

Supporting In Situ Operations, Administration, and Maintenance Using MPLS Network Actions

draft-ietf-mpls-mna-ioam-07

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Agenda

- Requirements and Scope
 - IOAM Pre-allocated-Trace/Edge-to-Edge/Proof-of-Transit
 - IOAM Direct Export
- IOAM MPLS Network Actions
 - In-Stack Network Actions
 - Post-Stack Network Actions
- Next Steps

Requirements and Scope

Requirements:

- ✓ Support In Situ OAM (IOAM) Option-Types in MPLS Networks
- ✓ Support In Situ OAM Direct Export (IOAM-DEX) Option-Type in MPLS Networks

Scope:

- IOAM Option-Types
 - IOAM Pre-allocated-Trace/E2E/POT [RFC9197]
 - IOAM Direct Export [RFC9326]
- MPLS Network Action (MNA)
 - In-Stack Network Action [RFC9994]
 - Post-Stack Network Action [draft-ietf-mpls-mna-ps-hdr]

What's Realized

IOAM Option-Types realized using MNA

1. IOAM Pre-allocated-Trace/E2E/POT [RFC9197]
 - Realized as Post-Stack MNA
2. IOAM Direct Export [RFC9326]
 - Realized as In-Stack MNA and Post-Stack MNA
3. Pre-allocated-Trace not supported

IOAM and IOAM-DEX in PSD: In-Stack MNA Sub-Stack

1. Using MPLS Network Action (MNA) Sub-Stack [RFC9994]
2. Format B or Format C LSE:
 - a. Opcode (7-bit): Network Action Opcode TBA1 for IOAM and IOAM-DEX in PSD
 - b. Data (13-bit): IOAM or IOAM-DEX in PSD offset from BoS in 4-octet unit
 - c. P (1-bit): Indicates the presence of the Post-Stack MNA
 - d. IHS Scope (2-bit): Edge-To-Edge (00b), Hop-By-Hop (01b) or Select Node (10b) Processing Scope
 - e. U Flag (1-bit): Unknown Action Handling - 0 for “Skip to the next Network Action” for IOAM/IOAM-DEX

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MNA Label (4)																				TC		S	TTL								
Opcode = TBA1										IOAM or IOAM-DEX Offset in PSMH										P IHS		S	NASL			U		NAL			

IOAM and IOAM-DEX in PSD: Post-Stack MPLS Header

1. Post-Stack MPLS Base Header [draft-ietf-mpls-mna-ps-hdr]
2. Post-Stack MPLS Header [draft-ietf-mpls-mna-ps-hdr]
 - a. PS-NA (7-bit): Network Action Opcode TBA1 for IOAM and IOAM-DEX in PSD
 - b. PS-NAL (7-bit): Length of the (one or more) IOAM Data fields in 4-octet units (not including first 4-bytes)
 - c. Block-Number (8-bit): Aggregate IOAM/IOAM-DEX data, e.g., compute measurement metrics for each block of data flow
 - d. IOAM Option-Type (7-bit): Types 0, 2, or 3 defined in [RFC9197] and 4 defined in [RFC9326]

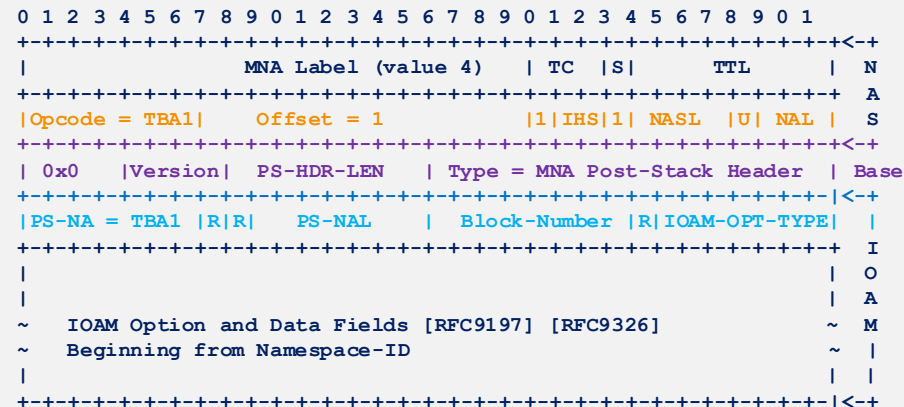


Figure: Example Network Action for IOAM and IOAM-DEX in PSD

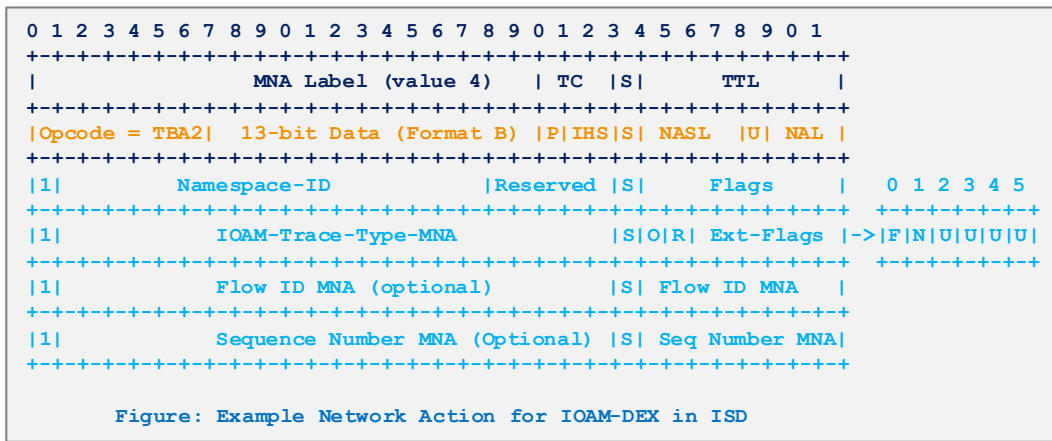
IOAM-DEX in ISD: In-Stack MNA Sub-Stack

1. IOAM-DEX In-Stack Network Action Sub-Stack [RFC9994]

- a. Format B or C LSE
- b. Opcode (7-bit): Opcode TBA2 for IOAM-DEX in ISD
- c. NAL (7-bit): Length of the (one or more) IOAM Data fields in 4-octet units (not including first 4-bytes)

2. IOAM-DEX Option-Type (4)

- a. Format D LSE
- b. 24-bit IOAM-Trace-Type
- c. F bit: Optional 30-bit Flow ID
- d. N bit: Optional 30-bit Sequence Number



MNA Processing Scope for IOAM and IOAM-DEX

- I2E Scope (IHS = 0x0):
 1. IOAM Option-Type(s) in the data packets are processed on edge nodes only.
 2. The intermediate nodes ignore the E2E IOAM Option-Type(s) carried by the data packets.
 3. E2E Option-Type (value 3) [RFC9197], Direct Export (DEX) Option-Type (value 4) [RFC9326] can be carried in the IOAM data field with I2E scope.
- HBH Scope (IHS = 0x1):
 1. HBH IOAM Option-Type(s) in the data packets are processed on the intermediate and edge nodes.
 2. Pre-allocated (value 0) and Proof of Transit (value 2) [RFC9197], Direct Export (DEX) Option-Type (value 4) [RFC9326] can be carried in the IOAM data field with HBH Scope.
 3. Not supported: Incremental Option-Type (value 1) in IOAM data field with HBH Scope.
- Select Scope (IHS = 0x2):
 1. HBH IOAM Option-Type(s) in the data packets are processed on Select nodes only.
 2. IOAM Option-Types same as defined for HBH IOAM Scope.

IANA Requests

+=====+=====+	
Opcode	Description
+=====+=====+	
TBA1	Network Action for IOAM and IOAM-DEX in PSD
+-----+-----+	
TBA2	Network Action for IOAM-DEX in ISD
+-----+-----+	

Next Steps

- Welcome your review comments and suggestions
- Ready for MPLS WGLC

Thank you!

Abbreviations

Abbreviations	Meaning
AD	Ancillary Data
BOS	Bottom of Stack
bSPL	Base Special Purpose Label
DEX	Direct Export
E2E	Edge-To-Edge
HBH	Hop By Hop
I2E	Ingress-To-Egress
IHS	Ingress-To-Egress, Hop-By-Hop or Select Processing Scope
IOAM	In Situ OAM
ISD	In-Stack Data
MNA	MPLS Network Action
MSD	Maximum Stack Depth
NAI	Network Action Indicator
NAI-OP	Network Action Indicator Opcode
NAS	Network Action Sub-Stack
POT	Proof of Transit
PSD	Post-Stack Data
RLD	Readable Label Depth