Definitions about properties/actions/events

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Introduction

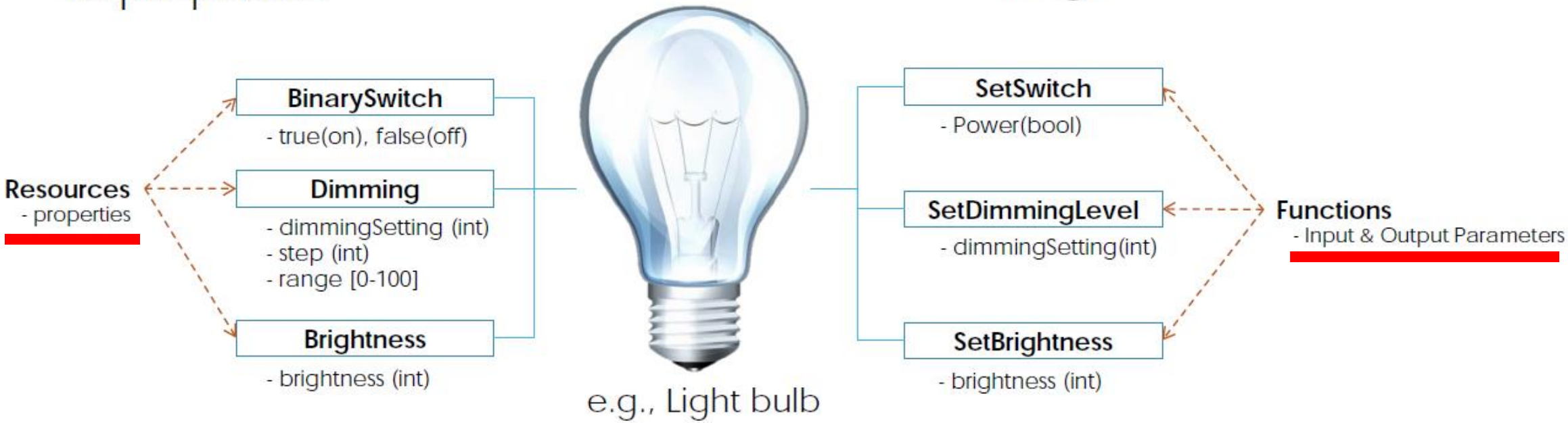
- How to integrate other platforms/protocols like LWM2M or IPSO.
- Two primary models for API design: RPC and REST, for most software developers.

  - gRPC vs REST: Understanding gRPC, OpenAPI and REST and when to use them in API design
  - https://cloud.google.com/blog/products/api-management/understanding-grpc-openapi-and-rest-and-when-to-use-them
  - REST vs RPC: What problems are you trying to solve with your APIs?
  - https://cloud.google.com/blog/products/application-development/rest-vs-rpc-what-problems-are-you-trying-to-solve-with-your-apis

From OCF 2.0.3 Specification overview slides.

Approaches to definition of various Things

- By defining resources of things and its properties
- By defining functions/operations of things



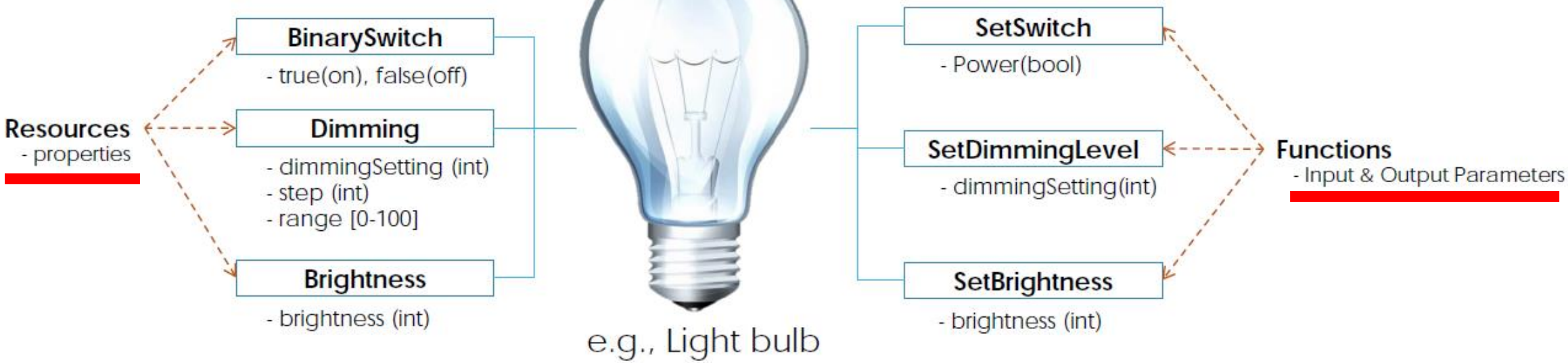
- (no Verbs) + Objects
  *Fixed set of verbs (CRUDN) from transport layer will be used
- Resource model in RESTful Architecture (e.g., W3C, CSEP, etc.)

- (Verbs + Objects)
- RPC model

From OCF 2.0.3 Specification overview slides.

Approaches to definition of various Things

- By defining resources of things and **Properties**
- By defining functions/operations of things **Actions**



- (no Verbs) + Objects
  *Fixed set of verbs (CRUDN) from transport layer will be used
- Resource model in RESTful Architecture (e.g., W3C, CSEP, etc.)

- (Verbs + Objects)
- RPC model

```
"properties": {
        "Switch": {
                "type": "boolean",
                "forms": [⋯]
        },
        "Brightness": {
                "type": "number",
                "forms": [⋯]
        },
},
```

Definition by just properties

```
"properties": {
        "Switch": {
                "type": "boolean",
                "readOnly": true,
                "forms": [⋯]
        },
        "Brightness": {
                "type": "number",
                "readOnly": true,
                "forms": [⋯]
        },
},
"actions": {
        "SetSwitch": {
                "input": {
                        "Switch": "boolean"
                },
                {
                "output": {
                        "Switch": "boolean"
                },
                "forms": [⋯]
        },
        "SetBrightness": {
                "input": {
                        "Brightness": "number"
                },
                {
                "output": {
                        "Brightness": "number"
                }
```

Definition by properties and actions

Property vs. Action

- Devices defined by Properties can be mapped to both Properties and Actions of WoT.
  - But mapping to actions can be a verbose representation.
  - LWM2M, NETCONF, and TR-069(BBF) are defined with Properties.
    - These protocols are used in the device managements.
  - OCF, KNX, BACnet, and ECHONET are defined with mainly Properties.
- Simple to map these protocols to properties rather than actions.

Events

- For devices defined by properties, events are defined as property changes.
  - Simple to map these protocols to properties rather than events.

```
“properties”: {
        “Temperature”: {
                “type”: “number”,
                “observable”; true,
                “forms”; […]
        }
}
```

Definition by just properties

```
“properties”: {
        “Temperature”: {
                “type”: “number”,
                forms”; […]
        }
}
“events”: {
        “TemperatureChanged”: {
                “Temperature”: {
                        “type”: “number”,
                }
                “forms”: […]
        }
}
```

Definition by properties and events

Device difficult to define as properties

- Only Actions and Events can define the interface.

```
“properties”: {
                    No property definition
},
“actions”: {
        “StartMotors”: {
                “forms”: […]
        },
},
“events”: {
        “OverHeated”: {
                “Temperature”: {
                        “type”: “number”,
                }
                “forms”: […]
        }
}
```

Example: StorageBattery – ECHONET

- Storage battery has 55 properties and 2 actions

Property Resource Name	Access Method	Data Type	EPC(EL)	プロパティ名称(EL)	Note
acEffectiveChargingCapacity	GET	number	0xA0	AC実効容量（充電） AC effective capacity (charging)	
acEffectiveDischargingCapacity	GET	numb		AC実効容量（放電）	
acChargeableCapacity	GET	numb			
acDischargeableCapacity	GET	numb			

Properties part

Actions part

ECHONET Lite Web API Guidelines
Device Specifications

Date: Jun 25, 2021
Version 1.3.0
ECHONET Consortium

Property Resource Name	Access Method	EPC(EL)	プロパティ名称(EL)	Note
resetCumulativeDischargingElectricEnergy	POST	0xD7	積算放電電力量リセット設定 Measured cumulative discharging electric energy reset setting	
resetCumulativeChargingElectricEnergy	POST	0xD9	積算充電電力量リセット設定 Measured cumulative charging electric energy reset setting	

https://echonet.jp/wp/wp-content/uploads/pdf/General/Download/web_API/ECHONET_Lite_Web_API_Dev_Specs_v1.3.0.pdf

Device Description


```
{
  "deviceType": "storageBattery",
  "eoj": "0x027D",
  "descriptions": {
    "ja": "蓄電池",
    "en": "Storage battery"
  },
  "properties": {
    "acEffectiveChargingCapacity": {
      "epc": "0xA0",
      "descriptions": {
        "ja": "AC実効容量（充電）",
        "en": "AC effective capacity (charging)"
      },
      "writable": false,
      "observable": false,
      "schema": {
        "type": "number",
        "unit": "Wh",
        "minimum": 0,
        "maximum": 999999999
      }
    },
    "acEffectiveDischargingCapacity": {
      "epc": "0xA1",
      "descriptions": {
        "ja": "AC実効容量（放電）",
        "en": "AC effective capacity (discharging)"
```


Properties part

Actions part


```
    },
    "actions": {
      "resetCumulativeDischargingElectricEnergy": {
        "epc": "0xD7",
        "descriptions": {
          "ja": "積算放電電力量リセット設定",
          "en": "Measured cumulative discharging electric energy reset setting"
        },
        "schema": {},
        "note": {
          "ja": "ECHONET LiteではSet only property",
          "en": "Access rule of the corresponding ECHONET Lite property is Set only."
        }
      },
      "resetCumulativeChargingElectricEnergy": {
        "epc": "0xD9",
        "descriptions": {
          "ja": "積算充電電力量リセット設定",
          "en": "Measured cumulative charging electric energy reset setting"
        },
        "schema": {},
        "note": {
          "ja": "ECHONET LiteではSet only property",
          "en": "Access rule of the corresponding ECHONET Lite property is Set only."
        }
      }
    }
  }
```