

IoT Extensions for schema.org

Community Teleconference

March 21, 2019

Agenda

- Updates
- One Data Model Update
- schema.org integration proposal
- Issue #54 – General Input/Output Data Types

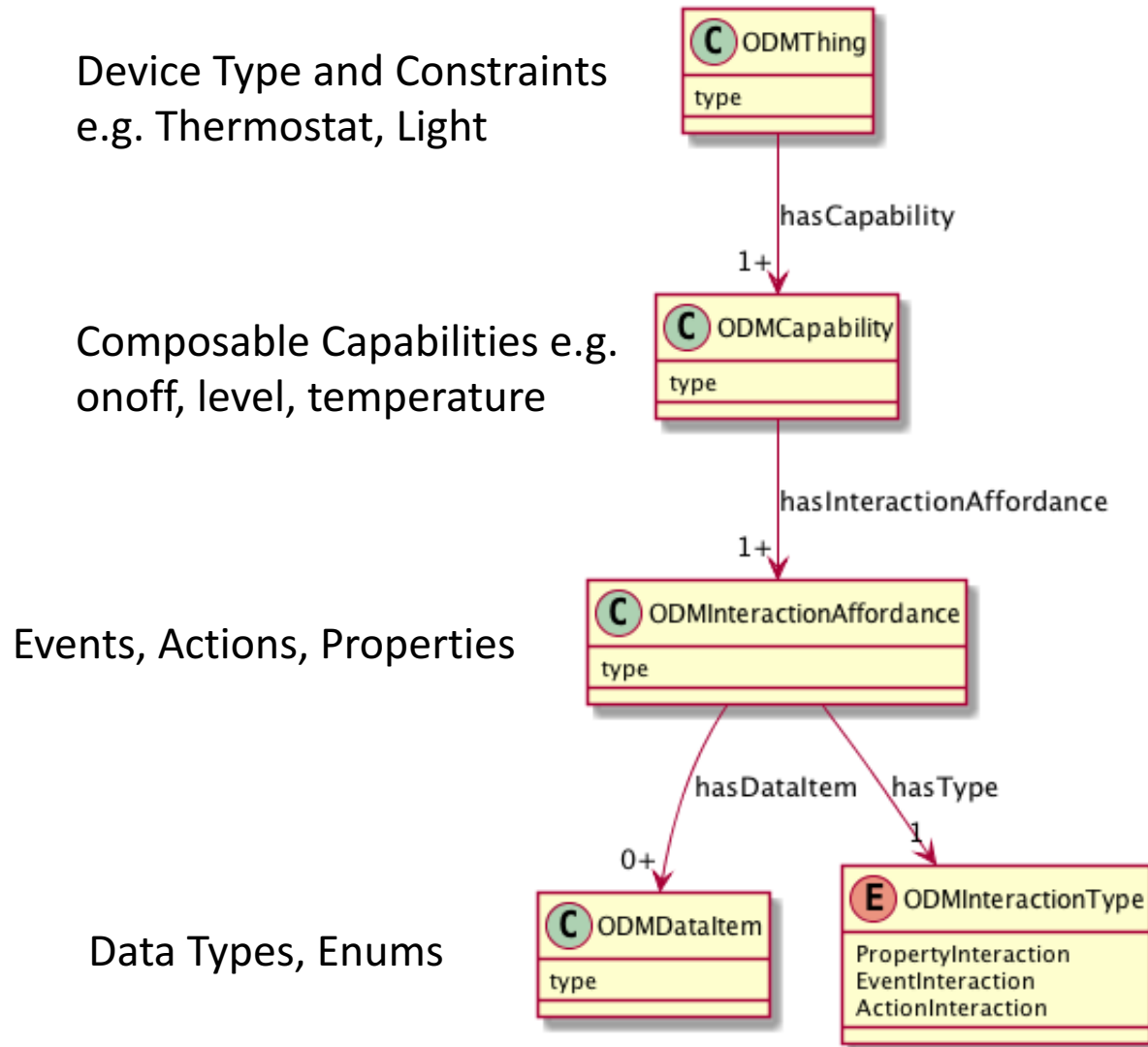
Brief Updates

- Community Group is still not active
 - Need to elect chairs and create the mail list
- IETF 104 in Prague CZ, March 22-30
 - March 22 all-day T2TRG Workshop
 - March 23-24 WISHI Hackathon
 - Semantic and Hypermedia Interoperability work
- Other updates?

One Data Model Proposal

- High level semantic model that is aligned with the pattern we have been using for the prototype definitions
- "has" property types
- DataItem class without any directionality
- Protocol Binding based on @type annotations in OCF/Swagger definition files – same format as the WoT TD annotation
- <https://github.com/mjkoster/ODM-Examples>

UML Model



ST Based Capabilities

```
{
  "@id": "st:SwitchCapability",
  "rdfs:subClassOf": "odm:Capability",
  "rdfs:comment": "Basic On/Off Switch Capability",
  "rdfs:label": "SmartThings Switch Capability",
  "odm:hasInteractionAffordance": [
    "st:Switch.valueProperty",
    "st:Switch.onAction",
    "st:Switch.offAction"
  ]
},
{
  "@id": "st:SwitchLevelCapability",
  "rdfs:subClassOf": "odm:Capability",
  "rdfs:comment": "Capability to control the level",
  "rdfs:label": "SmartThings SwitchLevel Capability",
  "odm:hasInteractionAffordance": [
    "st:SwitchLevel.levelProperty",
    "st:SwitchLevel.setLevelAction"
  ]
}
```

Properties, Actions, Events

```
{
  "@id": "st:SwitchLevel.levelProperty",
  "rdfs:comment": "The current level setting",
  "rdfs:label": "SwitchLevel levelProperty",
  "@type": "odm:PropertyInteraction",
  "rdfs:subClassOf": "odm:InteractionAffordance",
  "odm:hasDataItem": "st:SwitchLevel.levelData"
},
{
  "@id": "st:SwitchLevel.setLevelAction",
  "rdfs:comment": "Action to set the level",
  "rdfs:label": "SwitchLevel setLevelAction",
  "@type": "odm:ActionInteraction",
  "rdfs:subClassOf": "odm:InteractionAffordance",
  "odm:hasDataItem": [
    "st:SwitchLevel.levelData"
    "st:SwitchLevel.rateData"
  ]
}
```

Data Items

```
{
  "@id": "st:Switch.valueData",
  "rdfs:comment": "value data for Switch (on/off string
encoding)",
  "rdfs:label": "SmartThings SwitchLevel.levelData",
  "rdfs:subClassOf": "odm:DataItem",
  "odm:DataItemType": "js:string",
  "js:enum": ["on", "off"]
},
{
  "@id": "st:SwitchLevel.levelData",
  "rdfs:comment": "Level data for SwitchLevel",
  "rdfs:label": "SmartThings SwitchLevel.levelData",
  "rdfs:subClassOf": "odm:DataItem",
  "odm:DataItemType": "js:integer",
  "js:minimum": 0,
  "js:maximum": 100
},
{
  "@id": "st:SwitchLevel.rateData",
  "rdfs:comment": "Rate time data for setLevelAction",
  "rdfs:label": "SmartThings SwitchLevel.rateData",
  "rdfs:subClassOf": "odm:DataItem",
  "odm:DataItemType": "js:integer",
  "js:minimum": 0,
  "js:maximum": 65535
}
```


OCF Definition with annotations

```
"title": "Binary Switch",
"version": "v1.1.0-20160519",
"license": {
  "name": "copyright 2016-2017 Open Connectivity
Foundation, Inc. All rights reserved.",
}
},
"@type": "ocf:BinarySwitchCapability",
"schemes": ["http"],
"consumes": ["application/json"],
"produces": ["application/json"],
"paths": {
  "/BinarySwitchResURI" : {
    "@type": [
      "ocf:BinarySwitch.valueProperty",
      "ocf:BinarySwitch.OnAction",
      "ocf:BinarySwitch.OffAction"
    ],

```

OCF Definition with annotated paths and operations

```
"paths": {  
  "/BinarySwitchResURI" : {  
    "@type": [  
      "ocf:BinarySwitch.valueProperty",  
      "ocf:BinarySwitch.OnAction",  
      "ocf:BinarySwitch.OffAction"  
    ],  
    "get": {  
      "@type": "ocf:BinarySwitch.valueProperty",  
    }  
  
    "post": {  
      "@type": [  
        "ocf:BinarySwitch.valueProperty",  
        "ocf:BinarySwitch.OnAction",  
        "ocf:BinarySwitch.OffAction"  
      ],  
    }  
  }  
}
```

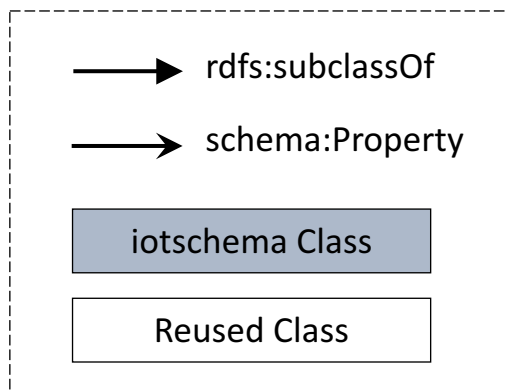
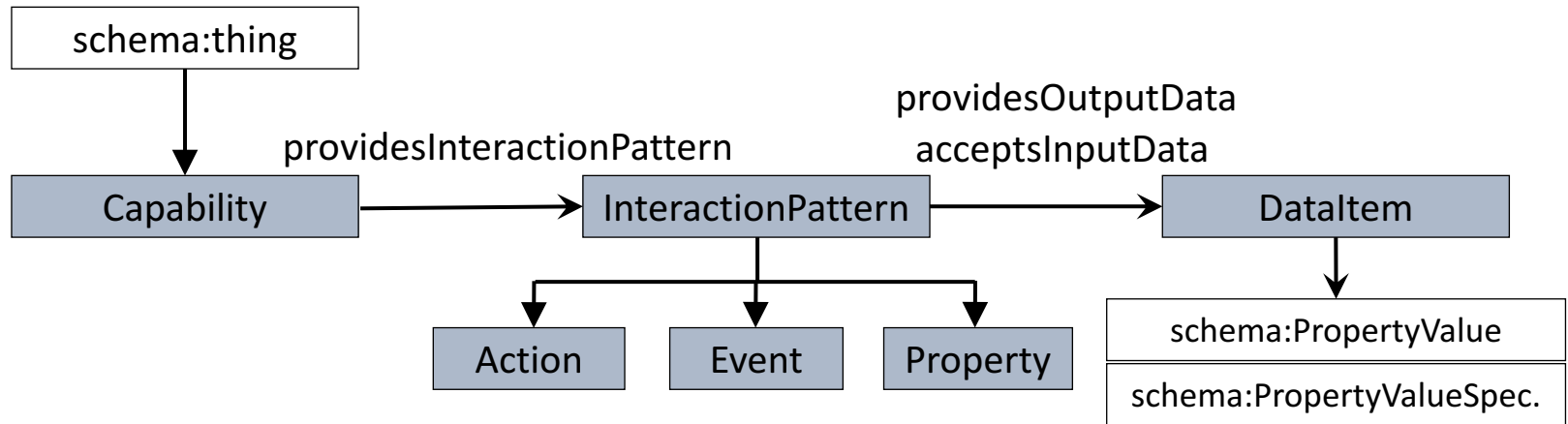
OCF Definition with data annotations

```
(...)  
  "minItems": 1,  
  "readOnly": true,  
  "type": "array"  
},  
"value" :  
  {  
    "@type": [  
      "ocf:BinarySwitch.valueData",  
      "ocf:BinarySwitch.OnValueData",  
      "ocf:BinarySwitch.OffValueData"  
    ],  
    "description": "Status of the switch",  
    "type": "boolean"  
  },  
}
```

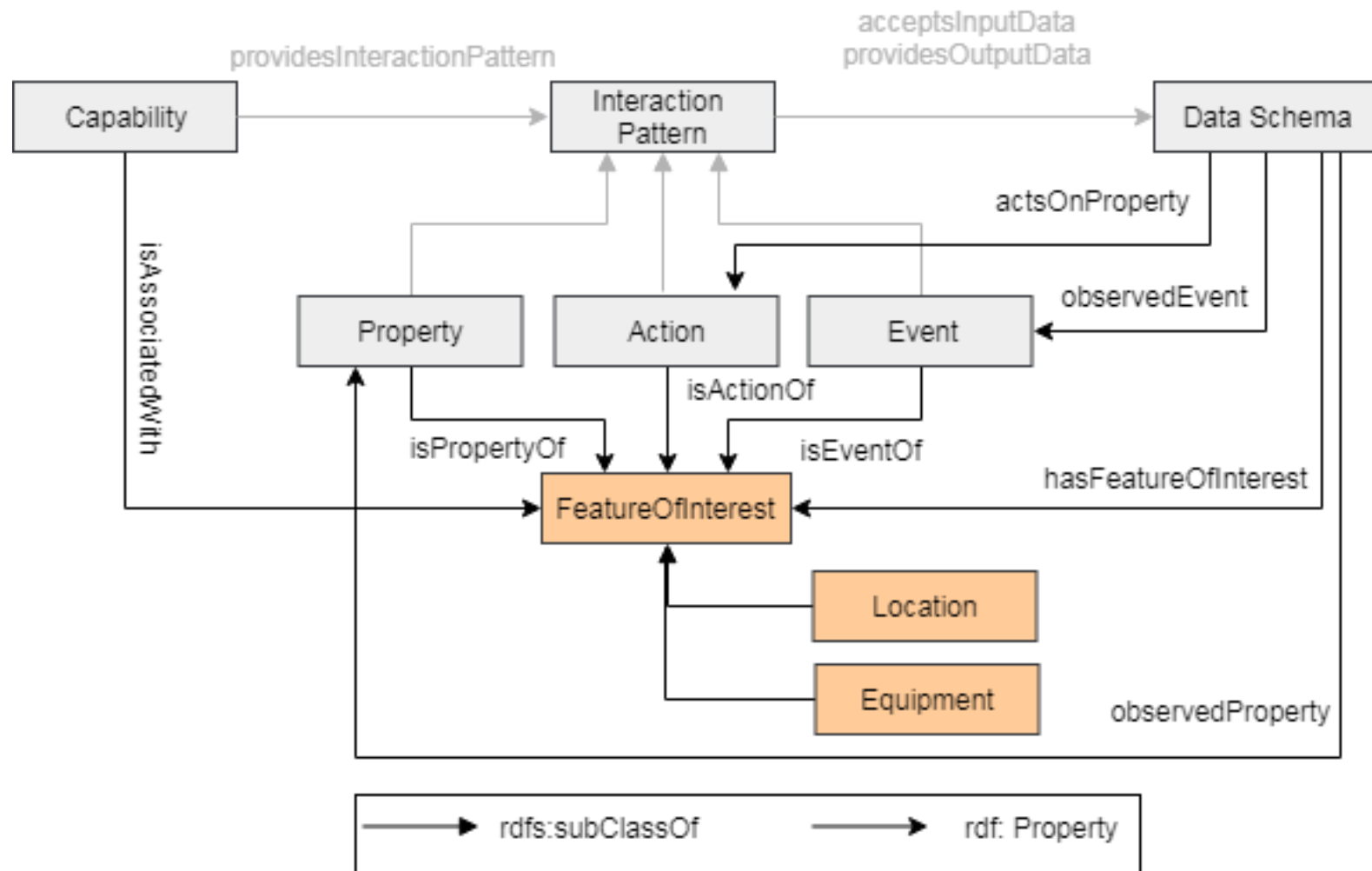
Schema.org integration

- Contribution to schema.org based on our prototype definition ontology (the terms need work)
- Capability, InteractionAffordance, Event, Action, Property, DataItem classes
- ProvidesInteractionPattern, AcceptsInputData, ProvidesOutputData property types
- DataItem constraints using PropertyValueConstraint or other suitable vocabularies (e.g. JSON Schema)
- Fol property types
- The definitions can be in external namespaces, only the core model needs to be accepted to start

schema.org IoT Extension Core Model



Feature of Interest Properties



Schema.org integration

- Drive it through issues and discussion on our [iotschema-collab](#) github organization and in the new CG
- At some key point, create issues on the [schema.org](#) github organization

Issue #54 Data Types

- Currently we intend to define a semantic category for DataItems that we apply application-specific terms to, e.g. a TemperatureData type as defined for use in a TemperatureCapability
- Applications can associate TemperatureData with the TemperatureCapability (concrete or abstract)
- We define relations that can associate TemperatureData with Features of Interest
- The intention is to be able to relate TemperatureData to concepts like Phenomenon and Observation

What is needed for this use case?

Other Business?

- AOB
- Adjourn

Technical Plan – Schema.org Integration

- Develop the existing ontology to be suitable for integration into schema.org
 - Terminology needs broad agreement
- Develop the references and browser navigation hooks to definitions in external namespaces

Technical Plan – Definitions

- Create example definition sets from existing ecosystems – Annotation and Feature Extraction
 - ZCL/dotdot, OCF, LWM2M, SmartThings
- Create a Developer Guideline for new definitions and for using existing definitions
- Collect useful tools and scripts
- New classes
 - Data classes
 - Capability sets for common Thing types?
 - Definitions for common Enumerations?

Technical Plan – Web Interface

- Add Shapes Constraints to the definitions
- Develop the browser navigation hooks
- Determine namespace references from schema.org

Technical Plan – Feature of Interest

- Develop integrations for external Fol ontologies
 - Automotive (VSS Schema)
 - Buildings (Brick Schema)
 - Sensor data and geospatial (W3C, OGC)
 - Industrial (IIC collaboration?)
- Examples of annotations including domain-specific Fol definitions