Verify IP Device Tracking Post-MAB Configuration on Switch

Contents

Introduction

This document describes the behavior of IP device tracking after MAB config and possible solutions for communication issue after MAB authentication.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Configuration of Cisco Identity Services Engine
- Configuration of Cisco Catalyst

Components Used

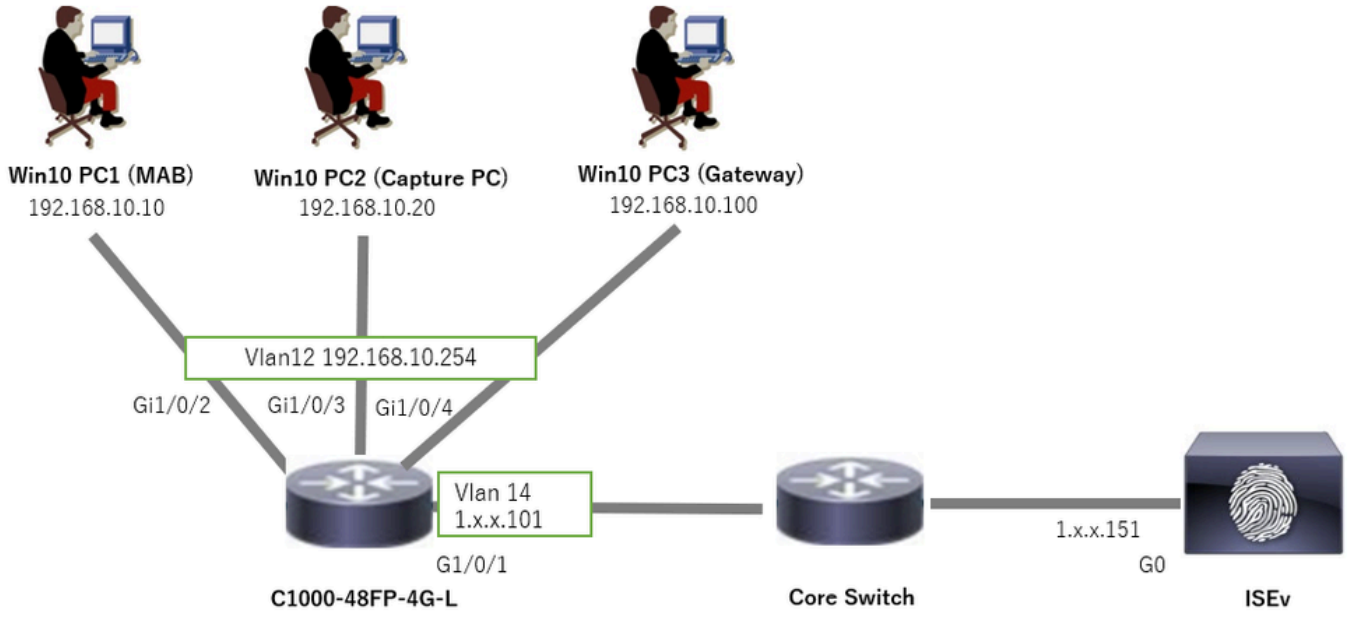
The information in this document is based on these software and hardware versions:

- Identity Services Engine Virtual 3.3 Patch 1
- C1000-48FP-4G-L 15.2(7)E9

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Diagram

This document introduces the configuration and verification for MAB authentication on this diagram.



Network Diagram

Background Information

Even though MAB authentication succeeds, after rebooting (or unplugging and replugging the cable) Win10 PC1, it cannot ping the gateway (Win10 PC3) successfully. This unexpected behavior is due to an IP address conflict on Win10 PC1.
IP device tracking and its ARP probes is enabled by default on the interface which is configured MAB. When Windows PC are connected to a Catalyst Switch with IP device tracking enabled, there is a possibility that the Windows side detects an IP address conflict. This occurs because an ARP Probe (with a sender IP address of 0.0.0.0) is received during the detection window of this mechanism, it is treated as an IP address conflict.

Configuration

This configuration example demonstrates the behavior of IP device tracking after MAB configuration.

Configuration in C1000

This is the minimal configuration in C1000 CLI.

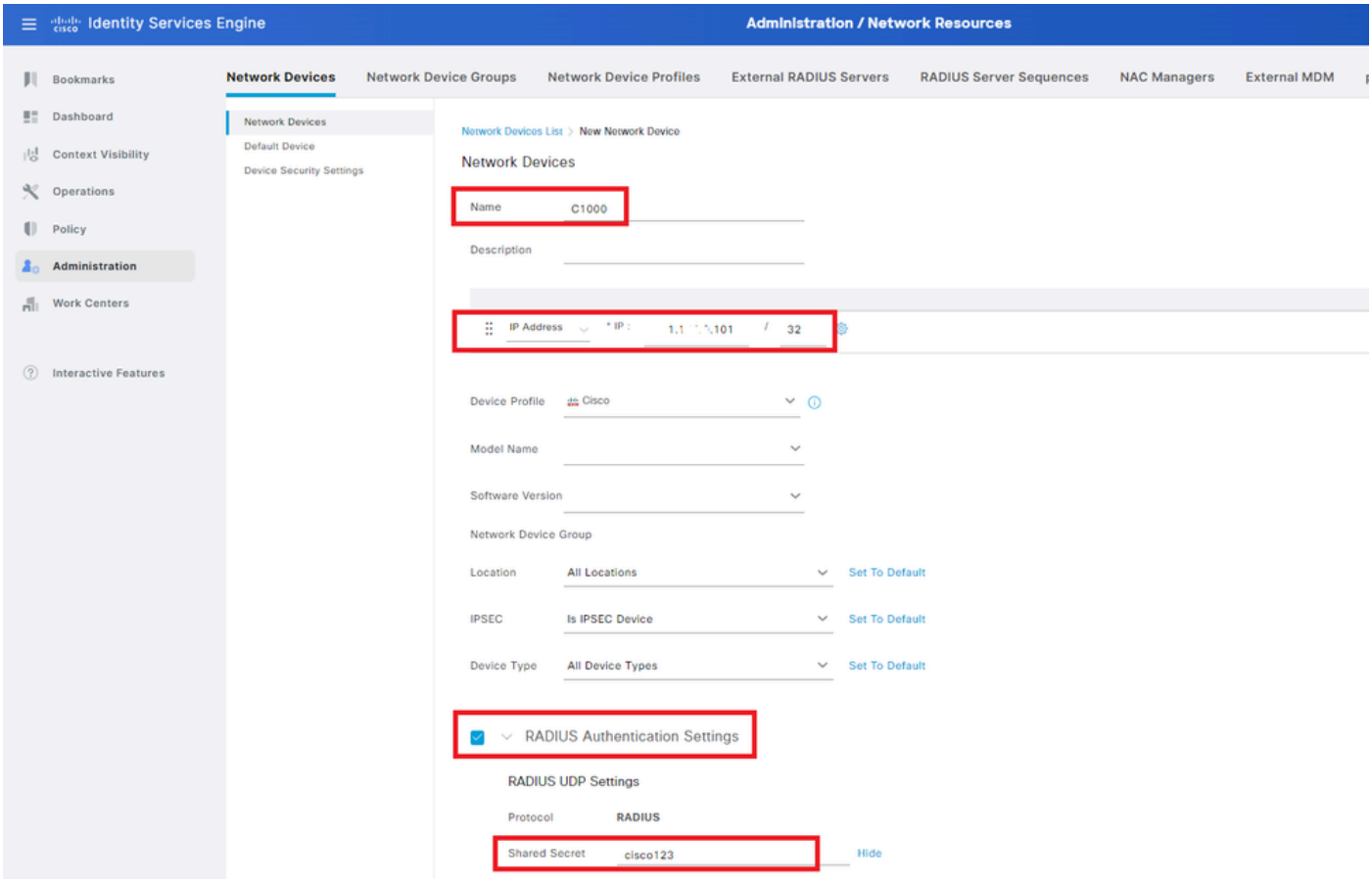
```
aaa new-model

radius server ISE33
address ipv4 1.x.x.191
key cisco123

aaa group server radius AAASERVER
server name ISE33

aaa authentication dot1x default group AAASERVER
aaa authorization network default group AAASERVER
aaa accounting dot1x default start-stop group AAASERVER
dot1x system-auth-control

interface Vlan12
ip address 192.168.10.254 255.255.255.0

interface Vlan14
ip address 1.x.x.101 255.0.0.0

interface GigabitEthernet1/0/1
Switch port access vlan 14
Switch port mode access

interface GigabitEthernet1/0/3
Switch port access vlan 12
Switch port mode access

interface GigabitEthernet1/0/4
Switch port access vlan 12
Switch port mode access

interface GigabitEthernet1/0/2
Switch port access vlan 12
Switch port mode access
authentication host-mode multi-auth
authentication port-control auto
spanning-tree portfast edge
mab

// for packet capture
monitor session 1 source interface Gi1/0/2
monitor session 1 destination interface Gi1/0/3
```

Configuration in ISE

Step 1. Add Device

Navigate to **Administration > Network Devices**, click **Add** button to add C1000 device.

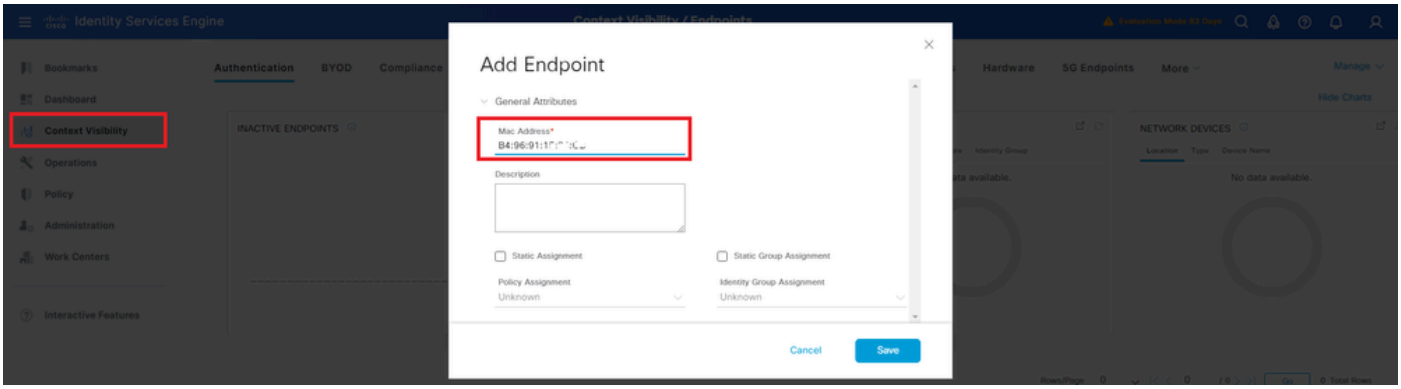
- **Name** : C1000
- **IP Address** : 1.x.x.101



Add Device

Step 2. Add Endpoint

Navigate to **Context Visibility > Endpoints**, click **Add** button to add MAC of Endpoint.



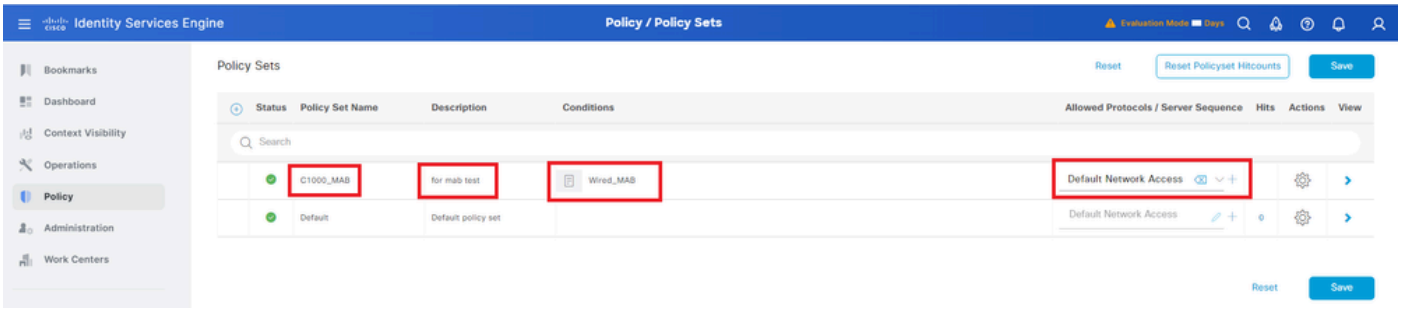
Add Endpoint

Step 3. Add Policy Set

Navigate to **Policy > Policy Sets**, click **+** to add a policy set.

- **Policy Set Name** : C1000_MAB
- **Description** : for mab test
- **Conditions** : Wired_MAB

- **Allowed Protocols / Server Sequence** : Default Network Access

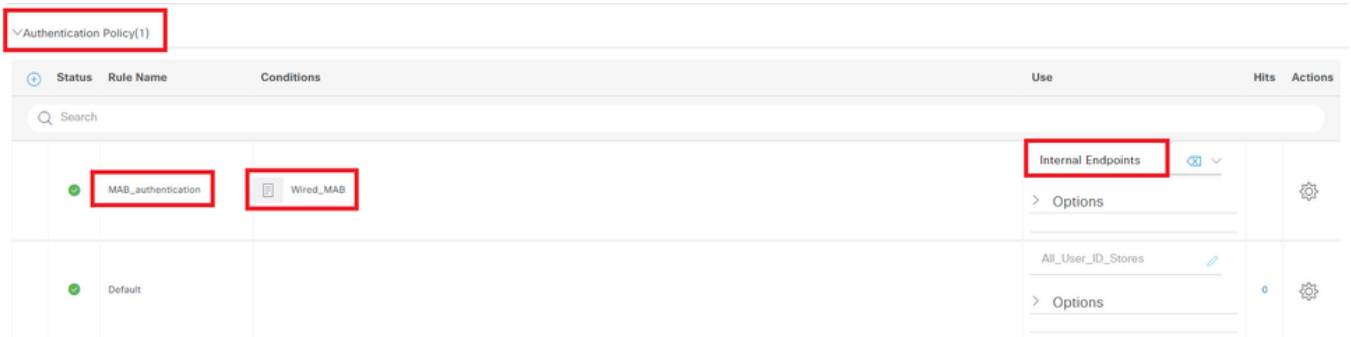


Add Policy Set

Step 4. Add Authentication Policy

Navigate to **Policy Sets**, click **C1000_MAB** to add an authentication policy.

- **Rule Name** : MAB_authentication
- **Conditions** : Wired_MAB
- **Use** : Internal Endpoints



Add Authentication Policy

Step 5. Add Authorization Policy

Navigate to **Policy Sets**, click **C1000_MAB** to add an authorization policy.

- **Rule Name** : MAB_authorization
- **Conditions** : Network_Access_Authentication_Passed
- **Results** : PermitAccess

Add Authorization Policy

Verify

Before Configuration of MAB

Run show ip device tracking all command to confirm that IP device tracking feature is disabled.

```
<#root>

Switch #

show ip device tracking all


Global IP Device Tracking for clients =

Disabled


-----------------------------------------------------------------------------------------------
IP Address MAC Address Vlan Interface Probe-Timeout State Source
-----------------------------------------------------------------------------------------------
```

After Configuration of MAB

Step 1. Before MAB Authentication

Run show ip device tracking all command to confirm that IP device tracking feature is enabled.

```
<#root>

Switch #

show ip device tracking all


Global IP Device Tracking for clients =

Enabled


Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
Global IP Device Tracking Probe Delay Interval = 0
-----------------------------------------------------------------------------------------------
IP Address MAC Address Vlan Interface Probe-Timeout State Source
-----------------------------------------------------------------------------------------------

Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2
```

Step 2. After MAB Authentication

Initialize MAB authentication from Win10 PC1 and run show ip device tracking all command to confirm the status of IP device tracking on GigabitEthernet1/0/2.

<#root>

Switch #

show ip device tracking all

Global IP Device Tracking for clients =

Enabled

Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
Global IP Device Tracking Probe Delay Interval = 0

IP Address MAC Address Vlan Interface Probe-Timeout State Source
---

192.168.10.10

b496.9115.84cb 12 GigabitEthernet1/0/2 30

ACTIVE

ARP

Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2

Step 3. Confirm Authentication Session

Run show authentication sessions interface GigabitEthernet1/0/2 details command to confirm the MAB authentication session.

<#root>

Switch #

show authentication sessions interface GigabitEthernet1/0/2 details

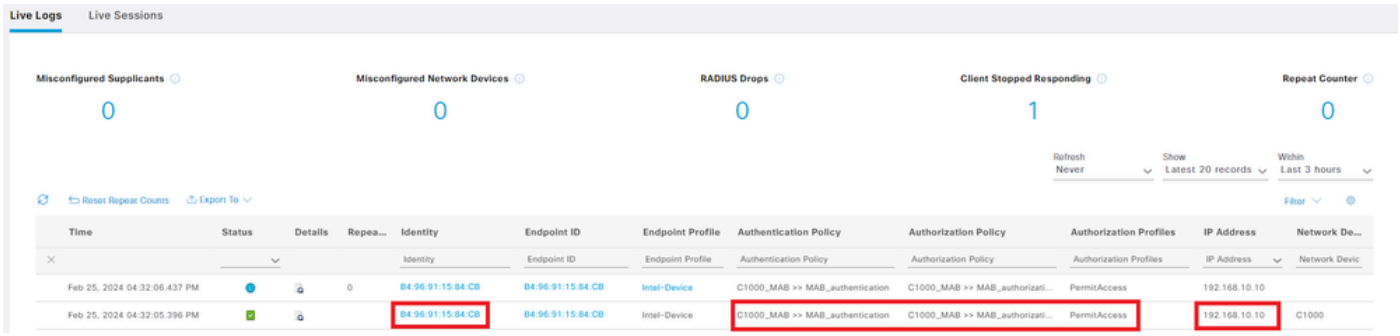
Interface: GigabitEthernet1/0/2
MAC Address: b496.9115.84cb
IPv6 Address: Unknown
IPv4 Address: 192.168.10.10
User-Name: B4-96-91-15-84-CB
Status: Authorized
Domain: DATA
Oper host mode: multi-auth
Oper control dir: both
Session timeout: N/A
Restart timeout: N/A
Periodic Acct timeout: N/A
Session Uptime: 114s
Common Session ID: 01C200650000001D62945338
Acct Session ID: 0x0000000F
Handle: 0xBE000007
Current Policy: POLICY_Gi1/0/2

Local Policies:

```
Service Template: DEFAULT_LINKSEC_POLICY_SHOULD_SECURE (priority 150)

Server Policies:


Method status list:
Method State

mab Authc Success
```

Step 4. Confirm Radius Live Log

Navigate to **Operations** > **RADIUS** > **Live Logs**in ISE GUI, confirm the live log for MAB authentication.



Step 5. Confirm Packet Detail of IP Device Tracking

Run show interfaces GigabitEthernet1/0/2 command to confirm the MAC address of GigabitEthernet1/0/2.

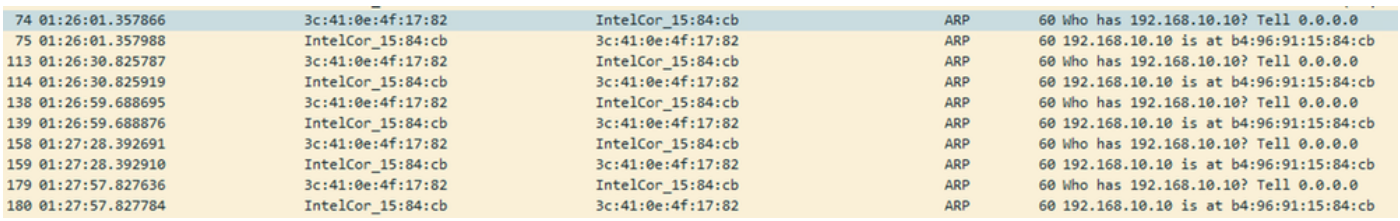
<#root>

```
Switch #
```

show interfaces GigabitEthernet1/0/2

```
GigabitEthernet1/0/2 is up, line protocol is up (connected)
Hardware is Gigabit Ethernet, address is 3c41.0e4f.1782 (bia 3c41.0e4f.1782)
```

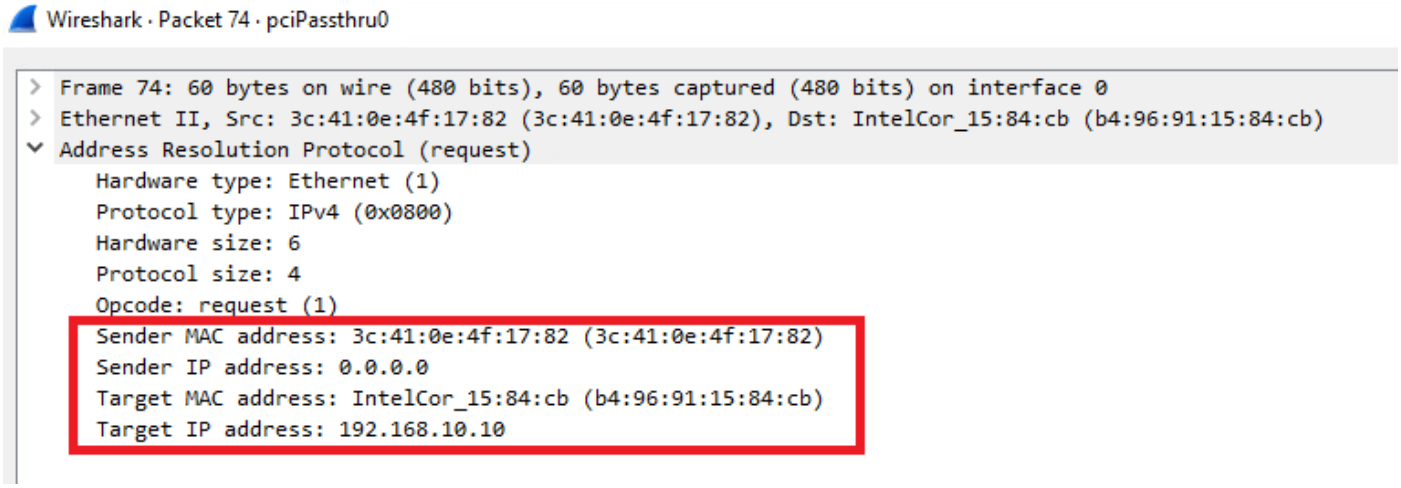
In the packet capture, confirm that ARP probes are sent by GigabitEthernet1/0/2 every 30s.



74	01:26:01.357866	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 0.0.0.0
75	01:26:01.357988	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
113	01:26:30.825787	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 0.0.0.0
114	01:26:30.825919	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
138	01:26:59.688695	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 0.0.0.0
139	01:26:59.688876	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
158	01:27:28.392691	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 0.0.0.0
159	01:27:28.392910	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
179	01:27:57.827636	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 0.0.0.0
180	01:27:57.827784	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb

ARP Probes

In the packet capture, confirm that the sender IP address of ARP Probes are 0.0.0.0.



Detail of ARP Probes

Problem

There is a possibility that the IP device tracking feature of the Catalyst Switch could cause an IP address conflict on a Windows PC when it sends an ARP Probe with a sender IP address of 0.0.0.0.

Possible Solutions

Please refer to Troubleshoot Duplicate IP Address 0.0.0.0 Error Messages for possible solutions.
Here are examples of each solution tested in a Cisco lab for further details.

1. Delay the Sending of ARP Probes

Run ip device tracking probe delay <1-120> command to delay the sending of ARP probes from Switch. This command does not allow a Switch to send a probe for <1-120> seconds when it detects a link UP/flap, which minimizes the possibility to have the probe sent while the host on the other side of the link checks for duplicate IP addresses.

This is an example to config the delay of ARP probe for 10s.

```
Switch (config)#ip device tracking probe delay 10
```

Run show ip device tracking all command to confirm the setting of delay.

<#root>

```
Switch #show ip device tracking all
Global IP Device Tracking for clients = Enabled
Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
```

Global IP Device Tracking Probe Delay Interval = 10

```
---------------------------------------------------------------------------------------
IP Address MAC Address Vlan Interface Probe-Timeout State Source
```

```
-------------------------------------------------------------------------------------------
192.168.10.10 b496.9115.84cb 12 GigabitEthernet1/0/2 30 ACTIVE ARP

Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2
```

2. Config Auto-Source for ARP Probes

Run ip device tracking probe auto-source fallback <host-ip> <mask> [override] command to change the source IP address for ARP Probes. With this command, the IP source of ARP Probes is not be 0.0.0.0, but it is the IP address of Switch Virtual Interface (SVI) in the VLAN where the host resides, or it is automatically calculated if the SVI does not have an IP address set.

This is an example to config the <host-ip> to 0.0.0.200.

```
Switch (config)#ip device tracking probe auto-source fallback 0.0.0.200 255.255.255.0 override
```

Pattern 1. IP of SVI is Configured

In this document, since the SVI IP address (the IP address of vlan12) is set for the interface (GigabitEthernet1/0/2) performing MAB authentication, the source IP address for the ARP probe is changed to 192.168.10.254.

Run show ip device tracking all command to confirm the setting of auto source.

<#root>

```
Switch #show ip device tracking all
Global IP Device Tracking for clients = Enabled
Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
Global IP Device Tracking Probe Delay Interval = 0
IP Device Tracking Probe Auto Source = Enabled
```

Probe source IP selection order: SVI,Fallback 0.0.0.200 255.255.255.0

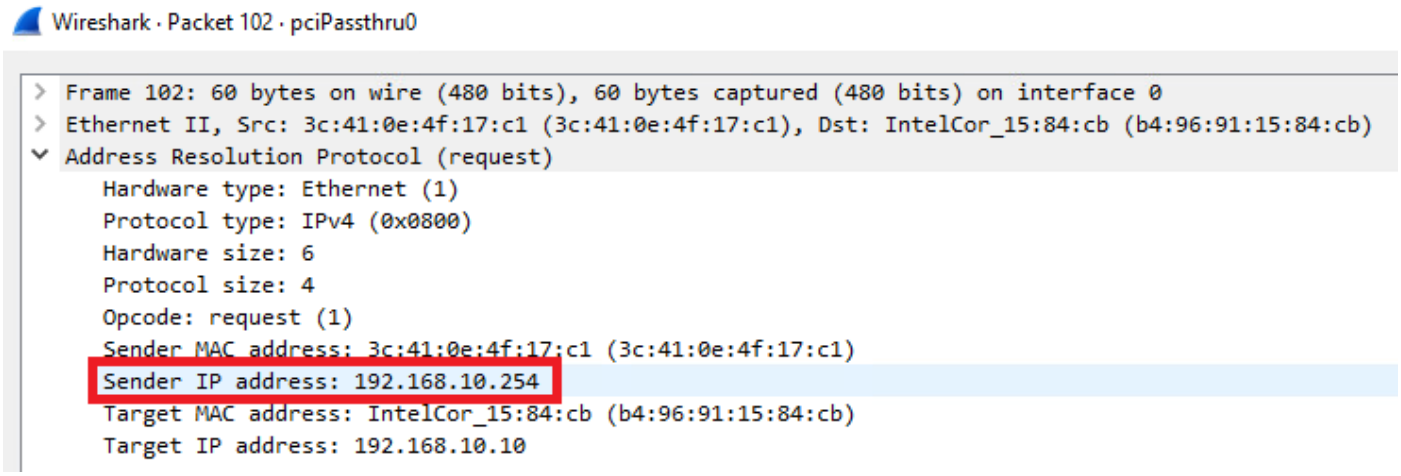
```
-------------------------------------------------------------------------------------------
IP Address MAC Address Vlan Interface Probe-Timeout State Source
-------------------------------------------------------------------------------------------
192.168.10.10 b496.9115.84cb 12 GigabitEthernet1/0/2 30 ACTIVE ARP

Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2
```

In the packet capture, confirm that ARP probes are sent by GigabitEthernet1/0/2 every 30s.

```
102 13:31:03.121397 3c:41:0e:4f:17:c1    IntelCor_15:84:cb          ARP       60 Who has 192.168.10.10? Tell 192.168.10.254
103 13:31:03.121608 IntelCor_15:84:cb    3c:41:0e:4f:17:c1          ARP       60 192.168.10.10 is at b4:96:91:15:84:cb
123 13:31:33.006355 3c:41:0e:4f:17:c1    IntelCor_15:84:cb          ARP       60 Who has 192.168.10.10? Tell 192.168.10.254
124 13:31:33.006502 IntelCor_15:84:cb    3c:41:0e:4f:17:c1          ARP       60 192.168.10.10 is at b4:96:91:15:84:cb
144 13:32:01.534263 3c:41:0e:4f:17:c1    IntelCor_15:84:cb          ARP       60 Who has 192.168.10.10? Tell 192.168.10.254
145 13:32:01.534377 IntelCor_15:84:cb    3c:41:0e:4f:17:c1          ARP       60 192.168.10.10 is at b4:96:91:15:84:cb
163 13:32:30.386323 3c:41:0e:4f:17:c1    IntelCor_15:84:cb          ARP       60 Who has 192.168.10.10? Tell 192.168.10.254
164 13:32:30.386325 IntelCor_15:84:cb    3c:41:0e:4f:17:c1          ARP       60 192.168.10.10 is at b4:96:91:15:84:cb
182 13:32:59.104148 3c:41:0e:4f:17:c1    IntelCor_15:84:cb          ARP       60 Who has 192.168.10.10? Tell 192.168.10.254
183 13:32:59.104318 IntelCor_15:84:cb    3c:41:0e:4f:17:c1          ARP       60 192.168.10.10 is at b4:96:91:15:84:cb
```

ARP Probes

In the packet capture, confirm that the sender IP address of ARP Probes are 192.168.10.254 which is the IP of SVI (vlan 12).



Detail of ARP Probes

Pattern 2. IP of SVI is Not Configured

In this document, as the destination for the ARP probe is 192.168.10.10/24, if the SVI IP address is not configured, the source IP address is 192.168.10.200.

Delete the IP address of SVI.

```
Switch (config)#int vlan 12
Switch (config-if)#no ip address
```

Run `show ip device tracking all` command to confirm the setting of auto source.

<#root>

```
Switch #show ip device tracking all
Global IP Device Tracking for clients = Enabled
Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
Global IP Device Tracking Probe Delay Interval = 0
IP Device Tracking Probe Auto Source = Enabled

Probe source IP selection order: SVI,Fallback 0.0.0.200 255.255.255.0

-------------------------------------------------------------------------------------------
```

```
IP Address MAC Address Vlan Interface Probe-Timeout State Source
-----------------------------------------------------------------------------------------------
192.168.10.10 b496.9115.84cb 12 GigabitEthernet1/0/2 30 ACTIVE ARP

Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2
```

In the packet capture, confirm that ARP probes are sent by GigabitEthernet1/0/2 every 30s.

176	13:39:00.167788	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
177	13:39:00.167975	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
196	13:39:29.131512	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
197	13:39:29.131616	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
217	13:39:58.724683	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
218	13:39:58.724858	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
238	13:40:27.746620	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
239	13:40:27.746784	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
257	13:40:57.240571	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
258	13:40:57.240702	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb
278	13:41:27.193284	3c:41:0e:4f:17:82	IntelCor_15:84:cb	ARP	60 Who has 192.168.10.10? Tell 192.168.10.200
279	13:41:27.193419	IntelCor_15:84:cb	3c:41:0e:4f:17:82	ARP	60 192.168.10.10 is at b4:96:91:15:84:cb

ARP Probes

In the packet capture, confirm that the sender IP address of ARP Probes are changed to 192.168.10.200.

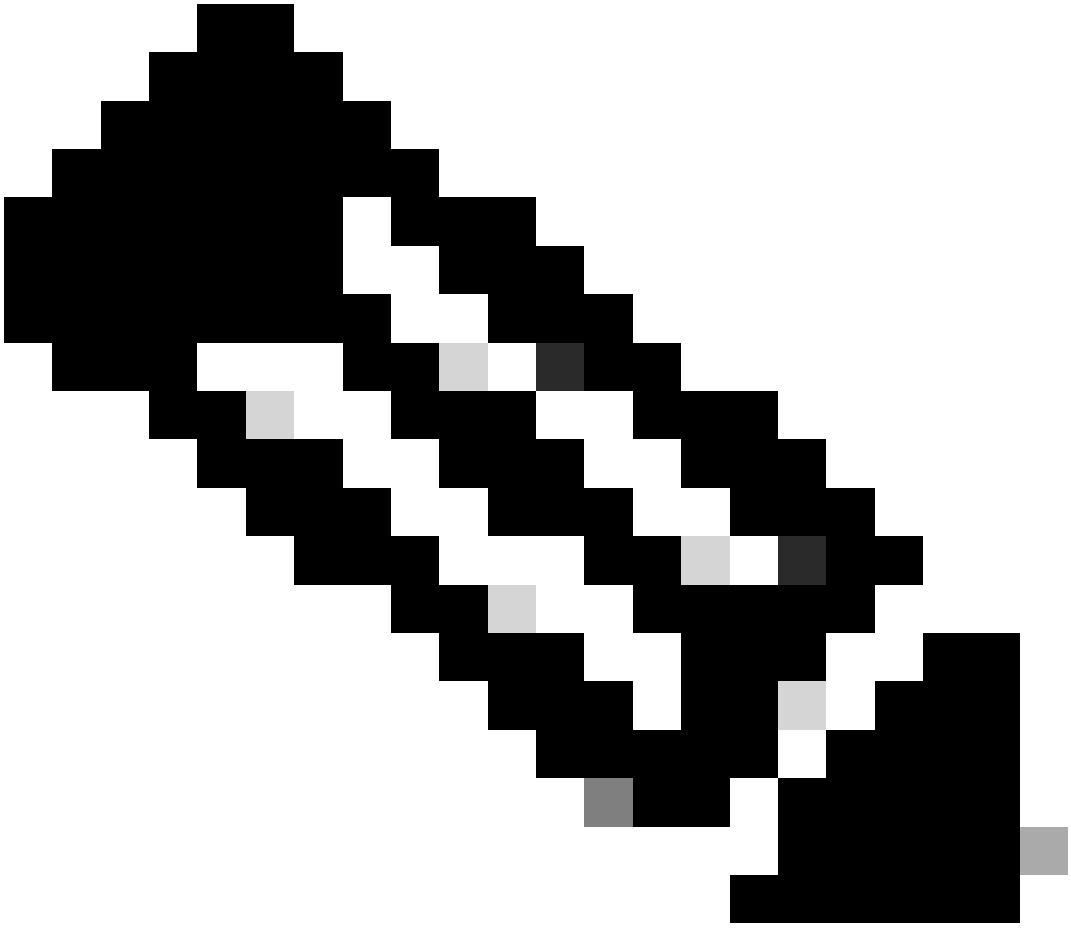
Wireshark · Packet 176 · pciPassthru0

```
> Frame 176: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
> Ethernet II, Src: 3c:41:0e:4f:17:82 (3c:41:0e:4f:17:82), Dst: IntelCor_15:84:cb (b4:96:91:15:84:cb)
v Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: 3c:41:0e:4f:17:82 (3c:41:0e:4f:17:82)
    Sender IP address: 192.168.10.200
    Target MAC address: IntelCor_15:84:cb (b4:96:91:15:84:cb)
    Target IP address: 192.168.10.10
```

Detail of ARP Probes

3. Forcibly Disable IP Device Tracking

Run **ip device tracking maximum 0** command to disable IP device tracking.



Note: This command does not truly disable IP device tracking, but it does limit the number of tracked hosts to zero.

```
Switch (config)#int g1/0/2
Switch (config-if)#ip device tracking maximum 0
```

Run `show ip device tracking all` command to confirm the status of IP device tracking on GigabitEthernet1/0/2.

```
Switch #show ip device tracking all
Global IP Device Tracking for clients = Enabled
Global IP Device Tracking Probe Count = 3
Global IP Device Tracking Probe Interval = 30
Global IP Device Tracking Probe Delay Interval = 0
-----------------------------------------------------------------------------------------
IP Address MAC Address Vlan Interface Probe-Timeout State Source
-----------------------------------------------------------------------------------------
```

```
Total number interfaces enabled: 1
Enabled interfaces:
Gi1/0/2
```

Reference

Troubleshoot Duplicate IP Address 0.0.0.0 Error Messages

Verify IPDT Device Operations