

draft-kumar-ippm-ifa-00

IETF-103

Motivation

Provide simple, protocol agnostic, flexible, inband mechanism to track and collect per flow per packet network telemetry data with low cost and high performance of HW

IFA – Protocol Requirements

For Use When

- Standard protocol header can not be overloaded
 - VxLAN header fields are overloaded in various proprietary implementations
 - GRE header fields are overloaded in various proprietary implementations
 - IP TOS bits are fully utilized and can not be overloaded for IFA identification
- Work with regular packet headers
 - E.g., need to maintain the flow path for TCP/UDP flows
 - Tunneling packets is NOT acceptable
- L4 Header is needed for load balancing hash computation
 - L4 ACLs need to be supported
 - L4 fields are needed for hash computation
- Protocol agnostic deployment is required
 - Consistent implementation
 - Single consistent definition for IPv4 and IPv6 domains

IFA – Operational Requirements

For Use When

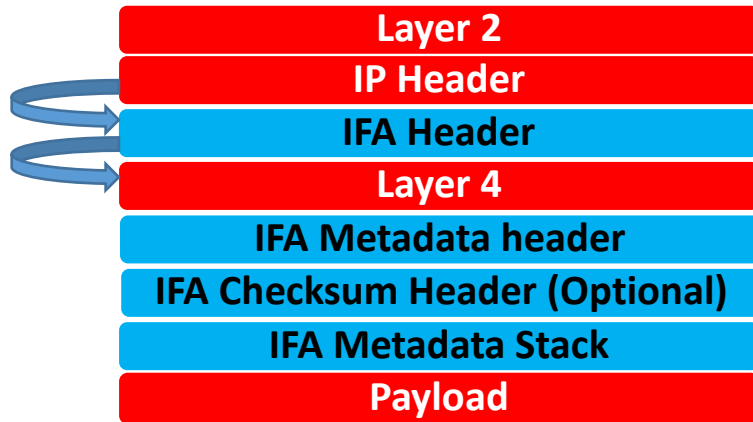
- Topology needs to support a disparate set of metadata
 - Standard metadata is NOT sufficient
- Need to allow for clone, truncate, and drop
 - PMTU modification is not acceptable
- Inserting large amount of per packet metadata is NOT acceptable

IFA – Performance Requirements

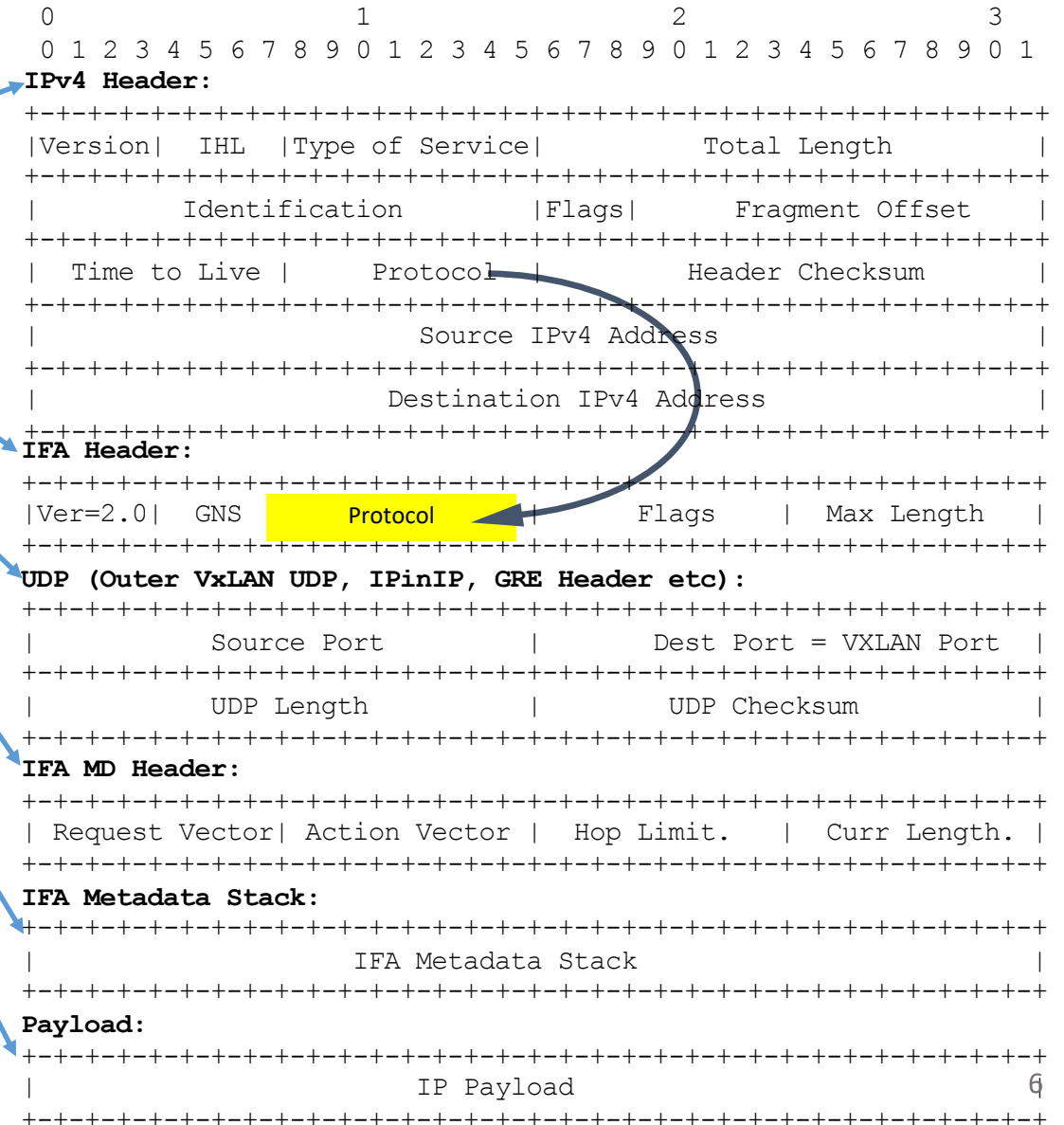
For Use When

- High Performance H/W implementation is required
 - No penalty of processing IFA packets
 - Low impact on HW parse depth for performing Strip and Forward
- Localized edits with in a single block
 - Localization of all modifiable fields
- Low cost of implementation
 - Single consistent implementation for all protocols
 - Keeps the cost of HW low

IFA – Upper Layer Protocol



- Use 1 experimental IP protocol type (143 – 252): PROTO_IFA
- Original IP->proto is copied in IFA->proto
- IFA header is treated as L3 upper layer protocol
- Metadata is treated as L4 information
- Metadata is treated as foreign object
 - L4 length and checksum is not updated
 - This is to ease load on hw to strip and forward



Status of I-D

draft-kumar-ippm-ifa-00

<https://tools.ietf.org/html/draft-kumar-ippm-ifa-00>

Revised proposal

Simplified

Request

Would appreciate review and comments from WG

Thank You

Side Meeting @Room: Apartment 3 (9th Floor) 17:00 Hr, Nov 6, 2018

BACKUP

IFA IPv4/IPv6 Encapsulation

```

0          1          2          3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv4 Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Version|  IHL  |Type of Service|          Total Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Identification                       |Flags|          Fragment Offset    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Time to Live | Protocol = IFA|          Header Checksum     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Source IPv4 Address                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 Destination IPv4 Address    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Ver=2.0|  GNS  | NextHdr = UDP |          Flags           |Max Length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
UDP (Outer VxLAN UDP, IPinIP, GRE Header etc):
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Source Port          |          Dest Port = VXLAN Port   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          UDP Length           |          UDP Checksum        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA MD Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Request Vector| Action Vector | Hop Limit.   | Curr Length. |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA Metadata Stack:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 IFA Metadata Stack              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

```

```

0          1          2          3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv6 Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Version| Traffic Class |                               Flow Label   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Payload Length          |Next Hdr = IFA | Hop Limit   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|
|
+
|
+
|                               Source IPv6 Address
|
+
|
+
|                               Destination IPv6 Address
|
+
|
+
|                               Destination IPv6 Address
|
+
|
+
|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Ver=2.0|  GNS  | NextHdr = UDP |          Flags           |Max Length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
UDP (Outer VxLAN UDP, IPinIP, GRE Header etc):
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Source Port          |          Dest Port = VXLAN Port   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          UDP Length           |          UDP Checksum        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA MD Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Request Vector| Action Vector | Hop Limit.   | Curr Length. |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IFA Metadata Stack:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 IFA Metadata Stack              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

```

IFA IPv4 IPinIP and GRE Encapsulation

```

0          1          2          3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPinIP IPv4 Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Version|  IHL  |Type of Service|          Total Length          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Identification          |Flags|      Fragment Offset  |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Time to Live | Protocol = IFA|          Header Checksum      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Source IPv4 Address          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Destination IPv4 Address          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Ver=2.0|  GNS  | NextHdr = 55 |          Flags          | Max Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
Inner IP Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~          Protocol = 6          ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Metadata Stack:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          IFA Metadata Header and Stack          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IP Data:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~          TCP Header and Payload          ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

- ~ IP Options are not supported for IFA encap ~
- Inner IP if has IP options will not be parsed for IFA
- Outer IP if has IP options, will not be parsed for IFA
- Load Balancing hash (if using inner IP L4 fields) may not be able to reach inner L4 fields

```

0          1          2          3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
GRE IPv4 Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Version|  IHL  |Type of Service|          Total Length          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Identification          |Flags|      Fragment Offset  |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Time to Live | Protocol = IFA|          Header Checksum      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Source IPv4 Address          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Destination IPv4 Address          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Ver=2.0|  GNS  | NextHdr = 47 |          Flags          | Max Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
GRE Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~          Protocol = 0x0800          ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Metadata Stack:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          IFA Metadata Header and Stack          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
GRE Data:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~          IP, TCP Header and Payload          ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

- Load Balancing hash (if using GRE IP fields) may not be able to reach GRE L4 fields
- GRE options C,R,K,S are treated as part of GRE Header as they are bit defined presence fields (not a header chain)

IFA IPv4 AH (TCP payload) Encapsulation

```

0          1          2          3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv4 Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Version|  IHL  |Type of Service|          Total Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         Identification        |Flags|      Fragment Offset  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Time to Live | Protocol = IFA|    Header Checksum          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Source IPv4 Address                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Destination IPv4 Address                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IFA Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Ver=2.0|  GNS  | NextHdr = 51 |          Flags              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

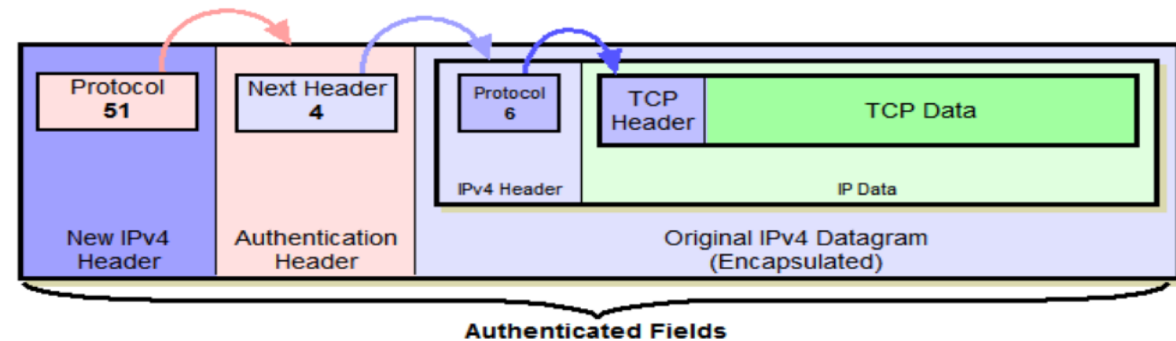
AH Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               Next Header = 6              ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IFA Metadata Stack:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       IFA Metadata Header and Stack        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IP Data (Transport Mode):
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               TCP Header and Payload        ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               ....                             ~

```

- IPv4 options are separate then protocol extension headers (unlike IPv6)
- IFA base header is inserted after the IP header
- MD stack is inserted after the IP AH header (works for both transport and tunnel mode)
- IPv4 IFA layering remains same if protocol extension headers are present are not
- AH payload is not touched so IPsec tunnel strip and forward is easy



IP Data (Tunnel Mode):

```

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               Original IP, TCP Header and Payload        ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               ....                             ~

```

IFA IPv4 ESP (TCP payload) Encapsulation

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv4 Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Version|  IHL  |Type of Service|          Total Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         Identification        |Flags|      Fragment Offset  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Time to Live | Protocol = IFA|    Header Checksum          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Source IPv4 Address                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 Destination IPv4 Address     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IFA Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Ver=2.0|  GNS  | NextHdr = 50 |      Flags      | Max Length  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

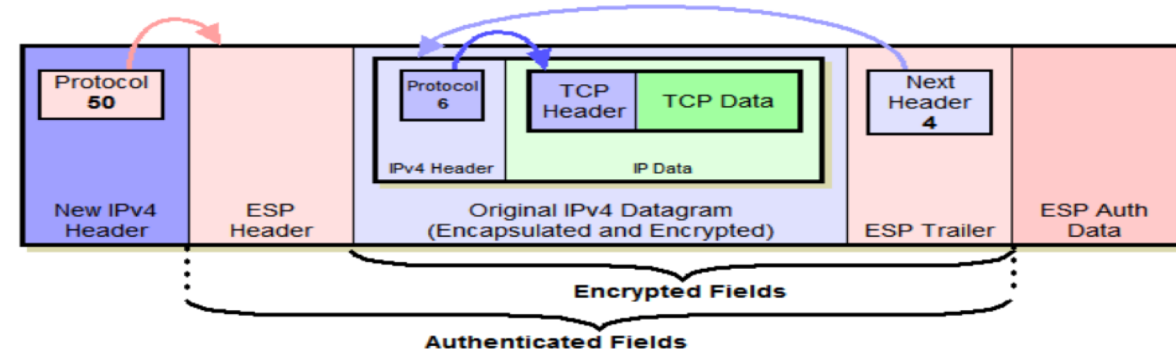
ESP Header:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               Next Header = 6                               ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IFA Metadata Stack:
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                               IFA Metadata Header and Stack    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

Encrypted IP Data (Transport Mode):
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               TCP Header and Payload            ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               ....                               ~

```

- IPv4 options are separate then protocol extension headers (unlike IPv6)
- IFA base header is inserted after the IP header
- MD stack is inserted after the IP AH header (works for both transport and tunnel mode)
- IPv4 IFA layering remains same if protocol extension headers are present are not
- ESP payload is encrypted and not touched so IPsec tunnel strip and forward is easy



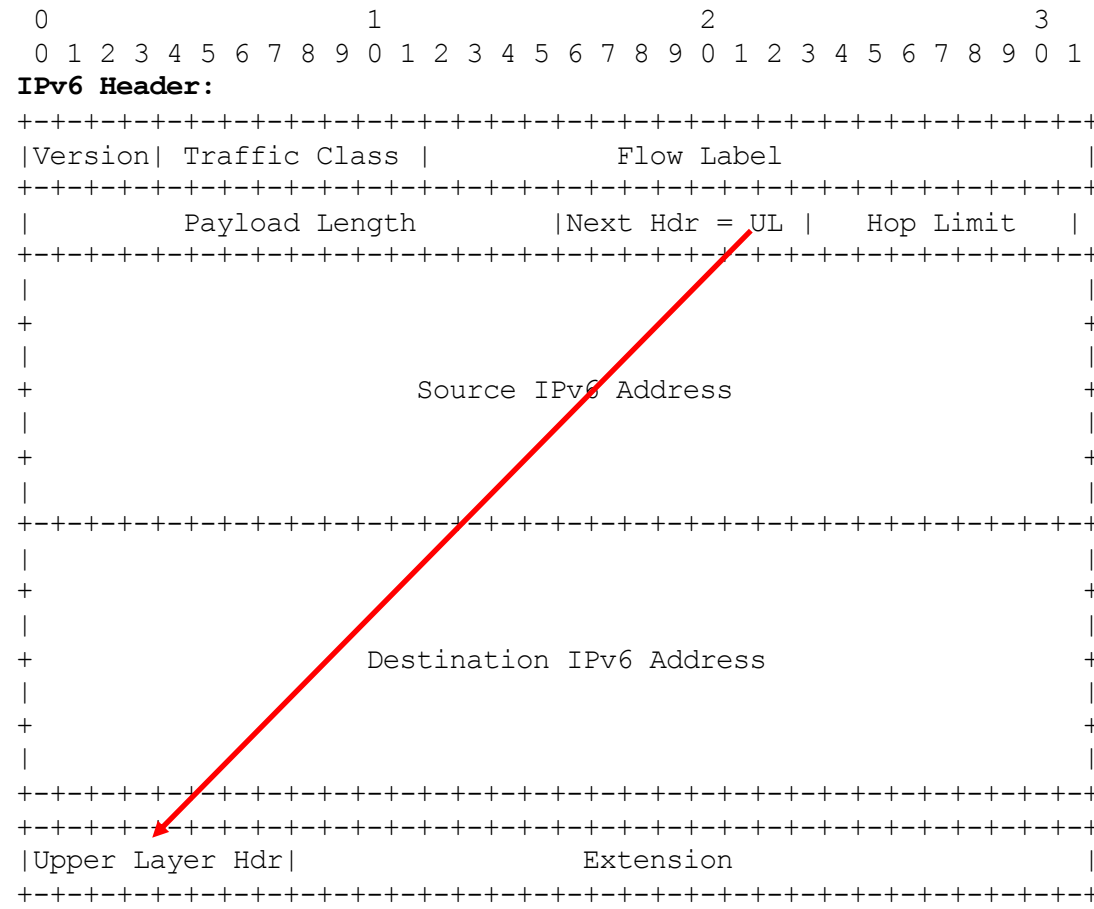
Encrypted IP Data (Tunnel Mode):

```

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               Original IP, TCP Header and Payload ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                               ....                               ~

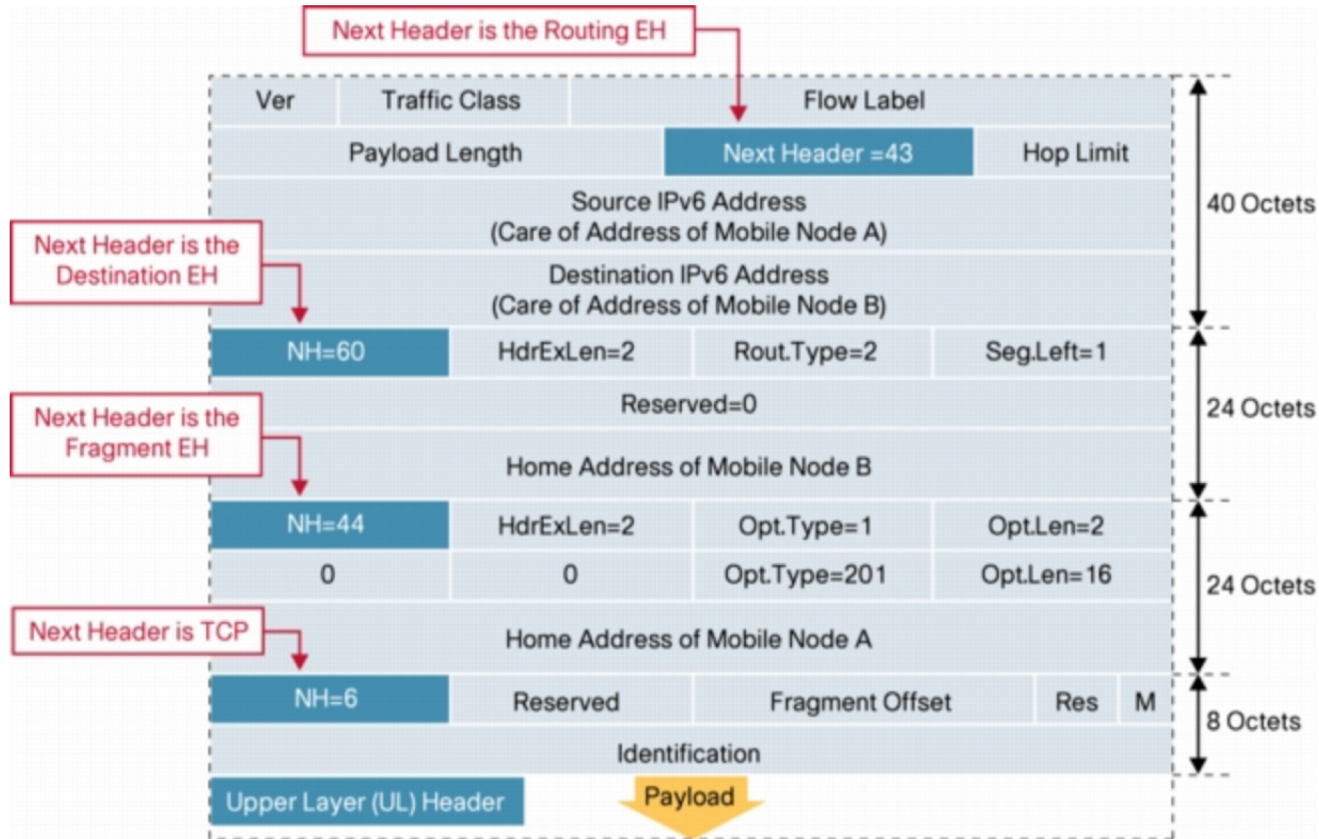
```

IPv6 Extension Header Processing



Order	Header Type	Next Header Code
1	Basic IPv6 Header	-
2	Hop-by-Hop Options	0
3	Destination Options (with Routing Options)	60
4	Routing Header	43
5	Fragment Header	44
6	Authentication Header	51
7	Encapsulation Security Payload Header	50
8	Destination Options	60
9	Mobility Header	135
	No next header	59
Upper Layer	TCP	6
Upper Layer	UDP	17
Upper Layer	ICMPv6	58
Upper Layer	IFA	XXX

IPv6 Extn Header Data Traffic Example



Order	Header Type	Next Header Code
1	Basic IPv6 Header	-
2	Hop-by-Hop Options	0
3	Destination Options (with Routing Options)	60
4	Routing Header	43
5	Fragment Header	44
6	Authentication Header	51
7	Encapsulation Security Payload Header	50
8	Destination Options	60
9	Mobility Header	135
	No next header	59
Upper Layer	TCP	6
Upper Layer	UDP	17
Upper Layer	ICMPv6	58
Upper Layer	IFA	XXX

IFA IPv6 Extn Header Data Traffic Example

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv6 Header with Extension Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Version| Traffic Class |                               Flow Label |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Payload Length |Next Hdr = 43 | Hop Limit |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~                               Source IPv6 Address ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~                               Destination IPv6 Address ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|  NH = 60.  |                               Extension Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|  NH = 44.  |                               Extension Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|  NH = IFA  |                               Extension Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Ver=2.0| GNS |NextHdr=UDP/TCP|      Flags      | Max Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
UDP/TCP Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               UDP/TCP Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Metadata Stack:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               IFA Metadata Header and Stack |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
UDP/TCP Payload:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               L4 Payload |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
IPv6 Header without Extension Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Version| Traffic Class |                               Flow Label |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Payload Length |Next Hdr = 6  | Hop Limit |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~                               Source IPv6 Address ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
~                               Destination IPv6 Address ~
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|  NH = IFA  |                               Extension Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Ver=2.0| GNS | NextHdr = 6 |      Flags      | Max Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
TCP Header:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               UDP/TCP Header |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
IFA Metadata Stack:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               IFA Metadata Header and Stack |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
TCP Payload:
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               L4 Payload |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

- Parse Extension header as is (May need punt to CPU)
- Insert IFA base header if UL header is detected
- Insert metadata after the UL header
- Ipv6 IFA layering remains same if extension headers are present are not

Thank You