OPC UA

NOT ONLY FOR SPECIALISTS

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+49 156 79016680
Albert-Einstein-Str. 26
18059 Rostock
info@adaept.engineering

OPC UA – The global standard for machine data

Data is the gold of the 21st century. It is not only the large US and Asian technology companies that have long understood this. European industry is also working intensively on the seamless exchange of production data. One standard makes it possible: OPC UA. At Adaept Engineering, we support you in integrating the new technologies.

Previous efforts to network industrial machines and systems were based on the use of various specialized communication protocols. On the one hand, there are a large number of standards for interconnecting industrial machines and, on the other there are a wide variety of IoT protocols for forwarding machine data to management systems. An additional challenge is the interpretation of the data. Ultimately, it is up to each manufacturer to communicate the status of the machines in their own codes and message formats. This Babylonian linguistic landscape restricts the networking of devices and systems to isolated solutions.

Semantic protocols, in which the instructions for interpreting the coded process data are part of the standard, are the solution. OPC UA in particular stands out due to the active participation of a wide range of industrial companies in the standardization process. Machines from different manufacturers can thereby exchange data with each other and interpret it without errors. If a machine manufacturer supports these standards, its products can be seamlessly integrated into the customer's production systems. This is a huge advantage for plant operators, who no longer have to retrofit expensive adapter or gateway solutions.

Adaept Engineering is a member of the OPC Foundation, a globally recognized organization dedicated to the development and promotion of the OPC UA standard, and thus part of the global network for the integration and interoperability of industrial machines.

Companion Specifications – Tailor-made standards

Under the umbrella of the OPC Foundation and in cooperation with regional industry associations and the VDMA (German Engineering Federation), working groups are continuously working on improving and expanding the OPC UA protocol. The aim of these working groups is to develop so-called Companion Specifications (CS). These industry-specific data models supplement the core OPC UA protocol and are specially tailored to different industry sectors and use cases. By working closely with industry experts, the working groups ensure that the standards developed meet real requirements and challenges. Companion Specifications thus contribute significantly to the success of OPC UA as the predominant Industry 4.0 protocol.

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It is not only specialized industries that benefit from standardization. The Companion Specification for Machinery, for example, defines general machine information such as a digital nameplate or KPIs such as productive time and downtime. The extension for Job Management also provides modules for the execution and control of work orders, while the CS Machinery Result Transfer provides mechanisms for reporting production results.

The Asset Management Basics specification enables efficient management and integration of systems and machines, for example by describing operating conditions such as plug type, operating temperature or machine status and current position.

Proven data specifications are also embedded in OPC UA. The CS for BACnet, for example, bridges the gap between building automation and industrial processes, while the PackML specification aligns the standards for packaging machines with OPC UA. The CS for AutomationML is of central importance for the networking of tools from plant planning, mechanical engineering, electrical engineering and robotics via OPC UA.

Specifications for the communication of field devices and process automation devices such as IO-Link, PROFINET and POWERLINK enable their translation to OPC UA. The CS PLC Client Function Blocks defines the integration of programmable logic controllers into the OPC UA framework. In addition, the PROFIenergy specification enables information on energy consumption and energy-saving modes of machines to be checked and controlled.

These data models represent the lowest common denominator in an industry or application. OPC UA also makes it possible to accommodate manufacturer-specific special functions within the Vendor Specific Extensions. These vendor-specific data models describe special capabilities of machines that remain as a unique selling point in the vendor's own ecosystem. In addition to the widely applicable standards for core machine data and functions, OPC UA also allows for customized solutions.

Versatile and complex

The block diagram below shows the architecture of OPC UA. Two types of data transfer form the basis: Client-Server and Publish-Subscribe. Both are based on different technologies such as HTTPS or MQTT. The access methods then build on this, for example to search through data or event notifications. This is followed by the definition of the basic data model components, such as data nodes and their links. The actual data models form the uppermost layers of the OPC UA architecture. Here, Vendor Specific Extensions are based on industry standards in the Companion Specifications, which in turn are based on the basic data model of the Core Information Models.
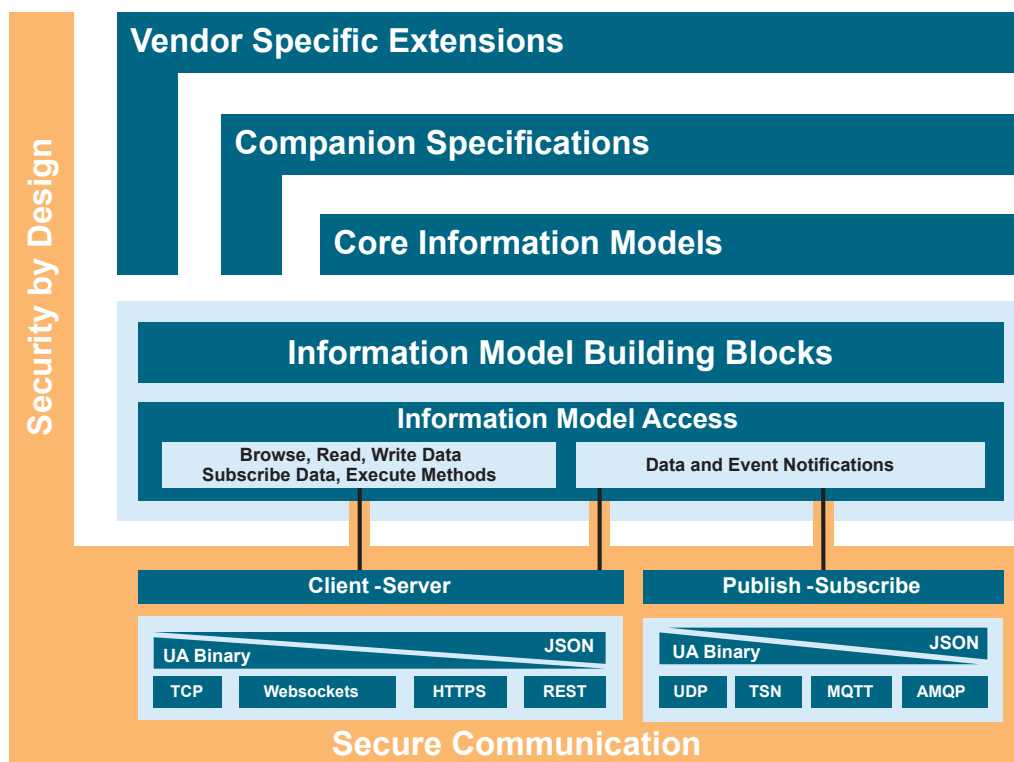
The architecture of OPC UA

In addition to semantic data transfer, OPC UA offers a wide range of options and modern protection mechanisms for IT security. Users can choose between various constantly expanding communication patterns such as client-server and publish-subscribe. Finally, real-time communication is also being integrated via 5G and TSN. Due to all these possibilities, the integration of OPC UA into devices and machines differs greatly from the integration of conventional fieldbus systems, so that considerable expertise from the field of Industrial IoT (IIoT) is required. Competencies that Adaept Engineering provides.

Adaept Engineering supports the integration of OPC UA

Thanks to our software, the IIoT interface, machine manufacturers can avoid developing their own OPC UA-compliant interface and concentrate on their core competencies. Customized consulting and development services ensure precise integration into existing and newly developed machines.

Adaept Engineering helps companies to make new and existing machines OPC UA-capable quickly and cost-effectively. We have driven research and development projects together with industrial companies and are now eager to enable other companies to offer products that support the modern communication standard. The IIoT interface structures the information from the machine and enriches it, enabling standard-compliant machine interpretation, processing and evaluation. A wide variety of machines can retrieve and use this data without the need for further manufacturer-specific agreements.

The founders of Adaept Engineering from left to right: M.Sc. Hannes Raddatz, Dr.-Ing. Arne Wall und M.Sc. Fabian Hölzke

One step ahead

In addition to simply providing data, Adaept Engineering goes one step further. Together with our industry partners, we were able to demonstrate how machines can automatically network with each other via Pub-Sub, temporarily subscribe to each other's process and position data and thus follow each other around the factory floor. With this development, we are taking a step towards autonomous machine-to-machine interaction in the factories of the future.

We are currently working with IT security experts to prepare the certification of the software in accordance with IEC 62443. We are also aiming for certification in accordance with IEC 61508 for safety-relevant use in industrial automation and a safety evaluation of IT security in accordance with ISO/IEC 15408-1:2022.

Everything from a single source

it is important to Adaept Engineering that machine manufacturers and plant operators fully utilize the potential of the technology and convey it to their customers. That is why we offer training courses and workshops in which we teach the basics and use cases as well as the technical details of OPC UA. In addition to the integration of the communication standard, we offer additional products for the visualization and analysis of process data and production alarms for smartphones and PCs. We also expertly integrate unique machine features into the data model during data engineering. In this way, Adaept Engineering enables its customers to mine their data gold with the greatest possible efficiency.

Get in touch with us
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