IS-IS邻接和区域类型。

目录

简介

本文描述Intermediate System to Intermediate System (IS-IS)协议邻接和区域类型。它显示一个示例网络方案和其配置和一些调试、捕获和输出更加好了解的。

先决条件

要求

没有这样需求，然而IS-IS OSPF (首先开放最短路径)协议基本的了解和运行知识一定将帮助。

使用的组件

本文档不限于特定的软件和硬件版本。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

背景信息

IS-IS协议广泛使用作为内部网关路由协议(IGP)在互联网服务提供商环境。范围本文是提供关于IS-IS区域类型、配置和故障排除的信息。在思科世界集成IS-IS部署，含义Is-is路由网络协议(IP)。在本文期限IS-IS中含义“集成IS-IS’。IS-IS实时电源在其使用在TLV (类型长度值)进行的IS-IS高度可扩展协议。当新特性进来，使用TLV，他们可以被添加到协议。

IS-IS区域

在OSPF协议其中任一路由器接口能分配到特定区域，然而区域的概念Is-is的不同的。此处每一个路由器一般来说，属于区域。此的想法来自事实IS-IS最初创建路由地址属于设备的无连接网络协议(CLNP) (路由器)，而在网络协议(IP)地址属于特定接口。

IS-IS协议有两个级别或层级、1级和级别2. 1级对应OSPF区域内路由选择，而2级对应与OSPF骨干网Area 0路由。2级地区加入有骨干区域的所有区域。默认情况下每个Cisco路由器来作为级别1-2 (L1/L2)路由器允许容易配置和部署。

1级路由器能变得相邻与1级和级别1-2 (L1/L2)路由器。二级路由器能变得相邻与2级或级别1-2 (L1/L2)路由器。没有在仅L1和L2仅路由器之间的邻接。

IS-IS 1级(L1)路由器

IS-IS 1级路由器有其所有区域内拓扑的自己的区域链路状态信息。为了路由数据包到其他区域它使用最接近的2级有能力(L1/L2)路由器。1级地区几乎正常运行作为OSPF完全末节的区域。L1路由器仅发送L1 Hello。

IS-IS级别1-2 (L1/L2)路由器

IS-IS L1/L2路由器维护两条链路状态数据库信息。一是为1级，并且其他级别在1级链路状态数据库的2.Hence两明显的Shortest Path First (SPF)计算的运行，一和其他在2级链路状态数据库。IS-IS级别1-2路由器正常运行非常接近OSPF区域边界路由器(ABR)。L1/L2路由器发送L1和L2 hello。

因为默认行为L1/L2路由器只将允许前缀一个方式段落从L1区域到L2区域，但是不在背面。

然而，如果它要求移动从L2区域的前缀向L1区域然后redistribute命令下面IS-IS配置要求。

IS-IS 2级(L2)路由器

IS-IS二级路由器有区域内以及区域间路由的链路状态信息。L2路由器仅发送L2 hello。IS-IS 2级地区可以与OSPF骨干网area 0比较。

IS-IS邻接表

路由器类型	**L1**	**L1/L2**
L1	L1邻接，如果区域ID配比，其他没有邻接	L1邻接，如果区域ID配比，其他没有邻接
L1/L2	L1邻接，如果区域ID配比，其他没有邻接	L1和L2邻接，如果区域ID配比，仅其他L2邻接
L2	没有邻接	L2邻接，区域ID不重要

MTU	如果一个IS-IS路由器收到有更加高的MTU的一ISIS Hello数据包比可以支持(在接口)它丢弃Hello因
电路类型	此属性在接口配置并且定义了即什么类型的hello L1或L2在特定接口发送。L1/L2路由器能选择性 此路由器必须发送兼容的类型hello。
验证	IS-IS能分开验证hello和林克状态协议数据单元(LSP)。如果hello正确地验证，并且LSP验证发生
功能TLV	如果IS-IS路由器不支持从另一个IS-IS路由器的功能TLV静静地忽略TLV。然而，也许有事件由于
网络类型	只有在IS-IS的两种网络类型。广播和点对点。广播是默认网络类型。如果一端用"isis network po
Hello	Hello计时器不需要配比为了邻接能出现。

IS-IS邻接状态

只有IS-IS的三邻接状态。

下来：这是初始状态。其意味着hello未从邻居接收。

正在初始化：此状态意味着本地路由器顺利地有从相邻路由器的接收的Hello，然而不肯定相邻路由器顺利地也接收本地路由器的hello。

：现在它确认相邻路由器接收本地路由器的hello。

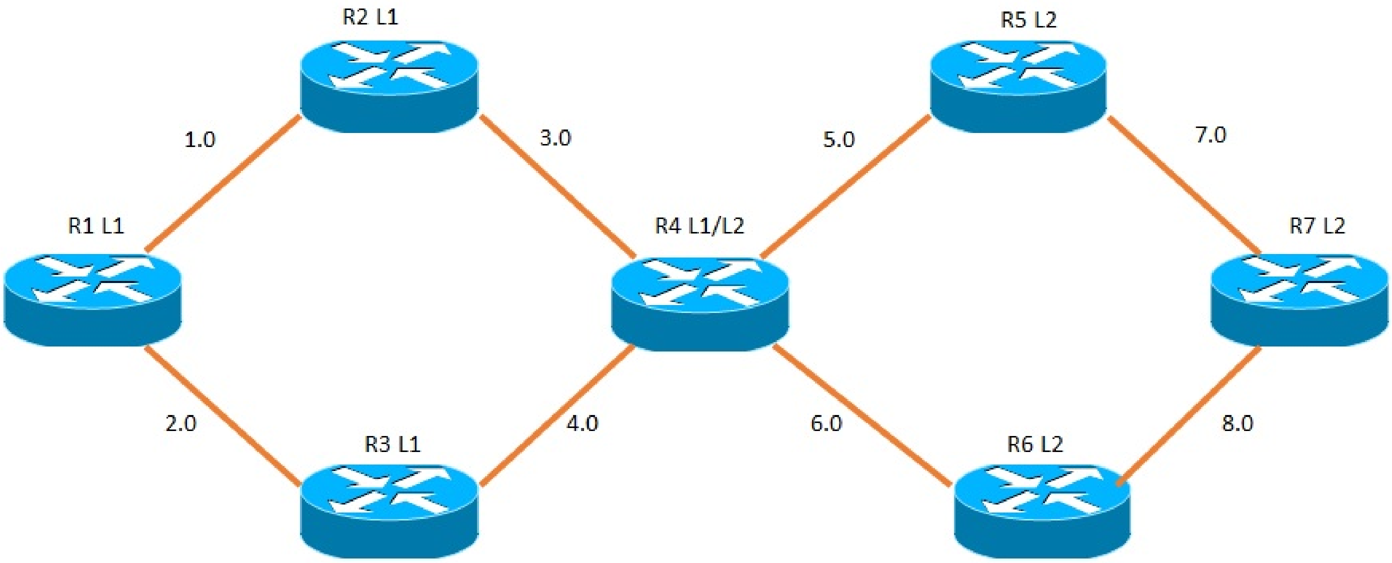
配置

网络图

将使用下述的网络图。编址方案如下。

子网X在图表中显示在接口之间的是类型192.168.X.0。环回是类型192.168.YY.YY， Y是1，当路由器是R1时。因此对于R1环回ip将是192.168.11.11。

L1、L1/L2和L2分别为1级、级别1-2和二级路由器。



配置

需要的图表的下面提供设备的配置。IS-IS协议要求全局配置在接口级和。

R1

```
!
interface Loopback1
 ip address 192.168.11.11 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.1.1 255.255.255.0
 ip router isis 1
 interface FastEthernet1/0
 ip address 192.168.2.1 255.255.255.0
 ip router isis 1
!
router isis 1
 net 49.0000.0000.0001.00
 is-type level-1
!
```

R2

```
!
interface Loopback1
 ip address 192.168.22.22 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.1.2 255.255.255.0
 ip router isis 1
 interface FastEthernet1/0
```

```
 ip address 192.168.3.2 255.255.255.0
 ip router isis 1
!
router isis 1
net 49.0000.0000.0002.00
 is-type level-1
!
```

R3

```
!
interface Loopback1
 ip address 192.168.33.33 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.2.3 255.255.255.0
 ip router isis 1
 interface FastEthernet1/0
 ip address 192.168.4.3 255.255.255.0
 ip router isis 1
!
router isis 1
 net 49.0000.0000.0003.00
 is-type level-1
!
```

R4

```
!
interface Loopback1
 ip address 192.168.44.44  255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.3.4 255.255.255.0
 ip router isis 1
!
interface FastEthernet1/0
 ip address 192.168.4.4 255.255.255.0
 ip router isis 1
!
interface FastEthernet1/1
 ip address 192.168.5.4 255.255.255.0
 ip router isis 1
!
interface FastEthernet2/0
 ip address 192.168.6.4 255.255.255.0
 ip router isis 1
!
router isis 1
 net 49.0000.0000.0004.00
!
```

R5

```
!
```

```
interface Loopback1
 ip address 192.168.55.55 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.5.5 255.255.255.0
 ip router isis 1
!
interface FastEthernet1/0
 ip address 192.168.7.5 255.255.255.0
 ip router isis 1
!
router isis 1
 net 50.0000.0000.0005.00
 is-type level-2-only
!
```

R6

```
!
interface Loopback1
 ip address 192.168.66.66 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.6.6 255.255.255.0
 ip router isis 1
!
interface FastEthernet1/0
 ip address 192.168.8.6 255.255.255.0
 ip router isis 1
!
router isis 1
 net 50.0000.0000.0006.00
 is-type level-2-only
!
```

R7

```
!
interface Loopback1
 ip address 192.168.77.77 255.255.255.255
 ip router isis 1
!
interface FastEthernet0/0
 ip address 192.168.7.7 255.255.255.0
 ip router isis 1
!
interface FastEthernet1/0
 ip address 192.168.8.7 255.255.255.0
 ip router isis 1
!
router isis 1
 net 50.0000.0000.0007.00
 is-type level-2-only
!
```

验证

在R1和R2之间的邻接

区域ID是同样在R1和R2。两个是1级路由器。L1邻接所以将存在他们之间。

```
R1#show isis neighbors
Tag 1:
System Id      Type Interface   IP Address      State Holdtime Circuit Id
R2                    L1    Fa0/0        192.168.1.2      UP       7                  R2.01
```

因为R1和R2是两L1路由器并且只属于同一个区域L1类型IS-IS hello在R1和R2之间的LAN分段来源。

```
R1#debug isis adj-packets fastEthernet 0/0
*Nov 25 19:25:53.995: ISIS-Adj: Sending L1 LAN IIH on FastEthernet0/0, length 1497
*Nov 25 19:25:54.071: ISIS-Adj: Rec L1 IIH from ca02.1c80.0000 (FastEthernet0/0), cir type L1,
cir id 0000.0000.0002.01, length 1497
-- The highlighted portion shows the Mac Address and the circuit id of R2, it also shows that L1
IS-IS hello packet was received from R2 --
*Nov 25 19:25:54.075: ISIS-Adj: New adjacency, level 1 for ca02.1c80.0000
-- The above line shows that R1 has discovered a new neighbour capable of L1 adjacency, having
the mac address ca02.1c80.0000 i.e. R2 --
*Nov 25 19:25:54.991: ISIS-Adj: Sending L1 LAN IIH on FastEthernet0/0, length 1497
*Nov 25 19:25:55.047: ISIS-Adj: Rec L1 IIH from ca02.1c80.0000 (FastEthernet0/0), cir type L1,
cir id 0000.0000.0002.01, length 1497
*Nov 25 19:25:55.051: ISIS-Adj: L1 adj count 1
*Nov 25 19:25:55.055: ISIS-Adj: L1 adjacency state goes to Up
-- Once both the routers mutually agree on interface settings and other global parameters (e.g.
authentication, circuit-type, mtu etc.) the L1 adjacency finally comes up --
```

数据包捕获

从R2to发送的IS-IS hello数据包捕获R1

```
ISIS HELLO
    .... ..01 = Circuit type: Level 1 only (0x01) >>>            Circuit type is Level 1
   0000 00.. = Reserved: 0x00
    SystemID {Sender of PDU}: 0000.0000.0002     >>>            Identification of R2
   Holding timer: 10                             >>>            Hold timer for hellos
   PDU length: 1497                              >>>            Entire PDU in bytes
   .100 0000 = Priority: 64                     >>>            Default Priority for DR election
   0... .... = Reserved: 0
   SystemID {Designated IS}: 0000.0000.0002.01   >>>            SystemID + Pseudonode ID
   Protocols Supported (1)
       NLPID(s): IP (0xcc)                       >>>            IS-IS is routing IP
   Area address(es) (2)
       Area address (1): 49                      >>>            Area id of R2
   IP Interface address(es) (4)
       IPv4 interface address: 192.168.1.2 (192.168.1.2) >>>    IP of R2’s fa0/0
   Restart Signaling (3)
       Restart Signaling Flags: 0x00
           .... .0.. = Suppress Adjacency: False
           .... ..0. = Restart Acknowledgment: False
           .... ...0 = Restart Request: False
   IS Neighbor(s) (6)
       IS Neighbor: ca:01:1d:a4:00:00 (ca:01:1d:a4:00:00) >>>   Mac of R2 ( fa0/0 )
   Padding (255)
   Padding (255)
   Padding (255)
   Padding (255)
   Padding (255)
   Padding (157)
```

从R1发送的IS-IS hello捕获到R2

```
ISIS HELLO
   .... ..01 = Circuit type: Level 1 only (0x01)  >>>           Circuit type is Level 1
   0000 00.. = Reserved: 0x00
   SystemID {Sender of PDU}: 0000.0000.0001       >>>           Identification of R1
   Holding timer: 30                              >>>           Hold time for hellos
   PDU length: 1497                               >>>           Entire PDU in bytes
   .100 0000 = Priority: 64                       >>>           Default Priority for DR election
   0... .... = Reserved: 0
   SystemID {Designated IS}: 0000.0000.0001.01   >>>           SystemID + Pseudonode Id
   Protocols Supported (1)
       NLPID(s): IP (0xcc)                        >>>           IS-IS is routing IP
   Area address(es) (2)
       Area address (1): 49                       >>>           Area id of R1
   IP Interface address(es) (4)
       IPv4 interface address: 192.168.1.1 (192.168.1.1) >>>    IP of R1 fa0/0  interface
   Restart Signaling (3)
       Restart Signaling Flags: 0x00
           .... .0.. = Suppress Adjacency: False
           .... ..0. = Restart Acknowledgment: False
           .... ...0 = Restart Request: False
   IS Neighbor(s) (6)
       IS Neighbor: ca:02:1c:80:00:00 (ca:02:1c:80:00:00)>>>    Mac of R1 fa0/0 interface
   Padding (255)
   Padding (255)
   Padding (255)
Padding (255)
   Padding (255)
Padding (157)
```

填充

关于填充符，在邻接设立前， IOS实现机制检测在接口的MTU。因此，在邻接设立后丢包不应该发生到期MTU问题并且防止数据库损坏。填充IS-IS hello增加其直到接口的MTU的大小，并且注意到另一端是否能接受有此MTU的Hello数据包。如果在另一端更小的MTU退出那么末端将下降hello并且邻接不会出来。

保持计时器

也许有关于暂挂计时器的混乱。即在IS-IS中在广播LAN分段的DR总是发送正常hello时间的hello三分之一10秒。因此从DR的角度hello时间是3.33秒，并且保持时间是10秒。在上述捕获R2是DR。这可能从下面输出也验证。

```
R2#sh clns interface fastEthernet 0/0
FastEthernet0/0 is up, line protocol is up
Checksums enabled, MTU 1497, Encapsulation SAP
ERPDUs enabled, min. interval 10 msec.
CLNS fast switching enabled
CLNS SSE switching disabled
DEC compatibility mode OFF for this interface
Next ESH/ISH in 31 seconds
Routing Protocol: IS-IS
Circuit Type: level-1-2
Interface number 0x1, local circuit ID 0x1
Level-1 Metric: 10, Priority: 64, Circuit ID: R2.01
DR ID: R2.01
Level-1 IPv6 Metric: 10
```

```
Number of active level-1 adjacencies: 1
Next IS-IS LAN Level-1 Hello in 1 seconds
```

在R2和R4之间的邻接

区域ID同样在R2和R4之间。R2是1级，并且R4是级别1-2。因为将发送L1和L2 hello的R4是L1/L2路由器，如被提及的更早的R2 L1仅路由器，并且区域ID同样，因此L1邻接将形成。

```
R2#show isis neighbors
Tag 1:
System Id Type Interface IP Address State Holdtime Circuit Id
R4 L1 Fa1/0 192.168.3.4 UP 8 R4.01

*Nov 26 03:56:25.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: New adjacency, level 1 for ca04.0cf4.0000
*Nov 26 03:56:26.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:26.339: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.343: ISIS-Adj: L1 adj count 1
*Nov 26 03:56:26.343: ISIS-Adj: L1 adjacency state goes to Up
*Nov 26 03:56:26.347: ISIS-Adj: Run level-1 DR election for FastEthernet1/0
*Nov 26 03:56:26.351: ISIS-Adj: New level-1 DR 0000.0000.0004 on FastEthernet1/0
*Nov 26 03:56:26.467: ISIS-Adj: Rec L2 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.471: ISIS-Adj: is-type mismatch
-- The above line in output is due to the fact that R2 is L1 only and hence does not understand
the L2 hellos from the L1/L2 Router R2 --
```

数据包捕获

L2 Hello的数据包捕获从R4到R2


```
R2#show isis neighbors
Tag 1:
System Id Type Interface IP Address State Holdtime Circuit Id
R4 L1 Fa1/0 192.168.3.4 UP 8 R4.01

*Nov 26 03:56:25.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: New adjacency, level 1 for ca04.0cf4.0000
*Nov 26 03:56:26.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:26.339: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.343: ISIS-Adj: L1 adj count 1
*Nov 26 03:56:26.343: ISIS-Adj: L1 adjacency state goes to Up
*Nov 26 03:56:26.347: ISIS-Adj: Run level-1 DR election for FastEthernet1/0
*Nov 26 03:56:26.351: ISIS-Adj: New level-1 DR 0000.0000.0004 on FastEthernet1/0
*Nov 26 03:56:26.467: ISIS-Adj: Rec L2 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.471: ISIS-Adj: is-type mismatch
-- The above line in output is due to the fact that R2 is L1 only and hence does not understand
the L2 hellos from the L1/L2 Router R2 --
```


L1 Hello的数据包捕获从R4到R2

R2#show isis neighbors

```
Tag 1:
System Id Type Interface IP Address State Holdtime Circuit Id
R4 L1 Fa1/0 192.168.3.4 UP 8 R4.01

*Nov 26 03:56:25.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: New adjacency, level 1 for ca04.0cf4.0000
*Nov 26 03:56:26.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:26.339: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.343: ISIS-Adj: L1 adj count 1
*Nov 26 03:56:26.343: ISIS-Adj: L1 adjacency state goes to Up
*Nov 26 03:56:26.347: ISIS-Adj: Run level-1 DR election for FastEthernet1/0
*Nov 26 03:56:26.351: ISIS-Adj: New level-1 DR 0000.0000.0004 on FastEthernet1/0
*Nov 26 03:56:26.467: ISIS-Adj: Rec L2 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.471: ISIS-Adj: is-type mismatch
```

-- The above line in output is due to the fact that R2 is L1 only and hence does not understand the L2 hellos from the L1/L2 Router R2 --

L1 Hello的数据包捕获从R2to R4的

R2#show isis neighbors

```
Tag 1:
System Id Type Interface IP Address State Holdtime Circuit Id
R4 L1 Fa1/0 192.168.3.4 UP 8 R4.01

*Nov 26 03:56:25.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:25.355: ISIS-Adj: New adjacency, level 1 for ca04.0cf4.0000
*Nov 26 03:56:26.299: ISIS-Adj: Sending L1 LAN IIH on FastEthernet1/0, length 1497
*Nov 26 03:56:26.339: ISIS-Adj: Rec L1 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.343: ISIS-Adj: L1 adj count 1
*Nov 26 03:56:26.343: ISIS-Adj: L1 adjacency state goes to Up
*Nov 26 03:56:26.347: ISIS-Adj: Run level-1 DR election for FastEthernet1/0
*Nov 26 03:56:26.351: ISIS-Adj: New level-1 DR 0000.0000.0004 on FastEthernet1/0
*Nov 26 03:56:26.467: ISIS-Adj: Rec L2 IIH from ca04.0cf4.0000 (FastEthernet1/0), cir type L1L2,
cir id 0000.0000.0004.01, length 1497
*Nov 26 03:56:26.471: ISIS-Adj: is-type mismatch
```

-- The above line in output is due to the fact that R2 is L1 only and hence does not understand the L2 hellos from the L1/L2 Router R2 --

在R4和R5之间的邻接

区域ID是不同的在R4和R5之间。R4是级别1-2，并且R5是2级。L2邻接所以将形成。

R4#show isis neighbors

Tag 1:

System Id	Type	Interface	IP Address	State	Holdtime	Circuit Id
R2	**L1**	Fa0/0	192.168.3.2	**UP**	19	R4.01
R5	**L2**	Fa1/1	192.168.5.5	**UP**	4	R5.01

在R5和R7之间的邻接

区域ID是同样在R5和R7之间。R5是2级，并且R7是2级。L2邻接所以将形成。

```
R5#show isis neighbors
Tag 1:
System Id      Type Interface   IP Address State Holdtime Circuit Id
R4                  L2    Fa0/0       192.168.5.4        UP      29             R5.01
R7                  L2    Fa1/0       192.168.7.7        UP      4              R7.01
```

在L1路由器的前缀。

作为被提及的更加早期的L1路由器有仅内部区域LSA并且使用最近的L1/L2路由器到达网络的其他部分。L1区域几乎正常运行作为OSPF完全末节的区域。L1/L2路由器生成的默认路由R4在路由表里被看到，使用此默认路由目的地的外部可以被到达。

```
R1#sh ip route
Codes: L - local, C - connected, S - static, 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
      i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
      + - replicated route, % - next hop override

Gateway of last resort is 192.168.2.3 to network 0.0.0.0
i*L1  0.0.0.0/0 [115/20] via 192.168.2.3, 00:25:31, FastEthernet1/0
               [115/20] via 192.168.1.2, 00:25:31, FastEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, FastEthernet0/0
L        192.168.1.1/32 is directly connected, FastEthernet0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.2.0/24 is directly connected, FastEthernet1/0
L        192.168.2.1/32 is directly connected, FastEthernet1/0
i L1  192.168.3.0/24 [115/20] via 192.168.1.2, 00:25:31, FastEthernet0/0
i L1  192.168.4.0/24 [115/20] via 192.168.2.3, 03:17:05, FastEthernet1/0
i L1  192.168.5.0/24 [115/30] via 192.168.2.3, 00:25:31, FastEthernet1/0
-----------Output Omitted -----------
```

在L1/L2路由器的前缀

L1/L2路由器维护两个链路状态数据库，一个L1区域的和L2区域的。因此两个明显的SPF计算要求。L1/L2路由器在L1区域发送默认路由，因此L1路由器能到达网络的其他部分。作为解释的以上此处L1和L2路由被观察。

```
R4#sh ip route
Codes: L - local, C - connected, S - static, 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
      i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
      + - replicated route, % - next hop override

Gateway of last resort is not set

i L1  192.168.1.0/24 [115/20] via 192.168.3.2, 00:30:18, FastEthernet0/0
i L1  192.168.2.0/24 [115/20] via 192.168.4.3, 03:21:58, FastEthernet1/0
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.3.0/24 is directly connected, FastEthernet0/0
```

```
L        192.168.3.4/32 is directly connected, FastEthernet0/0
     192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.4.0/24 is directly connected, FastEthernet1/0
L        192.168.4.4/32 is directly connected, FastEthernet1/0
     192.168.5.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.5.0/24 is directly connected, FastEthernet1/1
L        192.168.5.4/32 is directly connected, FastEthernet1/1
     192.168.6.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.6.0/24 is directly connected, FastEthernet2/0
L        192.168.6.4/32 is directly connected, FastEthernet2/0
i L2  192.168.7.0/24 [115/20] via 192.168.5.5, 00:00:57, FastEthernet1/1
i L2  192.168.8.0/24 [115/20] via 192.168.6.6, 00:00:32, FastEthernet2/0
-----------Output Omitted -----------
```

在L2路由器的前缀

L2路由器是类似OSPF骨干网路由器。所有信息是存在L2路由器。注意到从L1区域的环回是存在作为L2路由在L2路由器的路由表里。

```
R7#sh ip route
Codes: L - local, C - connected, S - static, 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
      i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
      + - replicated route, % - next hop override

Gateway of last resort is not set

i L2  192.168.1.0/24 [115/40] via 192.168.8.6, 00:31:54, FastEthernet1/0
                     [115/40] via 192.168.7.5, 00:31:54, FastEthernet0/0
i L2  192.168.2.0/24 [115/40] via 192.168.8.6, 03:23:23, FastEthernet1/0
                     [115/40] via 192.168.7.5, 03:23:23, FastEthernet0/0
i L2  192.168.3.0/24 [115/30] via 192.168.8.6, 03:23:23, FastEthernet1/0
                     [115/30] via 192.168.7.5, 03:23:23, FastEthernet0/0
i L2  192.168.4.0/24 [115/30] via 192.168.8.6, 03:23:23, FastEthernet1/0
                     [115/30] via 192.168.7.5, 03:23:23, FastEthernet0/0
i L2  192.168.5.0/24 [115/20] via 192.168.7.5, 00:02:35, FastEthernet0/0
i L2  192.168.6.0/24 [115/20] via 192.168.8.6, 00:02:10, FastEthernet1/0
     192.168.7.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.7.0/24 is directly connected, FastEthernet0/0
L        192.168.7.7/32 is directly connected, FastEthernet0/0
     192.168.8.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.8.0/24 is directly connected, FastEthernet1/0
L        192.168.8.7/32 is directly connected, FastEthernet1/0
     192.168.11.0/32 is subnetted, 1 subnets
i L2     192.168.11.11 [115/50] via 192.168.8.6, 03:23:23, FastEthernet1/0
                       [115/50] via 192.168.7.5, 03:23:23, FastEthernet0/0
     192.168.22.0/32 is subnetted, 1 subnets
i L2     192.168.22.22 [115/40] via 192.168.8.6, 00:31:54, FastEthernet1/0
                       [115/40] via 192.168.7.5, 00:31:54, FastEthernet0/0
-----------Output Omitted -----------
```

故障排除

目前没有针对此配置的故障排除信息。