IETF 90 ROLL

Routing over Low-Power And Lossy Networks

Chairs:
Michael Richardson
Ines Robles

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Source: https://www.ietf.org/about/note-well.html

Meeting Materials

- Remote Participation
  - Jabber Room: roll@jabber.ietf.org
  - Meetecho: http://www.meetecho.com/ietf90/roll
- Etherpad:
  - http://tools.ietf.org/wg/roll/minutes
- Audio Streaming: http://ietf90streaming.dnsalias.net/ietf/ietf907.m3u
- Minutes taker:
- Jabber Scribe:
- **Please sign blue sheets :-)**

Agenda

- State of all drafts (5min)
  - Related Internet-Drafts
- State of all Issues (3min)
- Updates to Milestones, Schedule and Practice (5min)
- Report LLN Plugfest Event IETF 90(5min)
- Updates on: draft-ietf-roll-applicability-template. (5min)
- Updates on: draft-ietf-roll-security-threats (10min)
- Updates on: draft-ietf-roll-mpl-parameter-configuration (15min)
- Updates on: draft-ietf-roll-admin-local-policy (15min)
- Updates on: draft-ietf-roll-applicability-ami (10min)
- Updates on: draft-thubert-6man-flow-label-for-rpl (15min)
- Open floor (15 minutes)

State of Active Internet-Drafts

draft-ietf-roll-admin-local-policy-00	New draft - Slides today	
draft-ietf-roll-applicability-ami-09	Slides today	Tickets to solve: #135, #136, #137
draft-ietf-roll-applicability-home-building-03	Alignment with template draft	Tickets #142 and #144 closed.
draft-ietf-roll-applicability-template-05	New version May 2014 - Are all the applicability statements I-D following this model? Slide today	
draft-ietf-roll-security-threats-08	Slides today - Submitted to IESG for Publication	
draft-ietf-roll-trickle-mcast-09	Submitted to IESG for Publication - Adrian is working on it	
draft-ietf-roll-mpl-parameter-configuration-02	Tickets #157,#158 and #159. **Need Review of WG**	

Related Internet-Drafts

draft-ajunior-roll-energy-awareness-01	Energy-awareness metrics global applicability guidelines	Working in a new version with only RPL
draft-doi-roll-mpl-nan-requirements-00	Neighborhood Area Network Requirements for MPL	Future Discussion
draft-ko-roll-mix-network-pathology-04	RPL Routing Pathology In a Network With a Mix of Nodes Operating in Storing and Non-Storing Modes	Future Discussion

Open Tickets

Ticket	Summary
applicability-ami - To be updated with version 09 of the draft	
#135	Point to the Security Considerations section of RFC 6550
#136	Add a section of the Security Considerations for each instance where the RPL security mechanism are not to be used
#137	Incorporate a model for initial and incremental deployments

Open Tickets (cont.)

Ticket	Summary
draft-ietf-roll-mpl-parameter-configuration - Tickets updated with version 01 and 02	
#157	mpl-parameter-configuration-00 - Effect of inconsistent parameter set among nodes
#158	mpl-parameter-configuration-00 - new MPL domain
#159	mpl-parameter-configuration-00 - Format to encode timers

Milestones: Done

Resolve question of whether to keep this in roll or 6tisch
draft-ietf-roll-rpl-industrial-applicability

Milestones (cont.)

Milestone	Schedule	Practice
Submit REVISED thread-analysis document based upon security directorate review to IESG. draft-ietf-roll-security-threats	Jan 2014	July 21, 2014
Submit first draft of RPL applicability statement for Home Automation applications to the IESG to be considered as an Informational RFC	Feb 2014	
Evaluate WG progress, recharter or close	Jun 2014	You are here today.

Report LLN PLUGFEST IETF 90

Chairs:

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PARTICIPANTS

(alphabetically)

Nicola Accettura
Cedric Adjih
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Tengfei Chang
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

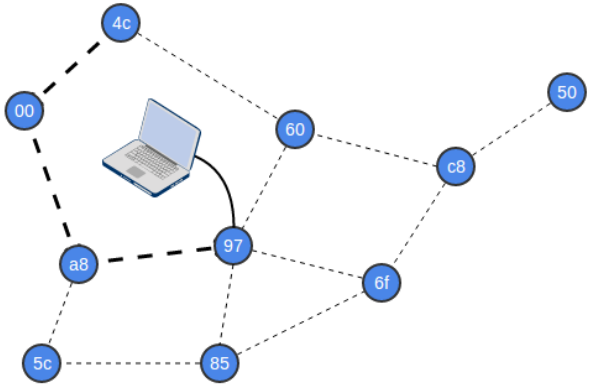
1. Efficient ND based registration to Ethernet Backbone Router End-to-end (SmartMesh) IP (Pascal Thubert, Thomas Watteyne)
2. UC Berkeley's OpenWSN
    a. Introduction and Overview (Nicola Accettura)
    b. OpenWSN Web Interface (Vitor Garbellini, Marcelo Barros)
    c. 6TiSCH Operation Sublayer (6top) (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)

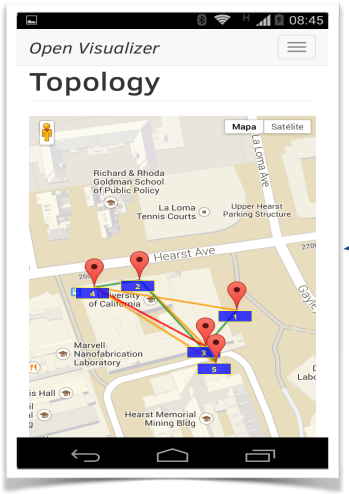
Outcome

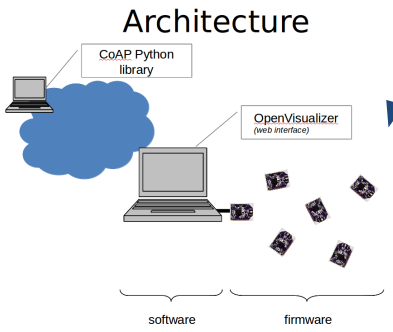
1. Draft were successfully implemented.
    a. draft-ietf-6lo-lowpan-mib-01
    b. draft-thubert-6man-flow-label-for-rpl-03
    c. draft-ietf-6tisch-minimal-02
    d. draft-wang-6tisch-6top-sublayer-01
    e. draft-dujovne-6tisch-on-the-fly-03
    f. draft-thubert-6lowpan-backbone-router-03
    g. draft-ietf-6tisch-architecture-03
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.

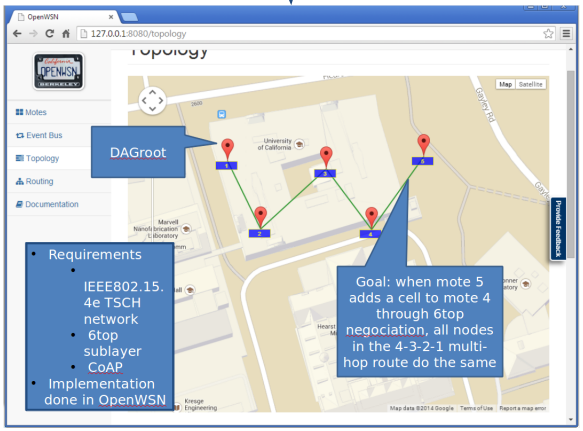
PARTICIPANTS

- 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**

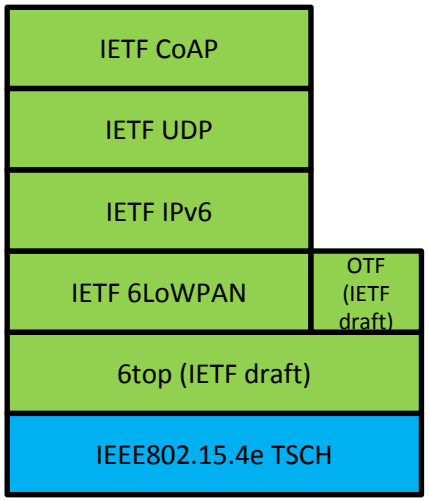








Protocol Stack



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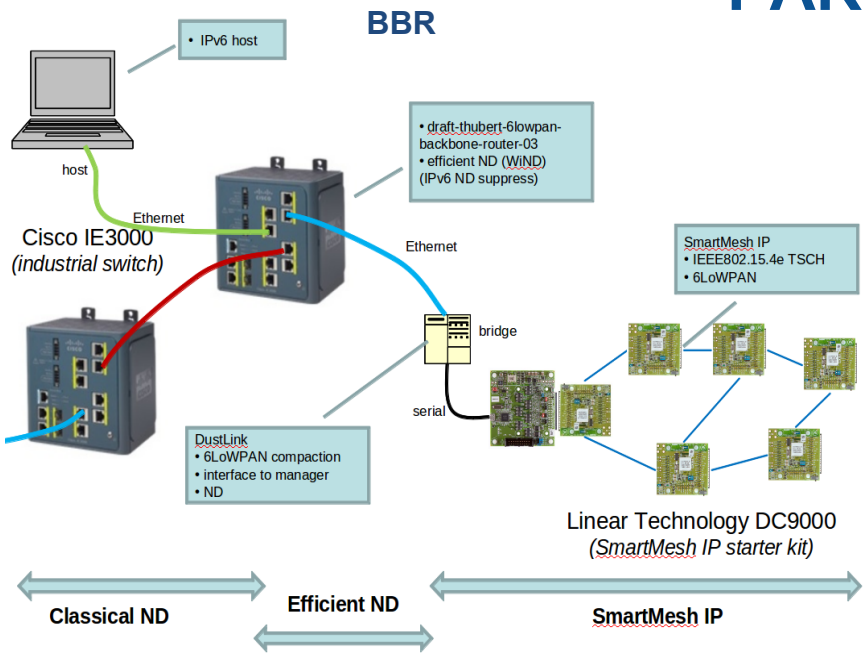
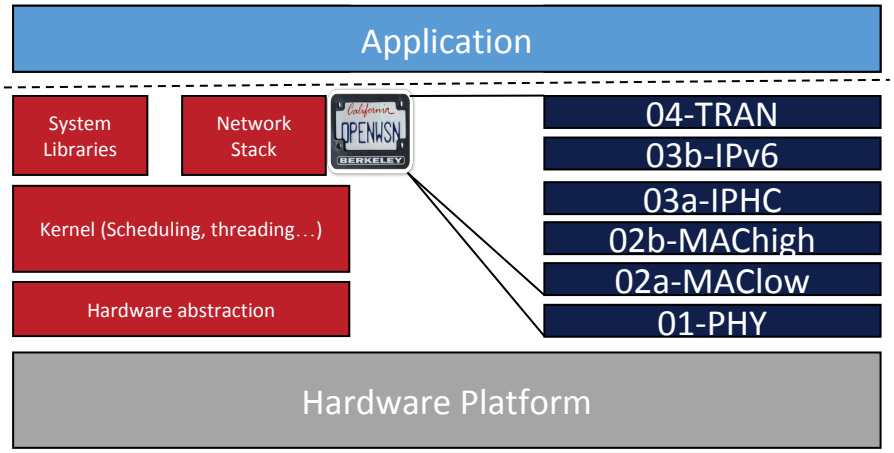
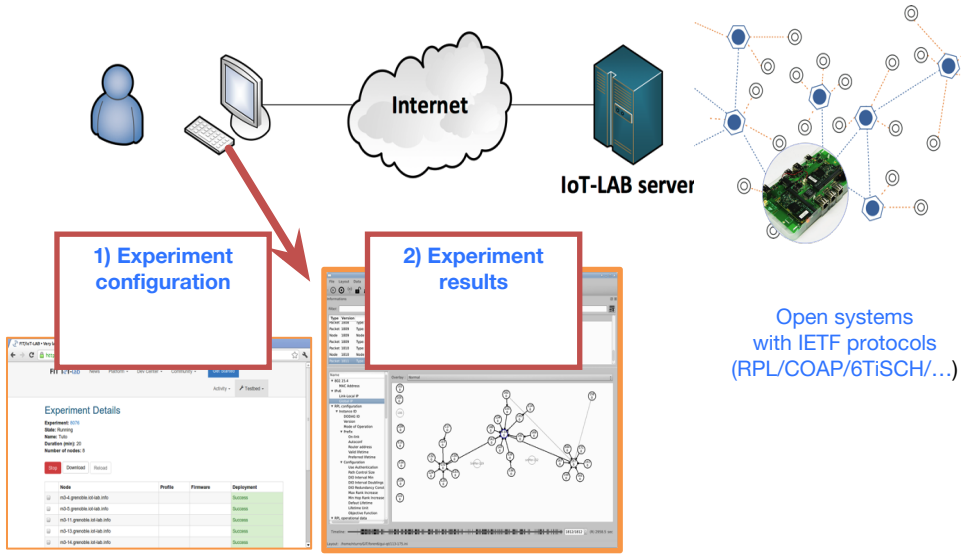




OpenMote Family		
OpenMote	**OpenBase**	**OpenBattery**
TI CC2538 SoC	Ethernet PHY+MAC	Temp./Humd.
(Cortex M3 + radio)	USB-to-UART port	Acceleration
4 LEDs, 2 Buttons	USB-to-PHY port	Luminance
2 antennas	10-pin ARM JTAG	2xAAA batteries



Open systems with IETF protocols (RPL/COAP/6TiSCH/…)

OpenMote
Open hardware for the Internet of Things.

FIT IoT-lab

PARTICIPANTS

6LOWPAN-MIB

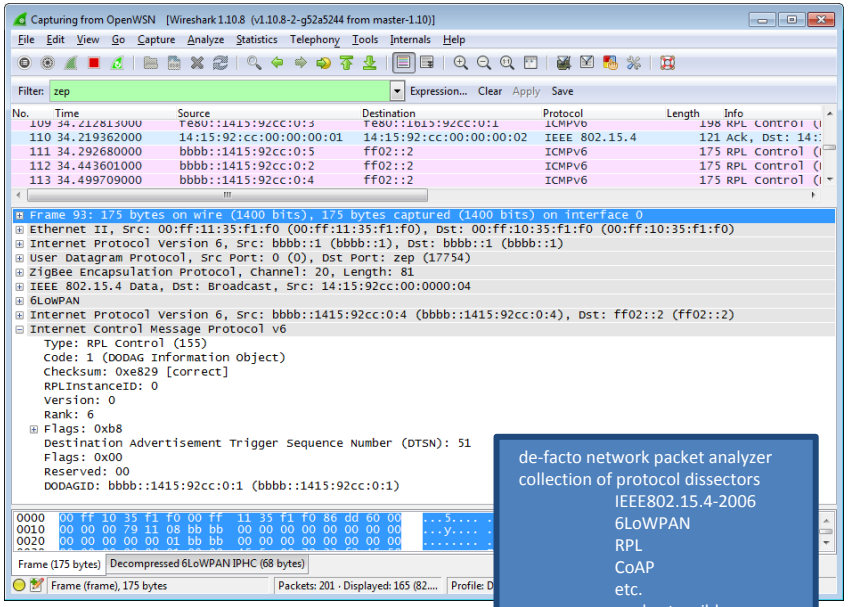
SNMP Access to the Counters

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

```
$ ~/src/scli/scli/scli
100 scli version 0.4.0 (c) 2001-2010 Juergen Schoenwaelder
scli > set scli protocol SNMPv1
scli > open snmp://[aaaa::11:22ff:fe33:4455]:1610//
(aaaa::11:22ff:fe33:4455) scli > 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) scli >
```

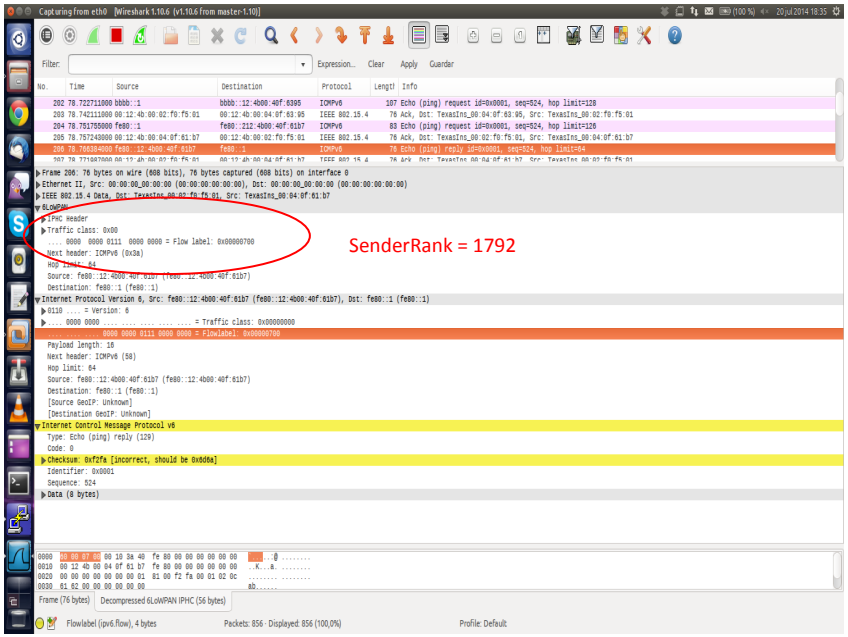
```
Agent:    snmp://public@[aaaa::11:22ff:fe33:4455]:1610// up 0 days 00:04:25    09:38:33
Descr:    6LoWPAN MIB Test Node
Command:  monitor 6lowpan stats

inDelivers          3 (887)       outRequests         3 (855)
inDiscards          0 (79)              v
    ^                                 outCompReqds      3 (855)
inCompOKs           3 (889)       outCompFails        0 (0)
inCompFails         0 (0)         outCompOKs          3 (855)
inCompReqds         3 (889)             v
    ^                             outFragReqds        2 (340)
inReasmOKs          2 (357)       outFragFails        0 (0)
inReasmFails        0 (6)         outFragOKs          2 (339)
inReasmReqds        6 (1346)      outFragCreates      6 (1178)
    ^                                 v
inHdrErrors         0 (0)         outDiscards         0 (0)
inReceives          7 (1884)      outTransmits        7 (1692)
```

WIRESHARK DISECTOR

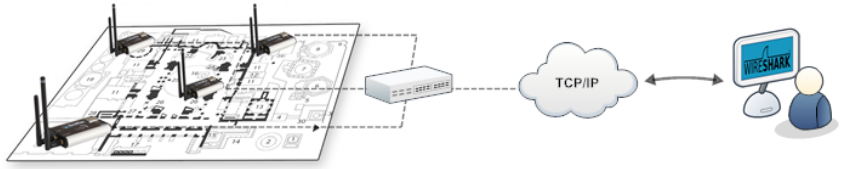


de-facto network packet analyzer
collection of protocol dissectors
- IEEE802.15.4-2006
- 6LoWPAN
- RPL
- CoAP
- etc.

open-source and extensible



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/llnplugfest
- 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.

Thanks to Stephanie McCammon for her help in the organization of this event.

draft-ietf-roll-applicability-template-05

Michael Richardson
IETF 90 - Toronto

Status: Applicability template

Voice calls with Security Directorate reviewers, decided that the documents need more glue to connect them.

Thanks to Peter van der Stok

Added relationship to other documents:

ROLL has specified a set of routing protocols for Lossy and Low- resource Networks (LLN) [RFC6550]. This applicability text describes a subset of these protocols and the conditions which make the subset the correct choice. The text recommends and motivates the accompanying parameter value ranges. Multiple applicability domains are recognized including: Building and Home, and Advanced Metering Infrastructure. The applicability domains distinguish themselves in the way they are operated, their performance requirements, and the most probable network structures. Each applicabilitystatement identifies the distinguishing properties according to a common set of subjects described in as many sections.
A common set of security threats are described in [I-D.ietf-roll-security-threats]. The applicability statements complement the security threats document by describing preferred security settings and solutions within the applicability statement conditions. This applicability statements may recommend more light weight security solutions and specify the conditions under which these solutions are appropriate.

draft-ietf-roll-security-threats-08

Michael Richardson
IETF 90 - Toronto

Changes to draft-ietf-roll-security-threats

1) 06 produced in December, closing issues #115, 116, 119, 121, 124, 125, 133
2) 2014-02-14 WG LC, Shepard write-up by Robert Craigie, 7 issues opened, further revisions
3) 07 produced June 16, 2014, write-up proceeding.
4)08 uploaded 2014-July-21, submitted to IESG.

Issue: threats to integrity vs multicast

- Many intend to specify layer-2 keys, with per-link keying (e.g. using MLE)
- Multicast messages (DIO, DIS) will have to be sent using a (symmetric) group key for entire network
  - Origin authentication is not possible with group keys.
  - Needs to be noted.

draft-ietf-roll-mpl-parameter-configuration

IETF 90

Yusuke DOI
TOSHIBA Corporation

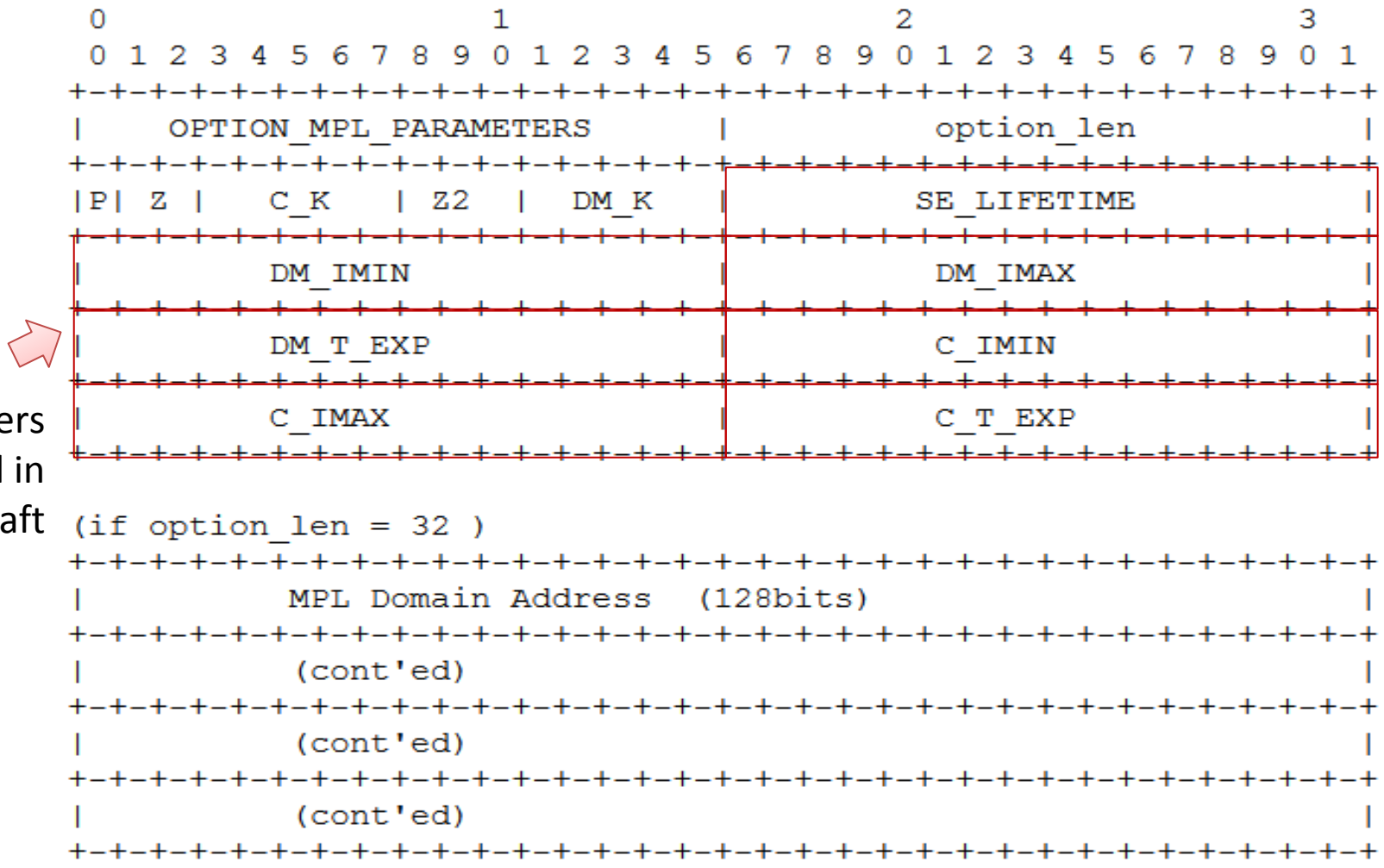
00 to 01 (~~submitted~~ previous)

- Operational considerations are added (#157)
- a node /SHOULD/MAY/ join the MPL domain by the option (#158)

01 to 02 (~~planned~~ just submitted)

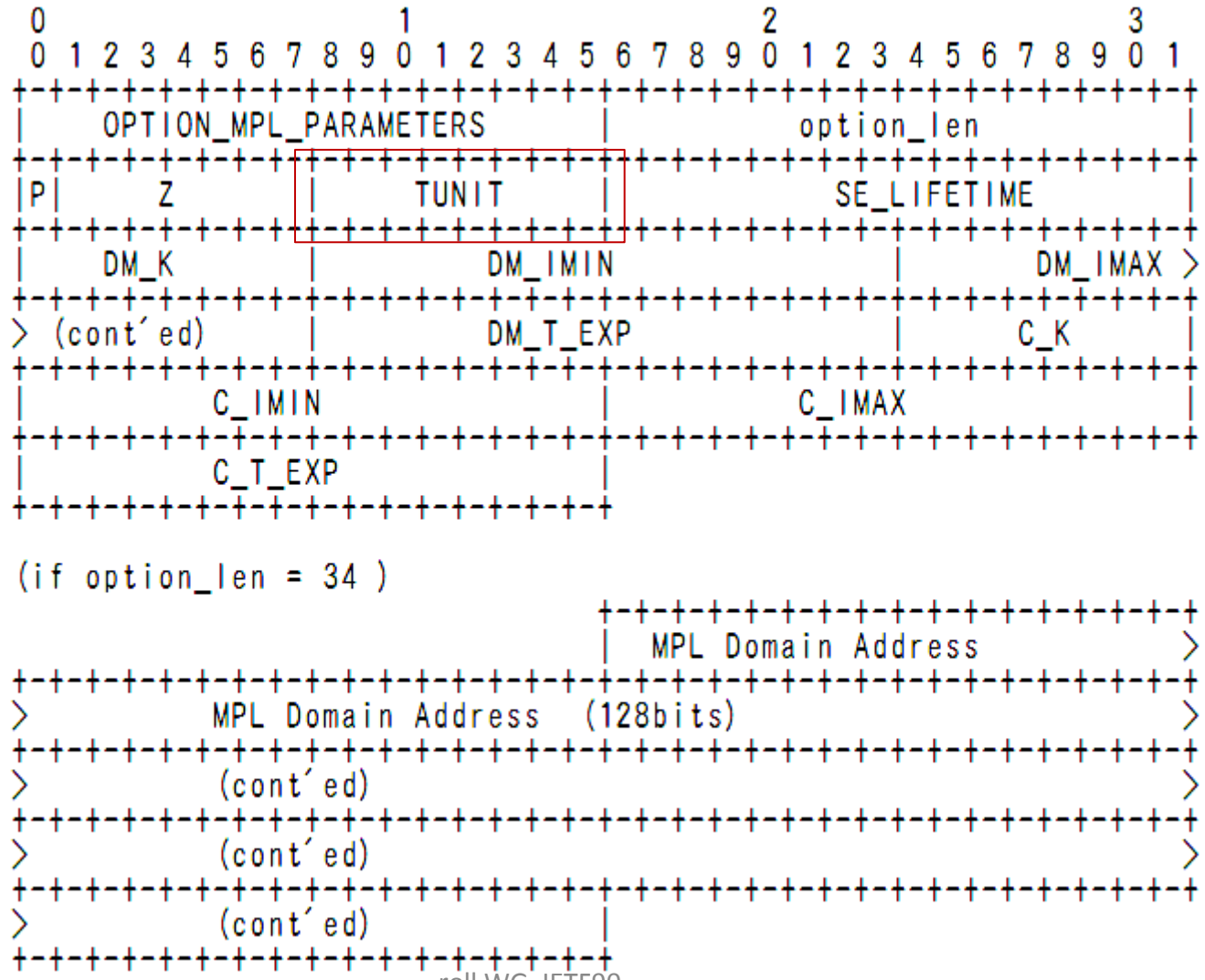
- Feedbacks from DHC wg (#159)
  - Option format is simplified (but unaligned)
  - Short floating point is removed and TUNIT is added to describe precision of timers

Option Format (current)



Timers defined in MPL draft

Option Format (will be updated) → #159



DHCP folks are favor of simple unaligned values than 'packed' format.

TUNIT: Unit of Time

- TUNIT: 0-255 (0 and 0xff SHALL NOT be used)
- Timers: 0-65535 (0 and 0xffff SHALL NOT be used)
- High precision: 1ms – 65 seconds
- Low precision: 254 ms – 4.6 hours

Next Step

- Needs more input from roll WG?

(additional slides)

I-D.roll-trickle-mcast-06 Section 5.4 (again)

- *Following [RFC6206], it is RECOMMENDED that all MPL Interfaces attached to the same link of a given MPL Domain use the same values for the Trickle Parameters above for a given MPL Domain. The mechanism for setting the Trickle Parameters is not specified within this document.*
- Candidates of '*the mechanism*':
  - Preconfigured, (Stateless)DHCPv6, SNMP, NetConf, etc.
  - Some LLN may use DHCPv6 anyway: Let's piggyback on it.

Issue #157

- Effect of inconsistent parameter set
  - If update is reasonable, it should have negligible effects
    - Reasonable: both old and new configuration does not break the network
  - Operational recommendation will be given:
    - MPL parameter configuration option should not updated more often than two times of expected refresh interval
  - Persistent failure
    - If a node has received information refresh option along with MPL parameter configuration option, and the node is failed to refresh DHCPv6 options for two times of information-refresh-time, it shall suspend operation of MPL forwarders until successful update.

Issue #158

- Addition of new MPL domain
  - MAY
  - SHOULD
  - MUST <- may not be a good idea
- Removal of previously-added MPL domain
  - When a corresponding field is removed from a refreshed DHCPv6 option
  - When a REMOVAL flag is set on the field of a refreshed DHCPv6 option

Issue #159

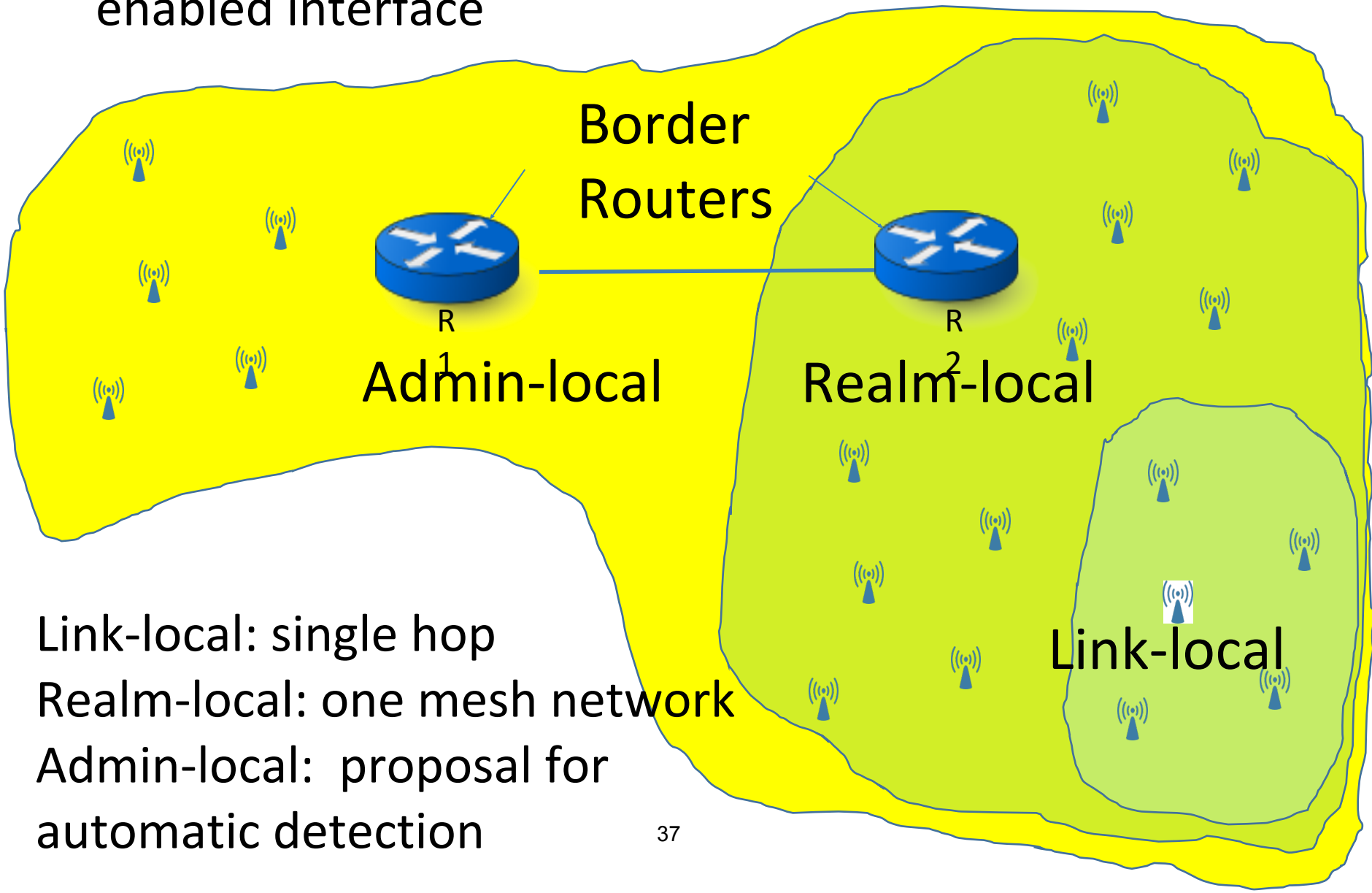
- Format should be much more simple
  - No special value encodings
  - No packed values
  - Each group of values may have its own option → MPL domain configuration is considered a group and can be packed.

ROLL working group

MPL forwarder policy for multicast with admin-local scope
draft-ietf-roll-admin-local-policy-00

P. van der Stok; R. Cragie

Wireless node with single MPL-enabled interface



Link-local: single hop
Realm-local: one mesh network
Admin-local: proposal for automatic detection

Multicast scopes relevant to MPL

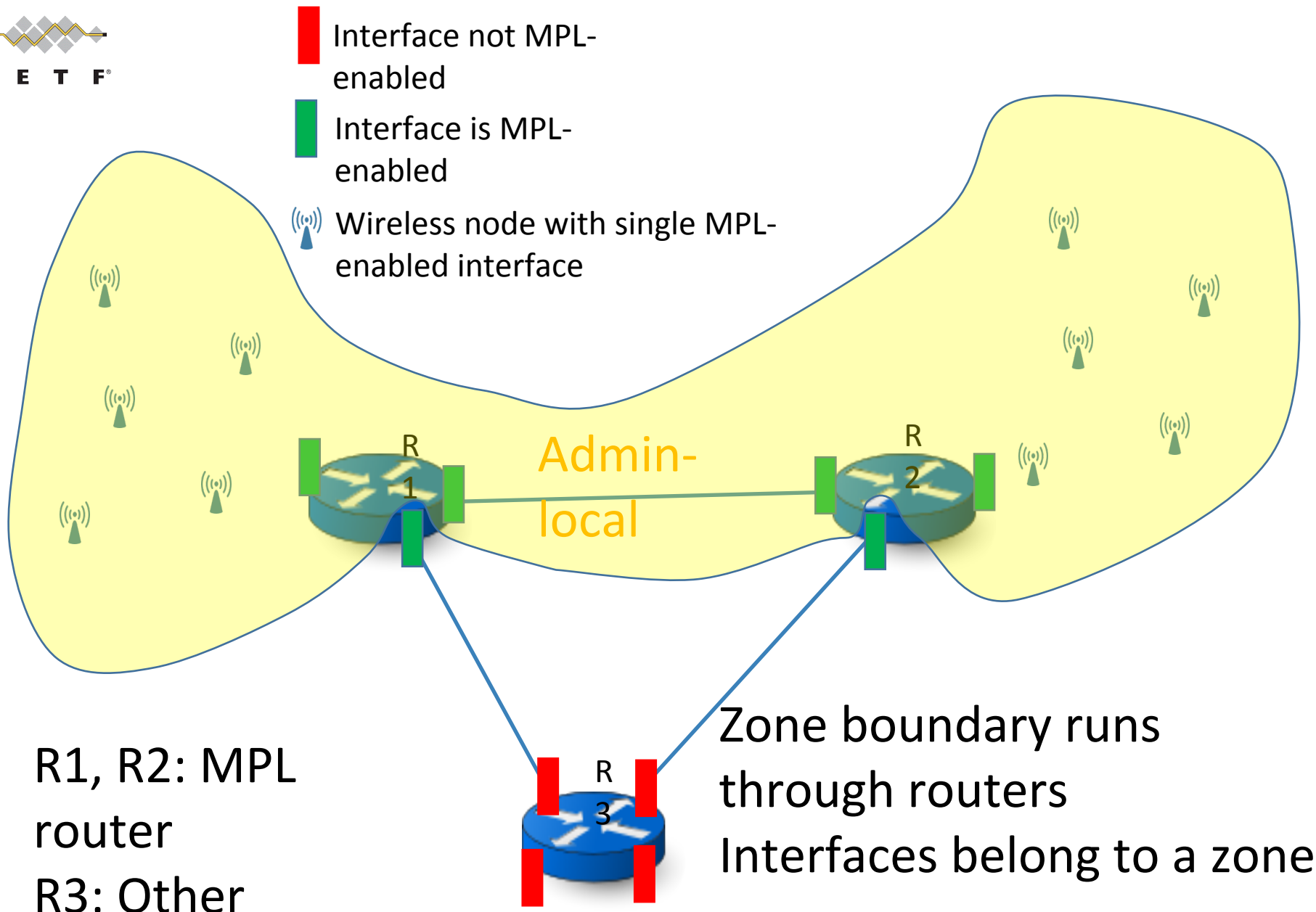
Link-local:
Single hop determined automatically from hardware characteristics

Realm-local:
Multi-hop automatically determined by layer-2 network standard

Admin-local:
Multi-hop including several layer-2 networks.
The draft proposes an automatic determination by standardizing border router behaviour

Distinguish MPL routers from other routers

- **MPL routers**
  - run a MPL Forwarder
  - all interfaces are MPL-enabled
  - subscribed to ALL_MPL_FORWARDERS (scope 3 and scope 4)
- **Other routers**
  - MUST discard packets with MPL Option



R1, R2: MPL router
R3: Other router

Zone boundary runs through routers
Interfaces belong to a zone

Aim of automatic scope 4 zone configuration policy is to exclude R3

Introduce Boolean flag: MPL blocked

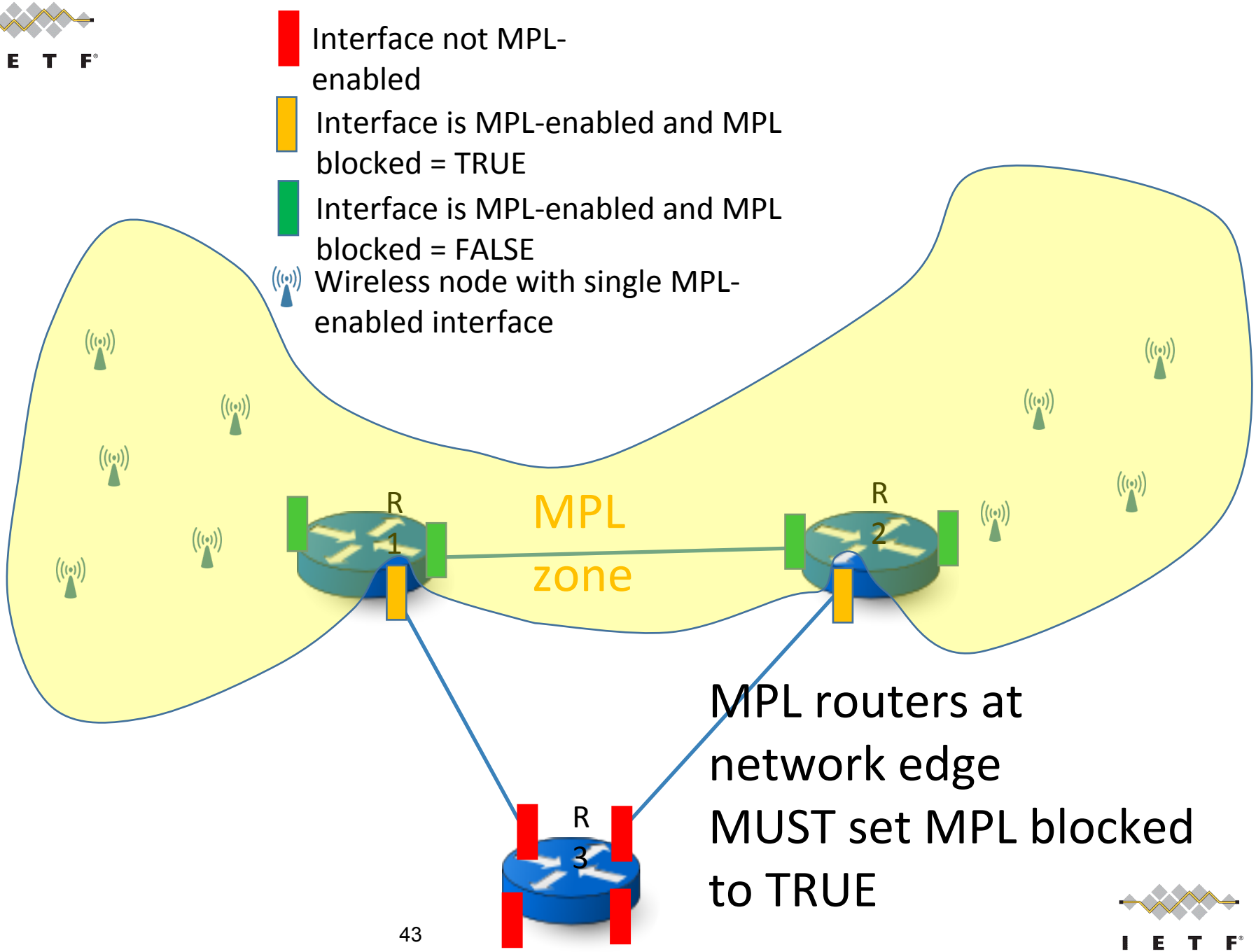
- MPL blocked = TRUE: Do not send MPL Messages over this interface
- MPL blocked = FALSE: Send MPL Messages over this interface

MPL blocked is set using proposed protocol

MPL block protocol

- MPL-blocked is set to FALSE at a MPL-enabled interface:
  - Whenever a MPL Message is received and processed at the interface
- At least every hour (configurable), send a MPL Message to ALL_MPL_FORWARDERS (scope 4)
  - MPL-blocked is accordingly set to FALSE
- If no MPL Message is received at the interface within 5 minutes (configurable), set MPL blocked to TRUE

- MPL-blocked prevents sending of MPL messages


Interface not MPL-enabled
Interface is MPL-enabled and MPL blocked = TRUE
Interface is MPL-enabled and MPL blocked = FALSE
Wireless node with single MPL-enabled interface
R 1
MPL zone
R 2
R 3
MPL routers at network edge MUST set MPL blocked to TRUE

Update on AMI RPL applicability statement

draft-ietf-roll-applicability-ami-09

What's changed

- Updated "*Section 9.1 - Security considerations during initial deployment*"
- Updated "*Section 9.2 - Security Considerations during incremental deployment*"
- Removed "*Section 10 - Other Related Protocols Section*"
- Updated "*Section 7.2.2 - 802.15.4g/e PHY and MAC feature implementation details*"

Questions?

draft-thubert-6man-flow-label-for-rpl

Xavier Vilajosana

Universitat Oberta de Catalunya

Pascal Thubert

Cisco

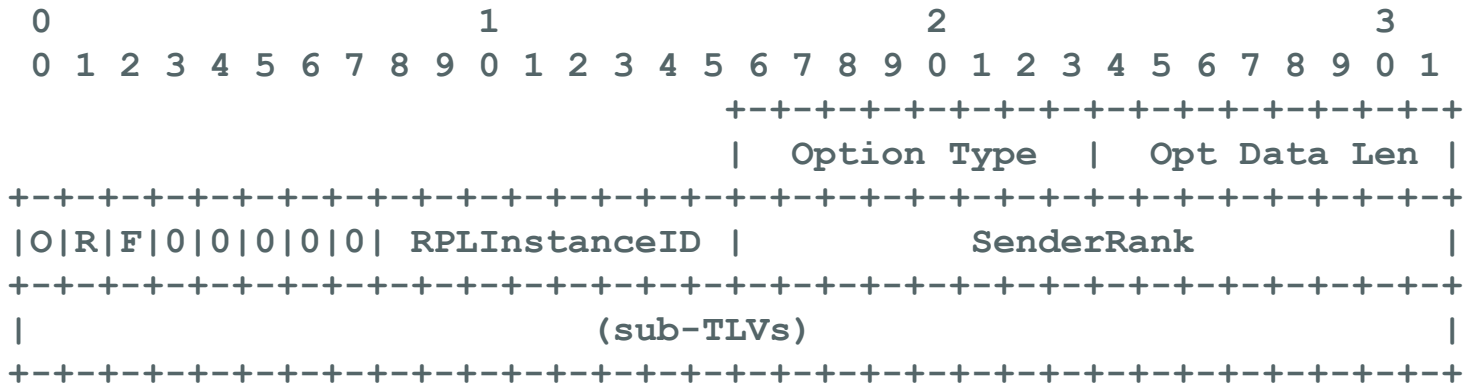
ROLL IETF 90 Toronto

RPL info in current RPL implementations

- [RFC6550 11.2. Loop Avoidance and Detection] :

"RPL loop detection uses RPL Packet Information that is transported within the data packets, relying on an external mechanism **such as** [RFC6553] that places in the RPL Packet Information in an IPv6 Hop- by-Hop option header."

- [RFC6553] : **8 octets encoding** (2 octets for HbH header and then 6 octets option):



- [RFC6553 4. RPL Router Behavior] :

"When the router is the source of the original packet and the destination is known to be within the same RPL Instance, the router SHOULD include the RPL Option directly within the original packet. Otherwise, **routers MUST use IPv6-in-IPv6 tunneling** [RFC2473] and place the RPL Option in the tunnel header."

Problem with RPL option in HbH header [RFC6553]

8-octets overhead detrimental to the LLN operation

- Almost innocuous with G-PHY (ZigbeeIP, CG-Mesh)
- May cause fragmentation with classical PHY (127 octets/Frame)
- Not compressed by 6LoWPAN HC
- Wasted Energy in constrained devices

Additional IP-in-IP encapsulation

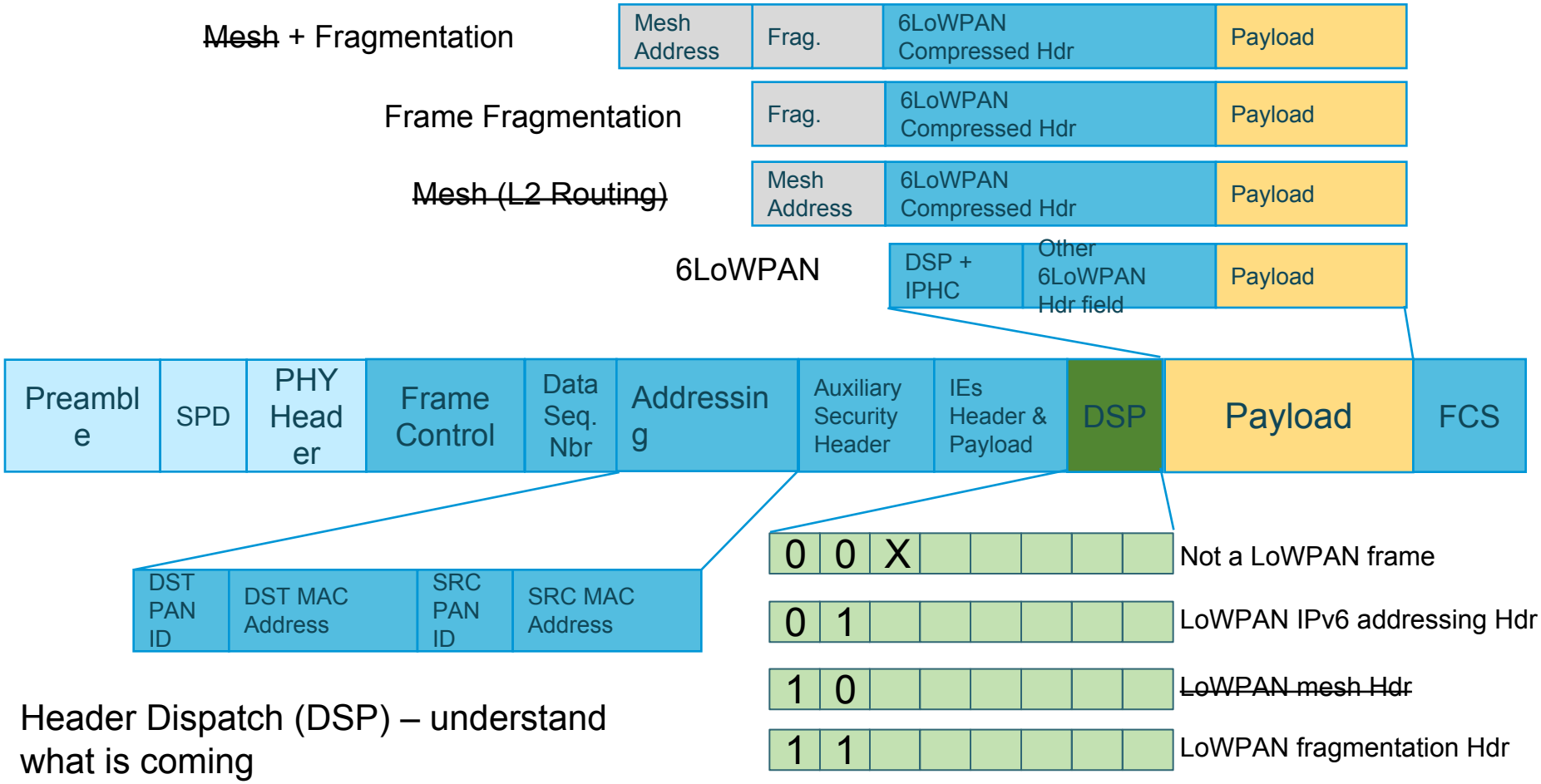
- Deeply aggravating factor for energy consumption and fragmentation

6TiSCH supports classical PHY

- **Overheads above are show stoppers for adoption by ext. SDOs**

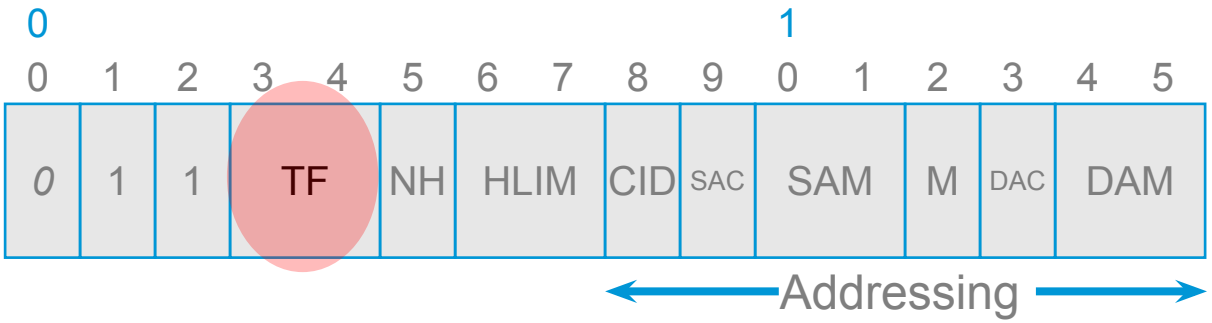
RFC 6282: 6LoWPAN Adaptation Layer

Simple MAC allows coexistence with other network protocols over same link, similar to Ethernet, although not seen in deployment



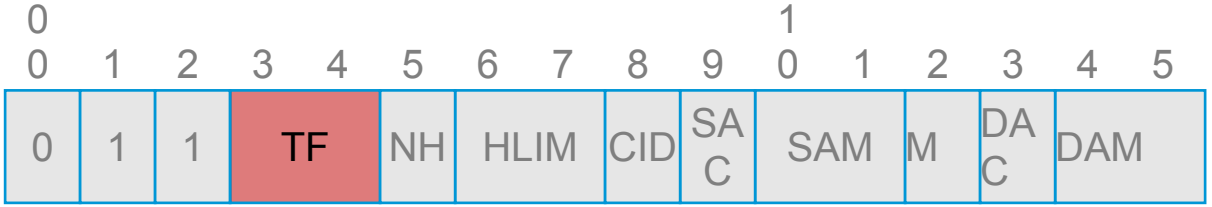
Header Dispatch (DSP) – understand what is coming

RFC 6282: 6LoWPAN IPv6 Header Compression

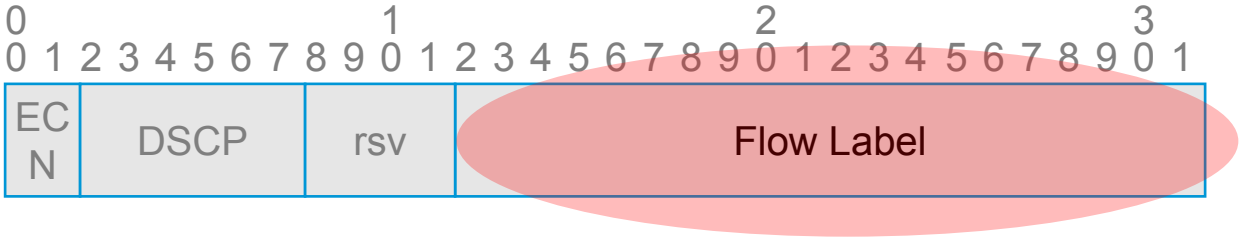


TF	2 bits	Traffic Class and Flow Label
NH	1 bit	Next Header
HLIM	2 bits	Hop Limit
CID	1 bit	Context Identifier Extension
SAC	1 bit	Source Address Context
SAM	2 bits	Source Address Mode
M	1 bit	Multicast Address Compression
DAC	1 bit	Destination Address Context
DAM	2 bits	Destination Address Mode

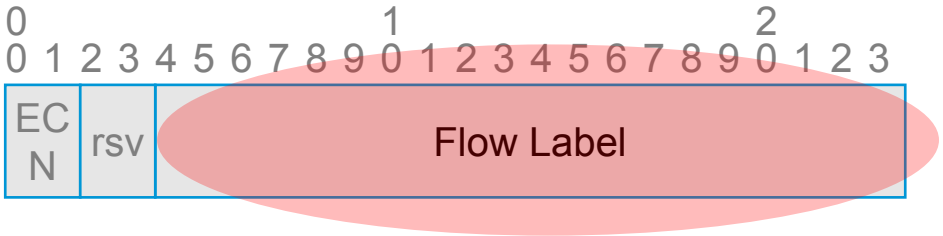
6LoWPAN: Traffic Class & Flow Label



TF = 0



TF = 1

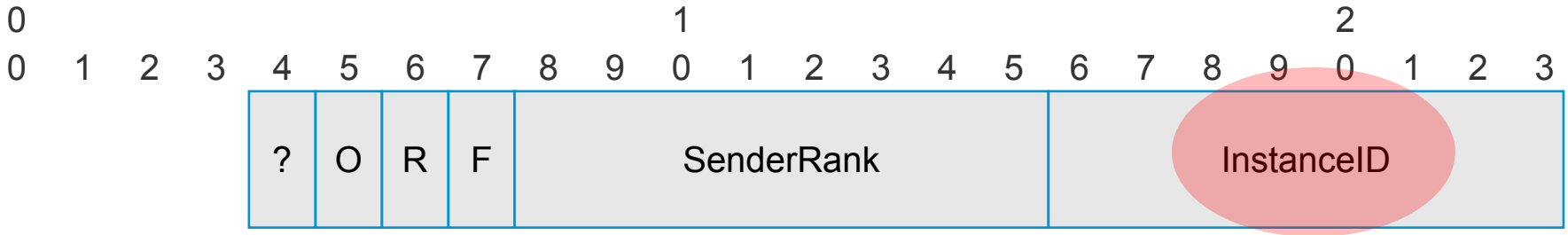


TF = 2

TF = 3

Traffic Class and Flow Label elided.

draft-thubert-6man-flow-label-for-rpl



Places in Flow Label the RPL Packet Information is defined in RFC 6550 Section 11.2

Save extra HbH header bytes incurred in RFC 6553 AND eventual IP-in-IP tunneling

Discussed with Brian Carpenter on the ROLL ML than converged on 6MAN ML

http://www.ietf.org/mail-archive/web/roll/current/msg06967.html

Status WRT to 6MAN

Consensus to support this work at ROLL, 6TiSCH and ISA100.

Series of rounds with help from Brian and Fernando; text now ready.

Unclear whether the work should be completed in 6MAN or ROLL

- ⇒ Definitely needs 6MAN stamp of approval.
- ⇒ Brian Carpenter suggested a special WGLC in 6MAN.
- ⇒ Ideally WGLC at both ROLL and 6MAN
- ⇒ Approval at ROLL requires a slight recharter

Adrian Stepped in to help

Shown at the plugfest

Impl. draft-thubert-6man-flow-label-for-rpl-03

RPL Non-Storing Mode (rfc6550-53,54)

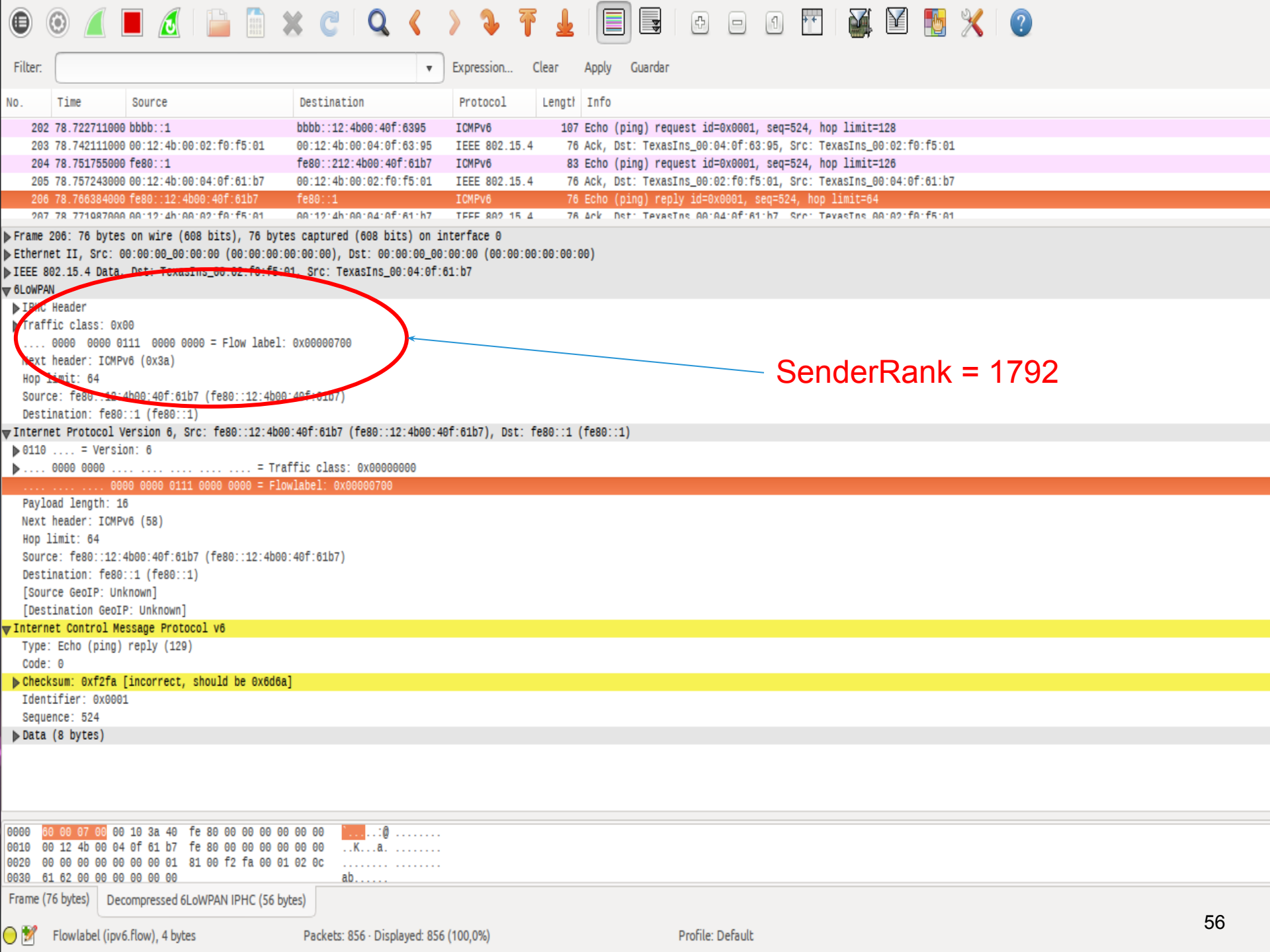
draft-ietf-6tisch-minimal-02

On IEEE802.15.4eTSCH

3 hop network, demonstrating the use of flow label as a replacement to the IPv6 Extension Header (rfc6282#section-4.2)

On OpenWSN. (www.openwsn.org)

OpenMote platform (www.openmote.com)



SenderRank = 1792

Open Mic

-?

Thank you!!

Please sign blue sheets :-)