使用轉換模式設定增強開放式 SSID - OWE

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簡介

本檔案介紹如何在Catalyst 9800無線LAN控制器(9800 WLC)上設定Enhanced Open(具有過渡模式)並疑難排解。

必要條件

需求

思科建議您瞭解以下主題:

- 思科無線 LAN 控制器 (WLC) 9800.
- 支援WPA3的思科接入點(AP)。
- IEEE 標準 802.11ax
- Wireshark.

採用元件

本文中的資訊係根據以下軟體和硬體版本:

- WLC 9800-CL 搭配 IOS® XE 17.9.3。
- 接入點C9130、C9136、CW9162、CW9164和CW9166。
- Wi-Fi 6客戶端:
 - 。IOS 16上的iPhone SE3第1代

- Mac OS 12上的MacBook。
- Wi-Fi 6客戶端:
 - Lenovo X1 Carbon Gen11 搭載 Intel AX211 Wi-Fi 6 和 6E 介面卡,並搭配 22.200.2(1) 版驅動程式
 - ◎ Netgear A8000 Wi-Fi 6 和 6E 介面卡搭配驅動程式 v1(0.0.108)
 - · 搭載 Android 13 的手機 Pixel 6a
 - · 搭載 Android 13 的手機 Samsung S23

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

背景資訊

增強開放是WiFi聯盟提供的認證,是WPA3無線安全標準的一部分。與公共PSK無線網路相比,它 在開放式(未經驗證的)網路上使用機會無線加密(OWE)來防止被動監聽並防止簡單攻擊。

使用增強型Open時,使用者端和WLC(在中央驗證的情況下)或AP(在FlexConnect本地驗證的 情況下)在關聯過程中執行Diffie-Hellman金鑰交換,並在四次握手中使用成對主金鑰密碼(PMK)。

OWE

機會性無線加密 (OWE) 是 IEEE 802.11 的延伸,可為無線媒體提供加密 (<u>IETF RFC 8110</u>)。 OWE 型驗證目的在於避免 AP 和用戶端之間開啟不安全的無線連線。OWE 使用 Diffie-Hellman 演算法型 的加密來設定無線加密。使用OWE時,客戶端和AP在訪問過程中執行Diffie-Hellman金鑰交換,並 使用生成的成對主金鑰(PMK)金鑰和4次握手。使用 OWE 可提升部署開放式或共用 PSK 型網路時 的無線網路安全性。



OWE 訊框交換

過渡模式

通常,企業網路只有一個未加密訪客SSID,並且偏好使用不支援增強型開放客戶端的舊客戶端和增 強型開放到共存的較新客戶端。過渡模式是專為迎合此情況而引入的。

這要求配置兩個SSID — 一個隱藏SSID以支援OWE,另一個為開放式SSID且已廣播。

機會無線加密(OWE)轉換模式使OWE和非OWE STA能夠同時連線到同一個SSID。當所有OWE STA都在OWE轉換模式下看到SSID時,它們會使用OWE進行連線。

開放式WLAN和OWE WLAN都會傳輸信標幀。來自OWE WLAN的信標和探測響應幀包括Wi-Fi Alliance供應商IE封裝開放WLAN的BSSID和SSID,類似地,開放WLAN也包括OWE WLAN。

OWE STA只應在可用網路清單中向使用者顯示在OWE轉換模式下運行的OWE AP的開放BSS的 SSID,並抑制該OWE AP的OWE BSS SSID的顯示。

准則和限制:

- 增強型開放要求僅使用WPA3策略。Cisco Wave 1(基於Cisco IOS®)AP不支援WPA3。
- 必須將受保護管理幀(PMF)設定為「必需」。預設情況下,該設定僅使用WPA3第2層安全設 定。

- 增強型Open只在運行支援Enhanced Open的較新版本的最終客戶端上起作用。
- 6GHz頻段上不允許Wi-Fi增強型開放式過渡模式。根據<u>WPA3™規範v3.4</u>:存在與6GHz和Wi-Fi 7(EHT — 超高吞吐量或MLO — 多鏈路操作)相關的限制:
 - ◎ 「當AP在6 GHz頻段中運行BSS時:[...]AP的BSS配置不應允許Wi-Fi增強型開放過渡模 式(即,OWE過渡模式元素包含在信標和探測響應中)」。
 - 「當AP在啟用EHT或MLO的情況下運行BSS時[...]:AP的BSS配置不允許使用Wi-Fi增強 型開放過渡模式(即信標和探測響應中包含OWE過渡模式元素)。

設定

典型的使用案例,管理員想要配置增強型Open,但仍然允許較舊客戶端連線到訪客SSID。



網路圖表

網路拓撲

GUI的配置步驟:

建立第一個SSID,特此稱為「OWE_Transition」。在此範例中,WLAN ID 3,並確保其在停用選項「Broadcast SSID」時隱藏:

步驟1選擇Configuration > Tags & Profiles > WLANs以開啟WLANs頁面。

第2步點選Add以新增的WLAN >新增的WLAN名稱「OWE_Transition」>將Status變更為Enable

>確保Broadcast SSID已停用。

Cisco Cisco Cata	alyst 98	300-CL V	vireless Controller		Welcome admin	* * & = •	1 O C Search APs and Chems Q
Q. Search Menu Items	Conf	guration • 3	Tags & Profiles - > V	VLANs	Edit WLAN		×
Dashboard	Selec	ridd	Close	Enable WLAN Disable WLAN	General Security	ng WLAN parameters while it is Advanced Add To	anabled will result in loss of connectivity for clients connected to it.
Configuration >		Status T O O O O	Name MacFiber dot1x OWE_Transition open	▼ 10 ● 1 ● 2 ● 3 ● 4	Profile Name* SSID* WLAN ID*	OWE_Transition OWE_Transition 3	Radio Policy ① Show slot configuration 6 GHz Status DISABLED
Troubleshooting	0	0	whče_test	s 5	Broadcast SSID	ENABLED DISABLED	5 GHz Status EMABLED 2.4 GHz Status DISABILID 802.11b/g • Policy

OWE轉換增強型開放式SSID隱藏

第3步選擇Security > Layer 2頁籤>選擇WPA3。

第4步將受保護管理幀(PMF)設置為必需。

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

第6步將WLAN ID 4(開放式WLAN)新增到「Transition Mode WLAN ID」框中。

第7步點擊Apply to Device。

Cisco Cata	lyst 9800-CL Wireless Controller	Welcome admin Letting record reside.
Q. Search Menu Items.	Configuration * > Tags & Profiles * > WLANs	Edit WLAN *
Dashboard	+ Add X Delete Chone Enable WLAN Deable 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 T Name T D Image: Status S MacFilter 1 1 Image: Status S dot1x 2 2	Layer2 Layer3 AAA O WPA + WPA2 O WPA2 + WPA3 Image: WPA3 O Static WEP O None
Interview Interview Interview Interview Interview Interview	O OWE_Transition 3 O oppin 4 O wid6E_test 5 x 1 ∞	MAC Fittering Image: Contract with a contract wi
		SA Query Time* 200

OWE轉換模式 — OWE SSID

建立第二個SSID,在本例中將其稱為「open」(開放),WLAN ID 4,並確保啟用「Broadcast SSID」:

步驟1選擇Configuration > Tags & Profiles > WLANs以開啟WLANs頁面。

第2步點選Add以新增的WLAN >新增的WLAN名稱「open」>將Status變更為Enable >確保 Broadcast SSID已啟用。

Q. Search Mirris Items	Conf	figuration •	> Tags & Profiles * > WLAN	5	Edit WLAN		
Dashboard	- Add X Delete Cone Einsbe WLAN Deable WLAN				🛆 Changi	ng WLAN parameters while	it is enabled will result in loss of connectivity for clients connected to it.
	Selec	cted WLANs :	0		General Security	Advanced Add	To Policy Tags
Configuration		Status 🕈	Name MacFilter	T 10	Profile Name*	open	Radio Policy ①
Administration	0	0	dot1x OWE_Transition	2	SSID*	open	6 GHz
C Licensing	0	0	open wh6E test	4	Status	4	S GHz
Troubleshooting		- 1 -			Broadcast SSID		Status ENABLED
							Status DISABLED

步驟3選擇Security > Layer 2索引標籤>選擇None。

第4步將WLAN ID 3(OWE_Transition)新增到「Transition Mode WLAN ID」框中。

步驟5按一下「Apply to Device」。

Cisco Cisco Cata	alyst 9800-CL Wireless Controller	Welcome admin APS and Clients Q
Q. Search Menu Items	Configuration * > Tags & Profiles * > WLANs	Edit WLAN *
Dashboard	+ Add X Deleter	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
N) Configuration	C Status Y Name Y ID	Layer2 Layer3 AAA
S contiguation	O O MacFillar 1	
Administration	dotlx 2	O WPA + WPA2 O WPA2 + WPA3 O WPA3 O Static WEP None
C Licensing		MAC Fittering O
Y Troubleshooting		OWE Transition Mode Transition Mode WLAN ID* 3
2		Protected Management Frame Fast Transition
		PMF Disabled •
Walk Me Through 3		Over the DS O
		Reassociation Timeout * 20

OWE轉換模式開放式WLAN安全

OWE轉換開放式SSID



注意:如果您之前使用相同的OWE WLAN SSID的開放式WLAN,則Windows客戶端會將 「2」附加到SSID名稱。要解決此問題,請導航到「Network & Internet > Wi-Fi > Manage known networks」(網路和網際網路> Wi-Fi >管理已知網路)並刪除舊連線。

此螢幕截圖顯示了最終結果:一個為WPA3+OWE+WPA3(名為「OWE_Transition」)提供安全保護 並進行配置,另一個為名為「open」的完全開放SSID。 只有名為「open」的完全開放SSID的 SSID在信標中廣播其SSID,而「OWE_Transition」被隱藏。

Cisco Cat	alyst 98	300-CL V	Vireless Controller		Welcome admin		earch APs and Cherts Q
Q. Search Manu Itama	Confi	iguration * 3	> Tags & Profiles * > WLANs				
Dashboard	+	Add	K Delete Enabl	e WLAN Disable WLAN			WLAN Wizard
Monitoring >	Select	ted WLANs : (0				
	0	Status Y	Name	T ID	T	SSID	Y Security Y
Configuration >	0	0	MacFilter	 1 		MucFilter	[open].MAC Filtering,[Web Auth]
Administration	0	0	dot1x	• 2		dot1x	[WPA2[802.1x]]AES]
ф	0	0	OWI: Transition	• 3		OWE_Transition	[WPA3][OWE][AES]
C Licensing		0	open	♦ 4		open	[open]
	0	0	wifi6E_test	\$ 5		wih6E_test	[WPA3][OWE][AES]
X Troubleshooting	ж	< 1.1					1 - 5 of 5 items

步驟6 將建立的WLAN映射到所需的策略配置檔案到策略標籤,並將其應用到AP。

Edit Policy Tag			×				
A Changes may	result in loss of connectivity for some	clients that are associated to APs with this Polic	y Tag.				
Name*	Wifi6E_TestPolicy						
VIAN-POLICY	 WLAN-POLICY Maps: 2 						
+ Add × Dele	te						
WLAN Profile		Policy Profile	T				
OWE_Transition		CentralSwPolicyProfile					
O open		CentralSwPolicyProfile					
⊨ ⊲ 1 ⊨ ⊨	10 🔻		1 - 2 of 2 items				

策略標籤

為CLI配置:

增強型開放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

開放式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

策略配置檔案:

Device(config)# wireless tag policy Wifi6E_TestPolicy Device(config-policy-tag)# wlan open policy CentralSwPolicyProfile Device(config-policy-tag)# wlan OWE_Transition policy CentralSwPolicyProfile



這是檢驗部分。

在CLI上驗證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

Wi-Fi Protected Access (WPA/WPA2/WPA3) : Enabled

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

在WLC中,您可以前往AP組態,驗證兩個WLAN在AP上是否均處於使用中狀態:

Q Search Manu Items	Configuration • > Wireless • perational Configuration Viewe	Access Points
Dashboard		
Configuration	WLANs Wifi6E	and Policies TestPolicy
Administration		
Licensing	WLAN 🔶 : open	WLAN $rac{1}{2}$: OWE_Transition
C Troubleshooting	VLAN ID : default Security : Open	VLAN ID : default Security : WPA3

OWE轉換模式AP操作配置檢視器

PMF SA Query Time (msecs) : 200

[...]

啟用時,AP僅使用開放式SSID但帶有OWE轉換模式資訊元素(IE)的信標。 當能夠增強開放連線的

客戶端連線到此SSID時,它會自動使用OWE在關聯後加密所有流量。

以下是在空中觀察的內容(OTA):



OWE轉換開放式SSID信標

使用SSID「open」傳送的信標包含內部具有增強開放SSID詳細資訊的OWE轉換模式IE,如 BSSID和SSID名稱「OWE_Transition」。

也有隱藏SSID的信標OTA,如果我們按bssid進行過濾,則幀將傳送到BSSID 00:df:1d:dd:7d:3e,該地址是OWE轉換模式IE:中的BSSID



OWE信標

您還可以看到,OWE隱藏信標還包含帶有開放式ssid BSSID和SSID名稱「開放」的OWE轉換模式 IE。

以下螢幕截圖顯示了支援「增強開放」的Android手機:它只顯示不帶鎖圖示的開放式SSID(鎖圖 示會使使用者認為需要密碼進行連線),但一旦連線後,安全顯示使用增強型開放安全。

09:03 🖻		🙆 😟 🗟 л 30% 🛢	
< wi	i-Fi	چې	
Ligado			
Rede atual			
(((÷	Ligado	୍ର ଜୁନ	
Redes disp	oníveis		
((ر.	MEO-WiFi É necessário iniciar sessão.		
(((·	open		
((î;0	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

而且我們可在WLC GUI中觀察到相同情況:

Cisco Cataly	yst 9800-CL Wireless Controller	Welcome admin 🕋 🐨 🛕 🖺	🔅 🖄 😧 🎜 Search APs and Clients C
Q Search Menu Items	Monitoring * > Wireless * > Clients	Client	
Dashboard	Clients Sleeping Clients Excluded Clients	360 View General QOS Statistics	ATF Statistics Mobility History Call 5
Image: Configuration > Image: Configuration > <td< th=""><th>× Delote ✓ Selected 0 out of 2 Clients Client MAC Address ✓ IPv4 Address ▼ IPv6 Address 0 429.2ec9.e371 192.168.1.160 fe80::6a20:34e8:ab1b:6332 2 286b.3598.580f 192.168.1.159 2001:8a0:tb91:1c00:d0cb:dd1b:71e4:f H 1 H 10 ▼</th><th>Client Properties AP Properties Sec MAC Address Client MAC Type Client DUID IPV4 Address IPV6 Address User Name Policy Profile Flox Profile Wireless LAN Id WLAN Profile Name Wireless LAN Network Name (SSID) RSSID</th><th>urity Information Client Statistics QOS 286b.3598.580f Universally Administered Address NA 192.168.1.159 2001:8a0:fb91:1c00:d0cb:dd1b:71e4:f29d f680::ac5bx=1e1:67ba:c353 2001:8a0:fb91:1c00:edb2:8d62:d379:c53b N/A CentralSwPolicyProfile N/A 3 OWE_Transition OWE_Transition 00rdf 1/ddd 7d3e</th></td<>	× Delote ✓ Selected 0 out of 2 Clients Client MAC Address ✓ IPv4 Address ▼ IPv6 Address 0 429.2ec9.e371 192.168.1.160 fe80::6a20:34e8:ab1b:6332 2 286b.3598.580f 192.168.1.159 2001:8a0:tb91:1c00:d0cb:dd1b:71e4:f H 1 H 10 ▼	Client Properties AP Properties Sec MAC Address Client MAC Type Client DUID IPV4 Address IPV6 Address User Name Policy Profile Flox Profile Wireless LAN Id WLAN Profile Name Wireless LAN Network Name (SSID) RSSID	urity Information Client Statistics QOS 286b.3598.580f Universally Administered Address NA 192.168.1.159 2001:8a0:fb91:1c00:d0cb:dd1b:71e4:f29d f680::ac5bx=1e1:67ba:c353 2001:8a0:fb91:1c00:edb2:8d62:d379:c53b N/A CentralSwPolicyProfile N/A 3 OWE_Transition OWE_Transition 00rdf 1/ddd 7d3e
Cisco Cataly	yst 9800-CL Wireless Controller	Welcome admin	Search APs and Clients
Q. Search Menu Items	Monitoring * > Wireless * > Clients	Client	
Dashboard	Clients Sleeping Clients Excluded Clients	Client Properties AP Properties Se	ATF Statistics Mobility History Call
[™]	Selected 0 out of 2 Clients	Client State Servers Client ACLs Client Entry Create Time	None 424 seconds
Administration	Client MAC T IPv4 T Address Address IPv6 Address AP	Name Policy Type Encryption Cipher	WPA3 CCMP (AES)
C Licensing	0429.2ec9.e371 J 192.168.1.160 fe80::6a20:34e8:ab1b:6332 AP 286b.3598.5801 J 192.168.1.159 fe80::ac5b:e1e1:67ba:c353 AP	Authentication Key Management EAP Type	OWE Not Applicable
		aussion Limeout	1600

對於不支援「增強開放」的客戶端,它們只能看到並連線到開放的SSID,而不進行加密。

如圖所示,這些客戶端不支援增強開放(分別是IOS 15上的iPhone和Mac OS 12上的 MacBook),並且只能看到開放的訪客SSID,並且不使用加密。



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

疑難排解

- 1. 確保客戶端支援OWE,因為並非所有客戶端都支援OWE。檢視客戶端供應商文檔,例如 Apple在此處記錄了對其裝置的<u>支援</u>。
- 2. 由於OWE轉換模式IE的存在,某些較舊的客戶端甚至可能不接受開放的ssid信標,並且在範 圍內的網路中不會顯示SSID。如果您的使用者端無法看到開放式SSID,請從WLAN組態中移 除Transition VLAN(設為0),然後檢查其是否看到WLAN。
- 3. 如果客戶端看到開放的SSID,支援OWE,但是它們仍然連線不帶WPA3,然後驗證轉換 VLAN ID是否正確並在兩個WLAN的信標中廣播。您可以在監聽器模式下使用AP來捕獲 OTA流量。請執行以下步驟在監聽器模式下配置AP:在監<u>聽器模式下配置AP Catalyst 91xx</u>。
 - 使用SSID「open」傳送的信標包含內部具有增強開放SSID詳細資訊的OWE轉換模式



IE,如BSSID和SSID名稱「OWE_Transition」:

OWE轉換開放式SSID信標

也有隱藏SSID的信標OTA,如果我們按bssid進行過濾,則幀將傳送到BSSID
 00:df:1d:dd:7d:3e,該地址是OWE轉換模式IE:中的BSSID

	1.	19(apr) - 19(apr) (19)	CTRP FINAL CRASH	10000	The second second			. Parmer 1976s and budge on view (1986 biks) and budge continued (1986 biks) on takenface (Berlanting /Barlant 1986 and a
No.	Time	Delta Source	Destination	Protocol	Length Cha	annel. Signal stri	Into	Prime ster, wis with the (see with), wis with district but the state of the but had bit
	3533 20.685167	0.000333 Cisco_dd:7d:3e	Broadcast	892.11	475	64 -44 dBR	Beacon frame, SN+604, FN+0, Flags+C, BI+100, SSID+Hildcard (Broadcast)	Televise as active dependence of the set of the set of the the
	3534 20.707074	e.101907 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -44 dBm	Beacon frame, SN+3451, FN+0, Flags+C, BI+100, SSID+"open"	A stratige flowing we saw a, set and store and the state state
	3535 20.787682	e.eeeces Cisco_dd:7d:3e	Broadcast	802.11	475	64 -44 088	Beacon frame, SNx685, FNx0, Flags+C, BIx100, SSID-Wildcard (Broadcast)	A start where an investigation of the start
	3541 20.009591	0.101909 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 dBm	Beacon frame, SN+3452, FN+0, Flags+C, BI+100, SSID+"open"	2 AD VEEL WEATER ENGINEER SEE ONLYS
	3542 20.090003	0.000412 Cisco_dd:7d:3e	Broadcast	882.11	475	64 -45 dBm	Beacon frame, SNx606, FNx0, Flags+C, BIx100, SSID-Wildcard (Broadcast)	V THE ALL THE ALTER THE ATT A THE ALTER A THE ALTER ATT A THE
	3553 20.991883	e.101000 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 dBm	Beacon frame, SN+3453, FN+0, Flags+C, BI+100, SSID+"open"	The second second range frager contents
	3554 20.992456	e.eees73 Cisco_dd:7d:3e	Broadcast	802.11	475	64 -45 dbm	Beacon frame, SN+687, FN+0, Flags+C, BI+100, SSID+Wildcard (Broadcast)	S Enam Control 5 (1314 - 6-588)
	3555 21.095434	0.202975 Cisco_dd:7d:3f	Broadcast	882.11	454	64 -46 dam	Beacon frame, SN+3454, FN+0, Flags+C, BI+100, SSID+"open"	Prime control region control or control of control of the
	3556 21.095434	e.eeeeee Cisco_dd:7d:3e	Broadcast	802.11	475	64 -46 dan	Beacon frame, SN+688, FN+0, Flags+C, BI+100, SSID+Hildcard (Broadcast)	
	3557 21.196678	0.101236 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -45 dbm	Beacon frame, SN+3455, FN+0, Flags+C, BI+100, SSID+"open"	Destanti non ess. erono (friftiftiftiftiftiftiftiftiftiftiftiftifti
	3558 21.197421	0.000751 Cisco_dd:7d:3e	Broadcast	802.11	475	64 -45 dbm	Beacon frame, SN+639, FN+0, Flags+C, BI+100, SSID+Hildcard (Broadcast)	Transmitter address, Browness (Transmitter) (1997)
	3559 21.299091	0.101670 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -46 dbs	Beacon frame, SN+3456, FN+0, Flags+C, BI+100, SSID+"open"	Teronicier dures. Liste de la contra de la c
	3560 21.299530	0.000447 Cisco_dd:7d:3e	Broadcast	882.11	475	64 -45 dBm	Beacon frame, SN+690, FN+0, Flags+C, BI+100, SSID-wildcard (Broadcast)	Source asseress: Carco de Maria (de director de de la companya de la
	3561 21.401640	0.102102 Cisco_dd:7d:3f	Broadcast	802.11	454	64 -46 088	Bracon frame, ShuldST, Durg, Claps, C. STulke, SSTO-"open"	E22 10: C12C0_001/0114 (40101101001/0116)
0	3562 21.402040	0.000400 Cisco_dd:7d:3e	Broadcast	882.11	475	64 -46 dem	Beacon frame, SN+691, FN+0, Flags+C, B1+100, SSID+Hildcard (Broadcast)	the the the term of a pregners function of
	3563 21.433282	0.031242 IntelCor_98:58	:_ Broadcast	802.11	219	64 -34 dBm	Proce Request, surger, runs, ringss	edie 1011 0011 = Sequence number: 401
	3564 21.434668	0.001386 192.168.1.15	192.168.1.121	882.11	76	64 -35 dbm	Acknowledgement, FlagsC	Frame check sequence: exceededede [unversites]
	3565 21.448921	0.014253 IntelCor_98:58	: Broadcast	882.11	219	64 -35 dbm	Probe Request, SN+187, FN+0, Flags+C, SSID+"ONE_Transition"	[FCS Status: unverified]
	3566 21.450101	e.ee1260 Cisco_dd:7d:3e	IntelCor_95:58:0f	882.11	483	64 -46 088	Probe Response, SN+62, Fh+0, Flags+C, BI+100, SSID+"OHE_Transition"	 IEEE 802.11 wireless Management
	3567 21.450181	0.000000 192.168.1.15	192.168.1.121	882.11	76	64 -35 dbm	Acknowledgement, FlagiC	> Fixed parameters (12 bytes)
	3568 21.503984	0.053803 Clsco_dd:7d:3f	Broadcast	802.11	454	64 -46 dbm	Beacon frame, SN+3458, FN+0, Flags+C, BI+100, SSID+"open"	V (arrest carameters (372 bytes)
	3569 21.504428	0.000444 Cisco_dd:7d:3e	Broadcast	802.11	475	64 -46 dBm	Beacon frame, SN+692, FN+0, Flags+C, BI+180, SSID+Hildcard (Broadcast)	 Teg: SSID parameter set: Wildcard SSID
	3570 21.518478	0.014050 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	0.024021 IntelCor_90:58	1. Clsco_dd:7d:3e	802.11	96	64 -34 dbm	Authentication, SNe4, FNe0, FlagseC	Tag length: 0
	3626 21.542561	0.000062 192.168.1.15	192.168.1.121	002.11	76	64 -45 dbm	Acknowledgement, FlagsC	SSID: OISSING
	3627 21.543892	0.001331 Cisco dd:7d:3e	IntelCor 98:58:0f	882.11	96	64 -45 dbm	Authentication, SNv0, FNv0, Flags+C	> Tag: Supported Hates 6(8), 9, 12(8), 18, 24(8), 36, 40, 54, [Abit/sec]
	3628 21.543892	0.000000 192.168.1.15	192.168.1.121	882.11	76	64 -34 dbm	Acknowledgement, FlagswC	> Tag: DS Parameter set: Current Channel: 64
	3629 21.545841	0.001949 IntelCor 98:58	1. Cisco dd:7d:3e	882.11	324	64 -34 dam	Association Request, SNu5, FNu6, Flags	> Teg: Traffic Indication Hap (TIH): DTIH @ of 1 bitmap
	3630 21.545841	0.000000 192,165,1,15	192,168,1,121	882.11	76	64 -45 dbm	Acknowledgement, FlagtsC	> Tag: Country Information: Country Code PT, Environment Global operating classes
	3632 21.553468	0.007627 192.168.1.15	192,168,1,121	882.11	76	64 -34 dam	Acknowledgement, FlagswC	> Tag: Power Constraint: 3
	3633 21.554524	a parase totalcor saisa	1 Clisco del 2413e	882.11	91	64 .35 /88	Artiss Shud, Dash, C	> Tag: TPC Report Transmit Power: 4, Link Hargin: 0
	3634 21.554524	8.000000 192.168.1.15	192.148.1.121	882.11	76	44 -45 100	Arknowledgement, flagt,	> Tag: R5N Information
	3635 21.556591	8.001667 Clarn dd:7d:3e	Tetelcor spissiof	EAPOL	221	44 -45 100	Tey (Hessage 1 of 4)	> Tag: Q855 Load Element 802.11e CCA version
	3636 21.556957	0.000166 197.168.1.15	192,168,1,121	882.11	76	64 .36 088	Arknowledgement, flagtsC	> Tag: RH Enabled Capabilities (5 octets)
	3637 21.558653	0.001696 TotelCor SEISE	1. Clisco dd:7d:3e	EAPOL	227	64 .36 088	Key (Message 2 of 4)	> Tag: HT Capabilities (802.11n 01.10)
	3438 21 668463	8 000000 197 168 1 15	192.148.1.121	882.11	76	44 .45 /84	Alternationent flats. F	> Tag: HT Information (802.11n 01.10)
	1619 21 COMM	8 682251 Cisco 44:74:34	Tetalcon GEILEIGH	1400	295	44.45 100	Pay (Massage 1 of 2)	> Tag: Extended Capabilities (11 octets)
	3648 21 568986	8 000000 192 168 1 15	197,168,1,171	882.11	76	44 .34 /84	L'énnulatement flant.	> Tag: VHT Capabilities
	3642 21.561916	a deleta totalcor stist	C16/0 /01/26/3e	FAROL	199	44 -44 100	Tey (Neccare 4 of 4)	> Tag: VHT Operation
	3643 21.561964	8.000048 192.168.1.15	197.148.1.171	882.11	26	44 -45 /00	Arknuladrement, flagte	> Tag: Tx Power Envelope
	3644 21.566689	8.664725 192.168.1.15	192,168,1,121	882.11	111	44 -45 100	Tripper Buffer Status Berret Poll (BSBP), Elapia	> Tag: Reduced Neighbor Report
	3646 31 663471	0.000703 103 100 1 15	107 148 1 171	887.11	24	44 .37 .004	Arison determent flam.	> Ext Tag: HE Capabilities
	3648 21 667638	0 000000 107 168 1 15	107 168 1 171	887.11	74	44 .37 .008	kingdefragent flagt. f	> Ext Tag: HE Operation
	3649 31 548554	a aniane cliero del tella	Tetalcor Stituit	887.11	110	44 .45 .000	Action Shit Bud Flags, n. (Inh)formed Parket]	> Ext Tag: Spatial Reuse Parameter Set
	3650 21.562556	8 888888 197 168 1 15	193.168.1.131	887.11	76	44 .37 684	Likely sets, respectively the set of the set	> Ext Tag: HU EDCA Parameter Set
	3651 21.566316	a apares totalcor stist	Tion dittie	887.11	110	44 .37 684	Action 61-7 Dud Flare, n. Chalingant Parket]	> Tag: Vendor Specific: Hicrosoft Corp.: WHV/WHE: Parameter Element
	3/65 31 2/0310	A ADDADA 163 167 1 16	101 128 1 111			22 22 48	Alanda adapted films	> Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (44)
	3651 21 581217	a attatt risen de 24-14	Tetalcon GE-ER-DA	882.11	114	44 -45 000	Liting Chul Chad Flages C	Teg: Vendor Specific: Hi-Fi Alliance: OwE Transition Hode
	3654 21.581222	8.000000 192.163.1.14	192, 168, 1, 121	882.1*	74	44 -37 (***	Arknin advent flags f	Tag Number: Vendor Specific (221)
	3000 31 (00311)	a attate ciero de teste	Records and	883.11	12.4	44 44 484	Bancon Arana (b. 1016 (b. 8 flags, C St. 100 (CTD. Same)	Tag length: 15
	3666 31 (065303	a analise cisco_00:70:31	Broadcast	882.11	475	44 48 484	Ranco frame Third Die Class. C ST-100 (Strad (Read(art))	OUT: 50:6f:9a (ki-Fi Alliance)
	3467 31 41368	A AMERIA 163 168 1 16	101 148 1 111	883.11	-10	44 .41 684	flast to seed flast.	vendor Specific OUI Type: 28
	3713 31 636677	0.017073 107 168 1 15	103 108 1 131	882.11	76	44 .44 000	Advantationant flam,	855ID: C1sco_dd:7d:3f (80:df:1d:dd:7d:3f)
	3714 31 639377	A AMALIA 103 108 1 10					Class to read flam.	SSID length: 4
	3714 31 638478	A AMALIAN 103 108 1 10	202 200 1 221			44 45 454	triandational flag.	SSID: open

OWE信標

您還可以看到,OWE隱藏信標還包含帶有開放式ssid BSSID和SSID名稱「開放」的 OWE轉換模式IE。

• 您還可以檢視AKM資訊並驗證MFP是否通告為「必需」和「支援」



OWE Beacon AKM

4. 根據客戶端MAC地址收集RadioActive跟蹤,您會看到類似如下所示的日誌:

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

參考資料

<u>Cisco Catalyst 9800 系列無線控制器軟體設定指南 17.9.x</u>

WPA3 部署指南

<u>Wi-Fi聯盟® WPA3™規格v3.4</u>

關於此翻譯

思科已使用電腦和人工技術翻譯本文件,讓全世界的使用者能夠以自己的語言理解支援內容。請注 意,即使是最佳機器翻譯,也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準 確度概不負責,並建議一律查看原始英文文件(提供連結)。