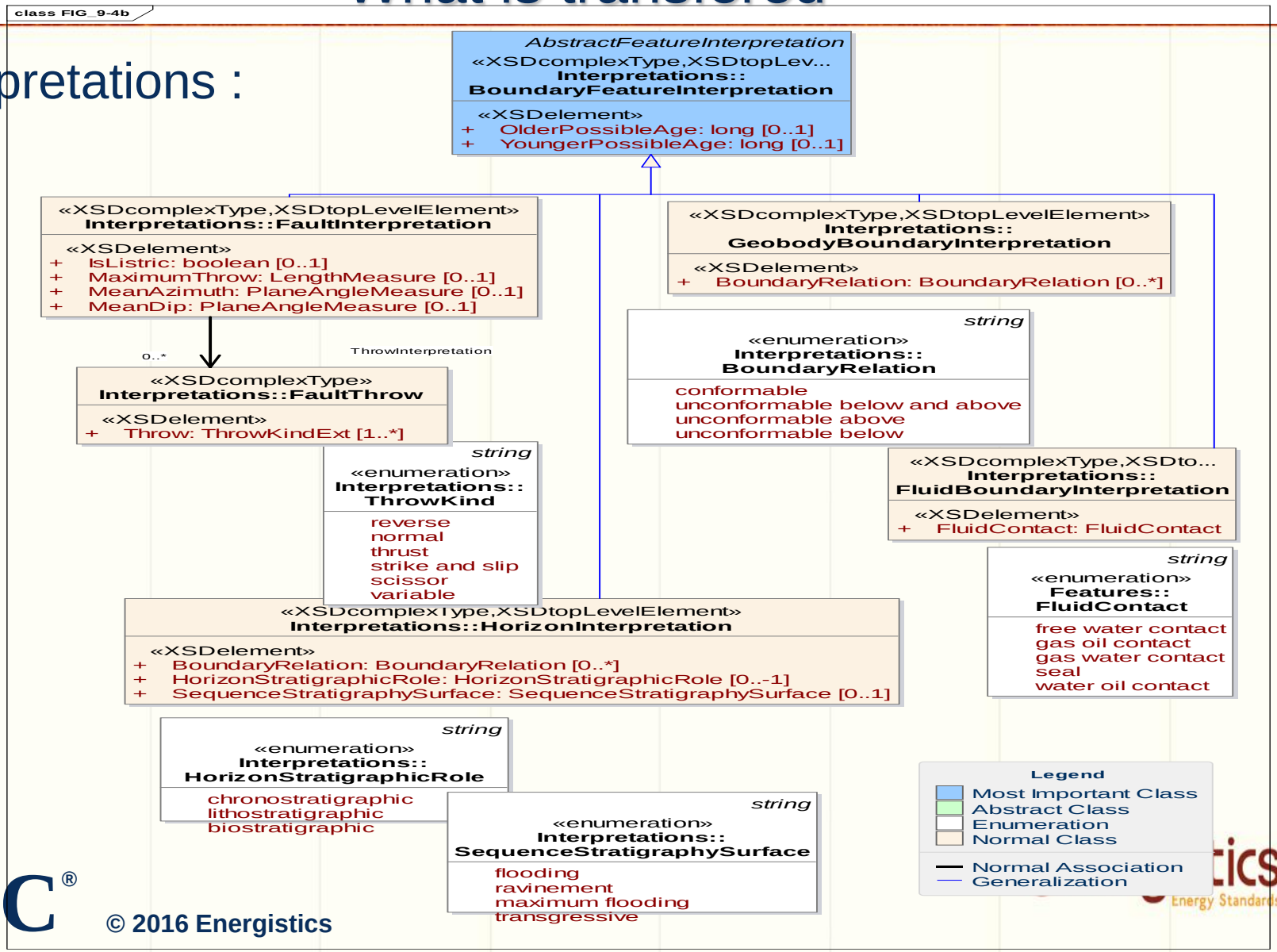
What is transfered

- Technical Features



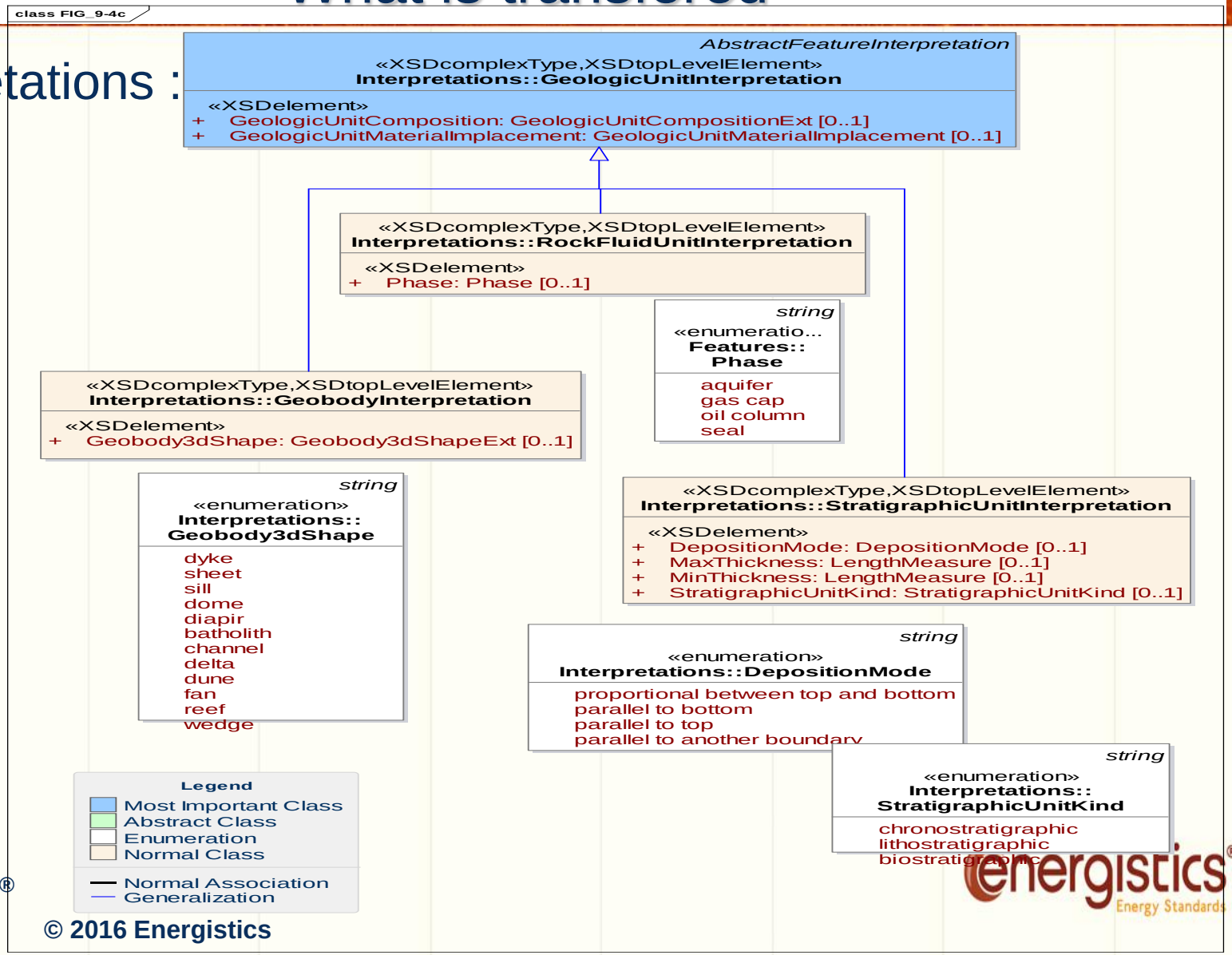
What is transfered

- Interpretations :



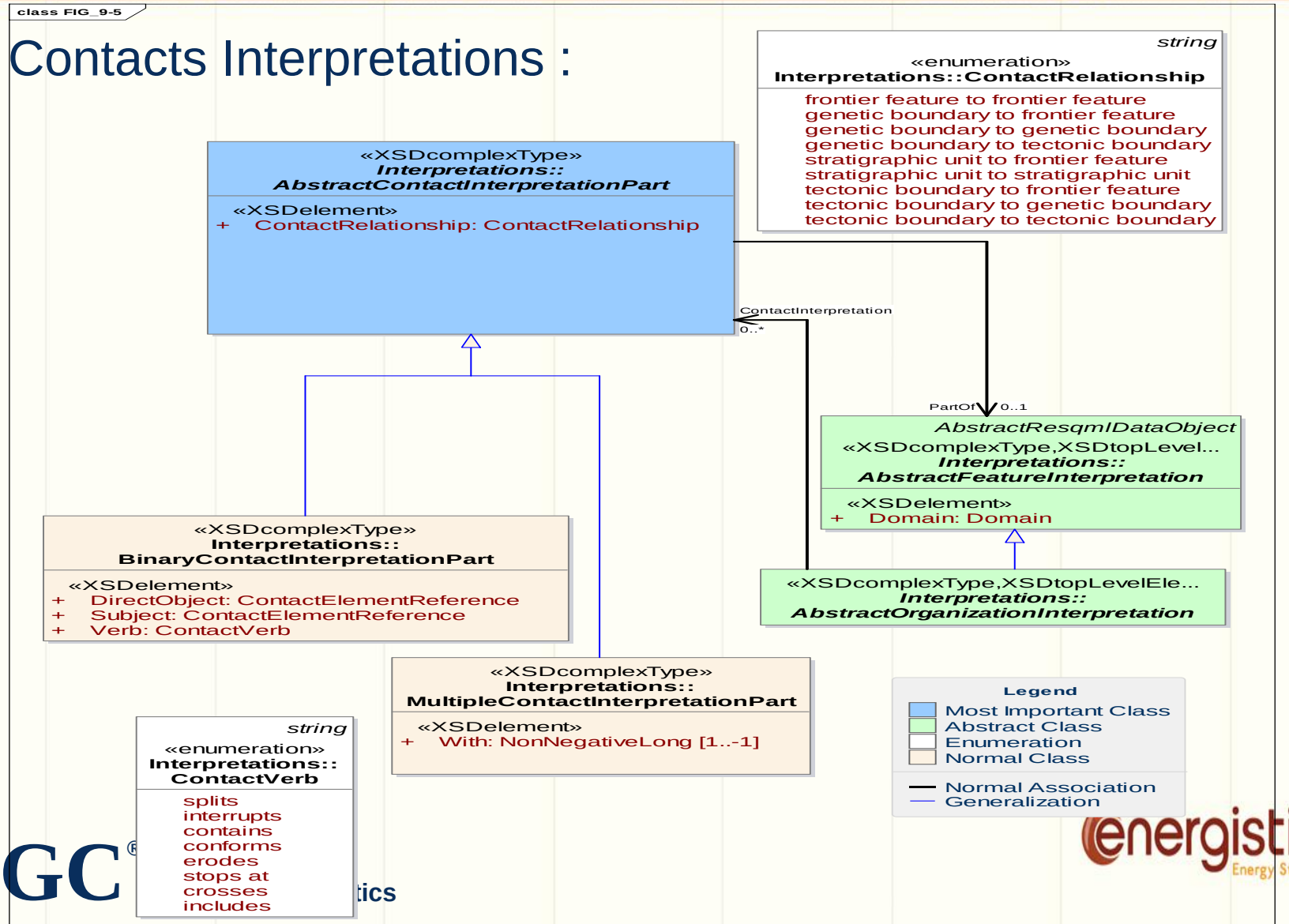
What is transfered

- Interpretations :



What is transfered

- Contacts Interpretations :



What is transfered

- Organizations Interpretations /
  - Structural Organization
  - Stratigraphic Organization
  - Rock Fluid Organization (Reservoir)
- Representations for every Interpretation (hdf5 only):
  - Surfaces : Point sets, polyline sets, plane sets, 2D grid Sets
  - Volumes : 3D BREP frameworks, 3D structured Grids (explicit or parametric :pilar based) , 3D unstructured grids, refined Grids
- Every Representation is linked to a3 local 3D CRS depending of a global 3D CR defined by using OGC standard.
- Properties
  - Standardized property Kinds
  - Standardized units of measure

The status today : you can play with !!

- Two main versions were released previously
  - RESQML V1.1 in Septembre 2011 :
  - RESQML V2.0 in September 2014 :

- A new version
  - RESQML V2.1 (bug fix) is planned for October 2016.

- An automatic EPC instance validation Tool and a RESQML explorer is available for V2.0

- An open source C++,C#,Java API is available for V2.0

- The main focus now for the team is pushing the adoption by a majority of vendors and companies (commercial versions exist today)

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Thanks for Attention

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