Generic Delivery Functions

draft-zzhang-intarea-generic-delivery-functions

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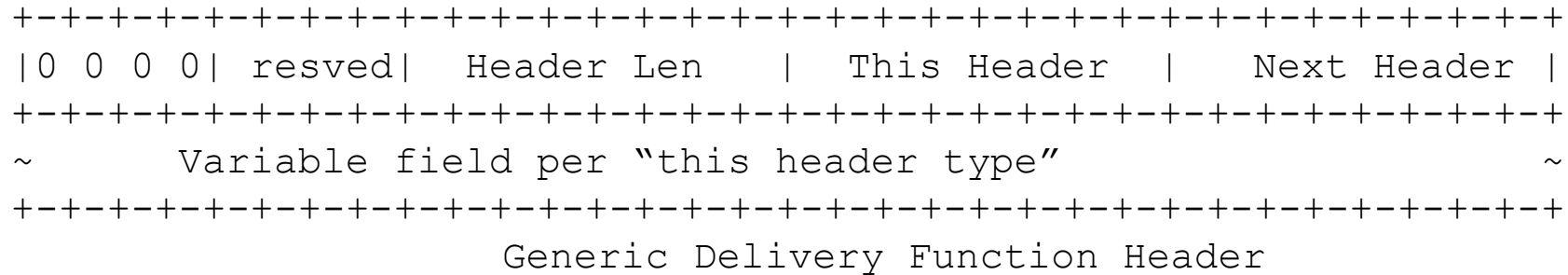
Juniper Networks

IETF 110

Observation & Proposal

- Some IP Functions can be viewed as independent of IP
  - Fragmentation/reassembly
  - ESP/AH
  - In-Situ OAM?
- What if we extract them out and apply to any layer?
  - IP, MPLS, BIER, Ethernet
  - "Generic Delivery Functions"
    - Between two points at a L2/L2.5/L3/whatever layer
      - Two Ethernet nodes
      - LSP ingress/egress
      - BIER ingress/egress
      - IP source/destination nodes
        - For future GDFs that are applicable to both IP and other layers

GDFH

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|   Header Len    |   This Header   |    Next Header  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~        Variable field per "this header type"                    ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
              Generic Delivery Function Header
```

- "This header" uses its own number space – for different GDFs
- "Next header" comes from "IP Protocol" number space
  - It could point to another GDFH
- Outer header indicates that a GDFH follows
  - MPLS label, BIER proto field, IP "next header", EtherType
- In case of MPLS:
  - 0000 nibble prevents it from being mistaken as IP header
  - Currently the GDFH indicator label is a signaled regular label
  - A special label may be warranted if the GDF concept is accepted

Generic Fragmentation Header

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|  Header Len   |This Hdr (frag)|   Next Header |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Fragment Offset    |R|S|M|  Identification              ~
+-------------------------------------------------------------+
~        Identification (optional/variable)                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

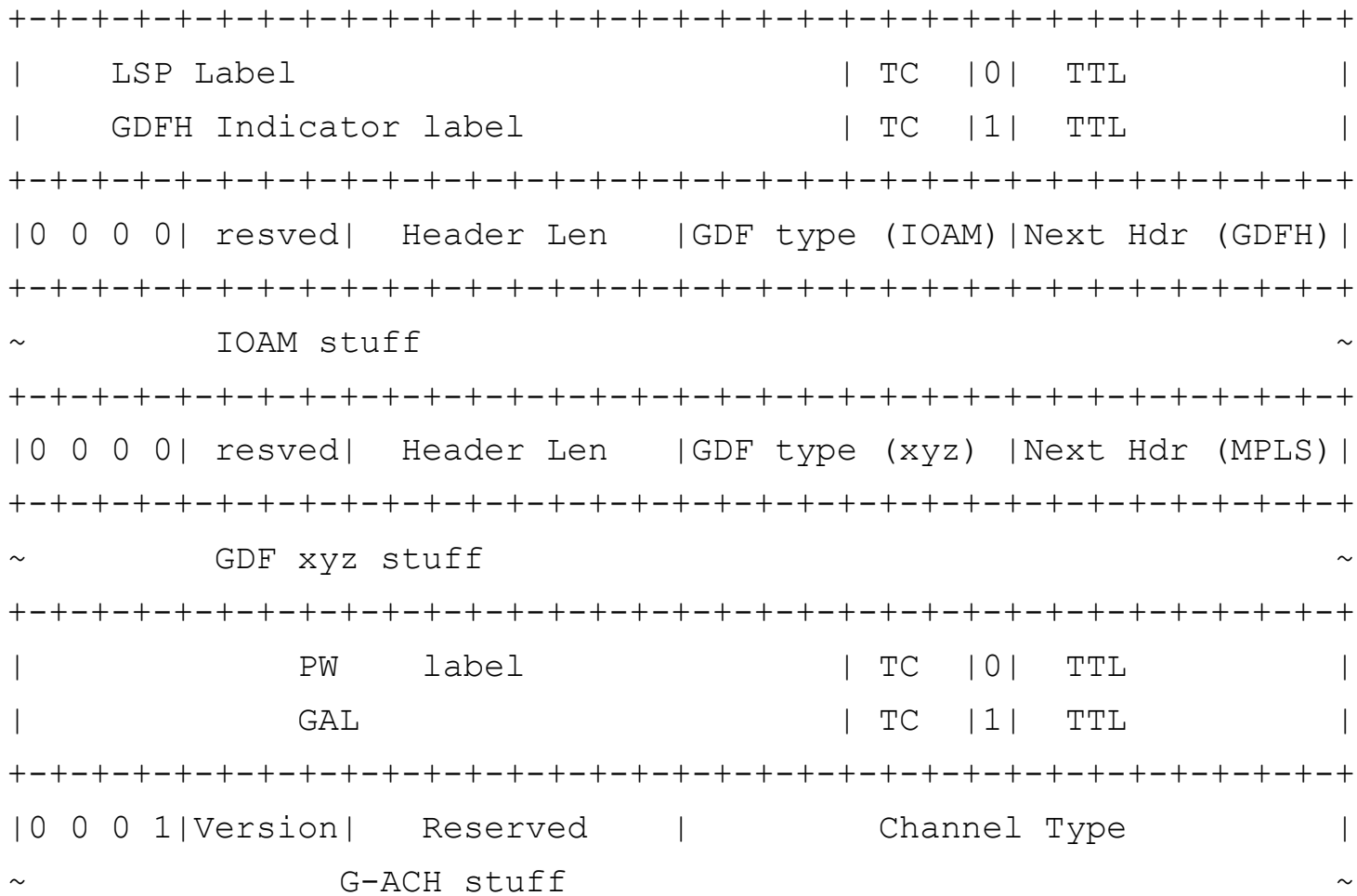Indicating MPLS payload type – as a by-product
- If agreed as useful, a new "this header" could be defined to save 2-octets

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved| Header Len (6)|This Hdr (frag)|   Next Header |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      0                        |0|0|0|
+------------------------------------+
```

IOAM (implemented as GDF)

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|  Header Len    | IOAM hdr type |   Next Header |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+<-+
| Reserved        | Block Number  | IOAM-OPT-Type |IOAM HDR Length| |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  I
|                                                               |  O
|                                                               |  A
~                  IOAM Option and Data Space                   ~  M
|                                                               |  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+<-+
```

MPLS + IOAM + GDF + PW w/ G-ACH

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    LSP Label                          | TC  |0|   TTL        |
|    GDFH Indicator label               | TC  |1|   TTL        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|  Header Len   |GDF type (IOAM)|Next Hdr (GDFH)|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~           IOAM stuff                                         ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|  Header Len   |GDF type (xyz) |Next Hdr (MPLS)|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~           GDF xyz stuff                                      ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         PW    label                   | TC  |0|   TTL        |
|         GAL                           | TC  |1|   TTL        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 1|Version|  Reserved    |      Channel Type            |
~             G-ACH stuff                                      ~
```

Two independent label stacks _separated by GDFHs_

Having two independent label stacks is nothing new
- A BIER header could separate transport/bier labels and payload labels
- An MPLS network on top of PWs implemented on another infrastructure MPLS network

GDF and G-ACh

- GDF is for Generic Delivery Functions
  - Over different layers – MPLS is just one use-case
  - Supporting different stackable functions
  - Applicable to both user and control traffic

- G-ACh was designed for MPLS control channel purpose
  - GAL and G-ACh are not to be used for user traffic
  - G-ACh structure does not have "next" concept

What if G-Ach/GAL is allowed for user traffic?

- *Note: we're not promoting this – this is just a "what if"*

- The first GDFH could be treated as a G-ACh "channel"
  - Just to make use of GAL in case of MPLS
  - GDFH structure would not change
    - "this header" and "next header" concept is critical for extensibility
    - Especially for non-MPLS case
- What if we extend G-ACh to provide GDF?
  - Keeping old name does not make sense
    - Not even for MPLS
    - Let alone for BIER/Ethernet/other layers
  - Developing GDFH is a better option and it is not re-inventing wheels

Relation to draft-song-mpls-extension-header

- draft-song-mpls-extension-header proposes a similar MPLS specific stackable extension headers
- GDFH is for generic functions applicable to any layers
  - MPLS, BIER, IP, Ethernet
  - Ideally, any non-MPLS-specific functions would be done with GDFH

Seeking Comments & Suggestions

- Payload type indication?

- IOAM function?

- G-ACH?

- Label for GDFH?

- E2E vs HbH?