Configurar e verificar a segurança da camada 2 da WLAN do Wi-Fi 6E

Contents

Introdução

Este documento descreve como configurar a segurança da camada 2 da WLAN Wi-Fi 6E e o que esperar em clientes diferentes.

Pré-requisitos

Requisitos

A Cisco recomenda que você tenha conhecimento destes tópicos:

- Controladores de LAN sem fio (WLC) 9800 da Cisco
- Pontos de acesso (APs) da Cisco que suportam Wi-Fi 6E.
- Padrão IEEE 802.11ax.
- Ferramentas: Wireshark v4.0.6

Componentes Utilizados

As informações neste documento são baseadas nestas versões de software e hardware:

- WLC 9800-CL com IOS® XE 17.9.3.
- APs C9136, CW9162, CW9164 e CW9166.
- Clientes Wi-Fi 6E:
  - Lenovo X1 Carbon Gen11 com adaptador Intel AX211 Wi-Fi 6 e 6E com driver versão 22.200.2(1).
  - Adaptador Netgear A8000 Wi-Fi 6 e 6E com driver v1(0.0.108);
  - Celular Pixel 6a com Android 13;
  - Celular Samsung S23 com Android 13.

As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. Todos os dispositivos utilizados neste documento foram iniciados com uma configuração (padrão) inicial. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

Informações de Apoio

O principal é saber que o Wi-Fi 6E não é um padrão totalmente novo, mas uma extensão. Em sua base, o Wi-Fi 6E é uma extensão do padrão sem fio Wi-Fi 6 (802.11ax) na banda de radiofreqüência de 6 GHz.

O Wi-Fi 6E baseia-se no Wi-Fi 6, que é a última geração do padrão Wi-Fi, mas apenas dispositivos e aplicativos Wi-Fi 6E podem operar na banda de 6 GHz.

Segurança Wi-Fi 6E

O Wi-Fi 6E aumenta a segurança com Wi-Fi Protected Access 3 (WPA3) e Opportunistic Wireless Encryption (OWE) e não há compatibilidade com versões anteriores da segurança Open e WPA2.

A WPA3 e a Segurança Aberta Avançada são agora obrigatórias para a certificação Wi-Fi 6E, e o Wi-Fi 6E também exige Quadro de Gerenciamento Protegido (PMF - Protected Management Frame) em AP e Clientes.

Ao configurar um SSID de 6 GHz, há certos requisitos de segurança que devem ser atendidos:

- Segurança WPA3 L2 com OWE, SAE ou 802.1x-SHA256
- Quadro De Gerenciamento Protegido Ativado;
- Nenhum outro método de segurança de L2 é permitido, isto é, nenhum modo misto é possível.

WPA3

A WPA3 foi projetada para melhorar a segurança Wi-Fi, permitindo uma melhor autenticação pela WPA2, fornecendo uma força criptográfica expandida e aumentando a resiliência de redes críticas.

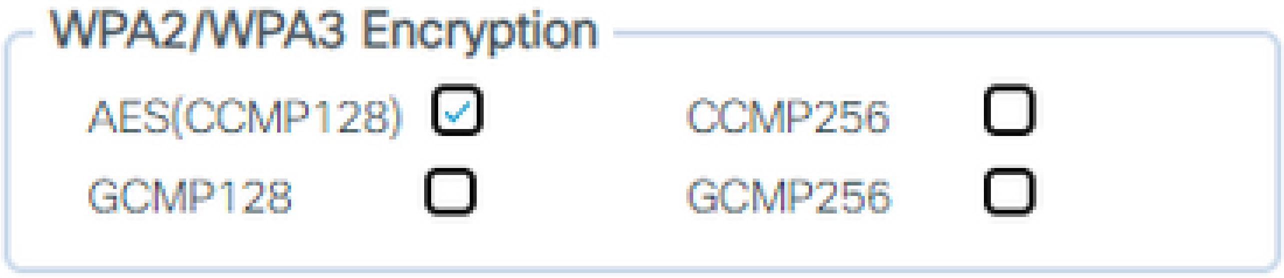
Os principais recursos da WPA3 incluem:

- O Protected Management Frame (PMF) protege quadros de gerenciamento unicast e broadcast e criptografa quadros de gerenciamento unicast. Isso significa que a detecção de intrusão sem fio e o sistema de prevenção de intrusão sem fio têm menos maneiras de aplicar as políticas do cliente.
- A Autenticação Simultânea de Iguais (SAE - Simultaneous Authentication of Equals) permite a autenticação baseada em senha e um mecanismo de acordo de chave. Isso protege contra ataques de força bruta.
- O modo de transição é um modo misto que permite o uso de WPA2 para conectar clientes que não suportam WPA3.

A WPA3 trata do desenvolvimento e da conformidade de segurança contínuos, bem como da interoperabilidade.
Não há nenhum elemento de informação que designe WPA3 (o mesmo que WPA2). A WPA3 é definida pelas combinações AKM/Cipher Suite/PMF.

Na configuração da WLAN 9800, você tem 4 algoritmos de criptografia WPA3 diferentes que podem ser usados.

Eles se baseiam no Galois/Counter Mode Protocol (GCMP) e no Counter Mode com Cipher Block Chaining Message Authentication Code Protocol (CCMP): AES (CCMP128), CCMP256, GCMP128 e GCMP256:



WPA2/WPA3 Encryption

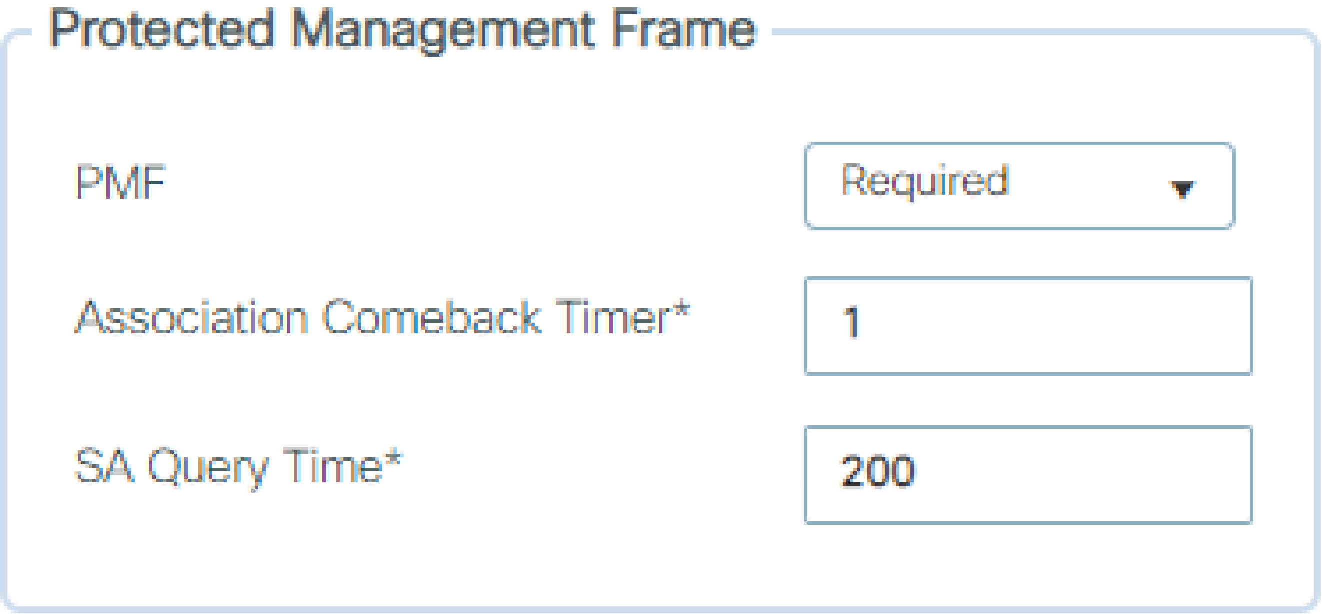
AES(CCMP128) ☑ CCMP256 □
GCMP128 □ GCMP256 □

Opções de criptografia WPA2/3

PMF

O PMF é ativado em uma WLAN quando você habilita o PMF.

Por padrão, os quadros de gerenciamento 802.11 não são autenticados e, portanto, não são protegidos contra falsificação. A Estrutura de proteção de gerenciamento de infraestrutura (MFP) e as estruturas de gerenciamento protegidas (PMF) 802.11w fornecem proteção contra tais ataques.



Protected Management Frame

PMF: Required

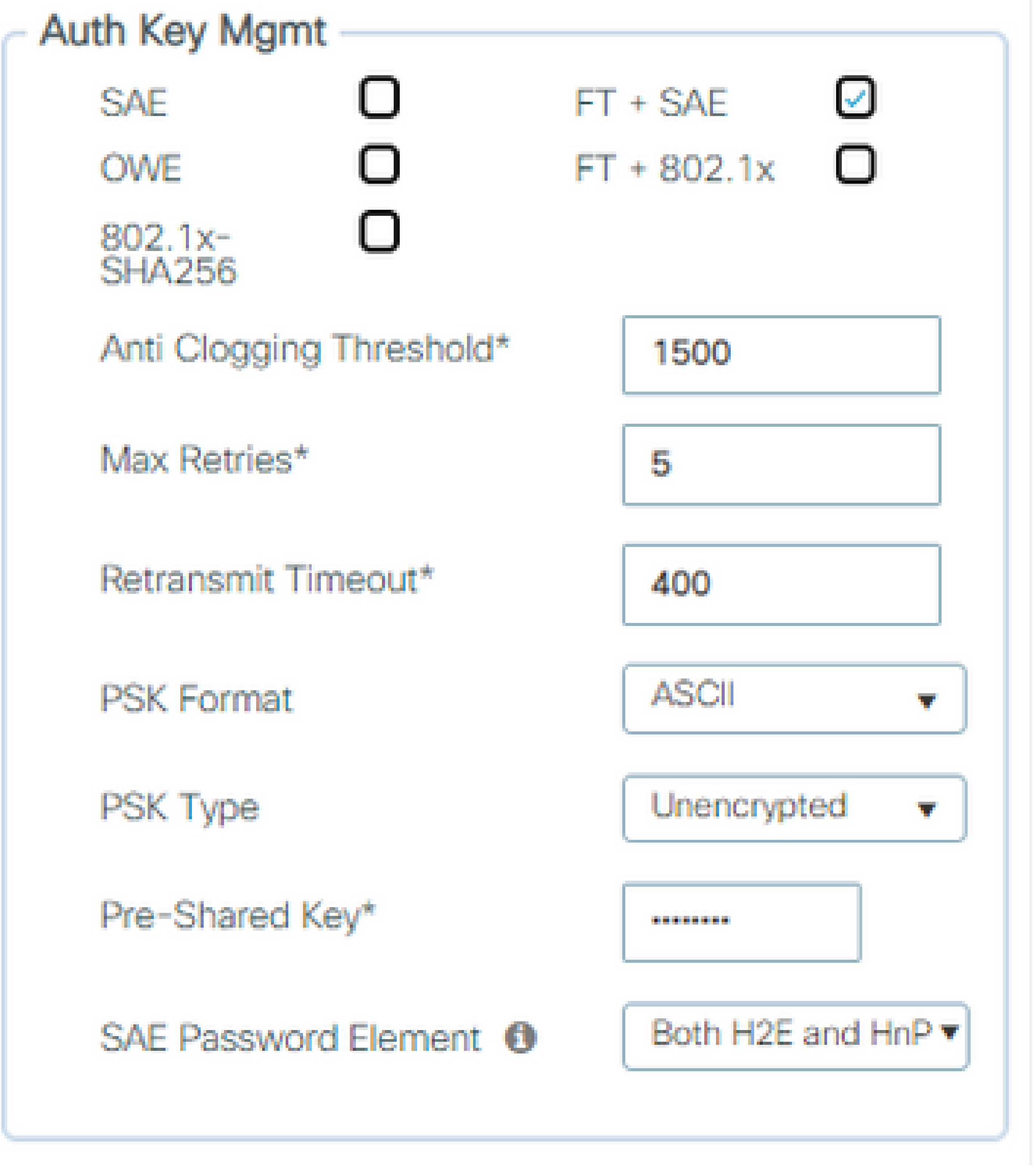
Association Comeback Timer*: 1

SA Query Time*: 200

Opções de PMF

Gerenciamento de chave de autenticação

Estas são as opções do AKM disponíveis na versão 17.9.x:



Auth Key Mgmt

SAE □ FT + SAE ☑

OWE □ FT + 802.1x □

802.1x-SHA256 □

Anti Clogging Threshold* 1500

Max Retries* 5

Retransmit Timeout* 400

PSK Format ASCII

PSK Type Unencrypted

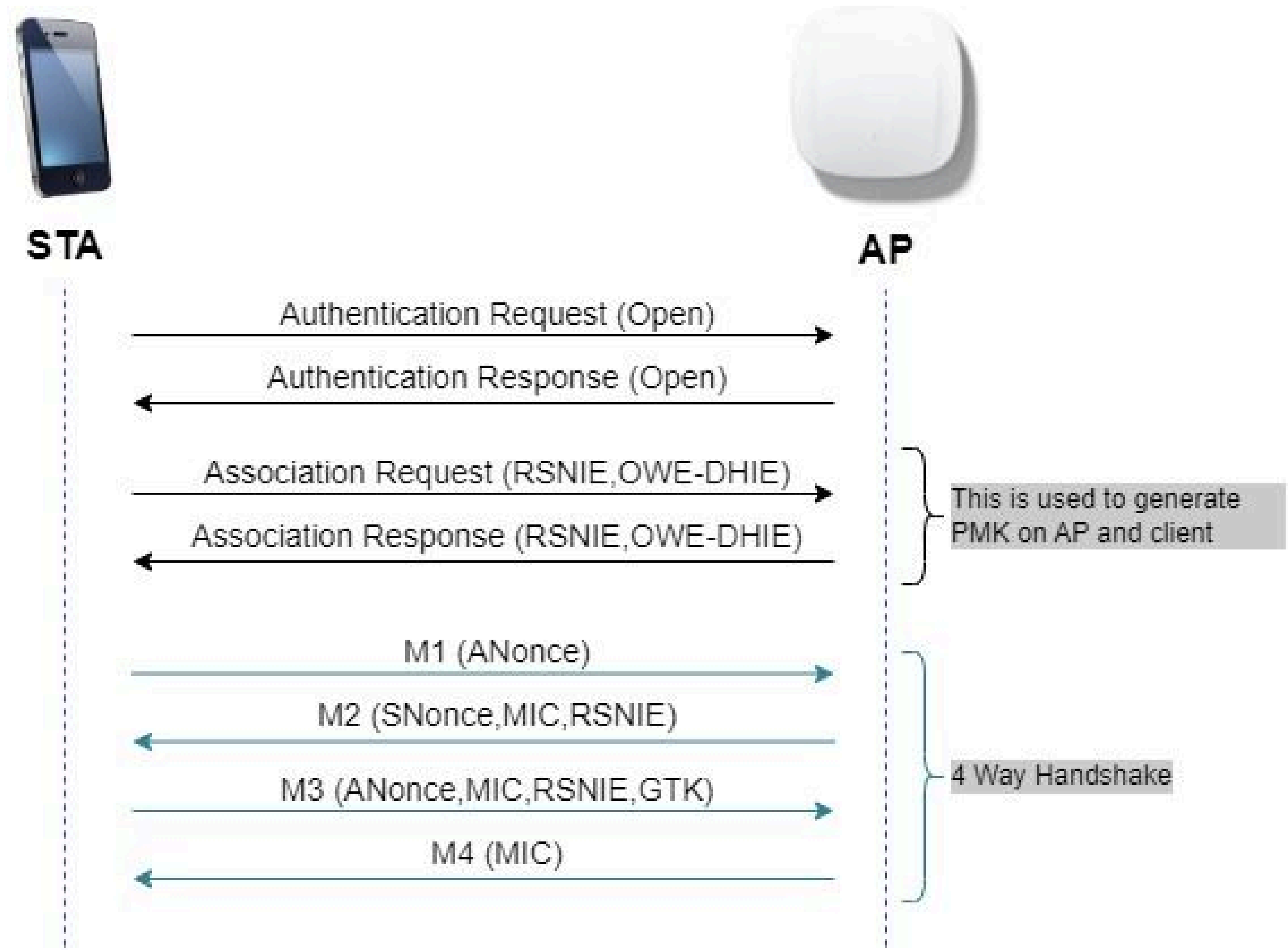
Pre-Shared Key* ·········

SAE Password Element Both H2E and HnP

Opções do AKM

DEVER

O Opportunistic Wireless Encryption (OWE) é uma extensão do IEEE 802.11 que fornece criptografia do meio sem fio (IETF RFC 8110). A finalidade da autenticação baseada em OWE é evitar a conectividade sem fio aberta e não segura entre o AP e os clientes. O OWE usa os algoritmos Diffie-Hellman baseados em criptografia para configurar a criptografia sem fio. Com o OWE, o cliente e o AP executam uma troca de chave Diffie-Hellman durante o procedimento de acesso e usam o segredo resultante da chave mestra em pares (PMK) com o handshake de 4 vias. O uso do OWE melhora a segurança da rede sem fio para implantações em que redes abertas ou compartilhadas baseadas em PSK são implantadas.


STA
AP
Authentication Request (Open)
Authentication Response (Open)
Association Request (RSNIE,OWE-DHIE)
Association Response (RSNIE,OWE-DHIE)
This is used to generate PMK on AP and client
M1 (ANonce)
M2 (SNonce,MIC,RSNIE)
M3 (ANonce,MIC,RSNIE,GTK)
M4 (MIC)
4 Way Handshake

Troca de quadros OWE

SAE

A WPA3 usa um novo mecanismo de gerenciamento de autenticação e chave chamado Autenticação Simultânea de Iguais. Esse mecanismo é aprimorado ainda mais com o uso do SAE Hash-to-Element (H2E).

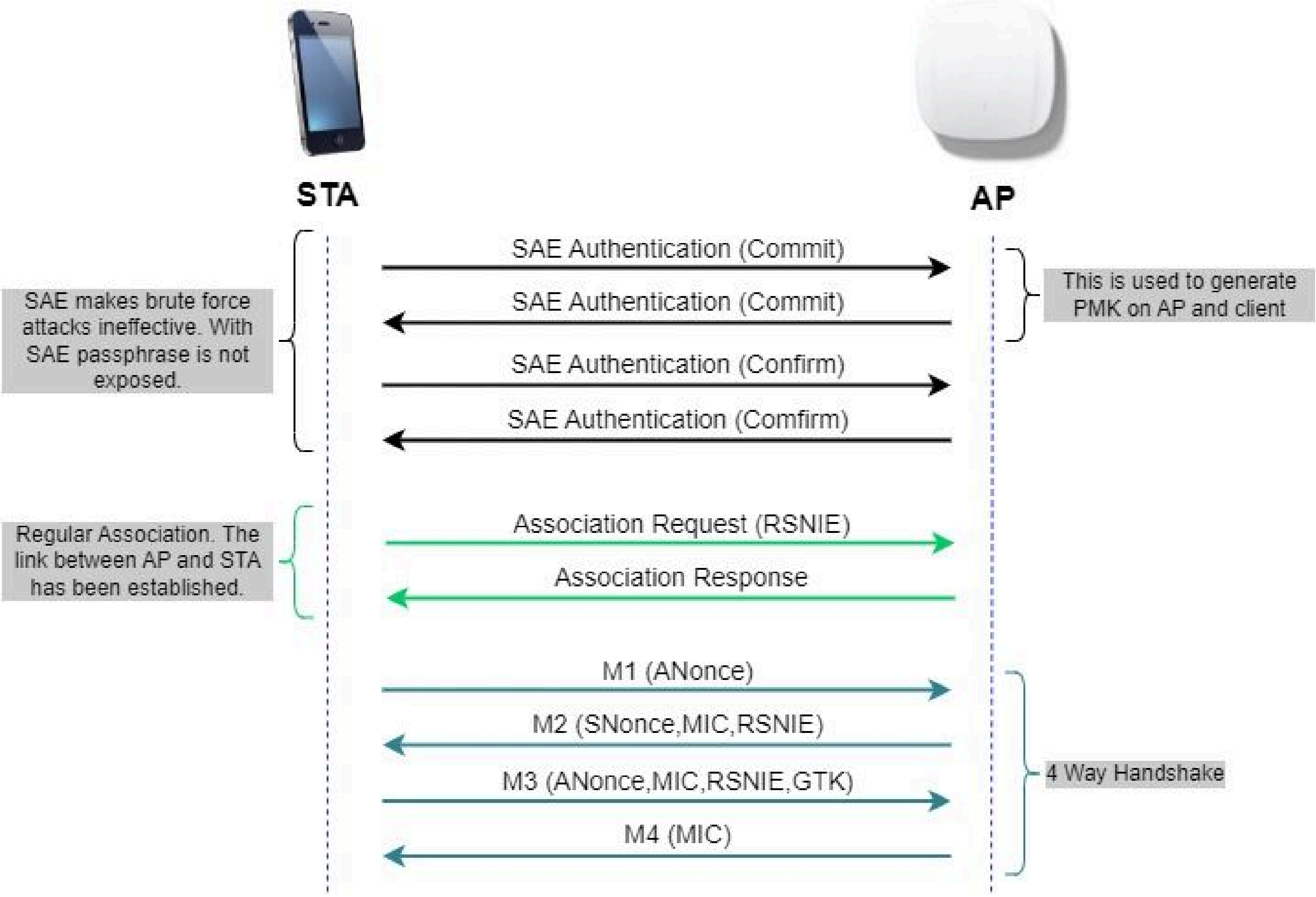
O SAE com H2E é obrigatório para WPA3 e Wi-Fi 6E.

O SAE emprega uma criptografia de logaritmo discreto para realizar uma troca eficiente de forma que execute a autenticação mútua usando uma senha que provavelmente seja resistente a um ataque de dicionário off-line.

Um ataque de dicionário offline é quando um adversário tenta determinar uma senha de rede tentando senhas possíveis sem interação de rede adicional.

Quando o cliente se conecta ao access point, ele executa uma troca SAE. Se obtiverem êxito, eles criam uma chave criptograficamente forte, da qual a chave de sessão é derivada. Basicamente, um cliente e um ponto de acesso entram em fases de confirmação e depois confirmam.

Quando houver um compromisso, o cliente e o ponto de acesso poderão entrar nos estados de confirmação cada vez que houver uma chave de sessão a ser gerada. O método usa sigilo de encaminhamento, onde um invasor pode quebrar uma única chave, mas não todas as outras chaves.


STA
AP
SAE makes brute force attacks ineffective. With SAE passphrase is not exposed.
SAE Authentication (Commit)
SAE Authentication (Commit)
This is used to generate PMK on AP and client
SAE Authentication (Confirm)
SAE Authentication (Comfirm)
Regular Association. The link between AP and STA has been established.
Association Request (RSNIE)
Association Response
M1 (ANonce)
M2 (SNonce,MIC,RSNIE)
M3 (ANonce,MIC,RSNIE,GTK)
M4 (MIC)
4 Way Handshake

intercâmbio de quadros SAE

Hash para elemento (H2E)

Hash-to-Element (H2E) é um novo método SAE Password Element (PWE). Nesse método, o PWE secreto usado no protocolo SAE é gerado a partir de uma senha.

Quando uma estação (STA) que suporta H2E inicia o SAE com um AP, ele verifica se o AP suporta H2E. Se sim, o AP usa o H2E para derivar o PWE usando um valor de código de status recém-definido na mensagem SAE Commit.

Se a STA usar Hunting-and-Pecking (HnP), toda a troca SAE permanecerá inalterada.

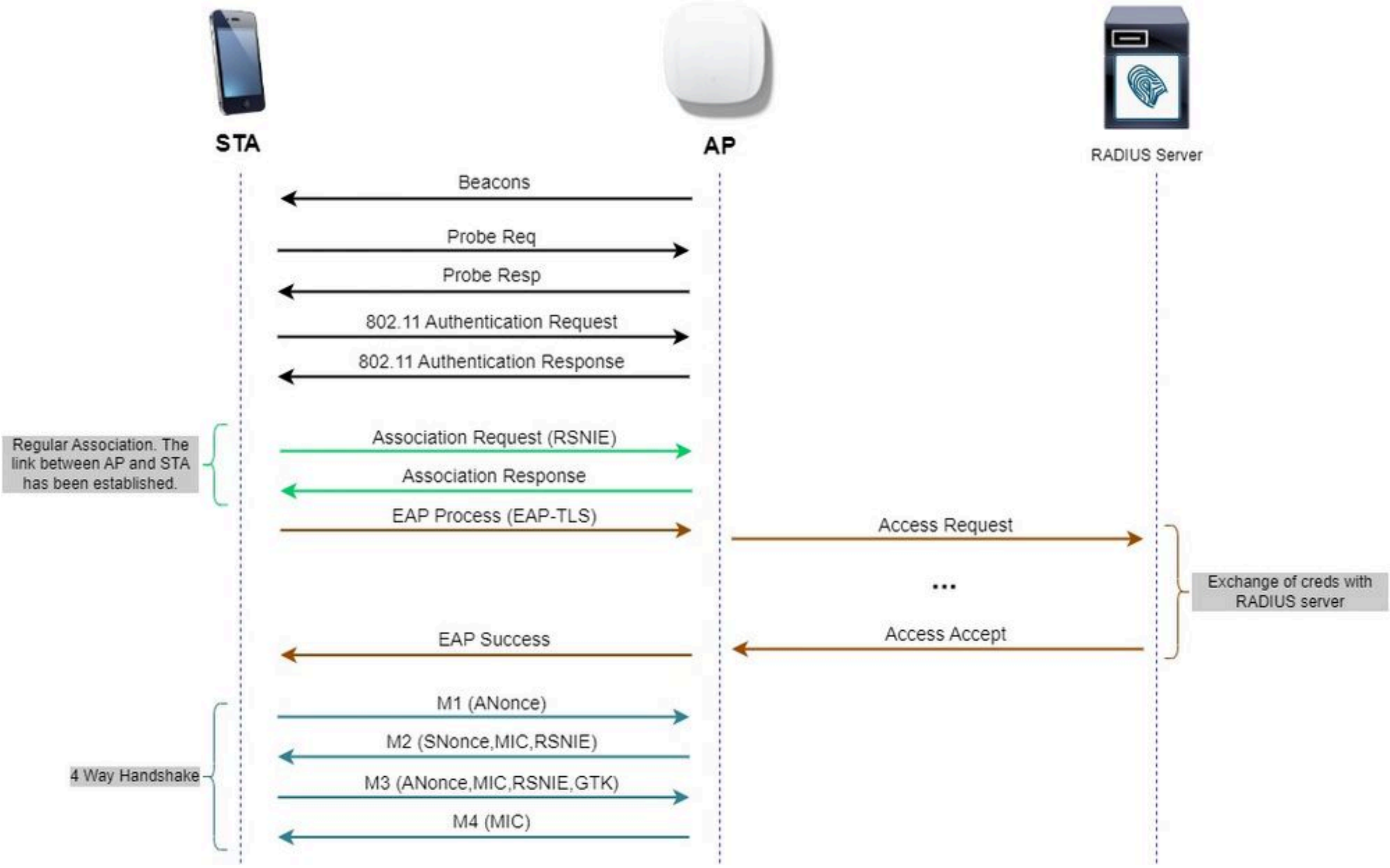
Ao usar o H2E, a derivação PWE é dividida nestes componentes:

- Derivação de um elemento intermediário secreto (PT) da senha. Isso pode ser feito off-line quando a senha é inicialmente configurada no dispositivo para cada grupo suportado.
- Derivação do PWE do PT armazenado. Isso depende do grupo negociado e dos endereços MAC dos peers. Isso é realizado em tempo real durante a troca de SAE.

Observação: 6-GHz suporta apenas o método Hash-to-Element SAE PWE.

WPA-Enterprise também conhecido como 802.1x

A WPA3-Enterprise é a versão mais segura da WPA3 e usa uma combinação de nome de usuário e senha com 802.1X para autenticação de usuário com um servidor RADIUS. Por padrão, a WPA3 usa a criptografia de 128 bits, mas também introduz uma criptografia de nível criptográfico de 192 bits configurável opcionalmente, que fornece proteção adicional a qualquer rede que transmita dados confidenciais.


STA
AP
RADIUS Server
Beacons
Probe Req
Probe Resp
802.11 Authentication Request
802.11 Authentication Response
Regular Association. The link between AP and STA has been established.
Association Request (RSNIE)
Association Response
EAP Process (EAP-TLS)
Access Request
...
Exchange of creds with RADIUS server
Access Accept
EAP Success
M1 (ANonce)
M2 (SNonce,MIC,RSNIE)
4 Way Handshake
M3 (ANonce,MIC,RSNIE,GTK)
M4 (MIC)

Fluxo do diagrama empresarial WPA3

Nível definido: Modos WPA3

- WPA3-Pessoal
  - Modo somente WPA3-Personal
    - PMF obrigatório
  - Modo de transição WPA3-Personal
    - Regras de configuração: em um AP, sempre que a WPA2-Personal for habilitada, o modo de transição WPA3-Personal também deverá ser habilitado por padrão, a menos que seja substituído explicitamente pelo administrador para operar no modo somente WPA2-Personal

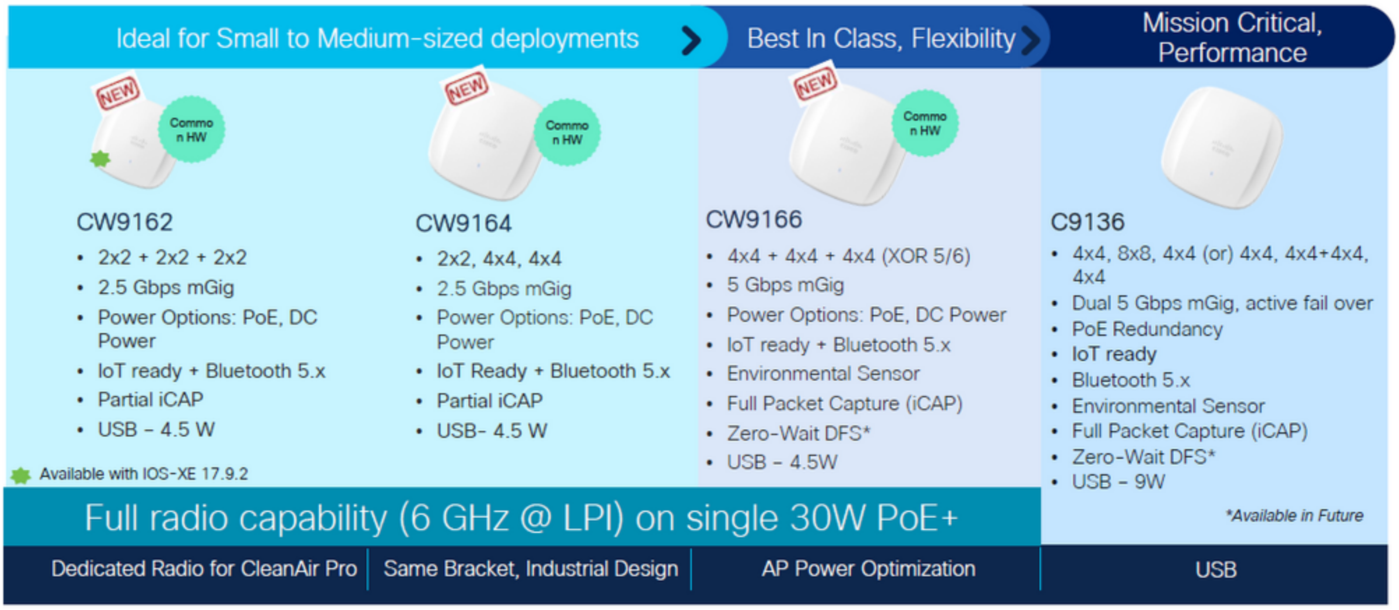
- WPA3-Empresa
  - Modo somente WPA3-Empresa
    - O PMF deve ser negociado para todas as conexões WPA3
  - Modo de transição WPA3-Enterprise
    - O PMF deve ser negociado para uma conexão WPA3
    - PMF opcional para uma conexão WPA2
  - Modo "192 bits" do WPA3-Enterprise Suite-B alinhado com o Commercial National Security Algorithm (CNSA)
    - Mais do que apenas para o governo federal
    - Conjuntos de cifras criptográficas consistentes para evitar erros de configuração
    - Adição de GCMP e ECCP para funções de criptografia e hash melhores

    (SHA384)
    - PMF obrigatório
    - A segurança WPA3 de 192 bits será exclusiva para EAP-TLS, que exigirá certificados tanto no solicitante quanto no servidor RADIUS.
    - Para usar WPA3 de 192 bits corporativo, os servidores RADIUS devem usar uma das cifras EAP permitidas:

      TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
      TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
      TLS_DHE_RSA_WITH_AES_256_GCM_SHA384

Para saber mais sobre informações detalhadas sobre a implementação de WPA3 em WLANs da Cisco, incluindo a matriz de compatibilidade de segurança do cliente, consulte o Guia de Implantação de WPA3.

APs Cisco Catalyst Wi-Fi 6E



Ideal for Small to Medium-sized deployments

Best In Class, Flexibility

Mission Critical, Performance

CW9162
- 2x2 + 2x2 + 2x2
- 2.5 Gbps mGig
- Power Options: PoE, DC Power
- IoT ready + Bluetooth 5.x
- Partial iCAP
- USB – 4.5 W

Available with IOS-XE 17.9.2

CW9164
- 2x2, 4x4, 4x4
- 2.5 Gbps mGig
- Power Options: PoE, DC Power
- IoT Ready + Bluetooth 5.x
- Partial iCAP
- USB- 4.5 W

CW9166
- 4x4 + 4x4 + 4x4 (XOR 5/6)
- 5 Gbps mGig
- Power Options: PoE, DC Power
- IoT ready + Bluetooth 5.x
- Environmental Sensor
- Full Packet Capture (iCAP)
- Zero-Wait DFS*
- USB – 4.5W

C9136
- 4x4, 8x8, 4x4 (or) 4x4, 4x4+4x4, 4x4
- Dual 5 Gbps mGig, active fail over
- PoE Redundancy
- IoT ready
- Bluetooth 5.x
- Environmental Sensor
- Full Packet Capture (iCAP)
- Zero-Wait DFS*
- USB – 9W

*Available in Future

Full radio capability (6 GHz @ LPI) on single 30W PoE+

Dedicated Radio for CleanAir Pro | Same Bracket, Industrial Design | AP Power Optimization | USB

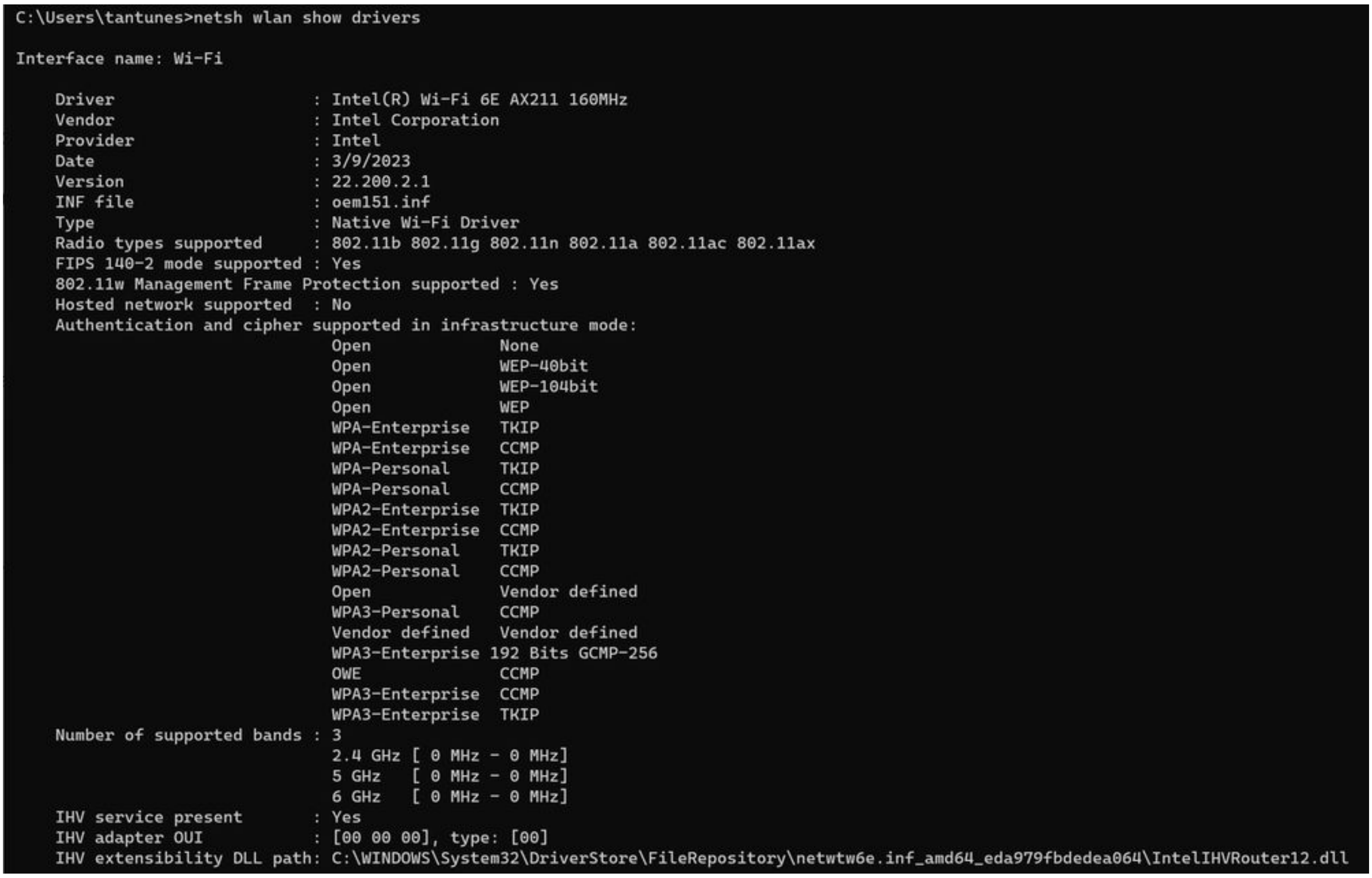
Pontos de acesso Wi-Fi 6E

Configurações de Segurança de Clientes com Suporte

Você pode descobrir qual suporte de produto WPA3-Enterprise está usando o localizador de produtos da página da WiFi Alliance.

Em dispositivos Windows, você pode verificar quais são as configurações de segurança suportadas pelo adaptador, usando o comando "netsh wlan show drivers".

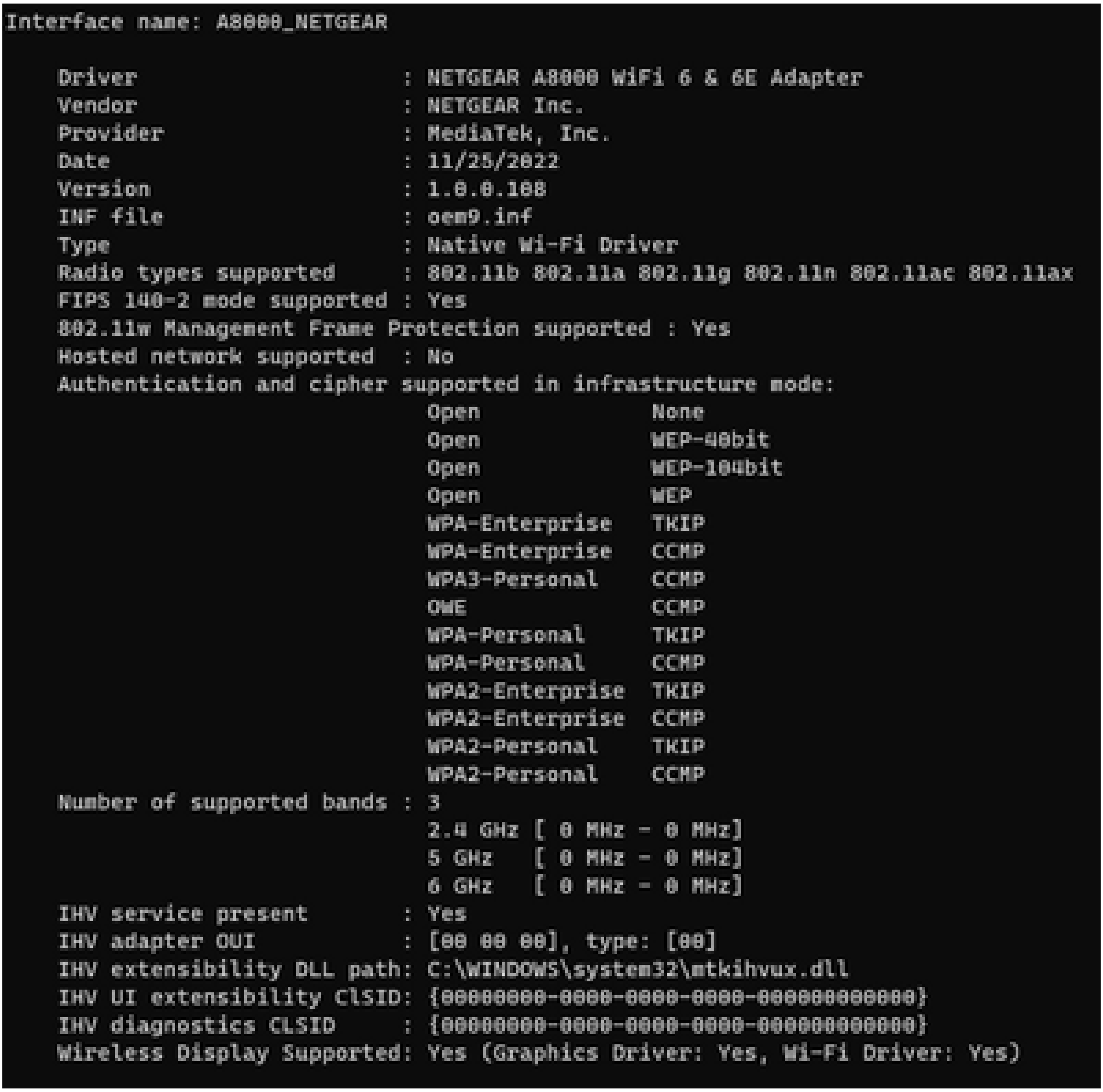
Aqui você pode ver a saída do Intel AX211:



```
C:\Users\tantunes>netsh wlan show drivers

Interface name: Wi-Fi

    Driver                    : Intel(R) Wi-Fi 6E AX211 160MHz
    Vendor                    : Intel Corporation
    Provider                  : Intel
    Date                      : 3/9/2023
    Version                   : 22.200.2.1
    INF file                  : oem151.inf
    Type                      : Native Wi-Fi Driver
    Radio types supported     : 802.11b 802.11g 802.11n 802.11a 802.11ac 802.11ax
    FIPS 140-2 mode supported : Yes
    802.11w Management Frame Protection supported : Yes
    Hosted network supported  : No
    Authentication and cipher supported in infrastructure mode:
                                Open             None
                                Open             WEP-40bit
                                Open             WEP-104bit
                                Open             WEP
                                WPA-Enterprise   TKIP
                                WPA-Enterprise   CCMP
                                WPA-Personal     TKIP
                                WPA-Personal     CCMP
                                WPA2-Enterprise  TKIP
                                WPA2-Enterprise  CCMP
                                WPA2-Personal    TKIP
                                WPA2-Personal    CCMP
                                Open             Vendor defined
                                WPA3-Personal    CCMP
                                Vendor defined   Vendor defined
                                WPA3-Enterprise 192 Bits GCMP-256
                                OWE              CCMP
                                WPA3-Enterprise  CCMP
                                WPA3-Enterprise  TKIP
    Number of supported bands : 3
                                2.4 GHz [ 0 MHz - 0 MHz]
                                5 GHz   [ 0 MHz - 0 MHz]
                                6 GHz   [ 0 MHz - 0 MHz]
    IHV service present       : Yes
    IHV adapter OUI           : [00 00 00], type: [00]
    IHV extensibility DLL path: C:\WINDOWS\System32\DriverStore\FileRepository\netwtw6e.inf_amd64_eda979fbdedea064\IntelIHVRouter12.dll
```

Saída do Windows de _netsh wlan show driver_ para o cliente AX211

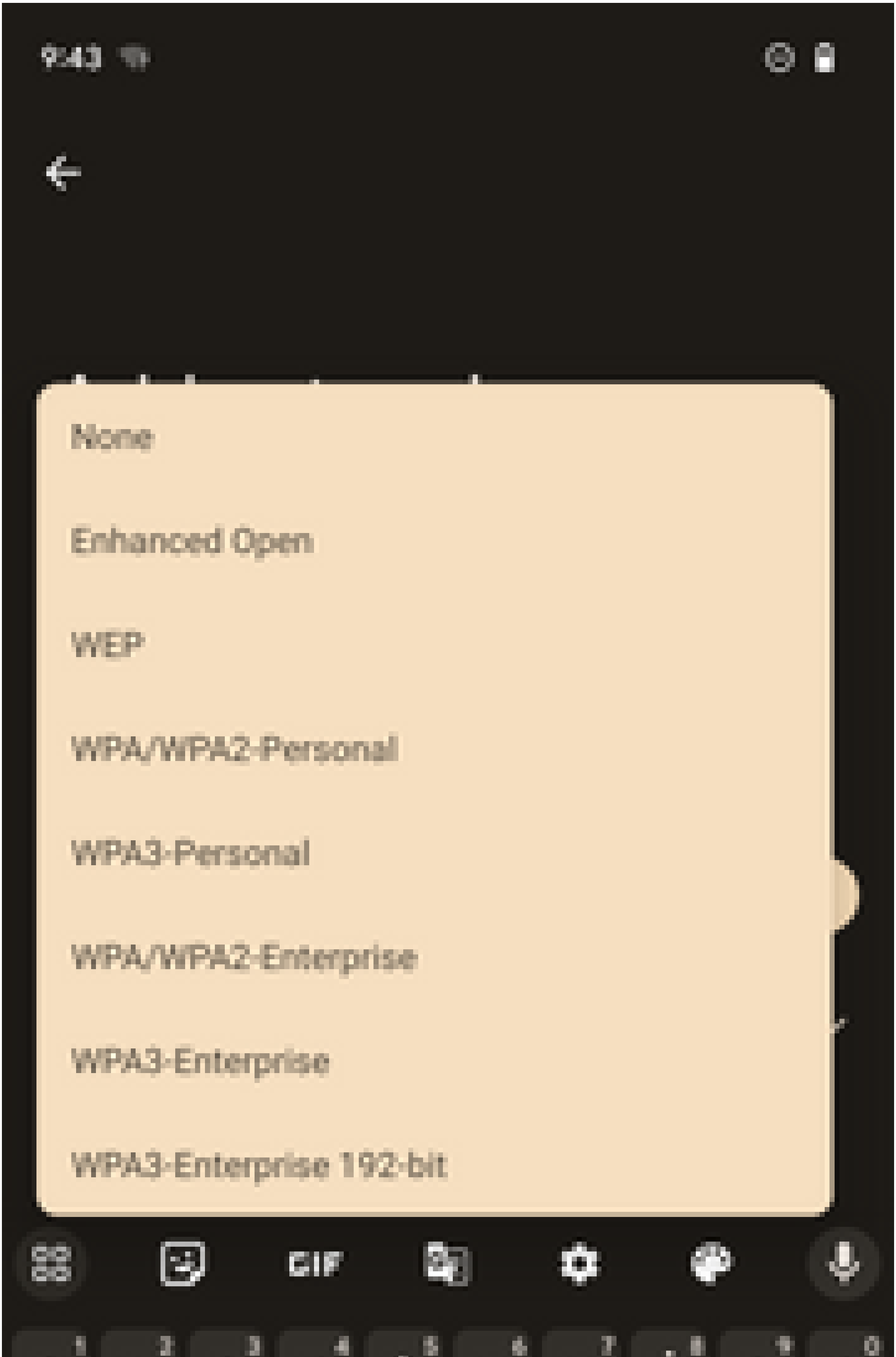
Netgear A8000:



```
Interface name: A8000_NETGEAR

    Driver                    : NETGEAR A8000 WiFi 6 & 6E Adapter
    Vendor                    : NETGEAR Inc.
    Provider                  : MediaTek, Inc.
    Date                      : 11/25/2022
    Version                   : 1.0.0.108
    INF file                  : oem9.inf
    Type                      : Native Wi-Fi Driver
    Radio types supported     : 802.11b 802.11a 802.11g 802.11n 802.11ac 802.11ax
    FIPS 140-2 mode supported : Yes
    802.11w Management Frame Protection supported : Yes
    Hosted network supported  : No
    Authentication and cipher supported in infrastructure mode:
                                Open            None
                                Open            WEP-40bit
                                Open            WEP-104bit
                                Open            WEP
                                WPA-Enterprise  TKIP
                                WPA-Enterprise  CCMP
                                WPA3-Personal   CCMP
                                OWE             CCMP
                                WPA-Personal    TKIP
                                WPA-Personal    CCMP
                                WPA2-Enterprise TKIP
                                WPA2-Enterprise CCMP
                                WPA2-Personal   TKIP
                                WPA2-Personal   CCMP
    Number of supported bands : 3
                                2.4 GHz [ 0 MHz - 0 MHz]
                                5 GHz   [ 0 MHz - 0 MHz]
                                6 GHz   [ 0 MHz - 0 MHz]
    IHV service present       : Yes
    IHV adapter OUI           : [00 00 00], type: [00]
    IHV extensibility DLL path: C:\WINDOWS\system32\mtkihvux.dll
    IHV UI extensibility ClSID: {00000000-0000-0000-0000-000000000000}
    IHV diagnostics CLSID     : {00000000-0000-0000-0000-000000000000}
    Wireless Display Supported: Yes (Graphics Driver: Yes, Wi-Fi Driver: Yes)
```

Saída do Windows de _netsh wlan show driver_ para Netgear A8000s cliente

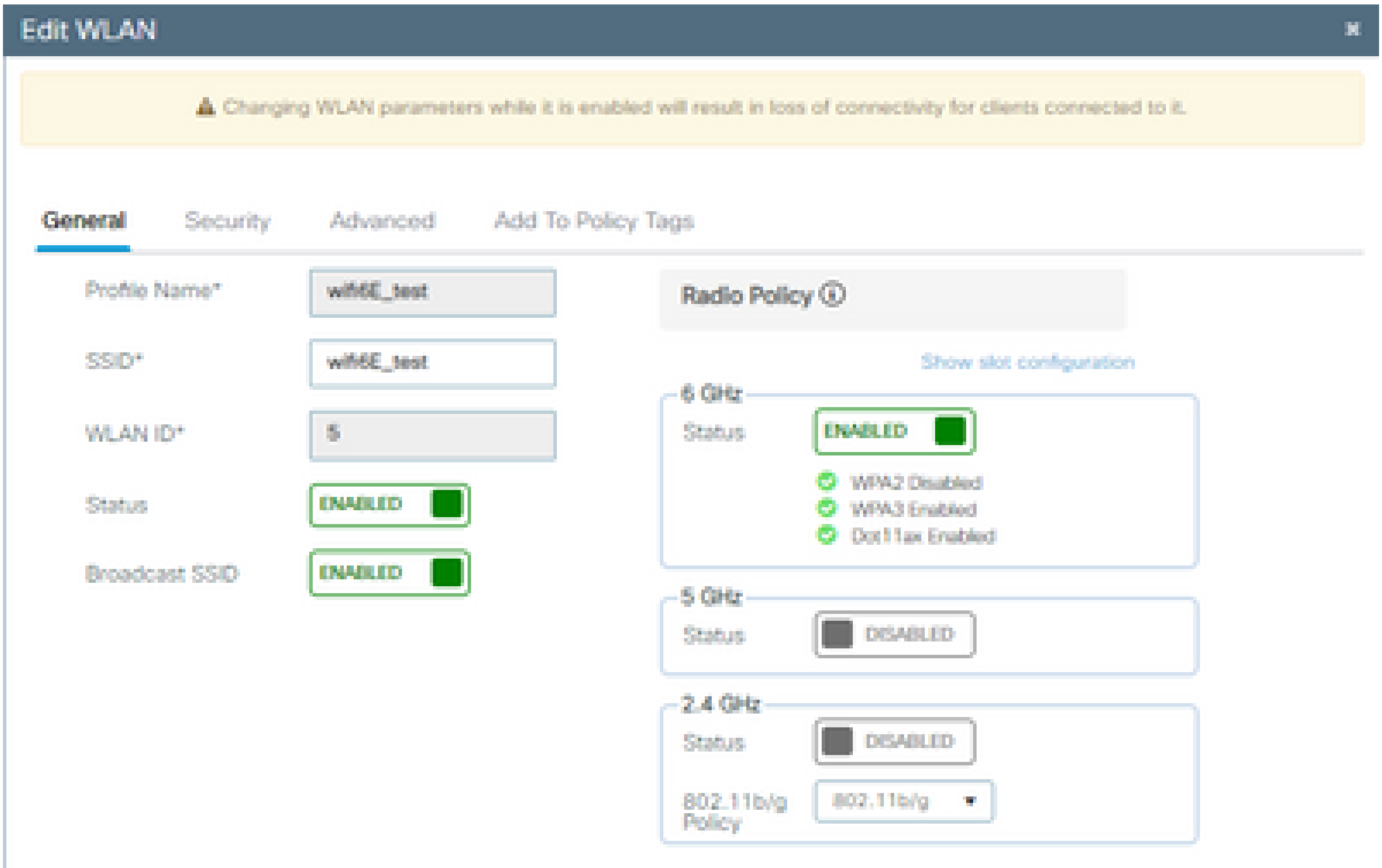
Pixel 6a para Android:


9:43
None
Enhanced Open
WEP
WPA/WPA2-Personal
WPA3-Personal
WPA/WPA2-Enterprise
WPA3-Enterprise
WPA3-Enterprise 192-bit
GIF
1
2
3
4
5
6
7
8
9
0

- WPA3 + codificação AES + 802.1x-SHA256 (FT) AKM
- WPA3 + codificação AES + OWE AKM
- WPA3 + codificação AES + SAE (FT) AKM
- WPA3 + CCMP256 cifra + SUITEB192-1X AKM
- WPA3 + codificação GCMP128 + SUITEB-1X AKM
- WPA3 + codificação GCMP256 + SUITEB192-1X AKM

Configuração de base

A WLAN foi configurada com o método de descoberta UPR (Broadcast Probe Response) e Política de Rádio somente de 6 GHz:



Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

Profile Name* wifi6E_test

SSID* wifi6E_test

WLAN ID* 5

Status ENABLED

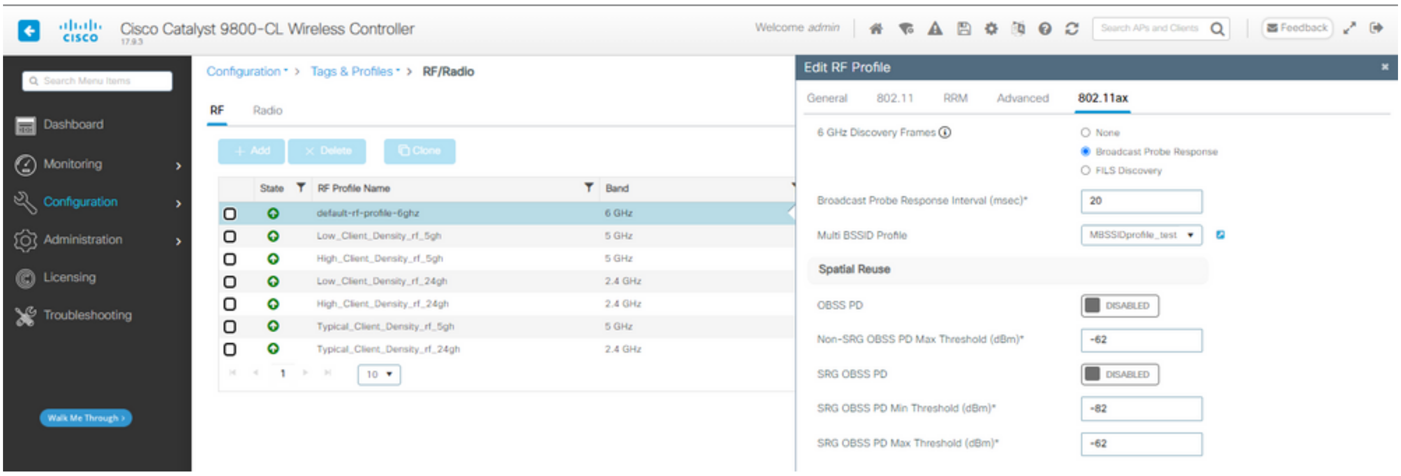
Broadcast SSID ENABLED

6 GHz
Status ENABLED
WPA2 Disabled
WPA3 Enabled
Dot11ax Enabled

5 GHz
Status DISABLED

2.4 GHz
Status DISABLED
802.11b/g Policy 802.11b/g

Configuração básica de WLAN



State	RF Profile Name	Band
●	default-rf-profile-6ghz	6 GHz
●	Low_Client_Density_rf_5gh	5 GHz
●	High_Client_Density_rf_5gh	5 GHz
●	Low_Client_Density_rf_24gh	2.4 GHz
●	High_Client_Density_rf_24gh	2.4 GHz
●	Typical_Client_Density_rf_5gh	5 GHz
●	Typical_Client_Density_rf_24gh	2.4 GHz

1 10

6 GHz Discovery Frames: ○ None ● Broadcast Probe Response ○ FILS Discovery

Broadcast Probe Response Interval (msec)*: 20

Multi BSSID Profile: MBSSIDprofile_test

Spatial Reuse

OBSS PD: DISABLED

Non-SRG OBSS PD Max Threshold (dBm)*: -62

SRG OBSS PD: DISABLED

SRG OBSS PD Min Threshold (dBm)*: -82

SRG OBSS PD Max Threshold (dBm)*: -62

Configuração do perfil de RF de 6 GHz

Verificar

Verificação de segurança

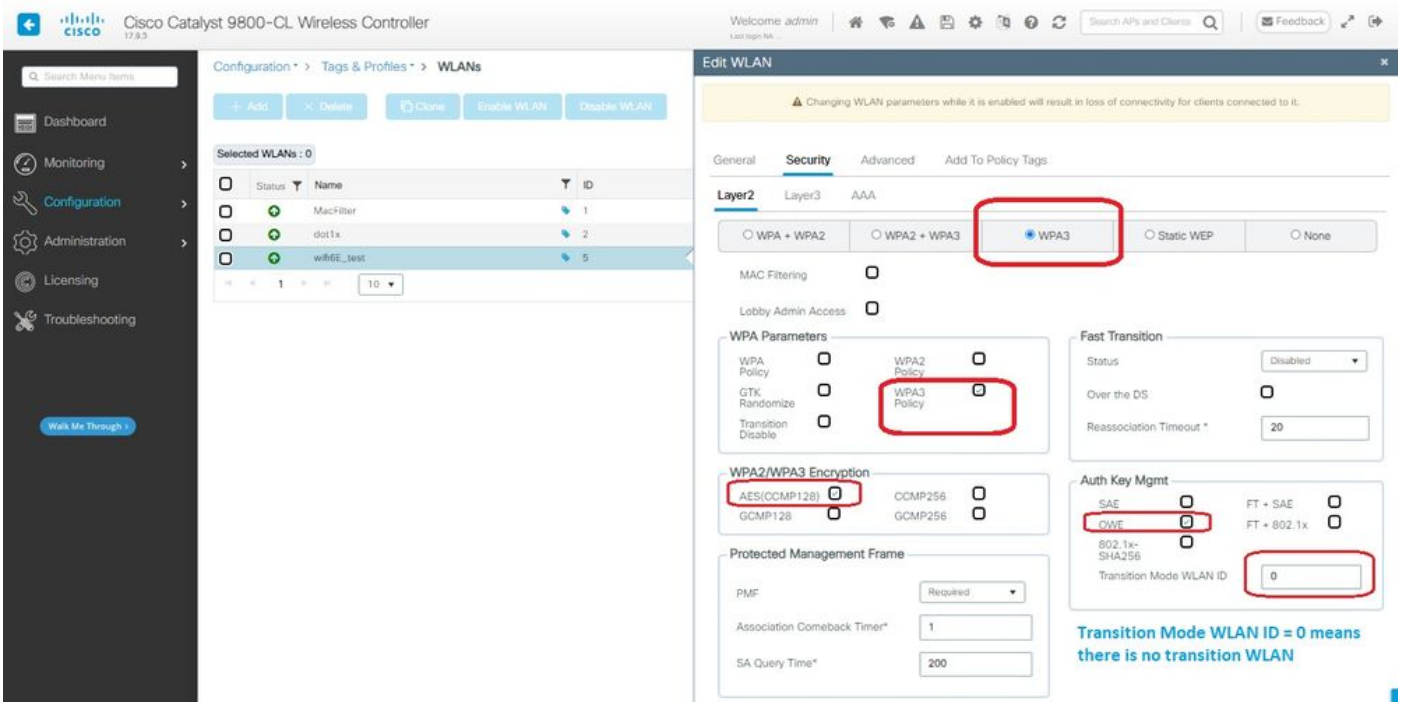
Nesta seção, é apresentada a configuração de segurança e a fase de associação do cliente usando estas combinações de protocolo WPA3:

- WPA3- AES(CCMP128) + OWE
  - Modo de transição OWE
- WPA3-Pessoal
  - AES(CCMP128) + SAE
- WPA3-Empresa
  - AES(CCMP128) + 802.1x-SHA256
  - AES(CCMP128) + 802.1x-SHA256 + FT
  - Cifra GCMP128 + SUITEB-1X
  - Cifra GCMP256 + SUITEB192-1X

Observação: mesmo que não haja clientes que suportem a codificação GCMP128 + SUITEB-1X no momento de escrever este documento, ele foi testado para observar que ele foi transmitido e verificar as informações de RSN nos beacons.

WPA3 - AES(CCPM128) + OWE

Esta é a configuração de Segurança da WLAN:



Selected WLANs : 0

□	Status	Name	ID
□	●	MacFilter	1
□	●	dot1x	2
□	●	wifi6E_test	5

Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

○ WPA + WPA2 ○ WPA2 + WPA3 ● WPA3 ○ Static WEP ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

WPA Policy □ WPA2 Policy □

GTK Randomize □ WPA3 Policy ☑

Transition Disable □

WPA2/WPA3 Encryption

AES(CCMP128) ☑ CCMP256 □

GCMP128 □ GCMP256 □

Protected Management Frame

PMF: Required

Association Comeback Timer*: 1

SA Query Time*: 200

Fast Transition

Status: Disabled

Over the DS □

Reassociation Timeout *: 20

Auth Key Mgmt

SAE □ FT + SAE □

OWE ☑ FT + 802.1x □

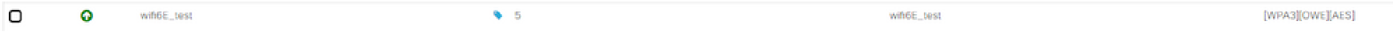
802.1x-SHA256 □

Transition Mode WLAN ID: 0

Transition Mode WLAN ID = 0 means there is no transition WLAN

Configurações de segurança OWE

Visualizar na GUI da WLC as configurações de segurança da WLAN:



□ ● wifi6E_test 5 wifi6E_test [WPA3][OWE][AES]

Configurações de segurança da WLAN na GUI da WLC

Aqui podemos observar o processo de conexão de clientes Wi-Fi 6E:

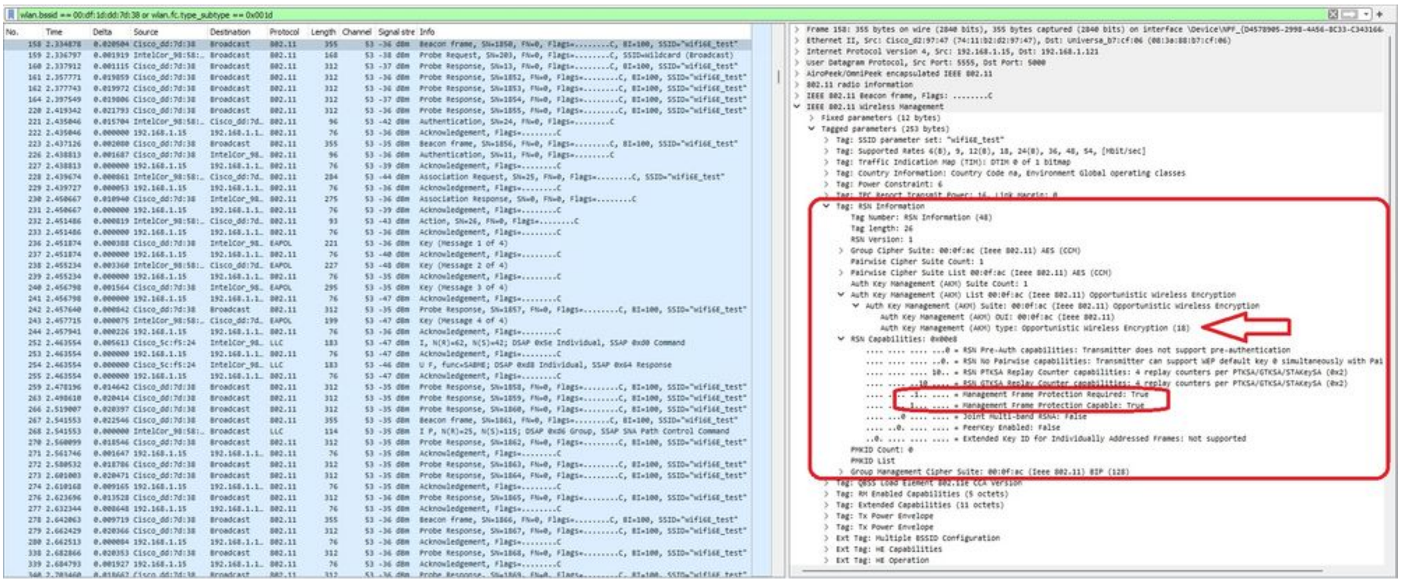
AX211 Intel

Aqui mostramos o processo completo de conexão do cliente Intel AX211.

Descoberta de OWE

Aqui você pode ver os beacons OTA. O AP anuncia suporte para OWE usando o seletor de camarotes AKM para OWE sob o elemento de informação RSN.

Você pode ver o valor 18 do tipo de conjunto AKM (00-0F-AC:18) que indica suporte OWE.



```
wlan.bssid == 00:df:1d:dd:7d:38 or wlan.fc.type_subtype == 0x001d

No.  Time      Delta    Source            Destination    Protocol Length Channel Signal stre Info
 158 2.334878  0.020504 Cisco_dd:7d:38    Broadcast      802.11   355    53 -36 dBm  Beacon frame, SN=1850, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 159 2.336797  0.001919 IntelCor_98:58:…  Broadcast      802.11   168    53 -38 dBm  Probe Request, SN=203, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
 160 2.337912  0.001115 Cisco_dd:7d:38    Broadcast      802.11   312    53 -37 dBm  Probe Response, SN=13, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 161 2.357771  0.019859 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1852, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 162 2.377743  0.019972 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1853, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 164 2.397549  0.019806 Cisco_dd:7d:38    Broadcast      802.11   312    53 -37 dBm  Probe Response, SN=1854, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 220 2.419342  0.021793 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1855, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 221 2.435046  0.015704 IntelCor_98:58:…  Cisco_dd:7d…   802.11    96    53 -42 dBm  Authentication, SN=24, FN=0, Flags=........C
 222 2.435046  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 223 2.437126  0.002080 Cisco_dd:7d:38    Broadcast      802.11   355    53 -35 dBm  Beacon frame, SN=1856, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 226 2.438813  0.001687 Cisco_dd:7d:38    IntelCor_98…   802.11    96    53 -36 dBm  Authentication, SN=11, FN=0, Flags=........C
 227 2.438813  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
 228 2.439674  0.000861 IntelCor_98:58:…  Cisco_dd:7d…   802.11   284    53 -44 dBm  Association Request, SN=25, FN=0, Flags=........C, SSID="wifi6E_test"
 229 2.439727  0.000053 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 230 2.450667  0.010940 Cisco_dd:7d:38    IntelCor_98…   802.11   275    53 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
 231 2.450667  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
 232 2.451486  0.000819 IntelCor_98:58:…  Cisco_dd:7d…   802.11    93    53 -43 dBm  Action, SN=26, FN=0, Flags=........C
 233 2.451486  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 236 2.451874  0.000388 Cisco_dd:7d:38    IntelCor_98…   EAPOL    221    53 -36 dBm  Key (Message 1 of 4)
 237 2.451874  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -40 dBm  Acknowledgement, Flags=........C
 238 2.455234  0.003360 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    227    53 -48 dBm  Key (Message 2 of 4)
 239 2.455234  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
 240 2.456798  0.001564 Cisco_dd:7d:38    IntelCor_98…   EAPOL    295    53 -35 dBm  Key (Message 3 of 4)
 241 2.456798  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
 242 2.457640  0.000842 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1857, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 243 2.457715  0.000075 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    199    53 -47 dBm  Key (Message 4 of 4)
 244 2.457941  0.000226 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 252 2.463554  0.005613 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -47 dBm  I, N(R)=62, N(S)=42; DSAP 0x5e Individual, SSAP 0xd0 Command
 253 2.463554  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
 254 2.463554  0.000000 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -46 dBm  U F, func=SABME; DSAP 0xd8 Individual, SSAP 0x64 Response
 255 2.463554  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
 259 2.478196  0.014642 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1858, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 263 2.498610  0.020414 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1859, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 266 2.519007  0.020397 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1860, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 267 2.541553  0.022546 Cisco_dd:7d:38    Broadcast      802.11   355    53 -35 dBm  Beacon frame, SN=1861, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 268 2.541553  0.000000 IntelCor_98:58:…  Broadcast      LLC      114    53 -35 dBm  I P, N(R)=25, N(S)=115; DSAP 0xd6 Group, SSAP SNA Path Control Command
 270 2.560099  0.018546 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1862, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 271 2.561746  0.001647 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
 272 2.580532  0.018786 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1863, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 273 2.601003  0.020471 Cisco_dd:7d:38    Broadcast      802.11   312    53 -35 dBm  Probe Response, SN=1864, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 274 2.610168  0.009165 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
 276 2.623696  0.013528 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1865, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 277 2.632344  0.008648 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
 278 2.642063  0.009719 Cisco_dd:7d:38    Broadcast      802.11   355    53 -36 dBm  Beacon frame, SN=1866, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 279 2.662429  0.020366 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1867, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 280 2.662513  0.000084 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 338 2.682866  0.020353 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1868, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 339 2.684793  0.001927 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
 340 2.703460  0.018667 Cisco_dd:7d:38    Broadcast      802.11   312    53 -36 dBm  Probe Response, SN=1869, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
```

```
> Frame 158: 355 bytes on wire (2840 bits), 355 bytes captured (2840 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (12 bytes)
  v Tagged parameters (253 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Traffic Indication Map (TIM): DTIM 0 of 1 bitmap
    > Tag: Country Information: Country Code na, Environment Global operating classes
    > Tag: Power Constraint: 6
    > Tag: TPC Report Transmit Power: 16, Link Margin: 0
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: Opportunistic Wireless Encryption (18)
      v RSN Capabilities: 0x00e8
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with Pai
          .... .... .... 10.. = RSN PTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... ..10 .... = RSN GTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: QBSS Load Element 802.11e CCA Version
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (11 octets)
    > Tag: Tx Power Envelope
    > Tag: Tx Power Envelope
    > Ext Tag: Multiple BSSID Configuration
    > Ext Tag: HE Capabilities
    > Ext Tag: HE Operation
```

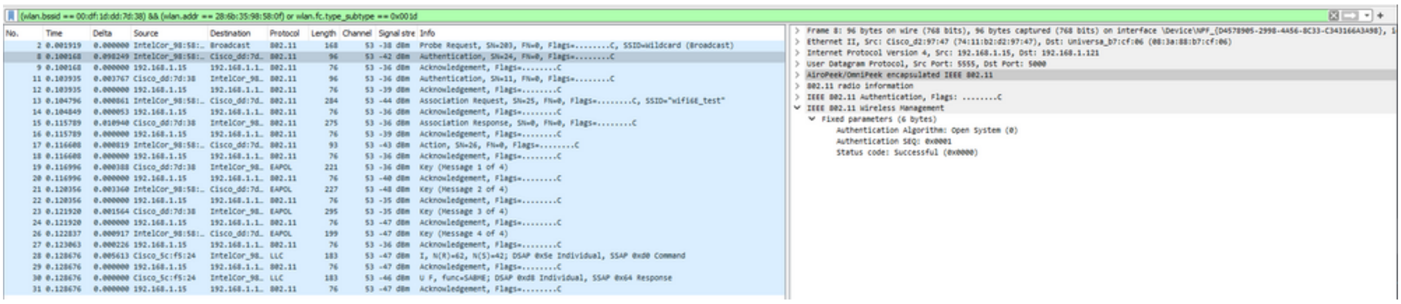
quadro de beacon OWE

Se você observar o campo de recursos RSN, poderá ver que o AP está anunciando os recursos de Proteção de Quadro de Gerenciamento (MFP - Management Frame Protection) e o bit necessário de MFP definido como 1.

Associação OWE

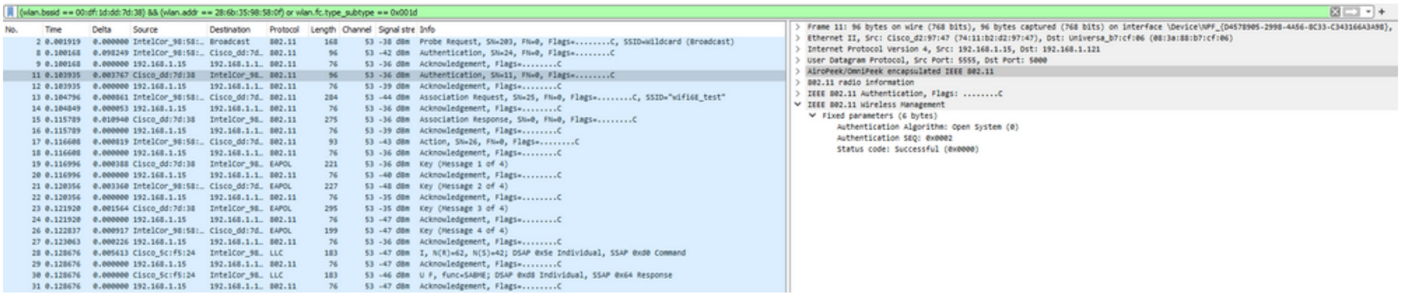
Você pode ver o UPR enviado no modo de broadcast e, em seguida, a própria associação.

O OWE começa com a solicitação e a resposta de autenticação OPEN:



```
(wlan.bssid == 00:df:1d:dd:7d:38) && (wlan.addr == 28:6b:35:98:58:0f) or wlan.fc.type_subtype == 0x001d

No.  Time      Delta    Source            Destination    Protocol Length Channel Signal stre Info
   2 0.001919  0.000000 IntelCor_98:58:…  Broadcast      802.11   168    53 -38 dBm  Probe Request, SN=203, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
   8 0.100168  0.098249 IntelCor_98:58:…  Cisco_dd:7d…   802.11    96    53 -42 dBm  Authentication, SN=24, FN=0, Flags=........C
   9 0.100168  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  11 0.103935  0.003767 Cisco_dd:7d:38    IntelCor_98…   802.11    96    53 -36 dBm  Authentication, SN=11, FN=0, Flags=........C
  12 0.103935  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
  13 0.104796  0.000861 IntelCor_98:58:…  Cisco_dd:7d…   802.11   284    53 -44 dBm  Association Request, SN=25, FN=0, Flags=........C, SSID="wifi6E_test"
  14 0.104849  0.000053 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  15 0.115789  0.010940 Cisco_dd:7d:38    IntelCor_98…   802.11   275    53 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
  16 0.115789  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
  17 0.116608  0.000819 IntelCor_98:58:…  Cisco_dd:7d…   802.11    93    53 -43 dBm  Action, SN=26, FN=0, Flags=........C
  18 0.116608  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  19 0.116996  0.000388 Cisco_dd:7d:38    IntelCor_98…   EAPOL    221    53 -36 dBm  Key (Message 1 of 4)
  20 0.116996  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -40 dBm  Acknowledgement, Flags=........C
  21 0.120356  0.003360 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    227    53 -48 dBm  Key (Message 2 of 4)
  22 0.120356  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
  23 0.121920  0.001564 Cisco_dd:7d:38    IntelCor_98…   EAPOL    295    53 -35 dBm  Key (Message 3 of 4)
  24 0.121920  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
  26 0.122837  0.000917 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    199    53 -47 dBm  Key (Message 4 of 4)
  27 0.123063  0.000226 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  28 0.128676  0.005613 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -47 dBm  I, N(R)=62, N(S)=42; DSAP 0x5e Individual, SSAP 0xd0 Command
  29 0.128676  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
  30 0.128676  0.000000 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -46 dBm  U F, func=SABME; DSAP 0xd8 Individual, SSAP 0x64 Response
  31 0.128676  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
```

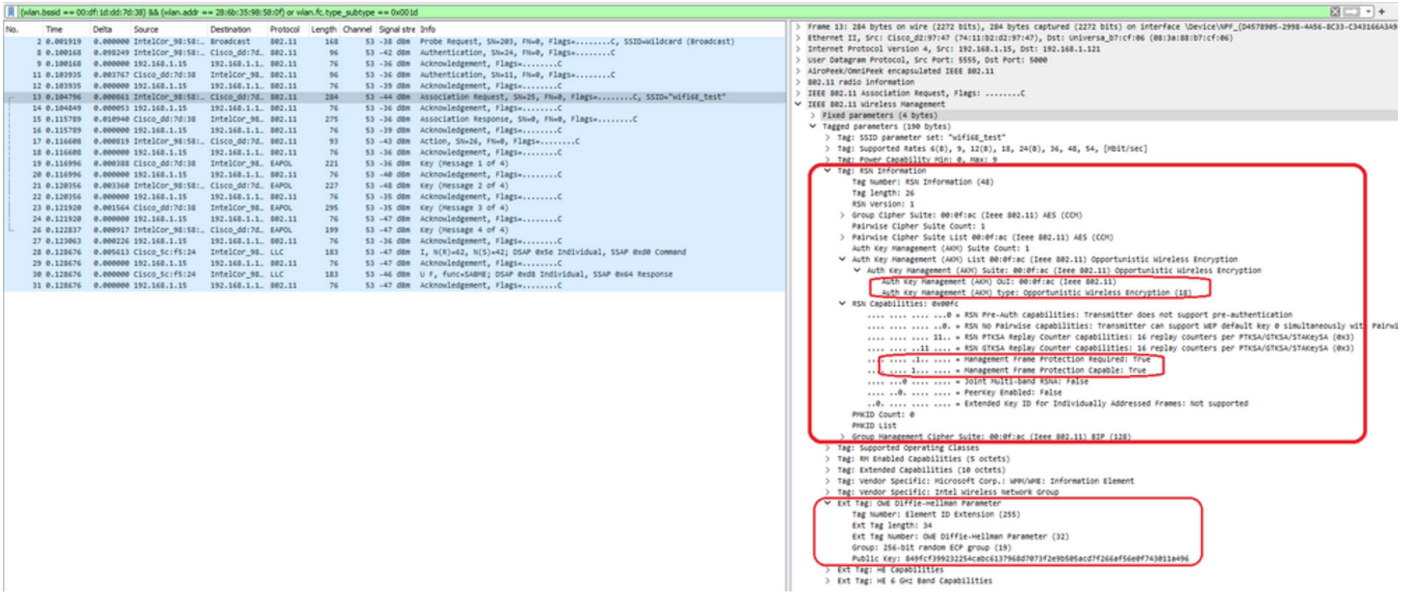
```
> Frame 8: 96 bytes on wire (768 bits), 96 bytes captured (768 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A3A98}, i
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Authentication, Flags: ........C
v IEEE 802.11 Wireless Management
  v Fixed parameters (6 bytes)
      Authentication Algorithm: Open System (0)
      Authentication SEQ: 0x0001
      Status code: Successful (0x0000)
```



```
(wlan.bssid == 00:df:1d:dd:7d:38) && (wlan.addr == 28:6b:35:98:58:0f) or wlan.fc.type_subtype == 0x001d

No.  Time      Delta    Source            Destination    Protocol Length Channel Signal stre Info
   2 0.001919  0.000000 IntelCor_98:58:…  Broadcast      802.11   168    53 -38 dBm  Probe Request, SN=203, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
   8 0.100168  0.098249 IntelCor_98:58:…  Cisco_dd:7d…   802.11    96    53 -42 dBm  Authentication, SN=24, FN=0, Flags=........C
   9 0.100168  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  11 0.103935  0.003767 Cisco_dd:7d:38    IntelCor_98…   802.11    96    53 -36 dBm  Authentication, SN=11, FN=0, Flags=........C
  12 0.103935  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
  13 0.104796  0.000861 IntelCor_98:58:…  Cisco_dd:7d…   802.11   284    53 -44 dBm  Association Request, SN=25, FN=0, Flags=........C, SSID="wifi6E_test"
  14 0.104849  0.000053 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  15 0.115789  0.010940 Cisco_dd:7d:38    IntelCor_98…   802.11   275    53 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
  16 0.115789  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -39 dBm  Acknowledgement, Flags=........C
  17 0.116608  0.000819 IntelCor_98:58:…  Cisco_dd:7d…   802.11    93    53 -43 dBm  Action, SN=26, FN=0, Flags=........C
  18 0.116608  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  19 0.116996  0.000388 Cisco_dd:7d:38    IntelCor_98…   EAPOL    221    53 -36 dBm  Key (Message 1 of 4)
  20 0.116996  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -40 dBm  Acknowledgement, Flags=........C
  21 0.120356  0.003360 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    227    53 -48 dBm  Key (Message 2 of 4)
  22 0.120356  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -35 dBm  Acknowledgement, Flags=........C
  23 0.121920  0.001564 Cisco_dd:7d:38    IntelCor_98…   EAPOL    295    53 -35 dBm  Key (Message 3 of 4)
  24 0.121920  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
  26 0.122837  0.000917 IntelCor_98:58:…  Cisco_dd:7d…   EAPOL    199    53 -47 dBm  Key (Message 4 of 4)
  27 0.123063  0.000226 192.168.1.15      192.168.1.1…   802.11    76    53 -36 dBm  Acknowledgement, Flags=........C
  28 0.128676  0.005613 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -47 dBm  I, N(R)=62, N(S)=42; DSAP 0x5e Individual, SSAP 0xd0 Command
  29 0.128676  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
  30 0.128676  0.000000 Cisco_5c:f5:24    IntelCor_98…   LLC      183    53 -46 dBm  U F, func=SABME; DSAP 0xd8 Individual, SSAP 0x64 Response
  31 0.128676  0.000000 192.168.1.15      192.168.1.1…   802.11    76    53 -47 dBm  Acknowledgement, Flags=........C
```

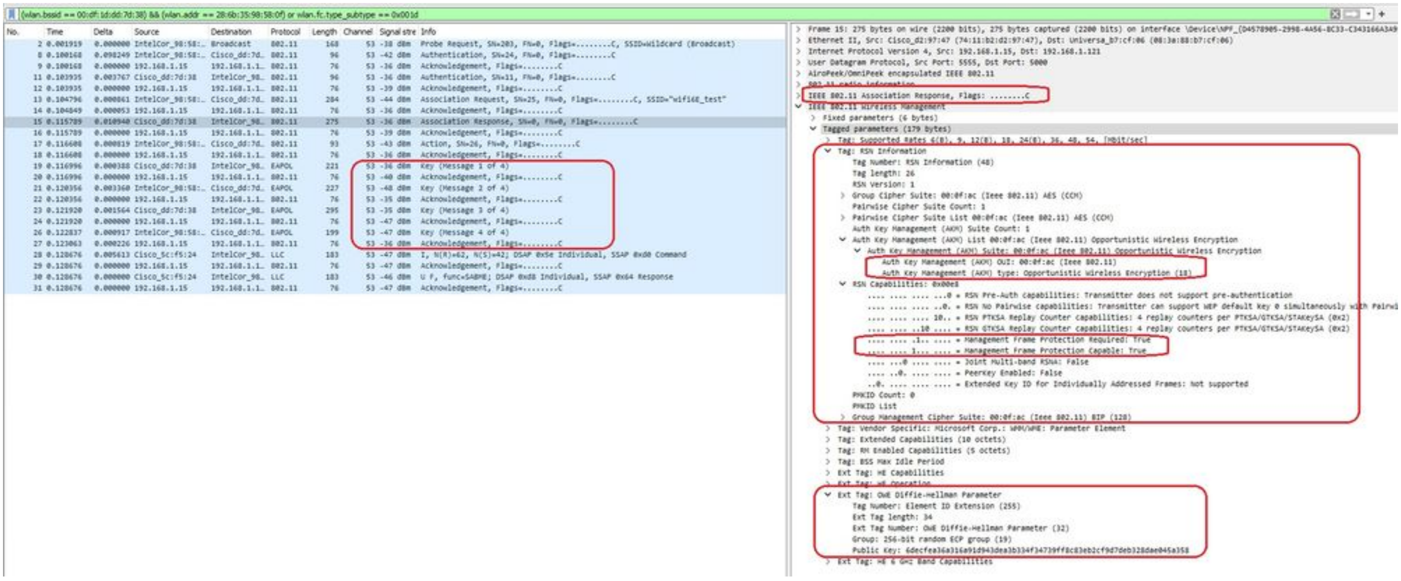
```
> Frame 11: 96 bytes on wire (768 bits), 96 bytes captured (768 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A3A98},
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Authentication, Flags: ........C
v IEEE 802.11 Wireless Management
  v Fixed parameters (6 bytes)
      Authentication Algorithm: Open System (0)
      Authentication SEQ: 0x0002
      Status code: Successful (0x0000)
```

Em seguida, um cliente que deseja fazer OWE deve indicar OWE AKM no IE RSN do quadro de solicitação de associação e incluir o elemento de parâmetro Diffie Helman (DH):



```
(wlan.bssid == 00:df:1d:dd:7d:38) && (wlan.addr == 28:6b:35:98:58:0f) or wlan.fc.type_subtype == 0x001d

No.  Time     Delta    Source            Destination    Protocol Length Channel Signal stre Info
   2 0.001919 0.000000 IntelCor_98:58:… Broadcast       802.11   168    53 -38 dBm Probe Request, SN=203, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
   8 0.100168 0.098249 IntelCor_98:58:… Cisco_dd:7d…    802.11    96    53 -42 dBm Authentication, SN=24, FN=0, Flags=........C
   9 0.100168 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  11 0.103935 0.003767 Cisco_dd:7d:38   IntelCor_98…    802.11    96    53 -36 dBm Authentication, SN=11, FN=0, Flags=........C
  12 0.103935 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -39 dBm Acknowledgement, Flags=........C
  13 0.104796 0.000861 IntelCor_98:58:… Cisco_dd:7d…    802.11   284    53 -44 dBm Association Request, SN=25, FN=0, Flags=........C, SSID="wifi6E_test"
  14 0.104849 0.000053 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  15 0.115789 0.010940 Cisco_dd:7d:38   IntelCor_98…    802.11   275    53 -36 dBm Association Response, SN=0, FN=0, Flags=........C
  16 0.115789 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -39 dBm Acknowledgement, Flags=........C
  17 0.116608 0.000819 IntelCor_98:58:… Cisco_dd:7d…    802.11    93    53 -43 dBm Action, SN=26, FN=0, Flags=........C
  18 0.116608 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  19 0.116996 0.000388 Cisco_dd:7d:38   IntelCor_98…    EAPOL    221    53 -36 dBm Key (Message 1 of 4)
  20 0.116996 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -40 dBm Acknowledgement, Flags=........C
  21 0.120356 0.003360 IntelCor_98:58:… Cisco_dd:7d…    EAPOL    227    53 -48 dBm Key (Message 2 of 4)
  22 0.120356 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -35 dBm Acknowledgement, Flags=........C
  23 0.121920 0.001564 Cisco_dd:7d:38   IntelCor_98…    EAPOL    295    53 -35 dBm Key (Message 3 of 4)
  24 0.121920 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
  26 0.122837 0.000917 IntelCor_98:58:… Cisco_dd:7d…    EAPOL    199    53 -47 dBm Key (Message 4 of 4)
  27 0.123063 0.000226 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  28 0.128676 0.005613 Cisco_5c:f5:24   IntelCor_98…    LLC      183    53 -47 dBm I, N(R)=62, N(S)=42; DSAP 0x5e Individual, SSAP 0xd0 Command
  29 0.128676 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
  30 0.128676 0.000000 Cisco_5c:f5:24   IntelCor_98…    LLC      183    53 -46 dBm U F, func=SABME; DSAP 0xd8 Individual, SSAP 0x64 Response
  31 0.128676 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
```

```
> Frame 13: 284 bytes on wire (2272 bits), 284 bytes captured (2272 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A3A9
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (4 bytes)
  v Tagged parameters (190 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 0, Max: 9
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: Opportunistic Wireless Encryption (18)
      v RSN Capabilities: 0x00fc
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with Pairwi
          .... .... .... 11.. = RSN PTKSA Replay Counter capabilities: 16 replay counters per PTKSA/GTKSA/STAKeySA (0x3)
          .... .... ..11 .... = RSN GTKSA Replay Counter capabilities: 16 replay counters per PTKSA/GTKSA/STAKeySA (0x3)
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: Supported Operating Classes
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    > Tag: Vendor Specific: Intel Wireless Network Group
    v Ext Tag: OWE Diffie-Hellman Parameter
        Tag Number: Element ID Extension (255)
        Ext Tag length: 34
        Ext Tag Number: OWE Diffie-Hellman Parameter (32)
        Group: 256-bit random ECP group (19)
        Public Key: 849fcf399232254cabc6137968d7073f2e9b505acd7f266af56e0f743011a496
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
```



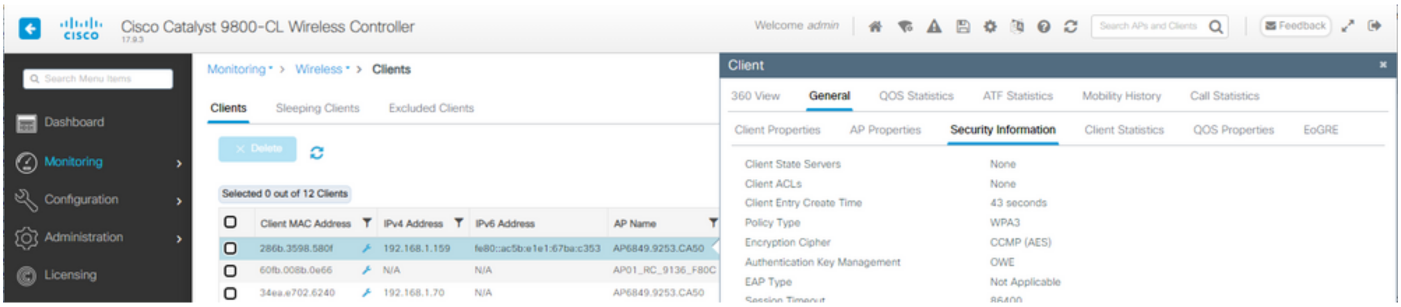
```
(wlan.bssid == 00:df:1d:dd:7d:38) && (wlan.addr == 28:6b:35:98:58:0f) or wlan.fc.type_subtype == 0x001d

No.  Time     Delta    Source            Destination    Protocol Length Channel Signal stre Info
   2 0.001919 0.000000 IntelCor_98:58:… Broadcast       802.11   168    53 -38 dBm Probe Request, SN=203, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
   8 0.100168 0.098249 IntelCor_98:58:… Cisco_dd:7d…    802.11    96    53 -42 dBm Authentication, SN=24, FN=0, Flags=........C
   9 0.100168 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  11 0.103935 0.003767 Cisco_dd:7d:38   IntelCor_98…    802.11    96    53 -36 dBm Authentication, SN=11, FN=0, Flags=........C
  12 0.103935 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -39 dBm Acknowledgement, Flags=........C
  13 0.104796 0.000861 IntelCor_98:58:… Cisco_dd:7d…    802.11   284    53 -44 dBm Association Request, SN=25, FN=0, Flags=........C, SSID="wifi6E_test"
  14 0.104849 0.000053 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  15 0.115789 0.010940 Cisco_dd:7d:38   IntelCor_98…    802.11   275    53 -36 dBm Association Response, SN=0, FN=0, Flags=........C
  16 0.115789 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -39 dBm Acknowledgement, Flags=........C
  17 0.116608 0.000819 IntelCor_98:58:… Cisco_dd:7d…    802.11    93    53 -43 dBm Action, SN=26, FN=0, Flags=........C
  18 0.116608 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  19 0.116996 0.000388 Cisco_dd:7d:38   IntelCor_98…    EAPOL    221    53 -36 dBm Key (Message 1 of 4)
  20 0.116996 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -40 dBm Acknowledgement, Flags=........C
  21 0.120356 0.003360 IntelCor_98:58:… Cisco_dd:7d…    EAPOL    227    53 -48 dBm Key (Message 2 of 4)
  22 0.120356 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -35 dBm Acknowledgement, Flags=........C
  23 0.121920 0.001564 Cisco_dd:7d:38   IntelCor_98…    EAPOL    295    53 -35 dBm Key (Message 3 of 4)
  24 0.121920 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
  26 0.122837 0.000917 IntelCor_98:58:… Cisco_dd:7d…    EAPOL    199    53 -47 dBm Key (Message 4 of 4)
  27 0.123063 0.000226 192.168.1.15     192.168.1.1…    802.11    76    53 -36 dBm Acknowledgement, Flags=........C
  28 0.128676 0.005613 Cisco_5c:f5:24   IntelCor_98…    LLC      183    53 -47 dBm I, N(R)=62, N(S)=42; DSAP 0x5e Individual, SSAP 0xd0 Command
  29 0.128676 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
  30 0.128676 0.000000 Cisco_5c:f5:24   IntelCor_98…    LLC      183    53 -46 dBm U F, func=SABME; DSAP 0xd8 Individual, SSAP 0x64 Response
  31 0.128676 0.000000 192.168.1.15     192.168.1.1…    802.11    76    53 -47 dBm Acknowledgement, Flags=........C
```

```
> Frame 15: 275 bytes on wire (2200 bits), 275 bytes captured (2200 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A3A9
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Response, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (6 bytes)
  v Tagged parameters (179 bytes)
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: Opportunistic Wireless Encryption (18)
      v RSN Capabilities: 0x00e8
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with Pairwi
          .... .... .... 10.. = RSN PTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... ..10 .... = RSN GTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Parameter Element
    > Tag: Extended Capabilities (10 octets)
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: BSS Max Idle Period
    > Ext Tag: HE Capabilities
    > Ext Tag: HE Operation
    v Ext Tag: OWE Diffie-Hellman Parameter
        Tag Number: Element ID Extension (255)
        Ext Tag length: 34
        Ext Tag Number: OWE Diffie-Hellman Parameter (32)
        Group: 256-bit random ECP group (19)
        Public Key: 6decfea36a316a91d943dea3b334f34739ff8c83eb2cf9d7deb328dae045a358
    > Ext Tag: HE 6 GHz Band Capabilities
```

Resposta de associação OWE

Após a resposta da associação, podemos ver o handshake de 4 vias e o cliente passa para o estado conectado.

Aqui você pode ver os detalhes do cliente na GUI da WLC:



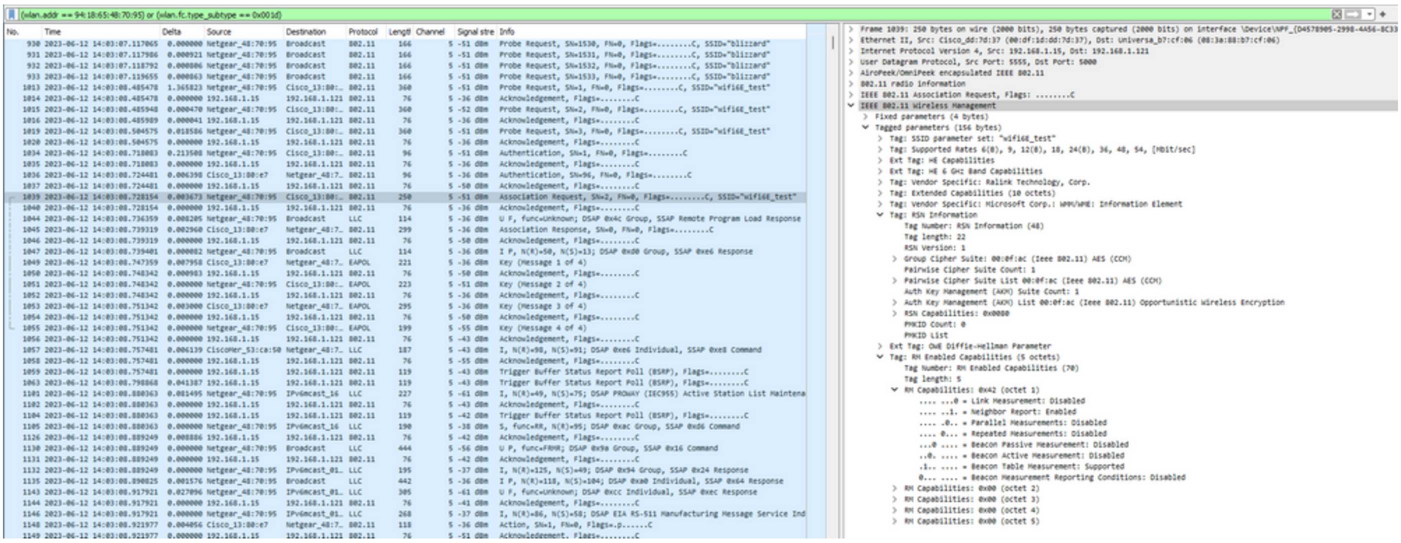
Selected 0 out of 12 Clients

□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	286b.3598.580f	192.168.1.159	fe80::ac5b:e1e1:67ba:c353	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80C
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50

Client State Servers	None
Client ACLs	None
Client Entry Create Time	43 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	OWE
EAP Type	Not Applicable
Session Timeout	86400

NetGear A8000

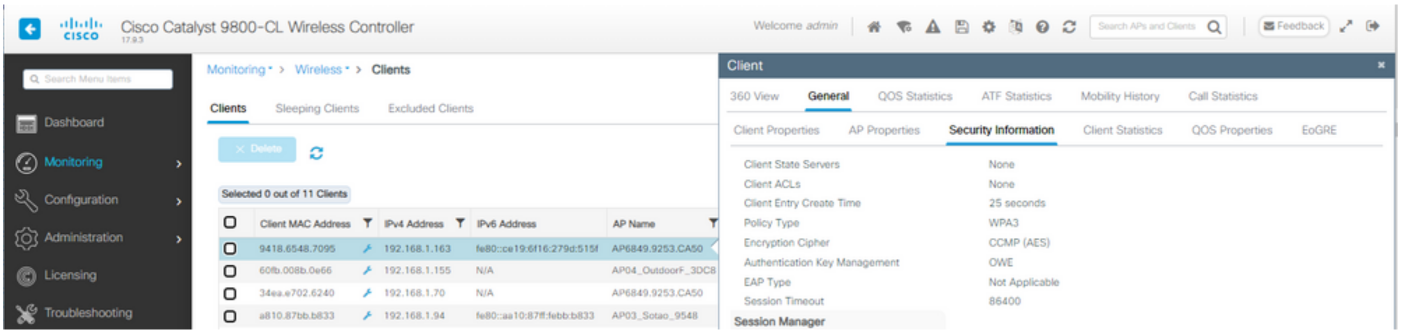
OTA de conexão com foco nas informações de RSN do cliente:



```
(wlan.addr == 94:18:65:48:70:95) or (wlan.fc.type_subtype == 0x001d)

No.  Time                          Delta    Source             Destination     Protocol Length Channel Signal stre Info
 930 2023-06-12 14:03:07.117065 0.000000 Netgear_48:70:95   Broadcast       802.11   166    5 -51 dBm  Probe Request, SN=1530, FN=0, Flags=........C, SSID="blizzard"
 931 2023-06-12 14:03:07.117986 0.000921 Netgear_48:70:95   Broadcast       802.11   166    5 -51 dBm  Probe Request, SN=1531, FN=0, Flags=........C, SSID="blizzard"
 932 2023-06-12 14:03:07.118792 0.000806 Netgear_48:70:95   Broadcast       802.11   166    5 -51 dBm  Probe Request, SN=1532, FN=0, Flags=........C, SSID="blizzard"
 933 2023-06-12 14:03:07.119655 0.000863 Netgear_48:70:95   Broadcast       802.11   166    5 -51 dBm  Probe Request, SN=1533, FN=0, Flags=........C, SSID="blizzard"
1013 2023-06-12 14:03:08.485478 1.365823 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -51 dBm  Probe Request, SN=1, FN=0, Flags=........C, SSID="wifi6E_test"
1014 2023-06-12 14:03:08.485478 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1015 2023-06-12 14:03:08.485948 0.000470 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -52 dBm  Probe Request, SN=2, FN=0, Flags=........C, SSID="wifi6E_test"
1016 2023-06-12 14:03:08.485989 0.000041 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1019 2023-06-12 14:03:08.504575 0.018586 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -51 dBm  Probe Request, SN=3, FN=0, Flags=........C, SSID="wifi6E_test"
1020 2023-06-12 14:03:08.504575 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1034 2023-06-12 14:03:08.718083 0.213508 Netgear_48:70:95   Cisco_13:80:…   802.11    96    5 -51 dBm  Authentication, SN=1, FN=0, Flags=........C
1035 2023-06-12 14:03:08.718083 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1036 2023-06-12 14:03:08.724481 0.006398 Cisco_13:80:e7     Netgear_48:7…   802.11    96    5 -36 dBm  Authentication, SN=96, FN=0, Flags=........C
1037 2023-06-12 14:03:08.724481 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -50 dBm  Acknowledgement, Flags=........C
1039 2023-06-12 14:03:08.728154 0.003673 Netgear_48:70:95   Cisco_13:80:…   802.11   250    5 -51 dBm  Association Request, SN=2, FN=0, Flags=........C, SSID="wifi6E_test"
1040 2023-06-12 14:03:08.728154 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1044 2023-06-12 14:03:08.736359 0.008205 Netgear_48:70:95   Broadcast       LLC      114    5 -36 dBm  U F, func=Unknown; DSAP 0x4c Group, SSAP Remote Program Load Response
1045 2023-06-12 14:03:08.739319 0.002960 Cisco_13:80:e7     Netgear_48:7…   802.11   299    5 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
1046 2023-06-12 14:03:08.739319 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -50 dBm  Acknowledgement, Flags=........C
1047 2023-06-12 14:03:08.739401 0.000082 Netgear_48:70:95   Broadcast       LLC      114    5 -36 dBm  I P, N(R)=50, N(S)=13; DSAP 0xd0 Group, SSAP 0xe6 Response
1049 2023-06-12 14:03:08.747359 0.007958 Cisco_13:80:e7     Netgear_48:7…   EAPOL    221    5 -36 dBm  Key (Message 1 of 4)
1050 2023-06-12 14:03:08.748342 0.000983 192.168.1.15       192.168.1.121   802.11    76    5 -50 dBm  Acknowledgement, Flags=........C
1051 2023-06-12 14:03:08.748342 0.000000 Netgear_48:70:95   Cisco_13:80:…   EAPOL    223    5 -51 dBm  Key (Message 2 of 4)
1052 2023-06-12 14:03:08.748342 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
1053 2023-06-12 14:03:08.751342 0.003000 Cisco_13:80:e7     Netgear_48:7…   EAPOL    295    5 -36 dBm  Key (Message 3 of 4)
1054 2023-06-12 14:03:08.751342 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -50 dBm  Acknowledgement, Flags=........C
1055 2023-06-12 14:03:08.751342 0.000000 Netgear_48:70:95   Cisco_13:80:…   EAPOL    199    5 -55 dBm  Key (Message 4 of 4)
1056 2023-06-12 14:03:08.751342 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -43 dBm  Acknowledgement, Flags=........C
1057 2023-06-12 14:03:08.757481 0.006139 CiscoMer_53:ca:50  Netgear_48:7…   LLC      187    5 -43 dBm  I, N(R)=98, N(S)=91; DSAP 0xe6 Individual, SSAP 0xe8 Command
1058 2023-06-12 14:03:08.757481 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -55 dBm  Acknowledgement, Flags=........C
1059 2023-06-12 14:03:08.757481 0.000000 192.168.1.15       192.168.1.121   802.11   119    5 -43 dBm  Trigger Buffer Status Report Poll (BSRP), Flags=........C
1063 2023-06-12 14:03:08.798868 0.041387 192.168.1.15       192.168.1.121   802.11   119    5 -43 dBm  Trigger Buffer Status Report Poll (BSRP), Flags=........C
1101 2023-06-12 14:03:08.880363 0.081495 Netgear_48:70:95   IPv6mcast_16    LLC      227    5 -61 dBm  I, N(R)=49, N(S)=75; DSAP PROWAY (IEC955) Active Station List Maintena
1102 2023-06-12 14:03:08.880363 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -43 dBm  Acknowledgement, Flags=........C
1104 2023-06-12 14:03:08.880363 0.000000 192.168.1.15       192.168.1.121   802.11   119    5 -42 dBm  Trigger Buffer Status Report Poll (BSRP), Flags=........C
1105 2023-06-12 14:03:08.880363 0.000000 Netgear_48:70:95   IPv6mcast_16    LLC      190    5 -38 dBm  S, func=RR, N(R)=95; DSAP 0xac Group, SSAP 0xd6 Command
1126 2023-06-12 14:03:08.889249 0.008886 192.168.1.15       192.168.1.121   802.11    76    5 -42 dBm  Acknowledgement, Flags=........C
1130 2023-06-12 14:03:08.889249 0.000000 Netgear_48:70:95   Broadcast       LLC      444    5 -56 dBm  U P, func=FRMR; DSAP 0x9a Group, SSAP 0x16 Command
1131 2023-06-12 14:03:08.889249 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -42 dBm  Acknowledgement, Flags=........C
1132 2023-06-12 14:03:08.889249 0.000000 Netgear_48:70:95   IPv6mcast_01…   LLC      195    5 -37 dBm  I, N(R)=125, N(S)=49; DSAP 0x94 Group, SSAP 0x24 Response
1135 2023-06-12 14:03:08.890825 0.001576 Netgear_48:70:95   Broadcast       LLC      442    5 -36 dBm  I P, N(R)=118, N(S)=104; DSAP 0xa0 Individual, SSAP 0x64 Response
1143 2023-06-12 14:03:08.917921 0.027096 Netgear_48:70:95   IPv6mcast_01…   LLC      305    5 -61 dBm  U F, func=Unknown; DSAP 0xcc Individual, SSAP 0xec Response
1144 2023-06-12 14:03:08.917921 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -41 dBm  Acknowledgement, Flags=........C
1146 2023-06-12 14:03:08.917921 0.000000 Netgear_48:70:95   IPv6mcast_01…   LLC      268    5 -37 dBm  I, N(R)=86, N(S)=58; DSAP EIA RS-511 Manufacturing Message Service Ind
1148 2023-06-12 14:03:08.921977 0.004056 Cisco_13:80:e7     Netgear_48:7…   802.11   118    5 -36 dBm  Action, SN=1, FN=0, Flags=.p......C
1149 2023-06-12 14:03:08.921977 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -51 dBm  Acknowledgement, Flags=........C
```

```
> Frame 1039: 250 bytes on wire (2000 bits), 250 bytes captured (2000 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
   > Fixed parameters (4 bytes)
   v Tagged parameters (156 bytes)
      > Tag: SSID parameter set: "wifi6E_test"
      > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
      > Ext Tag: HE Capabilities
      > Ext Tag: HE 6 GHz Band Capabilities
      > Tag: Vendor Specific: Ralink Technology, Corp.
      > Tag: Extended Capabilities (10 octets)
      > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
      v Tag: RSN Information
           Tag Number: RSN Information (48)
           Tag length: 22
           RSN Version: 1
         > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
           Pairwise Cipher Suite Count: 1
         > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
           Auth Key Management (AKM) Suite Count: 1
         > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
         > RSN Capabilities: 0x0000
           PMKID Count: 0
           PMKID List
      > Ext Tag: OWE Diffie-Hellman Parameter
      v Tag: RM Enabled Capabilities (5 octets)
           Tag Number: RM Enabled Capabilities (70)
           Tag length: 5
         v RM Capabilities: 0x42 (octet 1)
              .... ...0 = Link Measurement: Disabled
              .... ..1. = Neighbor Report: Enabled
              .... .0.. = Parallel Measurements: Disabled
              .... 0... = Repeated Measurements: Disabled
              ...0 .... = Beacon Passive Measurement: Disabled
              ..0. .... = Beacon Active Measurement: Disabled
              .1.. .... = Beacon Table Measurement: Supported
              0... .... = Beacon Measurement Reporting Conditions: Disabled
         > RM Capabilities: 0x00 (octet 2)
         > RM Capabilities: 0x00 (octet 3)
         > RM Capabilities: 0x00 (octet 4)
         > RM Capabilities: 0x00 (octet 5)
```

Detalhes do cliente no WLC:



Selected 0 out of 11 Clients

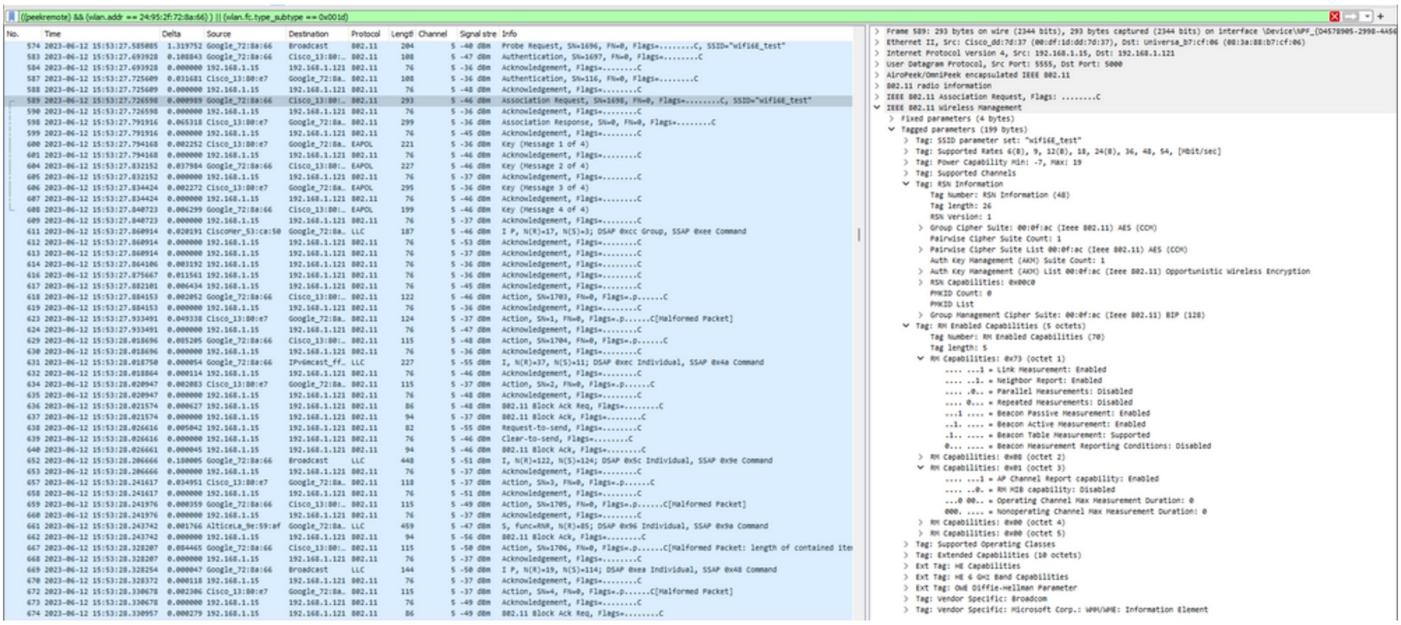
□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	9418.6548.7095	192.168.1.163	fe80::ce19:6f16:279d:515f	AP6849.9253.CA50
□	60fb.008b.0e66	192.168.1.155	N/A	AP04_OutdoorF_3DC8
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
□	a810.87bb.b833	192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548

Client State Servers	None
Client ACLs	None
Client Entry Create Time	25 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	OWE
EAP Type	Not Applicable
Session Timeout	86400

Session Manager

Pixel 6a

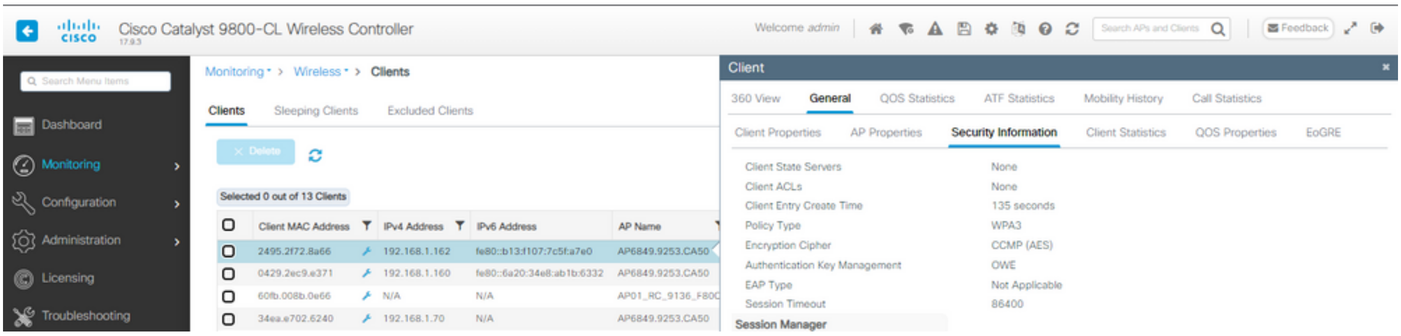
OTA de conexão com foco nas informações de RSN do cliente:



```
((peekremote) && (wlan.addr == 24:95:2f:72:8a:66) ) || (wlan.fc.type_subtype == 0x001d)

No.  Time                          Delta    Source             Destination     Protocol Length Channel Signal stre Info
574 2023-06-12 15:53:27.585085 1.319752 Google_72:8a:66    Broadcast       802.11   204    5 -40 dBm  Probe Request, SN=1696, FN=0, Flags=........C, SSID="wifi6E_test"
583 2023-06-12 15:53:27.693928 0.108843 Google_72:8a:66    Cisco_13:80:…   802.11   108    5 -47 dBm  Authentication, SN=1697, FN=0, Flags=........C
584 2023-06-12 15:53:27.693928 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
587 2023-06-12 15:53:27.725609 0.031681 Cisco_13:80:e7     Google_72:8a…   802.11   108    5 -36 dBm  Authentication, SN=116, FN=0, Flags=........C
588 2023-06-12 15:53:27.725609 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -48 dBm  Acknowledgement, Flags=........C
589 2023-06-12 15:53:27.726598 0.000989 Google_72:8a:66    Cisco_13:80:…   802.11   293    5 -46 dBm  Association Request, SN=1698, FN=0, Flags=........C, SSID="wifi6E_test"
590 2023-06-12 15:53:27.726598 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
598 2023-06-12 15:53:27.791916 0.065318 Cisco_13:80:e7     Google_72:8a…   802.11   299    5 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
599 2023-06-12 15:53:27.791916 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -45 dBm  Acknowledgement, Flags=........C
600 2023-06-12 15:53:27.794168 0.002252 Cisco_13:80:e7     Google_72:8a…   EAPOL    221    5 -36 dBm  Key (Message 1 of 4)
601 2023-06-12 15:53:27.794168 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -46 dBm  Acknowledgement, Flags=........C
604 2023-06-12 15:53:27.832152 0.037984 Google_72:8a:66    Cisco_13:80:…   EAPOL    227    5 -46 dBm  Key (Message 2 of 4)
605 2023-06-12 15:53:27.832152 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
606 2023-06-12 15:53:27.834424 0.002272 Cisco_13:80:e7     Google_72:8a…   EAPOL    295    5 -36 dBm  Key (Message 3 of 4)
607 2023-06-12 15:53:27.834424 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -46 dBm  Acknowledgement, Flags=........C
608 2023-06-12 15:53:27.840723 0.006299 Google_72:8a:66    Cisco_13:80:…   EAPOL    199    5 -46 dBm  Key (Message 4 of 4)
609 2023-06-12 15:53:27.840723 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
611 2023-06-12 15:53:27.860914 0.020191 CiscoMer_53:ca:50  Google_72:8a…   LLC      187    5 -46 dBm  I P, N(R)=17, N(S)=3; DSAP 0xcc Group, SSAP 0xee Command
612 2023-06-12 15:53:27.860914 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -53 dBm  Acknowledgement, Flags=........C
613 2023-06-12 15:53:27.860914 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
614 2023-06-12 15:53:27.864106 0.003192 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
616 2023-06-12 15:53:27.875667 0.011561 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
617 2023-06-12 15:53:27.882101 0.006434 192.168.1.15       192.168.1.121   802.11    76    5 -45 dBm  Acknowledgement, Flags=........C
618 2023-06-12 15:53:27.884153 0.002052 Google_72:8a:66    Cisco_13:80:…   802.11   122    5 -46 dBm  Action, SN=1703, FN=0, Flags=.p......C
619 2023-06-12 15:53:27.884153 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
623 2023-06-12 15:53:27.933491 0.049338 Cisco_13:80:e7     Google_72:8a…   802.11   124    5 -37 dBm  Action, SN=1, FN=0, Flags=.p......C[Malformed Packet]
624 2023-06-12 15:53:27.933491 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -47 dBm  Acknowledgement, Flags=........C
629 2023-06-12 15:53:28.018696 0.085205 Google_72:8a:66    Cisco_13:80:…   802.11   115    5 -48 dBm  Action, SN=1704, FN=0, Flags=.p......C
630 2023-06-12 15:53:28.018696 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
631 2023-06-12 15:53:28.018750 0.000054 Google_72:8a:66    IPv6mcast_ff…   LLC      227    5 -55 dBm  I, N(R)=37, N(S)=11; DSAP 0xec Individual, SSAP 0x4a Command
632 2023-06-12 15:53:28.018864 0.000114 192.168.1.15       192.168.1.121   802.11    76    5 -46 dBm  Acknowledgement, Flags=........C
634 2023-06-12 15:53:28.020947 0.002083 Cisco_13:80:e7     Google_72:8a…   802.11   115    5 -37 dBm  Action, SN=2, FN=0, Flags=.p......C
635 2023-06-12 15:53:28.020947 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -48 dBm  Acknowledgement, Flags=........C
636 2023-06-12 15:53:28.021574 0.000627 192.168.1.15       192.168.1.121   802.11    86    5 -48 dBm  802.11 Block Ack Req, Flags=........C
637 2023-06-12 15:53:28.021574 0.000000 192.168.1.15       192.168.1.121   802.11    94    5 -37 dBm  802.11 Block Ack, Flags=........C
638 2023-06-12 15:53:28.026616 0.005042 192.168.1.15       192.168.1.121   802.11    82    5 -55 dBm  Request-to-send, Flags=........C
639 2023-06-12 15:53:28.026616 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -46 dBm  Clear-to-send, Flags=........C
640 2023-06-12 15:53:28.026661 0.000045 192.168.1.15       192.168.1.121   802.11    94    5 -46 dBm  802.11 Block Ack, Flags=........C
652 2023-06-12 15:53:28.206666 0.180005 Google_72:8a:66    Broadcast       LLC      448    5 -51 dBm  I, N(R)=122, N(S)=124; DSAP 0x5c Individual, SSAP 0x9e Command
653 2023-06-12 15:53:28.206666 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
657 2023-06-12 15:53:28.241617 0.034951 Cisco_13:80:e7     Google_72:8a…   802.11   118    5 -37 dBm  Action, SN=3, FN=0, Flags=.p......C
658 2023-06-12 15:53:28.241617 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -51 dBm  Acknowledgement, Flags=........C
659 2023-06-12 15:53:28.241976 0.000359 Google_72:8a:66    Cisco_13:80:…   802.11   115    5 -49 dBm  Action, SN=1705, FN=0, Flags=.p......C[Malformed Packet]
660 2023-06-12 15:53:28.241976 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
661 2023-06-12 15:53:28.243742 0.001766 AlticeLa_9e:59:af  Google_72:8a…   LLC      459    5 -47 dBm  S, func=RNR, N(R)=85; DSAP 0x96 Individual, SSAP 0x9a Command
662 2023-06-12 15:53:28.243742 0.000000 192.168.1.15       192.168.1.121   802.11    94    5 -56 dBm  802.11 Block Ack, Flags=........C
667 2023-06-12 15:53:28.328207 0.084465 Google_72:8a:66    Cisco_13:80:…   802.11   115    5 -50 dBm  Action, SN=1706, FN=0, Flags=.p......C[Malformed Packet: length of contained ite
668 2023-06-12 15:53:28.328207 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
669 2023-06-12 15:53:28.328254 0.000047 Google_72:8a:66    Broadcast       LLC      144    5 -50 dBm  I P, N(R)=19, N(S)=114; DSAP 0xea Individual, SSAP 0x48 Command
670 2023-06-12 15:53:28.328372 0.000118 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
672 2023-06-12 15:53:28.330678 0.002306 Cisco_13:80:e7     Google_72:8a…   802.11   115    5 -37 dBm  Action, SN=4, FN=0, Flags=.p......C[Malformed Packet]
673 2023-06-12 15:53:28.330678 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -49 dBm  Acknowledgement, Flags=........C
674 2023-06-12 15:53:28.330957 0.000279 192.168.1.15       192.168.1.121   802.11    86    5 -49 dBm  802.11 Block Ack Req, Flags=........C
```

```
> Frame 589: 293 bytes on wire (2344 bits), 293 bytes captured (2344 bits) on interface \Device\NPF_{D4578905-2998-4A56
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
   > Fixed parameters (4 bytes)
   v Tagged parameters (199 bytes)
      > Tag: SSID parameter set: "wifi6E_test"
      > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
      > Tag: Power Capability Min: -7, Max: 19
      > Tag: Supported Channels
      v Tag: RSN Information
           Tag Number: RSN Information (48)
           Tag length: 26
           RSN Version: 1
         > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
           Pairwise Cipher Suite Count: 1
         > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
           Auth Key Management (AKM) Suite Count: 1
         > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
         > RSN Capabilities: 0x00c0
           PMKID Count: 0
           PMKID List
         > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
      v Tag: RM Enabled Capabilities (5 octets)
           Tag Number: RM Enabled Capabilities (70)
           Tag length: 5
         v RM Capabilities: 0x73 (octet 1)
              .... ...1 = Link Measurement: Enabled
              .... ..1. = Neighbor Report: Enabled
              .... .0.. = Parallel Measurements: Disabled
              .... 0... = Repeated Measurements: Disabled
              ...1 .... = Beacon Passive Measurement: Enabled
              ..1. .... = Beacon Active Measurement: Enabled
              .1.. .... = Beacon Table Measurement: Supported
              0... .... = Beacon Measurement Reporting Conditions: Disabled
         > RM Capabilities: 0x08 (octet 2)
         v RM Capabilities: 0x01 (octet 3)
              .... ...1 = AP Channel Report capability: Enabled
              .... ..0. = RM MIB capability: Disabled
              ...0 00.. = Operating Channel Max Measurement Duration: 0
              000. .... = Nonoperating Channel Max Measurement Duration: 0
         > RM Capabilities: 0x00 (octet 4)
         > RM Capabilities: 0x00 (octet 5)
      > Tag: Supported Operating Classes
      > Tag: Extended Capabilities (10 octets)
      > Ext Tag: HE Capabilities
      > Ext Tag: HE 6 GHz Band Capabilities
      > Ext Tag: OWE Diffie-Hellman Parameter
      > Tag: Vendor Specific: Broadcom
      > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
```

Detalhes do cliente no WLC:

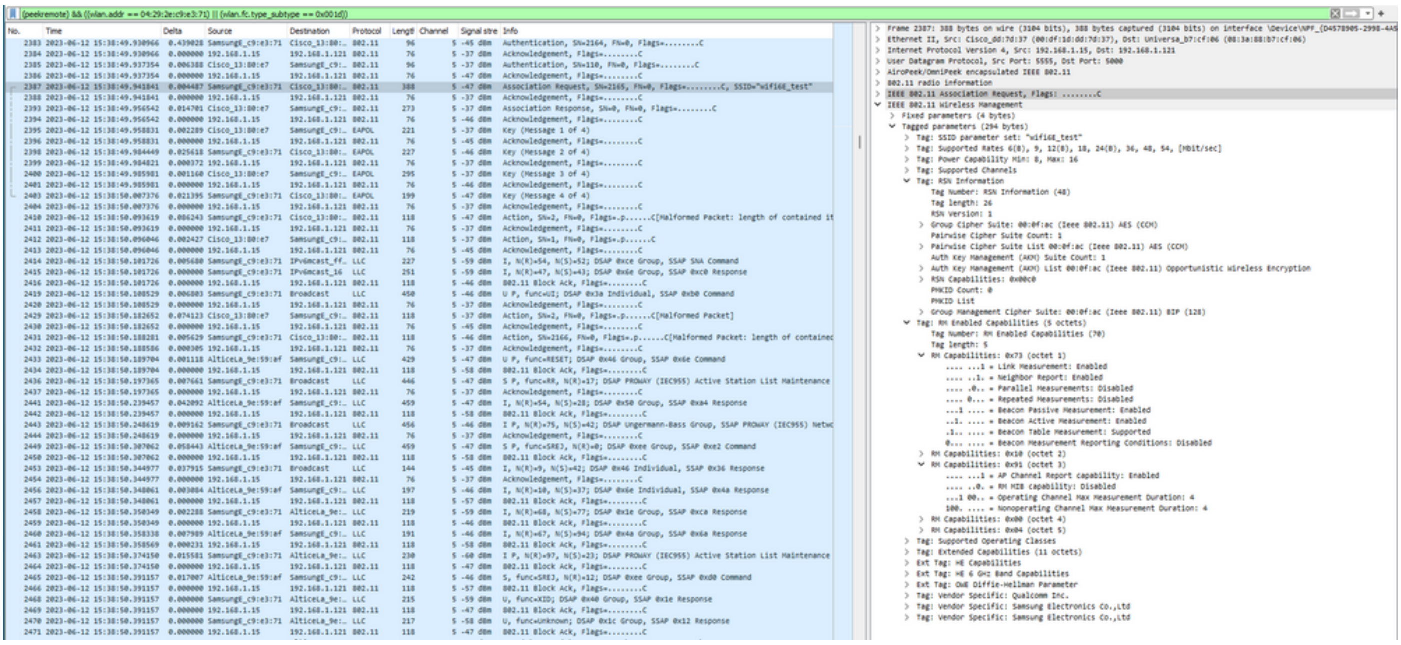


	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	2495.2f72.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP6849.9253.CA50
□	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80C
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50

Client State Servers	None
Client ACLs	None
Client Entry Create Time	135 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	OWE
EAP Type	Not Applicable
Session Timeout	86400

Samsung S23

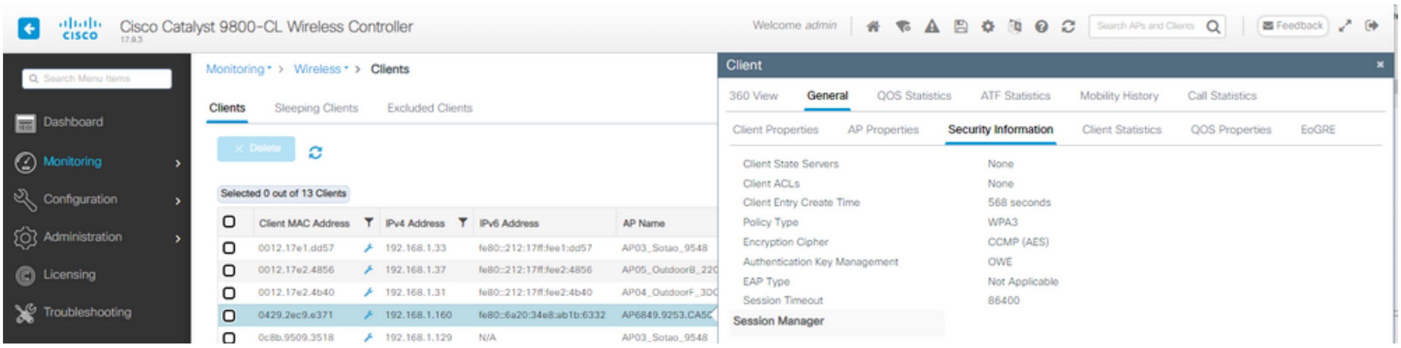
OTA de conexão com foco nas informações de RSN do cliente:



```
(peekremote) && ((wlan.addr == 04:29:2e:c9:e3:71) || (wlan.fc.type_subtype == 0x001d))

No.  Time                       Delta    Source            Destination    Protocol Length Channel Signal stre Info
2383 2023-06-12 15:38:49.930966 0.439028 SamsungE_c9:e3:71 Cisco_13:80:… 802.11   96   5 -45 dBm Authentication, SN=2164, FN=0, Flags=........C
2384 2023-06-12 15:38:49.930966 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2385 2023-06-12 15:38:49.937354 0.006388 Cisco_13:80:e7    SamsungE_c9:… 802.11   96   5 -37 dBm Authentication, SN=110, FN=0, Flags=........C
2386 2023-06-12 15:38:49.937354 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -47 dBm Acknowledgement, Flags=........C
2387 2023-06-12 15:38:49.941841 0.004487 SamsungE_c9:e3:71 Cisco_13:80:… 802.11  388   5 -47 dBm Association Request, SN=2165, FN=0, Flags=........C, SSID="wifi6E_test"
2388 2023-06-12 15:38:49.941841 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2393 2023-06-12 15:38:49.956542 0.014701 Cisco_13:80:e7    SamsungE_c9:… 802.11  273   5 -37 dBm Association Response, SN=0, FN=0, Flags=........C
2394 2023-06-12 15:38:49.956542 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -46 dBm Acknowledgement, Flags=........C
2395 2023-06-12 15:38:49.958831 0.002289 Cisco_13:80:e7    SamsungE_c9:… EAPOL   221   5 -37 dBm Key (Message 1 of 4)
2396 2023-06-12 15:38:49.958831 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -45 dBm Acknowledgement, Flags=........C
2398 2023-06-12 15:38:49.984449 0.025618 SamsungE_c9:e3:71 Cisco_13:80:… EAPOL   227   5 -46 dBm Key (Message 2 of 4)
2399 2023-06-12 15:38:49.984821 0.000372 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2400 2023-06-12 15:38:49.985981 0.001160 Cisco_13:80:e7    SamsungE_c9:… EAPOL   295   5 -37 dBm Key (Message 3 of 4)
2401 2023-06-12 15:38:49.985981 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -46 dBm Acknowledgement, Flags=........C
2403 2023-06-12 15:38:50.007376 0.021395 SamsungE_c9:e3:71 Cisco_13:80:… EAPOL   199   5 -47 dBm Key (Message 4 of 4)
2404 2023-06-12 15:38:50.007376 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2410 2023-06-12 15:38:50.093619 0.086243 SamsungE_c9:e3:71 Cisco_13:80:… 802.11  118   5 -47 dBm Action, SN=2, FN=0, Flags=.p......C[Malformed Packet: length of contained it
2411 2023-06-12 15:38:50.093619 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2412 2023-06-12 15:38:50.096046 0.002427 Cisco_13:80:e7    SamsungE_c9:… 802.11  118   5 -37 dBm Action, SN=1, FN=0, Flags=.p......C
2413 2023-06-12 15:38:50.096046 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -45 dBm Acknowledgement, Flags=........C
2414 2023-06-12 15:38:50.101726 0.005680 SamsungE_c9:e3:71 IPv6mcast_ff… LLC     227   5 -59 dBm I, N(R)=54, N(S)=52; DSAP 0xce Group, SSAP SNA Command
2415 2023-06-12 15:38:50.101726 0.000000 SamsungE_c9:e3:71 IPv6mcast_16  LLC     251   5 -59 dBm I, N(R)=47, N(S)=43; DSAP 0x6e Group, SSAP 0xc0 Response
2416 2023-06-12 15:38:50.101726 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -46 dBm 802.11 Block Ack, Flags=........C
2419 2023-06-12 15:38:50.108529 0.006803 SamsungE_c9:e3:71 Broadcast     LLC     450   5 -46 dBm U P, func=UI; DSAP 0x3a Individual, SSAP 0xb0 Command
2420 2023-06-12 15:38:50.108529 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2429 2023-06-12 15:38:50.182652 0.074123 Cisco_13:80:e7    SamsungE_c9:… 802.11  118   5 -37 dBm Action, SN=2, FN=0, Flags=.p......C[Malformed Packet]
2430 2023-06-12 15:38:50.182652 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -45 dBm Acknowledgement, Flags=........C
2431 2023-06-12 15:38:50.188281 0.005629 SamsungE_c9:e3:71 Cisco_13:80:… 802.11  118   5 -46 dBm Action, SN=2166, FN=0, Flags=.p......C[Malformed Packet: length of containec
2432 2023-06-12 15:38:50.188586 0.000305 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2433 2023-06-12 15:38:50.189704 0.001118 AlticeLa_9e:59:af SamsungE_c9:… LLC     429   5 -47 dBm U P, func=RESET; DSAP 0x46 Group, SSAP 0x6e Command
2434 2023-06-12 15:38:50.189704 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -58 dBm 802.11 Block Ack, Flags=........C
2436 2023-06-12 15:38:50.197365 0.007661 SamsungE_c9:e3:71 Broadcast     LLC     446   5 -47 dBm S P, func=RR, N(R)=17; DSAP PROWAY (IEC955) Active Station List Maintenance
2437 2023-06-12 15:38:50.197365 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2441 2023-06-12 15:38:50.239457 0.042092 AlticeLa_9e:59:af SamsungE_c9:… LLC     459   5 -47 dBm I, N(R)=54, N(S)=28; DSAP 0x50 Group, SSAP 0xa4 Response
2442 2023-06-12 15:38:50.239457 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -58 dBm 802.11 Block Ack, Flags=........C
2443 2023-06-12 15:38:50.248619 0.009162 SamsungE_c9:e3:71 Broadcast     LLC     456   5 -46 dBm I P, N(R)=75, N(S)=42; DSAP Ungermann-Bass Group, SSAP PROWAY (IEC955) Netwo
2444 2023-06-12 15:38:50.248619 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2449 2023-06-12 15:38:50.307062 0.058443 AlticeLa_9e:59:af SamsungE_c9:… LLC     459   5 -47 dBm S P, func=SREJ, N(R)=0; DSAP 0xee Group, SSAP 0xe2 Command
2450 2023-06-12 15:38:50.307062 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -58 dBm 802.11 Block Ack, Flags=........C
2453 2023-06-12 15:38:50.344977 0.037915 SamsungE_c9:e3:71 Broadcast     LLC     144   5 -45 dBm I, N(R)=9, N(S)=42; DSAP 0x46 Individual, SSAP 0x36 Response
2454 2023-06-12 15:38:50.344977 0.000000 192.168.1.15      192.168.1.121 802.11   76   5 -37 dBm Acknowledgement, Flags=........C
2456 2023-06-12 15:38:50.348061 0.003084 AlticeLa_9e:59:af SamsungE_c9:… LLC     197   5 -46 dBm I, N(R)=10, N(S)=37; DSAP 0x6e Individual, SSAP 0x4a Response
2457 2023-06-12 15:38:50.348061 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -57 dBm 802.11 Block Ack, Flags=........C
2458 2023-06-12 15:38:50.350349 0.002288 SamsungE_c9:e3:71 AlticeLa_9e:… LLC     219   5 -59 dBm I, N(R)=68, N(S)=77; DSAP 0x1e Group, SSAP 0xca Response
2459 2023-06-12 15:38:50.350349 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -46 dBm 802.11 Block Ack, Flags=........C
2460 2023-06-12 15:38:50.358338 0.007989 AlticeLa_9e:59:af SamsungE_c9:… LLC     191   5 -46 dBm I, N(R)=67, N(S)=94; DSAP 0x4a Group, SSAP 0x6a Response
2461 2023-06-12 15:38:50.358569 0.000231 192.168.1.15      192.168.1.121 802.11  118   5 -58 dBm 802.11 Block Ack, Flags=........C
2463 2023-06-12 15:38:50.374150 0.015581 SamsungE_c9:e3:71 AlticeLa_9e:… LLC     230   5 -60 dBm I P, N(R)=97, N(S)=23; DSAP PROWAY (IEC955) Active Station List Maintenance
2464 2023-06-12 15:38:50.374150 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -47 dBm 802.11 Block Ack, Flags=........C
2465 2023-06-12 15:38:50.391157 0.017007 AlticeLa_9e:59:af SamsungE_c9:… LLC     242   5 -46 dBm S, func=SREJ, N(R)=12; DSAP 0xee Group, SSAP 0xd0 Command
2466 2023-06-12 15:38:50.391157 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -57 dBm 802.11 Block Ack, Flags=........C
2468 2023-06-12 15:38:50.391157 0.000000 SamsungE_c9:e3:71 AlticeLa_9e:… LLC     215   5 -59 dBm U, func=XID; DSAP 0x40 Group, SSAP 0x1e Response
2469 2023-06-12 15:38:50.391157 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -47 dBm 802.11 Block Ack, Flags=........C
2470 2023-06-12 15:38:50.391157 0.000000 SamsungE_c9:e3:71 AlticeLa_9e:… LLC     217   5 -58 dBm U, func=Unknown; DSAP 0x1c Group, SSAP 0x12 Response
2471 2023-06-12 15:38:50.391157 0.000000 192.168.1.15      192.168.1.121 802.11  118   5 -47 dBm 802.11 Block Ack, Flags=........C
```

```
> Frame 2387: 388 bytes on wire (3104 bits), 388 bytes captured (3104 bits) on interface \Device\NPF_{D4578905-2998-4A5
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (4 bytes)
  v Tagged parameters (294 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 8, Max: 16
    > Tag: Supported Channels
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) Opportunistic Wireless Encryption
      > RSN Capabilities: 0x00c0
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    v Tag: RM Enabled Capabilities (5 octets)
        Tag Number: RM Enabled Capabilities (70)
        Tag length: 5
      v RM Capabilities: 0x73 (octet 1)
            .... ...1 = Link Measurement: Enabled
            .... ..1. = Neighbor Report: Enabled
            .... .0.. = Parallel Measurements: Disabled
            .... 0... = Repeated Measurements: Disabled
            ...1 .... = Beacon Passive Measurement: Enabled
            ..1. .... = Beacon Active Measurement: Enabled
            .1.. .... = Beacon Table Measurement: Supported
            0... .... = Beacon Measurement Reporting Conditions: Disabled
      > RM Capabilities: 0x10 (octet 2)
      v RM Capabilities: 0x91 (octet 3)
            .... ...1 = AP Channel Report capability: Enabled
            .... ..0. = RM MIB capability: Disabled
            ...1 00.. = Operating Channel Max Measurement Duration: 4
            100. .... = Nonoperating Channel Max Measurement Duration: 4
      > RM Capabilities: 0x00 (octet 4)
      > RM Capabilities: 0x04 (octet 5)
    > Tag: Supported Operating Classes
    > Tag: Extended Capabilities (11 octets)
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
    > Ext Tag: OWE Diffie-Hellman Parameter
    > Tag: Vendor Specific: Qualcomm Inc.
    > Tag: Vendor Specific: Samsung Electronics Co.,Ltd
    > Tag: Vendor Specific: Samsung Electronics Co.,Ltd
```

Detalhes do cliente no WLC:



	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548
□	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_22C
□	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC
□	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP6849.9253.CA5C
□	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548

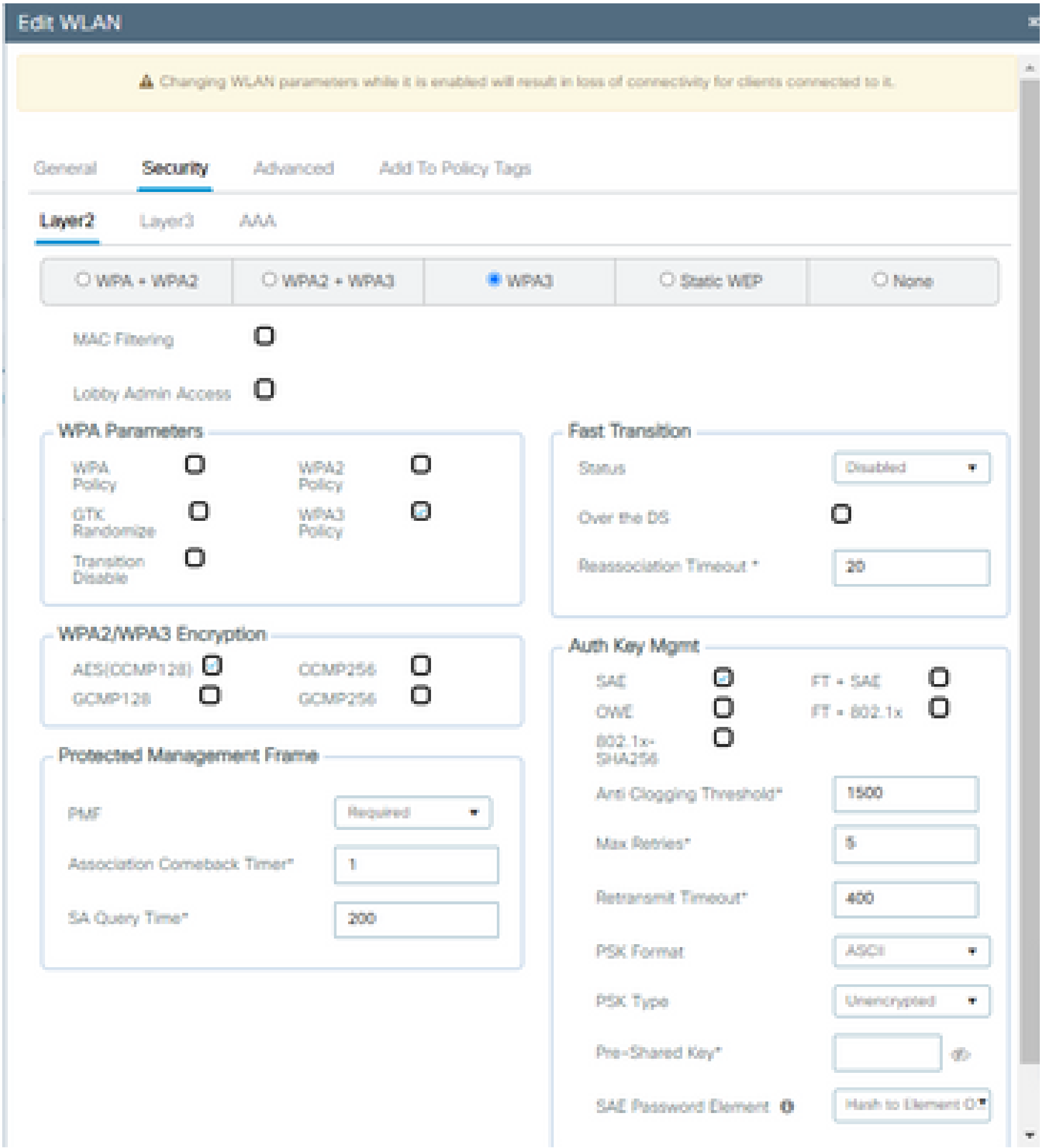
Client State Servers	None
Client ACLs	None
Client Entry Create Time	568 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	OWE
EAP Type	Not Applicable
Session Timeout	86400

WPA3 - AES(CCPM128) + OWE com modo de transição

Configuração e solução de problemas detalhadas do Modo de transição OWE disponíveis neste documento: Configure Enhanced Open SSID with Transition Mode - OWE.

WPA3-Personal - AES(CCMP128) + SAE

Configuração de segurança da WLAN:



Edit WLAN

⚠ Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

○ WPA + WPA2 ○ WPA2 + WPA3 ● WPA3 ○ Static WEP ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

WPA Policy □ WPA2 Policy □

GTK Randomize □ WPA3 Policy ☑

Transition Disable □

WPA2/WPA3 Encryption

AES(CCMP128) ☑ CCMP256 □

GCMP128 □ GCMP256 □

Protected Management Frame

PMF: Required

Association Comeback Timer*: 1

SA Query Time*: 200

Fast Transition

Status: Disabled

Over the DS □

Reassociation Timeout *: 20

Auth Key Mgmt

SAE ☑ FT + SAE □

OWE □ FT + 802.1x □

802.1x-SHA256 □

Anti Clogging Threshold*: 1500

Max Retries*: 5

Retransmit Timeout*: 400

PSK Format: ASCII

PSK Type: Unencrypted

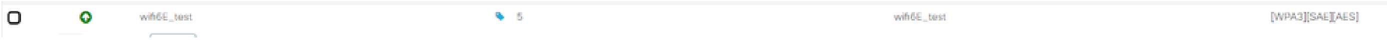
Pre-Shared Key*:

SAE Password Element: Hash to Element O

Configuração WPA3 SAE

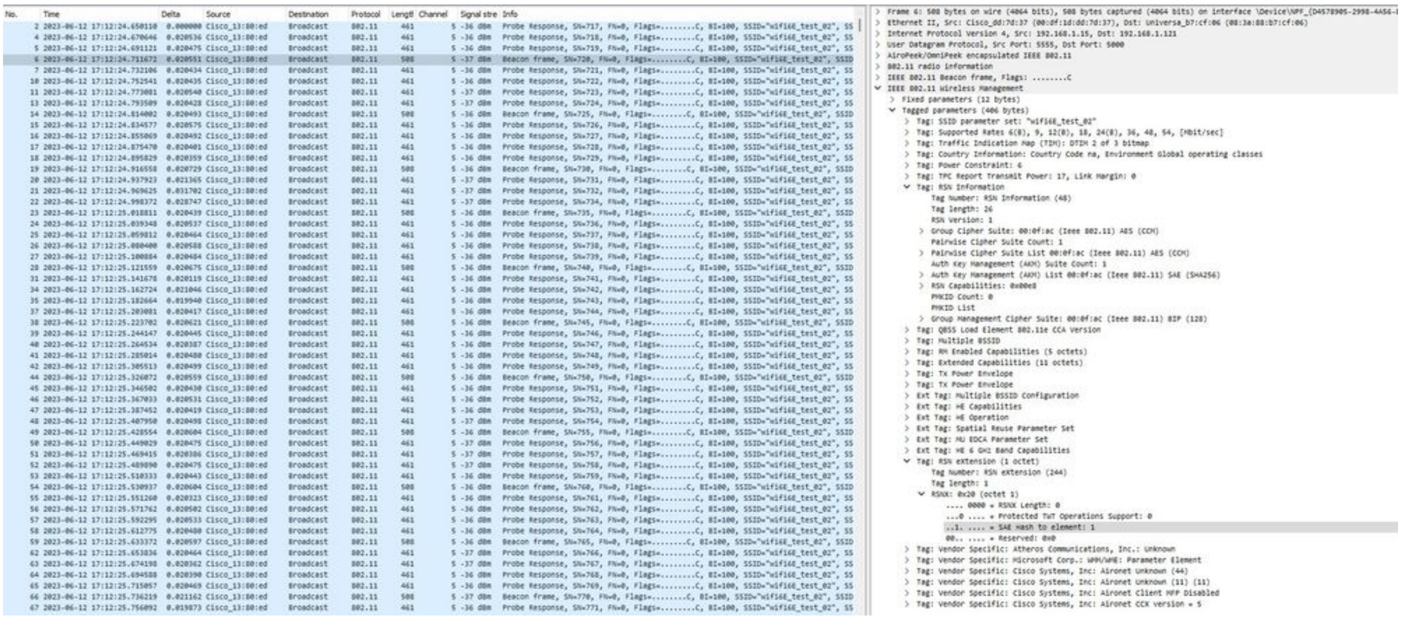
Observação: lembre-se de que Hunting and Pecking não é permitido com a política de rádio de 6 GHz. Ao configurar uma WLAN somente de 6 GHz, você deve selecionar o elemento de senha H2E SAE.

Visualizar na GUI da WLC as configurações de segurança da WLAN:



□	●	wifi6E_test	5	wifi6E_test	[WPA3][SAE][AES]

Verificação das balizas OTA:



```
No.  Time                        Delta     Source          Destination Protocol Length Channel Signal stre Info
   2 2023-06-12 17:12:24.650110  0.000000  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=717, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
   4 2023-06-12 17:12:24.670646  0.020536  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=718, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
   5 2023-06-12 17:12:24.691121  0.020475  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=719, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
   6 2023-06-12 17:12:24.711672  0.020551  Cisco_13:80:ed  Broadcast   802.11   508    5 -37 dBm  Beacon frame, SN=720, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
   7 2023-06-12 17:12:24.732106  0.020434  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=721, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  10 2023-06-12 17:12:24.752541  0.020435  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=722, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  11 2023-06-12 17:12:24.773081  0.020540  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=723, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  13 2023-06-12 17:12:24.793509  0.020428  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=724, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  14 2023-06-12 17:12:24.814002  0.020493  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=725, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  15 2023-06-12 17:12:24.834577  0.020575  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=726, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  16 2023-06-12 17:12:24.855069  0.020492  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=727, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  17 2023-06-12 17:12:24.875470  0.020401  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=728, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  18 2023-06-12 17:12:24.895829  0.020359  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=729, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  19 2023-06-12 17:12:24.916558  0.020729  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=730, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  20 2023-06-12 17:12:24.937923  0.021365  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=731, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  21 2023-06-12 17:12:24.969625  0.031702  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=732, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  22 2023-06-12 17:12:24.998372  0.028747  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=734, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  23 2023-06-12 17:12:25.018811  0.020439  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=735, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  24 2023-06-12 17:12:25.039348  0.020537  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=736, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  25 2023-06-12 17:12:25.059812  0.020464  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=737, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  26 2023-06-12 17:12:25.080400  0.020588  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=738, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  27 2023-06-12 17:12:25.100884  0.020484  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=739, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  28 2023-06-12 17:12:25.121559  0.020675  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=740, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  31 2023-06-12 17:12:25.141678  0.020119  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=741, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  34 2023-06-12 17:12:25.162724  0.021046  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=742, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  35 2023-06-12 17:12:25.182664  0.019940  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=743, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  37 2023-06-12 17:12:25.203081  0.020417  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=744, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  38 2023-06-12 17:12:25.223702  0.020621  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=745, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  39 2023-06-12 17:12:25.244147  0.020445  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=746, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  40 2023-06-12 17:12:25.264534  0.020387  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=747, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  41 2023-06-12 17:12:25.285014  0.020480  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=748, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  42 2023-06-12 17:12:25.305513  0.020499  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=749, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  44 2023-06-12 17:12:25.326072  0.020559  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=750, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  45 2023-06-12 17:12:25.346502  0.020430  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=751, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  46 2023-06-12 17:12:25.367033  0.020531  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=752, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  47 2023-06-12 17:12:25.387452  0.020419  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=753, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  48 2023-06-12 17:12:25.407950  0.020498  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=754, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  49 2023-06-12 17:12:25.428554  0.020604  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=755, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  50 2023-06-12 17:12:25.449029  0.020475  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=756, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  51 2023-06-12 17:12:25.469415  0.020386  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=757, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  52 2023-06-12 17:12:25.489890  0.020475  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=758, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  53 2023-06-12 17:12:25.510333  0.020443  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=759, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  54 2023-06-12 17:12:25.530937  0.020604  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=760, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  55 2023-06-12 17:12:25.551260  0.020323  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=761, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  56 2023-06-12 17:12:25.571762  0.020502  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=762, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  57 2023-06-12 17:12:25.592295  0.020533  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=763, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  58 2023-06-12 17:12:25.612775  0.020480  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=764, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  59 2023-06-12 17:12:25.633372  0.020597  Cisco_13:80:ed  Broadcast   802.11   508    5 -36 dBm  Beacon frame, SN=765, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  62 2023-06-12 17:12:25.653836  0.020464  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=766, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  63 2023-06-12 17:12:25.674198  0.020362  Cisco_13:80:ed  Broadcast   802.11   461    5 -37 dBm  Probe Response, SN=767, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  64 2023-06-12 17:12:25.694588  0.020390  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=768, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  65 2023-06-12 17:12:25.715057  0.020469  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=769, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
  66 2023-06-12 17:12:25.736219  0.021162  Cisco_13:80:ed  Broadcast   802.11   508    5 -37 dBm  Beacon frame, SN=770, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID
  67 2023-06-12 17:12:25.756092  0.019873  Cisco_13:80:ed  Broadcast   802.11   461    5 -36 dBm  Probe Response, SN=771, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SS
```

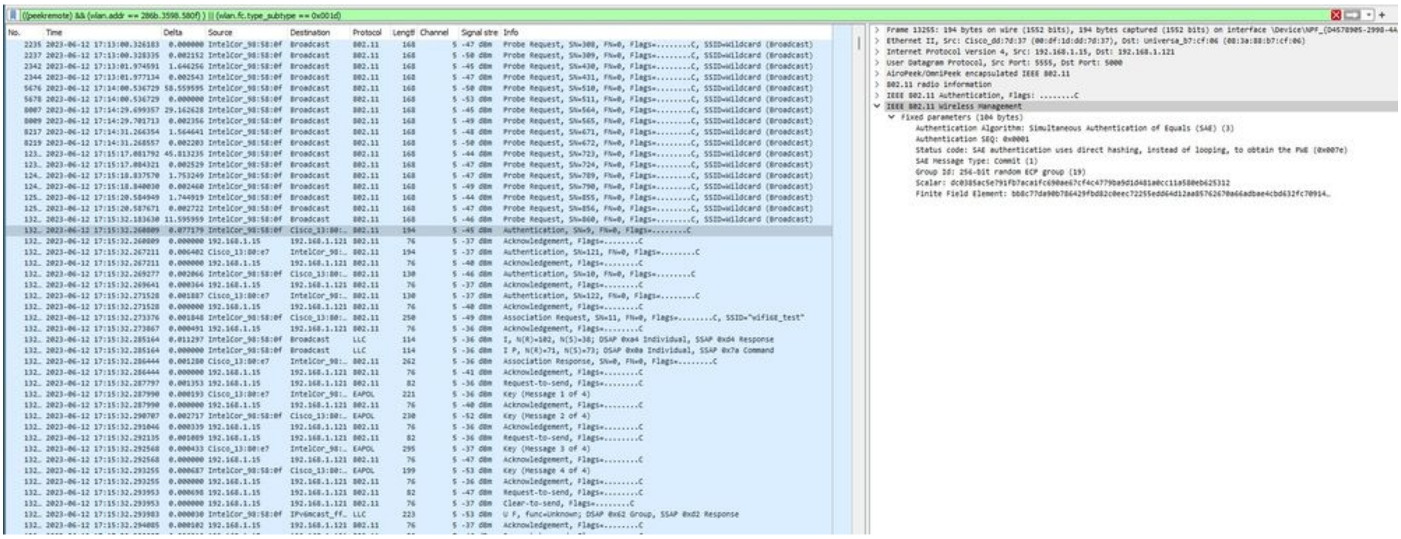
```
> Frame 6: 508 bytes on wire (4064 bits), 508 bytes captured (4064 bits) on interface \Device\NPF_{D4578905-2998-4A56-
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
    > Fixed parameters (12 bytes)
    v Tagged parameters (406 bytes)
        > Tag: SSID parameter set: "wifi6E_test_02"
        > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
        > Tag: Traffic Indication Map (TIM): DTIM 2 of 3 bitmap
        > Tag: Country Information: Country Code na, Environment Global operating classes
        > Tag: Power Constraint: 6
        > Tag: TPC Report Transmit Power: 17, Link Margin: 0
        v Tag: RSN Information
              Tag Number: RSN Information (48)
              Tag length: 26
              RSN Version: 1
            > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
              Pairwise Cipher Suite Count: 1
            > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
              Auth Key Management (AKM) Suite Count: 1
            > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
            > RSN Capabilities: 0x00e8
              PMKID Count: 0
              PMKID List
            > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
        > Tag: QBSS Load Element 802.11e CCA Version
        > Tag: Multiple BSSID
        > Tag: RM Enabled Capabilities (5 octets)
        > Tag: Extended Capabilities (11 octets)
        > Tag: Tx Power Envelope
        > Tag: Tx Power Envelope
        > Ext Tag: Multiple BSSID Configuration
        > Ext Tag: HE Capabilities
        > Ext Tag: HE Operation
        > Ext Tag: Spatial Reuse Parameter Set
        > Ext Tag: MU EDCA Parameter Set
        > Ext Tag: HE 6 GHz Band Capabilities
        v Tag: RSN eXtension (1 octet)
              Tag Number: RSN eXtension (244)
              Tag length: 1
            v RSNX: 0x20 (octet 1)
                  .... 0000 = RSNX Length: 0
                  ...0 .... = Protected TWT Operations Support: 0
                  ..1. .... = SAE Hash to element: 1
                  00.. .... = Reserved: 0x0
        > Tag: Vendor Specific: Atheros Communications, Inc.: Unknown
        > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Parameter Element
        > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (44)
        > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (11) (11)
        > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Client MFP Disabled
        > Tag: Vendor Specific: Cisco Systems, Inc: Aironet CCX version = 5
```

Beacons WPA3 SAE

Aqui podemos observar os clientes Wi-Fi 6E associando:

AX211 Intel

OTA de conexão com foco nas informações de RSN do cliente:

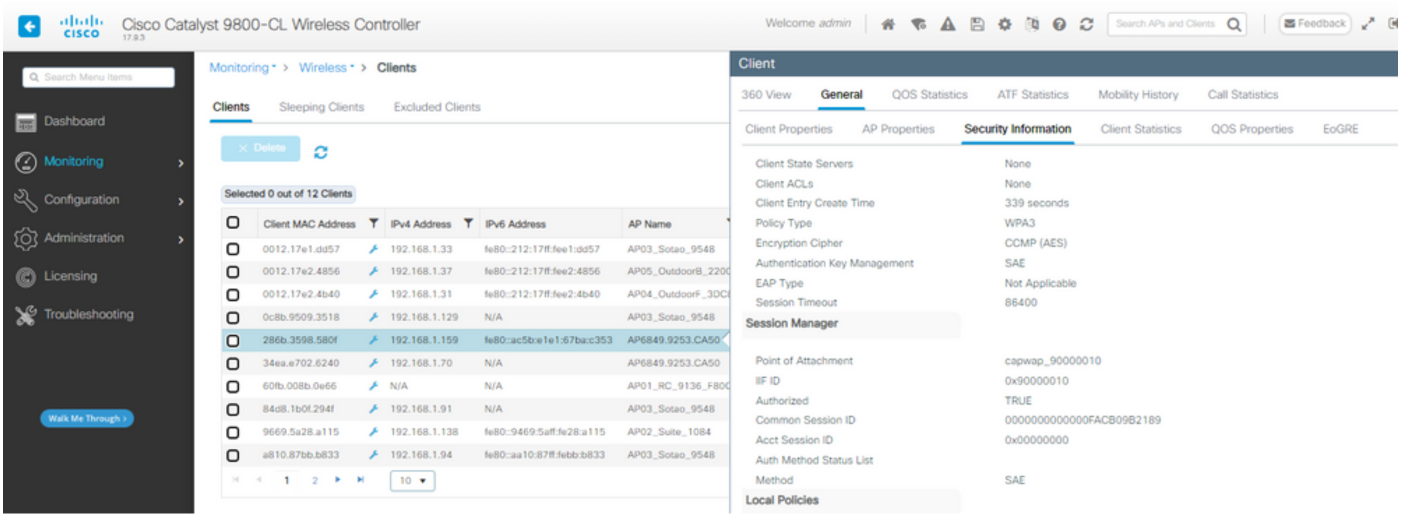


```
((peekremote) && (wlan.addr == 286b.3598.580f) ) || (wlan.fc.type_subtype == 0x001d)
```

```
No.   Time                        Delta      Source              Destination     Protocol Length Channel Signal stre Info
2235  2023-06-12 17:13:00.326183  0.000000   IntelCor_98:58:0f   Broadcast       802.11   168    5 -47 dBm  Probe Request, SN=308, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
2237  2023-06-12 17:13:00.328335  0.002152   IntelCor_98:58:0f   Broadcast       802.11   168    5 -50 dBm  Probe Request, SN=309, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
2342  2023-06-12 17:13:01.974591  1.646256   IntelCor_98:58:0f   Broadcast       802.11   168    5 -45 dBm  Probe Request, SN=430, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
2344  2023-06-12 17:13:01.977134  0.002543   IntelCor_98:58:0f   Broadcast       802.11   168    5 -47 dBm  Probe Request, SN=431, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
5676  2023-06-12 17:14:00.536729  58.559595  IntelCor_98:58:0f   Broadcast       802.11   168    5 -50 dBm  Probe Request, SN=510, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
5678  2023-06-12 17:14:00.536729  0.000000   IntelCor_98:58:0f   Broadcast       802.11   168    5 -53 dBm  Probe Request, SN=511, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
8007  2023-06-12 17:14:29.699357  29.162628  IntelCor_98:58:0f   Broadcast       802.11   168    5 -45 dBm  Probe Request, SN=564, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
8009  2023-06-12 17:14:29.701713  0.002356   IntelCor_98:58:0f   Broadcast       802.11   168    5 -49 dBm  Probe Request, SN=565, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
8217  2023-06-12 17:14:31.266354  1.564641   IntelCor_98:58:0f   Broadcast       802.11   168    5 -48 dBm  Probe Request, SN=671, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
8219  2023-06-12 17:14:31.268557  0.002203   IntelCor_98:58:0f   Broadcast       802.11   168    5 -50 dBm  Probe Request, SN=672, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
123…  2023-06-12 17:15:17.081792  45.813235  IntelCor_98:58:0f   Broadcast       802.11   168    5 -44 dBm  Probe Request, SN=723, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
123…  2023-06-12 17:15:17.084321  0.002529   IntelCor_98:58:0f   Broadcast       802.11   168    5 -47 dBm  Probe Request, SN=724, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
124…  2023-06-12 17:15:18.837570  1.753249   IntelCor_98:58:0f   Broadcast       802.11   168    5 -47 dBm  Probe Request, SN=789, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
124…  2023-06-12 17:15:18.840030  0.002460   IntelCor_98:58:0f   Broadcast       802.11   168    5 -49 dBm  Probe Request, SN=790, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
125…  2023-06-12 17:15:20.584949  1.744919   IntelCor_98:58:0f   Broadcast       802.11   168    5 -44 dBm  Probe Request, SN=855, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
125…  2023-06-12 17:15:20.587671  0.002722   IntelCor_98:58:0f   Broadcast       802.11   168    5 -47 dBm  Probe Request, SN=856, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
132…  2023-06-12 17:15:32.183630  11.595959  IntelCor_98:58:0f   Broadcast       802.11   168    5 -46 dBm  Probe Request, SN=860, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
132…  2023-06-12 17:15:32.260809  0.077179   IntelCor_98:58:0f   Cisco_13:80:…   802.11   194    5 -45 dBm  Authentication, SN=9, FN=0, Flags=........C
132…  2023-06-12 17:15:32.260809  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -37 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.267211  0.006402   Cisco_13:80:e7      IntelCor_98:…   802.11   194    5 -37 dBm  Authentication, SN=121, FN=0, Flags=........C
132…  2023-06-12 17:15:32.267211  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -40 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.269277  0.002066   IntelCor_98:58:0f   Cisco_13:80:…   802.11   130    5 -46 dBm  Authentication, SN=10, FN=0, Flags=........C
132…  2023-06-12 17:15:32.269641  0.000364   192.168.1.15        192.168.1.121   802.11   76     5 -37 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.271528  0.001887   Cisco_13:80:e7      IntelCor_98:…   802.11   130    5 -37 dBm  Authentication, SN=122, FN=0, Flags=........C
132…  2023-06-12 17:15:32.271528  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -40 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.273376  0.001848   IntelCor_98:58:0f   Cisco_13:80:…   802.11   250    5 -49 dBm  Association Request, SN=11, FN=0, Flags=........C, SSID="wifi6E_test"
132…  2023-06-12 17:15:32.273867  0.000491   192.168.1.15        192.168.1.121   802.11   76     5 -36 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.285164  0.011297   IntelCor_98:58:0f   Broadcast       LLC      114    5 -36 dBm  I, N(R)=102, N(S)=38; DSAP 0xa4 Individual, SSAP 0xd4 Response
132…  2023-06-12 17:15:32.285164  0.000000   IntelCor_98:58:0f   Broadcast       LLC      114    5 -36 dBm  I P, N(R)=71, N(S)=73; DSAP 0x0a Individual, SSAP 0x7a Command
132…  2023-06-12 17:15:32.286444  0.001280   Cisco_13:80:e7      IntelCor_98:…   802.11   262    5 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
132…  2023-06-12 17:15:32.286444  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -41 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.287797  0.001353   192.168.1.15        192.168.1.121   802.11   82     5 -36 dBm  Request-to-send, Flags=........C
132…  2023-06-12 17:15:32.287990  0.000193   Cisco_13:80:e7      IntelCor_98:…   EAPOL    221    5 -36 dBm  Key (Message 1 of 4)
132…  2023-06-12 17:15:32.287990  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -40 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.290707  0.002717   IntelCor_98:58:0f   Cisco_13:80:…   EAPOL    230    5 -52 dBm  Key (Message 2 of 4)
132…  2023-06-12 17:15:32.291046  0.000339   192.168.1.15        192.168.1.121   802.11   76     5 -36 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.292135  0.001089   192.168.1.15        192.168.1.121   802.11   82     5 -36 dBm  Request-to-send, Flags=........C
132…  2023-06-12 17:15:32.292568  0.000433   Cisco_13:80:e7      IntelCor_98:…   EAPOL    295    5 -37 dBm  Key (Message 3 of 4)
132…  2023-06-12 17:15:32.292568  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -47 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.293255  0.000687   IntelCor_98:58:0f   Cisco_13:80:…   EAPOL    199    5 -53 dBm  Key (Message 4 of 4)
132…  2023-06-12 17:15:32.293255  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -36 dBm  Acknowledgement, Flags=........C
132…  2023-06-12 17:15:32.293953  0.000698   192.168.1.15        192.168.1.121   802.11   82     5 -47 dBm  Request-to-send, Flags=........C
132…  2023-06-12 17:15:32.293953  0.000000   192.168.1.15        192.168.1.121   802.11   76     5 -37 dBm  Clear-to-send, Flags=........C
132…  2023-06-12 17:15:32.293983  0.000030   IntelCor_98:58:0f   IPv6mcast_ff…   LLC      223    5 -53 dBm  U F, func=Unknown; DSAP 0x62 Group, SSAP 0xd2 Response
132…  2023-06-12 17:15:32.294085  0.000102   192.168.1.15        192.168.1.121   802.11   76     5 -37 dBm  Acknowledgement, Flags=........C
```

```
> Frame 13255: 194 bytes on wire (1552 bits), 194 bytes captured (1552 bits) on interface \Device\NPF_{D4578905-2998-4A
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Authentication, Flags: ........C
v IEEE 802.11 Wireless Management
    v Fixed parameters (104 bytes)
          Authentication Algorithm: Simultaneous Authentication of Equals (SAE) (3)
          Authentication SEQ: 0x0001
          Status code: SAE authentication uses direct hashing, instead of looping, to obtain the PWE (0x007e)
          SAE Message Type: Commit (1)
          Group Id: 256-bit random ECP group (19)
          Scalar: dc0385ac5e791fb7aca1fc690ae67cf4c4779ba9d1d481a0cc11a580eb625312
          Finite Field Element: bb8c77da90b786429fbd82c0eec72255edd64d12aa8576267 0a66adbae4cbd632fc70914…
```

Detalhes do cliente no WLC:



Monitoring › Wireless › Clients

Clients | Sleeping Clients | Excluded Clients

✕ Delete

Selected 0 out of 12 Clients

□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548
□	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_220
□	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC
□	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548
□	286b.3598.580f	192.168.1.159	fe80::ac5b:e1e1:67ba:c353	AP6849.9253.CA50
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80
□	84d8.1b0f.294f	192.168.1.91	N/A	AP03_Sotao_9548
□	9669.5a28.a115	192.168.1.138	fe80::9469:5aff:fe28:a115	AP02_Suite_1084
□	a810.87bb.b833	192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548

1 2 | 10

Client

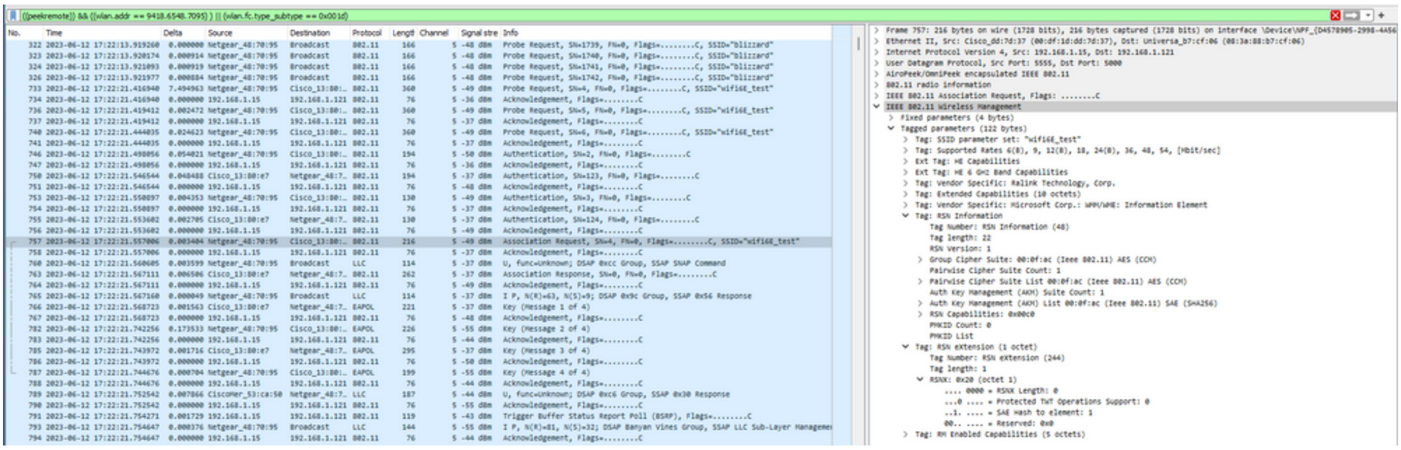
360 View | General | QOS Statistics | ATF Statistics | Mobility History | Call Statistics

Client Properties | AP Properties | Security Information | Client Statistics | QOS Properties | EoGRE

Client State Servers	None
Client ACLs	None
Client Entry Create Time	339 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400
Session Manager	
Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FACB09B2189
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE
Local Policies	

NetGear A8000

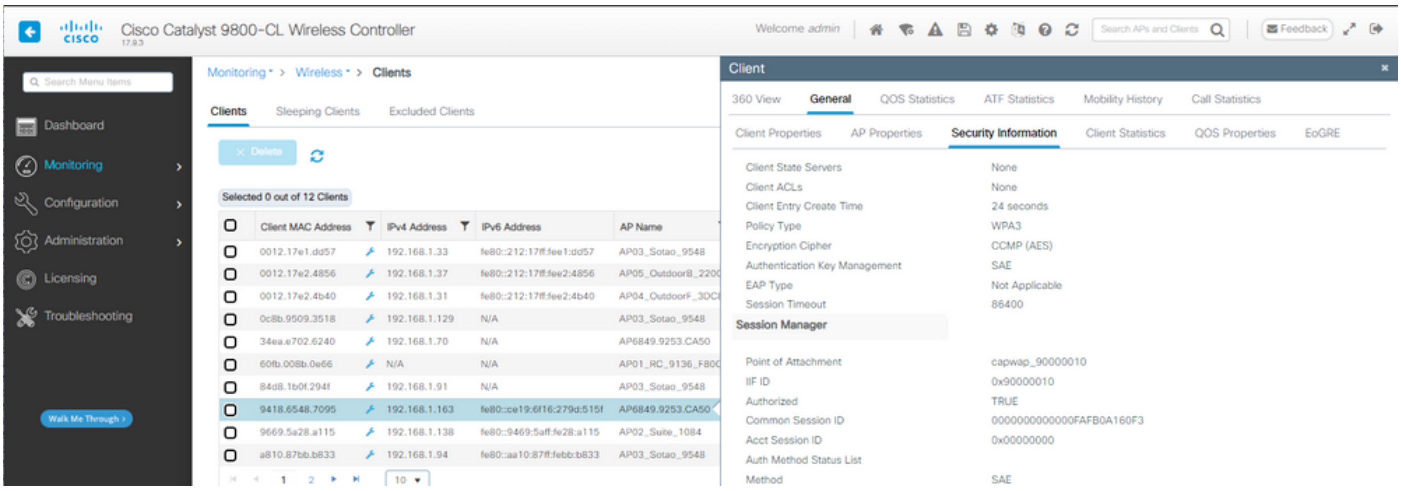
OTA de conexão com foco nas informações de RSN do cliente:



```
((peekremote)) && ((wlan.addr == 9418.6548.7095) ) || (wlan.fc.type_subtype == 0x001d)

No.  Time                        Delta     Source            Destination      Protocol Length Channel Signal stre Info
 322 2023-06-12 17:22:13.919260  0.000000  Netgear_48:70:95  Broadcast        802.11   166    5 -48 dBm  Probe Request, SN=1739, FN=0, Flags=........C, SSID="blizzard"
 323 2023-06-12 17:22:13.920174  0.000914  Netgear_48:70:95  Broadcast        802.11   166    5 -48 dBm  Probe Request, SN=1740, FN=0, Flags=........C, SSID="blizzard"
 324 2023-06-12 17:22:13.921093  0.000919  Netgear_48:70:95  Broadcast        802.11   166    5 -48 dBm  Probe Request, SN=1741, FN=0, Flags=........C, SSID="blizzard"
 326 2023-06-12 17:22:13.921977  0.000884  Netgear_48:70:95  Broadcast        802.11   166    5 -48 dBm  Probe Request, SN=1742, FN=0, Flags=........C, SSID="blizzard"
 733 2023-06-12 17:22:21.416940  7.494963  Netgear_48:70:95  Cisco_13:80:…    802.11   360    5 -49 dBm  Probe Request, SN=4, FN=0, Flags=........C, SSID="wifi6E_test"
 734 2023-06-12 17:22:21.416940  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
 736 2023-06-12 17:22:21.419412  0.002472  Netgear_48:70:95  Cisco_13:80:…    802.11   360    5 -49 dBm  Probe Request, SN=5, FN=0, Flags=........C, SSID="wifi6E_test"
 737 2023-06-12 17:22:21.419412  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 740 2023-06-12 17:22:21.444035  0.024623  Netgear_48:70:95  Cisco_13:80:…    802.11   360    5 -49 dBm  Probe Request, SN=6, FN=0, Flags=........C, SSID="wifi6E_test"
 741 2023-06-12 17:22:21.444035  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 746 2023-06-12 17:22:21.498056  0.054021  Netgear_48:70:95  Cisco_13:80:…    802.11   194    5 -50 dBm  Authentication, SN=2, FN=0, Flags=........C
 747 2023-06-12 17:22:21.498056  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
 750 2023-06-12 17:22:21.546544  0.048488  Cisco_13:80:e7    Netgear_48:7…    802.11   194    5 -37 dBm  Authentication, SN=123, FN=0, Flags=........C
 751 2023-06-12 17:22:21.546544  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -48 dBm  Acknowledgement, Flags=........C
 753 2023-06-12 17:22:21.550897  0.004353  Netgear_48:70:95  Cisco_13:80:…    802.11   130    5 -49 dBm  Authentication, SN=3, FN=0, Flags=........C
 754 2023-06-12 17:22:21.550897  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 755 2023-06-12 17:22:21.553602  0.002705  Cisco_13:80:e7    Netgear_48:7…    802.11   130    5 -37 dBm  Authentication, SN=124, FN=0, Flags=........C
 756 2023-06-12 17:22:21.553602  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -49 dBm  Acknowledgement, Flags=........C
 757 2023-06-12 17:22:21.557006  0.003404  Netgear_48:70:95  Cisco_13:80:…    802.11   216    5 -49 dBm  Association Request, SN=4, FN=0, Flags=........C, SSID="wifi6E_test"
 758 2023-06-12 17:22:21.557006  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 760 2023-06-12 17:22:21.560605  0.003599  Netgear_48:70:95  Broadcast        LLC      114    5 -37 dBm  U, func=Unknown; DSAP 0xCC Group, SSAP SNAP Command
 763 2023-06-12 17:22:21.567111  0.006506  Cisco_13:80:e7    Netgear_48:7…    802.11   262    5 -37 dBm  Association Response, SN=0, FN=0, Flags=........C
 764 2023-06-12 17:22:21.567111  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -49 dBm  Acknowledgement, Flags=........C
 765 2023-06-12 17:22:21.567160  0.000049  Netgear_48:70:95  Broadcast        LLC      114    5 -37 dBm  I P, N(R)=63, N(S)=9; DSAP 0x9c Group, SSAP 0x56 Response
 766 2023-06-12 17:22:21.568723  0.001563  Cisco_13:80:e7    Netgear_48:7…    EAPOL    221    5 -37 dBm  Key (Message 1 of 4)
 767 2023-06-12 17:22:21.568723  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -48 dBm  Acknowledgement, Flags=........C
 782 2023-06-12 17:22:21.742256  0.173533  Netgear_48:70:95  Cisco_13:80:…    EAPOL    226    5 -55 dBm  Key (Message 2 of 4)
 783 2023-06-12 17:22:21.742256  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -44 dBm  Acknowledgement, Flags=........C
 785 2023-06-12 17:22:21.743972  0.001716  Cisco_13:80:e7    Netgear_48:7…    EAPOL    295    5 -37 dBm  Key (Message 3 of 4)
 786 2023-06-12 17:22:21.743972  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -50 dBm  Acknowledgement, Flags=........C
 787 2023-06-12 17:22:21.744676  0.000704  Netgear_48:70:95  Cisco_13:80:…    EAPOL    199    5 -55 dBm  Key (Message 4 of 4)
 788 2023-06-12 17:22:21.744676  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -44 dBm  Acknowledgement, Flags=........C
 789 2023-06-12 17:22:21.752542  0.007866  CiscoMer_53:ca:50 Netgear_48:7…    LLC      187    5 -44 dBm  U, func=Unknown; DSAP 0xC6 Group, SSAP 0x30 Response
 790 2023-06-12 17:22:21.752542  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -55 dBm  Acknowledgement, Flags=........C
 791 2023-06-12 17:22:21.754271  0.001729  192.168.1.15      192.168.1.121    802.11   119    5 -43 dBm  Trigger Buffer Status Report Poll (BSRP), Flags=........C
 793 2023-06-12 17:22:21.754647  0.000376  Netgear_48:70:95  Broadcast        LLC      144    5 -55 dBm  I P, N(R)=81, N(S)=32; DSAP Banyan Vines Group, SSAP LLC Sub-Layer Manageme
 794 2023-06-12 17:22:21.754647  0.000000  192.168.1.15      192.168.1.121    802.11    76    5 -44 dBm  Acknowledgement, Flags=........C
```

```
> Frame 757: 216 bytes on wire (1728 bits), 216 bytes captured (1728 bits) on interface \Device\NPF_{D4578905-2998-4A56
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (4 bytes)
  v Tagged parameters (122 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
    > Tag: Vendor Specific: Ralink Technology, Corp.
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 22
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
      > RSN Capabilities: 0x00c0
        PMKID Count: 0
        PMKID List
    v Tag: RSN eXtension (1 octet)
        Tag Number: RSN eXtension (244)
        Tag length: 1
      v RSNX: 0x20 (octet 1)
          .... 0000 = RSNX Length: 0
          ...0 .... = Protected TWT Operations Support: 0
          ..1. .... = SAE Hash to element: 1
          00.. .... = Reserved: 0x0
    > Tag: RM Enabled Capabilities (5 octets)
```

Detalhes do cliente no WLC:



Monitoring › Wireless › Clients

Clients | Sleeping Clients | Excluded Clients

✕ Delete

Selected 0 out of 12 Clients

□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548
□	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_220
□	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC
□	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80
□	84d8.1b0f.294f	192.168.1.91	N/A	AP03_Sotao_9548
□	9418.6548.7095	192.168.1.163	fe80::ce19:6f16:279d:515f	AP6849.9253.CA50
□	9669.5a28.a115	192.168.1.138	fe80::9469:5aff:fe28:a115	AP02_Suite_1084
□	a810.87bb.b833	192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548

1 2 | 10

Client

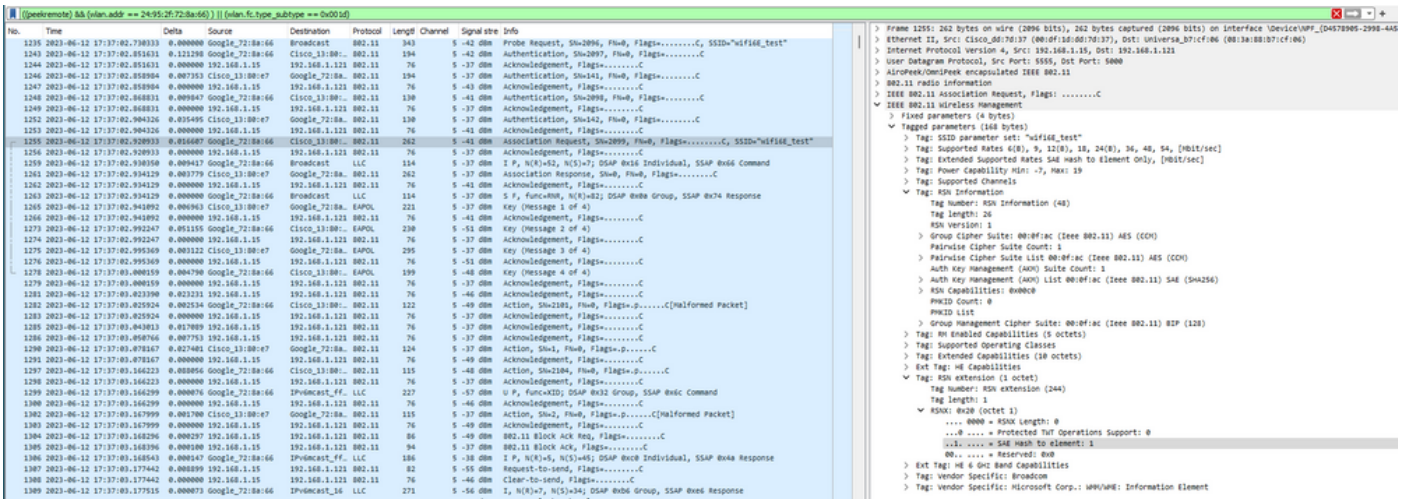
360 View | General | QOS Statistics | ATF Statistics | Mobility History | Call Statistics

Client Properties | AP Properties | Security Information | Client Statistics | QOS Properties | EoGRE

Client State Servers	None
Client ACLs	None
Client Entry Create Time	24 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400
Session Manager	
Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FAFB0A160F3
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE

Pixel 6a

OTA de conexão com foco nas informações de RSN do cliente:

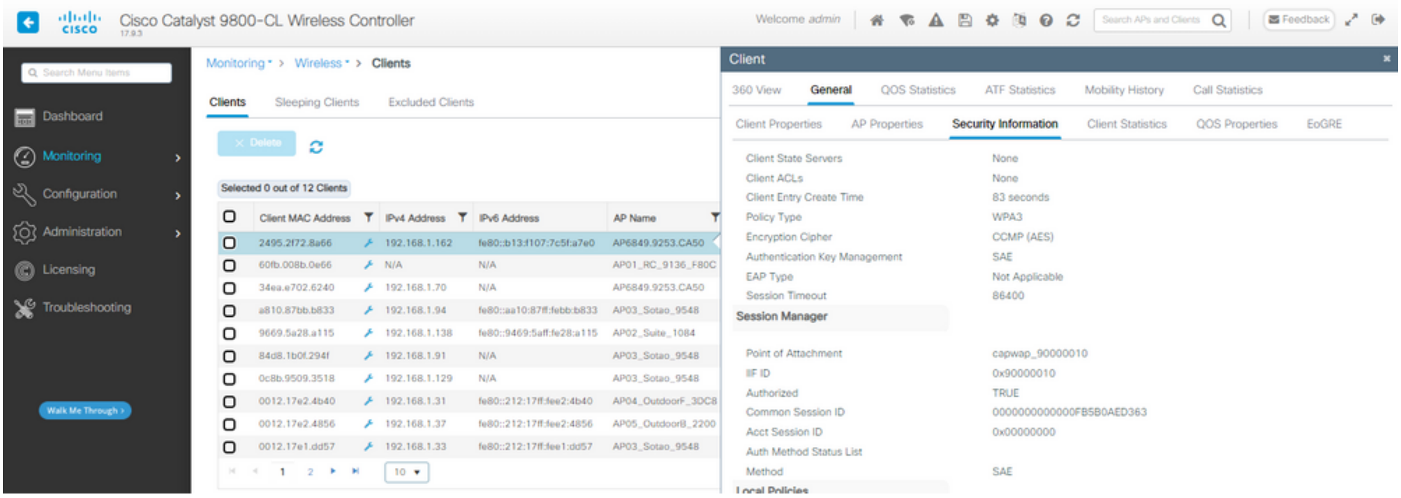


```
((peekremote) && (wlan.addr == 24:95:2f:72:8a:66) ) || (wlan.fc.type_subtype == 0x001d)
```

```
No.   Time                        Delta    Source            Destination      Protocol Length Channel Signal stre Info
 1235 2023-06-12 17:37:02.730333 0.000000 Google_72:8a:66   Broadcast        802.11   343    5 -42 dBm  Probe Request, SN=2096, FN=0, Flags=........C, SSID="wifi6E_test"
 1243 2023-06-12 17:37:02.851631 0.121298 Google_72:8a:66   Cisco_13:80:…    802.11   194    5 -42 dBm  Authentication, SN=2097, FN=0, Flags=........C
 1244 2023-06-12 17:37:02.851631 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1246 2023-06-12 17:37:02.858984 0.007353 Cisco_13:80:e7    Google_72:8a…    802.11   194    5 -37 dBm  Authentication, SN=141, FN=0, Flags=........C
 1247 2023-06-12 17:37:02.858984 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -43 dBm  Acknowledgement, Flags=........C
 1248 2023-06-12 17:37:02.868831 0.009847 Google_72:8a:66   Cisco_13:80:…    802.11   130    5 -41 dBm  Authentication, SN=2098, FN=0, Flags=........C
 1249 2023-06-12 17:37:02.868831 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1252 2023-06-12 17:37:02.904326 0.035495 Cisco_13:80:e7    Google_72:8a…    802.11   130    5 -37 dBm  Authentication, SN=142, FN=0, Flags=........C
 1253 2023-06-12 17:37:02.904326 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -41 dBm  Acknowledgement, Flags=........C
 1255 2023-06-12 17:37:02.920933 0.016607 Google_72:8a:66   Cisco_13:80:…    802.11   262    5 -41 dBm  Association Request, SN=2099, FN=0, Flags=........C, SSID="wifi6E_test"
 1256 2023-06-12 17:37:02.920933 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1259 2023-06-12 17:37:02.930350 0.009417 Google_72:8a:66   Broadcast        LLC      114    5 -37 dBm  I P, N(R)=52, N(S)=7; DSAP 0x16 Individual, SSAP 0x66 Command
 1261 2023-06-12 17:37:02.934129 0.003779 Cisco_13:80:e7    Google_72:8a…    802.11   262    5 -37 dBm  Association Response, SN=0, FN=0, Flags=........C
 1262 2023-06-12 17:37:02.934129 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -41 dBm  Acknowledgement, Flags=........C
 1263 2023-06-12 17:37:02.934129 0.000000 Google_72:8a:66   Broadcast        LLC      114    5 -37 dBm  S F, func=RNR, N(R)=82; DSAP 0x8a Group, SSAP 0x74 Response
 1265 2023-06-12 17:37:02.941092 0.006963 Cisco_13:80:e7    Google_72:8a…    EAPOL    221    5 -37 dBm  Key (Message 1 of 4)
 1266 2023-06-12 17:37:02.941092 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -41 dBm  Acknowledgement, Flags=........C
 1273 2023-06-12 17:37:02.992247 0.051155 Google_72:8a:66   Cisco_13:80:…    EAPOL    230    5 -51 dBm  Key (Message 2 of 4)
 1274 2023-06-12 17:37:02.992247 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1275 2023-06-12 17:37:02.995369 0.003122 Cisco_13:80:e7    Google_72:8a…    EAPOL    295    5 -37 dBm  Key (Message 3 of 4)
 1276 2023-06-12 17:37:02.995369 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -51 dBm  Acknowledgement, Flags=........C
 1278 2023-06-12 17:37:03.000159 0.004790 Google_72:8a:66   Cisco_13:80:…    EAPOL    199    5 -48 dBm  Key (Message 4 of 4)
 1279 2023-06-12 17:37:03.000159 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1281 2023-06-12 17:37:03.023390 0.023231 192.168.1.15      192.168.1.121    802.11    76    5 -46 dBm  Acknowledgement, Flags=........C
 1282 2023-06-12 17:37:03.025924 0.002534 Google_72:8a:66   Cisco_13:80:…    802.11   122    5 -49 dBm  Action, SN=2101, FN=0, Flags=.p......C[Malformed Packet]
 1283 2023-06-12 17:37:03.025924 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1285 2023-06-12 17:37:03.043013 0.017089 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1286 2023-06-12 17:37:03.050766 0.007753 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1290 2023-06-12 17:37:03.078167 0.027401 Cisco_13:80:e7    Google_72:8a…    802.11   124    5 -37 dBm  Action, SN=1, FN=0, Flags=.p......C
 1291 2023-06-12 17:37:03.078167 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -49 dBm  Acknowledgement, Flags=........C
 1297 2023-06-12 17:37:03.166223 0.088056 Google_72:8a:66   Cisco_13:80:…    802.11   115    5 -48 dBm  Action, SN=2104, FN=0, Flags=.p......C
 1298 2023-06-12 17:37:03.166223 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 1299 2023-06-12 17:37:03.166299 0.000076 Google_72:8a:66   IPv6mcast_ff…    LLC      227    5 -57 dBm  U P, func=XID; DSAP 0x32 Group, SSAP 0x6c Command
 1300 2023-06-12 17:37:03.166299 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -46 dBm  Acknowledgement, Flags=........C
 1302 2023-06-12 17:37:03.167999 0.001700 Cisco_13:80:e7    Google_72:8a…    802.11   115    5 -37 dBm  Action, SN=2, FN=0, Flags=.p......C[Malformed Packet]
 1303 2023-06-12 17:37:03.167999 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -49 dBm  Acknowledgement, Flags=........C
 1304 2023-06-12 17:37:03.168296 0.000297 192.168.1.15      192.168.1.121    802.11    86    5 -49 dBm  802.11 Block Ack Req, Flags=........C
 1305 2023-06-12 17:37:03.168396 0.000100 192.168.1.15      192.168.1.121    802.11    94    5 -37 dBm  802.11 Block Ack, Flags=........C
 1306 2023-06-12 17:37:03.168543 0.000147 Google_72:8a:66   IPv6mcast_ff…    LLC      186    5 -38 dBm  I P, N(R)=5, N(S)=45; DSAP 0xc0 Individual, SSAP 0x4a Response
 1307 2023-06-12 17:37:03.177442 0.008899 192.168.1.15      192.168.1.121    802.11    82    5 -55 dBm  Request-to-send, Flags=........C
 1308 2023-06-12 17:37:03.177442 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -46 dBm  Clear-to-send, Flags=........C
 1309 2023-06-12 17:37:03.177515 0.000073 Google_72:8a:66   IPv6mcast_16     LLC      271    5 -56 dBm  I, N(R)=7, N(S)=34; DSAP 0xb6 Group, SSAP 0xe6 Response
```

```
> Frame 1255: 262 bytes on wire (2096 bits), 262 bytes captured (2096 bits) on interface \Device\NPF_{D4578905-2998-4AS
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (4 bytes)
  v Tagged parameters (168 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Extended Supported Rates SAE Hash to Element Only, [Mbit/sec]
    > Tag: Power Capability Min: -7, Max: 19
    > Tag: Supported Channels
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
      > RSN Capabilities: 0x00c0
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Supported Operating Classes
    > Tag: Extended Capabilities (10 octets)
    > Ext Tag: HE Capabilities
    v Tag: RSN eXtension (1 octet)
        Tag Number: RSN eXtension (244)
        Tag length: 1
      v RSNX: 0x20 (octet 1)
          .... 0000 = RSNX Length: 0
          ...0 .... = Protected TWT Operations Support: 0
          ..1. .... = SAE Hash to element: 1
          00.. .... = Reserved: 0x0
    > Ext Tag: HE 6 GHz Band Capabilities
    > Tag: Vendor Specific: Broadcom
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
```

Detalhes do cliente no WLC:



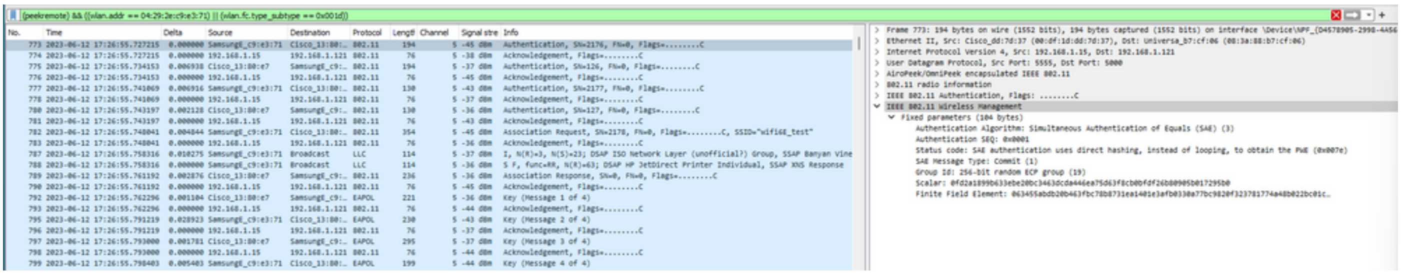
Selected 0 out of 12 Clients

☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
☐	2495.2f72.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP6849.9253.CA50
☐	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80C
☐	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
☐	a810.87bb.b833	192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548
☐	9669.5a28.a115	192.168.1.138	fe80::9469:5aff:fe28:a115	AP02_Suite_1084
☐	84d8.1b0f.294f	192.168.1.91	N/A	AP03_Sotao_9548
☐	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548
☐	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC8
☐	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_2200
☐	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548

Client State Servers	None
Client ACLs	None
Client Entry Create Time	83 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400
Session Manager	
Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FB5B0AED363
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE
Local Policies	

Samsung S23

OTA de conexão com foco nas informações de RSN do cliente:

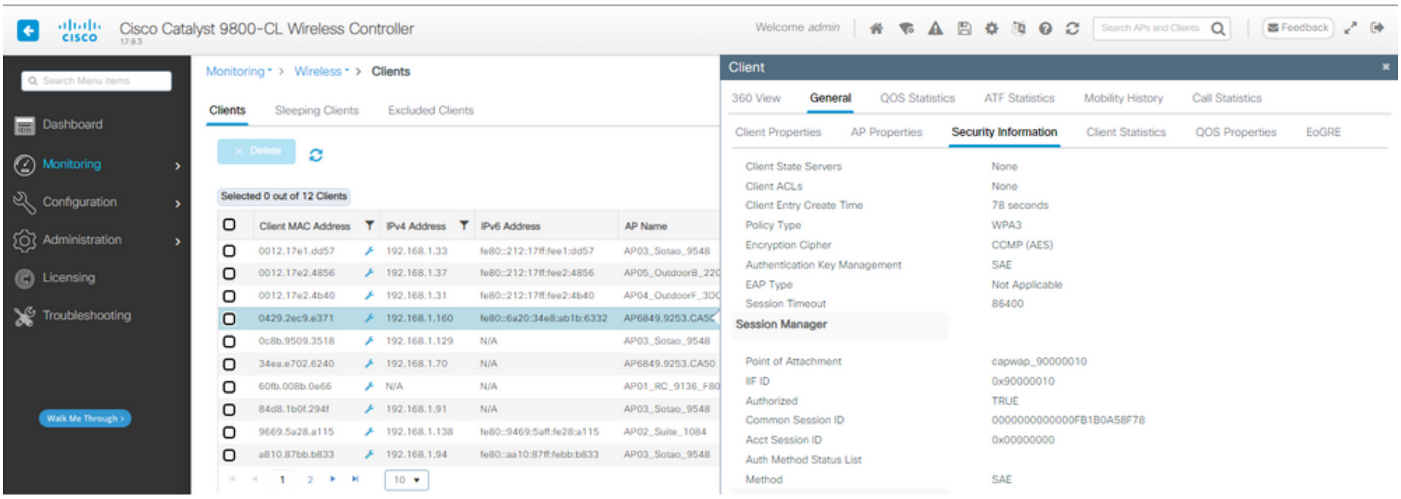


```
(peekremote) && ((wlan.addr == 04:29:2e:c9:e3:71) || (wlan.fc.type_subtype == 0x001d))
```

```
No.  Time                        Delta    Source            Destination      Protocol Length Channel Signal stre Info
 773 2023-06-12 17:26:55.727215 0.000000 SamsungE_c9:e3:71 Cisco_13:80:…    802.11   194    5 -45 dBm  Authentication, SN=2176, FN=0, Flags=........C
 774 2023-06-12 17:26:55.727215 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -38 dBm  Acknowledgement, Flags=........C
 775 2023-06-12 17:26:55.734153 0.006938 Cisco_13:80:e7    SamsungE_c9:…    802.11   194    5 -37 dBm  Authentication, SN=126, FN=0, Flags=........C
 776 2023-06-12 17:26:55.734153 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -45 dBm  Acknowledgement, Flags=........C
 777 2023-06-12 17:26:55.741069 0.006916 SamsungE_c9:e3:71 Cisco_13:80:…    802.11   130    5 -43 dBm  Authentication, SN=2177, FN=0, Flags=........C
 778 2023-06-12 17:26:55.741069 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 780 2023-06-12 17:26:55.743197 0.002128 Cisco_13:80:e7    SamsungE_c9:…    802.11   130    5 -36 dBm  Authentication, SN=127, FN=0, Flags=........C
 781 2023-06-12 17:26:55.743197 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -43 dBm  Acknowledgement, Flags=........C
 782 2023-06-12 17:26:55.748041 0.004844 SamsungE_c9:e3:71 Cisco_13:80:…    802.11   354    5 -45 dBm  Association Request, SN=2178, FN=0, Flags=........C, SSID="wifi6E_test"
 783 2023-06-12 17:26:55.748041 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -36 dBm  Acknowledgement, Flags=........C
 787 2023-06-12 17:26:55.758316 0.010275 SamsungE_c9:e3:71 Broadcast        LLC      114    5 -37 dBm  I, N(R)=3, N(S)=23; DSAP ISO Network Layer (unofficial?) Group, SSAP Banyan Vine
 788 2023-06-12 17:26:55.758316 0.000000 SamsungE_c9:e3:71 Broadcast        LLC      114    5 -36 dBm  S F, func=RR, N(R)=63; DSAP HP JetDirect Printer Individual, SSAP XNS Response
 789 2023-06-12 17:26:55.761192 0.002876 Cisco_13:80:e7    SamsungE_c9:…    802.11   236    5 -36 dBm  Association Response, SN=0, FN=0, Flags=........C
 790 2023-06-12 17:26:55.761192 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -45 dBm  Acknowledgement, Flags=........C
 792 2023-06-12 17:26:55.762296 0.001104 Cisco_13:80:e7    SamsungE_c9:…    EAPOL    221    5 -36 dBm  Key (Message 1 of 4)
 793 2023-06-12 17:26:55.762296 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -44 dBm  Acknowledgement, Flags=........C
 795 2023-06-12 17:26:55.791219 0.028923 SamsungE_c9:e3:71 Cisco_13:80:…    EAPOL    230    5 -43 dBm  Key (Message 2 of 4)
 796 2023-06-12 17:26:55.791219 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -37 dBm  Acknowledgement, Flags=........C
 797 2023-06-12 17:26:55.793000 0.001781 Cisco_13:80:e7    SamsungE_c9:…    EAPOL    295    5 -37 dBm  Key (Message 3 of 4)
 798 2023-06-12 17:26:55.793000 0.000000 192.168.1.15      192.168.1.121    802.11    76    5 -44 dBm  Acknowledgement, Flags=........C
 799 2023-06-12 17:26:55.798403 0.005403 SamsungE_c9:e3:71 Cisco_13:80:…    EAPOL    199    5 -44 dBm  Key (Message 4 of 4)
```

```
> Frame 773: 194 bytes on wire (1552 bits), 194 bytes captured (1552 bits) on interface \Device\NPF_{D4578905-2998-4A56
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Authentication, Flags: ........C
v IEEE 802.11 Wireless Management
  v Fixed parameters (104 bytes)
      Authentication Algorithm: Simultaneous Authentication of Equals (SAE) (3)
      Authentication SEQ: 0x0001
      Status code: SAE authentication uses direct hashing, instead of looping, to obtain the PWE (0x007e)
      SAE Message Type: Commit (1)
      Group Id: 256-bit random ECP group (19)
      Scalar: 0fd2a1899b633ebe20bc3463dcda446ea75d63f8cb0bfdf26b80905b017295b0
      Finite Field Element: 063455abdb20b463fbc78b8731ea1401e3afb0330a77bc9820f323781774a48b022bc01c…
```

Detalhes do cliente no WLC:



□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548
□	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_220
□	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC
□	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP6849.9253.CA5C
□	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80
□	84d8.1b0f.294f	192.168.1.91	N/A	AP03_Sotao_9548
□	9669.5a28.a115	192.168.1.138	fe80::9469:5aff:fe28:a115	AP02_Suite_1084
□	a810.87bb.b833	192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548

1 2 10

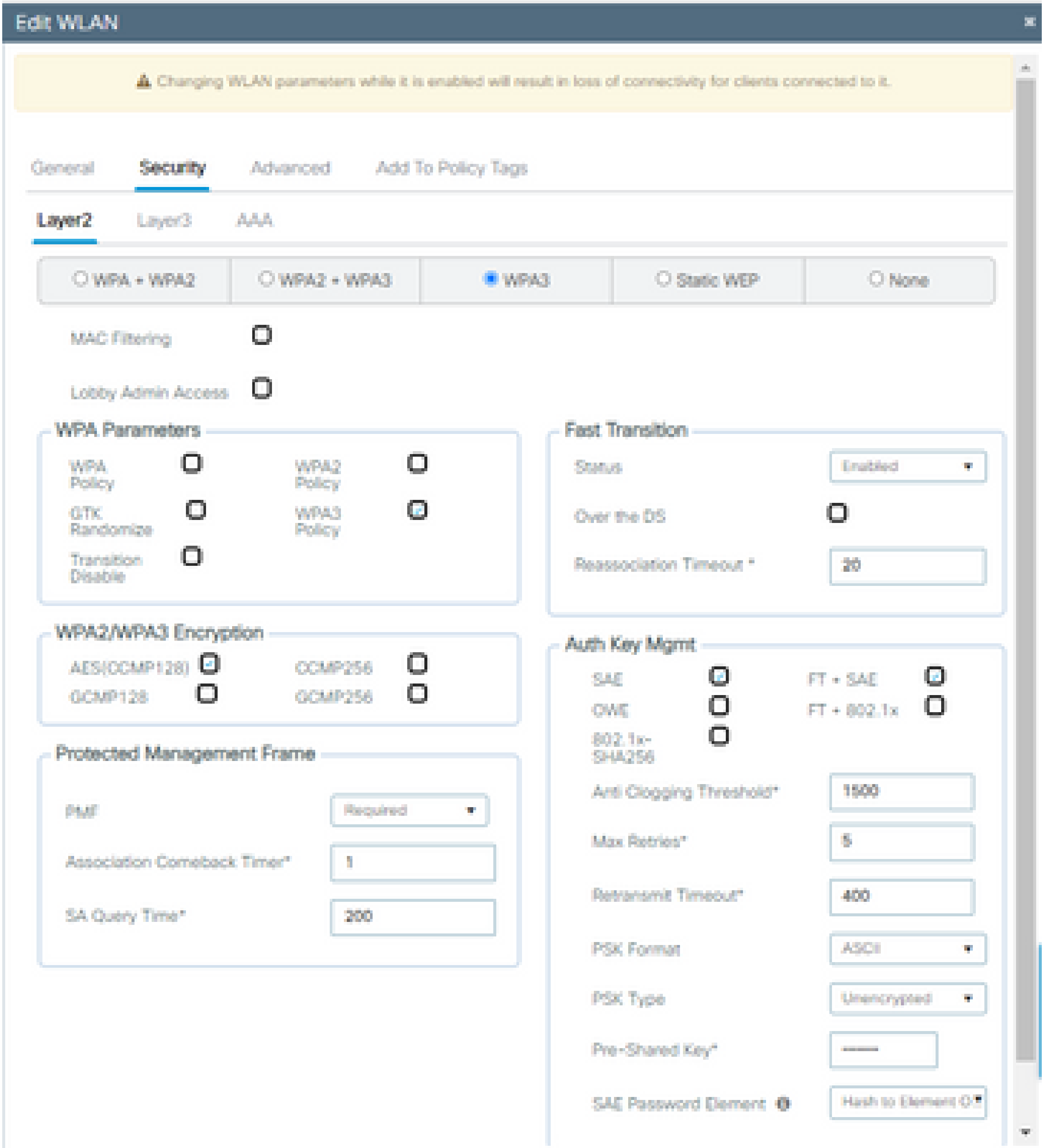
Client State Servers	None
Client ACLs	None
Client Entry Create Time	78 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400

Session Manager

Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FB1B0A58F78
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE

WPA3-Personal - AES(CCMP128) + SAE + FT

Configuração de segurança da WLAN:



Edit WLAN

⚠ Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

General | **Security** | Advanced | Add To Policy Tags

Layer2 | Layer3 | AAA

○ WPA + WPA2 | ○ WPA2 + WPA3 | ● WPA3 | ○ Static WEP | ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

WPA Policy □ | WPA2 Policy □
GTK Randomize □ | WPA3 Policy ☑
Transition Disable □

WPA2/WPA3 Encryption

AES(CCMP128) ☑ | CCMP256 □
GCMP128 □ | GCMP256 □

Protected Management Frame

PMF: Required

Association Comeback Timer*: 1

SA Query Time*: 200

Fast Transition

Status: Enabled

Over the DS □

Reassociation Timeout *: 20

Auth Key Mgmt

SAE ☑ | FT + SAE ☑
OWE □ | FT + 802.1x □
802.1x-SHA256 □

Anti Clogging Threshold*: 1500

Max Retries*: 5

Retransmit Timeout*: 400

PSK Format: ASCII

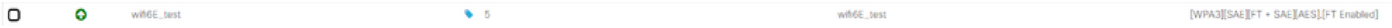
PSK Type: Unencrypted

Pre-Shared Key*: ••••••••

SAE Password Element: Hash to Element O

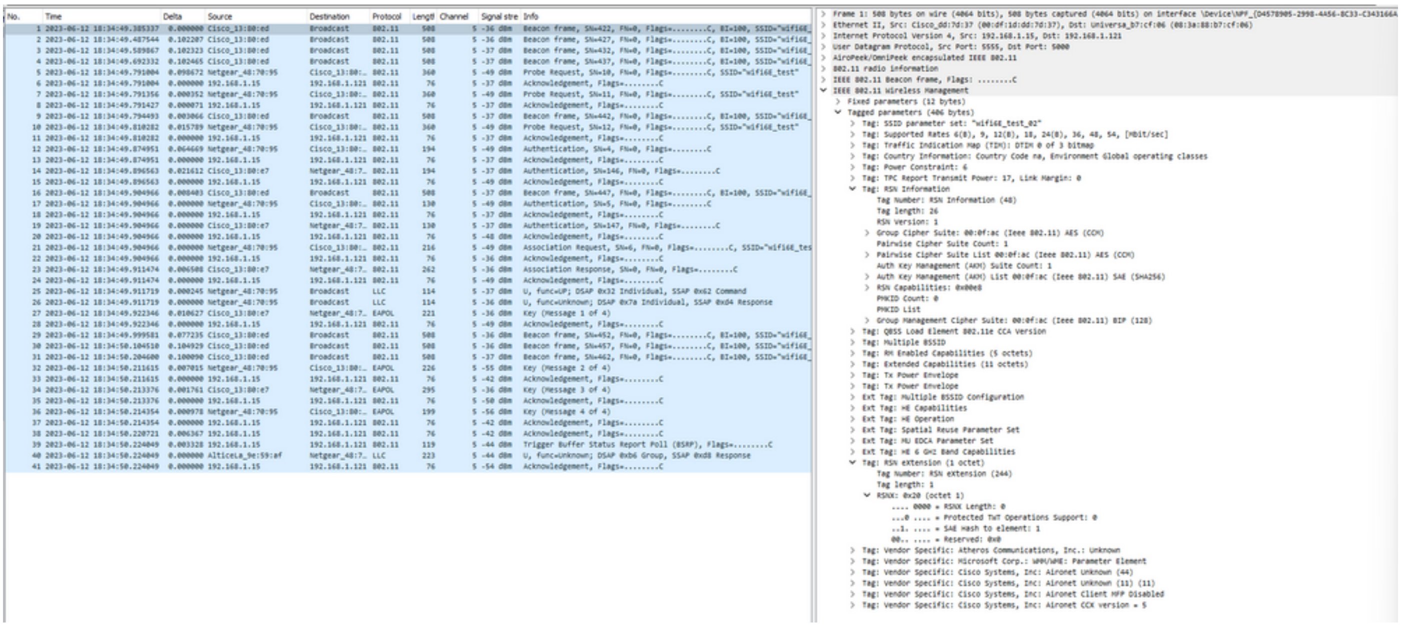
Cuidado: no Gerenciamento de chave de autenticação, a WLC permite selecionar FT+SAE sem SAE habilitado, no entanto, foi observado que os clientes não conseguiram se conectar. Sempre ative as duas caixas de seleção SAE e FT+SAE se desejar usar SAE com a transição rápida.

Visualizar na GUI da WLC as configurações de segurança da WLAN:



□	●	wifi6E_test	5	wifi6E_test	[WPA3][SAE][FT + SAE][AES],[FT Enabled]

Verificação das balizas OTA:



```
No.  Time                          Delta    Source             Destination     Protocol Lengtl Channel Signal stre Info
   1 2023-06-12 18:34:49.385337 0.000000 Cisco_13:80:ed     Broadcast       802.11   508    5 -36 dBm   Beacon frame, SN=422, FN=0, Flags=........C, BI=100, SSID="wifi6E_
   2 2023-06-12 18:34:49.487544 0.102207 Cisco_13:80:ed     Broadcast       802.11   508    5 -36 dBm   Beacon frame, SN=427, FN=0, Flags=........C, BI=100, SSID="wifi6E_
   3 2023-06-12 18:34:49.589867 0.102323 Cisco_13:80:ed     Broadcast       802.11   508    5 -37 dBm   Beacon frame, SN=432, FN=0, Flags=........C, BI=100, SSID="wifi6E_
   4 2023-06-12 18:34:49.692332 0.102465 Cisco_13:80:ed     Broadcast       802.11   508    5 -37 dBm   Beacon frame, SN=437, FN=0, Flags=........C, BI=100, SSID="wifi6E_
   5 2023-06-12 18:34:49.791004 0.098672 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -49 dBm   Probe Request, SN=10, FN=0, Flags=........C, SSID="wifi6E_test"
   6 2023-06-12 18:34:49.791004 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
   7 2023-06-12 18:34:49.791356 0.000352 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -49 dBm   Probe Request, SN=11, FN=0, Flags=........C, SSID="wifi6E_test"
   8 2023-06-12 18:34:49.791427 0.000071 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
   9 2023-06-12 18:34:49.794493 0.003066 Cisco_13:80:ed     Broadcast       802.11   508    5 -37 dBm   Beacon frame, SN=442, FN=0, Flags=........C, BI=100, SSID="wifi6E_
  10 2023-06-12 18:34:49.810282 0.015789 Netgear_48:70:95   Cisco_13:80:…   802.11   360    5 -49 dBm   Probe Request, SN=12, FN=0, Flags=........C, SSID="wifi6E_test"
  11 2023-06-12 18:34:49.810282 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
  12 2023-06-12 18:34:49.874951 0.064669 Netgear_48:70:95   Cisco_13:80:…   802.11   194    5 -49 dBm   Authentication, SN=4, FN=0, Flags=........C
  13 2023-06-12 18:34:49.874951 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
  14 2023-06-12 18:34:49.896563 0.021612 Cisco_13:80:e7     Netgear_48:7…   802.11   194    5 -37 dBm   Authentication, SN=146, FN=0, Flags=........C
  15 2023-06-12 18:34:49.896563 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -49 dBm   Acknowledgement, Flags=........C
  16 2023-06-12 18:34:49.904966 0.008403 Cisco_13:80:ed     Broadcast       802.11   508    5 -37 dBm   Beacon frame, SN=447, FN=0, Flags=........C, BI=100, SSID="wifi6E_
  17 2023-06-12 18:34:49.904966 0.000000 Netgear_48:70:95   Cisco_13:80:…   802.11   130    5 -49 dBm   Authentication, SN=5, FN=0, Flags=........C
  18 2023-06-12 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
  19 2023-06-12 18:34:49.904966 0.000000 Cisco_13:80:e7     Netgear_48:7…   802.11   130    5 -37 dBm   Authentication, SN=147, FN=0, Flags=........C
  20 2023-06-12 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -48 dBm   Acknowledgement, Flags=........C
  21 2023-06-12 18:34:49.904966 0.000000 Netgear_48:70:95   Cisco_13:80:…   802.11   216    5 -49 dBm   Association Request, SN=6, FN=0, Flags=........C, SSID="wifi6E_tes
  22 2023-06-12 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
  23 2023-06-12 18:34:49.911474 0.006508 Cisco_13:80:e7     Netgear_48:7…   802.11   262    5 -36 dBm   Association Response, SN=0, FN=0, Flags=........C
  24 2023-06-12 18:34:49.911474 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -49 dBm   Acknowledgement, Flags=........C
  25 2023-06-12 18:34:49.911719 0.000245 Netgear_48:70:95   Broadcast       LLC      114    5 -37 dBm   U, func=UP; DSAP 0x32 Individual, SSAP 0x62 Command
  26 2023-06-12 18:34:49.911719 0.000000 Netgear_48:70:95   Broadcast       LLC      114    5 -36 dBm   U, func=Unknown; DSAP 0x7a Individual, SSAP 0xd4 Response
  27 2023-06-12 18:34:49.922346 0.010627 Cisco_13:80:e7     Netgear_48:7…   EAPOL    221    5 -36 dBm   Key (Message 1 of 4)
  28 2023-06-12 18:34:49.922346 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -49 dBm   Acknowledgement, Flags=........C
  29 2023-06-12 18:34:49.999581 0.077235 Cisco_13:80:ed     Broadcast       802.11   508    5 -36 dBm   Beacon frame, SN=452, FN=0, Flags=........C, BI=100, SSID="wifi6E_
  30 2023-06-12 18:34:50.104510 0.104929 Cisco_13:80:ed     Broadcast       802.11   508    5 -36 dBm   Beacon frame, SN=457, FN=0, Flags=........C, BI=100, SSID="wifi6E_
  31 2023-06-12 18:34:50.204600 0.100090 Cisco_13:80:ed     Broadcast       802.11   508    5 -37 dBm   Beacon frame, SN=462, FN=0, Flags=........C, BI=100, SSID="wifi6E_
  32 2023-06-12 18:34:50.211615 0.007015 Netgear_48:70:95   Cisco_13:80:…   EAPOL    226    5 -55 dBm   Key (Message 2 of 4)
  33 2023-06-12 18:34:50.211615 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -42 dBm   Acknowledgement, Flags=........C
  34 2023-06-12 18:34:50.213376 0.001761 Cisco_13:80:e7     Netgear_48:7…   EAPOL    295    5 -36 dBm   Key (Message 3 of 4)
  35 2023-06-12 18:34:50.213376 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -50 dBm   Acknowledgement, Flags=........C
  36 2023-06-12 18:34:50.214354 0.000978 Netgear_48:70:95   Cisco_13:80:…   EAPOL    199    5 -56 dBm   Key (Message 4 of 4)
  37 2023-06-12 18:34:50.214354 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -42 dBm   Acknowledgement, Flags=........C
  38 2023-06-12 18:34:50.220721 0.006367 192.168.1.15       192.168.1.121   802.11    76    5 -42 dBm   Acknowledgement, Flags=........C
  39 2023-06-12 18:34:50.224049 0.003328 192.168.1.15       192.168.1.121   802.11   119    5 -44 dBm   Trigger Buffer Status Report Poll (BSRP), Flags=........C
  40 2023-06-12 18:34:50.224049 0.000000 AlticeLa_9e:59:af  Netgear_48:7…   LLC      223    5 -44 dBm   U, func=Unknown; DSAP 0xb6 Group, SSAP 0xd8 Response
  41 2023-06-12 18:34:50.224049 0.000000 192.168.1.15       192.168.1.121   802.11    76    5 -54 dBm   Acknowledgement, Flags=........C
```

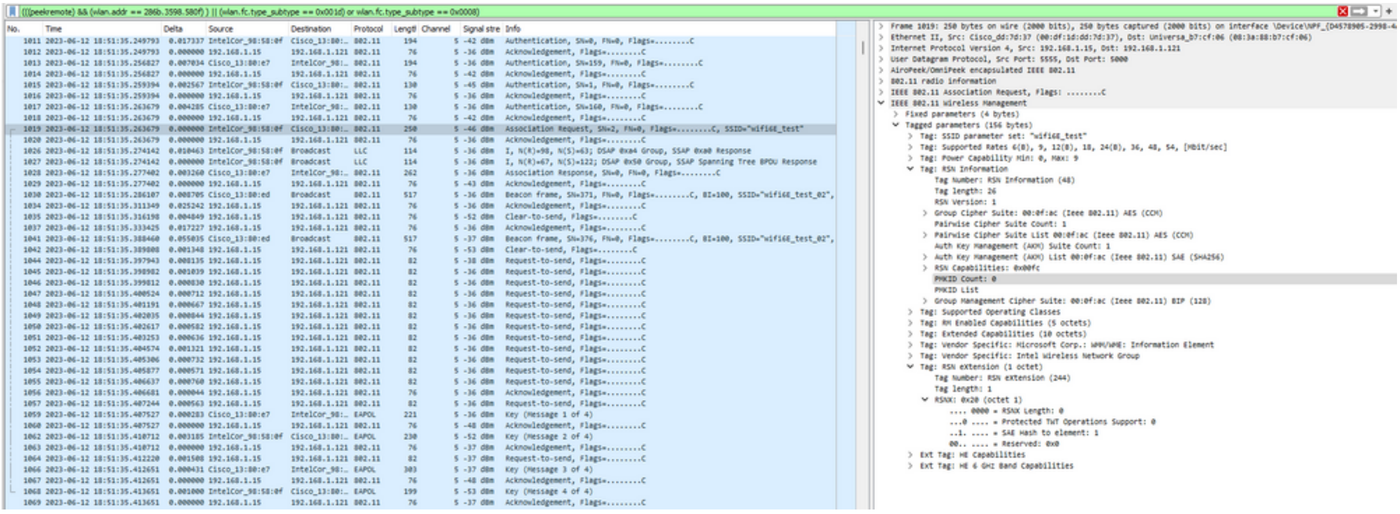
```
> Frame 1: 508 bytes on wire (4064 bits), 508 bytes captured (4064 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (12 bytes)
  v Tagged parameters (406 bytes)
    > Tag: SSID parameter set: "wifi6E_test_02"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Traffic Indication Map (TIM): DTIM 0 of 3 bitmap
    > Tag: Country Information: Country Code na, Environment Global operating classes
    > Tag: Power Constraint: 6
    > Tag: TPC Report Transmit Power: 17, Link Margin: 0
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
      > RSN Capabilities: 0x00e8
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: QBSS Load Element 802.11e CCA Version
    > Tag: Multiple BSSID
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (11 octets)
    > Tag: Tx Power Envelope
    > Tag: Tx Power Envelope
    > Ext Tag: Multiple BSSID Configuration
    > Ext Tag: HE Capabilities
    > Ext Tag: HE Operation
    > Ext Tag: Spatial Reuse Parameter Set
    > Ext Tag: MU EDCA Parameter Set
    > Ext Tag: HE 6 GHz Band Capabilities
    v Tag: RSN eXtension (1 octet)
        Tag Number: RSN eXtension (244)
        Tag length: 1
      v RSNX: 0x20 (octet 1)
          .... 0000 = RSNX Length: 0
          ...0 .... = Protected TWT Operations Support: 0
          ..1. .... = SAE Hash to element: 1
          00.. .... = Reserved: 0x0
    > Tag: Vendor Specific: Atheros Communications, Inc.: Unknown
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Parameter Element
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (44)
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (11) (11)
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Client MFP Disabled
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet CCX version = 5
```

Beacons WPA3 SAE + FT

Aqui podemos observar os clientes Wi-Fi 6E associando:

AX211 Intel

OTA de conexão com foco nas informações de RSN do cliente:

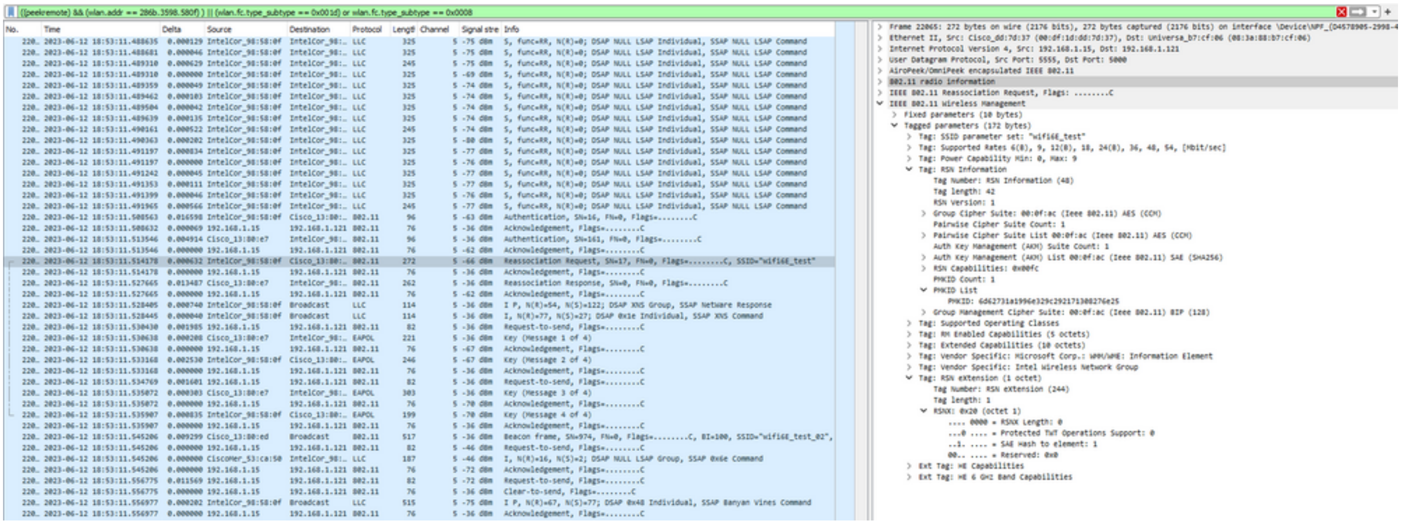


```
(((peekremote) && (wlan.addr == 286b.3598.580f) ) || (wlan.fc.type_subtype == 0x001d) or wlan.fc.type_subtype == 0x0008)
```

```
No.   Time                          Delta    Source              Destination     Protocol Lengtl Channel Signal stre Info
 1011 2023-06-12 18:51:35.249793 0.017337 IntelCor_98:58:0f   Cisco_13:80:…   802.11   194    5 -42 dBm   Authentication, SN=0, FN=0, Flags=........C
 1012 2023-06-12 18:51:35.249793 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1013 2023-06-12 18:51:35.256827 0.007034 Cisco_13:80:e7      IntelCor_98:…   802.11   194    5 -36 dBm   Authentication, SN=159, FN=0, Flags=........C
 1014 2023-06-12 18:51:35.256827 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -42 dBm   Acknowledgement, Flags=........C
 1015 2023-06-12 18:51:35.259394 0.002567 IntelCor_98:58:0f   Cisco_13:80:…   802.11   130    5 -45 dBm   Authentication, SN=1, FN=0, Flags=........C
 1016 2023-06-12 18:51:35.259394 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1017 2023-06-12 18:51:35.263679 0.004285 Cisco_13:80:e7      IntelCor_98:…   802.11   130    5 -36 dBm   Authentication, SN=160, FN=0, Flags=........C
 1018 2023-06-12 18:51:35.263679 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -42 dBm   Acknowledgement, Flags=........C
 1019 2023-06-12 18:51:35.263679 0.000000 IntelCor_98:58:0f   Cisco_13:80:…   802.11   250    5 -46 dBm   Association Request, SN=2, FN=0, Flags=........C, SSID="wifi6E_test"
 1020 2023-06-12 18:51:35.263679 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1026 2023-06-12 18:51:35.274142 0.010463 IntelCor_98:58:0f   Broadcast       LLC      114    5 -36 dBm   I, N(R)=98, N(S)=63; DSAP 0xa4 Group, SSAP 0xa0 Response
 1027 2023-06-12 18:51:35.274142 0.000000 IntelCor_98:58:0f   Broadcast       LLC      114    5 -36 dBm   I, N(R)=67, N(S)=122; DSAP 0x50 Group, SSAP Spanning Tree BPDU Response
 1028 2023-06-12 18:51:35.277402 0.003260 Cisco_13:80:e7      IntelCor_98:…   802.11   262    5 -36 dBm   Association Response, SN=0, FN=0, Flags=........C
 1029 2023-06-12 18:51:35.277402 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -43 dBm   Acknowledgement, Flags=........C
 1030 2023-06-12 18:51:35.286107 0.008705 Cisco_13:80:ed      Broadcast       802.11   517    5 -36 dBm   Beacon frame, SN=371, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02",
 1034 2023-06-12 18:51:35.311349 0.025242 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1035 2023-06-12 18:51:35.316198 0.004849 192.168.1.15        192.168.1.121   802.11    76    5 -52 dBm   Clear-to-send, Flags=........C
 1037 2023-06-12 18:51:35.333425 0.017227 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1041 2023-06-12 18:51:35.388460 0.055035 Cisco_13:80:ed      Broadcast       802.11   517    5 -37 dBm   Beacon frame, SN=376, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02",
 1042 2023-06-12 18:51:35.389808 0.001348 192.168.1.15        192.168.1.121   802.11    76    5 -53 dBm   Clear-to-send, Flags=........C
 1044 2023-06-12 18:51:35.397943 0.008135 192.168.1.15        192.168.1.121   802.11    82    5 -38 dBm   Request-to-send, Flags=........C
 1045 2023-06-12 18:51:35.398982 0.001039 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1046 2023-06-12 18:51:35.399812 0.000830 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1047 2023-06-12 18:51:35.400524 0.000712 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1048 2023-06-12 18:51:35.401191 0.000667 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1049 2023-06-12 18:51:35.402035 0.000844 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1050 2023-06-12 18:51:35.402617 0.000582 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1051 2023-06-12 18:51:35.403253 0.000636 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1052 2023-06-12 18:51:35.404574 0.001321 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1053 2023-06-12 18:51:35.405306 0.000732 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1054 2023-06-12 18:51:35.405877 0.000571 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1055 2023-06-12 18:51:35.406637 0.000760 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1056 2023-06-12 18:51:35.406681 0.000044 192.168.1.15        192.168.1.121   802.11    76    5 -36 dBm   Acknowledgement, Flags=........C
 1057 2023-06-12 18:51:35.407244 0.000563 192.168.1.15        192.168.1.121   802.11    82    5 -36 dBm   Request-to-send, Flags=........C
 1059 2023-06-12 18:51:35.407527 0.000283 Cisco_13:80:e7      IntelCor_98:…   EAPOL    221    5 -36 dBm   Key (Message 1 of 4)
 1060 2023-06-12 18:51:35.407527 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -48 dBm   Acknowledgement, Flags=........C
 1062 2023-06-12 18:51:35.410712 0.003185 IntelCor_98:58:0f   Cisco_13:80:…   EAPOL    230    5 -52 dBm   Key (Message 2 of 4)
 1063 2023-06-12 18:51:35.410712 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
 1064 2023-06-12 18:51:35.412220 0.001508 192.168.1.15        192.168.1.121   802.11    82    5 -37 dBm   Request-to-send, Flags=........C
 1066 2023-06-12 18:51:35.412651 0.000431 Cisco_13:80:e7      IntelCor_98:…   EAPOL    303    5 -37 dBm   Key (Message 3 of 4)
 1067 2023-06-12 18:51:35.412651 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -48 dBm   Acknowledgement, Flags=........C
 1068 2023-06-12 18:51:35.413651 0.001000 IntelCor_98:58:0f   Cisco_13:80:…   EAPOL    199    5 -53 dBm   Key (Message 4 of 4)
 1069 2023-06-12 18:51:35.413651 0.000000 192.168.1.15        192.168.1.121   802.11    76    5 -37 dBm   Acknowledgement, Flags=........C
```

```
> Frame 1019: 250 bytes on wire (2000 bits), 250 bytes captured (2000 bits) on interface \Device\NPF_{D4578905-2998-4
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (4 bytes)
  v Tagged parameters (156 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 0, Max: 9
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
      > RSN Capabilities: 0x00fc
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: Supported Operating Classes
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    > Tag: Vendor Specific: Intel Wireless Network Group
    v Tag: RSN eXtension (1 octet)
        Tag Number: RSN eXtension (244)
        Tag length: 1
      v RSNX: 0x20 (octet 1)
          .... 0000 = RSNX Length: 0
          ...0 .... = Protected TWT Operations Support: 0
          ..1. .... = SAE Hash to element: 1
          00.. .... = Reserved: 0x0
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
```

Evento de roaming no qual você pode ver o PMKID:

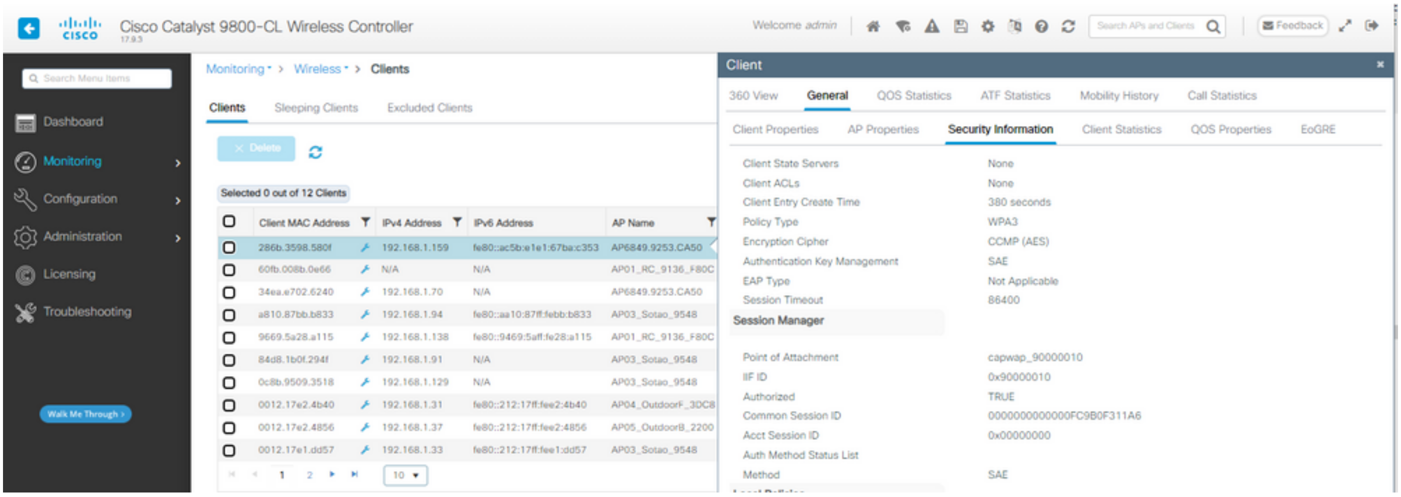


```
((peekremote) && (wlan.addr == 286b.3598.580f) ) || (wlan.fc.type_subtype == 0x001d) or wlan.fc.type_subtype == 0x0008

No.   Time                        Delta    Source                 Destination      Protocol Length Channel Signal stre Info
220.. 2023-06-12 18:53:11.488635 0.000129 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -75 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.488681 0.000046 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -75 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489310 0.000629 IntelCor_98:58:0f      IntelCor_98:..   LLC      245     5 -75 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489310 0.000000 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -69 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489359 0.000049 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -74 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489462 0.000103 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -74 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489504 0.000042 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -74 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.489639 0.000135 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -74 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.490161 0.000522 IntelCor_98:58:0f      IntelCor_98:..   LLC      245     5 -74 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.490363 0.000202 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -80 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491197 0.000834 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -77 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491197 0.000000 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -76 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491242 0.000045 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -77 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491353 0.000111 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -77 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491399 0.000046 IntelCor_98:58:0f      IntelCor_98:..   LLC      325     5 -76 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.491965 0.000566 IntelCor_98:58:0f      IntelCor_98:..   LLC      245     5 -77 dBm  S, func=RR, N(R)=0; DSAP NULL LSAP Individual, SSAP NULL LSAP Command
220.. 2023-06-12 18:53:11.508563 0.016598 IntelCor_98:58:0f      Cisco_13:80:..   802.11    96     5 -63 dBm  Authentication, SN=16, FN=0, Flags=........C
220.. 2023-06-12 18:53:11.508632 0.000069 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.513546 0.004914 Cisco_13:80:e7         IntelCor_98:..   802.11    96     5 -36 dBm  Authentication, SN=161, FN=0, Flags=........C
220.. 2023-06-12 18:53:11.513546 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -62 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.514178 0.000632 IntelCor_98:58:0f      Cisco_13:80:..   802.11   272     5 -66 dBm  Reassociation Request, SN=17, FN=0, Flags=........C, SSID="wifi6E_test"
220.. 2023-06-12 18:53:11.514178 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.527665 0.013487 Cisco_13:80:e7         IntelCor_98:..   802.11   262     5 -36 dBm  Reassociation Response, SN=0, FN=0, Flags=........C
220.. 2023-06-12 18:53:11.527665 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -62 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.528405 0.000740 IntelCor_98:58:0f      Broadcast        LLC      114     5 -36 dBm  I P, N(R)=54, N(S)=122; DSAP XNS Group, SSAP NetWare Response
220.. 2023-06-12 18:53:11.528445 0.000040 IntelCor_98:58:0f      Broadcast        LLC      114     5 -36 dBm  I, N(R)=77, N(S)=27; DSAP 0x1e Individual, SSAP XNS Command
220.. 2023-06-12 18:53:11.530430 0.001985 192.168.1.15           192.168.1.121    802.11    82     5 -36 dBm  Request-to-send, Flags=........C
220.. 2023-06-12 18:53:11.530638 0.000208 Cisco_13:80:e7         IntelCor_98:..   EAPOL    221     5 -36 dBm  Key (Message 1 of 4)
220.. 2023-06-12 18:53:11.530638 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -67 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.533168 0.002530 IntelCor_98:58:0f      Cisco_13:80:..   EAPOL    246     5 -67 dBm  Key (Message 2 of 4)
220.. 2023-06-12 18:53:11.533168 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.534769 0.001601 192.168.1.15           192.168.1.121    802.11    82     5 -36 dBm  Request-to-send, Flags=........C
220.. 2023-06-12 18:53:11.535072 0.000303 Cisco_13:80:e7         IntelCor_98:..   EAPOL    303     5 -36 dBm  Key (Message 3 of 4)
220.. 2023-06-12 18:53:11.535072 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -70 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.535907 0.000835 IntelCor_98:58:0f      Cisco_13:80:..   EAPOL    199     5 -70 dBm  Key (Message 4 of 4)
220.. 2023-06-12 18:53:11.535907 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.545206 0.009299 Cisco_13:80:ed         Broadcast        802.11   517     5 -36 dBm  Beacon frame, SN=974, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02",
220.. 2023-06-12 18:53:11.545206 0.000000 192.168.1.15           192.168.1.121    802.11    82     5 -46 dBm  Request-to-send, Flags=........C
220.. 2023-06-12 18:53:11.545206 0.000000 CiscoMer_53:ca:50      IntelCor_98:..   LLC      187     5 -46 dBm  I, N(R)=16, N(S)=2; DSAP NULL LSAP Group, SSAP 0x6e Command
220.. 2023-06-12 18:53:11.545206 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -72 dBm  Acknowledgement, Flags=........C
220.. 2023-06-12 18:53:11.556775 0.011569 192.168.1.15           192.168.1.121    802.11    82     5 -72 dBm  Request-to-send, Flags=........C
220.. 2023-06-12 18:53:11.556775 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Clear-to-send, Flags=........C
220.. 2023-06-12 18:53:11.556977 0.000202 IntelCor_98:58:0f      Broadcast        LLC      515     5 -75 dBm  I P, N(R)=67, N(S)=77; DSAP 0x48 Individual, SSAP Banyan Vines Command
220.. 2023-06-12 18:53:11.556977 0.000000 192.168.1.15           192.168.1.121    802.11    76     5 -36 dBm  Acknowledgement, Flags=........C
```

```
> Frame 22065: 272 bytes on wire (2176 bits), 272 bytes captured (2176 bits) on interface \Device\NPF_{D4578905-2998-4
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Reassociation Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (10 bytes)
  v Tagged parameters (172 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 0, Max: 9
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 42
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
      > RSN Capabilities: 0x00fc
        PMKID Count: 1
      v PMKID List
          PMKID: 6d62731a1996e329c292171308276e25
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: Supported Operating Classes
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    > Tag: Vendor Specific: Intel Wireless Network Group
    v Tag: RSN eXtension (1 octet)
        Tag Number: RSN eXtension (244)
        Tag length: 1
      v RSNX: 0x20 (octet 1)
          .... 0000 = RSNX Length: 0
          ...0 .... = Protected TWT Operations Support: 0
          ..1. .... = SAE Hash to element: 1
          00.. .... = Reserved: 0x0
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
```

Solicitação de reassociação WPA3 SAE + FT

Detalhes do cliente no WLC:



Selected 0 out of 12 Clients

	Client MAC Address		IPv4 Address	IPv6 Address	AP Name
□	286b.3598.580f		192.168.1.159	fe80::ac5b:e1e1:67ba:c353	AP6849.9253.CA50
□	60fb.008b.0e66		N/A	N/A	AP01_RC_9136_F80C
□	34ea.e702.6240		192.168.1.70	N/A	AP6849.9253.CA50
□	a810.87bb.b833		192.168.1.94	fe80::aa10:87ff:febb:b833	AP03_Sotao_9548
□	9669.5a28.a115		192.168.1.138	fe80::9469:5aff:fe28:a115	AP01_RC_9136_F80C
□	84d8.1b0f.294f		192.168.1.91	N/A	AP03_Sotao_9548
□	0c8b.9509.3518		192.168.1.129	N/A	AP03_Sotao_9548
□	0012.17e2.4b40		192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC8
□	0012.17e2.4856		192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_2200
□	0012.17e1.dd57		192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548

1 2 10

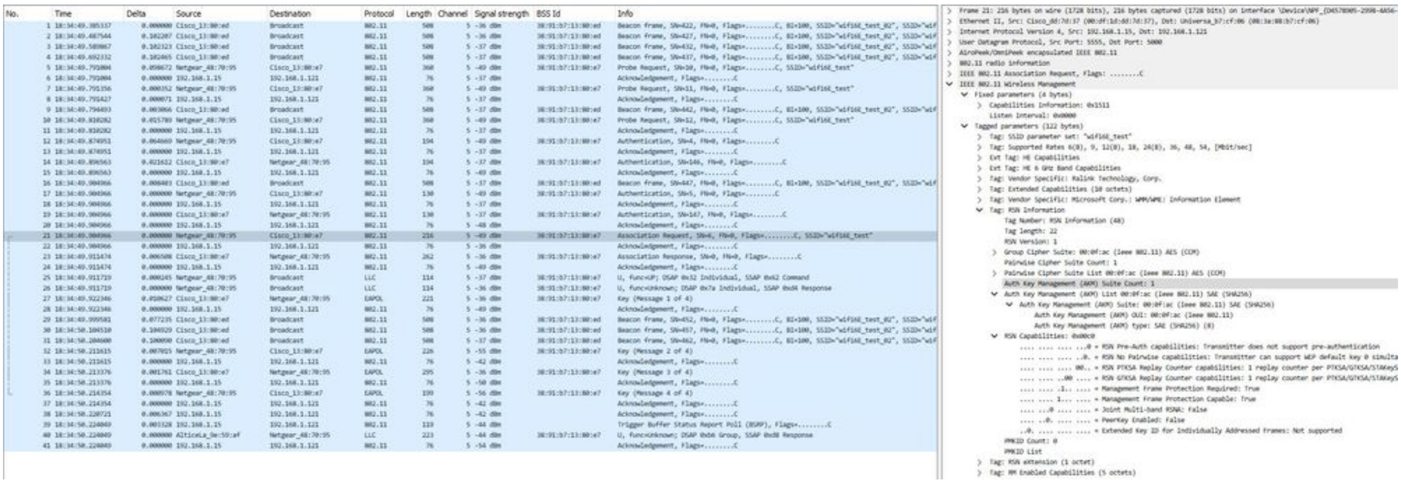
Client State Servers	None
Client ACLs	None
Client Entry Create Time	380 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400

Session Manager

Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FC9B0F311A6
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE

NetGear A8000

OTA de conexão com foco nas informações de RSN do cliente. Conexão inicial:

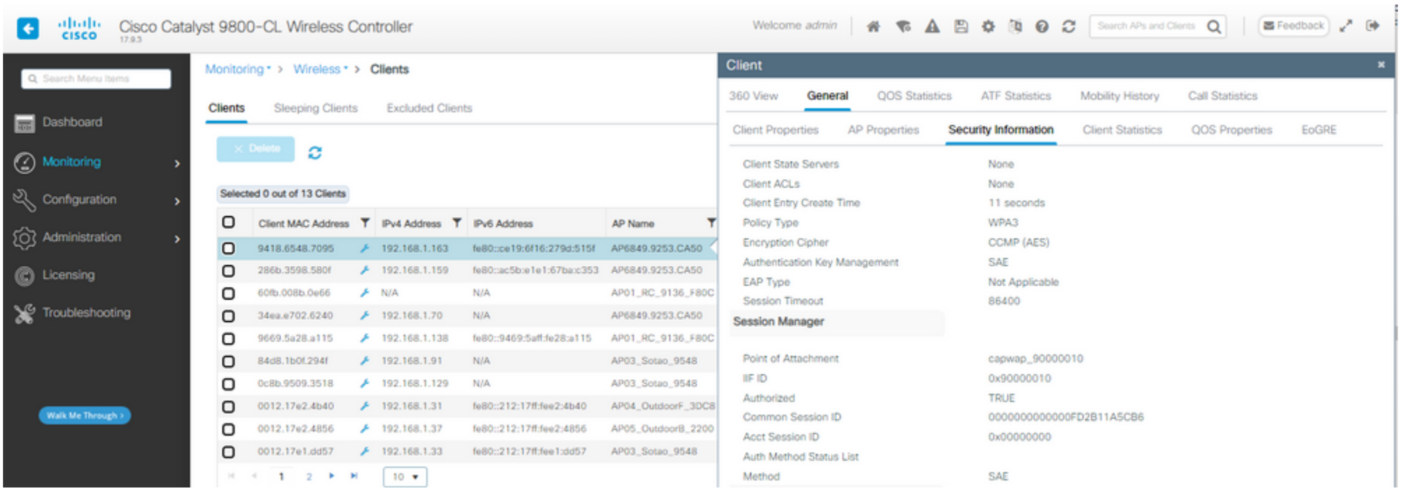


```
No. Time             Delta    Source             Destination        Protocol Length Channel Signal strength BSS Id            Info
 1 18:34:49.385337 0.000000 Cisco_13:80:ed     Broadcast          802.11   508    5 -36 dBm  38:91:b7:13:80:ed Beacon frame, SN=422, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
 2 18:34:49.487544 0.102207 Cisco_13:80:ed     Broadcast          802.11   508    5 -36 dBm  38:91:b7:13:80:ed Beacon frame, SN=427, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
 3 18:34:49.589867 0.102323 Cisco_13:80:ed     Broadcast          802.11   508    5 -37 dBm  38:91:b7:13:80:ed Beacon frame, SN=432, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
 4 18:34:49.692332 0.102465 Cisco_13:80:ed     Broadcast          802.11   508    5 -37 dBm  38:91:b7:13:80:ed Beacon frame, SN=437, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
 5 18:34:49.791004 0.098672 Netgear_48:70:95   Cisco_13:80:e7     802.11   360    5 -49 dBm  38:91:b7:13:80:e7 Probe Request, SN=10, FN=0, Flags=........C, SSID="wifi6E_test"
 6 18:34:49.791004 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -37 dBm                    Acknowledgement, Flags=........C
 7 18:34:49.791356 0.000352 Netgear_48:70:95   Cisco_13:80:e7     802.11   360    5 -49 dBm  38:91:b7:13:80:e7 Probe Request, SN=11, FN=0, Flags=........C, SSID="wifi6E_test"
 8 18:34:49.791427 0.000071 192.168.1.15       192.168.1.121      802.11    76    5 -37 dBm                    Acknowledgement, Flags=........C
 9 18:34:49.794493 0.003066 Cisco_13:80:ed     Broadcast          802.11   508    5 -37 dBm  38:91:b7:13:80:ed Beacon frame, SN=442, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
10 18:34:49.810282 0.015789 Netgear_48:70:95   Cisco_13:80:e7     802.11   360    5 -49 dBm  38:91:b7:13:80:e7 Probe Request, SN=12, FN=0, Flags=........C, SSID="wifi6E_test"
11 18:34:49.810282 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -37 dBm                    Acknowledgement, Flags=........C
12 18:34:49.874953 0.064669 Netgear_48:70:95   Cisco_13:80:e7     802.11   104    5 -49 dBm  38:91:b7:13:80:e7 Authentication, SN=4, FN=0, Flags=........C
13 18:34:49.874953 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -37 dBm                    Acknowledgement, Flags=........C
14 18:34:49.896563 0.021612 Cisco_13:80:e7     Netgear_48:70:95   802.11   104    5 -37 dBm  38:91:b7:13:80:e7 Authentication, SN=146, FN=0, Flags=........C
15 18:34:49.896563 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -49 dBm                    Acknowledgement, Flags=........C
16 18:34:49.904966 0.008403 Cisco_13:80:ed     Broadcast          802.11   508    5 -37 dBm  38:91:b7:13:80:ed Beacon frame, SN=447, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
17 18:34:49.904966 0.000000 Netgear_48:70:95   Cisco_13:80:e7     802.11   130    5 -49 dBm  38:91:b7:13:80:e7 Authentication, SN=5, FN=0, Flags=........C
18 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -37 dBm                    Acknowledgement, Flags=........C
19 18:34:49.904966 0.000000 Cisco_13:80:e7     Netgear_48:70:95   802.11   130    5 -37 dBm  38:91:b7:13:80:e7 Authentication, SN=147, FN=0, Flags=........C
20 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -48 dBm                    Acknowledgement, Flags=........C
21 18:34:49.904966 0.000000 Netgear_48:70:95   Cisco_13:80:e7     802.11   216    5 -49 dBm  38:91:b7:13:80:e7 Association Request, SN=6, FN=0, Flags=........C, SSID="wifi6E_test"
22 18:34:49.904966 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -36 dBm                    Acknowledgement, Flags=........C
23 18:34:49.915474 0.006508 Cisco_13:80:e7     Netgear_48:70:95   802.11   262    5 -36 dBm  38:91:b7:13:80:e7 Association Response, SN=0, FN=0, Flags=........C
24 18:34:49.915474 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -49 dBm                    Acknowledgement, Flags=........C
25 18:34:49.911719 0.000245 Netgear_48:70:95   Broadcast          LLC      114    5 -37 dBm  38:91:b7:13:80:e7 U, func=UP; DSAP 0x32 Individual, SSAP 0x62 Command
26 18:34:49.911719 0.000000 Netgear_48:70:95   Broadcast          LLC      114    5 -36 dBm  38:91:b7:13:80:e7 U, func=Unknown; DSAP 0x7a Individual, SSAP 0xd4 Response
27 18:34:49.922346 0.010627 Cisco_13:80:e7     Netgear_48:70:95   EAPOL    221    5 -36 dBm  38:91:b7:13:80:e7 Key (Message 1 of 4)
28 18:34:49.922346 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -49 dBm                    Acknowledgement, Flags=........C
29 18:34:49.999581 0.077235 Cisco_13:80:ed     Broadcast          802.11   508    5 -36 dBm  38:91:b7:13:80:ed Beacon frame, SN=452, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
30 18:34:50.104510 0.104929 Cisco_13:80:ed     Broadcast          802.11   508    5 -36 dBm  38:91:b7:13:80:ed Beacon frame, SN=457, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
31 18:34:50.204600 0.100090 Cisco_13:80:ed     Broadcast          802.11   508    5 -37 dBm  38:91:b7:13:80:ed Beacon frame, SN=462, FN=0, Flags=........C, BI=100, SSID="wifi6E_test_02", SSID="wif
32 18:34:50.211615 0.007015 Netgear_48:70:95   Cisco_13:80:e7     EAPOL    226    5 -55 dBm  38:91:b7:13:80:e7 Key (Message 2 of 4)
33 18:34:50.211615 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -42 dBm                    Acknowledgement, Flags=........C
34 18:34:50.213376 0.001761 Cisco_13:80:e7     Netgear_48:70:95   EAPOL    295    5 -36 dBm  38:91:b7:13:80:e7 Key (Message 3 of 4)
35 18:34:50.213376 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -50 dBm                    Acknowledgement, Flags=........C
36 18:34:50.214354 0.000978 Netgear_48:70:95   Cisco_13:80:e7     EAPOL    199    5 -56 dBm  38:91:b7:13:80:e7 Key (Message 4 of 4)
37 18:34:50.214354 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -42 dBm                    Acknowledgement, Flags=........C
38 18:34:50.220721 0.006367 192.168.1.15       192.168.1.121      802.11    76    5 -42 dBm                    Acknowledgement, Flags=........C
39 18:34:50.224049 0.003328 192.168.1.15       192.168.1.121      802.11   119    5 -44 dBm                    Trigger Buffer Status Report Poll (BSRP), Flags=........C
40 18:34:50.224049 0.000000 AlticeLa_9e:59:af  Netgear_48:70:95   LLC      223    5 -44 dBm  38:91:b7:13:80:e7 U, func=Unknown; DSAP 0xb6 Group, SSAP 0xd8 Response
41 18:34:50.224049 0.000000 192.168.1.15       192.168.1.121      802.11    76    5 -54 dBm                    Acknowledgement, Flags=........C
```

```
> Frame 21: 216 bytes on wire (1728 bits), 216 bytes captured (1728 bits) on interface \Device\NPF_{D4578905-2998-4A56-
> Ethernet II, Src: Cisco_dd:7d:37 (00:df:1d:dd:7d:37), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
  v Fixed parameters (4 bytes)
    > Capabilities Information: 0x1511
      Listen Interval: 0x0000
  v Tagged parameters (122 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
    > Tag: Vendor Specific: Ralink Technology, Corp.
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 22
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) SAE (SHA256)
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) SAE (SHA256)
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: SAE (SHA256) (8)
      v RSN Capabilities: 0x00c0
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simulta
          .... .... .... 00.. = RSN PTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeyS
          .... .... ..00 .... = RSN GTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeyS
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
    > Tag: RSN eXtension (1 octet)
    > Tag: RM Enabled Capabilities (5 octets)
```

ssss

Detalhes do cliente no WLC:



Selected 0 out of 13 Clients

□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
□	9418.6548.7095	192.168.1.163	fe80::ce19:6f16:279d:515f	AP6849.9253.CA50
□	286b.3598.580f	192.168.1.159	fe80::ac5b:e1e1:67ba:c353	AP6849.9253.CA50
□	60fb.008b.0e66	N/A	N/A	AP01_RC_9136_F80C
□	34ea.e702.6240	192.168.1.70	N/A	AP6849.9253.CA50
□	9669.5a28.a115	192.168.1.138	fe80::9469:5aff:fe28:a115	AP01_RC_9136_F80C
□	84d8.1b0f.294f	192.168.1.91	N/A	AP03_Sotao_9548
□	0c8b.9509.3518	192.168.1.129	N/A	AP03_Sotao_9548
□	0012.17e2.4b40	192.168.1.31	fe80::212:17ff:fee2:4b40	AP04_OutdoorF_3DC8
□	0012.17e2.4856	192.168.1.37	fe80::212:17ff:fee2:4856	AP05_OutdoorB_2200
□	0012.17e1.dd57	192.168.1.33	fe80::212:17ff:fee1:dd57	AP03_Sotao_9548

1 2 10

Client State Servers	None
Client ACLs	None
Client Entry Create Time	11 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	SAE
EAP Type	Not Applicable
Session Timeout	86400
Session Manager	
Point of Attachment	capwap_90000010
IIF ID	0x90000010
Authorized	TRUE
Common Session ID	000000000000FD2B11A5CB6
Acct Session ID	0x00000000
Auth Method Status List	
Method	SAE

Pixel 6a

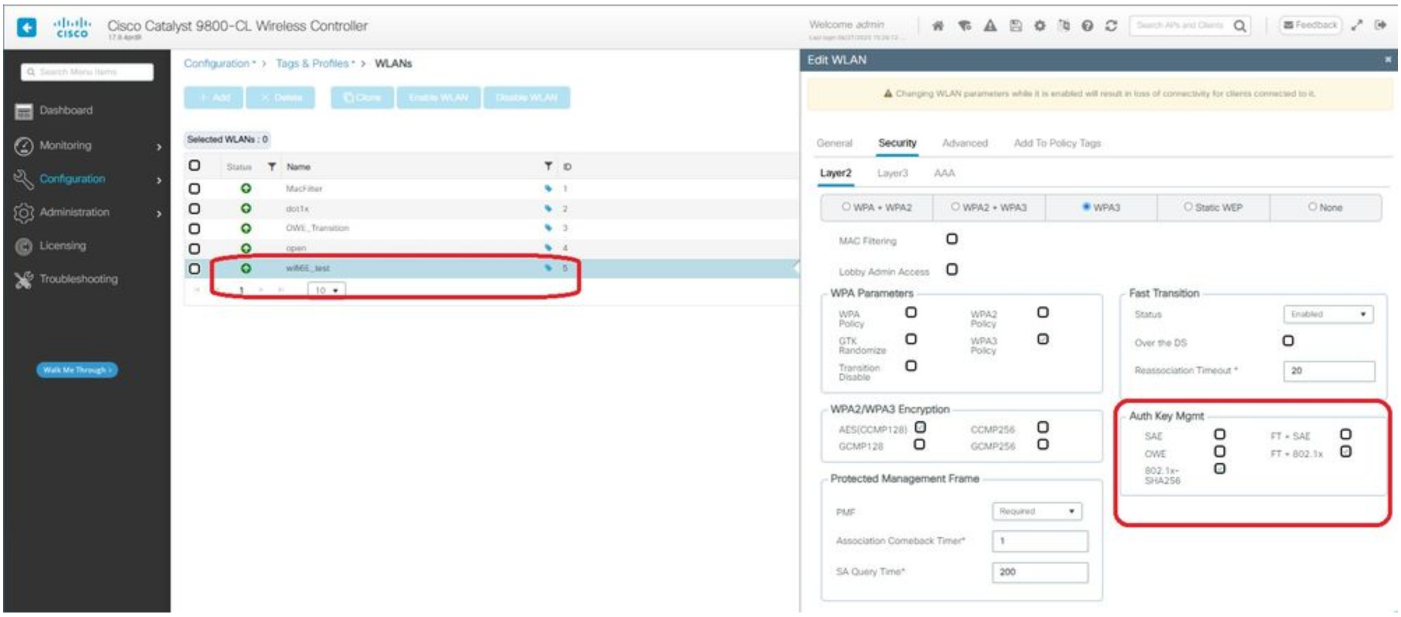
O dispositivo não pôde fazer roaming quando o FT está habilitado.

Samsung S23

O dispositivo não pôde fazer roaming quando o FT está habilitado.

WPA3-Empresa + AES(CCMP128) + 802.1x-SHA256 + FT

Configuração de segurança da WLAN:



Selected WLANs : 0

□	Status	Name	ID
□	⊕	MacFilter	1
□	⊕	dot1x	2
□	⊕	OWE_Transition	3
□	⊕	open	4
□	⊕	wifi6E_test	5

1 10

⚠ Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

○ WPA + WPA2 ○ WPA2 + WPA3 ● WPA3 ○ Static WEP ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

WPA Policy □ WPA2 Policy □
GTK Randomize □ WPA3 Policy ☑
Transition Disable □

WPA2/WPA3 Encryption

AES(CCMP128) ☑ CCMP256 □
GCMP128 □ GCMP256 □

Protected Management Frame

PMF: Required
Association Comeback Timer*: 1
SA Query Time*: 200

Fast Transition

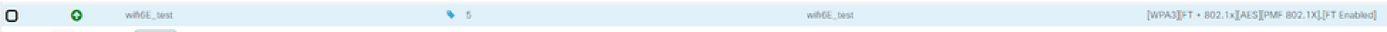
Status: Enabled
Over the DS □
Reassociation Timeout *: 20

Auth Key Mgmt

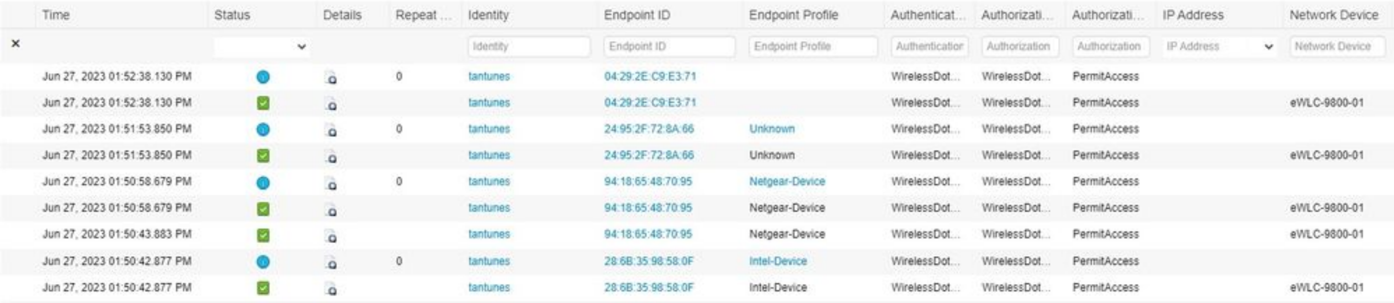
SAE □ FT + SAE □
OWE □ FT + 802.1x ☑
802.1x-SHA256 ☑

Configuração de segurança WPA3 Enterprise 802.1x-SHA256 + FTWLAN

Visualizar na GUI da WLC as configurações de segurança da WLAN:


□ ⊕ wifi6E_test 5 wifi6E_test [WPA3][FT + 802.1x][AES][PMF 802.1X],[FT Enabled]

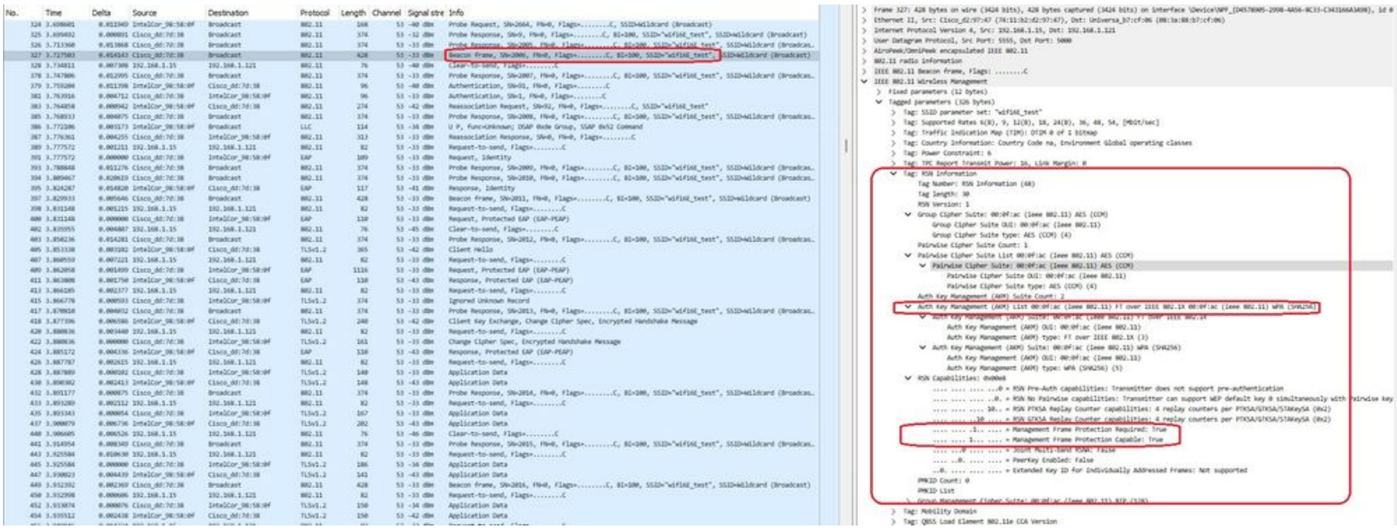
Aqui podemos ver os logs do ISE Live mostrando as autenticações vindas de cada dispositivo:



	Time	Status	Details	Repeat ...	Identity	Endpoint ID	Endpoint Profile	Authenticat...	Authorizati...	Authorizati...	IP Address	Network Device
×					Identity	Endpoint ID	Endpoint Profile	Authenticatior	Authorization	Authorization	IP Address	Network Device
	Jun 27, 2023 01:52:38.130 PM	●	🔍	0	tantunes	04:29:2E:C9:E3:71		WirelessDot...	WirelessDot...	PermitAccess		
	Jun 27, 2023 01:52:38.130 PM	☑	🔍		tantunes	04:29:2E:C9:E3:71		WirelessDot...	WirelessDot...	PermitAccess		eWLC-9800-01
	Jun 27, 2023 01:51:53.850 PM	●	🔍	0	tantunes	24:95:2F:72:8A:66	Unknown	WirelessDot...	WirelessDot...	PermitAccess		
	Jun 27, 2023 01:51:53.850 PM	☑	🔍		tantunes	24:95:2F:72:8A:66	Unknown	WirelessDot...	WirelessDot...	PermitAccess		eWLC-9800-01
	Jun 27, 2023 01:50:58.679 PM	●	🔍	0	tantunes	94:18:65:48:70:95	Netgear-Device	WirelessDot...	WirelessDot...	PermitAccess		
	Jun 27, 2023 01:50:58.679 PM	☑	🔍		tantunes	94:18:65:48:70:95	Netgear-Device	WirelessDot...	WirelessDot...	PermitAccess		eWLC-9800-01
	Jun 27, 2023 01:50:43.883 PM	☑	🔍		tantunes	94:18:65:48:70:95	Netgear-Device	WirelessDot...	WirelessDot...	PermitAccess		eWLC-9800-01
	Jun 27, 2023 01:50:42.877 PM	●	🔍	0	tantunes	28:6B:35:98:58:0F	Intel-Device	WirelessDot...	WirelessDot...	PermitAccess		
	Jun 27, 2023 01:50:42.877 PM	☑	🔍		tantunes	28:6B:35:98:58:0F	Intel-Device	WirelessDot...	WirelessDot...	PermitAccess		eWLC-9800-01

Registros ativos do ISE

O OTA dos beacons tem esta aparência:



```
No.   Time     Delta    Source             Destination        Protocol Length Channel Signal stre Info
  324 3.698601 0.011949 IntelCor_98:58:0f  Broadcast          802.11     168   53 -40 dBm Probe Request, SN=2664, FN=0, Flags=........C, SSID=Wildcard (Broadcast)
  325 3.699492 0.000891 Cisco_dd:7d:38     Broadcast          802.11     374   53 -32 dBm Probe Response, SN=9, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcast)
  326 3.713360 0.013868 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2005, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  327 3.727503 0.014143 Cisco_dd:7d:38     Broadcast          802.11     428   53 -33 dBm Beacon frame, SN=2006, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcast)
  328 3.734811 0.007308 192.168.1.15       192.168.1.121      802.11      76   53 -40 dBm Clear-to-send, Flags=........C
  378 3.747806 0.012995 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2007, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  379 3.759204 0.011398 IntelCor_98:58:0f  Cisco_dd:7d:38     802.11      96   53 -40 dBm Authentication, SN=91, FN=0, Flags=........C
  381 3.763916 0.004712 Cisco_dd:7d:38     IntelCor_98:58:0f  802.11      96   53 -33 dBm Authentication, SN=1, FN=0, Flags=........C
  383 3.764858 0.000942 IntelCor_98:58:0f  Cisco_dd:7d:38     802.11     274   53 -42 dBm Reassociation Request, SN=92, FN=0, Flags=........C, SSID="wifi6E_test"
  385 3.768933 0.004075 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2008, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  386 3.772106 0.003173 IntelCor_98:58:0f  Broadcast          LLC        114   53 -34 dBm U P, func=Unknown; DSAP 0x0e Group, SSAP 0x52 Command
  387 3.776361 0.004255 Cisco_dd:7d:38     IntelCor_98:58:0f  802.11     313   53 -33 dBm Reassociation Response, SN=0, FN=0, Flags=........C
  389 3.777572 0.001211 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  391 3.777572 0.000000 Cisco_dd:7d:38     IntelCor_98:58:0f  EAP        109   53 -33 dBm Request, Identity
  393 3.788848 0.011276 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2009, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  394 3.809467 0.020619 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2010, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  395 3.824287 0.014820 IntelCor_98:58:0f  Cisco_dd:7d:38     EAP        117   53 -41 dBm Response, Identity
  397 3.829933 0.005646 Cisco_dd:7d:38     Broadcast          802.11     428   53 -33 dBm Beacon frame, SN=2011, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcast)
  398 3.831148 0.001215 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  400 3.831148 0.000000 Cisco_dd:7d:38     IntelCor_98:58:0f  EAP        110   53 -33 dBm Request, Protected EAP (EAP-PEAP)
  402 3.835955 0.004807 192.168.1.15       192.168.1.121      802.11      76   53 -45 dBm Clear-to-send, Flags=........C
  403 3.850236 0.014281 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2012, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  405 3.853338 0.003102 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    365   53 -42 dBm Client Hello
  407 3.860559 0.007221 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  409 3.862058 0.001499 Cisco_dd:7d:38     IntelCor_98:58:0f  EAP       1116   53 -33 dBm Request, Protected EAP (EAP-PEAP)
  411 3.863808 0.001750 IntelCor_98:58:0f  Cisco_dd:7d:38     EAP        110   53 -43 dBm Response, Protected EAP (EAP-PEAP)
  413 3.866185 0.002377 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  415 3.866778 0.000593 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    374   53 -33 dBm Ignored Unknown Record
  417 3.870810 0.004032 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2013, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  418 3.877396 0.006586 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    240   53 -42 dBm Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
  420 3.880836 0.003440 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  422 3.880836 0.000000 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    161   53 -33 dBm Change Cipher Spec, Encrypted Handshake Message
  424 3.885172 0.004336 IntelCor_98:58:0f  Cisco_dd:7d:38     EAP        110   53 -43 dBm Response, Protected EAP (EAP-PEAP)
  426 3.887787 0.002615 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  428 3.887889 0.000102 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    140   53 -33 dBm Application Data
  430 3.890302 0.002413 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    140   53 -43 dBm Application Data
  432 3.891177 0.000875 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2014, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  433 3.893289 0.002112 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  435 3.893343 0.000054 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    167   53 -33 dBm Application Data
  437 3.900079 0.006736 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    202   53 -43 dBm Application Data
  440 3.906605 0.006526 192.168.1.15       192.168.1.121      802.11      76   53 -46 dBm Clear-to-send, Flags=........C
  441 3.914954 0.008349 Cisco_dd:7d:38     Broadcast          802.11     374   53 -33 dBm Probe Response, SN=2015, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcas…
  443 3.925584 0.010630 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  445 3.925584 0.000000 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    186   53 -34 dBm Application Data
  447 3.930023 0.004439 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    141   53 -43 dBm Application Data
  449 3.932392 0.002369 Cisco_dd:7d:38     Broadcast          802.11     428   53 -33 dBm Beacon frame, SN=2016, FN=0, Flags=........C, BI=100, SSID="wifi6E_test", SSID=Wildcard (Broadcast)
  450 3.932998 0.000606 192.168.1.15       192.168.1.121      802.11      82   53 -33 dBm Request-to-send, Flags=........C
  452 3.933874 0.000876 Cisco_dd:7d:38     IntelCor_98:58:0f  TLSv1.2    150   53 -34 dBm Application Data
  454 3.935512 0.002438 IntelCor_98:58:0f  Cisco_dd:7d:38     TLSv1.2    150   53 -42 dBm Application Data
```

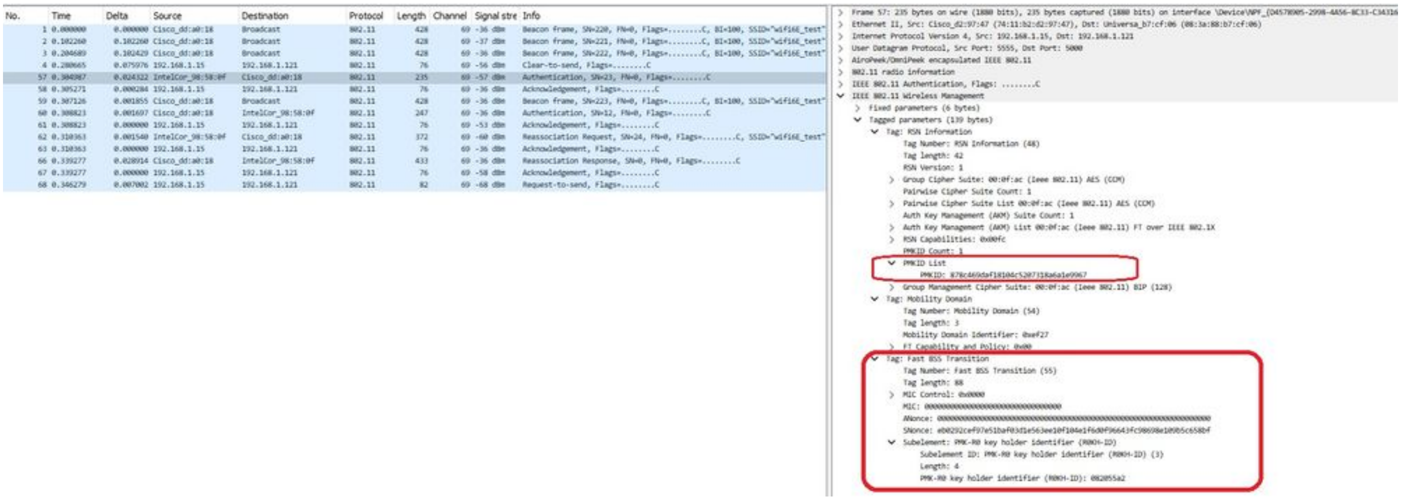
```
> Frame 327: 428 bytes on wire (3424 bits), 428 bytes captured (3424 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343166A3498}, id 0
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (12 bytes)
  v Tagged parameters (326 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Traffic Indication Map (TIM): DTIM 0 of 1 bitmap
    > Tag: Country Information: Country Code na, Environment Global operating classes
    > Tag: Power Constraint: 6
    > Tag: TPC Report Transmit Power: 16, Link Margin: 0
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 30
        RSN Version: 1
      v Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
          Group Cipher Suite OUI: 00:0f:ac (Ieee 802.11)
          Group Cipher Suite type: AES (CCM) (4)
        Pairwise Cipher Suite Count: 1
      v Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        v Pairwise Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
            Pairwise Cipher Suite OUI: 00:0f:ac (Ieee 802.11)
            Pairwise Cipher Suite type: AES (CCM) (4)
        Auth Key Management (AKM) Suite Count: 2
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X 00:0f:ac (Ieee 802.11) WPA (SHA256)
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: FT over IEEE 802.1X (3)
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) WPA (SHA256)
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: WPA (SHA256) (5)
      v RSN Capabilities: 0x00e8
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with Pairwise key
          .... .... .... 10.. = RSN PTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... ..10 .... = RSN GTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    > Tag: Mobility Domain
    > Tag: QBSS Load Element 802.11e CCA Version
```

Beacon WPA3 Enterprise 802.1x +FT

Aqui podemos observar os clientes Wi-Fi 6E associando:

AX211 Intel

OTA de conexão com foco nas informações de RSN do cliente em um evento de roaming:



```
No.  Time     Delta    Source             Destination        Protocol Length Channel Signal stre Info
   1 0.000000 0.000000 Cisco_dd:a0:18     Broadcast          802.11     428   69 -36 dBm Beacon frame, SN=220, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
   2 0.102260 0.102260 Cisco_dd:a0:18     Broadcast          802.11     428   69 -37 dBm Beacon frame, SN=221, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
   3 0.204689 0.102429 Cisco_dd:a0:18     Broadcast          802.11     428   69 -36 dBm Beacon frame, SN=222, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
   4 0.280665 0.075976 192.168.1.15       192.168.1.121      802.11      76   69 -56 dBm Clear-to-send, Flags=........C
  57 0.304987 0.024322 IntelCor_98:58:0f  Cisco_dd:a0:18     802.11     235   69 -57 dBm Authentication, SN=23, FN=0, Flags=........C
  58 0.305271 0.000284 192.168.1.15       192.168.1.121      802.11      76   69 -36 dBm Acknowledgement, Flags=........C
  59 0.307126 0.001855 Cisco_dd:a0:18     Broadcast          802.11     428   69 -36 dBm Beacon frame, SN=223, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
  60 0.308823 0.001697 Cisco_dd:a0:18     IntelCor_98:58:0f  802.11     247   69 -36 dBm Authentication, SN=12, FN=0, Flags=........C
  61 0.308823 0.000000 192.168.1.15       192.168.1.121      802.11      76   69 -53 dBm Acknowledgement, Flags=........C
  62 0.310363 0.001540 IntelCor_98:58:0f  Cisco_dd:a0:18     802.11     372   69 -60 dBm Reassociation Request, SN=24, FN=0, Flags=........C, SSID="wifi6E_test"
  63 0.310363 0.000000 192.168.1.15       192.168.1.121      802.11      76   69 -36 dBm Acknowledgement, Flags=........C
  66 0.339277 0.028914 Cisco_dd:a0:18     IntelCor_98:58:0f  802.11     433   69 -36 dBm Reassociation Response, SN=0, FN=0, Flags=........C
  67 0.339277 0.000000 192.168.1.15       192.168.1.121      802.11      76   69 -58 dBm Acknowledgement, Flags=........C
  68 0.346279 0.007002 192.168.1.15       192.168.1.121      802.11      82   69 -68 dBm Request-to-send, Flags=........C
```

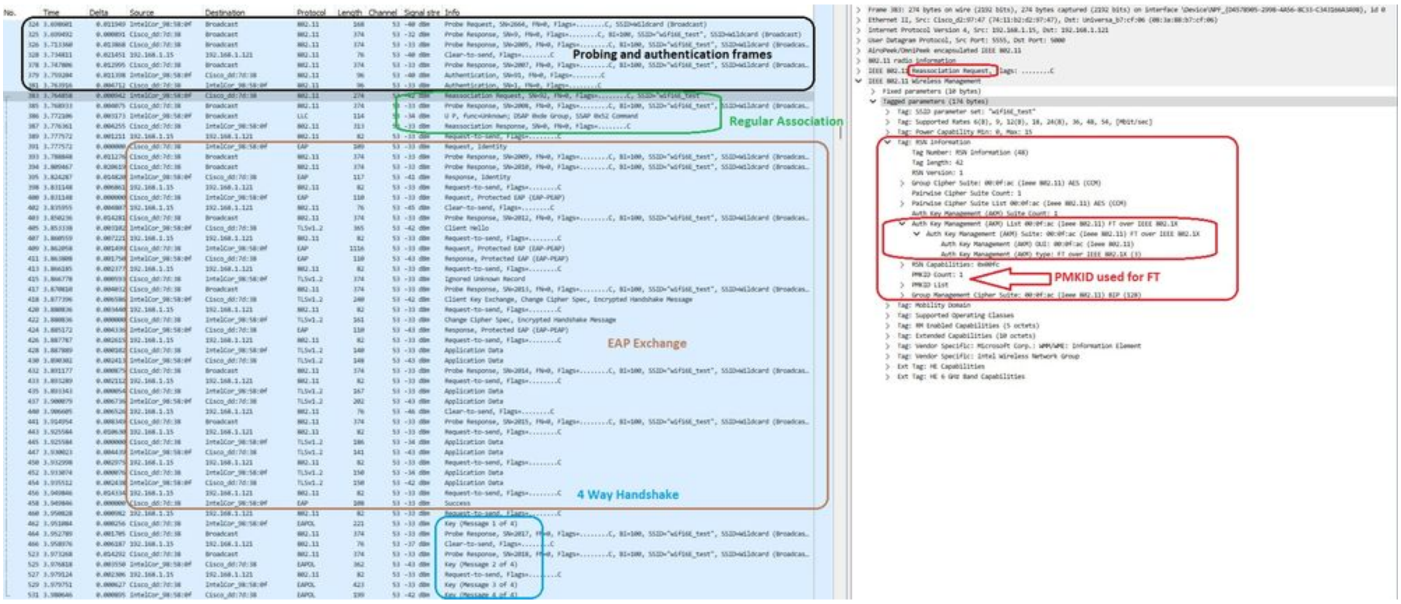
```
> Frame 57: 235 bytes on wire (1880 bits), 235 bytes captured (1880 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C34316
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Authentication, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (6 bytes)
  v Tagged parameters (139 bytes)
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 42
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
      > RSN Capabilities: 0x00fc
        PMKID Count: 1
      v PMKID List
          PMKID: 878c469daf18104c5207318a6a1e9967
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    v Tag: Mobility Domain
        Tag Number: Mobility Domain (54)
        Tag length: 3
        Mobility Domain Identifier: 0xef27
      > FT Capability and Policy: 0x00
    v Tag: Fast BSS Transition
        Tag Number: Fast BSS Transition (55)
        Tag length: 88
      > MIC Control: 0x0000
        MIC: 00000000000000000000000000000000
        ANonce: 0000000000000000000000000000000000000000000000000000000000000000
        SNonce: eb0292cef97e51baf03d1e563ee10f104e1f6d0f96643fc98698e10905c658bf
      v Subelement: PMK-R0 key holder identifier (R0KH-ID)
          Subelement ID: PMK-R0 key holder identifier (R0KH-ID) (3)
          Length: 4
          PMK-R0 key holder identifier (R0KH-ID): 082055a2
```

Evento de WPA3 Enterprise 802.1x + FT Roaming

Um comportamento interessante acontece se você excluir manualmente o cliente da WLAN (da

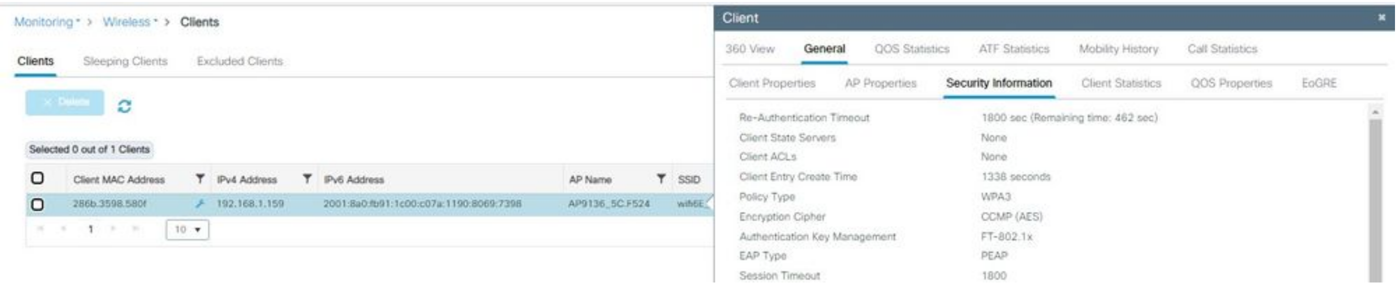
GUI da WLC, por exemplo). O cliente recebe um quadro de desassociação, mas tenta se reconectar ao mesmo AP e usa um quadro de reassociação seguido por uma troca EAP completa, pois os detalhes do cliente foram excluídos do AP/WLC.

Esta é basicamente a mesma troca de quadros que em um novo processo de associação. Aqui você pode ver a troca de quadros:



Fluxo de conexão WPA3 Enterprise 802.1x + FT Ax211

Detalhes do cliente no WLC:



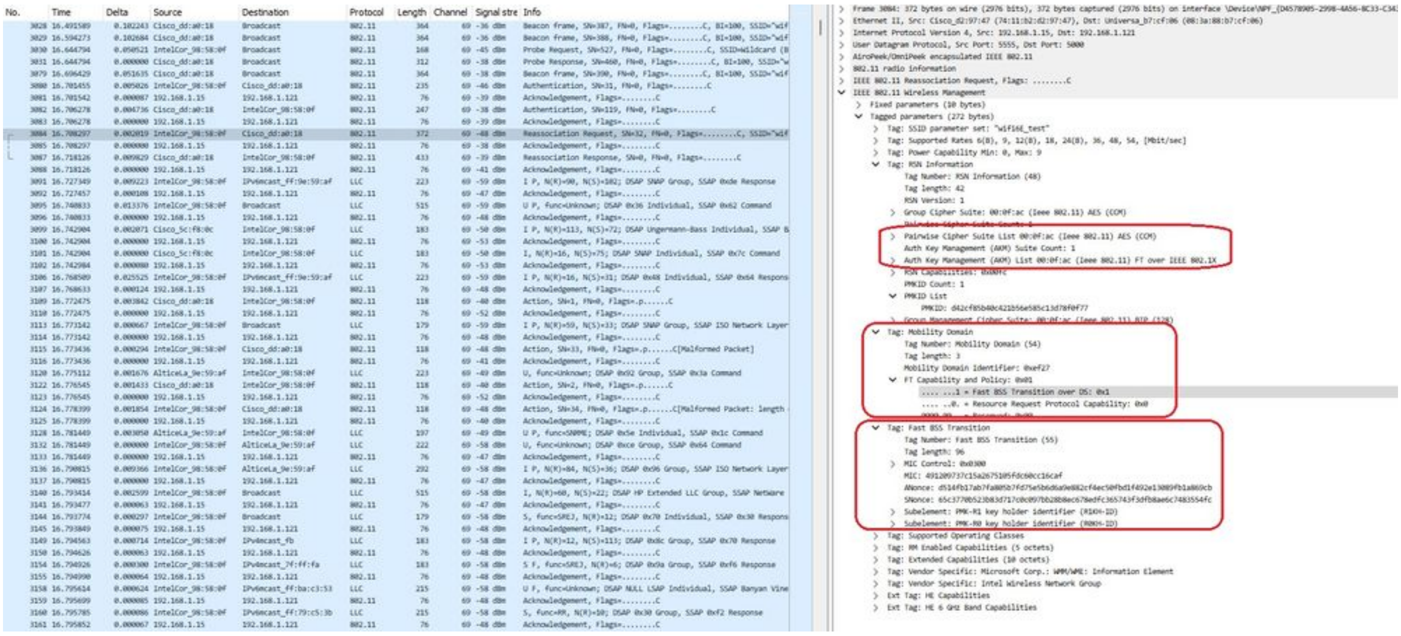
Selected 0 out of 1 Clients

□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name	SSID
□	286b.3598.580f	192.168.1.159	2001:8a0:fb91:1c00:c07a:1190:8069:7398	AP9136_5C.F524	wifi6E

Re-Authentication Timeout	1800 sec (Remaining time: 462 sec)
Client State Servers	None
Client ACLs	None
Client Entry Create Time	1338 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	FT-802.1x
EAP Type	PEAP
Session Timeout	1800

Detalhes do cliente WPA3 Enterprise 802.1x + FT

Esse cliente também foi testado usando FT no DS e conseguiu fazer roaming usando 802.11r:

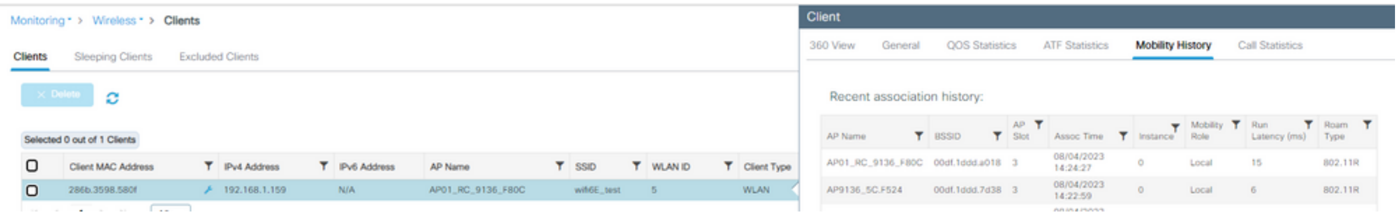


```
No.   Time        Delta     Source               Destination           Protocol Length Channel Signal stre Info
3028 16.491589  0.102243 Cisco_dd:a0:18       Broadcast              802.11   364   69 -36 dBm  Beacon frame, SN=387, FN=0, Flags=........C, BI=100, SSID="wif
3029 16.594273  0.102684 Cisco_dd:a0:18       Broadcast              802.11   364   69 -36 dBm  Beacon frame, SN=388, FN=0, Flags=........C, BI=100, SSID="wif
3030 16.644794  0.050521 IntelCor_98:58:0f    Broadcast              802.11   168   69 -45 dBm  Probe Request, SN=527, FN=0, Flags=........C, SSID=Wildcard (B
3031 16.644794  0.000000 Cisco_dd:a0:18       Broadcast              802.11   312   69 -38 dBm  Probe Response, SN=460, FN=0, Flags=........C, BI=100, SSID="w
3079 16.696429  0.051635 Cisco_dd:a0:18       Broadcast              802.11   364   69 -38 dBm  Beacon frame, SN=390, FN=0, Flags=........C, BI=100, SSID="wif
3080 16.701455  0.005026 IntelCor_98:58:0f    Cisco_dd:a0:18         802.11   235   69 -46 dBm  Authentication, SN=31, FN=0, Flags=........C
3081 16.701542  0.000087 192.168.1.15         192.168.1.121          802.11    76   69 -39 dBm  Acknowledgement, Flags=........C
3082 16.706278  0.004736 Cisco_dd:a0:18       IntelCor_98:58:0f      802.11   247   69 -38 dBm  Authentication, SN=119, FN=0, Flags=........C
3083 16.706278  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -39 dBm  Acknowledgement, Flags=........C
3084 16.708297  0.002019 IntelCor_98:58:0f    Cisco_dd:a0:18         802.11   372   69 -48 dBm  Reassociation Request, SN=32, FN=0, Flags=........C, SSID="wif
3085 16.708297  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -38 dBm  Acknowledgement, Flags=........C
3087 16.718126  0.009829 Cisco_dd:a0:18       IntelCor_98:58:0f      802.11   433   69 -39 dBm  Reassociation Response, SN=0, FN=0, Flags=........C
3088 16.718126  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -41 dBm  Acknowledgement, Flags=........C
3091 16.727349  0.009223 IntelCor_98:58:0f    IPv6mcast_ff:9e:59:af  LLC      223   69 -59 dBm  I P, N(R)=90, N(S)=102; DSAP SNAP Group, SSAP 0xde Response
3092 16.727457  0.000108 192.168.1.15         192.168.1.121          802.11    76   69 -47 dBm  Acknowledgement, Flags=........C
3095 16.740833  0.013376 IntelCor_98:58:0f    Broadcast              LLC      515   69 -59 dBm  U P, func=Unknown; DSAP 0x36 Individual, SSAP 0x62 Command
3096 16.740833  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3099 16.742904  0.002071 Cisco_5c:f8:0c       IntelCor_98:58:0f      LLC      183   69 -50 dBm  I P, N(R)=113, N(S)=72; DSAP Ungermann-Bass Individual, SSAP B
3100 16.742904  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -53 dBm  Acknowledgement, Flags=........C
3101 16.742904  0.000000 Cisco_5c:f8:0c       IntelCor_98:58:0f      LLC      183   69 -50 dBm  I, N(R)=16, N(S)=75; DSAP SNAP Individual, SSAP 0x7c Command
3102 16.742984  0.000080 192.168.1.15         192.168.1.121          802.11    76   69 -53 dBm  Acknowledgement, Flags=........C
3106 16.768509  0.025525 IntelCor_98:58:0f    IPv6mcast_ff:9e:59:af  LLC      223   69 -59 dBm  I P, N(R)=16, N(S)=31; DSAP 0x48 Individual, SSAP 0x64 Respons
3107 16.768633  0.000124 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3109 16.772475  0.003842 Cisco_dd:a0:18       IntelCor_98:58:0f      802.11   118   69 -40 dBm  Action, SN=1, FN=0, Flags=.p......C
3110 16.772475  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -52 dBm  Acknowledgement, Flags=........C
3113 16.773142  0.000667 IntelCor_98:58:0f    Broadcast              LLC      179   69 -59 dBm  I P, N(R)=59, N(S)=33; DSAP SNAP Group, SSAP ISO Network Layer
3114 16.773142  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3115 16.773436  0.000294 IntelCor_98:58:0f    Cisco_dd:a0:18         802.11   118   69 -48 dBm  Action, SN=33, FN=0, Flags=.p......C[Malformed Packet]
3116 16.773436  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -41 dBm  Acknowledgement, Flags=........C
3120 16.775112  0.001676 AlticeLa_9e:59:af    IntelCor_98:58:0f      LLC      223   69 -49 dBm  U, func=Unknown; DSAP 0x92 Group, SSAP 0x3a Command
3122 16.776545  0.001433 Cisco_dd:a0:18       IntelCor_98:58:0f      802.11   118   69 -40 dBm  Action, SN=2, FN=0, Flags=.p......C
3123 16.776545  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -52 dBm  Acknowledgement, Flags=........C
3124 16.778399  0.001854 IntelCor_98:58:0f    Cisco_dd:a0:18         802.11   118   69 -48 dBm  Action, SN=34, FN=0, Flags=.p......C[Malformed Packet: length
3125 16.778399  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -40 dBm  Acknowledgement, Flags=........C
3128 16.781449  0.003050 AlticeLa_9e:59:af    IntelCor_98:58:0f      LLC      197   69 -49 dBm  U P, func=SNRME; DSAP 0x5e Individual, SSAP 0x1c Command
3132 16.781449  0.000000 IntelCor_98:58:0f    AlticeLa_9e:59:af      LLC      222   69 -58 dBm  U, func=Unknown; DSAP 0xce Group, SSAP 0x64 Command
3133 16.781449  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -47 dBm  Acknowledgement, Flags=........C
3136 16.790815  0.009366 IntelCor_98:58:0f    AlticeLa_9e:59:af      LLC      292   69 -58 dBm  I P, N(R)=84, N(S)=36; DSAP 0x96 Group, SSAP ISO Network Layer
3137 16.790815  0.000000 192.168.1.15         192.168.1.121          802.11    76   69 -47 dBm  Acknowledgement, Flags=........C
3140 16.793414  0.002599 IntelCor_98:58:0f    Broadcast              LLC      515   69 -58 dBm  I, N(R)=60, N(S)=22; DSAP HP Extended LLC Group, SSAP NetWare
3141 16.793477  0.000063 192.168.1.15         192.168.1.121          802.11    76   69 -47 dBm  Acknowledgement, Flags=........C
3144 16.793774  0.000297 IntelCor_98:58:0f    Broadcast              LLC      179   69 -58 dBm  S, func=SREJ, N(R)=12; DSAP 0x70 Individual, SSAP 0x30 Respons
3145 16.793849  0.000075 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3149 16.794563  0.000714 IntelCor_98:58:0f    IPv4mcast_fb           LLC      183   69 -58 dBm  I P, N(R)=12, N(S)=113; DSAP 0x8c Group, SSAP 0x70 Response
3150 16.794626  0.000063 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3154 16.794926  0.000300 IntelCor_98:58:0f    IPv4mcast_7f:ff:fa     LLC      183   69 -58 dBm  S F, func=SREJ, N(R)=6; DSAP 0x9a Group, SSAP 0xf6 Response
3155 16.794990  0.000064 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3158 16.795614  0.000624 IntelCor_98:58:0f    IPv6mcast_ff:ba:c3:53  LLC      215   69 -58 dBm  U F, func=Unknown; DSAP NULL LSAP Individual, SSAP Banyan Vine
3159 16.795699  0.000085 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
3160 16.795785  0.000086 IntelCor_98:58:0f    IPv6mcast_ff:79:c5:3b  LLC      215   69 -58 dBm  S, func=RR, N(R)=10; DSAP 0x30 Group, SSAP 0xf2 Response
3161 16.795852  0.000067 192.168.1.15         192.168.1.121          802.11    76   69 -48 dBm  Acknowledgement, Flags=........C
```

```
> Frame 3084: 372 bytes on wire (2976 bits), 372 bytes captured (2976 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C34
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Reassociation Request, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (10 bytes)
  v Tagged parameters (272 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Power Capability Min: 0, Max: 9
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 42
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
        Auth Key Management (AKM) Suite Count: 1
      > Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
      > RSN Capabilities: 0x00fc
        PMKID Count: 1
      v PMKID List
          PMKID: d42cf85b40c421b56e585c13d78f0f77
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
    v Tag: Mobility Domain
        Tag Number: Mobility Domain (54)
        Tag length: 3
        Mobility Domain Identifier: 0xef27
      v FT Capability and Policy: 0x01
          .... ...1 = Fast BSS Transition over DS: 0x1
          .... ..0. = Resource Request Protocol Capability: 0x0
          0000 00.. = Reserved: 0x00
    v Tag: Fast BSS Transition
        Tag Number: Fast BSS Transition (55)
        Tag length: 96
      > MIC Control: 0x0300
        MIC: 491209737c15a2675105fdc60cc16caf
        ANonce: d514fb17ab7fa005b7fd75e5b6d6a9e082cf4ec50fbd1f492e13089fb1a069cb
        SNonce: 65c3770b523b83d717c0c097bb28b8ec678edfc365743f3dfb8ae6c7483554fc
      > Subelement: PMK-R1 key holder identifier (R1KH-ID)
      > Subelement: PMK-R0 key holder identifier (R0KH-ID)
    > Tag: Supported Operating Classes
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (10 octets)
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
    > Tag: Vendor Specific: Intel Wireless Network Group
    > Ext Tag: HE Capabilities
    > Ext Tag: HE 6 GHz Band Capabilities
```

AX211 em roaming com FT sobre DS

Também podemos ver os eventos de roaming do FT:



Selected 0 out of 1 Clients

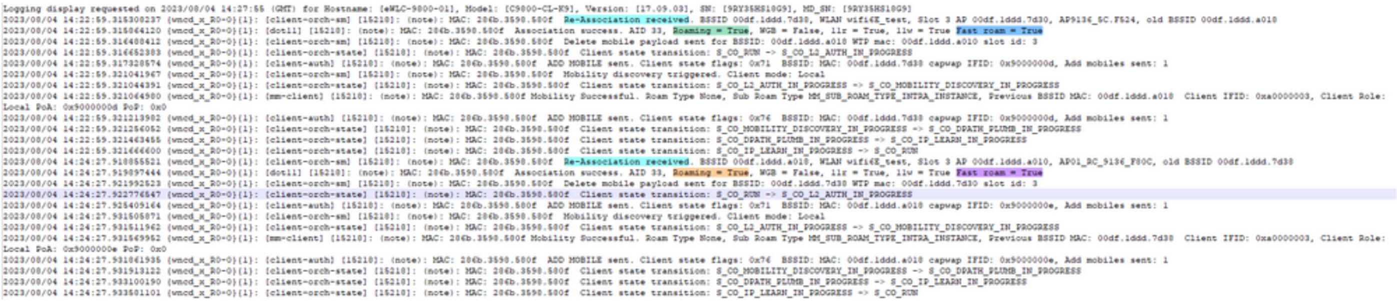
□	Client MAC Address	IPv4 Address	IPv6 Address	AP Name	SSID	WLAN ID	Client Type
□	286b.3598.580f	192.168.1.159	N/A	AP01_RC_9136_F80C	wifi6E_test	5	WLAN

Recent association history:

AP Name	BSSID	AP Slot	Assoc Time	Instance	Mobility Role	Run Latency (ms)	Roam Type
AP01_RC_9136_F80C	00df.1ddd.a018	3	08/04/2023 14:24:27	0	Local	15	802.11R
AP9136_5C.F524	00df.1ddd.7d38	3	08/04/2023 14:22:59	0	Local	6	802.11R

WPA3 Enterprise com FT

E rastreamento de ra de cliente do wlc:



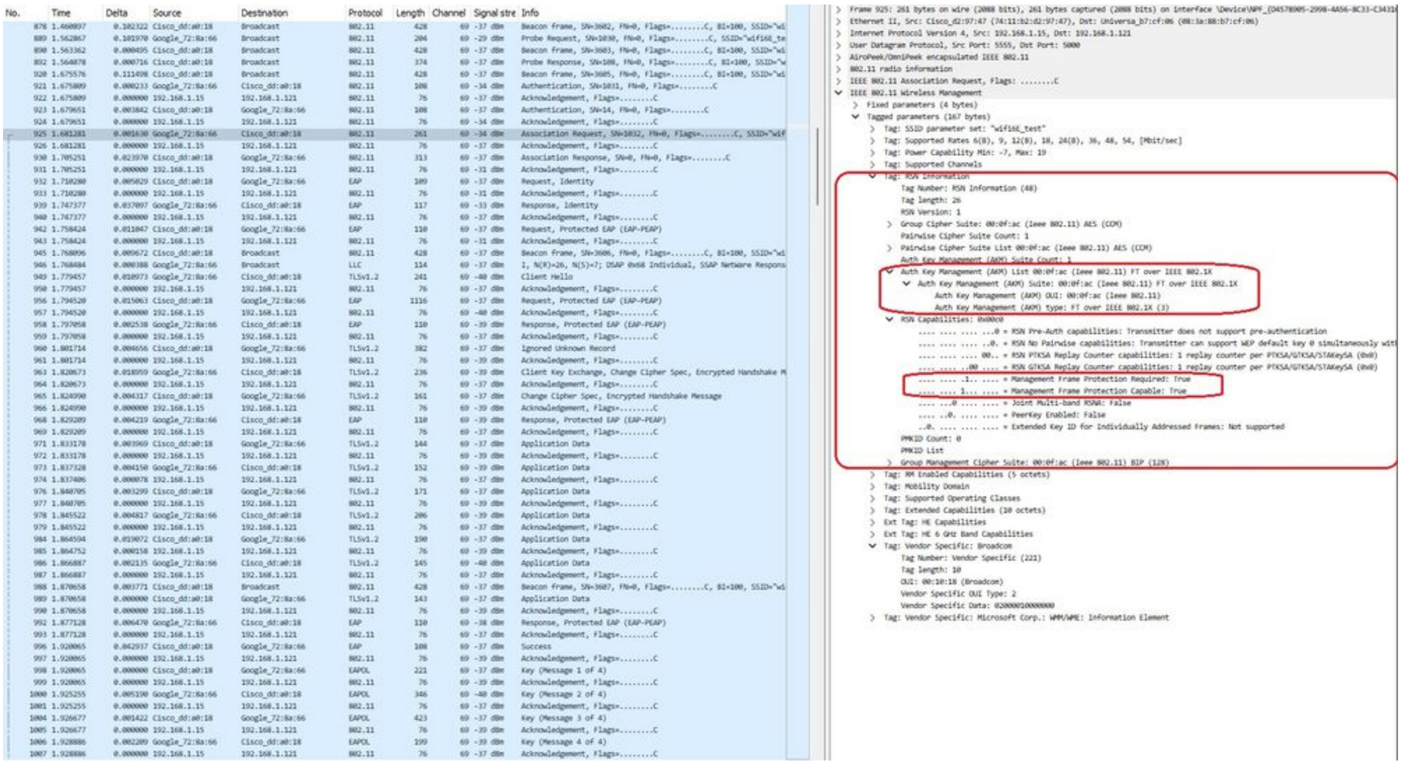
```
Logging display requested on 2023/08/04 14:27:55 (GMT) for Hostname: [eWLC-9800-01], Model: [C9800-CL-K9], Version: [17.09.03], SN: [9RY35HS10G9], MD_SN: [9RY35HS10G9]
2023/08/04 14:22:59.315300237 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Re-Association received. BSSID 00df.1ddd.7d38, WLAN wifi6E_test, Slot 3 AP 00df.1ddd.7d30, AP9136_5C.F524, old BSSID 00df.1ddd.a018
2023/08/04 14:22:59.315864120 {wncd_x_R0-0}{1}: [dot11] [15210]: (note): MAC: 286b.3598.580f  Association success. AID 33, Roaming = True, WGB = False, 11r = True, 11w = True Fast roam = True
2023/08/04 14:22:59.316488412 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Delete mobile payload sent for BSSID: 00df.1ddd.a018 WTP mac: 00df.1ddd.a010 slot id: 3
2023/08/04 14:22:59.316652383 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_RUN -> S_CO_L2_AUTH_IN_PROGRESS
2023/08/04 14:22:59.317328574 {wncd_x_R0-0}{1}: [client-auth] [15210]: (note): MAC: 286b.3598.580f  ADD MOBILE sent. Client state flags: 0x71  BSSID: MAC: 00df.1ddd.7d38 capwap IFID: 0x9000000d, Add mobiles sent: 1
2023/08/04 14:22:59.321041967 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Mobility discovery triggered. Client mode: Local
2023/08/04 14:22:59.321044391 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_L2_AUTH_IN_PROGRESS -> S_CO_MOBILITY_DISCOVERY_IN_PROGRESS
2023/08/04 14:22:59.321064980 {wncd_x_R0-0}{1}: [mm-client] [15210]: (note): MAC: 286b.3598.580f Mobility Successful. Roam Type None, Sub Roam Type MM_SUB_ROAM_TYPE_INTRA_INSTANCE, Previous BSSID MAC: 00df.1ddd.a018  Client IFID: 0xa0000003, Client Role:
Local PoA: 0x9000000d PoP: 0x0
2023/08/04 14:22:59.321213982 {wncd_x_R0-0}{1}: [client-auth] [15210]: (note): MAC: 286b.3598.580f  ADD MOBILE sent. Client state flags: 0x76  BSSID: MAC: 00df.1ddd.7d38 capwap IFID: 0x9000000d, Add mobiles sent: 1
2023/08/04 14:22:59.321256052 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_MOBILITY_DISCOVERY_IN_PROGRESS -> S_CO_DPATH_PLUMB_IN_PROGRESS
2023/08/04 14:22:59.321463455 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_DPATH_PLUMB_IN_PROGRESS -> S_CO_IP_LEARN_IN_PROGRESS
2023/08/04 14:22:59.321666600 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_IP_LEARN_IN_PROGRESS -> S_CO_RUN
2023/08/04 14:24:27.918855521 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Re-Association received. BSSID 00df.1ddd.a018, WLAN wifi6E_test, Slot 3 AP 00df.1ddd.a010, AP01_RC_9136_F80C, old BSSID 00df.1ddd.7d38
2023/08/04 14:24:27.919897444 {wncd_x_R0-0}{1}: [dot11] [15210]: (note): MAC: 286b.3598.580f  Association success. AID 33, Roaming = True, WGB = False, 11r = True, 11w = True Fast roam = True
2023/08/04 14:24:27.921992523 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Delete mobile payload sent for BSSID: 00df.1ddd.7d38 WTP mac: 00df.1ddd.7d30 slot id: 3
2023/08/04 14:24:27.922776547 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_RUN -> S_CO_L2_AUTH_IN_PROGRESS
2023/08/04 14:24:27.925409164 {wncd_x_R0-0}{1}: [client-auth] [15210]: (note): MAC: 286b.3598.580f  ADD MOBILE sent. Client state flags: 0x71  BSSID: MAC: 00df.1ddd.a018 capwap IFID: 0x9000000e, Add mobiles sent: 1
2023/08/04 14:24:27.931505871 {wncd_x_R0-0}{1}: [client-orch-sm] [15210]: (note): MAC: 286b.3598.580f  Mobility discovery triggered. Client mode: Local
2023/08/04 14:24:27.931511962 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_L2_AUTH_IN_PROGRESS -> S_CO_MOBILITY_DISCOVERY_IN_PROGRESS
2023/08/04 14:24:27.931549952 {wncd_x_R0-0}{1}: [mm-client] [15210]: (note): MAC: 286b.3598.580f Mobility Successful. Roam Type None, Sub Roam Type MM_SUB_ROAM_TYPE_INTRA_INSTANCE, Previous BSSID MAC: 00df.1ddd.7d38  Client IFID: 0xa0000003, Client Role:
Local PoA: 0x9000000e PoP: 0x0
2023/08/04 14:24:27.931861935 {wncd_x_R0-0}{1}: [client-auth] [15210]: (note): MAC: 286b.3598.580f  ADD MOBILE sent. Client state flags: 0x76  BSSID: MAC: 00df.1ddd.a018 capwap IFID: 0x9000000e, Add mobiles sent: 1
2023/08/04 14:24:27.931913122 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_MOBILITY_DISCOVERY_IN_PROGRESS -> S_CO_DPATH_PLUMB_IN_PROGRESS
2023/08/04 14:24:27.933100190 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_DPATH_PLUMB_IN_PROGRESS -> S_CO_IP_LEARN_IN_PROGRESS
2023/08/04 14:24:27.933501101 {wncd_x_R0-0}{1}: [client-orch-state] [15210]: (note): MAC: 286b.3598.580f  Client state transition: S_CO_IP_LEARN_IN_PROGRESS -> S_CO_RUN
```

NetGear A8000

Não há suporte para WPA3-Enterprise neste cliente.

Pixel 6a

OTA de conexão com foco nas informações de RSN do cliente:

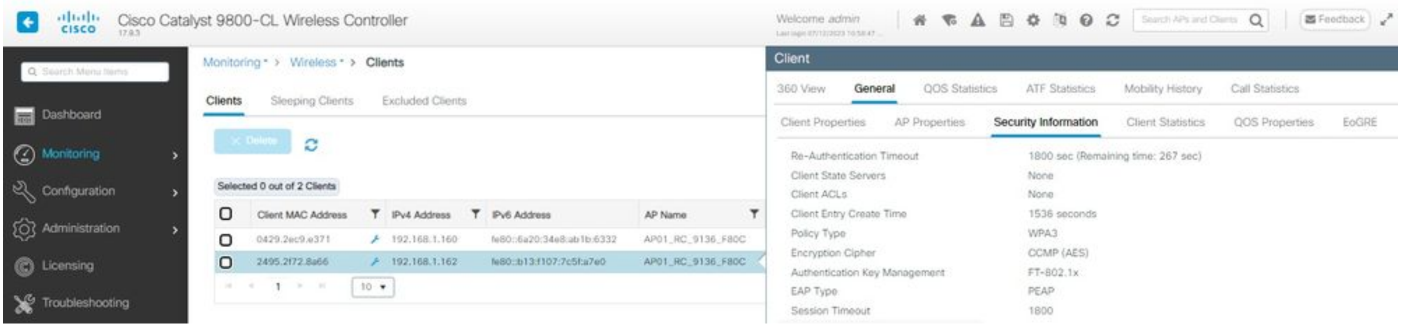


```
No.   Time      Delta    Source          Destination     Protocol Length Channel Signal stre Info
  878 1.460897  0.102322 Cisco_dd:a0:18  Broadcast       802.11   428    69 -37 dBm  Beacon frame, SN=3602, FN=0, Flags=........C, BI=100, SSID="wi
  889 1.562867  0.101970 Google_72:8a:66 Broadcast       802.11   204    69 -29 dBm  Probe Request, SN=1030, FN=0, Flags=........C, SSID="wifi6E_te
  890 1.563362  0.000495 Cisco_dd:a0:18  Broadcast       802.11   428    69 -37 dBm  Beacon frame, SN=3603, FN=0, Flags=........C, BI=100, SSID="wi
  892 1.564078  0.000716 Cisco_dd:a0:18  Broadcast       802.11   374    69 -37 dBm  Probe Response, SN=108, FN=0, Flags=........C, BI=100, SSID="w
  920 1.675576  0.111498 Cisco_dd:a0:18  Broadcast       802.11   428    69 -37 dBm  Beacon frame, SN=3605, FN=0, Flags=........C, BI=100, SSID="wi
  921 1.675809  0.000233 Google_72:8a:66 Cisco_dd:a0:18  802.11   108    69 -34 dBm  Authentication, SN=1031, FN=0, Flags=........C
  922 1.675809  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  923 1.679651  0.003842 Cisco_dd:a0:18  Google_72:8a:66 802.11   108    69 -37 dBm  Authentication, SN=14, FN=0, Flags=........C
  924 1.679651  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -34 dBm  Acknowledgement, Flags=........C
  925 1.681281  0.001630 Google_72:8a:66 Cisco_dd:a0:18  802.11   261    69 -34 dBm  Association Request, SN=1032, FN=0, Flags=........C, SSID="wif
  926 1.681281  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  930 1.705251  0.023970 Cisco_dd:a0:18  Google_72:8a:66 802.11   313    69 -37 dBm  Association Response, SN=0, FN=0, Flags=........C
  931 1.705251  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -31 dBm  Acknowledgement, Flags=........C
  932 1.710280  0.005029 Cisco_dd:a0:18  Google_72:8a:66 EAP      109    69 -37 dBm  Request, Identity
  933 1.710280  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -31 dBm  Acknowledgement, Flags=........C
  939 1.747377  0.037097 Google_72:8a:66 Cisco_dd:a0:18  EAP      117    69 -33 dBm  Response, Identity
  940 1.747377  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  942 1.758424  0.011047 Cisco_dd:a0:18  Google_72:8a:66 EAP      110    69 -37 dBm  Request, Protected EAP (EAP-PEAP)
  943 1.758424  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -31 dBm  Acknowledgement, Flags=........C
  945 1.768096  0.009672 Cisco_dd:a0:18  Broadcast       802.11   428    69 -37 dBm  Beacon frame, SN=3606, FN=0, Flags=........C, BI=100, SSID="wi
  946 1.768484  0.000388 Google_72:8a:66 Broadcast       LLC      114    69 -37 dBm  I, N(R)=26, N(S)=7; DSAP 0x68 Individual, SSAP NetWare Respons
  949 1.779457  0.010973 Google_72:8a:66 Cisco_dd:a0:18  TLSv1.2  241    69 -40 dBm  Client Hello
  950 1.779457  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  956 1.794520  0.015063 Cisco_dd:a0:18  Google_72:8a:66 EAP     1116    69 -37 dBm  Request, Protected EAP (EAP-PEAP)
  957 1.794520  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
  958 1.797058  0.002538 Google_72:8a:66 Cisco_dd:a0:18  EAP      110    69 -39 dBm  Response, Protected EAP (EAP-PEAP)
  959 1.797058  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  960 1.801714  0.004656 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  382    69 -37 dBm  Ignored Unknown Record
  961 1.801714  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  963 1.820673  0.018959 Google_72:8a:66 Cisco_dd:a0:18  TLSv1.2  236    69 -39 dBm  Client Key Exchange, Change Cipher Spec, Encrypted Handshake M
  964 1.820673  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  965 1.824990  0.004317 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  161    69 -37 dBm  Change Cipher Spec, Encrypted Handshake Message
  966 1.824990  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  968 1.829209  0.004219 Google_72:8a:66 Cisco_dd:a0:18  EAP      110    69 -39 dBm  Response, Protected EAP (EAP-PEAP)
  969 1.829209  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  971 1.833178  0.003969 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  144    69 -37 dBm  Application Data
  972 1.833178  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  973 1.837328  0.004150 Google_72:8a:66 Cisco_dd:a0:18  TLSv1.2  152    69 -39 dBm  Application Data
  974 1.837406  0.000078 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  976 1.840705  0.003299 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  171    69 -37 dBm  Application Data
  977 1.840705  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  978 1.845522  0.004817 Google_72:8a:66 Cisco_dd:a0:18  TLSv1.2  206    69 -39 dBm  Application Data
  979 1.845522  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  984 1.864594  0.019072 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  190    69 -37 dBm  Application Data
  985 1.864752  0.000158 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  986 1.866887  0.002135 Google_72:8a:66 Cisco_dd:a0:18  TLSv1.2  145    69 -40 dBm  Application Data
  987 1.866887  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  988 1.870658  0.003771 Cisco_dd:a0:18  Broadcast       802.11   428    69 -37 dBm  Beacon frame, SN=3607, FN=0, Flags=........C, BI=100, SSID="wi
  989 1.870658  0.000000 Cisco_dd:a0:18  Google_72:8a:66 TLSv1.2  143    69 -37 dBm  Application Data
  990 1.870658  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  992 1.877128  0.006470 Google_72:8a:66 Cisco_dd:a0:18  EAP      110    69 -38 dBm  Response, Protected EAP (EAP-PEAP)
  993 1.877128  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
  996 1.920065  0.042937 Cisco_dd:a0:18  Google_72:8a:66 EAP      108    69 -37 dBm  Success
  997 1.920065  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
  998 1.920065  0.000000 Cisco_dd:a0:18  Google_72:8a:66 EAPOL    221    69 -37 dBm  Key (Message 1 of 4)
  999 1.920065  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1000 1.925255  0.005190 Google_72:8a:66 Cisco_dd:a0:18  EAPOL    346    69 -40 dBm  Key (Message 2 of 4)
 1001 1.925255  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
 1004 1.926677  0.001422 Cisco_dd:a0:18  Google_72:8a:66 EAPOL    423    69 -37 dBm  Key (Message 3 of 4)
 1005 1.926677  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1006 1.928886  0.002209 Google_72:8a:66 Cisco_dd:a0:18  EAPOL    199    69 -39 dBm  Key (Message 4 of 4)
 1007 1.928886  0.000000 192.168.1.15    192.168.1.121   802.11    76    69 -37 dBm  Acknowledgement, Flags=........C
```

```
> Frame 925: 261 bytes on wire (2088 bits), 261 bytes captured (2088 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C3431
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
    > Fixed parameters (4 bytes)
    v Tagged parameters (167 bytes)
        > Tag: SSID parameter set: "wifi6E_test"
        > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
        > Tag: Power Capability Min: -7, Max: 19
        > Tag: Supported Channels
        v Tag: RSN Information
            Tag Number: RSN Information (48)
            Tag length: 26
            RSN Version: 1
          > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
            Pairwise Cipher Suite Count: 1
          > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
            Auth Key Management (AKM) Suite Count: 1
          v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
              v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
                    Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
                    Auth Key Management (AKM) type: FT over IEEE 802.1X (3)
          v RSN Capabilities: 0x00c0
                .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
                .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with
                .... .... .... 00.. = RSN PTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeySA (0x0)
                .... .... ..00 .... = RSN GTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeySA (0x0)
                .... .... .1.. .... = Management Frame Protection Required: True
                .... .... 1... .... = Management Frame Protection Capable: True
                .... ...0 .... .... = Joint Multi-band RSNA: False
                .... ..0. .... .... = PeerKey Enabled: False
                ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
            PMKID Count: 0
            PMKID List
          > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
        > Tag: RM Enabled Capabilities (5 octets)
        > Tag: Mobility Domain
        > Tag: Supported Operating Classes
        > Tag: Extended Capabilities (10 octets)
        > Ext Tag: HE Capabilities
        > Ext Tag: HE 6 GHz Band Capabilities
        v Tag: Vendor Specific: Broadcom
            Tag Number: Vendor Specific (221)
            Tag length: 10
            OUI: 00:10:18 (Broadcom)
            Vendor Specific OUI Type: 2
            Vendor Specific Data: 0200001000000000
        > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
```

Associação WPA3 Enterprise 802.1x + FT Pixel6a

Detalhes do cliente no WLC:



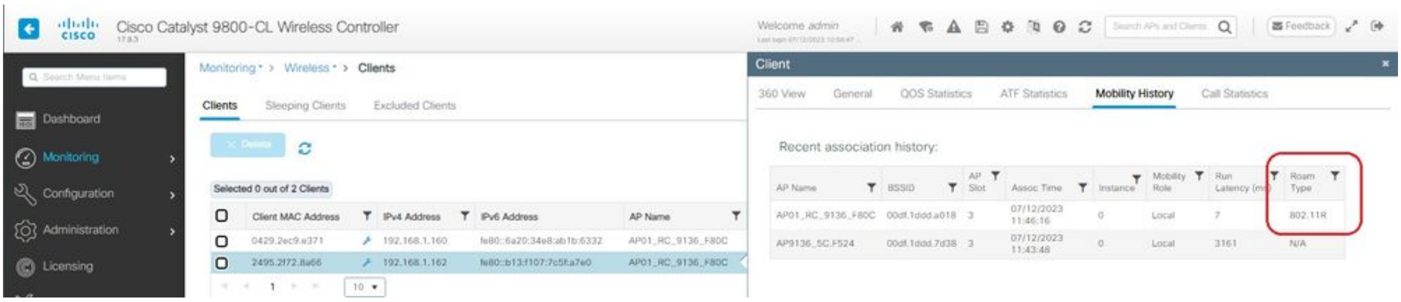
Selected 0 out of 2 Clients

☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
☐	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP01_RC_9136_F80C
☐	2495.2172.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP01_RC_9136_F80C

Re-Authentication Timeout	1800 sec (Remaining time: 267 sec)
Client State Servers	None
Client ACLs	None
Client Entry Create Time	1536 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	FT-802.1x
EAP Type	PEAP
Session Timeout	1800

Detalhes do cliente WPA3 Enterprise 802.1x + FT Pixel6a

Concentre-se no tipo de roam Over the Air, onde podemos ver o tipo de roam 802.11R:



Selected 0 out of 2 Clients

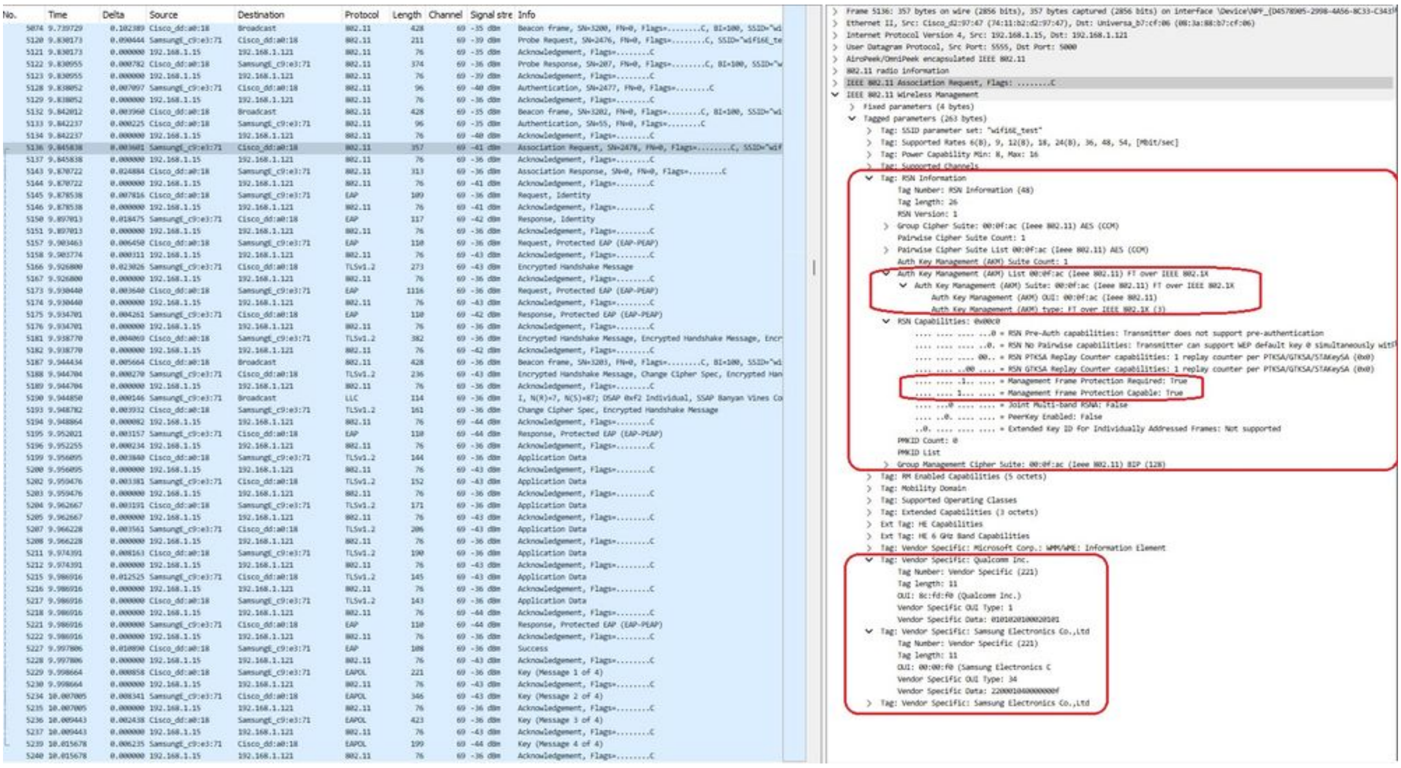
☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
☐	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP01_RC_9136_F80C
☐	2495.2172.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP01_RC_9136_F80C

Recent association history:

AP Name	BSSID	AP Slot	Assoc Time	Instance	Mobility Role	Run Latency (ms)	Roam Type
AP01_RC_9136_F80C	00df.1ddd.a018	3	07/12/2023 11:46:16	0	Local	7	802.11R
AP9136_5C.F524	00df.1ddd.7d38	3	07/12/2023 11:43:48	0	Local	3161	N/A

Samsung S23

OTA de conexão com foco nas informações de RSN do cliente:

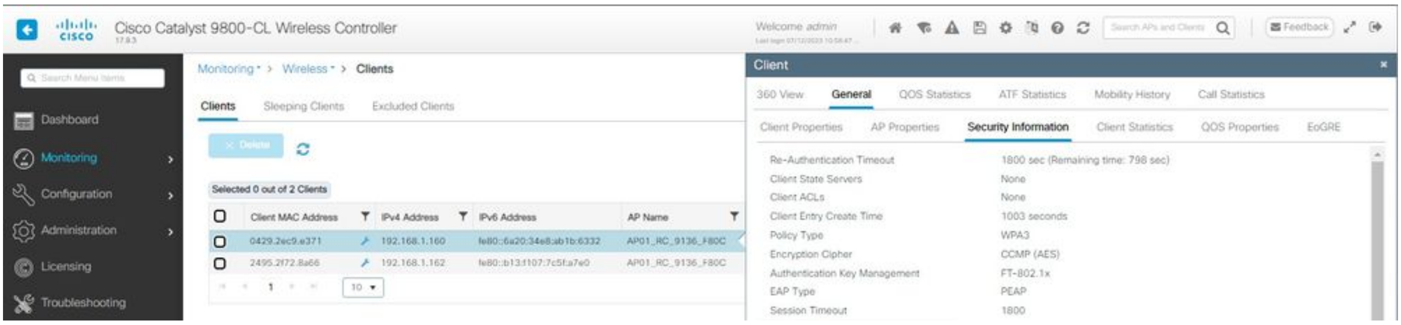


```
No.   Time       Delta     Source             Destination        Protocol Length Channel Signal stre Info
 5074 9.739729   0.102389 Cisco_dd:a0:18      Broadcast          802.11     428   69 -35 dBm   Beacon frame, SN=3200, FN=0, Flags=........C, BI=100, SSID="wi
 5120 9.830173   0.090444 SamsungE_c9:e3:71   Cisco_dd:a0:18     802.11     211   69 -39 dBm   Probe Request, SN=2476, FN=0, Flags=........C, SSID="wifi6E_te
 5121 9.830173   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -35 dBm   Acknowledgement, Flags=........C
 5122 9.830955   0.000782 Cisco_dd:a0:18      SamsungE_c9:e3:71  802.11     374   69 -36 dBm   Probe Response, SN=207, FN=0, Flags=........C, BI=100, SSID="w
 5123 9.830955   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -39 dBm   Acknowledgement, Flags=........C
 5128 9.838052   0.007097 SamsungE_c9:e3:71   Cisco_dd:a0:18     802.11      96   69 -40 dBm   Authentication, SN=2477, FN=0, Flags=........C
 5129 9.838052   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5132 9.842012   0.003960 Cisco_dd:a0:18      Broadcast          802.11     428   69 -35 dBm   Beacon frame, SN=3202, FN=0, Flags=........C, BI=100, SSID="wi
 5133 9.842237   0.000225 Cisco_dd:a0:18      SamsungE_c9:e3:71  802.11      96   69 -35 dBm   Authentication, SN=55, FN=0, Flags=........C
 5134 9.842237   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -40 dBm   Acknowledgement, Flags=........C
 5136 9.845838   0.003601 SamsungE_c9:e3:71   Cisco_dd:a0:18     802.11     357   69 -41 dBm   Association Request, SN=2478, FN=0, Flags=........C, SSID="wif
 5137 9.845838   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5143 9.870722   0.024884 Cisco_dd:a0:18      SamsungE_c9:e3:71  802.11     313   69 -36 dBm   Association Response, SN=0, FN=0, Flags=........C
 5144 9.870722   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -41 dBm   Acknowledgement, Flags=........C
 5145 9.878538   0.007816 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAP        109   69 -36 dBm   Request, Identity
 5146 9.878538   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -41 dBm   Acknowledgement, Flags=........C
 5150 9.897013   0.018475 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAP        117   69 -42 dBm   Response, Identity
 5151 9.897013   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5157 9.903463   0.006450 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAP        110   69 -36 dBm   Request, Protected EAP (EAP-PEAP)
 5158 9.903774   0.000311 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5166 9.926800   0.023026 SamsungE_c9:e3:71   Cisco_dd:a0:18     TLSv1.2    273   69 -43 dBm   Encrypted Handshake Message
 5167 9.926800   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5173 9.930440   0.003640 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAP       1116   69 -36 dBm   Request, Protected EAP (EAP-PEAP)
 5174 9.930440   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5175 9.934701   0.004261 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAP        110   69 -42 dBm   Response, Protected EAP (EAP-PEAP)
 5176 9.934701   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5181 9.938770   0.004069 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    382   69 -36 dBm   Encrypted Handshake Message, Encrypted Handshake Message, Encr
 5182 9.938770   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -42 dBm   Acknowledgement, Flags=........C
 5187 9.944434   0.005664 Cisco_dd:a0:18      Broadcast          802.11     428   69 -36 dBm   Beacon frame, SN=3203, FN=0, Flags=........C, BI=100, SSID="wi
 5188 9.944704   0.000270 SamsungE_c9:e3:71   Cisco_dd:a0:18     TLSv1.2    236   69 -43 dBm   Encrypted Handshake Message, Change Cipher Spec, Encrypted Han
 5189 9.944704   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5190 9.944850   0.000146 SamsungE_c9:e3:71   Broadcast          LLC        114   69 -36 dBm   I, N(R)=7, N(S)=87; DSAP 0xf2 Individual, SSAP Banyan Vines Co
 5193 9.948782   0.003932 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    161   69 -36 dBm   Change Cipher Spec, Encrypted Handshake Message
 5194 9.948864   0.000082 192.168.1.15        192.168.1.121      802.11      76   69 -44 dBm   Acknowledgement, Flags=........C
 5195 9.952021   0.003157 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAP        110   69 -44 dBm   Response, Protected EAP (EAP-PEAP)
 5196 9.952255   0.000234 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5199 9.956095   0.003840 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    144   69 -36 dBm   Application Data
 5200 9.956095   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5202 9.959476   0.003381 SamsungE_c9:e3:71   Cisco_dd:a0:18     TLSv1.2    152   69 -43 dBm   Application Data
 5203 9.959476   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5204 9.962667   0.003191 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    171   69 -36 dBm   Application Data
 5205 9.962667   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5207 9.966228   0.003561 SamsungE_c9:e3:71   Cisco_dd:a0:18     TLSv1.2    206   69 -43 dBm   Application Data
 5208 9.966228   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5211 9.974391   0.008163 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    190   69 -36 dBm   Application Data
 5212 9.974391   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5215 9.986916   0.012525 SamsungE_c9:e3:71   Cisco_dd:a0:18     TLSv1.2    145   69 -43 dBm   Application Data
 5216 9.986916   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5217 9.986916   0.000000 Cisco_dd:a0:18      SamsungE_c9:e3:71  TLSv1.2    143   69 -36 dBm   Application Data
 5218 9.986916   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -44 dBm   Acknowledgement, Flags=........C
 5221 9.986916   0.000000 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAP        110   69 -44 dBm   Response, Protected EAP (EAP-PEAP)
 5222 9.986916   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5227 9.997806   0.010890 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAP        108   69 -36 dBm   Success
 5228 9.997806   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5229 9.998664   0.000858 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAPOL      221   69 -36 dBm   Key (Message 1 of 4)
 5230 9.998664   0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5234 10.007005  0.008341 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAPOL      346   69 -43 dBm   Key (Message 2 of 4)
 5235 10.007005  0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
 5236 10.009443  0.002438 Cisco_dd:a0:18      SamsungE_c9:e3:71  EAPOL      423   69 -36 dBm   Key (Message 3 of 4)
 5237 10.009443  0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -43 dBm   Acknowledgement, Flags=........C
 5239 10.015678  0.006235 SamsungE_c9:e3:71   Cisco_dd:a0:18     EAPOL      199   69 -44 dBm   Key (Message 4 of 4)
 5240 10.015678  0.000000 192.168.1.15        192.168.1.121      802.11      76   69 -36 dBm   Acknowledgement, Flags=........C
```

```
> Frame 5136: 357 bytes on wire (2856 bits), 357 bytes captured (2856 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C343
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Association Request, Flags: ........C
v IEEE 802.11 Wireless Management
   > Fixed parameters (4 bytes)
   v Tagged parameters (263 bytes)
      > Tag: SSID parameter set: "wifi6E_test"
      > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
      > Tag: Power Capability Min: 8, Max: 16
      > Tag: Supported Channels
      v Tag: RSN Information
           Tag Number: RSN Information (48)
           Tag length: 26
           RSN Version: 1
         > Group Cipher Suite: 00:0f:ac (Ieee 802.11) AES (CCM)
           Pairwise Cipher Suite Count: 1
         > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) AES (CCM)
           Auth Key Management (AKM) Suite Count: 1
         v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
            v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) FT over IEEE 802.1X
                 Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
                 Auth Key Management (AKM) type: FT over IEEE 802.1X (3)
         v RSN Capabilities: 0x00c0
              .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
              .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously wit
              .... .... .... 00.. = RSN PTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeySA (0x0)
              .... .... ..00 .... = RSN GTKSA Replay Counter capabilities: 1 replay counter per PTKSA/GTKSA/STAKeySA (0x0)
              .... .... .1.. .... = Management Frame Protection Required: True
              .... .... 1... .... = Management Frame Protection Capable: True
              .... ...0 .... .... = Joint Multi-band RSNA: False
              .... ..0. .... .... = PeerKey Enabled: False
              ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
           PMKID Count: 0
           PMKID List
         > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (128)
      > Tag: RM Enabled Capabilities (5 octets)
      > Tag: Mobility Domain
      > Tag: Supported Operating Classes
      > Tag: Extended Capabilities (3 octets)
      > Ext Tag: HE Capabilities
      > Ext Tag: HE 6 GHz Band Capabilities
      > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
      v Tag: Vendor Specific: Qualcomm Inc.
           Tag Number: Vendor Specific (221)
           Tag length: 11
           OUI: 8c:fd:f0 (Qualcomm Inc.)
           Vendor Specific OUI Type: 1
           Vendor Specific Data: 0101020100020101
      v Tag: Vendor Specific: Samsung Electronics Co.,Ltd
           Tag Number: Vendor Specific (221)
           Tag length: 11
           OUI: 00:00:f0 (Samsung Electronics C
           Vendor Specific OUI Type: 34
           Vendor Specific Data: 2200010400000000f
      > Tag: Vendor Specific: Samsung Electronics Co.,Ltd
```

Evento de roaming S23 FToTA

Detalhes do cliente no WLC:



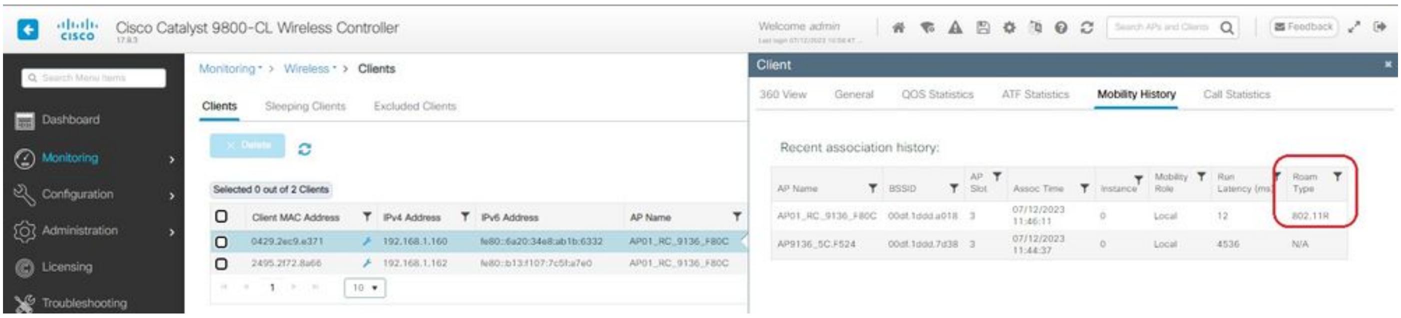
Selected 0 out of 2 Clients

☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
☐	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP01_RC_9136_F80C
☐	2495.2f72.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP01_RC_9136_F80C

Re-Authentication Timeout	1800 sec (Remaining time: 798 sec)
Client State Servers	None
Client ACLs	None
Client Entry Create Time	1003 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	FT-802.1x
EAP Type	PEAP
Session Timeout	1800

Propriedades do cliente S23

Concentre-se no tipo de roam Over the Air, onde podemos ver o tipo de roam 802.11R:



Selected 0 out of 2 Clients

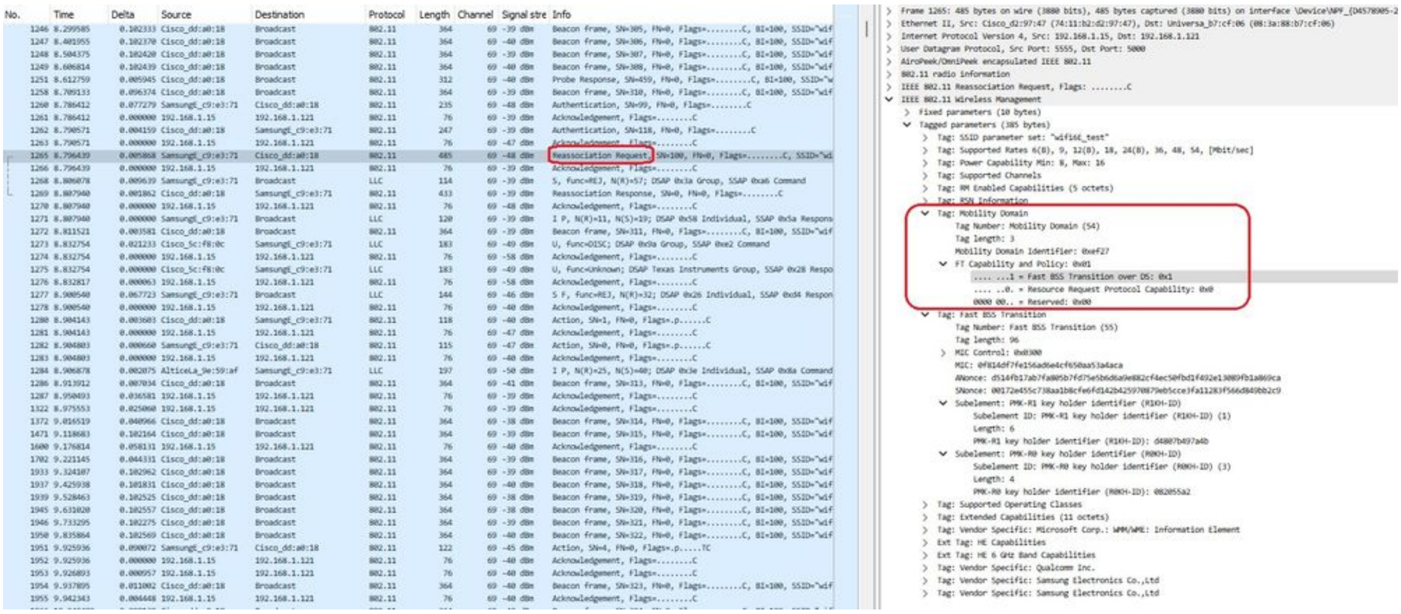
☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name
☐	0429.2ec9.e371	192.168.1.160	fe80::6a20:34e8:ab1b:6332	AP01_RC_9136_F80C
☐	2495.2f72.8a66	192.168.1.162	fe80::b13:f107:7c5f:a7e0	AP01_RC_9136_F80C

Recent association history:

AP Name	BSSID	AP Slot	Assoc Time	Instance	Mobility Role	Run Latency (ms)	Roam Type
AP01_RC_9136_F80C	00df.1ddd.a018	3	07/12/2023 11:46:11	0	Local	12	802.11R
AP9136_5C.F524	00df.1ddd.7d38	3	07/12/2023 11:44:37	0	Local	4536	N/A

S23 Roaming tipo 802.11R

Esse cliente também foi testado usando FT no DS e conseguiu fazer roaming usando 802.11r:



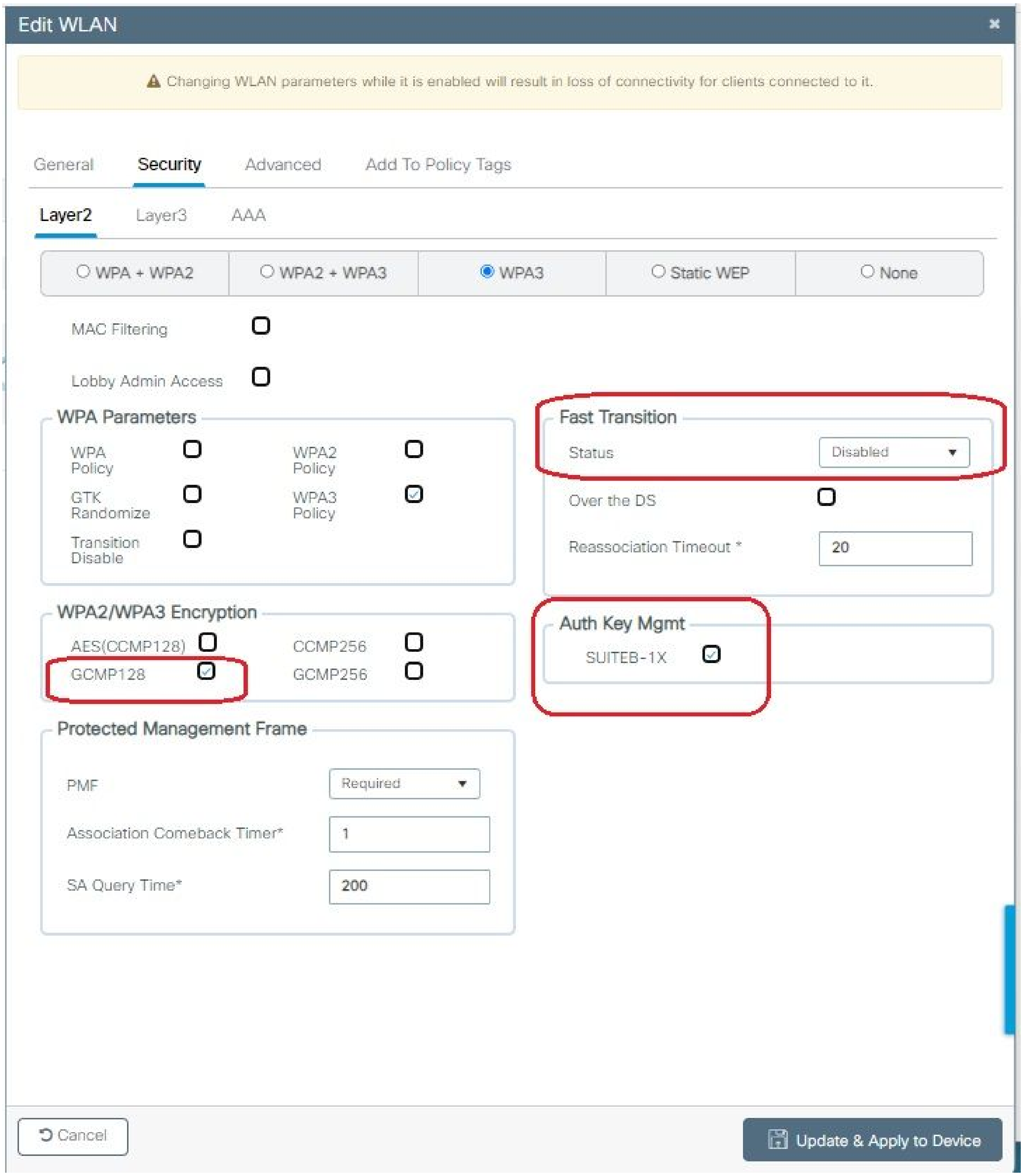
```
No.   Time     Delta    Source             Destination        Protocol Length Channel Signal stre Info
 1246 8.299585 0.102333 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=305, FN=0, Flags=........C, BI=100, SSID="wif
 1247 8.401955 0.102370 Cisco_dd:a0:18     Broadcast          802.11   364    69 -40 dBm  Beacon frame, SN=306, FN=0, Flags=........C, BI=100, SSID="wif
 1248 8.504375 0.102420 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=307, FN=0, Flags=........C, BI=100, SSID="wif
 1249 8.606814 0.102439 Cisco_dd:a0:18     Broadcast          802.11   364    69 -40 dBm  Beacon frame, SN=308, FN=0, Flags=........C, BI=100, SSID="wif
 1251 8.612759 0.005945 Cisco_dd:a0:18     Broadcast          802.11   312    69 -40 dBm  Probe Response, SN=459, FN=0, Flags=........C, BI=100, SSID="w
 1258 8.709133 0.096374 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=310, FN=0, Flags=........C, BI=100, SSID="wif
 1260 8.786412 0.077279 SamsungE_c9:e3:71  Cisco_dd:a0:18     802.11   235    69 -48 dBm  Authentication, SN=99, FN=0, Flags=........C
 1261 8.786412 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1262 8.790571 0.004159 Cisco_dd:a0:18     SamsungE_c9:e3:71  802.11   247    69 -39 dBm  Authentication, SN=118, FN=0, Flags=........C
 1263 8.790571 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -47 dBm  Acknowledgement, Flags=........C
 1265 8.796439 0.005868 SamsungE_c9:e3:71  Cisco_dd:a0:18     802.11   485    69 -48 dBm  Reassociation Request, SN=100, FN=0, Flags=........C, SSID="wi
 1266 8.796439 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1268 8.806078 0.009639 SamsungE_c9:e3:71  Broadcast          LLC      114    69 -39 dBm  S, func=REJ, N(R)=57; DSAP 0x3a Group, SSAP 0xa6 Command
 1269 8.807940 0.001862 Cisco_dd:a0:18     SamsungE_c9:e3:71  802.11   433    69 -39 dBm  Reassociation Response, SN=0, FN=0, Flags=........C
 1270 8.807940 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -48 dBm  Acknowledgement, Flags=........C
 1271 8.807940 0.000000 SamsungE_c9:e3:71  Broadcast          LLC      120    69 -39 dBm  I P, N(R)=11, N(S)=19; DSAP 0x58 Individual, SSAP 0x5a Respons
 1272 8.811521 0.003581 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=311, FN=0, Flags=........C, BI=100, SSID="wif
 1273 8.832754 0.021233 Cisco_5c:f8:0c     SamsungE_c9:e3:71  LLC      183    69 -49 dBm  U, func=DISC; DSAP 0x9a Group, SSAP 0xe2 Command
 1274 8.832754 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -58 dBm  Acknowledgement, Flags=........C
 1275 8.832754 0.000000 Cisco_5c:f8:0c     SamsungE_c9:e3:71  LLC      183    69 -49 dBm  U, func=Unknown; DSAP Texas Instruments Group, SSAP 0x28 Respo
 1276 8.832817 0.000063 192.168.1.15       192.168.1.121      802.11    76    69 -58 dBm  Acknowledgement, Flags=........C
 1277 8.900540 0.067723 SamsungE_c9:e3:71  Broadcast          LLC      144    69 -46 dBm  S F, func=REJ, N(R)=32; DSAP 0x26 Individual, SSAP 0xd4 Respon
 1278 8.900540 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
 1280 8.904143 0.003603 Cisco_dd:a0:18     SamsungE_c9:e3:71  802.11   118    69 -40 dBm  Action, SN=1, FN=0, Flags=.p......C
 1281 8.904143 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -47 dBm  Acknowledgement, Flags=........C
 1282 8.904803 0.000660 SamsungE_c9:e3:71  Cisco_dd:a0:18     802.11   115    69 -47 dBm  Action, SN=0, FN=0, Flags=.p......C
 1283 8.904803 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
 1284 8.906878 0.002075 AlticeLa_9e:59:af  SamsungE_c9:e3:71  LLC      197    69 -50 dBm  I P, N(R)=25, N(S)=40; DSAP 0x3e Individual, SSAP 0x8a Command
 1286 8.913912 0.007034 Cisco_dd:a0:18     Broadcast          802.11   364    69 -41 dBm  Beacon frame, SN=313, FN=0, Flags=........C, BI=100, SSID="wif
 1287 8.950493 0.036581 192.168.1.15       192.168.1.121      802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1322 8.975553 0.025060 192.168.1.15       192.168.1.121      802.11    76    69 -39 dBm  Acknowledgement, Flags=........C
 1372 9.016519 0.040966 Cisco_dd:a0:18     Broadcast          802.11   364    69 -38 dBm  Beacon frame, SN=314, FN=0, Flags=........C, BI=100, SSID="wif
 1471 9.118683 0.102164 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=315, FN=0, Flags=........C, BI=100, SSID="wif
 1600 9.176814 0.058131 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
 1702 9.221145 0.044331 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=316, FN=0, Flags=........C, BI=100, SSID="wif
 1933 9.324107 0.102962 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=317, FN=0, Flags=........C, BI=100, SSID="wif
 1937 9.425938 0.101831 Cisco_dd:a0:18     Broadcast          802.11   364    69 -40 dBm  Beacon frame, SN=318, FN=0, Flags=........C, BI=100, SSID="wif
 1939 9.528463 0.102525 Cisco_dd:a0:18     Broadcast          802.11   364    69 -38 dBm  Beacon frame, SN=319, FN=0, Flags=........C, BI=100, SSID="wif
 1945 9.631020 0.102557 Cisco_dd:a0:18     Broadcast          802.11   364    69 -38 dBm  Beacon frame, SN=320, FN=0, Flags=........C, BI=100, SSID="wif
 1946 9.733295 0.102275 Cisco_dd:a0:18     Broadcast          802.11   364    69 -39 dBm  Beacon frame, SN=321, FN=0, Flags=........C, BI=100, SSID="wif
 1950 9.835864 0.102569 Cisco_dd:a0:18     Broadcast          802.11   364    69 -40 dBm  Beacon frame, SN=322, FN=0, Flags=........C, BI=100, SSID="wif
 1951 9.925936 0.090072 SamsungE_c9:e3:71  Cisco_dd:a0:18     802.11   122    69 -45 dBm  Action, SN=4, FN=0, Flags=.p.....TC
 1952 9.925936 0.000000 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
 1953 9.926893 0.000957 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
 1954 9.937895 0.011002 Cisco_dd:a0:18     Broadcast          802.11   364    69 -40 dBm  Beacon frame, SN=323, FN=0, Flags=........C, BI=100, SSID="wif
 1955 9.942343 0.004448 192.168.1.15       192.168.1.121      802.11    76    69 -40 dBm  Acknowledgement, Flags=........C
```

```
> Frame 1265: 485 bytes on wire (3880 bits), 485 bytes captured (3880 bits) on interface \Device\NPF_{D4578905-2
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Reassociation Request, Flags: ........C
v IEEE 802.11 Wireless Management
   > Fixed parameters (10 bytes)
   v Tagged parameters (385 bytes)
      > Tag: SSID parameter set: "wifi6E_test"
      > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
      > Tag: Power Capability Min: 8, Max: 16
      > Tag: Supported Channels
      > Tag: RM Enabled Capabilities (5 octets)
      > Tag: RSN Information
      v Tag: Mobility Domain
            Tag Number: Mobility Domain (54)
            Tag length: 3
            Mobility Domain Identifier: 0xef27
         v FT Capability and Policy: 0x01
               .... ...1 = Fast BSS Transition over DS: 0x1
               .... ..0. = Resource Request Protocol Capability: 0x0
               0000 00.. = Reserved: 0x00
      v Tag: Fast BSS Transition
            Tag Number: Fast BSS Transition (55)
            Tag length: 96
         > MIC Control: 0x0300
            MIC: 0f814df7fe156ad6e4cf650aa53a4aca
            ANonce: d514fb17ab7fa005b7fd75e5b6d6a9e082cf4ec50fbd1f492e13089fb1a869ca
            SNonce: 00172e455c738aa1b8cfe6fd142b4259708 79eb5cce3fa11283f566d849bb2c9
         v Subelement: PMK-R1 key holder identifier (R1KH-ID)
               Subelement ID: PMK-R1 key holder identifier (R1KH-ID) (1)
               Length: 6
               PMK-R1 key holder identifier (R1KH-ID): d4807b497a4b
         v Subelement: PMK-R0 key holder identifier (R0KH-ID)
               Subelement ID: PMK-R0 key holder identifier (R0KH-ID) (3)
               Length: 4
               PMK-R0 key holder identifier (R0KH-ID): 082055a2
      > Tag: Supported Operating Classes
      > Tag: Extended Capabilities (11 octets)
      > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Information Element
      > Ext Tag: HE Capabilities
      > Ext Tag: HE 6 GHz Band Capabilities
      > Tag: Vendor Specific: Qualcomm Inc.
      > Tag: Vendor Specific: Samsung Electronics Co.,Ltd
      > Tag: Vendor Specific: Samsung Electronics Co.,Ltd
```

S23 Pacotes FToDS em roaming

WPA3-Empresa + codificação GCMP128 + SUITEB-1X

Configuração de segurança da WLAN:



Edit WLAN

⚠ Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

General | **Security** | Advanced | Add To Policy Tags

Layer2 | Layer3 | AAA

○ WPA + WPA2 | ○ WPA2 + WPA3 | ● WPA3 | ○ Static WEP | ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

- WPA Policy □
- WPA2 Policy □
- GTK Randomize □
- WPA3 Policy ☑
- Transition Disable □

WPA2/WPA3 Encryption

- AES(CCMP128) □
- CCMP256 □
- GCMP128 ☑
- GCMP256 □

Protected Management Frame

- PMF: Required
- Association Comeback Timer*: 1
- SA Query Time*: 200

Fast Transition

- Status: Disabled
- Over the DS □
- Reassociation Timeout *: 20

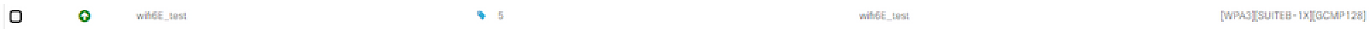
Auth Key Mgmt

- SUITEB-1X ☑

Configuração de segurança do WPA3 Enterprise SuiteB-1X

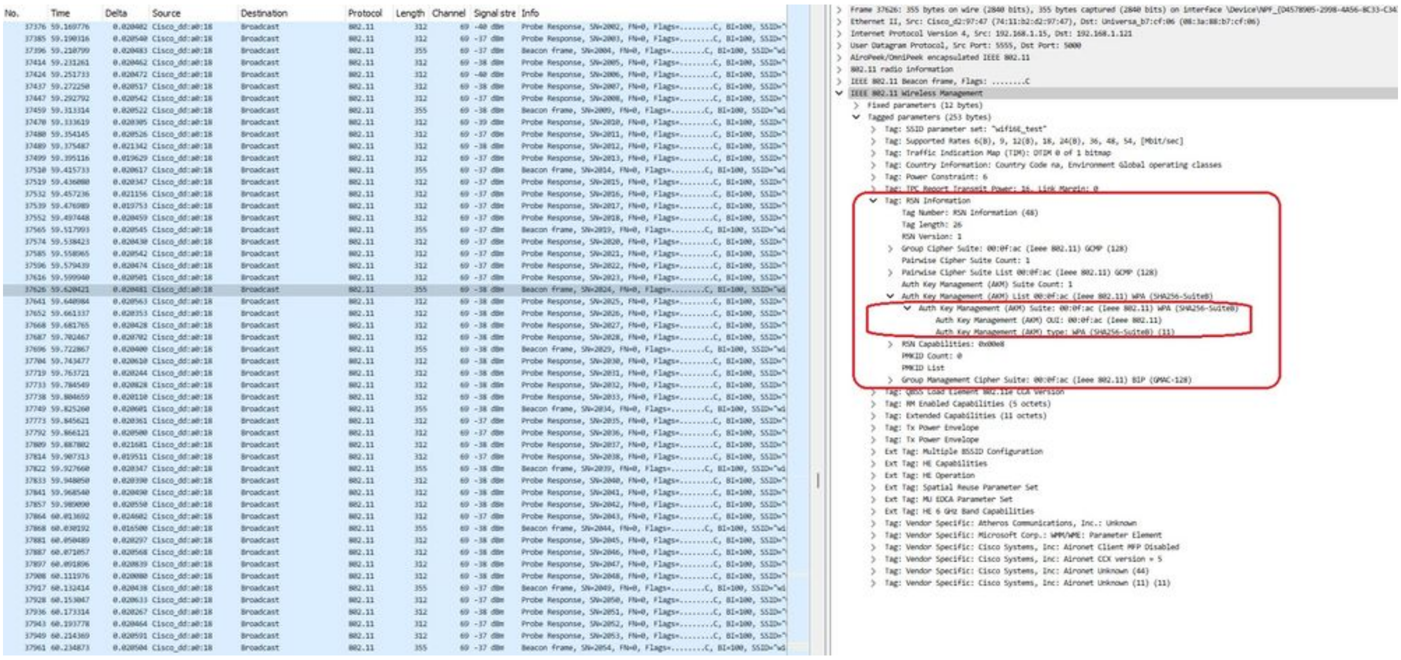
Observação: o FT não é suportado no SUITEB-1X

Visualizar na GUI da WLC as configurações de segurança da WLAN:



□ wifi6E_test 5 wifi6E_test [WPA3][SUITEB-1X][GCMP128]

Verificação das balizas OTA:



```
No.    Time      Delta    Source            Destination  Protocol Length Channel Signal stre Info
 37376 59.169776 0.020402 Cisco_dd:a0:18   Broadcast    802.11   312    69 -40 dBm  Probe Response, SN=2002, FN=0, Flags=........C, BI=100, SSID="
 37385 59.190316 0.020540 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2003, FN=0, Flags=........C, BI=100, SSID="
 37396 59.210799 0.020483 Cisco_dd:a0:18   Broadcast    802.11   355    69 -37 dBm  Beacon frame, SN=2004, FN=0, Flags=........C, BI=100, SSID="wi
 37414 59.231261 0.020462 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2005, FN=0, Flags=........C, BI=100, SSID="
 37424 59.251733 0.020472 Cisco_dd:a0:18   Broadcast    802.11   312    69 -40 dBm  Probe Response, SN=2006, FN=0, Flags=........C, BI=100, SSID="
 37437 59.272250 0.020517 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2007, FN=0, Flags=........C, BI=100, SSID="
 37447 59.292792 0.020542 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2008, FN=0, Flags=........C, BI=100, SSID="
 37459 59.313314 0.020522 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2009, FN=0, Flags=........C, BI=100, SSID="wi
 37470 59.333619 0.020305 Cisco_dd:a0:18   Broadcast    802.11   312    69 -39 dBm  Probe Response, SN=2010, FN=0, Flags=........C, BI=100, SSID="
 37480 59.354145 0.020526 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2011, FN=0, Flags=........C, BI=100, SSID="
 37489 59.375487 0.021342 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2012, FN=0, Flags=........C, BI=100, SSID="
 37499 59.395116 0.019629 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2013, FN=0, Flags=........C, BI=100, SSID="
 37510 59.415733 0.020617 Cisco_dd:a0:18   Broadcast    802.11   355    69 -37 dBm  Beacon frame, SN=2014, FN=0, Flags=........C, BI=100, SSID="wi
 37519 59.436080 0.020347 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2015, FN=0, Flags=........C, BI=100, SSID="
 37532 59.457236 0.021156 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2016, FN=0, Flags=........C, BI=100, SSID="
 37539 59.476989 0.019753 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2017, FN=0, Flags=........C, BI=100, SSID="
 37552 59.497448 0.020459 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2018, FN=0, Flags=........C, BI=100, SSID="
 37565 59.517993 0.020545 Cisco_dd:a0:18   Broadcast    802.11   355    69 -37 dBm  Beacon frame, SN=2019, FN=0, Flags=........C, BI=100, SSID="wi
 37574 59.538423 0.020430 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2020, FN=0, Flags=........C, BI=100, SSID="
 37585 59.558965 0.020542 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2021, FN=0, Flags=........C, BI=100, SSID="
 37596 59.579439 0.020474 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2022, FN=0, Flags=........C, BI=100, SSID="
 37616 59.599940 0.020501 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2023, FN=0, Flags=........C, BI=100, SSID="
 37626 59.620421 0.020481 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2024, FN=0, Flags=........C, BI=100, SSID="wi
 37641 59.640984 0.020563 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2025, FN=0, Flags=........C, BI=100, SSID="
 37652 59.661337 0.020353 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2026, FN=0, Flags=........C, BI=100, SSID="
 37668 59.681765 0.020428 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2027, FN=0, Flags=........C, BI=100, SSID="
 37687 59.702467 0.020702 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2028, FN=0, Flags=........C, BI=100, SSID="
 37696 59.722867 0.020400 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2029, FN=0, Flags=........C, BI=100, SSID="wi
 37704 59.743477 0.020610 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2030, FN=0, Flags=........C, BI=100, SSID="
 37719 59.763721 0.020244 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2031, FN=0, Flags=........C, BI=100, SSID="
 37733 59.784549 0.020828 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2032, FN=0, Flags=........C, BI=100, SSID="
 37738 59.804659 0.020110 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2033, FN=0, Flags=........C, BI=100, SSID="
 37749 59.825260 0.020601 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2034, FN=0, Flags=........C, BI=100, SSID="wi
 37773 59.845621 0.020361 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2035, FN=0, Flags=........C, BI=100, SSID="
 37792 59.866121 0.020500 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2036, FN=0, Flags=........C, BI=100, SSID="
 37809 59.887802 0.021681 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2037, FN=0, Flags=........C, BI=100, SSID="
 37814 59.907313 0.019511 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2038, FN=0, Flags=........C, BI=100, SSID="
 37822 59.927660 0.020347 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2039, FN=0, Flags=........C, BI=100, SSID="wi
 37833 59.948050 0.020390 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2040, FN=0, Flags=........C, BI=100, SSID="
 37841 59.968540 0.020490 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2041, FN=0, Flags=........C, BI=100, SSID="
 37857 59.989090 0.020550 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2042, FN=0, Flags=........C, BI=100, SSID="
 37864 60.013692 0.024602 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2043, FN=0, Flags=........C, BI=100, SSID="
 37868 60.030192 0.016500 Cisco_dd:a0:18   Broadcast    802.11   355    69 -38 dBm  Beacon frame, SN=2044, FN=0, Flags=........C, BI=100, SSID="wi
 37881 60.050489 0.020297 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2045, FN=0, Flags=........C, BI=100, SSID="
 37887 60.071057 0.020568 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2046, FN=0, Flags=........C, BI=100, SSID="
 37897 60.091896 0.020839 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2047, FN=0, Flags=........C, BI=100, SSID="
 37908 60.111976 0.020080 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2048, FN=0, Flags=........C, BI=100, SSID="
 37917 60.132414 0.020438 Cisco_dd:a0:18   Broadcast    802.11   355    69 -37 dBm  Beacon frame, SN=2049, FN=0, Flags=........C, BI=100, SSID="wi
 37928 60.153047 0.020633 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2050, FN=0, Flags=........C, BI=100, SSID="
 37936 60.173314 0.020267 Cisco_dd:a0:18   Broadcast    802.11   312    69 -38 dBm  Probe Response, SN=2051, FN=0, Flags=........C, BI=100, SSID="
 37943 60.193778 0.020464 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2052, FN=0, Flags=........C, BI=100, SSID="
 37949 60.214369 0.020591 Cisco_dd:a0:18   Broadcast    802.11   312    69 -37 dBm  Probe Response, SN=2053, FN=0, Flags=........C, BI=100, SSID="
 37961 60.234873 0.020504 Cisco_dd:a0:18   Broadcast    802.11   355    69 -37 dBm  Beacon frame, SN=2054, FN=0, Flags=........C, BI=100, SSID="wi
```

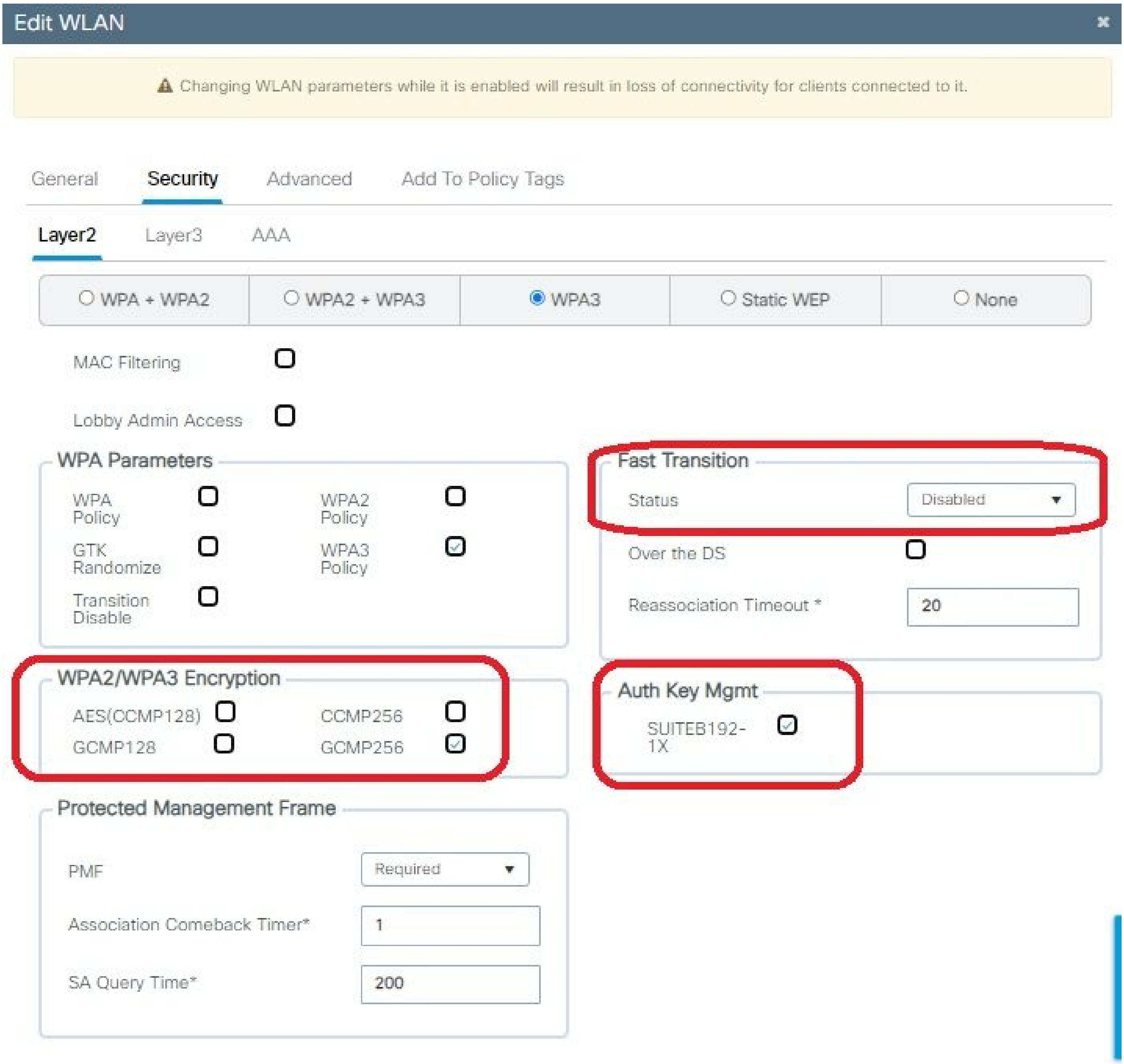
```
> Frame 37626: 355 bytes on wire (2840 bits), 355 bytes captured (2840 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C34
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (12 bytes)
  v Tagged parameters (253 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Traffic Indication Map (TIM): DTIM 0 of 1 bitmap
    > Tag: Country Information: Country Code na, Environment Global operating classes
    > Tag: Power Constraint: 6
    > Tag: TPC Report Transmit Power: 16, Link Margin: 0
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) GCMP (128)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) GCMP (128)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) WPA (SHA256-SuiteB)
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) WPA (SHA256-SuiteB)
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: WPA (SHA256-SuiteB) (11)
      > RSN Capabilities: 0x00e8
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (GMAC-128)
    > Tag: QBSS Load Element 802.11e CCA Version
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (11 octets)
    > Tag: Tx Power Envelope
    > Tag: Tx Power Envelope
    > Ext Tag: Multiple BSSID Configuration
    > Ext Tag: HE Capabilities
    > Ext Tag: HE Operation
    > Ext Tag: Spatial Reuse Parameter Set
    > Ext Tag: MU EDCA Parameter Set
    > Ext Tag: HE 6 GHz Band Capabilities
    > Tag: Vendor Specific: Atheros Communications, Inc.: Unknown
    > Tag: Vendor Specific: Microsoft Corp.: WMM/WME: Parameter Element
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Client MFP Disabled
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet CCX version = 5
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (44)
    > Tag: Vendor Specific: Cisco Systems, Inc: Aironet Unknown (11) (11)
```

Beacon WPA3 Enterprise SuiteB-1X

Nenhum dos clientes testados conseguiu se conectar à WLAN usando o SuiteB-1X, confirmando que nenhum suporta esse método de segurança.

WPA3-Empresa + codificação GCMP256 + SUITEB192-1X

Configuração de segurança da WLAN:



Edit WLAN

⚠ Changing WLAN parameters while it is enabled will result in loss of connectivity for clients connected to it.

General | **Security** | Advanced | Add To Policy Tags

Layer2 | Layer3 | AAA

○ WPA + WPA2 ○ WPA2 + WPA3 ● WPA3 ○ Static WEP ○ None

MAC Filtering □

Lobby Admin Access □

WPA Parameters

- WPA Policy □
- WPA2 Policy □
- GTK Randomize □
- WPA3 Policy ☑
- Transition Disable □

Fast Transition

- Status: Disabled
- Over the DS □
- Reassociation Timeout *: 20

WPA2/WPA3 Encryption

- AES(CCMP128) □
- CCMP256 □
- GCMP128 □
- GCMP256 ☑

Auth Key Mgmt

- SUITEB192-1X ☑

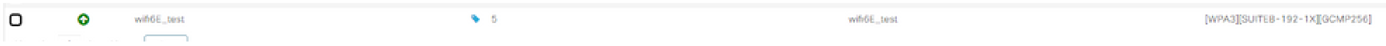
Protected Management Frame

- PMF: Required
- Association Comeback Timer*: 1
- SA Query Time*: 200

Configurações de segurança WPA3 Enterprise SUITEB192-1x

Observação: o FT não é suportado com GCMP256+SUITEB192-1X.

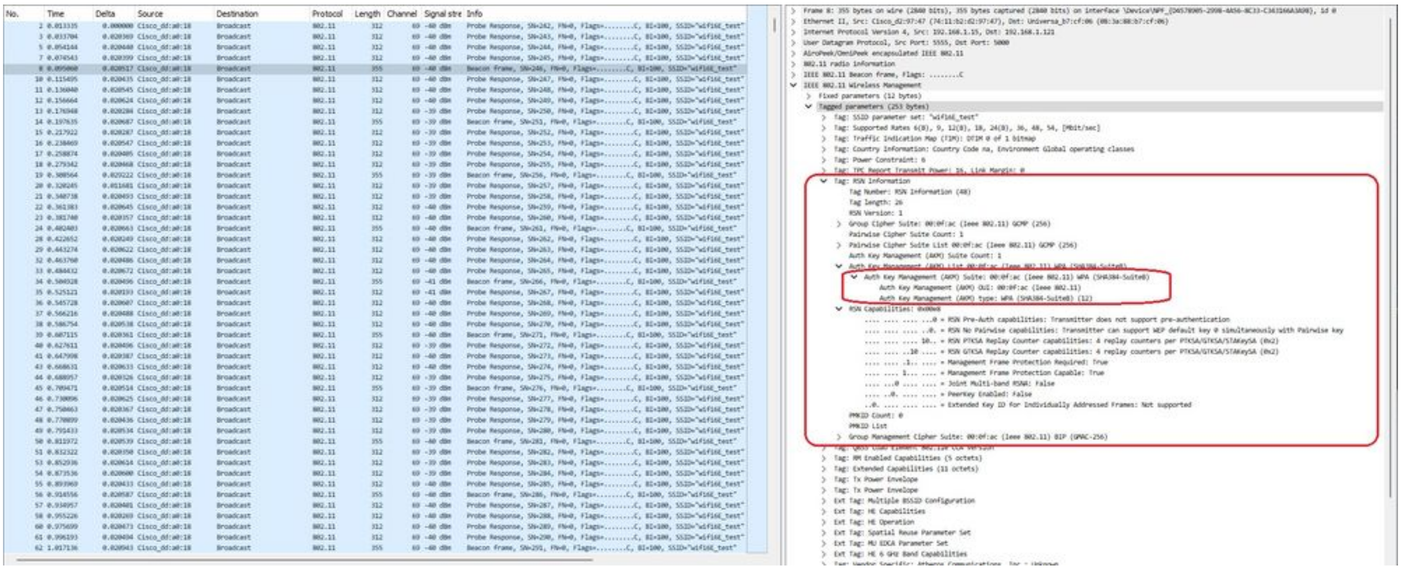
WLAN na WLC GUI Lista de WLANs:



□	⊕	wifi6E_test	5	wifi6E_test	[WPA3][SUITEB-192-1X][GCMP256]

WLAN usada para testes

Verificação das balizas OTA:



```
No.  Time      Delta     Source            Destination  Protocol  Length  Channel  Signal stre  Info
 2 0.013335  0.000000 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=242, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 3 0.033704  0.020369 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=243, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 5 0.054144  0.020440 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=244, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 7 0.074543  0.020399 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=245, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
 8 0.095060  0.020517 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=246, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
10 0.115495  0.020435 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=247, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
11 0.136040  0.020545 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=248, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
12 0.156664  0.020624 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=249, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
13 0.176948  0.020284 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=250, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
14 0.197635  0.020687 Cisco_dd:a0:18  Broadcast  802.11  355  69 -39 dBm  Beacon frame, SN=251, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
15 0.217922  0.020287 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=252, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
16 0.238469  0.020547 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=253, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
17 0.258874  0.020405 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=254, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
18 0.279342  0.020468 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=255, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
19 0.308564  0.029222 Cisco_dd:a0:18  Broadcast  802.11  355  69 -39 dBm  Beacon frame, SN=256, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
20 0.320245  0.011681 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=257, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
21 0.340738  0.020493 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=258, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
22 0.361383  0.020645 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=259, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
23 0.381740  0.020357 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=260, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
24 0.402403  0.020663 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=261, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
28 0.422652  0.020249 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=262, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
29 0.443274  0.020622 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=263, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
32 0.463760  0.020486 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=264, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
33 0.484432  0.020672 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=265, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
34 0.504928  0.020496 Cisco_dd:a0:18  Broadcast  802.11  355  69 -41 dBm  Beacon frame, SN=266, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
35 0.525121  0.020193 Cisco_dd:a0:18  Broadcast  802.11  312  69 -41 dBm  Probe Response, SN=267, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
36 0.545728  0.020607 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=268, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
37 0.566216  0.020488 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=269, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
38 0.586754  0.020538 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=270, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
39 0.607115  0.020361 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=271, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
40 0.627611  0.020496 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=272, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
41 0.647998  0.020387 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=273, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
43 0.668631  0.020633 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=274, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
44 0.688957  0.020326 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=275, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
45 0.709471  0.020514 Cisco_dd:a0:18  Broadcast  802.11  355  69 -39 dBm  Beacon frame, SN=276, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
46 0.730096  0.020625 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=277, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
47 0.750463  0.020367 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=278, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
48 0.770899  0.020436 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=279, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
49 0.791433  0.020534 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=280, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
50 0.811972  0.020539 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=281, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
51 0.832322  0.020350 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=282, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
53 0.852936  0.020614 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=283, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
54 0.873536  0.020600 Cisco_dd:a0:18  Broadcast  802.11  312  69 -39 dBm  Probe Response, SN=284, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
55 0.893969  0.020433 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=285, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
56 0.914556  0.020587 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=286, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
57 0.934957  0.020401 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=287, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
58 0.955226  0.020269 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=288, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
60 0.975699  0.020473 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=289, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
61 0.996193  0.020494 Cisco_dd:a0:18  Broadcast  802.11  312  69 -40 dBm  Probe Response, SN=290, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
62 1.017136  0.020943 Cisco_dd:a0:18  Broadcast  802.11  355  69 -40 dBm  Beacon frame, SN=291, FN=0, Flags=........C, BI=100, SSID="wifi6E_test"
```

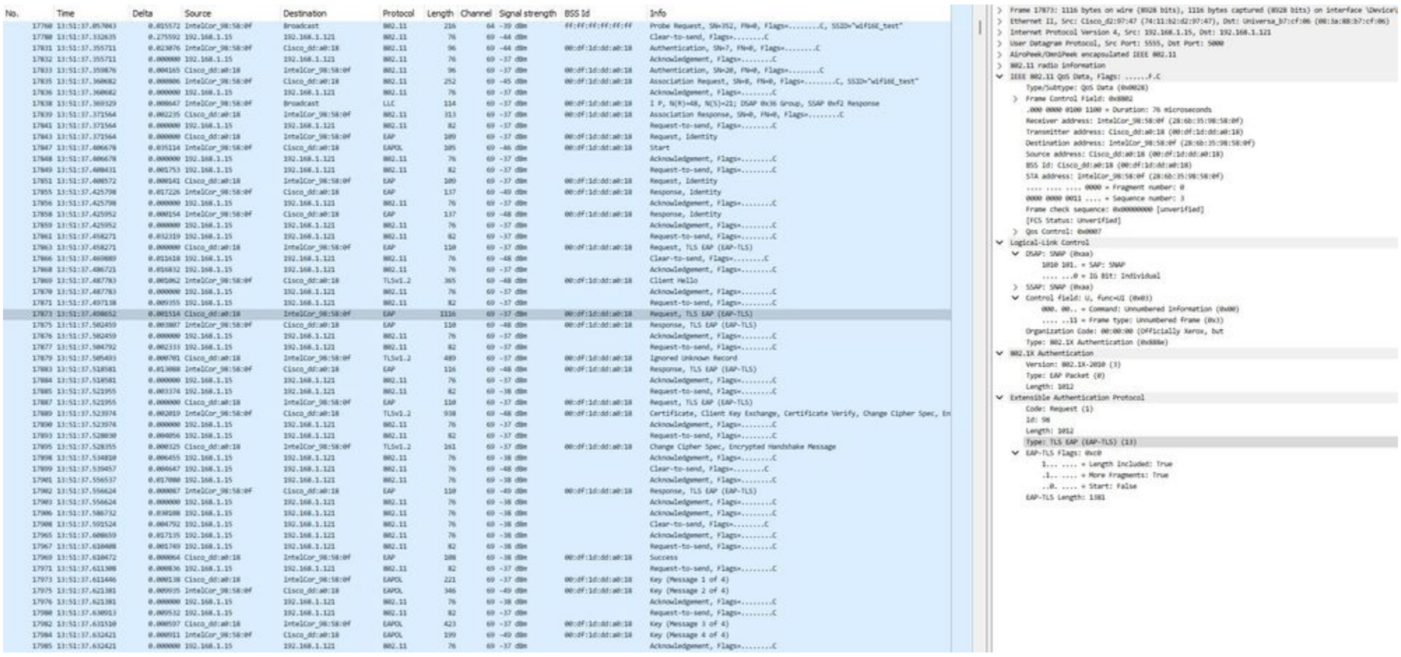
```
> Frame 8: 355 bytes on wire (2840 bits), 355 bytes captured (2840 bits) on interface \Device\NPF_{D4578905-2998-4A56-8C33-C3435A6A3A08}, id 0
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (00:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 Beacon frame, Flags: ........C
v IEEE 802.11 Wireless Management
  > Fixed parameters (12 bytes)
  v Tagged parameters (253 bytes)
    > Tag: SSID parameter set: "wifi6E_test"
    > Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    > Tag: Traffic Indication Map (TIM): DTIM 0 of 1 bitmap
    > Tag: Country Information: Country Code na, Environment Global operating classes
    > Tag: Power Constraint: 6
    > Tag: TPC Report Transmit Power: 16, Link Margin: 0
    v Tag: RSN Information
        Tag Number: RSN Information (48)
        Tag length: 26
        RSN Version: 1
      > Group Cipher Suite: 00:0f:ac (Ieee 802.11) GCMP (256)
        Pairwise Cipher Suite Count: 1
      > Pairwise Cipher Suite List 00:0f:ac (Ieee 802.11) GCMP (256)
        Auth Key Management (AKM) Suite Count: 1
      v Auth Key Management (AKM) List 00:0f:ac (Ieee 802.11) WPA (SHA384-SuiteB)
        v Auth Key Management (AKM) Suite: 00:0f:ac (Ieee 802.11) WPA (SHA384-SuiteB)
            Auth Key Management (AKM) OUI: 00:0f:ac (Ieee 802.11)
            Auth Key Management (AKM) type: WPA (SHA384-SuiteB) (12)
      v RSN Capabilities: 0x00e8
          .... .... .... ...0 = RSN Pre-Auth capabilities: Transmitter does not support pre-authentication
          .... .... .... ..0. = RSN No Pairwise capabilities: Transmitter can support WEP default key 0 simultaneously with Pairwise key
          .... .... .... 10.. = RSN PTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... ..10 .... = RSN GTKSA Replay Counter capabilities: 4 replay counters per PTKSA/GTKSA/STAKeySA (0x2)
          .... .... .1.. .... = Management Frame Protection Required: True
          .... .... 1... .... = Management Frame Protection Capable: True
          .... ...0 .... .... = Joint Multi-band RSNA: False
          .... ..0. .... .... = PeerKey Enabled: False
          ..0. .... .... .... = Extended Key ID for Individually Addressed Frames: Not supported
        PMKID Count: 0
        PMKID List
      > Group Management Cipher Suite: 00:0f:ac (Ieee 802.11) BIP (GMAC-256)
    > Tag: QBSS Load Element 802.11e CCA Version
    > Tag: RM Enabled Capabilities (5 octets)
    > Tag: Extended Capabilities (11 octets)
    > Tag: Tx Power Envelope
    > Tag: Tx Power Envelope
    > Ext Tag: Multiple BSSID Configuration
    > Ext Tag: HE Capabilities
    > Ext Tag: HE Operation
    > Ext Tag: Spatial Reuse Parameter Set
    > Ext Tag: MU EDCA Parameter Set
    > Ext Tag: HE 6 GHz Band Capabilities
    > Tag: Vendor Specific: Atheros Communications, Inc.: Unknown
```

WPA3 Enterprise SUITEB192-1x beacons

Aqui podemos observar os clientes Wi-Fi 6E associando:

AX211 Intel

OTA de conexão com foco nas informações de RSN do cliente:

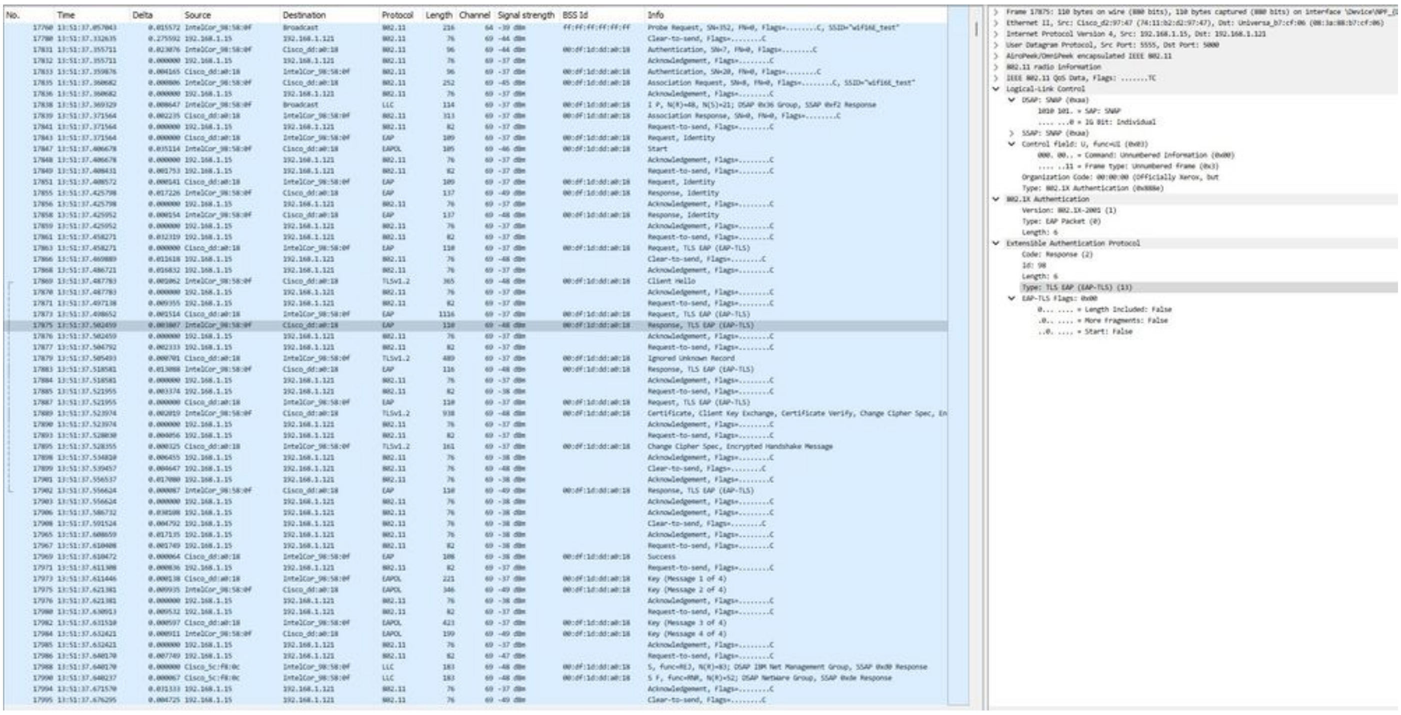


```
No.    Time             Delta     Source                 Destination           Protocol  Length  Channel  Signal strength  BSS Id             Info
17760  13:51:37.057043  0.015572  IntelCor_98:58:0f      Broadcast             802.11    216     64 -39 dBm  ff:ff:ff:ff:ff:ff  Probe Request, SN=352, FN=0, Flags=........C, SSID="wifi6E_test"
17780  13:51:37.332635  0.275592  192.168.1.15           192.168.1.121         802.11    76      69 -44 dBm                     Clear-to-send, Flags=........C
17831  13:51:37.355711  0.023076  IntelCor_98:58:0f      Cisco_dd:a0:18        802.11    96      69 -44 dBm  00:df:1d:dd:a0:18  Authentication, SN=7, FN=0, Flags=........C
17832  13:51:37.355711  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17833  13:51:37.359876  0.004165  Cisco_dd:a0:18         IntelCor_98:58:0f     802.11    96      69 -37 dBm  00:df:1d:dd:a0:18  Authentication, SN=20, FN=0, Flags=........C
17835  13:51:37.360682  0.000806  IntelCor_98:58:0f      Cisco_dd:a0:18        802.11    252     69 -45 dBm  00:df:1d:dd:a0:18  Association Request, SN=8, FN=0, Flags=........C, SSID="wifi6E_test"
17836  13:51:37.360682  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17838  13:51:37.369329  0.008647  IntelCor_98:58:0f      Broadcast             LLC       114     69 -37 dBm  00:df:1d:dd:a0:18  I P, N(R)=48, N(S)=21; DSAP 0x36 Group, SSAP 0xf2 Response
17839  13:51:37.371564  0.002235  Cisco_dd:a0:18         IntelCor_98:58:0f     802.11    313     69 -37 dBm  00:df:1d:dd:a0:18  Association Response, SN=0, FN=0, Flags=........C
17841  13:51:37.371564  0.000000  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17843  13:51:37.371564  0.000000  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       109     69 -37 dBm  00:df:1d:dd:a0:18  Request, Identity
17847  13:51:37.406678  0.035114  IntelCor_98:58:0f      Cisco_dd:a0:18        EAPOL     105     69 -46 dBm  00:df:1d:dd:a0:18  Start
17848  13:51:37.406678  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17849  13:51:37.408431  0.001753  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17851  13:51:37.408572  0.000141  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       109     69 -37 dBm  00:df:1d:dd:a0:18  Request, Identity
17855  13:51:37.425798  0.017226  IntelCor_98:58:0f      Cisco_dd:a0:18        EAP       137     69 -49 dBm  00:df:1d:dd:a0:18  Response, Identity
17856  13:51:37.425798  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17858  13:51:37.425952  0.000154  IntelCor_98:58:0f      Cisco_dd:a0:18        EAP       137     69 -48 dBm  00:df:1d:dd:a0:18  Response, Identity
17859  13:51:37.425952  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17861  13:51:37.458271  0.032319  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17863  13:51:37.458271  0.000000  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       110     69 -37 dBm  00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17866  13:51:37.469889  0.011618  192.168.1.15           192.168.1.121         802.11    76      69 -48 dBm                     Clear-to-send, Flags=........C
17868  13:51:37.486721  0.016832  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17869  13:51:37.487783  0.001062  IntelCor_98:58:0f      Cisco_dd:a0:18        TLSv1.2   365     69 -48 dBm  00:df:1d:dd:a0:18  Client Hello
17870  13:51:37.487783  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17871  13:51:37.497138  0.009355  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17873  13:51:37.498652  0.001514  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       1116    69 -37 dBm  00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17875  13:51:37.502459  0.003807  IntelCor_98:58:0f      Cisco_dd:a0:18        EAP       110     69 -48 dBm  00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17876  13:51:37.502459  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17877  13:51:37.504792  0.002333  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17879  13:51:37.505493  0.000701  Cisco_dd:a0:18         IntelCor_98:58:0f     TLSv1.2   489     69 -37 dBm  00:df:1d:dd:a0:18  Ignored Unknown Record
17883  13:51:37.518581  0.013088  IntelCor_98:58:0f      Cisco_dd:a0:18        EAP       116     69 -48 dBm  00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17884  13:51:37.518581  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17885  13:51:37.521955  0.003374  192.168.1.15           192.168.1.121         802.11    82      69 -38 dBm                     Request-to-send, Flags=........C
17887  13:51:37.521955  0.000000  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       110     69 -37 dBm  00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17889  13:51:37.523974  0.002019  IntelCor_98:58:0f      Cisco_dd:a0:18        TLSv1.2   938     69 -48 dBm  00:df:1d:dd:a0:18  Certificate, Client Key Exchange, Certificate Verify, Change Cipher Spec, En
17890  13:51:37.523974  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
17893  13:51:37.528030  0.004056  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17895  13:51:37.528355  0.000325  Cisco_dd:a0:18         IntelCor_98:58:0f     TLSv1.2   161     69 -37 dBm  00:df:1d:dd:a0:18  Change Cipher Spec, Encrypted Handshake Message
17898  13:51:37.534810  0.006455  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17899  13:51:37.539457  0.004647  192.168.1.15           192.168.1.121         802.11    76      69 -48 dBm                     Clear-to-send, Flags=........C
17901  13:51:37.556537  0.017080  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17902  13:51:37.556624  0.000087  IntelCor_98:58:0f      Cisco_dd:a0:18        EAP       110     69 -49 dBm  00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17903  13:51:37.556624  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17906  13:51:37.586732  0.030108  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17908  13:51:37.591524  0.004792  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Clear-to-send, Flags=........C
17965  13:51:37.608659  0.017135  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17967  13:51:37.610408  0.001749  192.168.1.15           192.168.1.121         802.11    82      69 -38 dBm                     Request-to-send, Flags=........C
17969  13:51:37.610472  0.000064  Cisco_dd:a0:18         IntelCor_98:58:0f     EAP       108     69 -38 dBm  00:df:1d:dd:a0:18  Success
17971  13:51:37.611308  0.000836  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17973  13:51:37.611446  0.000138  Cisco_dd:a0:18         IntelCor_98:58:0f     EAPOL     221     69 -37 dBm  00:df:1d:dd:a0:18  Key (Message 1 of 4)
17975  13:51:37.621381  0.009935  IntelCor_98:58:0f      Cisco_dd:a0:18        EAPOL     346     69 -49 dBm  00:df:1d:dd:a0:18  Key (Message 2 of 4)
17976  13:51:37.621381  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -38 dBm                     Acknowledgement, Flags=........C
17980  13:51:37.630913  0.009532  192.168.1.15           192.168.1.121         802.11    82      69 -37 dBm                     Request-to-send, Flags=........C
17982  13:51:37.631510  0.000597  Cisco_dd:a0:18         IntelCor_98:58:0f     EAPOL     423     69 -37 dBm  00:df:1d:dd:a0:18  Key (Message 3 of 4)
17984  13:51:37.632421  0.000911  IntelCor_98:58:0f      Cisco_dd:a0:18        EAPOL     199     69 -49 dBm  00:df:1d:dd:a0:18  Key (Message 4 of 4)
17985  13:51:37.632421  0.000000  192.168.1.15           192.168.1.121         802.11    76      69 -37 dBm                     Acknowledgement, Flags=........C
```

```
> Frame 17873: 1116 bytes on wire (8928 bits), 1116 bytes captured (8928 bits) on interface \Device\
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (00:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
v IEEE 802.11 QoS Data, Flags: ......F.C
    Type/Subtype: QoS Data (0x0028)
  > Frame Control Field: 0x8802
    .000 0000 0100 1100 = Duration: 76 microseconds
    Receiver address: IntelCor_98:58:0f (28:6b:35:98:58:0f)
    Transmitter address: Cisco_dd:a0:18 (00:df:1d:dd:a0:18)
    Destination address: IntelCor_98:58:0f (28:6b:35:98:58:0f)
    Source address: Cisco_dd:a0:18 (00:df:1d:dd:a0:18)
    BSS Id: Cisco_dd:a0:18 (00:df:1d:dd:a0:18)
    STA address: IntelCor_98:58:0f (28:6b:35:98:58:0f)
    .... .... .... 0000 = Fragment number: 0
    0000 0000 0011 .... = Sequence number: 3
    Frame check sequence: 0x00000000 [unverified]
    [FCS Status: Unverified]
  > Qos Control: 0x0007
v Logical-Link Control
  v DSAP: SNAP (0xaa)
      1010 101. = SAP: SNAP
      .... ...0 = IG Bit: Individual
  > SSAP: SNAP (0xaa)
  v Control field: U, func=UI (0x03)
      000. 00.. = Command: Unnumbered Information (0x00)
      .... ..11 = Frame type: Unnumbered frame (0x3)
    Organization Code: 00:00:00 (Officially Xerox, but
    Type: 802.1X Authentication (0x888e)
v 802.1X Authentication
    Version: 802.1X-2010 (3)
    Type: EAP Packet (0)
    Length: 1012
v Extensible Authentication Protocol
    Code: Request (1)
    Id: 98
    Length: 1012
    Type: TLS EAP (EAP-TLS) (13)
  v EAP-TLS Flags: 0xc0
      1... .... = Length Included: True
      .1.. .... = More Fragments: True
      ..0. .... = Start: False
    EAP-TLS Length: 1381
```

Empresa WPA3 com associação EAP-TLS com cliente Intel AX211 e informações de RSN

E o intercâmbio EAP-TLS:

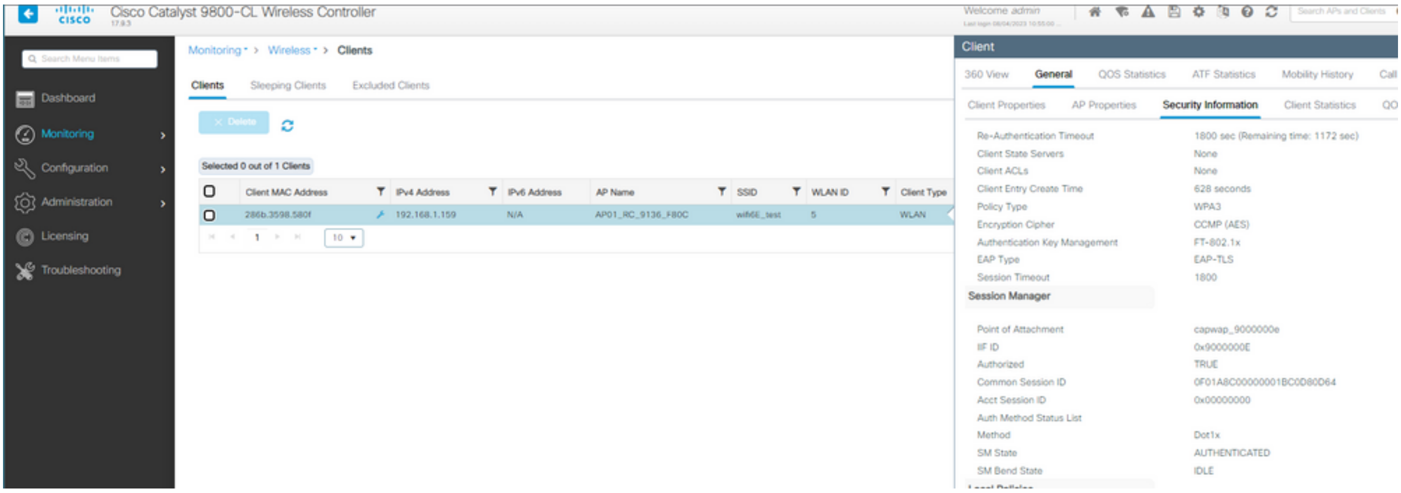


```
No.     Time             Delta     Source             Destination        Protocol Length Channel Signal strength BSS Id             Info
17760   13:51:37.057043  0.015572  IntelCor_98:58:0f  Broadcast          802.11   216    64      -39 dBm         ff:ff:ff:ff:ff:ff  Probe Request, SN=352, FN=0, Flags=........C, SSID="wifi6E_test"
17780   13:51:37.332635  0.275592  192.168.1.15       192.168.1.121      802.11   76     69      -44 dBm                            Clear-to-send, Flags=........C
17831   13:51:37.355711  0.023076  IntelCor_98:58:0f  Cisco_dd:a0:18     802.11   96     69      -44 dBm         00:df:1d:dd:a0:18  Authentication, SN=7, FN=0, Flags=........C
17832   13:51:37.355711  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17833   13:51:37.359876  0.004165  Cisco_dd:a0:18     IntelCor_98:58:0f  802.11   96     69      -37 dBm         00:df:1d:dd:a0:18  Authentication, SN=20, FN=0, Flags=........C
17835   13:51:37.360682  0.000806  IntelCor_98:58:0f  Cisco_dd:a0:18     802.11   252    69      -45 dBm         00:df:1d:dd:a0:18  Association Request, SN=8, FN=0, Flags=........C, SSID="wifi6E_test"
17836   13:51:37.360682  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17838   13:51:37.369329  0.008647  IntelCor_98:58:0f  Broadcast          LLC      114    69      -37 dBm         00:df:1d:dd:a0:18  I P, N(R)=48, N(S)=21; DSAP 0x36 Group, SSAP 0xf2 Response
17839   13:51:37.371564  0.002235  Cisco_dd:a0:18     IntelCor_98:58:0f  802.11   313    69      -37 dBm         00:df:1d:dd:a0:18  Association Response, SN=0, FN=0, Flags=........C
17841   13:51:37.371564  0.000000  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17843   13:51:37.371564  0.000000  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      109    69      -37 dBm         00:df:1d:dd:a0:18  Request, Identity
17847   13:51:37.406678  0.035114  IntelCor_98:58:0f  Cisco_dd:a0:18     EAPOL    105    69      -46 dBm         00:df:1d:dd:a0:18  Start
17848   13:51:37.406678  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17849   13:51:37.408431  0.001753  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17851   13:51:37.408572  0.000141  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      109    69      -37 dBm         00:df:1d:dd:a0:18  Request, Identity
17855   13:51:37.425798  0.017226  IntelCor_98:58:0f  Cisco_dd:a0:18     EAP      137    69      -49 dBm         00:df:1d:dd:a0:18  Response, Identity
17856   13:51:37.425798  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17858   13:51:37.425952  0.000154  IntelCor_98:58:0f  Cisco_dd:a0:18     EAP      137    69      -48 dBm         00:df:1d:dd:a0:18  Response, Identity
17859   13:51:37.425952  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17861   13:51:37.458271  0.032319  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17863   13:51:37.458271  0.000000  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      110    69      -37 dBm         00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17866   13:51:37.469889  0.011618  192.168.1.15       192.168.1.121      802.11   76     69      -48 dBm                            Clear-to-send, Flags=........C
17868   13:51:37.486721  0.016832  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17869   13:51:37.487783  0.001062  IntelCor_98:58:0f  Cisco_dd:a0:18     TLSv1.2  365    69      -48 dBm         00:df:1d:dd:a0:18  Client Hello
17870   13:51:37.487783  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17871   13:51:37.497138  0.009355  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17873   13:51:37.498652  0.001514  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      1116   69      -37 dBm         00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17875   13:51:37.502459  0.003807  IntelCor_98:58:0f  Cisco_dd:a0:18     EAP      110    69      -48 dBm         00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17876   13:51:37.502459  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17877   13:51:37.504792  0.002333  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17879   13:51:37.505493  0.000701  Cisco_dd:a0:18     IntelCor_98:58:0f  TLSv1.2  489    69      -37 dBm         00:df:1d:dd:a0:18  Ignored Unknown Record
17883   13:51:37.518581  0.013088  IntelCor_98:58:0f  Cisco_dd:a0:18     EAP      116    69      -48 dBm         00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17884   13:51:37.518581  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17885   13:51:37.521955  0.003374  192.168.1.15       192.168.1.121      802.11   82     69      -38 dBm                            Request-to-send, Flags=........C
17887   13:51:37.521955  0.000000  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      110    69      -37 dBm         00:df:1d:dd:a0:18  Request, TLS EAP (EAP-TLS)
17889   13:51:37.523974  0.002019  IntelCor_98:58:0f  Cisco_dd:a0:18     TLSv1.2  938    69      -48 dBm         00:df:1d:dd:a0:18  Certificate, Client Key Exchange, Certificate Verify, Change Cipher Spec, En
17890   13:51:37.523974  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17893   13:51:37.528030  0.004056  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17895   13:51:37.528355  0.000325  Cisco_dd:a0:18     IntelCor_98:58:0f  TLSv1.2  161    69      -37 dBm         00:df:1d:dd:a0:18  Change Cipher Spec, Encrypted Handshake Message
17898   13:51:37.534810  0.006455  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17899   13:51:37.539457  0.004647  192.168.1.15       192.168.1.121      802.11   76     69      -48 dBm                            Clear-to-send, Flags=........C
17901   13:51:37.556537  0.017080  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17902   13:51:37.556624  0.000087  IntelCor_98:58:0f  Cisco_dd:a0:18     EAP      110    69      -49 dBm         00:df:1d:dd:a0:18  Response, TLS EAP (EAP-TLS)
17903   13:51:37.556624  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17906   13:51:37.586732  0.030108  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17908   13:51:37.591524  0.004792  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Clear-to-send, Flags=........C
17965   13:51:37.608659  0.017135  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17967   13:51:37.610408  0.001749  192.168.1.15       192.168.1.121      802.11   82     69      -38 dBm                            Request-to-send, Flags=........C
17969   13:51:37.610472  0.000064  Cisco_dd:a0:18     IntelCor_98:58:0f  EAP      108    69      -38 dBm         00:df:1d:dd:a0:18  Success
17971   13:51:37.611308  0.000836  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17973   13:51:37.611446  0.000138  Cisco_dd:a0:18     IntelCor_98:58:0f  EAPOL    221    69      -37 dBm         00:df:1d:dd:a0:18  Key (Message 1 of 4)
17975   13:51:37.621381  0.009935  IntelCor_98:58:0f  Cisco_dd:a0:18     EAPOL    346    69      -49 dBm         00:df:1d:dd:a0:18  Key (Message 2 of 4)
17976   13:51:37.621381  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -38 dBm                            Acknowledgement, Flags=........C
17980   13:51:37.630913  0.009532  192.168.1.15       192.168.1.121      802.11   82     69      -37 dBm                            Request-to-send, Flags=........C
17982   13:51:37.631510  0.000597  Cisco_dd:a0:18     IntelCor_98:58:0f  EAPOL    423    69      -37 dBm         00:df:1d:dd:a0:18  Key (Message 3 of 4)
17984   13:51:37.632421  0.000911  IntelCor_98:58:0f  Cisco_dd:a0:18     EAPOL    199    69      -49 dBm         00:df:1d:dd:a0:18  Key (Message 4 of 4)
17985   13:51:37.632421  0.000000  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17986   13:51:37.640170  0.007749  192.168.1.15       192.168.1.121      802.11   82     69      -47 dBm                            Request-to-send, Flags=........C
17988   13:51:37.640170  0.000000  Cisco_5c:f8:0c     IntelCor_98:58:0f  LLC      183    69      -48 dBm         00:df:1d:dd:a0:18  S, func=REJ, N(R)=83; DSAP IBM Net Management Group, SSAP 0xd0 Response
17990   13:51:37.640237  0.000067  Cisco_5c:f8:0c     IntelCor_98:58:0f  LLC      183    69      -48 dBm         00:df:1d:dd:a0:18  S F, func=RNR, N(R)=52; DSAP NetWare Group, SSAP 0xde Response
17994   13:51:37.671570  0.031333  192.168.1.15       192.168.1.121      802.11   76     69      -37 dBm                            Acknowledgement, Flags=........C
17995   13:51:37.676295  0.004725  192.168.1.15       192.168.1.121      802.11   76     69      -49 dBm                            Clear-to-send, Flags=........C
```

```
> Frame 17875: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface \Device\NPF_{
> Ethernet II, Src: Cisco_d2:97:47 (74:11:b2:d2:97:47), Dst: Universa_b7:cf:06 (08:3a:88:b7:cf:06)
> Internet Protocol Version 4, Src: 192.168.1.15, Dst: 192.168.1.121
> User Datagram Protocol, Src Port: 5555, Dst Port: 5000
> AiroPeek/OmniPeek encapsulated IEEE 802.11
> 802.11 radio information
> IEEE 802.11 QoS Data, Flags: .......TC
v Logical-Link Control
    v DSAP: SNAP (0xaa)
          1010 101. = SAP: SNAP
          .... ...0 = IG Bit: Individual
    > SSAP: SNAP (0xaa)
    v Control field: U, func=UI (0x03)
          000. 00.. = Command: Unnumbered Information (0x00)
          .... ..11 = Frame type: Unnumbered frame (0x3)
      Organization Code: 00:00:00 (Officially Xerox, but
      Type: 802.1X Authentication (0x888e)
v 802.1X Authentication
      Version: 802.1X-2001 (1)
      Type: EAP Packet (0)
      Length: 6
v Extensible Authentication Protocol
      Code: Response (2)
      Id: 98
      Length: 6
      Type: TLS EAP (EAP-TLS) (13)
    v EAP-TLS Flags: 0x00
          0... .... = Length Included: False
          .0.. .... = More Fragments: False
          ..0. .... = Start: False
```

Empresa WPA3 com associação EAP-TLS com cliente Intel AX211 e foco EAP-TLS

Detalhes do cliente no WLC:



☐	Client MAC Address	IPv4 Address	IPv6 Address	AP Name	SSID	WLAN ID	Client Type
☐	286b.3598.580f	192.168.1.159	N/A	AP01_RC_9136_F80C	wifi6E_test	5	WLAN

Re-Authentication Timeout	1800 sec (Remaining time: 1172 sec)
Client State Servers	None
Client ACLs	None
Client Entry Create Time	628 seconds
Policy Type	WPA3
Encryption Cipher	CCMP (AES)
Authentication Key Management	FT-802.1x
EAP Type	EAP-TLS
Session Timeout	1800
Session Manager	
Point of Attachment	capwap_9000000e
IIF ID	0x9000000E
Authorized	TRUE
Common Session ID	0F01A8C00000001BC0D80D64
Acct Session ID	0x00000000
Auth Method Status List	
Method	Dot1x
SM State	AUTHENTICATED
SM Bend State	IDLE

WPA3 Enterprise com detalhes do cliente EAP-TLS

NetGear A8000

Não há suporte para WPA3-Enterprise neste cliente.

Pixel 6a

Na data em que este documento foi escrito, este cliente não conseguiu se conectar à WPA3 Enterprise usando EAP-TLS.

Trata-se de uma questão do lado do cliente que está a ser trabalhada e, assim que for resolvida, este documento será atualizado.

Samsung S23

Na data em que este documento foi escrito, este cliente não conseguiu se conectar à WPA3 Enterprise usando EAP-TLS.

Trata-se de uma questão do lado do cliente que está a ser trabalhada e, assim que for resolvida, este documento será atualizado.

Conclusões de segurança

Depois de todos os testes anteriores, as conclusões são as seguintes:

Protocolo	Criptografia	AKM	Cifra AKM	Método EAP	FT-OverTA	FT-OverDS	AX211 Intel	Samsung/Go Android
DEVER	AES-CCMP128	DEVER	NA.	NA.	NA	NA	Supported	Supported
SAE	AES-CCMP128	SAE (somente H2E)	SHA256	NA.	Supported	Supported	Suportado: apenas H2E e FT-oTA	Suportado: Apenas H2E Falha de FT. Falha de FT-oDS.
Empresa	AES-CCMP128	802.1x-SHA256	SHA256	PEAP/FAST/TLS	Supported	Supported	Suportado: SHA256 e FT-oTA/oDS Sem suporte: EAP-FAST	Suportado: SHA256 e FT oTA, FT-oDS (S23) Sem suporte EAP-FAST, F oDS (Pixel6a
Empresa	GCMP128	SuiteB-1x	SHA256-SuiteB	PEAP/FAST/TLS	Not Supported	Not Supported	Not Supported	Not Supporte
Empresa	GCMP256	SuiteB-192	SHA384-SuiteB	TLS	Not Supported	Not Supported	NA/TBD	NA/TBD

Troubleshooting

A solução de problemas usada neste documento foi baseada no documento on-line:

Solucionar problemas de APs COS

A diretriz geral para a solução de problemas é coletar o rastreamento de RA no modo de depuração da WLC usando o endereço MAC do cliente, certificando-se de que o cliente esteja se conectando usando o mac do dispositivo e não um endereço MAC aleatório.

Para a solução de problemas Over the Air, a recomendação é usar o AP no modo farejador, capturando o tráfego no canal do cliente que atende o AP.

Observação: consulte Informações Importantes sobre Comandos de Depuração antes de usar os comandos debug.

Informações Relacionadas

O que é Wi-Fi 6E?

O que é Wi-Fi 6 versus Wi-Fi 6E?

Introdução ao Wi-Fi 6E

Wi-Fi 6E: o próximo grande capítulo no white paper sobre Wi-Fi

Cisco Live - Arquitetando a rede sem fio de próxima geração com pontos de acesso Catalyst Wi-Fi 6E

Guia de Configuração de Software do Cisco Catalyst 9800 Series Wireless Controller 17.9.x

Guia de implantação WPA3