

Web Standards for the IoT

IRTF T2TRG WISHI

Prague, Czech Republic, July 2017

W3C WoT Mission

Not to be yet another standard

SITUATION:
THERE ARE
14 COMPETING
STANDARDS.

14?! RIDICULOUS!
WE NEED TO DEVELOP
ONE UNIVERSAL STANDARD
THAT COVERS EVERYONE'S
USE CASES.



YEAH!

SOON:

SITUATION:
THERE ARE
15 COMPETING
STANDARDS.

W3C WoT Mission

Not to be yet another standard



Web of Things



...

Be descriptive instead of prescriptive
and complement existing standards

plantronics



inswave
Technology and Inspiration

TOSHIBA

ACCESS



Australian
National
University

UNIVERSITY OF
Southampton



SONY

W3C WoT Scope



AVAYA

CableLabs

HITACHI
Inspire the Next



SIEMENS



Inria
INVENTORS FOR THE DIGITAL WORLD



Panasonic

ITMO UNIVERSITY

China
unicom 中国联通

OCF

KONICA MINOLTA

Fairhair
Alliance

RWE



Insight

cross-platform, cross-domain

Pacific
Northwest
NATIONAL
LABORATORY

SMARTRAC



oma
Open Mobile Alliance
For a Connected World

FUJITSU

...

TNO

EURECOM
Sophia Antipolis



NOKIA



KDDI

ETRI
Electronics and Telecommunications
Research Institute



JS Foundation

Google

Blockstream

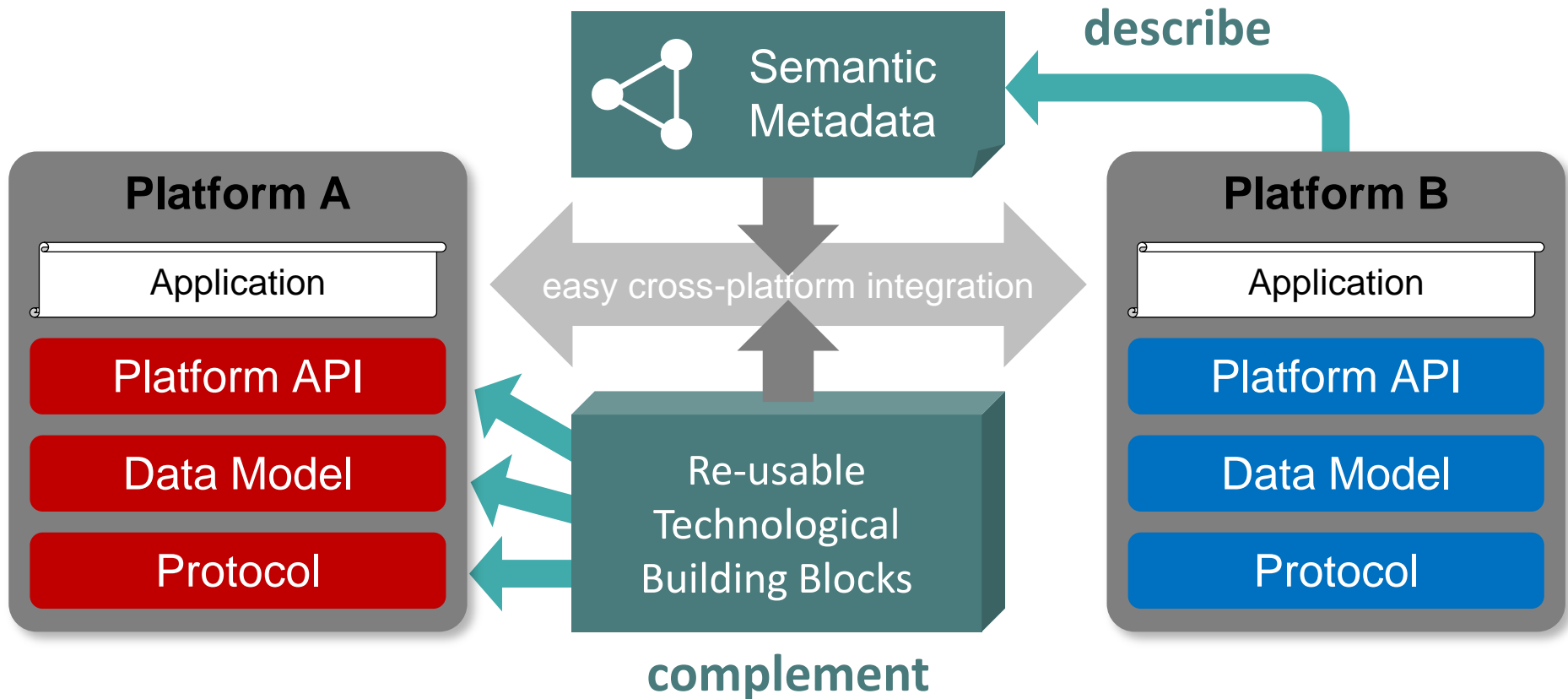
SoftBank



ORACLE

Alibaba Group

W3C WoT Approach



Describe



- Formal model around simple interactions
 - Linked Data vocabulary
 - Semantic Web ontology
- Multiple serializations
 - JSON-LD (first CR release)
 - JSON (future versions)
application/wot-td+json
 - CBOR, EXI, ...
- Domain-specific extensions

JSON-LD
(Linked Data)

JSON-LD Serialization

W3C WoT TD
vocabulary

```
{
  "@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",
```

domain-specific
vocabulary

JSON Schema
vocabulary
in Linked Data

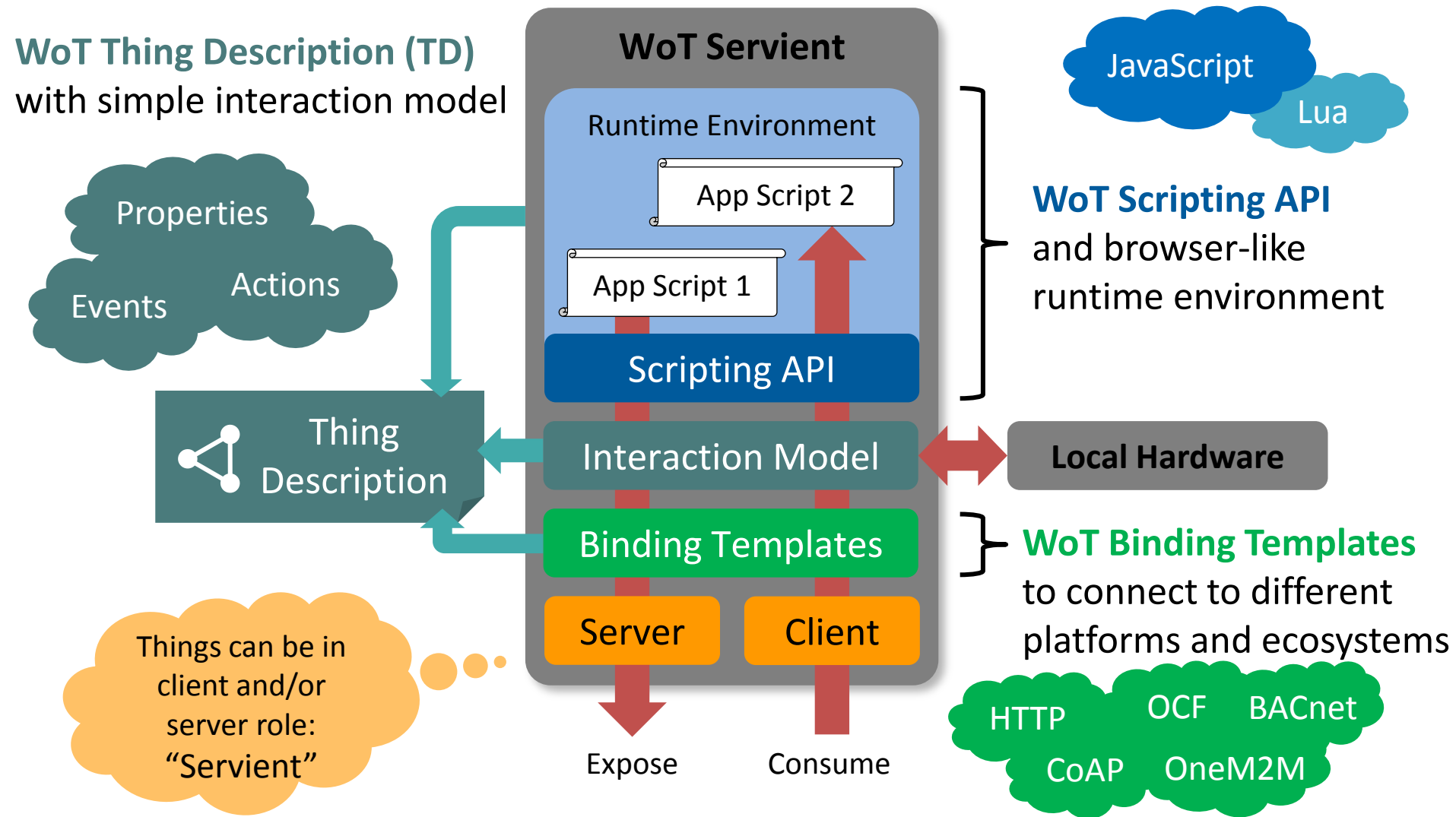
Complement

- WoT Thing Description
 - See “Describe” slide
- WoT Binding Templates
 - Descriptions for specific protocols and platforms
 - Binding implementations as (open-source) drivers
- WoT Scripting API
 - Platform-independent application logic

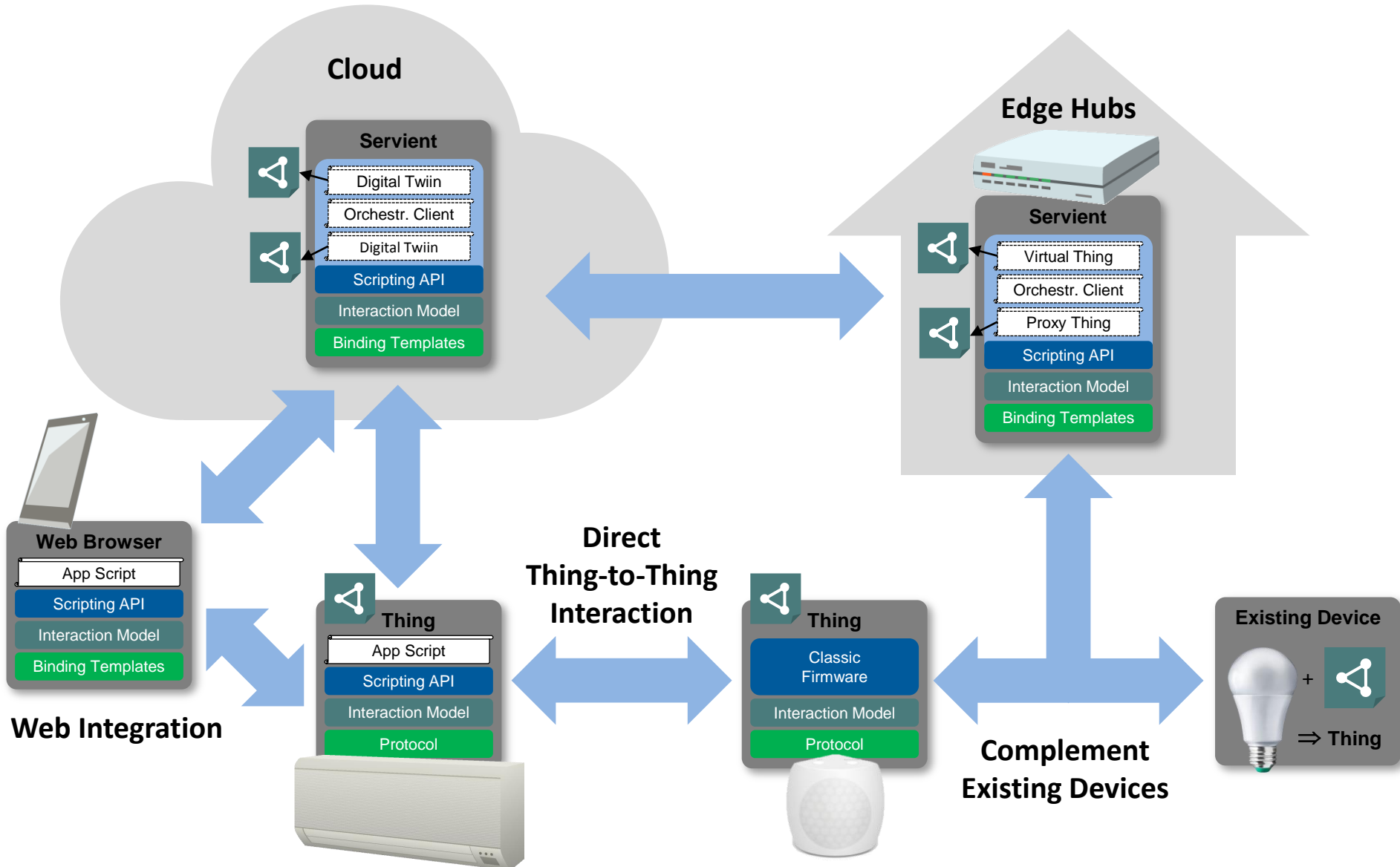


Re-usable
Technological
Building Blocks

W3C WoT Building Blocks



W3C WoT Architecture



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



GitHub

- 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

- IG started 2015 to identify initial building blocks
 - Current Practices documented
 - Practical evaluation in “PlugFests”
- WG chartered end of 2016 until end of 2018
 - Editor’s Drafts available
 - First Public Working Drafts expected August 2017
 - Candidate Recommendations end of 2018...
- WG re-chartering for 2019+

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 like in the Web
 - Semantic vocabulary → iot.schema.org, oneM2M
 - Binding Templates → OCF, oneM2M, other liaisons
 - 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 Interest Group
 - <https://www.w3.org/WoT/IG/> (blog)
 - <https://www.w3.org/2016/07/wot-ig-charter.html> (charter)
 - <https://lists.w3.org/Archives/Public/public-wot-ig/> (subscribe to mailing list)
- W3C WoT Working Group
 - <https://www.w3.org/WoT/WG/> (dashboard)
 - <https://www.w3.org/2016/12/wot-wg-2016.html> (charter)
- W3C WoT Wiki (IG+WG organizational information)
 - https://www.w3.org/WoT/IG/wiki/Main_Page
- W3C WoT GitHub (IG technical proposals)
 - <https://github.com/w3c/wot>
- W3C WoT WG Documents
 - <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/>