

# Limitação do alvo da rota

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## Introdução

Este documento descreve um mecanismo por meio de que a troca do VPNv4 e dos prefixos VPNv6 para o Roteadores da ponta de provedor (PE) é reduzida ao necessário mínimo.

## Finalidade da limitação do alvo da rota

Com Multiprotocol Label Switching (MPLS) VPN, o par do internal border gateway protocol (iBGP) ou o refletor de rota (RR) enviam todos os prefixos VPN4 e/ou VPN6 aos roteadores de PE. O roteador de PE deixa cair os prefixos VPN4/6 para que não há nenhum VPN Routing and Forwarding de importação (VRF). Este é um comportamento onde o RR envie os prefixos VPN4/6 ao roteador de PE, que não precisa. Este é um desperdício da potência de processamento no RR e no PE e de um desperdício da largura de banda.

Com limitação do alvo da rota (RTC), o RR envia somente os prefixos VPN4/6 queridos ao PE. “Quis” significa que o PE tem o VRF que importa os prefixos específicos.

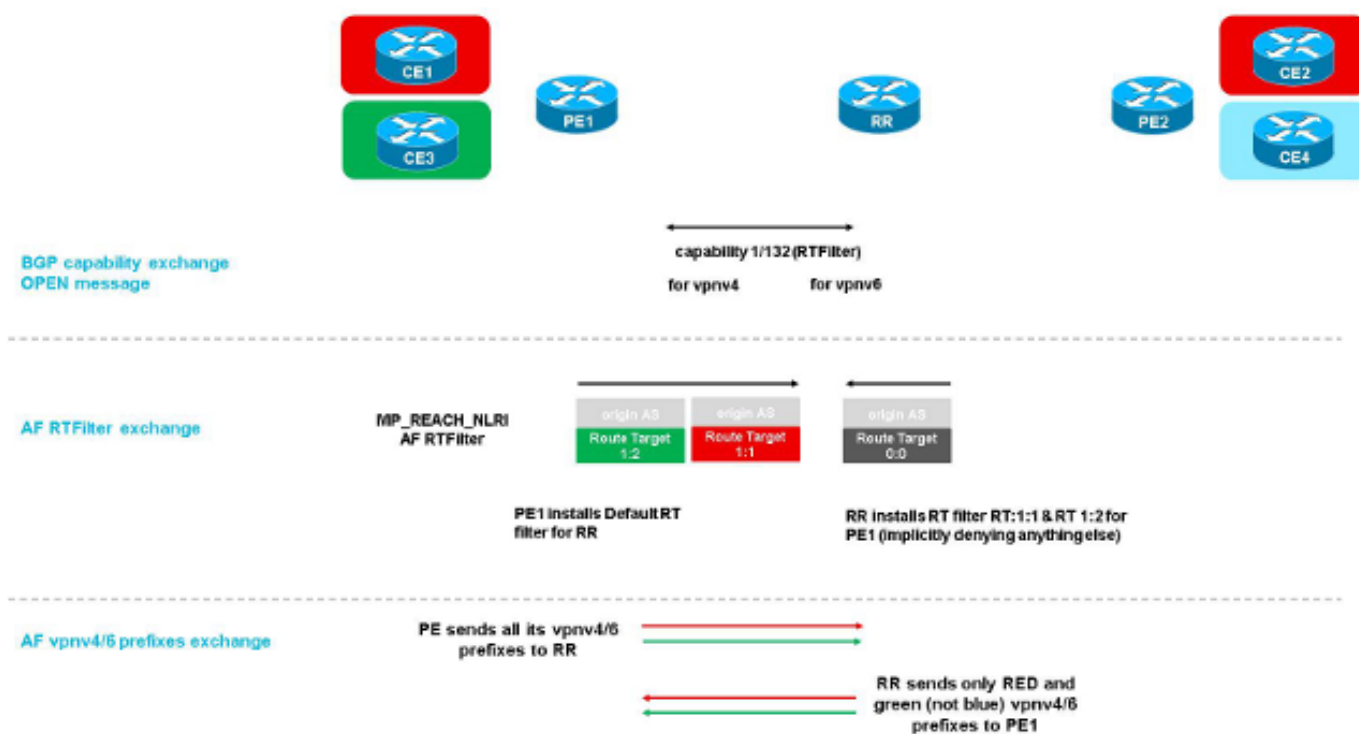
O RFC 4684 especifica o RTC. O apoio é através de um rfilter novo da família do endereço para o VPNv4 e o VPNv6.

A informação de filtragem do alvo da rota (RT) é obtida da lista de importação VPN RT de todos os VRF no roteador de PE. O roteador de PE envia esta informação de filtragem como uma atualização BGP no rfilter da família do endereço ao RR. Esta informação de filtragem ou a sociedade RT são codificadas na informação de alcançabilidade da camada de rede (NLRI) dos atributos MP\_REACH\_NLRI e MP\_UNREACH\_NLRI.

O bgp peer de recepção traduz este NLRI em um filtro e instala este filtro de partida ao par de emissão. O bgp peer de recepção usa este filtro para decidir que prefixos VPNv4/6 a enviar ou não enviar, dependente da presença de RT anexados.

Para que o RTC trabalhe, ambos os bgp peer precisam de apoiar o RTC. Isto é, o RR e o PE precisam de apoiá-lo. Contudo, o desenvolvimento pode ser incremental, que significa que não todo o RR e roteadores de PE precisam do apoiar em um vão. O RTC pode trabalhar na rede, com alguns roteadores de PE que apoiam a e outro não. No Roteadores que o apoia, o RTC já será ativo. No Roteadores que não o apoia ainda as propagandas trabalharão como antes, que é sem RTC (assim sem algum filtragem externa).

Esta figura mostra o princípio de RTC:



## Comportamento sem RTC

O RR envia todos os prefixos VPN4/6 ao PE. O PE deixa cair esses para que não há nenhuma importação do RT. Debugar atualizações BGP mostram os prefixos deixados cair. NEGADO da mensagem "devido a: a comunidade extendida não apoiada" é dada.

Um exemplo para o unicast do VPNv4 é como segue:

```
BGP(4): 10.100.1.3 rcvd UPDATE w/ att: nexthop 10.100.1.1, origin i, localpref 100,
metric 0, originator 10.100.1.1, clusterlist 10.100.1.3, merged path 65003,
AS_PATH , extended community RT:1:2
BGP(4): 10.100.1.3 rcvd 1:2:10.100.1.6/32, label 27 -- DENIED due to: extended
community not supported;
```

Um exemplo para o unicast VPNv6 é como segue:

```
BGP(5): 10.100.1.3 rcvd UPDATE w/ attr: nexthop ::FFFF:10.100.1.1, origin i,
```

```
localpref 100, metric 0, originator 10.100.1.1, clusterlist 10.100.1.3,  
merged path 65003, AS_PATH , extended community RT:1:2  
BGP(5): 10.100.1.3 rcvd [1:2]2001:10:100:1::6/128, label 23 -- DENIED due to:  
extended community not supported;
```

## Configuração de RTC

### Configuração PE

```
vrf definition green  
  rd 1:2  
  route-target export 1:2  
  route-target import 1:2  
  !  
  address-family ipv4  
  exit-address-family  
!  
vrf definition red  
  rd 1:1  
  route-target export 1:1  
  route-target import 1:1  
  !  
  address-family ipv4  
  exit-address-family  
  !  
  address-family ipv6  
  exit-address-family  
  
router bgp 1  
  bgp log-neighbor-changes  
  neighbor 10.100.1.3 remote-as 1  
  neighbor 10.100.1.3 update-source Loopback0  
  neighbor 10.100.1.4 remote-as 1  
  neighbor 10.100.1.4 update-source Loopback0  
  !  
  address-family vpnv4  
  neighbor 10.100.1.3 activate  
  neighbor 10.100.1.3 send-community both  
  neighbor 10.100.1.4 activate  
  neighbor 10.100.1.4 send-community both  
  exit-address-family  
  !  
  address-family rtfiler unicast  
  neighbor 10.100.1.3 activate  
  neighbor 10.100.1.3 send-community extended  
  exit-address-family  
  !  
  address-family ipv4 vrf green  
  neighbor 10.1.6.6 remote-as 65003  
  neighbor 10.1.6.6 activate  
  neighbor 10.1.6.6 send-community both  
  exit-address-family  
  !  
  address-family ipv4 vrf red  
  neighbor 10.1.5.5 remote-as 65001
```

```
neighbor 10.1.5.5 activate
neighbor 10.1.5.5 send-community both
exit-address-family
```

## Configuração RR

```
router bgp 1
  bgp log-neighbor-changes
  neighbor 10.100.1.1 remote-as 1
  neighbor 10.100.1.1 update-source Loopback0
  neighbor 10.100.1.2 remote-as 1
  neighbor 10.100.1.2 update-source Loopback0
  !
  address-family vpnv4
    neighbor 10.100.1.1 activate
    neighbor 10.100.1.1 send-community both
    neighbor 10.100.1.1 route-reflector-client
    neighbor 10.100.1.2 activate
    neighbor 10.100.1.2 send-community both
    neighbor 10.100.1.2 route-reflector-client
  exit-address-family
  !
  address-family rtfiler unicast
    neighbor 10.100.1.1 activate
    neighbor 10.100.1.1 send-community both
    neighbor 10.100.1.1 route-reflector-client
    neighbor 10.100.1.1 default-originate
  exit-address-family
```

## Comportamento do RTC

Quando espreitar BGP estabelece, os pares trocam a capacidade pelo rtfiler, que é 1/132 (para o VPNV4 e o VPNV6).

```
RR1# show bgp rtfiler unicast all neighbors 10.100.1.1
BGP neighbor is 10.100.1.1, remote AS 1, internal link
  BGP version 4, remote router ID 10.100.1.1
  BGP state = Established, up for 00:14:28
  Last read 00:00:01, last write 00:00:56, hold time is 180,
  keepalive interval is 60 seconds
  Neighbor sessions:
    1 active, is not multiseession capable (disabled)
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Four-octets ASN Capability: advertised and received
    Address family IPv4 Unicast: received
    Address family VPNv4 Unicast: advertised and received
    Address family VPNv6 Unicast: advertised and received
    Address family RT Filter: advertised and received
    Enhanced Refresh Capability: advertised and received
    Multiseession Capability:
      Stateful switchover support enabled: NO for session 1
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
```

	Sent	Rcvd
Opens:	1	1
Notifications:	0	0
Updates:	6	7
Keepalives:	17	18
Route Refresh:	0	0
Total:	24	30

Default minimum time between advertisement runs is 0 seconds

For address family: VPNv4 Unicast

Session: 10.100.1.1

BGP table version 65, neighbor version 65/0

Output queue size : 0

Index 19, Advertise bit 1

Route-Reflector Client

19 update-group member

RT Filter activate

Community attribute sent to this neighbor

Slow-peer detection is disabled

Slow-peer split-update-group dynamic is disabled

	Sent	Rcvd
--	------	------

...

For address family: VPNv6 Unicast

Session: 10.100.1.1

BGP table version 5, neighbor version 5/0

Output queue size : 0

Index 3, Advertise bit 1

Route-Reflector Client

3 update-group member

RT Filter activate

Community attribute sent to this neighbor

Slow-peer detection is disabled

Slow-peer split-update-group dynamic is disabled

...

For address family: RT Filter

Session: 10.100.1.1

BGP table version 52, neighbor version 52/0

Output queue size : 0

Index 13, Advertise bit 0

Route-Reflector Client

13 update-group member

NEXT\_HOP is always this router for eBGP paths

Community attribute sent to this neighbor

Default information originate, default sent

Slow-peer detection is disabled

Slow-peer split-update-group dynamic is disabled

	Sent	Rcvd
Prefix activity:	----	----
Prefixes Current:	1	2 (Consumes 160 bytes)
Prefixes Total:	1	2
Implicit Withdraw:	0	0
Explicit Withdraw:	0	0
Used as bestpath:	n/a	2
Used as multipath:	n/a	0

	Outbound	Inbound
Local Policy Denied Prefixes:	-----	-----
Bestpath from iBGP peer:	2	n/a
Total:	2	0

Number of NLRIs in the update sent: max 1, min 0

Last detected as dynamic slow peer: never  
Dynamic slow peer recovered: never  
Refresh Epoch: 1  
Last Sent Refresh Start-of-rib: never  
Last Sent Refresh End-of-rib: never  
Last Received Refresh Start-of-rib: never  
Last Received Refresh End-of-rib: never

	Sent	Rcvd
Refresh activity:	----	----
Refresh Start-of-RIB	0	0
Refresh End-of-RIB	0	0

Address tracking is enabled, the RIB does have a route to 10.100.1.1  
Connections established 16; dropped 15  
Last reset 00:14:28, due to Peer closed the session of session 1  
Transport(tcp) path-mtu-discovery is enabled  
Graceful-Restart is disabled

## PE

RR1# **show bgp rtfilter unicast all neighbors 10.100.1.1**

BGP neighbor is 10.100.1.1, remote AS 1, internal link  
BGP version 4, remote router ID 10.100.1.1  
BGP state = Established, up for 00:14:28  
Last read 00:00:01, last write 00:00:56, hold time is 180,  
keepalive interval is 60 seconds

Neighbor sessions:

1 active, is not multiseession capable (disabled)

Neighbor capabilities:

Route refresh: advertised and received(new)  
Four-octets ASN Capability: advertised and received  
Address family IPv4 Unicast: received  
Address family VPNv4 Unicast: advertised and received  
Address family VPNv6 Unicast: advertised and received  
Address family RT Filter: advertised and received  
Enhanced Refresh Capability: advertised and received  
Multiseession Capability:  
Stateful switchover support enabled: NO for session 1

Message statistics:

InQ depth is 0  
OutQ depth is 0

	Sent	Rcvd
Opens:	1	1
Notifications:	0	0
Updates:	6	7
Keepalives:	17	18
Route Refresh:	0	0
Total:	24	30

Default minimum time between advertisement runs is 0 seconds

For address family: VPNv4 Unicast

Session: 10.100.1.1

BGP table version 65, neighbor version 65/0

Output queue size : 0

Index 19, Advertise bit 1

Route-Reflector Client

19 update-group member

RT Filter activate  
Community attribute sent to this neighbor  
Slow-peer detection is disabled  
Slow-peer split-update-group dynamic is disabled

	Sent	Rcvd
--	------	------

...

For address family: VPNv6 Unicast  
Session: 10.100.1.1  
BGP table version 5, neighbor version 5/0  
Output queue size : 0  
Index 3, Advertise bit 1  
Route-Reflector Client  
3 update-group member  
RT Filter activate  
Community attribute sent to this neighbor  
Slow-peer detection is disabled  
Slow-peer split-update-group dynamic is disabled

...

For address family: RT Filter  
Session: 10.100.1.1  
BGP table version 52, neighbor version 52/0  
Output queue size : 0  
Index 13, Advertise bit 0  
Route-Reflector Client  
13 update-group member  
NEXT\_HOP is always this router for eBGP paths  
Community attribute sent to this neighbor  
Default information originate, default sent  
Slow-peer detection is disabled  
Slow-peer split-update-group dynamic is disabled

	Sent	Rcvd
Prefix activity:	----	----
Prefixes Current:	1	2 (Consumes 160 bytes)
Prefixes Total:	1	2
Implicit Withdraw:	0	0
Explicit Withdraw:	0	0
Used as bestpath:	n/a	2
Used as multipath:	n/a	0

	Outbound	Inbound
Local Policy Denied Prefixes:	-----	-----
Bestpath from iBGP peer:	2	n/a
Total:	2	0

Number of NLRIs in the update sent: max 1, min 0  
Last detected as dynamic slow peer: never  
Dynamic slow peer recovered: never  
Refresh Epoch: 1  
Last Sent Refresh Start-of-rib: never  
Last Sent Refresh End-of-rib: never  
Last Received Refresh Start-of-rib: never  
Last Received Refresh End-of-rib: never

	Sent	Rcvd
Refresh activity:	----	----
Refresh Start-of-RIB	0	0
Refresh End-of-RIB	0	0

Address tracking is enabled, the RIB does have a route to 10.100.1.1  
Connections established 16; dropped 15  
Last reset 00:14:28, due to Peer closed the session of session 1  
Transport(tcp) path-mtu-discovery is enabled  
Graceful-Restart is disabled

```

PE1# show bgp rtfilter unicast rt 1:1
BGP routing table entry for 1:2:1:1, version 3
Paths: (1 available, best #1)
  Advertised to update-groups:
    13
  Refresh Epoch 1
  Local
    0.0.0.0 from 0.0.0.0 (10.100.1.1)
      Origin IGP, localpref 100, weight 32768, valid, sourced, local, best
      RT generation: import
      rx pathid: 0, tx pathid: 0x0

```

O rtfilter AF igualmente usa grupos da atualização:

```

PE1# show bgp rtfilter unicast all update-group 13
BGP version 4 update-group 13, internal, Address Family: RT Filter
BGP Update version : 12/0, messages 0
Extended-community attribute sent to this neighbor
Topology: global, highest version: 12, tail marker: 12
Format state: Current working (OK, last not in list)
  Refresh blocked (not in list, last not in list)
Update messages formatted 1, replicated 1, current 0, refresh 0, limit 1000
Number of NLRIs in the update sent: max 2, min 0
Minimum time between advertisement runs is 0 seconds
Has 1 member:
  10.100.1.3

```

Verifique o RTFilter enviado pelo PE:

```

PE1# show bgp rtfilter unicast all neighbors 10.100.1.3 advertised-routes
BGP table version is 8, local router ID is 10.100.1.1
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

```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1:2:1:1	0.0.0.0			32768	i
*> 1:2:1:2	0.0.0.0			32768	i

Total number of prefixes 2

A codificação do prefixo da sociedade do alvo da rota é 4 bytes para o número de sistema autônomo e 8 bytes para o alvo da rota, que é um atributo da comunidade estendida. No exemplo acima, o prefixo "1:2:1:1" do rtfilter é decodificado como segue:

- 1 é o número de sistema autônomo
- 2 são o tipo e o subtipo do atributo da comunidade estendida (no decimal) (refira o RFC 4360)
- 1:1 são o alvo próprio da rota

O RR envia o filtro do padrão a PE (RR-cliente). Isto é porque pelo projeto, o RR quer todas as rotas do VPNv4:

```

PE1# show bgp rtfilter unicast all neighbors 10.100.1.3 advertised-routes
BGP table version is 8, local router ID is 10.100.1.1
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

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1:2:1:1	0.0.0.0			32768	i
*> 1:2:1:2	0.0.0.0			32768	i

Total number of prefixes 2

O PE recebe e instala um filtro rt do padrão. Por exemplo, envia tudo ao RR:  
(debugar atualizações do unicast do rfilter BGP)

```
PE1# show bgp rfilter unicast all neighbors 10.100.1.3 advertised-routes
BGP table version is 8, local router ID is 10.100.1.1
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
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1:2:1:1	0.0.0.0			32768	i
*> 1:2:1:2	0.0.0.0			32768	i

Total number of prefixes 2

O RR recebe e instala o rfilter do PE1:  
(debugar atualizações do unicast do rfilter BGP)

```
PE1# show bgp rfilter unicast all neighbors 10.100.1.3 advertised-routes
BGP table version is 8, local router ID is 10.100.1.1
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
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1:2:1:1	0.0.0.0			32768	i
*> 1:2:1:2	0.0.0.0			32768	i

Total number of prefixes 2

Verifique os filtros recebidos no RR:

```
RR1# show bgp vpnv4 unicast all neighbors 10.100.1.1 received rfilters
Address family: VPNv4 Unicast
Extended community filter has: 2 entries with default filtering disabled
Incremental refresh walk mode
Status codes: * valid, S Stale > installed
Route-Target Outbound Filter
*> Extended Community RT:1:2
*> Extended Community RT:1:1
```

O PE não instala um filtro RT com RT específicos. O PE recebeu o filtro rt do padrão do RR,  
assim que o PE envia todos os prefixos VPNv4/v6:

```
PE1# show bgp vpnv4 unicast all neighbors 10.100.1.3 received rfilters
Address family: VPNv4 Unicast
```

```
Extended community filter has: 1 entries with default filtering enabled  
Incremental refresh walk mode
```

A fim criar um filtro do padrão RT, configurar o “vizinho que x.x.x.x padrão-originam” sob o rtfiler AF.

Isto será criado automaticamente no RR para os peerings do cliente RR.

## RR

```
PE1# show bgp vpnv4 unicast all neighbors 10.100.1.3 received rtfilters  
Address family: VPNv4 Unicast  
Extended community filter has: 1 entries with default filtering enabled  
Incremental refresh walk mode
```

## A rota refresca a manipulação

Quando uma importação nova RT é configurada ou quando a importação RT está removida, uma rota refresca está enviada do PE ao RR para as famílias VPNv4/6 do endereço.

Quando um VRF novo é configurado, o PE envia um rota-refrescamento ao RR.

Em ambos os casos com active RTC, o RR não envia todos os prefixos VPNv4/6 ao PE. Envia somente o grupo de acordo com o filtro RT.

## Informações Relacionadas

- [Suporte Técnico e Documentação - Cisco Systems](#)