



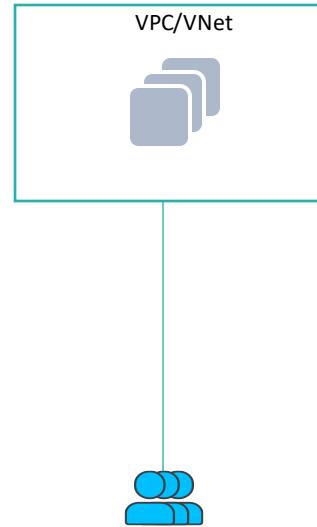
User VPN

ACE Team

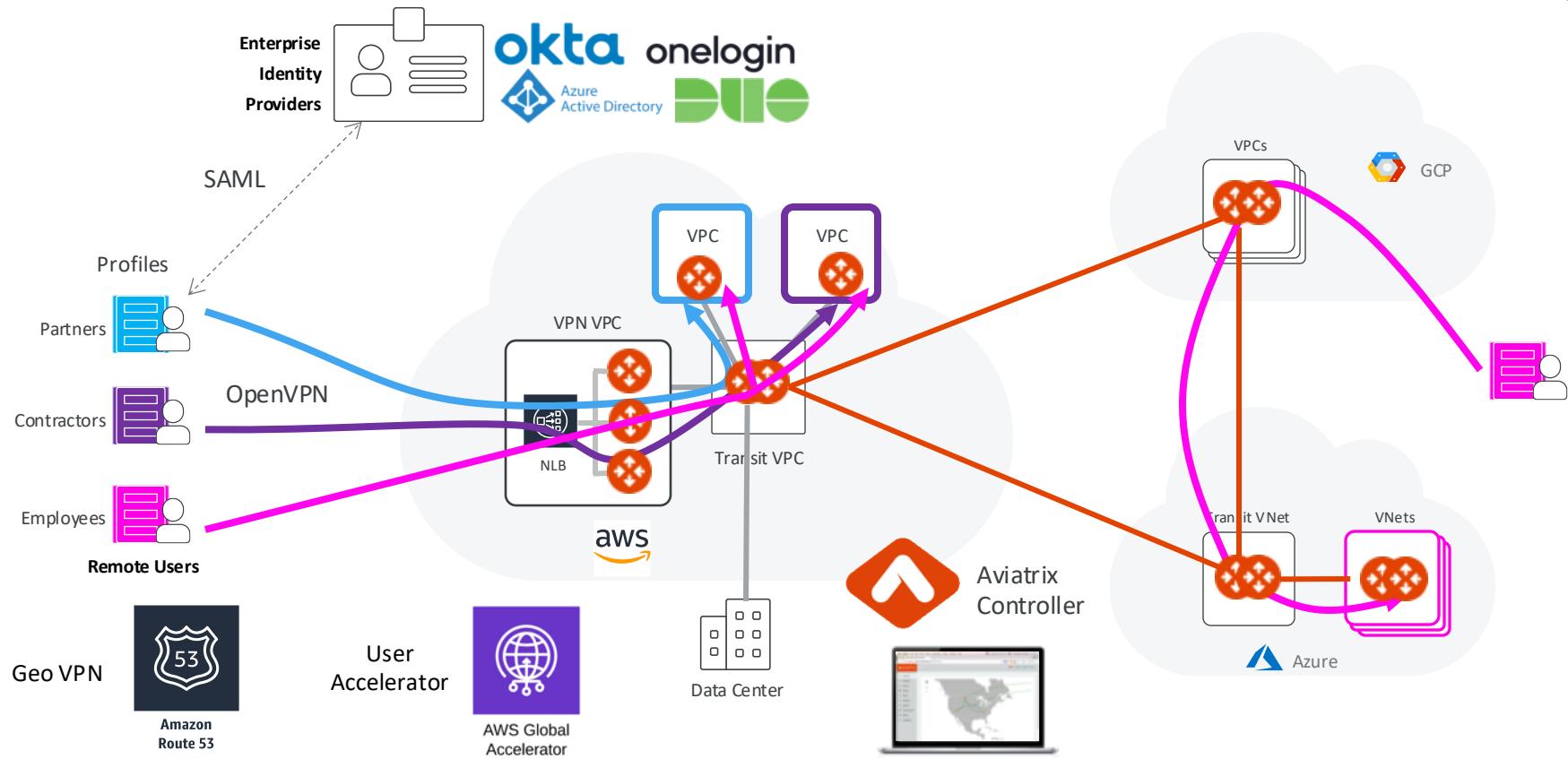


Problem Statement

- Connect **users/partners/developers** securely and seamlessly to public cloud resources
- **Least latency** accessing the cloud resources
- Cloud-native: **should not backhaul** to on-premises Data Center first
- Enterprise-grade: **Identity Provider** integration
- **Multicloud** repeatability



User VPN Overview



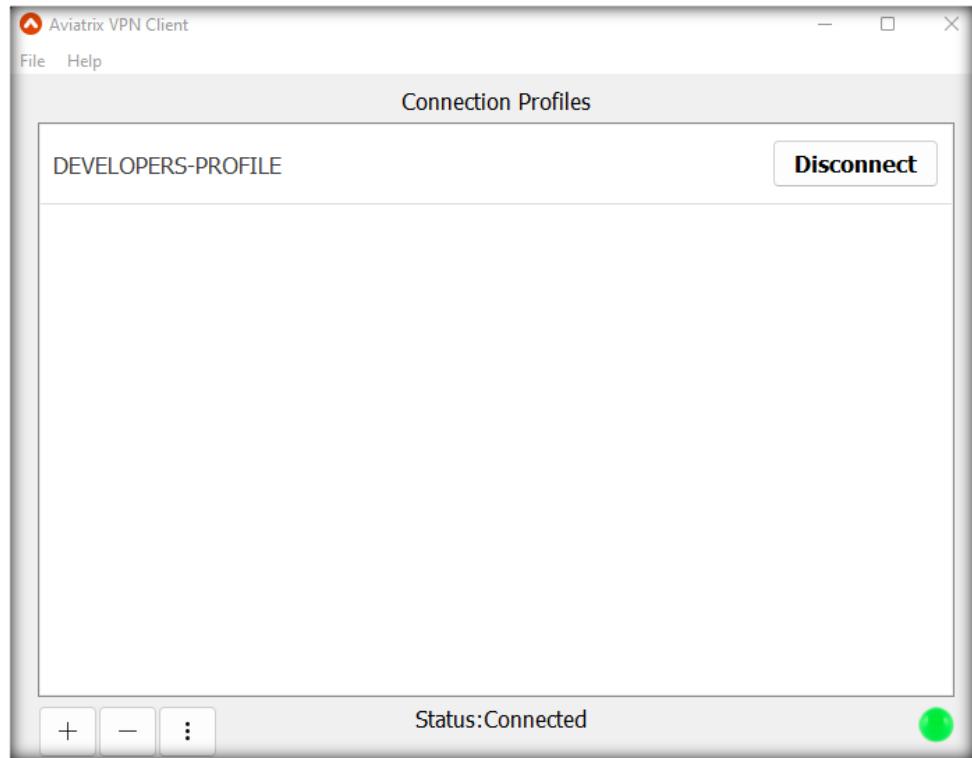
Client Software

- OpenVPN Client

- All OpenVPN client software are supported. The supported clients are macOS, Windows iOS, Android, Chromebook, Linux and BSD

- Aviatrix VPN Client

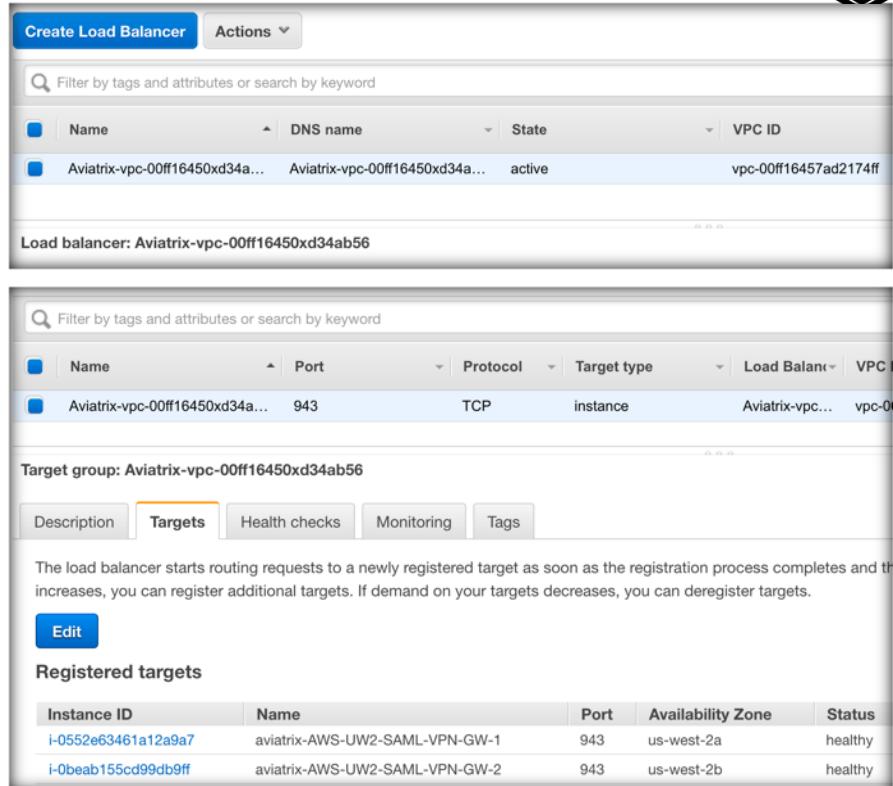
- Aviatrix VPN Client supports macOS, Windows, Linux Debian distribution, and BSD distribution
- Choose Aviatrix VPN Client if you require SAML authentication directly from VPN client software



<https://docs.aviatrix.com/previous/documentation/latest/aviatrix-openvpn/download-vpn-client.html>

Automated Load Balancer

- The controller automatically launches a cloud-native load balancer based on the cloud type
- Automates target groups to attach Aviatrix VPN gateways to the LB
- The domain name of the cloud provider's load balancer, such as AWS ELB, will be the connection when a VPN user connects to the VPN gateway
- Seamless relaunch of VPN Gateways after deletion without reissuing a new .ovpn cert file



The screenshot displays two main sections of the Aviatrix interface:

Create Load Balancer: This section shows a table for creating a new load balancer. A single row is present, representing an Aviatrix VPN gateway. The columns include Name, DNS name, State, and VPC ID.

Name	DNS name	State	VPC ID
Aviatrix-vpc-00ff16450xd34a...	Aviatrix-vpc-00ff16450xd34a...	active	vpc-00ff16457ad2174ff

Load balancer: Aviatrix-vpc-00ff16450xd34ab56

Target group: Aviatrix-vpc-00ff16450xd34ab56

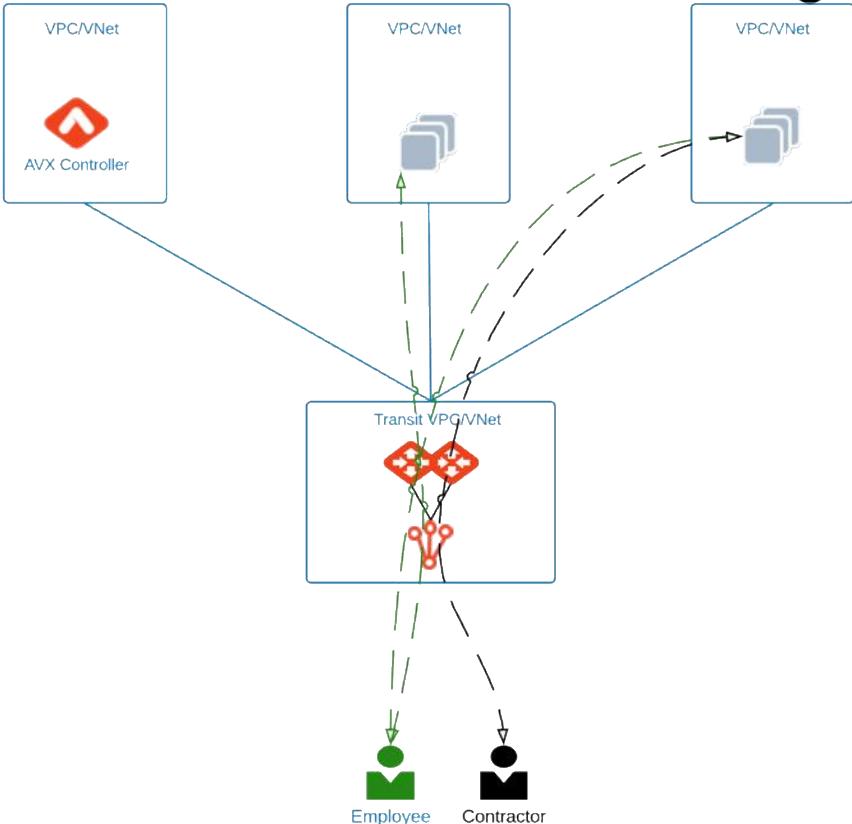
This section shows the configuration of a target group. It includes tabs for Description, Targets (which is selected), Health checks, Monitoring, and Tags. A note states: "The load balancer starts routing requests to a newly registered target as soon as the registration process completes and there increases, you can register additional targets. If demand on your targets decreases, you can deregister targets."

Registered targets:

Instance ID	Name	Port	Availability Zone	Status
i-0552e63461a12a9a7	aviatrix-AWS-UW2-SAML-VPN-GW-1	943	us-west-2a	healthy
i-0beab155cd99db9ff	aviatrix-AWS-UW2-SAML-VPN-GW-2	943	us-west-2b	healthy

Profile-Based Security Policies

- A user is dynamically assigned a virtual IP address when connected to a gateway
- Isolation between employees, contractors, partners, or developers
- Supports multiple profiles
- Automated firewall rules
- Security based on user not source IP
- The security policy is dynamically pushed to the landing Aviatrix VPN gateway when a VPN user connects
- It is only active when a VPN user is connected
- When a VPN user disconnects, the security policy is deleted from the VPN gateway





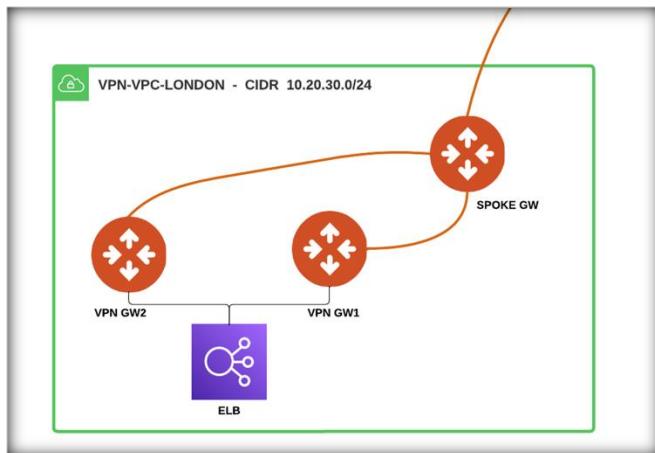
Secure Assertion Markup Language

- Supports IDPs like Azure AD, Okta, Duo, Office 365
- User accounts are onboarded on the IDP portal
- Users can be onboarded on Aviatrix controller if SAML is not required



Ad-hoc VPN VPC

- Create a dedicated VPC
 - Select the **Default** VPC (i.e. Spoke VPC)
- This VPC will host the User-VPN Gateways, the ELB and the Spoke Gateways



Create VPC/VNet

Name: **VPN-VPC-LONDON**

Cloud: **aws Standard** (selected)

Account: **aws-account**

Region: **eu-west-2 (London)**

VPC CIDR: **10.20.30.0/24**

VPC Function: **Default** (highlighted with a red box and arrow)

Advanced Settings

Cancel **Save**

This screenshot shows the 'Create VPC/VNet' configuration interface. The 'Cloud' section is set to 'aws Standard'. The 'Account' is 'aws-account' and the 'Region' is 'eu-west-2 (London)'. The 'VPC CIDR' is '10.20.30.0/24'. The 'VPC Function' dropdown is set to 'Default', which is highlighted with a red box and a red arrow points to it from below. At the bottom, there are 'Cancel' and 'Save' buttons.

Default VPN Gateways and ELB Creation

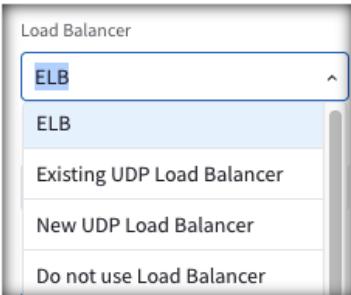


- Configure one or more VPN Gateways

- Each VPN Gateway must be configured with its own **VPN CIDR Block**
- When a VPN user connects to the VPN gateway, the user will be assigned a virtual IP address from the VPN CIDR Block
- The default IP address pool is **192.168.43.0/24**

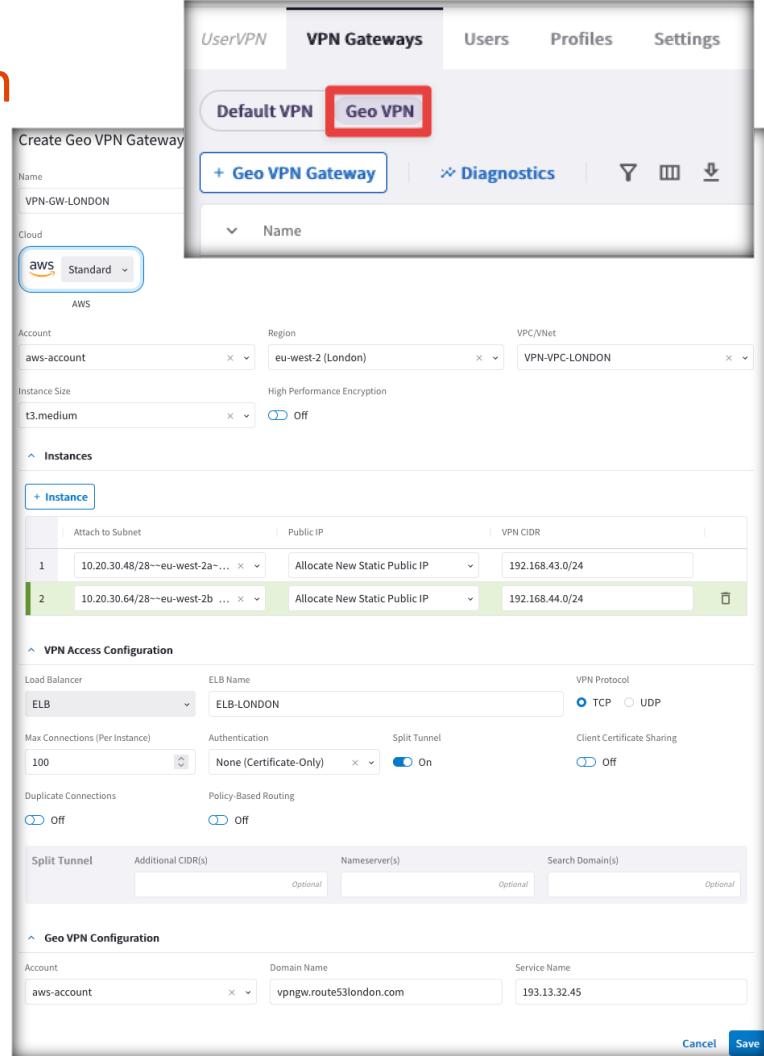
- The ELB template is pre-configured by default

- Depending on the cloud type you selected, you can select:
 - ELB**
 - Existing UDP Load Balancer**
 - New UDP Load Balancer**
 - No Load Balancer**



Geo VPN Gateways and ELB Creation

- Configure one or more VPN Gateways
 - Each VPN Gateway must be configured with its own **VPN CIDR Block**
 - When a VPN user connects to the VPN gateway, the user will be assigned a virtual IP address from the **VPN CIDR Block**
 - The default IP address pool is **192.168.43.0/24**
- The ELB template is pre-configured by default
- Geo VPN configuration options:
 - Domain Name: this domain name must be hosted by AWS Route53
 - VPN Service: the hostname that users will connect to



The screenshot shows the Aviatrix Cloud interface for creating a Geo VPN Gateway. The top navigation bar includes tabs for UserVPN, VPN Gateways (which is selected and highlighted in red), Users, Profiles, and Settings. Below the navigation is a sub-header with 'Default VPN' and 'Geo VPN' buttons, with 'Geo VPN' being the active tab.

The main form is titled 'Create Geo VPN Gateway' and contains the following fields:

- Name:** VPN-GW-LONDON
- Cloud:** AWS (Standard)
- Account:** aws-account
- Region:** eu-west-2 (London)
- VPC/VNet:** VPN-VPC-LONDON
- Instance Size:** t3.medium
- Encryption:** High Performance Encryption (Off)
- Instances:** A table showing two instances:

	Attach to Subnet	Public IP	VPN CIDR
1	10.20.30.48/28~~eu-west-2a~...	Allocate New Static Public IP	192.168.43.0/24
2	10.20.30.64/28~~eu-west-2b ...	Allocate New Static Public IP	192.168.44.0/24
- VPN Access Configuration:**
 - Load Balancer: ELB
 - ELB Name: ELB-LONDON
 - VPN Protocol: TCP (selected)
 - Max Connections (Per Instance): 100
 - Authentication: None (Certificate-Only)
 - Split Tunnel: On
 - Duplicate Connections: Off
 - Policy-Based Routing: Off
- Geo VPN Configuration:**
 - Account: aws-account
 - Domain Name: vpngw.route53london.com
 - Service Name: 193.13.32.45

At the bottom right are 'Cancel' and 'Save' buttons.

Create the Spoke GW inside the VPN VPC

- After the VPN Gateways deployment:
 - >Create the Spoke Gateway inside the VPN VPC
 - The Aviatrix Controller will take care of the routing between the VPN Gateway and the Spoke Gateway
 - Attach the Spoke Gateway to any Transit Gateways such that the VPN Gateway will be able to be interconnected to the MCNA

Create Spoke Gateway

Name: SPOKE-GW-LONDON

Cloud: AWS (Standard) selected, Azure, GCP, OCI, Alibaba

Account: aws-account

Region: eu-west-2 (London)

VPC/VNet: VPN-VPC-LONDON (highlighted with a red box)

Instance Size: t3.micro

High Performance Encryption: Off

Attach To Transit Gateway: AVX-AWS-TRANSIT-GW

Advanced Settings

BGP: Off

Instances

+ Instance

	Attach to Subnet	Public IP
1	10.20.30.48/28~~eu-west-2a~~VPN-VPC-LONDON-Publi... (highlighted with a red box)	Allocate New Static Public IP

Cancel Save

Create a VPN Profile

- The profile-based security policy lets you define security rules to a target address, protocol, and ports.
- The default rule for a profile can be configured as deny all or allow all during profile creation.
- This capability allows flexible firewall rules based on the users, instead of a source IP address.

Create Profile

Name

Allow All Deny All

+ Deny Rule

	Target CIDR	Protocol	Port
1	10.1.1.64/28	ALL	x 0:65535
2	10.1.1.48/28	ALL	x 0:65535
3	10.1.2.48/28	ALL	x 0:65535

User

Cancel **Save**

Create a VPN User

- After at least one gateway is created, you can add VPN users.
- As soon as a user is created, an email is sent from right away to the recipient, with instructions on how to download client software and connect to a VPN server
- If you would like to assign user profile-based policies, you need to create profiles first

Create VPN User

Name

Email

VPN Gateway

Base Policy

Allow All Deny All

Profile

Cancel Save

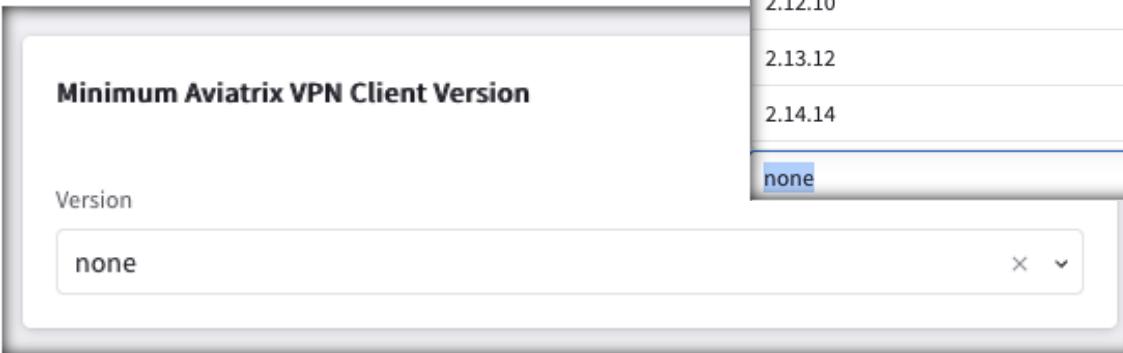
Preserve Client IP

- Client IP can be preserved up to the application
- NAT needs to be disabled on the VPN gateway
- VPN CIDRs must be advertised to the transit for return traffic, from the Spoke Gateway

A screenshot of a UI dialog box with a light gray background and a thin gray border. At the top, the title "Customize Spoke Advertised VPC/VNet CIDRs" is displayed in bold black font, followed by a question mark icon. Below the title, the label "CIDRs" is shown. A horizontal list of three CIDR blocks is present, each enclosed in a light gray button-like box with a close "X" icon on its right side. The CIDRs listed are "192.168.43.0/24", "192.168.44.0/24", and "10.20.30.0/24".

Minimum Client Version & Duplicate Connections

- Enforcement of Minimum VPN Client Version
- Duplicate Connections
 - User can connect simultaneously from multiple devices
 - When disabled, simultaneous sessions are not allowed, and existing VPN connection gets disconnected



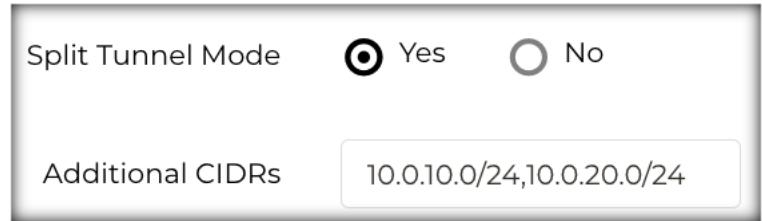
The screenshot shows a configuration dialog box with the title "Minimum Aviatrix VPN Client Version". Inside the dialog, there is a dropdown menu labeled "Version" with the value "none". Above the dropdown, a list of available versions is displayed in a scrollable window:

- none
- 2.4.10
- 2.5.7
- 2.6.6
- 2.7.9
- 2.8.2
- 2.9.6
- 2.10.7
- 2.11.6
- 2.12.10
- 2.13.12
- 2.14.14

Split Tunnel or Full Tunnel

- **Split Tunnel**

Only specified CIDRs ranges go through the VPN tunnel



- **Full Tunnel**

All user IP sessions including Internet browsing go through the VPN tunnel

```
[umair@umair-mbp ~ % ifconfig utun5
utun5: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
        inet 192.168.44.6 --> 192.168.44.5 netmask 0xffffffff
[umair@umair-mbp ~ % netstat -r
Routing tables

Internet:
Destination      Gateway          Flags      Netif Expire
default          192.168.1.1    UGScg      en0
10.0.10/24       192.168.44.5   UGSc      utun5
10.0.20/24       192.168.44.5   UGSc      utun5
```

Gateway Failover

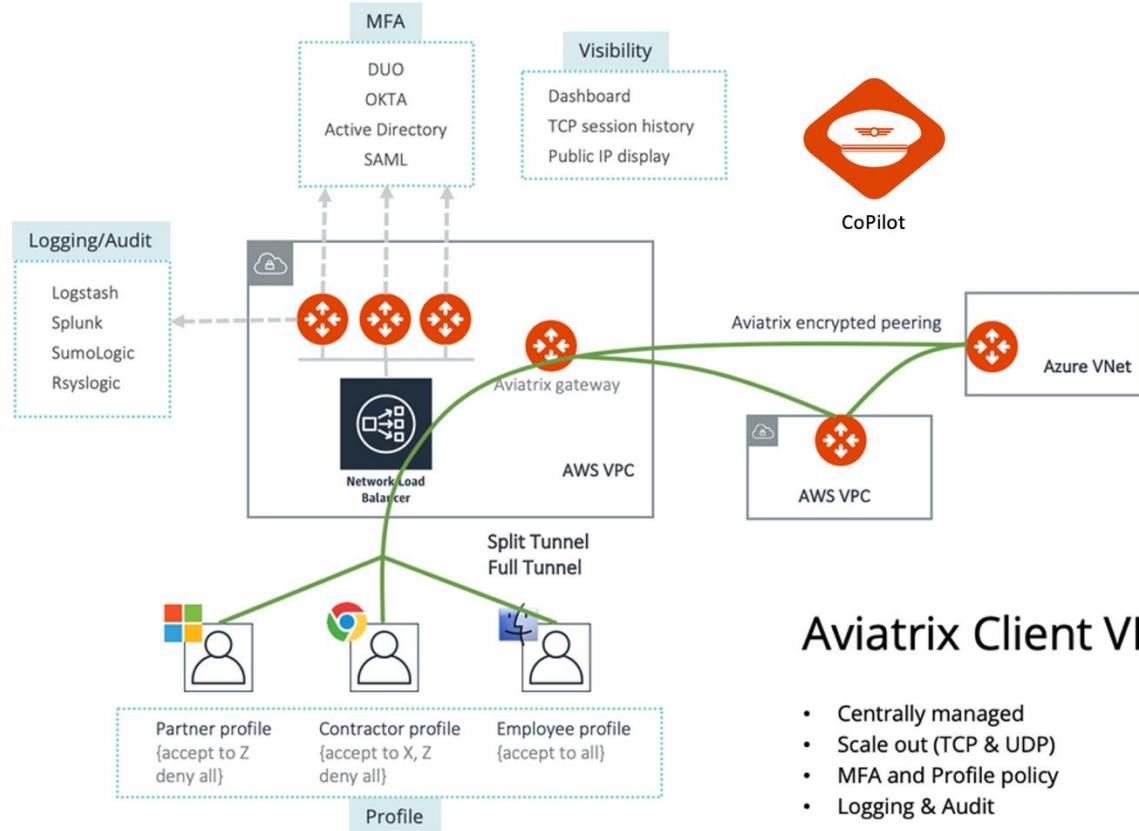
- Users will automatically get reconnected to another VPN gateway behind the load-balancer
- No change of certificate or user intervention

```

umair@umair-mbp ~ % ifconfig utun4
utun4: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
inet 192.168.43.14 --> 192.168.43.13 netmask 0xffffffff
umair@umair-mbp ~ % ping 10.120.127.191
PING 10.120.127.191 (10.120.127.191): 56 data bytes
64 bytes from 10.120.127.191: icmp_seq=0 ttl=250 time=73.976 ms
64 bytes from 10.120.127.191: icmp_seq=1 ttl=250 time=70.885 ms
64 bytes from 10.120.127.191: icmp_seq=2 ttl=250 time=70.846 ms
64 bytes from 10.120.127.191: icmp_seq=3 ttl=250 time=60.916 ms
64 bytes from 10.120.127.191: icmp_seq=4 ttl=250 time=67.720 ms
64 bytes from 10.120.127.191: icmp_seq=5 ttl=250 time=61.405 ms
64 bytes from 10.120.127.191: icmp_seq=6 ttl=250 time=61.982 ms
Request timeout for icmp_seq 7
Request timeout for icmp_seq 8
Request timeout for icmp_seq 9
Request timeout for icmp_seq 10
Request timeout for icmp_seq 11
Request timeout for icmp_seq 12
Request timeout for icmp_seq 13
Request timeout for icmp_seq 14
Request timeout for icmp_seq 15
Request timeout for icmp_seq 16
Request timeout for icmp_seq 17
Request timeout for icmp_seq 18
Request timeout for icmp_seq 19
64 bytes from 10.120.127.191: icmp_seq=20 ttl=250 time=72.759 ms
64 bytes from 10.120.127.191: icmp_seq=21 ttl=250 time=63.880 ms
64 bytes from 10.120.127.191: icmp_seq=22 ttl=250 time=67.266 ms
64 bytes from 10.120.127.191: icmp_seq=23 ttl=250 time=66.668 ms
64 bytes from 10.120.127.191: icmp_seq=24 ttl=250 time=68.084 ms
^C
--- 10.120.127.191 ping statistics ---
25 packets transmitted, 12 packets received, 52.0% packet loss
round-trip min/avg/max/stddev = 60.916/67.199/73.976/4.246 ms
umair@umair-mbp ~ % ifconfig utun4
utun4: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
inet 192.168.44.6 --> 192.168.44.5 netmask 0xffffffff
umair@umair-mbp ~ %

```

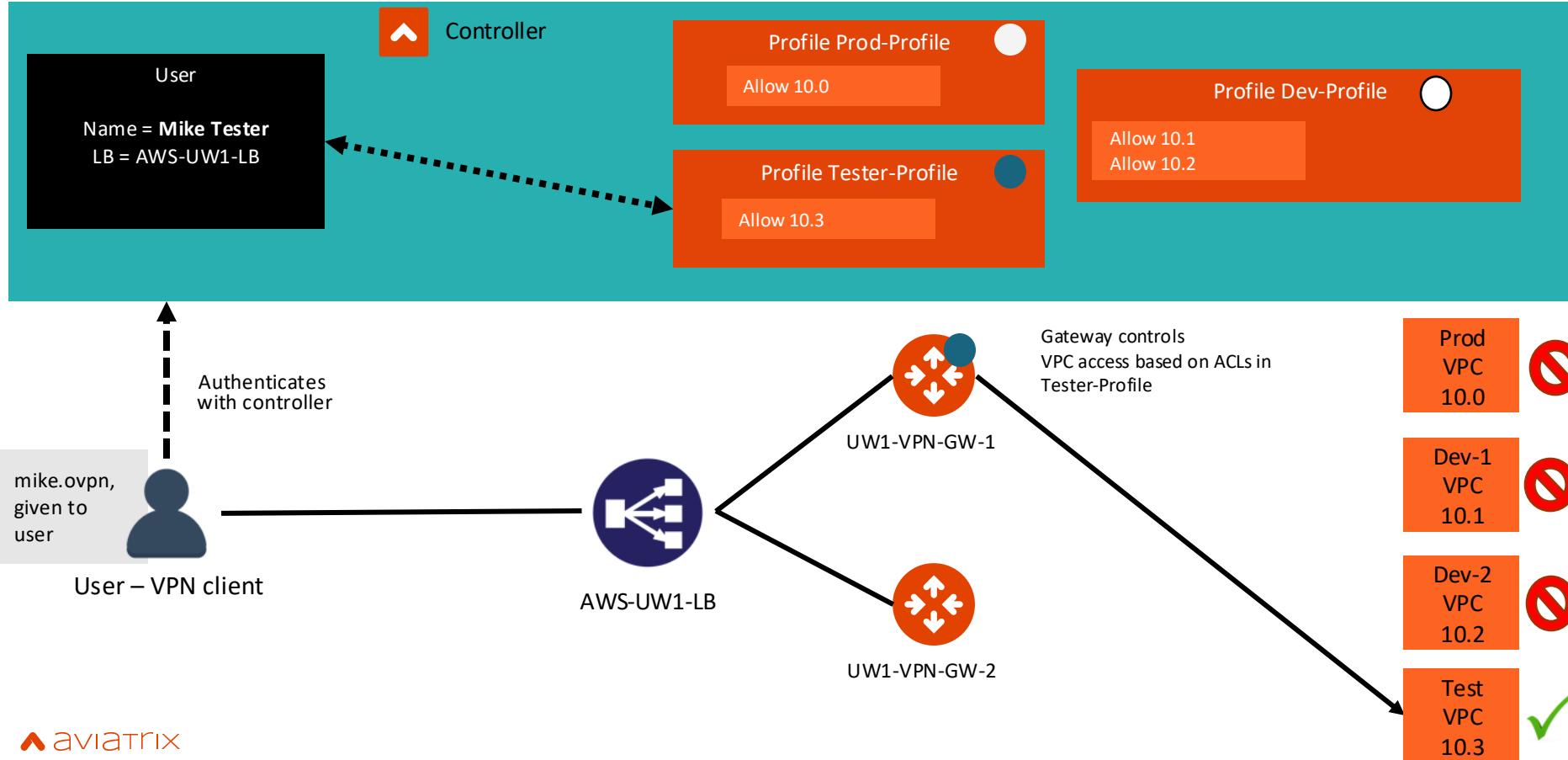
UserVPN Reference Architecture



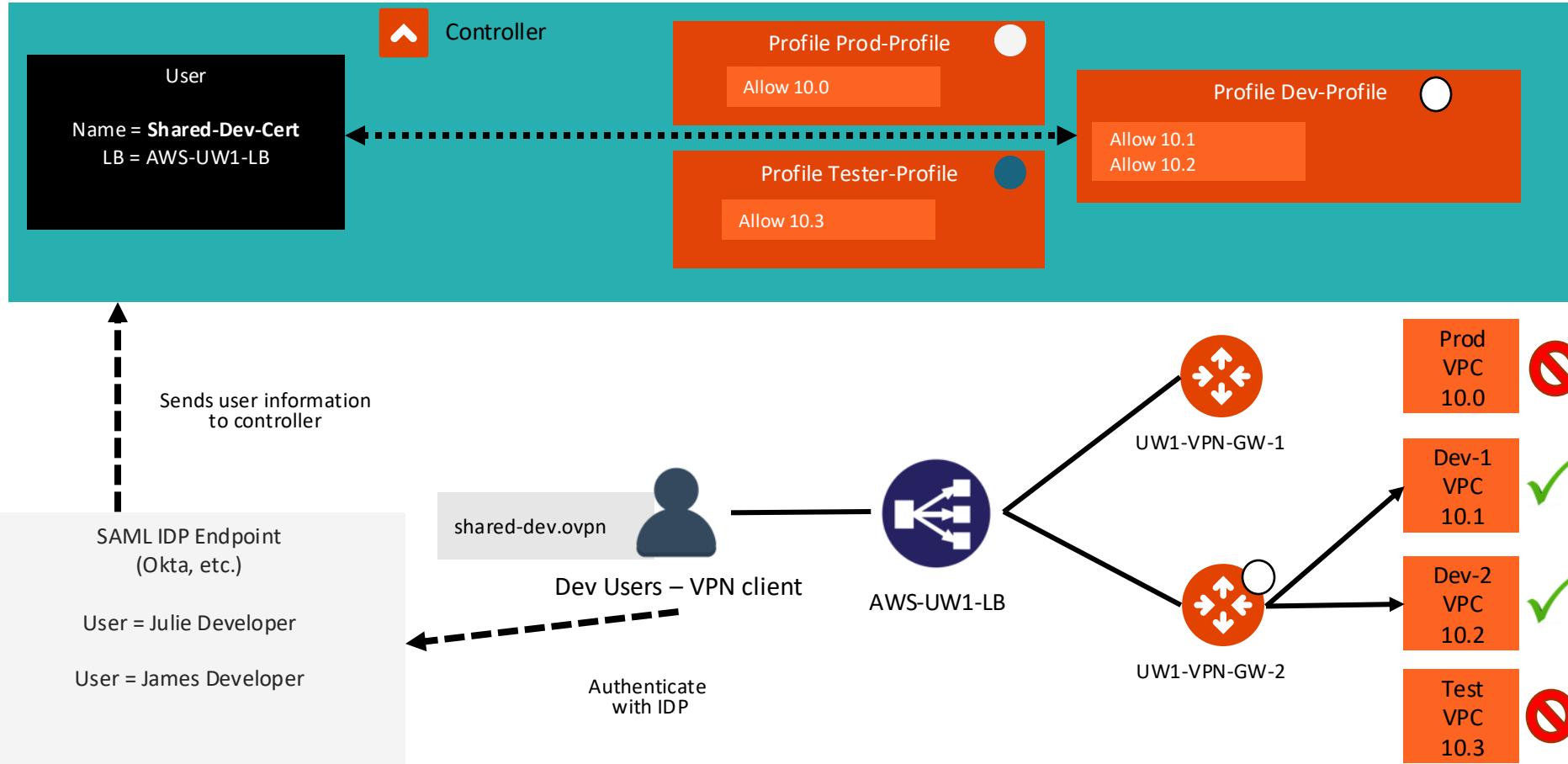
Aviatrix Client VPN Solution

- Centrally managed
- Scale out (TCP & UDP)
- MFA and Profile policy
- Logging & Audit

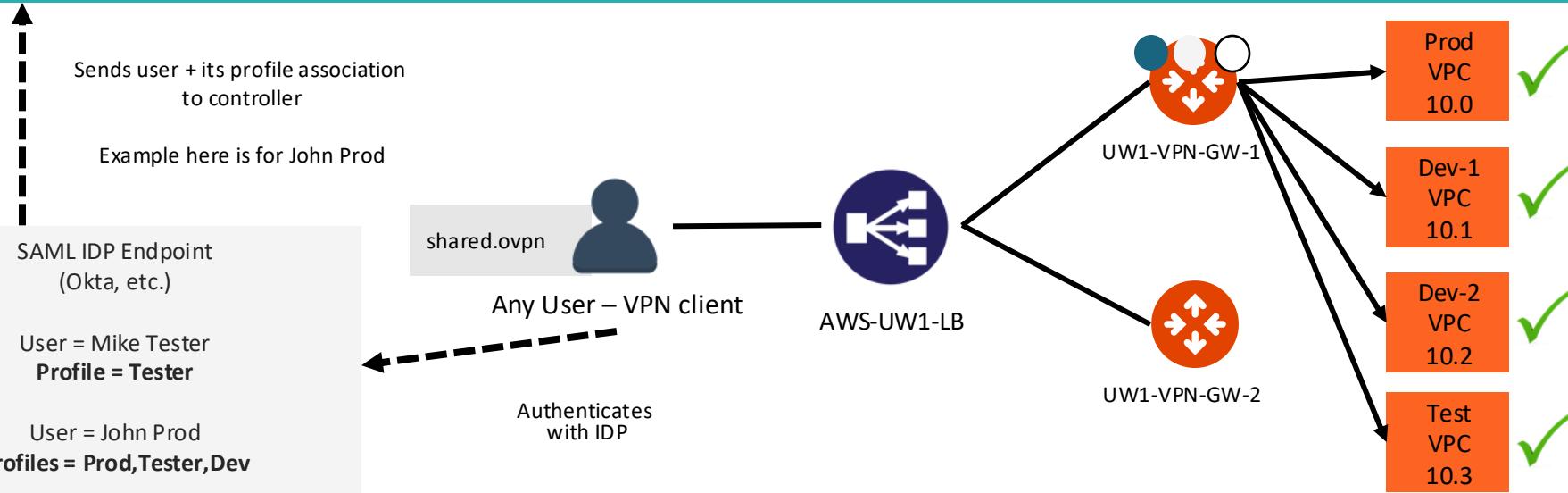
Users and Profiles



Users in IDP, Profile Association in Controller



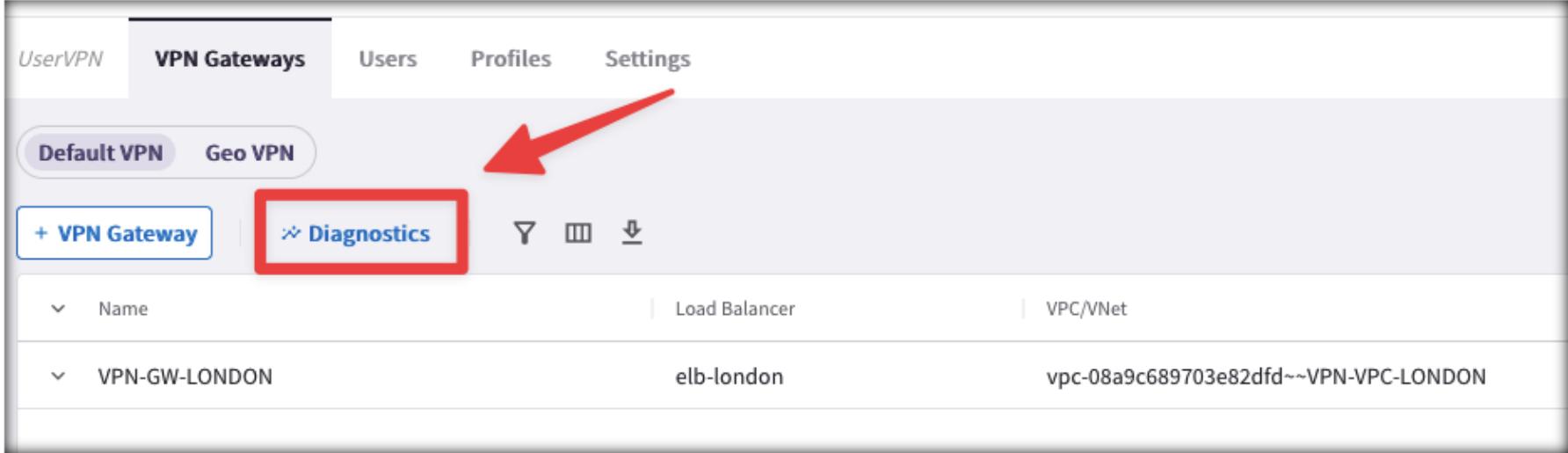
Users in IDP, Profile Association in IDP Profile as SAML Attribute





Visibility and Troubleshooting

User VPN Diagnostics Tools



The screenshot shows the UserVPN interface with the following navigation tabs: UserVPN, VPN Gateways (selected), Users, Profiles, and Settings. Below these are two buttons: Default VPN and Geo VPN. A red box highlights the 'Diagnostics' button, which is located next to '+ VPN Gateway'. A red arrow points from the text above to this button. The main table displays a single row of data:

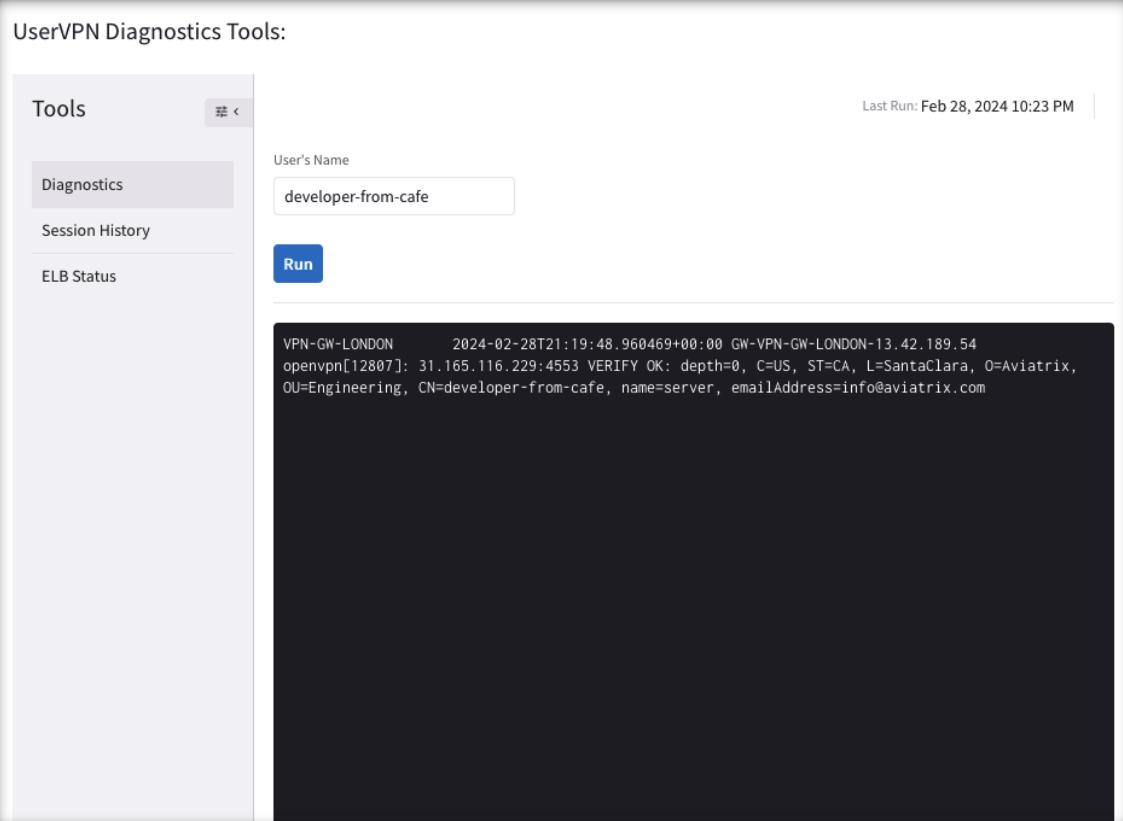
Name	Load Balancer	VPC/VNet
VPN-GW-LONDON	elb-london	vpc-08a9c689703e82dfd~~VPN-VPC-LONDON

- Use the UserVPN **Diagnostics** tool to check a VPN gateway's performance and connectivity

Diagnostics

- **Diagnostics Tab:** to run diagnostics on a VPN user to check their connectivity and performance
- **Session History Tab:** to review specific VPN gateway sessions in more detail
- **ELB Status Tab:** to check on the status of load balancers within specific VPCs/VNet

UserVPN Diagnostics Tools:



Last Run: Feb 28, 2024 10:23 PM

User's Name: developer-from-cafe

Run

```
VPN-GW-LONDON      2024-02-28T21:19:48.960469+00:00 GW-VPN-GW-LONDON-13.42.189.54
openvpn[12897]: 31.165.116.229:4553 VERIFY OK: depth=0, C=US, ST=CA, L=SantaClara, O=Aviatrix,
OU=Engineering, CN=developer-from-cafe, name=server, emailAddress=info@aviatrix.com
```



Next: Lab 7 – Site2Cloud
Lab 8 – Aviatrix Edge