Catalyst 9000 Series 스위치에서 SPAN 및 ERSPAN 확인

목차

소개

이 문서에서는 Catalyst 9000 Series 스위치에서 SPAN 및 ERSPAN을 확인하는 방법에 대해 설명합니다.

사전 요구 사항

요구 사항

이 문서에 대한 특정 요건이 없습니다.

사용되는 구성 요소

이 문서의 정보는 다음 소프트웨어 및 하드웨어 버전을 기반으로 합니다.

- Catalyst 9300(Cisco IOS®-XE 17.3.5)
- Catalyst 9500(Cisco IOS®-XE 17.3.5)

이 문서의 정보는 특정 랩 환경의 디바이스를 토대로 작성되었습니다. 이 문서에 사용된 모든 디바이스는 초기화된(기본) 컨피그레이션으로 시작되었습니다. 현재 네트워크가 작동 중인 경우 모든 명령의 잠재적인 영향을 미리 숙지하시기 바랍니다.

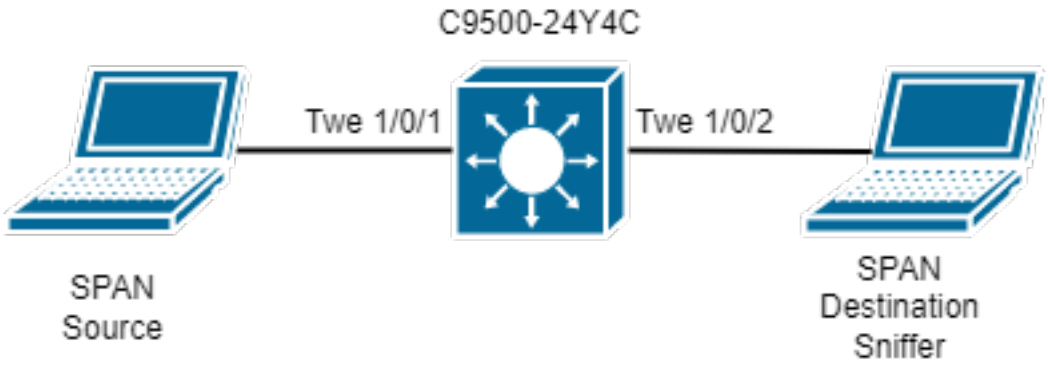
관련 제품

이 문서는 다음 하드웨어 및 소프트웨어 버전에서도 사용할 수 있습니다.

- Catalyst 9200
- Catalyst 9300
- Catalyst 9500
- Catalyst 9400
- Catalyst 9600

SPAN 확인

네트워크 다이어그램



SPAN 컨피그레이션

```
monitor session 1 source interface Twe1/0/1
monitor session 1 destination interface Twe1/0/2
```

SPAN 소프트웨어 컨피그레이션을 확인합니다. Source 및 Destination SPAN 인터페이스와 SPAN 캡처의 방향을 확인합니다.

```
C9500-SPAN#show monitor session all
Session 1
---------
Type                    : Local Session
Source Ports            :
    Both                : Twe1/0/1
Destination Ports       : Twe1/0/2
    Encapsulation       : Native
          Ingress       : Disabled
```

SPAN 하드웨어 항목을 확인합니다. 이SPAN 컨피그레이션당 고유한 FED 세션 ID. 동시에 최대 8개의 FED 세션을 구성할 수 있습니다(FED 세션 0~7).

```
C9500-SPAN# show platform software monitor session 1
Span Session 1 (FED Session 0):
  Type:      Local SPAN
  Prev type: Local SPAN
  Ingress Src Ports: Twe1/0/1    <-- Hardware entry for source interface.
  Egress Src Ports:  Twe1/0/1    <-- Hardware entry for source interface.
  Ingress Local Src Ports: (null)
  Egress Local Src Ports: (null)
  Destination Ports:  Twe1/0/2   <-- Hardware entry for destination interface.
  Ingress Src Vlans:
  Egress Src Vlans:
```

```
  Ingress Up Src Vlans: (null)
  Egress Up Src Vlans:  (null)
  Src Trunk filter Vlans:
  RSPAN dst vlan: 0
  RSPAN src vlan: 0
  RSPAN src vlan sav: 0
  Dest port encap = 0x0000
  Dest port ingress encap = 0xFFFFFFFFFFFFFFFF
  Dest port ingress vlan = 0x0
  SrcSess: 1  DstSess: 0 DstPortCfgd: 1  RspnDstCfg: 0  RspnSrcVld: 0
  DstCliCfg: 0  DstPrtInit: 1  PsLclCfgd: 0
  Flags: 0x00000031 PSPAN
  Remote dest port: 0   Dest port group: 0
  FSPAN disabled
FSPAN not notified
```

구성된 소스 및 대상 SPAN 포트의 ASIC, 코어 및 포트 번호를 수집합니다. Source SPAN 인터페이스가 제대로 프로그래밍되었는지, SPAN이 올바른 Destination SPAN 인터페이스를 가리키는지 확인하려면 Port 번호가 필요합니다.

> **팁:** 적절한 명명법 독립형 디바이스 **show platform software/hardware fed active 또**는 스택 디바이스 **show platform software/hardware fed switch <number>를 사용합니다**.

```
C9500-SPAN# show platform software fed active ifm mappings
Interface                IF_ID    Inst Asic Core Port SubPort Mac  Cntx LPN  GPN  Type Active
TwentyFiveGigE1/0/1      0x8        1   0    1    20     0      16   4    1    101  NIF  Y
TwentyFiveGigE1/0/2      0x9        1   0    1    21     0      17   5    2    102  NIF  Y
```

IlePortLeSpanBitMapTable 도플러 레지스터는 포트가 인그레스(RX) 방향으로 SPAN을 적용하는지 여부를 정의하는 데 사용됩니다. 구성된 소스 SPAN 포트(ASIC 포트 20)가 오른쪽 FED 세션(세션 0)**에 할당되었는지** 확인하려면 다음을 수행합니다.

```
C9500-SPAN# show platform hardware fed active fwd-asic register read register-name
IlePortLeSpanBitMapTable-20 asic 0 core 1
For asic 0 core 1

Module 0 - IlePortLeSpanBitMapTable[0][20]

ssbm                     : 0x1     <-- Convert from Hexadecimal to Binary: 0b00000001. Bit 0 is
set.
```

SPAN 세션 비트 맵은 8비트 레지스터입니다. 각 비트는 FED 세션에 해당합니다. 최하위 비트는 FED Session 0에 해당하고, 최상위 비트는 FED Session 7에 해당하므로 앞에서 언급한 대로 지원되는 최대 SPAN 세션 수는 8입니다.

인터페이스가 여러 SPAN 세션에 대한 SPAN 소스 포트로 구성된 경우 모든 FED 세션이 SSBM 레지스터에 표시되어야 합니다. 예를 들어 값이 0x5(0b00000101)인 SSBM은 인터페이스가 FED Session 0 및 FED Session 2 모두에 대한 SPAN 소스임을 의미합니다.

마찬가지로, 도플러 레지스터 **ElePortLeSpanBitMapTable** 레지스터는 포트가 이그레스(TX) 방향으로 SPAN을 적용받는지 여부를 결정합니다. 분석은 IlePortLeSpanBitMapTable 레지스터와 동일합니다. 구성된 소스 SPAN 포트(ASIC 포트 20)가 오른쪽 FED 세션(세션 0)**에 할당되었는지** 확인하려면 다음을 수행합니다.

```
C9500-SPAN# show platform hardware fed active fwd-asic register read register-name
ElePortLeSpanBitMapTable-20 asic 0 core 1
For asic 0 core 1
```

```
Module 0 - ElePortLeSpanBitMapTable[0][20]

ssbm                          : 0x1
```

이렇게 하면 소스 SPAN 인터페이스가 RX 및 TX 방향 모두에 대해 올바른 FED 세션에 매핑됩니다 .

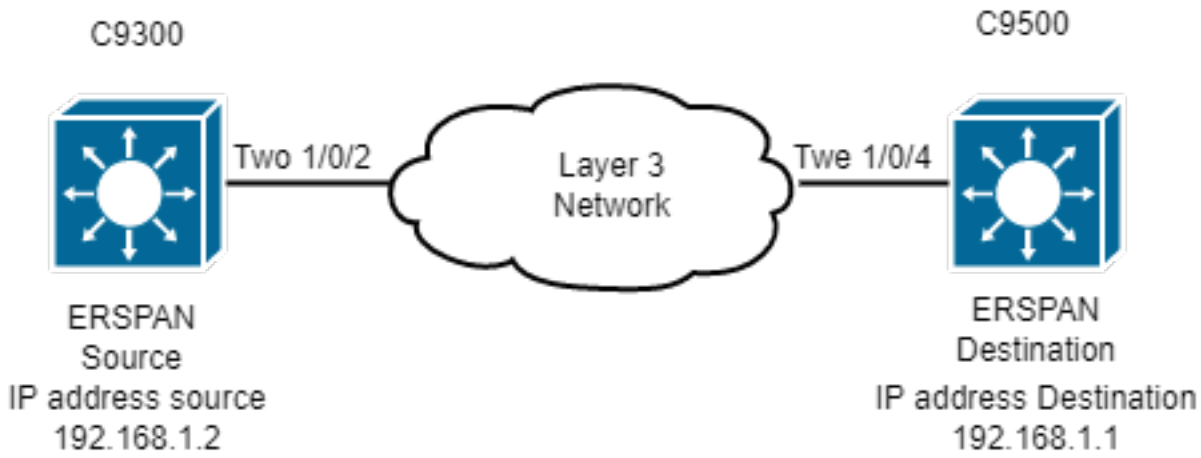
FED **세션 ID를 사용하여** AqmRepSpanPortMap Doppler 레지스터 내에서 SPAN의 대상 포트를 찾을 수 있습니다. FED 세션 0이 오른쪽 SPAN 대상 포트(ASIC 포트 21)를 가리키는지 확인하려면 다음을 수행합니다.

```
C9500-SPAN# show platform hardware fed active fwd-asic register read register-name
AqmRepSpanPortMap-0 asic 0 core 1
For asic 0 core 1

Module 0 - AqmRepSpanPortMap[0][0]

cpuQueueNum                   : 0x0
cpuSpanValid                  : 0x0
indirectApPortMap             : 0x0
portMap0                      : 0x200000     <-- Convert from Hexadecimal to Binary:
0b00100000000000000000000. Bit 21 is set.
rcpPortMap                    : 0x0
spanCtiLo                     : 0x0
```

이렇게 하면 SPAN으로 캡처된 패킷이 인터페이스 Tw1/0/2(ASIC 포트 21) 밖으로 복제된 상태로 표시되어야 합니다. 더 많은 SPAN 대상 포트가 구성된 경우, 이는 AqmRepSpanPortMap **레지스터에** 표시됩니다.

ERSPAN 확인

네트워크 다이어그램



참고: Catalyst C9200은 ERSPAN을 지원하지 않습니다.

참고: DNA-Advantage 라이센스가 필요합니다.

ERSPAN 컨피그레이션

```
### Source ESRPAN Device ###

C9300-ERSPAN# show run | section monitor
monitor session 1 type erspan-source
 source vlan 10
 destination
  erspan-id 3                    <-- ERSPAN id must be identical on source and destination.
  ip address 192.168.1.1         <-- GRE tunnel destination IP (IP addr configured on ERSPAN
destination switch).
  origin ip address 192.168.1.2  <-- GRE tunnel source IP (IP addr configured on ERSPAN source
switch).

C9300-ERSPAN# show ip interface brief | exclude unassigned
Interface              IP-Address      OK? Method Status                Protocol
<snip>
Loopback0              192.168.1.2     YES NVRAM  up                    up

### Destination ERSPAN Device ###

C9500-ERSPAN# show run | section monitor
monitor session 1 type erspan-destination
destination interface Twe1/0/3
source
erspan-id 3 <-- ERSPAN id must be identical on source and destination.
ip address 192.168.1.1  <-- GRE tunnel destination IP (IP addr configured on ERSPAN destination
switch).

C9500-ERSPAN# show ip interface brief | exclude unassigned
Interface IP-Address OK? Method Status Protocol
<snip>
Loopback0 192.168.1.1 YES NVRAM up up
```

소스 디바이스

원본과 대상 IP 간의 연결성을 확인합니다.

```
C9300-ERSPAN#ping 192.168.1.1 source 192.168.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.2
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

Cisco IOS 소프트웨어 프로그래밍

Cisco **IOS** Software에서 ERSPAN 세션에 대한 항목을 확인합니다.

```
C9300-ERSPAN#show monitor session 1
Session 1
---------
Type                     : ERSPAN Source Session
Status                   : Admin Enabled
Source VLANs             :
    Both                 : 10
Destination IP Address   : 192.168.1.1
Destination ERSPAN ID    : 3
Origin IP Address        : 192.168.1.2
```

SHIM 프로그래밍

소프트웨어가 프로그램 하드웨어(**SHIM 개체**)로 전송하는지 확인합니다.

```
C9300-ERSPAN#show platform software monitor session 1
Span Session 1 (FED Session 0):
  Type:      ERSPAN Source
  Prev type: Unknown
  Ingress Src Ports:
  Egress Src Ports:
  Ingress Local Src Ports: (null)
  Egress Local Src Ports: (null)
  Destination Ports:
  Ingress Src Vlans: 10     <-- Replicate Traffic.
  Egress Src Vlans:  10     <-- Replicate Traffic.
  Ingress Up Src Vlans: 10
  Egress Up Src Vlans:  10
  Src Trunk filter Vlans:
  RSPAN dst vlan: 0
  RSPAN src vlan: 0
  RSPAN src vlan sav: 0
  Dest port encap = 0x0000
  Dest port ingress encap = 0x0000
  Dest port ingress vlan = 0x0
  SrcSess: 1  DstPortCfgd: 0  RspnDstCfg: 0  RspnSrcVld: 0    <-- Monitor session number.
  DstCliCfg: 0  DstPrtInit: 0  PsLclCfgd: 0
  Flags: 0x00000002 VSPAN
  Remote dest port: 0   Dest port group: 0
  FSPAN disabled
  FSPAN not notified
  ERSPAN Id    : 3           <-- Value match with the software setting.
  ERSPAN Org Ip: 192.168.1.2  <-- Value match with the software setting.
  ERSPAN Dst Ip: 192.168.1.1  <-- Value match with the software setting.
  ERSPAN Ip Ttl: 255
  ERSPAN State : Enabled
  ERSPAN Tun id: 77
```

Forwarding Manager Route Processor

소프트웨어가 프로그램 하드웨어(FMAN **RP 계층**)로 전송하는지 확인합니다.

```
C9300-ERSPAN#show platform software swspan switch active R0 source
Showing SPAN source table summary info

Sess-id   IF-type   IF-id   Sess-type   Dir
-------------------------------------------------
0         VLAN      10      ERSPAN SRC  Ingress
0         VLAN      10      ERSPAN SRC  Egress


C9300-ERSPAN#show platform software swspan switch active R0 source sess-id 0
Showing SPAN source detail info
Session ID : 0 Intf Type : VLAN Vlan id : 10 <-- Vlan entry
PD Sess ID : 0
Session Type : ERSPAN SRC
Direction : Ingress
Filter Enabled : No
ACL Configured : No
ERSPAN Enable : Yes

Session ID : 0
Intf Type : VLAN
Vlan id : 10    <-- Match with the Vlan/Interface SPAN.
```

```
PD Sess ID : 0
Session Type : ERSPAN SRC
Direction : Egress
Filter Enabled : No
ACL Configured : No
ERSPAN Enable : Yes
```

Forward Manager-Forwarding Processor

소프트웨어가 프로그램 하드웨어(FMAN **FP 계층**)로 전송하는지 확인합니다.

```
C9300-ERSPAN#show platform software swspan switch active F0 source
Showing SPAN source table summary info

Sess-id   IF-type   IF-id   Sess-type   Dir
-----------------------------------------------
0         VLAN      10      ERSPAN SRC  Ingress
0         VLAN      10      ERSPAN SRC  Egress


C9300-ERSPAN#show platform software swspan switch active F0 source sess-id 0
Showing SPAN source detail info

Session ID : 0
Intf Type : VLAN
Vlan id : 10
PD Sess ID : 0
Session Type : ERSPAN SRC   <-- Source Interface.
Direction : Ingress
Filter Enabled : No
ACL Configured : No
AOM Object id : 519
AOM Object Status : Done
Parent AOM object Id : 30
Parent AOM object Status : Done

Session ID : 0
Intf Type : VLAN
Vlan id : 10
PD Sess ID : 0
Session Type : ERSPAN SRC  <-- Source Interface.
Direction : Egress
Filter Enabled : No
ACL Configured : No
AOM Object id : 520
AOM Object Status : Done
Parent AOM object Id : 30
Parent AOM object Status : Done


C9300-ERSPAN#show platform software swspan switch active F0 counters  <-- Check for any err
counters that increment on PI/PD/HW
Dump Switch SPAN FP operation counters  <-- Operational Counters.

Source SPAN Config Counters

PI: Create 2 (err 0), Modify 0 (err 0), Delete 0 (err 0) <-- PI = platform independent
(Software/IOS).
PD: Create 2 (err 0), Modify 0 (err 0), Delete 0 (err 0) <-- PD = platform dependent
(SHIM/FMAN/FED).
HW: Create 2 (err 0), Modify 0 (err 0), Delete 0 (err 0) <-- HW = hardware (FED/ASIC).
```

```
Destination SPAN Config Counters

PI: Create 1 (err 0), Modify 0 (err 0), Delete 0 (err 0)
PD: Create 1 (err 0), Modify 0 (err 0), Delete 0 (err 0)
HW: Create 1 (err 0), Modify 0 (err 0), Delete 0 (err 0)

Filter SPAN Config Counters

PI: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
PD: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
HW: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
```

포워딩 엔진 드라이버

ASIC(FED)를 프로그래밍하는 레이어를 확인합니다.

```
C9300-ERSPAN#show platform software fed switch active monitor 0
Session 0
---------
  Session Type         : ERSPAN Source Session
  Source Ports         : RX: None  TX: None
  Destination Ports    : None
  Source VLANs         : VLAN-10
  Destination VLANs    : VLAN-10
  Source RSPAN VLAN    : 0
  DST RSPAN VLAN       : 0
  Encap                : Native
  Ingress Forwarding   : Disabled
  Filter VLANs         : None
  ERSPAN Enable        : 1         <-- 1 = On/Completed.
  ERSPAN Hw Programmed : 1         <-- 1 = On/Completed.
  ERSPAN Mandatory Cfg : 1         <-- 1 = On/Completed.
  ERSPAN Id            : 3
  Gre Prot             : 88be
  MTU                  : 9000
  Ip Tos               : 0
  Ip Ttl               : 255
  Cos                  : 0
  Vrf Id               : 0
  Dst Ip               : 192.168.1.1
Org Ip : 192.168.1.2
Dst Ipv6 : ::
Org Ipv6 : ::
SGT count : 0
SGT Tag(s) :
```

FED(Hardware Tunnel Programming)를 확인합니다.

```
C9300-ERSPAN#show platform software fed switch active ifm interfaces tunnel
Interface                      IF_ID               State
----------------------------------------------------------------------
Tunnel1000000000               0x00000035          READY            <-- 0x35 in Hex is 53 in
Decimal (tunnel number 53).


C9300-ERSPAN#show platform software fed switch active ifm if-id 0x35 <-- Hardware tunnel number
0x35.
Interface IF_ID : 0x0000000000000035
```

```
Interface Name : Tunnel1000000000
Interface Block Pointer : 0x55d0ff5b6c98
Interface Block State : READY
Interface State : Enabled
Interface Status : ADD
Interface Ref-Cnt : 4
Interface Type : TUNNEL
Unit : 0
SNMP IF Index : 0
Encap L3If LE Handle : 0x7f00e0a50a28 <-- Hardware handle info (used to check final Hardware
program state).
Decap L3If LE Handle : 0x7f00e0a50bd8 <-- Hardware handle info (used to check final Hardware
program state).
Tunnel Mode : 0 [gre] <-- Tunnel Protocol Enable.
Tunnel Sub-mode: 0 [none]
Hw Support : Yes
Tunnel Vrf : 0
IPv4 MTU : 0
IPv6 MTU : 0
IPv4 VRF ID : 0
IPv6 VRF ID : 0
Protocol flags : 0x0001 [ ipv4 ]
Misc flags : 0x0000 [ None ]
ICMPv4 flags : 0x03 [ unreachable redirect ]
ICMPv6 flags : 0x03 [ unreachable redirect ]

Port Information
Handle ..... [0xcf000051]
Type ..... [L3-Tunnel]
Identifier ..... [0x35]
Unit ..... [53]
Port Logical Tunnel Subblock
Encap-L3ifle.......[0x7f00e0a50a28] <-- Same number as previous highlighted output.
Decap-L3ifle.......[0x7f00e0a50bd8] <-- Same number as previous highlighted output.
decap-portle.......[0x0]
RI-decap...........[0x7f00e0a5a1a8]
SI-decap...........[0x7f00e0a5a678]
Decap-Tcam_handle..[0x7f00e0a5a9a8]
Tunnel_capability..[0x3]
Encap-RCP-PMAP.....[0x0]
GPN................[0]

C9300-ERSPAN#show platform software fed switch active ifm mappings l3if-le | include L3IF|Tunnel
L3IF_LE                  Interface                       IF_ID               Type
0x00007f00e0a50a28       Tunnel1000000000                0x00000035          ENCAP_L3_LE <--
L3IF + IF_ID (ENCAP) match here.
0x00007f00e0a50bd8       Tunnel1000000000                0x00000035          DECAP_L3_LE <--
L3IF + IF_ID (DECAP) match here.

Encapsulation LE

C9300-ERSPAN#show platform hardwware fed switch active fwd-asic abstraction print-resource-
handle 0x00007f00e0a50a28 0 <-- ENCAP.
Handle:0x7f00e0a50a28 Res-Type:ASIC_RSC_L3IF_LE Res-Switch-Num:255 Asic-Num:255 Feature-
ID:AL_FID_IFM Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x27 mtu_index/l3u_ri_index0:0x5
sm handle [ASIC 0]: 0x7f00e0a56d08 index1:0x27 mtu_index/l3u_ri_index1:0x5
============================================================
Decapsulation LE
C9300-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x00007f00e0a50a28 0 <-- DECAP.
Handle:0x7f00e0a50bd8 Res-Type:ASIC_RSC_L3IF_LE Res-Switch-Num:255 Asic-Num:255 Feature-
ID:AL_FID_IFM Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
```

```
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x28 mtu_index/l3u_ri_index0:0x0
sm handle [ASIC 0]: 0x7f00e0a559c8 index1:0x28 mtu_index/l3u_ri_index1:0x0
============================================================
```

목적지 스위치로 향하는 이그레스 포트에서 임베디드 패킷 캡처를 실행합니다. GRE 터널의 소스 및 목적지 IP를 사용하여 필터를 적용할 수 있습니다(패킷은 캡슐화된 패킷임).

```
Frame 1: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface 0
 <snip>
Internet Protocol Version 4, Src: 192.168.1.2, Dst: 192.168.1.1 <-- ERSPAN IP HEADER.
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 96
    Identification: 0x1018 (4120)
    Flags: 0x00
        0... .... = Reserved bit: Not set
        .0.. .... = Don't fragment: Not set
        ..0. .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 255
    Protocol: Generic Routing Encapsulation (47)  <-- GRE tunnel encapsulation.
    Header checksum: 0x9c56 [validation disabled]
        [Good: False]
        [Bad: False]
    Source: 192.168.1.2             <-- Source GRE IP tunnel.
    Destination: 192.168.1.1        <-- Destination GRE IP tunnel.
Generic Routing Encapsulation (ERSPAN)
    Flags and Version: 0x1000
        0... .... .... .... = Checksum Bit: No
        .0.. .... .... .... = Routing Bit: No
        ..0. .... .... .... = Key Bit: No
        ...1 .... .... .... = Sequence Number Bit: Yes
        .... 0... .... .... = Strict Source Route Bit: No
        .... .000 .... .... = Recursion control: 0
        .... .... 0000 0... = Flags (Reserved): 0
        .... .... .... .000 = Version: GRE (0)
    Protocol Type: ERSPAN (0x88be)         <--ERSPAN enable.
    Sequence Number: 0
Encapsulated Remote Switch Packet Analysis
    0001 .... .... .... = Version: Type II (1)
    .... 0000 0001 1000 = Vlan: 10
    000. .... .... .... = Priority: 0
    ...1 .... .... .... = Unknown2: 1
    .... 1... .... .... = Direction: Outgoing (1)
    .... .0.. .... .... = Truncated: Not truncated (0)
    .... ..00 0000 0011 = SpanID: 3       <--ERSPAN ID.
    Unknown7: 00000002
Ethernet II, Src: Xerox_00:02:00 (00:00:08:00:02:00), Dst: Cisco_eb:90:68 (00:9e:1e:eb:90:68)
  <snip>
(Internal data packet comes here, output truncated)
```

ERSPAN 대상 장치

Cisco IOS 소프트웨어 프로그래밍

```
C9500-ERSPAN#show monitor session 1
Session 1
---------
```

```
Type                      : ERSPAN Destination Session
Status                    : Admin Enabled
Destination Ports         : Twe1/0/3
Source IP Address         : 192.168.1.1
Source ERSPAN ID          : 3
```

SHIM 프로그래밍

어떤 소프트웨어가 프로그램 하드웨어(SHIM 개체)로 전송되는지 확인합니다.

```
C9500-ERSPAN#show platform software monitor session 1
Span Session 1 (FED Session 0):
  Type:      ERSPAN Destination
  Prev type: Unknown
  Ingress Src Ports:
  Egress Src Ports:
  Ingress Local Src Ports: (null)
  Egress Local Src Ports: (null)
  Destination Ports:  Twe1/0/3
  Ingress Src Vlans:
  Egress Src Vlans:
  Ingress Up Src Vlans: (null)
  Egress Up Src Vlans:  (null)
  Src Trunk filter Vlans:
  RSPAN dst vlan: 0
  RSPAN src vlan: 0
  RSPAN src vlan sav: 0
  Dest port encap = 0x0004
  Dest port ingress encap = 0x0000
  Dest port ingress vlan = 0x0
  SrcSess: 0  DstSess: 1 DstPortCfgd: 1  RspnDstCfg: 0  RspnSrcVld: 0
  DstCliCfg: 0  DstPrtInit: 1  PsLclCfgd: 0
  Flags: 0x00000000
  Remote dest port: 0   Dest port group: 0
  FSPAN disabled
  FSPAN not notified
  ERSPAN Id    : 3
  ERSPAN Dst Ip: 192.168.1.1
  ERSPAN Vrf   : 0
```

Forward Manager-Forwarding Processor

소프트웨어가 프로그램 하드웨어(FMAN FP 계층)로 전송하는 내용을 확인합니다.

```
C9500-ERSPAN#show platform software swspan switch active r0 destination
Showing SPAN destination table summary info Sess-id IF-type IF-id Sess-type --------------------
------------------ 0 PORT 11  Local        <-- IF-if 0xb maps to Twe1/0/3 (Check under 'show
platform software fed active ifm mapping').
0         ERSPAN    ERSPAN   DST


C9500-ERSPAN#show platform software swspan R0 destination sess-id 0
Showing SPAN destination detail info

Session ID : 0
Intf Type : PORT
Port dpidx :11         <--Match with IF-id
PD Sess Id : 0
```

```
Session Type : Local   <-- Type of monitor session
Ingress Fwd : No
Ingress Encape : Disabled
Ingress Vlan : 0
Encap Value : Replicate
RSPAN Vlan : 0

Session ID : 0
Intf Type : ERSPAN
Vlan id :
PD Sess Id : 0
Session Type : ERSPAN DST
ERSPAN Id : 3
ERSPAN Dst Ip: 192.168.1.1
ERSPAN Src Ip: 0.0.0.0
GRE Prot  : 35006
MTU       : 0
IP Tos    : 0
IP Ttl    : 255
Cos       : 0
Vrf Id    : 0
Tunnel Ifid: 38         <-- 38 in Decimal is 0x26 in Hex which is the IF_ID of Tunnel1
ERSPAN En : TDL_TRUE
```

Forward Manager-Forwarding Processor

소프트웨어가 프로그램 하드웨어(FMAN FP 계층)로 전송하는 내용을 확인합니다.

```
C9500-ERSPAN#show platform software swspan switch active F0 counters  <-- (check for any error
counters on PI/PD/HW).
Dump Switch SPAN FP operation counters

Source SPAN Config Counters

PI: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)  <-- PI = platform independent
(Software/IOS).
PD: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)  <-- PD = platform dependent
(SHIM/FMAN/FED).
HW: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)  <-- HW = hardware (FED/ASIC).

Destination SPAN Config Counters

PI: Create 10 (err 0), Modify 6 (err 0), Delete 4 (err 0)
PD: Create 4 (err 0), Modify 0 (err 0), Delete 2 (err 0)
HW: Create 4 (err 0), Modify 0 (err 0), Delete 2 (err 0)

Filter SPAN Config Counters

PI: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
PD: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
HW: Create 0 (err 0), Modify 0 (err 0), Delete 0 (err 0)
```

```
C9500-ERSPAN#show platform software swspan switch active F0 destination
Showing SPAN destination table summary info

Sess-id   IF-type   IF-id   Sess-type
--------------------------------------
0         PORT      11       Local
0         VLAN      0       ERSPAN DST
```

포워딩 엔진 드라이버

ASIC(FED)를 프로그래밍하는 레이어를 확인합니다.

```
C9500-ERSPAN#show platform software fed switch active monitor 0
Session 0
---------
  Session Type          : ERSPAN Destination Session
Source Ports : RX: None TX: Tunnel1000000000 Destination Ports    : TwentyFiveGigE1/0/3
  Source VLANs          : None
  Destination VLANs     : None
  Source RSPAN VLAN     : 0
  DST RSPAN VLAN        : 0
  Encap                 : Replicate
  Ingress Forwarding    : Disabled
  Filter VLANs          : None
  ERSPAN Enable         : 1
  ERSPAN Hw Programmed  : 1
  ERSPAN Mandatory Cfg  : 1
  ERSPAN Id             : 3
  Ip Tos                : 0 (DSCP:0)
  Ip Ttl                : 0
  Cos                   : 0
  Vrf Id                : 0
  Tunnel IfId           : 38                <-- 38 in Decicmal is 0x26 in Hex which is the IF_ID
of Tunnel1
  Dst Ip                : 192.168.1.1
  Org Ip                : 0.0.0.0
  SGT count             : 0
  SGT Tag(s)            :
```

FED(Hardware Tunnel Programming)를 확인합니다.

```
C9500-ERSPAN#show platform software fed switch active ifm interfaces tunnel
Interface IF_ID State
------------------------------------------------------------------------
Tunnel1000000000  0x00000026   READY

C9500-ERSPAN#show platform software fed switch active ifm if-id 0x00000026
Interface IF_ID : 0x0000000000000026
Interface Name : Tunnel1000000000
Interface Block Pointer : 0x7f2cd48e9958
Interface Block State : READY
Interface State : Enabled
Interface Status : ADD
Interface Ref-Cnt : 5
Interface Type : TUNNEL
Unit : 0 SNMP IF Index : 0 Encap L3If LE Handle : 0x7f2cd4904e08    <-- Hardware handle info
(used to check final Hardware program state).
Decap L3If LE Handle : 0x7f2cd48dabc8    <-- Hardware handle info (used to check final Hardware
program state).
Tunnel Mode     : 0 [gre]                <-- Tunnel Protocol Enable.
Hw Support      : Yes
Tunnel Vrf      : 0
IPv4 MTU        : 0
IPv6 MTU        : 0
IPv4 VRF ID     : 0
IPv6 VRF ID     : 0
```

```
Protocol flags : 0x0001 [ ipv4 ]
Misc flags     : 0x0000 [ None ]
ICMPv4 flags   : 0x03 [ unreachable redirect ]
ICMPv6 flags   : 0x03 [ unreachable redirect ]

Port Information
Handle ..... [0xd4000043]
Type ..... [L3-Tunnel] Identifier ..... [0x26] Unit ..... [38] Port Logical
Tunnel Subblock Encap-L3ifle.....[0x7f2cd4904e08]     <-- Same number as previous highlighted
output.
Decap-L3ifle.....[0x7f2cd48dabc8]     <-- Same number as previous highlighted output.
decap-portle.....[0x0]
RI-decap.....[0x7f2cd49615d8]     <-- Same number as previous highlighted output.
SI-decap.....[0x7f2cd4958dd8]     <-- Same number as previous highlighted output.
Decap-Tcam_handle..[0x7f2cd46eee08]     <-- Same number as previous highlighted output.
Tunnel_capability..[0x3]
Encap-RCP-PMAP.....[0x0]
GPN.............[0]
<snip>

C9500-ERSPAN#show platform software fed switch active ifm mappings l3if-le | include L3IF|Tunnel
L3IF_LE                  Interface                      IF_ID              Type
0x00007f2cd48dabc8       Tunnel1000000000               0x00000026         DECAP_L3_LE
<-- L3IF + IF_ID (DECAP) match here.
0x00007f2cd4904e08       Tunnel1000000000               0x00000026         ENCAP_L3_LE
<-- L3IF + IF_ID (ENCAP) match here.

### Encapsulation LE ###

C9500-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x7f2cd4904e08 0 <--ENCAP
Handle:0x7f2cd4904e08 Res-Type:ASIC_RSC_L3IF_LE Res-Switch-Num:255 Asic-Num:255 Feature-
ID:AL_FID_IFM Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x27  mtu_index/l3u_ri_index0:0x2
sm handle [ASIC 0]: 0x7f2cd46ece38 index1:0x27 mtu_index/l3u_ri_index1:0x4

============================================================

### Decapsulation LE ###

C9500-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x7f2cd48dabc8 0 <--DECAP
Handle:0x7f2cd48dabc8 Res-Type:ASIC_RSC_L3IF_LE Res-Switch-Num:255 Asic-Num:255 Feature-
ID:AL_FID_IFM Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x28 mtu_index/l3u_ri_index0:0x0
sm handle [ASIC 0]: 0x7f2cd46d91c8 index1:0x28 mtu_index/l3u_ri_index1:0x0



### Rewrite Index (decapsulation) ###

C9500-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x7f2cd49615d8 1   <-- RI-decap
Handle:0x7f2cd49615d8 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_GRE
Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
priv_ri/priv_si Handle: 0x7f2cd48daf28Hardware Indices/Handles: index0:0x16
mtu_index/l3u_ri_index0:0x0 index1:0x16 mtu_index/l3u_ri_index1:0x0
Features sharing this resource:107 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 28 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 6b 33 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Detailed Resource Information (ASIC# 0) ----------------------------------------
Rewrite Data Table Entry, ASIC#:0 RI:22 Rewrite_type:AL_RRM_REWRITE_IPV4_ERSPAN2_DECAP(61)
Mapped_rii:TUNNEL_IPv4Erspan_DECAP(83)   L3IF LE Index: 40          <-- 64 in Decimal is 0x40
```

in Hex which matches Decap LE index seen above

```
Detailed Resource Information (ASIC# 1)
---------------------------------------

Rewrite Data Table Entry,
ASIC#:1 RI:22 Rewrite_type:AL_RRM_REWRITE_IPV4_ERSPAN2_DECAP(61)
Mapped_rii:TUNNEL_IPv4Erspan_DECAP(83)

L3IF LE Index: 40 ============================================================
```

Station Index (decapsulation)

```
C9500-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x7f2cd4958dd8 1  <-- SI-decap
Handle:0x7f2cd4958dd8 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_GRE
Lkp-ftr-id:LKP_FEAT_INVALID ref_count:1
priv_ri/priv_si Handle: 0x7f2cd49615d8Hardware Indices/Handles: index0:0xae
mtu_index/l3u_ri_index0:0x0 index1:0xae mtu_index/l3u_ri_index1:0x0
Features sharing this resource:107 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 28 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 6b 36 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Detailed Resource Information (ASIC# 0) ---------------------------------------- Station Index
(SI) [0xae]
RI = 0x16 DI = 0x5012 stationTableGenericLabel = 0 stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0x15 rcpServiceId = 0 dejaVuPreCheckEn = 0 Replication Bitmap: LD Detailed
Resource Information (ASIC# 1) ---------------------------------------- Station Index (SI)
[0xae]
RI = 0x16 DI = 0x5012 stationTableGenericLabel = 0 stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0x15 rcpServiceId = 0 dejaVuPreCheckEn = 0 Replication Bitmap: CD
============================================================
```

Tunnel Decap (TCAM)

```
C9500-ERSPAN#show platform hardware fed switch active fwd-asic abstraction print-resource-handle
0x7f2cd46eee08 1  <-- Decap-Tcam_handle.
Handle:0x7f2cd46eee08 Res-Type:ASIC_RSC_HASH_TCAM Res-Switch-Num:0 Asic-Num:255 Feature-
ID:AL_FID_GRE Lkp-ftr-id:LKP_FEAT_TT_IPV4_GRE ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: handle [ASIC: 0]: 0x7f2cd48db018
Detailed Resource Information (ASIC# 0) ---------------------------------------- Number of HTM
Entries: 3 Entry 0: (handle 0x7f2cd48db018)
Labels  Port   Vlan   L3If   Group
M:      0000   0000   0000   0000
V:      0000   0000   0000   0000

M: ffffffff 00000000 00000000 000003ff 00000000 00000100 01000000 00000fff
3f000000 V: c0a80101 00000000 00000000 00000003 00000000 00000100 01000000 00000000      <--
c0a80101 in Hex maps to 192.168.1.1
        00000000

GREv4 Dst       Src     Key     C S R D E F VRF Fl L3P GreP Misc RCPSVCId
  M: ffffffff 00000000 00000000 0 0 0 0 0 1 000 0  00  0000 00 3f               <-- F=1
Forwarding
  V: c0a80101 00000000 00000000 0 0 0 0 0 1 000 0  00  0000 00 00
Action: 00000100 06000000 00000000 00000000 00000000 00000000 000000ad 00000000
        00000000 00000000
RL2 RL3 ACF SPK CLPC LKV PRI STL LPC ADC LKI   SI

0   1   0   0    0   0   6   0   0   0   0    ad                                 <-- Hexadecimal
value for Station Index.
Start/Skip Word: 0x00000003
Start Feature, Terminate
```

```
Entry 1: (handle 0x7f2cd495c3f8)
Labels  Port   Vlan   L3If   Group
M:      0000   0000   0000   0000
V:      0000   0000   0000   0000

M: ffffffff 00000000 00000000 000003ff 00000000 00000100 00000000 000a0000
        3f000000
V: c0a80101 00000000 00000000 00000003 00000000 00000100 00000000 00080000
        00000000

GREv4 Dst       Src     Key     C S R D E F VRF Fl L3P GreP Misc RCPSVCId
  M: ffffffff 00000000 00000000 0 0 0 0 0 0 000 a  00  0000 00 3f
  V: c0a80101 00000000 00000000 0 0 0 0 0 0 000 8  00  0000 00 00
Action: 00000100 06000000 00000000 00000000 00000000 00000000 000000ad 00000000
        00000000 00000000
RL2 RL3 ACF SPK CLPC LKV PRI STL LPC ADC LKI   SI

0   1   0   0    0   0   6   0   0   0   0   ad
Start/Skip Word: 0x00000000
No Start, Terminate


Entry 2: (handle 0x7f2cd46ef568)
Labels  Port   Vlan   L3If   Group
M:      0000   0000   0000   0000
V:      0000   0000   0000   0000

M: ffffffff 00000000 00000000 000003ff 00000000 00000100 00000000 00020fff
        00000000
V: c0a80101 00000000 00000000 00000003 00000000 00000100 00000000 00000000
        00000000

GREv4 Dst       Src     Key     C S R D E F VRF Fl L3P GreP Misc RCPSVCId
  M: ffffffff 00000000 00000000 0 0 0 0 0 0 000 2  00  0000 00 00
  V: c0a80101 00000000 00000000 0 0 0 0 0 0 000 0  00  0000 00 00
Action: 00000100 06000000 00000000 00000000 00000000 00000000 000000ae 00000000
        00000000 00000000
RL2 RL3 ACF SPK CLPC LKV PRI STL LPC ADC LKI   SI

0   1   0   0    0   0   6   0   0   0   0   ae                                  <-- Hexadecimal
value for Station Index.
Start/Skip Word: 0x00000000
No Start, Terminate
================================================================


C9500-ERSPAN#show platform hardware fed switch active fwd-asic resource asic 0 station-index
range 0xab 0xab
ASIC#0:
Station Index (SI) [0xad]
RI = 0x14
DI = 0x505a                  <-- Destination Index
stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0x15
rcpServiceId = 0xd
dejaVuPreCheckEn = 0
Replication Bitmap: LD

C9500-ERSPAN#show platform hardware fed switch active fwd-asic resource asic 0 station-index
range 0xae 0xae
```

```
Station Index (SI) [0xae]
RI = 0x16
DI = 0x5012                 <-- Destination Index
stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0x15
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD

C9500-ERSPAN#show platform hardware fed switch active fwd-asic resource asic 0 destination-index
range 0x505a 0x505a
Destination index = 0x505a DI_RCP_PORT2
pmap = 0x00000000 0x00000000
cmi = 0x0
rcp_pmap = 0x2
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
C9500-ERSPAN#show platform hardware fed switch active fwd-asic resource asic 0 destination-index
range 0x5012 0x5012
ASIC#0:
Destination Index (DI) [0x5012]
portMap = 0x00000000 00000000
cmi1 = 0
rcpPortMap = 0x1

CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

관련 디버그 및 추적

Cisco IOS XE

```
debug monitor all
debug platform monitor
```

FMAN-RP

```
set platform software trace forwarding-manager switch <> R0 switch-span  verbose
show platform software trace message forwarding-manager switch <> R0
```

FMAN-FP

```
set platform software trace forwarding-manager switch <> F0 switch-span verbose
show platform software trace message forwarding-manager switch <> F0
```

연방

```
set platform software trace fed switch <> swspan verbose
set platform software trace fed switch <> asic_spn verbose
set platform software trace fed switch <> acl verbose  (Useful when ip/ipv6 filter is
configured)
show platform software trace message fed switch <>
```

관련 정보

- 기술 지원 및 문서 – Cisco Systems
- 네트워크 관리 컨피그레이션 가이드, Cisco IOS XE Amsterdam 17.3.x(Catalyst 9500 스위치) ERSPAN
- 네트워크 관리 컨피그레이션 가이드, Cisco IOS XE Amsterdam 17.3.x(Catalyst 9500 스위치) SPAN
- 블로그: Cisco TAC에서 문서를 변환하고 셀프 서비스를 간소화하는 방법

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