THE ASSET ADMINISTRATION SHELL: IMPLEMENTING DIGITAL TWINS FOR USE IN INDUSTRIE 4.0

Making Industrie 4.0 components interoperable

Many companies want to invest in digital solutions and develop new business models. However, they don't know which solution they should invest in as this solution needs to be compatible with the systems used by its customers, partners and suppliers. The use of Industrie 4.0 solutions requires interoperability so that components, devices and applications can communicate seamlessly across companies, industries and countries. This is where the Asset Administration Shell comes in. It provides the basis for the development and use of unified and open Industrie 4.0 standards.

> The Asset Administration Shell helps implement digital twins for Industrie 4.0 and create interoperability across the solutions of different suppliers.

The Asset Administration Shell including sub-models on technical data, operational data and documentation for a sample servomotor.

The Asset Administration Shell (AAS)

In the world of Industrie 4.0, each asset[1] is given an Asset Administration Shell (AAS). The AAS consists of a number of submodels in which all the information and functionalities of a given asset – including its features, characteristics, properties, status, parameters, measurement data and capabilities – are described. It allows for the use of different communication channels and applications and serves as the link between I4.0 objects and the connected, digital and distributed world.
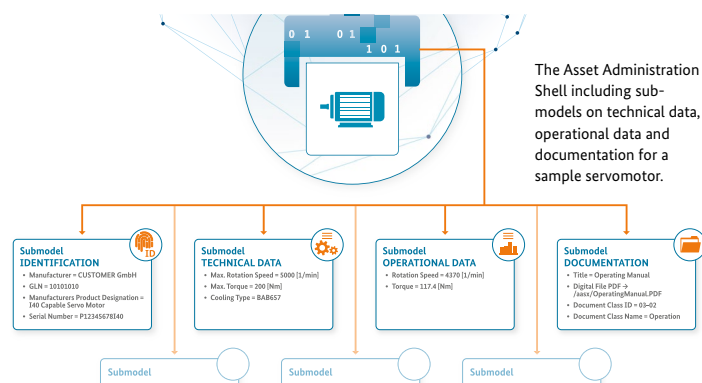
The Asset Administration Shell

❱ can be used for **non-intelligent and intelligent products**.
❱ covers the **complete lifecycle** of products, devices, machines and facilities.
❱ allows for **integrated value chains**.
❱ serves as the digital basis for the development of **autonomous systems and AI**.

Description of the Asset Administration Shell

The Working Group 'Reference Architectures, Standards and Norms' (WG1) of Plattform Industrie 4.0 is gradually developing the principles for the Asset Administration Shell. RAMI 4.0 (the Reference Architecture Model Industrie 4.0) and the Industrie 4.0 components – which consist of the asset and the Asset Administration Shell – set out the necessary core elements. This is used as a basis for developing the building blocks that are required for the implementation of the AAS and the specifications and rules governing the interaction between the I4.0 components. The description and publication will take place in several steps.

Updated version of 'Details of the Asset Administration Shell' now includes information on OPC UA, AutomationML and RDF mapping

The 2018 publication entitled **'Details of the Asset Administration Shell Part 1 – The exchange of information between partners in the value chain of Industrie 4.0'** has recently been updated by Plattform Industrie 4.0 and is now available as version 2.0. The publication states how companies can use the Asset Administration

Shell to compile and structure information in a way that allows for all this information to be shared as a package (set of files) with partners at several levels of the value chain without having to provide online access to this data from the very beginning.

The publication provides valuable information on the Asset Administration Shell

❱ It describes the **information content** and **serialization formats** of an Asset Administration Shell.
❱ It specifies a technology-neutral **UML model**, an **XML and JSON schema** and mappings for **OPC UA, AutomationML** and the **Resource Description Framework (RDF)**.
❱ It includes a definition of the **AASX exchange format**, which is used for the secure transmission of Asset Administration Shells.
❱ It takes account of **security aspects** and defines access rights for information stored in the Asset Administration Shell based on the **Attributes Based Access Control (ABAC)** concept.

> *'Details of the Asset Administration Shell' is a document that will constantly be updated. This said, developers have started implementing data models for the Asset Administration Shell immediately after the first version was made available. Thus, they have a good basis for future interoperability. The updated version provides information on a wide range of interesting topics such as RDF implementation and AML and OPC UA mappings that have been developed together with AutomationML e.V. and the OPC Foundation. So it definitely makes sense to stay on board."*

Dr Birgit Boss (Robert Bosch GmbH), head of the 'Asset Administration Shell' working group in WG1 of Plattform Industrie 4.0

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1   **Asset:** An asset is anything that needs to be connected in order to create an Industrie 4.0 solution, i.e. all items that are of value in a specific use case. In Industrie 4.0, this can be a physical product or piece of equipment, a software item or documents such a plans, contracts and orders.

THE ASSET ADMINISTRATION SHELL –
A STARTER KIT FOR DEVELOPERS

Making your company's components fit for Industrie 4.0

Updated publication: a deep dive for developers

The AASX Package Explorer – a tool that helps software developers to work with the Asset Administration Shell right away
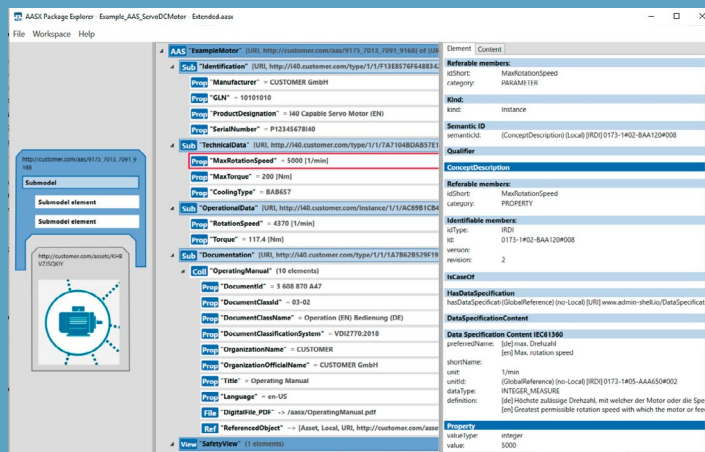
The AASX Package Explorer is a software tool that helps you create and edit Asset Administration Shells for your business use case in the XML and JSON formats. Concept descriptions featuring eCl@ss IRDIs are automatically created and referenced. Import and export functions – for example for BMEcat, AutomationML and OPC UA – allow for the swift integration of other data formats and relevant company data.



Download the tool for free!

The AASX Package Explorer is an open source implementation that can be downloaded as a compiled software that is licensed under Eclipse Public License 2.0 (EPL 2.0).

> **The AASX Package Explorer helps you create your first Asset Administration Shell easily and quickly. Many companies have already made use of this opportunity to explore the potential of the Asset Administration Shell."**
>
> Dr Michael Hoffmeister (Festo AG & Co. KG), chair of the ZVEI Working Group on 'Models and Standards' in WG1 of Plattform Industrie 4.0

UML model and mappings for XML, JSON, OPC UA, AutomationML and RDF

The Asset Administration Shell model is described in UML, which is technology-neutral. This is used as a basis for deriving mappings to other standards such as OPC UA (widely used in operation and maintenance in production), AutomationML (widely used in engineering) and RDF (widely used for ontologies) and defining schemas for serialization.
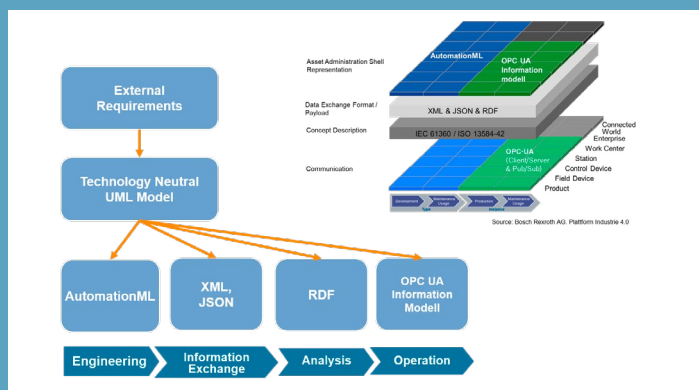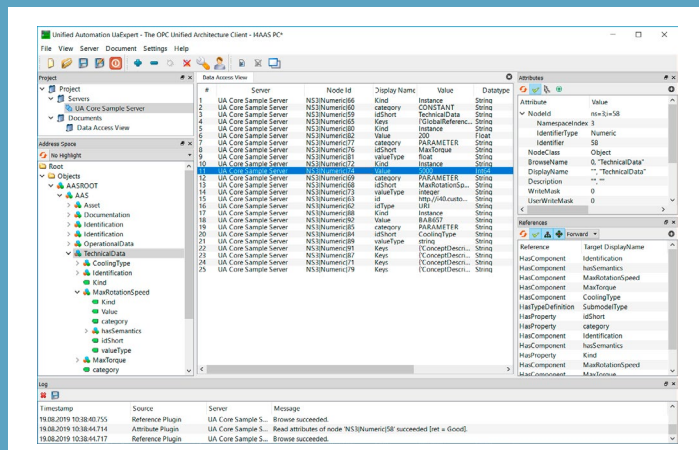

Serializations and mappings for the Asset Administration Shell

The following examples provide an insight into the predefined model:
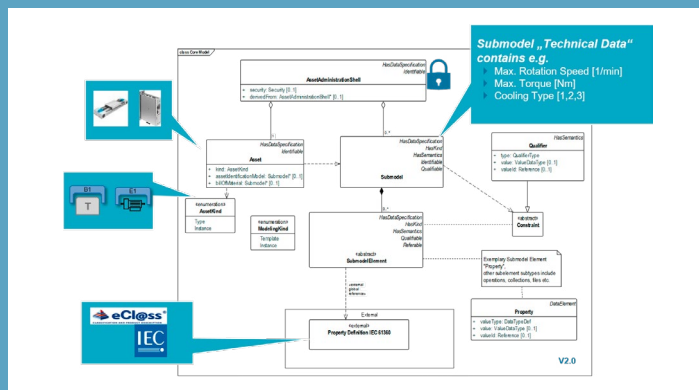
Simplified meta model of the Asset Administration Shell

Graphic representation of the Asset Administration Shell in an OPC UA server

Want to learn more?

Then have a look at the updated version of 'Details of the Asset Administration Shell Part 1'. The publication is available in Plattform Industrie 4.0's online library.