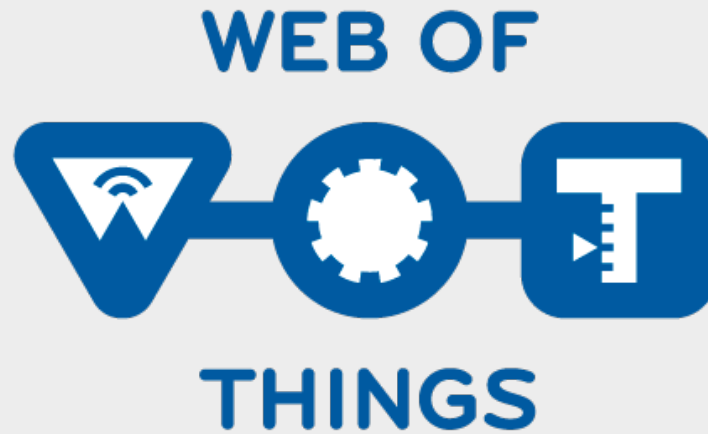




Insight into W3C Web of Things

Sebastian **Käbis**ch | Siemens AG | W3C Web of Things WG/IG Co-Chair

Wan Li Ma (马万里) | Siemens China

October 30, 2025

It's about the *Things* that are used in application domains

Factory



Building

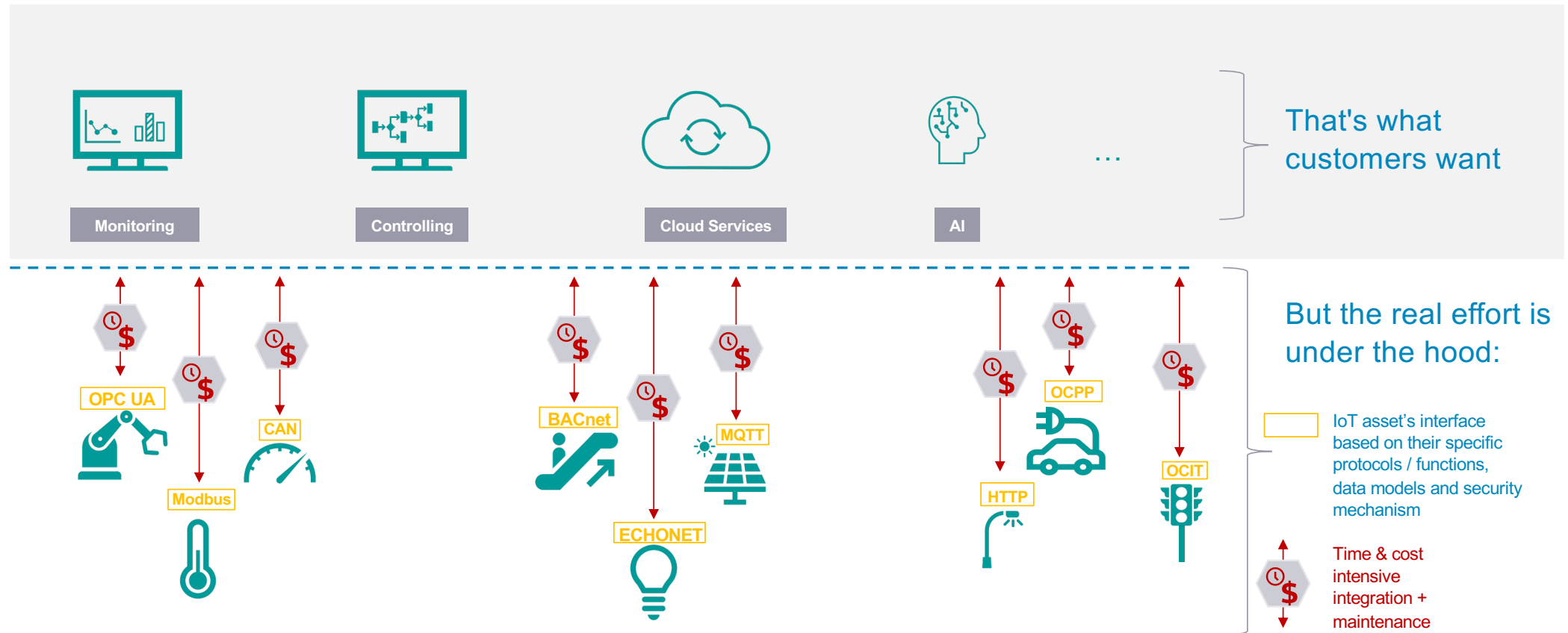


City



...

There is a common problem if you want to use Things smart: Onboarding



57	2	3-phase average voltage L-N	Float	V	-	R
59	2	3-phase average voltage L-L	Float	V	-	R
61	2	3-Phase Average Current L-L	Float	A	-	R
63	2	Total Apparent Power	Float	VA	-	R
65	2	Total Active Power	Float	W	-	R
67	2	Total Reactive Power (Qn)	Float	VAR	-	R

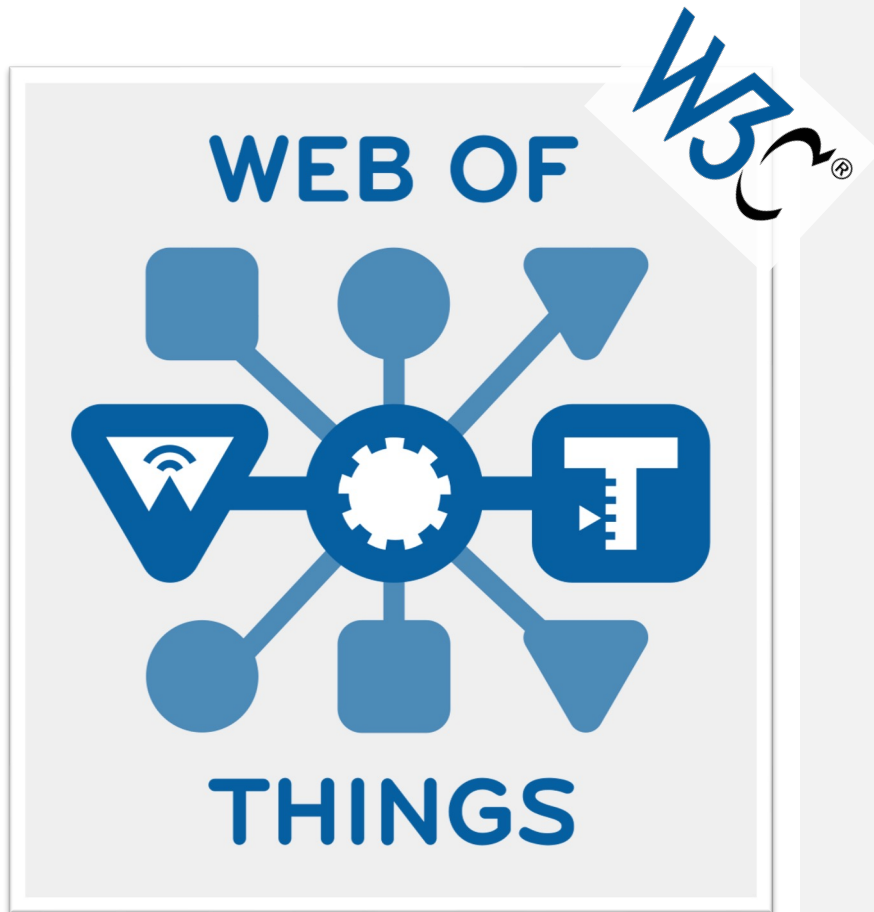


R	32792	8018	2 var	1 R	FI32	Total reactive power vectorial	Vectorial total reactive power according to DIN EN 61557-12 with sign as sum of the individual reactive powers. >0: Demand
R	32794	801A	2 VA	1 R	FI32	Total apparent power vectorial	Vectorial total apparent power according to DIN EN 61557-12 with sign
R	32796	801C	2 -	1 R	FI32	Total power factor vectorial	Vectorial total power factor according to DIN EN 61557-12 with sign >0: Inductive <0: Capacitive
D	32798	801E	2 W	1 D	FI32	Active power phase 1	Active power with sign on phase 1. >0: Demand <0: Delivery



Image source: Siemens and PhoenixContact

Enter the W3C Web of Things



- Based on IT-Friendly technologies, reuse established Web standards
- Works with all protocols (MQTT, HTTP, Modbus, OPC UA, BACnet, KNX IoT,...)
- Adapts to any application domain
- Local, Edge, Cloud
- Key technology: Standardized Device Description Language called **WoT Thing Description (TD)**
- Open and royalty-free W3C standard
- Published the 1.1 version; currently working on WoT 2.0

WoT Thing Description

Standardized machine and human readable device interface descriptions

```
1 {
2   "@context": "https://www.w3.org/2022/wot/td/v1.1",
3   "title": "Siemens SENTRON PAC4200",
4   "base": "modbus+tcp://192.168.10.100:502/1/",
5   "description": "The SENTRON PAC4200 is a measuring device for",
6   "support": "https://support.industry.siemens.com/dl/dl-media",
7   "securityDefinitions": {
8     "nosec_sc": {
9       "scheme": "nosec"
10    }
11  },
12  "security": "nosec_sc",
13  "properties": {
14    "voltage_l1_n": {
15      "title": "Voltage L1-N",
16      "type": "number",
17      "unit": "V",
18      "forms": [
19        {
20          "href": "40001?quantity=2",
21          "contentType": "application/octet-stream",
22          "modv: function": "readHoldingRegisters",
23          "modv: type": "xsd:float",
24          "modv: mostSignificantByte": true,
25          "modv: mostSignificantWord": true,
26        }
27      ]
28    },
29    "voltage_l2_n": {
30      "title": "Voltage L2-N",
31      "type": "number",
32      "unit": "V",
33      "forms": [
34        {
35          "href": "40003?quantity=2",
36          "contentType": "application/octet-stream",
```



Web of Things (WoT) Thing Description

W3C Recommendation 9 April 2020 (Link errors corrected 23 June 2020)



This version:

<https://www.w3.org/TR/2020/REC-wot-thing-description-20200409/>

Latest published version:

<https://www.w3.org/TR/wot-thing-description/>

Latest editor's draft:

<https://w3c.github.io/wot-thing-description/>

Implementation report:

<https://w3c.github.io/wot-thing-description/testing/report.html>

Previous version:

<https://www.w3.org/TR/2020/PR-wot-thing-description-20200130/>

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Participate:

[GitHub w3c/wot-thing-description](#)
[File a bug](#)
[Commit history](#)
[Pull requests](#)

Contributors:

[In the GitHub repository](#)

Repository:

[We are on GitHub](#)
[File a bug](#)

Please check the [errata](#) for any errors or issues reported since publication.

See also [translations](#).

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Abstract

WoT Thing Description

Standardized machine and human readable device interface descriptions

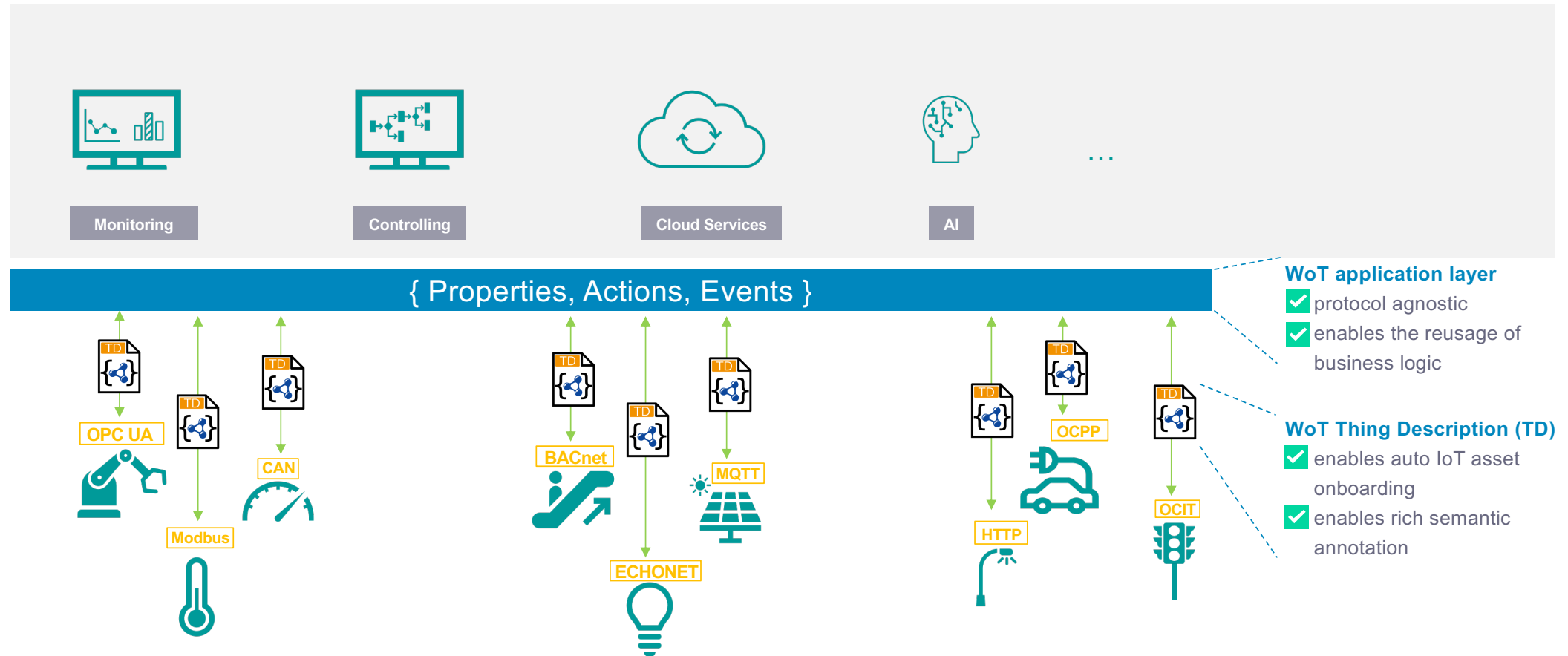
```
1 {
2   "@context": "https://www.w3.org/2022/wot/td/v1.1",
3   "title": "Siemens SENTRON PAC4200",
4   "base": "modbus-tcp://192.168.10.100:502/1/",
5   "description": "The SENTRON PAC4200 is a measuring device for",
6   "support": "https://support.industry.siemens.com/dl/dl-media",
7   "securityDefinitions": {
8     "nosec_sc": {
9       "scheme": "nosec"
10    }
11  },
12  "security": "nosec_sc",
13  "properties": {
14    "voltage_l1_n": {
15      "title": "Voltage L1-N",
16      "type": "number",
17      "unit": "V",
18      "forms": [
19        {
20          "href": "40001?quantity=2",
21          "contentType": "application/octet-stream",
22          "modv:function": "readHoldingRegisters",
23          "modv:type": "xsd:float",
24          "modv:mostSignificantByte": true,
25          "modv:mostSignificantWord": true,
26        }
27      ]
28    },
29    "voltage_l2_n": {
30      "title": "Voltage L2-N",
31      "type": "number",
32      "unit": "V",
33      "forms": [
34        {
35          "href": "40003?quantity=2",
36          "contentType": "application/octet-stream",
```



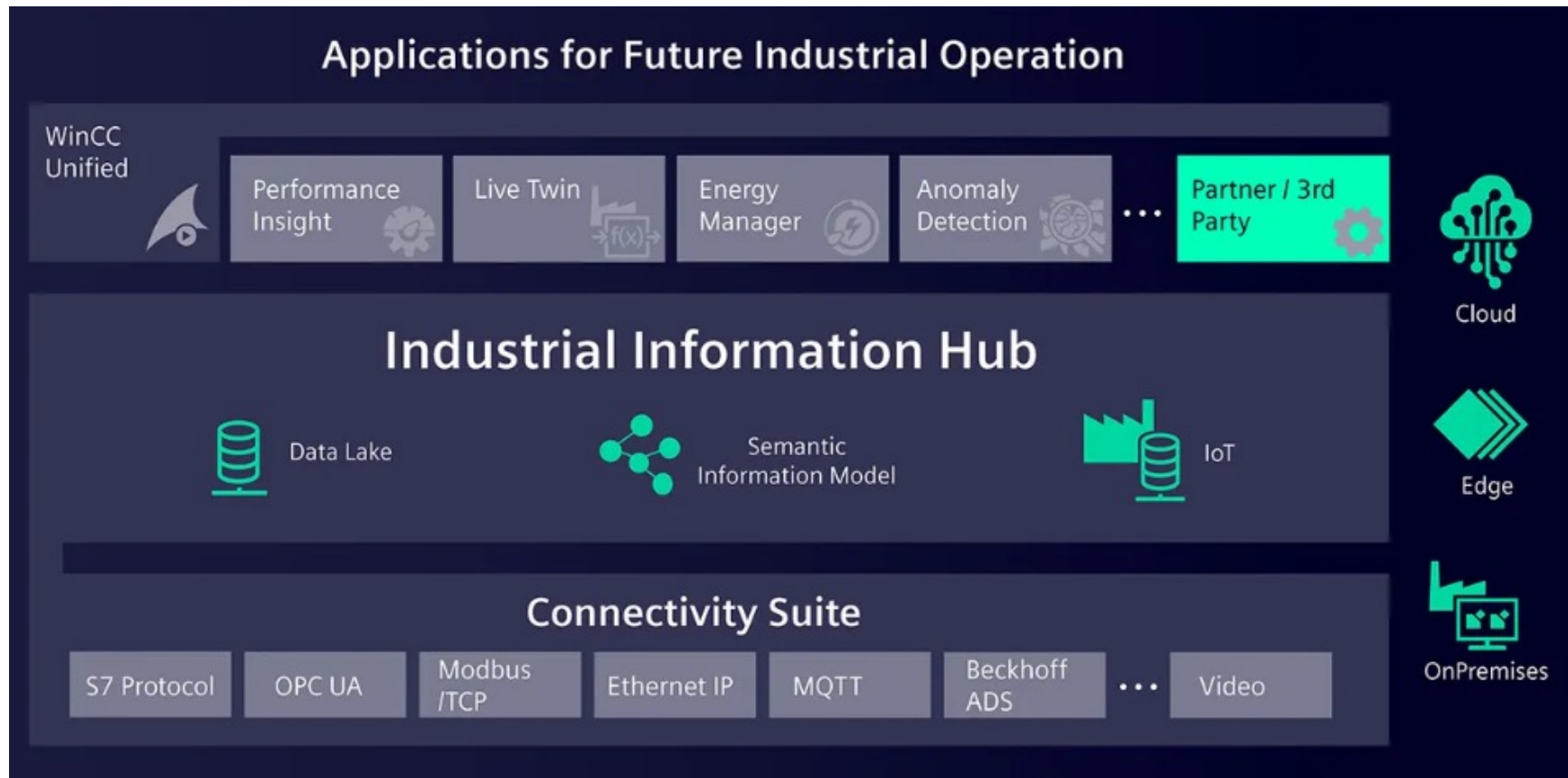
Provides details about ...

- ... the interface endpoint
(e.g., IP and port address) ✓
- ... the used protocols and serializations
(e.g., Modbus, OPC UA, UA Binary, JSON, ...) ✓
- ... what kind of data and functions are served
(e.g., voltage values, on/off,...) ✓
- ... how the payload structure look like
(e.g., simple types, complex types) ✓
- ... context and semantics
(e.g., based on ECLASS, OPC UA DM, ...) ✓
- ... security requirements
(e.g., Bearer, OAuth2, ...) ✓

W3C WoT simplifies the Thing onboarding and IoT application development

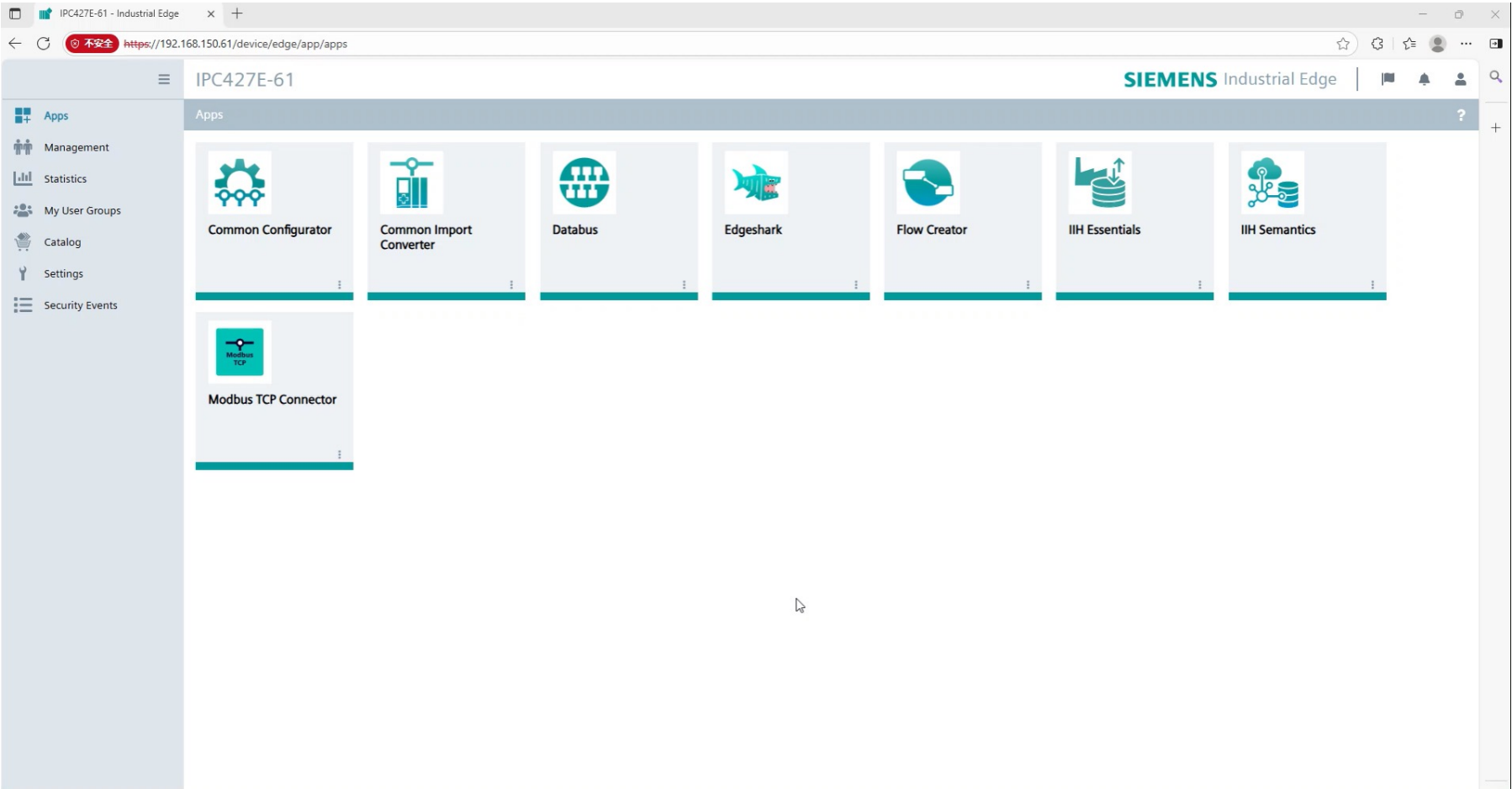


Connectivity Suite with Web of Things



<https://www.siemens.com/global/en/products/software/simatic-apps/industrial-information-hub.html>

Demo : Connectivity Suite with Web of Things



WoT Simplifies Onboarding Process

```
1 {
2   "@context": "https://www.w3.org/2022/wot/td/v1.1",
3   "title": "Siemens SENTRON PAC4200",
4   "base": "modbus+tcp://192.168.10.100:502/1/",
5   "description": "The SENTRON PAC4200 is a measuring device for",
6   "support": "https://support.industry.siemens.com/dl/dl-media",
7   "securityDefinitions": {
8     "nosec_sc": {
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32      "unit": "V",
33      "forms": [
34        {
35          "href": "40003?quantity=2",
36          "contentType": "application/octet-stream",
```



Get data / Modbus TCP Connector

Connectors
Modbus TCP Connector

Data source (1)
+ Add - Delete
Search data source

Siemens SENTRON PAC4200 Modbus TCP

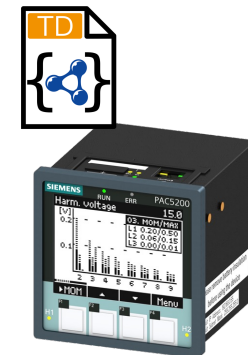
Log messages Tags

Siemens SENTRON PAC4200 177 Tags + Add tag

☐	Name	Data Type	Access mode	Function	Address
☐	Voltage L1-N	Real	Read	Holding Re...	1
☐	Voltage L2-N	Real	Read	Holding Re...	3
☐	Voltage L3-N	Real	Read	Holding Re...	5
☐	Voltage L1-L2	Real	Read	Holding Re...	7
☐	Voltage L2-L3	Real	Read	Holding Re...	9
☐	Voltage L3-L1	Real	Read	Holding Re...	11
☐	Current L1	Real	Read	Holding Re...	13
☐	Current L2	Real	Read	Holding Re...	15
☐	Current L3	Real	Read	Holding Re...	17
☐	Apparent power L1	Real	Read	Holding Re...	19
☐	Apparent power L2	Real	Read	Holding Re...	21
☐	Apparent power L3	Real	Read	Holding Re...	23
☐	Active power L1	Real	Read	Holding Re...	25
☐	Active power L2	Real	Read	Holding Re...	27
☐	Active power L3	Real	Read	Holding Re...	29
☐	Reactive Power L1 (Qn)	Real	Read	Holding Re...	31
☐	Reactive power L2 (Qn)	Real	Read	Holding Re...	33
☐	Reactive power L3 (Qn)	Real	Read	Holding Re...	35
☐	Power factor L1	Real	Read	Holding Re...	37

Concentrate on the business logic, hide protocol specifics

```
1  const TD_PATH = "file:///TDs/Siemens/Sentronpac.td.jsonld";
2  const sentronTD= WoT.fetch(TD_PATH)
3  let sentron = WoT.consume(sentronTD)
4  setInterval(() => {
5
6      // read total active power value
7      let totActPw = sentron.readProperty("Total_Active_Power")
8      console.log(totActPw)
9
10     // adjust metering rate based on the hour
11     if (time.getUTCHours() > 20) {
12         sentron.invokeAction("changeRate", 1)
13     } else {
14         sentron.invokeAction("changeRate", 0)
15     }
16 }, 10000) // read every 10 seconds
```



<https://github.com/eclipse-thingweb/node-wot>

Learn more about WoT: [https://www.w3.org/WoT/](https://www.w3.org/WoT/Specifications, Tutorials, Videos, Tools, ...)

Web of Things

Standards

Participate

Membership

W3C

Groups

Activities

Developers

Documentation

Videos

About

W3C Web of Things

The Web of Things (WoT) seeks to counter the fragmentation of the IoT by using and extending existing, standardized Web technologies. By providing standardized metadata and other re-usable technological building blocks, W3C WoT enables easy integration across IoT platforms and application domains.

Get more background about the Web of Things in the Documentation area and check out upcoming Events.

Working Group

Normative work on deliverables under W3C Patent Policy.

Interest Group

Practical evaluation, exploration, and outreach by W3C Members.

Community Groups

Users, stakeholders, and open discussion for everyone.

Task Forces

Organizational information and coordination.

Developers

Implementations, online Things, and tools.

Documentation

Learn more through our presentations and whitepaper.

Web of Things

wot@w3c.social

@galler94 from the Web of Things Community Group will be at the "What Hackers Yearn 2025" @why2025camp in Amsterdam on August 9th. He will talk about his open-source Web of Things project and give an introduction to the standards developed at the W3C.

If you are there, make sure to get some stickers from him!

We are also active on X (formerly known as Twitter). Follow us there at @W3C_WoT.

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Developer Resources

There are various resources available to build Web of Things applications. These are libraries, ready-to-use software, services or SDKs, which can be used in different stages of development or for development needs and are grouped below.

TD Tooling

Runtimes for TD Exposers

TD Directories

Other Tooling

WoT Development Tools

Runtimes for TD Consumers

WoT Software and Middleware

Online Things

TD Tooling

Tools that allow editing and validation of TDs or that allow parsing them in programming language specific environments.

- Thing Description Playground - Reference TD Validation suite with additional tools such as OpenAPI generation, testing, and more.
- Eclipse EUDitor - Web-based Editor for easy creation and visualization of Thing Descriptions and Thing Models.
- TD editor - Visual Studio Code plugin for TD validation and code snippets.
- Java API for Thing Descriptions of WoT (JDTN) - Java module for creating Java Thing Description ORM from a TD in JSON-LD or RDF triples.
- Eclipse Ditto - WoT - Model - Java module for using TDs and TMs.
- SPSS-Hoover: wot-td - Rust crate to produce and consume Web of Things Thing Descriptions.

WoT Development Tools

Ready-to-use tools that help the development of WoT applications by providing user interfaces and other tooling.

- WoT Application Manager (WAM) - CLI tool to quickly set up node-wot application projects. Additional information is available at slides or video.
- WoT API Development Environment (WADE) - Desktop application based on node-wot, Vue.js, and Electron that allows interaction with Things, profiling, Mashup generation.
- WoT FULL - UI for desktop, mobile, and browser for interacting with Things based on their TDs.
- Thing Control Panel - Visual admin client for Things compliant with WoT, like a control panel, to test or interact with a server that has its OSA Live Demo.
- BLAST - Block Applications For Things - Blocky-based programming interface to build WoT Consumer applications leveraging Thingweb node-wot Live Demo.

Runtime Implementations for TD Exposers

Software libraries that implement a WoT Runtime so that Things can be built following the WoT paradigms.

- Eclipse Thingweb node-wot - W3C Web of Things implementation in Node.js with support for multiple bindings. A website is available at Thingweb.
- WoT Integration for Eclipse Ditto - Ditto managed digital twins can be linked to WoT Thing Models from which Ditto can create Thing Descriptions containing the API descriptions of the twins.
- SAWEE WoT Servant - W3C Web of Things implementation in Java with support for multiple bindings, inspired by node-wot.
- wot-py - Experimental W3C Web of Things implementation in Python with support for multiple bindings.
- SPSS-Hoover: wot-server - Rust crate to serve WoT Things.

Runtime Implementations for TD Consumers

Software libraries that implement a WoT Runtime so that Things can be consumed and custom applications can be built on top, following the WoT paradigms.

- Eclipse Thingweb node-wot - W3C Web of Things implementation in Node.js with support for multiple bindings. A website is available at Thingweb.
- Node-Red Node generator - CLI tool to generate WoT Consumer Nodes from a TD. Additional information at slides or video.
- dart-wot - W3C Web of Things implementation written in Dart with support for HTTP and CoAP.
- SAWEE WoT Servant - W3C Web of Things implementation in Java with support for multiple bindings, inspired by node-wot.
- wot-go - Experimental W3C Web of Things implementation in Go with support for multiple bindings.
- kotlin-wot - A Framework for implementing Web of Things in Kotlin.
- WoT-Test - A .NET Standard 2.0 WoT Consumer implementation.

TD Directory (TDD) Implementations

Services that host a Thing Description Directory which implements the W3C WoT Discovery specification.

- Things I Thing Directory - TDD implementation with features such as DNS-SD registration, XPath 3.0 and JSONPath queries, authentication, and more.
- WoThive Thing Directory - TDD implementation with features such as SPARQL and JSONPath queries, SHACL-based validation, and more.
- Eclipse Thingweb Dorus TDD API - TDD implementation with features such as SPARQL queries, contextual validation, and more, with a flexible storage mechanism.
- SPSS-Hoover: wot-discovery - Tiny implementation of WoT Discovery written in Rust.
- Zion - A scalable Thing Description Directory

WoT Software and Middleware

Ready to use software applications that can be deployed in order to provide a certain functionality in a system, such as gateway and proxy, simulation, and testing services.

- iothive77 - Industrial-grade implementation that allows integration of devices into Siemens software products.
- Web of Things Test Bench - CLI-based tool that tests a WoT Thing by executing interactions automatically, based on its TD.
- WebThings Gateway - An open source Web of Things gateway for smart buildings, which bridges a wide range of IoT protocols to the Web of Things.
- UA Edge Translator - An industrial connectivity edge reference application translating from proprietary protocols to OPC UA, leveraging the W3C Web of Things (WoT) Thing Descriptions.
- VO-WoT - A Python-based stack that allows developing WoT Things with additional functionalities, called Virtual Objects (VOs). A documentation website is available here.
- Shadow Thing - CLI-based tool for creating and deploying a Thing based on its TD for simulation, proxy, or protocol translation purposes.

Others

- WoT Plugin for AASX Package Explorer - Plugin to import/export WoT Thing Description into Asset Administration Shell definitions.
- Eclipse LMCS - Open-source, cloud-native platform for building and running Multi-Agent systems.

Online Things

Publicly accessible Things that can be used during development to test Consumer applications or learn how to understand Thing Descriptions to communicate with Things.

- Eclipse Thingweb - Online Things for Testing

Thank you very much for your attention



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