Paris Declaration of the Trilateral Group for Smart Manufacturing

Digitizing European Industry | Stakeholder Forum 2018 in Paris

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The 4th industrial revolution is radically transforming our economies, as innovation and digitization call for a paradigm shift in industrial production and products. Therefore, integrating the digital revolution is the new road ahead for industry.France, Germany and Italy as important players in the field of digitization in Europe have started initiatives to keep up and improve their position in industry. Alliance Industrie du Futur in France, Plattform Industrie 4.0 in Germany and Piano Impresa 4.0 in Italy have agreed to join forces working on a shared action plan towards internationalization as end-to-end digital continuity and global standardization are of crucial importance for a digitized economy. Industrial production is facing a tremendous technological shift. At the same time, the global work shares of future production and also of value creation will be redistributed. Almost 30 years ago, Europe revolutionized mobile communications globally with the creation of the GSM™[1] standard and proved how to achieve a "BIG" transformation by combining forces together.

The trilateral cooperation between France, Germany and Italy contributes to the European Multi-Stakeholder-Platform (EU-MSP) which develops a coordinated European approach. Europe is home of worldwide leading and innovative manufacturers of all sizes who want to maintain and even extend their global leading position through this digital transition.

Therefore, we have the opportunity and challenge to revive the spirit of GSM™ to favorize digitization of European Industry by developing **global standards for Smart Manufacturing**.

The trilateral group is working on the document: **"Structure of the Asset Administration Shell"** that will be published at the Hanover Fair on 25.04.2018 and describes fundamental principles of Smart Manufacturing.

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[1] GSM is a registered trademark of ETSI (European Telecommunication Standardization Institute)

Scope and definition of an Asset regarding Smart Manufacturing

A data-driven economy knows no barriers. The potential for value creation can only be exploited, if all aspects of industrial production are considered. Therefore, the discussion on Smart Manufacturing can be roughly understood as the interaction between different aspects such as:

- Horizontal integration through value networks
- Vertical integration, e.g. within a factory/or production shop
- Life cycle management, end-to-end engineering
- Human orchestrating the value streams

The Administration Shell provides a flexible framework on the information and functions that can be defined and made available to facilitate and promote the Smart Manufacturing aspects.

Assets may be of various natures:
- physical objects, for example, equipment (machine, cabinet, contacteur, computer, actuator, cables, connectors, sensors ...), raw material, parts components and pieces (screw, wheel ...), supplies, consumables (paper ...), or products (final or intermediate)
- Software (firmware, applications, engineering tools ...)

It might be extended to:
- documents (data media, life cycle documentation ...)
- immaterial (license, copyright, idea, plan, process definition, standards, patents, general procedure, recipe, equipment type definition, product/family type definition, production plans, project plans business procedures, actual states ...)
- Information
- human (service technician, programmer, operator ...);
- Service ...

An Administration Shell encloses an asset providing its properties and functions in the information world. The Administration Shell is the standardized digital representation of an asset, a corner stone for interoperability between applications in manufacturing systems. The Smart Manufacturing component is the combination of the asset with its logical representation, which is the Administration Shell.
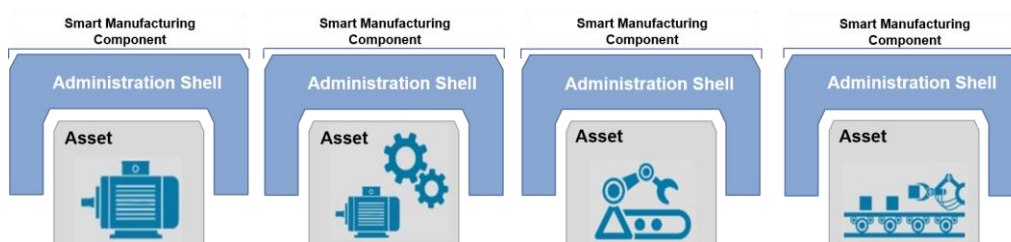
Structure and Requirements of an Administration Shell

The Administration Shell is split into a "header" and "body". The "header" contains everything which happened to the asset, the body contains everything which is relevant to describe the characteristics of an asset, i.e. a list of properties and functions that ensures identification and description of the asset(s) and its Administration Shell(s). In accordance with the Smart Manufacturing requirements and the required suitability, an Administration Shell shall be capable of holding information and functions for different technical disciplines, different life cycle phases and different application and analysis scenarios. The quantities of different properties to support should be correspondingly high and broad-based. A large amount of properties needs to be defined from three different sources:
- Standards
- Consortium specifications
- Manufacturer specifications
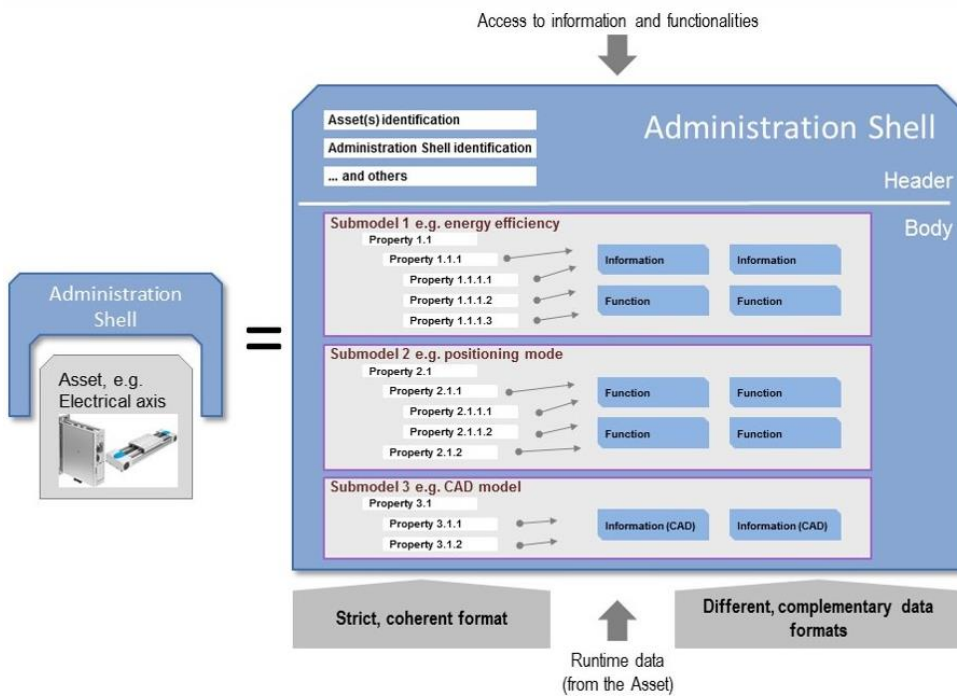
The five main requirements for properties are defined as follows:

- The properties and other elements of information in the Administration Shell must be suitable for types and instances
- There must be a capability of hierarchical and countable structuring of the properties
- Properties must be able to reference other properties, also in other Administration Shells
- Properties must be able to reference information and functions of the Administration Shell
- Properties must take into account aspects of information security by means of graduated guarantees of availability, integrity, confidentiality, visibility and authenticity

Example: mapping of several assets in the Administration Shell using an electrical axis system

A manufacturer provides a unique Administration Shell for several individual assets that are also provided individually with their own Administration Shell. Therefore, identification is a fundamental concept requirement of Smart Manufacturing

Requirements:
- Individual Administration Shells should, while retaining their structure, be combinable into an overall Administration Shell
- An identifier must achieve global unique identification of assets types and instances, their Administration Shells, properties and class relationships (see picture next page)
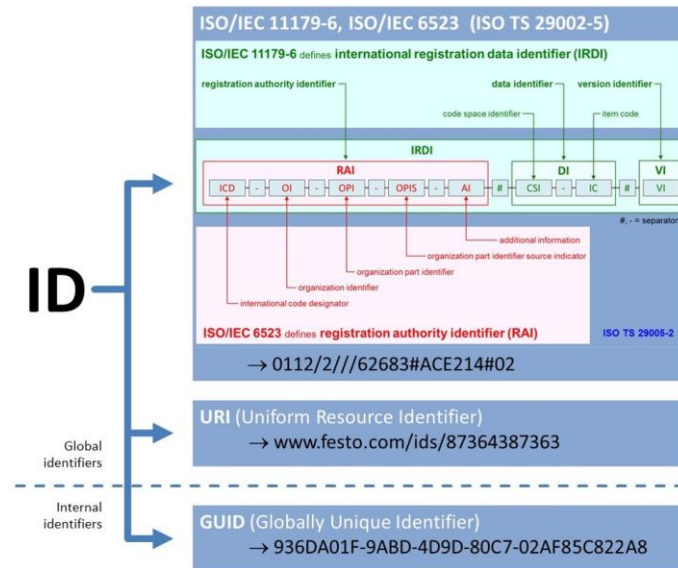
Next steps

The trilateral working group, while delivering a first technical contribution by the "Structure of the Asset Administration Shell" document, recognizes that, for an effective exploitation and adoption of Smart Manufacturing, is important to investigate also the potential role of European industries, especially SME, in this framework. Therefore, a "**User document**" is under development, to collect industrial requirements and challenges for Smart Manufacturing, by interviewing manufacturing companies, system integrators, machinery builders, components and IT suppliers This document will be published at the **BI-MU in Milano** (Machine Tool Fair) in October 2018.

Further a significant quantity of Administration Shell sub-models will be developed in order to fill the Administration Shell with real content. A European approach for the development of these submodels will be needed (infrastructure, public-funding, methodology ...) in order to facilitate a broad participation of all European stakeholders.

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