From Systems Integration To Sustainable Interoperability
A Pragmatic Approach To Gain Value From Open Standards

Standards Leadership Council Forum

China National Institute of Standardization
Beijing, China

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MIMOSA President
ISO TC 184/WG 6 Convener
MIMOSA Summary

- Focus on Physical Asset Life-Cycle Management and Facilities O&M
  - Develops and publishes industry-driven standards in alignment with ISO
  - Officially organized as a 501 c(6) non-profit industry association in 1997
- Membership
  - Owner/Operators – Oil and Gas, Chemical, Aerospace and Defense Sectors
  - Suppliers/integrators
  - Academia/Researchers
  - Industrial Media
- Founding Member and IP Manager for OpenO&M™ Initiative
- OpenO&M Owner/Operator Leadership Council
- Founding Member Standards Leadership Council
Requirements-driven Development of Standards

- MIMOSA has a rich history of developing industry standards which are driven by industry requirements
  - Open Systems Architecture for Enterprise Application Integration (OSA-EAI)
  - Open Systems Architecture for Condition Based Maintenance (OSA-CBM)
  - OpenO&M Information Service Bus Model (ISBM)
  - OpenO&M Common Interoperability Register (CIR)
- MIMOSA works closely with formal standards bodies to help develop international standards reflecting industry requirements
  - ISO TC 108/SC 5 – ISO 13374 (CBM)
  - ISO TC 184/SC 5 – ISO 18435 (O&M)
  - ISO TC 184/WG 6 – Developing ISO OGI Technical Specification
Oil and Gas Industry Adoption of Standards

BP Refining's Portal: Use of standards and future needs

Michael Knight - BP Refining Supply Chain Advisor
ARC Next Generation Manufacturing Forum, February 2006
### Plant Lifecycle

#### Engineering
- Material Specifications
- Piping Specs.
- Material Master Catalog

#### Procurement
- Vendor Catalogs
- Bill of Material
- Service Contracts
- Contracted Service Contracts

#### Construction
- Design Requirements
- Purchase Requests
- Construction Schedule
- As-built P&ID’s
- HAZOP minutes

#### Operation
- Calculations
- Project P&ID’s
- Invoices
- As-built P&ID’s
- HAZOP minutes
- Crude Assays
- MSDS
- Operations Procedures
- Equipment & Alarm Configuration
- Operating Envelopes
- Operator Unit knowledge
- Shift roster
- Daily plans
- Stock progressions
- Price sets
- Monitoring Locations PCR Data
- Tank inventories
- Lab results
- Bill of Lading
- Transfer Advices
- Operator Logs

#### Capability
- TAR reports
- Fault data w/ Op Params
- Component tracking
- Inspection records
- Maintenance Procedures
- Job plans
- As maintained eqpt. data
- As operated reliability data
- Trade skills register
- Root Cause Analysis Data
- Work requests
- TAR plans
- PM program
- Inspection schedule
- Maintenance roster
- Equip. Calibration
- Equip. Capability Forecast
- Work Order History
- Work Permits

### Standards
- PISTEP PIDX
- ISA95
- OPC
- MIMOSA
- ISO14224
- ISO 15926
Industry Standards Contributing to Aerospace and Defense

- ISO 15926-3&4
- MIMOSA
- OSA-EAI, OSA-CBM
- GEIA STD 0007
- ASD S1000D
- STEP PLCS
- DEXs
- GEIA 927
- Process Industry Developed, Ontology-based Geometry, Topology and Reference Information Standards
- Cross Industry Developed Physical Asset Management Standards (Sensor To Enterprise)
- Aerospace and Defense Industry Developed Life-cycle Reference Data Exchange Sets
- Government Developed Military Platform Element Definitions in ISO STEP AP Formats
- Aerospace and Defense Industry Developed IETM Standard

Cross Industry Standards Contributing to Aerospace and Defense Industry

- Process Industry Developed, Ontology-based Geometry, Topology and Reference Information Standards
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From Integration to Interoperability – Industry Effort

Organization Legend
1 - 3eTI
2 - Ivara
3 - Indus
4 - Iconics
5 - ESRG
6 - IFS
7 - Honeywell
8 - AspenTech
9 - Matrikon
10 - PdMA
11 - Synergen
12 - Yokogawa
13 - Rockwell
14 - DEI

Function Legend
ALM - Asset Lifecycle Mgmt & Universal ID
CM - Condition Monitoring
ODH - Operational Data Historian
HMI - Human-Machine Interface
ICDM - Instrumentation & Control Device Management
DSS - Decision Support System
EAM - Enterprise Asset Management / CMMS
MRB - Maintenance & Reliability Browser

December 2004
Various Interoperability Definitions

- **IEEE**: The capability...
  - of two or more systems or elements to exchange information and to use the information that has been exchanged.
  - for units of equipment to work together to do useful functions.
  - that enables heterogeneous equipment, generally built by various vendors, to work together in a network environment.
  - of two or more systems or components to exchange information in a heterogeneous network and use that information.

- **SEI**: The ability of a set of communicating entities to
  - (1) exchange specified state data
  - (2) operate on that state data according to specified, agreed-upon, operational semantics

  Data/information interoperability is necessary, but only part of the requirement for Interoperable Systems of Systems
Transforming the Oil and Gas Industry Solutions Model

- **OGI Solutions-Process**
  - Transforming industry solutions model from integration to sustainable interoperability
  - Driven by owner/operators, with standards org & supplier participation
  - Prioritized fully dressed industry use cases

- **OGI Ecosystem** - The To Be State - A full life-cycle industrial ecosystem
  - Enables sustainable system of systems interoperability for key classes of systems
  - Portfolio of published, supplier-neutral **standards-incorporated by reference**
  - **Semantics, Objects, Services Oriented & Event-Driven Architecture**

- **OGI Pilot** - Developmental and interoperability testing grounds
  - Participating standards bodies suppliers help shape the ecosystem rules
  - COTS solutions components must support fully dressed use cases-evaluation matrix
  - Provide basis for ISO OGI Technical Specification
  - Develops core of permanent OGI eco-system test-bed
Oil and Gas Interoperability (OGI) Pilot

OGI Pilot Business Use Cases Roadmap - Part 1 (Summary)

**Primary Actors**
Business and system actors involved in each use case
e.g. Plant Construction Manager, Engineering Design System

**Continuous Handover of Structured Digital Assets**
Establishing an Environment for Lifecycle System of Systems Interoperability

**Major Unstructured Digital Assets**
Information that is not intended for further computer-based processing
e.g. Documents, Rendered Drawings/Diagrams, Certificates

**Major Structured Digital Assets**
Information that is intended for further computer processing and extraction
e.g. Tags, Data Sheets, Breakdown Structures, Topological Networks

**Referenced OGI Use Cases**
- Use Case 1: Capital project handovers to O&M
- Use Case 10: Automated provisioning of O&M systems
- Use Case 4: Enterprise Product Data Library Management
- Use Case 11: Enterprise Reference Data Library (RDL) Management

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Oil and Gas Interoperability (OGI) Pilot

OGI Pilot Business Use Cases Roadmap - Part 2 (Summary)

Primary Actors
Business and system actors involved in each use case
- e.g. Plant Operations Manager, Engineering Asset Management System

Turnover 
Engineer / Procure / Construct 
Responsibility for initial setup of Digital Assets

Operations & Maintenance
Continue Handover of Structured Digital Assets

Sustained Lifecycle Digital Asset Management
Sustaining the Interoperable O&M Environment

Decommissioning / Disposal
Approved for decommissioning

Major Structured Digital Assets
Information that is intended for further computer processing and extraction
- e.g. Tags, Data Sheets, Breakdown Structures, Topological Networks

Referenced OGI Use Cases

Use Case 2: Recurring Engineering Updates to O&M
Use Case 3: Field Changes to Plant/Facility Engineering
Use Case 4: Enterprise Product Data Library Management
Use Case 5: Asset Installation/Removal Updates
Use Case 6: Preventive Maintenance Triggering
Use Case 7: Condition-Based Maintenance Triggering
Use Case 8: Early Warning Notifications
Use Case 9: Incident Management/Accountability
Use Case 10: Provisioning of O&M systems
Use Case 11: Enterprise Reference Data Library (RDL) Management

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Oil and Gas Interoperability (OGI) Pilot - Methods

- Owner/Operator leadership
- Industry Use Case driven - *(OpenO&M, PCA and SPE DSA-TS)* Use Cases
- Cooperatively aligned with PCA under Joint MIMOSA/PCA O&M SIG
- **Managed like a true capital project**- Worley Parsons-Lead EPC for downstream
- Pragmatic focus on Commercial Off The Shelf (COTS) products
- Suppliers assume responsibility for compliance of their own products

- Publication – All working documents and results are on the mimosa website at [www.mimosa.org](http://www.mimosa.org)

- Proven OGI Pilot output provides basis for ISO OGI Technical Specification
OGI Pilot Phase 1+ Presentation

IBM ISBM Implementation Provides Connectivity Environment

- AVEVA P&ID
- Bentley OpenPlant
- Intergraph P&ID
- UniSA 15926 Transform
- MIMOSA CCOM-ML
- IBM IIC

ISO 15926 Reference Data

- OWL/ecXML
- XMpLant
- Proteus

MIMOSA CCOM Reference Data

- Tag Register
- OPCUA
- OSIsoft PI/AF Historian
- Worley Parsons - Lead EPC for Downstream OGI Pilot
  • Developing and Managing Reference Engineering Data Set
  • Providing standard engineering artifacts used for EPC process

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Debutanizer Fractionator
Flow Sheet (Red)
LEVERAGING THE ISO PROCESS FOR ESTABLISHING STANDARDS AND SPECIFICATIONS
ISO TC184 Manufacturing Asset Management Integration Task Force
Total Asset Life-Cycle Summary

Product/Asset/Plant/Facility/Vehicle Life-Cycles

Product Design → Asset MFG → Construction → Operations & Maintenance (O&M) → End of Life

Continuous Improvement Feedback Loops

FIATECH
POSC CAESAR
MIMOSA/OpenO&M™

SC1 & SC4
Other Standards
IEC TC 65 Standards
SC5, SC5-IEC/JWG5, SC4-SC5/JWG8
OpenO&M & Other Standards
Other Standards

DB 1 → DB 2 → DB 3 → DB 4 → DB N → DB N+1 → DB N+2 → ISO/IEC UID → DB N+4

Services Oriented Architecture Using Standards-based Federated Data Model
ISO TC 184/WG 6
Oil and Gas asset management operations and maintenance Interoperability (OGI) Technical Specification Project Update

Alan T. Johnston
Convener
Nils Sandsmark
Co-convener

September 23-25, 2012
Orlando, FL

ISO TC 184/WG 6
Scope and Deliverables

- The OGI TS specifies the use of a combination of ISO and industry standards to meet the interoperability requirements of the Oil and Gas industry and appropriate closely related industry groups such as the Petrochemical industry.

- Major associated deliverables include:
  - Industry developed and owned Pilots driven by industry Use Cases
    - Downstream Pilot
    - Upstream Production Optimization and Drilling Automation Pilots
  - Industry developed and owned Use Cases are prioritized by owner/operators and incorporated by reference
  - Industry developed and owned pilot & Compliance Data Sets are incorporated by reference
    - Downstream Data Set – Plant Light Ends Unit with debutanizer and depropanizer towers
    - Upstream – Drilling Automation, Rigs and Wells Construction Data Sets – with SPE DSATS

ISO TC 184/WG 6
Some Relevant ISO Related Activities

ISO TC 67
Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries

ISO TC 108
Mechanical vibration and shock

ISO TC 184
Industrial automation systems and integration

ISO 14224
Petroleum, petrochemical and natural gas industries -- Collection and exchange of reliability and maintenance data for equipment

ISO 13374
MIMOSA OSA-CBM
WG6
Formats and methods for communicating, presenting and displaying relevant information and data

ISO 13926
Data for Process Industries
10303-Product data representation and exchange
STEP/PLCS
OASIS
Collaborating on the deployment of an international standard for product data exchange (ISO 10303)

ISO 18435
MIMOSA OSA-EAI
WG7
Diagnostic and maintenance applications integration