May 16th 2017

Getting Started with WoT project @ Osaka F2F

W3C WoT WG

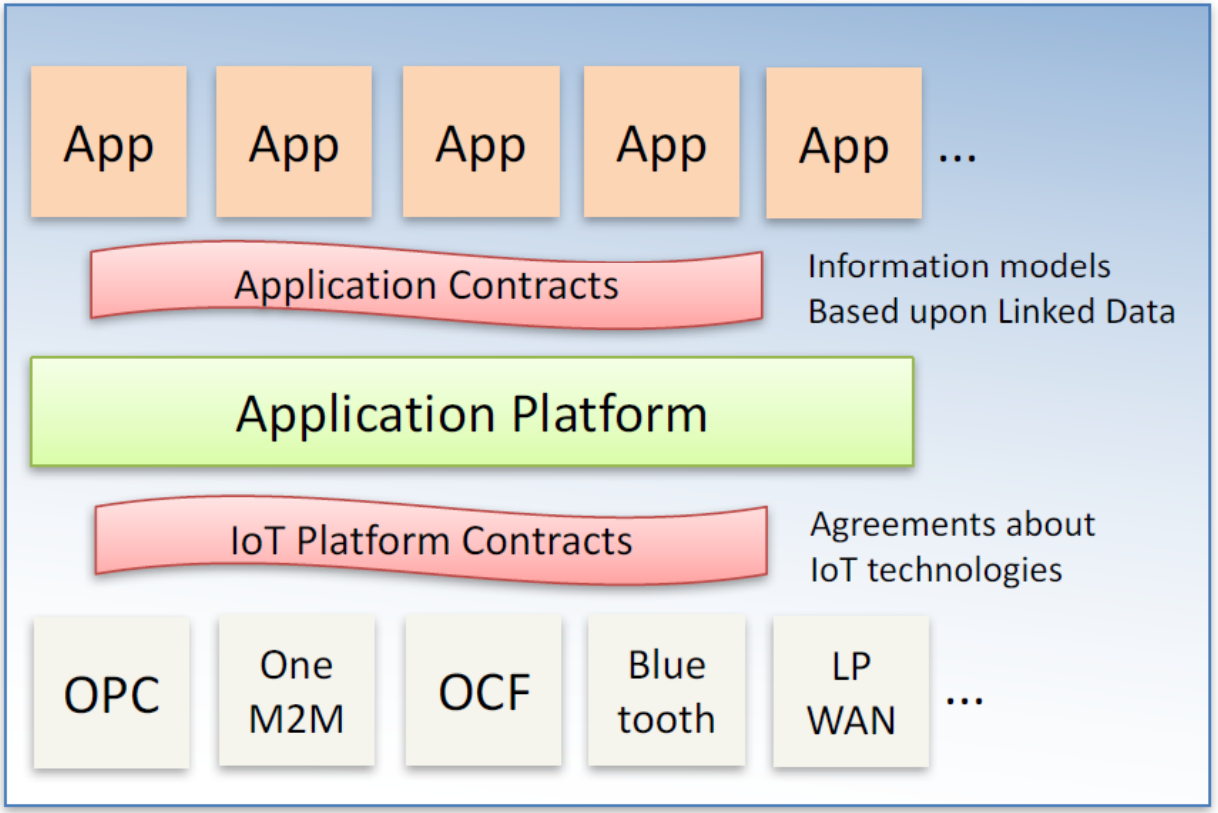
Co-chair: Kazuo Kajimoto

(Panasonic)

Conceptual Architecture and Objective

Web of Things

- By analogy to the Internet as an abstraction layer that enables services over different networks and technologies
- Web of Things seeks to enable application platforms and open markets of services based upon an abstraction layer for the IoT
- Based upon Linked Data as a lingua franca for data and data models



(Source: Dave Raggett's slide)

WoT would **enhance IoT business** by enabling open market across whole Things even which run on different conventional IoT standards.

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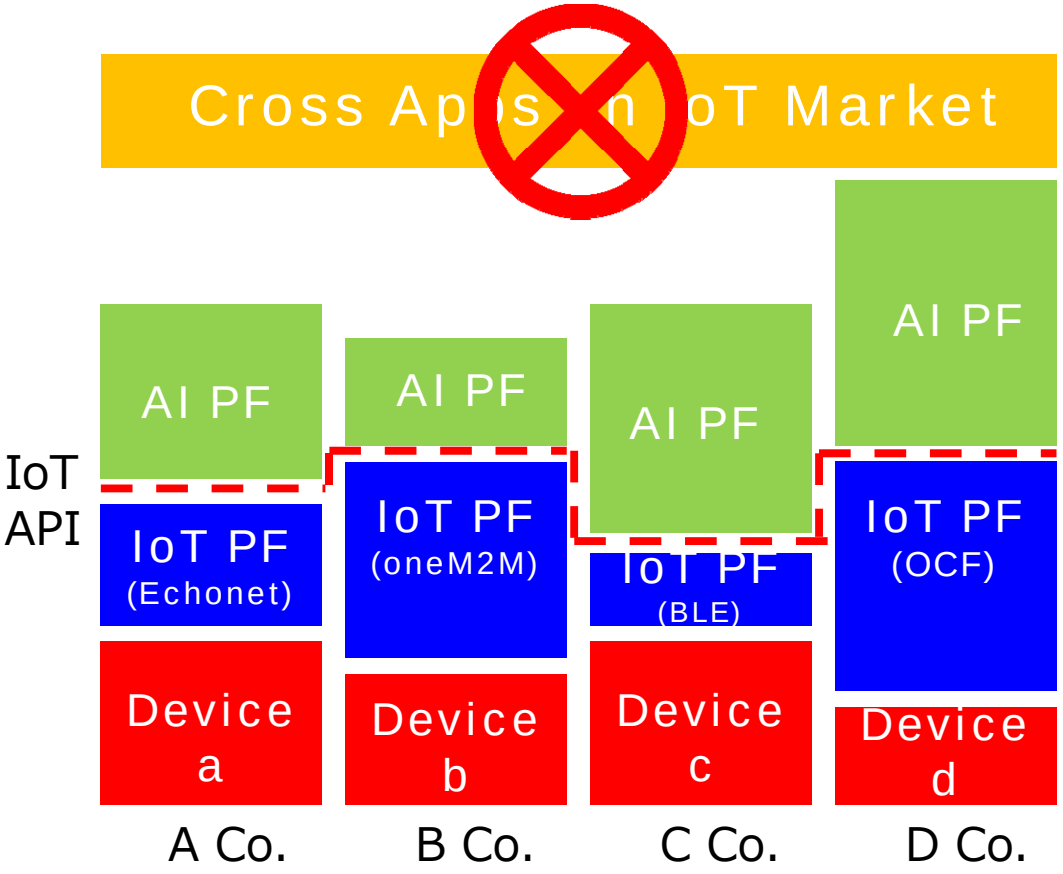
Practical viewpoint of Silo vs WoT

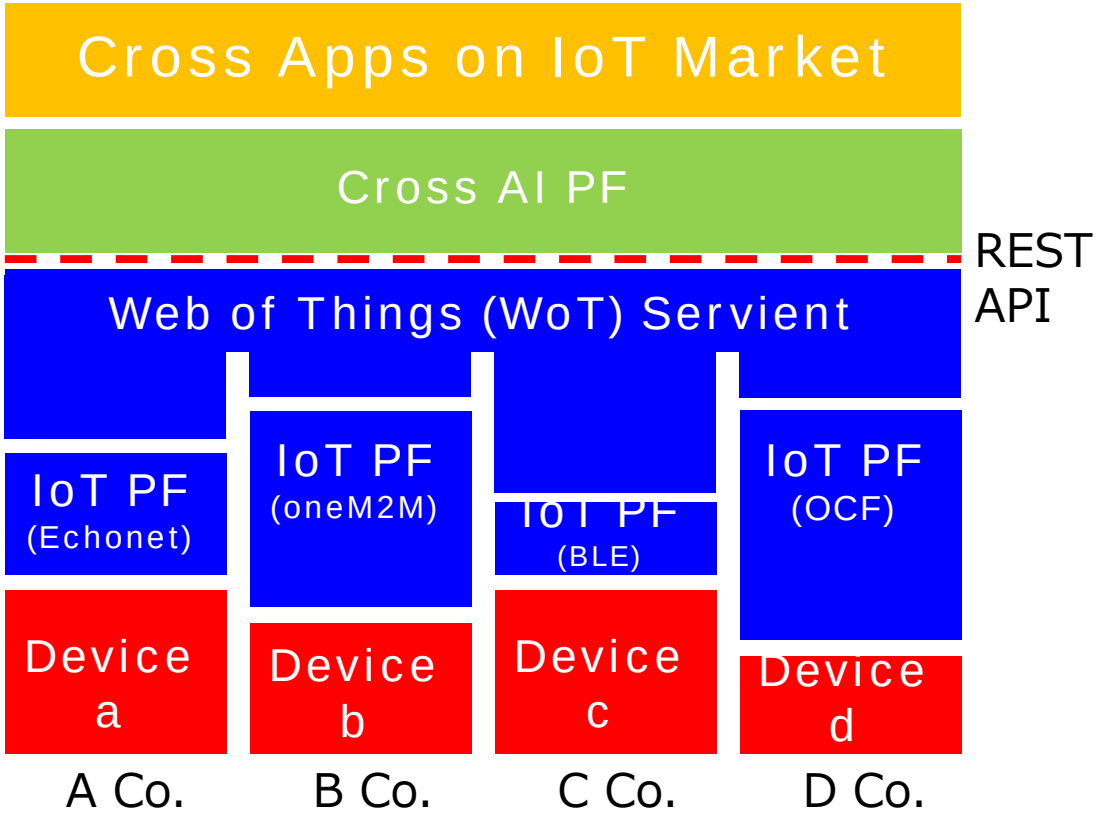
Current Silo Architecture

- No one stop universal PF
- No eco system
- No third party's service
- But services has been launched

WoT Architecture

- One stop universal PF by Web on IoT
- Ecosystem with third party servicers
- **Coexist with other SDO's APIs**
- **Maintain current services as well as new services on WoT**





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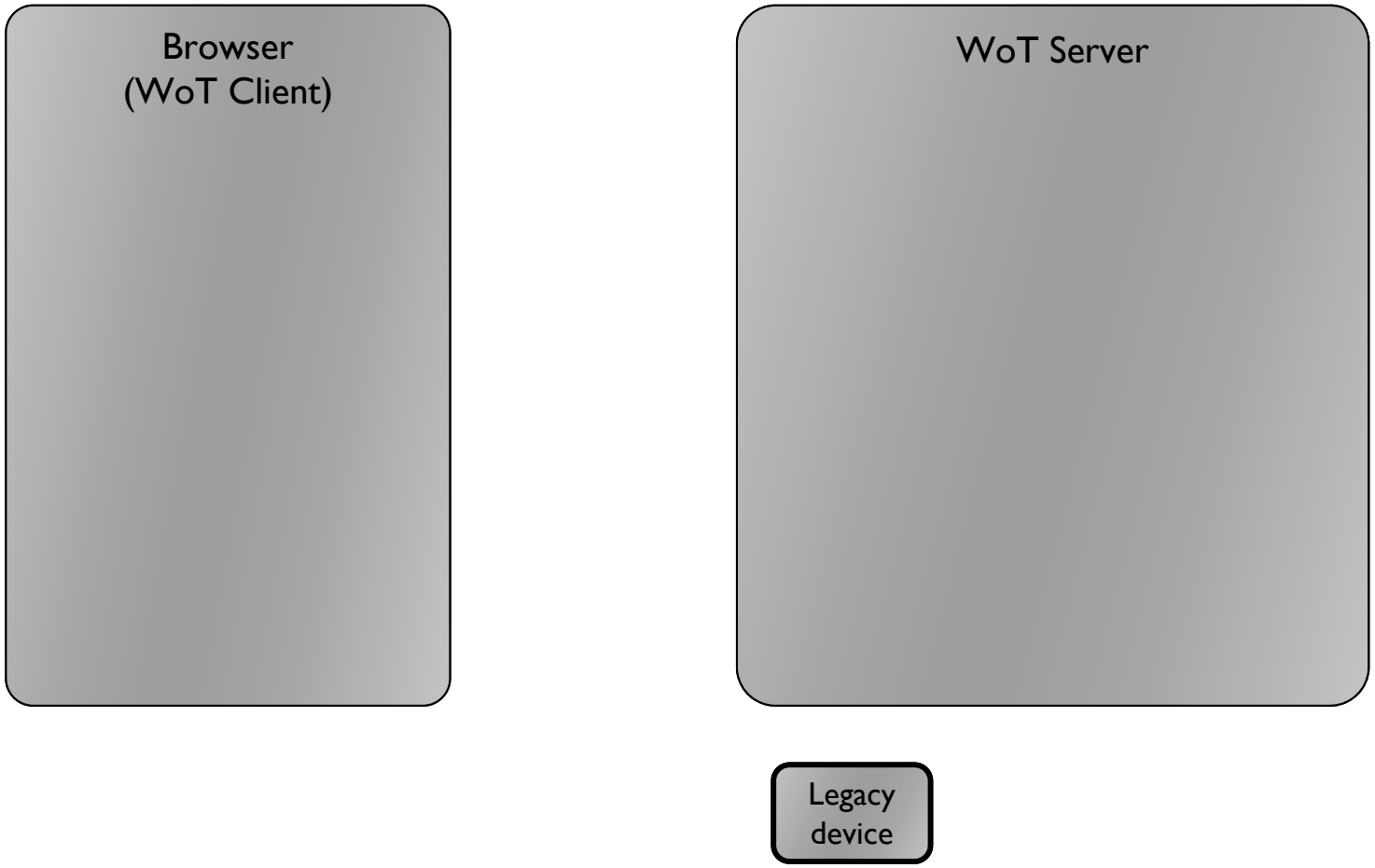
WoT Framework example



There are following 3 entities in this example.

1) Legacy device which is accessible thru local network.
2) WoT server on internet which can access to legacy device. (WoT resource exposer)
3) WoT client such as browser which is application service software by controlling legacy device thru internet. (WoT resource consumer)

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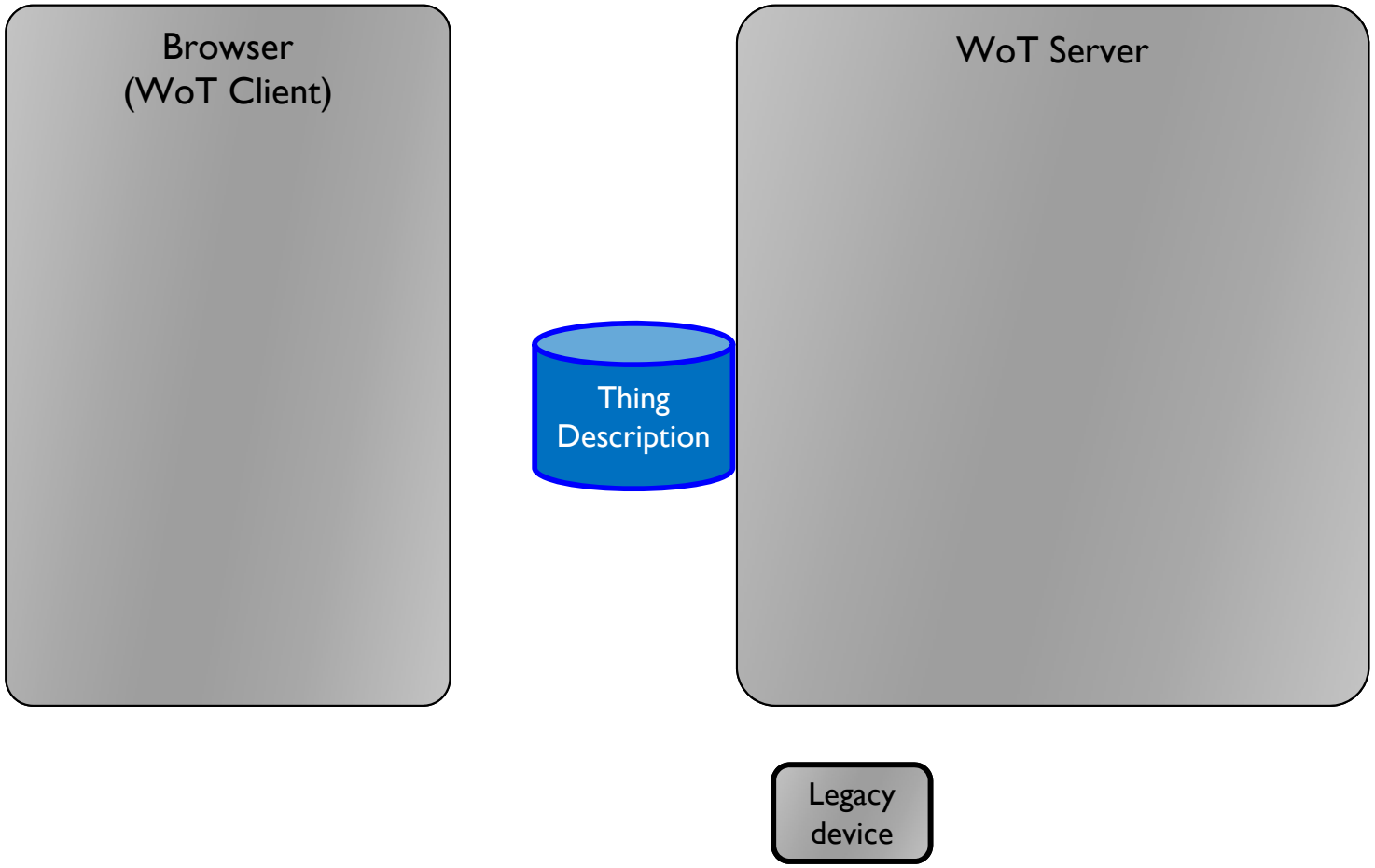
WoT Framework example



WoT server opens “Thing Description“ as semantics of WoT
such as “Vocabulary of Things category”, “Attribute for Discovery”, “API declaration”
and link URI to WoT server instance for each protocol.

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Usage of Semantics on WoT

Vocabulary of Things Category

Panasonic: “Home Air Conditioner”
Daikin : “Room Air Conditioner”
Mitsubishi: “エアコン”
LG :”에어컨”

→ “Home Air Conditioner”

Identical name should be defined.

Synonym can be bound with “same as” operator.

Attribute for Discovery

Attribute is important for key of discovery.
e.g.) How hot my living room ?

- Which thing is owned by Kajimoto ?
- Which thing is located in living room ?
- Which thing has temperature sensor ?

API Declaration

For client Apps, knowing what functionalities the thing provides is important to implement services.
e.g.) set_temperature (from 20 to 29 degrees Celcius at cooling mode)

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TD Syntax based on JSON-LD

```
{
 "@context": {wot-td : http://w3c.github.io/wot/w3c-wot-td-context.jsonld},
 "@type": “wot-td : Thing",
 "name": "MyTemperatureThing",
 "uris": ["coap://mytemp.example.com:5683/"],
 "encodings": ["JSON"],
 "properties": [
   {
     "name": "temperature",
     "valueType": { "type": "number" },
     "writable": false,
     "hrefs": ["temp"]
   }
 ]
}
```

TD consists of 3 parts.

- (Red) Definition of terminology and vocabulary, Attribute of thing
- (Green) Method to access processing WoT servient
- (Blue) Definition of APIs (API Prototype definition except “hrefs” tag)

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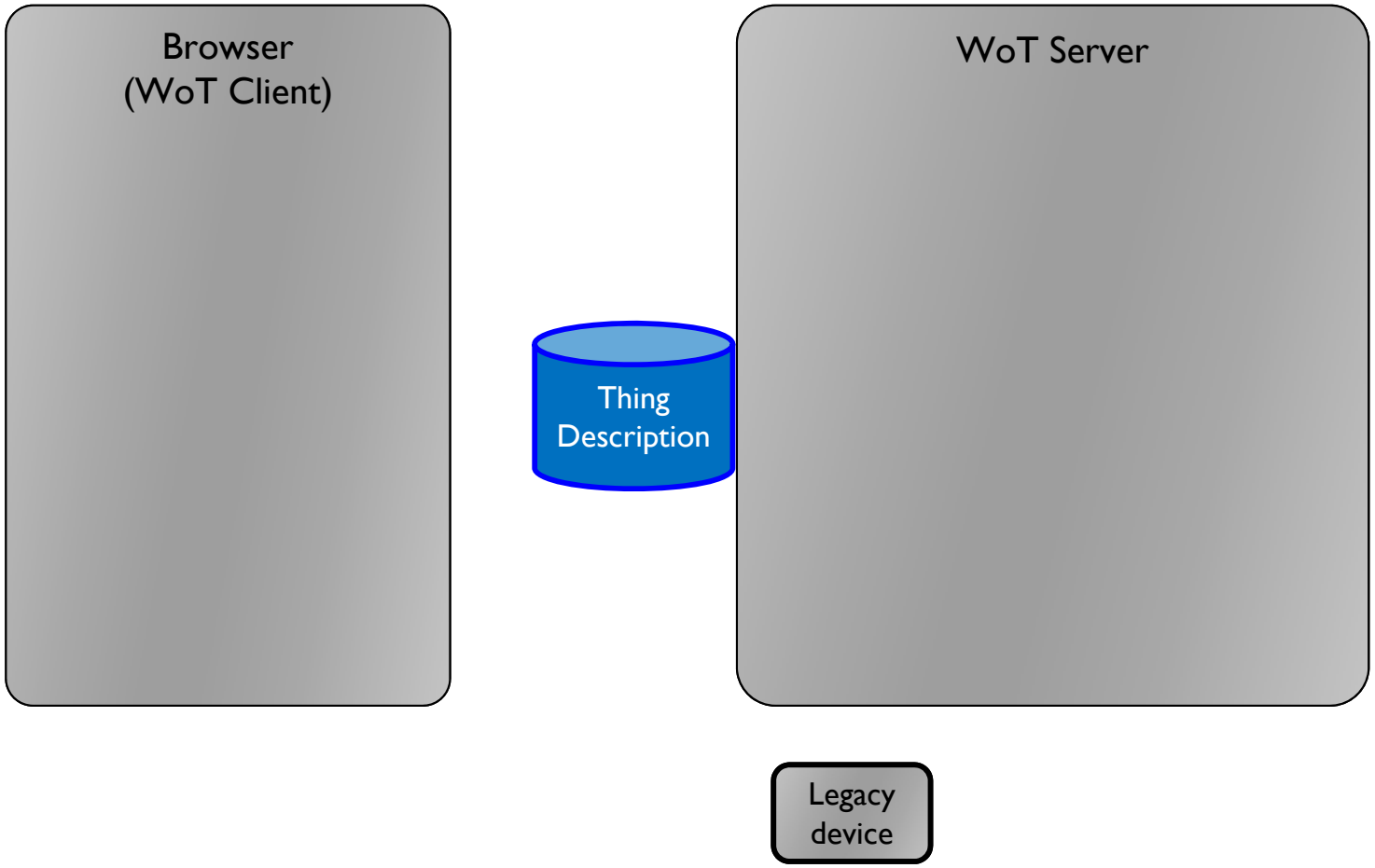
WoT Framework example



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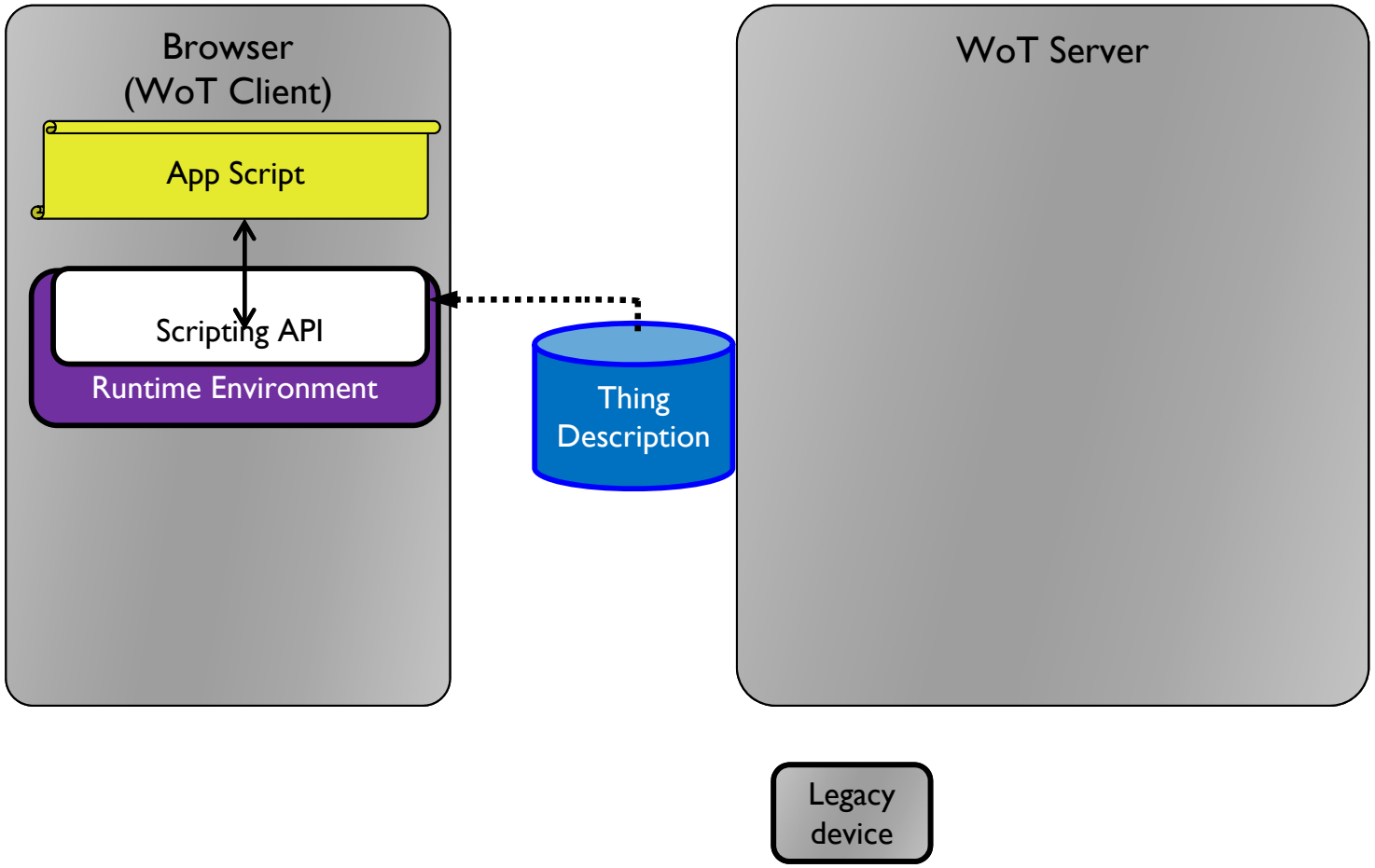
WoT Framework example



WoT client service is implemented by App Script calling WoT scripting API provided in runtime environment.

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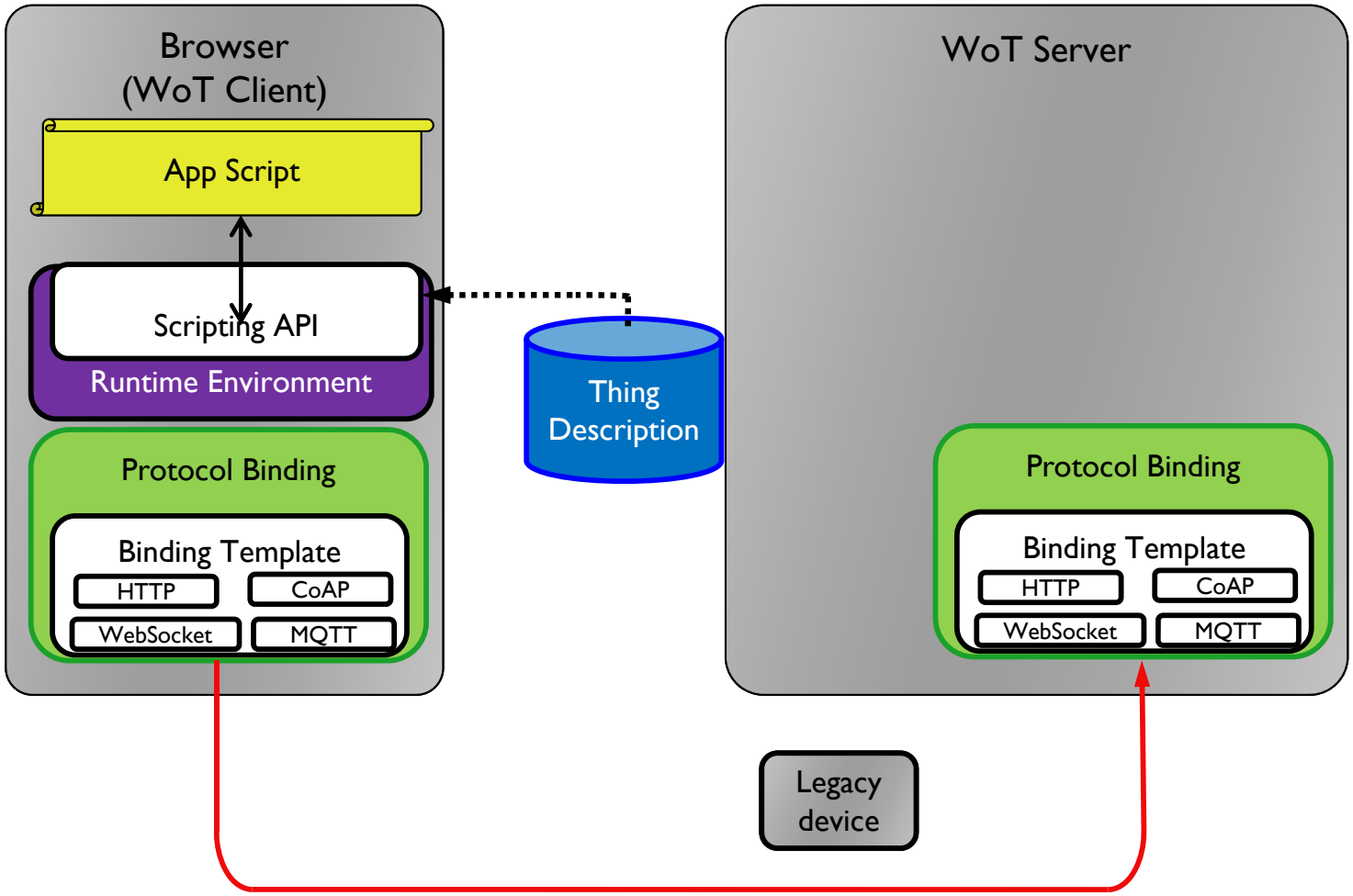
WoT Framework example



WoT client runtime environment calls protocol binding block and the requests are bound with internet protocols such as HTTP, CoAP and so on.
And with such protocol, the requests are transferred to WoT server.
Response from WoT server is processed in the same way.

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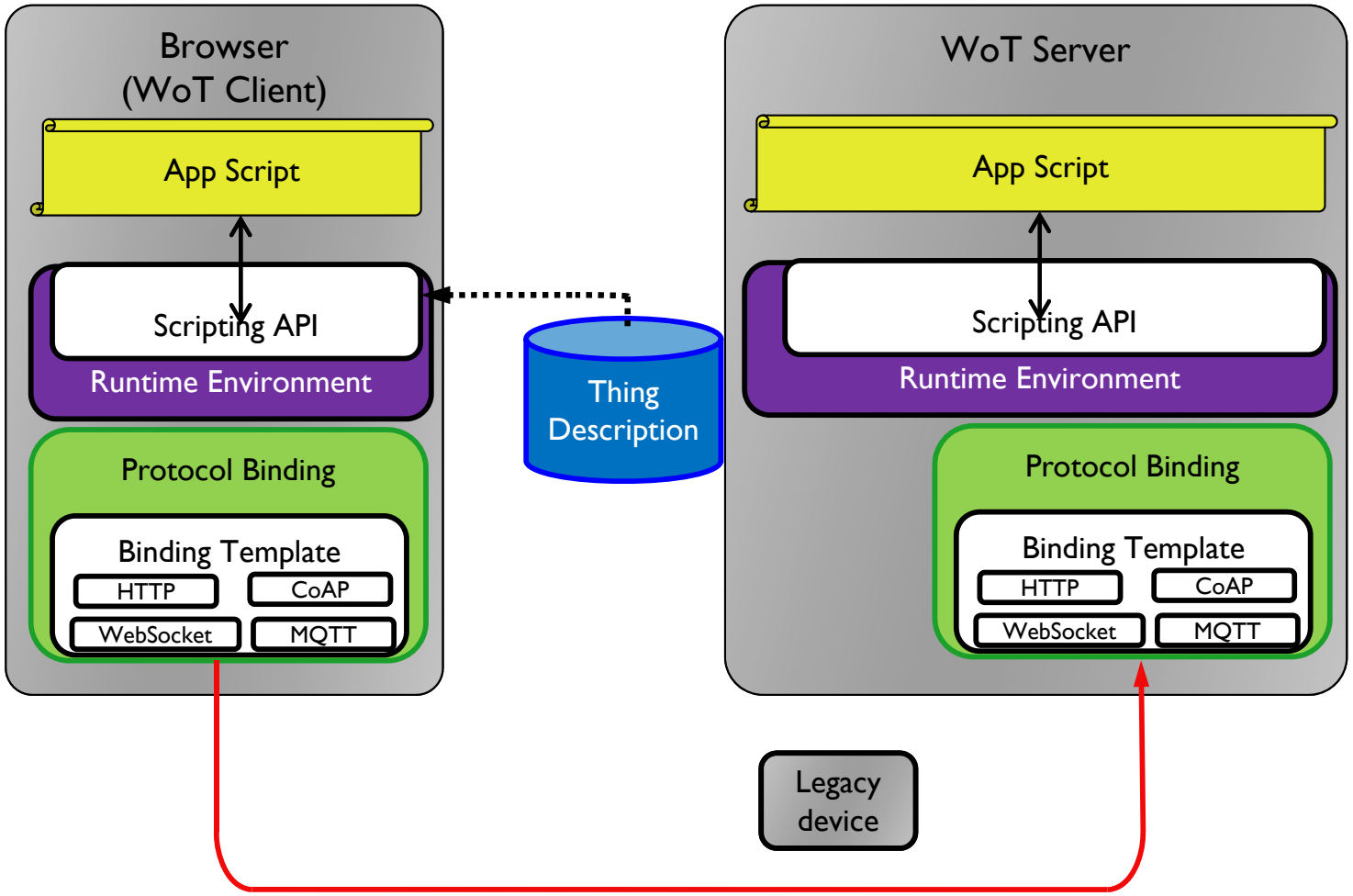
WoT Framework example



Transferred requests are interpreted in WoT server runtime environment. After that, WoT server logic, that is, App script recognizes the requests thru scripting API and processes the requests.

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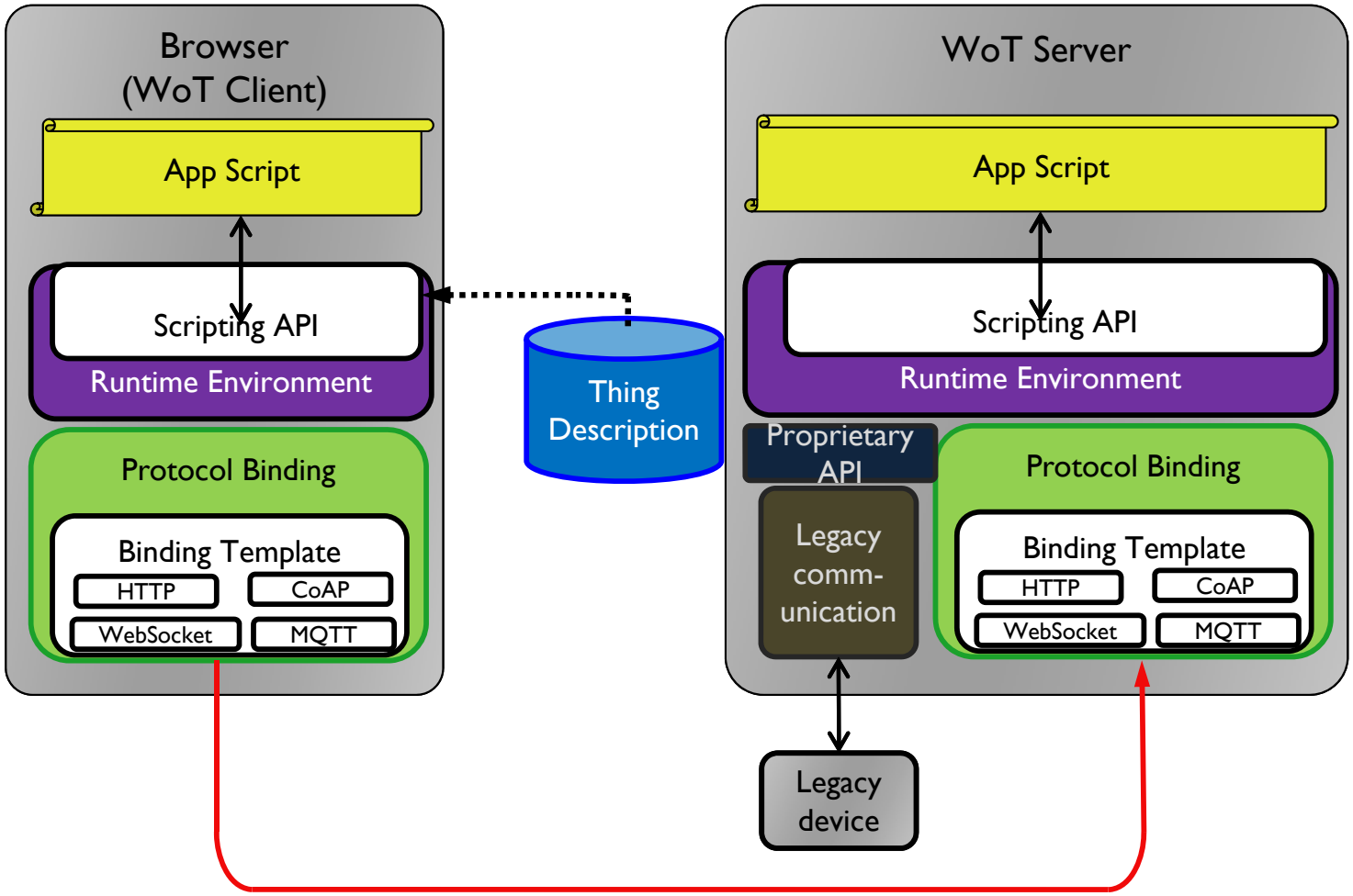
WoT Framework example



App script calls proprietary APIs and thru legacy communication block, transferred requests are sent to legacy device as proprietary command.
Then legacy device is actuated.

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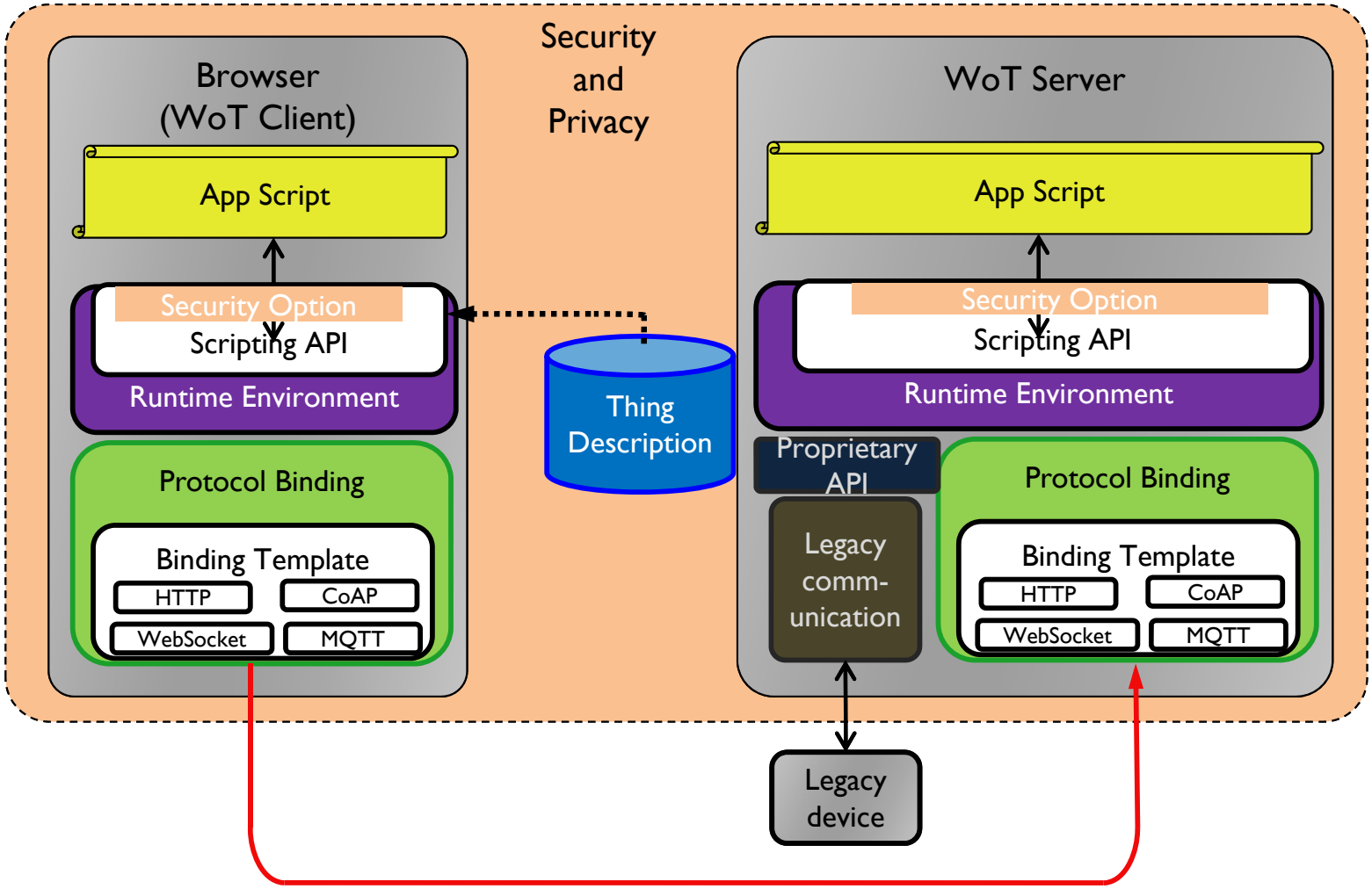
WoT Framework example



Source: https://w3c.github.io/wot-architecture/

And all of web and internet related communication is built on security and privacy mechanism.
This mechanism is not included in the deliverable of WoT WG but it will be mentioned as some kind of guideline and/or a set of requirements.

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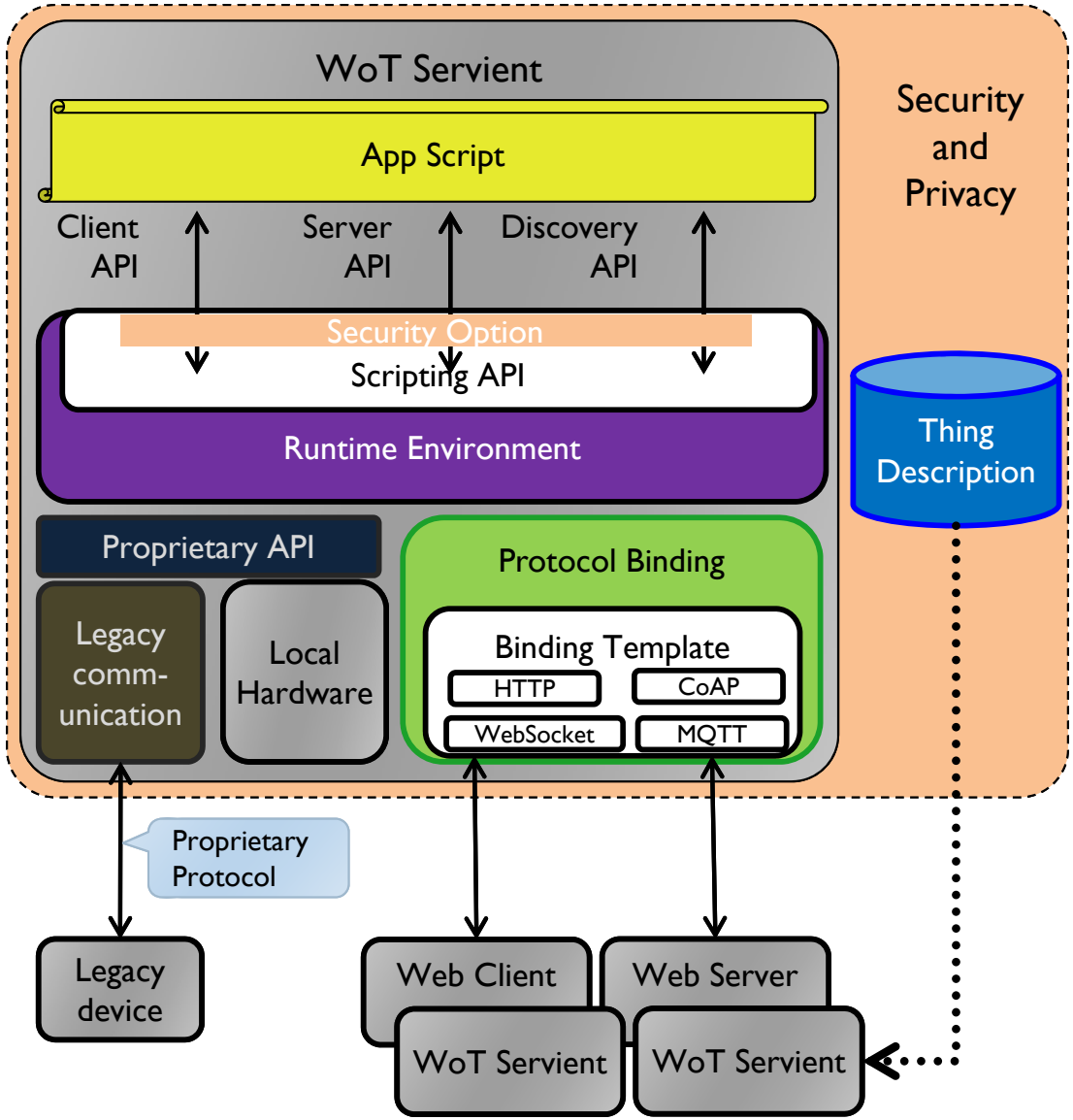
WoT Servient building block

Source: https://w3c.github.io/wot-architecture/



WoT server would be cascaded to other WoT servers, then WoT server plays a role of WoT client. So we call “WoT Servient” which is combined by server and client.

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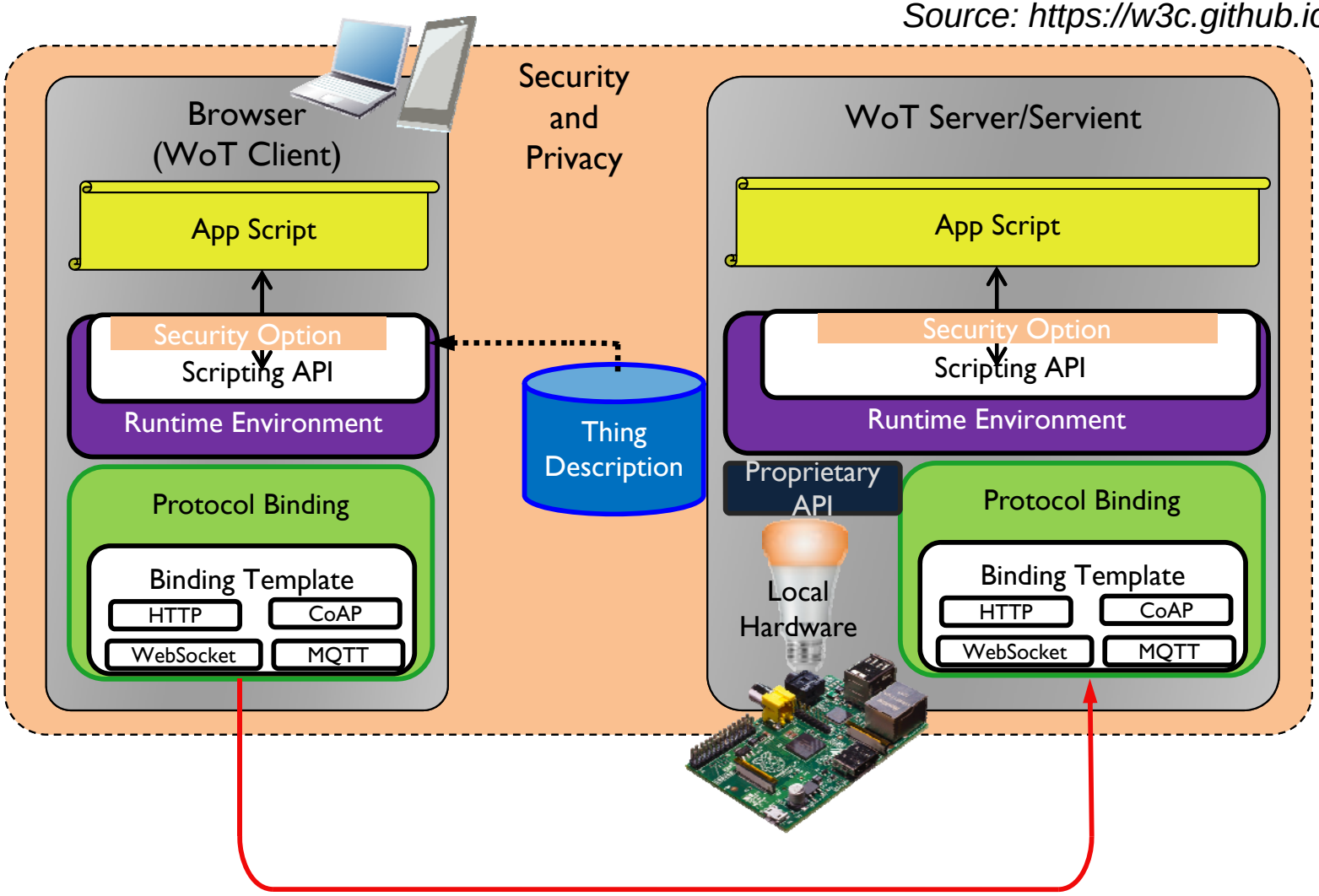
WoT server in device itself

Source: https://w3c.github.io/wot-architecture/



In the future, almost all devices could be connected to internet directly and every device provides WoT server functionality individually. KDDI's CHIRIMEN is one of trials of this type implementation.

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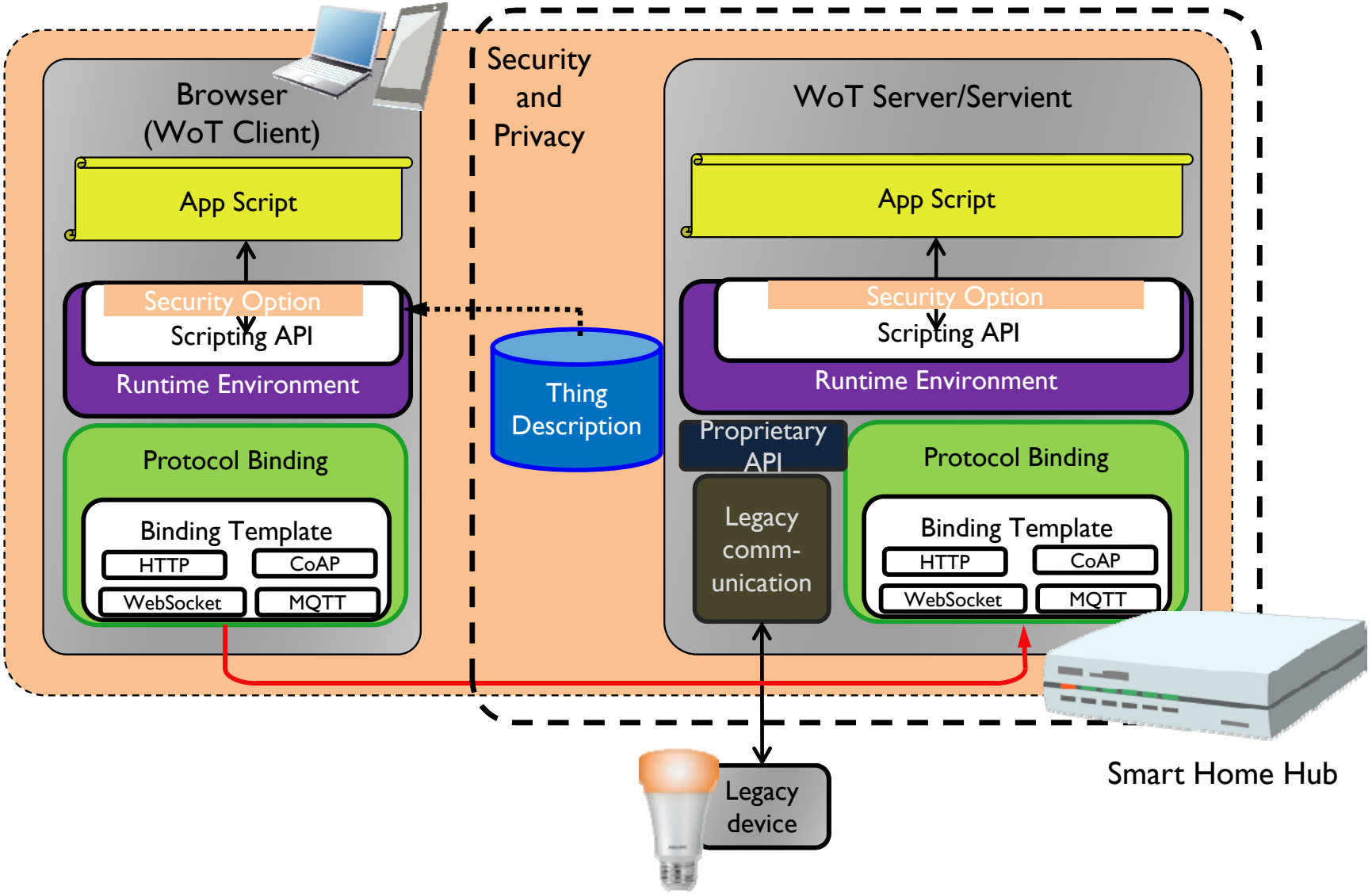
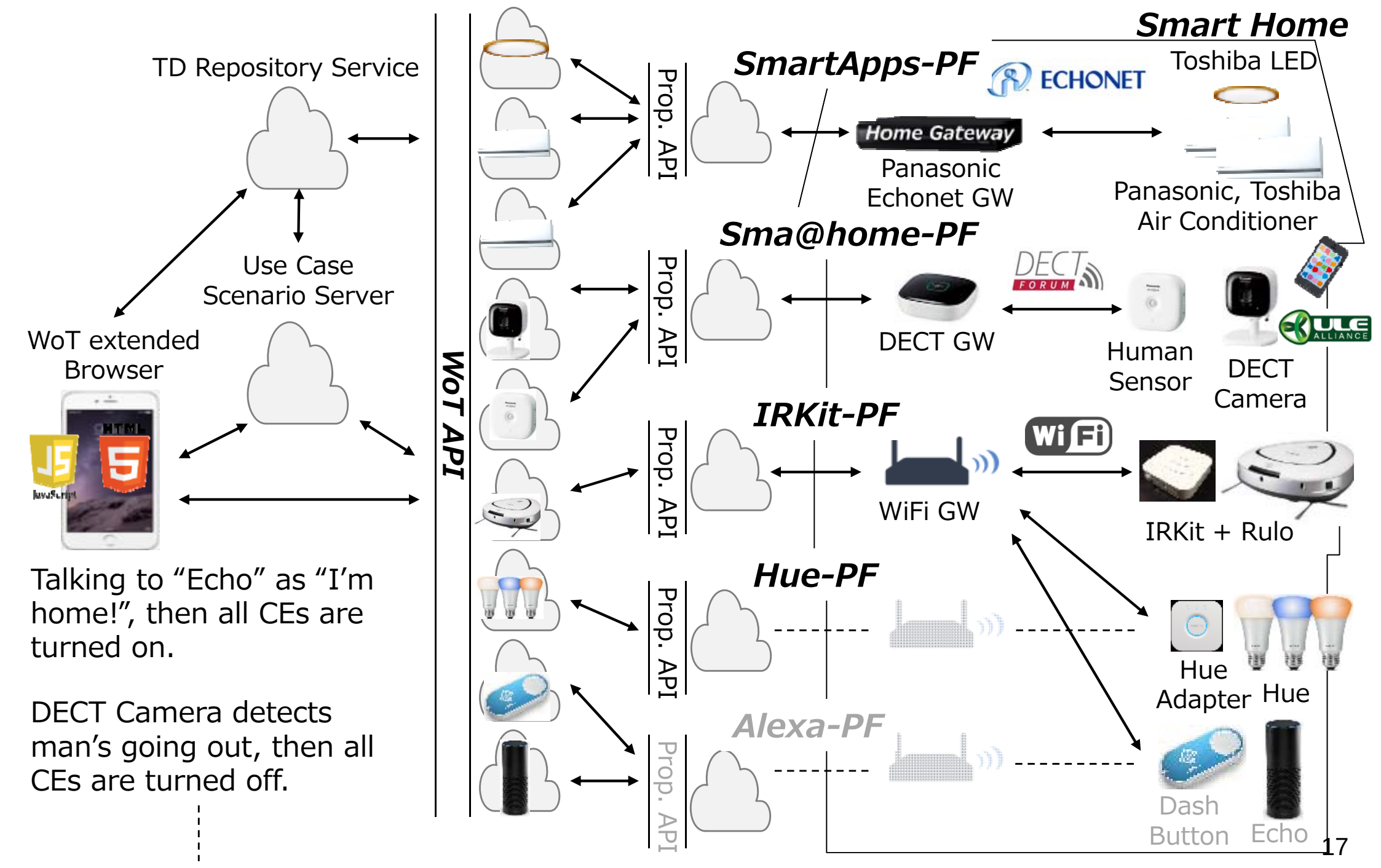
WoT server for constraint device

Source: https://w3c.github.io/wot-architecture/



Constraint device such as sensors, cheap actuators has no resource to provide internet connectivity nor WoT server. Then some hardware such as smart home hub and/or cloud software provide WoT server functionality on behalf of constraint device.

WoT interoperability PoC in Panasonic

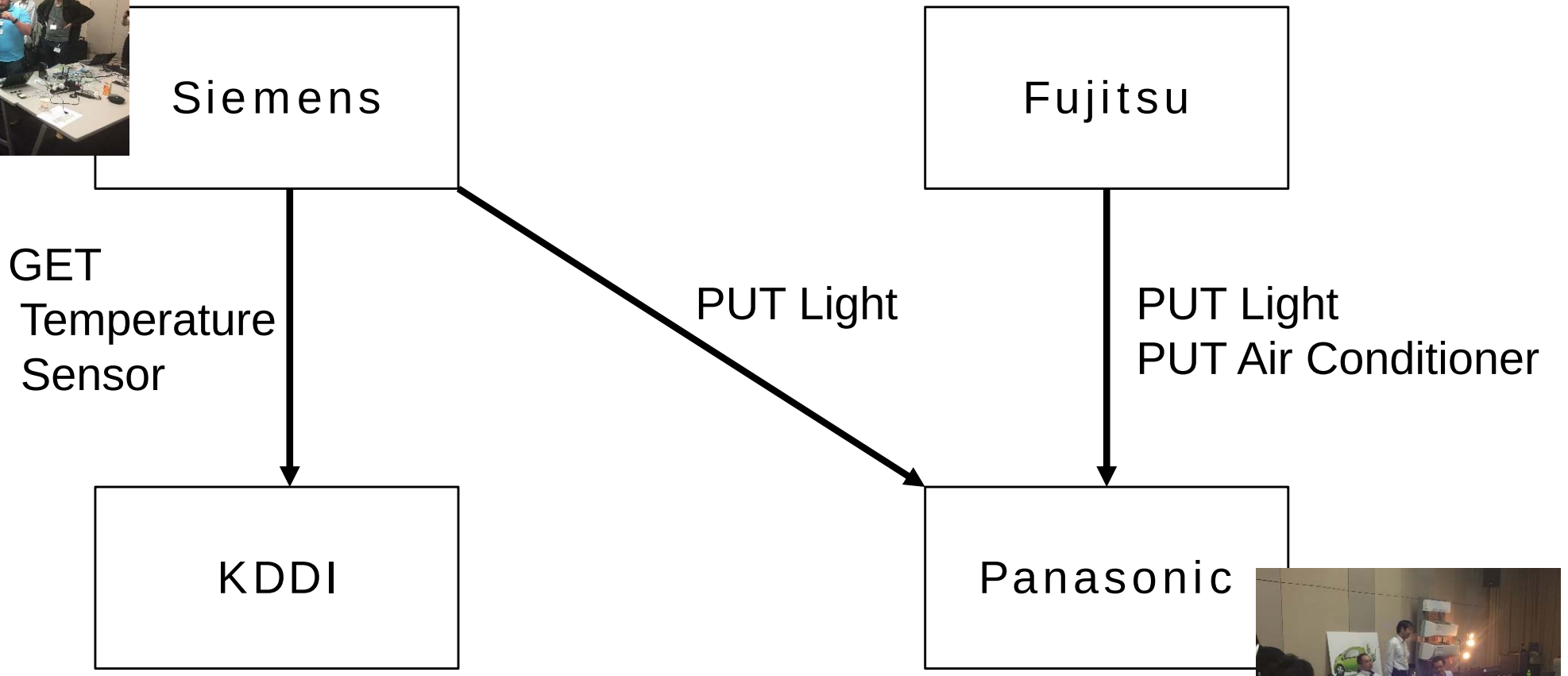


Talking to “Echo” as “I’m home!”, then all CEs are turned on.

DECT Camera detects man’s going out, then all CEs are turned off.

Cross Interaction Demo

We achieved following cross interaction at Plugfest.



Some demos are available until Wednesday.

Standardization Process in WoT

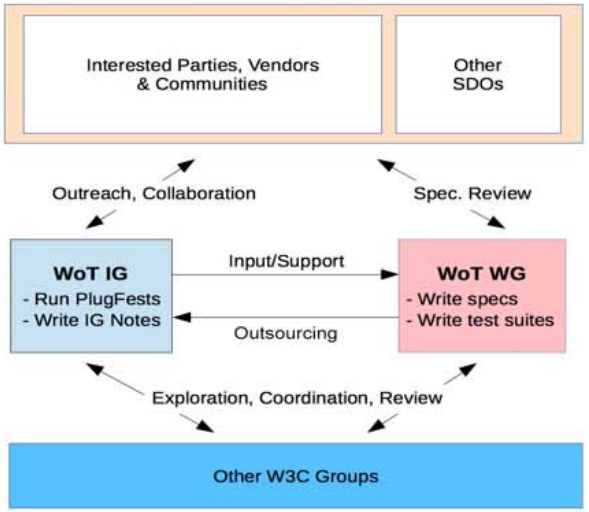
The Role of W3C in IoT/WoT – Play with the Industry

Reaching out to industry alliances and SDO's:

- AIOTI
- BSI & Hypercat
- IETF/IRTF
- Industrial Internet Consortium
- IoT-SF
- IPSO Alliance
- ISO/IEC JTC1
- Open Connectivity Foundation
- OPC Foundation
- Open Group
- oneM2M
- Plattform Industrie 4.0
- ...

WoT IG: outreach & collaboration

WoT WG: standard development



source: WoT IG Charter

W3C ADVISORY COMMITTEE MEETING - BEIJING, CHINA - APRIL 2017 32

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Source: Yongjing's W3C AC meeting material

Please join WoT IG/WG to enhance IoT business market together!

Wonders!

by Panasonic