

Configure EIGRP SAF to Push Policies in PfRv3

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Introduction

This document describes Performance Routing (PfRv3), an intelligent solution that monitors various network performance related parameters like delay, jitter, link utilization. PfRv3 accordingly chooses the best exit link amongst several candidates and routes traffic over it. To achieve this, PfRv3 allows network administrator to configure centralized policies on hub master which are then pushed to several hub spokes.

Prerequisites

Requirements

Cisco recommends that you have basic knowledge of Performance Routing (PfR).

Components Used

This document is not restricted to specific software and hardware 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.

Configure

Centralized Policy Definition

In Pfrv3 , all the policies are created and modified by master hub device. Master hub is also responsible for pushing these policies to all master spoke devices. This central provisioning of policies adds great deal to scalability of Pfrv3. Network administrator-defined policies dictates treatment of various type of traffic. Traffic could be grouped/categorized based on DSCP value or on basis of application type like Lotus notes, WebEx and so on.

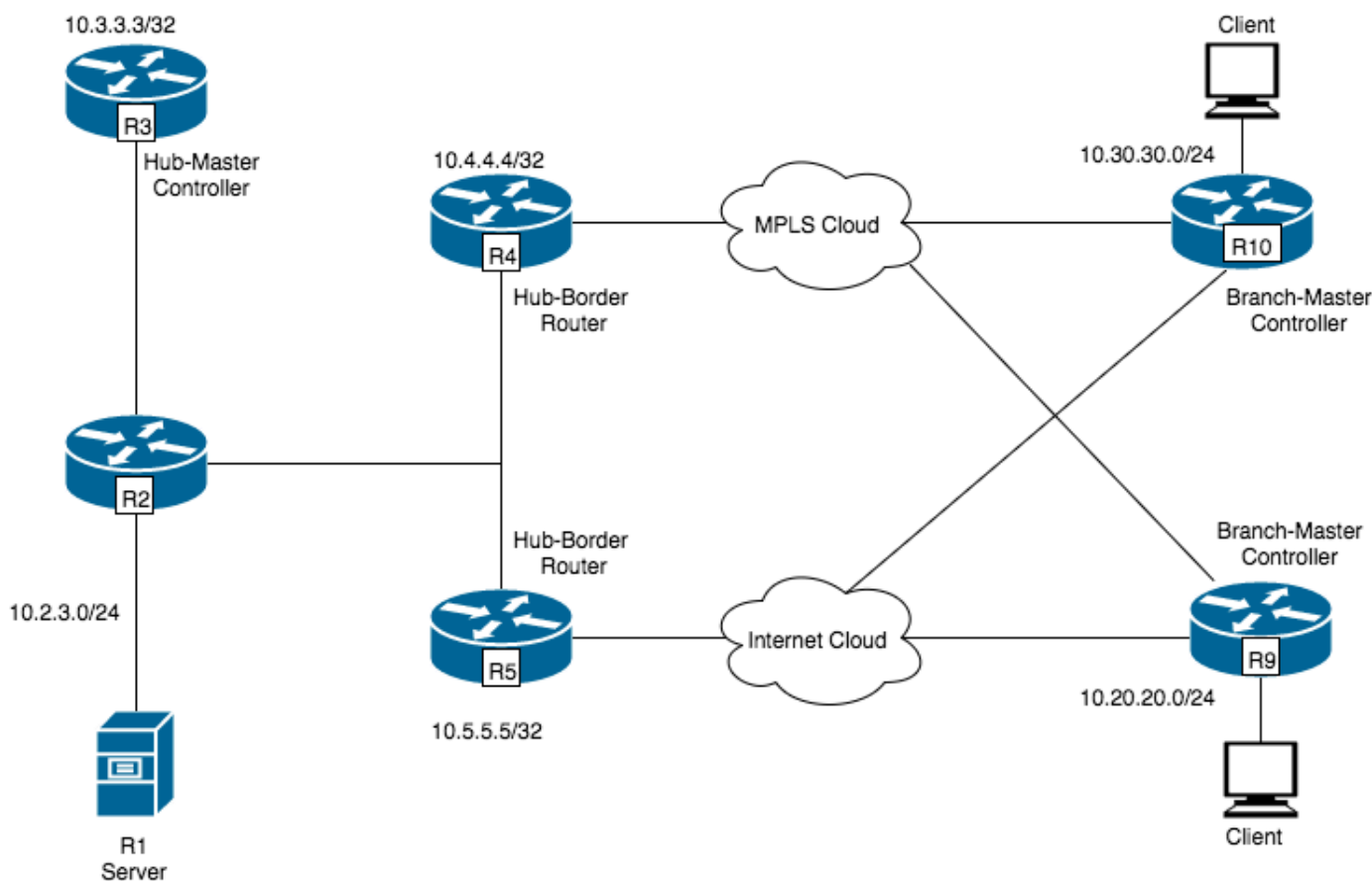
EIGRP Service Address Family(SAF):

EIGRP forms the SAF neighbor adjacency with Hub Border Router as well as Master Branch router as well. This is a set of EIGRP SAF neighbor adjacency formed:

1. Hub Master Controller <---> Hub Border Router
2. Hub Master Controller <---> Branch Master Controller
3. Branch Master Controller <---> Branch Border Router

EIGRP SAF framework is used by Pfrv3 to push policies from hub site to several spoke sites. Only hub master is authorised to modify any pre-deployed policy and these modified polices are then synchronised with other spoke-master over EIGRP SAF framework.

Network Diagram



Configurations

R3 Master Hub Router

```
interface Loopback0
ip address 10.3.3.3 255.255.255.255
```

```
!  
domain PFRv3  
vrf default  
  master hub  
  source-interface Loopback0  
  class VOICE sequence 10  
  match dscp ef policy voice  
  path-preference MPLS fallback INET
```

R4 Hub Border Router

```
interface Loopback0  
  ip address 10.4.4.4 255.255.255.255  
!  
domain PFRv3  
vrf default  
  border  
  source-interface Loopback0  
  master 10.3.3.3  
domain one path MPLS
```

R5 Hub Border Router

```
interface Loopback0  
  ip address 10.5.5.5 255.255.255.255  
  
domain one  
vrf default  
  border  
  source-interface Loopback0  
  master 10.3.3.3  
domain one path INET
```

R9 Branch Master Router

```
interface Loopback0  
  ip address 10.9.9.9 255.255.255.255  
  
domain PFRv3  
vrf default  
  border  
  source-interface Loopback0  
  master local  
  master branch  
  source-interface Loopback0  
  hub 10.3.3.3
```

R10 Branch Master Router

```
interface Loopback0
 ip address 10.10.10.10 255.255.255.255

domain PFRv3
 vrf default
  border
  source-interface Loopback0
  master local
  master branch
  source-interface Loopback0
  hub 10.3.3.3
```

Verify

Checking And Verifying EIGRP SAF

R3 forms the EIGRP SAF adjacency with Spoke Master Controller (R9 and R10) and Hub Border routers (R4 and R5).

<#root>

```
R3#show eigrp service-family ipv4 neighbors
```

```
EIGRP-SFv4 VR(#AUTOCFG#) Service-Family Neighbors for AS(59501)
H   Address          Interface          Hold Uptime      SRTT   RTO   Q   Seq
                               (sec)            (ms)            Cnt  Num
3   10.4.4.4          Lo0                503 01:30:28     9    100  0   7
2   10.5.5.5          Lo0                592 01:30:28    11    100  0   7
1   10.9.9.9          Lo0                505 01:30:28    22    132  0  10
0   10.10.10.10       Lo0                519 01:30:28    21    132  0  10
```

Spoke Master router forms the SAF neighbor relationship with hub master controller

<#root>

```
R9#show eigrp service-family ipv4 neighbors
```

```
EIGRP-SFv4 VR(#AUTOCFG#) Service-Family Neighbors for AS(59501)
H   Address          Interface          Hold Uptime      SRTT   RTO   Q   Seq
                               (sec)            (ms)            Cnt  Num
0   10.3.3.3          Lo0                530 01:34:43    32    192  0  19
```

When Pfrv3 is configured, EIGRP SAF is automatically initiated in the background. There is no additional configuration needed to be done. EIGRP SAF neighborhood is built between master hub and master border routers (BR) as well as master hub and master spokes.

It is essential to have EIGRP SAF adjacency established as SAF lays the foundation for exchange and synchronization of policies ,performance monitoring indexes (PMIs) and so on.

Policy Push From Master Hub To Master Spokes Over EIGRP SAF

<#root>

```
R3#show domain one master policy
```

```
No Policy publish pending
class VOICE sequence 10
  path-preference MPLS fallback INET
  class type: Dscp Based
  match dscp ef policy voice
    priority 2 packet-loss-rate threshold 1.0 percent
    priority 1 one-way-delay threshold 150 msec
    priority 3 jitter threshold 30000 usec
    priority 2 byte-loss-rate threshold 1.0 percent
```

<#root>

```
R9#show domain one master policy
```

```
class VOICE sequence 10
  path-preference MPLS fallback INET
  class type: Dscp Based
  match dscp ef policy voice
    priority 2 packet-loss-rate threshold 1.0 percent
    priority 1 one-way-delay threshold 150 msec
    priority 3 jitter threshold 30000 usec
    priority 2 byte-loss-rate threshold 1.0 percent
```

Site-Prefixes Also Being Pushed Over SAF Address Family

Site prefixes are inside prefixes for each site. Site prefix database resides on Master Controllers and Border Routers. Site prefixes are learnt when traffic is initiated from each site destined to spoke location. Master Controller and Border router maintains the Site-Prefix table which must be synchronised at each PFR running site. Flags in site-prefix table help in understanding how prefixes are being learnt.

L Flag :- Indicates Locally learned prefixes learnt by monitoring the egress traffic on the wan links.

S Flag :- Indicates prefixes learnt via SAF address family.

C Flag :- Indicates prefixes configured on the master using the command "site-prefixes".

T Flag :- Indicates prefixes as enterprise prefix.

In this example prefix 10.2.3.0/24 is learned locally on R3 and its information is passed to R9 via SAF:

<#root>

```
R3#sh domain one master site-prefix
```

```
Change will be published between 5-60 seconds
Next Publish 01:54:04 later
Prefix DB Origin: 10.3.3.3
Prefix Flag: S-From SAF; L-Learned; T-Top Level; C-Configured;
```

Site-id	Site-prefix	Last Updated	Flag
10.3.3.3			
10.2.3.0/24			
10.9.9.9	1w1d ago L, 10.20.20.0/24	00:06:30 ago	S,

<#root>

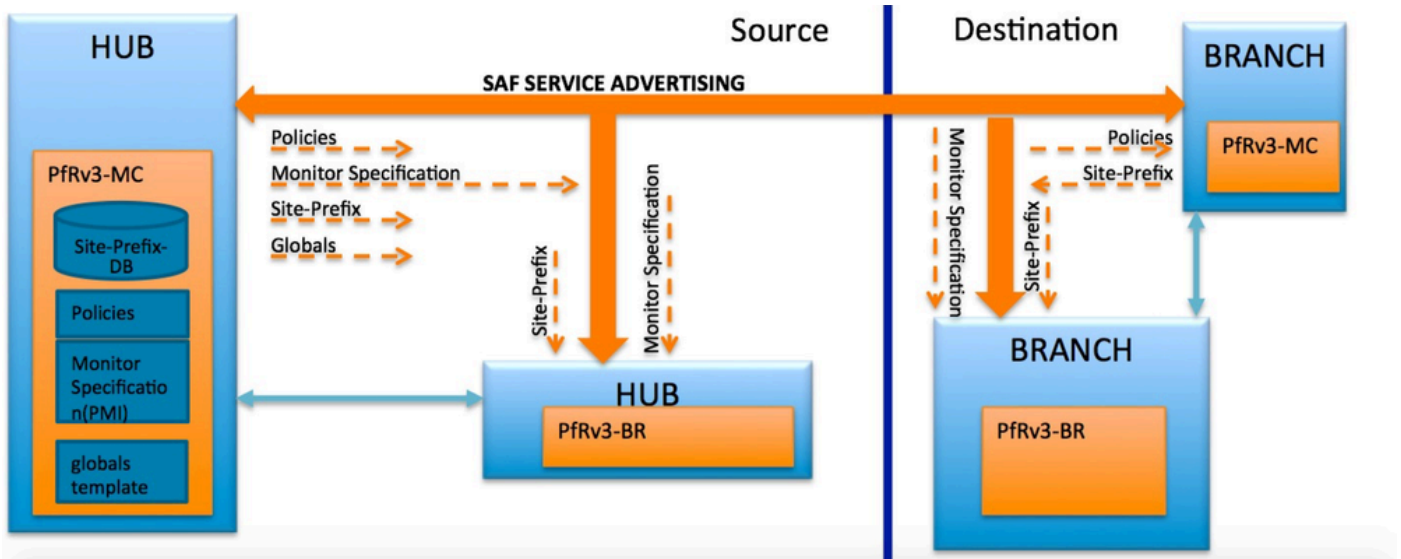
```
R9#sh domain one master site-prefix
```

```
Change will be published between 5-60 seconds
Next Publish 01:55:53 later
Prefix DB Origin: 10.9.9.9
Prefix Flag: S-From SAF; L-Learned; T-Top Level; C-Configured;
```

Site-id	Site-prefix	Last Updated	Flag
10.3.3.3			
10.2.3.0/24			
10.9.9.9	00:11:41 ago S, 10.20.20.0/24	00:04:06 ago	L,

This diagram shows various attributes being pushed over EIGRP SAF family:

1. Site prefix database, monitoring specification and the global templates on Hub MC are pushed by the EIGRP SAF to all hub border devices.
2. Master Hub also pushes site-prefixes and global template to the Border Master using the SAF.
3. Border Master then pushes its local site-prefixes as well as attributes it subscribed from hub MC, as shown in step 2, to its BR.



This is the output from Master Hub Router which shows that it is publishing the services

```
<#root>
```

```
R3#show domain one master peering
```

```
Peering state: Enabled
Origin:      Loopback0(10.3.3.3)
Peering type: Listener
Subscribed service:
  cent-policy (2) :
  site-prefix (1) :
    Last Notification Info: 01:06:33 ago, Size: 242, Compressed size: 160, Status: No Error, Count:
  service-provider (4) :
  globals (5) :
  pmi (3) :
```

```
Published service:
```

```
site-prefix (1)
```

```
:
  Last Publish Info: 01:06:33 ago, Size: 168, Compressed size: 132, Status: No Error
```

```
cent-policy (2)
```

```
:
  Last Publish Info: 1w0d ago, Size: 1380, Compressed size: 345, Status: No Error
```

```
pmi (3)
```

```
:
  Last Publish Info: 1w0d ago, Size: 1535, Compressed size: 432, Status: No Error
```

```
globals (5)
```

```
:
```

Last Publish Info: 1w0d ago, Size: 325, Compressed size: 197, Status: No Error

This is the output from Hub Border router

<#root>

R5#show domain one border peering

Peering state: Enabled
Origin: Loopback0(10.5.5.5)
Peering type: Peer(With 10.3.3.3)

Subscribed service:

pmi (3) :

Last Notification Info: 01:30:58 ago, Size: 1535, Compressed size: 452, Status: No Error, Count: 3

site-prefix (1)

:

Last Notification Info: 01:07:09 ago, Size: 242, Compressed size: 160, Status: No Error, Count: 1

globals (5) :

Last Notification Info: 01:30:58 ago, Size: 325, Compressed size: 217, Status: No Error, Count: 5

Published service:

So it is only Subscribing the services being offered from Hub Master Router .

<#root>

R9#show domain one maste peering

Peering state: Enabled
Origin: Loopback0(10.9.9.9)
Peering type: Listener, Peer(With 10.3.3.3)

Subscribed service:

cent-policy (2)

:

Last Notification Info: 01:35:29 ago, Size: 1380, Compressed size: 365, Status: No Error, Count: 2

site-prefix (1)

:
Last Notification Info: 01:11:39 ago, Size: 242, Compressed size: 160, Status: No Error, Count:
service-provider (4) :

globals (5) :

Last Notification Info: 01:35:29 ago, Size: 325, Compressed size: 217, Status: No Error, Count:

Published service:

site-prefix (1)

:
Last Publish Info: 01:11:40 ago, Size: 242, Compressed size: 140, Status: No Error

<#root>

R9#show domain one border peering

Peering state: Enabled
Origin: Loopback0(10.9.9.9)
Peering type: Peer(With 10.9.9.9)

Subscribed service:

pmi (3)

:
Last Notification Info: 01:36:26 ago, Size: 1535, Compressed size: 452, Status: No Error, Count:

site-prefix (1)

:
Last Notification Info: 01:12:36 ago, Size: 242, Compressed size: 160, Status: No Error, Count:

globals (5)

:
Last Notification Info: 01:36:26 ago, Size: 325, Compressed size: 217, Status: No Error, Count:

Published service: