

对帧中继配置与故障排除的全面的指南

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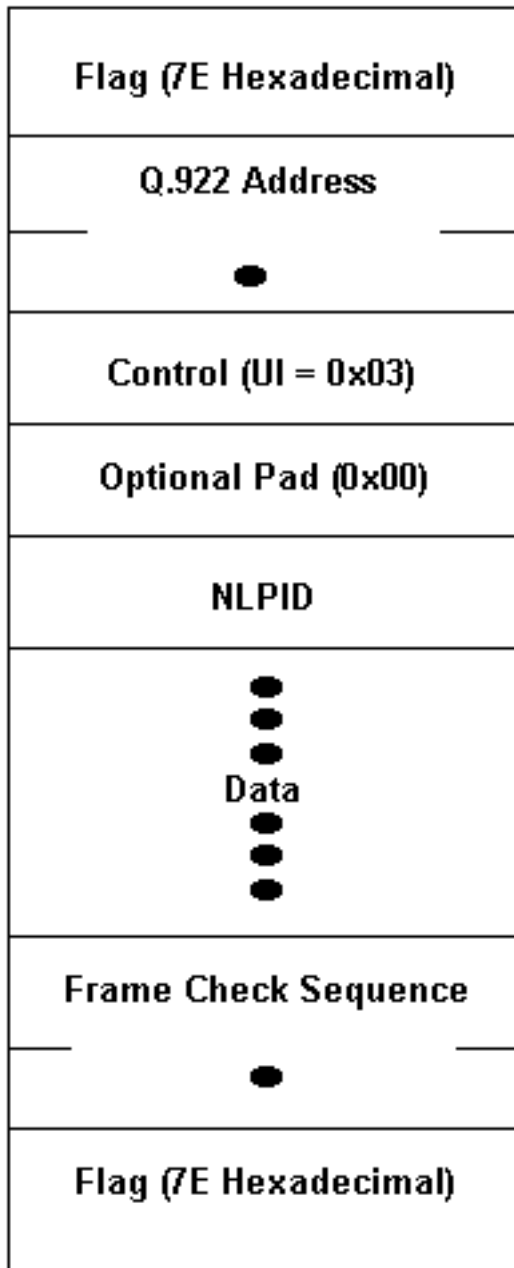
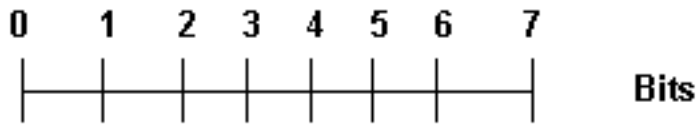
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[Introduction](#)

帧中继是行业标准，使用在连接的设备之间的高级数据链路控制(HDLC)封装处理多个虚拟电路的交换数据链路层协议。在许多情况下，帧中继比X.25效率更高，通常认为更换的协议。以下图说明一个帧中继帧(ANSI T1.618)。



● = Octet

注释在上述图， Q.922地址， 如目前被定义， 是两个八位位组并且包含10位数据链路连接标识符 (DLCI)。 在一些网络Q.922地址可以可选地增加到三个或四个八位位组。

“标志位”字段分隔帧的初期和结束。 在主导的" flag "字段之后是两字节的地址信息。 十位这两个字节组成实际电路ID (称为DLCI， 数据链路连接标识符的)。

10位DLCI值是帧中继报头的重点。 它识别多元化到物理信道的逻辑连接。 在寻址基本的(即没延伸由本地管理接口[LMI])模式下， DLCI有本地意义;即终端设备在连接的两个不同的末端可能使用不同的DLCI是指同样连接。

[开始使用前](#)

[Conventions](#)

Refer to [Cisco Technical Tips Conventions](#) for more information on document conventions.

[Prerequisites](#)

欲知更多信息和定义用于本文的术语的，请参见[帧中继术语](#)。

[Components Used](#)

This document is not restricted to specific software and hardware versions.

本文档中的信息都是基于特定实验室环境中的设备创建的。All of the devices used in this document started with a cleared (default) configuration.如果您是在真实网络上操作，请确保您在使用任何命令前已经了解其潜在影响。

[背景理论](#)

帧中继最初被设想了一个协议为在ISDN接口的使用。对此效果的最初的建议被提交了给国际电信联盟电信标准化部门(ITU-T) (以前国际电报电话咨询委员会[CCITT])在1984年。在帧中继的工作在ANSI认可的T1S1标准委员会里也执行在美国。

在1990年，Cisco系统、StrataCom、Northern Telecom和Digital Equipment Corporation组成协会集中帧中继技术开发和加速相互可行的帧中继产品的简介。他们开发了一个规格符合基本帧中继协议讨论在T1S1和ITU-T，但是扩大它与为复杂互联网工作环境提供另外的功能的功能。这些帧中继扩展共同指LMI。这是在路由器的“cisco” LMI与“ansi”或“q933a” LMI相对。

帧中继提供在用户设备的一个数据包交换数据通信功能(例如路由器、网桥，主机)和网络设备之间的接口间使用(例如交换节点)。用户设备经常指数据终端设备(DTE)，当建立接口对DTE经常指数据电路终端设备的网络设备时(DCE)。提供帧中继接口的网络可以是一个运营商提供的公共网络或为企业服务的私有的设备网络。

帧中继与在其功能和格式的X.25极大有不同。特别是，帧中继是一个更加效率化的协议，实现高性能和更加了不起的效率。

作为用户和网络设备之间的一个接口，帧中继为统计复用许多逻辑数据会话提供方法(指虚拟电路)在单个物理传输链路。这与使用支持多数据流的仅Time Division Multiplexing (TDM)技术的系统形成对比。帧中继的统计多路复用提供可用的带宽灵活和有效利用。它可以使用，不用TDM技术或在TDM系统提供的信道顶部。

帧中继的另一个重要特性是在广域网(广域网)传输技术方面利用最新进展。当模拟传输传动系统和铜媒体是主要的，更早的广域网协议，例如X.25，被开发了。这些链路比可用光纤的媒体/数字式的传输链路今天较不可靠的。在链路例如这些，链路层协议能抛弃费时的错误校正的算法，离开这些将执行在更高的协议层。因此更加了不起的性能和效率是可能的，无需牺牲数据完整性。帧中继设计考虑到此方法。它包括发现的损坏的位(因此数据一种循环冗余校验(CRC)算法能丢弃)，但是不包括更正的坏数据任何协议机制(例如，通过在这个阶层重新传输它协议)。

在帧中继和X.25之间的另一个区别是缺乏在帧中继的明确，每条虚拟电路流控制。即然许多上层协

议有效执行他们自己的流控制算法，对此功能的需要在链路层减少。帧中继，因此，不包括在更高层复制那些的明确流控制程序。反而，非常提供简单的拥塞通知机制允许网络通知用户设备网络资源是接近一个拥塞的状态。此通知能警告更高层协议流控制可能是需要的。

配置基本帧中继

一旦有对本地帧中继的可靠的连接交换在永久虚拟电路(PVC)的两端，然后是时间开始计划帧中继配置。在此第一个示例中，对“cisco” LMI的本地管理接口(LMI)型的默认值在Spicey。默认情况下接口如此是“多点”接口，帧中继inverse-arp打开(对于点对点，没有相反ARP)。默认情况下IP分开展望期检查为帧中继封装被禁用，因此路由更新里里外外来同一个接口。他们需要从帧中继交换机使用通过LMI更新的路由器了解数据链路连接标识符(DLCI)。路由器然后远程IP地址的相反ARP和创建本地DLCI映射和他们相关的远程IP地址。

Network Diagram



配置

- [Spicey](#)
- [Prasit](#)

Spicey

```
Spicey#show running-config
Building configuration...

Current configuration : 1705 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 ip address 3.1.3.1 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 140
!
!
router rip
```

```
network 3.0.0.0
network 124.0.0.0
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...
Current configuration : 1499 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
!
!
interface Ethernet0
  ip address 123.123.123.1 255.255.255.0
!
!
interface Serial1
  ip address 3.1.3.2 255.255.255.0
  encapsulation frame-relay
  frame-relay interface-dlci 150
!
!
router rip
  network 3.0.0.0
  network 123.0.0.0
!
!
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
end
```

[debug 和 show 命令](#)

在发出 **debug** 命令之前，请参阅[有关 Debug 命令的重要信息](#)。

- **show frame-relay map**
- **show frame-relay PVC**
- **show frame-relay lmi**
- **ping <device name>**

- show ip route

Spicey

```
Spicey#show frame-relay map
```

```
Serial0 (up): ip 3.1.3.2 dlci 140(0x8C,0x20C0), dynamic,  
             broadcast,, status defined, active
```

```
Spicey#show frame-relay pvc
```

```
PVC Statistics for interface Serial0 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0
```

```
input pkts 83          output pkts 87          in bytes 8144  
out bytes 8408        dropped pkts 0          in FECN pkts0  
in BECN pkts 0        out FECN pkts 0        out BECN pkts0  
in DE pkts 0          out DE pkts 0  
out bcast pkts 41     out bcast bytes 3652  
pvc create time 01:31:50, last time pvc status changed 01:28:28
```

```
Spicey#show frame-relay lmi
```

```
LMI Statistics for interface Serial0 (Frame Relay DTE) LMI TYPE = CISCO
```

```
Invalid Unnumbered info 0          Invalid Prot Disc 0  
Invalid dummy Call Ref 0          Invalid Msg Type 0  
Invalid Status Message 0          Invalid Lock Shift 0  
Invalid Information ID 0          Invalid Report IE Len 0  
Invalid Report Request 0          Invalid Keep IE Len 0  
Num Status Enq. Sent 550          Num Status msgs Rcvd 552  
Num Update Status Rcvd 0          Num Status Timeouts 0
```

```
Spicey#ping 123.123.123.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/40 ms
```

```
Spicey#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
```

```
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
```

```
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
```

```
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
```

```
inter area
```

```
       * - candidate default, U - per-user static route, o - ODR
```

```
       P - periodic downloaded static route
```

```
Gateway of last resort is not set
```

```
   3.0.0.0/24 is subnetted, 1 subnets
```

```
C       3.1.3.0 is directly connected, Serial0
```

```
   124.0.0.0/24 is subnetted, 1 subnets
```

```
C       124.124.124.0 is directly connected, Ethernet0
```

```
R       123.0.0.0/8 [120/1] via 3.1.3.2, 00:00:08, Serial0
```

Prasit

```
Prasit#show frame-relay map
```

```
Serial1 (up): ip 3.1.3.1 dlci 150(0x96,0x2460), dynamic,  
             broadcast,, status defined, active
```

```
Prasit#show frame-relay pvc
```

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1

```
input pkts 87          output pkts 83          in bytes 8408
out bytes 8144        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 38     out bcast bytes 3464
pvc create time 01:34:29, last time pvc status changed 01:28:05
```

Prasit#show frame-relay lmi

LMI Statistics for interface Serial1 (Frame Relay DTE) LMI TYPE = CISCO

Invalid Unnumbered info	0	Invalid Prot Disc	0
Invalid dummy Call Ref	0	Invalid Msg Type	0
Invalid Status Message	0	Invalid Lock Shift	0
Invalid Information ID	0	Invalid Report IE Len	0
Invalid Report Request	0	Invalid Keep IE Len	0
Num Status Enq. Sent	569	Num Status msgs Rcvd	570
Num Update Status Rcvd	0	Num Status Timeouts	0

Prasit#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

Prasit#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS

inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

3.0.0.0/24 is subnetted, 1 subnets

C 3.1.3.0 is directly connected, Serial1

R 124.0.0.0/8 [120/1] via 3.1.3.1, 00:00:19, Serial1

123.0.0.0/24 is subnetted, 1 subnets

C 123.123.123.0 is directly connected, Ethernet0

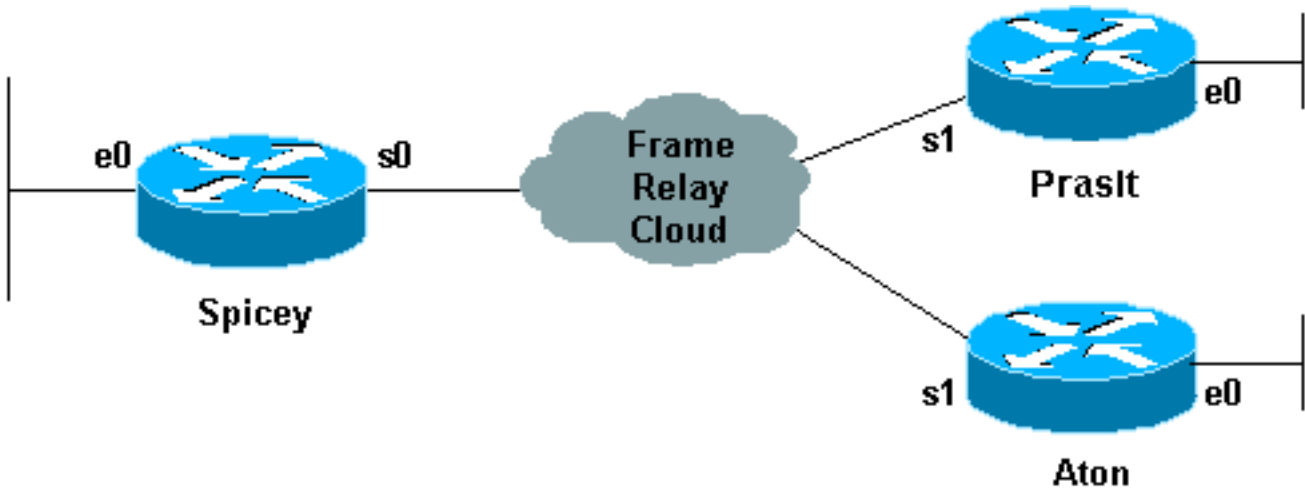
配置星型网帧中继

在本例中，路由器了解哪些数据链路连接标识符(DLCI)从帧中继交换机使用并且分配他们到主要接口。然后路由器远程IP地址的相反ARP。

Note: 除非在每个末端的帧中继映射明确地补充说您不能从Aton连接Prasit的序列IP地址。如果正确地配置路由，起源在LAN的数据流不应该有问题。如果使用以太网IP地址作为源地址在扩展的ping，您能连接。

当帧中继inverse-arp是启用的，默认情况下广播IP数据流在连接将出去。

Network Diagram



配置

- [Spicey](#)
- [Prasit](#)
- [Aton](#)

Spicey

```

spicey#show running-config
Building configuration...
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname spicey
!
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 ip address 3.1.3.1 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 130
 frame-relay interface-dlci 140
!
!
router rip
 network 3.0.0.0
 network 124.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

Prasit

```
prasit#show running-config
Building configuration...

Current configuration : 1499 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname prasit
!
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 ip address 3.1.3.2 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 150
!
!
router rip
 network 3.0.0.0
 network 123.0.0.0
!
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Aton

```
aton#show running-config
Building configuration...
Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname aton
!
!
interface Ethernet0
 ip address 122.122.122.1 255.255.255.0
!
interface Serial1
 ip address 3.1.3.3 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 160
!
!
router rip
 network 3.0.0.0
```

```

network 122.0.0.0
!
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
end

```

显示命令

- show frame-relay map
- show frame-relay PVC
- ping <device name>

Spicey

spicey#**show frame-relay map**

```

Serial0 (up): ip 3.1.3.2 dlci 140(0x8C,0x20C0), dynamic,
              broadcast,, status defined, active
Serial0 (up): ip 3.1.3.3 dlci 130(0x82,0x2020), dynamic,
              broadcast,, status defined, active

```

spicey#**show frame-relay pvc**

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	2	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 130, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

```

input pkts 32          output pkts 40          in bytes 3370
out bytes 3928        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 30     out bcast bytes 2888
pvc create time 00:15:46, last time pvc status changed 00:10:42

```

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

```

input pkts 282        output pkts 291        in bytes 25070
out bytes 27876      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 223    out bcast bytes 20884
pvc create time 02:28:36, last time pvc status changed 02:25:14

```

spicey#

spicey#**ping 3.1.3.2**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.1.3.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms

spicey#**ping 3.1.3.3**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms

Prasit

prasit#show frame-relay map

Serial1 (up): ip 3.1.3.1 dlci 150(0x96,0x2460), dynamic,
broadcast,, status defined, active

prasit#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1

input pkts 311	output pkts 233	in bytes 28562
out bytes 22648	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 162	out bcast bytes 15748	

pvc create time 02:31:39, last time pvc status changed 02:25:14

prasit#ping 3.1.3.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.1.3.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

prasit#ping 3.1.3.3

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:

.....

Success rate is 0 percent (0/5)

Aton

aton#show frame-relay map

Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic,
broadcast,, status defined, active

aton#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 160, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1

input pkts 35	output pkts 32	in bytes 3758
out bytes 3366	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 27	out bcast bytes 2846	

pvc create time 00:10:53, last time pvc status changed 00:10:53

aton#ping 3.1.3.1

Type escape sequence to abort.

```

Sending 5, 100-byte ICMP Echos to 3.1.3.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms

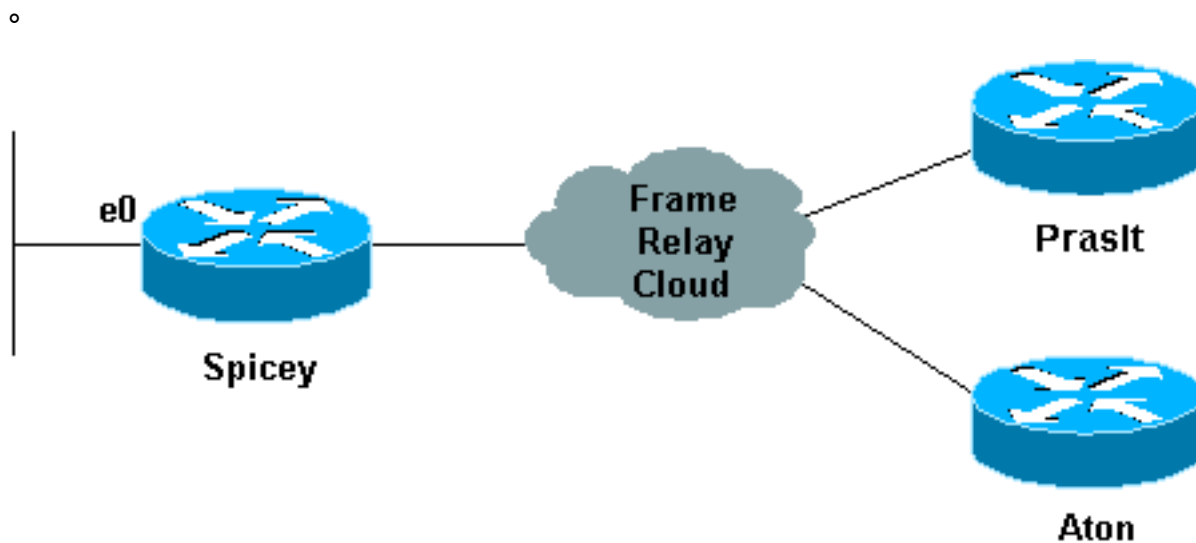
aton#ping 3.1.3.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

```

连接从分支到分支

因为没有其他spoke的IP地址的，映射您不能从一连接与在一种星型网配置的另一分支讲了话使用多点接口。仅集线器地址通过反向地址解析协议(IARP)是获知。如果配置静态映射使用远程辐射点的IP地址的frame-relay map命令使用本地数据链路连接标识符(DLCI)，您能ping其他spoke的地址。



配置

```

Prasit

prasit#show running-config
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial
 ip address 3.1.3.2 255.255.255.0
 encapsulation frame-relay
 frame-relay map ip 3.1.3.3 150
 frame-relay interface-dlci 150

```

显示命令

- show frame-relay map
- ping <device name>
- show running-config

Prasit

```

prasit#show frame-relay map
Serial1 (up): ip 3.1.3.1 dlci 150(0x96,0x2460), dynamic,
                broadcast,, status defined, active
Serial1 (up): ip 3.1.3.3 dlci 150(0x96,0x2460), static,
                CISCO, status defined, active

prasit#ping 3.1.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/70/80 ms

prasit#ping 122.122.122.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 122.122.122.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/67/76 ms

```

Aton

```

aton#show running-config
interface Ethernet0
ip address 122.122.122.1 255.255.255.0
!
interface Serial1
ip address 3.1.3.3 255.255.255.0
no ip directed-broadcast
encapsulation frame-relay
frame-relay map ip 3.1.3.2 160
frame-relay interface-dlci 160

aton#show frame-relay map
Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic,
                broadcast,, status defined, active
Serial1 (up): ip 3.1.3.2 dlci 160(0xA0,0x2800), static,
                CISCO, status defined, active

aton#ping 3.1.3.2
Type escape sequence to abort
Sending 5, 100-byte ICMP Echos to 3.1.3.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/68/68 ms

aton#ping 123.123.123.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/67/80 ms

```

配置帧中继子接口

帧中继子接口为支持部分地网状连接的帧中继网络提供一个机制。多数协议假设在一个逻辑网络的及物性;即,如果位置A能与B站谈和B站能谈驻防C,然后驻防A应该能谈直接地驻防C。除非A直接地被连接到C,及物性是真的在LAN,但是不在帧中继网络。

另外,不可能部分地网状网络支持某些协议,例如AppleTalk和透明桥接,因为他们要求“分裂展望期”在哪些在接口收到的信息包不可能传输同一个接口,即使信息包在不同的虚拟电路收到并且传输

配置帧中继子接口保证单个物理接口被对待作为多个虚拟接口。此功能允许我们解决水平分割规则。可能当前转发在一个虚拟接口收到的信息包另一个虚拟接口，即使他们在同一个物理接口被配置。

子接口通过提供方式寻址帧中继网络的限制细分部分地网状连接的帧中继网络到一定数量更小，充分地网状连接的(或点对点)子网络。每个子网络分配其自己的网络号并且看来对协议，好象通过独立接口可及的。(请注意点对点子接口可以是未编号的为了用在IP上，减少否则可能结果)的寻址负担。

点对点子接口

Network Diagram



配置

- [Spicey](#)
- [Prasit](#)

Spicey

```
Spicey#show running-config
Building configuration...

Current configuration : 1338 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
enable password ww
!
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 no ip address
 encapsulation frame-relay
!
interface Serial0.1 point-to-point
 ip address 3.1.3.1 255.255.255.0
 frame-relay interface-dlci 140
```

```
!  
!  
router igrp 2  
  network 3.0.0.0  
  network 124.0.0.0  
!  
!  
line con 0  
  exec-timeout 0 0  
  transport input none  
line aux 0  
line vty 0 4  
  login  
!  
end
```

Prasit

```
Prasit#show running-config  
Building configuration...  
  
Current configuration : 1234 bytes  
!  
version 12.1  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
hostname Prasit  
!  
!  
!  
interface Ethernet0  
  ip address 123.123.123.1 255.255.255.0  
!  
  interface Serial1  
  no ip address  
  encapsulation frame-relay  
!  
  interface Serial1.1 point-to-point  
  ip address 3.1.3.2 255.255.255.0  
  frame-relay interface-dlci 150  
!  
router igrp 2  
  network 3.0.0.0  
  network 123.0.0.0  
!  
line con 0  
  exec-timeout 0 0  
  transport input none  
line aux 0  
line vty 0 4  
  login  
!  
end
```

显示命令

- show frame-relay map
- show frame-relay PVC

[Spicey](#)

Spicey#show frame-relay map

Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast status defined, active

Spicey#show frame-relay pvc

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1

```
input pkts 193          output pkts 175          in bytes 20450
out bytes 16340         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 50      out  bcast bytes 3786
pvc create time 01:11:27, last time pvc status changed 00:42:32
```

Spicey#ping 123.123.123.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

[Prasit](#)

Prasit#show frame-relay map

Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast status defined, active

Prasit#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1.1

```
input pkts 74          output pkts 89          in  bytes 7210
out bytes 10963        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 24     out bcast bytes 4203
pvc create time 00:12:25, last time pvc status changed 00:12:25
```

Prasit#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

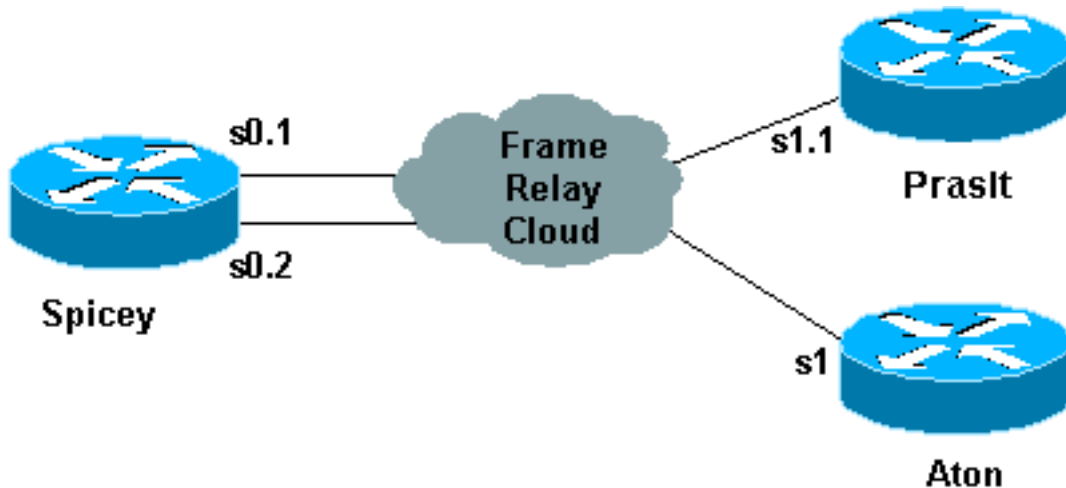
!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

[星型网子接口](#)

以下星型网配置示例显示两个点对点子接口并且使用在一个远程站点的动态地址解析。每个子接口带有一个单个协议地址和子网掩码，并且interface-dlci命令连结子接口与指定的数据链路连接标识符(DLCI)。远端目的地的地址每个点对点子接口的不是解决的，因为他们点到点，并且必须发送数据流到对等体在另一边。远程终端(Aton)使用相反ARP其映射和主集线器相应地回应子接口的IP地址。默认情况下，因为帧中继相反ARP开为多点接口，这发生。

Network Diagram



配置

- [Spicey](#)
- [Prasit](#)
- [Aton](#)

Spicey

```
Spicey#show running-config
Building configuration...
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 no ip address
 encapsulation frame-relay
!
interface Serial0.1 point-to-point
 ip address 4.0.1.1 255.255.255.0
 frame-relay interface-dlci 140
!
interface Serial0.2 point-to-point
```

```
ip address 3.1.3.1 255.255.255.0
frame-relay interface-dlci 130
!
router igrp 2
 network 3.0.0.0
 network 4.0.0.0
 network 124.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...

version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 point-to-point
 ip address 4.0.1.2 255.255.255.0
 frame-relay interface-dlci 150
!
router igrp 2
 network 4.0.0.0
 network 123.0.0.0
!
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Aton

```
Aton#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
```

```

service timestamps log uptime
!
hostname Aton
!
!
!
interface Ethernet0
 ip address 122.122.122.1 255.255.255.0
!
interface Serial1
 ip address 3.1.3.3 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 160
!
router igrp 2
 network 3.0.0.0
 network 122.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

显示命令

- show frame-relay map
- show frame-relay PVC

Spicey

Spicey#**show frame-relay map**

```

Serial0.2 (up): point-to-point dlci, dlci 130(0x82,0x2020), broadcast
                status defined, active
Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
                status defined, active

```

Spicey#**show frame-relay pvc**

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	2	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 130, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.2

```

input pkts 11          output pkts 22          in bytes 1080
out bytes 5128         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 17     out bcast bytes 4608
pvc create time 00:06:36, last time pvc status changed 00:06:36

```

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1

```
input pkts 33          output pkts 28          in bytes 3967
out bytes 5445         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 17     out bcast bytes 4608
pvc create time 00:06:38, last time pvc status changed 00:06:38
```

Spicey#**ping 122.122.122.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 122.122.122.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms

Spicey#**ping 123.123.123.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

Prasit

Prasit#**show frame-relay map**

Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast
status defined, active

Prasit#**show frame-relay pvc**

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE =
Serial1.1

```
input pkts 45          output pkts 48          in bytes 8632
out bytes 6661         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 31     out bcast bytes 5573
pvc create time 00:12:16, last time pvc status changed 00:06:23
```

Prasit#**ping 124.124.124.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

Aton

Aton#**show frame-relay map**

Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic,
broadcast,, status defined, active

Aton#**show frame-relay pvc**

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 160, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1
input pkts 699          output pkts 634          in bytes 81290
out bytes 67008        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 528
out bcast bytes 56074  out bcast bytes 56074
pvc create time 05:46:14, last time pvc status changed 00:05:57
```

Aton#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

配置动态和多点子接口的静态映射

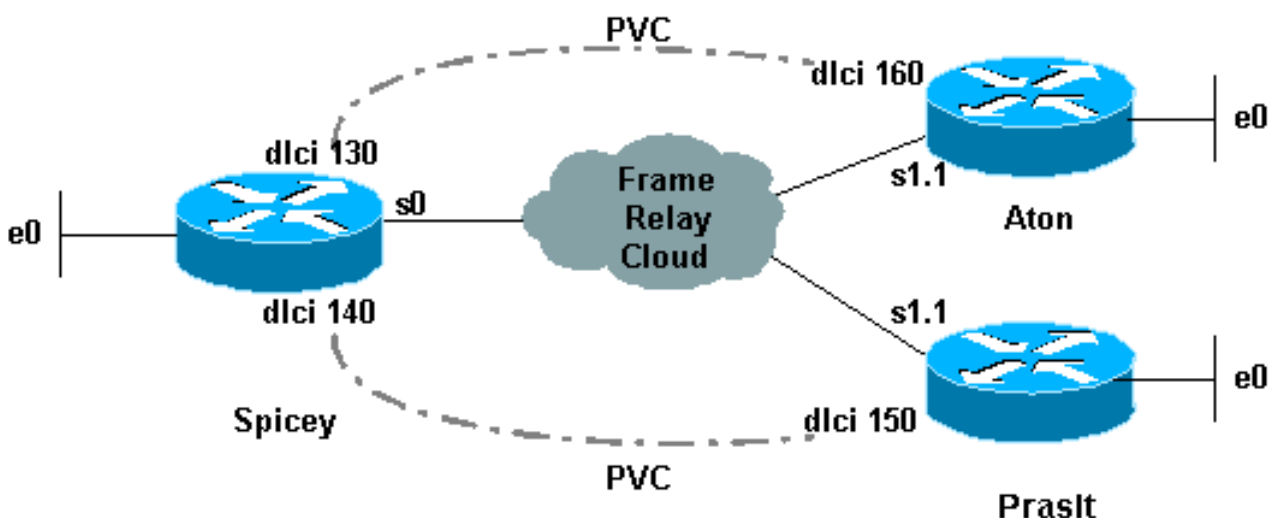
动态地址映射使用帧中继相反ARP为特定连接请求下一跳协议地址给出数据链路连接标识符(DLCI)。对相反ARP请求的回应 在路由器或接入服务器的地址对DLCI映射表里被输入;表然后用于供应下一跳协议地址或DLCI流出的数据流的。

因为物理接口当前被配置作为多个子接口，您必须提供与物理接口区分一个子接口并且连结一个特定子接口与特定DLCI的信息。

支持默认情况下的相反ARP为所有协议被启用，但是可以是失效的为特定协议DLCI对。结果，您能使用动态映射一些协议和静态映射关于同样DLCI的其他协议。您能明确地禁用一个协议DLCI对的相反ARP，如果知道连接的不支持协议。默认情况下由于相反ARP为支持的所有协议被启用，没有要求其它命令配置在子接口的动态地址映射。静态映射与指定的DLCI连接指定的下一跳协议地址。静态映射取消对相反ARP请求的需要;当您供应静态映射时，相反ARP为在指定的DLCI的指定的协议自动地被禁用。您必须使用静态映射，如果路由器在另一边不支持相反ARP也不支持您要在帧中继使用的一个特定协议的相反ARP。

Network Diagram

我们已经看见如何配置Cisco路由器执行相反ARP。万一为多点接口或子接口，需要他们以下示例显示如何配置静态映射：



配置

- [Aton](#)
- [Spicey](#)
- [Prasit](#)

Aton

```
Aton#show running-config
Building configuration...
Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Aton
!
!
interface Ethernet0
 ip address 122.122.122.1 255.255.255.0
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 multipoint
 ip address 4.0.1.3 255.255.255.0
 frame-relay map ip 4.0.1.1 160 broadcast
!
router igrp 2
 network 4.0.0.0
 network 122.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Spicey

```
Spicey#show running-config
Building configuration...Current configuration : 1652
bytes!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 ip address 4.0.1.1 255.255.255.0
 encapsulation frame-relay
```

```
frame-relay map ip 4.0.1.2 140 broadcast
frame-relay map ip 4.0.1.3 130 broadcast
!
router igrp 2
network 4.0.0.0
network 124.0.0.0
!
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...
Current configuration : 1162 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 multipoint
 ip address 4.0.1.2 255.255.255.0
 frame-relay map ip 4.0.1.1 150 broadcast
!
router igrp 2
 network 4.0.0.0
 network 123.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

[debug 和 show 命令](#)

- show frame-relay map
- show frame-relay PVC

[Aton](#)

Aton#show frame-relay map

Serial1.1 (up): ip 4.0.1.1 dlci 160(0xA0,0x2800), static, broadcast,
CISCO, status defined, active

Aton#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 160, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE =
Serial1.1

input pkts 16	output pkts 9	in bytes 3342
out bytes 450	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 9	out bcast bytes 450	
pvc create time 00:10:02, last time pvc status changed 00:10:02		

Aton#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms

[Spicey](#)

Spicey#show frame-relay map

Serial0 (up): ip 4.0.1.2 dlci 140(0x8C,0x20C0), static, broadcast,
CISCO, status defined, active

Serial0 (up): ip 4.0.1.3 dlci 130(0x82,0x2020), static, broadcast,
CISCO, status defined, active

Spicey#show frame-relay pvc

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	2	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 130, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

input pkts 9	output pkts 48	in bytes 434
out bytes 11045	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 48	out bcast bytes 11045	
pvc create time 00:36:25, last time pvc status changed 00:36:15		

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

input pkts 17	output pkts 26	in bytes 1390
out bytes 4195	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 16	out bcast bytes 3155	

```
pvc create time 00:08:39, last time pvc status changed 00:08:39
```

```
Spicey#ping 122.122.122.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 122.122.122.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/40 ms
```

```
Spicey#ping 123.123.123.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36
```

[Prasit](#)

```
Prasit#show frame-relay map
```

```
Serial1.1 (up): ip 4.0.1.1 dlci 150(0x96,0x2460), static,  
broadcast,  
CISCO, status defined, active
```

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1.1
```

input pkts 28	output pkts 19	in bytes 4753
out bytes 1490	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 9	out bcast bytes 450	

```
pvc create time 00:11:00, last time pvc status changed 00:11:00
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms
```

关于这些命令的更多信息，请参阅[帧中继命令](#)。

[配置IP未编号的帧中继](#)

如果没有使用的IP地址空间许多子接口，您能使用IP未编号的在每个子接口。如果这是实际情形，您需要使用静态路由或动态路由，以便您的数据流照常被路由，并且您必须使用点对点子接口。

[Network Diagram](#)

下面的示例说明此：



配置

- [Spicey](#)
- [Prasit](#)

Spicey

```
Spicey#show running-config
Building configuration...
Current configuration : 1674 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 no ip address
 encapsulation frame-relay
!
interface Serial0.1 point-to-point
 ip unnumbered Ethernet0
 frame-relay interface-dlci 140
!
router igrp 2
 network 124.0.0.0
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...

Current configuration : 1188 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
```

```

interface Serial1
  no ip address
  encapsulation frame-relay
!
interface Serial1.1 point-to-point
  ip unnumbered Ethernet0
  frame-relay interface-dlci 150
!
router igrp 2
  network 123.0.0.0
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
end

```

显示命令

- show frame-relay map
- show frame-relay PVC

Spicey

Spicey#**show frame-relay map**

Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
status defined, active

Spicey#**show frame-relay pvc**

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE =
Serial0.1

```

input pkts 23          output pkts 24          in bytes 3391
out bytes 4952        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 14    out bcast bytes 3912
pvc create time 00:04:47, last time pvc status changed 00:04:47

```

Spicey#**show ip route**

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

```
Gateway of last resort is not set
  124.0.0.0/24 is subnetted, 1 subnets
C    124.124.124.0 is directly connected, Ethernet0
  123.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
I    123.0.0.0/8 [100/8576] via 123.123.123.1, 00:01:11, Serial0.1
I    123.123.123.0/32 [100/8576] via 123.123.123.1, 00:01:11,
Serial0.1
```

Spicey#**ping 123.123.123.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

[Prasit](#)

Prasit#**show frame-relay map**

Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast
status defined, active

Prasit#**show frame-relay pvc**

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE =
Serial1.1

```
input pkts 24          output pkts 52          in bytes 4952
out bytes 10892        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 41     out bcast bytes 9788
pvc create time 00:10:54, last time pvc status changed 00:03:51
```

Prasit#**show ip route**

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

```
Gateway of last resort is not set
  124.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
I    124.0.0.0/8 [100/8576] via 124.124.124.1, 00:00:18, Serial1.1
I    124.124.124.0/32 [100/8576] via 124.124.124.1, 00:00:18,
Serial1.1
  123.0.0.0/24 is subnetted, 1 subnets
C    123.123.123.0 is directly connected, Ethernet0
```

Prasit#**ping 124.124.124.1**

Type escape sequence to abort.

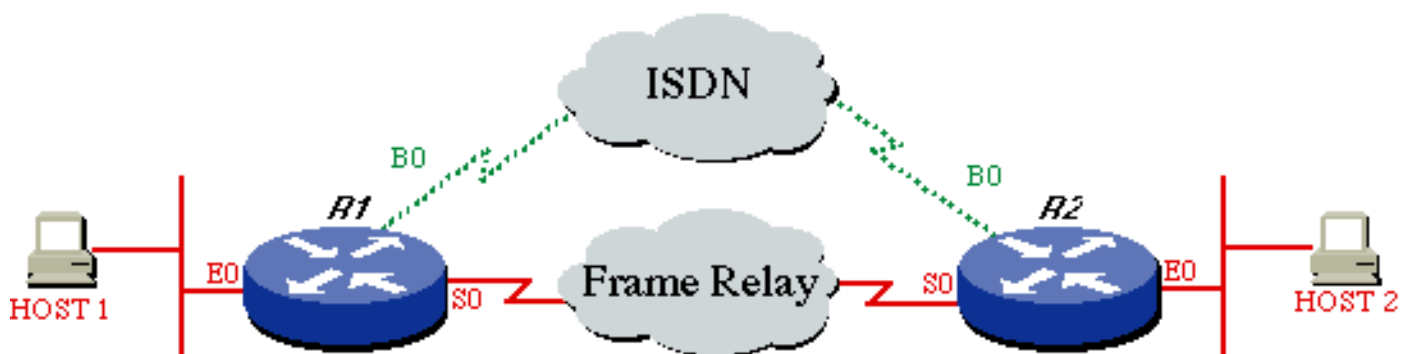
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/120/436 ms

配置帧中继备份

在ISDN的帧中继备份

使用ISDN，您可以希望到备用帧中继电路。有几个方式执行此。第一和很可能最佳，是使用对基本速率接口(BRI) IP地址的路由流量和使用适当路由度量的浮动静态路由。您能也使用一备份接口在主要接口或根据一个每个数据链接连接标识符(DLCI)基本类型。它可能不帮助备份主要接口，因为您可能丢失永久虚拟电路(PVC)，不用断开的主要接口。切记，协议交换与本地帧中继交换机，不是远程路由器。



配置

- [路由器 1](#)
- [路由器 2](#)

路由器 1

```
Prasit#show frame-relay map
Serial1.1 (up): point-to-point dlci, dlci
150(0x96,0x2460), broadcast
        status defined, active

Prasit#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

          Active      Inactive      Deleted
Static
  Local          1           0           0
0
  Switched       0           0           0
0
  Unused         0           0           0
0
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE,
INTERFACE =
Serial1.1

  input pkts 24          output pkts 52          in
bytes 4952
  out bytes 10892       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 41    out bcast bytes 9788
```

```
pvc create time 00:10:54, last time pvc status changed
00:03:51
```

```
Prasit#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
```

```
    D - EIGRP, EX - EIGRP external, O - OSPF, IA -
OSPF inter area
```

```
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
```

```
    E1 - OSPF external type 1, E2 - OSPF external
type 2, E - EGP
```

```
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-
2, ia - IS-IS
```

```
inter area
```

```
    * - candidate default, U - per-user static route,
o - ODR
```

```
    P - periodic downloaded static route
```

```
Gateway of last resort is not set
```

```
124.0.0.0/8 is variably subnetted, 2 subnets, 2
masks
```

```
I    124.0.0.0/8 [100/8576] via 124.124.124.1,
00:00:18, Serial1.1
```

```
I    124.124.124.0/32 [100/8576] via 124.124.124.1,
00:00:18,
Serial1.1
```

```
123.0.0.0/24 is subnetted, 1 subnets
```

```
C    123.123.123.0 is directly connected, Ethernet0
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout
is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip
```

```
min/avg/max = 36/120/436 ms
```

路由器 2

```
Prasit#show frame-relay map
```

```
Serial1.1 (up): point-to-point dlci, dlci
```

```
150(0x96,0x2460), broadcast
```

```
status defined, active
```

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

```
Active      Inactive    Deleted
```

```
Static
```

```
Local      1          0          0
```

```
0
```

```
Switched  0          0          0
```

```
0
```

```
Unused    0          0          0
```

```
0
```

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE,
```

```
INTERFACE =
```

```
Serial1.1
```

```
input pkts 24          output pkts 52          in
```

```
bytes 4952
```

```
out bytes 10892        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 41      out bcast bytes 9788
  pvc create time 00:10:54, last time pvc status changed
00:03:51

Prasit#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA -
OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external
type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-
2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route,
o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set
 124.0.0.0/8 is variably subnetted, 2 subnets, 2
masks
I      124.0.0.0/8 [100/8576] via 124.124.124.1,
00:00:18, Serial1.1
I      124.124.124.0/32 [100/8576] via 124.124.124.1,
00:00:18,
Serial1.1
      123.0.0.0/24 is subnetted, 1 subnets
C      123.123.123.0 is directly connected, Ethernet0

Prasit#ping 124.124.124.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout
is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip
min/avg/max = 36/120/436 ms

```

显示命令

要验证ISDN是否工作，请使用以下调试指令。在发出 **debug** 命令之前，请参阅[有关 Debug 命令的重要信息](#)。

- debug isdn q931
- debug ppp neg
- debug ppp auth

设法由主叫方做ISDN呼叫到中心端，不用备份命令。如果这是成功的，请添加备份命令到主叫方。

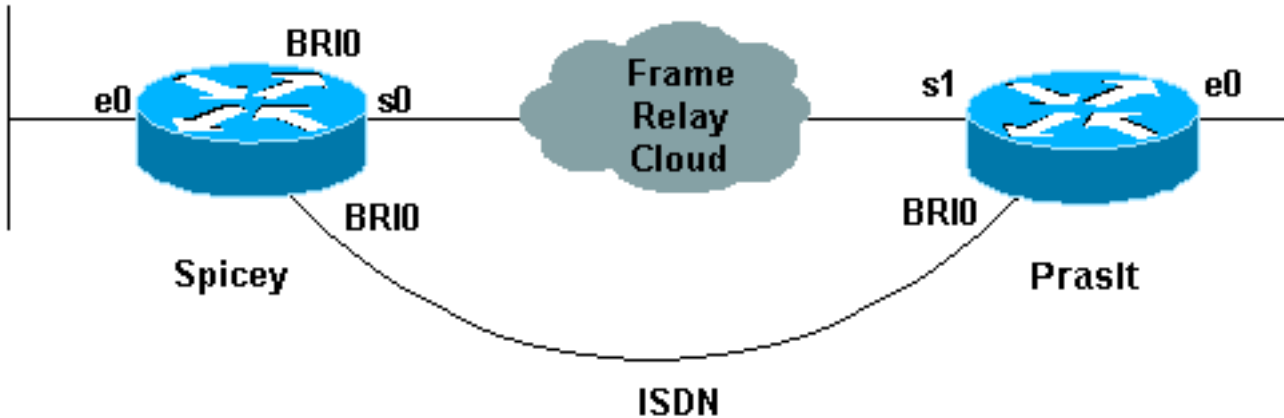
Note: 要测试备份，请勿使用**shutdown**命令在serial interfaces，然而通过拔出从串行线路的电缆模拟真正串联线问题。

配置每个DCLI备份

现在假设，Spicey是中心端，并且Prasit是建立与中心端(Spicey)的边联系。保重您只添加备份命令到告诉中心端的边。

Note: 子接口不支持备份负载。因为我们不跟踪在子接口的数据流级别，负荷没有被计算。

[Network Diagram](#)



[配置](#)

- [Spicey](#)
- [Prasit](#)

Spicey

```
Spicey#show running-config
Building configuration...

Current configuration : 1438 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
username Prasit password 0 cisco
!
!
!
isdn switch-type basic-net3
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 no ip address
 encapsulation frame-relay
!
interface Serial0.1 point-to-point
 ip address 4.0.1.1 255.255.255.0
```

```
frame-relay interface-dlci 140
!
interface BRI0
 ip address 3.1.6.1 255.255.255.0
 encapsulation ppp
 dialer map ip 3.1.6.2 name Prasit broadcast
 dialer-group 1
 isdn switch-type basic-net3
 no peer default ip address
 no cdp enable
 ppp authentication chap
!
router igrp 2
 network 3.0.0.0
 network 4.0.0.0
 network 124.0.0.0
!
ip classless
 ip route 123.123.123.0 255.255.255.0 3.1.6.2 250
!
access-list 101 deny igrp any any
access-list 101 permit ip any any
dialer-list 1 protocol ip list 101
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...

Current configuration : 1245 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
username Spicey password 0 cisco
!
!
isdn switch-type basic-net3
!
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 point-to-point
 backup delay 5 10
```

```

backup interface BRI0
ip address 4.0.1.2 255.255.255.0
frame-relay interface-dlci 150
!
interface BRI0
ip address 3.1.6.2 255.255.255.0
encapsulation ppp
dialer map ip 3.1.6.1 name Spicely broadcast 6106
dialer-group 1
isdn switch-type basic-net3
ppp authentication chap
!
router igrp 2
network 3.0.0.0
network 4.0.0.0
network 123.0.0.0
!
ip route 124.124.124.0 255.255.255.0 3.1.6.1 250
!
access-list 101 deny igrp any any
access-list 101 permit ip any any
dialer-list 1 protocol ip list 101
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
end

```

[显示命令](#)

- **show frame-relay map**
- **show ip route**
- **show isdn history**
- **show isdn status**
- **show interface bri 0**
- **show isdn active**

[Spicely](#)

Spicely#**show frame-relay map**

Serial0.2 (up): point-to-point dlci, dlci 130(0x82,0x2020), broadcast
status defined, active

Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
status defined, active

Spicely#**show ip route**

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS

inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

3.0.0.0/24 is subnetted, 2 subnets C
3.1.3.0 is directly connected, Serial0.2 C
3.1.6.0 is directly connected, BRI0
4.0.0.0/24 is subnetted, 1 subnets C
4.0.1.0 is directly connected, Serial0.1
124.0.0.0/24 is subnetted, 1 subnets C
124.124.124.0 is directly connected, Ethernet0
123.0.0.0/8 is variably subnetted, 2 subnets, 2 masks I
123.0.0.0/8 [100/8576] via 4.0.1.2, 00:00:00, Serial0.1 S
123.123.123.0/24 [250/0] via 3.1.6.2 I
122.0.0.0/8 [100/8576] via 3.1.3.3, 00:00:37, Serial0.2

Spicey#

*Mar 1 00:59:12.527: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Mar 1 00:59:13.983: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:1, changed state to up
*Mar 1 00:59:18.547: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 6105 Prasit

Spicey#**show isdn history**

ISDN CALL HISTORY

Call History contains all active calls, and a maximum of 100 inactive calls.
Inactive call data will be retained for a maximum of 15 minutes.

Call Calling Called Remote Seconds Seconds Seconds
Charges Number Number Name Used Left Idle Units/Currency

In 6105 6106 Prasit 31 90 29

Spicey#

*Mar 1 01:01:14.547: %ISDN-6-DISCONNECT: Interface BRI0:1 disconnected
from 6105 Prasit, call lasted 122 seconds
*Mar 1 01:01:14.663: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
*Mar 1 01:01:15.663: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:1, changed state to down

[Prasit](#)

Prasit#**show frame-relay map**

Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast
status defined, active

Prasit#**ping 124.124.124.1**

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/40 ms

Prasit#**show ip route**

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

```
I 3.0.0.0/8 [100/10476] via 4.0.1.1, 00:00:55, Serial1.1
  4.0.0.0/24 is subnetted, 1 subnets
C 4.0.1.0 is directly connected, Serial1.1
  124.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
S 124.124.124.0/24 [250/0] via 3.1.6.1
I 124.0.0.0/8 [100/8576] via 4.0.1.1, 00:00:55, Serial1.1
  123.0.0.0/24 is subnetted, 1 subnets
C 123.123.123.0 is directly connected, Ethernet0
I 122.0.0.0/8 [100/10576] via 4.0.1.1, 00:00:55, Serial1.1
```

串行线路断开。

Prasit#

```
*Mar 1 01:23:50.531: %LINK-3-UPDOWN: Interface Serial1, changed state to down
*Mar 1 01:23:51.531: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial1, changed state to down
*Mar 1 01:23:53.775: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
*Mar 1 01:23:53.791: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
*Mar 1 01:23:53.827: %LINK-3-UPDOWN: Interface BRI0, changed state to up
*Mar 1 01:23:57.931: %ISDN-6-LAYER2UP: Layer 2 for Interface BR0, TEI 64 changed to up
```

Prasit#**show ip route**

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route
```

Gateway of last resort is not set

```
3.0.0.0/24 is subnetted, 1 subnets
C 3.1.6.0 is directly connected, BRI0
  124.0.0.0/24 is subnetted, 1 subnets
S 124.124.124.0 [250/0] via 3.1.6.1
  123.0.0.0/24 is subnetted, 1 subnets
C 123.123.123.0 is directly connected, Ethernet0
```

Prasit#**show isdn status**

```
Global ISDN Switchtype = basic-net3
ISDN BRI0 interface
  dsl 0, interface ISDN Switchtype = basic-net3
Layer 1 Status:
  ACTIVE
Layer 2 Status:
  TEI = 64, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
Layer 3 Status:
  0 Active Layer 3 Call(s)
Active dsl 0 CCBs = 0
The Free Channel Mask: 0x80000003
Total Allocated ISDN CCBs = 0
```

Prasit#**ping 124.124.124.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!

```
*Mar 1 01:25:47.383: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 36/36/36 ms
Prasit#
*Mar 1 01:25:48.475: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:1, changed state to up
```

Prasit#

```
*Mar 1 01:25:53.407: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 6106 Spicey
```

Prasit#**show isdn status**

Global ISDN Switchtype = basic-net3

ISDN BRI0 interface

dsl 0, interface ISDN Switchtype = basic-net3

Layer 1 Status:

ACTIVE

Layer 2 Status:

TEI = 64, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED

Layer 3 Status:

1 Active Layer 3 Call(s)

CCB:callid=8003, sapi=0, ces=1, B-chan=1, calltype=DATA

Active dsl 0 CCBs = 1

The Free Channel Mask: 0x80000002

Total Allocated ISDN CCBs = 1

Prasit#**show isdn active**

ISDN ACTIVE CALLS

Call Type	Calling Number	Called Number	Remote Name	Seconds Used	Seconds Left	Seconds Idle	Charges Units/Currency
Out		6106	Spicey	21	100	19	0

Prasit#

```
*Mar 1 01:27:49.027: %ISDN-6-DISCONNECT: Interface BRI0:1 disconnected
from 6106 Spicey, call lasted 121 seconds
```

```
*Mar 1 01:27:49.131: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
```

```
*Mar 1 01:27:50.131: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:1, changed state to down
```

```
*Mar 1 01:28:09.215: %LINK-3-UPDOWN: Interface Serial1, changed state to up
```

```
*Mar 1 01:28:10.215: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial1, changed state to up
```

```
*Mar 1 01:28:30.043: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BRI0,
TEI 64 changed to down
```

```
*Mar 1 01:28:30.047: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BR0, TEI
64 changed to down
```

```
*Mar 1 01:28:30.371: %LINK-5-CHANGED: Interface BRI0, changed state to standby mode
```

```
*Mar 1 01:28:30.387: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
```

```
*Mar 1 01:28:30.403: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
```

Prasit#

串行连接再回来。

Prasit#**show isdn status**

Global ISDN Switchtype = basic-net3

ISDN BRI0 interface

dsl 0, interface ISDN Switchtype = basic-net3

Layer 1 Status:

DEACTIVATED

Layer 2 Status:

Layer 2 NOT Activated

```
Layer 3 Status:
  0 Active Layer    3 Call(s)
Active dsl 0 CCBs = 0
The Free Channel Mask: 0x80000003
Total Allocated ISDN CCBs = 0
```

Prasit#**show interface bri 0**

```
BRI0 is standby mode, line protocol is down
Hardware is BRI
Internet address is 3.1.6.2/24
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, loopback not set
Last input 00:01:00, output 00:01:00, output hang never
Last clearing of "show interface" counters 01:28:16
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
  Conversations 0/1/16 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  128 packets input, 601 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  132 packets output, 687 bytes, 0 underruns
  0 output errors, 0 collisions, 10 interface resets
  0 output buffer failures, 0 output buffers swapped out
  14 carrier transitions
```

Prasit#**ping 124.124.124.1**

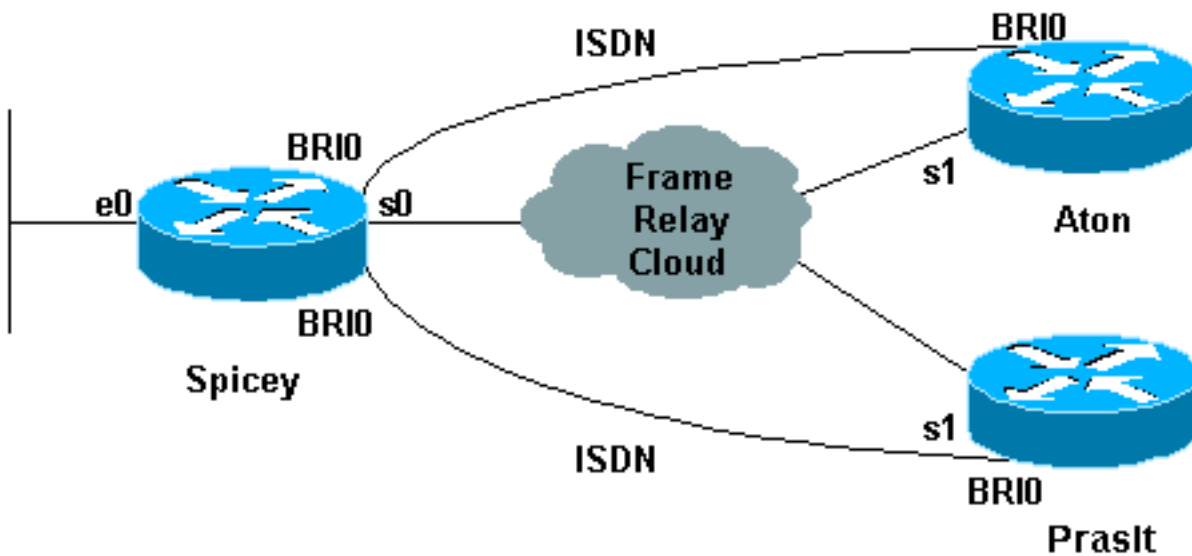
```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms
```

[与拨号配置文件的星型网](#)

这是星型网的示例每个DLCI备份配置。分支路由器呼叫集线路由器。正如你看到的我们只允许每边一条B信道通过使用在拨号池的最大连接选项在集线器端。

Note: 子接口不支持备份负载。因为我们不跟踪在子接口的数据流级别，负荷没有被计算。

[Network Diagram](#)



配置

- [Aton](#)
- [Spicey](#)
- [Prasit](#)

Aton

```
Aton#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Aton
!
!
username Spicey password 0 cisco
!
isdn switch-type basic-net3
!
!
!
interface Ethernet0
 ip address 122.122.122.1 255.255.255.0
!
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 point-to-point
 ip address 3.1.3.3 255.255.255.0
 backup delay 5 10
 backup interface BRI0
 frame-relay interface-dlci 160
```



```
!  
interface BRI0  
  ip address 155.155.155.3 255.255.255.0  
  encapsulation ppp  
  no ip route-cache  
  no ip mroute-cache  
  dialer map ip 155.155.155.2 name Spicey broadcast 6106  
  dialer-group 1  
  isdn switch-type basic-net3  
  ppp authentication chap  
!  
router igrp 2  
  network 3.0.0.0  
  network 122.0.0.0  
  network 155.155.0.0  
!  
ip route 124.124.124.0 255.255.255.0 155.155.155.2 250  
!  
access-list 101 deny igrp any any  
access-list 101 permit ip any any  
dialer-list 1 protocol ip list 101  
!  
line con 0  
  exec-timeout 0 0  
  transport input none  
line aux 0  
line vty 0 4  
  login  
!  
end
```

Spicey

```
Spicey#show running-config  
Building configuration...  
Current configuration : 1887 bytes  
!  
version 12.1  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
hostname Spicey  
!  
username Prasit password 0 cisco  
username Aton password 0 cisco  
!  
isdn switch-type basic-net3  
!  
!  
!  
interface Ethernet0  
  ip address 124.124.124.1 255.255.255.0  
!  
interface Serial0  
  no ip address  
  encapsulation frame-relay  
!  
interface Serial0.1 point-to-point  
  ip address 4.0.1.1 255.255.255.0  
  frame-relay interface-dlci 140  
!  
interface Serial0.2 point-to-point
```

```
ip address 3.1.3.1 255.255.255.0
frame-relay interface-dlci 130
!
interface BRI0
no ip address
encapsulation ppp
no ip route-cache
no ip mroute-cache
dialer pool-member 2 max-link 1
dialer pool-member 1 max-link 1
isdn switch-type basic-net3
no peer default ip address
no cdp enable
ppp authentication chap
!
interface Dialer1
ip address 160.160.160.1 255.255.255.0
encapsulation ppp
no ip route-cache
no ip mroute-cache
dialer pool 1
dialer remote-name Prasit
dialer-group 1
ppp authentication chap
!
interface Dialer2
ip address 155.155.155.2 255.255.255.0
encapsulation ppp
no ip route-cache
no ip mroute-cache
dialer pool 2
dialer remote-name Aton
dialer-group 1
ppp authentication chap
!
router igrp 2
network 3.0.0.0
network 4.0.0.0
network 124.0.0.0
network 155.155.0.0
network 160.160.0.0
!
access-list 101 deny igrp any any
access-list 101 permit ip any any
dialer-list 1 protocol ip list 101
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...

Current configuration : 1267 bytes
!
version 12.1
```

```

service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
username Spicey password 0 cisco
!
isdn switch-type basic-net3
!
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 no ip address
 encapsulation frame-relay
!
interface Serial1.1 point-to-point
 backup delay 5 10
 backup interface BRI0
 ip address 4.0.1.2 255.255.255.0
 frame-relay interface-dlci 150
!
interface BRI0
 ip address 160.160.160.2 255.255.255.0
 encapsulation ppp
 dialer map ip 160.160.160.1 name Spicey broadcast 6106
 dialer-group 1
 isdn switch-type basic-net3
 ppp authentication chap
!
router igrp 2
 network 4.0.0.0
 network 123.0.0.0
 network 160.160.0.0
!
ip route 124.124.124.0 255.255.255.0 160.160.160.1 250
!
access-list 101 deny igrp any any
access-list 101 permit ip any any
dialer-list 1 protocol ip list 101
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

[显示命令](#)

- **show frame-relay map**
- **show ip route**
- **show frame map**
- **show frame-relay PVC**

Aton

Aton#show frame-relay map

```
Serial1.1 (up): point-to-point dlci, dlci 160(0xA0,0x2800), broadcast
status defined, active
```

Aton#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms

Aton#show ip route

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
U - per-user static route, o - ODR, P - periodic downloaded static route
T - traffic engineered route
```

Gateway of last resort is not set

```
I 155.155.0.0/16 [100/182571] via 3.1.3.1, Serial1.1
3.0.0.0/24 is subnetted, 1 subnets
C 3.1.3.0 is directly connected, Serial1.1
I 4.0.0.0/8 [100/10476] via 3.1.3.1, Serial1.1
I 160.160.0.0/16 [100/182571] via 3.1.3.1, Serial1.1
124.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
S 124.124.124.0/24 [250/0] via 155.155.155.2
I 124.0.0.0/8 [100/8576] via 3.1.3.1, Serial1.1
I 123.0.0.0/8 [100/10576] via 3.1.3.1, Serial1.1
122.0.0.0/24 is subnetted, 1 subnets
C 122.122.122.0 is directly connected, Ethernet0
```

Aton#

Serial1断开。

Aton#

```
01:16:33: %LINK-3-UPDOWN: Interface Serial1, changed state to down
01:16:34: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1,
changed state to down
01:16:37: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
01:16:37: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
01:16:37: %LINK-3-UPDOWN: Interface BRI0, changed state to up
01:16:41: %ISDN-6-LAYER2UP: Layer 2 for Interface BR0, TEI 64 changed to up
```

Aton#show ip route

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
U - per-user static route, o - ODR, P - periodic downloaded static route
T - traffic engineered route
```

Gateway of last resort is not set

```
155.155.0.0/24 is subnetted, 1 subnets
C 155.155.155.0 is directly connected, BRI0
124.0.0.0/24 is subnetted, 1 subnets
S 124.124.124.0 [250/0] via 155.155.155.2
```

```
122.0.0.0/24 is subnetted, 1 subnets
C 122.122.122.0 is directly connected, Ethernet0
```

```
Aton#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
01:21:33: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 36/36/36 ms
Aton#
```

```
01:21:34: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1,
changed state to up
```

```
01:21:39: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 6106
Spicey
```

```
Aton#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/123/296 ms
```

```
Aton#
```

Serial1再变得激活

```
Aton#
```

```
01:24:02: %ISDN-6-DISCONNECT: Interface BRI0:1 disconnected from 6106
Spicey, call lasted 149 seconds
```

```
01:24:02: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
```

```
01:24:03: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1,
changed state to down
```

```
Aton#show frame map
```

```
Serial1.1 (down): point-to-point dlci, dlci 160(0xA0,0x2800), broadcast
status deleted
```

```
Aton#
```

```
01:26:35: %LINK-3-UPDOWN: Interface Serial1, changed state to up
```

```
01:26:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1,
changed state to up
```

```
01:26:56: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BRI0, TEI 64 changed
to down
```

```
01:26:56: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BR0, TEI 64 changed
to down
```

```
01:26:56: %LINK-5-CHANGED: Interface BRI0, changed state to standby mode
```

```
01:26:56: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
```

```
01:26:56: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
```

```
Aton#show frame map
```

```
Serial1.1 (up): point-to-point dlci, dlci 160(0xA0,0x2800), broadcast
status defined, active
```

```
Aton#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms
```

```
Aton#ping 124.124.124.1
```

```
Aton#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0

```
Switched      0          0          0          0
Unused        0          0          0          0
```

```
DLCI = 160, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE =
Serial1.1
  input pkts 60          output pkts 69          in    bytes 9694
  out bytes 10811       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 44    out    bcast bytes 7565
  pvc create time 01:28:35, last time pvc status changed 00:02:19
```

Spicey

Spicey#show frame-relay map

```
Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
  status defined, active
Serial0.2 (up): point-to-point dlci, dlci 130(0x82,0x2020), broadcast
  status defined, active
```

Spicey#ping 122.122.122.1

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 122.122.122.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/35/36 ms
```

Spicey#ping 123.123.123.1

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms
```

Spicey#show ip route

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
Gateway of last resort is not set
 155.155.0.0/24 is subnetted, 1 subnets
C    155.155.155.0 is directly connected, Dialer2
 3.0.0.0/24 is subnetted, 1 subnets
C    3.1.3.0 is directly connected, Serial0.2
 4.0.0.0/24 is subnetted, 1 subnets
C    4.0.1.0 is directly connected, Serial0.1
 160.160.0.0/24 is subnetted, 1 subnets
C    160.160.160.0 is directly connected, Dialer1
 124.0.0.0/24 is subnetted, 1 subnets
C    124.124.124.0 is directly connected, Ethernet0
I    123.0.0.0/8 [100/8576] via 4.0.1.2, 00:00:55, Serial0.1
I    122.0.0.0/8 [100/8576] via 3.1.3.3, 00:00:35, Serial0.2
```

从主叫方的两串行线路断开。

Spicey#

```
*Mar 1 01:21:30.171: %LINK-3-UPDOWN: Interface BRI0:1, changed state toup
*Mar 1 01:21:30.627: %DIALER-6-BIND: Interface BR0:1 bound to profile Di2
*Mar 1 01:21:31.647: %LINEPROTO-5-UPDOWN: Line protocol on Interface
```

```

BRI0:1, changed state to up
*Mar 1 01:21:36.191: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 6104 Aton
*Mar 1 01:21:40.923: %LINK-3-UPDOWN: Interface BRI0:2, changed state to up
*Mar 1 01:21:41.359: %DIALER-6-BIND: Interface BR0:2 bound to profile Di1
*Mar 1 01:21:42.383: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:2, changed state to up
*Mar 1 01:21:46.943: %ISDN-6-CONNECT: Interface BRI0:2 is now connected
to 6105 Prasit
*Mar 1 01:23:59.819: %DIALER-6-UNBIND: Interface BR0:1 unbound from
profile Di2
*Mar 1 01:23:59.831: %ISDN-6-DISCONNECT: Interface BRI0:1 disconnected
from 6104 Aton, call lasted 149 seconds
*Mar 1 01:23:59.927: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
*Mar 1 01:24:00.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:1, changed state to down
*Mar 1 01:24:03.015: %DIALER-6-UNBIND: Interface BR0:2 unbound from
profile Di1
*Mar 1 01:24:03.023: %ISDN-6-DISCONNECT: Interface BRI0:2 disconnected
from 6105 Prasit, call lasted 142 seconds
*Mar 1 01:24:03.107: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
*Mar 1 01:24:04.107: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI0:2, changed state to down

```

Spicey#show frame map

```

Serial0.1 (down): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
status defined, inactive
Serial0.2 (down): point-to-point dlci, dlci 130(0x82,0x2020), broadcast
status defined, inactive

```

Spicey#

两串行线路再是可用的。

Spicey#show frame pvc

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	2	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 130, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.2

```

input pkts 54          output pkts 61          in   bytes 7014
out bytes 9975        dropped pkts 3          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 40     out   bcast bytes 7803
pvc create time 01:28:14, last time pvc status changed 00:02:38

```

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1

```

input pkts 56          output pkts 60          in   bytes 7604
out bytes 10114       dropped pkts 2          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 39     out   bcast bytes 7928
pvc create time 01:28:15, last time pvc status changed 00:02:29

```

[Prasit](#)

Prasit#show frame-relay map

Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast
status defined, active

Prasit#ping 124.124.124.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/40 ms

Prasit#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

```
I 155.155.0.0/16 [100/182571] via 4.0.1.1, 00:00:41, Serial1.1
I 3.0.0.0/8 [100/10476] via 4.0.1.1, 00:00:41, Serial1.1
  4.0.0.0/24 is subnetted, 1 subnets
C 4.0.1.0 is directly connected, Serial1.1
I 160.160.0.0/16 [100/182571] via 4.0.1.1, 00:00:41, Serial1.1
  124.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
S 124.124.124.0/24 [250/0] via 160.160.160.1
I 124.0.0.0/8 [100/8576] via 4.0.1.1, 00:00:41, Serial1.1
  123.0.0.0/24 is subnetted, 1 subnets
C 123.123.123.0 is directly connected, Ethernet0
I 122.0.0.0/8 [100/10576] via 4.0.1.1, 00:00:42, Serial1.1
```

Prasit#

Serial1断开。

Prasit#

```
*Mar 1 01:16:08.287: %LINK-3-UPDOWN: Interface Serial1, changed state to down
*Mar 1 01:16:09.287: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial1, changed state to down
*Mar 1 01:16:11.803: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
*Mar 1 01:16:11.819: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
*Mar 1 01:16:11.855: %LINK-3-UPDOWN: Interface BRI0, changed state to up
*Mar 1 01:16:15.967: %ISDN-6-LAYER2UP: Layer 2 for Interface BR0, TEI
64 changed to up
```

Prasit#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

```
160.160.0.0/24 is subnetted, 1 subnets
C 160.160.160.0 is directly connected, BRI0
  124.0.0.0/24 is subnetted, 1 subnets
S 124.124.124.0 [250/0] via 160.160.160.1
```



```
123.0.0.0/24 is subnetted, 1 subnets
C 123.123.123.0 is directly connected, Ethernet0
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
*Mar 1 01:21:38.967: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up!!!!
```

```
Success rate is 80 percent (4/5), round-trip min/avg/max = 36/36/36 ms
```

```
Prasit#
```

```
*Mar 1 01:21:40.063: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1, changed state to up
```

```
*Mar 1 01:21:44.991: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to 6106 Spicey
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/36 ms
```

```
Prasit#
```

Serial1再变得激活。

```
Prasit#
```

```
*Mar 1 01:26:40.579: %LINK-3-UPDOWN: Interface Serial1, changed state to up
```

```
*Mar 1 01:26:41.579: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1, changed state to up
```

```
*Mar 1 01:27:01.051: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BRI0, TEI 64 changed to down
```

```
*Mar 1 01:27:01.055: %ISDN-6-LAYER2DOWN: Layer 2 for Interface BR0, TEI 64 changed to down
```

```
*Mar 1 01:27:01.363: %LINK-5-CHANGED: Interface BRI0, changed state to standby mode
```

```
*Mar 1 01:27:01.379: %LINK-3-UPDOWN: Interface BRI0:1, changed state to down
```

```
*Mar 1 01:27:01.395: %LINK-3-UPDOWN: Interface BRI0:2, changed state to down
```

```
Prasit#show frame map
```

```
Serial1.1 (up): point-to-point dlci, dlci 150(0x96,0x2460), broadcast status defined, active
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/116/432 ms
```

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1.1
```

input pkts 58	output pkts 66	in bytes 9727
out bytes 10022	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 46      out   bcast bytes 7942
pvc create time 01:27:37, last time pvc status changed 00:01:59
```

配置帧中继交换

帧中继交换是根据数据链路连接标识符(DLCI)的交换信息包方法。我们在此能查找作为媒体访问控制(MAC)地址的帧中继等同。您通过配置您的Cisco路由器或接入服务器执行交换到帧中继网络。有两部分对帧中继网络：

- 帧中继数据终端设备(DTE) -路由器或接入服务器。
- 帧中继数据电路终端设备(DCE)交换机。

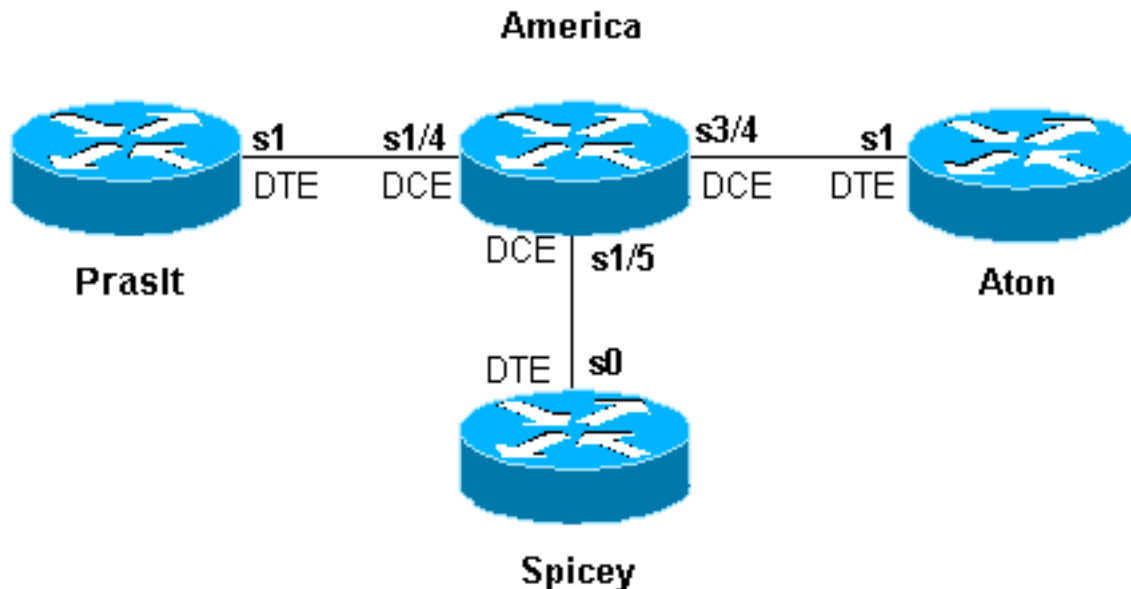
Note: 在Cisco IOS软件release 12.1(2)T及以上版本，**frame route命令被连接命令替换了。**

请查看配置示例。在下面的配置中，我们使用路由器美国作为帧中继交换机。我们使用Spicey作为集线路由器和Prasit和Aton作为分支路由器。我们连接了他们如下：

- Prasit序列1 (s1) DTE被连接到美国序列1/4 (s1/4) DCE。
- Spicey serial0 (s0) DTE被连接到美国序列1/5 (s1/5) DCE。
- Aton序列1 (s1) DTE被连接到美国序列3/4 (s3/4) DCE。

Network Diagram

本文根据以下配置：



配置

- [Spicey](#)
- [Prasit](#)
- [Aton](#)
- [美国](#)

Spicey

```
Spicey#show running-config
Building configuration...

!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spicey
!
!
!
interface Ethernet0
 ip address 124.124.124.1 255.255.255.0
!
interface Serial0
 ip address 3.1.3.1 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 130
 frame-relay interface-dlci 140
!
!
router rip
 network 3.0.0.0
 network 124.0.0.0
!
line con 0
!
exec-timeout 0 0
 transport input none
 line aux 0
 line vty 0 4
 login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...
Current configuration : 1499 bytes
!
 version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Prasit
!
!
!
interface Ethernet0
 ip address 123.123.123.1 255.255.255.0
!
interface Serial1
 ip address 3.1.3.2 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 150
!
!
```

```
router rip
 network 3.0.0.0
 network 123.0.0.0
!
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Aton

```
Aton#show running-config
Building configuration...
Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Aton
!
!
!
interface Ethernet0
 ip address 122.122.122.1 255.255.255.0
!
interface Serial1
 ip address 3.1.3.3 255.255.255.0
 encapsulation frame-relay
 frame-relay interface-dlci 160
!
router rip
 network 3.0.0.0
 network 122.0.0.0
!
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

美国

```
america#show running-config
Building configuration...
Current configuration:
!
!
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname america
```

```

!
frame-relay switching
!
!
interface Serial1/4
description *** static DCE connection to s1 Prasit
no ip address
encapsulation frame-relay
clockrate 2000000
frame-relay intf-type dce
frame-relay route 150 interface Serial1/5 140
!
interface Serial1/5
description *** static DCE connection to s0 spicy
no ip address
encapsulation frame-relay
bandwidth 1000000
tx-queue-limit 100
frame-relay intf-type dce
frame-relay route 130 interface Serial3/4 160
frame-relay route 140 interface Serial1/4 150
transmitter-delay 10
!
interface Serial3/4
description *** static DCE connection to s1 Aton
encapsulation frame-relay
no ip mroute-cache
clockrate 2000000
frame-relay intf-type dce
frame-relay route 160 interface Serial1/5 130
!

```

[显示命令](#)

请使用以下显示命令测试您的网络正常运行：

- **show frame-relay map**
- **show frame-relay PVC**

如下所示的输出是输入这些on命令的结果我们在此配置示例方面使用的设备。

[Spicey](#)

Spicey#**show frame-relay map**

```

Serial0 (up): ip 3.1.3.2 dlci 140(0x8C,0x20C0), dynamic,
              broadcast,, status defined, active
Serial0 (up): ip 3.1.3.3 dlci 130(0x82,0x2020), dynamic,
              broadcast,, status defined, active

```

Spicey#**show frame-relay pvc**

PVC Statistics for interface Serial0 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	2	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 130, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

```
input pkts 32          output pkts 40          in bytes 3370
out bytes 3928        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 30    out bcast bytes 2888
pvc create time 00:15:46, last time pvc status changed 00:10:42
```

DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0

```
input pkts 282          output pkts 291          in bytes 25070
out bytes 27876        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 223    out bcast bytes 20884
pvc create time 02:28:36, last time pvc status changed 02:25:14
```

Prasit

Prasit#show frame-relay map

```
Serial1 (up): ip 3.1.3.1 dlci 150(0x96,0x2460), dynamic,
                broadcast,, status defined, active
```

Prasit#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1

```
input pkts 311          output pkts 233          in bytes 28562
out bytes 22648        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 162    out bcast bytes 15748
pvc create time 02:31:39, last time pvc status changed 02:25:14
```

Aton

Aton#show frame-relay map

```
Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic, broadcast, status defined, active
```

Aton#show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 160, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial

```
input pkts 35          output pkts 32          in bytes 3758
out bytes 3366        dropped pkts 0          in FECN pkt 0
in BECN pkts 0       out FECN pkts 0        out BECN pkts 0
in DE pkts 0          out DE pkts 0
out bcast pkts 27 out bcast bytes 2846
pvc create time 00:10:53, last time pvc status changed 00:10:53
```

配置帧中继DLCI优先级划分

数据链路连接标识符(DLCI)优先级是进程，藉以不同的话务类型被放置在分开的DLCI，以便帧中继网络能为每种话务类型提供一个不同的承诺信息速率。它可以与自定义排列或优先级排队一道用于

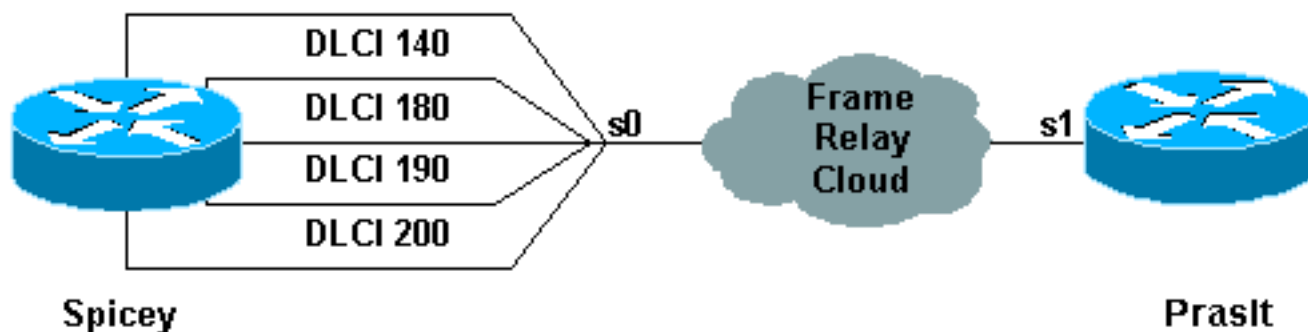
提供对接入链路的带宽管理控制给帧中继网络。另外，一些帧中继服务提供商和帧中继交换机(例如Stratacom网际分组交换[IPX]、IGX和BPX或者AXIS交换机)实际上提供在根据此优先级设置的帧中继网云内的优先级。

实施注意事项

当实现DLCI优先级划分，请注意下列问题：

- 如果第二DLCI断开，您丢失为仅该队列注定的数据流。
- 如果丢失主要的DLCI，子接口断开，并且您丢失所有数据流。

Network Diagram



为了使用此设置，您需要有将使用DLCI优先级划分的边的四DLCI。在本例中，我们配置了优先级的Spicey排队如下：

- Ping在高优先级队列。
- Telnet在媒体优先级队列。
- 文件传输协议(FTP)在normal-priority队列。
- 其他IP数据流在低优先级队列。

Note: 保证您配置DLCI对应与优先级列表或者系统不会使用正确的队列。

配置

- [Spicey](#)
- [Prasit](#)

```
Spicey
-----
Spicey#show running-config
Building configuration...

Current configuration : 1955 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname Spicey
!
!
interface Ethernet0
```

```
ip address 124.124.124.1 255.255.255.0
!
interface Serial0
no ip address
encapsulation frame-relay
priority-group 1
!
interface Serial0.1 point-to-point
ip address 4.0.1.1 255.255.255.0
frame-relay priority-dlci-group 1 140 180 190 200
frame-relay interface-dlci 140
!
router igrp 2
network 4.0.0.0
network 124.0.0.0
!
access-list 102 permit icmp any any
priority-list 1 protocol ip high list 102
priority-list 1 protocol ip medium tcp telnet
priority-list 1 protocol ip normal tcp ftp
priority-list 1 protocol ip low
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
end
```

Prasit

```
Prasit#show running-config
Building configuration...

!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname Prasit
!
!
!
interface Ethernet0
ip address 123.123.123.1 255.255.255.0
!
interface Serial1
ip address 4.0.1.2 255.255.255.0
encapsulation frame-relay
!
router igrp 2
network 4.0.0.0
network 123.0.0.0
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
```



```
end
```

[debug 和 show 命令](#)

请使用以下显示和调试指令测试您的网络正常运行。在发出 **debug** 命令之前，请参阅[有关 Debug 命令的重要信息](#)。

- **show frame-relay PVC**
- **show frame-relay map**
- **show queueing priority**
- **debug priority**

如下所示的输出是输入这些命令的结果我们在此配置示例方面使用的设备。

[Spicey](#)

```
Spicey#show frame-relay pvc
```

```
PVC Statistics for interface Serial0 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	4	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 140, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1
```

```
input pkts 106          output pkts 15          in bytes 6801
out bytes 1560          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
pvc create time 00:29:22, last time pvc status changed 00:20:37
Priority DLCI Group 1, DLCI 140 (HIGH), DLCI 180 (MEDIUM)
DLCI 190 (NORMAL), DLCI 200 (LOW)
```

```
DLCI = 180, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1
```

```
input pkts 0            output pkts 51          in bytes 0
out bytes 2434          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
pvc create time 00:29:23, last time pvc status changed 00:14:48
```

```
DLCI = 190, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1
```

```
input pkts 0            output pkts 13          in bytes 0
out bytes 3653          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 13      out bcast bytes 3653
pvc create time 00:29:23, last time pvc status changed 00:14:28
```

```
DLCI = 200, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.1
```

```
input pkts 0            output pkts 42          in bytes 0
out bytes 2554          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 10          out bcast bytes 500
pvc create time 00:29:24, last time pvc status changed 00:14:09
```

```
Spicey#show frame-relay map
```

```
Serial0.1 (up): point-to-point dlci, dlci 140(0x8C,0x20C0), broadcast
status defined, active
Priority DLCI Group 1, DLCI 140 (HIGH), DLCI 180 (MEDIUM)
DLCI 190 (NORMAL), DLCI 200 (LOW)
```

```
Spicey#show queueing priority
```

```
Current priority queue configuration:
```

```
List  Queue  Args
1     high   protocol ip          list 102
1     medium protocol ip          tcp port telnet
1     normal protocol ip          tcp port ftp
1     low    protocol ip
```

要验证优先级队列，请使用**debug priority**命令。

```
Spicey#debug priority
```

```
Priority output queueing debugging is on
```

```
Spicey#ping 123.123.123.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48 ms
```

```
Spicey#
```

```
*Mar 1 00:32:30.391: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.395: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.399: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.439: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.443: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.447: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.487: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.491: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.495: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.535: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.539: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.583: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.587: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.587: PQ: Serial0 output (Pk size/Q 104/0)Spicey#
```

```
Spicey#telnet 123.123.123.1
```

```
Trying 123.123.123.1 ... Open
```

```
User Access Verification
```

```
Password:
```

```
*Mar 1 00:32:59.447: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.451: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.451: PQ: Serial0 output (Pk size/Q 48/1)
*Mar 1 00:32:59.475: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.479: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.483: PQ: Serial0 output (Pk size/Q 44/1)
*Mar 1 00:32:59.487: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.487: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.491: PQ: Serial0 output (Pk size/Q 53/1)
*Mar 1 00:32:59.495: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.499: PQ: Serial0: ip (tcp 23) -> medium
```

```
*Mar 1 00:32:59.499: PQ: Serial0 output (Pk size/Q 44/1)
*Mar 1 00:32:59.511: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.511: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.515: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.519: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.519: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.523: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.527: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.527: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.531: PQ: Serial0 output (Pk size/Q 53/1)
*Mar 1 00:32:59.539: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.543: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.547: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.751: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.755: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.755: PQ: Serial0 output (Pk size/Q 44/1)
```

Password:

其他IP数据流通过低队列。

Spicey#**debug priority**

Priority output queueing debugging is on

Spicey#**ping 123.123.123.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 123.123.123.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48 ms

Spicey#

```
*Mar 1 00:32:30.391: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.395: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.399: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.439: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.443: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.447: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.487: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.491: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.495: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.535: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.539: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:32:30.583: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.587: PQ: Serial0: ip (s=4.0.1.1, d=123.123.123.1) ->high
*Mar 1 00:32:30.587: PQ: Serial0 output (Pk size/Q 104/0)Spicey#
```

Spicey#**telnet 123.123.123.1**

Trying 123.123.123.1 ... Open

User Access Verification

Password:

```
*Mar 1 00:32:59.447: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.451: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.451: PQ: Serial0 output (Pk size/Q 48/1)
*Mar 1 00:32:59.475: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.479: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.483: PQ: Serial0 output (Pk size/Q 44/1)
*Mar 1 00:32:59.487: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.487: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.491: PQ: Serial0 output (Pk size/Q 53/1)
*Mar 1 00:32:59.495: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.499: PQ: Serial0: ip (tcp 23) -> medium
```

```

*Mar 1 00:32:59.499: PQ: Serial0 output (Pk size/Q 44/1)
*Mar 1 00:32:59.511: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.511: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.515: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.519: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.519: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.523: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.527: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.527: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.531: PQ: Serial0 output (Pk size/Q 53/1)
*Mar 1 00:32:59.539: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.543: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.547: PQ: Serial0 output (Pk size/Q 47/1)
*Mar 1 00:32:59.751: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.755: PQ: Serial0: ip (tcp 23) -> medium
*Mar 1 00:32:59.755: PQ: Serial0 output (Pk size/Q 44/1)

```

Password:

Prasit

```
Prasit#show frame-relay pvc
```

PVC Statistics for interface Serial11 (Frame Relay DTE)

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial11

```

input pkts 134          output pkts 119          in bytes 12029
out bytes 7801          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 18      out bcast bytes 1260
pvc create time 00:21:15, last time pvc status changed 00:21:15

```

```
Prasit#show frame-relay map
```

```
Serial11 (up): ip 4.0.1.1 dlci 150(0x96,0x2460), dynamic,
               broadcast, status defined, active
```

```
Prasit#ping 124.124.124.1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48

Here is the debug output shown on Spicey when you use the command above to ping to Spicey from Prasit.

```
Spicey#
```

```

*Mar 1 00:33:26.755: PQ: Serial0 output (Pk size/Q 13/0)
*Mar 1 00:33:28.535: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.539: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.583: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.631: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.679: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high

```

```
*Mar 1 00:33:28.683: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.723: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.727: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.731: PQ: Serial0 output (Pk size/Q 104/0)
```

```
Prasit#telnet 124.124.124.1
```

```
Trying 124.124.124.1 ... Open
```

```
User Access Verification
```

```
Password:
```

```
Spicey>exit
```

```
[Connection to 124.124.124.1 closed by foreign host]
```

```
Prasit#
```

这是在Spicey显示的调试输出，当您使用上面命令对telnet对从Prasit时的Spicey。

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1
```

```
input pkts 134          output pkts 119          in bytes 12029
out bytes 7801          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 18      out bcast bytes 1260
pvc create time 00:21:15, last time pvc status changed 00:21:15
```

```
Prasit#show frame-relay map
```

```
Serial1 (up): ip 4.0.1.1 dlci 150(0x96,0x2460), dynamic,
              broadcast, status defined, active
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48
```

```
Here is the debug output shown on Spicey when you use the command above to ping to Spicey from Prasit.
```

```
Spicey#
```

```
*Mar 1 00:33:26.755: PQ: Serial0 output (Pk size/Q 13/0)
*Mar 1 00:33:28.535: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.539: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.583: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.631: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.679: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0 output (Pk size/Q 104/0)
```

```
*Mar 1 00:33:28.723: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.727: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.731: PQ: Serial0 output (Pk size/Q 104/0)
```

```
Prasit#telnet 124.124.124.1
Trying 124.124.124.1 ... Open
```

```
User Access Verification
Password:
Spicey>exit
```

```
[Connection to 124.124.124.1 closed by foreign host]
Prasit#
```

帧中继广播队列

广播队列是在对大IP或IPX网络的媒体使用路由和服务访问点的一个主要功能(SAP)广播必须在帧中继网络流。广播队列独立正常接口队列被管理，有其自己的缓冲区，并且有一项可配置大小和服务速率。此广播队列没有使用桥接生成树更新(BPDU)由于时钟灵敏度。这些信息包将流经正常队列。interface命令对enable (event)广播队列跟随：

帧中继广播队列大小字节速率信息包费率

产生广播队列在字节每秒和信息包测量的一最大传输速率(吞吐量)限制每秒。队列被服务保证提供仅此最大数量。当传输以一种费率在配置的最大值之下，并且有保证的最低的带宽分配时，广播队列有优先级。两个传输速率限额打算避免充斥接口与广播。实际限制在所有秒钟是达到的第一个速率限制。假使传输速率限制，要求另外的缓冲存储广播包。广播队列是可配置的存储很大数量的广播包。应该设置队列大小避免广播路由更新信息包损失。确切大小取决于协议使用的和对于每次更新是必需的信息包的数量。要是安全的，应该设置队列大小，以便可以存储一完全路由更新从每个协议和每数据链路连接标识符(DLCI)的。通常，请从每个DLCI 20个信息包开始。比特率比两个应该是较少的下列：

- N/4计时最低的远程访问存取速率(测量在字节每秒)，其中N是必须复制广播DLCI的编号
- 1/4本地接入速率(测量在字节每秒)

如果适当地，设置比特率信息包速率不是重要。一般来说，应该设置信息包速率假设250-byte信息包。serial interfaces的默认值是64个队列大小、256,000个字节每秒(2,048,000 bps)和36 pps。高速的Serial interfaces的(HSSI)默认值是256个队列大小、1,024,000个字节每秒(8,192,000 bps)和144 pps。

流量整形

流量整形使用称为令牌桶过滤器的一个速率控制控制机制。设置此令牌桶过滤器如下：

超额突发加上承诺突发量(Bc+Be) =虚拟电路的(VC)最大速度

在最大速度上的数据流在与加权公平队列的流量整形队列被缓冲(WFQ)的大小是相等的。令牌桶过滤器不过滤流量，然而控制数据流在出局接口被发送的费率。关于令牌桶过滤器的更多信息，请参阅[策略和整形概述](#)。

本文提供通用流量整形和帧中继流量整形概述。

流量整形参数

我们能使用以下流量整形参数：

- CIR = 承诺信息速率(=平均时间)
- EIR = 过大信息速率
- TB = 令牌桶(= $B_c + B_e$)
- BC = 承诺突发流量大小(=持续的突发流量大小)
- 是 = 超额突发流量大小
- DE = 丢弃资格
- Tc = 测量间隔
- 与物理接口相应的费率的AR = 接入速率(如此，如果使用T1，AR近似是1.5 Mbps)。

请较详细地查看其中一些参数：

存取速率(AR)

比特每秒的最大数量终端站能传输到网络的由用户网络接口的接入速率一定。用户网络连接的线路速度限制接入速率。您在您的订阅能设立此到服务提供商。

承诺突发流量大小(BC)

您能为网络提供的最大承诺数据量被定义成BC。BC是网络保证消息发送的数据量的一次测量通常情况下。在承诺速率Tc期间，它被测量。

超额突发流量大小(Be)

非承诺的位的数量(在CIR外面)由帧中继交换机仍然接受，但是被标记作为合格被丢弃(DE)。

令牌桶是‘虚拟’缓冲区。它包含一定数量的令牌，使您发送有限的每个时间间隔。令牌桶充满BC位每个Tc。桶的最大大小是 $B_c + B_e$ 。如果是非常大，如果在T0桶充满 $B_c + B_e$ 令牌，您能发送 $B_c + B_e$ 位以接入速率。当采取发送是的时候，这没有由Tc限制，但是。这是接入速率的功能。

承诺信息速率(CIR)

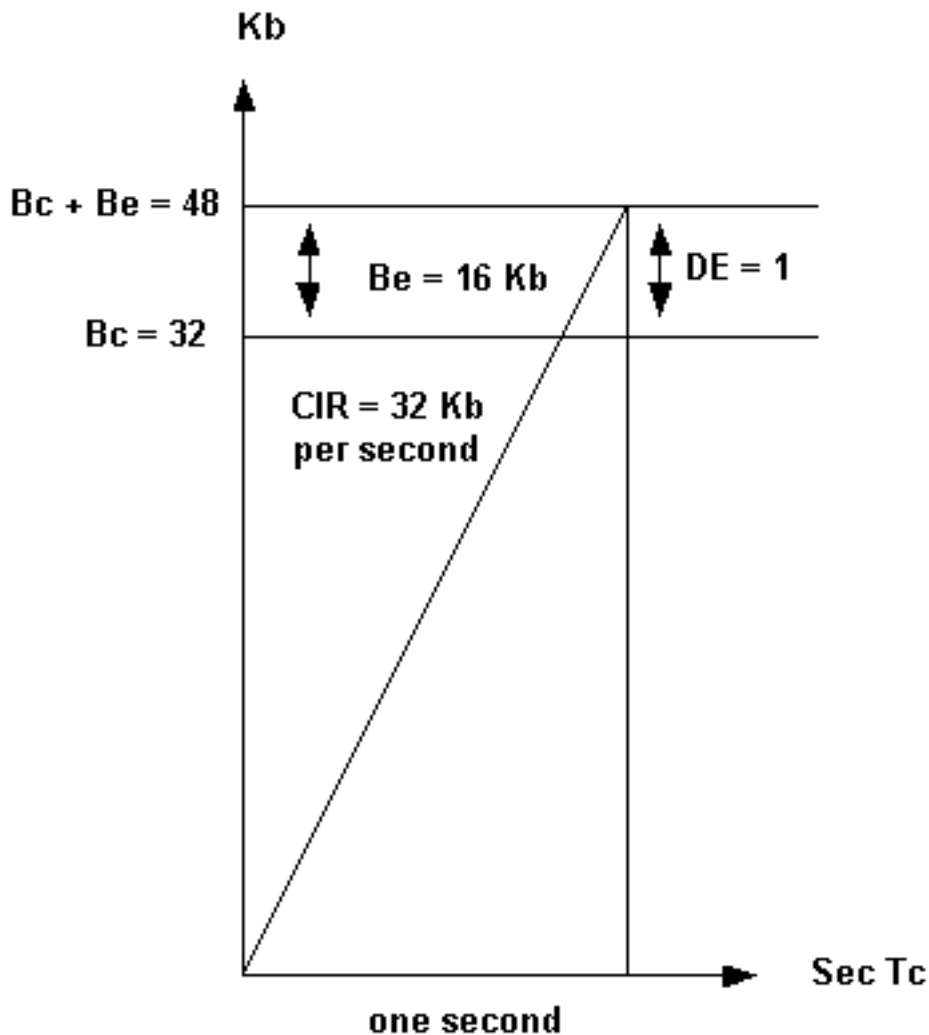
CIR是通常情况下网络做传递的允许的相当数量数据。费率在时间被平均Tc的增量。CIR也指最低的可接受的吞吐量。BC和是用位表示、Tc以秒钟和接入速率和CIR在比特每秒。

BC，是，Tc和CIR每数据链路连接标识符(DLCI)被定义。由于此，令牌桶过滤器控制费率每个DLCI。接入速率每个用户网络接口是有效的。对于 B_c ， B_e 及CIR流入和流出的值可以是著名的。如果连接是对称的，在两个方向的值是相同的。对于永久虚拟电路，我们定义了流入和流出的 B_c ， B_e 及CIR在订阅时间。

- 高峰 = DLCI的最大速度。该特定DLCI的带宽。
- $T_c = B_c / CIR$
- 高峰 = $CIR + B_e / T_c = CIR (1 + B_e / B_c)$

如果Tc是一秒钟然后：

- 高峰 = CIR + 是 = $B_c + B_e$
- EIR = 是



在示例中我们使用得这里，路由器发送数据流在48 Kbps和32 Kbps之间根据在网络的拥塞。网络可能用DE标记在BC上的帧，但是有大量空闲容量传输帧。反向也是可能的：他们能立即限制了容量，丢弃额外的帧。网络可能用DE标记在Bc+Be上的帧和可能传输它或者丢弃帧如建议由国际电信联盟电信标准化部门规格ITU-T I.370。流量整形抑制根据从交换网络的后向显式拥塞通知(BECN)标记信息包的数据流。如果接受50% BECN，路由器由八分之一该特定DLCI的当前传输带宽减轻数据流。

示例

传输的速度是42千字节。路由器减少速度到42减8除的42 (42 - 42/8)，做36.75千字节。如果拥塞减少，在更改，路由器进一步后减少数据流，下降到八分之一当前传输带宽。减少数据流，直到达到被配置的CIR值。然而，当我们能仍然看到BECN时，速度能下降在CIR下。您能指定一底下限制，例如CIR/2。当从网络接收的所有帧不再有一个特定时间间隔的时，BECN位网络不再被堵塞。200毫秒此间隔的是DEFAULT值。

通用流量整形

通用流量整形功能是帮助减少出局流量流的媒体和独立封装流量整形形成切刀，当有拥塞在网云内，在链路，或者在接受终端路由器时。我们在接口或子接口能设置它在路由器内。

通用流量整形在以下情况下是有用的：

- 当您有包括在中心站点和低速的(少于56 Kbps)连接的高速的一个网络拓扑(T1线路速度)连接在分组或远程办公人员站点。由于速度不匹配，瓶颈为在分组或远程办公人员站点的数据流经常存在，当中心站点发送远程站点能接受的数据高速度时。这导致在最后交换机的一个瓶颈在远程点路由器前。
- 如果是提供次速率服务的服务提供商，此功能enable (event)使用路由器的您分成您的T1或T3连接，例如，到更小的信道。您能用匹配用户订购的服务的一个令牌的过滤器桶配置每个子接口。

在您的帧中继连接，您可以路由器抑制数据流而不是发送它到网络。抑制数据流将限制在服务提供商的网云的信息包丢失。基于BECN的节流的功带有此功能动态地允许您有根据收到BECN标记信息包的路由器节流孔数据流从网络。节流的这保持在路由器的缓冲区的信息包减少从路由器的数据流到帧中继网络里。根据子接口基本类型的路由器控制数据流和费率，当少量BECN标记的信息包收到时，也增加。

通用流量整形的命令

要定义速率控制，请使用此命令：

traffic-shape rate 位元速率 [burst-size [excess-burst-size]] [group access-list]

要节流在帧中继接口的BECN使用此命令：

traffic-shape.adaptive [bit-rate]

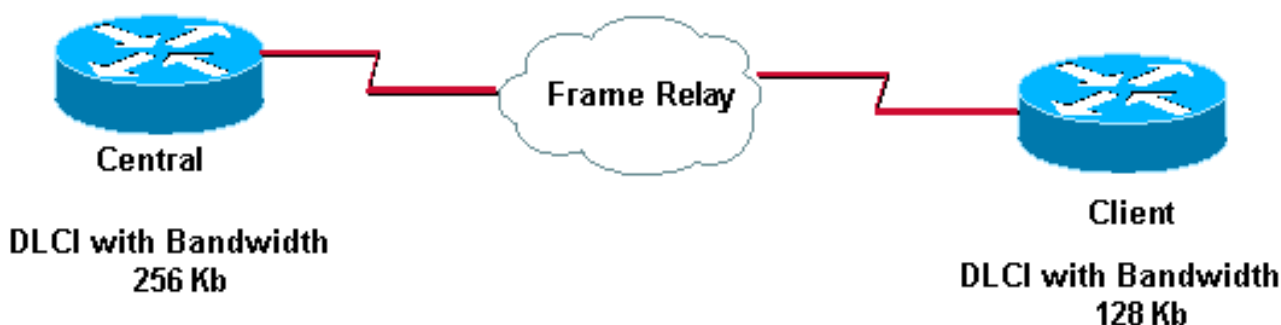
要配置帧中继子接口估计可用的带宽，当接受BECN时，请使用**traffic-shape adaptive**命令。

Note: 在您能使用**traffic-shape adaptive**命令前，您必须在接口的enable (event)流量整形用**traffic-shape rate**命令。

为**traffic-shape rate**命令指定的比特率是上限，并且为**traffic-shape adaptive**命令指定的比特率是下限(通常CIR值)数据流是整形的，当接口接受BECN时。实际上使用的费率通常在这两种费率之间。您应该配置**traffic-shape adaptive**命令在链路的两端，因为也配置设备在流末端反射前向显式拥塞通知(FECN)信号作为BECN。此enable (event)路由器在发现和适应的高速的末端拥塞，既使当数据流主要在一个方向流。

示例

以下示例用上限(通常Bc+Be) 128 Kbps和64 Kbps下限配置在接口0.1的流量整形。这允许链路从64运行到128 Kbps，根据拥塞程度。如果中心端有256 Kbps上限，您应该使用最低值的上限。



这是我们在这些路由器配置了：

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1
```

```
input pkts 134          output pkts 119          in bytes 12029
out bytes 7801          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 18      out bcast bytes 1260
pvc create time 00:21:15, last time pvc status changed 00:21:15
```

```
Prasit#show frame-relay map
```

```
Serial1 (up): ip 4.0.1.1 dlci 150(0x96,0x2460), dynamic,
              broadcast, status defined, active
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48
```

```
Here is the debug output shown on Spicey when you use the command above to ping to Spicey from Prasit.
```

```
Spicey#
```

```
*Mar 1 00:33:26.755: PQ: Serial0 output (Pk size/Q 13/0)
*Mar 1 00:33:28.535: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.539: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.583: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.631: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.679: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.723: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.727: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.731: PQ: Serial0 output (Pk size/Q 104/0)
```

```
Prasit#telnet 124.124.124.1
```

```
Trying 124.124.124.1 ... Open
```

```
User Access Verification
```

```
Password:
```

```
Spicey>exit
```

```
[Connection to 124.124.124.1 closed by foreign host]
```

```
Prasit#
```

[帧中继流量整形](#)

使用通用流量整形您能只指定一高峰速率(上限)每个物理接口和每个子接口—CIR (下限)值。使用帧中继流量整形，您启动一个令牌桶过滤器每条虚拟电路。

在帧中继功能的流量整形提供以下功能：

- 根据逐个VC的速率强制：您能配置高峰速率对CIR或某其他被定义的值限制出局流量例如突发信息速率。
- 根据逐个VC的概括的BECN技术支持：路由器能监控根据从帧中继网络的BECN标记的信息包反馈和节流孔数据流的BECN。
- 优先级排队(PQ)、客户排队(CQ)或者WFQ技术支持在VC级别。这允许在优先顺序化和排队的精细数据流，产生您对通信流的更多控制在单个VC。在帧中继功能的流量整形适用于帧中继永久虚拟电路(PVC)和交换虚拟电路(SVC)。

示例

```
Prasit#show frame-relay pvc
```

```
PVC Statistics for interface Serial1 (Frame Relay DTE)
```

	Active	Inactive	Deleted	Static
Local	1	0	0	0
Switched	0	0	0	0
Unused	0	0	0	0

```
DLCI = 150, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1
```

```
input pkts 134          output pkts 119          in bytes 12029
out bytes 7801          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 18      out bcast bytes 1260
pvc create time 00:21:15, last time pvc status changed 00:21:15
```

```
Prasit#show frame-relay map
```

```
Serial1 (up): ip 4.0.1.1 dlci 150(0x96,0x2460), dynamic,
              broadcast, status defined, active
```

```
Prasit#ping 124.124.124.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 124.124.124.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48
```

```
Here is the debug output shown on Spicey when you use the command above to ping to Spicey from Prasit.
```

```
Spicey#
```

```
*Mar 1 00:33:26.755: PQ: Serial0 output (Pk size/Q 13/0)
*Mar 1 00:33:28.535: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.539: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.543: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.583: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.587: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.631: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.635: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.679: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.683: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
```

```
*Mar 1 00:33:28.683: PQ: Serial0 output (Pk size/Q 104/0)
*Mar 1 00:33:28.723: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.727: PQ: Serial0: ip (s=124.124.124.1, d=4.0.1.2) ->high
*Mar 1 00:33:28.731: PQ: Serial0 output (Pk size/Q 104/0)
```

```
Prasit#telnet 124.124.124.1
Trying 124.124.124.1 ... Open
```

```
User Access Verification
Password:
Spicey>exit
```

```
[Connection to 124.124.124.1 closed by foreign host]
Prasit#
```

在本例中路由器添加两令牌时段。

- 一运行在64000个(CIR之间)，并且128000(Bc +是)。
- 其他运行在16000 (CIR)和64000之间(Bc+Be)。

如果从以太网的流入的数据流大于令牌桶过滤器，数据流在帧中继数据流队列被缓冲。

要查看显示信息包流的流程图，当您实现帧中继流量整形时，请参阅[帧中继流量整形流程图](#)。使用令牌桶过滤器，特别地要查看流程图，请参阅[帧中继流量整形-令牌桶流程图](#)。

常用帧中继命令

此部分描述是特别有用的，当配置帧中继时的两Cisco IOS命令。

show frame-relay PVC

此命令显示永久虚拟电路(PVC)的状况，等等里里外外信息包，丢弃的数据包，如果有在线路的拥塞通过前向显式拥塞通知(FECN)和后向显式拥塞通知(BECN)。对于字段的一个详细规格说明与**show frame-relay pvc命令一起使用**，请点击此处。

如果有输出的一**show frame-relay pvc命令**从您的Cisco设备，您能使用[Output Interpreter \(仅限注册用户\)](#)显示潜在问题和修正。

Output Interpreter仅限注册用户

输出示例:如下所示：

```
RouterA#show frame-relay pvc
PVC Statistics for interface Serial0 (Frame Relay DTE)
DLCI = 666, DLCI USAGE = UNUSED, PVC STATUS = DELETED, INTERFACE = Serial0
  input pkts 0                output pkts 0                in bytes 0
  out bytes 0                 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
  pvc create time 0:03:18    last time pvc status changed 0:02:27
  Num Pkts Switched 0
DLCI = 980, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0
  input pkts 19               output pkts 87               in bytes 2787
  out bytes 21005            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
```

pvc create time 1:17:47 last time pvc status changed 0:58:27

DLCI USAGE字段包含以下条目之一：

- 交换式-路由器或接入服务器使用作为交换机。
- 本地-路由器或接入服务器使用作为数据终端设备(DTE)。
- 未使用-数据链路连接标识符(DLCI)没有由用户输入的配置on命令参考路由器。

PVC能有四个可能的状态。这些由PVC STATUS字段显示如下：

- 活动- PVC是上和通常作用。
- 非激活- PVC不是端到端。这可能是因为没有映射(或不正确映射)本地DLCI的在帧中继网云或PVC的远程终端被删除。
- 删除-本地管理接口(LMI)没有被交换在路由器和本地交换机之间或者交换机没有在本本地交换机配置的DLCI。
- 静态-在路由器的帧中继接口配置的no keepalive。

[show frame-relay map](#)

请使用此命令确定帧中继inverse-arp是否解决了一个远程IP地址对本地DLCI。此命令为点对点子接口不是启用的。为仅多点接口和子接口是有用的。输出示例:如下所示：

```
RouterA#show frame-relay map
Serial0 (up): ip 157.147.3.65 dlci 980(0x3D4,0xF440), dynamic,
             broadcast,, status defined, active
```

关于字段的一个详细规格说明与show frame-relay map命令一起使用，请参阅[在帧中继命令的文档](#)。

如果有输出的一show frame-relay map命令从您的Cisco设备，您能使用[Output Interpreter \(仅限注册用户\)](#)显示潜在问题和修正。

[Output Interpreter仅限注册用户](#)

[帧中继和桥接](#)

(BPDU)用于支持称为网桥协议数据数据单元的配置消息Cisco网桥和路由器生成树协议。这些定期流在网桥之间并且构成巨大数量的数据流由于他们的频繁发生。有生成树协议的两种类型在透明桥接的。首先介绍由Digital Equipment Corporation (DEC)，算法由IEEE 802委员会在IEEE 802.1d规格随后修改并且发布了。DEC生成树协议发出BPDU在一秒间隔，而IEEE问题BPDU在两秒钟间隔。每个信息包是41个字节，包括BPDU信息一种35字节的配置，2字节帧中继报头，2字节以太网类型和2字节FCS。

[帧中继和内存](#)

帧中继资源的内存消耗量在四个区域中发生：

1. 每数据链路连接标识符(DLCI)：216个字节
2. 每个映射语句：96个字节(或动态建立的映射)
3. 每个IDB (硬件接口+ encaps帧中继)：5040个+ 8346个= 13,386个字节
4. 每个IDB (软件子接口)：2260个字节

例如，Cisco 2501使用两个帧中继接口，其中每一与四个子接口，与总共八DLCI和相关的映射需要以下：

- 2接口硬件IDB x 13,386 = 26,772
- 8子接口IDB x 2260 = 18,080子接口
- 8 DLCI x 216 = 1728 DLCI
- 8个映射语句x 96 = 768映射语句或Dynamics

总数与使用的47,348字节是相等的RAM。

Note: 使用的值这里为Cisco IOS Release 11.1，12.0和12.1是有效的软件。

排除帧中继故障

此部分包含您可以遇到，当排除故障时可能的**show interface**命令输出的部分。提供输出的解释。

"Serial0发生故障，线路通信协议发生故障"

此输出意味着您有一个问题电缆、信道服务单元/数据服务单元(CSU/DSU)，或者串行线路。您需要用环回测试排除问题故障。要进行环回测试，请遵从下面步骤：

1. 设置串联线封装为HDLC和Keepalive为10秒。执行如此，发出encapsulation hdlc命令和 **keepalive 10**在serial interfaces下。
2. 安置CSU/DSU或调制解调器在本地循环模式。如果线路通信协议出来，当CSU、DSU或者调制解调器在本地环回模式下(表示由"line protocol is up (looped)"消息)，建议问题在本地CSU/DSU之外发生。如果状态行不更改状态，可能有在路由器、连接电缆、CSU/DSU或者调制解调器的问题。在许多情况下，问题是CSU/DSU或调制解调器。
3. 连接您自己的IP地址用循环的CSU/DSU或调制解调器。不应该有任何错过。因为T1或E1从数据获取时钟并且要求转换每8位，0x0000扩展的ping是有用的在解决的线路问题。B8ZS保证那。一个大量零的数据模式帮助确定转变是否在Trunk适当地被强制。万一有一个对在路径的数据变换器大量一个仿造使用适当地模拟高零负载。交替的模式(0x5555)表示“典型的”数据模式。如果您的ping发生故障或，如果收到循环冗余校验(CRC)错误，有点错误率测试程序(BERT)用从telco的一个适当的分析器是需要的。
4. 当您是完成测试时，请确定您回归封装到帧中继。

"Serial0是UP，线路通信协议发生故障"

此线路在输出中意味着路由器从CSU/DSU或调制解调器获得载波信号。检查确定帧中继供应商激活了他们的端口，并且您的本地管理接口(LMI)设置配比。通常，帧中继交换机忽略数据终端设备(DTE)，除非看到正确的LMI(使用对“cisco”LMI的思科的默认值)。检查确定Cisco路由器传输数据。您很可能将需要检查线路完整性使用环线试验在多种位置从本地CSU和工作您的出口开始，直到您达到供应商的帧中继交换机。请参阅前面的部分关于如何执行环回测试。

"Serial0是UP，线路通信协议"

如果没有关闭Keepalive，输出此线路意味着路由器与帧中继运营商交换机对话。您应该看到双向数据流成功的交换在serial interfaces的没有CRC错误。Keepalive是必要的在帧中继，因为他们是路由器用途“了解”数据链路连接标识符的机制(DLCI)供应商设置了。要观看交换，您能在任何情况下安全使用**debug frame-relay lmi**。**debug frame-relay lmi**命令生成非常少量消息，并且能提供回答问题

例如：

1. Cisco路由器与本地帧中继交换机对话？
2. 路由器从帧中继供应商收到被预订的永久虚拟电路(PVC)的充分的LMI状态消息？
3. DLCI是否是正确的？

这是从成功的连接输出的某示例debug frame-relay lmi：

```
*Mar 1 01:17:58.763: Serial0(out): StEnq, myseq 92, yourseen 64, DTE up
*Mar 1 01:17:58.763: datagramstart = 0x20007C, datagramsize = 14
*Mar 1 01:17:58.763: FR encap = 0x0001030800 75 95 01 01 01 03 02 5C 40
*Mar 1 01:17:58.767:
*Mar 1 01:17:58.815: Serial0(in): Status, myseq 92
*Mar 1 01:17:58.815: RT IE 1, length 1, type 1
*Mar 1 01:17:58.815: KA IE 3, length 2, yourseq 65, myseq 92
*Mar 1 01:18:08.763: Serial0(out): StEnq, myseq 93, yourseen 65, DTE up
*Mar 1 01:18:08.763: datagramstart = 0x20007C, datagramsize = 14
*Mar 1 01:18:08.763: FR encap = 0x0001030800 75 95 01 01 01 03 02 5D 41
*Mar 1 01:18:08.767:
*Mar 1 01:18:08.815: Serial0(in): Status, myseq 93
*Mar 1 01:18:08.815: RT IE 1, length 1, type 1
*Mar 1 01:18:08.815: KA IE 3, length 2, yourseq 66, myseq 93
*Mar 1 01:18:18.763: Serial0(out): StEnq, myseq 94, yourseen 66, DTE up
*Mar 1 01:18:18.763: datagramstart = 0x20007C, datagramsize = 14
*Mar 1 01:18:18.763: FR encap = 0x0001030800 75 95 01 01 00 03 02 5E 42
*Mar 1 01:18:18.767:
*Mar 1 01:18:18.815: Serial0(in): Status, myseq 94
*Mar 1 01:18:18.815: RT IE 1, length 1, type 0
*Mar 1 01:18:18.819: KA IE 3, length 2, yourseq 67, myseq 94
*Mar 1 01:18:18.819: PVC IE 0x7 , length 0x3 , dlci 980, status 0x2
```

注意“在以上输出的DLCI 980”的状态。Status字段的可能的值如下解释：

1. **0x0**-添加了/非激活意味着交换机有被编程的此DLCI，但是由于某种原因(例如此PVC另一个结尾发生故障)，它不是可用的。
2. **0x2**-被添加/激活意味着帧中继交换机有DLCI，并且一切是可操作的。您能开始发送它与此DLCI的数据流在报头。
3. **0x3-0x3**是设置有效状态(0x2)和RNR的组合(或r-bit) (0x1)。这意味着交换机-或在交换机的一个特定队列-此PVC的备份，并且您停止传输，万一帧溢出。
4. **0x4**-被删除意味着帧中继交换机没有为路由器编程的此DLCI。但是它被编程了得过去在某些程度上。这能也造成由在路由器被倒转的DLCI，或者由telco被删除的PVC的帧中继网云。配置交换机没有)的DLCI (请出现作为0x4)。
5. **0x8**-新/非激活
6. **0x0a**-新/激活

帧中继特性

此部分说明您应该知道的几个帧中继特性。

IP分开展望期检查

默认情况下IP分开展望期检查为帧中继封装被禁用，因此路由更新里里外外将来同一个接口。他们需要从帧中继交换机使用通过本地管理接口(LMI)的路由器了解数据链路连接标识符(DLCI)更新。路

由器然后使用相反ARP远程IP地址并且创建本地DLCI映射和他们相关的远程IP地址。另外，不可能部分地网状网络支持某些协议例如AppleTalk，透明桥接和IPX，因为他们要求“分裂展望期”，在哪些在接口收到的信息包不可能传输同一个接口，即使信息包在不同的虚拟电路收到并且传输。配置帧中继子接口保证单个物理接口被对待作为多个虚拟接口。此功能允许我们解决水平分割规则。可能当前转发在一个虚拟接口收到的信息包另一个虚拟接口，即使他们在同一个物理接口被配置。

连接您在多点帧中继的自己的IP地址

您不能连接您在一个多点帧中继接口的自己的IP地址。这是因为帧中继多点(子)接口非广播，(不同于以太网和点到点接口高级数据链路控制[HDLC])和帧中继点对点接口。

此外，您不能从一连接与在一种星型网配置的另一分支讲了话。这是因为没有您自己的IP地址的映射(和无通过相反ARP是获知)。但是，如果配置静态映射(使用**frame-relay map**命令)您自己的IP地址的(或一个远程辐射点的)使用本地DLCI，您能然后连接您的设备。

```
aton#ping 3.1.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

aton#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
aton(config)#interface serial 1
aton(config-if)#frame-relay map ip 3.1.3.3 160
aton(config-if)#

aton#show frame-relay map
Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic,
              broadcast,, status defined, active
Serial1 (up): ip 3.1.3.2 dlci 160(0xA0,0x2800), static,
              CISCO, status defined, active
Serial1 (up): ip 3.1.3.3 dlci 160(0xA0,0x2800), static,
              CISCO, status defined, active
aton#ping 3.1.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/68/76 ms
aton#
aton#show running-config
!
interface Serial1
ip address 3.1.3.3 255.255.255.0
no ip directed-broadcast
encapsulation frame-relay
frame-relay map ip 3.1.3.2 160
frame-relay map ip 3.1.3.3 160
frame-relay interface-dlci 160
!
```

关键字广播

广播关键字提供两个功能：它转送广播，当组播不是启用的时，并且简单化开放最短路径优先(OSPF)的配置使用帧中继的非广播网络的。

广播关键字也许对于一些路由协议也是必需的--例如，AppleTalk--那取决于正常路由表更新，特别

是当在远程终端的路由器等待路由更新信息包在添加路由前到达时。

通过要求一个指定路由器的选择，OSPF对待一个非广播，多路访问网络例如帧中继，以与对待广播网络相似的方式。在早先版本中，在OSPF配置的此必需的手工的分配使用**neighbor interface router**命令。当**frame-relay map**命令在与**广播关键字**时的配置包括，并且(与**广播关键字**)配置**ip ospf network**命令，没有需要手工配置所有相邻。OSPF自动地当前运行帧中继网络作为广播网络。(请参阅**ip ospf network interface**命令以获得详情。)

Note: OSPF广播机制假设，IP D类地址从未使用在帧中继的定期数据流。

示例

以下示例映射目的地IP地址172.16.123.1对DLCI 100：

```
aton#ping 3.1.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

aton#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
aton(config)#interface serial 1
aton(config-if)#frame-relay map ip 3.1.3.3 160
aton(config-if)#

aton#show frame-relay map
Serial1 (up): ip 3.1.3.1 dlci 160(0xA0,0x2800), dynamic,
              broadcast,, status defined, active
Serial1 (up): ip 3.1.3.2 dlci 160(0xA0,0x2800), static,
              CISCO, status defined, active
Serial1 (up): ip 3.1.3.3 dlci 160(0xA0,0x2800), static,
              CISCO, status defined, active
aton#ping 3.1.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.1.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/68/76 ms
aton#
aton#show running-config
!
interface Serial1
ip address 3.1.3.3 255.255.255.0
no ip directed-broadcast
encapsulation frame-relay
frame-relay map ip 3.1.3.2 160
frame-relay map ip 3.1.3.3 160
frame-relay interface-dlci 160
!
```

OSPF播放更新的用途DLCI 100。

重新配置子接口

一旦创建子接口的一种特定类型，您不能更改它没有重新加载。例如，您不能创建一个多点子接口serial0.2，然后更改它到点对点。要更改它，您需要重新载入路由器或创建另一个子接口。这是帧中继代码在Cisco IOS软件工作的方式。

DLCI限制

DLCI地址空间

大约1000 DLCI在单个物理链路可以被配置，提供10位地址。由于某DLCI是后备的(根据vendor-implementation)，最大数量约为1000。Cisco LMI的范围是16-1007。ANSI/ITU的陈述的范围是16-992。这些是传送用户数据的DLCI。

然而，当配置在子接口时的帧中继VC，您需要考虑一个实用限额叫作IDB限制。接口和子接口的总数每个系统由接口您的Cisco IOS版本支持的描述符块限制(IDBs)的数量。IDB是暂挂关于接口的信息例如计数器内存的部分，接口的状况，等等。IOS维护每个接口的IDB在平台并且维护每个子接口的IDB。更高的速度接口比更加低速的接口要求更多的内存。每个平台包含不同的相当数量最大IDBs，并且这些限额可能随每个Cisco IOS版本改变。

欲知更多信息，请参阅[最大接口数和子接口关于Cisco IOS软件平台：IDB 限制](#)。

LMI状态更新

LMI协议要求所有永久虚拟电路(PVC)状态报告适合到单个信息包和通常限制DLCI的编号对少于800，根据最大传输单元(MTU)大小。

$$\begin{aligned} \text{Max DLCIs} &\cong \frac{\text{MTU bytes} - 20 \text{ bytes}}{5 \frac{\text{bytes}}{\text{DLCI}}} \\ \text{MTU} = 4000 \text{ bytes} & \\ & \\ & \frac{4000 - 20}{5} \cong 796 \end{aligned}$$

DLCIs, where 20 = Frame Relay and LMI Header

在serial interfaces的默认MTU是1500个字节，产生最多每个接口296 DLCI。您能增加MTU支持从帧中继交换机的一个更大的充分的状态更新消息。如果充分的状态更新消息大于接口MTU，信息包被丢弃，并且接口大型计数器被增加。当更改MTU时，请保证同一值被配置在远程路由器和干预的网络设备。

请注意:这些编号根据LMI类型稍有变化。最大DLCI每个路由器(不是接口)平台指南，根据从在思科7000路由器平台设立的经验数据的推测，如下是列出的：

- Cisco2500 : 1条X T1/E1链路@每个接口60 DLCI = 60总数
- Cisco4000 : 1条X T1/E1链路@每个接口120 DLCI = 120总数
- Cisco4500 : 3条X T1/E1链路@每个接口120 DLCI = 360总数
- Cisco 4700 : 4条X T1/E1链路@每个接口120 DLCI = 480总数
- Cisco 7000 : 4条X T1/E1/T3/E3链路@每个接口120 DLCI = 480总数

- Cisco7200 : 5条X T1/E1/T3/E3链路@每个接口120 DLCI = 600总数
- Cisco 7500 : 6条X T1/E1/T3/E3链路@每个接口120 DLCI = 720总数

Note: 这些编号是仅指南，并且假设，所有数据流快速交换。

其他注意事项

一个实用的DLCI限制也取决于VC是否运行动态或静态路由协议。动态路由协议和交换数据库表的其他协议类似IPX SAP，传送必须由CPU看到和处理的hello和转发信息信息。通常，使用静态路由将允许您配置VC大数在单个帧中继接口的。

IP/IPX/AT地址

如果使用子接口，请勿放置IP、IPX或者AT地址在主要接口。在您enable (event)保证该帧中继的主要接口inverse-arp适当地前，工作请分配DLCI到他们的子接口。万一它发生故障，请遵从下面步骤：

1. 通过使用no frame-relay inverse-arp ip 16和clear frame-relay-inarp命令，关闭该DLCI的相反地址解析服务(ARP)。
2. 修正您的配置。
3. 再打开frame-relay inverse-arp命令。

RIP和IGRP

路由信息协议(RIP)更新流每30秒。每个RIP信息包能包含25路由条目，总共536个字节的;36字节的此总数是报头信息，并且每路由条目是20个字节。所以，如果为50 DLCI通告在被配置的帧中继链路的1000个路由，结果是路由更新数据1 MB每30秒或者被消耗的285千位每秒带宽。在T1链路，此带宽表示带宽的18.7%，当每个更新期限是5.6秒。此相当数量开销是严重的，并且是国界可接受的，但是承诺信息速率(CIR)将必须是大约接入速率。明显地，任何较少比T1将导致许多笔开销。例如：

- $1000/25 = 40$ 个信息包x 36 = 1440报头字节
- 1000×20 个字节 = 20,000字节的路由条目
- 总数21,440字节x 50 RIP DLCI = 1072 MB更新每30秒
- $1,072,000$ 个字节/30秒x 8位 = 285 Kbps

增强型内部网关路由协议(EIGRP)更新流每90秒(此间隔是可配置的)。每个IGRP信息包能包含104路由条目，总共1492个字节的，38是报头信息，并且每路由条目是14个字节。如果通告在帧中继链路的1000个路由配置有50 DLCI，请求是大约路由更新数据720 KB每90秒或者被消耗的64千位每秒带宽。在T1链路，此带宽将表示带宽的4.2%，当每个更新期限是3.7秒。此开销是一可接受的数量：

- $1000/104 = 9$ 个信息包x 38 = 342报头字节
- $1000 \times 14 = 14,000$ 字节的路由条目
- 总数 = $14,342$ 个字节x 50 DLCI = IGRP 717 KB更新每90秒
- $717,000$ 字节/90 x 8位 = 63.7 Kbps

路由表维护协议(RTMP)路由更新出现每10秒(此间隔是可配置的)。每个RTMP信息包能包含94被扩大的路由条目，总共564个字节的，23个报头字节信息，并且每路由条目是6个字节。如果为50 DLCI通告在被配置的帧中继链路的1000个AppleTalk网络，结果是大约RTMP 313 KB更新每10秒或者被消耗的250千位每秒带宽。在可接受的水平开销内要保持15%或较少)，需要T1费率。例如：

- $1000/94 = 11$ 个信息包x 23个字节= 253个报头字节
- $1000 \times 6 = 6000$ 字节的路由条目
- 总数= 6253×50 DLCI = RTMP 313 KB更新每10秒
- $313,000/10$ 秒x 8位= 250 Kbps

IPX RIP信息包更新出现每60秒(此间隔是可配置的)。每个IPX RIP信息包能包含总共536个字节的50路由条目，38个报头字节信息，并且每路由条目是8个字节。如果为50 DLCI通告在被配置的帧中继链路的1000 IPX路由，结果是IPX 536 KB更新每60秒或者被消耗的58.4千位每秒带宽。在可接受的水平开销内要保持(15%或较少)，需要512 Kbps的费率。例如：

- $1000/50 = 20$ 个信息包x 38个字节= 760个报头字节
- $1000 \times 8 = 8000$ 字节的路由条目
- 总数= 8760×50 DLCI = 438,000字节的IPX更新每60秒
- $438,000/60$ 秒x 8位= 58.4 Kbps

IPX服务访问点(SAP)信息包更新出现每60秒(此间隔是可配置的)。每个IPX SAP信息包能包含总共536个字节的七个通告条目，38个报头字节信息，并且每个通告条目是64个字节。如果播放了在为50 DLCI配置的帧中继链路的1000个IPX广告，您会最终获得IPX 536 KB更新每60秒或者被消耗的58.4千位每秒带宽。在可接受的水平开销内要保持(15%或较少)，比2 Mbps需要费率的极大。明显地，SAP过滤在此方案需要。与在此部分提及的其他协议比较，IPX SAP更新要求多数带宽：

- $1000/7 = 143$ 个信息包x 38个字节= 5434个报头字节
- $1000 \times 64 = 64,000$ 字节的路由条目
- 总数= $69,434 \times 50$ DLCI = 3,471,700字节的IPX服务广告每60秒
- $3,471,700/60$ 秒x 8位= 462 Kbps

Keepalive

有时，需要设置在Cisco设备的Keepalive轻微短(大约8秒)比在交换机的Keepalive。如果接口继续出来和下来，您将看到对此的需要。

Serial interfaces

Serial interfaces，默认情况下多点，是非广播媒介，而点对点接口是广播。如果使用静态路由，您能指向下一跳或串行子接口。对于多点，您需要指向下一跳。当执行帧中继上的OSPF时，此概念是非常重要的。路由器需要知道这是OSPF的一个广播接口能工作。

OSPF和多点

OSPF和多点可以是非常麻烦的。OSPF需要指定路由器(DR)。如果开始丢失PVC，一些路由器可能丢失连接和设法成为DR，即使其他路由器仍然看到老DR。这造成OSPF进程发生故障。

在头顶上没有与OSPF产生关联一样明显和可预测的象那对传统距离矢量路由协议。不可预料来自OSPF网络链路是否稳定的。如果对帧中继路由器的所有邻接稳定的，只有邻居Hello信息包(Keepalive)将流，比那相当是较少开销导致与距离矢量协议(例如RIP和IGRP)。然而，如果路由(邻接)是不稳定，连接状态的泛滥将发生，并且带宽可能迅速使用。OSPF也非常处理器密集型当运行dijkstra算法，使用计算的路由。

在Cisco IOS软件中更早版本，当配置在多路接入非广播媒体的OSPF例如帧中继、X.25和ATM时，特别注意必须保重。OSPF协议考虑这些媒体类似所有其他广播介质例如以太网。非广播多重接入(NBMA)网云在一星型网拓扑里典型地被构件。PVC或交换虚拟电路(SVC)在部分网状和物理结构里被计划不提供多路接入OSPF相信在那里。对于点到点serial interfaces盒，OSPF总是形成在相

邻之间的邻接。OSPF邻接交换数据库信息。为了使在一个特定段交换的信息量减到最小，OSPF决定一个路由器是DR和一个路由器是一个备份指定路由(BDR)在每个多路访问分段。BDR 选择作为 DR 停机时的备用机制。

在此设置后的想法是路由器有信息交换的中心联络点。DR的选择成为问题，因为DR和BDR需要有充分的物理连接性用在网云存在的所有路由器。并且，由于缺乏广播功能，DR和BDR需要有其他路由器静态列表附有网云。使用**neighbor命令**，此设置达到：

neighbor ip-address [priority number] [poll-interval seconds]

在Cisco IOS软件中最新版本，不同的方法可以用于避免配置静态邻居的复杂性和有特定路由器成为的DR或BDRs在非广播网云。哪个方法影响使用网络是否是新的或需要修改的一个现有设计。

子接口是定义接口的逻辑方法。同一个物理接口可以被分裂成多个逻辑接口，当每个子接口被定义成点对点。此方案最初创建为了更好地处理在NBMA的已分解展望期导致的问题，并且向量根据路由协议。

点对点子接口具有任何物理点对点接口的属性。就OSPF而言，邻接在一个点对点子接口总是形成没有DR或BDR选择。OSPF考虑网云一组点对点链接而不是一个多路访问网络。点对点的唯一的缺点是每个分段属于一个不同的子网。因为一些管理员为全部网云，已经分配一个IP子网此方案也许不是可接受的。另一个解决方法是在网云上使用 IP 不编号的接口。此方案也许也是管理根据串行线路的IP地址的广域网的一些管理员的一个问题。

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10. [RFC 1293帧中继相反ARP](#)
11. [RFC 1144-TCP/IP报头压缩](#)
12. 帧中继Forum(FRF) 1.1用户网络接口(UNI)
13. FRF 2.1帧中继网络对网络界面(NNI)
14. FRF 3.1多协议封装
15. FRF 4 SVCS
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17. 四LMI的帮会
18. Q.922附件A

19. ANSI T1.617 Annex D
20. ANSI T1.618 , T1.606
21. ITU-T Q.933 , Q.922
22. [OSPF设计指南](#)
23. [改进的IGRP的增强实施的配置注释](#)

Related Information

- [关于帧中继命令的更多信息](#)
- [关于配置帧中继的更多信息](#)
- [关于拨号备份命令的更多信息](#)
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