Configure Custom TACACS Role for Nexus 9K Using ISE 3.2

Contents

Introduction

This document describes how to configure a customized Nexus role for TACACS via CLI on NK9.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- TACACS+
- ISE 3.2

Components Used

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

- Cisco Nexus9000, NXOS image file is: bootflash:///nxos.9.3.5.bin
- Identity Service Engine version 3.2

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.

Background Information

Licensing Requirements:

Cisco NX-OS - TACACS+ requires no license.

Cisco Identity Service Engine - For fresh ISE installations you have 90 days evaluation period license that has access to all ISE features, if you do not have an evaluation license, in order to use ISE TACACS feature you need a Device Admin license for the Policy Server Node that does the authentication.

After the Admin/Help desk users authenticate on the Nexus device ISE returns the desired Nexus shell role.

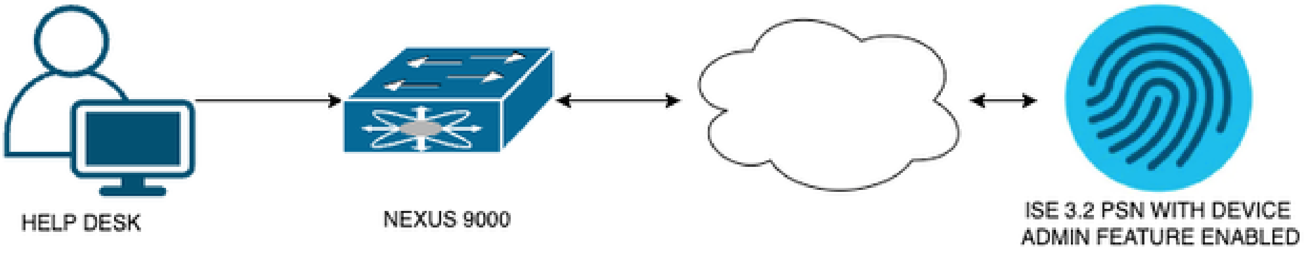
The user assigned with this role can perform basic troubleshooting and bounce certain ports.

The TACACS session that gets the Nexus role must be able to only use and run the next commands and actions:

- Access to configure terminal to ONLY execute shut down and no shut-on interfaces from 1/1-1/21 and 1/25-1/30
- ssh
- ssh6
- telnet
- Telnet6
- Traceroute
- Traceroute6
- Ping
- Ping6
- Enable

Configure

Network Diagram



Flow Components Diagram

Step 1: Configure Nexus 9000

1. AAA configuration.

Warning: After you enable TACACS authentication, the Nexus device stops using local authentication and starts using AAA server based authentication.

```
Nexus9000(config)# feature tacacs+
Nexus9000(config)# tacacs-server host <Your ISE IP> key 0 Nexus3xample
Nexus9000(config)# tacacs-server key 0 "Nexus3xample"
Nexus9000(config)# aaa group server tacacs+ IsePsnServers
Nexus9000(config-tacacs+)# server <Your ISE IP>
Nexus9000(config)# aaa authentication login default group IsePsnServers local
```

2. Configure the customized role with the requirements specified.

```
Nexus9000(config)# role name helpdesk
Nexus9000(config-role)#   description Can perform basic Toubleshooting and bounce certain  ports
Nexus9000(config-role)# rule 1 permit read
Nexus9000(config-role)# rule 2 permit command enable *
Nexus9000(config-role)# rule 3 permit command ssh *
```

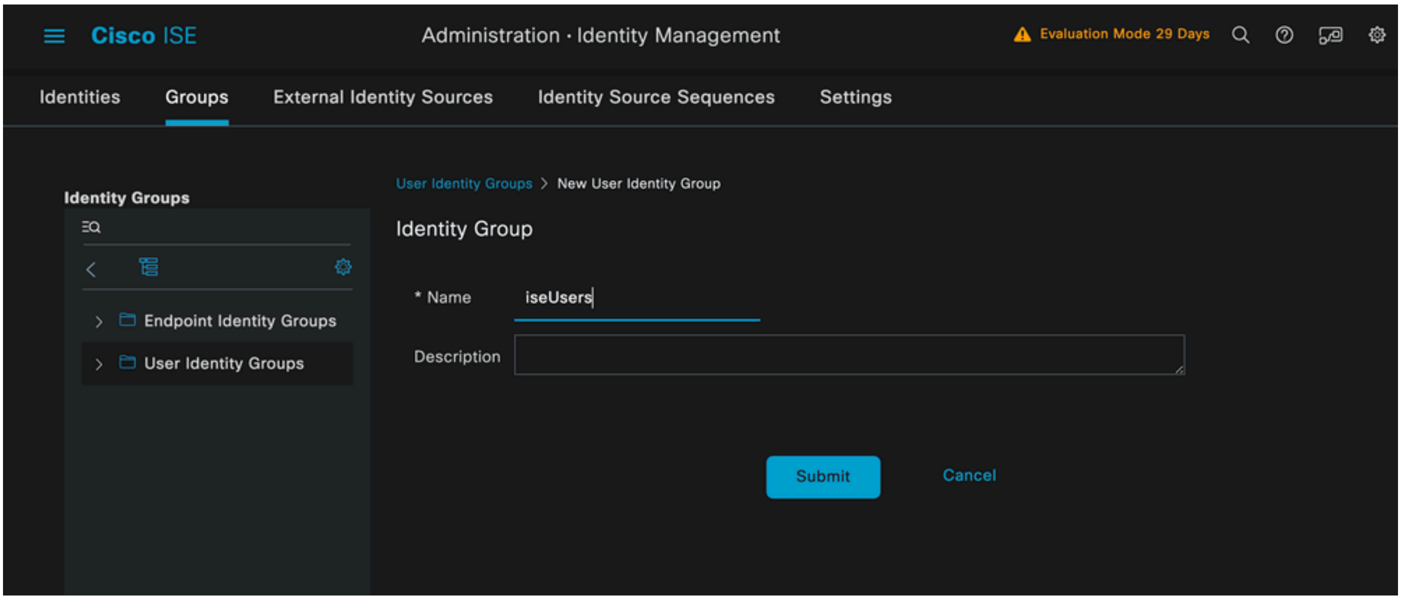
```
Nexus9000(config-role)# rule 4 permit command ssh6 *
Nexus9000(config-role)# rule 5 permit command ping *
Nexus9000(config-role)# rule 6 permit command ping6 *
Nexus9000(config-role)# rule 7 permit command telnet *
Nexus9000(config-role)# rule 8 permit command traceroute *
Nexus9000(config-role)# rule 9 permit command traceroute6 *
Nexus9000(config-role)# rule 10 permit command telnet6 *
Nexus9000(config-role)# rule 11 permit command config t ; interface * ; shutdown
Nexus9000(config-role)# rule 12 permit command config t ; interface * ; no shutdown

vlan policy deny
interface policy deny

Nexus9000(config-role-interface)#     permit interface Ethernet1/1
Nexus9000(config-role-interface)#     permit interface Ethernet1/2
Nexus9000(config-role-interface)#     permit interface Ethernet1/3
Nexus9000(config-role-interface)#     permit interface Ethernet1/4
Nexus9000(config-role-interface)#     permit interface Ethernet1/5
Nexus9000(config-role-interface)#     permit interface Ethernet1/6
Nexus9000(config-role-interface)#     permit interface Ethernet1/7
Nexus9000(config-role-interface)#     permit interface Ethernet1/8
Nexus9000(config-role-interface)#     permit interface Ethernet1/8
Nexus9000(config-role-interface)#     permit interface Ethernet1/9
Nexus9000(config-role-interface)#     permit interface Ethernet1/10
Nexus9000(config-role-interface)#     permit interface Ethernet1/11
Nexus9000(config-role-interface)#     permit interface Ethernet1/12
Nexus9000(config-role-interface)#     permit interface Ethernet1/13
Nexus9000(config-role-interface)#     permit interface Ethernet1/14
Nexus9000(config-role-interface)#     permit interface Ethernet1/15
Nexus9000(config-role-interface)#     permit interface Ethernet1/16
Nexus9000(config-role-interface)#     permit interface Ethernet1/17
Nexus9000(config-role-interface)#     permit interface Ethernet1/18
Nexus9000(config-role-interface)#     permit interface Ethernet1/19
Nexus9000(config-role-interface)#     permit interface Ethernet1/20
Nexus9000(config-role-interface)#     permit interface Ethernet1/21
Nexus9000(config-role-interface)#     permit interface Ethernet1/22
Nexus9000(config-role-interface)#     permit interface Ethernet1/25
Nexus9000(config-role-interface)#     permit interface Ethernet1/26
Nexus9000(config-role-interface)#     permit interface Ethernet1/27
Nexus9000(config-role-interface)#     permit interface Ethernet1/28
Nexus9000(config-role-interface)#     permit interface Ethernet1/29
Nexus9000(config-role-interface)#     permit interface Ethernet1/30

Nexus9000# copy running-config startup-config
[########################################] 100%
Copy complete, now saving to disk (please wait)...

Copy complete.
```

Step 2. Configure Identity Service Engine 3.2

1. Configure the identity that is used during Nexus TACACS session.

ISE local authentication is used.

Navigate to the **Administration > Identity Management > Groups** tab and create the group that the user needs to be part of, the identity group created for this demonstration is **iseUsers.**



* Name iseUsers

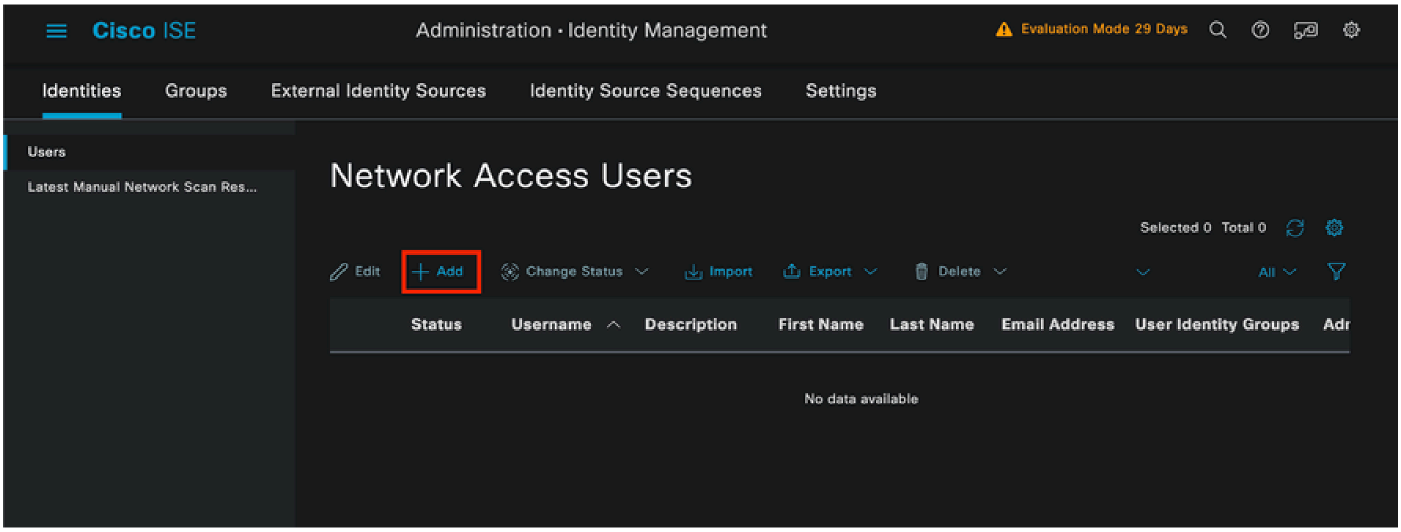
Description

Creating a user group

Click the **Submit** button.

Next navigate to **Administration** > **Identity Management** > **Identity** tab.

Press on the **Add Button**.

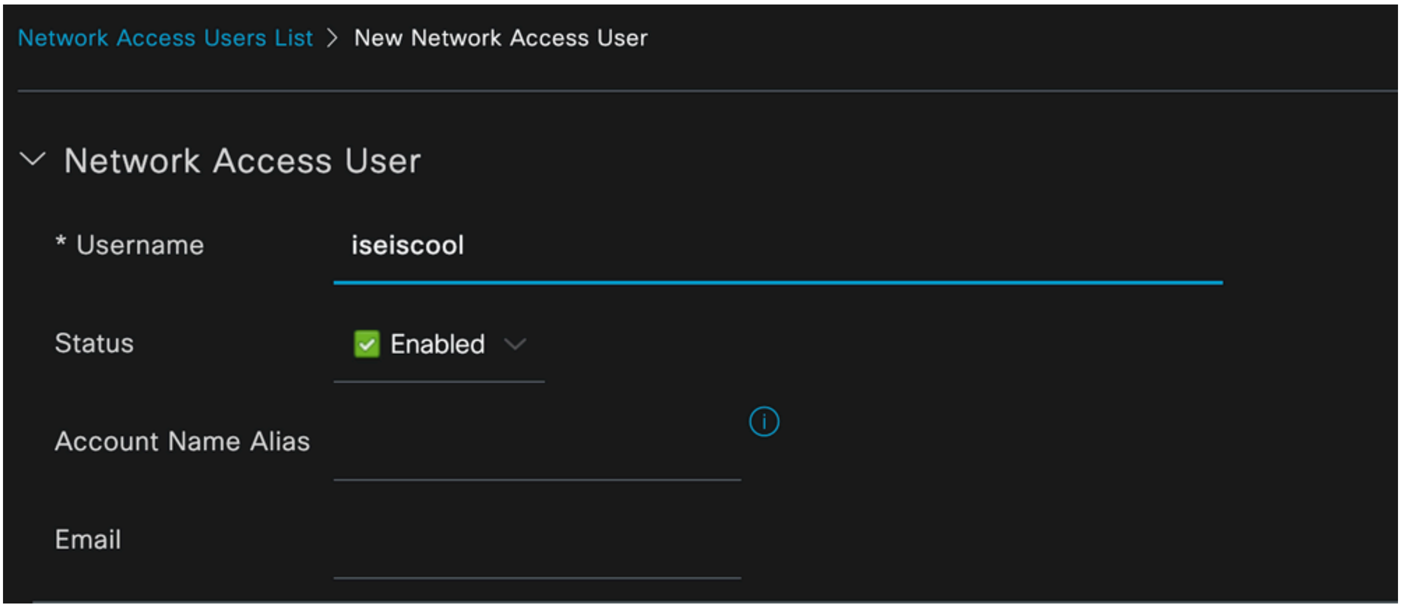


Status	Username	Description	First Name	Last Name	Email Address	User Identity Groups	Adr

No data available

User creation

As part of the mandatory fields, start with the name of the user, the username **iseiscool** is used in this example.


Network Access Users List > New Network Access User

Network Access User

* Username: iseiscool

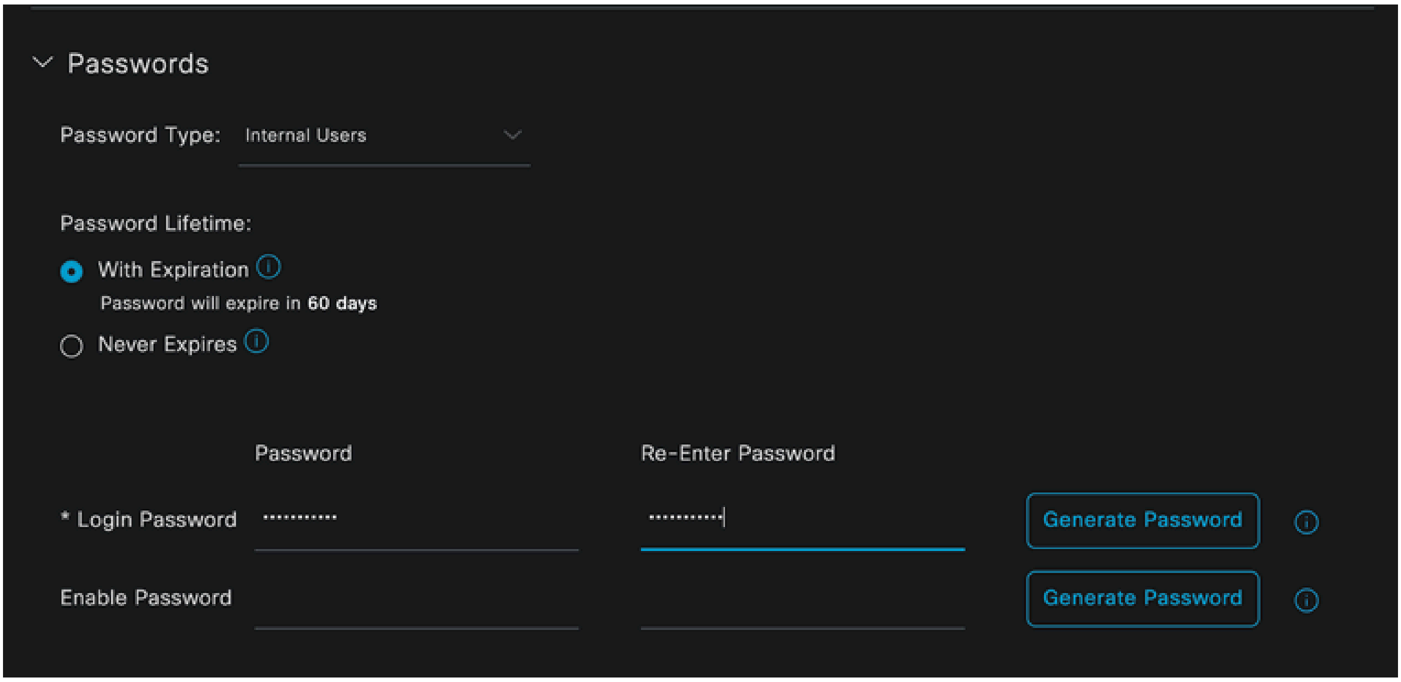
Status: ☑ Enabled

Account Name Alias:

Email:

Naming the User and Creating it

The next step is to assign a password to the username created, VainillaISE97 is the password used in this demonstration.


Passwords

Password Type: Internal Users

Password Lifetime:

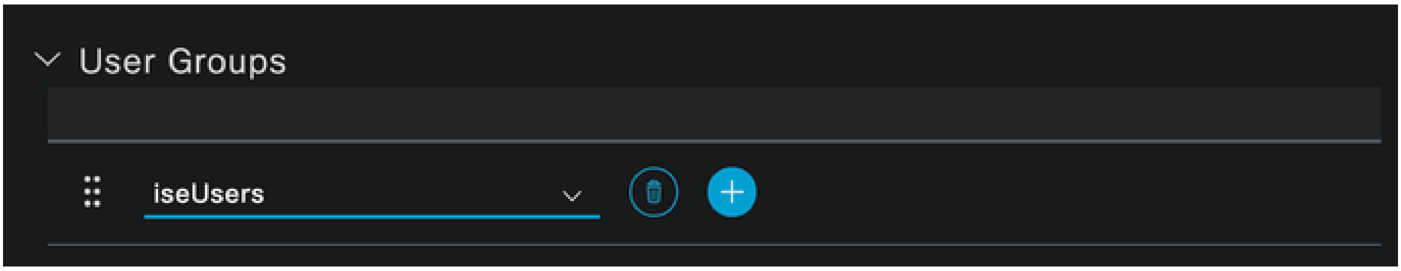
● With Expiration
Password will expire in **60 days**

○ Never Expires

	Password	Re-Enter Password
* Login Password	············	············
Enable Password		

Password assignement

Finally, assign the user to the group previously created, which is in this case **iseUsers**.


User Groups

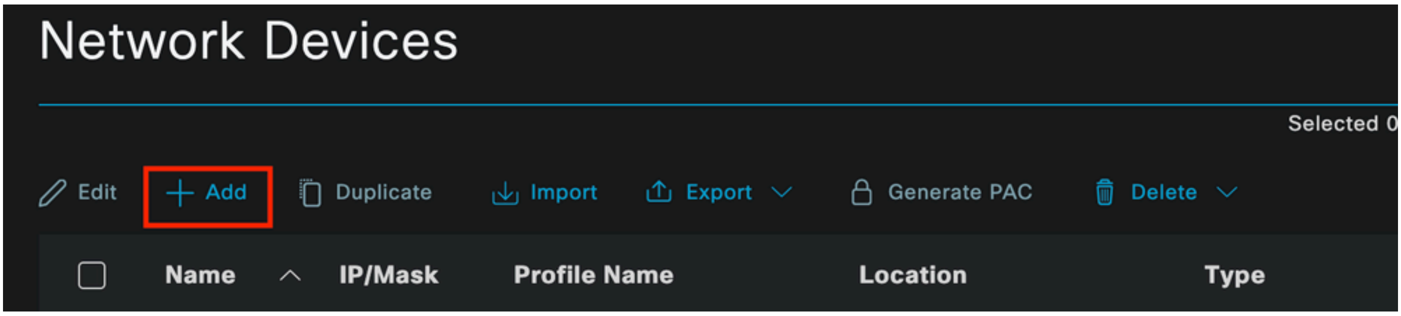
iseUsers

Group assignation

2. Configure and Add the Network Device.

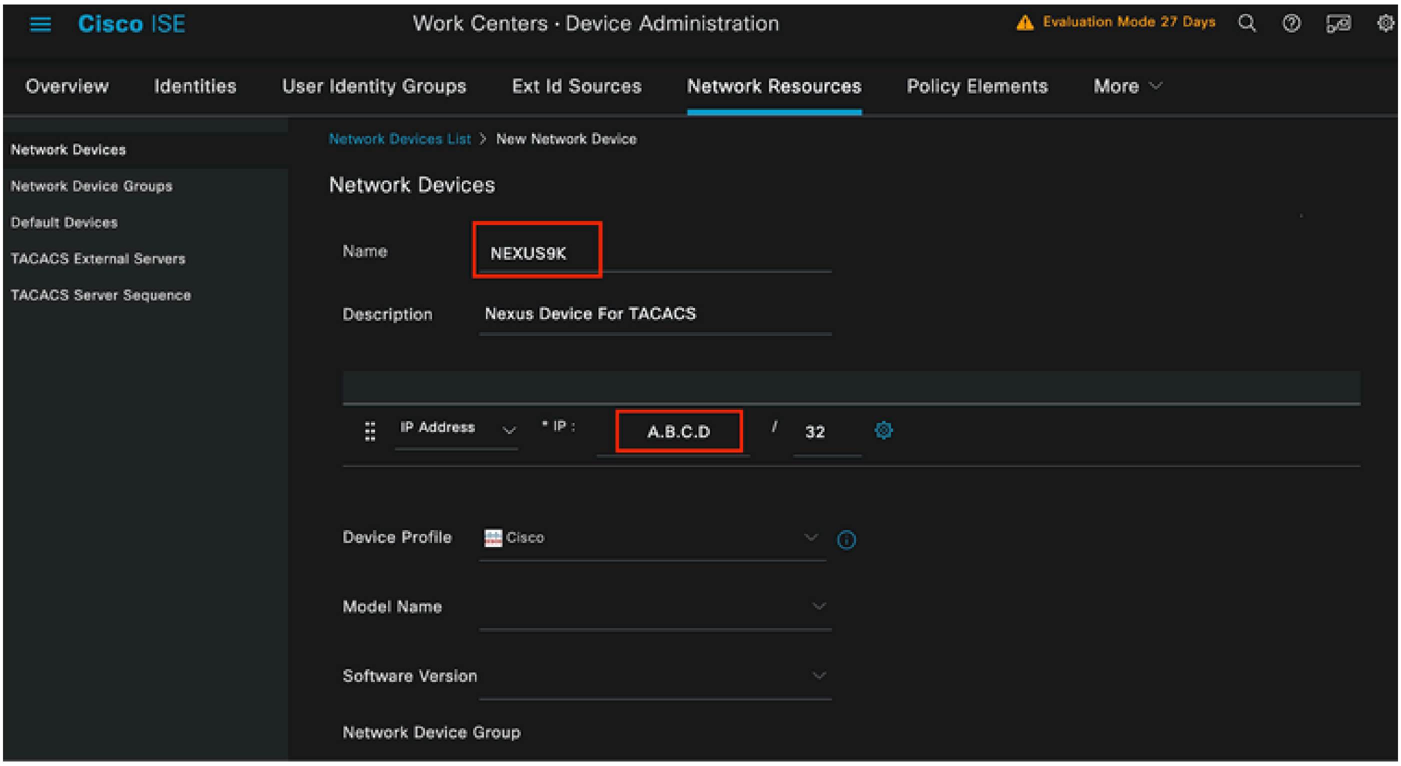
Add the NEXUS 9000 device to ISE **Administration** > **Network Resources** > **Network Devices**

Click the **Add** button in order to start.



Network Access Device Page

Enter the values to the form, assign a name to the NAD you are creating, and an IP from which the NAD contacts ISE for the TACACS conversation.



Network Devices

Name: NEXUS9K

Description: Nexus Device For TACACS

IP Address * IP : A.B.C.D / 32

Device Profile: Cisco

Model Name

Software Version

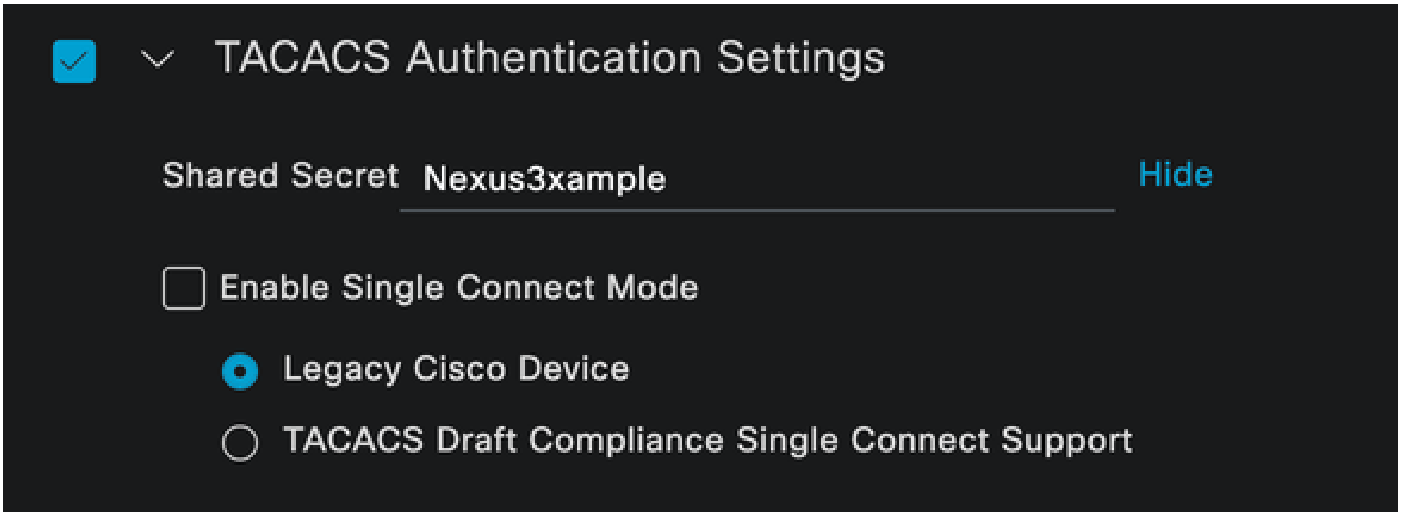
Network Device Group

Configure Network Device

The drop-down options can be left in blank and can be omitted, these options are intended to categorize your NADs by Location, Device type, Version, and then change the authentication flow based on these filters.

On the **Administration** > **Network Resources** > **Network Devices** > **Your NAD** > **TACACS Authentication Settings.**

Add the Shared Secret that you used under your NAD configuration for this demonstration, Nexus3xample is used in this demonstration.



☑ TACACS Authentication Settings

Shared Secret Nexus3xample

□ Enable Single Connect Mode

● Legacy Cisco Device

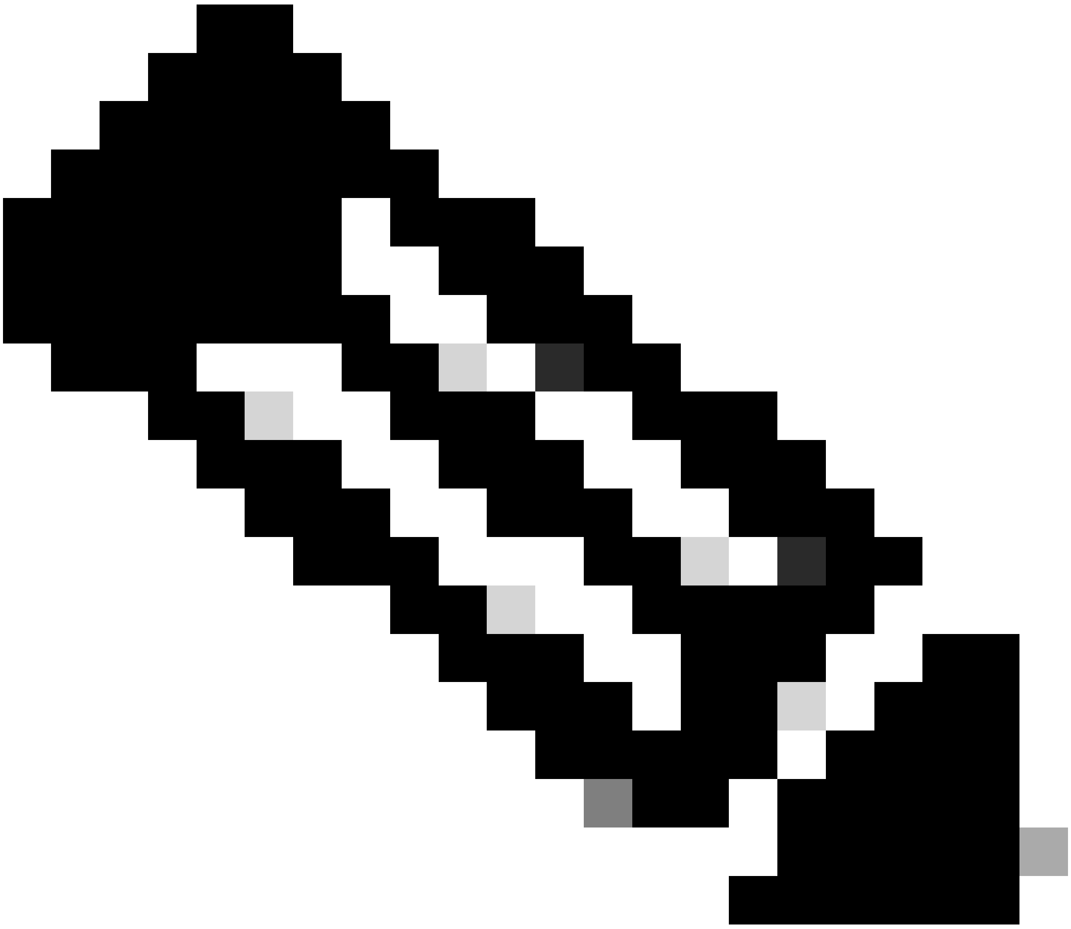
○ TACACS Draft Compliance Single Connect Support

TACACS configuration section

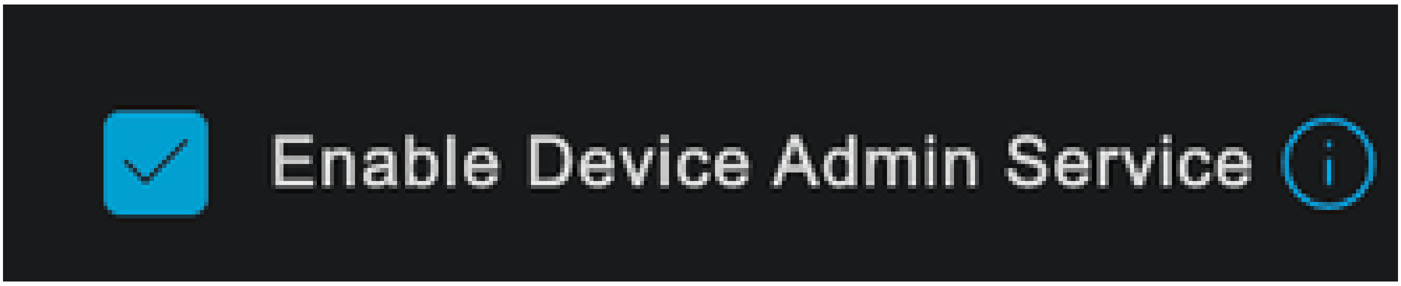
Save the changes by clicking the **Submit** button.

3. TACACS configuration on ISE.

Double-check that the PSN you configured in the Nexus 9k has the option **Device Admin** enabled.



Note: Enable Device Admin Service does NOT cause a restart on ISE.



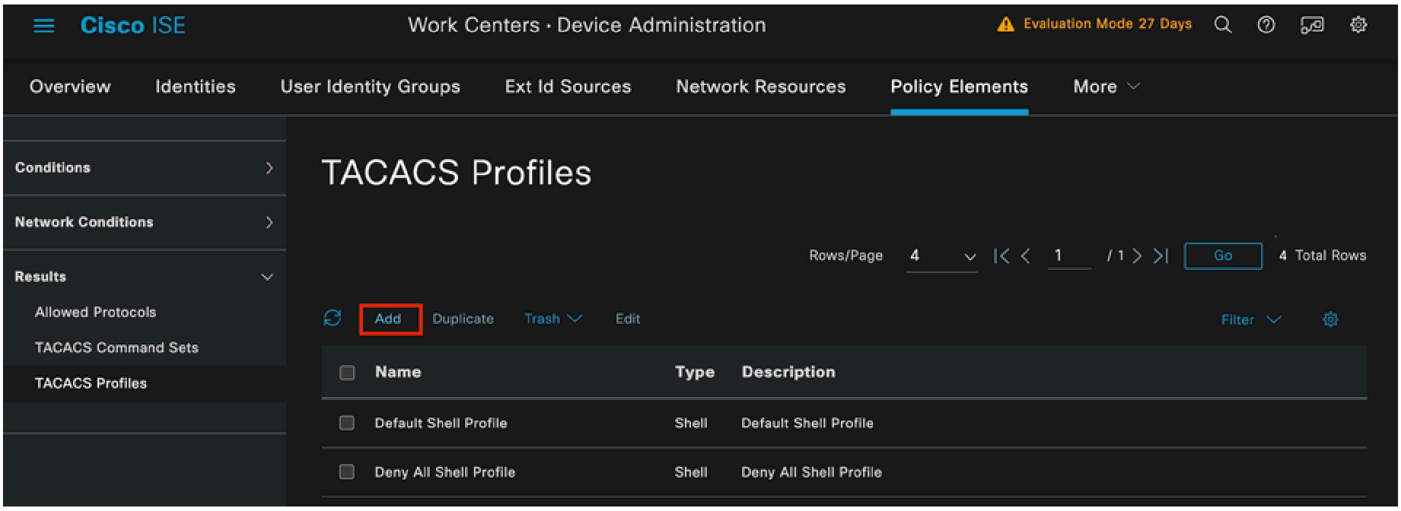
☑ Enable Device Admin Service

PSN Device Admin feature check

This can be checked under ISE menu **Administration** > **System** > **Deployment** > **Your PSN** > **Policy Server section** > **Enable Device Admin Services.**

- Create a TACACS profile, that returns the role helpdesk to the Nexus device if the authentication is successful.

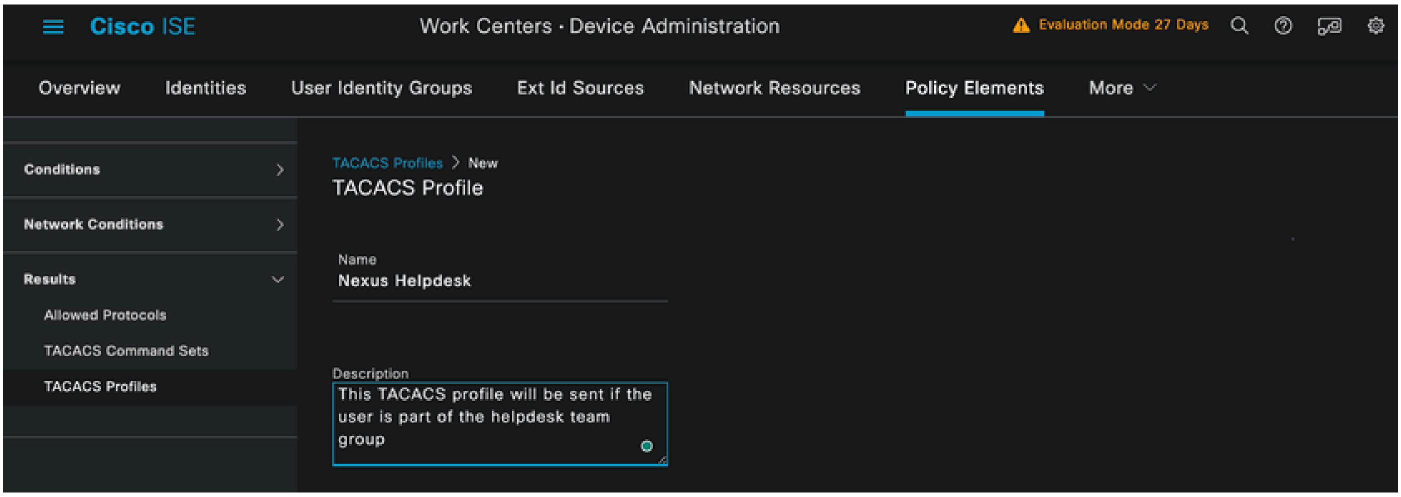
From the ISE Menu, navigate to **Workcenters** > **Device Administration** > **Policy Elements** > **Results** > **TACACS Profiles** and click the **Add** button.



	Name	Type	Description
□	Default Shell Profile	Shell	Default Shell Profile
□	Deny All Shell Profile	Shell	Deny All Shell Profile

TACACS Profile

Assign a Name, and optionally a description.



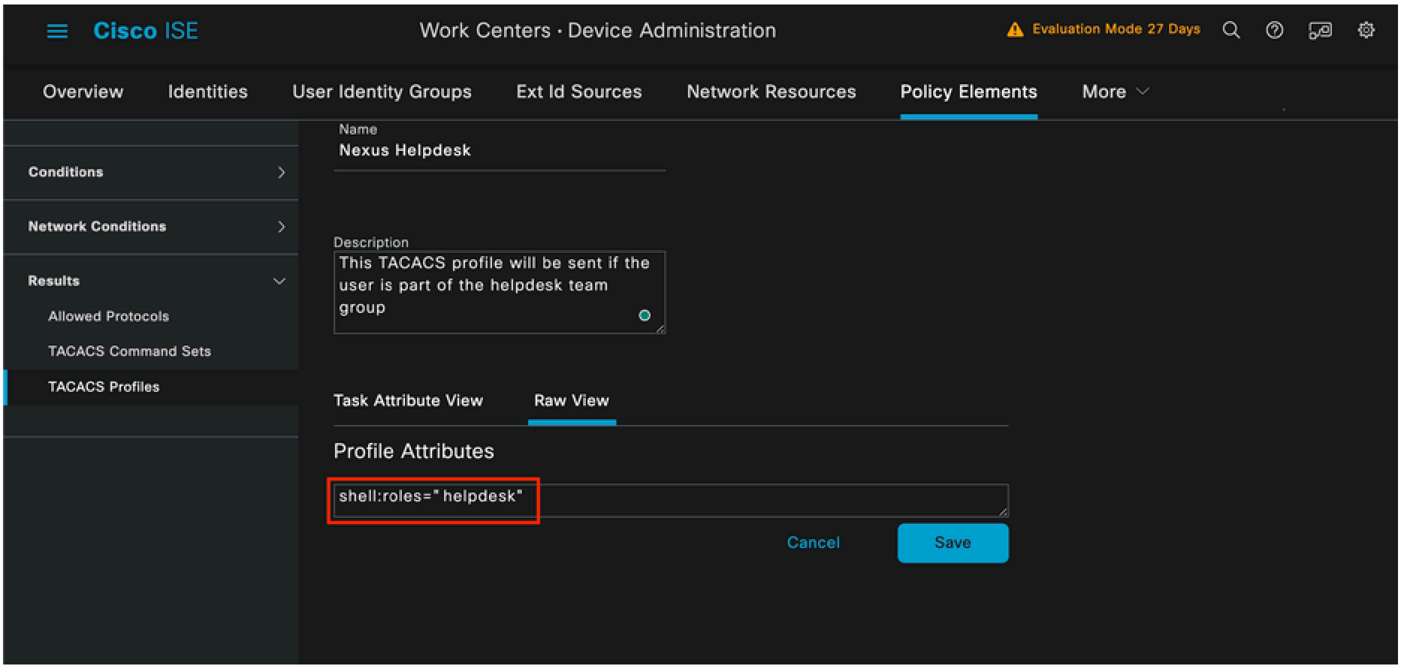
Name
Nexus Helpdesk

Description
This TACACS profile will be sent if the user is part of the helpdesk team group

Naming Tacacs profile

Ignore the **Task Attribute View** section and navigate to the **Raw View** section.

And enter the value **shell:roles="helpdesk"**.



Name: Nexus Helpdesk

Description: This TACACS profile will be sent if the user is part of the helpdesk team group

Profile Attributes

```
shell:roles=" helpdesk"
```

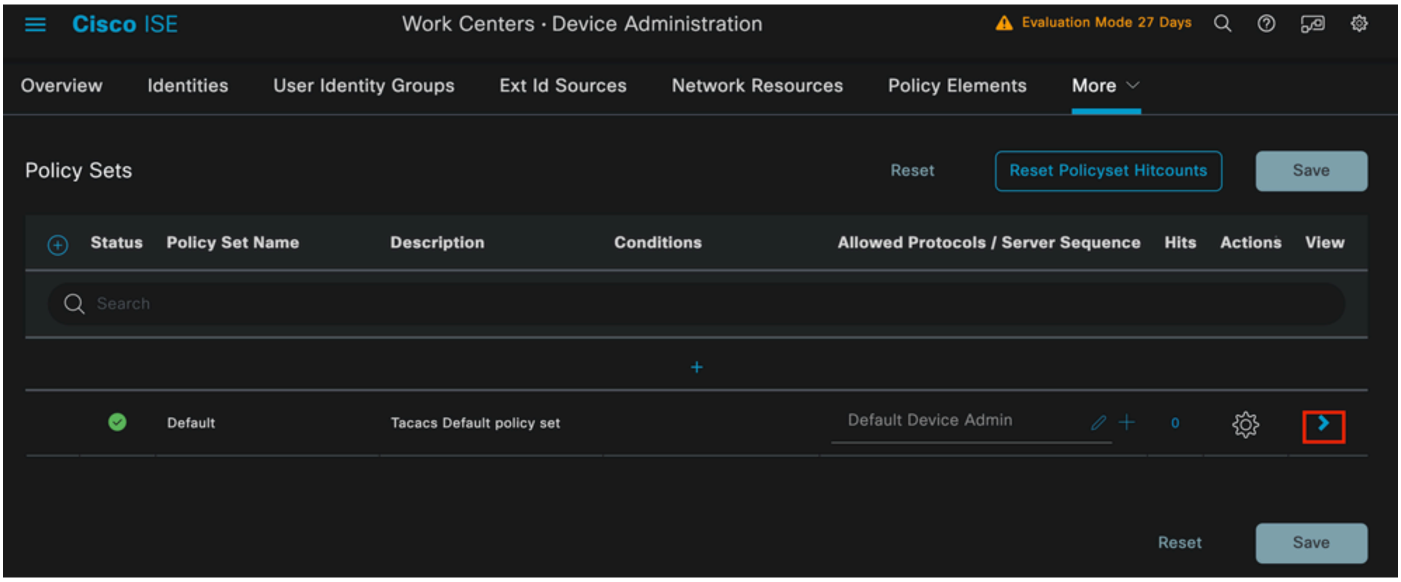
Adding Profile Attribute

Configure the Policy Set that includes the Authentication Policy and the Authorization Policy.

On the ISE menu access **Work Centers > Device Administration > Device Admin Policy Sets**.

For demonstration purposes, the Default Policy set is used. However, another Policy set can be created, with conditions in order to match specific scenarios.

Click the arrow at the end of the row.



Policy Sets

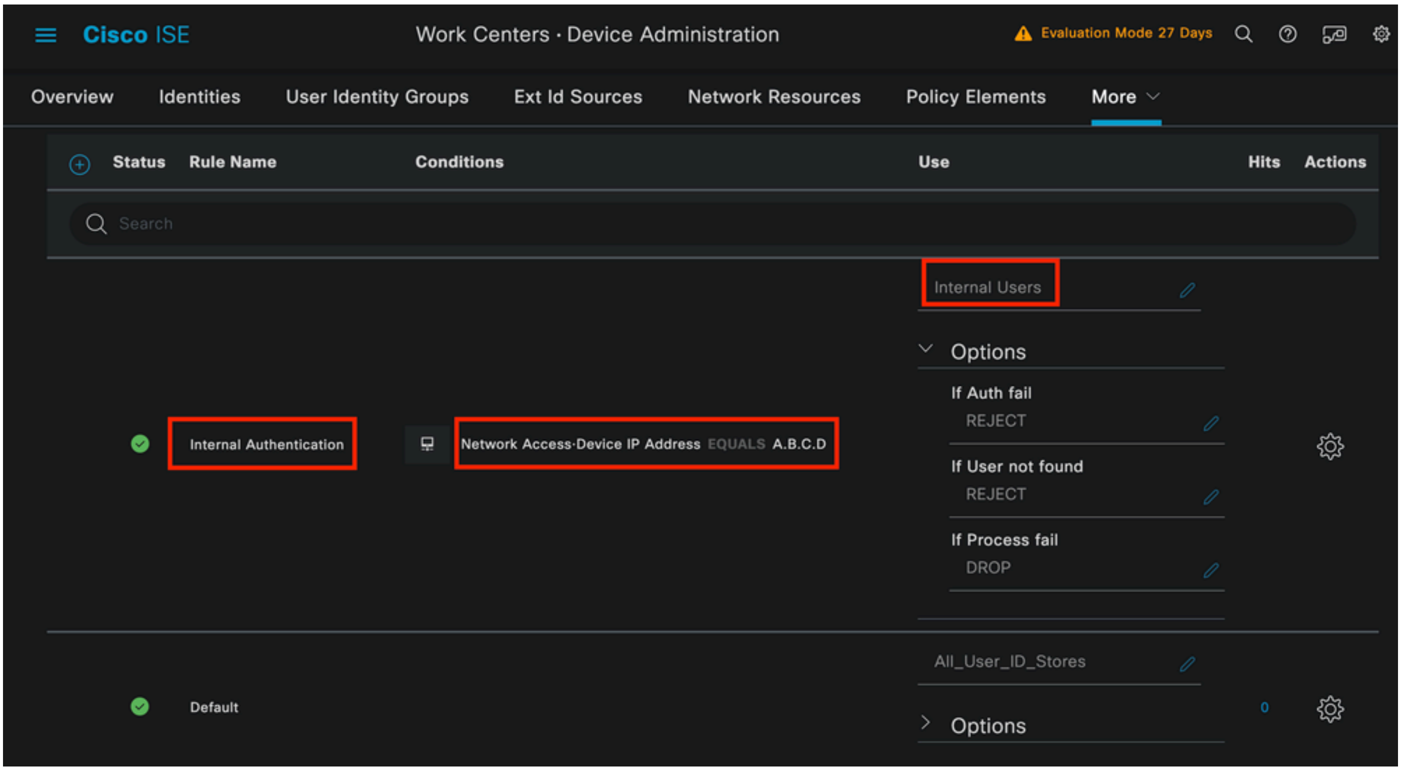
Status	Policy Set Name	Description	Conditions	Allowed Protocols / Server Sequence	Hits	Actions	View
✓	Default	Tacacs Default policy set		Default Device Admin	0	⚙	>

Device Admin Policy Sets page

Once inside the policy set configuration scroll down and expand the **Authentication Policy** section.

Click the **Add** icon.

For this configuration example, the Name value is **Internal Authentication** and the condition chosen is the Network Device (Nexus) IP (substitute the **A.B.C.D.**). This Authentication policy uses the Internal Users Identity Store.

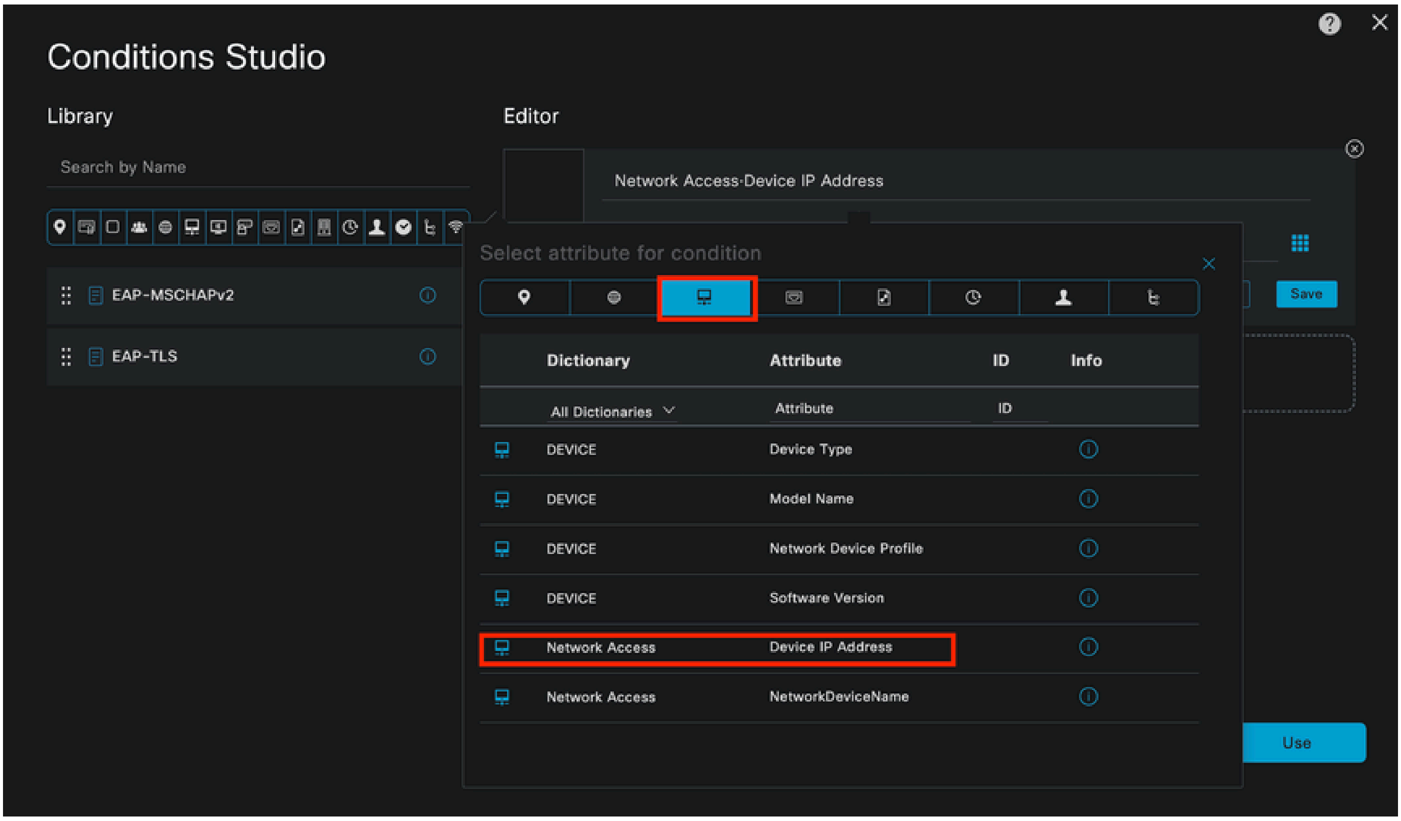


Status	Rule Name	Conditions	Use	Hits	Actions
✓	Internal Authentication	Network Access·Device IP Address EQUALS A.B.C.D	Internal Users Options If Auth fail REJECT If User not found REJECT If Process fail DROP		
✓	Default		All_User_ID_Stores Options	0	

Authentication Policy

Here is how the condition was configured.

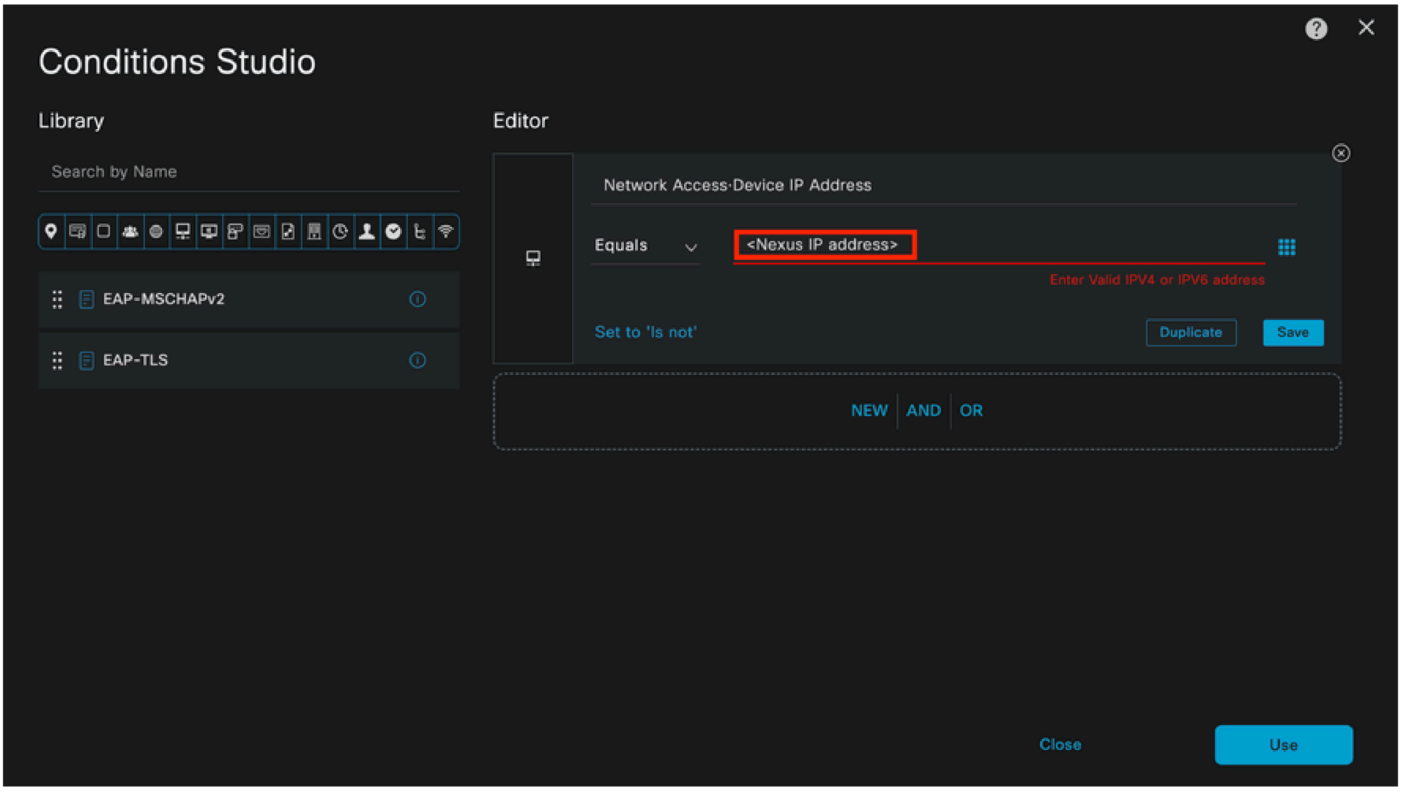
Select the **Network Access > Device IP address Dictionary Attribute**.



Dictionary	Attribute	ID	Info
All Dictionaries	Attribute	ID	
DEVICE	Device Type		ⓘ
DEVICE	Model Name		ⓘ
DEVICE	Network Device Profile		ⓘ
DEVICE	Software Version		ⓘ
Network Access	Device IP Address		ⓘ
Network Access	NetworkDeviceName		ⓘ

Condition studio for authentication policy

Replace the **<Nexus IP address>** comment with the correct IP.



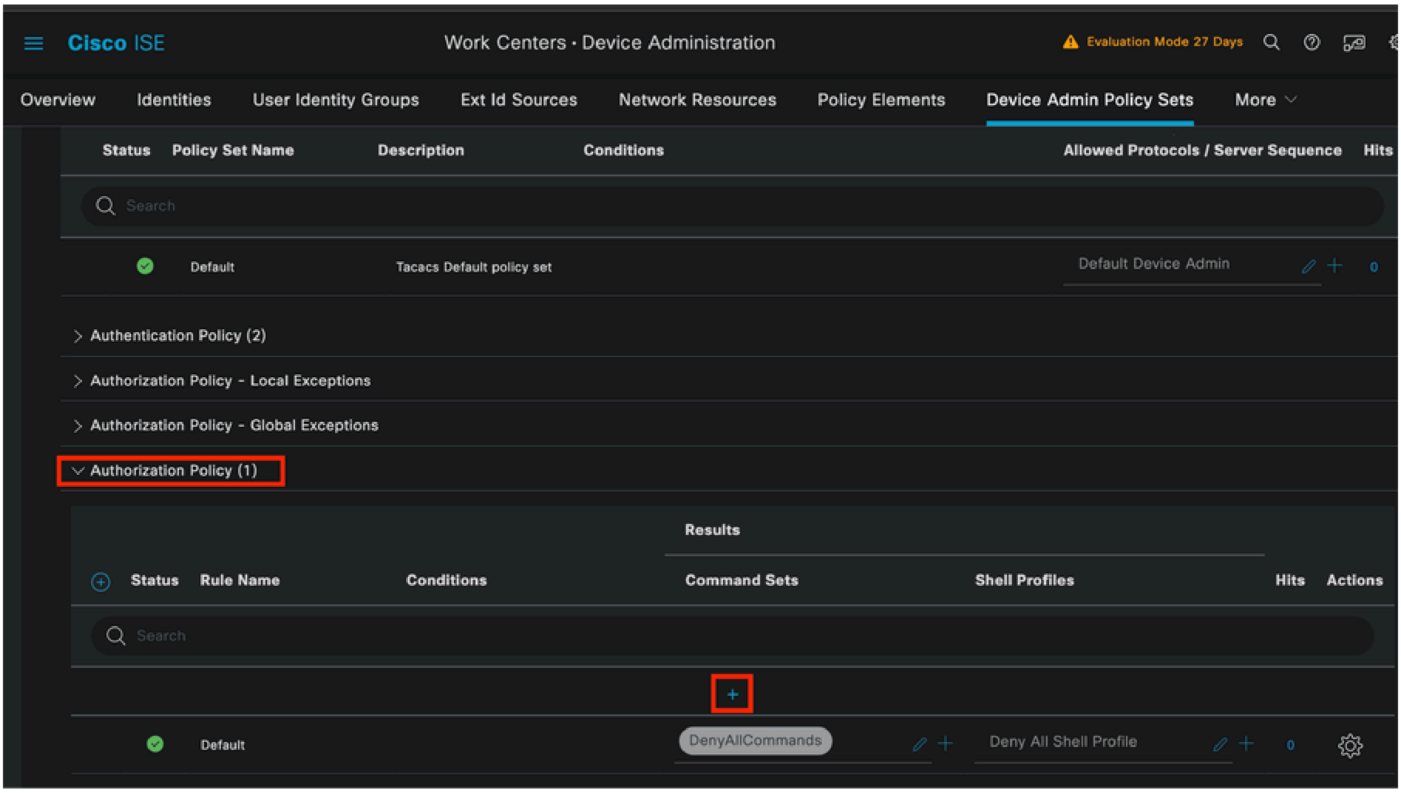
Adding the IP filter

Click on the **Use** button.

This condition is hit only by the Nexus Device you configured, however, if the purpose is to enable this condition for a large amount of devices, a different condition must be considered.

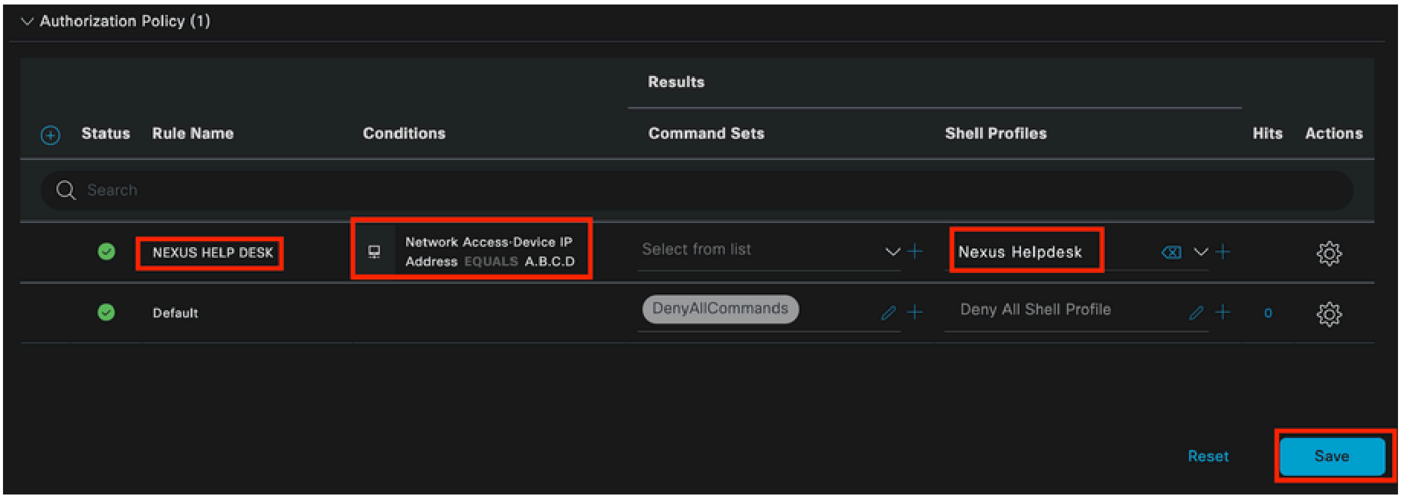
Then navigate to the **Authorization Policy** section and expand it.

Click on the + (plus) icon.



Authorization policy section

In this example **NEXUS HELP DESK** as the name of the Authorization Policy was used.



Condition studio for Authorization Policy

The same condition that was configured in the Authentication Policy is used for the Authorization policy.

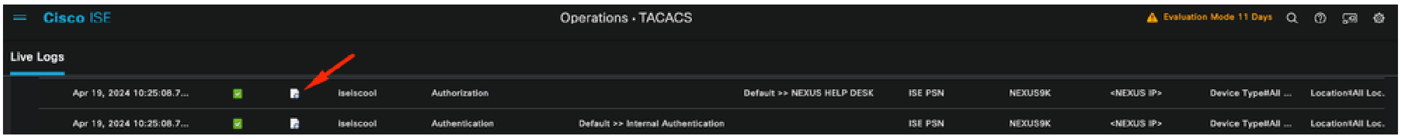
In the Shell Profiles column, the Profile configured before **Nexus Helpdesk** was selected.

Finally, click the **Save** button.

Verify

Use this section in order to confirm that your configuration works properly.

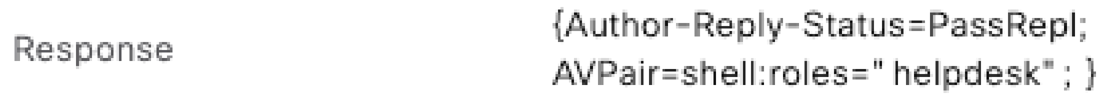
From ISE GUI, navigate to **Operations** > **TACACS** > **Live Logs**, identify the record that matches the username used, and click the Live Log Detail of the Authorization event.



Apr 19, 2024 10:25:08.7...	✓	🗎	iseiscool	Authorization		Default >> NEXUS HELP DESK	ISE PSN	NEXUS9K	<NEXUS IP>	Device Type#All ...	Location#All Loc.
Apr 19, 2024 10:25:08.7...	✓	🗎	iseiscool	Authentication	Default >> Internal Authentication		ISE PSN	NEXUS9K	<NEXUS IP>	Device Type#All ...	Location#All Loc.

TACACS Live Log

As part of the details that this report includes, it can be found a **Response** section, where you can see how ISE returned the value shell:roles="helpdesk"



Response {Author-Reply-Status=PassRepl; AVPair=shell:roles=" helpdesk" ; }

Live Log Detail Response

On the Nexus device:

```
Nexus9000 login: iseiscool
Password: VainillaISE97

Nexus9000# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Nexus9000(config)# interface ethernet 1/23
% Interface permission denied

Nexus9000(config)# ?
  interface  Configure interfaces
  show       Show running system information
  end        Go to exec mode
  exit       Exit from command interpreter

Nexus9000(config)# role name test
% Permission denied for the role

Nexus9000(config)#

Nexus9000(config)# interface loopback 0
% Interface permission denied

Nexus9000(config)#
Nexus9000# conf t

Nexus9000(config)# interface ethernet 1/5
Notice that only the commands allowed are listed.
Nexus9000(config-if)# ?

  no        Negate a command or set its defaults
  show      Show running system information
  shutdown  Enable/disable an interface
  end       Go to exec mode
  exit      Exit from command interpreter

Nexus9000(config-if)# cdp
Nexus9000(config-if)# cdp enable
% Permission denied for the role
Nexus9000(config-if)#
```

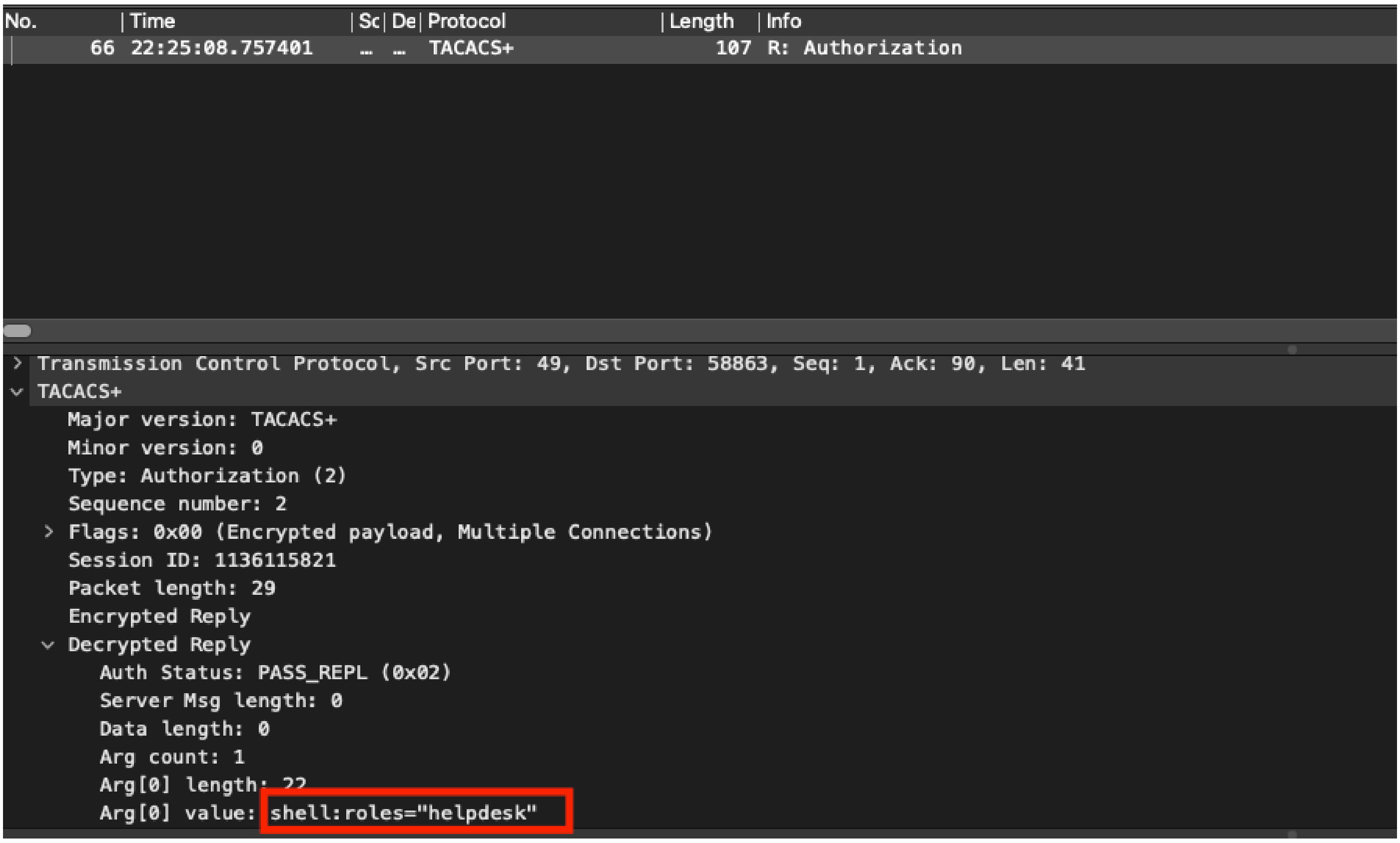
Troubleshoot

- Verify that ISE is reachable from the Nexus device.Nexus9000# ping <Your ISE IP>
  ```
  PING <Your ISE IP> (<Your ISE IP> 56 data bytes
  64 bytes from <Your ISE IP> : icmp_seq=0 ttl=59 time=1.22 ms
  64 bytes from <Your ISE IP> : icmp_seq=1 ttl=59 time=0.739 ms
  64 bytes from <Your ISE IP> : icmp_seq=2 ttl=59 time=0.686 ms
  64 bytes from <Your ISE IP> : icmp_seq=3 ttl=59 time=0.71 ms
  64 bytes from <Your ISE IP> : icmp_seq=4 ttl=59 time=0.72 ms
  ```
- Verify, that port 49 is opened, between ISE and the Nexus device.
  ```
  Nexus9000# telnet <Your ISE IP> 49
  Trying <Your ISE IP> ...
  Connected to <Your ISE IP> .
  Escape character is '^]'.
  ```
- Use these debugs:

```
debug tacacs+ all
Nexus9000#
Nexus9000# 2024 Apr 19 22:50:44.199329 tacacs: event_loop(): calling process_rd_fd_set
2024 Apr 19 22:50:44.199355 tacacs: process_rd_fd_set: calling callback for fd 6
2024 Apr 19 22:50:44.199392 tacacs: fsrv didnt consume 8421 opcode
2024 Apr 19 22:50:44.199406 tacacs: process_implicit_cfs_session_start: entering...
2024 Apr 19 22:50:44.199414 tacacs: process_implicit_cfs_session_start: exiting; we are in distribution disabled state
2024 Apr 19 22:50:44.199424 tacacs: process_aaa_tplus_request: entering for aaa session id 0
2024 Apr 19 22:50:44.199438 tacacs: process_aaa_tplus_request:Checking for state of mgmt0 port with servergroup IsePsnServers
2024 Apr 19 22:50:44.199451 tacacs: tacacs_global_config(4220): entering ...
2024 Apr 19 22:50:44.199466 tacacs: tacacs_global_config(4577): GET_REQ...
2024 Apr 19 22:50:44.208027 tacacs: tacacs_global_config(4701): got back the return value of global Protocol configuration operation:SUCCESS
2024 Apr 19 22:50:44.208045 tacacs: tacacs_global_config(4716): REQ:num server 0
2024 Apr 19 22:50:44.208054 tacacs: tacacs_global_config: REQ:num group 1
2024 Apr 19 22:50:44.208062 tacacs: tacacs_global_config: REQ:num timeout 5
2024 Apr 19 22:50:44.208070 tacacs: tacacs_global_config: REQ:num deadtime 0
2024 Apr 19 22:50:44.208078 tacacs: tacacs_global_config: REQ:num encryption_type 7
2024 Apr 19 22:50:44.208086 tacacs: tacacs_global_config: returning retval 0
2024 Apr 19 22:50:44.208098 tacacs: process_aaa_tplus_request:group_info is populated in aaa_req, so Using servergroup IsePsnServers
2024 Apr 19 22:50:44.208108 tacacs: tacacs_servergroup_config: entering for server group, index 0
2024 Apr 19 22:50:44.208117 tacacs: tacacs_servergroup_config: GETNEXT_REQ for Protocol server group index:0 name:
2024 Apr 19 22:50:44.208148 tacacs: tacacs_pss2_move2key: rcode = 40480003 syserr2str = no such pss key
2024 Apr 19 22:50:44.208160 tacacs: tacacs_pss2_move2key: calling pss2_getkey
2024 Apr 19 22:50:44.208171 tacacs: tacacs_servergroup_config: GETNEXT_REQ got Protocol server group index:2 name:IsePsnServers
2024 Apr 19 22:50:44.208184 tacacs: tacacs_servergroup_config: got back the return value of Protocol group operation:SUCCESS
2024 Apr 19 22:50:44.208194 tacacs: tacacs_servergroup_config: returning retval 0 for Protocol server group:IsePsnServers
2024 Apr 19 22:50:44.208210 tacacs: process_aaa_tplus_request: Group IsePsnServers found.
```

```
corresponding vrf is default, source-intf is 0
2024 Apr 19 22:50:44.208224 tacacs: process_aaa_tplus_request: checking for mgmt0 vrf:management against vrf:default of requested group
2024 Apr 19 22:50:44.208256 tacacs: process_aaa_tplus_request:mgmt_if 83886080
2024 Apr 19 22:50:44.208272 tacacs: process_aaa_tplus_request:global_src_intf : 0, local src_intf is 0 and vrf_name is default
2024 Apr 19 22:50:44.208286 tacacs: create_tplus_req_state_machine(902): entering for aaa session id 0
2024 Apr 19 22:50:44.208295 tacacs: state machine count 0
2024 Apr 19 22:50:44.208307 tacacs: init_tplus_req_state_machine: entering for aaa session id 0
2024 Apr 19 22:50:44.208317 tacacs: init_tplus_req_state_machine(1298):tplus_ctx is NULL it should be if author and test
2024 Apr 19 22:50:44.208327 tacacs: tacacs_servergroup_config: entering for server groupIsePsnServers, index 0
2024 Apr 19 22:50:44.208339 tacacs: tacacs_servergroup_config: GET_REQ for Protocol server group index:0 name:IsePsnServers
2024 Apr 19 22:50:44.208357 tacacs: find_tacacs_servergroup: entering for server group IsePsnServers
2024 Apr 19 22:50:44.208372 tacacs: tacacs_pss2_move2key: rcode = 0 syserr2str = SUCCESS
2024 Apr 19 22:50:44.208382 tacacs: find_tacacs_servergroup: exiting for server group IsePsnServers index is 2
2024 Apr 19 22:50:44.208401 tacacs: tacacs_servergroup_config: GET_REQ: find_tacacs_servergroup error 0 for Protocol server group IsePsnServers
2024 Apr 19 22:50:44.208420 tacacs: tacacs_pss2_move2key: rcode = 0 syserr2str = SUCCESS
2024 Apr 19 22:50:44.208433 tacacs: tacacs_servergroup_config: GET_REQ got Protocol server group index:2 name:IsePsnServers
2024 A2024 Apr 19 22:52024 Apr 19 22:52024 Apr 19 22:5
Nexus9000#
```

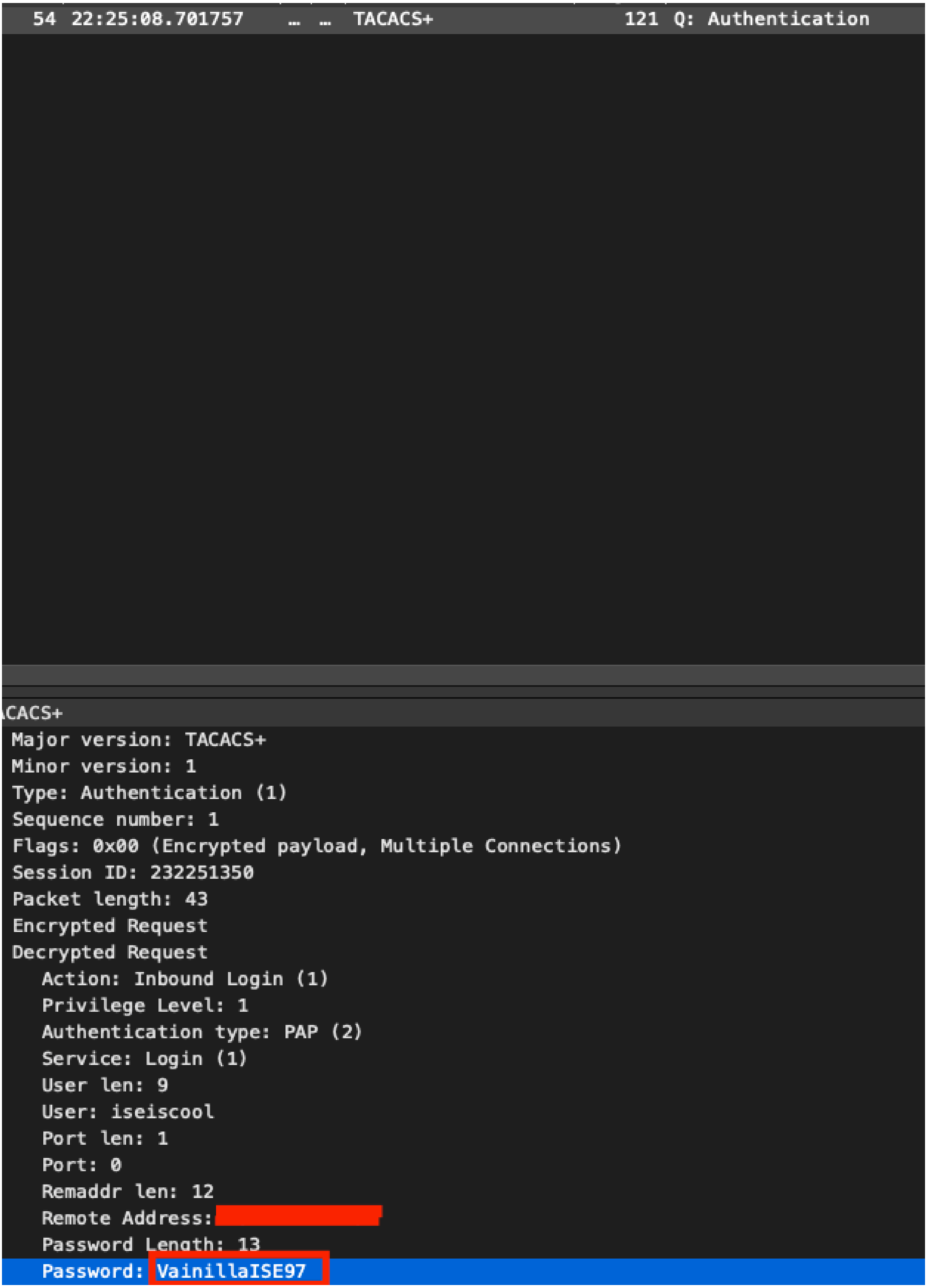
- Perform a packet capture (In order to see the packet details you must change Wireshark TACACS+ Preferences, and update the shared key used by the Nexus and ISE)



```
No.        Time              Sc De Protocol          Length  Info
       66  22:25:08.757401   …  …  TACACS+              107  R: Authorization

> Transmission Control Protocol, Src Port: 49, Dst Port: 58863, Seq: 1, Ack: 90, Len: 41
v TACACS+
    Major version: TACACS+
    Minor version: 0
    Type: Authorization (2)
    Sequence number: 2
  > Flags: 0x00 (Encrypted payload, Multiple Connections)
    Session ID: 1136115821
    Packet length: 29
    Encrypted Reply
  v Decrypted Reply
      Auth Status: PASS_REPL (0x02)
      Server Msg length: 0
      Data length: 0
      Arg count: 1
      Arg[0] length: 22
      Arg[0] value: shell:roles="helpdesk"
```

TACACS Authorization Packet

- Verify that the shared key is the same on ISE and Nexus side. This can also be checked in Wireshark.



```
 54 22:25:08.701757    …   …   TACACS+                121 Q: Authentication

CACS+
 Major version: TACACS+
 Minor version: 1
 Type: Authentication (1)
 Sequence number: 1
 Flags: 0x00 (Encrypted payload, Multiple Connections)
 Session ID: 232251350
 Packet length: 43
 Encrypted Request
 Decrypted Request
    Action: Inbound Login (1)
    Privilege Level: 1
    Authentication type: PAP (2)
    Service: Login (1)
    User len: 9
    User: iseiscool
    Port len: 1
    Port: 0
    Remaddr len: 12
    Remote Address: [redacted]
    Password Length: 13
    Password: VainillaISE97
```