

# Configure a Preferred Default-Route or Prefix Route for vEdge or cEdge

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## Introduction

This document describes how to configure Software-Defined Wide-Area Network (SD-WAN) Control Policy to prefer a default-route or prefix.

## Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco SD-WAN Overlay Management Protocol (OMP).
- SD-WAN Centralized Control Policy.

## Components Used

The information in this document is based on these software and hardware versions:

- Cisco cEdge version 17.3.3
- Cisco vEdge version 20.3.2
- Cisco vSmart Controller version 20.4.2

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.

## Background Information

For the purpose of this demonstration, the lab is set up with 5 cEdges/vEdges on different Site IDs where Router01, Router02, and Router03 have a default-route configured in VPN 1.

- vSmart system ip 10.1.1.7.
- cEdge Router01 system ip 10.70.70.1, Site ID 70.
- cEdge Router02 system ip 10.80.80.1, Site ID 80.
- cEdge Router03 system ip 10.80.80.2, Site ID 80.
- cEdge Router04 system ip 10.70.70.2, Site ID 40.
- vEdge Router05 system ip 10.20.20.1, Site ID 20.

**Router04** (10.70.70.2) and **Router05** (10.20.20.1) receive and install the default-route from the **Router01** (10.70.70.1), **Router02** (10.80.80.1) and **Router03** (10.80.80.1). There is no active Centralized policy or Localized policies applied to the devices, it is a Full-Mesh topology by default.

**Router04** and **Router05** receive a default-route from three different devices.

```
Router04# 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
```

VPN	PREFIX	FROM PEER	PATH	STATUS	ATTRIBUTE	TLOC IP
COLOR	ENCAP	PREFERENCE	ID	LABEL	TYPE	
1	0.0.0.0/0	10.1.1.7	29	1002	C,I,R	installed 10.70.70.1
biz-internet	ipsec -	10.1.1.7	30	1005	C,I,R	installed 10.80.80.1
mpls	ipsec -	10.1.1.7	31	1003	C,I,R	installed 10.80.80.2
mpls	ipsec -					

**Tip:** The `show sdwan omp routes` output for cEdges can be large if the router receive to much routes. You can use `show sdwan omp route vpn <ID> <prefix>` to filter the output or also, you can use `show sdwan omp route vpn <ID> | s <prefix>` to filter all the sector output of the prefix in cEdges.

```
Router05# show omp routes vpn 1
```

```
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
```

VPN COLOR	PREFIX	ENCAP	FROM PEER	PATH		STATUS	ATTRIBUTE	TLOC IP	
			PREFERENCE	ID	LABEL		TYPE		
1	0.0.0.0/0		10.1.1.7	5	1002	C,I,R	installed	10.70.70.1	
biz-internet		ipsec	-	10.1.1.7	6	1005	C,I,R	installed	10.80.80.1
mpls		ipsec	-	10.1.1.7	7	1003	C,I,R	installed	10.80.80.2
mpls		ipsec	-						

**Tip:** The `show omp route` output for vEdges can be large if the router receives too routes. You can use `show omp routes vpn <ID> <prefix>` to filter the output in vEdges. You can use `| tab` next to the command to see the output in format table in vEdges.

**Router04** (10.70.70.2) and **Router05** (10.20.20.1) install the default-route from **Router01** (10.70.70.1), **Router02** (10.80.80.1), and **Router03** (10.80.80.1).

```
Router04# show ip route vrf 1
```

```
Routing Table: 1
```

```
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
H - NHRP, G - NHRP registered, g - NHRP registration summary
o - ODR, P - periodic downloaded static route, l - LISP
a - application route
+ - replicated route, % - next hop override, p - overrides from PfR
& - replicated local route overrides by connected
```

```
Gateway of last resort is 10.80.80.2 to network 0.0.0.0
```

```
m* 0.0.0.0/0 [251/0] via 10.80.80.2, 00:05:02, Sdwan-system-intf
    [251/0] via 10.80.80.1, 00:05:02, Sdwan-system-intf
    [251/0] via 10.70.70.1, 00:05:02, Sdwan-system-intf
```

**Tip:** The `show ip route vrf <ID>` output for cEdges can be large if the router receives too routes. You can use `show ip route vrf <ID> <prefix without mask>` to filter the output, or also, you can use `show ip route vrf <ID> | s <prefix>` to filter all the sector output of the prefix.

```
Router05# show ip routes vpn 1 0.0.0.0/0
Codes Proto-sub-type:
  IA -> ospf-intra-area, IE -> ospf-inter-area,
  E1 -> ospf-external1, E2 -> ospf-external2,
  N1 -> ospf-nssa-external1, N2 -> ospf-nssa-external2,
  e -> bgp-external, i -> bgp-internal
Codes Status flags:
  F -> fib, S -> selected, I -> inactive,
  B -> blackhole, R -> recursive, L -> import
```

VPN	PREFIX	COLOR	PROTOCOL		PROTOCOL	NEXTHOP	NEXTHOP	NEXTHOP	TLOC
			ENCAP	STATUS	SUB	TYPE	IF	NAME	
1	0.0.0.0/0		omp		-	-	-	-	-
10.70.70.1		biz-internet	ipsec	F,S					
1	0.0.0.0/0		omp		-	-	-	-	-
10.80.80.1		mpls	ipsec	F,S					
1	0.0.0.0/0		omp		-	-	-	-	-
10.80.80.2		mpls	ipsec	F,S					

**Tip:** The `show ip routes` output for vEdges can be large if the router receives too routes. You can use `show ip routes vpn <ID> <prefix>` to filter the output in vEdges.

## Configurations

### Solution 1: Centralized Control-Policy Usage to Prefer the Default-Route from Router01 on Specific Remote Router Router04

Use a Topology Custom Control and apply a preference for the default-route in the OMP.

Use Route Rule instead of Transport Location (TLOC) rule.

#### Match Conditions

- Match originator option for **Router01** System-ip 10.70.70.1 and Prefix-list predefined on policies lists with the 0.0.0.0/0 prefix.
- ip prefix-list 0.0.0.0/0 just matches the default-route not all routes, so you can use this prefix for the prefix list.
- ip prefix-list 0.0.0.0/0 le 32 matches all routes.

## Action

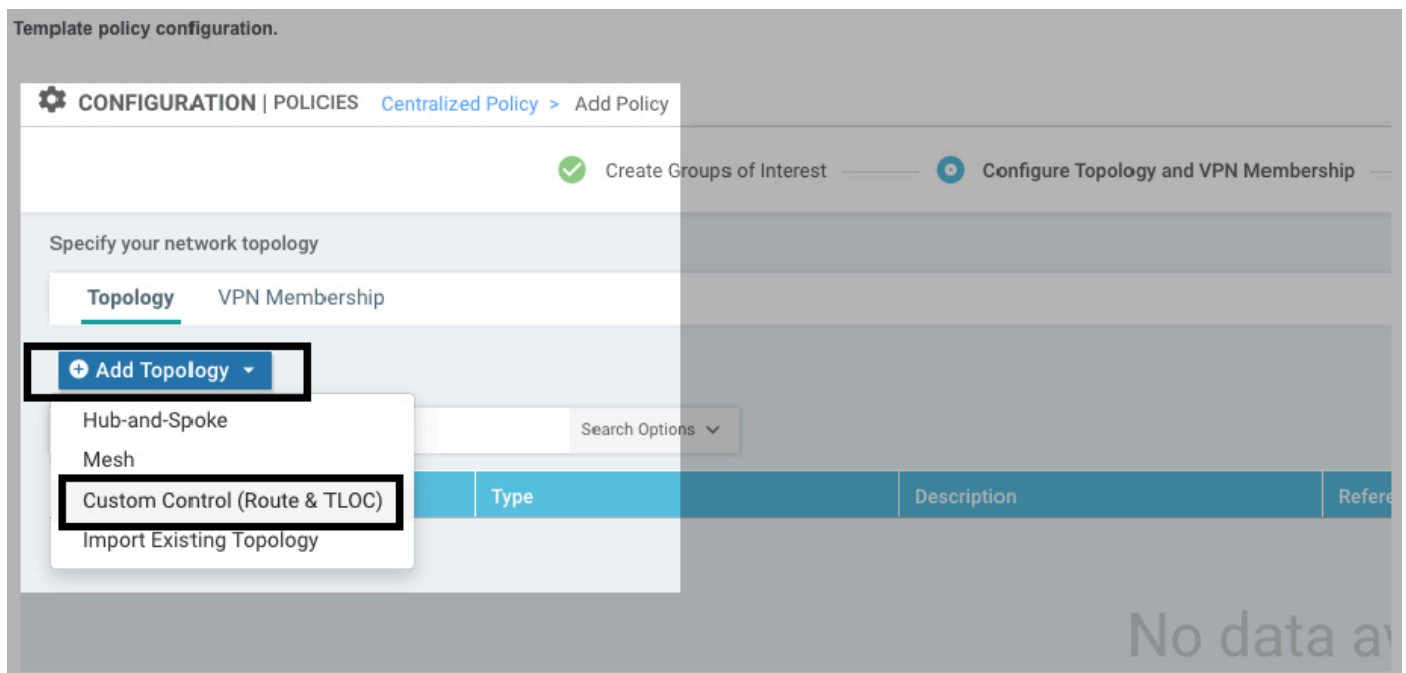
Apply this policy in the outbound direction to **Router04** site ID 40.

## Template Policy Configuration

You can use vManage GUI to configure the **Centralized Policy** with the **Control Policy**.

Control policies are configured in **Topology**, and you can choose Hub-and-Spoke, Mesh, or Custom Control policies.

Custom Control(Route & TLOC) is used for this specific scenario, as shown in the image.



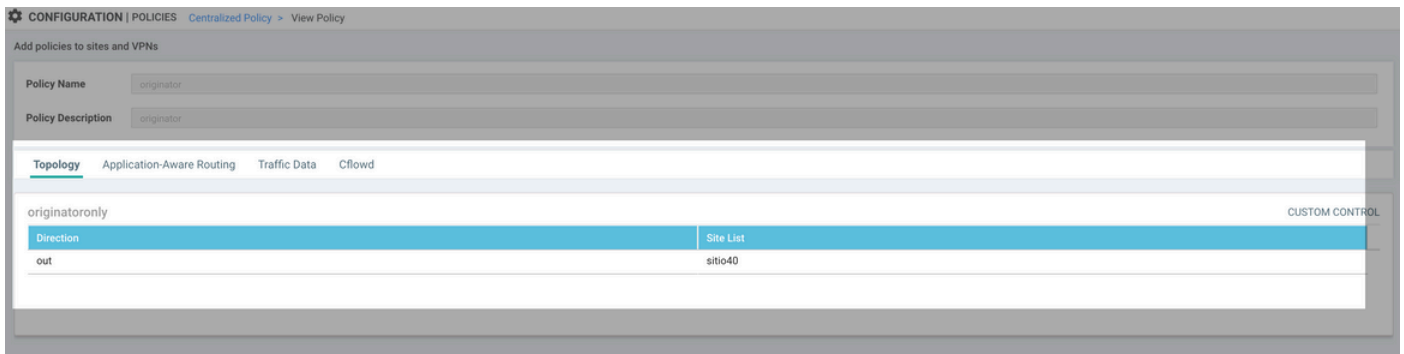
Sequence type and Sequence Rule is added.

Originator system-ip and prefix list are set in match conditions.

Accept and Preference is set on actions for same sequence, as shown in the image.



Control Policy is applied in the outbound direction for site 40, as shown in the image.



**Caution:** To activate a Centralized Policy, the vSmart needs a device template attached, or the **Centralized Policy** send a Failed to activate policy error. The vSmart has to be in vManage mode.

## CLI Policy Configuration

You can configure the vSmart manually instead of vManage GUI.

```
control-policy originatoronly
  sequence 1
  match route
    originator 10.70.70.1
    prefix-list Default_Route
  !
  action accept
  set
    preference 200
  !
  !
  !
  default-action accept
  !
  lists
    prefix-list Default_Route
      ip-prefix 0.0.0.0/0
    !
    site-list sitio40
      site-id 40
    !
  !
  !
  !
  apply-policy
    site-list sitio40
    control-policy originatoronly out <<<<<<<
  !
  !
```

The vSmart sends out to **Router04** only the default-route from the originator **Router01** (10.70.70.1) with a higher preference 200.

**Caution:** The default action is set to reject.  
The default action can be set to accept or reject.

**Caution:** If the sequence is not matched, the routes take the default action.  
It means that if the default action is set to reject and the route does not match any

sequence, it is rejected from the vSmart and it is not advertised to the overlay.

If the default action is set to accept and the route does not match any sequence, it is accepted from the vsmart and advertised to the overlay.

## Verify

You can use the `show running-config policy` command on vSmart to verify that the **Control-Policy** is applied correctly.

```
vsmart# show running-config policy control-policy
policy
control-policy originatoronly
sequence 1
match route
  originator 10.70.70.1
  prefix-list Default_Route
!
action accept
set
  preference 200
!
!
!
default-action accept
!
!
```

Use `show running-config apply-policy` to check the site and direction that the **Control-Policy** is applied.

```
vsmart# show running-config apply-policy
apply-policy
site-list sitio40
control-policy originatoronly out
!
!
```

**Tip:** You can use `show running-config policy control-policy <name> default-action | sequence` to filter the output if the vSmart has many control policies.

**Router04** (10.70.70.2) receives all the default-routes from **Router01** (10.70.70.1), **Router02** (10.80.80.1), and **Router03** (10.80.80.1), but the default-route from **Router01** have higher preference (200).

```
Router04# 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
```





```

-----
1      0.0.0.0/0          10.1.1.7          5      1002      C,I,R      installed  10.70.70.1
biz-internet  ipsec -          <<<<<<< no preference
10.1.1.7          6      1005      C,I,R      installed  10.80.80.1
mpls        ipsec -          10.1.1.7          7      1003      C,I,R      installed  10.80.80.2
mpls        ipsec -

```

Router05# show ip routes vpn 1

Codes Proto-sub-type:

IA -> ospf-intra-area, IE -> ospf-inter-area,  
E1 -> ospf-external1, E2 -> ospf-external2,  
N1 -> ospf-nssa-external1, N2 -> ospf-nssa-external2,  
e -> bgp-external, i -> bgp-internal

Codes Status flags:

F -> fib, S -> selected, I -> inactive,  
B -> blackhole, R -> recursive, L -> import

VPN	PREFIX	PROTOCOL	PROTOCOL	NEXTHOP	NEXTHOP	NEXTHOP	NEXTHOP	TLOC
IP	COLOR	ENCAP	STATUS	SUB TYPE	IF NAME	ADDR	VPN	
1	0.0.0.0/0	omp	-	-	-	-	-	-
10.70.70.1	biz-internet	ipsec	F,S	-	-	-	-	-
1	0.0.0.0/0	omp	-	-	-	-	-	-
10.80.80.1	mpls	ipsec	F,S	-	-	-	-	-
1	0.0.0.0/0	omp	-	-	-	-	-	-
10.80.80.2	mpls	ipsec	F,S	-	-	-	-	-

## Solution 2: Centralized Control-Policy Usage to Prefer Default-Route from Router01 to all Routers in Full-Mesh

Use the same policy that solution 1 used, and apply it in the inbound direction from Router01 site ID 70.

```

control-policy originatoronly
sequence 1
match route
originator 10.70.70.1
prefix-list Default_Route
!
action accept
set
preference 200
!
!
!
default-action accept
!
lists
prefix-list Default_Route
ip-prefix 0.0.0.0/0
!
site-list SiteList_70
site-id 70
!
!
!
apply-policy

```

```

site-list SiteList_70
control-policy originatoronly in <<<<<<<<<
!
!

```

## Verify

If you use the inbound direction, **Router04** (10.70.70.2) and **Router05** (10.20.20.1) receive and install the default-route from **Router01** (10.70.70.1) only.

```
Router04# 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

```

VPN	PREFIX	FROM PEER	PATH	STATUS	ATTRIBUTE	TLOC IP
COLOR	ENCAP	PREFERENCE	ID	LABEL	TYPE	
1	0.0.0.0/0	10.1.1.7	29	1002	C,I,R	installed 10.70.70.1
biz-internet	ipsec	200	<<<<<<<<			

```
Router05# show omp routes vpn 1
```

```
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

```

VPN	PREFIX	FROM PEER	PATH	STATUS	ATTRIBUTE	TLOC IP
COLOR	ENCAP	PREFERENCE	ID	LABEL	TYPE	
1	0.0.0.0/0	10.1.1.7	5	1002	C,I,R	installed 10.70.70.1
biz-internet	ipsec	200	<<<<<<<			

## Consideration for both Scenarios: Inbound or Outbound Direction

If you lose **Router01** (10.70.70.1), the routers install all default-routes that receive without preference. In this scenario, from **Router02** (10.80.80.1) and **Router03** (10.80.80.2):

Router04# **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

VPN	PREFIX		FROM PEER	PATH		STATUS	ATTRIBUTE	
COLOR		ENCAP	PREFERENCE	ID	LABEL		TYPE	TLOC IP
1	0.0.0.0/0		10.1.1.7	36	1005	C,I,R	installed	10.80.80.1
mpls		ipsec	-					
			10.1.1.7	37	1003	C,I,R	installed	10.80.80.2
mpls		ipsec	-					

Router05# **show omp routes vpn 1**

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

VPN	PREFIX		FROM PEER	PATH		STATUS	ATTRIBUTE	
COLOR		ENCAP	PREFERENCE	ID	LABEL		TYPE	TLOC IP
1	0.0.0.0/0		10.1.1.7	14	1005	C,I,R	installed	10.80.80.1
mpls		ipsec	-					
			10.1.1.7	15	1003	C,I,R	installed	10.80.80.2
mpls		ipsec	-					

### **Solution 3: Centralized Control-Policy Usage to Prefer Default-Route From Router01 with Backup Default-Routes from other Routers**

In this Solution, routers receive the default-router only from **Router01** (10.70.70.1), but if you lose it, you want the backup default-route that remote routers install came from **Router02** (10.80.80.1) and not from both **Router02** (10.80.80.1) and **Router03** (10.80.80.1) as in **Solution 1** and **Solution 2**.

Add a sequence on the same Control Policy and apply a lower preference that you set from default-route for **Router01** preference 200, but a higher than the default preference (100).

For the default-route advertised from **Router02** (10.80.80.1), you can set a preference of 150.

```
control-policy originator
  sequence 1
    match route
      originator 10.70.70.1
      prefix-list Default_Route
    !
    action accept
      set
        preference 200
    !
    !
  !
  sequence 11 <<<<< new sequence
    match route
      originator 10.80.80.1 <<<<< Router02 system ip as originator
      prefix-list Default_Route
    !
    action accept
      set
        preference 150 <<< lower preference of Router01
    !
    !
  !
  default-action accept
!
lists
  prefix-list Default_Route
    ip-prefix 0.0.0.0/0
  !
  site-list sitio40
    site-id 40
  !
!
!
!
apply-policy
  site-list sitio40
  control-policy originator out
!
!
```

## Verify

The router receives the default-routes with preferences of 200, 150, and default preference.

```
Router04# show sdwa 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

VPN COLOR	PREFIX	FROM PEER		PATH		STATUS	ATTRIBUTE	
		ENCAP	PREFERENCE	ID	LABEL		TYPE	TLOC IP
1	0.0.0.0/0		10.1.1.7	36	1005	R	installed	10.80.80.1
mpls		ipsec	150 <<<<<<<<					
			10.1.1.7	37	1003	R	installed	10.80.80.2
mpls		ipsec	-					
			10.1.1.7	38	1002	C,I,R	installed	10.70.70.1
biz-internet		ipsec	200 <<<<<<<<					

**Router04 (10.70.70.2) installs in routing table only the default-route from Router01 (10.70.70.1) with higher preference:**

Router04# **show ip route vrf 1**

Routing Table: 1

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP  
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
 E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP  
 n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA  
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2  
 ia - IS-IS inter area, \* - candidate default, U - per-user static route  
 H - NHRP, G - NHRP registered, g - NHRP registration summary  
 o - ODR, P - periodic downloaded static route, l - LISP  
 a - application route  
 + - replicated route, % - next hop override, p - overrides from PfR  
 & - replicated local route overrides by connected

Gateway of last resort is 10.70.70.1 to network 0.0.0.0

m\* 0.0.0.0/0 [251/0] via 10.70.70.1, 00:02:47, Sdwan-system-intf

If you lose **Router01 (10.70.70.1)**, **Router04 (10.70.70.2)** installs only the route with the next higher preference from **Router02 (10.80.80.1)**.

Router04# **show sdwa 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
VPN      PREFIX          FROM PEER          ID    LABEL    STATUS    ATTRIBUTE
COLOR          ENCAP  PREFERENCE
-----
1        0.0.0.0/0        10.1.1.7          36    1005    C,I,R    installed  10.80.80.1
mpls                    ipsec  150    <<<<<<<
          10.1.1.7          37    1003    R        installed  10.80.80.2
mpls                    ipsec  -
Router04# show ip route vrf 1
```

Routing Table: 1

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP  
n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA  
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2  
ia - IS-IS inter area, \* - candidate default, U - per-user static route  
H - NHRP, G - NHRP registered, g - NHRP registration summary  
o - ODR, P - periodic downloaded static route, l - LISP  
a - application route  
+ - replicated route, % - next hop override, p - overrides from PfR  
& - replicated local route overrides by connected

Gateway of last resort is 10.80.80.1 to network 0.0.0.0

```
m* 0.0.0.0/0 [251/0] via 10.80.80.1, 00:00:15, Sdwan-system-intf
```

If you lose **Router02**, **Router04** installs default-route from **Router03** (10.80.80.1) that is the route with the default preference.

**Tip:** The inbound and outbound direction works on next way, the inbound if you want to advertise the preferences to all remote routers in Full-Mesh or the outbound if you want to advertise the preferences only to a specific remote site.

## Solution 4: Centralized Control-Policy Usage to Prefer some Prefix Route

All previous solutions works exactly the same if you use any other prefix instead of the default-route prefix.

Example with prefix **10.40.40.0/24** advertised from **Router01** (10.70.70.1) to **Router04** (10.70.70.2).

```
control-policy originator
sequence 1
match route
originator 10.70.70.1
prefix-list prefix40
!
action accept
set
preference 200
!
```

```

!
!
default-action accept
!
lists
  prefix-list prefix40
    ip-prefix 10.40.40.0/24 <<<<<<<<<
!
  site-list sitio40
    site-id 40
!
!
!
apply-policy
  site-list sitio40
  control-policy originator out
!
!

```

## Verify

Router04# **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

```

VPN	PREFIX	FROM PEER	PATH	STATUS	ATTRIBUTE	TLOC IP
COLOR	ENCAP	PREFERENCE	ID	LABEL	TYPE	
1	0.0.0.0/0	10.1.1.7	36	1005	C,I,R	installed 10.80.80.1
mpls	ipsec	150				
		10.1.1.7	37	1003	R	installed 10.80.80.2
mpls	ipsec	-				
1	10.40.40.0/24	10.1.1.7	13	1002	C,I,R	installed 10.70.70.1
biz-internet	ipsec	200 <<<<<<<<<				
		10.1.1.7	15	1005	R	installed 10.80.80.1
mpls	ipsec	-				
		10.1.1.7	16	1003	R	installed 10.80.80.2
mpls	ipsec	-				

Router04# **show ip route vrf 1**

Routing Table: 1

```

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

```

ia - IS-IS inter area, \* - candidate default, U - per-user static route  
H - NHRP, G - NHRP registered, g - NHRP registration summary  
o - ODR, P - periodic downloaded static route, l - LISP  
a - application route  
+ - replicated route, % - next hop override, p - overrides from PfR  
& - replicated local route overrides by connected

Gateway of last resort is 10.80.80.1 to network 0.0.0.0

```
m* 0.0.0.0/0 [251/0] via 10.80.80.1, 00:11:55, Sdwan-system-intf
    10.0.0.0/24 is subnetted, 1 subnets
m   10.40.40.0 [251/0] via 10.70.70.1, 00:02:17, Sdwan-system-intf <<<<<<
Router04#
```

## Related Information

[Policies Configuration Guide for vEdge Routers, Cisco SD-WAN  
Technical Support & Documentation - Cisco Systems](#)