12 February 2016 Webex

IPv6 over the TSCH mode of IEEE 802.15.4e

Chairs:
 Pascal Thubert
 Thomas Watteyne
Etherpad for minutes:
 http://etherpad.tools.ietf.org:9000/p/6tisch?useMonospaceFont=true

Note Well

This summary is only meant to point you in the right direction, and doesn't have all the nuances. The IETF's IPR Policy is set forth in BCP 79; please read it carefully.

The brief summary:

- By participating with the IETF, you agree to follow IETF processes.
- If you are aware that a contribution of yours (something you write, say, or discuss in any IETF context) is covered by patents or patent applications, you need to disclose that fact.
- You understand that meetings might be recorded, broadcast, and publicly archived.

For further information, talk to a chair, ask an Area Director, or review the following:

- BCP 9 (on the Internet Standards Process)
- BCP 25 (on the Working Group processes)
- BCP 78 (on the IETF Trust)
- BCP 79 (on Intellectual Property Rights in the IETF)

Reminder:

Minutes are taken *
This meeting is recorded **
Presence is logged ***

* Scribe; please contribute online to the minutes at
http://etherpad.tools.ietf.org:9000/p/6tisch?useMonospaceFont=true
** Recordings and Minutes are public and may be subject to discovery in the event of litigation.
*** From the Webex login

Agenda

- Administrivia   [3min]
  - Agenda bashing
  - Approval minutes from last meeting
  - Misc including recharter
- ETSI 6TiSCH #2 plugtest - report   [20min]
- draft-munoz-6tisch-examples-00   [10min]
- 6LoRH discussion and next Steps   [15min]
- Status suggested 6P enhancements and next steps   [10min]
- AOB   [1min]

Administrivia

Admin is trivia

- Approval Agenda
- Approval minutes

ETSI 6TiSCH #2 plugtest - report

Maria Rita Palattella

draft-munoz-6tisch-examples-00

Jonathan Munoz

Context

- ETSI 2nd 6tisch plugtest

- Implements the following:

  - https://datatracker.ietf.org/doc/draft-ietf-6tisch-minimal/

  - https://datatracker.ietf.org/doc/draft-ietf-6lo-routing-dispatch/

  - https://datatracker.ietf.org/doc/draft-ietf-6lo-paging-dispatch/

  - https://datatracker.ietf.org/doc/draft-wang-6tisch-6top-sublayer/

- Full examples of (parsed) packets were needed

Status

- draft-munoz-6tisch-examples-00 to be published in the next days

- Based on 6TiSCH Wireshark dissector at https://github.com/openwsn-berkeley/dissectors

- Authors:

  - Jonathan Muñoz, Gridbee Communications - Inria

  - Emmanuel Riou, Gridbee Communications

  - Guillaume Gaillard, Orange Labs

  - Dominique Barthel, Orange Labs

Table of Contents

Examples

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: ▼ Expression... Clear Apply Save

Time	Node	Event	Info
15:20:53.544400910			ACK, MID:8295, 2.04 Changed, TKN:db
15:20:53.545919526			Data, Dst: 14:15:92:cc:00:00:00:02, Src: 14:15:92:cc:00:00:00:03
15:20:53.550155831			Ack, Dst: 14:15:92:cc:00:00:00:02, Src: 14:15:92:cc:00:00:00:01
15:20:53.558279124			ACK, MID:8295, 2.04 Changed, TKN:db
15:20:53.617729612			Data, Dst: 14:15:92:cc:00:00:00:02, Src: 14:15:92:cc:00:00:00:03
15:20:53.624443437			Ack, Dst: 14:15:92:cc:00:00:00:03, Src: 14:15:92:cc:00:00:00:02
15:20:53.686517905			Data, Dst: 14:15:92:cc:00:00:00:03, Src: 14:15:92:cc:00:00:00:02
15:20:53.693030662			Ack, Dst: 14:15:92:cc:00:00:00:02, Src: 14:15:92:cc:00:00:00:03
15:20:54.033608059			Beacon, Dst: Broadcast, Src: 14:15:92:cc:00:00:00:01
15:20:55.253803803			Beacon, Dst: Broadcast, Src: 14:15:92:cc:00:00:00:02
15:20:55.684341899			RPL Control (DODAG Information Object)
15:20:55.687474426			RPL Control (DODAG Information Object)

▶ Frame 65: 114 bytes on wire (912 bits), 114 bytes captured (912 bits) on interface 0
  Raw packet data
▶ Internet Protocol Version 6, Src: bbbb::1, Dst: bbbb::1
▶ User Datagram Protocol, Src Port: 0 (0), Dst Port: 17754 (17754)
▶ ZigBee Encapsulation Protocol, Channel: 20, Length: 34
▼ IEEE 802.15.4 Data, Dst: 14:15:92:cc:00:00:00:03, Src: 14:15:92:cc:00:00:00:02
  ▶ Frame Control Field: 0xee21, Frame Type: Data, Acknowledge Request, Information Elements
    Sequence Number: 19
    Destination PAN: 0xcafe
    Destination: 14:15:92:cc:00:00:00:03 (14:15:92:cc:00:00:00:03)
    Extended Source: 14:15:92:cc:00:00:00:02 (14:15:92:cc:00:00:00:02)
  ▶ Header Information Elements: Header Termination 1 IE (0x3f00)
  ▼ Payload Information Elements: 6top Group ID (0x9007)
      Information Element Length: 7
      .001 0... .... = Information Element ID: 6top Group ID (0x0002)
      1... .... = Payload IE. This bit must be set to 1: True
    ▼ 6TOP Message: Success Response
        6P Sub IE ID: 0x00
        6P Version: 0x01
        6P Code: 0x06
        6P SF ID: 0x00
        Slot Offset: 0x0006
        Channel Offset: 0x0000
    FCS: 0x4fd7 (Correct)

```
0000  60 00 00 00 00 4a 11 08  bb bb 00 00 00 00 00 00   `....J.. ........
0010  00 00 00 00 00 00 00 01  bb bb 00 00 00 00 00 00   ........ ........
0020  00 00 00 00 00 00 00 01  00 00 45 5a 00 4a c9 98   ........ ..EZ.J..
0030  45 58 02 01 14 00 01 01  ff 01 01 01 01 01 01 01   EX...... ........
0040  01 02 02 02 02 00 00 00  00 00 00 00 00 00 00 22   ........ ......."
0050  21 ee 13 fe ca 03 00 00  00 cc 92 15 14 02 00 00   !....... ........
0060  00 cc 92 15 14 00 3f 07  90 00 61 00 06 00 00 00   ......?. ..a.....
0070  d7 4f                                              .O
```

Time
15:21:04.405382078
15:21:04.451461567
15:21:04.455353069
15:21:04.511472388
15:21:04.516798760
15:21:05.267856739
15:21:05.269301510
15:21:05.326531771
15:21:05.559404111
15:21:08.185650904

▶ Frame 92: 124 bytes on wire (992 bits)
  Raw packet data
▶ Internet Protocol Version 6, Src: bbbb
▶ User Datagram Protocol, Src Port: 0 (0
▶ ZigBee Encapsulation Protocol, Channel
▼ IEEE 802.15.4 Data, Dst: 14:15:92:cc:0
  ▶ Frame Control Field: 0xee21, Frame Ty
    Sequence Number: 26
    Destination PAN: 0xcafe
    Destination: 14:15:92:cc:00:00:00:01 (14:15:92:cc:00:00:00:01)
    Extended Source: 14:15:92:cc:00:00:00:02 (14:15:92:cc:00:00:00:02)
  ▶ Header Information Elements: Header Termination 1 IE (0x3f00)
  ▼ Payload Information Elements: 6top Group ID (0x9011)
      Information Element Length: 17
      .001 0... .... = Information Element ID: 6top Group ID (0x0002)
      1... .... = Payload IE. This bit must be set to 1: True
    ▼ 6TOP Message: Add Command
        6P Sub IE ID: 0x00
        6P Version: 0x01
        6P Code: 0x01
        6P SF ID: 0x00
        Number of desired cells: 0x01
        Container: 0x01
        Slot Offset: 0x0008
        Channel Offset: 0x0000
        Slot Offset: 0x0005
        Channel Offset: 0x0000
        Slot Offset: 0x0007
        Channel Offset: 0x0000
    FCS: 0x5aa5 (Correct)

6LoRH discussion and next Steps

Pascal Thubert

News

- Draft split complete
  - draft-ietf-6lo-paging-dispatch-01
  - draft-ietf-6lo-routing-dispatch-03
- Validation at ETSI plugtest
- New draft
  - draft-thubert-6lo-inner-compression
  - Updates RFC 6282
  - RFC 6282 stateless => LL prefix FE80::
  - Proposal to get prefix from outer header
  - Also from 6LoRH even if no IP in IP

Issues

- Better compression for various length
  - Current: only powers of 2

Issues

- Better compression for various length
  - Current: only powers of 2
- RPI-6LoRH
  - Generic Name in RFC6550
  - Expands into RPL opt in HbH
  - Should it be named more specifically ?
- RH3-6LoRH
  - Specific Name inherited from RFC6554
  - But called SRH in that spec, not specific
  - Compressed format valid for other RH types
  - Should it be named less specifically ?

e.g. 6LoRH – RPI only, ICMP

```
+- ...  -+- ... -+-+-+-+-+-  ...  -+-+-+-+-+ ... -+-+-+-+-+-+-+-+-+-+...
|11110001|  RPI-6LoRH  |  NH = 0       | NH = 58 |  ICMP message
|Page 1  |   type 5   | 6LOWPAN-IPHC  | (ICMP)  |  (no compression)
+- ...  -+- ... -+-+-+-+-  ...  -+-+-+-+ ... -+-+-+-+-+-+-+-+-+-+...
                    <-      RFC 6282       ->
                    No RPL artifact
```

<=>

| IPv6 header | HbH header | RPL option | ICMP header | ICMP Payload |

With inner-compression:
LOWPAN_IPHC stateless based on root prefix for source and destination

e.g. Fragmented 6LoRH – IP-in-IP + RPI

```
+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...
|Frag type|Frag hdr |11110001|  RPI  | IP-in-IP | RFC 6282 Dispatch
|RFC 4944 |RFC 4944 | Page 1 | 6LoRH | 6LoRH    |   + LOWPAN_IPHC
+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...
                                            <-    RFC 6282     ->


+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...
|Frag type|Frag hdr |
|RFC 4944 |RFC 4944 |  Payload (cont)
+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...


+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...
|Frag type|Frag hdr |
|RFC 4944 |RFC 4944 |  Payload (cont)
+-  ... -+-  ... -+-+ ... -+-+ ... -+- ... +-+-+-+-+-+-+-+-+-+...
```

<=>

| IPv6 header | HbH header | RPL option | IPv6 header | Hdrs + Payload |

With inner-compression:
LOWPAN_IPHC stateless based on outer packet source and destination

Proposed order

I think that the original proposal MAC RH3-6LoRH* RPI-6LoRH IP-in-IP-LoRH IPHC blah   Works better

Reason 1: We modify the RH3-6LoRH on the way, popping the first address as we go. It is easier to do if it is the first header of the compressed packet so we always play with the very beginning of the packet

Reason 2: So that IP header always TERMINATES the 6LoRH encapsulation,

  When there is no IP in IP , this is already true for instance MAC RPI-6LoRH IPHC

  One needs to differentiate a case that in UNCOMPRESSED form is

  IP-in-IP   RPI   RH3   IP blah   vs.   IP-in-IP IP RPI   RH3   blah

With a format like   MAC IP-in-IP-LoRH RH3-6LoRH* RPI-6LoRH IPHC blah   You cannot tell : (

With this format we have a clear separation for IP in IP in IP all the way

MAC	RH3-6LoRH* RPI-6LoRH IP-in-IP-LoRH	RH3-6LoRH* RPI-6LoRH IP-in-IP-LoRH	RPI-6LoRH IPHC	data

  The separation of which header is in which encaps is clearly delineation with the IP header that terminates the encapsulated 6LoRH-headers.

02/12/16

UDP packet forwarded by the root

```
+-+-+-+-+-+-+- ... +-+-+- ... -+-+-- ... -+-+- ... -+-+-+-+-+-+-+ ... -+-+-+-+...
|11110001 |RH3-6LoRH | RPI-6LoRH | IP-in-IP | NH=1 |11110CPP| Compressed | UDP
|Page 1   |Type1 S=2 |          |          | 6LoRH  | IPHC | UDP    | UDP header | Payload
+-+-+-+-+-+-+- ... +-+-+- ... -+-+-- ... -+-+- ... -+-+-+-+-+-+-+ ... -+-+-+-+...
        <-8bytes->                                <-      RFC 6282      ->
                                                     No RPL artifact
```

One may note that the RPI is provided. This is because the address of the root
that is the source of the IP-in-IP header is elided and inferred from the
InstanceID in the RPI. Once found from a local context, that address is
used as Compression Reference to expand addresses in the RH3-6LoRH.

<=>

| IPv6 header | HbH RPI | Routing hdr | Hop | Hop | Dest | IPv6 header | UDP hdr | UDP Payload |

With inner-compression:
LOWPAN_IPHC stateless based on outer packet
source from header source (itself from root)
Last Hop (Dest) from last RH3-6LoRH entry

AOB ?

Thank you!