ETSI 6TiSCH #2 Plugtests

Informal Report

(Note Well: no official results yet)
Administrivia

**Organizers:**
- ETSI (Miguel Angel Reina Ortega, Aurelie Sfez)

**Supporters:**
- Inria (host)
- OpenWSN (golden device software)
- OpenMote (golden device hardware)

**Team of experts:**
- Maria Rita Palattella (lead: Test Description)
- Xavier Vilajosana (lead: Hardware)
- Tengfei Chang (lead: Tools)
- Thomas Watteyne (lead: coordination)
Logistics

• 2-4 Feb 2016
• Inria-Paris

• 14 companies
• 5 different implementations

• Under NDA
Scope

**ETSI 6TiSCH #1 Plugtests**
17-19 July 2015, Prague, CZ

**ETSI 6TiSCH #2 Plugtests**
2-4 Feb 2016, Paris, France

**Minimal 6TiSCH configuration**
- *draft-ietf-6tisch-minimal*
- simpleTSCH schedule
- link-layer security
- RPL

**6top Protocol (6P)**
- *draft-wang-6tisch-6top-sublayer*
- 6LoRH
- *draft-ietf-6lo-paging-dispatch*
- *draft-ietf-6lo-routing-dispatch*
Test Description

#14 tests, 4 classes of tests

1. SYNCH
   - Synch to EB w/ default timeslot template
   - Synch to EB w/out default timeslot template

2. RPL
   - Join priority
   - Rank computation

3. 6P
   - ADD
   - COUNT
   - LIST
   - DELETE
   - CLEAR
   - Timeout

4. 6LoRH
   - source routing header correctly encoded as a 6LoRH Critical RH3
   - RPL Information Option correctly encoded as a 6LoRH RPI
   - IP in IP 6LoRH when packet travel inside RPL domain
   - IP in IP 6LoRH when packet travel outside RPL domain
## Test Description: an example

<table>
<thead>
<tr>
<th>Test Number</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test ID</td>
<td>TD_6TiSCH_6P_01</td>
</tr>
<tr>
<td>Test Objective</td>
<td>Check a 6N can ADD a cell in the schedule according to draft-wang-6tisch-6top-sublayer-04</td>
</tr>
<tr>
<td>Configuration</td>
<td>Star</td>
</tr>
<tr>
<td>Applicability</td>
<td>SUT includes a PS to see the 6P packets on the air. To this purpose, GD/sniffer, or a vendor PS can be used.</td>
</tr>
<tr>
<td>References</td>
<td>IEEE802.15.4e, draft-wang-6tisch-6top-sublayer-04</td>
</tr>
<tr>
<td>Pre-test conditions</td>
<td>The DR sends EB periodically, every 10 sec [2]. All EB packets are sent on a single frequency. Power on DR. Wait until both 6N join the DR.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test sequence</th>
<th>Step</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stimulus</td>
<td>The 6N1 sends a 6P ADD request to the DR for 1 slot. The candidate list is ( {4,5} )</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>IOP Check</td>
<td>The PS captures the sequence of request and response</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IOC Check</td>
<td>Check the packet header captured by the sniffer has the same format defined in the draft-wang-6tisch-6top-sublayer-04 for both the request and the response</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>IOC Check</td>
<td>Check that the returned code for the operation is IANA_6TOP_RC_SUCCESS</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stimulus</td>
<td>The 6N2 sends a 6P ADD request to the DR for 1 slot. The candidate list is ( {4} )</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IOP Check</td>
<td>The PS captures the sequence of request and response</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IOC Check</td>
<td>Check that the returned code for the operation is IANA_6TOP_RC_RESET</td>
<td></td>
</tr>
</tbody>
</table>

IOP Verdict
Test Scenarios

Legend
- Golden Device
- Vendor Device

Figure 1 Single-hop scenario

Figure 2 Multi-hop scenario

Figure 3 Star scenario
Tools

**Wireshark dissector:**
- 6top Protocol (6P), part of 6TiSCH
- 6LoRH, part of 6LoWPAN

**Contributor:** Jonathan Munoz (thanks!)

**Golden device:**
- Based on OpenWSN
- Adding commands to help testing

**Contributor:** Tengfei Chang (thanks!)
<table>
<thead>
<tr>
<th>Time</th>
<th>Tuesday 02</th>
<th>Wednesday 03</th>
<th>Thursday 04</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 - 09:00</td>
<td>Registration &amp; Set up</td>
<td>Room Opening</td>
<td>Room Opening</td>
</tr>
<tr>
<td>09:00 - 12:00</td>
<td>Registration &amp; Set up</td>
<td>TEST SESSIONS</td>
<td>TEST SESSIONS</td>
</tr>
<tr>
<td>12:00 - 13:00</td>
<td>NETWORKING LUNCH</td>
<td>NETWORKING LUNCH</td>
<td>NETWORKING LUNCH</td>
</tr>
<tr>
<td>13:00 - 14:00</td>
<td>Welcome Presentation</td>
<td>NETWORKING LUNCH</td>
<td>NETWORKING LUNCH</td>
</tr>
<tr>
<td>14:00 - 18:00</td>
<td>TEST SESSIONS</td>
<td>TEST SESSIONS</td>
<td>Tear Down</td>
</tr>
<tr>
<td>18:00 - 18:30</td>
<td>WRAP UP SESSION</td>
<td>WRAP UP SESSION</td>
<td></td>
</tr>
</tbody>
</table>
Feedback to standardization bodies

• to IETF 6TiSCH working group
  • first 6P working and inter-operating implementations!
  • work in progress about e.g. 6P sequence number not integrated yet, will need to happen before next Plugtests

• to IETF 6lo working group
  • first 6LoRH working and inter-operating implementations!
  • 2 issues were opened and flagged as the result of this event:
    • behavior of 6LoWPAN is unclear with encapsulated IPHC ([https://trac.tools.ietf.org/wg/6lo/trac/ticket/16](https://trac.tools.ietf.org/wg/6lo/trac/ticket/16))
    • whether or not it's a good idea to remove the addresses from the source routing header as the packet progresses through the network
H2020 F-Interop

Goal
To develop and provide online (and remote) interoperability and performance test tools to support emerging technologies from research to standardization and market launch

Duration
36 months

Dates
1 November 2015 – 31 October 2018

Consortium
9 partners from 6 countries: Including 2 companies (EANTC, DG), 2 universities (UPMC, UL), 4 public and private research centres (iMinds, MI, INRIA, DigiCat) and 1 standardization organisation (ETSI)
F-Interop and IETF 6TiSCH

• One of the target technologies: 6TiSCH

• Scope: from today face-to-face Interop events to tomorrow remote (online) Interop tests which take into account a diversity of end-user requirements and potential configurations

• Advertise F-Interop to IETF and promote adoption of test tools

• Preliminary F-Interop 6TiSCH test tool at IETF96 Berlin