配置PfRv2效能監控方法

目錄

簡介

本檔案介紹效能路由版本2(PfRv2)中監控分支機構路由器上廣域網(WAN)連結效能的方法。

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

本文件所述內容不限於特定軟體和硬體版本。

> **附註**：Polaris代碼16.x.x不支援PFRv2。

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路正在作用，請確保您已瞭解任何指令可能造成的影響。

背景資訊

PfRv2使用三種方法測量邊界路由器(BR)鏈路的效能。收集的資訊由主控制器(MC)用於執行PfR策

略。這三種方法是被動監控、主動監控和混合模式。

被動監控

在此模式下，BR上啟用的Netflow（預設情況下使用PfR）會收集有關流量類的此資訊，並將其傳送回主控制器。

此資訊適用於通過BR的TCP流量：

- **可達性**：這是根據尚未收到對應的TCP ACK的TCP SYN計算得出的。
- **Delay**:在TCP三次握手期間，計算TCP SYN和TCP ACK消息之間的時間。然後將總值除以二。
- **虧損**：根據TCP序列號測量。例如，當收到的TCP序列號高於或低於預期值時，就會報告丟失。

此資訊適用於通過BR的所有流量（包括TCP）：

- **輸出頻寬**：從BR開始的流量類的吞吐量（使用Netflow以每秒位數計算）。
- **輸入頻寬**：使用BR的流量類注入的吞吐量（使用Netflow以位/秒計算）。

主動監控

在此模式下，BR通過其WAN介面發出IP SLA探測來測量有關流量類的多個引數。收集的資訊將傳送回主控制器。測量以下引數：

- 可達性
- 延遲
- 損失
- 輸出頻寬
- 輸入頻寬

在主控制器上配置的監視方法處於活動狀態時，將自動生成這些探測器，而且也可以手動配置。預設情況下，傳送的探測是ICMP回應，但可以更改為TCP或UDP探測，具體取決於通過WAN鏈路傳送的流量型別。

當退出BR選擇正在進行時，所有BR將傳送活動探測器以獲取Netflow學習的字首。選擇退出BR後，其他BR將停止傳送活動探測器。選定的BR將繼續傳送活動探測器。

混合模式

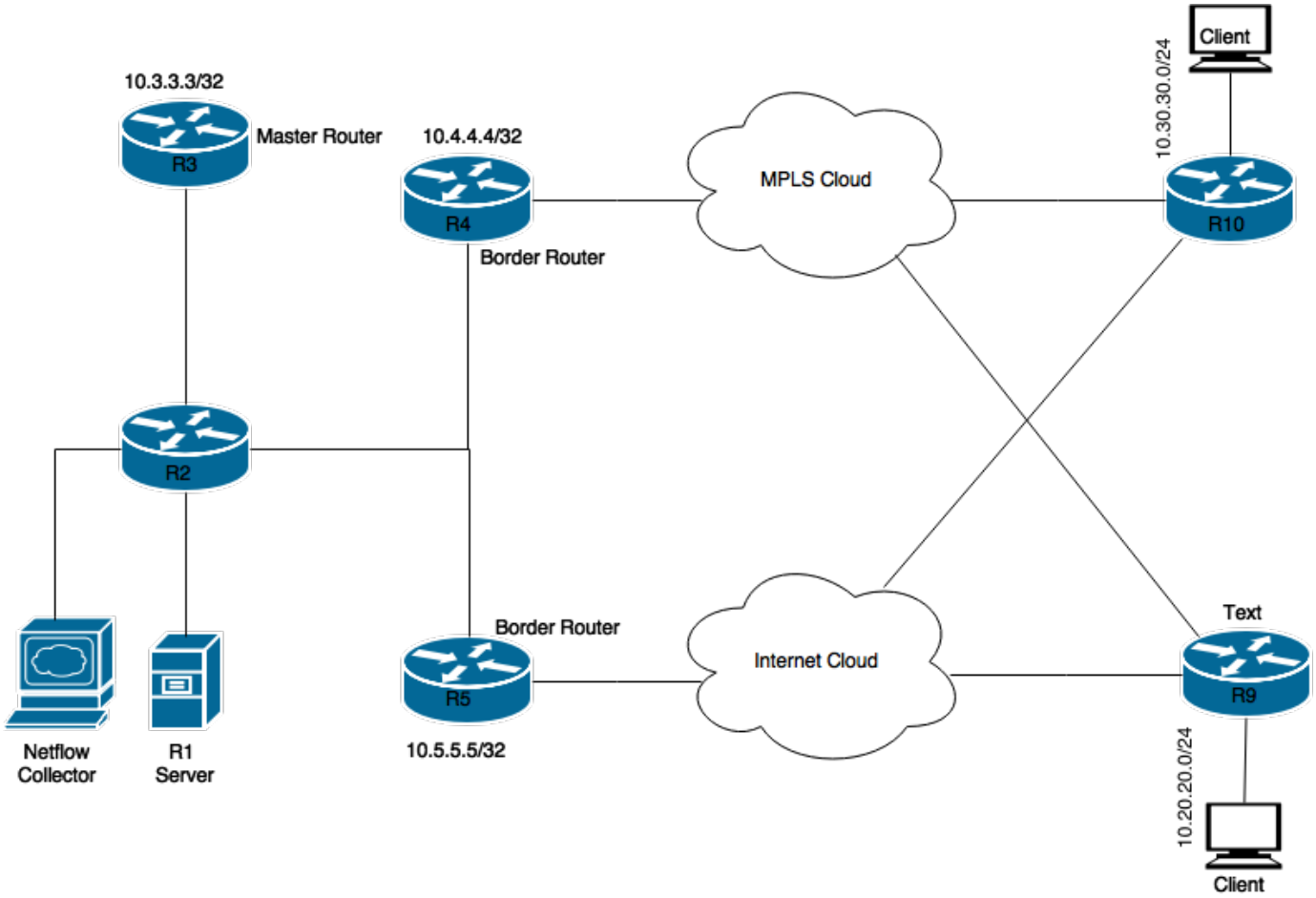
混合模式使用Netflow統計資訊和IP服務級別協定(SLA)來確定出口點(BR)和鏈路監控。在此模式下，IP SLA探測資訊用於選擇退出點，然後使用Netflow統計資訊監視該BR到目的地的WAN連線。

當PfR處於學習狀態且尚未進入「INPOLICY」狀態時，所有BR都將傳送從Netflow收集的字首的活動探測器。這是為了確定各自的鏈路條件。當MC狀態更改為「INPOLICY」時，所有BR都將停止傳送主動探測器，並且現在將被動地執行監控（使用Netflow）。

設定

此影象可用作本文檔其餘部分的示例拓撲：

網路圖表



相關配置

使用不同模式時需要此基本配置。R3配置為MC，因此必須在R3上完成以下配置：

被動模式

```
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
```

主動模式

```
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

這是預設模式。如果未提及mode命令，則混合模式將被啟用，或者同時使用命令**mode monitor**來啟用混合模式。

```
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
```

> **附註**：如果手動指定命令**mode monitor**，則不會在組態中顯示該命令，因為它是一個預設命令。

驗證

大多數驗證命令在MC上執行。這些命令可用於驗證不同模式下的工作。

被動模式

```
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
```

測試1 — 從伺服器啟動TCP資料流

```
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 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 N
                          INPOLICY        0          10.5.5.5 Et0/1           BGP
              1        1        0        0        0        0       14        1
              N        N        N        N        N        N
```

測試2 — 從伺服器啟動UDP資料流

```
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 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 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，對於TCP流量，您可以看到延遲和無法到達計數器也在填充中，但是對於UDP流，您只能看到頻寬計數器在填充中。

主動模式

```
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
```

測試 — 從伺服器發起TCP資料流

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 N
                         INPOLICY        0          10.4.4.4 Et0/1           BGP
             N        N        N        N        N        N        N        N
            54       54        0        0        N        N        N        N

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

在MC上的流量類進入「INPOLICY」狀態並選擇BR1作為傳送所有流量的BR後，BR2將停止傳送探測：

```
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
```

測試 — 從伺服器發起TCP資料流

當正在測量流量類(TC)且狀態尚未「INPOLICY」時，兩個BR都將向從Netflow收集的字首傳送活動探測器。這是為了確定各自的鏈路條件。

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
          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 N
                          HOLDDOWN        61          10.5.5.5Et0/1           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 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
```

當MC上的狀態更改為「INPOLICY」時，兩個BR都將停止傳送主動探測器，並且各自的監控將會切換到被動模式（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           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           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
```

如圖所示，您可以看到被動元件和主動元件的計數器。此外，在TC移至「INPOLICY」狀態後，BR上的探測將停止。

```
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
```

附註：15.6(3)M版、15.7(3)M版和更高版本的T系列版本不支援PfRv2。此外，版本16.3.1具有PfRv2 CLI，但不支援功能。當代碼從MCP移動到Polaris時，功能被破壞，這在Polaris版本中無法修復。

疑難排解

目前尚無適用於此組態的具體疑難排解資訊。