Web of Things – Panel session
Emerging IoT Researches and Technologies
IoT-Week, Geneva, June 8th 2017
F-Interop H2020 Project

- [www.f-interop.eu](http://www.f-interop.eu)
- 1 November 2015 – 31 October 2018
- *develop and provide online interoperability and performance test tools to support emerging technologies from research to standardization and market launch*
- 9 partners
State of the Art: Face-to-Face Events

Similar requirements from all SDOs:

- ETSI
- IETF
- ITU
- oneM2M
- W3C

Goals of these events:
- Make better standards
- Reduced time-to-market
- Increase adoption

Example: ETSI plugtests
- 6TiSCH: Jul’15, Feb’16, Jul’16
- oneM2M: Sep’15, May’16, Nov’16
- CoAP: Mar’12, Nov’12, Nov’13, Mar’14
<table>
<thead>
<tr>
<th>Time</th>
<th>Friday 15</th>
<th>Saturday 16</th>
<th>Sunday 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Room Opening</td>
<td>Room Opening</td>
<td></td>
</tr>
<tr>
<td>09:00</td>
<td>SET-UP</td>
<td>TEST SESSION #3</td>
<td>TEST SESSION #7</td>
</tr>
<tr>
<td>11:00</td>
<td>LUNCH 12:30 to 13:30</td>
<td>TEST SESSION #4</td>
<td>TEST SESSION #8</td>
</tr>
<tr>
<td>13:00</td>
<td>LUNCH 13:30 to 14:00</td>
<td>WELCOME 13:30 to 14:00</td>
<td>LUNCH</td>
</tr>
<tr>
<td>14:00</td>
<td>TEST SESSION #1</td>
<td>TEST SESSION #5</td>
<td>TEAR-DOWN 14:00 to 15:00</td>
</tr>
<tr>
<td>16:00</td>
<td>TEST SESSION #2</td>
<td>TEST SESSION #6</td>
<td></td>
</tr>
<tr>
<td>18:00</td>
<td>WRAP UP</td>
<td>WRAP UP</td>
<td></td>
</tr>
</tbody>
</table>
Challenges with Face-to-Face Events

From a user’s point of view

Few and far apart
• Once or twice a year

Short
• 2-5 days typical

Face-to-face
• Cost of traveling

In practice, attended by large companies working on standardization 😞

Inclusive of SMEs, more standards-based products on the market, faster 😊
Remote interoperability testing – Overview

Data plane
Control plane

Interoperability Test System

Internet

GUI
IUT

GUI
IUT

IUT: Implementation Under Test
Remote reference-based interoperability testing

Data plane

Control plane

Internet

Interoperability Test System

Reference (Automated IUT)

GUI

IUT

IUT: Implementation Under Test
Different Configurations

A. Tested Device ↔ F-Interop test server
B. Deported test with downloaded resource
C. Remote interop with 2 participants
D. Interop against testbed
E. Local interop
F. Remote interop with N participants
G. Remote interop with N participants and testbeds
Testbeds

32 testbeds, 4755 nodes

- **Fed4FIRE**
  (www.fed4fire.eu/testbeds)
  - 24 testbeds
  - ~1000 nodes

- **OneLab**
  (onelab.eu)
  - Includes 6 IoT-lab deployments
    (including 2728 IoT nodes)

- **IoT lab**
  (www.iotlab.eu)
Targeted Standards

• The ETSI plugtests specifications are used as starting point to build an architecture that allows them to be done remotely

• Initially standards of the IoT realm
  • CoAP
  • 6TiSCH

• Next step
  • Web of Things (WoT)

• Contributions/extensions are expected by design
  • Including:
    • oneM2M
    • 6LoWPAN
WoT interop test case example (1/2)

Properties

<table>
<thead>
<tr>
<th>Identifier</th>
<th>TC_WOT_BASE_01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Read Boolean Property</td>
</tr>
<tr>
<td>References</td>
<td>3.2.3.1 Property, 3.2.4.1 Simple Data</td>
</tr>
<tr>
<td>Pre-test conditions</td>
<td>Exposing Thing provides boolean Property</td>
</tr>
</tbody>
</table>

**Test sequence**

1. **Stimulus**
   - Consuming Thing sends `Retrieve` to Property

2. **Check**
   - Consuming Thing sends
     - protocol operation bound to `Retrieve`
     - no payload
     - to Property URI

3. **Check**
   - Exposing Thing sends
     - positive response code
     - payload formatted according to TD

4. **Verify**
   - Consuming Thing displays read value

Source: https://github.com/w3c/wot/blob/master/plugfest/2016-beijing/plugfest-test-cases-beijing-2016.md
## WoT interop test case example (2/2)

<table>
<thead>
<tr>
<th>Identifier</th>
<th>TC_WOT_DISC_02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Register Thing with Repository</td>
</tr>
<tr>
<td>References</td>
<td>3.2.6.2.2 Repository</td>
</tr>
<tr>
<td>Pre-test conditions</td>
<td>Exposing Thing has Thing Description, TD Repository is reachable</td>
</tr>
</tbody>
</table>

### Test sequence

1. **Stimulus**
   - Exposing Thing or commissioning tool sends `Create` with the TD to Repository registration resource

2. **Check**
   - Exposing Thing or commissioning tool sends
     - protocol operation bound to `Create`
     - valid TD in payload
     - to registration URI

3. **Check**
   - Repository responds with
     - positive response code
     - Location of the registration handle

4. **Verify**
   - TD Repository look-up returns Exposing Thing

Source: https://github.com/w3c/wot/blob/master/plugfest/2016-beijing/plugfest-test-cases-beijing-2016.md
How the WoT community make use of this?

- Use F-Interop platform for remote interop events, plugtests
- Use WoT testing tools as support tooling for face to face events (plugtests, plugfests)
- Extend WoT testing tool to other WoT testing needs
  - testing tool will be an open source project
- Provide to F-Interop some reference implementations (golden images) of virtual devices promoting good practices used in WoT
Next Milestones

• July 2017
  • requirements for WoT testing tool
• November 2017
  • functional platform available
  • first WoT CoAP interop tests
• March 2018
  • WoT interop tests (advanced version)
• June 2018
  • minimal WoT interop testing tool
  • use in WoT plugfest/plugtests
Thank you for your attention

Please, feel free to contact us directly or later via email:

Federico.Sismondi@inria.fr, Cesar.Viho@irisa.fr