



Industry 4.0: La visione di IEC

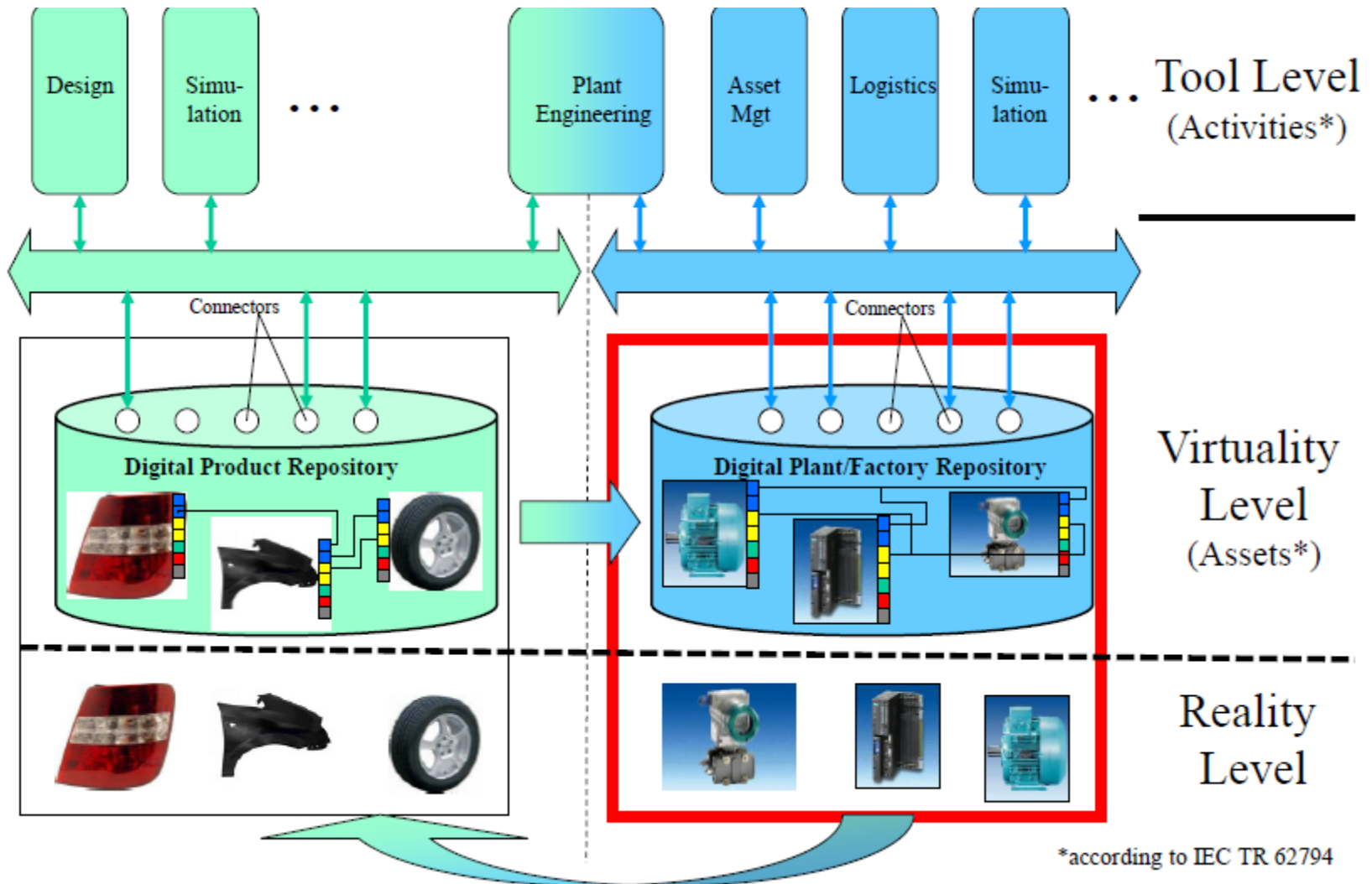


Micaela Caserza Magro
Paolo Pinceti

Università di Genova – DITEN
paolo.pinceti@unige.it



Digital Factory – Industry 4.0



Smart Factory: un tema sentito

La situazione in Italia

203 imprese

46 università

19
associazioni

6 distretti
tecnologici

Cluster nazionale



Ha lo scopo di promuovere nuove tecnologie e nuove soluzioni integrate per la fabbrica del futuro

Da chi è formato il Cluster



Attività previste: I primi 4 progetti del Cluster

Primi progetti per lo sviluppo delle enabling technologies

Primo set di enabling technologies ritenute prioritarie dalle imprese



Project	Research topic	Enabling Technologies								
		ICT for Manufacturing and "Digital Factory" technologies	High-performance manufacturing technologies	Sustainable processes and technologies	Technologies for End Of Life	Resource and system control technologies	Factory reconfiguration technologies	Resource management and maintenance technologies	Monitoring, context-aware and quality control technologies	Man-machine interaction technologies
PROJECT 1 SUSTAINABLE MANUFACTURING	Environmentally Friendly Manufacturing			X	X	X				
	De-Manufacturing			X	X	X				
	Human Centered Manufacturing			X						X
PROJECT 2 Adaptive and Modular Approaches for the Digital Factory	Re-configurability and flexibility of robotic cells.		X			X	X			
	Flexible, modular and adaptive manufacturing systems.		X			X	X	X	X	
	Human-machine adaptive and efficient interfaces									X
PROJECT 3 Smart Manufacturing	Smart Monitoring and Planning	X		X				X	X	
	Smart maintenance	X						X		
	Smart Products and Services	X								
	Virtual Product and Production Design	X		X						
PROJECT 4 High-Performance Manufacturing	Methodologies to improve machines and processes		X					X	X	
	High performance low cost machining centres and components		X	X						
	Data Fusion for the supervision of flexible systems	X	X			X				
	High performance deformation systems		X							
	High performance packaging		X							
	Additive Manufacturing, Micro and Nano Systems, MEMS		X							

Quali sinergie?



- Definizione del modello concettuale
- Definizione degli asset
- Costituzione del Digital Factory Respository

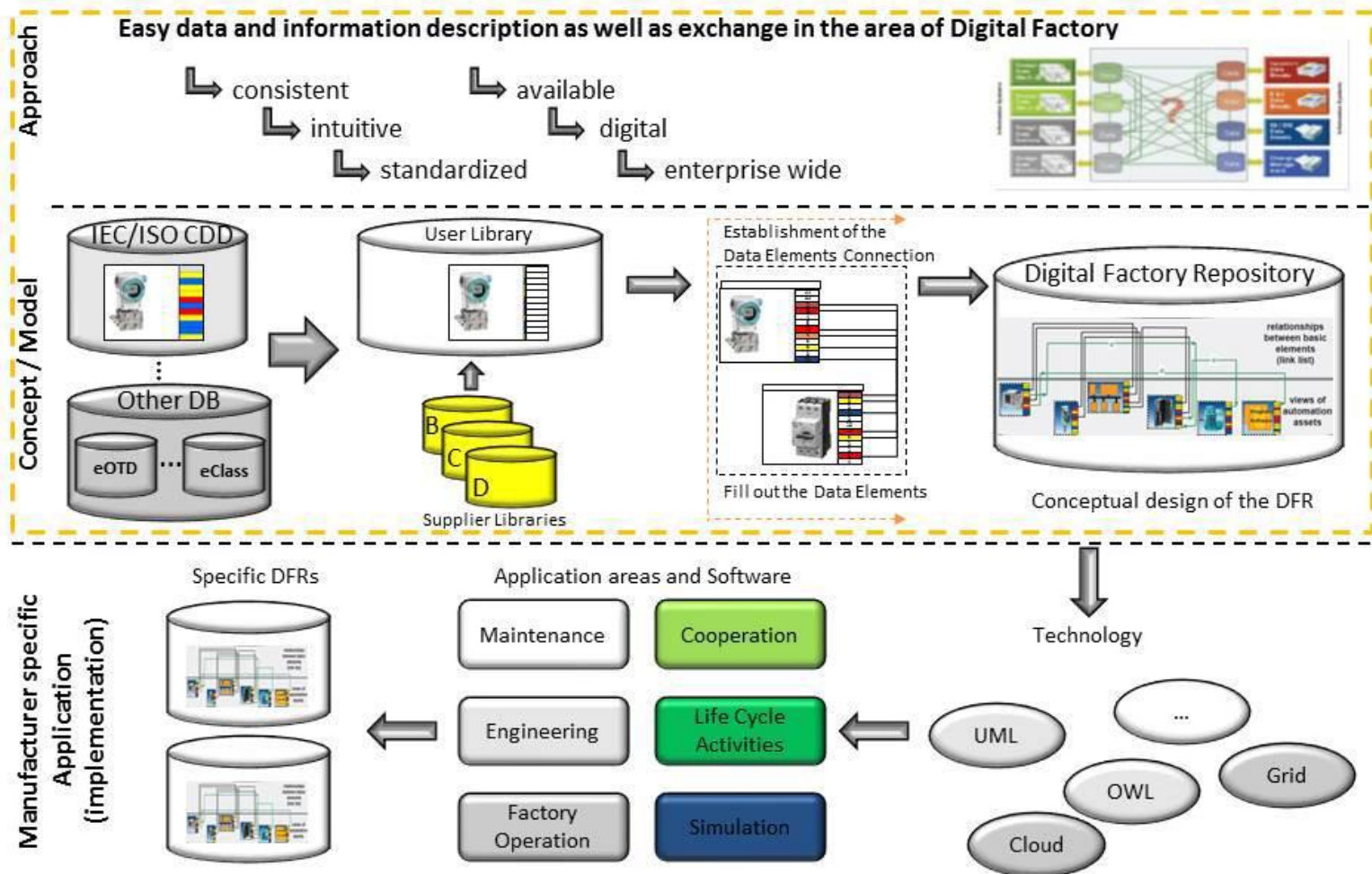
- Sviluppo di nuove tecnologie
- Implementazione di prototipi
- Rendere più competitivo il settore manifatturiero italiano



compliant  62832

Scopo della norma e contesto

Overall approach



1 - Asset di un dispositivo

Asset



Properties of Asset

- Diameter of the Sensor Cell
- Sensor Cell Material
- Weight of the Sensor
- Dimension of the Housing
- Material of the Housing
- Vibration Protection
- Local Display
- Local Operator Panel
- Threshold Level and Event Signalling
- Linearization Curve
- Time Stamp Function
- Self Calibration

Properties with Identifiers

Properties	
AAB418	Diameter of the Sensor Cell
AAB529	Sensor Cell Material
AAC603	Weight of the Sensor
AAC019	Dimension of the Housing
AAA529	Material of the Housing
AAC529	Vibration Protection
AAC113	Local Display
AAB305	Local Operator Panel
AAA530	Threshold Level and Event Signalling
AAB719	Linearization Curve
AAB805	Time Stamp Function
AAC017	Self Calibration

1a - Proprietà di un dispositivo

Properties

IEC 61360

m/o/c	Attribute	Value Example
m	Code	AAE254
m	Version number	005
m	Revision number	02
m	Value format	Real
m	Data element type class	E01
m	Preferred name	LOW-state output current
o	Synonymus name	output sink
m	Definition	The minimum guaranteed LOW-state dc output current (in A) of a digital function of an IC
o	Source document of data element type definition	IEC748-2 (III.5.3.1)(1985)
o	Unit of measure	A >> link to Units
o	Formula
o	Figure

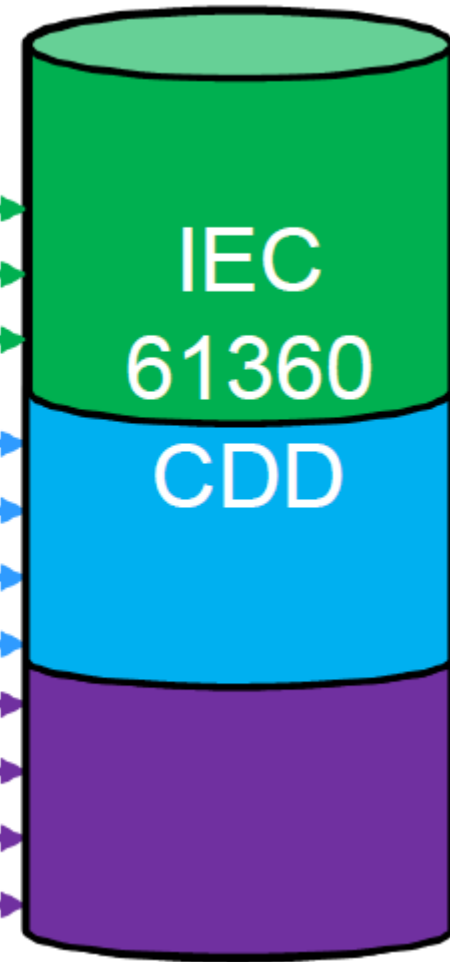
1b – Database IEC delle proprietà

Current contents

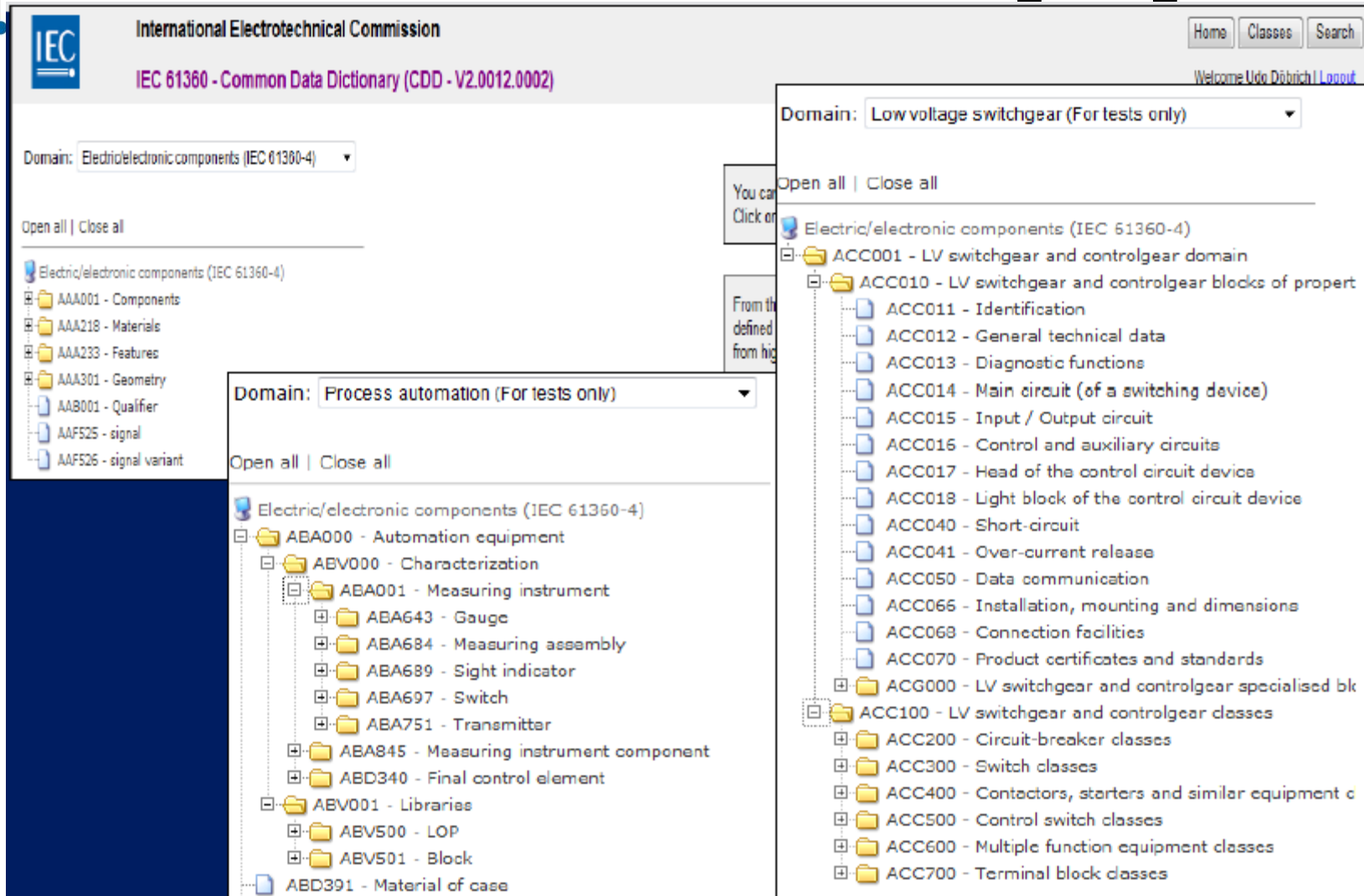
- IEC SC 3D (IEC 61360-4) **electronic components**
- IEC TC 111 (IEC 60079) **explosive atmosphere**
- IEC TC 111 (IEC 60721) **enviromental conditions**
- IEC TC 111 (IEC 62474) **material declarations**
- ISO TC 184 (ISO 10303-42/ PAS 62515) **geometry**

Contents under development

- IEC SC65E WG2 **Flow** IEC 61987-12
- IEC SC65B JWG 16 **Pressure** IEC 61987-13
- IEC SC65B JWG 17 **Temperature** IEC 61987-14
- IEC SC65B JWG 18 **Level** IEC 61987-15
- Density** IEC 61987-16
- Control valve** IEC 61987-22
- ...
- Signal adjustm.** IEC 61987-32
- Aspects** IEC 61987-92
- Measuring equip.** IEC 61987-11
- Actuators** IEC 61987-21
- Signal adj.** IEC 61987-31
- IEC 61987-10 Horizontal Standard**
- IEC 17B (IEC 62682-ff) **Contactors, Starters**
- Control Switches**
- Circuit Breakers**
- Switches, Dis-connectors**
- Terminal Blocks**
- IEC 61987-10 Horizontal Standard**



1b – Database IEC delle proprietà



International Electrotechnical Commission
IEC 61360 - Common Data Dictionary (CDD - V2.0012.0002)

Home Classes Search
Welcome Udo Döbrich | Logout

Domain: Electric/electronic components (IEC 61360-4)

Open all | Close all

- Electric/electronic components (IEC 61360-4)
 - AAA001 - Components
 - AAA218 - Materials
 - AAA233 - Features
 - AAA301 - Geometry
 - AAB001 - Qualifier
 - AAF525 - signal
 - AAF526 - signal variant

Domain: Process automation (For tests only)

Open all | Close all

- Electric/electronic components (IEC 61360-4)
 - ABA000 - Automation equipment
 - ABV000 - Characterization
 - ABA001 - Measuring instrument
 - ABA643 - Gauge
 - ABA684 - Measuring assembly
 - ABA689 - Sight indicator
 - ABA697 - Switch
 - ABA751 - Transmitter
 - ABA845 - Measuring instrument component
 - ABD340 - Final control element
 - ABV001 - Libraries
 - ABV500 - LOP
 - ABV501 - Block
 - ABD391 - Material of case

Domain: Low voltage switchgear (For tests only)

Open all | Close all

- Electric/electronic components (IEC 61360-4)
 - ACC001 - LV switchgear and controlgear domain
 - ACC010 - LV switchgear and controlgear blocks of proper
 - ACC011 - Identification
 - ACC012 - General technical data
 - ACC013 - Diagnostic functions
 - ACC014 - Main circuit (of a switching device)
 - ACC015 - Input / Output circuit
 - ACC016 - Control and auxiliary circuits
 - ACC017 - Head of the control circuit device
 - ACC018 - Light block of the control circuit device
 - ACC040 - Short-circuit
 - ACC041 - Over-current release
 - ACC050 - Data communication
 - ACC066 - Installation, mounting and dimensions
 - ACC068 - Connection facilities
 - ACC070 - Product certificates and standards
 - ACG000 - LV switchgear and controlgear specialised blk
 - ACC100 - LV switchgear and controlgear classes
 - ACC200 - Circuit-breaker classes
 - ACC300 - Switch classes
 - ACC400 - Contactors, starters and similar equipment c
 - ACC500 - Control switch classes
 - ACC600 - Multiple function equipment classes
 - ACC700 - Terminal block classes

1b – Database IEC delle proprietà

Domain:

Open all | Close all

- Electric/electronic components (IEC 61360-4)
 - ABA000 - Automation equipment
 - ABV000 - Characterization
 - ABA001 - Measuring instrument
 - ABA643 - Gauge
 - ABA684 - Measuring assembly
 - ABA689 - Sight indicator
 - ABA697 - Switch
 - ABA751 - Transmitter**
 - ABA752 - Accelerometer
 - ABA753 - Current transmitter
 - ABA754 - Density transmitter
 - ABA761 - Flow transmitter
 - ABA803 - Level transmitter
 - ABA830 - Power transmitter
 - ABA831 - Pressure transmitter
 - ABA835 - Temperature transmitter
 - ABA839 - Velocity transmitter
 - ABA841 - Voltage transmitter
 - ABA842 - Weight transmitter
 - ABA845 - Measuring instrument component
 - ABD340 - Final control element

Print Export

English French German Japanese

Code:	ABA751
Version:	001
Revision:	02
Preferred name:	Transmitter
Synonymous name:	
Coded name:	
Definition:	instrument intended to transmit a standardized signal th
Note:	NOTE 1: A transmitter may also be equipped with the me flowmeter, NOTE 3: A transmitter may also be a compon
Remark:	
Definition source:	
Drawing:	
Class type:	ITEM_CLASS
Applicable documents:	
Requisiy of properties:	

2 -Classificazione delle proprietà

Construction Properties

- Length of the Sensor Cell
- Diameter of the Sensor Cell
- Sensor Cell Material
- Weight of the Sensor
- Dimension of the Housing
- Material of the Housing
- Vibration Protection
- Local Display etc.

Function Properties

- Threshold Level & Event Signalling
- Linearisation Curve
- Compensating Function
- Time Stamp Function
- Self Calibration
- Fail Safe Mode
- etc.

Performance Properties

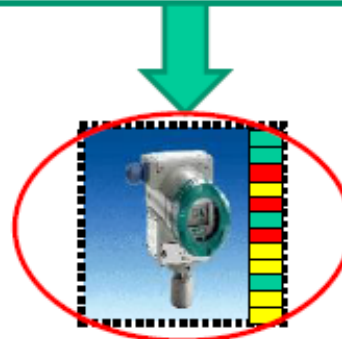
- Measuring Time
- Filter Time
- Communication Interval
- Start up Time
- Wake up Time
- Energy Consumption etc.

Business Properties

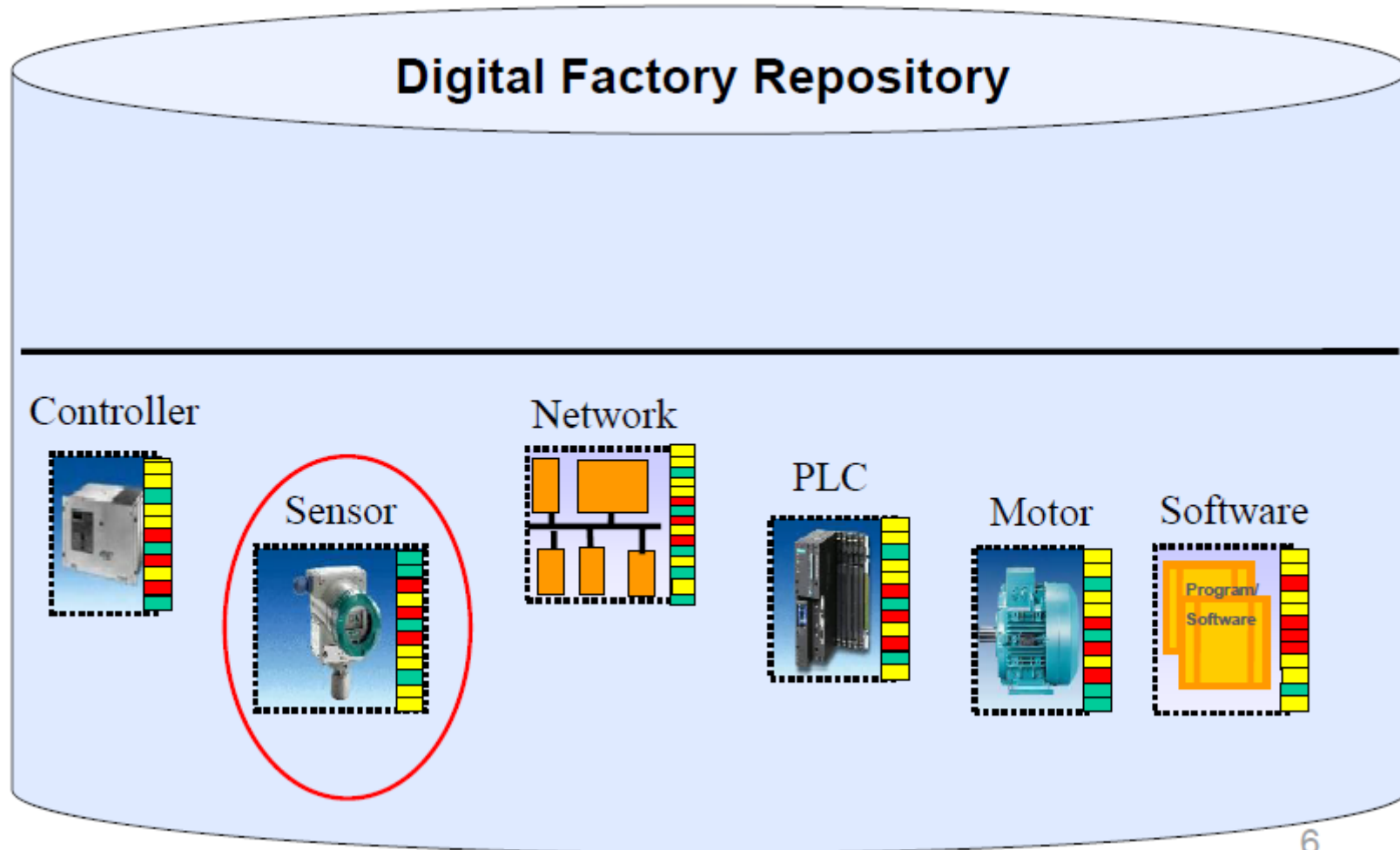
- Price
- Delivery Time
- Rebate

Location Properties

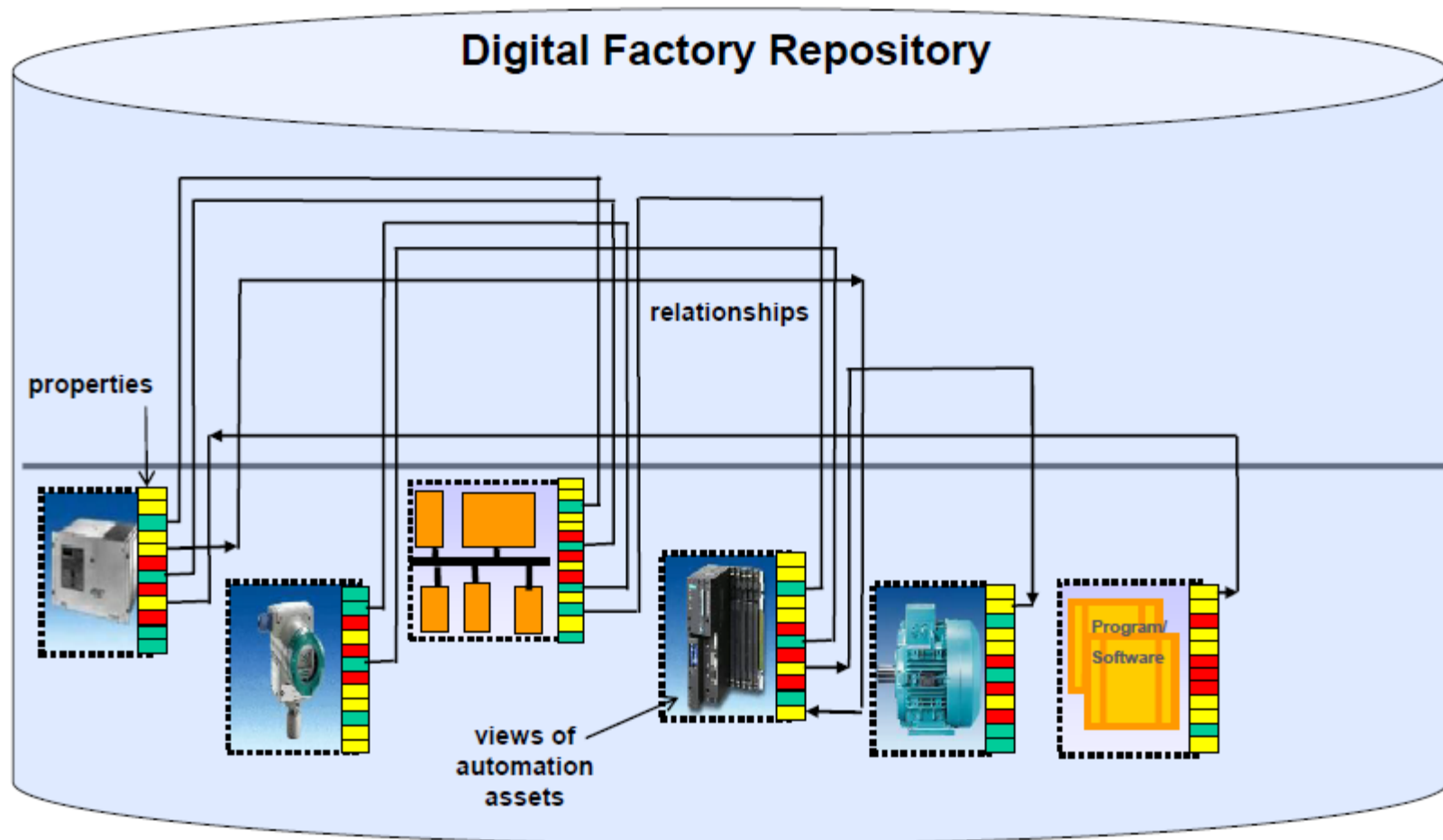
- Location of mainboard
- Location of communication Board



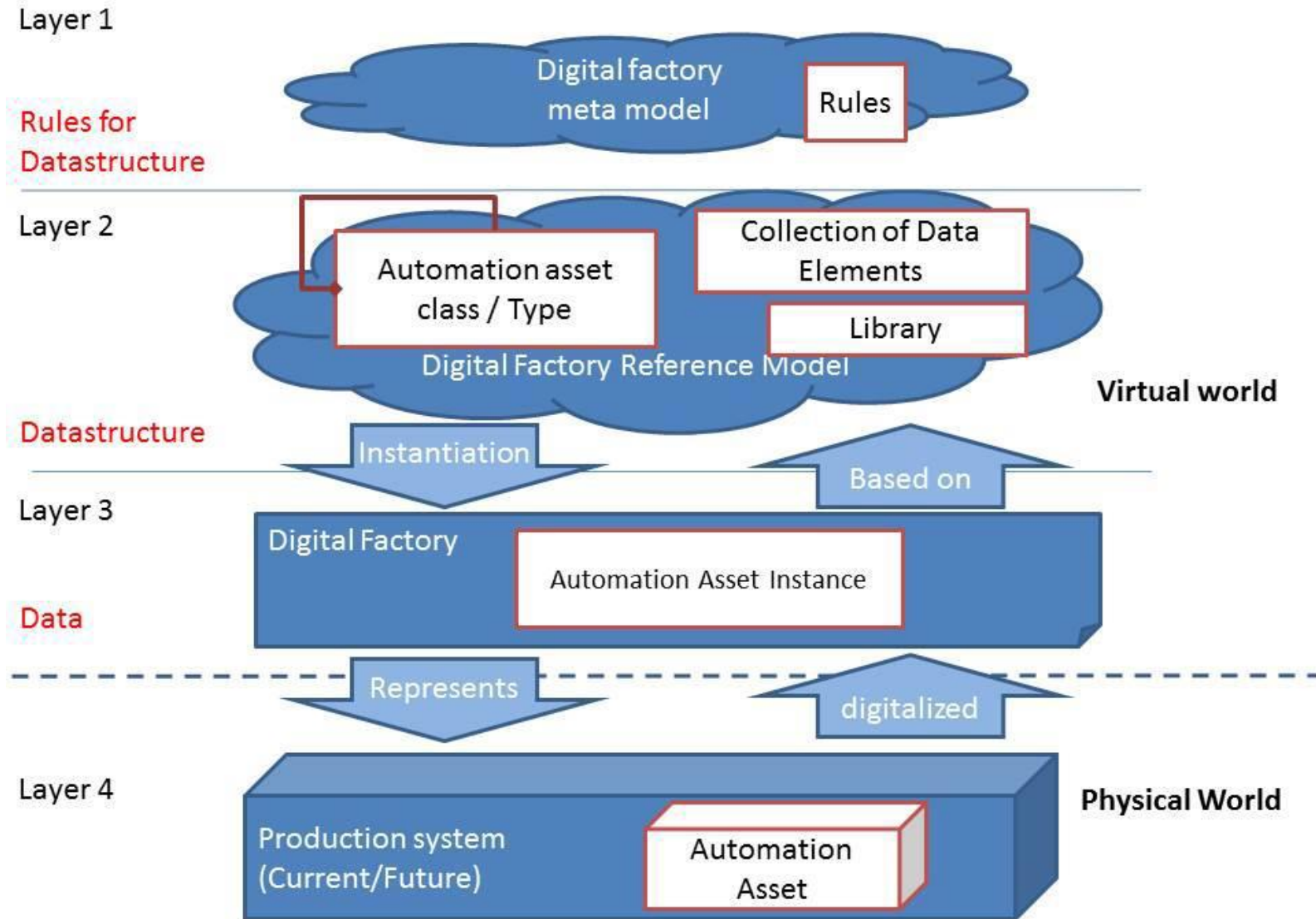
3 - Digital Factory Database



4 - Rappresentazione virtual plant



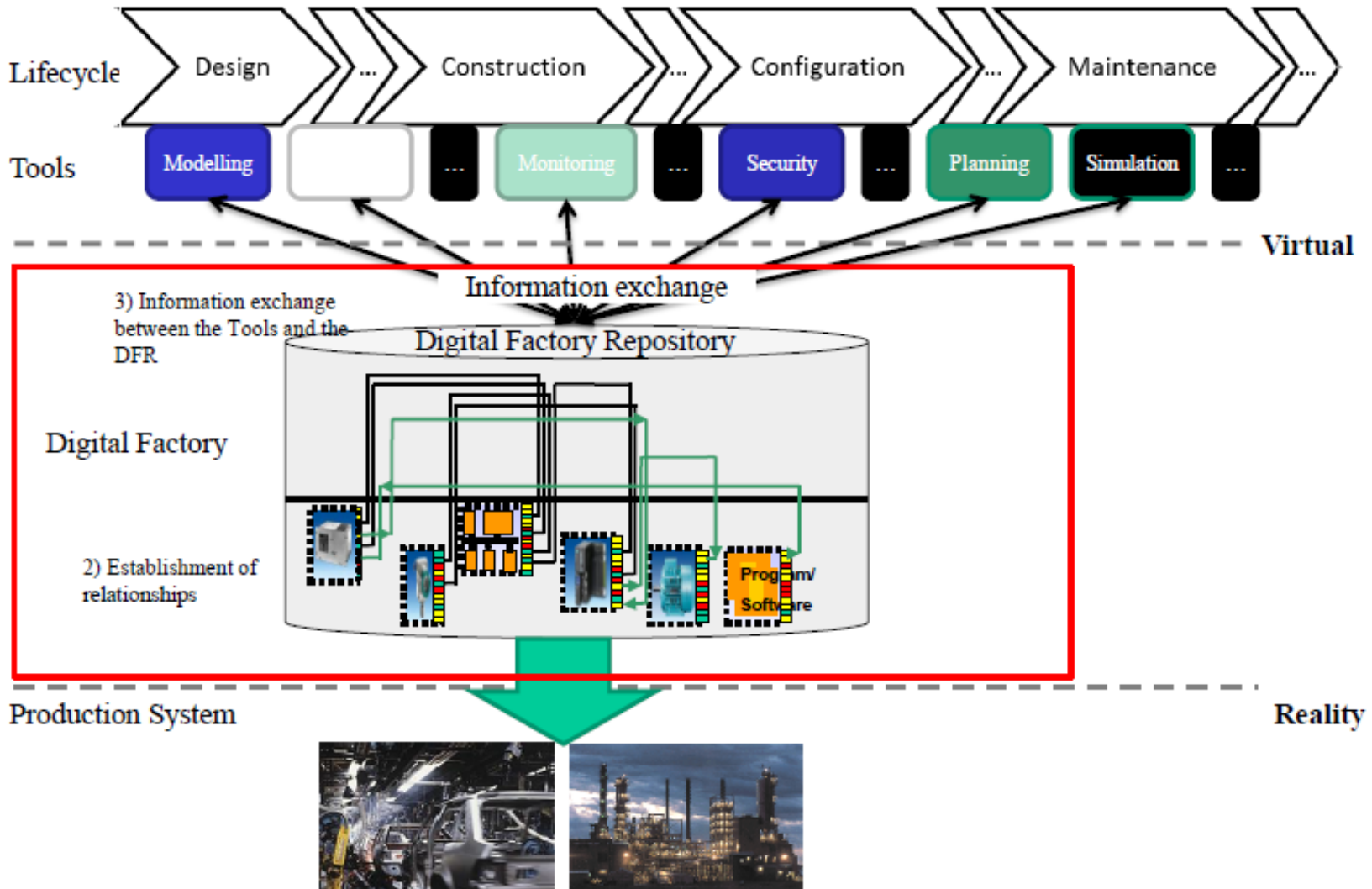
Struttura del modello definito



Struttura della norma IEC 62832

1. Scope
 2. Normative References
 3. Terms
 4. Overview of the Digital Factory
 5. Digital Factory Meta Model
 6. Digital Factory Reference Model
 7. Digital Factory
 8. Lifecycle of the Digital Factory
- Annex A: UML
- Annex B: IEC 61360/ ISO13584-42
- Annex C: ISO 22745
- Annex D: Use Cases

5 - Tools e Lifecycle



Quale il ruolo del fieldbus?

Scambio dati

Fornire servizi

Comunicazione

Diagnostica

Protocolli di comunicazione

Sender	Receiver	Designation and function of the layers	
7	7	Application layer	Interface to application program with application-oriented commands (read, write)
6	6	Presentation layer	Representation (coding) of data for analysis and interpretation in the next layer
5	5	Session layer	Establishing and clearing temporary station connections; synchronization of communicating processes
4	4	Transport layer	Controlling data transmission for layer 5 (transport errors, break down into packets)
3	3	Network layer	Establishing and clearing connections, avoiding network congestion
2	2	Data-link layer	Description of bus access protocol (Medium Access Control, MAC) including data security
1	1	Physical layer	Definition of the medium (hardware), coding and speed of the data transmission
Transmission medium			

Definiscono come trasmettere i dati:

- Livello fisico: cavi, segnali elettrici e codifica utilizzata
- Livello Data Link: metodo di accesso, formato telegramma
- Livello Applicazione: servizi resi agli utenti e comandi da e verso il campo

Profili di comunicazione

Definiscono cosa trasmettere :

- Composizione del frame dei dati utili
- Dati per tipologia di famiglia di dispositivi in campo

Orizzontali

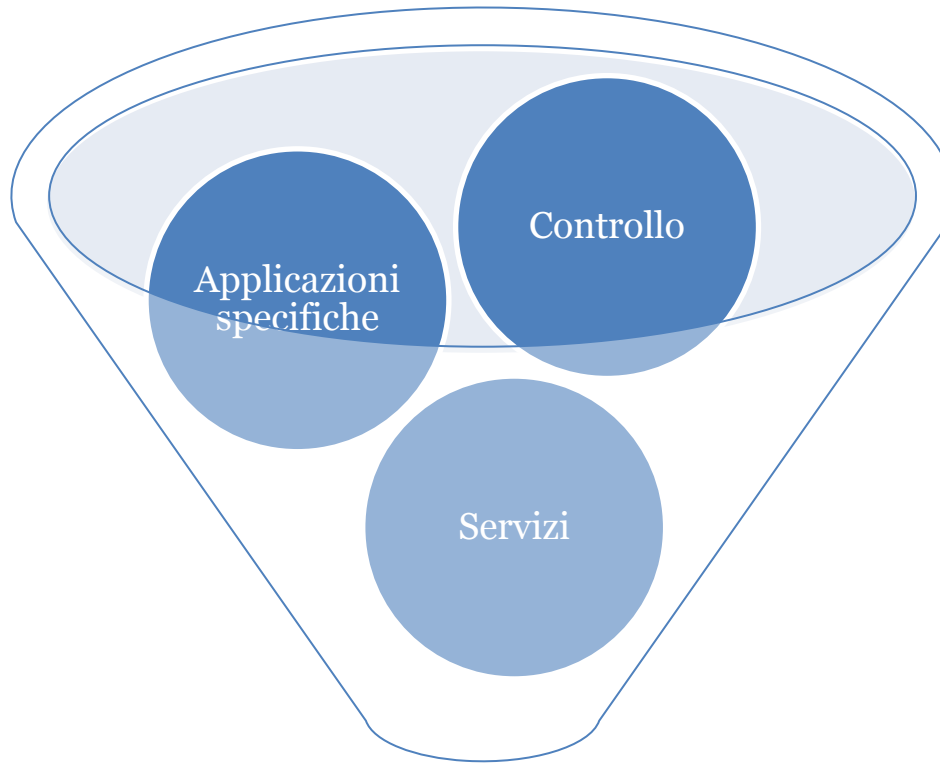
- Per il protocolli



Verticali per applicazione

- Sicurezza
- Energy saving
- Motion control
- Controllo distribuito

I fieldbus per i servizi



**Tecnologia abilitante per
Industry 4.0**

Conclusioni

Codice Progetto

CTN01_00163_216744

Budget

12 MEuro

Contatti

CLUSTER FABBRICA INTELLIGENTE

www.fabbricaintelligente.it

info@fabbricaintelligente.it

TECNOLOGIE ABILITANTI

Nuovi metodi di pianificazione, monitoraggio, controllo ed analisi delle fabbriche intelligenti della next generation

Sistemi avanzati di analisi industriale
Tecnologie come sensori, elementi di intelligenza embedded e strumenti di connettività distribuita

Una piattaforma integrata, modulare e scalabile per supportare l'implementazione rapida, efficiente ed affidabile di soluzioni manifatturiere di manutenzione preventiva

Sviluppo di dispositivi "smart" e "always connected", nonché la realizzazione di servizi ICT mirati il cui scopo è di aumentare la "customer satisfaction" e il benessere degli utenti a breve e lungo termine

Avanzate metodologie per il prototyping virtuale insieme a innovativi strumenti di ottimizzazione, applicati ai prodotti e ai relativi processi di produzione con applicazione nel campo delle macchine per confezionamento e della produzione di stampi per sanitari in ceramica

APPLICAZIONI INDUSTRIALI

Industria del bianco

Produzione di macchine per imbustamento, confezionamento e produzioni di stampi in ceramica
Produzione di sistemi frenanti per auto motive

Integrazione fra "Virtual World" e "Real World" per l'ottimizzazione, la gestione e il monitoring di fabbrica



Il Cluster Fabbrica Intelligente (CFI) è parte del sistema italiano dei Cluster Tecnologici Nazionali