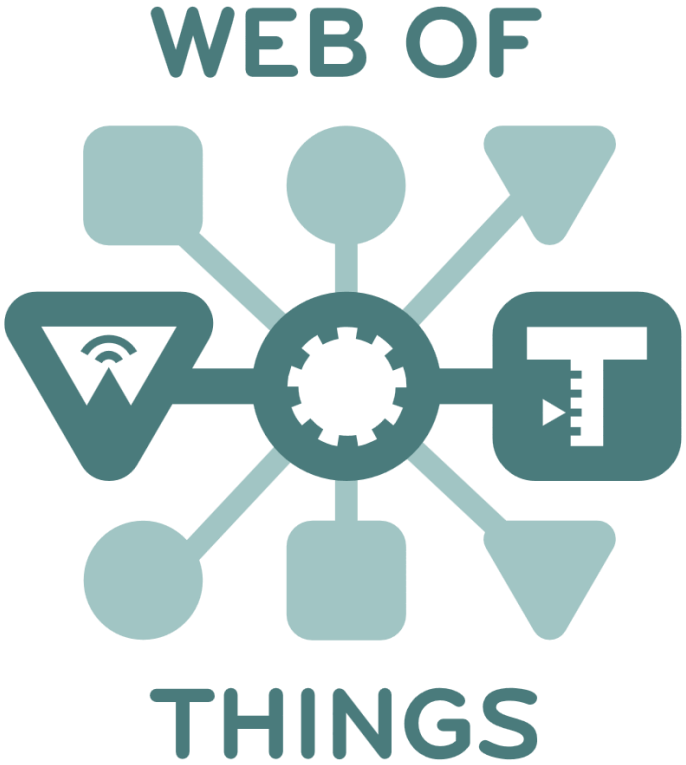


Web Standards for the IoT

IRTF T2TRG WISHI

Prague, Czech Republic, July 2017

W3C WoT Mission

Not to be yet another standard

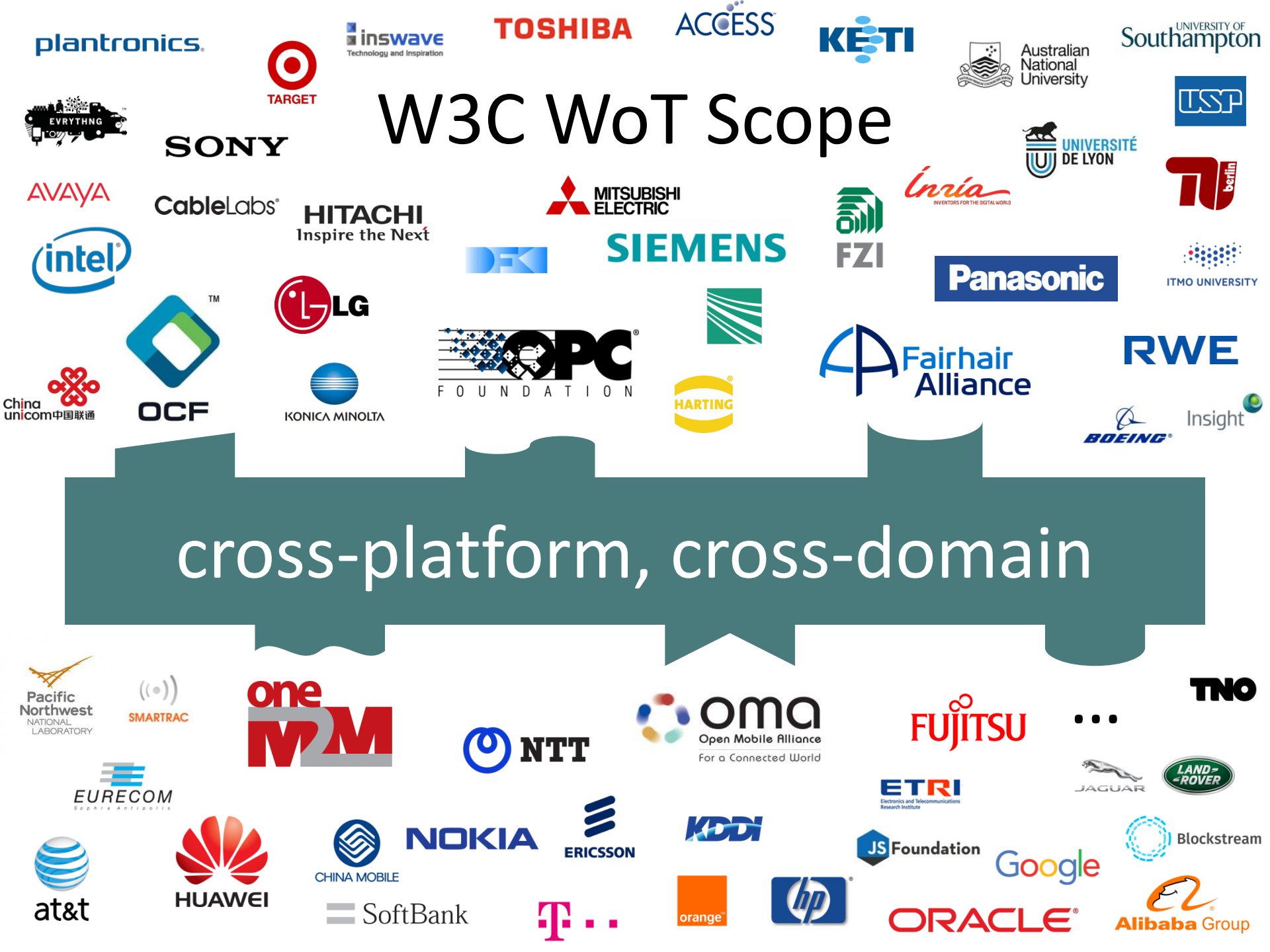
W3C WoT Mission

Not to be yet another standard

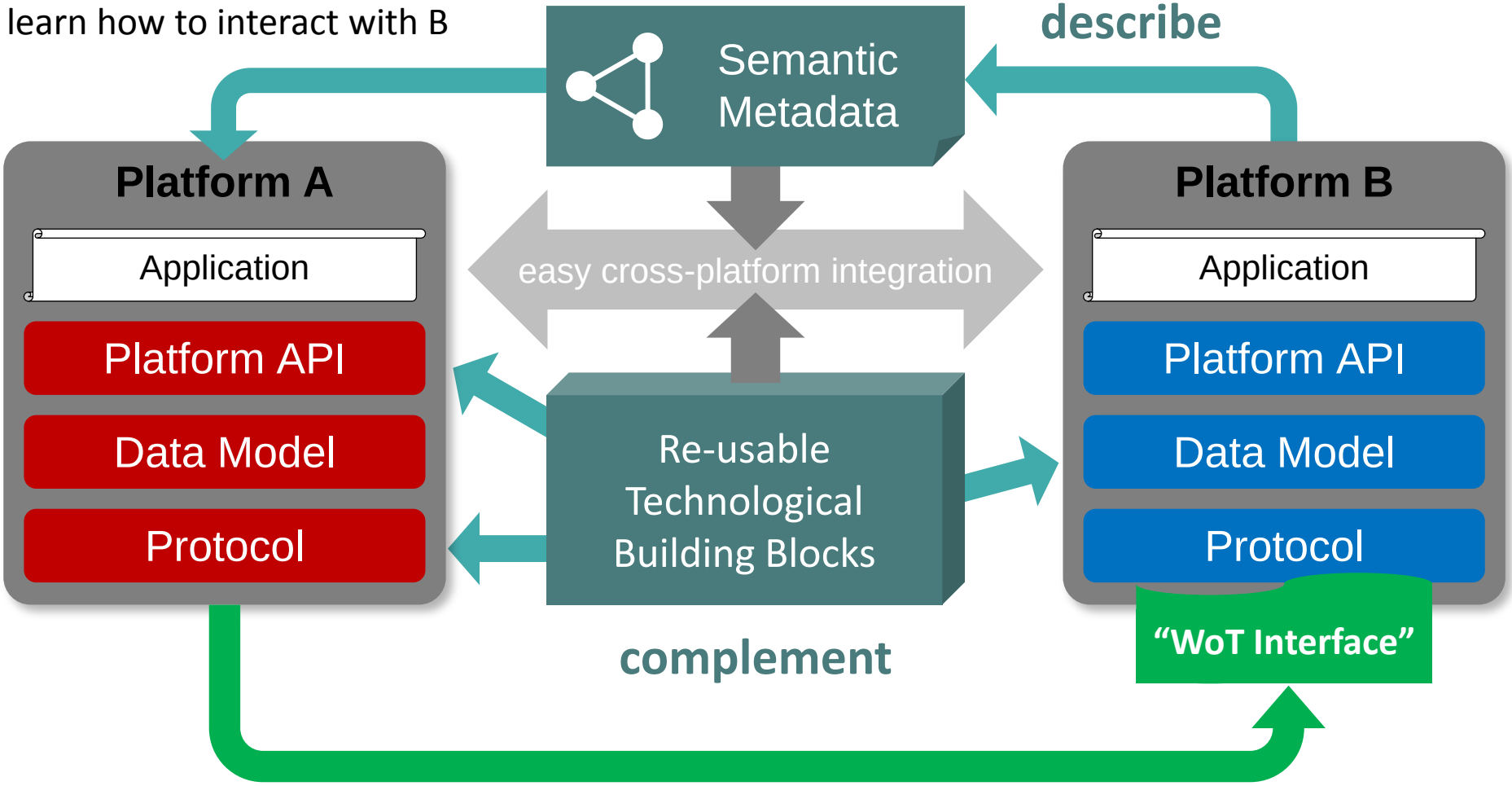
Web of Things

...

Extend Web technologies to the IoT to complement IoT standards and be *descriptive* instead of prescriptive


plantronics
TARGET
inswave
Technology and Inspiration
TOSHIBA
ACCESS
KETI
Australian National University
UNIVERSITY OF Southampton
EVRYTHNG
SONY
W3C WoT Scope
USP
UNIVERSITÉ DE LYON
AVAYA
CableLabs
HITACHI
Inspire the Next
MITSUBISHI ELECTRIC
Inria
INVENTORS FOR THE DIGITAL WORLD
berlin
intel
SIEMENS
FZI
Panasonic
ITMO UNIVERSITY
LG
OCF
KONICA MINOLTA
OPC
FOUNDATION
HARTING
Fairhair Alliance
RWE
China unicom中国联通
BOEING
Insight
cross-platform, cross-domain
Pacific Northwest NATIONAL LABORATORY
SMARTRAC
oneM2M
NTT
oma
Open Mobile Alliance
For a Connected World
FUJITSU
TNO
EURECOM
ETRI
JAGUAR
LAND ROVER
at&t
HUAWEI
CHINA MOBILE
NOKIA
ERICSSON
KDDI
JS Foundation
Blockstream
Google
SoftBank
orange
hp
ORACLE
Alibaba Group

W3C WoT Approach



Describe: Machine-understandable Model

Start with versatile core and evolve like the Web

- Linked Data vocabularies
  - Simple interaction model
  - Generic data model (JSON-like)
  - Semantic Web ontology
- Extension points
  - Domain-specific vocabularies
- Multiple serializations
  - JSON-LD (first CR release)
  - JSON
  - CBOR, EXI, …

*CR: W3C Candidate Recommendation

JSON-LD Serialization

Linked Data

W3C WoT TD vocabulary

domain-specific vocabulary

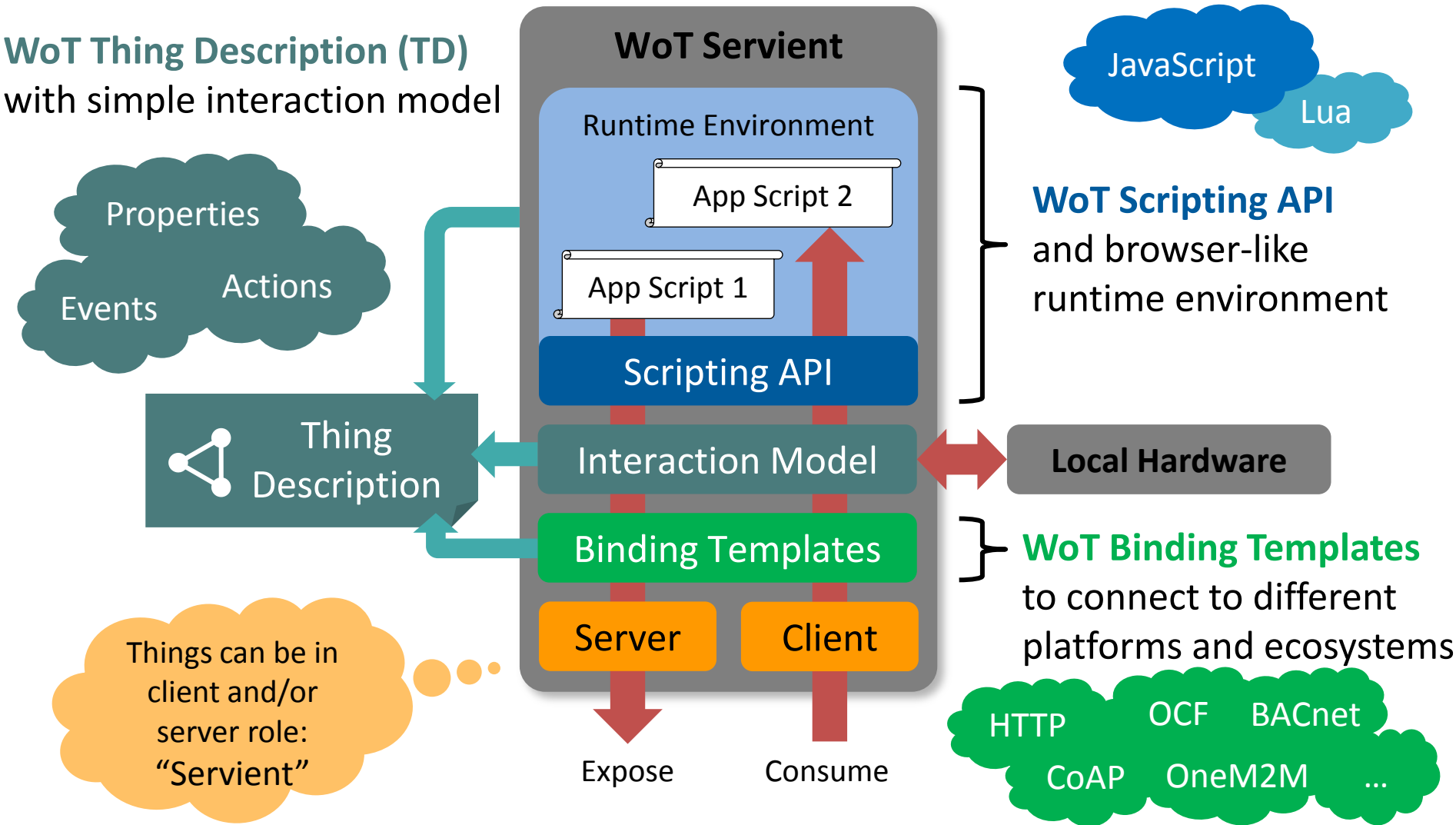
JSON Schema base types plus semantics

```
{
  "@context": [
    "http://w3c.github.io/wot/w3c-wot-td-context.jsonld",
    { "domain": "http://example.org/actuator#" }
  ],
  "@type": "Thing",
  "name": "MyLEDThing",
  "security": {
    "cat": "token:jwt",
    "alg": "HS256",
    "as": "https://authority-issuing.example.org"
  },
  "interaction": [
    {
      "@type": ["Action", "domain:fadeIn"],
      "name": "fadeIn",
      "inputData": {
        "type": "integer",
        "minimum": "0",
        "domain:unit": "domain:ms"
      },
      "link": [
        {
          "href": "coaps://myled.example.com:5684/in",
```

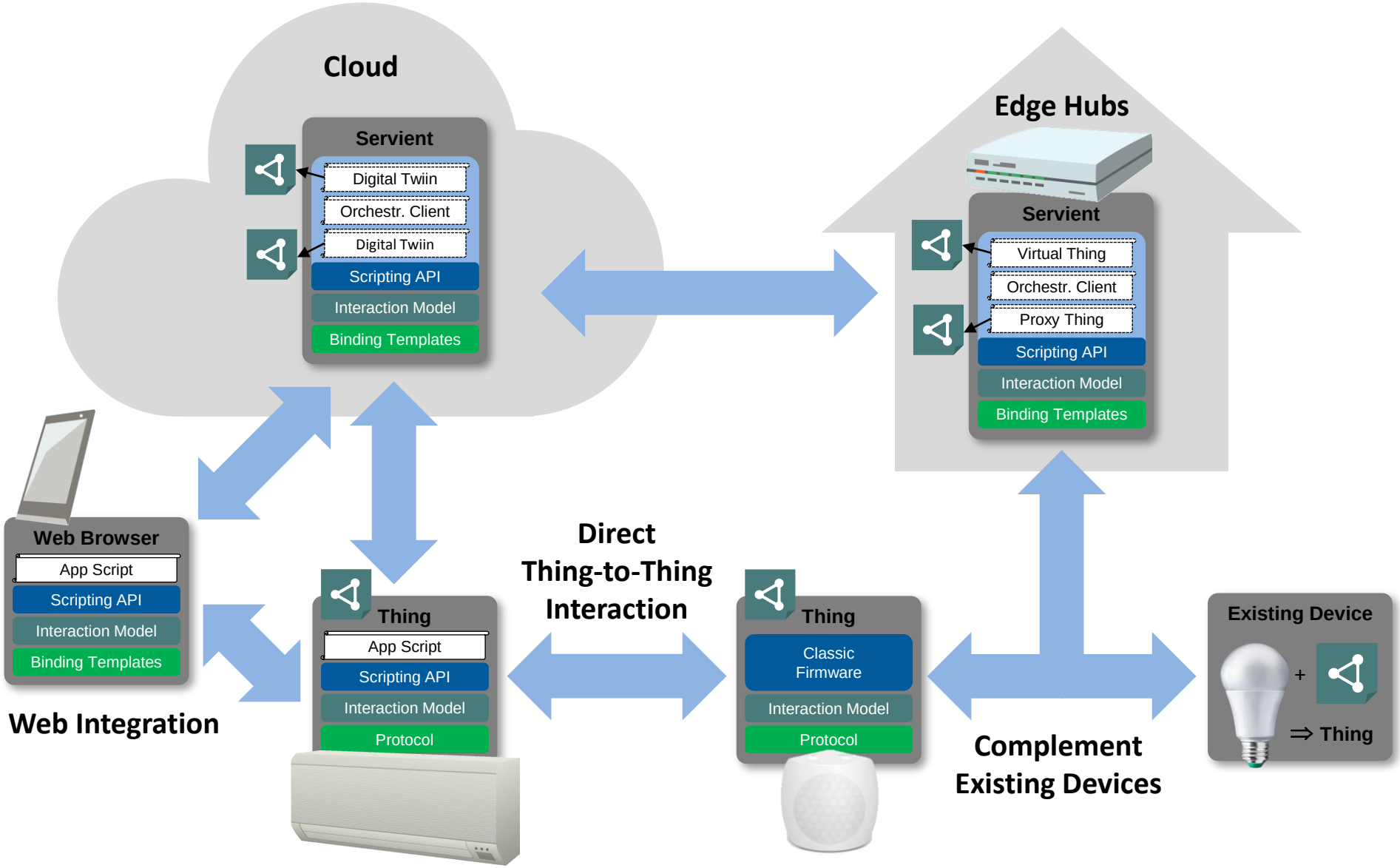
Complement: Building Blocks

- WoT Thing Description (TD)
  - Machine-understandable format
  - Uniform documentation
- WoT Binding Templates
  - Descriptions for specific protocols and platforms
  - Used in Thing Description
  - Re-usable binding “drivers”
- WoT Scripting API
  - Browser-like runtime for platform-independent IoT applications

W3C WoT Building Blocks



W3C WoT Architecture Patterns



W3C WoT Process

Interest Group (IG)

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

- Started spring 2015
- 220 participants
- Informal work, outreach

- Explorative work, validation
- PlugFests with running code
- Liaisons and collaborations with other organizations and SDOs (+ “OpenDays”)

Working Group (WG)

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

- Started December 2016
- 92 participants
- Normative standardization

- Work on deliverables
- W3C Patent Policy for royalty-free standards
- Member organizations and Invited Experts

W3C WoT Process

- IG: https://github.com/w3c/wot/
- WG:
  - https://github.com/w3c/wot-architecture
  - https://github.com/w3c/wot-thing-description
  - https://github.com/w3c/wot-scripting-api/
  - https://github.com/w3c/wot-binding-templates
- Open Issues to comment, Pull Requests to contribute

W3C WoT Progress

- 2014: Stakeholders identified at W3C Workshop
- 2015: IG started to identify initial building blocks
  - Current Practices documented (http://w3c.github.io/wot/current-practices/wot-practices.html)
  - Practical evaluation in “PlugFests”
- 2016/17: WG chartered until end of 2018
  - Editor’s Drafts available
  - First Public Working Drafts expected August 2017
  - Candidate Recommendations end of 2018…
- 2019: WG re-chartering for next building blocks

Opportunities for Reuse/Integration

- Royalty-free Web standards
- Technological building blocks
  - Non-prescriptive: take what you need
  - Open source reference implementation https://github.com/thingweb/node-wot
- Extension points
  - Semantic vocabulary → iot.schema.org, oneM2M, …
  - Binding Templates → Web, CoRE, OCF, oneM2M, …
  - Libraries on top of Scripting API → individual Members

Opportunities for Collaboration

1. OpenDay at W3C WoT Face-to-Face
   - Proposed and invited talks for awareness
2. W3C WoT Call invites
   - Opportunity for more detailed discussions
3. Liaisons as formal collaboration
   - Chance for mutual alignment
   - Liaison inputs taken into account for WoT design
4. W3C WoT Group Member
   - Organization needs to be W3C Member
   - Invited Expert status
   - Note W3C Patent Policy for WG contributions (https://www.w3.org/Consortium/Patent-Policy-20040205/)

Opportunities for Research

- Machine-understandable interaction models
  - Hypermedia controls
  - Programming abstractions for goal definition
  - Recovery from errors
- Semantic Web beyond knowledge management
  - Dynamic graphs
  - Privacy preservation
  - Reasoning in constrained environments
- Security in loosely-coupled systems

W3C WoT Online Resources

- W3C WoT Wiki (IG+WG organizational information)
  - https://www.w3.org/WoT/IG/wiki/Main_Page
- W3C WoT Interest Group
  - https://www.w3.org/2016/07/wot-ig-charter.html (charter)
  - https://lists.w3.org/Archives/Public/public-wot-ig/ (subscribe to 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 Editor's Drafts
  - https://w3c.github.io/wot-architecture/
  - https://w3c.github.io/wot-thing-description/
  - https://w3c.github.io/wot-scripting-api/
  - https://w3c.github.io/wot-binding-templates/