对思科路由器和 Microsoft Windows PC 上的 IPv6 动态地址分配问题进行故障排除

目录

简介

本文档介绍动态 IPv6 地址分配的可用选项。本章介绍无状态地址自动配置(SLAAC)和动态主机配置协议第6版(DHCPv6)故障排除。

先决条件

要求

Cisco 建议您了解以下主题：

- IPv6地址架构
- Microsoft Windows操作系统
- 基本Wireshark用法

使用的组件

本文档中的信息基于以下硬件/软件版本：

- 采用Cisco IOS®的Cisco路由器
- Microsoft Windows® [7] PC

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。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

运行Microsoft Windows的计算机和笔记本电脑等IPv6终端主机可能面临IPv6地址未按预期动态接收或显示的情况。

建议对Cisco IOS和Microsoft Windows操作系统进行故障排除，以确保配置正确。

注意：不同操作系统的行为可能不同。这取决于IPv6在其代码中的实施方式。本文档旨在为读者提供Microsoft Windows上IPv6所需配置的示例。本文档中介绍的Microsoft Windows配置已在实验室中测试，并发现可以按预期工作。思科技术支持中心(TAC)不支持Microsoft Windows配置帮助。

IPv6动态地址分配方法

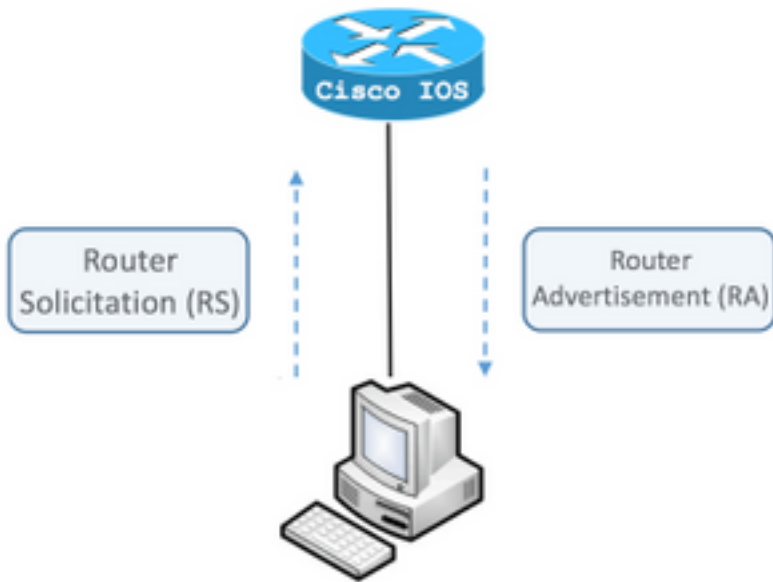|	
SLAAC	- SLAAC是本地IPv6方法，用于为终端主机动态提供IPv6地址和默认网关信息。 - 它使用互联网控制消息协议第6版(ICMPv6)数据包。 - ICMPv6路由器请求(RS)和ICMPv6路由器通告(RA)数据包在启用IPv6的路由器和终端 - 路由器定期向本地网络发送RA数据包（默认情况下，在Cisco IOS中每200秒），或由请求。 - 收到RA数据包后，终端主机必须根据数据包中包含的信息获取IPv6地址（通过对主机关。
DHCPv6无状态	- DHCPv6无状态用于获取其他配置参数（不由SLAAC提供），如DNS、域名等。 - DHCPv6有状态数据库可以为终端主机提供IPv6地址并跟踪租用的地址。
DHCPv6有状态	- DNS、域名等信息也可以通过DHCPv6有状态方法提供。 - 路由器在本地网络上发送RA数据包后，仍必须提供默认网关信息。 - 此选项与IPv4的DHCP最相似。

注：终端主机动态获取IPv6默认网关信息的唯一方式是从本地路由器发起的ICMPv6路由器通告(RA)数据包。DHCPv6数据包当前不传输任何IPv6默认网关信息。

SLAAC

路由器与终端主机之间的数据包交换如下所示：

步骤1.终端主机最初发送ICMPv6 RS数据包。

步骤2.路由器用ICMPv6 RA数据包重播。

要查看交换，请在计算机上运行免费的开源数据包分析器Wireshark，并使用以下过滤器：

ICMPv6 icmpv6.type ==
RS   133

ICMPv6 icmpv6.nd.ra.flag
RA

终端主机必须根据收到的ICMPv6 RA数据包中包含的信息获取IPv6地址和默认网关信息。

使用Wireshark获取ICMPv6 RA数据包的示例：

```
Frame 187: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface 0
Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: IPv6mcast_01 (33:33:00:00:00:01)
Internet Protocol Version 6, Src: fe80::c801:b9ff:fef0:8, Dst: ff02::1           ! Default
Gateway.
Internet Control Message Protocol v6
    Type: Router Advertisement (134)
    Code: 0
    Checksum: 0x4ce1 [correct]
    Cur hop limit: 64
    Flags: 0x00
    Router lifetime (s): 1800
    Reachable time (ms): 0
    Retrans timer (ms): 0
    ICMPv6 Option (Source link-layer address : ca:01:b9:f0:00:08)
    ICMPv6 Option (MTU : 1500)
```

```
    ICMPv6 Option (Prefix information : 2001:abcd::/64)                          ! Prefix
information.
```

1)ICMPv6选项（前缀信息）字段。

这是终端主机用于其IPv6地址网络部分的前缀信息。

接口标识符（主机部分）由使用EUI-64方法的终端主机创建。

Microsoft Windows可以随机创建主机部分。

2)Internet协议版本6，源字段。

终端主机使用RA数据包的IPv6源地址配置其IPv6默认网关。

排除SLAAC故障

从Cisco IOS

步骤1.确保在全局配置模式下配置了ipv6 unicast-routing命令。

步骤2.确保本地网络中的接口配置了有效的IPv6地址。

```
ipv6 unicast-routing                ! Enable IPv6 Routing. In absence of this command ! ! the
Router does not send any ICMPv6 RA packet. interface GigabitEthernet0/0/0 ipv6 address
2001:ABCD::1/64 end
```
步骤3.确保在ICMPv6 RA数据包中通告的前缀是前缀长度/64。否则，终端主机无法通过SLAAC创建任何IPv6地址：

```
ipv6 unicast-routing
!
interface GigabitEthernet0/0/0
 ipv6 address 2001:ABCD::1/64      ! Prefix length defined as /64 on the Router.
end
```
ICMPv6 RA数据包捕获：

```
Frame 187: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface 0
Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: IPv6mcast_01 (33:33:00:00:00:01)
Internet Protocol Version 6, Src: fe80::c801:b9ff:fef0:8, Dst: ff02::1
Internet Control Message Protocol v6
    Type: Router Advertisement (134)
    Code: 0
    Checksum: 0x4ce1 [correct]
    Cur hop limit: 64
    Flags: 0x00
    Router lifetime (s): 1800
    Reachable time (ms): 0
    Retrans timer (ms): 0
    ICMPv6 Option (Source link-layer address : ca:01:b9:f0:00:08)
    ICMPv6 Option (MTU : 1500)
    ICMPv6 Option (Prefix information : 2001:abcd::/64)                ! Prefix & prefix lenght
information.
```

步骤4.命令debug ipv6 nd 实时显示ICMPv6 RS数据包的接收和ICMPv6 RA在本地网络上的通告。

```
Router# debug ipv6 nd
  ICMP Neighbor Discovery events debugging is on
Router#
Router# show logging | include RS
ICMPv6-ND: Received RS on GigabitEthernet0/0/0 from FE80::5850:6D61:1FB:EF3A
R1#

Router# show logging | include RA
ICMPv6-ND: Sending solicited RA on GigabitEthernet0/0/0
ICMPv6-ND: Request to send RA for FE80::C801:EFFF:FE5A:8
ICMPv6-ND: Setup RA from FE80::C801:EFFF:FE5A:8 to FF02::1 on GigabitEthernet0/0/0
Router#
```
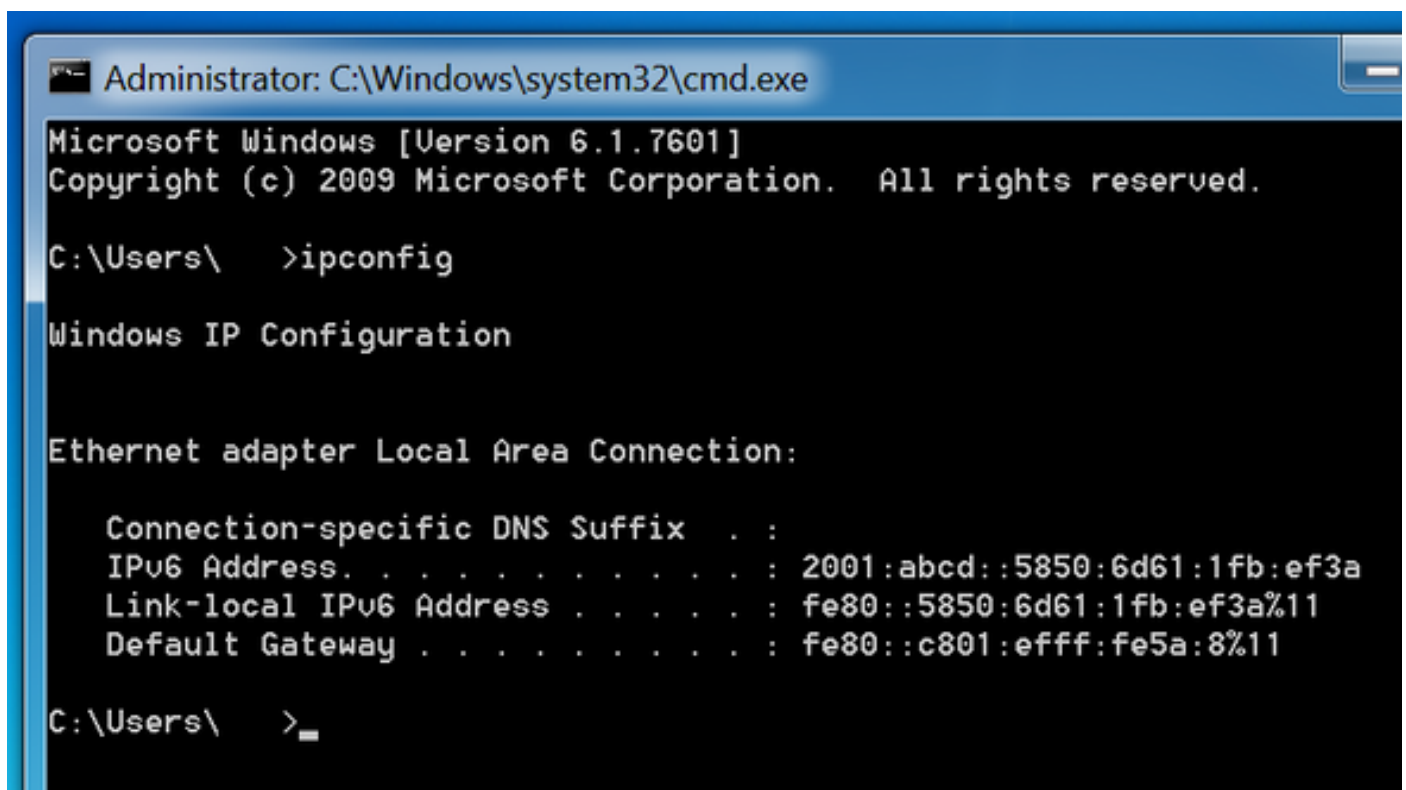
从Microsoft Windows PC

步骤1.确保终端主机收到RA数据包。

这可以通过Wireshark和icmpv6.nd.ra.fl ag过滤器执**行捕**获。

步骤2.使用命令ipconfig检验IPv6地址。

如果IPv6地址仍未显示，请执行后续步骤。

步骤3.确保网络适配器在Windows计**算机上激活了Internet协议第6**版(TCP/IPv6)复选框。
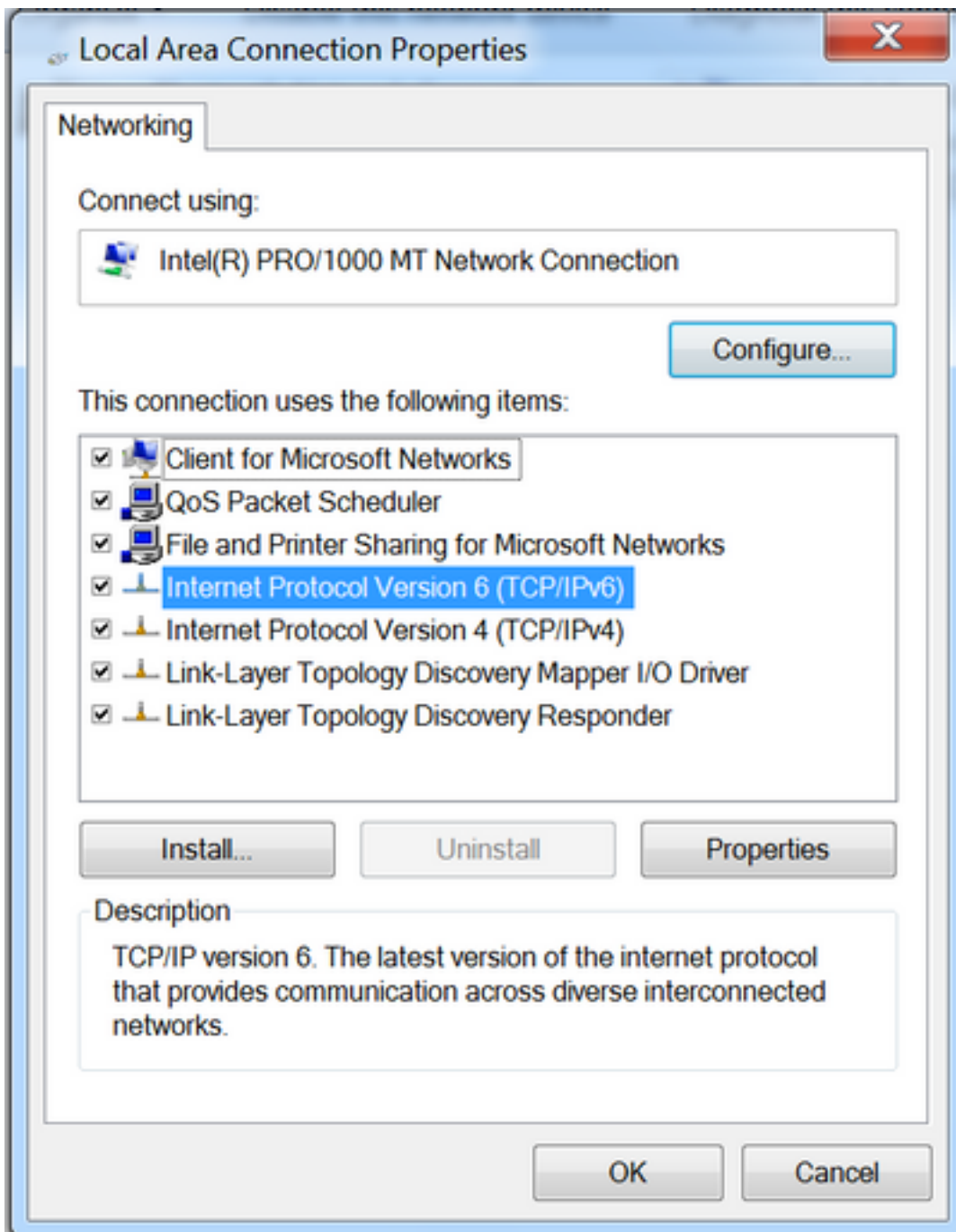
在Windows上，您可以在以下位置找到此配置：

步骤1.**导航至"控制面板">"网络和共享中心">"更改适配器设置"**

步骤2.右键单击所选的网络适配器>**属性**

当您在Windows命令提示符(CMD)中使用**netsh interface ipv6 show interface "Local Area Connection"**命令时，网络适配器未启用Internet协议第6版(TCP/IPv6)。

> **注意：**在此命令中，可以用Microsoft Windows用于连接网络的网络适配器的名称替换**本地连接。**

> **提示：**打开命令提示符。在键盘上按Windows + R打开"**Run(运行)**"框。运行命令**cmd**并按确定

步骤3.确保将路由器发现参数设置为启用。

在CMD中运行命令netsh interface ipv6 show interface "Local Area Connection"。

当"路由器发现"参数设置为禁用时，Microsoft Windows可以忽略已接收的ICMPv6 RA数据包的内容。这可能导致Microsoft Windows无法生成任何IPv6地址。

使用此命令可启用路由器发现：

```
C:\> netsh interface ipv6 set interface "Local Area Connection" routerdiscovery=enabled
```
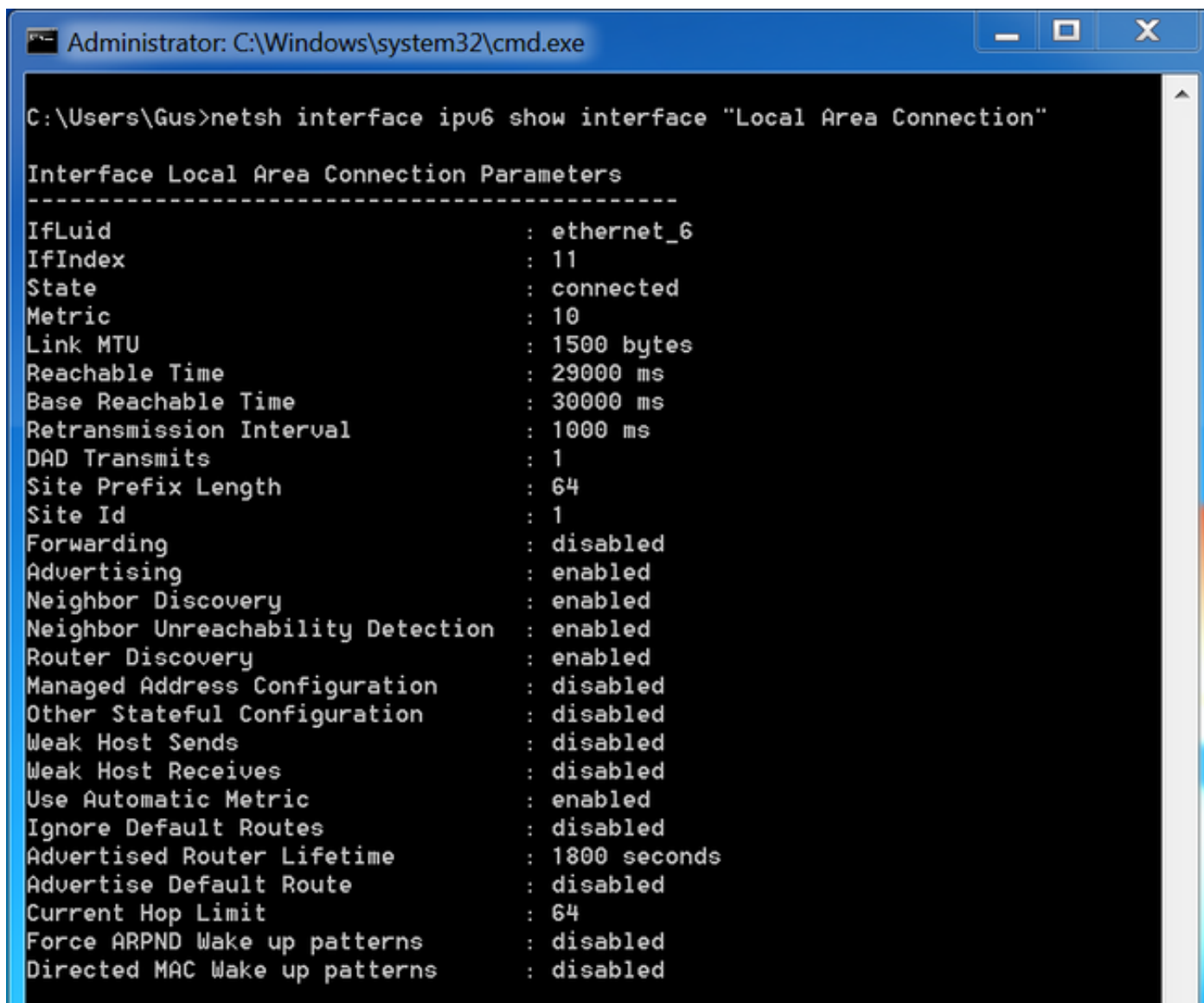
步骤4.确保Advertising参数设置为禁用。

在CMD中运**行命令**netsh interface ipv6 show interface "Local Area Connection"。

如果Advertising参数设置为启用，则Microsoft Windows可以忽略已接收的ICMPv6 RA数**据包**的内容
。

启用**Advertising**参数会导致Microsoft Windows像IPv6路由器一样运行，生成并发送其自己的
ICMPv6 RA数据包到本地网络。

必须禁用Advertising参数的默认**状态**。

```
Administrator: C:\Windows\system32\cmd.exe

C:\Users\Gus>netsh interface ipv6 show interface "Local Area Connection"

Interface Local Area Connection Parameters
-----------------------------------------------------
IfLuid                               : ethernet_6
IfIndex                              : 11
State                                : connected
Metric                               : 10
Link MTU                             : 1500 bytes
Reachable Time                       : 29000 ms
Base Reachable Time                  : 30000 ms
Retransmission Interval              : 1000 ms
DAD Transmits                        : 1
Site Prefix Length                   : 64
Site Id                              : 1
Forwarding                           : disabled
Advertising                          : enabled
Neighbor Discovery                   : enabled
Neighbor Unreachability Detection    : enabled
Router Discovery                     : enabled
Managed Address Configuration        : disabled
Other Stateful Configuration         : disabled
Weak Host Sends                      : disabled
Weak Host Receives                   : disabled
Use Automatic Metric                 : enabled
Ignore Default Routes                : disabled
Advertised Router Lifetime           : 1800 seconds
Advertise Default Route              : disabled
Current Hop Limit                    : 64
Force ARPND Wake up patterns         : disabled
Directed MAC Wake up patterns        : disabled
```

使用此命令可禁用**通告**：

```
C:\> netsh interface ipv6 set interface "Local Area Connection" advertise=disabled
```

DHCPv6无状态

使用DHCPv6无状态，终端主机可以请求DNS、域名等其他IPv6配置参数。为此，ICMPv6 RA数据
包必须设置**其他配置标志**(O位)。

当Cisco IOS接口配置模式下**出现**ipv6 nd other-config-flag命令时，**路由器会设置O标志。**

```
Router#

interface GigabitEthernet0/0/0
 ipv6 address 2001:ABCD::1/64
 ipv6 nd other-config-flag
!
```

路由器和终端主机之间的数据包交换如图所示。
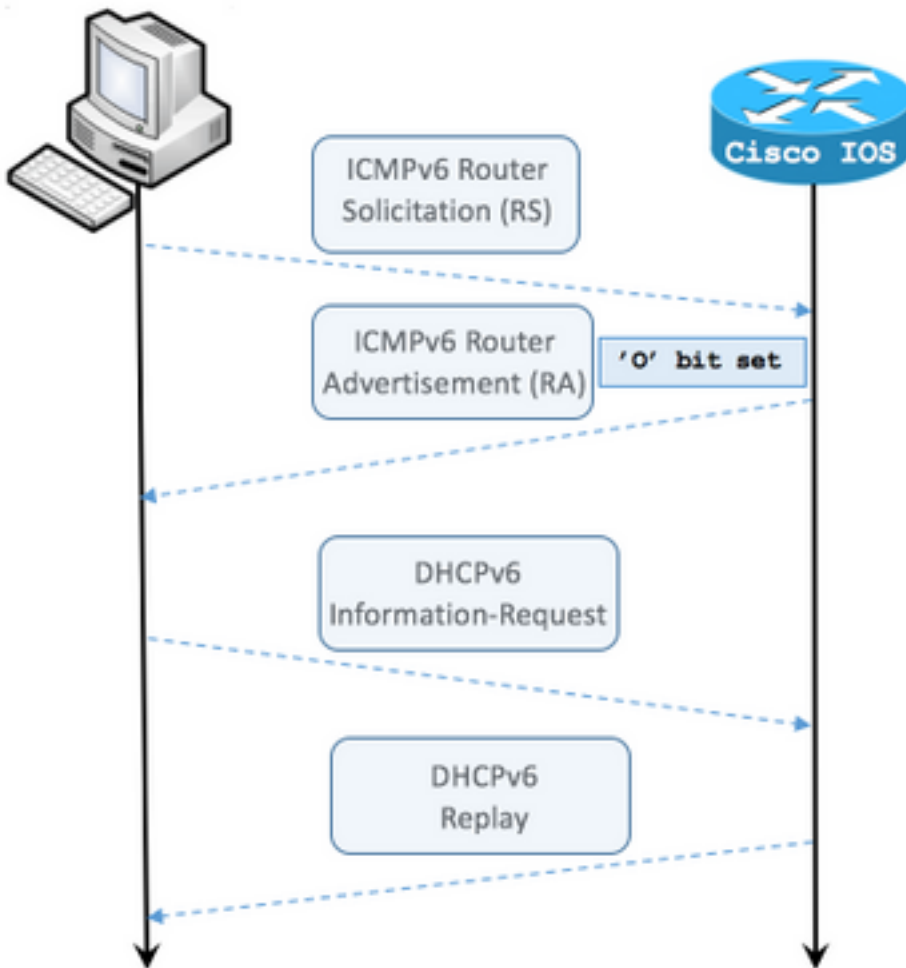
步骤1.终端主机最初发送ICMPv6 RS

步骤2.路由器用ICMPv6 RA重播并包含O标志集

步骤3.终端主机发送DHCPv6信息请求

步骤4.路由器用DHCPv6应答重播

ICMPv6 RA(带其**他配置**标志集数据包捕获：

```
Frame 9: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface 0
Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: IPv6mcast_01 (33:33:00:00:00:01)
Internet Protocol Version 6, Src: fe80::c801:b9ff:fef0:8, Dst: ff02::1
Internet Control Message Protocol v6
    Type: Router Advertisement (134)
    Code: 0
    Checksum: 0x4ca1 [correct] Cur hop limit: 64 Flags: 0x40 0... .... = Managed address
```

configuration: Not set **.1.. .... = Other configuration: Set !** Cisco IOS command **ipv6 nd other-config-flag** sets the **O** flag
        ..0. .... = Home Agent: Not set
        ...0 0... = Prf (Default Router Preference): Medium (0)
        .... .0.. = Proxy: Not set
        .... ..0. = Reserved: 0
    Router lifetime (s): 1800
    Reachable time (ms): 0
    Retrans timer (ms): 0
    ICMPv6 Option (Source link-layer address : ca:01:b9:f0:00:08)
    ICMPv6 Option (MTU : 1500)
    ICMPv6 Option (Prefix information : 2001:abcd::/64)

在Wireshark上，使用**dhcpv6**过滤器显示DHCPv6数据包的交换：

Source Destination Protocol Length Info
PC IPv6 link local ff02::1:2 DHCPv6 120 **Information-request** XID: 0x8018f9 CID:
000100011f3e8772000c29806ccc

Frame 3884: 120 bytes on wire (960 bits), 120 bytes captured (960 bits) on interface 0
Ethernet II, Src: Vmware_80:6c:cc (00:0c:29:80:6c:cc), Dst: IPv6mcast_01:00:02
(33:33:00:01:00:02)
Internet Protocol Version 6, Src: PC IPv6 link local (fe80::5850:6d61:1fb:ef3a), Dst: ff02::1:2
(ff02::1:2)
User Datagram Protocol, Src Port: 546 (546), Dst Port: 547 (547) **DHCPv6 Message type:**
Information-request (11) Transaction ID: 0x8018f9 Elapsed time Client Identifier Vendor Class
Option Request Source Destination Protocol Length Info Router IPv6 link local PC IPv6 link local
DHCPv6 136 **Reply XID:** 0x8018f9 CID: 000100011f3e8772000c29806ccc Frame 3887: 136 bytes on wire
(1088 bits), 136 bytes captured (1088 bits) on interface 0 Ethernet II, Src: ca:01:b9:f0:00:08
(ca:01:b9:f0:00:08), Dst: Vmware_80:6c:cc (00:0c:29:80:6c:cc) Internet Protocol Version 6, Src:
Router IPv6 link local (fe80::c801:b9ff:fef0:8), Dst: PC IPv6 link local
(fe80::5850:6d61:1fb:ef3a) User Datagram Protocol, Src Port: 547 (547), Dst Port: 546 (546)
DHCPv6 Message type: Reply (7) Transaction ID: 0x8018f9 Server Identifier Client Identifier DNS
recursive name server Domain Search List

Cisco IOS上的DHCPv6无状态服务器配置示例

从Cisco IOS

本示例显示Cisco IOS中DHCPv6无状态服务器的配置。

步骤1.在全局配置模式下运行**ipv6 dhcp pool NAME命令。**

步骤2.使用**dns-server**和**doman-name**子命令定义通过DHCPv6发送到终端主机的参数。

步骤3.使用命令**ipv6 dhcp server NAME**应用在接口配置模式**下定义的池。**

步骤4.在接口配置模式下添加**ipv6 nd other-config-flag**命令。

```
ipv6 unicast-routing
!
ipv6 dhcp pool LAN_POOL
 dns-server 2001:4860:4860::8888
 domain-name lab-test.net ! interface GigabitEthernet0/0/0 ipv6 address 2001:ABCD::1/64  ipv6 nd
other-config-flag ! Sets the Other Configuration flag in the RA packet.
 ipv6 dhcp server LAN_POOL
!
```

要验证Cisco IOS上的配置是否正确，请使用以下命令：

步骤1. show ipv6 dhcp pool必须确认配置中应用的参数。

步骤2. show ipv6 dhcp binding not show any information，因为DHCPv6无状态不跟踪IPv6客户端。

步骤3. show ipv6 dhcp interface必须显示池已应用到本地网络中的接口。

```
Router#show ipv6 dhcp pool
DHCPv6 pool: LAN_POOL
  DNS server: 2001:4860:4860::8888
  Domain name: lab-test.net
  Active clients: 0          ! DHCPv6 Stateless does not keep track of IPv6 clients.
Router#

Router#show ipv6 dhcp binding
Router#

Router#show ipv6 dhcp interface
FastEthernet0/0 is in server mode
  Using pool: LAN_POOL
  Preference value: 0
  Hint from client: ignored
  Rapid-Commit: disabled
Router#
```

命令debug ipv6 dhcp必须显示路由器与终端主机之间的消息交换：

```
Router#debug ipv6 dhcp
   IPv6 DHCP debugging is on
IPv6 DHCP: Received INFORMATION-REQUEST from FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
IPv6 DHCP: Option VENDOR-CLASS(16) is not processed
IPv6 DHCP: Using interface pool LAN_POOL
IPv6 DHCP: Source Address from SAS FE80::C801:B9FF:FEF0:8
IPv6 DHCP: Sending REPLY to FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
Router#
```

从Microsoft Windows

在命令提示符下，运行命令ipconfig /all，确保Microsoft Windows已收到DNS服务器信息和域名：

```
C:\Users\ >ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : MY-LAPTOP
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : lab-test.net

Ethernet adapter Local Area Connection:   Connection-specific DNS Suffix . : lab-test.net
   Description . . . . . . . . . . . : Intel(R) PRO/1000 MT Network Connection
   Physical Address. . . . . . . . . : 00-0C-29-80-6C-CC
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
```

```
    IPv6 Address. . . . . . . . . . . : 2001:abcd::5850:6d61:1fb:ef3a(Preferred)

    Temporary IPv6 Address. . . . . . : 2001:abcd::7151:b553:1a0a:80bb(Preferred)

    Link-local IPv6 Address . . . . . : fe80::5850:6d61:1fb:ef3a%11(Preferred)
    Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11
    DHCPv6 IAID . . . . . . . . . . . : 234884137
    DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-1F-3E-87-72-00-0C-29-80-6C-CC

 DNS Servers . . . . . . . . . . . : 2001:4860:4860::8888
    NetBIOS over Tcpip. . . . . . . . : Disabled
    Connection-specific DNS Suffix Search List :
                                     lab-test.net

C:\Users\ >
```

DHCPv6有状态

终端主机可以使用DHCPv6有状态地址请求IPv6地址和其他参数。为此，ICMPv6 RA数据包必须设置托管地址配置标志（M标志）。

当Cisco IOS接口配置模式中存在ipv6 nd managed-config-flag命令时，路由器会设置M标志。

```
Router#

interface GigabitEthernet0/0/0
 ipv6 address 2001:ABCD::1/64
 ipv6 nd managed-config-flag
!
```
路由器和终端主机之间的数据包交换如图所示。
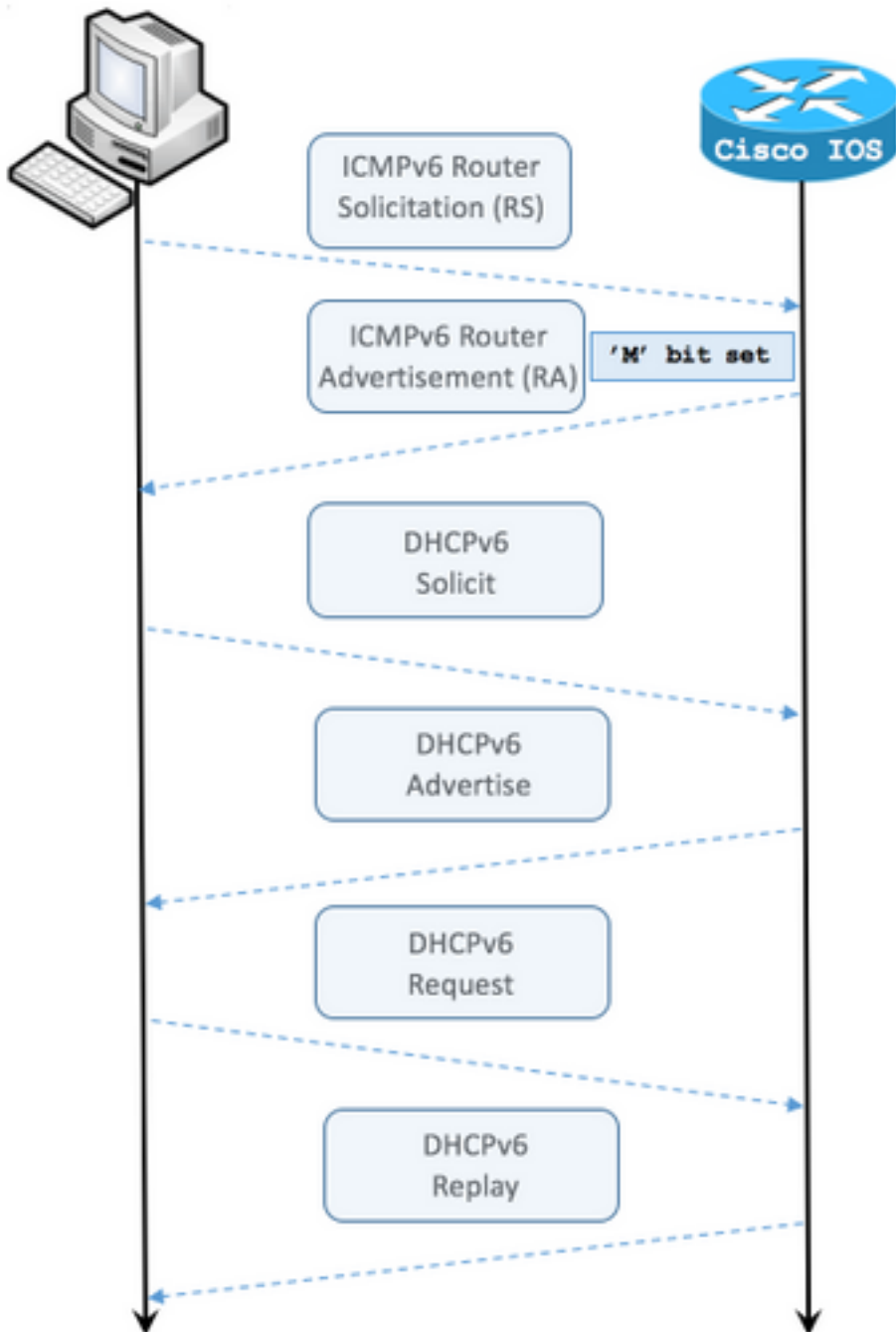
步骤1.终端主机最初发送ICMPv6 RS。

步骤2.路由器使用ICMPv6 RA重播,并**设置**M标志。

步骤3.终端主机发送DHCPv6请求。

步骤4.路由器用DHCPv6通告重播。

步骤5.终端主机发送DHCPv6请求。

步骤6.路由器用DHCPv6应答重播。

ICMPv6 RA,带受管**地址配置标**志集数据包捕获:

```
Frame 1190: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface 0
```

Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: IPv6mcast_01 (33:33:00:00:00:01)
Internet Protocol Version 6, Src: Router IPv6 link local (fe80::c801:b9ff:fef0:8), Dst: ff02::1
(ff02::1)
Internet Control Message Protocol v6
    Type: Router Advertisement (134)
  Code: 0 Checksum: 0x0642 [correct] Cur hop limit: 64 Flags: 0x80 **1... .... = Managed address**
configuration: Set
        .0.. .... = Other configuration: Not set
        ..0. .... = Home Agent: Not set
        ...0 0... = Prf (Default Router Preference): Medium (0)
        .... .0.. = Proxy: Not set
        .... ..0. = Reserved: 0
    Router lifetime (s): 1800
    Reachable time (ms): 0
    Retrans timer (ms): 0
    ICMPv6 Option (Source link-layer address : ca:01:b9:f0:00:08)
    ICMPv6 Option (MTU : 1500)
    ICMPv6 Option (Prefix information : 2001:abcd::/64)
    Type: Prefix information (3)
    Length: 4 (32 bytes)
    Prefix Length: 64
    Flag: 0x80
        1... .... = On-link flag(L): Set
        .0.. .... = Autonomous address-configuration flag(A): Not set
        ..0. .... = Router address flag(R): Not set
        ...0 0000 = Reserved: 0
    Valid Lifetime: 1800
    Preferred Lifetime: 1800
    Reserved
    Prefix: 2001:abcd:: (2001:abcd::)

在Wireshark中，使用dhcpv6过滤器显示DHCPv6数据包的交换：

Source Destination Protocol Length Info PC IPv6 link local ff02::1:2 DHCPv6 157 Solicit XID:
0x328090 CID: 000100011f3e8772000c29806ccc Frame 965: 157 bytes on wire (1256 bits), 157 bytes
captured (1256 bits) on interface 0 Ethernet II, Src: Vmware_80:6c:cc (00:0c:29:80:6c:cc), Dst:
IPv6mcast_01:00:02 (33:33:00:01:00:02) Internet Protocol Version 6, Src: PC IPv6 link local
(fe80::5850:6d61:1fb:ef3a), Dst: ff02::1:2 (ff02::1:2) User Datagram Protocol, Src Port: 546
(546), Dst Port: 547 (547) **DHCPv6 Message type: Solicit (1)**
    Transaction ID: 0x328090
    Elapsed time
    Client Identifier
    Identity Association for Non-temporary Address
    Fully Qualified Domain Name
    Vendor Class
    Option Request

Source   Destination   Protocol Length Info
Router IPv6 link localPC IPv6 link local DHCPv6   180   Advertise XID: 0x328090 CID:
000100011f3e8772000c29806ccc IAA: 2001:abcd::70a1:36a7:3e72:fa95

Frame 966: 180 bytes on wire (1440 bits), 180 bytes captured (1440 bits) on interface 0
Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: Vmware_80:6c:cc
(00:0c:29:80:6c:cc)
Internet Protocol Version 6, Src: Router IPv6 link local (fe80::c801:b9ff:fef0:8), Dst: PC IPv6
link local (fe80::5850:6d61:1fb:ef3a)
User Datagram Protocol, Src Port: 547 (547), Dst Port: 546 (546)
DHCPv6 Message type: Advertise (2)
    Transaction ID: 0x328090
    Server Identifier
    Client Identifier
    Identity Association for Non-temporary Address

```
    DNS recursive name server
    Domain Search List


Source              Destination  Protocol  Length  Info
PC IPv6 link local  ff02::1:2 DHCPv6      199  Request XID: 0x328090 CID:
000100011f3e8772000c29806ccc IAA: 2001:abcd::70a1:36a7:3e72:fa95


Frame 967: 199 bytes on wire (1592 bits), 199 bytes captured (1592 bits) on interface 0
Ethernet II, Src: Vmware_80:6c:cc (00:0c:29:80:6c:cc), Dst: IPv6mcast_01:00:02
(33:33:00:01:00:02)
Internet Protocol Version 6, Src: PC IPv6 link local (fe80::5850:6d61:1fb:ef3a), Dst: ff02::1:2
(ff02::1:2)
User Datagram Protocol, Src Port: 546 (546), Dst Port: 547 (547)
DHCPv6 Message type: Request (3)
    Transaction ID: 0x328090
    Elapsed time
    Client Identifier
    Server Identifier
    Identity Association for Non-temporary Address
    Fully Qualified Domain Name
    Vendor Class
    Option Request


Source                 Destination          Protocol  Length  Info
Router IPv6 link localPC IPv6 link local   DHCPv6    180     Reply XID: 0x328090 CID:
000100011f3e8772000c29806ccc IAA: 2001:abcd::70a1:36a7:3e72:fa95


Frame 968: 180 bytes on wire (1440 bits), 180 bytes captured (1440 bits) on interface 0
Ethernet II, Src: ca:01:b9:f0:00:08 (ca:01:b9:f0:00:08), Dst: Vmware_80:6c:cc
(00:0c:29:80:6c:cc)
Internet Protocol Version 6, Src: Router IPv6 link local (fe80::c801:b9ff:fef0:8), Dst: PC IPv6
link local (fe80::5850:6d61:1fb:ef3a)
User Datagram Protocol, Src Port: 547 (547), Dst Port: 546 (546)
DHCPv6 Message type: Reply (7)
    Transaction ID: 0x328090
    Server Identifier
    Client Identifier
    Identity Association for Non-temporary Address
    DNS recursive name server
    Domain Search List
```

Cisco IOS上的DHCPv6状态服务器配置示例

从Cisco IOS

本示例显示Cisco IOS中DHCPv6有状态服务器的配置。

步骤1.在全局配置模式下运行ipv6 dhcp pool NAME命令。

步骤2.使用address prefix、dns-server和doman-name子命令定义通过DHCPv6发送到终端主机的参数。

步骤3.使用命令ipv6 dhcp server NAME应用在接口配置模式下定义的池。

步骤4.在接口配置模式下添加命令ipv6 nd managed-config-flag。

步骤5.在接口配置模式下**添加命令ipv6 nd prefix default 1800 1800 no-autoconfig**，以禁用ICMPv6 RA数据包中的Autonomous address-configuration(A)标志。

> **注意：** 使用DHCPv6有状态服务器方法时，终端主机可以为自己配置两个不同的IPv6地址。第一个包含ICMPv6 RA数据包中包含的信息。第二个数据包包含DHCPv6数据包中的信息。为避免这种情况，ICMPv6 RA数据包可以禁用**A**标志，以指示终端主机不根据其中包含的信息生成IPv6地址。

> **注意：** 在接口配置模式下，使用命令ipv6 nd prefix default no-advertise可以从ICMPv6 RA数据包的内**容中删除前缀信息**。

```
ipv6 unicast-routing
!ipv6 dhcp pool LAN_POOL  address prefix 2001:ABCD::/64 ! Includes the IPv6 prefix in the DHCPv6
packet exchange.
 dns-server 2001:4860:4860::8888
 domain-name lab-test.net
!
interface GigabitEthernet0/0/0
 ipv6 address 2001:ABCD::/64 eui-64
 ipv6 nd prefix default 1800 1800 no-autoconfig ! Disables the Autonomous address-
configuration(A) flag in the ICMPv6 RA packet.
 ipv6 nd managed-config-flag ! Sets the Managed address configuration flag in the ICMPv6 RA
packet.
 ipv6 dhcp server LAN_POOL
end
```

要验证Cisco IOS上的配置是否正确，请使用以下命令：

步骤1. show ipv6 dhcp pool必须确认配置中应用的参数。

步骤2. show ipv6 dhcp binding must information for the IPv6 addresses leased to end hosts.（show ipv6 dhcp binding必须是租给终端主机的IPv6地址的信息。）

步骤3. show ipv6 dhcp interface必须显示池已应用到本地网络中的接口。

```
Router#show ipv6 dhcp pool
DHCPv6 pool: LAN_POOL
  Address allocation prefix: 2001:ABCD::/64 valid 172800 preferred 86400 (1 in use, 0 conflicts)
  DNS server: 2001:4860:4860::8888
  Domain name: lab-test.net Active clients: 1 Router#


Router#show ipv6 dhcp binding
Client: FE80::5850:6D61:1FB:EF3A
  DUID: 000100011F3E8772000C29806CCC
  Username : unassigned
  IA NA: IA ID 0x0E000C29, T1 43200, T2 69120
    Address: 2001:ABCD::3DD4:77BB:E035:9375
            preferred lifetime 86400, valid lifetime 172800
            expires at Dec 28 2016 10:44 PM (172488 seconds)
Router#


Router#show ipv6 dhcp interface
FastEthernet0/0 is in server mode
  Using pool: LAN_POOL
```

```
  Preference value: 0
  Hint from client: ignored
  Rapid-Commit: disabled
Router#
```
命令debug ipv6 dhcp必须显示路由器与终端主机之间的消息交换：


```
Router#debug ipv6 dhcp
  IPv6 DHCP debugging is on
Router#IPv6 DHCP: Received SOLICIT from FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
IPv6 DHCP: Option UNKNOWN(39) is not processed
IPv6 DHCP: Option VENDOR-CLASS(16) is not processed
IPv6 DHCP: Using interface pool LAN_POOL
IPv6 DHCP: Creating binding for FE80::5850:6D61:1FB:EF3A in pool LAN_POOL
IPv6 DHCP: Binding for IA_NA 0E000C29 not found
IPv6 DHCP: Allocating IA_NA 0E000C29 in binding for FE80::5850:6D61:1FB:EF3A
IPv6 DHCP: Looking up pool 2001:ABCD::/64 entry with username
'000100011F3E8772000C29806CCC0E000C29'
IPv6 DHCP: Poolentry for user not found
IPv6 DHCP: Allocated new address 2001:ABCD::D9F7:61C:D803:DCF1
IPv6 DHCP: Allocating address 2001:ABCD::D9F7:61C:D803:DCF1 in binding for
FE80::5850:6D61:1FB:EF3A, IAID 0E000C29
IPv6 DHCP: Updating binding address entry for address 2001:ABCD::D9F7:61C:D803:DCF1
IPv6 DHCP: Setting timer on 2001:ABCD::D9F7:61C:D803:DCF1 for 60 seconds
IPv6 DHCP: Source Address from SAS FE80::C801:B9FF:FEF0:8
IPv6 DHCP: Sending ADVERTISE to FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
IPv6 DHCP: Received REQUEST from FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
IPv6 DHCP: Option UNKNOWN(39) is not processed
IPv6 DHCP: Option VENDOR-CLASS(16) is not processed
IPv6 DHCP: Using interface pool LAN_POOL
IPv6 DHCP: Looking up pool 2001:ABCD::/64 entry with username
'000100011F3E8772000C29806CCC0E000C29'
IPv6 DHCP: Poolentry for user found
IPv6 DHCP: Found address 2001:ABCD::D9F7:61C:D803:DCF1 in binding for FE80::5850:6D61:1FB:EF3A,
IAID 0E000C29
IPv6 DHCP: Updating binding address entry for address 2001:ABCD::D9F7:61C:D803:DCF1
IPv6 DHCP: Setting timer on 2001:ABCD::D9F7:61C:D803:DCF1 for 172800 seconds
IPv6 DHCP: Source Address from SAS FE80::C801:B9FF:FEF0:8
IPv6 DHCP: Sending REPLY to FE80::5850:6D61:1FB:EF3A on FastEthernet0/0
Router#
```

从Microsoft Windows

运行命令ipconfig /all，确保Microsoft Windows已收到IPv6地址、默认网关、DNS服务器信息和域名：


```
C:\Users\ >ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : MY-LAPTOP
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No WINS Proxy Enabled. . . . . . . . : No DNS Suffix
Search List. . . . . . : lab-test.net Ethernet adapter Local Area Connection: Connection-
specific DNS Suffix . : lab-test.net
   Description . . . . . . . . . . . : Intel(R) PRO/1000 MT Network Connection
   Physical Address. . . . . . . . . : 00-0C-29-80-6C-CC
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   IPv6 Address. . . . . . . . . . . : 2001:abcd::3dd4:77bb:e035:9375(Preferred)
```

```
   Lease Obtained. . . . . . . . . . . : Sunday, January 01, 2017 4:47:02 PM
   Lease Expires . . . . . . . . . . . : Tuesday, January 03, 2017 4:47:02 PM
   Link-local IPv6 Address . . . . . : fe80::5850:6d61:1fb:ef3a%11(Preferred)
   Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11
   DHCPv6 IAID . . . . . . . . . . . : 234884137
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-1F-3E-87-72-00-0C-29-80-6C-CC

 DNS Servers . . . . . . . . . . . : 2001:4860:4860::8888
   NetBIOS over Tcpip. . . . . . . . : Disabled
   Connection-specific DNS Suffix Search List :
                                       lab-test.net

C:\Users\ >
```

禁用Windows随机生成的接口ID

默认情况下，Microsoft Windows会为自动配置的IPv6地址（使用SLAAC）生成随机接口ID，而不是使用EUI-64方法。

```
C:\Users\    >ipconfig

Windows IP Configuration
Ethernet adapter Local Area Connection: Connection-specific DNS Suffix . : IPv6 Address. . . . .
. . . . . . : 2001:abcd::5850:6d61:1fb:ef3a    ! Randomly generated interface ID.
   Temporary IPv6 Address. . . . . . : 2001:abcd::8d1:8bbb:14e4:658e
   Link-local IPv6 Address . . . . . : fe80::5850:6d61:1fb:ef3a%11
   Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11
```

可以更改此行为，使Windows使用EUI-64进程。

```
netsh interface ipv6 set global randomizeidentifiers=disabled
```

您现在可以看到接口ID是使用EUI-64进程生成的。

```
C:\Users\    >ipconfigWindows IP Configuration Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : IPv6 Address. . . . . . . . . . . :
2001:abcd::20c:29ff:fe80:6ccc    ! Interface ID now generated by EUI-64 method.
   Temporary IPv6 Address. . . . . . : 2001:abcd::9818:d729:fadb:8812
   Link-local IPv6 Address . . . . . : fe80::20c:29ff:fe80:6ccc%11
   Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11
```

要再次使用随机接口ID进程，可以运行以下命令：

```
netsh interface ipv6 set global randomizeidentifiers=enabled
```

禁用Windows临时IPv6地址

出于安全原因，Windows可以临时创建IPv6地址并将其用作出站连接的源。

当期望终端主机使用某些IPv6地址来源通信时（如在网络中定义防火墙规则时），这会在场景中造成混乱。

临时IPv6地址是因为Windows实施了RFC 4941。

```
C:\Users\   >ipconfig
Windows IP Configuration Ethernet adapter Local Area Connection: Connection-specific DNS Suffix
. : IPv6 Address. . . . . . . . . . . : 2001:abcd::5850:6d61:1fb:ef3a Temporary IPv6 Address. .
. . . . : 2001:abcd::8d1:8bbb:14e4:658e Link-local IPv6 Address . . . . . :
fe80::5850:6d61:1fb:ef3a%11 Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11


C:\Users\ >netsh interface ipv6 show privacy
Querying active state...

Temporary Address Parameters
------------------------------------------------

Use Temporary Addresses            : enabled
Duplicate Address Detection Attempts: 5
Maximum Valid Lifetime             : 7d
Maximum Preferred Lifetime         : 1d
Regenerate Time                    : 5s
Maximum Random Time                : 10m
Random Time                        : 0s


C:\Users\Gus>
```

要禁用自动创建临时IPv6**地址，请**运行以下命令：

```
netsh interface ipv6 set privacy state=disabled
```
应用命令后，输出显示：

```
C:\Users\   >ipconfig

Windows IP Configuration
 Ethernet adapter Local Area Connection: Connection-specific DNS Suffix . : IPv6 Address. . . .
. . . . . . . : 2001:abcd::5850:6d61:1fb:ef3a Link-local IPv6 Address . . . . . :
fe80::5850:6d61:1fb:ef3a%11 Default Gateway . . . . . . . . . : fe80::c801:b9ff:fef0:8%11
C:\Users\ >netsh interface ipv6 show privacy
Querying active state...

Temporary Address Parameters
---------------------------------------------
Use Temporary Addresses : disabled
Duplicate Address Detection Attempts: 5
Maximum Valid Lifetime             : 7d
Maximum Preferred Lifetime         : 1d
Regenerate Time                    : 5s
Maximum Random Time                : 10m
Random Time                        : 0s
```

要再次**使用临时**IPv6地址，可以运行命令：

```
netsh interface ipv6 set privacy state=enable
```
在IPv4中，IPv6动态地址分配提供的选项比DHCP更多。必须知道主要配置点以及当过程未按预期
完成时要检查什么。在Cisco IOS和Microsoft Windows上提供基本配置命令，以全面了解整个过程
。

相关信息

- [Cisco IOS IPv6 命令参考](#)
- [使用Windows工具获取IPv6配置信息](#)