Testing and Validation

WoT Test Bench

A Special Servient for Testing a Thing Implementation based on its Thing Description
Motivation

1) As a Thing consumer (Human or Consumer Thing):
   1) How to know whether a Thing respects its TD, for example:
      1) Are all said interactions available?
      2) Are all writable properties writable?
      3) Do all actions with an output return an output?
      4) Is data delivered like in the TD data schema
         And more...

2) As a Thing developer:
   1) How to test my implementation during the development time
   2) I can set a TD as my requirement and develop the implementation until I reach what is specified in the TD
Proposal

Building a tool that can execute all the interactions of a Thing with as many possible combinations:

- Read properties
- Write into properties
- Invoke actions
- (Subscribe to events and wait)
Proposal

Would be better to implement it as a WoT servient:

• No need to learn how to use it
• Can run anywhere by anyone
• Rely on scripting API in order to reduce development time
Proposal
Proposal

Repeated for different interactions

Generates a report
User Point of View

1) Send a TD
2) Receive a Report

This should be the simplest case with any configuration being optional
Testing Flow

1. **Start**
2. Pick a Test Scenario
3. Pick an Interaction
4. Test Interaction

- Interaction test finished
- Scenario finished
- Scenarios finished
  - Repeat if needed

Flowchart indicating the testing process.
Testing Flow Configuration

```
{
    "name": "wot-test-bench",
    "scenarios": 5,
    "repetitions": 2,
    "http": {
        "port": 8980,
        "allowSelfSigned": true
    },
    "timeout": 4000,
    "credentials": {
        "urn:com:oracle:iot:device:obd2": {
            "username": "XXX",
            "password": "XXX"
        }
    }
}
```

There is a default configuration so configuration is entirely optional.
Interaction Testing

- Read Property
  - Verify Data Structure
    - If writable
      - Write Property
        - Read Property
          - Verify Data Structure
            - Compare with Written Value
- Invoke Action
  - Receive Response
    - Verify Data Structure
- Subscribe to Event
  - Wait for Notification
    - Receive Response
      - Verify Data Structure
Plugfest

• Was used to test many Things:
  - Blue Pump
  - EventSource
  - Festo
  - Fujitsu-RotaryBeaconLight
  - Fujitsu-WiFiAgent240AC40783A0
  - Illuminance Sensor
  - Intel-WebSpeak-upsq0
  - ora_obd2_device_model
  - PanasonicAirConditionerP1
  - Sense HAT
  - SiemensIoTDemo
  - TestServient
  - TestThing
  ...

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Demo
Plugfest Summary

• The detected errors were split into two main groups:
  – (Small) Data Schema errors:
    • Number vs Integer
    • Const
  – (Big) Connection related issues:
    • Not being able to connect to a Thing in any way
    • Part of the interactions being not executable

• Multiple forms with multiple security requirements are not well handled at the moment

• Only JSON data format is supported
Future Work

- Event testing
- Other mediaTypes
- Separate the testing into connection testing and Thing testing