

# **Using Semantic Web technologies to accelerate Deployment of ISO 15926 in Open Applications**

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## **1. Business Driver**

Integration, exchange, and hand-over of information between all stakeholders during the entire life cycle of an asset is estimated to result in a significant productivity improvement in engineering, construction, supply-chain, operations, and maintenance; reduction in time spent preparing for decisions; and overall reduction in engineering and operation costs.

POSC Caesar Association (<http://www.posccaesar.org>) and FIATECH (<http://www.fiatech.org>) member companies working in collaboration (<http://www.ids-adi.org>) through their respective Intelligent Data Sets (IDS) and Accelerating the Deployment of ISO 15926 (ADI) projects are making great strides in accelerating the standardization activities around ISO 15926. These efforts are also producing methodology and basic software tools to serve as an example for building commercial applications. In 2008, these projects have established a work-in-progress (WIP) ISO 15926 reference data system (RDS) leveraging the rapidly evolving Semantic Web technologies.

This milestone will dramatically accelerate the creation of ISO 15926 based life cycle information models. These models are a necessary first step towards practical implementations of standard based life cycle integration technologies. However, it is the responsibility of the Technology Developers to aggressively implement these immersing interoperability standards into their products and solutions so that the Oil and Gas industry can reap the benefits of these standards as soon as possible.

## **2. ISO 15926 and Semantic Web Technologies**

As stated above, problem in oil gas industry, boils down to myriad information generators generating information about the same asset in different formats using different software applications at distributed locations at different points in life of that asset. Same is true for information consumers including multiple software

applications and people doing analysis/validation/representation. ISO 15926 identified this problem couple of decades ago and set out to provide a common stepping stone. The problem it tries to address can be sub divided as

- Way to model the lifecycle asset information in an open, software neutral modeling language,
- Way to extract information out of existing native models to the common, agreed upon, explicit information model,
- Way to easily convey information across globally distributed points,
- Way to easily verify the information at multiple conversion points.

In the process of trying to solve these problems, ISO 15926 used technologies from existing standards and consortia mostly from W3C among others. As shown in Figure 1, we see ISO 15926 evolving alongside W3C in past few years as lifecycle data modeling requirements became clear and W3C standards became more mature. On timescale we see ISO 15926 evolving with W3C to a point where detailed lifecycle information models based upon ‘ISO 15926 Part 2’ can now be represented in a framework which can be implemented across much wider industry segments.

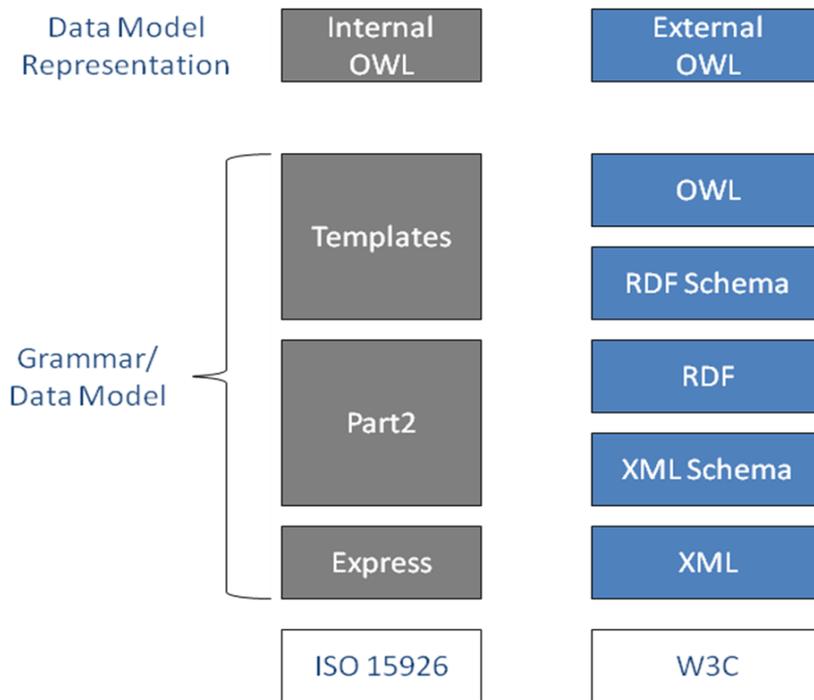


Figure 1 - Evolution of ISO 15926 alongside W3C

It is very interesting to know that ISO 15926 modeling team did try to convey ISO 15926 Part 2 lifecycle data model using XML Schema and came to similar realization to what we think W3C had while evolving to RDF, RDFS and OWL. For other sub problems listed earlier, other parts of ISO 15926 are heavily relying on W3C standards like WSDL, SWRL, and SPARQL.

### **3. Bentley's Vision of Open Applications**

Bentley, as one of the major contributors to ISO 15926 and a prominent technology provider to Oil and Gas Industry has been building solutions supporting ISO 15926 and utilizing W3C technologies. Data Interoperability using Open Industry Standards is Bentley's strategic objective. Bentley is actively implementing ISO 15926 at the core of its DigitalPlant Framework. This allows interoperability not just among various Bentley applications but also with third parties in a consistent way.

To fully realize and leverage the advantages of the common ISO 15926 ontology beyond the interoperability requirements, it needs to be a fundamental part of the software application. Bentley's new OpenPlant™ set of products is open software designed for the distributed world and uses ISO15926 ontology natively within the product. Bentley has started to implement ISO 15926 with the P&ID which is one of the key documents necessary for design and operation of plants around the world and will soon be delivered in the OpenPlant PowerPID product. The product's data configuration is based on the class definitions contained in the ISO 15926 Reference Data.

### **4. Bentley Class Editor and RDS/WIP Connection**

The most important aspect of any interoperability implementation is the ability to define, manage, and extend the information models using a feature rich information model builder. The Bentley Class Editor provides a user-friendly view of ISO 15926 information models to the domain experts who want to contribute to the standard as well as to the implementers who want to write adapters to the neutral standard. It provides easy mechanism to extend the ISO 15926 information models to project specific customizations. A simple and consistent interface is provided to map native application data to ISO 15926 information models by defining metadata against classes, relationships, and properties in the information models. The Bentley Class Editor allows users to create dictionaries of Classes, Properties, and Units from the RDS/WIP and build their own information models. It allows for a flexible implementation by allowing extension of information models and addition of new data mappings at any stage of a project or lifecycle.

Bentley Class Editor allows users to build local ontology by referencing the standard ISO 15926 ontology present on the RDS/WIP Server. This is done by connecting the desktop Bentley Class Editor application to the RDF triple store on the RDS/WIP Server via a SPARQL gateway as shown in Figure 2 below.

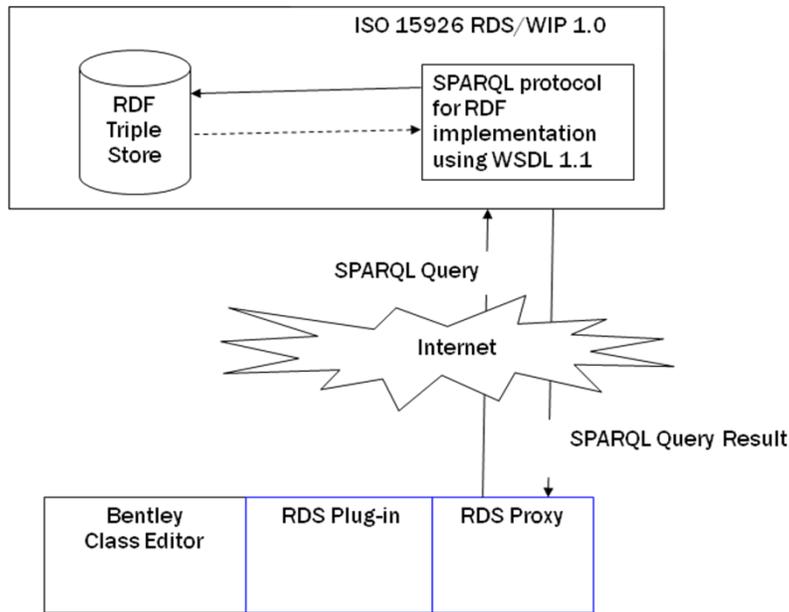


Figure 2 - Overview of RDS/WIP Connection using SPARQL

## 5. Next Steps and role of W3C for Oil and Gas Industry

We welcome the fact that there is growing interest in W3C about Oil and Gas industry. W3C can influence Oil and Gas Owner/Operators and large Engineering Contractors towards implementing these standards as part of their project deliverable requirements by bringing its solid reputation behind the ISO 15926 related projects that are trying to accelerate the deployment of these standards. At the same time, W3C can work closely with the large Core Technology providers such as Microsoft, SUN, Oracle, etc. to rapidly provide tools that support emerging protocols for effectively implementing these standards. Having Oil and Gas industry readily building and implementing solutions around emerging W3C standards will benefit W3C to push for adoption of these standards in other industries. Here are some steps we suggest might help making this a reality:

Short Term:

- Consider use cases from Oil and Gas industry while developing new W3C standards.
- In many cases ISO 15926 is at forefront of building tools around latest W3C protocols like SPARQL. It is important to have effective communication between W3C and Oil and Gas community to effectively and timely resolve implementation issues around these standards.

Long Term:

- Make sure the RDF /OWL is capable of supporting all aspects of asset lifecycle modeling needs. For e.g., temporal aspects in OWL
- Work closely on projects related to deciphering the existing information models into more explicit ontology.