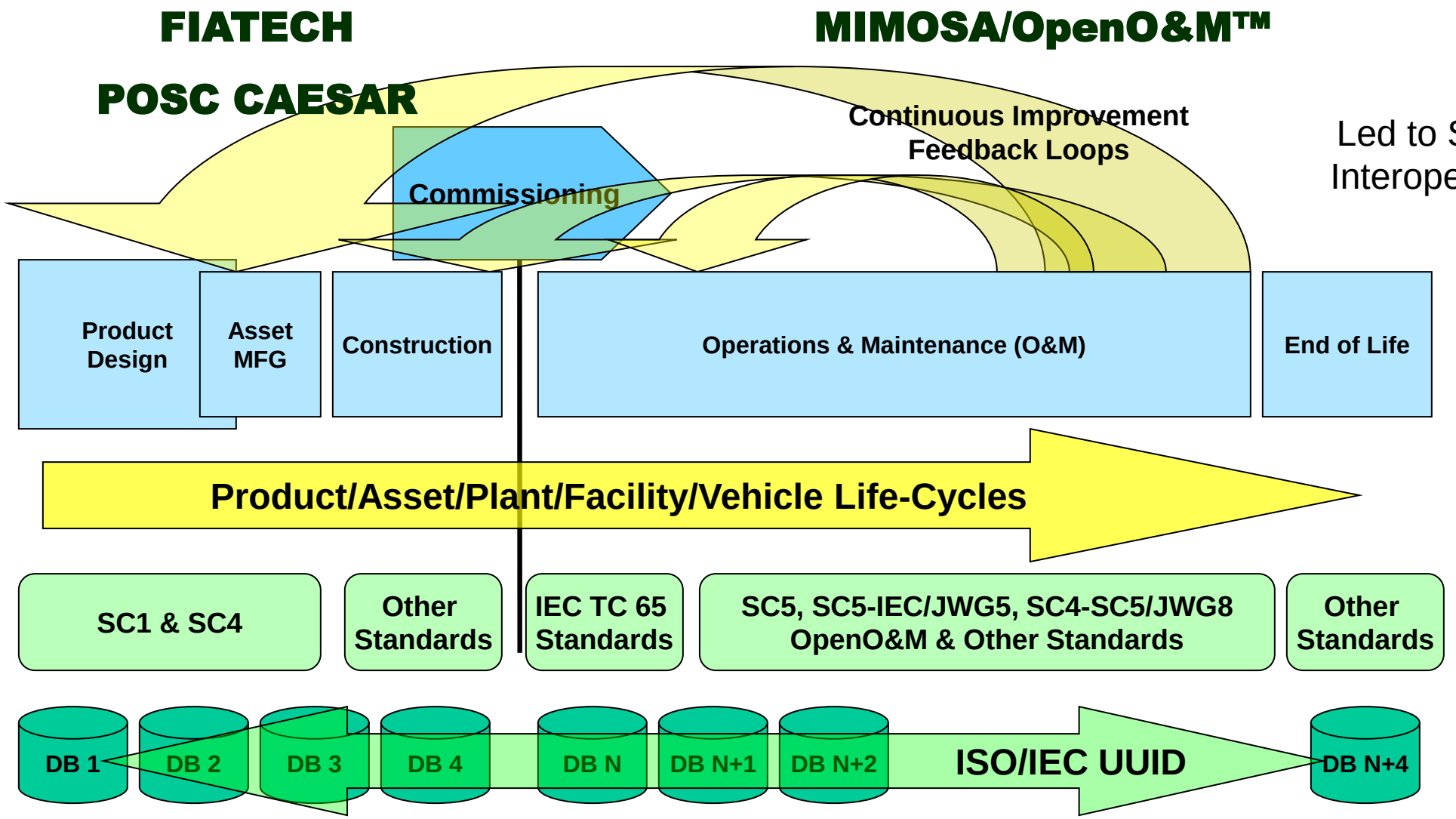
Standards-based Interoperability for Physical Asset Lifecycle Management and the Open Industrial Interoperability Ecosystem (OIIE)

Alan Johnston
MIMOSA President, ISO TC 184/WG 6 Convenor, ISA95 Voting Member, ISO/IEC JWG 21 TF 8 Member

Harmonizing Asset Management Workshop
Frankfurt, Germany
Jan 31, 2020

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



Services Oriented Architecture Using Standards-based Federated Data Model

Task Force TR
October 2008
Led to Start of ISO TC 184/WG 6 Interoperability for Asset Intensive Industries

Some ISO Technical Committees & Activities

Industry Specific
Practices and Content
(ISD versus ISDD)

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

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, shock and condition monitoring

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

ISO TC 184
Automation systems and integration

WG 6
ISO 18101-Asset intensive industry interoperability

SC 4
Industrial Data

ISO 15926-Process Plant Data
ISO 8000–Data Quality

SC 5
Interoperability, integration, and architectures for enterprise systems and automation applications

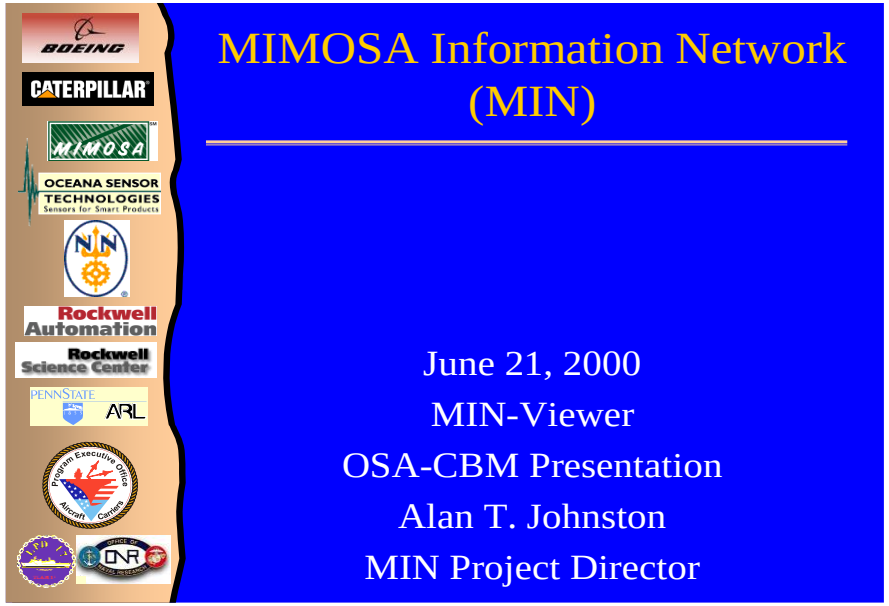
ISO 18435-O&M Integration

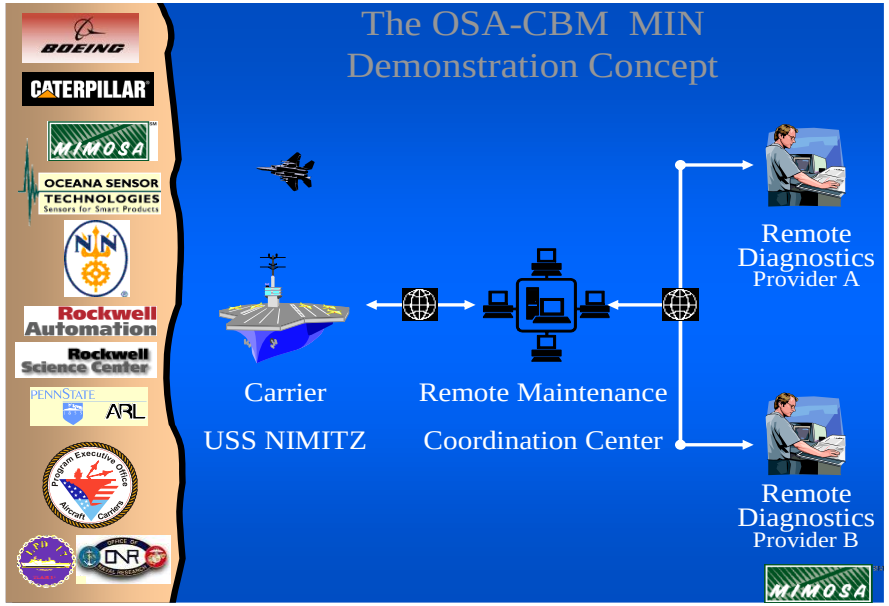
ISO 55000 Provides High Level Asset Mgt Guidance

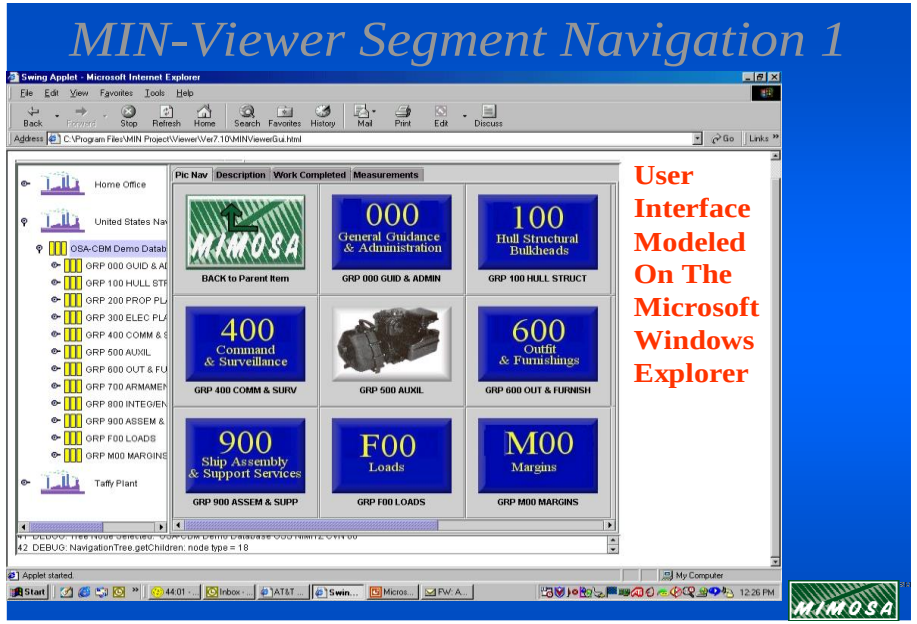
Cooperation also exist with IEC TC 65 and IEC/ISO JWG 21

OSA-CBM Dual Use Technology Program

Office of Naval Research





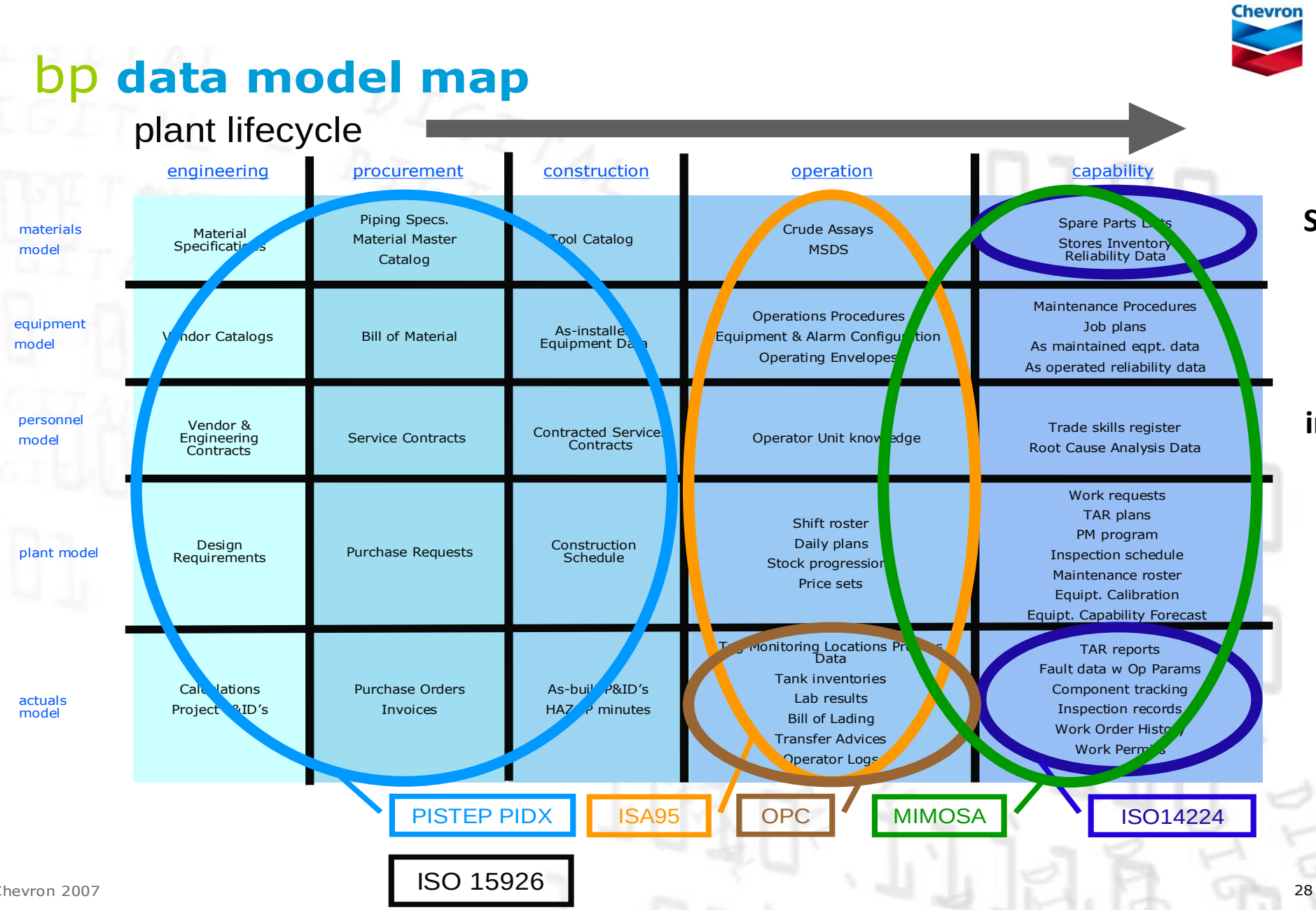


Model, Monitor and Manage Complex Physical Assets Circa 2000

MIMOSA OSA-CBM
ISO 13374
Plan to re-open in 2020

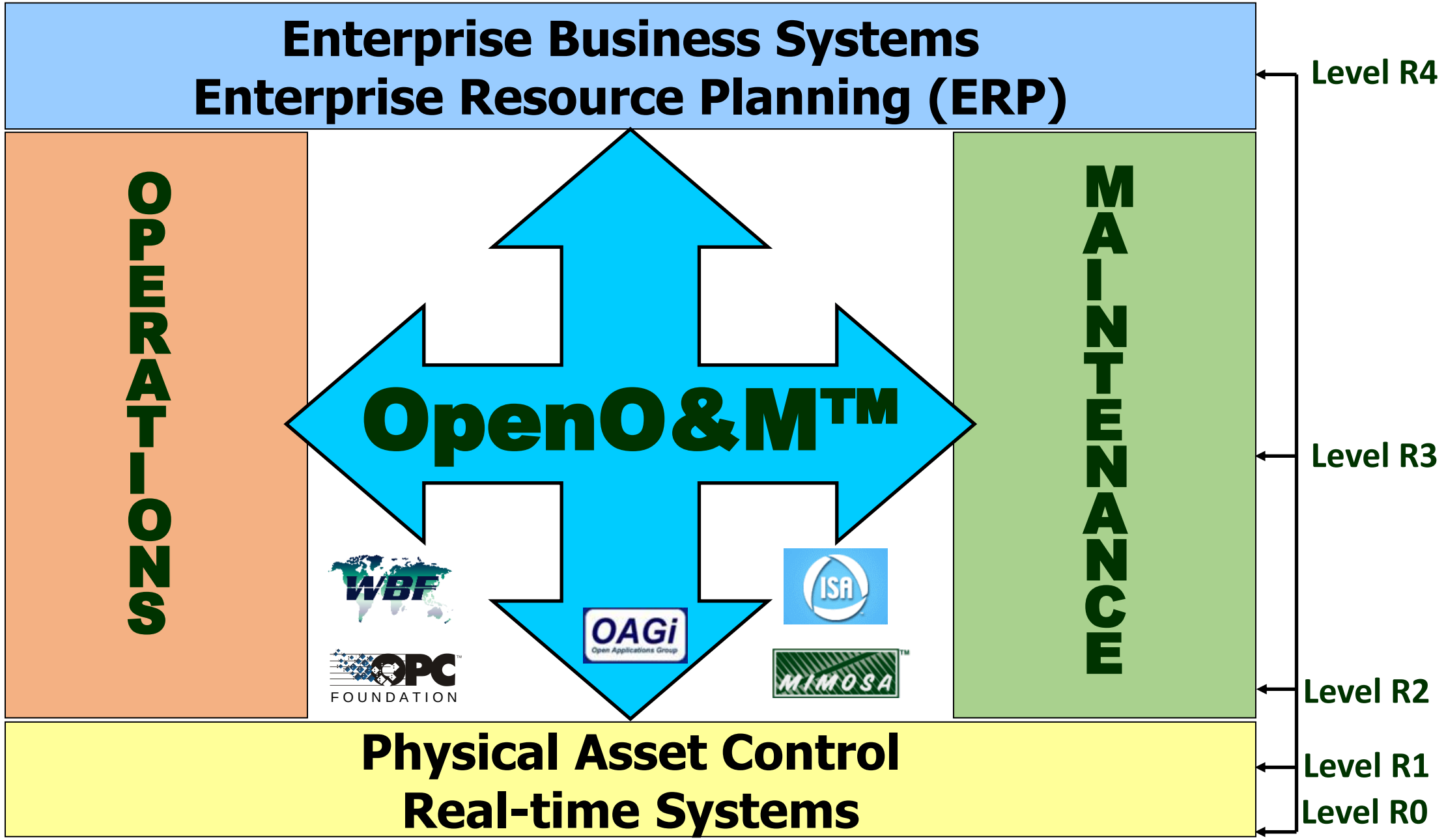
MIMOSA™

Industry Example of Asset Management Standards Domain Mapping-Circa 2007



Slide Initially developed by BP in 2003. ALL general principals of Asset Management Information Modeling in process industries were established in actual industry use by 2007.

OpenO&M Initiative – Formed 2004



MIMOSA™

Owner/Operators Objective
Shared Industry Foundation Architecture

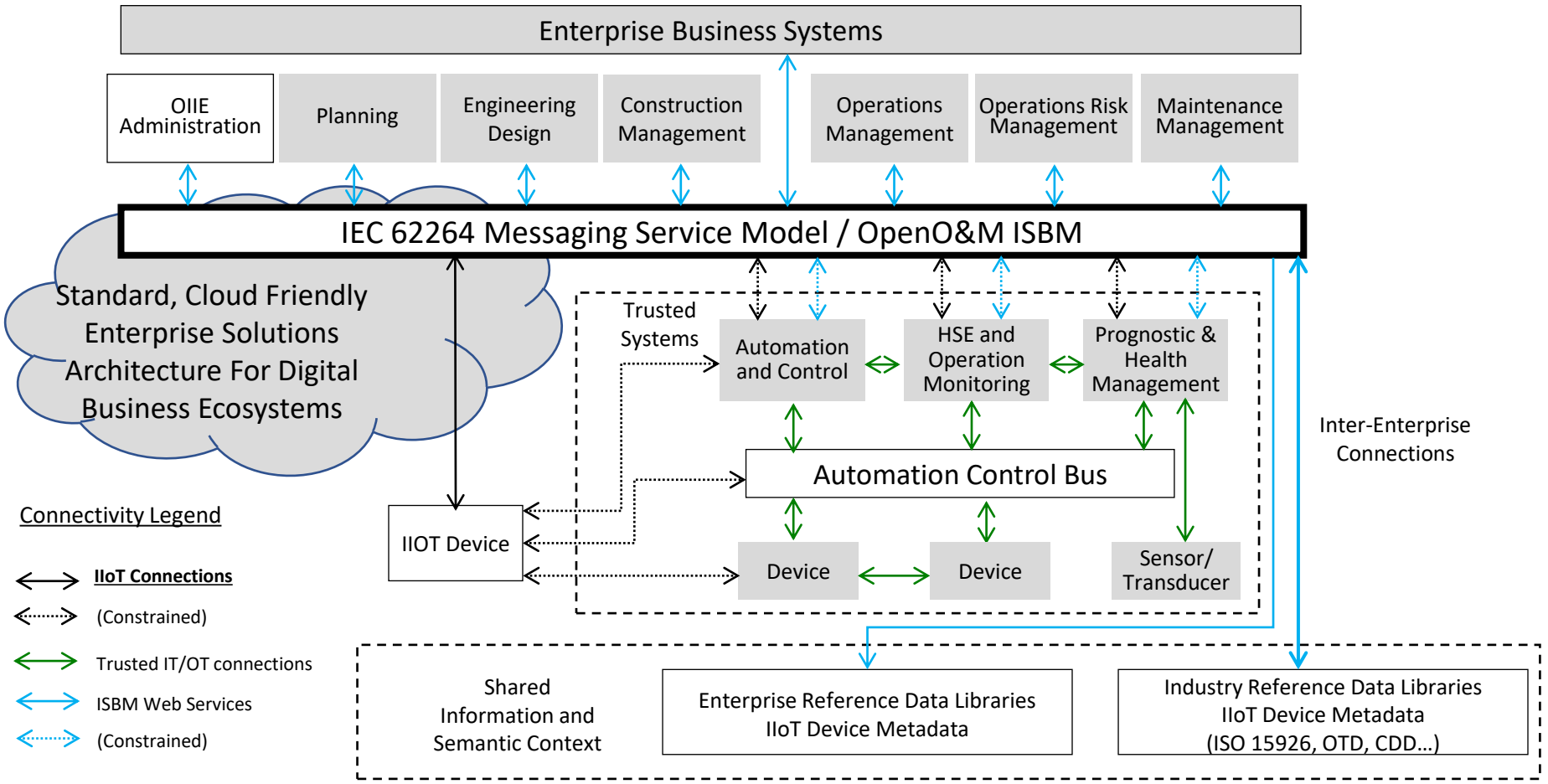
From:
OpenO&M Owner/Operator Leadership Team (BP, Chevron, Dow, Dupont, Nova Chemical, Saudi Aramco Suncor)
Circa 2008

2

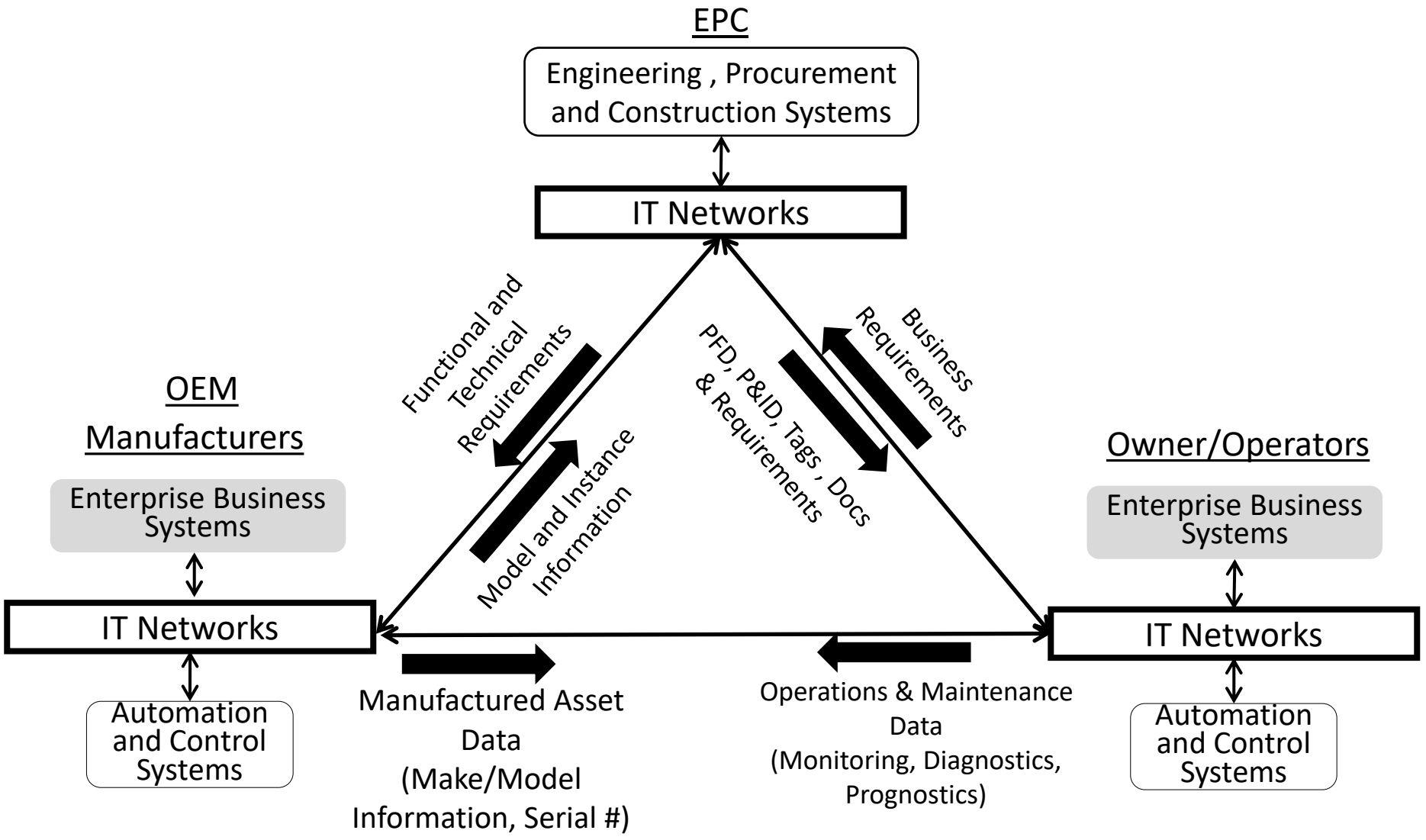
1

Request for Standard Architecture for Interoperability

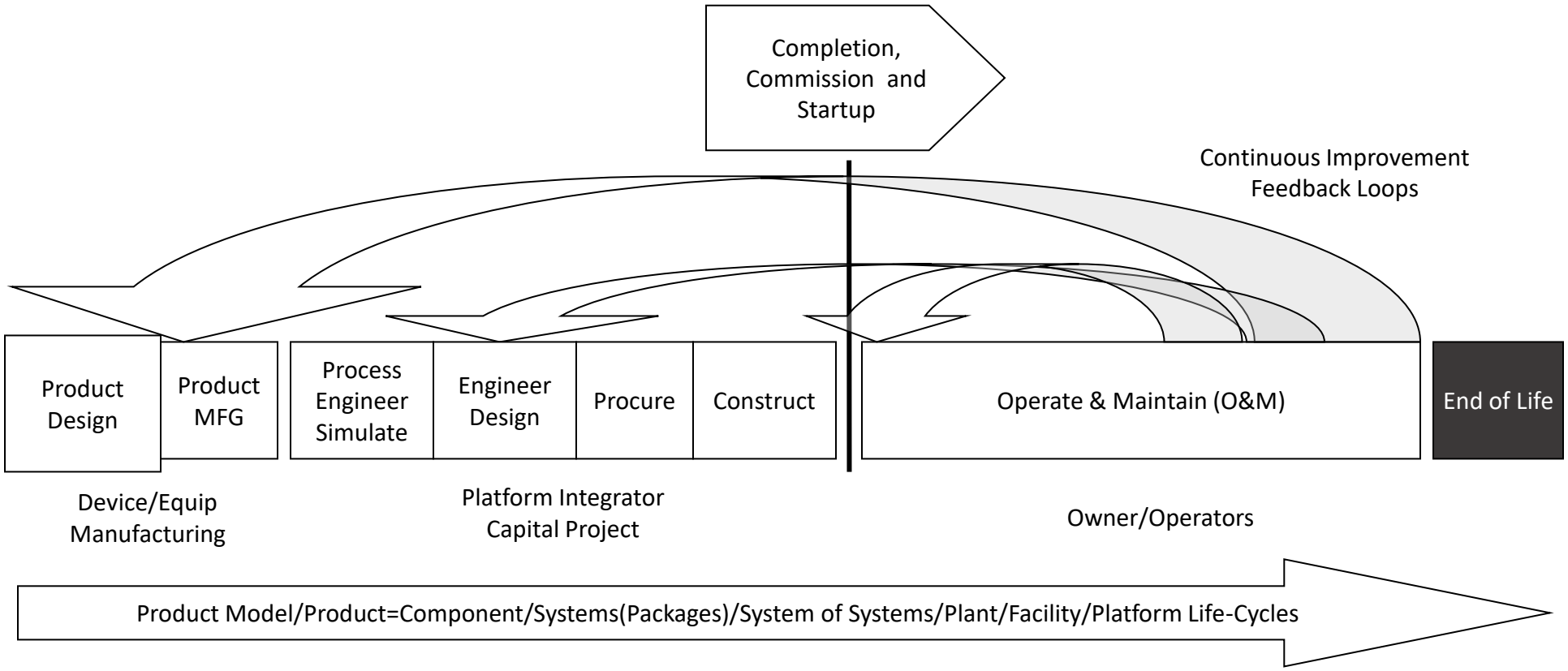
Intra-Enterprise OIIE Digital Ecosystem



Inter-Enterprise OIIE Digital Ecosystem



Secondary Business Process



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

TECHNICAL SPECIFICATION

ISO/TS 18101-1

First edition
2019-06

Automation systems and integration — Oil and gas interoperability —

Part 1:
Overview and fundamental principles

Systèmes d'automatisation et intégration — Interopérabilité entre les industries du pétrole et du gaz —

Partie 1: Vue d'ensemble et principes fondamentaux

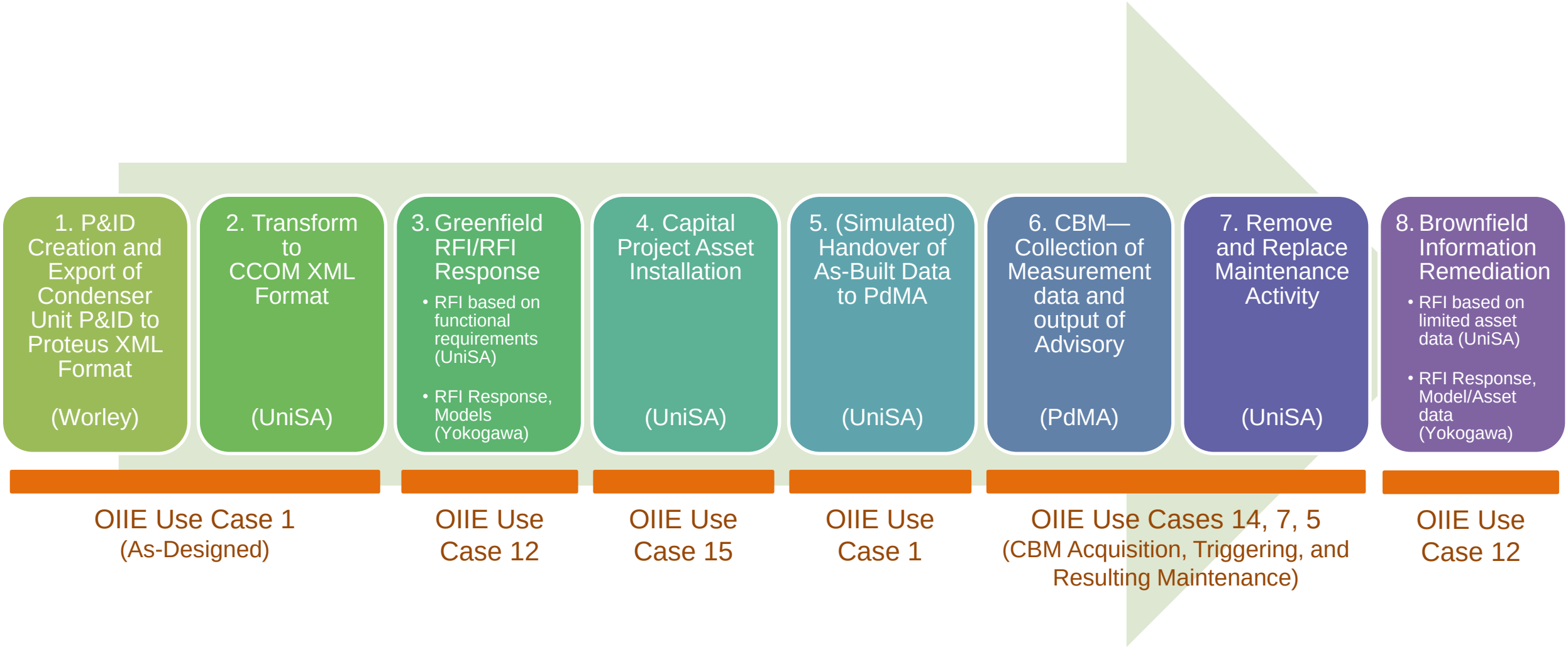
Reference number
ISO/TS 18101-1:2019(E)

ISO TS 18101-1 Foreword
Paragraph 6

"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 (OIIE) use case architecture and validated using the OIIE 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."

Build on Success from OIIE OGI Pilot Phase 3.1



OIIE Standard Use Case List

Derived from OpenO&M Standard Use Case List – Circa 2007

OIIE Use Case 1 – Information Handover from EPC to O/O
OIIE Use Case 2 – Engineering Updates
OIIE Use Case 3 – Field Changes to Plant/Facility Engineering
OIIE Use Case 4 – Online Product Data Library Management
OIIE Use Case 5 – Asset Installation/Removal Updates
OIIE Use Case 6 – Preventive Maintenance Triggering
OIIE Use Case 7 – Condition-Based Maintenance Triggering
OIIE Use Case 8 – Early Warning Notifications
OIIE Use Case 9 – Incident Management/Accountability
OIIE Use Case 10 – Information Provisioning of O&M Systems
OIIE Use Case 11 – Enterprise Reference Data Library Management
OIIE Use Case 12 – RFI and RFI Response for Models Meeting Requirements (Greenfield & Brownfield)
OIIE Use Case 13 – Lockout-Tagout
OIIE Use Case 14 – Condition-Based Maintenance Data Acquisition
OIIE Use Case 15 – Capital Project Asset Installation

The Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101
Australia Energy Sector OIIE Network (Subnet of AU Critical Infrastructure)

MIMOSA.org
OpenO&M.org
Reference Info

Cloud-based Analytics A

Cloud-based Analytics B

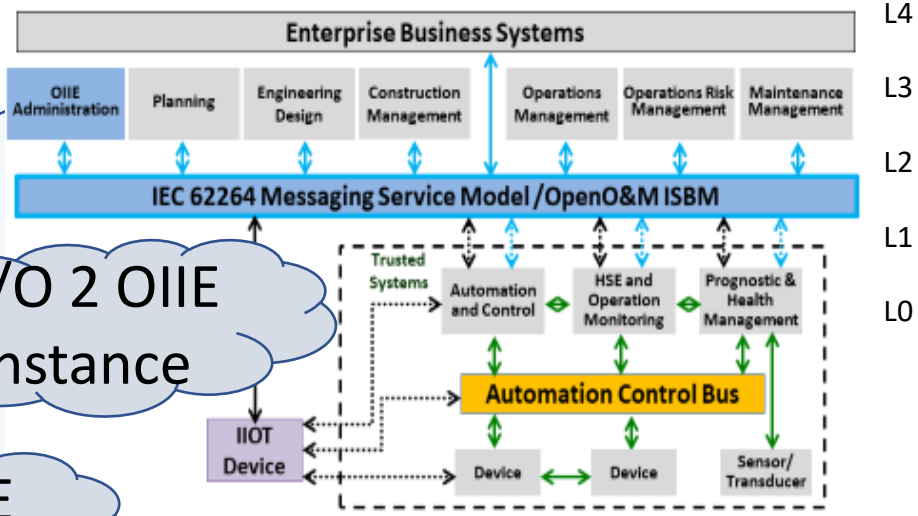
Australian Energy Cluster OIIE

Supplier A Cloud

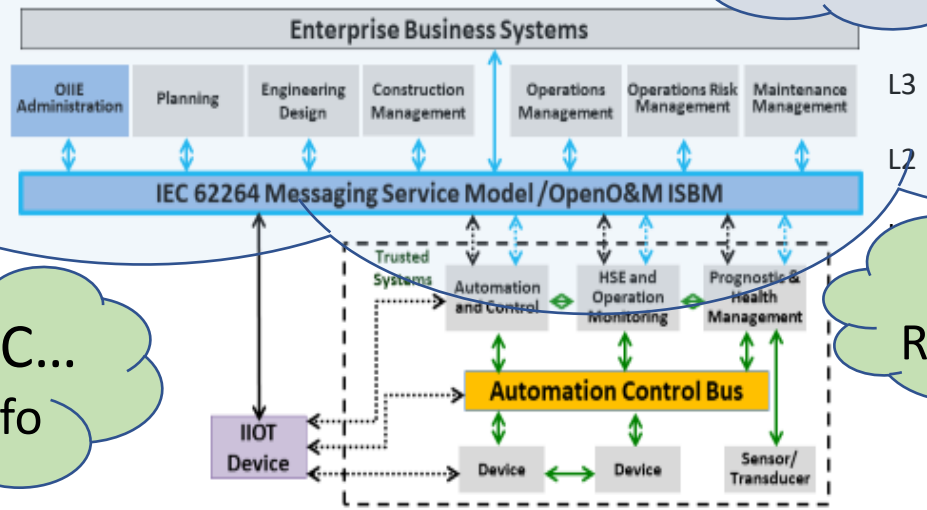
NERA.org.au
Reference Info

"Hub" A, B, C...
Reference Info

O/O 2 OIIE Instance



O/O 1 OIIE Instance



Supplier B Cloud

CII
Reference Info

Open Standards for
Physical Asset Management

MIMOSA CCOM and OPC UA Companion Specification

Dr. Matt Selway

Research Fellow University of South Australia

January 31, 2020

MIMOSA CCOM Purpose

- Conceptual model for Physical Asset Lifecycle Management
- Exchange model enables *Enterprise Application Interoperability*
- O/O, EPC, and OEM *secondary business process* requirements:
  - "As-Engineered"
  - "As-Designed"
  - "As-Built" / "As-Constructed", and
  - "As-Maintained"
  - Information spanning manufacturing, plant, facility, fleet, critical infrastructure, etc., environments

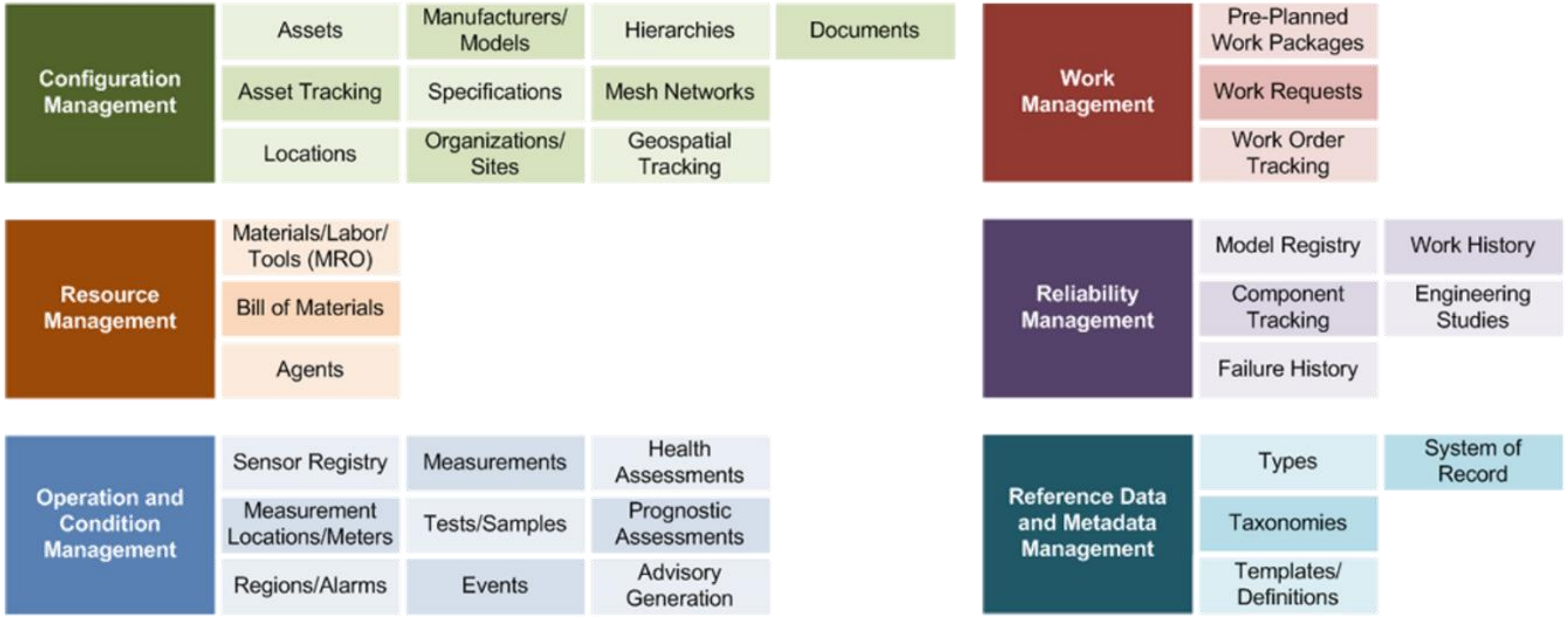
Identifiers in CCOM

- CCOM provides a federating capability
  - Identification, and
  - Provenance (Owner, System of Record)
- Every entity has an *immutable*, *globally unique identifier*: UUID
- ISO/IEC 9834-8
- Mapping to other local and global identifiers
  - OIIE specification includes a mapping and query service to resolve IDs

MIMOSA CCOM and Digital Twins

- CCOM supports the creation and management of *Digital Twins*
- Digital Twins provide the context for Transactions, Events, and Sensor-based data
  - Simultaneously updating the Digital Twins
- CCOM traditionally enables analytics for Condition-Based Maintenance and Reliability Management
- Semantic linkages in conjunction with industry partners open new possibilities in advanced analytics, reasoning, and AI capabilities

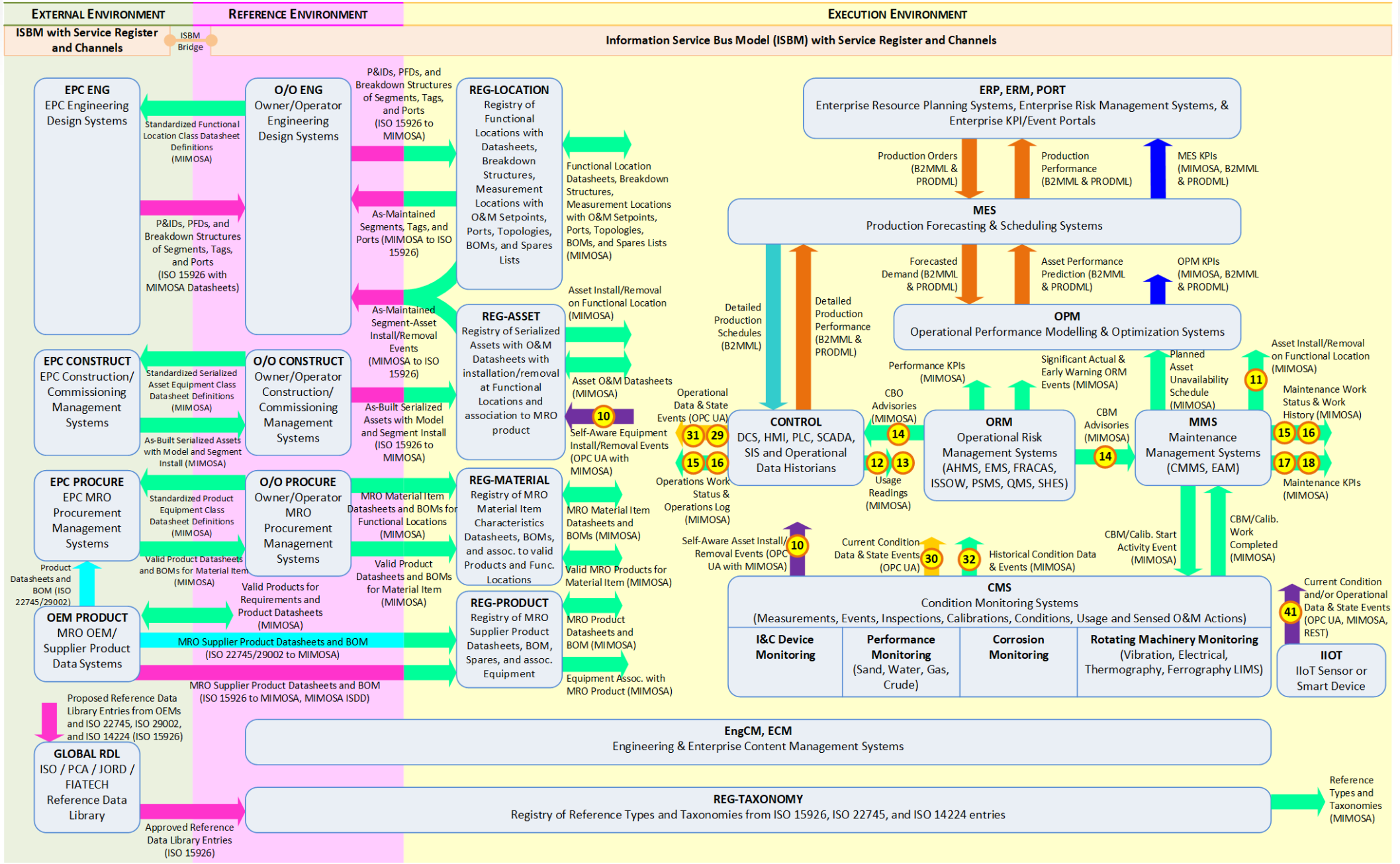
CCOM Modules



CCOM Modules

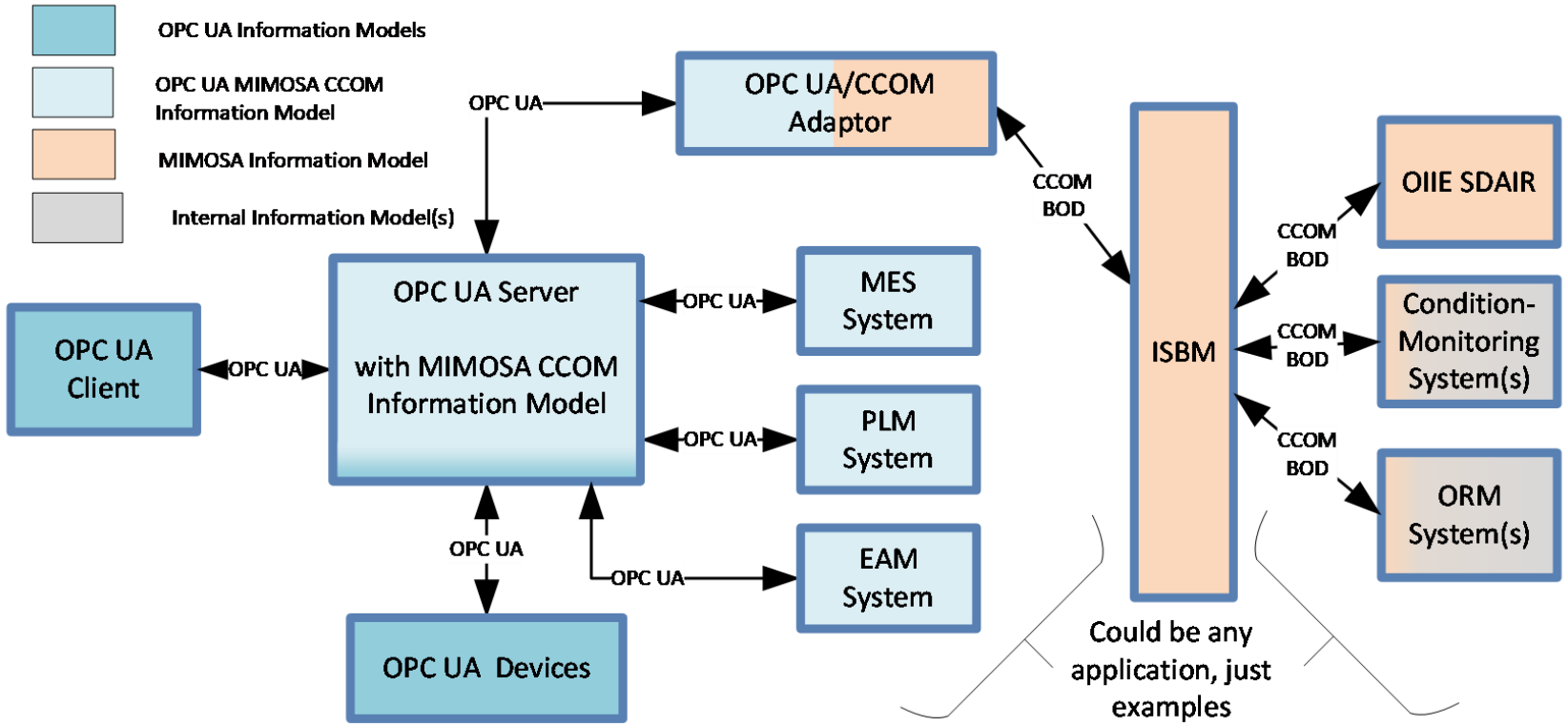
CCOM OPC UA Companion Specification

- Joint purpose:
  - Bring Asset Lifecycle Management capabilities to OPC UA systems
  - Bridge the gap to non-OPC UA systems through CCOM and the OIIE
- Does not cover entire scope of CCOM at present
- Focuses on modules:
  - Configuration Management, and
  - Operation & Condition Management



OIIE Landscape Diagram – Companion Spec. Scope

CCOM and OPC UA Working Together



For More Information Please Contact

- Alan T. Johnston, MIMOSA President:
  - atjohn@mimosa.org
- Prof. Markus Stumptner, MIMOSA Co-CTO
  - University of South Australia: mst@cs.unisa.edu.au
- Dr. Matt Selway: Research Fellow
  - University of South Australia: Matt.Selway@unisa.edu.au