

W3C Web of Things

Summary, Status, and Next Steps

8 April 2019

W3C Web of Things

Goal: Support IoT Interoperability via Open Standards

- **W3C WoT Interest Group (IG)**

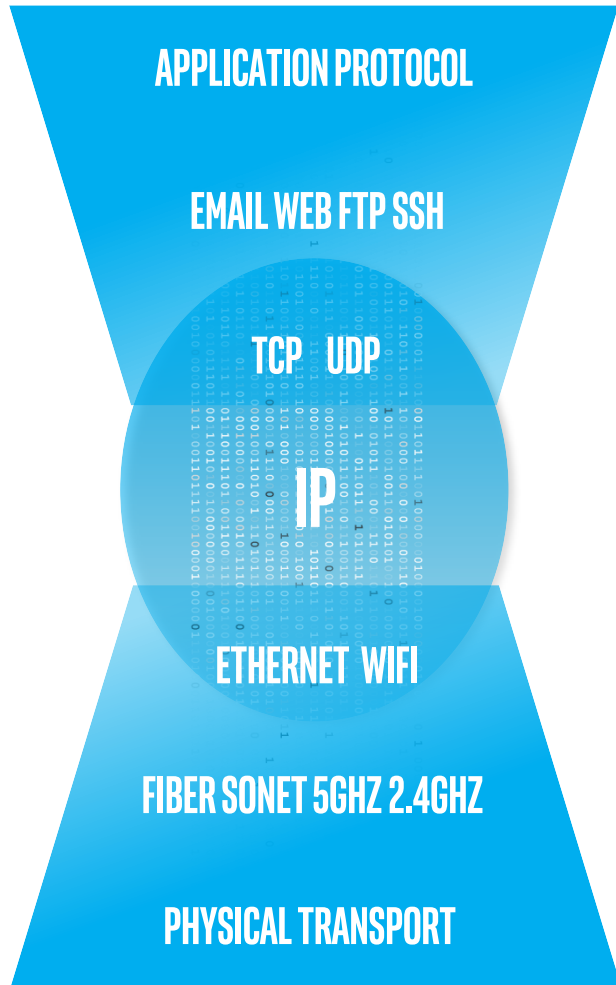
<https://www.w3.org/2016/07/wot-ig-charter.html>

- Started spring 2015
- ~200 participants
- Informal work and outreach
- “PlugFest” validation with running code
- Exploration of new building blocks
- “OpenDays” with external speakers
- Liaisons and collaborations with other organizations and SDOs
- ***Second Workshop on Web of Things planned for 3-5 June 2019 in Munich***

- **W3C WoT Working Group (WG)**

<https://www.w3.org/2016/12/wot-wg-2016.html>

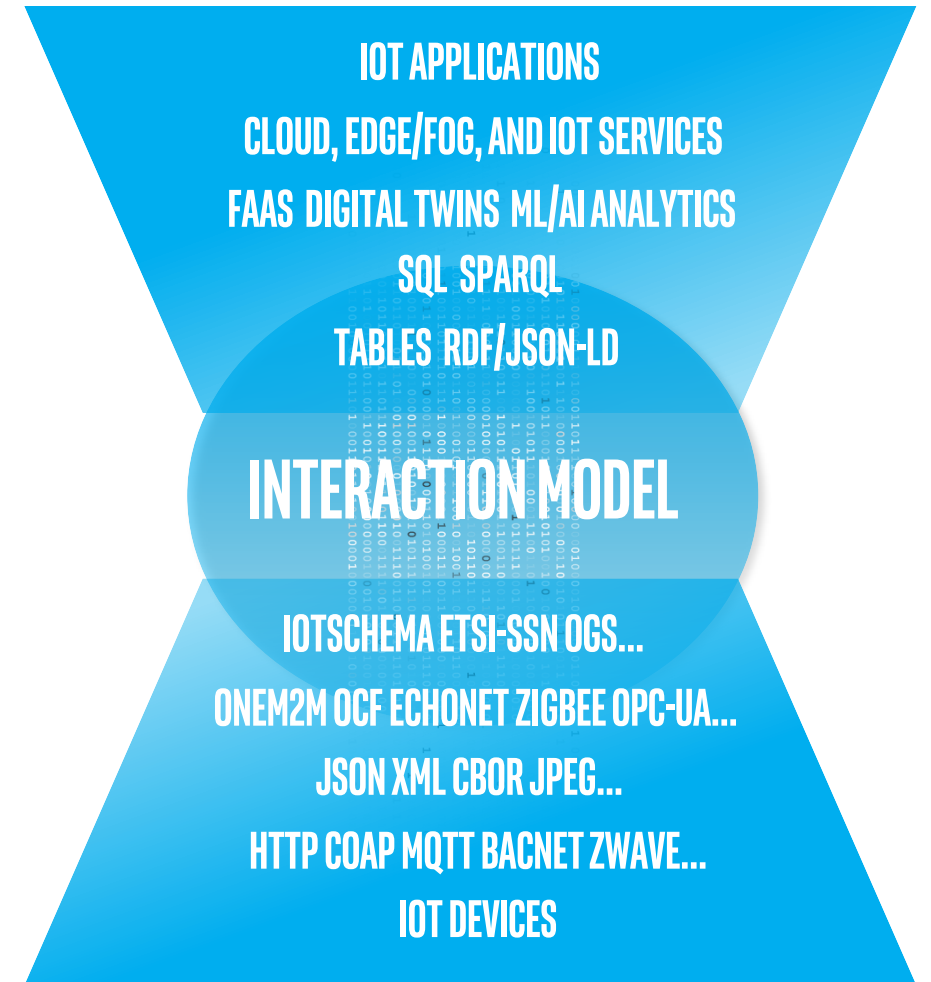
- Started end of 2016 (effectively Feb 2017)
- ~100 participants
- Normative work on specific deliverables
- W3C Patent Policy for royalty-free standards
- Only W3C Members and Invited Experts
- ***Notes published on Protocol Bindings, Security, and Scripting API***
- ***Architecture and Thing Description submitted to TAG Review 26 March 2019***



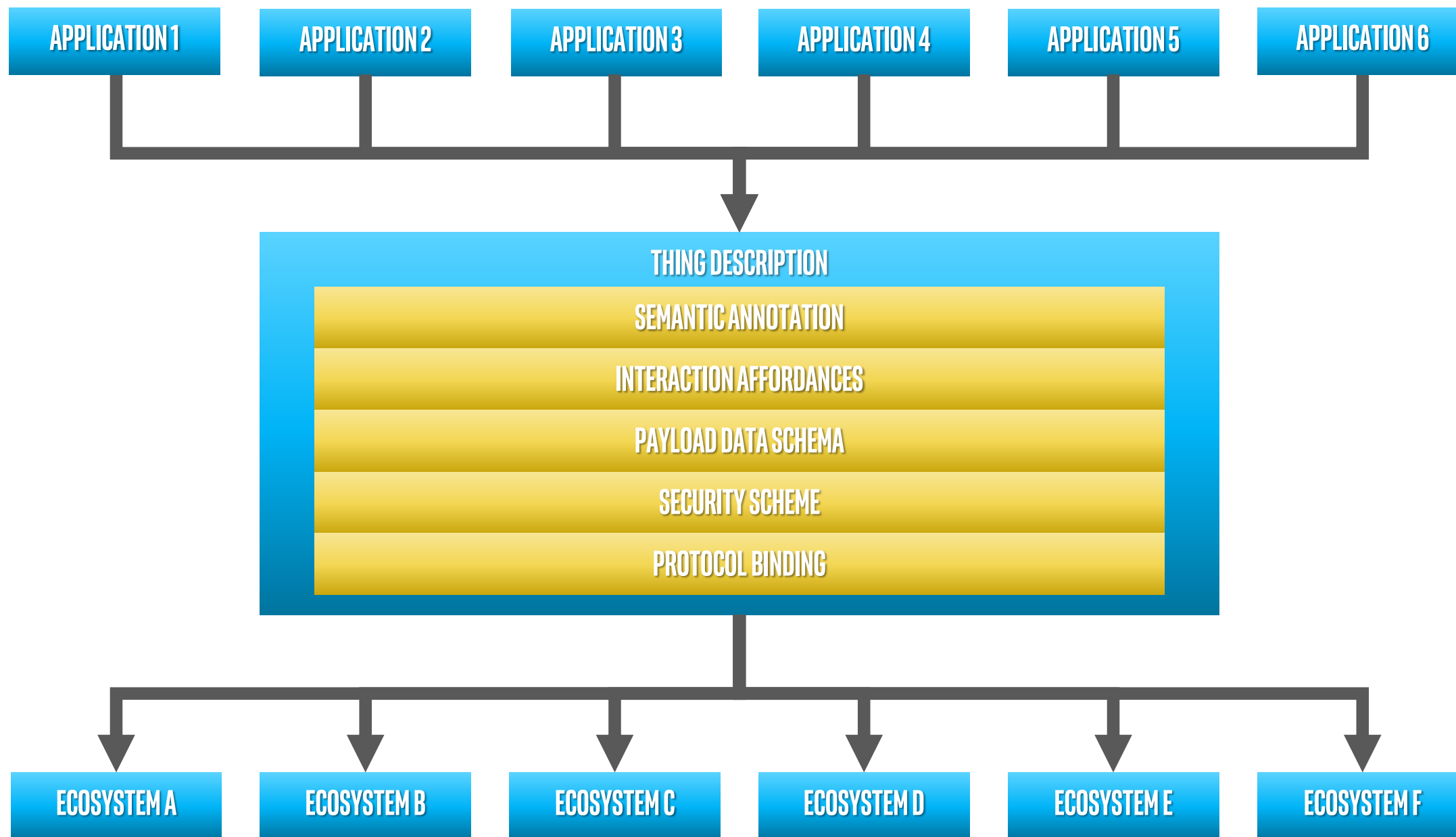
INTERNET



WEB



IOT



W3C WoT WG Deliverables

WoT Thing Description (TD)

Information model and **JSON-LD 1.1** serialization to describe Thing *instances* with **metadata**. Uses **formal interaction model** and **domain-specific vocabularies** to uniformly describe Thing interaction affordances, which enables semantic interoperability.



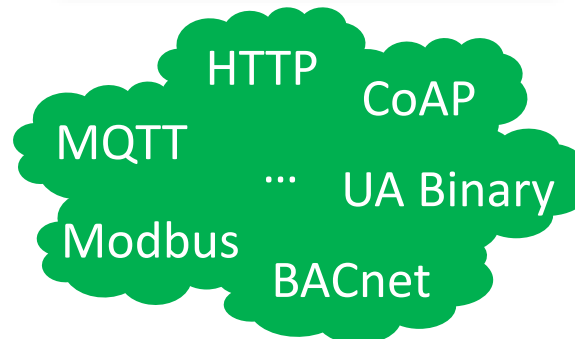
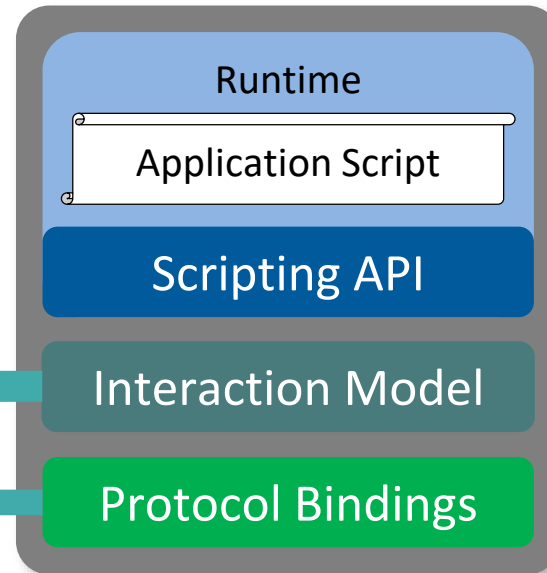
WoT Security and Privacy

Cross-cutting support and guidance to support appropriate security and privacy mechanisms and considerations.

JavaScript

WoT Scripting API

Standardized **JavaScript** API for an IoT runtime system **similar to the Web browser**. Provides an interface between applications and Things to simplify IoT application development and enable **portable apps** across vendors, devices, edge, and cloud.



WoT Binding Templates

Capture how the **formal Interaction Model** is mapped to concrete protocol operations (e.g., CoAP) and platform features (e.g., OCF). These templates are re-used by concrete TDs.

WoT Thing Description (TD) – JSON-LD 1.1

JSON-LD
(Linked Data)
Converts to
RDF triples

W3C WoT TD
vocabulary

Domain-specific
vocabulary

Security
Metadata

Protocol
Bindings

JSON Schema
Compatible
data schemas

Optional
semantic
types

Extended metadata
using domain-specific
vocabulary

```
{
  "@context": [
    "https://www.w3.org/ns/td",
    { "iot": "http://iotschema.org/" }
  ],
  "id": "urn:dev:org:32473:1234567890",
  "name": "MyLEDThing",
  "description": "RGB LED torchiere",
  "@type": ["Thing", "iot:Light"],
  "securityDefinitions": { "basic_sc": {
    "scheme": "basic",
    "in": "header"
  } },
  "security": ["oauth2_sc"],
  "properties": {
    "brightness": {
      "type": "integer",
      "minimum": 0,
      "maximum": 100,
      "@type": ["iot:Brightness"],
      "iot:Unit": "iot:Percent"
    },
    "forms": [ ... ]
  },
  "actions": {
    "fadeIn": {
```

WoT Binding Templates – Instantiated in TDs

Basics to build
the request


```
...
  "properties": {
    "brightness": {
      ...
      "forms": [
        {
          // Defaults: GET to read, PUT to write
          "href": "https://myled.example.com:8080/pwr",
          "contentType": "application/json"
        }
      ]
    }
  },
```

Deviation from
defaults

```
  "actions": {
    "fadeIn": {
      ...
      "forms": [
        {
          "href": "coaps://myled.example.com:5684/pwr",
          "contentType": "application/ocf+cbor",
          "coap:methodCode": 3, // PUT instead of POST to invoke
          "coap:options": [ { // OCF-Content-Format-Version
            "coap:optionNumber": 2053,
            "coap:optionValue": "1.1.0"
          } ]
        }
      ]
    }
  }
```

Status and Recent Developments

- Decision to adopt JSON-LD 1.1 proposed features to allow:
 - Default values
 - Object name:value notation
 - More similarity to standard JSON practices
- Security metadata
 - Focus on HTTP(S), CoAP(S), and MQTT(S)
- Protocol Bindings
 - Focus on HTTP, CoAP, and MQTT and structured payloads compatible with JSON
 - Support for Observe, using subProtocols (eg long polling in HTTP) when appropriate
- ***Architecture and Thing Description submitted to TAG Review 26 March 2019***
- ***Notes published on Protocol Bindings, Security, and Scripting API***



Second W3C Workshop on the Web of Things The Open Web to Challenge IoT Fragmentation

3-5 June 2019, Munich, Germany

<https://www.w3.org/WoT/ws-2019/cfp.html>

Express your interest or address some new topics or challenges in a position paper
Application deadline: **15th April**

W3C WoT Summary

- Counter fragmentation in the IoT
 - Web of Things to Internet of Things is similar to the Web to Internet relation
 - Narrow waist: common interaction model and metadata description
 - Take patterns from the World Wide Web and adapt and apply them to the IoT
 - JSON Schema and Linked Data
 - URIs and Media Types
 - JavaScript runtime
- By describing and complementing
 - Not competing with existing IoT standards, as not prescribing a full-stack solution
 - Instead, *describes* existing solutions so they can work with each other (interoperate)
 - W3C WoT defines common building blocks to enable semantic interoperability
 - WoT Thing Description (TD)
 - WoT Binding Templates
 - WoT Scripting API

W3C WoT Resources

- W3C WoT Wiki
 - <https://www.w3.org/WoT/IG/wiki>
(IG/WG organizational information)
- W3C WoT Interest Group
 - <https://www.w3.org/2016/07/wot-ig-charter.html>
(charter)
 - <https://lists.w3.org/Archives/Public/public-wot-ig/>
(mailing list)
 - <https://github.com/w3c/wot>
(technical proposals)
- W3C WoT Working Group
 - <https://www.w3.org/2016/12/wot-wg-2016.html>
(charter)
 - <https://www.w3.org/WoT/WG/>
(dashboard)
- W3C WoT Working Drafts
 - <https://www.w3.org/TR/wot-architecture/>
 - <https://www.w3.org/TR/wot-thing-description/>
 - <https://www.w3.org/TR/wot-binding-templates/>
 - <https://www.w3.org/TR/wot-scripting-api/>
 - <https://www.w3.org/TR/wot-security/>
- W3C WoT Editors' Drafts and Issue Tracker
 - <https://github.com/w3c/wot-architecture/>
 - <https://github.com/w3c/wot-thing-description/>
 - <https://github.com/w3c/wot-binding-templates/>
 - <https://github.com/w3c/wot-scripting-api/>
 - <https://github.com/w3c/wot-security/>
- Reference Implementation: node-wot
 - <https://github.com/eclipse/thingweb.node-wot>
- TAG Design Reviews
 - <https://github.com/w3ctag/design-reviews/issues/355>
 - <https://github.com/w3ctag/design-reviews/issues/357>

Contacts

Dr. Michael McCool

Intel

michael.mccool@intel.com

Dr. Matthias Kovatsch

Huawei

matthias.kovatsch@huawei.com