

配置验证并排除Mac过滤器上的Web身份验证故障

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简介

本文档介绍如何使用ISE进行外部身份验证，在“Mac过滤器故障”功能上配置、故障排除和验证本地网络身份验证。

先决条件

为MAC身份验证配置ISE

在ISE/Active Directory上配置的有效用户凭证

要求

Cisco 建议您了解以下主题：

基本了解如何在控制器Web UI中导航

策略、WLAN配置文件和策略标记配置

ISE上的服务策略配置

使用的组件

9800 WLC版本17.12.2

C9120 AXI AP

9300 交换机

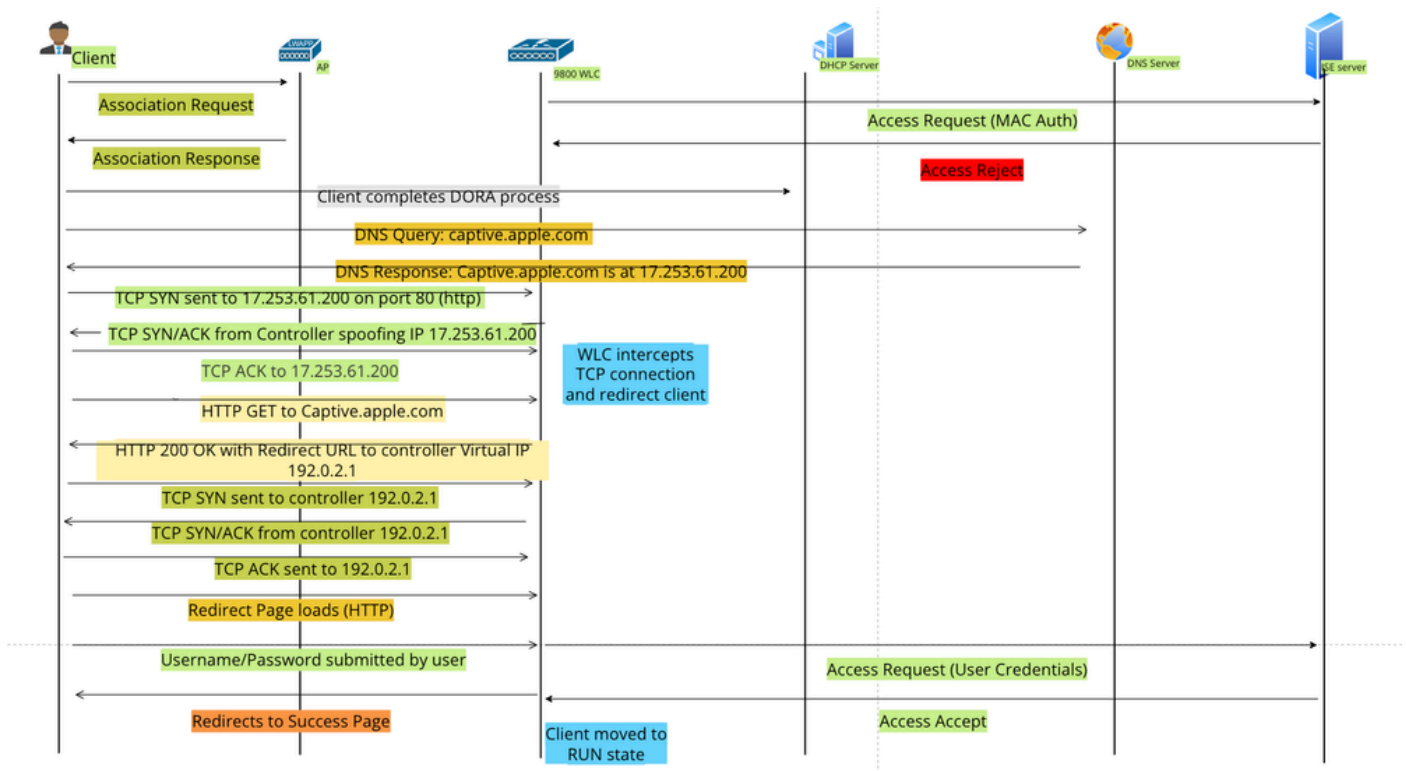
ISE版本3.1.0.518

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

背景信息

在同时使用MAC身份验证和Web身份验证的WLAN环境中，Web身份验证“On Mac Failure Filter”（On Mac故障过滤器）功能可用作后退机制。

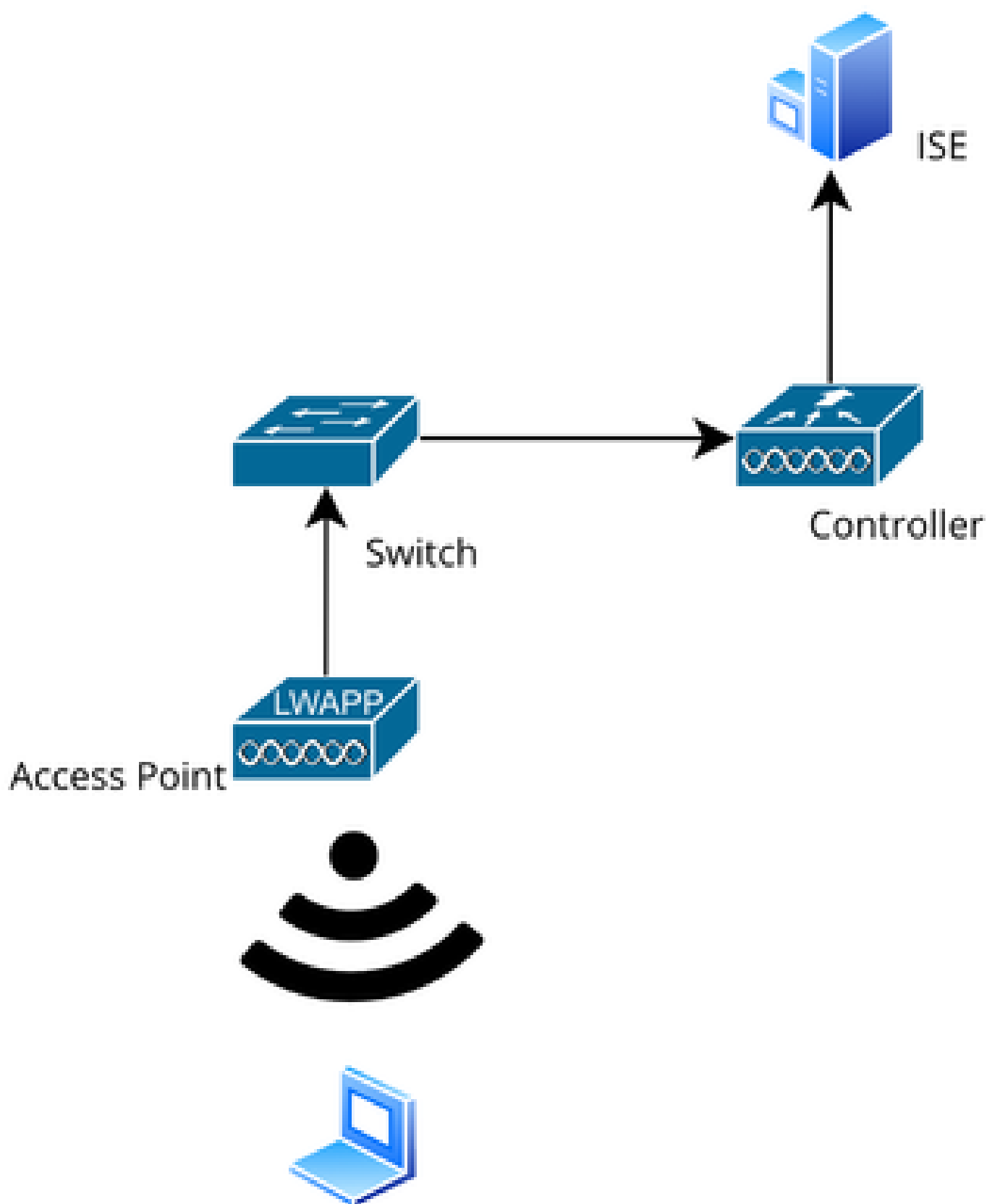
- 回退机制：当客户端尝试使用MAC过滤器针对外部RADIUS服务器(ISE)或本地服务器连接到WLAN且无法进行身份验证时，此功能会自动启动第3层Web身份验证。
- 身份验证成功：如果客户端通过MAC过滤器成功进行身份验证，则会绕过Web身份验证，从而允许客户端直接连接到WLAN。
- 避免取消关联：此功能有助于防止因MAC过滤器身份验证失败而导致取消关联。



Web身份验证流程

配置

网络图



网络拓扑

配置

配置Web参数

导航到配置>安全> Web身份验证并选择全局参数映射

从全局参数映射验证虚拟IP和信任点配置。所有自定义Web身份验证参数配置文件均从全局参数映射继承虚拟IP和信任点配置。

Parameter	Value
Parameter-map Name	global
Maximum HTTP connections	100
Init-State Timeout(secs)	120
Type	webauth
Captive Bypass Portal	<input type="checkbox"/>
Disable Success Window	<input type="checkbox"/>
Disable Logout Window	<input type="checkbox"/>
Disable Cisco Logo	<input type="checkbox"/>
Sleeping Client Status	<input type="checkbox"/>
Virtual IPv4 Address	192.0.2.1
Trustpoint	TP-self-signed-3...
Virtual IPv4 Hostname	
Virtual IPv6 Address	xxxx:xx:xx:xx
Web Auth intercept HTTPs	<input type="checkbox"/>
Enable HTTP server for Web Auth	<input checked="" type="checkbox"/>
Disable HTTP secure server for Web Auth	<input type="checkbox"/>

全局Web身份验证参数配置文件

第1步：选择“添加”(Add)创建自定义Web身份验证参数映射。输入配置文件名称，然后选择“Type”作为“Webauth”。

Configuration > Security > Web Auth

+ Add Delete

Parameter Map Name

- global

Create Web Auth Parameter

Parameter-map Name*	Web-Filter
Maximum HTTP connections	1-200
Init-State Timeout(secs)	60-3932100
Type	webauth

Close Apply to Device

Web身份验证参数配置文件

如果客户端也获得IPv6地址，您还必须在参数映射中添加虚拟IPv6地址。使用文档范围2001:db8::/32中的IP

如果您的客户端获得IPv6地址，他们很可能会尝试在V6而不是V4中获取HTTP网络身份验证重定向，这就是您还需要设置虚拟IPv6的原因。

CLI 配置：

```
parameter-map type webauth Web-Filter
type webauth
```

配置策略配置文件

第1步：创建策略配置文件

导航到Configuration > Tags & Profiles > Policy。选择“添加”。在“常规”选项卡中，指定配置文件的名称并启用状态切换。

The screenshot shows the 'Add Policy Profile' configuration page. The 'Name' field is set to 'Web-Filter-Policy'. The 'Status' is set to 'ENABLED'. The 'WLAN Switching Policy' section has 'Central Switching', 'Central Authentication', and 'Central DHCP' set to 'ENABLED', and 'Flex NAT/PAT' set to 'DISABLED'. The 'CTS Policy' section has 'Inline Tagging' and 'SGACL Enforcement' set to 'DISABLED'.

策略配置文件

步骤2：

在Access Policies (访问策略) 选项卡下，从VLAN部分下拉列表中选择客户端VLAN。

RADIUS Profiling	<input type="checkbox"/>	
HTTP TLV Caching	<input type="checkbox"/>	
DHCP TLV Caching	<input type="checkbox"/>	
WLAN Local Profiling		
Global State of Device Classification	<input type="checkbox"/>	(i)
Local Subscriber Policy Name	<input type="text" value="Search or Select"/>	(+)
VLAN		
VLAN/VLAN Group	<input type="text" value="VLAN2074"/>	(i)
Multicast VLAN	<input type="text" value="Enter Multicast VLAN"/>	

WLAN ACL	
IPv4 ACL	<input type="text" value="Search or Select"/> (+)
IPv6 ACL	<input type="text" value="Search or Select"/> (+)
URL Filters (i)	
Pre Auth	<input type="text" value="Search or Select"/> (+)
Post Auth	<input type="text" value="Search or Select"/> (+)

Access Policy选项卡

CLI 配置 :

```
wireless profile policy Web-Filter-Policy  
vlan VLAN2074  
no shutdown
```

配置WLAN配置文件

第1步：导航至配置>标签和配置文件> WLAN。选择“添加”以创建新配置文件。定义配置文件名称和 SSID名称，并启用状态字段。

Configuration > Tags & Profiles > WLANs

+ Add × Delete Clone Enable WLAN Disable WLAN

Add WLAN

General Security Advanced

Profile Name* Mac_Filtering_Wlan

SSID* Mac_Filtering_Wlan

WLAN ID* 9

Status ENABLED

Broadcast SSID ENABLED

Radio Policy ⓘ

[Show slot configuration](#)

6 GHz

Status ENABLED ⓘ

- ✖ WPA3 Enabled
- ✔ Dot11ax Enabled

5 GHz

Status ENABLED

2.4 GHz

Status ENABLED

802.11b/g Policy 802.11b/g ▼

WLAN配置文件

第2步：在“安全”(Security)选项卡下，启用“Mac过滤”(Mac Filtering)复选框，并在授权列表中配置RADIUS服务器（ISE或本地服务器）。此设置将ISE用于Mac身份验证和Web身份验证。

Add WLAN

General **Security** Advanced

Layer2 Layer3 AAA

WPA + WPA2 WPA2 + WPA3 WPA3 Static WEP None

MAC Filtering

Authorization List*

network

OWE Transition Mode

Lobby Admin Access

Fast Transition

Status

Disabled

Over the DS

Reassociation Timeout *

20

WLAN第2层安全性

第3步：导航到安全>第3层。启用Web策略并将其与Web身份验证参数映射配置文件关联。选中“On Mac Filter Failure”复选框并从Authentication下拉列表中选择RADIUS服务器。

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

Web Policy

Web Auth Parameter Map

Web-Filter

Authentication List

ISE-List

For Local Login Method List to work, please make sure

<< Hide

On MAC Filter Failure

Splash Web Redirect

DISABLED

Preauthentication ACL

WLAN Layer3 Security选项卡

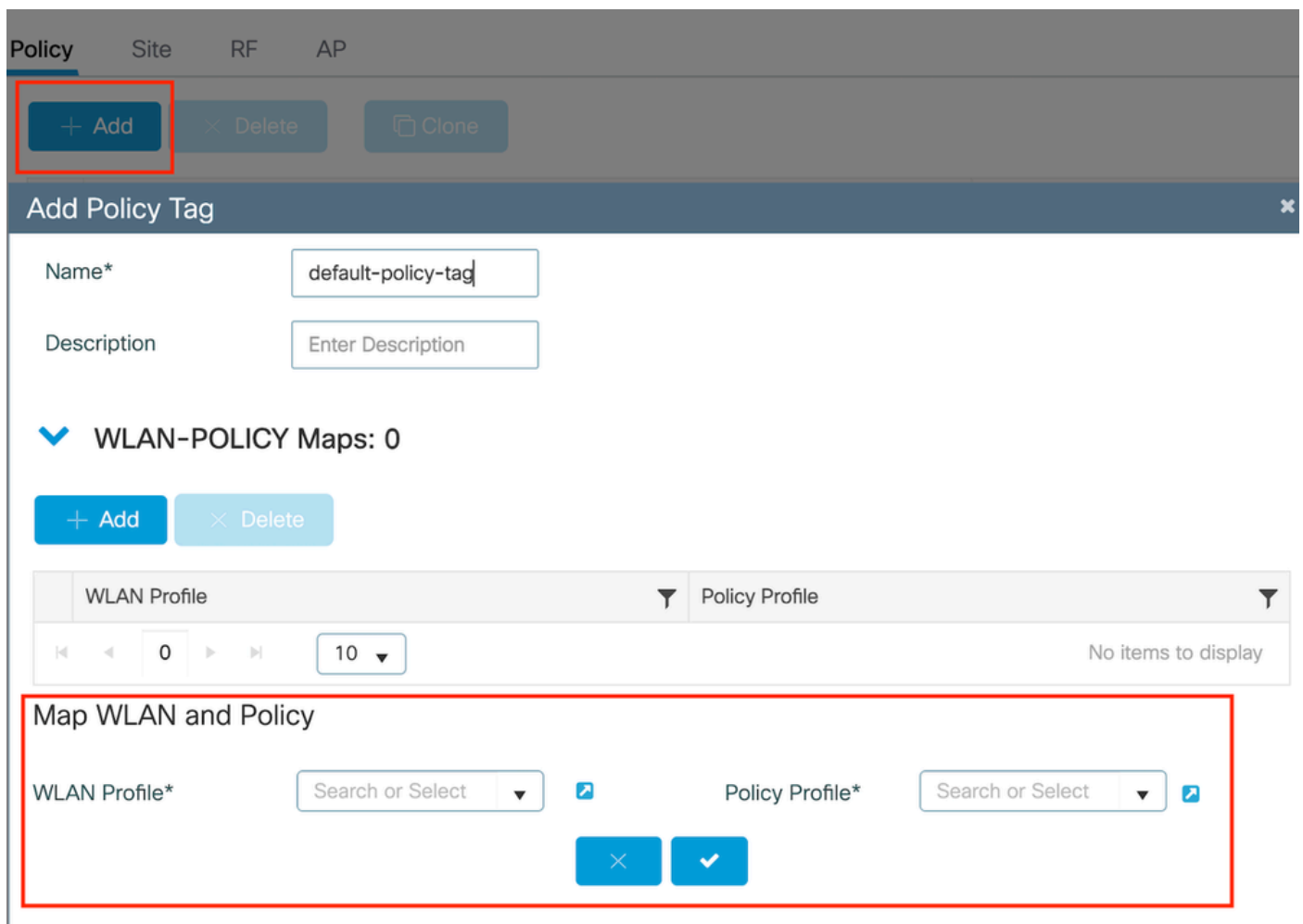
CLI 配置

```
wlan Mac_Filtering_Wlan 9 Mac_Filtering_Wlan
```

```
mac-filtering network
radio policy dot11 24ghz
radio policy dot11 5ghz
no security ft adaptive
no security wpa
no security wpa wpa2
no security wpa wpa2 ciphers aes
no security wpa akm dot1x
security web-auth
security web-auth authentication-list ISE-List
security web-auth on-macfilter-failure
security web-auth parameter-map Web-Filter
no shutdown
```

第4步：配置策略标记、创建WLAN配置文件和策略配置文件映射

导航到Configuration > Tags & Profiles > Tags > Policy。点击Add以定义策略标记的名称。在WLAN-Policy Maps下，选择“Add”以映射之前创建的WLAN和策略配置文件。

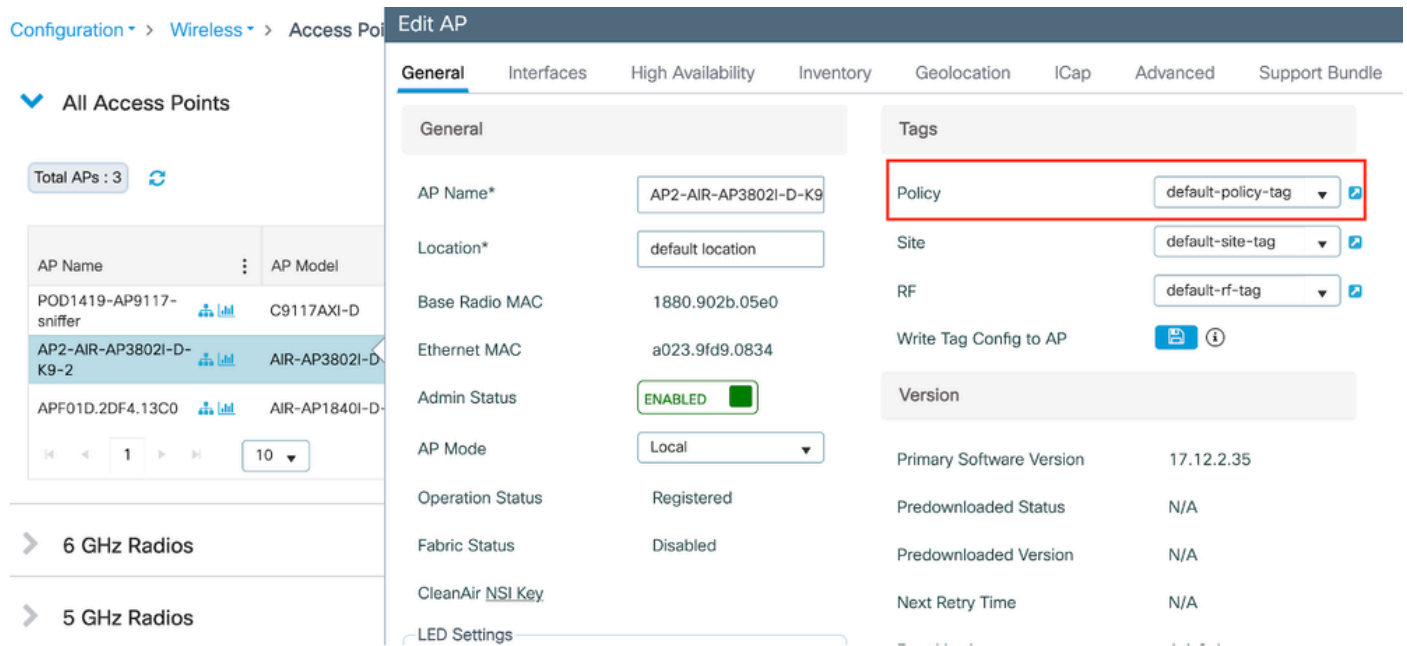


策略标记映射

CLI 配置：

```
wireless tag policy default-policy-tag
description "default policy-tag"
```

第5步：导航至配置(Configuration) >无线(Wireless) >接入点(Access Point)。选择负责广播此SSID的接入点。在Edit AP菜单中，分配创建的策略标记。



将策略TAG映射到AP

配置AAA设置：

第1步：创建Radius服务器：

导航至Configuration > Security > AAA。单击“服务器/组”部分下的“添加”选项。在“创建AAA Radius服务器”页上，输入服务器名称、IP地址和共享密钥。

Configuration > Security > AAA [Show Me How](#)

+ AAA Wizard

Servers / Groups AAA Method List AAA Advanced

+ Add Delete

RADIUS **Servers** Server Groups

Create AAA Radius Server

Name*	<input type="text"/>	Support for CoA ⓘ	ENABLED <input checked="" type="checkbox"/>
Server Address*	<input type="text" value="IPv4/IPv6/Hostname"/>	CoA Server Key Type	Clear Text ▼
PAC Key	<input type="checkbox"/>	CoA Server Key ⓘ	<input type="text"/>
Key Type	Clear Text ▼	Confirm CoA Server Key	<input type="text"/>
Key* ⓘ	<input type="text"/>	Automate Tester	<input type="checkbox"/>
Confirm Key*	<input type="text"/>		
Auth Port	<input type="text" value="1812"/>		
Acct Port	<input type="text" value="1813"/>		
Server Timeout (seconds)	<input type="text" value="1-1000"/>		
Retry Count	<input type="text" value="0-100"/>		

服务器配置

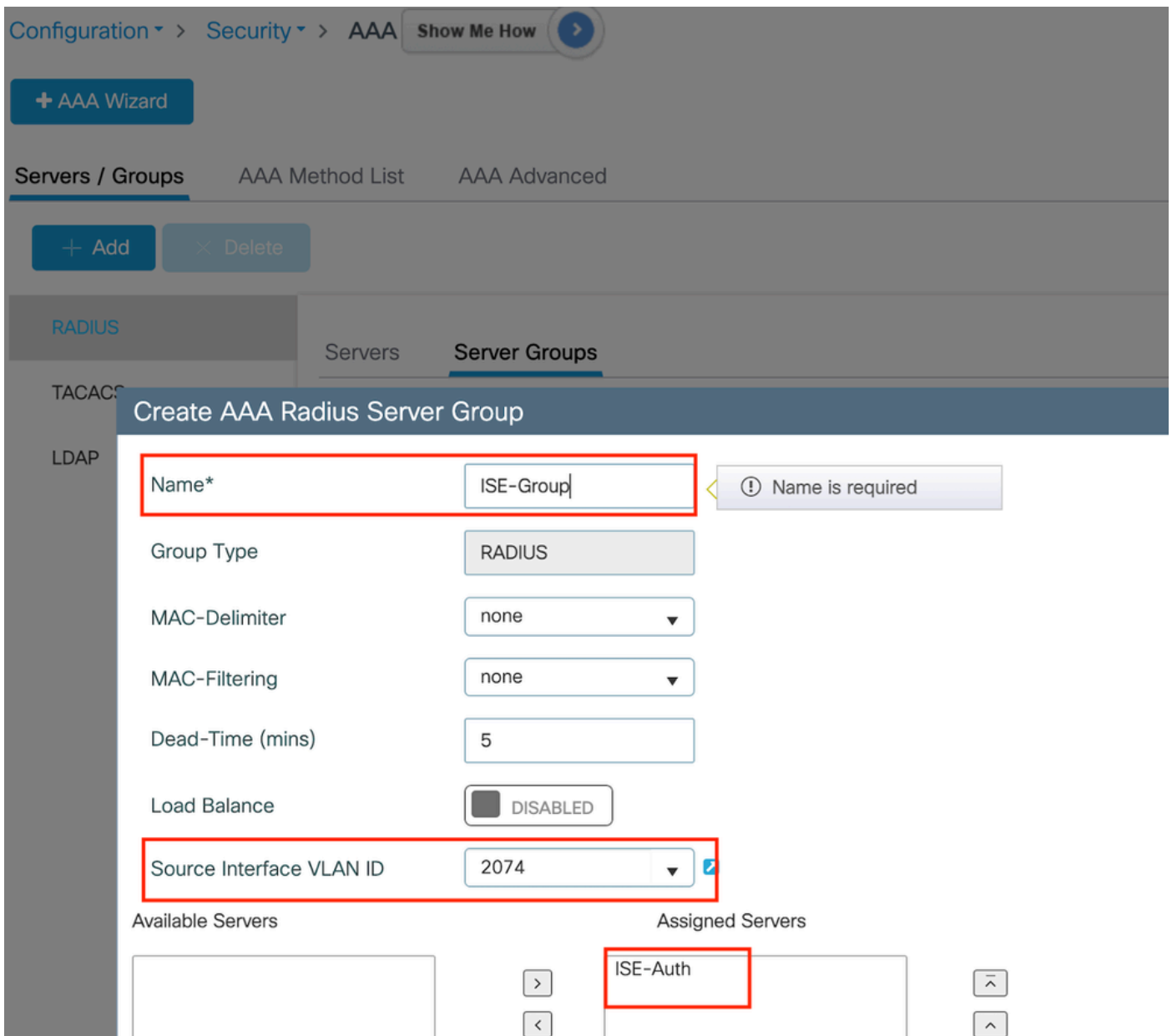
CLI 配置

```
radius server ISE-Auth
address ipv4 10.197.224.122 auth-port 1812 acct-port 1813
key *****
server name ISE-Auth
```

第2步：创建Radius服务器组：

选择“服务器组”部分下的“添加”选项以定义服务器组。切换要包括在同一组配置中的服务器。

无需设置源接口。默认情况下，9800使用其路由表来确定用于连接RADIUS服务器的接口，并且通常使用默认网关。



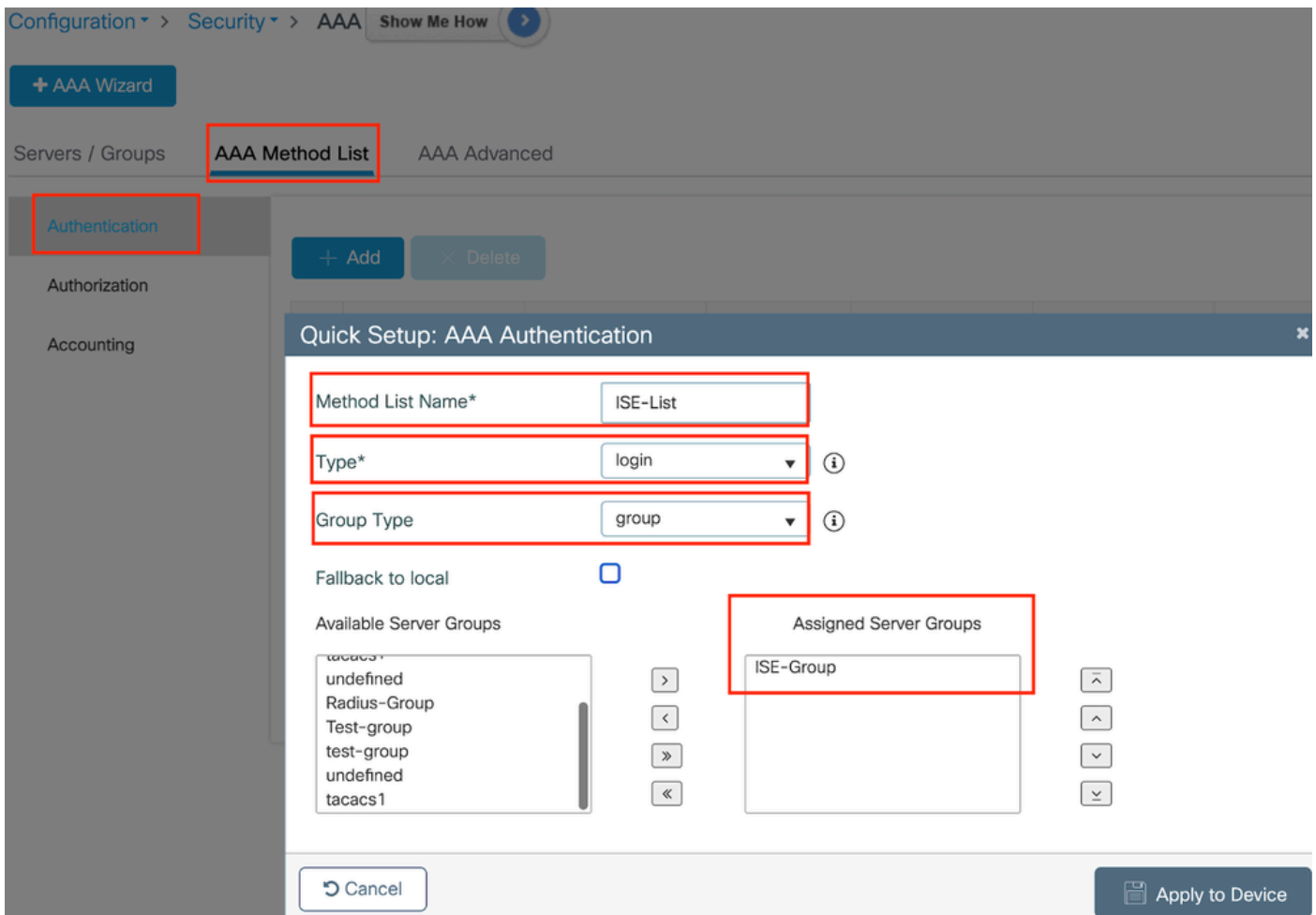
服务器组

CLI 配置

```
aaa group server radius ISE-Group
server name ISE-Auth
ip radius source-interface Vlan2074
deadtime 5
```

第3步：配置AAA方法列表：

导航到AAA Method List选项卡。在Authentication下，点击Add。定义一个方法列表名称，其中Type为“login”，Group type为“Group”。在Assigned Server Group部分下映射已配置的身份验证服务器组。



身份验证方法列表

CLI 配置

```
aaa authentication login ISE-List group ISE-Group
```

导航到Authorization Method List部分，然后点击Add。定义方法列表名称，并将类型设置为“network”，将组类型设置为“Group”。将已配置的RADIUS服务器切换到Assigned Server Groups部分。

+ AAA Wizard

Servers / Groups **AAA Method List** AAA Advanced

Authentication

Authorization

Accounting

+ Add × Delete

Quick Setup: AAA Authorization

Method List Name* network

Type* network ⓘ

Group Type group ⓘ

Fallback to local

Authenticated

Available Server Groups

Assigned Server Groups

tacacs+
undefined
Radius-Group
Test-group
test-group
undefined
tacacs1

> < >> <<

ISE-Group

^ v ^ v

授权方法列表

CLI 配置

```
aaa authorization network network group ISE-Group
```

ISE 配置:

在ISE上添加WLC作为网络设备

第1步：导航到管理>网络设备，然后点击添加。在Radius Authentication Settings下输入控制器IP地址、主机名和共享密钥

Network Devices

Name

Description

 IP Address * IP : / 32 

添加网络设备

RADIUS Authentication Settings

RADIUS UDP Settings

Protocol RADIUS

Shared Secret

Show

共享密钥

第2步：创建用户条目

在Identity Management > Identities下，选择添加选项。

配置客户端必须用于Web身份验证的用户名和密码

✓ Network Access User

* Username

Status Enabled ▼

Email

✓ Passwords

Password Type: ▼

* Login Password

添加用户凭证

第3步：导航到管理(Administration) > 身份管理(Identity Management) > 组(Groups) > 注册设备(Registered Devices)，然后点击添加(Add)。

输入设备MAC地址以在服务器上创建条目。

Identities **Groups** External Identity Sources Identity Source Sequences Settings

Identity Groups

Endpoint Identity Groups

- Blocked List
- GuestEndpoints
- Profiled
- RegisteredDevices**
- Unknown

User Identity Groups

Endpoint Identity Group List > RegisteredDevices

Endpoint Identity Group

* Name: **RegisteredDevices**

Description: Asset Registered Endpoints Identity Group

Parent Group

Identity Group Endpoints

+ Add Remove

Save

Select

MAC Address Static Group Assignment Endpoint Profile

添加设备MAC地址

第4步：创建服务策略

导航到Policy > Policy sets并选择“+”符号以创建新策略集

此策略集用于用户Web身份验证，其中在身份管理中创建客户端的用户名和密码

Policy Sets → User-Webauth

Reset Reset Policyset Hitcounts Save

Status	Policy Set Name	Description	Conditions	Allowed Protocols / Server Sequence	Hits
✓	User-Webauth		Wireless_802.1X	Default Network Access	0

Authentication Policy (1)

Status	Rule Name	Conditions	Use	Hits	Actions
✓	Default		Internal Users		

Options

Web身份验证服务策略

同样，创建MAB服务策略并在身份验证策略下映射内部终端。

Status	Policy Set Name	Description	Conditions	Allowed Protocols / Server Sequence	Hits
✓	Test-MAB		Normalised Radius-RadiusFlowType EQUALS WirelessMAB	Default Network Access	0

Authentication Policy (1)

Status	Rule Name	Conditions	Use	Hits	Actions
✓	Default		Internal Endpoints	0	Options

MAB身份验证服务策略

验证

控制器配置

```
<#root>
```

```
show wireless tag policy detailed
```

```
default-policy-tag
```

```
Policy Tag Name : default-policy-tag
Description      : default policy-tag
Number of WLAN-POLICY maps: 1
WLAN Profile Name           Policy Name
```

```
-----
Mac_Filtering_Wlan
```

```
Web-Filter-Policy
```

```
<#root>
```

```
show wireless profile policy detailed
```

```
Web-Filter-Policy
```

```
Policy Profile Name           :
```

```
Web-Filter-Policy
```

```
Description                   :
```

Status :
ENABLED
VLAN :
2074
Multicast VLAN : 0

<#root>

show wlan name

Mac_Filtering_Wlan

WLAN Profile Name :

Mac_Filtering_Wlan

=====
Identifier : 9
Description :
Network Name (SSID) :

Mac_Filtering_Wlan

Status :

Enabled

Broadcast SSID :

Enabled

Mac Filter Authorization list name :

network

Webauth On-mac-filter Failure :

Enabled

Webauth Authentication List Name :

ISE-List

Webauth Authorization List Name : Disabled

Webauth Parameter Map :

Web-Filter

<#root>

show parameter-map type webauth name Web-Filter

Parameter Map Name :

Web-Filter

Type :

webauth

Auth-proxy Init State time : 120 sec
Webauth max-http connection : 100
Webauth logout-window :

Enabled

Webauth success-window :

Enabled

Consent Email : Disabled
Activation Mode : Replace
Sleeping-Client : Disabled
Webauth login-auth-bypass:

<#root>

show ip http server status

HTTP server status:

Enabled

HTTP server port:

80

HTTP server active supplementary listener ports: 21111
HTTP server authentication method: local
HTTP server auth-retry 0 time-window 0
HTTP server digest algorithm: md5
HTTP server access class: 0
HTTP server IPv4 access class: None
HTTP server IPv6 access class: None
HTTP server base path:
HTTP File Upload status: Disabled
HTTP server upload path:
HTTP server help root:
Maximum number of concurrent server connections allowed: 300
Maximum number of secondary server connections allowed: 50
Server idle time-out: 180 seconds
Server life time-out: 180 seconds
Server session idle time-out: 600 seconds
Maximum number of requests allowed on a connection: 25
Server linger time : 60 seconds
HTTP server active session modules: ALL
HTTP secure server capability: Present
HTTP secure server status:

Enabled

HTTP secure server port:

443

show ap name AP2-AIR-AP3802I-D-K9-2 tag detail

Policy tag mapping

WLAN Profile Name	Policy Name	VLAN	Flex
Mac_Filtering_Wlan	Web-Filter-Policy	2074	ENAB

控制器上的客户端策略状态

导航到Dashboard (控制面板) > Clients (客户端) 部分，确认连接的客户端的状态。
客户端当前处于Web身份验证挂起状态

Clients Sleeping Clients Excluded Clients

Selected 0 out of 1 Clients

Client MAC Address	IPv4 Address	IPv6 Address	AP Name	Slot ID	SSID	WLAN ID	Client Type	State	Protocol	User Name	Device Type
6c7e.67e3.6db9	10.76.6.150	fe80::10eb:ede2:23fe:75c3	AP2-AIR-AP3802I-D-K9-2	1	Mac_Filtering_Wlan	9	WLAN	Web Auth Pending	11ac	6c7e67e36db9	N/A

1 - 1 of 1 clients

客户端详细信息

```
show wireless client summary
```

```
Number of Clients: 1
```

MAC Address	AP Name	Type	ID	State	Protocol	Method
6c7e.67e3.6db9	AP2-AIR-AP3802I-D-K9-2	WLAN	9	Webauth Pending	11ac	Web

```
<#root>
```

```
show wireless client mac-address 6c7e.67e3.6db9 detail
```

```
Client MAC Address :
```

```
6c7e.67e3.6db9
```

```
Client MAC Type : Universally Administered Address
```

```
Client DUID: NA
```

```
Client IPv4 Address :
```

```
10.76.6.150
```

```
Client IPv6 Addresses : fe80::10eb:ede2:23fe:75c3
```

```
Client Username :
```

```
6c7e67e36db9
```

```
AP MAC Address : 1880.902b.05e0
```

```
AP Name: AP2-AIR-AP3802I-D-K9-2
```

```
AP slot : 1
```

```
Client State : Associated
```

```
Policy Profile :
```

```
Web-Filter-Policy
```

```
Flex Profile : N/A
```

```
Wireless LAN Id: 9
WLAN Profile Name:

Mac_Filtering_Wlan

Wireless LAN Network Name (SSID): Mac_Filtering_Wlan
BSSID : 1880.902b.05eb

Client ACLs : None
Mac authentication :

Failed

Policy Manager State:

Webauth Pending

Last Policy Manager State :

IP Learn Complete

Client Entry Create Time : 88 seconds
Policy Type : N/A
Encryption Cipher : None

Auth Method Status List
    Method: Web Auth
        Webauth State      :

Get Redirect

        Webauth Method    :

Webauth
```

在网络身份验证成功后，客户端策略管理器状态会转换为RUN

```
<#root>
```

```
show wireless client mac-address 6c7e.67e3.6db9 detail
```

```
Client ACLs : None
Mac authentication : Failed
Policy Manager State:

Run

Last Policy Manager State :

Webauth Pending

Client Entry Create Time : 131 seconds
Policy Type : N/A
```

故障排除

Web Auth on MAC Failure功能的功能依赖于控制器功能在MAB出现故障时触发Web身份验证。我们的主要目标是从控制器中有效地收集RA跟踪，以进行故障排除和分析。

放射性痕量收集

激活Radio Active Tracing以在CLI中为指定的MAC地址生成客户端调试跟踪。

启用放射性跟踪的步骤：

确保禁用所有条件调试

```
clear platform condition all
```

启用对指定MAC地址的调试

```
debug wireless mac <H.H.H> monitor-time <Time in seconds>
```

重现问题后，请禁用调试以停止RA跟踪收集。

```
no debug wireless mac <H.H.H>
```

一旦RA跟踪停止，就会在控制器bootflash中生成调试文件。

```
show bootflash: | include ra_trace  
2728          179 Jul 17 2024 15:13:54.0000000000 +00:00 ra_trace_MAC_aaaabbbbcccc_HHMMSS.XXX_timezone_Da
```

将文件复制到外部服务器。

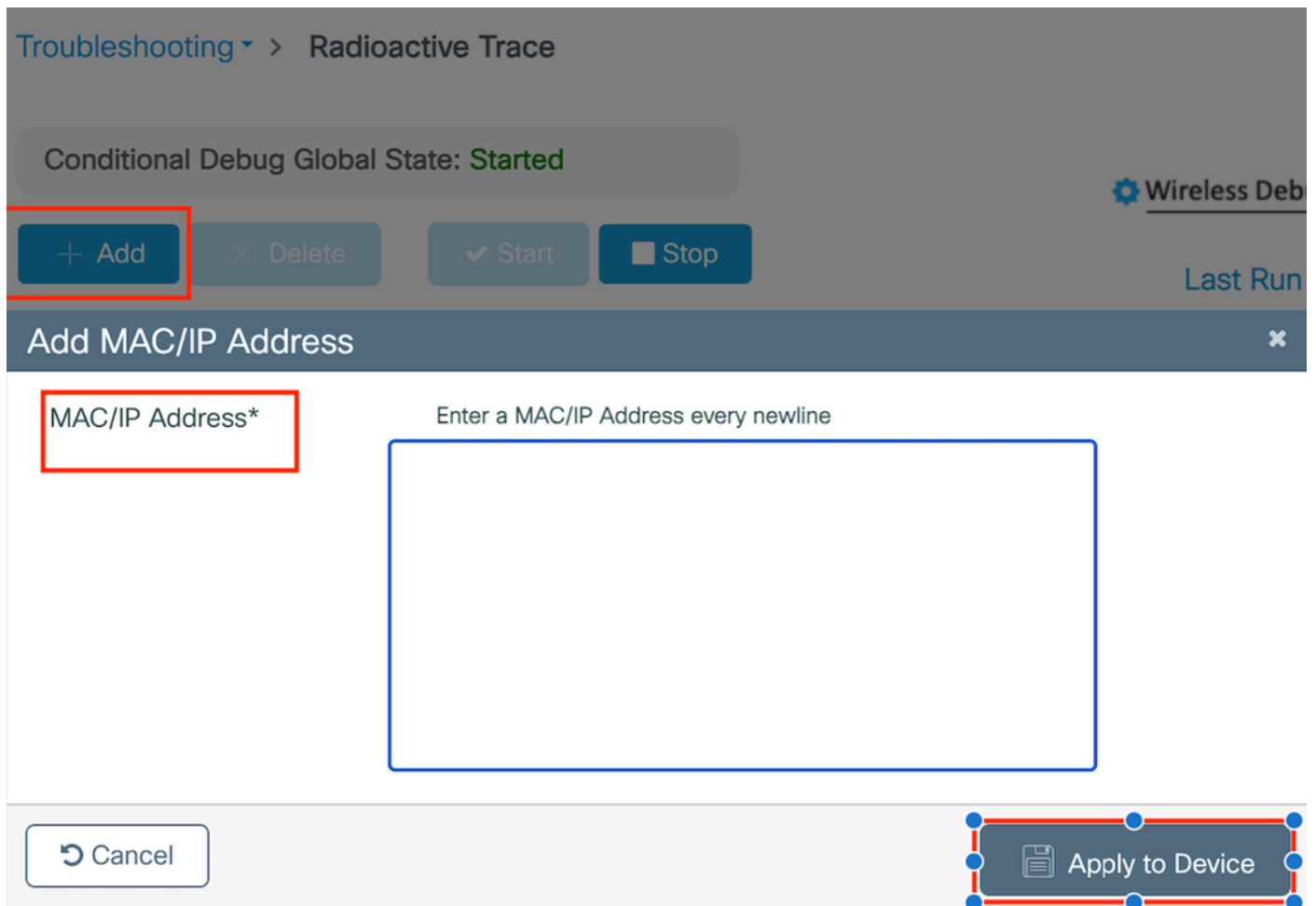
```
copy bootflash:ra_trace_MAC_aaaabbbbcccc_HHMMSS.XXX_timezone_DayWeek_Month_Day_year.log tftp://<IP address>
```

显示调试日志：

```
more bootflash:ra_trace_MAC_aaaabbbbcccc_HHMMSS.XXX_timezone_DayWeek_Month_Day_year.log
```

在GUI中启用RA跟踪，

第1步：导航至故障排除>放射性跟踪。选择添加新条目的选项，然后在指定的添加MAC/IP地址 (Add MAC/IP Address)选项卡中输入客户端MAC地址。



无线电主动跟踪

嵌入式数据包捕获：

导航到Troubleshooting > Packet Capture。输入捕获名称并指定客户端MAC地址作为内部过滤器MAC。将缓冲区大小设置为100并选择上行链路接口来监控传入和传出数据包。

+ Add × Delete

Create Packet Capture

Capture Name* TestPCap

Filter* any

Monitor Control Plane

Inner Filter Protocol DHCP

Inner Filter MAC

Buffer Size (MB)* 100

Limit by* Duration 3600 secs ~ 1.00 hour

Available (12) Search

- Tw0/0/1
- Tw0/0/2
- Tw0/0/3
- Te0/1/0

Selected (1)

- Tw0/0/0

嵌入式数据包捕获

注意：选择“监控控制流量”选项以查看重定向到系统CPU并重新注入数据平面的流量。

选择Start捕获数据包

Capture Name	Interface	Monitor Control Plane	Buffer Size	Filter by	Limit	Status	Action
<input type="checkbox"/> TestPCap	TwoGigabitEthernet0/0/0	No	0%	any	3600 secs	Inactive	<input type="button" value="Start"/>

开始捕获

CLI 配置

```
monitor capture TestPCap inner mac <H.H.H>  
monitor capture TestPCap buffer size 100  
monitor capture TestPCap interface twoGigabitEthernet 0/0/0 both  
monitor capture TestPCap start
```

<Reproduce the issue>

monitor capture TestPCap stop

show monitor capture TestPCap

Status Information for Capture TestPCap

Target Type:

Interface: TwoGigabitEthernet0/0/0, Direction: BOTH

Status : Inactive

Filter Details:

Capture all packets

Inner Filter Details:

Mac: 6c7e.67e3.6db9

Continuous capture: disabled

Buffer Details:

Buffer Type: LINEAR (default)

Buffer Size (in MB): 100

Limit Details:

Number of Packets to capture: 0 (no limit)

Packet Capture duration: 3600

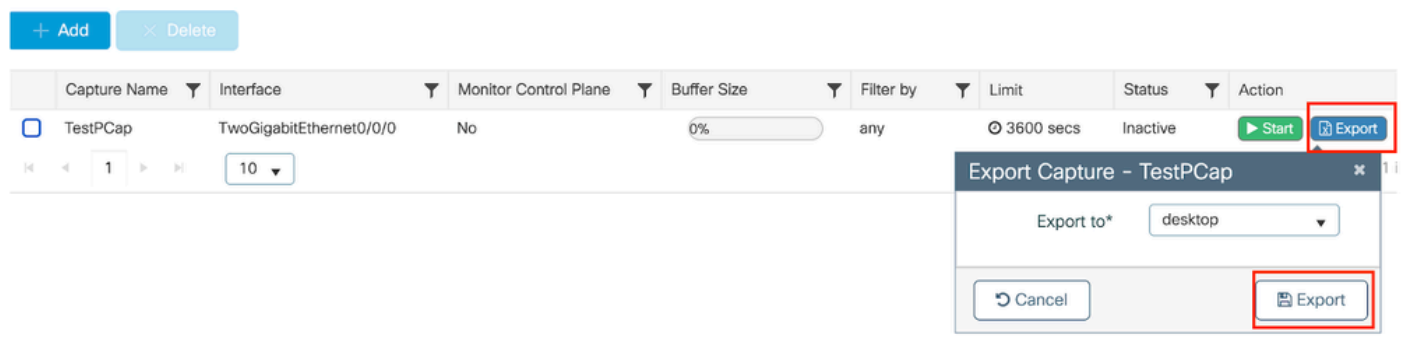
Packet Size to capture: 0 (no limit)

Maximum number of packets to capture per second: 1000

Packet sampling rate: 0 (no sampling)

将数据包捕获导出到外部TFTP服务器

monitor capture TestPCap export tftp://<IP address>/ TestPCap.pcap



导出数据包捕获

示例场景在MAC身份验证成功期间，客户端设备连接到网络，其MAC地址由RADIUS服务器通过配置的策略进行验证，并在验证后，由网络接入设备授予访问权限，从而允许网络连接。

客户端关联后，控制器向ISE服务器发送访问请求，

User name是客户端的MAC地址，因为这是MAB身份验证

2024/07/16 21:12:52.711298748 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Send Access-Request t

```
2024/07/16 21:12:52.711310730 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: authenticator 19 c6
2024/07/16 21:12:52.711326401 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: User-Name
2024/07/16 21:12:52.711329615 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: User-Password
2024/07/16 21:12:52.711337331 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Service-Type
2024/07/16 21:12:52.711340443 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Vendor, Cisco
2024/07/16 21:12:52.711344513 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Cisco AVpair
2024/07/16 21:12:52.711349087 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Framed-MTU
2024/07/16 21:12:52.711351935 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Message-Authenticato
2024/07/16 21:12:52.711377387 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: EAP-Key-Name
2024/07/16 21:12:52.711382613 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Vendor, Cisco
2024/07/16 21:12:52.711385989 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Cisco AVpair
```

ISE发送Access-Accept , 因为我们有有效的用户条目

```
2024/07/16 21:12:52.779147404 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Received from id 1812
2024/07/16 21:12:52.779156117 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: authenticator 5d dc
2024/07/16 21:12:52.779161793 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: User-Name
2024/07/16 21:12:52.779165183 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Class
2024/07/16 21:12:52.779219803 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Message-Authenticato
```

```
2024/07/16 21:12:52.779417578 {wncd_x_R0-0}{1}: [mab] [17765]: (info): [6c7e.67b7.2d29:capwap_90000005]
2024/07/16 21:12:52.779436247 {wncd_x_R0-0}{1}: [mab] [17765]: (info): [6c7e.67b7.2d29:capwap_90000005]
```

客户端策略状态转换为Mac Auth已完成

```
2024/07/16 21:12:52.780181486 {wncd_x_R0-0}{1}: [client-auth] [17765]: (info): MAC: 6c7e.67b7.2d29 Cli
2024/07/16 21:12:52.780238297 {wncd_x_R0-0}{1}: [client-orch-sm] [17765]: (debug): MAC: 6c7e.67b7.2d29
```

在成功MAB身份验证后 , 客户端处于IP learn状态

```
2024/07/16 21:12:55.791404789 {wncd_x_R0-0}{1}: [client-orch-state] [17765]: (note): MAC: 6c7e.67b7.2d29
2024/07/16 21:12:55.791739386 {wncd_x_R0-0}{1}: [client-iplearn] [17765]: (info): MAC: 6c7e.67b7.2d29
```

```
2024/07/16 21:12:55.794130301 {iosrp_R0-0}{1}: [buginf] [4440]: (debug): AUTH-FEAT-SISF-EVENT: IP updat
```

客户端策略管理器状态更新为RUN , 对完成MAB身份验证的客户端跳过Web身份验证

```
2024/07/16 21:13:11.210786952 {wncd_x_R0-0}{1}: [errmsg] [17765]: (info): %CLIENT_ORCH_LOG-6-CLIENT_ADD
```

使用嵌入式数据包捕获进行验证

No.	Time	Source	Destination	Length	Protocol	Info
53	02:42:52.710961	10.76.6.156	10.197.224.122		RADIUS	Access-Request id=0
54	02:42:52.778951	10.197.224.122	10.76.6.156		RADIUS	Access-Accept id=0

Frame 53: 464 bytes on wire (3712 bits), 464 bytes captured (3712 bits)
Ethernet II, Src: Cisco_58:42:4b (f4:bd:9e:58:42:4b), Dst: Cisco_34:90:e7 (6c:5e:3b:34:90:e7)
Internet Protocol Version 4, Src: 10.76.6.156, Dst: 10.197.224.122
User Datagram Protocol, Src Port: 65433, Dst Port: 1812
RADIUS Protocol
Code: Access-Request (1)
Packet identifier: 0x0 (0)
Length: 422
Authenticator: 19c6635633a7e6b6f30070b02a7f753c
[The response to this request is in frame 54]
Attribute Value Pairs
> AVP: t=User-Name(1) l=14 val=6c7e67b72d29
> AVP: t=User-Password(2) l=18 val=Encrypted
> AVP: t=Service-Type(6) l=6 val=Call-Check(10)
> AVP: t=Vendor-Specific(26) l=31 vnd=ciscoSystems(9)
> AVP: t=Framed-MTU(12) l=6 val=1485

Radius数据包

客户端设备的MAC身份验证失败的示例

在成功关联后为客户端启动MAC身份验证

```
2024/07/17 03:20:59.842211775 {wncd_x_R0-0}{1}: [mab] [17765]: (info): [6c7e.67e3.6db9:capwap_90000005]  
2024/07/17 03:20:59.842280253 {wncd_x_R0-0}{1}: [ewlc-infra-evq] [17765]: (note): Authentication Success  
2024/07/17 03:20:59.842284313 {wncd_x_R0-0}{1}: [client-auth] [17765]: (info): MAC: 6c7e.67e3.6db9 Cli  
2024/07/17 03:20:59.842320572 {wncd_x_R0-0}{1}: [mab] [17765]: (info): [6c7e.67e3.6db9:capwap_90000005]
```

ISE将发送Access-Reject，因为ISE中不存在此设备条目

```
2024/07/17 03:20:59.842678322 {wncd_x_R0-0}{1}: [mab] [17765]: (info): [6c7e.67e3.6db9:capwap_90000005]  
2024/07/17 03:20:59.842877636 {wncd_x_R0-0}{1}: [auth-mgr] [17765]: (info): [6c7e.67e3.6db9:capwap_90000005]
```

由于MAB失败，已为客户端设备启动Web-Auth

```
2024/07/17 03:20:59.843728206 {wncd_x_R0-0}{1}: [client-auth] [17765]: (info): MAC: 6c7e.67e3.6db9 Cli
```

一旦客户端发起HTTP GET请求，重定向URL将被推送到客户端设备，因为相应的TCP会话被控制器欺骗。

```
2024/07/17 03:21:37.817434046 {wncd_x_R0-0}{1}: [webauth-httpd] [17765]: (info): capwap_90000005[6c7e.6
2024/07/17 03:21:37.817459639 {wncd_x_R0-0}{1}: [webauth-httpd] [17765]: (debug): capwap_90000005[6c7e.
2024/07/17 03:21:37.817466483 {wncd_x_R0-0}{1}: [webauth-httpd] [17765]: (debug): capwap_90000005[6c7e.
2024/07/17 03:21:37.817482231 {wncd_x_R0-0}{1}: [webauth-state] [17765]: (info): capwap_90000005[6c7e.6
```

客户端向重定向URL发起HTTP Get，页面加载后，登录凭证即被提交。

控制器向ISE发送访问请求

这是Web身份验证，因为在Access-Accept数据包中观察到有效的用户名

```
2024/07/17 03:22:51.132347799 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Send Access-Request t
2024/07/17 03:22:51.132362949 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: authenticator fd 40
2024/07/17 03:22:51.132368737 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Calling-Station-Id
2024/07/17 03:22:51.132372791 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: User-Name
2024/07/17 03:22:51.132376569 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Vendor, Cisco
```

从ISE接收的Access - Accept

```
2024/07/17 03:22:51.187040709 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Received from id 1812
2024/07/17 03:22:51.187050061 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: authenticator d3 ac
2024/07/17 03:22:51.187055731 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: User-Name
2024/07/17 03:22:51.187059053 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Class
2024/07/17 03:22:51.187102553 {wncd_x_R0-0}{1}: [radius] [17765]: (info): RADIUS: Message-Authenticato
```

Web身份验证成功，客户端状态转换到运行状态

```
2024/07/17 03:22:51.193775717 {wncd_x_R0-0}{1}: [errmsg] [17765]: (info): %CLIENT_ORCH_LOG-6-CLIENT_ADD
2024/07/17 03:22:51.194009423 {wncd_x_R0-0}{1}: [client-orch-state] [17765]: (note): MAC: 6c7e.67e3.6db
```

通过EPC捕获进行验证

客户端完成与控制器虚拟IP地址的TCP握手，然后客户端加载重定向门户页面。用户提交用户名和密码后，我们可以观察来自控制器管理IP地址的radius访问请求。

身份验证成功后，客户端TCP会话关闭，并且在控制器上，客户端转换到RUN状态。

15649	08:52:51.122979	10.76.6.150	192.0.2.1	TCP	58832 → 443 [SYN, ECE, CWR] Seq=0 Win=65535 Len=0 MSS=1250 WS=64 TSval=4022788869 TSecr=0 SACK_PERM
15650	08:52:51.123986	192.0.2.1	10.76.6.150	TCP	443 → 58832 [SYN, ACK, ECE] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM TSval=3313564363 TSecr=4022
15651	08:52:51.125985	10.76.6.150	192.0.2.1	TCP	58832 → 443 [ACK] Seq=1 Ack=1 Win=131200 Len=0 TSval=4022788871 TSecr=3313564363
15652	08:52:51.126992	10.76.6.150	192.0.2.1	512	TLSv1.2 Client Hello
15653	08:52:51.126992	192.0.2.1	10.76.6.150	TCP	443 → 58832 [ACK] Seq=1 Ack=518 Win=64768 Len=0 TSval=3313564366 TSecr=4022788871
15654	08:52:51.126992	192.0.2.1	10.76.6.150	85,1,64	TLSv1.2 Server Hello, Change Cipher Spec, Encrypted Handshake Message
15655	08:52:51.129982	10.76.6.150	192.0.2.1	TCP	58832 → 443 [ACK] Seq=518 Ack=166 Win=131008 Len=0 TSval=4022788876 TSecr=3313564367
15656	08:52:51.129982	10.76.6.150	192.0.2.1	1,64	TLSv1.2 Change Cipher Spec, Encrypted Handshake Message
15657	08:52:51.130989	10.76.6.150	192.0.2.1	640	TLSv1.2 Application Data
15658	08:52:51.130989	10.76.6.150	192.0.2.1	160	TLSv1.2 Application Data
15659	08:52:51.130989	192.0.2.1	10.76.6.150	TCP	443 → 58832 [ACK] Seq=166 Ack=1403 Win=64000 Len=0 TSval=3313564371 TSecr=4022788876
15660	08:52:51.131981	10.76.6.156	10.197.224.122	RADIUS	Access-Request id=3
15663	08:52:51.186986	10.197.224.122	10.76.6.156	RADIUS	Access-Accept id=3
15665	08:52:51.191976	192.0.2.1	10.76.6.150	TCP	443 → 58832 [ACK] Seq=166 Ack=1403 Win=64128 Len=948 TSval=3313564432 TSecr=4022788876 [TCP segment o
15666	08:52:51.191976	192.0.2.1	10.76.6.150	TCP	443 → 58832 [ACK] Seq=1114 Ack=1403 Win=64128 Len=948 TSval=3313564432 TSecr=4022788876 [TCP segment i
15667	08:52:51.191976	192.0.2.1	10.76.6.150	2496	TLSv1.2 Application Data
15668	08:52:51.192983	192.0.2.1	10.76.6.150	48	TLSv1.2 Encrypted Alert
15673	08:52:51.196980	10.76.6.150	192.0.2.1	TCP	58832 → 443 [ACK] Seq=1403 Ack=2667 Win=128512 Len=0 TSval=4022788942 TSecr=3313564432
15674	08:52:51.196980	10.76.6.150	192.0.2.1	TCP	58832 → 443 [ACK] Seq=1403 Ack=2721 Win=128512 Len=0 TSval=4022788942 TSecr=3313564432
15675	08:52:51.196980	10.76.6.150	192.0.2.1	TCP	[TCP Window Update] 58832 → 443 [ACK] Seq=1403 Ack=2721 Win=131072 Len=0 TSval=4022788942 TSecr=331356
15676	08:52:51.197987	10.76.6.150	192.0.2.1	48	TLSv1.2 Encrypted Alert
15677	08:52:51.197987	10.76.6.150	192.0.2.1	TCP	58832 → 443 [FIN, ACK] Seq=1456 Ack=2721 Win=131072 Len=0 TSval=4022788942 TSecr=3313564432
15678	08:52:51.197987	192.0.2.1	10.76.6.150	TCP	443 → 58832 [RST] Seq=2721 Win=0 Len=0
15679	08:52:51.197987	192.0.2.1	10.76.6.150	TCP	443 → 58832 [RST] Seq=2721 Win=0 Len=0

使用RADIUS数据包的TCP流

15660	08:52:51.131981	10.76.6.156	10.197.224.122	RADIUS	Access-Request id=3
15663	08:52:51.186986	10.197.224.122	10.76.6.156	RADIUS	Access-Accept id=3

Frame 15660: 499 bytes on wire (3992 bits), 499 bytes captured (3992 bits)
 Ethernet II, Src: Cisco_58:42:4b (f4:bd:9e:58:42:4b), Dst: Cisco_34:90:e7 (6c:5e:3b:34:90:e7)
 Internet Protocol Version 4, Src: 10.76.6.156, Dst: 10.197.224.122
 User Datagram Protocol, Src Port: 65433, Dst Port: 1812
 RADIUS Protocol

```
Code: Access-Request (1)
Packet identifier: 0x3 (3)
Length: 457
Authenticator: fd400f7e3567dc5a63cfefaef379eaa
[The response to this request is in frame 15663]
Attribute Value Pairs
  AVP: t=Calling-Station-Id(31) l=19 val=6c-7e-67-e3-6d-b9
  AVP: t=User-Name(1) l=10 val=testuser
  AVP: t=Vendor-Specific(26) l=49 vnd=ciscoSystems(9)
  AVP: t=Framed-IP-Address(8) l=6 val=10.76.6.150
  AVP: t=Message-Authenticator(80) l=16 val=501b124c30216efd5973086d99f3a185
  AVP: t=Service-Type(6) l=6 val=Dialout-Framed-User(5)
  AVP: t=Vendor-Specific(26) l=29 vnd=ciscoSystems(9)
  AVP: t=Vendor-Specific(26) l=22 vnd=ciscoSystems(9)
  AVP: t=User-Password(2) l=18 val=Encrypted
```

使用用户凭证发送到ISE的RADIUS数据包

客户端wireshark捕获验证客户端流量是否被重定向到门户页面，并验证与控制器虚拟ip地址/Web服务器的TCP握手

Time	Source	Destination	Length	Protocol	Info
105	08:51:34.203945	10.76.6.150	10.76.6.145	HTTP	GET /auth/discovery?architecture=9 HTTP/1.1
108	08:51:34.206602	10.76.6.145	10.76.6.150	HTTP	HTTP/1.1 200 OK (text/html)
234	08:51:39.028084	10.76.6.150	7.7.7.7	HTTP	GET / HTTP/1.1
236	08:51:39.031420	7.7.7.7	10.76.6.150	HTTP	HTTP/1.1 200 OK (text/html)

Frame 108: 703 bytes on wire (5624 bits), 703 bytes captured (5624 bits) on interface en0, id 0
 Ethernet II, Src: Cisco_34:90:e7 (6c:5e:3b:34:90:e7), Dst: Apple_e3:6d:b9 (6c:7e:67:e3:6d:b9)
 Internet Protocol Version 4, Src: 10.76.6.145, Dst: 10.76.6.150
 Transmission Control Protocol, Src Port: 80, Dst Port: 58811, Seq: 1, Ack: 107, Len: 637
 Hypertext Transfer Protocol
 Line-based text data: text/html (9 lines)
 <HTML><meta http-equiv="Content-Type" content="text/html; charset=utf-8" name="viewport" content="width=device-width, initial-scale=1">\n
 <HEAD>\n
 <TITLE> Web Authentication Redirect</TITLE>\n
 <META http-equiv="Cache-control" content="no-cache">\n
 <META http-equiv="Pragma" content="no-cache">\n
 <META http-equiv="Expires" content="-1">\n
 <META http-equiv="refresh" content="1; URL=https://192.0.2.1/login.html?redirect=http://10.76.6.145/auth/discovery?architecture=9">\n
 /HEAD>\n
 </HTML>

客户端捕获以验证重定向url

客户端与控制器的虚拟IP地址建立TCP握手

Time	Source	Destination	Length	Protocol	Info
115	08:51:34.208377	10.76.6.150	192.0.2.1	TCP	58812 → 443 [SYN, ECE, CWR] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=3224314628 TSecr=0 SACK_P
117	08:51:34.211190	192.0.2.1	10.76.6.150	TCP	443 → 58812 [SYN, ACK, ECE] Seq=0 Ack=1 Win=65160 Len=0 MSS=1250 SACK_PERM TSval=3313491061 TSec
118	08:51:34.211275	10.76.6.150	192.0.2.1	TCP	58812 → 443 [ACK] Seq=1 Ack=1 Win=131200 Len=0 TSval=3224314631 TSecr=3313491061
120	08:51:34.212673	10.76.6.150	192.0.2.1	512 TLsv1.2	Client Hello
122	08:51:34.217896	192.0.2.1	10.76.6.150	TCP	443 → 58812 [ACK] Seq=1 Ack=518 Win=64768 Len=0 TSval=3313491066 TSecr=3224314632
124	08:51:34.220834	192.0.2.1	10.76.6.150	89,830 TLsv1.2	Server Hello, Certificate
125	08:51:34.220835	192.0.2.1	10.76.6.150	783 TLsv1.2	Server Key Exchange, Server Hello Done

客户端和Web服务器之间的TCP握手

会话在Web身份验证成功后关闭，

144	08:51:34.235915	10.76.6.150	192.0.2.1	TCP	[TCP Window Update] 58812 → 443 [ACK] Seq=1145 Ack=10183 Win=131072 Len=0 TSval=3224314655 TS
145	08:51:34.235996	10.76.6.150	192.0.2.1	52 TLsv1.2	Encrypted Alert
146	08:51:34.236029	10.76.6.150	192.0.2.1	TCP	58812 → 443 [FIN, ACK] Seq=1202 Ack=10183 Win=131072 Len=0 TSval=3224314655 TSecr=3313491084
147	08:51:34.238965	192.0.2.1	10.76.6.150	52 TLsv1.2	Encrypted Alert
148	08:51:34.238966	192.0.2.1	10.76.6.150	TCP	443 → 58812 [FIN, ACK] Seq=10240 Ack=1203 Win=64256 Len=0 TSval=3313491089 TSecr=3224314655

客户端完成Web身份验证后TCP会话关闭

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