

トランジットMPLSトラフィックに対する誤ったL2ヘッダーのトラブルシューティング

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概要

このドキュメントでは、NCS4Kノード(6.5.26)でL2ヘッダーの破損が原因でMPLS転送パスが破損した場合のトラブルシューティング方法について説明します。

問題

このシナリオでは、Traffic Engineering (TE ; トラフィックエンジニアリング) トンネルはアップ状態ですが、Multiprotocol Label Switching (MPLS ; マルチプロトコルラベルスイッチング) pingはMPLSトンネル経由では動作しません。

```
tunnel-te5180 10.38.101.62 Up Up default #ping mpls traffic-eng tunnel-te 5180 Thu Jan 5
21:30:29.245 UTC Sending 5, 100-byte MPLS Echos to tunnel-te5180, timeout is 2 seconds, send
interval is 0 msec: Codes: '!' - success, 'Q' - request not sent, '.' - timeout, 'L' - labeled
output interface, 'B' - unlabeled output interface, 'D' - DS Map mismatch, 'F' - no FEC mapping,
'f' - FEC mismatch, 'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label, 'P' - no
rx intf label prot, 'p' - premature termination of LSP, 'R' - transit router, 'I' - unknown
upstream index, 'X' - unknown return code, 'x' - return code 0 Type escape sequence to abort.
..... Success rate is 0 percent (0/5)
```

MPLSのtracerouteにホップがいくつか表示されます。

```
#traceroute mpls traffic-eng tunnel-te 5180 Thu Jan 5 21:30:49.405 UTC Tracing MPLS TE Label
Switched Path on tunnel-te5180, timeout is 2 seconds Codes: '!' - success, 'Q' - request not
sent, '.' - timeout, 'L' - labeled output interface, 'B' - unlabeled output interface, 'D' - DS
Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch, 'M' - malformed request, 'm' -
unsupported tlvs, 'N' - no rx label, 'P' - no rx intf label prot, 'p' - premature termination of
LSP, 'R' - transit router, 'I' - unknown upstream index, 'X' - unknown return code, 'x' - return
code 0 Type escape sequence to abort. 0 172.16.61.78 MRU 9582 [Labels: 27769 Exp: 0] L 1
172.16.61.79 MRU 9582 [Labels: 28136 Exp: 0] 7 ms . 2 * . 3 * . 4 * . 5 *^C
```

MPLSトンネルをチェックすると、Explicit Router (ERO ; 明示ルータ) に対して次の2つのホップがシグナリングされていることがわかります。

```
#show mpls traffic-eng tunnels 5180 Thu Jan 5 21:31:11.958 UTC Name: tunnel-te5180 Destination:
10.38.96.1 Ifhandle:0x80002c4 Signalled-Name: MIVLPAMI-0112003A_t5180 Status: Admin: up Oper: up
Path: valid Signalling: connected path option 10, type dynamic (Basis for Setup, path weight
3000) Accumulative metrics: TE 3000 IGP 30 Delay 900000 Path-option attribute: eline-any Number
of affinity constraints: 1 Include bit map : 0x2 Include ext bit map : Length: 256 bits Value :
0x::2 Include affinity name : eline(1) G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 7 kbps CT0 Creation Time: Thu Nov 10 22:17:55 2022 (7w6d ago) Config
```

Parameters: Bandwidth: 0 kbps (CT0) Priority: 5 5 Affinity: 0x0/0xffff Metric Type: TE
(interface) Path Selection: Tiebreaker: Min-fill (default) Hop-limit: disabled Cost-limit:
disabled Delay-limit: disabled Path-invalidation timeout: 10000 msec (default), Action: Tear
(default) AutoRoute: enabled LockDown: disabled Policy class: not set Forward class: 0 (not
enabled) Forwarding-Adjacency: disabled Autoroute Destinations: 0 Loadshare: 0 equal loadshares
Auto-bw: enabled Last BW Applied: 7 kbps CT0 BW Applications: 29 Last Application Trigger:
Periodic Application Bandwidth Min/Max: 0-4294967295 kbps Application Frequency: 60 min Jitter:
0s Time Left: 46m 48s Collection Frequency: 5 min Samples Collected: 2 Next: 1m 3s Highest BW: 0
kbps Underflow BW: 0 kbps Adjustment Threshold: 10% 10 kbps Overflow Detection disabled
Underflow Detection disabled Resignal Last-bandwidth Disabled Auto-Capacity: Disabled: Fast
Reroute: Enabled, Protection Desired: Any Path Protection: Not Enabled BFD Fast Detection:
Disabled Reoptimization after affinity failure: Enabled Soft Preemption: Disabled History:
Tunnel has been up for: 7w6d (since Thu Nov 10 22:17:55 UTC 2022) Current LSP: Uptime: 15:09:12
(since Thu Jan 05 06:22:00 UTC 2023) Reopt. LSP: Last Failure: LSP not signalled, identical to
the [CURRENT] LSP Date/Time: Thu Jan 05 19:03:33 UTC 2023 [02:27:39 ago] Prior LSP: ID: 32 Path
Option: 10 Removal Trigger: reoptimization completed Path info (IS-IS 1 level-2): Node hop
count: 3 Hop0: 172.16.61.79 Hop1: 172.16.57.244 Hop2: 172.16.6.59 Hop3: 10.38.96.1

パス上の最初のホップに移動すると、このトンネルの正しいMPLSラベル転送情報ベース(LFIB)エントリが表示されます。

```
#show mpls forwarding labels 27769 Fri Jan 6 06:13:04.220 UTC Local Outgoing Prefix Outgoing
Next Hop Bytes Label Label or ID Interface Switched -----
----- 27769 28136 TE: 5180 Hu0/10/0/11/2.4001 172.16.57.244 0
28136 TE: 5180 tt60409 point2point 0 (!)
```

このノードの出カインターフェイスはこのMACアドレスを使用するため、このMACアドレスはL2フレームのL2ヘッダーで送信元(SRC)MACとして使用できます。

```
#show interfaces hundredGigE 0/10/0/11/2.4001 Fri Jan 6 06:14:45.773 UTC
HundredGigE0/10/0/11/2.4001 is up, line protocol is up Interface state transitions: 79 Hardware
is VLAN sub-interface(s), address is 0c11.67c8.2041 Description: To
HundredGigE1/3/0/10/2.PHLAPALO-12121302A:CID:I1001/GE100/PHLAPALO/SLTNPAST Internet address is
172.16.57.245 MTU 9600 bytes, BW 100000000 Kbit (Max: 100000000 Kbit) reliability 255/255,
txload 0/255, rxload 0/255 Encapsulation 802.1Q Virtual LAN, VLAN Id 4001, loopback not set,
Last link flapped 1w6d ARP type ARPA, ARP timeout 04:00:00 Last input 00:00:00, output 00:00:00
Last clearing of "show interface" counters never 5 minute input rate 64000 bits/sec, 62
packets/sec 5 minute output rate 2198000 bits/sec, 699 packets/sec 4529877895 packets input,
2267795435148 bytes, 6 total input drops 0 drops for unrecognized upper-level protocol Received
124 broadcast packets, 0 multicast packets 3926978895 packets output, 1611587340639 bytes, 0
total output drops Output 0 broadcast packets, 0 multicast packets
```

ただし、**show captured packets ingress location <active LC VM>**のネイバー側では、正しいMPLSラベルが表示されますが、L2のSRCとDestination(DST)のMACアドレスが完全に間違っています。

```
[200] Jan 6 06:10:12.449, len: 103, hits: 1, buffhdr type: 1 i/p i/f: HundredGigE1/3/0/10/2 punt
reason: DROP_PACKET Ingress Headers: port_ifh: 0x8001ae4, sub_ifh: 0x0, bundle_ifh: 0x0
logical_port: 0x6c1, pd_pkt_type: 3 punt_reason: DROP_PACKET (0) payload_offset: 21, l3_offset:
21 FTMH: pkt_size: 0x7e, tc: 0, tm_act_type: 0, ssp: 0x981 PPH: pph_fwd_code: CPU Trap (7),
fwd_hdr_offset: 0 inlif: 0x0, vrf: 0x0, rif: 0x0 FHEI: trap_code: Rx_UNKNOWN_PACKET (63),
trap_qual: 193 [ether dst: 0000.0000.0000 src: 0c11.67c8.2000 type/len: 0x8847] [MPLS label:
28136, exp 0x6, eos 0, ttl 255]
```

DST MACアドレスはall-0で、SRC MACアドレスはNCS4Kノードの管理インターフェイスと一致します。

```
#show interfaces mgmtEth 0/rpl/emS/0 Fri Jan 6 06:15:59.141 UTC MgmtEth0/RP1/EMS/0 is down, line
protocol is down Interface state transitions: 0 Hardware is Management Ethernet, address is
0c11.67c8.2000 (bia 0c11.67c8.2000) Internet address is 10.230.192.86 MTU 1514 bytes, BW 100000
```

Kbit (Max: 100000 Kbit) reliability 255/255, txload 0/255, rxload 0/255 Encapsulation ARPA, Full-duplex, 100Mb/s, unknown, link type is autonegotiation loopback not set, ARP type ARPA, ARP timeout 04:00:00 Last input never, output never Last clearing of "show interface" counters never 5 minute input rate 0 bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 0 packets input, 0 bytes, 0 total input drops 0 drops for unrecognized upper-level protocol Received 0 broadcast packets, 0 multicast packets 0 runts, 0 giants, 0 throttles, 0 parity 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort 0 packets output, 0 bytes, 0 total output drops Output 0 broadcast packets, 0 multicast packets 0 output errors, 0 underruns, 0 applique, 0 resets 0 output buffer failures, 0 output buffers swapped out 0 carrier transitions

解決方法

根本的な原因は、このDDTSです。 [Cisco Bug ID CSCvz99253](#) [Cisco Bug ID CSCwa11748](#) [Cisco Bug ID CSCvz99253](#)の重複 これは6.5.32リリースで修正されています。

```
+++++++ Dec 23 23:24:58.214 ofa_ipnhgroup_event 0/LC1 3235382# t4839
TP3147224,dnxsdk_l3_fec_create,enter,trans_id,357633649,npu_id,0,is_modify,1,use_eei_encoding,0,
dest,0x6052,encap_id,0x4000304a,fec_id,0x2001fe98, Dec 23 15:10:16.787 ofa_ipnh_event 0/LC1
210586# t5614
TP2061,client_ipnh_create,grid_res_id_alloc_req_success,trans_id,357386085,encap_id,0x304a,alloc
_sz,2 Dec 23 15:10:16.787 ofa_ipnh_event 0/LC1 286920# t4857
TP9909,dispatch_ipnh,resolve_refhdl_success,ref_l3intf_trans_id,357386081,hdl,0x87a75238 Dec 23
15:10:16.787 ofa_ipnh_event 0/LC1 172418# t4857
TP9913,dummy_block,trans_id,357386085,wait,duration,time,0.1742 Dec 23 15:10:16.787
ofa_ipnh_event 0/LC1 153352# t4857
TP3149344,srv_ipnh_create,entry,trans_id,357386085,npu_mask,0x100000,l3a_mac_addr,00af.1f18.0043
,l3a_intf_id,28,port_id,0 Dec 23 15:10:16.780 ofa_ipnh_event 0/LC1 258284# t5614
TP2061,client_ipnh_create,grid_res_id_alloc_req_success,trans_id,357386077,encap_id,0x3048,alloc
_sz,2 Dec 23 15:10:16.780 ofa_ipnh_event 0/LC1 105614# t4857
TP9909,dispatch_ipnh,resolve_refhdl_success,ref_l3intf_trans_id,357383451,hdl,0x87a75238 Dec 23
15:10:16.780 ofa_ipnh_event 0/LC1 172408# t4857
TP9913,dummy_block,trans_id,357386077,wait,duration,time,0.1947 Dec 23 15:10:16.780
ofa_ipnh_event 0/LC1 286912# t4857
TP3149344,srv_ipnh_create,entry,trans_id,357386077,npu_mask,0x100000,l3a_mac_addr,00af.1f18.0043
,l3a_intf_id,28,port_id,0 +++++++
```

回復方法として、影響を受ける出力サブインターフェイスを再設定できます。

翻訳について

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