Troubleshoot vEdge Bidirectional Forwarding Detection and Data Plane Connections Issues

Contents

Introduction

This document describes vEdge data plane connection problems after a control plane connection however no data plane connectivity between sites.

Prerequisites

Requirements

Cisco recommends knowledge of **Cisco Software Defined Wide Area Network (SDWAN)** solution.

Components Used

This document is not restricted to specific software and hardware versions. This document is focused on

vEdge platforms.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.
For Cisco Edge routers (Cisco IOS® XE routers in controller mode) , please read .

Control Plane Information

Check Control Local Properties

In order to check the status of the **Wide Area Network (WAN)** interfaces on a vEdge, use the command, **show control local-properties wan-interface-list.**

In this output, you can see the RFC 4787 **Network Address Translation (NAT) Type.**

When the vEdge is behind a NAT device (Firewall, Router, etc), Public and Private IPv4 address, Public and Private source **User Datagram Protocol (UDP)** ports are used to build the data plane tunnels.

You can also find the state of the tunnel interface, color, and maximum number of control connections configured.

```
vEdge1# show control local-properties wan-interface-list

 NAT TYPE: E -- indicates End-point independent mapping
           A -- indicates Address-port dependent mapping
           N -- indicates Not learned
           Requires minimum two vbonds to learn the NAT type

           PUBLIC          PUBLIC PRIVATE         PRIVATE          PRIVATE                          MA
INTERFACE  IPv4            PORT   IPv4            IPv6             PORT    VS/VM COLOR        STATE CNT

-------------------------------------------------------------------------------------------------------
ge0/0      203.0.113.225   4501   10.19.145.2     ::               12386    1/1  gold           up    2
ge0/1      10.20.67.10     12426  10.20.67.10     ::               12426    0/0  mpls           up    2
```

With this data, you can identify certain information about how the data tunnels must be built and what ports you can expect (from the routers perspective) to use when you form the data tunnels.

Check Control Connections

It is important to ensure that the color that does not form data plane tunnels has a control connection established with the controllers in the overlay.

Otherwise, the vEdge does not send the **Transport Locator (TLOC)** information to the vSmart via **Overlay Management Protocol (OMP).**

You can verify if it is operational with the use of **show control connections** command, and look for the **connect** state.

```
vEdge1# show control connections
```

```
                                                                                                  PEER
PEER    PEER PEER            SITE       DOMAIN PEER                                              PRIV  PEER
TYPE    PROT SYSTEM IP       ID         ID     PRIVATE IP                                        PORT  PUBLIC IP
-------------------------------------------------------------------------------------------------------------
vsmart  dtls 10.1.0.3         3          1      203.0.113.13                                    12446 203.0.113.1
vbond   dtls -                0          0      203.0.113.12                                    12346 203.0.113.1
vmanage dtls 10.1.0.1         1          0      203.0.113.14                                    12646 203.0.113.1
```

If the interface (that does not form data tunnels) tries to connect, solve it with a successful start-up of the control connections via that color.

Or, set the **max-control-connections 0** in the selected interface under the tunnel interface section.

```
vpn 0
 interface ge0/1
  ip address 10.20.67.10/24
  tunnel-interface
   encapsulation ipsec
   color mpls restrict
   max-control-connections 0
   no allow-service bgp
   allow-service dhcp
   allow-service dns
   allow-service icmp
   no allow-service sshd
   no allow-service netconf
   no allow-service ntp
   no allow-service ospf
   no allow-service stun
  !
  no shutdown
 !
```

Note: Sometimes, you can use the **no control-connections** command to achieve the same goal. However, that command does not establish a maximum number of control connections. This command is deprecated from version 15.4 and is not used on newer software.

Overlay Management Protocol

Verify OMP TLOCs are Advertised from the vEdges

OMP TLOCs cannot be sent because the interface tries to form control connections via that color and is not able to reach the controllers.

Check if the color (that the data tunnels) sends the TLOC for that particular color to the vSmarts.

Use the command **show omp tlocs advertised** in order to check the TLOCs that are sent to the OMP peers.

Example: Colors **mpls** and **gold**. No TLOC is sent to vSmart for color mpls.

```
vEdge1# show omp tlocs advertised
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Stg -> staged
Inv -> invalid

ADDRESS                                                                    PSEUDO                  P
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP        P
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         gold             ipsec  0.0.0.0          C,Red,R   1       203.0.113.225    4
         10.1.0.2         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.20      1
         10.1.0.2         blue             ipsec  10.1.0.3          C,I,R     1       198.51.100.187   1
         10.1.0.30         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.30
         10.1.0.30         gold             ipsec  10.1.0.3          C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.40      1
         10.1.0.4         gold             ipsec  10.1.0.3          C,I,R     1       203.0.113.226    1
```

Example: Colors **mpls** and **gold**. TLOC is sent for both the colors.

```
vEdge2# show omp tlocs advertised
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Stg -> staged
Inv -> invalid

ADDRESS                                                                    PSEUDO                  P
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP        P
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         gold             ipsec  10.1.0.3          C,I,R     1       203.0.113.225    4
         10.1.0.2         mpls             ipsec  0.0.0.0          C,Red,R   1       10.20.67.20      1
         10.1.0.2         blue             ipsec  0.0.0.0          C,Red,R   1       198.51.100.187   1
         10.1.0.30         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.30
         10.1.0.30         gold             ipsec  10.1.0.3          C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.40      1
         10.1.0.4         gold             ipsec  10.1.0.3          C,I,R     1       203.0.113.226    1
```

Note: For any locally generated control plane information, "**FROM PEER**" field is set to 0.0.0.0. When you look for locally originated information, ensure to match based on this value.

Verify vSmart Receives and Advertises the TLOCs

TLOCs are now advertised out to the vSmart. Confirm that it receives TLOCs from the correct peer and advertises it to the other vEdge.

Example: vSmart receives the TLOCs from 10.1.0.2 vEdge1.

<#root>

```
vSmart1# show omp tlocs received

C   -> chosen
I   -> installed

Red -> redistributed
Rej -> rejected
L   -> looped

R   -> resolved

S   -> stale
Ext -> extranet
Stg -> staged
Inv -> invalid


ADDRESS                                                                PSEUDO                  P
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP         P
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         gold             ipsec  10.1.0.5         C,I,R     1       203.0.113.225  450

         10.1.0.2         mpls             ipsec  10.1.0.2         C,I,R     1       10.20.67.20      12


         10.1.0.2         blue             ipsec  10.1.0.2         C,I,R     1       198.51.100.187   12


         10.1.0.30        mpls             ipsec  10.1.0.30         C,I,R     1       10.20.67.30
         10.1.0.30        gold             ipsec  10.1.0.30         C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.4         C,I,R     1       10.20.67.40      1
         10.1.0.4         gold             ipsec  10.1.0.4         C,I,R     1       203.0.113.226    1
```

If you do not see the TLOCs or you see any other codes here, check these:

<#root>

```
vSmart-vIPtela-MEX# show omp tlocs received

C   -> chosen

I   -> installed

Red -> redistributed

Rej -> rejected

L   -> looped

R   -> resolved

S   -> stale
Ext -> extranet
```

Stg -> staged

Inv -> invalid

```
ADDRESS                                                                    PSEUDO                    P
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP        P
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         gold             ipsec  10.1.0.5         C,I,R     1       203.0.113.225    4

         10.1.0.2         mpls             ipsec  10.1.0.2         C,I,R     1       10.20.67.20      12


         10.1.0.2         blue             ipsec  10.1.0.2         Rej,R,Inv 1       198.51.100.187   12


         10.1.0.30         mpls             ipsec  10.1.0.30         C,I,R     1       10.20.67.30
         10.1.0.30         gold             ipsec  10.1.0.30         C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.4         C,I,R     1       10.20.67.40      1
         10.1.0.4         gold             ipsec  10.1.0.4         C,I,R     1       203.0.113.226    1
```

Verify that there is no policy that blocks the TLOCs.

show run policy control-policy - look for any tloc-list that rejects your TLOCs as **advertised** or **received** in the vSmart.

<#root>

```
vSmart1(config-policy)# sh config
policy
 lists
  tloc-list SITE20
   tloc 10.1.0.2 color blue encap ipsec
  !
 !
 control-policy SDWAN
  sequence 10
   match tloc
    tloc-list SITE20
   !
   action reject ---->
here we are rejecting the TLOC 10.1.0.2,blue,ipsec
   !
  !
  default-action accept
 !
apply-policy
 site-list SITE20
  control-policy SDWAN in ----->
the policy is applied to control traffic coming IN the vSmart, it will filter the tlocs before adding i
```

Note: If a TLOC is **Rejected** or **Invalid,** it is not advertised to the other vEdges.

Ensure that a policy does not filter the TLOC when it is advertised from the vSmart. You can see that the TLOC is received on the vSmart, but you do not see it on the other vEdge.

Example 1: vSmart with TLOC in C,I,R.

<#root>

```
vSmart1# show omp tlocs

C   -> chosen
I   -> installed

Red -> redistributed
Rej -> rejected
L   -> looped

R   -> resolved

S   -> stale
Ext -> extranet
Stg -> staged
Inv -> invalid


ADDRESS                                                                    PSEUDO                    P
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP        P
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         mpls             ipsec  10.1.0.5         C,I,R     1       10.20.67.10      1
         10.1.0.5         gold             ipsec  10.1.0.5         C,I,R     1       203.0.113.225    4


 10.1.0.2         mpls             ipsec  10.1.0.2         C,I,R     1       10.20.67.20      12386   10
         10.1.0.2         blue             ipsec  10.1.0.2         C,I,R     1       198.51.100.187   12


         10.1.0.30         mpls             ipsec  10.1.0.30         C,I,R     1       10.20.67.30
         10.1.0.30         gold             ipsec  10.1.0.30         C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.4         C,I,R     1       10.20.67.40      1
         10.1.0.4         gold             ipsec  10.1.0.4         C,I,R     1       203.0.113.226    1
```

Example 2: vEdge1 does not see the TLOC from color blue that comes of vEdge2. It only sees MPLS TLOC.

<#root>

```
vEdge1# show omp tlocs
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Stg -> staged
Inv -> invalid
```

```
ADDRESS                                                                    PSEUDO                  PU
FAMILY   TLOC IP          COLOR            ENCAP  FROM PEER        STATUS    KEY     PUBLIC IP        PO
-------------------------------------------------------------------------------------------------------
ipv4     10.1.0.5         mpls             ipsec  0.0.0.0          C,Red,R   1       10.20.67.10      12
         10.1.0.5         gold             ipsec  0.0.0.0          C,Red,R   1       203.0.113.225    4

         10.1.0.2         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.20       1


         10.1.0.30         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.30
         10.1.0.30         gold             ipsec  10.1.0.3          C,I,R     1       192.0.2.129
         10.1.0.4         mpls             ipsec  10.1.0.3          C,I,R     1       10.20.67.40       1
         10.1.0.4         gold             ipsec  10.1.0.3          C,I,R     1       203.0.113.226     1
```

When you check the policy, you can see why the TLOC does not appear on the vEdge1.

<#root>

```
vSmart1# show running-config policy
policy
 lists
  tloc-list SITE20

   tloc 10.1.0.2 color blue encap ipsec

  !
  site-list SITE10
   site-id 10
  !
 !
 control-policy SDWAN
  sequence 10
   match tloc

    tloc-list SITE20

   !
   action reject
   !
  !
  default-action accept
 !
apply-policy
 site-list SITE10

  control-policy SDWAN out


 !
!
```

Bidirectional Forwarding Detection

Understand the show bfd sessions command

These are the key things to look for in the output:

<#root>

```
vEdge-2# show bfd sessions
                                       SOURCE TLOC      REMOTE TLOC
SYSTEM IP        SITE ID  STATE       COLOR            COLOR            SOURCE IP
-------------------------------------------------------------------------------------------------------

10.1.0.5         10       down        blue             gold             10.19.146.2


10.1.0.30         30       up          blue             gold             10.19.146.2
10.1.0.4         40       up          blue             gold             10.19.146.2

10.1.0.4         40       up          mpls             mpls             10.20.67.10
```

- **SYSTEM IP**: Peers system-ip
- **SOURCE and REMOTE TLOC COLOR**: This is useful to know what TLOC is expected to receive and send.
- **SOURCE IP**: It is the **private** source IP. If you are behind a NAT, this information is displayed here (it can be seen with the use of **show control local-properties <wan-interface-list).**
- **DST PUBLIC IP**: It is the destination that the vEdge uses to form the **Data Plane** tunnel, whether or not it is behind NAT. (Example: vEdges directly attached to the Internet, or **Multi-Protocol Label Switching (MPLS)** links)
- **DST PUBLIC PORT** Public NAT-ed port that the vEdge uses in order to form the **Data Plane** tunnel to the remote vEdge.
- **TRANSITIONS**: Number of times the BFD session has changed its status, from **NA** to **UP** and vice versa.

Command show tunnel statistics

The **show tunnel statistics** can display information about the data plane tunnels. You can determine if you send or receive packets for a particular IPSEC tunnel between the vEdges.

This can help you understand if packets arrive on each end, and isolate connectivity issues between the nodes.

In the example, when you run the command multiple times, you can notice an increment or no increment in the **tx-pkts** or **rx-pkts.**

Tip: If your counter for tx-pkts increment, you transmit data out to the peer. If your rx-pkts does not increment, it means that data is not received from your peer. In this event, check the other end and confirm if the tx-pkts increments.

<#root>

```
vEdge2# show tunnel statistics

TUNNEL                                    SOURCE  DEST
PROTOCOL  SOURCE IP      DEST IP          PORT    PORT   SYSTEM IP    LOCAL COLOR      REMOTE COLOR     I
-------------------------------------------------------------------------------------------------------
```

```
ipsec     172.16.16.147  10.88.244.181   12386   12406  10.1.0.5     public-internet  default          1


ipsec     172.16.16.147  10.152.201.104  12386   63364  10.1.0.0  public-internet  default          144
ipsec     172.16.16.147  10.152.204.31   12386   58851  10.1.0.7     public-internet  public-internet  1
ipsec     172.24.90.129  10.88.244.181   12426   12406  10.1.0.5     biz-internet     default          1
ipsec     172.24.90.129  10.152.201.104  12426   63364  10.1.0.0  biz-internet     default          144
ipsec     172.24.90.129  10.152.204.31   12426   58851  10.1.0.7     biz-internet     public-internet  1

TUNNEL                                    SOURCE  DEST                                                    T
PROTOCOL  SOURCE IP      DEST IP          PORT    PORT   SYSTEM IP    LOCAL COLOR      REMOTE COLOR     I
-----------------------------------------------------------------------------------------------------------

ipsec     172.16.16.147  10.88.244.181   12386   12406  10.1.0.5     public-internet  default          1


ipsec     172.16.16.147  10.152.201.104  12386   63364  10.1.0.0  public-internet  default          144
ipsec     172.16.16.147  10.152.204.31   12386   58851  10.1.0.7     public-internet  public-internet  1
ipsec     172.24.90.129  10.88.244.181   12426   12406  10.1.0.5     biz-internet     default          1
ipsec     172.24.90.129  10.152.201.104  12426   63364  10.1.0.0  biz-internet     default          144
ipsec     172.24.90.129  10.152.204.31   12426   58851  10.1.0.7     biz-internet     public-internet  1
```

Another useful command is **show tunnel statistics bfd** that can be used to check the number of BFD packets sent and received within particular data plane tunnel:

```
vEdge1# show tunnel statistics bfd

                                                                                                  BFD   BFD
                                                  BFD       BFD                                   PMTU  PMT
TUNNEL                                    SOURCE  DEST    ECHO TX   ECHO RX   BFD ECHO   BFD ECHO   TX    RX
PROTOCOL  SOURCE IP      DEST IP          PORT    PORT    PKTS      PKTS      TX OCTETS  RX OCTETS  PKTS  PKT
-----------------------------------------------------------------------------------------------------------
ipsec     192.168.109.4  192.168.109.5    4500    4500    0         0         0          0          0     0
ipsec     192.168.109.4  192.168.109.5    12346   12366   1112255   1112253   186302716  186302381  487   48
ipsec     192.168.109.4  192.168.109.7    12346   12346   1112254   1112252   186302552  186302210  487   48
ipsec     192.168.109.4  192.168.110.5    12346   12366   1112255   1112253   186302716  186302381  487   48
```

Access List

An access list is a useful and a necessary step after you look at the **show bfd sessions** output.

Now that the private, and public IPs and Ports are known, you can create an **Access Control List (ACL)** to match against the SRC_PORT, DST_PORT, SRC_IP, DST_IP.

This can help to verify sent and received BFD messages.

Here, you can find an example of an ACL configuration:

```
policy
 access-list checkbfd-out
  sequence 10
   match
```

```
    source-ip        192.168.0.92/32
    destination-ip   198.51.100.187/32
    source-port      12426
    destination-port 12426
   !
   action accept
    count bfd-out-to-dc1-from-br1
   !
  !
  default-action accept
 !
 access-list checkbfd-in
  sequence 20
   match
    source-ip        198.51.100.187/32
    destination-ip   192.168.0.92/32
    source-port      12426
    destination-port 12426
   !
   action accept
    count bfd-in-from-dc1-to-br1
   !
  !
  default-action accept
 !
vpn 0
 interface ge0/0
   access-list checkbfd-in in
   access-list checkbfd-out out
  !
 !
!
```

In the example, this ACL uses two sequences. The sequence 10 matches the BFD messages that are sent from this vEdge to the peer. Sequence 20 does the opposite.

It matches against the source (**Private**) port and destination (**Public**) ports. If the vEdge uses NAT, ensure to check the right source and destination ports.

To check the hits on each sequence counter issue the **show policy access-list counters <access-list name>**

```
vEdge1# show policy access-list-counters

NAME      COUNTER NAME               PACKETS  BYTES
-----------------------------------------------------
checkbfd  bfd-out-to-dc1-from-br1    10       2048
          bfd-in-from-dc1-to-br1        0        0
```

Network Address Translation

How to Use tools stun-client to Detect NAT Maps and Filters.

If you have done all the steps and you are behind NAT, the next step is to identify the **UDP NAT Traversal (RFC 4787) Map and Filter** behavior.

This tool is used to discover the local vEdge external IP address when that vEdge is located behind a NAT device.

This command obtains a port mapping for the device and optionally discovers properties about the NAT between the local device and a server (public server: example google stun server).

Note: For more detailed information visit: Docs Viptela - STUN Client

---

<#root>

```
vEdge1# tools stun-client vpn 0 options "--mode full --localaddr 192.168.12.100 12386 --verbosity 2 stun
```

```
stunclient --mode full --localaddr 192.168.12.100 stun.l.google.com in VPN 0
Binding test: success
Local address: 192.168.12.100:12386
Mapped address: 203.0.113.225:4501
Behavior test: success
```

```
Nat behavior: Address Dependent Mapping
```

```
Filtering test: success
```

```
Nat filtering: Address and Port Dependent Filtering
```

On newer versions of software, syntax can be bit different:

<#root>

```
vEdge1# tools stun-client vpn 0 options "--mode full --localaddr 192.168.12.100 --localport 12386 --verb
```

In this example, you perform a full NAT detection test with the use of UDP source port 12386 to the Google STUN server.

The output of this command gives you NAT behavior and the NAT filter type based on RFC 4787.

Note: When you use **tools stun**, remember to allow the STUN service in the tunnel interface, otherwise it does not work. Use **allow-service stun** in order to let the stun data pass.

<#root>

```
vEdge1# show running-config vpn 0 interface ge0/0
vpn 0
 interface ge0/0
  ip address 10.19.145.2/30
  !
  tunnel-interface
   encapsulation ipsec
   color gold
   max-control-connections 1
   no allow-service bgp
```

```
   allow-service dhcp
   allow-service dns
   no allow-service icmp
   no allow-service sshd
   no allow-service netconf
   no allow-service ntp
   no allow-service ospf
   allow-service stun
  !
  no shutdown
 !
!
```

This shows the mapping between STUN terminology (Full-Cone NAT) and RFC 4787 (NAT Behavioral for UDP).

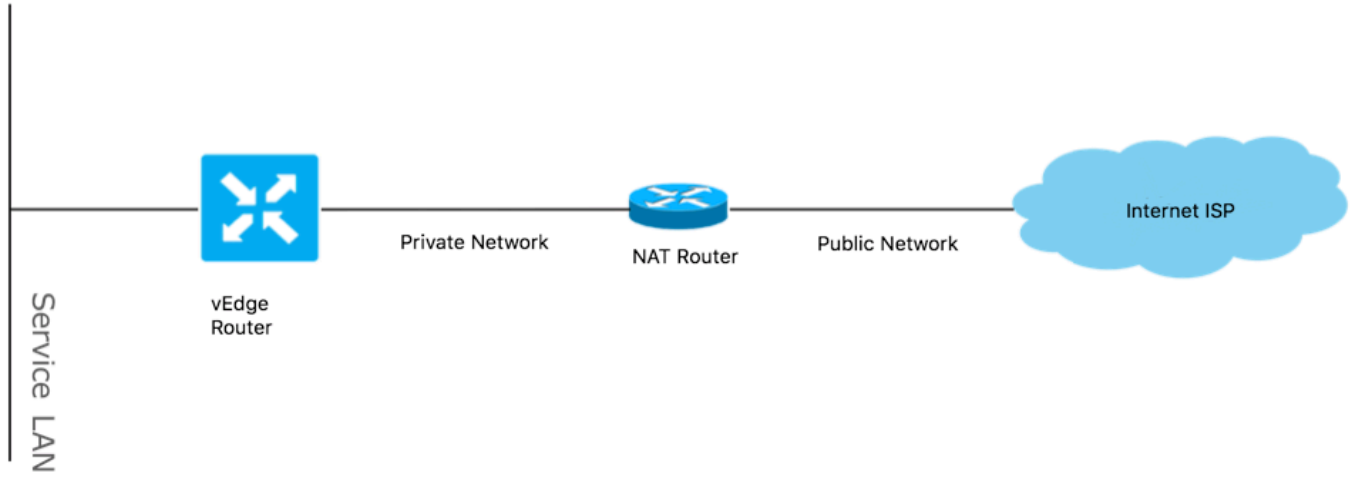
NAT Traversal Mapping Between used Viptela Terminologies		
STUN RFC 3489 Terminology	**RFC 4787 Terminology**	
	Mapping Behavior	**Filtering Behavior**
Full-cone NAT	Endpoint-Independent Mapping	Endpoint-Independent Filtering
Restricted Cone NAT	Endpoint-Independent Mapping	Address-Dependent Filtering
Port-Restricted Cone NAT	Endpoint-Independent Mapping	Address and Port-Dependent Filtering
Symmetric NAT	Address-and(or) Port-Dependent Mapping	Address-Dependent Filtering
		Address and Port-Dependent Filtering

Supported NAT Types for Data Plane Tunnels“Sending” used in CLI

In most of the cases, your public colors like biz-internet or public-internet can be directly attached to the internet.

In other cases, there is a NAT device behind the vEdge WAN interface and the actual Internet Service Provider.

In this manner, the vEdge can have a private IP and the other device (Router, Firewall, etc) can be the device with the public facing IP addresses.



If you have an incorrect NAT type, then it could potentially be one of the most common reasons that do not allow the formation of Data Plane tunnels. These are the supported NAT types.

NAT Traversal Support		
Source	**Destination**	**Supported (YES/NO)**
Full-Cone NAT	Full-cone NAT	Yes
Full-Cone NAT	Restricted Cone NAT	Yes
Full-Cone NAT	Port-Restricted Cone NAT	Yes
Full-Cone NAT	Symmetric NAT	Yes
Restricted Cone NAT	Full-cone NAT	Yes
Restricted Cone NAT	Restricted Cone NAT	Yes
Restricted Cone NAT	Port-Restricted Cone NAT	Yes
Restricted Cone NAT	Symmetric NAT	Yes
Port-Restricted Cone NAT	Full-cone NAT	Yes
Port-Restricted Cone NAT	Restricted Cone NAT	Yes
Port-Restricted Cone NAT	Port-Restricted Cone NAT	Yes
Port-Restricted Cone NAT	Symmetric NAT	**No**
Symmetric NAT	Full-cone NAT	Yes
Symmetric NAT	Restricted Cone NAT	yes
Symmetric NAT	Port-Restricted Cone NAT	**No**
Symmetric NAT	Symmetric NAT	**No**

Firewalls

If you already checked the NAT and its not in the unsupported **Source** and **Destination** types, it is possible that a Firewall blocks the ports used to form the **Data Plane** tunnels.

Ensure that these ports are open in the Firewall for Data Plane connections: **vEdge to vEdge Data Plane**:

UDP 12346 to 13156

For control connections from vEdge to controllers:

UDP 12346 to 13156

TCP 23456 to 24156

Ensure that you open these ports in order to achieve successful connection of the Data Plane tunnels.

When you check the source and destination ports used for Data Plane tunnels, you can use **show tunnel statistics** or **show bfd sessions | tab** but not **show bfd sessions.**

It does not show any source ports, only destination ports as you can see:

```
vEdge1# show bfd sessions
                                       SOURCE TLOC      REMOTE TLOC
SYSTEM IP        SITE ID  STATE       COLOR            COLOR            SOURCE IP
-----------------------------------------------------------------------------------------------------
192.168.30.105   50       up          biz-internet     biz-internet     192.168.109.181
192.168.30.105   50       up          private1         private1         192.168.110.181

vEdge1# show bfd sessions | tab
```

```
                                          SRC    DST                    SITE
SRC IP          DST IP          PROTO     PORT   PORT   SYSTEM IP       ID    LOCAL COLOR   COLOR
-------------------------------------------------------------------------------------------------------
192.168.109.181 192.168.109.182 ipsec     12346  12346  192.168.30.105  50    biz-internet  biz-internet
192.168.110.181 192.168.110.182 ipsec     12346  12346  192.168.30.105  50    private1      private1
```

Note: More information about SD-WAN firewall ports used can be found here.

Security

If you observe that the ACL counter increases inbound and outbound, check several iterations **show system statistics diff** and ensure there are no drops.

<#root>

```
vEdge1# show policy access-list-counters

NAME      COUNTER NAME               PACKETS  BYTES
-----------------------------------------------------

checkbfd  bfd-out-to-dc1-from-br1    55       9405



   bfd-in-from-dc1-to-br1     54      8478
```

In this output, **rx_replay_integrity_drops** increase with every iteration of the **show system statistics diff** command.

<#root>

```
vEdge1#show system statistics diff

 rx_pkts : 5741427
 ip_fwd : 5952166
 ip_fwd_arp : 3
 ip_fwd_to_egress : 2965437
 ip_fwd_null_mcast_group : 26
 ip_fwd_null_nhop : 86846
 ip_fwd_to_cpu : 1413393
 ip_fwd_from_cpu_non_local : 15
 ip_fwd_rx_ipsec : 1586149
 ip_fwd_mcast_pkts : 26
 rx_bcast : 23957
 rx_mcast : 304
 rx_mcast_link_local : 240
 rx_implicit_acl_drops : 12832
 rx_ipsec_decap : 21
 rx_spi_ipsec_drops : 16

rx_replay_integrity_drops : 1586035
```

```
 port_disabled_rx : 2
 rx_invalid_qtags : 212700
 rx_non_ip_drops : 1038073
 pko_wred_drops : 3
 bfd_tx_record_changed : 23
 rx_arp_non_local_drops : 19893
 rx_arp_reqs : 294
 rx_arp_replies : 34330
 arp_add_fail : 263
 tx_pkts : 4565384
 tx_mcast : 34406
 port_disabled_tx : 3
 tx_ipsec_pkts : 1553753
 tx_ipsec_encap : 1553753
 tx_pre_ipsec_pkts : 1553753
 tx_pre_ipsec_encap : 1553753
 tx_arp_replies : 377
 tx_arp_reqs : 34337
 tx_arp_req_fail : 2
 bfd_tx_pkts : 1553675
 bfd_rx_pkts : 21
 bfd_tx_octets : 264373160
 bfd_rx_octets : 3600
 bfd_pmtu_tx_pkts : 78
 bfd_pmtu_tx_octets : 53052
 rx_icmp_echo_requests : 48
 rx_icmp_network_unreach : 75465
 rx_icmp_other_types : 47
 tx_icmp_echo_requests : 49655
 tx_icmp_echo_replies : 48
 tx_icmp_network_unreach : 86849
 tx_icmp_other_types : 7
vEdge1# show system statistics diff

 rx_pkts : 151
 ip_fwd : 157
 ip_fwd_to_egress : 75
 ip_fwd_null_nhop : 3
 ip_fwd_to_cpu : 43
 ip_fwd_rx_ipsec : 41
 rx_bcast : 1


rx_replay_integrity_drops : 41


 rx_invalid_qtags : 7
 rx_non_ip_drops : 21
 rx_arp_non_local_drops : 2
 tx_pkts : 114
 tx_ipsec_pkts : 40
 tx_ipsec_encap : 40
 tx_pre_ipsec_pkts : 40
 tx_pre_ipsec_encap : 40
 tx_arp_reqs : 1
 bfd_tx_pkts : 40
 bfd_tx_octets : 6800
 tx_icmp_echo_requests : 1
vEdge1# show system statistics diff

 rx_pkts : 126
 ip_fwd : 125
 ip_fwd_to_egress : 58
```

```
 ip_fwd_null_nhop : 3
 ip_fwd_to_cpu : 33
 ip_fwd_rx_ipsec : 36
 rx_bcast : 1
 rx_implicit_acl_drops : 1


rx_replay_integrity_drops : 35


 rx_invalid_qtags : 6
 rx_non_ip_drops : 22
 rx_arp_replies : 1
 tx_pkts : 97
 tx_mcast : 1
 tx_ipsec_pkts : 31
 tx_ipsec_encap : 31
 tx_pre_ipsec_pkts : 31
 tx_pre_ipsec_encap : 31
 bfd_tx_pkts : 32
 bfd_tx_octets : 5442
 rx_icmp_network_unreach : 3
 tx_icmp_echo_requests : 1
 tx_icmp_network_unreach : 3
vEdge1# show system statistics diff

 rx_pkts : 82
 ip_fwd : 89
 ip_fwd_to_egress : 45
 ip_fwd_null_nhop : 3
 ip_fwd_to_cpu : 24
 ip_fwd_rx_ipsec : 22
 rx_bcast : 1
 rx_implicit_acl_drops : 1


rx_replay_integrity_drops : 24


 rx_invalid_qtags : 2
 rx_non_ip_drops : 14
 rx_arp_replies : 1
 tx_pkts : 62
 tx_mcast : 1
 tx_ipsec_pkts : 24
 tx_ipsec_encap : 24
 tx_pre_ipsec_pkts : 24
 tx_pre_ipsec_encap : 24
 tx_arp_reqs : 1
 bfd_tx_pkts : 23
 bfd_tx_octets : 3908
 rx_icmp_network_unreach : 3
 tx_icmp_echo_requests : 1
 tx_icmp_network_unreach : 3
vEdge1# show system statistics diff

 rx_pkts : 80
 ip_fwd : 84
 ip_fwd_to_egress : 39
 ip_fwd_to_cpu : 20
 ip_fwd_rx_ipsec : 24


rx_replay_integrity_drops : 22
```

```
 rx_invalid_qtags : 3
 rx_non_ip_drops : 12
 tx_pkts : 66
 tx_ipsec_pkts : 21
 tx_ipsec_encap : 21
 tx_pre_ipsec_pkts : 21
 tx_pre_ipsec_encap : 21
 bfd_tx_pkts : 21
 bfd_tx_octets : 3571
```

First, perform a **request security ipsec-rekey** on the vEdge. Then, go through several iterations of **show system statistics diff** and see if you still see **rx_replay_integrity_drops.**

If you do, check your security configuration.

```
vEdge1# show running-config security
security
 ipsec
 authentication-type sha1-hmac ah-sha1-hmac
 !
!
```

ISP Problems with DSCP Marked Traffic

By default, all control and management traffic from the vEdge router to the controllers travels over DTLS or TLS connections and marked with a DSCP value of CS6 (48 decimal).

For data place tunnels traffic, vEdge routers use IPsec or GRE encapsulation to send data traffic to each other.

For data plane failure detection and performance measurement, routers periodically send each other BFD packets.

These BFD packets are also marked with a DSCP value of CS6 (48 decimal).

From the perspective of ISP, this type of traffic is seen as UDP traffic with DSCP value CS6 as well because vEdge routers and SD-WAN controllers copy DSCP that marks to the outer IP header by default.

Here is how it can look like if tcpdump runs on transit ISP router:

```
14:27:15.993766 IP (tos 0xc0, ttl 64, id 44063, offset 0, flags [DF], proto UDP (17), length 168)
    192.168.109.5.12366 > 192.168.20.2.12346: [udp sum ok] UDP, length 140
14:27:16.014900 IP (tos 0xc0, ttl 63, id 587, offset 0, flags [DF], proto UDP (17), length 139)
    192.168.20.2.12346 > 192.168.109.5.12366: [udp sum ok] UDP, length 111
14:27:16.534117 IP (tos 0xc0, ttl 63, id 0, offset 0, flags [DF], proto UDP (17), length 157)
    192.168.109.5.12366 > 192.168.110.6.12346: [no cksum] UDP, length 129
14:27:16.534289 IP (tos 0xc0, ttl 62, id 0, offset 0, flags [DF], proto UDP (17), length 150)
    192.168.110.6.12346 > 192.168.109.5.12366: [no cksum] UDP, length 122
```

As can be seen here, all packets are marked with TOS byte 0xc0 also known as DS field (that is equal to decimal 192, or 110 000 00 in binary.

First 6 high order bits correspond to DSCP bits value 48 in decimal or CS6).

First 2 packets in the output correspond to a control plane tunnel and the 2 that remain, to a data plane tunnel traffic.

Based on the packet length and the TOS mark, it can conclude with high confidence that it was BFD packets (RX and TX directions). These packets are marked with CS6 as well.

Sometimes some service providers (especially MPLS L3 VPN/MPLS L2 VPN service providers) maintain different SLA and can handle a different class of traffic based on DSCP marks differently.

For example, if you have premium service to prioritize DSCP EF and CS6 voice and signaling traffic.

Since priority traffic is almost always policed, even if the total bandwidth of an uplink is not exceeded, for this type of traffic packet loss can be seen and hence BFD sessions can be flapping as well.

It was seen in some cases that if dedicated priority queue on service provider router is starved, you do not see any drops for normal traffic (for example, when you run simple **ping** from vEdge router).

This is because such traffic is marked with default DSCP value 0 as can be seen here (TOS byte):

```
15:49:22.268044 IP (tos 0x0, ttl 62, id 0, offset 0, flags [DF], proto UDP (17), length 142)
    192.168.110.5.12366 > 192.168.109.7.12346: [no cksum] UDP, length 114
15:49:22.272919 IP (tos 0x0, ttl 62, id 0, offset 0, flags [DF], proto UDP (17), length 142)
    192.168.110.5.12366 > 192.168.109.7.12346: [no cksum] UDP, length 114
15:49:22.277660 IP (tos 0x0, ttl 62, id 0, offset 0, flags [DF], proto UDP (17), length 142)
    192.168.110.5.12366 > 192.168.109.7.12346: [no cksum] UDP, length 114
15:49:22.314821 IP (tos 0x0, ttl 62, id 0, offset 0, flags [DF], proto UDP (17), length 142)
    192.168.110.5.12366 > 192.168.109.7.12346: [no cksum] UDP, length 114
```

But at the same time, your BFD sessions flap:

```
show bfd history
                                                    DST PUBLIC       DST PUBLIC
SYSTEM IP        SITE ID  COLOR            STATE     IP               PORT        ENCAP  TIME
-------------------------------------------------------------------------------------------------
192.168.30.4     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  down      192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  down      192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  down      192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  down      192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.4     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.6     13       public-internet  up        192.168.109.4    12346       ipsec  2019-05-01T0
192.168.30.6     13       public-internet  down      192.168.109.4    12346       ipsec  2019-05-01T0
```

And here **nping** comes handy in order to troubleshoot:

```
vedge2# tools nping vpn 0 options "--tos 0x0c --icmp --icmp-type echo --delay 200ms -c 100 -q" 192.168.
Nping in VPN 0

Starting Nping 0.6.47 ( http://nmap.org/nping ) at 2019-05-07 15:58 CEST
Max rtt: 200.305ms | Min rtt: 0.024ms | Avg rtt: 151.524ms
Raw packets sent: 100 (2.800KB) | Rcvd: 99 (4.554KB) | Lost: 1 (1.00%)
Nping done: 1 IP address pinged in 19.83 seconds
```

Debug BFD

If deeper investigation is required, run debugging of BFD on the vEdge router.

Forwarding Traffic Manager (FTM) is responsible for BFD operations on vEdge routers and hence you need **debug ftm bfd.**

All debugging output is stored in **/var/log/tmplog/vdebug** file and if you want to have those messages on the console (similar to Cisco IOS **terminal monitor** behavior), you can use **monitor start /var/log/tmplog/vdebug.**

In order to stop logging, you can use **monitor stop /var/log/tmplog/vdebug**

Here is how the output looks for BFD session that goes down because of the timeout (remote TLOC with IP address 192.168.110.6 is not reachable anymore):

```
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_state[1008]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_proc_tunnel_public_tloc_msg[252]: tun_rec_index
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_increment_wanif_bfd_flap[2427]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_state[1119]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1140]: Attempting to add TLOC : from_t
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32771
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32770
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32771:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32770:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32771:32772) src 192.168.1
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32770:32772) src 192.168.1
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_state[1008]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_proc_tunnel_public_tloc_msg[252]: tun_rec_index
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_increment_wanif_bfd_flap[2427]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_state[1119]: BFD-session TNL
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1140]: Attempting to add TLOC : from_t
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32771
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32770
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32771:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32770:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32771:32772) src 192.168.1
```

```
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32770:32772) src 192.168.1
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_send_bfd_msg[499]: Sending BFD notification Dow
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1140]: Attempting to add TLOC : from_t
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32771
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_set_del_marker_internal[852]: (32770
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1285]: UPDATE local tloc
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32771:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_create[238]: Attempting BFD session
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_clear_delete_marker[828]: (32770:327
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32771:32772) src 192.168.1
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: bfdmgr_session_update_sa[1207]: BFD-session TNL 192
log:local7.debug: May  7 16:23:09 vedge2 FTMD[674]: ftm_tloc_add[1653]: BFD (32770:32772) src 192.168.1
log:local7.info: May  7 16:23:09 vedge2 FTMD[674]: %Viptela-vedge2-ftmd-6-INFO-1400002: Notification: 5
log:local7.info: May  7 16:23:09 vedge2 FTMD[674]: %Viptela-vedge2-ftmd-6-INFO-1400002: Notification: 5
```

Another valuable debug in order to enable is **Tunnel Traffic Manager (TTM)** events debug is **debug ttm events.**

Here is how **BFD DOWN** event looks like from the perspective of TTM:

```
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Received TTM Msg LINK_
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[413]:     Remote-TLOC: 192.1
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Received TTM Msg LINK_
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[413]:     Remote-TLOC: 192.1
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Received TTM Msg BFD,
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[402]:     TLOC: 192.168.30.6
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_af_tloc_db_bfd_status[234]:   BFD message: I SA
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Sent TTM Msg TLOC_ADD,
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[213]:     TLOC: 192.168.30.6
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[217]:       Attributes: GROU
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[220]:         Preference: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[223]:         Weight: 1
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[226]:         Gen-ID: 214748
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[229]:         Version: 2
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[232]:         Site-ID: 13
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[235]:         Carrier: 4
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[241]:         Restrict: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[249]:         Group: Count:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[262]:         Groups: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[269]:         TLOCv4-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[273]:         TLOCv4-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[277]:         TLOCv6-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[281]:         TLOCv6-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[285]:         TLOC-Encap: ip
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[295]:           Authenticati
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[312]:           SPI 334, Fla
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[317]:           Number of pr
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[328]:           Number of en
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[339]:           Number of in
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[344]:           integrity ty
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[349]:       #Paths: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Sent TTM Msg TLOC_ADD,
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[213]:     TLOC: 192.168.30.6
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[217]:       Attributes: GROU
```

```
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[220]:         Preference: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[223]:         Weight: 1
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[226]:         Gen-ID: 214748
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[229]:         Version: 2
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[232]:         Site-ID: 13
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[235]:         Carrier: 4
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[241]:         Restrict: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[249]:         Group: Count:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[262]:         Groups: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[269]:         TLOCv4-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[273]:         TLOCv4-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[277]:         TLOCv6-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[281]:         TLOCv6-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[285]:         TLOC-Encap: ip
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[295]:           Authenticati
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[312]:           SPI 334, Fla
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[317]:           Number of pr
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[328]:           Number of en
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[339]:           Number of in
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[344]:           integrity ty
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[349]:       #Paths: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Sent TTM Msg TLOC_ADD,
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[213]:     TLOC: 192.168.30.6
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[217]:       Attributes: GROU
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[220]:         Preference: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[223]:         Weight: 1
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[226]:         Gen-ID: 214748
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[229]:         Version: 2
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[232]:         Site-ID: 13
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[235]:         Carrier: 4
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[241]:         Restrict: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[249]:         Group: Count:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[262]:         Groups: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[269]:         TLOCv4-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[273]:         TLOCv4-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[277]:         TLOCv6-Public:
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[281]:         TLOCv6-Private
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[285]:         TLOC-Encap: ip
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[295]:           Authenticati
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[312]:           SPI 334, Fla
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[317]:           Number of pr
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[328]:           Number of en
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[333]:           Encrypt type
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[339]:           Number of in
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[344]:           integrity ty
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[349]:       #Paths: 0
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[194]: Sent TTM Msg DATA_DEVI
log:local7.debug: May  7 16:58:19 vedge2 TTMD[683]: ttm_debug_announcement[431]:     Device: 192.168.30
log:local7.info: May  7 16:58:19 vedge2 FTMD[674]: %Viptela-vedge2-ftmd-6-INFO-1400002: Notification: 5
log:local7.info: May  7 16:58:20 vedge2 FTMD[674]: %Viptela-vedge2-ftmd-6-INFO-1400002: Notification: 5
```

Use Packet-Trace to Capture BFD Packets (20.5 and later)

Another useful tool introduced in 20.5.1 and later software is packet-trace for vEdges.

Because the BFD session uses the same standard ports, generally 12346, it is simplest to filter based on the peer IP address.

For example:

```
vedge# show bfd sessions
                                       SOURCE TLOC      REMOTE TLOC
SYSTEM IP        SITE ID  STATE       COLOR            COLOR            SOURCE IP
-------------------------------------------------------------------------------------------------------
10.4.4.1         101      up          default          default          192.168.16.29
10.4.4.2         102      up          default          default          192.168.16.29
```

The packet-trace would be configured:

vedge# **debug packet-trace condition ingress-if ge0/0 vpn 0 source-ip 192.168.29.39**
vedge# **debug packet-trace condition start**
vedge# **debug packet-trace condition stop**

The results can be displayed using the show commands noted below. For ingress packets, there is an 'isBFD' flag which is set to '1' (true) for BFD traffic.

```
vedge# show packet-trace statistics
packet-trace statistics 0
 source-ip             192.168.29.39
 source-port           12346
 destination-ip        192.168.16.29
 destination-port      12346
 source-interface      ge0_0
 destination-interface loop0.1
 decision              FORWARD
 duration              25
packet-trace statistics 1
 source-ip             192.168.29.39
 source-port           12346
 destination-ip        192.168.16.29
 destination-port      12346
 source-interface      ge0_0
 destination-interface loop0.1
 decision              FORWARD
 duration              14
packet-trace statistics 2
 source-ip             192.168.29.39
 source-port           12346
 destination-ip        192.168.16.29
 destination-port      12346
 source-interface      ge0_0
 destination-interface loop0.1
 decision              FORWARD
 duration              14

vedge# show packet-trace detail 0
=============================================================================================================
Pkt-id           src_ip(ingress_if)            dest_ip(egress_if)           Duration           Decision
=============================================================================================================
0         192.168.29.39:12346 (ge0_0)    192.168.16.29:12346 (loop0.1)        25 us             FORWARD
```

```
INGRESS_PKT:
00 50 56 84 79 be 00 50 56 84 3c b5 08 00 45 c0 00 96 ab 40 40 00 3f 11 e0 c1 c0 a8 1d 27 c0
a8 10 1d 30 3a 30 3a 00 82 00 00 a0 00 01 02 00 00 0e 3f 4b 65 07 bc 61 03 38 71 93 53 58
88 d8 08 41 95 7c 1a ff 8b cc b4 d0 d8 61 44 40 67 cc 1a 01 fd 1f c4 45 95 ea 7e 15 c9 08
2e b6 63 84 00
EGRESS_PKT:
a1 5e fe 11 00 00 00 00 00 00 00 00 00 04 00 0c 04 00 41 01 02 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 04 00 00 00 00 00 00 00 02 00 3a 30 3a 30 1d 10 a8 c0 00 00 00 00 00 00
00 00 00 00 00 00 01 00 00 00 27 1d a8 c0 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00
a4 00 01 00 00
Feature Data
-------------------------------------
TOUCH : fp_proc_packet
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_proc_packet2
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_ip_forward
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_ipsec_decrypt
core_id: 2
DSCP: 48
-------------------------------------
FP_TRACE_FEAT_IPSEC_DATA:
src_ip : 192.168.29.39
src_port : 3784
dst_ip : 192.168.16.29
dst_port : 3784
isBFD : 1
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_send_pkt
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_hw_x86_pkt_free
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_proc_remote_bfd_
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : BFD_ECHO_REPLY
core_id: 2
DSCP: 48
-------------------------------------
TOUCH : fp_hw_x86_pkt_free
core_id: 2
DSCP: 48
```

Egress BFD packets are captured in a similar manner. These results identify the specific type, whether an echo request or reply.

vedge# **debug packet-trace condition vpn 0 destination-ip 192.168.29.39**
vedge# **debug packet-trace condition start**
vedge# **debug packet-trace condition stop**

```
vedge# show packet-trace statistics
packet-trace statistics 0
 source-ip              192.168.16.29
 source-port            3784
 destination-ip         192.168.29.39
 destination-port       3784
 source-interface       loop0.0
 destination-interface ge0_0
 decision               FORWARD
 duration               15
packet-trace statistics 1
 source-ip              192.168.16.29
 source-port            3784
 destination-ip         192.168.29.39
 destination-port       3784
 source-interface       loop0.0
 destination-interface ge0_0
 decision               FORWARD
 duration               66
packet-trace statistics 2
 source-ip              192.168.16.29
 source-port            3784
 destination-ip         192.168.29.39
 destination-port       3784
 source-interface       loop0.0
 destination-interface ge0_0
 decision               FORWARD
 duration               17

vedge# show packet-trace details 0
================================================================================================================
Pkt-id            src_ip(ingress_if)             dest_ip(egress_if)            Duration            Decision
================================================================================================================
0          192.168.16.29:3784 (loop0.0)   192.168.29.39:3784 (ge0_0)            15 us              FORWARD
INGRESS_PKT:
45 c0 00 4f 00 00 40 00 ff 11 cc 48 c0 a8 10 1d c0 a8 1d 27 0e c8 0e c8 00 3b 00 00 80 c0 07
00 00 00 00 01 00 00 00 01 00 0f 42 40 00 0f 42 40 00 0f 42 40 01 00 0c 01 00 00 1d 3b b1
c9 89 d7 03 00 0f c0 a8 10 1d 30 3a c0 a8 1d 27 30 3a a3 96 07 3b 47 1c 60 d1 d5 76 4c 72
78 1f 9a 0d 00
EGRESS_PKT:
00 50 56 84 3c b5 00 50 56 84 79 be 08 00 45 c0 00 96 ab 40 40 00 3f 11 e0 c1 c0 a8 10 1d c0
a8 1d 27 30 3a 30 3a 00 82 00 00 a0 00 01 01 00 00 5c 3d 88 9a c7 28 23 1b e6 18 ea fe 73
1b b9 e3 79 bf d9 f4 72 41 96 c1 47 07 44 56 77 5a a2 fb 43 59 c1 97 59 47 62 21 77 d4 f4
47 8b 30 b0 00
Feature Data
-----------------------------------
TOUCH : fp_send_bfd_pkt
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : BFD_ECHO_REPLY
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : fp_ipsec_loopback_f
core_id: 0
```

```
DSCP: 48
-----------------------------------
TOUCH : fp_send_pkt
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : fp_ip_forward
core_id: 2
DSCP: 48
-----------------------------------
TOUCH : fp_send_ip_packet
core_id: 2
DSCP: 48
-----------------------------------
TOUCH : fp_send_pkt
core_id: 2
DSCP: 48
-----------------------------------
TOUCH : fp_hw_x86_pkt_free
core_id: 2
DSCP: 48
vedge# show packet-trace details 1
=============================================================================================================
Pkt-id           src_ip(ingress_if)            dest_ip(egress_if)           Duration           Decision
=============================================================================================================
1         192.168.16.29:3784 (loop0.0)   192.168.29.39:3784 (ge0_0)           66 us              FORWARD
INGRESS_PKT:
45 c0 00 56 00 00 40 00 ff 11 cc 41 c0 a8 10 1d c0 a8 1d 27 0e c8 0e c8 00 42 00 00 80 c0 07
00 00 00 00 01 00 00 00 01 00 0f 42 40 00 0f 42 40 00 0f 42 40 01 00 0c 00 00 00 1d b8 35
a8 09 88 03 00 0f c0 a8 10 1d 30 3a c0 a8 1d 27 30 3a 04 00 07 01 00 05 a6 38 ff 7e 06 1e
da 23 19 d5 00
EGRESS_PKT:
00 50 56 84 3c b5 00 50 56 84 79 be 08 00 45 c0 00 9d ab 40 40 00 3f 11 e0 ba c0 a8 10 1d c0
a8 1d 27 30 3a 30 3a 00 89 00 00 a0 00 01 01 00 00 5c 3e 2d 3b 9e 81 aa 10 26 54 7f 47 5c
d8 81 4f 23 2e 3c 39 1e 94 b2 f4 fb a4 ba 98 54 73 99 8f 2e 95 d7 69 fb 91 41 96 93 03 5b
a4 e4 e8 82 00
Feature Data
-----------------------------------
TOUCH : fp_send_bfd_pkt
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : BFD_ECHO_REQUEST
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : fp_ipsec_loopback_f
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : fp_send_pkt
core_id: 0
DSCP: 48
-----------------------------------
TOUCH : fp_ip_forward
core_id: 2
DSCP: 48
-----------------------------------
TOUCH : fp_send_ip_packet
core_id: 2
DSCP: 48
-----------------------------------
```

```
TOUCH : fp_send_pkt
core_id: 2
DSCP: 48
-----------------------------------
TOUCH : fp_hw_x86_pkt_free
core_id: 2
DSCP: 48
```

Related Information

- **Technical Support & Documentation - Cisco Systems**