



Pre-Meeting OPC UA / W3C WoT Joint Activity

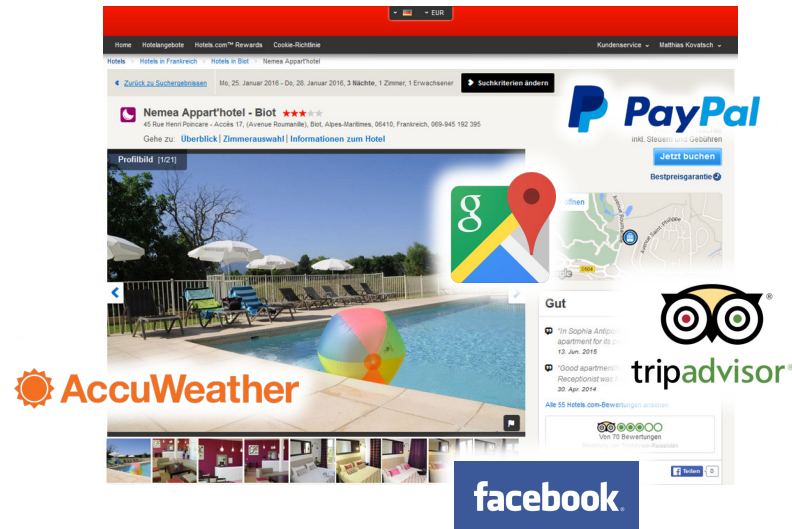
1 July 2022

Agenda

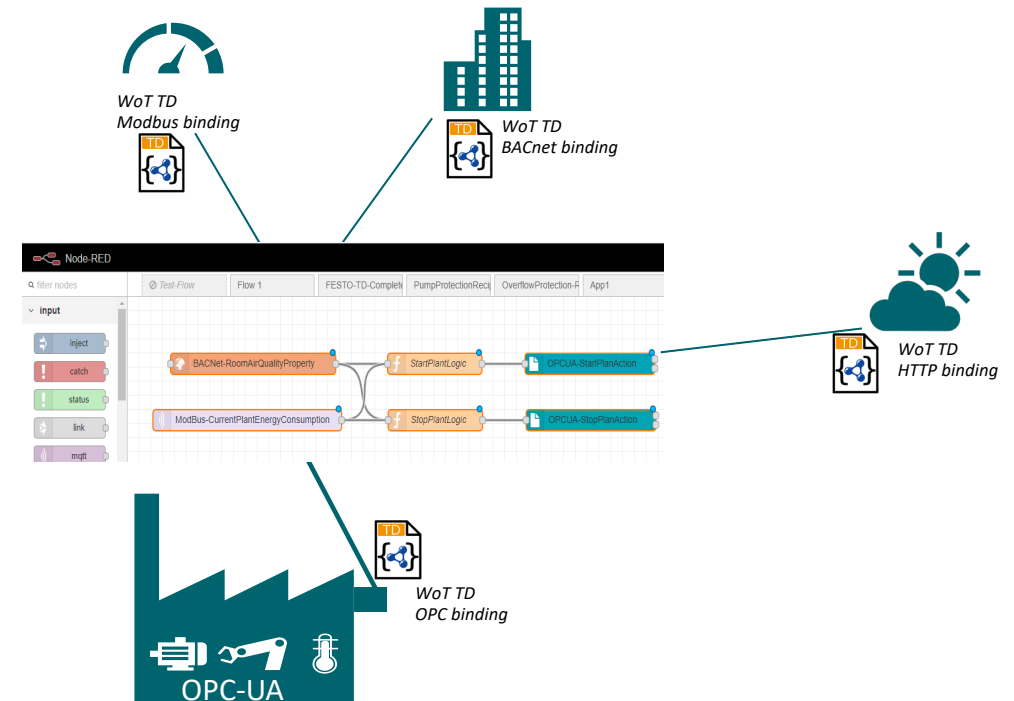
- Welcome & Scope of the Meeting
 - IRC: <https://irc.w3.org/?channels=wot>
- Short round of introduction
- Proposed Idea: OPC UA Binding for Web of Things
- Current status of collaboration
- Proposed next steps
- Questions

Motivation

The **Web** and its standardized **technology building blocks** are established in our daily life and in many businesses.



W3C Web of Things (WoT) – Standardized technology building blocks for IoT as enablers to reuse established Web paradigm
Example:



What is Missing?

HTTP Binding Template

W3C Editor's Draft 23 September 2021



▼ More details about this document

This version:

<https://w3c.github.io/wot-binding-templates/http>

Latest published version:

<https://www.w3.org/TR/wot-http-template/>

Latest editor's draft:

<https://w3c.github.io/wot-binding-templates/http>

Editors:

Michael Koster (SmartThings)

Ege Korkan (Siemens AG)

Other documentation

In the GitHub repository

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MQTT Binding Template

W3C Editor's Draft 23 September 2021



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This version:

<https://w3c.github.io/wot-binding-templates/coap>

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CoAP Binding Template

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MODBUS binding template

W3C Editor's Draft 23 September 2021



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<https://www.w3.org/TR/wot-modbus-template/>

Latest editor's draft:

<https://w3c.github.io/wot-binding-templates/modbus>

Editor:

Cristiano Aguzzi (Invited Expert)

Other documentation

MODBUS ontology

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Defines formally how the *forms* in the TD should be set up for OPC UA based endpoints.
→ Not existing yet!

OPCUA binding

W3C Editor's Draft 15 October 2021



▼ More details about this document

This version:

<https://w3c.github.io/wot-binding-templates/opcu>

Latest published version:

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

Latest editor's draft:

<https://w3c.github.io/wot-binding-templates/opcu>

Editor:

idea / proposal

Proposed Idea



Setup new OPC UA companion specification

- defines OPC UA Binding Ontology for having metadata available for communication and security definition (namespace already exists for UA data modeling)
- guideline to transform UA NodesetFile to Thing Description (and vice versa)

Setup new W3C Binding for OPC UA

- Provide formal approach how TD *forms* should be designed for UA based endpoints based on OPC UA Binding Ontology (similar with, e.g., HTTP)
- organize PlugFest and design scenarios to evaluate working assumptions

Technical discussion: <https://github.com/w3c/wot/pull/1020>

Current status of collaboration

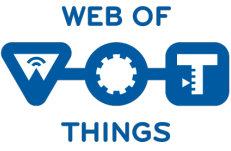
- Since April 2016 official liaison [1]
- Exchange idea with W3C CEO (Jeff Jaffe) about an official OPC UA Binding as joint activity with OPCF (end of 2021)
- Presented idea at OPCF TCB Meeting in Feb 2022
- OPCF members voted positive to start this joint activity
 - created Multi-Organization Cooperation Agreement (MOCA) document
- Exchange again with W3C CEO about the status:
 - If there is a detailed technical plan, the Memorandum of Understanding between OPCF and W3C should be renewed
 - include joint activity in the new upcoming W3C WoT Charter (WoT 2.0)

[1] <https://opcfoundation.org/news/opcf-foundation-news/w3c-and-opcf-to-integrate-opc-ua-into-the-web-of-things/>

Proposed Next Step

1. Schedule meeting between OPCF representative (TCB members) and W3C WoT Chairs + staff
 - scope the technical plan as content for MoU (e.g., shall we also address discovery topic)
2. Exchange result within W3C (WoT liaison team + CEO) and OPCF
3. Setup MoU and sign it until TPAC 2022

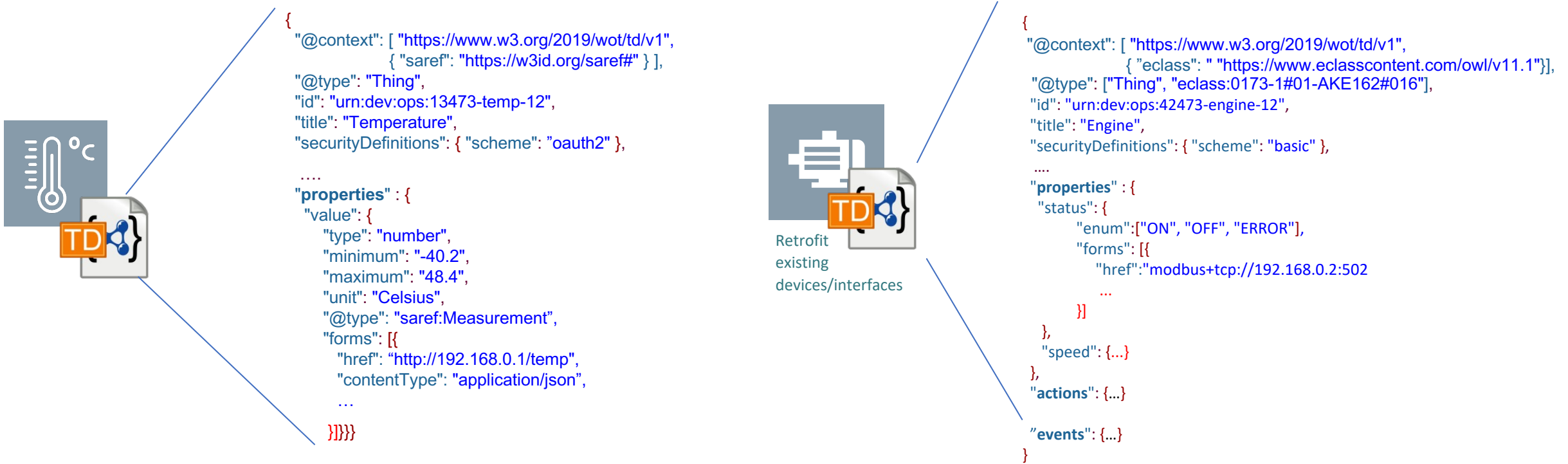
Questions



Backup

Describe any Thing's Interface with a TD

The “index.html” for Things – A common language based on JSON-LD / RDF



WoT Binding Templates – Uniform Documentation of IoT Protocols

HTTP

```
"properties": {
  "forms": [
    {
      "op": "readproperty",
      "href": "https://myled.example.com:8080/livingroom/lamp/status",
      "contentType": "application/json",
      "htv:methodName": "GET"
    }
  ]
}
```

MQTT

```
"events": {
  "forms": [
    {
      "op": "subscribeevent",
      "href": "mqtt://mybroker.example.com:1883/livingroom/lamp/criticalCond",
      "contentType": "application/json",
      "mqv:controlPacketValue": "SUBSCRIBE"
    }
  ]
}
```

MQTT Broker
address

MQTT Topic

CoAP

```
"actions": {
  "forms": [
    {
      "op": "invokeaction",
      "href": "coaps://myled.example.com:5684/lr/l/fi",
      "contentType": "application/ocf+cbor",
      "cov:methodName": "POST",
      "cov:options": [ {
        "cov:optionNumber": 2053,
        "cov:optionValue": "1.1.0"
      } ]
    }
  ]
}
```

CoAP header
settings

/// OCF-Content-Format-Version

WoT Binding Templates – Uniform Documentation of IoT Protocols (cont.)

Modbus

```
"properties": {
  "forms": [
    {
      "op": "readproperty",
      "href": "modbus+tcp://127.0.0.1:60000/1/",
      "contentType": "application/octet-stream;byteSeq=BIG_ENDIAN;length=4",
      "modbus:function": "readHoldingRegisters",
      "modbus:address": 40001,
      "modbus:quantity": 2,
      "modbus:pollingTime": 500
    }
  ]
}
```

M-Bus

```
"properties": {
  "forms": [
    {
      "op": "readproperty",
      "href": "mbus+tcp://127.0.0.1:8182",
      "contentType": "application/octet-stream",
      "mbus:unitID": 3,
      "mbus:offset": 1,
      "mbus:timeout": 2000
    }
  ]
}
```

Not yet formally
defined!

OPC UA

```
"properties": {
  "forms": [
    {
      "op": "readproperty",
      "href": "opc.tcp://localhost:26543/ns=3;s=\"Case_Lamp_Variable\"",
      "contentType": "application/x.opcua-binary",
      "opc:method": "READ"
    }
  ]
}
```

Alternative
addressing possible
(e.g via browse path)

...

Liaison & Memorandum of Understanding between W3C WoT and OPC-UA

W3C and OPCF to integrate OPC-UA into the Web of Things

05/09/2016

2016 | April – At the Hannover Fair, Thomas J. Burke, President and Executive Director of the OPC Foundation and Dave Raggett, W3C lead for the Web of Things signed a Memorandum of Understanding in which both organizations agree to closely cooperate to ensure interoperability for the Internet of Things (IoT).

OPC and W3C have mutual goals, requirements and use cases developing an infrastructure to promote and facilitate across domain applications for open markets for horizontal integration along the value chain and supply chain, and vertical integration from manufacturing cells to enterprise management systems. These integration opportunities are the infrastructure necessary for IoT.

This unique collaboration between the OPC Foundation and W3C provides a complete solution as the essence of IoT connectivity horizontally and vertically across a multitude of domains. The collaboration provides the infrastructure for the Industrie 4.0 reference architecture facilitating the vision and execution of a “Smart Factory”.

Read more [here](#)

<https://opcfoundation.org/news/opc-foundation-news/w3c-and-opcf-to-integrate-opc-ua-into-the-web-of-things/>

OPC Foundation and W3C agree to cooperate together to ensure interoperability for IoT

04/26/2016

For Immediate Release

OPC Foundation and W3C Sign Memorandum of Understanding at Hannover Fair

OPC Foundation and W3C agree to cooperate together to ensure interoperability for IoT

Hannover, Germany – April 26, 2016 – At the Hannover Fair, Thomas J. Burke, President and Executive Director of the OPC Foundation and Dave Raggett, W3C lead for the Web of Things signed a Memorandum of Understanding in which both organizations agree to closely cooperate to ensure interoperability for the Internet of Things (IoT).

OPC and W3C have mutual goals, requirements and use cases developing an infrastructure to promote and facilitate across domain applications for open markets for horizontal integration along the value chain and supply chain, and vertical integration from manufacturing cells to enterprise management systems. These integration opportunities are the infrastructure necessary for IoT.

This unique collaboration between the OPC Foundation and W3C provides a complete solution as the essence of IoT connectivity horizontally and vertically across a multitude of domains. The collaboration provides the infrastructure for the Industrie 4.0 reference architecture facilitating the vision and execution of a “Smart Factory”.

Based on this motivation, OPC and W3C will collaborate with a strong focus on semantic interoperability. Both organizations will share requirements and use cases for consideration in their joint work. The primary goal of this collaboration is to establish a common framework for semantic interoperability and secure services across platforms, that have broad applicability beyond digital automation. This collaboration will provide the underpinning necessary to achieve seamless interoperability in the IoT.

The OPC Foundation and W3C collaboration will result in the development of specifications, white papers, guidelines and processes that provide the infrastructure necessary for the two organizations to promote system wide interoperability as the foundation of IoT. Deliverables from the collaboration between the two organizations will benefit the members of both of the respective organizations in the pursuit of developing and achieving information integration across a multitude of domains. IoT is an exciting opportunity for connectivity and information integration across

<https://opcfoundation.org/news/press-releases/opc-foundation-and-w3c-agree-to-cooperate-together-to-ensure-interoperability-for-iot/>

Collaboration Work

achieve seamless interoperability in the IoT.

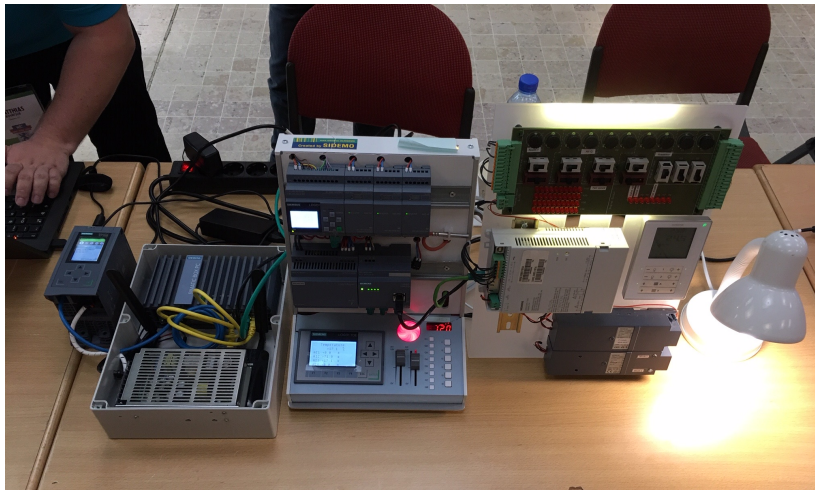
The OPC Foundation and W3C collaboration will result in the development of specifications, white papers, guidelines and processes that provide the infrastructure necessary for the two organizations to promote system wide interoperability as the foundation of IoT. Deliverables from the collaboration between the two organizations will benefit the members of both of the respective organizations in the pursuit of developing and achieving information integration across a multitude of domains. IoT is an exciting opportunity for connectivity and information integration across disparate systems and disparate domains; the collaboration between the OPC Foundation and W3C clearly provides the solution for the IoT.

"Industrie 4.0 integrates IIoT, IoT, and M2M as part of the reference architecture for the Smart Factory", says Stefan Hoppe, OPC Foundation Global vice president. "The collaboration between the OPC Foundation and W3C provides the solution for semantic interoperability for connected devices across the IoT spectrum, accurately realizing the vision of Industrie 4.0."

"There is huge potential for digital automation, but this is being held back by a lack of interoperability across different IoT platforms", said Dr. Dave Raggett, W3C lead for the Web of Things. "The collaboration with the OPC Foundation will help W3C in its efforts to develop inter-platform Web technology standards on semantic interoperability and end to end security"

Experiences in WoT PlugFest

Example:



TPAC 2018, Lyon



WoT Event 2019, Munich

2022-06-29

W3C Web of Things (WoT) WG/IG



Protocol Support

- HTTP ✓
- HTTPS ✓
- CoAP ✓
- CoAPS ✓
- MQTT ✓
- Firestore ✓
- Websocket + (Server only)
- OPC-UA + (Client only) based on → **node-opcua**
- NETCONF + (Client only)
- Modbus + (Client only)
- M-Bus + (Client only)

Coming soon: OPC-UA P/S