# The Path Forward
# 2020 and Beyond…

Alan Johnston

2019 MIMOSA Open Meeting

December 4, 2019

# Presentation Outline

- It’s a Risky World: Identify, Model and Address Problems/Risks
- The Present – The Development of the OIIE and ISO 18101
- The Path Forward – Industry Digital Transformation in 2020 and Beyond

# It’s a Risky World

## Identifying, Modeling and Addressing Industrial Risks

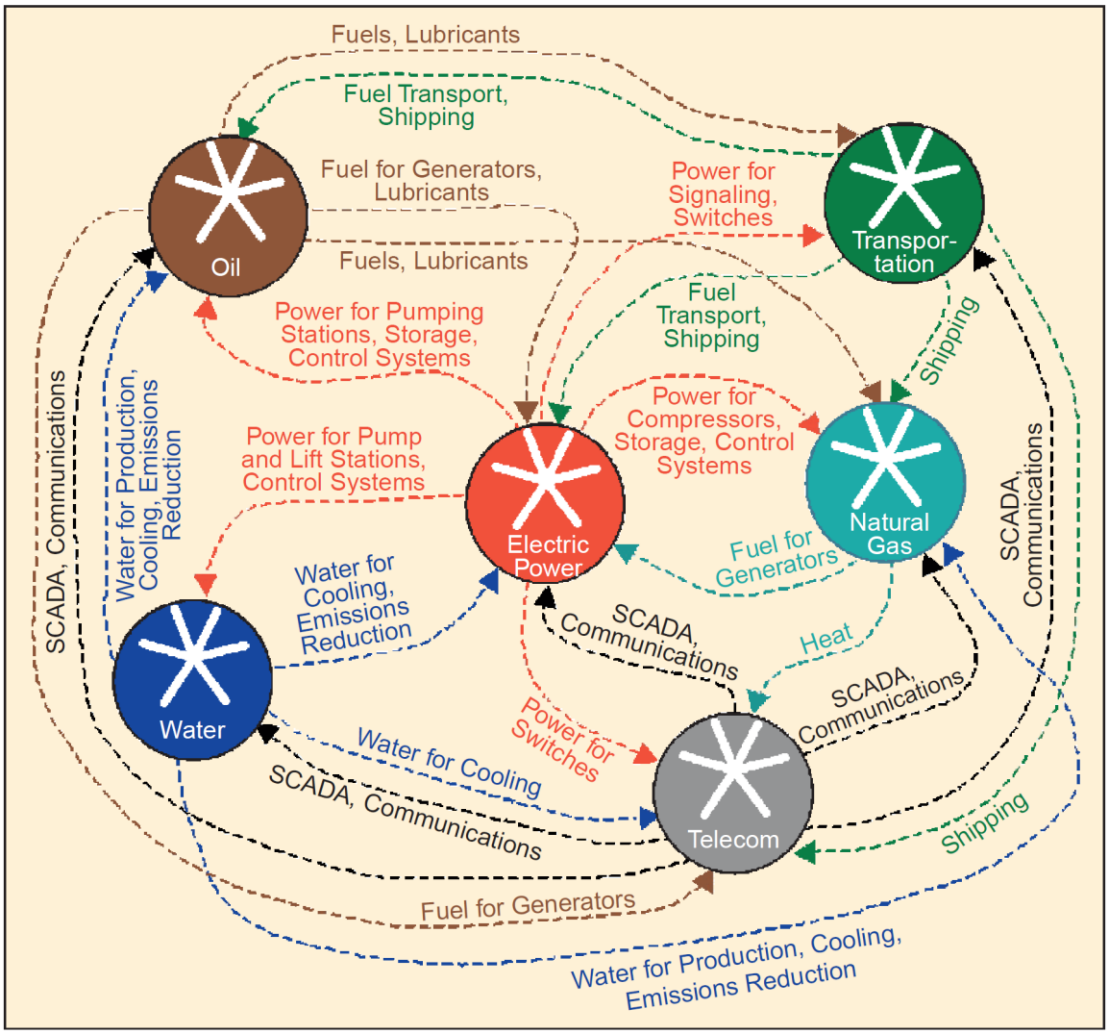
# What is Critical Infrastructure

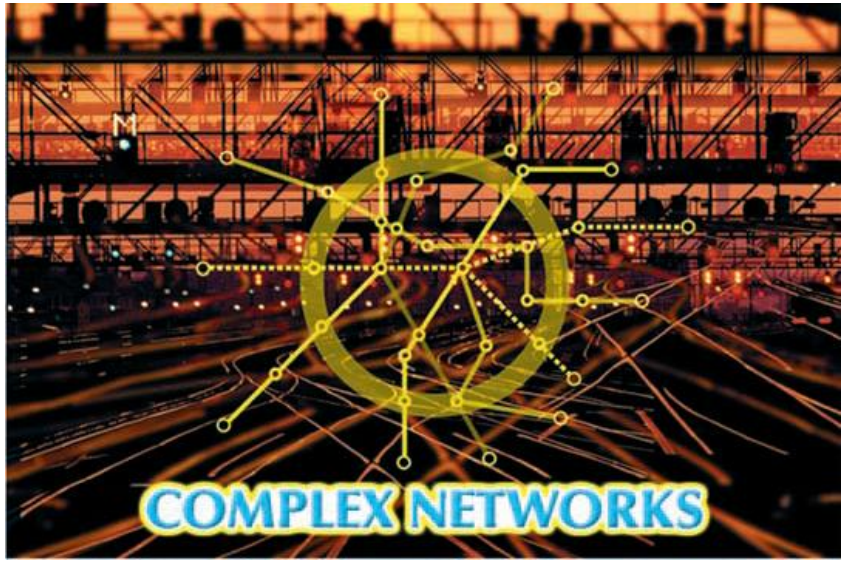
- **Critical infrastructure** (or **critical national infrastructure** (**CNI**) in the UK) is a term used by governments to describe assets that are essential for the functioning of a society and economy – the infrastructure. – Wikipedia
- Government led efforts have addressed key aspects of **Security** (physical and cyber) and **Resilience** (usually focused on disaster and emergency preparedness).
- A key aspect of Critical Infrastructure is that it is **Highly Interdependent**.

# Critical Infrastructure Sectors – From US PPD 21-2013

- Chemical
- Commercial facilities
- Communications
- Critical manufacturing
- Dams
- Defense industrial base
- Emergency services
- Energy
- Financial services (including insurance)
- Food and agriculture
- Government facilities
- Healthcare and public health
- Information technology
- Nuclear reactors, materials, and waste
- Transportation systems
- Water and wastewater systems

# Critical Infrastructure Interdependencies-1




IEEE Journal- Dec 2001

Identifying, Understanding, and Analyzing Critical Infrastructure Interdependencies

Steven M. Rinaldi
James P. Peerenboom
Terrence K. Kelly

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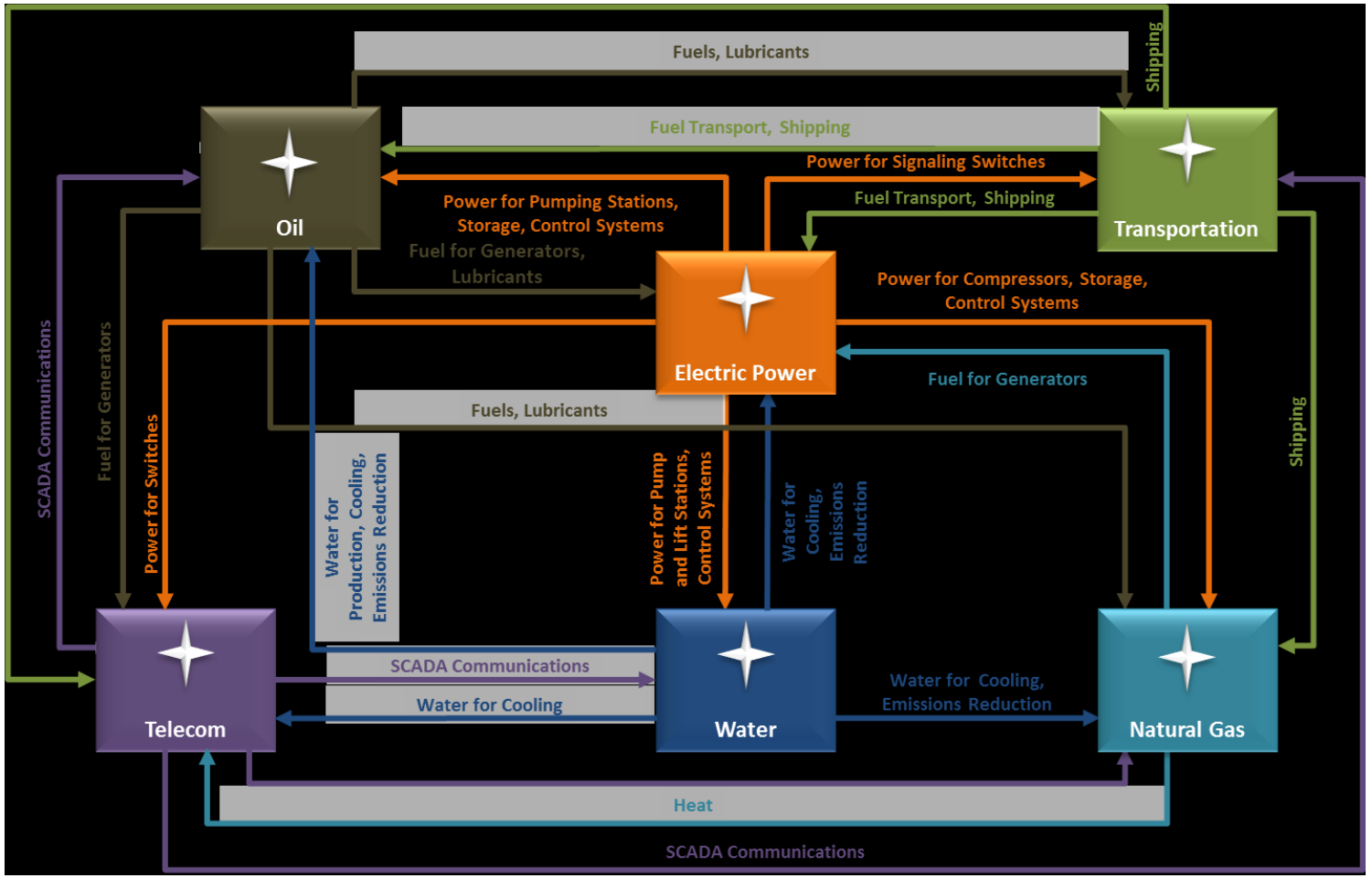
# Critical Infrastructure Interdependencies-2

National Institute of Standards and Technology
U.S. Department of Commerce




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

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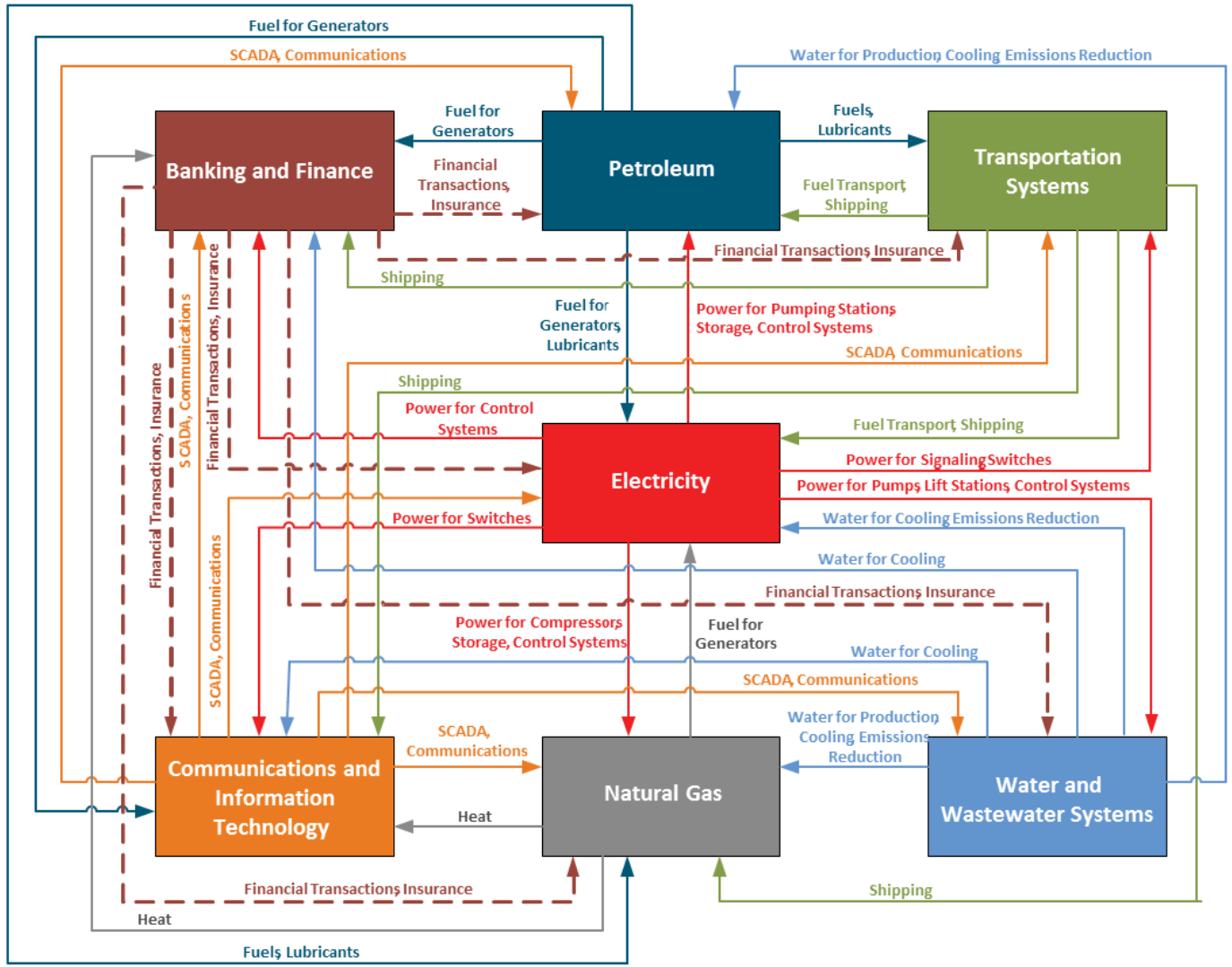
# Critical Infrastructure Interdependencies-4




Incorporating Prioritization in Critical Infrastructure Security and Resilience Programs

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

Duane Verner, Frederic Petit, and Kibaek Kim

October 2017

NPS PRAESTANTIA PER SCIENTIAM

CENTER FOR HOMELAND DEFENSE AND SECURITY
NAVAL POSTGRADUATE SCHOOL

FEMA

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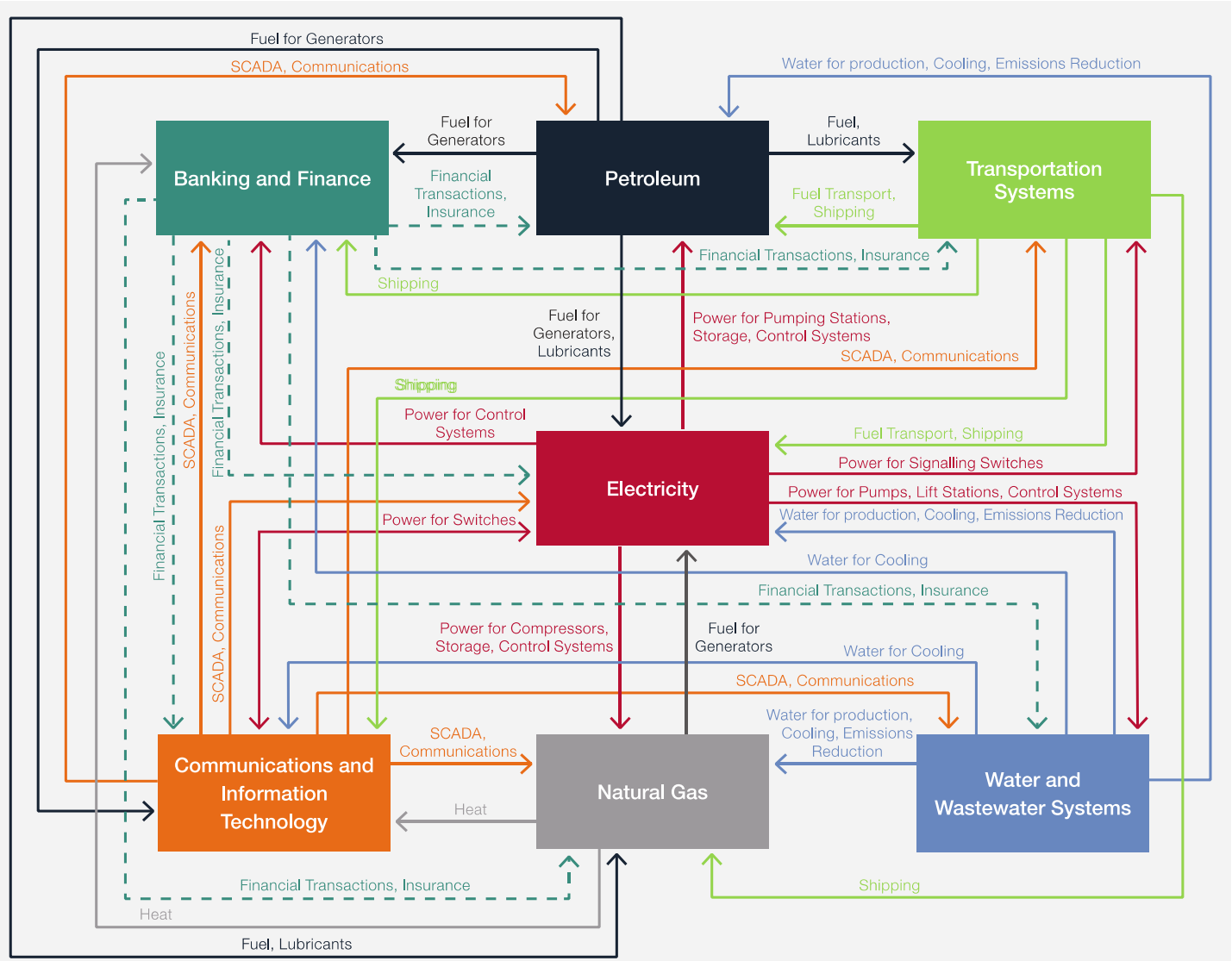
# Critical Infrastructure Interdependencies-5




NSW GOVERNMENT

NSW Critical Infrastructure Resilience Strategy

Partner, Prepare, Provide

NSW Department of Justice | Office of Emergency Management

2018

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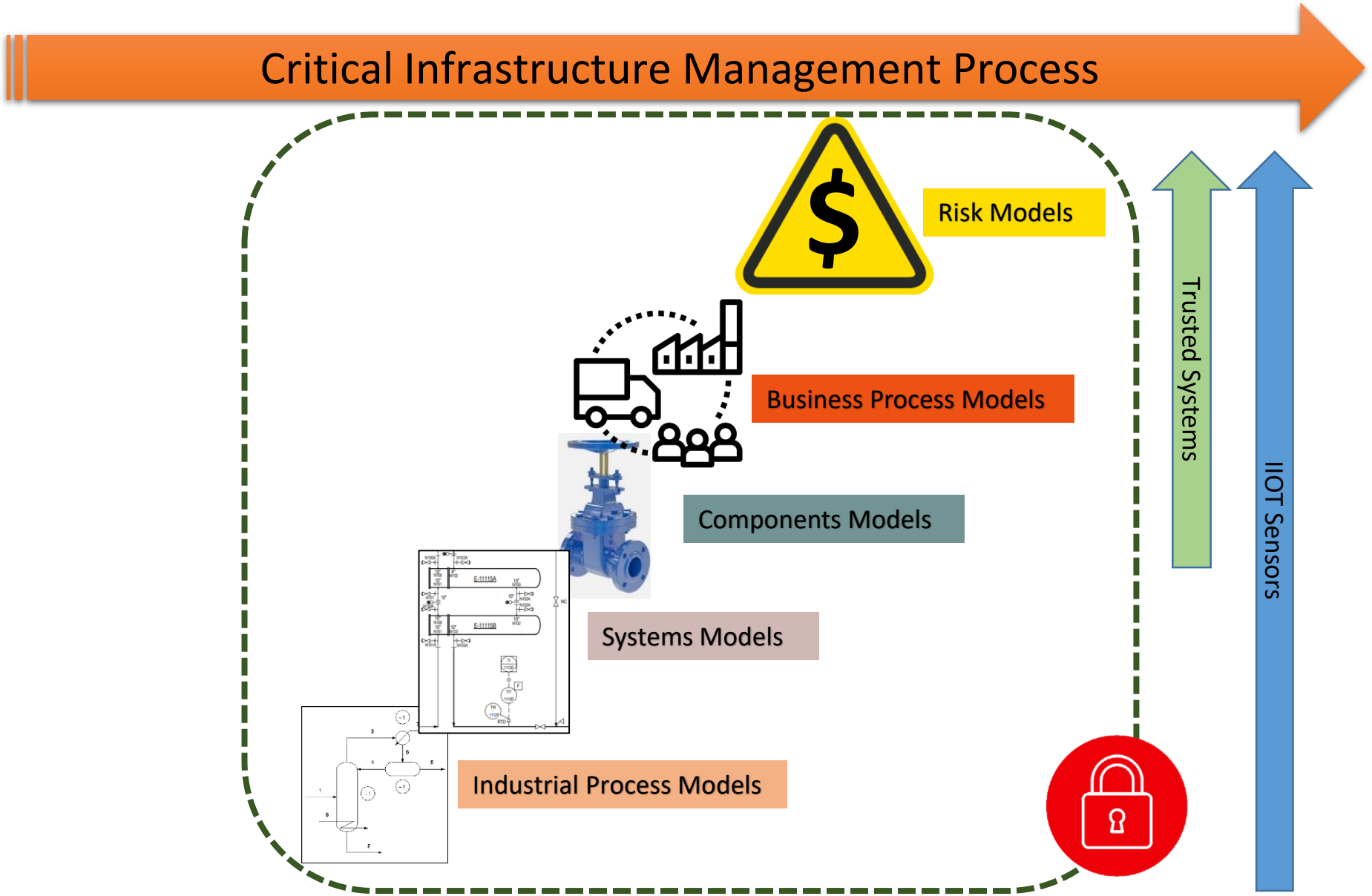
# The Critical 5

- The Critical Five was established in 2012 to enhance information sharing and work on issues of mutual interest between Australia, Canada, New Zealand, the United Kingdom and the United States.
- One of the first efforts was to understand how each country addresses critical infrastructure as a basis for clearly articulating and communicating a common message on the value, meaning, and importance of critical infrastructure.
- "Forging a Common Understanding of Critical Infrastructure" published March 2014.
- "The Role of Critical Infrastructure in National Prosperity" published October 2015

# Australia, Japan and United States Trilateral Partnership

- Announced July 31, 2018
  - Australia: Minister for Foreign Affairs-The Hon Julie Bishop MP
  - Japan: Japanese Bank for International Cooperation
  - United States: United States Overseas Private Investment Corporation (OPIC)
- Indo-Pacific region
- Cooperation on Investment to:
  1. Build infrastructure
  2. Address development challenges
  3. Increase connectivity
  4. Promote economic growth

# Critical Infrastructure Risk Modelling and Management



# OSA-CBM Dual Use Technology Program

## Office of Naval Research

### MIMOSA Information Network (MIN)

June 21, 2000

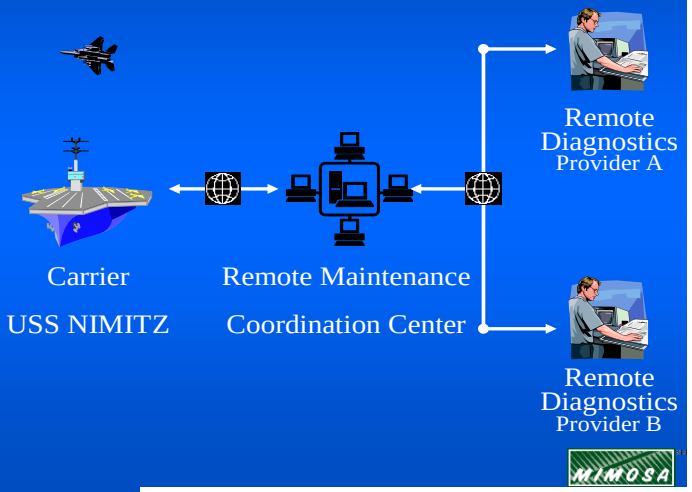
MIN-Viewer

OSA-CBM Presentation

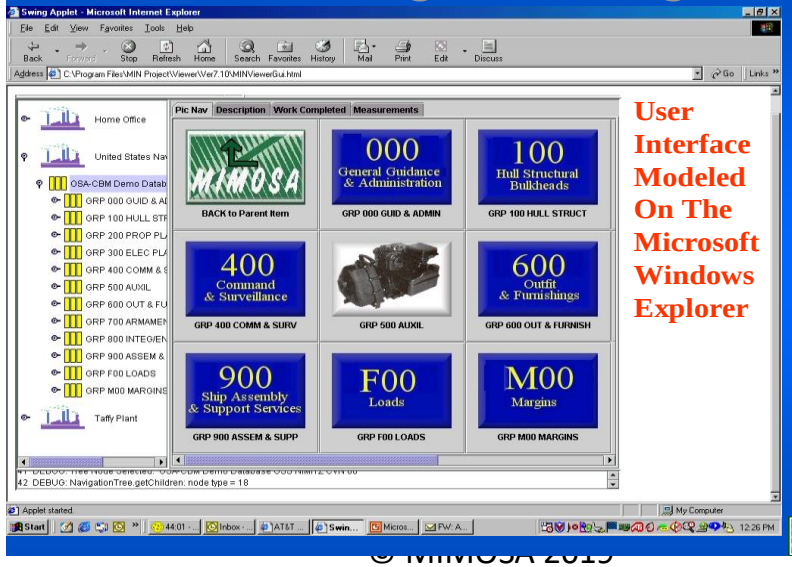
Alan T. Johnston

MIN Project Director

### The OSA-CBM MIN Demonstration Concept




### MIN-Viewer Segment Navigation 1




User Interface Modeled On The Microsoft Windows Explorer

**Model, Monitor and Manage Complex Physical Assets**

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

# Army Collaborative Telemaintenance

## US Army CECOM

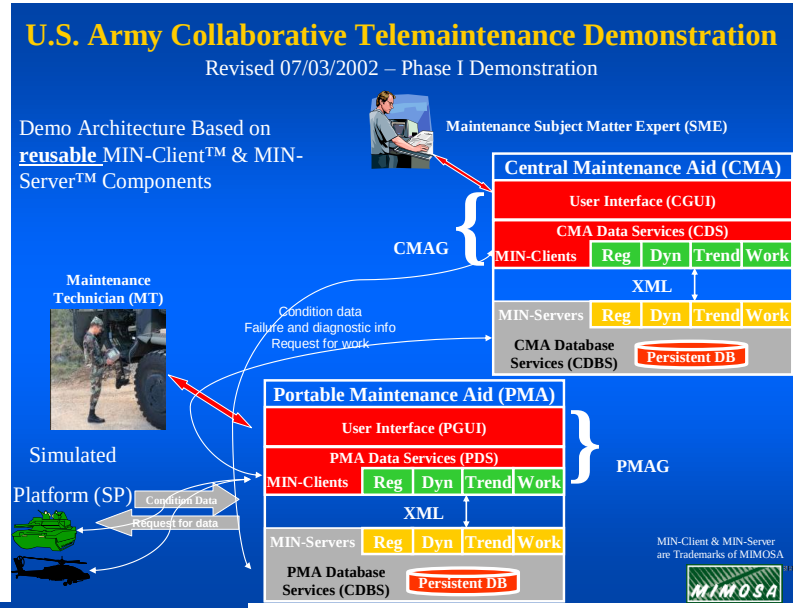
### U.S. Army CECOM
### Collaborative Telemaintenance Project

Phase I Demonstration Briefing – July 31, 2002

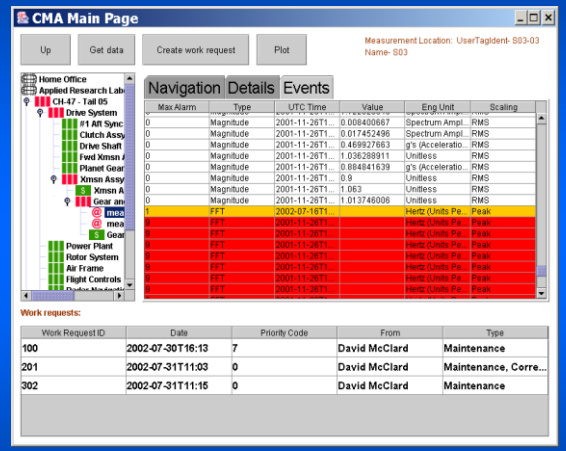
Alan Johnston – MIMOSA
Kenneth Bever – MIMOSA
Bob Walter – Penn State ARL

### U.S. Army Collaborative Telemaintenance Demonstration

Revised 07/03/2002 – Phase I Demonstration



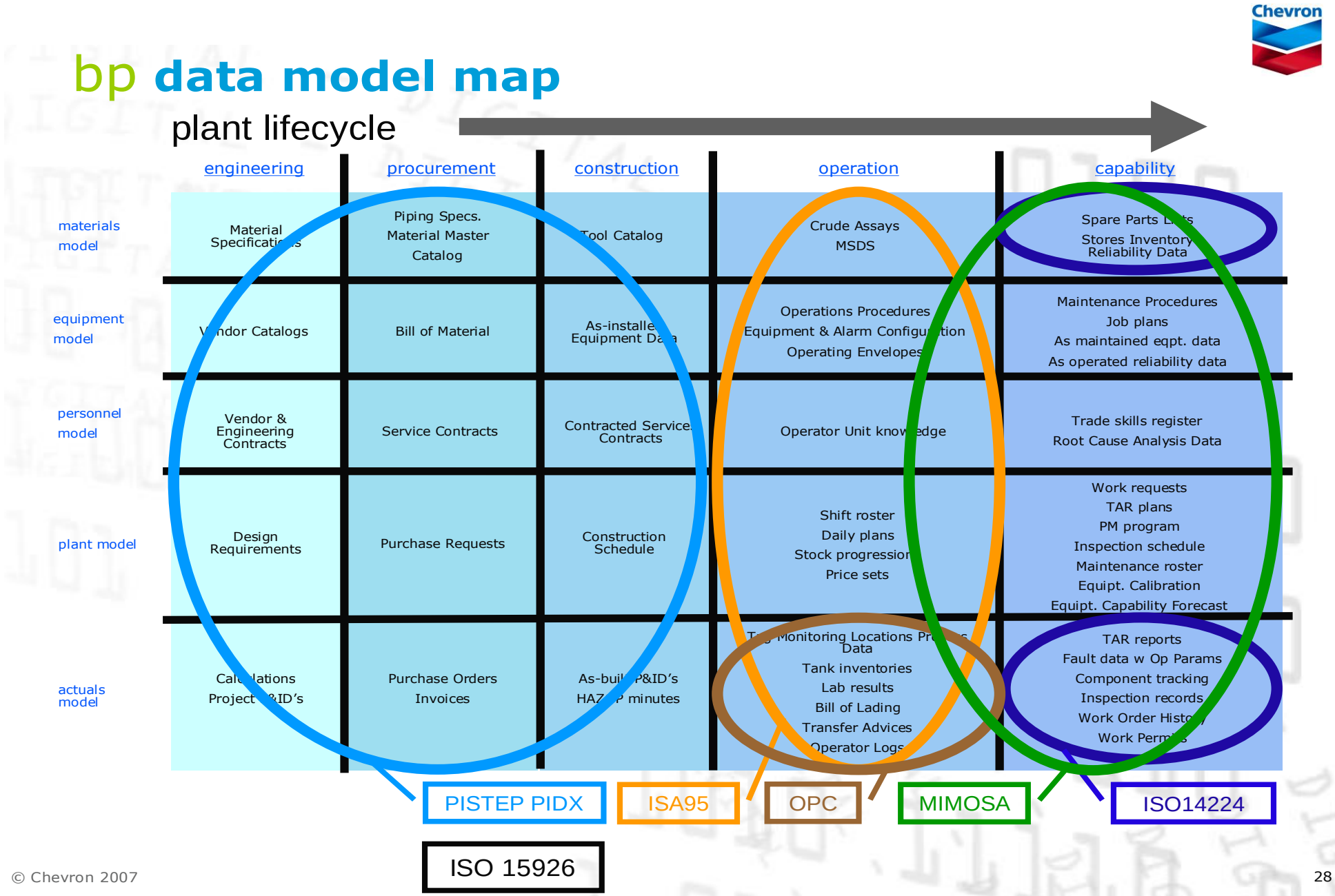

### CMA Showing Measurement Events In Alarm



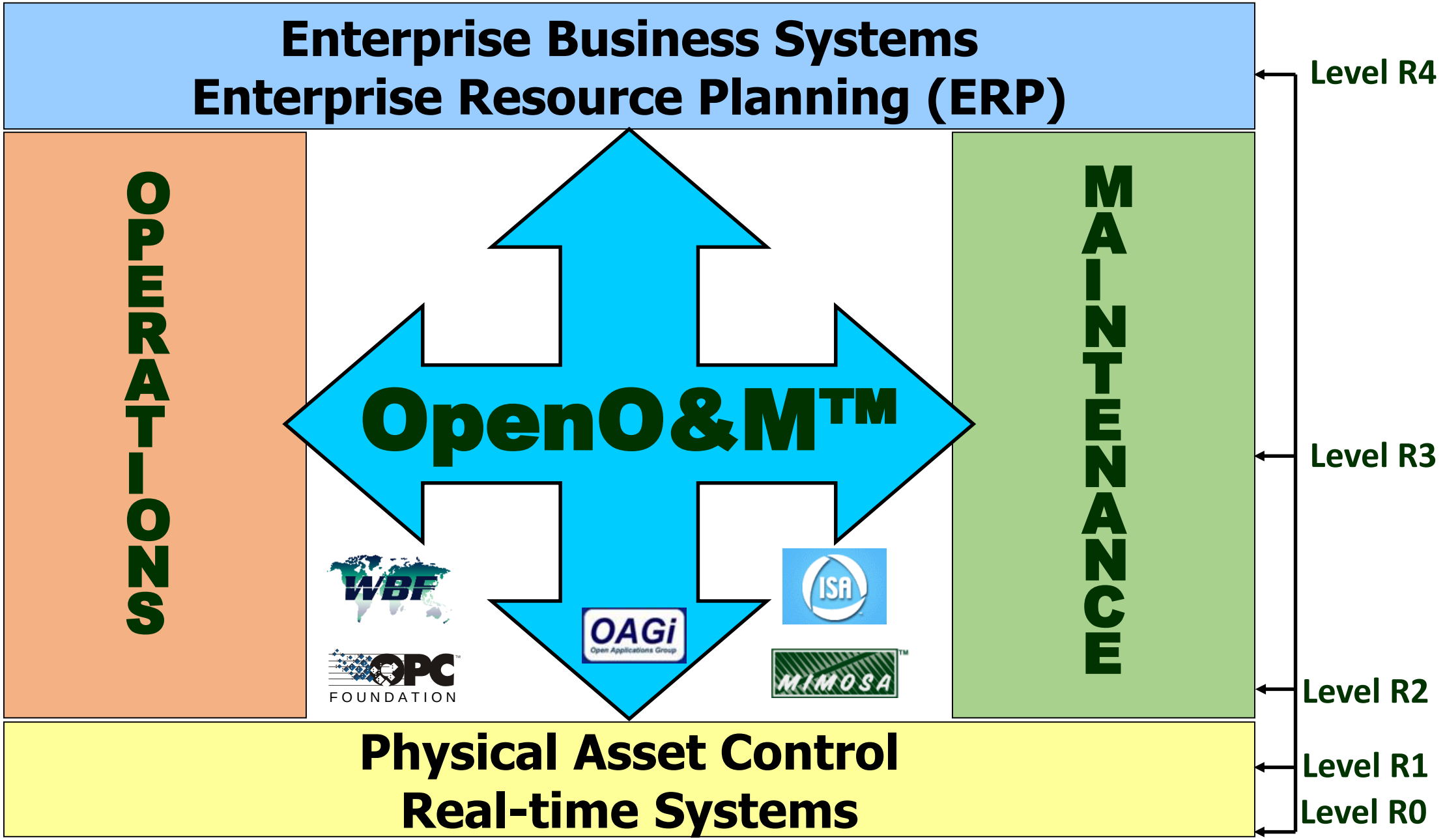

**Model, Monitor and Manage Complex Physical Assets**

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

# Industry Example of Asset Management Standards Domain Mapping-Circa 2007



# OpenO&M Initiative – Formed 2004

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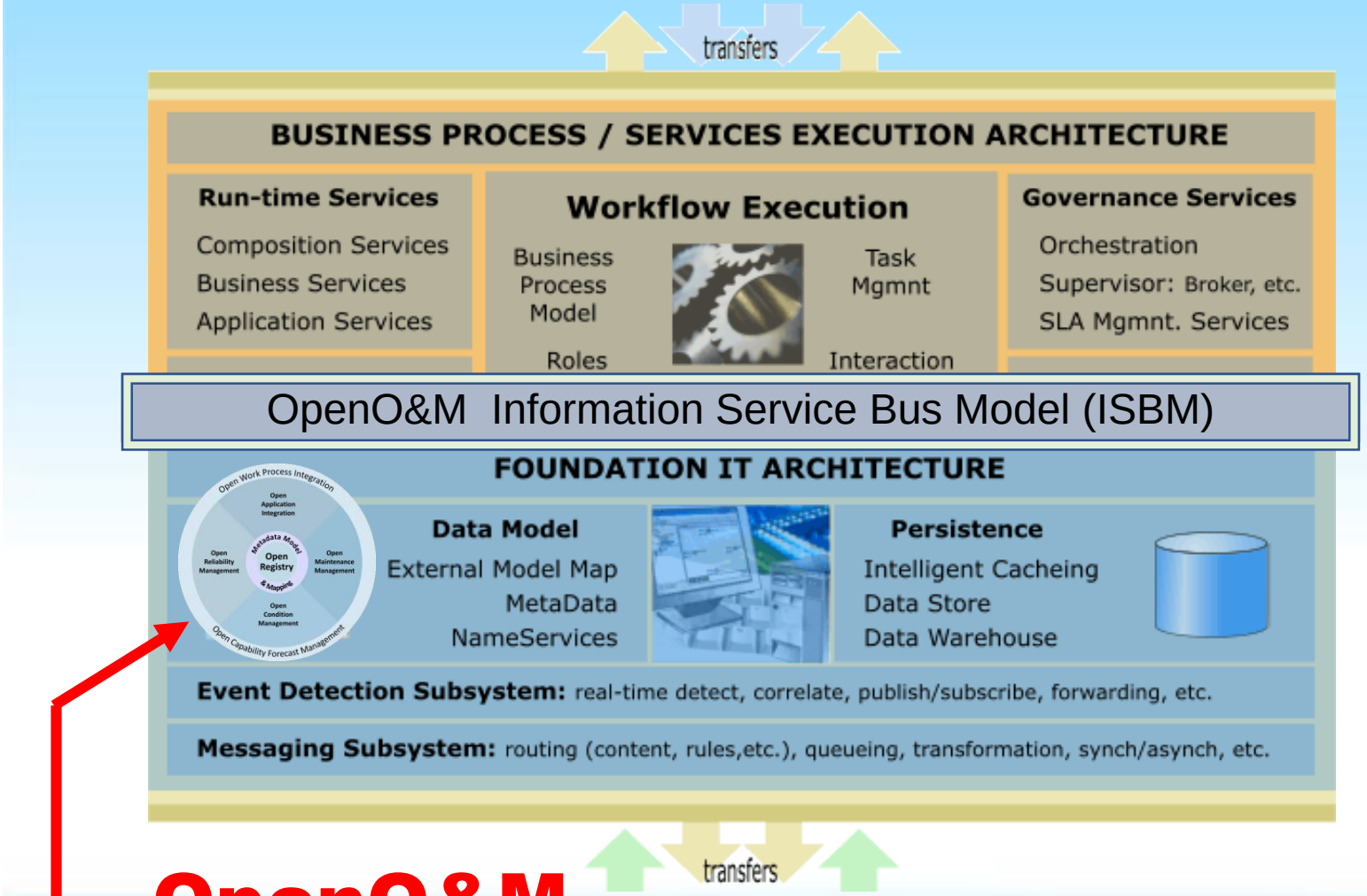
# Owner/Operators Objective
# Shared Industry Foundation Architecture




2

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# The Present

## Industrialization of the Internet

## Industry, ISO and IEC Level Cooperation

Many business models are already broken. Others are breaking. Major changes are inevitable.

- Network Models are inherently adaptive and fault tolerant.
- **The OIIE and ISO 18101 provide a pragmatic path forward.**

# Relevant 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

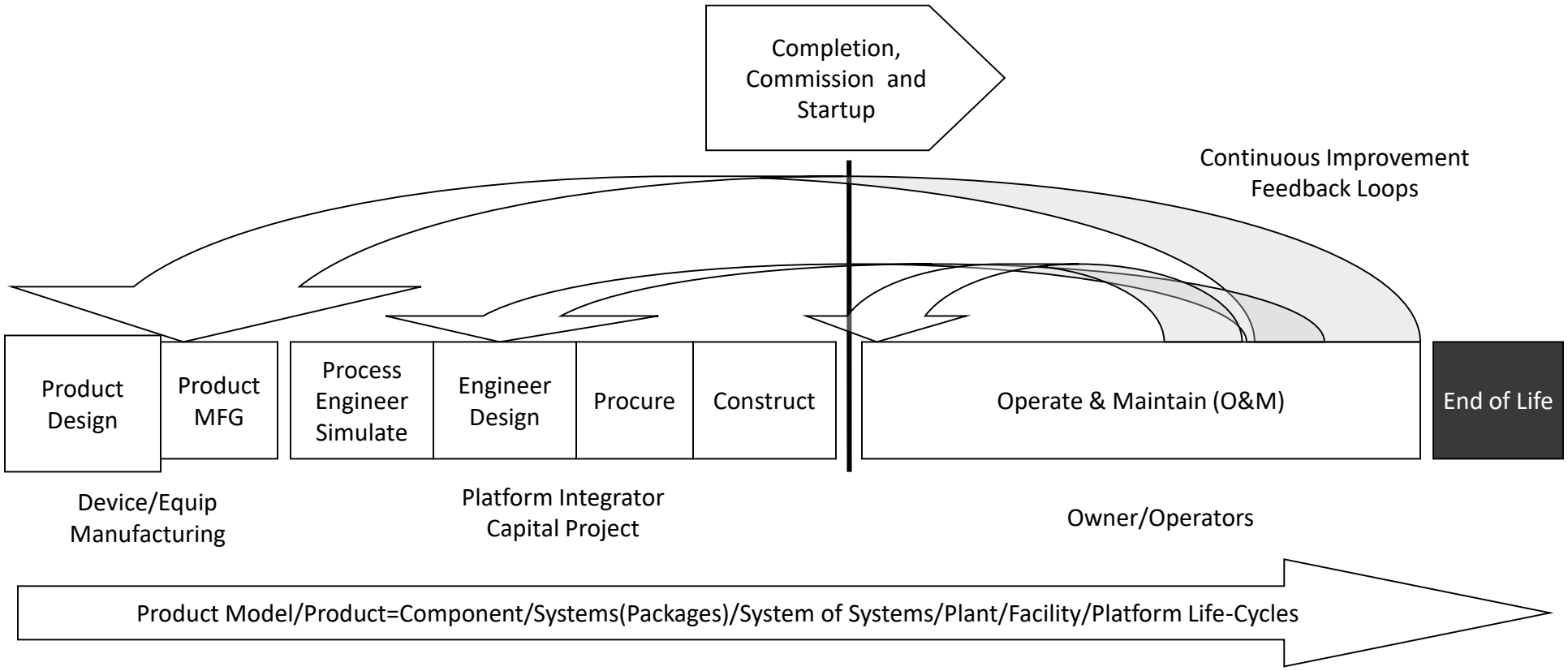
ISO 15926-Process Data
ISO 8000–Data Quality

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

ISO 18435-O&M Integration

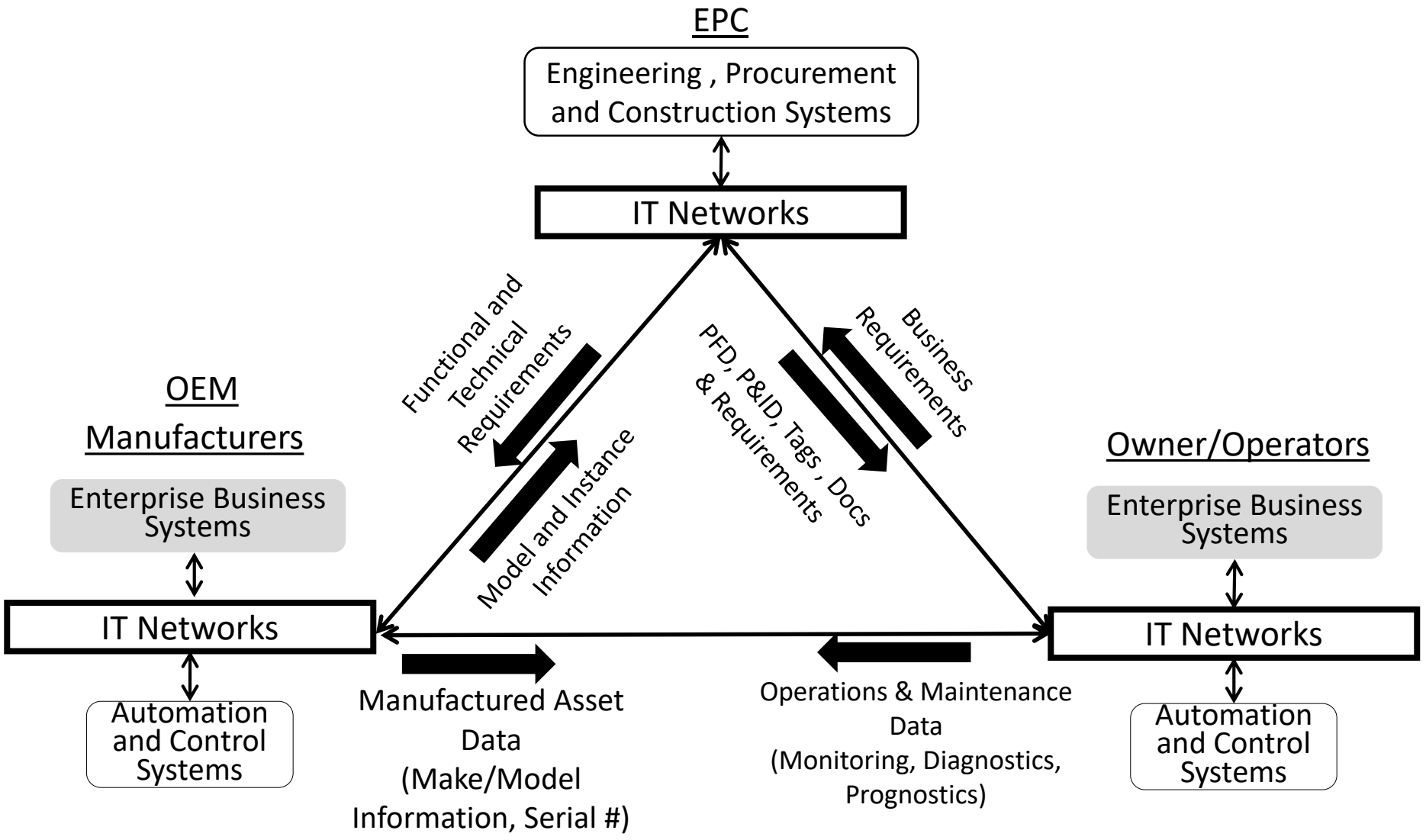
**Relevant Cooperation also exist between ISO and IEC**
**IEC TC 165 and JIEC/ISO WG 21**

# Secondary Business Process

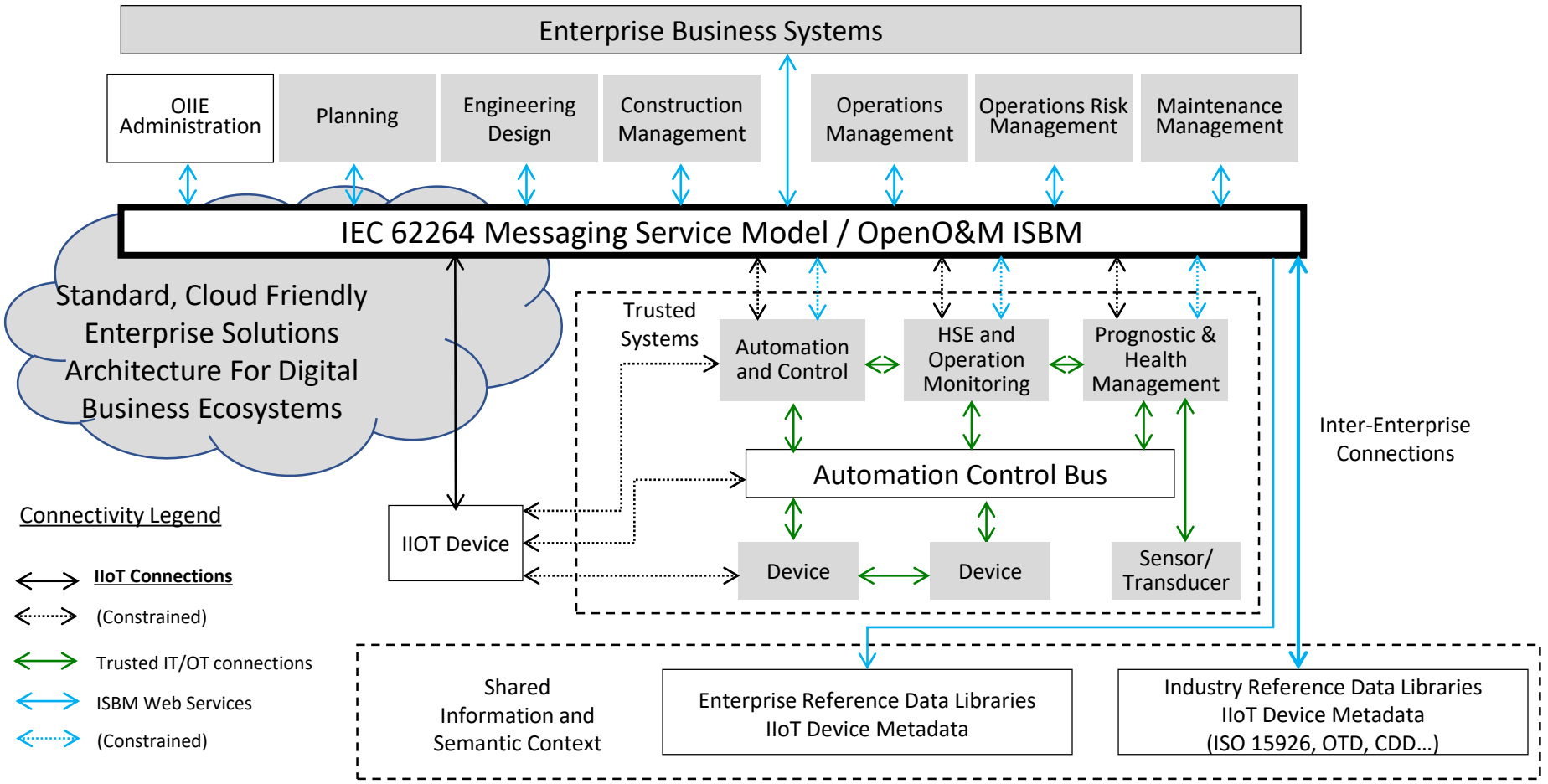



Derived from ISO TC 184
Manufacturing Asset Management Integration Task Force Final Report

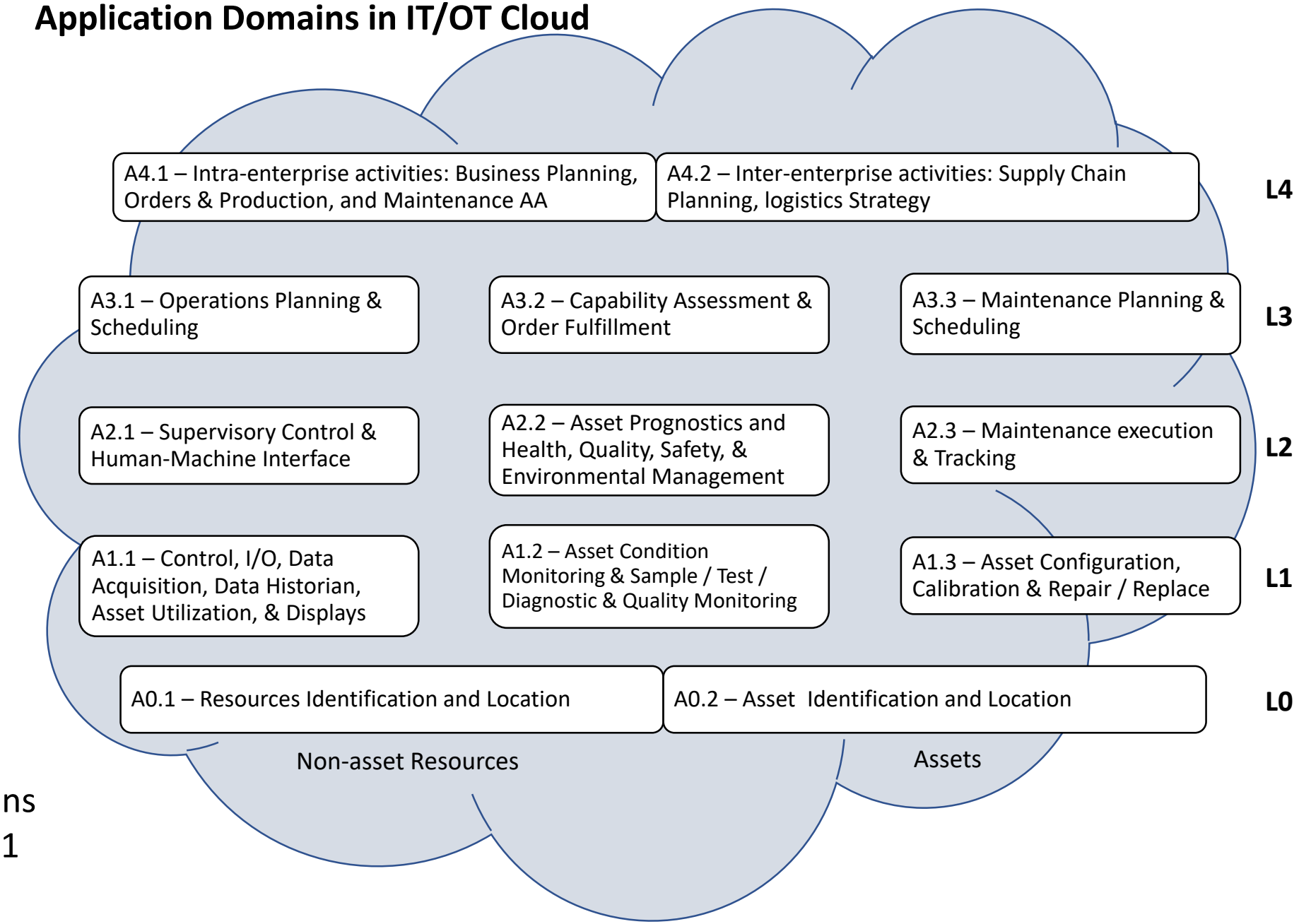
# Inter-Enterprise OIIE Digital Ecosystem



# Intra-Enterprise OIIE Digital Ecosystem



# Application Domains in IT/OT Cloud




ISO 18435 Application Domains as Depicted in ISO TS 18101-1 Normative Annex

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)

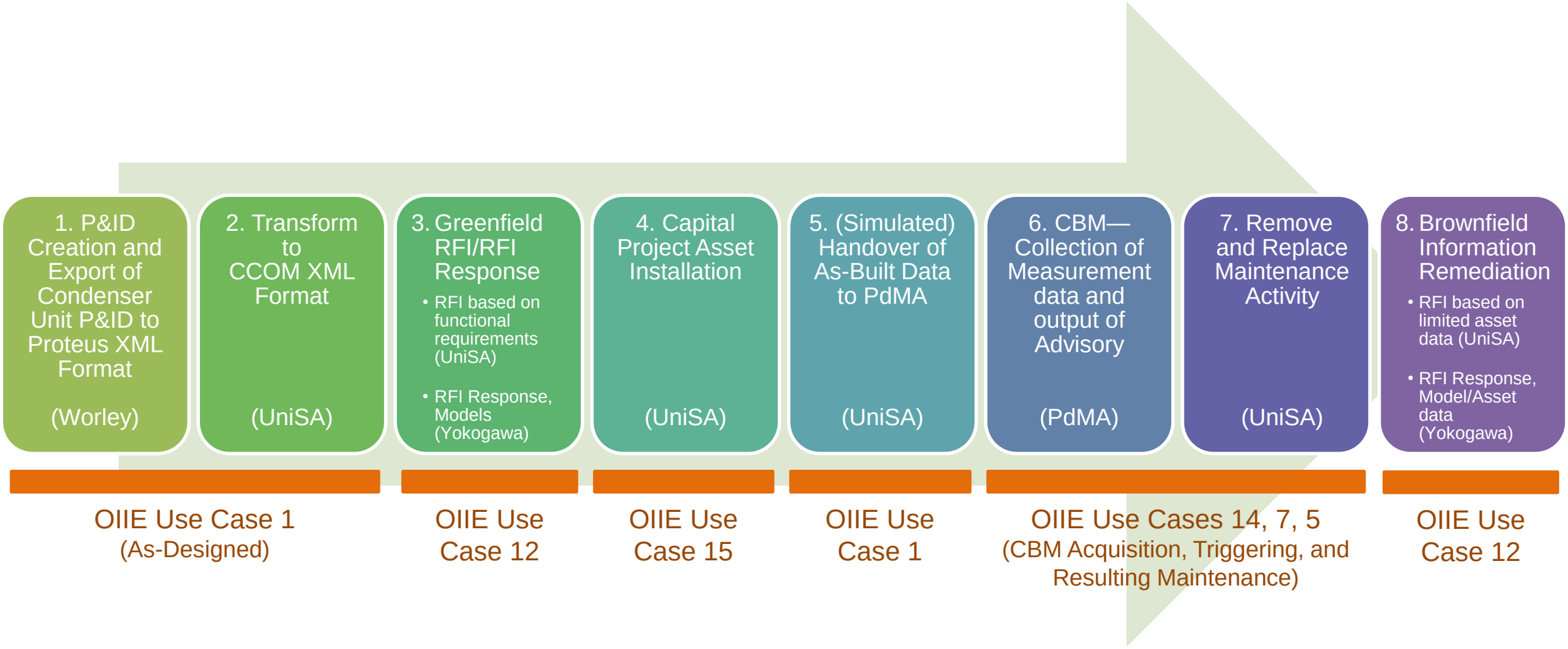


# ISO TS 18101-1 Foreword
## Paragraph 6

"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



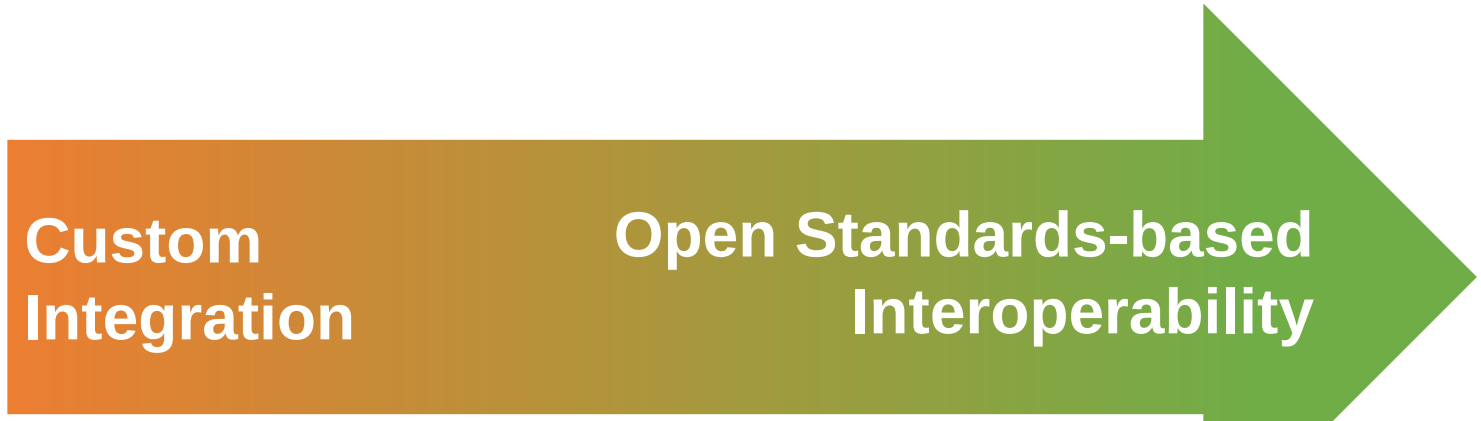
# Path Forward
## Pragmatic Industrial Digital Transformation

Cooperation in network-based industry business models

- Stimulate and connect sources of innovation
- Supplier-neutral Industrial Digital Ecosystems enable Industrial Digital Transformation

# Industrial Digital Transformation - 2020

## A Pragmatic Solution: Standards-based Interoperability




**Open Industrial Interoperability Ecosystem (OIIE) ISO TS 18101**

- Owner/operator responsible for sustainment
- High Development and Sustainment Costs
- Inflexible and Fragile
- High Risk/Vulnerable
- No practical basis for industry transformation

- Defined by supplier-neutral standards
- Suppliers build and maintain standard adaptors with commercial support model
- Higher quality with lower costs and risks
- Practical Basis for industry transformation

**Industry Standard Digital Ecosystem**

- Supplier neutral – open source and COTS
- Standard shared set of standards
- Standard APIs and services definitions
- Standard information payloads
- Standard reference data - ISDDs
- Standard ecosystem administration
- Standard piloting testbed
- ➢ Standard use case architecture
- ➢ Standard use cases, scenarios & events
- ➢ Standard adaptors

# OIIE OGI Pilot Phase 3.2

- **Starting NOW**
- Includes sponsorship by National Energy Resources Australia
  - Mission is to improve efficiencies in Australian Energy Sector
  - Australia does not have globally dominant IT suppliers and wants to be free to innovate
  - They are positioning the OIIE as the innovation template for their SMEs
  - 4 University based research centres are included along with Woodside and Origin
  - Australia Roadshow in early 2020 – Adelaide, Brisbane, Perth
- Scope
  - Add basic Inter-bus and Inter-enterprise features to OIIE OGI Pilot
    - Associated with OpenO&M ISBM 1.2 Specification Update (OpenO&M and NIST)
    - Driven by Use Cases (starting with RFI/RFI Response)
    - **Test validate joint work on IIOT/CBM with NIST**
  - OIIE Entry Point for ILAP (with Team Norway)
  - OIIE Entry Point for SPIR
  - Preparation for next steps with NIST, NERA, CII, THTH and IOGP

# The Open Industrial Interoperability Ecosystem (OIIE) and ISO 18101
# The Industry and ISO Standard Solution