SLOVENSKI STANDARD
oSIST prEN IEC 63278-1:2022

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Upravno ogrodje dobrin za industrijske aplikacije - 1. del: Struktura upravnega ogrodja dobrin

Asset Administration Shell for industrial applications - Part 1: Asset Administration Shell structure

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SECRETARIAT: France	SECRETARY: Mr Didier GIARRATANO
OF INTEREST TO THE FOLLOWING COMMITTEES: SC 3D,SC 65E,SyC SM,ISO/IEC JTC 1/SC 41	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
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TITLE:

Asset Administration Shell for industrial applications – Part 1: Asset Administration Shell structure

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NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Asset Administration Shell for industrial applications

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FOREWORD

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The text of this standard is based on the following documents:

FDIS	Report on voting
65/XX/FDIS	65/XX/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

0.1 General

Production system life cycle focuses on the design, deployment, commissioning, operation and decommissioning of an entire production facility. Product life cycle management is the process of managing the entire life cycle of a product with the information flows and controls from inception, through engineering design and manufacture, to service and end of life treatment of manufactured products. The supply chain management is the management of the flow of products and services and includes processes that transform raw materials, and parts components into final products, and it involves the streamlining of business activities to maximize customer value and gain a competitive advantage in the marketplace. Each of these dimensions intersects at the vertical integration of machines, plants, and enterprise systems in the equipment hierarchy of an enterprise pyramid. The integration of manufacturing software applications along each dimension and across dimensions helps to enable advanced controls at the shop floor and optimal decision-making at the enterprise. Details of existing manufacturing standards for each of the three life cycle dimensions are provided in [5].

Several integration technologies have been individually put into practical use (e.g. CAD/CAM) aiming to accelerate product innovation cycles, streamline supply chains, and increase production system flexibility through information exchange between the dimensions. Details of the integration technologies and capabilities supported by them are provided in [5].

The Asset Administration Shell (AAS) is seen as one interoperable manifestation of a digital twin in manufacturing that facilitates tighter integration within and across the three dimensions mentioned above.

This document is the first part of the series "Asset Administration Shell for Industrial Applications". The multiple parts of the series will detail structure, information models, definition of services, and online interfaces, required security aspects and communication languages including mapping contents of OPC UA and AutomationML models to the Asset Administration Shell.

0.2 Overview on parts of the series

The current planning foresees parts covering the following topics:

- Asset Administration Shell structure (this document)
- Information meta model (to allow to access standardized information)
- Security provisions for Asset Administration Shells
- Online interfaces to Asset Administration Shells
- Communication language among sets of Asset Administration Shells
- Specification of content of Asset Administration Shells for various domains

This first part will describe requirements towards the general structure, that each possible Asset Administration Shell needs to comply with. In a following part of the series, this structure will be developed further towards a meta-model of the Asset Administration Shell. Based on these specifications, individual Asset Administration Shells can be created. These individual Asset Administration Shells will be the actual containers of information and will provide information and services with respect to the described asset.

0.3 Interoperability

The Asset Administration Shell pursues the overall purpose to support interoperability of software applications. According to ISO/IEC 21823-1, different facets for interoperability can be considered, see Figure 1.

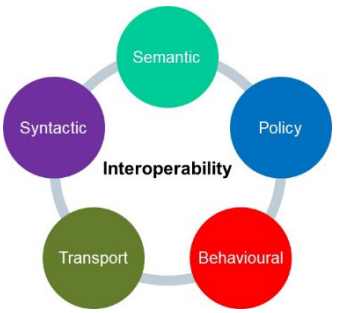

Figure 1 – Facets of interoperability according to ISO/IEC 21823-1

Transport interoperability considers the data transfer between software applications based on an established communication infrastructure between the participating software applications. This facet is not addressed in this part of the series but will be considered in further parts of the series.

Syntactic interoperability considers the data format that the exchanged information can be understood by the participating software applications. This facet is not addressed in this part of the series but will be considered in further parts of the series.

Behavioural interoperability considers the expected outcomes to interface operations. This facet is addressed by the Asset Administration Shell in the way that the Asset Administration Shell provides a standardized interface to software applications. The concrete behaviour of this standardized interface will be considered in further parts of the series.

Semantic interoperability considers the meaning of the data model within the context of a subject area so that it is understood by the participating software applications. The Asset Administration Shell addresses semantic interoperability by associating well-known concepts to the data, which is exchanged between the software applications.

Policy interoperability considers the compliance with the legal, organizational, and policy frameworks applicable to the participating software systems. The Asset Administration Shell addresses policy interoperability in the following way:

- The Asset Administration Shell provides uniform identity and access control management including usage restriction for information and services of assets.

- The Asset Administration Shell enables uniform structuring of information and services of assets. This allows that the structure of information and services of an asset is defined and maintained by the Asset Administration Shell and not by the individual software applications. This simplifies information management in manufacturing industries by both reducing the effort and increasing the quality of information.

0.4 Key objectives of the Asset Administration Shell

The following statements summarize these discussions and formulate some aims for the Asset Administration Shell, helping to keep the focus:

- **Asset Administration Shell aims at establishing cross-company interoperability.**
  Assets within manufacturing are provided by many different enterprises. In order to fulfil the scenarios of today and tomorrow, information and services on assets need to be interoperable.

- **Asset Administration Shell is intended for non-intelligent and intelligent products.**
  The perception of asset comprises many different entities, with or without the ability to communicate actively or being intelligent. To leverage benefits in engineering, maintenance or operation throughout all hierarchy levels, the idea of the Asset Administration Shell is suitable to be applied by all assets.

- **Asset Administration Shell aims at covering the complete life cycle of products, devices, machines and facilities.**
  Much useful information on assets is formed in the early phase of their life cycle, such as design, engineering and marketing. To maintain economic efficiency, digitized information from these early phases needs to be preserved and used in later phases, such as engineering higher level structures and operating and maintaining these structures.

- **Asset Administration Shell aims at enabling integrated value chains.**
  Assets for manufacturing lines and products are provided by many different value chain partners. To maintain economic efficiency, digitized information needs to be exchanged among value chain partners. This will also enable advanced production modes (see 0.1).
- **Asset Administration Shell is intended to be a base for autonomous systems and artificial intelligence.**
  In the future, many benefits are expected from approaches such as autonomous systems and artificial intelligence. These approaches require a sound basis of information and identifiers of elements. The Asset Administration Shell provides both.

Asset Administration Shell for industrial applications

Part 1: Asset Administration Shell structure

1 Scope

This document defines the structure of a standardized digital representation of an asset, called Asset Administration Shell. The Asset Administration Shell gives uniform access to information and services.

The purpose of the Asset Administration Shell is to enable two or more software applications to exchange information and to mutually use the information that has been exchanged in a trusted and secure way.

This document focusses on Asset Administration Shells representing assets of manufacturing enterprises including products produced by those enterprises and the full hierarchy of industrial equipment. It defines the related structures, information, and services.

The Asset Administration Shell applies to:

– any type of industrial process (discrete manufacturing, continuous process, batch process, hybrid production);
– any industrial sector applying industrial-process measurement, control and automation;
– the entire life cycle of assets from idea to end of life treatment;
– assets which are physical, digital, or intangible entities.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62832-1:2020, *Industrial-process measurement, control and automation – Digital Factory framework – Part 1: General principles*.

IEC 62832-2:2020, *Industrial-process measurement, control and automation – Digital Factory framework – Part 2: Model elements*.

IEC 62890:2020, *Industrial-process measurement, control and automation – Life-cycle-management for systems and components*.

IEC TR 63283-1: *Industrial-process measurement, control and automation – Smart Manufacturing – Part 1: Terms and definitions.*

3 Terms, definitions, abbreviated terms, and conventions

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

– IEC Electropedia: available at http://www.electropedia.org/
– ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
asset
physical, digital, or intangible entity that has value to an individual or an organization

[SOURCE: IEV 741-01-04 (modified)]

@Editors: please review latest version of the IEC 63283-1 for the latest definition.

Note 1 to entry: An asset can be single entity, a collection of entities, an assembly of entities or a composition of entities.

EXAMPLE 1 Examples for physical entities are equipment, raw material, parts components and pieces, supplies, consumables, physical products and waste.

EXAMPLE 2 Software is an example of a digital asset.

EXAMPLE 3 A software license is an example of an intangible asset.

3.1.2
Asset Administration Shell
AAS
standardized digital representation of an asset

3.1.3
AAS interface
interface of an AAS giving uniform access to information and services

EXAMPLE Examples for services are exploration services, asset services, and asset related services.

3.1.4
AAS responsible
Individual or organization having interest in an asset and governing an Asset Administration Shell

3.1.5
AAS user application
software application which accesses an AAS via its AAS interface(s) for use by humans or for automatic processing

3.1.6
asset integration
software and/or computing infrastructure needed to access asset services

3.1.7
asset service
service that is provided by the considered asset

3.1.8
asset related service
service that is not provided by the considered asset, but by software and/or by computing infrastructure outside of the considered asset

3.1.9
component
product used as a constituent in an assembled product, system or plant

[SOURCE: IEC 61666:2010, 3.6)

3.1.10
concept
unit of knowledge created by a unique combination of characteristics

[SOURCE: IEC 61360-1:2016, 3.1.8] 3D/265/CDV

3.1.11
concept repository
collection of entries that allows lookup by concept identifier and where relationships between entries can be described

[SOURCE: IEC 62832-1:2020, 3.1.5, modified – "concept dictionary" deleted]

3.1.12
concept repository entry
description of a concept containing, at a minimum, an unambiguous concept identifier, a preferred name, and a description

[SOURCE: IEC 62832-1:2020, 3.1.6]

3.1.13
dereferencing
act of retrieving a digital representation based on an identifier of the entity

3.1.14
digital representation
information and services representing an entity from a given viewpoint

EXAMPLE 1 Examples of information are properties (e.g. maximum temperature), actual parameters (e.g. actual velocity), events (e.g. notification of status change), schematics (electrical) and visualization information (2D drawings, 3D drawing).

EXAMPLE 2 Examples of services are providing the history of the configuration data, providing the actual velocity, and providing a simulation.

EXAMPLE 3 Examples of viewpoints are mechanical, electrical, or commercial characteristics.

3.1.15
end of life treatment
operation after a waste has been handed over to a facility for product and product part reuse, material recycling, energy recovery and residue disposal

Note 1 to entry: This includes dismantling, material separation and disposal.

SOURCE: IEC TR 62635:2012, 3.3, modified – Hyphens in term deleted, insertion of Note 1 to entry

3.1.16
entity
thing (physical or non-physical) having a distinct existence

[SOURCE: ISO/IEC FDIS 20924, 3.1.18]

3.1.17
industrial sector
grouping based on similar production processes, similar products, similar activities or similar behaviour in financial markets

[SOURCE: Alliance pour l'Industrie du Futur - Smart Manufacturing Standards Landscape]

Examples: Health care technology, Environment-Health protection-Safety, Metrology and measurement-Physical phenomena, Testing, Mechanical systems and components for general use, Fluid systems and components for general use, Manufacturing engineering, Energy and heat transfer engineering, Electrical engineering, Electronics, Telecommunications-Audio and video engineering, Information technology, Image technology, Precision mechanics-Jewellery, Road vehicles engineering, Railway engineering, Shipbuilding and marine structures, Aircraft and space vehicle engineering, Materials handling equipment, Packaging and distribution of goods, Textile and leather technology, Clothing industry, Agriculture, Food technology, Chemical technology, Mining and minerals, Petroleum and related technologies, Metallurgy, Wood technology, Glass and ceramics industries, Rubber and plastic industries, Paper technology, Paint and colour industries, Construction materials and building, Civil engineering, Military affairs-Military engineering-Weapons, Domestic and commercial equipment-Entertainment-Sports.

3.1.18
interface
shared boundary between two entities defined by functional characteristics, signal characteristics, or other characteristics as appropriate

3.1.19
interoperability
capability of two or more entities to exchange items in accordance with a set of rules and mechanisms implemented by an interface in each entity, in order to perform their respective tasks

Note 1 to entry: Examples of entities include devices, equipment, machines, people, processes, applications, software units, systems and enterprises.

Note 2 to entry: Examples of items include information, material, energy, control, assets and ideas.

3.1.20
instance asset
specific asset that is uniquely identifiable

EXAMPLE Examples of instance assets are material, a product, a part, a device, a machine, software, a control system, or a production system.

3.1.21
property instance
information consisting at least of the identifier of a property type and a property value

Note 1 to entry: The concept of type and instance applies to properties. If omitted, the term property refers to property types.

Note 2 to entry: The property instances have a value which might be provided by the manufacturer or another partner in the value chain. Sometimes, a property instance exists without a specific value, e.g. giving an existential statement.

Note 3 to entry: A property instance is also called property-value pair in certain standards. A property instance is also called data element in some standards.