Configure Machine Two Factor Authentication for Supplicant Access

Contents

Introduction

This document describes the steps required to configure Two-Factor authentication with machine and dot1x

authentication.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Configuration of Cisco Identity Services Engine
- Configuration of Cisco Catalyst
- IEEE802.1X

Components Used

- Identity Services Engine Virtual 3.3 Patch 1
- C1000-48FP-4G-L 15.2(7)E9

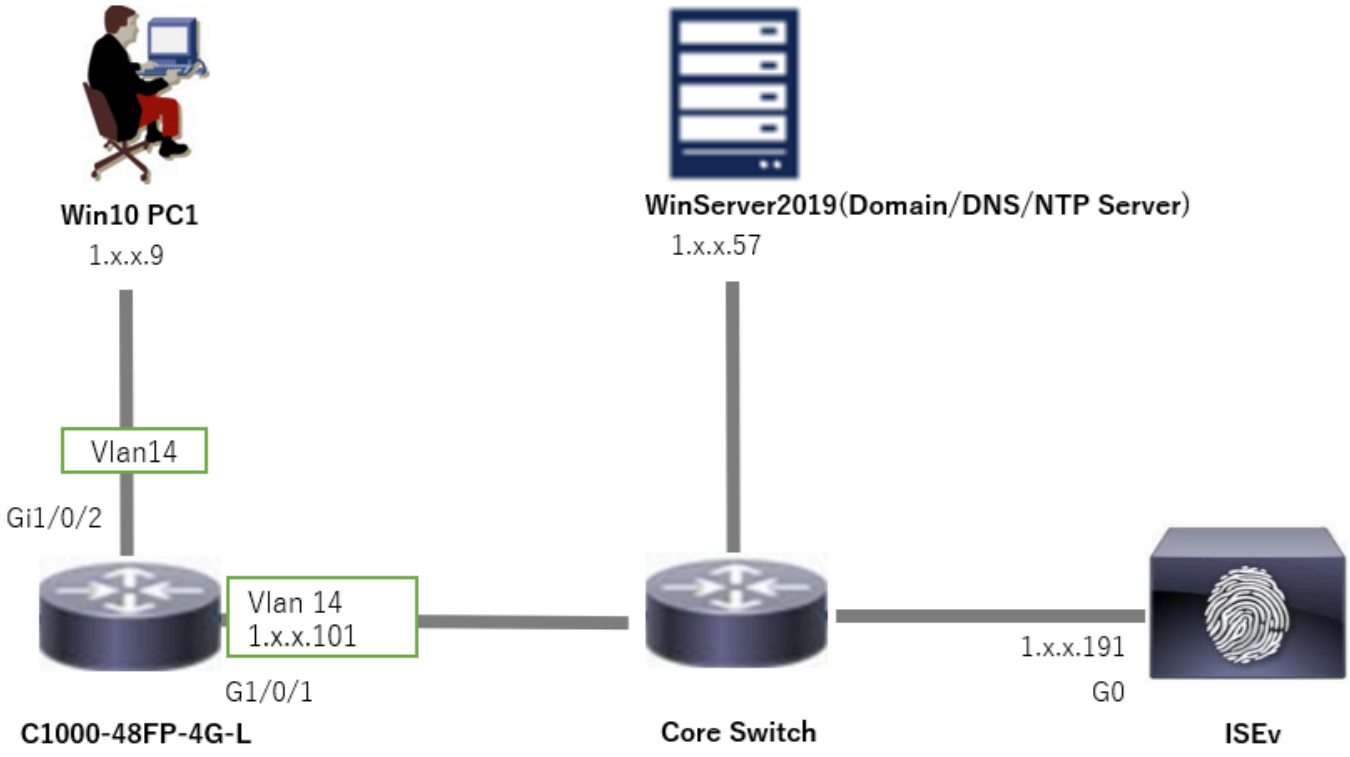
- Windows Server 2019

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.

Network Diagram

This image shows the topology that is used for the example of this document.

The domain name configured on Windows Server 2019 is ad.rem-xxx.com, which is used as an example in this document.



Network Diagram

Background Information

Machine authentication is a security process that verifies the identity of a device seeking access to a network or system. Unlike user authentication, which verifies the identity of a person based on credentials like a username and password, machine authentication focuses on validating the device itself. This is often done using digital certificates or security keys that are unique to the device.

By using machine and user authentication together, an organization can ensure that only authorized devices and users can access its network, thereby providing a more secure environment. This Two-Factor authentication method is particularly useful for protecting sensitive information and complying with strict regulatory standards.

Configurations

Configuration in C1000

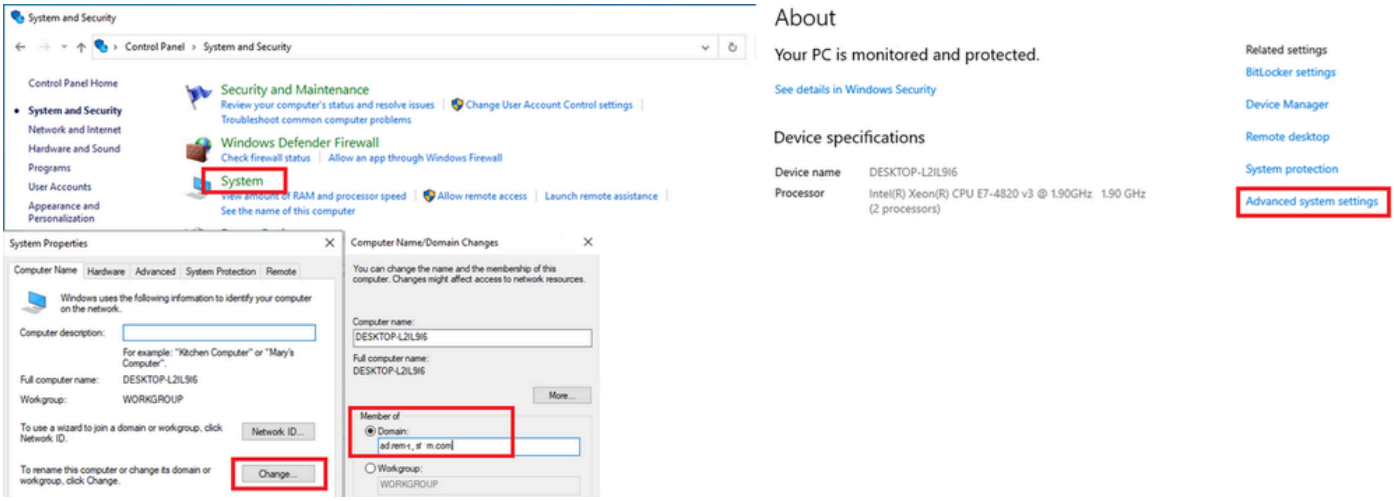
This is the minimal configuration in C1000 CLI.

```
aaa new-model

radius server ISE33
address ipv4 1.x.x.191
key cisco123

aaa group server radius AAASERVER
server name ISE33

aaa authentication dot1x default group AAASERVER
aaa authorization network default group AAASERVER
aaa accounting dot1x default start-stop group AAASERVER
dot1x system-auth-control

interface Vlan14
ip address 1.x.x.101 255.0.0.0

interface GigabitEthernet1/0/1
switchport access vlan 14
switchport mode access

interface GigabitEthernet1/0/2
switchport access vlan 14
switchport mode access
authentication host-mode multi-auth
authentication port-control auto
dot1x pae authenticator
spanning-tree portfast edge
```

Configuration in Windows PC

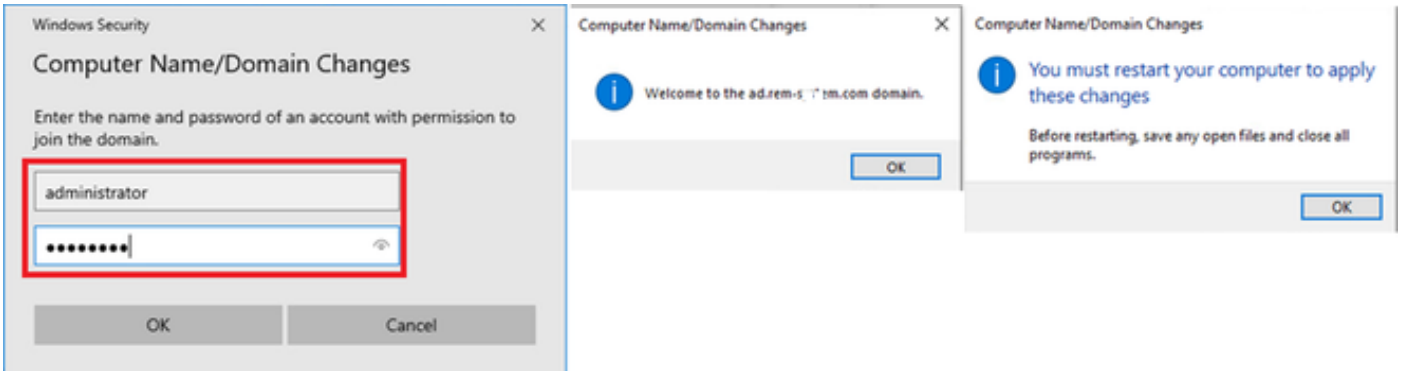
Step 1. Add PC to AD Domain

Navigate to **Control Panel > System and Security**, click **System**, and then click **Advanced system settings**. In System Properties window, click **Change**, select **Domain** and input the domain name.



Add PC to AD Domain

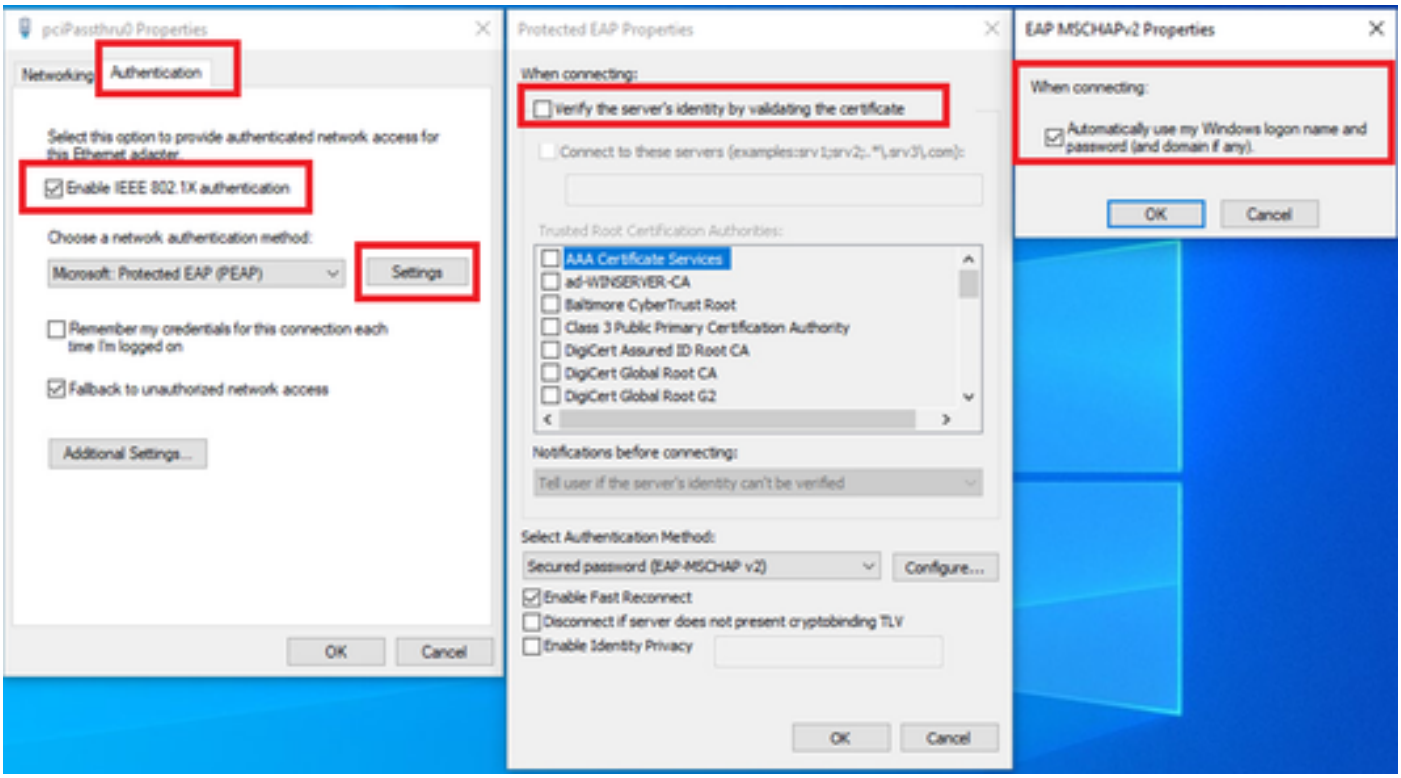
In Windows Security window, input username and password of domain server.



Input Username and Password

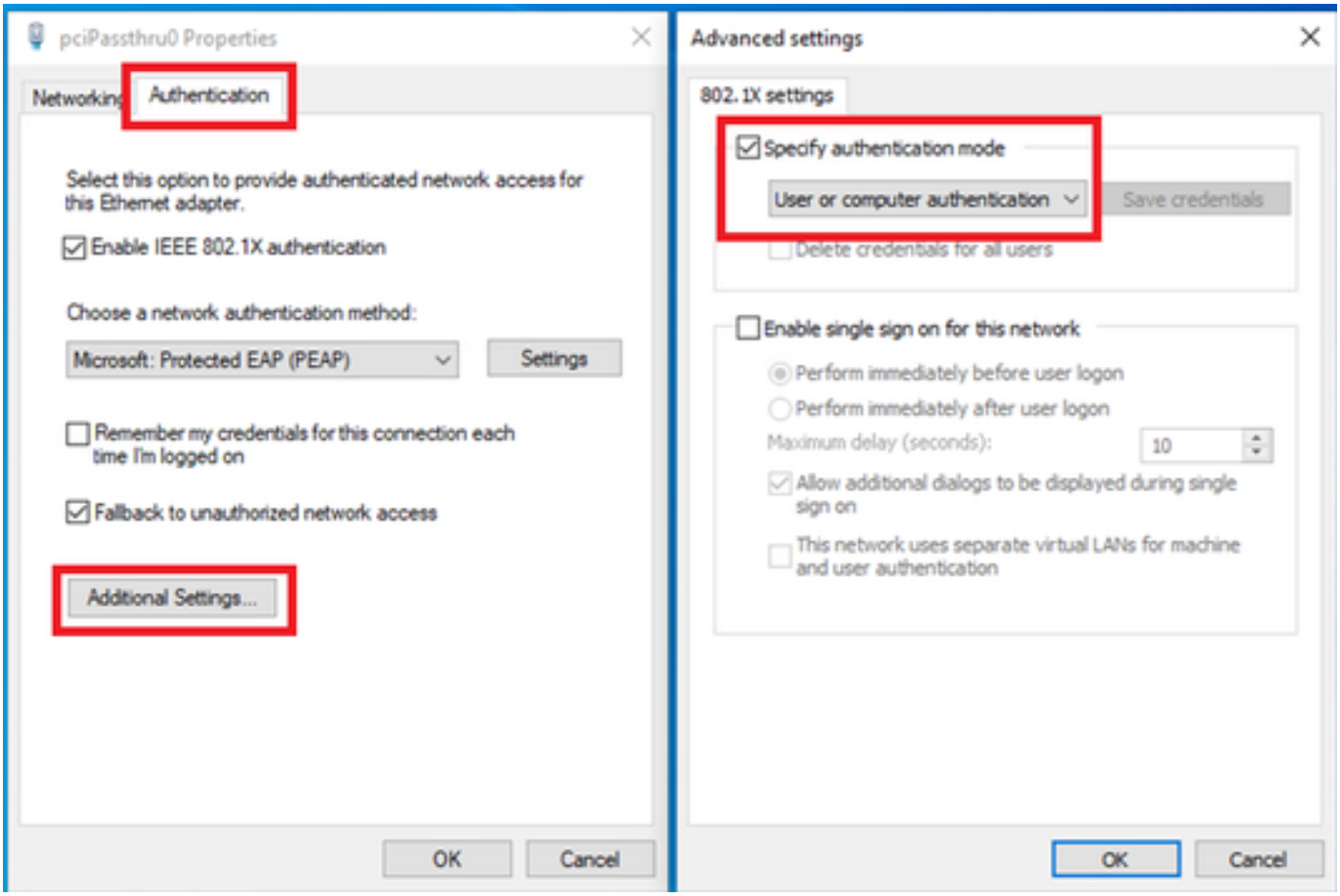
Step 2. Configure User Authentication

Navigate to **Authentication**, check **Enable IEEE 802.1X authentication**. Click **Settings** in Protected EAP Properties window, uncheck **Verify the server's identity by validating the certificate** and then click **Configure**. In EAP MSCHAPv2 Properties window, check **Automatically use my Windows logon name and password (and domain if any)** to use the username entered during the windows machine login for user authentication.



Enable User Authentication

Navigate to **Authentication**, check **Additional Settings**. Select **User or computer authentication** from drop-down list.

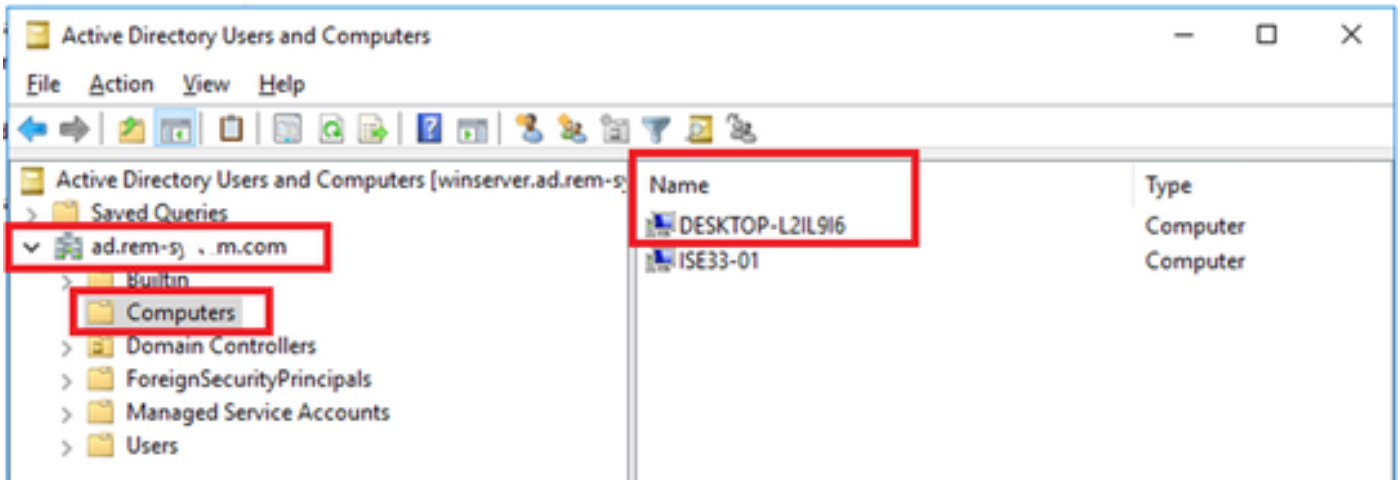


Specify Authentication Mode

Configuration in Windows Server

Step 1. Confirm Domain Computers

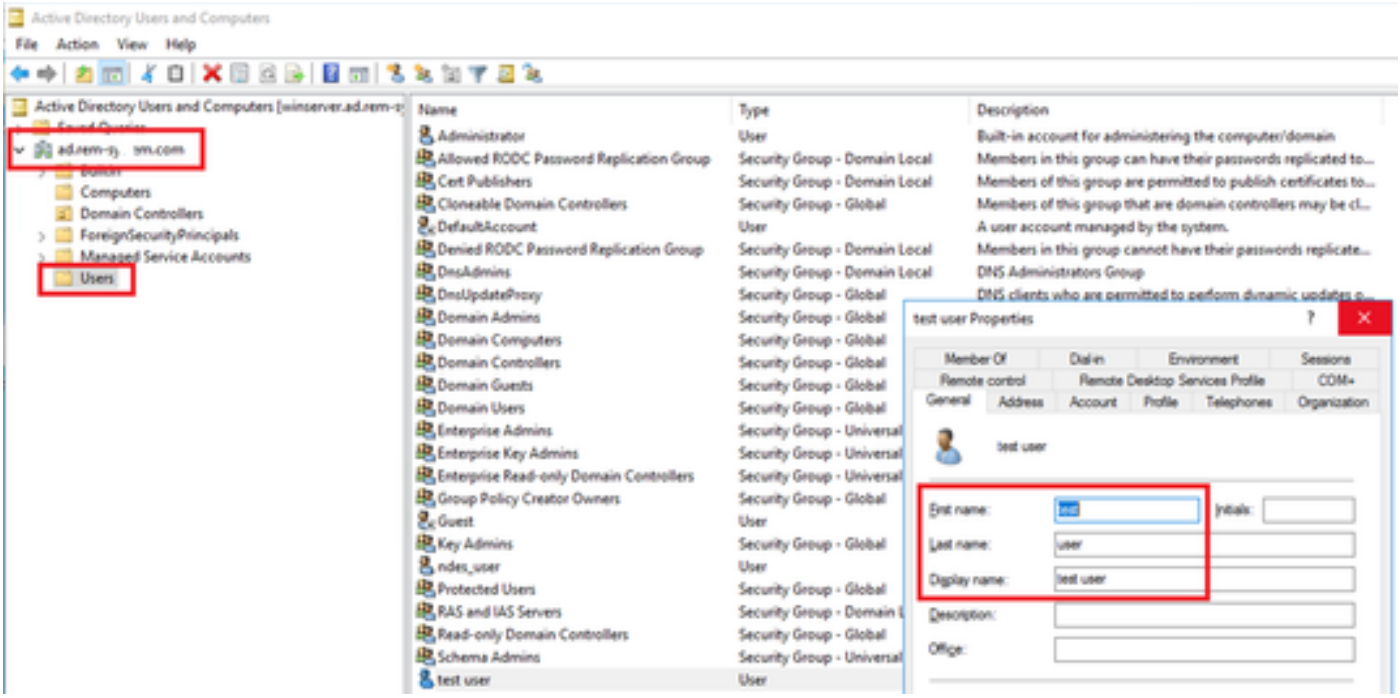
Navigate to **Active Directory Users and Computers**, click **Computers**. Confirm that Win10 PC1 is listed in the domain.



Confirm Domain Computer

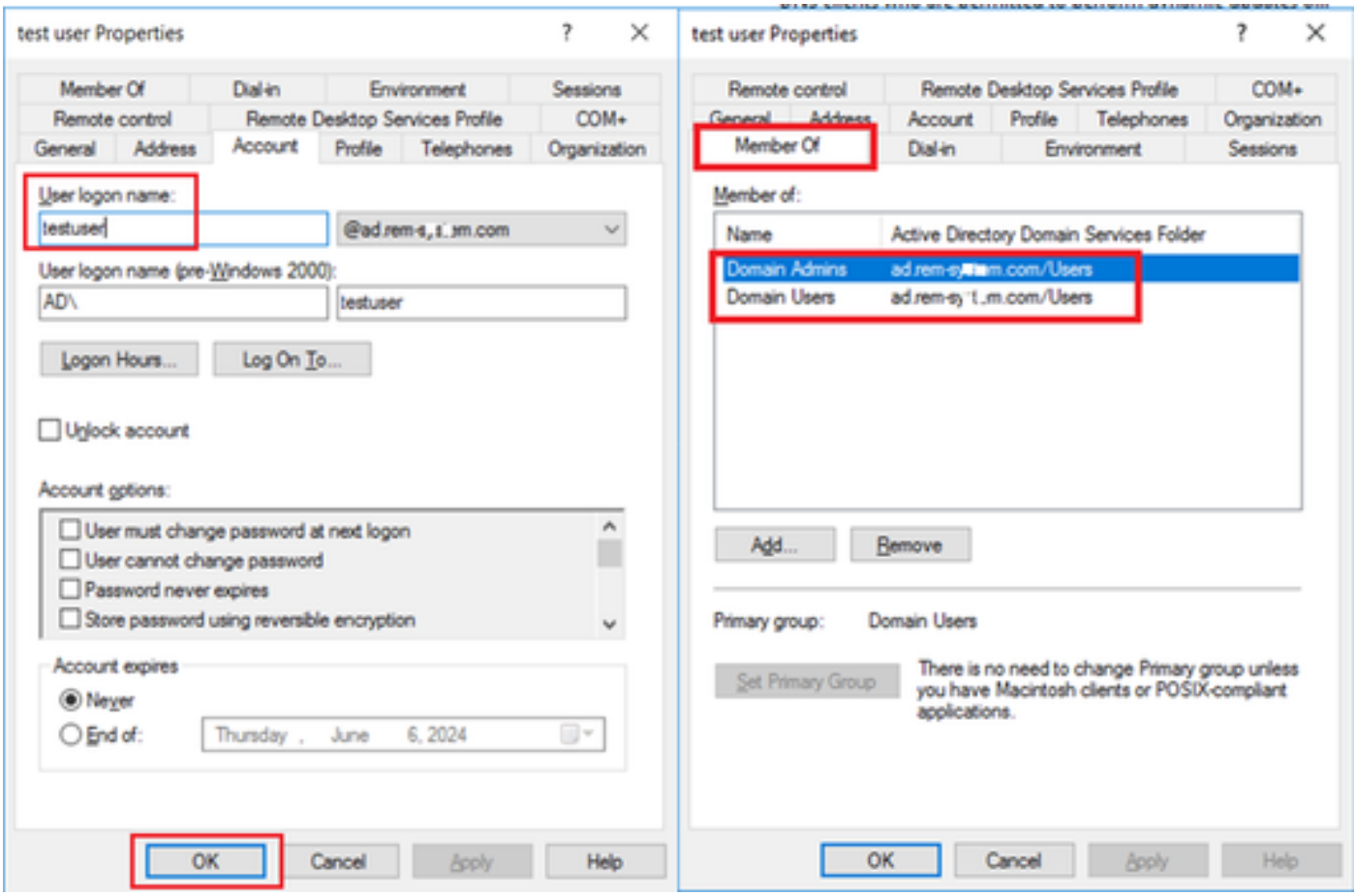
Step 2. Add Domain User

Navigate to **Active Directory Users and Computers**, click **Users**. Add testuser as domain user.



Add Domain User

Add the domain user to member of **Domain Admins** and **Domain Users**.

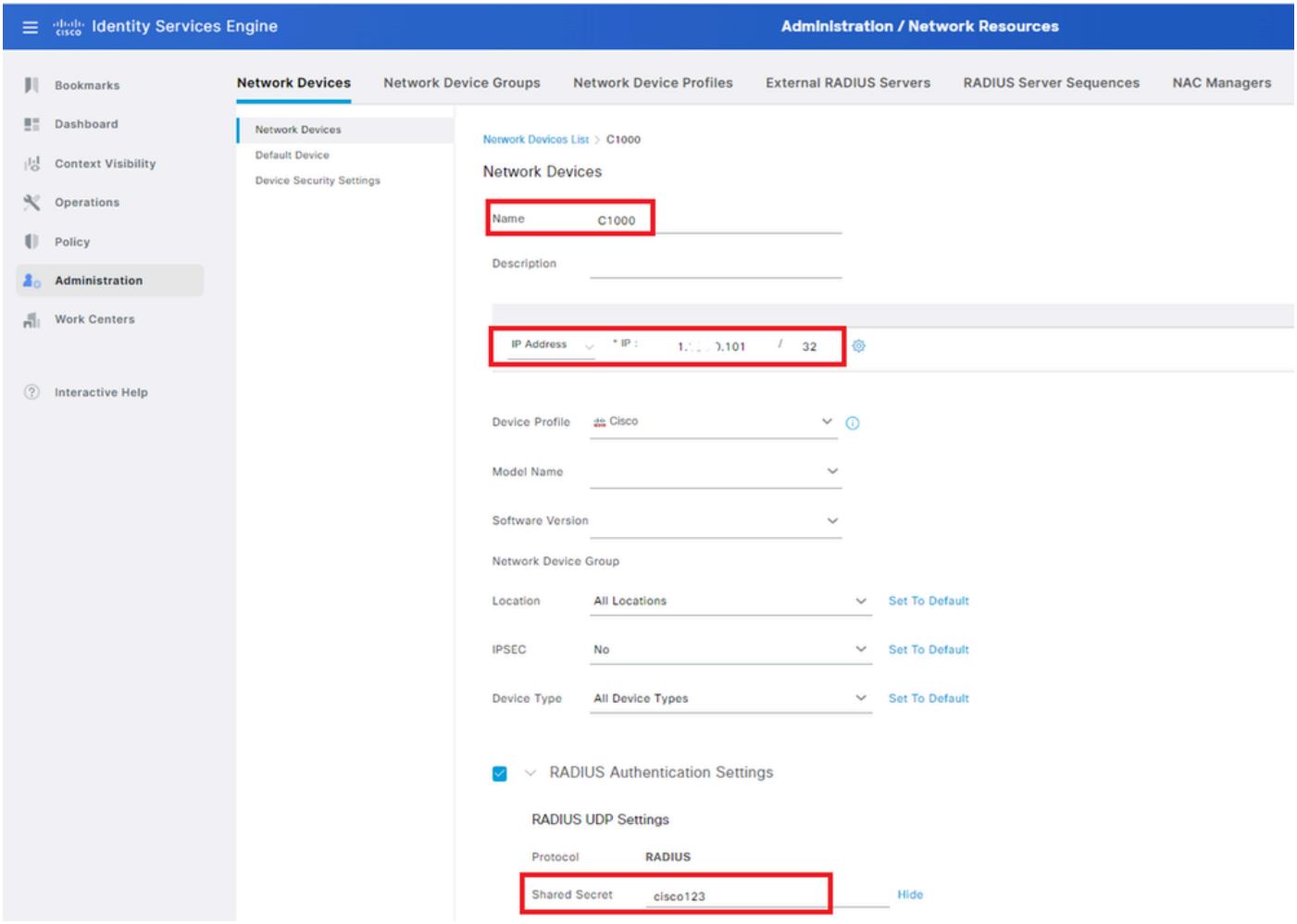


Domain Admins and Domain Users

Configuration in ISE

Step 1. Add Device

Navigate to **Administration > Network Devices**, click **Add** button to add C1000 device.

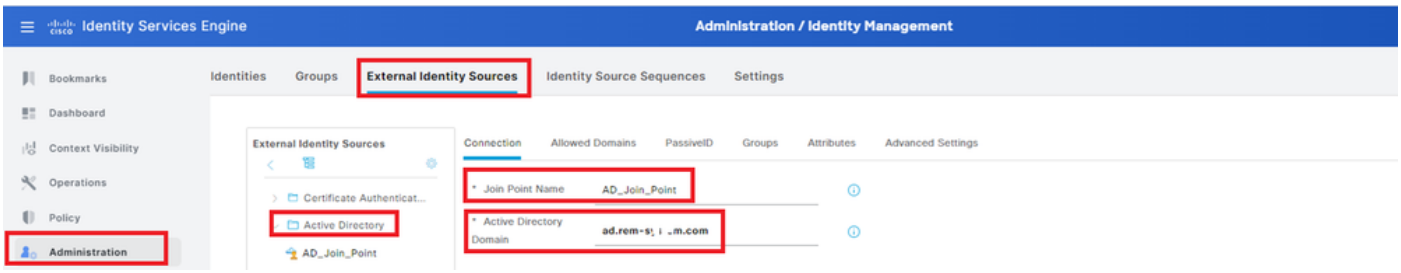


Add Device

Step 2. Add Active Directory

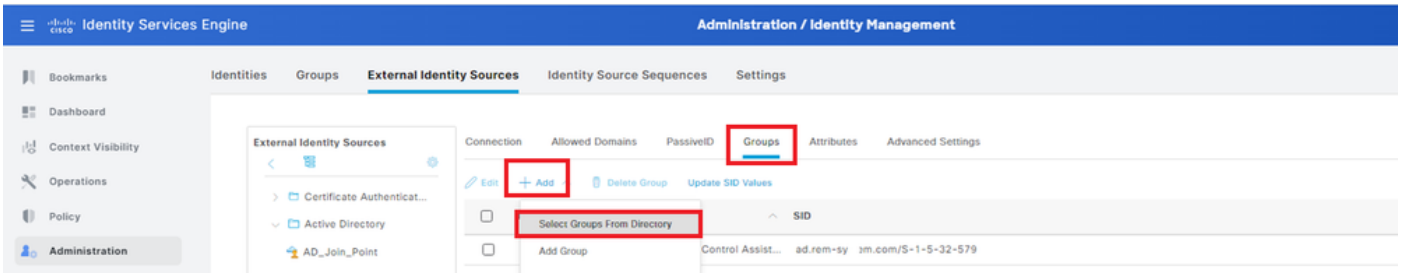
Navigate to **Administration > External Identity Sources > Active Directory**, click **Connection** tab, add Active Directory to ISE.

- Join Point Name: AD_Join_Point
- Active Directory Domain: ad.rem-xxx.com



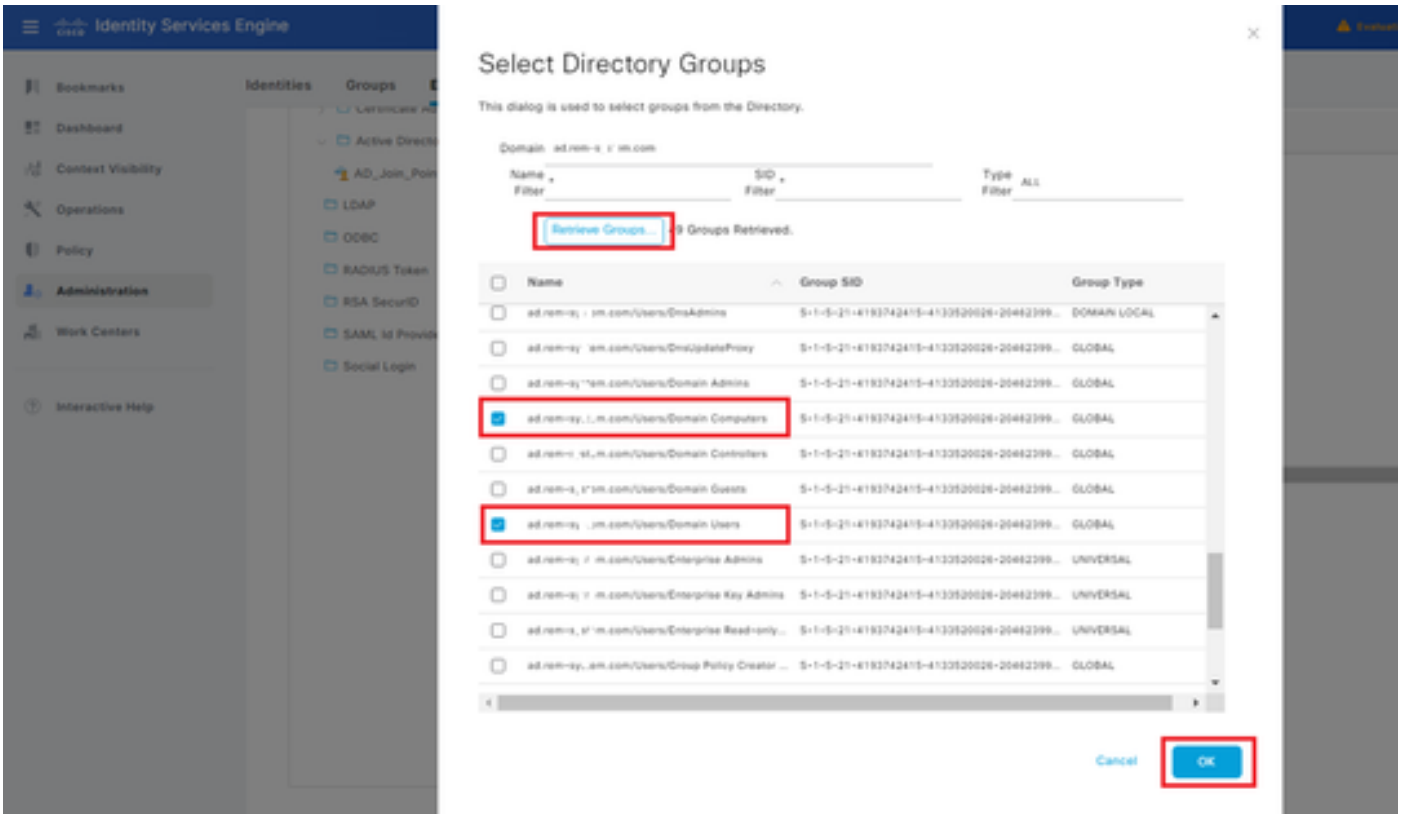
Add Active Directory

Navigate to **Groups** tab, select **Select Groups From Directory** from drop-down list.



Select Groups from Directory

Click **Retrieve Groups** from drop-down list. Check **ad.rem-xxx.com/Users/Domain Computers** and **ad.rem-xxx.com/Users/Domain Users** and click **OK**.

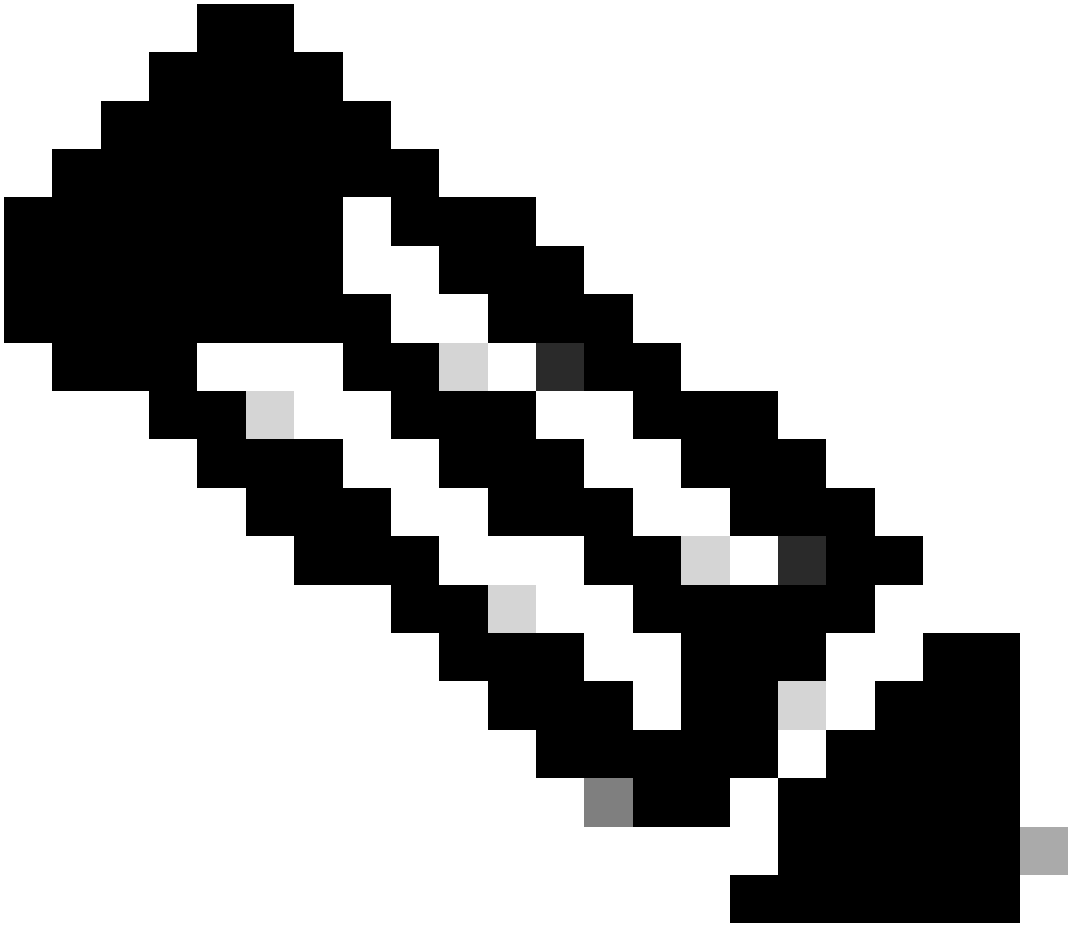


Add Domain Computers and Users

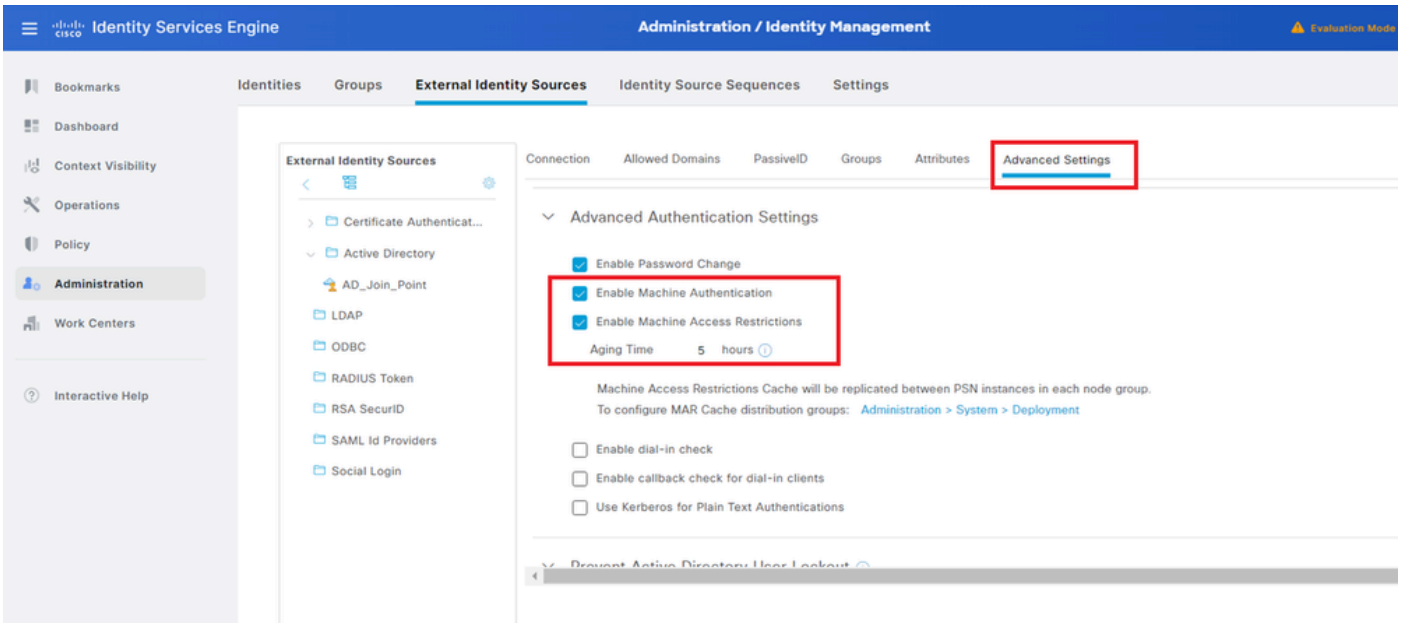
Step 3. Confirm Machine Authentication Setting

Navigate to **Advanced Settings** tab, confirm the setting of machine authentication.

- Enable Machine Authentication: To enable machine authentication
- Enable Machine Access Restriction: To combine user and machine authentication before authorization



Note: Valid range of aging time is 1 to 8760.

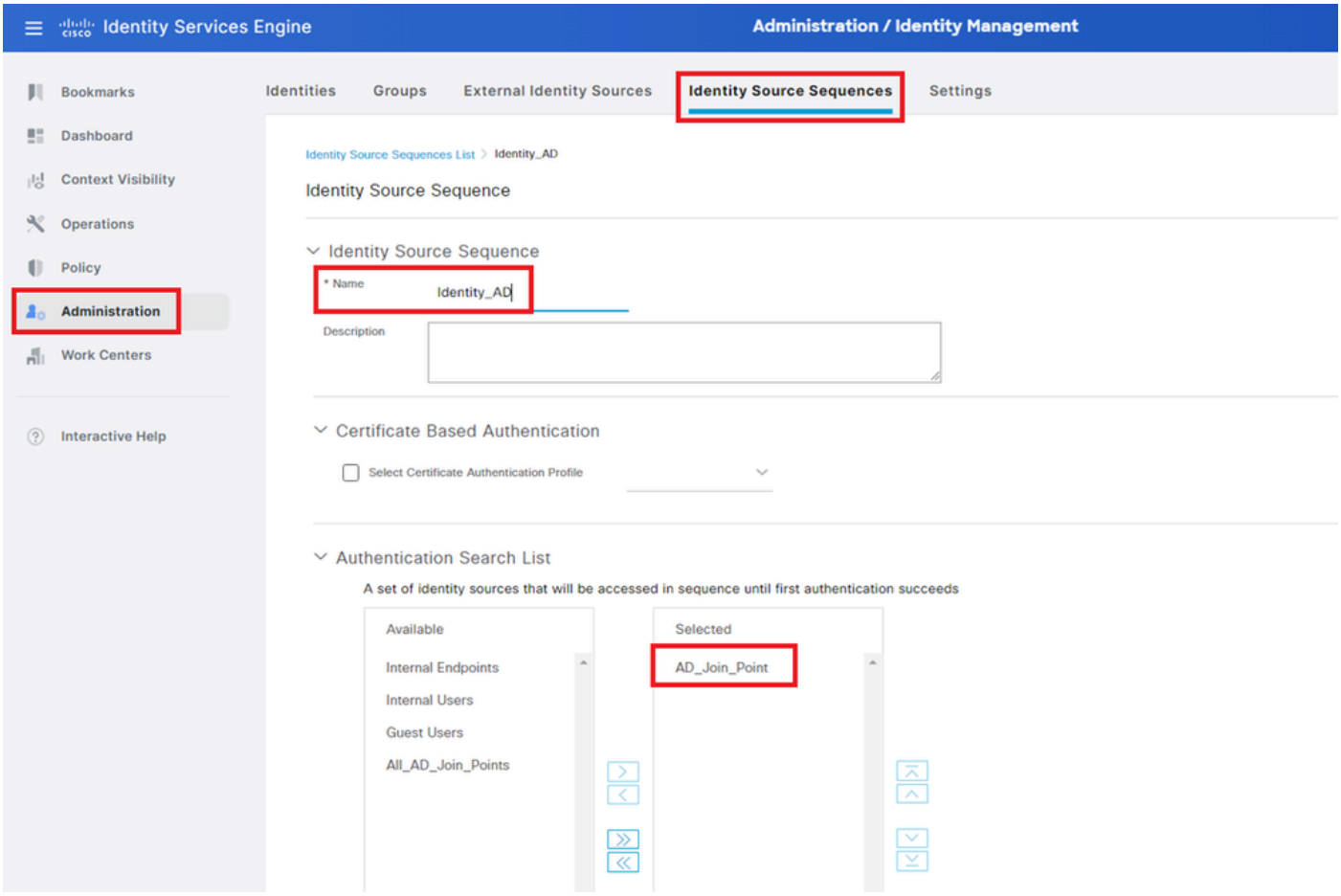


Machine Authentication Setting

Step 4. Add Identity Source Sequences

Navigate to **Administration > Identity Source Sequences**, add an Identity Source Sequence.

- Name: Identity_AD
- Authentication Search List: AD_Join_Point

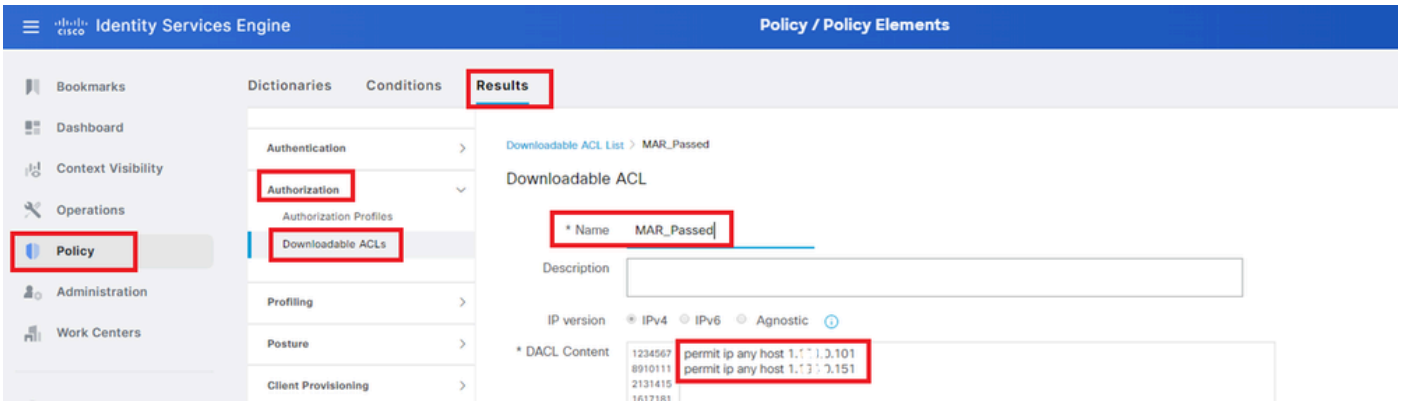


Add Identity Source Sequences

Step 5. Add DACL and Authorization Profile

Navigate to **Policy > Results > Authorization > Downloadable ACLs**, add a DACL.

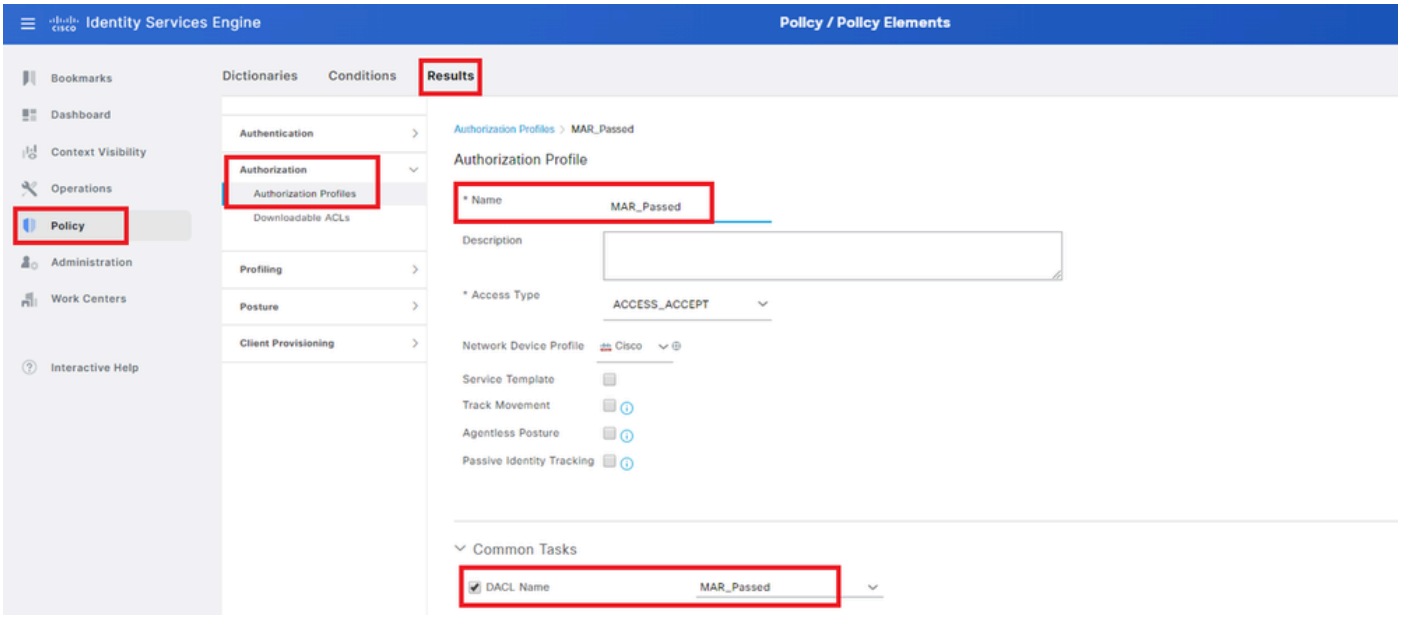
- Name: MAR_Passed
- DACL Content: permit ip any host 1.x.x.101 and permit ip any host 1.x.x.105



Add DACL

Navigate to **Policy > Results > Authorization > Authorization Profiles**, add a authorization profile.

- Name: MAR_Passed
- DACL Name: MAR_Passed

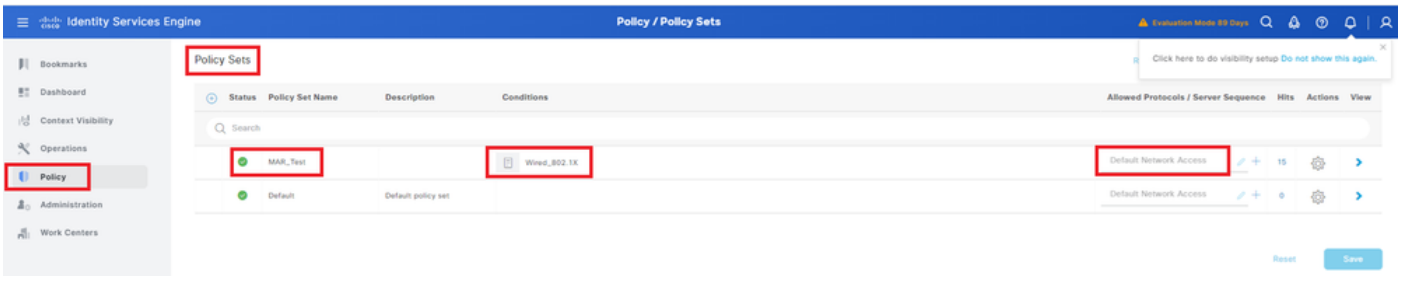


Add Authorization Profile

Step 6. Add Policy Set

Navigate to **Policy > Policy Sets**, click + to add a policy set.

- Policy Set Name: MAR_Test
- Conditions: Wired_802.1X
- Allowed Protocols / Server Sequence: Default Network Access

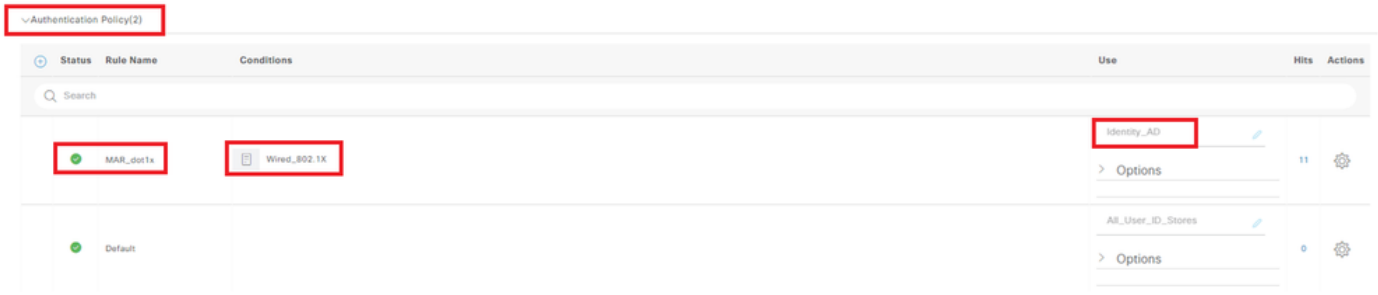


Add Policy Set

Step 7. Add Authentication Policy

Navigate to **Policy Sets**, click **MAR_Test** to add an authentication policy.

- Rule Name: MAR_dot1x
- Conditions: Wired_802.1X
- Use: Identity_AD



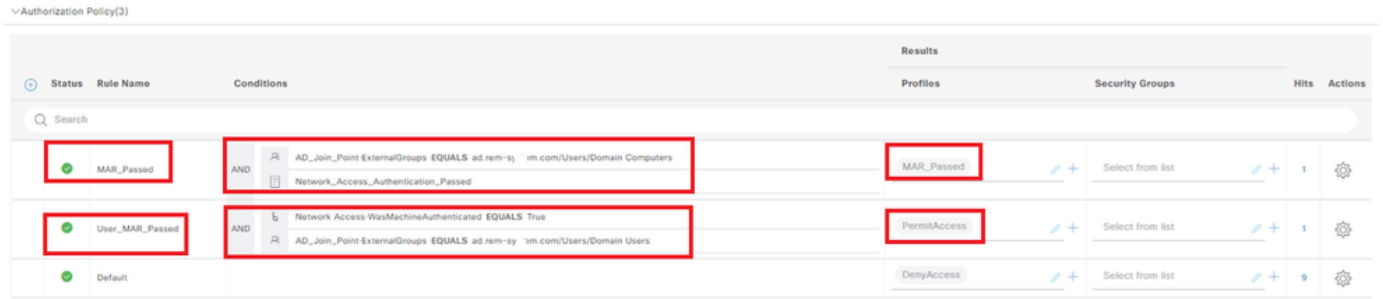
Add Authentication Policy

Step 8. Add Authorization Policy

Navigate to **Policy Sets**, click **MAR_Test** to add an authorization policy.

- Rule Name: MAR_Passed
- Conditions: AD_Join_Point·ExternalGroups **EQUALS** ad.rem-xxx.com/Users/Domain Computers **AND** Network_Access_Authentication_Passed
- Results: MAR_Passed

- Rule Name: User_MAR_Passed
- Conditions: Network Access·WasMachineAuthenticated **EQUALS** True **AND** AD_Join_Point·ExternalGroups **EQUALS** ad.rem-xxx.com/Users/Domain Users
- Results: PermitAccess



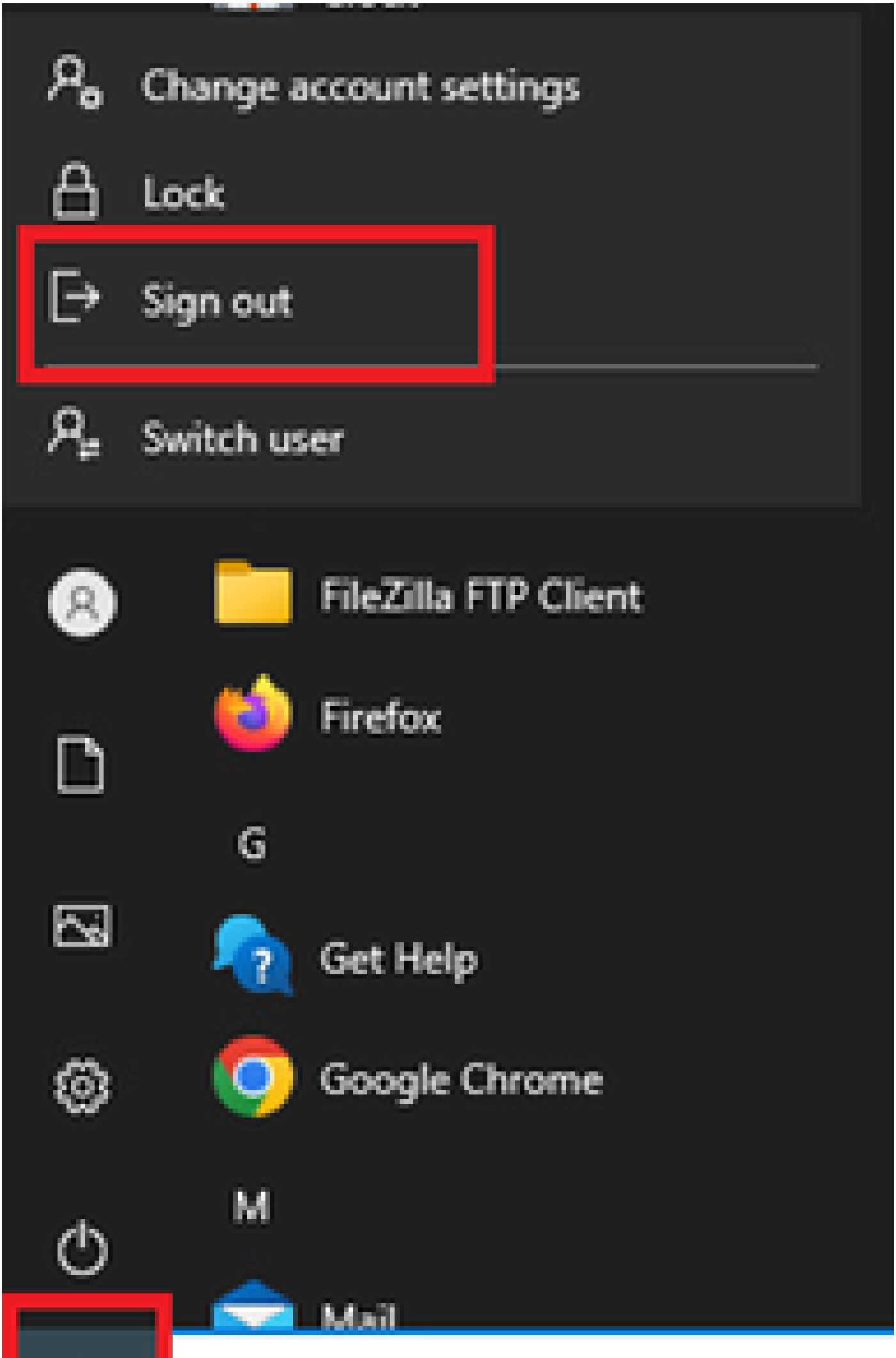
Add Authorization policy

Verify

Pattern 1. Machine Authentication and User Authentication

Step 1. Sign Out of Windows PC

Click **Sign out** button from Win10 PC1 to trigger machine authentication.


Change account settings
Lock
Sign out
Switch user
FileZilla FTP Client
Firefox
G
Get Help
Google Chrome
M
Mail

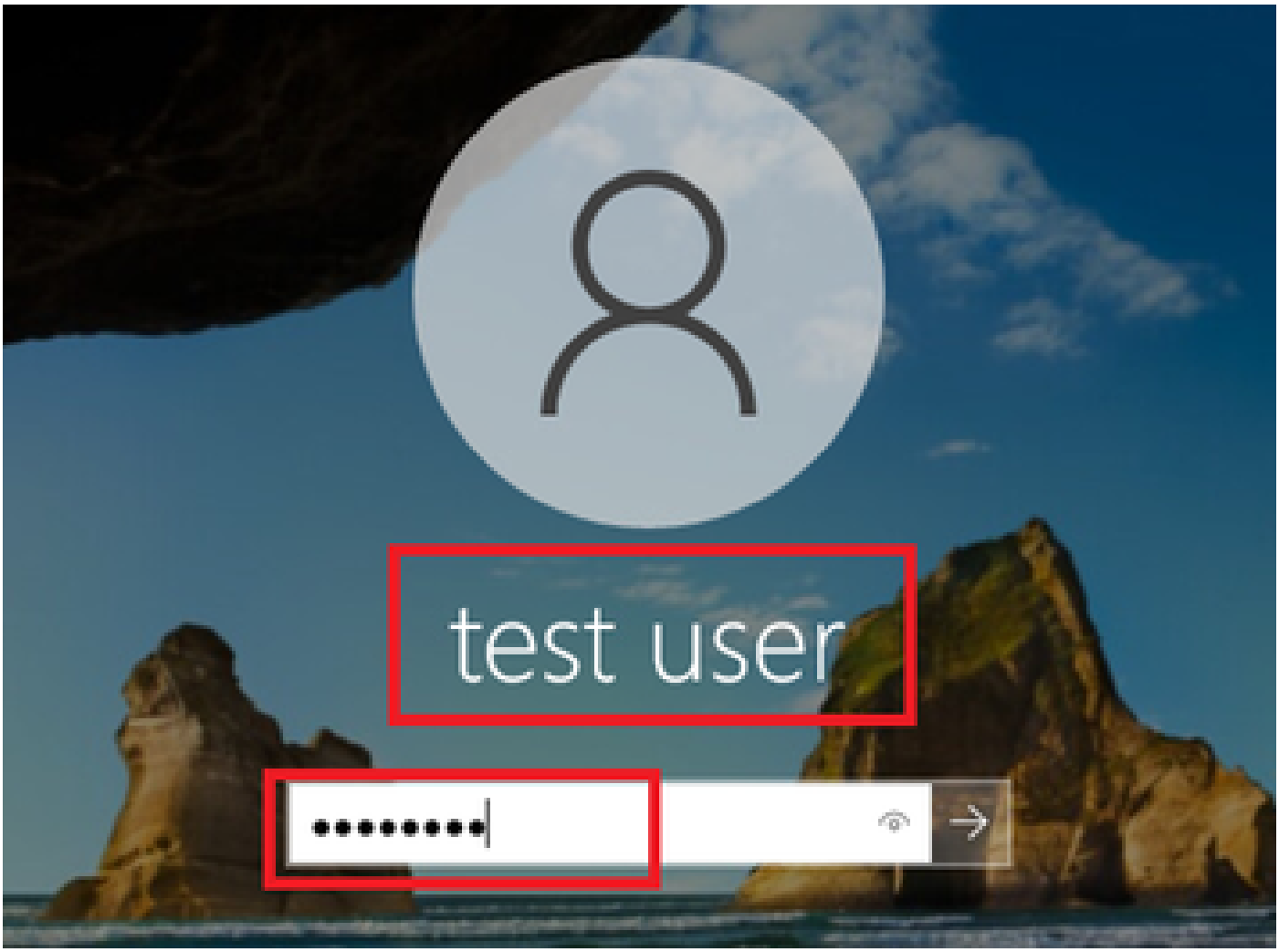
```
Interface: GigabitEthernet1/0/2
MAC Address: b496.9115.84cb
IPv6 Address: Unknown
IPv4 Address: 1.x.x.9
User-Name:
```

host/DESKTOP-L2IL9I6.ad.rem-xxx.com

```
Status: Authorized
Domain: DATA
Oper host mode: multi-auth
Oper control dir: both
Session timeout: N/A
Restart timeout: N/A
Periodic Acct timeout: N/A
Session Uptime: 5s
Common Session ID: 01C2006500000049AA780D80
Acct Session ID: 0x0000003C
Handle: 0x66000016
Current Policy: POLICY_Gi1/0/2

Local Policies:
Service Template: DEFAULT_LINKSEC_POLICY_SHOULD_SECURE (priority 150)

Server Policies:
ACS ACL: xACSACLx-IP-MAR_Passed-6639ba20

Method status list:
Method State

dot1x Authc Success
```

Step 3. Login Windows PC

Login Win10 PC1, input username and password to trigger user authentication.



Login Windows PC

Step 4. Confirm Authentication Session

Run show authentication sessions interface GigabitEthernet1/0/2 details command to confirm user authentication session in C1000.

<#root>

Switch#

show authentication sessions interface GigabitEthernet1/0/2 details

Interface: GigabitEthernet1/0/2
MAC Address: b496.9115.84cb
IPv6 Address: Unknown
IPv4 Address: 1.x.x.9
User-Name:

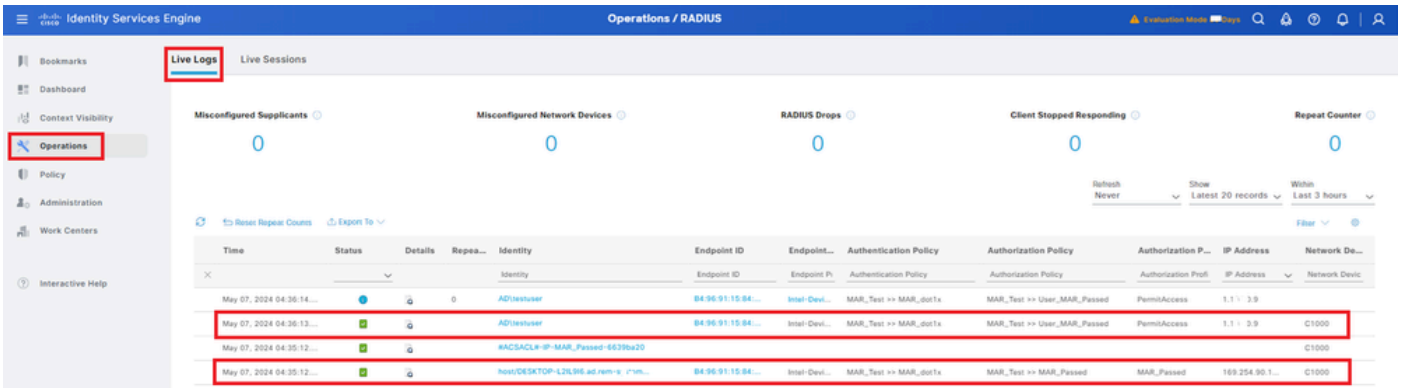
AD\testuser

Status: Authorized
Domain: DATA
Oper host mode: multi-auth
Oper control dir: both
Session timeout: N/A

```
Restart timeout: N/A
Periodic Acct timeout: N/A
Session Uptime: 85s
Common Session ID: 01C2006500000049AA780D80
Acct Session ID: 0x0000003D
Handle: 0x66000016
Current Policy: POLICY_Gi1/0/2

Local Policies:
Service Template: DEFAULT_LINKSEC_POLICY_SHOULD_SECURE (priority 150)

Server Policies:


Method status list:
Method State

dot1x Authc Success
```

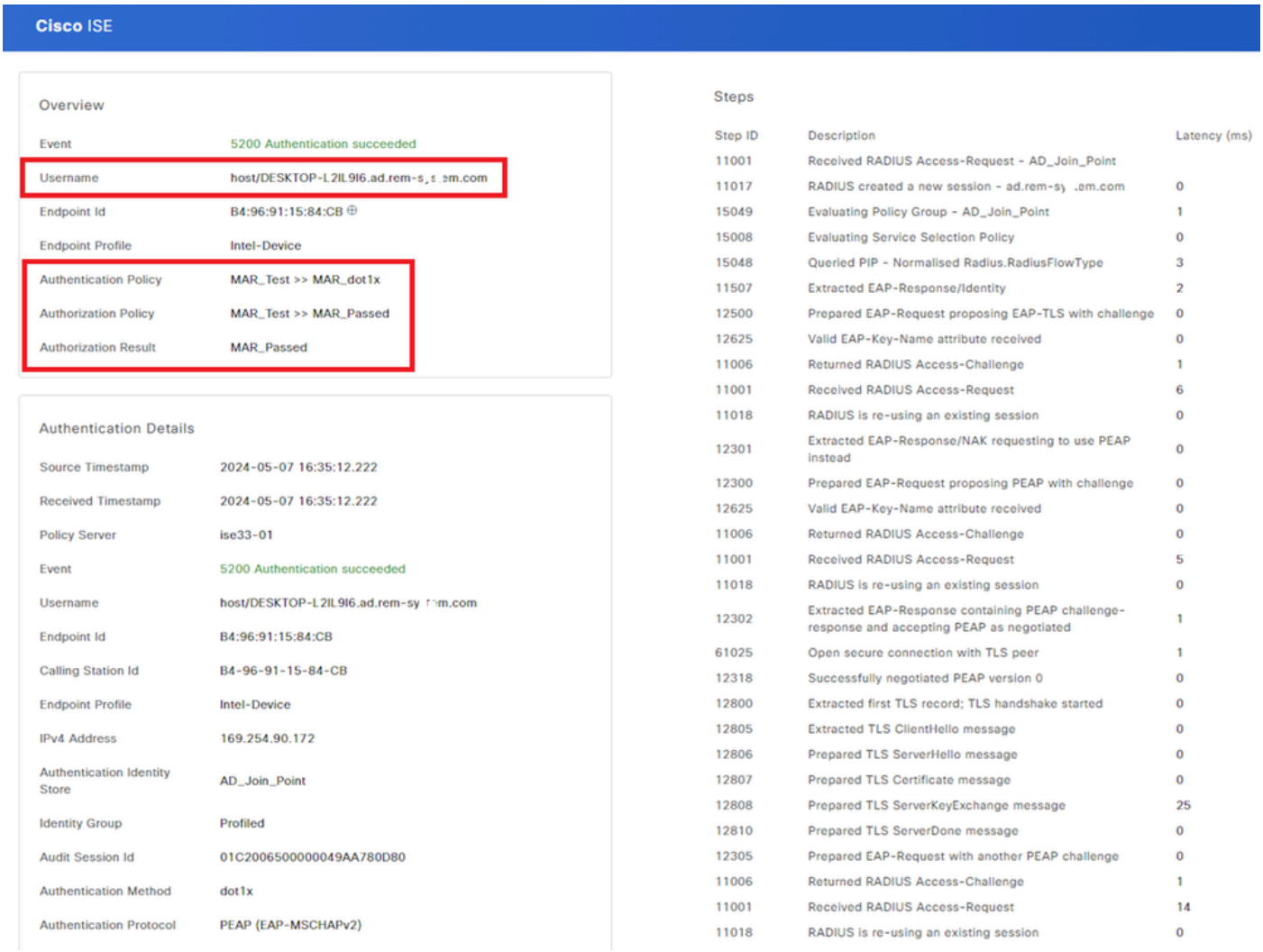
Step 5. Confirm Radius Live Log

Navigate to **Operations > RADIUS > Live Logs** in ISE GUI, confirm the live log for machine authentication and user authentication.



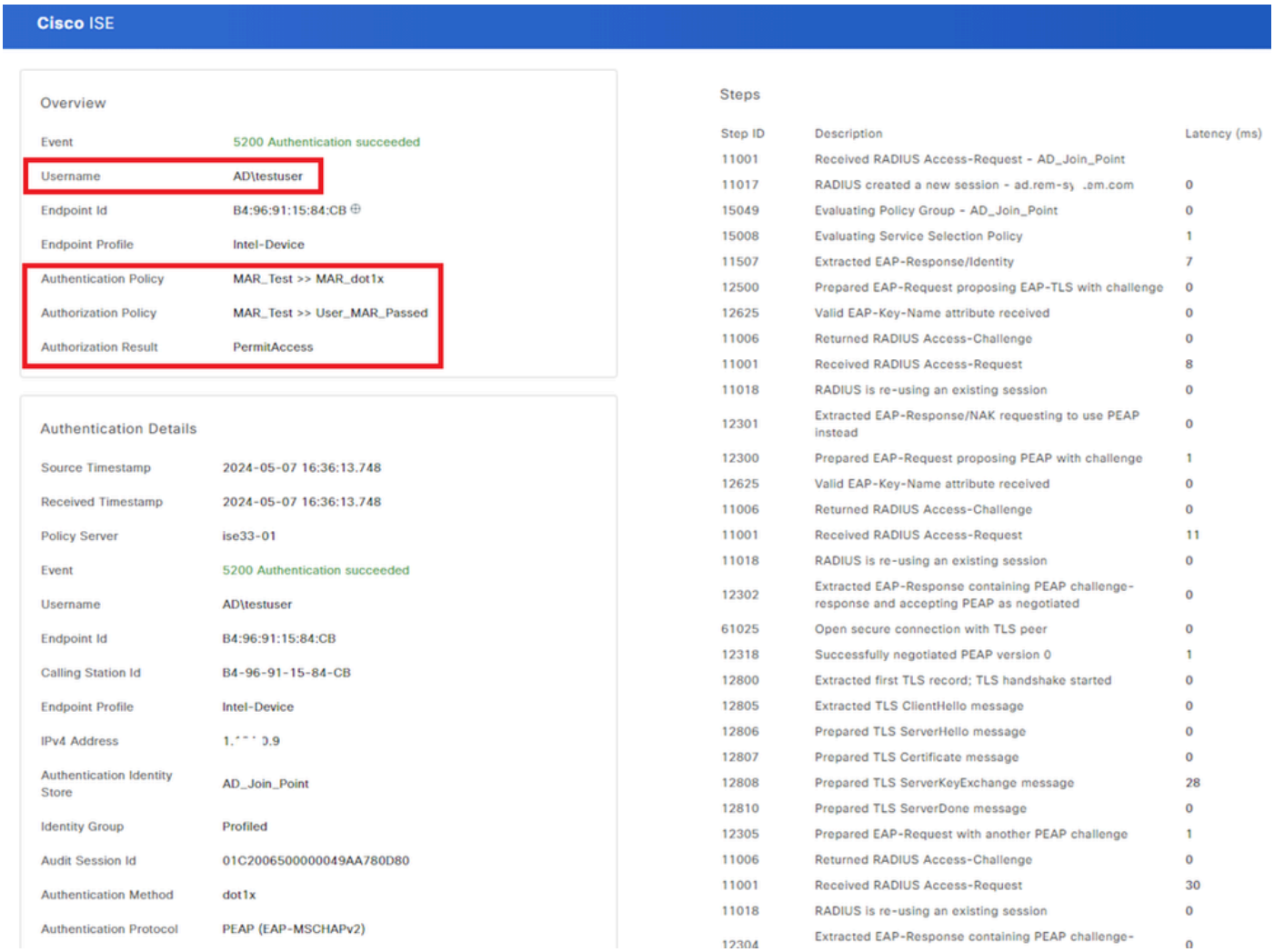
Radius Live Log

Confirm the detailed live log of machine authentication.



Detail of Machine Authentication

Confirm the detailed live log of user authentication.



Detail of User Authentication

Pattern 2. User Authentication Only

Step 1. Disable and Enable NIC of Windows PC

In order to trigger user authentication, disable and enable the NIC of Win10 PC1.

Step 2. Confirm Authentication Session

Run `show authentication sessions interface GigabitEthernet1/0/2 details` command to confirm user authentication session in C1000.

<#root>

```
Switch#
```

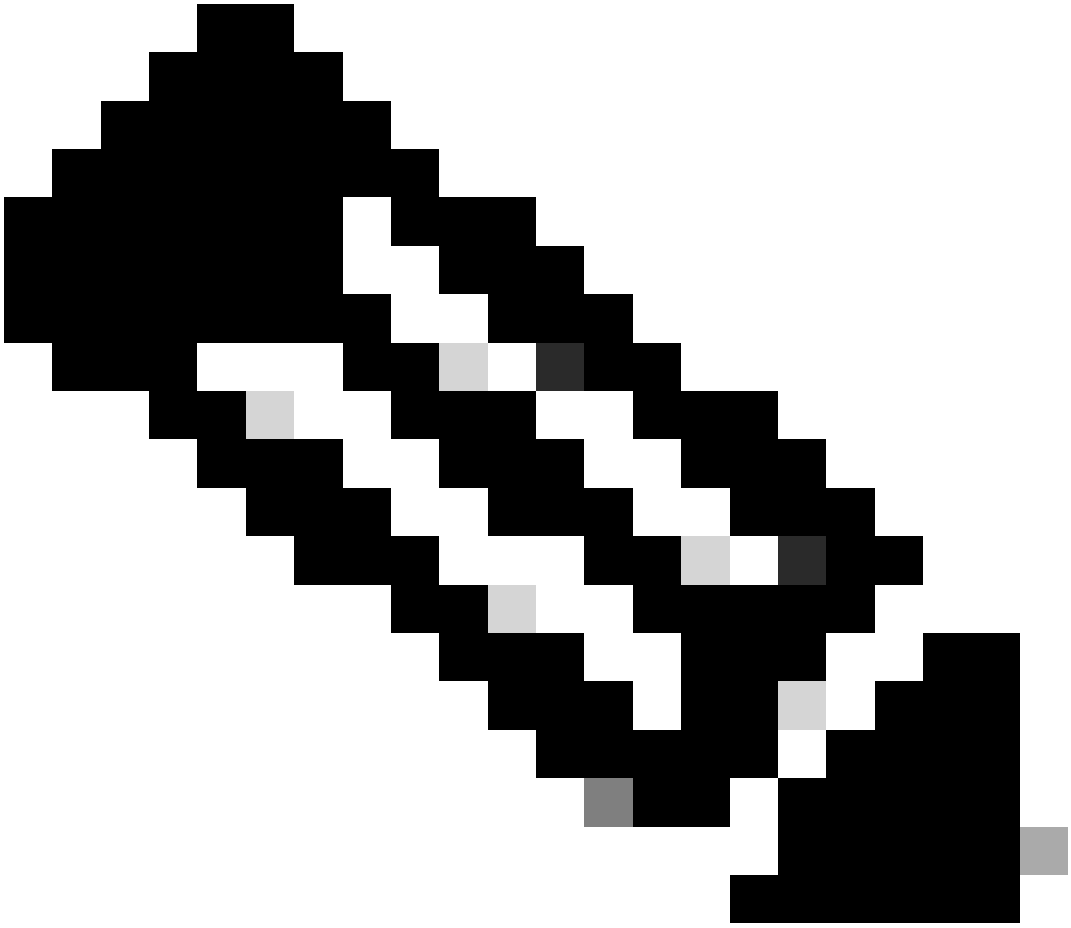
```
show authentication sessions interface GigabitEthernet1/0/2 details
```

```
Interface: GigabitEthernet1/0/2
MAC Address: b496.9115.84cb
IPv6 Address: Unknown
IPv4 Address: 1.x.x.9
User-Name: AD\testuser
Status: Authorized
```

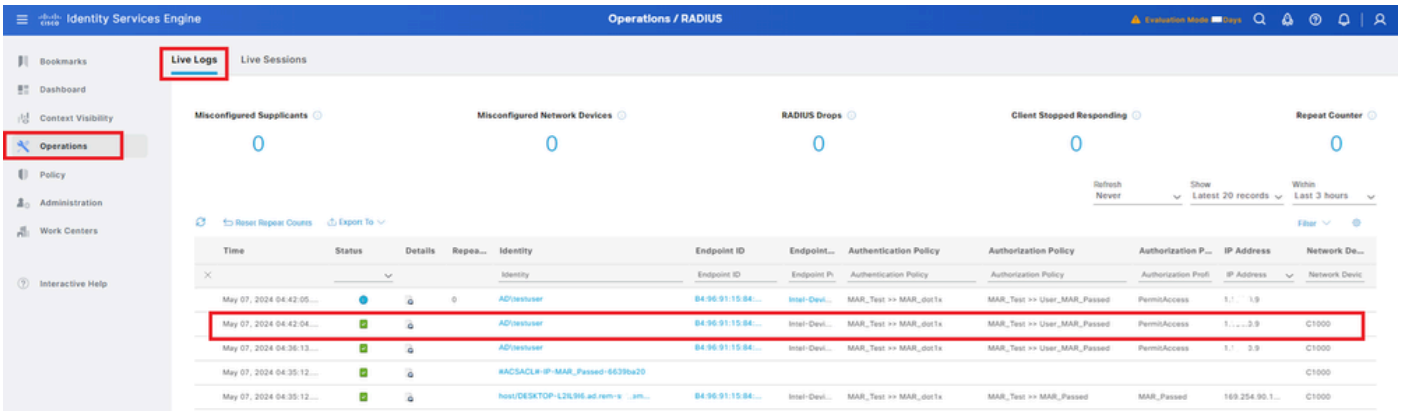
```
Domain: DATA
Oper host mode: multi-auth
Oper control dir: both
Session timeout: N/A
Restart timeout: N/A
Periodic Acct timeout: N/A
Session Uptime: 419s
Common Session ID: 01C2006500000049AA780D80
Acct Session ID: 0x0000003D
Handle: 0x66000016
Current Policy: POLICY_Gi1/0/2

Local Policies:
Service Template: DEFAULT_LINKSEC_POLICY_SHOULD_SECURE (priority 150)

Server Policies:


Method status list:
Method State

dot1x Authc Success
```

Step 3. Confirm Radius Live Log

Navigate to **Operations > RADIUS > Live Logs** in ISE GUI, confirm the live log for user authentication.



Note: Because the MAR cache is stored in ISE, only user authentication is needed.



Radius Live Log

Confirm the detailed live log of user authentication.

Detail of User Authentication

Troubleshoot

These debug logs (prrt-server.log) help you to confirm the detailed behavior of authentication in ISE.

- runtime-config
- runtime-logging
- runtime-AAA

This is an example of the debug log for **Pattern 1. Machine Authentication and User Authentication** in this document.

<#root>

// machine authentication
MAR,2024-05-08 16:54:50,582,DEBUG,0x7fb2fd3db700,cntx=0000034313,sesn=ise33-01/504417979/41,CPMSessionI

user=host/DESKTOP-L2IL9I6.ad.rem-xxx.com

,CallingStationID=B4-96-91-15-84-CB,FramedIPAddress=1.x.x.9,MARCache::checkInsertConditions:

subject=machine

, calling-station-id=B4-96-91-15-84-CB, HostName=DESKTOP-L2IL9I6$@ad.rem-xxx.com,MARCache.cpp:105

// insert MAR cache
MAR,2024-05-08 16:54:50,582,DEBUG,0x7fb2fd3db700,cntx=0000034313,sesn=ise33-01/504417979/41,CPMSessionI

user=host/DESKTOP-L2IL9I6.ad.rem-xxx.com

,CallingStationID=B4-96-91-15-84-CB,FramedIPAddress=1.x.x.9,

Inserting new entry to cache

CallingStationId=B4-96-91-15-84-CB, HostName=DESKTOP-L2IL9I6$@ad.rem-xxx.com, IDStore=AD_Join_Point an
MAR,2024-05-08 16:54:50,582,DEBUG,0x7fb2fd3db700,cntx=0000034313,sesn=ise33-01/504417979/41,CPMSessionI

user=host/DESKTOP-L2IL9I6.ad.rem-xxx.com

,CallingStationID=B4-96-91-15-84-CB,FramedIPAddress=1.x.x.9,MARCache::onInsertRequest: event not locall

// user authentication
MAR,2024-05-08 16:55:11,120,DEBUG,0x7fb2fdde0700,cntx=0000034409,sesn=ise33-01/504417979/45,CPMSessionI

user=AD\testuser

,CallingStationID=B4-96-91-15-84-CB,FramedIPAddress=1.x.x.9,MARCache::onQueryRequest:

machine authentication confirmed locally

,MARCache.cpp:222
MAR,2024-05-08 16:55:11,130,DEBUG,0x7fb2fe5e4700,cntx=0000034409,sesn=ise33-01/504417979/45,CPMSessionI

user=AD\testuser

,CallingStationID=B4-96-91-15-84-CB,FramedIPAddress=1.x.x.9,MARCache::onMachineQueryResponse:

machine DESKTOP-L2IL9I6$@ad.rem-xxx.com valid in AD

,MARCache.cpp:316

Related Information

Machine Access Restriction Pros and Cons