Interoperable Interfaces for Intelligent Production

OPC UA interfaces connect the world of production

The Interoperable Interfaces for Intelligent Production project, which is supported by the German Federal Ministry of Economics and Technology (BMWi), aims to promote the development of cross-sector OPC UA standards and the publication thereof. The project is being carried out by the Mechanical Engineering Research Federation (Forschungskuratorium Maschinenbau e.V. FKM) with assistance from the Mechanical Engineering Industry Association (VDMA). The project is scheduled to run from February 2020 to January 2023.

Cross-sector interfaces for machines and components in the form of the OPC UA standard “OPC UA for Machinery” are being developed on the basis of available sector-specific OPC UA standards for mechanical engineering as well as those under development. As part of this, it is important that the requirements of the manufacturing industry and indeed of the entire industrial value-creation network are taken into account and that players both within and outside mechanical engineering are involved. The project focuses on ensuring interoperability across the mechanical engineering sector, especially with a view to meeting the needs of the manufacturing industry. Extensive transfer activities are therefore planned to increase interoperability in production. In this way, the results of the project will provide a central building block for Industrie 4.0, both nationally and internationally.

The project’s specific aims:

• Identifying key components or machines in order to achieve comprehensive interoperable communication in production
• Developing cross-sector standards for the entire mechanical engineering industry in the form of the OPC UA for Machinery
• Aligning the needs of Industrie 4.0 and the manufacturing industry
• Ensuring the consistency of sector-specific OPC UA Companion Specifications
• National and international transfer and cooperation
• Establishing the OPC UA interface standards among politics, the scientific community and the manufacturing industry
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“OPC UA for Machinery” provides basic building blocks for information models that can be used to digitally describe machines and systems in every sector. This not only promotes interoperability between production machinery in different industries, but also accelerates the speed of the development of sector-specific OPC UA Companion Specifications.

In addition to standardizing the interfaces in the OPC UA for Machinery, the project also plans to conduct further work to promote interoperability. This will include analysing interoperability approaches in other industries, which must be categorized, evaluated and compared with the approaches taken in mechanical engineering.

The development of a cross-sector interface standard OPC UA for Machinery comprises four fields of activity:

1. Determining the requirements of different interest groups as well as cross-sector needs
2. Analysing available standards – OPC UA Companion Specifications and relevant standards – and identifying cross-sector characteristics
3. Developing cross-sector interfaces in the form of the standard “OPC UA for Machinery” series
4. Drawing up a concept for continuing the OPC UA Companion Specifications through versioning and revision guidelines
Open Platform Communications Unified Architecture (OPC UA) is an open interface standard that defines communication mechanisms in industry. It enables mechanical engineering and plant construction companies to network their production facilities in an interoperable and manufacturer-independent manner, thus paving the way for Industrie 4.0. As a potential global production language, OPC UA provides the grammar, but not the vocabulary. This is standardized in the form of information models known as Companion Specifications.

As part of the project, a cross-sector taxonomy is being developed for machines in order to show the connections between machines and components in mechanical engineering. This will enable the identification of OPC UA Companion Specifications that are currently missing so that the necessary standardization activities can be initiated and driven forward. Thus the consistency and efficiency of the standardization of interfaces along the entire industrial value-adding chain will increase.

The VDMA is coordinating the development of the OPC UA Companion Specifications in close collaboration with national and international sector committees, trade associations and the OPC Foundation. Experts from over 500 member companies and interested institutions were involved in creating more than 30 working groups to represent the specialist areas within mechanical engineering. These include power transmission engineering, robotics, machine tools, plastics and rubber machines, among others.
Industrie 4.0 is based on digital communication between systems, machines and plants. The mechanical engineering sector, which is represented by the VDMA, has agreed to adopt the OPC UA interface standard. This standard forms the basis for interoperability by defining product features of equal significance, irrespective of the sector and the communication partners.

The Plattform Industrie 4.0 – a joint initiative by more than 300 players in the worlds of politics, business, trade associations and unions – has identified interoperability between machines and systems as a central issue to be addressed in order to ensure the successful implementation of Industrie 4.0.

The approaches developed within the project will make a major contribution to the entire manufacturing industry.

A global approach to production digitization

Industrie 4.0 can only truly be beneficial through cooperation between many global players and complex value-adding chains. For this reason, it is important that the results of the project are also publicized and discussed by and with international experts and standardization bodies. Only through global acceptance and a common understanding a global production language can be developed and established.

The different dimensions of digital industrial value-creation can be represented with the aid of the Industrie 4.0 reference architecture model. This three-dimensional layer model visualizes the lifecycle of machines and systems vis-à-vis the hierarchy levels of Industrie 4.0. The development of interoperable OPC UA interfaces relates to the hierarchy level “Information” and the lifecycle phase “Production and usage” (Instance).
The Interoperable Interfaces for Intelligent Production (II4IP) project is supported by funds from the German Federal Ministry of Economics and Technology (BMWi). The project is being carried out by the Mechanical Engineering Research Federation (FKM) in cooperation with the Mechanical Engineering Industry Association (VDMA) in the period from February 2020 and January 2023.