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JSON-LD "@include" Implementation for Thing Description Lifecycle

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https://github.com/w3c/wot/blob/master/proposals/td-lifecycle/JSON-LD_Include_Implementation.pptx

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TD sample in Vertical Industry (1)

Some SDOs have defined Device Object Description.
Here is Echonet Consortium's sample for "home air conditioner".
https://echonet.jp/wp/wp-content/uploads/pdf/General/Standard/Release/Release_H_en/SpecAppendixH_e.pdf

3. 2. 1 Requirements for home air conditioner class

Class group code : 0x01
Class code : 0x30
Instance code : 0x01–0x7F (0x00: All-instance specification code)

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Man-datory	Announcement at status change	Remark
Operation status	0x80	This property indicates the ON/OFF status. ON=0x30, OFF=0x31	unsigned char	1 byte	—	Set Get	○ ○	○	
Operation power-saving	0x8F	Used to specify the power-saving operation mode and to acquire the current setting. power saving mode = 0x41 normal mode = 0x42	unsigned char	1 byte	–	Set/Get	○	○	
Operation mode setting	0xB0	Used to specify the operation mode ("automatic," "cooling," "heating," "dehumidification," "air circulator" or "other"), and to acquire the current setting. The following values shall be used: Automatic: 0x41 Cooling: 0x42 Heating: 0x43 Dehumidification: 0x44 Air circulator: 0x45 Other: 0x40	unsigned char	1 byte	–	Set/Get	○	○	
Automatic temperature	0xB1	Used to specify whether or not to use the automatic temperature control	unsigned char	1 byte	–	Set/Get			

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TD sample in Vertical Industry (2)

Echonet Consortium's definition can be converted to JSON-LD format according to Things Description syntax.

http://133.242.180.86/Echonet_Aircon.jsonld


```
{
  "@context": {
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "td": "http://w3c.github.io/wot/w3c-wot-td-ontology.owl#",
    "sch": "http://schema.org",
    "wot":"http://w3c.github.io/wot/w3c-wot-td-context.jsonld#",
    "name":"wot:name",
    "valueType":"wot:valueType",
    "writable":"wot:writable",
    "interactions":{
        "@id":"td:hasProperty",
        "@container":"@set"
    }
  },
  "@type": "td:Thing",
  "name":"echonet",
  "interactions": [
      {
       "@type": "td:Property",
       "name": "operationStatus",
       "EPC":"80",
       "valueType": { "@type": "xsd:boolean" },
       "writable": true
      },
      {
       "@type": "td:Property",
       "name": "EchoOperationSetting",
       "EPC":"8F",
       "valueType": { "@type": "xsd:string" },
        "owl:oneOf": [
              "EchoOperation", "NORMAL"
        ],
       "writable": true
      },
      {
       "@type": "td:Property",
       "name": "operationMode",
       "EPC":"B0",
       "valueType": { "@type": "xsd:string" },
       "writable": true,
        "owl:oneOf": [
              { "@id":"echonet:AirCirculator" },
              { "@id":"echonet:Automatic" },
              { "@id":"echonet:Cooling" },
              { "@id":"echonet:Dehumidification" },
              { "@id":"echonet:Heating" },
              { "@id":"echonet:OtherMode" }
        ]
      },
      {
       "@type": "td:Property",
       "name": "AutoTemperature",
       "EPC":"B1",
       "valueType": { "@type": "xsd:string" },
       "writable": true,
```

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Data Operator “@include”

As vertical industry, minimum set of APIs for home air conditioner could be defined, e.g. Generic Home Air Conditioner.
This description can be created

1) Removing needless APIs from full set of APIs.
2) After that, including whole original JSON-LD as follows;

http://133.242.180.86/Generic_Aircon_context.jsonld

```
"interactions":{
      "@id":"td:hasProperty",
      "@container":"@set",
      "@include": {
        "@id":"eco:interactions",
        "@remove":[
          "UserRemoteControlTemperatureSettingValue",
          "BlowoutTemperatureMeasurementValue",
          "Non-priorityState",
          "InstallationAirPurificationMethod",
          "AirCleaningFunctionModeSetting",
          "InstallationRefreshMethod",
          "RefreshFunctionModeSetting",
          "InstallationSelfCleaningMethod",
          "SelfCleaningFunctionModeSetting",
          "SpecialOperationModeSetting",
          "ForcedThermalModeSetting",
          "AirPurificationModeSetting"
        ]
      }
    }
  },
```

APIs expected to be removed

Including whole “echo:interactions”

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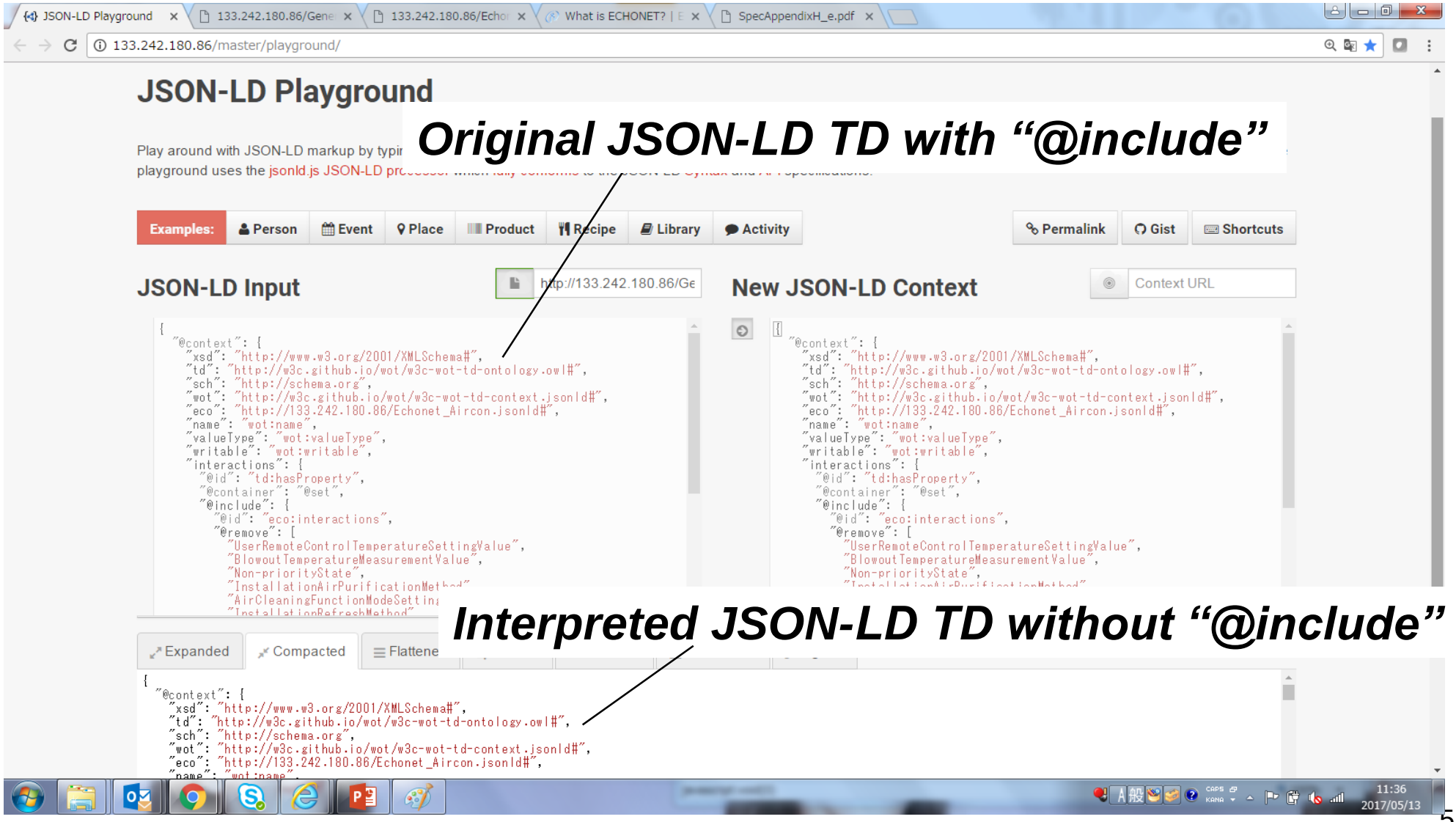
Customized JSON-LD Playground

As PoC, Panasonic customized JSON-LD playground.

http://133.242.180.86/master/playground/



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Interpretation in Playground

Included TD (Echonet_Aircon.jsonld)

```
{
    "@type": "td:Property",
    "name": "IndoorTemperatureMeasurementValue",
    "EPC":"BB",
    "valueType": {
      "@type": "xsd:number",
      "minValue": 16,
      "maxValue": 30
     },
    "writable": false
   },
   {
    "@type": "td:Property",
    "name": "UserRemoteControlTemperatureSettingValue",
    "EPC":"BC",
    "valueType": {
      "@type": "xsd:number",
      "minValue": 16,
      "maxValue": 30
     },
    "writable": false
   },
   {
    "@type": "td:Property",
    "name": "BlowoutTemperatureMeasurementValue",
    "EPC":"BD",
    "valueType": {
      "@type": "xsd:number",
      "minValue": 16,
      "maxValue": 30
     },
    "writable": false
   },
   {
    "@type": "td:Property",
    "name": "OutsideTemperatureMeasurementValue",
    "EPC":"BE",
    "valueType": {
      "@type": "xsd:number",
      "minValue": 16,
      "maxValue": 30
     },
    "writable": false
   },
```

Include

Remove

Remove

Include

@include w/@remove

Including TD (Generic_Aircon.jsonld)

```
"@include": {
      "@id": "eco:interactions",
      "@remove": [
       "UserRemoteControlTemperatureSettingValue",
       "BlowoutTemperatureMeasurementValue"
]
    }
```

Interpretation in Playground

Interpreted TD (Generic_Aircon.jsonld)

```
{
    "@type": "td:Property",
    "name": "IndoorTemperatureMeasurementValue",
    "valueType": {
      "@type": "xsd:number"
    },
    "writable": false
   },
   {
    "@type": "td:Property",
    "name": "OutsideTemperatureMeasurementValue",
    "valueType": {
      "@type": "xsd:number"
    },
    "writable": false
   },
```

The relationship example of organizations and TD

W3C/WoT-WG

- who maintains the style of TD as semantics container type definition for IoT

Organization of each vertical industry

- who maintains the generic semantics of things which belongs to the industry

Mass production manufacturer

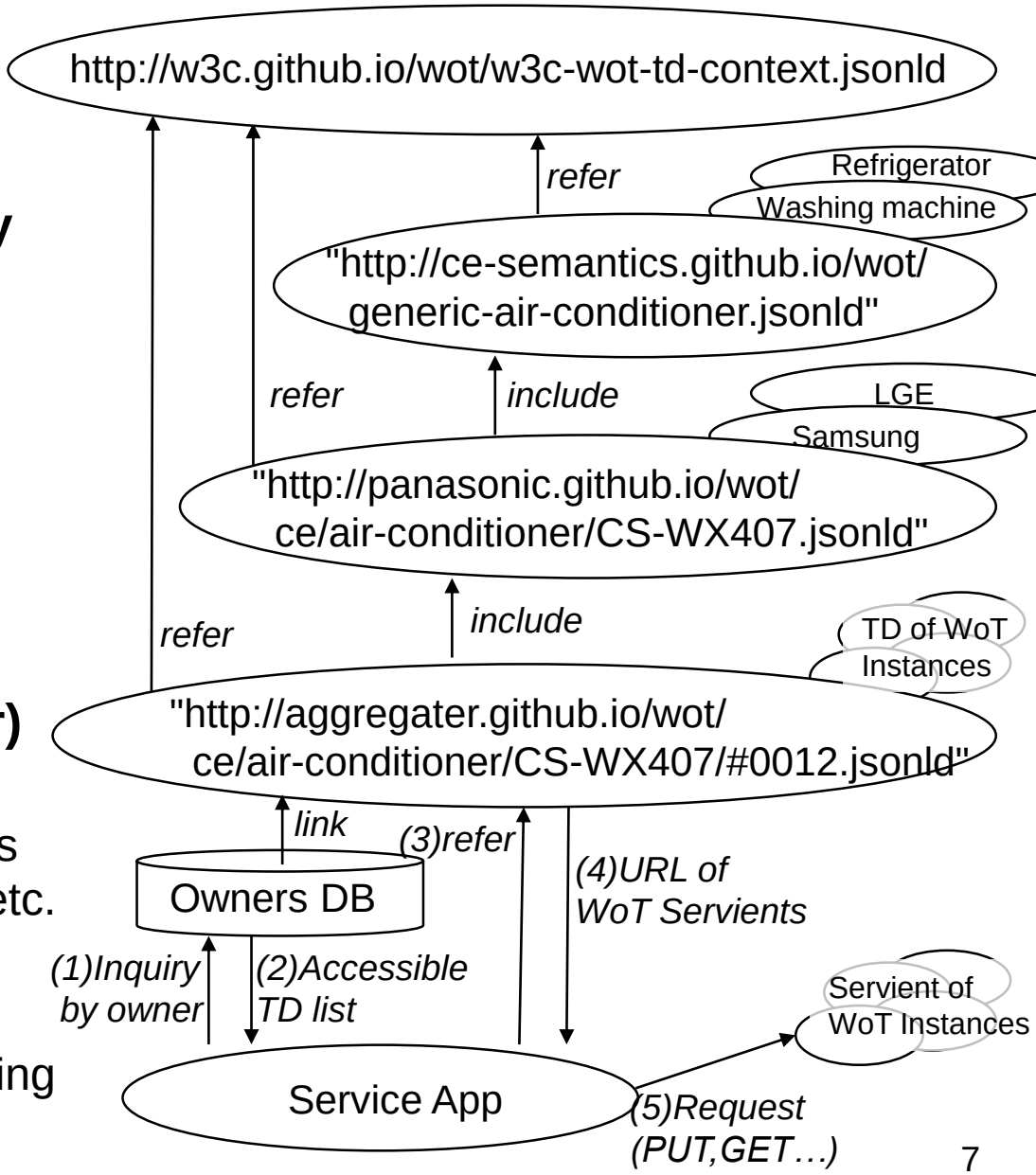
- who maintains the specific semantics of each product with reference to generic semantics of its category thing

Platform provider (Things aggregator)

- who aggregates wide variety of things, manages the relationship between things and its context such as owner, location etc.

Service provider

- who provides service to customers utilizing TDs provided by platform provider(s)



Panasonic would like to contribute the standardization on Consumer Electronics semantics and open it for all stakeholders such as Manufacturers, aggregators and servicers.

Wonders!

by Panasonic