Configure Static IP Address Assignment to AnyConnect Users via RADIUS Authorization

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Introduction

This document describes how to configure RADIUS Authorization with an Identity Services Engine (ISE) server so it always forwards the same IP address to the Firepower Threat Defense (FTD) for a specific Cisco AnyConnect Secure Mobility Client user via the RADIUS Attribute 8 Framed-IP-Address.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- FTD
- Firepower Management Center (FMC)
- ISE
- Cisco AnyConnect Secure Mobility Client
- RADIUS protocol

Components Used

The information in this document is based on these software versions:

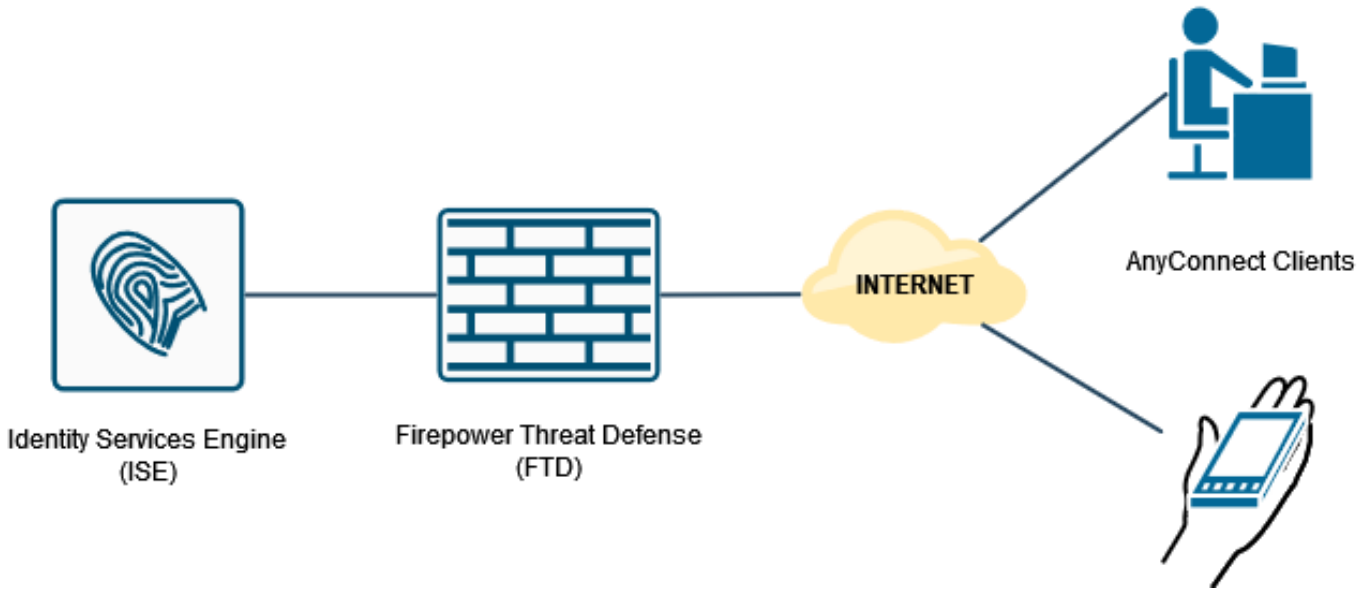
- FMCv - 7.0.0 (build 94)
- FTDv - 7.0.0 (Build 94)
- ISE - 2.7.0.356
- AnyConnect - 4.10.02086
- Windows 10 Pro

The information in this document was created from the devices in a specific lab environment. All of the

devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Configure

Network Diagram



Configure Remote Access VPN with AAA/RADIUS Authentication via FMC

For a step-by-step procedure, refer to this document and this video:

- AnyConnect Remote Access VPN Configuration on FTD
- Initial AnyConnect Configuration for FTD Managed by FMC

Remote Access VPN configuration on the FTD CLI is:

```
ip local pool AC_Pool 10.0.50.1-10.0.50.100 mask 255.255.255.0

interface GigabitEthernet0/0
 nameif Outside_Int
 security-level 0
 ip address 192.168.0.100 255.255.255.0

aaa-server ISE_Server protocol radius
aaa-server ISE_Server host 172.16.0.8
 key *****
 authentication-port 1812
 accounting-port 1813

crypto ca trustpoint RAVPN_Self-Signed_Cert
 enrollment self
 fqdn none
 subject-name CN=192.168.0.100
 keypair <Default-RSA-Key>
 crl configure

ssl trust-point RAVPN_Self-Signed_Cert
```

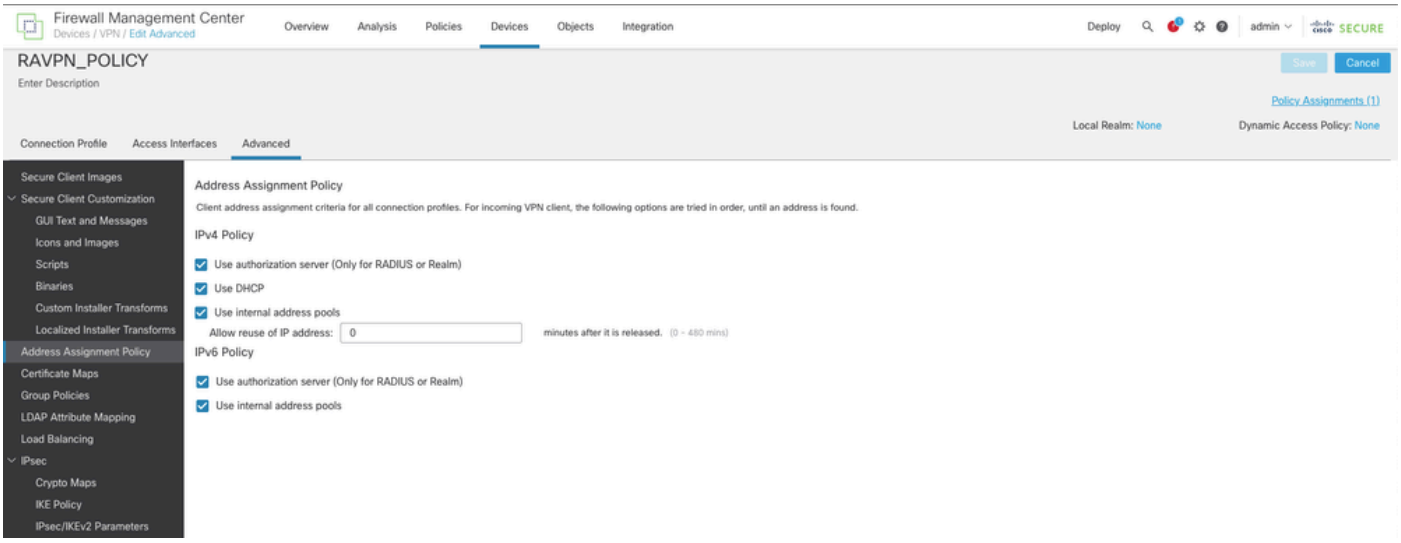
```
webvpn
 enable Outside_Int
 http-headers
  hsts-server
   enable
   max-age 31536000
   include-sub-domains
   no preload
  hsts-client
   enable
  x-content-type-options
  x-xss-protection
  content-security-policy
 anyconnect image disk0:/csm/anyconnect-win-4.10.02086-webdeploy-k9.pkg 1 regex "Windows"
 anyconnect enable
 tunnel-group-list enable
 cache
  no disable
 error-recovery disable

group-policy DfltGrpPolicy attributes
 vpn-tunnel-protocol ikev2 ssl-client
 user-authentication-idle-timeout none
 webvpn
  anyconnect keep-installer none
  anyconnect modules value none
  anyconnect ask none default anyconnect
  http-comp none
  activex-relay disable
  file-entry disable
  file-browsing disable
  url-entry disable
  deny-message none

tunnel-group RA_VPN type remote-access
tunnel-group RA_VPN general-attributes
 address-pool AC_Pool
 authentication-server-group ISE_Server
tunnel-group RA_VPN webvpn-attributes
 group-alias RA_VPN enable
```

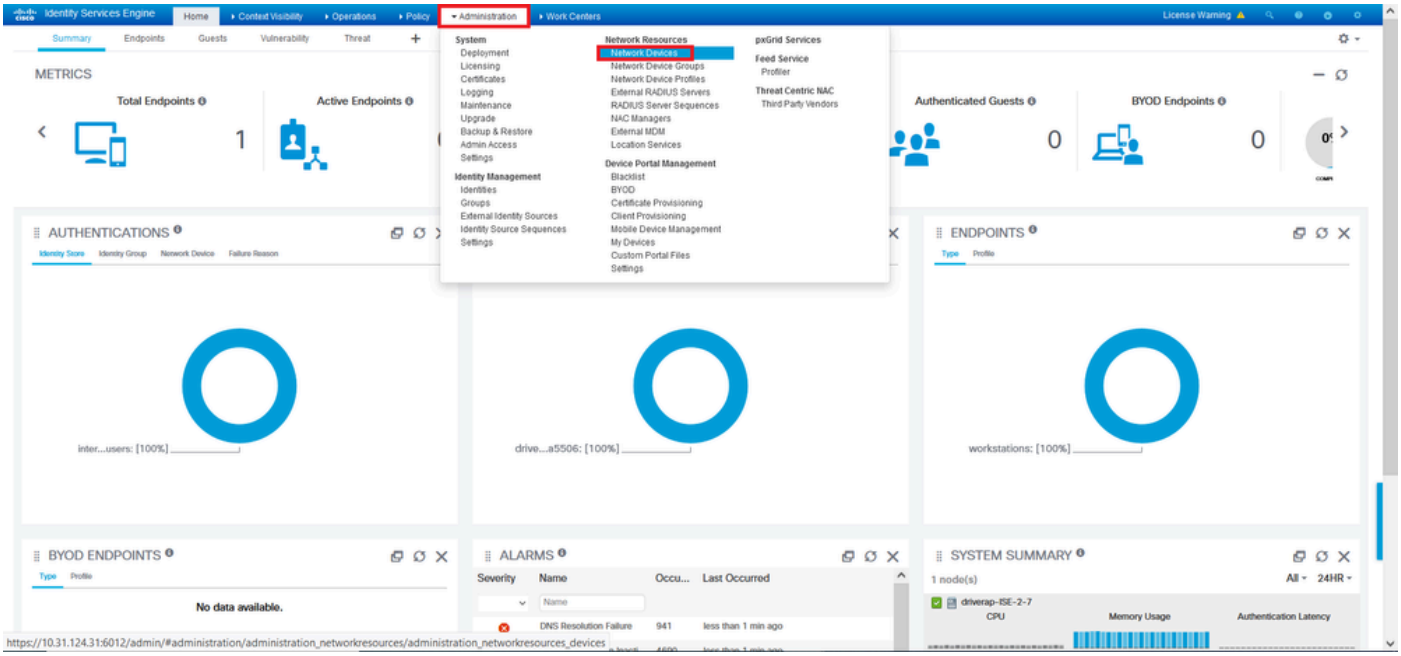
Configure to Use Authorization Server On FMC

Navigate to **Devices > Remote Access** and select the desired Remote Access VPN policy. Navigate to **Advanced > Address Assignment Policy** and ensure the option **Use authorization server (Only for RADIUS or Realm)** is enabled.

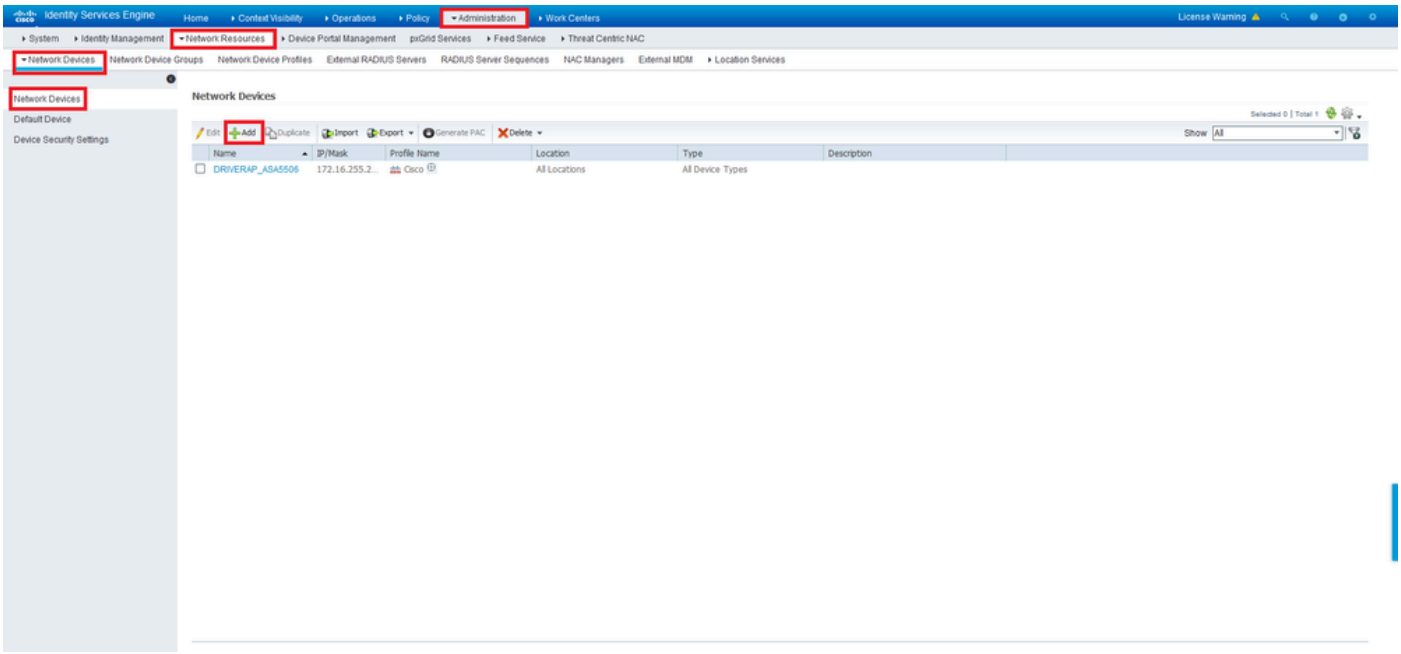


Configure Authorization Policy on ISE (RADIUS Server)

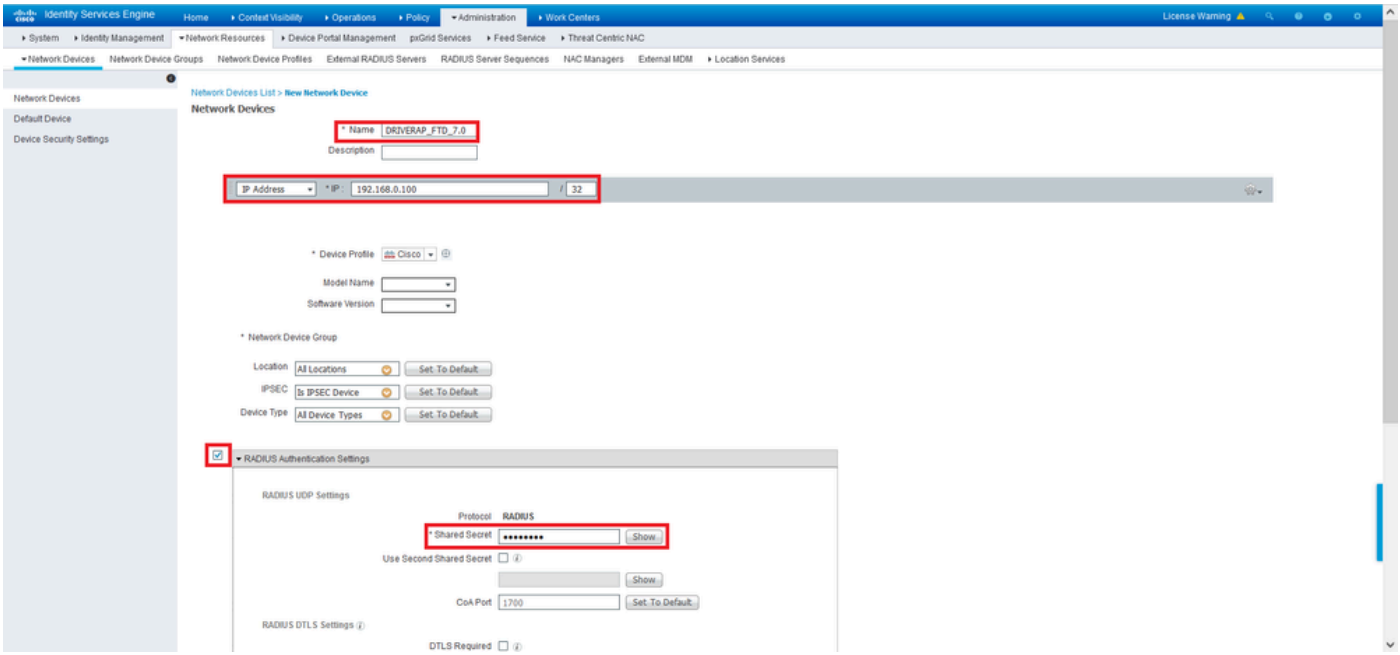
Step 1. Log in to the ISE server and navigate to **Administration > Network Resources > Network Devices**.



Step 2. In the Network Devices section, click **Add** so ISE can process RADIUS Access Requests from the FTD.

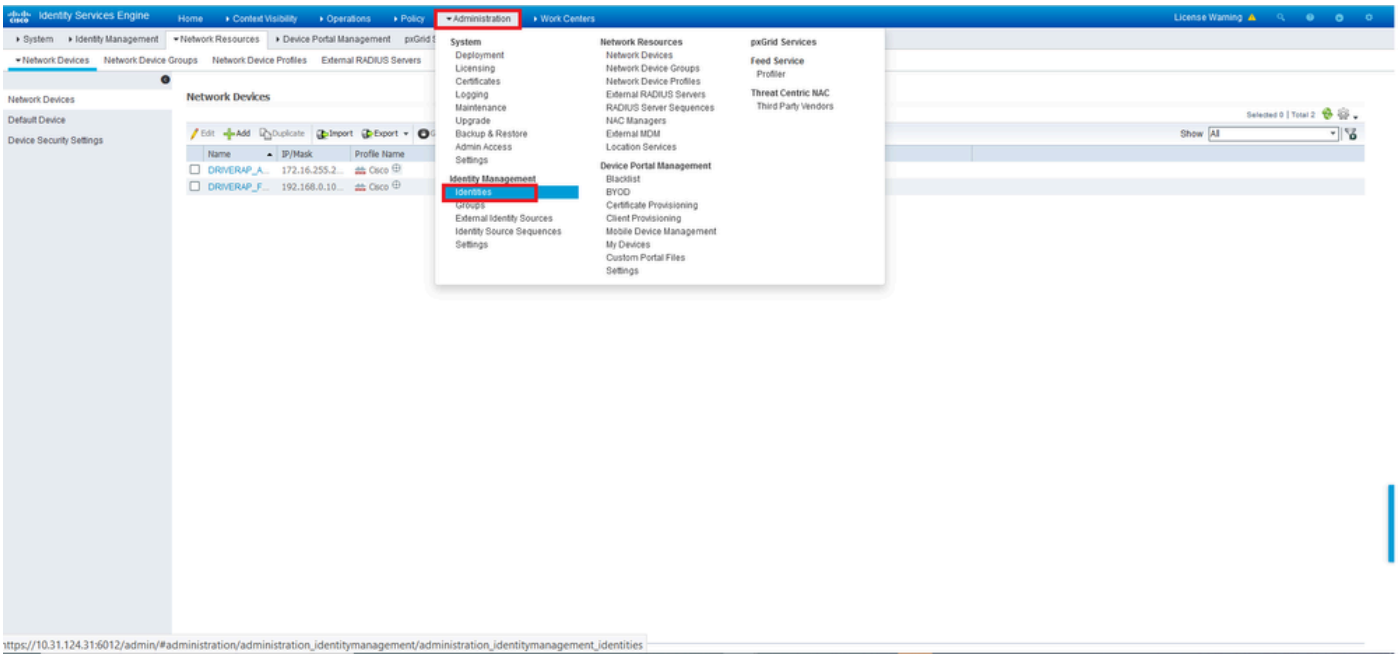


Enter the network device **Name** and **IP Address** fields and then check **RADIUS Authentication Settings** box. The **Shared Secret** must be the same value that was used when the RADIUS Server object on FMC was created.

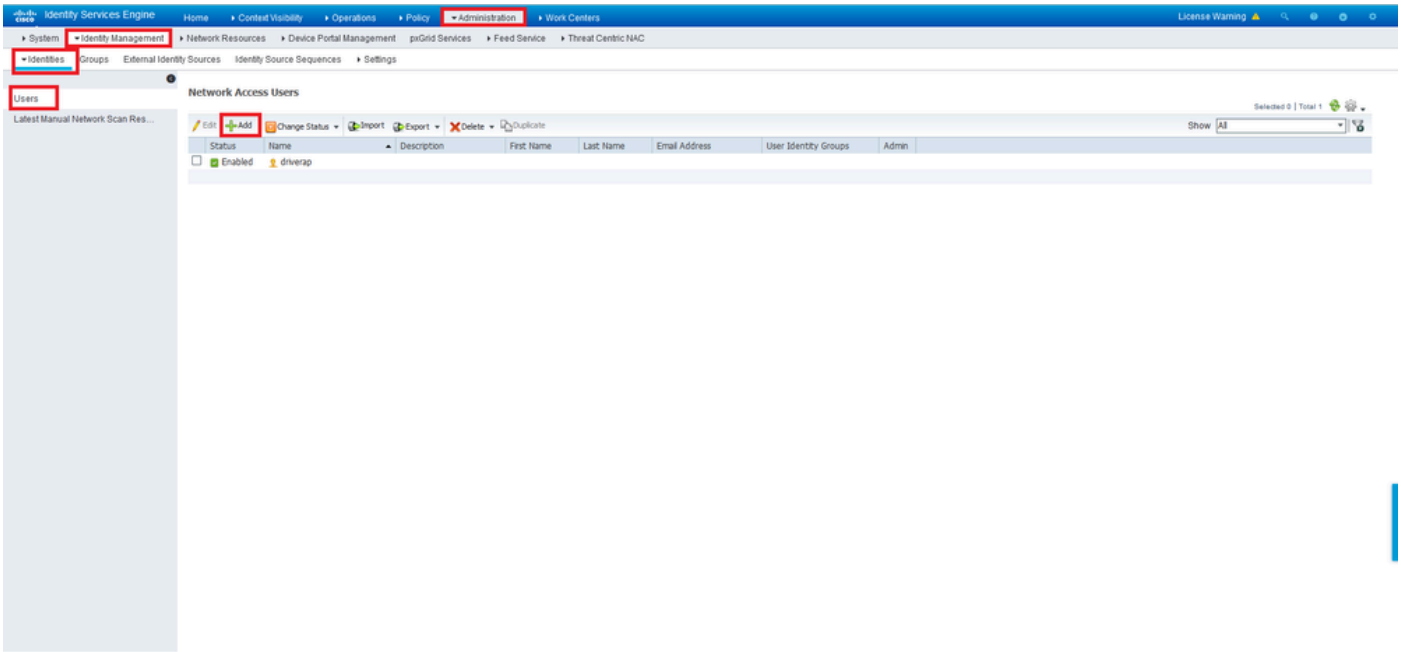


Save it with the button at the end of this page.

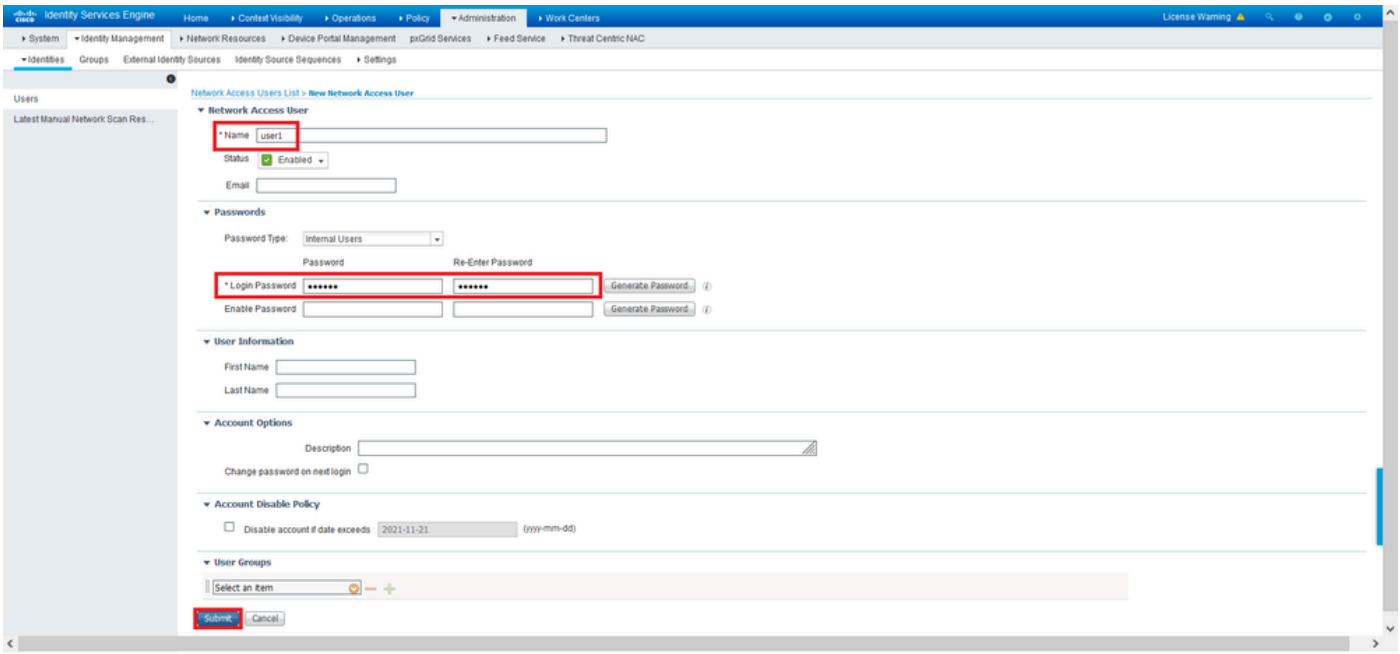
Step 3. Navigate to **Administration > Identity Management > Identities**.



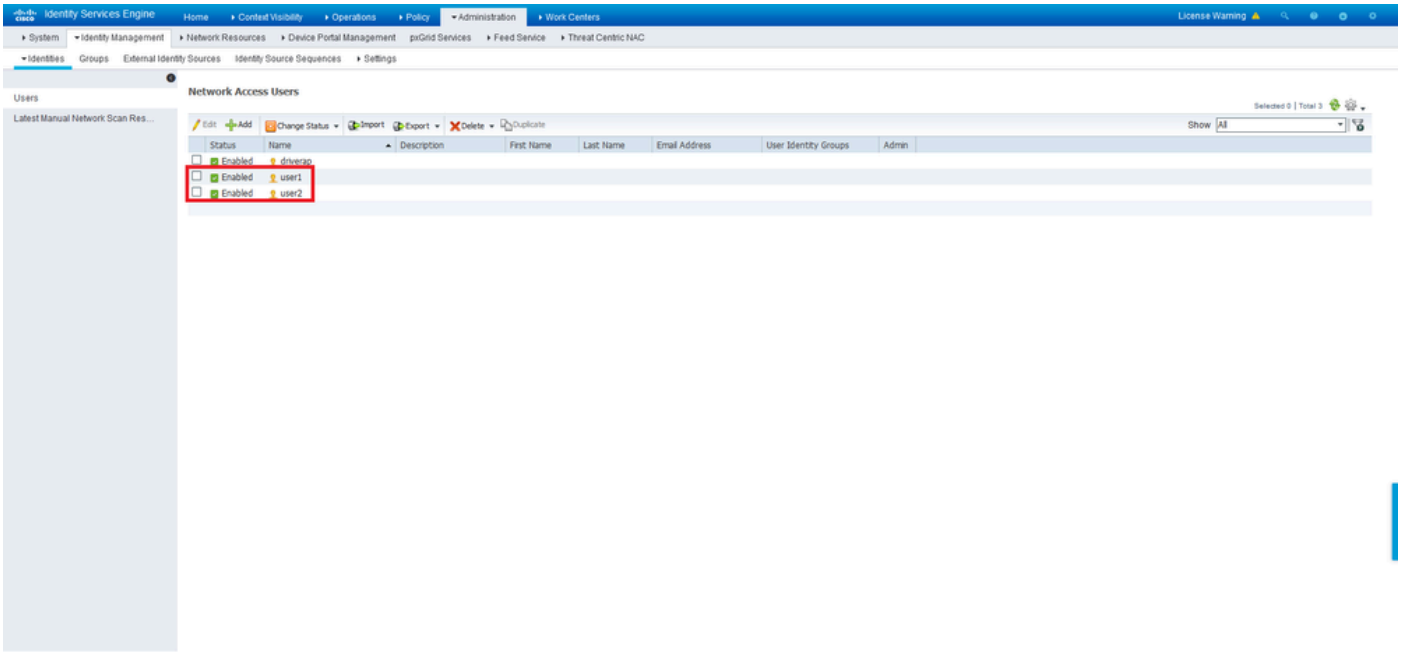
Step 4. In the Network Access Users section, click **Add** in order to create *user1* in ISE local database.



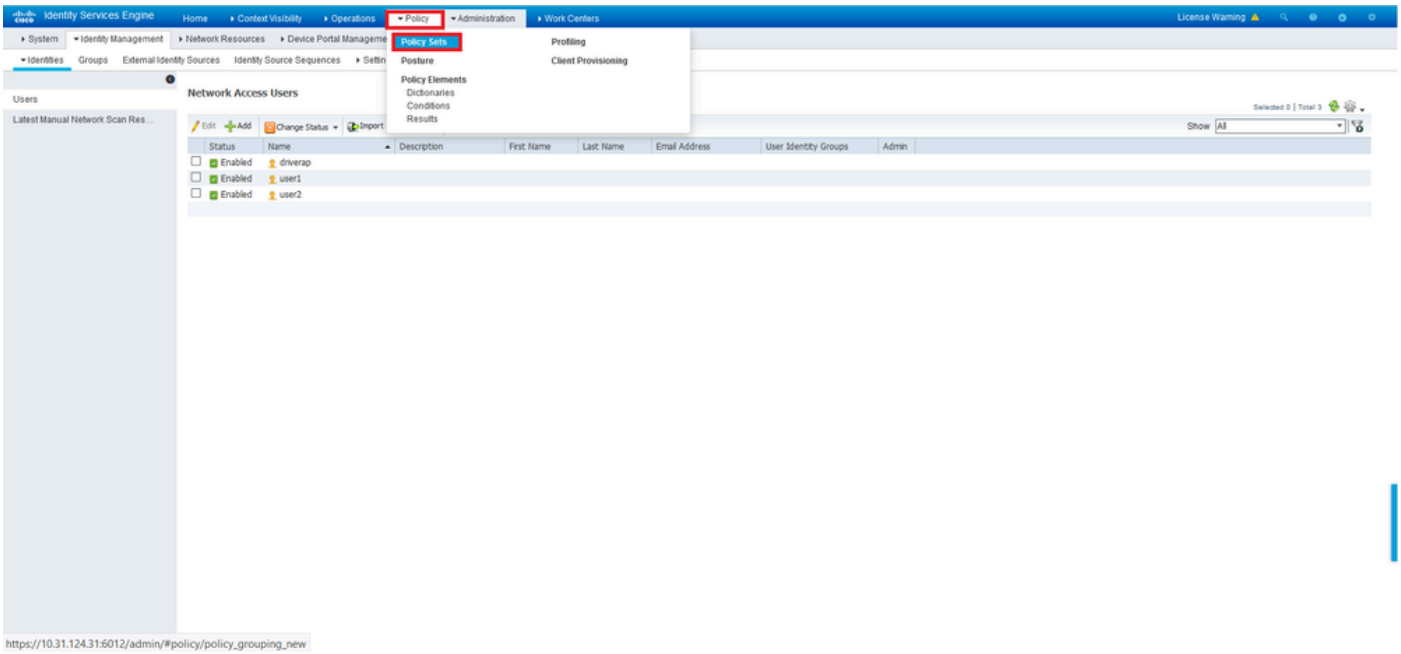
Enter username and password in the **Name** and **Login Password** fields, and then click **Submit**.



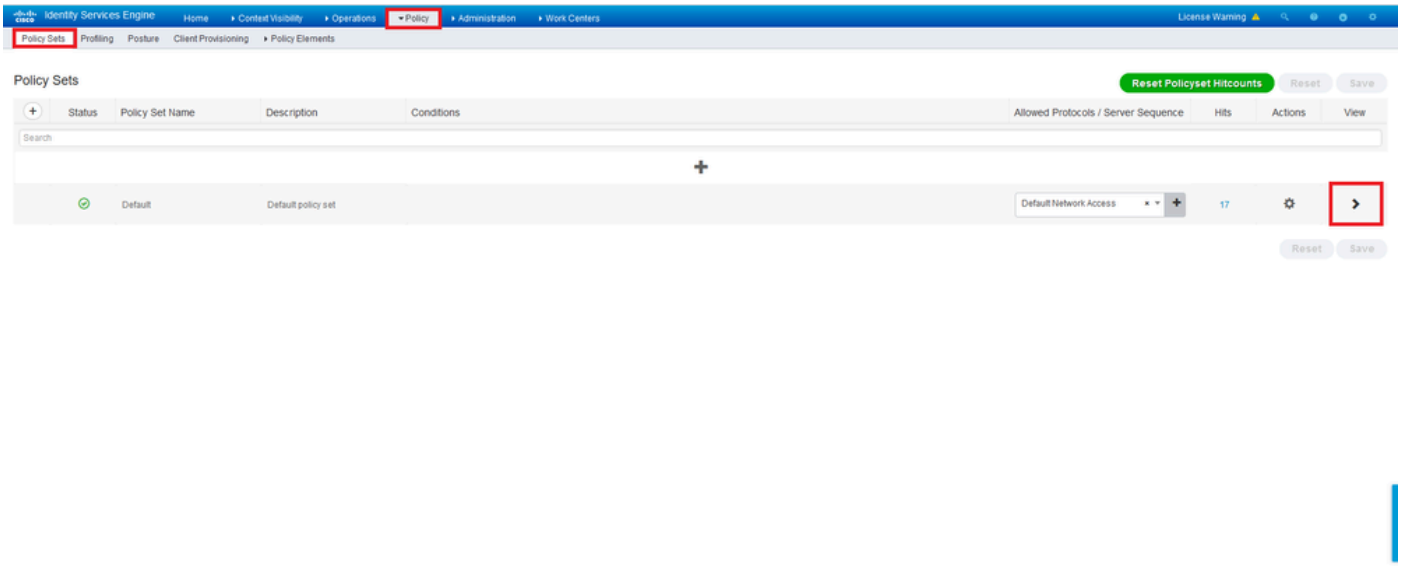
Step 5. Repeat the previous steps in order to create *user2*.



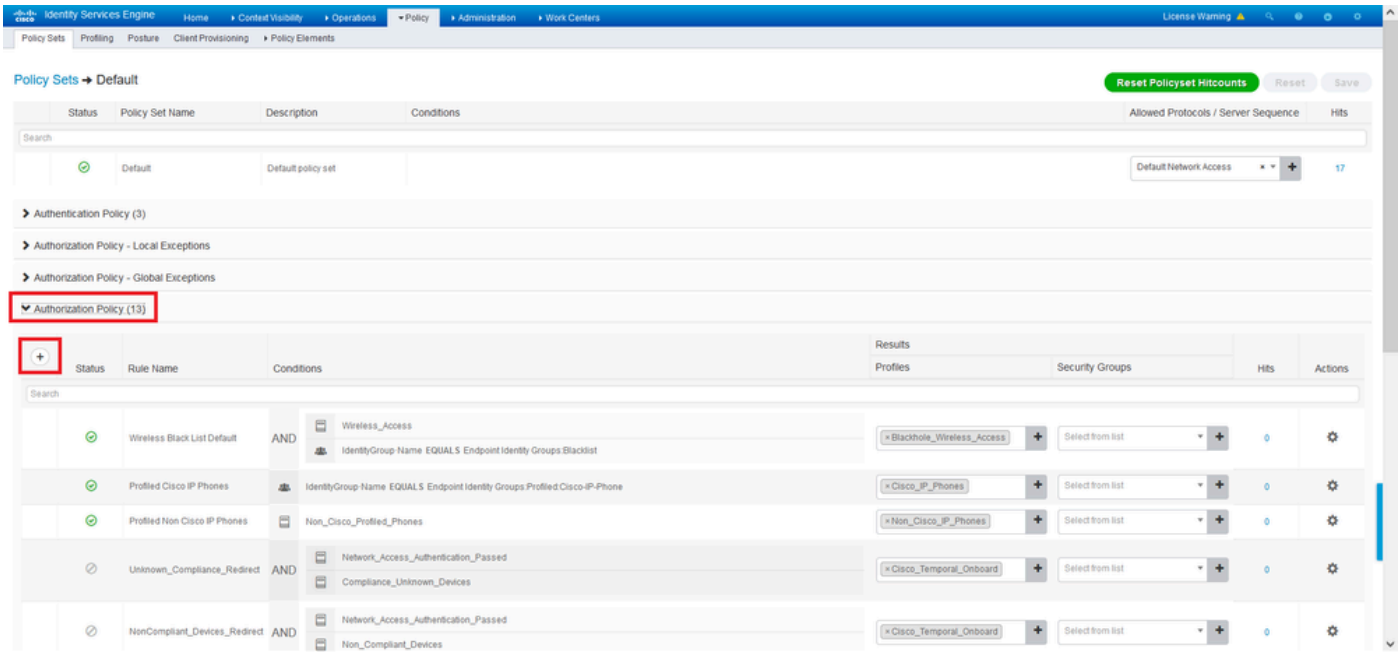
Step 6. Navigate to **Policy > Policy Sets**.



Step 7. Click the arrow > on the right side of the screen.



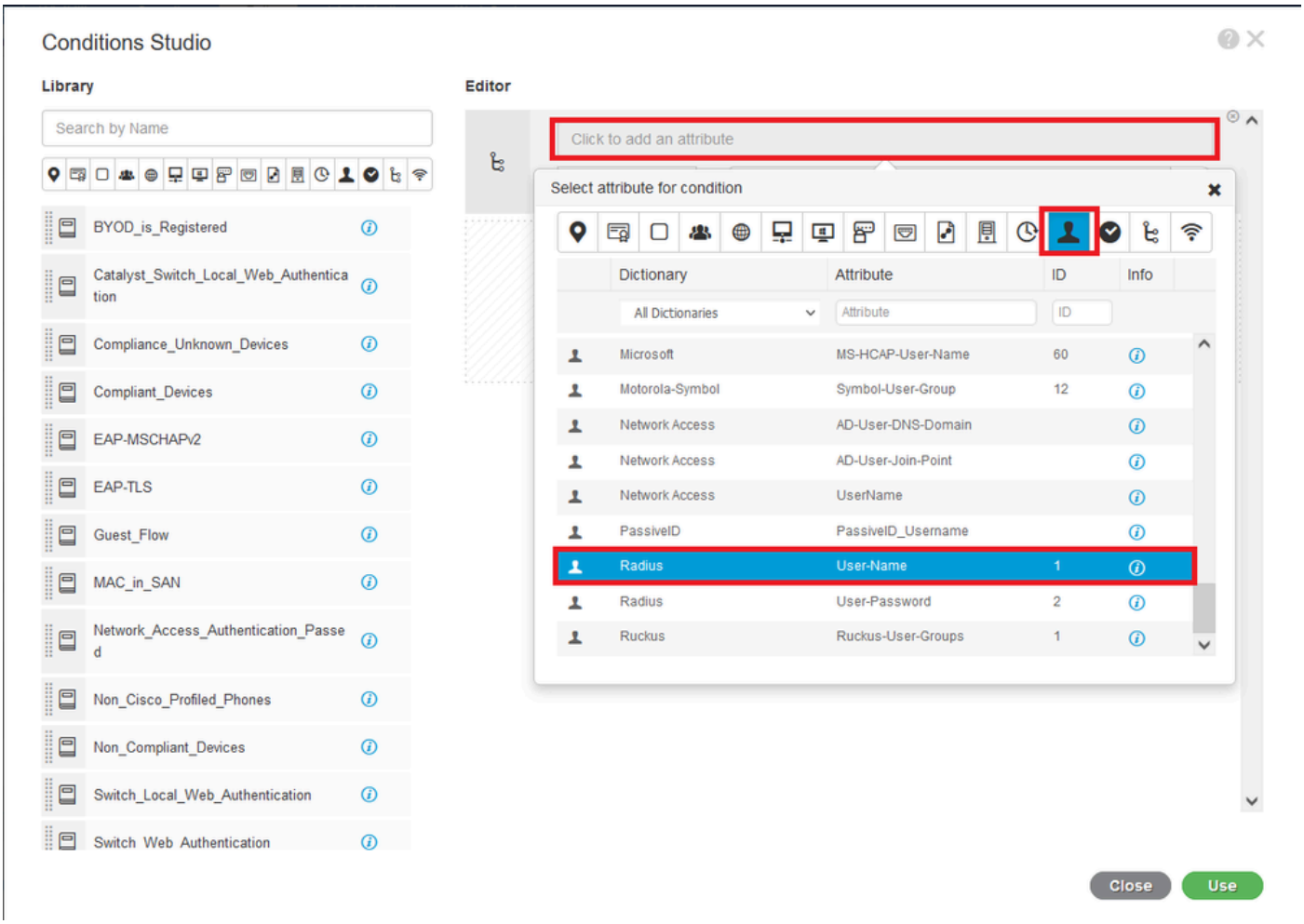
Step 8. Click the arrow > next to **Authorization Policy** to expand it. Now, Click the + symbol in order to add a new rule.



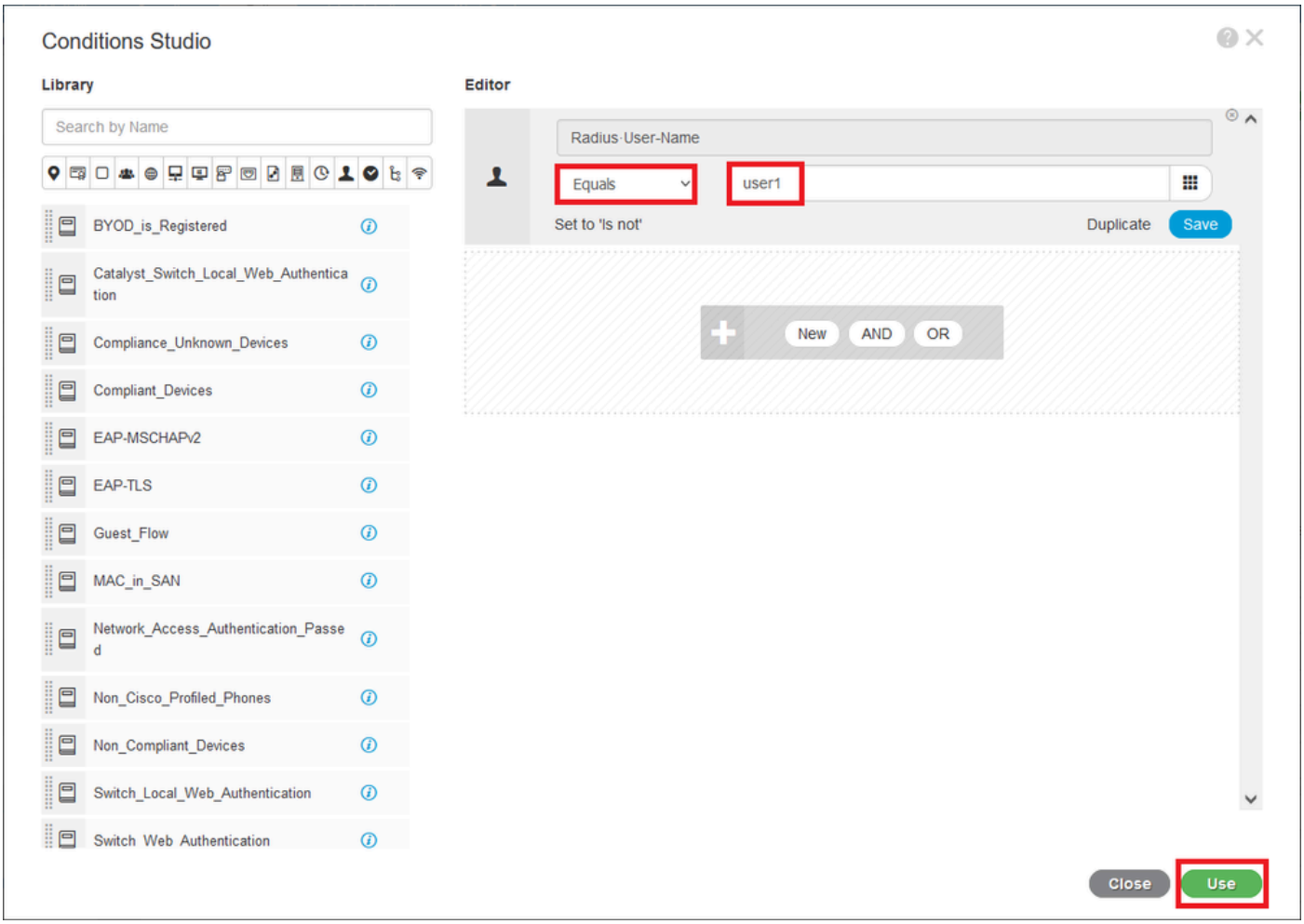
Provide a name to the rule an select the + symbol under **Conditions** column.



Click in the Attribute Editor textbox and click the **Subject** icon. Scroll down until you find *RADIUS User-Name* attribute and choose it.



Keep **Equals** as the operator and enter *user1* in the text box next to it. Click **Use** in order to save the attribute.

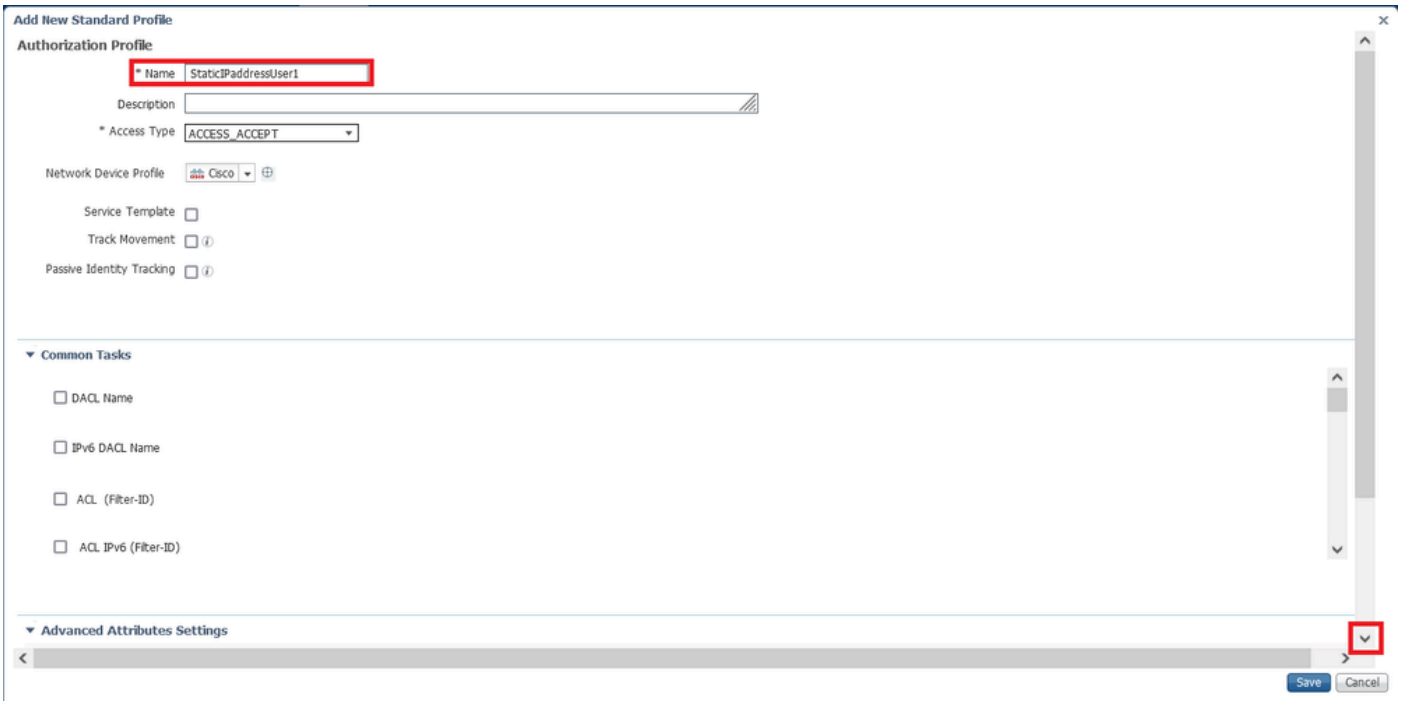


The condition for this rule is now set.

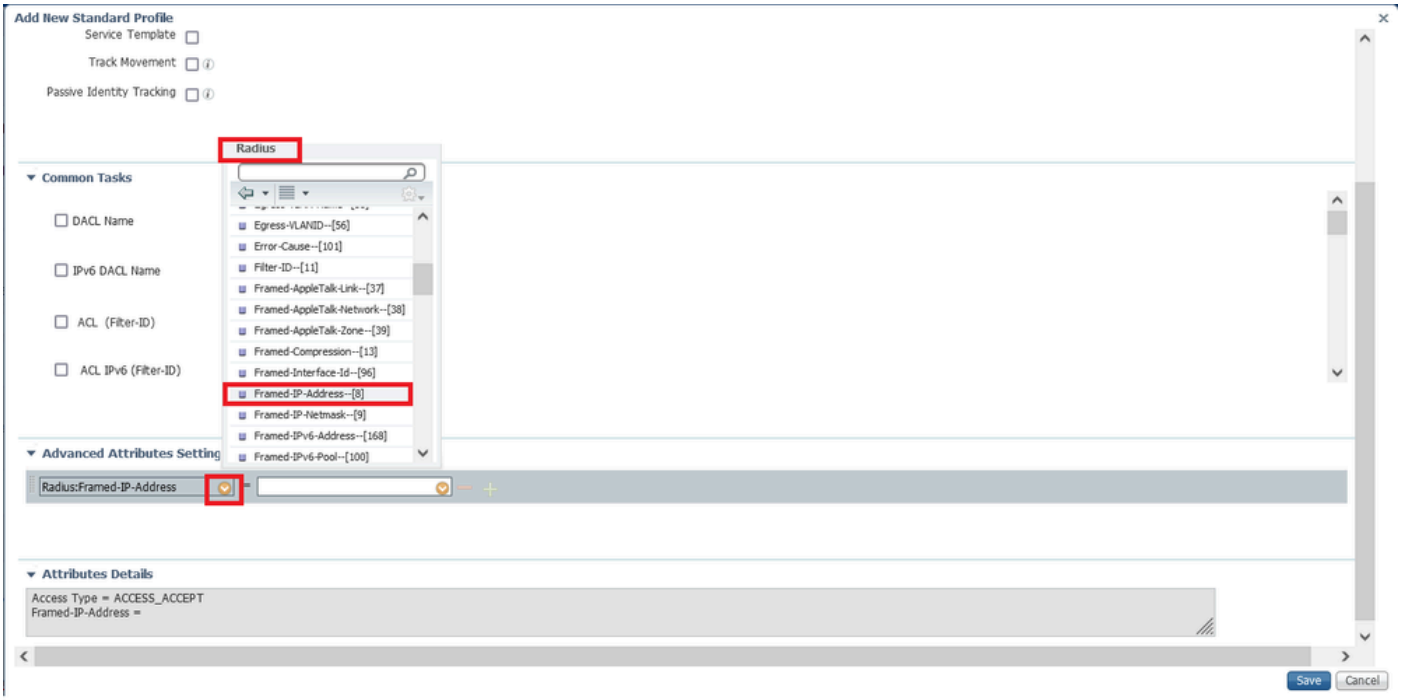
Step 9. In the **Results**/**Profiles** column, click the + symbol and choose **Create a New Authorization Profile**.



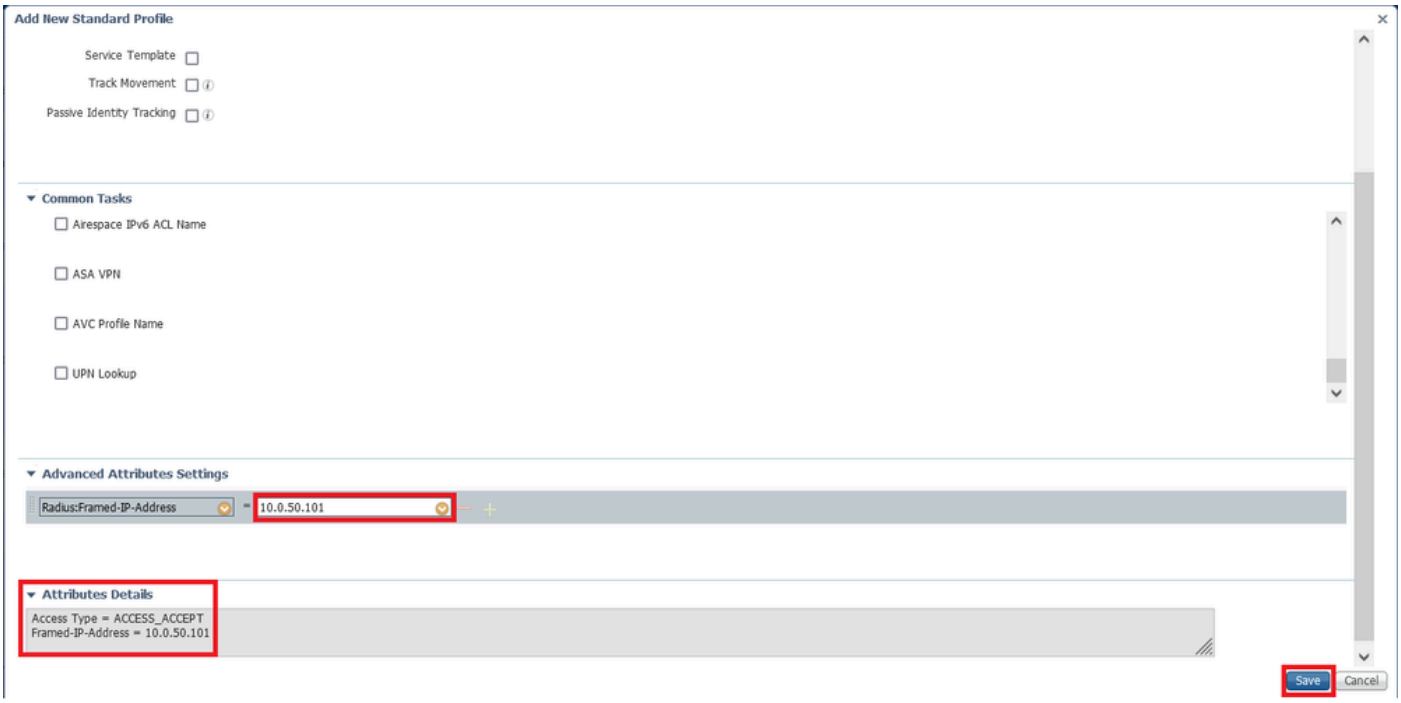
Give it a **Name** and keep *ACCESS_ACCEPT* as the **Access Type**. Scroll down to the **Advance Attributes Settings** section.



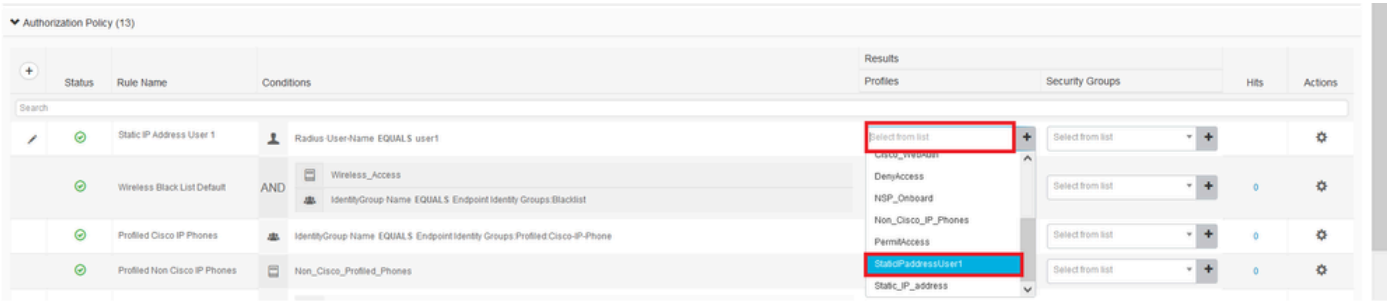
Click the orange arrow and choose **Radius > Framed-IP-Address--[8]**.



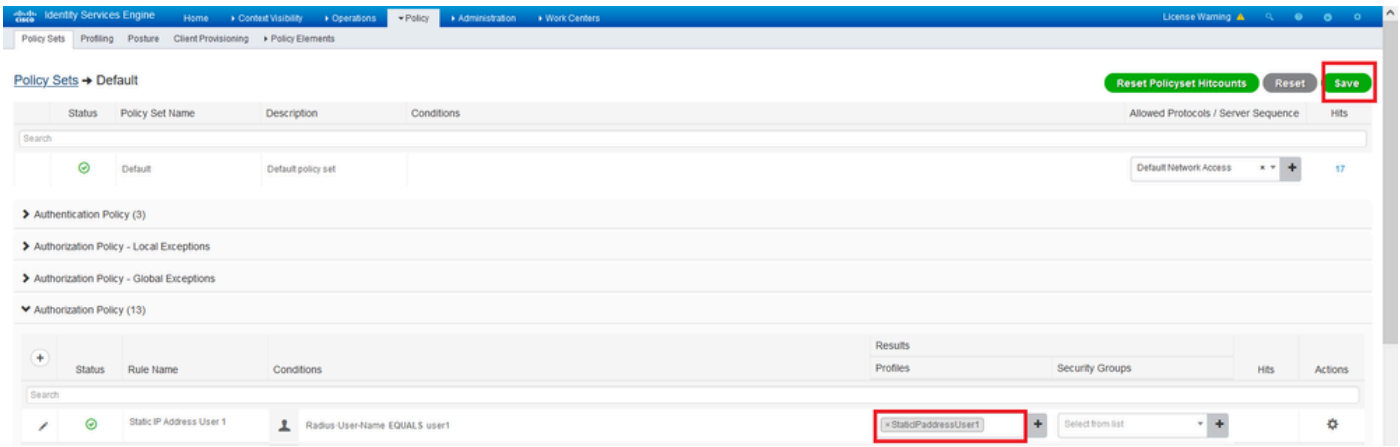
Type the IP address that you want to statically assign always to this user and click **Save**.



Step 10. Now, choose the newly created Authorization Profile.

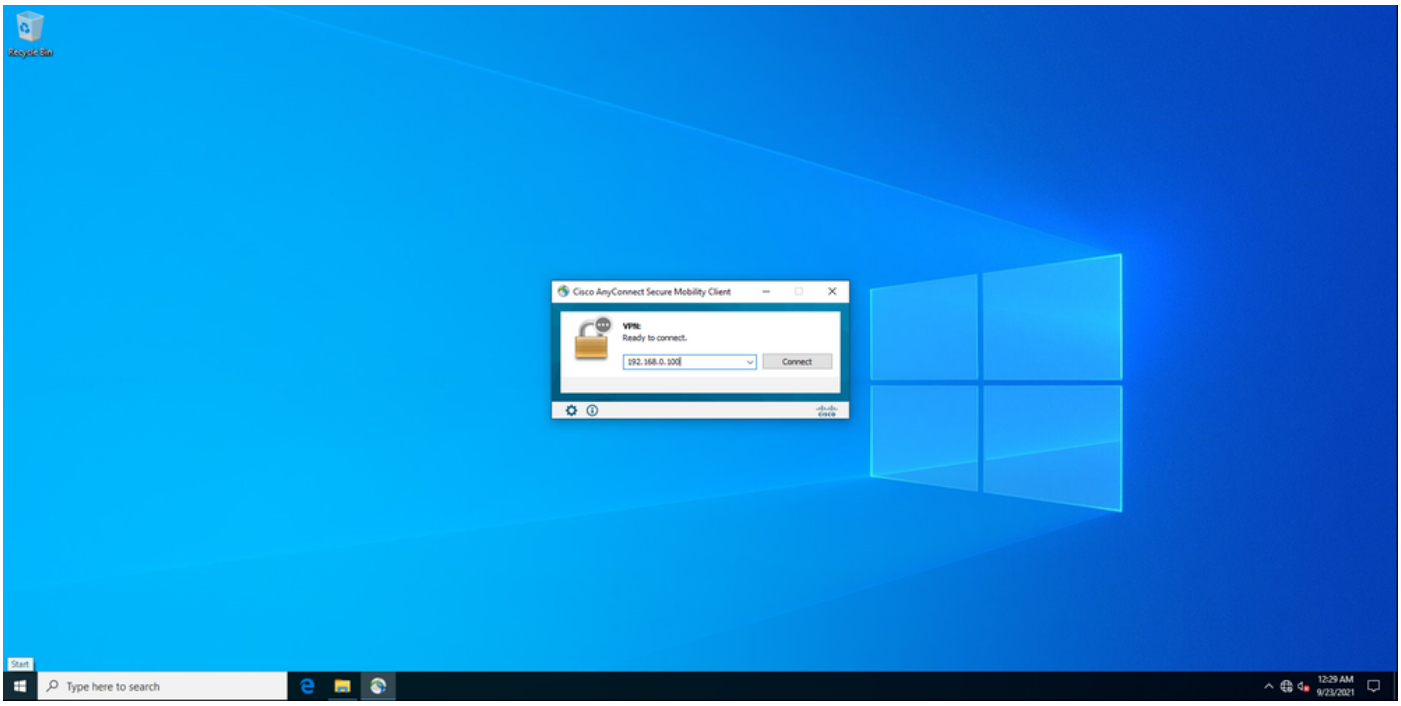


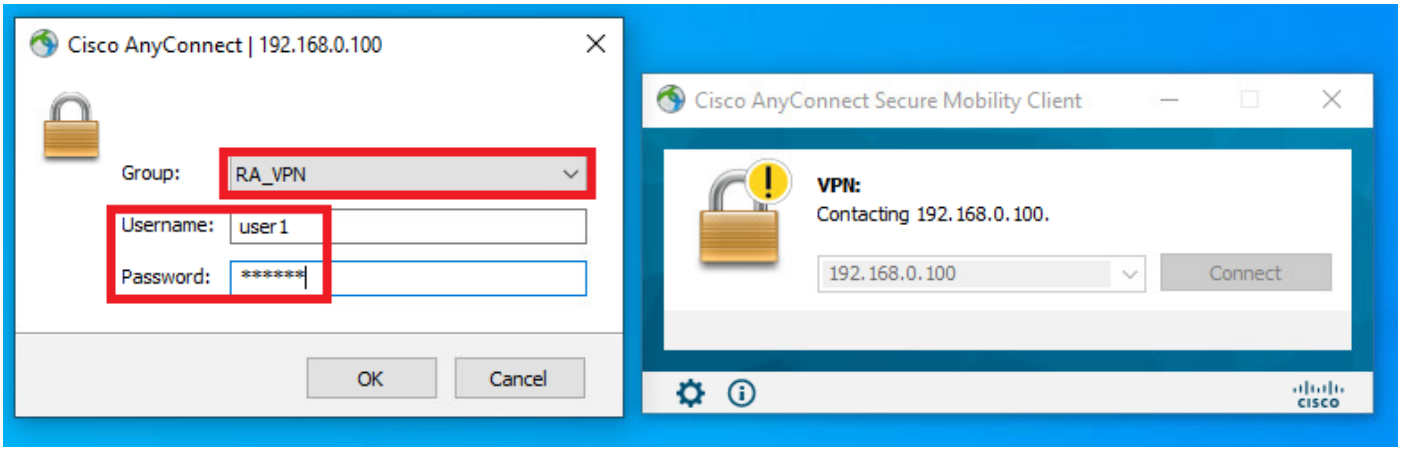
The Authorization rule is now all set. Click **Save**.



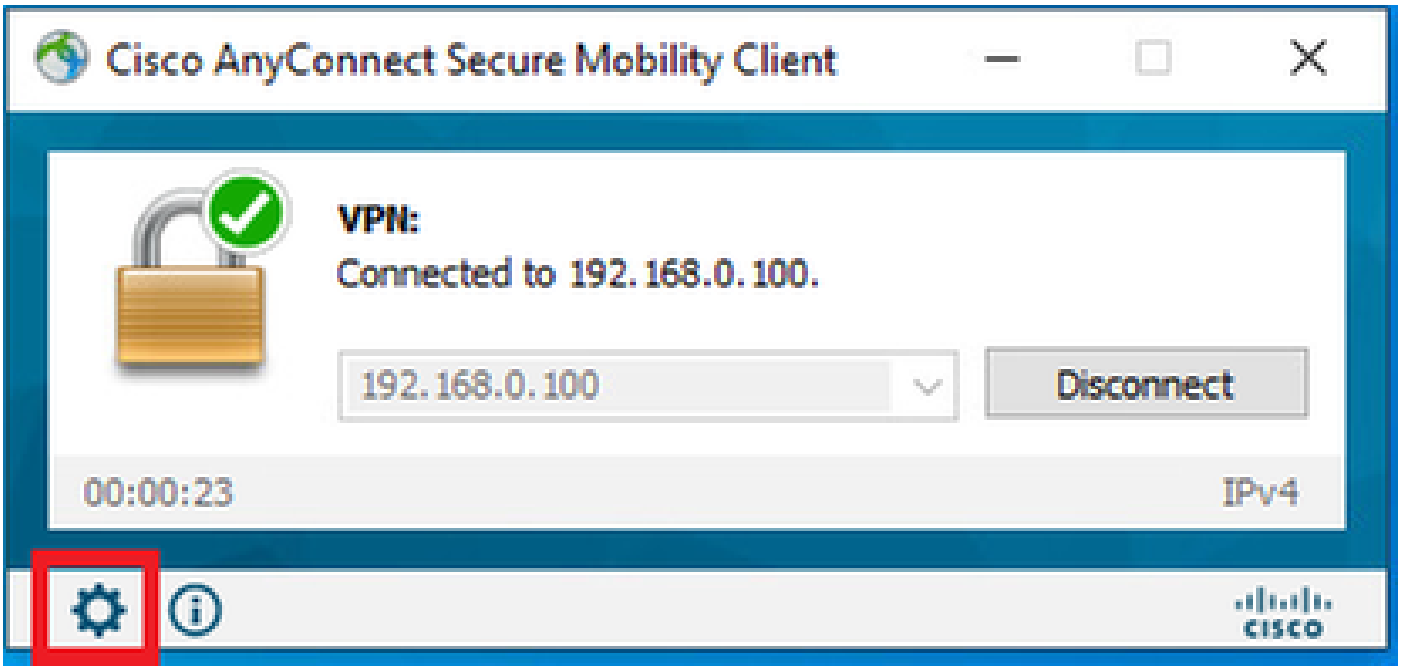
Verify

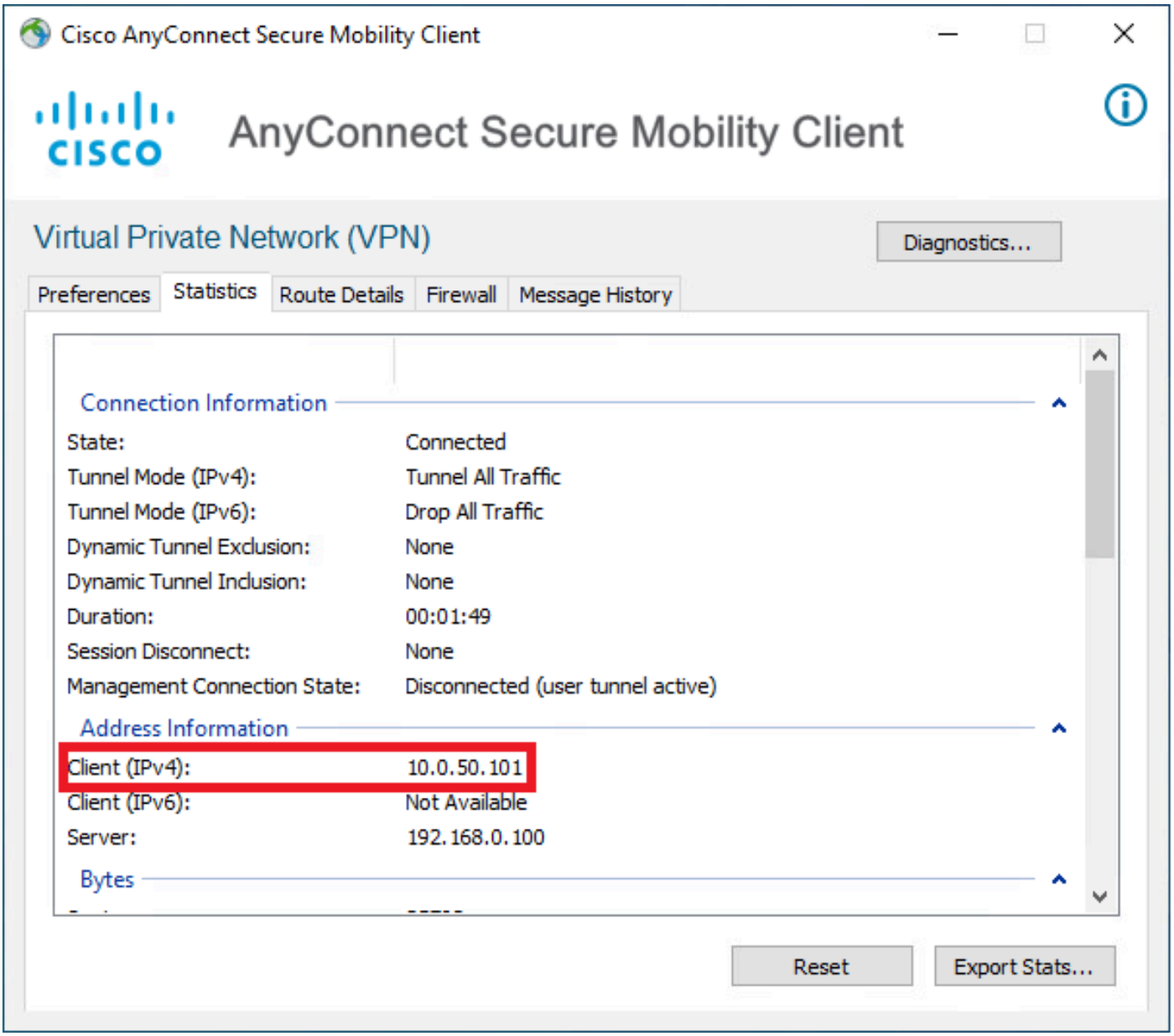
Step 1. Navigate to your client machine where the Cisco AnyConnect Secure Mobility client is installed. Connect to your FTD headend (a Windows machine is used here) and enter the *user1* credentials.





Click the gear icon (lower left corner) and navigate to the **Statistics** tab. Confirm in the **Address Information** section that the IP address assigned is indeed the one configured on ISE Authorization policy for this user.


Cisco AnyConnect Secure Mobility Client
VPN:
Connected to 192.168.0.100.
192.168.0.100
Disconnect
00:00:23
IPv4
cisco


Cisco AnyConnect Secure Mobility Client
cisco
AnyConnect Secure Mobility Client
Virtual Private Network (VPN)
Diagnostics...
Preferences
Statistics
Route Details
Firewall
Message History
Connection Information
State: Connected
Tunnel Mode (IPv4): Tunnel All Traffic
Tunnel Mode (IPv6): Drop All Traffic
Dynamic Tunnel Exclusion: None
Dynamic Tunnel Inclusion: None
Duration: 00:01:49
Session Disconnect: None
Management Connection State: Disconnected (user tunnel active)
Address Information
Client (IPv4): 10.0.50.101
Client (IPv6): Not Available
Server: 192.168.0.100
Bytes
Reset
Export Stats...

The **debug radius all** command output on FTD shows:

<#root>

```
firepower# SVC message: t/s=5/16: The user has requested to disconnect the connection.
webvpn_svc_np_tear_down: no ACL
webvpn_svc_np_tear_down: no IPv6 ACL
np_svc_destroy_session(0x9000)
radius mkreq: 0x13
alloc_rip 0x0000145d043b6460
new request 0x13 --> 3 (0x0000145d043b6460)
```

got user 'user1'

```
got password
add_req 0x0000145d043b6460 session 0x13 id 3
RADIUS_REQUEST
radius.c: rad_mkpkt
rad_mkpkt: ip:source-ip=192.168.0.101

RADIUS packet decode (authentication request)
<omitted output>
```

RADIUS packet decode (response)

```
--------------------------------------
Raw packet data (length = 136).....
02 03 00 88 0c af 1c 41 4b c4 a6 58 de f3 92 31 | .......AK..X...1
7d aa 38 1e 01 07 75 73 65 72 31 08 06 0a 00 32 | }.8...user1....2
65 19 3d 43 41 43 53 3a 63 30 61 38 30 30 36 34 | e.=CACS:c0a80064
30 30 30 30 61 30 30 30 36 31 34 62 63 30 32 64 | 0000a000614bc02d
3a 64 72 69 76 65 72 61 70 2d 49 53 45 2d 32 2d | :driverap-ISE-2-
37 2f 34 31 37 34 39 34 39 37 38 2f 32 31 1a 2a | 7/417494978/21.*
00 00 00 09 01 24 70 72 6f 66 69 6c 65 2d 6e 61 | .....$profile-na
6d 65 3d 57 69 6e 64 6f 77 73 31 30 2d 57 6f 72 | me=Windows10-Wor
6b 73 74 61 74 69 6f 6e | kstation

Parsed packet data.....
Radius: Code = 2 (0x02)
Radius: Identifier = 3 (0x03)
Radius: Length = 136 (0x0088)
Radius: Vector: 0CAF1C414BC4A658DEF392317DAA381E
```

Radius: Type = 1 (0x01) User-Name

```
Radius: Length = 7 (0x07)
```

Radius: Value (String) =

75 73 65 72 31 | user1

Radius: Type = 8 (0x08) Framed-IP-Address

```
Radius: Length = 6 (0x06)
```

```
Radius: Value (IP Address) = 10.0.50.101 (0x0A003265)


Radius: Type = 25 (0x19) Class
Radius: Length = 61 (0x3D)
Radius: Value (String) =
43 41 43 53 3a 63 30 61 38 30 30 36 34 30 30 30 | CACS:c0a80064000
30 61 30 30 30 36 31 34 62 63 30 32 64 3a 64 72 | 0a000614bc02d:dr
69 76 65 72 61 70 2d 49 53 45 2d 32 2d 37 2f 34 | iverap-ISE-2-7/4
31 37 34 39 34 39 37 38 2f 32 31 | 17494978/21
Radius: Type = 26 (0x1A) Vendor-Specific
Radius: Length = 42 (0x2A)
Radius: Vendor ID = 9 (0x00000009)
Radius: Type = 1 (0x01) Cisco-AV-pair
Radius: Length = 36 (0x24)
Radius: Value (String) =
70 72 6f 66 69 6c 65 2d 6e 61 6d 65 3d 57 69 6e | profile-name=Win
64 6f 77 73 31 30 2d 57 6f 72 6b 73 74 61 74 69 | dows10-Workstati
6f 6e | on

rad_procpkt: ACCEPT


Got AV-Pair with value profile-name=Windows10-Workstation
RADIUS_ACCESS_ACCEPT: normal termination
RADIUS_DELETE
remove_req 0x0000145d043b6460 session 0x13 id 3
free_rip 0x0000145d043b6460
radius: send queue empty
```

The FTD logs show:

<#root>

```
firepower#
<omitted output>
Sep 22 2021 23:52:40: %FTD-6-725002: Device completed SSL handshake with client Outside_Int:192.168.0.1
Sep 22 2021 23:52:48: %FTD-7-609001: Built local-host Outside_Int:172.16.0.8
Sep 22 2021 23:52:48: %FTD-6-113004: AAA user authentication Successful : server = 172.16.0.8 : user =
Sep 22 2021 23:52:48: %FTD-6-113009: AAA retrieved default group policy (DfltGrpPolicy) for user = user
Sep 22 2021 23:52:48: %FTD-6-113008:

AAA transaction status ACCEPT : user = user1


Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.radius[
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.radius[
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.radius[
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.cisco.g
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute

aaa.cisco.ipaddress = 10.0.50.101


Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute

 aaa.cisco.username = user1


Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.cisco.u
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.cisco.u
```

```
Sep 22 2021 23:52:48: %FTD-7-734003: DAP: User user1, Addr 192.168.0.101: Session Attribute aaa.cisco.t
Sep 22 2021 23:52:48: %FTD-6-734001: DAP: User user1, Addr 192.168.0.101, Connection AnyConnect: The fo
Sep 22 2021 23:52:48: %FTD-6-113039: Group <DfltGrpPolicy> User <user1> IP <192.168.0.101> AnyConnect p
<omitted output>
Sep 22 2021 23:53:17: %FTD-6-725002: Device completed SSL handshake with client Outside_Int:192.168.0.1
Sep 22 2021 23:53:17: %FTD-7-737035: IPAA: Session=0x0000c000, 'IPv4 address request' message queued
Sep 22 2021 23:53:17: %FTD-7-737035: IPAA: Session=0x0000c000, 'IPv6 address request' message queued
Sep 22 2021 23:53:17: %FTD-7-737001: IPAA: Session=0x0000c000, Received message 'IPv4 address request'
Sep 22 2021 23:53:17: %FTD-6-737010: IPAA: Session=0x0000c000,
```

AAA assigned address 10.0.50.101, succeeded

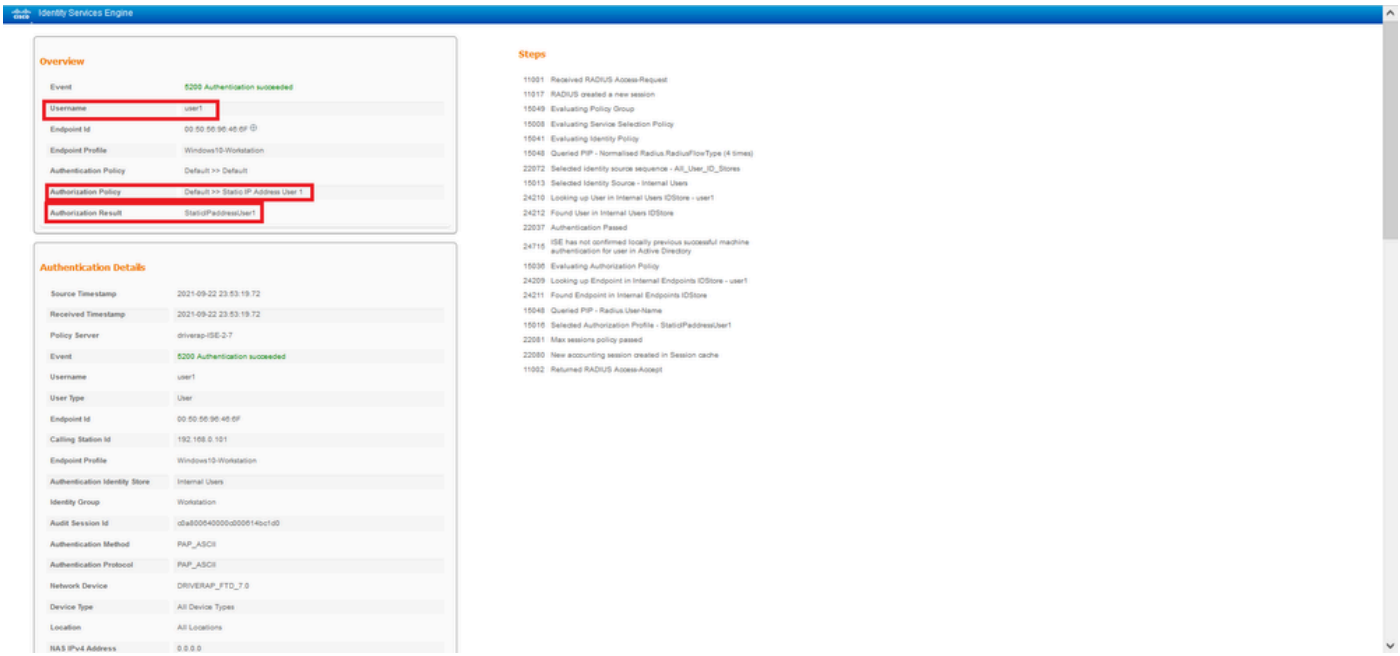
```
Sep 22 2021 23:53:17: %FTD-7-737001: IPAA: Session=0x0000c000, Received message 'IPv6 address request'
Sep 22 2021 23:53:17: %FTD-5-737034: IPAA: Session=0x0000c000, IPv6 address: no IPv6 address available
Sep 22 2021 23:53:17: %FTD-5-737034: IPAA: Session=0x0000c000, IPv6 address: callback failed during IPv
Sep 22 2021 23:53:17: %FTD-4-722041: TunnelGroup <RA_VPN> GroupPolicy <DfltGrpPolicy> User <user1> IP <
Sep 22 2021 23:53:17: %FTD-7-609001: Built local-host Outside_Int:10.0.50.101
Sep 22 2021 23:53:17: %FTD-5-722033: Group <DfltGrpPolicy> User <user1> IP <192.168.0.101> First TCP SV
Sep 22 2021 23:53:17: %FTD-6-722022: Group <DfltGrpPolicy> User <user1> IP <192.168.0.101> TCP SVC conn
Sep 22 2021 23:53:17: %FTD-7-746012:
```

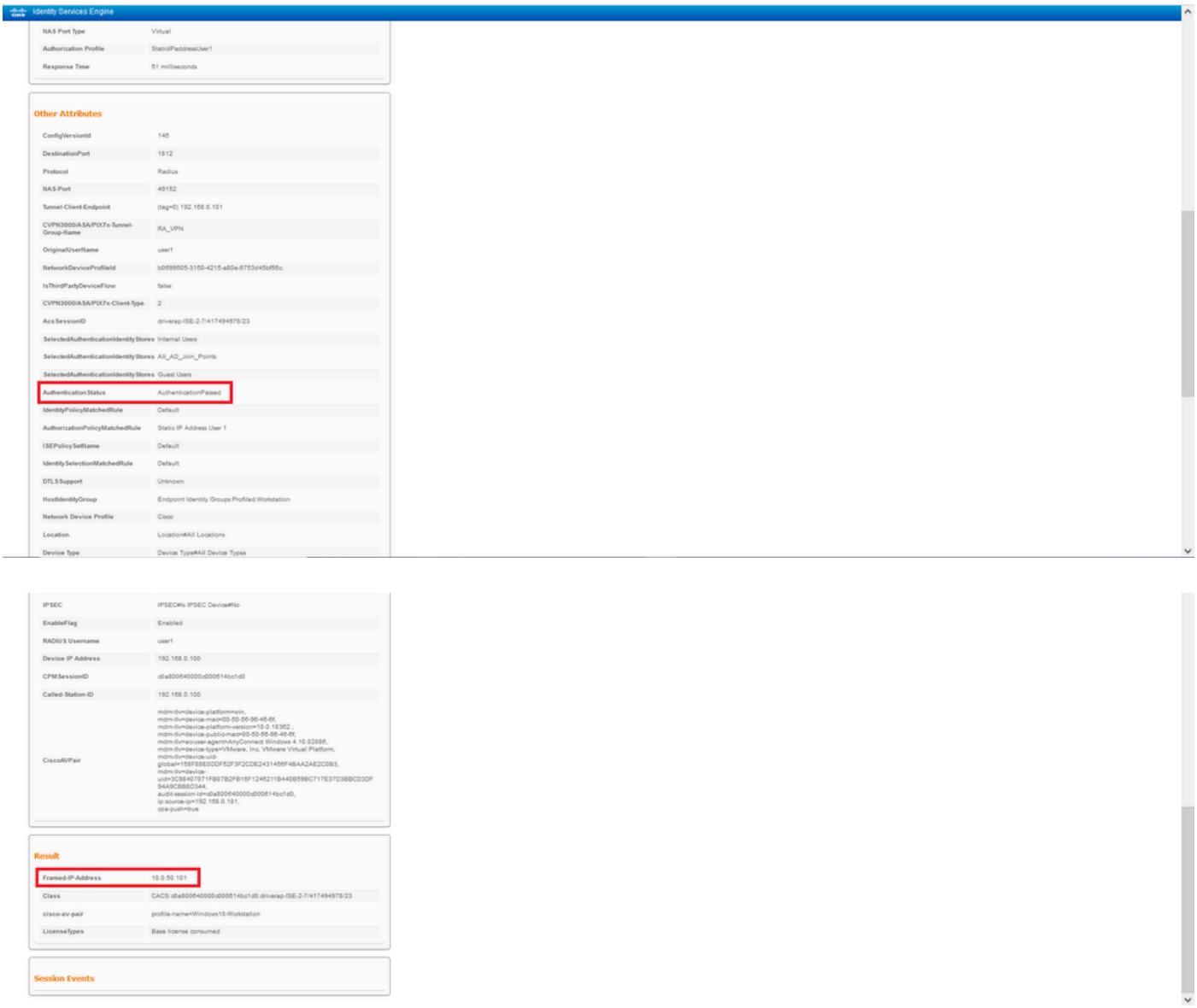
user-identity: Add IP-User mapping 10.0.50.101 - LOCAL\user1 Succeeded - VPN user

```
Sep 22 2021 23:53:17: %FTD-6-722055: Group <DfltGrpPolicy> User <user1> IP <192.168.0.101> Client Type:
Sep 22 2021 23:53:17: %FTD-4-722051:
```

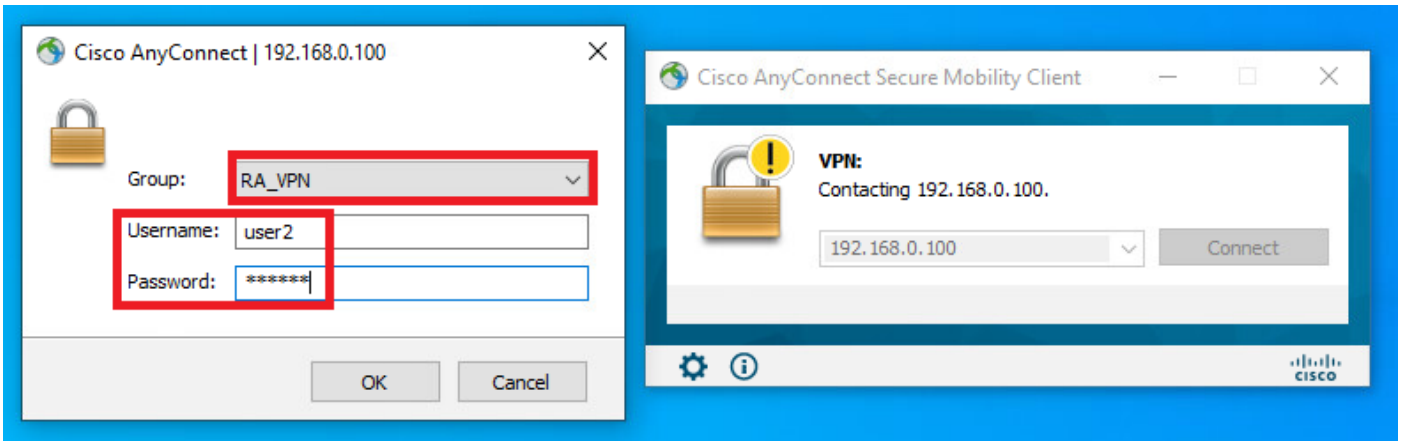
Group <DfltGrpPolicy> User <user1> IP <192.168.0.101> IPv4 Address <10.0.50.101> IPv6 address <::> assig

The RADIUS Live logs on ISE show:

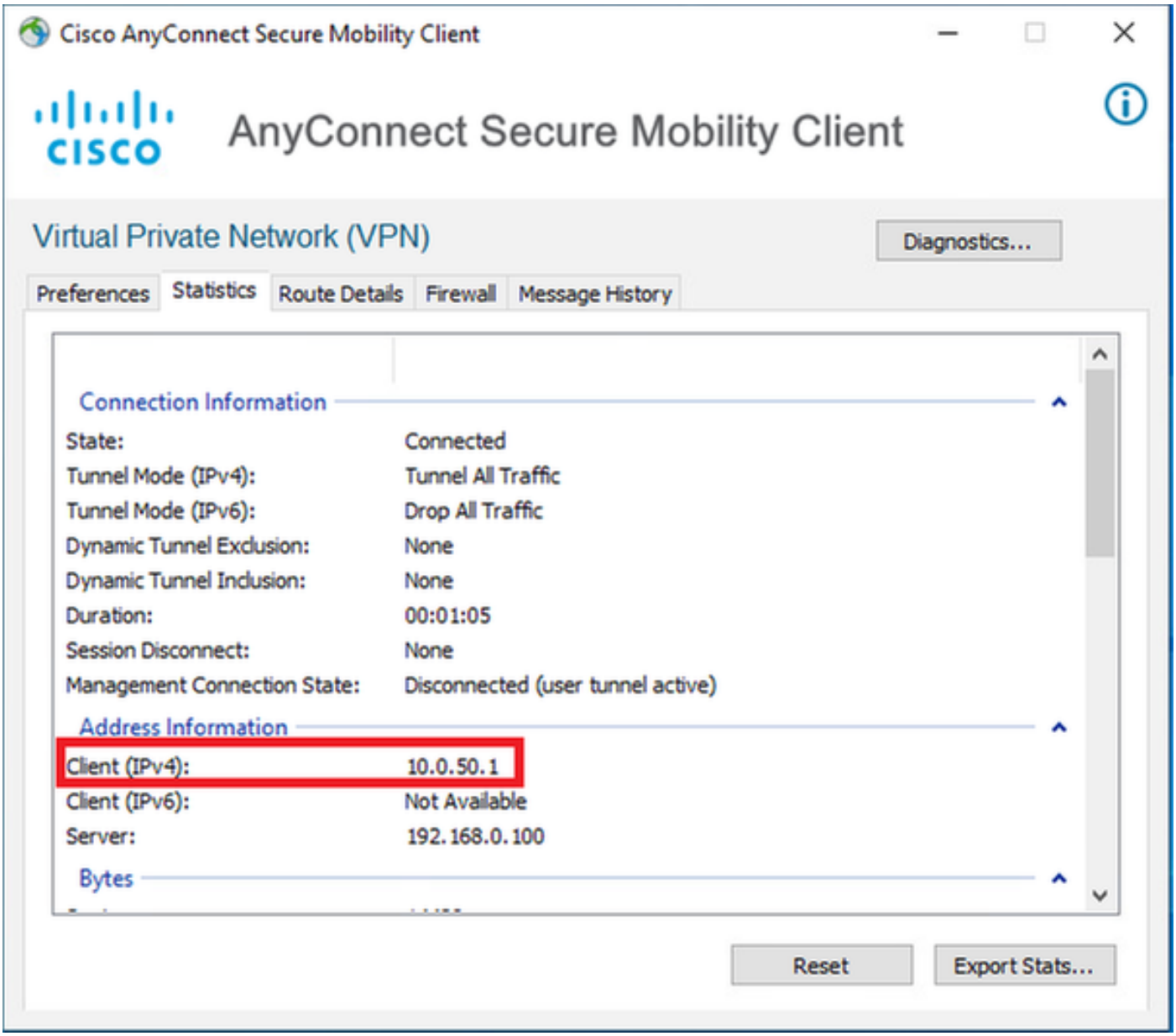




Step 2. Connect to your FTD headend (a Windows machine is used here) and enter the *user2* credentials.



The **Address Information** section shows that the IP address assigned is indeed the first IP address available in the IPv4 local pool configured via FMC.



The **debug radius all** command output on FTD shows:

<#root>

```
firepower# SVC message: t/s=5/16: The user has requested to disconnect the connection.
webvpn_svc_np_tear_down: no ACL
webvpn_svc_np_tear_down: no IPv6 ACL
np_svc_destroy_session(0xA000)
radius mkreq: 0x15
alloc_rip 0x0000145d043b6460
new request 0x15 --> 4 (0x0000145d043b6460)
```

got user 'user2'

```
got password
add_req 0x0000145d043b6460 session 0x15 id 4
RADIUS_REQUEST
radius.c: rad_mkpkt
rad_mkpkt: ip:source-ip=192.168.0.101

RADIUS packet decode (authentication request)
```

<omitted output>

RADIUS packet decode (response)

```
--------------------------------------
Raw packet data (length = 130).....
02 04 00 82 a6 67 35 9e 10 36 93 18 1f 1b 85 37 | .....g5..6.....7
b6 c3 18 4f 01 07 75 73 65 72 32 19 3d 43 41 43 | ...O..user2.=CAC
53 3a 63 30 61 38 30 30 36 34 30 30 30 30 62 30 | S:c0a800640000b0
30 30 36 31 34 62 63 30 61 33 3a 64 72 69 76 65 | 00614bc0a3:drive
72 61 70 2d 49 53 45 2d 32 2d 37 2f 34 31 37 34 | rap-ISE-2-7/4174
39 34 39 37 38 2f 32 32 1a 2a 00 00 00 09 01 24 | 94978/22.*.....$
70 72 6f 66 69 6c 65 2d 6e 61 6d 65 3d 57 69 6e | profile-name=Win
64 6f 77 73 31 30 2d 57 6f 72 6b 73 74 61 74 69 | dows10-Workstati
6f 6e | on

Parsed packet data.....
Radius: Code = 2 (0x02)
Radius: Identifier = 4 (0x04)
Radius: Length = 130 (0x0082)
Radius: Vector: A667359E103693181F1B8537B6C3184F
```

Radius: Type = 1 (0x01) User-Name

```
Radius: Length = 7 (0x07)
```

Radius: Value (String) =

75 73 65 72 32 | user2

```
Radius: Type = 25 (0x19) Class
Radius: Length = 61 (0x3D)
Radius: Value (String) =
43 41 43 53 3a 63 30 61 38 30 30 36 34 30 30 30 | CACS:c0a80064000
30 62 30 30 30 36 31 34 62 63 30 61 33 3a 64 72 | 0b000614bc0a3:dr
69 76 65 72 61 70 2d 49 53 45 2d 32 2d 37 2f 34 | iverap-ISE-2-7/4
31 37 34 39 34 39 37 38 2f 32 32 | 17494978/22
Radius: Type = 26 (0x1A) Vendor-Specific
Radius: Length = 42 (0x2A)
Radius: Vendor ID = 9 (0x00000009)
Radius: Type = 1 (0x01) Cisco-AV-pair
Radius: Length = 36 (0x24)
Radius: Value (String) =
70 72 6f 66 69 6c 65 2d 6e 61 6d 65 3d 57 69 6e | profile-name=Win
64 6f 77 73 31 30 2d 57 6f 72 6b 73 74 61 74 69 | dows10-Workstati
6f 6e | on
```

rad_procpkt: ACCEPT

```
Got AV-Pair with value profile-name=Windows10-Workstation
RADIUS_ACCESS_ACCEPT: normal termination
RADIUS_DELETE
remove_req 0x0000145d043b6460 session 0x15 id 4
free_rip 0x0000145d043b6460
radius: send queue empty
```

The FTD logs show:

<#root>

```
<omitted output>
Sep 22 2021 23:59:26: %FTD-6-725002: Device completed SSL handshake with client Outside_Int:192.168.0.1
Sep 22 2021 23:59:35: %FTD-7-609001: Built local-host Outside_Int:172.16.0.8
Sep 22 2021 23:59:35: %FTD-6-113004: AAA user authentication Successful : server = 172.16.0.8 : user =
Sep 22 2021 23:59:35: %FTD-6-113009: AAA retrieved default group policy (DfltGrpPolicy) for user = user
Sep 22 2021 23:59:35: %FTD-6-113008: AAA transaction status ACCEPT : user = user2
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.radius[
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.radius[
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.cisco.g
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101:

Session Attribute aaa.cisco.username = user2


Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.cisco.u
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.cisco.u
Sep 22 2021 23:59:35: %FTD-7-734003: DAP: User user2, Addr 192.168.0.101: Session Attribute aaa.cisco.t
Sep 22 2021 23:59:35: %FTD-6-734001: DAP: User user2, Addr 192.168.0.101, Connection AnyConnect: The fo
Sep 22 2021 23:59:35: %FTD-6-113039: Group <DfltGrpPolicy> User <user2> IP <192.168.0.101> AnyConnect p
<omitted output>
Sep 22 2021 23:59:52: %FTD-6-725002: Device completed SSL handshake with client Outside_Int:192.168.0.1
Sep 22 2021 23:59:52: %FTD-7-737035: IPAA: Session=0x0000d000, 'IPv4 address request' message queued
Sep 22 2021 23:59:52: %FTD-7-737035: IPAA: Session=0x0000d000, 'IPv6 address request' message queued
Sep 22 2021 23:59:52: %FTD-7-737001: IPAA: Session=0x0000d000, Received message 'IPv4 address request'
Sep 22 2021 23:59:52: %FTD-5-737003: IPAA: Session=0x0000d000, DHCP configured, no viable servers found
Sep 22 2021 23:59:52: %FTD-7-737400:

POOLIP: Pool=AC_Pool, Allocated 10.0.50.1 from pool


Sep 22 2021 23:59:52: %FTD-7-737200:

VPNFIP: Pool=AC_Pool, Allocated 10.0.50.1 from pool


Sep 22 2021 23:59:52: %FTD-6-737026:

IPAA: Session=0x0000d000, Client assigned 10.0.50.1 from local pool AC_Pool


Sep 22 2021 23:59:52: %FTD-6-737006:

IPAA: Session=0x0000d000, Local pool request succeeded for tunnel-group 'RA_VPN'

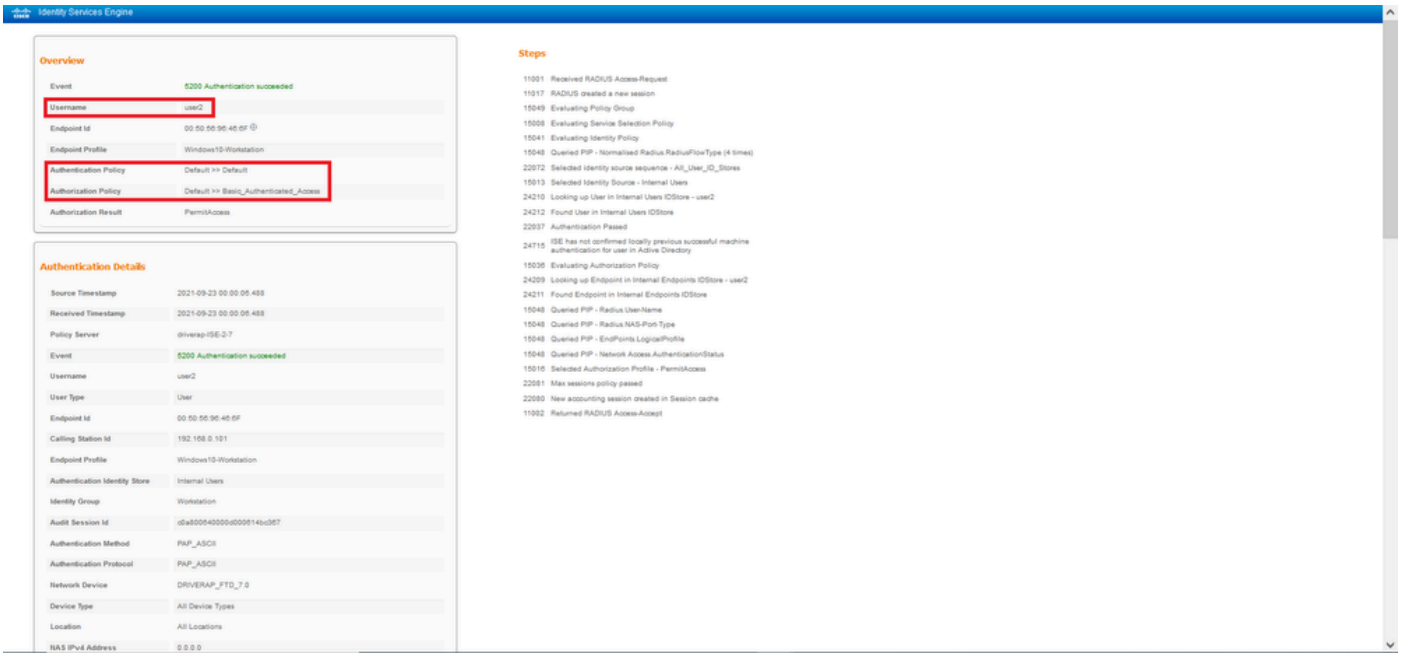

Sep 22 2021 23:59:52: %FTD-7-737001: IPAA: Session=0x0000d000, Received message 'IPv6 address request'
Sep 22 2021 23:59:52: %FTD-5-737034: IPAA: Session=0x0000d000, IPv6 address: no IPv6 address available
Sep 22 2021 23:59:52: %FTD-5-737034: IPAA: Session=0x0000d000, IPv6 address: callback failed during IPv
Sep 22 2021 23:59:52: %FTD-4-722041: TunnelGroup <RA_VPN> GroupPolicy <DfltGrpPolicy> User <user2> IP <
Sep 22 2021 23:59:52: %FTD-7-609001: Built local-host Outside_Int:10.0.50.1
Sep 22 2021 23:59:52: %FTD-5-722033: Group <DfltGrpPolicy> User <user2> IP <192.168.0.101> First TCP SV
Sep 22 2021 23:59:52: %FTD-6-722022: Group <DfltGrpPolicy> User <user2> IP <192.168.0.101> TCP SVC conn
Sep 22 2021 23:59:52: %FTD-7-746012:

user-identity: Add IP-User mapping 10.0.50.1 - LOCAL\user2 Succeeded - VPN user


Sep 22 2021 23:59:52: %FTD-6-722055: Group <DfltGrpPolicy> User <user2> IP <192.168.0.101> Client Type:
Sep 22 2021 23:59:52: %FTD-4-722051:
```

```
Group <DfltGrpPolicy> User <user2> IP <192.168.0.101> IPv4 Address <10.0.50.1> IPv6 address <::> assigne
```

The RADIUS Live logs on ISE show:







Note: You must use different IP address ranges for IP address assignment on both FTD ip local pool and ISE Authorization policies in order to avoid duplicate IP address conflicts among your AnyConnect Clients. In this configuration example, FTD was configured with an IPv4 local pool from 10.0.50.1 through 10.0.50.100 and ISE server assigns static IP address of 10.0.50.101.

Troubleshoot

This section provides the information you can use in order to troubleshoot your configuration.

On FTD:

- **debug radius all**

On ISE:

- RADIUS live logs