A Status Quo Review of the Industrial Digitalization

-Asset Administration Shell (AAS) Submodels Analysis

Introduction and Background

Industrie 4.0[1] is the German strategic initiative to lead the fourth industrial revolution, focused on smart manufacturing, cyber-physical systems (CPS), and interconnected production. Key aspects of Indutrie 4.0 include real-time monitoring, predictive maintenance, optimization, lifecycle management and decision Support. None of the aspects can be achieved without digitalization of the industrial assets.

Asset Administration Shell (AAS)[2] is the recommended data model from the Industrie 4.0. It is meant to create digital representation of assets produced in various industries (see Figure 1).

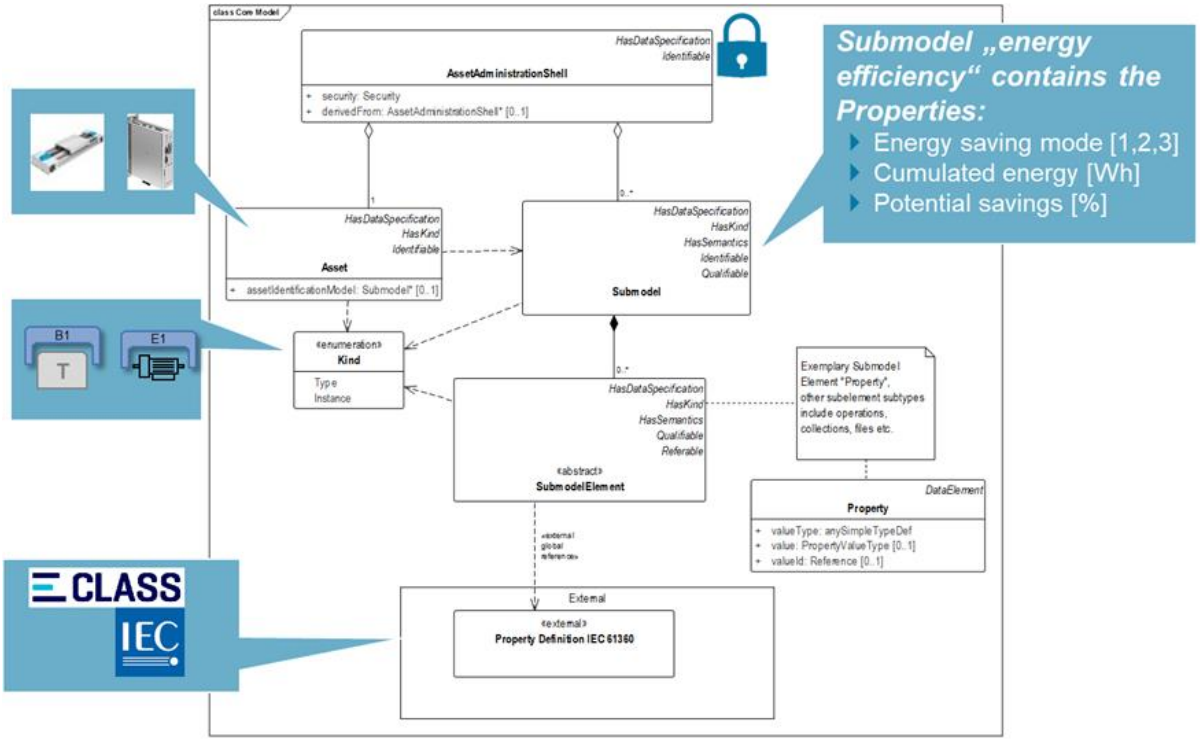

Figure 1: overview of the abstract model of the AAS.[3]

The AAS metamodel defines the structure of how to represent the physical asset in the digitalized fashion, as well as providing the templates of submodels. All features, characteristics and even measurement data of a given asset is then described in detail by a number of submodels. These submodels together with the AAS metamodel, makes up the AAS digitalization framework.

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[1] https://bit.ly/3kaRz2N

[2] https://www.plattformi40.de/IP/Redaktion/EN/Downloads/Publikation/Details_of_the_Asset_Administration_Shell_Part1_V3.html

[3] https://reference.opcfoundation.org/I4AAS/v100/docs/4.1

Thesis Goal

However, the creation of AAS submodels are scattered across many domains. Conceptual restrains are not defined. Data models are lacking semantics that created redundancies among submodels and even contradictions. Thus, the reusability of the existing submodels is very limited. Many submodels are even kept as private usage within companies. This hinders the adoption of the AAS as a commonly used industrial standard.

The goal of this thesis is to take a closer look at the current status of the AAS submodels. Specifically, the focus will lie on the officially registered and supported submodels from the International digital twin association (IDTA)[4].

Indicatively, it should be analysed how many semantic entities are described in multiple submodels. If submodels contradict one another and how often does it happen. As well as if submodels lack of precision description, such as missing units for measurement data.

Requirements

The ideal student for this project should be familiar with data format such as json and xml. Programming in Java will be good to have. Interests in conceptual data modelling as well as semantic web technology is a huge pre.

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[4] https://industrialdigitaltwin.org/en/content-hub/submodels