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The ISO 15926 implemented in OWL/RDF

Almost 40 FIATECH-associated owners, contractors, equipment suppliers and software providers are working together in two jointly funded projects, to create a methodology for interoperability based on ISO 15926 and W3C-OWL that includes life cycle information models as well as software interface tools for process industry life cycle information integration.

- The POSC Caesar IDS project, and
- The FIATECH ADI project.

ISO 15926 can be applied to many different problems, but in practice today, it is a suite of standards that supports interoperability for data about the equipment and systems used in industrial processes, over the lifecycle of those objects.
Some of typical scenarios for use of ISO 15926 are: sharing information between engineering contractors and their subcontractors, acquiring information from equipment vendors, handing over data to the operators of a new industrial plant and harmonizing the information across an enterprise that owns many plants.

The scope of the ISO 15926 is Oil, Gas (upstream and downstream) and Power Industry, from engineering, procurement, manufacturing, construction, to operation and maintenance. However it is the common belief that the scope of this standard can be increased to be much wider.

ISO 15926 achieves its interoperability ends by standardizing all of the elements required for information transfer between systems:

- A temporal data model that defines and classifies information in space and time.
- Geometry and topology definitions.
- A reference data library for contributed classifications.
- A layer for concisely expressing relationships, bindings to a serialization format for exchange and bindings to protocols for query and transfer.

Business Case for Fluor's participation in the IDS and ADI projects

Integration, exchange, and hand-over of information between all parties during the entire life cycle of a capital project is estimated to result in a 30% productivity improvement in engineering, construction, supply-chain, operations, and maintenance. For example users of ERP systems are benefiting by having up-to-date and historical (meta) data readily available. Other benefits include:

- The produced software and methodology will serve as an example for building commercial applications to the benefit of the process industries.
- The establishment of the work-in-progress (WIP) ISO 15926 reference data repository will dramatically accelerate the creation of life cycle information models required for practical implementations of life cycle integration technologies.

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- The vast knowledge-base available to these projects will enable rapid registration of new information models created by companies for their specific projects. The ISO 15926 provides the ability to build common data models.

In 2007, DuPont Engineering prepared a case study detailing the procurement process for an item of engineered equipment. The study proved a 5.25% savings on a twenty pump order by implementing e-commerce tools not including project cycle time savings, operations and maintenance savings, and other intangible savings.

ISO 15926 and the Semantic Web

For the serialization format, bindings to OWL/RDF are defined. The protocol for query is SPARQL - a language similar to SQL, but for ontologies in OWL/RDF rather than relational databases. SPARQL is built on WSDL, which in turn is built on SOAP using HTTP(S) as a transport. Similarly, the transfer and modification features are built on WSDL.
In short, as far as raw data interoperability is concerned, ISO 15926 relies wholly on the World Wide Web Consortium's Semantic Web standards, with of course the ubiquitous Internet Engineering Task Force standards HTTP and SSL underneath it all. These standards are well supported on every major enterprise platform: J2EE, .NET, PHP, and others in both commercial and open source implementations. The upshot is that in order to implement ISO 15926 all you need is one of these platforms and some semantic web toolsets.

Retaining interoperability with customization of core ontology

New reference data agreed upon by communicating parties can be created in the core database and used as needed. These elements may be contributed back into the standard proper, simply made public (but not part of the standard), or formally marked as equivalent to other elements of the standard. This spectrum of approaches allows information management projects to gain effective communication in the short term and wider interoperability in the long term, without the delays attendant to forcing everything through the standards process from the start. What this means is that ISO 15926 can be rapidly adapted to the specifics of an integration project, without compromising the standard, or the portability of the data.

Leveraging protocols and common data models in ontology

The main benefits to an information technology project in using ISO 15926, rather developing from scratch, or developing new work over the top of OWL are that the hard work of defining the base temporal data model, serialization and protocol bindings have already been done.
There are also consortia, such as FIATECH and POSC Caesar, which are dedicated to the public face and the public services of the standard - such as organizing for the central repository for reference data.

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Distributing the Cost of Reference Data – standardizing ontology

An "object information model" in ISO 15926 nomenclature loosely means the set of relations necessary to record information about an object of some particular classification. Formerly these were known as product models, but the name was changed since they apply to more than just products. Any system aiming to exchange information about industrial equipment and systems needs to have something equivalent to an object information model.
The work required building an object information model for a typical piece of industrial plant equipment that is precise enough and flexible enough to form as a basis for interoperation is very high. The skills required to produce such models include some domain expertise in the relevant engineering fields along with data modeling expertise.

Fluor's position

Given that there are at the very least thousands of classifications in a typical process plant such as a refinery, the cost for a software vendor to "go it alone" in building up ontology models on this front is prohibitive. For a software services company, the risk of not acquiring sufficient people with the right skills is high, and even if it were to be done successfully, the cost passed on to the customer would be extremely high.

Therefore it is regarded not doable to have every company develop their own ontology and later couple them in interoperability, as each new interface will bring new work to interpret. Working through a common ontology by use of a standardized ISO 15926 data model methodology will save countless work hours of mapping and integrating.

So the collaborative, standards-based approach to reference data allows all organizations using ISO 15926 to contribute small pieces, and benefit from the work of all the other organizations - distributing and reducing the total cost, and retaining domain knowledge across generations.
The way that ISO 15926 works allows the object information modeling work to be pushed out to the software user, where there is already engineering domain expertise - engineering companies, plant owners, equipment vendors.

The benefit of this approach to software vendors and services companies is near incalculable - it makes the difference between a feasible project and an infeasible project: between a favorable cost/benefit ratio and an unfavorable one.

Service Oriented Architecture (SOA)

One of the primary uses of ISO 15926 is to present an enterprise software product as a Service Oriented Architecture. The first and most obvious advantage to ISO 15926 as an SOA implementation is that it is standard: any software vendor can compete, and products can interoperate without infringing on legal rights or dealing with uncertainties of proprietary definitions. Also, since the standard provides the query and transfer layers, there is little required

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in terms of service definition. This is particularly attractive from the product planning point of view - it is much easier to encourage other vendors to operate against a product's SOA definition if that definition is also used in yet other vendors' products.

Staging ISO 15926 Implementation

Many of the concrete gains of ISO 15926 can be realized without even necessarily engaging in the standard. For example, uniform classification enabled by the ISO 15926 core reference data library (a central database) can be an enormous gain to enterprise-wide data harmonization.
OWL/RDF can be used for data import or export of ISO 15926 data without going as far as implementing façades (the SOA portion) - this sort of solution could be used for generating or consuming handover data.

Finally, once both import and export are implemented, the vendor could implement full SOA to expose real-time data held within their systems, automatically enabling ad-hoc queries and taut integration with other applications and services.

This layered approach to ISO 15926-compatibility will be implemented in the standard as recommended best practice of how starting to use these methodologies. Each compatibility layer brings new advantages and further cost reduction.

Conclusion on Fluor's position

ISO 15926 brings tangible benefits to enterprise software in the process industry realm. With the compatibility levels approach, it allows implementation to be staged into individually useful pieces, and therefore, allows risks to be managed. The standards' utilization of the W3C's Semantic Web as a foundation for interoperation ensures toolset availability and relevance now and into the future. Putting the ISO 15926 data model methodology on top of RDF/OWL instead of letting companies work out their own ontology models will save countless hours in implementing interoperability. Prominent software vendors with traditional markets on both the engineering and plant operator sides are investing substantially in this standard today. Engineering, Procurement and Construction companies have long supported the initiative with an expensive application of staff and resources. Plant Owner Operators are writing ISO 15926 into contract terms. ISO 15926 is a market opportunity.