

Report LLN PLUGFEST IETF 90

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PARTICIPANTS

(alphabetically)

Nicola Accettura

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Thomas Eichinger

Vitor Garbellini

Oliver Hahm

Vicent Ladeveze

Jürgen Schönwälder

Pascal Thubert

Nestor Tiglao

Pere Tuset Peiró

Xavier Vilajosana

Qin Wang

Thomas Watteyne

Goal

The goal of this event is to bring together people interested in hands-on experience around the technology developed by the 6TiSCH, 6lo and ROLL WGs, with a particular focus on the TSCH mode of IEEE802.15.4e, 6lowpan, RPL and new WG specifications.

Presentations

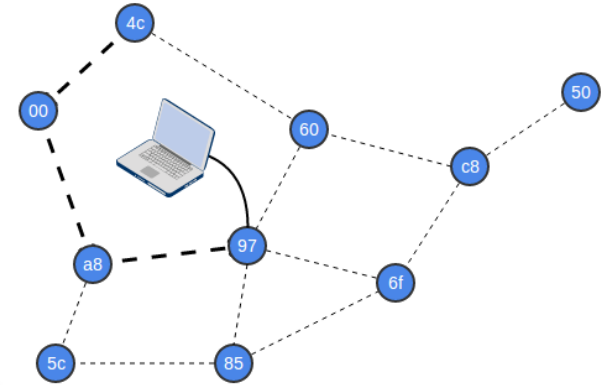
1. Efficient ND based registration to Ethernet Backbone Router End-to-end (SmartMesh) IP (Pascal Thubert, Thomas Watteyne)
2. UC Berkeley's OpenWSN
 - a. Introduction and Overview (Nicola Accettura)
 - b. OpenWSN Web Interface (Vitor Garbellini, Marcelo Barros)
 - c. 6TiSCH Operation Sublayer (6top) (Qin Wang, Tengfei Chang)
 - d. On-The-Fly Scheduling (Thomas Watteyne)
 - e. The IP Flow Label within a RPL Domain (Xavier Vilajosana)
3. Analysis of TSCH networks using open source tools: OpenMote + Wireshark (Pere Tuset-Peiró)
4. FIT IoT-lab: a very large-scale open testbed for the IoT (Cédric Adjih)
5. RIOT, The friendly Operating System for the Internet of Things (Oliver Hahm, Thomas Eichinger)
6. Counters for Troubleshooting and Monitoring the 6LoWPAN Layer (Anuj Sehgal, Jürgen Schönwälder)
7. Wireshark integration (Vincent Ladeveze)
8. Live demonstration of Sewio's open sniffer solution (Nestor Tiglao)

Outcome

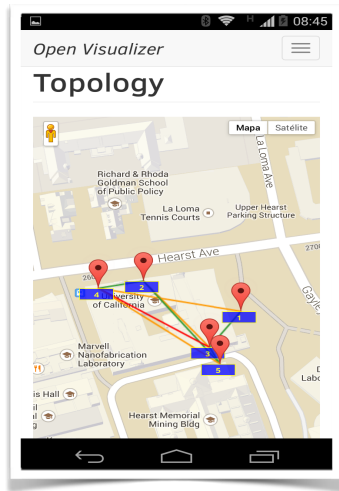
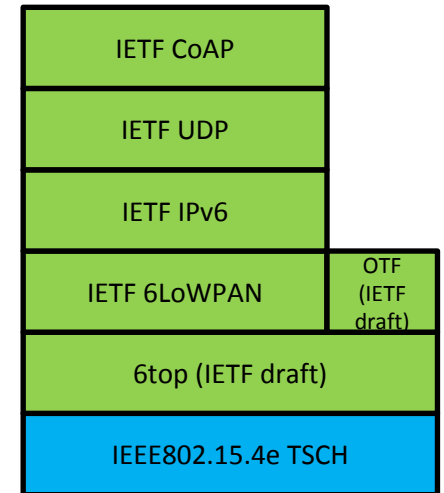
1. Draft were successfully implemented.
 - a. draft-ietf-6lo-lowpan-mib-01
 - b. draft-thubert-6man-flow-label-for-rpl-03
 - c. draft-ietf-6tisch-minimal-02
 - d. draft-wang-6tisch-6top-sublayer-01
 - e. draft-dujovne-6tisch-on-the-fly-03
 - f. draft-thubert-6lowpan-backbone-router-03
 - g. draft-ietf-6tisch-architecture-03
2. Let the people know that the participation in the development of the presented tools are open to everyone. Looking for volunteer.
3. Set base to work together in future projects.
4. Suggestions received to improve current implementations.

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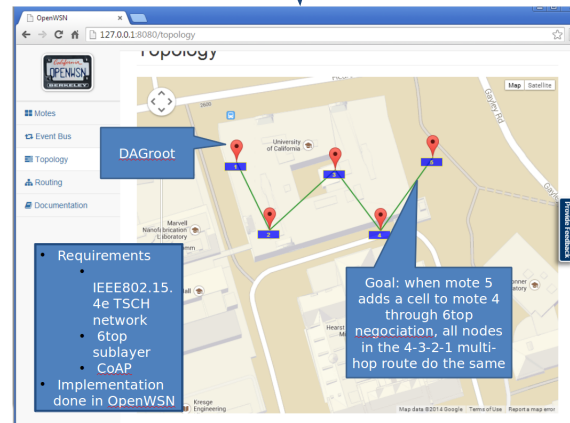
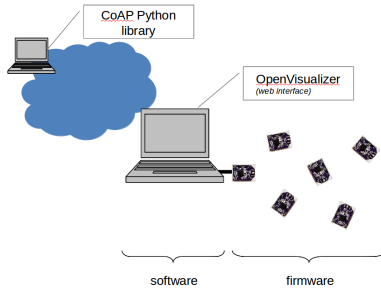
- <http://www.openwsn.org/>
- **Goal:** **open-source** implementations of a protocol stack based on **Internet of Things** standards, using a **variety** of hardware and software platforms
- Supported standards: **IEEE802.15.4e TSCH**, 6TiSCH, 6LoWPAN, RPL, CoAP
- Implementation of **6top sublayer**



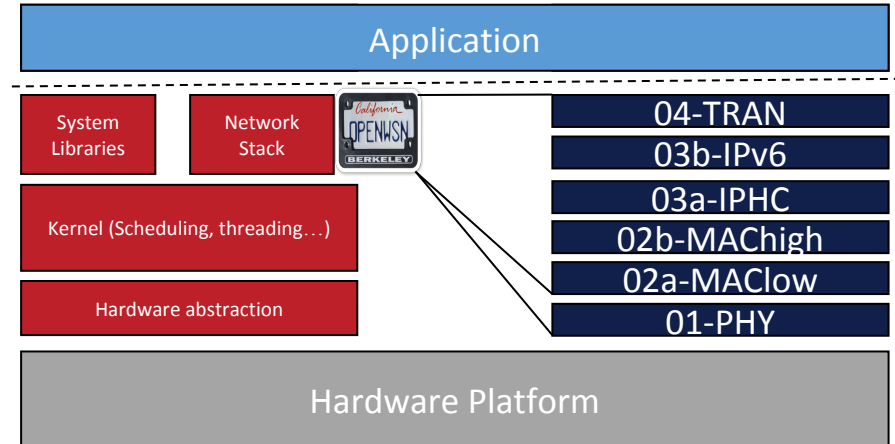
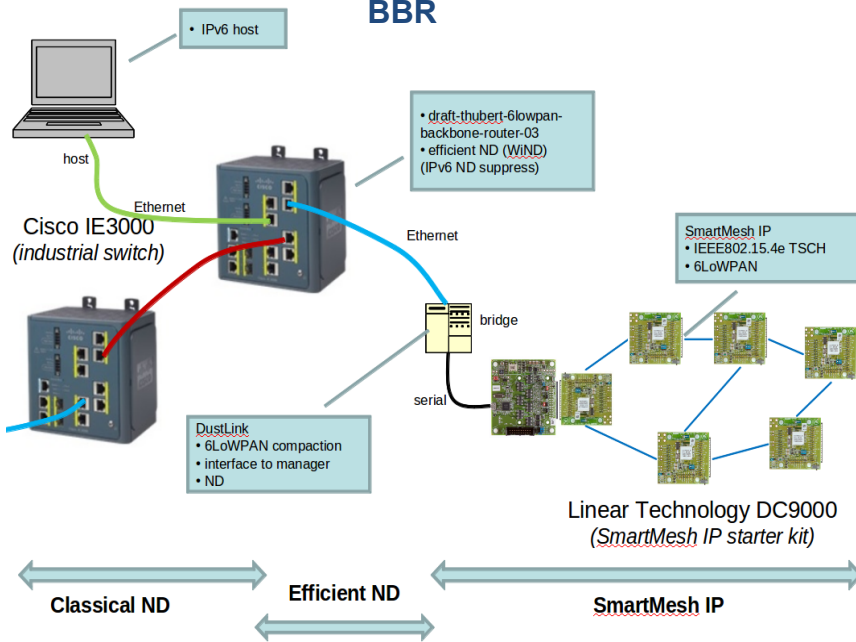
Protocol Stack



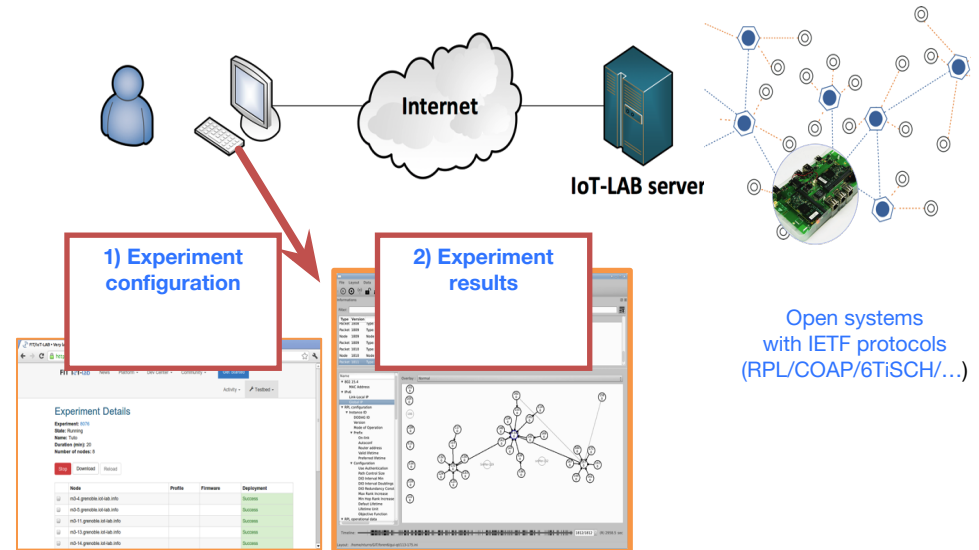
Architecture



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OpenMote Family		
OpenMote TI CC2538 SoC (Cortex M3 + radio) 4 LEDs, 2 Buttons 2 antennas	OpenBase Ethernet PHY+MAC USB-to-UART port USB-to-PHY port 10-pin ARM JTAG	OpenBattery Temp./Humd. Acceleration Luminance 2xAAA batteries





SNMP Access to the Counters

```

$ snmpwalk -v 1 -c public -Os -O
p -v Mesh
lowpanReasmTimeout.0 = 3 seconds
lowpanInReceives.0 = 877
lowpanInHdrErrors.0 = 0
lowpanInReasmRels.0 = 406
lowpanInReasmFails.0 = 4
lowpanInReasmOKs.0 = 30
lowpanInCompFails.0 = 505
lowpanInCompOKs.0 = 507
lowpanInDiscards.0 = 88
lowpanInDelivers.0 = 508
lowpanOutRequests.0 = 508
lowpanOutCompRels.0 = 509
lowpanOutCompFails.0 = 0
lowpanOutCompOKs.0 = 511
lowpanOutFragRels.0 = 31
lowpanOutFragFails.0 = 0
lowpanOutFragOKs.0 = 31
lowpanOutFragCreates.0 = 291
lowpanOutDiscards.0 = 0
lowpanOutTransmits.0 = 782
End of MIB
$

$ ~$src/sccli/sccli
100 sccli version 0.4.0 (c) 2001-2010 Juergen Schoenwaelder
sccli > set sccli protocol SNMPv1
sccli > open snmp://[aaaa:11:22ff:fe33:4455]:1610//
[aaaa:11:22ff:fe33:4455] sccli > show system info
Name: AVR Raven
Agent: snmp://public@[aaaa:11:22ff:fe33:4455]:1610//
Description: 6LOWPAN MIB Test Node
Contact: Anuj Sehgal <s.anuj@jacobs-university.de>
Location: Jacobs University Bremen
Vendor: Jacobs University <http://www.jacobs-university.de/>
Services: datalink network transport application
Agent-Boot-Time: 2014-07-18 11:26:47 +02:00
[aaaa:11:22ff:fe33:4455] sccli >

Agent: snmp://public@[aaaa:11:22ff:fe33:4455]:1610// up 00:04:25 00:38:33
Descr: 6LOWPAN MIB Test Node
Command: monitor 6lowpan stats

inDelivers 3 (887) outRequests 3 (855)
inDiscards 0 (79) outCompFails 0 (0)
inCompOKs 3 (889) outCompRels 3 (855)
inCompFails 0 (0) outCompOKs 3 (855)
inCompRels 3 (889) outFragRels 2 (340)
inReasmOKs 2 (357) outFragFails 0 (0)
inReasmFails 0 (6) outFragOKs 2 (339)
inReasmRels 6 (1346) outFragCreates 6 (1178)
inHdrErrors 0 (0) outDiscards 0 (0)
inReceives 7 (1884) outTransmits 7 (1692)

```

Capturing from OpenWSN [Wireshark 1.10.8 (v1.10.8-2-g52a5244 from master-1.10)]

Filter: zep

No.	Time	Source	Destination	Protocol	Length	Info
109	34.212813000	FE80::1415:92CC:0:3	FE80::1013:92CC:0:1	ICMPv6	198	RPL Control (1)
110	34.219362000	14:15:92:cc:00:00:00:01	14:15:92:cc:00:00:00:02	IEEE 802.15.4	121	Ack, Dst: 14:15:92:cc:00:00:00:02
111	34.292680000	bbbb::1415:92cc:0:5	ff02::2	ICMPv6	175	RPL Control (1)
112	34.443601000	bbbb::1415:92cc:0:2	ff02::2	ICMPv6	175	RPL Control (1)
113	34.499709000	bbbb::1415:92cc:0:4	ff02::2	ICMPv6	175	RPL Control (1)

Frame 93: 175 bytes on wire (1400 bits), 175 bytes captured (1400 bits) on interface 0

Ethernet II, Src: 00:ff:11:35:f1:f0 (00:ff:11:35:f1:f0), Dst: 00:ff:10:35:f1:f0 (00:ff:10:35:f1:f0)

Internet Protocol Version 6, Src: bbbb::1 (bbbb::1), Dst: bbbb::1 (bbbb::1)

User Datagram Protocol, Src Port: 0 (0), Dst Port: zep (17754)

ZigBee Encapsulation Protocol, channel: 20, Length: 81

IEEE 802.15.4 Data, Dst: Broadcast, Src: 14:15:92:cc:00:00:00:04

6LOWPAN

Internet Protocol Version 6, Src: bbbb::1415:92cc:0:4 (bbbb::1415:92cc:0:4), Dst: ff02::2 (ff02::2)

Internet Control Message Protocol v6

Type: RPL Control (155)

Code: 1 (ODAG Information object)

checksum: 0xa829 [correct]

RPLInstanceID: 0

Version: 0

Rank: 6

Flags: 0xb8

Destination Advertisement Trigger Sequence Number (DTSN): 51

Flags: 0x00

Reserved: 00

ODAGID: bbbb::1415:92cc:0:1 (bbbb::1415:92cc:0:1)

0000 00 ff 10 35 f1 f0 00 ff 11 35 f1 f0 86 dd 60 00 ...5...
 0010 00 00 00 79 11 08 bb 00 00 00 00 00 00 00 00 ...Y...
 0020 00 00 00 00 01 01 bb 00 00 00 00 00 00 00 00 ...

Frame (175 bytes) | Decompressed 6LOWPAN IPHC (68 bytes)

Frame (frame), 175 bytes | Packets: 201 - Displayed: 165 (82....) | Profile: D

de-facto network packet analyzer
 collection of protocol dissectors
 IEEE802.15.4-2006
 6LOWPAN
 RPL
 CoAP
 etc.
 open-source and extensible

Capturing from eth0 [Wireshark 1.10.8 (v1.10.8-2-g52a5244 from master-1.10)]

Filter:

No.	Time	Source	Destination	Protocol	Length	Info
202	78.722712000	0000::12:4000:40f:6107	0000::12:4000:40f:6107	ICMPv6	187	Echo (ping) request ID=0000, seq=054, hop limit=128
203	78.742123000	00:12:40:00:04:0f:61:07	00:12:40:00:04:0f:61:07	IEEE 802.15.4	78	ack, Dst: TexasIn_00:04:0f:61:07, Src: TexasIn_00:04:0f:61:07
204	78.751709000	fe80::12:4000:40f:6107	fe80::12:4000:40f:6107	ICMPv6	83	Echo (ping) request ID=0000, seq=054, hop limit=128
205	78.757428000	00:12:40:00:04:0f:61:07	00:12:40:00:02:79:7b:01	IEEE 802.15.4	78	ack, Dst: TexasIn_00:02:79:7b:01, Src: TexasIn_00:04:0f:61:07
206	78.757428000	00:12:40:00:04:0f:61:07	00:12:40:00:02:79:7b:01	IEEE 802.15.4	78	ack, Dst: TexasIn_00:02:79:7b:01, Src: TexasIn_00:04:0f:61:07
207	78.757428000	00:12:40:00:04:0f:61:07	00:12:40:00:02:79:7b:01	IEEE 802.15.4	78	ack, Dst: TexasIn_00:02:79:7b:01, Src: TexasIn_00:04:0f:61:07

Frame 206: 78 bytes on wire (624 bits), 78 bytes captured (624 bits) on interface 0

Ethernet II, Src: 00:00:00:00:00:00 (00:00:00:00:00:00), Dst: 00:00:00:00:00:00 (00:00:00:00:00:00)

IEEE 802.15.4 Data, Dst: TexasIn_00:02:79:7b:01, Src: TexasIn_00:04:0f:61:07

RPL

IPHC header

Traffic class: 0x00

0000 0000 0111 0000 0000 = FlowLabel: 0x00000700

Next header: ICMPv6 (0x3a)

Hop limit: 64

Source: fe80::12:4000:40f:6107 (fe80::12:4000:40f:6107)

Destination: fe80::1 (fe80::1)

Internet Protocol Version 6, Src: fe80::12:4000:40f:6107 (fe80::12:4000:40f:6107), Dst: fe80::1 (fe80::1)

ICMPv6 ... Version: 6

0000 0000 ... Traffic class: 0x00000000

0000 0000 0111 0000 0000 = FlowLabel: 0x00000700

Payload length: 18

Next header: ICMPv6 (58)

Hop limit: 64

Source: fe80::12:4000:40f:6107 (fe80::12:4000:40f:6107)

Destination: fe80::1 (fe80::1)

[Source destP: unknown]

[Destination destP: unknown]

Internet Control Message Protocol v6

Type: Echo (ping) reply (129)

Code: 0

checksum: 0x7afe [incorrect, should be 0x0000]

Identifier: 0x0001

Sequence: 054

Data (4 bytes)

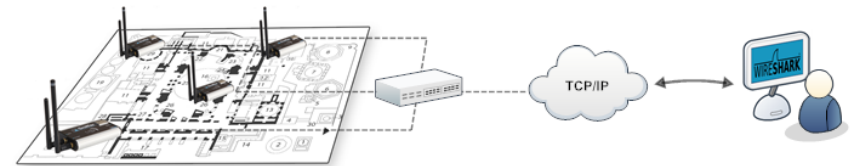
0000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...
 0020 00 12 40 00 04 0f 61 07 fe 80 00 00 00 00 00 ...X...
 0040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...
 0060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...

Frame (78 bytes) | Decompressed 6LOWPAN IPHC (56 bytes)

Flowlabel (ipv6 flow), 4 bytes | Packets: 856 - Displayed: 856 (100.0%) | Profile: Default

SenderRank = 1792

Sewio Open Sniffer



← FLOW LABEL
IMPLEMENTATION



MORE INFORMATION

- Wiki page
 - https://bitbucket.org/6tisch/meetings/wiki/140720a_ietf90_toronto_plugfest
- Recording
 - Meetecho: <http://www.meetecho.com/ietf90/Inplugfest>
- Slides
 - To be published in the MLs
- Pictures
 - To be published in the MLs

Acknowledgements

We would like to thank authors of the ETSI CTI Plugtest draft 2012-02 that served as a guideline for this document. Thanks to Jari Arkko, Samita Chakrabarti, Oliver Hahm, Ulrich Herberg, Ted Lemon, Michael Richardson, Pascal Thubert and Thomas Watteyne, for their suggestions and helpful advice.

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