

*Instrument standards
workshop 21 - 22 November
in London*

- a) **company or projects specifications that prevail in the industry, and**
- b) **their views on the need for and development of international standards.**



ABB

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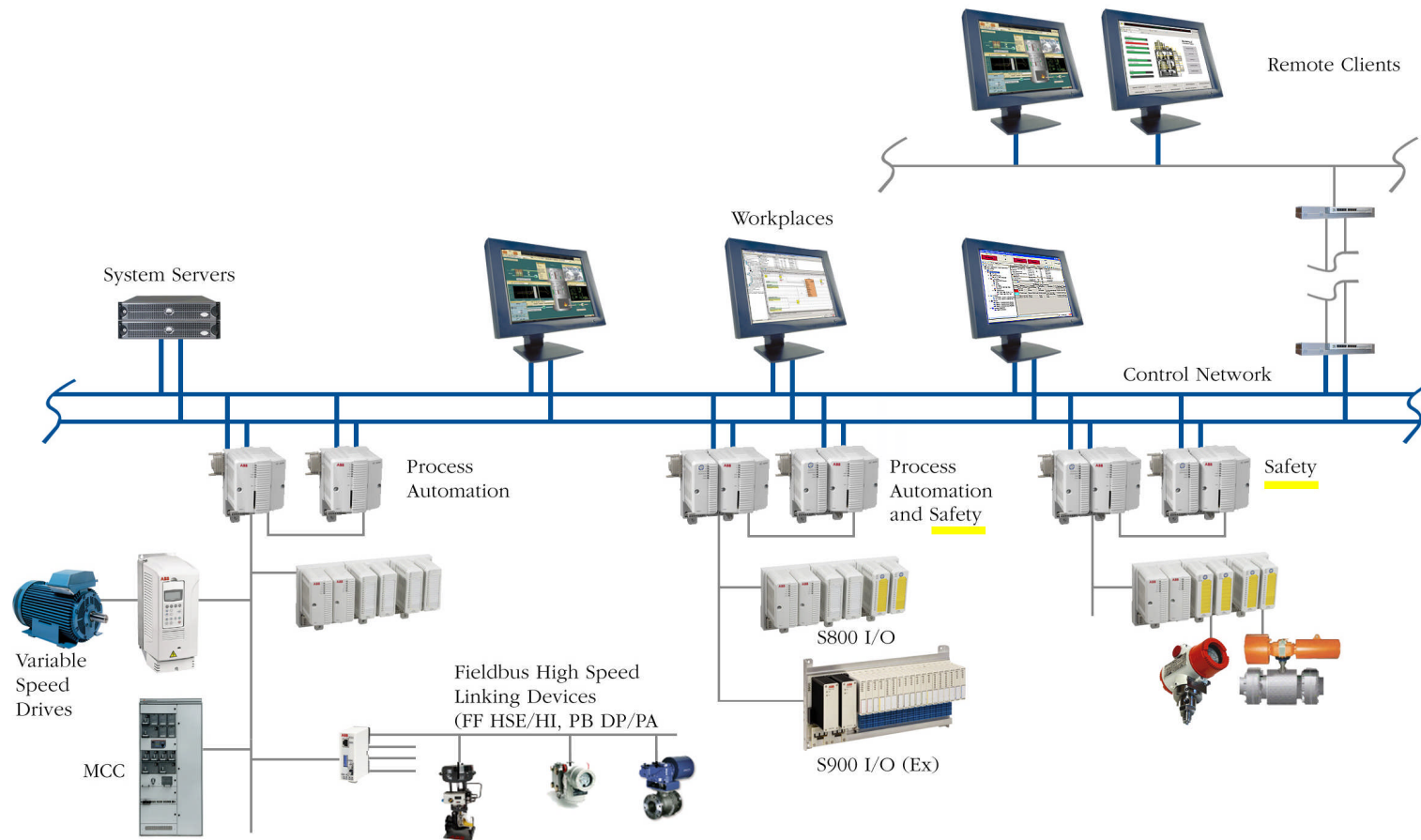
IndustrialIT
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Extended Automation System 800xA



Standards in Safety and Automation Systems (ABB)



A large number of standards many with overlaps

- The following pages show a typical selection from recent projects
- Overlap causes conflicts (Company/International, US/EUR etc.) within the same project.
- Multiple choices actually causes loss of standardization
- Much focus on low level and high level, missing focus on middle functionality (later)

A Selection of International Standards (1)

- ANSI/ISA
 - ISA-S5.1 Instrument Symbols and Identification
 - ISA-S5.2 Binary logic diagrams for process operations
 - ISA-S5.3 Graphic Symbols for DCS
 - ISA-S5.2 Instrument Loop Diagrams
 - ISA-S51.1 Process Instrumentation Technology
 - ISA-S71.01 Environmental Conditions for Process Measurement and Control Systems, Temperature and Humidity
 - ISA 75.01 Flow equations for sizing control valves

A Selection of International Standards (2)

■ ISO

- ISO 1000 SI units and recommendation for the use of their multiples and of certain other units
- ISO 3511 Process measurement control functions and instrumentation – Symbolic representation
- ISO 5167 Measurement of fluid flow by means of pressure differential devices – part 1.
- ISO 5660 Fire Tests – Reaction to fire – Rate of heat release from building products
- ISO 9000 Quality Management and Quality Assurance Standards
- ISO 10418 Recommended practice for Analysis, Design, Installation and Testing of Basic surface Safety Systems for Offshore Production Platforms
- ISO 13702 Petroleum and Natural Gas Industries Offshore production installations Control and mitigation of fires and explosions – Requirements and Guidelines

A Selection of International Standards (3)

- EN
 - EN 50014 Electrical Apparatus for potentially explosive atmospheres – General Requirements
 - EN 50018 Electrical Apparatus for potentially explosive atmospheres – Flameproof Enclosure ‘d’
 - EN 50019 Electrical Apparatus for potentially explosive atmospheres – Increased Safety ‘e’
 - EN50081 Electro Magnetic Compatibility – general emission standard
 - EN50082 Electro Magnetic Compatibility – generic immunity standard
 - EN50170 Fieldbus
 - EN60534-2-1/2 Industrial process control valves P2, sect. 1 and 2
 - EN60584-1/2 Thermocouples
 - EN60751 Resistance Temperature Detectors (RTD)
 - EN 61000-5-7 Electromagnetic Compatibility (EMC)

A Selection of International Standards (4)

- IEC
 - IEC 60529 Degrees of protection provided by enclosures
 - IEC 60079 Electrical apparatus for explosive gas atmospheres
 - IEC 60331 Fire resisting characteristics of electrical cables
 - IEC 60332 Test on Electric cable under fire conditions
 - IEC 61000 Electromagnetic Compatibility (EMC) part 1-6
 - IEC 61131-1 Programmable controllers – part 1 general information
 - IEC 61131-3 Programmable controllers – part 2 programming languages
 - IEC 61158 Digital data communications for measurement and control –
Fieldbus for use in industrial control systems
 - IEC 61508 Functional Safety of electrical/electronic/programmable
electronic safety related systems
 - IEC 61511 Functional Safety for the process industry sector part 1-3
 - IEC 60534 Industrial process control valves
 - IEC 60584 Thermocouples
 - IEC 60751 Resistance Temperature Detectors (RTD)

A Selection of International Standards (5)

- ANSI
 - ANSI B16.10 Face to Face and end-to-end dimensions of valves
 - ANSI B16.36 Steel Orifice Flanges
 - ANSI B16.5 Pipe Flanges and Flanged Fittings
 - ANSI/FCI 70-2 Control Valve seat leakage
 - ANSI/ASME B1.20.1 Pipe threads general purpose (imperial units)
 - ANSI/ASME Performance test codes 19.3-1974 chapter 1, thermo wells

A Selection of International Standards (6)

- ANSI/EIA
 - ANSI/EIA-152-C Minimum Standards for Land-Mobile Communications, FM or PM Transmitters, 25-866 MHz
 - ANSI/EIA-RS-204-C Minimum Standards for Land-Mobile Communications, FM or PM Transmitters, 25-946 MHz
 - ANSI/EIA-RS-232 Minimum Standards for Serial communications....
 - ANSI/EIA-RS-329 Minimum Standards for Land-Mobile Communication Antennas Part 1 Base or fixed station Antennas
 - EIA/TIA-607 Communication building grounding and bonding requirements for Telecommunications
 - EIA/TIA-568-A Commercial Building Telecommunications Wiring Standard
 - EIA/TIA-569 Commercial Building Standard for Telecommunications Pathway and Spaces
 - EIA/TIA-606 Administrative Standard for the Telecommunications Infra-Structure of Commercial Buildings
 - EIA/TIA-TSB 40 Technical Communications Bulletin – Additional Transmission Specifications for UTP

Industry Standards (1)

- AGA
 - AGA XX Gas Flow metering 1..7
- API
 - API RP 520 Sizing selection and Installation of Pressure-Relieving Devices in refineries part I and II
 - API RP 526 Flanged Steel safety Relief Valves
 - API RP 527 Seat Tightness of Pressure Relief Valves
 - API RP 670 Vibration, axial position and bearing temperature system
 - API RP 678 Accelerometer based Vibration Monitoring System
- EU/EEC
 - 89/336/EEC EMC Directive
- IPS
 - IP Pert 15 Area Classification Code for Petroleum Installation

Industry Standards (2)

- NFPA
 - NFPA 11A Standard for medium and high expansion foam systems
 - NFPA 13 Integration of Sprinkler Systems
 - NFPA 14 Standards for the Installation of Standpipe and Hose Systems
 - NFPA 16 Deluge Foam-Water Sprinkler systems and Foam-Water Spray Systems.
 - NFPA 20 Standard for the Installation of Centrifugal Fire Pumps
 - National Fire Alarm Code
 - NFPA 72E -3-3 Temperature classification

Industry Standards (3)

- ASME VIII Boiler and Pressure Vessel code Section VIII, Div 1
- BICSI Building Industry Consulting Services, International Telecommunications Methods Manual
- IEEE 802.3 Carrier Sense Multiple Access/Collision Detection Access Method (CSMA/CD)
- IEEE 802.4 Token Bus Access Method
- IEEE 802.5 Token Ring Access Method
- NAMUR Normenarbeitsgemeinschaft für Mess- und Regeungstechnik in der Chemischen Industrie
- NEMA ICS.6 Enclosure for Industrial Control system
- NEC National Electric Code
- NESC National Electrical Safety Code
- NFC National Fire Code
- REQ-PE-90 Specification for totally filled Fiber Optic Cable

Industry standards (4)

- Norsok I-001 Field Instrumentation
- Norsok I-002 Safety and Automation Systems
- Norsok I_005 System Control Diagram
- Norsok L-002 Piping Design, Layout and Stress Analysis
- Norsok L-003 Piping Details
- Norsok M-501 Surface Preparation and Protective Coating
- Norsok Z-002 Code Manual
- Norsok Z-004 CAD Symbol Libraries
- NS 1710 Technical Drawings – Drawing Symbols for Piping systems
- NS 1438 Process measurement control functions and instrumentation – Symbolic representation – Part 1: Basic requirements
- BS-6121 part 5 Specification for Metallic glands
- BS-6739 Instrumentation in Process Control Systems: Installation design and Practice
- BS-6883 Elastomer Insulated cables for fixed wiring in ships and on mobile and fixed offshore units.

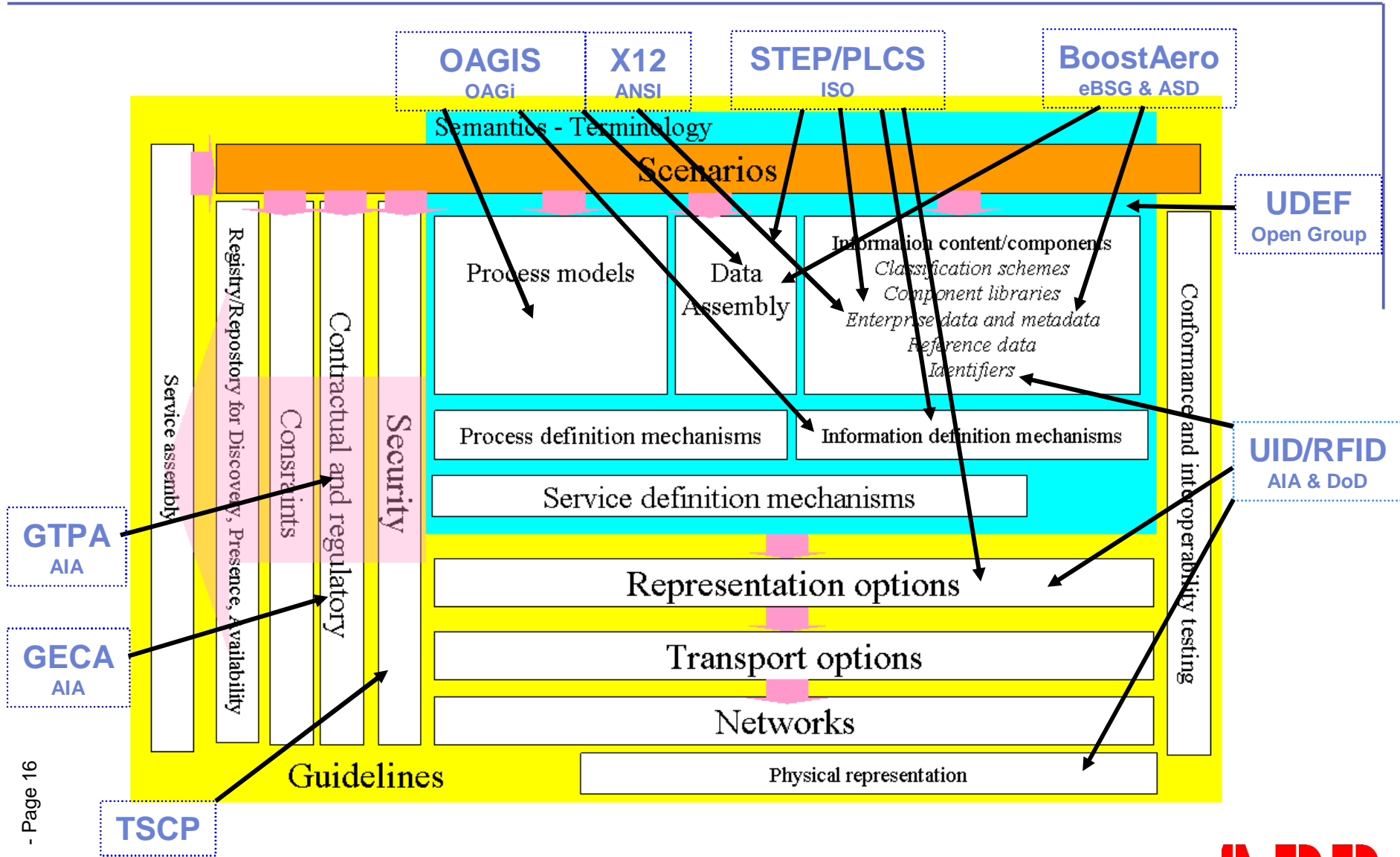
Industry standards (5)

- FF (In IEC 61158, EN ISA 50170)
 - Fieldbus Foundation H1
 - Fieldbus Foundation HSE
 - Fieldbus Foundation DD (Device Descriptions)
 - Fieldbus Foundation SIS (Safety)
- Profibus (In IEC 61158, EN ISA 50170)
 - Profibus DP, PA
 - Profinet
 - Profidrive
 - ProfiSafe
- Microsoft
 - Various Windows
 - OLE, OPC
- Other
 - Modbus (Classic, TCP/IP)
 - Device Net

Examples of Company Standards

- Instrument Installation General Specification
- Preservation of Materials and New Equipment
- General Specification for protective coating
- Engineering Standards for Control and Instrumentation cables for offshore topsides facilities
- Pre delivery Testing & Inspection of Instrumentation & Control Systems
- Specification for the Supply of Control Systems
- Flame Retardant Cables
- Process Automation System Procurement
- Data Historian System Procurement
- Human Machine Interface Procurement
- General Requirements for Control System Procurement
- Control Hardware / Process Control Automation
- Data Historian
- Human Machine Interface / Alarm System
- Control System Integration
- Control System Advanced Applications
- Process Control Networks
- Control Panels
- I&C vendor packaged equipment
- Testing and Commissioning
- Material Specification for Automation systems
- Material Specification for Remote Terminal Units
- Material Specification for Process Safety Systems
- Material Specification for Process Instrumentation
- Material Specification for Process Safety Equipment

Towards an Industrial Automation Framework (IEC SB3)



The AIA eBusiness "Radar Screen"

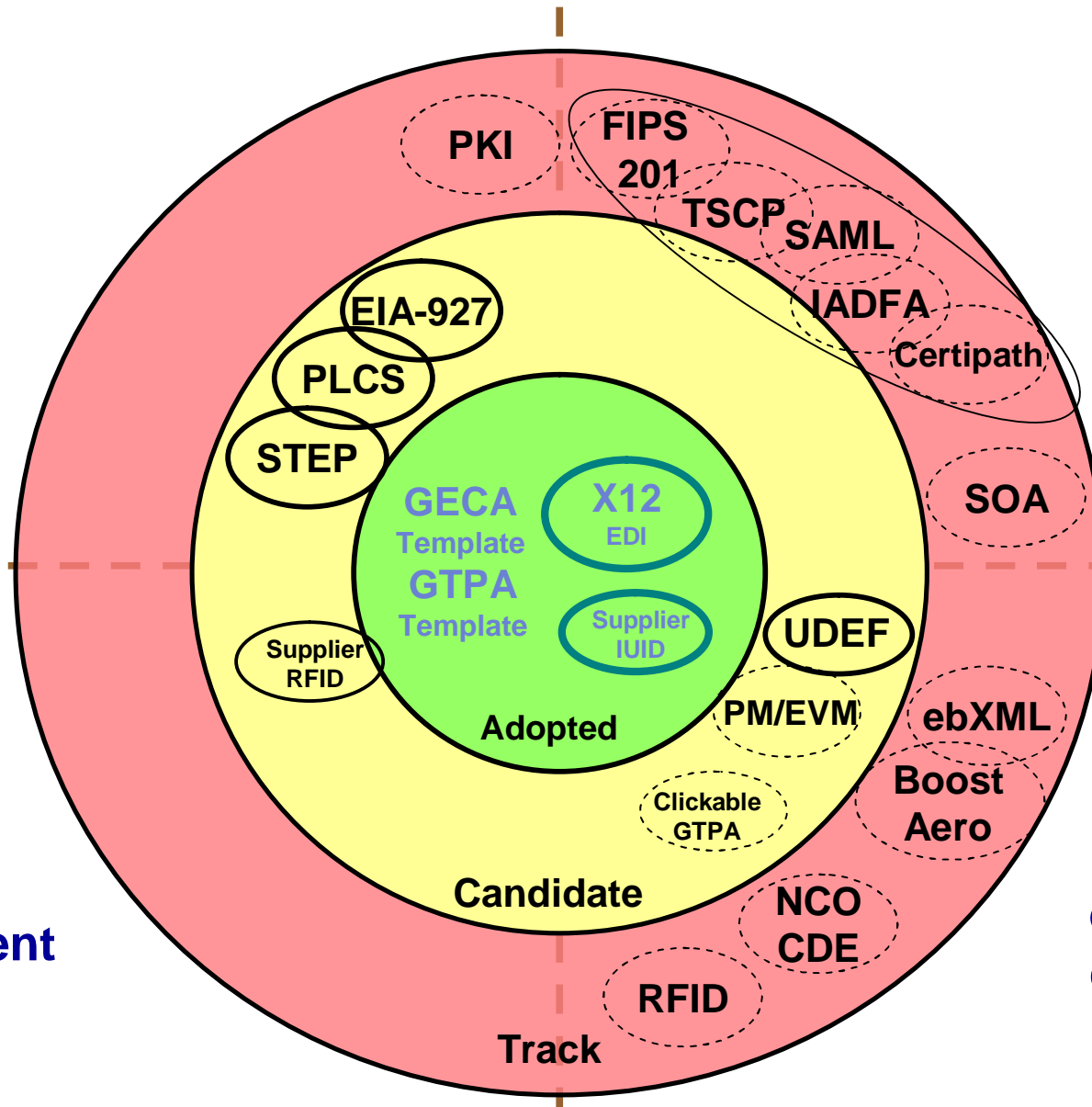
Adopt existing standard

AIA development

Active AIA Project
AIA Guidelines

Monitor external development

Participate in external development



Some areas of concern

- Vendors
 - Drive for Value Add = Diversity
 - Participate in and dominate relevant standards groups
 - Highest level of technological knowledge on products and systems
 - Standardization becomes slow and “political”
- End Users
 - Low participation in standards group
 - Higher level of knowledge on plants processes and operation
- But still end users are quick to jump on new features instead of priority on interoperability, standardization etc. Evaluation based on often based on features rather than operability and performance.
- Result: Vendors drive for more unique features, diversification. Interoperability becomes less important than unique value.

Examples (1)

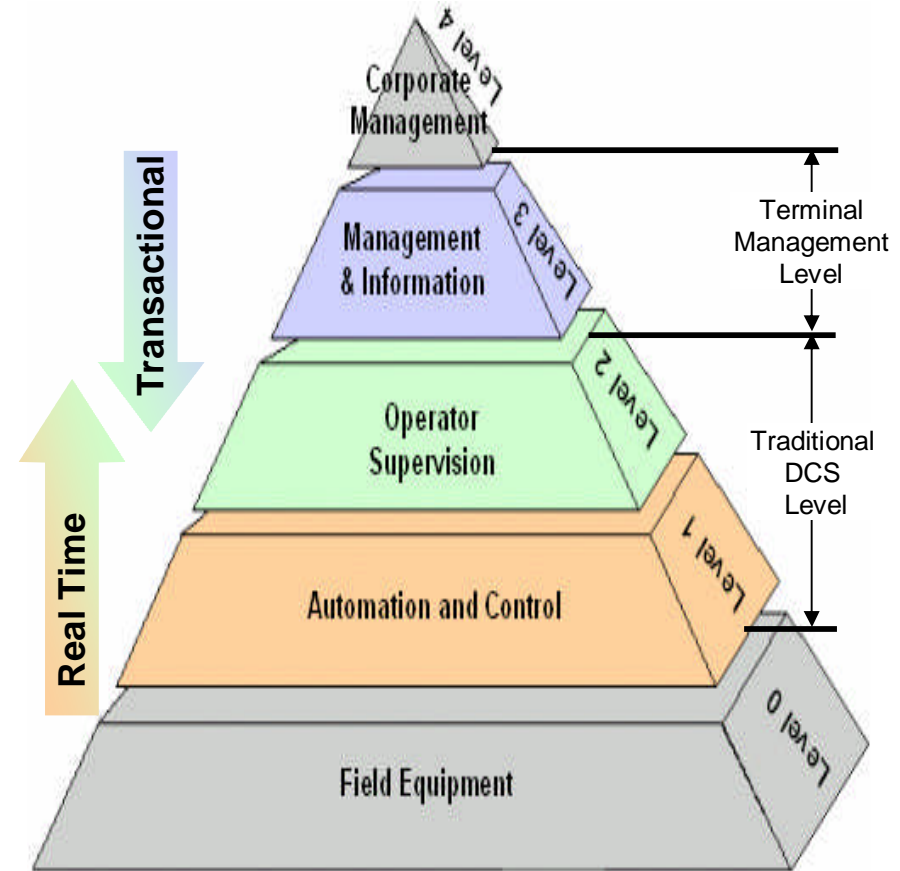
- Fieldbus: Ensures basic connectivity, but interoperability in areas of asset management/diagnostics, maintenance, field control etc. protected as unique features.
- OPC (OLE for Process control) provides connectivity (possibility for transfer data), but no interoperability. Each new connection requires interface between vendor A and vendor B OLE Objects.
- We use IEC 1131.3 but can we actually program across vendors ?
- Solution: IEC SB3 studied “Automation Objects”, effort delayed by “politics” and lack of end user engagement.

Examples (2)

- IEC 61508/61511 Safety
 - Intention to provide neutral evaluation of safety integrity level (SIL).
 - System architecture neutral, based on performance rather than architecture, features.
- But...
 - Still discussion is on Triplicates, Redundant, Dual...
 - Name (even location) of certification authority (Requiring TUV Sudwest!)
 - This ProfiSafe, That FF SIS

Categories of Functions

- Automation and control functions.
 - Measurements of process variables.
 - Control of variables.
 - Communication with field equipment.
- Functions related to operator supervision.
 - HSI, alarms, trends, history.
- Management and information.
 - Access, product accounting and reporting, databases, interface with corporate systems, etc.



The missing middle

- Much focus on level 2,3,4 (e.g. ISA SP95)
- Much focus on level 0,1 (e.g. FF, Profi)
- Limited focus on 1,2:
 - Portable applications (IEC 61131.3 type)
 - Interconnectivity (TCP/IP, OLE ...)
 - Reusable data (OPC Automation objects)
 - System status and diagnostics.

ABB

ISA-95 Functional Hierarchy of Activities

