iot.schema.org Definitions for Semantic Annotation

WISHI Teleconference

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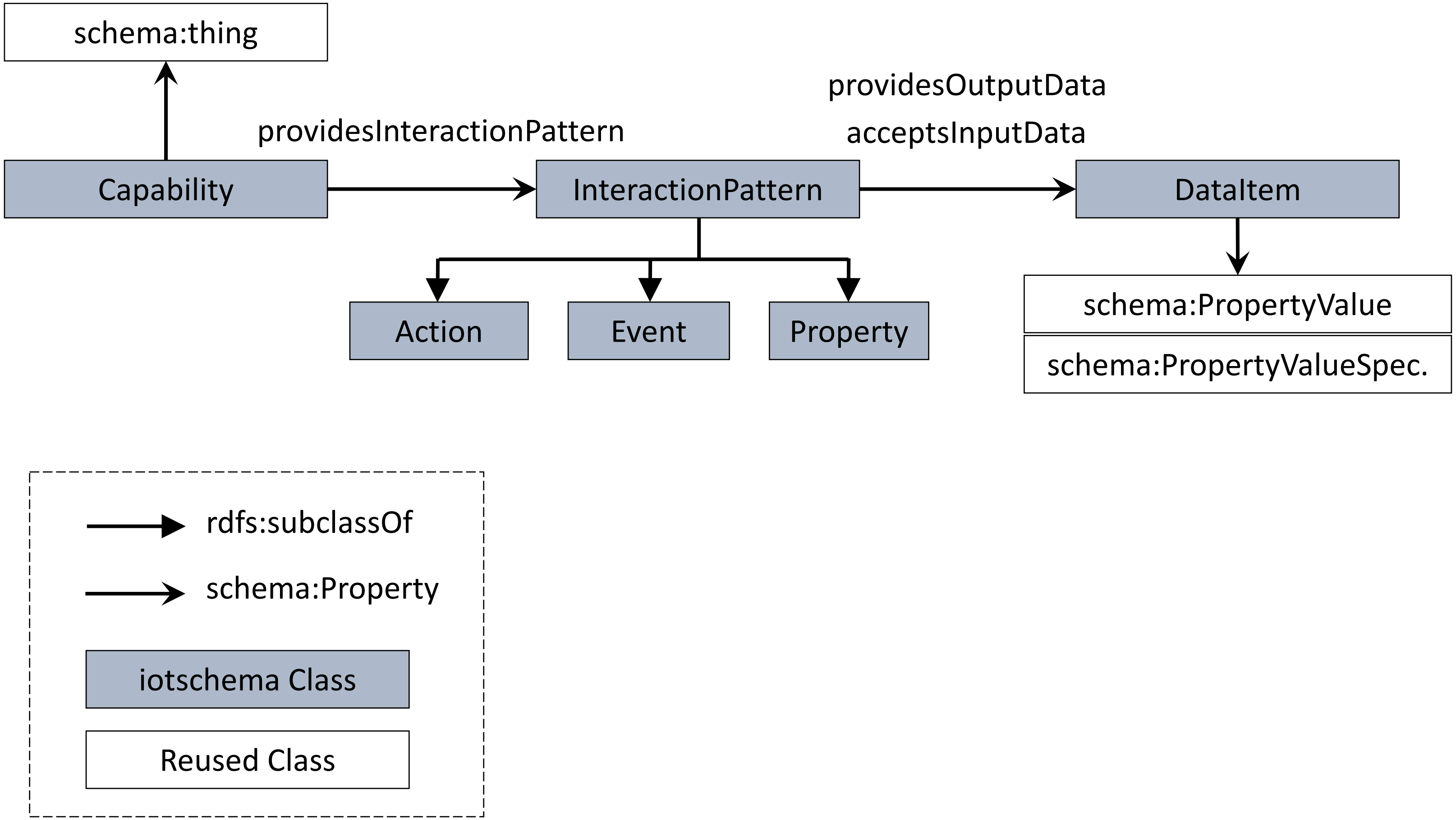
Semantic Annotation

- iot.schema.org Semantic Categories
- Annotation is semantic metadata that applications can use in discovery and configuration
    - Link target attributes, embedded microformats in web pages
- Annotation of schemas and descriptors
    - CoRE Link-Format (LWM2M)
    - JSON-Schema (OpenAPI, OCF, Amazon)
    - HAL, CORAL, Hydra, JSON-Hyperschema
    - W3C TD

iot.schema.org Semantic Categories



schema:thing

providesInteractionPattern

providesOutputData

acceptsInputData

Capability

InteractionPattern

DataItem

Action

Event

Property

schema:PropertyValue

schema:PropertyValueSpec.

rdfs:subclassOf

schema:Property

iotschema Class

Reused Class

Example Capability Definition

```
{
  "@id": "iot:ColorControlCapability",
  "@type": "rdfs:Class",
  "rdfs:subClassOf": { "@id": "iot:Capability" },
  "rdfs:comment": "Color Control",
  "rdfs:label": "ColorControlCapability",
  "iot:providesInteractionPattern": [
    {
    "@id": "iot:Hue",
    "@id": "iot:Saturation",
    "@id": "iot:SetHue",
    "@id": "iot:SetSaturation",
    "@id": "iot:SetColor"
    }
  ]
}
```

Example Interaction Definition

```
{
  "@id": "iot:SetColor",
  "@type": "rdfs:Class",
  "rdfs:comment": "Set Color Action",
  "rdfs:label": "SetColorAction",
  "rdfs:subClassOf": { "@id": "iot:Action" },
  "iot:acceptsInputData": [
    {"@id": "iot:HueData"},
    {"@id": "iot:SaturationData"},
    {"@id": "iot:LevelData"},
    {"@id": "iot:SwitchData"},
    {"@id": "iot:TransitionTimeData"}
  ]
}
```

Categories align with existing definitions + enable adaptation

- Capabilities – use in discovery
  - LWM2M Objects, OCF Resource Types, Zigbee Clusters, Alexa Skills, SmartThings Capabilities
- Interactions – configure applications
  - Commands, Actions, Events, Subscriptions
  - Target Resources for read/update or other interactions
- Data – adapt to specific formats and types
  - Payload format
  - Number type and range
  - Units of Measure

Examples

- Alexa Skill – uses JSON-Schema
- OCF Definition – OpenAPI, JSON-Schema
- LWM2M Link Annotation

Alexa Skill API Message Example

```
"directive": {
  "header": {
    "namespace": "Alexa.ColorController",
    "name": "SetColor",
    "payloadVersion": "3",
    "messageId": "1bd5d003-31b9-476f-ad03-71d471922820",
    "correlationToken": "dFMb0z+PgpgdDmluhJ1LddFvSqZ/jCc8ptlAKulUj90jSqg=="
  },
  "endpoint": {
    "scope": {
      "type": "BearerToken",
      "token": "access-token-from-skill"
    },
    "endpointId": "endpoint-001",
    "cookie": {}
  },
  "payload": {
    "color": {
      "hue": 350.5,
      "saturation": 0.7138,
      "brightness": 0.6524
    }
  }
```

Action

Properties

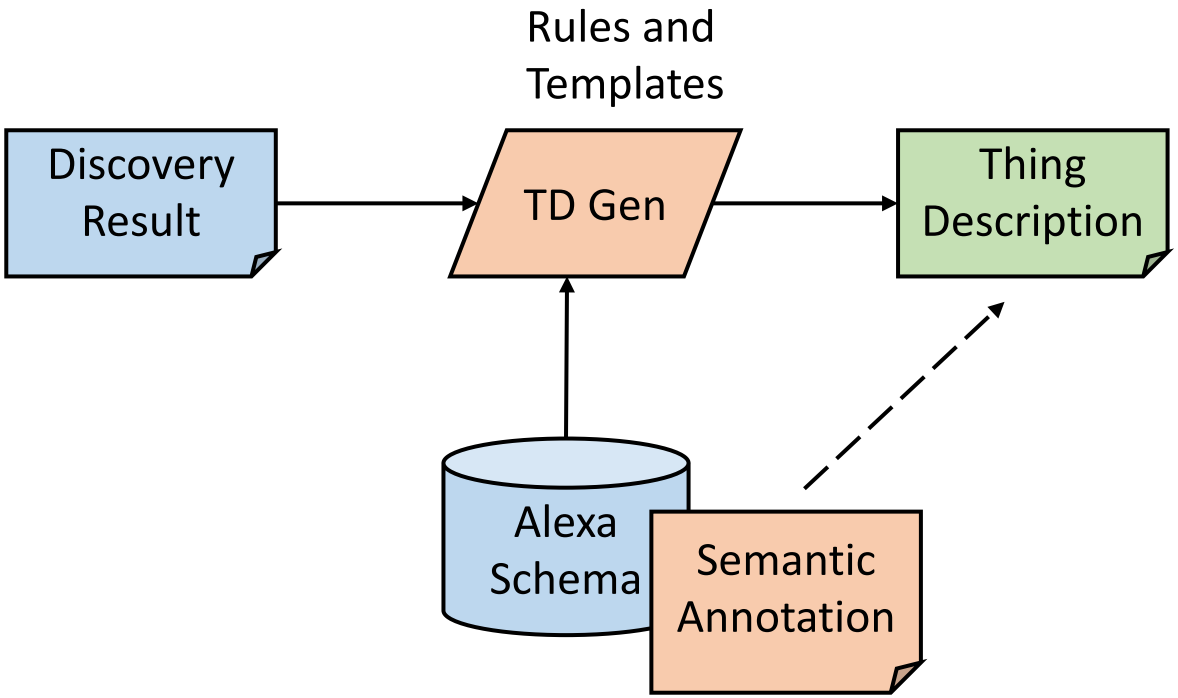
Message part is the Action

```
"actions": {
  "setColor": {
    "@type" : "iot:SetColor",
    "input": {
      "description": "From the Alexa message request schema",
      "type": "object",
      "properties": {
        "directive": {
          "type": "object",
```

Data part

```
"properties": {
  "color": {
    "type": "object",
    "type": "iot:ColorMap",
    "properties": {
      "hue": {
        "@type": ["iot:Hue","iot:HueData"],
        "type": "number",
        "minimum": 0,
        "maximum": 360
      },
      "saturation": {
        "@type": ["iot:Saturation","iot:SaturationData"],
        "type": "number",
        "minimum": 0,
        "maximum": 1
      },
      "brightness": {
        "@type": ["iot:Level","iot:LevelData"],
        "type": "number",
        "minimum": 0,
        "maximum": 1
      }
    }
  }
}
```

Use Case Example


Rules and Templates
Discovery Result
TD Gen
Thing Description
Alexa Schema
Semantic Annotation