含WLC偵錯和擷取的無線PMIPv6（WLC上的MAG）流量

目錄

簡介

本檔案介紹無線LAN控制器(WLC)上啟用PMIPv6的WLAN所涉及的關鍵術語和使用者端連線處理流程。

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背景資訊

代理移動IPv6、PMIPv6或PMIP是一種基於網路的無線客戶端移動解決方案。這意味著客戶端可以在LTE和WiFi以及控制器間WLAN漫遊之間漫遊，甚至無縫執行供應商間WLAN漫遊。

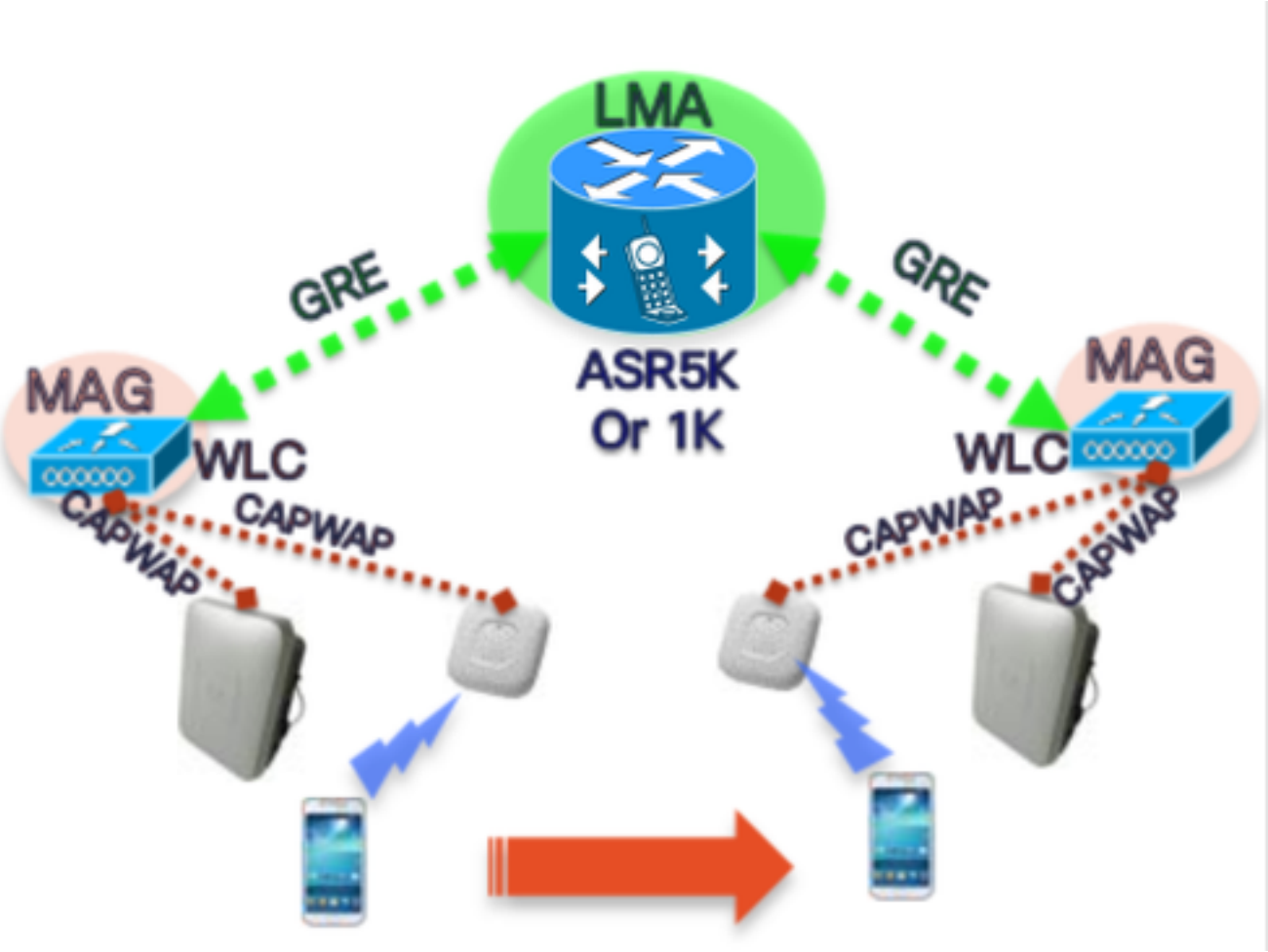
客戶端保留相同的IP地址、網關地址、DHCP伺服器和單個錨點。無線客戶端連線到為PMIPv6配置的WLAN與常規WLAN的主要區別在於如何處理DHCP和客戶端流量。

術語

- 本地移動錨點(LMA)是分配和維護客戶端IP地址和處理客戶端流量路由的錨點。LMA通常是ASR5K或ASR1K路由器。
- 移動接入網關(Mobile Access Gateway，MAG)扮演中介者的角色，它代表無線客戶端執行移動性管理，同時處理實際的DHCP事務。這將與LMA形成雙向隧道以接收和轉發客戶端流量。此通道是靜態GRE通道，UDP埠5436同時用作源埠和目的埠。
  在這種情況下，MAG將是無線控制器。但是，我們也可以將MAG作為Flexconnect AP。
- 客戶端稱為移動節點(MN)，其IP地址稱為家鄉地址(HOA)。
- 網路存取識別碼(NAI)是使用者端的唯一識別碼，可用於路由目的地為它的流量，而不是使用IP位址。其格式為mac-address@realm。
- NAI領域通常採用域名形式，例如cisco.com。這將用於確定客戶端應屬於哪個「網路」。在無線術語中，這代替了將所需的VLAN對映到客戶端的動態介面。
  這在WLAN上配置，並將確定MAG將與哪個LMA形成雙向隧道。

有關IP移動術語的詳細資訊，請參閱https://www.cisco.com/c/en/us/td/docs/ios-

xml/ios/mob_ip/configuration/15-mt/mob-ip-15-mt-book/imo-nai-haa.html



流

- PMIP客戶端將完成802.11關聯和WLAN上配置的任何第2層身份驗證。

  *apfMsConnTask_2:6月18日14:50:40.023:[PA] 00:23:c2:db:29:2d 0.0.0.0 START(0)將狀態更改為AUTHCHECK(2)last state START(0)
  *apfMsConnTask_2:6月18日14:50:40.023:[PA] 00:23:c2:db:29:2d 0.0.0.0 AUTHCHECK(2)將狀態更改為L2AUTHCOMPLETE(4)最後狀態AUTHCHECK(2)
- L2身份驗證完成後，在將客戶端推進到下一階段之前，MAG將通知LMA此客戶端並請求為其提供IP地址。在技術術語中，MAG將向LMA傳送代理繫結更新(PBU)。LMA將回覆代理繫結確認(PBA)。

- 然後，WLC將作為客戶端的DHCP伺服器，並根據從LMA收到的資訊與其執行DHCP事務。啟用DHCP代理不是必需的，但啟用代理意味著客戶端將看到WLC的虛擬介面IP作為DHCP伺服器地址。在本示例中，DHCP代理已啟用。

PMIPv6事件細分，包含WLC調試和資料包捕獲

採用元件

```
MAG: WLC 3504 running 8.8.120.0

LMA: ASR1K running 3.13.10S

AP: AIR-CAP3802-D-K9



WLC IP: 10.106.35.111

Virtual Interface IP: 192.0.2.1

Router IP: 10.106.37.40

Client IP (Received via DHCP): 192.168.5.44
```

使用的Debug命令

（思科控制器）>debug client <mac-addr>

（思科控制器）>debug proxy-mobility all enable

在WLC上行鏈路連線埠上擷取封包擷取。

首先，一旦客戶端完成L2身份驗證，MAG上就會出現L2 Attach觸發器

```
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*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MAG_EVENT]: Trigger request received (L2 Attach trigger) from (0023.c2db.292d)

*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MAG_EVENT]: Event received New MN intf attached in state: NULL, new state: INIT

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```

客戶端的PMIP繫結更新消息使用日誌中可見的nai進行準備。

```
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*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MAG_INFO]: PBU message nai(0023.c2db.292d@ciscotacbangalore.com), nai len: 15, hoa(0),
att(4) llid(0023.c2db.292d) , ll len: 16 seqNo:9465

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```

繫結更新請求資料包由MAG傳送到LMA

```
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*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MM] Sending UDP Packet, src: 0x0a6a236f, dst: 0x0a6a2528, sport: 5436, dport:5436

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```

```
0x0a6a236f = IP Address of MAG

0x0a6a2528 = IP Address of LMA
```

以下為要求使用者端IP和預設路由器位址的畫面：

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*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MM] V4HOAREQ option included len 6 val 0

*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MM] V4DFT_RTR option included len 6 val 0

*PMIPV6_Thread_2: Jun 18 14:50:40.023: [PA]

[PMIPV6_MAG_EVENT]: PBU message sent

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> Frame 1: 198 bytes on wire (1584 bits), 198 bytes captured (1584 bits) on interface 0
> Ethernet II, Src: Cisco_78:be:cd (50:0f:80:78:be:cd), Dst: Cisco_7a:97:71 (00:00:0c:7a:97:71)
> 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 35
> Internet Protocol Version 4, Src: 10.106.35.111, Dst: 10.106.37.40
> User Datagram Protocol, Src Port: 5436, Dst Port: 5436
v Mobile IPv6
    Payload protocol: No Next Header for IPv6 (59)
    Header length: 18 (152 bytes)
    Mobility Header Type: Binding Update (5)
    Reserved: 0x00
    Checksum: 0x0000
  > Binding Update
  v Mobility Options
    > MIPv6 Option - PadN
    > MIPv6 Option - Mobile Node Identifier: 0023.c2db.292d
    > MIPv6 Option - Service Selection: @ciscotacbangalore.com
    > MIPv6 Option - Handoff Indicator: Attachment over a new interface
    > MIPv6 Option - Access Technology Type Option: IEEE 802.11a/b/g
      MIPv6 Option - Pad1
    > MIPv6 Option - Timestamp: Jun 18, 2019 04:50:40.0000 UTC
    > MIPv6 Option - PadN
    > MIPv6 Option - Mobile Node Link-layer Identifier
    > MIPv6 Option - PadN
    > MIPv6 Option - IPv4 Home Address Request: 0.0.0.0
    > MIPv6 Option - IPv4 Default-Router Address: 0.0.0.0
```

響應作為繫結更新ACK接收，同時接收要分配給客戶端的IP地址和預設路由器地址。

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*PMIPV6_Thread_0: Jun 18 14:50:40.026: [PA]
```

```
[PMIPV6_MM] NAI option received len 15

*PMIPV6_Thread_0: Jun 18 14:50:40.026: [PA]

[PMIPV6_MM] V4HOAREPLY option received len 6 val 3232236844

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3232236844 = IP address of MN returned by LMA from the IP Pool in Decimal.

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*PMIPV6_Thread_0: Jun 18 14:50:40.026: [PA]

[PMIPV6_MM] V4DFT_RTR option received len 6 val 3232236801

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3232236801 = Default router address in Decimal

```
   Mobility Header Type: Binding Acknowledgement (6)
   Reserved: 0x00
   Checksum: 0x0604
 ⌄ Binding Acknowledgement
      Status: Binding Update accepted (0)
      0... .... = Key Management Compatibility (K) flag: No Key Management Mobility Compatibility
      .0.. .... = Mobile Router (R) flag: No Mobile Router Compatibility
      ..1. .... = Proxy Registration (P) flag: Proxy Registration
      ...0 .... = TLV-header format (T) flag: No TLV-header format
      .... 0... = Bulk-Binding-Update flag (B): Disabled bulk binding update support
      Sequence number: 9465
      Lifetime: 7200 (28800 seconds)
 ⌄ Mobility Options
    › MIPv6 Option - PadN
    › MIPv6 Option - Mobile Node Identifier: 0023.c2db.292d
    › MIPv6 Option - Handoff Indicator: Attachment over a new interface
    › MIPv6 Option - Access Technology Type Option: IEEE 802.11a/b/g
      MIPv6 Option - Pad1
    › MIPv6 Option - Timestamp: Jun 18, 2019 04:50:40.0000 UTC
    › MIPv6 Option - PadN
    › MIPv6 Option - Mobile Node Link-layer Identifier
    › MIPv6 Option - PadN
    ⌄ MIPv6 Option - IPv4 Home Address Reply: Success : 192.168.5.44
         Length: 6
         Status: Success (0)
         0100 11.. = Prefix-len: 24
         IPv4 Home Address: 192.168.5.44
    › MIPv6 Option - IPv4 Default-Router Address: 192.168.5.1
```

MAG繫結狀態更改為活動。

```
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*PMIPV6_Thread_2: Jun 18 14:50:40.026: [PA]

[PMIPV6_MAG_EVENT]: Event received PBA accept in state: INIT, new state: ACTIVE
```

```
*PMIPV6_Thread_2: Jun 18 14:50:40.026: [PA]

[PMIPv6_MM] L2 Attach Status: Success

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```

這將在客戶端狀態更改為DHCP_REQD且看到常規DHCP日誌後發生。DHCP封包交易將僅在WLC和使用者端之間，因為WLC已收到要包含在DHCP提供/確認封包中的IP位址、子網路遮罩和路由器位址。

```
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*apfMsConnTask_2: Jun 18 14:50:40.023: [PA] 00:23:c2:db:29:2d 0.0.0.0 L2AUTHCOMPLETE (4) Change
state to DHCP_REQD (7) last state L2AUTHCOMPLETE (4)

*DHCP Socket Task: Jun 18 14:50:40.235: [PA] 00:23:c2:db:29:2d DHCP transmitting DHCP DISCOVER
(1)

*DHCP Socket Task: Jun 18 14:50:40.236: [PA] 00:23:c2:db:29:2d DHCP transmitting DHCP OFFER (2)

*DHCP Socket Task: Jun 18 14:50:41.072: [PA] 00:23:c2:db:29:2d DHCP transmitting DHCP REQUEST
(3)

*DHCP Socket Task: Jun 18 14:50:41.074: [PA] 00:23:c2:db:29:2d DHCP transmitting DHCP ACK (5)

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No.	Time	Source	Destination	Protocol	Length	Info
1	2019-06-18 04:50:40.048613	10.106.35.111	10.106.37.40	MIPv6	198	Binding Update
2	2019-06-18 04:50:40.051456	10.106.37.40	10.106.35.111	MIPv6	174	Binding Acknowledgement
3	2019-06-18 04:50:40.399814	0.0.0.0	255.255.255.255	DHCP	430	DHCP Discover - Transaction ID 0xd24d2a35
4	2019-06-18 04:50:40.399931	192.0.2.1	192.168.5.44	DHCP	418	DHCP Offer - Transaction ID 0xd24d2a35
5	2019-06-18 04:50:40.401783	0.0.0.0	255.255.255.255	DHCP	442	DHCP Request - Transaction ID 0xd24d2a35
6	2019-06-18 04:50:40.401905	192.0.2.1	192.168.5.44	DHCP	418	DHCP ACK - Transaction ID 0xd24d2a35

驗證

使用本節內容，確認您的組態是否正常運作。

使用WLC上的以下輸出可以確認使用者端狀態：

```
(Cisco Controller) >show pmipv6 mag binding

[Binding][MN]: Domain: D1, Nai: 0023.c2db.292d@ciscotacbangalore.com

[Binding][MN]: State: ACTIVE

[Binding][MN]: Interface: Management

[Binding][MN]: Hoa: 0xc0a8052c, att: 3, llid: 0023.c2db.292d

[Binding][MN][LMA]: Id: LMA1

[Binding][MN][LMA]: lifetime: 3600

[Binding][MN][GREKEY]: Upstream: 100, Downstream: 1
```

```
(Cisco Controller) >show client detail 00:23:c2:db:29:2d

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Client Type..................................... PMIPv6

PMIPv6 State.................................... Complete

PMIPv6 MAG location............................. WLC

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