Open Industry 4.0 Alliance

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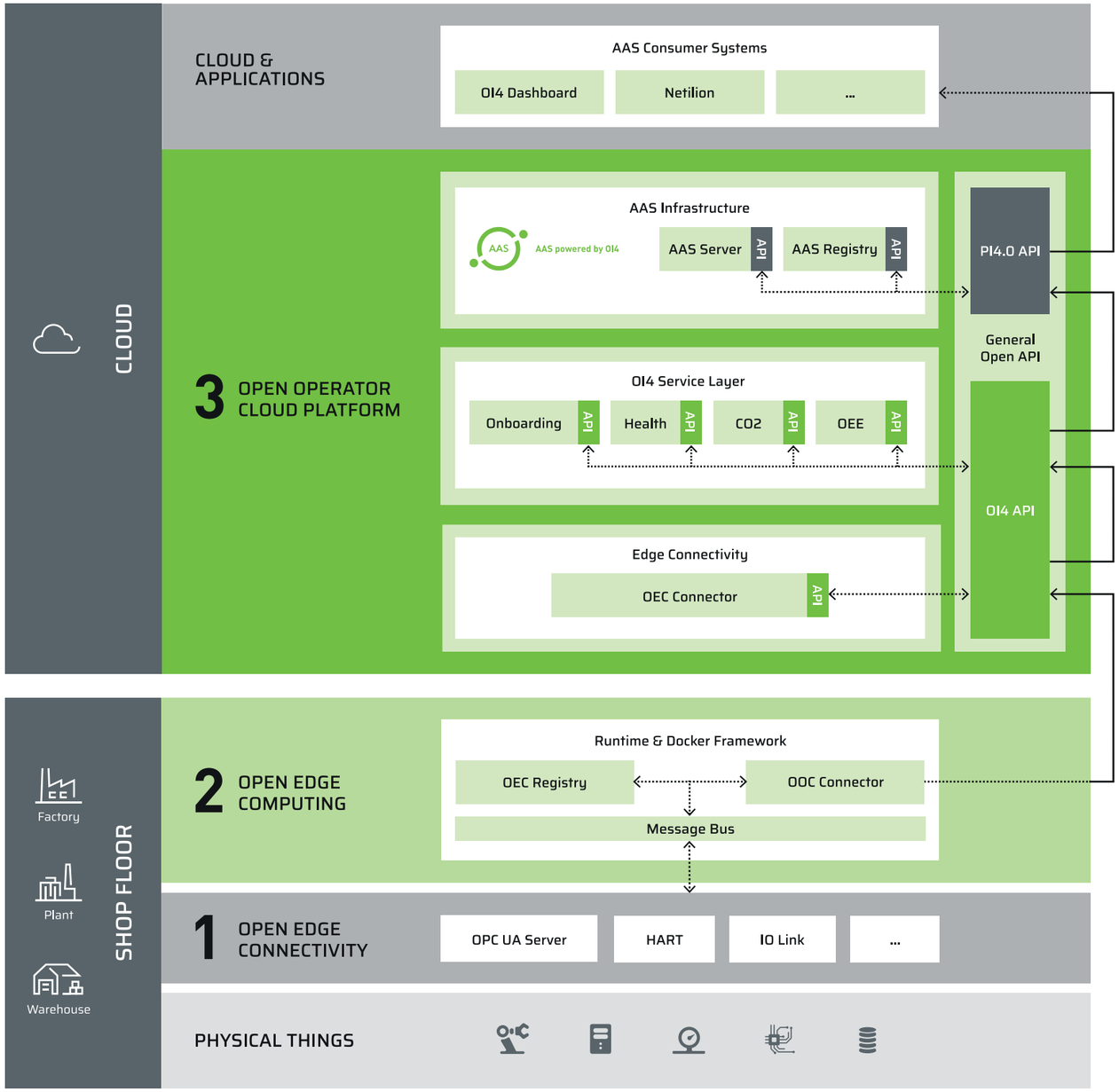
The Open Industry 4.0 Alliance (OI4A) is a network of leading suppliers for the manufacturing industries. It includes suppliers of information technology, automation technology, machines and systems. The goal of Alliance members is to make it significantly easier for production system operators to get started with Industry 4.0.

The approach is based on an open, standardized reference architecture that builds on existing technologies and standards. This collaborative architecture is intended to form the basis of a functioning ecosystem for Industry 4.0 that enables inter-company collaboration among operators and manufacturers – without compelling individual operators into complete dependence on individual suppliers.

The essence of the multi-layer reference architecture consists in four layers: Open Edge Connectivity, Open Edge Computing, Open Operator Cloud (OOC) and Common Cloud Central. One very important aspect of this architecture is the use of concepts from the so-called Asset Administration Shell (AAS), which was specified in the Industry 4.0 platform and continues to be developed further. AAS is the Industry 4.0 approach to implementing digital twins.

On behalf of the Alliance, M&M Software worked in close collaboration with other Alliance members to develop a reference implementation of key modules, which were then made available to all Alliance members as an open source solution.



OPEN INDUSTRY 4.0 ALLIANCE

RI 1.1 Reference Implementation

The main objective of the reference implementation was to implement a technical feature that provides the essential components to all levels of the reference architecture, linking them together into a functional overall system. The goal was to demonstrate the general functionality of the architecture and create a template for use as a basis for future implementations and expansions.

The reference implementation focused on two key use cases: automatic onboarding and health data exchange. Automatic onboarding involves the initial registration of assets (for example, automation components) in the operator's cloud. In the health data exchange application, data on the health status of the registered assets is collected continuously and further processed in Operator Cloud. The two applications require functionalities from all layers of the reference architecture and thus offered a useful basis for a robust proof of concept.

M&M Software's core responsibility in this collaborative project was to implement functional prototypes for software components that an automation component manufacturer would typically provide to a system operator. With these components, the system operator can seamlessly integrate the manufacturer's products into its cloud-based IT / OT infrastructure and also use the manufacturer's value-added services in the process.

The following components (among others) were provided in the form of Docker images:

- Data acquisition and data pre-processing in the edge node using the communication mechanisms specified by OI4A (OPC-UA, MQTT, open fieldbus communication etc.)

- Provision of a standardized OOC connector for the edge node to handle communication with Operator Cloud according to the specifications

- Plug-in-capable logic modules for evaluating asset-specific messages in Operator Cloud, which were reported from the Edge layer and transformed into compatible AAS submodels to pass on to the AAS infrastructure

In addition to the necessary specification and implementation work, a basic project structure was also established for future expansions of the reference implementation based on the GitHub platform. This not only stores the source code in corresponding repositories for the individual components, but is also where all DevOps mechanisms for automated component integration and distribution (CI / CD) are set up. All Alliance members have access to the project results and can make further use of them for their own development projects.

M&M Software also offers accompanying technology workshops to make it easier to get started with the solutions presented here. More information is available in the Accelerate Directory, the digital marketplace of the Open Industry 4.0 Alliance.

Benefits for the End Customer

The Open Industry 4.0 Alliance offers production system manufacturers a compelling strategy for working together with suppliers to switch to Industry 4.0.

The reference implementation presented here not only verified key aspects of the reference architecture's basic functionality, but also provided impressive confirmation of the viability of a vision of an inter-company ecosystem based on openness and collaboration.

OVERVIEW	
Sector(s):	automation technology, process industry, manufacturing industry, hybrid manufacturing
Customer:	Open Industry 4.0 Alliance

Technologies Used

- .NET Core
- Docker
- Linux
- OPC UA
- MQTT
- Rest API
- Asset Administration Shell
- GitHub

"M&M is a very committed member of Open Industry 4.0 Alliance and communicates the open approaches of our working groups beyond the member area in customer projects. As an implementation partner in the reference project of the administration shell, we have realized a prototypical implementation of the AAS with various sub-models as a technical breakthrough together with other partners. M&M has proven itself to be a competent development partner and has supported and strengthened the cooperation in an open team. I am very pleased that we have a driving force in the real economy with our colleagues and look forward to further cooperation within the framework of our working groups and lighthouse projects!"

Ricardo Dunkel, Technical Director at Open Industry 4.0 Alliance

This is us.

M&M Software is an international software and digitalization partner.

We accompany companies in the digital transformation of their organizations, products and business models. We identify potential, generate ideas, derive strategies and develop tailor-made software solutions for the digital world.

The results of our trusting and cooperative collaboration are digital products or systems that are successful on the market and that we accompany throughout their entire life cycle.

We consult and implement at eye level and in close coordination with our customers. In this way, we create new business opportunities and secure competitive advantages. Our global teams work closely with partners in research, academia, and industry.

We turn visions for a digital world into reality.

M&M Software offers more than 35 years of experience and state-of-the-art technical know-how. Our almost 300 highly motivated employees at four locations across the globe are the main success factor of our projects. Together we drive the digital future.

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