

配置PfRv2性能监控方法

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简介

本文档介绍性能路由第2版(PfRv2)中用于监控分支路由器上广域网(WAN)链路性能的方法。

先决条件

要求

思科建议您具备性能路由(PfR)的基本知识。

使用的组件

本文档不限于特定的软件和硬件版本。

注意： Polaris代码16.x.x不支持PFRv2。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

背景信息

PfRv2使用三种方法来测量边界路由器(BR)链路的性能。主控制器(MC)使用收集到的信息来实施

PfR策略。被动监控、主动监控和混合模式。

被动监控

在此模式下，BR上启用的Netflow（默认情况下使用PfR）会收集有关流量类的此信息，并将其发回主控制器。

此信息适用于通过BR的TCP流：

- **可达性**：这是根据尚未收到相应TCP ACK的TCP SYN计算的。
- **延迟**：TCP三次握手期间TCP SYN消息和TCP ACK消息之间计算的时间。然后总值除以二。
- **损失**：根据TCP序列号进行测量。例如，当收到的TCP序列号高于或低于预期时，会报告丢失。

此信息适用于通过BR的所有流（包括TCP）：

- **出口带宽**：流量类的吞吐量（使用Netflow以每秒比特数计算）。
- **入口带宽**：传入BR的流量类的吞吐量（使用Netflow以比特/秒计算）。

活动监控

在此模式下，BR通过其WAN接口发送IP SLA探测，以测量与流量类相关的多个参数。收集的信息会发回主控制器。测量以下参数：

- 可达性
- 延迟
- 损失
- 出口带宽
- 入口带宽

当在主控制器上配置的监控方法处于活动状态时，这些探测功能会自动生成，也可以手动配置。默认情况下，发送的探测是ICMP回应，但可以根据通过WAN链路发送的流量类型更改为TCP或UDP探测。

当Exit BR选择持续进行时，所有BR将为Netflow获取的前缀发送活动探测。选择退出BR后，其他BR将停止发送活动探测。所选BR将继续发送活动探测。

混合模式

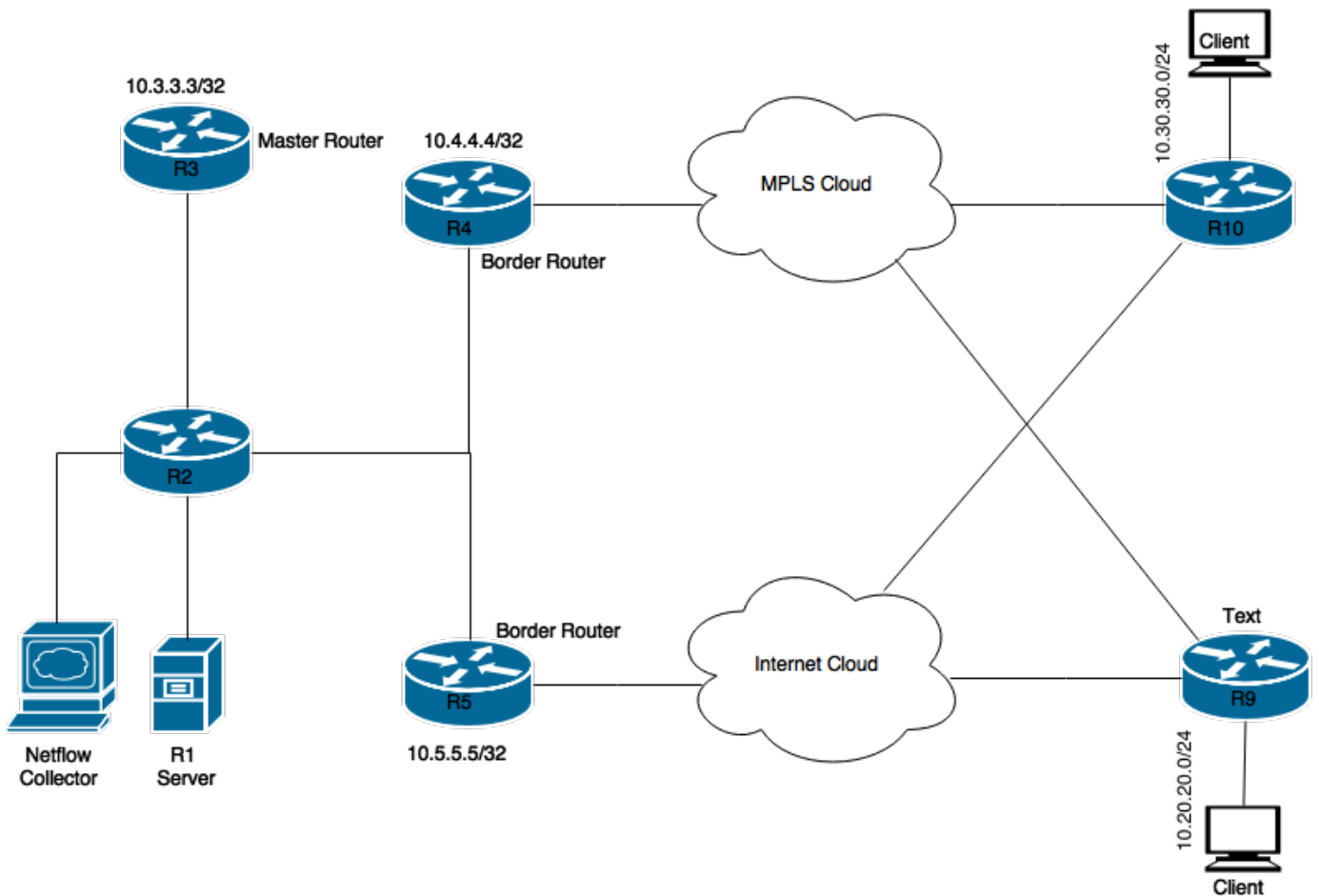
混合模式使用Netflow统计信息和IP服务等级协议(SLA)来决定出口点(BR)和链路监控。在此模式下，IP SLA探测信息用于选择出口点，然后Netflow统计信息用于监控BR到目的地的WAN连接。

当PfR处于学习状态且尚未进入“INPOLICY”状态时，所有BR将为从Netflow收集的前缀发送活动探测。这是为了确定各自的链路条件。当MC状态更改为“INPOLICY”时，所有BR将停止发送主用探测功能，现在监控将被动完成（使用Netflow）。

配置

此图像可用作文档其余部分的示例拓扑：

网络图



相关配置

使用不同模式需要此基本配置。R3配置为MC，因此必须在R3上完成以下配置：

被动模式

```
pfr master
!
border 10.4.4.4 key-chain pfr
interface Ethernet0/1 external
interface Ethernet0/0 internal
!
border 10.5.5.5 key-chain pfr
interface Ethernet0/0 internal
interface Ethernet0/1 external
!
mode monitor passive
```

主动模式

```
pfr master
!
border 10.4.4.4 key-chain pfr
interface Ethernet0/1 external
interface Ethernet0/0 internal
!
border 10.5.5.5 key-chain pfr
interface Ethernet0/0 internal
```

```
interface Ethernet0/1 external
!
```

```
mode monitor active
```

混合模式

这是默认模式。如果未提及模式命令，则混合模式将被激活，或者命令模式监控器可同时用于启用它。

```
pfr master
!
border 10.4.4.4 key-chain pfr
interface Ethernet0/1 external
interface Ethernet0/0 internal
!
border 10.5.5.5 key-chain pfr
interface Ethernet0/0 internal
interface Ethernet0/1 external
```

注意：如果手动给定命令模式监控器，则配置中不会显示该命令，因为它是默认命令。

验证

大多数验证命令都在MC上执行。这些命令可用于检验不同模式的工作情况。

被动模式

```
R3#show pfr master
<Output suppressed>
Default Policy Settings:
  backoff 90 900 90
  delay relative 50
  holddown 90
  periodic 0
  probe frequency 56
  number of jitter probe packets 100
  mode route control
mode monitor passive
  loss relative 10
  jitter threshold 20
  mos threshold 3.60 percent 30
  unreachable relative 50
  trigger-log percentage 30
```

测试1 — 从服务器启动TCP数据流

```
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		0	10.4.4.4	Et0/1		BGP
	46	46	0	0	35502	35502	2	1
	N	N	N	N	N	N		
10.30.30.0/24		N	N	N		N	N	
		INPOLICY		0	10.5.5.5	Et0/1		BGP
	1	1	0	0	0	0	14	1
	N	N	N	N	N	N		

测试2 — 从服务器启动UDP数据流

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		0	10.5.5.5	Et0/1		BGP
	U	U	0	0	0	0	13	0
	N	N	N	N	N	N		
10.30.30.0/24		N	N	N		N	N	
		INPOLICY		0	10.5.5.5	Et0/1		BGP
	U	U	0	0	0	0	14	0
	N	N	N	N	N	N		

如前所示，对于TCP流量，您可以看到Delay和Unreachable计数器也已填充，但在UDP流的情况下，您只能看到Bandwidth计数器已填充。

主动模式

R3#show pfr master

<Output suppressed>

Default Policy Settings:

```
backoff 90 900 90
delay relative 50
holddown 90
periodic 0
probe frequency 56
number of jitter probe packets 100
mode route control
mode monitor active
loss relative 10
jitter threshold 20
```

```

mos threshold 3.60 percent 30
unreachable relative 50
trigger-log percentage 30

```

测试 — 从服务器启动TCP数据流

在主控制器上：

```
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	
10.10.20.0/24			N	N	N		N	N	
			INPOLICY		0	10.4.4.4	Et0/1		BGP
	N	N	N	N	N	N	N	N	N
	54	54	0	0	N	N	N	N	N
10.30.30.0/24			N	N	N		N	N	
			INPOLICY		0	10.4.4.4	Et0/1		BGP
	N	N	N	N	N	N	N	N	N
	54	54	0	1000	N	N	N	N	N

在BR1上：

```
R4#show pfr border active-probes
```

OER Border active-probes

```

Type      = Probe Type
Target    = Target IP Address
TPort     = Target Port
Source    = Send From Source IP Address
Interface = Exit interface
Att       = Number of Attempts
Comps    = Number of completions
N - Not applicable

```

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						
echo	10.10.20.11	N	192.168.1.1	Et0/1	3	3
0						
echo	10.30.30.12	N	192.168.1.1	Et0/1	3	3
0						

在BR2上：

```
R5#show pfr border active-probes
```

OER Border active-probes

```

Type      = Probe Type
Target    = Target IP Address
TPort     = Target Port

```

Source = Send From Source IP Address
 Interface = Exit interface
 Att = Number of Attempts
 Comps = Number of completions
 N - Not applicable

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						
echo	10.10.20.11	N	192.168.2.1	Et0/1	3	3
0						
echo	10.30.30.12	N	192.168.2.1	Et0/1	3	3
0						

一旦MC上的流量类进入“INPOLICY”状态，并且BR1被选为用于发送所有流量的BR，BR2将停止发送探测：

R4#**show pfr border active-probes**

OER Border active-probes

Type = Probe Type
 Target = Target IP Address
 TPort = Target Port
 Source = Send From Source IP Address
 Interface = Exit interface
 Att = Number of Attempts
 Comps = Number of completions
 N - Not applicable

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						
echo	10.10.20.11	N	192.168.1.1	Et0/1	10	10
0						
echo	10.30.30.12	N	192.168.1.1	Et0/1	10	10
0						

R5#**show pfr border active-probes**

OER Border active-probes

Type = Probe Type
 Target = Target IP Address
 TPort = Target Port
 Source = Send From Source IP Address
 Interface = Exit interface
 Att = Number of Attempts
 Comps = Number of completions
 N - Not applicable

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						

混合模式

R3#**show pfr master**

OER state: ENABLED and ACTIVE

<Output Suppressed>

Default Policy Settings:

```

backoff 90 900 90
delay relative 50
holddown 90
periodic 0
probe frequency 56
number of jitter probe packets 100
mode route control
  mode monitor both
loss relative 10
jitter threshold 20
mos threshold 3.60 percent 30
unreachable relative 50
trigger-log percentage 30

```

测试 — 从服务器启动TCP数据流

在测量流量类(TC)且状态尚未“INPOLICY”时，两个BR将向从Netflow收集的前缀发送活动探测。这是为了确定各自的链路条件。

在MC上：

```
R3#show pfr mas 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				PasSLos	PasLLos		
	ActSDly	ActLDly	ActSun	ActLUn				ActSJit	ActPMOS	ActSLos	ActLLos
10.20.20.0/24			N	N	N		N	N			
			HOLDDOWN		61		10.5.5.5	Et0/1	BGP		
	1	1	0	0	0	0	16	1			
	1	1	0	0	N	N	N	N			
10.30.30.0/24			N	N	N		N	N			
			HOLDDOWN		61		10.5.5.5	Et0/1	BGP		
	1	1	0	0	0	0	16	1			
	4	4	0	0	N	N	N	N			

在BR1上：

```
R4#show pfr border active-probes
```

OER Border active-probes

```

Type      = Probe Type
Target    = Target IP Address
TPort     = Target Port
Source    = Send From Source IP Address
Interface = Exit interface
Att       = Number of Attempts
Comps    = Number of completions
N - Not applicable

```

Type	Target	TPort	Source	Interface	Att	Comps
------	--------	-------	--------	-----------	-----	-------


```
DSCP
echo 10.20.20.1 N 192.168.1.1 Et0/1 1 1
0
echo 10.30.30.1 N 192.168.1.1 Et0/1 1 1
0
```

在BR2上：

```
R5#show pfr border active-probes
```

```
OER Border active-probes
Type = Probe Type
Target = Target IP Address
TPort = Target Port
Source = Send From Source IP Address
Interface = Exit interface
Att = Number of Attempts
Comps = Number of completions
N - Not applicable
```

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						
echo	10.20.20.1	N	192.168.2.1	Et0/1	1	1
0						
echo	10.30.30.1	N	192.168.2.1	Et0/1	1	1

在MC上，状态更改为“INPOLICY”时，两个BR将停止发送主动探测，并且各自的监控将切换到被动模式（使用Netflow）。

```
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								
								INPOLICY	0	10.5.5.5	Et0/1			BGP
							1	1	0	0	0	0	3	1
							1	1	0	0	N	N	N	N
10.30.30.0/24		N	N	N		N								
								INPOLICY	0	10.5.5.5	Et0/1			BGP
							1	1	0	0	0	0	14	1
							1	1	0	0	N	N	N	N

如图所示，您可以看到被动和主动组件的计数器。此外，一旦TC进入“INPOLICY”状态，探测功能将停止在BR上。

```
R4#show pfr border active-probes
```

```
OER Border active-probes
Type = Probe Type
Target = Target IP Address
```

TPort = Target Port
Source = Send From Source IP Address
Interface = Exit interface
Att = Number of Attempts
Comps = Number of completions
N - Not applicable

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						

R5#**show pfr border active-probes**

OER Border active-probes

Type = Probe Type
Target = Target IP Address
TPort = Target Port
Source = Send From Source IP Address
Interface = Exit interface
Att = Number of Attempts
Comps = Number of completions
N - Not applicable

Type	Target	TPort	Source	Interface	Att	Comps
DSCP						

注意：版本15.6(3)M、15.7(3)M和更高版本的T系列版本不支持PfRv2。此外，版本16.3.1具有PfRv2 CLI，但不支持功能。当代码从MCP移动到Polaris时，功能中断，这在Polaris版本中无法修复。

故障排除

目前没有针对此配置的故障排除信息。