

VoIP QoS para Frame Relay para Entrelaçamento de ATM com LLQ, PPP LFI e cRTP

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Introdução

Este documento fornece um exemplo de configuração para Voz sobre IP, utilizando PPP Multilink sobre ATM e Entrelaçamento de Frame Relay (VoIP usando MLPoATM/MLPoFR). O foco central dos exemplos de configuração é a disposição do Qualidade de Serviço (QoS) a fim apoiar corretamente a Voz através de um ATM/Frame WAN colaborado relé. Os exemplos de configuração igualmente utilizam o Compressed Real-Time Protocol (cRTP), que foi apoiado no ATM desde a liberação 12.2(2)T do Cisco IOS ® Software.

O documento pode ser autônomo lido para a orientação de configuração, os exemplos de configuração, e os comandos de verificação a fim para ser usado em construir a rede. Também são fornecidas algumas informações de fundo sobre questões específicas associadas ao uso de entrelaçamento de ATM / Frame Relay. Refira estes documentos para obter mais informações sobre de QoS para o VOIP sobre o Frame Relay ou o PPP:

- [Links de VoIP por PPP com qualidade de serviço \(LLQ / prioridade IP RTP, LFI, cRTP\)](#)
- [VoIP sobre Frame Relay com QoS \(fragmentação, molde de tráfego, prioridade LLQ / IP RTP\)](#)

Pré-requisitos

Requisitos

Certifique-se de atender a estes requisitos antes de tentar esta configuração:

Você deve ser familiar com estas áreas de tecnologia:

- Listas de controle de acesso
- PVCs (circuitos virtuais permanentes) de ATM
- Circuitos virtuais permanentes de Frame Relay (Identificador de Conexão de Enlace de Dados (DLCIs))
- Gerenciamento de largura de banda
- LLQ
- LFI
- Moldes virtuais e interfaces de acesso virtual
- MLPPP
- cRTP

Componentes Utilizados

As informações neste documento são baseadas nestas versões de software e hardware:

- Cisco 3640 como o ATM Router
- Cisco 2620 como o Frame Relay Router
- Cisco IOS Software Release 12.2(8)T (IP Plus)

Nota: Como uma diretriz geral, a versão de manutenção a mais atrasada do mainline do Cisco IOS 12.2 é o Cisco IOS Software Release recomendado a usar-se para o MLPoATM/Cisco IOS Software Release 12.2T do QUADRO está exigida no ATM Router se o cRTP é usado.

As características relevantes foram introduzidas nestes Cisco IOS Software Release:

- O LFI foi introduzido no Software Cisco IOS Versão 11.3.
- O LLQ foi introduzido na Versão 12.0(7)T do Software Cisco IOS.
- Os recursos LLQ sobre Frame Relay e ATM por PVC foram introduzidos na versão do software Cisco IOS 12.1(2)T.
- O multienlace PPP LFI para Frame Relay e circuitos virtuais de ATM foi introduzido no software Cisco IOS versão 12.1(5)T.
- O cRTP via ATM foi introduzido no Software Cisco IOS Versão 12.2(2)T.

As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. Todos os dispositivos utilizados neste documento foram iniciados com uma configuração (padrão) inicial. Se a sua rede estiver ativa, certifique-se de que entende o impacto potencial de qualquer comando.

Convenções

Consulte as [Convenções de Dicas Técnicas da Cisco](#) para obter mais informações sobre convenções de documentos.

Informações de Apoio

As questões básicas em fornecer a prevenção de retardo e atraso de sincronização de ponta a ponta minimizada para VoIP através de uma rede colaborada relé do ATM/Frame são:

- Prioridade estrita para tráfego de voz (enfileiramento de baixa latência (LLQ))
- Fragmentação e intercalação de link (LFI)
- Modelagem de Tráfego Frame Relay (FRTS) para voz
- Modelagem de tráfego ATM

Estes documentos fornecem fontes úteis de uma informações de fundo mais adicional:

- [Qualidade de serviço de voz sobre IP](#)
- [Configurando a fragmentação e interfaceamento de link para Frame Relay e circuitos virtuais ATM](#)

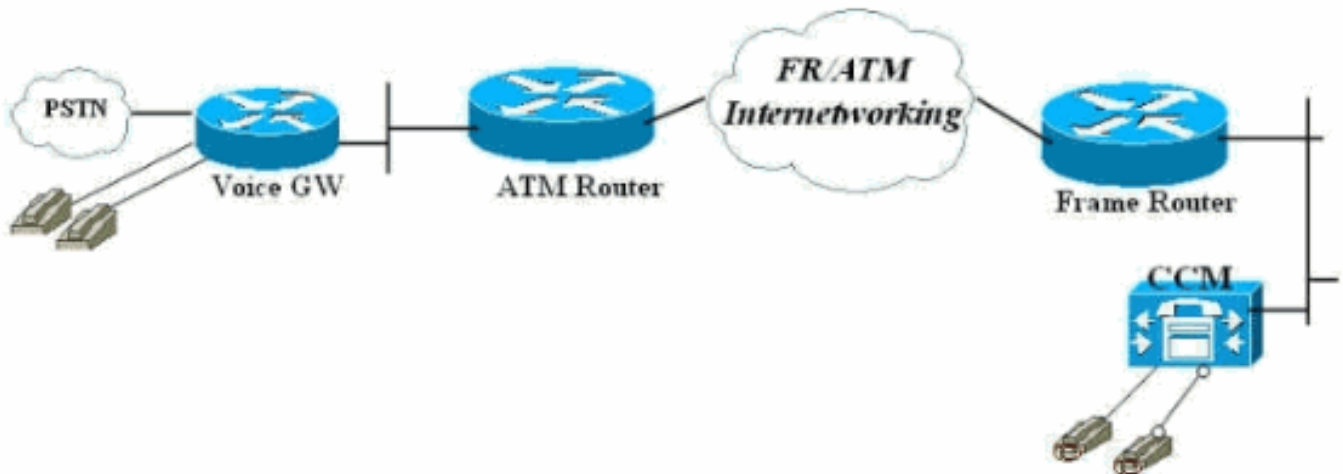
Configurar

Nesta seção, você encontrará informações para configurar os recursos descritos neste documento.

Nota: Use a [ferramenta de consulta de comandos \(clientes registrados somente\)](#) a fim encontrar mais informação nos comandos usados neste documento.

Diagrama de Rede

Este documento utiliza a seguinte configuração de rede:



Configurações

Este documento utiliza as seguintes configurações:

- [Roteador conectado do Frame Relay](#)
- [Roteador conectado ATM](#)

Nota: É importante notar que nesta configuração, os dois Roteadores são lado a lado conectado sobre um Frame Relay ao switch de entrelaçamento ATM. Na maioria de topologias contudo, os

roteadores ativado da Voz podem existir em qualquer lugar. Geralmente, o Roteadores da Voz usa a conectividade de LAN ao outro Roteadores, que são conectados ao ATM/Frame WAN. Nos casos, o Roteadores conectado a WAN, o Frame Relay, e o ATM têm que ser configurados para o LLQ, o LFI, e o MLPPP assim que pode fornecer QoS, e não o Gateways de voz segundo as indicações destas configurações.

Roteador conectado do Frame Relay

```
!--- Note: This configuration is commented and numbered
!--- in the order that commands should be entered.
version 12.2 service timestamps debug datetime msec
service timestamps log uptime no service password-
encryption ! hostname FR ! enable password cisco !
username ATM password 0 cisco voice-card 0 dspfarm ! ip
subnet-zero ! ! ! ! !--- access-list 105 permit ip any
any dscp ef specifies !--- that all traffic with
Differentiated Services Code Point (DSCP) !--- are set
to 40 falls into this access-list. !--- This class-map
command defines a class of traffic called "voice".
access-list 105 permit ip any any dscp ef access-list
105 permit udp any any range 16384 32767 access-list 105
permit ip any any precedence critical ! class-map match-
all voice match access-group 105 ! ! ! !--- This policy-
map command defines a policy for LLQ called "VoIP" and
!--- maps the "voice" class to the "VOIP" policy. !---
"priority" defines the amount of bandwidth reserved for
the priority queue. !--- "class-default" specifies that
the default class is also mapped to this policy. !---
"fair-queue" specifies that all other traffic is served
in the WFQ. policy-map VOIP class voice priority 48
class class-default fair-queue !--- Note: Although it is
possible to queue various types of !--- real-time
traffic to the priority queue, !--- Cisco recommends
that you direct only voice traffic !--- to it. Real-time
traffic such as video or voice !--- could introduce
variations in delay. Please note voice and !--- video
should not be combined in the same PVC. !--- (the
priority queue is a First In First Out (FIFO) !---
queue). Voice traffic requires that delay be !---
nonvariable in order to avoid jitter. !--- Note: The sum
of the values for priority and !--- bandwidth statements
needs to be less !--- than or equal to 75% of the link
bandwidth. !--- Otherwise service-policy cannot be !---
assigned to the link. When configuring VoIP over a !---
64 Kbps link to support two !--- voice calls, it is
common to allocate more than 75% !--- (48 Kbps) of the
link bandwidth to !--- the priority queue. In such
cases, you can use the !--- max-reserved-bandwidth <#%>
command in order to raise !--- available bandwidth to a
value more than 75%. ! ! ! fax interface-type fax-mail
mta receive maximum-recipients 0 ! interface Loopback0
ip address 10.1.1.2 255.255.255.0 ! ! interface
FastEthernet0/0 ip address 172.17.111.16 255.255.255.224
duplex auto speed auto ! interface Serial0/0 no ip
address encapsulation frame-relay IETF no ip route-cache
no ip mroute-cache frame-relay traffic-shaping ! !---
Choose the frame relay interface to be !--- associated
with the virtual interface. The !--- virtual template
could equally have been associated !--- with the
physical interface. !--- The "class mlp" associates the
virtual template interface !--- defined in "interface
Virtual-Template1" with a Frame Relay DLCI. !---
```

Associates a Frame Relay map class with a DLCI.

```

interface Serial0/0.1 point-to-point no ip route-cache
no ip mroute-cache frame-relay interface-dlci 16 ppp
Virtual-Templat1 class mlp !--- The interface command
creates a virtual !--- template called Virtual-
Templat1. !--- A bandwidth of 64 Kbps is assigned to
this !--- template interface. This bandwidth is used !--
- by Cisco IOS to calculate the data fragment size as
noted regarding !--- interleaving of PPP segments. !---
"ip rtp header-compression"-cRTP is supported in an
ATM/Frame Relay Interworking !--- environment. It
requires Cisco IOS Software Release 12.2(2)T on the !---
ATM router. !--- "service-policy output VOIP"-The VoIP
policy created earlier is assigned !--- to this
interface in the outbound direction. !--- PPP multilink
is enabled and the !--- maximum delay per segment is
specified. This bandwidth is !--- used by Cisco IOS to
calculate the data fragment size as noted. !---
Interleaving of PPP segments is enabled, which allows !-
-- voice packets to be expedited. Voice !--- packets
need only wait behind a single segment of !--- a
previously queued data packet (for example, 10 ms !---
delay) rather than wait until the end of the !--- entire
data packet. Cisco IOS calculates the !--- data fragment
size using the following formula: !--- fragment size =
delay x bandwidth/8 ! interface Virtual-Templat1
bandwidth 64 ip unnumbered loopback0 ip rtp header-
compression no ip route-cache load-interval 30 max-
reserved-bandwidth 99 service-policy output VOIP ppp
multilink ppp multilink fragment-delay 10 ppp multilink
interleave ! ! ip classless ip route 0.0.0.0 0.0.0.0
172.17.111.1 no ip http server ip pim bidir-enable ! ! !
!--- A map class called mlp is created. !--- With "no
frame-relay adaptive-shaping", adaptive !--- shaping is
disabled. You do not !--- want to exceed CIR and have
voice packets !--- possibly queued within the Frame
Relay network. !--- Waiting for a BECN to resolve this
!--- situation could result in poor voice quality. !---
The frame-relay cir 64000 command forces the router to
transmit !--- at the desired CIR rate rather than line
!--- rate for the port. !--- "frame-relay bc 640"
configures the Bc value to force the desired !--- Tc
(shaping interval) value is 10 ms. !--- This formula
should be used to determine !--- the Bc value to use:  $Tc = Bc/CIR$ . A !--- smaller Tc value reduces the interval a
voice !--- packet has to wait to be sent. !--- As in
"frame-relay be 0", the Be value should be set to zero
!--- in order to avoid voice being sent as part of a
burst !--- that is not guaranteed by the Frame Relay
network. map-class frame-relay mlp no frame-relay
adaptive-shaping frame-relay cir 64000 frame-relay bc
640 frame-relay be 0 ! call rsvp-sync ! voice-port 1/0/0
! voice-port 1/0/1 ! ! mgcp profile default ! dial-peer
cor custom ! ! ! dial-peer voice 123 voip destination-
pattern 123 session target ipv4:10.1.1.1 ip qos dscp cs5
media ip qos dscp cs5 signaling no vad ! dial-peer voice
456 pots destination-pattern 456 port 1/0/0 ! ! line con
0 line aux 0 line vty 0 4 exec-timeout 0 0 password
cisco login ! ! end

```

Roteador conectado ATM

!--- **Note:** This configuration is commented only !---
where additional consideration is required from the !---

```

above configuration of the Frame Relay router. version
12.2 service timestamps debug datetime msec service
timestamps log uptime no service password-encryption !
hostname ATM ! enable password cisco ! username FR
password 0 cisco memory-size iomem 25 ip subnet-zero ! !
! access-list 105 permit ip any any dscp ef access-list
105 permit udp any any range 16384 32767 access-list 105
permit ip any any precedence critical ! class-map match-
all voice match access-group 105 ! ! !--- Note: Matching
commands to the Frame Relay !--- router side of the
network. ! ! policy-map VOIP class voice priority 48
class class-default fair-queue !--- Note: Matching
commands to the Frame Relay !--- router side of the
network. ! ! fax interface-type fax-mail mta receive
maximum-recipients 0 ! controller T1 2/0 framing sf
linecode ami ! ! ! ! interface ATM0/0 no ip address ip
route-cache no atm ilmi-keepalive ! !--- "interface
ATM0/0.1 point-to-point" chooses the ATM subinterface.
!--- The physical interface could equally have been
used. !--- "pvc 10/100" creates an ATM PVC. !--- "cbr
64"-A VBR PVC has been defined on this example. !---
This exapmle uses VBR non-realtime and the sustained !--
- cell rate (SCR) should be equal to the peak !--- cell
rate (PCR) in order to avoid bursting. !--- ATM cell tax
and the possibility !--- of ATM bandwidth expansion due
to poor !--- fragment/cell alignment, means that it !---
cannot be assumed that the PCR/SCR on the ATM !--- side
should equal the CIR of the Frame Relay side. !---
Maintain the value of CIR on the Frame-Relay side to
define !--- our SCR, in this case, 64 kbps. This value
may in some networks !--- require some fine-tuning as
the CIR on the Frame side does not !--- exactly match
the SCR on the ATM but makes for a good-enough
estimation !--- for most purposes. !--- Refer to
Designing and Deploying !--- Multilink PPP over Frame
Relay and ATM !--- for more information. !---
"encapsulation aal5snap" is required. !--- "protocol ppp
Virtual-Templat1" associates the virtual !--- template
with the ATM PVC. interface ATM0/0.1 point-to-point ip
route-cache pvc 10/100 cbr 64 encapsulation aal5snap
protocol ppp Virtual-Templat1 ! ! interface loopback0
ip address 10.1.1.1 255.255.255.0 ! interface
Ethernet3/0 ip address 172.17.111.15 255.255.255.224
half-duplex ! interface Ethernet3/1 no ip address
shutdown half-duplex ! interface Virtual-Templat1
bandwidth 64 ip unnumbered loopback0 ip rtp header-
compression no ip route-cache load-interval 30 max-
reserved-bandwidth 99 service-policy output VOIP ppp
multilink ppp multilink fragment-delay 10 ppp multilink
interleave !--- Note: The virtual template is created in
!--- exactly the same way as for the !--- Frame Relay
router side of the network. !--- An additional
consideration for !--- the ATM router is that the
fragment size !--- should be optimized to fit into !---
an integral number of ATM cells. !--- Refer to Designing
and Deploying !--- Multilink PPP over Frame Relay and
ATM !--- for more information on this issue. ! ip
classless ip route 0.0.0.0 0.0.0.0 172.17.111.1 ip http
server ip pim bidir-enable ! ! call rsvp-sync ! voice-
port 1/0/0 description FXS ! voice-port 1/0/1 ! voice-
port 1/1/0 description FXO ! voice-port 1/1/1 ! ! mgcp
profile default ! dial-peer cor custom ! ! ! dial-peer
voice 456 voip destination-pattern 456 session target
ipv4:10.1.1.2 ip qos dscp cs5 media ip qos dscp cs5

```

```
signaling no vad ! dial-peer voice 123 pots destination-
pattern 123 port 1/1/0 ! ! line con 0 line aux 0 line
vty 0 4 exec-timeout 0 0 password cisco login ! ! end
```

Verificar

Use esta seção para confirmar se a sua configuração funciona corretamente.

A [Output Interpreter Tool \(apenas para clientes registrados\)](#) (OIT) suporta determinados comandos show. Use a OIT para exibir uma análise da saída do comando show.

Estes **comandos show** são úteis na verificação do status operacional do ambiente de colaboração do relé do ATM/Frame, que inclui o DLCI e as estatísticas do PVC, o estado do exame e da interface virtual, o aplicativo da política (QoS), e a informação de cRTP:

- **show ppp multilink interface interface-name** - Verifica se o pacote está up/down, qual interface de acesso virtual é o pacote (pacote MLPPP) e quais são membros (link PPP). Este comando igualmente verifica se as pilhas das quedas de portadora/quadros (<> perdido 0 dos fragmentos). A única perda de fragmento aceitável é aquela causada por erros de verificação de redundância cíclica (CRC).
- **show user** - Exibe o número associado à interface de acesso virtual. É possível utilizar informações desse comando ou do comando **show ppp multilink** para exibir estatísticas sobre a interface ou limpar a interface.
- **show frame-relay pvc dcli** — Indica a informação tal como parâmetros de modelagem de tráfego, valores de fragmentação, e pacotes descartado. Esse comando mostra também se a interface física foi vinculada à interface virtual.
- **show atm pvc pvc** - Exibe todos os ATM PVCs ativos e informações de tráfego.
- **show policy-map interface interface-name** Exibe toda a operação LLQ e as quedas no PQ. Refira compreendendo contadores de pacote de informação no **comando show policy-map interface** output para obter mais informações sobre dos vários campos deste comando. **Nota:** O enfileiramento complexo é sempre aplicado a uma interface virtual-access2. As outras interfaces usam o enfileiramento FIFO.
- **show ip rtp header-compression** – Exibe as estatísticas de compactação de cabeçalho RTP, se configuradas. Observe que as estatísticas estão anexadas à relação virtual-access2, que é o bundle interface.

Os exemplos destes comandos são mostrados aqui:

```
FR#show ppp multilink interface virtual-access 2 Virtual-Access2, bundle name is ATM Bundle up
for 00:22:42 0 lost fragments, 0 reordered, 0 unassigned 0 discarded, 0 lost received, 231/255
load 0x2E5 received sequence, 0x10C31 sent sequence Member links: 1 (max not set, min not set)
Virtual-Access1, since 00:22:42, last rcvd seq 0002E4 160 weight
```

Esta saída mostra os **usuários da mostra no Frame Relay Router**.

```
FR#show users Line User Host(s) Idle Location 67 vty 1 idle 00:00:00 10.1.1.1 Interface User
Mode Idle Peer Address Vi1 Virtual PPP (FR) - Vi2 Virtual PPP (Bundle) 00:00:00 10.1.1.1 FR#
```

Esta saída mostra os **usuários da mostra no ATM Router**.

```
ATM#show users Line User Host(s) Idle Location 131 vty 1 idle 00:00:00 64.104.207.95 Interface
User Mode Idle Peer Address Vi1 Virtual PPP (ATM) - Vi2 Virtual PPP (Bundle) 00:00:02 10.1.1.2
ATM#
```

Esta saída mostra o **comando show frame-relay pvc**.

```
FR#show frame-relay pvc 16 PVC Statistics for interface Serial0/0 (Frame Relay DTE) DLCI = 16,
DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0.1 input pkts 2301 output pkts
2295 in bytes 152266 out bytes 151891 dropped pkts 0 in FECN pkts 0 in BECN pkts 0 out FECN pkts
0 out BECN pkts 0 in DE pkts 0 out DE pkts 0 out bcast pkts 0 out bcast bytes 0 5 minute input
rate 9000 bits/sec, 9 packets/sec 5 minute output rate 9000 bits/sec, 9 packets/sec pvc create
time 23:46:56, last time pvc status changed 00:22:56 Bound to Virtual-Access1 (up, cloned from
Virtual-Template1) !--- PPP link interface. cir 64000 bc 640 be 0 byte limit 80 interval 10
mincir 64000 byte increment 80 Adaptive Shaping none pkts 2296 bytes 152053 pkts delayed 9 bytes
delayed 375 shaping active traffic shaping drops 0 Queueing strategy: fifo Output queue 0/40, 0
drop, 0 dequeued FR#
```

Esta saída mostra o comando show atm pvc 10/100 no ATM Router.

```
ATM#show atm pvc 10/100 ATM0/0.1: VCD: 1, VPI: 10, VCI: 100 CBR, SusRate: 128 AAL5-LLC/SNAP,
etype:0x0, Flags: 0x820, VCmode: 0x0 OAM frequency: 0 second(s), OAM retry frequency: 1
second(s) OAM up retry count: 3, OAM down retry count: 5 OAM Loopback status: OAM Disabled OAM
VC state: Not Managed ILMI VC state: Not Managed InARP frequency: 15 minutes(s) Transmit
priority 1 InPkts: 729, OutPkts: 729, InBytes: 49700, OutBytes: 51158 InProc: 0, OutProc: 729
InFast: 729, OutFast: 0, InAS: 0, OutAS: 0 InPktDrops: 0, OutPktDrops: 0/0/0
(holdq/outputq/total) CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0, LengthViolation: 0,
CPIErrors: 0 OAM cells received: 0 F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0 F4
InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0 OAM cells sent: 0 F5 OutEndloop: 0, F5
OutSegloop: 0, F5 OutRDI: 0 F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0 OAM cell drops: 0
Status: UP PPP: Virtual-Access2 from Virtual-Template1 !--- MLPPP bundle interface. ATM#
```

Este é o mapa de política da mostra no Frame Relay Router.

```
FR#show policy-map interface Virtual-Access2 Service-policy output: VoIP Class-map: voice
(match-all) 15483 packets, 959502 bytes 30 second offered rate 24000 bps, drop rate 0 bps Match:
ip dscp 40 Weighted Fair Queueing Strict Priority !--- LLQ Strict Priority Queue for voice.
Output Queue: Conversation 24 Bandwidth 48(kbps) Burst 1500 (Bytes) (pkts matched/bytes matched)
15536/962784 (total drops/bytes drops) 0/0 !--- No drops in the voice queue. Class-map: class-
default (match-any) 139 packets, 19481 bytes 30 second offered rate 1000 bps, drop rate 0 bps
Match: any Weighted Fair Queueing Flow Based Fair Queueing Maximum Number of Hashed Queues 16
(total queued/total drops/no-buffer drops) 0/0/0
```

Esta saída mostra o comando show policy map no ATM Router.

```
ATM#show policy-map interface Virtual-Access2 Service-policy output: VOIP Class-map: voice
(match-all) 11293 packets, 699718 bytes 30 second offered rate 24000 bps, drop rate 0 bps Match:
ip dscp 40 Weighted Fair Queueing Strict Priority !--- LLQ Strict Priority Queue for voice.
Output Queue: Conversation 24 Bandwidth 48 (kbps) Burst 1500 (Bytes) (pkts matched/bytes
matched) 11352/703376 (total drops/bytes drops) 0/0 !--- No drops in the voice queue. Class-map:
class-default (match-any) 63 packets, 9772 bytes 30 second offered rate 0 bps, drop rate 0 bps
Match: any Weighted Fair Queueing Flow Based Fair Queueing Maximum Number of Hashed Queues 16
(total queued/total drops/no-buffer drops) 0/0/0 ATM#
```

Esta saída mostra o comando show ip rtp header-compression no Frame Relay Router.

```
FR#show ip rtp header-compression RTP/UDP/IP header compression statistics: Interface Virtual-
Access1: Rcvd: 0 total, 0 compressed, 0 errors 0 dropped, 0 buffer copies, 0 buffer failures
Sent: 0 total, 0 compressed, 0 bytes saved, 0 bytes sent Connect: 16 rx slots, 16 tx slots, 0
long searches, 0 misses 0 collisions Interface Virtual-Template1: Rcvd: 0 total, 0 compressed, 0
errors 0 dropped, 0 buffer copies, 0 buffer failures Sent: 0 total, 0 compressed, 0 bytes saved,
0 bytes sent Connect: 16 rx slots, 16 tx slots, 0 long searches, 0 misses 0 collisions Interface
Virtual-Access2: Rcvd: 23682 total, 23681 compressed, 0 errors 0 dropped, 0 buffer copies, 0
buffer failures Sent: 327 total, 233 compressed, 8821 bytes saved, 5159 bytes sent 2.70
efficiency improvement factor Connect: 16 rx slots, 16 tx slots, 0 long searches, 94 misses 0
collisions 71% hit ratio, five minute miss rate 0 misses/sec, 0 max
```

Esta saída mostra o comando show ip rtp header-compression no ATM Router.

```
ATM#show ip rtp header-compression RTP/UDP/IP header compression statistics: Interface Virtual-
Access1: Rcvd: 0 total, 0 compressed, 0 errors 0 dropped, 0 buffer copies, 0 buffer failures
Sent: 0 total, 0 compressed, 0 bytes saved, 0 bytes sent Connect: 16 rx slots, 16 tx slots, 0
long searches, 0 misses 0 collisions, 0 negative cache hits Interface Virtual-Template1: Rcvd: 0
```


total, 0 compressed, 0 errors 0 dropped, 0 buffer copies, 0 buffer failures Sent: 0 total, 0 compressed, 0 bytes saved, 0 bytes sent Connect: 16 rx slots, 16 tx slots, 0 long searches, 0 misses 0 collisions, 0 negative cache hits Interface Virtual-Access2: Rcvd: 283 total, 233 compressed, 0 errors 0 dropped, 0 buffer copies, 0 buffer failures Sent: 25341 total, 25340 compressed, 955537 bytes saved, 564463 bytes sent 2.69 efficiency improvement factor Connect: 16 rx slots, 16 tx slots, 0 long searches, 1 misses 0 collisions, 100 negative cache hits 99% hit ratio, five minute miss rate 0 misses/sec, 0 max

Troubleshooting

Use esta seção para fazer o troubleshooting da sua configuração.

Esta seção fornece algum exemplo debuga pretendido esclarecer MLP LFI e servir-lo como exemplos de funcionamento para pesquisar defeitos sua configuração.

Comandos para Troubleshooting

A [Output Interpreter Tool \(apenas para clientes registrados\)](#) (OIT) suporta determinados comandos show. Use a OIT para exibir uma análise da saída do comando show.

Nota: Consulte [Informações Importantes sobre Comandos de Depuração](#) antes de usar comandos debug.

- depurar negociação de ppp - Ilustra o processo de clonagem das duas interfaces de acesso virtual para representar o PPP e os enlaces do conjunto PPP. A interface de acesso virtual 1 (Vi1) é o link de PPP a que (ATM ou quadro) o PVC é limitado. A interface virtual 2 (Vi2) é o enlace do pacote PPP ao qual estão anexadas as políticas de enfileiramento.
- debug ppp multilink fragment – Ilustra o conceito de pacotes de dados maiores sendo intercalados com pacotes de voz menores. A intercalação ocorre na relação Vi2 (o nível MLP) desde que o bundle interface tem o fancy queuing atribuído.

Este é o comando output para o **comando debug ppp negotiation**.

```
FR(config-if)#no shut FR(config-if)#^Z FR# FR# 6d23h: %LINK-3-UPDOWN: Interface Virtual-Access1,
changed state to up *Mar 7 23:20:42.842: Vi1 PPP: Treating connection as a dedicated line !---
Vi1 is the PPP link to which the PVC is bound. *Mar 7 23:20:42.842: Vi1 PPP: Phase is
ESTABLISHING, Active Open *Mar 7 23:20:42.842: Vi1 LCP: O CONFREQ [Closed] id 197 len 19 *Mar 7
23:20:42.842: Vi1 LCP: MagicNumber 0xF44128D2 (0x0506F44128D2) *Mar 7 23:20:42.842: Vi1 LCP:
MRRU 1524 (0x110405F4) *Mar 7 23:20:42.842: Vi1 LCP: EndpointDisc 1 FR (0x1305014652) !---
Router FR at one end of PPP discovery. *Mar 7 23:20:42.858: Vi1 LCP: I CONFREQ [REQsent] id 14
len 20 *Mar 7 23:20:42.858: Vi1 LCP: MagicNumber 0x294819D4 (0x0506294819D4) *Mar 7
23:20:42.858: Vi1 LCP: MRRU 1524 (0x110405F4) *Mar 7 23:20:42.858: Vi1 LCP: EndpointDisc 1 ATM
(0x13060141544D) !--- Router ATM at the other end of PPP discovery. *Mar 7 23:20:42.858: Vi1
LCP: O CONFACK [REQsent] id 14 len 20 *Mar 7 23:20:42.862: Vi1 LCP: MagicNumber 0x294819D4
(0x0506294819D4) *Mar 7 23:20:42.862: Vi1 LCP: MRRU 1524 (0x110405F4) *Mar 7 23:20:42.862: Vi1
LCP: EndpointDisc 1 ATM (0x13060141544D) *Mar 7 23:20:42.870: Vi1 LCP: I CONFACK [ACKsent] id
197 len 19 *Mar 7 23:20:42.870: Vi1 LCP: MagicNumber 0xF44128D2 (0x0506F44128D2) *Mar 7
23:20:42.870: Vi1 LCP: MRRU 1524 (0x110405F4) *Mar 7 23:20:42.870: Vi1 LCP: EndpointDisc 1 FR
(0x1305014652) *Mar 7 23:20:42.870: Vi1 LCP: State is Open *Mar 7 23:20:42.870: Vi1 PPP: Phase
is FORWARDING, Attempting Forward *Mar 7 23:20:42.874: Vi1 PPP: Phase is ESTABLISHING, Finish
LCP *Mar 7 23:20:42.874: Vi1 PPP: Phase is VIRTUALIZED *Mar 7 23:20:42.942: Vi2 PPP: Phase is
DOWN, Setup *Mar 7 23:20:43.222: Vi1 IPCP: Packet buffered while building MLP bundle interface
6d23h: %LINK-3-UPDOWN: Interface Virtual-Access2, changed state to up !--- MLP level queuing.
*Mar 7 23:20:43.226: Vi2 PPP: Treating connection as a dedicated line *Mar 7 23:20:43.226: Vi2
PPP: Phase is ESTABLISHING, Active Open *Mar 7 23:20:43.226: Vi2 LCP: O CONFREQ [Closed] id 1
len 19 *Mar 7 23:20:43.226: Vi2 LCP: MagicNumber 0xF4412A53 (0x0506F4412A53) *Mar 7
23:20:43.226: Vi2 LCP: MRRU 1524 (0x110405F4) *Mar 7 23:20:43.230: Vi2 LCP: EndpointDisc 1 FR
(0x1305014652) *Mar 7 23:20:43.230: Vi2 MLP: Added first link Vi1 to bundle ATM !--- PVCs make
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up the bundle. *Mar 7 23:20:43.230: Vi2 PPP: Phase is UP *Mar 7 23:20:43.230: Vi2 IPCP: O CONFREQ [Closed] id 1 len 10 *Mar 7 23:20:43.234: Vi2 IPCP: Address 10.1.1.2 (0x03060A010102) *Mar 7 23:20:43.234: Vi2 PPP: Pending ncpQ size is 1 *Mar 7 23:20:43.234: Vi1 IPCP: Redirect packet to Vi1 *Mar 7 23:20:43.234: Vi2 IPCP: I CONFREQ [REQsent] id 1 len 10 *Mar 7 23:20:43.234: Vi2 IPCP: Address 10.1.1.1 (0x03060A010101) *Mar 7 23:20:43.234: Vi2 IPCP: O CONFACK [REQsent] id 1 len 10 *Mar 7 23:20:43.234: Vi2 IPCP: Address 10.1.1.1 (0x03060A010101) *Mar 7 23:20:43.266: Vi2 IPCP: I CONFACK [ACKsent] id 1 len 10 *Mar 7 23:20:43.266: Vi2 IPCP: Address 10.1.1.2 (0x03060A010102) *Mar 7 23:20:43.266: Vi2 IPCP: State is Open *Mar 7 23:20:43.266: Vi2 IPCP: Install route to 10.1.1.1 *Mar 7 23:20:43.270: Vi2 IPCP: Add link info for cef entry 10.1.1.1

Esta saída do comando é do comando debug ppp multilink fragment.

*Mar 7 23:16:08.034: **Vi2 MLP: Packet interleaved from queue 24** *Mar 7 23:16:08.038: Vi1 MLP: O ppp UNKNOWN(0x0000) (0000) size 64 *Mar 7 23:16:08.038: Vi2 MLP: Packet interleaved from queue 24 *Mar 7 23:16:08.038: Vi1 MLP: O ppp UNKNOWN(0x0000) (0000) size 64 *Mar 7 23:16:08.038: Vi2 MLP: Packet interleaved from queue 24 *Mar 7 23:16:08.038: Vi1 MLP: O ppp UNKNOWN(0x0000) (0000) size 64 *Mar 7 23:16:08.038: Vi1 MLP: O frag 0000829B size 160 *Mar 7 23:16:08.042: Vi1 MLP: I ppp IP (0021) size 64 direct *Mar 7 23:16:08.046: Vi1 MLP: I ppp IP (0021) size 64 direct

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- [Projetando e implantando o Multilink PPP por Frame Relay e ATM](#)
- [Links de VoIP por PPP com qualidade de serviço \(LLQ / prioridade IP RTP, LFI, cRTP\)](#)
- [VoIP sobre Frame Relay com QoS \(fragmentação, molde de tráfego, prioridade LLQ / IP RTP\)](#)
- [Suporte à Tecnologia de Voz](#)
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