iot.schema.org

WoT Status Review

October 26, 2018

Topics

- Work on automating consumed and exposed APIs
- SSN Workshop
- Charter
- Explainer and introductory slides
- Integration with schema.org
- Definition tools
- Work on modeling target ecosystems
- Developer-user tools
- Going forward

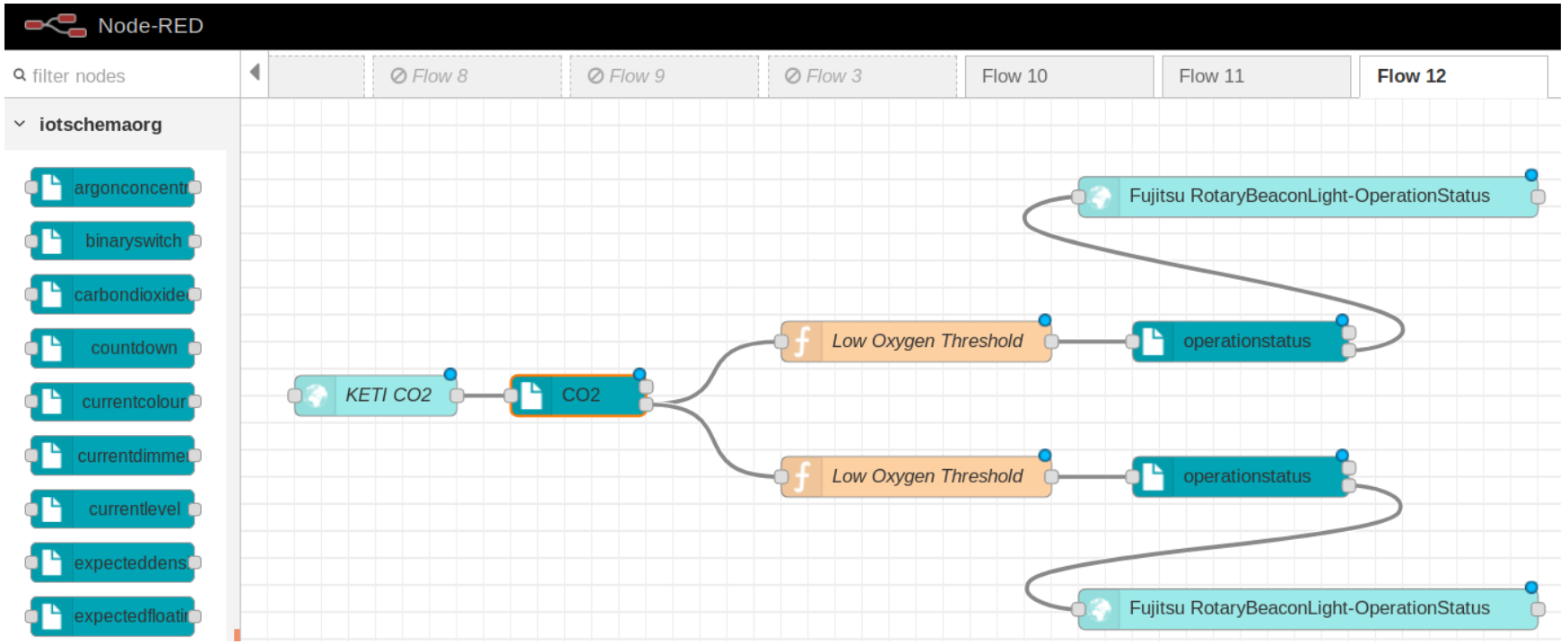
iot.schema.org for Node-RED

Semantic Interoperability

- iot.schema.org embedded in Node-RED tool
- Easies use of semantics for WoT developers
- Simplify creation of applications with W3C WoT
- Demonstrates semantic discovery and processing
- Handsome tool for WoT PlugFests

Example: Controlling Carbon Dioxide

Node-RED Application with W3C WoT Things



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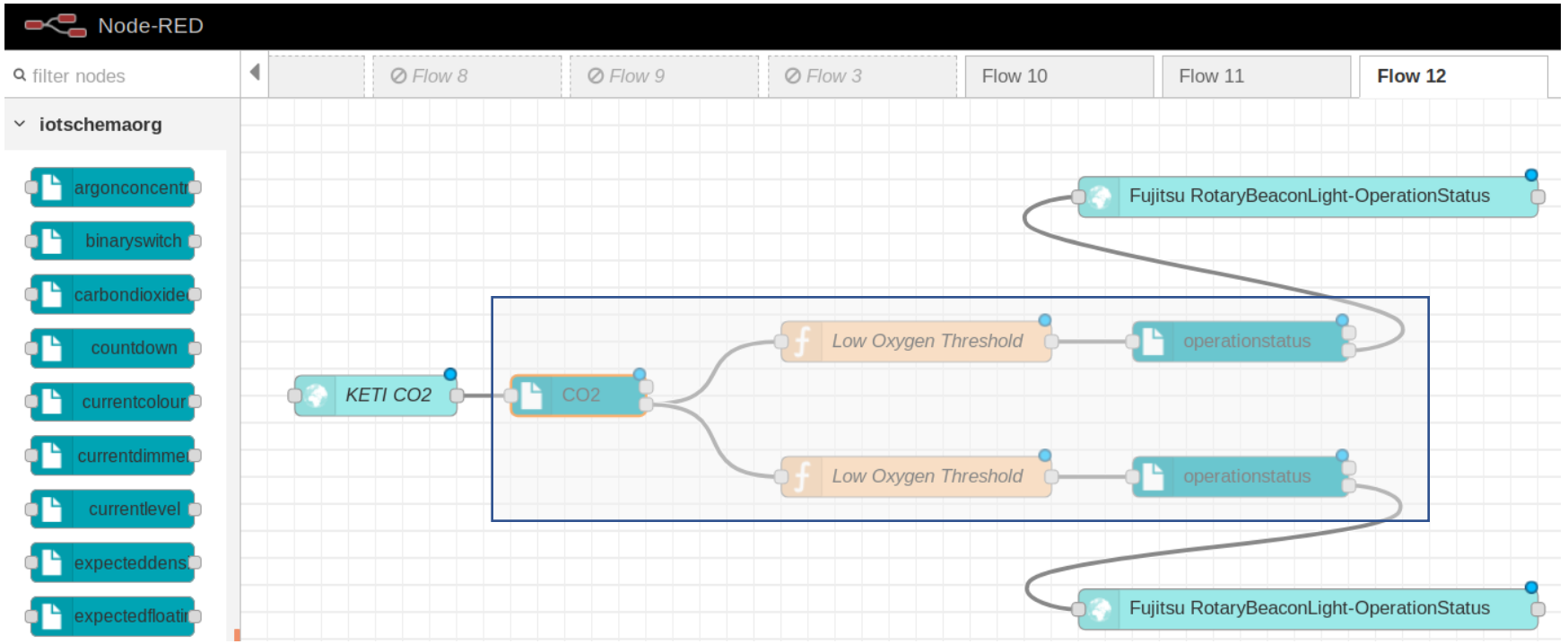
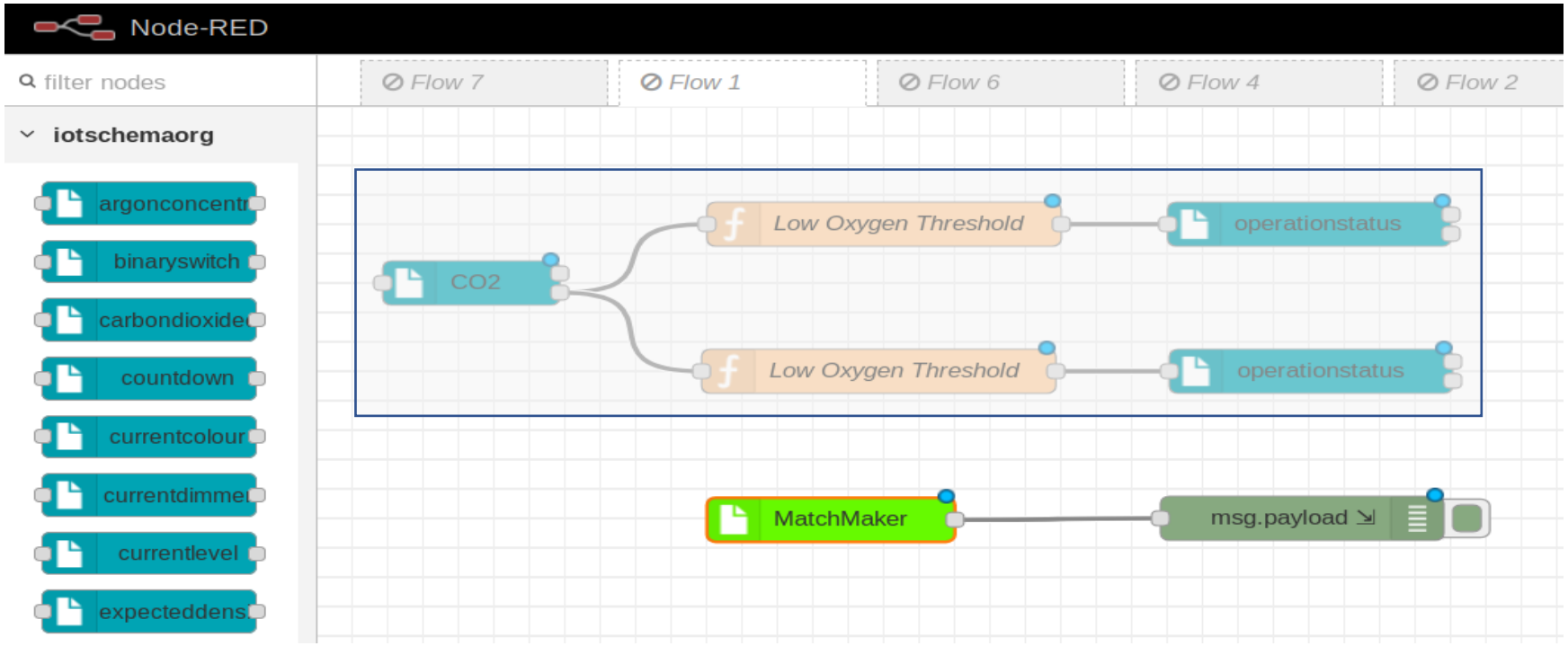


Semantic Recipe

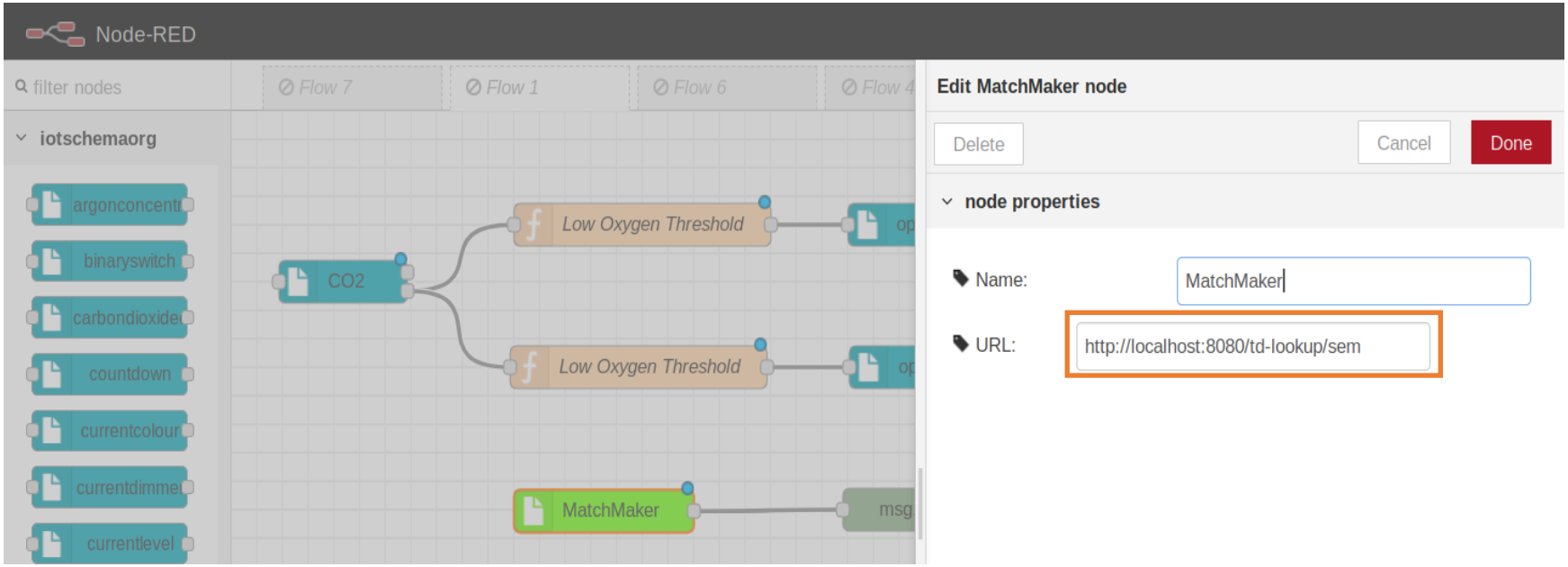
Reusable Flow Template



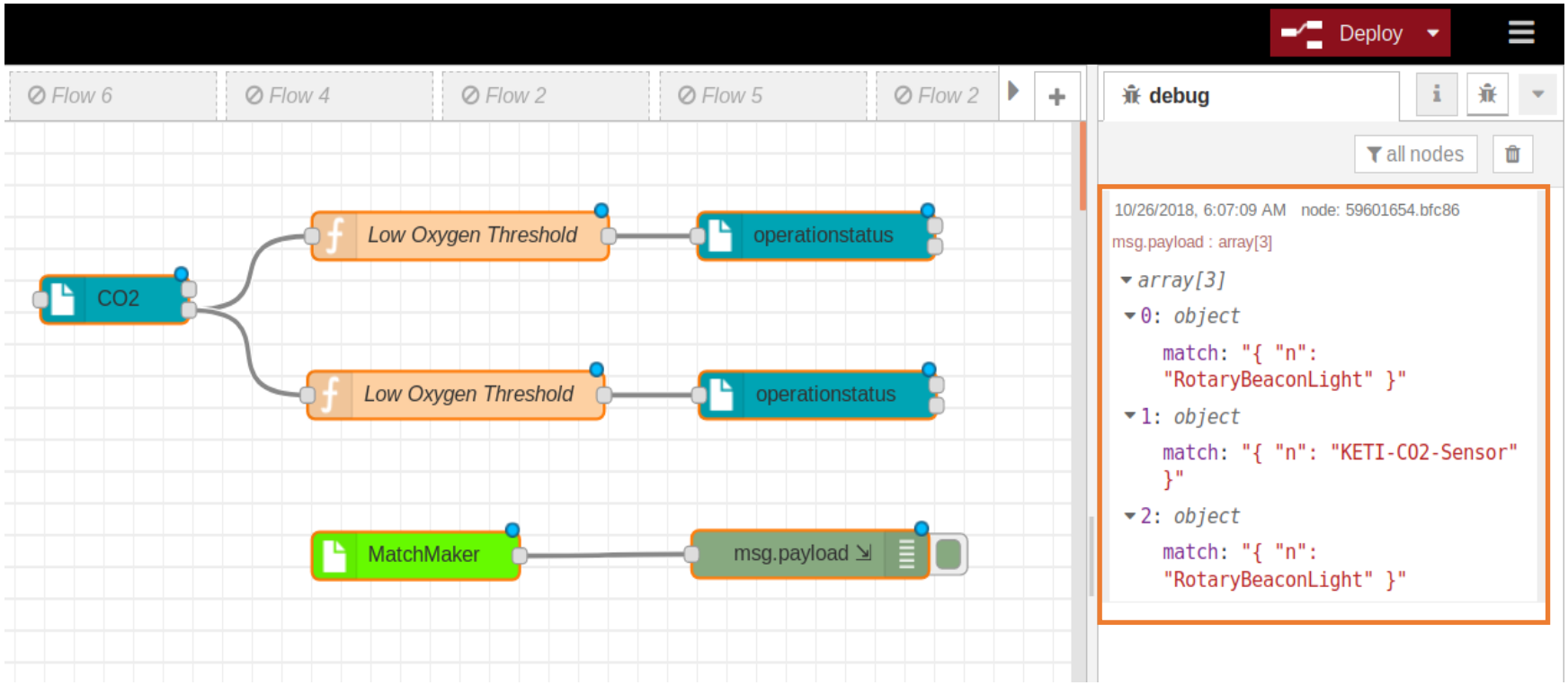
MatchMaker:

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

Configure Thing Description Directory



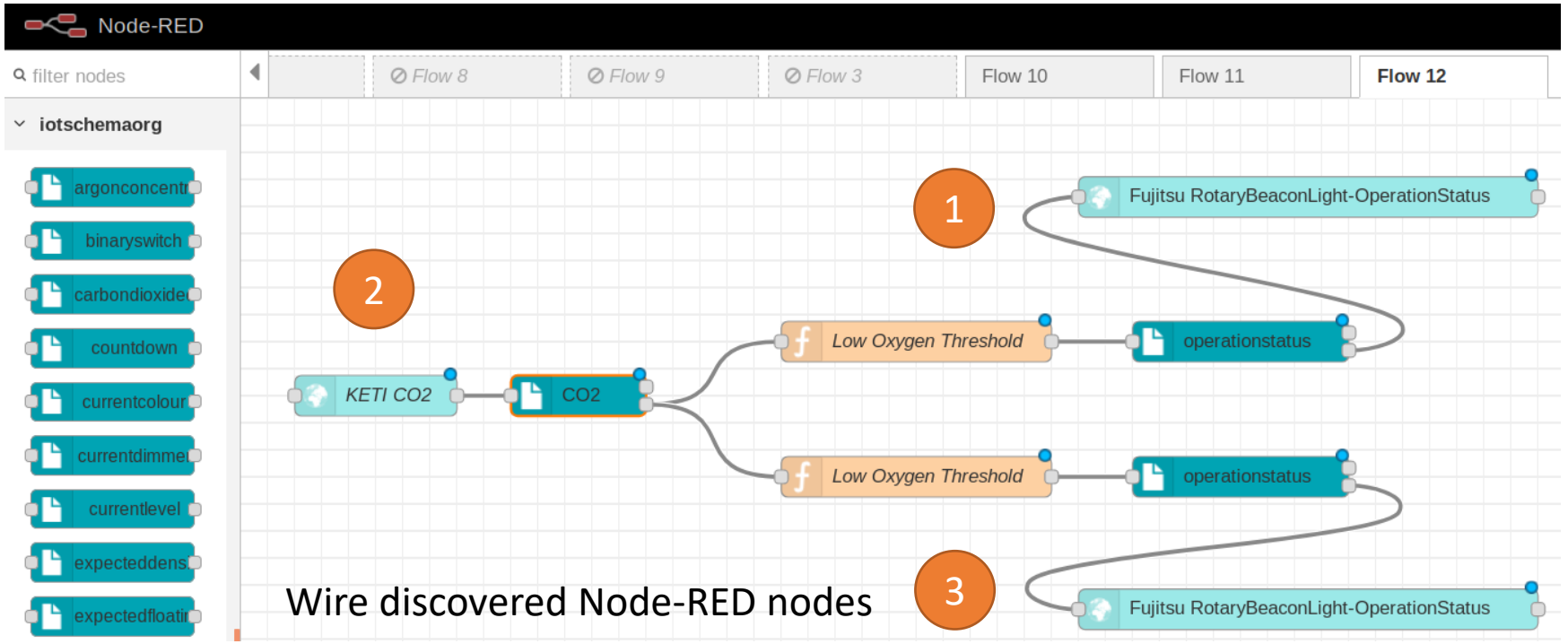
Semantic Discovery of Recipe Ingredients



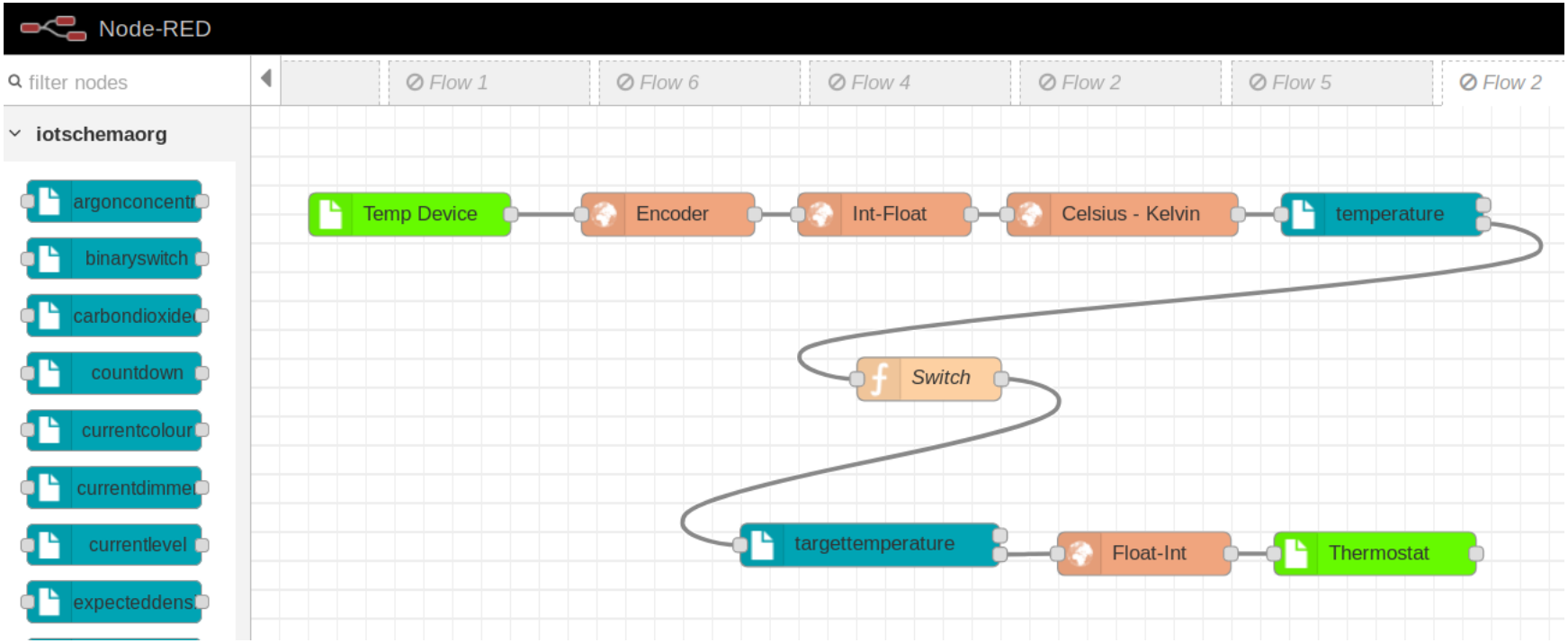
Ingredients are Node-RED Nodes

Example: Controlling Carbon Dioxide

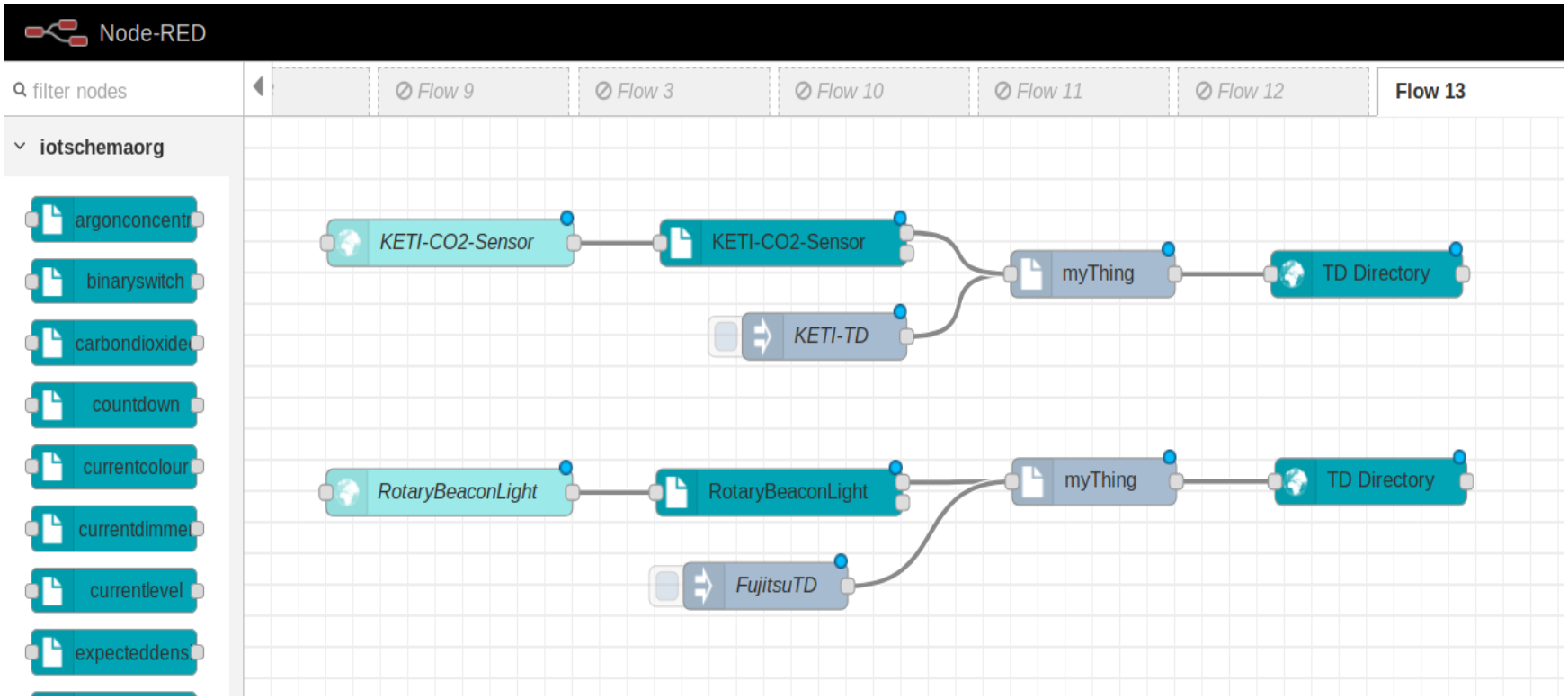
Node-RED Application with W3C WoT Things



Semantic-Based Adapters



iot.schema.org: Semantic Mark-Up for W3C WoT Thing Description



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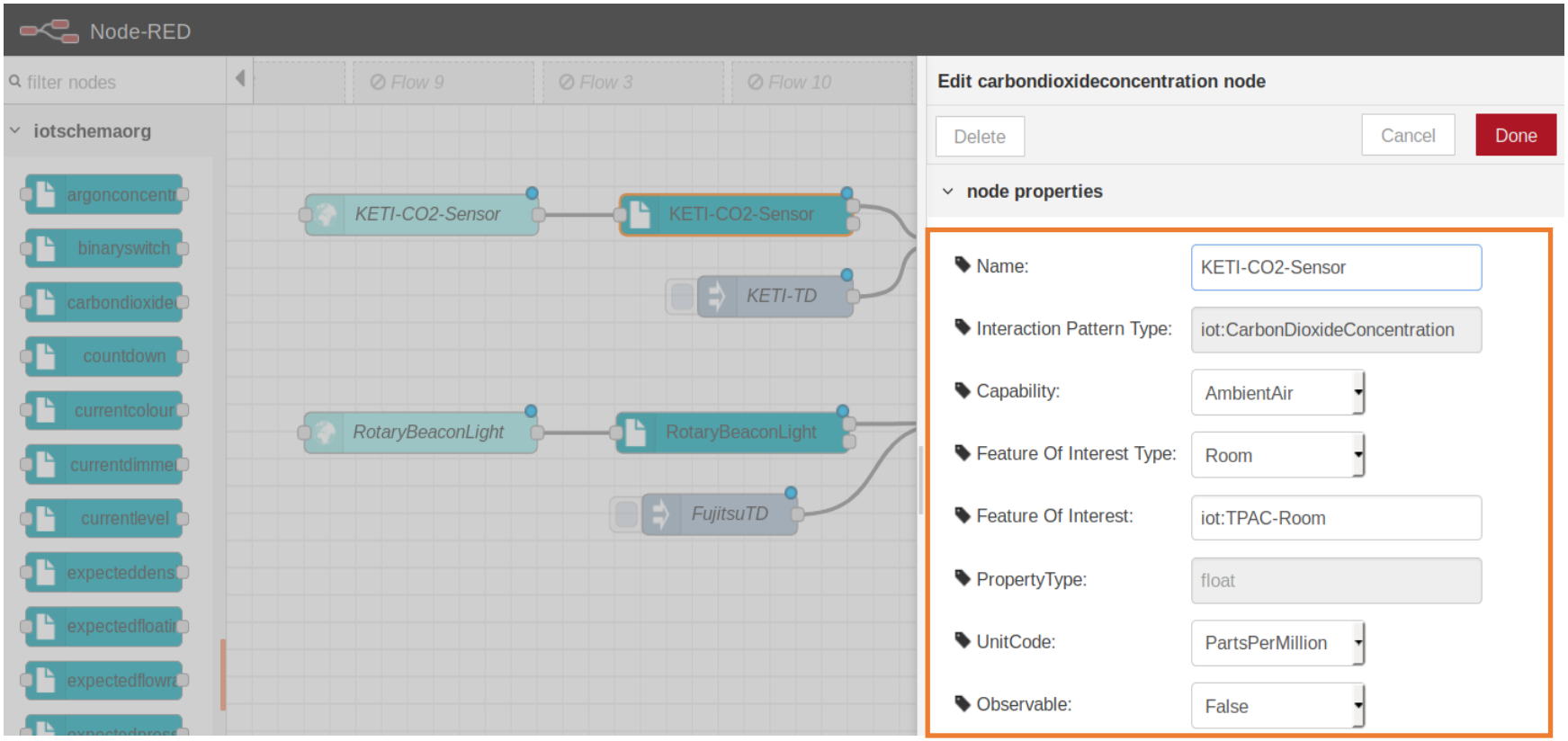


SSN Workshop at ICSW2018

- Presented iot.schema.org at the SSN Workshop last week
- Presentation is in the teleconferences folder
- Discussion:
  - Action, Event, Property terms are badly overloaded
  - When will the definitions be available on schema.org?
  - How do we create and use definitions?
  - What tools are available for definitions and annotation
  - How do we use definitions with existing device ecosystems?

SSN Workshop (contd)

- Presentations on Automotive, Building Management, Home Care use cases
- Clear focus on Feature of Interest concepts
- Gap analysis for Semantic IoT
  - Taxonomy of Observable Properties
  - FoI Vocabularies
  - Sensor/Actuator Vocabulary
  - Vocabulary for processes and procedures

Organization

- W3C CG Charter
- Introductory materials
  - Explainer
  - Slide set for introduction
  - SSN workshop slides
- Integration with schema.org
  - May not be a sub-domain, e.g. become part of schema.org
  - We need to enable the schema browser for iotschema definitions

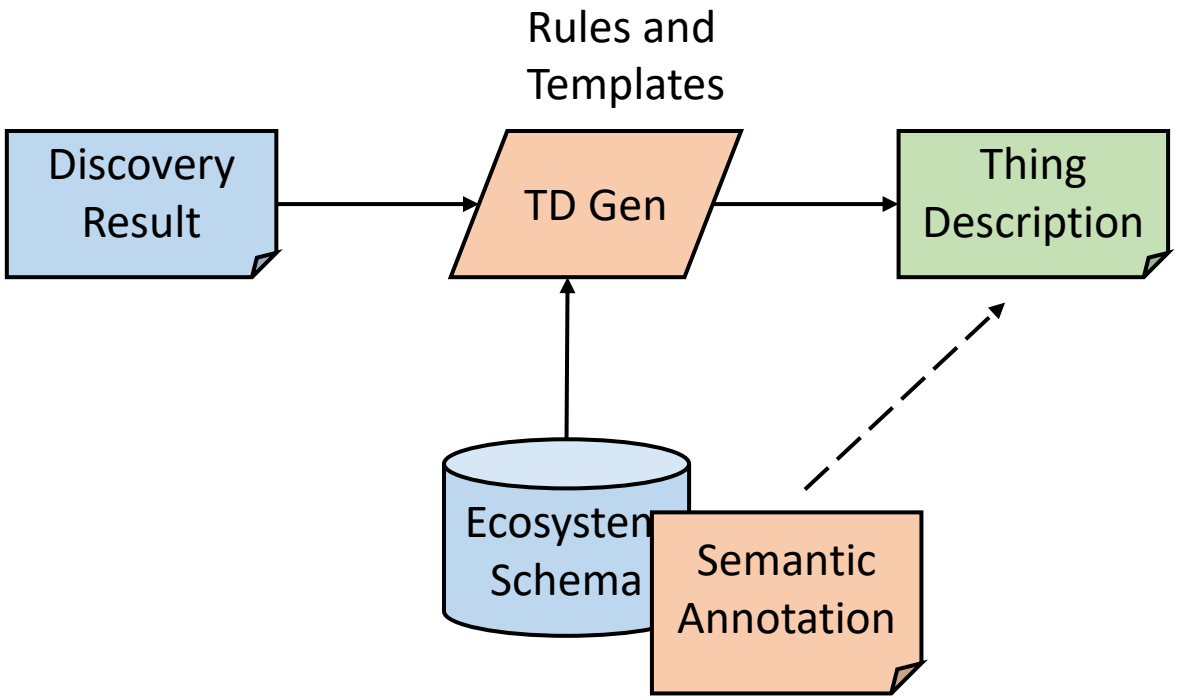
Developer tools

- How to create and maintain definitions
- How to use definitions in deployed systems
- **How to apply definitions to existing device ecosystems and FoI definitions**
  - OMA LWM2M
  - OCF
  - W3C WOT Thing Description
  - Genivi VSS
  - Haystack/Brick
  - What about Amazon Alexa, SmartThings, etc.
  - Other APIs using OAS/Swagger, HAL, JSON Hyperschema

Applying iot.schema.org definitions to existing ecosystems

- Existing definitions in some machine-readable format
  - XML, JSON-Schema, JSON, others e.g. YAML
- Annotate the definitions with Semantic terms to describe affordances
  - JSON-LD schema can be annotated as in WOT TD
  - Other annotation techniques (WISHI Research)
  - Use existing definition or create new definitions
- Generate hypermedia controls from the annotated definitions
  - TD Generator
  - Other annotations of instances

Process


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

Annotation of a JSON Schema fragment using JSON-LD

```
{
  "type": "object",
  "properties": {
    "name": "bri",
    "@type": ["iot:LevelData" ],
    "type": "integer",
    "min": 0,
    "max": 254
}
```

- Annotated schema is used to generate hypermedia controls for instances
- E.g. a link with a target attribute containing the annotation

Going Forward

- Set up the CG
- schema.org integration
- Accept definitions for target ecosystems
  - LWM2M/IPSO (Ericsson), OCF, SmartThings
- Would like to work with IIC to create testbeds for semantic interoperability

Upcoming Teleconferences

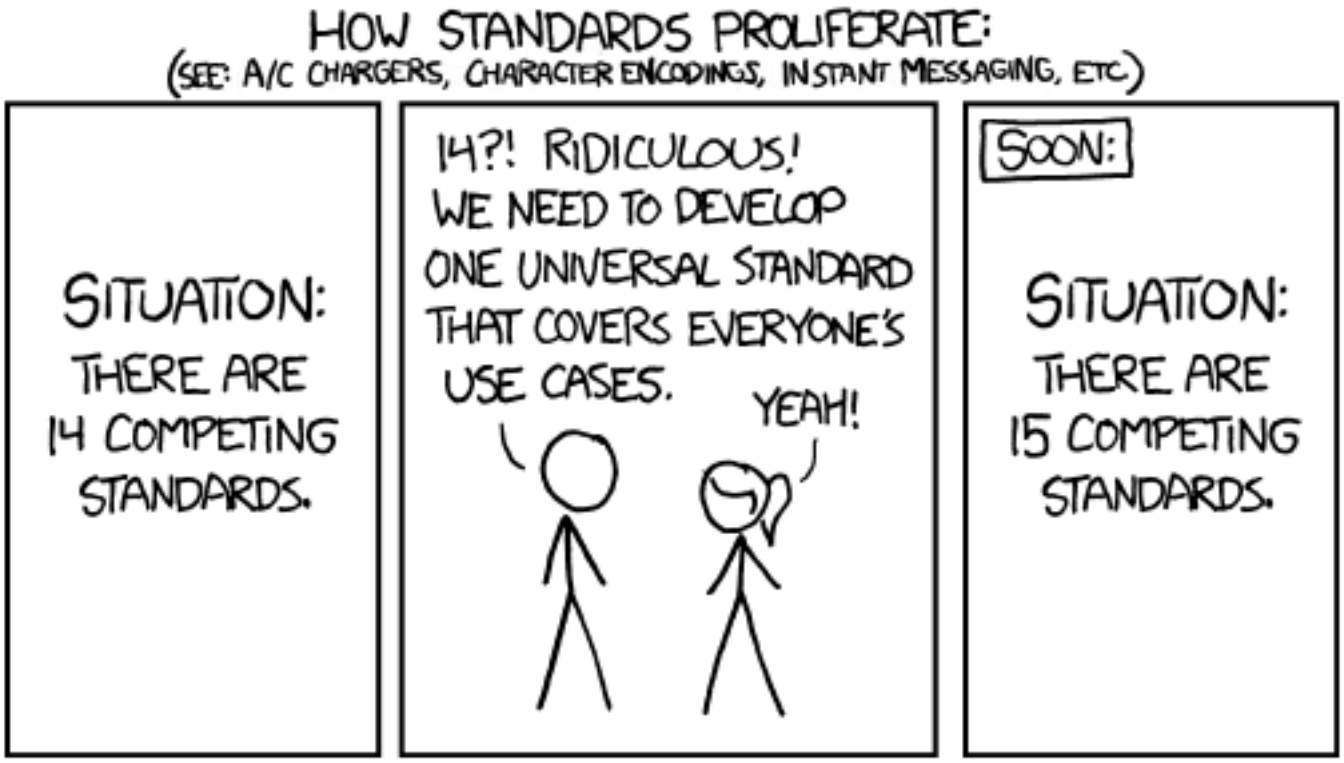
- Dr. Amelie Gyrard – Semantic Web of Things
  - Industry-wide survey of existing definitions
- Bruce Nordman – Lawrence Berkeley Laboratory
  - Device descriptions for energy monitoring

SSN Workshop Exit Keynote (condensed)

ISCW 2018

October 9, 2018

This is the Problem being solved:

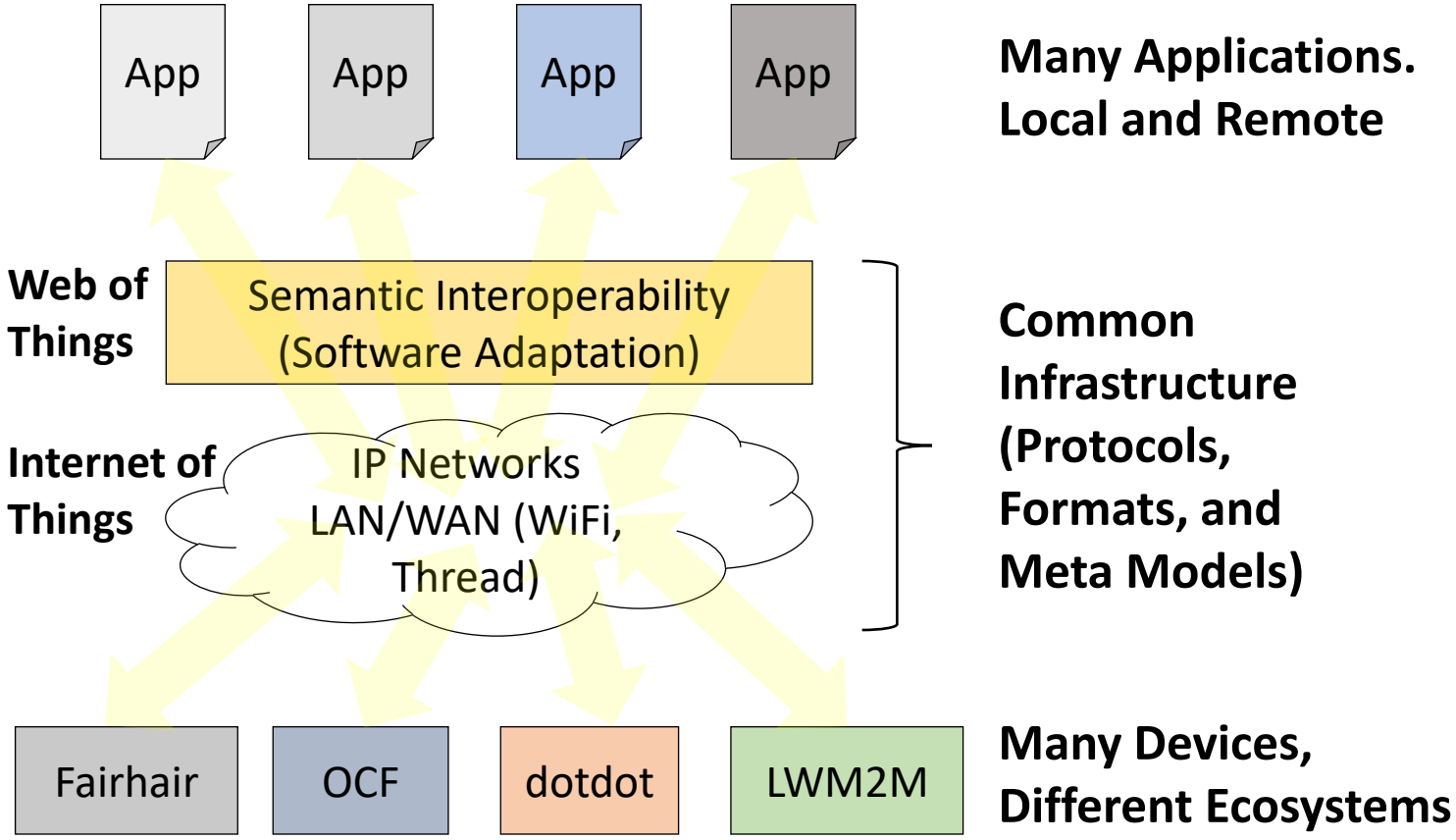


Source: https://xkcd.com/927/

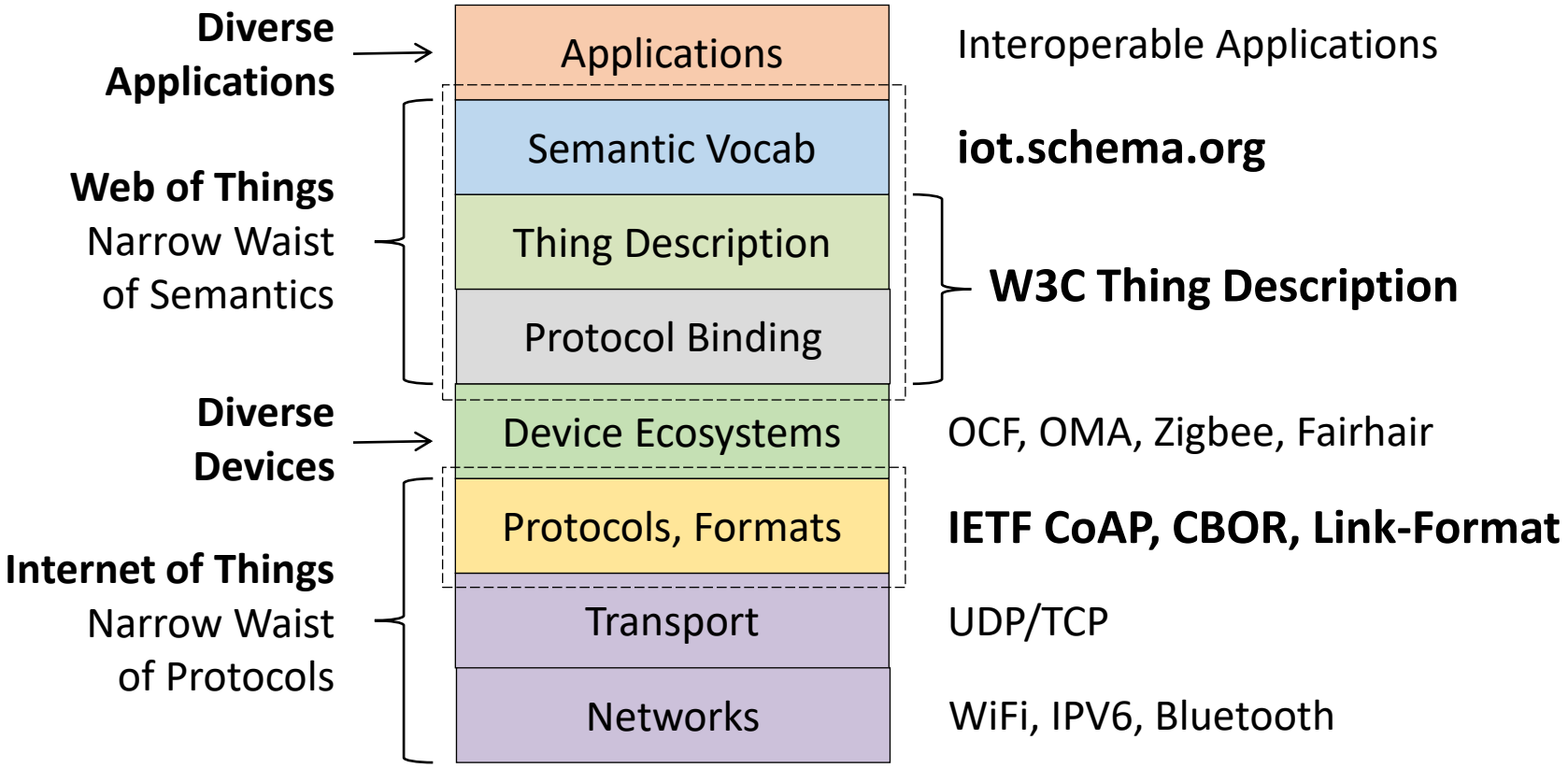
Problem being solved – Semantic Interoperability for IoT

- Acknowledge the diversity of IoT device ecosystems
  - Not another device standard
  - Adaptive to diverse protocol, language, and data models
  - Distill the common and stable operational features
  - Second "narrow waist" for systems above IP networks
- Address the ease of use of Semantic Web for IoT and use of IoT for Semantic Web
  - Not another IoT ontology
  - A conceptual layer that models connected things in relation to existing ontologies

Narrow Waist in System Design

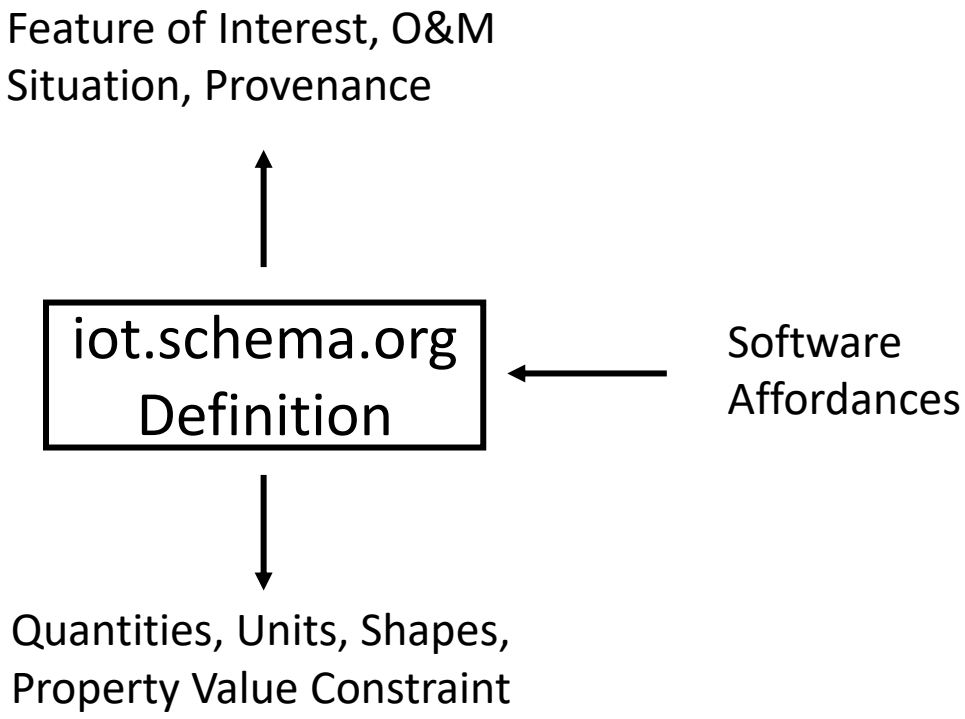


Diverse Devices and Applications, Common Protocols and Semantics



Integration with other Ontologies

Enables Well-Characterized interactions with Physical Entities



Connect things to the real world