Enabling Interoperability in Smart Factory: OPC UA, AutomationML, Ecl@ss - Testing, Certification & Support

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1. Interoperability in Smart Manufacturing
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3. AutomationML: Smart Engineering for Smart Manufacturing
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Interoperability in Smart Manufacturing Paradigm

Interoperability

Syntactic

Semantic

Horizontal

Vertical

Cloud Service Marketplace

External World

Enterprise Resource Planning

Mfg. Execution System

Process Control

Control (PLC)

Field Devices

Automation Pyramid

Automation Network

(Source: Interoperability in Smart Manufacturing- Abe Zeid)

Testing of the compliance with standards

Standards

Compliance to standards
Reference Architectures for Interoperable Manufacturing

IIRA

RAMI 4.0

(Source: Plattform4.0 and ZVEI interoperability report)
Implementation of Smart Connected Components

**WHAT??**

**Component Manager**: Interface for resources access of the smart component and enabling interoperability with other smart components

**Manifest**: Externally accessible defined set of meta-information about functional & non-functional properties of smart component

**Submodels**: Standardized representation of each aspect of the component

**How??**
OPC UA: Standard Connectivity for Smart Manufacturing

- OPC UA (IEC 62541): Communication technology for manufacturer independent information modelling and exchange in industrial automation, de-facto standard for open data connectivity

- Communication models: Client/Server; Publisher/Subscriber

**Why Testing and Certification?**

- Compliance and interoperability with OPC specifications and other OPC UA solutions
- Robustness check, usability and efficiency assurance

**What can be certified?**

- Any OPC UA client or OPC UA server (H/W and S/W)
OPC UA Interoperability Testing & Certification

- **DUT Configuration Checklist & test server prep**
  - DUT configuration
  - Pre-configured test server

- **Registration of device and test software configuration**
  - Registration of DUT in local testing network
  - Configuration of interoperability test software

- **Testing**
  - Testing against 5 OPC UA servers/clients authorized by the UA foundation
  - Semi-automated process

- **Test Report**
  - Detailed report with passed/failed cases
  - Log files on request
  - Certification

Interoperability Plug-fest day!
OPC UA Testing, Certification and Support

1) Compliance Test:

- Compliance Testing Tool

2) Robustness & Stress Test:

- User load
- Invalid input
- Physical faults
- Network stress

Training & Workshops:

- OPC UA Introduction
- OPC UA developer
- Interoperability
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AutomationML: Smart Engineering for Smart Manufacturing

- IEC 62714- exchanging engineering data along the entire lifecycle of production systems
- Recommended standard for implementing end-to-end engineering in Asset Administration Shells by Plattform Industrie 4.0

Source: AutomationML Brochure
AutomationML: Smart Digital Factory

- Tool 1
- Tool 2
- Tool 3
- Tool 4

Administration Shell

Headers & Submodels

- Self-sufficient description of arbitrary data structure for header
- Individual description of submodel data structure for body
- Self-description for interoperability between diverse assets (physical, logical, software etc.)

Topology information
Mechanical properties
Electrical & Pneumatic properties
Control properties

Interoperability in Smart Manufacturing
AutomationML Support Scope

AutomationML Introduction

AutomationML Developer

Integration of AutomationML data into AAS/digital twins

Use-case definition and value identification

Integration of AutomationML in software toolchains

Mapping of AutomationML data model to OPC UA information model (includes AutomationML to XML)

AutomationML model checker

Concept definition
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Ecl@ss: Semantics for Smart Manufacturing

- **Smart Manufacturing Requirement:** Standardized, formally defined, consistent semantics for data structures for communication between all components throughout production lifecycle.

- **Solution:** Smooth, error-free administration shell relevant data exchange enabled by Ecl@ss open, proprietary meta-language with unique semantics.

Ecl@ss: based on IEC 61360

ISO/IEC-compliant machine-readable property descriptions with dedicated IRDIs lead to unique identification of every entity in the system.
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In a Nutshell: Enabling Smart Manufacturing

- Smart Components
- Standards
- Interoperability
- Smart Safety & Security
Thank You!