Realizing "Lifestyle Update" through Web of Things

Position Paper for 2nd W3C Workshop on the Web of Things from Panasonic

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1. Introduction

Panasonic aims to realize "Lifestyle Update", which continuously provide new value to customers by connecting with them[1]. For this purpose, it is necessary that 1) devices are connected to the network, and 2) applications which make the devices to cooperate each other regardless of their manufacturers are continuously produced.

Panasonic has been working to standardize the Web of Thing (WoT) in order to realize such environment. By defining common interaction models and metadata formats, WoT aims to eliminate the barriers between platforms and to connect devices across fields.

2. Contribution to W3C Web of Things activity

We have been participating in WoT standardization since 2015 and have promoted standardization as a Co-chair Company. Our approach is shown below.

2.1. WoT Architecture

We advocated the importance of the gateway which is necessary to connect network-ready home appliances to the cloud, and reflected it in the implementation model in the WoT Architecture document[2]. We also drafted requirements section. Further, we drafted example sequence section to clarify interaction model, which is now going to move to WoT Protocol Binding Template document[3].

2.2. Liaison with ECHONET Consortium

We have promoted collaboration with the ECHONET Consortium, which is producing ECHONET Lite, a widely used in-home network standard in Japan, to enable wide adaption of WoT in Japan. The ECHONET Consortium have been producing the ECHONET Lite Web API Guidelines [4] by referring to the WoT interaction model. As part of this collaboration, we promoted multilingual support of WoT Thing Description[5].

2.3. Prototyping and evaluation

Based on the draft specification under development, we made trial development of WoT system. Using this system, we participated in the plugfest, performed interconnection verification and contributed to improve quality of the specification. Also, through demonstrations at TPAC etc., we contributed to the improvement of WoT's awareness. Some of our prototype systems are introduced below.

2.3.1. WoT server for real devices

A simulated smart home has been built in the laboratory in Osaka, and a number of network-enabled home appliances have been installed. These devices communicate with the gateway using an existing in-home communication protocol such as ECHONET Lite, connect from the gateway to the cloud via Websocket, and provide functions through the WoT server API on the cloud. By reading the thing description, the application can know the functions of these devices and their endpoint addresses, then performs collaboration of multiple connected devices. The operation result can be seen remotely through video streaming. Figure 1 shows an overview of the actual devices connected to the WoT server.

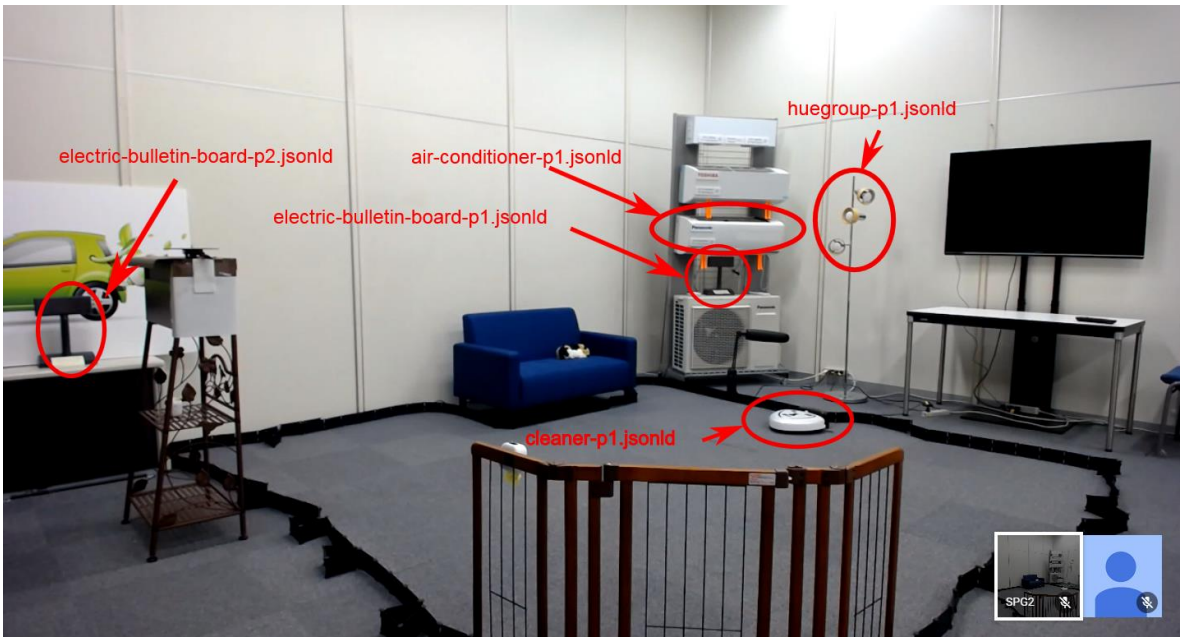

Figure 1 - Overview of real devices connected to WoT server

2.3.2. WoT device simulator

We also developed the WoT Device Simulator that works on the cloud and on local devices such as Raspberry Pi. As a result, even in an environment where actual devices can not be easily prepared, it became possible to prototype multiple orchestration scenarios using various devices. A screen shot of the WoT device simulator is shown in Figure 2 .

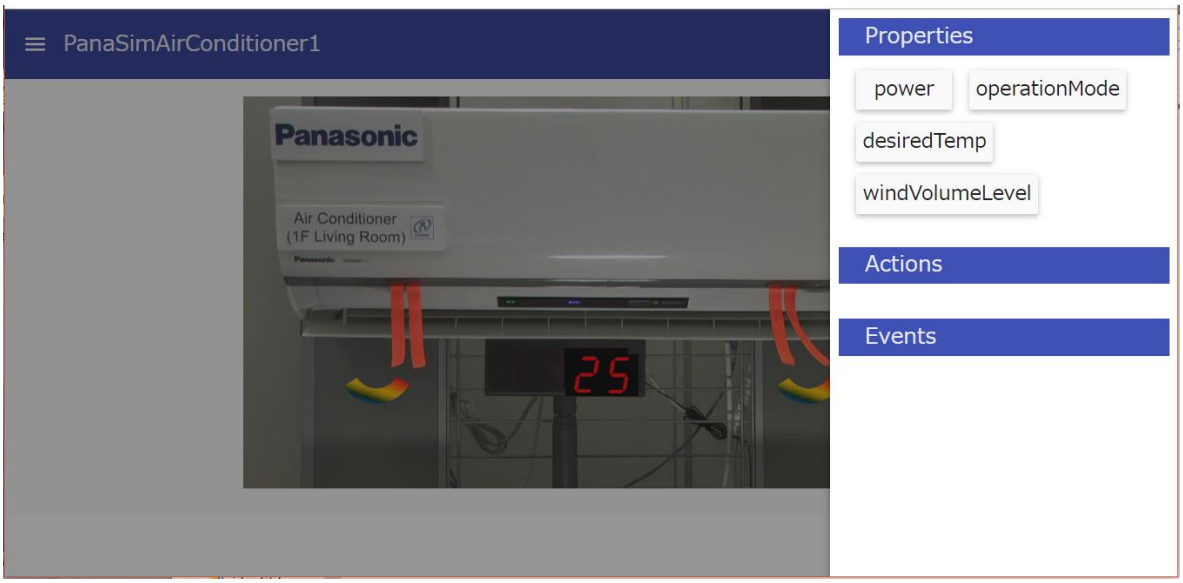

Figure 2 - Screen shot of WoT device simulator

2.3.3. WoT clients

We developed a general-purpose WoT client written in HTML/JavaScript. By using this, we verified the connection between WoT servers from several companies and web browsers such as Google Chrome. The screenshot of WoT client using web browser is shown in Figure 3 .

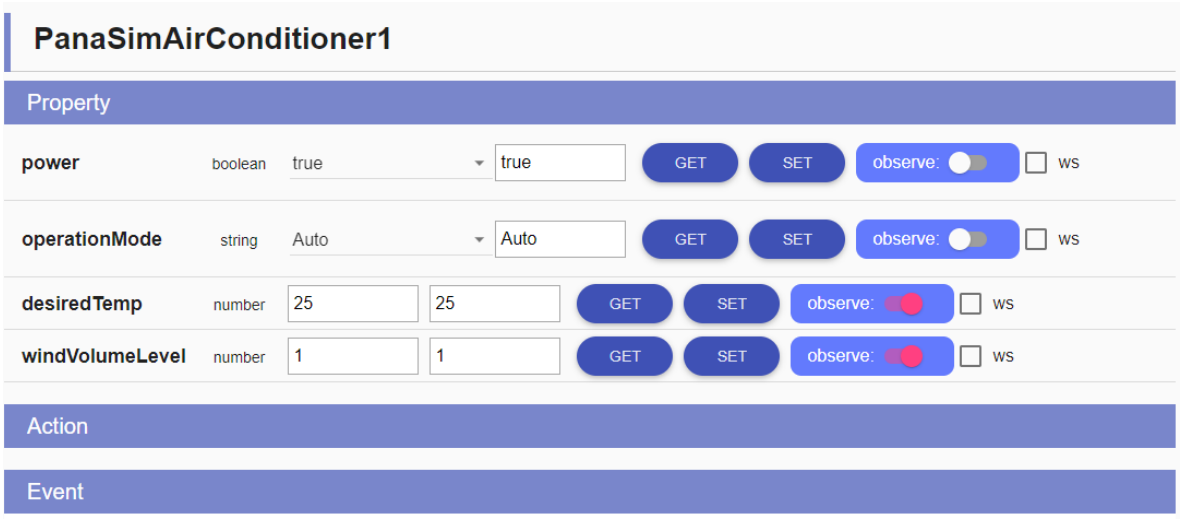

Figure 3 - Screen shot of WoT client using web browser

In addition, by utilizing Node-RED which can connect APIs with a graphical interface, various application scenarios connecting multiple WoT servers have been created and demonstrated. Screen shot of WoT client using Node-RED is shown in Figure 4 .

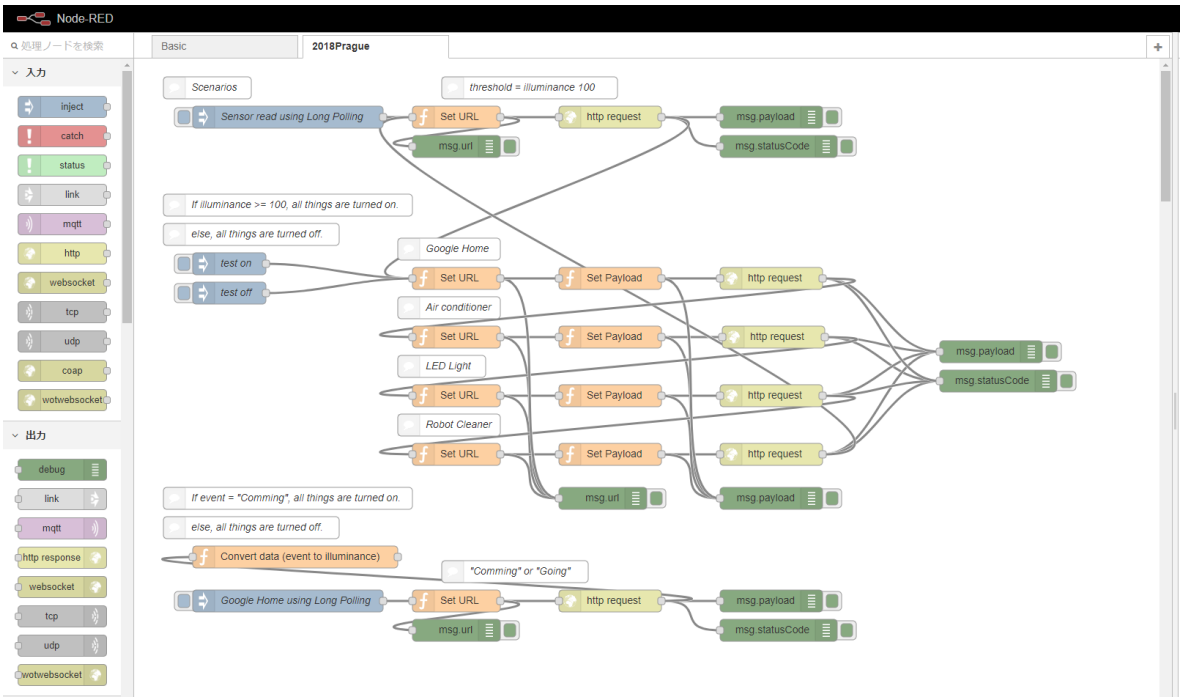

Figure 4 - Screen shot of WoT client using Node-RED

3. Future Developments

As mentioned above, Panasonic aims to realize "Lifestyle Update", which continuously provide new value to customers by connecting with them. To support this effort, we are building the Panasonic Digital Platform [6], a company-wide common platform. The conceptual diagram of Panasonic Digital Platform is shown in Figure 5 .

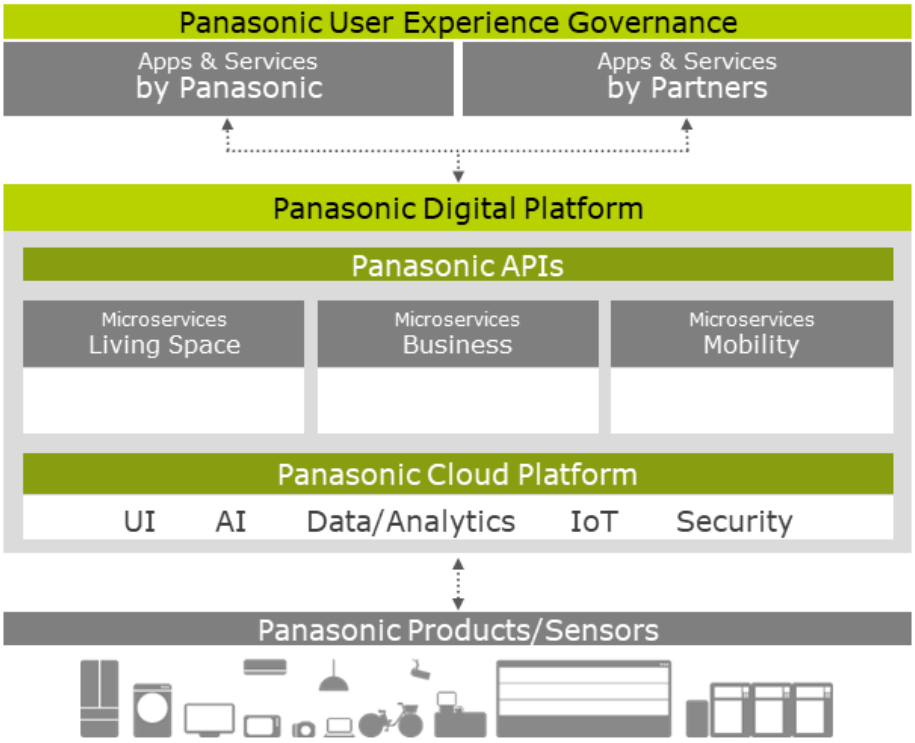

Figure 5 - Conceptual diagram of Panasonic Digital Platform

Various devices are connected to the cloud through Panasonic Cloud Platform, and their functions become accessible through Panasonic APIs on the cloud.

We are currently designing Panasonic APIs based on WoT's interaction model and experience in prototype system, which makes collaboration between our devices as well as other companies' WoT devices easier. We are also investigating use of the Thing Description to make applications easy to adapt various models of products.

We expect the wide spread of WoT, accelerating collaborations across companies and industries, generating several applications which orchestrate multiple devices continuously, and leading to the realization of "Life Update".

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1. Panasonic "Panasonic at 100: Kazuhiro Tsuga Reaffirms Commitment to Consumer through Co-creation with Business Partners and End-users" [Online]

https://news.panasonic.com/global/stories/2018/62640.html [2019, April 23]. ↩

2. W3C "Web of Things (WoT) Architecture Editor's Draft" [Online] https://w3c.github.io/wot-architecture [2019, April 23]. ↩

3. W3C "Web of Things (WoT) Protocol Binding Templates Editor's Draft" [Online] https://w3c.github.io/wot-binding-templates [2019, April 23]. ↩

4. The ECHONET Consortium "ECHONET Lite Web API Guideline (Japanese)" [Online] https://echonet.jp/web_api [2019, April 23]. ↩

5. W3C "Web of Things (WoT) Thing Description Editor's Draft" [Online] https://w3c.github.io/wot-thing-description [2019, April 23]. ↩

6. Asai, et al. (2018, May) "Design and Development of the Cloud Platform Supporting Panasonic IoT Services (Japanese)", *Panasonic Technical Journal Vol. 64 No. 1 May 2018* [Online] https://www.panasonic.com/jp/corporate/technology-design/ptj/pdf/v6401/p0103.pdf [2019, April 23]. ↩