The Open Industrial Interoperability Ecosystem (OIIE), the OIIE-Oil and Gas Interoperability (OGI) Pilot, and ISO 18101

For: THTH Fall Seminar
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**Presentation Topics**

- **Significant Progress in 2019**
  - ISO 18101-1 – Published by ISO
  - **1st ISO Standard Specifying a Supplier-neutral Industrial Digital Ecosystem and Process to Build/Sustain it**
    - Foreward: OIIE OGI Pilot to validate OIIE Use Cases before they are included to define next parts of standard
    - Scope: Asset Intensive Industries
    - WG 6 Scope Changed to “Asset intensive industry interoperability”
    - ISO TC 184 Report on Digital Twin Architecture
- **OIIE Oil and Gas Interoperability (OGI) Pilot**
  - R&D Testbed for OIIE and ISO 18101
  - Pilot Phase 3.1 Completed – Recording of demonstration with O/O Summary from Ken Dunn of BP
  - Phase 3.2 Starting next Month with NERA Sponsorship
- **Ongoing Cooperation**
  - ISA
  - OAGi
  - NIST
  - IOGP (coming)
- **Future cooperation between THTH Association and MIMOSA**
Relevant ISO Technical Committees & Activities

Industry Specific Practices and Content (ISD versus ISDD)

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

ISO TC 108
Mechanical vibration, shock and condition monitoring

ISO TC 184
Automation systems and integration

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

ISO 13374- Condition monitoring and diagnostics of machines — Data processing, communication and presentation

Cross-Industry Digitalization and Interoperability
Sensors Through Enterprise, Digital Twins, IT/IM Architecture (Machine Interpretable)

ISO TC 184
WG 6
ISO 18101-Asset intensive industry interoperability

SC 4
Industrial Data
ISO 15926-Process Data
ISO 8000–Data Quality

SC 5
Interoperability, integration, and architectures for enterprise systems and automation applications
ISO 18435-O&M Integration

Show Websites
“This document was prepared by Technical Committee ISO/TC 184, Automation systems and integration.

This document provides an overview and outlines the fundamental principles of the ISO 18101 series. Future parts of the ISO 18101 series will be developed including sets of industry developed use cases, once the use cases have been documented using the Open Industrial Interoperability Ecosystem (OIIIE) use case architecture and validated using the OIIIE Oil and Gas Interoperability (OGI) Pilot, with the results captured in Technical Reports. These use cases will incrementally define industry prioritized elements of the secondary business process, which is the scope of the ISO 18101 series.”
ISO TS 18101-1 SCOPE

This document provides requirements, specifications and guidance for an architecture of a supplier-neutral industrial digital ecosystem. It includes a standardized connectivity and services architecture, and a standardized use case architecture with methods to specify atomically re-usable scenarios and events, which can be used to specify the characteristics of standardized industry use cases.

NOTE 1 Examples of standard industry use cases included in the secondary business process are included in Annex A along with standardized use case architecture.

This document gives:
— guidance for an architecture applicable to the oil and gas, petrochemical, power generation, public utilities and other asset-intensive industries;
— requirements for interoperability among systems of systems, systems (including hardware and software) and components included in the secondary business process of a plant, platform or facility at any given time;
— guidance on how these interoperability requirements are to be achieved and sustained in support of operations in the same plant, platform or facility;
— specifications enabling the specialization of a digital ecosystem concept for the requirements of the secondary business process in included industries;
— guidance to industry participants, including owner/operators and their product and services suppliers, to support their secondary business process requirements using products, which interoperate based on the specifications included in this document.

NOTE 2 This document is focused on interoperability requirements for systems which play roles in the secondary business process, including those in domains identified in Figure 7.
Secondary Business Process

Derived from ISO TC 184
Manufacturing Asset Management Integration Task Force Final Report
Inter-Enterprise OIIIE Digital Ecosystem
Intra-Enterprise OIIE Digital Ecosystem

Enterprise Business Systems

- OIIE Administration
- Planning
- Engineering Design
- Construction Management
- Operations Management
- Operations Risk Management
- Maintenance Management

IEC 62264 Messaging Service Model / OpenO&M ISBM

- Automation and Control
- HSE and Operation Monitoring
- Prognostic & Health Management

Automation Control Bus

- IIOT Device
- Device
- Sensor/Transducer

Inter-Enterprise Connections

- Trusted IT/OT connections (Constrained)
- Standard, Cloud Friendly
  Enterprise Solutions
- Architecture For Digital Business Ecosystems

Shared Information and Semantic Context

Enterprise Reference Data Libraries

IIoT Device Metadata

IIoT Connections (Constrained)

Constrained Connectivity

ISO 19526, OTD, CDD...
Currently 35 Standard Scenarios

- Individual Message Exchange
- Specific Data Content
- Required Data Processing
- Expected Response Event
- Reference implementation using CCOM BODS

Currently 35 Standard Scenarios

- Information Service Bus Configuration
- (OIIE) Events

Use Cases

- Background
- Scope
- Preconditions
- Successful End Condition

- Actors
- Triggers
- Process Workflows
- Scenarios

Events

- Actors
- Data Content
- Data Formats
- Reference Data

User Stories

- High-level
- Pictographic
- Depict 1 or more Use Cases, Scenarios, and/or Events
- Actors, Systems, Exchanges, Data

Start with AWP
WG6 – Oil and Gas Interoperability (OGI) TS – ISO 18101 Standardization Concepts and Features

**OGI TS Objective:** Move From Systems Integration to Systems Interoperability and Digitalization

**Status:** ISO TS 18101-1
- Approved 13-0 – October 2018
- Published by ISO June 2019 – ISO Store
- 1st ISO standard to explicitly identify and define the basis for a supplier-neutral industrial digital ecosystem, previously identified as a requirement by the EU

**Participating National Committees:**
Canada, China, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom, United States (Plus Experts from Australia)
Industry Level Cooperation and OIIE Use Cases
Industrial Digital Transformation
A Pragmatic Solution: Standards-based Interoperability

Custom Integration
- Custom development
- Owner/operator responsible for sustainment
- High Development and Sustainment Costs
- High Risk/Vulnerable
- No practical basis for industry transformation

Open Standards-based Interoperability
- Defined by supplier-neutral standards
- Lower switching costs, reduces supplier lock-in and large supplier control
- Suppliers build and maintain standard adaptors with commercial support model
- Higher quality with lower costs and risks
- Practical Basis for industry transformation

Open Industrial Interoperability Ecosystem (OIIE)
ISO TS 18101

Industry Standard Digital Ecosystem
- Supplier neutral – open source and COTS
- Standard shared set of standards
- Standard APIs and services definitions
- Standard information payloads
- Standard reference data - ISDDs
- Standard ecosystem administration
- Standard piloting testbed
  ➢ Standard use case architecture
  ➢ Standard use cases, scenarios & events
  ➢ Standard adaptors
Simplify

Standardize (Industry Digital Transformation requires industries to share standards)

Digitalize

➢ Follow and leverage PERA / ISA95
➢ Industry Standard Datasheet Definitions linked to Industry Standard Datasheets
  • ISA
  • API
  • PIP
➢ PFD and P&ID Information
➢ Procurement
➢ Construction Work Orders
➢ Condition Monitoring and IIOT – In Cooperation with NIST
➢ Maintenance

Interoperate: (Systems of Systems, not just file exchange or integration)

Specialize: (In conjunction with industry specific associations and individual enterprises)
Industrial Digital Transformation: Interrelated Standardization Workstreams

➢ International Standards Organization (ISO): (Standards addressing many topics including Practices, IT and IM)

➢ OpenO&M Initiative – Group of Standards Developing Organizations (website)
  ➢ Formed by Multilateral MOU - ISA, MESA/B2MML, MIMOSA, OAGI, OPC (plus bi-lateral MOUs with some)
  ➢ Industry standards developing organizations cooperating to enable interoperability
  ➢ MIMOSA owns and manages OpenO&M branded IP
  ➢ NIST Smart Manufacturing and Integration teams (R&D, summits & white papers)

➢ MIMOSA (Website, Teams and GitHub)
  ➢ MOUs with ISA, USPI, THTH
  ➢ CII and NERA MOUs under development: Mostly focused on OIIIE Use Case Development
企业业务系统
企业资源计划 (ERP)

物理资产控制
实时系统

OpenO&M Initiative – Formed 2004

OpenO&M®

OPERA T I O N S

M A I N T E N A N C E

物理资产控制
实时系统

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OIIE OGI Pilot 3.1 Demonstration

LINK to demo recording on MIMOSA website

1. P&ID Creation and Export of Condenser Unit P&ID to Proteus XML Format
   (Worley)

2. Transform to CCOM XML Format
   (UniSA)

3. Greenfield RFI/RFI Response
   - RFI based on functional requirements (UniSA)
   - RFI Response, Models (Yokogawa)

4. Capital Project Asset Installation
   (UniSA)

5. (Simulated) Handover of As-Built Data to PdMA
   (UniSA)

6. CBM—Collection of Measurement data and output of Advisory
   (PdMA)

7. Remove and Replace Maintenance Activity
   (UniSA)

8. Brownfield Information Remediation
   - RFI based on limited asset data (UniSA)
   - RFI Response, Model/Asset data (Yokogawa)

OIIE Use Case 1 (As-Designed)

OIIE Use Case 12

OIIE Use Case 15

OIIE Use Case 1

OIIE Use Cases 14, 7, 5 (CBM Acquisition, Triggering, and Resulting Maintenance)

OIIE Use Case 12

12 September, 2019

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Starting in November

Will now include sponsorship by National Energy Resources Australia
- Mission is to improve efficiencies in Australian Energy Sector
- Australia does not have globally dominant IT suppliers and wants to be free to innovate

Scope
- Add basic Inter-bus and Inter-enterprise features to OIIIE
  - Multiple OIIIE Instances interoperating with each other forming supplier-neutral digital ecosystems
  - Driven by Use Cases (starting with RFI/RFI Response)
  - Associated with OpenO&M ISBM 1.2 Specification Update
- OIIIE Entry Point for ILAP (with Team Norway)
- SPIR Entry Point
- Preparation for next steps with NERA, CII and IOGP
MOU and Path Forward

- In May both associations identified the desire for an MOU framing the opportunity for mutually beneficial cooperation
  - THTH would build on top of existing OIIE Specifications
  - Share maximum practical amount of IT and IM Standards and Methods
  - Specialize for Pulp and Paper, following standard architecture and methods
  - Pulp and Paper specializations would be THTH IP, managed in a cooperative manner to extend OIIE on a scalable, repeatable and sustainable manner

- We have now executed such an MOU (Show PDF)
- OIIE OGI Pilot Phase 3.2 Starting next Month
- MIMOSA Open Meeting – Dec 4 – Dow Center – Houston, TX
- ISO TC 184/WG 6 Meeting – Dec 5 – Dow Center – Houston, TX