

AireOS WLC上的802.11v基本服务集(BSS)

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简介

本文档介绍在WLC（无线LAN控制器）上对协议802.11v的支持。

背景信息

802.11v是指IEEE（电气和电子工程师协会）802.11无线网络管理（修订8）。

支持WNM（无线网络管理）的站点可以相互交换信息（接入点和无线客户端）以提高其性能。

AireOS WLC 8.1版或更高版本支持以下WNM服务：

- 定向组播服务(DMS)

- BSS (基本服务集) 最大空闲期管理
- BSS过渡管理

定向组播服务(DMS):

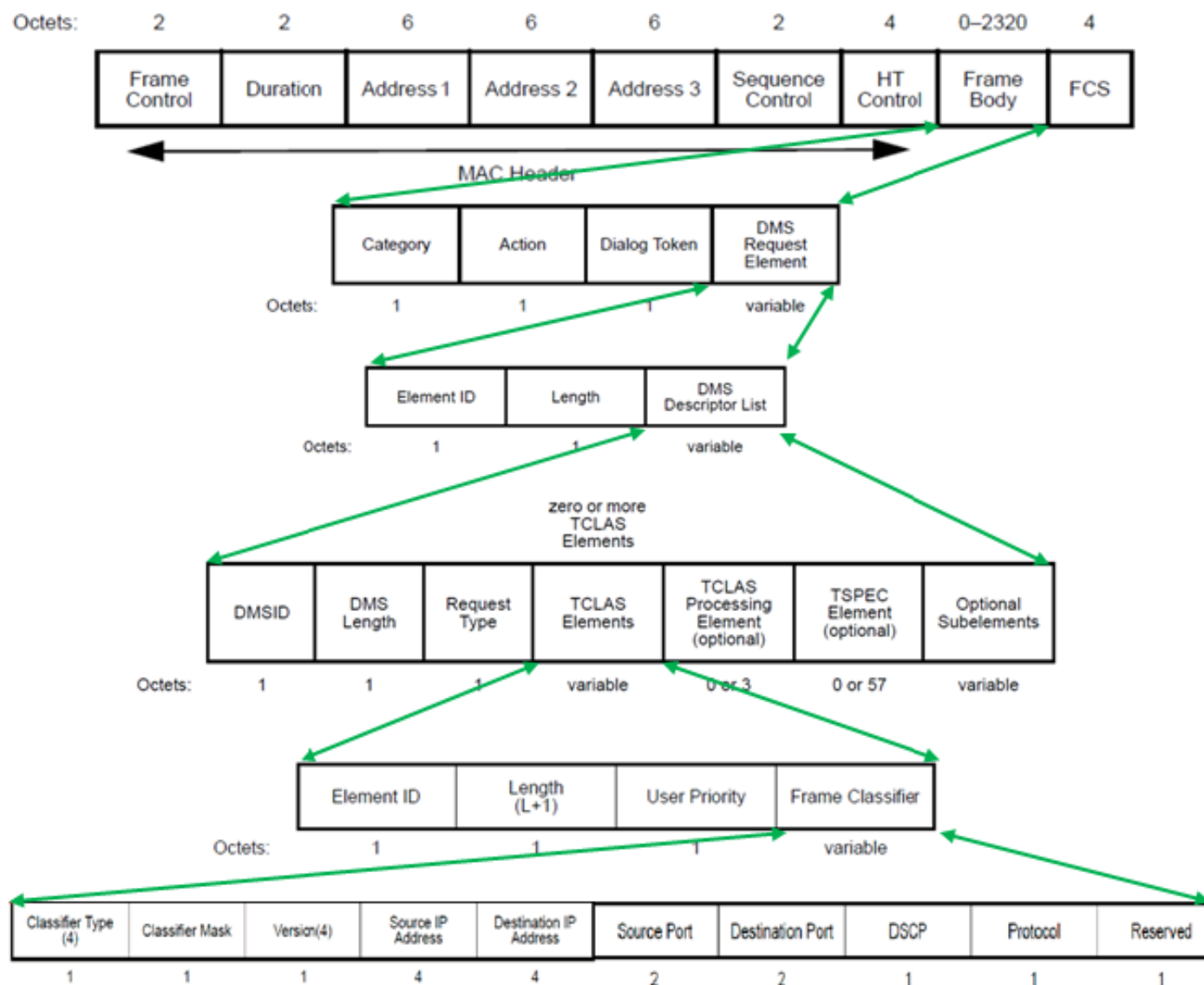
支持DMS的客户端可以请求AP (接入点) 以单播方式发送组播流, 如动态媒体流功能。

有关媒体流的详细信息: [VideoStream部署指南](#)

如果不使用DMS, 客户端必须唤醒每个DTIM间隔才能接收组播流量。使用DMS时, AP (接入点) 会缓冲特定客户端的组播流量, 当客户端唤醒时, 它会发送单播帧以请求此流量。它使客户端可以长时间睡眠并节省电池电量。组播帧以单播方式通过空中传输, 以比没有DMS时更高的数据速率发送。

无线客户端可以发送DMS请求类型Add帧, 以请求AP以单播方式发送一个或多个特定组播流的流量。

管理帧 — DMS请求类型



DMS请求有三种类型:

描述 请求类型值

添加 0
 删除 1
 更改 2
 预留 3-255

DMS request-Add包括DMS描述符。

在DMS描述符列表内有TCLAS元素，该元素指定无线客户端请求作为单播获取的组播流量流。TCLAS指定源/目标IP地址、源/目标端口（除其他字段外）。

AP将这些流量以单播方式发送到无线客户端，并且它继续将这些流以组播形式发送到网络中不支持DMS的任何其他客户端。

在DMS请求帧中，还可以有TSPEC元素（可选），无线客户端可以在其中定义流量的QoS要求和特征。

注意：不支持TSPEC

在本示例中，客户端发送了DMS请求(管理帧，类别代码10:WNM，操作代码23:DMS请求，用于组224.0.0.251上的组播流IPv4,UDP（协议17），目的端口9（在本文中，wireshark无法完全解码DMS请求）。

The screenshot shows a Wireshark capture of a DMS Request frame. The packet list pane shows the frame structure, with the IEEE 802.11 wireless LAN management frame expanded to show fixed parameters (Category code: WNM (10), Action code: DMS Request (23)) and tagged parameters (27 bytes). A red box highlights the [Malformed Packet: IEEE 802.11] error.

The packet bytes pane shows the hex dump of the frame. The following table summarizes the key fields from the hex dump:

Offset	Hex	Field	Value
0028	11110000 11011101	Category	10
0028	00000000 00000000	Action	23
0028	00000000 00000000	Dial.Token	00000000
0028	00000000 00000000	Element-ID	00000000
0028	00000000 00000000	Length	00000000
0028	00000000 00000000	DMS ID	00000000
0030	00000000 00000000	DMS Length	00000000
0030	00000000 00000000	Req-Type	00000000
0030	00000000 00000000	Ele-ID-TCLAS	00000000
0030	00000000 00000000	Length (L+1)	00000000
0030	00000000 00000000	User Priority	00000000
0030	00000000 00000000	Classif.Type	00000000
0030	00000000 00000000	Classif.Mask	00000000
0030	00000000 00000000	Version (4)	00000000
0038	00000000 00000000	Source IP address	00000000
0038	00000000 00000000	Destination IP address	00000000
0040	00000000 00000000	Source Port	00000000
0040	00000000 00000000	Destination Port	00000000
0040	00000000 00000000	DSCP	00000000
0040	00000000 00000000	Protocol	00111111
0048	11001100 01010000 10111000	Header	11001100 01010000 10111000

3... Apple 58:95:0a CiscoInc 7d:d9:10 802.11 DMS Request[Malformed Packet]

```

+ Frame 34853: 75 bytes on wire (600 bits), 75 bytes captured (600 bits) on interface 0
+ Radiotap Header v0, Length 18
+ 802.11 radio information
+ IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    - Category code: WNM (10)
    - Action code: DMS Request (23)
  + Tagged parameters (27 bytes)
  + [Malformed Packet: IEEE 802.11]

```

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..
0008	00010000	00000010	10000101	00001001	10100000	00000000	11011010	00000101	.....
0010	00000000	00000000	11010000	00000000	00111010	00000001	01111100	00001110	.....|.
0018	11001110	01111101	11011001	00010000	10100100	11110001	11101000	01011000	.}.....X
0020	10010101	00001010	01111100	00001110	11001110	01111101	11011001	00010000	..|}...
0028	11110000	11011101	00001010	00010111	00000101	01100011	00011000	00000000	.....C..
0030	00010110	00000000	00001110	00010011	00000000	00000100	01010101	00000100	.....U.
0038	00000000	00000000	00000000	00000000	11100000	00000000	00000000	11111011	.....
0040	00000000	00000000	00000000	00001001	00000000	00010001	00000000	00111111	.....P
0048	11001100	01010000	10111000						.P.

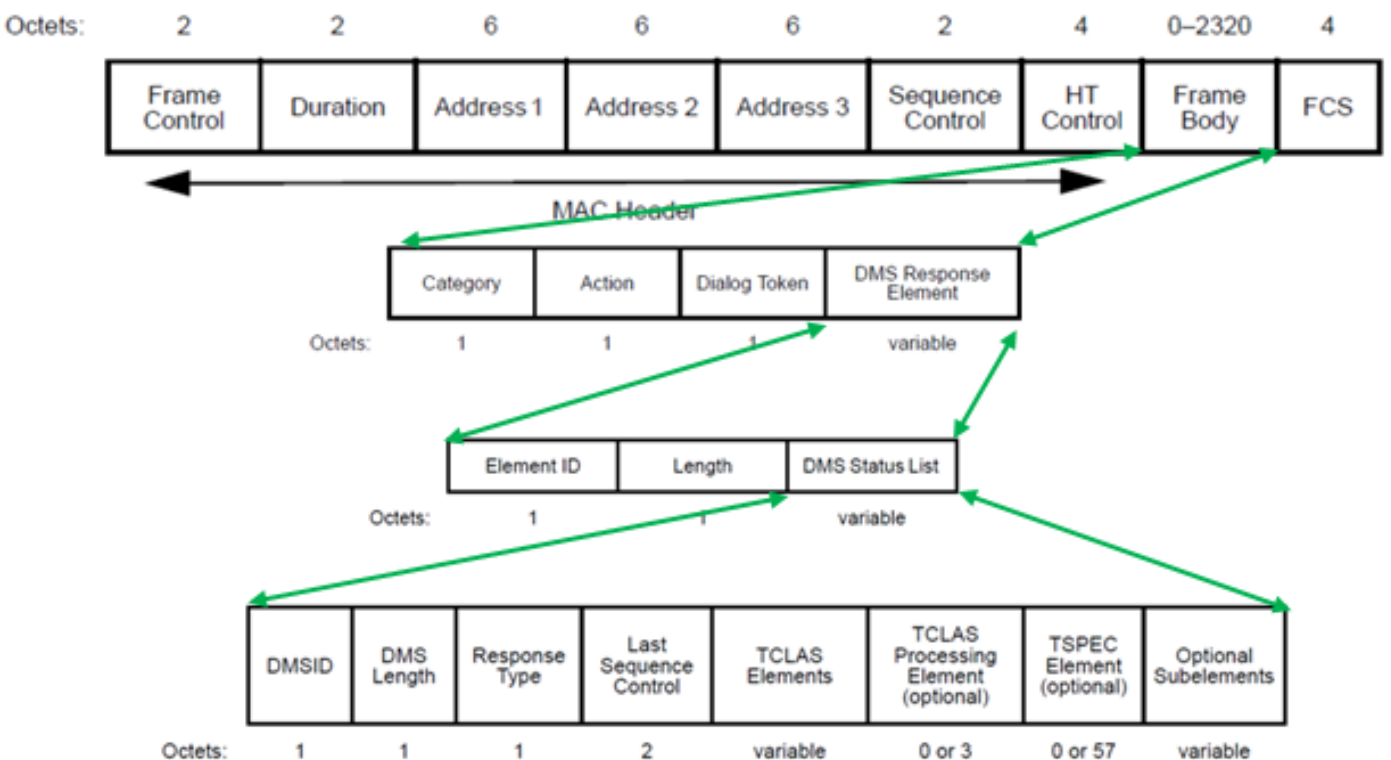
AP使用DMS响应（可以是DMS响应—接受或DMS响应—拒绝）来响应DMS请求。

如果AP发送DMS response-Accept，它还会向该通信流分配DMSID。

DMS请求类型更改可由无线客户端用于修改现有的DMSID，例如为流量请求不同的TSPEC。

注意：不支持DMS更改

管理帧 — DMS响应类型



DMS响应类型有三种：

域值 描述

- 0 接受
- 1 拒绝
- 2 终止
- 3-255 预留

在本示例中，AP发送了DMS Response-Accept，并将DMS ID 1分配给客户端发送的DMS请求。

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..
0008	00010000	00000010	10000101	00001001	10100000	00000000	11010101	00000101	.....
0010	00000000	00000000	11010000	00000000	11011010	00000000	10100100	11110001	.....
0018	11101000	01011000	10010101	00001010	01111100	00001110	11001110	01111101	.X..|..}
0020	11011001	00010000	01111100	00001110	11001110	01111101	11011001	00010000	..|..}..
0028	01110000	01000000	Category	Action	Dial.Token	Element-ID	Length	DMS ID	p@...d..
0030	DMS Length	Resp- Type	Last Sequence Control	10011100	00101011	10011110	00000011+..	

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..
0008	00010000	00000010	10000101	00001001	10100000	00000000	11010101	00000101	.....
0010	00000000	00000000	11010000	00000000	11011010	00000000	10100100	11110001	.....
0018	11101000	01011000	10010101	00001010	01111100	00001110	11001110	01111101	.X..|..}
0020	11011001	00010000	01111100	00001110	11001110	01111101	11011001	00010000	..|..}..
0028	01110000	01000000	00001010	00011000	00000101	01100100	00000101	00000001	p@...d..
0030	00000011	00000000	11111111	11111111	10011100	00101011	10011110	00000011+..

之后，如果端口9上有目的组为224.0.0.251的数据包，它将以组播形式发送到空中，并在AP上缓冲，直到发送DMS请求的客户端处于唤醒状态时，客户端才能以单播形式接收该数据包。

这是在作为常规组播发送的端口9上分组224.0.0.251的数据包目的地的示例。请注意，接收方和目的MAC地址是指组播组。

```
+ Radiotap Header v0, Length 18
+ 802.11 radio information
- IEEE 802.11 Data, Flags: .....F.C
  Type/Subtype: Data (0x0020)
+ Frame Control Field: 0x0802
  .... 0000 0000 0000 0000 = Duration: 0 microseconds
  Receiver address: IPv4mcast fb (01:00:5e:00:00:fb)
  Destination address: IPv4mcast_fb (01:00:5e:00:00:fb)
  Transmitter address: CiscoInc_7d:d9:10 (7c:0e:ce:7d:d9:10)
  Source address: IntelCor_7c:30:58 (e4:b3:18:7c:30:58)
  BSS Id: CiscoInc_7d:d9:10 (7c:0e:ce:7d:d9:10)
  STA address: IPv4mcast_fb (01:00:5e:00:00:fb)
  .... .... .... 0000 = Fragment number: 0
  0110 0000 0010 .... = Sequence number: 1538
  Frame check sequence: 0xb8fad31e [correct]
  [FCS Status: Good]
+ Logical-Link Control
+ Internet Protocol Version 4, Src: 172.16.0.51, Dst: 224.0.0.251
- User Datagram Protocol, Src Port: 59887, Dst Port: 9
  Source Port: 59887
  Destination Port: 9
  Length: 110
  Checksum: 0x6288 [unverified]
  [Checksum Status: Unverified]
  [Stream index: 124]
```

这是以单播方式发送到发送DMS请求的客户端的帧的示例。此处，目的地址和接收地址是客户端的MAC地址，而不是组播MAC地址。组播数据包也作为AMSDU发送。

```

+ Radiotap Header v0, Length 21
+ 802.11 radio information
- IEEE 802.11 QoS Data, Flags: .....F.C
  Type/Subtype: QoS Data (0x0028)
+ Frame Control Field: 0x8802
  ... 000 0000 0010 1100 = Duration: 44 microseconds
  Receiver address: Apple 58:95:0a (a4:f1:e8:58:95:0a)
  Destination address: Apple 58:95:0a (a4:f1:e8:58:95:0a)
  Transmitter address: CiscoInc_7d:d9:10 (7c:0e:ce:7d:d9:10)
  Source address: IntelCor_7c:30:58 (e4:b3:18:7c:30:58)
  BSS Id: CiscoInc_7d:d9:10 (7c:0e:ce:7d:d9:10)
  STA address: Apple_58:95:0a (a4:f1:e8:58:95:0a)
  .... .... .... 0000 = Fragment number: 0
  0000 0001 0000 .... = Sequence number: 16
  Frame check sequence: 0x174f6716 [correct]
  [FCS Status: Good]
+ Qos Control: 0x0083
- IEEE 802.11 Aggregate MSDU
  - A-MSDU Subframe #1
    Destination address: IPv4mcast_00 (01:00:5e:00:00:00)
    Source address: IntelCor_7c:30:58 (e4:b3:18:7c:30:58)
    A-MSDU Length: 138
    + Logical-Link Control
    + Internet Protocol Version 4, Src: 172.16.0.51, Dst: 224.0.0.251
    - User Datagram Protocol, Src Port: 59887, Dst Port: 9
      Source Port: 59887
      Destination Port: 9
      Length: 110
      Checksum: 0x6288 [unverified]
      [Checksum Status: Unverified]
      [Stream index: 124]

```

当无线客户端不再想以单播方式接收组播流时，它可以发送新的DMS请求来关闭该流，它使用之前由AP分配的DMS ID。这是DMS请求 — 删除类型(1)

```

49165 133.314820 Apple 58:95:0a CiscoInc 7d:d9:10 802.11 DMS Request
+ Frame 49165: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface 0
+ Radiotap Header v0, Length 18
+ 802.11 radio information
+ IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    Category code: WNM (10)
    Action code: DMS Request (23)
  + Tagged parameters (6 bytes)

```

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..
0008	00010000	00000010	10000101	00001001	10100000	00000000	11011101	00000101	.....
0010	00000000	00000000	11010000	00000000	00111010	00000001	01111100	00001110	.....|. .
0018	11001110	01111101	11011001	00010000	10100100	11110001	11101000	01011000	.}.....X
0020	10010101	00001010	01111100	00001110	11001110	01111101	11011001	00010000	..|.}..
0028	11110000	11100001	Category	Action	DiidToken	Element-ID	Length	DMS ID	...C..
0030	DMS Length	Req-Type	11010110	10111000	00111001	00110100			...94

49165 133.314820 Apple 58:95:0a CiscoInc 7d:d9:10 802.11 DMS Request

```

+ Frame 49165: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface 0
+ Radiotap Header v0, Length 18
+ 802.11 radio information
+ IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    - Category code: WNM (10)
    - Action code: DMS Request (23)
  + Tagged parameters (6 bytes)

```

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..
0008	00010000	00000010	10000101	00001001	10100000	00000000	11011101	00000101	.....
0010	00000000	00000000	11010000	00000000	00111010	00000001	01111100	00001110	.....|.
0018	11001110	01111101	11011001	00010000	10100100	11110001	11101000	01011000	.}.....X
0020	10010101	00001010	01111100	00001110	11001110	01111101	11011001	00010000	..|...}..
0028	11110000	11100001	00001010	00010111	00000110	01100011	00000011	00000001	...C..
0030	00000001	00000001	11010110	10111000	00111001	00110100			...94

AP通过DMS响应类型终止(2)确认此终止

49170 133.317305 CiscoInc 7d:d9:... Apple 58:95:0a 802.11 DMS Response

```

+ Frame 49170: 56 bytes on wire (448 bits), 56 bytes captured (448 bits) on interface 0
+ Radiotap Header v0, Length 18
+ 802.11 radio information
+ IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    - Category code: WNM (10)
    - Action code: DMS Response (24)
  + Tagged parameters (8 bytes)

```

0000	00000000	00000000	00010010	00000000	00101110	01001000	00000000	00000000	.....H..	
0008	00010000	00000010	10000101	00001001	10100000	00000000	11010101	00000101	.....	
0010	00000000	00000000	11010000	00000000	11011010	00000000	10100100	11110001	.....	
0018	11101000	01011000	10010101	00001010	01111100	00001110	11001110	01111101	.X..|..}		
0020	11011001	00010000	01111100	00001110	11001110	01111101	11011001	00010000	..|...}..	
0028	01100000	01100000			Category	Action	DialToken	Element-ID	Length	DMS ID	01
0030		DMS Length	Resp- Type	Last Sequence Control							00111010 10011010 00010001 00000100


```

49170 133.317305 CiscoInc 7d:d9:... Apple 58:95:0a      802.11      DMS Response
+ Frame 49170: 56 bytes on wire (448 bits), 56 bytes captured (448 bits) on interface 0
+ Radiotap Header v0, Length 18
+ 802.11 radio information
+ IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    - Category code: WNM (10)
    - Action code: DMS Response (24)
  + Tagged parameters (8 bytes)
0000  00000000 00000000 00010010 00000000 00101110 01001000 00000000 00000000  .....H..
0008  00010000 00000010 10000101 00001001 10100000 00000000 11010101 00000101  .....
0010  00000000 00000000 11010000 00000000 11011010 00000000 10100100 11110001  .....
0018  11101000 01011000 10010101 00001010 01111100 00001110 11001110 01111101  .X..|..}
0020  11011001 00010000 01111100 00001110 11001110 01111101 11011001 00010000  ..|..}..
0028  01100000 01100000 00001010 00011000 00000110 01100100 00000101 00000001  ``...d..
0030  00000011 00000010 11111111 11111111 00111010 10011010 00010001 00000100  ....:...

```

BSS最大空闲期：

当AP在一段时间内不再从无线客户端接收帧时，它会假设客户端离开网络并取消其关联。BSS Max idle period是AP在无需接收任何帧（客户端可以保持睡眠）的情况下保持客户端关联的时间量。此值通过关联和重新关联响应帧通知无线客户端。这样，客户端可以长时间保持睡眠状态，并节省电池电量。

BSS最大空闲期仅在关联响应或重新关联响应帧中显示

```

+ 802.11 radio information
+ IEEE 802.11 Association Response, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  + Fixed parameters (6 bytes)
  - Tagged parameters (153 bytes)
    + Tag: Supported Rates 1(B), 2(B), 5.5(B), 11(B), 6, 9, 12, 18, [Mbit/sec]
    + Tag: Extended Supported Rates 24, 36, 48, 54, [Mbit/sec]
    + Tag: HT Capabilities (802.11n D1.10)
    + Tag: HT Information (802.11n D1.10)
    + Tag: Extended Capabilities (4 octets)
    - Tag: BSS Max Idle Period
      - Tag Number: BSS Max Idle Period (90)
      - Tag length: 3
      - BSS Max Idle Period (1000 TUs): 400
      - .0 = BSS Max Idle Period Options: Protected Keep-Alive Required: 0
    + Tag: Vendor Specific: Microsoft: WMM/WME: Parameter Element
    + Tag: QoS Map Set

```

BSS最大空闲期以1000 TU（时间单位）为单位指定。每次单位等于1.024毫秒

空闲超时 = 1.024 x BSS最大空闲时间 = X秒

在示例帧中：

空闲超时 = 1.024 x 405 = 414.72秒

如果“保护保持连接所需”位设置为1，则意味着无线客户端必须向AP发送RSN保护帧以重置空闲计时器。如果设置为0（如本例所示），无线客户端可以发送任何类型的帧（受保护或未受保护）来重

置AP的空闲计时器。

BSS过渡管理

802.11v BSS过渡管理请求是给客户端的建议。客户可以自行决定是否遵循建议。如果启用了取消关联即刻功能，则可强制取消客户端关联。如果客户端未重新关联到建议的AP之一，则会在一段时间后取消关联客户端。

802.11v BSS过渡适用于以下四种情况：

请求

无线客户端在漫游之前发送802.11v BSS过渡管理查询，以获取更好的AP选项以重新关联。

802.11v BSS过渡管理查询示例

The image displays two screenshots of a network traffic analysis tool (Wireshark) showing an IEEE 802.11v BSS Transition Management Query frame. The top screenshot shows the frame structure, with the 'Tagged parameters (2 bytes)' field highlighted in red. The bottom screenshot shows the raw data of the tagged parameters, with four fields highlighted: Category (red), Action (green), DialToken (orange), and QReason (blue).

Offset	Hex	ASCII
0000	00000000 00000000 00010010 00000000 00101110 01001000 00000000 00000000	.....H..
0008	00010000 00000010 10000101 00001001 10100000 00000000 11101011 00000101	.....
0010	00000000 00000000 11010000 00000000 00111010 00000001 01111100 00001110	.....|.
0018	11001110 01111101 11011001 00010000 11000100 01111101 01001111 00111010	.}...}0:
0020	00001111 01011100 01111100 00001110 11001110 01111101 11011001 00010000	.\\|...}..
0028	11100000 11110010 Category Action DialToken QReason 00110001 10001001	.....1.
0030	01110101 01001111	u0

QReason表示BSS过渡查询原因，这是客户端请求候选AP列表的原因。在本示例中，客户端发送了与低RSSI对应的原因16。有关转换查询原因的完整列表，请参阅IEEE 802.11-2012的表8-138。

无线电收到此帧后，会以BSS过渡管理请求作出响应，以提供AP候选列表。

```
1098 2.522295 CiscoInc 7d:d9:... CiscoInc 3a:0f:5c 802.11 BSS Transition Management Request
Frame 1098: 122 bytes on wire (976 bits), 122 bytes captured (976 bits) on interface 0
Radiotap Header v0, Length 18
802.11 radio information
IEEE 802.11 Action, Flags: .....C
IEEE 802.11 wireless LAN management frame
  Fixed parameters
    Category code: WNM (10)
    Action code: BSS Transition Management Request (7)
    Dialog token: 0x06
    .... ..1 = Preferred Candidate List Included: 1
    .... ..0. = Abridged: 0
    .... .1.. = Disassociation Imminent: 1
    .... 0... = BSS Termination Included: 0
    ...0 .... = ESS Disassociation Imminent: 0
    Disassociation Timer: 1953
    Validity Interval: 200
    BSS Transition Candidate List Entries: 344300c88b262cd0e7020000000607000000000000000000...
```

未经请求的负载均衡请求

当WLC启用了负载均衡功能+ BSS转换时，当AP负载过重时，AP不再向无线客户端发送去身份验证帧，它会发送BSS转换管理请求，以建议无线客户端另一个负载较轻的AP。

有关负载均衡功能的详细信息：[配置主动负载均衡](#)

未经请求的优化漫游请求

当WLC启用了优化漫游+ BSS过渡时，当客户端不满足最小RSSI（或与优化漫游相关的任何其他参数）时，AP不再向无线客户端发送去身份验证帧，它会发送BSS过渡管理，以建议无线客户端使用更好的AP。

有关优化漫游功能的详细信息：[思科优化漫游](#)

FRA AP上的客户端转向（灵活无线电分配）

如果客户端连接到FRA AP中较不优化的信元，AP会向此客户端发送802.11v BSS过渡管理请求。

当支持FRA的AP（如2800或3800）仅使用5GHz时，有两个信元（微信元和宏信元）。如果客户端连接到宏信元，但微信元更优（基于RSSI），则AP向BSS转换管理请求发送802.11v以建议移动蜂窝，反之亦然。

此功能自8.2.110.0版起提供。

有关FRA的详细信息：[灵活的无线电分配\(FRA\)和冗余无线电](#)

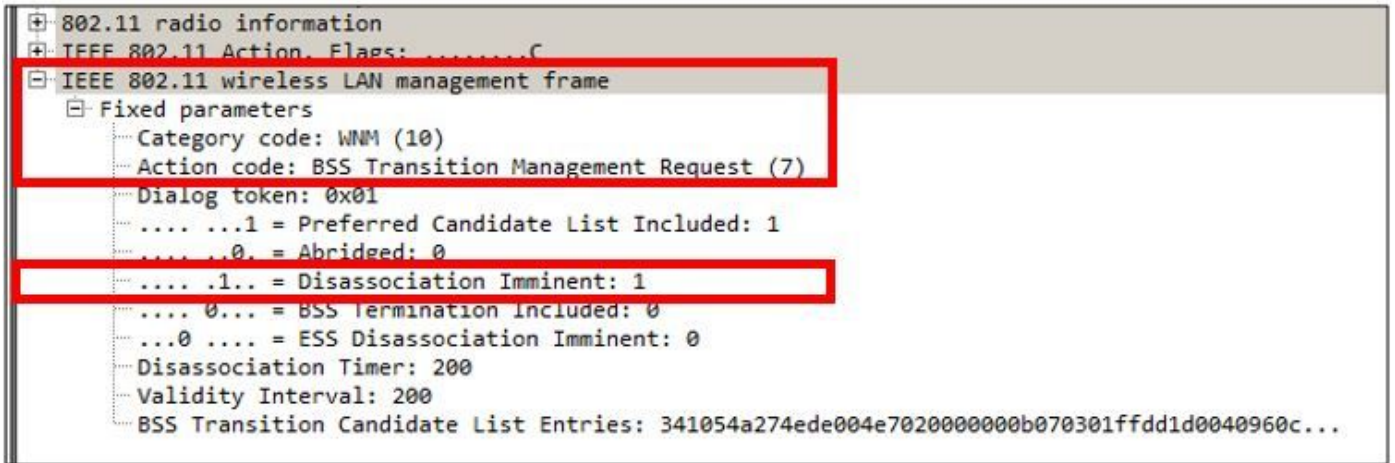
即将解除关联

在BSS过渡管理请求中，可以添加取消关联即刻字段。此功能是在一段时间后取消关联客户端，如果客户端未重新关联到其他AP。

当未经请求的优化漫游请求被触发时，AP向客户端发送BSS过渡管理请求，并等待一段时间（在优化漫游取消关联计时器下配置的时间），如果客户端在该时间段内未漫游到更好的AP，则AP完成客户端的取消关联。

当未经请求的负载平衡请求被触发时，AP向客户端发送BSS过渡管理请求，并等待一段时间（在取消关联计时器下配置的时间），如果客户端在该时间段内不漫游到较不拥塞的AP，则AP完成客户端的取消关联。

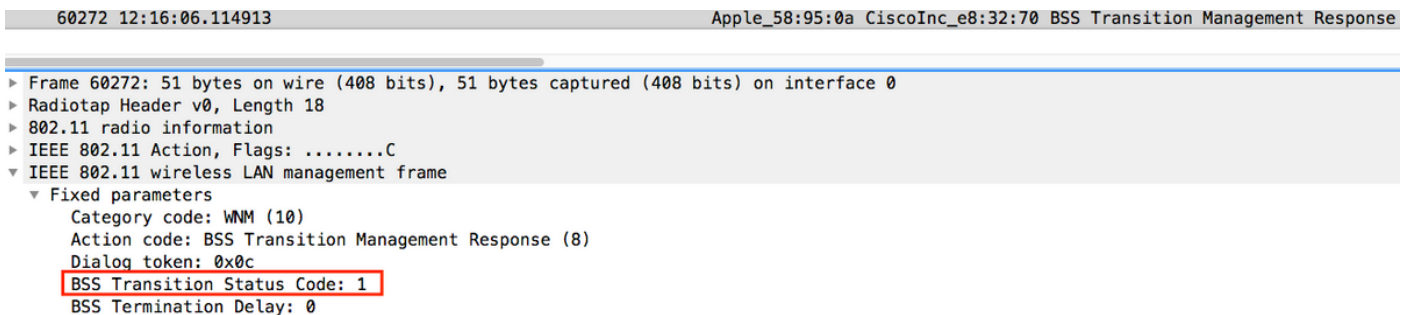
启用取消关联即将的BSS过渡管理帧示例：



BSS过渡管理响应

在无线客户端收到BSS过渡管理请求后，它可以或不能发送BSS过渡管理响应。如果客户端转换到另一个AP，则会发送状态代码为Accept的AP，但如果由于多种原因计划保持在同一AP上，则会发送状态代码为Reject的AP，并加上拒绝的原因。

BSS过渡管理响应帧示例



在本示例中，无线客户端拒绝AP候选列表，不漫游到其他AP。状态代码1显示客户端离开ESS的原因。有关状态代码定义的完整列表，请参阅IEEE 802.11-2012的表8-253。

先决条件

要求

要利用WLAN的802.11v功能，需要有支持802.11v的无线客户端。

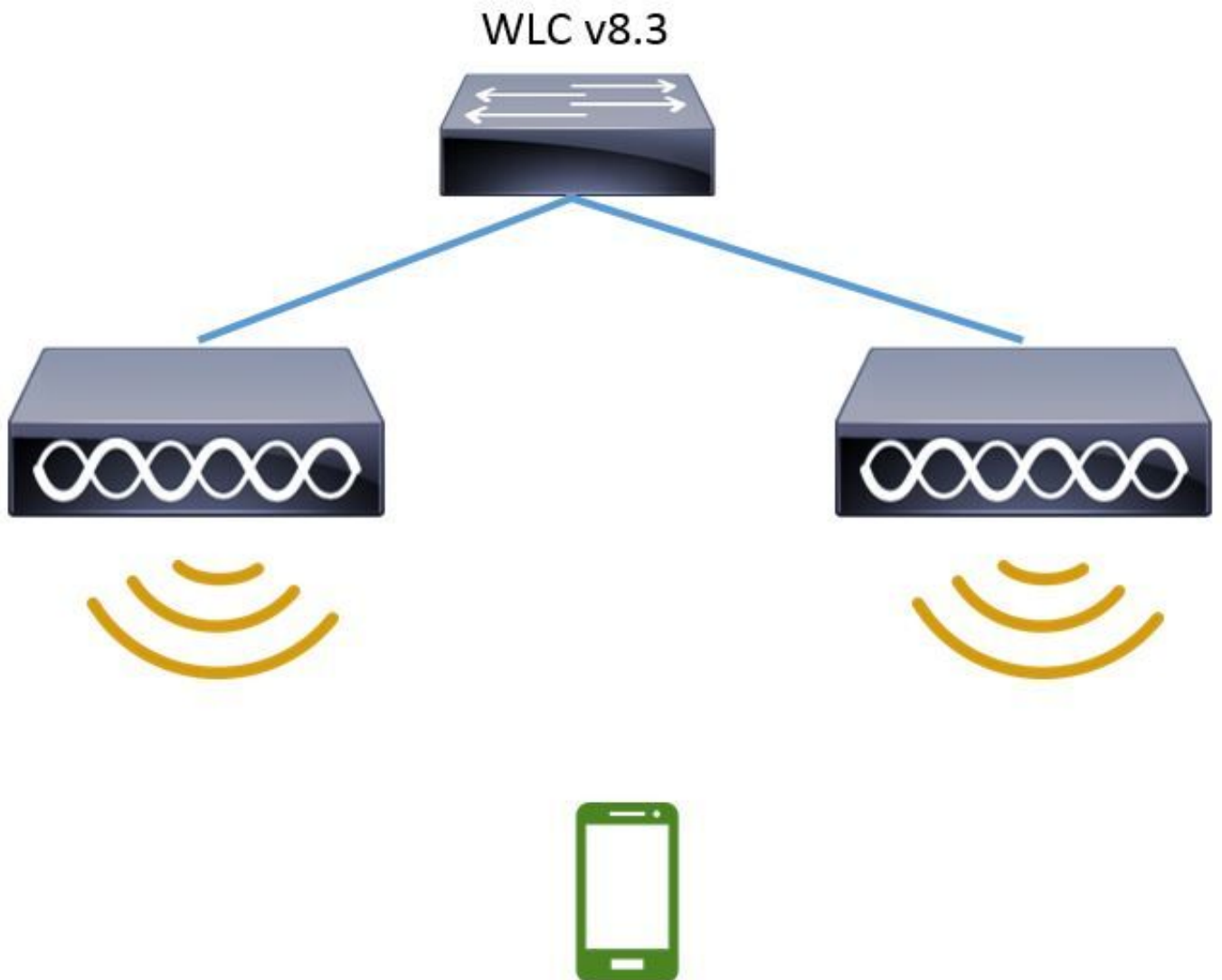
使用的组件

WLC v8.3

Ipod Touch第6代v10.1.1

配置

网络图



配置

定向组播服务(DMS)

通过WLAN配置以启用DMS:

CLI配置 :

```
> config wlan disable <wlan-id>  
> config wlan dms enable <wlan-id>  
> config wlan enable <wlan-id>
```

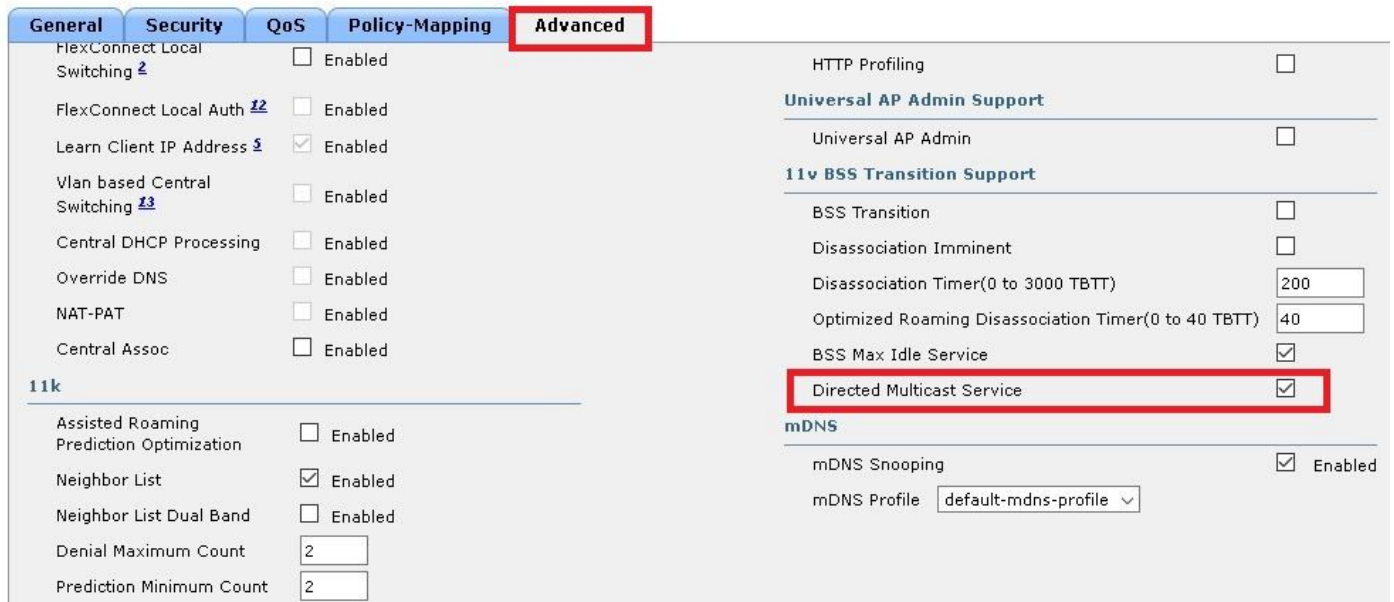
GUI配置 (从8.3版提供)

步骤1.导航至WLANs > Wlan-ID , 然后单击WLAN启用DMS。



步骤2. 导航至“高级”>“11v BSS过渡支持”并启用“定向组播服务”

WLANs > Edit '11v'



BSS最大空闲期管理

通过WLAN配置以启用BSS最大空闲期管理：

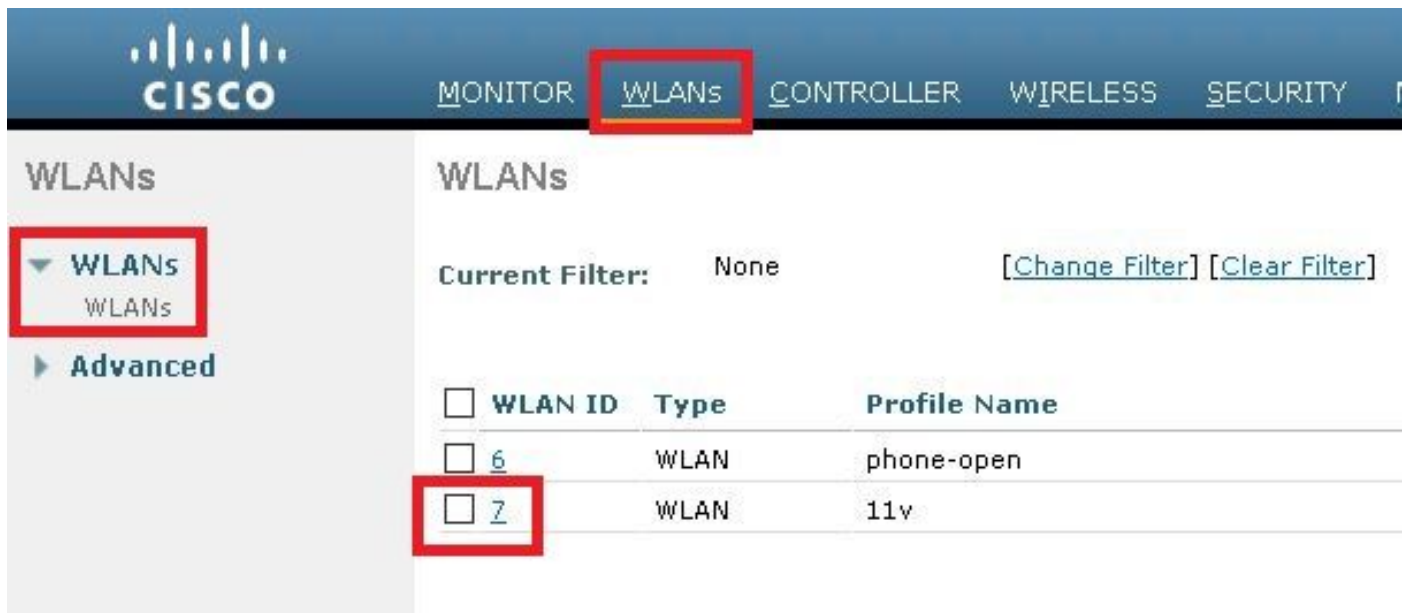
CLI配置：

```
> config wlan disable <wlan-id>
> config wlan bssmaxidle enable <wlan-id>
> config wlan usertimeout <seconds> <wlan-id>
> config wlan enable <wlan-id>
```

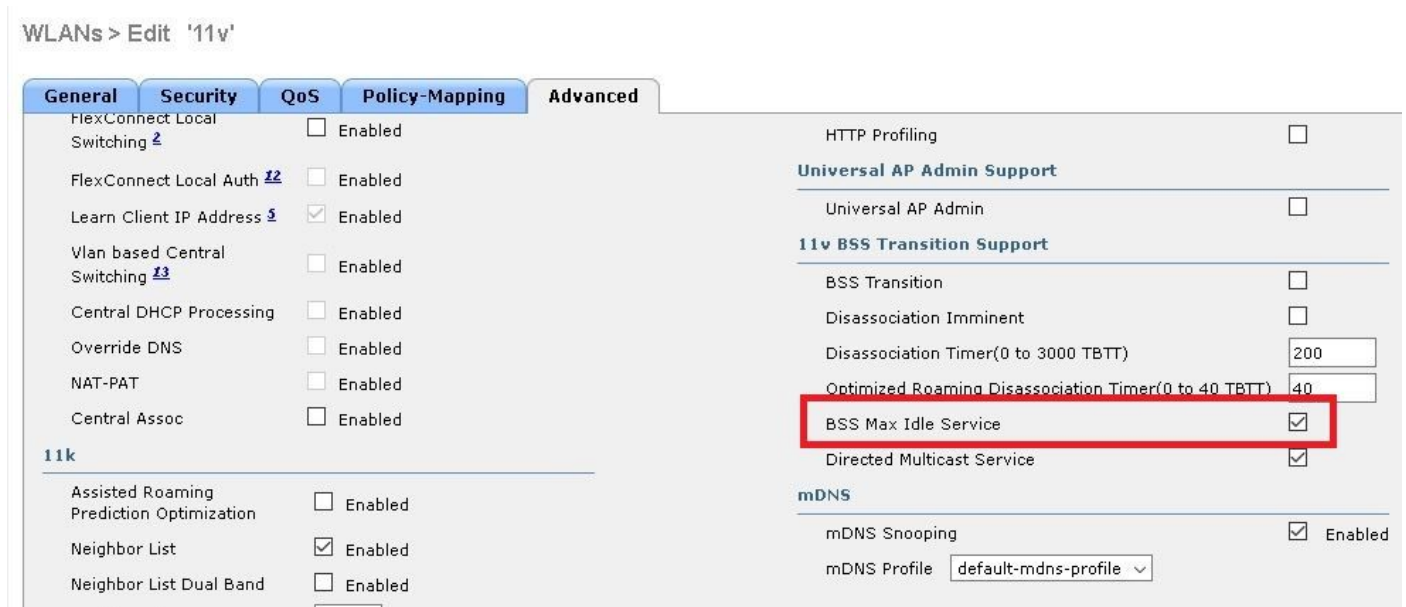
<seconds> Client Idle timeout(in seconds) on this WLAN. Range 0,15-100000 secs. 0 in order to disable

GUI配置：

步骤1.导航至WLANs > WLAN-ID，然后单击WLAN设置BSS最大空闲期。



步骤2.导航至“高级”>“11v BSS过渡支持”并启用BSS最大空闲服务。



注意：此GUI选项在8.3版中引入。对于以前的版本，请使用命令`config wlan bsmaxidle enable <wlan-id>`

步骤3.导航至Advanced > Client User Idle timeout，并设置超时值（以秒为单位）。

General	Security	QoS	Policy-Mapping	Advanced					
Static IP Forwarding ==		<input type="checkbox"/> Enabled							
Wi-Fi Direct Clients Policy		Disabled							
Maximum Allowed Clients Per AP Radio		200							
Clear HotSpot Configuration		<input type="checkbox"/> Enabled							
Client user idle timeout(15-100000)		<input checked="" type="checkbox"/>	400	Timeout Value (secs)					
Client user idle threshold (0-10000000)		0	Bytes						
Radius NAI-Realm		<input type="checkbox"/>							
11ac MU-MIMO		<input checked="" type="checkbox"/>							
Off Channel Scanning Defer									
Scan Defer Priority		0	1	2	3	4	5	6	7
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scan Defer Time(msecs)		100							
FlexConnect									

BSS过渡管理

通过WLAN配置以启用BSS过渡管理：

注意：如果仅启用BSS过渡，则接入点发送BSS过渡管理请求帧的唯一方式是无线客户端发送BSS过渡管理查询帧。

注意：要使AP在BSS过渡管理请求负载过重时发送这些请求，需要启用BSS过渡+负载均衡。

注意：要使AP在无线客户端没有最佳RSSI时发送BSS过渡管理请求，需要启用BSS过渡+优化漫游。

请求

CLI配置：

```
> config wlan disable <wlan-id>
```



```
> config wlan bss-transition enable <wlan-id>
> config wlan enable <wlan-id>
```

GUI配置：

步骤1.导航至WLANs > WLAN ID > Advanced，然后启用BSS Transition。

WLANs > Edit '11v'

General	Security	QoS	Policy-Mapping	Advanced
FlexConnect Local Switching 2	<input type="checkbox"/>	Enabled		HTTP Profiling <input type="checkbox"/>
FlexConnect Local Auth 22	<input type="checkbox"/>	Enabled		Universal AP Admin Support
Learn Client IP Address 5	<input checked="" type="checkbox"/>	Enabled		Universal AP Admin <input type="checkbox"/>
Vlan based Central Switching 43	<input type="checkbox"/>	Enabled		11v BSS Transition Support
Central DHCP Processing	<input type="checkbox"/>	Enabled		BSS Transition <input checked="" type="checkbox"/>
Override DNS	<input type="checkbox"/>	Enabled		Disassociation Imminent <input type="checkbox"/>
NAT-PAT	<input type="checkbox"/>	Enabled		Disassociation Timer(0 to 3000 TBTT) <input type="text" value="200"/>
Central Assoc	<input type="checkbox"/>	Enabled		Optimized Roaming Disassociation Timer(0 to 40 TBTT) <input type="text" value="40"/>
11k				BSS Max Idle Service <input checked="" type="checkbox"/>
Assisted Roaming Prediction Optimization	<input type="checkbox"/>	Enabled		Directed Multicast Service <input checked="" type="checkbox"/>
Neighbor List	<input checked="" type="checkbox"/>	Enabled		mDNS
Neighbor List Dual Band	<input type="checkbox"/>	Enabled		mDNS Snooping <input checked="" type="checkbox"/> Enabled
Denial Maximum Count	<input type="text" value="2"/>			mDNS Profile <input type="text" value="default-mdns-profile"/>
Prediction Minimum Count	<input type="text" value="2"/>			

未经请求的负载均衡请求

CLI配置：

```
> config wlan disable <wlan-id>
> config wlan bss-transition enable <wlan-id>
> config wlan load-balance allow enable <wlan-id>
> config wlan enable <wlan-id>
```

GUI配置：

步骤1.导航至WLANs > WLAN ID > Advanced，然后启用BSS过渡和客户端负载均衡。

General	Security	QoS	Policy-Mapping	Advanced
FlexConnect Local Switching 2	<input type="checkbox"/>	Enabled		HTTP Profiling <input type="checkbox"/>
FlexConnect Local Auth 22	<input type="checkbox"/>	Enabled		Universal AP Admin Support
Learn Client IP Address 1	<input checked="" type="checkbox"/>	Enabled		Universal AP Admin <input type="checkbox"/>
Vlan based Central Switching 23	<input type="checkbox"/>	Enabled		11v BSS Transition Support
Central DHCP Processing	<input type="checkbox"/>	Enabled		BSS Transition <input checked="" type="checkbox"/>
Override DNS	<input type="checkbox"/>	Enabled		Disassociation Imminent <input type="checkbox"/>
NAT-PAT	<input type="checkbox"/>	Enabled		Disassociation Timer(0 to 3000 TBTT) <input type="text" value="200"/>
Central Assoc	<input type="checkbox"/>	Enabled		Optimized Roaming Disassociation Timer(0 to 40 TBTT) <input type="text" value="40"/>
11k				
Assisted Roaming Prediction Optimization	<input type="checkbox"/>	Enabled		BSS Max Idle Service <input checked="" type="checkbox"/>
Neighbor List	<input checked="" type="checkbox"/>	Enabled		Directed Multicast Service <input checked="" type="checkbox"/>
Neighbor List Dual Band	<input type="checkbox"/>	Enabled		mDNS
Denial Maximum Count <input type="text" value="2"/>				mDNS Snooping <input checked="" type="checkbox"/> Enabled
Prediction Minimum Count <input type="text" value="2"/>				mDNS Profile <input type="text" value="default-mdns-profile"/>

General	Security	QoS	Policy-Mapping	Advanced
Layer2 Acl		<input type="text" value="None"/>		Management Frame Protection (MFP)
URL ACL		<input type="text" value="None"/>		MFP Client Protection 2 <input type="text" value="Optional"/>
P2P Blocking Action		<input type="text" value="Disabled"/>		DTIM Period (in beacon intervals)
Client Exclusion 3	<input checked="" type="checkbox"/>	Enabled	<input type="text" value="60"/> Timeout Value (secs)	802.11a/n (1 - 255) <input type="text" value="1"/>
Maximum Allowed Clients 4		<input type="text" value="0"/>		802.11b/g/n (1 - 255) <input type="text" value="1"/>
Static IP Tunneling 21	<input type="checkbox"/>	Enabled		NAC
Wi-Fi Direct Clients Policy		<input type="text" value="Disabled"/>		NAC State <input type="text" value="None"/>
Maximum Allowed Clients Per AP Radio		<input type="text" value="200"/>		Load Balancing and Band Select
Clear HotSpot Configuration	<input type="checkbox"/>	Enabled		Client Load Balancing <input checked="" type="checkbox"/>
Client user idle timeout(15-100000)	<input checked="" type="checkbox"/>	<input type="text" value="400"/> Timeout Value (secs)		Client Band Select <input type="checkbox"/>
Client user idle threshold (0-100000000)		<input type="text" value="0"/> Bytes		Passive Client
Radius NAI-Realm	<input type="checkbox"/>			Passive Client <input type="checkbox"/>
				Voice
				Media Session Snooping <input type="checkbox"/>

未经请求的优化漫游请求

CLI配置：

```
> config wlan disable <wlan-id>
> config wlan bss-transition enable <wlan-id>
> config wlan chd <wlan-id> enable
> config wlan enable <wlan-id>
> config advanced { 802.11a | 802.11b } optimized-roaming enable
```

GUI配置：

步骤1.导航至WLANs > WLAN ID > Advanced，并启用BSS过渡和覆盖盲区检测。

WLANs > Edit '11v'

General	Security	QoS	Policy-Mapping	Advanced
FlexConnect Local Switching 2	<input type="checkbox"/>	Enabled		HTTP Profiling <input type="checkbox"/>
FlexConnect Local Auth 22	<input type="checkbox"/>	Enabled		Universal AP Admin Support
Learn Client IP Address 1	<input checked="" type="checkbox"/>	Enabled		Universal AP Admin <input type="checkbox"/>
Vlan based Central Switching 23	<input type="checkbox"/>	Enabled		11v BSS Transition Support
Central DHCP Processing	<input type="checkbox"/>	Enabled		BSS Transition <input checked="" type="checkbox"/>
Override DNS	<input type="checkbox"/>	Enabled		Disassociation Imminent <input type="checkbox"/>
NAT-PAT	<input type="checkbox"/>	Enabled		Disassociation Timer(0 to 3000 TBTT) <input type="text" value="200"/>
Central Assoc	<input type="checkbox"/>	Enabled		Optimized Roaming Disassociation Timer(0 to 40 TBTT) <input type="text" value="40"/>
11k				BSS Max Idle Service <input checked="" type="checkbox"/>
Assisted Roaming Prediction Optimization	<input type="checkbox"/>	Enabled		Directed Multicast Service <input checked="" type="checkbox"/>
Neighbor List	<input checked="" type="checkbox"/>	Enabled		mDNS
Neighbor List Dual Band	<input type="checkbox"/>	Enabled		mDNS Snooping <input checked="" type="checkbox"/> Enabled
Denial Maximum Count	<input type="text" value="2"/>			mDNS Profile <input type="text" value="default-mdns-profile"/>
Prediction Minimum Count	<input type="text" value="2"/>			

WLANs > Edit '11v'

General	Security	QoS	Policy-Mapping	Advanced
Allow AAA Override	<input type="checkbox"/>	Enabled		
Coverage Hole Detection	<input checked="" type="checkbox"/>	Enabled		
Enable Session Timeout	<input type="checkbox"/>			
Aironet IE	<input type="checkbox"/>	Enabled		
Diagnostic Channel 18	<input type="checkbox"/>	Enabled		
Override Interface ACL	IPv4	<input type="text" value="None"/>		IPv6 <input type="text" value="None"/>
Layer2 Acl	<input type="text" value="None"/>			
URL ACL	<input type="text" value="None"/>			
P2P Blocking Action	<input type="text" value="Disabled"/>			
Client Exclusion 3	<input checked="" type="checkbox"/>	Enabled		<input type="text" value="60"/> Timeout Value (secs)
Maximum Allowed Clients 8	<input type="text" value="0"/>			

步骤2. 导航到“无线”>“高级”>“优化漫游”，并启用两个频段的“优化漫游”模式。有关“优化漫游”参数的详细信息，请参阅本文档：[高密度体验\(HDX\)部署指南，版本8.0](#)

即将解除关联

CLI配置：

```
> config wlan disable <wlan-id>
> config wlan bss-transition enable <wlan-id>
> config wlan disassociation-imminent enable <wlan-id>
> config wlan bss-transition disassociation-imminent oproam-timer <timer-in-TBTT> <WLAN id>
> config wlan bss-transition disassociation-imminent timer <timer-in-TBTT> <WLAN id>
> config wlan enable <wlan-id>
```

步骤1.导航至WLANs > WLAN ID > Advanced，启用BSS过渡、取消关联即将和设置取消关联计时器和优化漫游取消关联计时器。

GUI配置：

General	Security	QoS	Policy-Mapping	Advanced
FlexConnect Local Switching 2	<input type="checkbox"/>	Enabled		HTTP Profiling <input type="checkbox"/>
FlexConnect Local Auth 22	<input type="checkbox"/>	Enabled		Universal AP Admin Support
Learn Client IP Address 2	<input checked="" type="checkbox"/>	Enabled		Universal AP Admin <input type="checkbox"/>
Vlan based Central Switching 23	<input type="checkbox"/>	Enabled		11v BSS Transition Support
Central DHCP Processing	<input type="checkbox"/>	Enabled		BSS Transition <input checked="" type="checkbox"/>
Override DNS	<input type="checkbox"/>	Enabled		Disassociation Imminent <input type="checkbox"/>
NAT-PAT	<input type="checkbox"/>	Enabled		Disassociation Timer(0 to 3000 TBTT) <input type="text" value="200"/>
Central Assoc	<input type="checkbox"/>	Enabled		Optimized Roaming Disassociation Timer(0 to 40 TBTT) <input type="text" value="40"/>
11k				BSS Max Idle Service <input checked="" type="checkbox"/>
Assisted Roaming Prediction Optimization	<input type="checkbox"/>	Enabled		Directed Multicast Service <input checked="" type="checkbox"/>
Neighbor List	<input checked="" type="checkbox"/>	Enabled		mDNS
Neighbor List Dual Band	<input type="checkbox"/>	Enabled		mDNS Snooping <input checked="" type="checkbox"/> Enabled
Denial Maximum Count	<input type="text" value="2"/>			mDNS Profile <input type="text" value="default-mdns-profile"/>
Prediction Minimum Count	<input type="text" value="2"/>			

General	Security	QoS	Policy-Mapping	Advanced
FlexConnect Local Switching 2	<input type="checkbox"/>	Enabled		HTTP Profiling <input type="checkbox"/>
FlexConnect Local Auth 22	<input type="checkbox"/>	Enabled		Universal AP Admin Support
Learn Client IP Address 2	<input checked="" type="checkbox"/>	Enabled		Universal AP Admin <input type="checkbox"/>
Vlan based Central Switching 23	<input type="checkbox"/>	Enabled		11v BSS Transition Support
Central DHCP Processing	<input type="checkbox"/>	Enabled		BSS Transition <input checked="" type="checkbox"/>
Override DNS	<input type="checkbox"/>	Enabled		Disassociation Imminent <input checked="" type="checkbox"/>
NAT-PAT	<input type="checkbox"/>	Enabled		Disassociation Timer(0 to 3000 TBTT) <input type="text" value="200"/>
Central Assoc	<input type="checkbox"/>	Enabled		Optimized Roaming Disassociation Timer(0 to 40 TBTT) <input type="text" value="40"/>
11k				BSS Max Idle Service <input checked="" type="checkbox"/>
Assisted Roaming Prediction Optimization	<input type="checkbox"/>	Enabled		Directed Multicast Service <input checked="" type="checkbox"/>
				mDNS

注意：计时器以TBTT（目标信标传输时间）单位指定，即每个信标之间的间隔时间。默认情况下，每100毫秒发送一个信标，因此默认情况下1 TBTT = 100毫秒。计时器 = X TBTT/10 = x秒。

验证

这些图像显示了WLAN（无线局域网）和无线客户端对不同802.11v服务的支持。

SSID支持

- DMS

```

▷ 802.11 radio information
▷ IEEE 802.11 Beacon frame, Flags: .....C
└─ IEEE 802.11 Wireless LAN management frame
  └─ Fixed parameters (12 bytes)
    Timestamp: 0x0000002a95f28006
    Beacon Interval: 0.104448 [Seconds]
    ▷ Capabilities Information: 0x1011
  └─ Tagged parameters (267 bytes)
    ▷ Tag: SSID parameter set: tst-80211v
    ▷ Tag: Supported Rates 12(B), 18, 24, 36, 48, 54, [Mbit/sec]
    ▷ Tag: Traffic Indication Map (TIM): DTIM 0 of 0 bitmap
    ▷ Tag: Country Information: Country Code US, Environment Any
    ▷ Tag: QBSS Load Element 802.11e CCA Version
    ▷ Tag: HT Capabilities (802.11n D1.10)
    ▷ Tag: RSN Information
    ▷ Tag: HT Information (802.11n D1.10)
    └─ Tag: Extended Capabilities (8 octets)
      Tag Number: Extended Capabilities (127)
      Tag length: 8
      ▷ Extended Capabilities: 0x00 (octet 1)
      ▷ Extended Capabilities: 0x10 (octet 2)
      ▷ Extended Capabilities: 0x00 (octet 3)
      └─ Extended Capabilities: 0x04 (octet 4)
        .... 0 = Channel Usage: Not supported
        .... 0 = SSID List: Not supported
        .... 1 = DMS: Supported
        .... 0... = UTC TSF Offset: Not supported
        ...0 .... = Peer U-APSD Buffer STA Support: Not supported
        ..0. .... = TDLS Peer PSM Support: Not supported
        .0.. .... = TDLS channel switching: Not supported
        0... .... = Interworking: Not supported
      ▷ Extended Capabilities: 0x01 (octet 5)
      ▷ Extended Capabilities: 0x40 (octet 6)
      ▷ Extended Capabilities: 0x00 (octet 7)
      ▷ Extended Capabilities: 0x40 (octet 8)
    ▷ Tag: Cisco CCX1 CKIP + Device Name
    ▷ Tag: Vendor Specific: Aironet: Aironet DTPC Powerlevel 0x03
    ▷ Tag: VHT Capabilities (IEEE Std 802.11ac/D3.1)
    └─ Tag: VHT Operation (IEEE Std 802.11ac/D3.1)

```

- BSS过渡管理

```
IEEE 802.11 Beacon frame, Flags: .....C
IEEE 802.11 wireless LAN management frame
  Fixed parameters (12 bytes)
  Tagged parameters (231 bytes)
    Tag: SSID parameter set: tst-11v
    Tag: Supported Rates 11(B), 12, 18, 24, 36, 48, 54, [Mbit/sec]
    Tag: DS Parameter set: Current Channel: 11
    Tag: Traffic Indication Map (TIM): DTIM 0 of 0 bitmap
    Tag: Country Information: Country Code MX, Environment Any
    Tag: QBSS Load Element 802.11e CCA Version
    Tag: Power Constraint: 3
    Tag: ERP Information
    Tag: HT Capabilities (802.11n D1.10)
    Tag: RSN Information
    Tag: HT Information (802.11n D1.10)
    Tag: RM Enabled Capabilities (5 octets)
    Tag: Extended Capabilities (6 octets)
      Tag Number: Extended Capabilities (127)
      Tag length: 6
      Extended Capabilities: 0x00 (octet 1)
      Extended Capabilities: 0x10 (octet 2)
      Extended Capabilities: 0x08 (octet 3)
        .... 0 = TFS: Not supported
        .... ..0. = WNM-Sleep Mode: Not supported
        ..... 0 = TIM Broadcast: Not supported
        ... 1... = BSS Transition: Supported
        ...0 .... = QoS Traffic Capability: Not supported
        ..0. .... = AC Station Count: Not supported
        .0.. .... = Multiple BSSID: Not supported
        0... .... = Timing Measurement: Not supported
      Extended Capabilities: 0x00 (octet 4)
      Extended Capabilities: 0x01 (octet 5)
      Extended Capabilities: 0x40 (octet 6)
    Tag: Vendor Specific: Aironet: Aironet DTPC Powerlevel 0x02
      Tag Number: Vendor Specific (150)
```

客户端支持

- DMS

```

> 802.11 radio information
> IEEE 802.11 Association Request, Flags: .....C
< IEEE 802.11 wireless LAN management frame
  < Fixed parameters (4 bytes)
    > Capabilities Information: 0x1011
      Listen Interval: 0x0014
  < Tagged parameters (144 bytes)
    > Tag: SSID parameter set: tst-80211v
    > Tag: Supported Rates 12(B), 18, 24, 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 3, Max :22
    > Tag: Supported Channels
    > Tag: RSN Information
    > Tag: HT Capabilities (802.11n D1.10)
  < Tag: Extended Capabilities (4 octets)
    Tag Number: Extended Capabilities (127)
    Tag length: 4
    > Extended Capabilities: 0x00 (octet 1)
    > Extended Capabilities: 0x00 (octet 2)
    > Extended Capabilities: 0x00 (octet 3)
  < Extended Capabilities: 0x04 (octet 4)
    ....0 = Channel Usage: Not supported
    ....0 = SSID List: Not supported
    ... .1.. = DNS: Supported
    ....0... = UTC TSF Offset: Not supported
    ...0 .... = Peer U-APSD Buffer STA Support: Not supported
    ..0. .... = TDLS Peer PSM Support: Not supported
    .0.. .... = TDLS channel switching: Not supported
    0... .... = Interworking: Not supported
  > Tag: Vendor Specific: Broadcom
  > Tag: Vendor Specific: Epigram: HT Capabilities (802.11n D1.10)
  > Tag: Vendor Specific: Microsof: WMM/WME: Information Element

```

- BSS过渡管理


```
+ IEEE 802.11 Association Request, Flags: .....C
- IEEE 802.11 Wireless LAN management frame
  + Fixed parameters (4 bytes)
  - Tagged parameters (140 bytes)
    + Tag: SSID parameter set: tst-11v
    + Tag: Supported Rates 11(B), 12, 18, 24, 36, 48, 54, [Mbit/sec]
    + Tag: Power Capability Min: 5, Max :24
    + Tag: Supported Channels
    + Tag: RSN Information
    + Tag: HT Capabilities (802.11n D1.10)
    - Tag: Extended Capabilities (3 octets)
      Tag Number: Extended Capabilities (127)
      Tag length: 3
      + Extended Capabilities: 0x00 (octet 1)
      + Extended Capabilities: 0x00 (octet 2)
      - Extended Capabilities: 0x08 (octet 3)
        .... 0 = TFS: Not supported
        .... 0 = WMM-Sleep Mode: Not supported
        .... 0 = TIM Broadcast: Not supported
        .... 1... = BSS Transition: Supported
        .... 0 = QoS Traffic Capability: Not supported
        ..0. .... = AC Station Count: Not supported
        .0.. .... = Multiple BSSID: Not supported
        0... .... = Timing Measurement: Not supported
    + Tag: RM Enabled Capabilities (5 octets)
    + Tag: Vendor Specific: Broadcom
    + Tag: Vendor Specific: Epigram: HT Capabilities (802.11n D1.10)
    + Tag: Vendor Specific: Microsof: WMM/WME: Information Element
```

调试客户端活动

为了监控11v客户端活动，可使用以下命令。

```
> debug client <mac-add-of-client>
> debug mac addr <mac-add-of-client>
> debug 11v all enable
```

具有DMS功能的客户端

客户端支持11v

```
*apfMsConnTask_0: Nov 01 22:55:27.577: a4:f1:e8:58:95:0a Association received from mobile on
BSSID 7c:0e:ce:7d:d9:10 AP AP-3700-1
*apfMsConnTask_0: Nov 01 22:55:27.577: a4:f1:e8:58:95:0a Client is 11v BSS Transition capable
客户端发送组224.0.0.251 udp端口9的DMS请求，AP发送DMS accept
```

```
*apfMsConnTask_0: Nov 01 22:56:43.928: a4:f1:e8:58:95:0a Got action frame from this client.
*apfMsConnTask_0: Nov 01 22:56:43.928: a4:f1:e8:58:95:0a Received a 11v Action Frame with code
[23] from mobile station
*apfMsConnTask_0: Nov 01 22:56:43.928: Received 80211v_DMS_REQ Action Frame
*apfMsConnTask_0: Nov 01 22:56:43.928: WLAN-id : 1 | vap_ip : 1
*apfMsConnTask_0: Nov 01 22:56:43.928: a4:f1:e8:58:95:0a Posting msg of type:
APF_80211v_MSG_DMS_REQ for STA and LRAD:7c:0e:ce:7d:d9:10,slot:0, len:26
```

```

*apfMsConnTask_0: Nov 01 22:56:43.928: 11v g_msgQueue = 0x2b415828,          osapiMessageSend
rc = 0
*apf80211vTask: Nov 01 22:56:43.929: Tclas found:
*apf80211vTask: Nov 01 22:56:43.929: [
*apf80211vTask: Nov 01 22:56:43.929: Version = 4,
*apf80211vTask: Nov 01 22:56:43.929: Destination IP = 224.0.0.251,
*apf80211vTask: Nov 01 22:56:43.929: Destination Port = 9,
*apf80211vTask: Nov 01 22:56:43.929: Protocol = 17,
*apf80211vTask: Nov 01 22:56:43.929: ]
*apf80211vTask: Nov 01 22:56:43.929: a4:f1:e8:58:95:0a New client requesting DMS for this Tclas
*apf80211vTask: Nov 01 22:56:43.929: DMS Request IE processed: State: DMS_REQ_ADD_ACCEPTED
*apf80211vTask: Nov 01 22:56:43.929: DMS Response IE created.
*apf80211vTask: Nov 01 22:56:43.929: Element ID: 100, Length: 5
*apf80211vTask: Nov 01 22:56:43.929: DMS ID: 1, DMS Length: 3, Response Type: DMS_RESP_ACCEPT,
Last Sequence Control: 65535
*apf80211vTask: Nov 01 22:56:43.929: dmsRequestState = DMS_REQ_ADD_ACCEPTED
*apf80211vTask: Nov 01 22:56:43.929: a4:f1:e8:58:95:0a apf80211vSendPacketToMs: 802.11v Action
Frame sent successfully to wlc
*apf80211vTask: Nov 01 22:56:43.929: apf80211vDmsDB_AddSTA: New DMS Client: a4:f1:e8:58:95:0a
created and added under DMS ID: 1
*apf80211vTask: Nov 01 22:56:43.929: a4:f1:e8:58:95:0a apfPostDmsClientRequestMsg: posting
capwap for ms lrادمac7c:0e:ce:7d:d9:10
*apf80211vTask: Nov 01 22:56:43.929: 11v g_msgQueue = 0x2b415828,          osapiMessageSend rc
= 0
*apf80211vTask: Nov 01 22:56:43.929: a4:f1:e8:58:95:0a apf80211vHandleDmsMsgSend: send capwap
for STA lrادمac 7c:0e:ce:7d:d9:10

```

从客户端连接的AP

```
AP# debug dot11 dot11v all
```

```

*Nov  1 22:51:04.323: DOT11v: Inside DMS ADD Operation
*Nov  1 22:51:04.323: DOT11v: TCLAS found in DMS DB
*Nov  1 22:51:04.323: DOT11v: New client detected
*Nov  1 22:51:04.323: DOT11v: Ref Cnt: 1
*Nov  1 22:51:04.323: DOT11v: Client A4:F1:E8:58:95:0A added to DMS DB Entry
*Nov  1 22:51:04.323: DOT11v: DMS Add Operation Succeeded
*Nov  1 22:51:04.323: Received and decoded a DMS client request payload SUCCESSFULLY

```

之后，客户端将添加到wlan上的DMS数据库。为同一组播字符串发送DMS Request-Add的所有客户端都列在相同的DMS ID下。

```
> show wlan 1
```

```

WLAN Identifier..... 1
Profile Name..... 11v
Network Name (SSID)..... 11v
Status..... Enabled
.
.
.
Number of active DMS Clients..... 1
DMS ID Client MAC Addresses
1 a4:f1:e8:58:95:0a

```

DMS数据库存储在连接此客户端的AP中：

```
AP# show controllers dot11Radio { 0 | 1 } | beg Global DMS
```

```

Global DMS - requests:2 uc:130 drop:0
DMS enabled on WLAN(s): 11v

```

11v

DMS database:

Entry 1: mask=0x55 version=4 dstIp=0xE00000FB srcIp=0x00000000 dstPort=9 srcPort=0 dcsp=0 protocol=17

{Client, SSID}: {08:74:02:77:13:45, 11v}, {A4:F1:E8:58:95:0A, 11v},

当无线客户端关闭DMS流后，它会发送DMS请求删除

```
*apfMsConnTask_0: Nov 01 22:57:33.990: a4:f1:e8:58:95:0a Got action frame from this client.
*apfMsConnTask_0: Nov 01 22:57:33.990: a4:f1:e8:58:95:0a Received a 11v Action Frame with code
[23] from mobile station
*apfMsConnTask_0: Nov 01 22:57:33.990: Received 80211v_DMS_REQ Action Frame
*apfMsConnTask_0: Nov 01 22:57:33.990: WLAN-id : 1 | vap_ip : 1
*apfMsConnTask_0: Nov 01 22:57:33.990: a4:f1:e8:58:95:0a Posting msg of type:
APF_80211v_MSG_DMS_REQ for STA and LRAD:7c:0e:ce:7d:d9:10,slot:0, len:5
*apfMsConnTask_0: Nov 01 22:57:33.990: 11v g_msgQueue = 0x2b415828, osapiMessageSend
rc = 0
*apf80211vTask: Nov 01 22:57:33.991: DMS Request IE processed: State: DMS_REQ_DEL_ACCEPTED
*apf80211vTask: Nov 01 22:57:33.991: DMS Response IE created.
*apf80211vTask: Nov 01 22:57:33.991: Element ID: 100, Length: 5
*apf80211vTask: Nov 01 22:57:33.991: DMS ID: 1, DMS Length: 3, Response Type:
DMS_RESP_TERMINATE, Last Sequence Control: 65535
*apf80211vTask: Nov 01 22:57:33.991: dmsRequestState = DMS_REQ_DEL_ACCEPTED
*apf80211vTask: Nov 01 22:57:33.991: a4:f1:e8:58:95:0a apf80211vSendPacketToMs: 802.11v Action
Frame sent successfully to wlc
*apf80211vTask: Nov 01 22:57:33.991: STA: a4:f1:e8:58:95:0a has dequeued and deleted from the
DMS Entry with ID: 1
*apf80211vTask: Nov 01 22:57:33.991: apf80211vDmsDB_DeleteSTA: STA: a4:f1:e8:58:95:0a deleted
successfully under DMS ID: 1
*apf80211vTask: Nov 01 22:57:33.991: a4:f1:e8:58:95:0a apfPostDmsClientRequestMsg: posting
capwap for ms lrادمac7c:0e:ce:7d:d9:10
*apf80211vTask: Nov 01 22:57:33.991: 11v g_msgQueue = 0x2b415828, osapiMessageSend rc
= 0
```

从AP

```
*Nov 1 22:57:33.167: DOT11v: Removing client A4:F1:E8:58:95:0A from DMS DB Entry
*Nov 1 22:57:33.167: DOT11v: DMS DB Delete Operation Succeeded
*Nov 1 22:57:33.167: Received and decoded a DMS client request payload SUCCESSFULLY
```

支持客户端BSS过渡

客户端支持11v

```
*apfMsConnTask_3: Apr 12 10:46:36.239: 08:74:02:77:13:45 Association received from mobile on
BSSID f0:7f:06:e8:32:76 AP AP-3700
*apfMsConnTask_3: Apr 12 10:46:36.239: 08:74:02:77:13:45 Client is 11v BSS Transition capable
客户端发送BSS过渡管理查询
```

```
*apfMsConnTask_1: Nov 14 05:40:32.857: c4:7d:4f:3a:0f:5c Got action frame from this client.
*apfMsConnTask_1: Nov 14 05:40:32.858: c4:7d:4f:3a:0f:5c Received a 11v Action Frame with code
[6] from mobile station
*apfMsConnTask_1: Nov 14 05:40:32.858: Received 80211v_BSS_TRANS_QUERY Action Frame
*apfMsConnTask_1: Nov 14 05:40:32.859: WLAN-id : 1 | vap_ip : 1
*apfMsConnTask_1: Nov 14 05:40:32.859: c4:7d:4f:3a:0f:5c Posting msg of type:
APF_80211v_MSG_BSS_TRANS_QUERY for STA and LRAD:00:c8:8b:26:2c:d0,slot:0, len:1
*apf80211vTask: Nov 14 05:40:32.860: Session URL is not NULL
```

```
*apf80211vTask: Nov 14 05:40:32.860: Disassociation Imminent is 1
*apf80211vTask: Nov 14 05:40:32.860: Disassociation Timer is 200
*apf80211vTask: Nov 14 05:40:32.860: Building BSS Transition Request Frame
*apf80211vTask: Nov 14 05:40:32.860: Adding Neighbor List Subelement
*apfMsConnTask_1: Nov 14 05:40:32.861: 11v g_msgQueue = 0x2b415828,          osapiMessageSend
rc = 0
*apf80211vTask: Nov 14 05:40:32.861: Location Info: 0,0,0 for BSSID: 7c:0e:ce:7d:d9:10
*apf80211vTask: Nov 14 05:40:32.861: Data Length of BSS Transition Request Frame: 73
*apf80211vTask: Nov 14 05:40:32.862: apf80211vHandleBSSTransQuery: lradMacAddr:
00:c8:8b:26:2c:d0 rscb parent MAC ADDR: 00:c8:8b:26:2c:d0 rscb mac address: 00:00:00:00:00:00
*apf80211vTask: Nov 14 05:40:32.862: 11v Action Frame sent:
*apf80211vTask: Nov 14 05:40:32.863: c4:7d:4f:3a:0f:5c apf80211vSendPacketToMs: 802.11v Action
Frame sent successfully to wlc
*apf80211vTask: Nov 14 05:40:32.863: Successfully sent BSS Transition Request Action Frame to
STA: c4:7d:4f:3a:0f:5c
```

由于wlan已启用取消关联即将进行，因此在取消关联计时器结束后，客户端将取消关联

```
*apf80211vTask: Nov 14 05:40:32.863: c4:7d:4f:3a:0f:5c Setting Session Timeout to 20 sec -
starting session timer for the mobile
*apf80211vTask: Nov 14 05:40:32.863: c4:7d:4f:3a:0f:5c Disassociate client in 20 seconds
*osapiBsnTimer: Nov 14 05:40:52.768: c4:7d:4f:3a:0f:5c Authentication session timer expired:
mark mobile for immediate deletion
*osapiBsnTimer: Nov 14 05:40:52.768: c4:7d:4f:3a:0f:5c apfMsSessionExpireCallback (apf_ms.c:707)
Expiring Mobile!
*apfReceiveTask: Nov 14 05:40:52.769: apfMsExpireMobileStation: Delete Immediately
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c apfMsExpireMobileStation (apf_ms.c:7521)
Changing state for mobile c4:7d:4f:3a:0f:5c on AP 00:c8:8b:26:2c:d0 from Associated to
Disassociated
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c apfSendDisAssocMsgDebug
(apf_80211.c:3541) Changing state for mobile c4:7d:4f:3a:0f:5c on AP 00:c8:8b:26:2c:d0 from
Disassociated to Disassociated
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c Sent Disassociate to mobile on AP
00:c8:8b:26:2c:d0-0 (reason 1, caller apf_ms.c:7614)
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c Sent Deauthenticate to mobile on BSSID
00:c8:8b:26:2c:d0 slot 0(caller apf_ms.c:7616)
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c Setting active key cache index 8 ---> 8
*apfReceiveTask: Nov 14 05:40:52.769: c4:7d:4f:3a:0f:5c Deleting the PMK cache when de-
authenticating the client.
*apfReceiveTask: Nov 14 05:40:52.769: Sent Deauthenticate to STA: c4:7d:4f:3a:0f:5c on BSSID:
00:c8:8b:26:2c:d0, slotId: 0, vapId: 1
```

由于负载均衡，AP发送BSS过渡管理帧

```
*apfMsConnTask_3: Apr 12 10:47:18.785: 08:74:02:77:13:45 11v BSS Transition Request is posted to
11v queue.
*apf80211vTask: Apr 12 10:47:18.789: Session URL is not NULL
*apf80211vTask: Apr 12 10:47:18.789: Disassociation Imminent is 1
*apf80211vTask: Apr 12 10:47:18.789: Disassociation Timer is 200
*apf80211vTask: Apr 12 10:47:18.789: Building BSS Transition Request Frame
*apf80211vTask: Apr 12 10:47:18.789: Adding Neighbor List Subelement
*apf80211vTask: Apr 12 10:47:18.789: Data Length of BSS Transition Request Frame: 22
*apf80211vTask: Apr 12 10:47:18.789: apf80211vHandleBSSTransQuery: lradMacAddr:
f0:7f:06:e8:32:70 rscb parent MAC ADDR: f0:7f:06:e8:32:70 rscb mac address: 00:00:00:00:00:00
*apf80211vTask: Apr 12 10:47:18.789: 11v Action Frame sent:
*apf80211vTask: Apr 12 10:47:18.790: 08:74:02:77:13:45 apf80211vSendPacketToMs: 802.11v Action
Frame sent successfully to wlc
*apf80211vTask: Apr 12 10:47:18.790: Successfully sent BSS Transition Request Action Frame to
STA: 08:74:02:77:13:45
```

由于优化漫游，AP发送BSS转换管理帧

```
*apfMsConnTask_0: Nov 04 04:58:55.320: a4:f1:e8:58:95:0a Posting msg of type:
APF_80211v_MSG_BSS_TRANS_QUERY for STA and LRAD:7c:0e:ce:7d:d9:10,slot:0, len:0
*apfMsConnTask_0: Nov 04 04:58:55.320: 11v g_msgQueue = 0x2b415828,          osapiMessageSend
rc = 0
*apfMsConnTask_0: Nov 04 04:58:55.320: a4:f1:e8:58:95:0a 11v BSS Transition Request is posted to
11v queue.
*apf80211vTask: Nov 04 04:58:55.321: Session URL is not NULL
*apf80211vTask: Nov 04 04:58:55.321: Disassociation Imminent is 1
*apf80211vTask: Nov 04 04:58:55.321: Disassociation Timer is 40
*apf80211vTask: Nov 04 04:58:55.321: Building BSS Transition Request Frame
*apf80211vTask: Nov 04 04:58:55.321: Adding Neighbor List Subelement
*apf80211vTask: Nov 04 04:58:55.321: No Neighbor Candidate found :Resetting Candidate Included
List
*apf80211vTask: Nov 04 04:58:55.321: Data Length of BSS Transition Request Frame: 4
*apf80211vTask: Nov 04 04:58:55.321: apf80211vHandleBSSTransQuery: lradMacAddr:
7c:0e:ce:7d:d9:10 rscb parent MAC ADDR: 7c:0e:ce:7d:d9:10 rscb mac address: 00:00:00:00:00:00
*apf80211vTask: Nov 04 04:58:55.322: 11v Action Frame sent:
*apf80211vTask: Nov 04 04:58:55.322: a4:f1:e8:58:95:0a apf80211vSendPacketToMs: 802.11v Action
Frame sent successfully to wlc
*apf80211vTask: Nov 04 04:58:55.322: Successfully sent BSS Transition Request Action Frame to
STA: a4:f1:e8:58:95:0a
*apf80211vTask: Nov 04 04:58:55.322: a4:f1:e8:58:95:0a Setting Session Timeout to 4 sec -
starting session timer for the mobile
*apf80211vTask: Nov 04 04:58:55.322: a4:f1:e8:58:95:0a Disassociate client in 4 seconds
```

参考

[章节 : 802.11r、802.11k、802.11v、802.11w快速过渡漫游](#)

IEEE信息技术标准 — 系统之间的电信和信息交换局域网和城域网 — 特定要求 — 第11部分：无线局域网介质访问控制 (MAC)和物理层(PHY)规格