

Резервирование BRI ISDN с помощью интерфейса резервирования

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Введение

Этот документ предоставляет пример конфигурации для резервного ISDN и предоставляет основные сведения по устранению проблем для данного типа конфигурации.

Для получения информации о наиболее распространенных реализациях резервного копирования ISDN и сравнениях между ними, обращайтесь к следующему документу: [Оценка резервных интерфейсов, плавающих статических маршрутов и функции Dialer Watch для резервирования DDR.](#)

Предварительные условия

Требования

Для данного документа отсутствуют предварительные условия.

Используемые компоненты

Сведения в этом документе основаны на версиях оборудования и программного обеспечения, указанных ниже.

- Два Маршрутизатора Cisco 2500 (DTE-оборудование Frame Relay [DTE]) рабочие релизы 12.2 программного обеспечения Cisco IOS (3) и 12.2 (5).
- Один маршрутизатор Cisco 4500, действующий как Коммутатор Frame Relay.

Сведения, содержащиеся в данном документе, были получены с устройств в специальной лабораторной среде. Все устройства, описанные в данном документе, были запущены с конфигурацией по умолчанию. При работе с реальной сетью необходимо полностью осознавать возможные результаты использования всех команд.

Условные обозначения

[Дополнительные сведения об условных обозначениях см. в документе Технические рекомендации Cisco. Условные обозначения.](#)

Настройка

В этом разделе содержатся сведения о настройке функций, описанных в этом документе.

Примечание: [Поиск дополнительной информации о командах в данном документе можно выполнить с помощью средства "Command Lookup" \(Поиск команд\) \(только для зарегистрированных клиентов\).](#)

Схема сети

В данном документе используется сетевая установка, показанная на следующей схеме.

Конфигурации

В данном документе используются следующие конфигурации.

krimson (маршрутизатор Cisco 2500)

```
krimson#show running-config Building configuration... !
version 12.2 service timestamps debug datetime msec
service timestamps log datetime msec ! hostname krimson
! ! username kevin password 0 <password> ! isdn switch-
type basic-net3 ! ! interface Loopback0 ip address
10.7.7.1 255.255.255.0 ip ospf network point-to-point !
interface Ethernet0 ip address 10.200.16.30
255.255.255.0 ! interface Serial1 bandwidth 64 no ip
address encapsulation frame-relay no ip route-cache no
ip mroute-cache ! interface Serial1.1 point-to-point
backup interface Dialer0 ip address 10.5.5.2
255.255.255.0 no ip route-cache frame-relay interface-
dlci 20 ! interface BRI0 description Testanschluss
ISDN(intern), Nr. 4420038 no ip address encapsulation
ppp no ip route-cache no ip mroute-cache load-interval
30 no keepalive dialer pool-member 1 isdn switch-type
basic-net3 no fair-queue no cdp enable ppp
authentication chap ! interface Dialer0 ip address
10.9.9.1 255.255.255.0 encapsulation ppp no ip route-
cache no ip mroute-cache dialer pool 1 dialer remote-
name kevin dialer string 6120 dialer-group 1 no cdp
enable ppp authentication chap ! router ospf 10 log-
adjacency-changes network 10.5.5.0 0.0.0.255 area 0
network 10.7.7.0 0.0.0.255 area 0 network 10.9.9.0
0.0.0.255 area 0 ! ip default-gateway 10.200.16.1 no ip
classless no ip http server ! access-list 105 permit ip
any host 10.7.7.1 access-list 105 permit ip any host
10.8.8.1 access-list 105 permit ip any any dialer-list 1
```

```
protocol ip permit ! line con 0 exec-timeout 0 0
privilege level 15 line aux 0 transport input all line
vty 0 4 exec-timeout 0 0 password <password> login ! end
```

kevin (маршрутизатор Cisco 2500)

```
kevin#show running-config Building configuration...
version 12.2 service timestamps debug datetime msec
service timestamps log datetime msec ! hostname kevin !
! username krimson password 0 <password> ! isdn switch-
type basic-net3 ! ! interface Loopback0 ip address
10.8.8.1 255.255.255.0 ip ospf network point-to-point !
interface Loopback1 ip address 172.19.0.1
255.255.255.255 ! interface Ethernet0 ip address
10.200.16.26 255.255.255.0 ! interface Serial0 no ip
address encapsulation frame-relay ! interface Serial0.1
point-to-point ip address 10.5.5.1 255.255.255.0 no cdp
enable frame-relay interface-dlci 20 ! interface BRI0 no
ip address encapsulation ppp dialer pool-member 1 isdn
switch-type basic-net3 no cdp enable ppp authentication
chap ! interface Dialer0 ip address 10.9.9.2
255.255.255.0 encapsulation ppp dialer pool 1 dialer
remote-name krimson dialer-group 1 no cdp enable ppp
authentication chap ! router ospf 10 log-adjacency-
changes network 10.5.5.0 0.0.0.255 area 0 network
10.8.8.0 0.0.0.255 area 0 network 10.9.9.0 0.0.0.255
area 0 ! ip default-gateway 10.200.16.1 ip classless !
dialer-list 1 protocol ip permit no cdp run ! line con 0
exec-timeout 0 0 line aux 0 modem InOut line vty 0 4
exec-timeout 0 0 password <password> login ! ntp clock-
period 17180102 ntp server 10.200.20.134 end
```

Проверка

В этом разделе содержатся сведения, которые помогают убедиться в надлежащей работе конфигурации.

Используйте следующие команды для проверки конфигурации:

Некоторые команды **show** поддерживаются Интерпретатором выходных данных; это позволяет выполнять анализ выходных данных команды **show**.

- **show interfaces serial**: отображает сведения о коде подключения для канала групповой адресации данных (DLCI), кодах DLCI интерфейса и коде DLCI для интерфейса локального управления (LMI).
- **show interface dialer** - Отображает информацию об интерфейсе номеронабирателя.
- **show ip route** — отображаются элементы таблицы IP-маршрутизации.

```
krimson#show interface serial 1.1 ! --- The initial state before the simulated Frame Relay
network failure. ! --- The primary link is up and functional. Serial1.1 is up, line protocol is
up Hardware is HD64570 Internet address is 10.5.5.2/24 Backup interface Dialer0, failure delay 0
sec, secondary disable delay 0 sec MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability
255/255, txload 1/255, rxload 1/255 Encapsulation FRAME-RELAY krimson#show int dialer 0 ! ---
Initial state. The backup interface is in standby mode and inactive. Dialer0 is standby mode
(spoofing), line protocol is down (spoofing) Hardware is Unknown Internet address is 10.9.9.1/24
MTU 1500 bytes, BW 56 Kbit, DLY 20000 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, loopback not set DTR is pulsed for 1 seconds on reset Last input lw6d, output
never, output hang never Last clearing of "show interface" counters 6w4d 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) Available Bandwidth 42 kilobits/sec 5 minute input rate 0 bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 596 packets input, 48924 bytes 600 packets output, 49280 bytes krimson#**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 10.200.16.1 to network 0.0.0.0 192.168.64.0/30 is subnetted, 1 subnets C 192.168.64.0 is directly connected, Dialer4 10.0.0.0/24 is subnetted, 6 subnets O 10.9.9.0 [110/3347] via 10.5.5.1, 00:03:34, Serial1.1 O 10.8.8.0 [110/1563] via 10.5.5.1, 00:03:34, Serial1.1 ! --- *The route to the tested destination network points to the ! --- still-active primary link.* C 10.5.5.0 is directly connected, Serial1.1 C 10.7.7.0 is directly connected, Loopback0 C 10.9.8.0 is directly connected, Dialer1 C 10.200.16.0 is directly connected, Ethernet0 S* 0.0.0.0/0 [1/0] via 10.200.16.1

Здесь, мы видим, что выключается Интерфейс Frame Relay.

```
krimson#
*Apr 16 23:56:47.840: %LINK-3-UPDOWN: Interface Serial1,
changed state to down
*Apr 16 23:56:47.848: OSPF: Interface Serial1.1 going Down
! --- Here we have simulated a failure within the Frame Relay network. ! --- We can see what was
conducted to the Frame Relay DTE router, ! --- and the subinterface going down. *Apr 16
23:56:47.852: %OSPF-5-ADJCHG: Process 10, Nbr 172.19.0.1 on Serial1.1 from FULL to DOWN,
Neighbor Down: Interface down or detached *Apr 16 23:56:48.736: BACKUP(Serial1.1): event =
primary went down *Apr 16 23:56:48.740: BACKUP(Serial1.1): changed state to "waiting to backup"
*Apr 16 23:56:48.744: BACKUP(Serial1.1): event = timer expired *Apr 16 23:56:48.748: Di0 DDR is
shutdown, could not clear interface. *Apr 16 23:56:48.752: BACKUP(Serial1.1): secondary
interface (Dialer0) made active ! --- The configured backup interface is active. *Apr 16
23:56:48.752: BACKUP(Serial1.1): changed state to "backup mode" *Apr 16 23:56:48.756: OSPF:
Interface Dialer0 going Up *Apr 16 23:56:48.760: BR0 DDR: rotor dialout [priority] *Apr 16
23:56:48.764: BR0 DDR: Dialing cause ip (s=10.9.9.1, d=224.0.0.5) ! --- OSPF packets trigger the
call. *Apr 16 23:56:48.768: BR0 DDR: Attempting to dial 6120 *Apr 16 23:56:48.784: ISDN BR0: TX
-> SETUP pd = 8 callref = 0x3E *Apr 16 23:56:48.792: Bearer Capability i = 0x8890 *Apr 16
23:56:48.796: Channel ID i = 0x83 *Apr 16 23:56:48.804: Called Party Number i = 0x80, '6120',
Plan:Unknown, Type:Unknown *Apr 16 23:56:48.844: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial1, changed state to down *Apr 16 23:56:48.884: ISDN BR0: RX <- CALL_PROC pd = 8 callref =
0xBE *Apr 16 23:56:48.892: Channel ID i = 0x89 *Apr 16 23:56:49.144: ISDN BR0: RX <- CONNECT pd
= 8 callref = 0xBE *Apr 16 23:56:49.160: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Apr 16 23:56:49.168: %DIALER-6-BIND: Interface BR0:1 bound to profile Di0 *Apr 16 23:56:49.176:
BR0:1 PPP: Treating connection as a callout *Apr 16 23:56:49.180: BR0:1 PPP: Phase is
ESTABLISHING, Active Open [0 sess, 0 load] *Apr 16 23:56:49.184: BR0:1 LCP: O CONFREQ [Closed]
id 49 len 15 *Apr 16 23:56:49.188: BR0:1 LCP: AuthProto CHAP (0x0305C22305) *Apr 16
23:56:49.188: BR0:1 LCP: MagicNumber 0xF2143EDB (0x0506F2143EDB) *Apr 16 23:56:49.196: ISDN BR0:
TX -> CONNECT_ACK pd = 8 callref = 0x3E *Apr 16 23:56:49.224: BR0:1 LCP: I CONFREQ [REQsent] id
83 len 15 *Apr 16 23:56:49.228: BR0:1 LCP: AuthProto CHAP (0x0305C22305) *Apr 16 23:56:49.232:
BR0:1 LCP: MagicNumber 0x9ADACD69 (0x05069ADACD69) *Apr 16 23:56:49.236: BR0:1 LCP: O CONFACK
[REQsent] id 83 len 15 *Apr 16 23:56:49.236: BR0:1 LCP: AuthProto CHAP (0x0305C22305) *Apr 16
23:56:49.240: BR0:1 LCP: MagicNumber 0x9ADACD69 (0x05069ADACD69) *Apr 16 23:56:49.244: BR0:1
LCP: I CONFACK [ACKsent] id 49 len 15 *Apr 16 23:56:49.248: BR0:1 LCP: AuthProto CHAP
(0x0305C22305) *Apr 16 23:56:49.252: BR0:1 LCP: MagicNumber 0xF2143EDB (0x0506F2143EDB) *Apr 16
23:56:49.252: BR0:1 LCP: State is Open *Apr 16 23:56:49.256: BR0:1 PPP: Phase is AUTHENTICATING,
by both [0 sess, 0 load] *Apr 16 23:56:49.260: BR0:1 CHAP: O CHALLENGE id 49 len 28 from
"krimson" *Apr 16 23:56:49.276: BR0:1 CHAP: I CHALLENGE id 51 len 26 from "kevin" *Apr 16
23:56:49.284: BR0:1 CHAP: O RESPONSE id 51 len 28 from "krimson" *Apr 16 23:56:49.332: BR0:1
CHAP: I SUCCESS id 51 len 4 *Apr 16 23:56:49.344: BR0:1 CHAP: I RESPONSE id 49 len 26 from
"kevin" *Apr 16 23:56:49.352: BR0:1 CHAP: O SUCCESS id 49 len 4 *Apr 16 23:56:49.356: BR0:1 PPP:
Phase is UP [0 sess, 0 load] *Apr 16 23:56:49.360: BR0:1 IPCP: O CONFREQ [Not negotiated] id 41
len 10 *Apr 16 23:56:49.364: BR0:1 IPCP: Address 10.9.9.1 (0x03060A090901) *Apr 16 23:56:49.376:
BR0:1 IPCP: I CONFREQ [REQsent] id 29 len 10 *Apr 16 23:56:49.380: BR0:1 IPCP: Address 10.9.9.2
(0x03060A090902) *Apr 16 23:56:49.384: BR0:1 IPCP: O CONFACK [REQsent] id 29 len 10 *Apr 16
23:56:49.388: BR0:1 IPCP: Address 10.9.9.2 (0x03060A090902) *Apr 16 23:56:49.396: BR0:1 IPCP: I
CONFACK [ACKsent] id 41 len 10 *Apr 16 23:56:49.400: BR0:1 IPCP: Address 10.9.9.1
(0x03060A090901) *Apr 16 23:56:49.400: BR0:1 IPCP: State is Open *Apr 16 23:56:49.408: BR0:1
```

```

DDR: dialer protocol up *Apr 16 23:56:49.416: Di0 IPCP: Install route to 10.9.9.2 *Apr 16
23:56:49.960: OSPF: Rcv hello from 172.19.0.1 area 0 from Dialer0 10.9.9.2 *Apr 16 23:56:49.964:
OSPF: End of hello processing *Apr 16 23:56:50.356: %LINEPROTO-5-UPDOWN: Line protocol on
Interface BRI0:1, changed state to up *Apr 16 23:56:50.748: %LINK-3-UPDOWN: Interface Dialer0,
changed state to up *Apr 16 23:56:50.752: Di0 LCP: Not allowed on a Dialer Profile *Apr 16
23:56:50.752: BACKUP(Dialer0): event = primary came up *Apr 16 23:56:55.176: %ISDN-6-CONNECT:
Interface BRI0:1 is now connected to 6120 kevin *Apr 16 23:56:58.804: OSPF: Rcv DBD from
172.19.0.1 on Dialer0 seq 0x988 opt 0x42 flag 0x7 len 32 mtu 1500 state INIT *Apr 16
23:56:58.808: OSPF: 2 Way Communication to 172.19.0.1 on Dialer0, state 2WAY krimson#show
interface serial 1.1 Serial1.1 is down, line protocol is down ! --- The primary link is down.
Hardware is HD64570 Internet address is 10.5.5.2/24 Backup interface Dialer0, failure delay 0
sec, secondary disable delay 0 sec MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability
255/255, txload 1/255, rxload 1/255 Encapsulation FRAME-RELAY krimson#show interface dialer 0
Dialer0 is up, line protocol is up (spoofing) ! --- The backup interface is active and bearing
traffic. Hardware is Unknown Internet address is 10.9.9.1/24 MTU 1500 bytes, BW 56 Kbit, DLY
20000 usec, reliability 255/255, txload 1/255, rxload 1/255 Encapsulation PPP, loopback not set
DTR is pulsed for 1 seconds on reset Interface is bound to BR0:1 Last input 1w6d, output never,
output hang never Last clearing of "show interface" counters 6w4d 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) Available Bandwidth 42 kilobits/sec 5
minute input rate 0 bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 614
packets input, 50240 bytes 618 packets output, 50584 bytes Bound to: BRI0:1 is up, line protocol
is up Hardware is BRI MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability 255/255, txload
1/255, rxload 1/255 Encapsulation PPP, loopback not set Keepalive not set DTR is pulsed for 1
seconds on reset Time to interface disconnect: idle 00:01:57 Interface is bound to Di0
(Encapsulation PPP) LCP Open Open: IPCP Last input 00:00:01, output 00:00:02, output hang never
Last clearing of "show interface" counters never Queueing strategy: fifo Output queue 0/40, 0
drops; input queue 0/75, 0 drops 30 second input rate 0 bits/sec, 0 packets/sec 30 second output
rate 0 bits/sec, 0 packets/sec 3910 packets input, 394443 bytes, 0 no buffer Received 0
broadcasts, 0 runts, 0 giants, 0 throttles 29 input errors, 18 CRC, 0 frame, 0 overrun, 0
ignored, 11 abort 3613 packets output, 222417 bytes, 0 underruns 0 output errors, 0 collisions,
27 interface resets 0 output buffer failures, 0 output buffers swapped out 607 carrier
transitions krimson#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 10.200.16.1 to network 0.0.0.0 192.168.64.0/30 is subnetted, 1 subnets
C 192.168.64.0 is directly connected, Dialer4 10.0.0.0/8 is variably subnetted, 6 subnets, 2
masks C 10.9.9.2/32 is directly connected, Dialer0 O 10.8.8.0/24 [110/1786] via 10.9.9.2,
00:00:53, Dialer0 ! --- The route entry to the destination network is now pointing to ! --- the
backup interface as a next hop. C 10.9.9.0/24 is directly connected, Dialer0 C 10.7.7.0/24 is
directly connected, Loopback0 C 10.9.8.0/24 is directly connected, Dialer1 C 10.200.16.0/24 is
directly connected, Ethernet0 S* 0.0.0.0/0 [1/0] via 10.200.16.1 krimson#ping 10.8.8.1 Type
escape sequence to abort. Sending 5, 100-byte ICMP Echos to 10.8.8.1, timeout is 2 seconds:
!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 36/36/40 ms

```

Здесь мы видим системный возврат назад к его первоначальному состоянию, как только был очищен сбой в Сети Frame Relay:

```

krimson#show interface serial 1.1 Serial1.1 is up, line protocol is up Hardware is HD64570
Internet address is 10.5.5.2/24 Backup interface Dialer0, failure delay 0 sec, secondary disable
delay 0 sec MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability 255/255, txload 1/255,
rxload 1/255 Encapsulation FRAME-RELAY krimson#show interface dialer 0 Dialer0 is standby mode
(spoofing), line protocol is down (spoofing) Hardware is Unknown Internet address is 10.9.9.1/24
MTU 1500 bytes, BW 56 Kbit, DLY 20000 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, loopback not set DTR is pulsed for 1 seconds on reset Last input 1w6d, output
never, output hang never Last clearing of "show interface" counters 6w5d 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) Available Bandwidth 42 kilobits/sec 5
minute input rate 0 bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 665
packets input, 54008 bytes 671 packets output, 54548 bytes krimson#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 10.200.16.1 to network 0.0.0.0 192.168.64.0/30 is subnetted, 1 subnets C 192.168.64.0 is directly connected, Dialer4 10.0.0.0/24 is subnetted, 6 subnets O 10.9.9.0 [110/3347] via 10.5.5.1, 00:08:39, Serial1.1 O 10.8.8.0 [110/1563] via 10.5.5.1, 00:08:39, Serial1.1 C 10.5.5.0 is directly connected, Serial1.1 C 10.7.7.0 is directly connected, Loopback0 C 10.9.8.0 is directly connected, Dialer1 C 10.200.16.0 is directly connected, Ethernet0 S* 0.0.0.0/0 [1/0] via 10.200.16.1 krimson#

Примечание: Никакая определенная конфигурация не необходима на вызванной стороне.

Те же выходные данные show, зарегистрированные во время нормальной работы, содержат следующую информацию:

```
kevin#show interface serial 0.1 Serial0.1 is up, line protocol is up ! --- The primary interface
is up and running. Hardware is HD64570 Internet address is 10.5.5.1/24 MTU 1500 bytes, BW 1544
Kbit, DLY 20000 usec, reliability 255/255, txload 1/255, rxload 1/255 Encapsulation FRAME-RELAY
kevin#show interface dialer 0 Dialer0 is up (spoofing), line protocol is up (spoofing) ! ---
Note: On the called side, the dialer interface is active ! --- and not in standby mode. Hardware
is Unknown Internet address is 10.9.9.2/24 MTU 1500 bytes, BW 56 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255 Encapsulation PPP, loopback not set DTR is
pulsed for 1 seconds on reset Last input lw6d, output never, output hang never Last clearing of
"show interface" counters 4w2d 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) Available Bandwidth 42 kilobits/sec 5 minute input rate 0
bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 598 packets input, 49252
bytes 596 packets output, 48924 bytes kevin#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 10.200.16.1 to network 0.0.0.0 172.17.0.0/32 is
subnetted, 1 subnets S 172.17.247.195 [1/0] via 10.200.16.1 172.19.0.0/32 is subnetted, 1
subnets C 172.19.0.1 is directly connected, Loopback1 10.0.0.0/24 is subnetted, 5 subnets C
10.5.5.0 is directly connected, Serial0.1 O 10.7.7.0 [110/65] via 10.5.5.2, 00:04:27, Serial0.1
C 10.9.9.0 is directly connected, Dialer0 C 10.8.8.0 is directly connected, Loopback0 C
10.200.16.0 is directly connected, Ethernet0 S* 0.0.0.0/0 [1/0] via 10.200.16.1
```

Вот та же та же информация, зарегистрированная во время сбоя:

```
kevin#show interface serial 0.1 Serial0.1 is down, line protocol is down Hardware is HD64570
Internet address is 10.5.5.1/24 MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, reliability
255/255, txload 1/255, rxload 1/255 Encapsulation FRAME-RELAY kevin#show interface dialer 0
Dialer0 is up, line protocol is up (spoofing) Hardware is Unknown Internet address is
10.9.9.2/24 MTU 1500 bytes, BW 56 Kbit, DLY 20000 usec, reliability 255/255, txload 1/255,
rxload 1/255 Encapsulation PPP, loopback not set DTR is pulsed for 1 seconds on reset Interface
is bound to BR0:1 Last input lw6d, output never, output hang never Last clearing of "show
interface" counters 4w2d 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) Available Bandwidth 42 kilobits/sec 5 minute input rate 0 bits/sec, 0 packets/sec 5
minute output rate 0 bits/sec, 0 packets/sec 618 packets input, 50700 bytes 616 packets output,
50384 bytes Bound to: BRI0:1 is up, line protocol is up Hardware is BRI MTU 1500 bytes, BW 64
Kbit, DLY 20000 usec, reliability 255/255, txload 1/255, rxload 1/255 Encapsulation PPP,
loopback not set Keepalive set (10 sec) DTR is pulsed for 1 seconds on reset Time to interface
disconnect: idle 00:01:57 Interface is bound to Di0 (Encapsulation PPP) LCP Open Open: IPCP Last
input 00:00:03, output 00:00:02, output hang never Last clearing of "show interface" counters
never Queueing strategy: fifo Output queue 0/40, 0 drops; input queue 0/75, 0 drops 5 minute
input rate 0 bits/sec, 0 packets/sec 5 minute output rate 0 bits/sec, 0 packets/sec 1280 packets
input, 138077 bytes, 0 no buffer Received 0 broadcasts, 0 runts, 0 giants, 0 throttles 9789
input errors, 9789 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort 1309 packets output, 138487
```

bytes, 0 underruns 0 output errors, 0 collisions, 15 interface resets 0 output buffer failures, 0 output buffers swapped out 351 carrier transitions kevin#**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 10.200.16.1 to network 0.0.0.0 172.17.0.0/32 is subnetted, 1 subnets S 172.17.247.195 [1/0] via 10.200.16.1 172.19.0.0/32 is subnetted, 1 subnets C 172.19.0.1 is directly connected, Loopback1 10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks O 10.7.7.0/24 [110/1786] via 10.9.9.1, 00:01:21, Dialer0 C 10.9.9.0/24 is directly connected, Dialer0 C 10.8.8.0/24 is directly connected, Loopback0 C 10.9.9.1/32 is directly connected, Dialer0 C 10.200.16.0/24 is directly connected, Ethernet0 S* 0.0.0.0/0 [1/0] via 10.200.16.1

Устранение неполадок

В этом разделе описывается процесс устранения неполадок конфигурации.

Конфигурации Frame Relay с подчиненными интерфейсами типа точка-точка и Протоколом OSPF как протокол маршрутизации, используемый здесь, являются определенными для этой настройки. Однако показанные действия по устранению проблем являются более общими и могут использоваться с другими конфигурациями, такими как Сеть Frame Relay точка-многие точки или основное соединение с High-Level Data Link Control (HDLC) или инкапсуляцией Протокола PPP, независимо от используемого протокола маршрутизации.

Для проверки функциональных возможностей резервирования один из интерфейсов на маршрутизаторе Cisco 4500, который действует как Коммутатор Frame Relay, был размещен в состоянии завершения работы для моделирования проблемы в Сети Frame Relay. Следовательно, это приведет к передаче неактивного состояния ПВК в маршрутизатор DTE по сети Frame Relay и вызовет событие отключения подчиненного интерфейса Frame Relay. Это активирует резервный интерфейс.

Команды для устранения неполадок

Примечание: Прежде чем применять команды отладки, ознакомьтесь с разделом "Важные сведения о командах отладки".

- **debug isdn q931**
- команда **debug backup** выполняет отладку событий резервирования.
- **debug dialer** - вывод отладочных данных о пакетах или событиях в интерфейсе номеронабирателя.
- "**debug ppp negotiation**" - вызов команды "**debug ppp**" для отображения передаваемых пакетов PPP при согласовании параметров во время запуска протокола PPP.
- команда "**debug ppp authentication**" обеспечивает отображение сообщений протокола аутентификации с помощью команды "**debug ppp**", включая информацию об обмене пакетами CHAP и обмене по протоколу аутентификации по паролю (PAP).
- **debug ip ospf events** - вывод сведений о событиях OSPF, таких как события смежности, волновое распространение данных, выбор выделенного маршрутизатора и расчет кратчайшего пути (SPF)
- **debug frame-relay events** - Отображает информацию об отладке об ответах ARP Frame Relay в сетях, которые поддерживают многоадресный канал и используют динамическую адресацию.

Дополнительные сведения

- [Страницы поддержки технологии доступа с помощью дозвона](#)
- [Техническая поддержка - Cisco Systems](#)