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Information Integration in the Oil & Gas Industry

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Interoperability-related CIEAM Projects

- SI301 “Integrated Reliability Management” 2003-2007
Service Oriented “Data Bridge”



- SI302 “Improved OPAL Monitoring and Management System” 2008-2010



- MD201 “CIEAM Integration Project” 2008-2010



- SI2100 “Standards-Based Interoperability for Asset Management Information Systems” 2010-2013





Problems

- Version control
 - Rapid development of new versions
- Data transformation
 - Laborious
 - Traditionally restarts from scratch for each tool
 - Transformation is hidden in code
 - Applicable only between two tools

Data Transformation Engine

- Open Data Transformation
- Model Driven Architecture™
(Model Driven Engineering)
- Model Driven Integration
 - Lifting data structures and transformation to conceptual level (object models)
 - Visual representation
 - Simulation
 - Monitoring data transformation

Transform Engine cont'd

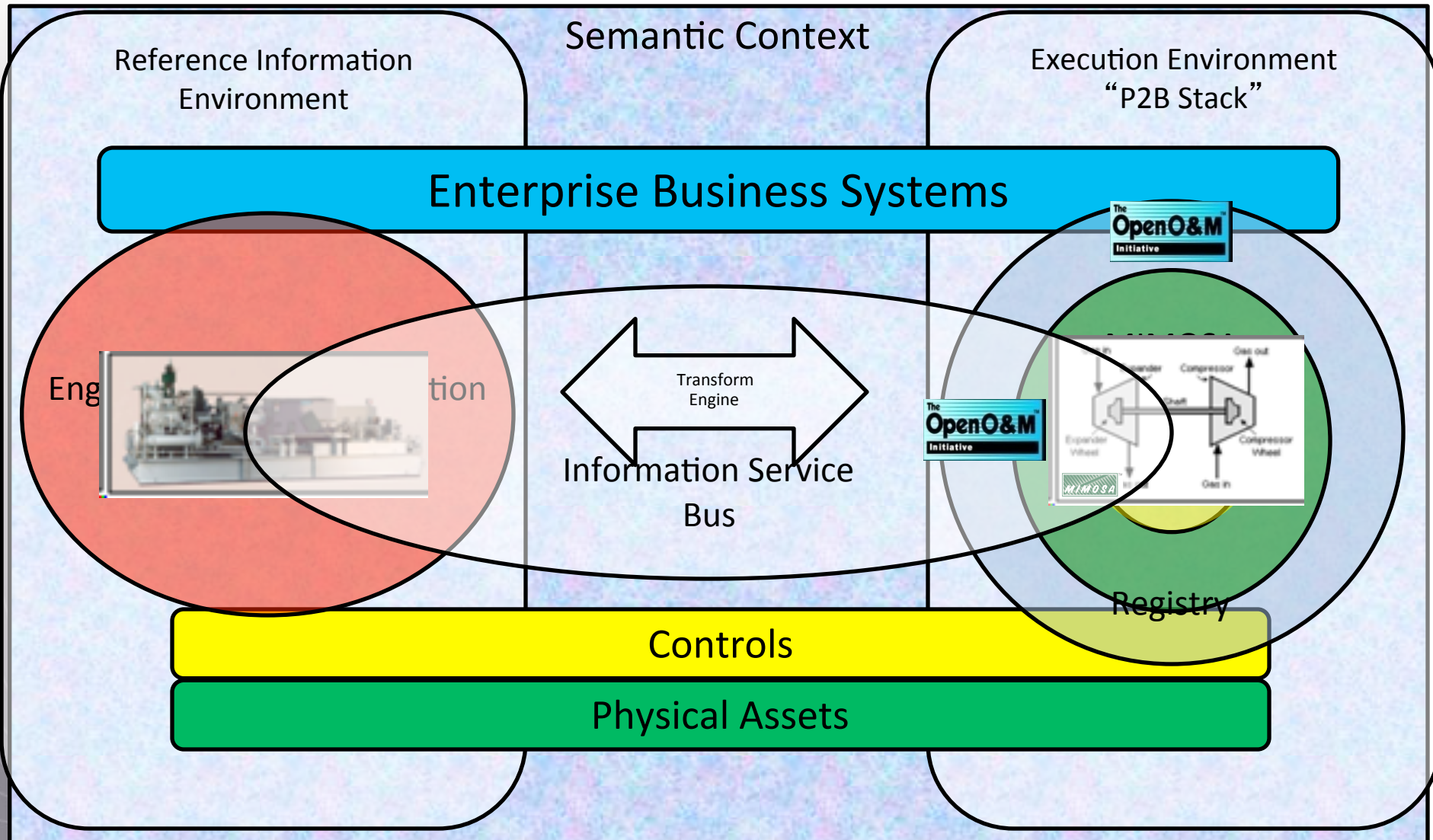
- Re-use of integration techniques through integration patterns and operators
- Support of various data formats
 - XML, RDF, WSDL, CSV, ...
- Support of various APIs
 - Web services, relational databases, SAP, ...

Motivation

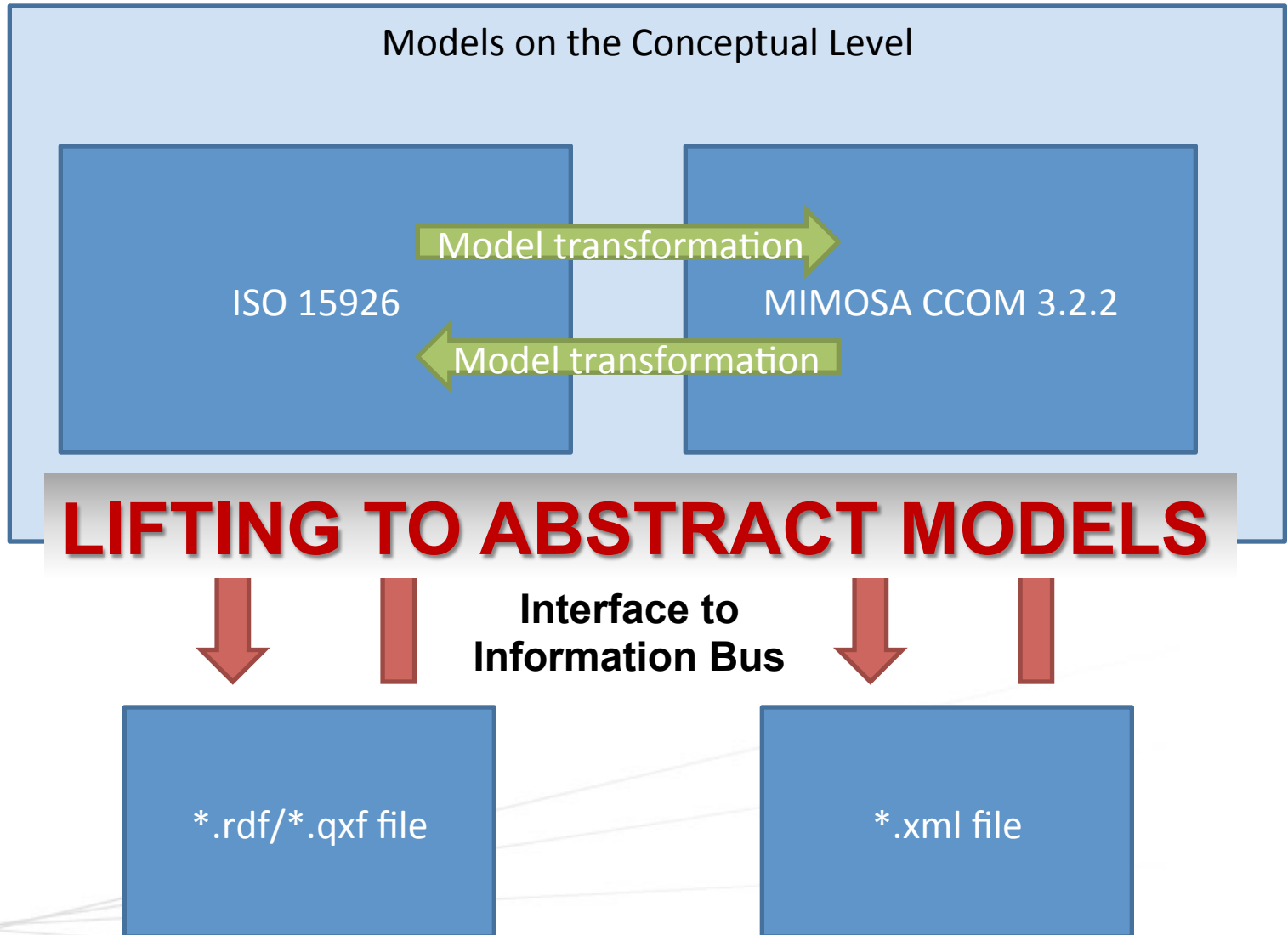
- Asset Management Use Case
 - Hand-over design documents to operational side (different ecosystems)
 - Bi-directional transformation required
 - Very complex data structures
- Challenges
 - Flexible data integration
 - Support for whole asset life-cycle
 - Light weight approach
 - Evolution of Asset Management Technology
 - Assets often live (far) longer than IT systems
 - New version of standards

Use Case

Based on The Safe Technology Roadmap™ for Interoperability



Transformation Concept

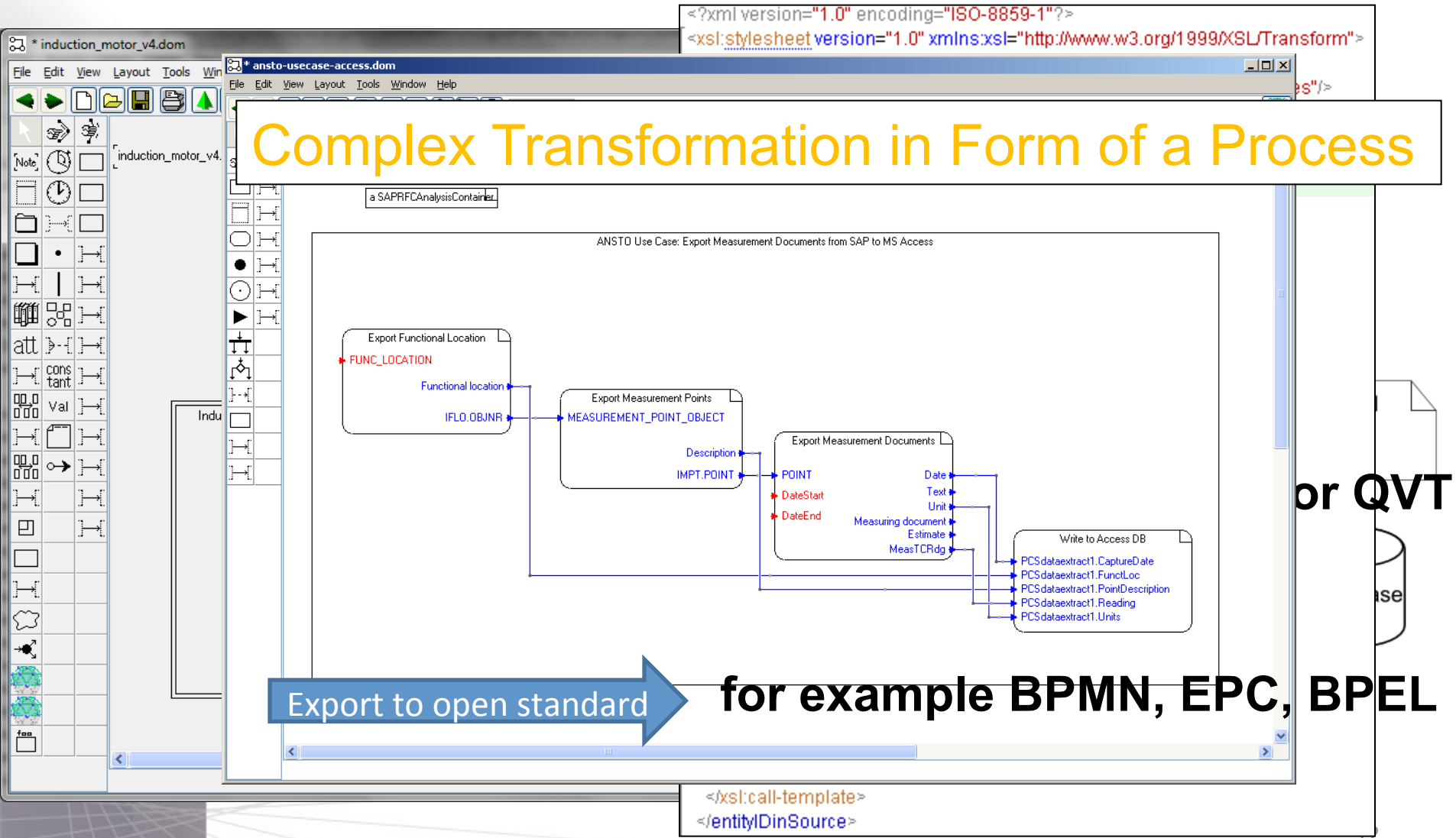


Use Case: Handover EPC to O&M



Use Case: Handover EPC to O&M

Complex Transformation in Form of a Process



Use Case: Handover EPC to O&M

```
<?xml version="1.0" encoding="UTF-8"?>
- <CCOMData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://www.mimosa.org/osa-eai/v3-3/xml/CCOM-ML">
  - <Event>
    <guid>251ff520-e40e-11de-8a39-0800200c9a36</guid>
    <userTag>[2010-02-10 13:21:00] Motor installed on 01G-7A</userTag>
    <userName languageID="en-us">[2010-02-10 13:21:00] Asset: Model Z400-A1 S/N 3Z84G32AA0-4 AC Induction Motor installed on Functional Location:
      01G-7A Motor </userName>
    <utcLastUpdated>2009-07-03T13:30:00</utcLastUpdated>
    <statusCode>1</statusCode>
  - <ofObjectType>
    <guid>cd0e974d-7f11-4f3d-91a5-903138e75c76</guid>
    <idInSource>0000040500000001.1.1</idInSource>
    <sourceId>www.mimosa.org/CRIS/V3-3/sg_as_event_type</sourceId>
    <crisEntityTypeId>29</crisEntityTypeId>
    <userTag>Install Event</userTag>
    <userName>Install Event</userName>
    <utcLastUpdated>2006-10-15T18:00:00.000000000</utcLastUpdated>
    <statusCode>1</statusCode>
    - <registrationInfoCollection xsi:type="InfoCollection">
      <guid>cd0e974d-7f11-4f3d-91a5-903138e75c76</guid>
      <idInSource>0000040500000001.1</idInSource>
      <sourceId>site_database</sourceId>
    </registrationInfoCollection>
  </ofObjectType>
  - <forCCOMObjectWithEvents xsi:type="Segment">
    <guid>abcf6703-4d26-4f0b-8f0e-c4d704da514a</guid>
    <userTag>01G-7A Motor</userTag>
    <userName>01G-7A Motor</userName>
  </forCCOMObjectWithEvents>
  - <hasMonitoredObject xsi:type="Asset">
```

Aims and Benefits

- **Automation** of semantic integration
- **Flexibility** through **open transformation** across ecosystems
- **Standards-based** transformation
- **Reusable transformation** through library of mapping operators
- **Transformation process** for complex transformations
- **Extensibility** allows dynamic changes
- **End-user friendly** tool guidance with abstract visual notations for non-IT-experts

Features

- Metamodel independence (UML, OWL, RDF, XML, RDB ...)
- Extensibility of Mapping Operators
- Formulation and consideration of constraints
- (Limited) Matching (e.g. SAP) at Process Level
- Openness (standard interface for mapping, e.g., QVT, XSD)
- Mappings as First Class Objects (save, store, load, export)
- Reusability of mapping definitions (some other products provide this)
- Minimal system dependencies, ease of installation

Joint MIMOSA/PCA O&M SIG Summary

- Key notion: Link-up of RD (ISO 15926) and Execution Environment (Open O&M)
- Driven by O&M Handover sample case (**NWRP**)
- Goal: develop input to MIMOSA and PCA which properly incorporates O&M concepts from the OpenO&M initiative and certain ISO standards (incl ISO15926 and ISO18435) in the joint MIMOSA/PCA solution set
 - Output from the SIG to be published in the annex of the upcoming ISO TC184 OGI TS along with the resulting updates (proposed and actual) to the related standards
- Different process characteristics
 - RDL: Large blocks of detailed information exchanged generally in batch
 - Execution: Small data sets exchanged in event-oriented fashion via specific services linked to use cases
- Focus and Timing based on current client handover case
 - 2 quick (90-day) iterations, then standard 6-month iterations