Problem Statement for Smart Home Device Vocabulary
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Abstract

This document provides an overview of the issues associated with the IoT device information model of smart home applications and systems.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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1. Introduction

Smart home is one of vertical applications of Internet of Things (IoT). The deployment of smart home applications and systems often requires various types of devices (for example, home appliances) from different device manufacturers, and each device requires multiple properties and/or methods (for example, switch, mode, etc.) supported.

Now, many consortiums are working on device models to describe the properties and methods of IoT devices, like information model to describe the data produced by device, and interaction model to define how to interact with device. However, simply relying on device model still cannot guarantee the semantic interoperability.

Current device information model vocabularies for smart home are often tightly coupled to limited number of device manufacturers, thus resulting in relatively rigid and static device vocabularies. The static nature of such device vocabularies greatly reduces and, in many cases, limits the ability of a smart home service provider to introduce new or modify existing device properties and/or methods.

This document outlines the problems encountered with existing device information model vocabularies for smart home, and provides the requirement that is necessary to solve the problem.

2. Problem Statement

The following points describe aspects of existing smart home device vocabularies that are problematic.
2.1. Device Information Model Vocabulary Fragmentation

Device information model vocabularies are often coupled to specific device manufacturers. Even for same kind of device type, the information model’s properties and command are different. For example, for the air conditioner, manufacturer A may define its switch feature as "on", and define value 1 as "switch on" and value 0 as "switch off"; whereas, manufacturer B may define the switch feature as "open", and define value 1 as "switch on" and value 0 as "switch off".

Such Fragmentation imposes constraints on smart home deployment, potentially inhibiting the smart home service provider from providing smart device interaction function for customers, and reduces flexibility because it would be difficult to support devices from new manufacturers.

One possible solution is to define an unified information model specification. Each device manufacturer can map its private device information model, thus helping to bridge between different device information model. This information model could be implemented on the IoT service platform in the cloud or locally on the smart home appliance. If implemented on Internet server, it is easy for device manufacturers to configure the mapping, but it may bring extra cost to IoT service platform as well as increase its complexity. If implemented locally, it could bring better user experience since the bridging is completed locally, but the updating of device information model would be difficult.

2.2. Standardization of Information Model

Even though many consortiums are working on defining an universal device information model for smart home, there is still no dominant standard that can cover the requirements of most manufacturers.

ZigBee Alliance is working on "ZigBee Cluster Library", which defines the device model as well as the detailed device vocabulary for smart home. But it is only limited to ZigBee environment.

OCF is working on "Smart Home Device Specification", which defines the device model and vocabulary for smart home. But the vocabulary is very basic, thus cannot satisfy the requirement of smart home implementation.

W3C is also working on TD (Things Description) standards.

However, those information model related standards only trying to standardize the way of describing the IoT device’s property and its
command. The difficulty is that there is no common "vocabulary" for the information model of the IoT device. Although the information model could be standardized, it is still impossible to interoperate in this case.

3. Proposed Solution

Define an unified "vocabulary" standards for the information model of smart home. This standards could be crucial to enable interoperate for smart home appliance.

4. IANA Considerations

TBD

5. Security Considerations

TBD

6. Acknowledgements

TBD

7. Normative References


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