

IS-IS網路型別和幀中繼介面

目錄

[簡介](#)

[必要條件](#)

[需求](#)

[採用元件](#)

[慣例](#)

[正確配置示例](#)

[配置不匹配問題](#)

[問題原因](#)

[解決方案](#)

[相關資訊](#)

簡介

在中間系統到中間系統(IS IS)協定中，有兩種網路：點對點和廣播。與開放最短路徑優先(OSPF)協定不同，IS-IS沒有其他網路型別，如非廣播和點對多點。對於每種型別的網路，會交換不同型別的IS-IS Hello(IIH)資料包以建立鄰接關係。在點對點網路中，交換點對點IIH;在廣播網路(例如LAN)上，交換第1級或第2級LAN IH。運行IS-IS的幀中繼網路可以配置為屬於這些網路型別之一，具體取決於路由器之間通過雲提供的連線型別(全網狀、部分網狀或中心輻射狀)。本文提供此類情形中網路型別組態不相符的範例，並說明如何診斷與修正問題。

必要條件

需求

本文檔的讀者應瞭解以下主題：

- 配置幀中繼
- 配置整合IS-IS

採用元件

本文件所述內容不限於特定軟體和硬體版本。

本文檔中顯示的輸出基於以下軟體和硬體版本：

- Cisco 2500系列路由器
- Cisco IOS[®]軟體版本12.2(27)

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

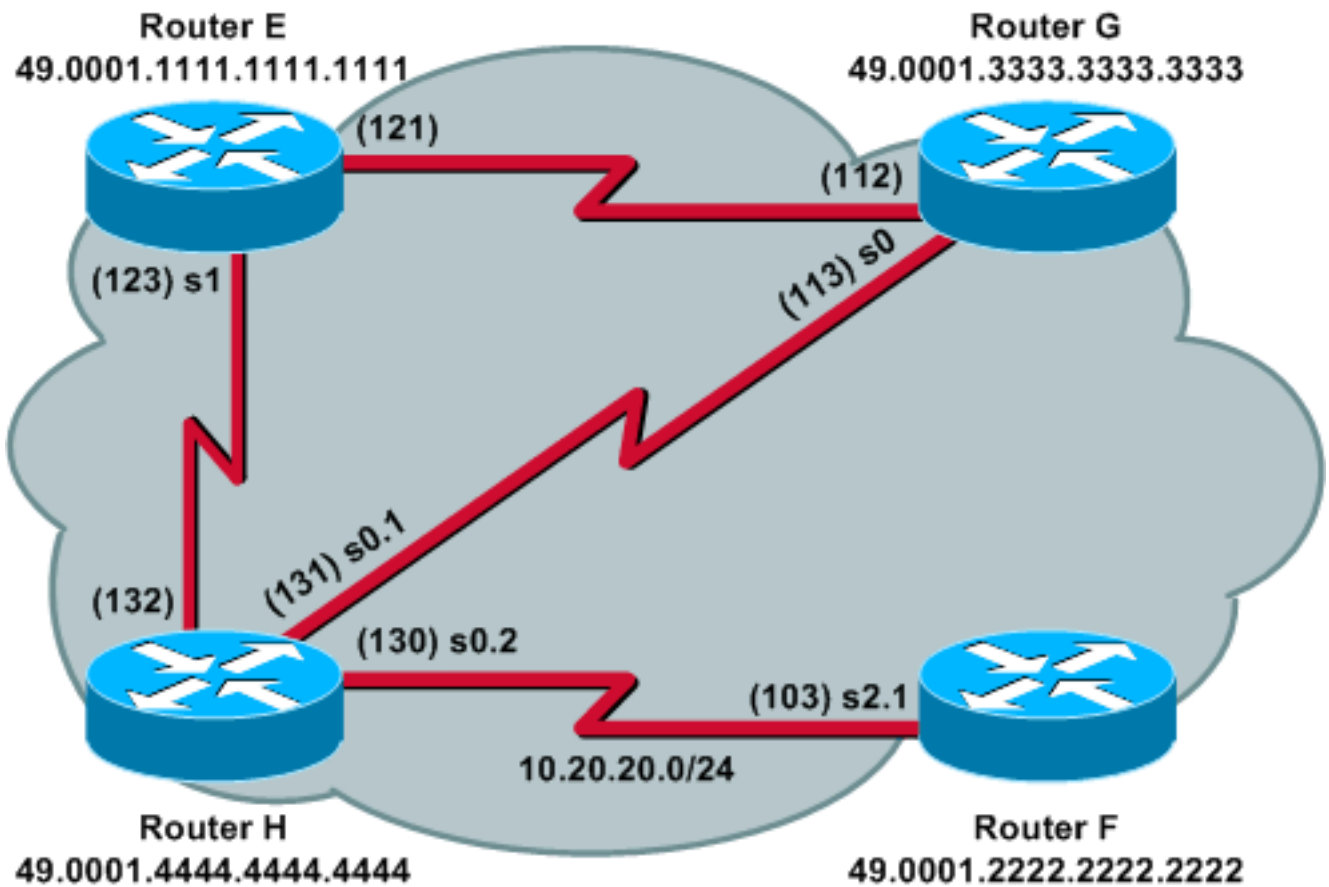
慣例

如需文件慣例的詳細資訊，請參閱[思科技術提示慣例](#)。

正確配置示例

IS-IS處理多點串行介面和子介面的方式與處理廣播介面的方式相同，但它將點對點子介面視為連線到點對點網路的介面。例如，在本節的網路示例拓撲中，將三台全網狀路由器之間的WAN多點連線視為LAN連線。與LAN一樣，第1級或第2級LAN IIH在它們之間交換，並選擇指定中間系統(DIS)。

在本示例拓撲中，所有三台路由器都連線到點對多點介面或子介面的幀中繼網雲。預設情況下，主介面（如路由器E上的Serial1和路由器G上的Serial0）是多點。路由器H和F通過點對點子介面建立了點對點連線，並且它們使用點對點IIH。



以下是此示例拓撲中使用的路由器配置：

- [路由器E](#)
- [路由器G](#)
- [路由器H](#)
- [路由器F](#)

路由器E

```
clns routing
!  
interface Serial1  
 ip address 10.10.10.1 255.255.255.0
```

```
ip router isis
encapsulation frame-relay
clns router isis
frame-relay map clns 123 broadcast
frame-relay map clns 121 broadcast
frame-relay map ip 10.10.10.3 121 broadcast
frame-relay map ip 10.10.10.4 123 broadcast
frame-relay lmi-type ansi
!
router isis
net 49.0001.1111.1111.1111.00
is-type level-1
```

路由器G

```
clns routing
!
interface Serial0
ip address 10.10.10.3 255.255.255.0
ip router isis
encapsulation frame-relay
clns router isis
frame-relay map clns 112 broadcast
frame-relay map clns 113 broadcast
frame-relay map ip 10.10.10.1 112 broadcast
frame-relay map ip 10.10.10.4 113 broadcast
frame-relay lmi-type ansi
!
router isis
net 49.0001.3333.3333.3333.00
is-type level-1
```

路由器H

```
clns routing
!
interface Serial0
no ip address
no ip directed-broadcast
no ip mroute-cache
encapsulation frame-relay
frame-relay lmi-type ansi
!
interface Serial0.1 multipoint
ip address 10.10.10.4 255.255.255.0
no ip directed-broadcast
ip router isis
clns router isis
frame-relay map clns 132 broadcast
frame-relay map clns 131 broadcast
frame-relay map ip 10.10.10.1 132 broadcast
frame-relay map ip 10.10.10.3 131 broadcast
!
interface Serial0.2 point-to-point
ip address 10.20.20.4 255.255.255.0
no ip directed-broadcast
ip router isis
clns router isis
frame-relay interface-dlci 130
!
router isis
net 49.0001.4444.4444.4444.00
is-type level-1
```

路由器F

```
clns routing
!
interface Serial2
  no ip address
  no ip directed-broadcast
  encapsulation frame-relay
  frame-relay lmi-type ansi
!
interface Serial2.1 point-to-point
  ip address 10.20.20.2 255.255.255.0
  no ip directed-broadcast
  ip router isis
  clns router isis
  frame-relay interface-dlci 103
!
router isis
  net 49.0001.2222.2222.2222.00
  is-type level-1
```

在網狀網路中的任何路由器上發出**show clns neighbors**、**show isis database**和**show isis database details**命令，觀察IS-IS配置對多點WAN連線的影響。以下是在所有路由器上**show clns neighbors**命令的輸出：

Router_E# **show clns neighbors**

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_G	Se1	DLCI 121	Up	29	L1	IS-IS
Router_H	Se1	DLCI 123	Up	7	L1	IS-IS

Router_G# **show clns neighbors**

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_E	Se0	DLCI 112	Up	27	L1	IS-IS
Router_H	Se0	DLCI 113	Up	7	L1	IS-IS

Router_H# **show clns neighbors**

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_E	Se0.1	DLCI 132	Up	23	L1	IS-IS
Router_F	Se0.2	DLCI 130	Up	25	L1	IS-IS
Router_G	Se0.1	DLCI 131	Up	28	L1	IS-IS

Router_F# **show clns neighbors**

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_H	Se2.1	DLCI 103	Up	24	L1	IS-IS

show isis database的輸出顯示，路由器H是DIS(基於拓撲結構的鏈路狀態資料包(LSP)ID):

Router_E# **show isis database**

```
IS-IS Level-1 Link State Database
LSPID          LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
Router_E.00-00 * 0x00000EA6   0xA415        54             10/0/0
Router_F.00-00 0x00000DD7   0xD76E        46             0/0/0
Router_G.00-00 0x00000DE7   0x780B        40             0/0/0
Router_H.00-00 0x00000DF0   0x4346        37             0/0/0
Router_H.01-00 0x00000DD5   0xFD1F        46             0/0/0
```

```
Router_G# show isis database
```

```
IS-IS Level-1 Link State Database
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
Router_E.00-00	0x00000E8F	0xD2FD	46	10/0/0
Router_F.00-00	0x00000DC0	0x0657	45	0/0/0
Router_G.00-00	* 0x00000DD0	0xA6F3	41	0/0/0
Router_H.00-00	0x00000DDA	0x6F30	42	0/0/0
Router_H.01-00	0x00000DBE	0x2C08	50	0/0/0

```
Router_H# show isis database
```

```
IS-IS Level-1 Link State Database
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
Router_E.00-00	0x000001EC	0x1D12	44	10/0/0
Router_F.00-00	0x00000124	0x63A2	54	0/0/0
Router_G.00-00	0x00000130	0x0C3B	33	0/0/0
Router_H.00-00	* 0x0000012F	0xEA6C	42	0/0/0
Router_H.01-00	* 0x00000123	0xBA21	43	0/0/0

您還可以檢查DIS生成的磁碟的LSP的詳細資訊。在此輸出中，偽節點LSP Router_H.01-00代表全網狀WAN，其中顯示連線到網狀網的所有路由器（就像偽節點LSP在LAN上所做的那樣）：

```
Router_E# show isis database detail Router_H.01-00
```

```
IS-IS Level-1 LSP Router_H.01-00
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
Router_H.01-00	0x00000DD6	0xFB20	42	0/0/0
Metric: 0 IS Router_H.00				
Metric: 0 IS Router_E.00				
Metric: 0 IS Router_G.00				

```
Router_G# show isis database detail Router_H.01-00
```

```
IS-IS Level-1 LSP Router_H.01-00
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
Router_H.01-00	0x00000DBE	0x2C08	35	0/0/0
Metric: 0 IS Router_H.00				
Metric: 0 IS Router_E.00				
Metric: 0 IS Router_G.00				

```
Router_H# show isis database detail Router_H.01-00
```

```
IS-IS Level-1 LSP Router_H.01-00
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
Router_H.01-00	* 0x00000126	0xB424	55	0/0/0
Metric: 0 IS Router_H.00				
Metric: 0 IS Router_G.00				
Metric: 0 IS Router_E.00				

[配置不匹配問題](#)

本節將檢查由於配置不匹配而導致的問題。路由器F的Serial2.1子介面從點對點更改為多點，從而在路由器F和H之間引入問題。如下一輸出所示，路由器F的配置已更改，而路由器H仍通過點對點子介面連線到路由器F。

- [路由器H](#)
- [路由器F](#)

路由器H

```
clns routing
!
interface Serial0
 no ip address
 no ip directed-broadcast
 no ip mroute-cache
 encapsulation frame-relay
 frame-relay lmi-type ansi
!
interface Serial0.1 multipoint
 ip address 10.10.10.4 255.255.255.0
 no ip directed-broadcast
 ip router isis
 clns router isis
 frame-relay map clns 132 broadcast
 frame-relay map clns 131 broadcast
 frame-relay map ip 10.10.10.1 132 broadcast
 frame-relay map ip 10.10.10.3 131 broadcast
!
interface Serial0.2 point-to-point
 ip address 10.20.20.4 255.255.255.0
 no ip directed-broadcast
 ip router isis
 clns router isis
 frame-relay interface-dlci 130
!
router isis
 passive-interface Ethernet0
 net 49.0001.4444.4444.4444.00
 is-type level-1
```

路由器F

```
clns routing
!
interface Serial2
 no ip address
 no ip directed-broadcast
 encapsulation frame-relay
 frame-relay lmi-type ansi
!
interface Serial2.1 multipoint
 ip address 10.20.20.2 255.255.255.0
 no ip directed-broadcast
 ip router isis
 clns router isis
 frame-relay interface-dlci 103
!
router isis
 net 49.0001.2222.2222.2222.00
 is-type level-1
```

現在，路由器H不再將路由器F視為IS-IS鄰居。

Router_H# **show clns neighbors**

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_E	Se0.1	DLCI 132	Up	23	L1	IS-IS
Router_G	Se0.1	DLCI 131	Up	22	L1	IS-IS

路由器F將路由器H視為鄰居；但是鄰接型別為IS而不是L1，且協定是終端系統到中間系統(ES-IS)而不是IS-IS。這表示路由器F存在鄰接問題。

```
Router_F# show clns neighbors
```

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_H	Se2.1	DLCI 103	Up	272	IS	ES-IS

問題原因

問題的核心是，路由器F在其多點子介面上傳送LAN IIH，而路由器H在其點對點子介面上傳送串列IIH。當在路由器H上啟用**debug isis adj packets**時，您可以看到它通過Serial0.2傳送串列IIH。但是，您看不到任何IIH通過Serial0.2到達，儘管路由器F正在通過Serial2.1傳送LAN IIH。

```
Router_H# debug isis adj-packets
```

```
IS-IS Adjacency related packets debugging is on
*Mar 2 01:11:10.065: ISIS-Adj: Rec L1 IIH from DLCI 131 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:11.421: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:11.961: ISIS-Adj: Rec L1 IIH from DLCI 132 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:14.657: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:15.205: ISIS-Adj: Sending serial IIH on Serial0.2, length 1499
*Mar 2 01:11:17.237: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:18.765: ISIS-Adj: Rec L1 IIH from DLCI 131 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:20.181: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:21.861: ISIS-Adj: Rec L1 IIH from DLCI 132 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:22.717: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:24.073: ISIS-Adj: Sending serial IIH on Serial0.2, length 1499
*Mar 2 01:11:25.845: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:27.289: ISIS-Adj: Rec L1 IIH from DLCI 131 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:28.637: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:31.853: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
*Mar 2 01:11:31.865: ISIS-Adj: Rec L1 IIH from DLCI 132 (Serial0.1),
cir type L1, cir id4444.01, length 1500
*Mar 2 01:11:33.181: ISIS-Adj: Sending serial IIH on Serial0.2, length 1499
*Mar 2 01:11:35.165: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

在路由器F上啟用同一調試時，可以看到路由器F在其Serial2.1介面上接收來自路由器H的串列IIH，但它忽略了Hello。路由器F嘗試傳送的LAN IIH因封裝失敗而丟棄。

```
Router_F# debug isis adj-packets
```

```
IS-IS Adjacency related packets debugging is on
*Mar 2 01:19:15.113: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar 2 01:19:15.117: ISIS-Adj: Point-to-point IIH received
on multi-point interface: ignored IIH
*Mar 2 01:19:17.177: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar 2 01:19:20.305: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar 2 01:19:22.813: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar 2 01:19:22.817: ISIS-Adj: Point-to-point IIH received
on multi-point interface: ignored IIH
```

```

*Mar  2 01:19:23.229: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar  2 01:19:26.157: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar  2 01:19:28.825: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar  2 01:19:30.833: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar  2 01:19:30.837: ISIS-Adj: Point-to-point IIH received
on multi-point interface: ignored IIH
*Mar  2 01:19:31.849: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar  2 01:19:34.929: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1
*Mar  2 01:19:38.029: ISIS-Adj: Encapsulation failed for L1 LAN IIH on Serial2.1

```

以下是路由器F和H之間鏈路型別不匹配時的分析：

- LAN鄰接關係使用握手，這會導致以下三種可能狀態之一：DOWN、INIT或UP。
- 在Serial2.1子介面上，從路由器F出站的第1級IIH存在封裝故障，因為它在多點子介面下沒有用於轉發IS-IS PDU的[frame-relay map cns](#) 命令。
- 路由器H沒有收到來自路由器F的任何LAN IIH，因為路由器F在傳送這些LAN IIH時發生了封裝故障。
- 路由器F確實看到來自路由器H的串列IIH，但它忽略了Hello，因為它在多點子介面上接收點對點Hello。路由器F確實檢測到來自路由器H的IIH中存在缺失或錯誤，因此路由器F建立LAN鄰接關係，但認為它是通過ES-IS獲知的，而不是通過IS-IS的L1型別鄰接關係獲知。

解決方案

解決方案是確保鏈路的兩端是點對點或多點。在這種情況下，將路由器F的Serial2.1子介面更改回點對點，以匹配路由器H的Serial0.2介面上配置的介面。變更後，擺動介面。

下一個調試輸出顯示您進行更改並交換路由器F上的Serial2介面後發生的情況。現在，路由器F能夠在其Serial2.1介面上傳送和接收串列IIH。

```
Router_F# debug isis adj-packets
```

```

*Mar  2 04:32:37.276: %LINK-5-CHANGED: Interface Serial2,
changed state to administratively down
*Mar  2 04:32:38.316: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2,
changed state to down
*Mar  2 04:32:45.868: %LINK-3-UPDOWN: Interface Serial2, changed state to up
*Mar  2 04:32:46.868: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2,
changed state to up
*Mar  2 04:33:05.896: ISIS-Adj: Sending serial IIH on Serial2.1, length 1499
*Mar  2 04:33:13.312: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar  2 04:33:13.316: ISIS-Adj: rcvd state DOWN, old state DOWN, new state INIT
*Mar  2 04:33:13.316: ISIS-Adj: Action = GOING UP, new type = L1
*Mar  2 04:33:13.320: ISIS-Adj: New serial adjacency
*Mar  2 04:33:13.324: ISIS-Adj: Sending serial IIH on Serial2.1, length 1499
*Mar  2 04:33:14.196: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar  2 04:33:14.204: ISIS-Adj: rcvd state INIT, old state INIT, new state UP
*Mar  2 04:33:14.204: ISIS-Adj: Action = GOING UP, new type = L1
*Mar  2 04:33:14.208: ISIS-Adj: L1 adj count 1
*Mar  2 04:33:14.212: ISIS-Adj: Sending serial IIH on Serial2.1, length 1499
*Mar  2 04:33:15.100: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),
cir type L1, cir id 00, length 1499
*Mar  2 04:33:15.100: ISIS-Adj: rcvd state UP, old state UP, new state UP
*Mar  2 04:33:15.104: ISIS-Adj: Action = ACCEPT
*Mar  2 04:33:22.924: ISIS-Adj: Rec serial IIH from DLCI 103 (Serial2.1),

```



```
cir type L1, cir id 00, length 1499
```

```
*Mar 2 04:33:22.928: ISIS-Adj: rcvd state UP, old state UP, new state UP
```

```
*Mar 2 04:33:22.932: ISIS-Adj: Action = ACCEPT
```

從路由器H的角度來看，配置已恢復正常：

```
Router_H# show clns neighbors
```

System Id	Interface	SNPA	State	Holdtime	Type	Protocol
Router_E	Se0.1	DLCI 132	Up	28	L1	IS-IS
Router_F	Se0.2	DLCI 130	Up	21	L1	IS-IS
Router_G	Se0.1	DLCI 131	Up	28	L1	IS-IS

debug isis adj packets指令輸出也回覆正常：

```
Router_H# debug isis adj-packets
```

```
*Mar 2 04:40:19.376: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:21.944: ISIS-Adj: Rec L1 IIH from DLCI 132 (Serial0.1),
```

```
cir type L1, cir id 4444.4444.01, length 1500
```

```
*Mar 2 04:40:22.020: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:22.428: ISIS-Adj: Rec L1 IIH from DLCI 131 (Serial0.1),
```

```
cir type L1, cir id 4444.4444.01, length 1500
```

```
*Mar 2 04:40:24.740: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:24.780: ISIS-Adj: Rec serial IIH from DLCI 130 (Serial0.2),
```

```
cir type L1, cir id 0ngth 1499
```

```
*Mar 2 04:40:24.784: ISIS-Adj: rcvd state UP, old state UP, new state UP
```

```
*Mar 2 04:40:24.784: ISIS-Adj: Action = ACCEPT
```

```
*Mar 2 04:40:26.068: ISIS-Adj: Sending serial IIH on Serial0.2, length 1499
```

```
*Mar 2 04:40:27.516: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:30.432: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:31.152: ISIS-Adj: Rec L1 IIH from DLCI 132 (Serial0.1),
```

```
cir type L1, cir id 4444.4444.01, length 1500
```

```
*Mar 2 04:40:31.540: ISIS-Adj: Rec L1 IIH from DLCI 131 (Serial0.1),
```

```
cir type L1, cir id 4444.4444.01, length 1500
```

```
*Mar 2 04:40:33.292: ISIS-Adj: Rec serial IIH from DLCI 130 (Serial0.2),
```

```
cir type L1, cir id 0ngth 1499
```

```
*Mar 2 04:40:33.296: ISIS-Adj: rcvd state UP, old state UP, new state UP
```

```
*Mar 2 04:40:33.296: ISIS-Adj: Action = ACCEPT
```

```
*Mar 2 04:40:33.664: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

```
*Mar 2 04:40:34.420: ISIS-Adj: Sending serial IIH on Serial0.2, length 1499
```

```
*Mar 2 04:40:36.328: ISIS-Adj: Sending L1 LAN IIH on Serial0.1, length 1500
```

相關資訊

- [中間系統到中間系統協定](#)
- [瞭解IS-IS偽節點LSP](#)
- [IS-IS支援頁面](#)
- [技術支援與文件 - Cisco Systems](#)