OPC DAY
FINLAND 2024
21.11.2024

OPC Foundation Cloud Initiative

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FINNISH SOCIETY OF AUTOMATION
SUOMEN AUTOMAATIOSEURA RY

OPC Foundation Cloud Initiative

Building the Industrial Cloud Interoperability Standard

Join our booth
at SPS 2024 – H5-140

Supporting cloud providers

Alibaba Cloud
aws
Google Cloud
Microsoft
HUAWEI
SAP

Supporting end-users

Boehringer Ingelheim
Continental CONTITECH
DANONE
equinor
L'ORÉAL OPERATIONS
Miele
Mondelēz International
Renault Group
JTI
Tetra Pak
PROTECTS WHAT'S GOOD
VOLKSWAGEN

Supporting automation providers

ABB
BECKHOFF
Honeywell
MITSUBISHI ELECTRIC
Changes for the Better
Rockwell Automation
Schneider Electric
SIEMENS
YOKOGAWA
Co-innovating tomorrow

opcfoundation.org/cloud

Vision

Accelerate the interoperability of IT and cloud applications through the OPC UA standard.

Goals

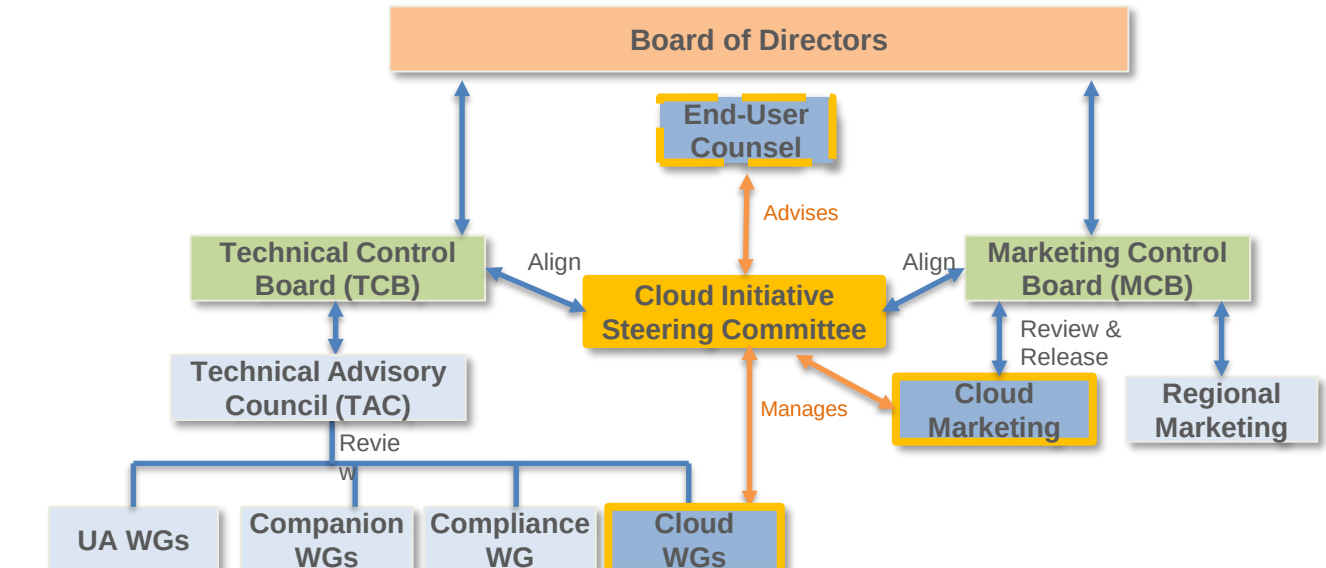
Accelerate **interoperability of IT and cloud applications** using OPC UA, targeting data analytics using AI, industrial data spaces, digital product passports, industrial metaverse as well as digital twin applications.

Cover the use of **OPC UA Companion Specs** and other OPC UA information models within cloud services.

Create a **cloud reference architecture** to provide best practices, increase standardized data sharing and cloud-optimized profiles for the OPC UA standard, in line with global regulations such as the Data Act or the Cyber Resilience Act.

Establish a new **Protected Identity** for OPC UA Cloud eXchange (UACX) – similar to OPC UA FX

Establish a new **validation and certification program** for OPC UA Cloud interoperability as the leading cloud vendors Alibaba Cloud, AWS, Huawei, Microsoft and SAP already support OPC UA to some extent, but no rules govern this support in the cloud to date.


Board of Directors
End-User Counsel
Advises
Technical Control Board (TCB)
Align
Cloud Initiative Steering Committee
Align
Marketing Control Board (MCB)
Review & Release
Technical Advisory Council (TAC)
Manages
Cloud Marketing
Regional Marketing
Revie
w
UA WGs
Companion WGs
Compliance WG
Cloud WGs

Cloud Initiative Working Groups

OPC UA over MQTT

OPC UA REST

UA Cloud Library

AI

Metaverse

WoT-Connectivity

WoT-Binding

I4AAS

New: Industrial Dataspaces (EDC)

New: Digital Product Passport/Battery Passport

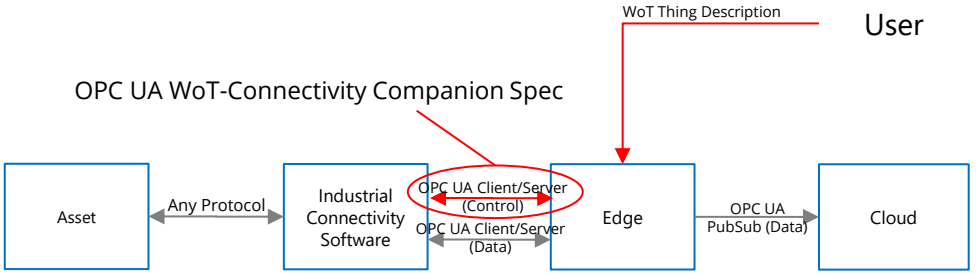
New: Cloud Marketing

Industrial Asset Onboarding via Connectivity Software: Data Model

1. Discoverable (~10%)
   a) OPC UA-enabled (PLC) (~4%) -> No ind. conn. software required!
   b) Non-OPC UA-enabled (PLC) (~6%) -> Automatic mapping by ind. conn. software

2. Non-Discoverable (~90%)
   a) Fixed function/data model (~63%) -> Automatic mapping based on WoT Thing Description sent to ind. conn. software
   b) Programmable (PLC) (~27%) -> Automatic mapping based on project file converter tool to WoT Thing Description sent via ind. conn. software

Automatic Asset Onboarding via WoT-Connectivity



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OPC 10100-1

OPC UA for WOT Connectivity
Part 1: API Definition

OPC UA Companion-Specification

amazon web services · BECKHOFF · brightly · Microsoft · Novotek · PROSYS OPC · Unified Automation · Valmet

OpenAI auto-generated WoT Thing Description File Including support for OPC UA Companion Specifications

pac4200.jsonld

Schema: https://json.schemastore.org/jsonld.json

```
{
  "@context": [
    "https://www.w3.org/2019/wot/td/v1",
    "https://si-ra.github.io/ontologies/td-context.jsonld",
    "http://opcfoundation.org/UA/PNEM/"
  ],
  "id": "urn:pac4200",
  "securityDefinitions": {
    "nosec_sc": {
      "scheme": "nosec"
    }
  },
  "security": [
    "nosec_sc"
  ],
  "@type": [
    "Thing"
  ],
  "name": "modbus-pac4200-sn324",
  "base": "modbus://192.168.10.100:502",
  "title": "Siemens SENTRON PAC4200",
  "properties": {
    "VoltageL1-N": {
      "type": "number",
      "readOnly": true,
      "observable": true,
      "forms": [
        {
          "href": "/1?address=1&quantity=2",
          "op": [
            "readproperty",
            "observeproperty"
          ],
          "opcua:type": "nsu=http://opcfoundation.org/UA/PNEM/;i=6098",
          "modbus:type": "float",
          "modbus:entity": "holdingregister",
          "modbus:pollingTime": 2000
        }
      ]
    },
    "VoltageL2-N": {
      "type": "number",
      "readOnly": true,
```

IDTA INTERNATIONAL

OPC FOUNDATION

CESMII

MANUFACTURING-X

zvei electrifying ideas

LNI4.0 LABS NETWORK INDUSTRIE 4.0

INTERNATIONAL DATA SPACES ASSOCIATION

CLASS

digital twin™ CONSORTIUM

VDMA

Digital Product Passport and Digital Battery Passport

powered by AAS, EDC & OPC UA

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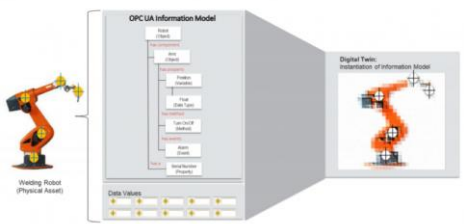
Combining Eco-Systems

OPC UA & AAS implementing the EU Digital Product Passport



Create

Embed

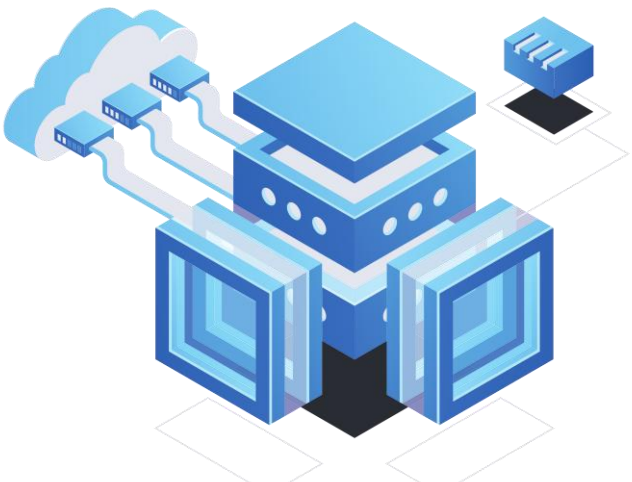
Store

Store

Why Combine?

- Details of the Asset Administration Shell Spec Part 1
  - OPC UA Information Model for AAS is defined in section 7.7
  - I4AAS OPC UA Companion Spec v1, IDTA-OPCF Joint Working Group developing a new v3 version!
- OPC UA REST Interface
  - An OpenAPI-compatible Interface for OPC UA Servers
- OPC UA has a rich ecosystem of 10+ free & professional OPC UA modelling tools
- AAS Submodel Templates
  - Semantic descriptions for a range of asset types
  - Can be manually converted to OPC UA nodeset2 (as done in DPP demo), potentially even automatically
- AAS REST Interface
  - An OpenAPI-compatible interface for AAS Repositories/Registries
- AASX File format
  - Based on OfficeOpenXML
  - Can contain OPC UA nodeset2.xml file describing the AAS (replacing the AAS XML or JSON file)

Dataspace Connectors



One example is the Eclipse Dataspace Connector, an **open-source framework** hosted by the Eclipse Foundation for building **secure, globally-scalable data-sharing services**. EDC provides highly customizable components for creating control planes, decentralized identity systems, and federated data catalogs. **Backed by leading companies and cloud providers**, EDC gives developers the tools they need to deliver innovative solutions for data exchange networks. Other projects are targeting dataspace connectivity issues, e.g. Data4Industry.

Next step: Integration and testing of Dataspace Connectors.

eclipse-edc.github.io

The Key to Reducing Costs: Data Interoperability

We need...

1. A common **Interface** (Analogy: A Book)
2. A common **Data Format** (Analogy: The Latin Alphabet)
3. A common **Data Model** (Analogy: The English Language)
4. Common **Semantics** (Analogy: The Plot and Characters from the Novel)

Only when all 4 things are present can we truly understand each other!

Putting it all together

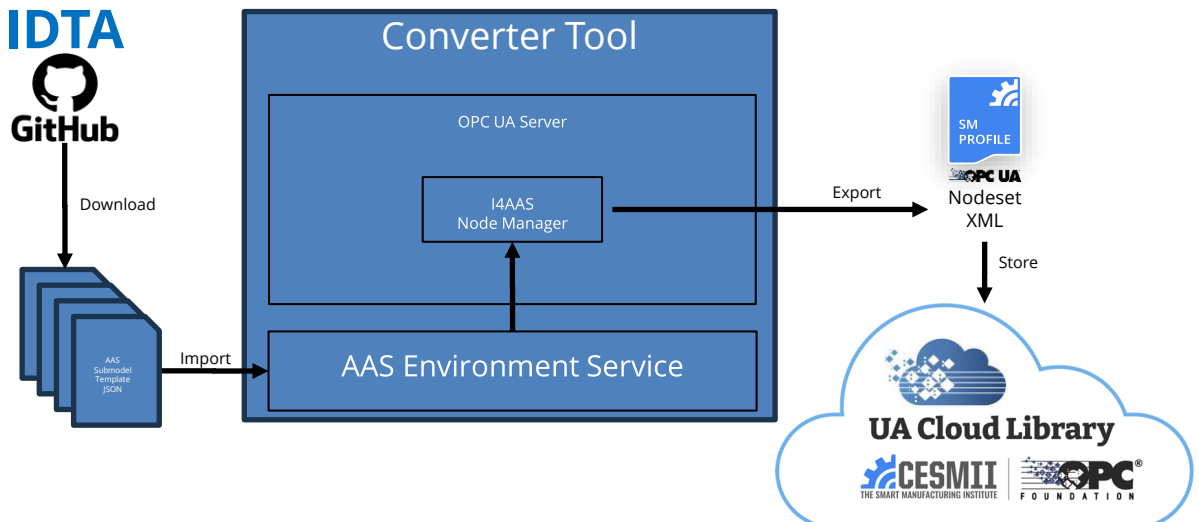
1. **Interface**: Combined OpenAPI-compatible interface for AAS Repository and OPC UA Server for the data exchange + EDC for supply chain digital contract negotiation

2. **Data Format:** Nodeset2XML in AASX file (OfficeOpenXML format)

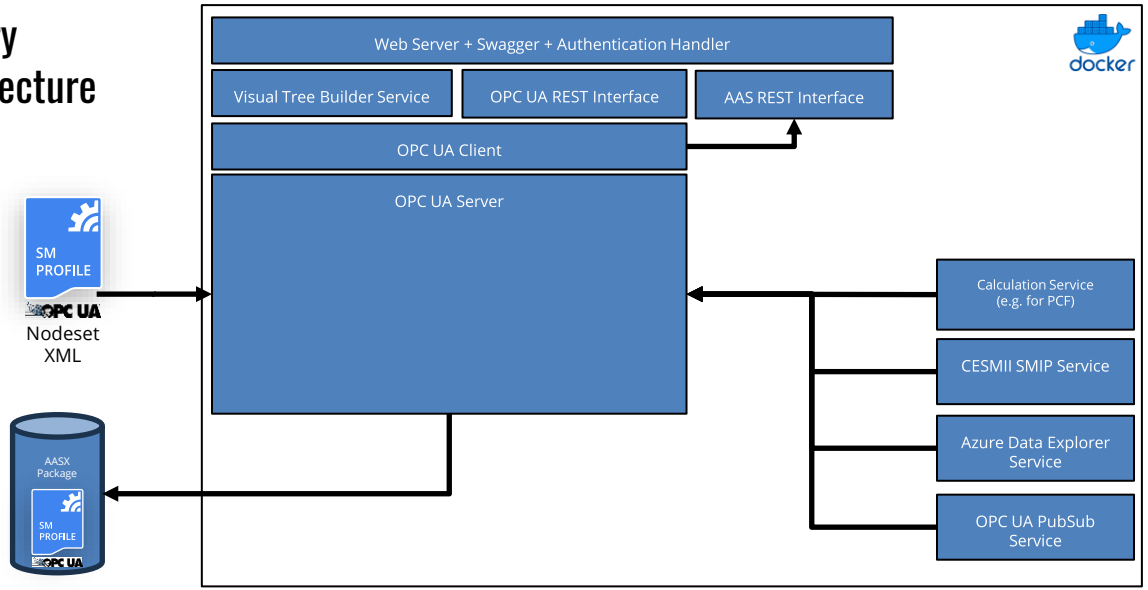
3. **Data Model:** OPC UA Information Models (a.k.a. CESMII SMP), e.g., using Siemens SiOME or CESMII's SMP Designer, incl. values!

4. **Semantics:** Asset Admin Shell Meta-Model & EClass, i.e. I4AAS Companion Spec & AAS Submodel Templates

AAS Submodel Template -> OPC UA Nodeset



AAS Repository System Architecture



github.com/digitaltwinconsortium/AAS-Repository