Configure Duo Multi-Factor Authentication for Remote Workers using Cisco Secure Firewall Management Center

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About Duo Multi-Factor Authentication

Duo Multi-Factor Authentication (MFA) is a security measure to protect against unauthorized access to digital accounts and systems. It requires users to provide two or more forms of authentication before granting access, typically a combination of something they know (such as a password or PIN) and something they have (such as a smartphone or security token).

You can configure MFA using Cisco Secure Firewall Management Center for remote workers connecting through a remote access VPN headend.

Is this Guide for You?

This use case is intended primarily for network administrators who use the secure firewall management center to configure Duo MFA for remote workers connecting to their organization’s network using remote access VPN.

This document covers the following use cases:

- Duo MFA using RADIUS as the primary authentication server.
- Duo MFA using Microsoft Active Directory as primary authentication server.

Scenario

Nik is a network administrator of an organization. Nik is responsible for setting up a remote access VPN for employees connecting to the organization's network from anywhere. For several reasons, a remote work environment can increase the risk of a cyber-attack. Their username and password cannot be the only authentication identifier for accessing the network through VPN as they can be easily compromised.

Therefore, Nik decides to use Duo MFA, which mandates remote workers to provide their username and password, plus additional information, such as a Duo passcode, to access the organization network safely.

Benefits of Using Duo MFA

- Compliance requirements: Many industries and organizations have compliance requirements that mandate using MFA to protect sensitive data and systems. Duo MFA can help meet these requirements. Duo offers FedRAMP Authorized authentication tailored to meet your security needs for Federal and public sector organizations.

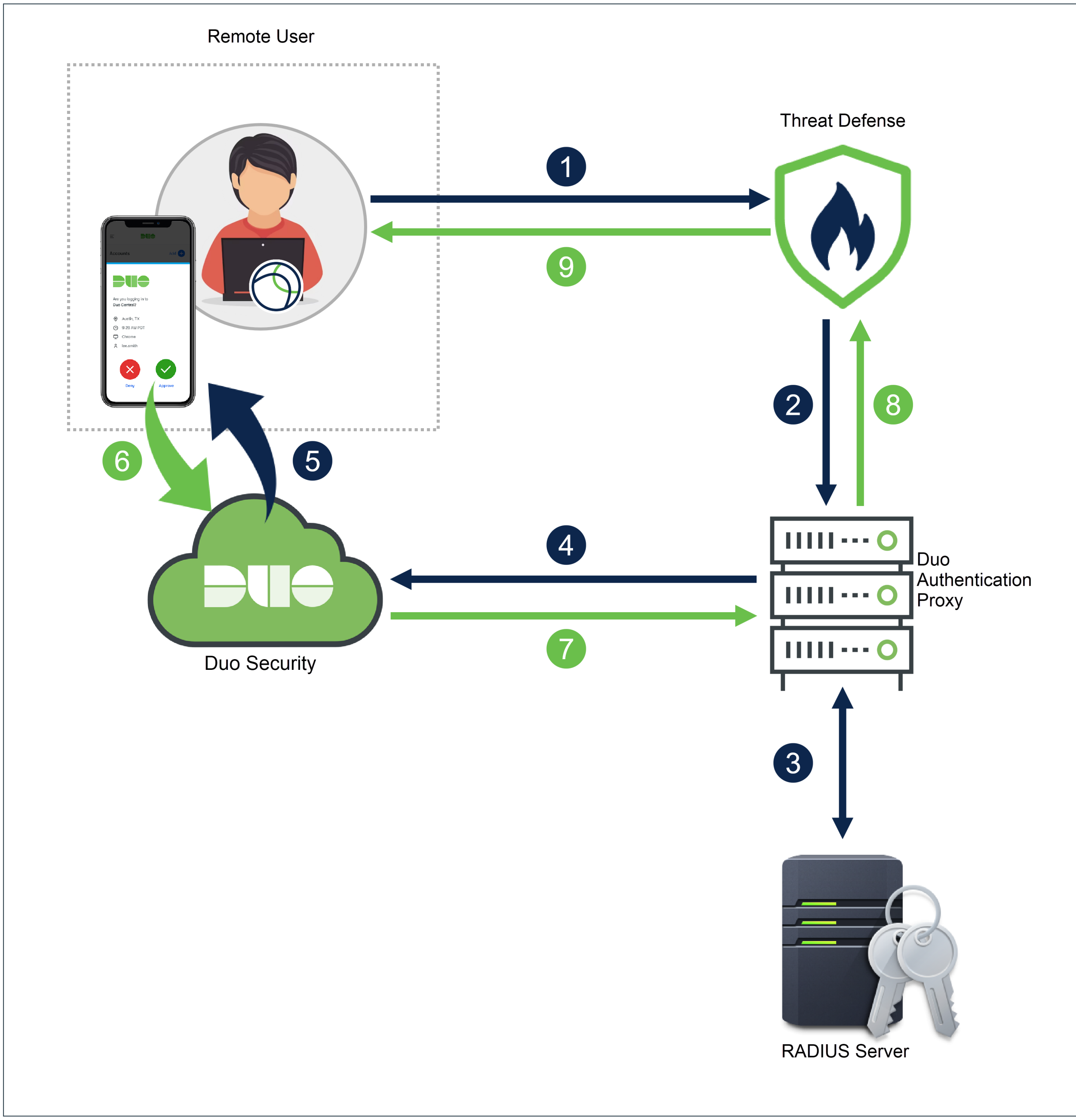
- Protection against phishing attacks: Duo MFA can help protect against phishing attacks, where attackers steal the login credentials of remote workers. With Duo MFA, the attacker would still need the second factor to gain access even if a user falls for a phishing attack and enters their password.
- User convenience: Duo MFA can be configured to remember trusted devices, reducing the need for users to enter their second factor every time they log in. This can make the authentication process more convenient for users while maintaining security.
- Easy to configure: Duo is a cloud-based solution that makes it easy to enroll remote workers and their details on them.

How Does the System Work?

The remote workers must authenticate using their credentials followed by one of the Duo passcode configured – push, phone call, passcode, or sms.

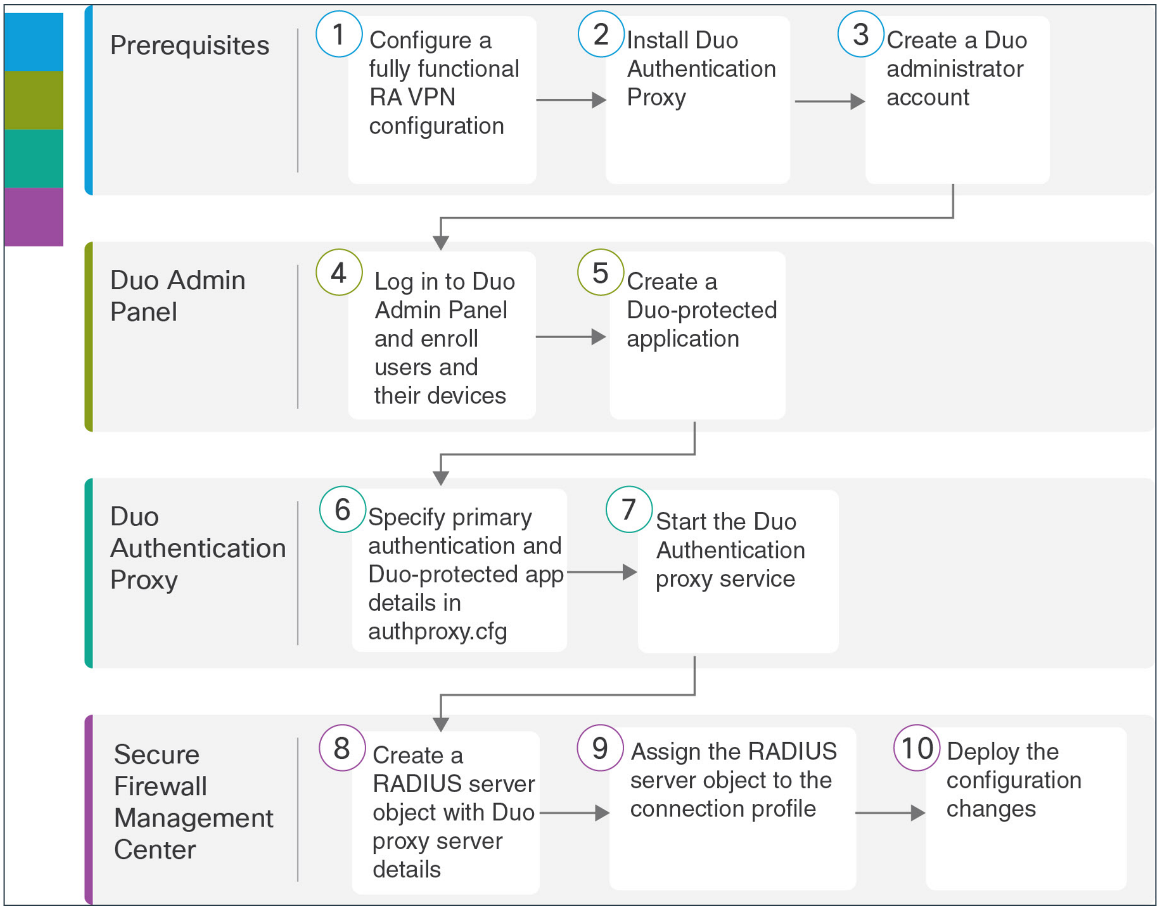
The Duo Multi-factor configuration comprises the following components:

- Secure Firewall Management Center: This is the on-premise manager for configuring remote access VPN policies and monitoring the live sessions.
- Secure Firepower Threat Defense: This device creates a VPN tunnel for remote workers to connect to their organization network.
- Cisco Secure Client: This utility is installed on a remote worker’s device for establishing VPN sessions with the threat defense device.
- Primary Authentication Server: The primary authentication server is a database that stores user credentials. You can configure the RADIUS or AD server as the primary authentication agent.
- Duo Authentication Proxy: The Duo Authentication Proxy is an on-premises software service that receives authentication requests from threat defense to perform primary authentication and then contacts Duo for secondary authentication.



End-to-End Procedure

The following illustration shows the tasks to configure Duo MFA for your remote workers.


Prerequisites
1 Configure a fully functional RA VPN configuration
2 Install Duo Authentication Proxy
3 Create a Duo administrator account
Duo Admin Panel
4 Log in to Duo Admin Panel and enroll users and their devices
5 Create a Duo-protected application
Duo Authentication Proxy
6 Specify primary authentication and Duo-protected app details in authproxy.cfg
7 Start the Duo Authentication proxy service
Secure Firewall Management Center
8 Create a RADIUS server object with Duo proxy server details
9 Assign the RADIUS server object to the connection profile
10 Deploy the configuration changes

Step	Application	Description
1	Prerequisites	Configure a fully functional remote access VPN configuration. See Prerequisites.
2	Prerequisites	Install Duo Authentication Proxy. See Prerequisites.
3	Prerequisites	Create a Duo Administrator account. See Prerequisites.
4	Duo Admin Panel	Add Users in Duo Admin Panel.
5	Duo Admin Panel	Create a Duo-protected application to generate integration details. See Create a Duo-protected Application
6	Duo Authentication Proxy	Configure the **Duo Authentication Proxy Manager** application to modify the “authproxy.cfg” file. See Configure Duo Authentication Proxy with RADIUS or AD Server Details.
7	Duo Authentication Proxy	Start the Duo Authentication proxy service. See Configure Duo Authentication Proxy with RADIUS or AD Server Details.
8	Management Center	Create a RADIUS Server object. See Create a RADIUS Server Object for Duo.

Step	Application	Description
9	Management Center	Assign the RADIUS Server object to the connection profile. See Assign RADIUS Server Object to Connection Profile using Management Center.
10	Management Center	Deploy the configuration to the device. See Assign RADIUS Server Object to Connection Profile using Management Center.

Prerequisites

Ensure that you have:

- Configured remote access VPN on an FMC-managed threat defense device.
- Installed the Duo Authentication Proxy server on the Windows/Linux host. For more information, see Duo Authentication Proxy Reference.

Note It is recommended to install the Proxy Manager for seamless configuration.

- Created a Duo administrator account. See Getting Started with Duo Security.

Note Use your new account to log in to the Duo Admin Panel and click **Billing** to upgrade to any plan you want.

Add Users in Duo Admin Panel

Procedure

Step 1 Log in to the Duo Admin Panel.

Step 2 Enroll the users of your organization in Duo. See Enroll Users.

- The usernames specified in Duo must match the usernames in the primary authentication server.
- To use Duo Push, users must install the Duo Mobile app on their devices and then add their Duo account to the app.

Create a Duo-protected Application

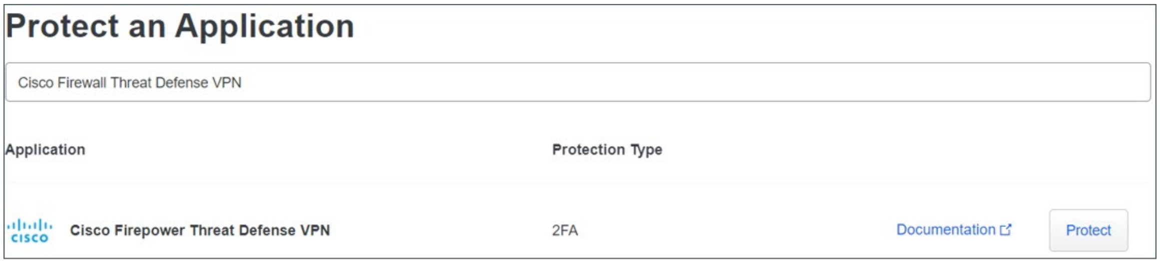
A Duo-protected application is a service that integrates Duo and secure firewall threat defense remote access VPN.

Procedure

Step 1 Log in to the Duo Admin Panel.

Step 2 Choose **Applications** > **Protect an Application**.

Step 3 Search *Cisco Firepower Threat Defense VPN* in the applications list and click **Protect**.



Protect an Application

Cisco Firewall Threat Defense VPN

Application	Protection Type		
Cisco Firepower Threat Defense VPN	2FA	Documentation	Protect

The application generates an **Integration key**,**Secret key**, and**API hostname**.You must specify this information to complete your Duo Authentication proxy setup.

See Protecting Applications for more information about protecting applications in Duo and additional application options.

Step 4 Scroll down the page until you see **Save**.

Step 5 Click **Save**.

Configure Duo Authentication Proxy with RADIUS or AD Server Details

You can use either RADIUS or Active Directory to perform the primary authentication.

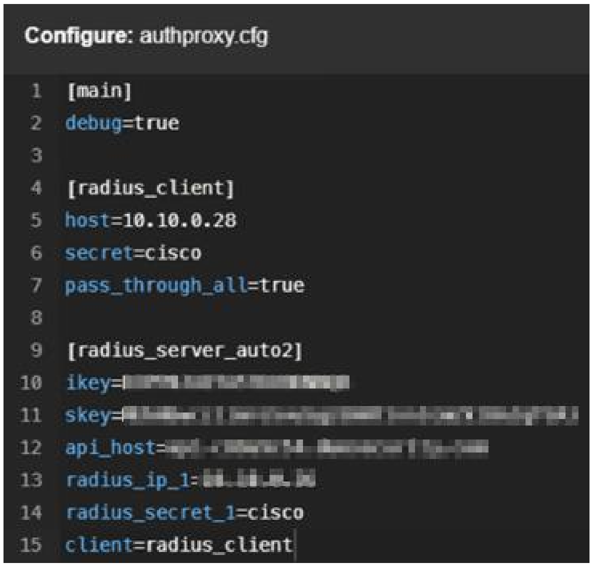
Procedure

Step 1 Log in to the host where Duo Authentication Proxy is installed.

Step 2 Open the **Duo Authentication Proxy Manager** application.

It may contain some sample content that can be removed.

Step 3 To use the RADIUS as your primary authenticator, modify the authoproxy.cfg file to the following configuration:



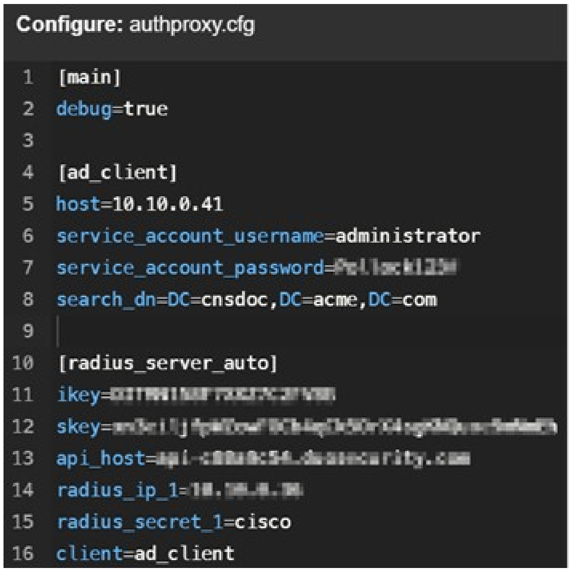
Configure: authproxy.cfg

```
[main]
debug=true

[radius_client]
host=10.10.0.28
secret=cisco
pass_through_all=true

[radius_server_auto2]
ikey=[redacted]
skey=[redacted]
api_host=[redacted]
radius_ip_1=[redacted]
radius_secret_1=cisco
client=radius_client
```

[radius_client]	To use RADIUS as your primary authenticator.
host	The IP address of your primary RADIUS server. In this example, 10.10.0.28 is the address of the Cisco ISE server.
secret	A secret to be shared between the Authentication Proxy and your existing RADIUS server. Enter the secret key specified during ISE server installation.
[radius_server_auto2]	—
ikey	Enter the Duo integration key generated when creating the Duo-protected application.
skey	Enter the secret key generated when creating the Duo-protected application.
api_host	Enter the Duo API hostname generated when creating the Duo-protected application.
radius_ip_1	The IP address of your threat defense SSL VPN device.
radius_secret_1	A secret to be shared between the proxy and your threat defense SSL VPN device.
client	radius_client Use RADIUS for primary authentication. Make sure you have a [radius_client] section configured.

For additional optional configuration, see RADIUS configuration.

Step 4 To use the AD server as your primary authenticator, modify the authoproxy.cfg file to the following configuration:



Configure: authproxy.cfg

```
[main]
debug=true

[ad_client]
host=10.10.0.41
service_account_username=administrator
service_account_password=[redacted]
search_dn=DC=cnsdoc,DC=acme,DC=com

[radius_server_auto]
ikey=[redacted]
skey=[redacted]
api_host=[redacted]
radius_ip_1=[redacted]
radius_secret_1=cisco
client=ad_client
```

[ad_client]	To use AD as your primary authenticator.
host	The hostname or IP address of your domain controller or directory server. In this example, 10.10.0.41 is the address of the AD server.
service_account_username	The username of a domain account that has permission to bind to your directory and perform searches. We recommend creating a service account that has read-only access.
service_account_password	The password corresponding to service_account_username.
search_dn	The LDAP distinguished name (DN) of an Active Directory/LDAP container or organizational unit (OU) containing all of the users you wish to permit to log in.
[radius_server_auto]	The Duo-protected application details.
ikey	Enter the Duo integration key generated when creating the Duo-protected application.
skey	Enter the secret key generated when creating the Duo-protected application.
api_host	Enter the Duo API hostname generated when creating the Duo-protected application.
radius_ip_1	The IP address of your threat defense SSL VPN device.
radius_secret_1	A secret to be shared between the proxy and your threat defense SSL VPN device.

client	ad_client Use Active Directory for primary authentication. Make sure you have an [ad_client] section configured.

For additional optional configuration, see Active Directory configuration.

Step 5 Click **Save**.

Step 6 Click the **Start Service** button at the top of the proxy manager window to start the service.

Step 7 Click **Validate** to test your configuration. If the window reports any configuration issues, you must read the log file to troubleshoot them. See Troubleshoot Duo Authentication Proxy Configuration.

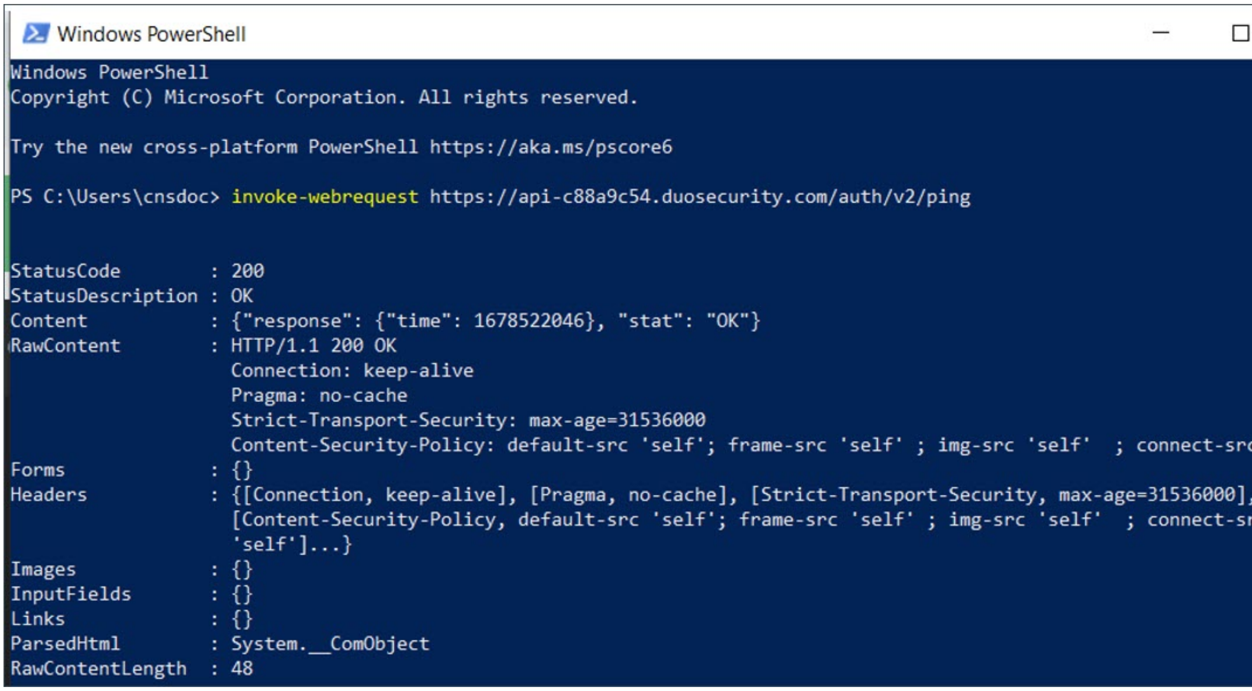
Verify Duo Authentication Proxy Configuration

Procedure

Step 1 Start the PowerShell application on the Windows host. You can execute the same command on a Linux host.

Step 2 Execute the **invoke-webrequest https://api-host/auth/v2/ping** command. Replace api-host with the Duo API hostname generated from the Duo-protected application.

If the configuration is correct, you must see a similar response.



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\cnsdoc> invoke-webrequest https://api-c88a9c54.duosecurity.com/auth/v2/ping


StatusCode        : 200
StatusDescription : OK
Content           : {"response": {"time": 1678522046}, "stat": "OK"}
RawContent        : HTTP/1.1 200 OK
                    Connection: keep-alive
                    Pragma: no-cache
                    Strict-Transport-Security: max-age=31536000
                    Content-Security-Policy: default-src 'self'; frame-src 'self' ; img-src 'self'  ; connect-src
Forms             : {}
Headers           : {[Connection, keep-alive], [Pragma, no-cache], [Strict-Transport-Security, max-age=31536000],
                    [Content-Security-Policy, default-src 'self'; frame-src 'self' ; img-src 'self'  ; connect-sr
                    'self']...}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : System.__ComObject
RawContentLength  : 48
```

Create a RADIUS Server Object for Duo

You must create a RADIUS Server object with information about the Windows/Linux machine where the Duo Authentication Proxy is installed. Use this object as the authentication server in the AAA server configuration page.

Procedure

Step 1 Log in to the management center that manages your threat defense headend.

Step 2 Create a Duo RADIUS server object with Duo proxy server details.

a. Choose **Objects** > **Object Management** > **AAA Server** > **RADIUS Server Group** > **Add RADIUS Server Group**.

b. Enter the following details:

Field	Value
Name	A descriptive name for the object, like “DuoRADIUS”.
Group Accounting Mode	Leave as **Single**.
Retry Interval	Leave as **10**.
Realms	It is not required.
Enable authorize only **Enable interim account update** **Enable dynamic authorization**	Do not enable.

c. Click + to add a RADIUS server.

d. In the **IP Address/Hostname**, enter the IP address of the Windows/Linux machine where the Duo Authentication Proxy is installed.

e. Leave the **Authentication Port** as 1812.

f. Enter a shared secret to encrypt data between the managed device (client) and the RADIUS server. The key you define in this field must match the Shared Secret key on the **RADIUS Authentication Settings** page inthe RADIUS server. Enter the key again in the **Confirm Key** field.

g. Select either "Routed" or "Specific Interface" and make a selection. Your choice here depends on how connectivity is established from the threat defense to the Duo RADIUS AAA server.

h. Save your changes.

Assign RADIUS Server Object to Connection Profile using Management Center

Procedure

Step 1 On the management center, choose **Devices** > **Remote Access**.

Step 2 Select an existing remote access VPN policy in the list and click the corresponding **Edit** icon.

Note You can assign the RADIUS server object when creating a new remote access VPN policy.

Step 3 Change the primary authentication method to Duo RADIUS in remote access VPN configuration.

a) Select a **Connection Profile** and click **Edit**.
b) Click the **AAA** tab.
c) In the **Authentication Server** list, select the Duo RADIUS server object you created.
d) Save your changes.

Step 4 Deploy the configuration changes. See the *Deploy Configuration Changes* section in the **Configuration Deployment** chapter of Cisco Secure Firewall Management Center Device Configuration Guide, X.Y.

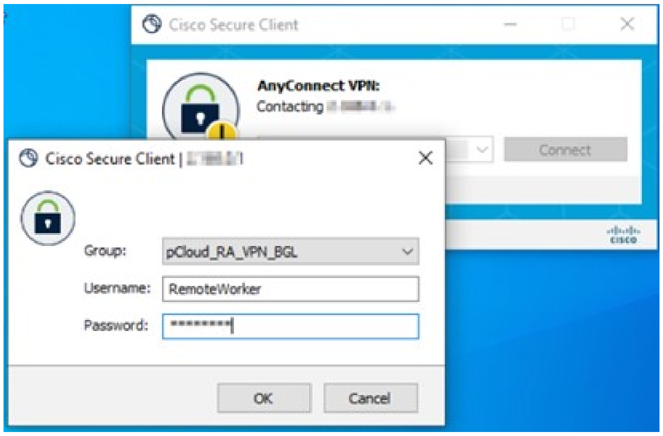
Test Your Connection

Procedure

Step 1 Launch the Cisco Secure AnyConnect client and select the VPN profile that now uses Duo RADIUS or Active Directory authentication.

Step 2 Enter the username and password and click **OK**.

You will receive an automatic passcode, push, sms, or phone call.



AnyConnect VPN:
Contacting [redacted]

Group: pCloud_RA_VPN_BGL
Username: RemoteWorker
Password: ********

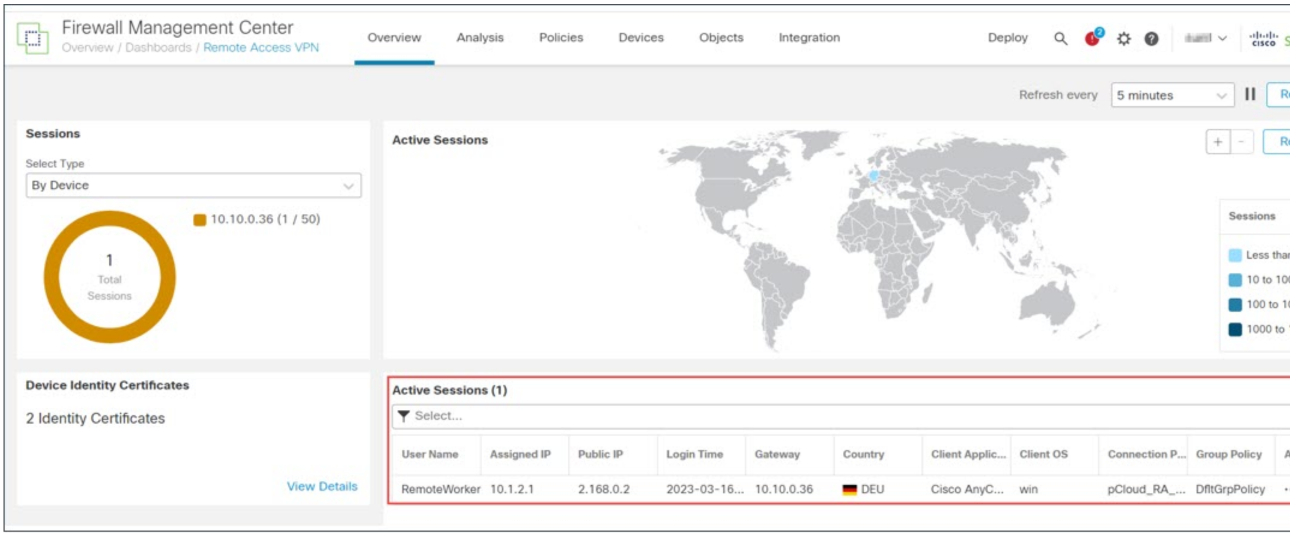
Step 3 Approve the Duo authentication request. The client is connected to the VPN.

Monitor Remote Access VPN Live Sessions on the Management Center

The management center provides a dashboard to monitor real-time data from active remote access VPN sessions on the devices. You can quickly determine problems related to user sessions and mitigate the problems for your network and users.

On the management center, choose **Overview** > **Remote Access VPN**.

The active session appears on the dashboard.



Active Sessions (1)

User Name	Assigned IP	Public IP	Login Time	Gateway	Country	Client Applic...	Client OS	Connection P...	Group Policy
RemoteWorker	10.1.2.1	2.168.0.2	2023-03-16...	10.10.0.36	DEU	Cisco AnyC...	win	pCloud_RA_...	DfltGrpPolicy

Troubleshoot Duo Authentication Proxy Configuration

Read the log file to resolve configuration issues.

- https://learn.microsoft.com/en-us/answers/questions/149890/unable-to-bind-or-log-into-ldap-using-specific-cre
- https://duo.com/docs/authproxy-reference#using-the-support-tool
- https://help.duo.com/s/article/1126?language=en_US
- https://help.duo.com/s/article/4758?language=en_US

Remote Worker is Unable to Connect to VPN

This section provides some diagnostic steps for remediating the connectivity issue faced by a remote worker.

- Check whether the Duo Admin Panel is receiving user authentication logs. See View Authentication Log Report in the Duo Admin Panel.

- Check whether the remote worker is receiving a notification from Duo. See Verify User Configuration with Duo Push.
- Check whether the threat defense can reach the primary authentication server. See Determine Threat Defense Connectivity with Authentication Server.

Note For general remote access VPN-related issues, see VPN Monitoring and Troubleshooting.

View Authentication Log Report in the Duo Admin Panel

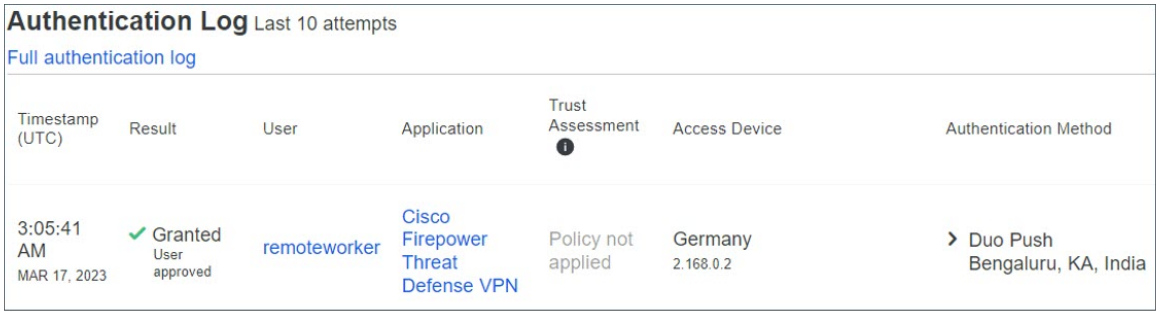
The Duo Admin Panel provides a dashboard showing whether the user's MFA authentication has passed or failed. These logs show where and how users authenticate, with usernames, location, time, type of authentication factor, and more.

Procedure

Step 1 Log in to the Duo Admin Panel.

Step 2 Click **Dashboard**.

Step 3 In the **Authentication Log** section, you can see the authentication logs.



Authentication Log Last 10 attempts

Full authentication log

Timestamp (UTC)	Result	User	Application	Trust Assessment ⓘ	Access Device	Authentication Method
3:05:41 AM MAR 17, 2023	✓ Granted User approved	remoteworker	Cisco Firepower Threat Defense VPN	Policy not applied	Germany 2.168.0.2	› Duo Push Bengaluru, KA, India

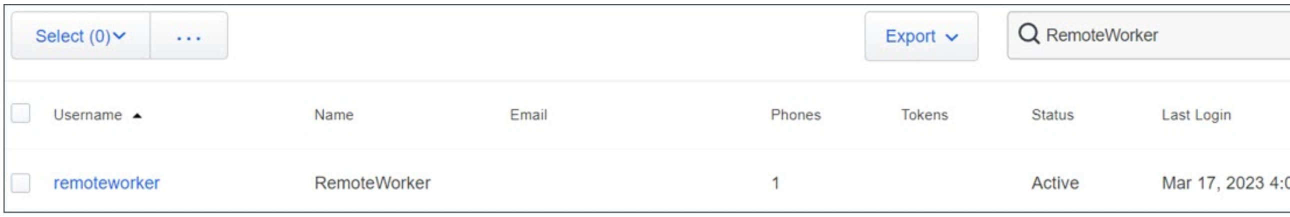
Verify User Configuration with Duo Push

You can send a Duo push token to a remote worker's smartphone from the Duo Admin Panel to verify whether their details are configured correctly.

Procedure

Step 1 Log in to the Duo Admin Panel.

Step 2 Click **Users** and searchfor the remote worker you want.

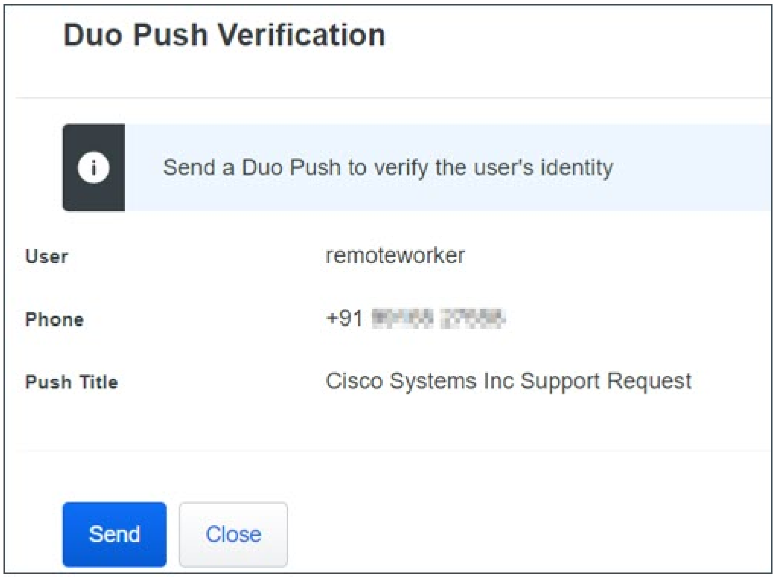


□	Username ▲	Name	Email	Phones	Tokens	Status	Last Login
□	remoteworker	RemoteWorker		1		Active	Mar 17, 2023 4:0

Step 3 Click the user name link to open the user details page.

Step 4 If the user has a smartphone attached with Duo Mobile activated, you will see a **Send Duo Push** link. If you don't see the link, you may need to assist the remote worker with activating their phone for Duo Push.

Step 5 Click the **Send Duo Push** link.



Duo Push Verification

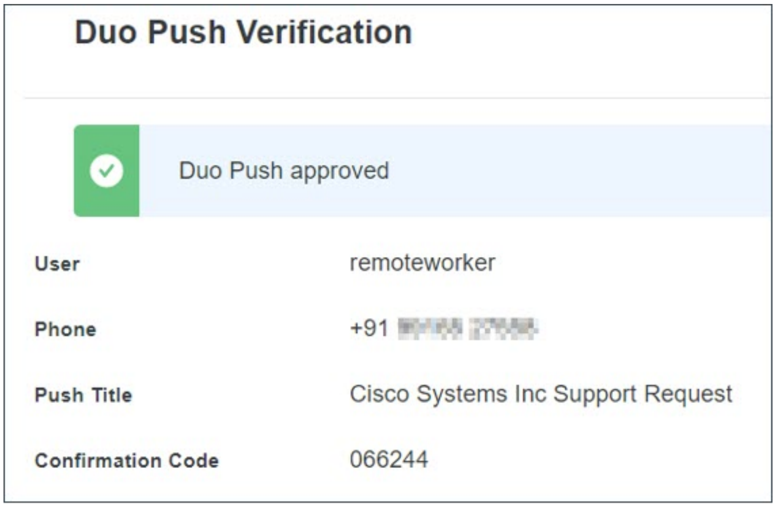
Send a Duo Push to verify the user's identity

User	remoteworker
Phone	+91 [redacted]
Push Title	Cisco Systems Inc Support Request

Step 6 Confirm the remote worker can access their device with Duo mobile application and then click **Send**.

The remote worker receives a notification on their smartphone if configured correctly.

Step 7 Once the remote worker confirms the request, you will receive a confirmation message.



Duo Push Verification

✓ Duo Push approved

User	remoteworker
Phone	+91 [redacted]
Push Title	Cisco Systems Inc Support Request
Confirmation Code	066244

Determine Threat Defense Connectivity with Authentication Server

Before you begin

This may occur when the threat defense cannot reach the primary authentication server.

For troubleshooting purposes, create a temporary user account in the authentication server and Duo Admin panel.

Procedure

Step 1 Log in to the threat defense CLI.

Step 2 Execute **system support diagnostic-cli**.

Step 3 Execute **show run aaa-server**.

```
> firepower# show run aaa-server
aaa-server Duo_RADIUS protocol radius
aaa-server Duo_RADIUS (management) host 10.10.0.34
 timeout 60
key *****
authentication-port 1812
accounting-port 1813
aaa-server Radius_ISE_Server protocol radius
aaa-server Radius_ISE_Server (management) host 10.10.0.28
key *****
authentication-port 1812
accounting-port 1813
```

Step 4 Copy the radius server object name. In this example, “Duo_RADIUS” is the name of the radius server object that contains the host information where the Duo Authentication Proxy is installed.

Step 5 Execute **test aaa authentication <radius server object name> host <host_ip_address>**.

radius_server_object_name	The name of the radius server object.

host_ip_address	The IP address of the host where Duo Authentication Proxy is installed.

Step 6 Enter the username and password of the temporary user account.

Step 7 You will receive a notification.

Step 8 If the device can reach the server, the following message appears:

INFO: Authentication Successful