



Enabling Life-cycle Interoperability for Critical Infrastructure Management

PCA
Owner/Operators Meeting
October 29, 2012

Alan T. Johnston
MIMOSA President
OpenO&M Initiative Chair
ISO TC 184/WG 6 Convener



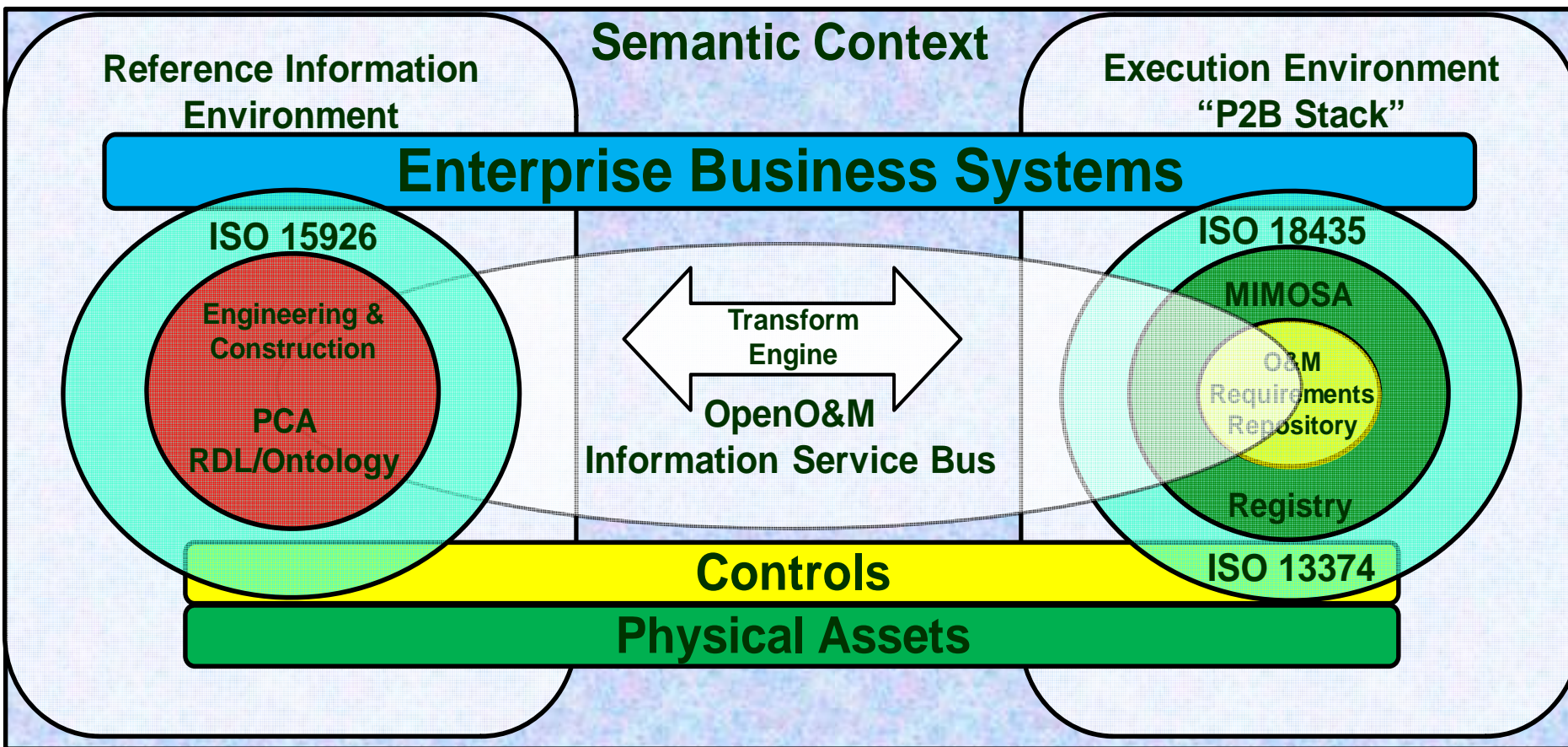
Critical Infrastructure

14 Sectors Identified by US Government – Shared Problems & Solutions

- Agriculture and Food – Departments of Agriculture and Health and Human Services
- Water – Environmental Protection Agency
- Public Health – Department of Health and Human Services
- Emergency Services – Department of Homeland Security
- Government – Department of Homeland Security
- **Defense Industrial Base – Department of Defense**
- Information and Telecommunications – Department of Commerce
- **Energy – Department of Energy**
- **Transportation and Shipping – Department of Transportation**
- Banking and Finance – Department of the Treasury
- **Chemical Industry and Hazardous Materials – Department of Homeland Security**
- Post – Department of Homeland Security
- National Monuments and icons - Department of the Interior
- **Critical Manufacturing - Department of Homeland Security**



Context for Collaboration



Interoperability Versus Integration

The New Industry Solutions Process

- Project specific solutions process - Integration
 - Use cases, custom code and testing are all project specific
 - Integration risks are borne by Owner/Operator and Integrator
 - Expensive and high risk to implement and sustain (20% - 25% annual recurring cost)
 - Not repeatable, lower quality due to project specific code base
- Industry-driven Solutions Process - Interoperability
 - Requirements Driven – The use case approach by OpenO&M is a good example of this
 - Industry Foundation Architecture – Open standards **incorporated by reference**
 - Industry compliance data sets are developed and managed by industry
 - ISO TC 184 OGI TS is an example of an activity that sets forward a 'Target Industry Foundation Architecture' and codifies piloted industry solution
 - Suppliers develop, maintain and license compliant adaptors as COTS products
 - Enables repeatable and scalable industry-driven solutions for **Oil and Gas** shared with other elements of **Critical Infrastructure**
 - Guided by Owner/Operators with assistance from service companies and standards bodies

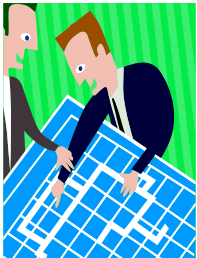
- do operators know which equipment has outstanding work orders?
- how can operators determine which assets are bad actors?
- how can process engineers distinguish bad asset actor vs. bad materials vs. operational problems when investigating process upsets?
 - do process engineers see asset changes when investigating historical process data?
- what is the reliability of an asset, not a tag?
 - transmitters, actuators, valves, units, areas, sites,...?
- what is the probability an asset will be available for production next week/month?
 - do operational planners know that?
- how are conflicting operational and maintenance missions avoided?
- how many times must asset data be entered into a system?

Core Problem

Lack of Interoperability Between Key People, Processes and Systems



Engineering Systems



Proprietary Enterprise Business Systems

Proprietary Middleware

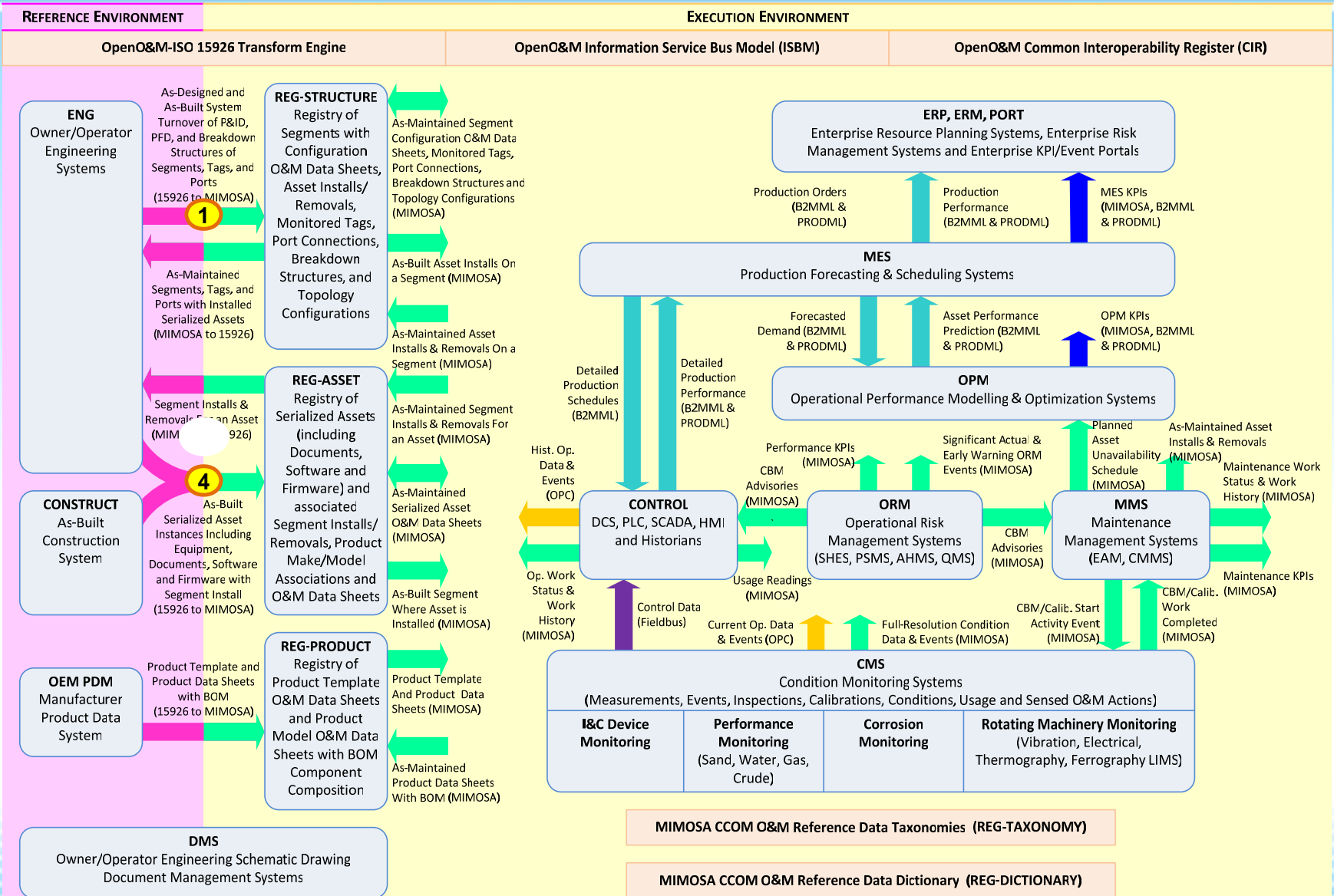
Proprietary Automation Systems

1. “handover” as-designed/built information from engineering, procurement, construction phase to O&M phase
2. recurring updates - send engineering upgrades to O&M systems
3. field engineering changes sent to engineering (bottom up)
4. on-line product data library updated with engineering reference information (asset based data)
5. operations & maintenance configuration changes (e.g. remove/replace transmitter)
6. preventive maintenance (PM) triggering
7. condition-based maintenance (CBM) triggering
8. early warning notification
9. incident management – actual & near-miss information captured and escalated along the lines of accountability
10. O&M systems information provisioning

the open O&M initiative

O&M Greenfield Handover for the Oil and Gas Industry

(OpenO&M Use Case #1, Scenario #1)



The OpenO&M™ Initiative

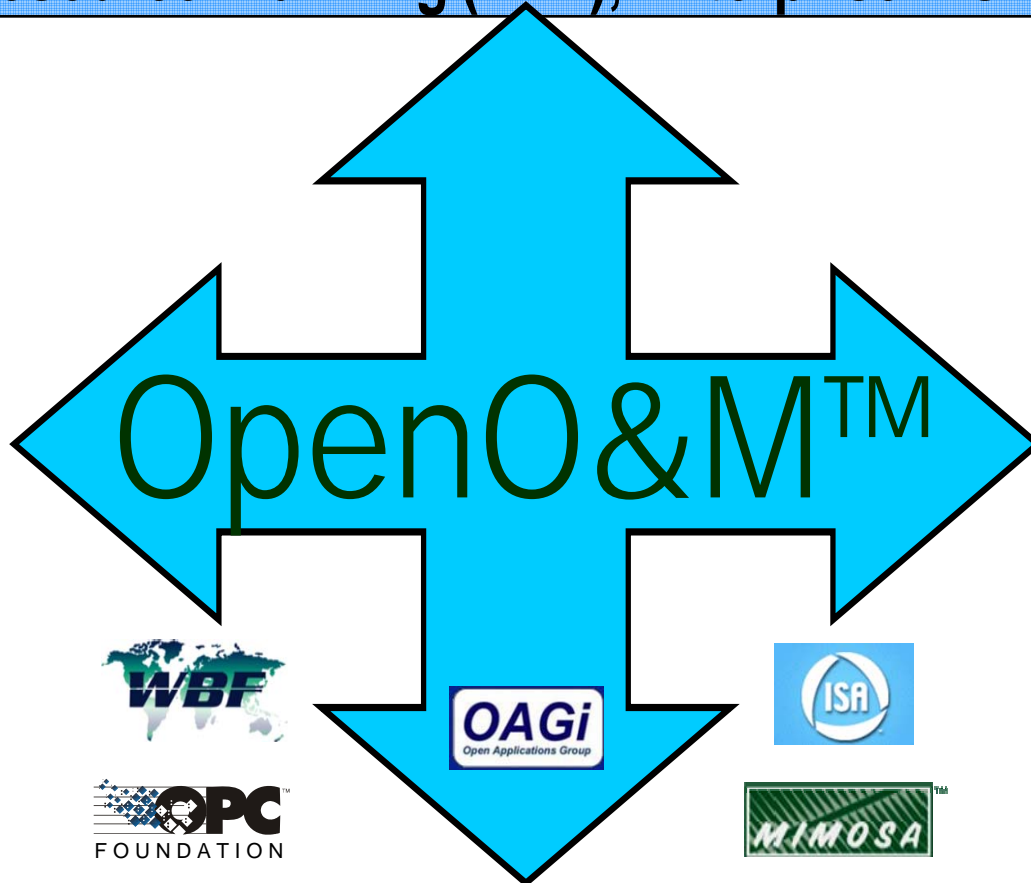
Brings People Processes and Systems Together

Enterprise Business Systems

Enterprise Resource Planning (ERP), Enterprise Risk Management

Operations

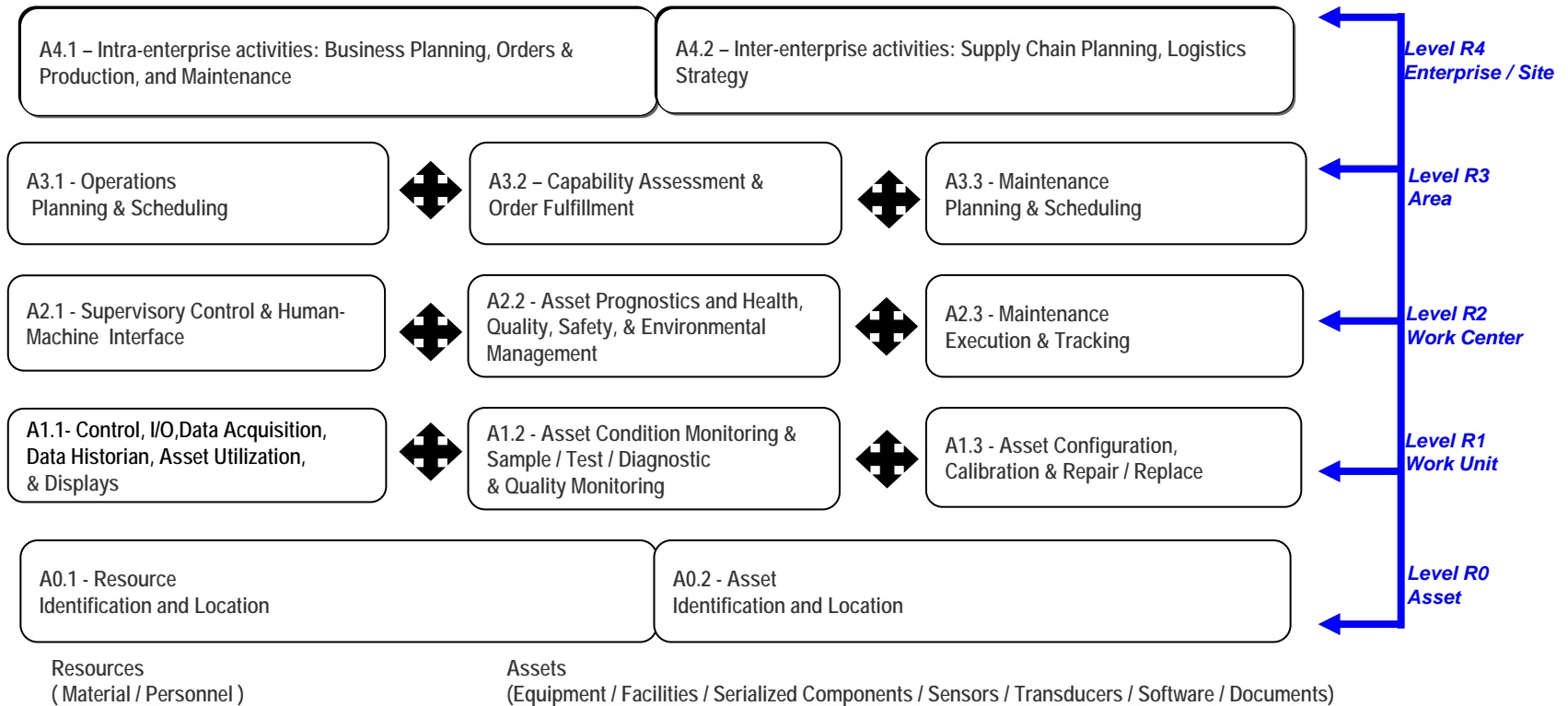
Maintenance

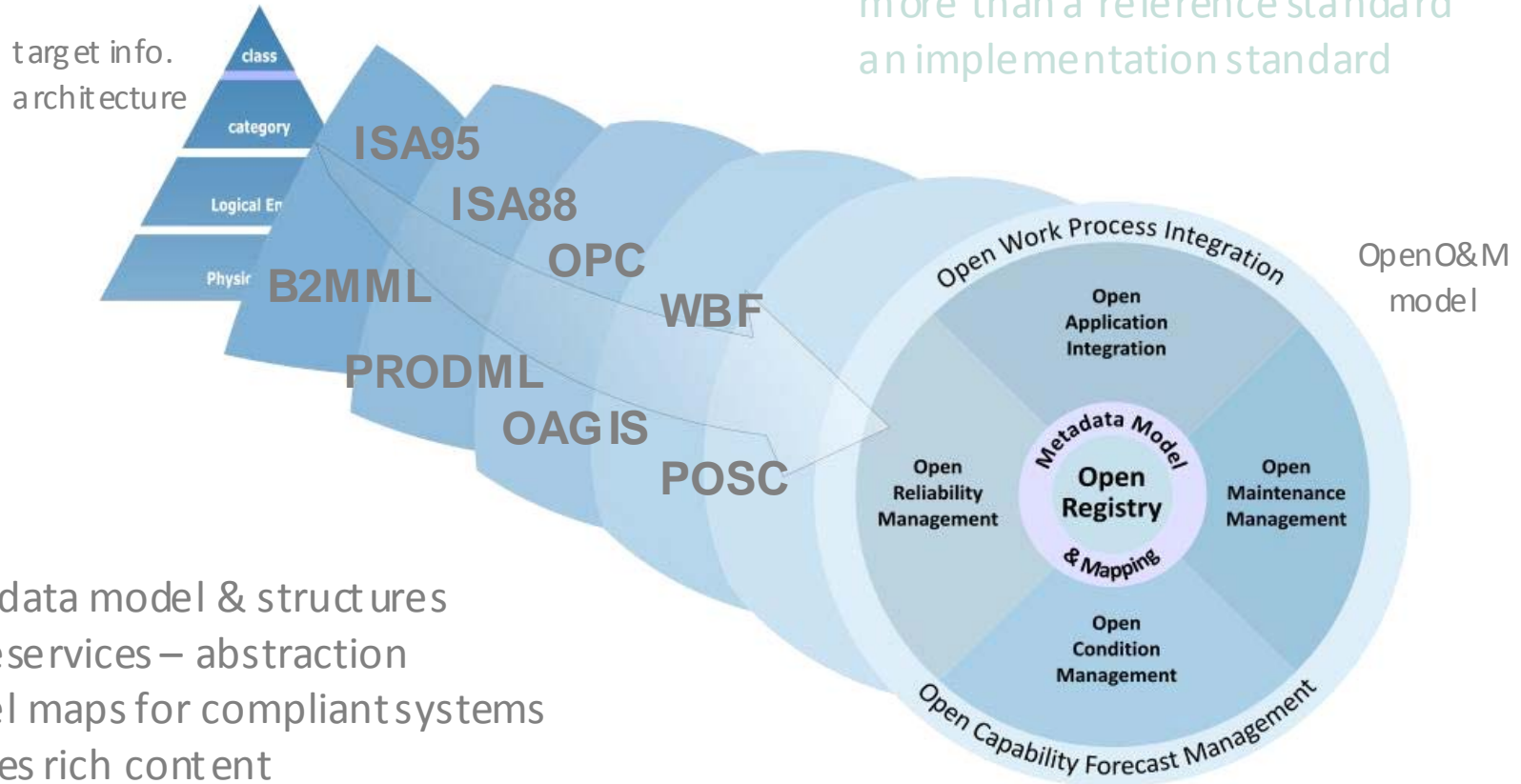
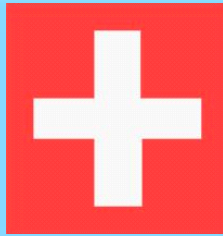


Physical Asset Control

Real-time Systems

ISO 18435 Application Domain Integration Diagram

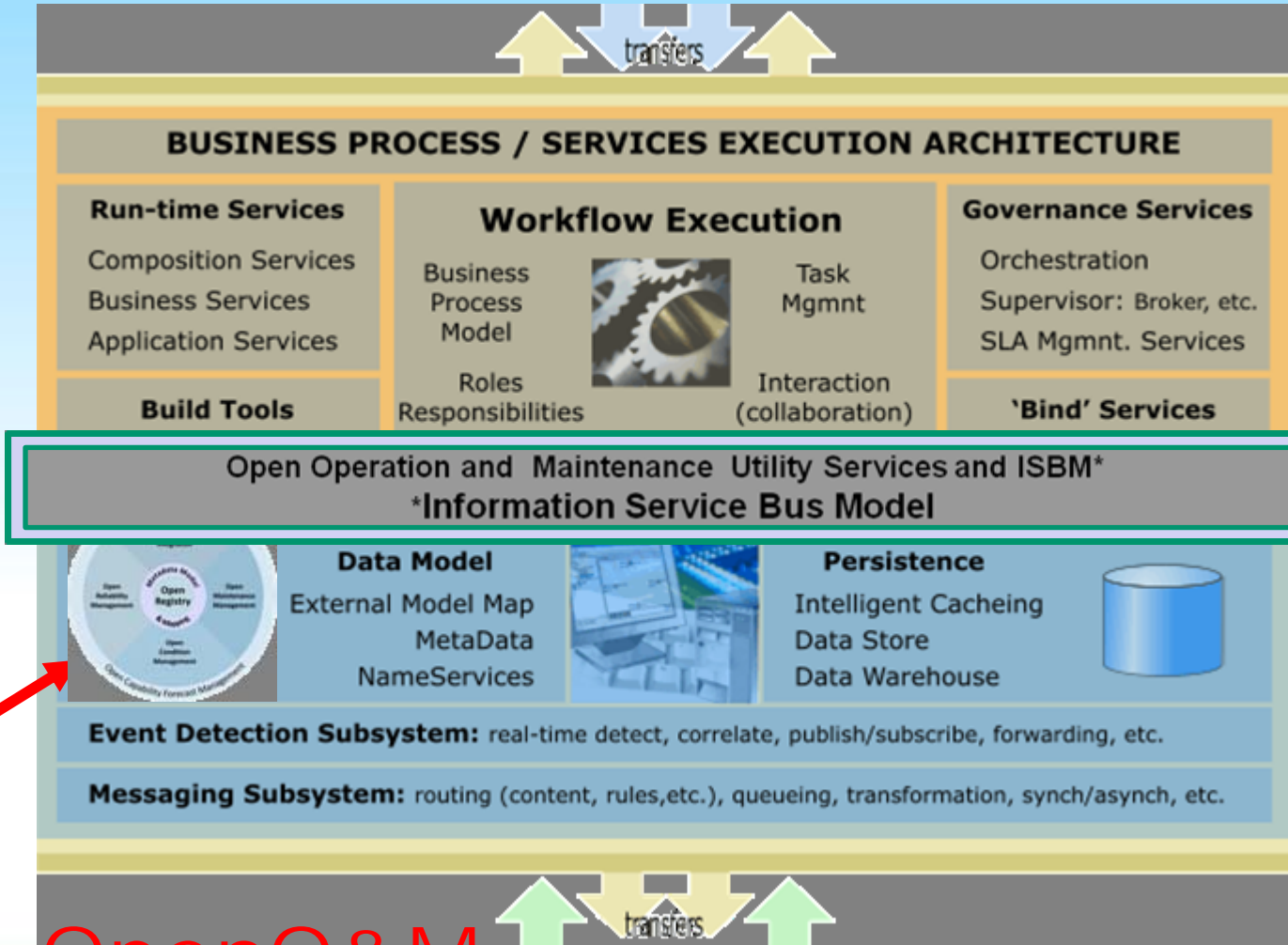




more than a reference standard
 an implementation standard

- metadata model & structures
- nameservices – abstraction
- model maps for compliant systems
- defines rich content
- commoditize O&M data exchange
- non-proprietary interoperability

OpenO&M harmonizes the standards



2

1

OpenO&M

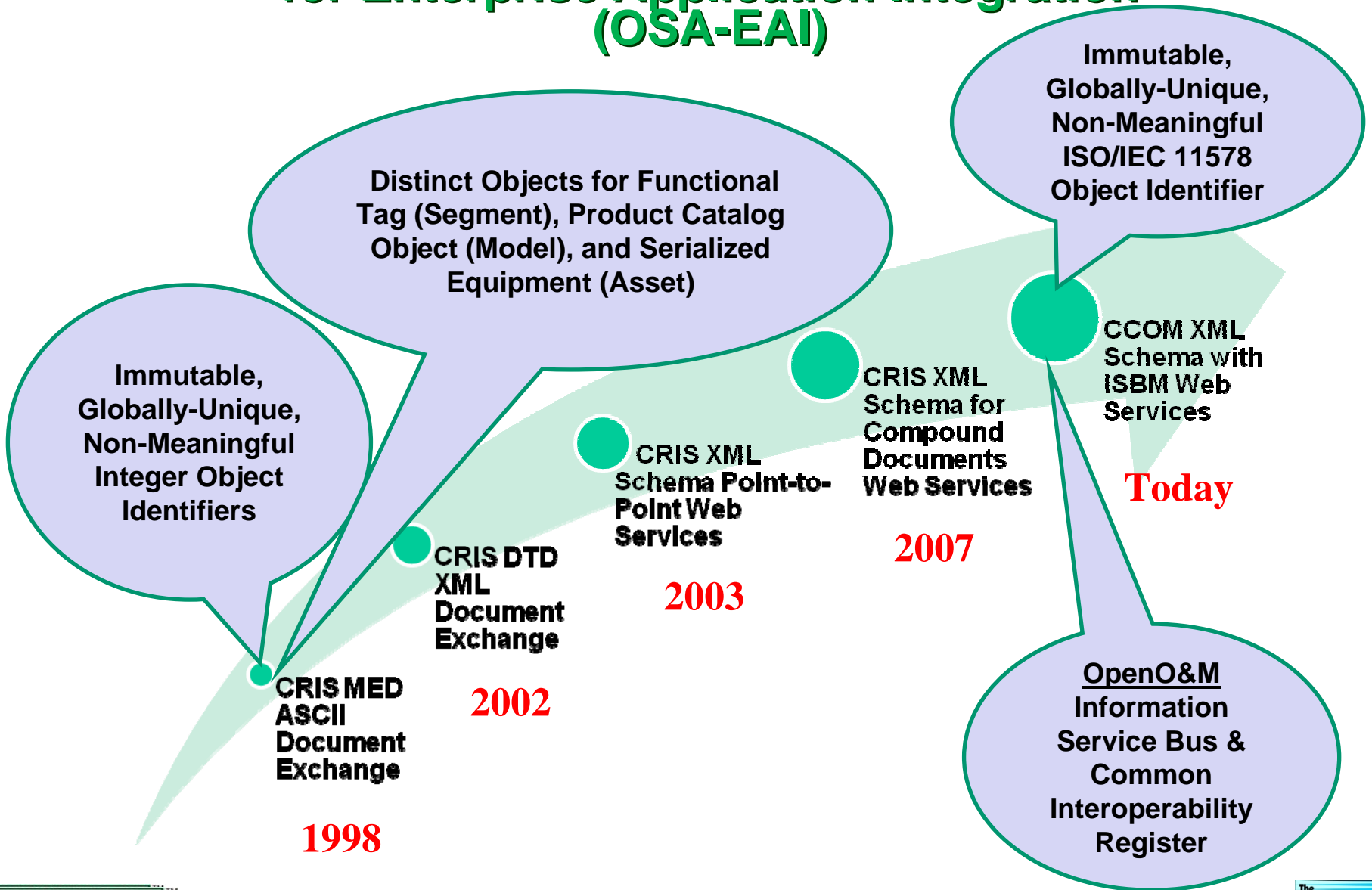
MIMOSA Summary

An Operations and Maintenance Information Open Systems Alliance

- Organized as a Trade Association in 1997
- A 501 (c) (6) non profit organization
- Funded by membership
 - ✓ Suppliers
 - ✓ Integrators
 - ✓ Researchers/Academia
 - ✓ End-Users- Owner/Operators
- Key Standards
 - ✓ OSA-EAI – Enterprise Application Integration
 - ✓ OSA-CBM – Condition Based Maintenance
 - ✓ OpenO&M CIR and ISBM

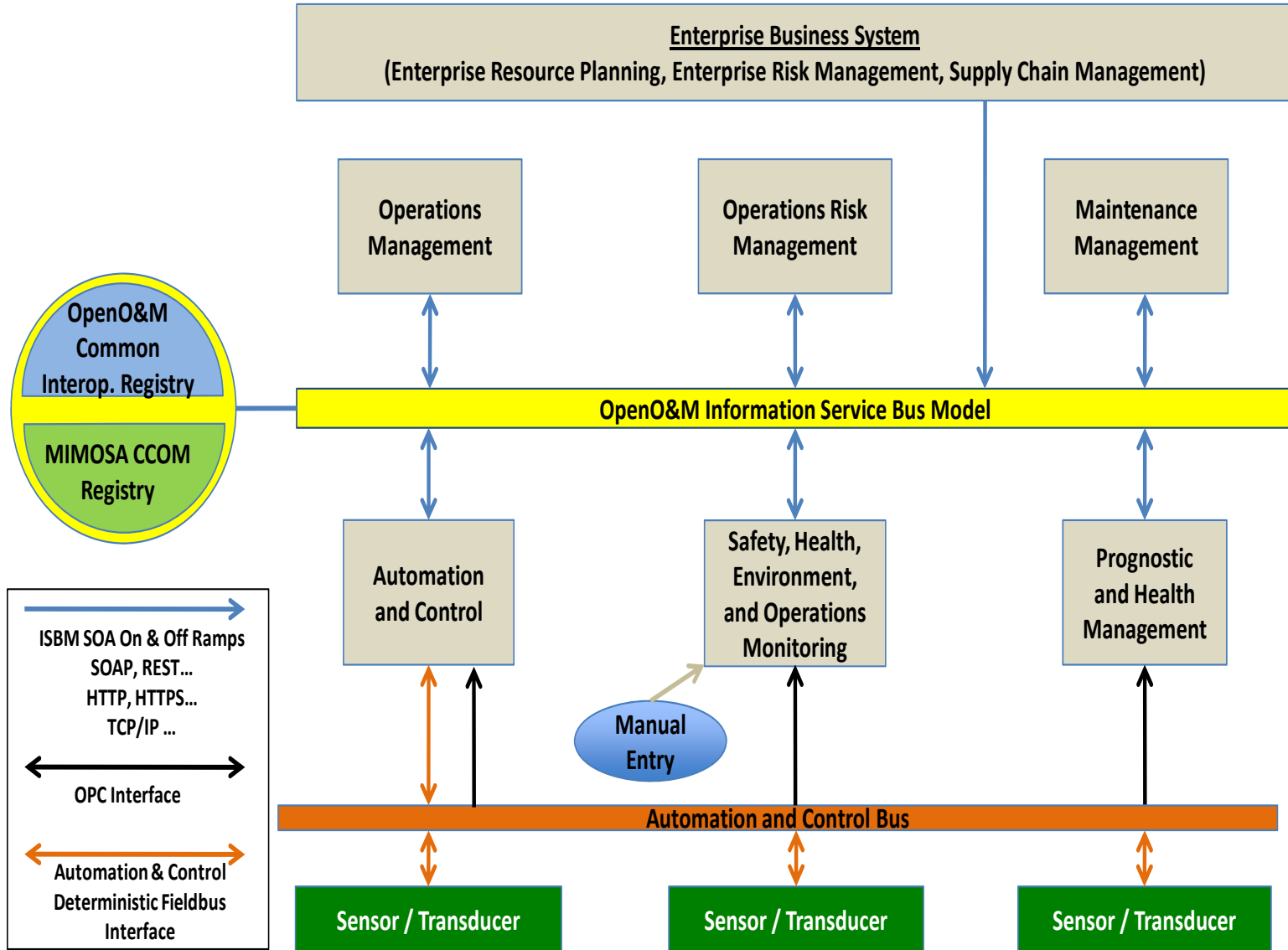


MIMOSA Open System Architecture for Enterprise Application Integration (OSA-EAI)



Second Generation SOA – Information Bus

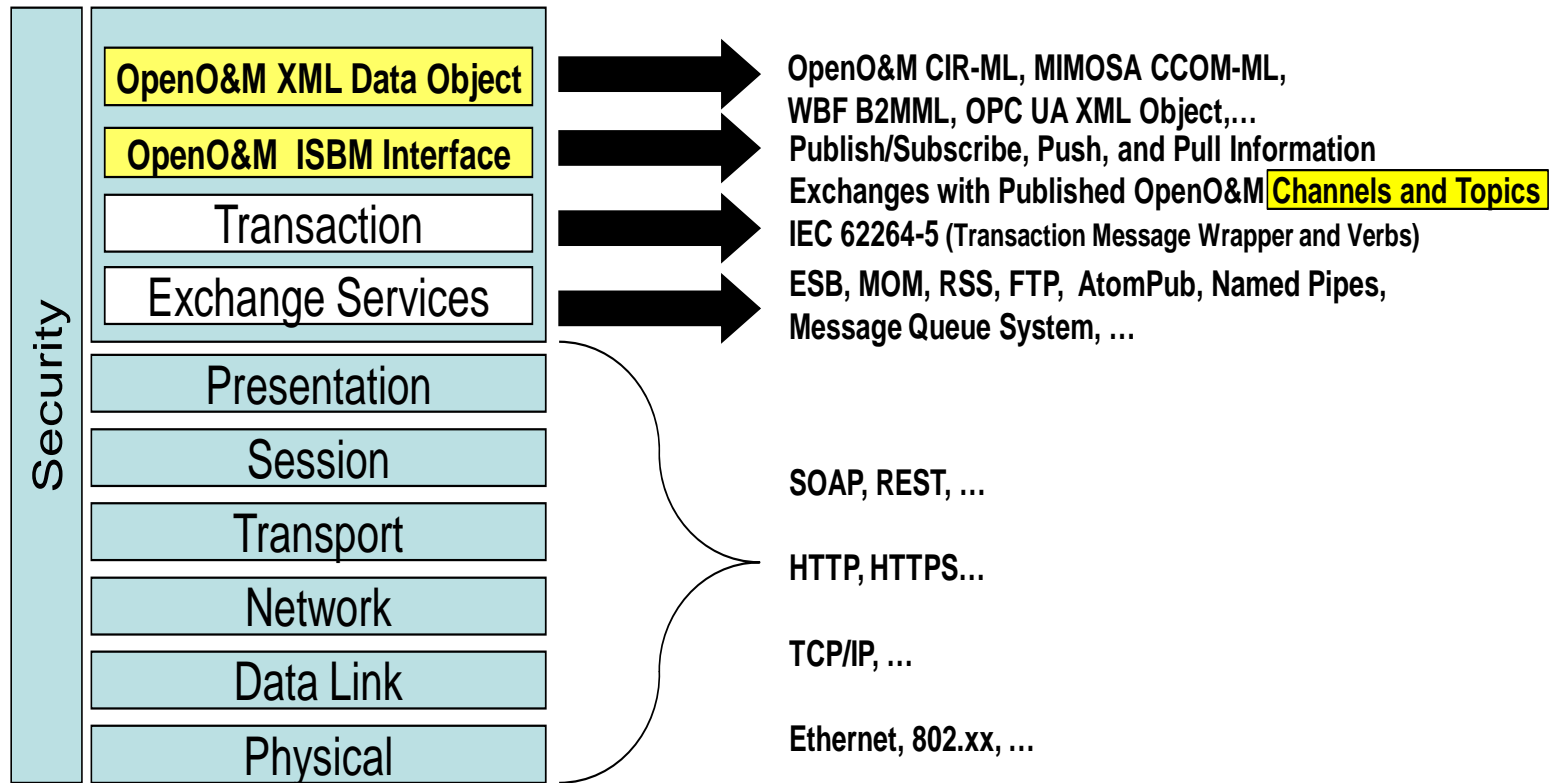
The Execution Environment



The IT Stack for Second Generation SOA

Building On the Past, Enabling the Future

information Bus Architecture



Channels – ISO 18435 Domains

Topics – MIMOSA CCOM Objects (UML)

ISO TC184 Manufacturing Asset Management Integration Task Force Total Asset Life-Cycle Summary



FIATECH

MIMOSA/OpenO&M™

POSC CAESAR

Continuous Improvement
Feedback Loops

Commissioning

Product
Design

Asset
MFG

Construction

Operations & Maintenance (O&M)

End of Life

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

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

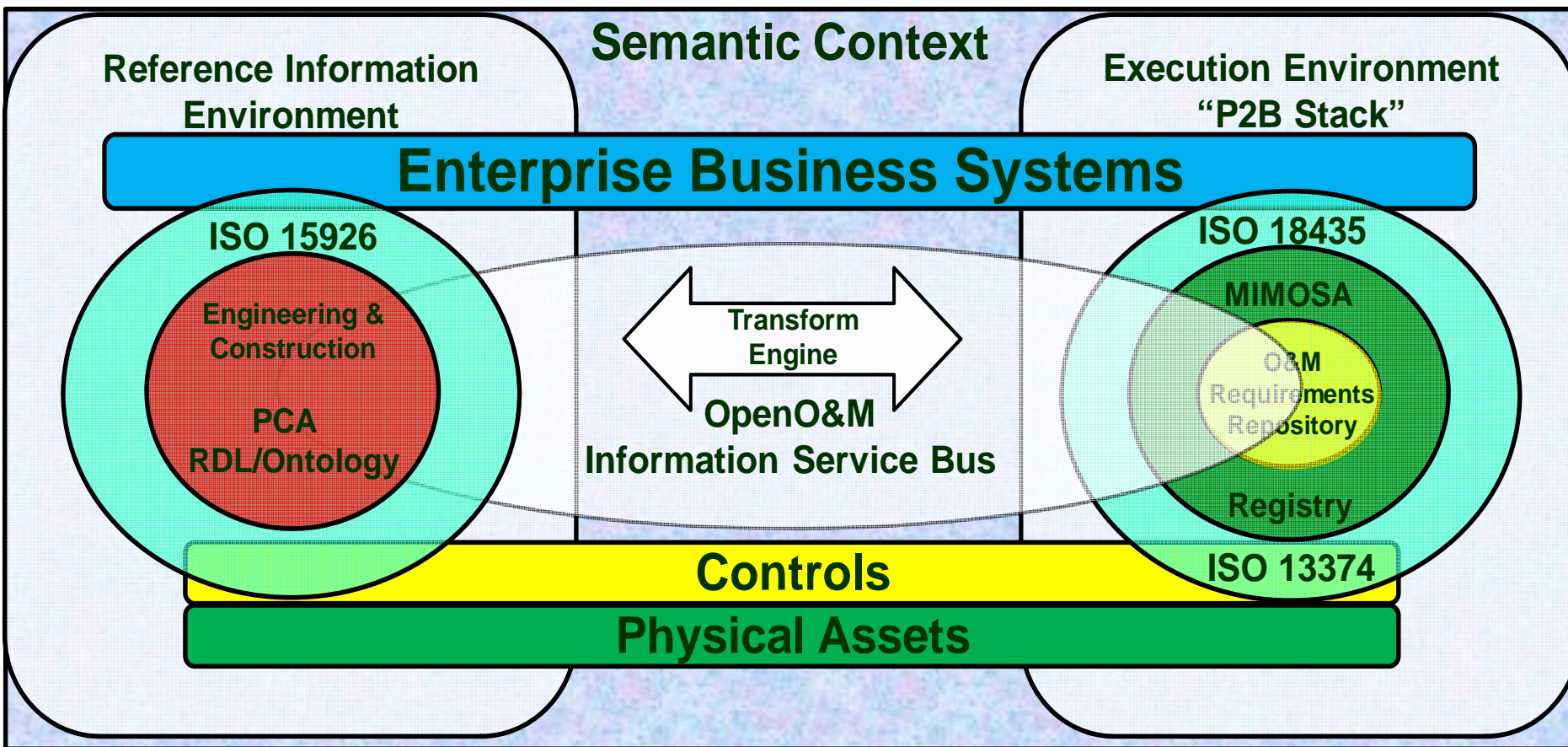


Scope and Deliverables

- **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 pilot & compliance data sets
 - Downstream Data Set – Plant Light Ends Unit with debutanizer and depropanizer towers
 - Upstream – Rigs and Wells Data Sets – In cooperation with SPE DSATS
 - Upstream Platform Data Set – In cooperation with PCA
 - ✓ Detailed industry use cases prioritized by owner/operators
 - OpenO&M Digital Handover of O&M information and Provisioning of O&M Systems
 - Upstream Production Optimization
 - OpenO&M Maintenance Use Case
 - ✓ Industry use case driven pilots
 - Downstream Pilot
 - Upstream Pilot



Context for Collaboration





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

SC5

Condition monitoring and diagnostics of machines

SC4

Industrial Data

SC5

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

WG6

Formats and methods for communicating, presenting and displaying relevant information and data

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

WG7

Diagnostic and maintenance applications integration



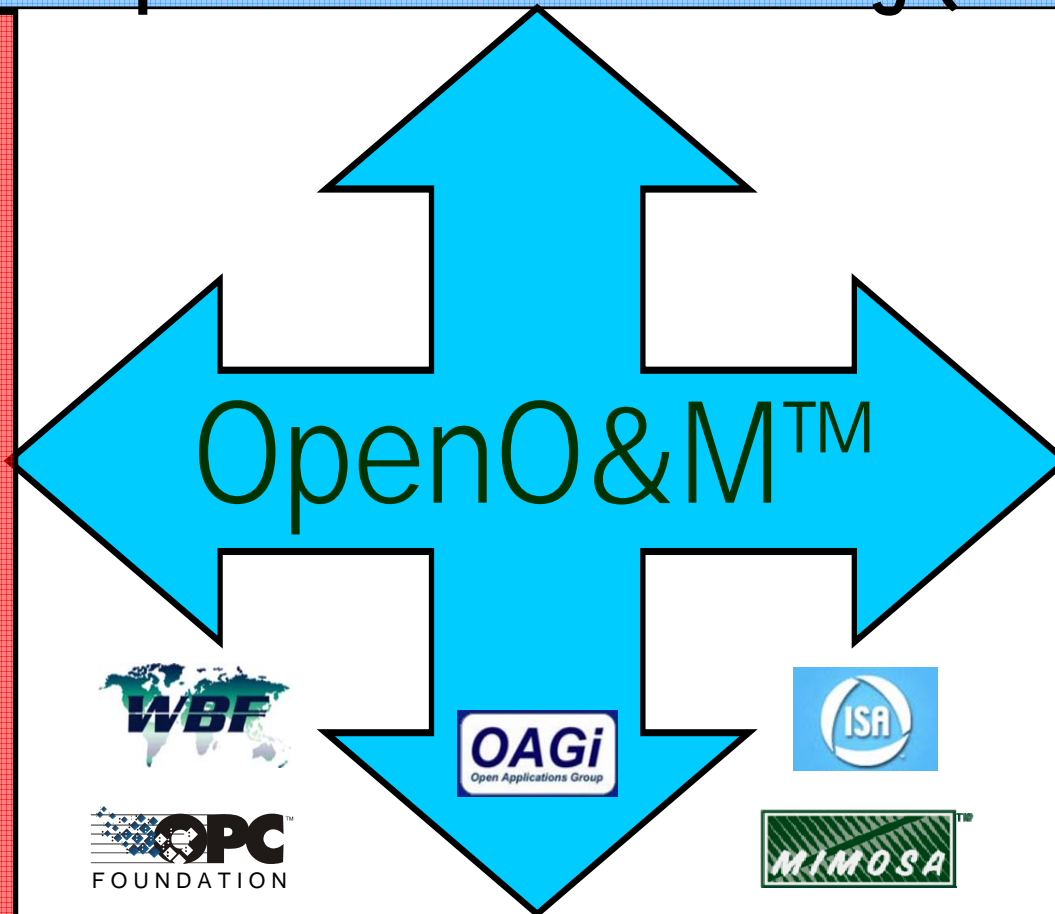
The OpenO&M™ Initiative

Enabling Open Standards-based O&M Interoperability

Enterprise Business Systems
Enterprise Resource Planning (ERP)

Operations

Maintenance



Physical Asset Control
Real-time Systems

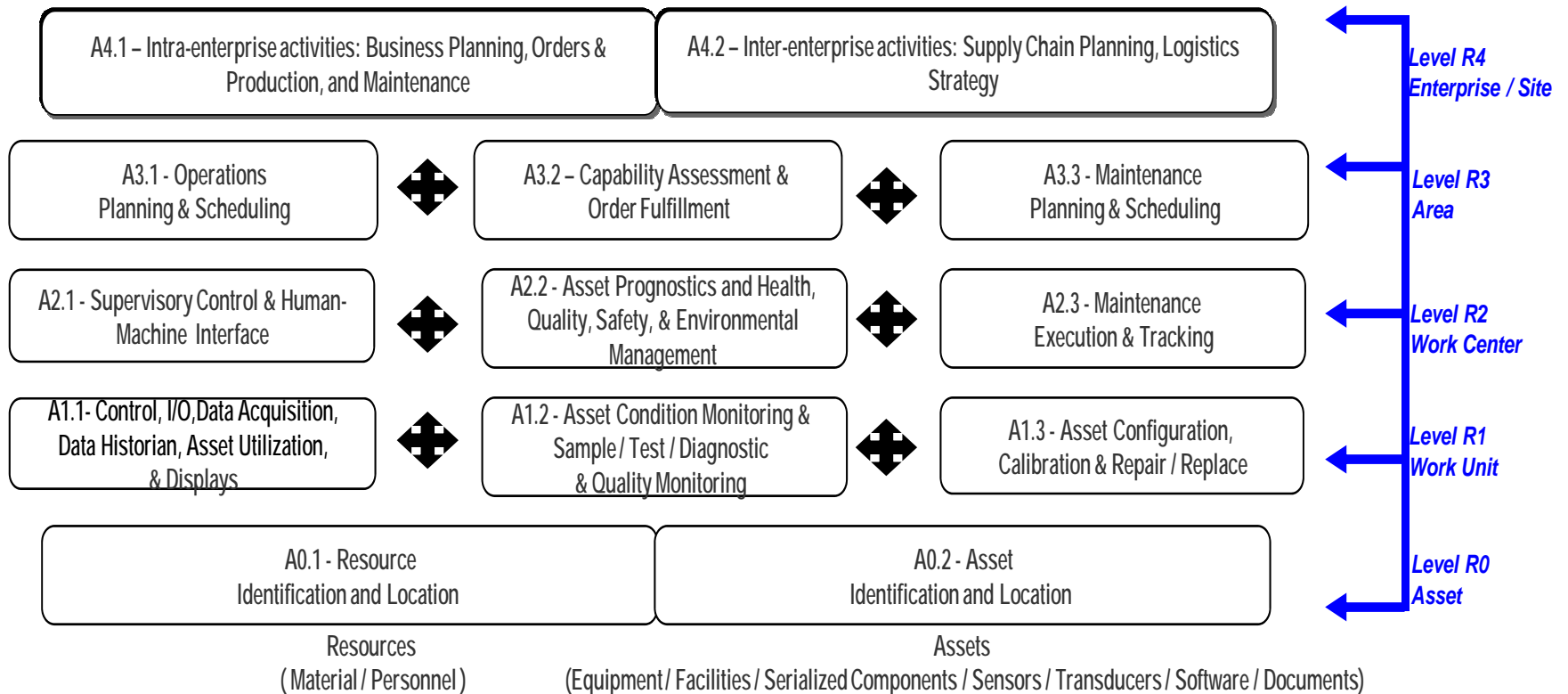


ISO 18435 - 1

Application Domain Integration Diagram



Application Domain Integration Diagram





OGI Use Cases



key industry use cases

1. “digital handover” as-designed/engineered/built O&M information from engineering, procurement, construction phase to O&M phase
2. recurring updates - send engineering upgrades to O&M systems
3. field engineering changes sent to engineering (bottom up)
4. on-line product data library updated with engineering reference information (asset based data)
5. **operations & maintenance configuration changes (e.g. remove/replace transmitter)**
6. preventive maintenance (PM) triggering
7. condition-based maintenance (CBM) triggering
8. early warning notification
9. incident management – actual & near-miss information captured and escalated along the lines of accountability
10. **O&M systems information provisioning**

6



Industry Use Cases

1. **Upstream Production Optimization**
2. Drilling Reporting
3. Production Reporting

ISO TC184



Global Collaboration

- Center for Integrated Engineering Asset Management (CIEAM)
- Energistics
- FIATECH
- MIMOSA/OpenO&M
- POSC Caesar Association



Global cooperation between industry organizations to enable open standards-based interoperability for asset management through an industry-use case driven solutions process

ISO TC 184/WG 6

OPPORTUNITY: LEVERAGE BEST PRACTICES, STANDARDS AND TECHNOLOGIES DEVELOPED ON A CROSS INDUSTRY BASIS

Critical Infrastructure Management

Dual Use Technology Investment

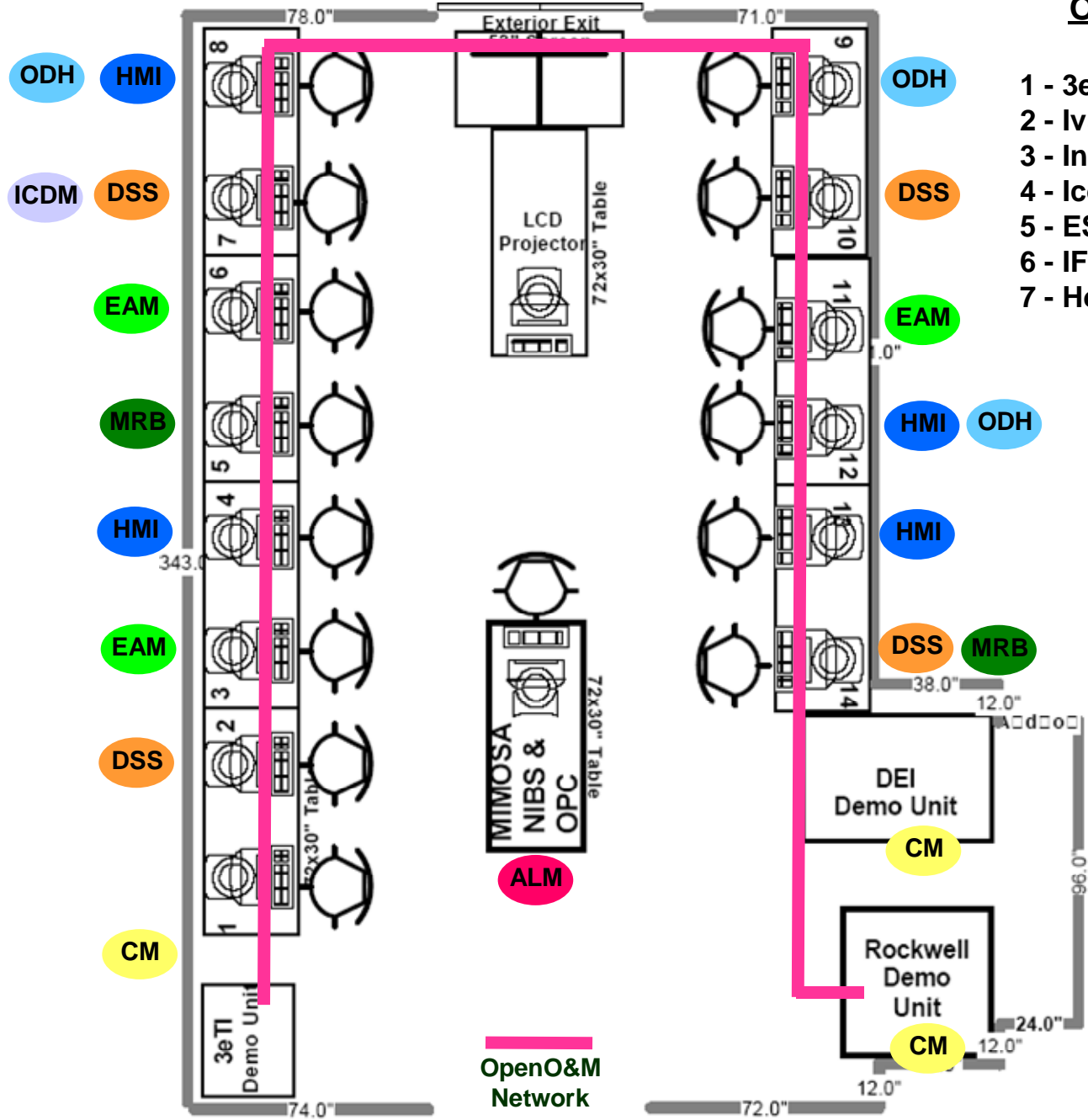
Applying Commercial Off The Shelf Solutions to Solve Complex Problems

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

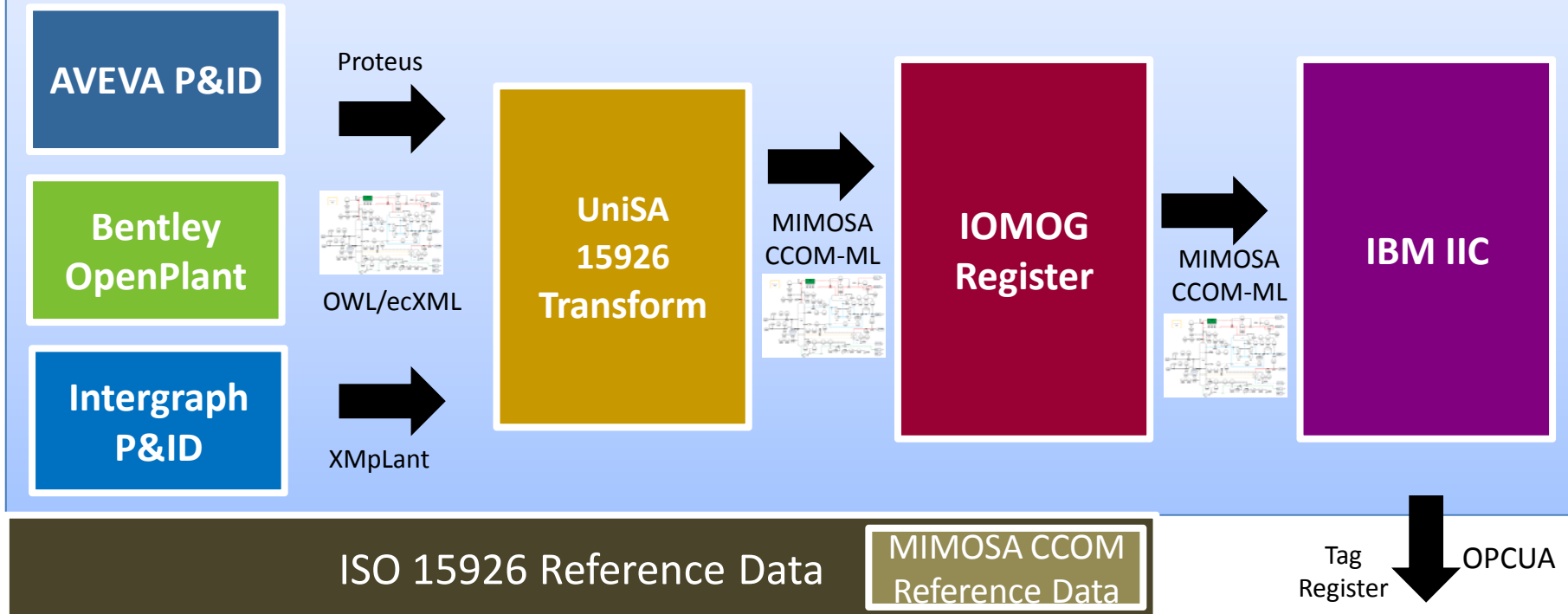


December 2004



2012 ISA Automation Week Live OGI Pilot Demo

IBM ISBM Implementation Provides Connectivity Environment

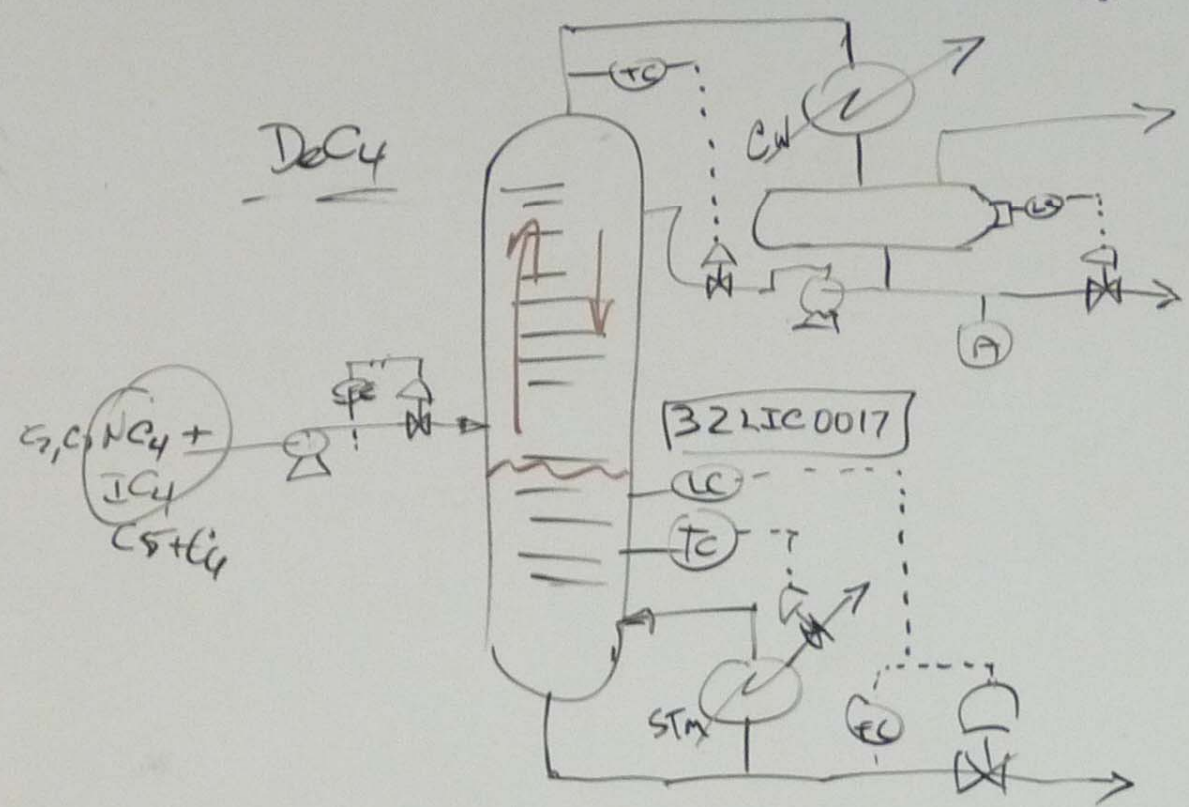


Live OGI Pilot Demonstration
Overall Product and Technology Map

**OSIsoft
PI/AF
Historian**

DeButanizer Fractionator

FlowSheet (PFD)



Capturing Equipment Data Requirements Using ISO 15926 and Assessing Compliance

Presented By:

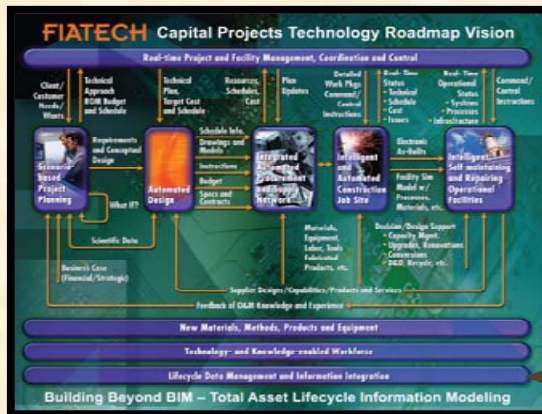
Manoj Dharwadkar

Director, Software Development

Bentley Systems Inc.

Proposed Project for:

Lifecycle Data Management & Information Integration (Roadmap Element 9)



Scope

- Collaboration with MIMOSA and PCA on their Oil and Gas Interoperability (OGI) Pilot
 - Focus on small subset scope that is common with OGI Pilot and HEED projects and consistent with IIP
 - Initial scope limited to few Equipment Classes and Parameters expanding to a small P&ID fragment
- ISO 15926 released documentation supplemented by JORD Phase 1 deliverables will be used
 - Engage and provide feedback to PCA/JORD and ISO 15926 T25 Core Team