

瞭解IPv6本地鏈路地址

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簡介

本文檔介紹IPv6本地鏈路地址在網路中的工作方式。

必要條件

需求

思科建議您瞭解以下主題：

- [Cisco IOS® IPv6命令參考中的IPv6地址格式](#)

採用元件

本檔案中的資訊是根據採用Cisco IOS®軟體版本12.4(15)T1的Cisco 3700系列路由器。

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。如果您的網路運作中，請確保您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。

背景資訊

本地鏈路地址是可以在任何使用本地鏈路字首FE80::/10(1111 110 10)和修改後的EUI-64格式的介面識別符號的介面上自動配置的IPv6單播地址。本地鏈路地址不一定繫結到MAC地址 (以EUI-64格式配置)。也可以使用[ipv6 address link-local](#)命令以FE80::/10格式[式手動配置本地鏈路](#)地址。

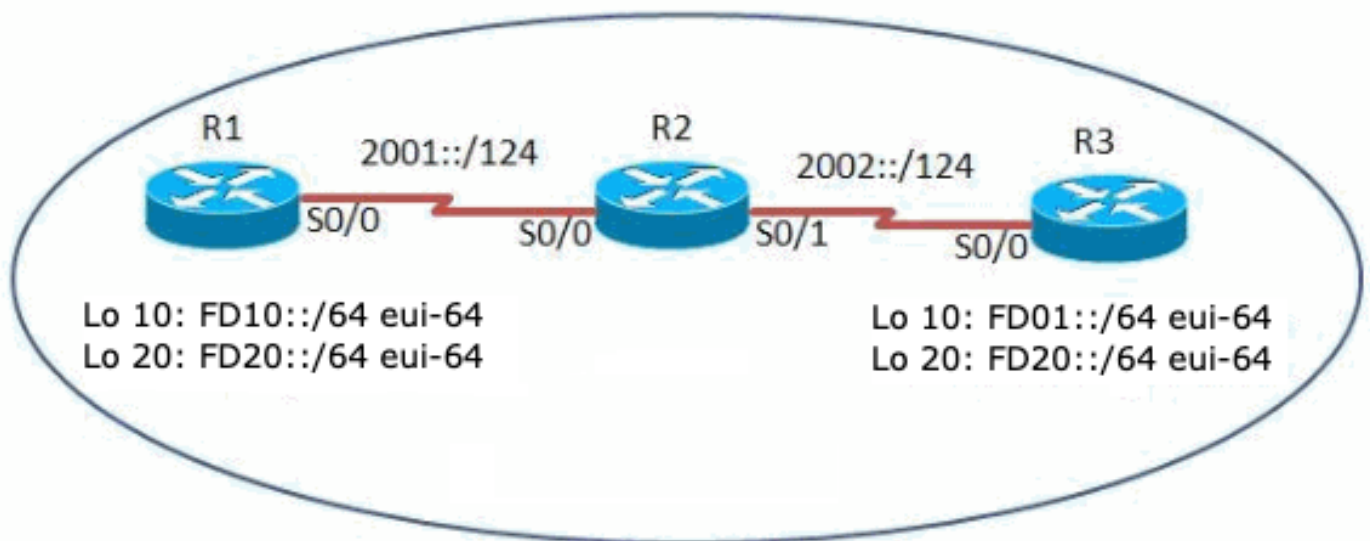
這些地址僅指特定物理鏈路，用於單個鏈路上的地址，用於自動地址配置和鄰居發現協定等目的。本地鏈路地址可用於到達連線到同一鏈路的相鄰節點。這類節點不須擁有全域唯一的位址，即可進行通訊。路由器不會使用本地鏈路地址轉發資料包。IPv6路由器不得將具有本地鏈路源地址或目標地址的資料包轉發到其他鏈路。所有啟用IPv6的介面都有一個本地鏈路單播地址。

組態

在本例中，路由器R1、R2和R3通過串列介面連線，並且按照網路圖所述配置了IPv6地址。路由器R1和R3上配置了環回地址，並且路由器使用OSPFv3相互通訊。此示例使用ping命令演示具有本地鏈路地址的路由器之間的連通性。路由器R1和R3可以使用IPv6本地單播地址互相ping通，但不能使用其本地鏈路地址。但是，路由器R2直接連線到R1和R3，因此它可以使用路由器的本地鏈路地址與這兩台路由器通訊，因為本地鏈路地址僅在特定於物理介面的本地網路中使用。

網路圖表

本檔案會使用以下網路設定：



使用的配置

本檔案會使用以下設定：

- 路由器R1
- 路由器R2
- 路由器R3

此影片展示Cisco IOS路由器中IPv6本地鏈路地址和全域性單播地址之間的關鍵差異：

- [瞭解IPv6本地鏈路地址](#)

路由器R1

```
hostname R1
```

```

!
ipv6 cef
!
ipv6 unicast-routing
!
interface Loopback10
no ip address
ipv6 address FD10::/64 eui-64

!--- Assigned a IPv6 unicast address in EUI-64 format. ipv6 ospf 1 area 1

!--- Enables OSPFv3 on the interface and associates the interface loopback10 to area 1. ! interface Loop
no ip address ipv6 address FD20::/64 eui-64
ipv6 ospf 1 area 2

!--- Associates the Interface loopback20 to area 2. ! interface Serial0/0 no ip address ipv6 address
2001::1/124
ipv6 ospf 1 area 0

!--- Associates the Interface serial0/0 to area 0. clock rate 2000000 ! ipv6 router ospf 1 router-id 10
!--- Router R1 uses 10.1.1.1 as router id. log-adjacency-changes ! end

```

路由器R2

```

hostname R2
!
ipv6 cef
!
ipv6 unicast-routing
!
!
!
interface Serial0/0
no ip address
ipv6 address 2001::2/124
ipv6 ospf 1 area 0
clock rate 2000000
!
!
interface Serial0/1
no ip address
ipv6 address 2002::1/124
ipv6 ospf 1 area 0
clock rate 2000000
!
!
!
ipv6 router ospf 1
router-id 10.2.2.2
log-adjacency-changes
!
end

```

路由器R3

```

hostname R3
!
ipv6 cef
!
ipv6 unicast-routing
!
interface Loopback10
no ip address
ipv6 address FD01::/64 eui-64
ipv6 ospf 1 area 1
!
interface Loopback20
no ip address
ipv6 address FD20::/64 eui-64
ipv6 ospf 1 area 2
!
interface Serial0/0
no ip address
ipv6 address FE80::AB8 link-local
ipv6 address 2002::2/124
ipv6 ospf 1 area 0
clock rate 2000000
!
ipv6 router ospf 1
router-id 10.3.3.3
log-adjacency-changes
!
end

```

驗證

檢驗OSPF配置

要檢驗OSPF是否配置正確，請使用 [show ipv6 route ospf](#) 命令。

```

show ipv6 route ospf

```

路由器R1

```
R1#show ipv6 route ospf
IPv6 Routing Table - 10 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
OI  FD01::C002:1DFF:FEE0:0/128 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
O   2002::/124 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
OI  FD20::C002:1DFF:FEE0:0/128 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
```

路由器R3

```
R3#show ipv6 route ospf
IPv6 Routing Table - 10 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
O   2001::/124 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
OI  FD10::C000:1DFF:FEE0:0/128 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
OI  FD20::C000:1DFF:FEE0:0/128 [110/128]
    via FE80::C001:1DFF:FEE0:0, Serial0/0
```

驗證本地鏈路地址可達性

路由器可以使用全域性單播地址互相ping。如果路由器僅使用本地鏈路地址，則直連網路可以通訊。例如，R1可以使用全域性單播地址ping R3，但兩台路由器無法與本地鏈路地址通訊。路由器R1和R3中的ping和debug ipv6 icmp命令會顯示此資訊。

從遠端網路Ping本地鏈路地址

當路由器R1嘗試使用鏈路本地地址與路由器R3通訊時，路由器R1會返回ICMP超時消息，該消息表示鏈路本地地址是本地特定的，無法與直連網路之外的鏈路本地地址通訊。

從路由器R1 ping R3的本地鏈路地址 在路由器R1中

```
R1#ping FE80::AB8
```

```
!--- Pinging Link-Local Address of router R3. Output Interface: serial0/0
```

```
!--- To ping LLA, output interface must be entered. Type escape sequence to abort. Sending 5, 100-byte
Echos to FE80::AB8, timeout is 2 seconds: Packet sent with a source address of FE80::C000:1DFF:FEE0:0 .
Success rate is 0 percent (0/5) !--- The ping is unsuccessful and the ICMP packet cannot reach the
destination through serial0/0. !--- This timeout indicates that R1 has not received any replies from th
router R3.
```

從直連網路Ping本地鏈路地址

對於路由器R2，路由器R1和R3直接連線，當路由器R1和R2與連線到路由器的相關介面通訊時，它們可以ping路由器R1和R2的本地鏈路地址。輸出如下所示：

從路由器R2 ping R1的本地鏈路地址 路由器R2中

```
R2#ping FE80::C000:1DFF:FEE0:0
```

```
!--- Pinging Link-Local Address of router R1. Output Interface: serial0/0
```

```
!--- Note that to ping LLA, output interface should be mentioned In our case, R2 connects to R1 via serial0/0. Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to FE80::C000:1DFF:FEE0:0, timeout is 2 seconds: Packet sent with a source address of FE80::C001:1DFF:FEE0:0 !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/19/56 ms
```

調試R1的輸出

```
R1#
```

```
*Mar 1 03:59:53.367: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.371: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.423: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.427: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.463: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.463: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.467: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.467: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.471: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 03:59:53.471: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
```

```
!--- The debug output shows that the router R2 can ping router R1's link-local address.
```

從路由器R2 ping R3的本地鏈路地址 路由器R2中

```
R2#ping FE80::AB8
```

```
!--- Pinging Link-Local Address of router R3. Output Interface: serial0/1
```

```
!--- Note that, to ping LLA, output interface should be mentioned. In our case, R2 connects to R3 through serial0/1. Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to FE80::AB8, timeout is 2 seconds: Packet sent with a source address of FE80::C001:1DFF:FEE0:0 !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/18/60 ms
```

調試R3的輸出

```
R3#
```

```
*Mar 1 04:12:11.518: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.522: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.594: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.598: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.618: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.618: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.622: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.622: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.626: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar 1 04:12:11.630: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
```

```
!--- The debug output shows that the router R2 can ping router R3's link-local address.
```

本地鏈路地址只特定於本地網路。路由器可以擁有相同的本地鏈路地址，而且直連網路可以彼此通訊，而不會發生衝突。對於全域性單播地址，情況並非如此。可路由的全域性單播地址在網路中必須是唯一的。[show ipv6 interface brief](#) 命令顯示有關介面上的本地鏈路地址的資訊。

show ipv6 interface brief

在路由器R1中

```
R1#show ipv6 interface brief
```

```
Serial0/0 [up/up]
  FE80::AB8
  2001::1
Loopback10 [up/up]
  FE80::C000:1DFF:FEE0:0
```

```
FD10::C000:1DFF:FEE0:0
Loopback20          [up/up]
FE80::C000:1DFF:FEE0:0
FD20::C000:1DFF:FEE0:0
```

路由器R3中

```
R3#show ipv6 interface brief
```

```
Serial0/0          [up/up]
  FE80::AB8
  2002::2
Loopback10        [up/up]
  FE80::C002:1DFF:FEE0:0
  FD01::C002:1DFF:FEE0:0
Loopback20        [up/up]
  FE80::C002:1DFF:FEE0:0
  FD20::C002:1DFF:FEE0:0
```

```
!--- Shows that R1 and R3's serial interface has same link-local address FE80::AB8.
```

在本例中，R1和R3分配了相同的本地鏈路地址，並且R2在指定相關輸出介面時仍然可以到達兩台路由器。

從R2 ping R1和R3的本地鏈路地址

從R2 ping R1的本地鏈路地址

```
R2#ping FE80::AB8
```

```
Output Interface: serial0/0
```

```
!--- R2 is connected to R1 through serial0/0. Type escape sequence to abort. Sending 5, 100-byte ICMP E
to FE80::AB8, timeout is 2 seconds: Packet sent with a source address of FE80::C001:1DFF:FEE0:0 !!!!! S
rate is 100 percent (5/5), round-trip min/avg/max = 0/26/92 ms
```

調試R1的輸出

```
R1#
```

```
*Mar  1 19:51:31.855: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.859: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.915: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.919: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.947: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.947: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.955: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.955: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.955: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:51:31.955: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
```

從R2 Ping R3本地鏈路地址

```
R2#ping FE80::AB8
```

```
Output Interface: serial0/1
```

```
!--- R2 is connected to R1 through serial0/1. Type escape sequence to abort. Sending 5, 100-byte ICMP E
to FE80::AB8, timeout is 2 seconds: Packet sent with a source address of FE80::C001:1DFF:FEE0:0 !!!!! S
rate is 100 percent (5/5), round-trip min/avg/max = 4/28/76 ms
```

調試R3的輸出

```
R3#
```

```
*Mar  1 19:53:38.815: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.819: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.911: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.915: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.923: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.927: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.955: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.955: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.963: ICMPv6: Received echo request from FE80::C001:1DFF:FEE0:0
*Mar  1 19:53:38.963: ICMPv6: Sending echo reply to FE80::C001:1DFF:FEE0:0
```

附註：R2僅能對R1和R3的本地鏈路地址執行ping操作，因為它們是直接連線的。R2無法對路由器R1和R3中環回介面的本地鏈路地址執行ping操作，因為它們不是直接連線的。只有在直連網路的情況下，Ping才能在本地鏈路地址上工作。

附註：Traceroute在本地鏈路地址的情況下不起作用，並返回錯誤消息「% No valid source address for destination」。這是因為IPv6路由器不能將具有本地鏈路源地址或目標地址的資料包轉發到其他鏈路。

相關資訊

- [IP第6版定址架構 — RFC 4291](#)
- [IPv6技術支援](#)
- [技術支援與文件 - Cisco Systems](#)

關於此翻譯

思科已使用電腦和人工技術翻譯本文件，讓全世界的使用者能夠以自己的語言理解支援內容。請注意，即使是最佳機器翻譯，也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準確度概不負責，並建議一律查看原始英文文件（提供連結）。