

使用BGP或EIGRP配置PfRv2流量控制機制

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簡介

本文檔介紹效能路由第2版(PfRv2)如何根據PfRv2策略決策控制流量。用於控制流量的方法和標準取決於通過哪個基礎協定獲知父路由。在本文檔中，當通過BGP和EIGRP獲知父路由時，將演示PfRv2流量控制操作。

必要條件

需求

思科建議您瞭解效能路由(PfR)的基本知識。

採用元件

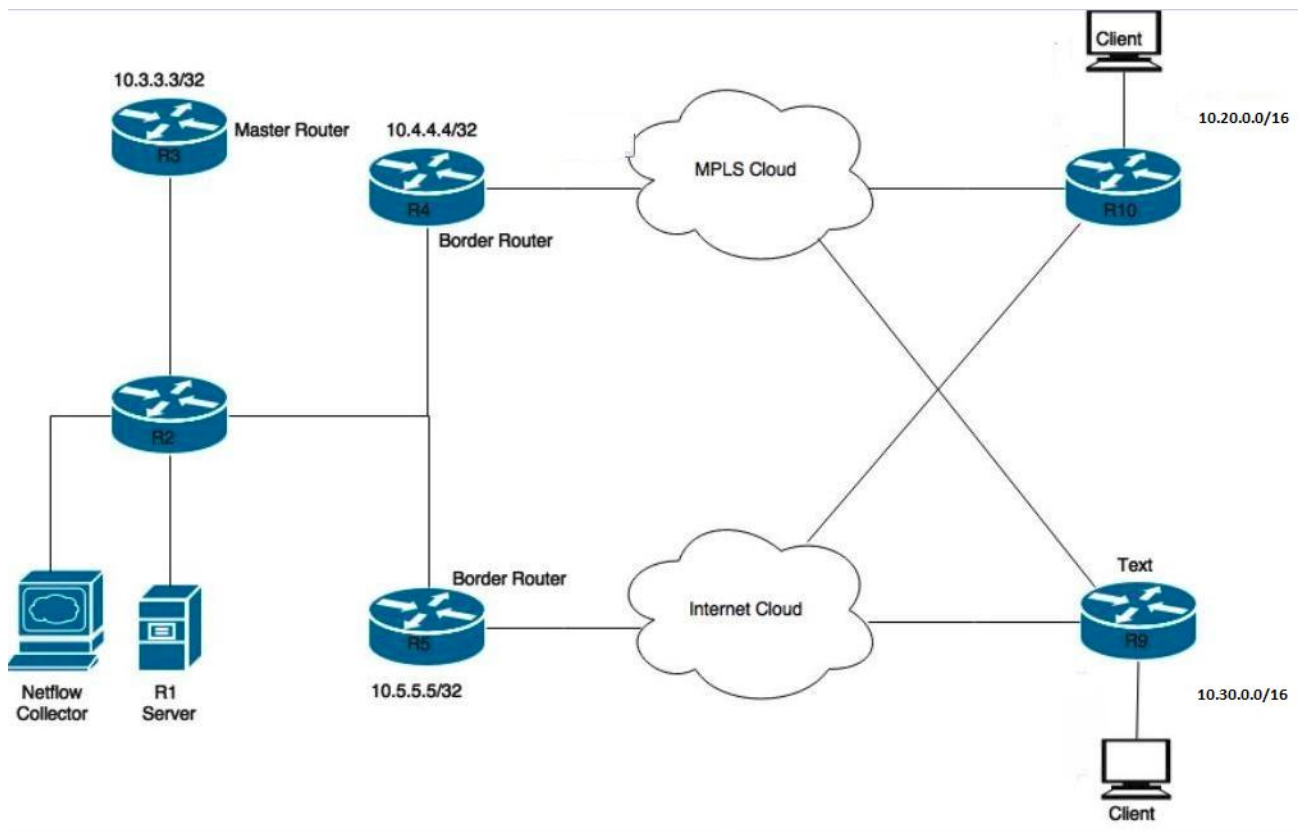
設定

PfRv2允許網路管理員配置learn-list對流量進行分組，應用配置的策略，並選擇滿足策略中定義的特定引數集（如延遲、抖動、利用率等）的最佳邊界路由器(BR)。PfRv2控制流量的模式多種多樣，這取決於獲知目的地首碼的父路由所使用的協定。PfRv2能夠通過操縱路由協定、注入靜態路由或通過基於動態策略的路由來更改路由資訊庫(RIB)。下表重點介紹各種協定的路由控制方法。

Parent route	Prefix control method
BGP	BGP via modifying local preference
EIGRP	EIGRP via injecting more specific route
Static	Static via injecting more specific route
RIP,OSPF,ISIS	Dynamic policy based routing

網路圖表

本文檔將以下影象作為本文檔其餘部分的示例拓撲。



R1 —
R3- PfR
R4&R5- PfR
R9R10R1

組態

```
!  
key chain pfr  
  key 0  
  key-string cisco  
pfr master  
  policy-rules PFR  
  !  
  border 10.4.4.4 key-chain pfr  
  interface Ethernet1/0 external  
  interface Ethernet1/2 internal  
  link-group MPLS  
  !  
  border 10.5.5.5 key-chain pfr  
  interface Ethernet1/3 internal  
  interface Ethernet1/0 external  
  link-group INET  
  !  
learn  
traffic-class filter access-list DENY-ALL  
  list seq 10 rename APPLICATION-LEARN-LIST  
  traffic-class prefix-list APPLICATION
```

```

throughput
list seq 20 refname DATA-LEARN-LIST
traffic-class prefix-list DATA
throughput
!
pfr-map PFR 10
match pfr learn list APPLICATION-LEARN-LIST
set periodic 90
set delay threshold 25
set mode monitor active
set active-probe echo 10.20.21.1
set probe frequency 5
set link-group MPLS fallback INET
!
pfr-map PFR 20
match pfr learn list DATA-LEARN-LIST
set periodic 90
set delay threshold 25
set mode monitor active
set active-probe echo 10.30.31.1
set probe frequency 5
set link-group INET fallback MPLS
!
ip prefix-list APPLICATION: 1 entries
seq 5 permit 10.20.0.0/16
!
ip prefix-list DATA: 1 entries
seq 5 permit 10.30.0.0/16
!

```

驗證

1: BGP

(10.20.0.0/16 10.30.0.0/16) BGPR4R5

R4#show ip route

```

--output suppressed--
B      10.20.0.0/16 [20/0] via 10.0.46.6, 01:26:58
B      10.30.0.0/16 [20/0] via 10.0.46.6, 01:26:58

```

R5#show ip route

```

--output suppressed--
B      10.20.0.0/16 [20/0] via 10.0.57.7, 00:42:37
B      10.30.0.0/16 [20/0] via 10.0.57.7, 00:42:37

```

INPOLICYR4 10.20.20.0/24 10.30.30.0/24 R5

R3#show pfr master traffic-class

```

OER Prefix Statistics:
Pas - Passive, Act - Active, S - Short term, L - Long term, Dly - Delay (ms),
P - Percentage below threshold, Jit - Jitter (ms),
MOS - Mean Opinion Score
Los - Packet Loss (percent/10000), Un - Unreachable (flows-per-million),
E - Egress, I - Ingress, Bw - Bandwidth (kbps), N - Not applicable
U - unknown, * - uncontrolled, + - control more specific, @ - active probe all
# - Prefix monitor mode is Special, & - Blackholed Prefix
% - Force Next-Hop, ^ - Prefix is denied

```

DstPrefix	Appl_ID	Dscp	Prot	SrcPort	DstPort	SrcPrefix	Protocol	
Flags	State	Time	CurrBR	CurrI/F	EBw	IBw		
PasSDly	PasLDly	PasSUn	PasLUn	PasSJos	PasLJos	ActSJos	ActLJos	
ActSDly	ActLDly	ActSUn	ActLUn	ActSJit	ActPMOS	ActSJos	ActLJos	
10.20.20.0/24	N	N	N	N	N	N	N	
	INPOLICY	56	10.4.4.4	Et1/0				BGP
N	N	N	N	N	N	N	N	N
1	2	0	0	N	N	N	N	N
10.30.30.0/24	N	N	N	N	N	N	N	
	INPOLICY	59	10.5.5.5	Et1/0				BGP
N	N	N	N	N	N	N	N	N
3	2	0	0	N	N	N	N	N

由於R4已被PfRv2選為10.20.20.0/24的送出路由器，因此R4會為10.20.20.0/24注入本地優先順序較高的路由，如下所示。注入路由的屬性由父路由繼承。

R4#show ip bgp 10.20.20.0/24

```
BGP routing table entry for 10.20.20.0/24, version 60
Paths: (1 available, best #1, table default, not advertised to EBGP peer)
  Advertised to update-groups:
    10
  Refresh Epoch 1
  200, (injected path from 10.20.0.0/16)
    10.0.46.6 from 10.0.46.6 (10.6.6.6)
      Origin incomplete, metric 0, localpref 100, valid, external, best
      Community: no-export
      rx pathid: 0, tx pathid: 0x0
```

iBGPBRR510.20.20.0/24

R5#show ip bgp 10.20.20.0/24

```
BGP routing table entry for 10.20.20.0/24, version 17
Paths: (1 available, best #1, table default)
  Advertised to update-groups:
    6
  Refresh Epoch 1
  200
    10.0.45.4 from 10.0.45.4 (10.4.4.4)
      Origin incomplete, metric 0, localpref 5000, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
```

R510.20.20.0/24R4PfRv2BR

R4#show pfr border routes bgp

```
BGP table version is 60, local router ID is 10.4.4.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
OER Flags: C - Controlled, X - Excluded, E - Exact, N - Non-exact, I - Injected
```

Network	Next Hop	OER	LocPrf	Weight	Path
*> 10.20.20.0/24	10.0.46.6	CEI	5000	0	200 ?
*>i10.30.30.0/24	10.0.45.5	XN	5000	0	300 ?

10.20.20.0/24 C'E'BGPI

10.30.30.0/24 XBR5XN

5000BGP5000

R3(config-pfr-mc)#mode route metric bgp local-pref

2:EIGRP

EIGRP(10.20.0.0/16 10.30.0.0/16)R4R5 eigrp

R4#show ip route

--output suppressed--

D EX 10.20.0.0/16 [170/25651200] via 10.0.46.6, 00:04:25, Ethernet1/0
D EX 10.30.0.0/16 [170/25651200] via 10.0.46.6, 00:04:25, Ethernet1/0

R5#show ip route

--output suppressed--

D EX 10.20.0.0/16 [170/25651200] via 10.0.57.7, 00:05:46, Ethernet1/0
D EX 10.30.0.0/16 [170/25651200] via 10.0.57.7, 00:05:46, Ethernet1/0

如前面的案例所示，兩個流量類別都有活動的流量流，在下面的輸出中，兩者都處於INPOLICY狀態。R4被選為字首10.20.20.0/24,R5被選為字首10.30.30.0/24。這是根據每個學習清單配置的鏈路組首選項而設定的。

R3#show pfr master traffic-class

OER Prefix Statistics:

Pas - Passive, Act - Active, S - Short term, L - Long term, Dly - Delay (ms),
P - Percentage below threshold, Jit - Jitter (ms),
MOS - Mean Opinion Score
Los - Packet Loss (percent/10000), Un - Unreachable (flows-per-million),
E - Egress, I - Ingress, Bw - Bandwidth (kbps), N - Not applicable
U - unknown, * - uncontrolled, + - control more specific, @ - active probe all
- Prefix monitor mode is Special, & - Blackholed Prefix
% - Force Next-Hop, ^ - Prefix is denied

DstPrefix	Appl_ID	Dscp	Prot	SrcPort	DstPort	SrcPrefix	Flags	State	Time	CurrBR	CurrI/F	Protocol		
							PasSDly	PasLUn	PasSUn	PasLUn	PasSLos	PasLLos	EBw	IBw
							ActSDly	ActLUn	ActSUn	ActLUn	ActSJit	ActPMOS	ActSLos	ActLLos
10.20.20.0/24		N	N	N		N		INPOLICY	31	10.4.4.4	Et1/0	EIGRP		
	N	N	N	N	N	N						N		
	1	2	0	0	N	N						N		
10.30.30.0/24		N	N	N		N		INPOLICY	24	10.5.5.5	Et1/0	EIGRP		
	N	N	N	N	N	N						N		
	2	2	0	0	N	N						N		

由於R4已被Pfrv2選為10.20.20.0/24的最佳出口路由器，因此R4會注入標籤5000的更具體的路由，如下所示。即使父路由是外部路由，該注入路由始終是EIGRP內部路由。此外，如果父路由帶有標籤值，則該值不會被注入的路由繼承。

附註：並非注入路由的所有屬性都由父路由繼承。

R4#show ip route 10.20.20.0 255.255.255.0

```
Routing entry for 10.20.20.0/24
  Known via "eigrp 100", distance 90, metric 25651200
  Tag 5000, type internal
  Redistributing via eigrp 100
  Last update from 10.0.46.6 on Ethernet1/0, 00:17:04 ago
  Routing Descriptor Blocks:
  * 10.0.46.6, from 0.0.0.0, 00:17:04 ago, via Ethernet1/0
    Route metric is 25651200, traffic share count is 1
    Total delay is 2000 microseconds, minimum bandwidth is 100 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 12/255, Hops 0
    Route tag 5000
```

R4#show ip eigrp topology 10.20.20.0/24

```
EIGRP-IPv4 Topology Entry for AS(100)/ID(10.4.4.4) for 10.20.20.0/24
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 25651200
  Descriptor Blocks:
  10.0.46.6 (Ethernet1/0), from 0.0.0.0, Send flag is 0x0
    Composite metric is (25651200/0), route is Internal
    Vector metric:
      Minimum bandwidth is 100 Kbit
      Total delay is 2000 microseconds
      Reliability is 255/255
      Load is 12/255
      Minimum MTU is 1500
      Hop count is 0
      Originating router is 10.4.4.4
      Internal tag is 5000
```

R4#show pfr border routes eigrp

```
Flags: C - Controlled by oer, X - Path is excluded from control,
       E - The control is exact, N - The control is non-exact
```

Flags	Network	Parent	Tag
CE	10.20.20.0/24	10.20.0.0/16	5000
XN	10.30.30.0/24		

10.20.0.0/1610.20.20.0/24R5R4Pfrv2BR

R5#show ip route 10.20.20.0

```
Routing entry for 10.20.20.0/24
  Known via "eigrp 100", distance 90, metric 26931200
  Tag 5000, type internal
  Redistributing via eigrp 100
  Last update from 10.0.45.4 on Tunnel10, 00:25:34 ago
  Routing Descriptor Blocks:
  * 10.0.45.4, from 10.0.45.4, 00:25:34 ago, via Tunnel10 // 10.0.45.4 is R4 IP.
    Route metric is 26931200, traffic share count is 1
    Total delay is 52000 microseconds, minimum bandwidth is 100 Kbit
    Reliability 255/255, minimum MTU 1476 bytes
    Loading 28/255, Hops 1
    Route tag 5000
```

/24R4/24

R4#show ip eigrp topology 10.20.20.0/24

```
EIGRP-IPv4 Topology Entry for AS(100)/ID(10.4.4.4) for 10.20.20.0/24
State is Passive, Query origin flag is 1, 1 Successor(s), FD is 25600000
Descriptor Blocks:
10.0.46.6 (Ethernet1/0), from 0.0.0.0, Send flag is 0x0
  Composite metric is (25600000/0), route is Internal
  Vector metric:
    Minimum bandwidth is 100 Kbit
    Total delay is 1 microseconds // Injected route with a delay of 1.
    Reliability is 255/255
    Load is 102/255
    Minimum MTU is 1500
    Hop count is 0
    Originating router is 10.4.4.4
    Internal tag is 5000
10.0.45.5 (Tunnel10), from 10.0.45.5, Send flag is 0x0
  Composite metric is (26931200/25651200), route is External
  Vector metric:
    Minimum bandwidth is 100 Kbit
    Total delay is 52000 microseconds
    Reliability is 255/255
    Load is 99/255
    Minimum MTU is 1476
    Hop count is 2
    Originating router is 10.0.78.7
  External data:
    AS number of route is 0
    External protocol is Static, external metric is 0
    Administrator tag is 0 (0x00000000)
10.0.46.6 (Ethernet1/0), from 10.0.46.6, Send flag is 0x0 //Parent route
  Composite metric is (25651200/281600), route is External
  Vector metric:
    Minimum bandwidth is 100 Kbit
    Total delay is 2000 microseconds
    Reliability is 255/255
    Load is 102/255
    Minimum MTU is 1500
    Hop count is 1
    Originating router is 10.0.68.6
  External data:
    AS number of route is 0
    External protocol is Static, external metric is 0
    Administrator tag is 0 (0x00000000)
```

MTUBRR5R5R4R4Pfrv2