Position paper: Describing Legacy Data in Thing Description

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Abstract

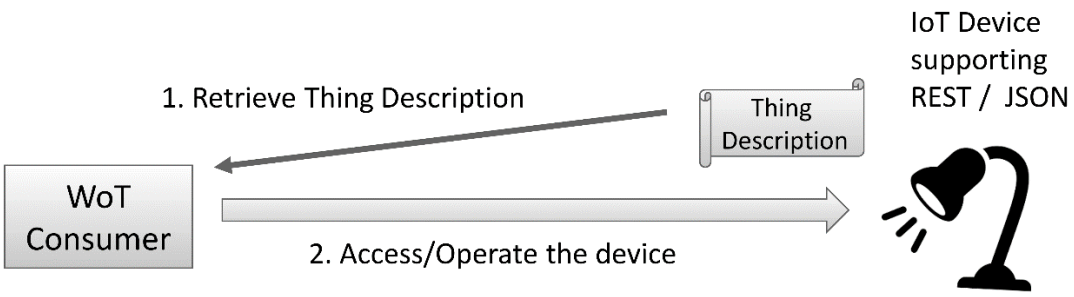
W3C (World Wide Web Consortium) is standardizing WoT (Web of Things) Thing Description to describe metadata of Things (both physical and virtual) so that Things can know how to interact with each other by understanding the metadata given in the Thing Description. For the data exchanged between Things in particular, the Thing Description uses JSON Schema for the description of the data. JSON Schema can describe JSON data quite nicely, and JSON is becoming more and more popular on the Web such as JSON quite nicely, However, TD is not able to describe legacy (or proprietary) data including CSV, TLV (such as ASN.1 BER). This position paper discusses the need for TD to support those legacy formats.

● Mission of Web of Things

WoT (Web of Things) is not yet another IoT standard. There are no shortage of IoT standards each building an eco-system with its particular focus domain. WoT aims to serve as a common description layer above all the IoT eco-systems, so that WoT becomes a glue for integrating IoT eco-systems together and greatly eases developing cross-domain IoT applications that run crossing industry boundaries. This is becoming all the more important as people start to realize that the accuracy, timeliness and volume of collected data makes a difference in building intelligent systems, but the benefit is maximized only when that data can be associated with data from other sources. Recall the time when the Web came out to serve as the glue to integrate disparate systems available on the Internet and the subsequent explosion of economics as the result of the Web as a common platform doing business on the Internet. WoT shares the Web's nature of common platform, and the recent publication of WoT documents (Thing Description and Architecture) is the first step in realizing such a common platform for the IoT applications.

● Device with REST / JSON support is immediately ready for WoT

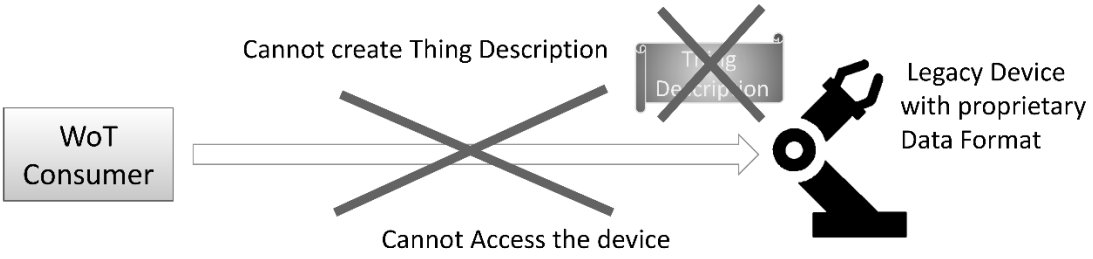
Many modern IoT devices supports REST protocol and JSON format. Even when the device was not shipped with TD, a TD can be created afterwards. With a TD, the device can participate in a WoT system, allowing WoT Consumer to interact with the device using the affordances described in the TD.



In the figure above, a smart lamp supporting REST / JSON is described by a TD. Once a WoT Consumer obtained a TD for the lamp and understand the TD, the WoT Consumer is ready to interact with the lamp and be able to turn on/off, set brightness, activate embedded motion sensor, etc.

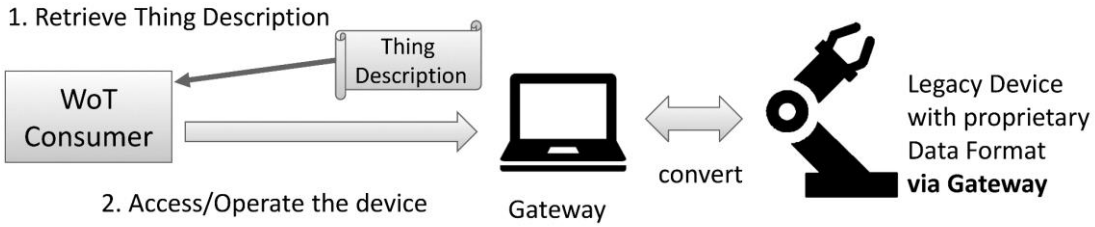
● Legacy IoT Device with non-JSON payloads

On the other hand, when a device only supports a non-JSON payload format (such as CSV, TLV, etc.), TD is not able to properly describe the device.



It is then currently necessary to have an intermediary such as a gateway (see below) to translate the non-JSON payload into JSON and vice versa. This configuration

makes sense for those systems that already have a gateway controlling and orchestrating multiple legacy devices.



● Support for Legacy Data such as CSV, TLV

Though data formats greatly vary, several formats outstand in terms of popularity and the number of systems supporting them. CSV and TLV (such as ASN.1 BER) probably would be found among the top in a popularity contest of data formats for legacy systems.

Supporting them directly in TD allows WoT Consumers to directly interact with a legacy Thing that uses those data formats. Gateways such as the one described in the previous section also benefit from this. Gateways can read a TD describing a legacy device, and generate another TD for use WoT Consumers that can only speak JSON.

The next version of WoT TD should support CSV and TLV. This will allow WoT to expand into areas where those data formats are prevalent. Lots of open data are CSV-based, and open data plays an important role in smart city applications. ASN.1-based TLV is probably the de-facto format in legacy M2M systems.

ASN.1 tools are known prohibitively expensive. By allowing TD to describe commonly used subset of ASN.1, TD can help free developers and users using ASN.1 from vendor lock-ins.

End

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IoT Integration – WoT's Approach

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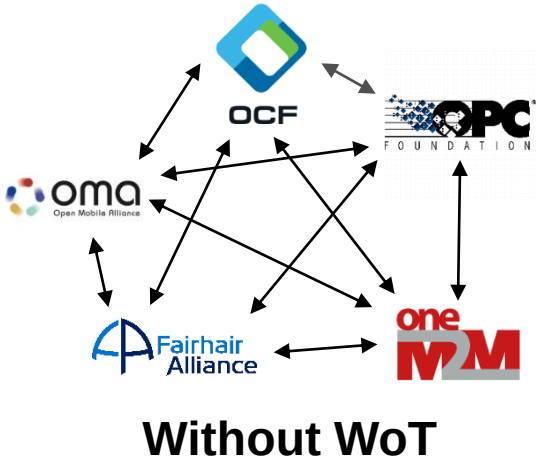
- WoT (Web of Things) is not yet another IoT standard.
  - There are no shortage of IoT standards each building a peculiar eco-system.
- WoT aims to serve as a common description layer above all the IoT eco-systems.
  - WoT shares the Web's nature of common platform
- Recent publication of W3C WoT documents (i.e. Thing Description and Architecture) is the first step towards the goal.
  - TD (Thing Description) is the center piece of WoT architecture.



WoT Thing Description (TD) Constructs

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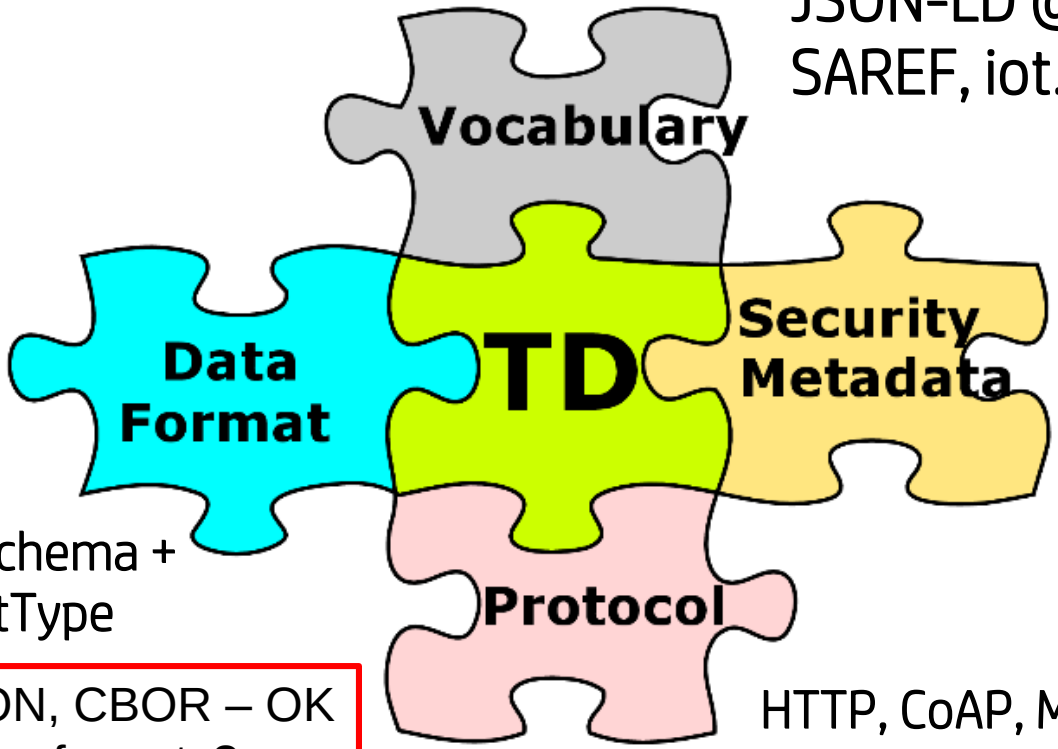


JSON-LD @context
SAREF, iot.schema.org, etc.

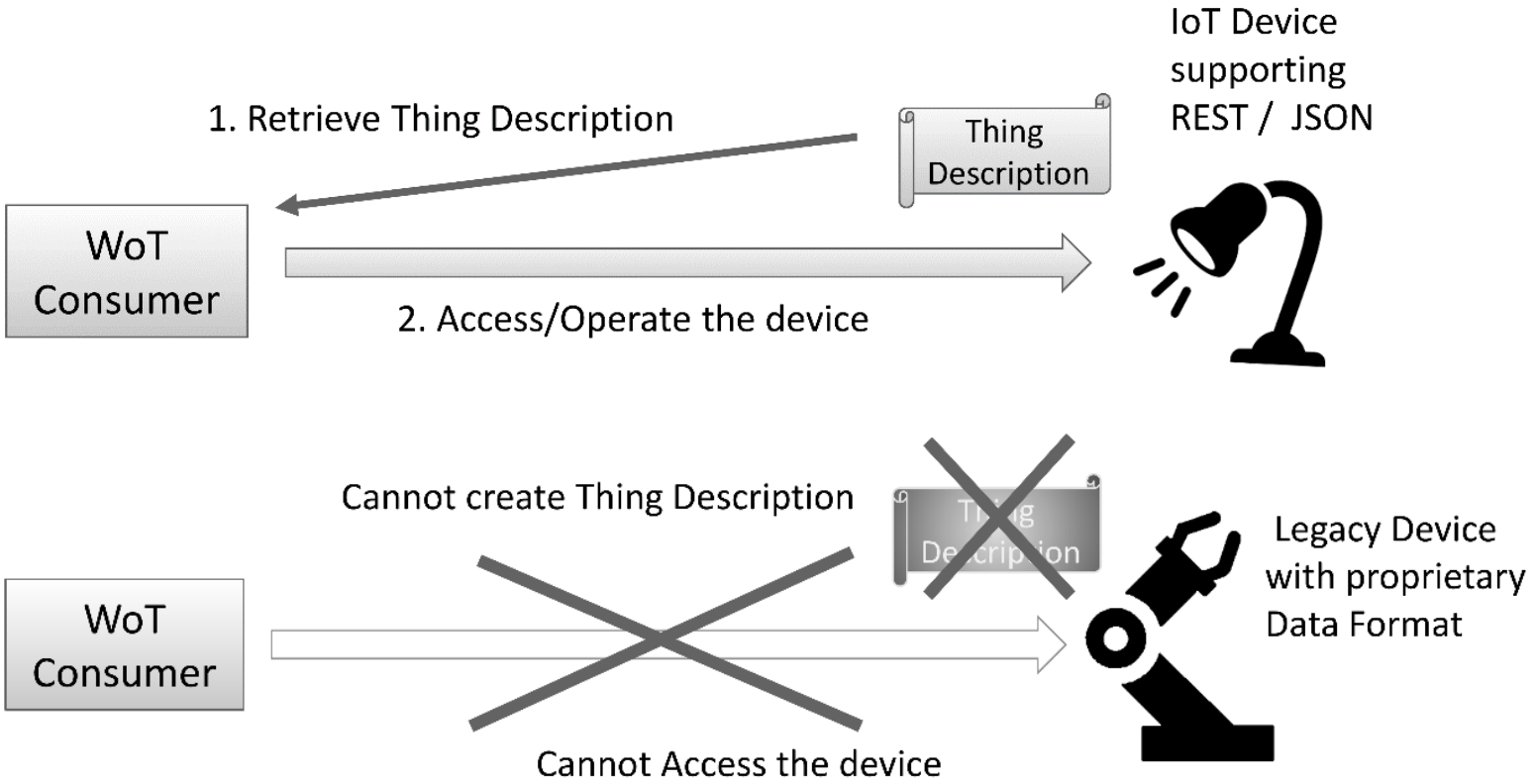
Bearer Authentication,
Basic Authentication,
etc.

JSON Schema +
contentType

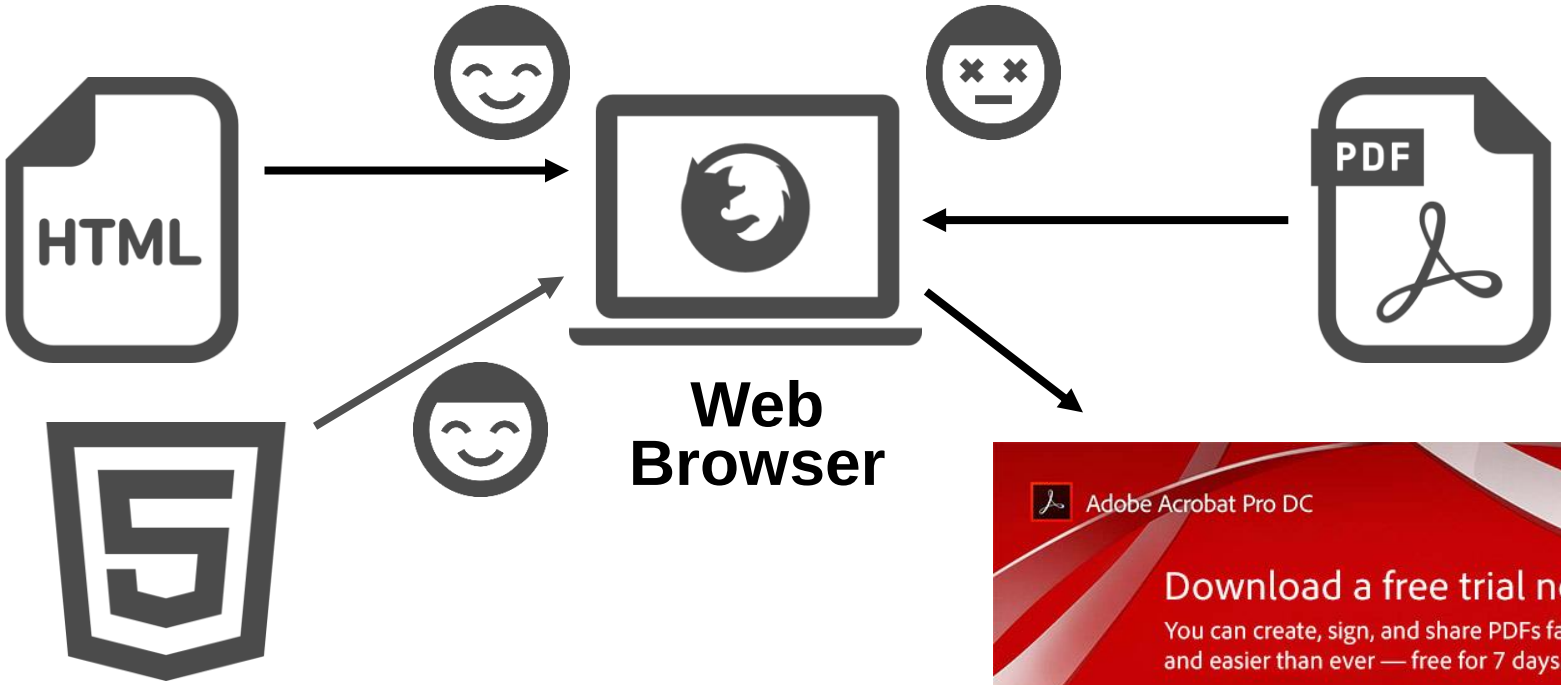
JSON, CBOR – OK
Other formats?

HTTP, CoAP, MQTT, etc.

Limited Data Support of Thing Description



Similar Experience on the Web



Formats for Consideration

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- Tabular data - Notably CSV
  - One of the most popular formats for publishing data on the Web.
  - In particular, the most popular format used in Open Data.
- M2M data – Notably ASN.1
  - ASN.1 is used virtually everywhere.
  - You can't live a day without using ASN.1
  - 4G/5G, Aerospace and Satellite communication, to Intelligent Transportation, Smart Grid, Healthcare, ASN.1 continues to be the foundation.
- … and there is XML/EXI …

Call for Making WoT more Versatile

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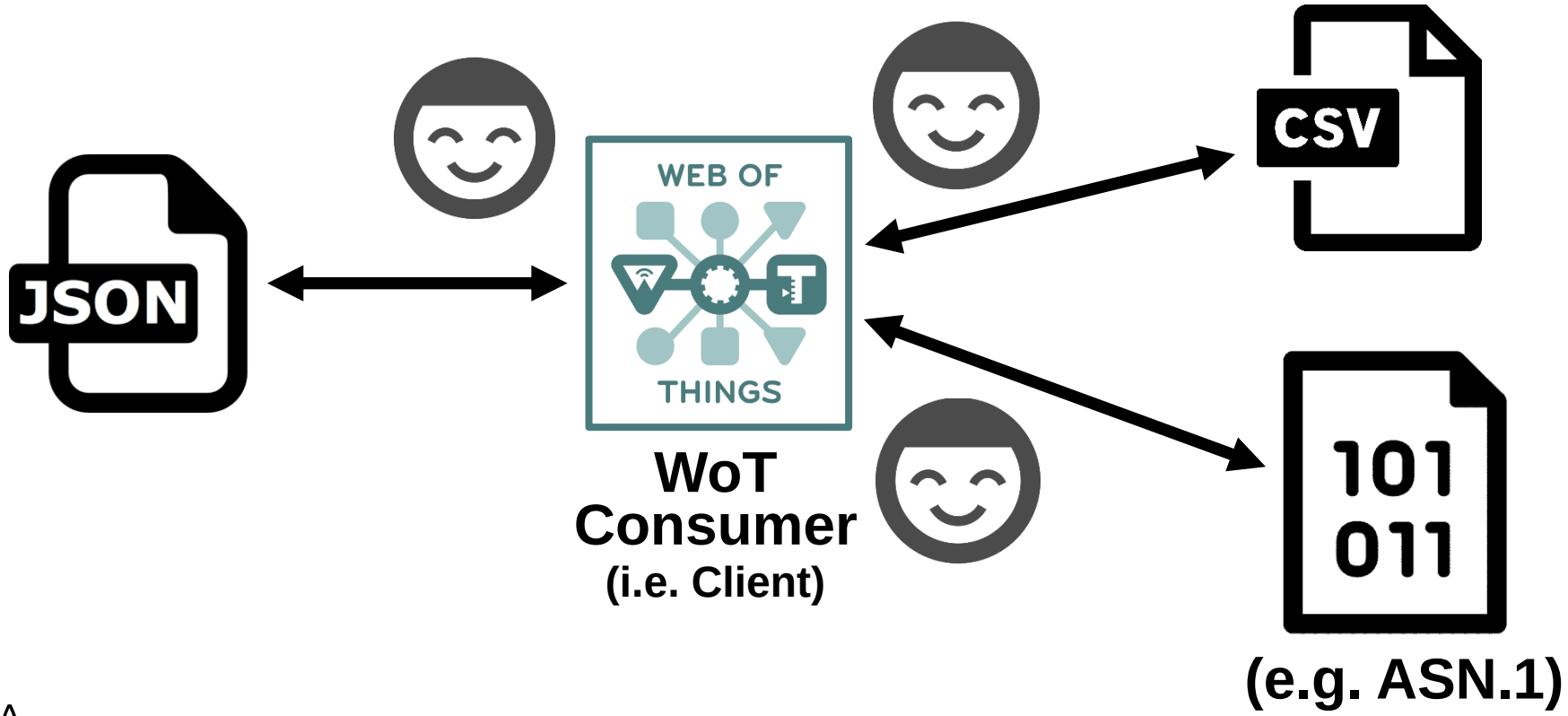

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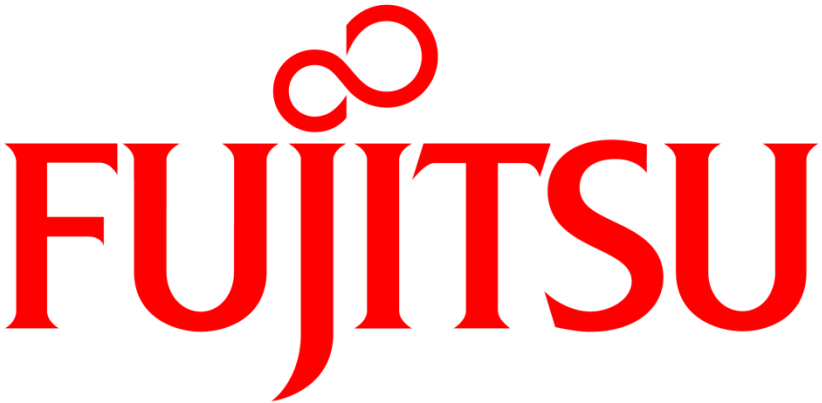

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