Troubleshoot OMP Route Instability in Failover Scenario

Introduction

This document describes how to troubleshoot Overlay Management Protocol (OMP) routes and explains vSmart route selection order of operations.

Prerequisites

Requirements

Cisco recommends that you have knowledge of Cisco Software Defined Wide Area Network (SD-WAN) solution.

Components Used

This document is not restricted to hardware platforms. This article depects a problem seen in a lab with vSmart on 20.6.3 and Cisco Edge Routers on 17.6.3, but can also been seen on other software versions.

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.

Scenario

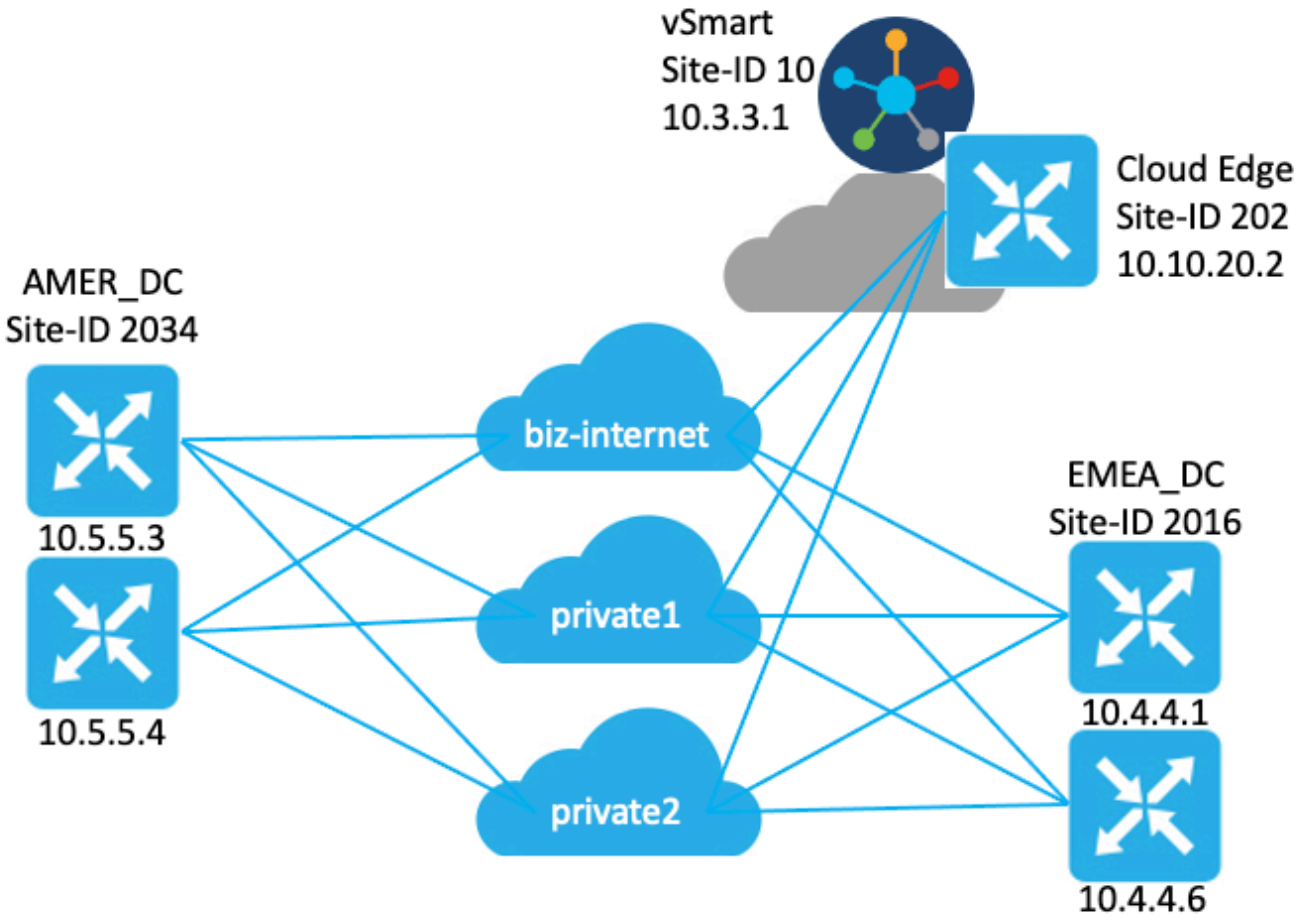
The scenario described in this document shows that two sites advertise a default route to vSmart. The vSmart chooses the best path and advertises that out to Edge devices. In this case, the AMER_DC is chosen due to a control policy which blocks the EMEAR_DC default route for the remote Edge, the Cloud Edge. The vSmart only has control connections on biz-internet with AMER_DC Edges. When there is an outage on the AMER_DC biz-internet, all control connections are lost and vSmart places all the routes learned from AMER_DC into a "stale" state. This causes vSmart not to consider these a best path.

At this point, vSmart would normally choose the EMEA_DC as the best-path and advertise that. However, the control policy blocks the default route from EMEA_DC, and this is applied to the Cloud Edge. Without the OMP configuration of **send-backup-paths**, the vSmart does not send the stale routes which are the only

default routes that are not rejected by the control policy. It is also necessary to increase the **send-path-limit** in vSmart OMP configuration in order to send more than the number of non-stale routes.

Topology

In order to understand the problem better, here is a simple topology diagram that depicts the setup:



Configuration

Edge Device Configurations

A brief summary of the configuration:

- Site EMEA_DC routers have Transport Locator (TLOC) colors **biz-internet**, **private1**, and **private2**.
  - **Max-control-connections 0** has been configured on the **private2** TLOC.
- Site AMER_DC routers have TLOC colors **biz-internet**, **private1**, and **private2**.
  - **Max-control-connections 0** has been configured on the **private1** and **private2** TLOCs.
- Cloud router have TLOC colors **biz-internet**, **private1**, and **private2**.

    - **Max-control-connections 0** has been configured on the **private2** TLOC.
- All routers have the default OMP configuration.
- All EMEA_DC and AMER_DC routers advertise a default route.
- There are two devices (172.16.4.1 and 172.16.5.1) are part of the overlay, but not relevant to this problem. Thus, they are not mentioned in the topology or table.

hostname	site-id	system-ip
EMEA_DC1	2016	10.4.4.1
EMEA_DC2	2016	10.4.4.6
AMER_DC1	2034	10.5.5.3
AMER_DC2	2034	10.5.5.4
Cloud	202	10.10.20.2
vSmart	10	10.3.3.1

vSmart OMP Configuration

The vSmart is configured with the default OMP configuration.

<#root>

vsmart1#

show running-config omp

```
omp
 no shutdown
 graceful-restart
!
vsmart1#
```

show running-config omp | details

```
omp
 no shutdown
 send-path-limit   4
 no send-backup-paths
 no discard-rejected
 graceful-restart
 timers
  holdtime               60
  advertisement-interval 1
  graceful-restart-timer 43200
  eor-timer              300
 exit
!
```

Tip: In order to see the full configuration, default and non-default, include **| details** at the end of the **show running-config** command.

vSmart Policy

The vSmart has a centralized control policy configured. The control policy is applied to the Cloud site, and has action reject configured for the default route from the EMEA_DC site.

Here is the policy configuration:

```
policy
 control-policy Rej_Remote_Default
    sequence 1
     match route
      site-list EMEA_DC
      prefix-list default_route
     !
     action reject
     !
    !
  default-action accept
 !
 lists
  prefix-list default_route
   ip-prefix 0.0.0.0/0
  !
  site-list Cloud
   site-id 202
  !
  site-list EMEA_DC
   site-id 2016
  !
 !
!
apply-policy
 site-list Cloud
  control-policy Rej_Remote_Default out
 !
!
```

Problem

Under normal operating conditions, the default route from the AMER_DC site is received by the Cloud site. This can be verified with the command **show sdwan omp routes vpn 1 0.0.0.0/0**. If your service vpn is not vpn 1, replace the number 1 with your service vpn number.

<#root>

Cloud#

show sdwan omp routes vpn 1 0.0.0.0/0

Generating output, this might take time, please wait ...

```
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved
                PATH                        PSEUDO
FROM PEER       ID     LABEL    STATUS      KEY     TLOC IP          COLOR            ENCAP  PREFERENCE
-------------------------------------------------------------------------------------------------------
10.3.3.1        81     1003     C,I,R       1       10.5.5.3         biz-internet     ipsec  -
10.3.3.1        97     1003     C,I,R       1       10.5.5.3         private1         ipsec  -
10.3.3.1        98     1003     C,I,R       1       10.5.5.3         private2         ipsec  -
10.3.3.1        99     1003     C,I,R       1       10.5.5.4         biz-internet     ipsec  -
```

The vSmart receives the default route on 3 TLOCs from all 4 DC routers. The vSmart has a total of 12 routes.

<#root>

vsmart1#

show omp routes vpn 1 0.0.0.0/0 received | tab

```
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved

                PATH                        ATTRIBUTE
FROM PEER       ID     LABEL    STATUS      TYPE       TLOC IP          COLOR            ENCAP  PREFEREN
-------------------------------------------------------------------------------------------------------
10.4.4.1        68     1002     C,R         installed  10.4.4.1         biz-internet     ipsec  -
10.4.4.1        81     1002     C,R         installed  10.4.4.1         private1         ipsec  -
10.4.4.1        82     1002     C,R         installed  10.4.4.1         private2         ipsec  -
10.4.4.6        68     1003     C,R         installed  10.4.4.6         biz-internet     ipsec  -
10.4.4.6        81     1003     C,R         installed  10.4.4.6         private1         ipsec  -
10.4.4.6        82     1003     C,R         installed  10.4.4.6         private2         ipsec  -
10.5.5.3        68     1003     C,R         installed  10.5.5.3         biz-internet     ipsec  -
10.5.5.3        81     1003     C,R         installed  10.5.5.3         private1         ipsec  -
10.5.5.3        82     1003     C,R         installed  10.5.5.3         private2         ipsec  -
10.5.5.4        68     1003     C,R         installed  10.5.5.4         biz-internet     ipsec  -
10.5.5.4        81     1003     C,R         installed  10.5.5.4         private1         ipsec  -
```

```
10.5.5.4         82     1003     C,R       installed  10.5.5.4         private2         ipsec  -
```

In the event that there is an outage on the **biz-internet** circuit at the AMER_DC site, the Cloud Edge device no longer receives a default route. You would expect it to lose the **biz-internet** route but keep the **private1** and **private2** routes. You can verify this with the commands **show sdwan omp routes vpn 1 0.0.0.0/0** and **show sdwan omp routes vpn 1**.

Note: If the prefix is not received by the device, the **show sdwan omp routes command** shows the CLI command error as shown here.

<#root>

Cloud#

show sdwan omp routes vpn 1 0.0.0.0/0

```
Generating output, this might take time, please wait ...
                show omp best-match-route family ipv4 entries vpn 1 0.0.0.0    | tab
show omp best-match-route family ipv4 entries vpn
syntax error: unknown argument
Error executing command: CLI command error -
```

Cloud#

show sdwan omp routes

```
Generating output, this might take time, please wait ...
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved
                                        PATH                    ATTRIBUTE
VPN    PREFIX              FROM PEER    ID     LABEL    STATUS   TYPE       TLOC IP          COLOR
-------------------------------------------------------------------------------------------------
1      10.5.100.0/24       10.3.3.1     72     1003     Inv,U    installed  10.5.5.3         biz-i
                           10.3.3.1     73     1003     C,I,R    installed  10.5.5.3         priva
                           10.3.3.1     74     1003     C,I,R    installed  10.5.5.3         priva
```

The vSmart goes into a graceful restart state with the AMER_DC Edge devices, which you can see from **show omp peers** command.

<#root>

vsmart1#

show omp peers

```
R -> routes received
I -> routes installed
S -> routes sent

                        DOMAIN    OVERLAY   SITE
PEER             TYPE   ID        ID        ID        STATE    UPTIME           R/I/S
-------------------------------------------------------------------------------------
172.16.4.1       vedge  1         1         101       up       0:13:13:02       9/0/22
172.16.5.1       vedge  1         1         104       up       0:13:13:03       3/0/28
10.4.4.1         vedge  1         1         2016      up       0:01:45:10       6/0/27
10.4.4.6         vedge  1         1         2016      up       0:02:13:27       6/0/27

10.5.5.3         vedge  1         1         2034      down-in-gr                 6/0/0
10.5.5.4         vedge  1         1         2034      down-in-gr                 6/0/0

10.10.20.2       vedge  1         1         202       up       0:12:40:09       3/0/24
```

The vSmart continues to receive all 12 routes, 3 for each DC device. This can be verified with the **show omp routes vpn 1 0.0.0.0/0 received | tab** command. The routes from the AMER_DC sites show in stale state.

Tip: In order to see the output in a user friendly tabular format, include **| tab** at the end. Without it, the output of the command is in a different format.

<#root>

vsmart1#

show omp routes vpn 1 0.0.0.0/0 received | tab

```
Code:

C   -> chosen

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

R   -> resolved


S   -> stale

Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
```

```
U   -> TLOC unresolved

                PATH                    ATTRIBUTE
FROM PEER       ID     LABEL    STATUS  TYPE       TLOC IP          COLOR            ENCAP  PREFEREN
-------------------------------------------------------------------------------------------------
10.4.4.1        68     1002     C,R     installed  10.4.4.1         biz-internet     ipsec  -
10.4.4.1        81     1002     C,R     installed  10.4.4.1         private1         ipsec  -
10.4.4.1        82     1002     C,R     installed  10.4.4.1         private2         ipsec  -
10.4.4.6        68     1003     C,R     installed  10.4.4.6         biz-internet     ipsec  -
10.4.4.6        81     1003     C,R     installed  10.4.4.6         private1         ipsec  -
10.4.4.6        82     1003     C,R     installed  10.4.4.6         private2         ipsec  -
10.5.5.3        68     1003     R,S     installed  10.5.5.3         biz-internet     ipsec  -
10.5.5.3        81     1003     R,S     installed  10.5.5.3         private1         ipsec  -
10.5.5.3        82     1003     R,S     installed  10.5.5.3         private2         ipsec  -
10.5.5.4        68     1003     R,S     installed  10.5.5.4         biz-internet     ipsec  -
10.5.5.4        81     1003     R,S     installed  10.5.5.4         private1         ipsec  -
10.5.5.4        82     1003     R,S     installed  10.5.5.4         private2         ipsec  -
```

In order to verify what routes the vSmart sends to the Edge device, you can run the command **show omp routes vpn 1 0.0.0.0/0 advertised detail | tab**.

A few things to make note of from the output:

1. Only the default routes from the EMEA_DC Edge routers are sent to other Edge devices.
2. No default routes are advertised to the Cloud Edge router.

<#root>

vsmart1#

show omp routes vpn 1 0.0.0.0/0 advertised detail | tab

```
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved

                                PATH
TO PEER         ADVERTISE ID    ID    LABEL    TLOC IP          COLOR            ENCAP  PROTOCOL
-------------------------------------------------------------------------------------------------
172.16.4.1      67              50    1003     10.4.4.6         biz-internet     ipsec  static
                78              56    1002     10.4.4.1         biz-internet     ipsec  static
                79              57    1002     10.4.4.1         private2         ipsec  static
                81              61    1002     10.4.4.1         private1         ipsec  static
172.16.5.1      67              56    1003     10.4.4.6         biz-internet     ipsec  static
                78              62    1002     10.4.4.1         biz-internet     ipsec  static
```

```
                79              63    1002      10.4.4.1         private2         ipsec  static
                81              67    1002      10.4.4.1         private1         ipsec  static
10.4.4.1        67              53    1003      10.4.4.6         biz-internet     ipsec  static
                68              54    1003      10.4.4.6         private1         ipsec  static
                69              55    1003      10.4.4.6         private2         ipsec  static
10.4.4.6        78              97    1002      10.4.4.1         biz-internet     ipsec  static
                79              98    1002      10.4.4.1         private2         ipsec  static
                81              102   1002      10.4.4.1         private1         ipsec  static
```

Solution

This is the expected behavior given the current configuration in this environment. It happens because of the order of operations for OMP route selection on the vSmart.

1. The vSmart chooses the best routes to send to the device. By default, the vSmart has a **send-path-limit** of 4, so the 4 best routes are chosen. Stale routes are not chosen when other routes are available. For the Cloud Edge route, the default routes from the EMEA_DC would be chosen as the best routes.
2. The outbound policy is applied, which rejects the routes from the EMEA_DC routes. Therefore, no default routes are sent to the Cloud Edge router.

To correct the issue, the vSmart OMP configuration needs to be modified to send more than 4 routes and more than the best routes.

- The **omp send-backup-paths** configuration is for vSmarts only, and has OMP advertise backup routes to Edge routers. By default, OMP advertises only the best route or routes. If you configure the send-backup-paths command, OMP also advertises the first non-best route in addition to the best route or routes.
- The **omp send-path-limit** configuration determines the maximum number of equal-cost routes that an Edge router advertises to a vSmart or that a vSmart advertises to the Edge routers. The default value is 4. The range is 1 to 16 for most SD-WAN networks. If the vSmart is in a Hierarchical SD-WAN architecture in 20.8.x or higher, the range is from 1 to 32. For this use case, the value needs to be greater than the number of non-stale routes the vSmart has from the EMEA_DC site, which is 6.

```
vsmart1# show running-config omp
omp
no shutdown
send-path-limit 16
send-backup-paths
graceful-restart
!
```

In order to verify that the vSmart OMP configuration change had the intended effect, you can run the command **show omp routes vpn 1 0.0.0.0/0 advertised detail | tab**.

A few things to make note of from the output:

1. Both EMEA_DC and AMER_DC default routers are advertised to some Edge routers in the network. Some routers are advertised on all 12 default routes.
2. The default routes from the AMER_DC site are advertised to the Cloud Edge router.

<#root>

vsmart1#

show omp routes vpn 1 0.0.0.0/0 advertised detail | tab

```
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved
```

TO PEER	ADVERTISE ID	PATH ID	LABEL	TLOC IP	COLOR	ENCAP	PROTOCOL
172.16.4.1	22	64	1003	10.5.5.3	biz-internet	ipsec	static
	23	65	1003	10.5.5.3	private1	ipsec	static
	24	66	1003	10.5.5.3	private2	ipsec	static
	28	67	1003	10.5.5.4	biz-internet	ipsec	static
	29	68	1003	10.5.5.4	private1	ipsec	static
	30	69	1003	10.5.5.4	private2	ipsec	static
	67	50	1003	10.4.4.6	biz-internet	ipsec	static
	68	62	1003	10.4.4.6	private1	ipsec	static
	69	63	1003	10.4.4.6	private2	ipsec	static
	78	56	1002	10.4.4.1	biz-internet	ipsec	static
	79	57	1002	10.4.4.1	private2	ipsec	static
	81	61	1002	10.4.4.1	private1	ipsec	static
172.16.5.1	22	70	1003	10.5.5.3	biz-internet	ipsec	static
	23	71	1003	10.5.5.3	private1	ipsec	static
	24	72	1003	10.5.5.3	private2	ipsec	static
	28	73	1003	10.5.5.4	biz-internet	ipsec	static
	29	74	1003	10.5.5.4	private1	ipsec	static
	30	75	1003	10.5.5.4	private2	ipsec	static
	67	56	1003	10.4.4.6	biz-internet	ipsec	static
	68	68	1003	10.4.4.6	private1	ipsec	static
	69	69	1003	10.4.4.6	private2	ipsec	static
	78	62	1002	10.4.4.1	biz-internet	ipsec	static
	79	63	1002	10.4.4.1	private2	ipsec	static
	81	67	1002	10.4.4.1	private1	ipsec	static
10.4.4.1	22	57	1003	10.5.5.3	biz-internet	ipsec	static
	23	58	1003	10.5.5.3	private1	ipsec	static
	24	59	1003	10.5.5.3	private2	ipsec	static
	28	60	1003	10.5.5.4	biz-internet	ipsec	static
	29	61	1003	10.5.5.4	private1	ipsec	static
	30	62	1003	10.5.5.4	private2	ipsec	static
	67	53	1003	10.4.4.6	biz-internet	ipsec	static
	68	54	1003	10.4.4.6	private1	ipsec	static

```
                69              55      1003      10.4.4.6          private2          ipsec  static
10.4.4.6        22              103     1003      10.5.5.3          biz-internet      ipsec  static
                23              104     1003      10.5.5.3          private1          ipsec  static
                24              105     1003      10.5.5.3          private2          ipsec  static
                28              106     1003      10.5.5.4          biz-internet      ipsec  static
                29              107     1003      10.5.5.4          private1          ipsec  static
                30              108     1003      10.5.5.4          private2          ipsec  static
                78              97      1002      10.4.4.1          biz-internet      ipsec  static
                79              98      1002      10.4.4.1          private2          ipsec  static
                81              102     1002      10.4.4.1          private1          ipsec  static

10.10.20.2      22              112     1003      10.5.5.3          biz-internet      ipsec  static
                23              113     1003      10.5.5.3          private1          ipsec  static
                24              114     1003      10.5.5.3          private2          ipsec  static
                28              115     1003      10.5.5.4          biz-internet      ipsec  static
                29              116     1003      10.5.5.4          private1          ipsec  static
                30              117     1003      10.5.5.4          private2          ipsec  static
```

The Cloud Edge router receives the default route from the AMER_DC site. This can be verified with the **show sdwan omp routes vpn 1 0.0.0.0/0** command. The **biz-internet** routes are in a **Inv, U** state as that circuit experienced an outage at the AMER_DC site.

```
Cloud#show sdwan omp routes vpn 1 0.0.0.0/0
Generating output, this might take time, please wait ...
Code:
C   -> chosen
I   -> installed
Red -> redistributed
Rej -> rejected
L   -> looped
R   -> resolved
S   -> stale
Ext -> extranet
Inv -> invalid
Stg -> staged
IA  -> On-demand inactive
U   -> TLOC unresolved
             PATH                PSEUDO
FROM PEER      ID    LABEL   STATUS   KEY    TLOC IP       COLOR         ENCAP  PREFERENCE
-----------------------------------------------------------------------------------------------------
10.3.3.1       112   1003    Inv,U    1      10.5.5.3      biz-internet  ipsec  -
10.3.3.1       113   1003    C,I,R    1      10.5.5.3      private1      ipsec  -
10.3.3.1       114   1003    C,I,R    1      10.5.5.3      private2      ipsec  -
10.3.3.1       115   1003    Inv,U    1      10.5.5.4      biz-internet  ipsec  -
10.3.3.1       116   1003    C,I,R    1      10.5.5.4      private1      ipsec  -
10.3.3.1       117   1003    C,I,R    1      10.5.5.4      private2      ipsec  -
```

Only the **private1** and **private2** are installed into the routing table since they are in **C,I,R** state. The routes are installed into the table based on the output of the **show ip route vrf 1 0.0.0.0** command.

Note: In the **show sdwan omp** commands, the **vpn** keyword is used to see the service side routers. In

---

the **show ip route** commands, the **vrf** keyword is used to see the service side routers.

```
Cloud# show ip route vrf 1 0.0.0.0

Routing Table: 1
Routing entry for 0.0.0.0/0, supernet
  Known via "omp", distance 251, metric 0, candidate default path, type omp
  Last update from 10.5.5.4 on Sdwan-system-intf, 00:17:07 ago
  Routing Descriptor Blocks:
    10.5.5.4 (default), from 10.5.5.4, 00:17:07 ago, via Sdwan-system-intf
      Route metric is 0, traffic share count is 1
  * 10.5.5.3 (default), from 10.5.5.3, 00:17:07 ago, via Sdwan-system-intf
      Route metric is 0, traffic share count is 1
```

Related Information

Overlay Management Protocol

Technical Support & Documentation - Cisco Systems