

排除Nexus 9000上的DHCP相關問題

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簡介

本文檔介紹驗證Nexus 9000上的DHCP中繼代理配置是否正確的步驟。

必要條件

需求

Cisco NXOS®建議您瞭解以下主題：

- DHCP
- ELAM
- Ethalyzer

採用元件

本文檔僅限於特定硬體，例如Nexus 9000

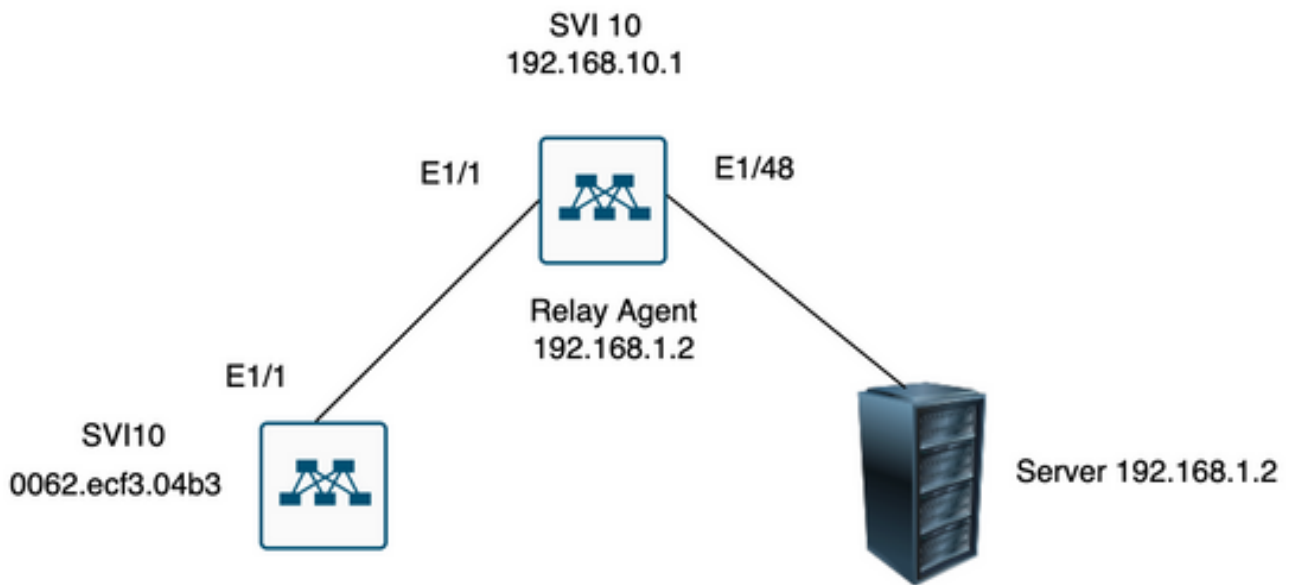
本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

您可以將裝置配置為運行DHCP中繼代理，該代理在客戶端和伺服器之間轉發DHCP資料包。當客戶端和伺服器不在同一物理子網中時，此功能非常有用。中繼代理接收DHCP消息，然後生成新的DHCP消息以在另一個介面上傳送。

拓撲

Nexus交換機充當DHCP中繼，從伺服器向客戶端提供IP。



驗證

1)驗證客戶端的配置 (未分配IP地址)

```
Client# show interface vlan 10
Vlan10 is up, line protocol is up, autostate enabled
Hardware is EtherSVI, address is 0062.ecf3.04b3
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not supported
ARP type: ARPA
Last clearing of "show interface" counters never
L3 in Switched:
ucast: 0 pkts, 0 bytes
```

2)檢驗DHCP配置

```
Switch1# show run dhcp
```

```
ip dhcp snooping
service dhcp
ip dhcp relay
ipv6 dhcp relay

interface Vlan10
 ip dhcp relay address 192.168.1.2
ip dhcp snooping vlan 1,10
```

3)驗證與伺服器的連線

```
Switch1# ping 192.168.1.2
PING 192.168.1.2 (192.168.1.2): 56 data bytes
64 bytes from 192.168.1.2: icmp_seq=0 ttl=253 time=1.678 ms
64 bytes from 192.168.1.2: icmp_seq=1 ttl=253 time=1.329 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=253 time=1.742 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=253 time=1.382 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=253 time=1.241 ms
--- 192.168.1.2 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 1.241/1.474/1.742 ms
Switch1#
```

```
Switch1# show ip route 192.168.1.2
IP Route Table for VRF "default"
'*' denotes best ucast next-hop
 '**' denotes best mcast next-hop
 '[x/y]' denotes [preference/metric]
 '%<string>' in via output denotes VRF <string>
192.168.1.2/32, ubest/mbest: 1/0, attached
 *via 192.168.1.2, Eth1/48, [250/0], 02:13:58, am
Switch1#
```

4)向前檢視DCHP的統計資訊，以仔細檢查資訊是否正確傳送。

```
Switch1# show ip dhcp relay statistics interface vlan 10
```

```
-----
Message Type Rx Tx Drops
```

```
-----
Discover 1 1 0
Offer 1 1 0
Request(*) 1 1 0
Ack 1 1 0
Release(*) 0 0 0
Decline 0 0 0
Inform(*) 0 0 0
Nack 0 0 0
```

```
-----
Total 4 4 0
-----
```

DHCP server stats:

```
-----  
Server Vrf Request Response  
-----  
192.168.1.2 2 2  
-----
```

DHCP L3 FWD:

Total Packets Received : 0

Total Packets Forwarded : 0

Total Packets Dropped : 0

Non DHCP:

Total Packets Received : 0

Total Packets Forwarded : 0

Total Packets Dropped : 0

DROP:

DHCP Relay not enabled : 0

Invalid DHCP message type : 0

Interface error : 0

Tx failure towards server : 0

Tx failure towards client : 0

Unknown output interface : 0

Unknown vrf or interface for server : 0

Max hops exceeded : 0

Option 82 validation failed : 0

Packet Malformed : 0

DHCP Request dropped on MCT : 0

Relay Trusted port not configured : 0

* - These counters show correct value when switch receives DHCP request packet with destination ip as broadcast address. If request is unicast it is being HW switched
Switch1#

Switch1# show ip dhcp global statistics

Packets processed 130

Packets received through cfsoe 0

Packets forwarded 24

Packets forwarded on cfsoe 0

Total packets dropped 106

Packets dropped from untrusted ports 0

Packets dropped due to MAC address check failure 0

Packets dropped due to Option 82 insertion failure 0

Packets dropped due to o/p intf unknown 0

Packets dropped which were unknown 0

Packets dropped due to no trusted ports 106

Packets dropped due to dhcp relay not enabled 0

Packets dropped due to no binding entry 0

Packets dropped due to interface error/no interface 0

Packets dropped due to max hops exceeded 0

Packets dropped due to Queue full 0

Switch1#

疑難排解

1)通過運行ethalyzer確認統計資訊是正確的。

```
Switch1# ethanalyzer local interface inband display-filter bootp limit-captured-frames 0
Capturing on inband
```

```
2023-07-18 21:30:01.935789 0.0.0.0 -> 255.255.255.255 DHCP DHCP Discover - Transaction ID 0x64b6400b
2023-07-18 21:30:01.937789 192.168.10.1 -> 192.168.1.2 DHCP DHCP Discover - Transaction ID 0x64b6400b
2023-07-18 21:30:03.938596 192.168.1.2 -> 192.168.10.1 DHCP DHCP Offer - Transaction ID 0x64b6400b
2023-07-18 21:30:03.938659 192.168.1.2 -> 192.168.10.1 DHCP DHCP Offer - Transaction ID 0x64b6400b
2023-07-18 21:30:03.940103 192.168.10.1 -> 255.255.255.255 DHCP DHCP Offer - Transaction ID 0x64b6400b
2023-07-18 21:30:07.939208 0.0.0.0 -> 255.255.255.255 DHCP DHCP Request - Transaction ID 0x64b6400b
2023-07-18 21:30:07.941220 192.168.10.1 -> 192.168.1.2 DHCP DHCP Request - Transaction ID 0x64b6400b
2023-07-18 21:30:07.941848 192.168.1.2 -> 192.168.10.1 DHCP DHCP ACK - Transaction ID 0x64b6400b
2023-07-18 21:30:07.941897 192.168.1.2 -> 192.168.10.1 DHCP DHCP ACK - Transaction ID 0x64b6400b
2023-07-18 21:30:07.942693 192.168.10.1 -> 255.255.255.255 DHCP DHCP ACK - Transaction ID 0x64b6400b
```

2)Ethanalyzer有一個詳細資訊選項，提供包括捕獲流量的報頭在內的其他資訊。

```
ethanalyzer local interface inband display-filter "(eth.addr==<MAC_address> and bootp )" limit-capture
```

3)在ethanalyzer捕獲中新增詳細資訊標誌，提供有關客戶端與伺服器之間通訊的更多詳細資訊。

[1]中繼代理從客戶端接收DHCP發現作為廣播：

源MAC是客戶端MAC: 00:62:ec:f3:04:b3

目的MAC是廣播的：ff:ff:ff:ff:ff:ff

由於客戶端沒有Ip地址，但源IP為0.0.0.0

源IP:0.0.0.0

目的IP:255.255.255.255

源埠：bootpc(68)

目的地連線埠：啟動(67)

消息型別：啟動請求(1)

DHCP消息型別= DHCP發現

Frame 14 (358 bytes on wire, 358 bytes captured)

Arrival Time: Jul 19, 2023 21:53:29.339064000

[Time delta from previous captured frame: 0.096490000 seconds]

[Time delta from previous displayed frame: 2.618117000 seconds]

[Time since reference or first frame: 2.618117000 seconds]

Frame Number: 14

Frame Length: 358 bytes

Capture Length: 358 bytes

[Frame is marked: False]

[Protocols in frame: eth:vlan:ip:udp:bootp]

Ethernet II, Src: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)

Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)

Address: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)

.... ..1 = IG bit: Group address (multicast/broadcast)

.... ..1. = LG bit: Locally administered address (this is NOT the factory default)

Source: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)

Address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
.... 0 = IG bit: Individual address (unicast)
.... 0 = LG bit: Globally unique address (factory default)
Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN, PRI: 0, CFI: 0, ID: 10
000. = Priority: 0
...0 = CFI: 0
.... 0000 0000 1010 = ID: 10
Type: IP (0x0800)
Internet Protocol, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0 = ECN-Capable Transport (ECT): 0
.... 0 = ECN-CE: 0
Total Length: 340
Identification: 0x0000 (0)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 255
Protocol: UDP (0x11)
Header checksum: 0xba99 [correct]
[Good: True]
[Bad : False]
Source: 0.0.0.0 (0.0.0.0)
Destination: 255.255.255.255 (255.255.255.255)
User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
Source port: bootpc (68)
Destination port: bootps (67)
Length: 320
Checksum: 0x2bbb [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Request (1)
Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 0.0.0.0 (0.0.0.0)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 0.0.0.0 (0.0.0.0)
Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Discover
Option: (53) DHCP Message Type
Length: 1
Value: 01
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier

Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=51,l=4) IP Address Lease Time = 2 hours
Option: (51) IP Address Lease Time
Length: 4
Value: 00001C20
Option: (t=60,l=19) Vendor class identifier = "Cisco NXOS® N9K-C9372PX-E"
Option: (60) Vendor class identifier
Length: 19
Value: 436973636F204E394B2D433933373250582D45
Option: (t=43,l=8) Vendor-Specific Information
Option: (43) Vendor-Specific Information
Length: 8
Value: F1060062ECF304AC
Option: (t=55,l=8) Parameter Request List
Option: (55) Parameter Request List
Length: 8
Value: 010306070C424396
1 = Subnet Mask
3 = Router
6 = Domain Name Server
7 = Log Server
12 = Host Name
66 = TFTP Server Name
67 = Bootfile name
150 = TFTP server address
End Option
Padding
Frame 15 (354 bytes on wire, 354 bytes captured)
Arrival Time: Jul 19, 2023 21:53:29.340263000
[Time delta from previous captured frame: 0.001199000 seconds]
[Time delta from previous displayed frame: 0.001199000 seconds]
[Time since reference or first frame: 2.619316000 seconds]
Frame Number: 15
Frame Length: 354 bytes
Capture Length: 354 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57), Dst: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Destination: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Address: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Source: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Type: IP (0x0800)

[2]中繼代理使用單播向伺服器傳送發現。

源MAC是nexus MAC: 6c:31:0e:a3:0c:57

目的MAC是DHCP伺服器MAC: c4:c6:03:09:cf:47

源Ip是SVI10上的Nexus IP:192.168.10.1

目的IP是DHCP伺服器IP:192.168.1.2

源埠：引導(67)

目的地連線埠：啟動(67)

客戶端MAC地址：00:62:ec:f3:04:b3 <<<<<客戶端MAC包含在UDP/DHCP報頭中

消息型別：啟動請求(1)

DHCP消息型別= DHCP發現

Frame 15 (354 bytes on wire, 354 bytes captured)
Arrival Time: Jul 19, 2023 21:53:29.340263000
[Time delta from previous captured frame: 0.001199000 seconds]
[Time delta from previous displayed frame: 0.001199000 seconds]
[Time since reference or first frame: 2.619316000 seconds]
Frame Number: 15
Frame Length: 354 bytes
Capture Length: 354 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57), Dst: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Destination: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Address: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Source: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Type: IP (0x0800)

Internet Protocol, Src: 192.168.10.1 (192.168.10.1), Dst: 192.168.1.2 (192.168.1.2)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0. = ECN-Capable Transport (ECT): 0
.... 0 = ECN-CE: 0
Total Length: 340
Identification: 0xefab (61355)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 255
Protocol: UDP (0x11)
Header checksum: 0x3e99 [correct]
[Good: True]
[Bad : False]
Source: 192.168.10.1 (192.168.10.1)
Destination: 192.168.1.2 (192.168.1.2)
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
Source port: bootps (67)
Destination port: bootps (67)
Length: 320
Checksum: 0xd4bc [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Request (1)
Hardware type: Ethernet
Hardware address length: 6
Hops: 1
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... .. = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000

Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 0.0.0.0 (0.0.0.0)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 192.168.10.1 (192.168.10.1)
Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Discover
Option: (53) DHCP Message Type
Length: 1
Value: 01
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=51,l=4) IP Address Lease Time = 2 hours
Option: (51) IP Address Lease Time
Length: 4
Value: 00001C20
Option: (t=60,l=19) Vendor class identifier = "Cisco NXOS® N9K-C9372PX-E"
Option: (60) Vendor class identifier
Length: 19
Value: 436973636F204E394B2D433933373250582D45
Option: (t=43,l=8) Vendor-Specific Information
Option: (43) Vendor-Specific Information
Length: 8
Value: F1060062ECF304AC
Option: (t=55,l=8) Parameter Request List
Option: (55) Parameter Request List
Length: 8
Value: 010306070C424396
1 = Subnet Mask
3 = Router
6 = Domain Name Server
7 = Log Server
12 = Host Name
66 = TFTP Server Name
67 = Bootfile name
150 = TFTP server address
End Option
Padding

[3]伺服器將單播提供回復到中繼代理。

源MAC是DHCP伺服器MAC: c4:c6:03:09:cf:47

目的MAC是Nexus MAC: 6c:31:0e:a3:0c:57

源Ip是DHCP伺服器 : 192.168.1.2

SVI10上的目標IP Nexus IP:192.168.10.1

源埠 : 引導(67)

目的地連線埠 : 啟動(67)

消息型別 : 引導回覆(2)

您的 (客戶端) IP地址 : 192.168.10.19(192.168.10.19)<<<<此產品資料包包含要分配給客戶端的IP地址

客戶端MAC地址 : 00:62:ec:f3:04:b3(00:62:ec:f3:04:b3)<<<來自客戶端的MAC地址

DHCP消息型別= DHCP提供

Frame 27 (348 bytes on wire, 348 bytes captured)
Arrival Time: Jul 19, 2023 21:53:31.340920000
[Time delta from previous captured frame: 0.097549000 seconds]
[Time delta from previous displayed frame: 2.000657000 seconds]
[Time since reference or first frame: 4.619973000 seconds]
Frame Number: 27
Frame Length: 348 bytes
Capture Length: 348 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47), Dst: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Destination: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Source: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Address: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Type: IP (0x0800)
Internet Protocol, Src: 192.168.1.2 (192.168.1.2), Dst: 192.168.10.1 (192.168.10.1)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0. = ECN-Capable Transport (ECT): 0
.... 0 = ECN-CE: 0
Total Length: 334
Identification: 0x0014 (20)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 254
Protocol: UDP (0x11)
Header checksum: 0x2f37 [correct]
[Good: True]
[Bad : False]
Source: 192.168.1.2 (192.168.1.2)
Destination: 192.168.10.1 (192.168.10.1)
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
Source port: bootps (67)
Destination port: bootps (67)
Length: 314
Checksum: 0x0500 [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Reply (2)
Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 192.168.10.19 (192.168.10.19)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 192.168.10.1 (192.168.10.1)

Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Offer
Option: (53) DHCP Message Type
Length: 1
Value: 02
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=54,l=4) DHCP Server Identifier = 192.168.1.2
Option: (54) DHCP Server Identifier
Length: 4
Value: C0A80102
Option: (t=51,l=4) IP Address Lease Time = 1 day
Option: (51) IP Address Lease Time
Length: 4
Value: 00015180
Option: (t=58,l=4) Renewal Time Value = 12 hours
Option: (58) Renewal Time Value
Length: 4
Value: 0000A8C0
Option: (t=59,l=4) Rebinding Time Value = 21 hours
Option: (59) Rebinding Time Value
Length: 4
Value: 00012750
Option: (t=1,l=4) Subnet Mask = 255.255.255.0
Option: (1) Subnet Mask
Length: 4
Value: FFFFFFF0
Option: (t=3,l=4) Router = 192.168.1.2
Option: (3) Router
Length: 4
Value: C0A80102
Option: (t=6,l=4) Domain Name Server = 8.8.8.8
Option: (6) Domain Name Server
Length: 4
Value: 08080808
End Option

[4]中繼代理使用廣播從DHCP伺服器轉發DHCP提供，該廣播資料包由子網接收，但它包含客戶端MAC，因此只有MAC的所有者處理該資料包。

源MAC是nexus MAC: 6c:31:0e:a3:0c:57

目的MAC是廣播的：ff:ff:ff:ff:ff

源Ip是SVI10上的Nexus IP:192.168.10.1

目的IP是廣播地址：255.255.255.255

源埠：引導(67)

目的地連線埠：bootpc(68)

消息型別：引導回覆(2)

您的(客戶端)IP地址：192.168.10.19

客戶端MAC地址：00:62:ec:f3:04:b3

DHCP消息型別= DHCP提供

Frame 28 (348 bytes on wire, 348 bytes captured)
Arrival Time: Jul 19, 2023 21:53:31.341325000
[Time delta from previous captured frame: 0.000405000 seconds]
[Time delta from previous displayed frame: 0.000405000 seconds]
[Time since reference or first frame: 4.620378000 seconds]
Frame Number: 28
Frame Length: 348 bytes
Capture Length: 348 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
.... ..1 = IG bit: Group address (multicast/broadcast)
.... ..1. = LG bit: Locally administered address (this is NOT the factory default)
Source: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... ..0 = IG bit: Individual address (unicast)
.... ..0. = LG bit: Globally unique address (factory default)
Type: IP (0x0800)
Internet Protocol, Src: 192.168.10.1 (192.168.10.1), Dst: 255.255.255.255 (255.255.255.255)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... ..0. = ECN-Capable Transport (ECT): 0
.... ...0 = ECN-CE: 0
Total Length: 334
Identification: 0x1400 (5120)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 255
Protocol: UDP (0x11)
Header checksum: 0xdbf5 [correct]
[Good: True]
[Bad : False]
Source: 192.168.10.1 (192.168.10.1)
Destination: 255.255.255.255 (255.255.255.255)
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)
Source port: bootps (67)
Destination port: bootpc (68)
Length: 314
Checksum: 0xc6a8 [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Reply (2)
Hardware type: Ethernet
Hardware address length: 6
Hops: 1
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 192.168.10.19 (192.168.10.19)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 192.168.10.1 (192.168.10.1)

Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Offer
Option: (53) DHCP Message Type
Length: 1
Value: 02
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=54,l=4) DHCP Server Identifier = 192.168.1.2
Option: (54) DHCP Server Identifier
Length: 4
Value: C0A80102
Option: (t=51,l=4) IP Address Lease Time = 1 day
Option: (51) IP Address Lease Time
Length: 4
Value: 00015180
Option: (t=58,l=4) Renewal Time Value = 12 hours
Option: (58) Renewal Time Value
Length: 4
Value: 0000A8C0
Option: (t=59,l=4) Rebinding Time Value = 21 hours
Option: (59) Rebinding Time Value
Length: 4
Value: 00012750
Option: (t=1,l=4) Subnet Mask = 255.255.255.0
Option: (1) Subnet Mask
Length: 4
Value: FFFFFFF0
Option: (t=3,l=4) Router = 192.168.1.2
Option: (3) Router
Length: 4
Value: C0A80102
Option: (t=6,l=4) Domain Name Server = 8.8.8.8
Option: (6) Domain Name Server
Length: 4
Value: 08080808
End Option

[5]中繼代理收到來自客戶端的請求並發出廣播。

源MAC是客戶端MAC: 00:62:ec:f3:04:b3

目的MAC是廣播的 : ff:ff:ff:ff:ff

此時，客戶端還沒有IP地址，源IP仍為0.0.0.0

源IP:0.0.0.0

目的IP:255.255.255.255

源埠 : bootpc(68)

目的地連線埠 : 啟動(67)

消息型別 : 啟動請求(1)<<<<此消息是客戶端對IP 192.168.10.19的請求

請求的IP地址= 192.168.10.19 <<<<<<<客戶端請求由DHCP伺服器分配的IP

DHCP消息型別= DHCP請求

Frame 47 (370 bytes on wire, 370 bytes captured)
Arrival Time: Jul 19, 2023 21:53:35.342380000
[Time delta from previous captured frame: 0.097649000 seconds]
[Time delta from previous displayed frame: 4.001055000 seconds]
[Time since reference or first frame: 8.621433000 seconds]
Frame Number: 47
Frame Length: 370 bytes
Capture Length: 370 bytes
[Frame is marked: False]
[Protocols in frame: eth:vlan:ip:udp:bootp]
Ethernet II, Src: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
.... 1 = IG bit: Group address (multicast/broadcast)
.... 1. = LG bit: Locally administered address (this is NOT the factory default)
Source: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
.... 0 = IG bit: Individual address (unicast)
.... 0. = LG bit: Globally unique address (factory default)
Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN, PRI: 0, CFI: 0, ID: 10
000. = Priority: 0
...0 = CFI: 0
.... 0000 0000 1010 = ID: 10
Type: IP (0x0800)
Internet Protocol, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0. = ECN-Capable Transport (ECT): 0
.... 0 = ECN-CE: 0
Total Length: 352
Identification: 0x0000 (0)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 255
Protocol: UDP (0x11)
Header checksum: 0xba8d [correct]
[Good: True]
[Bad : False]
Source: 0.0.0.0 (0.0.0.0)
Destination: 255.255.255.255 (255.255.255.255)
User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
Source port: bootpc (68)
Destination port: bootps (67)
Length: 332
Checksum: 0xbaae [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Request (1)
Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... = Broadcast flag: Broadcast

```
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 0.0.0.0 (0.0.0.0)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 0.0.0.0 (0.0.0.0)
Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Request
Option: (53) DHCP Message Type
Length: 1
Value: 03
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=50,l=4) Requested IP Address = 192.168.10.19
Option: (50) Requested IP Address
Length: 4
Value: C0A80A13
Option: (t=51,l=4) IP Address Lease Time = 2 hours
Option: (51) IP Address Lease Time
Length: 4
Value: 00001C20
Option: (t=54,l=4) DHCP Server Identifier = 192.168.1.2
Option: (54) DHCP Server Identifier
Length: 4
Value: C0A80102
Option: (t=60,l=19) Vendor class identifier = "Cisco NXOS® N9K-C9372PX-E"
Option: (60) Vendor class identifier
Length: 19
Value: 436973636F204E394B2D4339333373250582D45
Option: (t=43,l=8) Vendor-Specific Information
Option: (43) Vendor-Specific Information
Length: 8
Value: F1060062ECF304AC
Option: (t=55,l=8) Parameter Request List
Option: (55) Parameter Request List
Length: 8
Value: 010306070C424396
1 = Subnet Mask
3 = Router
6 = Domain Name Server
7 = Log Server
12 = Host Name
66 = TFTP Server Name
67 = Bootfile name
150 = TFTP server address
End Option
Padding
```

[6]中繼代理將DHCP請求從客戶端轉發到DHCP伺服器。

源MAC是nexus MAC: 6c:31:0e:a3:0c:57

目的MAC是DHCP伺服器MAC: c4:c6:03:09:cf:47

源Ip是SVI10上的Nexus IP:192.168.10.1

目的IP是DHCP伺服器IP:192.168.1.2

源埠 : 引導(67)

目的地連線埠：啟動(67)

消息型別：啟動請求(1)

請求的IP地址= 192.168.10.19

客戶端MAC地址：00:62:ec:f3:04:b3 <<<<<客戶端MAC包含在UDP/DHCP報頭中

DHCP消息型別= DHCP請求

```
Frame 48 (366 bytes on wire, 366 bytes captured)
Arrival Time: Jul 19, 2023 21:53:35.343718000
[Time delta from previous captured frame: 0.001338000 seconds]
[Time delta from previous displayed frame: 0.001338000 seconds]
[Time since reference or first frame: 8.622771000 seconds]
Frame Number: 48
Frame Length: 366 bytes
Capture Length: 366 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57), Dst: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Destination: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Address: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
.... 0.... = IG bit: Individual address (unicast)
.... 0.... = LG bit: Globally unique address (factory default)
Source: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... 0.... = IG bit: Individual address (unicast)
.... 0.... = LG bit: Globally unique address (factory default)
Type: IP (0x0800)
Internet Protocol, Src: 192.168.10.1 (192.168.10.1), Dst: 192.168.1.2 (192.168.1.2)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0.. = ECN-Capable Transport (ECT): 0
.... 0.. = ECN-CE: 0
Total Length: 352
Identification: 0xefac (61356)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 255
Protocol: UDP (0x11)
Header checksum: 0x3e8c [correct]
[Good: True]
[Bad : False]
Source: 192.168.10.1 (192.168.10.1)
Destination: 192.168.1.2 (192.168.1.2)
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
Source port: bootps (67)
Destination port: bootps (67)
Length: 332
Checksum: 0x63b0 [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Request (1)
Hardware type: Ethernet
Hardware address length: 6
Hops: 1
Transaction ID: 0x64b14fa7
```



```
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... .... = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 0.0.0.0 (0.0.0.0)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 192.168.10.1 (192.168.10.1)
Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Request
Option: (53) DHCP Message Type
Length: 1
Value: 03
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=50,l=4) Requested IP Address = 192.168.10.19
Option: (50) Requested IP Address
Length: 4
Value: C0A80A13
Option: (t=51,l=4) IP Address Lease Time = 2 hours
Option: (51) IP Address Lease Time
Length: 4
Value: 00001C20
Option: (t=54,l=4) DHCP Server Identifier = 192.168.1.2
Option: (54) DHCP Server Identifier
Length: 4
Value: C0A80102
Option: (t=60,l=19) Vendor class identifier = "Cisco N9K-C9372PX-E"
Option: (60) Vendor class identifier
Length: 19
Value: 436973636F204E394B2D433933373250582D45
Option: (t=43,l=8) Vendor-Specific Information
Option: (43) Vendor-Specific Information
Length: 8
Value: F1060062ECF304AC
Option: (t=55,l=8) Parameter Request List
Option: (55) Parameter Request List
Length: 8
Value: 010306070C424396
1 = Subnet Mask
3 = Router
6 = Domain Name Server
7 = Log Server
12 = Host Name
66 = TFTP Server Name
67 = Bootfile name
150 = TFTP server address
End Option
Padding
```

[7]伺服器向中繼代理回覆單播(ACK)。
源MAC是DHCP伺服器MAC: c4:c6:03:09:cf:47
目的MAC是Nexus MAC: 6c:31:0e:a3:0c:57

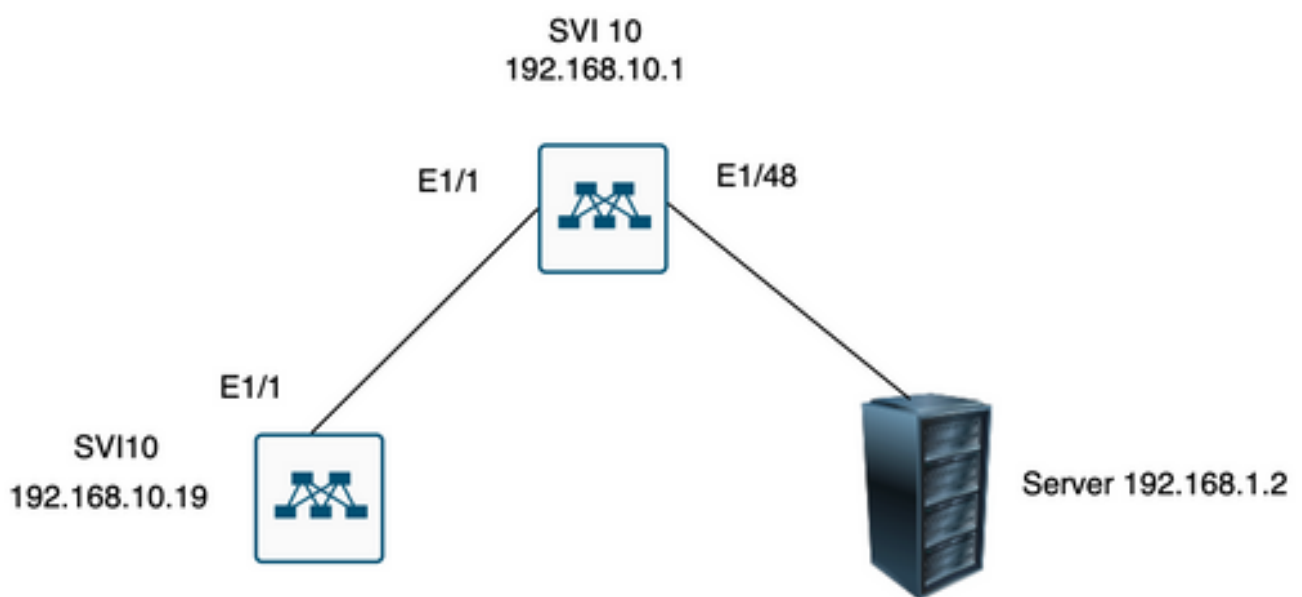
源Ip是DHCP伺服器：192.168.1.2
SVI10上的目標IP Nexus IP:192.168.10.1
源埠：引導(67)
目的地連線埠：啟動(67)
消息型別：引導回覆(2)
您的(客戶端)IP地址：192.168.10.19
客戶端MAC地址：00:62:ec:f3:04:b3
DHCP消息型別= DHCP ACK <<<這是來自伺服器的ACL

```
Frame 49 (348 bytes on wire, 348 bytes captured)
Arrival Time: Jul 19, 2023 21:53:35.344310000
[Time delta from previous captured frame: 0.000592000 seconds]
[Time delta from previous displayed frame: 0.000592000 seconds]
[Time since reference or first frame: 8.623363000 seconds]
Frame Number: 49
Frame Length: 348 bytes
Capture Length: 348 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:bootp]
Ethernet II, Src: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47), Dst: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Destination: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
Address: 6c:31:0e:a3:0c:57 (6c:31:0e:a3:0c:57)
.... 0 .... = IG bit: Individual address (unicast)
.... 0. .... = LG bit: Globally unique address (factory default)
Source: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
Address: c4:c6:03:09:cf:47 (c4:c6:03:09:cf:47)
.... 0 .... = IG bit: Individual address (unicast)
.... 0. .... = LG bit: Globally unique address (factory default)
Type: IP (0x0800)
Internet Protocol, Src: 192.168.1.2 (192.168.1.2), Dst: 192.168.10.1 (192.168.10.1)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
0000 00.. = Differentiated Services Codepoint: Default (0x00)
.... 0. = ECN-Capable Transport (ECT): 0
.... 0 = ECN-CE: 0
Total Length: 334
Identification: 0x0015 (21)
Flags: 0x00
0.. = Reserved bit: Not Set
.0. = Do not fragment: Not Set
..0 = More fragments: Not Set
Fragment offset: 0
Time to live: 254
Protocol: UDP (0x11)
Header checksum: 0x2f36 [correct]
[Good: True]
[Bad: False]
Source: 192.168.1.2 (192.168.1.2)
Destination: 192.168.10.1 (192.168.10.1)
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
Source port: bootps (67)
Destination port: bootps (67)
Length: 314
Checksum: 0x0200 [validation disabled]
[Good Checksum: False]
[Bad Checksum: False]
Bootstrap Protocol
Message type: Boot Reply (2)
```

Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x64b14fa7
Seconds elapsed: 0
Bootp flags: 0x8000 (Broadcast)
1... = Broadcast flag: Broadcast
.000 0000 0000 0000 = Reserved flags: 0x0000
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 192.168.10.19 (192.168.10.19)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 192.168.10.1 (192.168.10.1)
Client MAC address: 00:62:ec:f3:04:b3 (00:62:ec:f3:04:b3)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP ACK
Option: (53) DHCP Message Type
Length: 1
Value: 05
Option: (t=61,l=18) Client identifier
Option: (61) Client identifier
Length: 18
Value: 0046444F3230323431435548566C616E3130
Option: (t=54,l=4) DHCP Server Identifier = 192.168.1.2
Option: (54) DHCP Server Identifier
Length: 4
Value: C0A80102
Option: (t=51,l=4) IP Address Lease Time = 1 day
Option: (51) IP Address Lease Time
Length: 4
Value: 00015180
Option: (t=58,l=4) Renewal Time Value = 12 hours
Option: (58) Renewal Time Value
Length: 4
Value: 0000A8C0
Option: (t=59,l=4) Rebinding Time Value = 21 hours
Option: (59) Rebinding Time Value
Length: 4
Value: 00012750
Option: (t=1,l=4) Subnet Mask = 255.255.255.0
Option: (1) Subnet Mask
Length: 4
Value: FFFFFFF0
Option: (t=3,l=4) Router = 192.168.1.2
Option: (3) Router
Length: 4
Value: C0A80102
Option: (t=6,l=4) Domain Name Server = 8.8.8.8
Option: (6) Domain Name Server
Length: 4
Value: 08080808
End Option

此時，客戶端開始使用IP地址，並確認已將其分配給客戶端。

```
Client# show interface vlan 10
Vlan10 is up, line protocol is up, autostate enabled
Hardware is EtherSVI, address is 0062.ecf3.04b3
Internet Address is 192.168.10.19/24 <<<<<<< It is using the IP address
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not supported
ARP type: ARPA
Last clearing of "show interface" counters never
L3 in Switched:
ucast: 0 pkts, 0 bytes
Client#
```



相關資訊

[配置DHCP](#)

[Ethanalyzer](#)

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）。