

BGP 또는 EIGRP를 사용하여 PfRv2 트래픽 제어 메커니즘 구성

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소개

이 문서에서는 PfRv2 정책 결정에 따라 Performance Routing 버전 2(PfRv2)가 트래픽을 제어하는 방법에 대해 설명합니다. 트래픽을 제어하는 데 사용되는 방법 및 기준은 상위 경로가 학습되는 기본 프로토콜에 따라 달라집니다. 이 문서에서는 BGP 및 EIGRP를 통해 상위 경로가 학습될 때 PfRv2 트래픽 제어 작업을 시연합니다.

사전 요구 사항

요구 사항

PfR(Performance Routing)에 대한 기본적인 지식이 있는 것이 좋습니다.

사용되는 구성 요소

0

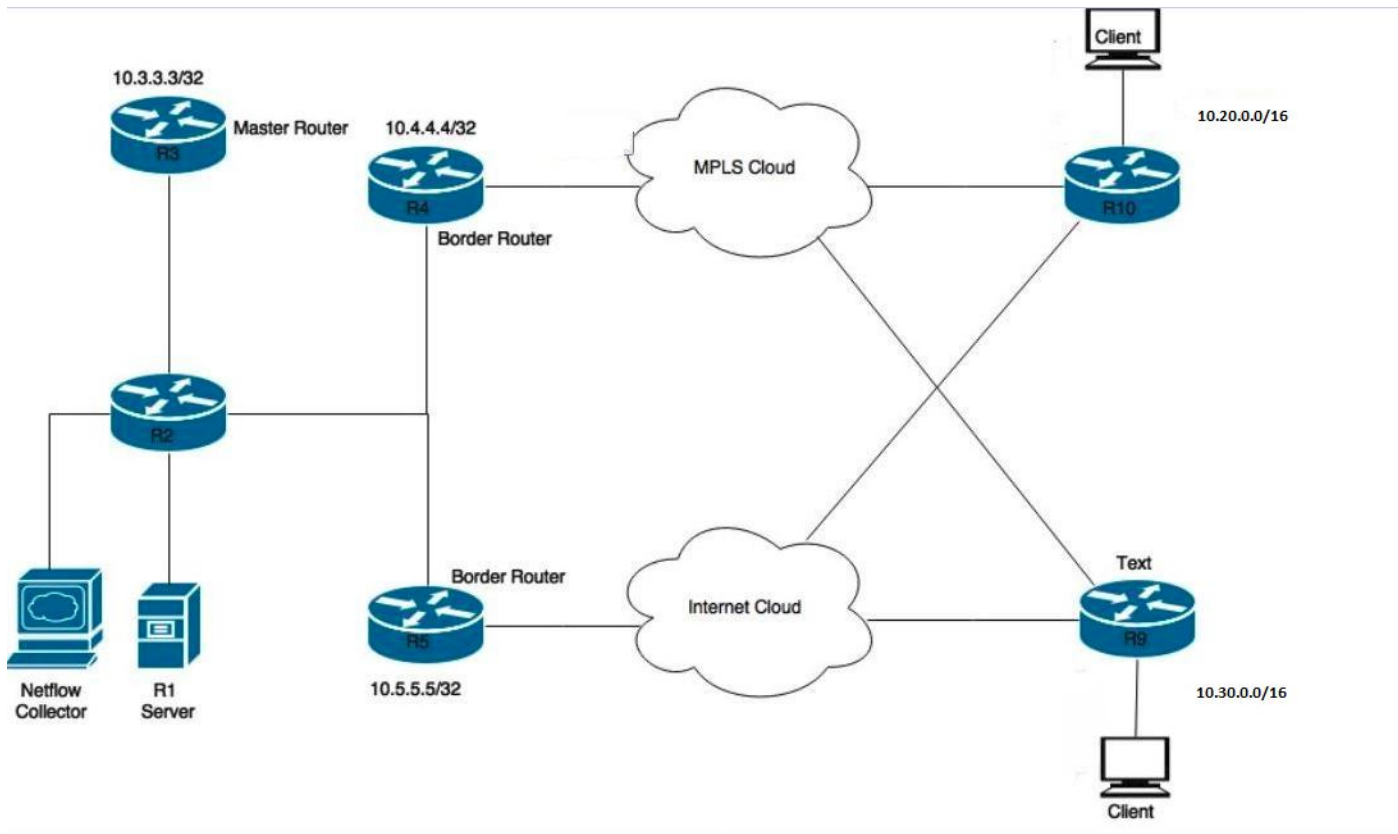
구성

PfRv2를 사용하면 네트워크 관리자가 learn-list를 구성하여 트래픽을 그룹화하고, 구성된 정책을 적용하고, 정책에 정의된 지연, 지터, 사용률 등 특정 매개 변수 집합을 충족하는 최상의 보더 라우터 (BR)를 선택할 수 있습니다. PfRv2는 트래픽을 제어하는 다양한 모드가 있으며 대상 접두사에 대한 상위 경로가 학습되는 프로토콜에 따라 달라집니다. PfRv2는 라우팅 프로토콜을 조작하거나 고정 경로를 삽입하거나 동적 정책 기반 라우팅을 통해 RIB(Routing Information Base)를 변경할 수 있습니다. 다음은 다양한 프로토콜의 경로 제어 방법을 강조 표시하는 테이블입니다.

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

네트워크 다이어그램

이 문서에서는 다음 이미지를 나머지 문서의 샘플 토폴로지로 참조합니다.



:
R1- , .
R3- PfR
R4&R5- PfR Border Router.
R9 R10 R1 .

구성

```
!
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 rename 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
!

```

다음을 확인합니다.

1:BGP

(: 10.20.0.0/16 10.30.0.0/16) BGP . (R4 R5) .

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

```

INPOLICY . 10.20.20.0/24 R4 10.30.30.0/24 R5 . learn-list .

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	PasLDly	PasSUn	PasLUn	PasSLos	PasLLos	EBw	IBw		
ActSDly	ActLDly	ActSUn	ActLUn	ActSJit	ActPMOS	ActSLos	ActLLos		

10.20.20.0/24		N	N	N		N	N		
		INPOLICY		56	10.4.4.4	Et1/0		BGP	
	N	N	N	N	N	N	N	N	
	1	2	0	0	N	N	N	N	
10.30.30.0/24		N	N	N		N	N		
		INPOLICY		59	10.5.5.5	Et1/0		BGP	
	N	N	N	N	N	N	N	N	
	3	2	0	0	N	N	N	N	

R4는 PfRv2에 의해 10.20.20.0/24에 대한 종료 라우터로 선택되었으므로 R4는 아래에 표시된 대로 10.20.20.0/24에 대해 더 높은 로컬 환경 설정이 있는 경로를 삽입합니다. 삽입된 경로의 속성은 상위 경로에 의해 상속됩니다.

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
```

.iBGP BR. 10.20.20.0/24 R5.

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
```

10.20.20.0/24 R5 PfRv2 BR R4 .

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'(exact) BGP .I'() .

10.30.30.0/24 .X'(excluded) BR, R5 .X' 'N' .

5000 .BGP 5000 . .

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

2: EIGRP

10.20.0.0/16 10.30.0.0/16 EIGRP . (R4 R5) . 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
  
```

이전 사례와 같이 두 트래픽 클래스에 대한 활성 트래픽 흐름이 있으며 두 트래픽 모두 아래 출력의 INPOLICY 상태에서 확인할 수 있습니다. 접두사 10.20.0/24에 대해 R4가 선택되었고 접두사 10.30.0/24에 대해 R5가 선택되었습니다. 이는 각 learn-list에 대해 구성된 링크 그룹 기본 설정에 따라 달라 집니다.

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	Flags	Appl_ID	Dscp	Prot	SrcPort	DstPort	SrcPrefix	OER	
								State	Time
	PasSDly	PasLDly	PasSUn	PasLUn	PasSLos	PasLLos	EBw	IBw	
	ActSDly	ActLDly	ActSUn	ActLUn	ActSJit	ActPMOS	ActSLos	ActLLos	
10.20.20.0/24			N	N	N		N	N	
			INPOLICY		31	10.4.4.4	Et1/0		EIGRP
	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	
			INPOLICY		24	10.5.5.5	Et1/0		EIGRP

N	N	N	N	N	N	N	N
2	2	0	0	N	N	N	N

R4는 Pfrv2에서 10.20.20.0/24에 대한 최상의 종료 라우터로 선택했으므로 R4는 아래와 같이 태그 5000이 포함된 더 구체적인 경로를 삽입합니다. 이 삽입된 경로는 상위 경로가 외부인 경우에도 항상 EIGRP 내부 경로입니다. 또한 상위 경로가 태그 값을 전달하는 경우, 삽입된 경로에 의해 상속되지 않습니다.

참고: 삽입된 경로의 일부 속성이 상위 경로에 의해 상속되는 것은 아닙니다.

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		

10.20.0.0/16 , 10.20.20.0/24 .R5 R4 Pfrv2 BR .

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

/24 R4 /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)
, ,,, MTU . BR(R5, R5, R5) R4 R4 . PfRv2 .