Grandstream Networks, Inc.

OpenVPN® Authentication with RADIUS and Duo MFA

User Guide

Overview

This guide explains how to secure **OpenVPN® remote access** using **RADIUS authentication** with **Duo multi-factor authentication (MFA)**. Users will continue to log in with their existing VPN username and password, and Duo will add a second verification step (for example, Duo Push) before the VPN connection is allowed.

The router acts as the **OpenVPN® server** and sends authentication requests to the **Duo Authentication Proxy** using RADIUS. The Duo Authentication Proxy validates the user against your **RADIUS server**, then triggers Duo MFA and returns an "**accept**" or "**reject**" back to the router. This keeps the router configuration simple, because from the router's perspective, it is "**just RADIUS**".

This setup is useful when you want to:

- Add MFA to OpenVPN® without changing the user login experience
- Reduce risk from compromised credentials and password reuse
- Centralize authentication through RADIUS while enforcing Duo approval

In this guide, you will:

- Confirm you have a working **RADIUS server** (local or existing)
- Create a **Duo application** and enroll at least one user/device
- Install and configure the **Duo Authentication Proxy** (Windows® or Linux®)
- Configure the router to use a **RADIUS profile** that points to the Duo proxy

> ***The End Result:*** *OpenVPN® connections require both valid credentials **and** Duo MFA approval before the VPN session is established.*

Supported Devices and Prerequisites

Supported Devices

This guide applies to Grandstream routers that support running an **OpenVPN® server** and authenticating users via **RADIUS**. The router does not integrate with Duo directly. It only sends RADIUS authentication requests to a RADIUS endpoint (*in this guide, that endpoint is the Duo Authentication Proxy*).

The supported devices are the following Grandstream models:

Series / Devices	Models
Grandstream GWN700x Routers	GWN7001, GWN7002, GWN7003
Grandstream GCC601x Series	GCC6010W, GCC6010, GCC6011
Grandstream GCC602x Series	GCC6020, GCC6021

Supported Devices

Prerequisites

Before you start, make sure you have:

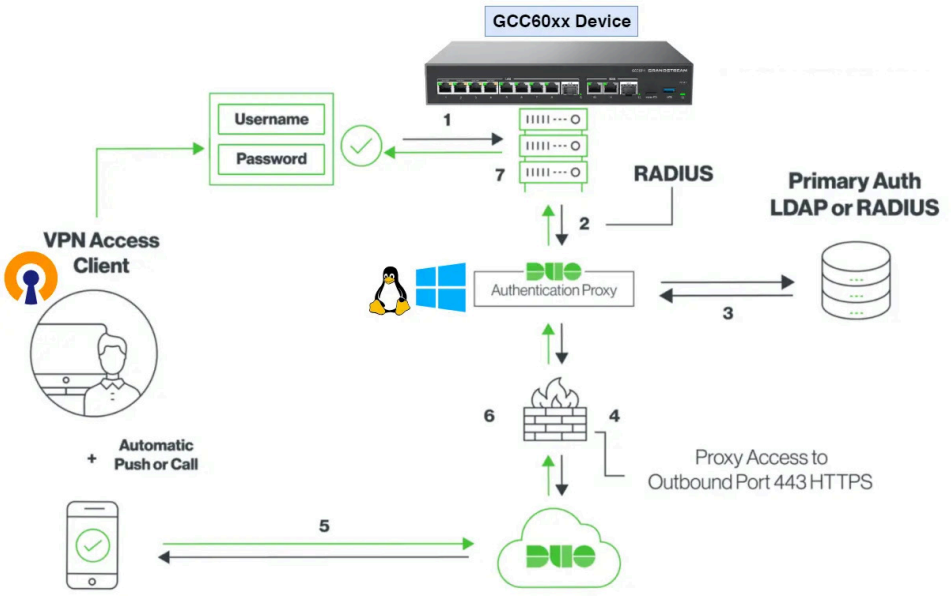
1. **A working RADIUS server** (*for example, FreeRADIUS*) with at least one test user.
2. A **Cisco Duo** tenant with admin access.
3. At least one **Duo user** enrolled with a second factor (for example, Duo Mobile).
4. A **Windows® or Linux®** machine/VM to run the **Duo Authentication Proxy**.

Topology and Authentication Flow

This deployment uses four main components:

- **VPN client** (user device running an OpenVPN® client: *e.g., OpenVPN® App*)
- **Grandstream router** (OpenVPN® server + RADIUS client)
- **Duo Authentication Proxy** (runs on Windows® or Linux®)
- **RADIUS server** (your primary username/password authentication source)

The router does not talk to Duo directly. It only talks **RADIUS**. Duo MFA is enforced by the **Duo Authentication Proxy**, which sits between the router and your RADIUS server.



Topology and Authentication Flow

High-level flow (what happens when a user connects):

1. **User starts VPN login**: The user enters their VPN username and password in the OpenVPN® client.
2. **Router forwards the login via RADIUS**: The router (OpenVPN® server) sends the credentials as a RADIUS Access-Request to the Duo Authentication Proxy.
3. **Proxy validates the username/password (Primary Auth)**: The Duo Authentication Proxy forwards the authentication request to the RADIUS server to confirm the credentials are correct.
4. **Proxy triggers Duo MFA**: If primary authentication succeeds, the proxy contacts Duo Cloud over HTTPS (TCP 443 outbound) to request MFA approval.
5. **User approves MFA**: Duo sends the MFA request to the user (typically Duo Push, or passcode/phone call depending on policy).
6. **Duo returns the MFA result to the proxy**: Duo Cloud sends "**approved**" or "**denied**" back to the Duo Authentication Proxy.
7. **Proxy returns the final result to the router**: The proxy sends a RADIUS Accept (approved) or RADIUS Reject (denied) to the router.

Key points to remember:

- The **router only needs a RADIUS profile** pointing to the Duo Authentication Proxy.
- Duo MFA is enforced by the **proxy**, not by the router.
- The **proxy must be reachable by the router** (RADIUS) and must have **outbound HTTPS (443)** access to Duo Cloud.
- The **RADIUS server** is still required, because it is the primary authentication source for username/password.

Ports used (typical defaults):

- Router → Duo Authentication Proxy: **RADIUS (UDP 1812)**
- Duo Authentication Proxy → Duo Cloud: **HTTPS (TCP 443 outbound)**
- Duo Authentication Proxy → RADIUS server: **RADIUS (UDP 1812)**

Step 1: RADIUS Server Configuration

Duo MFA does not replace the username and password check. The Duo Authentication Proxy still needs a RADIUS server to validate the user's credentials first, then Duo adds the second-factor approval.

> *If you already have a working RADIUS server, skip this step. Before continuing, make sure you have the **RADIUS server IP/hostname**, the **RADIUS port** (typically UDP 1812), **the shared secret**, and a **test username/password** that can authenticate successfully.*

1. **Install FreeRADIUS and the test tool (Ubuntu):**

```
sudo apt update
sudo apt install -y freeradius freeradius-utils
```

2. **Edit the RADIUS client configuration:**

```
sudo vim /etc/freeradius/3.0/clients.conf
```

Add the following block to the file, then save and exit (`i` → paste → `Esc` → `:wq` → Enter).

> *The `secret` value must **match** the **secret** you configure later in the **Duo Authentication Proxy**.*

```
client all {
    ipaddr = 0.0.0.0/0
    secret = password
}
```

> ***Note:** Setting `ipaddr = 0.0.0.0/0` allows RADIUS requests from **any** IP address. Use this **only** for isolated lab testing. In production, **do not** use `0.0.0.0/0`; restrict `ipaddr` to the **Duo Authentication Proxy IP address** (or the specific authorized RADIUS client IPs) to prevent unauthorized access.*

3. **Create a test user:**

```
sudo vim /etc/freeradius/3.0/users
```

Add the following lines to the file, then save and exit. This creates a temporary test account (username `gcc_duo`, password `admin123`) used to verify RADIUS is working; remove it after the full Duo flow is confirmed.

```
gcc_duo Cleartext-Password := "admin123"
    Reply-Message := "Hello, %{User-Name}"
```

Reply-Message is an optional success message returned by FreeRADIUS. `%{User-Name}` is replaced by the authenticating username, so the reply becomes `Hello, gcc_duo`. This helps confirm the test is working.

4. **Start FreeRADIUS (leave it running while testing):**

```
sudo freeradius
```

5. **Test authentication:**

```
radtest gcc_duo admin123 <RADIUS_SERVER_IP>:1812 0 password
```

> *`<RADIUS_SERVER_IP>` is the RADIUS server IP address. If the test succeeds, you should see `Access-Accept` and a reply message similar to `Hello, gcc_duo`.*

> *If the connection fails, confirm the server IP is correct and reachable. If authentication fails, verify the username/password and the shared secret match what you configured in `users` and `clients.conf`.*

Step 2: Duo Application and User Enrollment

In this step, you set up Cisco Duo so it can enforce MFA for OpenVPN® logins later (*Step 3*). You will access or create a Duo tenant, create a Duo application to obtain the integration values, and add a Duo user and enroll their phone with Duo Mobile so they can approve MFA requests.

> *By the end of Step 2, you should have the following ready for Step 3: **Client ID**, **Client secret**, and **API hostname**, plus at least one enrolled Duo user.*

2.1 Register or sign in to your Duo Admin Panel

Duo configuration is done in the Duo Admin Panel (web). If you already have a Duo tenant, sign in and continue to the next section. If you do not have one yet, create one or use the free trial.

Open the Duo Admin sign-in page: **https://admin.duosecurity.com/login**

2.2 Install Duo Mobile on the user phone

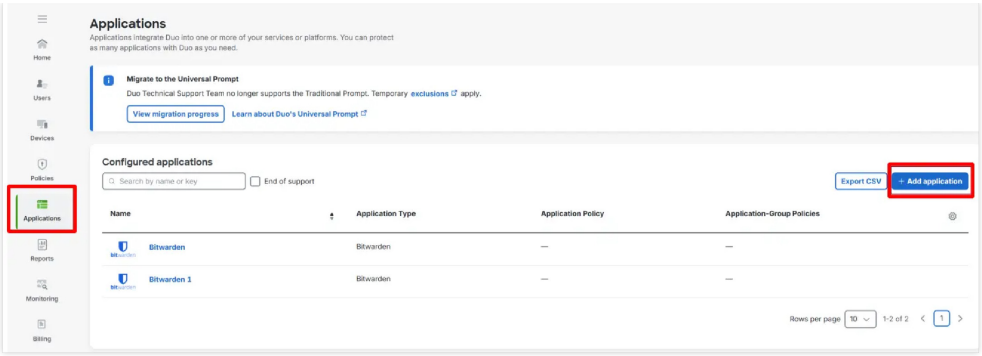
Duo Mobile is the second factor in this setup. When a VPN user logs in successfully with their username and password (validated by RADIUS), Duo sends an approval request to the user's phone (Duo Push) or expects a passcode, depending on policy. No phone enrollment means no MFA approval, which means no VPN access.

Install Duo Mobile from the official store: **iOS® (App Store)** or **Android® (Google Play)**

2.3 Create the Duo application (integration)

You need a Duo application so that Duo generates the integration values used by the Duo Authentication Proxy in *Step 3*.

In the Duo Admin Panel, open **Applications** and click **Add application**.

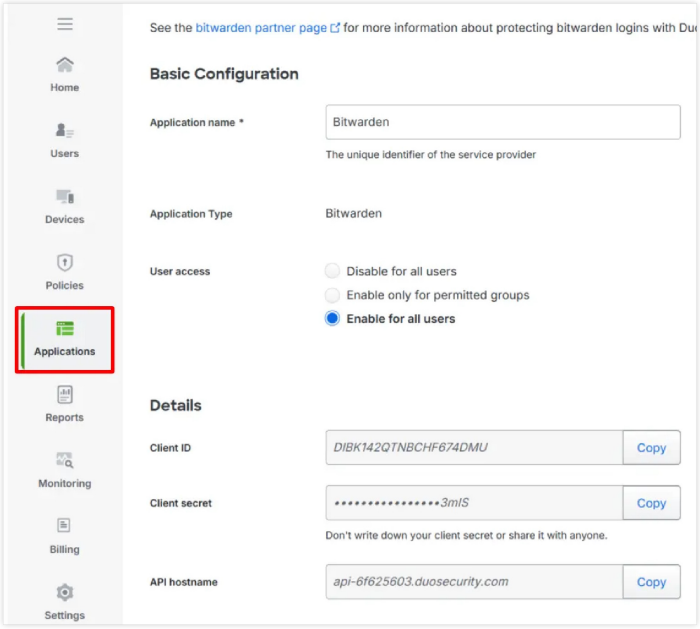


Create the Duo application integration

Search for the application template you want to use (your example uses "**Bitwarden**"), then select the entry with the **2FA** label and add it. After adding it, open the application from the Applications list.

On the application page, scroll to **Details** and locate: **Client ID**, **Client secret,** and **API hostname**.

> *These values are required in Step 3.*



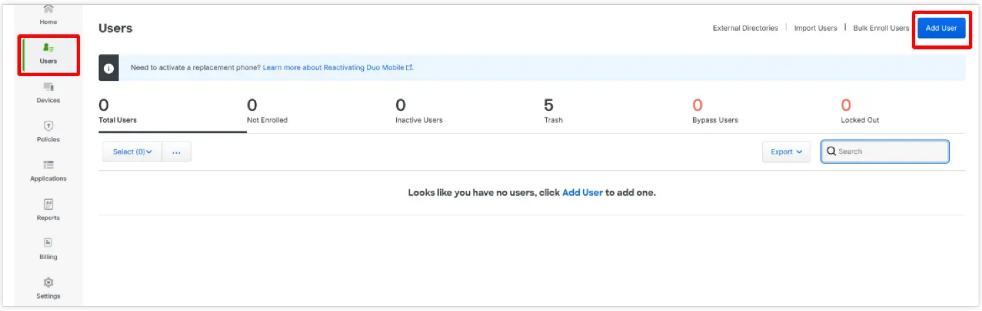
Client ID Client secret and API hostname

> ***Important: Client ID** becomes `ikey`, **Client secret** becomes `skey`, and the **API hostname** becomes `api_host` in the Duo Authentication Proxy configuration.*

2.4 Add a Duo user

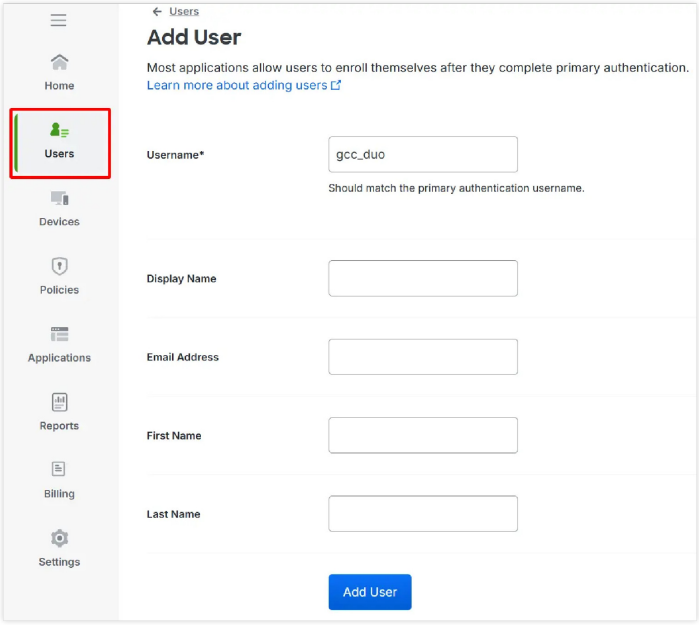
Now, create a Duo user who will receive the MFA prompt during VPN login.

Open **Users** and click **Add User**.



Add a Duo user

Enter the username and save.

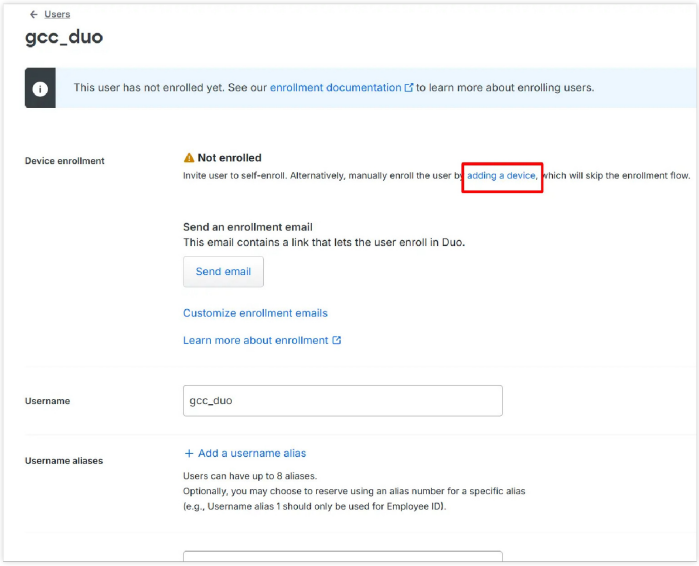


Username

> ***Important:*** *The username must* ***match*** *the username in your RADIUS server (Step 1).*

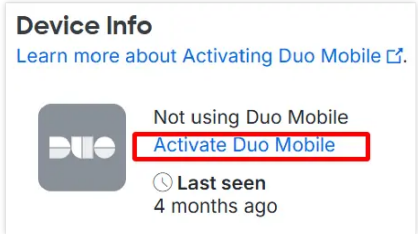
2.5 Enroll the phone and activate Duo Mobile

Open the user you created. If the user shows **Not enrolled**, click **adding a device** to start enrollment.



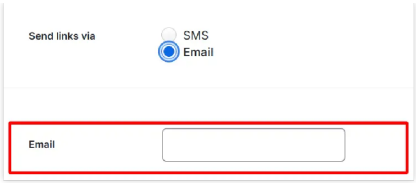
Enroll the phone and activate Duo Mobile

On the device section, choose **Activate Duo Mobile**.



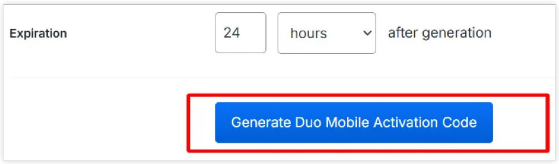
Activate Duo Mobile

Choose how you want to deliver activation (e.g. *Email or SMS*), then enter the user's email address.



Email or SMS

Generate the activation code/link.



Generate the activation codelink

On the phone, open Duo Mobile and complete activation (this is typically done by scanning a QR code or opening an activation link, depending on what Duo presents). Once completed, the user becomes enrolled and can approve MFA prompts.

Step 3: Duo Authentication Proxy Configuration

In this step, you install and configure **the Duo Authentication Proxy**. **The router (OpenVPN® server)** will send **RADIUS authentication** requests to **the proxy**. **The proxy** validates the username and password against your **RADIUS server** (Step 1), then triggers **Duo MFA** using the **Duo application** you created (Step 2).

For more details, check the Duo Authentication Proxy reference: https://duo.com/docs/authproxy_reference

3.1 Install Duo Authentication Proxy

Install the Duo Authentication Proxy on a Windows® or Linux® machine/VM that is reachable from the router and can reach both the RADIUS server and Duo Cloud.

Windows® download: https://dl.duosecurity.com/duoauthproxy-latest.exe

> ***Note**: Linux® is also supported. The configuration concepts and file sections are the same; only the installation method and file path differ.*

3.2 Open the proxy configuration file

The proxy is configured using `authproxy.cfg`. After making changes, the Duo Authentication Proxy must be restarted for the changes to take effect.

The configuration is organized into sections:

- **CLIENTS**: where **the proxy** sends primary authentication (**RADIUS** in this guide)
- **SERVERS**: how **the proxy** accepts requests from **the router** and enforces Duo MFA

3.3 Configure primary authentication (RADIUS server)

Add a `radius_client` section that points to **the RADIUS server** you configured in **Step** 1.

Example:

```
[radius_client]
host=192.168.70.249
secret=password
pass_through_all=true
```

> ***Note:*** *Replace* `host` *and* `secret` *with the* ***same RADIUS server IP/hostname*** *and shared secret you used in* ***Step 1****.*

3.4 Configure Duo MFA enforcement for the router

Add a `radius_server_auto` **section**. This section allows the proxy to accept **RADIUS** requests from the **router (OpenVPN® server)**, then perform **Duo MFA**.

Example:

```
[radius_server_auto]
ikey=AAAA1111BBBBBBB111CCC
skey=0000000AAAAAA0000000AAAAAA00000AAAAA11111
api_host=api-xxx.duosecurity.com
radius_ip_1=192.168.70.23
radius_secret_1=password
failmode=safe
client=radius_client
port=1812 (Note: defaults to 1812 if not specified)
```

> ***Note:*** *Replace* `ikey` *,* `skey` *, and* `api_host` *with the* ***Client ID****,* ***Client secret****, and* ***API hostname*** *from the* ***Duo application*** *you created in* ***Step 2****. Replace* `radius_ip_1` *with the IP address of the* ***router/OpenVPN server*** *that will send* ***RADIUS requests*** *to* ***this proxy****, and set* `radius_secret_1` *to the shared secret you will also configure on* ***the router in Step 4****. Keep* `client=radius_client` *as-is because it must* ***match*** *the* `[radius_client]` *section name you configured in* ***section 3.3****, so the proxy knows which RADIUS server to use for primary authentication.*

> ***Note:*** `failmode` *controls what happens if the Duo service is unreachable.* `failmode=safe` *allows authentication to continue (fail open) when Duo cannot be contacted, which improves availability but reduces security during an outage. Use* `failmode=secure` *to deny authentication when Duo is unavailable (fail closed) for stricter enforcement.*

3.5 Restart the Duo Authentication Proxy

After saving `authproxy.cfg` , **restart** the Duo Authentication Proxy service so the new configuration takes effect. Once the proxy is running with the updated configuration, continue to **Step 4** to configure the router to send RADIUS authentication requests to the Duo Authentication Proxy.

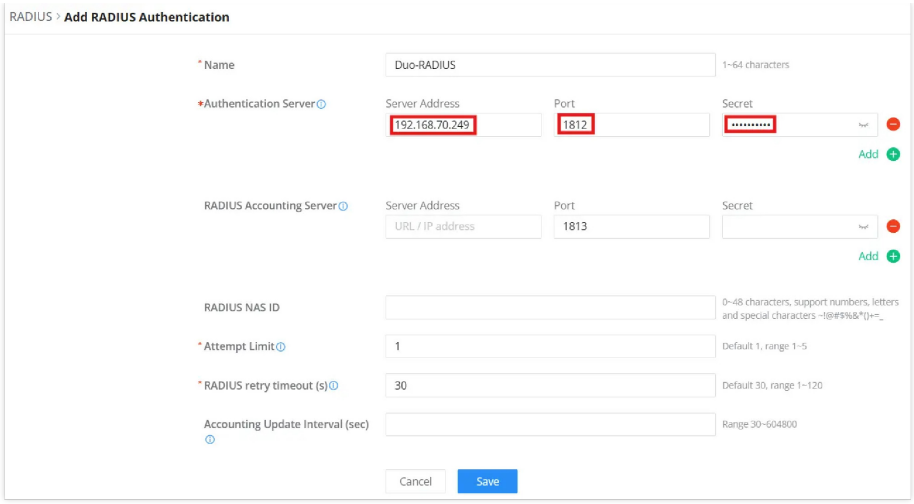
Step 4: Configure OpenVPN® on the Router

This step connects the OpenVPN® deployment to the Duo MFA flow. The router authenticates OpenVPN® users using **RADIUS**, and the **RADIUS** requests are sent to the **Duo Authentication Proxy**. The proxy validates the **username and password** against your primary authentication source (**RADIUS**) and then triggers **Duo MFA** approval.

To make this work end-to-end, **three items must align**: **the router RADIUS profile**, **the OpenVPN® server authentication mode**, and **the OpenVPN® client configuration**.

4.1 Create a RADIUS profile (Duo Authentication Proxy)

In the router web interface, open the RADIUS configuration page and add a new authentication profile.



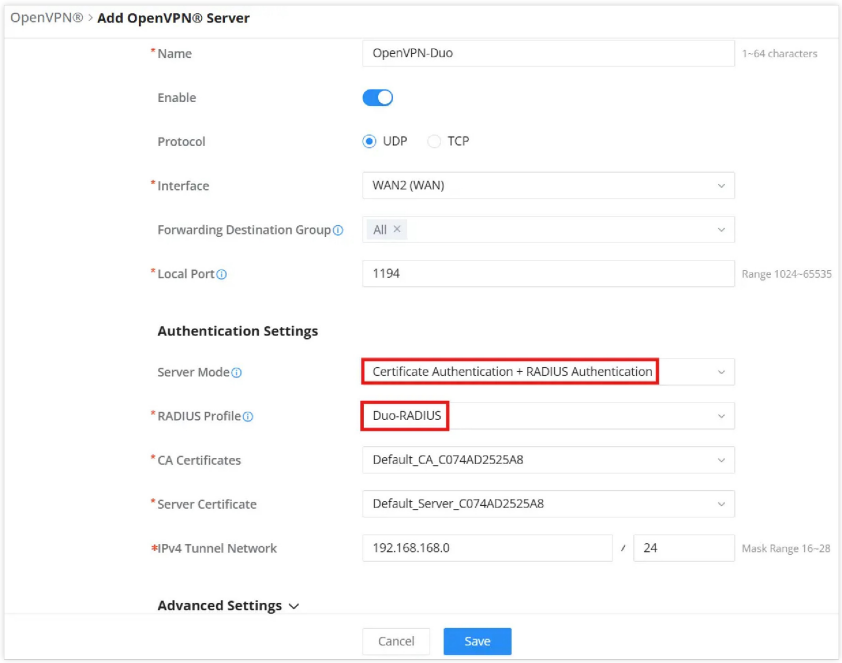
Add a RADIUS Profile

In **the Authentication Server fields**, enter the details of the machine running **Duo Authentication Proxy**:

Server Address: Duo Authentication Proxy IP/hostname
Port: 1812 (unless changed on the proxy)
Secret: the shared secret configured on the Duo Authentication Proxy for this router

4.2 Configure the OpenVPN server to use the RADIUS profile

Open the OpenVPN server settings on the router and create a new server (or edit the one you will use).



OpenVPN® Server Configuration

In the authentication settings, configure the Duo-related options:

Set Server Mode to **Certificate Authentication + RADIUS Authentication**.
Select RADIUS Profile and choose **Duo-RADIUS**.
Select the required CA certificate and server certificate.

This server mode enforces both certificate validation and a successful RADIUS login. Duo MFA is triggered during the RADIUS login step because the router sends the authentication request to the Duo Authentication Proxy.

4.3 Client requirements (to ensure Duo MFA is triggered)

Duo MFA is triggered only when the OpenVPN® connection includes a username and password that can be verified through RADIUS. The client must be configured to send credentials during connection.

Client authentication method
Select the client authentication method based on how the OpenVPN® server is configured:

If the server uses username/password authentication only, configure the client for **User Authentication**.
If the server uses certificates in addition to username/password authentication, configure the client for **Certificate + User Authentication**.

`.ovpn` profile requirement (PC/phone clients)
If clients connect using an exported `.ovpn` profile, ensure the profile includes the following directive:

```
auth-user-pass
```

This directive forces the OpenVPN® client to prompt for a username and password when connecting. Without it, the client may not send credentials, RADIUS authentication will not occur, and Duo MFA will not be triggered.

Router-to-router clients
If the OpenVPN® client is another router, select **User Authentication** or **Certificate + User Authentication** to match the server mode. The client must provide a username and password during connection so the server can perform RADIUS authentication and trigger Duo MFA.

> ***Expected user experience:***
> *When connecting, the user enters their **RADIUS username and password**. After credentials are submitted, Duo prompts the user to approve **the login in Duo Mobile**. The VPN connection is established only after **both the password verification and Duo approval succeed**.*

References

Standard OpenVPN® configuration and client setup: **VPN Guide**

Duo RADIUS documentation (Authentication Proxy + RADIUS behavior): **https://duo.com/docs/radius**
