



The Oil and Gas Interoperability Ecosystem

Enabling Sustainable Interoperability for the Oil and Gas Industry

Energistics PRODML SAM Working Meetings
Houston, TX

Sep 23 2013
Alan Johnston
MIMOSA President
ISO TC 184/WG 6 Convener

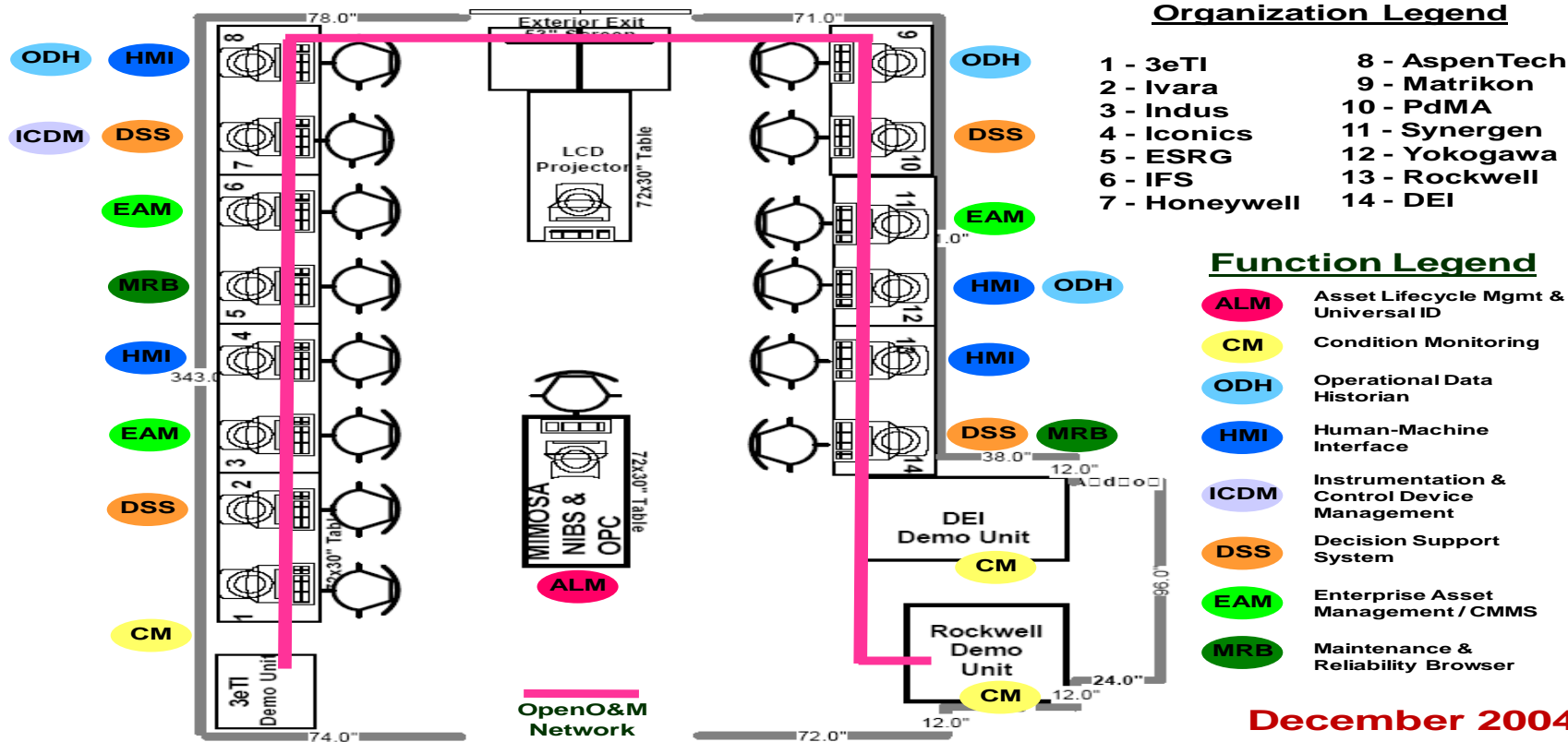


Presentation Outline

- Quick overview of
 - ✓ OpenO&M Initiative- A history of Collaboration
 - ✓ Standards Leadership Council
 - ✓ OGI Solutions Process and OGI Ecosystem
- Overview of MIMOSA CCOM and ISBM – Dr. Avin Mathew
- Review of existing OGI Pilot content on MIMOSA.org website
 - ✓ OGI Ecosystem Systems Architecture
 - ✓ Existing OGI Use Cases
 - ✓ OGI Pilot Participation Team
- Leveraging the ISO Process
- Quick look at iRING Today [article](#) about OGI Pilot
- Q&A



2004 International Maintenance Conference



December 2004

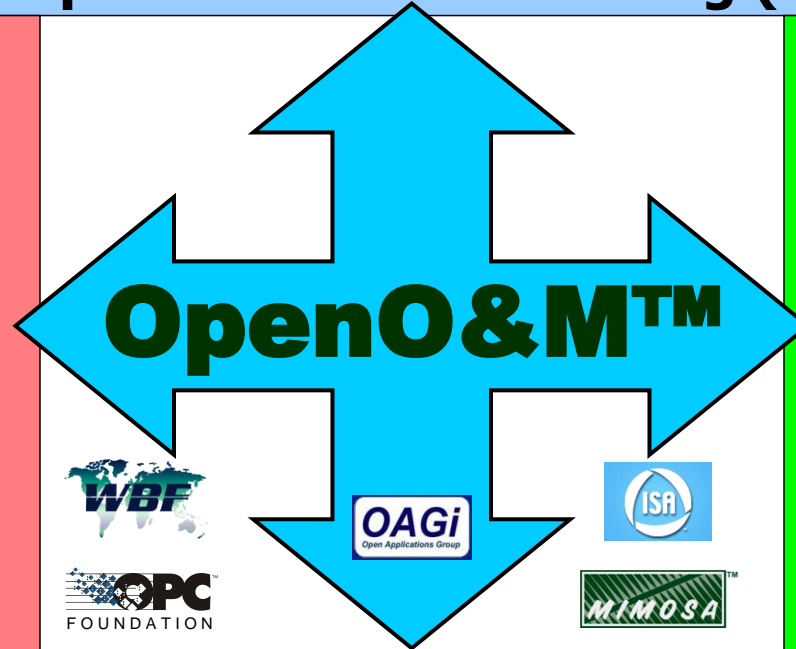
OpenO&M™ Initiative 2006

Standards Fill The Gaps



Enterprise Business Systems
Enterprise Resource Planning (ERP)

OPERATIONS



MAINTENANCE

Physical Asset Control
Real-time Systems

Points of intersection



Reasons for Oil and Gas Interoperability (OGI) Pilot and ISO OGI TS (ISO 18101)

- **Problem Statement** – Current Oil and Gas and other Asset Intensive industry enterprise solutions are too complex and too difficult to sustain.
 - ✓ The current enterprise solutions model is critically dependent on large amounts of custom Systems Integration and this is a weak link.
 - Expensive to sustain (20% annual recurring maintenance cost)
 - Fragile – Vulnerable to breakage
 - ✓ The current solutions model also forces data to be re-entered many times rather than managing it on a full life-cycle basis
 - Increases costs
 - Decreases quality
- **Owner/Operators are asking for a better Solutions Model**

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

➤ **To Be State -OGI Ecosystem**-Full life-cycle industrial ecosystem – “Unwalled Garden”

- ✓ 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
- ✓ “Black Box” approach for included solutions components- External Performance Specification

■ **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
- Develops core of permanent OGI eco-system test-bed

➤ Provide basis for ISO OGI Technical Specification (ISO 18101)



Oil and Gas Interoperability (OGI) Pilot - Methods

- Owner/Operator leadership
- Not a “reference architecture”, but an open industrial ecosystem
- Fully based on published standards, which are incorporated by reference
- Industry Use Case driven - (OpenO&M, PCA and SPE DSA-TS) Use Cases
- Cooperatively aligned with PCA under **Joint MIMOSA/PCA O&M SIG**
- Overall **Solutions Architecture** under **Joint MIMOSA/PCA IT Architecture SIG**
- Managed like a true capital project- Worley Parsons-Lead EPC for downstream pilot
- Pragmatic focus on Commercial Off The Shelf (COTS) products
- Suppliers assume responsibility for compliance of their own products
- All OGI Pilot Intellectual Property managed under MIMOSA IPR Policy
- Publication – All working documents and results are on the mimosa website at www.mimosa.org

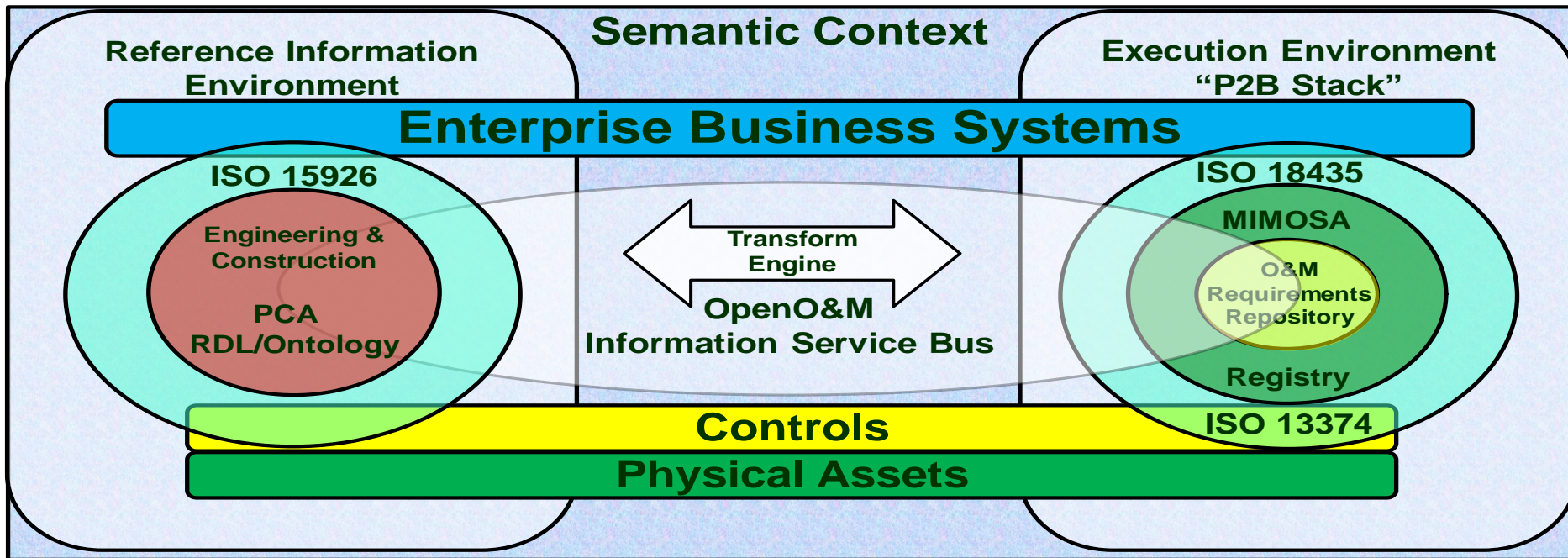


Various Interoperability Definitions

- 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



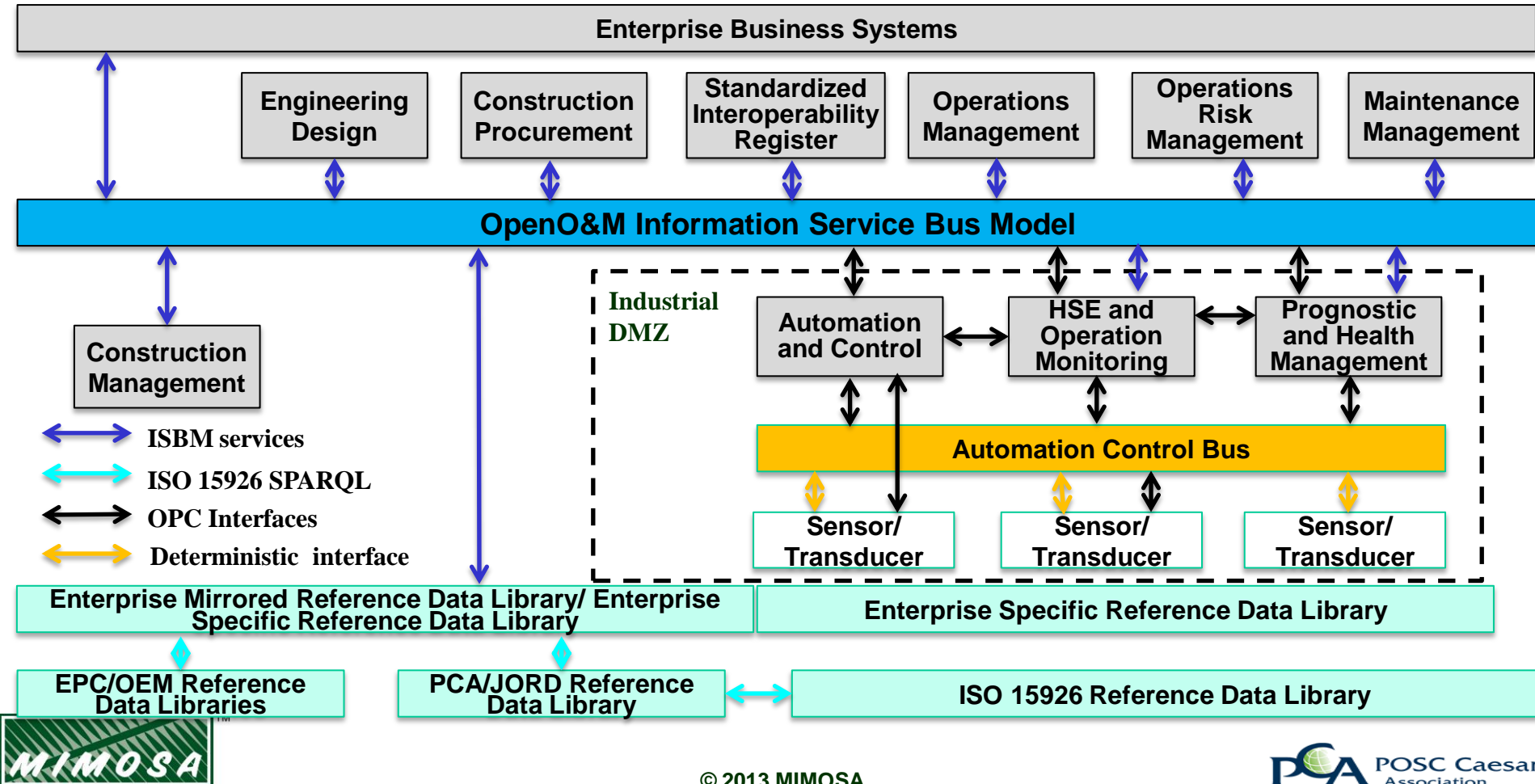
Context for Collaboration



ISO TC 184/WG 6



OGI Ecosystem Simplified Systems Architecture

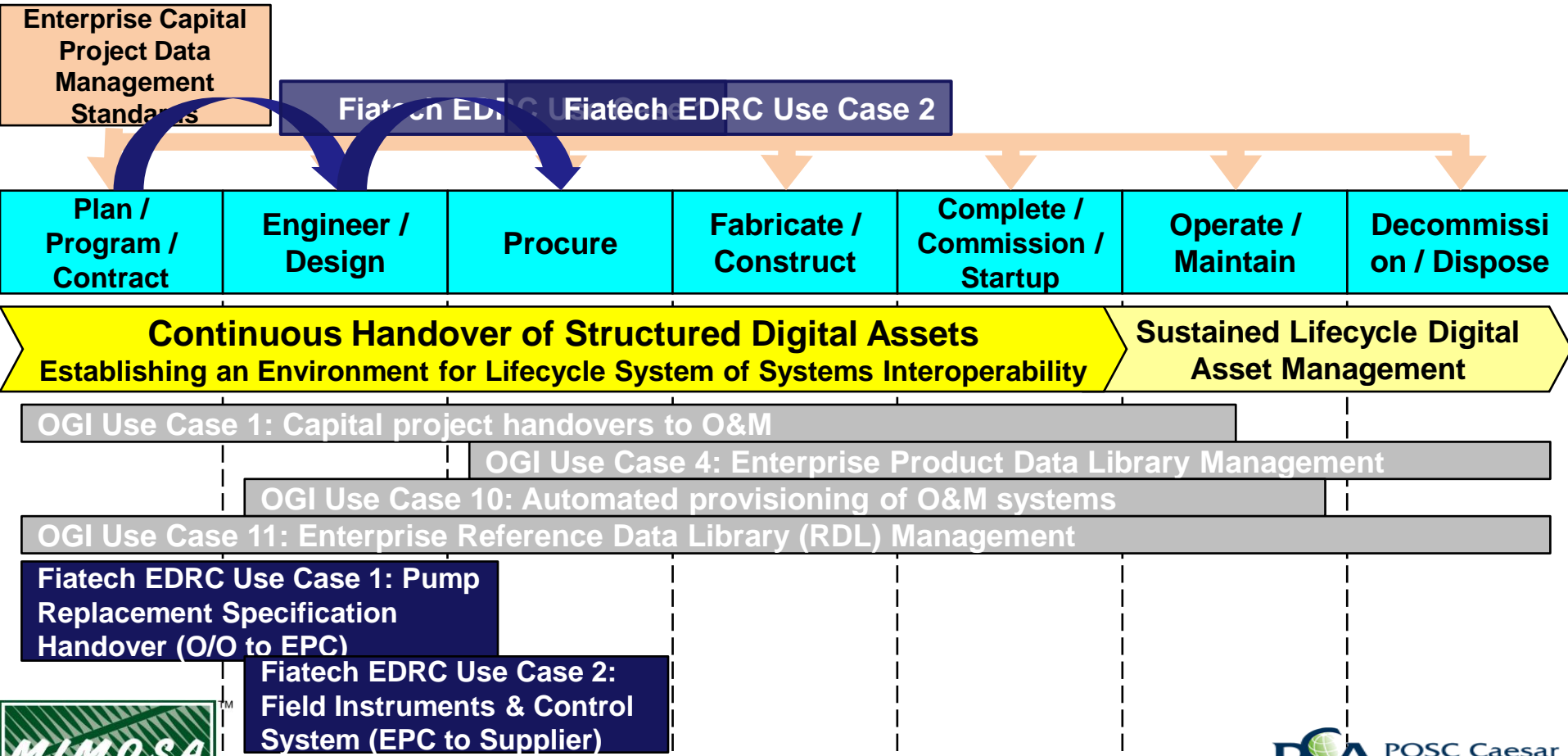


Dr. Avin Mathew

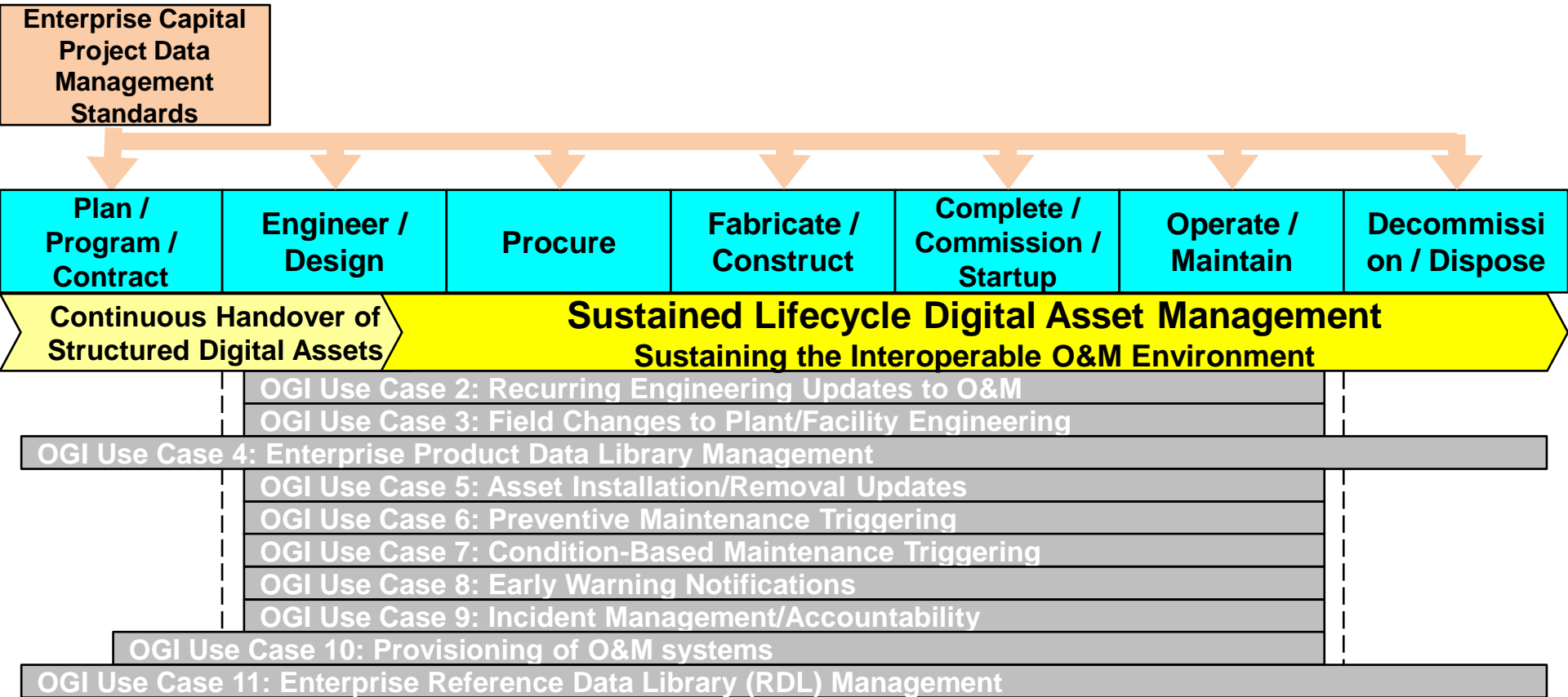
MIMOSA CCOM PRESENTATION AND DISCUSSION



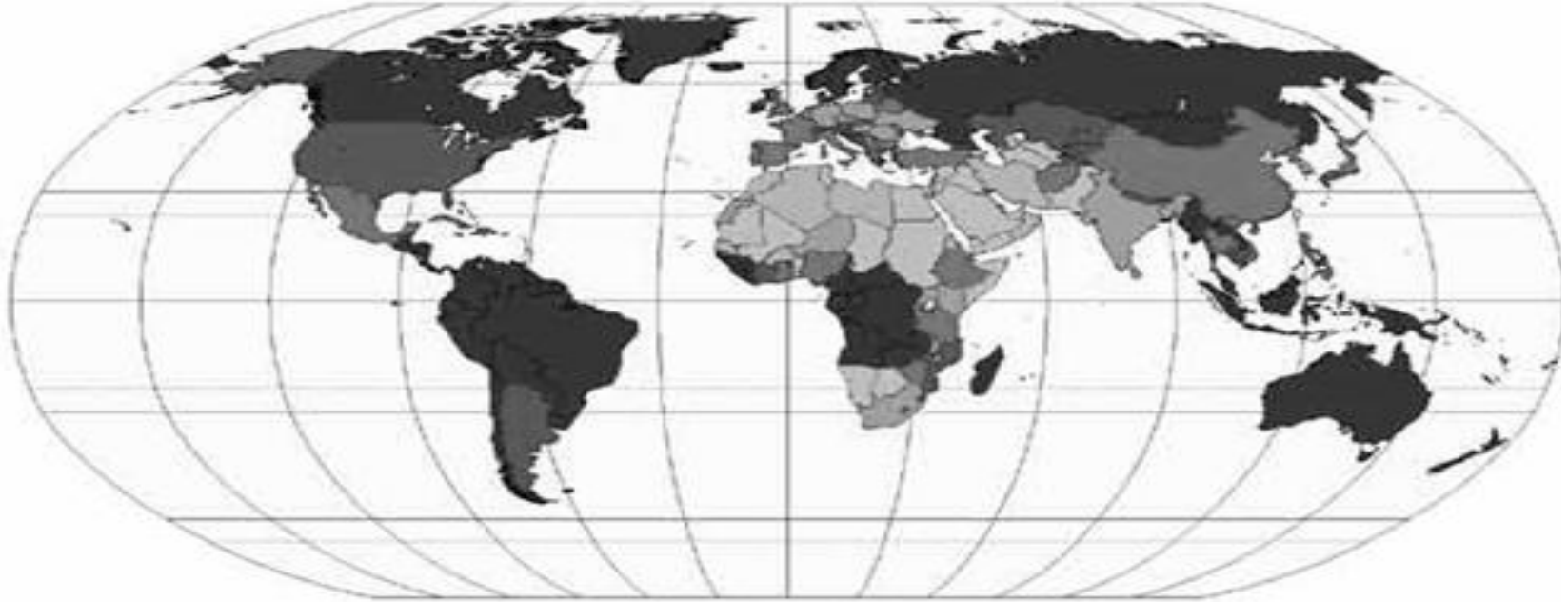
OGI Pilot Business Use Cases Roadmap - Part 1



OGI Pilot Business Use Cases Roadmap - Part 2



OGL Pilot Phase 1+ Presentation Team Semantic Days 2013 – Stavanger, Norway



Assetricity- Ken Bever - Cincinnati , USA

AVEVA – Jim Klein - Houston, USA

Bentley – Keith Willshaw, UK

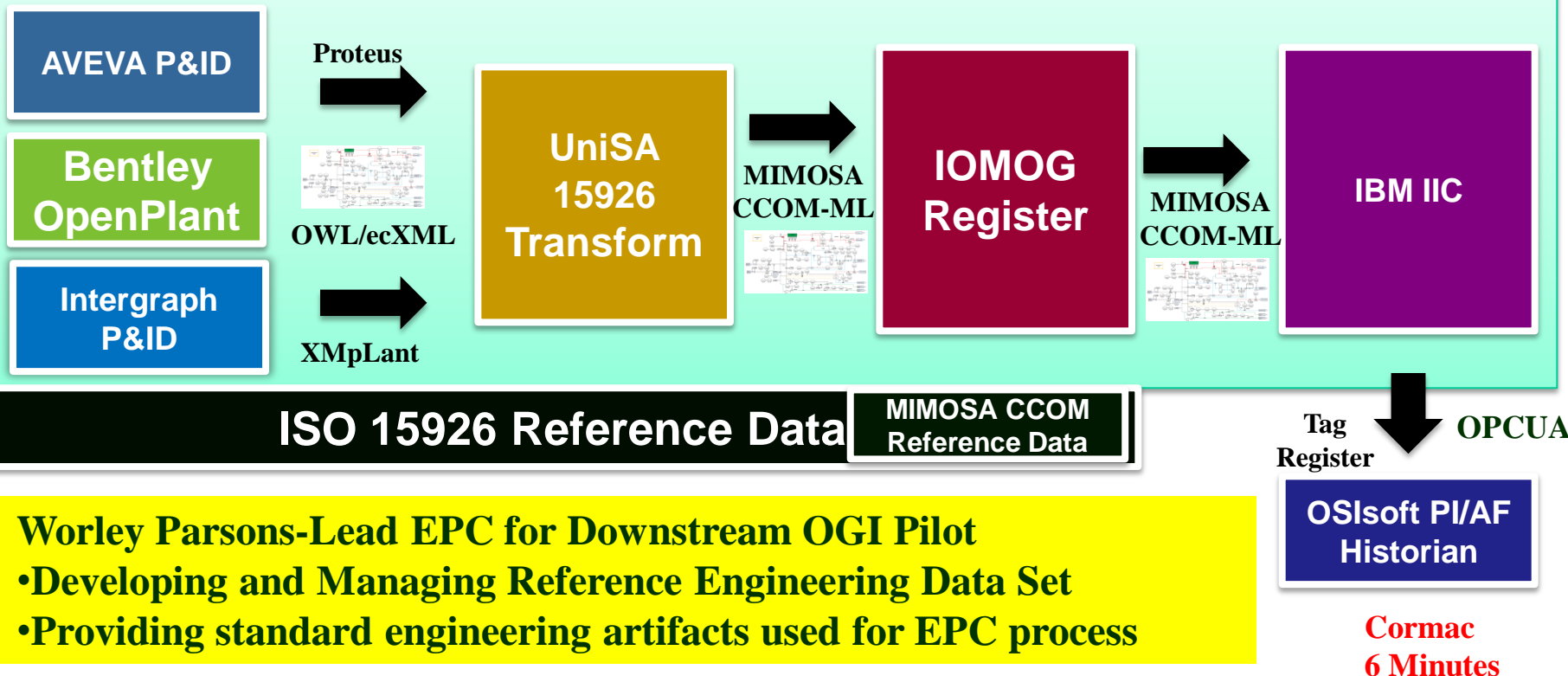
IBM – Bruce Hyre - Raleigh , USA

UniSA – Georg Grossmann - Adelaide, AUS

Worley Parsons – Cormac Ryan- Hong Kong

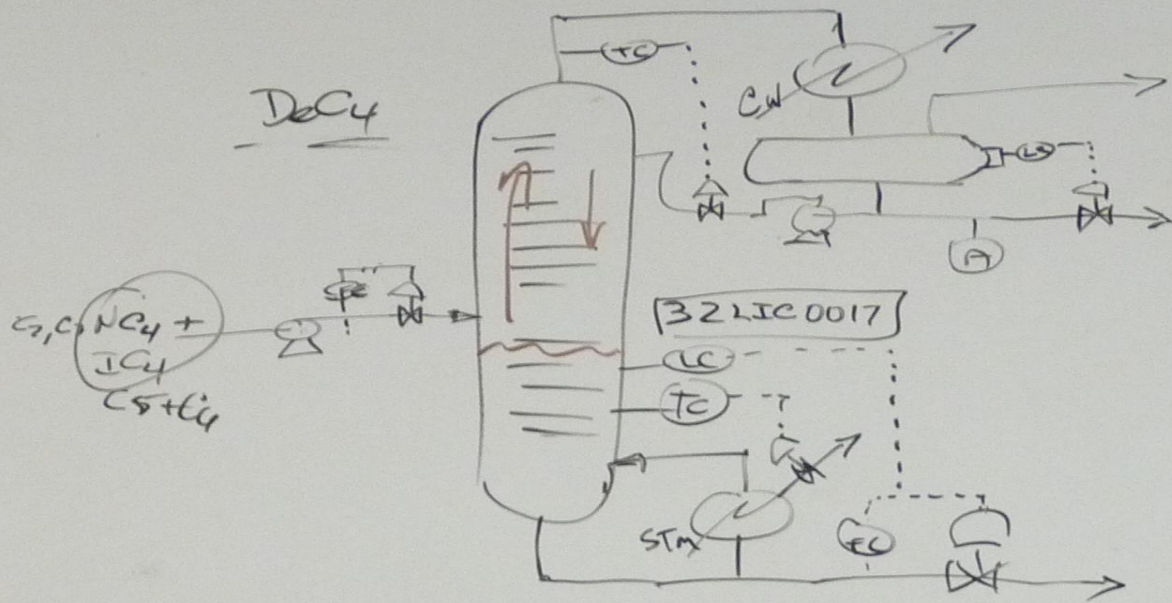
OGI Pilot Phase 1+ Presentation

IBM ISBM Implementation Provides Connectivity Environment

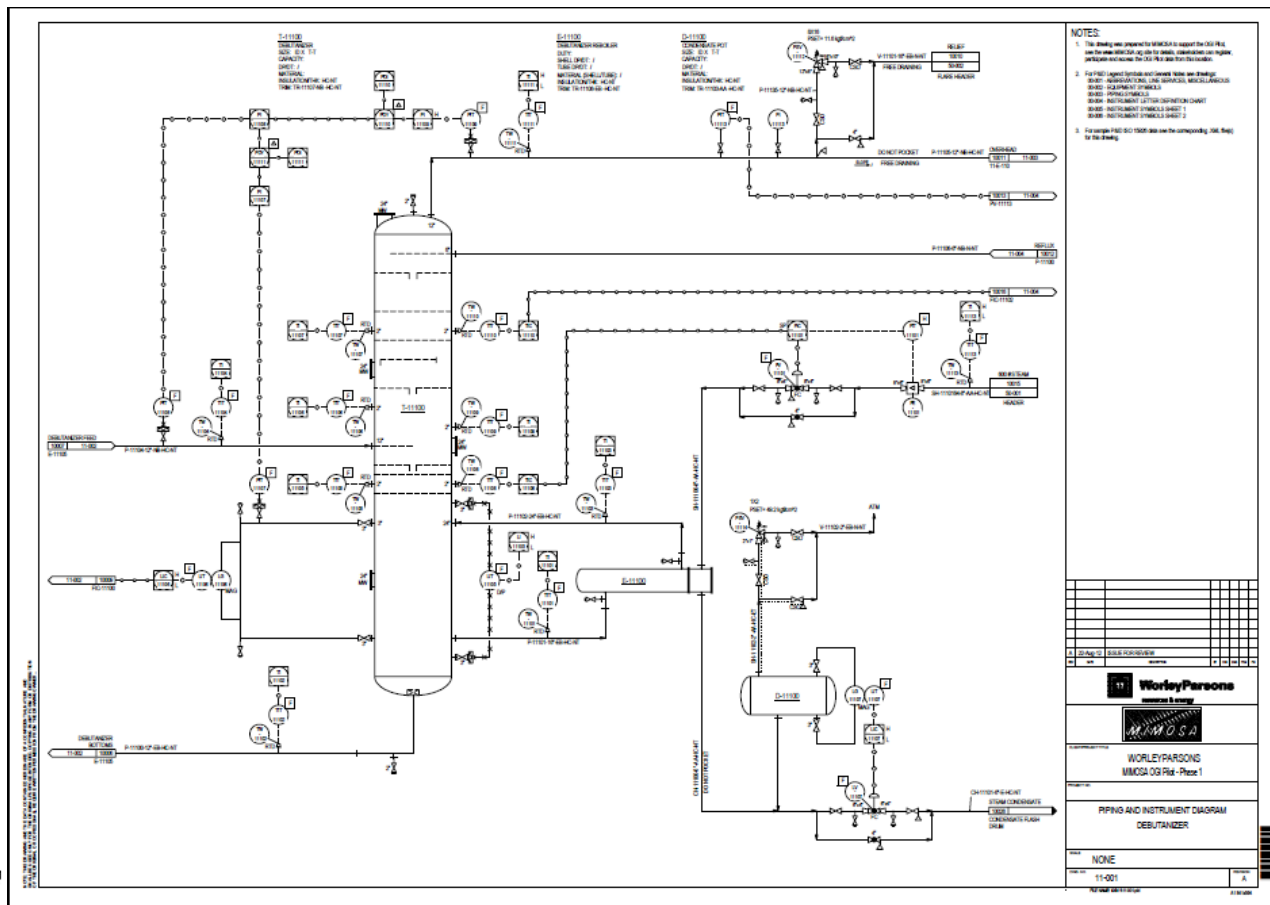


DeButanizer Fractionator

FlowSheet (PFD)

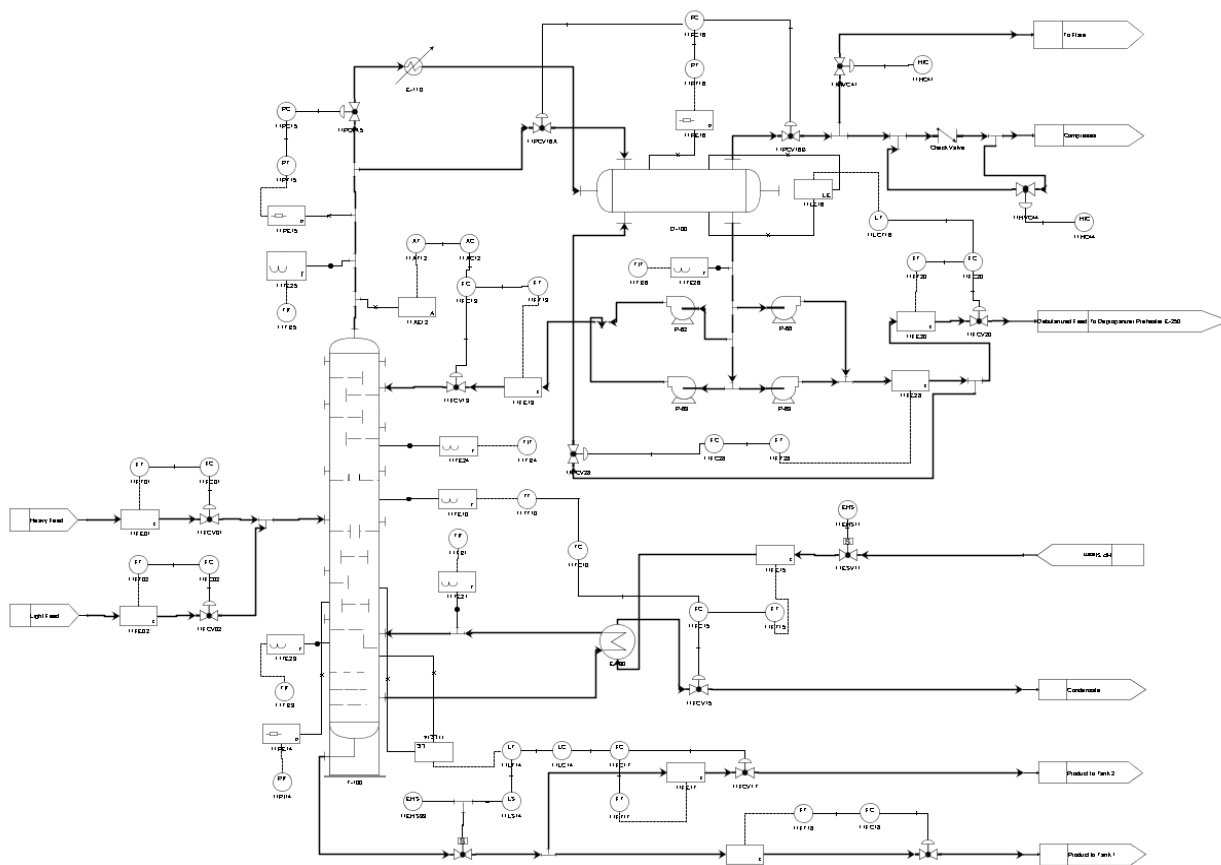


Debutanizer P&ID 001- Worley Parsons



- Diagrams and Enterprises
- My Diagrams
 - Published Diagrams
 - Enterprises
 - NWR
 - Alberta
 - ConnectivityFolder
 - ConnectivityDiagram
 - Sturgeon County
 - Condenser...
 - ConnectionType
 - Controller
 - Element
 - FlowMeter...
 - HeatExchange
 - Page... (more)
 - Pumps... (more)
 - Switches and F...
 - Tank... (more)
 - Tower... (more)
 - Transmitters...
 - Valves... (more)

ConnectivityDiagram:NWR_Debutanizer



Properties Connections Measur

| name | value |
|---------------|------------------|
| EquipmentN... | Connectivity ... |
| ID | 1313441998... |
| ParentID | DBB581B0D... |
| EquipType | CONNECTIV... |
| WidgetType | |
| ResourceClass | |

Palettes

- Base
- Connections
- Capillary
 - Data
 - Electric
 - Mechanical
 - Low Voltage
 - Major Process
 - Minor Process
 - Signal
 - Monitor
 - Tee

**MIMOSA LED MAJOR SYSTEMS OF SYSTEMS
INTEROPERABILITY EFFORTS FOR THE O&M
COMMUNITY**

**NOW, IN COOPERATION WITH PCA AND FIATECH, WE
ARE PROVIDING A FULL LIFE-CYCLE ECOSYSTEM FOR
INTEROPERABILITY**

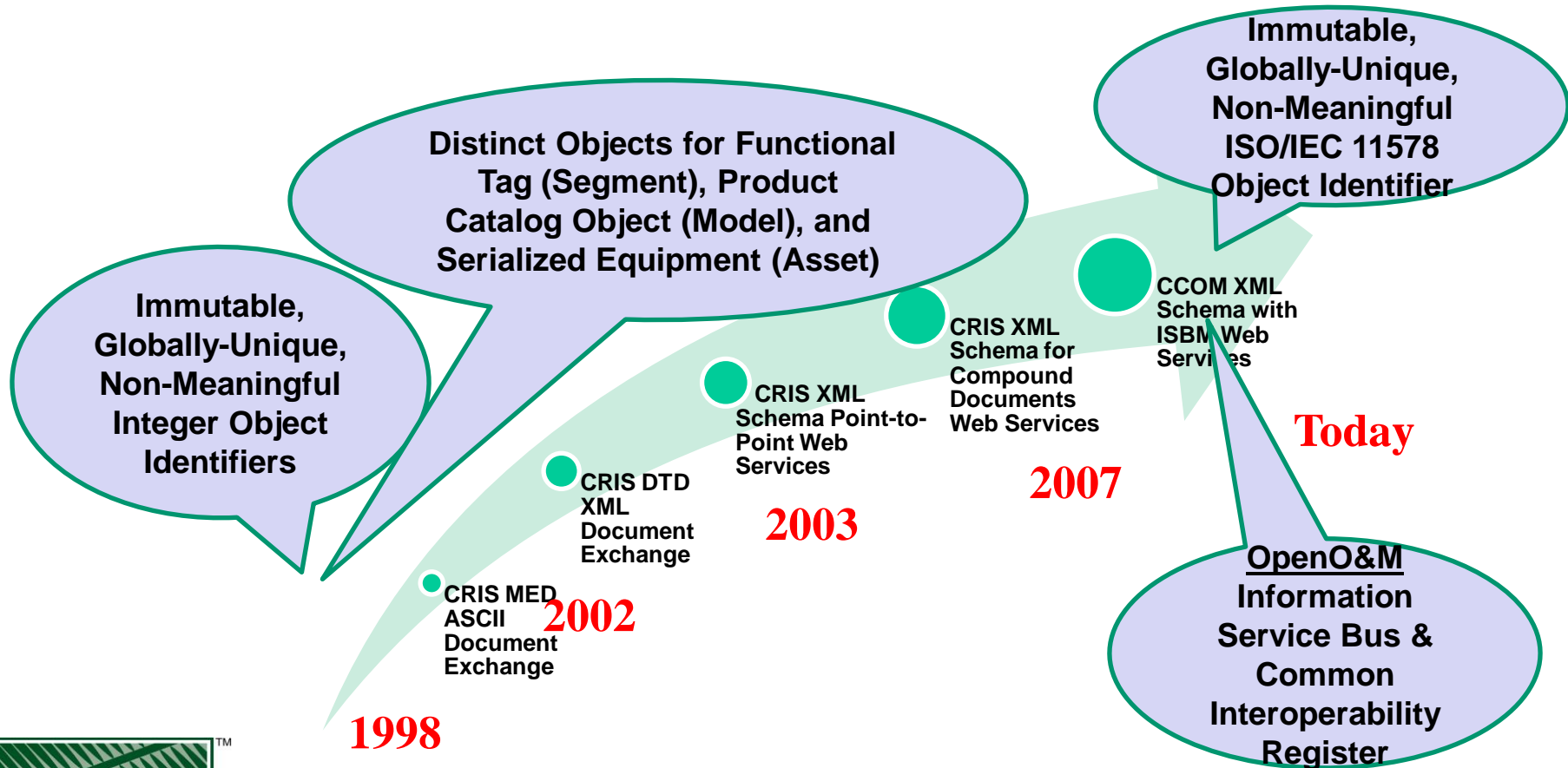


Requirements-driven Development of Standards

- MIMOSA has a rich history of developing industry standards which are driven by industry requirements
 - **Common Relational Information Schema (CRIS) – 5th Normal Form Relational Model**
 - **Common Conceptual Object Model (CCOM) – Asset Management Object Model**
 - **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



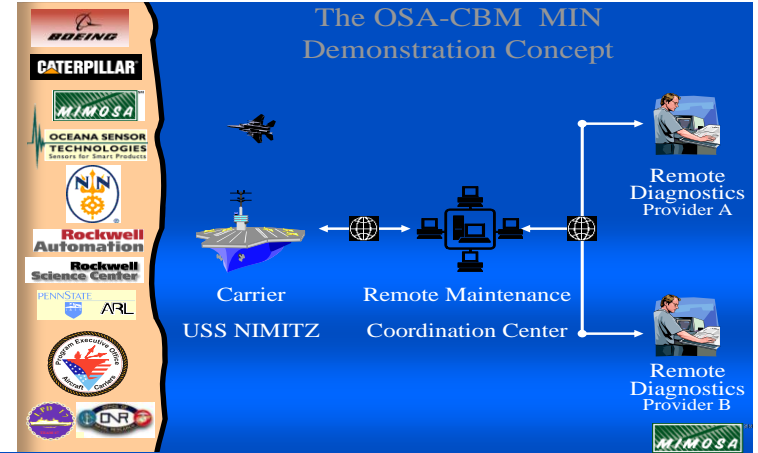
MIMOSA CCOM Object Identifier



OSA-CBM Dual Use Technology Program - Office of Naval Research

MIMOSA Information Network (MIN)

June 21, 2000
MIN-Viewer
OSA-CBM Presentation
Alan T. Johnston
MIN Project Director



MIN-Viewer Segment Navigation 1

User
Interface
Modeled
On The
Microsoft
Windows
Explorer



Army Collaborative Telemaintenance – Army CECOM

U.S. Army CECOM Collaborative Telemaintenance Project

Phase I Demonstration Briefing – July 31, 2002

Alan Johnston – MIMOSA

Kenneth Bever – MIMOSA

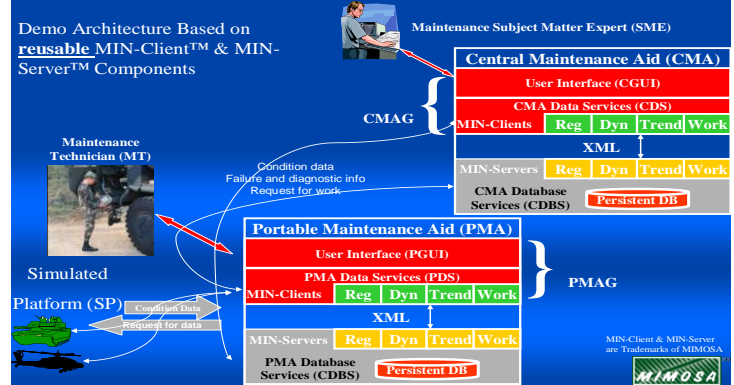
Bob Walter – Penn State ARL



U.S. Army Collaborative Telemaintenance Demonstration

Revised 07/03/2002 – Phase I Demonstration

Demo Architecture Based on
reusable MIN-Client™ & MIN-
Server™ Components



CMA Showing Measurement Events In Alarm

CMA Main Page

Up Get data Create work request Plot Measurement Location: UserTaglist: 003-03 Name: 003

Navigation Details Events

| Max Alarm | Type | UTC Time | Value | Eng Unit | Scaling |
|-----------|-----------|---------------------|---------------|----------------|---------|
| 0 | Magnitude | 2001-11-20T11:00:00 | 0.000400067 | Spectrum Amp | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 0.011432498 | Spectrum Amp | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 0.449927683 | gy Acceleratio | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 1.036288911 | Unitless | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 0.004841539 | gy Acceleratio | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 0.0 | Unitless | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 1.003 | Unitless | RMS |
| 0 | Magnitude | 2001-11-20T11:00:00 | 1.013748008 | Unitless | RMS |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |
| 1 | FFT | 2002-07-30T16:13:00 | Hard Exide Pa | Peak | |

Work requests:

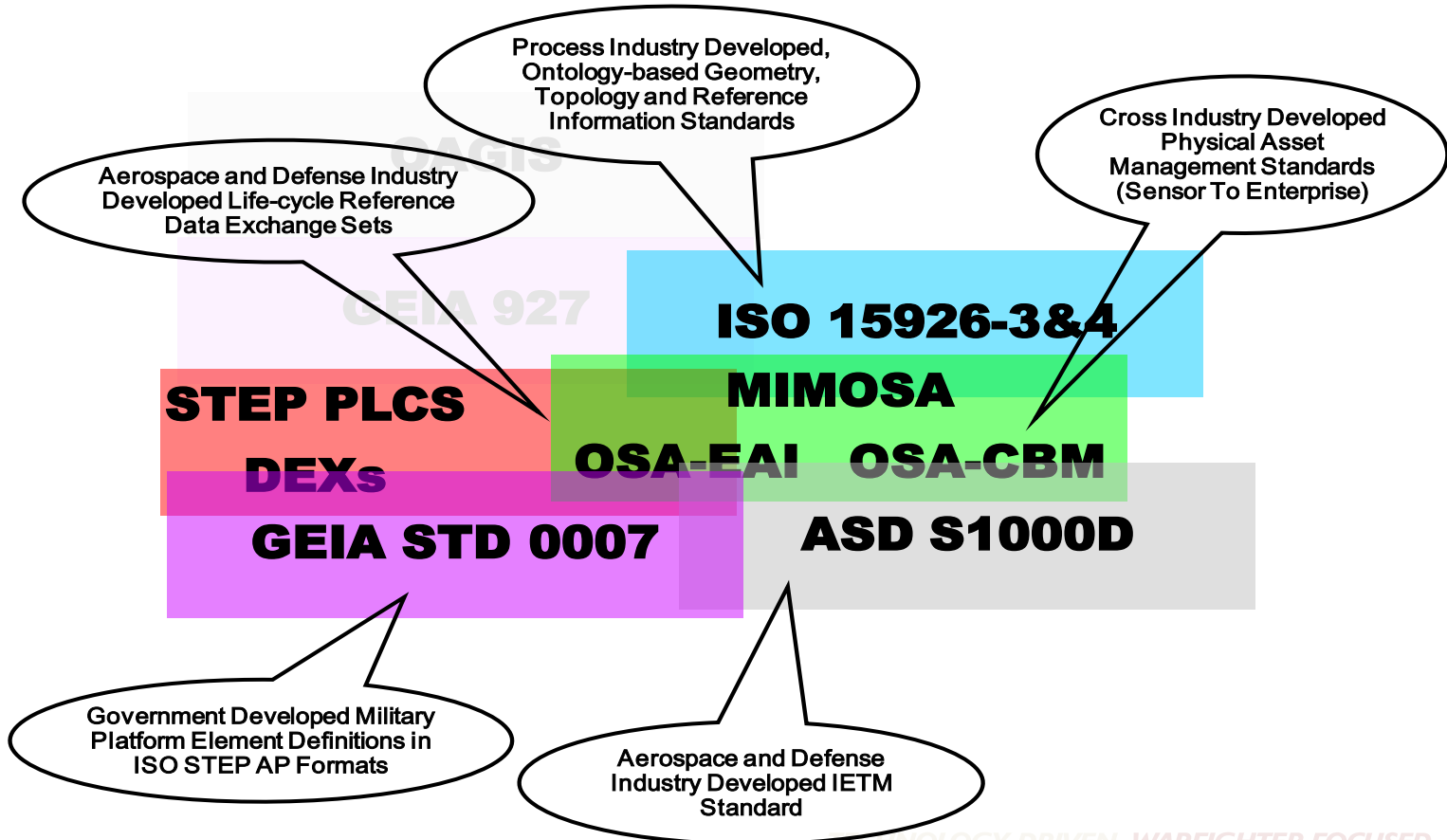
| Work Request ID | Date | Priority Code | From | Type |
|-----------------|------------------|---------------|---------------|-----------------------|
| 100 | 2002-07-30T16:13 | 7 | David McClard | Maintenance |
| 201 | 2002-07-31T11:03 | 0 | David McClard | Maintenance, Corre... |
| 302 | 2002-07-31T11:15 | 0 | David McClard | Maintenance |





Platform Life-cycle Information Management

Concept Mapping- Aerospace & Defense Industry



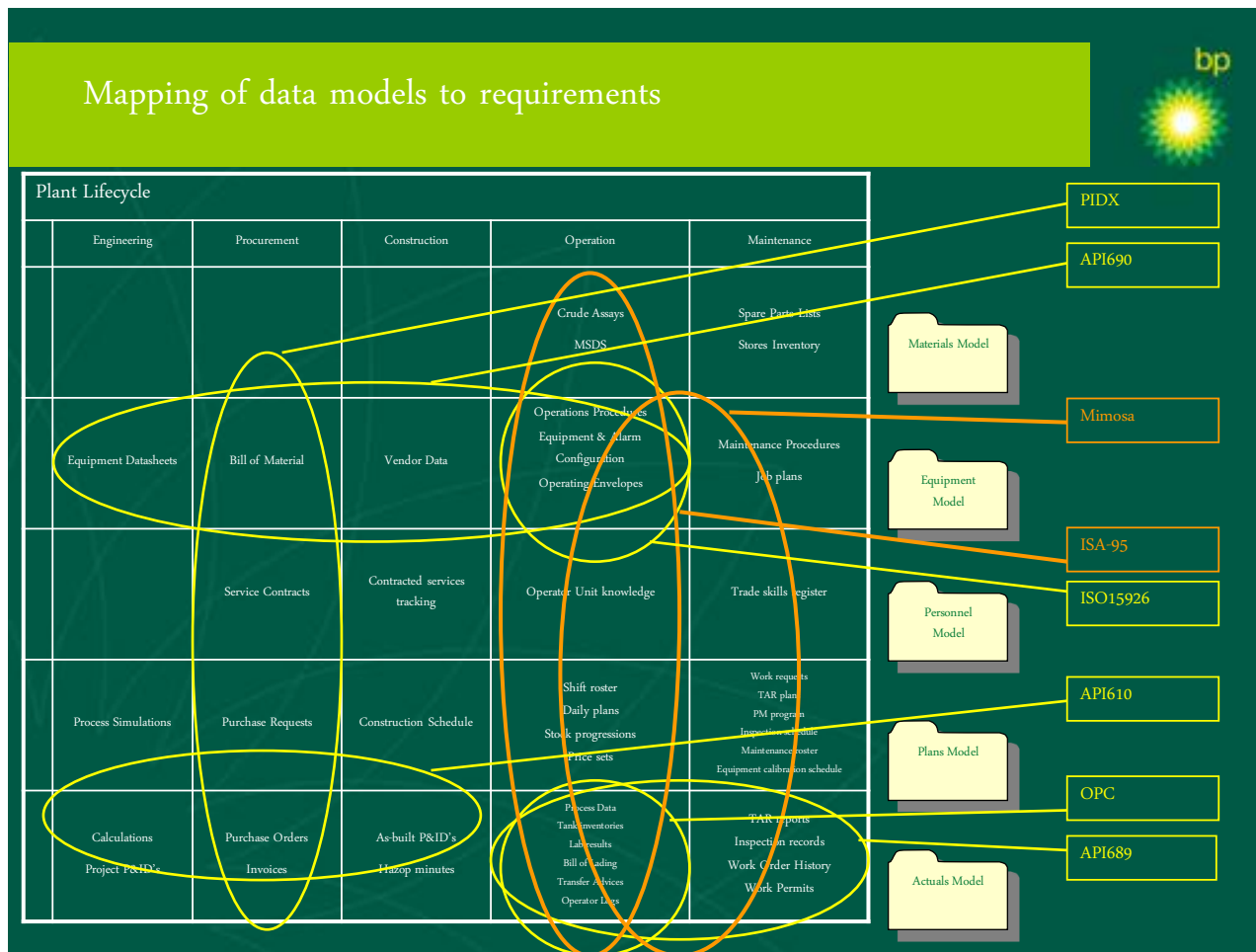
Oil and Gas Industry Adoption of Standards



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

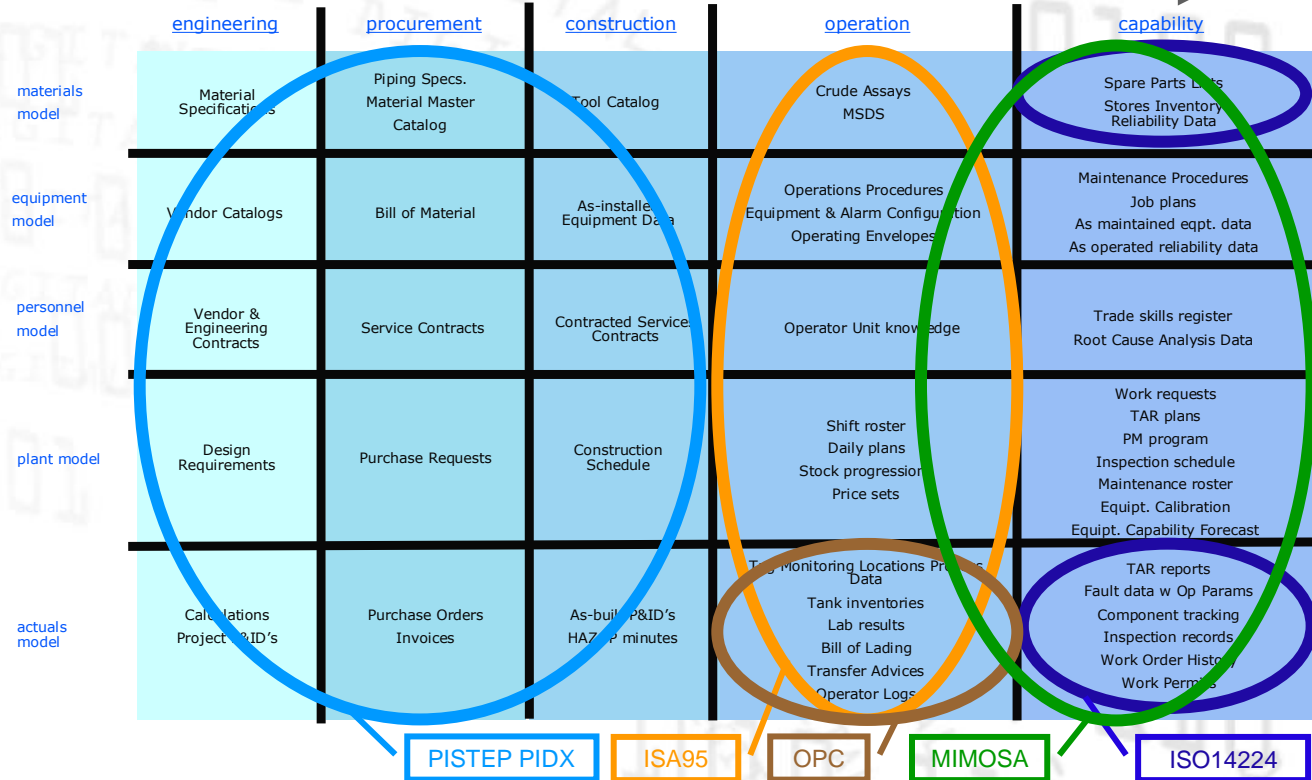
Michael Knight - BP Refining Supply Chain Advisor
ARC Next Generation Manufacturing Forum, February 2006

BP Refining Vision of the Future of Standards-Circa 2006



bp data model map

plant lifecycle



LEVERAGING THE ISO PROCESS FOR ESTABLISHING STANDARDS AND SPECIFICATIONS

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

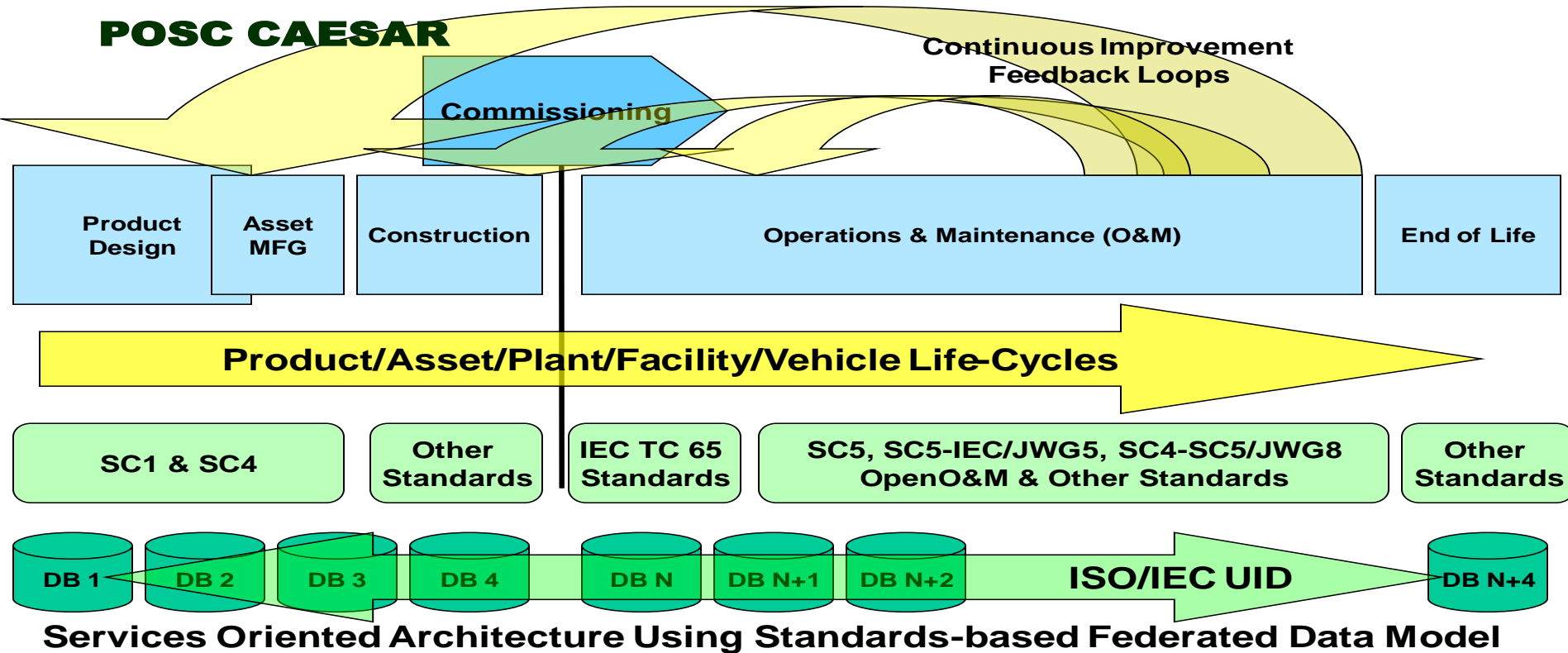


March 2009

FIATECH

MIMOSA/OpenO&M™

POSC CAESAR





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

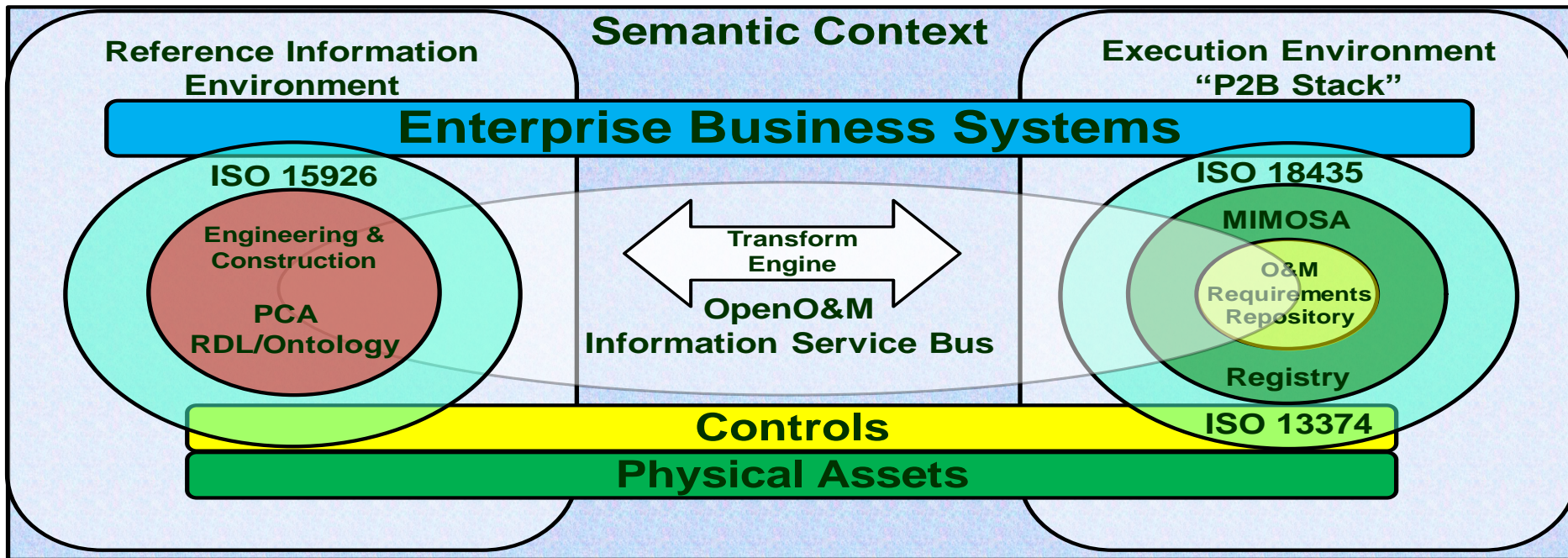


Scope and Deliverables

- **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



Context for Collaboration





O&G 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



Industry Use Cases

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



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**

DSA-TS Drilling Automation



SLC Conf Call Aug 13th 2012

Pradeep Annaiyappa
Clinton Chapman
Alan T Johnston
Moray Laing

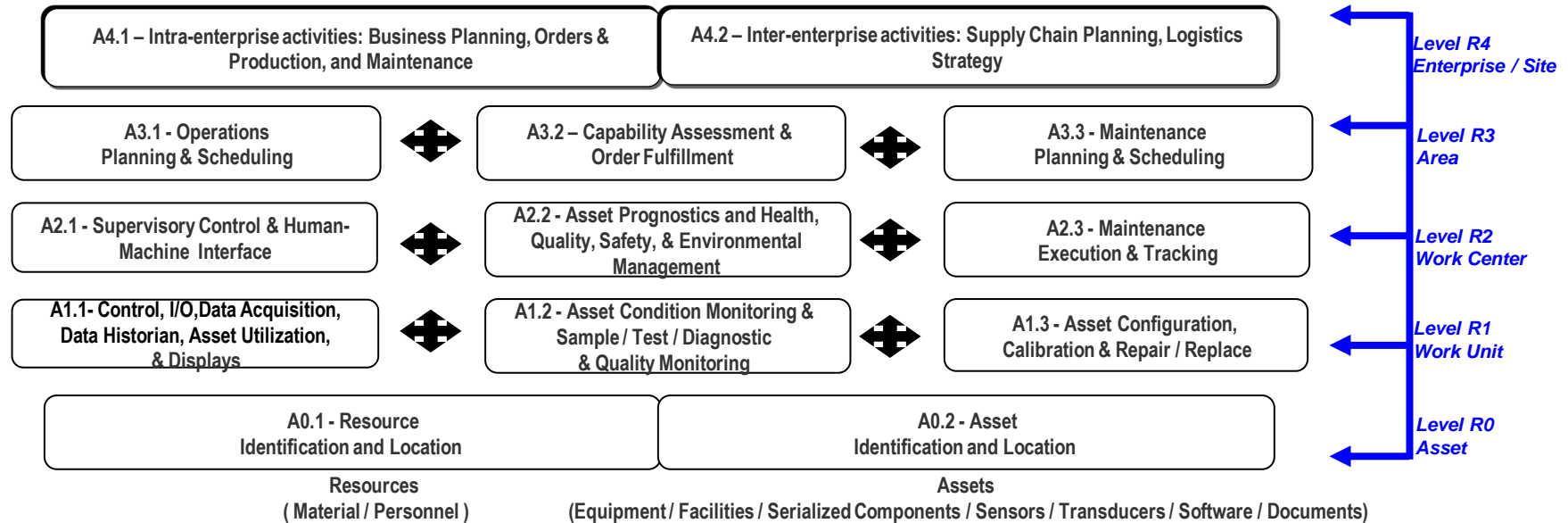


ISO 18435 - 1

Application Domain Integration Diagram



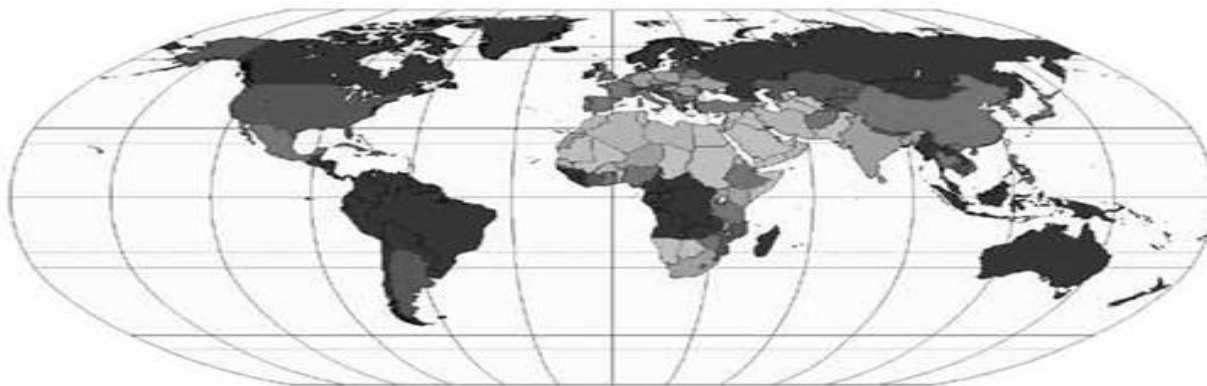
Application Domain Integration Diagram





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