Generic Delivery Functions

draft-zzhang-intarea-generic-delivery-functions

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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
      - Two IP 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
```
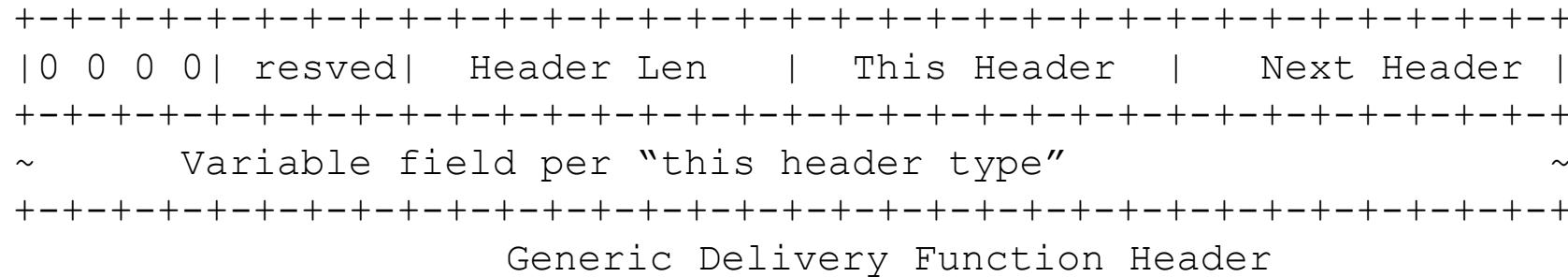
- "This header" uses its own number space – for different GDFs
- "Next header" comes from "IP Protocol" number space
- Outer header indicates that a GDFH follows
  - MPLS label, BIER proto field, IP "next header", EtherType
  - In case of MPLS label:
    - Currently the GDFH indicator label is a signaled regular label
    - A special label may be warranted if the GDF concept is accepted

Generic Fragmentation Header

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 0| resved|  Header Len   | Frag hdr type |   Next Header |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Fragment Offset    |R|S|M|  Identification              ~
+--------------------------------------------------------------+
~        Identification (optional/variable)                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

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
    |                                                               |  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+<-+
```
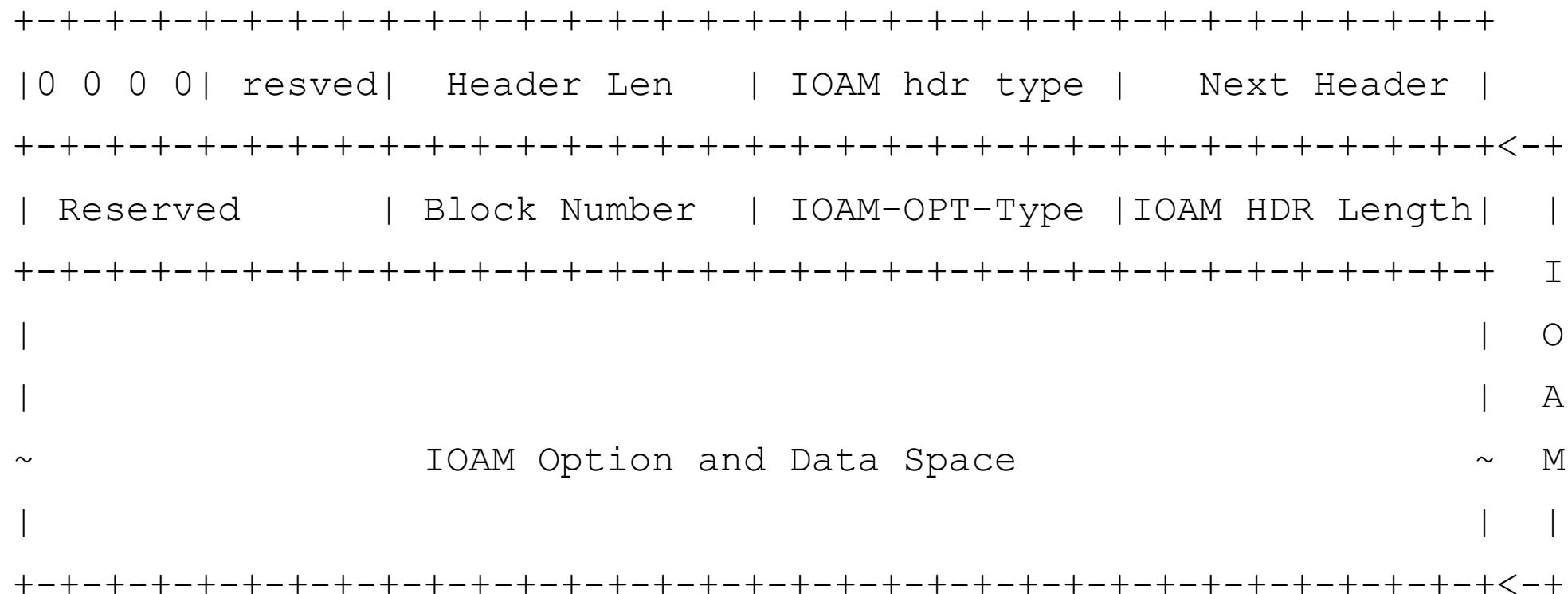
MPLS + IOAM + GDF + PW w/ G-ACH

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    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            |
~               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

- 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
- 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

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

- 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

- Extend G-ACh to provide similar functionality?
  - 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