Open Industrial Interoperability Ecosystem (OIIE), OIIE Oil and Gas Interoperability (OIIE-OGI) Pilot and ISO 18101-1

THTH Spring Seminar
May 29, 2019
Useful standardization activities gain business efficiencies

- Open Industrial Interoperability Ecosystem (OIIE)—Supplier-neutral Industrial Digital Ecosystem
  - Focused on the secondary business process—Life-cycle Asset Management
  - Multiple process industry groups have concluded they can standardize activities in the secondary business process
- Major business change from Integration to Standards-based Interoperability—The Industrial Model
  - Pragmatic solutions model based on standardization of traditional enterprise integration best practices
  - Industry use case driven

- OIIE Oil and Gas Interoperability (OGI) Pilot
  - Simulates real world life-cycle asset management in asset intensive process industries
  - Oil and Gas Specific only to the degree that the included asset classes are associated with a refinery
  - Future intent to have other asset classes for other industries (Waste Water Treatment, Pulp and Paper with THTH)
  - R&D Testbed for OIIE and ISO 18101
  - Pilot Phase 3.1 Running Now, Phase 3.2 Scheduled to start by August

- Industry Standard Datasheet Definitions (ISDDs) for Components & Packages

- ISO 18101—Oil and Gas Interoperability
  - Based on OIIE and OIIE OGI Pilot
  - Part 1 is at ISO for publication

- Existing Cooperation - MOU with MIMOSA and USPI

- Critical Infrastructure Risk Management, Interdependencies and Standardization

- NIST Open Industrial Digital Ecosystem Summit—Co-Sponsored by MIMOSA and OAGi

- Pending MOU between THTH Association
Full Asset Life-cycle Management

Derived from ISO TC 184
Manufacturing Asset Management Integration Task Force Final Report

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OIIIE Inter-Enterprise Systems Connectivity and Services Architecture Enabling Industry 4.0

EPC Firms
Engineering, Procurement and Construction

IT Networks

OEMs
Manufacturers

Enterprise Business Systems

Manufactured Asset Data
(Make/Model Information, Serial #)

Operations & Maintenance Data
(Monitoring, Diagnostics Prognostics)

Owner/Operators

Enterprise Business Systems

IT Networks

Automation and Control
OIIE Intra-Enterprise Systems Connectivity and Services Architecture

**Enterprise Business Systems**

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

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**IEC 62264 Messaging Service Model /OpenO&M Information Service Bus Model**

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

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**Connectivity Legend**

- IoT Connections
- (Constrained)
- Trusted IT/OT connections
- ISBM Web Services
  - (Constrained)

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**Shared Information and Semantic Context**

- Enterprise Reference Data Libraries
- IIoT Device Metadata

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**Industry Reference Data Libraries**

- IIoT Device Metadata
  - (ISO 15926, OTD, CDD...)

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OIIE/OGI Standardized Use Case Architecture

Standardized Methodology to Define and Re-use OIIE Components

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

Use Cases
- Background
- Scope
- Preconditions
- Successful End Condition
- Actors
- Triggers
- Process Workflows
- Scenarios

Scenarios
- Actors
- Data Content
- Data Formats
- Reference Data
- Information Service Bus Configuration
- (OIIE) Events
- Individual Message Exchange
- Specific Data Content
- Required data processing
- Expected Response Event
- Implemented by CCOM BODS and possibly others

Events

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OIIE OGI Pilot
Phase 3.1 – Ending in July 2019
Pilot sub-phases of 6 months duration
OIIE/OGI Pilot Background

- OGI Phase 1: 2009-2012 Daratech Plant, ISA Expo, ISA Automation Week
- OGI Pilot Phase 2: 2013-2015
  ➢ Identified need for ISDDs

**OIIE Background**

➢ OGI Pilot Phases 1 and 2: we realized the work was applicable to
  • Many process industries
  • Major Critical Infrastructure Sectors

➢ We saw the need for a standard industrial digital ecosystem specification

➢ The OIIIE OGI Pilot is an OIIE Instance, which
  • Includes Oil and Gas Industry Asset Classes
  • Includes Oil and Gas Industry Use Cases, most of which are applicable to other process industries

- ISO 18101 – Also leverages both OIIIE and OIIE OGI Pilot
Condenser Sub-System for OIIE OGI Pilot
OIIE OGI Pilot Phase 3.1 Activities 1-4 (Use Cases)

Debutanizer Tower Condenser Unit P&ID
- Worley Parsons, Fluor
- Aveva, Hexagon (Proteus XML)
- Bentley (CCOM XML)

P&ID Logical Connection information
MIMOSA Structured Digital Asset Interoperability Registry

RFI/RFI Response (Greenfield)
- RFI – Functional requirements
- RFI Response – Models
- Request for Model properties (ISDDs)

Capital Project Asset Installation
- Asset instances selected from RFI Response (defined using ISDDs)
- Installed on P&ID Tag locations (defined using ISDDs)

EPCE Procure With OAGi
Use Cases ISDD Based Way of Specifying, Selecting and Buying Devices and Equipment

Adding Detail to Prior Work
As-Designed O&M Takeoff using CCOM or Proteus
Use Case Adding As-Built Information Using OIIE Events

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OIIE OGI Pilot Phase 3.1 Activities 5-8 (Use Cases)

Information Handover
From Capital Project to Operations and Maintenance
Over ISBM (Information Service Bus Model)

Condition Based Maintenance
Diagnostics
Prognostics
Advisory Generation

Remove and Replace

RFI/RFI Response (Brownfield)
Information Remediation

Simulated
Use Case(s)
Use Case
Use Case
Industry Standard Datasheet Definition (ISDD) Project Update
## ISA 20T2221 Datasheet

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Current ISDD Build Process

- Applies to ISDs from all sources ISA (Rev 0, Rev 1), PIP, API, IEC..  
- Degree of automation differs with datasheet complexity/consistency  
- ISA Rev 1 now highly automatable  
- Manual QA review identifies issues with extracted properties and issues/ambiguities in source datasheets  
- XML—primary CCOM format  
- Excel Spreadsheet—for Human Readability  
- JSON—for IoT, light-weight data exchange
Using CCOM, Standard Functional Packages can be modeled as Standard Systems which can be included in Systems of Systems defining an entire Unit.

Package ISDDs: The Bigger Picture

Standardised ISDD Group for Package

ISDDs for Devices & Equipment
Business Object Document for Packages

Used to support Standard Packages such as those being defined by JIP 33.

- Use case for Make-Model Match-Up
- Scenarios for individual devices, equipment and packages.
- Scenario for retrieving model datasheets is reused across use cases.
- **BOD for packages** ensures the request is treated as a whole.
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

SC5
Condition monitoring and diagnostics of machines

ISO TC 184
Industrial automation systems and integration
WG 6 – ISO 18101: OGI TS
Digitalization & Interoperability

ISO TC 184
Industrial Data

SC4
Architecture, communications and integration frameworks

ISO TC 184
Architecture, communications and integration frameworks

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

ISO 13374
MIMOSA OSA-CBM
WG 6
Formats and methods for communicating, presenting and displaying relevant information and data

ISO 15926
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
WG 7
Diagnostic and maintenance applications integration
Current Cooperation between Standardization Associations

- OpenO&M Initiative
  - Organized 2004
  - ISA, MESA (B2MML), MIMOSA, OAGi, OPC
  - OIIIE, OGI Pilot and ISBM originated from this cooperation – ISBM 1.1 Update underway

- ISO 18101-1
  - Canada, China, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, UK, US +Australia
  - 12 Nations voted Yes, 0 Nations voted No

- OGI Pilot
  - Construction Industry Institute (Began with Fiatech in 2009)
  - Cooperation with PCA

- Standards Leadership Council
  - Energistics, MIMOSA, OPC, OMG, OpenGeospatial, PCA, PIDX, PODS, PPDM, USPI

- Bi-lateral MOUs with ISA, OAGi and USPI

- THTH – Pending MOU
NIST is working with MIMOSA on Interoperability for IIOT and Critical Infrastructure Risk Management Standardization.

MIMOSA CCOM can model the industrial processes, systems, components and risks as well as the sensor-based information.

NIST Summit – June 3-4
Critical Infrastructure Interdependencies

IEEE Journal- Dec 2001
Identifying, Understanding, and Analyzing Critical Infrastructure Interdependencies
Steven M. Rinaldi
James P. Peerenboom
Terrence K. Kelly
Critical Infrastructure Interdependencies-2

NIST Special Publication 1190
Community Resilience Planning Guide
For Buildings and Infrastructure Systems
Volume II
October 2015
Critical Infrastructure Interdependencies-3

State Energy Resilience Framework
Global Security Sciences Division
December 2016

J. Philips, M. Finster, J. Pillon, F. Petit and J. Trail
Critical Infrastructure Interdependencies

Incorporating Prioritization in Critical Infrastructure Security and Resilience Programs

Homeland Security Affairs 13, Article 7 (https://www.hsaj.org/articles/14091)
October 2017

Duane Verner, Frederic Petit, and Kibaek Kim
Critical Infrastructure Interdependencies - 5

NSW Critical Infrastructure Resilience Strategy
Partner, Prepare, Provide
NSW Department of Justice | Office of Emergency Management
2018
Future Cooperation

- MIMOSA and THTH have expressed a mutual interest in cooperation
- Proposed MOU
  - THTH would build on top of existing OIIIE 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 OIIIE on a scalable, repeatable and sustainable manner