INTEL OpenSource TECHNOLOGY CENTER

IoTivity: The Open Connectivity Foundation and the IoT Challenge

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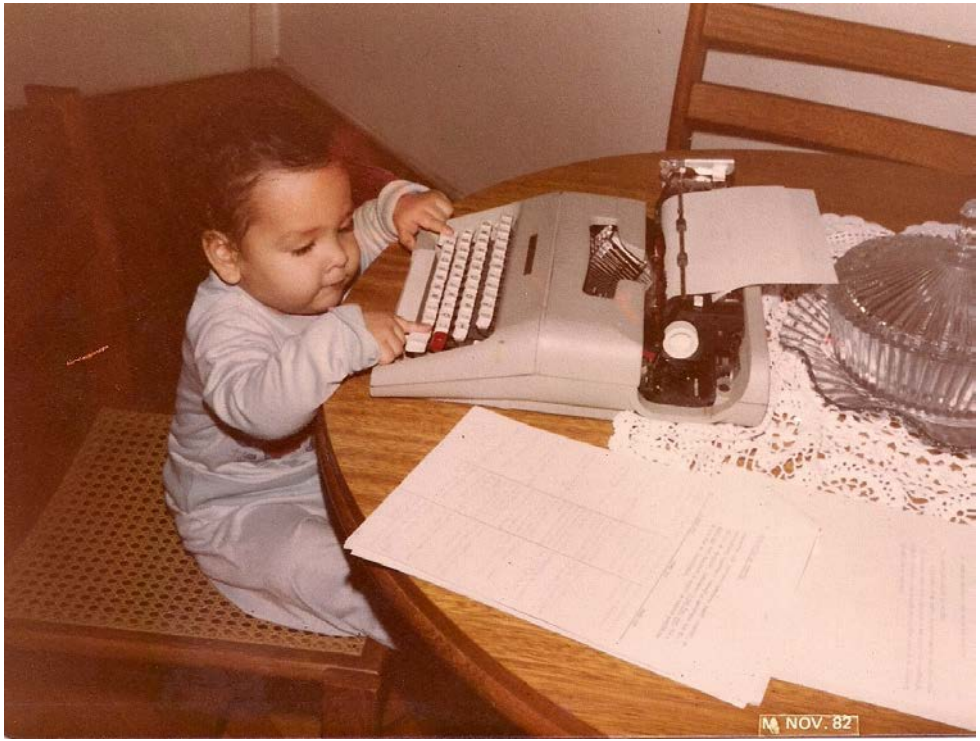
Who am I?



OPEN CONNECTIVITY FOUNDATION™

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ALLSEEN ALLIANCE

About the Open Connectivity Foundation

Specification

Defines OCF framework including standard model for IoT devices, apps & services to interact

Stop fragmentation and increase device orchestration by creating a common **standard for IoT** device **connectivity**

IoTivity Open Source

Delivers reference implementation of OCF framework & translation layers for non-OCF devices

Ease developer burden through **open source code** availability and **royalty-free license**

Certification

Ensures interoperability via compliance and interop testing

Ensure interoperability through a formal **testing and certification** program

OCF Vision

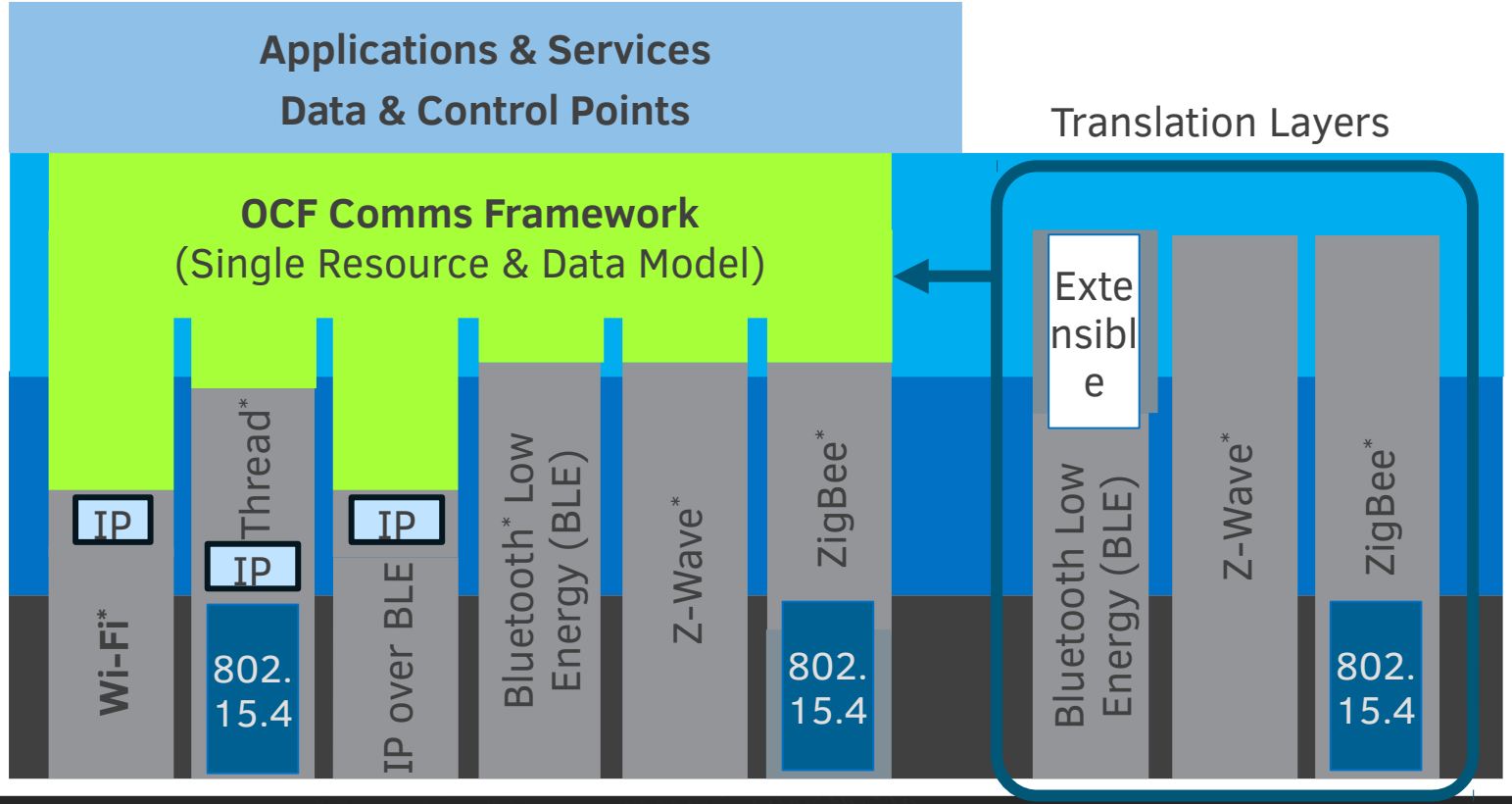
Deliver an IoT connectivity standard that is…

- Open
- Free
- Seamless
- Technology Agnostic
- Fair & Accessible
- Cross Industry
- More Secure
- Structured

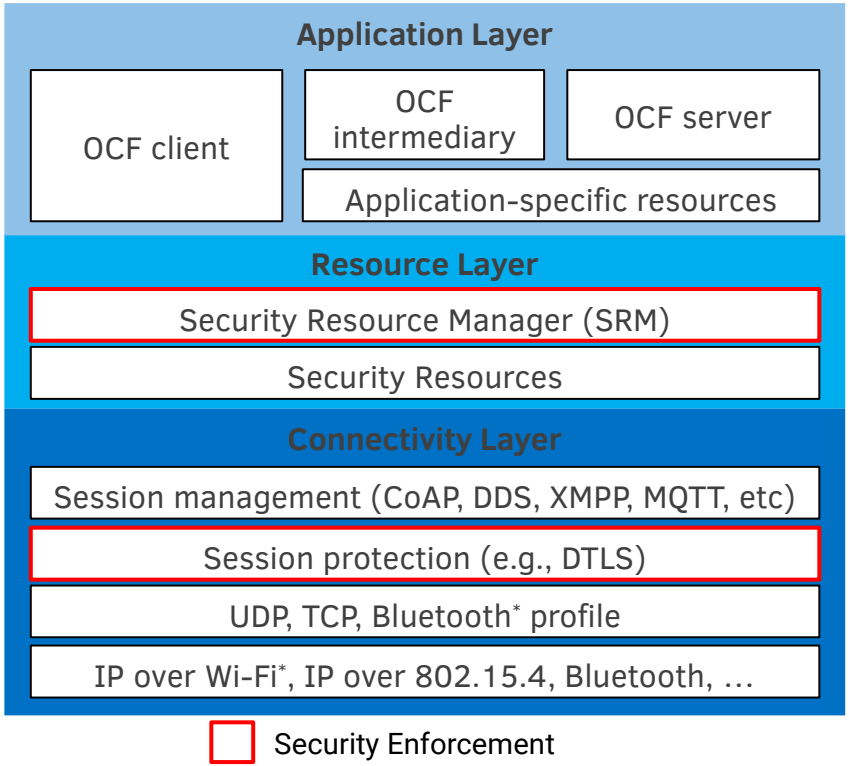
OCF Current members

For Gold, Basic and non-profit members, see openconnectivity.org

Where the stack sits



OCF Protocol Stack



- **Based on standard technologies**
  - Does not require TCP (only UDP)
- **Security built in from the start**
  - "Security 2.0" will be end-to-end
- **Hardening left as an exercise for the manufacturer**

Core Protocol

- **OCF adopted RESTful APIs**
- **Core framework defines 2 logical roles that devices can take:**
  - OCF Server : A logical entity that exposes hosted resources
  - OCF Client : A logical entity that accesses resources on an OIC Server

- **OCF Client**

  1) Initiate an transaction (send a request)

  2) access an OCF Server to get a service

- **OCF Server**

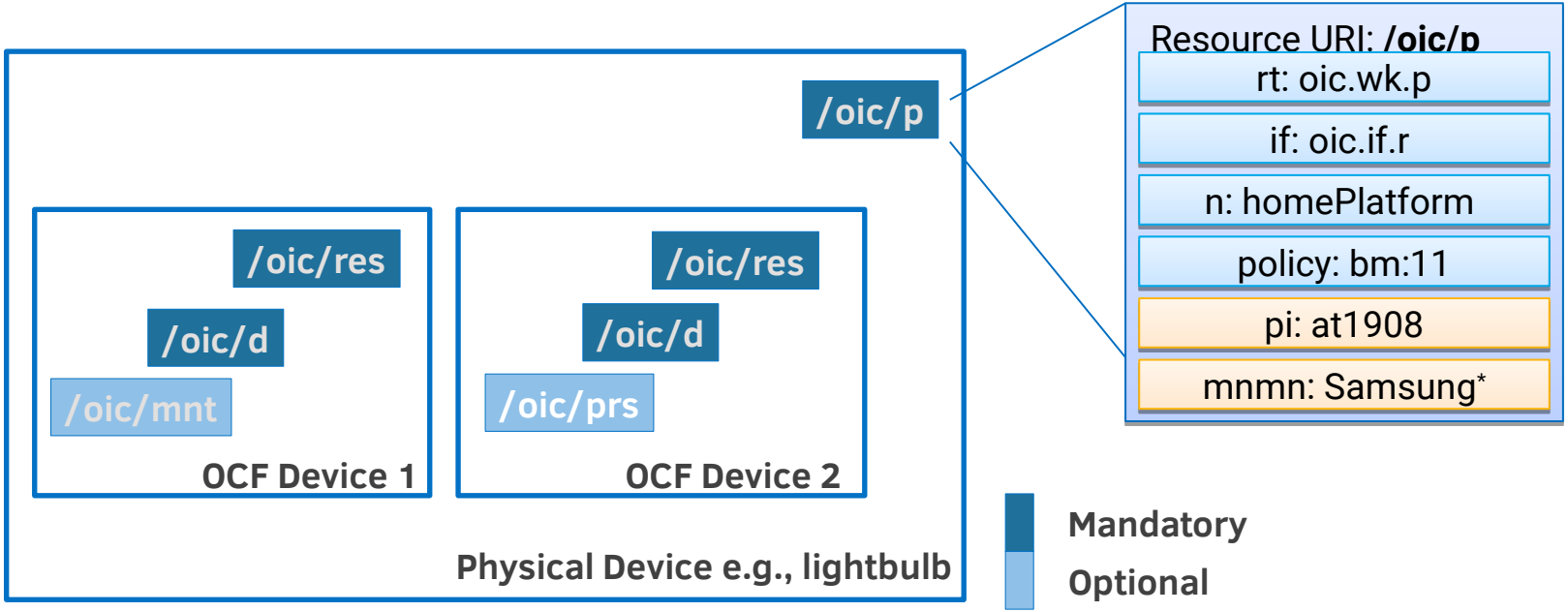
  1) host a Resource

  2) send a response

  3) provide a service

Organisation of an OCF device

Device concept:

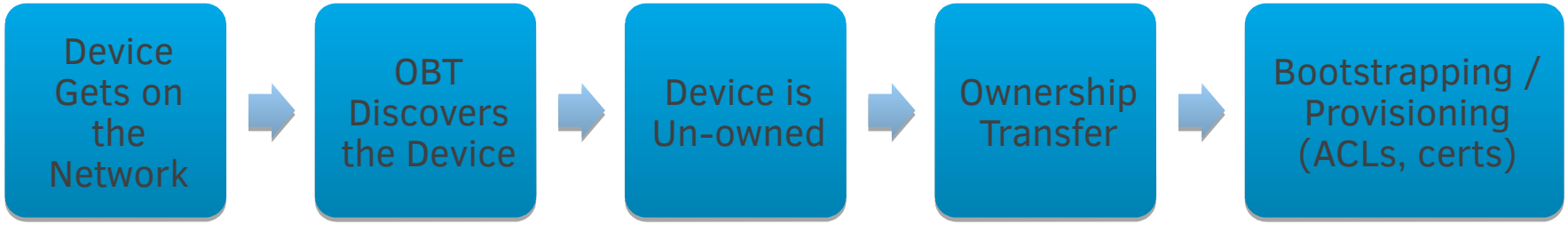


Device Example: Light Device (oic.d.light)

- **Example overview**
  - Smart light device with i) binary switch & ii) brightness resource
- **Device type: Light device (oic.d.light)**
- **Associated resources**

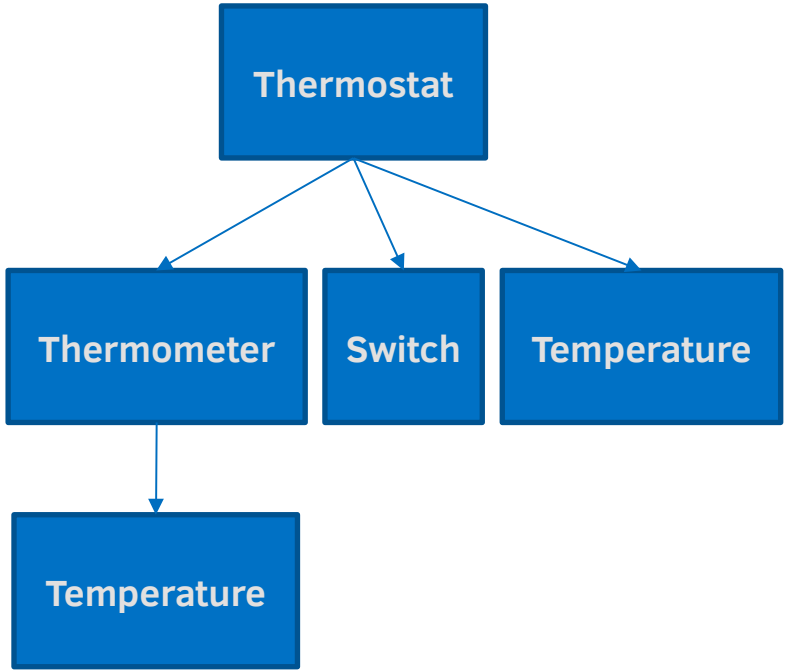
Device Title	Device Type	Associated Resource Type	Mandatory
Light	oic.d.light	/oic/res (oic.wk.core)	**Yes**
		/oic/d (**oic.d.light**)	**Yes**
		Binary switch (oic.r.switch.binary)	**Yes**
		Brightness (oic.r.light.brightness)	No

Ownership transfer and bootstrapping



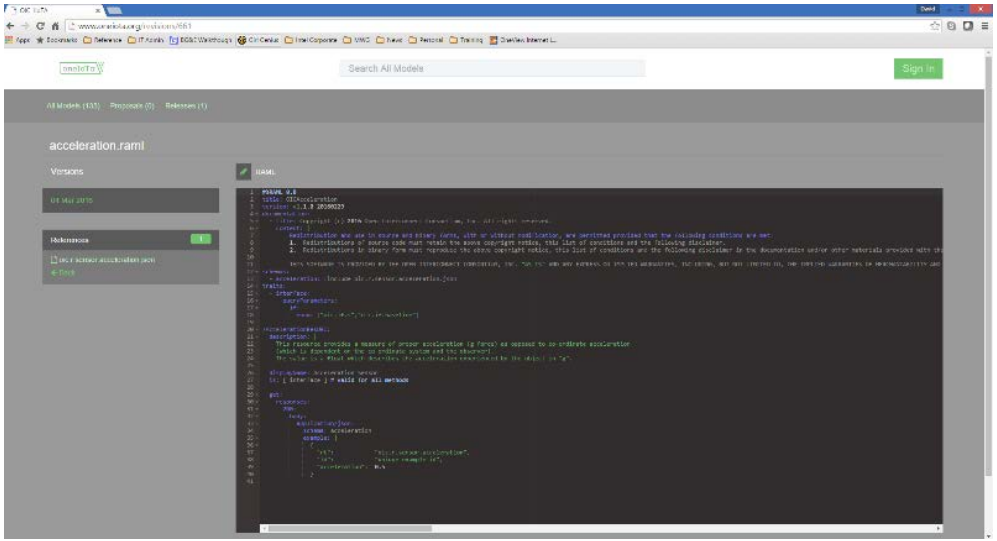
OCF Data Models

- **Starts with definition of individual elements**
  - Built on generic description strategy (e.g., RAML, JSON schemas)
  - Starts with physical properties (e.g., temperature, mass, color …)
- **Devices are comprised of collections of elements / properties**
  - Including previously defined devices
- **Abstract devices can also be defined**
  - (e.g., Joe's house, upstairs bedrooms …)



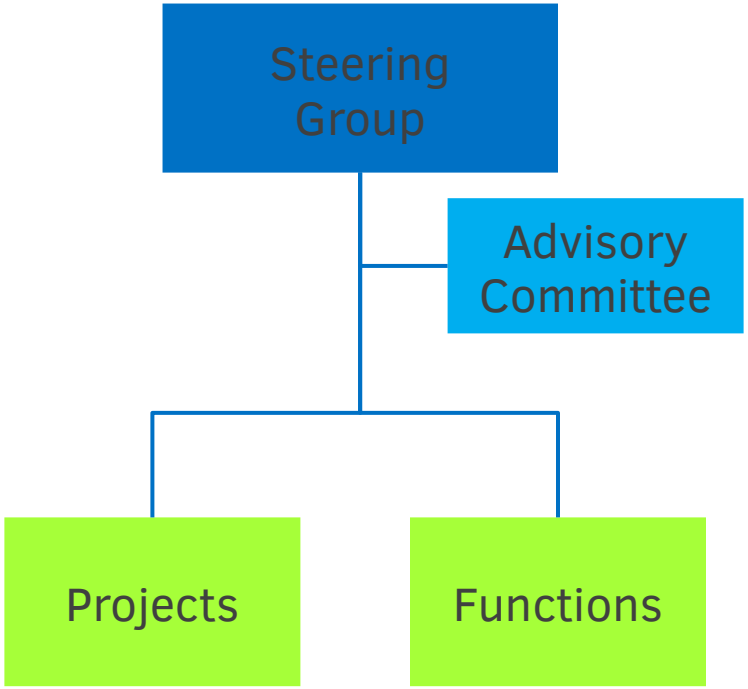
oneIoTa.org

- **A crowd-sourced Integrated Development Environment (IDE)**
  - RAML & JSON validated and syntax aware editors with shared editing
- **Automatic support for derived models and multiple organizations**
- **Submission and approval process per organization**



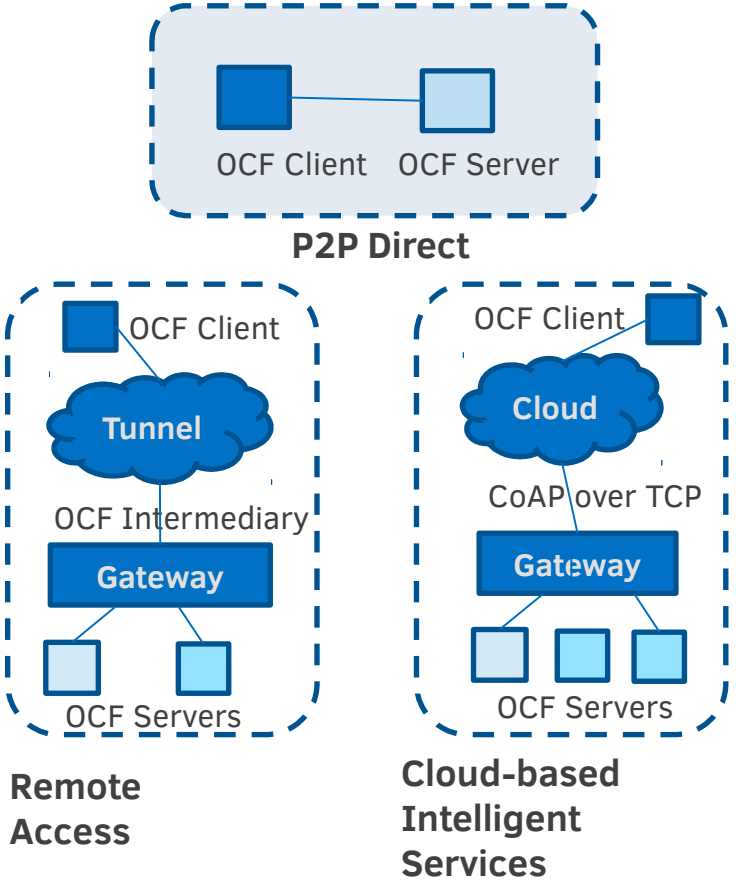
IoTivity Project Overview

- **An Open Source Project, hosted by the Linux* Foundation**
  - License: Apache Version 2.0
- **Goal: implement the reference implementation of OCF specification**
- **Meritocratic, fair and open development process**



IoTivity Main reference implementation

- **An open source software framework implementing OCF Standards**
- **Available on Android*, Linux*, Tizen* and Windows***
- **Notable features:**
  - CoAP over TCP and over Bluetooth* LE
  - Bridge plugins to other ecosystems
  - Cloud integration



Other IoTivity reference implementations

IoTivity for constrained devices

- Designed from scratch for small devices (e.g., Intel® Quark™ family)
  - Static memory allocation
- Fully compatible with OIC 1.1 specification and main IoTivity
- Support for Linux* and Zephyr

See session on IoTivity Constrained

IoTivity for Node.js*

- API in JavaScript*, provided as an npm package
- “Feels” native for Node.js developers
- Easy to integrate with other Node.js packages for richer experience

IoTivity for Node.js* API Sample

Client

Promise findResources();
Promise retrieve(id);
Promise update(resource);
Promise observe(id);
Events:
    resourcefound

Server

Promise<resource> register(data);
Events:
    retrieverequest
    updaterequest
    observerequest

Resource

Events:
    update
    delete

IoTivity for Node.js* Example Code

```
var device = require("iotivity-node")();

device.configure({role: "client"});

device.on("resourcefound", function(event) {
      console.log("client: resource found %s", event.resource.id.path);

      if (event.resource.id.path == "/a/light") {
            device.retrieveResource(event.resource.id)
            .then(function(resource) {
                  resource.properties.on = !resource.properties.on; // toggle
                  device.updateResource(resource).then(function() {
                        console.log("client: update OK");
                        process.exit(0);
                  });
            });
      }
});

device.findResources();
```

Other IoTivity Projects

- **Bridge to UPnP**
- **Bridge to AllJoyn***
- **Testing tool, with network simulation**

Get Involved!

- Participate in developing the reference implementation
  IoTivity (https://www.iotivity.org/get-involved)

- Participate in creating the specification & certification program
  OCF (http://openconnectivity.org/join)

- Participate in developing the OCF data models
  oneIoTa tool (https://www.oneiota.org)

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