



Rapid IoT Application Development using the Web of Things

Second W3C Workshop on the Web of Things

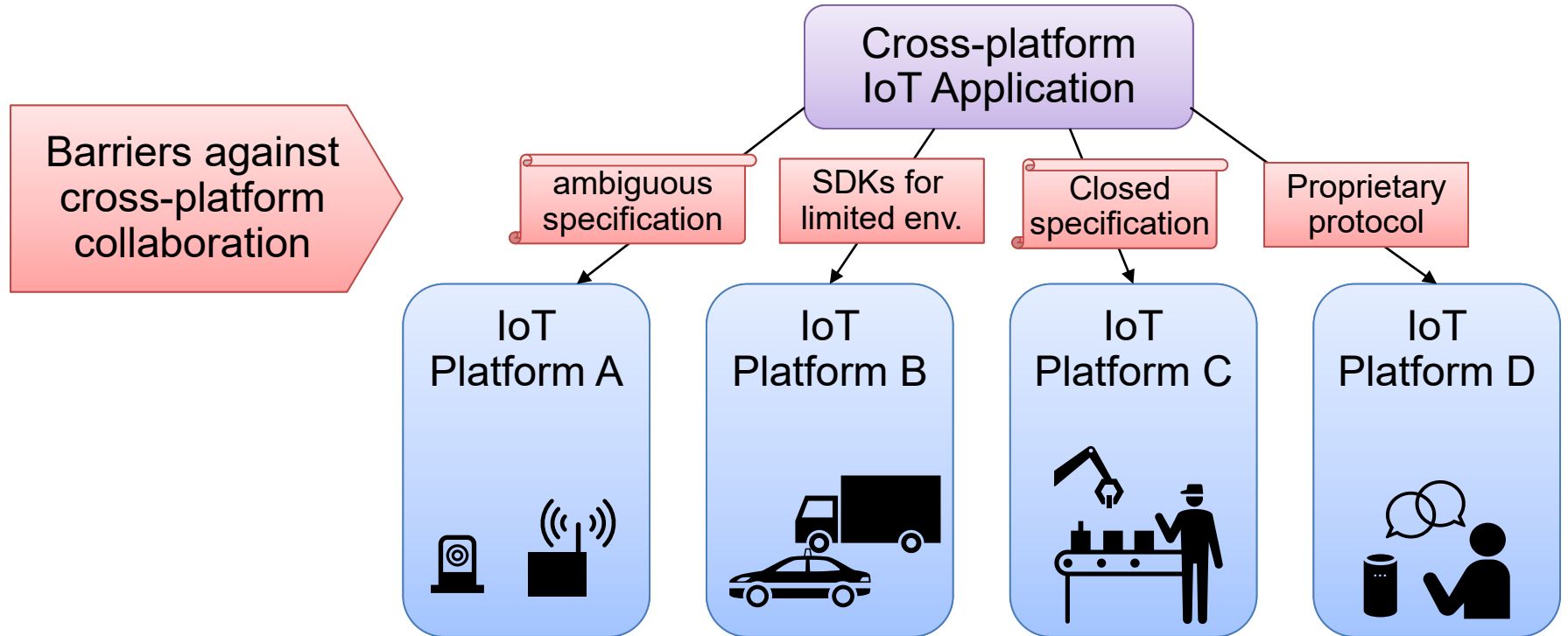
4 June 2019

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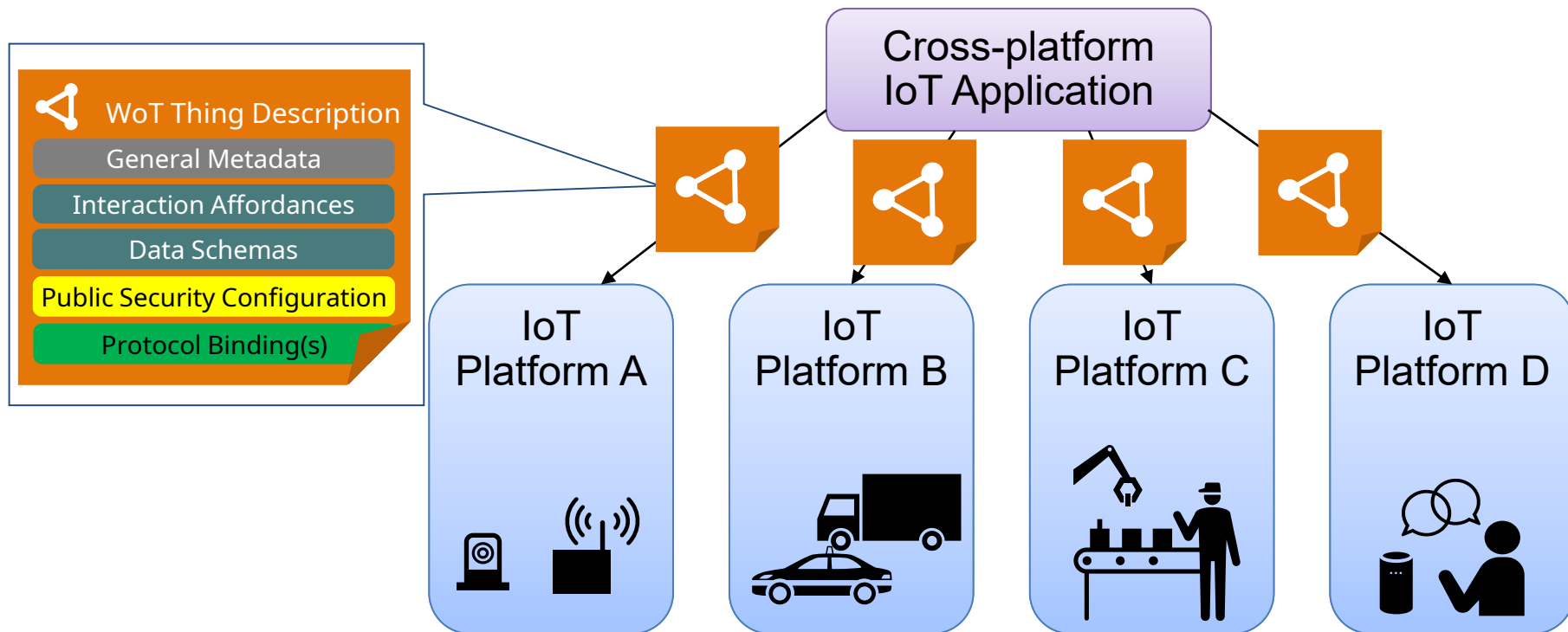
1. Current Issues in IoT Application Development

To connect things beyond their domain and platform,
we must go through the barrier of interoperability.



2. Web of Things Thing Description

WoT Thing Description describes each IoT Platform and Things, and Applications use the TD as an open specification of each PF or Things.



3. Rapid IoT Application Development Environment

Node-RED is widely used in IoT application development field, because of its intuitive programming user interface.

- Node-RED is a flow-based programming environment for IoT application.
- Developing application is simple: place and connect the “nodes”.

The screenshot displays the Node-RED web interface in a browser window. The address bar shows the URL `localhost:1880/#flow/dcc44995.d627b8`. The interface includes a search bar for nodes, a palette of available nodes, and a central workspace for building flows. A flow is visible with the following nodes: a `tcp:18080` node, a `function` node, and an `http request` node. A comment node above the flow reads "Listen TCP socket, and relay to Web API". The right-hand panel shows the information for the selected `function` node, including its ID, name, and type.

Information	
Node	"edb05661.e7c6b8"
Name	function
Type	function

Description

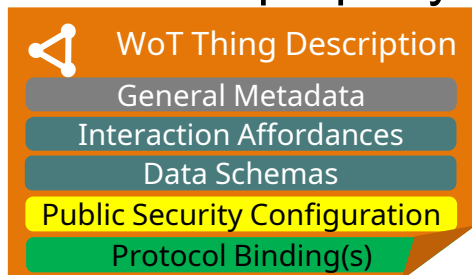
A JavaScript function block to run against the messages being received by the node.

The messages are passed in as a JavaScript object called `msg`.

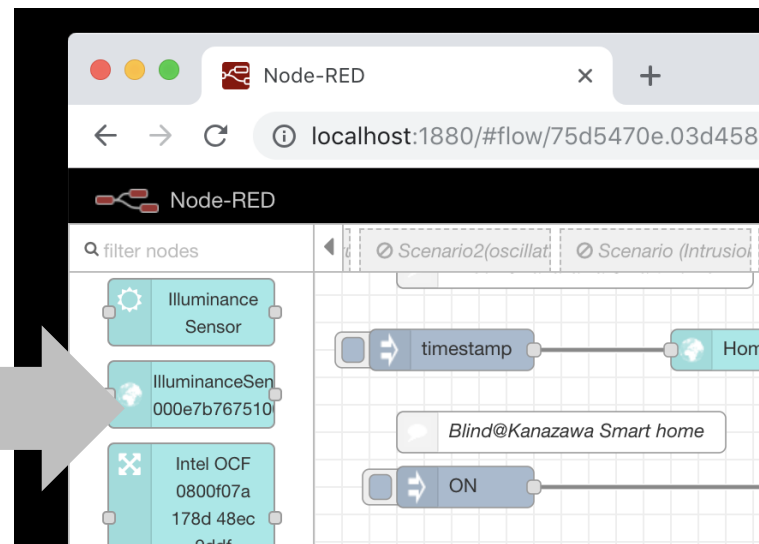
3. Combine Node-RED with the Web of Things

“Node Generator” simplifies IoT application development by generating Node module of Node-RED from a Thing Description

- By generating a Node, developer can handle a Node as an avatar of a Thing.
 - To write a property of the Thing, send message and its payload will be written.
 - To read a property, send a message as a trigger, and then the Node emit a message which contains a value of the property.



Node
Generator



4-1. How to Use: Preparation

1. Clone repository

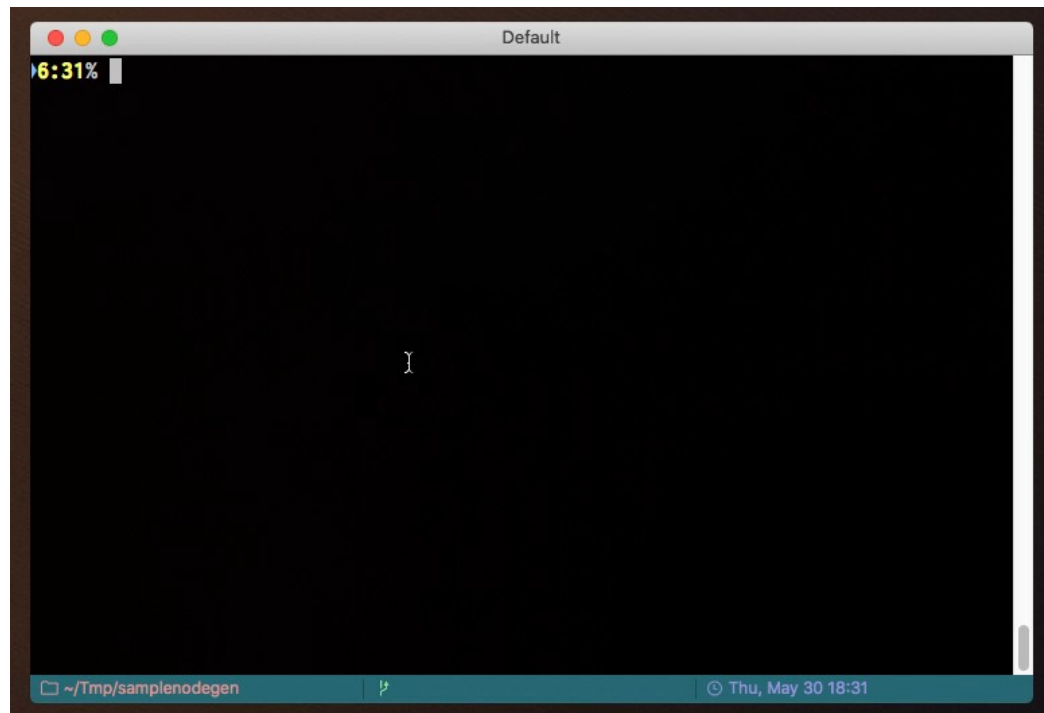
```
% git clone https://github.com/k-toumura/node-red-nodegen.git  
% cd node-red-nodegen  
% git checkout webofthings
```

2. Install dependent packages

```
% npm install
```

3. Run node-red-nodegen

```
% ./bin/node-red-nodegen.js
```



4-2. How to Use: Generate and Install a Node Module

1. Generate a Node module

```
% ./bin/node-red-nodegen td.jsonld
```

2. Install dependent packages

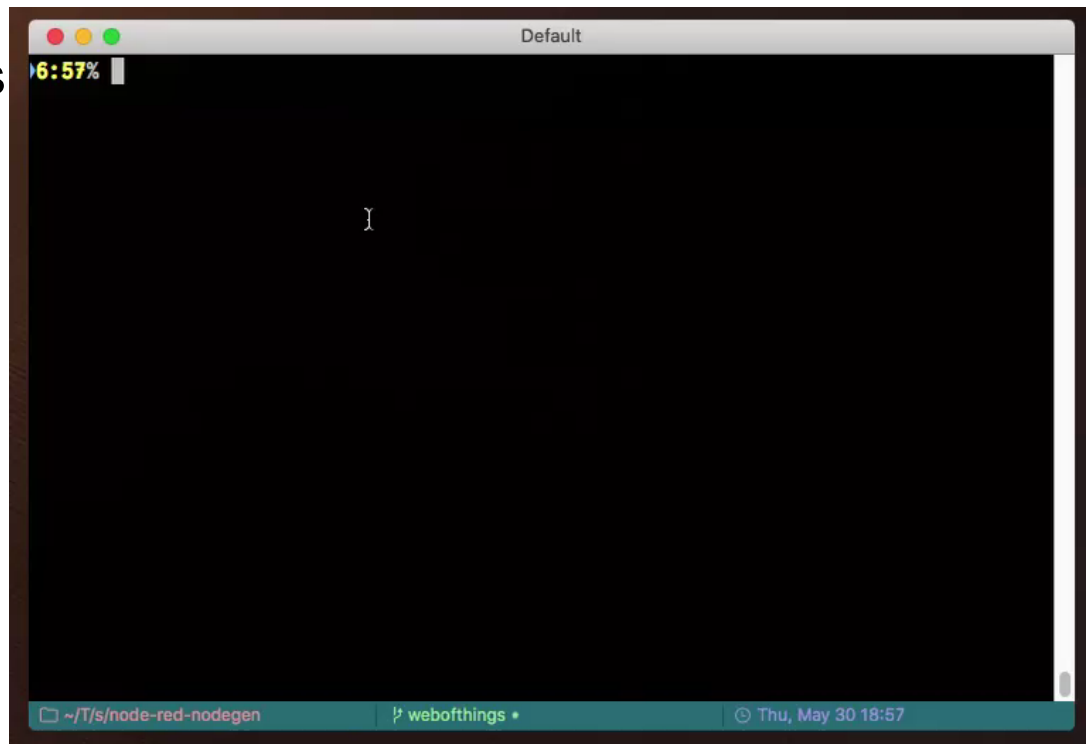
```
% cd ~/.node-red
```

```
% npm install
```

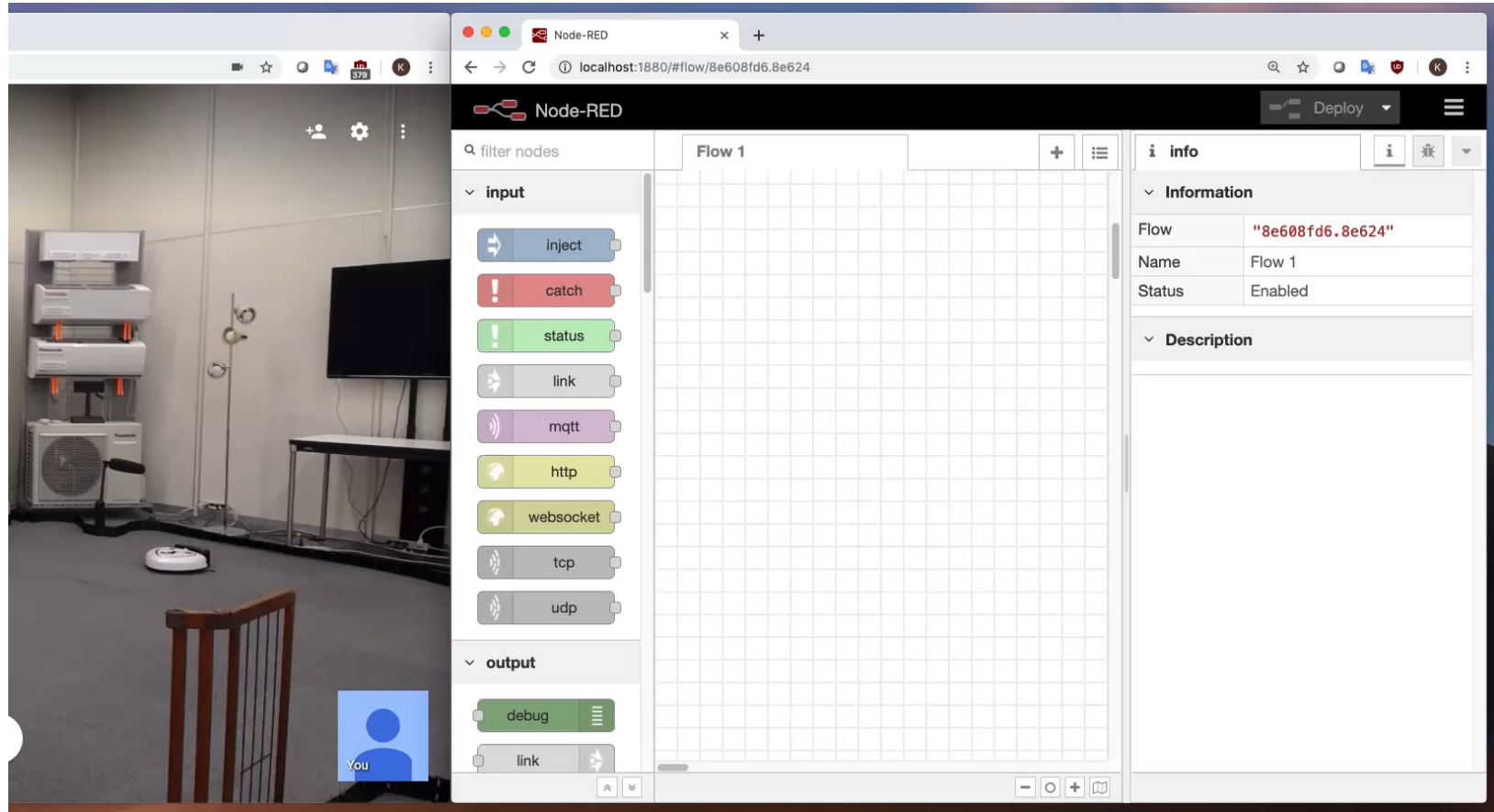
```
    generated-module-dir
```

3. Run Node-RED

```
% node-red
```



4-3. How to Use: Write a Simple Application



The screenshot displays the Node-RED web interface in a browser window. The browser's address bar shows the URL `localhost:1880/#flow/8e608fd6.8e624`. The interface is divided into several sections:

- Left Panel:** A list of nodes categorized into 'input' and 'output'. The 'input' nodes include inject, catch, status, link, mqtt, http, websocket, tcp, and udp. The 'output' nodes include debug and link.
- Center Panel:** A grid workspace titled 'Flow 1' where nodes can be placed and connected.
- Right Panel:** An 'info' sidebar showing details for the selected flow. It includes an 'Information' section with the following data:

Flow	"8e608fd6.8e624"
Name	Flow 1
Status	Enabled

Below this is a 'Description' section which is currently empty.

In the bottom-left corner of the interface, there is a small blue circular icon with a white silhouette of a person, labeled 'You'.

4-4. How to Use: Control the Thing using Dashboard

The image displays the Node-RED web interface. On the left, a browser window shows the 'Node-RED Dashboard' at localhost:1880/ui/#/07... with a 'Home' page containing a 'Default' section and a 'switch' control. The main interface shows a 'Flow 1' workspace with the following nodes and connections:

- A 'switch' node (initially 'off') is connected to a 'PanasonicHueGroupP1-operationStatus' node.
- A 'colour picker' node is connected to a 'change: 4 rules' node.
- The 'change: 4 rules' node is connected to a 'PanasonicHueGroupP1-rgbValue' node.

The 'dashboard' sidebar on the left lists various widget types: button, dropdown, switch, slider, numeric, text input, date picker, colour picker, form, text, gauge, and chart.

Simplify device integration process in IoT Application Development

- Developers need not to care about details of network protocol to interact with Things.
 - Detailed information is encapsulated in Thing Description, and Node Generator use them to generate specific protocol binding codes.
- Developers can get appropriate information of Things from Editor UI.
 - need not to search another document separately
 - can concentrate to implement logics that create real customer values.

Semantic Metadata may gain Developer's Productivity

- Semantic search/discovery of Thing Description
 - Recommend a related Node in Node-RED Editor UI
- Automatic reconciliation of message content between Nodes
 - Eliminate boilerplate coding for connecting Things
- Utilize Web links to incorporate other useful information of Things on Editor UI.
 - Manuals, pictures, contact person, support forum, etc.

END

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