

Schema.org Extensions for IoT (iotschema)

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Data Models and Semantic Interoperability

IoT Week, Aarhus, Denmark - 20.06.2019

Data models for IoT

- Web of Things
Thing Description
W3C Candidate Recommendation

Web of Things (WoT) Thing Description

W3C Candidate Recommendation 18 June 2019



This version:

<https://www.w3.org/TR/2019/CR-wot-thing-description-20190618/>

Latest published version:

<https://www.w3.org/TR/wot-thing-description/>

Latest editor's draft:

<https://w3c.github.io/wot-thing-description/>

Implementation report:

<https://w3c.github.io/wot-thing-description/testing/report.html>

Previous version:

<https://www.w3.org/TR/2019/CR-wot-thing-description-20190516/>

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- Few other IoT ecosystems revolve around similar thing data models.



The AWS IoT Things Graph
Data Model (TDM)

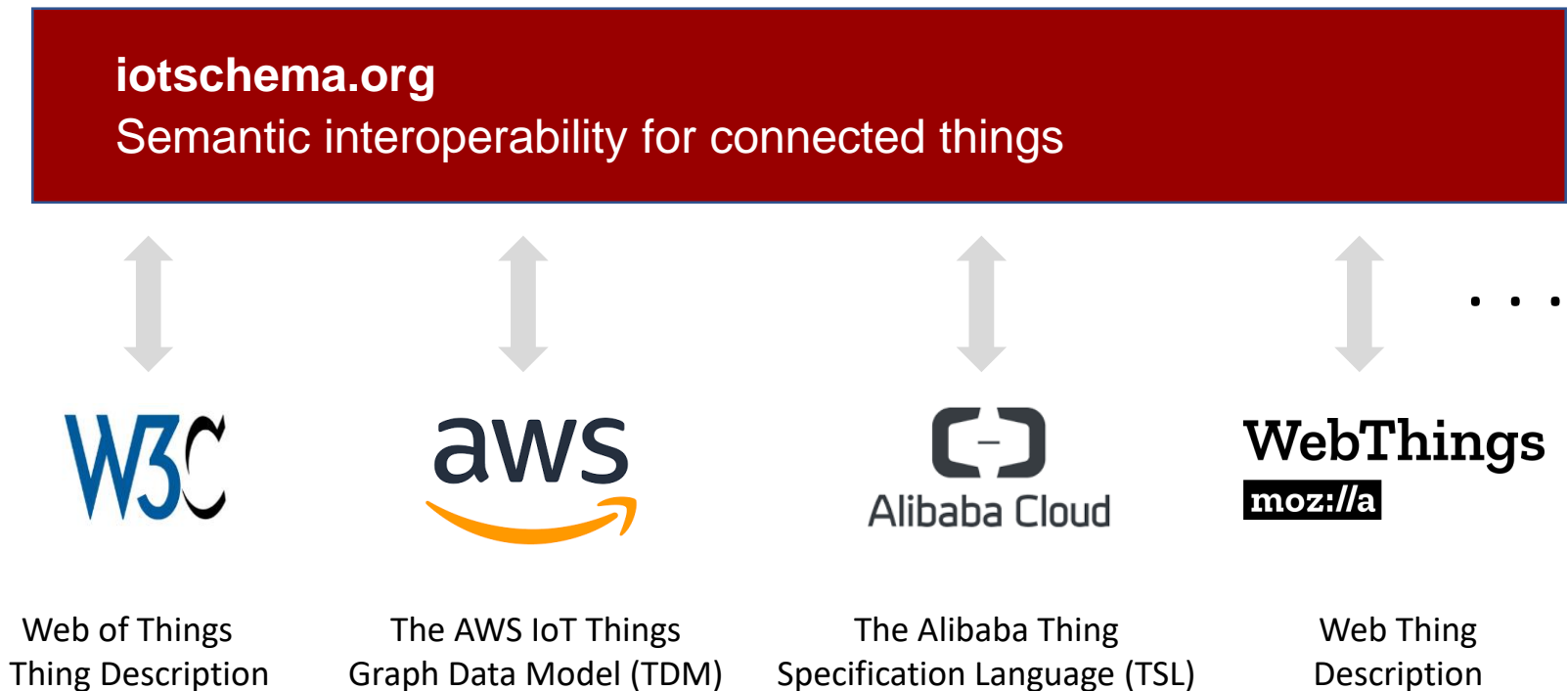


The Alibaba Thing
Specification Language (TSL)



Web Thing Description

Common semantic layer



What is iotschema ?

- An open, publicly available, repository of semantic definitions for connected things
- An extension of schema.org to enable descriptions of things in the physical world and their data
- A common set of tools and patterns, and a community process for contribution and publication of standardized definitions
- A way for domain experts to easily create semantic definitions that are relevant to their application domain

What is iotschema (2) ?

- A layer to bridge between device ecosystems and Semantic Web technology
- Property and relation types to enable reuse of existing ontologies and definitions
 - SSN, SOSA, SAREF, QUDT
 - Property types for e.g. Feature of Interest
- Annotation vocabulary for WoT Thing Description
 - Common definitions for application-specific Events, Actions, and Properties

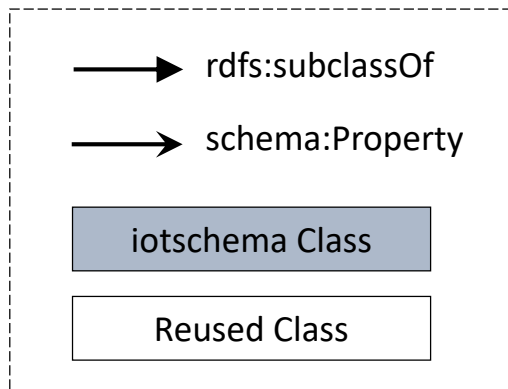
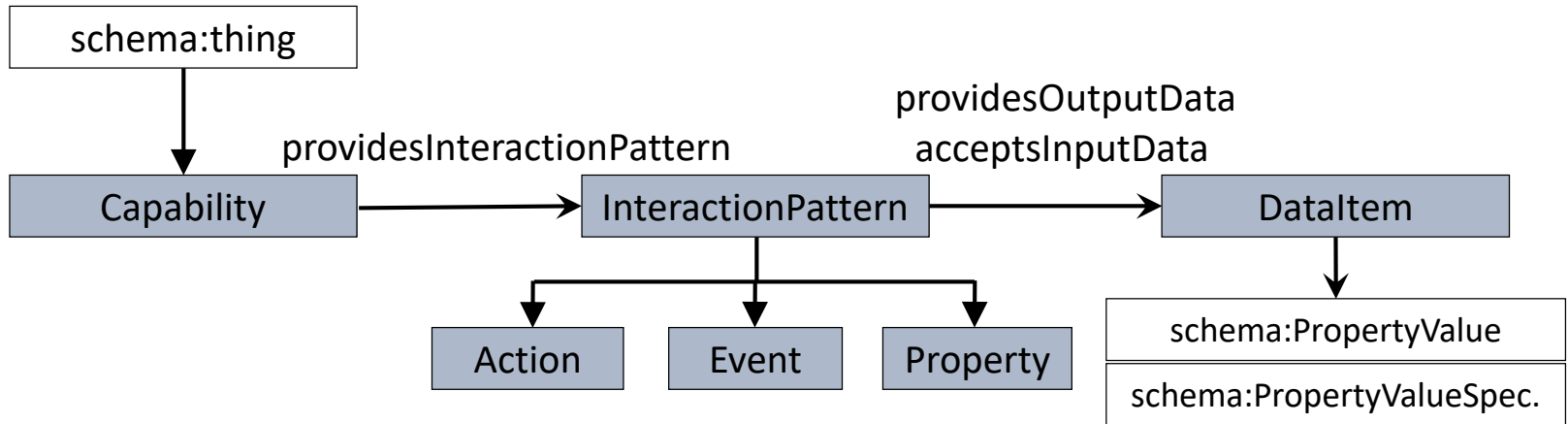
Who is iotschema for?

- **IoT platform providers** will use iotschema to make it easy for third party applications to use the platform
- **Device vendors** and SDOs will use iotschema to publish protocol-neutral definitions of their devices to enable web scale adoption
- **Domain experts** will use iotschema to create domain-specific languages for connected things and their applications
- **Application providers** will use iotschema to make their applications portable across platforms

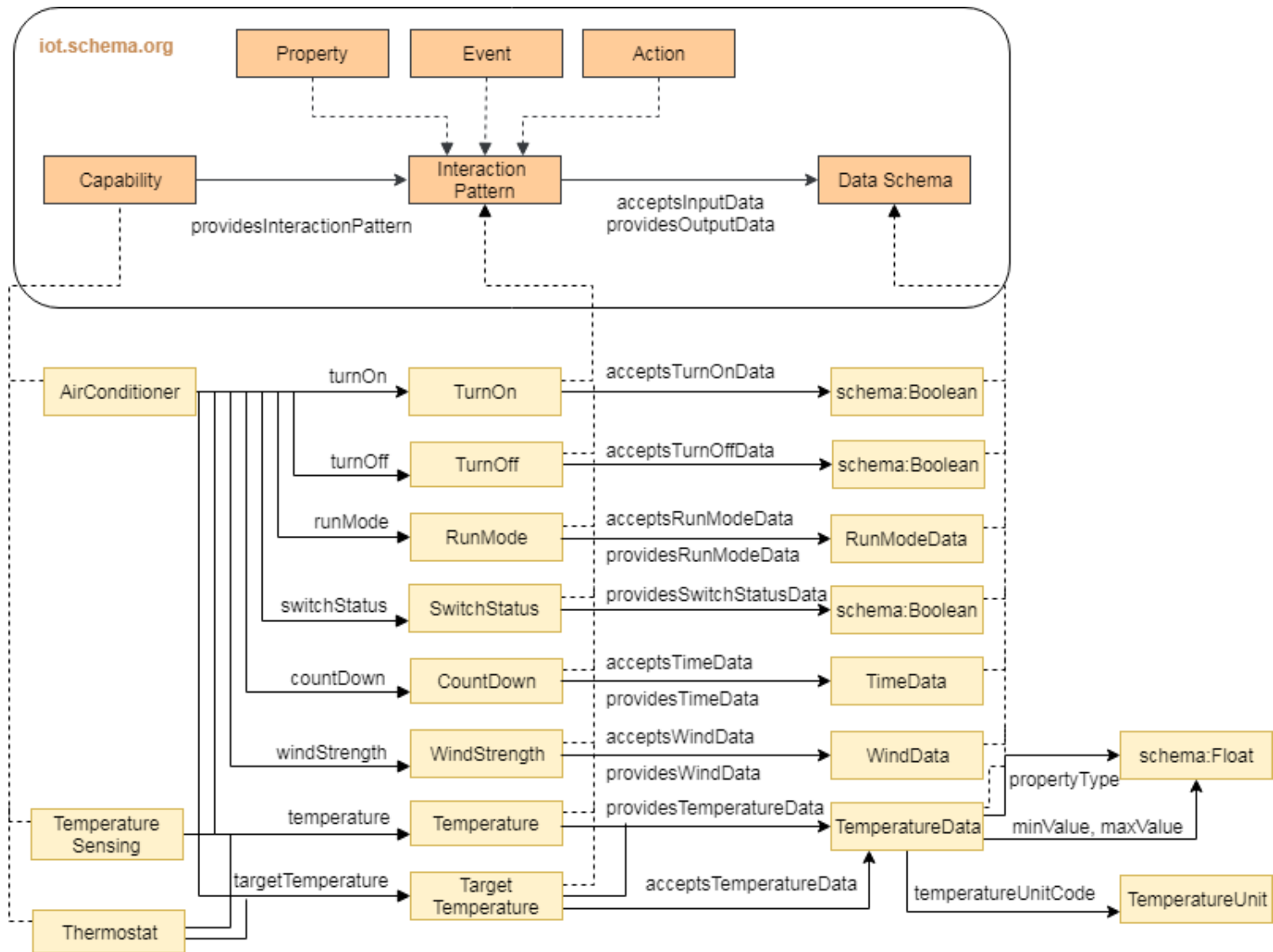
iotschema: Semantic categories

- **iotschema** semantic definitions consist of three categories, or classes, that describe a measurement or actuation, of some physical property or item
 - A **Capability** describes the smallest practical composable unit of functionality (measurement and/or actuation), e.g. the temperature of something, or the brightness of a light bulb. A Capability has some related Interactions.
 - An **Interaction (Event, Action, or Property)** describes an affordance to the capability, which may be to read or write a value, or perform a complex action.
 - **Data Item** descriptions contain data types, units, minimum and maximum values, and other information about the data model, for example a shape or schema

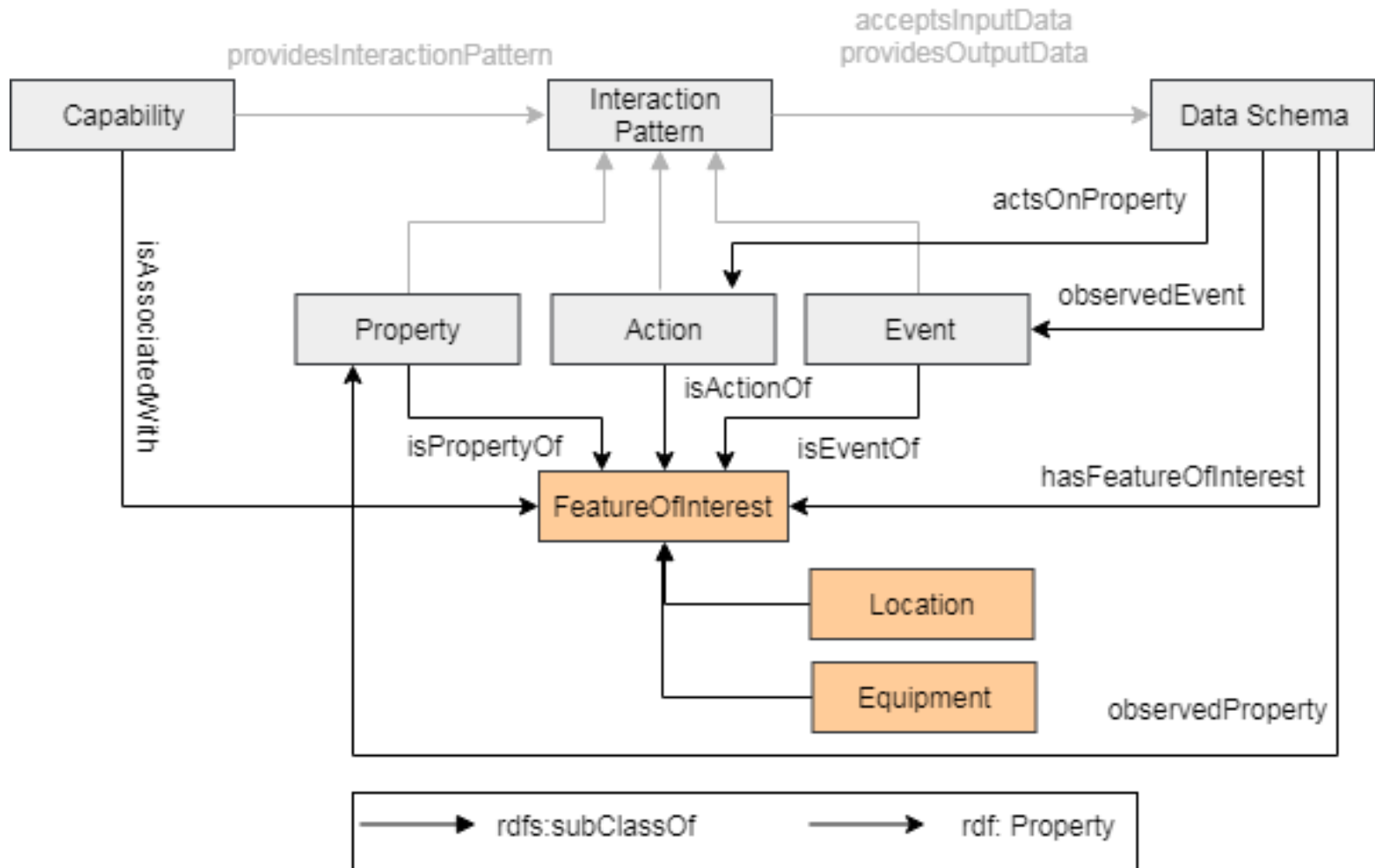
iotschema: Capability pattern



iotschema: Example



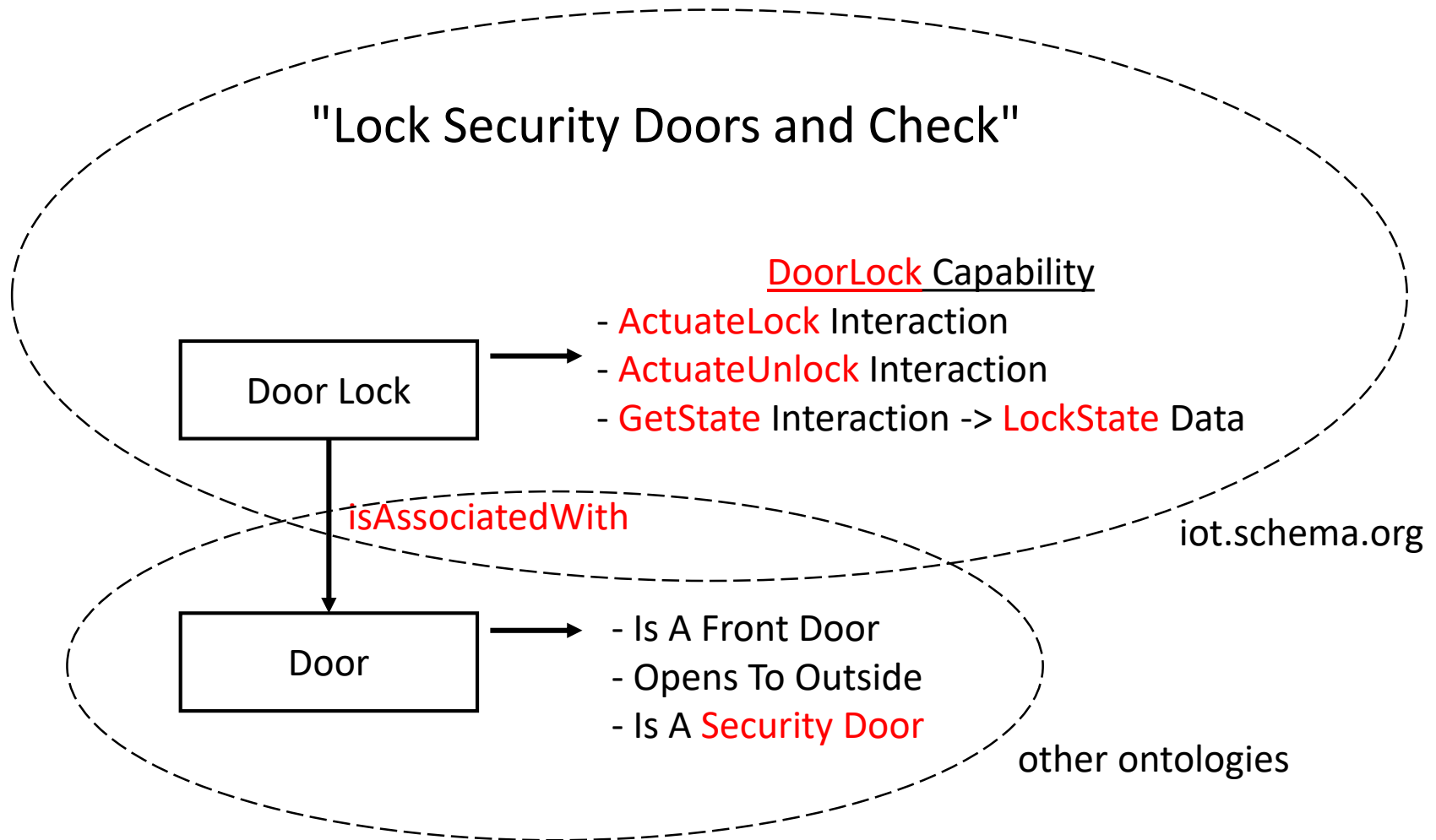
iotschema: Feature Of Interest pattern



iotschema: Conceptual integration with other ontologies

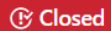
- Feature of Interest concepts and property types to describe location, equipment, or other classifiers
- For example, BrickSchema definitions from Haystack
- Quantity and Units constraints can use QUDT concepts and appropriate identifiers
- SSN, SOSA, SAREF concepts can extend a definition
- W3C Linked Building Data Group

Connect things to the real world



How to contribute to iotschema?

Capability: Thermostat #61



danicic opened this issue yesterday · 2 comments

[Edit](#)[New issue](#)

danicic commented yesterday

Member



Capability Thermostat

A capability for thermostat.

Properties

Name	Description	Input	Output
Temperature	Temperature interaction property	-	TemperatureData
TargetTemperature	Target temperature	TemperatureData	TemperatureData
Provide Input for writable properties.			

Data Types

Numeric Data Types:

Name	Definition	Min Value	Max Value	Unit Code
TemperatureData	Number	0	100	Celsius, Kelvin, Fahrenheit

Assignees



No one—assign yourself

Labels



Capability Proposal

Projects



None yet

Milestone



No milestone

Notifications

Unsubscribe



You're receiving notifications because you're watching this repository.

1 participant



Lock conversation

<https://github.com/iot-schema-collab/iotschema/tree/master/incoming>

Status

- Monthly Teleconferences since mid-2017
- Examples of Definitions in a Github repository
- Fol annotation examples are also in the repo
- Prototypes tested at W3C Web of Things Plugfests and WISHI/IETF Hackathons from mid 2017
- Contributors are ready to begin submitting definitions
- Next steps are to build out tools and processes
- W3C Community Group

Current members

W3C CG: Schema.org Extensions for IoT



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iotschema: Resources

- W3C Community Group:
The Schema Extensions For IoT

- <https://www.w3.org/community/iotschema/>

- GitHub repository:

- <https://github.com/iot-schema-collab/iotschema>

Teleconferences:

- <https://github.com/iot-schema-collab/teleconferences>

Contributions:

- <https://github.com/iot-schema-collab/iotschema>

Charter:

- <https://github.com/iot-schema-collab/ws-charter>

- Web site:
Current location

- <http://iotschema.org/docs/full.html>

Future location

- <http://iot.schema.org>

- Tools:
iotschema for Node-RED

- <https://github.com/iot-schema-collab/iotschema-node-red>

Tools: iotschema for Node-RED

Recipe based IoT applications

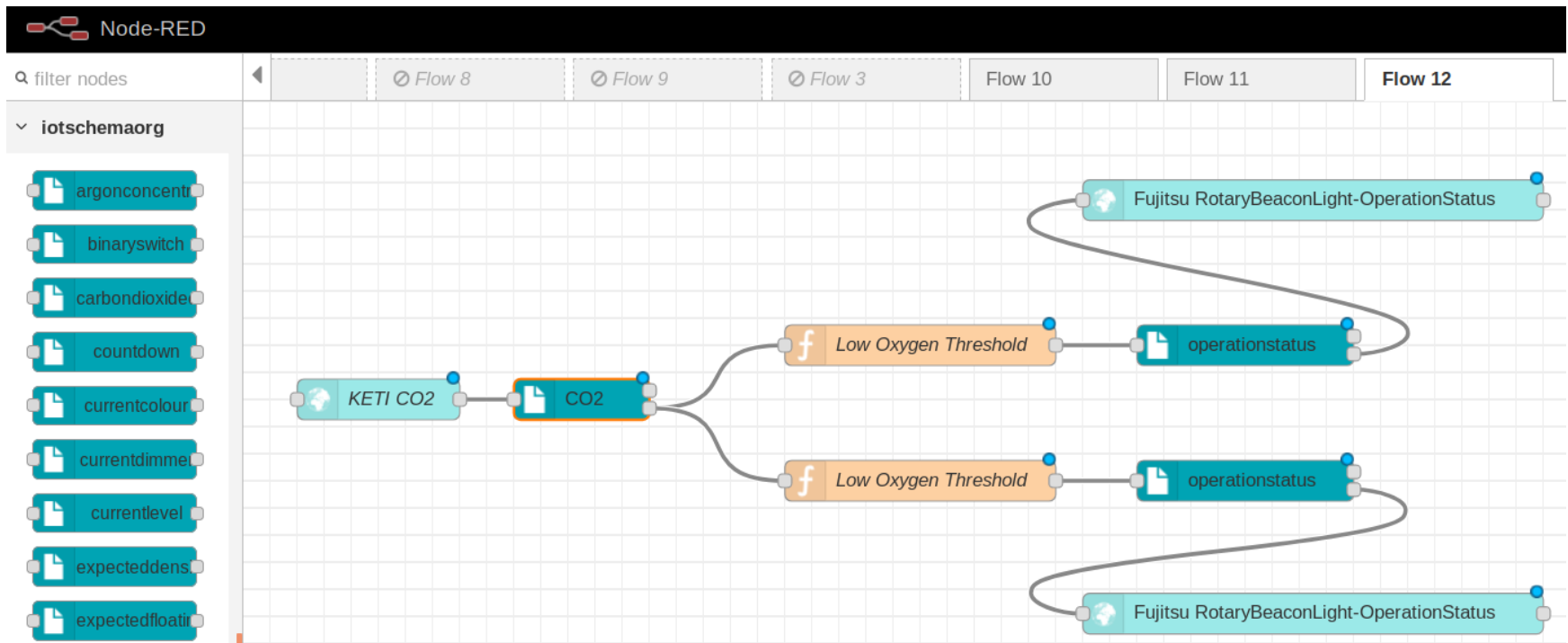
iotschema for Node-RED

Recipe-based applications

- iotschema embedded in Node-RED tool
 - Enables an easy configuration of things using iotschema definitions
- Easies the use of semantics for IoT developers
 - No need for a developer to know RDF(S), JSON-LD, RDF Shapes ...
- Simplify creation of applications with W3C WoT
 - Avoids translations of serializations formats, data types, units ...
- Demonstrates semantic discovery and processing
 - Integrates WoT Thing Directory
- GitHub project location:
 - <https://github.com/iot-schema-collab/iotschema-node-red>

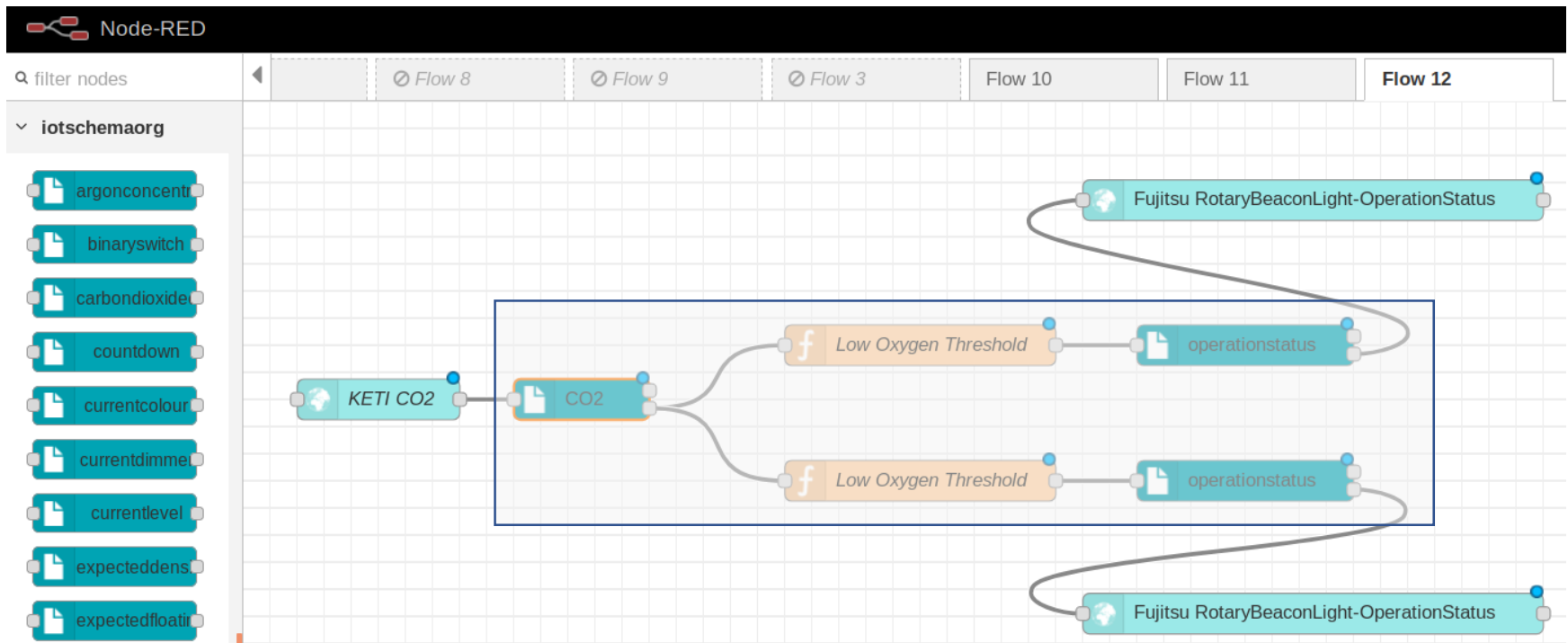
Example: Controlling Carbon Dioxide

Node-RED Application with W3C WoT Things



Example: Controlling Carbon Dioxide

Node-RED Application with W3C WoT Things



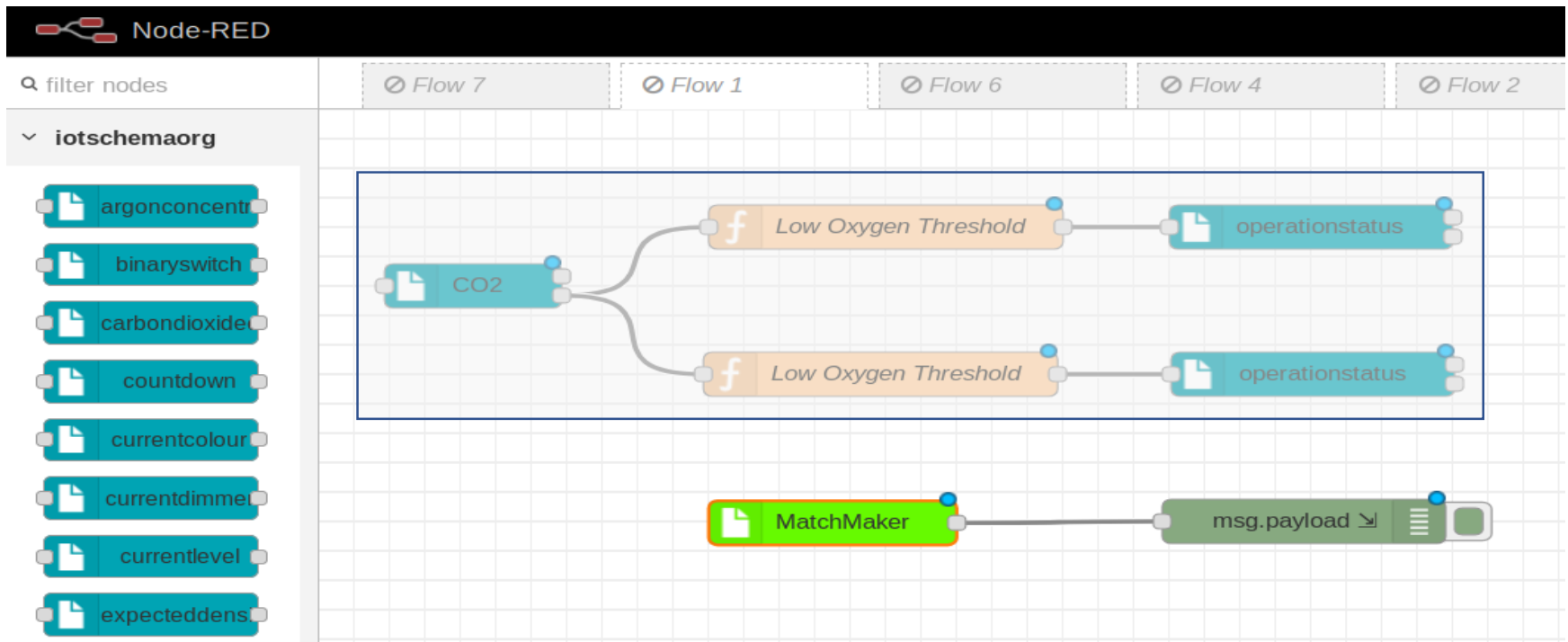
iotschema: Semantic Mark-Up for W3C WoT Thing Description

The image displays the Node-RED web interface. On the left, a sidebar lists nodes under the 'iotschemaorg' category, including 'argonconcent', 'binaryswitch', 'carbondioxide', 'countdown', 'currentcolour', 'currentdimme', 'currentlevel', 'expecteddens', 'expectedfloat', 'expectedflow', and 'expectedtemp'. The main workspace contains a flow with four nodes: 'KETI-CO2-Sensor', 'KETI-TD', 'RotaryBeaconLight', and 'FujitsuTD'. The 'KETI-CO2-Sensor' node is selected, and its configuration panel is open on the right. The panel is titled 'Edit carbondioxideconcentration node' and includes 'Delete', 'Cancel', and 'Done' buttons. Below these buttons, the 'node properties' section is expanded, showing the following configuration:

- Name: KETI-CO2-Sensor
- Interaction Pattern Type: `iot:CarbonDioxideConcentration`
- Capability: AmbientAir
- Feature Of Interest Type: Room
- Feature Of Interest: `iot:TPAC-Room`
- PropertyType: float
- UnitCode: PartsPerMillion
- Observable: False

Semantic Recipe

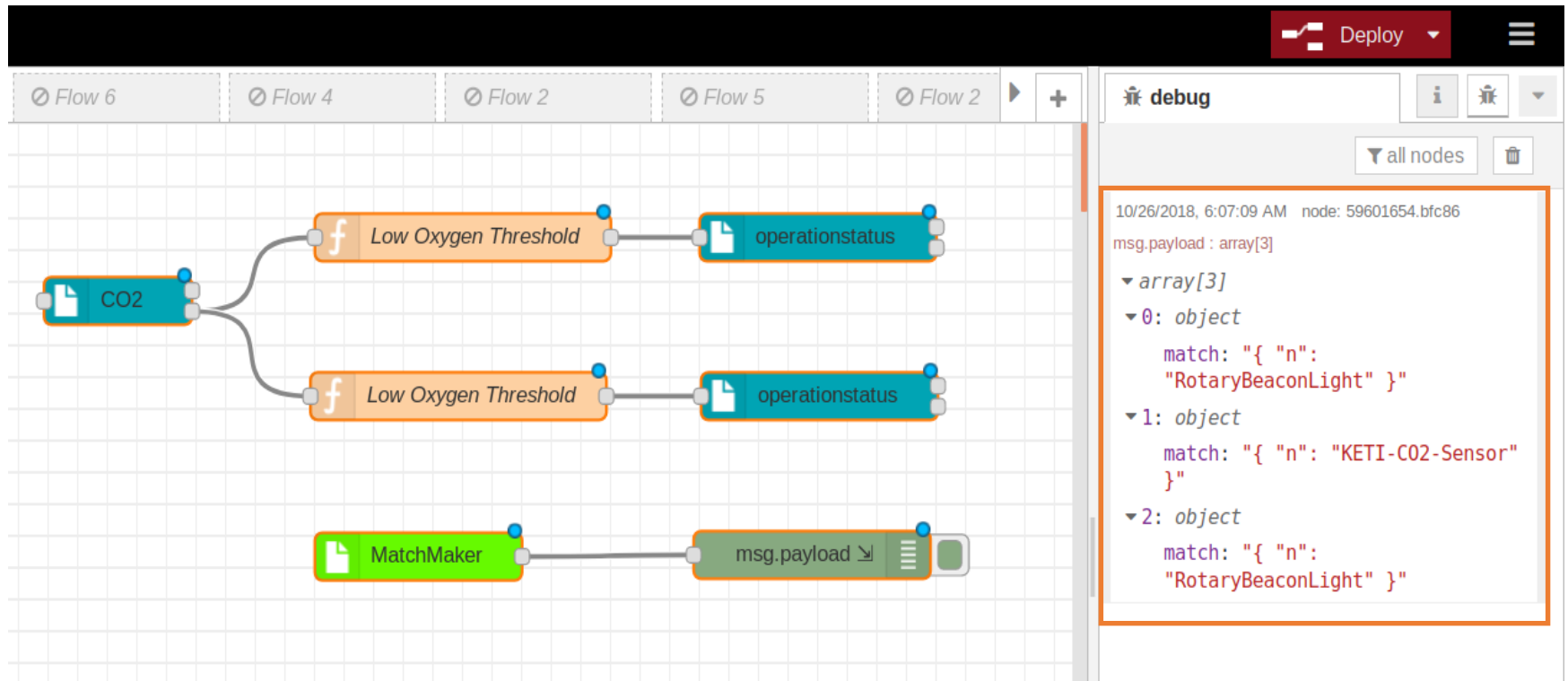
Reusable Flow Template



MatchMaker:

- finds Things that can implement the Recipe
- based on TD with iot.schema.org mark-ups

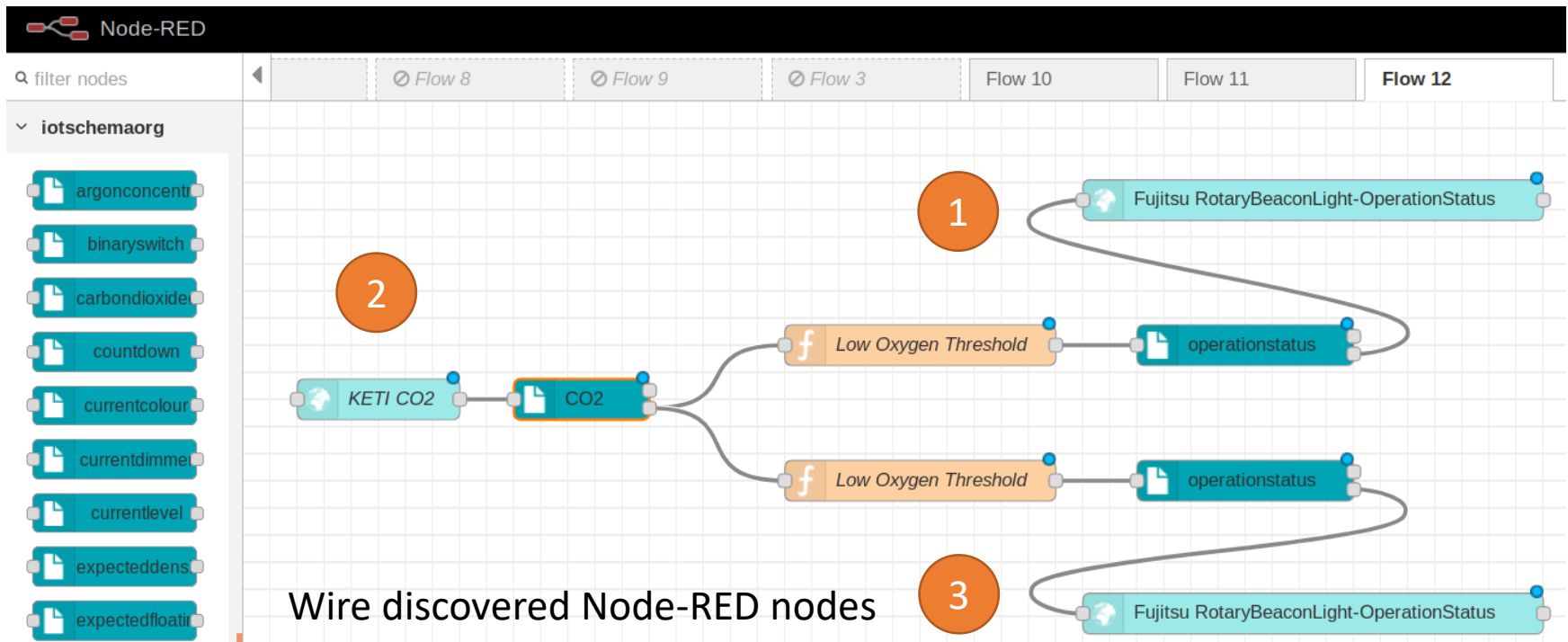
Semantic Discovery of Recipe Ingredients



Ingredients are Node-RED Nodes

Example: Controlling Carbon Dioxide

Node-RED Application with W3C WoT Things



Thank You!

Q & A