Open Industrial Interoperability Ecosystem (OIIE), OIIE Oil and Gas Interoperability (OIIE-OGI) Pilot and ISO 18101-1

THTH Spring Seminar

May 29, 2019

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Presentation Topics

- **Useful standardization activities gain business efficiencies**
- Open Industrial Interoperability Ecosystem (OIIE)–Supplier-neutral Industrial Digital Ecosystem
  - Focused on the secondary business process – Life-cycle Asset Management
  - Multiple process industry groups have concluded they can standardize activities in the secondary business process
  - **Major business change from Integration to Standards-based Interoperability – The Industrial Model**
  - Pragmatic solutions model based on standardization of traditional enterprise integration best practices
  - Industry use case driven
- OIIE Oil and Gas Interoperability (OGI) Pilot
  - Simulates real world life-cycle asset management in asset intensive process industries
  - Oil and Gas Specific only to the degree that the included asset classes are associated with a refinery
  - Future intent to have other asset classes for other industries (Waste Water Treatment, **Pulp and Paper with THTH)**
  - R&D Testbed for OIIE and ISO 18101
  - Pilot Phase 3.1 Running Now , Phase 3.2 Scheduled to start by August
- Industry Standard Datasheet Definitions (ISDDs) for Components & **Packages**
- ISO 18101 – Oil and Gas Interoperability
  - Based on OIIE and OIIE OGI Pilot
  - **Part 1 is at ISO for publication**
- Existing Cooperation - MOU with MIMOSA and USPI
- Critical Infrastructure Risk Management, Interdependencies and Standardization
- NIST Open Industrial Digital Ecosystem Summit-Co-Sponsored by MIMOSA and OAGi
- **Pending MOU between THTH Association**

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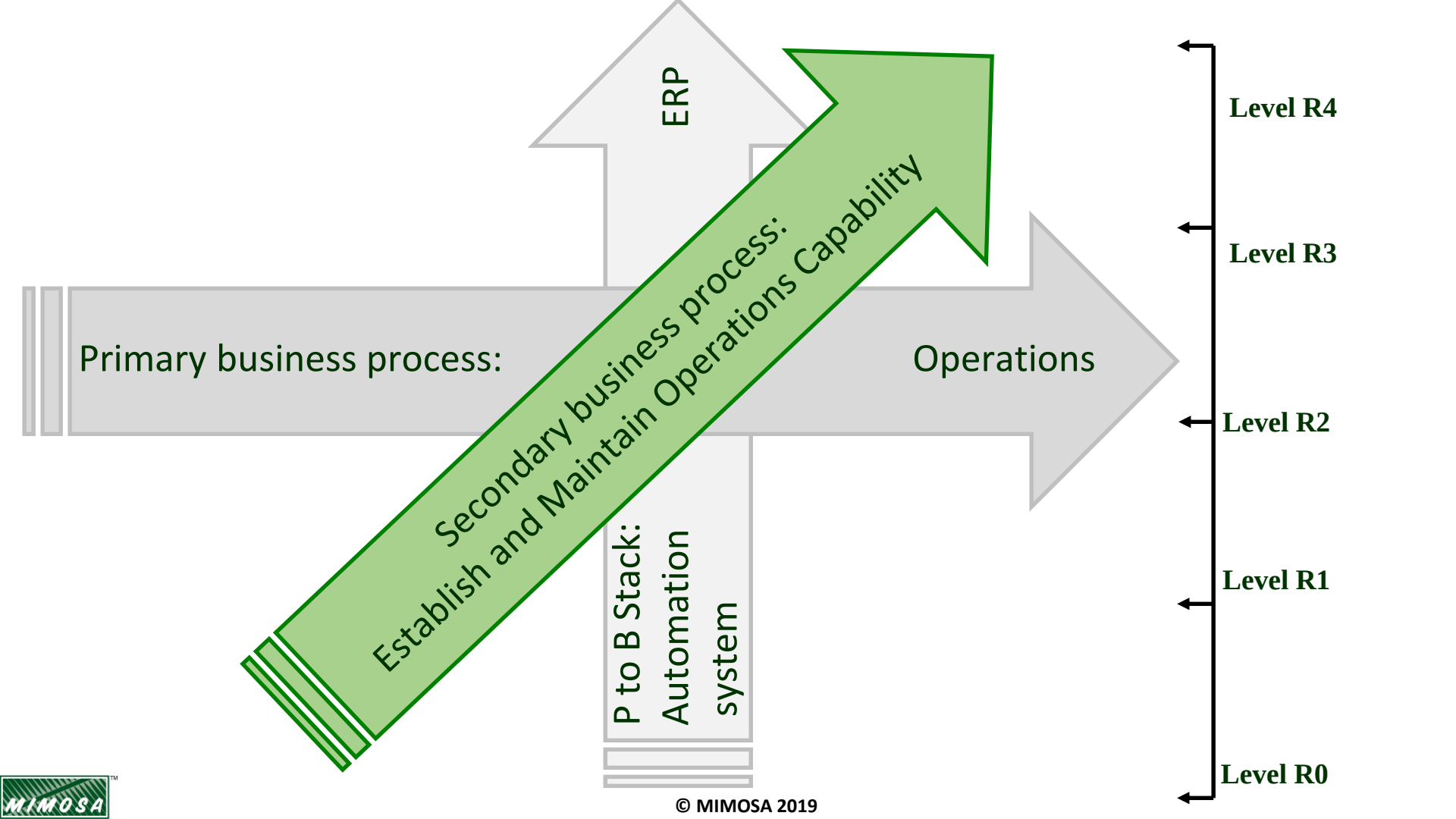
ERP
Primary business process:
Operations
Secondary business process:
Establish and Maintain Operations Capability
P to B Stack:
Automation
system
Level R4
Level R3
Level R2
Level R1
Level R0

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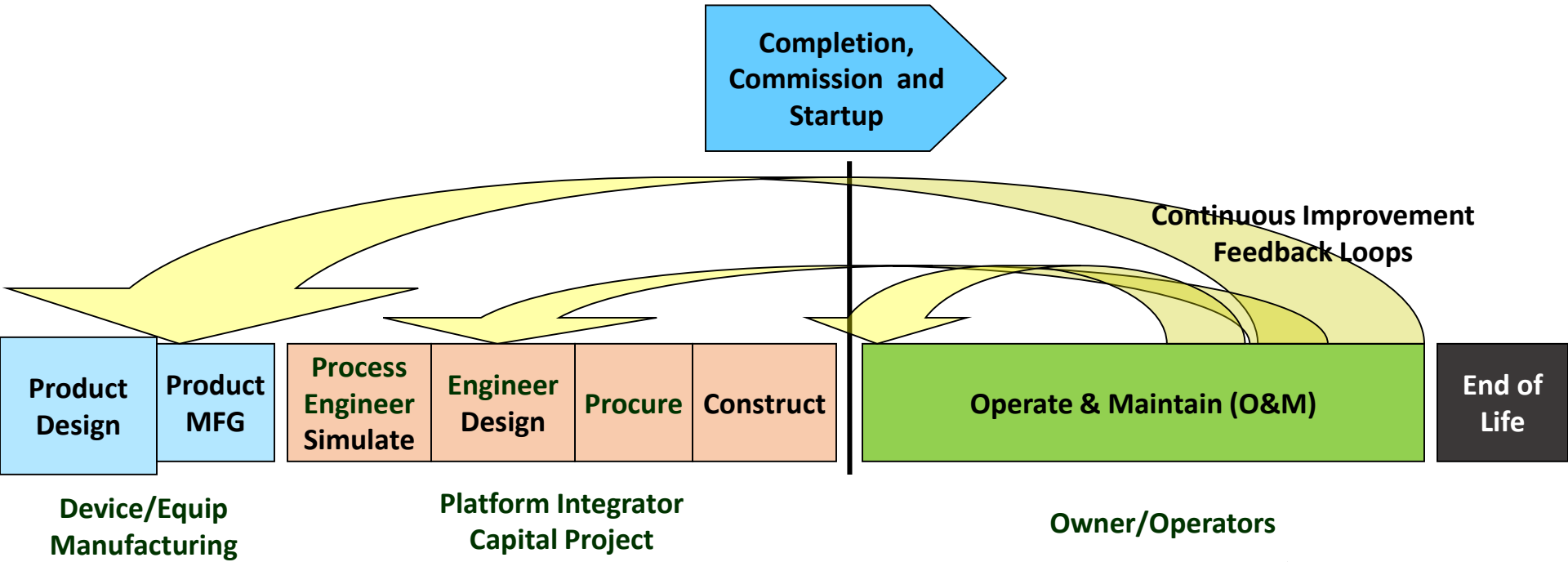
Full Asset Life-cycle Management



Product Model/Product=Component/Systems(Packages)/System of Systems/Plant/Facility/Platform Life-Cycles

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

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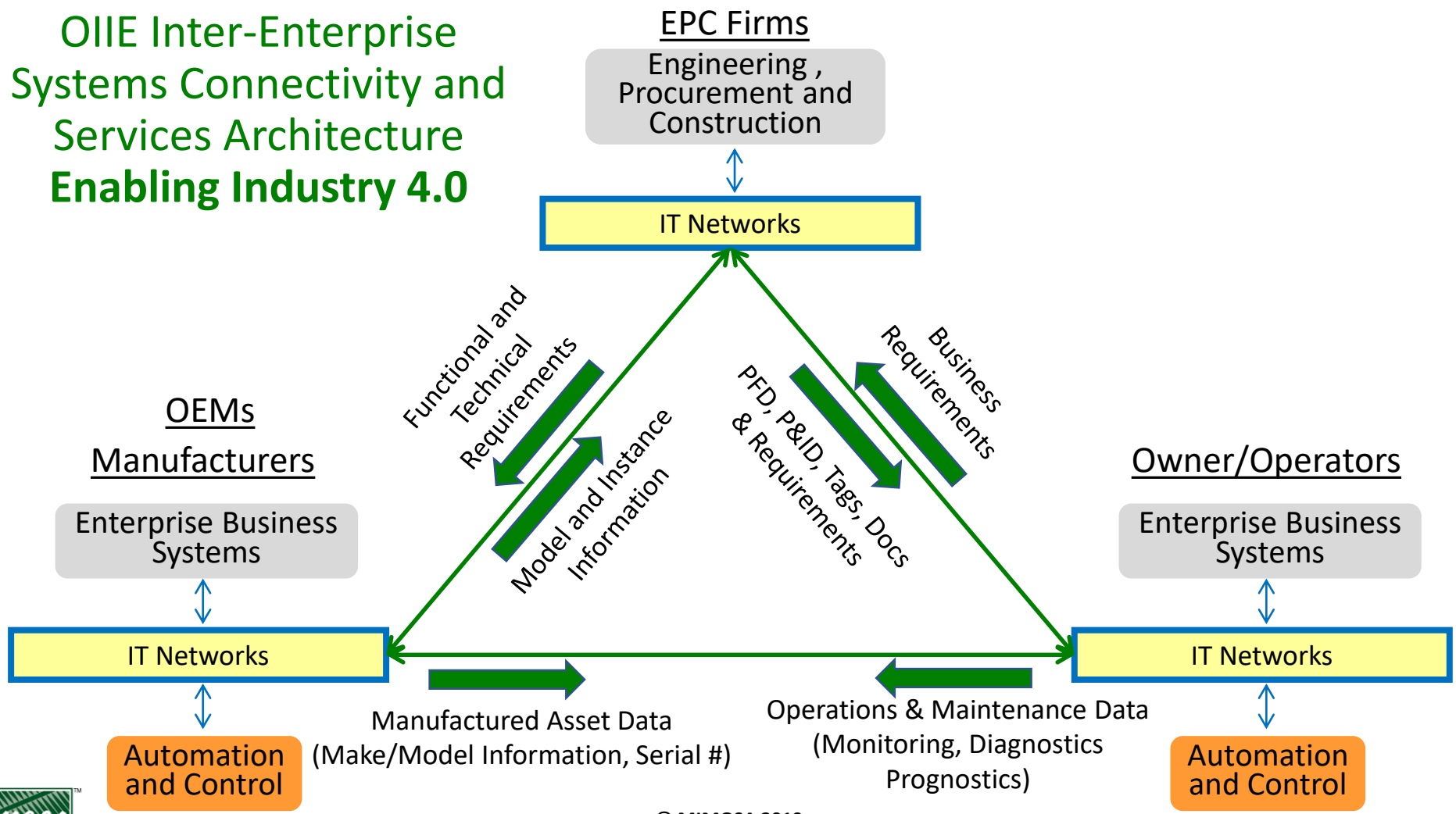
OIIE Inter-Enterprise Systems Connectivity and Services Architecture

Enabling Industry 4.0



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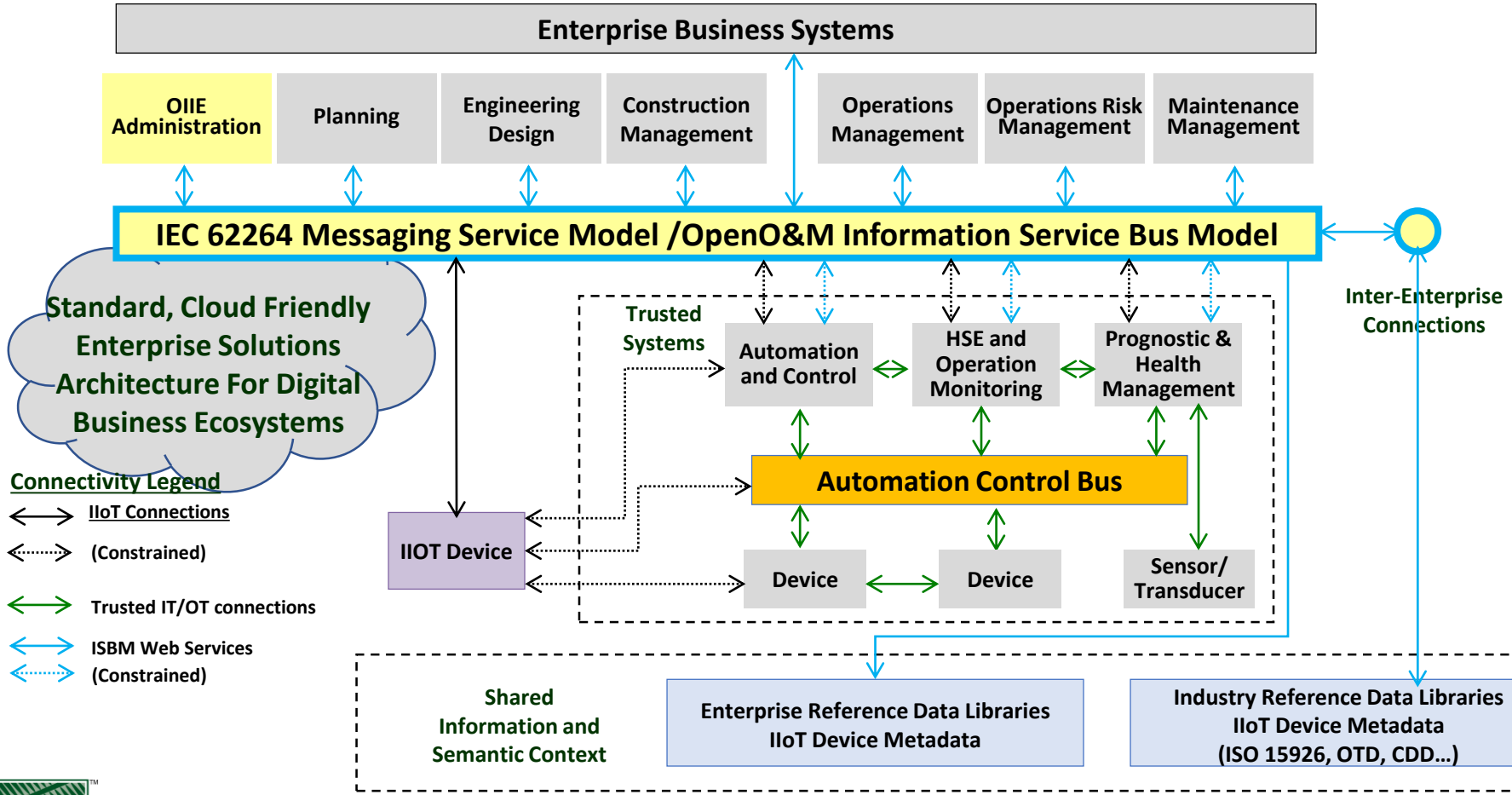
OIIE Intra-Enterprise Systems Connectivity and Services Architecture



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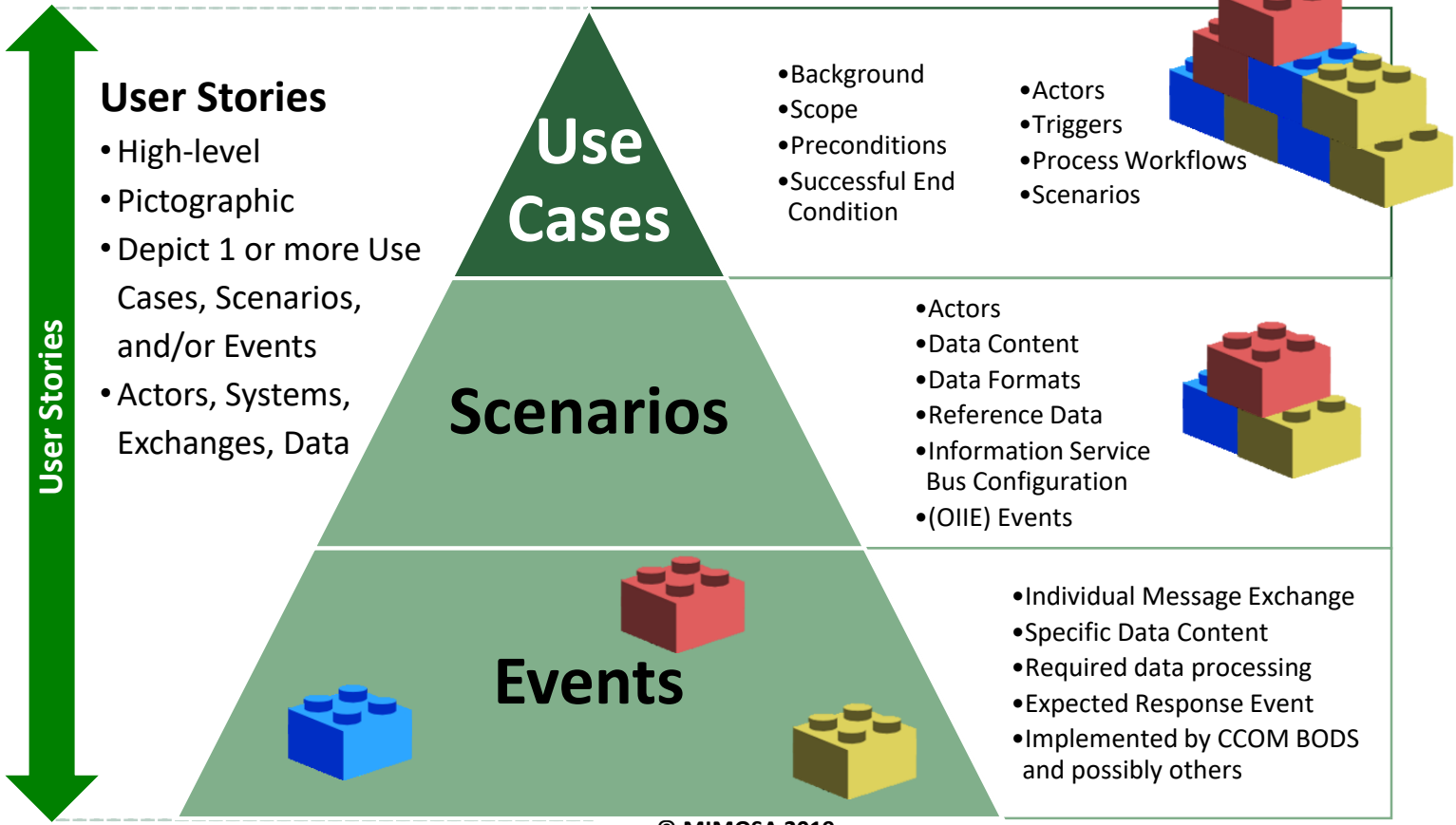
OIIE/OGI Standardized Use Case Architecture

Standardized Methodology to Define and Re-use OIIE Components



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OIIE OGI Pilot
Phase 3.1 – Ending in July 2019

Pilot sub-phases of 6 months duration

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OIIE/OGI Pilot Background

- OGI Phase 1: 2009-2012 Daratech Plant, ISA Expo, ISA Automation Week
- OGI Pilot Phase 2: 2013-2015
  - Identified need for ISDDs
- OIIE Background
  - OGI Pilot Phases 1 and 2 we realized the work was applicable to
    - Many process industries
    - Major Critical Infrastructure Sectors
  - We saw the need for a standard industrial digital ecosystem specification
  - The OIIE OGI Pilot is an OIIE Instance, which
    - Includes Oil and Gas Industry Asset Classes
    - Includes Oil and Gas Industry Use Cases, most of which are applicable to other process industries
- ISO 18101 – Also leverages both OIIE and OIIE OGI Pilot

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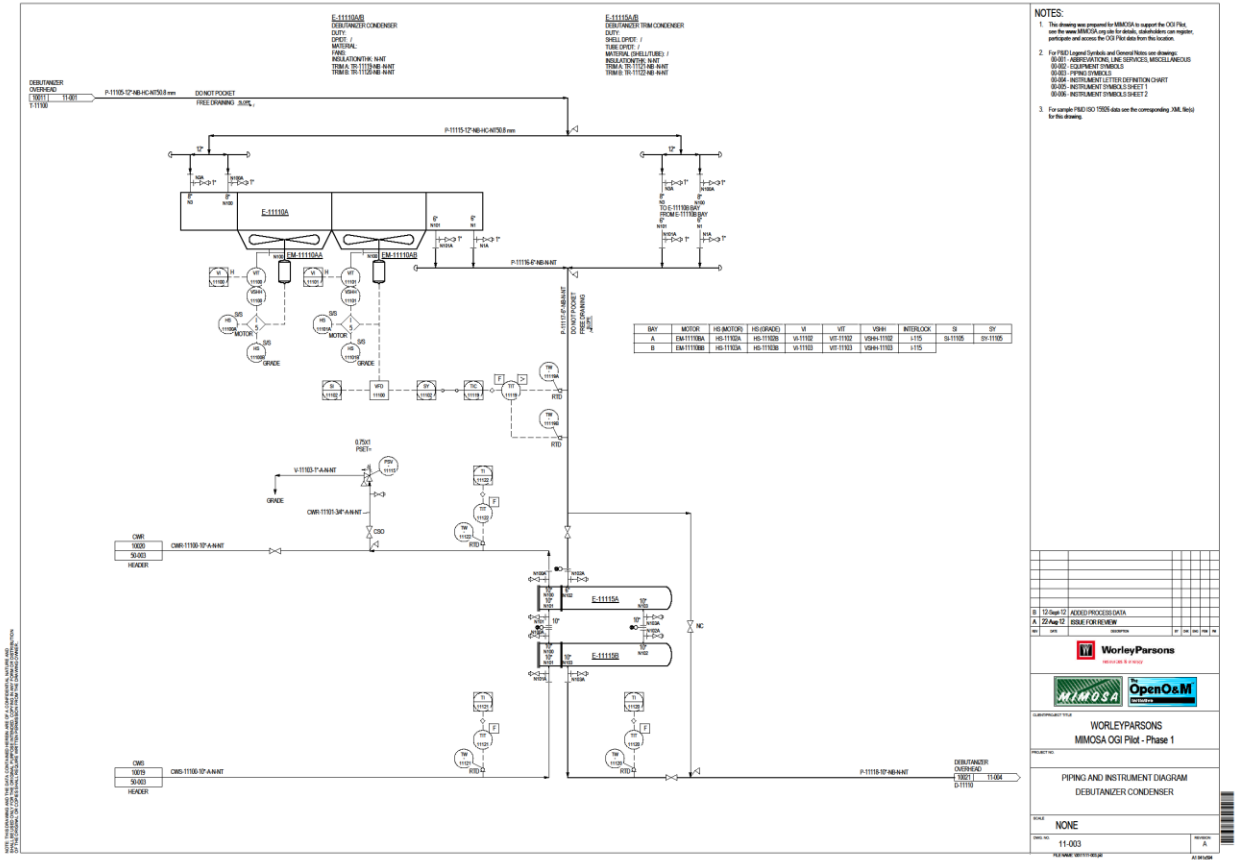
Condenser Sub-System for OIIE OGI Pilot



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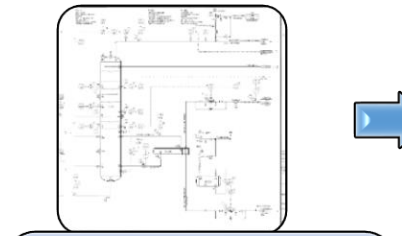
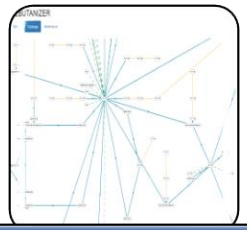
OIIE OGI Pilot Phase 3.1 Activities 1-4 (Use Cases)



Debutanizer Tower Condenser Unit P&ID

- Worley Parsons, Fluor
- Aveva, Hexagon (Proteus XML)
- Bentley (CCOM XML)

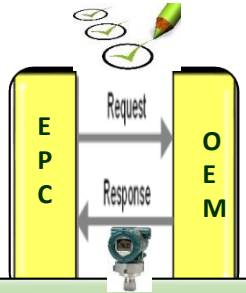
Adding Detail to Prior Work



P&ID Logical Connection information

MIMOSA Structured Digital Asset Interoperability Registry

As-Designed O&M Takeoff using CCOM or Proteus

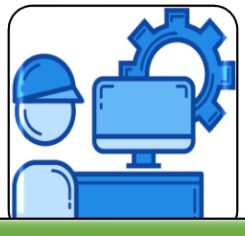


RFI/RFI Response (Greenfield)

- RFI – Functional requirements
- RFI Response – Models
- Request for Model properties (ISDDs)

Use Cases ISDD Based Way of Specifying, Selecting and Buying Devices and Equipment

Procure With OAGi



Capital Project Asset Installation

- Asset instances selected from RFI Response (defined using ISDDs)
- Installed on P&ID Tag locations (defined using ISDDs)

Use Case Adding As-Built Information Using OIIE Events

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OIIE OGI Pilot Phase 3.1 Activities 5-8 (Use Cases)

Information Handover

From Capital Project to Operations and Maintenance

Over ISBM (Information Service Bus Model)

Simulated

Condition Based Maintenance

Diagnostics

Prognostics

Advisory Generation

Use Case(s)

Remove and Replace

Use Case

RFI/RFI Response (Brownfield)

Information Remediation

Use Case

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Industry Standard Datasheet Definition (ISDD) Project Update

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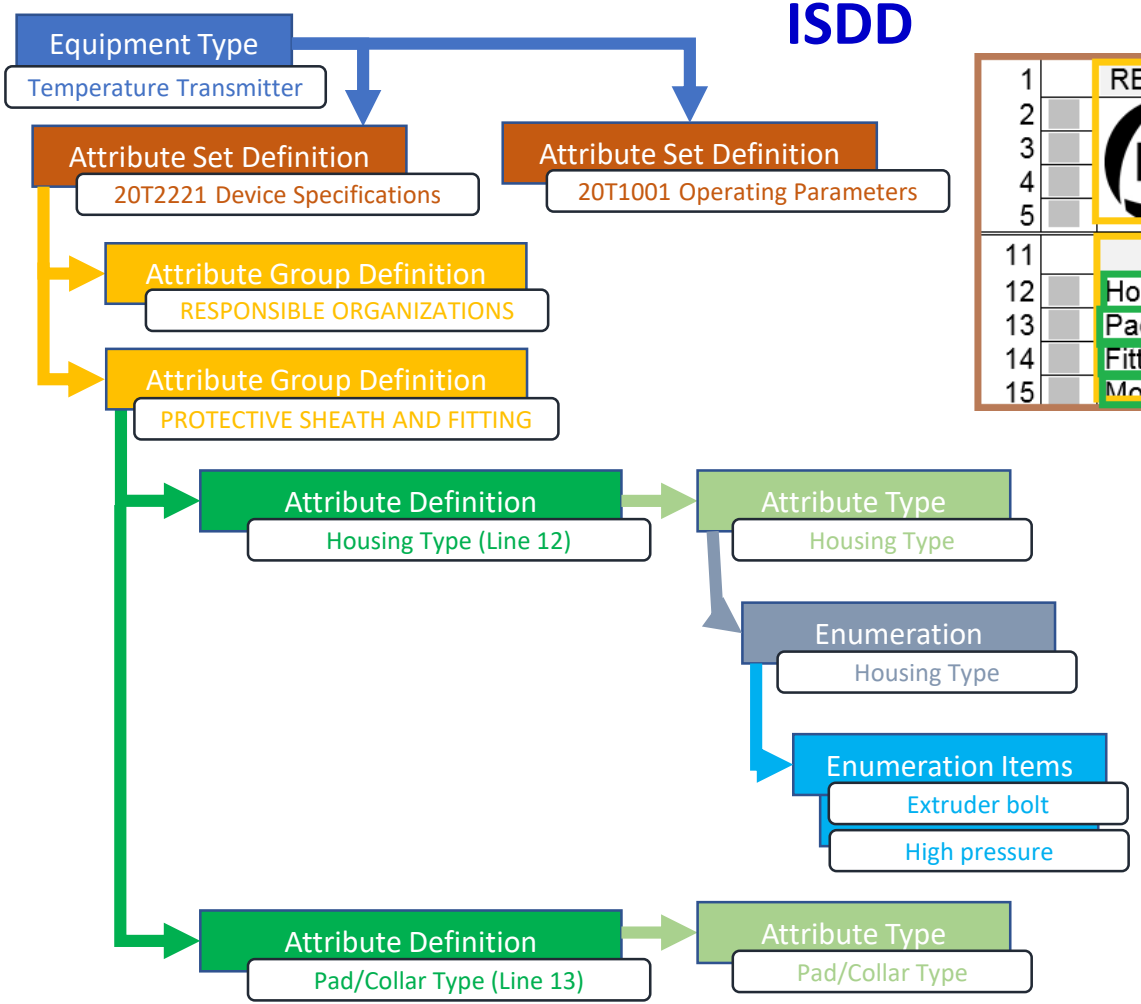
ISDD



ISA 20T2221 Datasheet

1	RESPONSIBLE ORGANIZATION		RTD ASSEMBLY w/wo THERMOWELL Device Specification	
2	ISA			
3				
4				
5				
11	PROTECTIVE SHEATH AND FITTING			
12	Housing type			
13	Pad/Collar type			
14	Fitting conn nominal size		Style	
15	Mounting fitting type			

ISA 20T2221 Picklist

Line No	Field Prompt	Pick List Data
011	PROTECTIVE SHEATH AND FITTING	SECTION TITLE
012	Housing type	extruder bolt
012	Housing type	high pressure
012	Housing type	overbraided
012	Housing type	pad design
012	Housing type	tubular
012	Housing type	tubular,reduced tip
013	Pad/Collar type	1 3/4x1 3/4 flat parallel
013	Pad/Collar type	1/4 in x 1 1/4 in
013	Pad/Collar type	1x1 flat parallel
013	Pad/Collar type	1x1 flat perpendicular
013	Pad/Collar type	1x1 formed parallel
013	Pad/Collar type	1x1 pad w/cover
013	Pad/Collar type	3/4x3/4 flat parallel
013	Pad/Collar type	3/8 in x 1 in
013	Pad/Collar type	NA

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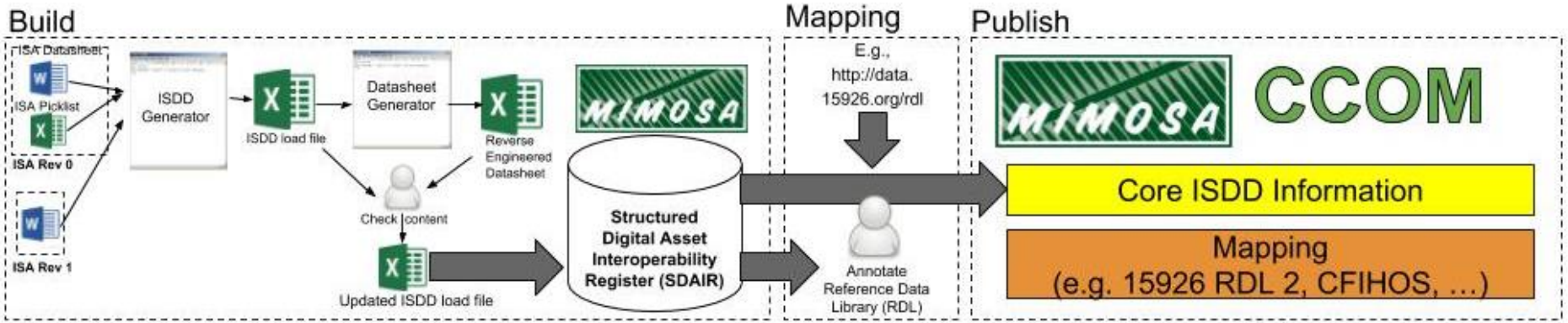
Current ISDD Build Process



- Applies to ISDs from all sources ISA (Rev 0, Rev 1), PIP, API, IEC..
- Degree of automation differs with datasheet complexity/consistency
- ISA Rev 1 now highly automatable
- Manual QA review identifies issues with extracted properties and issues/ambiguities in source datasheets
- XML–primary CCOM format
- Excel Spreadsheet–for Human Readability
- JSON–for IoT, light-weight data exchange

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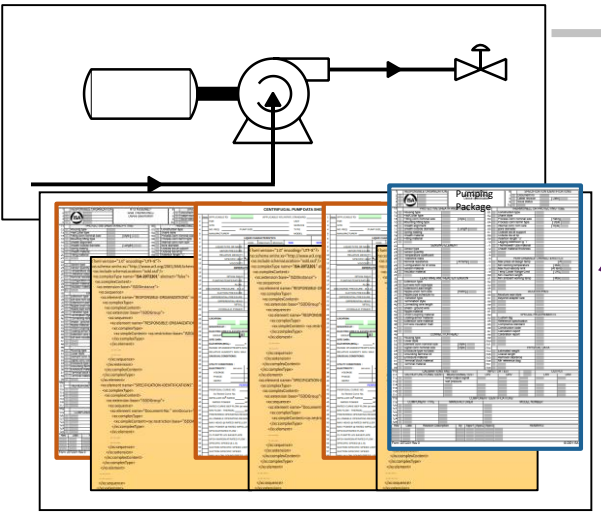
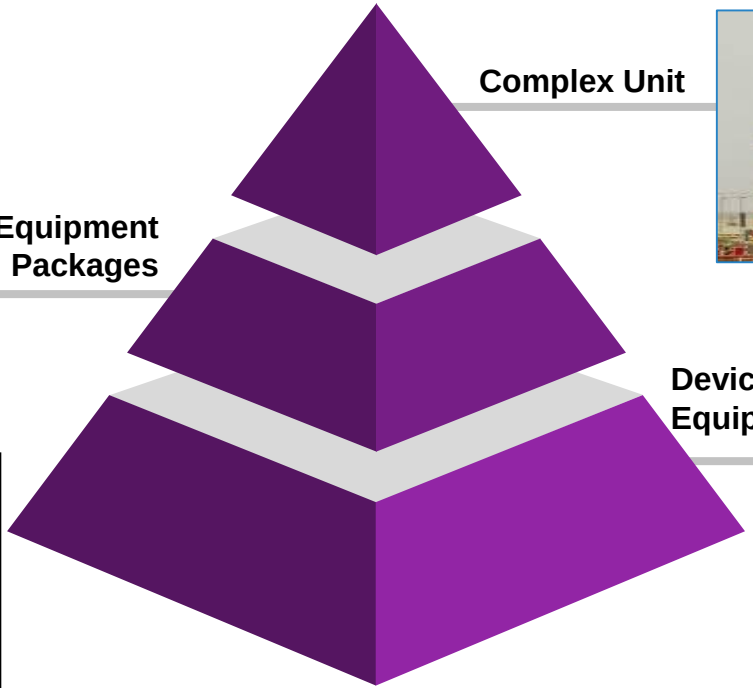
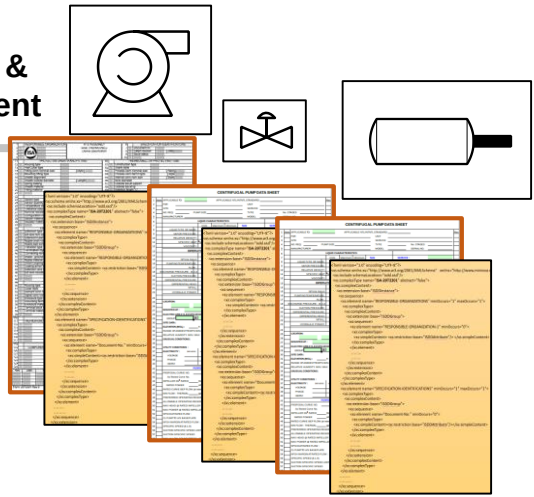
Package ISDDs: The Bigger Picture

Using CCOM, Standard Functional Packages can be modeled as Standard Systems which can be included in Systems of Systems defining an entire Unit.



Standardised ISDD Group for Package





ISDDs for Devices & Equipment

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Business Object Document for Packages

BOD: ProcessModelRequestforPackage

Application Area

Data Area

Verb: Process

Noun: ModelRequestForPackage

MIMOSA CCOM

Entity: **VF AC Drive**

ISDD Instances

Package ISDD Instance

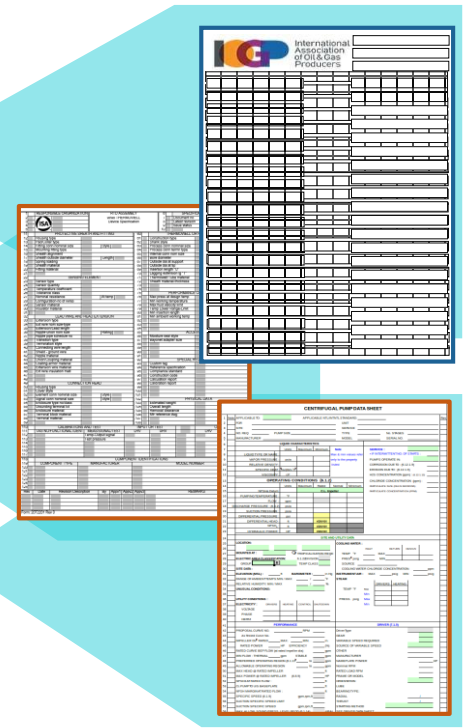
Entity: **Controller**

ISDD Instances

Entity: **Centrifugal Pump**

ISDD Instances

Used to support Standard Packages such as those being defined by JIP 33.



Use Case:
Make-Model Match-Up (Package)

Scenario: RFI for Possible Models for Package

- **Event 1: Process Model Request For Package**
- Event 2: Acknowledge Model Request For Package

Scenario: RFI Standard Model Properties

- Event 3: Get Model Datasheets
- Event 4: Show Standard Datasheets

- Use case for Make-Model Match-Up
- Scenarios for individual devices, equipment **and packages**.
- Scenario for retrieving model datasheets is reused across use cases.
- **BOD for packages** ensures the request is treated as a whole

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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
WG 6 – ISO 18101: OGI TS
Digitalization & Interoperability

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

Current Cooperation between Standardization Associations

- OpenO&M Initiative
  - Organized 2004
  - ISA, MESA (B2MML), MIMOSA, OAGi, OPC
  - OIIE, OGI Pilot and ISBM originated from this cooperation – **ISBM 1.1 Update underway**
- ISO 18101-1
  - Canada, China, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, UK, US +Australia
  - 12 Nations voted Yes, 0 Nations voted No
- OGI Pilot
  - Construction Industry Institute (Began with Fiatech in 2009)
  - Cooperation with PCA
- Standards Leadership Council
  - Energistics, MIMOSA, OPC, OMG, OpenGeospacial, PCA, PIDX, PODS, PPDM, USPI
- Bi-lateral MOUs with ISA, OAGi and USPI
- THTH – Pending MOU

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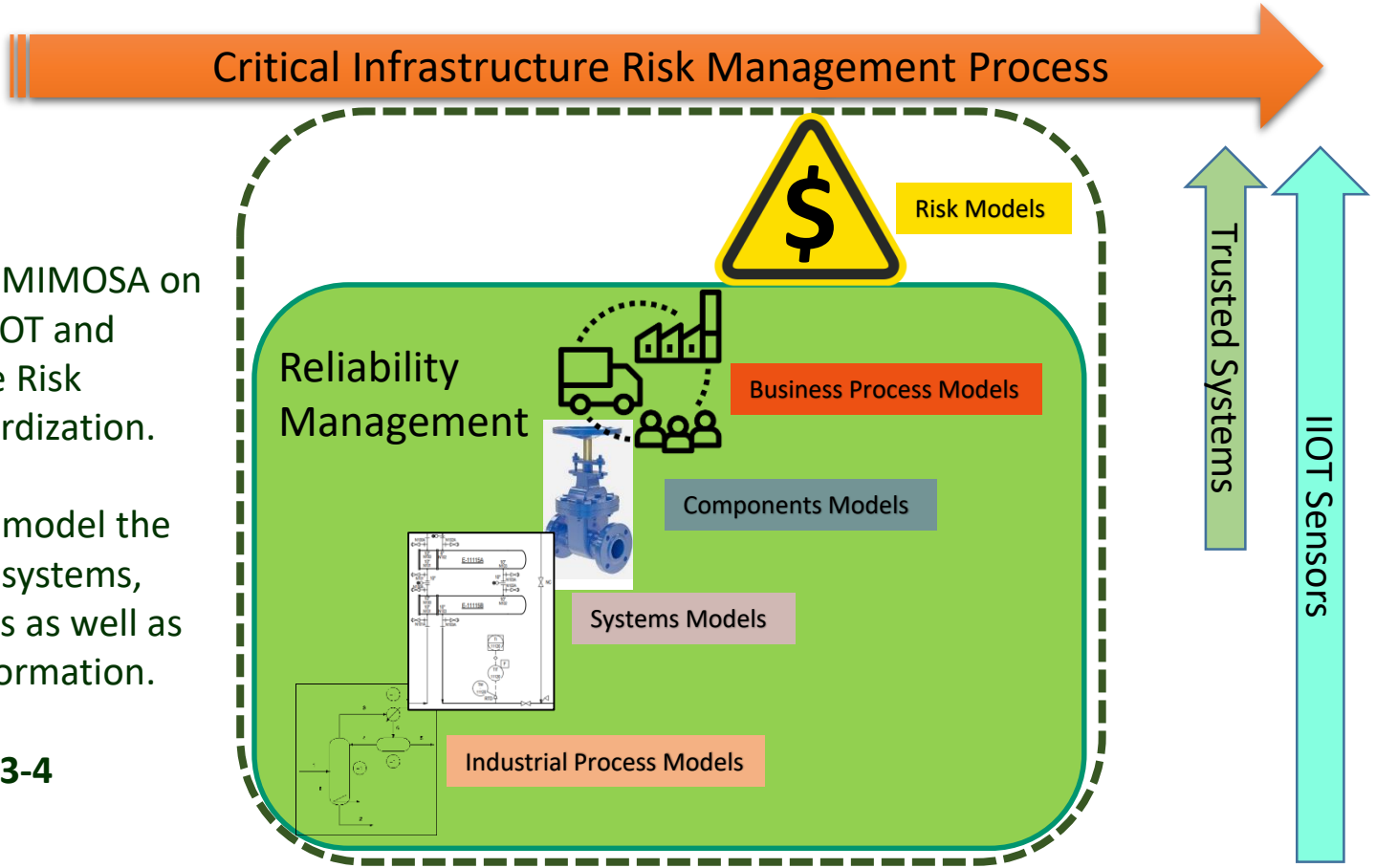
Critical Infrastructure Risk Management

NIST is working with MIMOSA on Interoperability for IIOT and Critical Infrastructure Risk Management Standardization.

MIMOSA CCOM can model the industrial processes, systems, components and risks as well as the sensor-based information.

NIST Summit – June 3-4



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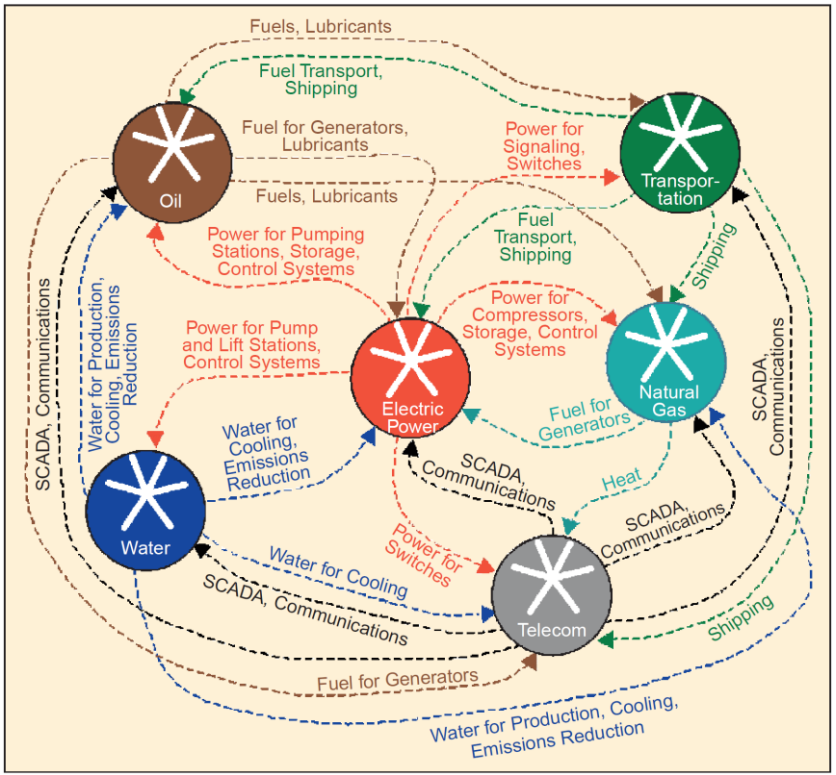
Critical Infrastructure Interdependencies-1



IEEE Journal- Dec 2001

Identifying, Understanding, and Analyzing Critical Infrastructure Interdependencies

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

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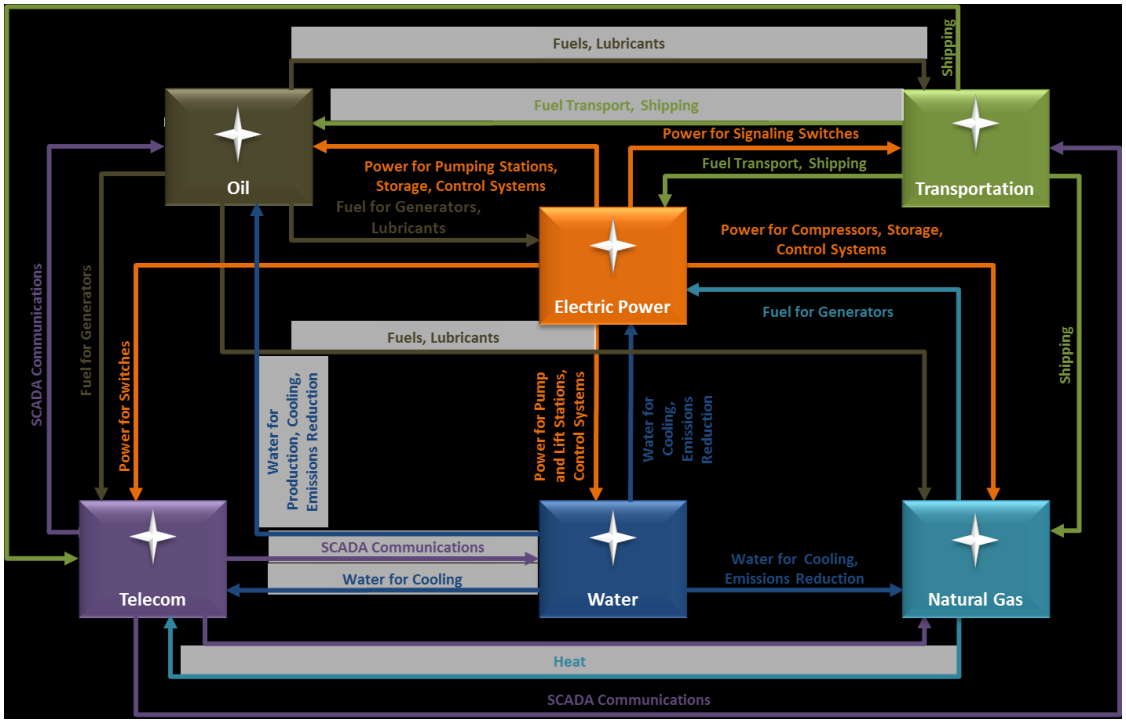
Critical Infrastructure Interdependencies-2

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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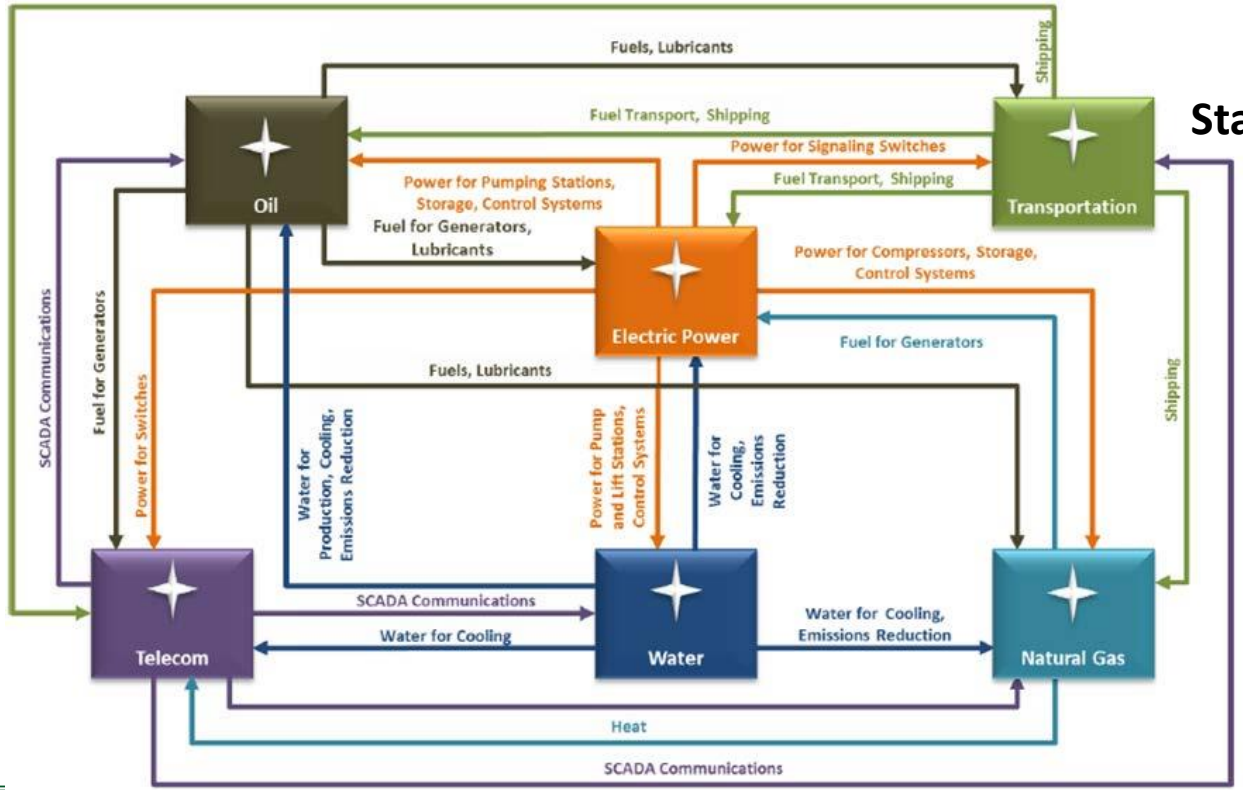
Critical Infrastructure Interdependencies-3



Argonne NATIONAL LABORATORY

State Energy Resilience Framework
Global Security Sciences Division
December 2016

J. Philips, M. Finster, J. Pillon, F. Petit and J. Trail

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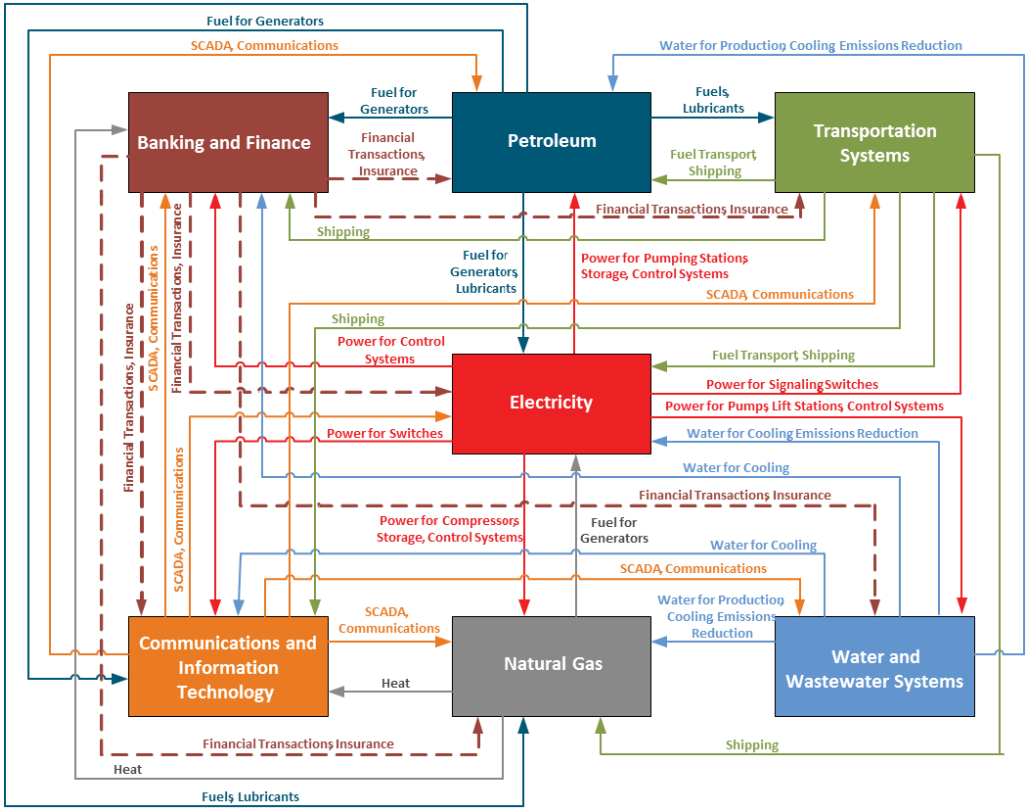
U.S. DEPARTMENT OF ENERGY

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)

October 2017

Duane Verner, Frederic Petit, and Kibaek Kim

CENTER FOR HOMELAND DEFENSE AND SECURITY
NAVAL POSTGRADUATE SCHOOL

FEMA

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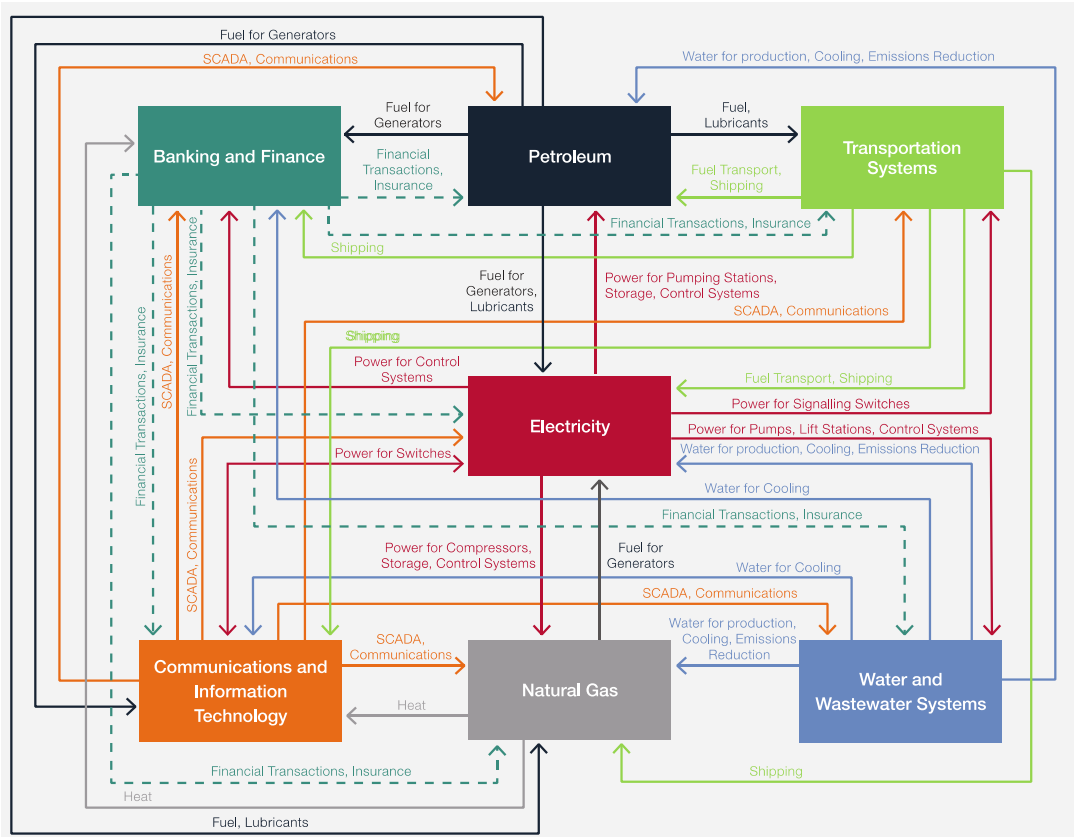
Critical Infrastructure Interdependencies-5



NSW GOVERNMENT

NSW Critical Infrastructure Resilience Strategy

Partner, Prepare, Provide

NSW Department of Justice | Office of Emergency Management

2018

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Co-sponsored by **MIMOSA** and **OAGi**

Future Cooperation

- MIMOSA and THTH have expressed a mutual interest in cooperation
- Proposed MOU
  - THTH would build on top of existing OIIE Specifications
  - Share maximum practical amount of IT and IM Standards and Methods
  - Specialize for Pulp and Paper, following standard architecture and methods
  - Pulp and Paper specializations would be THTH IP, managed in a cooperative manner to extend OIIE on a scalable, repeatable and sustainable manner

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