



Jean Vieille 2010

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Paternité - Pas d'Utilisation Commerciale - Partage des Conditions Initiales à l'Identique

Work: **ISA8895 Implementation**
Section: **Overview**
Chapter: **Modelling**

Language: **English**

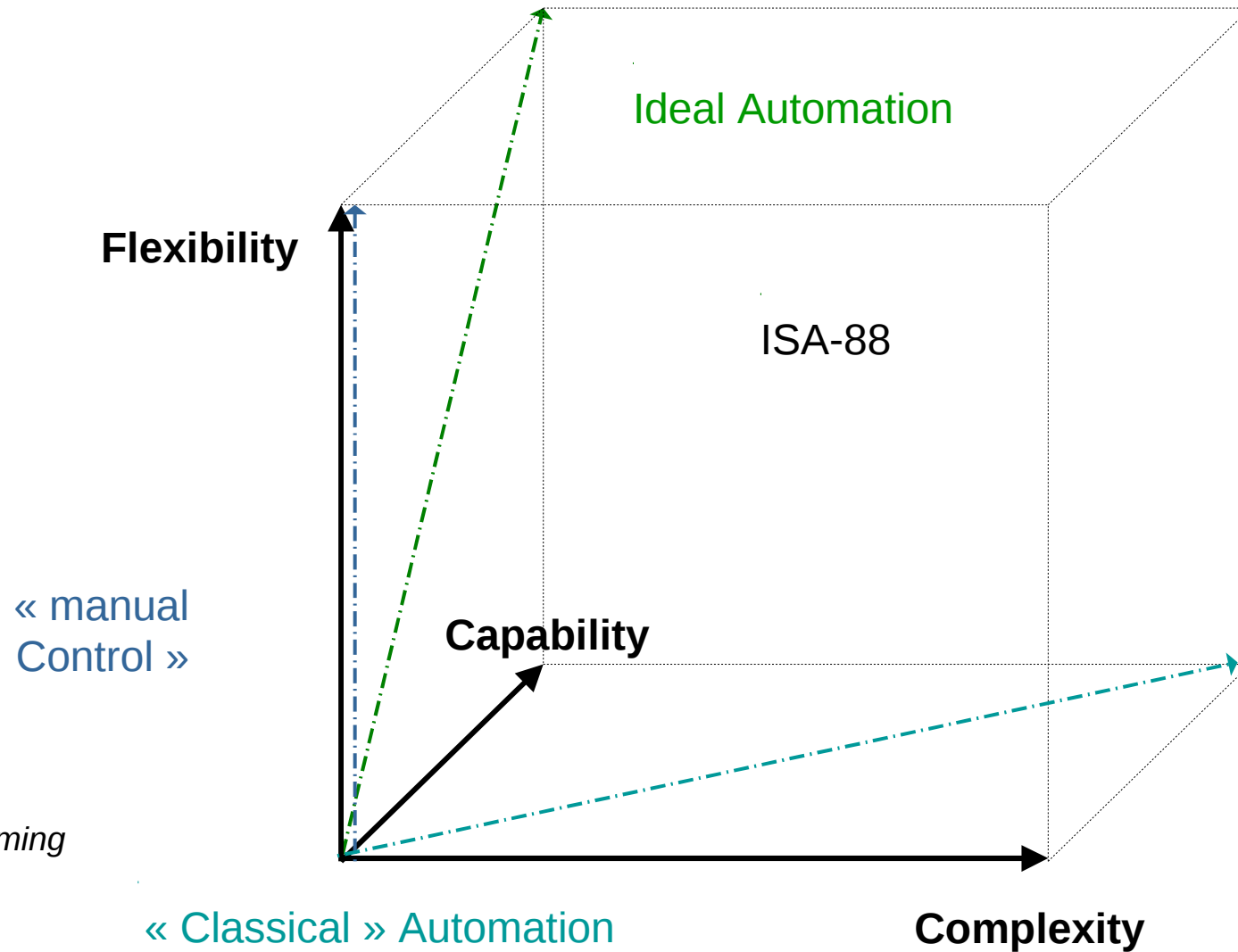
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www.controlchainmanagement.net
info@controlchainmanagement.net

Agenda

- ISA-88 snapshot
- ISA-95 snapshot
- IIPS Lifecycle
- CCM modelling framework
- ISA-88/95 based Models and Objects
- ISA-88/95 in Production Lifecycles
- Methodology

Automation challenge



Darin Flemming
Lou Pillai

ISA-88 standard

- US and International “Batch Control” standard
- The ISA88 committee develops the US ANSI standard
- The IEC65A WG11 develops the IEC international standard

US standard	INTL Standard	Sub Title
ANSI/ISA-88.00.01: 2010	IEC 61512-1: 1997	Part 1: Models and Terminology”
ANSI/ISA-88.00.02: 2001	IEC 61512-2: 2001	Part 2: Data structures and guidelines for languages
ANSI/ISA-88.00.03: 2003	IEC 61512-3: 2008	Part 3: General and Site Recipe - Models and Representation
ANSI/ISA-88.00.04: 2006	IEC 61512-4: 2009	Part 4: Batch Production Records
ISA Draft88.00.05	-	Part 5: Implementation Models & Terminology for Modular Equipment Control

ISA-88 snapshot

- **Object Design of automation applications**
 - Reuse, Knowledge Management, Robustness
- **Flexible Design of automation applications - No programming required for**
 - Modification of recipes, making different products with the same facility
 - Using alternate equipment for the same production step
 - Sequencing production runs for different products
- **Interoperability**
 - Assembling software components from different origins
- **Product Industrialization**
 - Neutral specification of product physico-chemical transformations
 - Conversion of this specification into operating procedure for target facilities
- **Production Information**
 - Data structures for production information history
 - Includes several ISA-95 models
- **Applications**
 - Initially designed for Batch processes, but applicable to any type of process
 - Functional specification, batch managers, historians, PDM/PLM

ISA-88 Adoption

- **Automation Functional Engineering Good Practices**
 - Largely applied worldwide, proven benefits
- **Best known in process industries**
 - Less in other domains...
- **All automation vendors offer solutions**
 - Generally limited to the support of recipes (authoring, execution, reporting)
 - Sometime at the equipment control level
- **Applies more and more to all types of production**
 - No equivalent standards for discrete and continuous processes...
 - Adapt easily
 - Most benefits with globalized application: all types of processes, all locations

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ISA-95 snapshot

- **B2M: Collaboration Business / Execution**
 - Communication between execution systems (MES/MOM, DCS, MMS, LIMS, WES, SCADA,...) and business systems (ERP, SCM)
 - Master data management
- **MES/MOM : Functional definition**
- **Data and Activity models**
 - Description of resources, capability, products, work order requests and reports
 - Definition of operation management activities (MES)
- **Applications:**
 - User requirements and functional specification of MES and B2M interfaces
 - Native B2M connectors - MES/ERP (B2MML)
 - Possible basis for developing MES applications and software...

What is ISA-95?

- US & International standard “Enterprise - Control System Integration”
- The ISA95 committee develops the ISA-95 standards
- The ISO/IEC JWG5 develops the international standard

US standard	INTL Standard	Sub Title
ANSI/ISA-95.00.01: 2010	IEC/ISO 62264-1: 2003	Part 1: Models and Terminology”
ANSI/ISA-95.00.02: 2010	IEC/ISO 62264-2: 2004	Part 2: Data Structures and Attributes”
ANSI/ISA-95.00.03: 2005	IEC/ISO 62264-3: 2007	Part 3: Activity Models of Manufacturing Operations Management
<i>ISA draft 95.00.04</i>	-	<i>(Part 4: Object Models and Attributes of Manufacturing Operations Management)</i>
ASNI/ISA-95.00.05: 2007	IEC/ISO 62264-5: 2010 (APUB)	Part 5: Business to Manufacturing Transactions

Benefits and adoption of ISA-95

- **Benefits:**

- Direct : Cost and risk reduction of MES and B2M projects
- Indirect :
 - Improvement of operational performance : CTP, agile manufacturing, planning feedback, error reduction
 - Dynamization of IT/Business alignment

- **Adoption:**

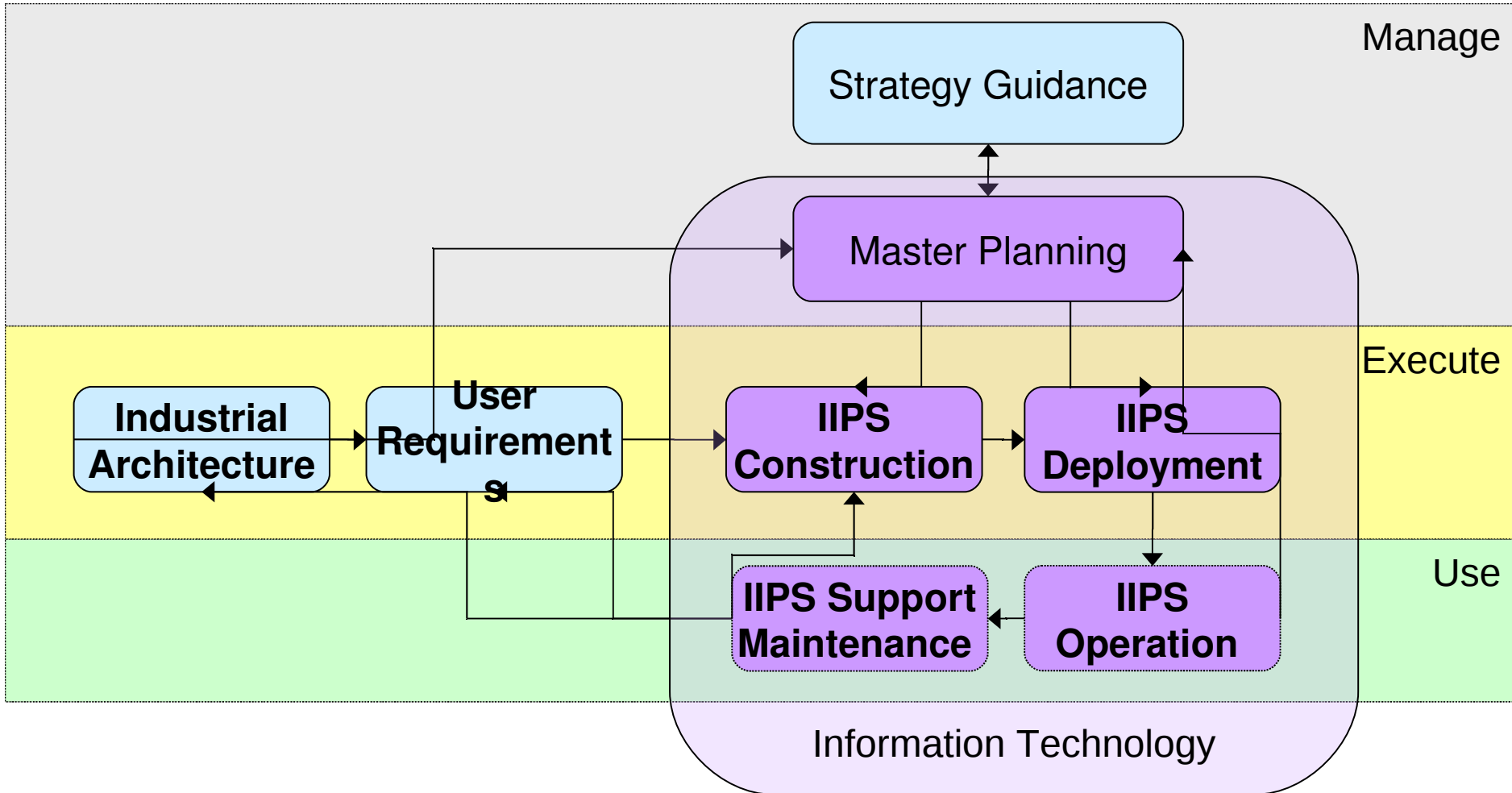
- Most automation / MES vendors claim their adhesion to ISA95
- ERP vendors ignore it
 - Noticeable exception: SAP since 2004
- B2MML becomes the de facto standard for B2M information exchange

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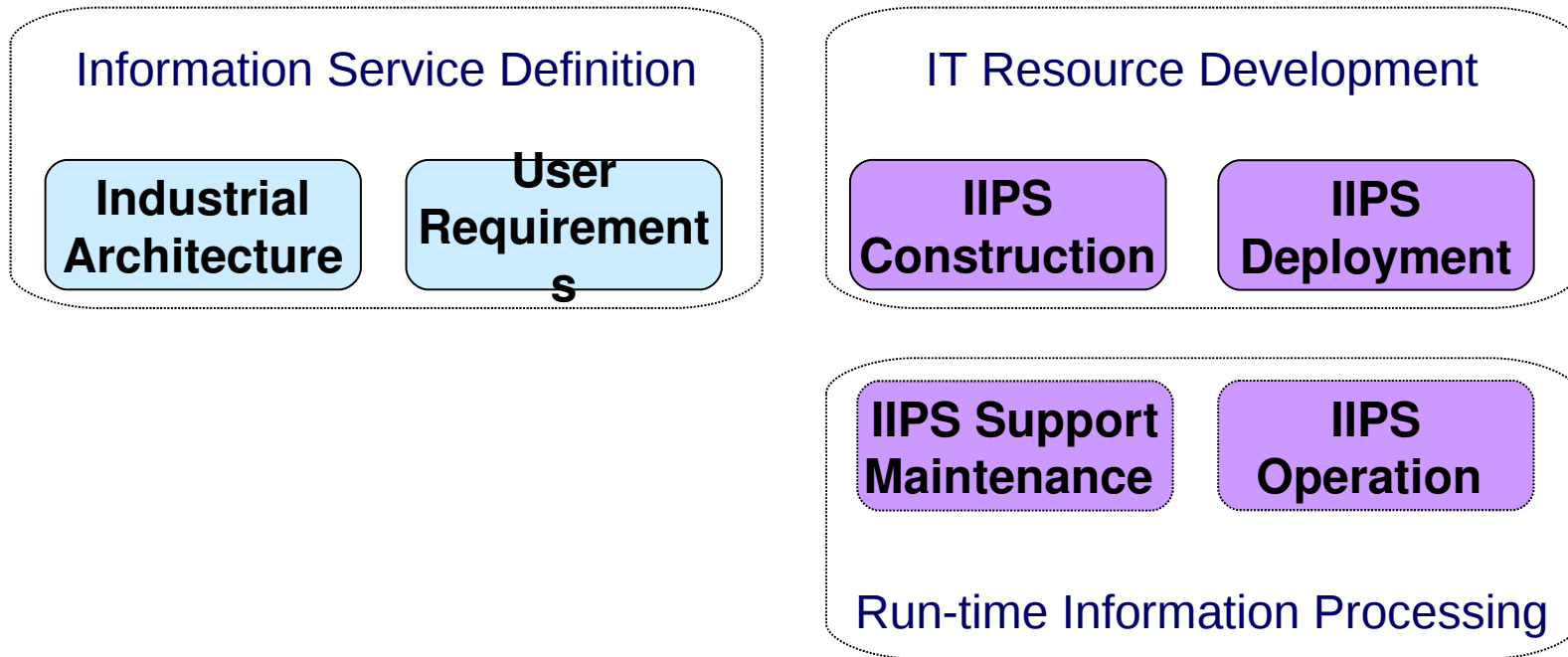
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CCM global IIPS life cycle

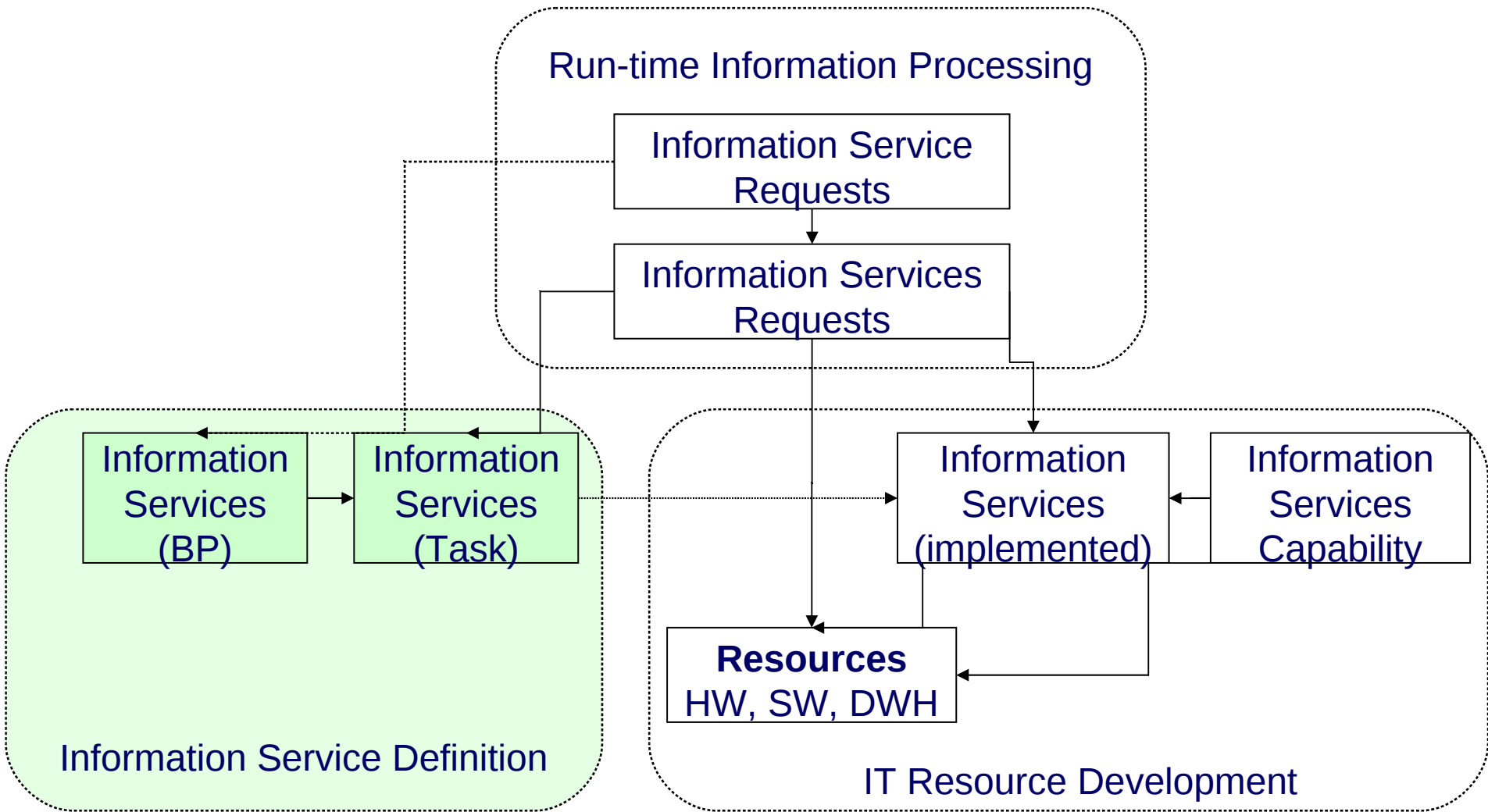
IIPS : Industrial Information Processing Systems



CCM global IIPS life cycle



ISA-95 like IIPS life cycle



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Industrial Architecture Models Purpose

- **Scope**

- The entire industrial facility – the Production sub-system within the Enterprise system
- Spatio-temporal description (structures and interactions) of this sub-system
- The information reality that tights Energy and Matter together

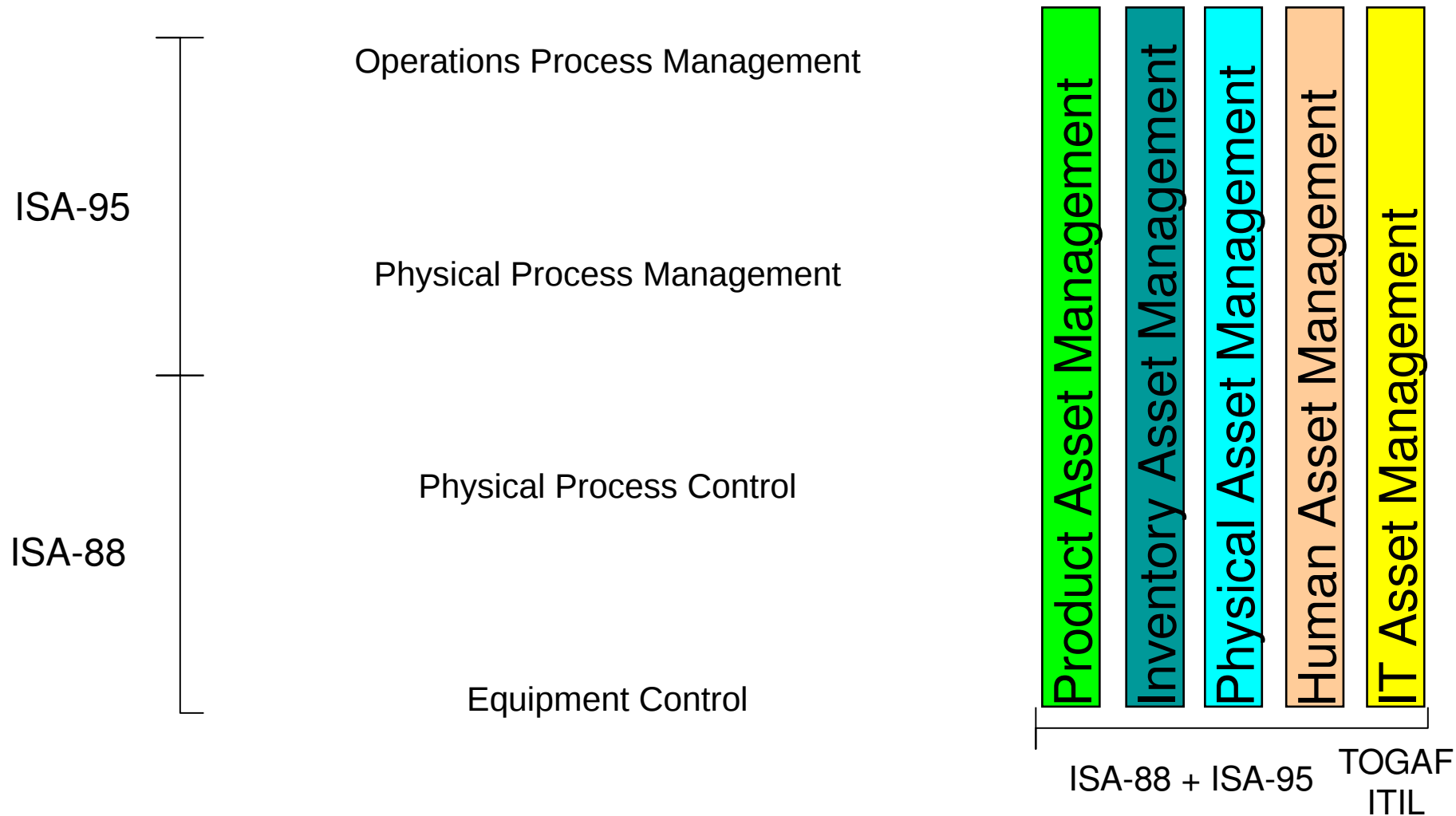
- **Ongoing maintenance**

- This module only presents models for describing the facility
- However, the facility is ever changing.
 - The Industrial Architecture Processes (IAP) integrates IAM within the global enterprise strategy definition and fulfillment process

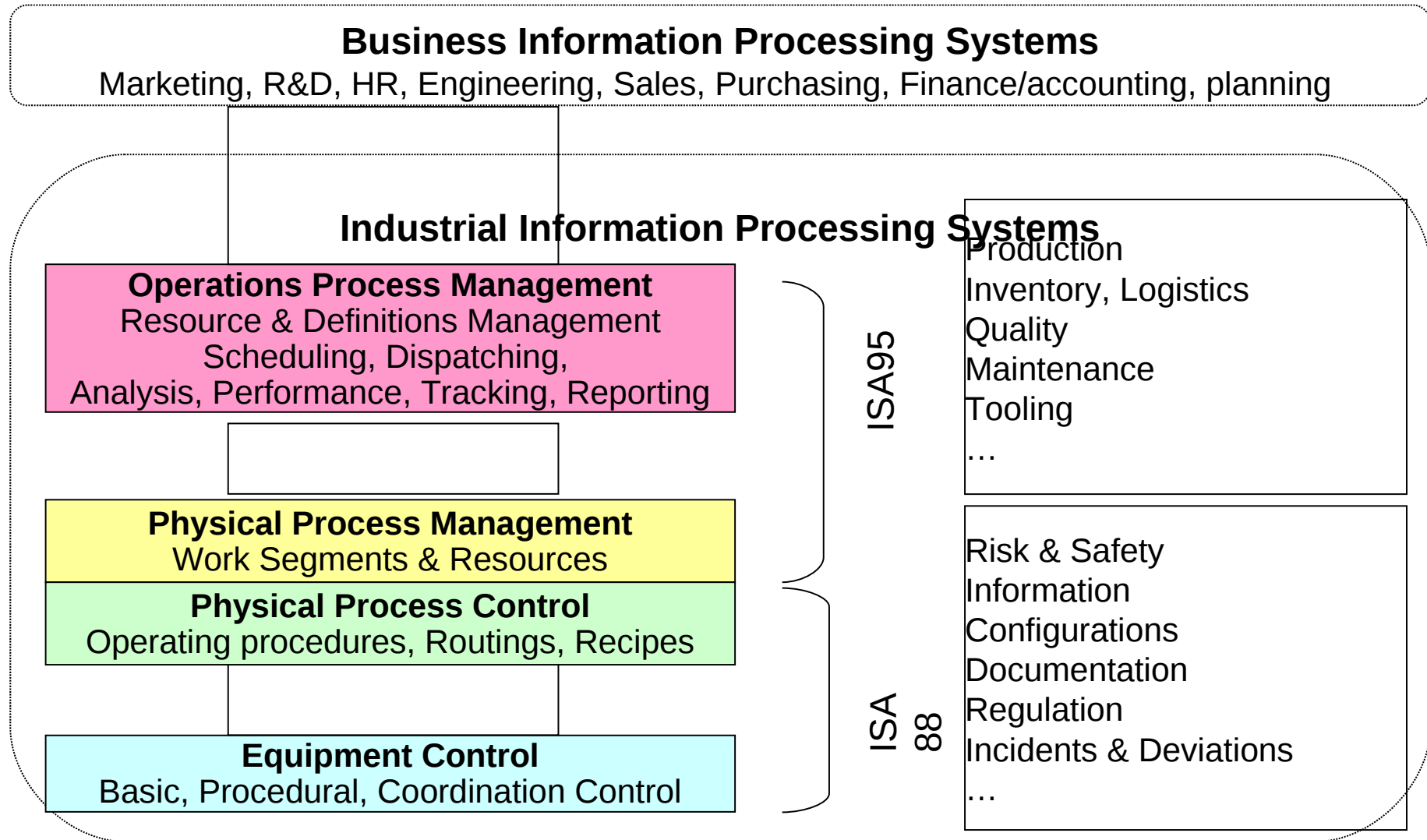
- **IAM provides the framework**

- For capturing and managing knowledge
- For mastering IIPS development planning

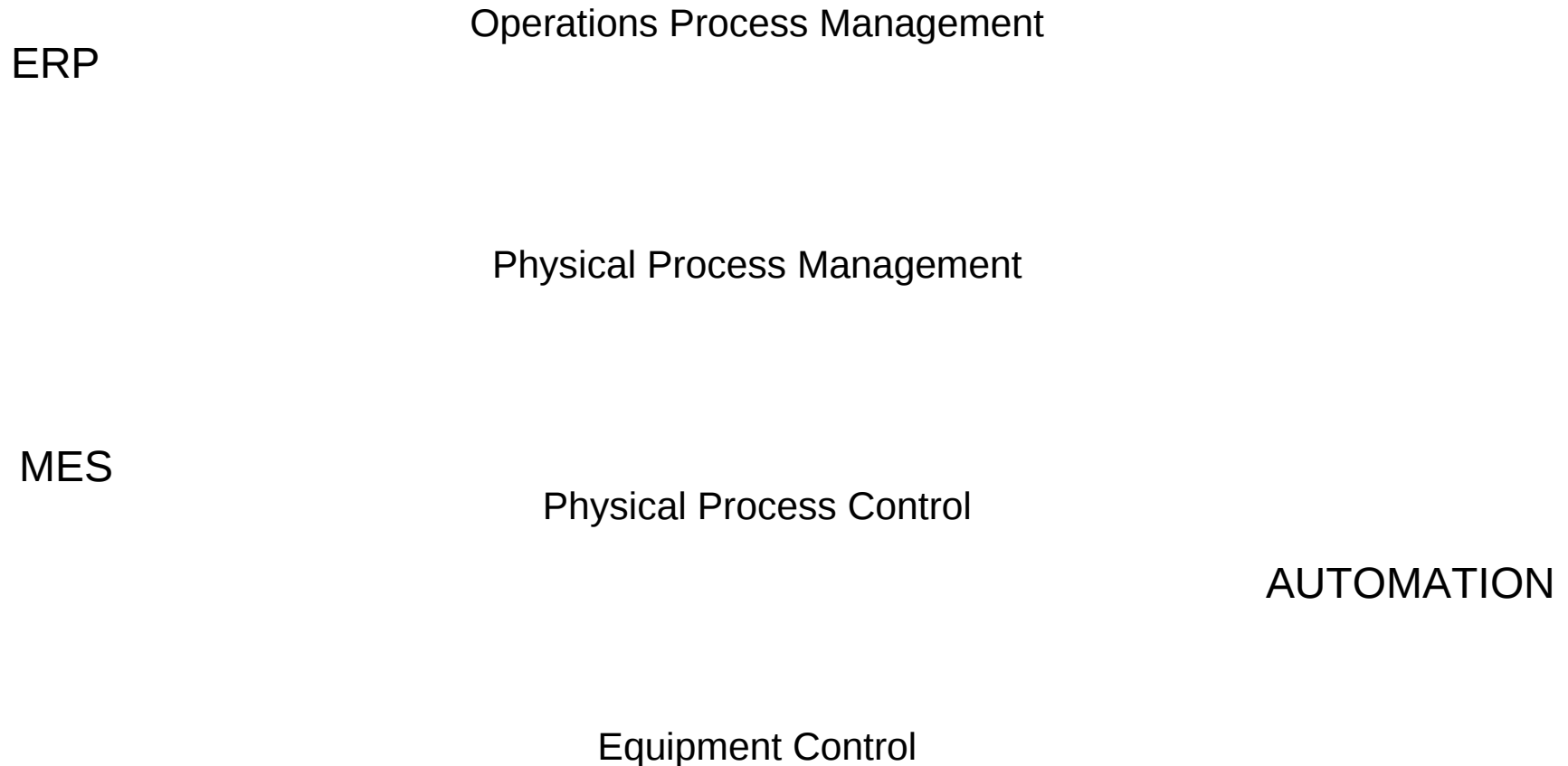
Industrial Architecture Dimensions



IIPS Scope in Industrial Architecture framework



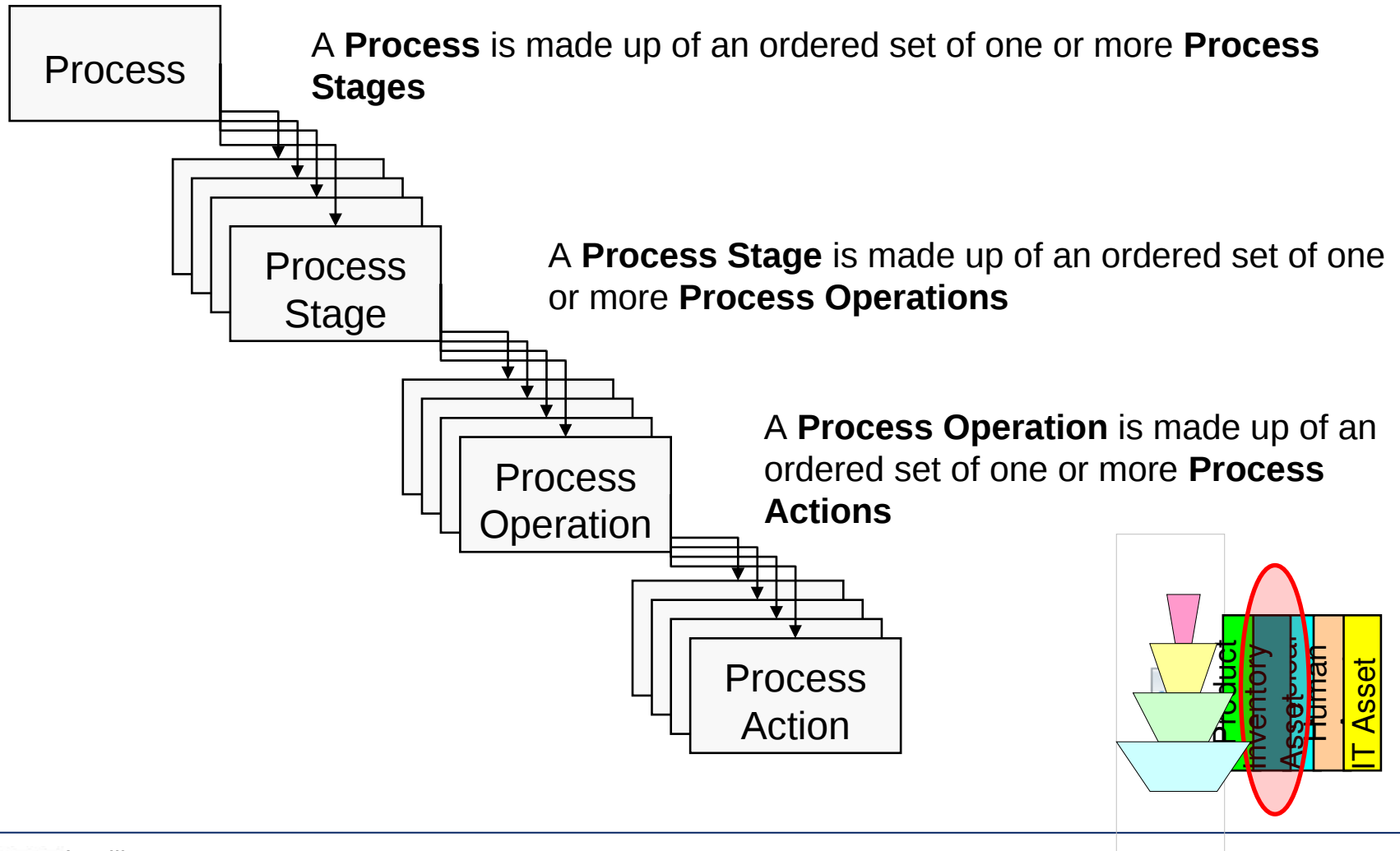
Common IT systems involved



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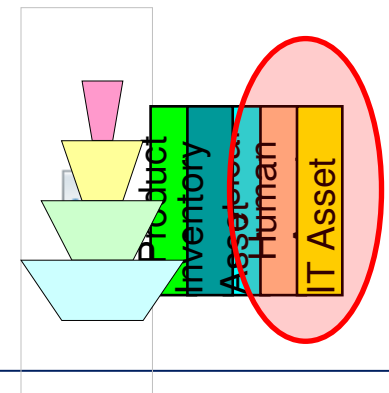
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ISA88 Process model (Processing Requirement)

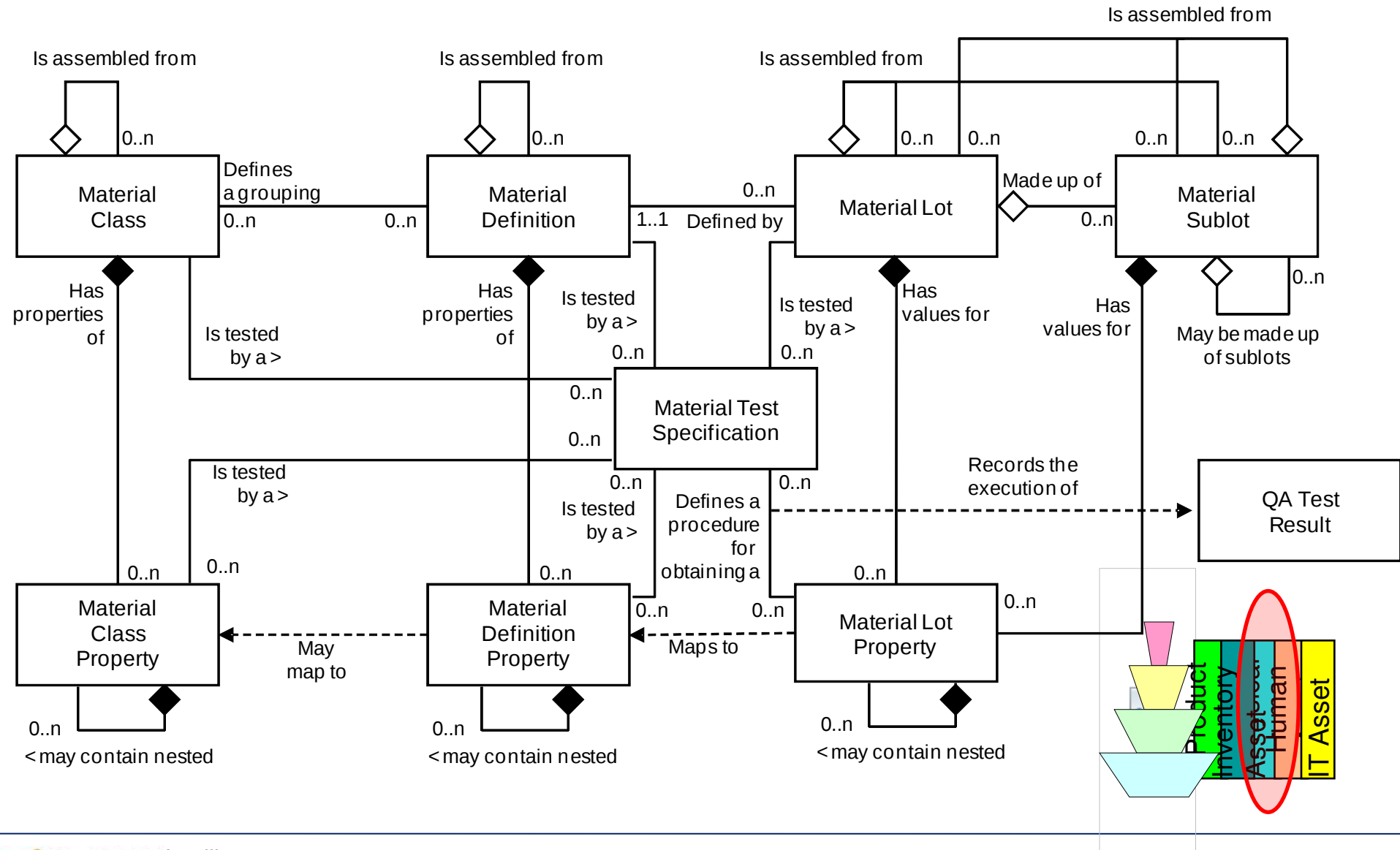


Resource models (Structural description)

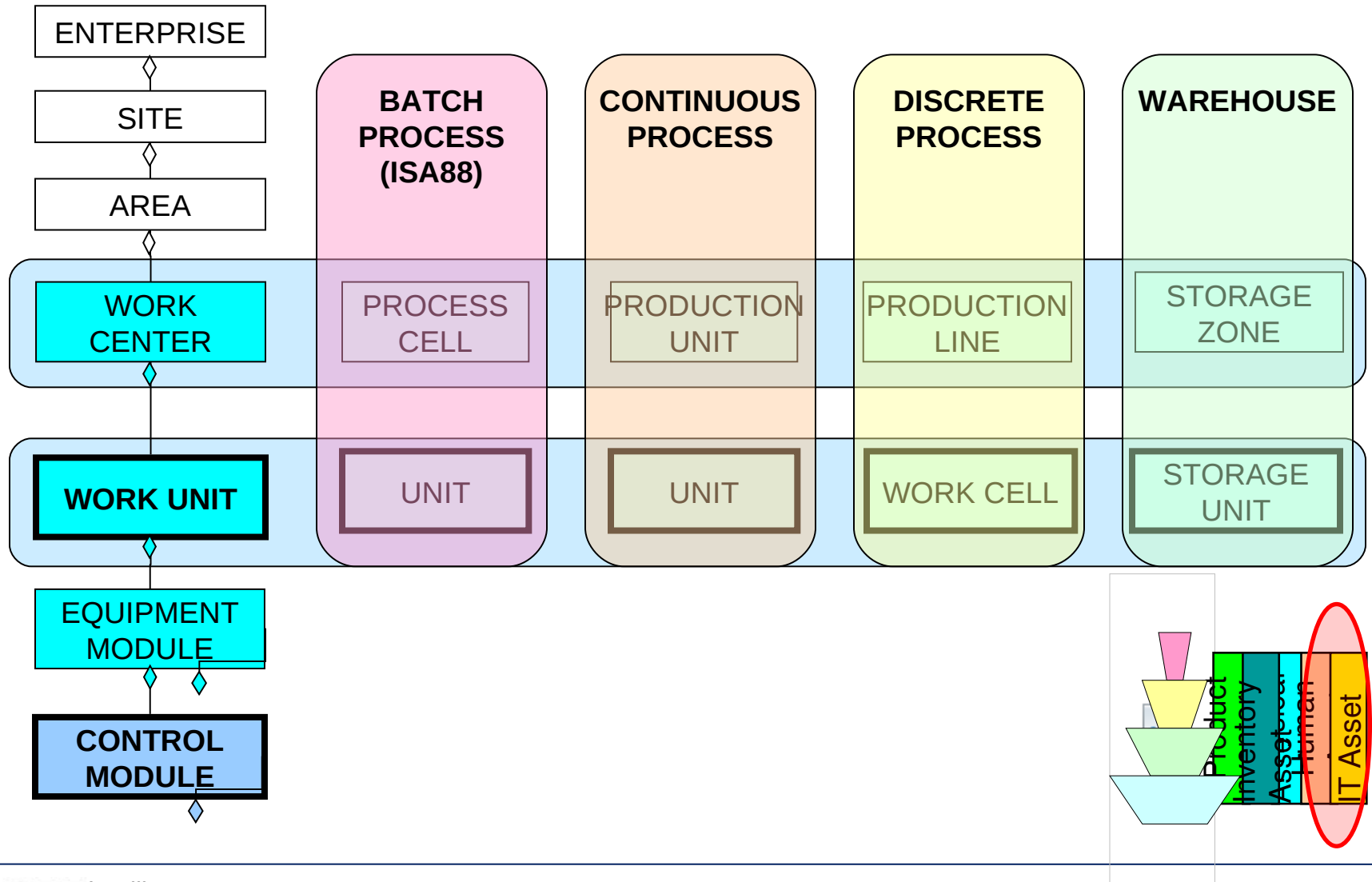
- The resource asset models (Personnel, Equipment, and Material) are based on the ISA-95 breakdown.
- All these resources share a similar pattern. Equipment and Material are indeed the same entity: A “machine” can be:
 - A “Physical Asset” for the company that makes products with it,
 - An “Inventory Asset” for the company that makes them (finish product) or sell / distributes it



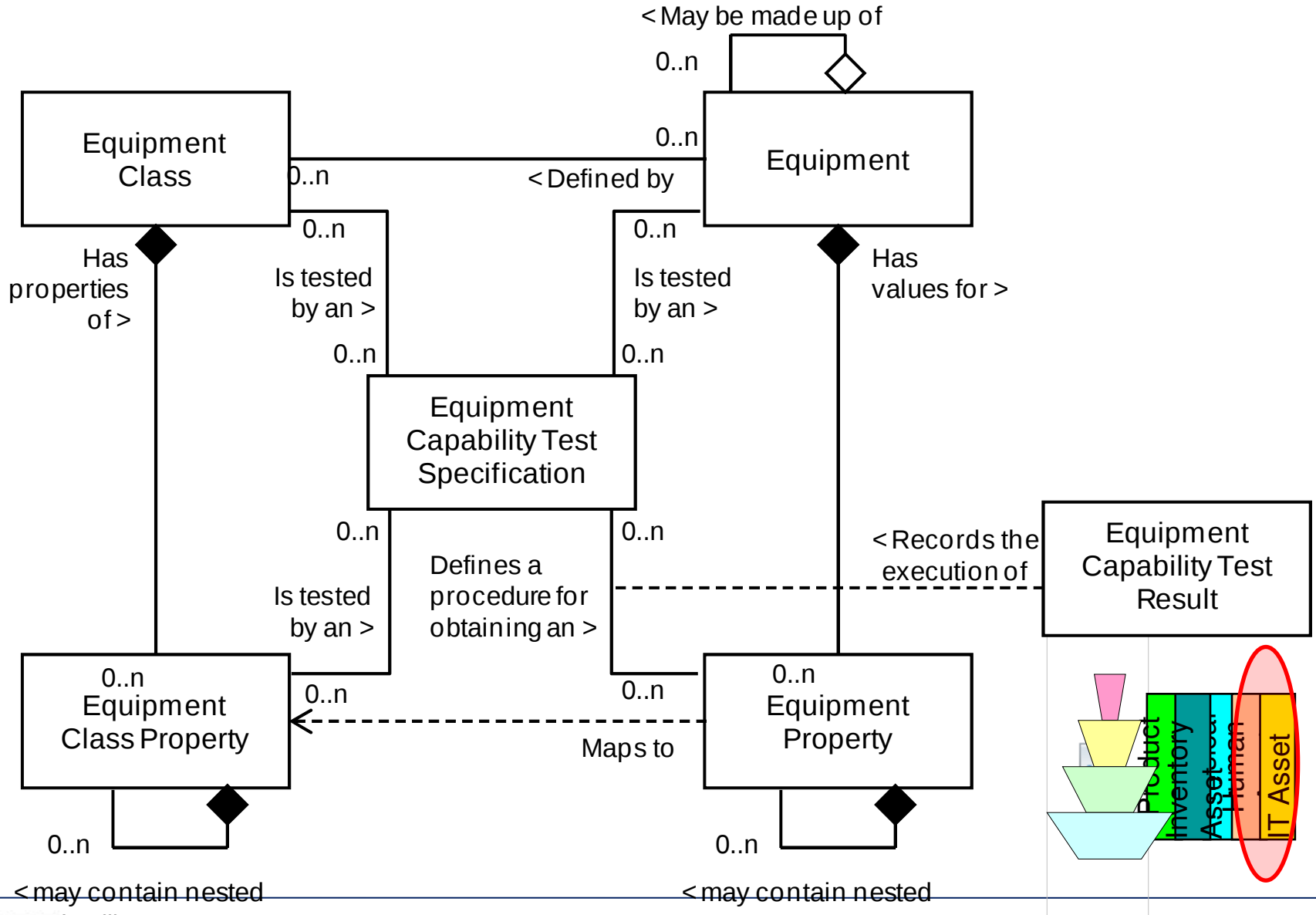
ISA-95 Material Model



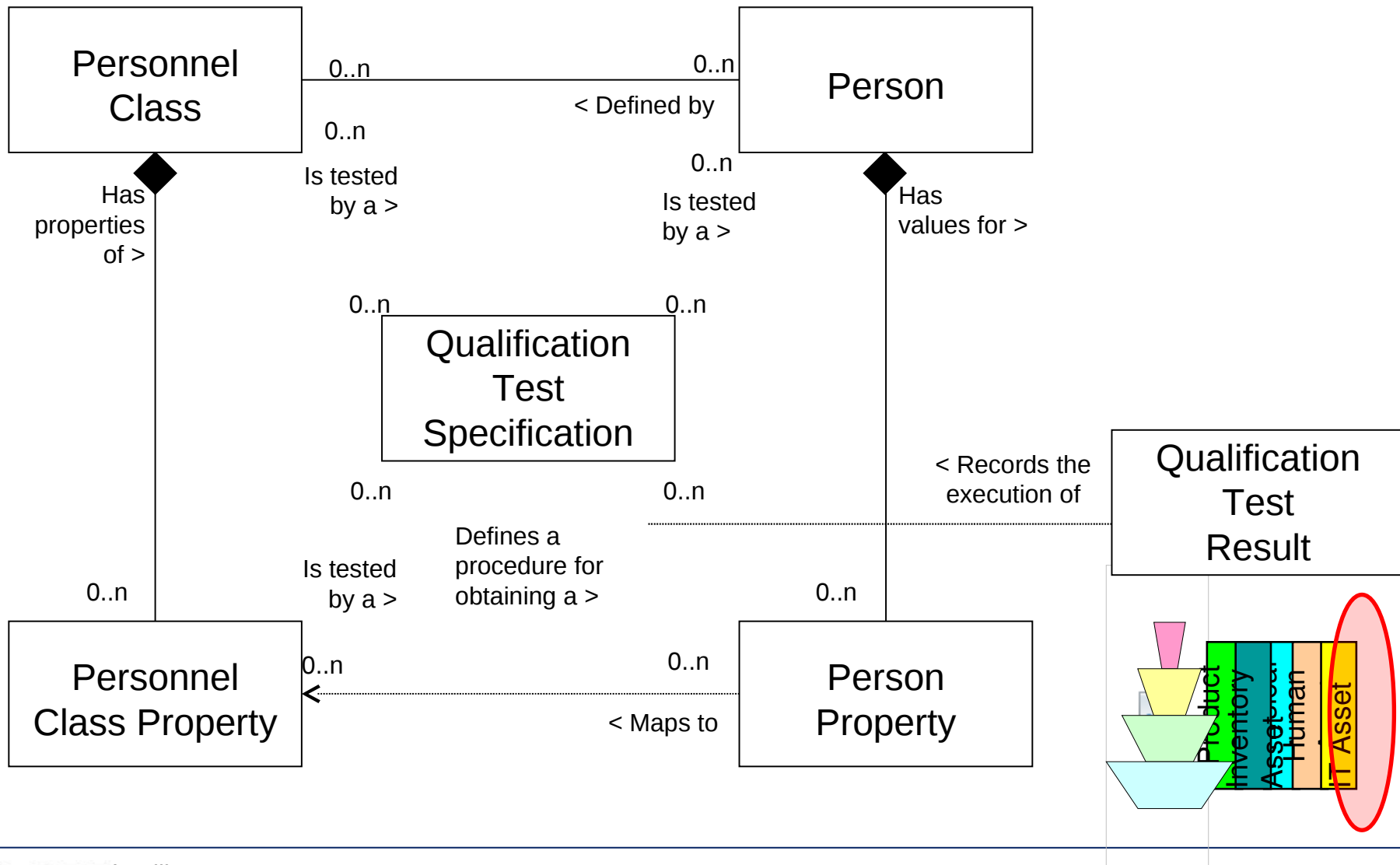
ISA-95 extended physical model (Actual Facility layout)



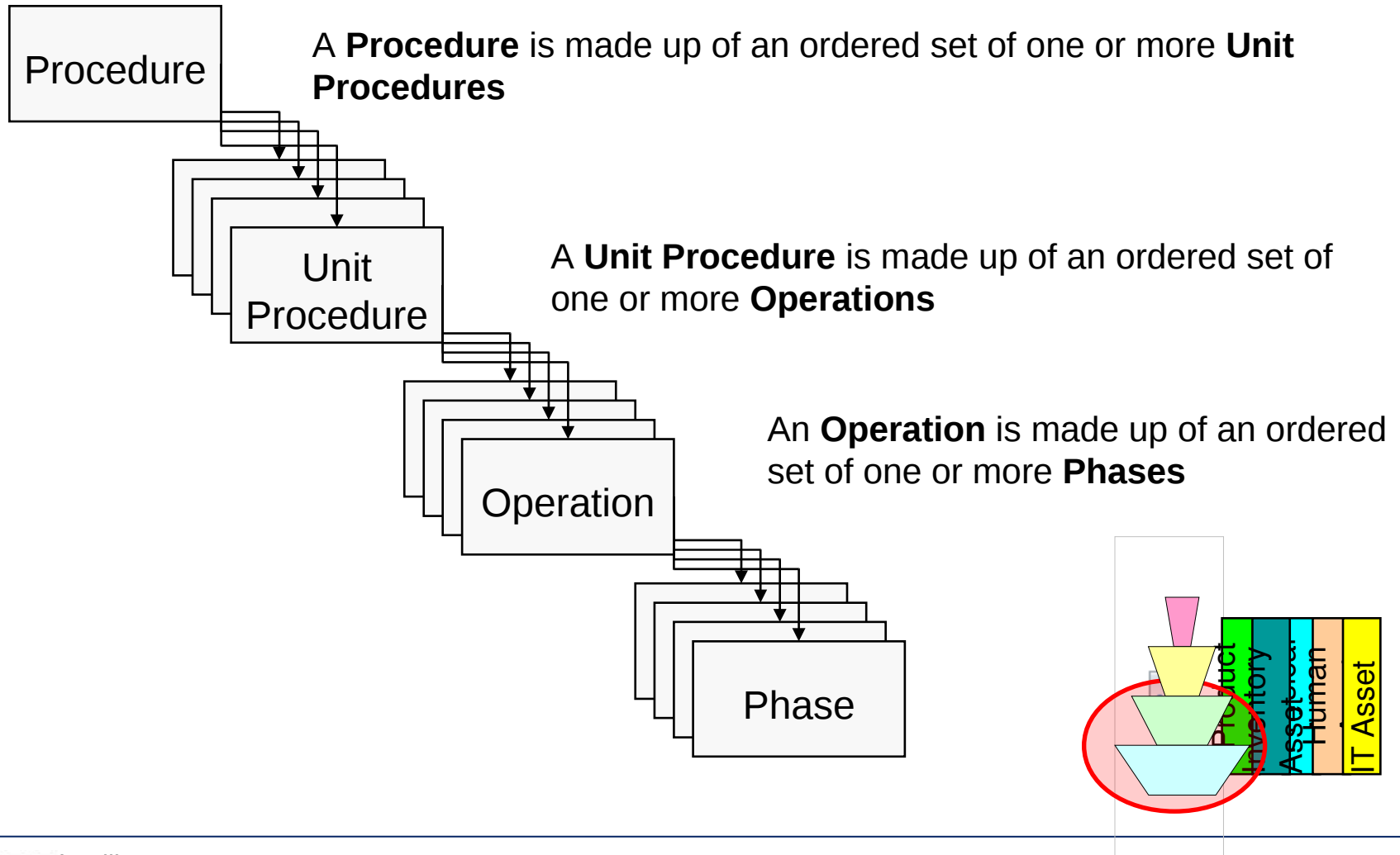
ISA-95 Equipment Model



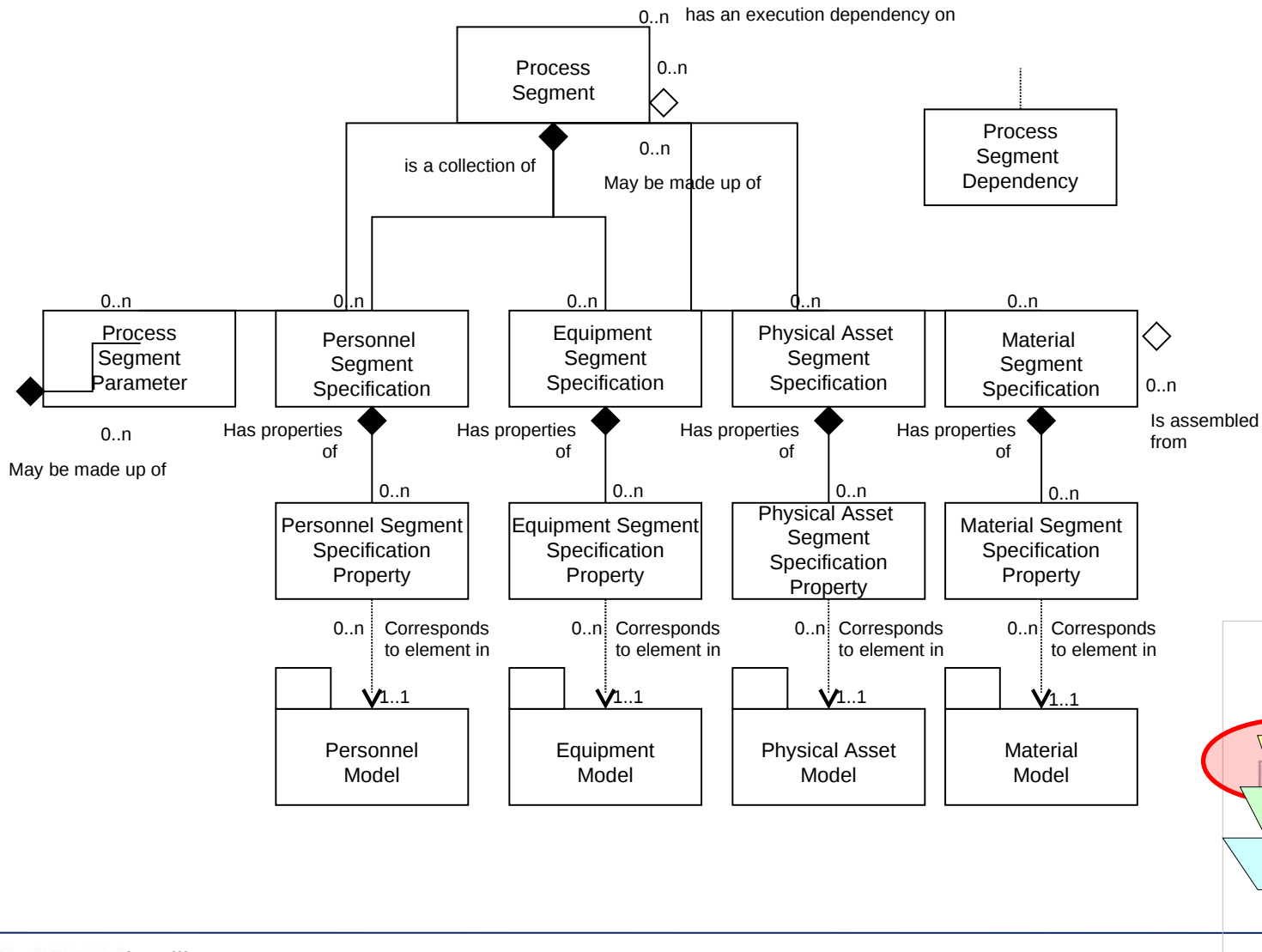
ISA-95 Personnel Model



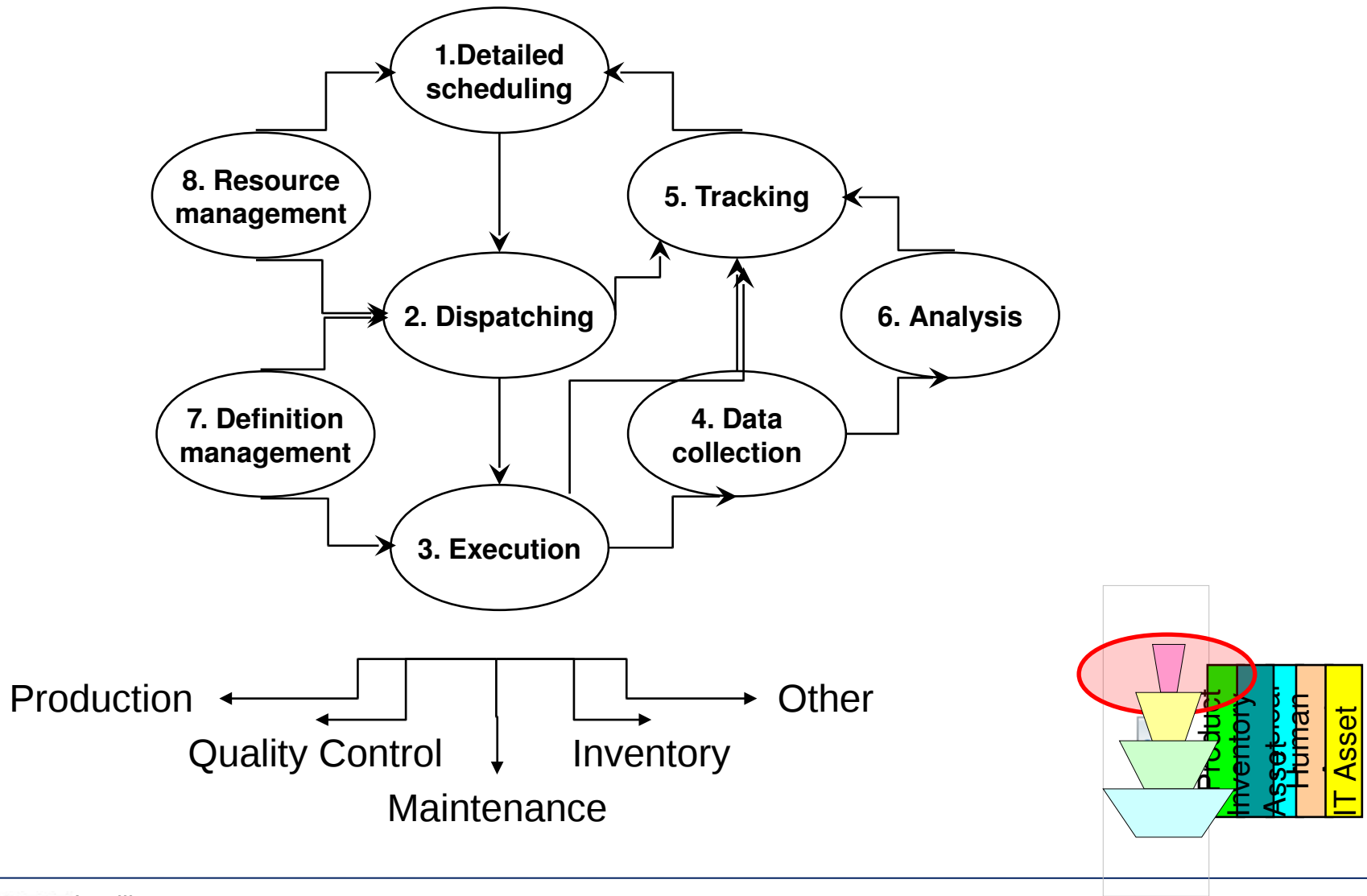
ISA-88 Procedural Control model (Equipment/Product Interactions)



ISA-95 Segment Model



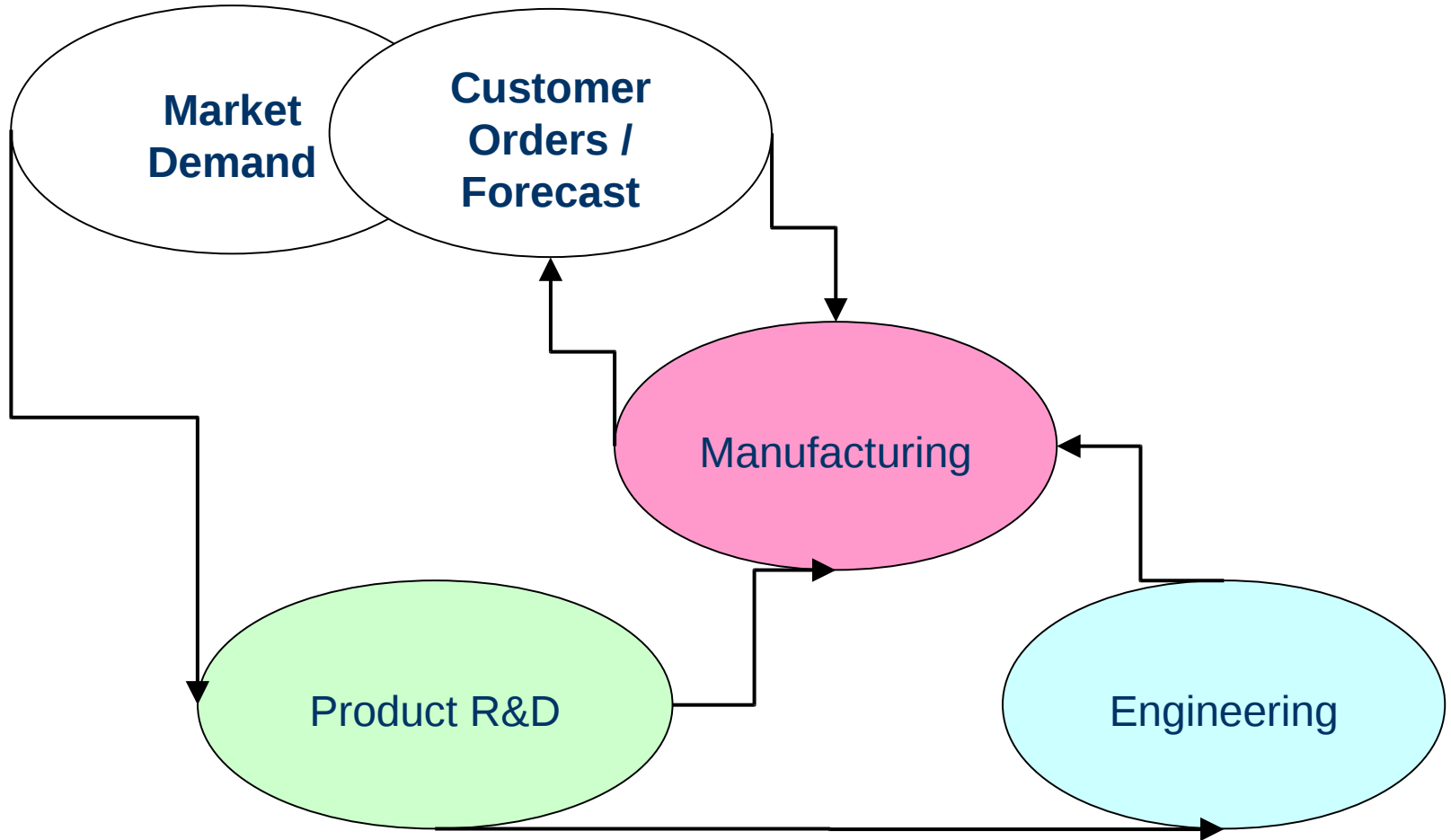
ISA-95 Operational Activity Model



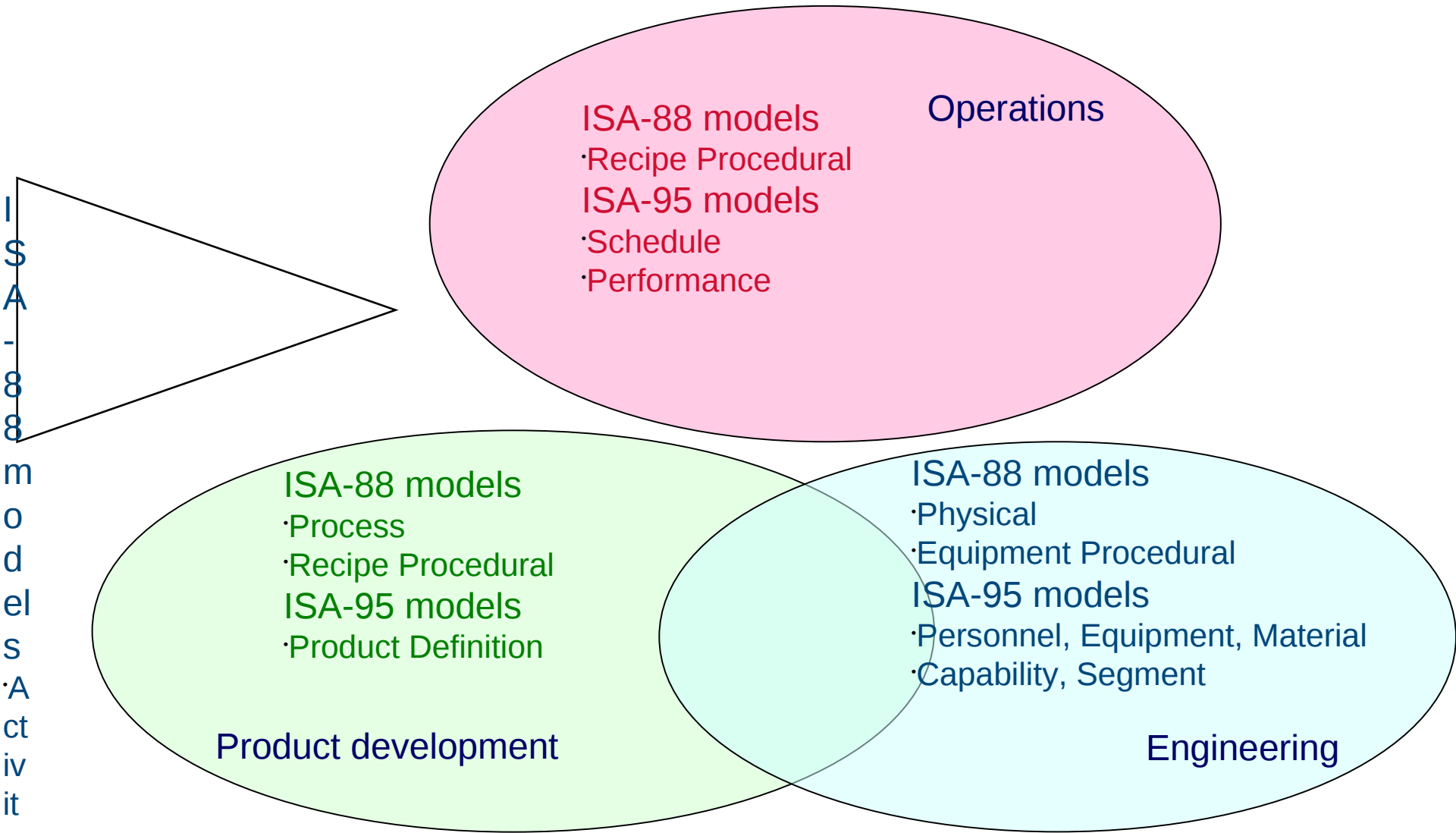
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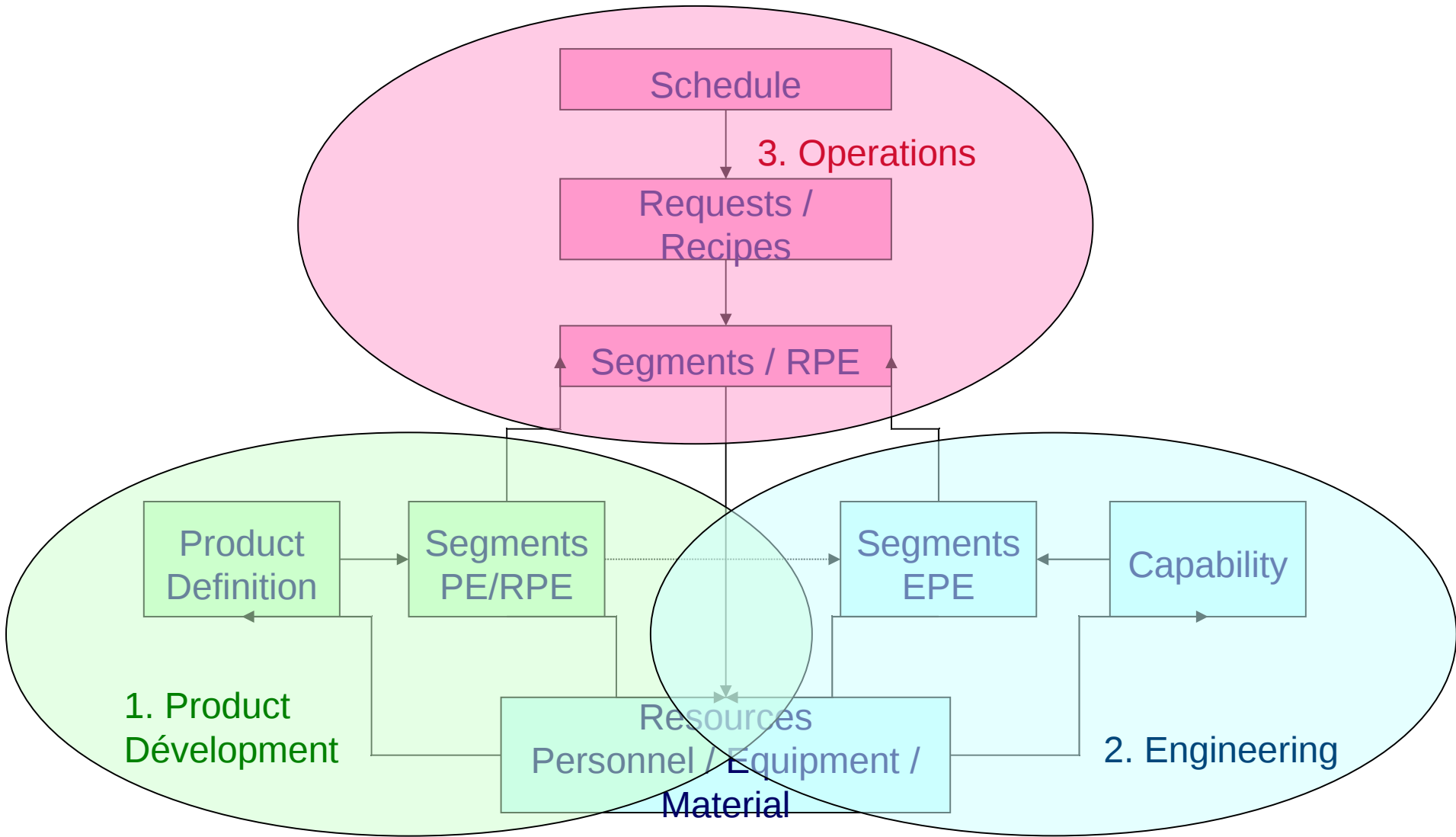
Production system Lifecycles



ISA-88 & ISA-95 models in Production Lifecycles



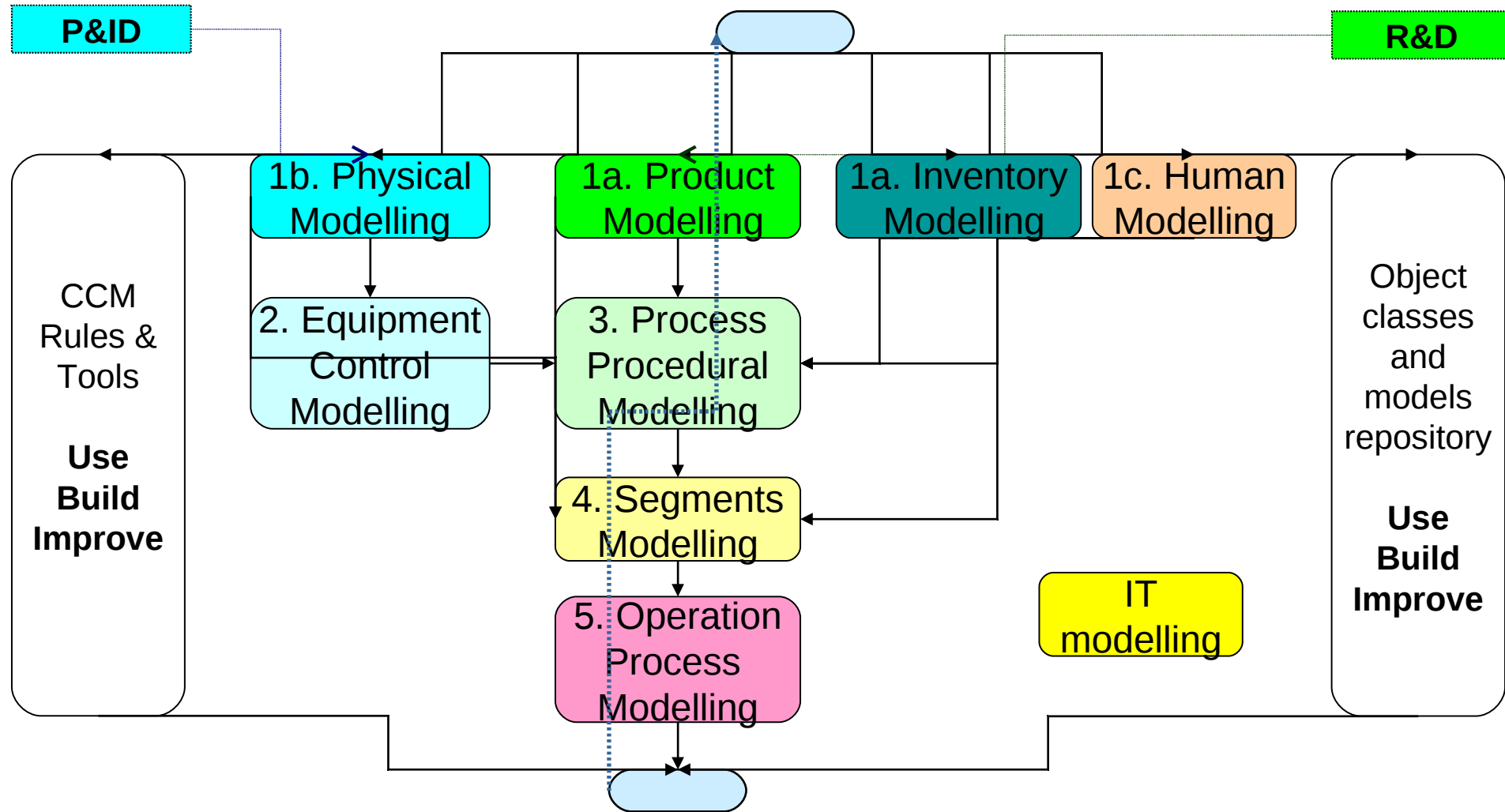
ISA-88 & ISA-95 Objects in Production Lifecycles



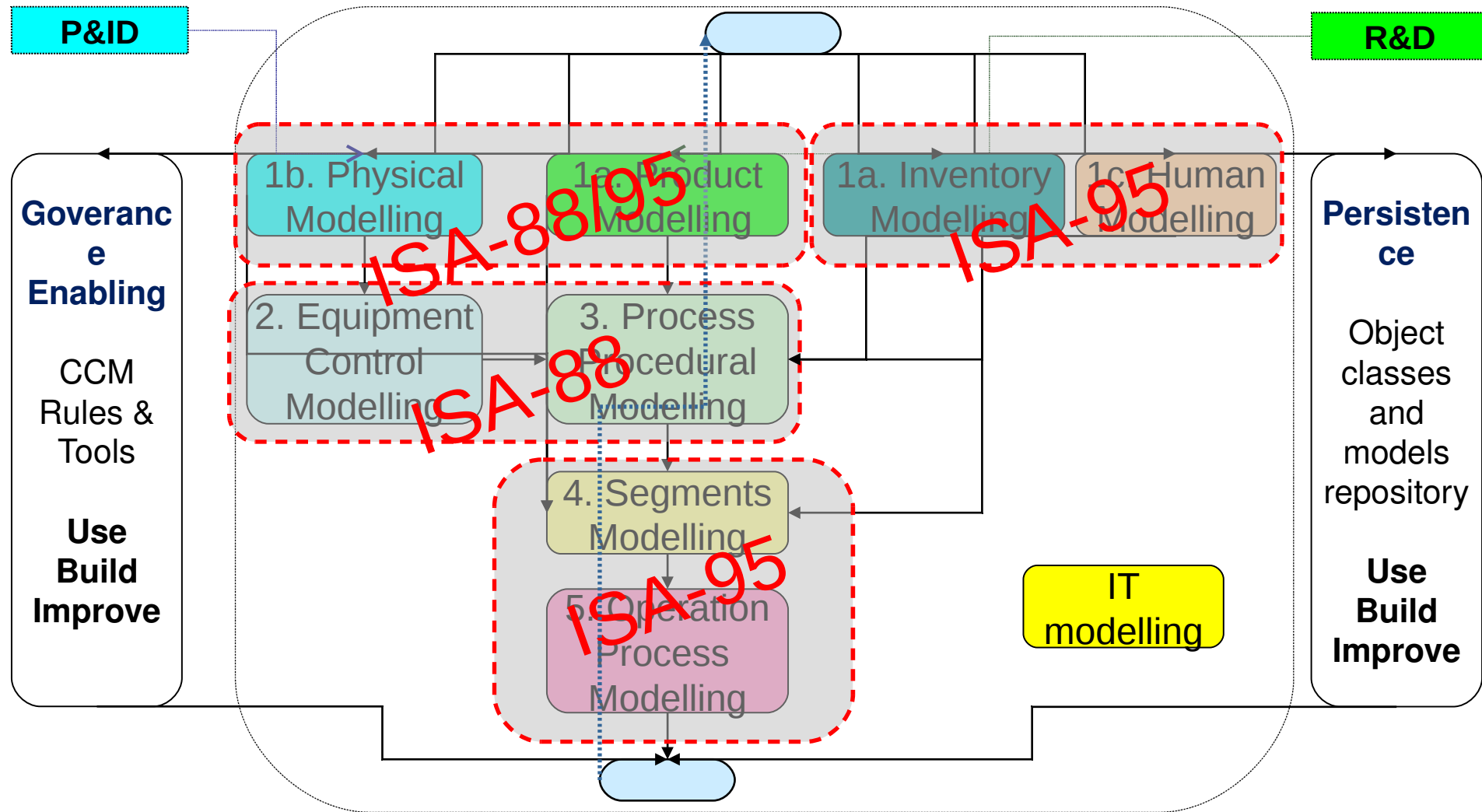
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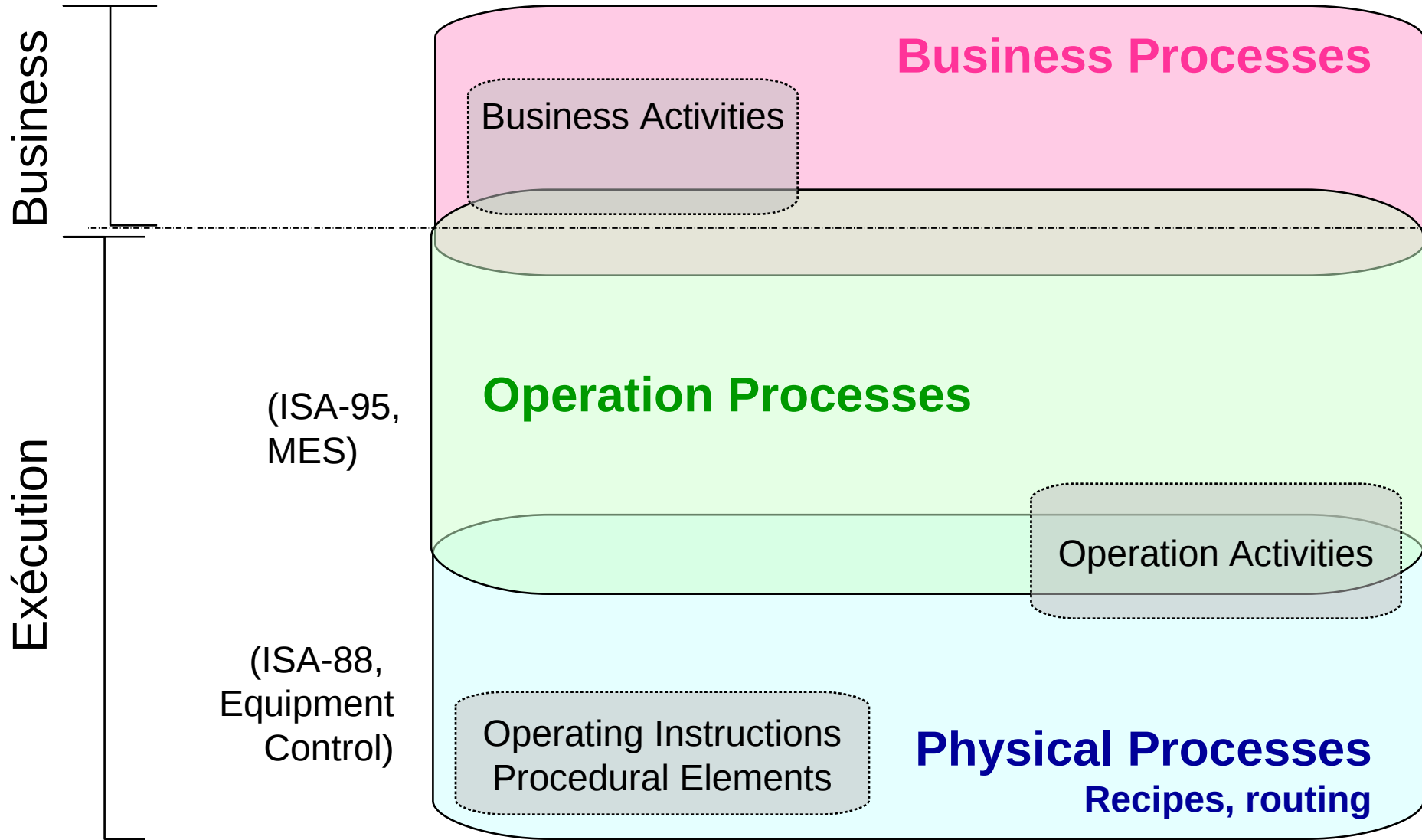
IAM framework definition overview (see IAP)



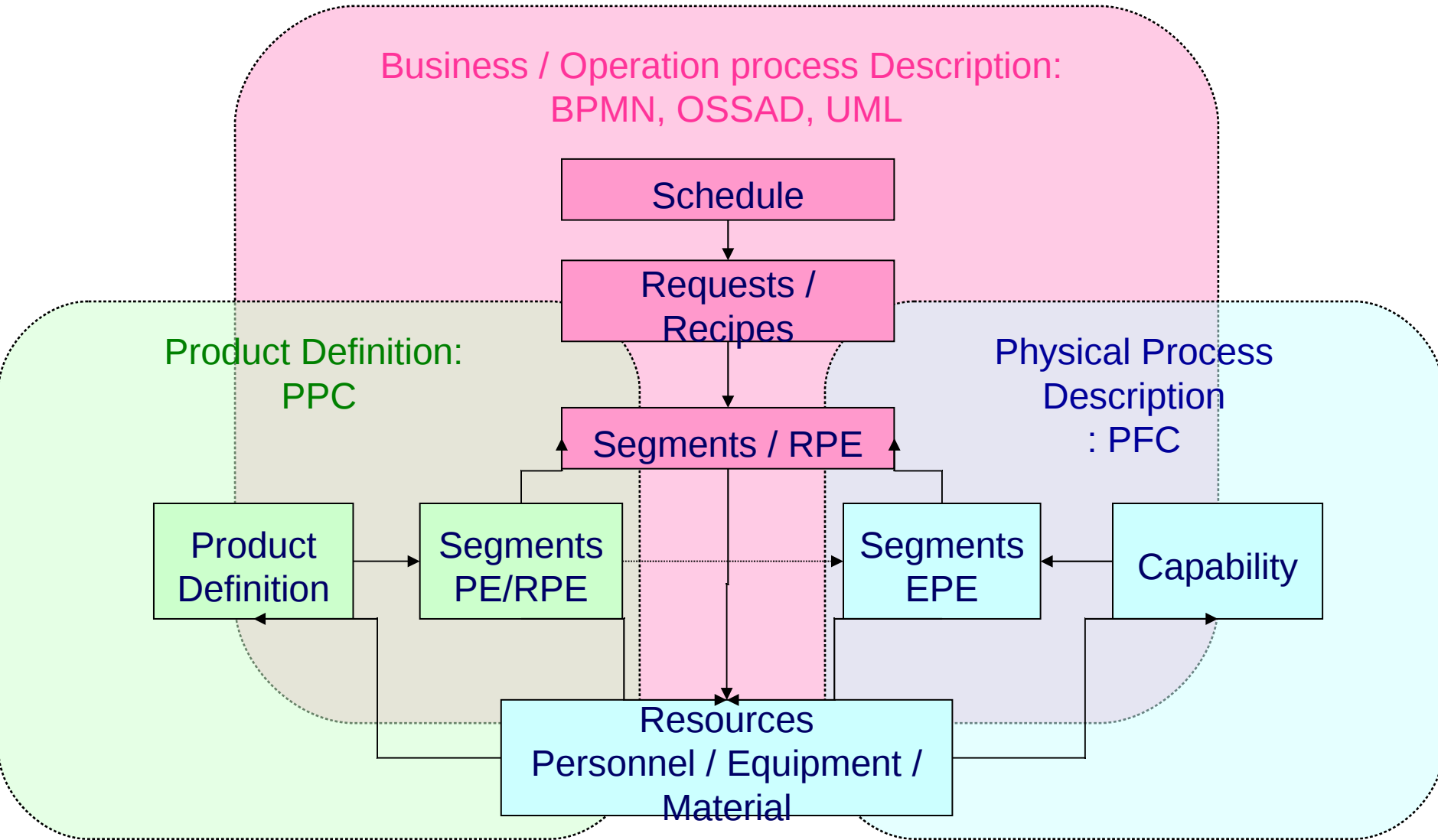
Ongoing Industrial Architecture



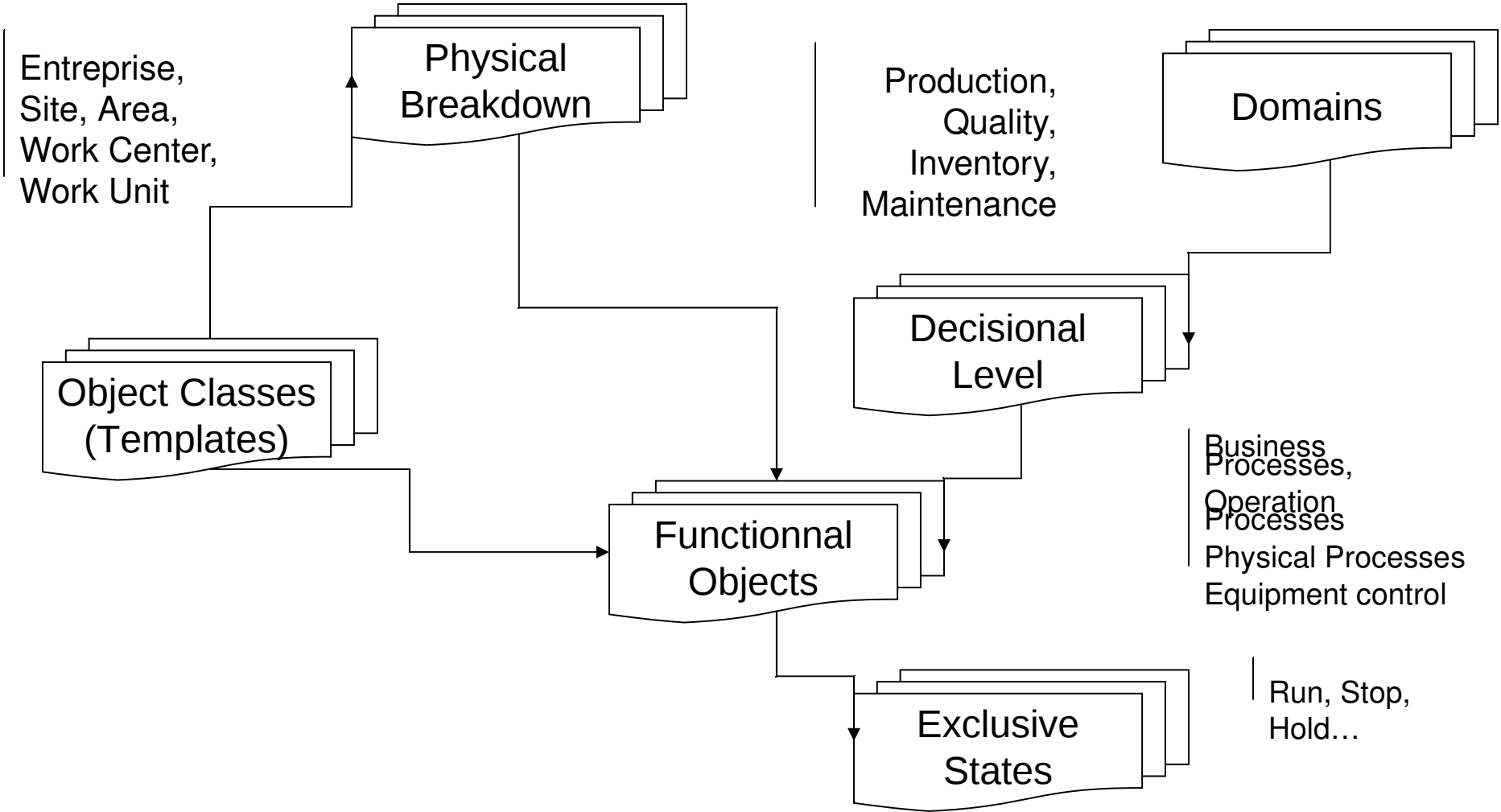
Interactions Hierarchy



Examples of Description standards



Modular ISA-88/95 structure



Information Elements

Domain	Model	Std	Information elements
Product Asset	Process Product	ISA-88 ISA-95	Product Hierarchy Product Definition
Inventory Asset	Material	ISA-95	Material Resources
Equipment Asset	Physical Equipment Physical Asset	ISA-88 ISA-95	Equipment Hierarchy Equipment Resources
Human Asset	Personnel	- ISA-95	Personnel Hierarchy Personnel Resources
Equipment Control	Procedural	ISA-88	Functional Hierarchy Equipment Procedural Elements
Physical Process Control	Procedural	ISA-88	Physical Processes / Procedural Elements Physical Process Transform Components
Physical Process Mngt	Segment	ISA-95	Segments
Operation Process Mngt	Operation Activity	ISA-95	Operation Processes Activities / Tasks

Thank You !