

# W3C WoT – Hypermedia Controls

Hypermedia Call, 17 Oct 2018

# Central Working Assumption

## Links

- Hypermedia control to discover resources and switch context by "following a link"
- Describes a relation

## Forms

- Hypermedia control to describe possible operations within a context by "submitting a form"
- Describes an operation
- Terminology is tricky; picked "operation" to grasp common understanding; "forms" hits resistance; "rel" became "op"

# Entry Point (e.g., Thing Directory)

Entry point URI



`http://thing-directory.example.com/`

# Thing Directory Representation (link-format-json)

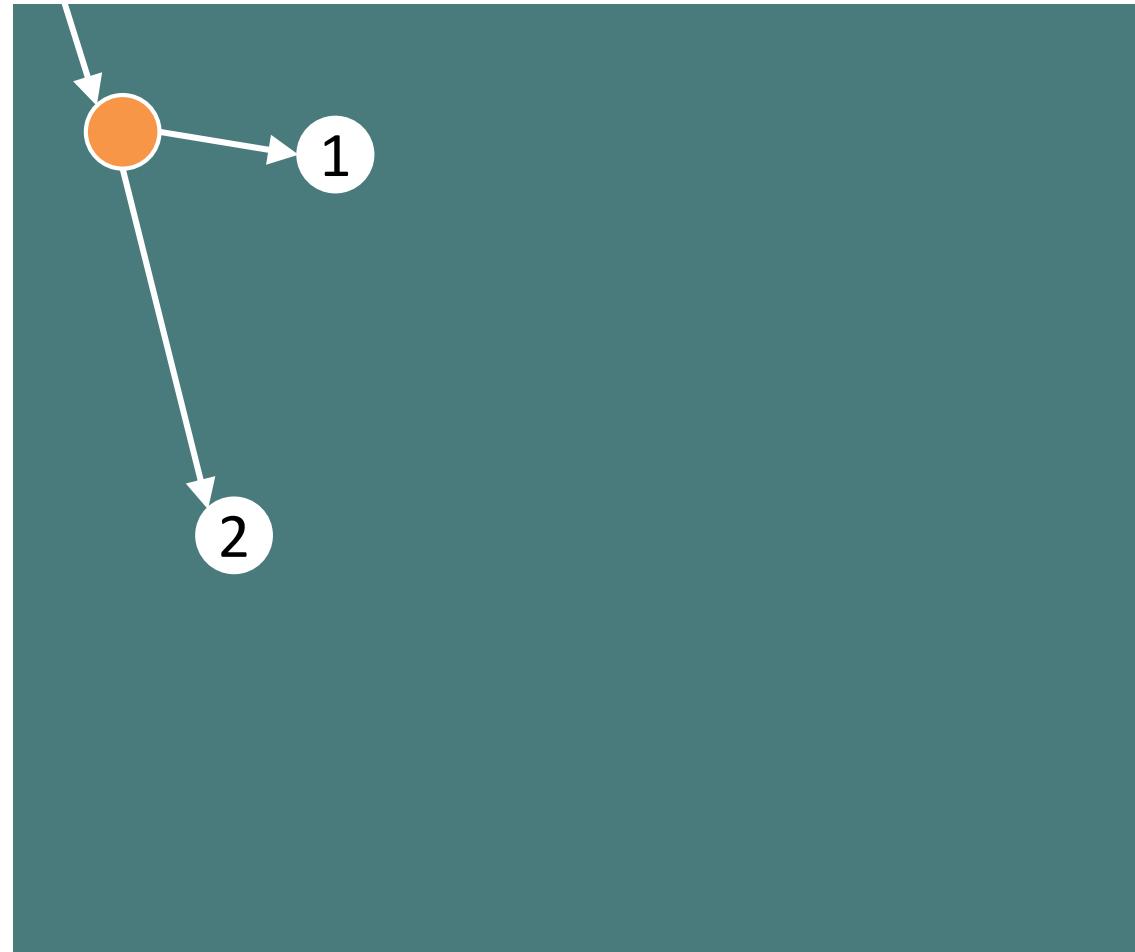
Entry point URI



```
[  
 {  
   "href": "http://t1.example.com/",  
   "rel": "thing",  
   "type": "application/x.td-edu+json"  
 },  
 {  
   "href": "http://t2.example.com/",  
   "rel": "thing",  
   "type": "application/x.td-edu+json"  
 }  
 ]
```

# Thing Directory Representation (link-format-json)

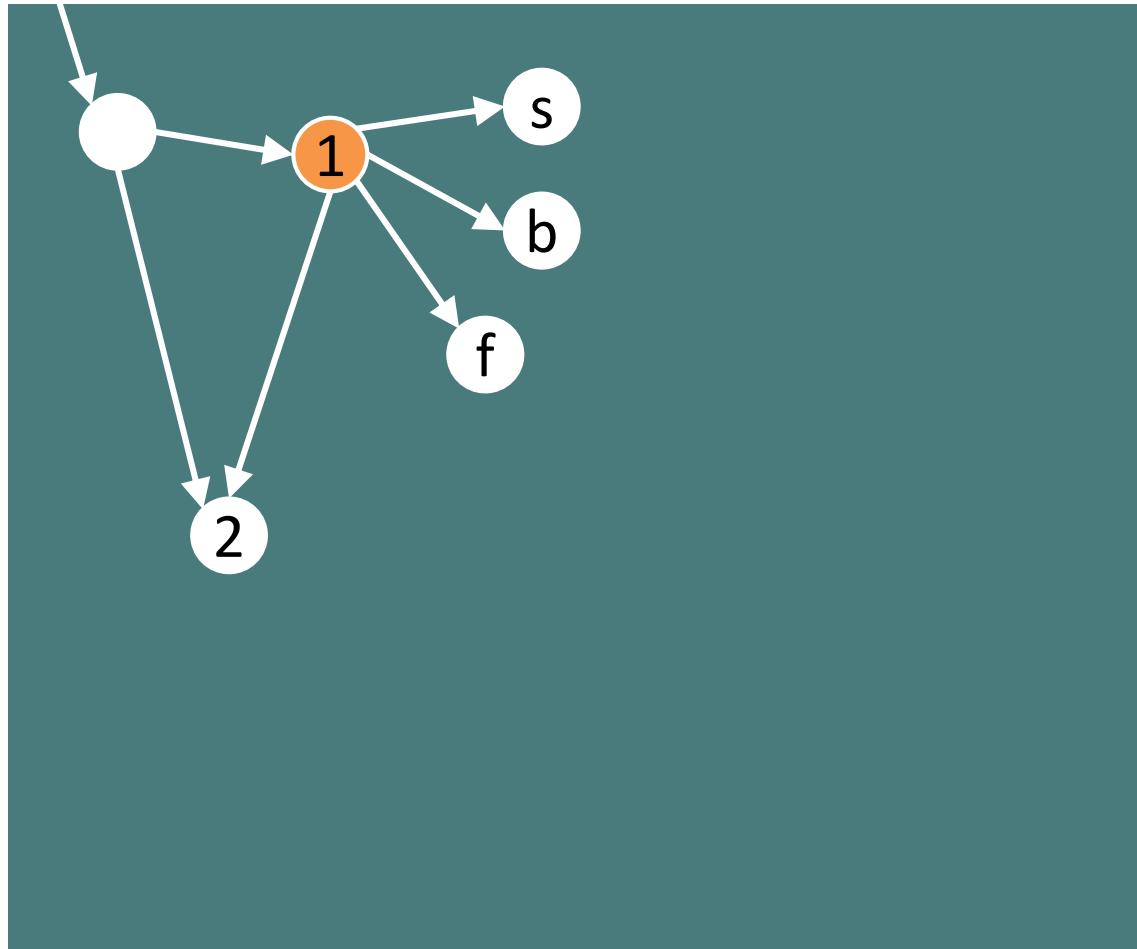
Entry point URI



```
[  
  {  
    "href": "http://t1.example.com/",  
    "rel": "thing",  
    "type": "application/x.td-edu+json"  
  },  
  {  
    "href": "http://t2.example.com/",  
    "rel": "thing",  
    "type": "application/x.td-edu+json"  
  }]  
]
```

# Thing Context (application/x.td-edu+json)

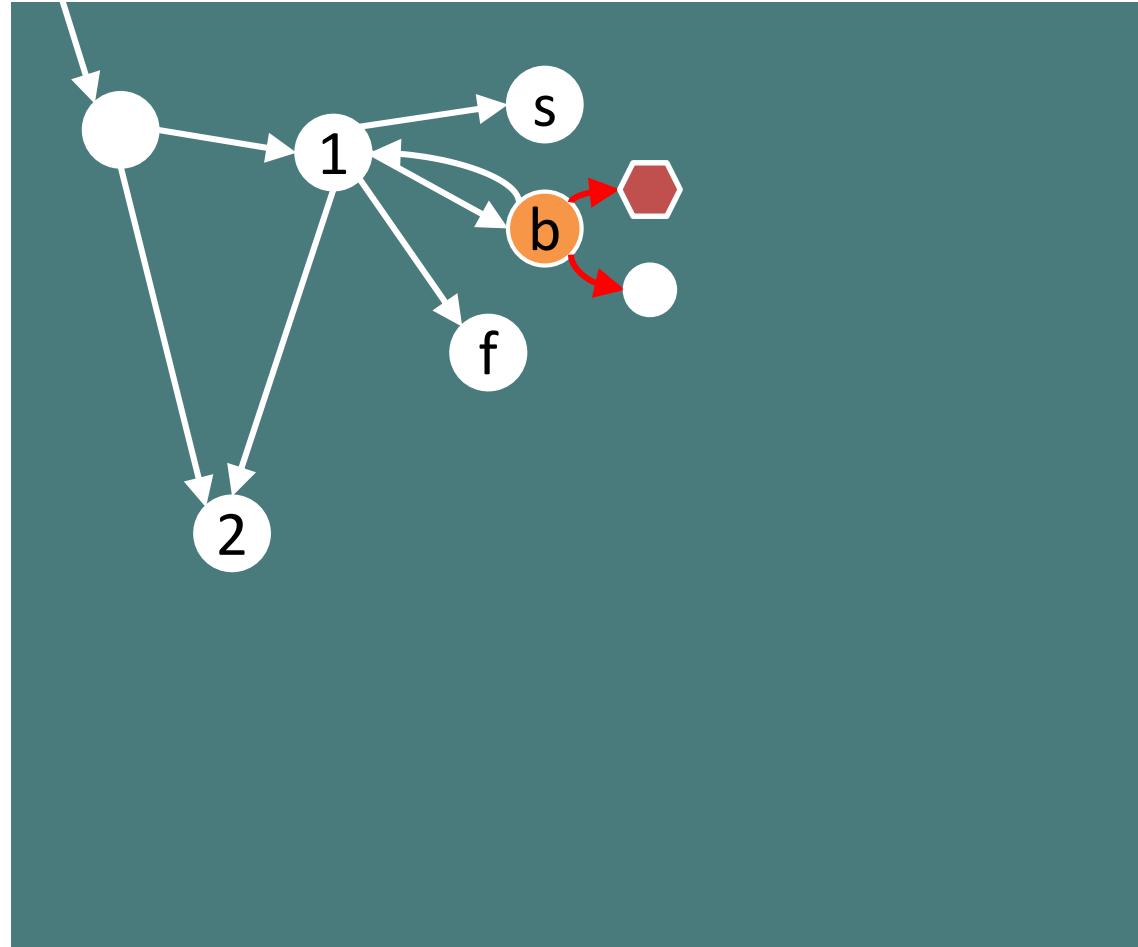
Invented TD variant for Educational Purposes



```
{  
  "id": "urn:dev:org:32473:1234567890",  
  "name": "Thing1",  
  "@type": ["Thing", "iot:LightControl"],  
  "links": [  
    {  
      "href": "http://t1.example.com/properties/status",  
      "rel": "property",  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t1.example.com/properties/brightness",  
      "rel": "property",  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t1.example.com/actions/fade",  
      "rel": "action",  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t2.example.com/",  
      "rel": "thing", "controlledBy" ,  
      "type": "application/x.td-edu+json"  
    }]  
}
```

Metadata

# Property Context (application/x.td-edu+json)



◆ Action Result

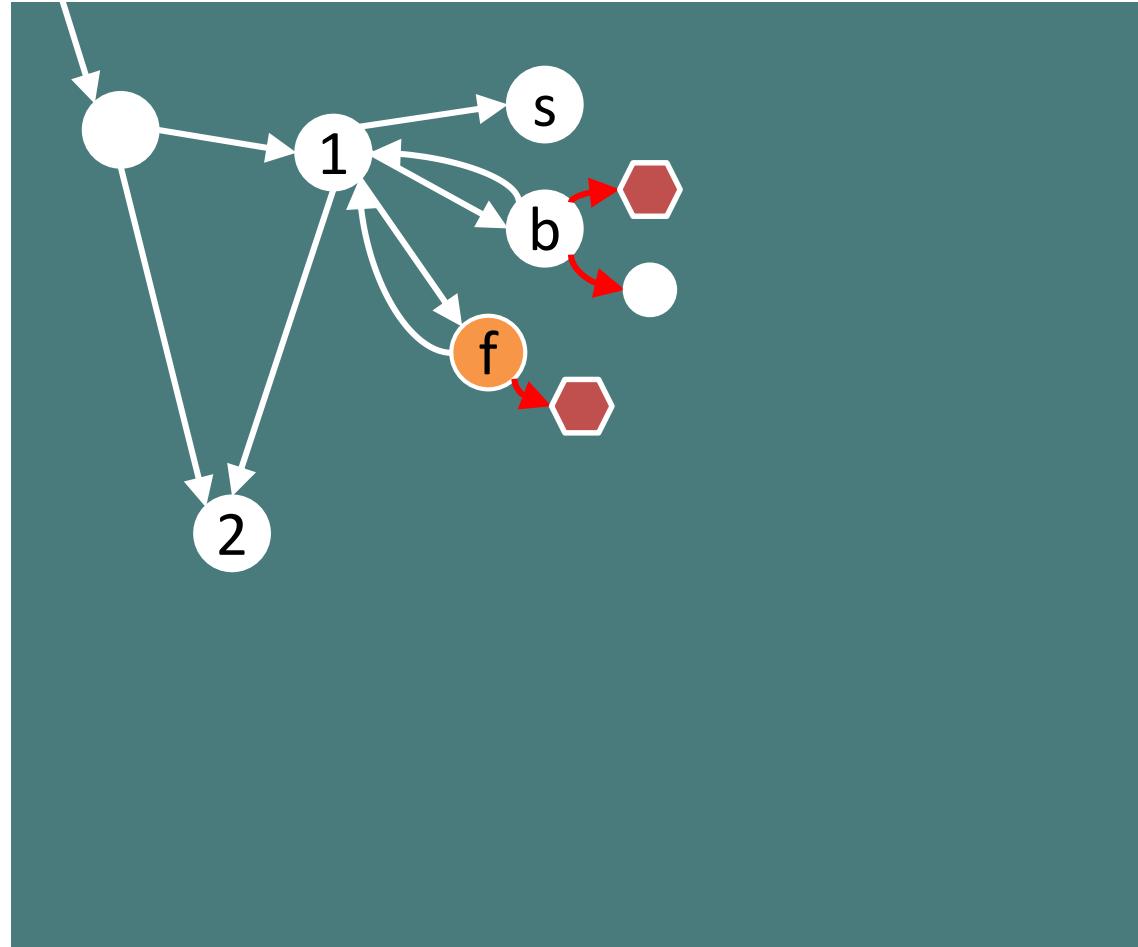
```
{  
    "value": 42,  
    "@type": ["Property",  
              "iot:CurrentDimmer"],  
    "type": "integer",  
    "minimum": 0,  
    "maximum": 100,  
  
    "forms": [  
        {"  
            "href": "http://t1.example.com/properties/brightness",  
            "op": "writeproperty",  
            "method": "PUT",  
            "contenttype": "application/json"  
        },  
        {"  
            "href": "http://t1.example.com/properties/brightness-obs",  
            "op": "observeproperty",  
            "method": "GET",  
            "subprotocol": "longpoll"  
        }],  
    "links": [  
        {"  
            "href": "http://t1.example.com/",  
            "rel": ["thing"]  
        }]  
}
```

} Data

} Metadata/Schema:  
Could be referenced  
through link like CSS

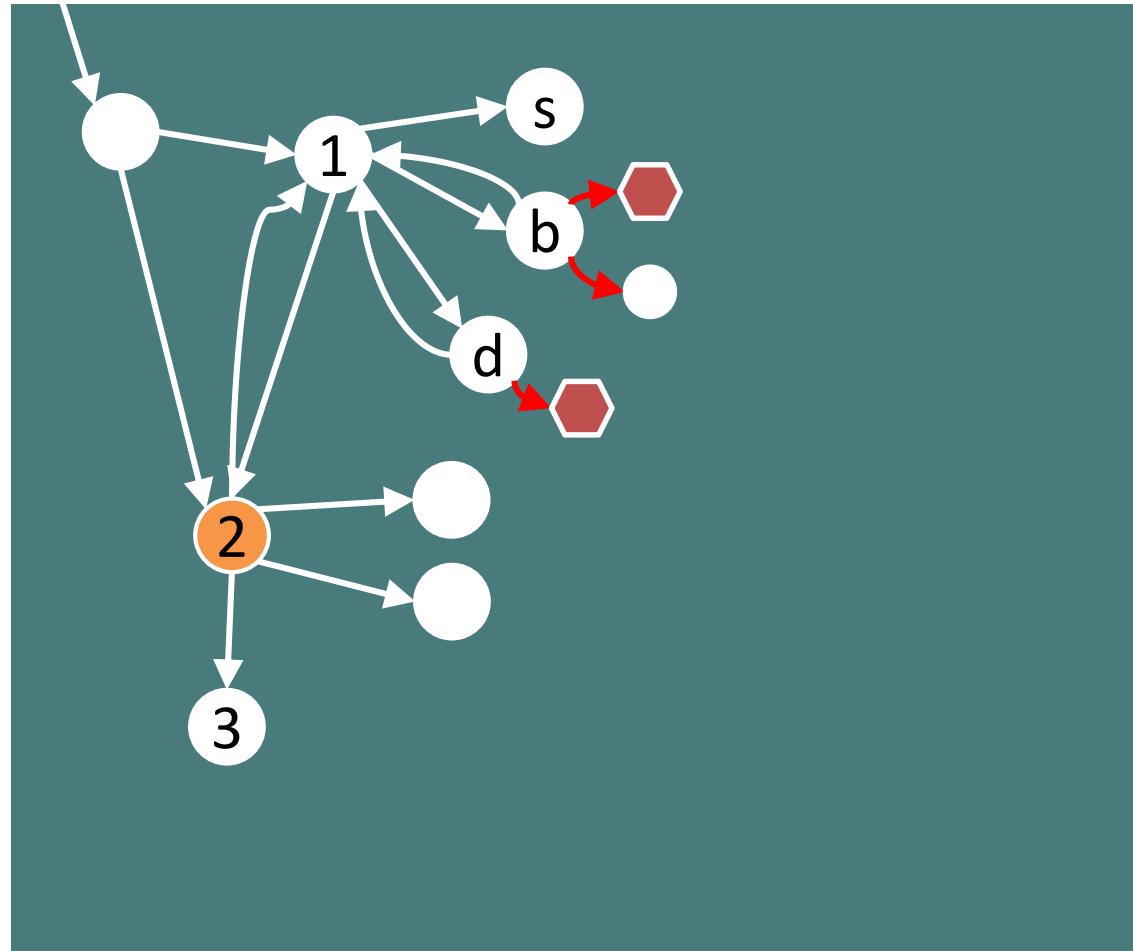
} type+parameters

# Action Context (application/x.td-edu+json)



```
{  
  "@type": ["Action", "iot:SetLevel"],  
  "input": {  
    "type": "object",  
    "properties": {  
      "target": {  
        "@type": "iot:CurrentDimmer",  
        "type": "integer", "minimum": 0, "maximum": 100  
      },  
      "duration": {  
        "@type": "iot:TransitionTime",  
        "type": "number"  
      }  
    },  
  },  
  "forms": [ {  
    "href": "http://t1.example.com/actions/fade",  
    "op": "invokeaction",  
    "method": "POST",  
    "contenttype": "application/json"  
  }],  
  "links": [ {  
    "href": "http://t1.example.com/",  
    "rel": ["thing"]  
  }]  
}
```

# Thing Context (application/x.td-edu+json)



```
{  
  "id": "urn:dev:org:32473:0987654321",  
  "name": "Thing2",  
  "@type": ["Thing", "iot:MotionControl"],  
  
  "links": [  
    {  
      "href": "http://t2.example.com/properties/motion",  
      "rel": "property",  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t2.example.com/properties/threshold",  
      "rel": "property",  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t1.example.com/",  
      "rel": "thing", "controls" ,  
      "type": "application/x.td-edu+json"  
    }, {  
      "href": "http://t3.example.com/",  
      "rel": "thing", "controls" ,  
      "type": "application/x.td-edu+json"  
    }  
  ]  
}
```

# Actual TD with Embedded Properties/Actions

```
{  
  "@context": [  
    "http://www.w3.org/ns/td",  
    { "iot": "http://iotschema.org/" }  
  ],  
  
  "id": "urn:dev:org:32473-lamp-4711",  
  "name": "Lamp",  
  "description": "Corner torchiere",  
  "@type": ["Thing", "iot:LightControl"],  
  
  "properties": {  
    "status": {  
      "type": "boolean",  
      "forms": [{  
        "href": "https://lamp.example.com/properties/status",  
        "contenttype": "application/json"  
      }]  
    },  
    "brightness": {  
      "@type": "iot:CurrentDimmer",  
      "type": "integer",  
      "minimum": 0,  
      "maximum": 100,  
      "writable": true,  
      "forms": [{  
        "href": "https://lamp.example.com/properties/brightness",  
        "contenttype": "application/json"  
      }]  
    },  
    ...  
  },  
  "actions": {  
    "fade": {  
      "@type": "iot:SetLevel",  
      "input": {  
        "type": "object",  
        "properties": {  
          "target": {  
            "@type": "iot:CurrentDimmer",  
            "type": "integer",  
            "minimum": 0,  
            "maximum": 100  
          },  
          "duration": {  
            "@type": "iot:TransitionTime",  
            "type": "number" }  
        }  
      },  
      "forms": [{  
        "href": "/things/lamp/actions/fade",  
        "contenttype": "application/json"  
      }]  
    },  
    "links": [{  
      "href": "https://servient.example.com/things/motion-detector",  
      "rel": "iot:ControlledBy",  
      "type": "application/td+json"  
    }]  
  }  
}
```

# More Complex Request Metadata

Default assumptions apply  
(GET to read, PUT to write)

Deviations from defaults

```
"properties": {  
    "brightness": {  
        "@type": "iot:CurrentDimmer",  
        "type": "integer",  
        "minimum": 0,  
        "maximum": 100,  
        "writable": true,  
        "forms": [{  
            "href": "https://lamp.example.com/properties/status",  
            "contenttype": "application/json"  
        }]  
    },  
    "actions": {  
        "fade": {  
            ...  
            "forms": [{  
                "href": "coaps://myled.example.com:5684/pwr",  
                "contenttype": "application/ocf+cbor",  
                "coap:methodCode": 3, // PUT instead of POST to invoke  
                "coap:options": [{  
                    "coap:optionNumber": 2053, // OCF-Content-Format-Version  
                    "coap:optionValue": "1.1.0"  
                }]  
            }]  
        }  
    }  
}
```

# Contact

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