Configuring IP SLA PBR Object Tracking

This chapter describes the PBR object tracking capabilities of IP Service Level Agreements (SLAs).

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IP SLA PBR Object Tracking

This feature allows you to make sure that the next hop is reachable before that route is used. If the next hop is not reachable, another route is used as defined in the policy-based routing (PBR) configuration. If no other route is present in the route map, the routing table is used.

Object Tracking

Object tracking monitors objects such as the following:

- State of the line protocol of an interface
- Existence of an entry in the routing table

Clients, such as PBR, can register their interest in specific, tracked objects and then take action when the state of the objects changes.

IP SLA PBR Object Tracking Overview

The PBR Object Tracking feature gives policy-based routing (PBR) access to all the objects that are available through the tracking process. The tracking process enables you to track individual objects—such as ICMP ping reachability, routing adjacency, an application running on a remote device, a route in the Routing Information Base (RIB)—or to track the state of an interface line protocol.

Object tracking functions in the following manner: PBR informs the tracking process that a certain object should be tracked, and the tracking process then notifies PBR when the state of that object changes.

Configuring IP SLA PBR Object Tracking

SUMMARY STEPS

1. **configure terminal**
2. **ip sla** *operation-number*
3. **icmp-echo** *destination-ip-address*
4. **exit**
5. **ip sla schedule** *operation-number* **life forever start-time now**
6. **track** *object-number* **ip sla** *entry-number* **reachability**
7. **exit**
8. **ip access-list standard** *access-list-name*
9. **permit ip** *source destination*
10. **ipv6 access-list** *access-list-name*
11. **permit ipv6** *source destination*
12. **exit**
13. **route-map** *map-tag*
14. **match ip address** *access-list-name*
15. **match ipv6 address** *access-list-name*
16. **set ip next-hop verify-availability** *next-hop-address* **track** *object*
17. **set ipv6 next-hop verify-availability** *next-hop-address* **track** *object*
18. **exit**
19. **interface** *type number*
20. **ip address** *ip-address mask*
21. **ipv6 address** *ip-address mask*
22. **ip policy route-map** *map-tag*
23. **ipv6 policy route-map** *map-tag*
24. **end**
25. **show track** *object-number*
26. **show route-map** *map-name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `switch# configure terminal`	Enters global configuration mode.
Step 2	**ip sla** *operation-number* **Example:** `switch(config)# ip sla 1`	Starts a Cisco IOS IP Service Level Agreement (SLA) operation configuration and enters IP SLA configuration mode.

	Command or Action	Purpose
Step 3	**icmp-echo** *destination-ip-address* **Example:** `switch(config-ip-sla)# icmp-echo 10.3.3.2`	Configures an IP SLA Internet Control Message Protocol (ICMP) echo probe operation.
Step 4	**exit** **Example:** `switch(config-ip-sla)# exit`	Exits IP SLA configuration mode and returns the router to global configuration mode.
Step 5	**ip sla schedule** *operation-number* **life forever start-time now** **Example:** `switch(config)# ip sla schedule 1 life forever start-time now`	Configures the scheduling parameters for a single Cisco IOS IP SLA operation. • In this example, the time parameters for the IP SLA operation are configured. **Note** Repeat Steps 2 to 5 to configure and schedule other IP SLA operations.
Step 6	**track** *object-number* **ip sla** *entry-number* **reachability** **Example:** `switch(config)# track 1 ip sla 1 reachability`	Tracks the reachability of an object and enters tracking configuration mode. **Note** Repeat this step to track other operations.
Step 7	**exit** **Example:** `switch(config-track)# exit`	Exits tracking configuration mode and returns the router to global configuration mode.
Step 8	**ip access-list standard** *access-list-name* **Example:** `switch(config)# ip access-list standard ACL`	Defines an IP access list and an access control list (ACL) in order to enable filtering for packets.
Step 9	**permit ip** *source destination* **Example:** `switch(config-acl)# permit ip 192.0.2.0/24 198.51.100.0/24`	Creates an access control list (ACL) rule that permits traffic matching its conditions.
Step 10	**ipv6 access-list** *access-list-name* **Example:** `switch(config)# ipv6 access-list IPv6ACL`	Defines an IPv6 access list ACL in order to enable filtering for packets.
Step 11	**permit ipv6** *source destination* **Example:**	Creates an access control list (ACL) rule that permits traffic matching its conditions.

	Command or Action	Purpose
	`switch(config-ipv6-acl)# permit ipv6 2001:DB8::/32 2001:DB8::/48`	
Step 12	**exit** **Example:** `switch(config-ipv6-acl)# exit`	Exits ACL configuration mode and returns the router to global configuration mode.
Step 13	**route-map** *map-tag* **Example:** `switch(config)# route-map PBR`	Specifies a route map and enters route-map configuration mode.
Step 14	**match ip address** *access-list-name* **Example:** `switch(config-route-map)# match ip address ACL`	Distributes any routes that have a destination IPv4 network number address that is permitted by a standard access list.
Step 15	**match ipv6 address** *access-list-name* **Example:** `switch(config-route-map)# match ipv6 address IPv6ACL`	Distributes any routes that have a destination IPv6 network number address that is permitted by a standard access list.
Step 16	**set ip next-hop verify-availability** *next-hop-address* **track** *object* **Example:** `switch(config-route-map)# set ip next-hop verify-availability 198.51.100.2 track 1`	Configures the route map to verify the reachability of the tracked object. **Note** Repeat this step to configure the route map to verify the reachability of other tracked objects.
Step 17	**set ipv6 next-hop verify-availability** *next-hop-address* **track** *object* **Example:** `switch(config-route-map)# set ipv6 next-hop verify-availability 2001:DB8:1::1 track 1`	Configures the route map to verify the reachability of the tracked object. **Note** Repeat this step to configure the route map to verify the reachability of other tracked objects.
Step 18	**exit** **Example:** `switch(config-route-map)# exit`	Exits route-map configuration mode and returns the router to global configuration mode.
Step 19	**interface** *type number* **Example:** `switch(config)# interface ethernet 0/0`	Specifies an interface type and number and enters interface configuration mode.

	Command or Action	Purpose
Step 20	**ip address** *ip-address mask* **Example:** `switch(config-if)# ip address 10.2.2.1 255.255.255.0`	Specifies a primary IP address for an interface.
Step 21	**ipv6 address** *ip-address mask* **Example:** `switch(config-if)# ipv6 address 2001:DB8::/48`	Specifies a primary IPv6 address for an interface.
Step 22	**ip policy route-map** *map-tag* **Example:** `switch(config-if)# ip policy route-map PBR`	Enables policy routing and identifies a route map to be used for policy routing.
Step 23	**ipv6 policy route-map** *map-tag* **Example:** `switch(config-if)# ipv6 policy route-map PBR`	Enables IPv6 policy routing and identifies a route map to be used for policy routing.
Step 24	**end** **Example:** `switch(config-if)# end`	Exits interface configuration mode and returns the router to privileged EXEC mode.
Step 25	**show track** *object-number* **Example:** `switch# show track 1`	(Optional) Displays tracking information. Use this command to verify the configuration.
Step 26	**show route-map** *map-name* **Example:** `switch# show route-map PBR`	(Optional) Displays route map information.

Example: Configuring IP SLA PBR Object Tracking

This example shows that object tracking is configured for PBR:

```
! Configure and schedule IP SLA operations
ip sla 1
 icmp-echo 10.3.3.2
ip sla schedule 1 life forever start-time now
!
ip sla 2
 udp-echo 10.4.4.2
```

```
ip sla schedule 2 life forever start-time now
!
ip sla 3
 icmp-echo 10.5.5.2
ip sla schedule 3 life forever start-time now
!
ip sla 4
 icmp-echo 10.6.6.2
ip sla schedule 4 life forever start-time now
!
ip sla 5
 icmp-echo 10.7.7.2
ip sla schedule 5 life forever start-time now
!
! Configure Object Tracking to track the operations
!
track 1 ip sla 1 reachability
track 2 ip sla 2 reachability
track 3 ip sla 3 reachability
track 4 ip sla 4 reachability
track 5 ip sla 5 reachability
!
! Configure ACL
ip access-list standard ACL
 permit ip 10.2.2.0/24 10.1.1.1/32
!
! Configure PBR policing on the router
route-map PBR
 match ip address ACL
 set ip next-hop verify-availability 10.3.3.2 track 1
 set ip next-hop verify-availability 10.4.4.2 track 2
 set ip next-hop verify-availability 10.5.5.2 track 3
!
! Apply PBR policy on the incoming interface of the router.
interface ethernet 0/0
 ip address 10.2.2.1 255.255.255.0
  ip policy route-map PBR
!
! Display PBR related information
show route-map
show track brief
show ip sla stat
show ip sla application
!
```