PlugFest diagrams and Architecture document
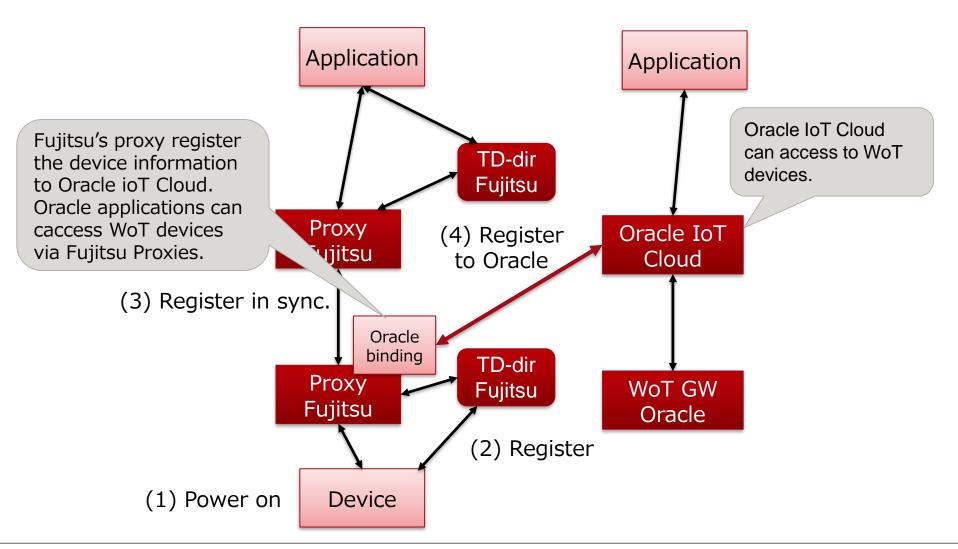
30 June, 2018
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shaping tomorrow with you
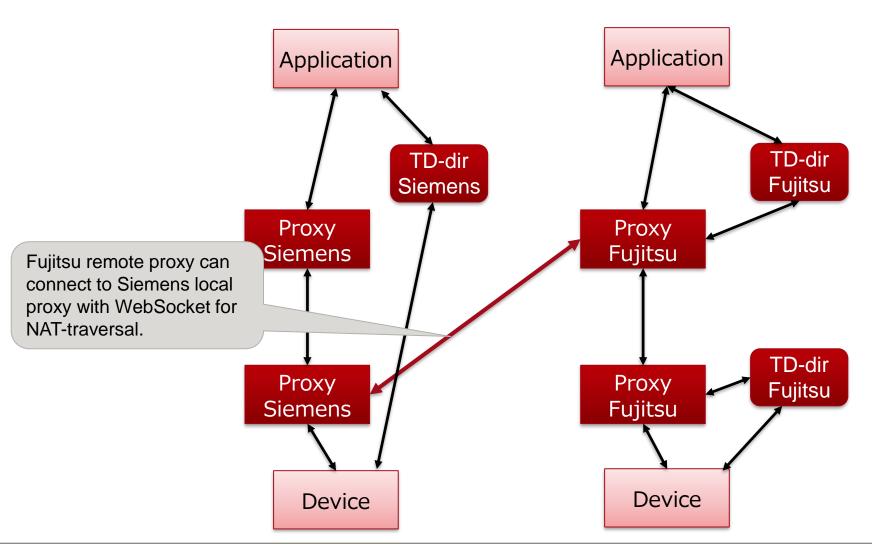
Connection with Oracle IoT Cloud

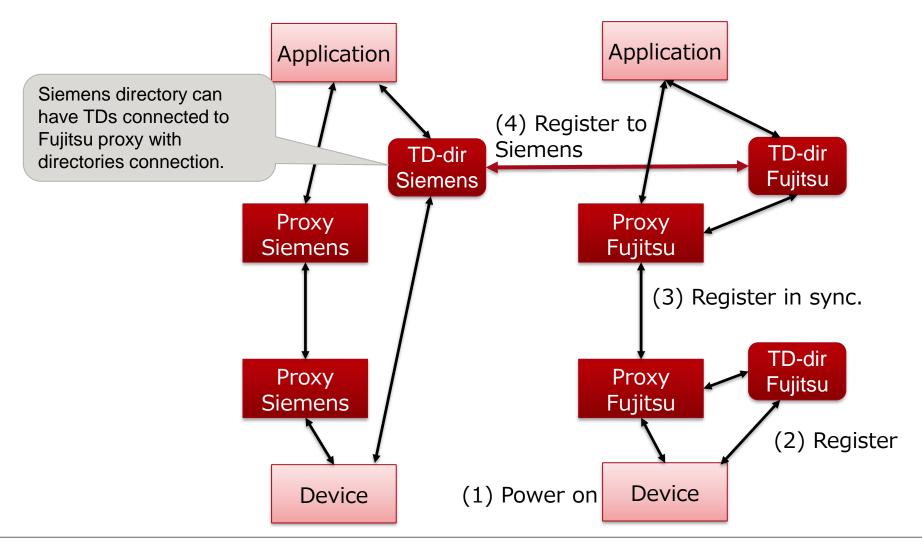- ■ Fujitsu proxy can connect with Oracle binding to transform Oracle IoT Cloud propriety interface

Application

Application

Fujitsu's proxy register the device information to Oracle ioT Cloud. Oracle applications can caccess WoT devices via Fujitsu Proxies.

TD-dir Fujitsu

Oracle IoT Cloud can access to WoT devices.

Proxy Fujitsu

(4) Register to Oracle

Oracle IoT Cloud

(3) Register in sync.

Oracle binding

Proxy Fujitsu

TD-dir Fujitsu

WoT GW Oracle

(2) Register

(1) Power on

Device

Connection with Siemens proxy

- Fujitsu Remote proxy servient can connect to Siemens local proxy with WebSocket

Fujitsu remote proxy can connect to Siemens local proxy with WebSocket for NAT-traversal.

Connection with Siemens TD directory

■ Fujitsu TD directory synchronize TDs of devices to be connected to Fujitsu Proxy to Siemens directory.
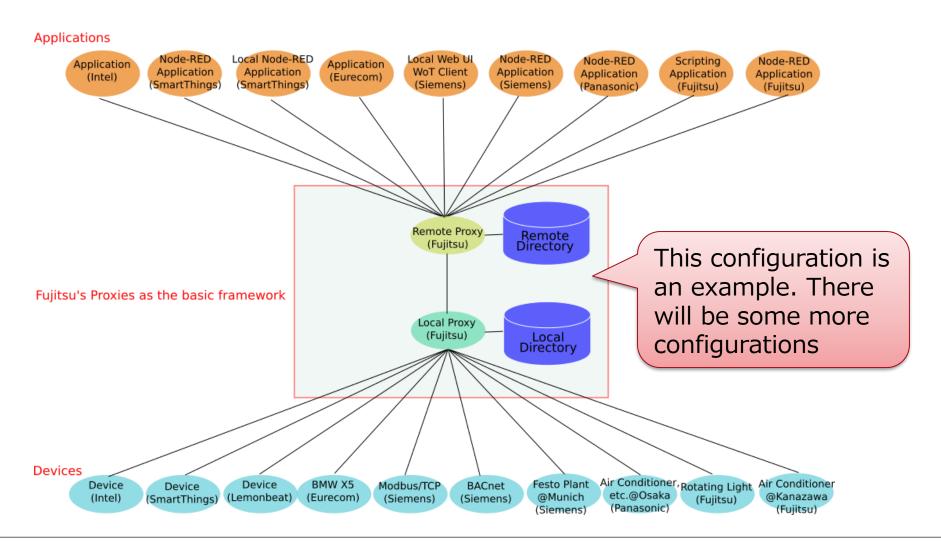

Siemens directory can have TDs connected to Fujitsu proxy with directories connection.

Application

Application

TD-dir Siemens

(4) Register to Siemens

TD-dir Fujitsu

Proxy Siemens

Proxy Fujitsu

(3) Register in sync.

Proxy Siemens

Proxy Fujitsu

TD-dir Fujitsu

(2) Register

Device

(1) Power on

Device

Integration by proxy servients

- **WoT proxy servient can coordinate Non-WoT entities**
  - Oracle IoT Cloud Service
  - ECHONET Lite, EtherCAT
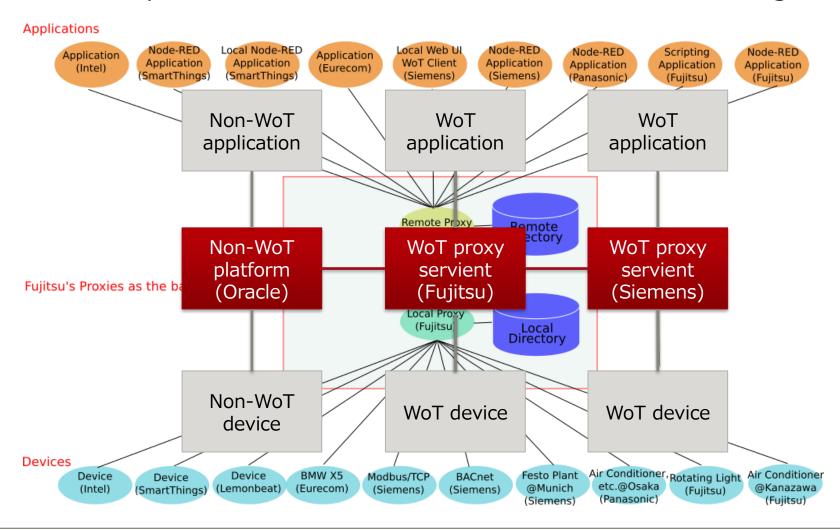 - Various kind of applications and devices will be coordinated.

Web of Things: "glue in between"

In Bundang plugfest

. . .

Narrow Waist model

■ Proxies coordinate the connections between applications and devices.

This configuration is an example. There will be some more configurations

Narrow Waist model

- ■ Proxies cooperation makes much more connections
  - ■ Not only **WoT servients** but also **non-WoT** can be integrated.
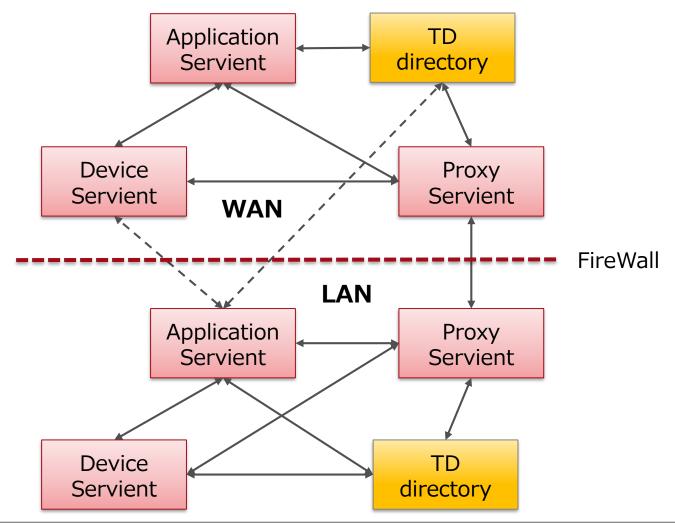
Servient integration

■ Consideration of potential configurations
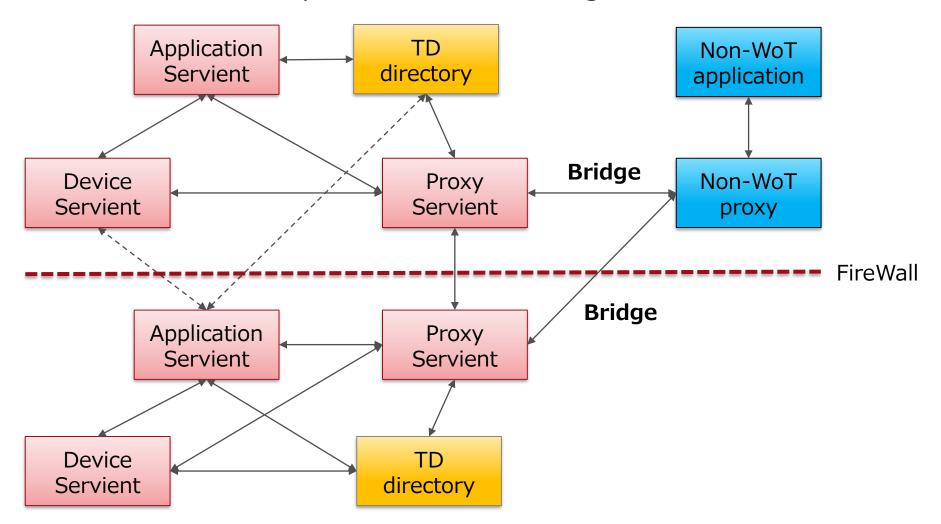
System Architecture from Koster's slide

- Proxy servients connect Servients on both of WAN and LAN.

System Architecture with Non-WoT

- **Integration with Oracle IoT Cloud Service**
  - Connected to Proxy Servient with binding for Non-WoT entities
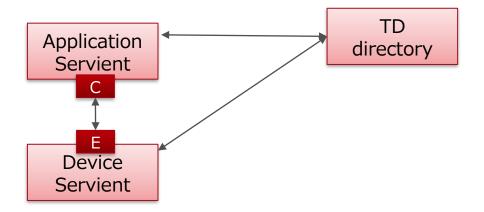
Servients integration

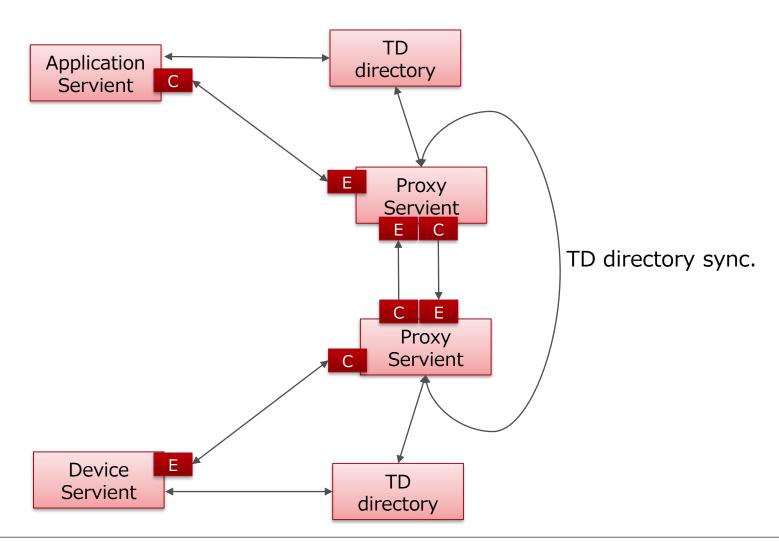# Use case: application and device

Use case: Proxy servient

Application Servient [C]

TD directory

Proxy Servient [E] [C]

Device Servient [E]
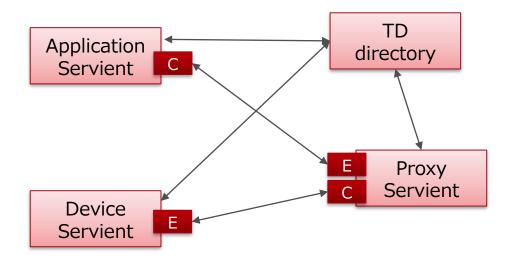
[C] Consumed Thing
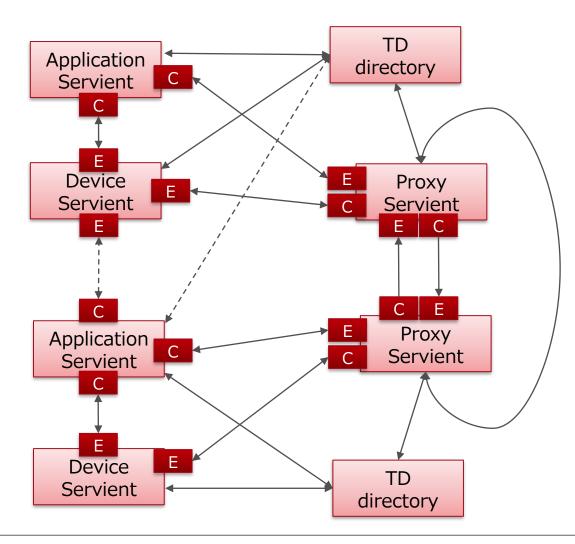[E] Exposed Thing
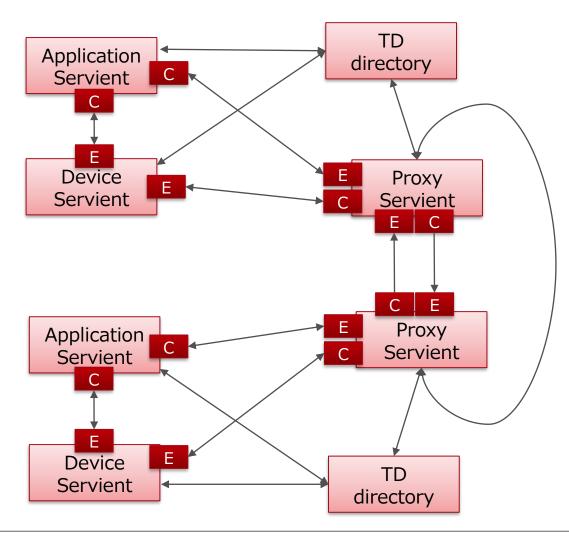
Orchestration

Orchestration

Orchestration

Abstract interfaces

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- Servient and TD directory abstract interfaces
  - Actual interfaces are defined by Binding template
  - Why don't you call the following interfaces "**WoT interface**" ?

Interfaces between Consumed and Exposed Thing

Consumed	direction	Exposed	
ReadProperty	→		
WriteProperty	→		
Subscribe	→		
	←	Event	
Action	→		
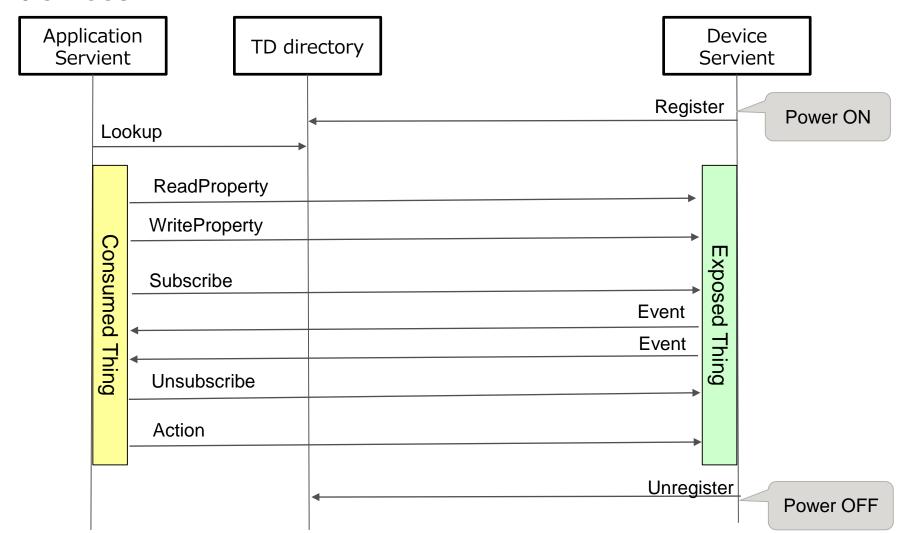
Interfaces between Servient and TD directory

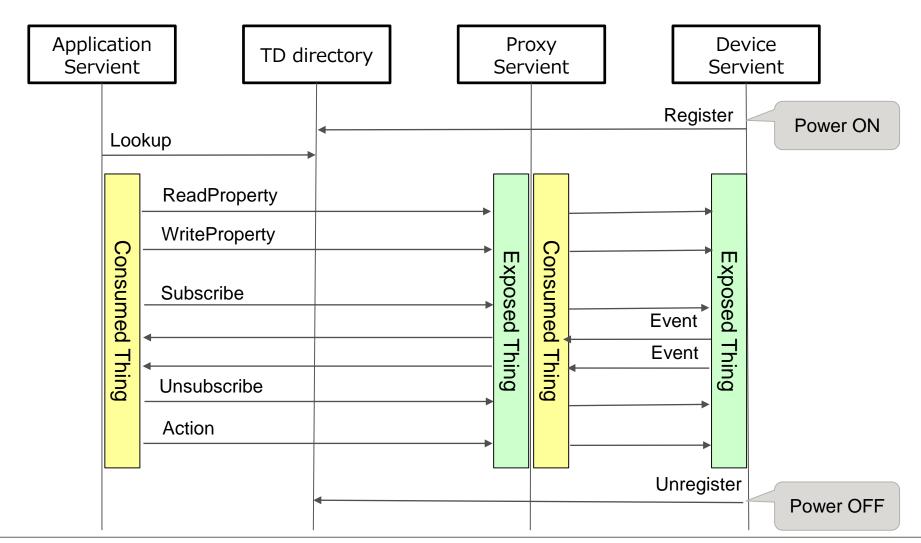| Servient	direction	TD directory	
Register	→		Register TD to dir.
Lookup	→		Search and get TDs from dir.

Overview of sequence diagram (1/2)

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■ Sequence of abstract interface between applications and devices.

Overview of sequence diagram (2/2)

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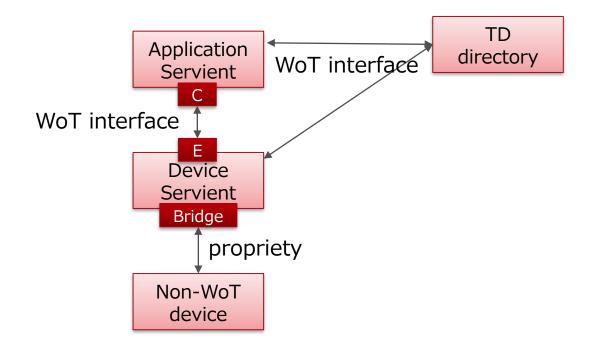■ Sequence of abstract interface with proxy servient.

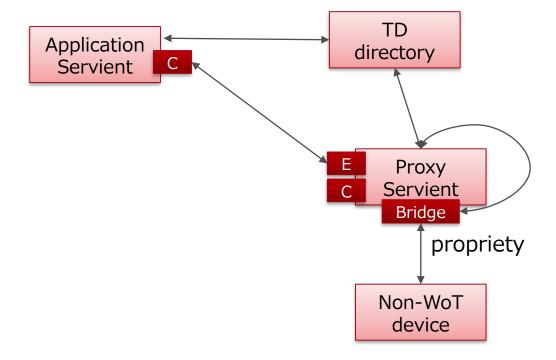# How to connect Non-WoT entities

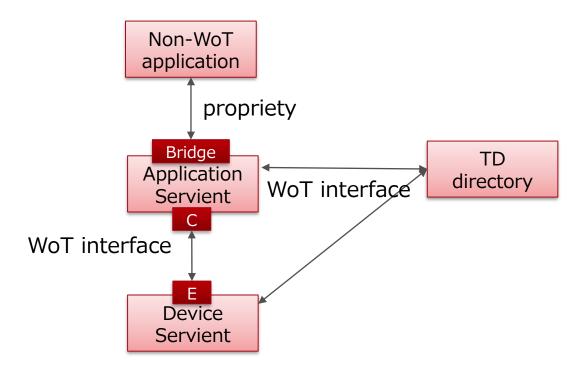# Device with non-WoT binding
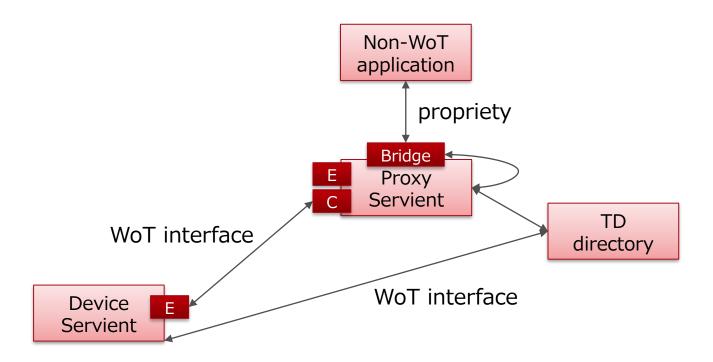
Proxy with Non-WoT device binding

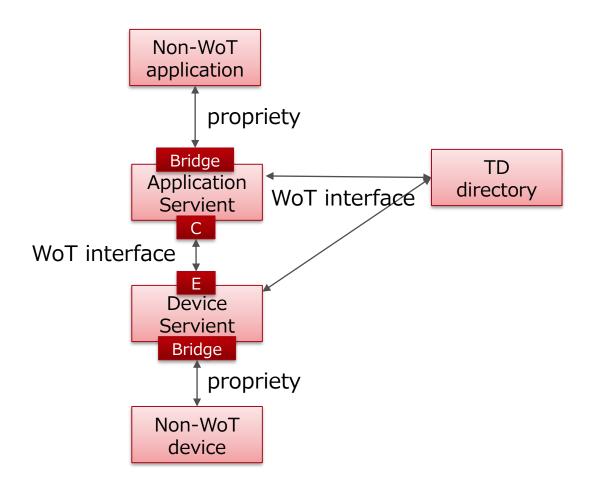# Application with Non-WoT binding

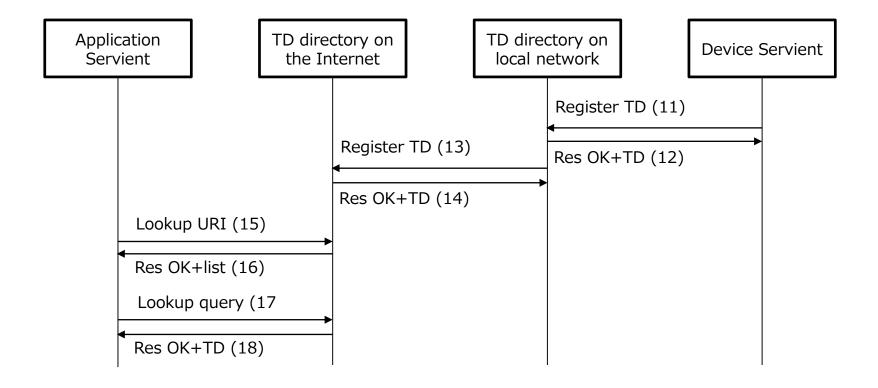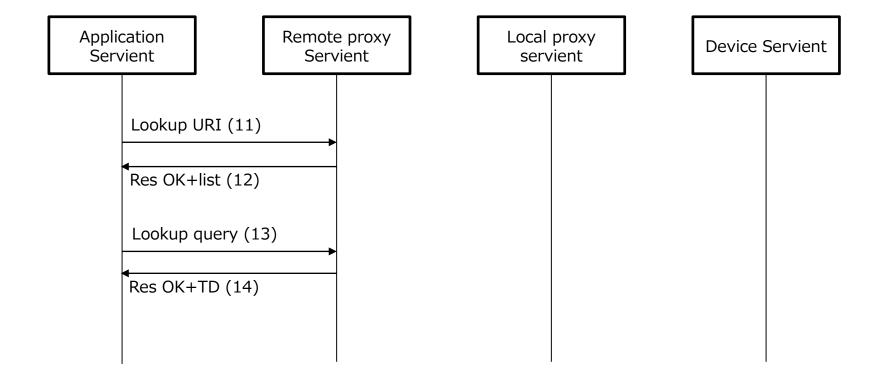# Proxy with Non-WoT binding

Proposals

Register

■ A device servient is registered to the local proxy servient and remote proxy servient. The proxy servient returned the TD with public uri. The proxy servients have TD repositories to store TDs registered from the other servients.
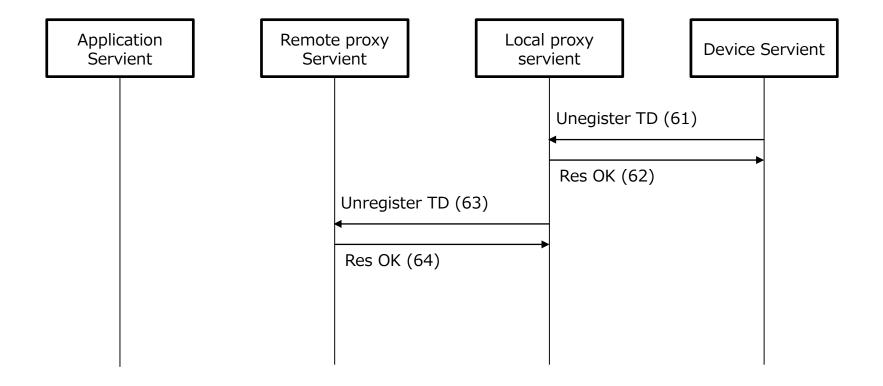
Lookup

- An application servient can lookup TDs registered the remote proxy servient with its URI. If the URI indicates the servient, it returns the list of the devices connected. If the URI specifies the devices registered on the proxy servient, it returns TD of it.
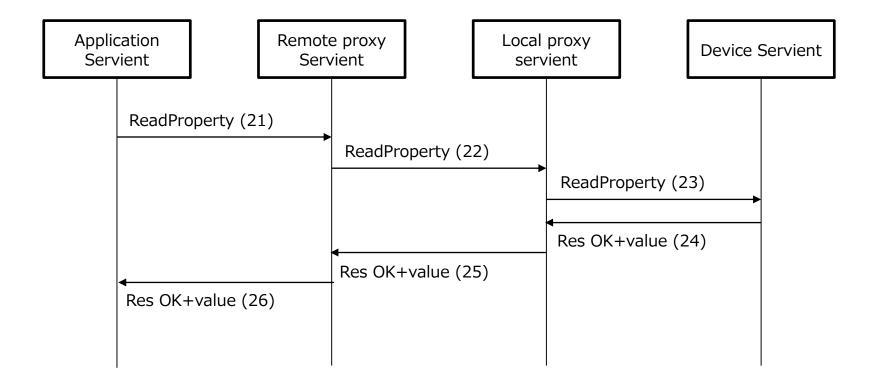
Unregister

■ The device servient unregister from the local proxy servient before shutdown. The local proxy servient unregister this device servient from the remote proxy not to access from the application.
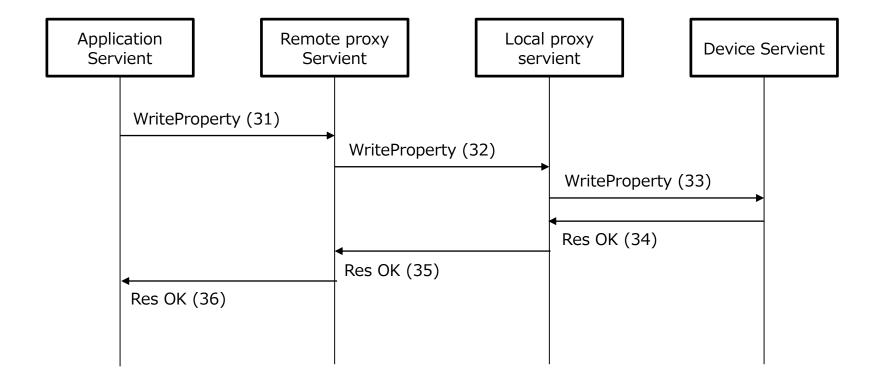
ReadProperty

- The application servient sends a request to read the value of the property of the device servient to the remote proxy servient. The remote and local proxy servient relay to this request to the device servient.
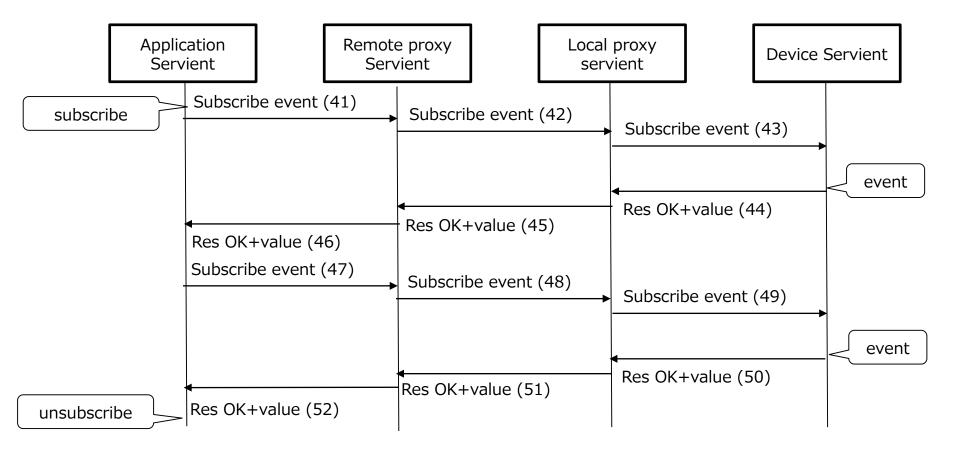
WriteProperty

- The application servient sends a request to write the value to the property of the device servient to the remote proxy servient. The remote and local proxy servient relay to this request to the device servient.

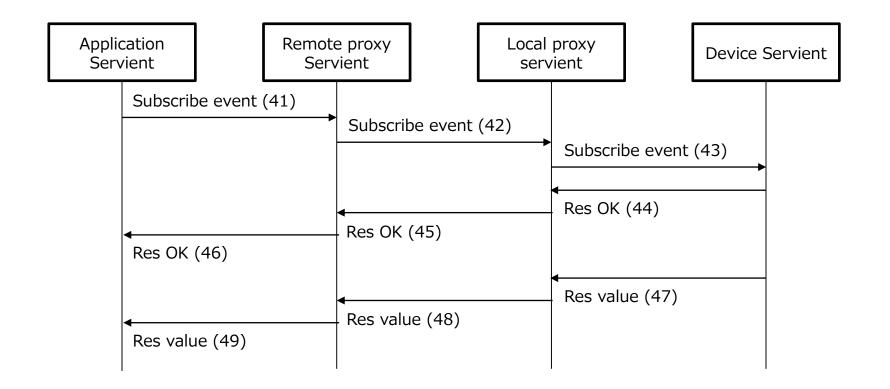# Subscribe and Event with long polling

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■ The application servient sends a request to subscribe the property of the device servient to the remote proxy servient. The device servient keep to send the value of the specified property periodically or when some events happen until the application unsubscribes.

Subscribe and event with Server Sent Event method
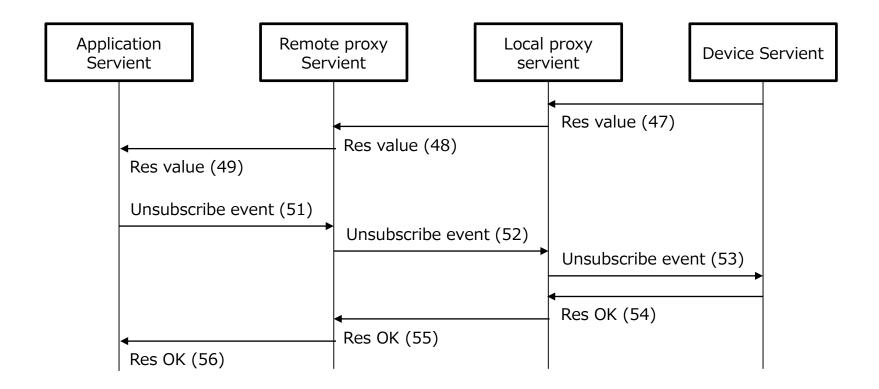
■ The application servient can obtain the change or the current status of the device servient via proxy servient using subscription procedures. The application servient sends a request to subscribe the property of the device servient via the remote and local proxy servient. The device servient keep to send the value of the specified property periodically or when some events happen.
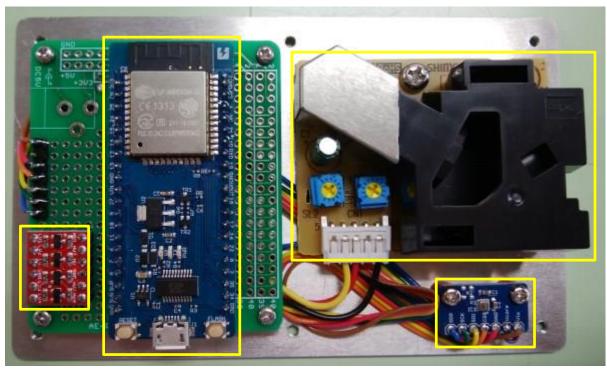
Unsubscribe

- The application servient sends a request to unsubscribe to the remote proxy servient to stop to notify the event from the device servient.

Device photograph

Dust sensor
(Shinyei PPD42)

Level shifter
Dust sensor output 5V
-> Microcontroller input 3.3V

Wi-Fi + Microcontroller
(Espressif ESP-WROOM-32)

Temperature, humidity, air pressure sensor
(Bosch BME280)

TD

```json
{
 "@context": ["https://w3c.github.io/wot/w3c-wot-td-context.jsonld"],
 "@type": "Thing",
 "name": "Fujitsu-WiFiAgent240AC4114764",
 "id": "urn:dev:wot:com:fujitsu:wifiagent",
 "base" : "http://(WoT device IP address)/Things/Property/",
 "properties": {
                "Temperature": {
                        "@type": "iot:Temperature",
                        "type": "object",
                        "properties": {
                                        "temperature":{"type":"number"},
                                        "rssi":{"type":"number"}
                        },
                        "writable": false,
                        "observable": false,
                        "forms": [{
                                        "href" : "temperature",
                                        "mediaType": "application/json"
                        }]
                },
                "Humidity": {
                        "@type": "iot:Humidity",
                        "type": "object",
                        "properties": {
                                        "humidity":{"type":"number"},
                                        "rssi":{"type":"number"}
                        },
                        "writable": false,
                        "observable": false,
                        "forms": [{
                                        "href" : "humidity",
                                        "mediaType": "application/json"
                        }]
                },
                "AirPressure": {
                        "@type": "iot:AirPressure",
                        "type": "object",
                        "properties": {
                                        "airPressure":{"type":"number"},
                                        "rssi":{"type":"number"}
                        },
                        "writable": false,
                        "observable": false,
                        "forms": [{
                                        "href" : "airPressure",
                                        "mediaType": "application/json"
                        }]
                },
                "Dust": {
                        "@type": "iot:Dust",
                        "type": "object",
                        "properties": {
                                        "dust":{"type":"number"},
                                        "rssi":{"type":"number"}
                        },
                        "writable": false,
                        "observable": false,
                        "forms": [{
                                        "href" : "dust",
                                        "mediaType": "application/json"
                        }]
                },
                "AllSensorData": {
                        "@type":"iot:AllSensor",
                        "type": "object",
                        "properties": {
                                        "temperature":{"type":"number"},
                                        "humidity":{"type":"number"},
                                        "airPressure":{"type":"number"},
                                        "dust":{"type":"number"},
                                        "rssi":{"type":"number"}
                        },
                        "writable": false,
                        "observable": false,
                        "forms": [{
                                        "href" : "allSensorData",
                                        "mediaType": "application/json"
                        }]
                }
 },
 "actions":{},
 "events":{}
}
";
```

TD.txt

Temperature:Degrees celsius
Humidity:%
AirPressure:hPa
Dust:particles (size over 0.1um)/m^3