# MIMOSA

## 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

**31 July 2013**

**Alan Johnston**

**MIMOSA President**

**ISO TC 184/WG 6 Convener**

# 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**

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# 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**
- **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)**

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# Interoperability Versus Integration
# The New Industry Solutions Process

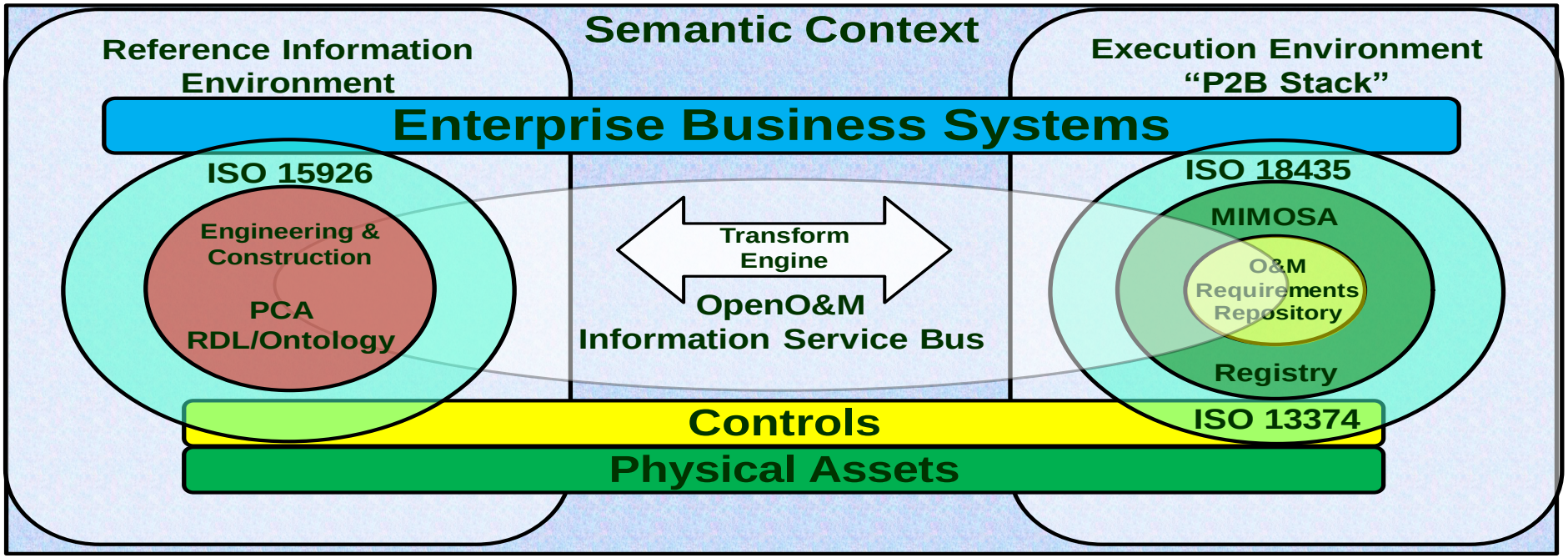
- Project specific solutions process - Integration
  - Use cases, custom code and testing are all project specific
  - Integration risks are borne by Owner/Operator and Integrator
  - Expensive and high risk to implement and sustain (20% - 25% annual recurring cost)
  - Not repeatable, lower quality 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

# 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

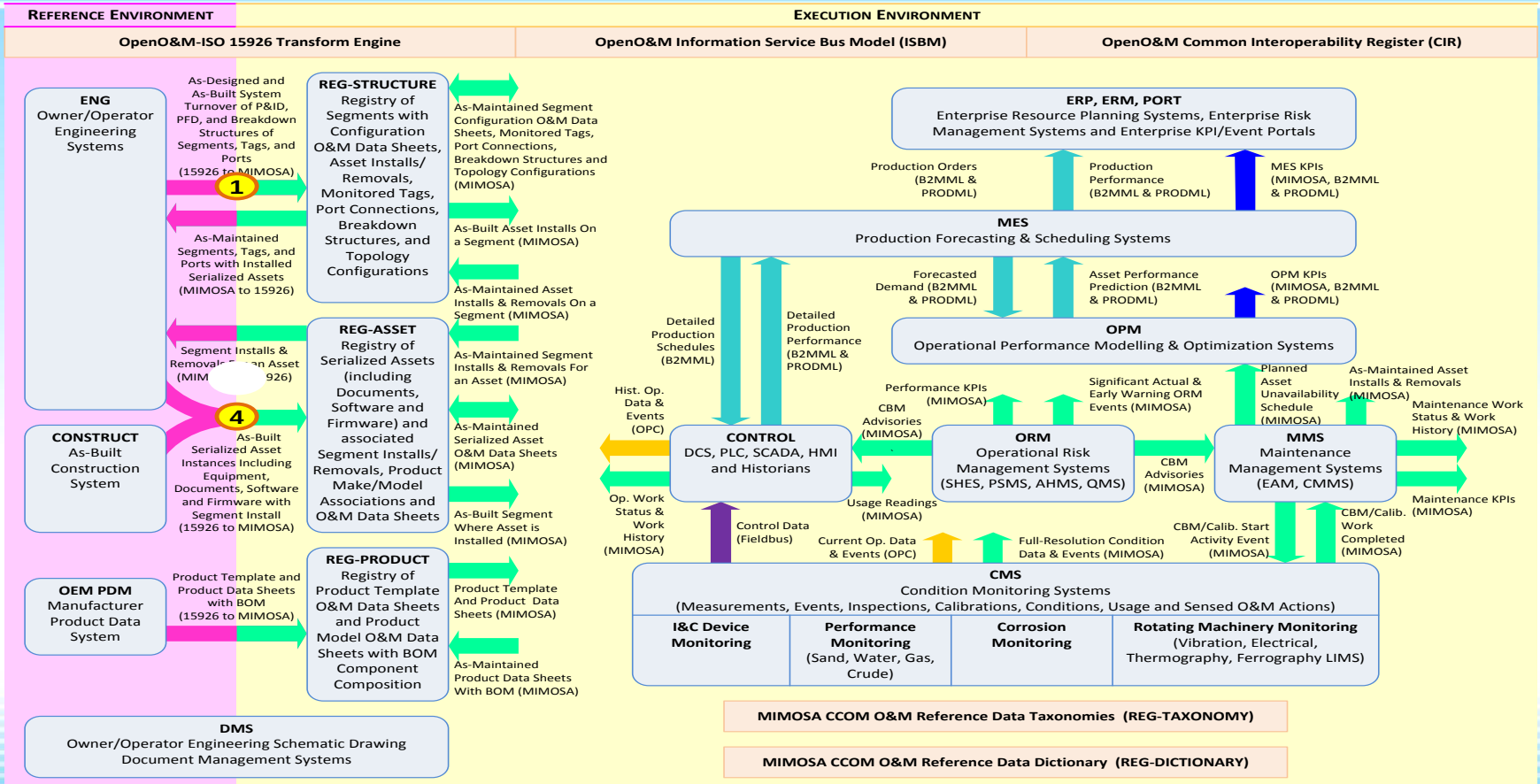
# Context for Collaboration




ISO TC 184/WG 6

# O&M Greenfield Handover for the Oil and Gas Industry

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



# Industry Foundation Architecture

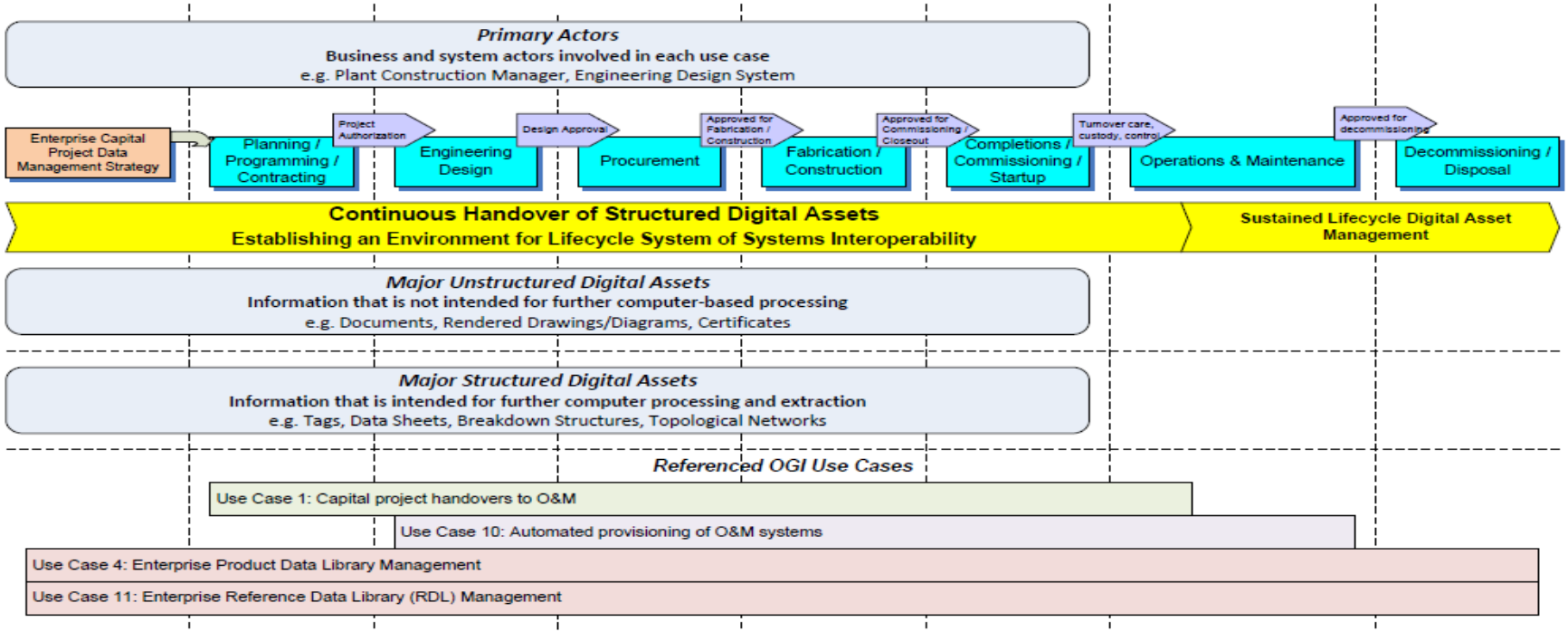

2

1

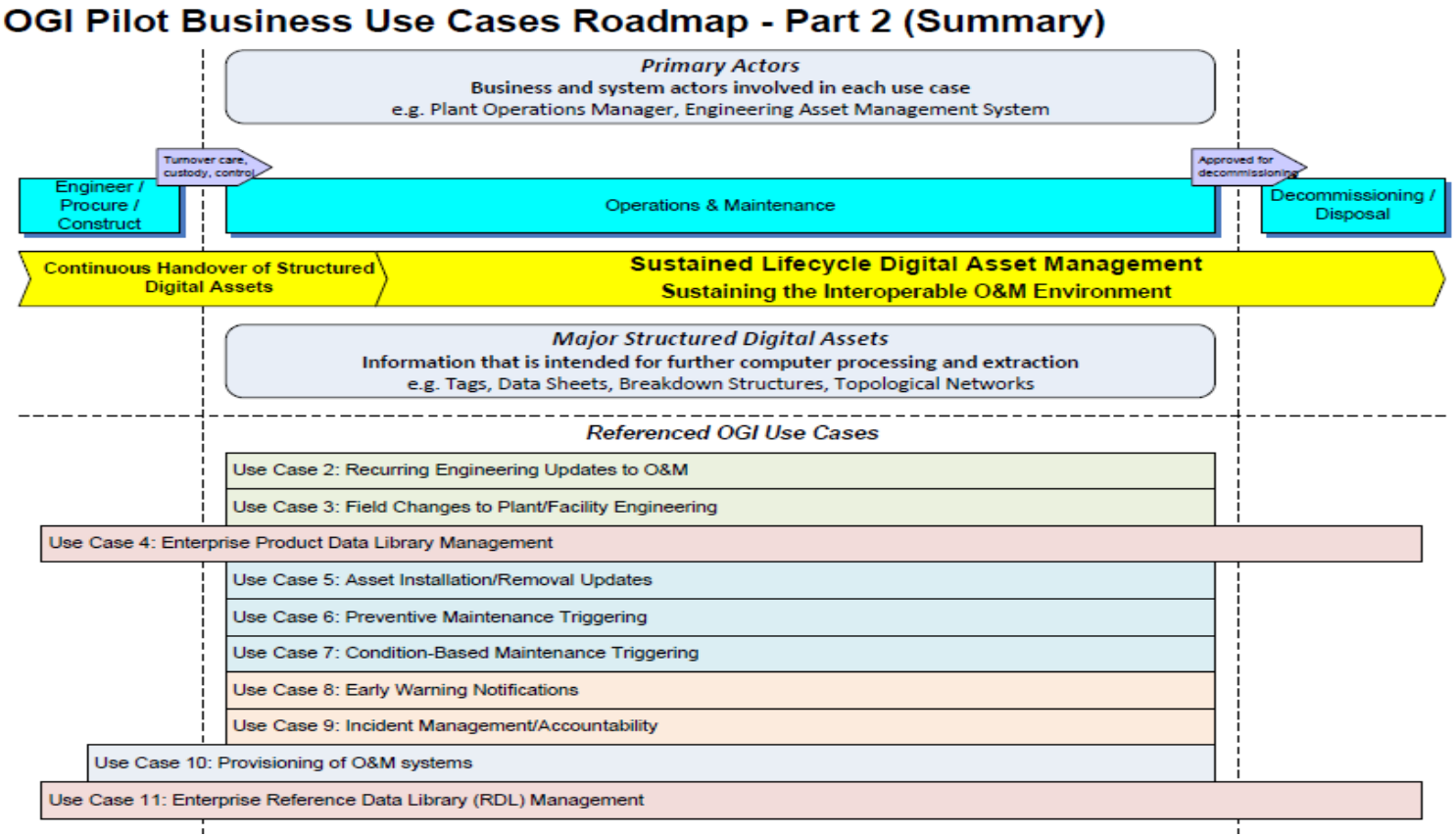
OpenO&M

# Oil and Gas Interoperability (OGI) Pilot

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



# Oil and Gas Interoperability (OGI) Pilot



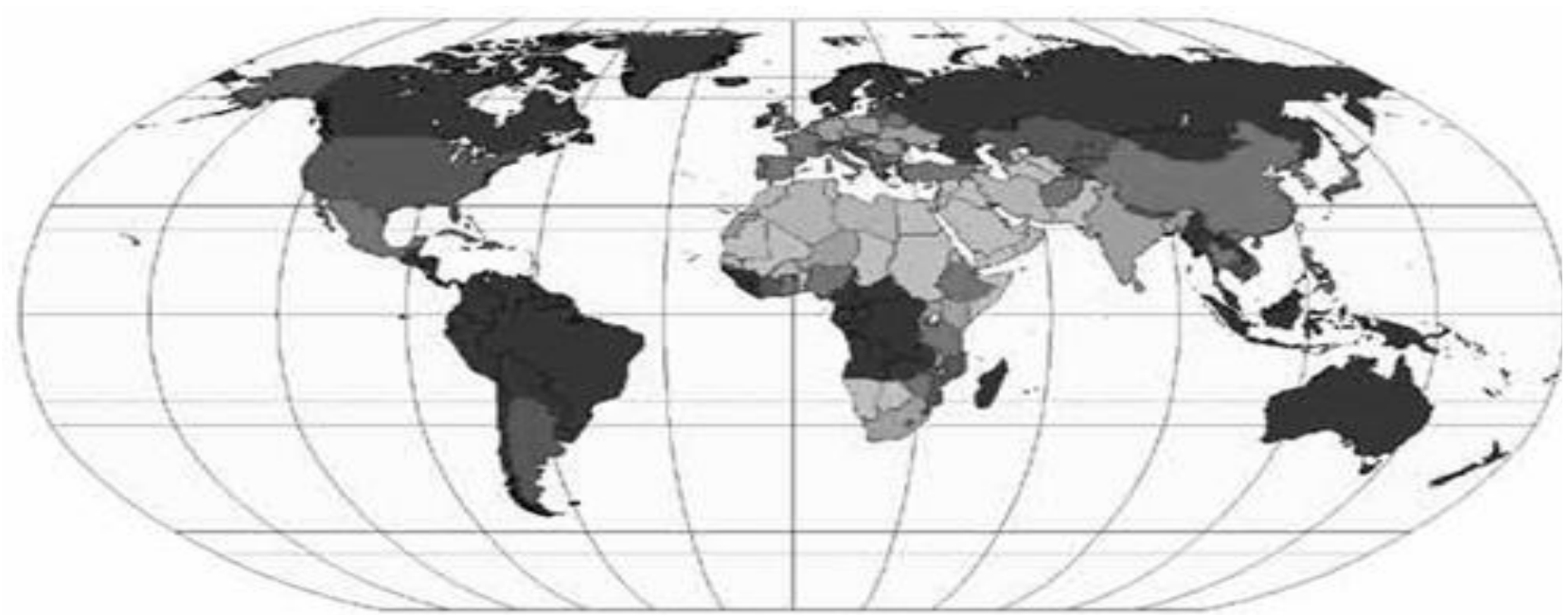
# Oil and Gas Interoperability (OGI) Pilot - Methods

- 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**
- 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

➢ Publication – All working documents and results are on the mimosa website at www.mimosa.org

➢ **Proven OGI Pilot output provides basis for ISO OGI Technical Specification**

# OGI 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**

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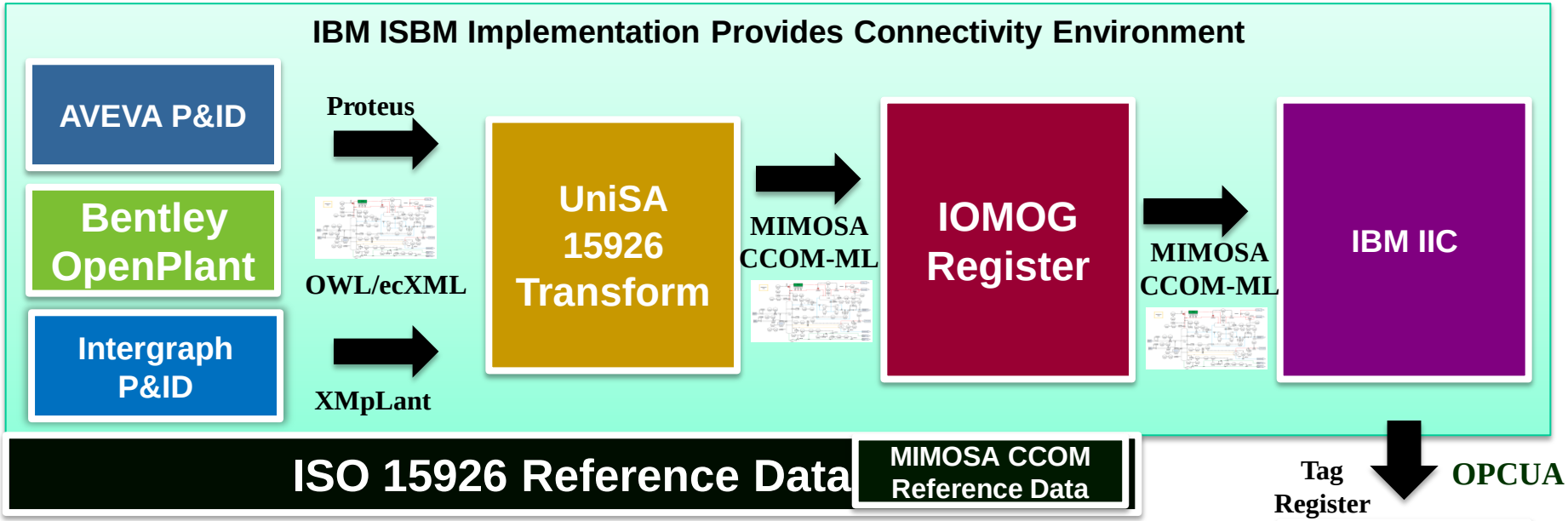
POSC Caesar Association

# OGI Pilot Phase 1+ Presentation



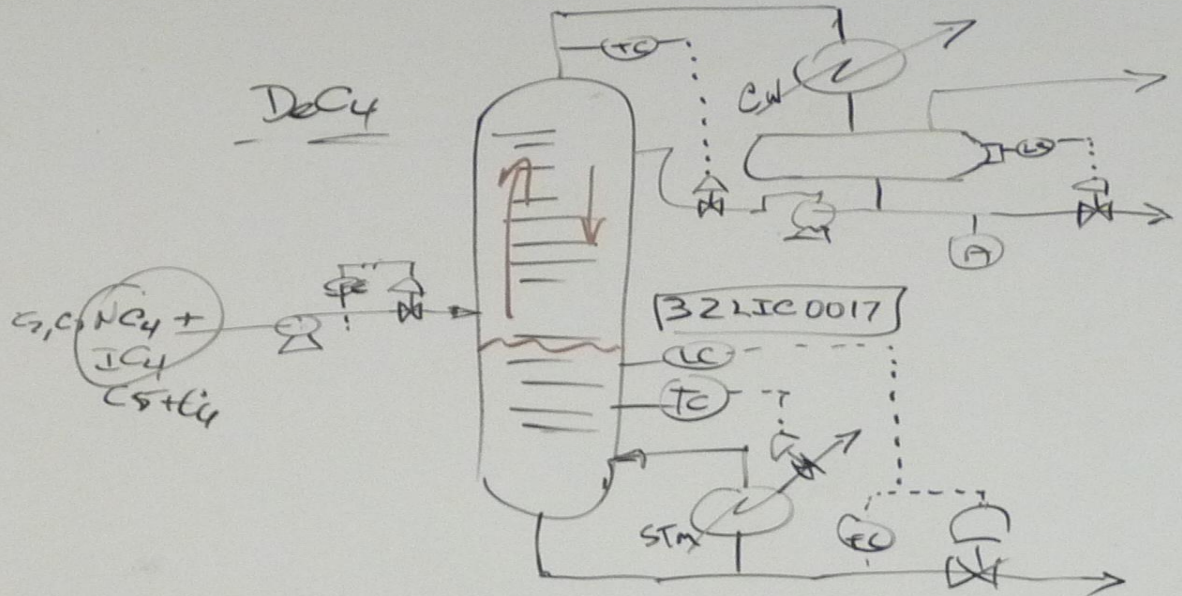

**Worley Parsons-Lead EPC for Downstream OGI Pilot**

- **Developing and Managing Reference Engineering Data Set**
- **Providing standard engineering artifacts used for EPC process**

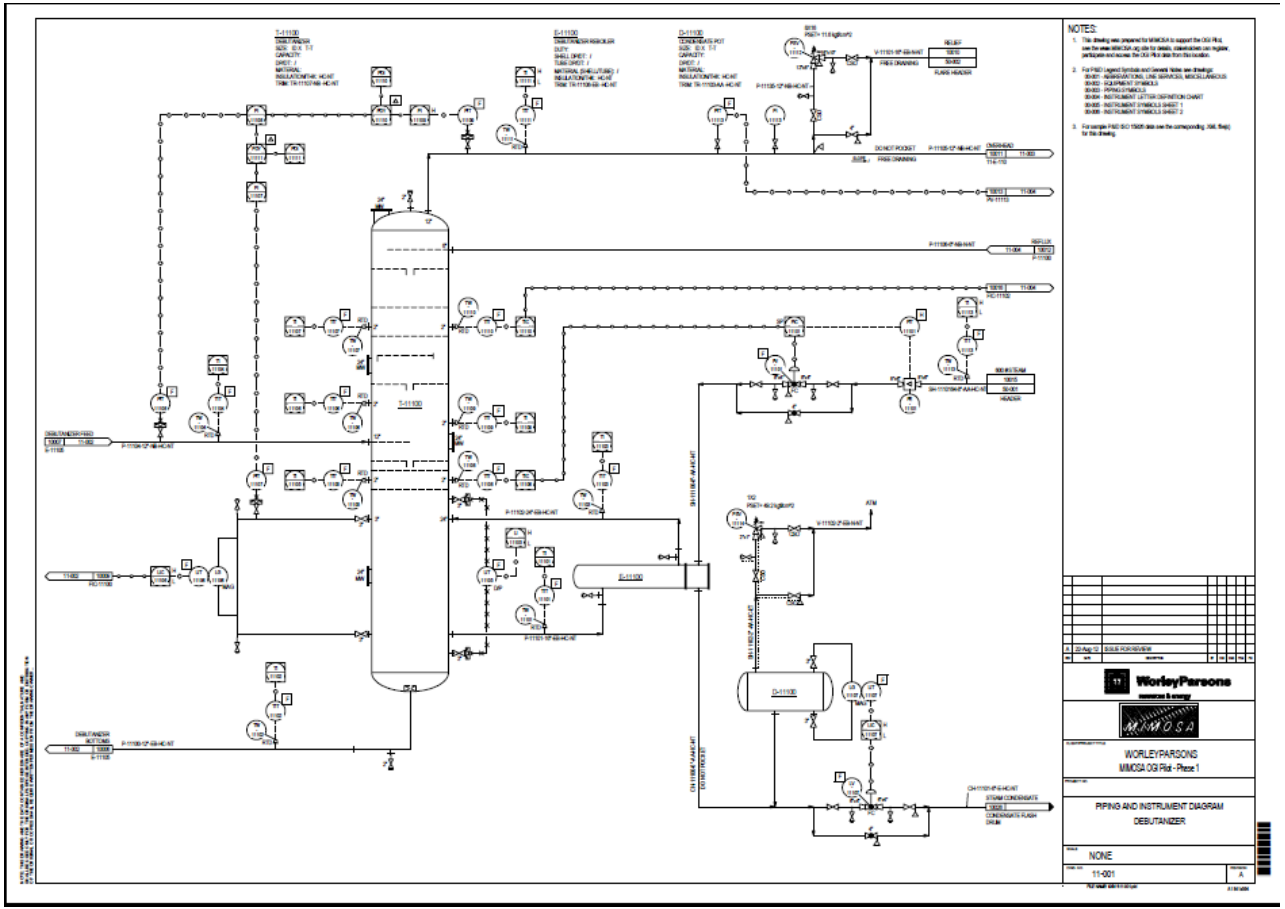
**Cormac**
**6 Minutes**

# DeButanizer Fractionator

## Flow Sheet (PFD)



# Debutanizer P&ID 001- Worley Parsons



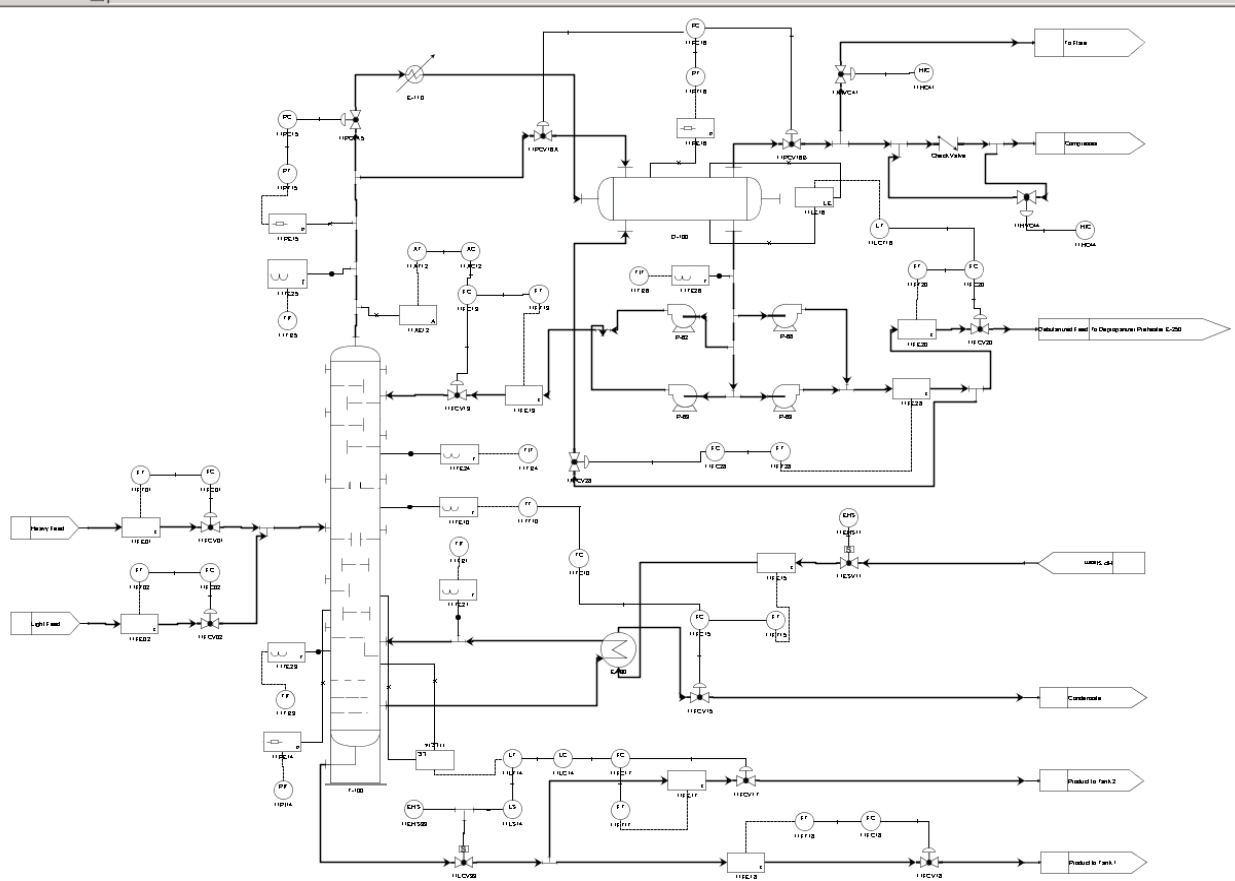
https://iicproc.indnwu.sc.ibm.com:9445 - IIC Studio Launch - Microsoft Internet Explorer

Links | Customize Links | Free Hotmail | Windows | Windows Marketplace | Windows Media

P&ID | Model | Adapter

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

ConnectivityDiagram:NWR_Debutanizer




Palettes
- Base
- Connections

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

Properties | Connections | Measur...

| name | value |
|---|---|
| EquipmentN... | Connectivity... |
| ID | 1313441998... |
| ParentID | DBB5B1B0D... |
| EquipType | CONNECTIV... |
| WidgetType | |
| ResourceClass | |

Zooms in or out to make the diagram fit the pane.

# 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

# 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 501c(6) non-profit industry association in 1997
- Membership
  - ✓ Owner/Operators – Oil and Gas, Chemical, Aerospace and Defense Sectors
  - ✓ Suppliers/integrators
  - ✓ Academia/Researchers
  - ✓ Industrial Media
- Intellectual Property (IP) Rights Policy fully based on OASIS Policy
- Founding Member and **IP Manager for OpenO&M™ Initiative**
- OpenO&M Owner/Operator Leadership Council
- Founding Member Standards Leadership Council

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# 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

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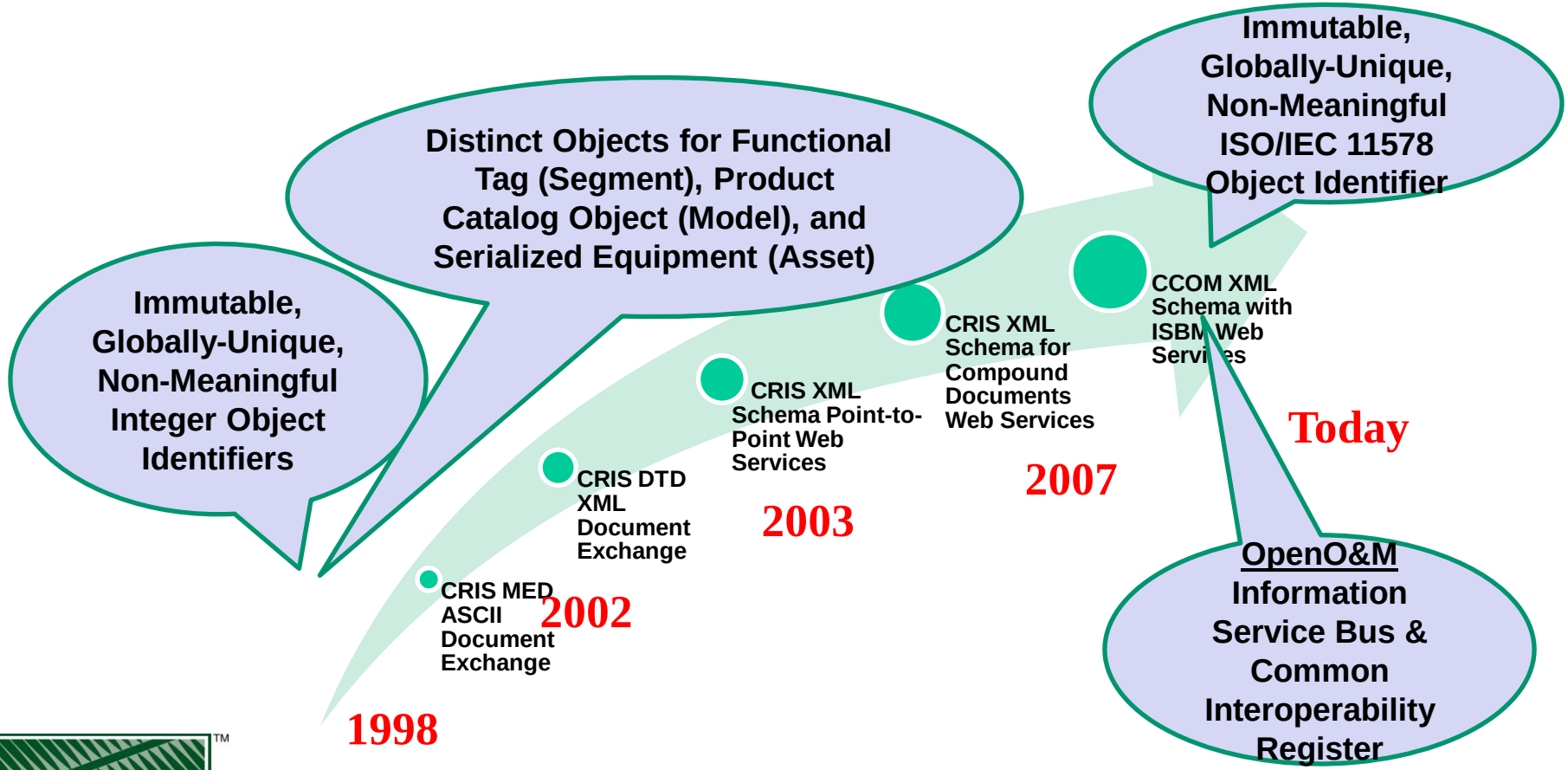
# MIMOSA CCOM Object Identifier

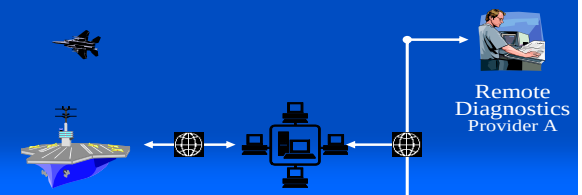


# OSA-CBM Dual Use Technology Program - Office of Naval Research

## MIMOSA Information Network (MIN)

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

## The OSA-CBM MIN Demonstration Concept




## MIN-Viewer Segment Navigation 1


User Interface Modeled On The Microsoft Windows Explorer

# Army Collaborative Telemaintenance – Army CECOM

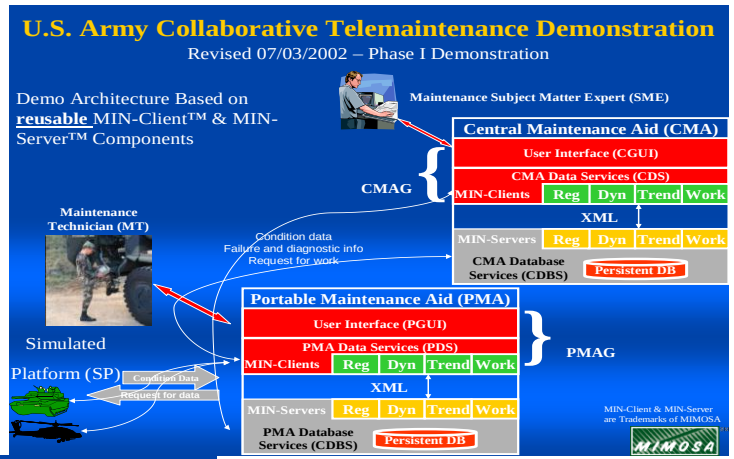
## U.S. Army CECOM
## Collaborative Telemaintenance Project

**Phase I Demonstration Briefing – July 31, 2002**

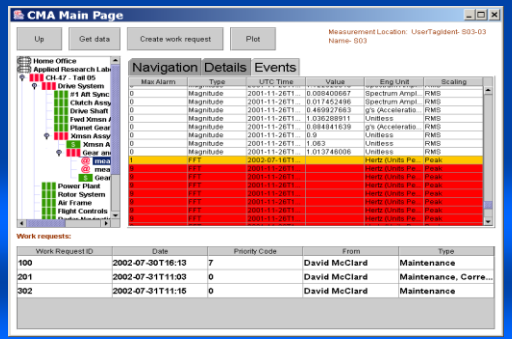

**Alan Johnston – MIMOSA**
**Kenneth Bever – MIMOSA**
**Bob Walter – Penn State ARL**


## U.S. Army Collaborative Telemaintenance Demonstration

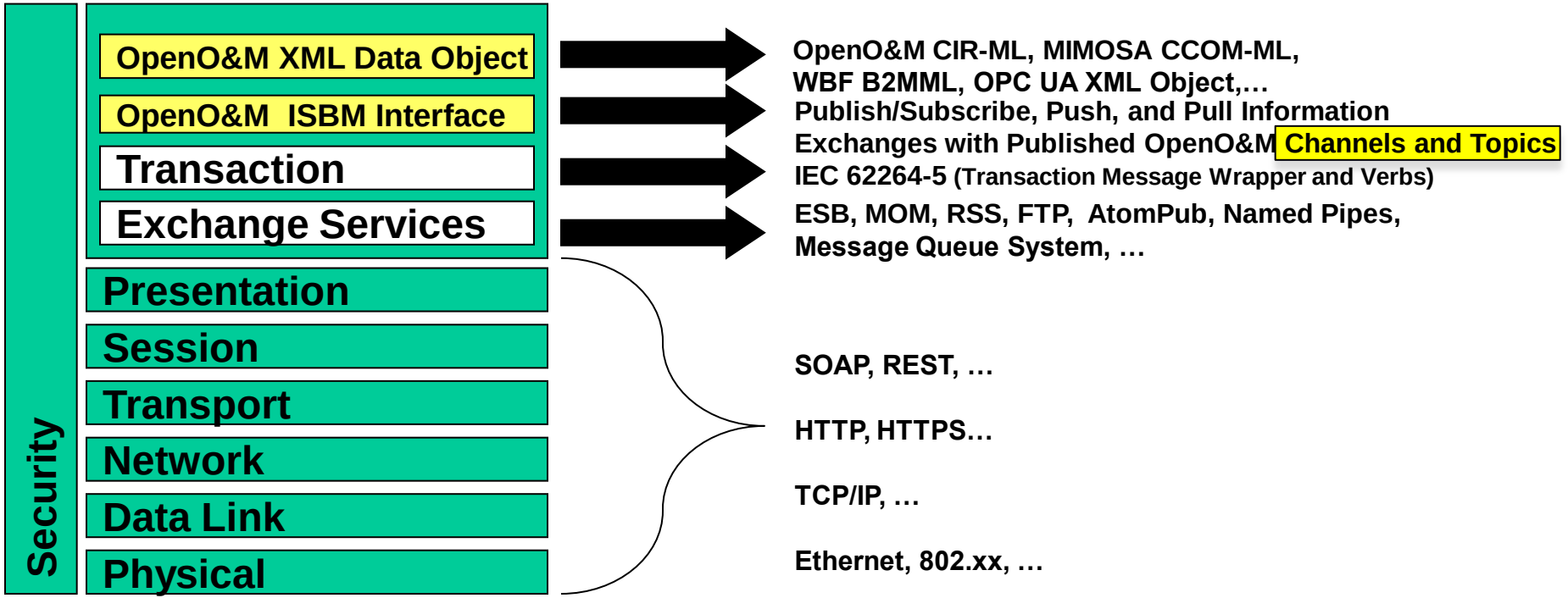
Revised 07/03/2002 – Phase I Demonstration




## CMA Showing Measurement Events In Alarm



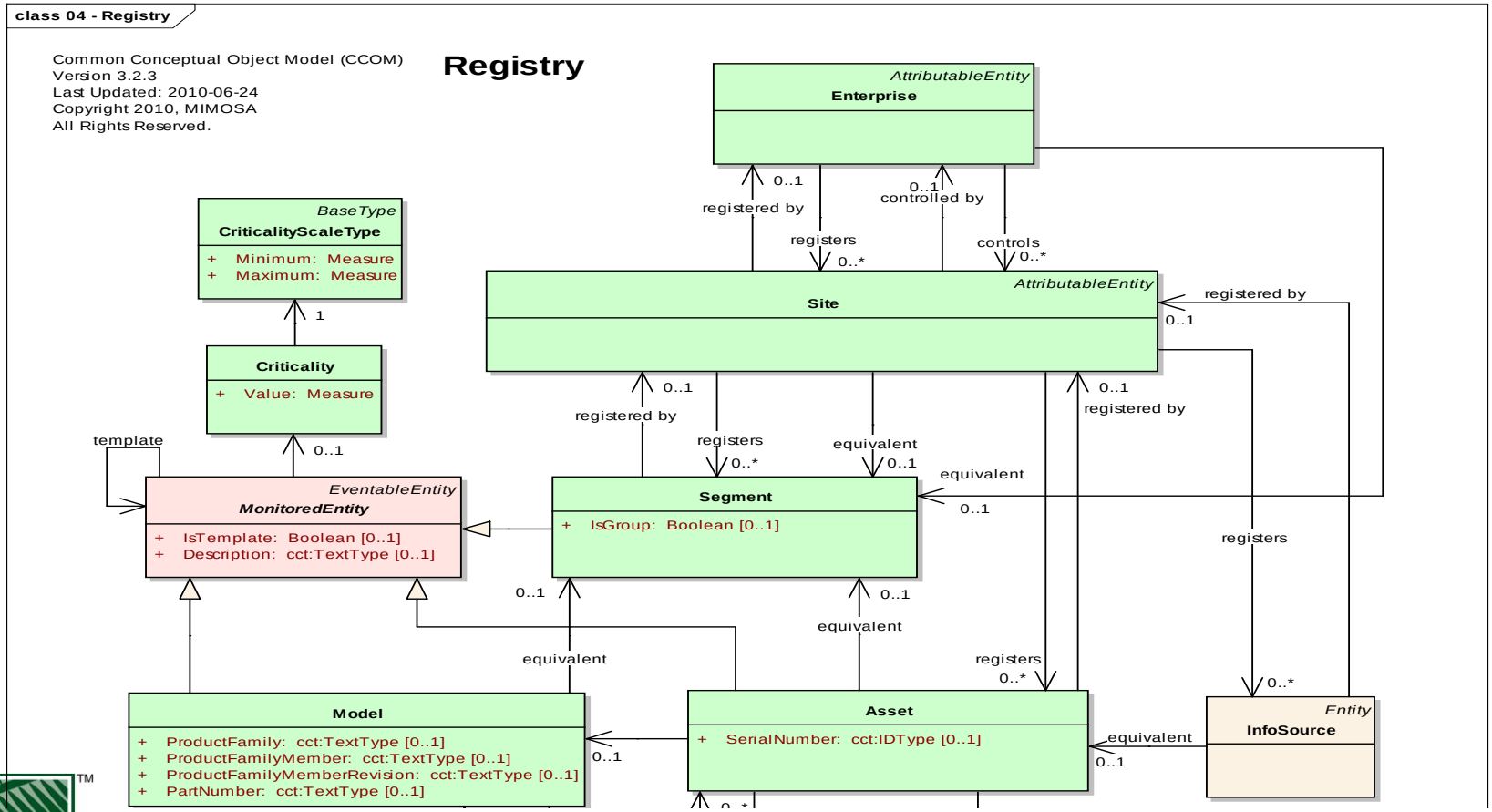
# Execution Environment Data Transport



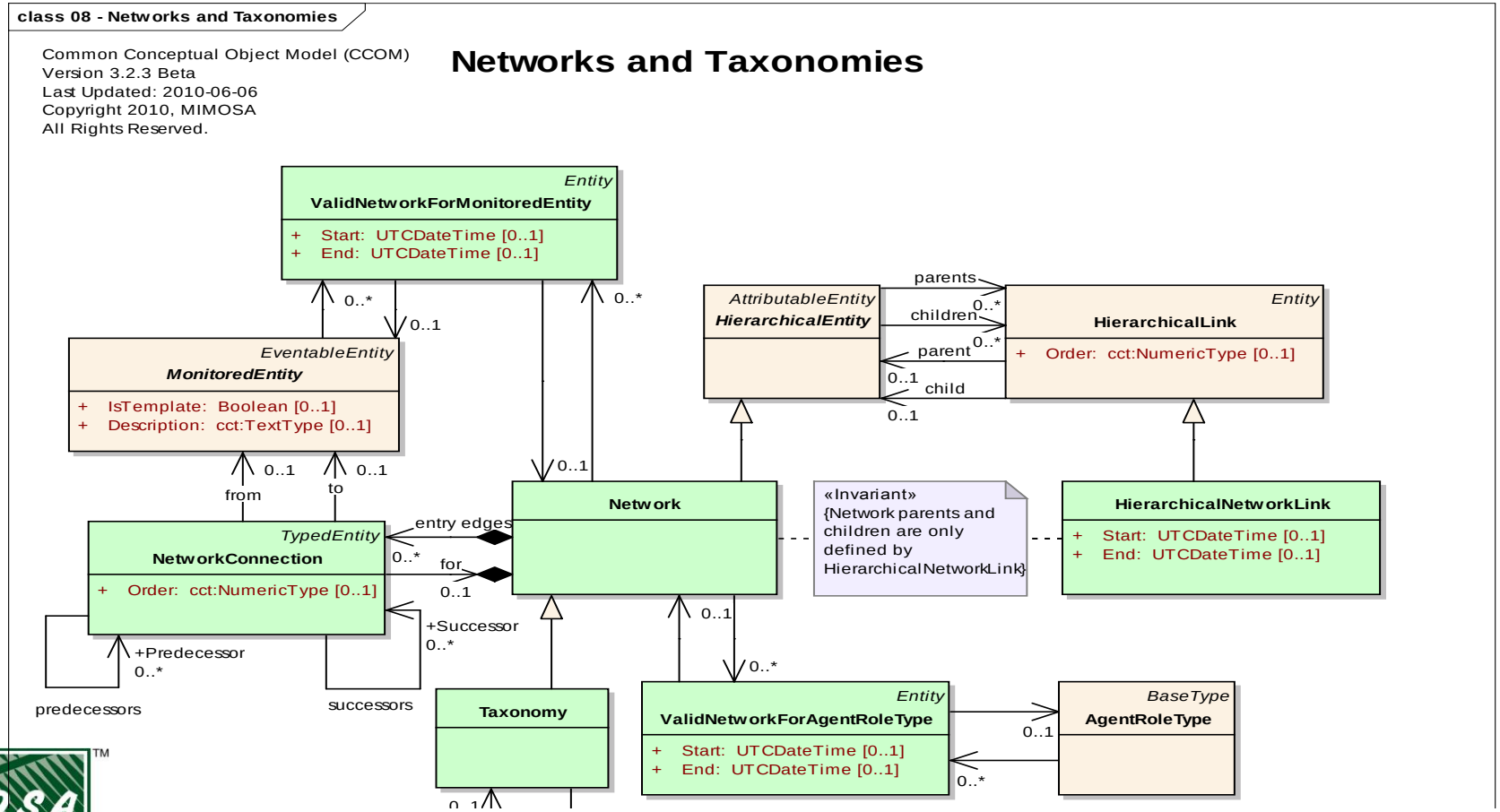

**Channels – ISO 18435 Domains**

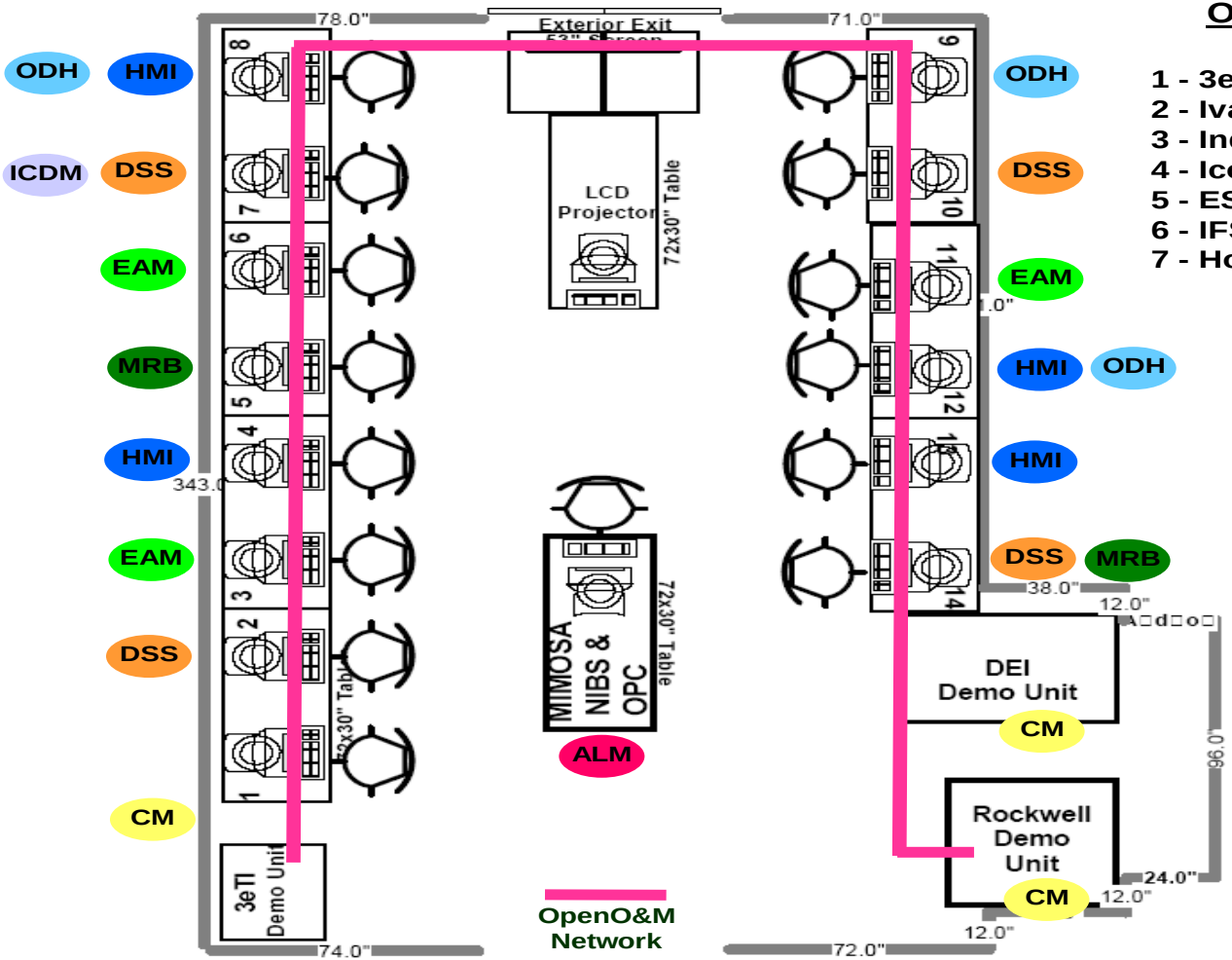
**Topics – MIMOSA CCOM Objects**

# MIMOSA Common Conceptual Object Model CCOM



# Common Conceptual Object Model






## 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**

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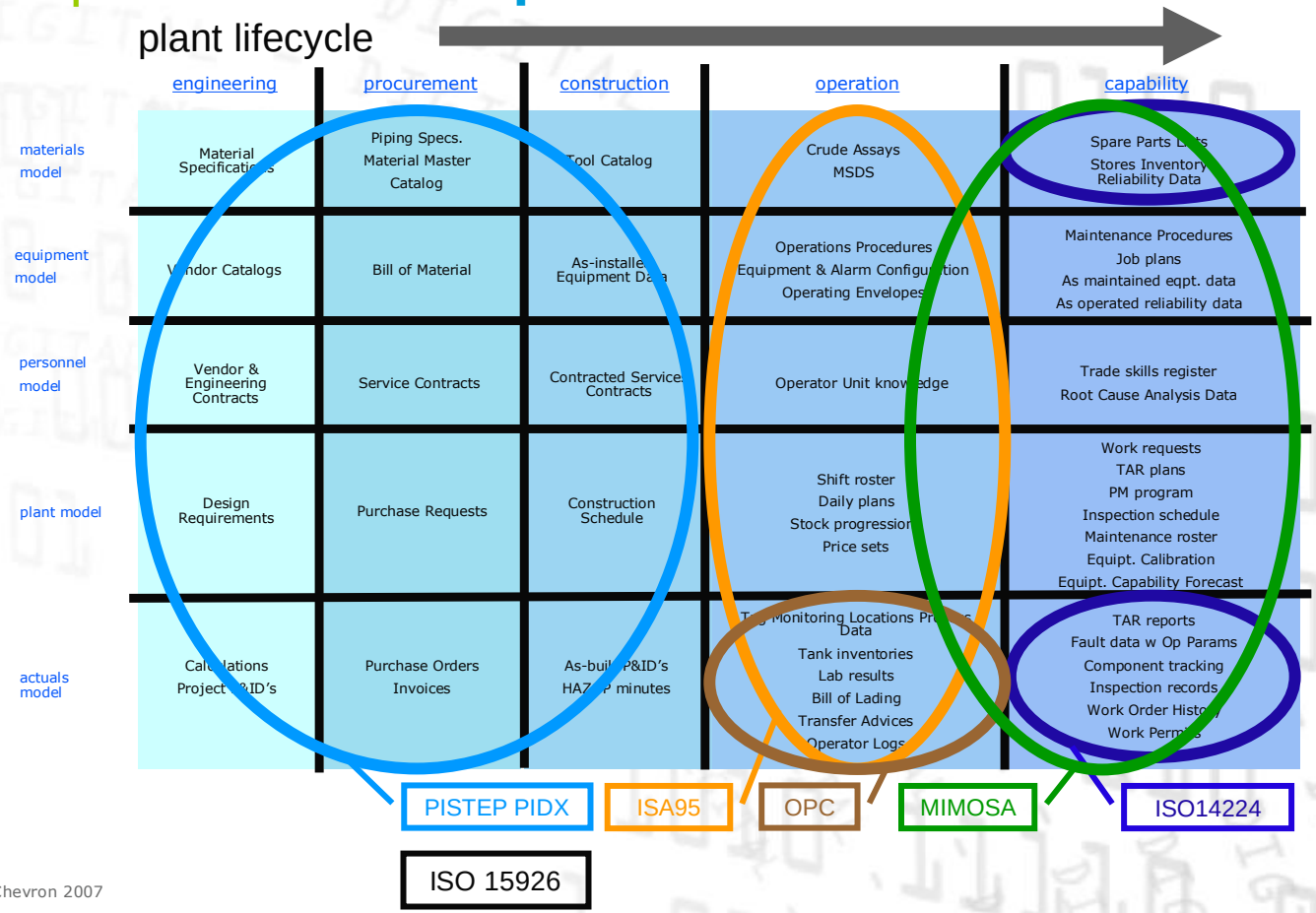
# Oil and Gas Industry Adoption of Standards

bp

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 data model map

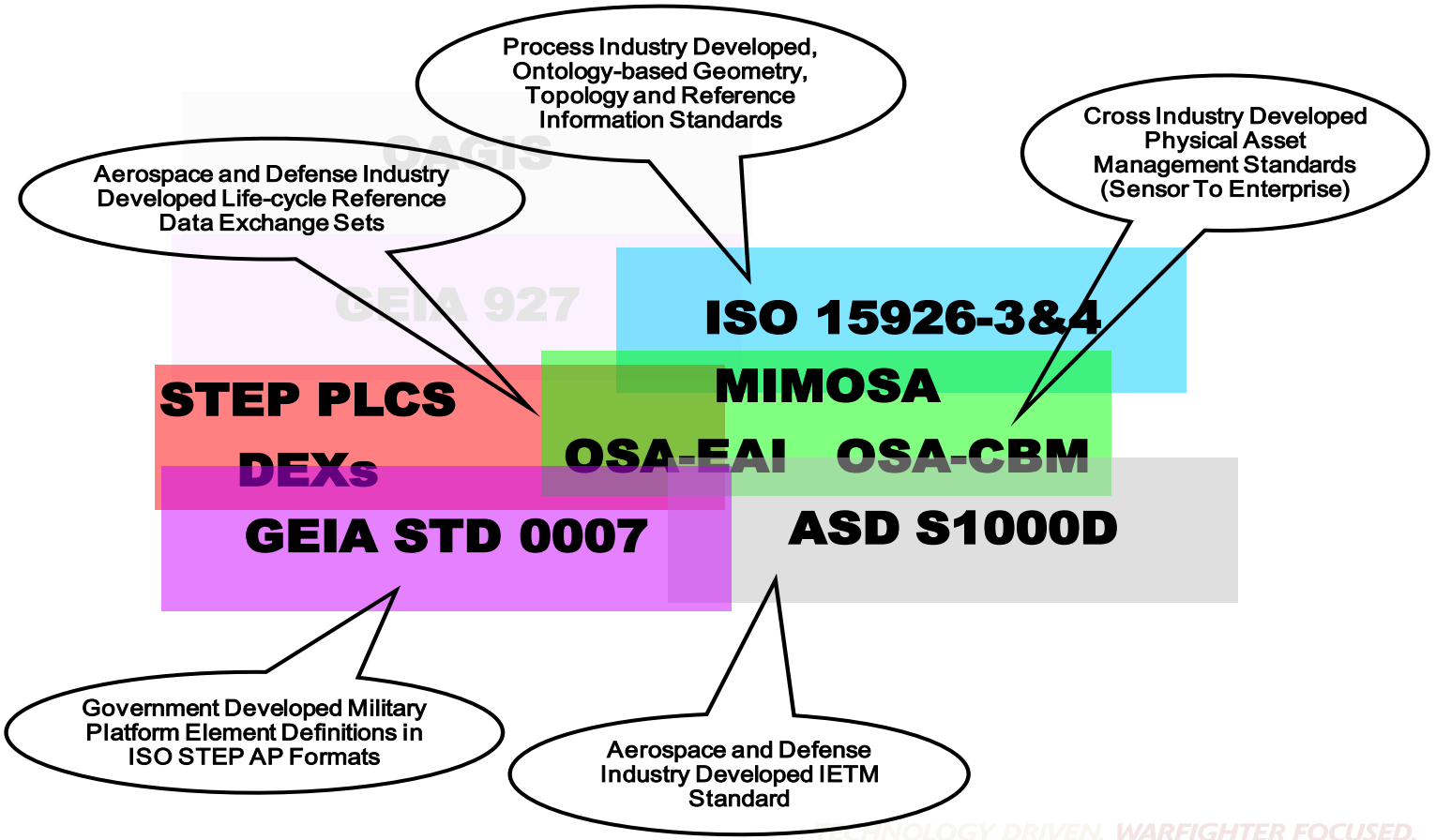


RDECOM

# Platform Life-cycle Information Management

## Concept Mapping- Aerospace & Defense Industry

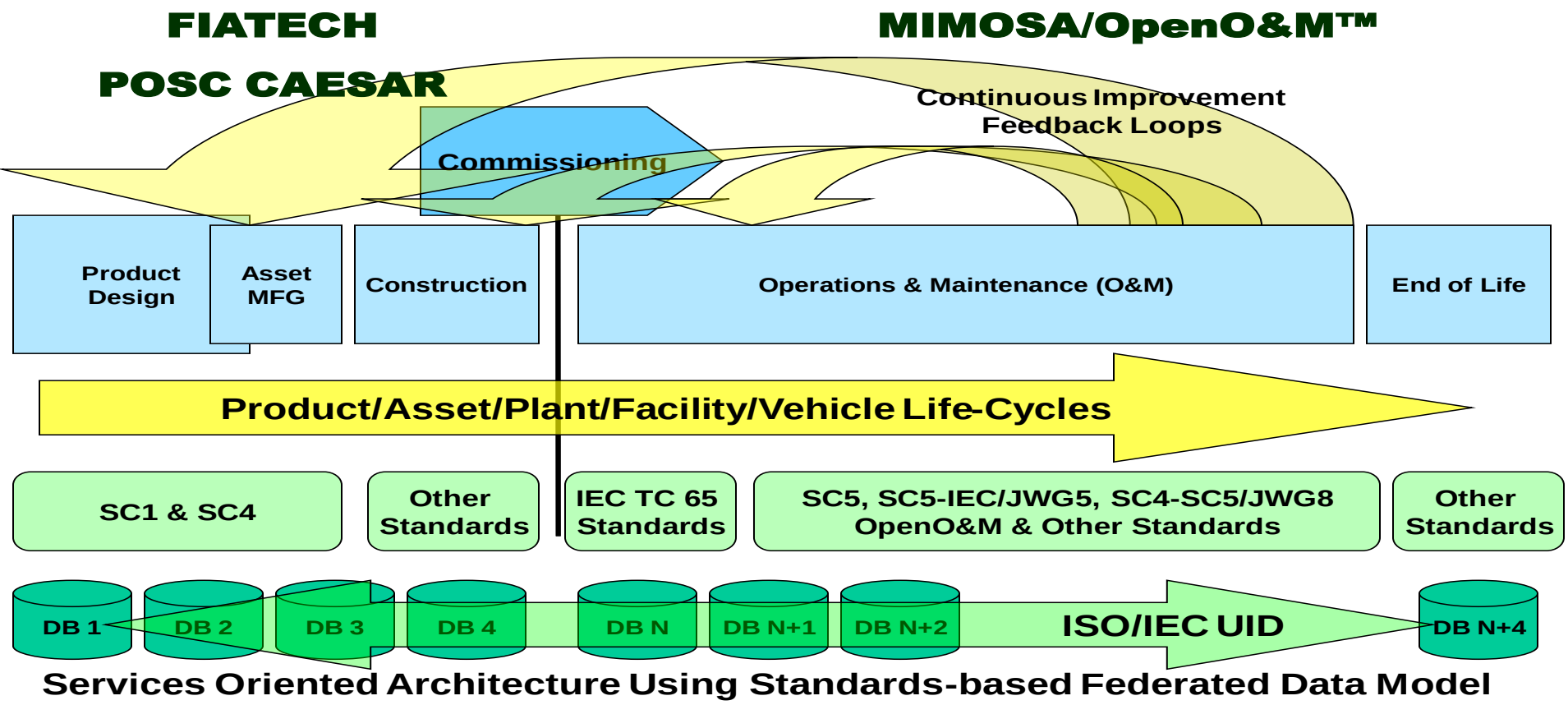
AMRDEC STRENGTH THROUGH TECHNOLOGY



# LEVERAGING THE ISO PROCESS FOR ESTABLISHING STANDARDS AND SPECIFICATIONS

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

March 2009



# 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

# 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

# OGI Use Cases

## the open O&M™ initiative 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**



+

POSC Caesar Association

**Industry Use Cases**

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

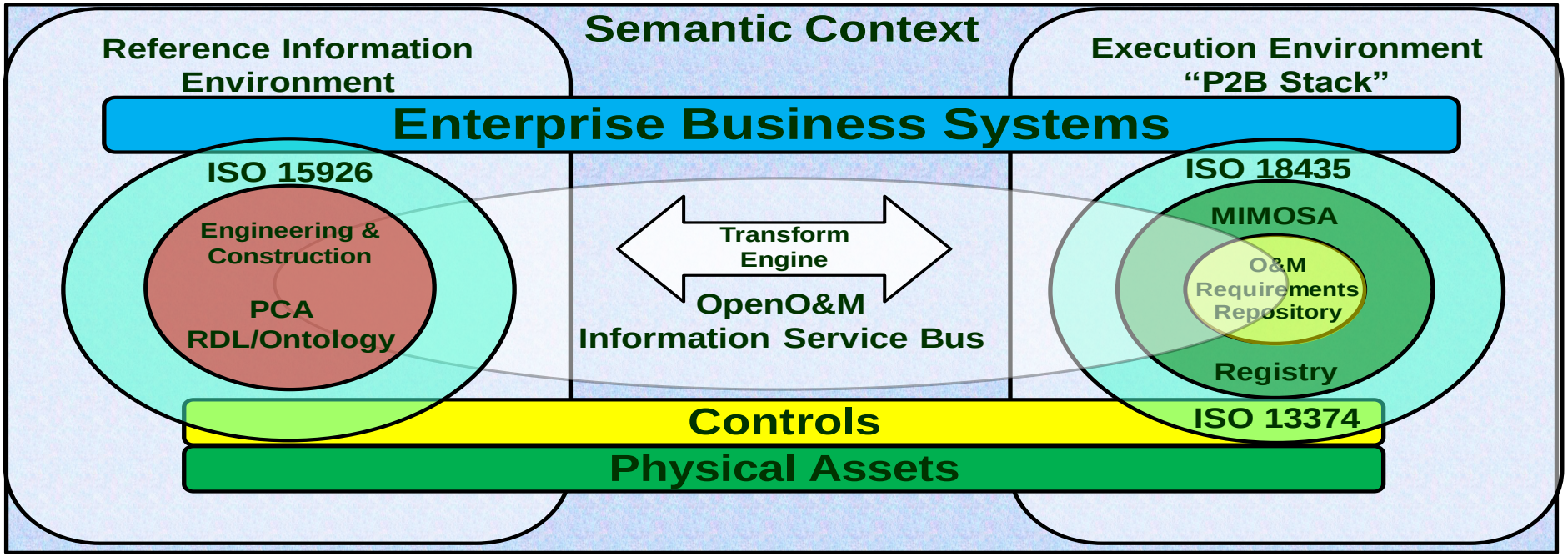
**ISO TC184**

# DSA-TS Drilling Automation

SLC Conf Call Aug 13th 2012

Pradeep Annaiyappa
Clinton Chapman
Alan T Johnston
Moray Laing

# Context for Collaboration



# Some Relevant ISO Related Activities

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

**ISO 14224**

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

**ISO TC 108**
**Mechanical vibration and shock**

**SC5**
**Condition monitoring and diagnostics of machines**

**ISO 13374**

**MIMOSA OSA-CBM**

**WG6**

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

**ISO TC 184**
**Industrial automation systems and integration**

**SC4**
**Industrial 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)***

**SC5**
**Architecture, communications and integration frameworks**

**ISO 18435**

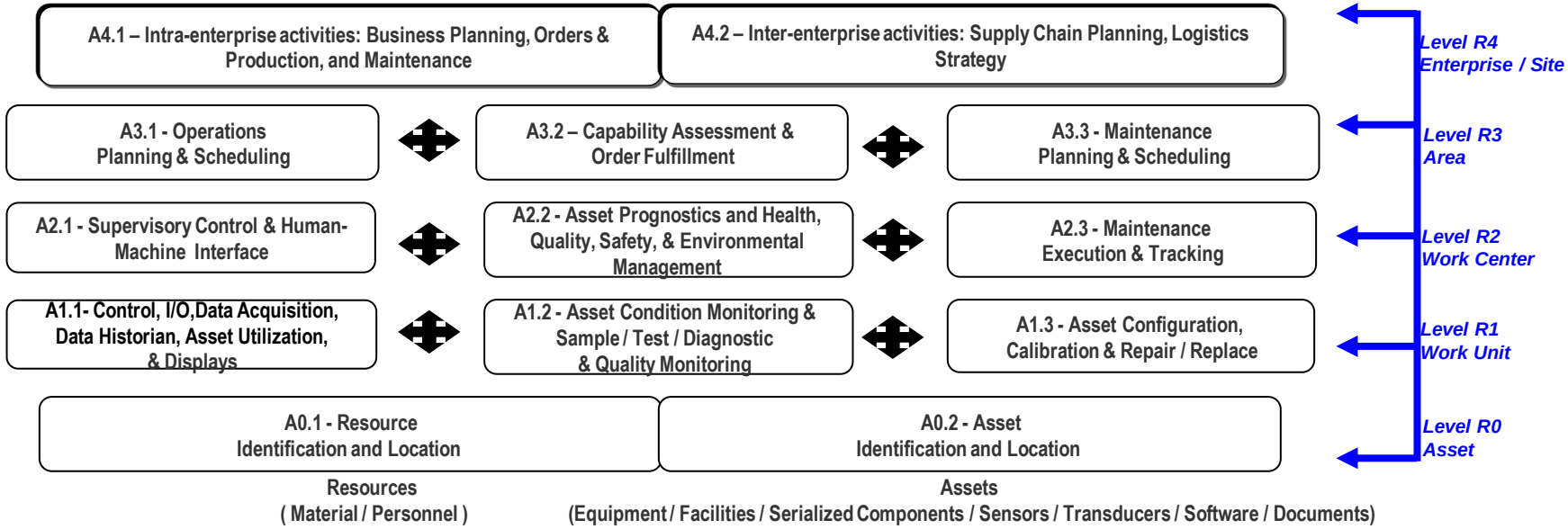
**MIMOSA OSA-EAI**

**WG7**

**Diagnostic and maintenance applications integration**

# ISO 18435 - 1
## Application Domain Integration Diagram

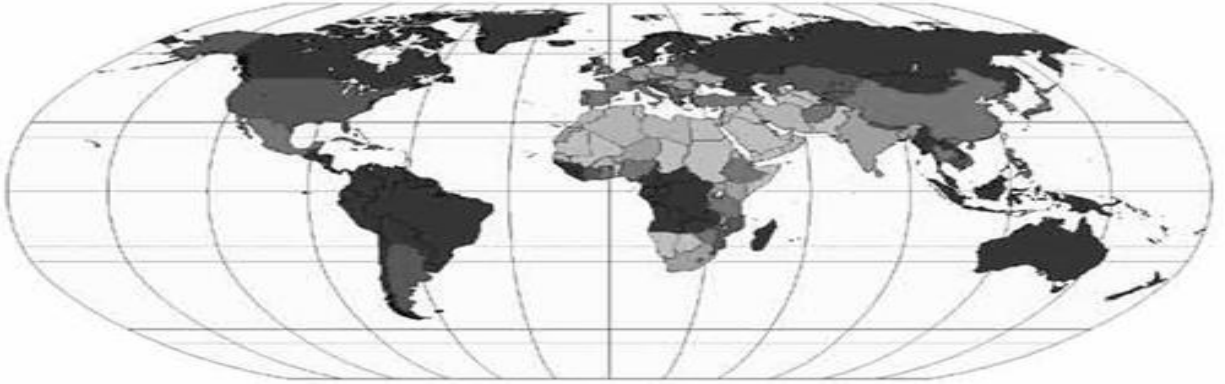
### Application Domain Integration Diagram




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**

# MIMOSA

## From Systems Integration To Sustainable Interoperability

### Providing Industry With A Pragmatic Approach To Gain Value From Open Standards

**Shell**
Rijswijk, Netherlands

June 27, 2013

Alan Johnston
MIMOSA President

# OGI Pilot Anticipated Additions for Phase 2

- Direct participation from Autodesk
- Multiple EPCs adding and managing engineering content using multiple products
- Multiple O&M Suppliers Are Being Added
  - ✓ OSISoft
  - ✓ Rockwell Automation
  - ✓ Emerson Process Management
  - ✓ Invensys
  - ✓ IFS

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# Summary Update from BP and Shell Hosted Meetings

- BP will begin “officially” participating in the OGI pilot activity on a resourced basis
- ISO TC 184/WG 6 meeting hosted by Shell in Rijswijk, Netherlands.
  - ✓ We are going to have increased cooperation with USPI (Netherlands) and the ENA (Japan)
  - ✓ We are working to align the CFIHOS activity (started by USPI and ENA) and the OGI Pilot
  - ✓ This should help avoid the creation of competing RDL and leverage the work from all 4 industry associations (MIMOSA, PCA, USPI and ENA) in a mutually beneficial way.
  - ✓ There are some concerns about the ISO process and export restrictions which we are going to need to work around. Following the process of leading with the Pilot will be more important than ever.
- The Shell VP of Technical Information Management hosted our closing meeting

➢ We Officially Invite China to participate in ISO TC 184/WG 6 and for all interested parties to participate in the OGI Pilot