Configure TACACS+ Authentication Domain on UCS Manager with ISE Server

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Related Information

Introduction

This document describes the configuration of Terminal Access Controller Access-Control System Plus (TACACS+) authentication on Unified Compute System Manager (UCSM). TACACS+ is a network protocol that is used for Authentication, Authorization and Accountability services (AAA) , it provides a centralized method to manage Network Access Devices (NAD) where you can administer and create rules through a server, in this use case scenario we are using Identity Services Engine (ISE).

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco UCS Manager (UCSM)
- Terminal Access Controller Access-Control System Plus (TACACS+)
- Identity Services Engine (ISE)

Components Used

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

- UCSM 4.2(3d)
- Cisco Identity Services Engine (ISE) version 3.2

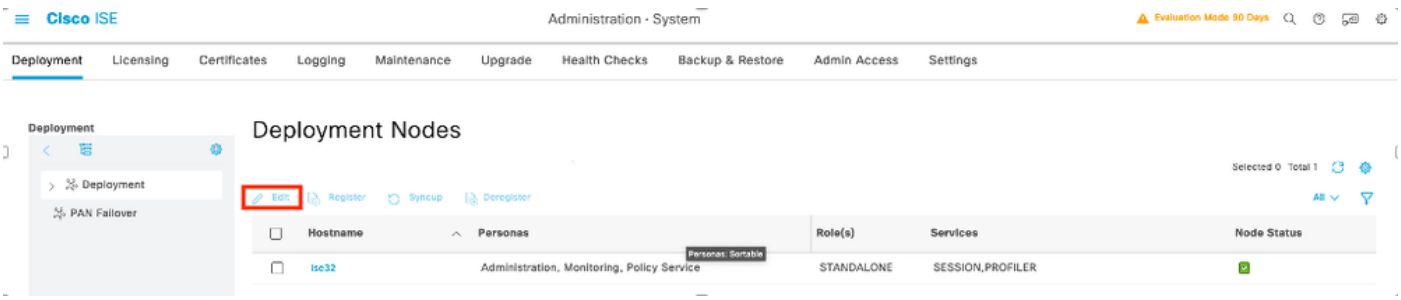
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Configuration

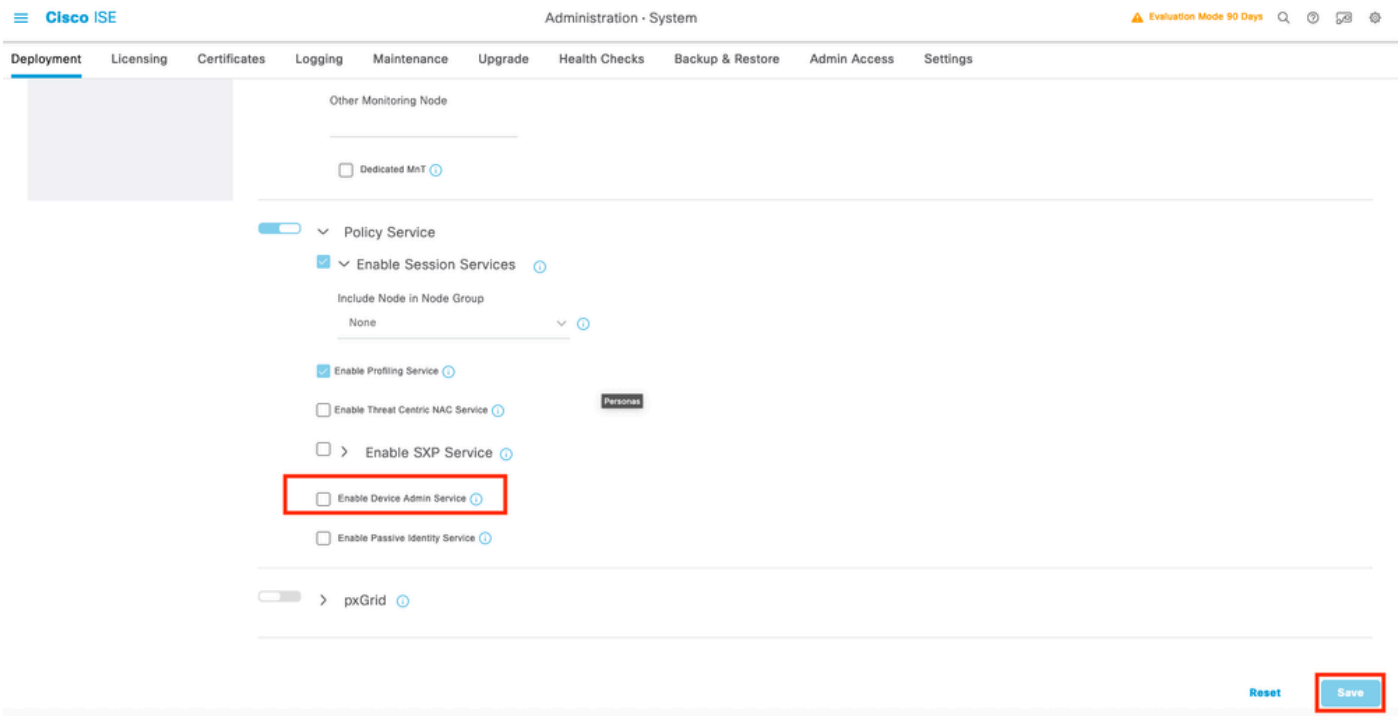
TACACS+ Configuration on ISE

Setup of TACACS+ on ISE

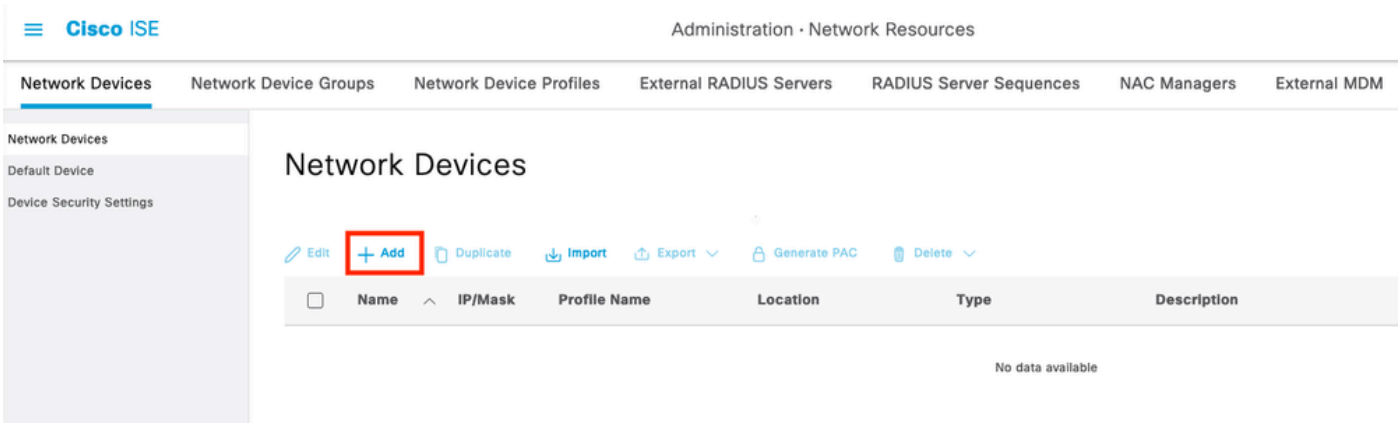
Step 1. The first task is to review if the ISE has the correct capabilities to handle TACACS+ authentications for such you need to check if within the Policy Service Node (PSN) desired you have the feature for **Device Admin Service**, browse through the menu **Administration > System > Deployment**, select the node where the ISE performs TACACS+ and then select the button edit.



Step 2. Scroll down until you see the corresponding feature called **Device Administration Service** (notice that for this feature to be enabled you need first to have Policy Server persona enabled on the node and moreover have licenses for TACACS+ available in your deployment), select that checkbox, and then save the configuration:

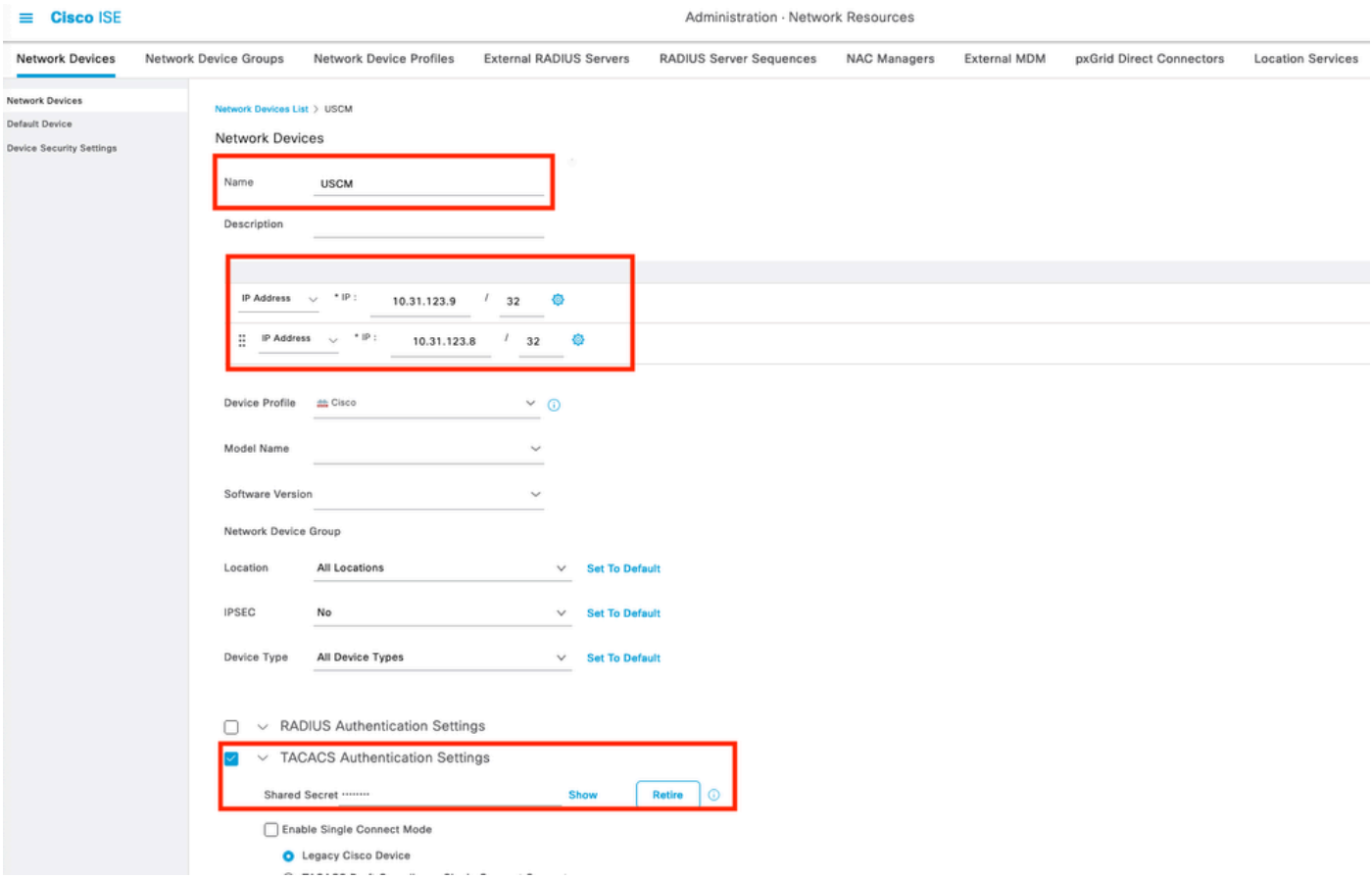


Step 3. Configure the Network Access Device (NAD) that uses the ISE as TACACS+ as server, navigate to the menu **Administration > Network Resources > Network Devices** then select the button **+Add**.



Step 4. In this section configure :

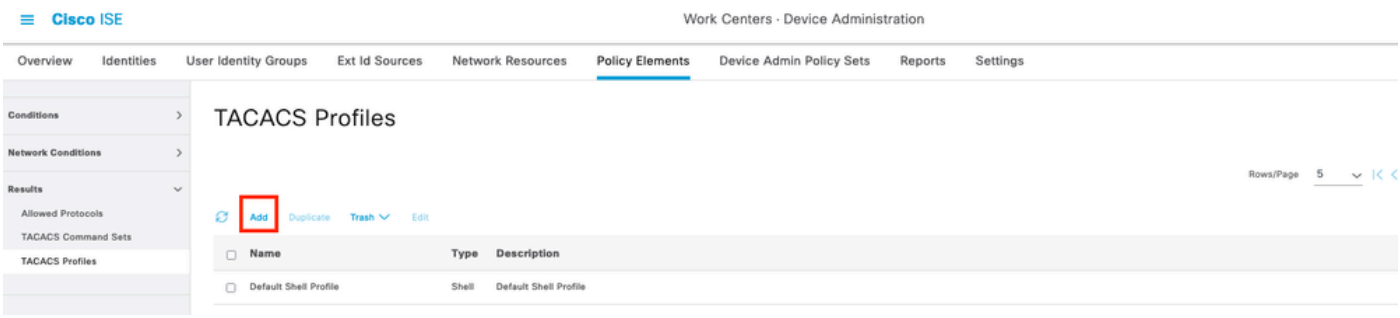
- A name for the UCSM to be the TACACS+ client.
- The IP addresses that the UCSM use to send request to ISE.
- TACACS+ Shared Secret, this is the password that is to be used to encrypt the packets between the UCSM and ISE



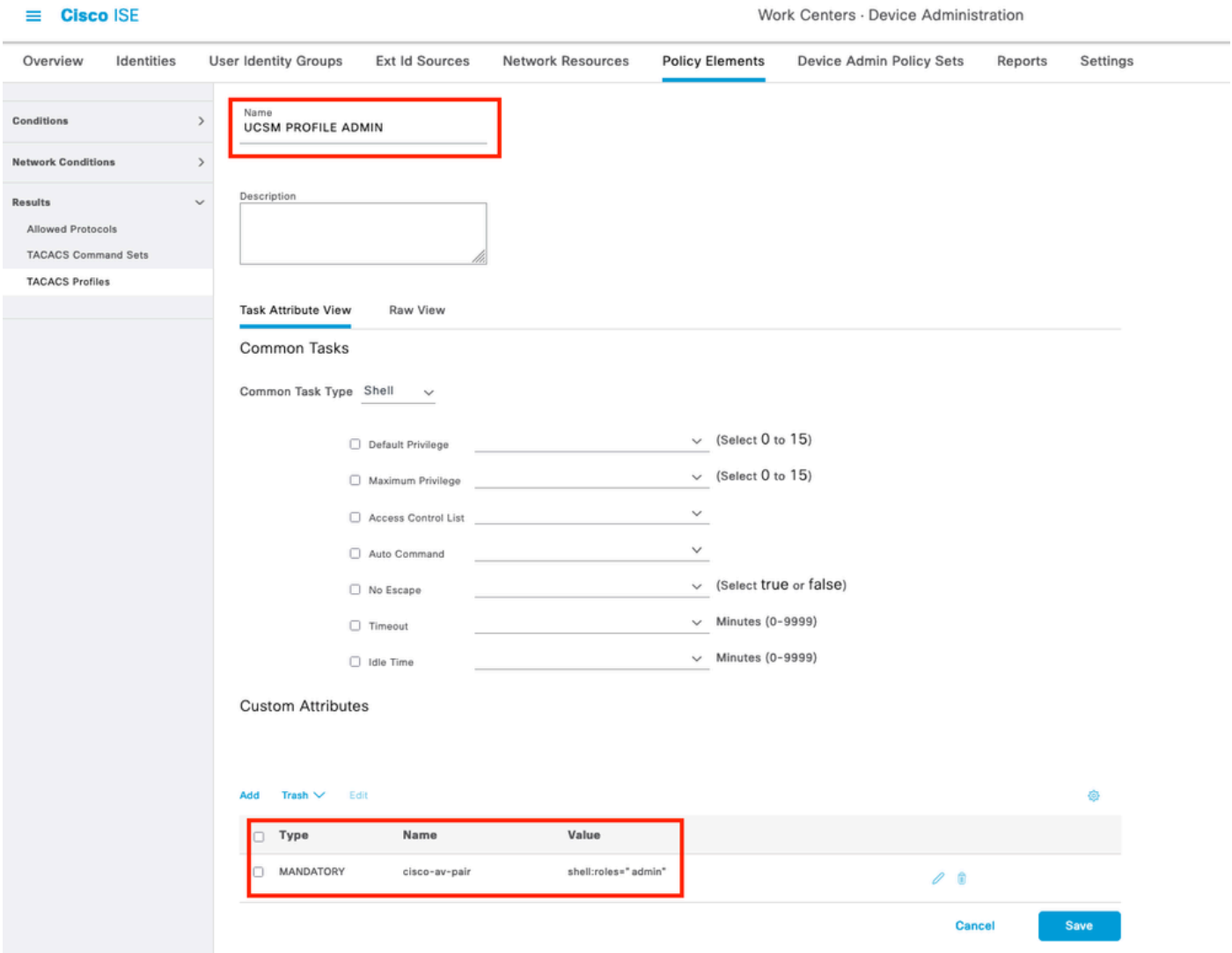
Note: For a cluster configuration, add the management port IP addresses for both fabric interconnects. This configuration ensures that remote users can continue to log in if the first fabric interconnect fails and the system fails over to the second fabric interconnect. All login requests are sourced from these IP addresses, not the virtual IP address used by Cisco UCS Manager.

Configure the attributes and rules on ISE

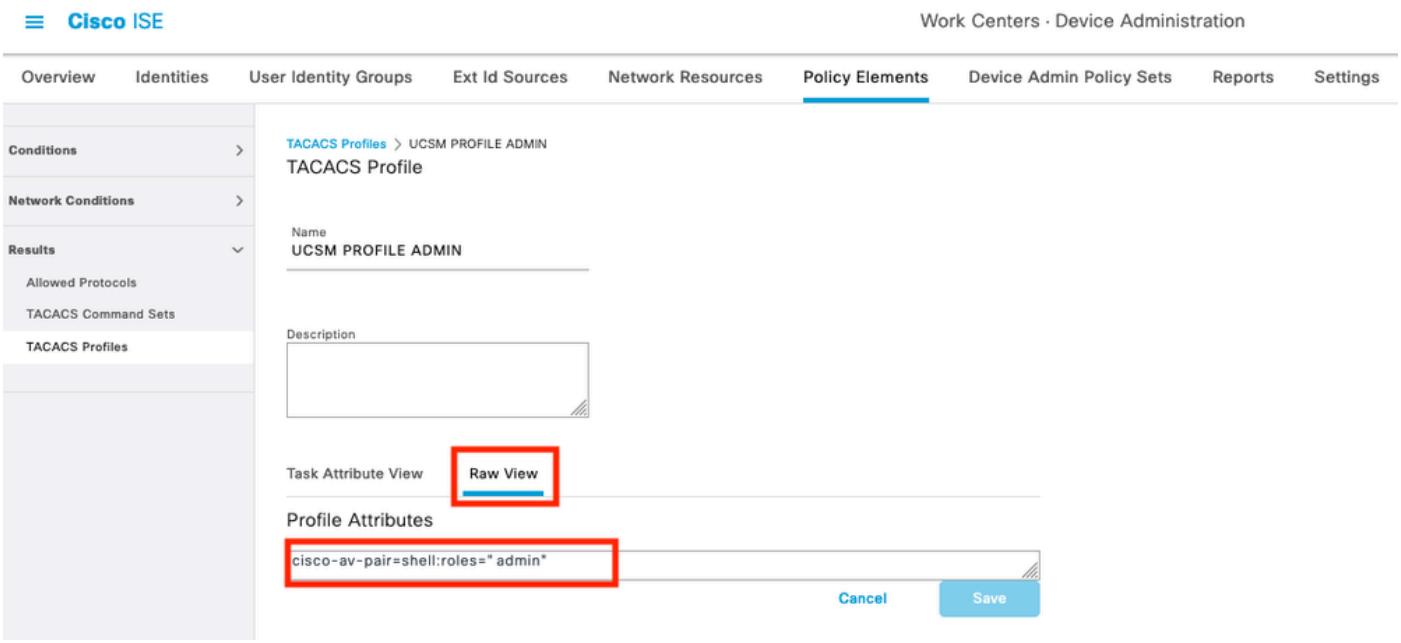
Step 1. Create a TACACS+ profile, navigate to the menu **Work Centers > Device Administration > Policy Elements > Results > TACACS Profiles** , then select **Add**



Step 2. In this section configure the profile with a name and in the **Custom Attributes** section, select **Add** , next create a one attribute of characteristic MANDATORY , name it as cisco-av-pair and in the value select one of the roles available within the UCSM and input that as a shell role, in this example it is using the role admin and the input selected needs to be **shell:roles=”admin”** as it shown here,



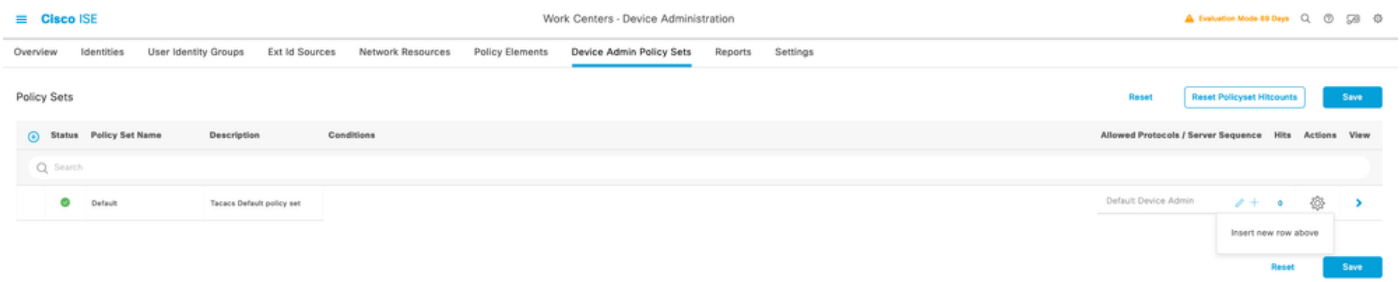
In the same menu if you select the **Raw View** for the TACACS Profile, you can verify the corresponding configuration of the attribute that is to be sent through ISE.



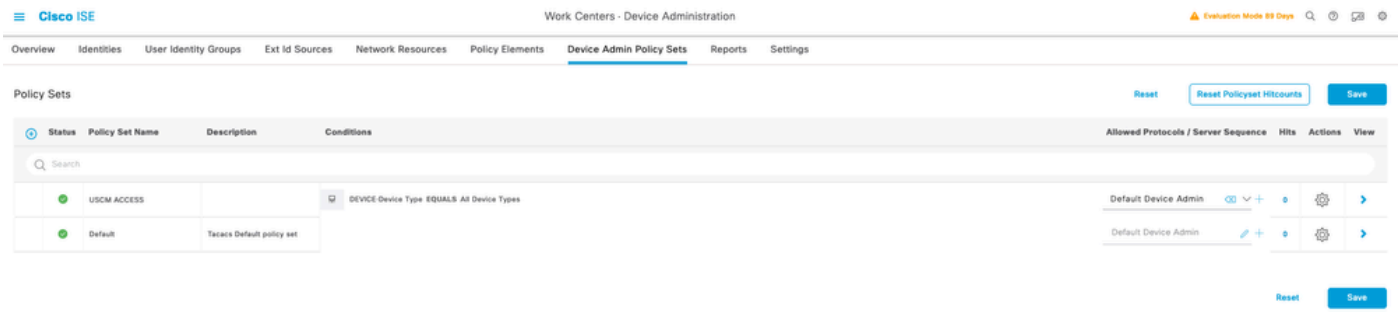
Note: The cisco-av-pair name is the string that provides the attribute ID for the TACACS+ provider.

Step 3. Select on the tick and save your configuration.

Step 4. Create a **Device Admin Policy Set** to be used for your UCSM, navigate the menu **Work Centers > Device Administration > Device Admin Policy Sets**, then from an existent policy set select the gear icon to then select **Insert** new row

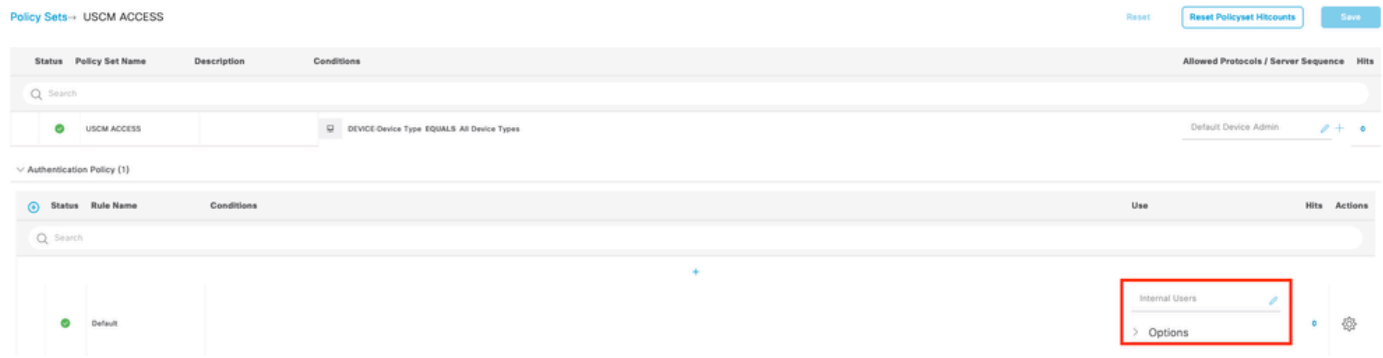


Step 5. Name this new **Policy Set**, add conditions depending upon the characteristics of the TACACS+ authentications that are ongoing from the UCSM server, and select as **Allowed Protocols > Default Device Admin, save** your configuration.



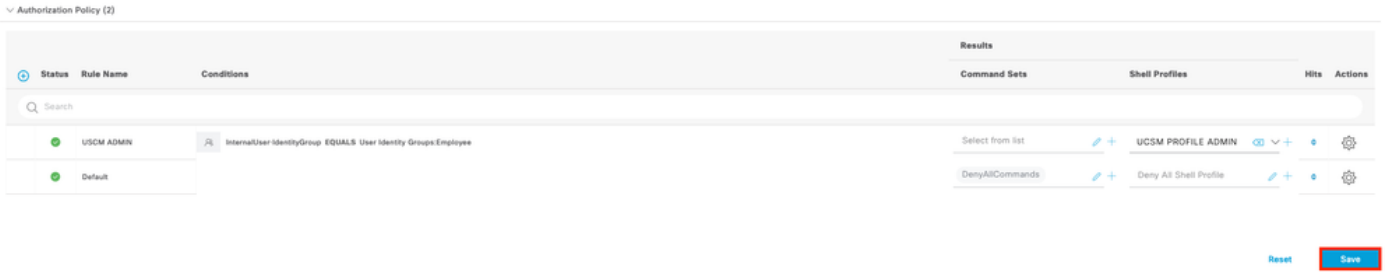
Step 6. Select in the > view option and select in the **Authentication Policy** section, the external identity source from where the ISE queries the username and credentials that are input in the UCSM, in this example

the credentials correspond to Internal Users stored within ISE.



Step 7. Scroll down until the section named **Authorization Policy** until the **Default policy**, select the gear icon, and then insert one rule.

Step 8. Name the new Authorization Rule, add conditions concerning the user that are authenticated already as group membership, and in the **Shell Profiles** section add the TACACS profile that you configured previously, **save** the configuration.



TACACS+ Configuration on UCSM

Log into**Cisco UCS Manager**GUI with a user with administrator privileges.

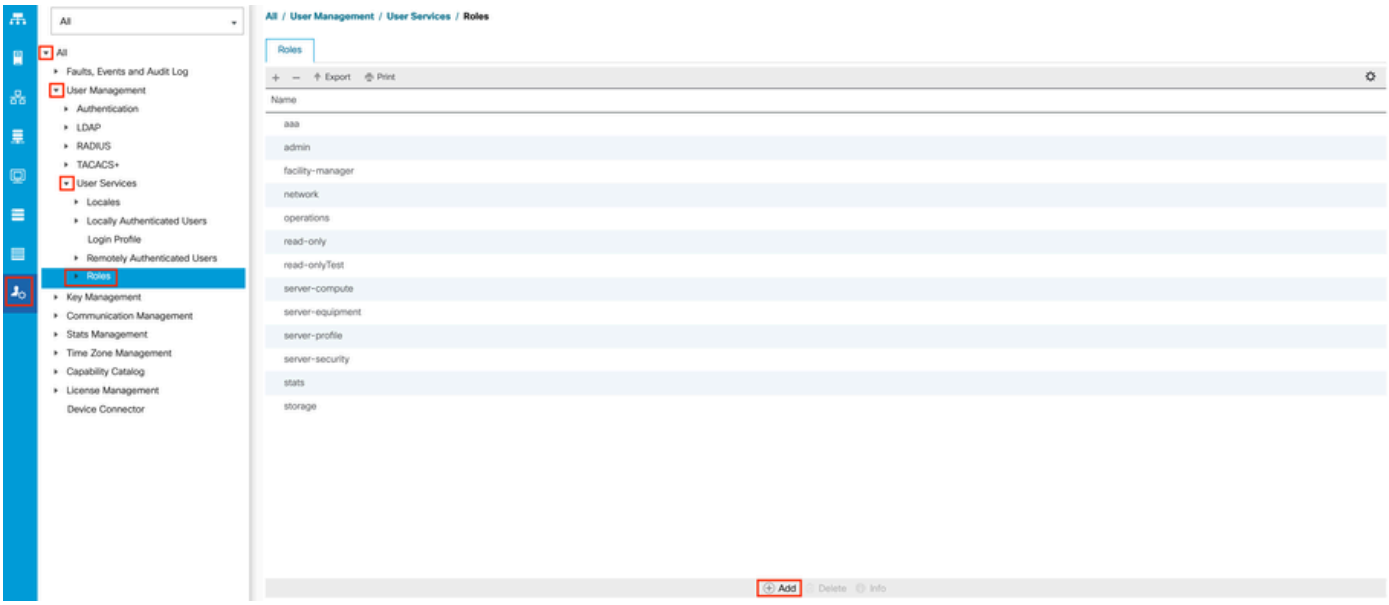
Create roles for users

Step 1. In the Navigation pane, select the **Admin** tab.
Step 2. On the **Admin** tab, expand **All > User Management >User Services > Roles**.

Step 3. In the**Work**pane, select the**General**tab.

Step 4. Select **Add** for custom roles. This sample use default **Roles**.

Step 5. Verify name role matchs with name configured previosly on TACACS profile.

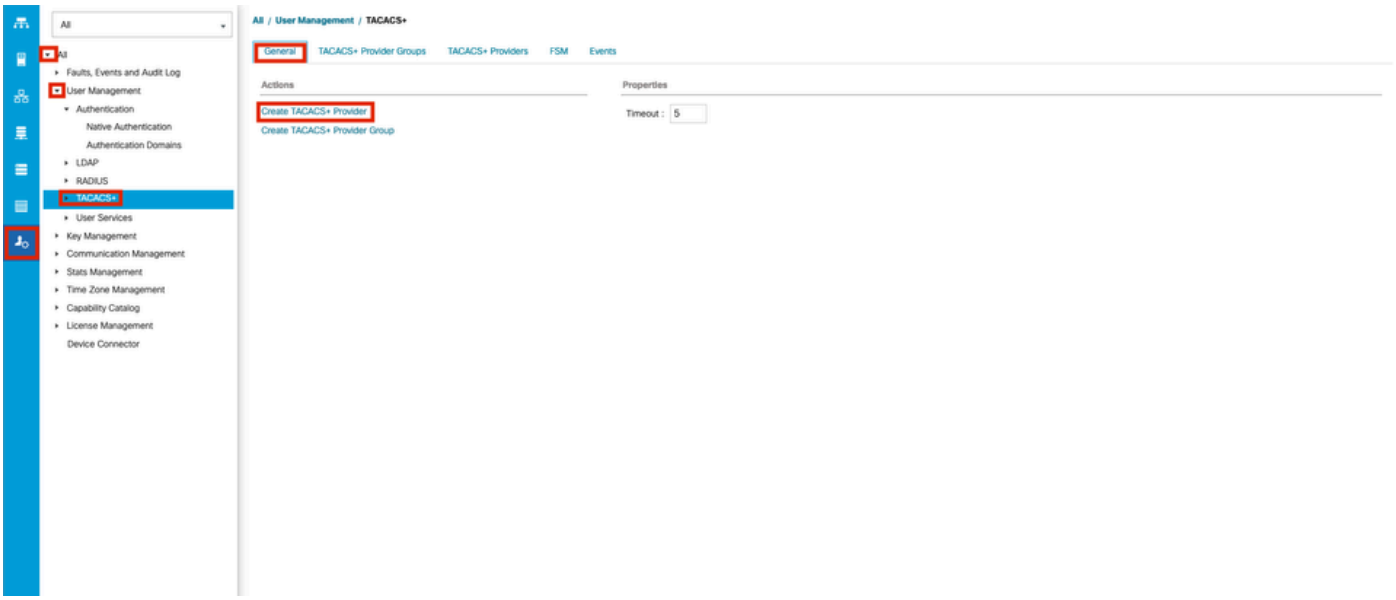


Create a TACACS+ Provider

Step 1. In the Navigation pane, select the **Admin** tab.
Step 2. On the **Admin** tab, expand **All** > **User Management** > **TACACS+**.

Step 3. In the**Work**pane, select the**General** tab.

Step 4. In the**Actions**area, select**Create TACACS+ Provider.**



Step 5. In the**Create TACACS+ Provider**wizard, input the appropriate information.

- In the **Hostname** field, type the IP addresss or hostname of TACACS+ Server.
- In the **Order** field, The order in which Cisco UCS uses this provider to authenticate users.

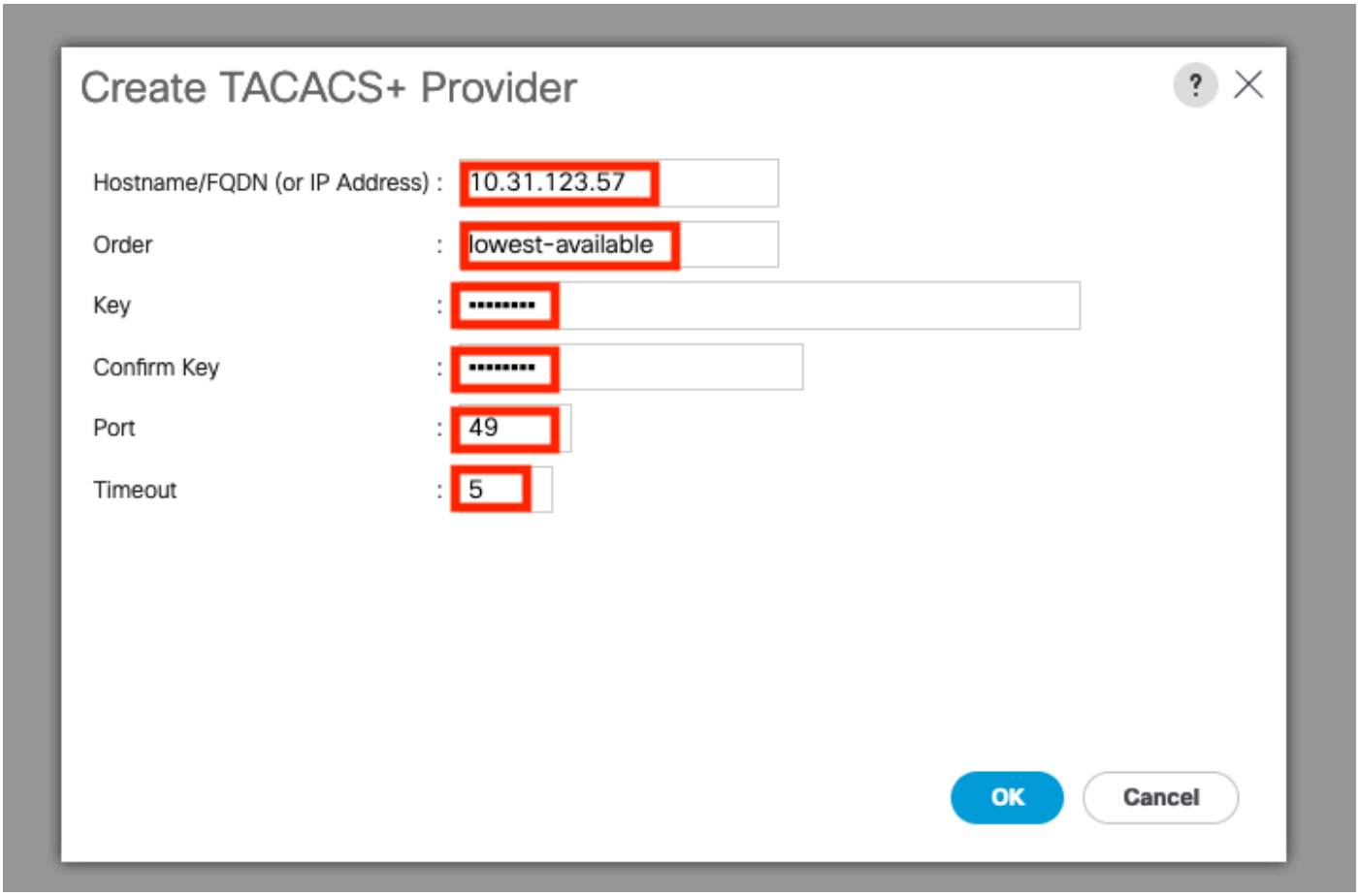
  Enter an integer between 1 and 16, or enter lowest-available or 0 (zero) if you want Cisco UCS to assign the next available order based on the other providers defined in this Cisco UCS instance.

- In the **Key** field, The SSL encryption key for the database.

-

In the **Confirm Key** field, The SSL encryption key repeated for confirmation purposes.

- In the **Port** field, The port through which Cisco UCS communicate with the TACACS+ database(Port 49 default port).
- In the **Timeout** field, The length of time in seconds the system spend trying to contact the TACACS+ database before it times out.



Step 6. Select **Ok**.

Note: If you use a hostname rather than an IP address, you must configure a DNS server in Cisco UCS Manager.

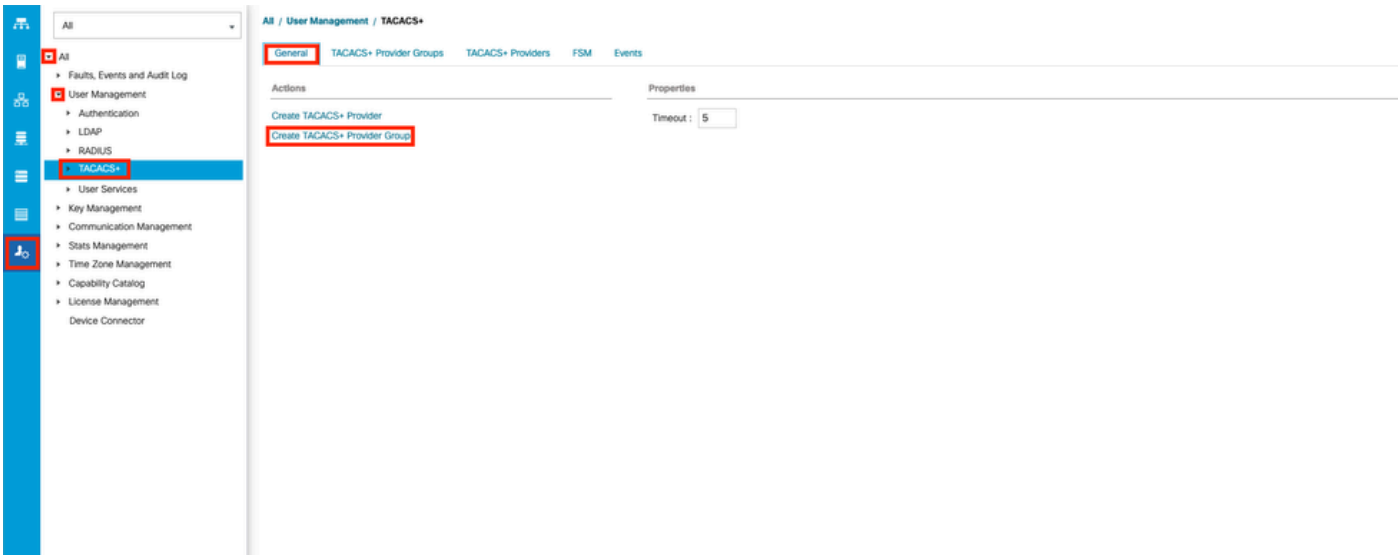
Create a TACAC+ Provider Group

Step 1. In the**Navigation**pane, select the **Admin** tab.

Step 2. On the**Admin**tab, expand **All > User Management > TACACS+**.

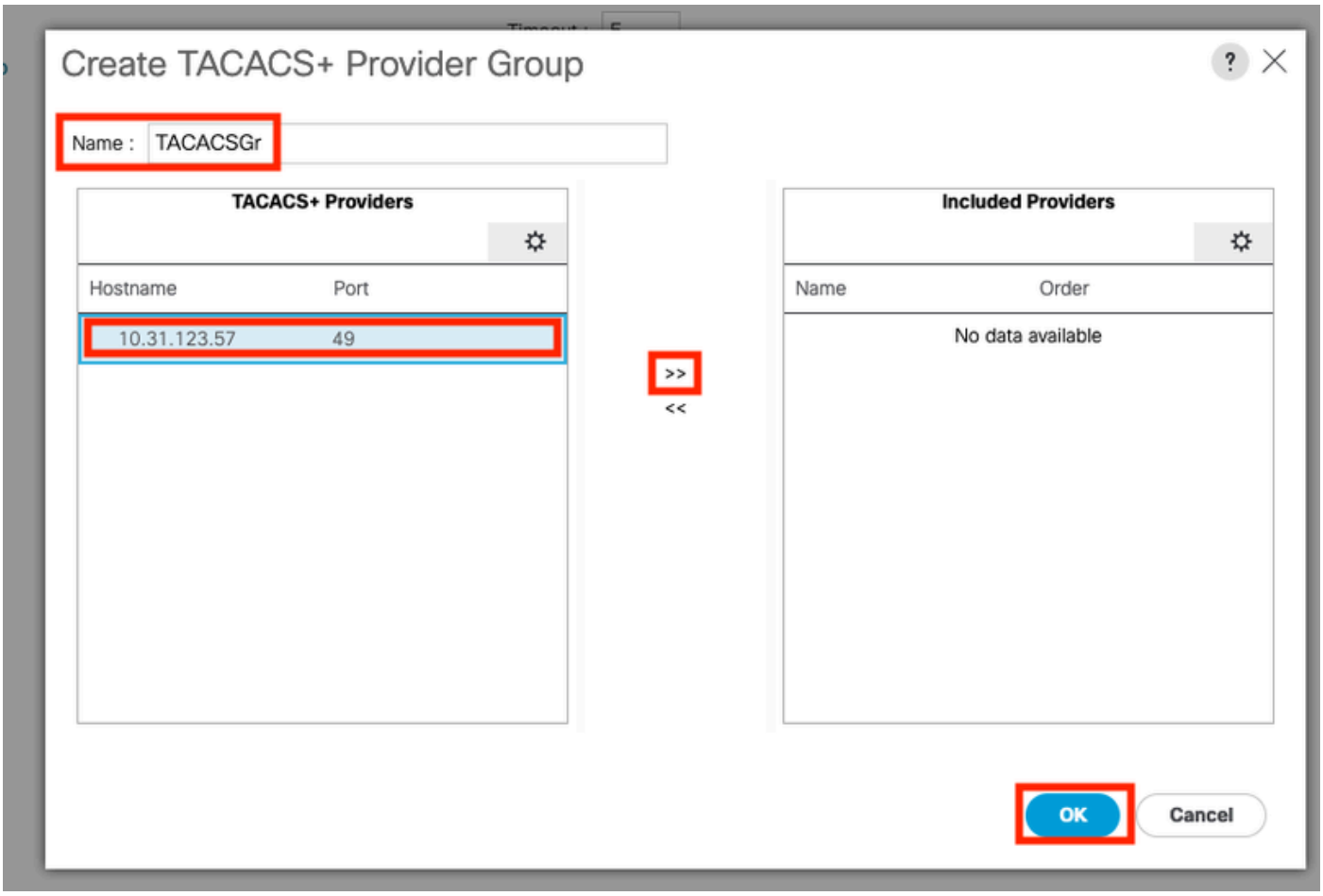
Step 3. In the**Work**pane, select the **General** tab.

Step 4. In the**Actions**area, selectCreate TACACS+ Provider**Group.**



Step 5. In the **Create TACACS+ Provider Group** dialog box, enter the infromation requested.

- In the **Name** field, enter a unique name for the group.
- In the **TACACS+ Providers** table, choose the providers to include in the group.
- Select the >> button to add the providers to the Included Providers table.



Step 6. Select **Ok**.

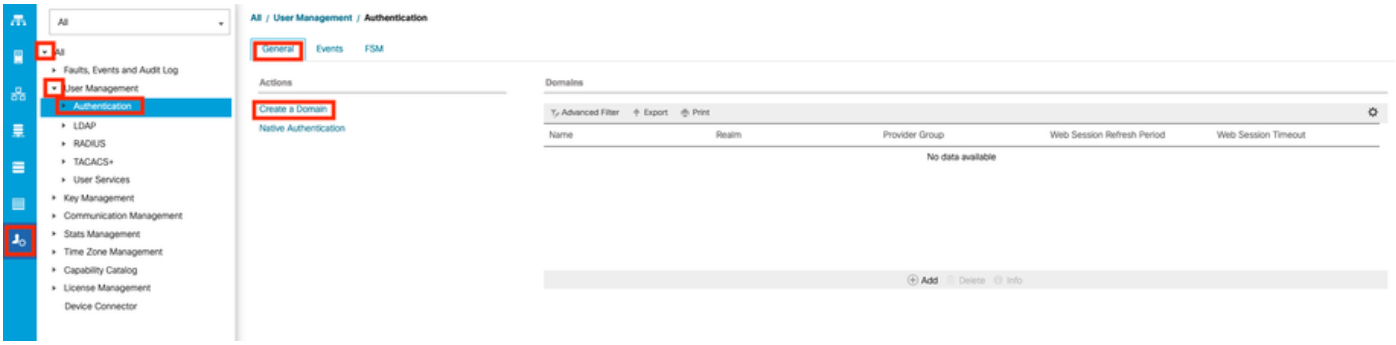
Create an Authentication Domain

Step 1. In the **Navigation** pane, select the **Admin** tab.

Step 2. On the **Admin** tab, expand **All > User Management > Authentication**

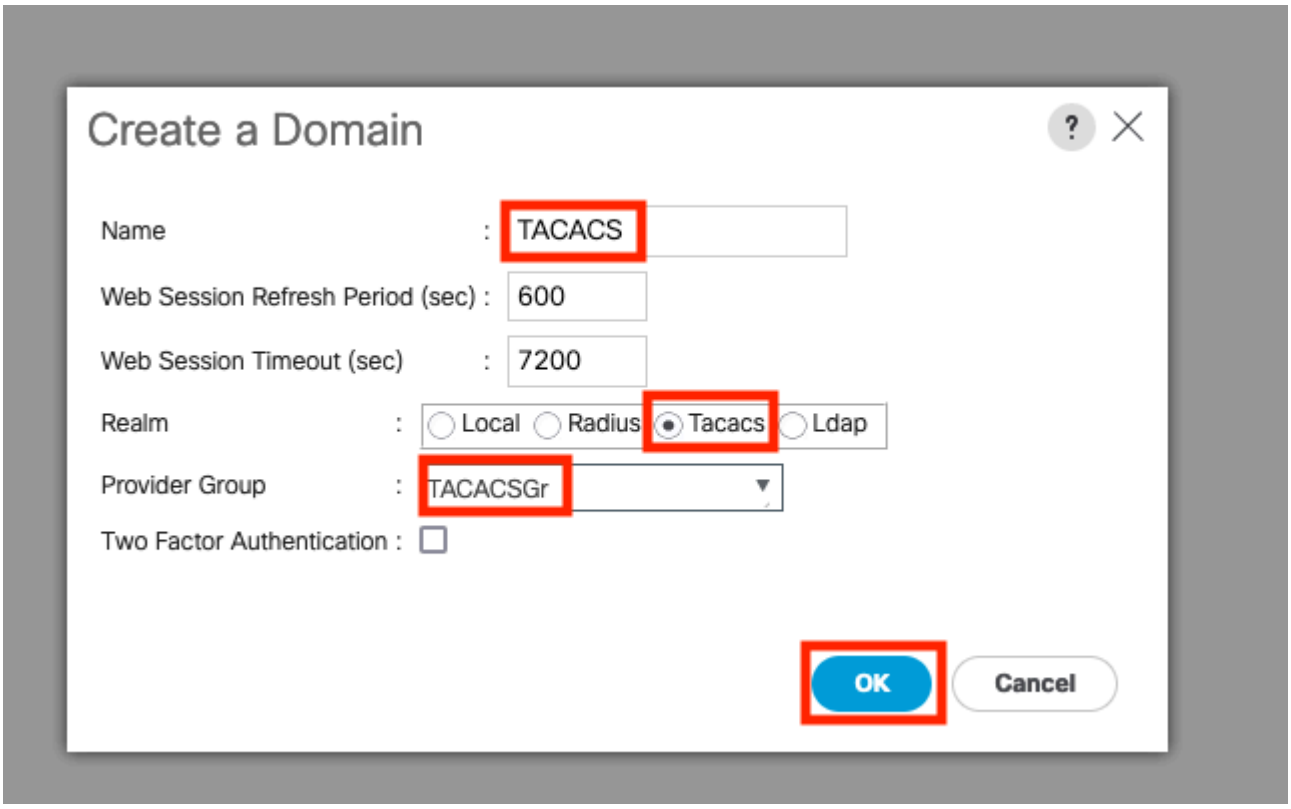
Step 3. In the**Work**pane, select the **General** tab.

Step 4. In the**Actions**area, select**Create a Domain.**



Step 5. In the **Create Domain** dialog box, enter the infromation requested.

- In the **Name** field, enter a unique name for the domain.
- In the **Realm**, select the Tacacs option.
- From the **Provider Group** drop-down list, select the TACACS+ provider group previously created and select **OK**



Troubleshoot

Common TACACS+ Issues on UCSM

- Wrong key or invalid characters.

- Wrong port.
- No communication with our provider due to a Firewall or Proxy rule.
- FSM is not 100%.

Verify UCSM TACACS+ configuration:

You must ensure that the UCSM has implemented the configuration checking the the status of the **Finite State Machine (FSM)** is shown as 100% complete.

Verify the configuration from the UCSM command line

<#root>

UCS-A#

scope security

UCS-A /security #

scope tacacs

UCS-A /security/tacacs #

show configuration

```
UCS-AS-MXC-P25-02-A# scope security
UCS-AS-MXC-P25-02-A /security # scope tacacs
UCS-AS-MXC-P25-02-A /security/tacacs # show configuration
  scope tacacs
      enter auth-server-group TACACSGr
          enter server-ref 10.31.123.57
              set order 1
          exit
      exit
      enter server 10.31.123.57
          set order 1
          set port 49
          set timeout 5
  !       set key
      exit
      set timeout 5
  exit
```

<#root>

UCS-A /security/tacacs #

show fsm status

```
[UCS-AS-MXC-P25-02-A /security/tacacs # show fsm status

    FSM 1:
        Status: Nop
        Previous Status: Update Ep Success
        Timestamp: 2023-06-24T20:54:05.021
        Try: 0
        Progress (%): 100
        Current Task:
```

Verify the Tacacs configuration from the NXOS:

<#root>

UCS-A#

connect nxos

UCS-A(nx-os)#

show tacacs-server

UCS-A(nx-os)#

show tacacs-server groups

```
UCS-AS-MXC-P25-02-A# connect nxos
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (C) 2002-2023, Cisco and/or its affiliates.
All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under their own
licenses, such as open source.  This software is provided "as is," and unless
otherwise stated, there is no warranty, express or implied, including but not
limited to warranties of merchantability and fitness for a particular purpose.
Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or
GNU General Public License (GPL) version 3.0  or the GNU
Lesser General Public License (LGPL) Version 2.1 or
Lesser General Public License (LGPL) Version 2.0.
A copy of each such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://opensource.org/licenses/gpl-3.0.html and
http://www.opensource.org/licenses/lgpl-2.1.php and
http://www.gnu.org/licenses/old-licenses/library.txt.
UCS-AS-MXC-P25-02-A(nx-os)# show tacacs-server
timeout value:5
deadtime value:0
source interface:any available
Global Test Username:test
Global Test Password:*******
total number of servers:1

following TACACS+ servers are configured:
        10.31.123.57:
                available on port:49
                TACACS+ shared secret:********
                timeout:5
UCS-AS-MXC-P25-02-A(nx-os)# show tacacs-server groups
total number of groups:2

following TACACS+ server groups are configured:
        group tacacs:
                server 10.31.123.57 on port 49
                deadtime is 0
                vrf is management
        group TACACSGr:
                server 10.31.123.57 on port 49
                deadtime is 0
                vrf is management
```

In order to test authentication from NX-OS, use the**test aaa**command (only available from NXOS).

Validate the configuration of our server:

<#root>

```
UCS-A(nx-os)#
```

test aaa server tacacs+

```
 <TACACS+-server-IP-address or FQDN> <username> <password>
```

```
UCS-AS-MXC-P25-02-A# connect nxos
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (C) 2002-2023, Cisco and/or its affiliates.
All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under their own
licenses, such as open source.  This software is provided "as is," and unless
otherwise stated, there is no warranty, express or implied, including but not
limited to warranties of merchantability and fitness for a particular purpose.
Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or
GNU General Public License (GPL) version 3.0  or the GNU
Lesser General Public License (LGPL) Version 2.1 or
Lesser General Public License (LGPL) Version 2.0.
A copy of each such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://opensource.org/licenses/gpl-3.0.html and
http://www.opensource.org/licenses/lgpl-2.1.php and
http://www.gnu.org/licenses/old-licenses/library.txt.
UCS-AS-MXC-P25-02-A(nx-os)# test aaa server tacacs+ 10.31.123.57 operator Cisc0123
```

UCSM Review

Reachability verification

<#root>

UCS-A#

connect local-mgmt

UCS-A(local-mgmt)#

ping

 <TACACS+-server-IP-address or FQDN>

```
UCS-AS-MXC-P25-02-A# connect local-mgmt
pCisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2009, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
license. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php

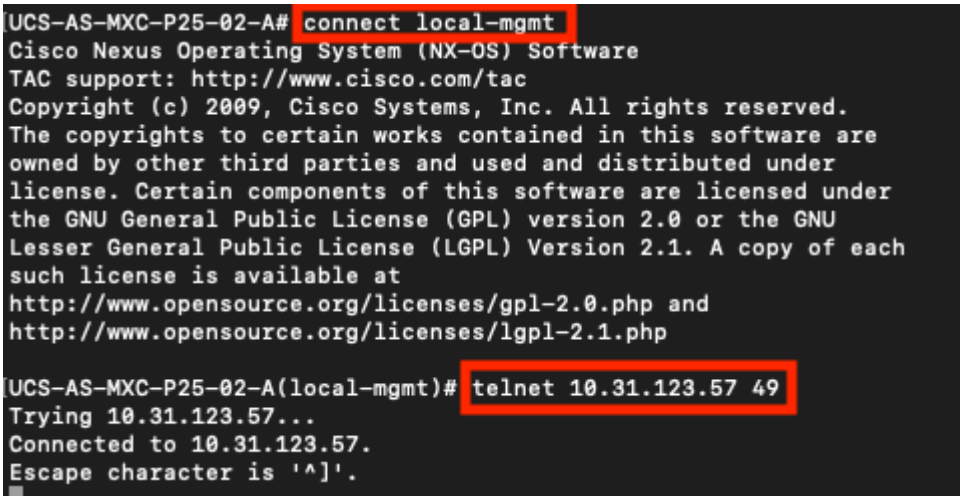
UCS-AS-MXC-P25-02-A(local-mgmt)# ping 10.31.123.57
PING 10.31.123.57 (10.31.123.57) from 10.31.123.8 : 56(84) bytes of data.
64 bytes from 10.31.123.57: icmp_seq=1 ttl=64 time=0.347 ms
64 bytes from 10.31.123.57: icmp_seq=2 ttl=64 time=0.309 ms
```

Port verification

<#root>

```
UCS-A#
connect local-mgmt

UCS-A(local-mgmt)#
 telnet
 <TACACS+-server-IP-address or FQDN> <Port>
```



The most effective method to see errors is to enable the NXOS debug, with this output you can see the groups, the connection, and the error message that causes miscommunication.

- Open an SSH session to UCSM and log in with with any privileged user with admin permissions(preferably a local user), change to NX-OS CLI context and start the **terminal monitor**.

```
<#root>
UCS-A#
connect nxos

UCS-A(nx-os)#
terminal monitor
```

- Enable debug flags and verify the SSH session output to the log file.

```
<#root>
UCS-A(nx-os)#
debug aaa all

UCS-A(nx-os)#
debug aaa aaa-request
```

```
UCS-A(nx-os)#
debug tacacs+ aaa-request

UCS-A(nx-os)#
debug tacacs+ aaa-request-lowlevel

UCS-A(nx-os)#
debug tacacs+ all
```

```
UCS-AS-MXC-P25-02-A# connect nxos
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (C) 2002-2023, Cisco and/or its affiliates.
All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under their own
licenses, such as open source.  This software is provided "as is," and unless
otherwise stated, there is no warranty, express or implied, including but not
limited to warranties of merchantability and fitness for a particular purpose.
Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or
GNU General Public License (GPL) version 3.0  or the GNU
Lesser General Public License (LGPL) Version 2.1 or
Lesser General Public License (LGPL) Version 2.0.
A copy of each such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://opensource.org/licenses/gpl-3.0.html and
http://www.opensource.org/licenses/lgpl-2.1.php and
http://www.gnu.org/licenses/old-licenses/library.txt.
UCS-AS-MXC-P25-02-A(nx-os)# terminal monitor
UCS-AS-MXC-P25-02-A(nx-os)# debug tacacs+ all
2023 Jun 26 04:42:22.104286 tacacs: event_loop(): calling process_rd_fd_set
2023 Jun 26 04:42:22.104311 tacacs: process_rd_fd_set: calling callback for fd 6
2023 Jun 26 04:42:22.104341 tacacs: fsrv didnt consume 182 opcode
2023 Jun 26 04:42:22.104994 tacacs: mts_message_handler: sdwrap_process_msg
2023 Jun 26 04:42:22.105011 tacacs: process_rd_fd_set: callback returned for fd 6
UCS-AS-MXC-P25-02-A(nx-os)# debug aaa all
```

- Now open a new GUI or CLI session and attempt to log in as a remote user (TACACS+).
- Once you received a login failure message, turn off the debugs closing the session or with this command.

```
UCS-A(nx-os)# undebug all
```

Common TACACs Issues on ISE

- Within ISE this behavior is displayed while attempting to configure a the tacacs profile in the attributes that are needed for UCSM to assign the corresponding roles for admin or any other role, select on the save button and this behavior is seen :



This error is due to the following bug https://bst.cloudapps.cisco.com/bugsearch/bug/CSCwc91917 , please ensure that you have where this defect has been addressed.

ISE Review

Step 1. Review if the TACACS+ serviceability is running, this can be checked in:

- GUI: Review if you have the node listed with the service DEVICE ADMIN in **Administration > System > Deployment.**
- CLI: Run the command **show ports | include 49** to confirm that there are connections in the TCP port that belong to TACACS+

<#root>

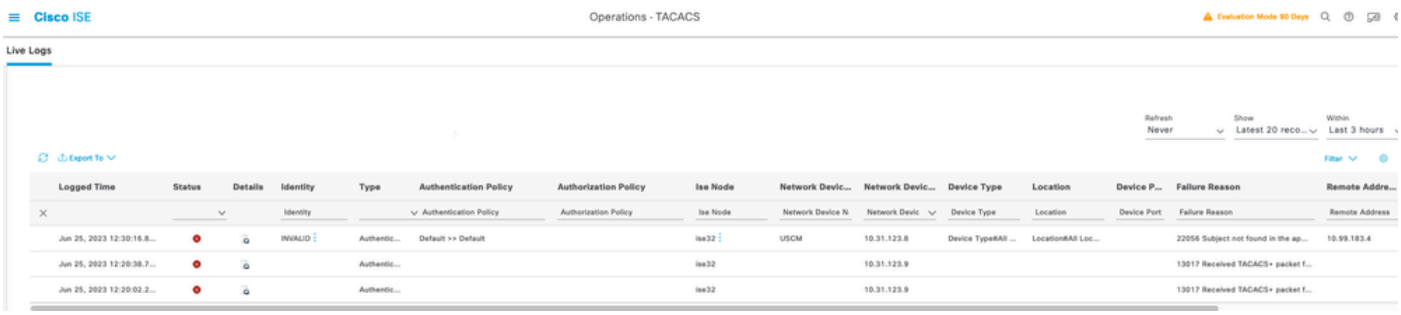
```
ise32/admin#
```

```
show ports | include 49
```

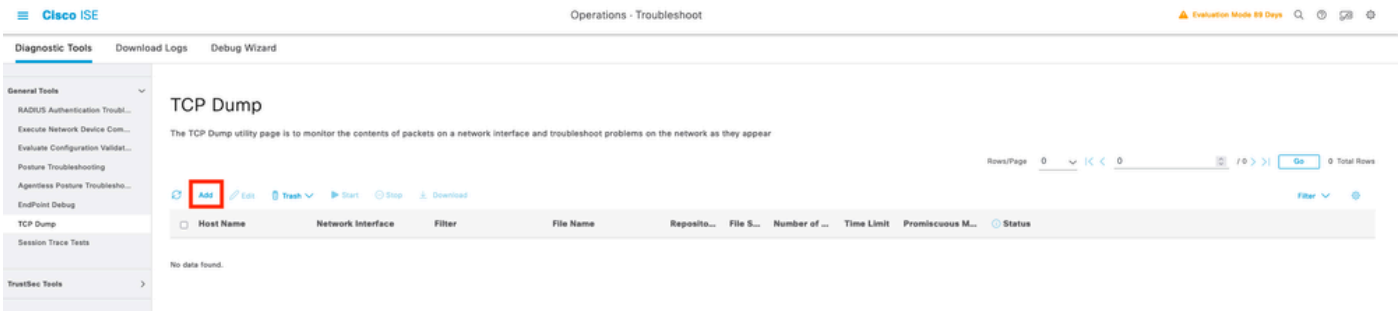
```
tcp: 169.254.4.1:49, 169.254.2.1:49, 169.254.4.1:49, 10.31.123.57:49
```

Step 2. Confirm if there are livelogs concerning TACACS+ authentications attemps : this can be checked in the menu **Operations > TACACS > Live logs** ,

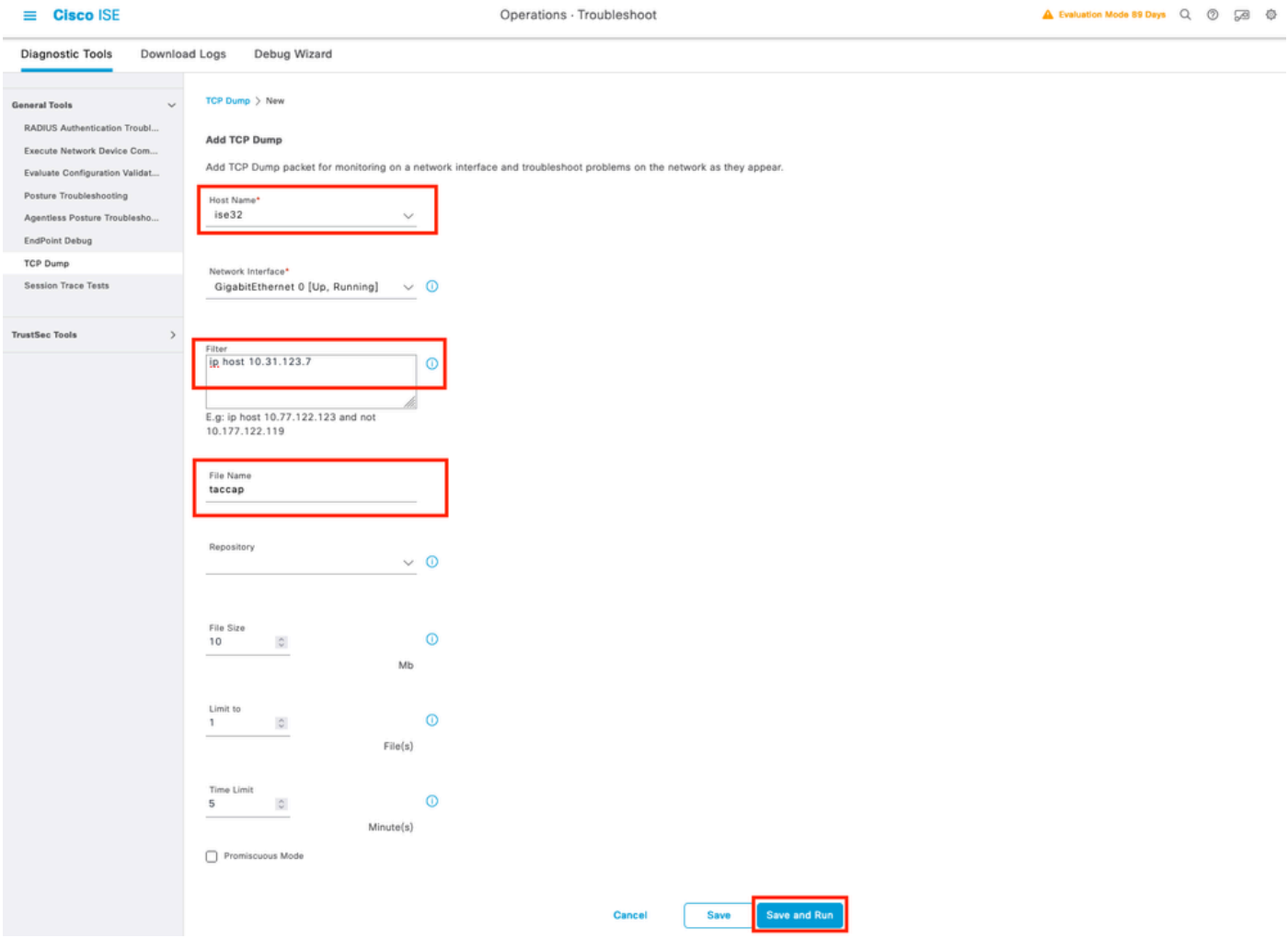
Depending upon the failure reason you can adjust your configuration or address the cause of failure.



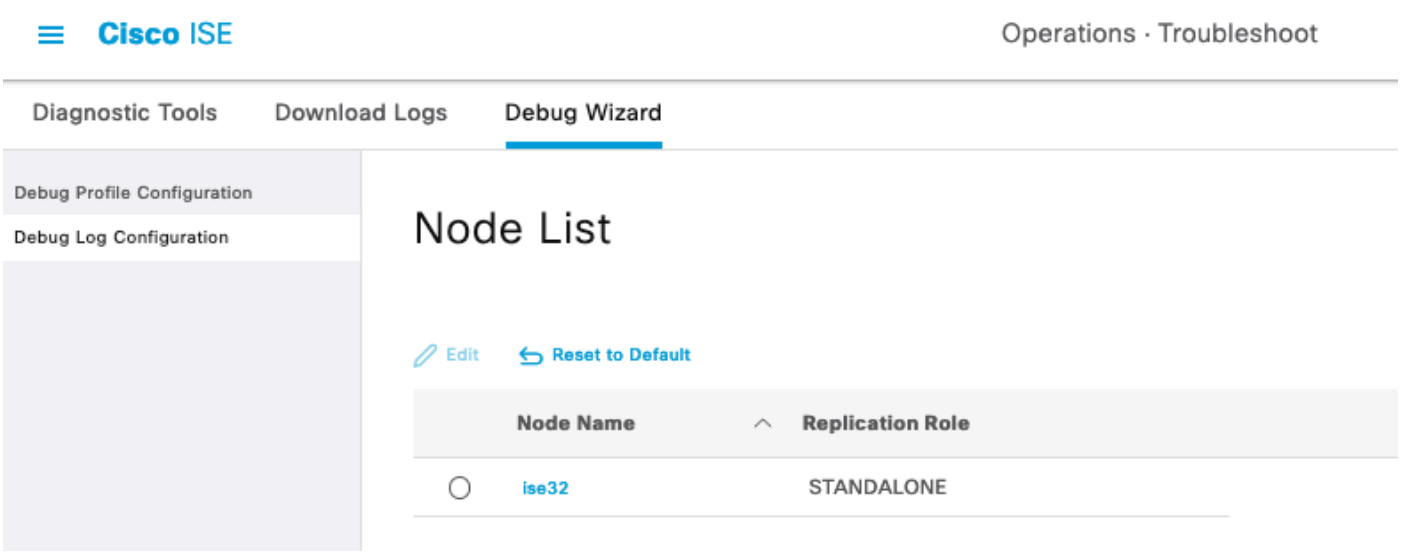
Step 3. In case you don't see any livelog, proceed to take a packet capture navigate to the menu **Operations > Troubleshoot > Diagnostic Tools > General Tools > TCP Dump** , select on add



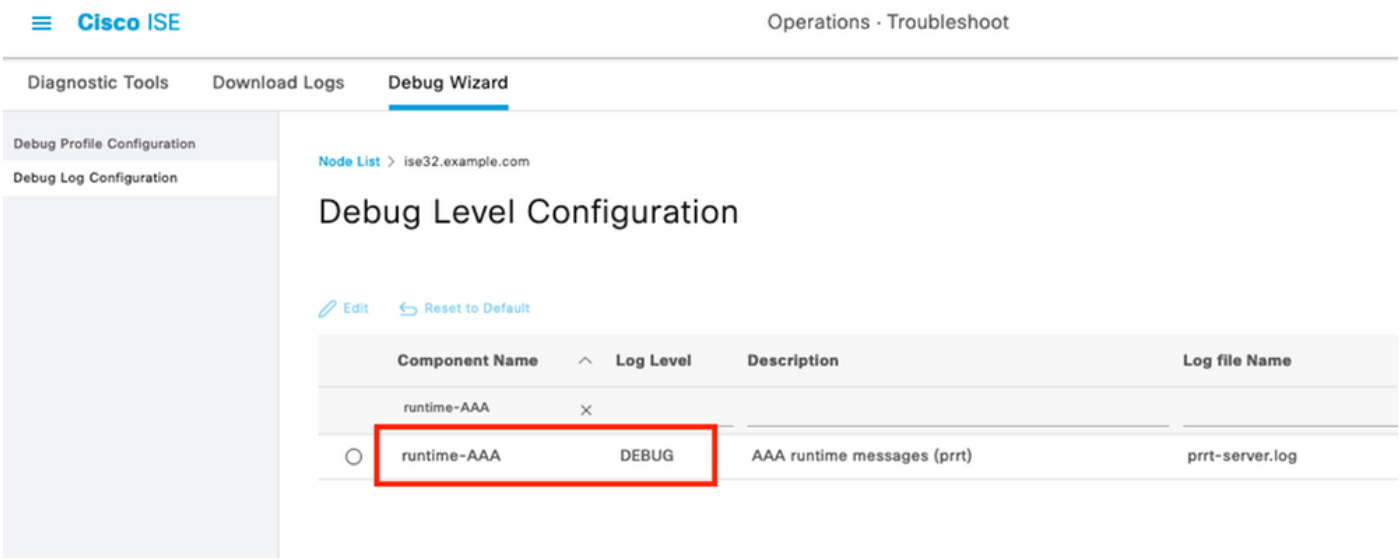
Select the Policy Service node from where the UCSM is sending the authentication and then in filters proceed to input ip host X.X.X.X corresponding the IP of the UCSM from where the authentication is being sent, name the capture and scroll down to save, run the capture and log in from the UCSM .



Step 4. Enable the component runtime-AAA in debug within the PSN from where the authentication is being performed in **Operations > Troubleshoot > Debug Wizard > Debug log configuration**, select PSN node , select then next in edit button .



Look for the component runtime-AAA and change its level to debug to then reproduce the issue again, and proceed to analyze the logs .



Note: For further information please refer to the video in the Cisco Youtube's channel How to Enable Deubgs on ISE 3.x Versions https://www.youtube.com/watch?v=E3USz8B76c8 .

Related Information

Cisco UCS Manager Administration Management Guide

Cisco UCS CIMC Configuration Guide TACACS+