# 使用过渡模式配置增强型开放式SSID - OWE

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# 简介

本文档介绍如何在Catalyst 9800无线LAN控制器(9800 WLC)上配置Enhanced Open并对其进行故 障排除。

# 先决条件

要求

Cisco 建议您了解以下主题:

- 思科无线局域网控制器(WLC)9800。
- 支持Wi-Fi 6E的思科接入点(AP)。
- IEEE标准802.11ax。
- Wireshark.

## 使用的组件

本文档中的信息基于以下软件和硬件版本:

- WLC 9800-CL,带IOS® XE 17.9.3。
- C9130、C9136、CW9162、CW9164和CW9166。
- Wi-Fi 6客户端:
  - 。IOS 16上的iPhone SE3gen

- Mac OS 12上的MacBook。
- Wi-Fi 6E客户端:
  - Lenovo X1 Carbon Gen11, 配备英特尔AX211 Wi-Fi 6和6E适配器,带驱动程序版本 22.200.2(1)。
  - ◎ 带驱动程序v1(0.0.108)的Netgear A8000 Wi-Fi 6和6E适配器;
  - ◎ 装有Android 13的手机Pixel 6a;
  - ◎ 手机三星S23,安卓13。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原 始(默认)配置。如果您的网络处于活动状态,请确保您了解所有命令的潜在影响。

# 背景信息

增强型开放是WiFi联盟提供的认证,是WPA3无线安全标准的一部分。与公共PSK无线网络相比 ,它在开放(未经身份验证的)网络上使用机会无线加密(OWE)来防止被动嗅探并防止简单攻击。

使用Enhanced Open,客户端和WLC(对于中央身份验证)或AP(对于FlexConnect本地身份验证)在关联过程中执行Diffie-Hellman密钥交换,并使用成对主密钥密钥(PMK)与4次握手。

#### OWE

机会无线加密(OWE)是IEEE 802.11的扩展,提供无线介质加密(<u>IETF RFC 8110</u>影响。基于OWE的 身份验证的目的是避免AP和客户端之间的开放式非安全无线连接。OWE使用基于Diffie-Hellman算 法的加密来设置无线加密。使用OWE时,客户端和AP在访问过程中执行Diffie-Hellman密钥交换 ,并将生成的成对主密钥(PMK)密钥与4次握手配合使用。使用OWE可增强部署基于开放式或共享 PSK的网络的无线网络安全性。



OWE帧交换

### 转换模式

通常,企业网络只有一个未加密访客SSID,并且首选使用不支持增强型开放式客户端的旧客户端和 带有增强型开放式共存功能的较新客户端。过渡模式是专门为适应此场景而引入的。

这要求配置两个SSID — 一个隐藏SSID以支持OWE,另一个为开放并广播的SSID。

机会无线加密(OWE)转换模式使OWE和非OWE STA能够同时连接到同一SSID。当所有OWE STA在OWE转换模式中看到SSID时,它们将使用OWE进行连接。

开放式WLAN和OWE WLAN都会传输信标帧。来自OWE WLAN的信标和探测响应帧包括Wi-Fi Alliance供应商IE,用于封装开放式WLAN的BSSID和SSID,同样,开放式WLAN也包括OWE WLAN。

OWE STA应仅在可用网络列表中向用户显示在OWE转换模式下运行的OWE AP的开放BSS的 SSID,并应抑制该OWE AP的OWE BSS SSID的显示。

准则和限制:

- 增强型开放需要仅WPA3策略。思科Wave 1(基于思科IOS®)AP不支持WPA3。
- 必须将受保护管理帧(PMF)设置为"必需"。默认情况下,此项设置为仅使用WPA3第2层安全。

• 增强型开放仅适用于运行支持"增强型开放"的较新版本的最终客户端。

# 配置

典型使用案例,管理员希望配置增强型开放,但仍允许较旧的客户端连接到访客SSID。

网络图



网络拓扑

## GUI的配置步骤:

创建第一个SSID,特此称为"OWE\_Transition"。在本示例中,WLAN ID 3并确保其隐藏,同时禁用 "Broadcast SSID"选项:

第1步选择Configuration > Tags & Profiles > WLANs以打开WLANs页面。

第2步点击Add以添加新的WLAN >添加WLAN名称"OWE\_Transition">将Status更改为Enable >确保 Broadcast SSID为Disabled。

Q. Search Menu Items       Configuration * > Tags & Profiles * > WLANs       Edit WLAN         Image: Dashboard       Image: Add image: Configuration * > Tags & Profiles * > WLANs       Image: Configuration * > Tags & Profiles * > WLANs         Image: Dashboard       Image: Configuration * > Tags & Profiles * > WLANs       Image: Configuration *          Image: Configuration *        Selected WLANs : 0       Image: Configuration *          Image: Configuration *        Satus T Name       Tip         Image: Configuration *        Image: Configuration *        1         Image: Configuration *	South APs and Chemic Q
Monitoring     Status Y Name     D       Configuration     Status Y Name     D       Administration     MacReer     1       Administration     O     dot1x     2       Configuration     O     OWE_Transition     3       Configuration     O     OWE_Transition     3       Configuration     O     OWE_Transition     3       Configuration     O     OWE_Transition     3       Configuration     Status     Status     Status	It is enabled will result in loss of connectivity for clients connected to it.
(Wait Ma Through D)	Radio Policy ③  Show slot configuration

OWE转换增强型开放式SSID隐藏

第3步选择Security > Layer 2选项卡> Select WPA3。

第4步将Protected Management Frame(PMF)设置为Required。

第5步在WPA Parameters >选中WPA3策略。选择AES(CCMP128)Encryption and OWE Auth Key Management。

第6步将WLAN ID 4(开放式WLAN)添加到"过渡模式WLAN ID"框。

#### 第7步点击Apply to Device。

Cisco Cata	lyst 9800-CL Wireless Controller	Welcome adminite terms administration of the state of the
Q. Search Menu Items	Configuration * > Tags & Profiles * > WLANs	Edit WLAN ×
Dashboard	+ Add X Dulete Dulete Enable WLAW Doat	A Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.
	Selected WLANs : 0	General Security Advanced Add To Policy Tags
Configuration	Status      Name     T     ID     MacFilter     1	Layer2 Layer3 AAA
(i) Administration	dot1x     2     OWE_Transition     3	O WPA + WPA2         O WPA2 + WPA3              • WPA3         O Static WEP               O None
C Licensing	o open 4	MAC Fitering O
Work Mc Through >>	v vole, test	Lobby Admin Access         WPA Parameters         WPA         WPA         GTk         CTK         Transition         Disable         WPA2/WPA3 Encryption         AES(CCMP128)         GCMP128         Transition Mode WLAN ID         4

OWE转换模式 — OWE SSID

创建第二个SSID,在本示例中将其称为"open",WLAN ID 4,并确保启用"Broadcast SSID":

第1步选择Configuration > Tags & Profiles > WLANs以打开WLANs页面。

第2步点击Add以添加新的WLAN >添加WLAN名称"open">将Status更改为Enable >确保Broadcast SSID为Enabled。

Cisco Cat	alyst 9800-CL	Wireless Controller		Welcome admin	* * * *	(i)      (i)      (ii)      (iii)      (iii)	•
Q. Search Menu Items	Configuration *	> Tags & Profiles * > W	/LANs	Edit WLAN			×
Dashboard	+ Add	× Delete	Englie WLAN Duable WLAN	🛦 Changi	ing WLAN parameters while	e it is enabled will result in loss of connectivity for clients connected to it.	
 (2) Monitoring	Selected WLANs	0		General Security	Advanced Add	d To Policy Tags	
Configuration		Name MacFilter	T ID	Profile Name*	open	Radio Policy ①	
(i) Administration	0 0	dot1x	2	SSID*	open	Show slot configuration	
C Licensing	0 0	open	<ul> <li>4</li> </ul>	WLAN ID*	4	Status DISABLED	
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						2.4 GHz Status DISABLED	
Walk Me Through 1						802.11b/g 802.11b/g ¥	

OWE转换开放式SSID

第3步选择Security > Layer 2选项卡> Choose None。

第4步将WLAN ID 4(OWE\_Transition)添加到"Transition Mode WLAN ID"框中。

## 第5步点击Apply to Device。

Cisco Cata	lyst 9800-CL Wireless Controller		Welcome admin APS and Clares Q
Q. Search Menu Items	Configuration * > Tags & Profiles * > WLANs		Edit WLAN *
Dashboard	+ Add X Delete	nable WLAN	Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.
Monitoring	Selected WLANs : 0		General Security Advanced Add To Policy Tags
⊰ Configuration →	Status Y Name MacFillar	T 10	Layer2 Layer3 AAA
(i) Administration	O O dot1x	2	O WPA + WPA2         O WPA3 + WPA3         O WPA3         O Static WEP              • None
C Licensing		• 4	MAC Fitering
X Troubleshooting	↓         ↓	• 5	OWE Transition Mode Transition Mode WLAN ID* 3 Lobby Admin Access
Walk Mr Through 1			Protected Management Prame PMF Disabled
			Reassociation Timeout * 20

OWE过渡模式开放式WLAN安全

此屏幕截图显示了最终结果:一个名为"OWE\_Transition"的WPA3+OWE+WPA3已保护并配置 WLAN,另一个名为"open"的完全开放SSID。只有名为"open"的完全开放的SSID才会在信标中广播 其SSID,而"OWE\_Transition"则会隐藏。

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Dashboard	+ Add	<b>-</b>	Delete	Enable WLAN Disable WLAN											W.	AN Wizard	
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3	0 8	tatus Y	Name	T ID	Ť	S	SID					T	Security				Ŧ
Configuration	0	0	MacFilter	• 1		M	tucFilter						[open].MAC Fit	tering.[Web	Auth]		
Administration	0	0	dot1x	▶ 2		d	ot1x						[WPA2][802.1x	[AES]			
<u>S</u>	0	0	OWE_Transition	• 3		0	WE_Tran	sition					(WPA3][OWE]]	AES]			
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	0	0	wifi6E_test	\$ 5		W	MAGE_tes	t) —					[WPA3][OWE]]	AES]			
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OWE转换模式WLAN

## 第6步将创建的WLAN映射到所需的Policy Profiles到Policy Tag并将其应用到AP。

Edit Policy Tag			×
A Changes may r	result in loss of connectivity for some clie	ents that are associated to APs with this Policy T	ag.
Name*	Wifi6E_TestPolicy		
Description	Enter Description		
VILAN-POLICY	Maps: 2		
+ Add × Dele	te		
WLAN Profile		Policy Profile	T
OWE_Transition		CentralSwPolicyProfile	
O open		CentralSwPolicyProfile	
H	10 🔻		1 - 2 of 2 items

策略标记

配置CLI:

增强型开放SSID:

Device# conf t Device(config)# wlan OWE\_Transition 3 OWE\_Transition Device(config)# no broadcast-ssid Device(config)# no security ft adaptive Device(config)# no security wpa wpa2 Device(config)# no security wpa akm dot1x Device(config)# security wpa akm owe Device(config)# security wpa transition-mode-wlan-id 4 Device(config)# security wpa wpa3 Device(config)# security pmf mandatory Device(config)# no shutdown

#### 开放式SSID:

Device# conf t Device(config)# wlan open 4 open Device(config)# no security ft adaptive Device(config)# no security wpa Device(config)# no security wpa wpa2 Device(config)# no security wpa wpa2 ciphers aes Device(config)# no security wpa akm dot1x Device(config)# security wpa transition-mode-wlan-id 3 Device(config)# no shutdown

#### 策略配置文件:

Device(config)# wireless tag policy Wifi6E\_TestPolicy Device(config-policy-tag)# wlan open policy CentralSwPolicyProfile Device(config-policy-tag)# wlan OWE\_Transition policy CentralSwPolicyProfile

## 验证

这是检验部分。

验证CLI上的WLAN配置:

<#root>

Device#show wlan id 3 WLAN Profile Name : OWE\_Transition

Identifier : 3

Description :

Network Name (SSID) : OWE\_Transition

Status : Enabled

Broadcast SSID : Disabled

[...] Security

802.11 Authentication : Open System

Static WEP Keys : Disabled

WPA (SSN IE) : Disabled WPA2 (RSN IE) : Disabled WPA3 (WPA3 IE) : Enabled AES Cipher : Enabled CCMP256 Cipher : Disabled GCMP128 Cipher : Disabled GCMP256 Cipher : Disabled Auth Key Management 802.1x : Disabled PSK : Disabled CCKM : Disabled FT dot1x : Disabled FT PSK : Disabled FT SAE : Disabled Dot1x-SHA256 : Disabled PSK-SHA256 : Disabled SAE : Disabled OWE : Enabled SUITEB-1X : Disabled SUITEB192-1X : Disabled SAE PWE Method : Hash to Element, Hunting and Pecking(H2E-HNP) Transition Disable : Disabled CCKM TSF Tolerance (msecs) : 1000 OWE Transition Mode : Enabled OWE Transition Mode WLAN ID : 4 OSEN : Disabled FT Support : Disabled FT Reassociation Timeout (secs) : 20 FT Over-The-DS mode : Disabled PMF Support : Required PMF Association Comeback Timeout (secs): 1 PMF SA Query Time (msecs) : 200 [...] #show wlan id 4 WLAN Profile Name : open Identifier : 4 Description :

Network Name (SSID) : open

```
Status : Enabled
Broadcast SSID : Enabled
[...]
Security
802.11 Authentication : Open System
Static WEP Keys : Disabled
Wi-Fi Protected Access (WPA/WPA2/WPA3) : Disabled
OWE Transition Mode : Enabled
OWE Transition Mode WLAN ID : 3
OSEN : Disabled
FT Support : Disabled
FT Reassociation Timeout (secs) : 20
FT Over-The-DS mode : Disabled
PMF Support : Disabled
PMF Association Comeback Timeout (secs): 1
PMF SA Query Time (msecs) : 200
[...]
```

在WLC中,您可以转到AP配置并验证两个WLAN在AP上均处于活动状态:



OWE转换模式AP操作配置查看器

启用时,AP仅具有开放式SSID但携带OWE转换模式信息元素(IE)的信标。当能够增强开放性的客 户端连接到此SSID时,它会自动使用OWE在关联后加密所有流量。

以下是可以在空中(OTA)观察到的内容:



OWE转换开放式SSID信标

带有SSID"open"的信标发送包含内部具有增强型开放SSID详细信息的OWE转换模式IE,如BSSID和SSID名称"OWE\_Transition"。

#### 还有隐藏了SSID的信标OTA,如果我们按bssid过滤,帧将发送到BSSID 00:df:1d:dd:7d:3e,BSSID是OWE转换模式IE:



OWE信标

您还可以看到,OWE隐藏信标包含带有开放式ssid BSSID和SSID名称"open"的OWE转换模式IE。

这些屏幕截图显示支持增强型开放的Android电话:它只显示不带锁图标(锁图标会使用户认为它需 要密码进行连接)的开放式SSID,但一旦连接,安全显示使用了增强型开放安全。

09:03 🖪		8 🕼 😤 11 3	0% 🔔
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Ligado			
Rede atual			
() (î;0	Ligado		ලා
Redes dispo	níveis		
(((.	MEO-WiFi É necessário iniciar sessão.		
(((î;	open		
((î <sup>0</sup>	snowstorm		

Client MAC Address : 286b.3598.580f [...] AP Name: AP9136\_5C.F524 AP slot : 1 Client State : Associated Policy Profile : CentralSwPolicyProfile Flex Profile : N/A Wireless LAN Id: 3 WLAN Profile Name: OWE\_Transition Wireless LAN Network Name (SSID): OWE\_Transition BSSID : 00df.1ddd.7d3e Connected For : 682 seconds Protocol : 802.11ax - 5 GHz Channel : 64 Client IIF-ID : 0xa0000003 Association Id : 2 Authentication Algorithm : Open System Idle state timeout : N/A [...] Policy Type : WPA3 Encryption Cipher : CCMP (AES) Authentication Key Management : OWE Transition Disable Bitmap : None User Defined (Private) Network : Disabled User Defined (Private) Network Drop Unicast : Disabled Encrypted Traffic Analytics : No Protected Management Frame - 802.11w : Yes EAP Type : Not Applicable

我们可以在WLC GUI中观察到同样的内容:



对于不支持"增强型开放"的客户端,它们只能看到开放式SSID并连接到该开放式SSID,而不会加密 。

如图所示,这些客户端不支持增强型开放(分别是IOS 15上的iPhone和Mac OS 12上的 MacBook),并且只能看到开放访客SSID,并且不使用加密。



Client MAC Address : b44b.d623.a199 [...] AP Name: AP9136\_5C.F524 AP slot : 1 Client State : Associated Policy Profile : CentralSwPolicyProfile Flex Profile : N/A

Wireless LAN Id: 4

WLAN Profile Name: open

Wireless LAN Network Name (SSID): open

BSSID : 00df.1ddd.7d3f [...]

Authentication Algorithm : Open System

[...]

Protected Management Frame - 802.11w : No

EAP Type : Not Applicable

## 故障排除

- 确保客户端支持OWE,因为并非所有客户端都支持OWE。查看客户端供应商文档,例如 Apple在此处记录了对其设备的<u>支持</u>。
- 2. 由于存在OWE转换模式IE,某些较早的客户端甚至可能不接受开放式ssid信标,并且不在范围内的网络中提供SSID。如果您的客户端看不到开放式SSID,请从WLAN配置中删除过渡 VLAN(设置为0),然后检查它是否看到该WLAN。
- 3. 如果客户端看到开放式SSID,支持OWE,但它们仍然不使用WPA3进行连接,则验证转换 VLAN ID是否正确并在两个WLAN的信标中广播。您可以在嗅探器模式下使用AP捕获OTA流 量。请执行以下步骤以配置处于嗅探器模式的AP:处于嗅探器模式的AP Catalyst 91xx。
  - 发送带有SSID"open"的信标时包含OWE转换模式IE,其中包含增强型开放SSID详细信



息,如BSSID和SSID名称"OWE\_Transition":

OWE转换开放式SSID信标

 还有隐藏了SSID的信标OTA,如果我们按bssid过滤,帧将发送到BSSID 00:df:1d:dd:7d:3e,BSSID是OWE转换模式IE:

No.	-	D-the	Sec. and	Development	Destand	a second links	and finedate		5 Frame 3552: 475 butes on wire (3888 bits), 475 butes captured (3888 bits) on interface (Device/NPF (De572005.2008))
190.	ing .	Dera	source	Destheoon	PTOSOCOA	Length Unit	aulei, ordine ente	0110	Sthannat TT Serv Flans At-87-41 (34-11-81-47-47), 514- Integras 57-47-64 (80-14-80-57-47-46)
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	3534 20.787074	0.10190	7 C15C0_dd:7d:3f	Broadcast	802.11	454	64 -44 dBM	Beacon frame, SN+3451, FN+0, Flags+C, BI+100, SSID+"open"	Linge Catagram Restored. See Booth 6555 April 2004
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	3541 20.009591	0.10190	9 C15C0_dd:7d:3f	Broadcast	802.11	454	64 -45 dBm	Beacon frame, SN+3452, FN+0, Flags+C, BI+100, SSID+"open"	1 880 II radio information
	3542 20.090003	0.00041	2 C1sco_dd:7d:3e	Broadcast	802.11	475	64 -45 dBm	Beacon frame, Shx686, FNx0, Flags+C, BIx100, SSID+Hildcard (Broadcast)	v Title 100 11 Basen frame, flam: /
	3553 20.991883	0.20100	e cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 dBm	Beacon frame, SN+3453, FN+0, Flags+C, BI+100, SSID+"open"	Type/Subtype: Beacon Frame (Byliddil)
	3554 20.992456	0.00057	3 C15c0_dd:7d:3e	Broadcast	802.11	475	64 -45 dBm	Beacon frame, Shx687, FixeD, Flags+C, BIx100, SSID+Willocard (Broadcast)	> Frame Control Field: Brinke
	3555 21.095434	0.20297	S Cisco_dd:7d:3f	Broadcast	802.11	454	64 -46 088	Beacon frame, Sik3454, Fike, FlagsC, Bix100, SSIDe open	ana anna anna anna - Duration à mirrorannata
	3556 21.095434	0.00000	e Cisco_dd:7d:3e	Broadcast	802.11	475	64 -46 dam	Beacon frame, Shw680, FNw0, Flags+C, BI+100, SSID-Wildcard (Broadcast)	Baraluar addars: Bradras (10-00-00-00-00)
	3557 21.196678	0.10123	6 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 dbm	Beacon frame, SN+3455, FN+0, Flags+C, BI+100, SSID+"open"	Destination advanty Broadcast (10-10-10-10-10)
	3558 21.197421	0.00075	1 Cisco_dd:7d:3e	Broadcast	802.11	475	64 -45 dbm	Beacon frame, Six609, FixeD, Flags+C, 81×100, SSID+Hildcard (Broadcast)	Transfelder address films de 2015 (de de 2015)
	3559 21.299091	0.10167	0 Clsco_dd:7d:3f	Broadcast	802.11	454	64 -46 dBM	Beacon frame, SN+3456, FN+0, Flags+C, BI+100, SSID+"open"	I Contract of the second
	3560 21.299530	0.00044	7 Cisco_dd:7d:3e	Broadcast	892.11	475	64 -45 dBm	Beacon frame, SN+690, FN+0, Flags+C, BI+100, SSID+Hildcard (Broadcast)	
	3561 21.401640	0.10210	2 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -46 d8m	Bracon frame, ShuldST, DurB, Elapo, F, BTulDB, SSTO-"open"	#35 10: C15C0_00:M0:M0 (#0:01:10:00:M0:M0)
	3562 21.402040	0.00040	e cisco_dd:7d:3e	Broadcast	882.11	475	64 -46 dbm	Beacon frame, SN=691, FN=0, Flags=C, BI=100, SSID=Hilldcard (Broadcast)	and the two two where a preparation where the
	3563 21.433282	0.03124	2 IntelCor_98:58:	. Broadcast	802.11	219	64 -34 dBm	Proce Request, State, Port, Fingst	WER 1011 0011 Separate number: 011
	3564 21.434668	0.00130	6 192.168.1.15	192.168.1.121	802.11	76	64 -35 dbm	Acknowledgement, FlagsC	Frame check sequence: extendenced [unversized]
	3565 21.448921	0.01425	3 IntelCor_98:58:	. Broadcast	882.11	219	64 -35 dbm	Probe Request, SN+187, FN+0, Flags+C, SSID+"ONE_Transition"	[HG STATUS: Unversited]
	3566 21.450101	8.00126	@ Cisco_dd:7d:3e	IntelCor_95:58:0f	802.11	483	64 -46 dbm	Probe Response, SN+62, FN+0, Flags+C, BI+100, SSID+"OHE_Transition"	<ul> <li>IEEE 802.11 wireless Henagement</li> </ul>
	3567 21.450181	8.00000	@ 192.168.1.15	192.168.1.121	802.11	76	64 -35 dbm	Acknowledgement, flagiC	> Fixed parameters (12 bytes)
	3568 21.503984	0.05308	0 Clsco_dd:7d:3f	Broadcast	802.11	454	64 -46 dbm	Beacon frame, SN+3458, Fh+0, Flags+C, BI+100, SSID+"open"	Tapped caranatact (372 bytet)
	3569 21.504428	0.00044	4 Cisco dd:7d:3e	Broadcast	802.11	475	64 -46 088	Beacon frame, SN+692, FN+0, Flags+C, BI+180, SSID-wildcard (Broadcast)	<ul> <li>Tag: SSID parameter set: wildcard SSID</li> </ul>
	3570 21.518478	0.01405	0 192.168.1.15	192.168.1.121	802.11	76	64 -42 088	Clear-to-send, Flags+C	Tag Number: SSID parameter set (0)
	3625 21.542499	0.02402	1 TotalCor 98:58:	Clsco ddi7di3e	882.11	96	64 .34 088	Authentication, Shek, Flags,	Tag length: 0
	3626 21.542561	0.00005	2 192.168.1.15	192.168.1.121	882.11	76	44 .45 088	Acknowledgement, Flags,C	SSID: OUSSING>
	3677 21 543892	8.00111	1 (14/0 64-74-34	Tetalcon daisaide	882.11		44 .45 .000	Authentication Co.d Disk Flats.	> Tag: Supported Rates 6(8), 9, 12(8), 18, 24(8), 36, 48, 54, [Abit/sec]
	3678 21 541892	0.00000	0 192 168 1 15	162, 168, 1, 121	882.11	76	64 .14 /84	Librouledreset flass, f	> Tag: DS Parameter set: Current Channel: 64
	3036 31 FOFEAS	0.0010.0	a TotalCos ABUTTI	C1440 44174134	885.11	224	44 34 day	irradiation tenunt for fine that of its to the tenuition"	> Tag: Traffic Indication Hap (TIH): DTIH @ of 1 bitmep
	3625 21.545544	0.00174	6 163 168 1 18	ART 148 1 111	883.11	74	44 47 484	Advantation Report, and, ranget	> Tag: Country Information: Country Code PT, Environment Global operating classes
	3630 31.043643	0.00000	7 107 108 1 15	163 168 1 131	885.11	74	44 .14 day	Advandadament flam.	> Tag: Power Constraint: 3
	3632 21.553468	0.00762	/ 192.168.1.15	192.100.1.121	002.11	100	64 - 34 000	Acknowledgement, Fingswittent	> Tag: TPC Report Transmit Power: 4, Link Hargin: 0
	3633 21.554924	0.00145	e intercor_serse:	. cisco_du:/d:Je	002.11	22	64 -35 000	Action, SNed, Field, Fildge	> Tec: R5N Information
	3634 21.554924	0.00000	0 192.100.1.15	172.190.1.121	002.11	10	54 -45 000	Acknowledgement, Fags+	> Tag: 0855 Load Element 202.114 CCA version
	3635 21.556591	0.00165	7 C15C0_00170136	Tutercor_asizetet	EAPOL	221	64 -45 008	key (Hessage 1 of 4)	> Tas: BN Enabled Capabilities (5 octets)
	3636 21.556997	0.00035	6 192.168.1.15	192.108.1.121	002.11	76	64 -36 008	Acknowledgement, Flags+C	> Ter: +T Cacabilities (S02.10 D1.10)
	3637 21.558653	0.00159	e Intercor_seise:	. cisco_dd:/d:je	EAPOL	227	64 -36 008	key (Hessage 2 of 4)	) Tat: aT Information (802, 110, 01, 18)
	3630 21.558653	0.00000	0 192.168.1.15	192.168.1.121	802.11	76	64 -45 088	Acknowledgement, FlagsC	Tag: Extended Cashilities (11 octats)
	3639 21.568986	0.00225	3 C15C0_dd:7d:3e	IntelCor_98:58:07	EXPOL	295	64 -45 088	Key (Nessage 3 of 4)	Tar: WT Canabilitian
	3640 21.560906	0.00000	0 192.168.1.15	192.168.1.121	882.11	76	64 -36 088	Acknowledgement, FlegieC	1 Tage Will Country in a
	3642 21.561916	0.00101	a IntelCor_98:58:	. Cisco_00:70:3e	EAPOL	199	54 -44 CBR	Key (Nessage 4 of 4)	1 Tast Ty Smar England
	3643 21.561964	0.00004	8 192.168.1.15	192.168.1.121	802.11	76	64 -45 000	Acknowledgement, flagsC	Tar- Endered to the bone to
	3644 21.566689	0.00472	5 192.168.1.15	192.168.1.121	802.11	119	64 -45 088	Trigger Buffer Status Report Poll (85RP), Flags+C	A red to a statistic regulation
	3646 21.567471	0.00078	2 192.168.1.15	192.168.1.121	802.11	76	64 -37 008	Acknowledgement, flags+C	A first region of Constitution
	3648 21.567538	0.00005	9 192.168.1.15	192.165.1.121	802.11	76	64 -37 dbm	Acknowledgement, Flags+C	> End Table Condition Researcher Cell
	3649 21.568556	0.00102	6 Cisco_dd:7d:3e	IntelCor_95:58:0f	802.11	118	64 -45 008	Action, SN+2, FN+0, Flags+.pC[Halformed Packet]	· the region of the second sec
	3650 21.568556	0.00000	0 192.168.1.15	192.168.1.121	802.11	76	64 -37 dbm	Acknowledgement, FlagswC	> EXT TAP: THE BOCK PERSENTER SHE
	3651 21.569319	0.00076	3 IntelCor_98:58:	. Cisco_dd:7d:3e	802.11	118	64 -37 088	Action, SN=7, FN=0, Flags=.pC[Malformed Packet]	> Tag: vendor specific: Hicrosoft Corp.: wervark: Farameter sizement
	3652 21.569319	0.00000	0 192.168.1.15	192.168.1.121	802.11	76	64 -44 088	Acknowledgement, FlagswC	> Tag: vendor Specific: Cisco Systems, Inc: Alroret Unknown (44)
	3653 21.583237	0.01391	E Cisco_dd:7d:3e	IntelCor_95:58:0f	882.11	116	64 -45 088	Action, SN=3, FN=0, Flags=C	<ul> <li>Tag: vendor specific: ki-F1 Allance: Owe Transition Rode</li> </ul>
	3654 21.583237	0.00000	0 192.163.1.15	192.168.1.121	802.11	76	64 -37 dbm	Acknowledgement, #lagswC	Tag Number: Vendor Specific (223)
	3655 21.606313	0.02307	& Cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 088	Beacon frame, SN+3459, FN+0, Flags+C, BI+100, SSID+"open"	Tag length: 15
	3656 21.686793	0.00040	@ Cisco_dd:7d:3e	Broadcast	802.11	475	64 -45 088	Reacon frame, SN+695, FN+0, Flags+C, BI+100, SSID+Hildcard (Broadcast)	OUI: 50:6f:9a (NI-F1 Allance)
	3657 21.612684	0.00581	1 192.163.1.15	192.168.1.121	882.11	76	64 -42 088	Clear-to-send, Flags+C	Vendor Specific OUI Type: 28
	3713 21.629677	0.01707	3 192.168.1.15	192.168.1.121	802.11	76	64 -44 088	Acknowledgement, Flags+C	#SSID: Cisce_dd:7d:3f (00:df:1d:dd:7d:3f)
	3714 21.629789	0.00011	2 192.168.1.15	192.165.1.121	802.11	76	64 -44 000	Clear-to-send, Flags+C	SSID length: 4
	3716 21.629979	0.00015	0 192.168.1.15	192.168.1.121	882.11	76	44 .45 .008	Arknowledgement, flagts	SSID: open

OWE信标

您还可以看到,OWE隐藏信标包含带有开放式ssid BSSID和SSID名称"open"的OWE转 换模式IE。

#### • 您还可以查看AKM信息,并验证MFP是否通告为"必需"和"支持":



OWE Beacon AKM

### 4. 根据客户端MAC地址和y收集RadioActive跟踪您会看到如下所示的类似日志:

2023/06/23 15:08:58.567933 {wncd\_x\_R0-0}{1}: [client-keymgmt] [14854]: (note): MAC: xxxx.xxxx EAP Key management successful. AKM:OWE Cipher:CCMP WPA Version: WPA3

2023/06/23 15:10:06.971651 {wncd\_x\_R0-0}{1}: [client-orch-state] [14854]: (note): MAC: xxxx.xxxx Client state transition: S\_CO\_IP\_LEARN\_IN\_PROGRESS -> S\_CO\_RUN

参考

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<u>什么是Wi-Fi 6与Wi-Fi 6E?</u>

<u>Wi-Fi 6E概览</u>

<u>Wi-Fi 6E: The Next Great Chapter in Wi-Fi白皮书</u>

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