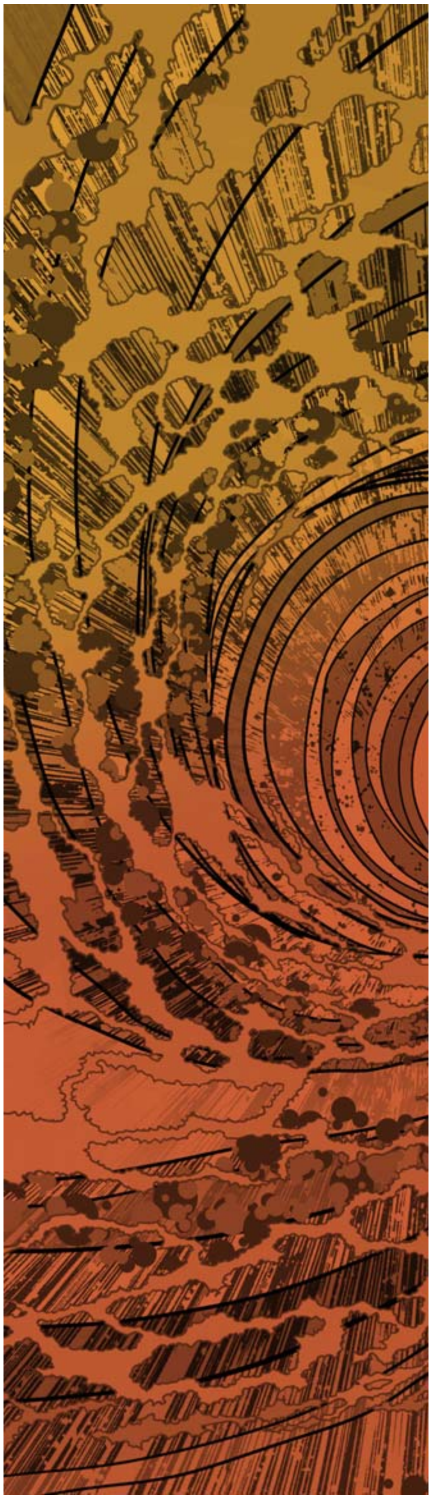

GlobalProtect™ Administrator's Guide

Version 7.1

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About this Guide

This guide describes how to deploy GlobalProtect™ to extend the same next-generation firewall-based policies that are enforced within the physical perimeter to your roaming users, no matter where they are located:

- For information on how to configure other components in the Palo Alto Networks Next-Generation Security Platform, go to the Technical Documentation portal: https://www.paloaltonetworks.com/documentation or search the documentation.
- For access to the knowledge base, complete documentation set, discussion forums, and videos, refer to https://live.paloaltonetworks.com.
- For contacting support, for information on support programs, to manage your account or devices, or to open a support case, refer to https://www.paloaltonetworks.com/support/tabs/overview.html.
- For the most current PAN-OS and GlobalProtect 7.1 release notes, go to https://www.paloaltonetworks.com/documentation/71/pan-os/pan-os-release-notes.html.

To provide feedback on the documentation, please write to us at: documentation@paloaltonetworks.com.

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GlobalProtect Overview

Whether checking email from home or updating corporate documents from the airport, the majority of today's employees work outside the physical corporate boundaries. This increased workforce mobility brings increased productivity and flexibility while simultaneously introducing significant security risks. Every time users leave the building with their laptops or mobile devices they are bypassing the corporate firewall and associated policies that are designed to protect both the user and the network. GlobalProtect solves the security challenges introduced by roaming users by extending the same next-generation firewall-based policies that are enforced within the physical perimeter to all users, no matter where they are located.

The following sections provide conceptual information about the Palo Alto Networks GlobalProtect offering and describe the components of GlobalProtect and the various deployment scenarios:

- About the GlobalProtect Components
- What Client OS Versions are Supported with GlobalProtect?
- About GlobalProtect Licenses

About the GlobalProtect Components

GlobalProtect provides a complete infrastructure for managing your mobile workforce to enable secure access for all your users, regardless of what devices they are using or where they are located. This infrastructure includes the following components:

- GlobalProtect Portal
- GlobalProtect Gateways
- GlobalProtect Client

GlobalProtect Portal

The GlobalProtect portal provides the management functions for your GlobalProtect infrastructure. Every client system that participates in the GlobalProtect network receives configuration information from the portal, including information about available gateways as well as any client certificates that may be required to connect to the GlobalProtect gateway(s). In addition, the portal controls the behavior and distribution of the GlobalProtect agent software to both Mac and Windows laptops. (On mobile devices, the GlobalProtect app is distributed through the Apple App Store for iOS devices or through Google Play for Android devices.) If you are using the Host Information Profile (HIP) feature, the portal also defines what information to collect from the host, including any custom information you require. You Configure the GlobalProtect Portal on an interface on any Palo Alto Networks next-generation firewall.

GlobalProtect Gateways

GlobalProtect gateways provide security enforcement for traffic from GlobalProtect agents/apps. Additionally, if the HIP feature is enabled, the gateway generates a HIP report from the raw host data the clients submit and can use this information in policy enforcement.

- **External gateways**—Provide security enforcement and/or virtual private network (VPN) access for your remote users.
- **Internal gateways**—An interface on the internal network configured as a GlobalProtect gateway for applying security policy for access to internal resources. When used in conjunction with User-ID and/or HIP checks, an internal gateway can be used to provide a secure, accurate method of identifying and controlling traffic by user and/or device state. Internal gateways are useful in sensitive environments where authenticated access to critical resources is required. You can configure an internal gateway in either tunnel mode or non-tunnel mode.

  You Configure GlobalProtect Gateways on an interface on any Palo Alto Networks next-generation firewall. You can run both a gateway and a portal on the same firewall, or you can have multiple, distributed gateways throughout your enterprise.

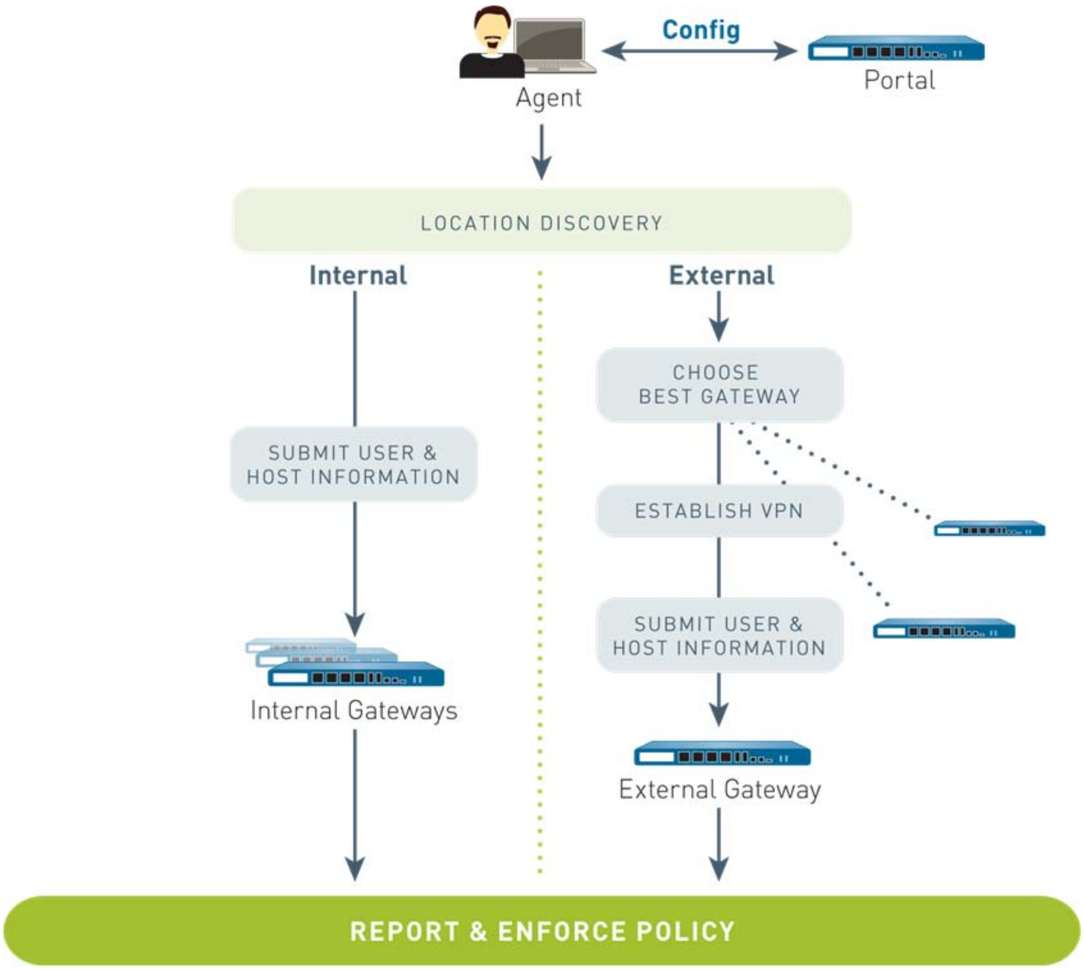
GlobalProtect Client

The GlobalProtect client software runs on end user systems and enables access to your network resources via the GlobalProtect portals and gateways you have deployed. There are two types of GlobalProtect clients:

- **The GlobalProtect Agent**—Runs on Windows and Mac OS systems and is deployed from the GlobalProtect portal. You configure the behavior of the agent—for example, which tabs the users can see, whether or not users can uninstall the agent—in the client configuration(s) you define on the portal. See Define the GlobalProtect Agent Configurations, Customize the GlobalProtect Agent, and Deploy the GlobalProtect Agent Software for details.
- **The GlobalProtect App**—Runs on iOS, Android, and Chromebook devices. Users must obtain the GlobalProtect app from the Apple App Store (for iOS), Google Play (for Android), or Chrome Web Store (for Chromebook).

See What Client OS Versions are Supported with GlobalProtect? for more details.

The following diagram illustrates how the GlobalProtect portals, gateways, and agents/apps work together to enable secure access for all your users, regardless of what devices they are using or where they are located.



What Client OS Versions are Supported with GlobalProtect?

The following table summarizes the supported GlobalProtect desktop, laptop, and mobile device operating systems and the minimum PAN-OS and GlobalProtect agent/app versions required to support each one.

Supported Client OS Versions	Minimum Agent/App Version	Minimum PAN-OS Version
Apple Mac OS 10.6 Apple Mac OS 10.7 Apple Mac OS 10.8 Apple Mac OS 10.9 Apple Mac OS 10.10 Apple Mac OS 10.11	1.1 1.1 1.1.6 1.2 2.1 2.3.2	4.1.0 or later
Windows XP (32-bit) Windows Vista (32-bit and 64-bit) Windows 7 (32-bit and 64-bit) Windows 8 (32-bit and 64-bit) Windows 8.1 (32-bit and 64-bit) Windows Surface Pro Windows 10 (32-bit and 64-bit)	1.0 1.0 1.0 1.2 1.2 1.2 2.3.1	4.0 or later
Apple iOS 6.0 Apple iOS 7.0 Apple iOS 8.0 Apple iOS 9.0	1.3 app 1.3 app 2.1 app 2.3.2 app	4.1.0 or later
Google Android 4.0.3 or later Google Android 4.0 Google Android 5.0 Google Android 6.0	1.3 app 2.3.3 app 2.3.3 app 2.3.3 app	4.1.6 or later 7.0 or later 7.0 or later 7.0 or later
Google Chrome OS 45 or later	3.0.0 app	PAN-OS 6.1 or later PAN-OS 7.0 or later PAN-OS 7.1 or later
Third-party X-Auth IPsec Clients: • iOS built-in IPsec client • Android built-in IPsec client • VPNC on Ubuntu Linux 10.04 and later versions and CentOS 6 and later versions	N/A	5.0 or later
• strongSwan on Ubuntu Linux and CentOS*	N/A	6.1

*For details on enabling strongSwan Ubuntu and CentOS clients to access GlobalProtect VPN, refer to Set Up Authentication for strongSwan Ubuntu and CentOS Clients.

Users must obtain the GlobalProtect app from the Apple App Store (for iOS), Google Play (for Android), or Chrome Web Store (for Chromebook). For information on how to distribute the GlobalProtect agent, see Deploy the GlobalProtect Agent Software.

About GlobalProtect Licenses

If you simply want to use GlobalProtect to provide a secure, remote access or virtual private network (VPN) solution via single or multiple internal/external gateways, you do not need any GlobalProtect licenses. However, to use some of the more advanced features, such as enabling HIP checks and associated content updates and enabling support for the GlobalProtect mobile app for iOS and Android, you need to purchase an annual gateway subscription. This license must be installed on each firewall running a gateway(s) that performs HIP checks and that supports the GlobalProtect app on mobile devices.

> In versions earlier than PAN-OS 7.0, a GlobalProtect portal license was required to enable remote access or virtual private network (VPN) solution via single or multiple internal/external gateways. To use these features in PAN-OS 7.0, a portal license is not required, but you must upgrade the GlobalProtect portal to PAN-OS 7.0 (the GlobalProtect gateway can run PAN-OS 7.0 or earlier).

Feature	Gateway Subscription
Single, external gateway (Windows and Mac)	
Single or multiple internal gateways	
Multiple external gateways	
HIP Checks	✓
Mobile app for iOS, Android, and/or Chromebooks	✓

See Activate Licenses for information on installing licenses on the firewall.

Set Up the GlobalProtect Infrastructure

For GlobalProtect to work, you must set up the infrastructure that allows all of the components to communicate. At a basic level, this means setting up the interfaces and zones to which the GlobalProtect end users connect to access the portal and the gateways to the network. Because the GlobalProtect components communicate over secure channels, you must acquire and deploy the required SSL certificates to the various components. The following sections guide you through the steps to set up the GlobalProtect infrastructure:

- Create Interfaces and Zones for GlobalProtect
- Enable SSL Between GlobalProtect Components
- Set Up GlobalProtect User Authentication
- Enable Group Mapping
- Configure GlobalProtect Gateways
- Configure the GlobalProtect Portal
- Enable Delivery of GlobalProtect Client VSAs to a RADIUS Server
- Deploy the GlobalProtect Client Software
- Deploy Agent Settings Transparently
- Manage the GlobalProtect App with a Third-Party MDM
- Reference: GlobalProtect Agent Cryptographic Functions

Create Interfaces and Zones for GlobalProtect

You must configure the following interfaces and zones for your GlobalProtect infrastructure:

- **GlobalProtect portal**—Requires a Layer 3 or loopback interface for the GlobalProtect clients' connection. If the portal and gateway are on the same firewall, they can use the same interface. The portal must be in a zone that is accessible from outside your network, for example: DMZ.
- **GlobalProtect gateways**—The interface and zone requirements for the gateway depend on whether the gateway you are configuring is external or internal, as follows:
  - **External gateways**—Requires a Layer 3 or loopback interface and a logical tunnel interface for the client to establish a VPN tunnel. The Layer 3/loopback interface must be in an external zone, such as DMZ. A tunnel interface can be in the same zone as the interface connecting to your internal resources (for example trust). For added security and better visibility, you can create a separate zone, such as corp-vpn. If you create a separate zone for your tunnel interface, you must create security policies that enable traffic to flow between the VPN zone and the trust zone.
  - **Internal gateways**—Requires a Layer 3 or loopback interface in your trust zone. You can also create a tunnel interface for access to your internal gateways, but this is not required.

> For tips on how to use a loopback interface to provide access to GlobalProtect on different ports and addresses, refer to Can GlobalProtect Portal Page be Configured to be Accessed on any Port?

For more information about portals and gateways, see About the GlobalProtect Components.

Set Up Interfaces and Zones for GlobalProtect		
Step 1	Configure a Layer 3 interface for each portal and/or gateway you plan to deploy. If the gateway and portal are on the same firewall, you can use a single interface for both. As a best practice use static IP addresses for the portal and gateway.	1. Select **Network > Interfaces > Ethernet** or **Network > Interfaces > Loopback** and then select the interface you want to configure for GlobalProtect. In this example, we are configuring ethernet1/1 as the portal interface. 2. (Ethernet only) Select **Layer3** from the **Interface Type** drop-down. 3. On the **Config** tab, select the zone to which the portal or gateway interface belongs as follows: • Place portals and external gateways in an untrust zone for access by hosts outside your network, such as l3-untrust. • Place internal gateways in an internal zone, such as l3-trust. • If you have not yet created the zone, select **New Zone** from the **Security Zone** drop-down. In the Zone dialog, define a **Name** for the new zone and then click **OK**. 4. In the **Virtual Router** drop-down, select **default**. 5. To assign an IP address to the interface, select the **IPv4** tab, click **Add** in the IP section, and enter the IP address and network mask to assign to the interface, for example 208.80.56.100/24. 6. To save the interface configuration, click **OK**.

Set Up Interfaces and Zones for GlobalProtect (Continued)

Step 2 On the firewall(s) hosting GlobalProtect gateway(s), configure the logical tunnel interface that will terminate VPN tunnels established by the GlobalProtect agents.

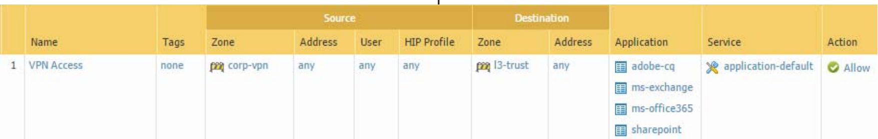
IP addresses are not required on the tunnel interface unless you require dynamic routing. In addition, assigning an IP address to the tunnel interface can be useful for troubleshooting connectivity issues.

Be sure to enable User-ID in the zone where the VPN tunnels terminate.

1. Select **Network > Interfaces > Tunnel** and click **Add**.
2. In the **Interface Name** field, specify a numeric suffix, such as **.2**.
3. On the **Config** tab, expand the **Security Zone** drop-down to define the zone as follows:
   - To use your trust zone as the termination point for the tunnel, select the zone from the drop-down.
   - (Recommended) To create a separate zone for VPN tunnel termination, click **New Zone**. In the Zone dialog, define a **Name** for new zone (for example, corp-vpn), select the **Enable User Identification** check box, and then click **OK**.
4. In the **Virtual Router** drop-down, select **None**.
5. (Optional) If you want to assign an IP address to the tunnel interface, select the **IPv4** tab, click **Add** in the IP section, and enter the IP address and network mask to assign to the interface, for example 10.31.32.1/32.
6. To save the interface configuration, click **OK**.

Step 3 If you created a separate zone for tunnel termination of VPN connections, create a security policy to enable traffic flow between the VPN zone and your trust zone.

For example, the following policy rule enables traffic between the corp-vpn zone and the l3-trust zone.



			Source				Destination				
	Name	Tags	Zone	Address	User	HIP Profile	Zone	Address	Application	Service	Action
1	VPN Access	none	corp-vpn	any	any	any	l3-trust	any	adobe-cq ms-exchange ms-office365 sharepoint	application-default	✓ Allow

Step 4 Save the configuration.

If you enabled management access to the interface hosting the portal, you must add a :4443 to the URL. For example, to access the web interface for the portal configured in this example, you would enter the following:

```
https://208.80.56.100:4443
```

Or, if you configured a DNS record for the FQDN, such as gp.acme.com, you would enter:

```
https://gp.acme.com:4443
```

Click **Commit**.

Enable SSL Between GlobalProtect Components

All interaction between the GlobalProtect components occurs over an SSL/TLS connection. Therefore, you must generate and/or install the required certificates before configuring each component so that you can reference the appropriate certificate(s) in the configurations. The following sections describe the supported methods of certificate deployment, descriptions and best practice guidelines for the various GlobalProtect certificates, and provide instructions for generating and deploying the required certificates:

- ▲ About GlobalProtect Certificate Deployment
- ▲ GlobalProtect Certificate Best Practices
- ▲ Deploy Server Certificates to the GlobalProtect Components

About GlobalProtect Certificate Deployment

There are three basic approaches to Deploy Server Certificates to the GlobalProtect Components:

- (Recommended) **Combination of third-party certificates and self-signed certificates**—Because the end clients will be accessing the portal prior to GlobalProtect configuration, the client must trust the certificate to establish an HTTPS connection.
- **Enterprise Certificate Authority**—If you already have your own enterprise CA, you can use this internal CA to issue certificates for each of the GlobalProtect components and then import them onto the firewalls hosting your portal and gateway(s). In this case, you must also ensure that the end user systems/mobile devices trust the root CA certificate used to issue the certificates for the GlobalProtect services to which they must connect.
- **Self-Signed Certificates**—You can generate a self-signed CA certificate on the portal and use it to issue certificates for all of the GlobalProtect components. However, this solution is less secure than the other options and is therefore not recommended. If you do choose this option, end users will see a certificate error the first time they connect to the portal. To prevent this, you can deploy the self-signed root CA certificate to all end user systems manually or using some sort of centralized deployment, such as an Active Directory Group Policy Object (GPO).

GlobalProtect Certificate Best Practices

The following table summarizes the SSL/TLS certificates you will need, depending on which features you plan to use:

Table: GlobalProtect Certificate Requirements

Certificate	Usage	Issuing Process/Best Practices
CA certificate	Used to sign certificates issued to the GlobalProtect components.	If you plan to use self-signed certificates, a best practice is to generate a CA certificate on the portal and then use that certificate to issue the required GlobalProtect certificates.

Certificate	Usage	Issuing Process/Best Practices
Portal server certificate	Enables GlobalProtect agents and apps to establish an HTTPS connection with the portal.	• This certificate is identified in an SSL/TLS service profile. You assign the portal server certificate by selecting its associated service profile in a portal configuration. • As a best practice, use a certificate from a well-known, third-party CA. This is the most secure option and ensures that the user endpoints can establish a trust relationship with the portal and without requiring you to deploy the root CA certificate. • If you do not use a well-known, public CA, you should export the root CA certificate that was used to generate the portal server certificate to all endpoints that run the GlobalProtect agent or application. Exporting this certificate prevents the end users from seeing certificate warnings during the initial portal login. • The Common Name (CN) and, if applicable, the Subject Alternative Name (SAN) fields of the certificate must match the IP address or FQDN of the interface that hosts the portal. • In general, a portal must have its own server certificate. However, if you are deploying a single gateway and portal on the same interface for basic VPN access, you must use the same certificate for both the gateway and the portal.
Gateway server certificate	Enables GlobalProtect agents and apps to establish an HTTPS connection with the gateway.	• This certificate is identified in an SSL/TLS service profile. You assign the portal server certificate by selecting its associated service profile in a gateway configuration. • As a best practice, generate a CA certificate on the portal and use that CA certificate to generate all gateway certificates. • The CN and, if applicable, the SAN fields of the certificate must match the FQDN or IP address of the interface where you plan to configure the gateway. • The portal distributes the gateway root CA certificates to agents in the client configuration, so the gateway certificates do not need to be issued by a public CA. • If you do not deploy the root CA certificates for the GlobalProtect gateways in the client configuration, the agent/app will not perform certificate checks when connecting, thereby making the connection vulnerable to man-in-the-middle attacks. • In general, each gateway must have its own server certificate. However, if you are deploying a single gateway and portal on the same interface for basic VPN access, you must use a single server certificate for both components. As a best practice, use a certificate that a public CA signed.

Certificate	Usage	Issuing Process/Best Practices
(Optional) Client certificate	Used to enable mutual authentication in establishing an HTTPS session between the GlobalProtect agents and the gateways/portal. This ensures that only devices with valid client certificates are able to authenticate and connect to the network.	• For simplified deployment of client certificates, configure the portal to deploy the client certificate to the agents upon successful login using either of the following methods: • Use a single client certificate across all GlobalProtect agents that receive the same configuration. You assign the **Local** client certificate by uploading the certificate to the portal and selecting it in a portal agent configuration. • Use simple certificate enrollment protocol (**SCEP**) to enable the GlobalProtect portal to deploy unique client certificates to your GlobalProtect agents. You enable this by configuring a SCEP profile and then selecting that profile in a portal agent configuration. • You can use other mechanisms to deploy unique client certificates to each client system for use in authenticating the end user. • Consider testing your configuration without the client certificate first, and then add the client certificate after you are sure that all other configuration settings are correct.
(Optional) Machine certificates	A machine certificate is a client certificate that is issued to a device. Each machine certificate identifies the device in the subject field (for example, CN=laptop1.acme.com) instead of a user. The certificate ensures that only trusted endpoints can connect to gateways or the portal. Machine certificates are required for users whose connect method is pre-logon, which enables GlobalProtect to establish a VPN tunnel before the user logs in.	If you plan to use the pre-logon feature, use your own PKI infrastructure to deploy machine certificates to each client system prior to enabling GlobalProtect access. This approach is important for ensuring security. For more information, see Remote Access VPN with Pre-Logon.

For details about the types of keys for secure communication between the GlobalProtect endpoint and the portals and gateways, see Reference: GlobalProtect Agent Cryptographic Functions.

Deploy Server Certificates to the GlobalProtect Components

The following workflow shows the best practice steps for deploying SSL/TLS certificates to the GlobalProtect components:

Deploy SSL Server Certificates to the GlobalProtect Components	
• Import a server certificate from a well-known, third-party CA. Use a server certificate from a well-known, third-party CA for the GlobalProtect portal. This practice ensures that the end users are able to establish an HTTPS connection without seeing warnings about untrusted certificates. The CN and, if applicable, the SAN fields of the certificate must match the FQDN or IP address of the interface where you plan to configure the portal or the device check-in interface on a third-party mobile device manager. Wildcard matches are supported.	Before you import a certificate, make sure the certificate and key files are accessible from your management system and that you have the passphrase to decrypt the private key. 1. Select **Device > Certificate Management > Certificates > Device Certificates**. 2. Click **Import**. 3. Use the **Local** certificate type (the default). 4. Enter a **Certificate Name**. 5. Enter the path and name to the **Certificate File** received from the CA, or **Browse** to find the file. 6. Select **Encrypted Private Key and Certificate (PKCS12)** as the **File Format**. 7. Enter the path and name to the PKCS#12 file in the **Key File** field or **Browse** to find it. 8. Enter and re-enter the **Passphrase** that was used to encrypt the private key and then click **OK** to import the certificate and key.
• Create the root CA certificate for issuing self-signed certificates for the GlobalProtect components. Create the Root CA certificate on the portal and use it to issue server certificates for the gateways and, optionally, for clients.	Before deploying self-signed certificates, you must create the root CA certificate that signs the certificates for the GlobalProtect components: 1. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 2. Use the **Local** certificate type (the default). 3. Enter a **Certificate Name**, such as GlobalProtect_CA. The certificate name cannot contain spaces. 4. Do not select a value in the **Signed By** field. (Without a selection for **Signed By**, the certificate is self-signed.) 5. Select the **Certificate Authority** check box. 6. Click **OK** to generate the certificate.

Deploy SSL Server Certificates to the GlobalProtect Components (Continued)	
• Use the root CA on the portal to generate a self-signed server certificate. Generate server certificates for each gateway you plan to deploy and optionally for the management interface of the third-party mobile device manager (if this interface is where the gateways retrieve HIP reports). In the gateway server certificates, the values in the CN and SAN fields must be identical. If the values differ, the GlobalProtect agent detects the mismatch and does not trust the certificate. Self-signed certificates contain a SAN field only if you add a **Host Name** attribute. As an alternative method, you can Use Simple Certificate Enrollment Protocol (SCEP) to request a server certificate from your enterprise CA.	1. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 2. Use the **Local** certificate type (the default). 3. Enter a **Certificate Name**. This name cannot contain spaces. 4. In the **Common Name** field, enter the FQDN (recommended) or IP address of the interface where you plan to configure the gateway. 5. In the **Signed By** field, select the GlobalProtect_CA you created. 6. In the Certificate Attributes section, **Add** and define the attributes that uniquely identify the gateway. Keep in mind that if you add a **Host Name** attribute (which populates the SAN field of the certificate), it must be the same as the value you defined for the **Common Name**. 7. Click **OK** to generate the certificate.

Deploy SSL Server Certificates to the GlobalProtect Components (Continued)	
- Use Simple Certificate Enrollment Protocol (SCEP) to request a server certificate from your enterprise CA. Configure separate SCEP profiles for each portal and gateway you plan to deploy. Then use the specific SCEP profile to generate the server certificate for each GlobalProtect component. In portal and gateway server certificates, the value of the CN field must include the FQDN (recommended) or IP address of the interface where you plan to configure the portal or gateway and must be identical to the SAN field. To comply with the U.S. Federal Information Processing Standard (FIPS), you must also enable mutual SSL authentication between the SCEP server and the GlobalProtect portal. (FIPS-CC operation is indicated on the firewall login page and in its status bar.) After you commit the configuration, the portal attempts to request a CA certificate using the settings in the SCEP profile. If successful, the firewall hosting the portal saves the CA certificate and displays it in the list of **Device Certificates**.	For each GlobalProtect portal or gateway that you deploy: 1. Configure a SCEP Profile: a. Enter a **Name** that identifies the SCEP profile and the component to which you deploy the server certificate. If this profile is for a firewall with multiple virtual systems capability, select a virtual system or **Shared** as the **Location** where the profile is available. b. (Optional) Configure a **SCEP Challenge**-response mechanism between the PKI and portal for each certificate request. Use either a **Fixed** challenge password which you obtain from the SCEP server or a **Dynamic** password where the portal-client submits a username and OTP of your choice to the SCEP Server. For a Dynamic SCEP challenge, this can be the credentials of the PKI administrator. c. Configure the **Server URL** that the portal uses to reach the SCEP server in the PKI (for example, `http://10.200.101.1/certsrv/mscep/`). d. Enter a string (up to 255 characters in length) in the **CA-IDENT Name** field to identify the SCEP server. e. Enter the **Subject** name to use in the certificates generated by the SCEP server. The subject must include a common name (CN) key in the format CN=<value> where *value* is the FQDN or IP address of the portal or gateway. f. Select the **Subject Alternative Name Type**. To enter the email name in a certificate's subject or Subject Alternative Name extension, select **RFC 822 Name**. You can also enter the **DNS Name** to use to evaluate certificates, or the **Uniform Resource Identifier** to identify the resource from which the client will obtain the certificate. g. Configure additional cryptographic settings and permitted uses of the certificate, either for signing or encryption. h. To ensure that the portal is connecting to the correct SCEP server, enter the **CA Certificate Fingerprint**. Obtain this fingerprint from the SCEP server interface in the Thumbprint field. i. Enable mutual SSL authentication between the SCEP server and the GlobalProtect portal. j. Click **OK** to save the settings and then **Commit** the configuration. 2. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 3. Enter a **Certificate Name**. This name cannot contain spaces. 4. Select the **SCEP Profile** to use to automate the process of issuing a server certificate that is signed by the enterprise CA to a portal or gateway. The GlobalProtect portal uses the settings in the SCEP profile to submit a CSR to your enterprise PKI. 5. Click **OK** to generate the certificate.

Deploy SSL Server Certificates to the GlobalProtect Components (Continued)	
• Assign the server certificate you imported or generated to an SSL/TLS service profile.	Configure an SSL/TLS service profile: 1. Select **Device > Certificate Management > SSL/TLS Service Profile** and click **Add**. 2. Enter a **Name** to identify the profile and select the server **Certificate** you imported or generated. 3. Define the range of SSL/TLS versions (**Min Version** to **Max Version**) for communication between GlobalProtect components. 4. Click **OK** to save the SSL/TLS service profile. 5. **Commit** the changes.
• Deploy the self-signed server certificates. **Best Practices:** • Export the self-signed server certificates issued by the root CA on the portal and import them onto the gateways. • Be sure to issue a unique server certificate for each gateway. • If specifying self-signed certificates, you must distribute the Root CA certificate to the end clients in the portal client configurations.	Export the certificate from the portal: 1. Select **Device > Certificate Management > Certificates > Device Certificates**. 2. Select the gateway certificate you want to deploy and click **Export**. 3. In the **File Format** drop-down, select **Encrypted Private Key and Certificate (PKCS12)**. 4. Enter (and re-enter) a **Passphrase** to encrypt the private key. 5. Click **OK** to download the PKCS12 file to a location of your choice. Import the certificate on the gateway: 1. Select **Device > Certificate Management > Certificates > Device Certificates**. 2. Click **Import**. 3. Enter a **Certificate Name**. 4. **Browse** to find and select the **Certificate File** you downloaded in step 5, above. 5. In the **File Format** drop-down, select **Encrypted Private Key and Certificate (PKCS12)**. 6. Enter (and re-enter) the **Passphrase** you used to encrypt the private key when you exported it from the portal. 7. Click **OK** to import the certificate and key. 8. **Commit** the changes to the gateway.

Set Up GlobalProtect User Authentication

The GlobalProtect portal and gateway must authenticate the end-user before it allows access to GlobalProtect resources. You must configure authentication mechanisms before continuing with the portal and gateway setup. The following sections detail the supported authentication mechanisms and how to configure them:

- ▲ About GlobalProtect User Authentication
- ▲ Set Up External Authentication
- ▲ Set Up Client Certificate Authentication
- ▲ Set Up Two-Factor Authentication
- ▲ Set Up Authentication for strongSwan Ubuntu and CentOS Clients

About GlobalProtect User Authentication

The first time a GlobalProtect client connects to the portal, the user is prompted to authenticate to the portal. If authentication succeeds, the GlobalProtect portal sends the GlobalProtect configuration, which includes the list of gateways to which the agent can connect, and optionally a client certificate for connecting to the gateways. After successfully downloading and caching the configuration, the client attempts to connect to one of the gateways specified in the configuration. Because these components provide access to your network resources and settings, they also require the end user to authenticate.

The appropriate level of security required on the portal and gateways varies with the sensitivity of the resources that the gateway protects. GlobalProtect provides a flexible authentication framework that allows you to choose the authentication profile and certificate profile that are appropriate to each component.

Supported GlobalProtect Authentication Methods

Authentication Method	Description
Local Authentication	Both the user account credentials and the authentication mechanisms are local to the firewall. This authentication mechanism is not scalable because it requires an account for every GlobalProtect user and is, therefore, advisable for only very small deployments.
External authentication	The user authentication functions are performed by an external LDAP, Kerberos, TACACS+, or RADIUS service (including support for two-factor, token-based authentication mechanisms, such as one-time password (OTP) authentication). To enable external authentication: • Create a server profile with settings for access to the external authentication service. • Create an authentication profile that refers to the server profile. • Specify client authentication in the portal and gateway configurations and optionally specify the OS of the endpoint that will use these settings. You can use different authentication profiles for each GlobalProtect component. See Set Up External Authentication for instructions. See Remote Access VPN (Authentication Profile) for an example configuration.

Authentication Method	Description
Client certificate authentication	For enhanced security, you can configure the portal or gateway to use a client certificate to obtain the username and authenticate the user before granting access to the system. • To authenticate the user, one of the certificate fields, such as the Subject Name field, must identify the username. • To authenticate the endpoint, the Subject field of the certificate must identify the device type instead of the username. (With the pre-logon connect method, the portal or gateway authenticates the endpoint before the user logs in.) For an agent configuration profile that specifies client certificates, each user receives a client certificate. The mechanism for providing the certificates determines whether a certificate is unique to each client or the same for all clients under that agent configuration: • To deploy client certificates that are unique to each user and device, use **SCEP**. When a user first logs in, the portal requests a certificate from the enterprise's PKI. The portal obtains a unique certificate and deploys it to the client. • To deploy the same client certificate to all users that receive an agent configuration, deploy a certificate that is **Local** to the firewall. Use an optional certificate profile to verify the client certificate that a client presents with a connection request. The certificate profile specifies the contents of the username and user domain fields; lists CA certificates; criteria for blocking a session; and offers ways to determine the revocation status of CA certificates. You must pre-deploy certificates used in certificate profiles to the endpoints before the users' initial portal login because the certificate is part of the authentication of the endpoint or user for a new session. The certificate profile specifies which certificate field contains the username. If the certificate profile specifies Subject in the Username Field, the certificate presented by the client must contain a common-name for the client to connect. If the certificate profile specifies a Subject-Alt with an Email or Principal Name as the Username Field, the certificate from the client must contain the corresponding fields, which will be used as the username when the GlobalProtect agent authenticates to the portal or gateway. GlobalProtect also supports authentication by common access cards (CACs) and smart cards, which rely on a certificate profile. With these cards, the certificate profile must contain the root CA certificate that issued the certificate to the smart card or CAC. If you specify client certificate authentication, you should not configure a client certificate in the portal configuration because the client system provides it when the user connects. For an example of how to configure client certificate authentication, see Remote Access VPN (Certificate Profile).
Two-factor authentication	With two-factor authentication, the portal or gateway uses two mechanisms to authenticate a user, such as a one-time password in addition to AD login credentials. You can enable two-factor authentication on the portal and gateways by configuring a certificate profile and an authentication profile and adding them both to the portal and/or gateway configuration. You can configure the portal and gateways to use the same authentication methods or use different methods. Regardless, with two-factor authentication, the client must successfully authenticate by the two mechanisms that the component demands before it grants access. If the certificate profile specifies a Username Field from which GlobalProtect can obtain a username, the external authentication service automatically uses the username to authenticate the user to the external authentication service specified in the authentication profile. For example, if the Username Field in the certificate profile is set to Subject, the value in the common-name field of the certificate is used as the username when the authentication server tries to authenticate the user. If you do not want to force users to authenticate with a username from the certificate, make sure the certificate profile is set to None for the Username Field. See Remote Access VPN with Two-Factor Authentication for an example configuration.

How Does the Agent or App Know What Credentials to Supply to the Portal and Gateway?

By default, the GlobalProtect agent attempts to use the same login credentials for the gateway that it used for portal login. In the simplest case, where the gateway and the portal use the same authentication profile and/or certificate profile, the agent will connect to the gateway transparently.

On a per-agent configuration basis, you can also customize which GlobalProtect portal and gateways—internal, external, or manual only—require different credentials (such as unique OTPs). This enables the GlobalProtect portal or gateway to prompt for the unique OTP without first prompting for the credentials specified in the authentication profile.

There are two options for modifying the default agent authentication behavior so that authentication is both stronger and faster:

- **Cookie authentication on the portal or gateway**—Cookie authentication improves the user experience by minimizing the number of times that users must enter credentials. After the portal or gateways deploy an authentication cookie to the endpoint, they rely on the cookie to authenticate the user. This simplifies the authentication process for end users because they will no longer be required to log in to both the portal and the gateway in succession or enter multiple OTPs for authenticating to each.

  In addition, cookies enable use of a temporary password to re-enable VPN access after the user's password expires.
- **Credential forwarding to some or all gateways**—With two-factor authentication, you can specify the portal and/or types of gateways (internal, external, or manual only) that prompt for their own set of credentials. This option speeds up the authentication process when the portal and the gateway require different credentials (either different OTPs or different login credentials entirely). For each portal or gateway that you select, the agent will not forward credentials, allowing you to customize the security for different GlobalProtect components. For example, you can have the same security on your portals and internal gateways, while requiring a second factor OTP or a different password for access to those gateways that provide access to your most sensitive resources.

For an example of how to use these options, see Set Up Two-Factor Authentication.

Set Up External Authentication

The following workflow describes how to set up the GlobalProtect portal and gateways to use an external authentication service. The supported authentication services are LDAP, Kerberos, RADIUS, or TACACS+.

This workflow also describes how to create an optional *authentication profile* that a portal or gateway can use to identify the external authentication service. This step is optional for external authentication because the authentication profile also can specify the local authentication database or None.

> GlobalProtect also supports *local* authentication. To use local authentication, create a local user database (**Device > Local User Database**) that contains the users and groups to which you want to allow VPN access and then refer to that database in the authentication profile.

For more information, see Supported GlobalProtect Authentication Methods or watch a video.

Set Up External User Authentication	
Step 1 Create a server profile. The server profile identifies the external authentication service and instructs the firewall how to connect to that authentication service and access the authentication credentials for your users. If you want to Enable Delivery of GlobalProtect Client VSAs to a RADIUS Server, you must create a RADIUS server profile. If you are using LDAP to connect to Active Directory (AD), you must create a separate LDAP server profile for every AD domain.	1. Select **Device > Server Profiles** and select the type of profile (**LDAP**, **Kerberos**, **RADIUS**, or **TACACS+**). 2. Click **Add** and enter a **Name** for the profile, such as GP-User-Auth. 3. (LDAP only) Select the **Type** of LDAP server. 4. Click **Add** in the Servers section and then enter the necessary information for connecting to the authentication server, including the server **Name**, IP address or FQDN of the **Server**, and **Port**. 5. (RADIUS, TACACS+, and LDAP only) Specify settings to enable the authentication service to authenticate the firewall, as follows: • RADIUS and TACACS+—Enter the shared **Secret** when adding the server entry. • LDAP—Enter the **Bind DN** and **Password**. 6. (LDAP only) If you want the device to use SSL or TLS for a more secure connection with the directory server, select the **Require SSL/TLS secured connection** check box (selected by default). The protocol that the device uses depends on the server **Port**: • 389 (default)—TLS (Specifically, the device uses the StartTLS operation, which upgrades the initial plaintext connection to TLS.) • 636—SSL • Any other port—The device first attempts to use TLS. If the directory server doesn't support TLS, the device falls back to SSL. 7. (LDAP only) For additional security, select the **Verify Server Certificate for SSL sessions** check box so that the device verifies the certificate that the directory server presents for SSL/TLS connections. To enable verification, you also have to select the **Require SSL/TLS secured connection** check box. For verification to succeed, the certificate must meet one of the following conditions: • It is in the list of device certificates: **Device > Certificate Management > Certificates > Device Certificates**. Import the certificate into the device, if necessary. • The certificate signer is in the list of trusted certificate authorities: **Device > Certificate Management > Certificates > Default Trusted Certificate Authorities**. 8. Click **OK** to save the server profile.

Set Up External User Authentication (Continued)

Step 2 (Optional) Create an authentication profile.

The authentication profile specifies the server profile for the portal or gateways to use when they authenticate users. On a portal or gateway, you can assign one or more authentication profiles in one or more *client authentication* profiles. For descriptions of how an authentication profile within a client authentication profile supports granular user authentication, see Configure a GlobalProtect Gateway and Set Up Access to the GlobalProtect Portal.

Best Practices:

•To enable users to connect and change their own expired passwords without administrative intervention, consider using the pre-logon connect method. See Remote Access VPN with Pre-Logon for details.

•If users allow their passwords to expire, you may assign a temporary LDAP password to enable them to log in to the VPN. In this case, the temporary password may be used to authenticate to the portal, but the gateway login may fail because the same temporary password cannot be re-used. To prevent this, enable an authentication override in the portal configuration (**Network > GlobalProtect > Portal**) to enable the agent to use a cookie to authenticate to the portal and use the temporary password to authenticate the gateway.

1. Select **Device > Authentication Profile** and **Add** a new profile.
2. Enter a **Name** for the profile and then select the authentication **Type**: **None**, **Local Database** (the authentication database on the firewall), **RADIUS**, **TACACS+**, **LDAP**, or **Kerberos**.
3. If the authentication **Type** is RADIUS, TACACS+, LDAP, or Kerberos, select the authentication **Server Profile** that you created in Step 1 from the drop-down.
4. Specify the domain name and username format. The device combines the **User Domain** and **Username Modifier** values to modify the domain/username string that a user enters during login. The device uses the modified string for authentication and uses the **User Domain** value for User-ID group mapping. Modifying user input is useful when the authentication service requires domain/username strings in a particular format and you don't want to rely on users to correctly enter the domain. You can select from the following options:
   - To send only the unmodified user input, leave the **User Domain** blank (the default) and set the **Username Modifier** to the variable **%USERINPUT%** (the default).
   - To prepend a domain to the user input, enter a **User Domain** and set the **Username Modifier** to **%USERDOMAIN%\%USERINPUT%**.
   - To append a domain to the user input, enter a **User Domain** and set the **Username Modifier** to **%USERINPUT%@%USERDOMAIN%**.

   If the **Username Modifier** includes the **%USERDOMAIN%** variable, the **User Domain** value replaces any domain string that the user enters. If the **User Domain** is blank, that means the device removes any user-entered domain string.
5. (Kerberos only) Configure Kerberos single sign-on (SSO) if your network supports it:
   - Enter the **Kerberos Realm** (up to 127 characters). This is the hostname portion of the user login name. For example, the user account name user@EXAMPLE.LOCAL has the realm EXAMPLE.LOCAL.
   - Specify a **Kerberos Keytab** file: click the **Import** link, **Browse** to the keytab file, and click **OK**. During authentication, the endpoint first tries to use the keytab to establish SSO. If it succeeds, and the user attempting access is in the **Allow List**, authentication succeeds immediately. Otherwise, the authentication process falls back to manual (username/password) authentication of the specified **Type**. The **Type** doesn't have to be Kerberos. To change this behavior so that users can authenticate only using Kerberos, set **Use Default Authentication on Kerberos Authentication Failure** to **No** in a GlobalProtect portal agent configuration.
6. (LDAP only) Enter **sAMAccountName** as the **Login Attribute**.

Set Up External User Authentication (Continued)	
	7. (LDAP only) Set the **Password Expiry Warning** to specify the number of days before password expiration that users will be notified. By default, users will be notified seven days prior to password expiration (range is 1-255). Because users must change their passwords before the end of the expiration period, make sure you provide a notification period that is adequate for your user base to ensure continued access to the VPN. Users cannot access the VPN if their passwords expire unless you enable pre-logon. 8. (LDAP only) Configure an optional custom expiry message to include additional instructions, such as help desk contact information or a link to a password portal where users can change their passwords (see Step 3 in Customize the GlobalProtect Agent). 9. Select the **Advanced** tab. 10. In the Allow List, **Add** and then select the users and groups that are allowed to authenticate with this profile. Selecting the predefined **all** option allows every user to authenticate. By default, the list has no entries, which means no users can authenticate. 11. Click **OK**.
Step 3 Commit the configuration.	Click **Commit**.

Set Up Client Certificate Authentication

With the optional client certificate authentication, the agent/app presents a client certificate along with its connection request to the GlobalProtect portal or gateway. The portal or gateway can use either a shared or unique client certificate to validate that the user or device belongs to your organization.

The methods for deploying client certificates depend on the security requirements for your organization:

- Deploy Shared Client Certificates for Authentication
- Deploy Machine Certificates for Authentication
- Deploy User-Specific Client Certificates for Authentication

Deploy Shared Client Certificates for Authentication

To confirm that a user belongs to your organization, you can use the same client certificate for all endpoints or generate separate certificates to deploy with a particular agent configuration. Use this workflow to issue self-signed client certificates for this purpose and deploy them from the portal.

Deploy Shared Client Certificates for Authentication		
Step 1	Generate a certificate to deploy to multiple GlobalProtect clients.	1. Create the root CA certificate for issuing self-signed certificates for the GlobalProtect components. 2. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 3. Use the **Local** certificate type (the default). 4. Enter a **Certificate Name**. This name cannot contain spaces. 5. In the **Common Name** field enter a name to identify this certificate as an agent certificate, for example GP_Windows_clients. Because this same certificate will be deployed to all agents using the same configuration, it does not need to uniquely identify a specific user or endpoint. 6. In the **Signed By** field, select your root CA. 7. Select an **OSCP Responder** to verify the revocation status of certificates. 8. Click **OK** to generate the certificate.
Step 2	Set Up Two-Factor Authentication.	Configure authentication settings in a GlobalProtect portal agent configuration to enable the portal to transparently deploy the client certificate that is **Local** to the firewall to clients that receive the configuration.

Deploy Machine Certificates for Authentication

To confirm that the endpoint belongs to your organization, use your own public-key infrastructure (PKI) to issue and distribute machine certificates to each endpoint (recommended) or generate a self-signed machine certificate for export. With the pre-logon connect method, a machine certificate is required and must be installed on the endpoint before GlobalProtect components will grant access.

To confirm that the endpoint belongs to your organization, you must also configure an authentication profile to authenticate the user. See Two-factor authentication.

Use the following workflow to create the client certificate and manually deploy it to an endpoint. For more information, see About GlobalProtect User Authentication. For an example configuration, see Remote Access VPN (Certificate Profile).

Deploy Machine Certificates for Authentication		
Step 3	Issue client certificates to GlobalProtect clients and endpoints. This enables the GlobalProtect portal and gateways to validate that the device belongs to your organization.	1. Create the root CA certificate for issuing self-signed certificates for the GlobalProtect components. 2. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 3. Enter a **Certificate Name**. The certificate name cannot contain any spaces. 4. In the Certificate Attributes section, **Add** and define the attributes that uniquely identify the . Keep in mind that if you add a **Host Name** attribute (which populates the SAN field of the certificate), it must be the same as the value you defined for the **Common Name**. 5. In the **Signed By** field, select your root CA. 6. Select an **OSCP Responder** to verify the revocation status of certificates. 7. (Optional) In the Certificate Attributes section, click **Add** and define the attributes to identify the GlobalProtect clients as belonging to your organization if required as part of your security requirements. 8. Click **OK** to generate the certificate.

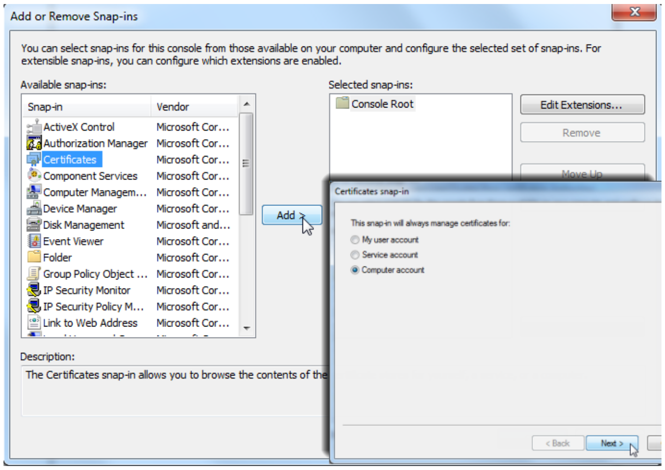
Deploy Machine Certificates for Authentication (Continued)

Step 4 Install certificates in the personal certificate store on the endpoints.

If you are using unique user certificates or machine certificates, you must install each certificate in the personal certificate store on the endpoint prior to the first portal or gateway connection. Install machine certificates to the Local Computer certificate store on Windows and in the System Keychain on Mac OS. Install user certificates to the Current User certificate store on Windows and in the Personal Keychain on Mac OS.

For example, to install a certificate on a Windows system using the Microsoft Management Console:

1. From the command prompt, enter `mmc` to launch the console.
2. Select **File > Add/Remove Snap-in**.
3. Select **Certificates**, click **Add** and then select one of the following, depending on what type of certificate you are importing:
   - **Computer account**—Select this option if you are importing a machine certificate.
   - **My user account**—Select this option if you are importing a user certificate.



Add or Remove Snap-ins

You can select snap-ins for this console from those available on your computer and configure the selected set of snap-ins. For extensible snap-ins, you can configure which extensions are enabled.

Available snap-ins:

Snap-in	Vendor
ActiveX Control	Microsoft Cor...
Authorization Manager	Microsoft Cor...
Certificates	Microsoft Cor...
Component Services	Microsoft Cor...
Computer Managem...	Microsoft Cor...
Device Manager	Microsoft Cor...
Disk Management	Microsoft and...
Event Viewer	Microsoft Cor...
Folder	Microsoft Cor...
Group Policy Object ...	Microsoft Cor...
IP Security Monitor	Microsoft Cor...
IP Security Policy M...	Microsoft Cor...
Link to Web Address	Microsoft Cor...

Selected snap-ins: Console Root

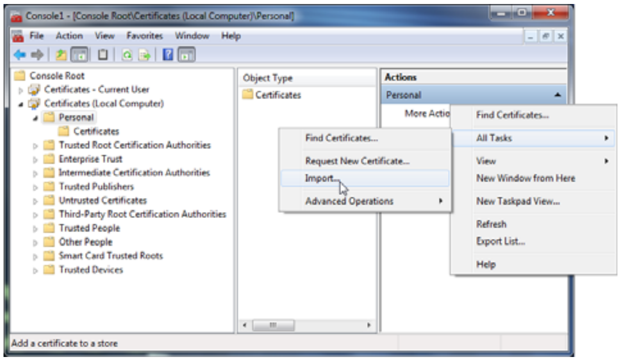
Description: The Certificates snap-in allows you to browse the contents of the

Certificates snap-in

This snap-in will always manage certificates for:

○ My user account
○ Service account
● Computer account

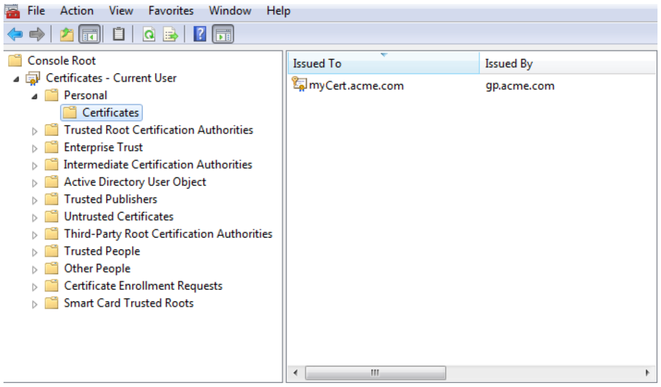
4. Expand **Certificates** and select **Personal** and then in the Actions column select **Personal > More Actions > All Tasks > Import**. and follow the steps in the Certificate Import Wizard to import the PKCS file you got from the CA.



Console1 - [Console Root\Certificates (Local Computer)\Personal]

Add a certificate to a store

5. Browse to the .p12 certificate file to import (select **Personal Information Exchange** as the file type to browse for) and enter the **Password** that you used to encrypt the private key. Select **Personal** as the **Certificate store**.

Deploy Machine Certificates for Authentication (Continued)		
Step 5	Verify that the certificate has been added to the personal certificate store.	Navigate to the personal certificate store:  File Action View Favorites Window Help Console Root Certificates - Current User Personal Certificates Trusted Root Certification Authorities Enterprise Trust Intermediate Certification Authorities Active Directory User Object Trusted Publishers Untrusted Certificates Third-Party Root Certification Authorities Trusted People Other People Certificate Enrollment Requests Smart Card Trusted Roots Issued To Issued By myCert.acme.com gp.acme.com
Step 6	Import the root CA certificate used to issue the client certificates onto the firewall. This step is required only if an external CA issued the client certificates, such as a public CA or an enterprise PKI CA. If you are using self-signed certificates, the root CA is already trusted by the portal and gateways.	1. Download the root CA certificate used to issue the client certificates (Base64 format). 2. Import the root CA certificate from the CA that generated the client certificates onto the firewall: a. Select **Device > Certificate Management > Certificates > Device Certificates** and click **Import**. b. Use the **Local** certificate type (the default). c. Enter a **Certificate Name** that identifies the certificate as your client CA certificate. d. **Browse** to the **Certificate File** you downloaded from the CA. e. Select **Base64 Encoded Certificate (PEM)** as the **File Format** and then click **OK**. f. Select the certificate you just imported on the **Device Certificates** tab to open it. g. Select **Trusted Root CA** and then click **OK**.
Step 7	Create a client certificate profile. If you plan to configure the portal or gateways to authenticate users with certificates only, you must specify the **Username Field**. This enables GlobalProtect to associate a username with the certificate. If you plan to set up the portal or gateway for two-factor authentication, your external authentication service checks the username in the client certificate to authenticate the user. This check ensures that the endpoint is the one to which the certificate was issued.	3. Select **Device > Certificates > Certificate Management > Certificate Profile**, click **Add**, and enter a profile **Name**. 4. Select a value for the **Username Field** to specify which field in the certificate will contain the user's identity information. 5. In the **CA Certificates** field, click **Add**, select the Trusted Root CA certificate you imported in Step 6 and then click **OK**.
Step 8	Save the configuration.	Click **Commit**.

Deploy User-Specific Client Certificates for Authentication

To authenticate individual users, you must issue a unique client certificate to each GlobalProtect user and deploy the client certificate to the endpoints prior to enabling GlobalProtect. To automate the generation and deployment of user-specific client certificates, you can configure your GlobalProtect portal to act as a Simple Certificate Enrollment Protocol (SCEP) client to a SCEP server in your enterprise PKI.

SCEP operation is dynamic in that the enterprise PKI generates a user-specific certificate when the portal requests it and sends the certificate to the portal. The portal then transparently deploys the certificate to the client. When a user requests access, the agent or app can then present the client certificate to authenticate with the portal or gateway.

The GlobalProtect portal or gateway uses identifying information about the device and user to evaluate whether to permit access to the user. GlobalProtect blocks access if the host ID is on a device block list or if the session matches any blocking options specified in a certificate profile. If client authentication fails due to an invalid SCEP-based client certificate, the GlobalProtect client tries to authenticate with the portal per the settings in the authentication profile and retrieve the certificate. If the client cannot retrieve the certificate from the portal, the device is not able to connect.

Deploy User-Specific Client Certificates for Authentication		
Step 1	Create a SCEP profile.	1. Select **Device > Certificate Management > SCEP** and then **Add** a new profile. 2. Enter a **Name** to identify the SCEP profile. 3. If this profile is for a firewall with multiple virtual systems capability, select a virtual system or **Shared** as the **Location** where the profile is available.
Step 2	(Optional) To make the SCEP-based certificate generation more secure, configure a SCEP challenge-response mechanism between the PKI and portal for each certificate request. After you configure this mechanism, its operation is invisible, and no further input from you is necessary. To comply with the U.S. Federal Information Processing Standard (FIPS), use a **Dynamic** SCEP challenge and specify a **Server URL** that uses HTTPS (see Step 7).	Select one of the following options: • **None**—(Default) The SCEP server does not challenge the portal before it issues a certificate. • **Fixed**—Obtain the enrollment challenge password from the SCEP server (for example, `http://10.200.101.1/CertSrv/mscep_admin/`) in the PKI infrastructure and then copy or enter the password into the **Password** field. • **Dynamic**—Enter the SCEP **Server URL** where the portal-client submits these credentials (for example, `http://10.200.101.1/CertSrv/mscep_admin/`), and a username and OTP of your choice. The username and password can be the credentials of the PKI administrator.

Deploy User-Specific Client Certificates for Authentication (Continued)		
Step 3	Specify the settings for the connection between the SCEP server and the portal to enable the portal to request and receive client certificates. When a user attempts to log in to the portal, the endpoint sends identifying information about it that includes its host ID value. The host ID value varies by device type, either GUID (Windows) MAC address of the interface (Mac), Android ID (Android devices), UDID (iOS devices), or a unique name that GlobalProtect assigns (Chrome). You can include additional information about the client device or user by specifying tokens in the **Subject** name of the certificate. The portal includes the token value and host ID in the CSR request to the SCEP server.	1. Configure the **Server URL** that the portal uses to reach the SCEP server in the PKI (for example, `http://10.200.101.1/certsrv/mscep/`). 2. Enter a string (up to 255 characters in length) in the **CA-IDENT Name** field to identify the SCEP server. 3. Enter the **Subject** name to use in the certificates generated by the SCEP server. The subject must be a distinguished name in the `<attribute>=<value>` format and must include a common name (CN) key. The CN supports the following dynamic variables: `$USERNAME`, `$EMAILADDRESS`, and `$HOSTID`. Use the *username* or *email address* variable to ensure that the portal requests certificates for a specific user. To request certificates for the device only, specify the *hostid* variable. When the GlobalProtect portal pushes the SCEP settings to the agent, the CN portion of the subject name is replaced with the actual value (*username*, *hostid*, or *email address*) of the certificate owner (for example, `O=acme,CN=$HOSTID`). 4. Select the **Subject Alternative Name Type**: • **RFC 822 Name**—Enter the email name in a certificate's subject or Subject Alternative Name extension. • **DNS Name**—Enter the DNS name used to evaluate certificates. • **Uniform Resource Identifier**—Enter the name of the resource from which the client will obtain the certificate. • **None**—Do not specify attributes for the certificate.
Step 4	(Optional) Configure cryptographic settings for the certificate.	• Select the key length (**Number of Bits**) for the certificate. If the firewall is in FIPS-CC mode and the key generation algorithm is RSA. The RSA keys must be 2048 bits or larger. • Select the **Digest for CSR** which indicates the digest algorithm for the certificate signing request (CSR): SHA1, SHA256, SHA384, or SHA512.
Step 5	(Optional) Configure the permitted uses of the certificate, either for signing or encryption.	• To use this certificate for signing, select the **Use as digital signature** check box. This enables the endpoint use the private key in the certificate to validate a digital signature. • To use this certificate for encryption, select the **Use for key encipherment** check box. This enables the client use the private key in the certificate to encrypt data exchanged over the HTTPS connection established with the certificates issued by the SCEP server.
Step 6	(Optional) To ensure that the portal is connecting to the correct SCEP server, enter the **CA Certificate Fingerprint**. Obtain this fingerprint from the SCEP server interface in the Thumbprint field.	1. Enter the URL for the SCEP server's administrative UI (for example, `http://<hostname or IP>/CertSrv/mscep_admin/`). 2. Copy the thumbprint and enter it in the **CA Certificate Fingerprint** field.

Deploy User-Specific Client Certificates for Authentication (Continued)		
Step 7	Enable mutual SSL authentication between the SCEP server and the GlobalProtect portal. This is required to comply with the U.S. Federal Information Processing Standard (FIPS). (FIPS-CC operation is indicated on the firewall login page and in its status bar.	Select the SCEP server's root **CA Certificate**. Optionally, you can enable mutual SSL authentication between the SCEP server and the GlobalProtect portal by selecting a **Client Certificate**.
Step 8	Save and commit the configuration.	1. Click **OK** to save the settings and close the SCEP configuration. 2. **Commit** the configuration. The portal attempts to request a CA certificate using the settings in the SCEP profile and saves it to the firewall hosting the portal. If successful, the CA certificate is shown in **Device > Certificate Management > Certificates**.
Step 9	(Optional) If after saving the SCEP profile, the portal fails to obtain the certificate, you can manually generate a certificate signing request (CSR) from the portal.	1. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 2. Enter a **Certificate Name**. This name cannot contain spaces. 3. Select the **SCEP Profile** to use to submit a CSR to your enterprise PKI. 4. Click **OK** to submit the request and generate the certificate.
Step 10	Set Up Two-Factor Authentication.	Assign the SCEP profile a GlobalProtect portal agent configuration to enable the portal to transparently request and deploy client certificates to clients that receive the configuration.

Set Up Two-Factor Authentication

If you require strong authentication to protect sensitive assets or to comply with regulatory requirements, such as PCI, SDX, or HIPAA, configure GlobalProtect to use an authentication service that uses a two-factor authentication scheme. A two-factor authentication scheme requires two things: something the end user knows (such as a PIN or password) and something the end user has (a hardware or software token/OTP, smart card, or certificate). You can also enable two-factor authentication using a combination of external authentication services, and client and certificate profiles.

The following topics provide examples for how to set up two-factor authentication on GlobalProtect:

- Enable Two-Factor Authentication Using Certificate and Authentication Profiles
- Enable Two-Factor Authentication Using One-Time Passwords (OTPs)
- Enable Two-Factor Authentication Using Smart Cards

Enable Two-Factor Authentication Using Certificate and Authentication Profiles

The following workflow describes how to configure GlobalProtect client authentication requiring the user to authenticate both to a certificate profile and an authentication profile. The user must successfully authenticate using both methods in order to connect to the portal/gateway. For more details on this configuration, see Remote Access VPN with Two-Factor Authentication.

Enable Two-Factor Authentication Using Certificate and Authentication Profiles		
Step 1	Create an authentication server profile. The authentication server profile determines how the firewall connects to an external authentication service and retrieves the authentication credentials for your users. If you are using LDAP to connect to Active Directory (AD), you must create a separate LDAP server profile for every AD domain.	1. Select **Device > Server Profiles** and a profile type (**LDAP**, **Kerberos**, **RADIUS**, or **TACACS+**). 2. **Add** a new server profile. 3. Enter a **Profile Name** for the profile, such as GP-User-Auth. 4. (LDAP only) Select the **Type** of LDAP server (**active-directory**, **e-directory**, **sun**, or **other**). 5. Click **Add** in the Servers list section and then enter the required information for connections to the authentication service, including the server **Name**, IP address or FQDN of the **Server**, and **Port**. 6. (RADIUS, TACACS+, and LDAP only) Specify settings to enable the firewall to authenticate to the authentication service as follows: • RADIUS and TACACS+—Enter the shared **Secret** when adding the server entry. • LDAP—Enter the **Bind DN** and **Password**. 7. (LDAP only) If you want the endpoint to use SSL or TLS for a more secure connection with the directory server, select the **Require SSL/TLS secured connection** check box (selected by default). The protocol that the device uses depends on the server **Port** in the **Server list**: • 389 (default)—TLS (specifically, the device uses the StartTLS operation to upgrade the initial plaintext connection to TLS). • 636—SSL. • Any other port—The device first attempts to use TLS. If the directory server does not support TLS, the device uses SSL. 8. (LDAP only) For additional security, select the **Verify Server Certificate for SSL sessions** check box so that the endpoint verifies the certificate that the directory server presents for SSL/TLS connections. To enable verification, you also must select the **Require SSL/TLS secured connection** check box. For verification to succeed, one of the following conditions must be true: • The certificate is in the list of device certificates: **Device > Certificate Management > Certificates > Device Certificates**. Import the certificate into the endpoint if necessary. • The certificate signer is in the list of trusted certificate authorities: **Device > Certificate Management > Certificates > Default Trusted Certificate Authorities**. 9. Click **OK** to save the server profile.

Enable Two-Factor Authentication Using Certificate and Authentication Profiles (Continued)		
Step 2	Create an authentication profile that identifies the service for authenticating users. (You later have the option of assigning the profile on the portal and on gateways.)	1. Select **Device > Authentication Profile** and **Add** a new profile. 2. Enter a **Name** for the profile. 3. Select the **Location**. 4. Select the **Type** of **Authentication** (**LDAP**, **Kerberos**, **RADIUS**, or **TACACS+**). 5. Select the **Server Profile** you created in Step 1. 6. (LDAP only) Enter **sAMAccountName** as the **Login Attribute**. 7. Click **OK** to save the authentication profile.
Step 3	Create a client certificate profile that the portal uses to authenticate the client certificates that come from user devices. When you configure two-factor authentication to use client certificates, the external authentication service uses the username value to authenticate the user, if specified, in the client certificate. This ensures that the user who is logging is in is actually the user to whom the certificate was issued.	1. Select **Device > Certificates > Certificate Management > Certificate Profile** and click **Add** and enter a profile **Name**. 2. Select a value for the **Username Field**: • If you intend for the client certificate to authenticate individual users, select the certificate field that identifies the user. • If you are deploying the client certificate from the portal, leave this field set to **None**. • If you are setting up a certificate profile for use with the pre-logon connect method, leave the field set to **None**. 3. In the **CA Certificates** area, click **Add** and then: a. Select the **CA certificate**, either a trusted root CA certificate or the CA certificate from a SCEP server. (If necessary, import the certificate). b. (Optional) Enter the **Default OCSP URL**. c. (Optional) Select a certificate for **OCSP Verify CA**. 4. (Optional) Select options that specify when to block the user's requested session: a. Status of certificate is unknown. b. GlobalProtect component does not retrieve certificate status within the number of seconds in **Certificate Status Timeout**. c. The authenticating device that is considering the login request did not issue the certificate that the user is offering. 5. Click **OK**.
Step 4	(Optional) Issue client certificates to GlobalProtect users/machines. To transparently deploy client certificates, configure your portal to distribute a shared client certificate to your endpoints or configure the portal to use SCEP to request and deploy unique client certificates for each user.	1. Use your enterprise PKI or a public CA to issue a client certificate to each GlobalProtect user. 2. For the pre-logon connect method, install certificates in the personal certificate store on the client systems.
Step 5	Save the GlobalProtect configuration.	Click **Commit**.

Enable Two-Factor Authentication Using One-Time Passwords (OTPs)

Use this workflow to configure two-factor authentication using one-time passwords (OTPs) on the portal and gateways. When a user requests access, the portal or gateway prompts the user to enter an OTP. The authentication service sends the OTP as a token to the user's RSA device.

Setting up a two-factor authentication scheme is similar to setting up other types of authentication and requires you to configure:

- A server profile (usually for a RADIUS service for two-factor authentication) assigned to an authentication profile.
- A client authentication profile that includes the authentication profile for the service that these components use.

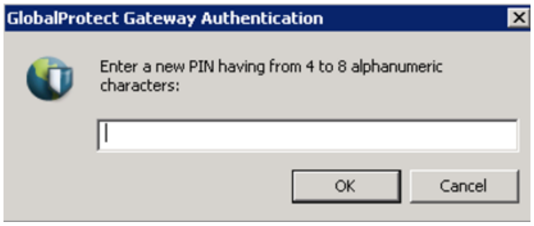
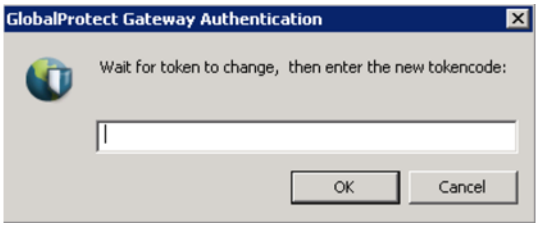
By default, the agent supplies the same credentials it used to log in to the portal and to the gateway. In the case of OTP authentication, this behavior will cause the authentication to initially fail on the gateway and, because of the delay this causes in prompting the user for a login, the user's OTP may expire. To prevent this, you must configure the portals and gateways that prompt for the OTP instead of using the same credentials on a per-agent configuration basis.

You can also reduce the frequency in which users are prompted for OTPs by configuring an authentication override. This enables the portals and gateways to generate and accept a secure encrypted cookie to authenticate the user for a specified amount of time. The portals and/or gateways will not require a new OTP until the cookie expires thus reducing the number of times users must provide an OTP.

Enable Two-Factor Authentication Using OTPs		
Step 1	Set up a RADIUS server to interact with the firewall. This task begins after: • You have configured the back-end RADIUS service to generate tokens for the OTPs. • Users have the necessary devices (such as a hardware token).	For specific instructions, refer to the documentation for your RADIUS server. In most cases, you need to set up an authentication agent and a client configuration on the RADIUS server to enable communication between the firewall and the RADIUS server. You also define the shared secret to use for encrypting sessions between the firewall and the RADIUS server.
Step 2	On each firewall that hosts the gateways and/or portal, create a RADIUS server profile. (For a small deployment, one firewall can host the portal and gateways.) **Best Practice:** When creating the RADIUS server profile, always enter a Domain name. This value serves as the default domain for User-ID mapping if users don't supply a User-ID upon login.	1. Select **Device > Server Profiles > RADIUS**. 2. **Add** a new profile. 3. Enter a **Name** for this RADIUS profile. 4. Enter a RADIUS **Domain** name. 5. In the **Servers** area, **Add** a RADIUS instance and enter: • A descriptive **Name** to identify this RADIUS server • The **RADIUS Server** IP address • The shared **Secret** for encrypting sessions between the firewall and the RADIUS server • The **Port** number on which the RADIUS server listens for authentication requests (default 1812) 6. Click **OK** to save the profile.

Enable Two-Factor Authentication Using OTPs (Continued)		
Step 3	Create an authentication profile.	1. Select **Device > Authentication Profile**. 2. **Add** a new profile. 3. Enter a **Name** for the profile. The name cannot contain spaces. 4. Select **RADIUS** as the **Type** of authentication service. 5. Select the **Server Profile** you created for accessing your RADIUS server. 6. Click **OK** to save the authentication profile.
Step 4	Assign the authentication profile to the GlobalProtect gateway(s) and/or portal. You can configure multiple Client Authentication configurations for the portal and gateways. For each Client Authentication configuration you can specify the authentication profile to apply to endpoints of a specific OS. This step describes only how to add the authentication profile to the gateway or portal configuration. For additional details on setting up these components, see Configure GlobalProtect Gateways and Configure the GlobalProtect Portal.	1. Select **Network > GlobalProtect > Gateways** and an existing gateway configuration by name (or **Add** one). If you are adding a new gateway, specify its name, location, and network parameters. 2. On the **Authentication** tab, select an SSL/TLS service profile or **Add** a new profile. 3. **Add** a Client Authentication configuration and enter its **Name**. 4. Select the endpoint OS to which this configuration applies. 5. Select the **Authentication Profile** you created in Create an authentication profile. 6. (Optional) Enter a custom authentication message. 7. To add additional Client Authentication configurations, repeat steps 3 through 6. 8. Click **OK** to save the configuration. 9. To add other gateways, repeat steps 2 through 8. 10. To assign the authentication profile to the portal, select **Network > GlobalProtect > Portals** and repeat steps 2 through 8.
Step 5	(Optional) Configure the portal or gateways to prompt for a username and password or only a password each time the user logs in. Saving the password is not supported with two-factor authentication using OTPs because the user must enter a dynamic password each time they log in. This step describes only how to configure the password setting in a portal agent configuration. For additional details, see Customize the GlobalProtect Agent.	1. Select **Network > GlobalProtect > Portals** and select an existing portal configuration. 2. Select **Agent**. 3. Select an existing agent configuration or **Add** one. 4. Set **Save User Credentials** to **Save Username Only** or **No**. This setting enables GlobalProtect to prompt for dynamic passwords for each component you select in the following step. 5. Click **OK** twice to save the configuration.

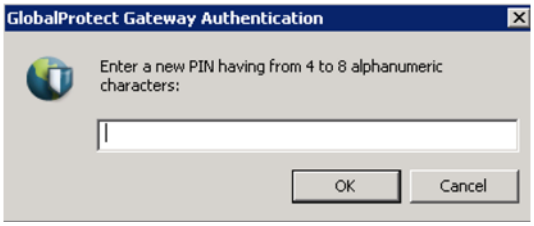
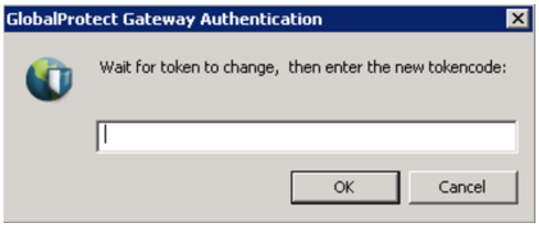
Enable Two-Factor Authentication Using OTPs (Continued)		
Step 6	Select the GlobalProtect components—portal and types of gateways—that prompt for dynamic passwords, such as OTPs, instead of using saved credentials.	1. Select **Network > GlobalProtect > Portals** and select an existing portal configuration. 2. Select **Agent**. 3. Select an existing agent configuration or **Add** one. 4. Select the **Authentication** tab, and then select the Components that Require Dynamic Passwords (Two-Factor Authentication). When selected, the portal and/or types of gateways prompt for OTPs. 5. Click **OK** twice to save the configuration.
Step 7	If single sign-on (SSO) is enabled, disable it. The agent configuration specifies RADIUS as the authentication service so Kerberos SSO is not supported. This step describes only how to disable SSO. For more details, see Define the GlobalProtect Agent Configurations.	1. Select **Network > GlobalProtect > Portals** and select the portal configuration. 2. Select **Agent** and then select the agent configuration (or **Add** one). 3. Select the **App** tab. 4. Set **Use Single Sign-on** to **No**. 5. Click **OK** twice to save the configuration.
Step 8	(Optional) To minimize the number of times a user must provide credentials, configure an authentication override. By default, the portal or gateways authenticate the user with an authentication profile and optional certificate profile. With authentication override, the portal or gateway authenticates the user with an encrypted cookie that it has deployed to the endpoint. While the cookie is valid, the user can log in without entering regular credentials or an OTP. If you need to immediately block access to a device whose cookie has not yet expired (for example, if the device is lost or stolen), you can Block Device Access by adding the device to a block list. This step describes how to configure the authentication override behavior on portals and gateways. For more details on setting up these components, see Configure GlobalProtect Gateways and Configure the GlobalProtect Portal.	1. Select **Network > GlobalProtect > Gateways** or **Portals** and select the configuration (or **Add** one). 2. Select **Agent > Client Settings** (on the gateway) or **Agent** (on the portal) and then select the configuration (or **Add** one). 3. In the **Authentication Override** area, configure the following: • **Generate cookie for authentication override**—Enable the portal or gateway to generate encrypted, endpoint-specific cookies. The portal or gateway sends this cookie to the endpoint after the user first authenticates with the portal. • **Cookie Lifetime**—Specify the hours, days, or weeks that the cookie is valid. Typical lifetime is 24 hours. The range for hours is 1–72; for weeks, 1–52; and for days, 1–365. After the cookie expires, the user must enter login credentials, and the portal or gateway subsequently encrypts a new cookie to send to the user endpoint. • **Accept cookie for authentication override**—Select the check box to instruct the portal or gateway to authenticate the user through a valid, encrypted cookie. When the endpoint presents a valid cookie, the portal or gateway verifies that the cookie was encrypted by the portal or gateway, decrypts the cookie, and then authenticates the user. • **Certificate to Encrypt/Decrypt Cookie**—Select the certificate to use to encrypt and decrypt the cookie. Ensure that the portal and gateways use the same certificate to encrypt and decrypt cookies. 4. Click **OK** twice to save the configuration.
Step 9	Commit the configuration.	Click **Commit**.

Enable Two-Factor Authentication Using OTPs (Continued)		
Step 10	Verify the configuration. The gateway and portal must be configured before you take his step. For details on setting up these components, see Configure GlobalProtect Gateways and Configure the GlobalProtect Portal.	From an endpoint running the GlobalProtect agent, try to connect to a gateway or portal on which you enabled OTP authentication. You should see two prompts similar to the following: The first prompt requests a PIN (either a user- or system-generated PIN):  GlobalProtect Gateway Authentication Enter a new PIN having from 4 to 8 alphanumeric characters: The second prompt requests your token or OTP:  GlobalProtect Gateway Authentication Wait for token to change, then enter the new tokencode:

Enable Two-Factor Authentication Using Smart Cards

If you want to enable your end users to authenticate using a smart card or common access card (CAC), you must import the Root CA certificate that issued the certificates contained on the end user CAC or smart cards onto the portal and gateway. You can then create a certificate profile that includes that Root CA and apply it to your portal and/or gateway configurations to enable use of the smart card in the authentication process.

Enable Smart Card Authentication		
Step 1	Set up your smart card infrastructure. This procedure assumes that you have deployed smart cards and smart card readers to your end users.	For specific instructions, refer to the documentation for the user authentication provider software. In most cases, setting up the smart card infrastructure involves the generating of certificates for end users and for the participating servers, which are the GlobalProtect portal and gateway(s) in this use case.
Step 2	Import the Root CA certificate that issued the client certificates contained on the end user smart cards.	Make sure the certificate is accessible from your management system and then complete the following steps: 1. Select **Device > Certificate Management > Certificates > Device Certificates**. 2. Click **Import** and enter a **Certificate Name**. 3. Enter the path and name to the **Certificate File** received from the CA, or **Browse** to find the file. 4. Select **Base64 Encoded Certificate (PEM)** as the **File Format** and then click **OK** to import the certificate.

Enable Smart Card Authentication (Continued)		
Step 3	Create the certificate profile. For details on other certificate profile fields, such as whether to use CRL or OCSP, refer to the online help.	Create the certificate profile on each portal/gateway on which you plan to use CAC or smart card authentication: 1. Select **Device > Certificate Management > Certificate Profile** and click **Add** and enter a profile **Name**. 2. In the **Username** field, select the certificate field that PAN-OS uses to match the IP address for User-ID, either **Subject** to use a common name, **Subject Alt: Email** to use an email address, or **Subject Alt: Principal Name** to use the Principal Name. 3. In the **CA Certificates** field, click **Add**, select the trusted root **CA Certificate** you imported in Step 2 and then click **OK**. 4. Click **OK** to save the certificate profile.
Step 4	Assign the certificate profile to the gateway(s) or portal. This section describes only how to add the certificate profile to the gateway or portal configuration. For details on setting up these components, see Configure GlobalProtect Gateways and Configure the GlobalProtect Portal.	1. Select **Network > GlobalProtect > Gateways** or **Portals** and select the configuration (or **Add** a new one). 2. On the **Authentication** tab, select the **Certificate Profile** you just created. 3. Click **OK** to save the configuration.
Step 5	Save the configuration.	Click **Commit**.
Step 6	Verify the configuration. The gateway and portal must be configured before you take his step. For details on setting up these components, see Configure GlobalProtect Gateways and Configure the GlobalProtect Portal.	From a client system running the GlobalProtect agent, try to connect to a gateway or portal on which you enabled OTP authentication. You should see two prompts similar to the following: The first prompt requests a PIN (either a user- or system-generated PIN):  Enter a new PIN having from 4 to 8 alphanumeric characters: The second prompt requests your token or OTP:  Wait for token to change, then enter the new tokencode:

Set Up Authentication for strongSwan Ubuntu and CentOS Clients

To extend GlobalProtect VPN remote access support to strongSwan Ubuntu and CentOS clients, set up authentication for the strongSwan clients.

> To view the minimum GlobalProtect release version that supports strongSwan on Ubuntu Linux and CentOS, see What Client OS Versions are Supported with GlobalProtect?.

To connect to the GlobalProtect gateway, the user must successfully authenticate. The following workflows show examples of how to enable authentication for strongSwan clients. For complete information about strongSwan, see the strongSwan wiki.

- ▲ Enable Authentication Using a Certificate Profile
- ▲ Enable Authentication Using an Authentication Profile
- ▲ Enable Authentication Using Two-Factor Authentication

Enable Authentication Using a Certificate Profile

The following workflow shows how to enable authentication for strongSwan clients using a certificate profile.

Enable Authentication Using a Certificate Profile		
Step 1	Configure an IPSec tunnel for the GlobalProtect gateway for communicating with a strongSwan client.	1. Select **Network > GlobalProtect > Gateways** and then select the gateway name. 2. Select the **Certificate Profile** you want to use for authentication in the **Authentication** tab. 3. Select **Agent > Tunnel Settings** and specify the following settings to set up a tunnel: • Select the check box to **Enable X-Auth Support**. • If a **Group Name** and **Group Password** are already configured, remove them. • Click **OK** to save the settings.

Enable Authentication Using a Certificate Profile (Continued)		
Step 2	Verify that the default connection settings in the `conn %default` section of the IPSec tunnel configuration file (`ipsec.conf`) are correctly defined for the strongSwan client. The `ipsec.conf` file is usually found in the `/etc` folder. The configurations in this procedure are tested and verified for the following releases: •Ubuntu 14.0.4 with strongSwan 5.1.2 and CentOS 6.5 with strongSwan 5.1.3 for PAN-OS 6.1. •Ubuntu 14.0.4 with strongSwan 5.2.1 for PAN-OS 7.0. The configurations in this procedure can be used for reference if you are using a different version of strongSwan. Refer to the strongSwan wiki for more information.	Modify the following settings in the `conn %default` section of the `ipsec.conf` file to these recommended settings. `ikelifetime=`**20m** `reauth=`**yes** `rekey=`**yes** `keylife=`**10m** `rekeymargin=`**3m** `rekeyfuzz=`**0%** `keyingtries=`**1** `type=`**tunnel**

Step 3	Modify the strongSwan client's IPSec configuration file (`ipsec.conf`) and the IPSec password file (`ipsec.secrets`) to use recommended settings.
	The `ipsec.secrets` file is usually found in the `/etc` folder.
	Use the strongSwan client username as the certificate's common name.
		Modify the following items in the `ipsec.conf` file to these recommended settings.
		`conn <`**connection name**`>`
		`keyexchange=`**ikev1**
		`authby=`**rsasig**
		`ike=`**aes-sha1-modp1024,aes256**
		`left=<`**strongSwan/Linux client IP address**`>`
		`leftcert=<`**client certificate with the strongSwan client username used as the certificate's common name**`>`
		`leftsourceip=`**%config**
		`leftauth2=`**xauth**
		`right=<`**GlobalProtect Gateway IP address**`>`
		`rightid="`**CN=<Subject name of gateway certificate**`>"`
		`rightsubnet=`**0.0.0.0/0**
		`auto=`**add**
		
		Modify the following items in the `ipsec.conf` file to these recommended settings.
		`:RSA <`**private key file**`> "<`**passphrase if used**`>"`

Step 4	Start strongSwan IPSec services and connect to the IPSec tunnel that you want the strongSwan client to use when authenticating to the GlobalProtect gateway.
	Use the `config <name>` variable to name the tunnel configuration.
		Ubuntu clients:
		`ipsec start`
		`ipsec up <`**name**`>`
		CentOS clients:
		`strongSwan start`
		`strongswan up <`**name**`>`

Enable Authentication Using a Certificate Profile (Continued)		
Step 5	Verify that the tunnel is set up correctly and the VPN connection is established to both the strongSwan client and the GlobalProtect gateway.	1. Verify the detailed status information on a specific connection (by naming the connection) or verify the status information for all connections from the strongSwan client: Ubuntu clients: `ipsec statusall [<`**connection name**`>]` CentOS clients: strongswan `statusall [<`**`connection name`**`>]` 2. Select **Network > GlobalProtect > Gateways**. Then, in the Info column, select **Remote Users** for the gateway configured for the connection to the strongSwan client. The strongSwan client should be listed under **Current Users**.

Enable Authentication Using an Authentication Profile

The following workflow shows how to enable authentication for strongSwan clients using an authentication profile. The authentication profile specifies which server profile to use when authenticating strongSwan clients.

Enable Authentication Using an Authentication Profile		
Step 1	Set up the IPSec tunnel that the GlobalProtect gateway will use for communicating with a strongSwan client.	1. Select **Network > GlobalProtect > Gateways** and select the gateway name. 2. Select the **Authentication Profile** you want to use in the **Authentication** tab. 3. Select **Agent > Tunnel Settings** and specify the following settings to set up a tunnel: • Select the check box to **Enable X-Auth Support**. • Enter a **Group Name** and **Group Password** if they are not already configured. • Click **OK** to save these tunnel settings.

Enable Authentication Using an Authentication Profile (Continued)		
Step 2	Verify that the default connection settings in the `conn %default` section of the IPSec tunnel configuration file (`ipsec.conf`) are correctly defined for the strongSwan client. The `ipsec.conf` file is usually found in the `/etc` folder. The configurations in this procedure are tested and verified for the following releases: •Ubuntu 14.0.4 with strongSwan 5.1.2 and CentOS 6.5 with strongSwan 5.1.3 for PAN-OS 6.1. •Ubuntu 14.0.4 with strongSwan 5.2.1 for PAN-OS 7.0. The configurations in this procedure can be used for reference if you are using a different version of strongSwan. Refer to the strongSwan wiki for more information.	In the `conn %default` section of the `ipsec.conf` file, configure the following recommended settings: `ikelifetime=`**20m** `reauth=`**yes** `rekey=`**yes** `keylife=`**10m** `rekeymargin=`**3m** `rekeyfuzz=`**0%** `keyingtries=`**1** `type=`**tunnel**

Enable Authentication Using an Authentication Profile (Continued)		
Step 3	Modify the strongSwan client's IPSec configuration file (`ipsec.conf`) and the IPSec password file (`ipsec.secrets`) to use recommended settings. The `ipsec.secrets` file is usually found in the `/etc` folder. Use the strongSwan client username as the certificate's common name.	Configure the following recommended settings in the `ipsec.conf` file: `conn` **<connection name>** `keyexchange=`**ikev1** `ikelifetime=`**1440m** `keylife=`**60m** `aggressive=`**yes** `ike=`**aes-sha1-modp1024,aes256** `esp=`**aes-sha1** `xauth=`**client** `left=`**<strongSwan/Linux client IP address>** `leftid=`**@#<hex of Group Name configured in the GlobalProtect gateway>** `leftsourceip=`**%modeconfig** `leftauth=`**psk** `rightauth=`**psk** `leftauth2=`**xauth** `right=`**<gateway IP address>** `rightsubnet=`**0.0.0.0/0** `xauth_identity=`**<LDAP username>** `auto=`**add** Configure the following recommended settings in the `ipsec.secrets` file: `:PSK` **<Group Name configured in the gateway>** **<username>** `:XAUTH "`**<user password>**`"`

Step 4	Start strongSwan IPSec services and connect to the IPSec tunnel that you want the strongSwan client to use when authenticating to the GlobalProtect gateway.	Ubuntu clients:
		`ipsec start`
		`ipsec up <`**name**`>`
		CentOS clients:
		`strongSwan start`
		`strongswan up <`**name**`>`

Enable Authentication Using an Authentication Profile (Continued)	

Step 5 Verify that the tunnel is set up correctly and the VPN connection is established to both the strongSwan client and the GlobalProtect gateway.	1. Verify the detailed status information on a specific connection (by naming the connection) or verify the status information for all connections from the strongSwan client:
	Ubuntu clients:
	`ipsec statusall [<`**connection name**`>]`
	CentOS clients:
	`strongswan statusall [<`**`connection name`**`>]`
	2. Select **Network > GlobalProtect > Gateways**. Then, in the Info column, select **Remote Users** for the gateway configured for the connection to the strongSwan client. The strongSwan client should be listed under **Current Users**.

Enable Authentication Using Two-Factor Authentication

With two-factor authentication, the strongSwan client needs to successfully authenticate using both a certificate profile and an authentication profile to connect to the GlobalProtect gateway. The following workflow shows how to enable authentication for strongSwan clients using two-factor authentication.

Enable Authentication Using Two-Factor Authentication	
Step 1 Set up the IPSec tunnel that the GlobalProtect gateway will use for communicating with a strongSwan client.	1. Select **Network > GlobalProtect > Gateways** and select the gateway name. 2. Select the **Certificate Profile** and **Authentication Profile** you want to use in the **Authentication** tab. 3. Select **Agent > Tunnel Settings** and specify the following settings to set up a tunnel: • Select the check box to **Enable X-Auth Support**. • If a **Group Name** and **Group Password** are already configured, remove them. • Click **OK** to save these tunnel settings.

Enable Authentication Using Two-Factor Authentication		
Step 2	Verify that the default connection settings in the `conn %default` section of the IPSec tunnel configuration file (`ipsec.conf`) are correctly defined for the strongSwan client. The `ipsec.conf` file usually resides in the `/etc` folder. The configurations in this procedure are tested and verified for the following releases: •Ubuntu 14.0.4 with strongSwan 5.1.2 and CentOS 6.5 with strongSwan 5.1.3 for PAN-OS 6.1. •Ubuntu 14.0.4 with strongSwan 5.2.1 for PAN-OS 7.0. Use the configurations in this procedure as a reference if you are using a different version of strongSwan. Refer to the strongSwan wiki for more information.	Configure the following recommended settings in the `conn %default` section of the `ipsec.conf` file: `ikelifetime=`**20m** `reauth=`**yes** `rekey=`**yes** `keylife=`**10m** `rekeymargin=`**3m** `rekeyfuzz=`**0%** `keyingtries=`**1** `type=`**tunnel**
Step 3	Modify the strongSwan client's IPSec configuration file (`ipsec.conf`) and the IPSec password file (`ipsec.secrets`) to use recommended settings. The `ipsec.secrets` file is usually found in the `/etc` folder. Use the strongSwan client username as the certificate's common name.	Configure the following recommended settings in the `ipsec.conf` file: `conn` **<connection name>** `keyexchange=`**ikev1** `authby=`**xauthrsasig** `ike=`**aes-sha1-modp1024** `esp=`**aes-sha1** `xauth=`**client** `left=`**<strongSwan/linux client IP address>** `leftcert=`**<client certificate without any passwords>** `leftsourceip=`**%config** `right=`**<GlobalProtect gateway IP address>** `rightid=`**%any** `rightsubnet=`**0.0.0.0/0** `leftauth2=`**xauth** `xauth_identity=`**<LDAP username>** `auto=`**add** Configure the following recommended settings in the `ipsec.secrets` file: **<username>** `:XAUTH` **<user password>** `:RSA` **<private key file>** "**<passphrase if used>**"

Enable Authentication Using Two-Factor Authentication		

Step 4	Start strongSwan IPSec services and connect to the IPSec tunnel that you want the strongSwan client to use when authenticating to the GlobalProtect gateway.	Ubuntu clients:
		`ipsec start`
		`ipsec up <`**name**`>`
		CentOS clients:
		`strongSwan start`
		`strongswan up <`**name**`>`

Step 5	Verify that the tunnel is setup correctly and the VPN connection is established to both the strongSwan client and the GlobalProtect gateway.	1. Verify the detailed status information on a specific connection (by naming the connection) or verify the status information for all connections from the strongSwan client: Ubuntu clients: `ipsec statusall [<`**connection name**`>]` CentOS clients: strongswan `statusall [<`**connection name**`>]` 2. Select **Network > GlobalProtect > Gateways**. Then, in the Info column, select **Remote Users** for the gateway configured for the connection to the strongSwan client. The strongSwan client should be listed under **Current Users**.

Enable Group Mapping

Because the agent or app running on your end-user systems requires the user to successfully authenticate before being granted access to GlobalProtect, the identity of each GlobalProtect user is known. However, if you want to be able to define GlobalProtect configurations and/or security policies based on group membership, the firewall must retrieve the list of groups and the corresponding list of members from your directory server. This is known as *group mapping*.

To enable this functionality, you must create an LDAP server profile that instructs the firewall how to connect and authenticate to the directory server and how to search the directory for the user and group information. After the firewall connects to the LDAP server and retrieves the group mappings, you can select groups when you define the agent configurations and security policies. The firewall supports a variety of LDAP directory servers, including Microsoft Active Directory (AD), Novell eDirectory, and Sun ONE Directory Server.

Use the following procedure to connect to your LDAP directory to enable the firewall to retrieve user-to-group mapping information:

Map Users to Groups		
Step 1	Create an LDAP Server Profile that specifies how to connect to the directory servers to which the firewall should connect to obtain group mapping information.	1. Select **Device > Server Profiles > LDAP** and click **Add**. 2. Enter a **Profile Name** to identify the server profile. 3. If this profile is for a firewall with multiple virtual systems capability, select a virtual system or **Shared** as the **Location** where the profile is available. 4. For each LDAP server (up to four), **Add** and enter a **Name** (to identify the server), server IP address (**LDAP Server** field), and server **Port** (default 389). 5. Select the server **Type** from the drop-down: **active-directory**, **e-directory**, **sun**, or **other**. 6. If you want the device to use SSL or TLS for a more secure connection with the directory server, select the **Require SSL/TLS secured connection** check box (it is selected by default). The protocol that the device uses depends on the server **Port**: • 389 (default)—TLS (Specifically, the device uses the StartTLS operation, which upgrades the initial plaintext connection to TLS.) • 636—SSL • Any other port—The device first attempts to use TLS. If the directory server doesn't support TLS, the device falls back to SSL. 7. For additional security, you can select the **Verify Server Certificate for SSL sessions** check box (it is cleared by default) so that the device verifies the certificate that the directory server presents for SSL/TLS connections. To enable verification, you also have to select the **Require SSL/TLS secured connection** check box. For verification to succeed, the certificate must meet one of the following conditions: • It is in the list of device certificates: **Device > Certificate Management > Certificates > Device Certificates**. Import the certificate into the device, if necessary. • The certificate signer is in the list of trusted certificate authorities: **Device > Certificate Management > Certificates > Default Trusted Certificate Authorities**. 8. Click **OK**.
Step 2	Add the LDAP server profile to the User-ID Group Mapping configuration.	1. Select **Device > User Identification > Group Mapping Settings** and click **Add**. 2. Enter a **Name** for the configuration. 3. Select the **Server Profile** you just created. 4. Make sure the **Enabled** check box is selected.

Map Users to Groups (Continued)		
Step 3	(Optional) Limit which groups can be selected in policy rules. By default, if you don't specify groups, all groups are available in policy rules.	1. Add existing groups from the directory service: a. Select the **Group Include List** tab. b. In the Available Groups list, select the groups you want to appear in policy rules and click the Add icon ⊞. 2. If you want to base policy rules on user attributes that don't match existing user groups, create custom groups based on LDAP filters: a. Select the **Custom Group** tab and click **Add**. b. Enter a group **Name** that is unique in the group mapping configuration for the current firewall or virtual system. If the **Name** has the same value as the Distinguished Name (DN) of an existing AD group domain, the firewall uses the custom group in all references to that name (for example, in policies and logs). c. Specify an **LDAP Filter** of up to 2,048 UTF-8 characters, then click **OK**. The firewall doesn't validate LDAP filters. To optimize LDAP searches and minimize the performance impact on the LDAP directory server, use only indexed attributes in the filter.
Step 4	Commit your changes.	Click **OK** and **Commit**.

Configure GlobalProtect Gateways

Because the GlobalProtect configuration that the portal delivers to the agents includes the list of gateways the client can connect to, it is a good idea to configure the gateways before configuring the portal.

The GlobalProtect Gateways can be configured to provide two main functions:

- Enforce security policy for the GlobalProtect agents and apps that connect to it. You can also enable HIP collection on the gateway for enhanced security policy granularity. For more information on enabling HIP checks, see Use Host Information in Policy Enforcement.
- Provide virtual private network (VPN) access to your internal network. VPN access is provided through an IPSec or SSL tunnel between the client and a tunnel interface on the gateway firewall.

> You can also configure GlobalProtect gateways on VM-Series firewalls deployed in the AWS cloud. By deploying the VM-Series firewall in the AWS cloud you can quickly and easily deploy GlobalProtect gateways in any region without the expense or IT logistics that are typically required to set up this infrastructure using your own resources. For details, see Use Case: VM-Series Firewalls as GlobalProtect Gateways in AWS.

Prerequisite Tasks for Configuring the GlobalProtect Gateway

Before you can configure the GlobalProtect gateway, you must have completed the following tasks:

❐ Created the interfaces (and zones) for the interface where you plan to configure each gateway. For gateways that require tunnel connections you must configure both the physical interface and the virtual tunnel interface. See Create Interfaces and Zones for GlobalProtect.

❐ Set up the gateway server certificates and SSL/TLS service profile required for the GlobalProtect agent to establish an SSL connection with the gateway. See Enable SSL Between GlobalProtect Components.

❐ Defined the authentication profiles and/or certificate profiles that will be used to authenticate GlobalProtect users. See Set Up GlobalProtect User Authentication.

Configure a GlobalProtect Gateway

After you have completed the prerequisite tasks, configure the GlobalProtect Gateways:

Configure the Gateway		
Step 1	Add a gateway.	1. Select **Network > GlobalProtect > Gateways** and click **Add**. 2. In the **General** screen, enter a **Name** for the gateway. The gateway name should have no spaces and, as a best practice, should include the location or other descriptive information to help users and administrators identify the gateway. 3. (Optional) Select the virtual system to which this gateway belongs from the **Location** field.

Configure the Gateway (Continued)		
Step 2	Specify the network information that enables clients to connect to the gateway. If you haven't created the network interface for the gateway, see Create Interfaces and Zones for GlobalProtect for instructions.	1. Select the **Interface** that clients will use for communication with the gateway. 2. Select the **IP Address** for the gateway web service. 3. Click **OK** to save changes.
Step 3	Specify how the gateway authenticates users. If you haven't created an SSL/TLS service profile for the gateway, see Deploy Server Certificates to the GlobalProtect Components. If you haven't set up the authentication profiles or certificate profiles, see Set Up GlobalProtect User Authentication for instructions.	Select **Authentication** and then configure any of the following: • To secure communication between the gateway and the agents, select the **SSL/TLS Service Profile** for the gateway. • To authenticate users with a local user database or an external authentication service, such as LDAP, Kerberos, TACACS+, or RADIUS (including OTP), **Add** a Client Authentication configuration with the following settings: • Enter a **Name** to identify the client authentication configuration. • Identify the type of client to which this configuration applies. By default, the configuration applies to **Any** client, but you can customize the type of endpoint by **OS** (**Android**, **iOS**, **Mac**, **Windows**, or **Chrome**) or by third-party IPSec VPN clients (**X-Auth**). • Select or add an **Authentication Profile** to authenticate an endpoint seeking access to the gateway. • Enter an **Authentication Message** to help end users understand which credentials to use when logging in. The message can be up to 100 characters in length (default is `Enter login credentials`). • To authenticate users based on a client certificate or a smart card/CAC, select the corresponding **Certificate Profile**. • To use two-factor authentication, select both an authentication profile and a certificate profile. Keep in mind that the user must successfully authenticate using both methods to be granted access.

Configure the Gateway (Continued)

Step 4 Enable tunneling and configure the tunnel parameters.

The tunnel parameters are required if you are setting up an external gateway. If you are configuring an internal gateway, they are optional.

If you want to force use of SSL-VPN tunnel mode, clear the **Enable IPSec** check box. By default, SSL-VPN will only be used if the endpoint fails to establish an IPSec tunnel. Extended authentication (X-Auth) is only supported on IPSec tunnels.

1. On the GlobalProtect Gateway Configuration dialog, select **Agent > Tunnel Settings**.
2. Select the **Tunnel Mode** check box to enable tunneling.
3. Select the **Tunnel Interface** you defined in Step 2 in Create Interfaces and Zones for GlobalProtect.
4. (Optional) Specify **Max User** for the maximum number of users that can access the gateway at the same time for authentication, HIP updates, and GlobalProtect agent updates (range is 1-25).

   (Optional) Select a **GlobalProtect IPSec Crypto** profile to secure the VPN tunnels between GlobalProtect agents and gateways. The **default** uses AES-128-CBC encryption and SHA1 authentication.

   You can also create a new IPSec crypto profile. To create a new profile, select **New GlobalProtect IPSec Crypto** in the same drop-down and configure the following:

   a. Enter a **Name** to identify the profile.

   b. **Add** encryption and authentication algorithms that the VPN peers can use to negotiate the keys for securing the data in the tunnel.

      If you are not certain of what the VPN peers support, you can add multiple encryption algorithms in top-to-bottom order of most-to-least secure, as follows: **aes-256-gcm**, **aes-128-gcm**, **aes-128-cbc**. The peers negotiate the strongest algorithm to establish the tunnel.

   c. Click **OK** to save the profile.
5. (Optional) Select **Enable X-Auth Support** if any endpoint needs to connect to the gateway by using a third-party VPN (for example, a VPNC client running on Linux). If you enable X-Auth, you must provide the **Group** name and **Group Password** if the endpoint requires it. By default, the user is not required to re-authenticate if the key used to establish the IPSec tunnel expires. To require users to re-authenticate, clear the option to **Skip Auth on IKE Rekey**.

   Although X-Auth access is supported on iOS and Android endpoints, it provides limited GlobalProtect functionality on these endpoints. Instead, use the GlobalProtect app for simplified access to all the security features that GlobalProtect provides on iOS and Android endpoints. The GlobalProtect app for iOS is available at the Apple App Store. The GlobalProtect app for Android is available at Google Play.

Configure the Gateway (Continued)		
Step 5	(Optional) Modify the default timeout settings for endpoints.	On the GlobalProtect Gateway Configuration dialog, select **Agent > Timeout Settings** and then configure the following settings: • Modify the maximum **Login Lifetime** for a single gateway login session. The default login lifetime is 30 days—during the lifetime, the user stays logged in as long as the gateway receives a HIP check from the endpoint within the **Inactivity Logout** period. After this time, the login session automatically logs out. • Modify the amount of time after which an inactive session is automatically logged out. The default **Inactivity Logout** period is 3 hours. A user is logged out of GlobalProtect if the gateway does not receive a HIP check from the endpoint during the configured amount of time. • Modify the number of minutes after which idle users are logged out of GlobalProtect. The default period for **Disconnect on Idle** is 180 minutes. Users are logged out of GlobalProtect if the GlobalProtect agent has not routed traffic through the VPN tunnel in the configured amount of time. This setting applies to GlobalProtect agents that use the on-demand connect method only.
Step 6	(Optional) Configure authentication override settings to enable the gateway to generate and accept secure, encrypted cookies to authenticate the user. This capability allows the user to provide login credentials only once during a specified period of time (for example, every 24 hours). By default, a gateway authenticates the user with an authentication profile and optional certificate profile. When authentication override is enabled, GlobalProtect caches the result of a successful login and uses the cookie to authenticate the user instead of prompting the user for credentials. If client certificates are required, the endpoint must also provide a valid certificate to be granted access. In the event that you need to immediately block access to a device whose cookie has not yet expired (for example, if the device is lost or stolen), you can immediately Block Device Access by adding the device to a block list.	1. On the GlobalProtect Gateway Configuration dialog, select **Agent > Client Settings**. 2. **Add** a new agent configuration or select an existing configuration. 3. Enter a **Name** to identify the agent configuration. 4. Configure the following settings in the **Authentication Override** section: • **Generate cookie for authentication override**—Enable the gateway to generate secure, encrypted, endpoint-specific cookies. The gateway sends this cookie to the agent after the cookie generated by the portal expires. • **Cookie Lifetime**—Specify the hours, days, or weeks that the cookie is valid. Default is 24 hours. The range for hours is 1–72; for weeks, 1–52; and for days, 1–365. After the cookie expires, the user must enter login credentials, and the gateway subsequently encrypts a new cookie to send to the agent. • **Accept cookie for authentication override**—Enable the gateway to authenticate users through a valid, encrypted cookie. When the agent presents a valid cookie, the gateway verifies that the cookie was encrypted by the portal or gateway, decrypts the cookie, and then authenticates the user. • **Certificate to Encrypt/Decrypt Cookie**—Select the certificate to use to encrypt and decrypt the cookie. The certificate that you use to encrypt and decrypt cookies must be the same on the portal and gateways.

Configure the Gateway (Continued)		
Step 7	Configure the user or user group and the endpoint OS to which the agent configuration applies. The gateway uses the user/user group settings you specify to determine which configuration to deliver to the GlobalProtect agents that connect. Therefore, if you have multiple configurations, you must make sure to order them properly. As soon as the gateway finds a match, it will deliver the configuration. Therefore, more specific configurations must precede more general ones. See Step 9 for instructions on ordering the list of agent configurations. Network settings are not required in internal gateway configurations in non-tunnel mode, because agents use the network settings assigned to the physical network adapter.	In a gateway agent configuration, select the **User/User Group** tab and configure the following settings: • To restrict this configuration to a specific user and/or group, click **Add** in the Source User section of the window and then select the user or group you want to receive this configuration from the drop-down. Repeat this step for each user/group you want to add. Before you can restrict the configuration to specific groups, you must map users to groups as described in Enable Group Mapping. • To restrict the configuration to users who have not yet logged in to their systems, select **pre-logon** from the User/User Group drop-down. You can also create configurations to be deployed to agents in **pre-logon** mode (that is, before the user has logged in to the system) or configurations to be applied to **any** user. • To deliver this configuration to agents or apps running on specific operating systems, click **Add** in the OS section of the window and then select the OS (**Android**, **Chrome**, **iOS**, **Mac**, or **Windows**) to which this configuration applies. Or leave the value in this section set to **Any** to deploy the configuration based on user/group only.

Configure the Gateway (Continued)		
Step 8	(Tunnel Mode only) Configure the network settings to assign to the virtual network adapter on the endpoint when an agent establishes a tunnel with the gateway. Network settings are not required in internal gateway configurations in non-tunnel mode because agents use the network settings assigned to the physical network adapter. You can optionally use address objects—which allow you to group specific source or destination addresses—when configuring gateway IP address pools or access routes.	In a gateway agent configuration, select the **Agent > Network Settings** tab and configure any of the following settings and then click **OK**: • To specify the authentication server IP address pool to assign addresses to endpoints that require static IP addresses, select the **Retrieve Framed-IP-Address attribute from authentication server** check box and then **Add** the subnet or IP address range to use to assign to remote users in the **Authentication Server IP Pool** area. When the tunnel is established, an interface is created on the remote user's computer with an address in the subnet or IP range that matches the Framed-IP attribute of the authentication server. The authentication server IP address pool must be large enough to support all concurrent connections. IP address assignment is static and is retained after the user disconnects. • To specify the **IP Pool** to use to assign IP addresses, click **Add** and then specify the IP address range or address object to use. As a best practice, use a different range of IP addresses from those assigned to endpoints that are physically connected to your LAN to ensure proper routing back to the gateway. • To disable split tunneling including direct access to local networks on Windows and Mac OS systems, enable **No direct access to local network**. In this case, users cannot send traffic to proxies or local resources while connected to GlobalProtect. • To define what destination subnets to route through the tunnel click **Add** in the **Access Route** area and then enter the routes as follows: • **Full-tunneling**—To route all endpoint traffic GlobalProtect, enter 0.0.0.0/0 as the access route. You will then need to use security policy to define what zones the endpoint can access (including untrust zones). The benefit of this configuration is that you have visibility into all VPN traffic and you can ensure that endpoints are secured according to your policy even when they are not physically connected to the LAN. Note that in this configuration traffic destined for the local subnet goes through the physical adapter, rather than being tunneled to the gateway. • **Split-tunneling**—To route only some traffic—likely traffic destined for your LAN—to GlobalProtect, specify the destination subnets or address object (of type **IP Netmask**) that must be tunneled. In this case, traffic that is not destined for a specified access route will be routed through the endpoint's physical adapter rather than through the virtual adapter (the tunnel). The firewall supports up to 100 access routes.

Configure the Gateway (Continued)	
Step 9 Arrange the gateway agent configurations so that the proper configuration is deployed to each agent. When an agent connects, the gateway will compare the source information in the packet against the agent configurations you have defined. As with security rule evaluation, the gateway looks for a match starting from the top of the list. When it finds a match, it delivers the corresponding configuration to the agent or app.	• To move a gateway configuration up on the list of configurations, select the configuration and click **Move Up**. • To move a gateway configuration down on the list of configurations, select the configuration and click **Move Down**.
Step 10 (Tunnel Mode only) Specify the network configuration settings for the endpoints. Network settings are not required in internal gateway configurations in non-tunnel mode because in this case agents use the network settings assigned to the physical network adapter.	In a GlobalProtect Gateway Configuration, select the **Agent > Network Services** tab and configure the settings for endpoints in one of the following ways: • If the firewall has an interface that is configured as a DHCP client, set the **Inheritance Source** to that interface and the GlobalProtect agent will be assigned the same settings received by the DHCP client. You can also **Inherit DNS Suffixes** from the inheritance source. • Manually assign the DNS server(s) and suffix, and WINS servers by completing the corresponding fields.
Step 11 (Optional) Define the notification messages end users will see when a security rule with a host information profile (HIP) is enforced. This step only applies if you have created host information profiles and added them to your security policies. For details on configuring the HIP feature and for more detailed information about creating HIP notification messages, see Use Host Information in Policy Enforcement.	In a GlobalProtect Gateway Configuration, select the **Agent > HIP Notification** tab and **Add** a new HIP Notification configuration: 1. From the **Host Information** drop-down, select the HIP object or profile to which this message applies. 2. Select **Match Message** or **Not Match Message** and then **Enable** notifications, depending on whether you want to display the message when the corresponding HIP profile is matched in policy or when it is not matched. In some cases, you might want to create messages for both a match and a non-match, depending on the objects on which you are matching and what your objectives are for the policy. For the Match Message, you can also enable the option to **Include Mobile App List** to indicate what applications can trigger the HIP match. 3. Select whether you want to display the message as a **System Tray Balloon** or as a **Pop Up Message**. 4. Enter and format the text of your message in the Template text box and then click **OK**. 5. Repeat these steps for each message you want to define.
Step 12 Save the gateway configuration.	1. Click **OK** to save the settings and close the GlobalProtect Gateway Configuration dialog. 2. **Commit** the changes.

Configure the GlobalProtect Portal

The GlobalProtect Portal provides the management functions for your GlobalProtect infrastructure. Every endpoint that participates in the GlobalProtect network receives configuration information from the portal, including information about available gateways as well as any client certificates that may be required to connect to the gateways. In addition, the portal controls the behavior and distribution of the GlobalProtect agent software to both Mac and Windows laptops, and app software to Chromebooks.

> The portal does not distribute the GlobalProtect app for use on mobile devices. To get the GlobalProtect app for iOS, end users must download it from the App Store. To get the GlobalProtect app for Android, end users must down load it from Google Play. However, the agent configurations that get deployed to mobile app users does control what gateway(s) the mobile devices have access to and if the mobile device is required to enroll with the GlobalProtect Mobile Security Manager. For more details on supported versions, see What Client OS Versions are Supported with GlobalProtect?

The following sections provide procedures for setting up the portal:

▲ Prerequisite Tasks for Configuring the GlobalProtect Portal

▲ Set Up Access to the GlobalProtect Portal

▲ Gateway Priority in a Multiple Gateway Configuration

▲ Define the GlobalProtect Agent Configurations

▲ Customize the GlobalProtect Agent

▲ Customize the GlobalProtect Portal Login, Welcome, and Help Pages

Prerequisite Tasks for Configuring the GlobalProtect Portal

Before you can configure the GlobalProtect Portal, you must complete the following tasks:

□ Create the interfaces (and zones) for the firewall interface where you plan to configure the portal. See Create Interfaces and Zones for GlobalProtect.

□ Set up the portal server certificate, gateway server certificate, SSL/TLS service profiles, and, optionally, any client certificates to deploy to end users to enable SSL/TLS connections for the GlobalProtect services. See Enable SSL Between GlobalProtect Components.

□ Define the optional authentication profiles and certificate profiles that the portal can use to authenticate GlobalProtect users. See Set Up GlobalProtect User Authentication.

□ Configure GlobalProtect Gateways.

Set Up Access to the GlobalProtect Portal

After you have completed the prerequisite tasks, configure the GlobalProtect Portal as follows:

Set Up Access to the Portal		
Step 1	Add the portal.	1. Select **Network > GlobalProtect > Portals** and click **Add**. 2. On the **General** page, enter a **Name** for the portal. The name cannot contain spaces. 3. (Optional) Select the virtual system to which this portal belongs from the **Location** field.
Step 2	Specify network settings to enable agents to communicate with the portal. If you have not yet created the network interface for the portal, see Create Interfaces and Zones for GlobalProtect for instructions. If you have not yet created an SSL/TLS service profile for the portal, see Deploy Server Certificates to the GlobalProtect Components.	1. Select the **Interface**. 2. Select the **IP Address** for the portal web service. 3. Select an **SSL/TLS Service Profile**.
Step 3	Disable the login page entirely or choose your own login page or help page. Although optional, a custom login or help page lets you decide on the look and content of the pages. See Customize the GlobalProtect Portal Login, Welcome, and Help Pages.	• Select the option to **Disable login page** to disable access to the GlobalProtect portal login page from a web browser. • Choose a **Custom Login Page** for user access to the portal or import a new one. • Choose a **Custom Help Page** to assist the user with GlobalProtect or import a new one.

Set Up Access to the Portal (Continued)		
Step 4	Specify how the portal authenticates the users. If you have not yet created a server certificate for the portal and issued gateway certificates, see Deploy Server Certificates to the GlobalProtect Components. If you have not yet set up the authentication profiles and/or certificate profiles, see Set Up GlobalProtect User Authentication for instructions.	On the GlobalProtect Portal Configuration dialog, select **Authentication**, and then configure any of the following: • To secure communication between the portal and the agents, select the **SSL/TLS Service Profile** you configured for the portal. • To authenticate users using a local user database or an external authentication service, such as LDAP, Kerberos, TACACS+, or RADIUS (including OTP), **Add** a *client authentication* configuration with the following settings: • Enter a **Name** to identify the client authentication configuration. • Specify the endpoints to which to deploy this configuration. By default, the configuration applies to all endpoints. Otherwise, you can apply the configuration to endpoints running a specific **OS** (**Android**, **iOS**, **Mac**, **Windows**, or **Chrome**) or to endpoints that access the portal from a web **Browser** with the intent of downloading the GlobalProtect agent. • Select or add an **Authentication Profile** for authenticating an endpoint that tries to access the gateway. • Enter an **Authentication Message** to help end users understand which credentials to use when logging in. The message can be up to 100 characters in length (default is `Enter login credentials`). • Select the corresponding **Certificate Profile** to authenticate users based on a client certificate or smart card. The Common Name (CN) and, if applicable, the Subject Alternative Name (SAN) fields of the certificate must exactly match the IP address or FQDN of the interface where you configure the portal or HTTPS connections to the portal will fail. • To enable two-factor authentication by using an authentication profile and a certificate profile, configure both in this portal configuration. Keep in mind the portal must authenticate the client by using both methods before the user can gain access.
Step 5	Save the portal configuration.	1. Click **OK** to save the settings and close the GlobalProtect Portal Configuration dialog. 2. **Commit** the changes.

Gateway Priority in a Multiple Gateway Configuration

To enable secure access for your mobile workforce no matter where they are located, you can strategically deploy additional Palo Alto Networks next-generation firewalls and configure them as GlobalProtect gateways. To determine the preferred gateway to which your agents connect, add the gateways to a portal agent configuration and assign each gateway a connection priority. See Define the GlobalProtect Agent Configurations.

If a GlobalProtect portal agent configuration contains more than one gateway, the agent will attempt to connect to all gateways listed in its agent configuration. The agent will then use priority and response time as to determine the gateway to which to connect. The agent connects to a lower priority gateway only if the response time for the higher priority gateway is greater than the average response time across all gateways.

For example, consider the following response times for gw1 and gw2:

Name	Priority	Response Time
gw1	Highest	80 ms
gw2	High	25 ms

The agent determines that the response time for the gateway with the highest priority (higher number) is greater than the average response time for both gateways (52.5 ms) and, as a result, connects to gw2. In this example, the agent did not connect to gw1 even though it had a higher priority because a response time of 80 ms was higher than the average for both.

Now consider the following response times for gw1, gw2, and a third gateway, gw3:

Name	Priority	Response Time
gw1	Highest	30 ms
gw2	High	25 ms
gw3	Medium	50 ms

In this example, the average response time for all gateways is 35 ms. The agent would then evaluate which gateways responded faster than the average response time and see that gw1 and gw2 both had faster response times. The agent would then connect to whichever gateway had the highest priority. In this example, the agent connects to gw1 because gw1 has the highest priority of all the gateways with response times below the average.

Define the GlobalProtect Agent Configurations

After a GlobalProtect user connects to the portal and is authenticated by the GlobalProtect portal, the portal sends the agent configuration to the agent or app, based on the settings you defined. If you have different roles for users or groups that need specific configurations, you can create a separate agent configuration for each user type or user group. The portal uses the OS of the endpoint and the username or group name to determine the agent configuration to deploy. As with other security rule evaluations, the portal starts to search for a match at the top of the list. When it finds a match, the portal sends the right configuration to the agent or app.

The configuration can include the following:

- A list of gateways to which the client can connect.
- Among the external gateways, any gateway that the user can manually select for the session.
- The root CA certificate required to enable the agent or app to establish an SSL connection with the GlobalProtect gateway(s).
- The root CA certificate for SSL forward proxy decryption.

- The client certificate that the endpoint should present to the gateway when it connects. This configuration is required only if mutual authentication between the client and the portal or gateway is required.
- A secure encrypted cookie that the endpoint should present to the portal or gateway when it connects. The cookie is included only if you enable the portal to generate one.
- The settings the endpoint uses to determine whether it is connected to the local network or to an external network.
- Settings for the behavior of the agent or app, such as what the end users can see in their display, whether they can save their GlobalProtect password, and whether they are prompted to upgrade their software.

> If the portal is down or unreachable, the agent will use the cached version of its agent configuration from its last successful portal connection to obtain settings, including the gateway(s) to which the agent can connect, what root CA certificate(s) to use to establish secure communication with the gateway(s), and what connect method to use.

Use the following procedure to create an agent configuration.

Create a GlobalProtect Agent Configuration		
Step 1	Add the trusted Root CA certificates that the client will use to perform certificate checks when it connects to the GlobalProtect gateway(s). If you do not add a trusted root CA certificate to the agent configuration, the associated client does not perform certificate checks when it connects. As a best practice, always deploy the trusted root CA certificates in the agent configuration. This certificate deployment ensures that the agents or apps perform a certificate check to validate the identity of the gateway before it connects. This certificate installation protects the agent or app from man-in-the-middle attacks.	1. Select **Network > GlobalProtect > Portals**. 2. Select the portal configuration to which you are adding the agent configuration and then select the **Agent** tab. 3. In the **Trusted Root CA** field, **Add** and then select the CA certificate that was used to issue the gateway server certificates. As a best practice, all of your gateways should use the same issuer.
Step 2	(Optional) Add the trusted Root CA certificate that the firewall will use for SSL forward proxy decryption. The firewall uses this certificate to terminate the HTTPS connection, inspect the traffic for policy compliance, and re-establish the HTTPS connection to forward the encrypted traffic.	1. Add the certificate as described in Step 1. 2. To the right of the certificate, select the **Install in Local Root Certificate Store** option. The portal automatically sends the certificate when the user logs in to the portal and installs it in the client's local store thus eliminating the need for you to install the certificate manually.
Step 3	Add an agent configuration. The agent configuration specifies the GlobalProtect configuration settings to deploy to the connecting agents/apps. You must define at least one agent configuration.	1. In the Agent area, **Add** a new configuration. 2. Enter a **Name** to identify the configuration. If you plan to create multiple configurations, make sure the name you define for each is descriptive enough to allow you to distinguish them.

Create a GlobalProtect Agent Configuration (Continued)		
Step 4	(Optional) Configure settings to specify how users with this configuration will authenticate with the portal. If the gateway is to authenticate the clients by using a client certificate, you must select the source that distributes the certificate.	On the **Authentication** tab, configure any of the following authentication settings: • To enable users to authenticate with the portal using client certificates, select the **Client Certificate** source (**SCEP**, **Local**, or **None**) that distributes the certificate and its private key to an endpoint. If you use an internal CA to distribute certificates to clients, select **None** (default). To enable the portal to generate and send a machine certificate to the agent for storage in the local certificate store and use the certificate for portal and gateway authentication, select **SCEP** and the associated SCEP profile. These certificates are device-specific and can only be used on the endpoint to which it was issued. To use the same certificate for all endpoints, select a certificate that is **Local** to the portal. With **None**, the portal does not push a certificate to the client, but you can use can other ways to get a certificate to the client's endpoint. • Specify whether to **Save User Credentials**. Select **Yes** to save the username and password (default), **Save Username Only** to save only the username, or **No** to never save credentials. If you configure the portal or gateways to prompt for a dynamic password such as a one-time password (OTP), the user must enter a new password at each login. In this case, the GlobalProtect agent/app ignores the selection to save both the username and password, if specified, and saves only the username. For more information, see Enable Two-Factor Authentication Using One-Time Passwords (OTPs).
Step 5	If the GlobalProtect endpoint does not require tunnel connections when it is on the internal network, configure internal host detection.	1. Select the **Internal Host Detection** check box. 2. Enter the **IP Address** of a host that can be reached from the internal network only. 3. Enter the DNS **Hostname** for the IP address you entered. Clients that try to connect to GlobalProtect attempt to do a reverse DNS lookup on the specified address. If the lookup fails, the client determines that it is on the external network and then initiates a tunnel connection to a gateway on its list of external gateways.
Step 6	Set up access to a third-party mobile device manager. This step is required if the mobile devices using this configuration will be managed by a third-party mobile device manager. All devices will initially connect to the portal and, if a third-party mobile device manager is configured on the corresponding portal agent configuration, the device will be redirected to it for enrollment.	1. Enter the IP address or FQDN of the device check-in interface associated with your mobile device manager. The value you enter here must exactly match the value of the server certificate associated with the device check-in interface. 2. Specify the **Enrollment Port** on which the mobile device manager will be listening for enrollment requests. This value must match the value set on the mobile device manager (default=443).

Create a GlobalProtect Agent Configuration (Continued)		
Step 7	Configure the user or user group and the endpoint OS to which the agent configuration applies. The portal uses the user/user group settings you specify to determine which configuration to deliver to the GlobalProtect agents that connect. Therefore, if you have multiple configurations, you must make sure to order them properly. As soon as the portal finds a match, it will deliver the configuration. Therefore, more specific configurations must precede more general ones. See Step 12 for instructions on ordering the list of agent configurations. Before you can restrict the configuration to specific groups, you must map users to groups as described in Enable Group Mapping.	Select the **User/User Group** tab and then specify any users, user groups, and/or operating systems to which this configuration should apply: • To deliver this configuration to agents or apps running on specific operating systems, click **Add** in the OS section of the window and then select the OS (**Android**, **Chrome**, **iOS**, **Mac**, or **Windows**) to which this configuration applies. • To restrict the configuration to users who have not yet logged in to their systems, select **pre-logon** from the **User/User Group** drop-down. • To restrict this configuration to a specific user or group, click **Add** in the User/User Group section of the window and then select the user or group you want to receive this configuration from the drop-down. Repeat this step for each user and group you want to add.
Step 8	Specify the gateways that users with this configuration can connect to. **Best Practices:** •If you are adding both internal and external gateways to the same configuration, make sure to enable Internal Host Detection. See Step 5 in Define the GlobalProtect Agent Configurations for instructions. •Make sure you do not use on-demand as the connect method if your configuration includes internal gateways. •To learn more about how a GlobalProtect client determines the gateway to which it should connect, see Gateway Priority in a Multiple Gateway Configuration.	1. On the **Gateways** tab, click **Add** in the section for Internal Gateways or External Gateways, depending on which type of gateway you are adding. 2. Enter a descriptive **Name** for the gateway. The name you enter here should match the name you defined when you configured the gateway and should be descriptive enough for users to know the location of the gateway they are connected to. 3. Enter the FQDN or IP address of the interface where the gateway is configured in the **Address** field. The address you specify must exactly match the Common Name (CN) in the gateway server certificate. 4. (External gateways only) Set the **Priority** of the gateway by clicking in the field and selecting a value: • If you have only one external gateway, you can leave the value set to **Highest** (the default). • If you have multiple external gateways, you can modify the priority values (ranging from **Highest** to **Lowest**) to indicate a preference for the specific user group to which this configuration applies. For example, if you prefer that the user group connects to a local gateway you would set the priority higher than that of more geographically distant gateways. The priority value is then used to weight the agent's gateway selection algorithm. • If you do not want agents to automatically establish tunnel connections with the gateway, select **Manual only**. This setting is useful in testing environments. 5. (External gateways only) Select the **Manual** check box if you want to allow users to be able to manually switch to the gateway.

Create a GlobalProtect Agent Configuration (Continued)		
Step 9	Customize the behavior of the GlobalProtect agent for users with this configuration.	Select the **App** tab and then modify the agent settings as desired. For more details about each option, see Customize the GlobalProtect Agent.
Step 10	(Optional) Define any custom host information profile (HIP) data that you want the agent to collect and/or exclude HIP categories from collection. This step only applies if you plan to use the HIP feature and there is information you want to collect that cannot be collected using the standard HIP objects or if there is HIP information that you are not interested in collecting. See Use Host Information in Policy Enforcement for details on setting up and using the HIP feature.	1. Select **Data Collection** and enable the GlobalProtect agent to **Collect HIP Data**. 2. Select **Exclude Categories** to exclude specific categories and/or vendors, applications, or versions within a category. For more details, see Step 3 in Configure HIP-Based Policy Enforcement. 3. Select **Custom Checks** to define any custom data you want to collect from hosts running this agent configuration, and add the category and vendor. For more details, see Step 2 in Use Host Information in Policy Enforcement.
Step 11	Save the agent configuration.	1. Click **OK** to save the settings and close the Configs dialog. 2. If you want to add another agent configuration, repeat Step 3 through Step 11.
Step 12	Arrange the agent configurations so that the proper configuration is deployed to each agent. When an agent connects, the portal will compare the source information in the packet against the agent configurations you have defined. As with security rule evaluation, the portal looks for a match starting from the top of the list. When it finds a match, it delivers the corresponding configuration to the agent or app.	• To move an agent configuration up on the list of configurations, select the configuration and click **Move Up**. • To move an agent configuration down on the list of configurations, select the configuration and click **Move Down**.
Step 13	Save the portal configuration.	1. Click **OK** to save the settings and close the GlobalProtect Portal Configuration dialog. 2. **Commit** the changes.

Customize the GlobalProtect Agent

The portal agent configuration allows you to customize how your end users interact with the GlobalProtect agents installed on their systems or the GlobalProtect app installed on their mobile devices. You can define different agent settings for the different GlobalProtect agent configurations you create. For more information on GlobalProtect client requirements, see What Client OS Versions are Supported with GlobalProtect?

You can customize the display and behavior of the agent such as:

- What menus and views users can access.
- Whether users can disable the agent (applies to the user-logon Connect Method only).
- Whether to display a welcome page upon successful login. You can also configure whether or not the user can dismiss the welcome page, and create custom welcome pages and help pages that direct your users on how to use GlobalProtect within your environment. See Customize the GlobalProtect Portal Login, Welcome, and Help Pages.
- Whether agent upgrades will happen automatically or whether the users will be prompted to upgrade.

> You can also define agent settings directly from the Windows registry or the global Mac plist. For Windows clients you can also define agent settings directly from the Windows installer (Msiexec). Settings defined in the portal agent configurations in the web interface take precedence over settings defined in the Windows registry/Msiexec or the Mac plist. For more details, see Deploy Agent Settings Transparently.

Additional options that are available through the Windows command line (Msiexec) or Windows registry only, enable you to (for more information, see Customizable Agent Settings):

- Specify whether the agent should prompt the end user for credentials if Windows SSO fails.
- Specify the default portal IP address (or hostname).
- Enable GlobalProtect to initiate a VPN connection before the user logs into the endpoint.
- Deploy scripts that run before or after GlobalProtect establishes a VPN connection or after GlobalProtect disconnects the VPN connection.
- Enable the GlobalProtect agent to wrap third-party credentials on the Windows client, allowing for SSO when using a third-party credential provider.

Customize the Agent		
Step 1	Select the **Agent** tab in the agent configuration you want to customize. You can also configure most settings that are on the **App** tab from a group policy by adding settings to the Windows registry/Mac plist. On Windows systems, you can also set them using the Msiexec utility on the command line during the agent installation. However, settings defined in the web interface or the CLI take precedence over registry/plist settings. See Deploy Agent Settings Transparently for details.	1. Select **Network > GlobalProtect > Portals** and select the portal configuration for which you want to add an agent configuration (or **Add** a new configuration). 2. Select the **Agent** tab and select the configuration you want to modify (or **Add** a new configuration). 3. Select the **App** tab. The App Configurations area displays the options with default values that you can customize for each agent configuration. When you change the default behavior, the web interface changes the color from gray to the default text color.

Customize the Agent (Continued)		
Step 2	Specify the **Connect Method** that an agent or app uses for its GlobalProtect connection. **Best Practices:** •Use only the **On-demand** option (default) if you are using GlobalProtect for VPN access to external gateways. •Do not use the **On-demand** option if you plan to run the GlobalProtect agent in hidden mode. •For faster connection times, use internal host detection in configurations where you have enabled SSO.	In the App Configurations area, configure any of the following options: • Select a **Connect Method**: 　• **User-logon (Always On)**—The GlobalProtect agent automatically connects to the portal as soon as the user logs in to the endpoint (or domain). When used in conjunction with SSO (Windows users only), GlobalProtect login is transparent to the end user. 　• **Pre-logon (Always On)**—Authenticates the user and establishes a VPN tunnel to the GlobalProtect gateway before the user logs in to the client. This option requires that you use an external PKI solution to pre-deploy a machine certificate to each endpoint that receives this configuration. See Remote Access VPN with Pre-Logon for details about pre-logon. 　• **On-demand (Manual user initiated connection)**—Users will have to manually launch the agent to connect to GlobalProtect. Use this connect method for external gateways only. • (Windows only) Set **Use Single Sign-On** to **No** to disallow GlobalProtect to use the Windows login credentials to automatically authenticate the user upon login to Active Directory. With single sign-on (SSO) enabled (the default), the GlobalProtect agent uses the user's Windows login credentials to automatically authenticate to and connect to the GlobalProtect portal and gateway. GlobalProtect with SSO enabled also allows for the GlobalProtect agent to wrap third-party credentials to ensure that Windows users can authenticate and connect, even when a third-party credential provider is being used to wrap the Windows login credentials. • Enter the **Maximum Internal Gateway Connection Attempts** to specify the number of times the GlobalProtect agent should retry the connection to an internal gateway after the first attempt fails (range is 0-100; 4 or 5 is recommended; default is 0, which means the GlobalProtect agent does not retry the connection). By increasing the value, you enable the agent to connect to an internal gateway that is temporarily down or unreachable during the first connection attempt but comes back up before the specified number of retries are exhausted. Increasing the value also ensures that the internal gateway receives the most up-to-date user and host information. • Enter the **GlobalProtect App Config Refresh Interval (hours)** to specify the number of hours the GlobalProtect portal waits before it initiates the next refresh of a client's configuration (range is 1-168; default is 24).

Customize the Agent (Continued)		
Step 3	Configure the menus and UI views that are available to users who have this agent configuration.	Configure any or all of the following options: • If you want users to be able to see only basic status information within the application, set **Enable Advanced View** to **No**. By default, the advanced view is enabled. It allows users to see detailed statistical, host, and troubleshooting information and to perform certain tasks, such as changing their password. • If you want hide the GlobalProtect agent on end-user systems, set **Display GlobalProtect Icon** to **No**. When the icon is hidden, users cannot perform other tasks such as changing passwords, rediscovering the network, resubmitting host information, viewing troubleshooting information, or performing an on-demand connection. However, HIP notification messages, login prompts, and certificate dialogs will still display as necessary for interacting with the end user. • To prevent users from performing a network rediscovery, set the **Enable Rediscover Network Option** to **No**. When you disable the option, it is grayed out in the GlobalProtect menu. • To prevent users from manually resubmitting HIP data to the gateway, set **Enable Resubmit Host Profile Option** to **No**. This option is enabled by default, and is useful in cases where HIP-based security policy prevents users from accessing resources because it allows the user to fix the compliance issue on the computer and then resubmit the HIP. • (Windows only) To allow GlobalProtect to display notifications in the notification area (system tray), set **Show System Tray Notifications** to **Yes**. • To create a custom message to display to users when their password is about to expire configure the **Custom Password Expiration Message (LDAP Authentication Only)**. The maximum message length is 200 characters.
Step 4	Define what the end users with this configuration can do in their client.	• Set **Allow User to Change Portal Address** to **No** to disable the **Portal** field on the **Home** tab in the GlobalProtect agent. Because the user will then be unable to specify a portal to which to connect, you must supply the default portal address in the Windows registry (`HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\PanSetup` with key `Portal`) or the Mac plist (`/Library/Preferences/com.paloaltonetworks.GlobalProtect.pansetup.plist` with key `Portal` under dictionary `PanSetup`). For more information, see Deploy Agent Settings Transparently. • To prevent users from dismissing the welcome page, set **Allow User to Dismiss Welcome Page** to **No**. Otherwise, when set to **Yes**, the user can dismiss the welcome page and prevent GlobalProtect from displaying the page after subsequent logins.

Customize the Agent (Continued)

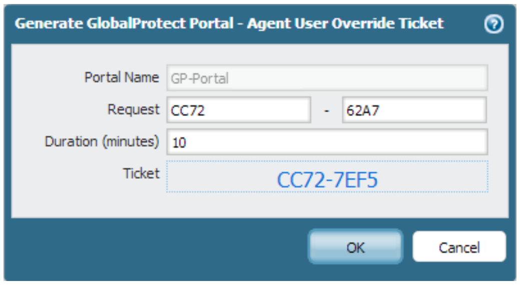
Step 5 Specify whether users can disable the GlobalProtect agent.

The **Allow User to Disable GlobalProtect** option applies to agent configurations that have the **Connect Method** set to **User-Logon (Always On)**. In user-logon mode, the agent or app automatically connects to GlobalProtect as soon as the user logs in to the endpoint. This mode is sometimes referred to as “always on,” which is why the user must override this behavior to disable GlobalProtect client.

By default, this option is set to **Allow** which permits users to disable GlobalProtect without providing a comment, passcode, or ticket number.

If the agent icon is not visible, users are not able to disable the GlobalProtect client. See Step 3 for details.

- To prevent users with the user-logon connect method from disabling GlobalProtect, set **Allow User to Disable GlobalProtect** to **Disallow**.
- To allow users to disable GlobalProtect if they provide a passcode, set **Allow User to Disable GlobalProtect** to **Allow with Passcode**. Then, in the Disable GlobalProtect App area, enter (and confirm) the **Passcode** that the end users must supply.
- To allow users to disconnect if they provide a ticket, set **Allow User to Disable GlobalProtect** to **Allow with Ticket**. With this option, the disconnect action triggers the agent to generate a Request Number. The end user must then communicate the Request Number to the administrator. The administrator then clicks **Generate Ticket** on the **Network > GlobalProtect > Portals** page and enters the request number from the user to generate the ticket. The administrator then provides the ticket to the end user, who enters it into the Disable GlobalProtect dialog to enable the agent to disconnect.



Generate GlobalProtect Portal - Agent User Override Ticket

Portal Name: GP-Portal

Request: CC72 - 62A7

Duration (minutes): 10

Ticket: CC72-7EF5

- To limit the number of times users can disable the GlobalProtect client, enter a value in the **Max Times User Can Disable** field in the Disable GlobalProtect App area. A value of 0 (the default) indicates that users are not limited in the number of times they can disable the client.
- To restrict how long the user may be disconnected, enter a value (in minutes) in the **User Can Disable Timeout (min)** field in the Disable GlobalProtect App area. A value of 0 (the default) means that there is no restriction on how long the user can keep the client disabled.

Customize the Agent (Continued)		
Step 6	Configure the certificate settings and behavior for the users that receive this configuration.	• **Client Certificate Store Lookup**—Select which store the agent should use to look up client certificates. **User** certificates are stored in the Current User certificate store on Windows and in the Personal Keychain on Mac OS. **Machine** certificates are stored in the Local Computer certificate store on Windows and in the System Keychain on Mac OS. By default, the agent looks for **User and machine** certificates in both places. • **SCEP Certificate Renewal Period (days)**—With SCEP, the portal can request a new client certificate before the certificate expires. This time before the certificate expires is the optional *SCEP certificate renewal period*. During a configurable number of days before a client certificate expires, the portal can request a new certificate from the SCEP server in your enterprise PKI (range is 0-30; default is 7). A value of 0 means the portal does not automatically renew the client certificate when it refreshes the agent configuration. For an agent or app to obtain the new certificate during the renewal period, the user must log in to the GlobalProtect client. For example, if a client certificate has a lifespan of 90 days, the certificate renewal period is 7 days, and the user logs in during the final 7 days of the certificate lifespan, the portal acquires a new certificate and deploys it along with a fresh agent configuration. For more information, see Deploy User-Specific Client Certificates for Authentication. • **Extended Key Usage OID for Client Certificate**—Enter the extended key usage of a client certificate by specifying its object identifier (OID). This setting ensures that the GlobalProtect agent selects only a certificate that is intended for client authentication when multiple certificate types are present and enables GlobalProtect to save the selection for future use. • If you do not want the agent to establish a connection with the portal when the portal certificate is not valid, set **Allow User to Continue with Invalid Portal Server Certificate** to **No**. Keep in mind that the portal provides the agent configuration only; it does not provide network access and therefore security to the portal is less critical than security to the gateway. However, if you have deployed a trusted server certificate for the portal, deselecting this option can help prevent man-in-the-middle (MITM) attacks.

Customize the Agent (Continued)		
Step 7	(Windows only) Configure settings for Windows-based endpoints that receive this configuration.	• **Restart GlobalProtect Agent After Timing Out**—Select **Yes** to restart GlobalProtect if the GlobalProtect agent does not respond. • **Update DNS Settings at Connect**—Select **Yes** to flush the DNS cache and force all adapters to use the DNS settings in the configuration. Select **No** (the default) to use the DNS settings from the physical adapter on the endpoint. • **Send HIP Report Immediately if Windows Security Center (WSC) State Changes**—Select **No** to prevent the GlobalProtect agent from sending HIP data when the status of the Windows Security Center (WSC) changes. Select **Yes** (default) to immediately send HIP data when the status of the WSC changes. • **Detect Proxy for Each Connection**—Select **No** to auto-detect the proxy for the portal connection and use that proxy for subsequent connections. Select **Yes** (default) to auto-detect the proxy at every connection. • **Clear Single Sign-On Credentials on Logout**—Select **No** to keep single sign-on credentials when the user logs out. Select **Yes** (default) to clear them and force the user to enter credentials upon the next login. • **Use Default Authentication on Kerberos Authentication Failure**—Select **No** to use only Kerberos authentication. Select **Yes** (default) to retry using the default authentication method after authentication using Kerberos fails.
Step 8	If your endpoints frequently experience latency or slowness when connecting to the GlobalProtect portal or gateways, consider adjusting the portal and TCP timeout values. To allow more time for your endpoints to connect to or receive data from the portal or gateway, increase the timeout values, as needed. Keep in mind that increasing the values can result in longer wait times if the GlobalProtect agent is unable to establish the connection. In contrast, decreasing the values can prevent the GlobalProtect agent from establishing a connection when the portal or gateway does not respond before the timeout expires.	Configure values for any of the following options: • **Portal Connection Timeout (sec)**—The number of seconds before a connection request to the portal times out due to no response from the portal (range is 1-600; default is 30). • **TCP Connection Timeout (sec)**—The number of seconds before a TCP connection request times out due to unresponsiveness from either end of the connection (range is 1-600; default is 60). • **TCP Receive Timeout (sec)**—The number of seconds before a TCP connection times out due to the absence of some partial response of a TCP request (range is 1-600; default is 30).

Customize the Agent (Continued)		
Step 9	Specify whether remote desktop connections are permitted over existing VPN tunnels by specifying the **User Switch Tunnel Rename Timeout**. When a new user connects to a Windows machine using Remote Desktop Protocol (RDP), the gateway reassigns the VPN tunnel to the new user. The gateway can then enforce security policies on the new user. Allowing remote desktop connections over VPN tunnels can be useful in situations where an IT administrator needs to access a remote end-user system using RDP.	By default, the **User Switch Tunnel Rename Timeout** field is set to 0 meaning the GlobalProtect gateway terminates the connection if a new user authenticates over the VPN tunnel. To modify this behavior, configure a timeout value from 1 to 600 seconds. If the new user does not log in to the gateway before the timeout value expires, the GlobalProtect gateway terminates the VPN tunnel assigned to the first user. Changing the **User Switch Tunnel Rename Timeout** value only affects the RDP tunnel and does not rename a pre-logon tunnel when configured.
Step 10	Specify how GlobalProtect agent upgrades occur. If you want to control when users can upgrade, for example if you want to test a release on a small group of users before deploying it to your entire user base, you can customize the agent upgrade behavior on a per-configuration basis. In this case, you could create a configuration that applies to users in your IT group only to allow them to upgrade and test and disable upgrade in all other user/group configurations. Then, after you have thoroughly tested the new version, you could modify the agent configurations for the rest of your users to allow the upgrade.	By default, the **Allow User to Upgrade GlobalProtect App** field is set to **prompt** the end user to upgrade. To modify this behavior, select one of the following options: • If you want upgrades to occur automatically without interaction with the user, select **Allow Transparently**. • To prevent agent upgrades, select **Disallow**. • To allow end users to initiate agent upgrades, select **Allow Manually**. In this case, the user would select the **Check Version** option in the agent to determine if there is a new agent version and then upgrade if desired. Note that this option will not work if the GlobalProtect agent is hidden from the user. See Step 4 for details.
Step 11	Specify whether to display a welcome page upon successful login. A welcome page can be a useful way to direct users to internal resources that they can only access when connected to GlobalProtect, such as your Intranet or other internal servers. By default, the only indication that the agent has successfully connected to GlobalProtect is a balloon message that displays in the system tray/menubar.	To display a welcome page after a successful login select **factory-default** from the **Welcome Page** drop-down on the right. GlobalProtect displays the welcome page in the default browser on Windows, Mac, and Chromebook endpoints, or within the GlobalProtect app on mobile devices. You can also select a custom welcome page that provides information specific to your users, or to a specific group of users (based on which portal configuration gets deployed). For details on creating custom pages, see Customize the GlobalProtect Portal Login, Welcome, and Help Pages.
Step 12	Save the agent configuration settings.	1. If you are done creating agent configurations, click **OK** to close the Configs dialog. Otherwise, for instructions on completing the agent configurations, return to Define the GlobalProtect Agent Configurations. 2. If you are done configuring the portal, click **OK** to close the GlobalProtect Portal Configuration dialog. 3. When you finish the portal configuration, **Commit** the changes.

Customize the GlobalProtect Portal Login, Welcome, and Help Pages

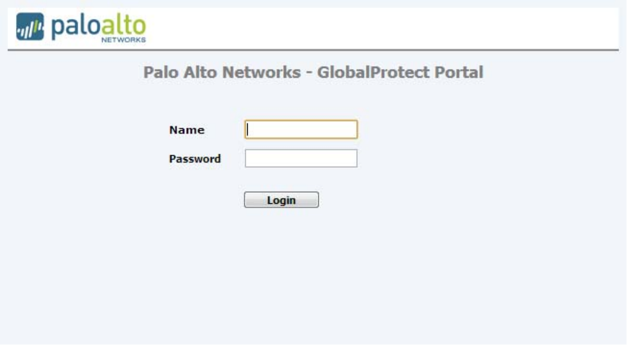
GlobalProtect provides default login, welcome, and/or help pages. However, you can create your own custom pages with your corporate branding, acceptable use policies, and links to your internal resources.

> You can alternatively disable browser access to the portal login page in order to prevent unauthorized attempts to authenticate to the GlobalProtect portal (configure the **Disable login page** option from **Network > GlobalProtect > Portals >** *portal_config* **> General**). With the portal login page disabled, you can instead use a software distribution tool, such as Microsoft's System Center Configuration Manager (SCCM), to allow your users to download and install the GlobalProtect agent.

Customize the Portal Login, Welcome, and Help Pages		
Step 1	Export the default portal login, welcome, or help page.	1. Select **Device > Response Pages**. 2. Select the link for the type of GlobalProtect portal page. 3. Select the **Default** predefined page and click **Export**.

Step 2	Edit the exported page.	1. Use the HTML text editor of your choice to edit the page.
		2. If you want to edit the logo image that is displayed, host the new logo image on a web server that is accessible from the remote GlobalProtect clients. For example, edit the following line in the HTML to point to the new logo image:
		`<img src="http://cdn.slidesharecdn.com/`
		`Acme-logo-96x96.jpg?1382722588"/>`
		3. Save the edited page with a new filename. Make sure that the page retains its UTF-8 encoding.

Step 3	Import the new page(s).	1. Select **Device > Response Pages**. 2. Select the link for the type of GlobalProtect portal page. 3. Click **Import** and then enter the path and filename in the **Import File** field or **Browse** to locate the file. 4. (Optional) Select the virtual system on which this page will be used from the **Destination** drop-down or select shared (default) to make it available to all virtual systems. 5. Click **OK** to import the file.
Step 4	Configure the portal to use the new page(s).	• **Custom Login Page** and **Custom Help Page**: 1. Select **Network > GlobalProtect > Portals** and select the portal to which you want to add the login page. 2. On the **General** tab, select the new page from the relevant drop-down in the Appearance area. • **Custom Welcome Page**: 1. Select **Network > GlobalProtect > Portals** and select the portal to which you want to add the login page. 2. On the **Agent** tab, select the agent configuration to which you want to add the welcome page. 3. Select the **App** tab, and select the new page from the **Welcome Page** drop-down. 4. Click **OK** to save the agent configuration.

Customize the Portal Login, Welcome, and Help Pages (Continued)		
Step 5	Save the portal configuration.	Click **OK** and then **Commit** your changes.
Step 6	Verify that the new page displays.	• **Test the login page**—Open a browser, go to the URL for your portal (be sure you do not add the :4443 port number to the end of the URL or you will be directed to the web interface for the firewall). For example, enter `https://myportal` rather than `https://myportal:4443`. The new portal login page will display.  Palo Alto Networks - GlobalProtect Portal Name Password • **Test the help page**—Right-click the GlobalProtect icon in the notification area (system tray), and select **Help**. The new help page will display. • **Test the welcome page**—Right-click the GlobalProtect icon in the notification area (system tray), and select **Welcome Page**. The new welcome page will display.

Enable Delivery of GlobalProtect Client VSAs to a RADIUS Server

When communicating with GlobalProtect portals or gateways, GlobalProtect clients send information that includes the client IP address, operating system (OS), hostname, user domain, and GlobalProtect agent/app version. You can enable the firewall to send this information as Vendor-Specific Attributes (VSAs) to a RADIUS server during authentication (by default, the firewall does not send the VSAs). RADIUS administrators can then perform administrative tasks based on those VSAs. For example, RADIUS administrators might use the client OS attribute to define a policy that mandates regular password authentication for Microsoft Windows users and one-time password (OTP) authentication for Google Android users.

The following are prerequisites for this procedure:

- ❐ Import the Palo Alto Networks RADIUS dictionary into your RADIUS server.
- ❐ Configure a RADIUS server profile and assign it to an authentication profile: see Set Up External Authentication.
- ❐ Assign the authentication profile to a GlobalProtect portal or gateway: see Set Up Access to the GlobalProtect Portal or Configure a GlobalProtect Gateway.

Enable Delivery of GlobalProtect Client VSAs to a RADIUS Server	
Step 1	Log in to the firewall CLI.
Step 2	Switch to configuration mode. `username@hostname>` **`configure`**

Step 3	Enter the command for each VSA you want to send.
	`username@hostname>` **`set authentication radius-vsa-on client-source-ip`**
	`username@hostname>` **`set authentication radius-vsa-on client-os`**
	`username@hostname>` **`set authentication radius-vsa-on client-hostname`**
	`username@hostname>` **`set authentication radius-vsa-on user-domain`**
	`username@hostname>` **`set authentication radius-vsa-on client-gp-version`**
	If you later want to stop the firewall from sending particular VSAs, run the same commands but use the `radius-vsa-off` option instead of `radius-vsa-on`.

Deploy the GlobalProtect Client Software

In order to connect to GlobalProtect, an end host must be running GlobalProtect client software. The software deployment method depends on the type of client as follows:

- **Mac OS and Microsoft Windows hosts**—Require the GlobalProtect agent software, which is distributed by the GlobalProtect portal. To enable the software for distribution, you must download the version you want the hosts in your network to use to the firewall hosting your GlobalProtect portal and then activate the software for download. For instructions on how to download and activate the agent software on the firewall, see Deploy the GlobalProtect Agent Software.
- **iOS and Android devices**—Require the GlobalProtect app. As with other mobile device apps, the end user must download the GlobalProtect app either from the Apple AppStore (iOS devices) or from Google Play (Android devices). For instructions on how to download and test the GlobalProtect app installation, see Download and Install the GlobalProtect Mobile App.
- **Chromebooks**—Require the GlobalProtect app for Chrome OS. Similar to the download process for mobile device apps, the end user can download the GlobalProtect app from the Chrome Web Store. You can also deploy the app to a managed Chromebook using the Chromebook Management Console. For instructions on Download and Install the GlobalProtect App for Chrome OS.

For more details, see What Client OS Versions are Supported with GlobalProtect?

Deploy the GlobalProtect Agent Software

There are several ways to deploy the GlobalProtect agent software:

- **Directly from the portal**—Download the agent software to the firewall hosting the portal and activate it so that end users can install the updates when they connect to the portal. This option provides flexibility in that it allows you to control how and when end users receive updates based on the agent configuration settings you define for each user, group, and/or operating system. However, if you have a large number of agents that require updates, it could put extra load on your portal. See Host Agent Updates on the Portal for instructions.
- **From a web server**—If you have a large number of hosts that will need to upgrade the agent simultaneously, consider hosting the agent updates on a web server to reduce the load on the firewall. See Host Agent Updates on a Web Server for instructions.
- **Transparently from the command line**—For Windows clients, you can automatically deploy agent settings in the Windows Installer (Msiexec). However, to upgrade to a later agent version using Msiexec, you must first uninstall the existing agent. In addition, Msiexec allows for deployment of agent settings directly on the endpoints by setting values in the Windows registry or Mac plist. See Deploy Agent Settings Transparently.
- **Using group policy rules**—In Active Directory environments, the GlobalProtect Agent can also be distributed to end users, using active directory group policy. AD Group policies allow modification of Windows host computer settings and software automatically. Refer to the article at http://support.microsoft.com/kb/816102 for more information on how to use Group Policy to automatically distribute programs to host computers or users.
- **From an MDM server**—If you use an MDM server to manage your mobile devices, you can use the MDM to deploy and configure the GlobalProtect app. See Manage the GlobalProtect App with a Third-Party MDM.

Host Agent Updates on the Portal

The simplest way to deploy the GlobalProtect agent software is to download the new agent installation package to the firewall that is hosting your portal and then activate the software for download to the agents connecting to the portal. To do this automatically, the firewall must have a service route that enables it to access the Palo Alto Networks Update Server. If the firewall does not have access to the Internet, you can manually download the agent software package from the Palo Alto Networks Software Updates support site using an Internet-connected computer and then manually upload it to the firewall.

> You must have a valid Palo Alto Networks account to log in to and download software from the Software Updates page. If you cannot log in and need assistance, go to https://www.paloaltonetworks.com/support/tabs/overview.html.)

You define how the agent software updates are deployed in the agent configurations you define on the portal—whether they happen automatically when the agent connects to the portal, whether the user is prompted to upgrade the agent, or whether the end user can manually check for and download a new agent version. For details on creating an agent configuration, see Define the GlobalProtect Agent Configurations.

Host the GlobalProtect Agent on the Portal		
Step 1	Launch the web interface on the firewall hosting the GlobalProtect portal and go to the GlobalProtect Client page.	Select **Device > GlobalProtect Client**.
Step 2	Check for new agent software images.	• If the firewall has access to the Update Server, click **Check Now** to check for the latest updates. If the value in the **Action** column is **Download** it indicates that an update is available. • If the firewall does not have access to the Update Server, go to the Palo Alto Networks Software Updates support site and **Download** the file to your computer. Then go back to the firewall to manually **Upload** the file. You must have a valid Palo Alto Networks account to log in to and download software from the Software Updates page. If you cannot log in and need assistance, go to: https://www.paloaltonetworks.com/support/tabs/overview.html)
Step 3	Download the agent software image. If your firewall does not have Internet access from the management port, you can download the agent update from the Palo Alto Networks Support Site: (https://www.paloaltonetworks.com/support/tabs/overview.html). You can then manually **Upload** the update to your firewall and then activate **Activate From File**.	Locate the agent version you want and then click **Download**. When the download completes, the value in the **Action** column changes to **Activate**. If you manually uploaded the agent software as detailed in Step 2, the **Action** column will not update. Continue to the next step for instructions on activating an image that was manually uploaded.

Host the GlobalProtect Agent on the Portal (Continued)		
Step 4	Activate the agent software image so that end users can download it from the portal. Only one version of agent software image can be activated at a time. If you activate a new version, but have some agents that require a previously activated version, you will have to activate the required version again to enable it for download.	• If you downloaded the image automatically from the Update Server, click **Activate**. • If you manually uploaded the image to the firewall, click **Activate From File** and then select the **GlobalProtect Client File** you uploaded from the drop-down. Click **OK** to activate the selected image. You may need to refresh the screen before the version displays as **Currently Activated**.

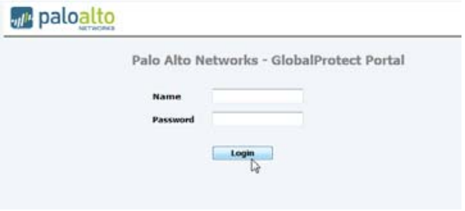
Host Agent Updates on a Web Server

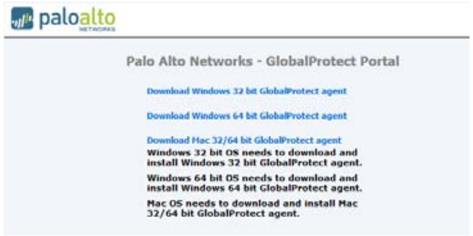
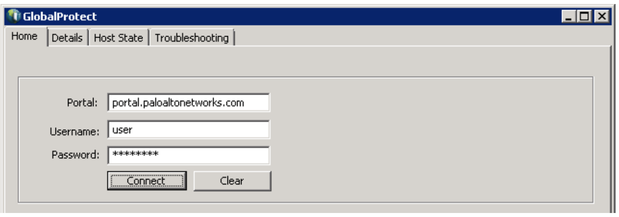
If you have a large number of endpoints that will need to install and/or update the GlobalProtect agent software, consider hosting the GlobalProtect agent software images on an external web server. This helps reduce the load on the firewall when users connect to download the agent. To use this feature, the firewall hosting the portal must be running PAN-OS 4.1.7 or later.

Host GlobalProtect Agent Images on a Web Server		
Step 1	Download the version of the GlobalProtect agent that you plan to host on the web server to the firewall and activate it.	Follow the steps for downloading and activating the agent software on the firewall as described in Host the GlobalProtect Agent on the Portal.
Step 2	Download the GlobalProtect agent image you want to host on your web server. You should download the same image that you activated on the portal.	From a browser, go to the Palo Alto Networks Software Updates site and **Download** the file to your computer.
Step 3	Publish the files to your web server.	Upload the image file(s) to your web server.
Step 4	Redirect the end users to the web server.	On the firewall hosting the portal, log in to the CLI and enter the following operational mode commands: > **set global-protect redirect on** > **set global-protect redirect location <path>** where `<path>` is the path is the URL to the folder hosting the image, for example `https://acme/GP`.
Step 5	Test the redirect.	1. Launch your web browser and go to the following URL: `https://<portal address or name>` For example, `https://gp.acme.com`. 2. On the portal login page, enter your user **Name** and **Password** and then click **Login**. After successful login, the portal should redirect you to the download.

Test the Agent Installation

Use the following procedure to test the agent installation.

Test the Agent Installation		
Step 1	Create an agent configuration for testing the agent installation. When initially installing the GlobalProtect agent software on the endpoint, the end user must be logged in to the system using an account that has administrative privileges. Subsequent agent software updates do not require administrative privileges.	As a best practice, create an agent configuration that is limited to a small group of users, such as administrators in the IT department responsible for administering the firewall: 1. Select **Network > GlobalProtect > Portals** and select the portal configuration to edit. 2. Select the **Agent** tab and either select an existing configuration or **Add** a new configuration to deploy to the test users/group. 3. On the **User/User Group** tab, click **Add** in the User/User Group section, select the user or group who will be testing the agent, and then click **OK**. 4. On the **Agent** tab, make sure **Agent Upgrade** is set to **prompt** and then click **OK** to save the configuration. 5. (Optional) Select the agent configuration you just created/modified and click **Move Up** so that it is before any more generic configurations you have created. 6. **Commit** the changes.
Step 2	Log in to the GlobalProtect portal.	1. Launch your web browser and go to the following URL: `https://<portal address or name>` For example, `https://gp.acme.com`. 2. On the portal login page, enter your user **Name** and **Password** and then click **Login**.  paloalto NETWORKS Palo Alto Networks - GlobalProtect Portal Name Password Login

Test the Agent Installation (Continued)		
Step 3	Download the agent.	1. Click the link that corresponds to the operating system you are running on your computer to begin the download.  Palo Alto Networks - GlobalProtect Portal Download Windows 32 bit GlobalProtect agent Download Windows 64 bit GlobalProtect agent Download Mac 32/64 bit GlobalProtect agent Windows 32 bit OS needs to download and install Windows 32 bit GlobalProtect agent. Windows 64 bit OS needs to download and install Windows 64 bit GlobalProtect agent. Mac OS needs to download and install Mac 32/64 bit GlobalProtect agent. 2. When prompted to run or save the software, click **Run**. 3. When prompted, click **Run** to launch the GlobalProtect Setup Wizard. When initially installing the GlobalProtect agent software on the endpoint, the end user must be logged in to the system using an account that has administrative privileges. Subsequent agent software updates do not require administrative privileges.
Step 4	Complete the GlobalProtect agent setup.	1. From the GlobalProtect Setup Wizard, click **Next**. 2. Click **Next** to accept the default installation folder (`C:\Program Files\Palo Alto Networks\GlobalProtect`) or **Browse** to choose a new location and then click **Next** twice. 3. After the installation successfully completes, click **Close**. The GlobalProtect agent will automatically start.
Step 5	Log in to GlobalProtect.	Enter the FQDN or IP address of the **Portal**, your **Username**, and your **Password** and then click **Connect**. If authentication is successful, the agent will connect to GlobalProtect. Use the agent to access resources on the corporate network as well as external resources, as defined in the corresponding security polices.  GlobalProtect Home | Details | Host State | Troubleshooting Portal: portal.paloaltonetworks.com Username: user Password: ******** Connect Clear To deploy the agent to end users, create agent configurations for the user groups for which you want to enable access and set the **Agent Upgrade** settings appropriately and then communicate the portal address. See Define the GlobalProtect Agent Configurations for details on setting up agent configurations.

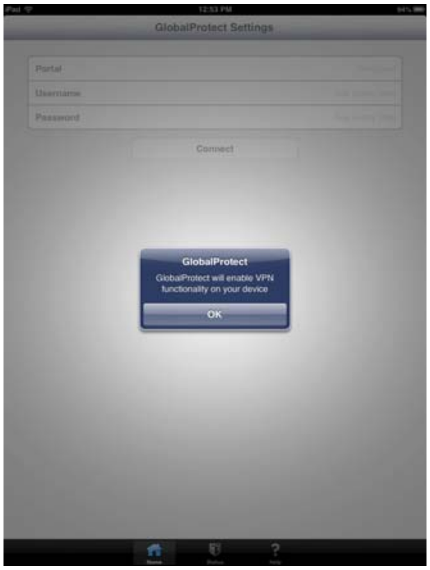
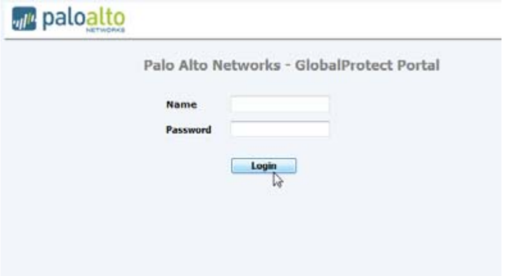
Download and Install the GlobalProtect Mobile App

The GlobalProtect app provides a simple way to extend the enterprise security policies out to mobile devices. As with other remote hosts running the GlobalProtect agent, the mobile app provides secure access to your corporate network over an IPSec or SSL VPN tunnel. The app will automatically connect to the gateway that is closest to the end user's current location. In addition, traffic to and from the mobile device is automatically subject to the same security policy enforcement as other hosts on your corporate network. Like the GlobalProtect agent, the app collects information about the host configuration and can use this information for enhanced HIP-based security policy enforcement.

There are two primary methods for installing the GlobalProtect app: You can deploy the app from your third-party MDM and transparently push the app to your managed devices; or, you can install the app directly from the app store (iOS devices) or Google Play (android devices). For details on installing the GlobalProtect app for Chrome OS, see Download and Install the GlobalProtect App for Chrome OS.

This workflow describes how to install the GlobalProtect app directly on the mobile device.

Install the GlobalProtect Mobile App		
Step 1	Create an agent configuration for testing the app installation.	As a best practice, create an agent configuration that is limited to a small group of users, such as administrators in the IT department responsible for administering the firewall: 1. Select **Network > GlobalProtect > Portals** and select the portal configuration to edit. 2. Select the **Agent** tab and either select an existing configuration or **Add** a new configuration to deploy to the test users/group. 3. On the **User/User Group** tab, click **Add** in the User/User Group section and then select the user or group who will be testing the agent. 4. In the OS section, select the app you are testing (iOS or Android). 5. (Optional) Select the agent configuration you just created/modified and click **Move Up** so that it is before any more generic configurations you have created. 6. **Commit** the changes.
Step 2	From the mobile device, follow the prompts to download and install the app.	• On Android devices, search for the app on Google Play • On iOS devices, search for the app at the App Store

Install the GlobalProtect Mobile App (Continued)	
Step 3 Launch the app.	When successfully installed, the GlobalProtect app icon displays on the device’s Home screen. To launch the app, tap the icon.When prompted to enable GlobalProtect VPN functionality, tap **OK**.  GlobalProtect Settings Portal Username Password Connect GlobalProtect GlobalProtect will enable VPN functionality on your device OK
Step 4 Connect to the portal.	1. When prompted, enter the **Portal** name or address, **Username**, and **Password**. The portal name must be an FQDN and it should not include the https:// at the beginning.  Palo Alto Networks - GlobalProtect Portal Name Password Login 2. Tap **Connect** and verify that the app successfully establishes a VPN connection to GlobalProtect. If a third-party mobile device manager is configured, the app will prompt you to enroll.

Download and Install the GlobalProtect App for Chrome OS

The GlobalProtect app for Chrome OS provides a simple way to extend the enterprise security policies out to Chromebooks. As with other remote hosts running the GlobalProtect agent, the app provides secure access to your corporate network over an IPSec or SSL VPN tunnel. After the user initiates a connection, the app will connect to the gateway that is closest to the end user’s current location. In addition, traffic to and from the Chromebook is automatically subject to the same security policy enforcement as other hosts on your corporate network. Like the GlobalProtect agent, the app collects information about the host configuration and can use this information for enhanced HIP-based security policy enforcement.

Use the following procedures to install and test the GlobalProtect app for Chrome OS.

▲ Install the GlobalProtect App from the Chrome Web Store

▲ Deploy the GlobalProtect App Using the Chromebook Management Console

▲ Test the GlobalProtect app for Chrome OS

Install the GlobalProtect App from the Chrome Web Store

You can install the GlobalProtect app on a Chromebook by downloading the app from the Chrome Web Store. As an alternative you can Deploy the GlobalProtect App Using the Chromebook Management Console.

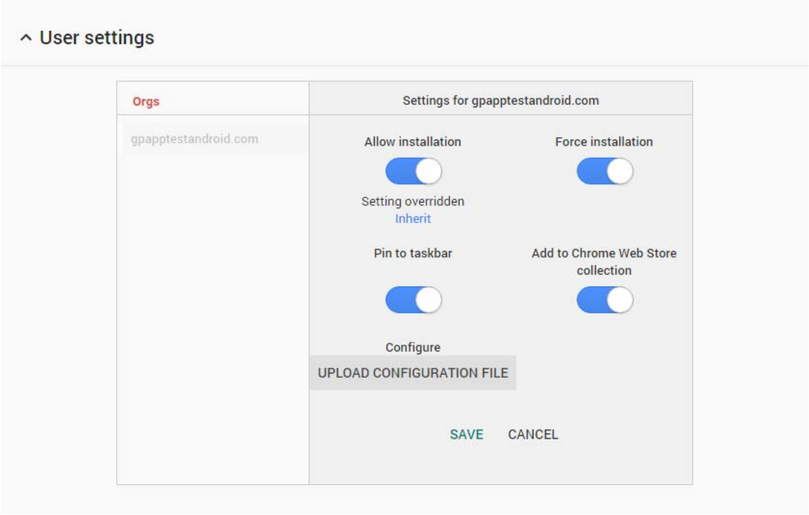
Install the GlobalProtect App from the Chrome Web Store		
Step 1	Create an agent configuration for testing the app installation. As a best practice, create an agent configuration that is limited to a small group of users, such as administrators in the IT department and who responsible for administering the firewall.	1. Select **Network > GlobalProtect > Portals** and select the portal configuration to edit. 2. Select the **Agent** tab and either select an existing configuration or **Add** a new configuration to deploy to the test users/group. 3. On the **User/User Group** tab, click **Add** in the User/User Group section and then select the user or group that will test the agent. 4. In the OS area, select the app you are testing (Chrome) and click **OK**. 5. (Optional) Select the agent configuration you just created or modified and click **Move Up** so that it is before any more generic configurations you have created. 6. **Commit** the changes.
Step 2	Install the GlobalProtect app for Chrome OS. You can also force-install the app on managed Chromebooks using the Chromebook Management Console. See Deploy the GlobalProtect App Using the Chromebook Management Console.	1. From the Chromebook, search for the app in the Chrome Web Store or go directly to the GlobalProtect app page. 2. Click **Add to Chrome** and then follow the prompts to download and install the app.
Step 3	Launch the app.	When successfully installed, the Chrome App Launcher displays the GlobalProtect app icon in the list of apps**.** To launch the app, click the icon.
Step 4	Configure the portal.	1. When prompted, enter the IP address or FQDN of the **Portal**. The portal should not include the https:// at the beginning. 2. Click **Add Connection** to add the GlobalProtect VPN configuration. The app displays the home screen after it adds the VPN configuration to the Internet connection settings of your Chromebook but does not initiate a connection.
Step 5	Test the connection.	Test the GlobalProtect app for Chrome OS

Deploy the GlobalProtect App Using the Chromebook Management Console

The Chromebook Management Console enables you to manage Chromebook settings and apps from a central, web-based location. From the console, you can deploy the GlobalProtect app to Chromebooks and customize VPN settings.

Use the following workflow to manage policies and settings for the GlobalProtect app for Chrome OS:

Configure the GlobalProtect App Using the Chromebook Management Console		
Step 1	View the user settings for the GlobalProtect app.	1. From the Chromebook Management Console, select **Device management > Chrome management > App management.** The console displays the list of apps configured in all organization (org) units in your domain and displays the status of each app. Click an app **Status** to display the org units to which that status is applied. 2. Select the GlobalProtect app and then select **User settings**. If the app is not present, **SEARCH** for GlobalProtect in the Chrome Web Store.



User settings

Orgs: gpapptestandroid.com

Settings for gpapptestandroid.com

Allow installation: on
Setting overridden
Inherit

Force installation: on

Pin to taskbar: on

Add to Chrome Web Store collection: on

Configure

Configure the GlobalProtect App Using the Chromebook Management Console (Continued)		

Step 2	Configure policies and settings for everyone in an org unit.	1. Select the org unit where you want to configure settings and configure any of the following options:
		Selecting the top-level org unit applies settings to everyone in that unit; selecting a child org unit applies settings only to users within that child org unit.
		- **Allow installation**—Allow users install this app from the Chrome Web Store. By default, an org unit inherits the settings of its parent organization. To override the default settings, select **Inherit**, which toggles the **Override** setting.
		- **Force installation**—Install this app automatically and prevents users from removing it.
		- **Pin to taskbar**—If the app is installed, pin the app to the taskbar (in Chrome OS only).
		- **Add to Chrome Web Store collection**—Recommend this app to your users in the Chrome Web Store.
		2. If you have not already done so, create a text file in JSON format that uses the following syntax and includes the FQDN or IP address of your GlobalProtect portal:
		`{`
		`  "PortalAddress": {`
		`    "Value": "192.0.2.191"`
		`  }`
		`}`
		3. On the **User settings** page, select **UPLOAD CONFIGURATION FILE** and then **Browse** to the GlobalProtect settings file.
		4. **SAVE** your changes. Settings typically take effect within minutes, but it might take up to an hour to propagate through your organization.

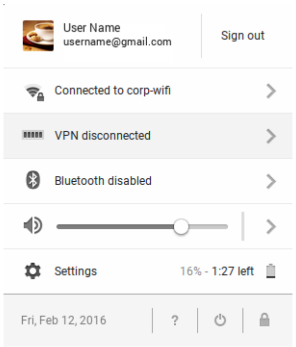
Step 3	Test the connection.	After Chrome Management Console successfully deploys the app, Test the GlobalProtect app for Chrome OS

Test the GlobalProtect app for Chrome OS

Use the GlobalProtect app to view status and other information about the app or to collect logs, or reset the VPN connection settings. After you install and configure the app, it is not necessary to open the app to establish a VPN connection. Instead, you can connect by selecting the portal from the VPN settings on the Chromebook.

Test the GlobalProtect App for Chrome OS

Step 1 Log in to GlobalProtect.

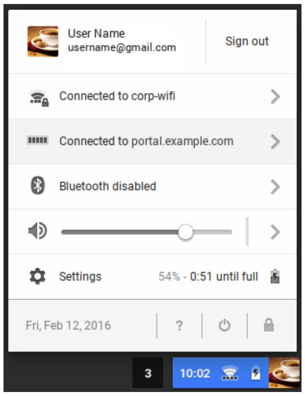


1. Click the status area at the bottom right corner of the Chromebook.
2. Select **VPN disconnected** and then select the portal that you entered when configuring the GlobalProtect VPN settings.

   To view VPN settings before connecting, select the portal from **Settings > Private network**, and then click **Connect**.
3. Enter the **Username** and **Password** for the portal and click **Connect**. Repeat this step to enter the **Username** and **Password** for the gateway. If authentication is successful, GlobalProtect connects you to your corporate network. If enabled, the GlobalProtect welcome page will display.

Step 2 View the connection status. When the app is connected, the status area displays the VPN icon along the bottom of the Wi-Fi icon ( ).

- To view the portal to which you are connected, click the status area.



- To view additional information about the connection including the gateway to which you are connected, launch the GlobalProtect app. The main page displays connection information and (if applicable) any errors or warnings.

Deploy Agent Settings Transparently

As an alternative to deploying agent settings from the portal configuration, you can define them directly from the Windows registry or global Mac plist or—on Windows clients only—using the Windows Installer (Msiexec). The benefit is that it enables deployment of GlobalProtect agent settings to endpoints prior to their first connection to the GlobalProtect portal.

Settings defined in the portal configuration always override settings defined in the Windows registry or Mac plist. So if you define settings in the registry or plist, but the portal configuration specifies different settings, the settings the agent receives from the portal will override the settings defined on the client. This override also applies to login-related settings, such as whether to connect on-demand, whether to use single sign-on (SSO), and whether the agent can connect if the portal certificate is invalid. Therefore, you should avoid conflicting settings. In addition, the portal configuration is cached on the endpoint and that cached configuration is be used anytime the GlobalProtect agent is restarted or the client machine is rebooted.

The following sections describe the customizable agent settings available and how to deploy these settings transparently to Windows and Mac clients:

- Customizable Agent Settings
- Deploy Agent Settings to Windows Clients
- Deploy Agent Settings to Mac Clients

In addition to using Windows registry and Mac plist to deploy GlobalProtect agent settings, you can enable the GlobalProtect agent to collect specific Windows registry or Mac plist information from clients, including data on applications installed on the clients, processes running on the clients, and attributes or properties of those applications and processes. You can then monitor the data and add it to a security rule as matching criteria. Device traffic that matches registry settings you have defined can be enforced according to the security rule. Additionally, you can set up custom checks to Collect Application and Process Data From Clients.

Customizable Agent Settings

In addition to pre-deploying the portal address, you can also define the agent configuration settings. To Deploy Agent Settings to Windows Clients you define keys in the Windows registry (`HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect`), or, to Deploy Agent Settings to Mac Clients you define entries in the `PanSetup` dictionary of the Mac plist (`/Library/Preferences/com.paloaltonetworks.GlobalProtect.pansetup.plist`). On Windows clients only, you can also use the Windows Installer to Deploy Agent Settings from Msiexec.

Table: Customizable Agent Behavior Options describes each customizable agent setting. Settings defined in the GlobalProtect portal agent configuration take precedence over settings defined in the Windows registry or the Mac plist.

> Some settings do not have a corresponding portal configuration settings on the web interface, and must be configured using Windows registry or Msiexec. These additional settings include: `can-prompt-user-credential`, `wrap-cp-guid`, and `filter-non-gpcp`.

- Agent Display Options
- User Behavior Options
- Agent Behavior Options
- Script Deployment Options

Agent Display Options

The following table lists the options that you can configure in the Windows registry and Mac plist to customize the display of the GlobalProtect agent.

Table: Customizable Agent Settings

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default
Enable Advanced View	`enable-advanced-view yes | no`	`ENABLEADVANCEDVIEW=”yes | no”`	yes
Display GlobalProtect Icon	`show-agent-icon yes | no`	`SHOWAGENTICON=”yes | no”`	yes
Enable Rediscover Network Option	`rediscover-network yes | n`	`REDISCOVERNETWORK=”yes | no”`	yes
Enable Resubmit Host Profile Option	`resubmit-host-info yes | no`	`RESUBMITHOSTINFO=”yes | no”`	yes
Show System Tray Notifications	`show-system-tray-notifications yes | no`	`SHOWSYSTEMTRAYNOTIFICATIONS=”yes | no”`	yes

User Behavior Options

The following table lists the options that you can configure in the Windows registry and Mac plist to customize how the user can interact with the GlobalProtect agent.

Table: Customizable User Behavior Options

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default
Allow User to Change Portal Address	`can-change-portal yes | no`	`CANCHANGEPORTAL=”yes | no”`	yes
Allow User to Dismiss Welcome Page	`enable-hide-welcome-page yes | no`	`ENABLEHIDEWELCOMEPAGE=”yes | no”`	yes
Allow User to Continue with Invalid Portal Server Certificate	`can-continue-if-portal-cert-invalid yes | no`	`CANCONTINUEIFPORTALCERTINVALID=”yes | no”`	yes
Allow User to Disable GlobalProtect App	`disable-allowed yes | no`	`DISABLEALLOWED="yes | no"`	no
Save User Credentials Specify a 0 to prevent GlobalProtect from saving credentials, a 1 to save both username and password, or a 2 to save the username only.	`save-user-credentials 0 | 1 | 2`	`SAVEUSERCREDENTIALS 0 | 1 | 2`	
Not in portal The **Allow user to save password** setting is deprecated in the web interface in PAN-OS 7.1 and later releases but is configurable from the Windows registry and Mac plist. Any value specified in the **Save User Credentials** field overwrites a value specified here.	`can-save-password yes | no`	`CANSAVEPASSWORD=”yes | no”`	yes

Agent Behavior Options

The following table lists the options that you can configure in the Windows registry and Mac plist to customize the behavior of the GlobalProtect agent.

Table: Customizable Agent Behavior Options

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default
Connect Method	`connect-method on-demand | pre-logon | user-logon`	`CONNECTMETHOD=”on-demand | pre-logon | user-logon”`	user-logon
GlobalProtect App Config Refresh Interval (hours)	`refresh-config-interval <hours>`	`REFRESHCONFIGINTERVAL=”<hours>”`	24
Restart GlobalProtect Agent After Timing Out (Windows Only)	`restartgpa yes | no`	`RESTARTGPA=”yes | no”`	no
Assign Tunnel IP Address Using Static Method (Windows Only)	`fallbackipstaticsettings yes | no`	`FALLBACKIPSTATICSETTINGS=”yes | no”`	yes

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default
Update DNS Settings at Connect (Windows Only)	`flushdns yes | no`	`FLUSHDNS=”yes | no”`	`no`
Send HIP Report Immediately if Windows Security Center (WSC) State Changes (Windows Only)	`wscautodetect yes | no`	`WSCAUTODETECT=”yes | no”`	`no`
Detect Proxy for Each Connection (Windows Only)	`ProxyMultipleAutoDetection yes | no`	`PROXYMULTIPLEAUTODETECTION=”yes | no”`	`no`
Clear Single Sign-On Credentials on Logout (Windows Only)	`LogoutRemoveSSO yes | no`	`LOGOUTREMOVESSO=”yes | no”`	`yes`
Use Default Authentication on Kerberos Authentication Failure (Windows Only)	`krb-auth-fail-fallback yes | no`	`KRBAUTHFAILFALLBACK=”yes | no”`	`no`
Custom Password Expiration Message (LDAP Authentication Only)	`PasswordExpiryMessage <message>`	`PASSWORDEXPIRYMESSAGE “<message>”`	
Portal Connection Timeout (sec)	`PortalTimeout <portaltimeout>`	`PORTALTIMEOUT=”<portaltimeout>”`	`30`
TCP Connection Timeout (sec)	`ConnectTimeout <portaltimeout>`	`CONNECTTIMEOUT=”<portaltimeout>”`	`60`
TCP Receive Timeout (sec)	`ReceiveTimeout <portaltimeout>`	`RECEIVETIMEOUT=”<portaltimeout>”`	`30`
Client Certificate Store Lookup	`certificate-store-lookup user | machine | user and machine | invalid`	`CERTIFICATESTORELOOKUP="user | machine | user and machine | invalid"`	`user and machine`
SCEP Certificate Renewal Period (days)	`scep-certificate-renewal-period <renewalPeriod>`	n/a	`7`
Maximum Internal Gateway Connection Attempts	`max-internal-gateway-connection-attempts <maxValue>`	`MIGCA="<maxValue>"`	`0`
Extended Key Usage OID for Client Certificate	`ext-key-usage-oid-for-client-cert <oidValue>`	`EXTCERTOID=”<oidValue>”`	`n/a`
User Switch Tunnel Rename Timeout (sec)	`user-switch-tunnel-rename-timeout <renameTimeout>`	n/a	`0`
Use Single Sign-On (Windows Only)	`use-sso yes | no`	`USESSO="yes | no"`	`yes`
Not in portal This setting specifies the default portal IP address (or hostname).	`portal <IPaddress>`	`PORTAL="<IPaddress>"`	n/a
Not in portal This setting enables GlobalProtect to initiate a VPN tunnel before a user logs in to the device and connects to the GlobalProtect portal.	`prelogon 1`	`PRELOGON="1"`	`1`

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default
Windows only/Not in portal This setting is used in conjunction with single sign-on (SSO) and indicates whether or not to prompt the user for credentials if SSO fails.	`can-prompt-user-credential yes | no`	`CANPROMPTUSERCREDENTIAL=”yes | no”`	`yes`

Windows only/Not in portal
This setting filters the third-party credential provider’s tile from the Windows login page so that only the native Windows tile is displayed.*
	`wrap-cp-guid {third party credential provider guid}`	`WRAPCPGUID=”{guid_value]”`
		`FILTERNONGPCP=”yes | no”`
			`no`

Windows only/Not in portal This setting is an additional option for the setting `wrap-cp-guid`, and allows the third-party credential provider tile to be displayed on the Windows login page, in addition to the native Windows logon tile.*	`filter-non-gpcp no`	n/a	n/a

*For detailed steps to enable these settings using the Windows registry or Windows Installer (Msiexec), see SSO Wrapping for Third-Party Credential Providers on Windows Clients.

Script Deployment Options

The following table displays options that enable GlobalProtect to initiate scripts before and after establishing a VPN tunnel and before disconnecting a VPN tunnel. Because these options are not available in the portal, you must define the values for the relevant key—either `pre-vpn-connect`, `post-vpn-connect`, or `pre-vpn-disconnect`—from the Windows registry or Mac plist. For detailed steps to deploy scripts, see Deploy Scripts Using the Windows Registry, Deploy Scripts Using Msiexec, or Deploy Scripts Using the Mac Plist.

Table: Customizable Script Deployment Options

Portal Agent Configuration	Windows Registry/ Mac Plist	Msiexec Parameter	Default

Execute the script specified in the command setting (including any parameters passed to the script).
Environmental variables are supported.
Specify the full path in commands.
	`command <parameter1> <parameter2> [...]`
	Windows example:
	`command %userprofile%\vpn_script.bat c: test_user`
	Mac example:
	`command $HOME/vpn_script.sh /Users/test_user test_user`
		`PREVPNCONNECTCOMMAND=”<parameter1> <parameter2> [...]”`
		`POSTVPNCONNECTCOMMAND=”<parameter1> <parameter2> [...]”`
		`PREVPNDISCONNECTCOMMAND=”<parameter1> <parameter2> [...]”`
			n/a

(Continued)Portal Agent	Windows Registry/ Mac Plist	Msiexec Parameter	Default

(Optional) Specify the privileges under which the command(s) can run (default is `user`: if you do not specify the context, the command runs as the current active user).	`context admin | user`	`PREVPNCONNECTCONTEXT=”admin | user”`
		`POSTVPNCONNECTCONTEXT=”admin | user”`
		`PREVPNDISCONNECTCONTEXT=”admin | user”`
			`user`

(Optional) Specify the number of seconds the GlobalProtect client waits for the command to execute (range is 0-120). If the command does not complete before the timeout, the client proceeds to establish or disconnect from the VPN tunnel. A value of 0 (the default) means the client will not wait to execute the command.
Not supported for post-vpn-connect.
	`timeout <value>`
	Example:
	`timeout 60`
		`PREVPNCONNECTTIMEOUT=”<value>”`
		`POSTVPNCONNECTTIMEOUT=”<value>”`
		`PREVPNDISCONNECTTIMEOUT=”<value>”`
			`0`

(Optional) Specify the full path of a file used in a command. The GlobalProtect client will verify the integrity of the file by checking it against the value specified in the `checksum` key.
Environmental variables are supported.
	`file <path_file>`	`PREVPNCONNECTFILE=”<path_file>”`
		`POSTVPNCONNECTFILE=”<path_file>”`
		`PREVPNDISCONNECTFILE=”<path_file>”`
			`n/a`

(Optional) Specify the SHA-256 checksum of the file referred to in the `file` key. If the checksum is specified, the GlobalProtect client executes the command(s) only if the checksum generated by the GlobalProtect client matches the checksum value specified here.	`checksum <value>`	`PREVPNCONNECTCHECKSUM=”<value>”`
		`POSTVPNCONNECTCHECKSUM=”<value>”`
		`PREVPNDISCONNECTCHECKSUM=”<value>”`
			`n/a`

(Optional) Specify an error message to inform the user that the command(s) cannot execute or if the command(s) exited with a non-zero return code.
The message must be 1,024 or fewer ANSI characters.
	`error-msg <message>`
	Example:
	`error-msg Failed executing pre-vpn-connect action!`
		`PREVPNCONNECTERRORMSG=”<message>”`
		`POSTVPNCONNECTERRORMSG=”<message>”`
		`PREVPNDISCONNECTERRORMSG=”<message>”`
			`n/a`

Deploy Agent Settings to Windows Clients

Use Windows registry or the Windows Installer (Msiexec) to deploy the GlobalProtect agent and settings to Windows clients transparently.

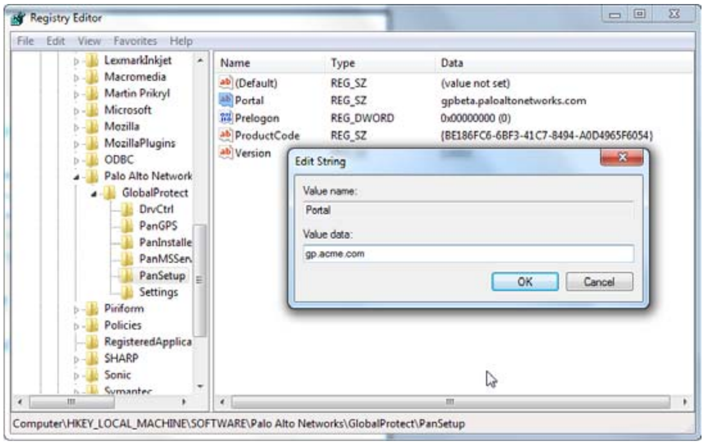
- ▲ Deploy Agent Settings in the Windows Registry
- ▲ Deploy Agent Settings from Msiexec
- ▲ Deploy Scripts Using the Windows Registry
- ▲ Deploy Scripts Using Msiexec
- ▲ SSO Wrapping for Third-Party Credential Providers on Windows Clients

Deploy Agent Settings in the Windows Registry

You can enable deployment of GlobalProtect agent settings to Windows clients prior to their first connection to the GlobalProtect portal by using the Windows registry. Use the options described in the following table to begin using the Windows registry to customize agent settings for Windows clients.

> In addition to using Windows registry to deploy GlobalProtect agent settings, you can enable the GlobalProtect agent to collect specific Windows registry information from Windows clients. You can then monitor the data and add it to a security rule as matching criteria. Device traffic that matches registry settings you have defined can be enforced according to the security rule. Additionally, you can set up custom checks to Collect Application and Process Data From Clients.

Use the Windows Registry to Deploy GlobalProtect Agent Settings	
• Locate the GlobalProtect agent customization settings in the Windows registry.	Open the Windows registry (enter `regedit` at the command prompt) and go to: `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\Settings\`

<table>
<tr><th colspan="2">Use the Windows Registry to Deploy GlobalProtect Agent Settings</th></tr>
<tr><td>• Set the portal name.</td><td>If you do not want the user to manually enter the portal address even for the first connection, you can pre-deploy the portal address through the Windows registry: (<code>HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\PanSetup with key Portal</code>).


<table>
<tr><th>Name</th><th>Type</th><th>Data</th></tr>
<tr><td>(Default)</td><td>REG_SZ</td><td>(value not set)</td></tr>
<tr><td>Portal</td><td>REG_SZ</td><td>gpbeta.paloaltonetworks.com</td></tr>
<tr><td>Prelogon</td><td>REG_DWORD</td><td>0x00000000 (0)</td></tr>
<tr><td>ProductCode</td><td>REG_SZ</td><td>{BE186FC6-6BF3-41C7-8494-A0D4965F6054}</td></tr>
<tr><td>Version</td><td></td><td></td></tr>
</table>
Edit String
Value name: Portal
Value data: gp.acme.com
OK Cancel
Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\PanSetup</td></tr>
<tr><td>• Deploy various settings to the Windows client from the Windows registry, including configuring the connect method for the GlobalProtect agent and enabling single sign-on (SSO).</td><td>View Table: Customizable Agent Behavior Options for a full list of the commands and values you can set up using the Windows registry.</td></tr>
<tr><td>• Enable the GlobalProtect agent to wrap third-party credentials on the Windows client, allowing for SSO when using a third-party credential provider.</td><td>Enable SSO Wrapping for Third-Party Credentials with the Windows Registry.</td></tr>
</table>

Deploy Agent Settings from Msiexec

On Windows endpoints, you have the option to deploy the agent and the settings automatically from the Windows Installer (Msiexec) by using the following syntax:

```
msiexec.exe /i GlobalProtect.msi <SETTING>="<value>"
```

> Msiexec is an executable program that installs or configures a product from the command line. On systems running Microsoft Windows XP or a later OS, the maximum length of the string that you can use at the command prompt is 8,191 characters.

For example, to prevent users from connecting to the portal if the certificate is not valid, change the allow to continue if invalid setting as follows:

```
msiexec.exe /i GlobalProtect.msi CANCONTINUEIFPORTALCERTINVALID="no"
```

For a complete list of settings and the corresponding default values, see Table: Customizable Agent Behavior Options.

> To set up the GlobalProtect agent to wrap third-party credentials on a Windows client from Msiexec, see Enable SSO Wrapping for Third-Party Credentials with the Windows Installer.

Deploy Scripts Using the Windows Registry

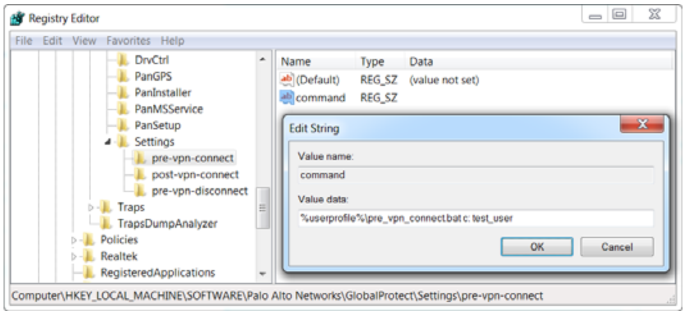
You can enable deployment of custom scripts to Windows endpoints using the Windows registry.

You can configure the GlobalProtect agent to initiate and run a script for any or all of the following events: before and after establishing the tunnel, and before disconnecting the tunnel. To run the script at a particular event, reference the batch script from a command registry entry for that event.

Depending on the configuration settings, the GlobalProtect agent can run a script before and after the agent establishes a VPN tunnel with the gateway, and before the agent disconnects from the VPN tunnel. Use the following workflow to get started using the Windows registry to customize agent settings for Windows clients.

> The registry settings that enable you to deploy scripts are supported in GlobalProtect clients running GlobalProtect agent 2.3 and later releases.

Deploy Scripts in the Windows Registry		
Step 1	Open the Windows registry, and locate the GlobalProtect agent customization settings.	Open the Windows registry (enter `regedit` in the command prompt) and go to the location of the key depending on when you want to execute scripts (pre/post connect or pre disconnect): • `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\Settings\pre-vpn-connect` • `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\Settings\post-vpn-connect` • `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\Settings\pre-vpn-disconnect` If the key does not exist within the **Settings** key, create it (right-click **Settings** and select **New > Key**).

Deploy Scripts in the Windows Registry		
Step 1	Enable the GlobalProtect agent to run scripts by creating a new String Value named `command`. The batch file specified here should contain the specific script (including any parameters passed to the script) that you want run on the device. For examples, see Windows OS Batch Script Examples.	1. If the `command` string does not already exist, create it (right-click the `pre-vpn-connect`, `post-vpn-connect`, or `pre-vpn-disconnect` key, select **New > String Value**, and name it `command`). 2. Right click `command` and select **Modify**. 3. Enter the commands or script that the GlobalProtect agent should run. For example: `%userprofile%\pre_vpn_connect.bat c: test_user`  Registry Editor File Edit View Favorites Help DrvCtrl PanGPS PanInstaller PanMSService PanSetup Settings pre-vpn-connect post-vpn-connect pre-vpn-disconnect Traps TrapsDumpAnalyzer Policies Realtek RegisteredApplications Edit String OK Cancel Name Type Data (Default) REG_SZ (value not set) command REG_SZ Value name: command Value data: %userprofile%\pre_vpn_connect.bat c: test_user Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\Settings\pre-vpn-connect
Step 2	(Optional) Add additional registry entries as needed for each command.	Create or modify registry strings and their corresponding values, including `context`, `timeout`, `file`, `checksum`, or `error-msg`. For additional information, see Customizable Agent Settings.

Windows OS Batch Script Examples

You can configure the GlobalProtect agent to initiate and run a script for any or all of the following events: before and after establishing the tunnel, and before disconnecting the tunnel. To run the script at a particular event, reference the batch script from a command registry entry for that event. The following topics show examples of scripts you can run on Windows systems at pre-connect, post-connect, and pre-disconnect events:

- Example: Exclude Traffic from the VPN Tunnel
- Example: Mount a Network Share

Example: Exclude Traffic from the VPN Tunnel

To exclude traffic from the VPN tunnel after establishing the VPN connection, reference the following script from a `command` registry entry for a post-vpn-connect event. This enables you to selectively exclude routes and to send all other traffic through the VPN tunnel.

> As a best practice, delete any exclude network routes that were previously added before adding the new exclude routes. In most cases, when a user moves between networks (such as when switching between Wi-Fi and a local network) the old network routes are automatically deleted. In the event that the old network routes persist, following this best practice ensures that traffic destined for the exclude routes will go through the gateway of the new network instead of the gateway of the old network.

For a script that you can copy and paste, go here.

```
@echo off
REM Run this script (route_exclude) post-vpn-connect.
REM Add exclude routes. This allows traffic to these network and hosts to go directly
and not use the tunnel.
REM Syntax: route_exclude <network1> <mask1> <network2> <mask2> ...<networkN> <maskN>
REM Example-1: route_exclude 10.0.0.0 255.0.0.0
REM Example-2: route_exclude 10.0.0.0 255.0.0.0 192.168.17.0 255.255.255.0
REM Example-3: route_exclude 10.0.0.0 255.0.0.0 192.168.17.0 255.255.255.0
192.168.24.25 255.255.255.255

REM Initialize 'DefaultGateway'
set "DefaultGateway="

REM Use the route print command and find the DefaultGateway on the endpoint
@For /f "tokens=3" %%* in (
   'route.exe print ^|findstr "\<0.0.0.0\>"'
   ) Do if not defined DefaultGateway Set "DefaultGateway=%%*"

REM Use the route add command to add the exclude routes
:add_route
if "%1" =="" goto end
route delete %1
route add %1 mask %2 %DefaultGateway%
shift
shift
goto add_route
:end
```

Example: Mount a Network Share

To mount a network share after establishing a VPN connection, reference the following script from a command registry entry for a post-vpn-connect event:

```
@echo off
REM Mount filer1 to Z: drive
net use Z: \\filer1.mycompany.local\share /user:mycompany\user1
```

Deploy Scripts Using Msiexec

On Windows clients, you can use the Windows Installer (Msiexec) to deploy the agent, agent settings, and scripts that the agent will run automatically (see Customizable Agent Settings). To do so, use the following syntax:

```
msiexec.exe /i GlobalProtect.msi <SETTING>="<value>"
```

Msiexec is an executable program that installs or configures a product from a command line. On systems running Microsoft Windows XP or a later release, the maximum length of the string that you can use at the command prompt is 8,191 characters.

This limitation applies to the command line, individual environment variables (such as the USERPROFILE variable) that are inherited by other processes, and all environment variable expansions. If you run batch files from the command line, this limitation also applies to batch file processing.

For example, to deploy scripts that run at specific connect or disconnect events, you can use syntax similar to the following examples:

- Example: Use Msiexec to Deploy Scripts that Run Before a Connect Event
- Example: Use Msiexec to Deploy Scripts that Run at Pre-Connect, Post-Connect, and Pre-Disconnect Events

Example: Use Msiexec to Deploy Scripts that Run Before a Connect Event

For a script that you can copy and paste, go here.

```
msiexec.exe /i GlobalProtect.msi
PREVPNCONNECTCOMMAND="%userprofile%\pre_vpn_connect.bat c: test_user"
PREVPNCONNECTCONTEXT="user"
PREVPNCONNECTTIMEOUT="60"
PREVPNCONNECTFILE="C:\Users\test_user\pre_vpn_connect.bat"
PREVPNCONNECTCHECKSUM="a48ad33695a44de887bba8f2f3174fd8fb01a46a19e3ec9078b0118647ccf59
9"
PREVPNCONNECTERRORMSG="Failed executing pre-vpn-connect action."
```

For a complete list of settings and the corresponding default values, see Customizable Agent Settings. Or, for examples of batch scripts, see Windows OS Batch Script Examples.

Example: Use Msiexec to Deploy Scripts that Run at Pre-Connect, Post-Connect, and Pre-Disconnect Events

For a script that you can copy and paste, go here.

```
msiexec.exe /i GlobalProtect.msi
PREVPNCONNECTCOMMAND="%userprofile%\pre_vpn_connect.bat c: test_user"
PREVPNCONNECTCONTEXT="user"
PREVPNCONNECTTIMEOUT="60"
PREVPNCONNECTFILE="C:\Users\test_user\pre_vpn_connect.bat"
PREVPNCONNECTCHECKSUM="a48ad33695a44de887bba8f2f3174fd8fb01a46a19e3ec9078b0118647ccf59
9"
PREVPNCONNECTERRORMSG="Failed executing pre-vpn-connect action."
POSTVPNCONNECTCOMMAND="c:\users\test_user\post_vpn_connect.bat c: test_user"
POSTVPNCONNECTCONTEXT="admin"
POSTVPNCONNECTFILE="%userprofile%\post_vpn_connect.bat"
```

```
POSTVPNCONNECTCHECKSUM="b48ad33695a44de887bba8f2f3174fd8fb01a46a19e3ec9078b0118647ccf5
98"
POSTVPNCONNECTERRORMSG="Failed executing post-vpn-connect action."
PREVPNDISCONNECTCOMMAND="%userprofile%\pre_vpn_disconnect.bat c: test_user"
PREVPNDISCONNECTCONTEXT="admin"
PREVPNDISCONNECTTIMEOUT="0"
PREVPNDISCONNECTFILE="C:\Users\test_user\pre_vpn_disconnect.bat"
PREVPNDISCONNECTCHECKSUM="c48ad33695a44de887bba8f2f3174fd8fb01a46a19e3ec9078b0118647cc
f597"
PREVPNDISCONNECTERRORMSG="Failed executing pre-vpn-disconnect action."
```

For a complete list of settings and the corresponding default values, see Customizable Agent Settings. Or, for examples of batch scripts, see Windows OS Batch Script Examples.

SSO Wrapping for Third-Party Credential Providers on Windows Clients

On Windows 7 and Windows Vista clients, the GlobalProtect agent utilizes the Microsoft credential provider framework to support single sign-on (SSO). With SSO, the GlobalProtect credential provider wraps the Windows native credential provider, which enables GlobalProtect to use Windows login credentials to automatically authenticate and connect to the GlobalProtect portal and gateway.

In some scenarios when other third-party credential providers also exist on the client, the GlobalProtect credential provider is unable to gather a user's Windows login credentials and, as a result, GlobalProtect fails to automatically connect to the GlobalProtect portal and gateway. If SSO fails, you can identify the third-party credential provider and then configure the GlobalProtect agent to wrap those third-party credentials, which enables users to successfully authenticate to Windows, GlobalProtect, and the third-party credential provider—all in a single step—using only their Windows login credentials when they log in to their Windows system.

Optionally, you can configure Windows to display separate login tiles: one for each third-party credential provider and another for the native Windows login. This is useful when a third-party credential provider adds additional functionality in the login tile that does not apply to GlobalProtect.

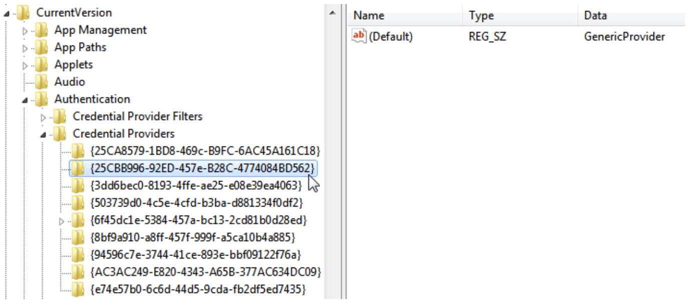
Use the Windows registry or the Windows Installer (Msiexec) to allow GlobalProtect to wrap third-party credentials:

- Enable SSO Wrapping for Third-Party Credentials with the Windows Registry
- Enable SSO Wrapping for Third-Party Credentials with the Windows Installer

> GlobalProtect SSO wrapping for third-party credential providers (CPs) is dependent on the third-party CP settings and, in some cases, GlobalProtect SSO wrapping might not work correctly if the third-party CP implementation does not allow GlobalProtect to successfully wrap their CP.

Enable SSO Wrapping for Third-Party Credentials with the Windows Registry

Use the following steps in the Windows registry to enable SSO to wrap third-party credentials on Windows 7 and Windows Vista clients.

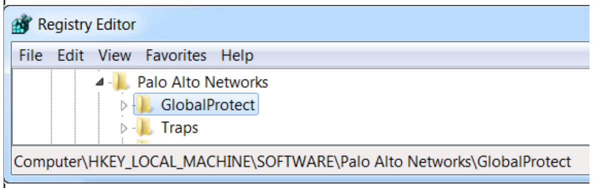
Use the Windows Registry to Enable SSO Wrapping for Third-Party Credentials		
Step 1	Open the Windows registry and locate the globally unique identifier (GUID) for the third-party credential provider that you want to wrap.	1. From the command prompt, enter the command `regedit` to open the Windows registry. 2. Locate currently installed credential providers at the following location: `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Authentication\Credential Providers.` 3. Copy the GUID key for the credential provider that you want to wrap (including the curly brackets— { and } —on either end of the GUID):  CurrentVersion App Management App Paths Applets Audio Authentication Credential Provider Filters Credential Providers {25CA8579-1BD8-469c-B9FC-6AC45A161C18} {25CBB996-92ED-457e-B28C-4774084BD562} {3dd6bec0-8193-4ffe-ae25-e08e39ea4063} {503739d0-4c5e-4cfd-b3ba-d881334f0df2} {6f45dc1e-5384-457a-bc13-2cd81b0d28ed} {8bf9a910-a8ff-457f-999f-a5ca10b4a885} {94596c7e-3744-41ce-893e-bbf09122f76a} {AC3AC249-E820-4343-A65B-377AC634DC09} {e74e57b0-6c6d-44d5-9cda-fb2df5ed7435} Name: (Default) Type: REG_SZ Data: GenericProvider

Use the Windows Registry to Enable SSO Wrapping for Third-Party Credentials (Continued)

Step 2 Enable SSO wrapping for third-party credential providers by adding the setting `wrap-cp-guid` to the GlobalProtect registry.

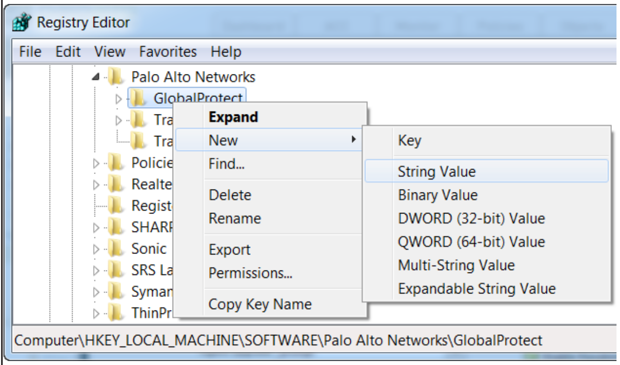
1. Go to the following Windows registry location:

   `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect`:



Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect

2. Add a new **String Value**:



Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect

3. Enter values for the **String Value**:

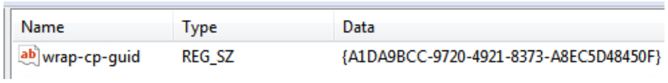
   - **Name**: `wrap-cp-guid`
   - **Value data**: {`<third-party credential provider GUID>`}

     For the **Value data** field, the GUID value that you enter must be enclosed with curly brackets: `{` and `}`.

     The following is an example of what a third-party credential provider GUID in the **Value data** field might look like:

     `{A1DA9BCC-9720-4921-8373-A8EC5D48450F}`

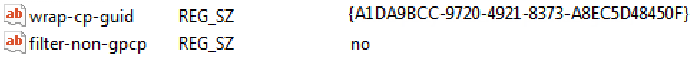
   For the new String Value, `wrap-cp-guid` is displayed as the String Value's Name and the GUID is displayed as the Data.



Name	Type	Data
wrap-cp-guid	REG_SZ	{A1DA9BCC-9720-4921-8373-A8EC5D48450F}

Next Steps...

- You can configure SSO wrapping for third-party credential providers successfully by completing steps 1 and 2. With this setup, the native Windows logon tile is displayed to users. Users click the tile and log in to the system with their Windows credentials and that single login authenticates the users to Windows, GlobalProtect, and the third-party credential provider.
- (Optional) If you want to display two tiles to users at login, the native Windows tile and the tile for the third-party credential provider, continue to Step 3.

Use the Windows Registry to Enable SSO Wrapping for Third-Party Credentials (Continued)		
Step 3	(Optional) Allow the third-party credential provider tile to be displayed to users at login.	Add a second **String Value** with the **Name** `filter-non-gpcp` and enter `no` for the string's **Value data**:  wrap-cp-guid REG_SZ {A1DA9BCC-9720-4921-8373-A8EC5D48450F} filter-non-gpcp REG_SZ no With this string value added to the GlobalProtect settings, two login options are presented to users when logging in to their Windows system: the native Windows tile and the third-party credential provider's tile.

Enable SSO Wrapping for Third-Party Credentials with the Windows Installer

Use the following options in the Windows Installer (Msiexec) to enable SSO to wrap third-party credential providers on Windows 7 and Windows Vista clients.

Use the Windows Installer to Enable SSO Wrapping for Third-Party Credentials
• Wrap third-party credentials and display the native tile to users at login. Users click the tile and log in to the system with their native Windows credentials and that single login authenticates users to Windows, GlobalProtect, and the third-party credential provider. Use the following syntax from the Windows Installer (Msiexec): `msiexec.exe /i GlobalProtect.msi WRAPCPGUID=”{guid_value}” FILTERNONGPCP=”yes”` In the syntax above, the `FILTERNONGPCP` parameter simplifies authentication for the user by filtering the option to log in to the system using the third-party credentials.
• If you would like users to have the option to log in with the third-party credentials, use the following syntax from the Msiexec: `msiexec.exe /i GlobalProtect.msi WRAPCPGUID=”{guid_value}” FILTERNONGPCP=”no”` In the syntax above, the `FILTERNONGPCP` parameter is set to “`no`”, which filters out the third-party credential provider's logon tile so that only the native tile displays. In this case, both the native Windows tile and the third-party credential provider tile is displayed to users when logging in to the Windows system.

Deploy Agent Settings to Mac Clients

Use the Mac global plist (property list) file to set GlobalProtect agent customization settings for or to deploy scripts to Mac endpoints.

- ▲ Deploy Agent Settings in the Mac Plist
- ▲ Deploy Scripts Using the Mac Plist

Deploy Agent Settings in the Mac Plist

You can set the GlobalProtect agent customization settings in the Mac global plist (Property list) file. This enables deployment of GlobalProtect agent settings to Mac endpoints prior to their first connection to the GlobalProtect portal.

On Mac systems, plist files are either located in `/Library/Preferences` or in `~/Library/Preferences`. The tilde (~) symbol indicates that the location is in the current user's home folder. The GlobalProtect agent on a Mac client first checks for the GlobalProtect plist settings. If the plist does not exist at that location, the GlobalProtect agent searches for plist settings in `~/Library/Preferences`.

> In addition to using the Mac plist to deploy GlobalProtect agent settings, you can enable the GlobalProtect agent to collect specific Mac plist information from clients. You can then monitor the data and add it to a security rule as matching criteria. Device traffic that matches registry settings you have defined can be enforced according to the security rule. Additionally, you can set up custom checks to Collect Application and Process Data From Clients.

Get Started using the Mac Plist to Deploy GlobalProtect Agent Settings.	
Open the GlobalProtect plist file and locate the GlobalProtect agent customization settings.	Use Xcode or an alternate plist editor to open the plist file `/Library/Preferences/com.paloaltonetworks.GlobalProtect.settings.plist` and then go to `/Palo Alto Networks/GlobalProtect/Settings`. If the `Settings` dictionary does not exist, create it. Then add each key to the `Settings` dictionary as a string.
• Set the portal name.	If you don't want the user to manually enter the portal address even for the first connection, you can pre-deploy the portal address through the Mac plist. Under the `PanSetup` dictionary, configure an entry for `Portal`.
• Deploy various settings to the Mac client from the Mac plist, including configuring the connect method for the GlobalProtect agent and enabling single sign-on (SSO).	View Customizable Agent Settings for a full list of the keys and values that you can configure using the Mac plist.

Deploy Scripts Using the Mac Plist

When a user connects to the GlobalProtect gateway for the first time, the GlobalProtect agent downloads a configuration file and stores agent settings in a GlobalProtect Mac property file (plist). In addition to making changes to the agent settings, you use the Mac plist to deploy scripts at any or all of the following events: before and after establishing the tunnel, and before disconnecting the tunnel. Use the following workflow to get started using the Mac plist to deploy scripts to Mac endpoints.

> The Mac plist settings that enable you to deploy scripts are supported in GlobalProtect clients running GlobalProtect agent 2.3 and later releases.

Deploy Scripts Using the Mac Plist		
Step 1	(Clients running Mac OS X 10.9 or a later OS) Flush the settings cache. This prevents the OS from using the cached preferences after making changes to the plist.	To clear the default preferences cache, run the `killall cfprefsd` command from a Mac terminal.

Deploy Scripts Using the Mac Plist		
Step 2	Open the GlobalProtect plist file, and locate or create the GlobalProtect dictionary associated with the connect or disconnect event. The dictionary under which you will add the settings will determine when the GlobalProtect agent runs the script(s).	Use Xcode or an alternate plist editor to open the plist file (`/Library/Preferences/com.paloaltonetworks.GlobalProtect.settings.plist`) and go to the location of the dictionary: • `/Palo Alto Networks/GlobalProtect/Settings/pre-vpn-connect` • `/Palo Alto Networks/GlobalProtect/Settings/post-vpn-connect` • `/Palo Alto Networks/GlobalProtect/Settings/pre-vpn-disconnect` If `Settings` dictionary does not exist, create it. Then, in `Settings`, create a new dictionary for the event or events at which you want to run scripts.
Step 3	Enable the GlobalProtect agent to run scripts by creating a new `String` named `command`. The value specified here should reference the shell script (and the parameters to pass to the script) that you want run on your devices. See Mac OS Script Examples.	If the `command` string does not already exist, add it to the dictionary and specify the script and parameters in the **Value** field, for example: `$HOME\pre_vpn_connect.sh /Users/username username` Environmental variables are supported. As a best practice, specify the full path in commands.
Step 4	(Optional) Add additional settings related to the command, including administrator privileges, a timeout value for the script, checksum value for the batch file, and an error message to display if the command fails to execute successfully.	Create or modify additional strings in the plist (`context`, `timeout`, `file`, `checksum`, and/or `error-msg)` and enter their corresponding values. For additional information, see Customizable Agent Settings.
Step 5	Save the changes to the plist file.	Save the plist.

Mac OS Script Examples

You can configure the GlobalProtect agent to initiate and run a script for any or all of the following events: before and after establishing the tunnel, and before disconnecting the tunnel. To run the script at a particular event, reference the shell script from a `command` plist entry for that event. The following topics show examples of scripts that you can run at pre-connect, post-connect and pre-disconnect events:

- Example: Terminate All Established SSH Sessions
- Example: Mount a Network Share

Example: Terminate All Established SSH Sessions

To force termination of all established SSH sessions before setting up the VPN tunnel, reference the following script from a `command` plist entry for a pre-vpn-connect event. Similarly, you can re-establish the sessions after establishing the GlobalProtect VPN tunnel by using a script that you reference from the `command` plist entry for a post-vpn-connect event. This can be useful if you want to force all SSH traffic to traverse the GlobalProtect VPN tunnel.

```
#!bin/bash
# Identify all SSH sessions and force kill them
ps | grep ssh | grep -v grep | awk '{ print $1 }' | xargs kill -9
```

Example: Mount a Network Share

To mount a network share after establishing a VPN connection, reference the following script from a `command` plist entry for a post-vpn-connect event:

For a script that you can copy and paste, go here.

```
#!/bin/bash
mkdir $1
mount -t smbfs
//username:password@10.101.2.17/shares/Departments/Engineering/SW_eng/username/folder
$1
sleep 1
```

Manage the GlobalProtect App with a Third-Party MDM

You can download the GlobalProtect app from the App Store or Google Play and then use the MDM to deploy a VPN configuration profile to set up the GlobalProtect app for end user automatically.

- Manage the GlobalProtect App for iOS Using AirWatch
- Manage the GlobalProtect App for iOS Using a Third-Party MDM
- Manage the GlobalProtect App for Android Using AirWatch
- Manage the GlobalProtect App for Android Using a Third-Party MDM

Manage the GlobalProtect App for iOS Using AirWatch

The GlobalProtect app provides a secure connection between AirWatch managed mobile devices and the firewall at either the device or application level. Using GlobalProtect as the secure connection allows consistent inspection of traffic and enforcement of network security policy for threat prevention on the mobile device.

- Configure a Device-Level VPN Configuration for iOS Devices Using AirWatch
- Configure a Per-App VPN Configuration for iOS Devices Using AirWatch

Configure a Device-Level VPN Configuration for iOS Devices Using AirWatch

You can easily enable access to internal resources from your managed mobile devices by configuring VPN access using AirWatch. In a device-level VPN configuration, you route all of the traffic that matches the access routes configured on the GlobalProtect gateway through the GlobalProtect VPN.

Configure a Device-Level VPN Configuration for iOS Devices Using AirWatch		
Step 1	(Optional) Add and configure settings for the GlobalProtect iOS app to distribute the GlobalProtect app for iOS to one or more iOS devices. Users can also download the GlobalProtect app directly from the App Store.	1. On the main page, select **Apps & Books > Public > Add Application**. 2. Select the organization group by which this app will be managed. 3. Select **Apple iOS** as the **Platform**. 4. Select your preferred method for locating the GlobalProtect app, either by searching the app store, or specifying a URL for the app in the App Store. • To search the App Store, enter GlobalProtect in the **Name** field, click **Next**, and then click **Select** next to the GlobalProtect app. • To search by URL, enter the URL for the GlobalProtect app in the App Store (https://itunes.apple.com/us/app/globalprotect/id592489989?mt=8&uo=4) and then click **Next**. 5. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app. 6. On the **Deployment** tab, select the **Push Mode**, either **Auto** or On **Demand**. 7. Select **Save & Publish** to push the App Catalog to the devices in the Smart Groups you assigned in the **Assignment** section.

Configure a Device-Level VPN Configuration for iOS Devices Using AirWatch (Continued)		
Step 2	From the AirWatch console, modify or add a new Apple iOS profile.	1. Navigate to **Devices > Profiles > List View**. 2. Select an existing profile to add the VPN configuration to it or add a new one (select **Add > Apple iOS)**. 3. Configure **General** profile settings: • **Description**—A brief description of the profile that indicates its purpose. • **Deployment**—Determines if the profile will be automatically removed upon unenrollment, either **Managed** (the profile is removed) or **Manual** (the profile remains installed until removed by the end user). • **Assignment Type**—Determines how the profile is deployed to devices, – **Auto**—The profile is deployed to all devices automatically. – **Optional**—The end user can optionally install the profile from the Self-Service Portal (SSP) or can be deployed to individual devices at the administrator's discretion. – **Compliance**—The profile is deployed when the end user violates a compliance policy applicable to the device. • **Managed By**—The Organization Group with administrative access to the profile. • **Assigned Smart Group**—The Smart Group to which you want the device profile added. Includes an option to create a new Smart Group which can be configured with specs for minimum OS, device models, ownership categories, organization groups and more. • **Allow Removal**—Determines whether or not the profile can be removed by the device's end user: – **Always**—The end user can manually remove the profile at any time. – **With Authorization**—The end user can remove the profile with the authorization of the administrator. Choosing this option adds a required Password field. – **Never**—The end user cannot remove the profile from the device. • **Exclusions** – If **Yes** is selected, a new field **Excluded Smart Groups** displays, enabling you to select those Smart Groups you wish to exclude from the assignment of this device profile.

Configure a Device-Level VPN Configuration for iOS Devices Using AirWatch (Continued)		
Step 3	Configure the VPN settings.	1. Select **VPN** and then click **Configure**. 2. Configure Connection information, including: • **Connection Name**—Enter the name of the connection name to be displayed. • **Connection Type**—Select **Palo Alto Networks GlobalProtect** as the network connection method. • **Server**—Enter the hostname or IP address of the GlobalProtect portal to which to connect. • **Account**—Enter the username of the VPN account or click add (“**+**”) to view supported lookup values you can insert. • **Authentication**—Choose the method to authenticate end users. Follow the related prompts to enter a **Password** or upload an **Identity Certificate** to use to authenticate users; Or, if you selected **Password + Certificate**, follow the related prompts for both. 3. Click **Save & Publish**.

Configure a Per-App VPN Configuration for iOS Devices Using AirWatch

You can easily enable access to internal resources from your managed mobile devices by configuring GlobalProtect VPN access using AirWatch. In a per-app VPN configuration, you can specify which managed apps on the device can send traffic through the GlobalProtect VPN tunnel. Unmanaged apps will continue to connect directly to the Internet instead of through the GlobalProtect VPN tunnel.

Configure a Per-App VPN Configuration for iOS Devices Using AirWatch		
Step 1	(Optional) Add and configure settings for the GlobalProtect iOS app to distribute the GlobalProtect app for iOS to one or more iOS devices. Users can also download the GlobalProtect app directly from the App Store.	1. On the main page, select **Apps & Books > Public > Add Application**. 2. Select the organization group by which this app will be managed. 3. Select **Apple iOS** as the **Platform**. 4. Select your preferred method for locating the GlobalProtect app, either by searching the app store, or specifying a URL for the app in the App Store. • To search the App Store, enter GlobalProtect in the **Name** field, click **Next**, and then click **Select** next to the GlobalProtect app. • To search by URL, enter the URL for the GlobalProtect app in the App Store (https://itunes.apple.com/us/app/globalprotect/id592489989?mt=8&uo=4) and then click **Next**. 5. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app. 6. On the **Deployment** tab, select the **Push Mode**, either **Auto** or On **Demand**. 7. Select **Save & Publish** to push the App Catalog to the devices in the Smart Groups you assigned in the **Assignment** section.

Configure a Per-App VPN Configuration for iOS Devices Using AirWatch (Continued)		
Step 2	From the AirWatch console, modify or add a new Apple iOS profile.	1. Navigate to **Devices > Profiles > List View**. 2. Select an existing profile to add the VPN configuration to it or add a new one (select **Add > Apple iOS**). 3. Configure **General** profile settings: • **Description**—A brief description of the profile that indicates its purpose. • **Deployment**—Determines if the profile will be automatically removed upon unenrollment, either **Managed** (the profile is removed) or **Manual** (the profile remains installed until removed by the end user). • **Assignment Type**—Determines how the profile is deployed to devices, – **Auto**—The profile is deployed to all devices automatically. – **Optional**—The end user can optionally install the profile from the Self-Service Portal (SSP) or can be deployed to individual devices at the administrator's discretion. – **Compliance**—The profile is deployed when the end user violates a compliance policy applicable to the device. • **Managed By**—The Organization Group with administrative access to the profile. • **Assigned Smart Group**—The Smart Group to which you want the device profile added. Includes an option to create a new Smart Group which can be configured with specs for minimum OS, device models, ownership categories, organization groups and more. • **Allow Removal**—Determines whether or not the profile can be removed by the device's end user: – **Always**—The end user can manually remove the profile at any time. – **With Authorization**—The end user can remove the profile with the authorization of the administrator. Choosing this option adds a required Password field. – **Never**—The end user cannot remove the profile from the device. • **Exclusions** – If **Yes** is selected, a new field **Excluded Smart Groups** displays, enabling you to select those Smart Groups you wish to exclude from the assignment of this device profile.

Configure a Per-App VPN Configuration for iOS Devices Using AirWatch (Continued)		
Step 3	Configure the per-app VPN settings in the Apple iOS profile.	1. Select **VPN** and then click **Configure**. 2. Configure Connection information, including: • **Connection Name**—Enter the name of the connection name to be displayed. • **Connection Type**—Select **Palo Alto Networks GlobalProtect** as the network connection method. • **Server**—Enter the hostname or IP address of the GlobalProtect portal to which to connect. • **Account**—Enter the username of the VPN account or click add (“**+**”) to view supported lookup values that you can insert. • **Send All Traffic**—Select this check box to force all traffic through the specified network. • **Disconnect on Idle**—Allow the VPN to auto-disconnect after a specific amount of time. • Enable **Per App VPN** to route all of the traffic for a managed app traffic through the GlobalProtect VPN. • **Connect Automatically**—Select this check box to allow the VPN to connect automatically to chosen Safari Domains. • Select the authentication method to use to authenticate users. For per-app VPN, you must use certificate-based authentication. Select **User Authentication: Certificate**, and then follow the prompts to upload an **Identity Certificate** to use for authentication. • Select either **Manual** or **Auto Proxy** type and enter the specific information needed. 3. Click **Save & Publish**.

Configure a Per-App VPN Configuration for iOS Devices Using AirWatch (Continued)		
Step 4	Configure per-app VPN settings for a new managed app, or modify the settings for an existing managed apps. After configuring the settings for the app and enabling per-app VPN, you can publish the app to a group of users and enable the app to send traffic through the GlobalProtect VPN tunnel.	1. On the main page, select **Apps & Books > Public.** 2. To add a new app, select **Add Application**. Or, to modify the settings of an existing app, locate the GlobalProtect app in the list of Public apps and then select the edit icon ✎ in the actions menu next to the row. 3. Select the organization group by which this app will be managed. 4. Select **Apple iOS** as the **Platform**. 5. Select your preferred method for locating the app, either by searching the app store, or specifying a URL for the app in the App Store. • To search the App Store, enter the app **Name**, click **Next**, and then **Select** the app from the list of search results. • To search by URL, enter the URL for the app in the App Store (for example, to add the Box app, enter https://itunes.apple.com/us/app/box-for-iphone-and-ipad/id290853822?mt=8&uo=4), click **Next**, and then enter a **Name** for the app. 6. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app. 7. On the **Deployment** tab, select the **Push Mode**, either **Auto** or On **Demand**. 8. Select **Use VPN** and then select the Apple iOS profile that you created in Step 3. Only profiles that have per-app VPN enabled are available from the drop-down. 9. Select **Save & Publish** to push the App Catalog to the devices in the Smart Groups you assigned in the **Assignment** section.

Manage the GlobalProtect App for iOS Using a Third-Party MDM

You can use any third-party MDM, that manages an iOS device to deploy and configure the GlobalProtect app.

- ▲ Configure the GlobalProtect App for iOS
- ▲ Example GlobalProtect iOS App App-Level VPN Configuration
- ▲ Example GlobalProtect iOS App Device-Level VPN Configuration

Configure the GlobalProtect App for iOS

While a third-party MDM allows you to push configuration settings that allow access to your corporate resources and provides a mechanism for enforcing device restrictions, it does not secure the connection between the mobile device and services it connects to. To enable the client to establish secure tunnel connections, you must enable VPN support on the device.

The following table describes typical settings that you can configure using your third-party MDM.

Setting	Description	Value
Connection Type	Type of connection enabled by the policy.	`Custom SSL`
Identifier	Identifier for the custom SSL VPN in reverse DNS format.	`com.paloaltonetworks.GlobalProtect.vpnplugin`
Server	Host name or IP address of the GlobalProtect gateway.	`<hostname or IP address>` For example: `gp.paloaltonetworks.com`
Account	User account for authenticating the connection.	`<username>`
User Authentication	Authentication type for the connection.	`Certificate | Password`
Credential	(Certificate User Authentication only) Credential for authenticating the connection.	`<credential>` For example: `clientcredial.p12`
Enable VPN On Demand	(Optional) Domain and hostname that will establish the connection and the on-demand action: • Always establish a connection • Never establish a connection • Establish a connection if needed	`<domain and hostname and the on-demand action>` For example: `gp.acme.com; Never establish`

Example GlobalProtect iOS App Device-Level VPN Configuration

The following example shows the XML configuration containing a VPN payload that you can use to verify the device-level VPN configuration of the GlobalProtect app for iOS.

Example: GlobalProtect iOS App Device-Level VPN Configuration

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
<key>PayloadContent</key>
<array>
<dict>
<key>PayloadDescription</key>
<string>Configures VPN settings, including authentication.</string>
<key>PayloadDisplayName</key>
<string>VPN (Sample Device Level VPN)</string>
<key>PayloadIdentifier</key>
<string>Sample Device Level VPN.vpn</string>
<key>PayloadOrganization</key>
<string>Palo Alto Networks</string>
<key>PayloadType</key>
<string>com.apple.vpn.managed</string>
<key>PayloadVersion</key>
<integer>1</integer>
<key>PayloadUUID</key>
<string>5436fc94-205f-7c59-0000-011d</string>
<key>UserDefinedName</key>
<string>Sample Device Level VPN</string>
<key>Proxies</key>
<dict/>
<key>VPNType</key>
<string>VPN</string>
<key>VPNSubType</key>
<string>com.paloaltonetworks.GlobalProtect.vpnplugin</string>
<key>IPv4</key>
<dict>
<key>OverridePrimary</key>
<integer>0</integer>
</dict>
<key>VPN</key>
<dict>
<key>RemoteAddress</key>
<string>cademogp.paloaltonetworks.com</string>
<key>AuthName</key>
<string></string>
<key>DisconnectOnIdle</key>
<integer>0</integer>
<key>OnDemandEnabled</key>
<integer>1</integer>
<key>OnDemandRules</key>
<array>
<dict>
<key>Action</key>
<string>Connect</string>
</dict>
</array>
<key>AuthenticationMethod</key>
<string>Password</string>
</dict>
<key>VendorConfig</key>
<dict>
<key>AllowPortalProfile</key>
<integer>0</integer>
<key>FromAspen</key>
<integer>1</integer>
</dict>
</dict>
</array>
<key>PayloadDisplayName</key>
<string>Sample Device Level VPN</string>
<key>PayloadOrganization</key>
<string>Palo Alto Networks</string>
```

Example GlobalProtect iOS App App-Level VPN Configuration

The following example shows the XML configuration containing a VPN payload that you can use to verify the app-level VPN configuration of the GlobalProtect app for iOS.

Example: GlobalProtect iOS App App-Level VPN Configuration

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
<key>PayloadContent</key>
<array>
<dict>
<key>PayloadDescription</key>
<string>Configures VPN settings, including authentication.</string>
<key>PayloadDisplayName</key>
<string>VPN (Sample App Level VPN)</string>
<key>PayloadIdentifier</key>
<string>Sample App Level VPN.vpn</string>
<key>PayloadOrganization</key>
<string>Palo Alto Networks</string>
<key>PayloadType</key>
<string>com.apple.vpn.managed.applayer</string>
<key>PayloadVersion</key>
<integer>1</integer>
<key>VPNUUID</key>
<string>cGFuU2FtcGxlIEFwcCBMZXZlbCBWUE52cG5TYW1wbGUgQXBwIExldmVsIFZQTg==</string>
<key>SafariDomains</key>
<array>
<string>*.paloaltonetworks.com</string>
</array>
<key>PayloadUUID</key>
<string>54370008-205f-7c59-0000-01a1</string>
<key>UserDefinedName</key>
<string>Sample App Level VPN</string>
<key>Proxies</key>
<dict/>
<key>VPNType</key>
<string>VPN</string>
<key>VPNSubType</key>
<string>com.paloaltonetworks.GlobalProtect.vpnplugin</string>
<key>IPv4</key>
<dict>
<key>OverridePrimary</key>
<integer>0</integer>
</dict>
<key>VPN</key>
<dict>
<key>RemoteAddress</key>
<string>cademogp.paloaltonetworks.com</string>
<key>AuthName</key>
<string></string>
<key>OnDemandMatchAppEnabled</key>
<integer>1</integer>
<key>OnDemandEnabled</key>
<integer>1</integer>
<key>DisconnectOnIdle</key>
<integer>0</integer>
<key>AuthenticationMethod</key>
<string>Password</string>
</dict>
<key>VendorConfig</key>
<dict>
<key>OnlyAppLevel</key>
<integer>1</integer>
<key>AllowPortalProfile</key>
<integer>0</integer>
<key>FromAspen</key>
<integer>1</integer>
</dict>
</dict>
</array>
<key>PayloadDisplayName</key>
<string>Sample App Level VPN</string>
<key>PayloadOrganization</key>
<string>Palo Alto Networks</string>
<key>PayloadDescription</key>
<string>Profile Description</string>
<key>PayloadIdentifier</key>
<string>Sample App Level VPN</string>
<key>PayloadType</key>
<string>Configuration</string>
```

Example: GlobalProtect iOS App App-Level VPN Configuration (Continued)

```
<key>PayloadVersion</key>
<integer>1</integer>
<key>PayloadUUID</key>
<string>5436fc94-205f-7c59-0000-011c</string>
<key>PayloadRemovalDisallowed</key>
<false/>
</dict>
</plist>
```

Manage the GlobalProtect App for Android Using AirWatch

Using the GlobalProtect app for Android as the secure connection allows consistent inspection of traffic and enforcement of network security policy for threat prevention on Android devices. The GlobalProtect app provides a secure connection between AirWatch managed mobile devices and the firewall at either the device or application level.

- Configure a Device-Level VPN Configuration for Android Devices Using AirWatch
- Configure a Per-App VPN Configuration for Android Devices Using AirWatch

Configure a Device-Level VPN Configuration for Android Devices Using AirWatch

You can easily enable access to internal resources from your managed Android mobile devices by configuring VPN access using AirWatch. In a device-level VPN configuration, you route all of the traffic that matches the access routes configured on the GlobalProtect gateway through the GlobalProtect VPN.

Configure a Device-Level VPN Configuration for Android Devices Using AirWatch		
Step 1	(Optional) Add and configure settings for the GlobalProtect app to distribute the GlobalProtect app to one or more Android for Work devices. Users can also download the GlobalProtect app directly from Google Play.	1. On the AirWatch console main page, select **Apps & Books > Applications > List View> Public > Add Application**. 2. Select the organization group by which this app will be managed. 3. Select **Android** as the **Platform**. 4. Select your preferred method for locating the app, either by specifying a URL or importing the app from Google Play. To search by URL, you must also enter the Google Play Store URL for the GlobalProtect app (https://play.google.com/store/apps/details?id=com.paloaltonetworks.globalprotect). 5. Click **Next**. If you selected **Import from Play** during the previous step, you must select the GlobalProtect app from the list of approved company apps, and then click **Import**. If you do not see GlobalProtect in the list, contact your Android for Work administrator to approve the GlobalProtect app. 6. Locate the GlobalProtect app in the list of Public apps and then select the edit icon ✎ in the actions menu next to the row. 7. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app or create a new Smart Group by configuring values for organization groups, user groups, ownership categories, tags, minimum OS, device models, and more. 8. On the **Deployment** tab, select the **Push Mode**, either **Auto** or **On Demand**. 9. Select **Save & Publish** to push the configured app to the Android devices in the Smart Groups you assigned in the **Assignment** section.

Configure a Device-Level VPN Configuration for Android Devices Using AirWatch (Continued)		
Step 2	From the AirWatch console, modify or add a new Android profile.	1. Navigate to **Devices > Profiles > List View**. 2. Select an existing profile to add the VPN configuration to it or add a new one (select **Add > Add Profile**). 3. Select **Android** as the platform and **Device** as the configuration type. 4. Configure **General** profile settings: • **Name**—Provide a meaningful name for this configuration. • Version—This field is auto-populated with the latest version number of the configuration profile. • **Description**—A brief description of the profile that indicates its purpose. • **Profile Scope**—Scope for this profile, either **Production, Staging**, or **Both**. • **Assignment Type**—Determines how the profile is deployed to devices: – **Auto**—The profile is deployed to all devices automatically. – **Optional**—You can deploy the profile to specific devices or you can allow the end user to install the profile from the Self-Service Portal (SSP). – **Compliance**—The profile is deployed when the end user violates a compliance policy applicable to the device. • **Allow Removal**—Determines whether or not the end user can remove the profile from the device: – **Always**—The end user can manually remove the profile at any time. – **With Authorization**—The end user can remove the profile with the authorization of the administrator. Choosing this option adds a required **Password** field. – **Never**—The end user cannot remove the profile from the device. • **Managed By**—The Organization Group with administrative access to the profile. • **Assigned Smart Group**—The Smart Group to which you want the device profile added. Includes an option to create a new Smart Group which you can configure with specs for organization groups, user groups, ownership categories, tags, minimum OS, device models, and more. • **Exclusions**—Selecting **Yes** displays a new field **Excluded Smart Groups** that enables you to select those Smart Groups you wish to exclude from the assignment of this device profile. 5. Select **Save and Publish** to push this profile to the assigned Smart Groups.

Configure a Device-Level VPN Configuration for Android Devices Using AirWatch (Continued)		
Step 3	Configure the VPN settings.	1. Select **VPN** and then click **Configure**. 2. Configure **Connection Info**, including: • **Connection Type**—Select **GlobalProtect** as the network connection method. • **Connection Name**—Enter the name of the connection name that the device will display. • **Server**—Enter the hostname or IP address of the GlobalProtect portal to which to connect. 3. Configure **Authentication** information and choose the method to authenticate end users: **Password** or **Certificate**. Enter the **Username** of the VPN account or click add (“**+**”) to view supported lookup values that you can insert. Enter a **Password** or upload an **Identity Certificate** that GlobalProtect will use to authenticate users. 4. Click **Save & Publish**.

Configure a Per-App VPN Configuration for Android Devices Using AirWatch

You can easily enable access to internal resources from your managed mobile devices by configuring GlobalProtect VPN access using AirWatch. In a per-app VPN configuration, you can specify which managed apps on the device can send traffic through the GlobalProtect VPN tunnel. Unmanaged apps will continue to connect directly to the Internet instead of through the GlobalProtect VPN tunnel.

Configure a Per-App VPN Configuration for Android Devices Using AirWatch		
Step 1	(Optional) Add and configure settings for the GlobalProtect app to distribute the GlobalProtect app for Android to one or more Android devices. Users can also download the GlobalProtect app directly from Google Play.	1. On the main page, select **Apps & Books > Applications > List View> Public > Add Application**. 2. Select the organization group by which this app will be managed. 3. Select **Android** as the **Platform**. 4. Select your preferred method for locating the app, either by specifying a URL or importing the app from Google Play. To search by URL, you must also enter the Google Play Store URL for the GlobalProtect app (https://play.google.com/store/apps/details?id=com.paloaltonetworks.globalprotect). 5. Click **Next**. If you selected **Import from Play** during the previous step, you must select the GlobalProtect app from the list of approved company apps, and then click **Import**. If you do not see GlobalProtect in the list, contact your Android for Work administrator to approve the GlobalProtect app. 6. Locate the GlobalProtect app in the list of Public apps and then select the edit icon ✎ in the actions menu next to the row. 7. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app or create a new Smart Group by configuring values for organization groups, user groups, ownership categories, tags, minimum OS, device models, and more. 8. On the **Deployment** tab, select the **Push Mode**, either **Auto** or **On Demand**. 9. Select **Save & Publish** to push the App Catalog to the devices in the Smart Groups you assigned in the **Assignment** section.

Configure a Per-App VPN Configuration for Android Devices Using AirWatch (Continued)		
Step 2	From the AirWatch console, modify or add a new Android profile.	1. Navigate to **Devices > Profiles > List View**. 2. Select an existing profile to add the VPN configuration to it or add a new one (select **Add > Add Profile**). 3. Select **Android** as the platform and **Device** as the configuration type. 4. Configure **General** profile settings: • **Name**—Provide a meaningful name for this configuration. • Version—This field is auto-populated with the latest version number of the configuration profile. • **Description**—A brief description of the profile that indicates its purpose. • **Profile Scope**—Scope for this profile, either **Production, Staging**, or **Both**. • **Assignment Type**—Determines how the profile is deployed to devices: – **Auto**—The profile is deployed to all devices automatically. – **Optional**—You can deploy the profile to specific devices, or you can allow the user to install the profile from the Self-Service Portal (SSP). – **Compliance**—The profile is deployed when the end user violates a compliance policy applicable to the device. • **Allow Removal**—Determines whether or not the end user can remove the profile from the device: – **Always**—The end user can manually remove the profile at any time. – **With Authorization**—The end user can remove the profile with the authorization of the administrator. Choosing this option adds a required **Password** field. – **Never**—The end user cannot remove the profile from the device. • **Managed By**—The Organization Group with administrative access to the profile. • **Assigned Smart Group**—The Smart Group to which you want the device profile added. Includes an option to create a new Smart Group which you can configure with specs for organization groups, user groups, ownership categories, tags, minimum OS, device models, and more. • **Exclusions**—Selecting **Yes** displays a new field **Excluded Smart Groups** that enables you to select those Smart Groups you wish to exclude from the assignment of this device profile. 5. Select **Save and Publish** to push this profile to the assigned Smart Groups.

Configure a Per-App VPN Configuration for Android Devices Using AirWatch (Continued)		
Step 3	Configure the per-app VPN settings in the Android profile.	1. Select **VPN** and then click **Configure**. 2. Configure **Connection Info** including: • **Connection Type**—Select **GlobalProtect** as the network connection method. • **Connection Name**—Enter the name of the connection name that the device will display. • **Server**—Enter the hostname or IP address of the GlobalProtect portal to which to connect. • Enable **Per App VPN** to route all of the traffic for a managed app traffic through the GlobalProtect VPN. 3. Select the authentication method to use to authenticate users. For per-app VPN, you must use certificate-based authentication. Select **User Authentication: Certificate**, and then follow the prompts to upload an **Identity Certificate** to use for authentication. 4. Click **Save & Publish**.
Step 4	Configure per-app VPN settings for a new managed app, or modify the settings for an existing managed apps.	1. On the main page, select **Apps & Books > Applications> List View> Public**. 2. To add a new app, select **Add Application**. Or, to modify the settings of an existing app, locate the app in the list of Public apps and then select the edit icon ✎ in the actions menu next to the row. 3. Select the organization group by which this app will be managed. 4. Select **Android** as the **Platform**. 5. Select your preferred method for locating the app, either by specifying a URL or importing the app from Google Play. To search by URL, you must also enter the Google Play Store URL for the app (for example, to search for the Box app by URL, enter https://play.google.com/store/apps/details?id=com.box.android). 6. Click **Next**. If you selected **Import from Play** during the previous step, you must select the app from the list of approved company apps, and then click **Import**. If you do not see the app in the list, contact your Android for Work administrator to approve the app. 7. On the **Assignment** tab, select **Assigned Smart Groups** that will have access to this app. 8. On the **Deployment** tab, select the **Push Mode**, either **Auto** or **On Demand**. 9. Select **Use VPN** and then select the Android profile that you created in Step 3. Only profiles that have per-app VPN enabled are available from the drop-down. 10. Select **Save & Publish** to push the configuration to the devices in the Smart Groups you assigned in the **Assignment** section.

Manage the GlobalProtect App for Android Using a Third-Party MDM

To simplify device management, you can use any third-party MDM to configure and deploy the GlobalProtect app to your Android device.

- Configure the GlobalProtect App for Android
- Example: Set VPN Configuration
- Example: Remove VPN Configuration

Configure the GlobalProtect App for Android

You can deploy and configure the GlobalProtect app on Android For Work devices from any third-party MDM supporting Android For Work App data restrictions.

On Android devices, traffic is routed through the VPN tunnel according to the access routes configured on the GlobalProtect gateway. From your third-party MDM that manages Android for Work devices, you can further refine the traffic that is routed though the VPN tunnel.

In an environment where the device is corporately owned, the device owner manages the entire device including all the apps installed on that device. By default, all installed apps can send traffic through the VPN tunnel according to the access routes defined on the gateway.

In a bring-your-own-device (BYOD) environment, the device is not corporately owned and uses a Work Profile to separate business and personal apps. By default only managed apps in the Work Profile can send traffic through the VPN tunnel according to the access routes defined on the gateway. Apps installed on the personal side of the device can not send traffic through the VPN tunnel set by the managed GlobalProtect app installed in the Work Profile.

To route traffic from an even smaller set of apps, you can enable Per-App VPN so that GlobalProtect only routes traffic from specific managed apps. For Per-App VPN, you can whitelist or blacklist specific managed apps from having their traffic routed through the VPN tunnel.

As part of the VPN configuration, you can also specify how the user connects to the VPN. When you configure the VPN connection method as `user-logon`, the GlobalProtect app will establish a connection automatically. When you configure the VPN connection method as `on-demand`, users can initiate a connection manually when attempting to connect to the VPN remotely.

> The VPN connect method defined in the MDM takes precedence over the connect method defined in the GlobalProtect portal configuration.

Removing the VPN configuration automatically restores the GlobalProtect app to the original configuration settings.

To configure the GlobalProtect app for Android, configure the following Android App Restrictions.

Key	Value Type	Example
portal	String	`10.1.8.190`
username	String	`john`
password	String	`Passwd!234`

Key	Value Type	Example
certificate	String (in Base64)	`DAFDSaweEWQ23wDSAFD….`
client_certificate_passphrase	String	`PA$$W0RD$123`
app_list*	String	`whiltelist	blacklist: com.google.calendar; com.android.email; com.android.chrome`
connect_method	String	`user-logon	on-demand`
remove_vpn_config_via_restriction	Boolean	`true	false`

*The `app_list` key specifies the configuration for Per-App VPN. Begin the string with either the whitelist or blacklist, and follow it with an array of app names separated by semicolon. The whitelist specifies the apps that will use the VPN tunnel for network communication. The network traffic for any other app that is not in the whitelist or expressly listed in the blacklist will not go through the VPN tunnel.

Example: Set VPN Configuration

```
private static String RESTRICTION_PORTAL = "portal";
private static String RESTRICTION_USERNAME = "username";
private static String RESTRICTION_PASSWORD = "password";
private static String RESTRICTION_CONNECT_METHOD = "connect_method";
private static String RESTRICTION_CLIENT_CERTIFICATE = "client_certificate";
private static String RESTRICTION_CLIENT_CERTIFICATE_PASSPHRASE =
"client_certificate_passphrase";
private static String RESTRICTION_APP_LIST = "app_list";
private static String RESTRICTION_REMOVE_CONFIG = "remove_vpn_config_via_restriction";

Bundle config = new Bundle();
config.putString(RESTRICTION_PORTAL, "192.168.1.1");
config.putString(RESTRICTION_USERNAME, "john");
config.putString(RESTRICTION_PASSWORD, "Passwd!234");
config.putString(RESTRICTION_CONNECT_METHOD, "user-logon");
config.putString(RESTRICTION_CLIENT_CERTIFICATE, "DAFDSaweEWQ23wDSAFD….");
config.putString(RESTRICTION_CLIENT_CERTIFICATE_PASSPHRASE, "PA$$W0RD$123");
config.putString(RESTRICTION_APP_LIST,
"whitelist:com.android.chrome;com.android.calendar");

DevicePolicyManager dpm = (DevicePolicyManager)
getSystemService(Context.DEVICE_POLICY_SERVICE);
dpm.setApplicationRestrictions(EnforcerDeviceAdminReceiver.getComponentName(this),
"com.paloaltonetworks.globalprotect", config);
```

Example: Remove VPN Configuration

```
Bundle config = new Bundle();
config.putBoolean(RESTRICTION_REMOVE_CONFIG, true );
DevicePolicyManager dpm = (DevicePolicyManager)
getSystemService(Context.DEVICE_POLICY_SERVICE);
```

```
dpm.setApplicationRestrictions(EnforcerDeviceAdminReceiver.getComponentName(this),
"com.paloaltonetworks.globalprotect", config);
```

Reference: GlobalProtect Agent Cryptographic Functions

The GlobalProtect agent uses the OpenSSL library 1.0.1h to establish secure communication with the GlobalProtect portal and GlobalProtect gateways. The following table lists each GlobalProtect agent function that requires a cryptographic function and the cryptographic keys the GlobalProtect agent uses:

Crypto Function	Key	Usage
Winhttp (Windows) and NSURLConnection (MAC) aes256-sha	Dynamic key negotiated between the GlobalProtect agent and the GlobalProtect portal and/or gateway for establishing the HTTPS connection.	Used to establish the HTTPS connection between the GlobalProtect agent and the GlobalProtect portal and GlobalProtect gateway for authentication.
OpenSSL aes256-sha	Dynamic key negotiated between the GlobalProtect agent and the GlobalProtect gateway during the SSL handshake.	Used to establish the SSL connection between the GlobalProtect agent and the GlobalProtect gateway for HIP report submission, SSL tunnel negotiation, and network discovery.
IPsec encryption and authentication aes-128-sha1, aes-128-cbc, aes-128-gcm, and aes-256-gcm	The session key sent from the GlobalProtect gateway.	Used to establish the IPSec tunnel between the GlobalProtect agent and the GlobalProtect gateway.

GlobalProtect MIB Support

Palo Alto Networks devices support standard and enterprise management information bases (MIBs) that enable you to monitor the device's physical state, utilization statistics, traps, and other useful information. Most MIBs use object groups to describe characteristics of the device using the Simple Network Management Protocol (SNMP) Framework. You must load these MIBs into your SNMP manager to monitor the objects (device statistics and traps) that are defined in the MIBs (for details, see Use an SNMP Manager to Explore MIBs and Objects in the *PAN-OS 7.1 Administrator's Guide*).

The PAN-COMMON-MIB—which is included with the enterprise MIBs—uses the panGlobalProtect object group. The following table describes the objects that make up the panGlobalProtect object group.

Object	Description
panGPGWUtilizationPct	Utilization (as a percentage) of the GlobalProtect gateway
panGPGWUtilizationMaxTunnels	Maximum number of tunnels allowed
panGPGWUtilizationActiveTunnels	Number of active tunnels

Use these SNMP objects to monitor utilization of GlobalProtect gateways and make changes as needed. For example, if the number of active tunnels reaches 80% or is higher than the maximum number of tunnels allowed, you should consider adding additional gateways.

Use Host Information in Policy Enforcement

Although you may have stringent security at your corporate network border, your network is really only as secure as the end devices that are accessing it. With today's workforce becoming more and more mobile, often requiring access to corporate resources from a variety of locations—airports, coffee shops, hotels—and from a variety of devices—both company-provisioned and personal—you must logically extend your network's security out to your endpoints to ensure comprehensive and consistent security enforcement. The GlobalProtect Host Information Profile (HIP) feature enables you to collect information about the security status of your end hosts—such as whether they have the latest security patches and antivirus definitions installed, whether they have disk encryption enabled, whether the device is jailbroken or rooted (mobile devices only), or whether it is running specific software you require within your organization, including custom applications—and base the decision as to whether to allow or deny access to a specific host based on adherence to the host policies you define.

The following topics provide information about the use of host information in policy enforcement. It includes the following sections:

About Host Information

One of the jobs of the GlobalProtect agent is to collect information about the host it is running on. The agent then submits this host information to the GlobalProtect gateway upon successfully connecting. The gateway matches this raw host information submitted by the agent against any HIP objects and HIP profiles you have defined. If it finds a match, it generates an entry in the HIP Match log. Additionally, if it finds a HIP profile match in a policy rule, it enforces the corresponding security policy.

Using host information profiles for policy enforcement enables granular security that ensures that the remote hosts accessing your critical resources are adequately maintained and in adherence with your security standards before they are allowed access to your network resources. For example, before allowing access to your most sensitive data systems, you might want to ensure that the hosts accessing the data have encryption enabled on their hard drives. You can enforce this policy by creating a security rule that only allows access to the application if the client system has encryption enabled. In addition, for clients that are not in compliance with this rule, you could create a notification message that alerts users as to why they have been denied access and links them to the file share where they can access the installation program for the missing encryption software (of course, to allow the user to access that file share you would have to create a corresponding security rule allowing access to the particular share for hosts with that specific HIP profile match).

- ▲ What Data Does the GlobalProtect Agent Collect?
- ▲ How Does the Gateway Use the Host Information to Enforce Policy?
- ▲ How Do Users Know if Their Systems are Compliant?
- ▲ How Do I Get Visibility into the State of the End Clients?

What Data Does the GlobalProtect Agent Collect?

By default, the GlobalProtect agent collects vendor-specific data about the end user security packages that are running on the computer (as compiled by the OPSWAT global partnership program) and reports this data to the GlobalProtect gateway for use in policy enforcement.

Because security software must continually evolve to ensure end user protection, your GlobalProtect gateway licenses also enable you to get dynamic updates for the GlobalProtect data file with the latest patch and software versions available for each package.

While the agent collects a comprehensive amount of data about the host it is running on, you may have additional software that you require your end-users to run in order to connect to your network or to access certain resources. In this case, you can define custom checks that instruct the agent to collect specific registry information (on Windows clients), preference list (plist) information (on Mac OS clients), or to collect information about whether or not specific services are running on the host.

The agent collects data about the following categories of information by default, to help to identify the security state of the host:

Category	Data Collected
General	Information about the host itself, including the hostname, logon domain, operating system, client version, and, for Windows systems, the domain to which the machine belongs. For Windows clients' domain, the GlobalProtect agent collects the domain defined for `ComputerNameDnsDomain`, which is the DNS domain assigned to the local computer or the cluster associated with the local computer. This data is what is displayed for the Windows clients' **Domain** in the HIP Match log details (**Monitor > HIP Match**).
Patch Management	Information about any patch management software that is enabled and/or installed on the host and whether there are any missing patches.
Firewall	Information about any client firewalls that are installed and/or enabled on the host.
Antivirus	Information about any antivirus software that is enabled and/or installed on the host, whether or not real-time protection is enabled, the virus definition version, last scan time, the vendor and product name.
Anti-Spyware	Information about any anti-spyware software that is enabled and/or installed on the host, whether or not real-time protection is enabled, the virus definition version, last scan time, the vendor and product name.
Disk Backup	Information about whether disk backup software is installed, the last backup time, and the vendor and product name of the software.
Disk Encryption	Information about whether disk encryption software is installed, which drives and/or paths are configured for encryption, and the vendor and product name of the software.
Data Loss Prevention	Information about whether data loss prevention (DLP) software is installed and/or enabled for the prevention sensitive corporate information from leaving the corporate network or from being stored on a potentially insecure device. This information is only collected from Windows clients.
Mobile Devices	Identifying information about the mobile device, such as the model number, phone number, serial number and International Mobile Equipment Identity (IMEI) number. In addition, the agent collects information about specific settings on the device, such as whether or not a passcode is set, whether the device is jailbroken, a list of apps installed on the device that are managed by a third-party mobile device manager, if the device contains apps that are known to have malware (Android devices only), and, optionally, the GPS location of the device and a list of apps that are not managed by the third-party mobile device manager. Note that for iOS devices, some information is collected by the GlobalProtect app and some information is reported directly by the operating system.

You can exclude certain categories of information from being collected on certain hosts (to save CPU cycles and improve client response time). To do this, you create a client configuration on the portal excluding the categories you are not interested in. For example, if you do not plan to create policy based on whether or not client systems run disk backup software, you can exclude that category and the agent will not collect any information about disk backup.

You can also choose to exclude collecting information from personal devices in order to allow for user privacy. This can include excluding device location and a list of apps installed on the device that are not managed by a third-party mobile device manager.

How Does the Gateway Use the Host Information to Enforce Policy?

While the agent gets the information about what information to collect from the client configuration downloaded from the portal, you define which host attributes you are interested in monitoring and/or using for policy enforcement by creating HIP objects and HIP profiles on the gateway(s):

- **HIP Objects**—Provide the matching criteria to filter out the host information you are interested in using to enforce policy from the raw data reported by the agent. For example, while the raw host data may include information about several antivirus packages that are installed on the client you may only be interested in one particular application that you require within your organization. In this case, you would create a HIP object to match the specific application you are interested in enforcing.

  The best way to determine what HIP objects you need is to determine how you will use the host information you collect to enforce policy. Keep in mind that the HIP objects themselves are merely building blocks that allow you to create the HIP profiles that are used in your security policies. Therefore, you may want to keep your objects simple, matching on one thing, such as the presence of a particular type of required software, membership in a specific domain, or the presence of a specific client OS. By doing this, you will have the flexibility to create a very granular (and very powerful) HIP-augmented policy.
- **HIP Profiles**—A collection of HIP objects that are to be evaluated together, either for monitoring or for security policy enforcement. When you create your HIP profiles, you can combine the HIP objects you previously created (as well as other HIP profiles) using Boolean logic such that when a traffic flow is evaluated against the resulting HIP profile it will either match or not match. If there is a match, the corresponding policy rule will be enforced; if there is not a match, the flow will be evaluated against the next rule, as with any other policy matching criteria.

Unlike a traffic log—which only creates a log entry if there is a policy match—the HIP Match log generates an entry whenever the raw data submitted by an agent matches a HIP object and/or a HIP profile you have defined. This makes the HIP Match log a good resource for monitoring the state of the hosts on your network over time—before attaching your HIP profiles to security policies—in order to help you determine exactly what policies you believe need enforcement. See Configure HIP-Based Policy Enforcement for details on how to create HIP objects and HIP profiles and use them as policy match criteria.

How Do Users Know if Their Systems are Compliant?

By default, end users are not given any information about policy decisions that were made as a result of enforcement of a HIP-enabled security rule. However, you can enable this functionality by defining HIP notification messages to display when a particular HIP profile is matched and/or not matched.

The decision as to when to display a message (that is, whether to display it when the user's configuration matches a HIP profile in the policy or when it doesn't match it), depends largely on your policy and what a HIP match (or non-match) means for the user. That is, does a match mean they are granted full access to your network resources? Or does it mean they have limited access due to a non-compliance issue?

For example, consider the following scenarios:

- You create a HIP profile that matches if the required corporate antivirus and anti-spyware software packages are *not* installed. In this case, you might want to create a HIP notification message for users who match the HIP profile telling them that they need to install the software (and, optionally, providing a link to the file share where they can access the installer for the corresponding software).
- You create a HIP profile that matches if those same applications *are* installed, you might want to create the message for users who do not match the profile, and direct them to the location of the install package.

See Configure HIP-Based Policy Enforcement for details on how to create HIP objects and HIP profiles and use in defining HIP notification messages.

How Do I Get Visibility into the State of the End Clients?

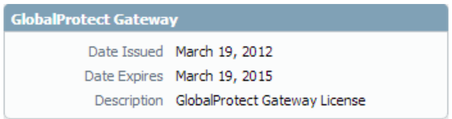
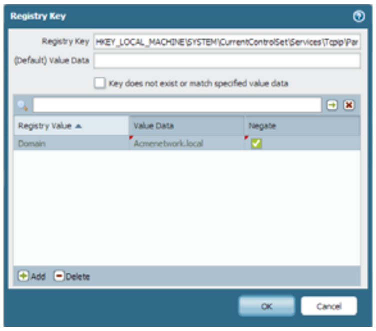
Whenever an end host connects to GlobalProtect, the agent presents its HIP data to the gateway. The gateway then uses this data to determine which HIP objects and/or HIP profiles the host matches. For each match, it generates a HIP Match log entry. Unlike a traffic log—which only creates a log entry if there is a policy match—the HIP Match log generates an entry whenever the raw data submitted by an agent matches a HIP object and/or a HIP profile you have defined. This makes the HIP Match log a good resource for monitoring the state of the hosts on your network over time—before attaching your HIP profiles to security policies—in order to help you determine exactly what policies you believe need enforcement.

Because a HIP Match log is only generated when the host state matches a HIP object you have created, for full visibility in to host state you may need to create multiple HIP objects to log HIP matches for hosts that are in compliance with a particular state (for security policy enforcement purposes) as well as hosts that are non-compliant (for visibility). For example, suppose you want to prevent a host that does not have Antivirus software installed from connecting to the network. In this case you would create a HIP object that matches hosts that have a particular Antivirus software installed. By including this object in a HIP profile and attaching it to the security policy rule that allows access from your VPN zone, you can ensure that only hosts that are protected with antivirus software can connect.

However, in this case you would not be able to see in the HIP Match log which particular hosts are not in compliance with this requirement. If you wanted to also see a log for hosts that do not have Antivirus software installed so that you can follow up with the users, you can also create a HIP object that matches the condition where the Antivirus software is not installed. Because this object is only needed for logging purposes, you do not need to add it to a HIP profile or attach it to a security policy rule.

Configure HIP-Based Policy Enforcement

To enable the use of host information in policy enforcement you must complete the following steps. For more information on the HIP feature, see About Host Information.

Enable HIP Checking		
Step 1	Verify proper licensing for HIP checks.  GlobalProtect Gateway Date Issued: March 19, 2012 Date Expires: March 19, 2015 Description: GlobalProtect Gateway License	To use the HIP feature, you must have purchased and installed a GlobalProtect Gateway subscription license on each gateway that will perform HIP checks. To verify the status of your licenses on each portal and gateway, select **Device > Licenses**. Contact your Palo Alto Networks Sales Engineer or Reseller if you do not have the required licenses. For more information on licensing, see About GlobalProtect Licenses.
Step 2	(Optional) Define any custom host information that you want the agent to collect. For example, if you have any required applications that are not included in the Vendor and/or Product lists for creating HIP objects, you could create a custom check that will allow you to determine whether that application is installed (has a corresponding registry or plist key) or is running (has a corresponding running process). Step 2 and Step 3 assume that you have already created a Portal Configuration. If you have not yet configured your portal, see Configure the GlobalProtect Portal for instructions.  Registry Key Registry Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Par (Default) Value Data: □ Key does not exist or match specified value data Registry Value: Domain; Value Data: Acmenetwork.local; Negate: ✓ 	1. On the firewall that is hosting your GlobalProtect portal, select **Network > GlobalProtect > Portals**. 2. Select your portal configuration to open the GlobalProtect Portal dialog. 3. Select the **Agent** tab and then select the agent configuration to which you want to add a custom HIP check, or click **Add** to create a new agent configuration. 4. Select the **Data Collection** tab. 5. Enable the option to **Collect HIP Data**. 6. Select **Custom Checks** and define the data you want to collect from hosts running this agent configuration as follows: - **To collect information about specific registry keys**: On the **Windows** tab, **Add** the name of a **Registry Key** for which to collect data in the Registry Key area. Optionally, to restrict data collection to a specific Registry Value, **Add** and then define the specific Registry Value or values. Click **OK** to save the settings. - **To collect information about running processes**: Select the appropriate tab (**Windows** or **Mac**) and then **Add** a process to the Process List. Enter the name of the process that you want the agent to collect information about. - **To collect information about specific property lists**: On the **Mac** tab, click **Add** in the Plist section. Enter the **Plist** for which to collect data. Optionally, click **Add** to restrict the data collection to specific **Key** values. Click **OK** to save the settings. 7. If this is a new client configuration, complete the rest of the configuration as desired. For instructions, see Define the GlobalProtect Agent Configurations. 8. Click **OK** to save the client configuration. 9. **Commit** the changes.

Enable HIP Checking (Continued)		
Step 3	(Optional) Exclude categories from collection.	1. On the firewall that is hosting your GlobalProtect portal, select **Network > GlobalProtect > Portals**. 2. Select your portal configuration to open the GlobalProtect Portal dialog. 3. On the **Agent** tab, select the Agent configuration from which to exclude categories, or **Add** a new one. 4. Select **Data Collection**, and then verify that **Collect HIP Data** is enabled. 5. On the **Exclude Categories** tab, click **Add**. The Edit Exclude Category dialog displays. 6. Select the **Category** you want to exclude from the drop-down list. 7. (Optional) If you want to exclude specific vendors and/or products from collection within the selected category rather than excluding the entire category, click **Add**. You can then select the **Vendor** to exclude from the drop-down on the Edit Vendor dialog and, optionally, click **Add** to exclude specific products from that vendor. When you are done defining that vendor, click **OK**. You can add multiple vendors and products to the exclude list. 8. Repeat Step 6 and Step 7 for each category you want to exclude. 9. If this is a new client configuration, complete the rest of the configuration as desired. For more information on defining client configurations, see Define the GlobalProtect Agent Configurations. 10. Click **OK** to save the client configuration. 11. **Commit** the changes.

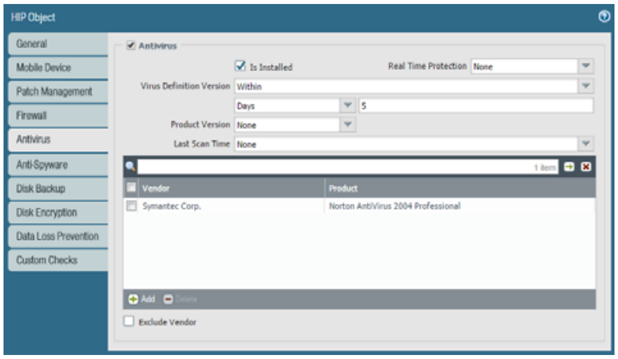
Enable HIP Checking (Continued)

Step 4 Create the HIP objects to filter the raw host data collected by the agents.

The best way to determine what HIP objects you need is to determine how you will use the host information you collect to enforce policy. Keep in mind that the HIP objects themselves are merely building blocks that allow you to create the HIP profiles that are used in your security policies. Therefore, you may want to keep your objects simple, matching on one thing, such as the presence of a particular type of required software, membership in a specific domain, or the presence of a specific client OS. By doing this, you will have the flexibility to create a very granular (and very powerful) HIP-augmented policy.

For details on a specific HIP category or field, refer to the online help.

1. On the gateway (or on Panorama if you plan to share the HIP objects among multiple gateways), select **Objects > GlobalProtect > HIP Objects** and click **Add**.
2. On the **General** tab, enter a **Name** for the object.
3. Select the tab that corresponds to the category of host information you are interested in matching against and select the check box to enable the object to match against the category. For example, to create an object that looks for information about Antivirus software, select the **Antivirus** tab and then select the **Antivirus** check box to enable the corresponding fields. Complete the fields to define the desired matching criteria. For example, the following screenshot shows how to create an object that will match if the Symantec Norton AntiVirus 2004 Professional application is installed, has Real Time Protection enabled, and has virus definitions that have been updated within the last 5 days.



☑ Antivirus

☑ Is Installed

Real Time Protection: None

Virus Definition Version: Within

Days: 5

Product Version: None

Last Scan Time: None

Vendor	Product
Symantec Corp.	Norton AntiVirus 2004 Professional

□ Exclude Vendor

Repeat this step for each category you want to match against in this object. For more information, see Table: Data Collection Categories.

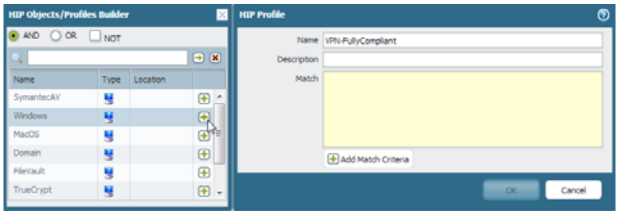
4. Click **OK** to save the HIP object.
5. Repeat these steps to create each additional HIP object you require.
6. **Commit** the changes.

Enable HIP Checking (Continued)

Step 5 Create the HIP profiles that you plan to use in your policies.

When you create your HIP profiles, you can combine the HIP objects you previously created (as well as other HIP profiles) using Boolean logic such that when a traffic flow is evaluated against the resulting HIP profile it will either match or not match. If there is a match, the corresponding policy rule will be enforced; if there is not a match, the flow will be evaluated against the next rule, as with any other policy matching criteria.

1. On the gateway (or on Panorama if you plan to share the HIP profiles among multiple gateways), select **Objects > GlobalProtect > HIP Profiles** and click **Add**.
2. Enter a descriptive **Name** for the profile and optionally a **Description**.
3. Click **Add Match Criteria** to open the HIP Objects/Profiles Builder.
4. Select the first HIP object or profile you want to use as match criteria and then click add ⊞ to move it over to the **Match** text box on the HIP Profile dialog. Keep in mind that if you want the HIP profile to evaluate the object as a match only when the criteria in the object is not true for a flow, select the **NOT** check box before adding the object.

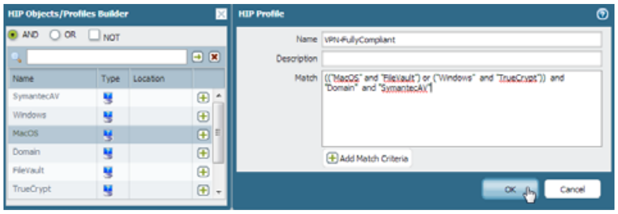


Name: VPN-FullyCompliant

Description:

Match:

5. Continue adding match criteria as appropriate for the profile you are building, making sure to select the appropriate Boolean operator radio button (**AND** or **OR**) between each addition (and, again, using the **NOT** check box when appropriate).
6. If you are creating a complex Boolean expression, you must manually add the parenthesis in the proper places in the **Match** text box to ensure that the HIP profile is evaluated using the logic you intend. For example, the following HIP profile will match traffic from a host that has either FileVault disk encryption (for Mac OS systems) or TrueCrypt disk encryption (for Windows systems) and also belongs to the required Domain, and has a Symantec antivirus client installed:



Name: VPN-FullyCompliant

Description:

Match: (("MacOS" and "FileVault") or ("Windows" and "TrueCrypt")) and "Domain" and "SymantecAV"

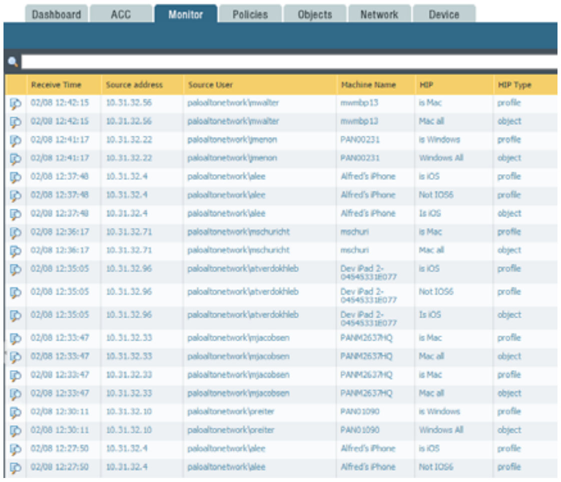
7. When you are done adding match criteria, click **OK** to save the profile.
8. Repeat these steps to create each additional HIP profile you require.
9. **Commit** the changes.

Enable HIP Checking (Continued)

Step 6 Verify that the HIP objects and HIP profiles you created are matching your GlobalProtect client traffic as expected.

Consider monitoring HIP objects and profiles as a means to monitor the security state and activity of your host endpoints. By monitoring the host information over time you will be better able to understand where your security and compliance issues are and you can use this information to guide you in creating useful policy. For more details, see How Do I Get Visibility into the State of the End Clients?

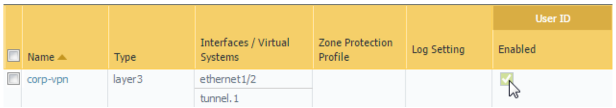
On the gateway(s) that your GlobalProtect users are connecting to, select **Monitor > Logs > HIP Match**. This log shows all of the matches the gateway identified when evaluating the raw HIP data reported by the agents against the defined HIP objects and HIP profiles. Unlike other logs, a HIP match does not require a security policy match in order to be logged.



	Receive Time	Source address	Source User	Machine Name	HIP	HIP Type
	02/08 12:42:15	10.31.32.56	paloaltonetwork\mwalter	mwmbp13	is Mac	profile
	02/08 12:42:15	10.31.32.56	paloaltonetwork\mwalter	mwmbp13	Mac all	object
	02/08 12:41:17	10.31.32.22	paloaltonetwork\jmenon	PAN00231	is Windows	profile
	02/08 12:41:17	10.31.32.22	paloaltonetwork\jmenon	PAN00231	Windows All	object
	02/08 12:37:48	10.31.32.4	paloaltonetwork\alee	Alfred's iPhone	is iOS	profile
	02/08 12:37:48	10.31.32.4	paloaltonetwork\alee	Alfred's iPhone	Not IOS6	profile
	02/08 12:37:48	10.31.32.4	paloaltonetwork\alee	Alfred's iPhone	Is iOS	object
	02/08 12:36:17	10.31.32.71	paloaltonetwork\mschuricht	mschuri	is Mac	profile
	02/08 12:36:17	10.31.32.71	paloaltonetwork\mschuricht	mschuri	Mac all	object
	02/08 12:35:05	10.31.32.96	paloaltonetwork\atverdokhleb	Dev iPad 2-04545331E077	is iOS	profile
	02/08 12:35:05	10.31.32.96	paloaltonetwork\atverdokhleb	Dev iPad 2-04545331E077	Not IOS6	profile
	02/08 12:35:05	10.31.32.96	paloaltonetwork\atverdokhleb	Dev iPad 2-04545331E077	Is iOS	object
	02/08 12:33:47	10.31.32.33	paloaltonetwork\mjacobsen	PANM2637HQ	is Mac	profile
	02/08 12:33:47	10.31.32.33	paloaltonetwork\mjacobsen	PANM2637HQ	Mac all	object
	02/08 12:33:47	10.31.32.33	paloaltonetwork\mjacobsen	PANM2637HQ	is Mac	profile
	02/08 12:33:47	10.31.32.33	paloaltonetwork\mjacobsen	PANM2637HQ	Mac all	object
	02/08 12:30:11	10.31.32.10	paloaltonetwork\preiter	PAN01090	is Windows	profile
	02/08 12:30:11	10.31.32.10	paloaltonetwork\preiter	PAN01090	Windows All	object
	02/08 12:27:50	10.31.32.4	paloaltonetwork\alee	Alfred's iPhone	is iOS	profile
	02/08 12:27:50	10.31.32.4	paloaltonetwork\alee	Alfred's iPhone	Not IOS6	profile

Step 7 Enable User-ID on the source zones that contain the GlobalProtect users that will be sending requests that require HIP-based access controls. You must enable User-ID even if you don't plan on using the user identification feature or the firewall will not generate any HIP Match logs entries.

1. Select **Network > Zones**.
2. Click on the **Name** of the zone in which you want to enable User-ID to open the Zone dialog.
3. Enable User ID by selecting the **Enabled** check box and then click **OK**.



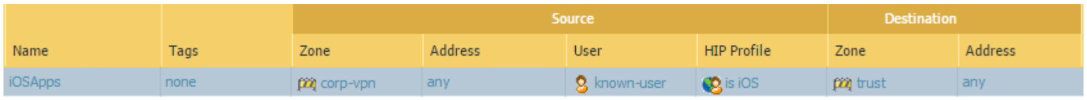
					User ID
□ Name	Type	Interfaces / Virtual Systems	Zone Protection Profile	Log Setting	Enabled
□ corp-vpn	layer3	ethernet1/2 tunnel.1			☑

Step 8 Create the HIP-enabled security rules on your gateway(s).

As a best practice, you should create your security rules and test that they match the expected flows based on the source and destination criteria as expected before adding your HIP profiles. By doing this you will also be better able to determine the proper placement of the HIP-enabled rules within the policy.

Add the HIP profiles to your security rules:

1. Select **Policies > Security** and select the rule to which you want to add a HIP profile.
2. On the **Source** tab, make sure the **Source Zone** is a zone for which you enabled User-ID in Step 7.
3. On the **User** tab, click **Add** in the **HIP Profiles** section and select the HIP profile(s) you want to add to the rule (you can add up to 63 HIP profiles to a rule).
4. Click **OK** to save the rule.
5. **Commit** the changes.



		Source				Destination	
Name	Tags	Zone	Address	User	HIP Profile	Zone	Address
iOSApps	none	corp-vpn	any	known-user	is iOS	trust	any

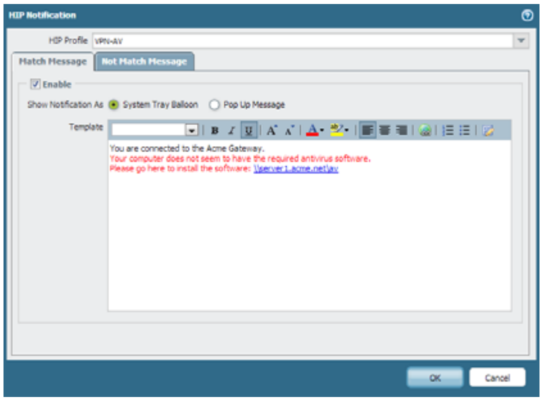
Enable HIP Checking (Continued)

Step 9 Define the notification messages end users will see when a security rule with a HIP profile is enforced.

The decision as to when to display a message (that is, whether to display it when the user's configuration matches a HIP profile in the policy or when it doesn't match it), depends largely on your policy and what a HIP match (or non-match) means for the user. That is, does a match mean they are granted full access to your network resources? Or does it mean they have limited access due to a non-compliance issue?

For example, suppose you create a HIP profile that matches if the required corporate antivirus and anti-spyware software packages are not installed. In this case, you might want to create a HIP notification message for users who match the HIP profile telling them that they need to install the software. Alternatively, if your HIP profile matched if those same applications are installed, you might want to create the message for users who do not match the profile.

1. On the firewall that is hosting your GlobalProtect gateway(s), select **Network > GlobalProtect > Gateways**.
2. Select a previously-defined gateway configuration to open the GlobalProtect Gateway dialog.
3. Select **Client Configuration > HIP Notification** and then click **Add**.
4. Select the **HIP Profile** this message applies to from the drop-down.
5. Select **Match Message** or **Not Match Message**, depending on whether you want to display the message when the corresponding HIP profile is matched in policy or when it is not matched. In some cases you might want to create messages for both a match and a non-match, depending on what objects you are matching on and what your objectives are for the policy. For the Match Message, you can also enable the option to **Include matched application list in message** to indicate what applications triggered the HIP match.
6. Select the **Enable** check box and select whether you want to display the message as a **Pop Up Message** or as a **System Tray Balloon**.
7. Enter the text of your message in the Template text box and then click **OK**. The text box provides both a WYSIWYG view of the text and an HTML source view, which you can toggle between using the Source Edit icon. The toolbar also provides many options for formatting your text and for creating hyperlinks to external documents, for example to link users directly to the download URL for a required software program.



HIP Profile: VPN-AV

☑ Enable

Show Notification As ● System Tray Balloon ○ Pop Up Message

Template:

You are connected to the Acme Gateway.
Your computer does not seem to have the required antivirus software.
Please go here to install the software: \\server1.acme.net\av

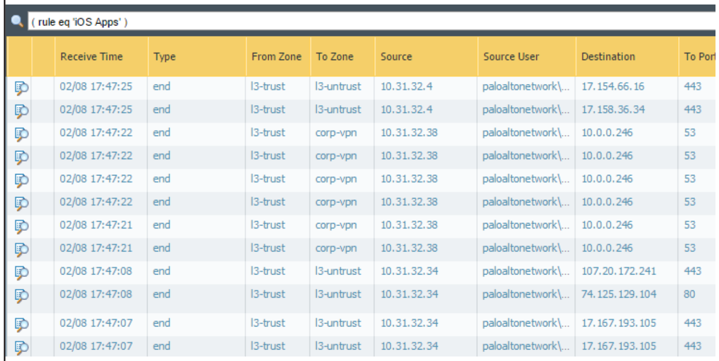
8. Repeat this procedure for each message you want to define.
9. **Commit** the changes.

Enable HIP Checking (Continued)

Step 10 Verify that your HIP profiles are working as expected.

You can monitor what traffic is hitting your HIP-enabled policies using the Traffic log as follows:

1. From the gateway, select **Monitor > Logs > Traffic**.
2. Filter the log to display only traffic that matches the rule that has the HIP profile you are interested in monitoring attached. For example, to search for traffic that matches a security rule named “iOS Apps” you would enter **`( rule eq 'iOS Apps' )`** in the filter text box as follows:



(rule eq 'iOS Apps')

Receive Time	Type	From Zone	To Zone	Source	Source User	Destination	To Port
02/08 17:47:25	end	l3-trust	l3-untrust	10.31.32.4	paloaltonetwork\...	17.154.66.16	443
02/08 17:47:25	end	l3-trust	l3-untrust	10.31.32.4	paloaltonetwork\...	17.158.36.34	443
02/08 17:47:22	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:22	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:22	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:22	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:21	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:21	end	l3-trust	corp-vpn	10.31.32.38	paloaltonetwork\...	10.0.0.246	53
02/08 17:47:08	end	l3-trust	l3-untrust	10.31.32.34	paloaltonetwork\...	107.20.172.241	443
02/08 17:47:08	end	l3-trust	l3-untrust	10.31.32.34	paloaltonetwork\...	74.125.129.104	80
02/08 17:47:07	end	l3-trust	l3-untrust	10.31.32.34	paloaltonetwork\...	17.167.193.105	443
02/08 17:47:07	end	l3-trust	l3-untrust	10.31.32.34	paloaltonetwork\...	17.167.193.105	443

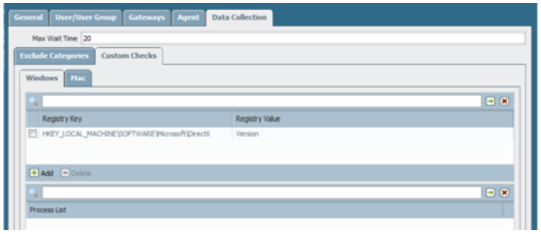
Collect Application and Process Data From Clients

The Windows Registry and Mac Plist can be used to configure and store settings and options for Windows and Mac operating systems, respectively. You can create a custom check that will allow you to determine whether an application is installed (has a corresponding registry or plist key) or is running (has a corresponding running process) on a Windows or Mac client. Enabling custom checks instructs the GlobalProtect agent to collect specific registry information (Registry Keys and Registry Key Values from Windows clients), preference list (plist) information (plist and plist keys from Mac OS clients). The data that you define to be collected in a custom check is included in the raw host information data collected by the GlobalProtect agent and then submitted to the GlobalProtect gateway when the agent connects.

To monitor the data collected with custom checks you can create a HIP object. You can then add the HIP object to a HIP profile to use the collected data to match to device traffic and enforce security rules. The gateway can use the HIP object (which matches to the data defined in the custom check) to filter the raw host information submitted by the agent. When the gateway matches the client data to a HIP object, a HIP Match log entry is generated for the data. A HIP profile allows the gateway to also match the collected data to a security rule. If the HIP profile is used as criteria for a security policy rule, the gateway will enforce that security rule on the matching traffic.

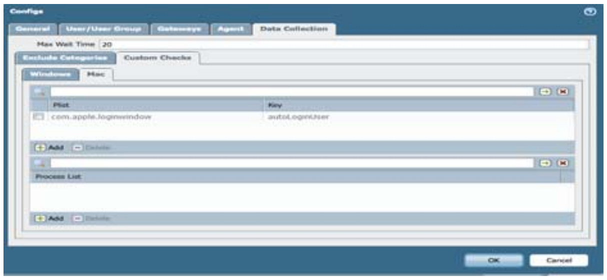
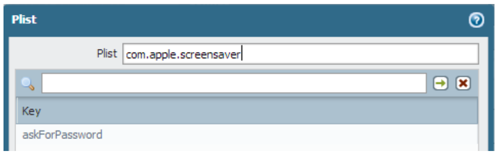
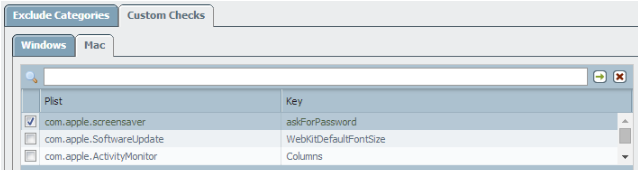
Use the following task to enable custom checks to collect data from Windows and Mac clients. This task includes the optional steps to create a HIP object and HIP profile for a custom check, if you would like to use client data as matching criteria for a security policy to monitor, identify, and act on traffic.

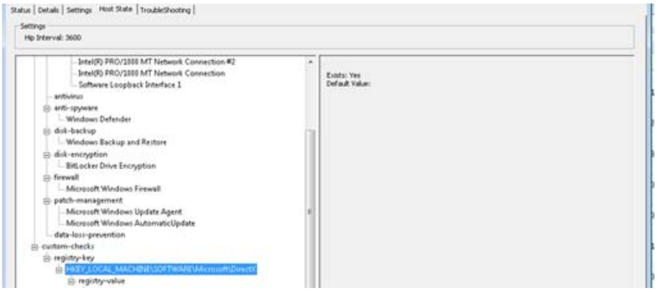
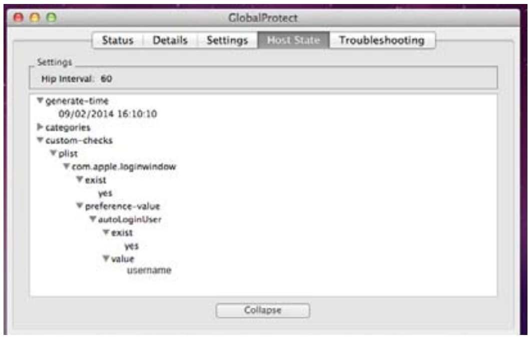
> For more information on defining agent settings directly from the Windows registry or the global Mac plist, see Deploy Agent Settings Transparently.

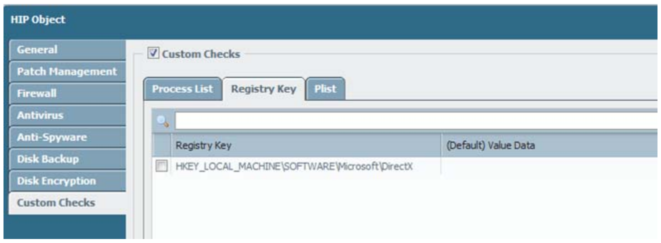
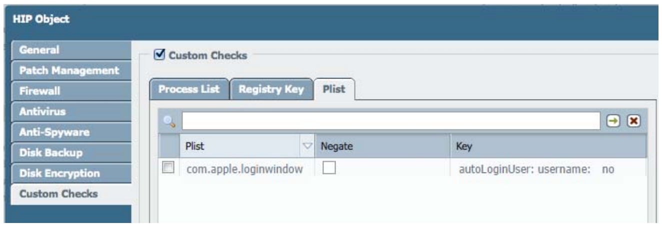
<table>
<tr><th colspan="2">Enable and Verify Custom Checks for Windows or Mac Clients</th></tr>
<tr>
<td>Step 1 Enable the GlobalProtect agent to collect Windows Registry information from Windows clients or Plist information from Mac clients. The type of information collected can include whether or not an application is installed on the client, or specific attributes or properties of that application.
This step enables the agent to report data on the applications and client settings. (Step 5 and Step 6 will show you how to monitor and use the reported data to identify or take action on certain device traffic).</td>
<td>Collect data from a Windows client:
1. Select <b>Network > GlobalProtect > Portals</b> and then select the portal configuration you want to modify or <b>Add</b> a new one.
2. Select the <b>Agent</b> tab and then select the Agent configuration you want to modify or <b>Add</b> a new one.
3. Select <b>Data Collection</b>, and then verify that <b>Collect HIP Data</b> is enabled.
4. Select <b>Custom Checks > Windows</b>.
5. Add the Registry Key that you want to collect information about. If you want to restrict data collection to a value contained within that Registry Key, add the corresponding <b>Registry Value</b>.


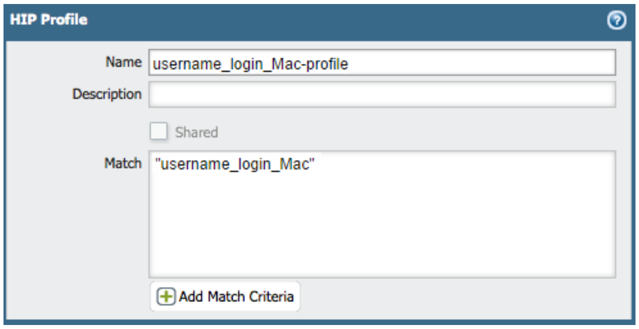
General
User/User Group
Gateways
Agent
Data Collection
Exclude Categories
Custom Checks
Windows
Mac
Add
Delete

Max Wait Time 20
Registry Key: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\DirectX
Registry Value: Version
Process List</td>
</tr>
</table>

Enable and Verify Custom Checks for Windows or Mac Clients		
		Collect data from a Mac client: 1. Select **Network > GlobalProtect > Portals** and then select the portal configuration you want to modify or **Add** a new one. 2. Select the **Agent** tab and then select the Agent configuration you want to modify or **Add** a new one. 3. Select **Data Collection**, and then verify that **Collect HIP Data** is enabled. 4. Select **Custom Checks > Mac**. 5. Add the **Plist** that you want to collect information about and the corresponding Plist **Key** to determine if the application is installed:  Configs General User/User Group Gateways Agent Data Collection Exclude Categories Custom Checks Windows Mac Add Delete OK Cancel Max Wait Time 20 Plist: com.apple.loginwindow — Key: autoLoginUser Process List For example, **Add** the **Plist** `com.apple.screensaver` and the **Key** `askForPassword` to collect information on whether a password is required to wake the Mac client after the screen saver begins:  Plist com.apple.screensaver Key askForPassword Confirm that the **Plist** and **Key** are added to the Mac custom checks:  Plist — Key ☑ com.apple.screensaver — askForPassword □ com.apple.SoftwareUpdate — WebKitDefaultFontSize □ com.apple.ActivityMonitor — Columns
Step 2	(Optional) Check if a specific process is running on the client.	1. Continue from Step 1 on the **Custom Checks** tab (**Network > GlobalProtect > Portals >** *portal-config* **> Agent >** *agent-config* **> Data Collection**) and select the **Windows** tab or **Mac** tab. 2. **Add** the name of the process that you want to collect information about to the **Process List**.
Step 3	Save the custom check.	Click **OK** and **Commit** the changes.

Enable and Verify Custom Checks for Windows or Mac Clients		
Step 4	Verify that the GlobalProtect agent is collecting the data defined in the custom check from the client.	For Windows clients: On the Windows client, double-click the GlobalProtect icon on the task bar and click the **Host State** tab to view the information that the GlobalProtect agent is collecting from the Mac client. Under the custom-checks dropdown, verify that the data that you defined for collection in Step 7 is displayed:  Status | Details | Settings | Host State | TroubleShooting Settings Hip Interval: 3600 Intel(R) PRO/1000 MT Network Connection #2 Intel(R) PRO/1000 MT Network Connection Software Loopback Interface 1 antivirus anti-spyware Windows Defender disk-backup Windows Backup and Restore disk-encryption BitLocker Drive Encryption firewall Microsoft Windows Firewall patch-management Microsoft Windows Update Agent Microsoft Windows AutomaticUpdate data-loss-prevention custom-checks registry-key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\DirectX registry-value Exists: Yes Default Value: For Mac clients: On the Mac client, click the GlobalProtect icon on the Menu bar, click **Advanced View**, and click **Host State** to view the information that the GlobalProtect agent is collecting for the Mac client. Under the custom-checks dropdown, verify that the data you defined for collection in Step 7 is displayed:  GlobalProtect Status | Details | Settings | Host State | Troubleshooting Collapse Settings Hip Interval: 60 generate-time 09/02/2014 16:10:10 categories custom-checks plist com.apple.loginwindow exist yes preference-value autoLoginUser exist yes value username

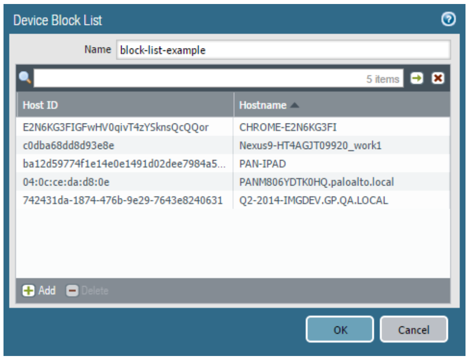
Enable and Verify Custom Checks for Windows or Mac Clients		
Step 5	(Optional) Create a HIP Object to match to a Registry Key (Windows) or Plist (Mac). This can allow you to filter the raw host information collected from the GlobalProtect agent in order to monitor the data for the custom check. With a HIP object defined for the custom check data, the gateway will match the raw data submitted from the agent to the HIP object and a HIP Match log entry is generated for the data (**Monitor > HIP Match**).	1. Select **Objects > GlobalProtect > HIP Objects** and **Add** a **HIP Object**. 2. Select and enable **Custom Checks**. For Windows clients: 3. To check Windows clients for a specific registry key, select **Registry Key** and **Add** the registry to match on. To only identify clients that do not have the specified registry key, select **Key does not exist or match the specified value data**. 4. To match on specific values within the Registry key, click **Add** and then enter the registry value and value data. To identify clients that explicitly do not have the specified value or value data, select the **Negate** check box.  HIP Object General Patch Management Firewall Antivirus Anti-Spyware Disk Backup Disk Encryption Custom Checks ☑ Custom Checks Process List Registry Key Plist Registry Key | (Default) Value Data □ HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\DirectX 5. Click **OK** to save the HIP object. You can **Commit** to view the data in the **HIP Match** logs at the next device check-in or continue to Step 6. For Mac clients: 1. Select the **Plist** tab and **Add** and enter the name of the **Plist** for which you want to check Mac clients. (If instead, you want to match Mac clients that do not have the specified Plist, continue by selecting **Plist does not exist**). 2. (Optional) You can match traffic to a specific key-value pair within the Plist by entering the **Key** and the corresponding **Value** to match. (Alternatively, if you want to identify clients that do not have a specific Key and Value, you can continue by selecting **Negate** after adding populating the **Key** and **Value** fields).  HIP Object General Patch Management Firewall Antivirus Anti-Spyware Disk Backup Disk Encryption Custom Checks ☑ Custom Checks Process List Registry Key Plist Plist | Negate | Key □ com.apple.loginwindow | □ | autoLoginUser: username: no 3. Click **OK** to save the HIP object. You can **Commit** to view the data in the **HIP Match** logs at the next device check-in or continue to Step 6.

Enable and Verify Custom Checks for Windows or Mac Clients		
Step 6	(Optional) Create a HIP profile to allow the HIP object you created in Step 5 to be evaluated against traffic. The HIP profile can be added to a security policy as an additional check for traffic matching that policy. When the traffic is matched to the HIP profile, the security policy rule will be enforced on the traffic. For more details on creating a HIP profiles, see Configure HIP-Based Policy Enforcement.	1. Select **Objects > GlobalProtect > HIP Profile**. 2. Click **Add Match Criteria** to open the **HIP Objects/Profiles Builder**. 3. Select the **HIP object** you want to use as match criteria and then move it over to the **Match** box on the HIP Profile dialog. 4. When you have finished adding the objects to the new HIP profile, click **OK** and **Commit**.  HIP Profile Name: username_login_Mac-profile Description: □ Shared Match: "username_login_Mac"
Step 7	Add the HIP profile to a security policy so that the data collected with the custom check can be used to match to and act on traffic.	Select **Policies > Security**, and **Add** or modify a security policy. Go to the **User** tab to add a HIP profile to the policy. For more details on security policies components and using security policies to match to and act on traffic, see Security Policy.

Block Device Access

In the event that a user loses a device that provides GlobalProtect access to your network, that device is stolen, or a user leaves your organization, you can block the device from gaining access to the network by placing the device in a block list.

A block list is local to a logical network location (vsys, 1 for example) and can contain a maximum of 1,000 devices per location. Therefore, you can create separate device block lists for each location hosting a GlobalProtect deployments.

<table>
<tr><th colspan="2">Block Device Access</th></tr>
<tr><td>Step 1 Create a device block list.
You cannot use Panorama templates to push a device block list to firewalls.</td><td>1. Select <b>Network > GlobalProtect > Device Block List</b> and <b>Add</b> a device block list.
2. Enter a descriptive <b>Name</b> for the list.
3. For a firewall with more than one virtual system (vsys), select the <b>Location</b> (vsys or <b>Shared</b>) where the profile is available.</td></tr>
<tr><td>Step 2 Add a device to a block list.

Device Block List
Name block-list-example
5 items
<table>
<tr><th>Host ID</th><th>Hostname</th></tr>
<tr><td>E2N6KG3FIGFwHV0qivT4zYSknsQcQQor</td><td>CHROME-E2N6KG3FI</td></tr>
<tr><td>c0dba68dd8d93e8e</td><td>Nexus9-HT4AGJT09920_work1</td></tr>
<tr><td>ba12d59774f1e14e0e1491d02dee7984a5...</td><td>PAN-IPAD</td></tr>
<tr><td>04:0c:ce:da:d8:0e</td><td>PANM806YDTK0HQ.paloalto.local</td></tr>
<tr><td>742431da-1874-476b-9e29-7643e8240631</td><td>Q2-2014-IMGDEV.GP.QA.LOCAL</td></tr>
</table>
</td><td>1. <b>Add</b> devices. Enter the host ID (required) and hostname (optional) for a device you need to block.
2. <b>Add</b> additional devices, if needed.
3. Click <b>OK</b> to save and activate the block list.
The device list does not require a commit and is immediately active.</td></tr>
</table>

GlobalProtect Quick Configigs

The following sections provide step-by-step instructions for configuring some common GlobalProtect deployments:

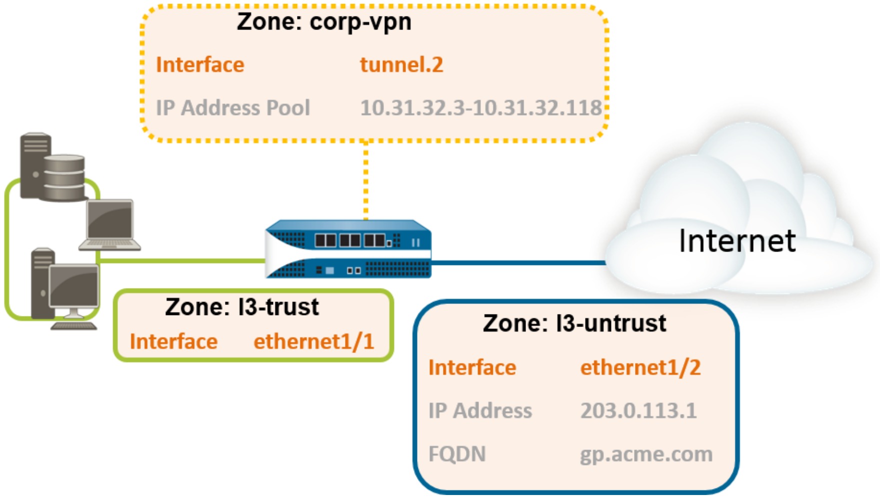
- Remote Access VPN (Authentication Profile)
- Remote Access VPN (Certificate Profile)
- Remote Access VPN with Two-Factor Authentication
- Always On VPN Configuration
- Remote Access VPN with Pre-Logon
- GlobalProtect Multiple Gateway Configuration
- GlobalProtect for Internal HIP Checking and User-Based Access
- Mixed Internal and External Gateway Configuration
- Manual Gateway Selection for Password Resets

Remote Access VPN (Authentication Profile)

In the Figure: GlobalProtect VPN for Remote Access, the GlobalProtect portal and gateway are configured on ethernet1/2, so this is the physical interface where GlobalProtect clients connect. After a client connects and the portal and gateway authenticates it, the client establishes a VPN tunnel from its virtual adapter, which has been assigned an address in the IP address pool associated with the gateway tunnel.2 configuration—10.31.32.3-10.31.32.118 in this example. Because GlobalProtect VPN tunnels terminate in a separate corp-vpn zone, you have visibility into the VPN traffic as well as the ability to customize security policy for remote users.

Watch the video.

Figure: GlobalProtect VPN for Remote Access



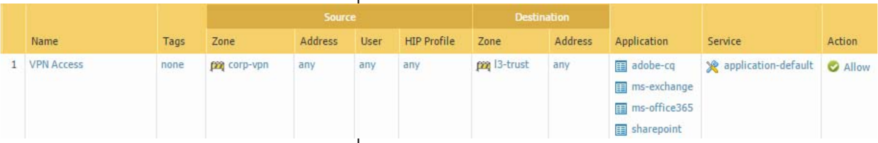
The following procedure provides the configuration steps for this example. You can also watch the video.

Quick Config: VPN Remote Access		
Step 1	Create Interfaces and Zones for GlobalProtect. Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.	• Select **Network > Interfaces > Ethernet** and configure ethernet1/2 as a Layer 3 Ethernet interface with IP address 203.0.113.1 and assign it to the l3-untrust zone and the default virtual router. • Create a DNS “A” record that maps IP address 203.0.113.1 to gp.acme.com. • Select **Network > Interfaces > Tunnel** and add the tunnel.2 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router. • Enable User Identification on the corp-vpn zone.

Quick Config: VPN Remote Access (Continued)

Step 2 Create security policy to enable traffic flow between the corp-vpn zone and the l3-trust zone to enable access to your internal resources.

1. Select **Policies > Security** and then **Add** a new rule.
2. For this example, you would define the rule with the following settings:
   - Name—VPN Access
   - Source Zone—corp-vpn
   - Destination Zone—l3-trust



			Source				Destination				
	Name	Tags	Zone	Address	User	HIP Profile	Zone	Address	Application	Service	Action
1	VPN Access	none	corp-vpn	any	any	any	l3-trust	any	adobe-cq ms-exchange ms-office365 sharepoint	application-default	✓ Allow

Step 3 Obtain a server certificate for the interface hosting the GlobalProtect portal and gateway using one of the following methods:

- (Recommended) Import a server certificate from a well-known, third-party CA.
- Use the root CA on the portal to generate a self-signed server certificate.

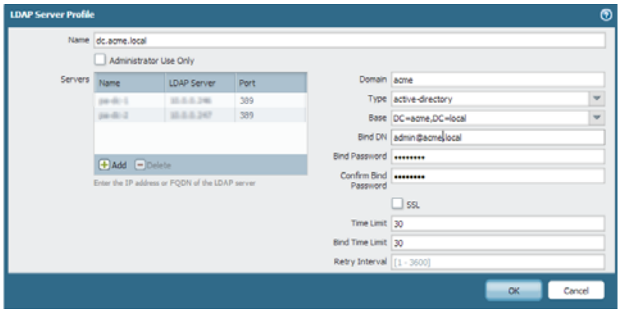
Select **Device > Certificate Management > Certificates** to manage certificates as follows:

- Obtain a server certificate. Because the portal and gateway are on the same interface, the same server certificate can be used for both components.
- The CN of the certificate must match the FQDN, gp.acme.com.
- To enable clients to connect to the portal without receiving certificate errors, use a server certificate from a public CA.

Step 4 Create a server profile.

The server profile instructs the firewall how to connect to the authentication service. Supported methods are Local, RADIUS, Kerberos, and LDAP authentication. This example shows an LDAP authentication profile for authenticating users against the Active Directory.

Create the server profile for connecting to the LDAP server: **Device > Server Profiles > LDAP**.



LDAP Server Profile

Name: dc.acme.local

□ Administrator Use Only

Servers

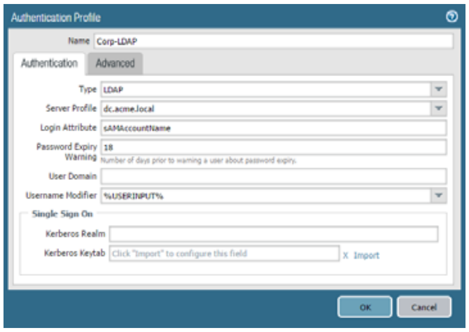
Name	LDAP Server	Port
[redacted]	[redacted]	389
[redacted]	[redacted]	389

Enter the IP address or FQDN of the LDAP server

Domain: acme
Type: active-directory
Base: DC=acme,DC=local
Bind DN: admin@acme.local
Bind Password: ••••••••
Confirm Bind Password: ••••••••
□ SSL
Time Limit: 30
Bind Time Limit: 30
Retry Interval: [1 - 3600]

Step 5 (Optional) Create an authentication profile.

Attach the server profile to an authentication profile: **Device > Authentication Profile**.



Authentication Profile

Name: Corp-LDAP

Type: LDAP
Server Profile: dc.acme.local
Login Attribute: sAMAccountName
Password Expiry Warning: 18
Number of days prior to warning a user about password expiry.
User Domain:
Username Modifier: %USERINPUT%

Single Sign On
Kerberos Realm:
Kerberos Keytab: Click "Import" to configure this field

Quick Config: VPN Remote Access (Continued)		
Step 6	Configure a GlobalProtect Gateway.	Select **Network > GlobalProtect > Portals** and add the following configuration: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Authentication Profile**—Corp-LDAP **Tunnel Interface**—tunnel.2 **IP Pool**—10.31.32.3 - 10.31.32.118
Step 7	Configure the GlobalProtect Portal.	Select **Network > GlobalProtect > Portals** and add the following configuration: 1. Set Up Access to the GlobalProtect Portal. This example uses the following settings: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Authentication Profile**—Corp-LDAP 2. Define the GlobalProtect Agent Configurations using the following settings: **Connect Method**—On-demand (Manual user initiated connection) **External Gateway Address**—gp.acme.com
Step 8	Deploy the GlobalProtect Agent Software.	Select **Device > GlobalProtect Client**. In this example, use the procedure to Host Agent Updates on the Portal.
Step 9	(Optional) Enable use of the GlobalProtect mobile app.	Purchase and install a GlobalProtect Gateway subscription (**Device > Licenses**) to enable use of the app.
Step 10	Save the GlobalProtect configuration.	Click **Commit**.

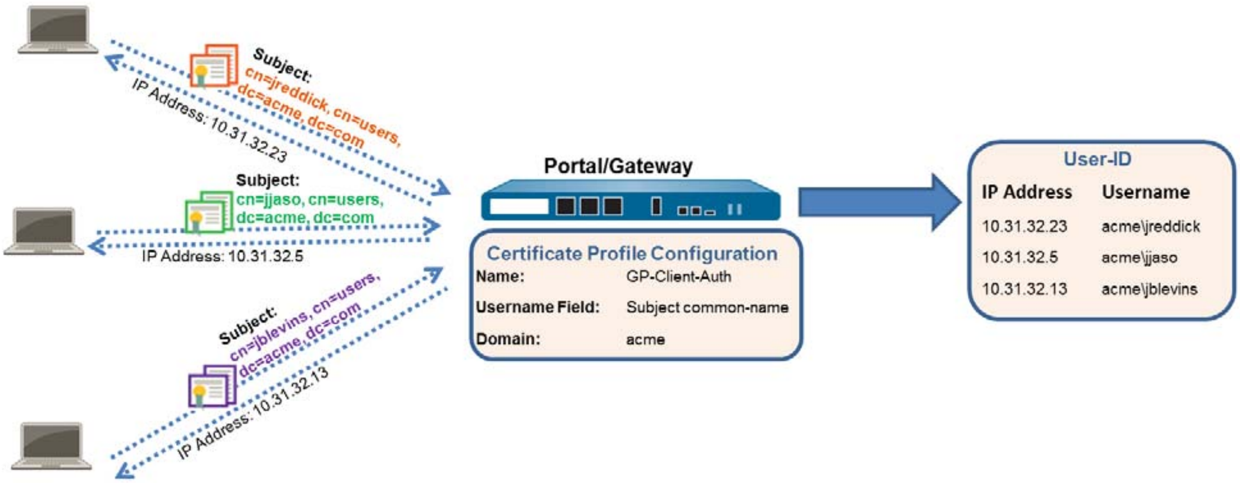
Remote Access VPN (Certificate Profile)

With certificate authentication, the client must present a valid client certificate that identifies the user to the GlobalProtect portal or gateway. In addition to the certificate itself, the portal or gateway can use a *certificate profile* to determine whether the client that sent the certificate is the client to which the certificate was issued.

When a client certificate is the only means of authentication, the certificate that the client presents must contain the username in one of the certificate fields; typically the username corresponds to the common name (CN) in the Subject field of the certificate.

Upon successful authentication, the GlobalProtect agent establishes a VPN tunnel with the gateway and is assigned an IP address from the IP pool in the gateway's tunnel configuration. To support user-based policy enforcement on sessions from the corp-vpn zone, the username from the certificate is mapped to the IP address that the gateway assigned. Also, if a security policy requires a domain name in addition to user name, the specified domain value in the certificate profile is appended to the username.

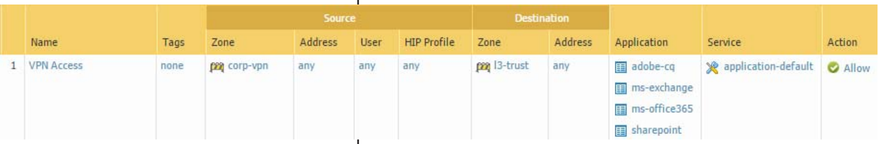
Figure: GlobalProtect Client Certificate Authentication Configuration


Subject:
cn=jreddick, cn=users, dc=acme, dc=com
IP Address: 10.31.32.23
Subject:
cn=jjaso, cn=users, dc=acme, dc=com
IP Address: 10.31.32.5
Subject:
cn=jblevins, cn=users, dc=acme, dc=com
IP Address: 10.31.32.13
Portal/Gateway
Certificate Profile Configuration
Name: GP-Client-Auth
Username Field: Subject common-name
Domain: acme
User-ID

IP Address	Username
10.31.32.23	acme\jreddick
10.31.32.5	acme\jjaso
10.31.32.13	acme\jblevins

This quick configuration uses the same topology as Figure: GlobalProtect VPN for Remote Access. The only configuration difference is that instead of authenticating users against an external authentication server, this configuration uses client certificate authentication only.

Quick Config: VPN Remote Access with Client Certificate Authentication		
Step 1	Create Interfaces and Zones for GlobalProtect. Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.	• Select **Network > Interfaces > Ethernet** and configure ethernet1/2 as a Layer 3 Ethernet interface with IP address 203.0.113.1 and assign it to the l3-untrust security zone and the default virtual router. • Create a DNS "A" record that maps IP address 203.0.113.1 to gp.acme.com. • Select **Network > Interfaces > Tunnel**. • Add tunnel.2 interface to a new zone called corp-vpn. Assign the interface to the default virtual router. • Enable User Identification on the corp-vpn zone.

<table>
<tr><th colspan="3">Quick Config: VPN Remote Access with Client Certificate Authentication (Continued)</th></tr>
<tr><td>Step 2</td><td>Create security policy to enable traffic flow between the corp-vpn zone and the l3-trust zone to enable access to your internal resources.</td><td>1. Select <b>Policies > Security</b> and then <b>Add</b> a new rule.
2. For this example, you would define the rule with the following settings:
• Name—VPN Access
• Source Zone—corp-vpn
• Destination Zone—l3-trust</td></tr>
<tr><td colspan="3">


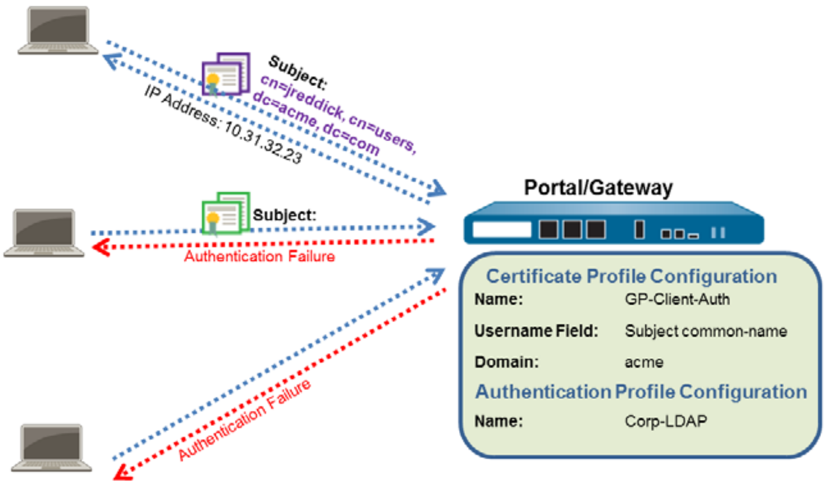
<table>
<tr><th></th><th></th><th></th><th colspan="4">Source</th><th colspan="2">Destination</th><th></th><th></th><th></th></tr>
<tr><th></th><th>Name</th><th>Tags</th><th>Zone</th><th>Address</th><th>User</th><th>HIP Profile</th><th>Zone</th><th>Address</th><th>Application</th><th>Service</th><th>Action</th></tr>
<tr><td>1</td><td>VPN Access</td><td>none</td><td>corp-vpn</td><td>any</td><td>any</td><td>any</td><td>l3-trust</td><td>any</td><td>adobe-cq
ms-exchange
ms-office365
sharepoint</td><td>application-default</td><td>✓ Allow</td></tr>
</table>
</td></tr>
<tr><td>Step 3</td><td>Obtain a server certificate for the interface hosting the GlobalProtect portal and gateway using one of the following methods:
• (Recommended) Import a server certificate from a well-known, third-party CA.
• Use the root CA on the portal to generate a self-signed server certificate.</td><td>Select <b>Device > Certificate Management > Certificates</b> to manage certificates as follows:
• Obtain a server certificate. Because the portal and gateway are on the same interface, the same server certificate can be used for both components.
• The CN of the certificate must match the FQDN, gp.acme.com.
• To enable clients to connect to the portal without receiving certificate errors, use a server certificate from a public CA.</td></tr>
<tr><td>Step 4</td><td>Issue client certificates to GlobalProtect clients and endpoints. This enables the GlobalProtect portal and gateways to validate that the device belongs to your organization.</td><td>1. Use your enterprise PKI or a public CA to issue a unique client certificate to each GlobalProtect user.
2. Install certificates in the personal certificate store on the endpoints.</td></tr>
<tr><td>Step 5</td><td>Create a client certificate profile.</td><td>1. Select <b>Device > Certificate Management > Certificate Profile</b>, click <b>Add</b> and enter a profile <b>Name</b> such as GP-client-cert.
2. Select <b>Subject</b> from the <b>Username Field</b> drop-down.
3. Click <b>Add</b> in the CA Certificates section, select the <b>CA Certificate</b> that issued the client certificates, and click <b>OK</b> twice.</td></tr>
<tr><td>Step 6</td><td>Configure a GlobalProtect Gateway.
See the topology diagram shown in Figure: GlobalProtect VPN for Remote Access.</td><td>Select <b>Network > GlobalProtect > Gateways</b> and add the following configuration:
<b>Interface</b>—ethernet1/2
<b>IP Address</b>—203.0.113.1
<b>Server Certificate</b>—GP-server-cert.pem issued by GoDaddy
<b>Certificate Profile</b>—GP-client-cert
<b>Tunnel Interface</b>—tunnel.2
<b>IP Pool</b>—10.31.32.3 - 10.31.32.118</td></tr>
</table>

Quick Config: VPN Remote Access with Client Certificate Authentication (Continued)		
Step 7	Configure the GlobalProtect Portal.	Select **Network > GlobalProtect > Portals** and add the following configuration: 1. Set Up Access to the GlobalProtect Portal: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Certificate Profile**—GP-client-cert 2. Define the GlobalProtect Agent Configurations: **Connect Method**—On-demand (Manual user initiated connection) **External Gateway Address**—gp.acme.com
Step 8	Deploy the GlobalProtect Agent Software.	Select **Device > GlobalProtect Client**. In this example, use the procedure to Host Agent Updates on the Portal.
Step 9	(Optional) Enable use of the GlobalProtect mobile app.	Purchase and install a GlobalProtect Gateway subscription (**Device > Licenses**) to enable use of the app.
Step 10	Save the GlobalProtect configuration.	Click **Commit**.

Remote Access VPN with Two-Factor Authentication

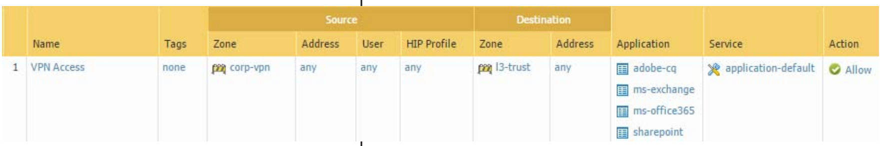
If you configure a GlobalProtect portal or gateway with an authentication profile and a certificate profile (which together can provide two-factor authentication), the end user must succeed at authentication through both profiles before gaining access. For portal authentication, this means that certificates must be pre-deployed to the end clients before their initial portal connection. Additionally, the client certificate presented by a client must match what is defined in the certificate profile.

- If the certificate profile does not specify a username field (that is, the **Username Field** it is set to **None**), the client certificate does not need to have a username. In this case, the client must provide the username when authenticating against the authentication profile.
- If the certificate profile specifies a username field, the certificate that the client presents must contain a username in the corresponding field. For example, if the certificate profile specifies that the username field is Subject, the certificate presented by the client must contain a value in the common-name field, or else the authentication fails. In addition, when the username field is required, the value from the username field of the certificate is automatically populated as the username when the user attempts to enter credentials for authenticating to the authentication profile. If you do not want force users to authenticate with a username from the certificate, do not specify a username field in the certificate profile.



This quick configuration uses the same topology as Figure: GlobalProtect VPN for Remote Access. However, in this configuration the clients must authenticate against a certificate profile and an authentication profile. For more details on a specific type of two-factor authentication, see the following topics:

- Enable Two-Factor Authentication Using Certificate and Authentication Profiles
- Enable Two-Factor Authentication Using One-Time Passwords (OTPs)
- Enable Two-Factor Authentication Using Smart Cards

<table>
<tr><th colspan="3">VPN Remote Access with Two-Factor Authentication</th></tr>
<tr><td>Step 1</td><td>Create Interfaces and Zones for GlobalProtect.
Use the <b>default</b> virtual router for all interface configurations to avoid having to create inter-zone routing.</td><td>• Select <b>Network > Interfaces > Ethernet</b> and configure ethernet1/2 as a Layer 3 Ethernet interface with IP address 203.0.113.1 and assign it to the l3-untrust security zone and the default virtual router.
• Create a DNS “A” record that maps IP address 203.0.113.1 to gp.acme.com.
• Select <b>Network > Interfaces > Tunnel</b> and add the tunnel.2 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router.
• Enable User Identification on the corp-vpn zone.</td></tr>
<tr><td>Step 2</td><td>Create security policy to enable traffic flow between the corp-vpn zone and the l3-trust zone to enable access to your internal resources.</td><td>1. Select <b>Policies > Security</b> and then click <b>Add</b> to add a new rule.
2. For this example, you would define the rule with the following settings:
• Name—VPN Access
• Source Zone—corp-vpn
• Destination Zone—l3-trust</td></tr>
<tr><td colspan="3">
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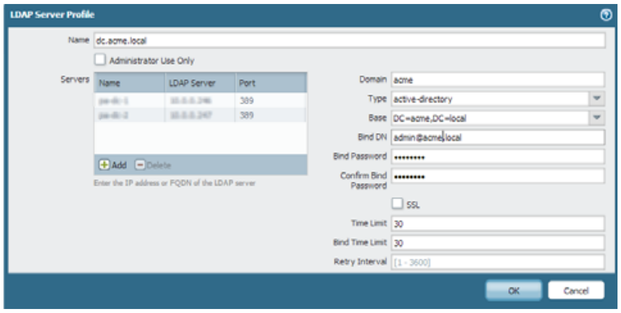
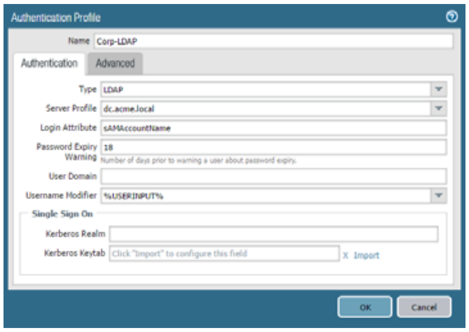
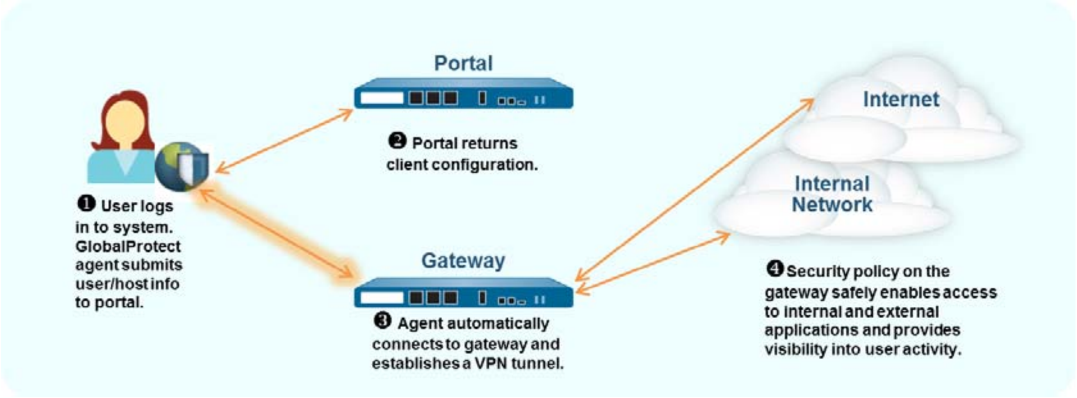
ms-exchange
ms-office365
sharepoint</td><td>application-default</td><td>✓ Allow</td></tr>
</table></td></tr>
<tr><td>Step 3</td><td>Obtain a server certificate for the interface hosting the GlobalProtect portal and gateway using one of the following methods:
• (Recommended) Import a server certificate from a well-known, third-party CA.
• Use the root CA on the portal to generate a self-signed server certificate.</td><td>Select <b>Device > Certificate Management > Certificates</b> to manage certificates as follows:
• Obtain a server certificate. Because the portal and gateway are on the same interface, the same server certificate can be used for both components.
• The CN of the certificate must match the FQDN, gp.acme.com.
• To enable clients to connect to the portal without receiving certificate errors, use a server certificate from a public CA.</td></tr>
<tr><td>Step 4</td><td>Issue client certificates to GlobalProtect clients and endpoints. This enables the GlobalProtect portal and gateways to validate that the device belongs to your organization.</td><td>1. Use your enterprise PKI or a public CA to issue a unique client certificate to each GlobalProtect user.
2. Install certificates in the personal certificate store on the endpoints.</td></tr>
</table>

VPN Remote Access with Two-Factor Authentication (Continued)		
Step 5	Create a client certificate profile.	1. Select **Device > Certificate Management > Certificate Profile**, **Add** and enter a profile **Name** such as GP-client-cert. 2. Specify where to get the username that will be used to authenticate the end user: - **From user**—If you want the end user to supply a username when authenticating to the service specified in the authentication profile, select **None** as the **Username Field**. - **From certificate**—If you want to extract the username from the certificate, select **Subject** as the **Username Field**. If you use this option, the CN contained in the certificate will automatically populated the username field when the user is prompted to login to the portal/gateway and the user will be required to log in using that username. 3. In the CA Certificates section, **Add** and then select the **CA Certificate** that issued the client certificates, and click **OK** twice.
Step 6	Create a server profile. The server profile instructs the firewall how to connect to the authentication service. Local, RADIUS, Kerberos, and LDAP authentication methods are supported. This example shows an LDAP authentication profile for authenticating users against the Active Directory.	Create the server profile for connecting to the LDAP server: **Device > Server Profiles > LDAP**  LDAP Server Profile Name: dc.acme.local □ Administrator Use Only Servers: Name / LDAP Server / Port [redacted] / [redacted] / 389 [redacted] / [redacted] / 389 Enter the IP address or FQDN of the LDAP server Domain: acme Type: active-directory Base: DC=acme,DC=local Bind DN: admin@acme.local Bind Password: •••••••• Confirm Bind Password: •••••••• □ SSL Time Limit: 30 Bind Time Limit: 30 Retry Interval: [1 - 3600]
Step 7	(Optional) Create an authentication profile.	Attach the server profile to an authentication profile: **Device > Authentication Profile**.  Authentication Profile Name: Corp-LDAP Type: LDAP Server Profile: dc.acme.local Login Attribute: sAMAccountName Password Expiry Warning: 18 Number of days prior to warning a user about password expiry. User Domain: Username Modifier: %USERINPUT% Single Sign On Kerberos Realm: Kerberos Keytab: Click "Import" to configure this field

VPN Remote Access with Two-Factor Authentication (Continued)		
Step 8	Configure a GlobalProtect Gateway. See the topology diagram shown in Figure: GlobalProtect VPN for Remote Access.	Select **Network > GlobalProtect > Gateways** and add the following configuration: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Certificate Profile**—GP-client-cert **Authentication Profile**—Corp-LDAP **Tunnel Interface**—tunnel.2 **IP Pool**—10.31.32.3 - 10.31.32.118
Step 9	Configure the GlobalProtect Portal.	Select **Network > GlobalProtect > Portals** and add the following configuration: 1. Set Up Access to the GlobalProtect Portal: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Certificate Profile**—GP-client-cert **Authentication Profile**—Corp-LDAP 2. Define the GlobalProtect Agent Configurations: **Connect Method**—On-demand (Manual user initiated connection) **External Gateway Address**—gp.acme.com
Step 10	Deploy the GlobalProtect Agent Software.	Select **Device > GlobalProtect Client**. In this example, use the procedure to Host Agent Updates on the Portal.
Step 11	(Optional) Deploy Agent Settings Transparently.	As an alternative to deploying agent settings from the portal configuration, you can define settings directly from the Windows registry or global MAC plist. Examples of settings that you can deploy include specifying the portal IP address or enabling GlobalProtect to initiate a VPN tunnel before a user logs in to the device and connects to the GlobalProtect portal. On Windows clients only, you can also configure settings using the MSIEXEC installer. For additional information, see Customizable Agent Settings.
Step 12	(Optional) Enable use of the GlobalProtect mobile app.	Purchase and install a GlobalProtect Gateway subscription (**Device > Licenses**) to enable use of the app.
Step 13	Save the GlobalProtect configuration.	Click **Commit**.

Always On VPN Configuration

In an “always on” GlobalProtect configuration, the agent connects to the GlobalProtect portal upon user logon to submit user and host information and receive the client configuration. It then automatically establishes the VPN tunnel to the gateway specified in the client configuration delivered by the portal without end user intervention as shown in the following illustration.


Portal
❷ Portal returns client configuration.
❶ User logs in to system. GlobalProtect agent submits user/host info to portal.
Gateway
❸ Agent automatically connects to gateway and establishes a VPN tunnel.
Internet
Internal Network
❹ Security policy on the gateway safely enables access to internal and external applications and provides visibility into user activity.

To switch any of the previous remote access VPN configurations to an always-on configuration, you simply change the connect method:

- Remote Access VPN (Authentication Profile)
- Remote Access VPN (Certificate Profile)
- Remote Access VPN with Two-Factor Authentication

Switch to an “Always On” Configuration
1. Select **Network > GlobalProtect > Portals** and select the portal configuration to open it.
2. Select the **Agent** tab and then select the agent configuration you want to modify.
3. Select the **App** tab.
4. Select **User-logon (Always On)** as the **Connect Method**. Repeat this step for each agent configuration.
5. Click **OK** twice to save the agent configuration and the portal configuration and then **Commit** your changes.

Remote Access VPN with Pre-Logon

Pre-logon is a connect method that establishes a VPN tunnel before a user logs in. The purpose of pre-logon is to authenticate the endpoint (not the user) and then enable domain scripts and other tasks of your choice to run as soon as the endpoint powers on. A machine certificate enables the endpoint to have the VPN tunnel to the gateway. A common practice for IT personnel is to install the machine certificate while staging the endpoint for the user.

A pre-logon VPN tunnel has no username association because the user has not logged in. Therefore, to let the endpoint have access to resources in the trust zone, you must create security policies that match the pre-logon user. These policies should allow access to only the basic services for starting up the system, such as DHCP, DNS, Active Directory (for example, to change an expired password), antivirus, or operating system update services.

After the gateway authenticates a Windows user, the VPN tunnel is reassigned to that user (the IP address mapping on the firewall changes from the pre-logon endpoint to the authenticated user).

> Mac systems behave differently from Windows systems with pre-logon. With Mac OS, the tunnel created for pre-logon is torn down and a new tunnel created when the user logs in.

When a client requests a new connection, the portal authenticates the client by using an authentication profile. The portal can also use an optional certificate profile that validates the client certificate (if the configuration includes a client certificate). In this case, the client certificate must identify the user.

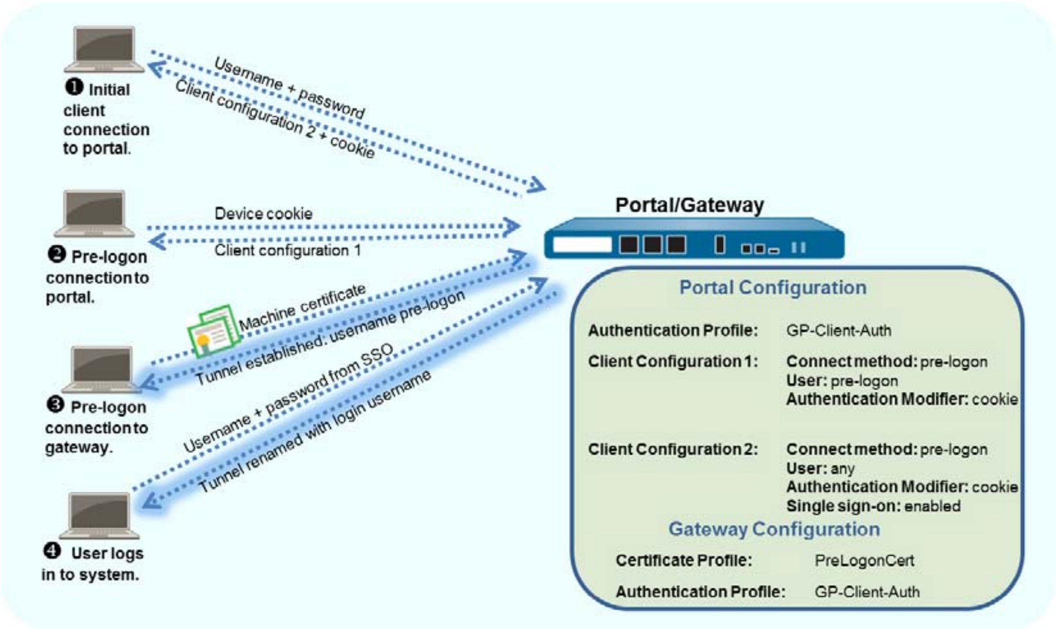
After authentication, the portal determines if the client's configuration is current. If the portal's configuration for the agent has changed, it pushes an updated configuration to the endpoint.

If the configuration on the portal or a gateway includes cookie-based authentication for the client, the portal or gateway installs an encrypted cookie on the client. Subsequently, the portal or gateway uses the cookie to authenticate users and for refreshing the client's configuration. Also, if an agent configuration profile includes the pre-logon connect method in addition to cookie-authentication, the GlobalProtect components can use the cookie for pre-logon.

If users never log into a device (for example, a headless device) or a pre-logon connection is required on a system that a user has not previously logged into, you can let the endpoint initiate a pre-logon tunnel without first connecting to the portal to download the pre-logon configuration. To do this, you must override the default behavior by creating entries in the Windows registry or Mac plist.

The GlobalProtect endpoint will then connect to the portal specified in the configuration and authenticate the endpoint by using its machine certificate (as specified in a certificate profile configured on the gateway) and establish the VPN tunnel.

When the end user subsequently logs in to the machine and if single sign-on (SSO) is enabled in the client configuration, the username and password are captured while the user logs in and used to authenticate to the gateway and so that the tunnel can be renamed (Windows). If SSO is not enabled in the client configuration or of SSO is not supported on the client system (for example, it is a Mac OS system) the users' credentials must be stored in the agent (that is, the **Save User Credentials** option must be set to **Yes**). After successful authentication to the gateway the tunnel will be renamed (Windows) or rebuilt (Mac) and user- and group-based policy can be enforced.


❶ Initial client connection to portal.
Username + password
Client configuration 2 + cookie
❷ Pre-logon connection to portal.
Device cookie
Client configuration 1
❸ Pre-logon connection to gateway.
Machine certificate
Tunnel established: username pre-logon
❹ User logs in to system.
Username + password from SSO
Tunnel renamed with login username
Portal/Gateway
Portal Configuration
Authentication Profile: GP-Client-Auth
Client Configuration 1: Connect method: pre-logon
User: pre-logon
Authentication Modifier: cookie
Client Configuration 2: Connect method: pre-logon
User: any
Authentication Modifier: cookie
Single sign-on: enabled
Gateway Configuration
Certificate Profile: PreLogonCert
Authentication Profile: GP-Client-Auth

This example uses the GlobalProtect topology shown in Figure: GlobalProtect VPN for Remote Access.

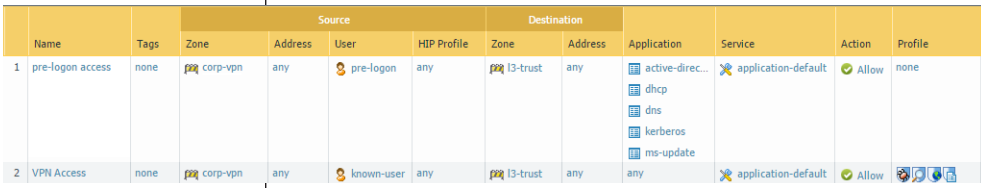
Remote Access VPN with Pre-Logon	
Step 1 Create Interfaces and Zones for GlobalProtect. Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.	• For this example, select **Network > Interfaces > Ethernet** and then: • Select **ethernet1/2**. • For its interface type, select **Layer 3**. • **Assign interface to**: default virtual router, default virtual system, and **l3-untrust** security zone. • Select **IPv4** and **Add**. • Select the address 203.0.113.1 (or the object that maps 203.0.113.1) or add a **New Address** to create a new object and address mapping. (Leave the address type as **Static**.) • Create a DNS "A" record that maps IP address 203.0.113.1 to gp.acme.com. • Select **Network > Interfaces > Tunnel**. • **Add** a tunnel.2 interface to a new zone called corp-vpn. Assign it to the default virtual router. • Enable User Identification on the corp-vpn zone.

Remote Access VPN with Pre-Logon (Continued)

Step 2 Create the security policy rules.

This configuration requires the following policies (**Policies > Security**):

- First create a rule that enables the pre-logon user access to basic services that are required for the computer to come up, such as authentication services, DNS, DHCP, and Microsoft Updates.
- Second create a rule to enable access between the corp-vpn zone and the l3-trust zone for any known user after the user successfully logs in.



			Source				Destination					
	Name	Tags	Zone	Address	User	HIP Profile	Zone	Address	Application	Service	Action	Profile
1	pre-logon access	none	corp-vpn	any	pre-logon	any	l3-trust	any	active-direc... dhcp dns kerberos ms-update	application-default	Allow	none
2	VPN Access	none	corp-vpn	any	known-user	any	l3-trust	any	any	application-default	Allow	

Step 3 Use one of the following methods to obtain a server certificate for the interface that is hosts the GlobalProtect portal and gateway:

- (Recommended) Import a server certificate from a well-known, third-party CA.
- Use the root CA on the portal to generate a self-signed server certificate.

Select **Device > Certificate Management > Certificates** to manage certificates with the following criteria:

- Obtain a server certificate. Because the portal and gateway are on the same interface, the same server certificate can be used for both components.
- The CN of the certificate must match the FQDN, gp.acme.com.
- To enable clients to connect to the portal without receiving certificate errors, use a server certificate from a public CA.

Step 4 Generate a machine certificate for each client system that will connect to GlobalProtect and import them into the personal certificate store on each machine.

Although you could generate self-signed certificates for each client system, as a best practice, use your own public-key infrastructure (PKI) to issue and distribute certificates to your clients.

1. Issue client certificates to GlobalProtect clients and endpoints. This enables the GlobalProtect portal and gateways to validate that the device belongs to your organization.
2. Install certificates in the personal certificate store on the endpoints. (Local Computer store on Windows or System Keychain on Mac OS)

Step 5 Import the trusted root CA certificate from the CA that issued the machine certificates onto the portal and gateway(s).

You do not have to import the private key.

1. Download the CA certificate in Base64 format.
2. Import the certificate onto each firewall that hosts a portal or gateway, as follows:
   a. Select **Device > Certificate Management > Certificates > Device Certificates** and click **Import**.
   b. Enter a **Certificate Name** that identifies the certificate as your client CA certificate.
   c. **Browse** to the **Certificate File** you downloaded from the CA.
   d. Select **Base64 Encoded Certificate (PEM)** as the **File Format** and then click **OK**.
   e. Select the certificate you just imported on the **Device Certificates** tab to open it.
   f. Select **Trusted Root CA** and then click **OK**.

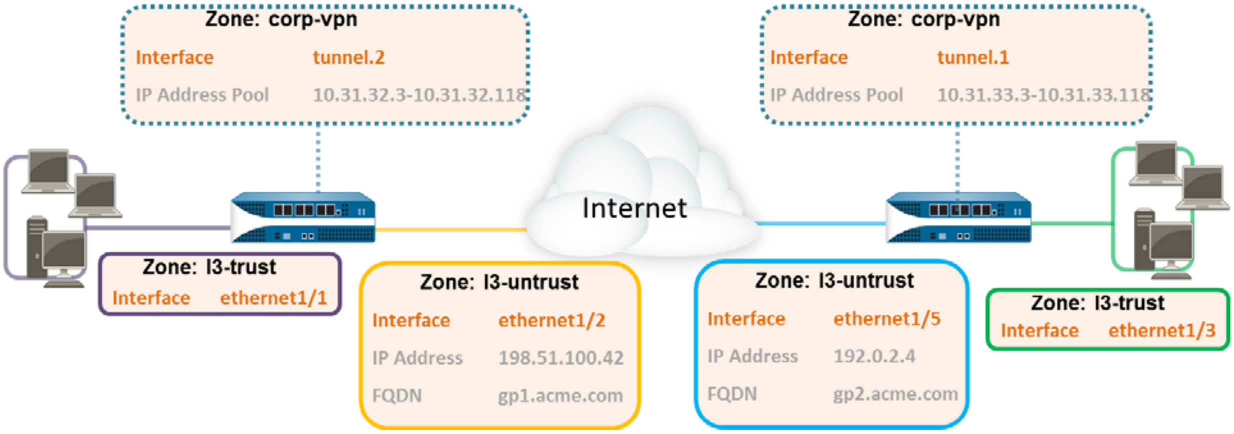
Remote Access VPN with Pre-Logon (Continued)		
Step 6	On each firewall that hosts a GlobalProtect gateway, create a certificate profile to identify the CA certificate for validating the machine certificates. Optionally, if you plan to use client certificate authentication to authenticate users when they log in to the system, make sure that the CA certificate that issues the client certificates is referenced in the certificate profile in addition to the CA certificate that issued the machine certificates if they are different.	1. Select **Device > Certificates > Certificate Management > Certificate Profile**. 2. Click **Add** and enter a **Name** to uniquely identify the profile, such as `PreLogonCert`. 3. Set **Username Field** to **None**. 4. (Optional) If you will also use client certificate authentication to authenticate users upon login, add the CA certificate that issued the client certificates if it is different from the one that issued the machine certificates. 5. In the **CA Certificates** field, click **Add**, select the Trusted Root CA certificate you imported in Step 5 and then click **OK**. 6. Click **OK** to save the profile.
Step 7	Configure a GlobalProtect Gateway. See the topology diagram shown in Figure: GlobalProtect VPN for Remote Access. Although you must create a certificate profile for pre-logon access to the gateway, you can use either client certificate authentication or authentication profile-based authentication for logged in users. In this example, the same LDAP profile is used that is used to authenticate users to the portal.	1. Select **Network > GlobalProtect > Gateways** and add the following configuration: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Certificate Profile**—PreLogonCert **Authentication Profile**—Corp-LDAP **Tunnel Interface**—tunnel.2 **IP Pool**—10.31.32.3 - 10.31.32.118 2. **Commit** the gateway configuration.

Remote Access VPN with Pre-Logon (Continued)		
Step 8	Configure the GlobalProtect Portal. First, configure **Device** details (networking parameters, the authentication service profile, and the certificate for the authentication server). Next, create two agent configuration profiles. With these two types of agent configurations, you can limit gateway access to one gateway for the pre-logon users and provide access to multiple gateways for the logged in users. As a best practice, enable SSO in the second agent configuration so that the correct username is immediately reported to the gateway when the user logs in to the endpoint. If SSO is not enabled, the saved username in the **Agent** settings panel is used.	Select **Network > GlobalProtect > Portals** and specify the following configuration: 1. Set Up Access to the GlobalProtect Portal: **Interface**—ethernet1/2 **IP Address**—203.0.113.1 **Server Certificate**—GP-server-cert.pem issued by GoDaddy **Certificate Profile**—None **Authentication Profile**—Corp-LDAP 2. Define the GlobalProtect Agent Configurations for pre-logon users and for logged in users: First Agent Configuration: **Connect Method**—pre-logon **External Gateway Address**—gp.acme.com **User/User Group**—pre-logon **Authentication Override**—Cookie authentication for transparently authenticating users and for configuration refresh Second Agent Configuration: **Use single sign-on**—enabled **Connect Method**—pre-logon **External Gateway Address**—gp.acme.com **User/User Group**—any **Authentication Override**—Cookie authentication for transparently authenticating users and for configuration refresh 3. Make sure the pre-logon client configuration is first in the list of configurations. If it is not, select it and click **Move Up**.
Step 9	Save the GlobalProtect configuration.	Click **Commit**.
Step 10	(Optional) If users will never log into a device (for example, a headless device) or a pre-logon connection is required on a system that a user has not previously logged into, create the `Prelogon` registry entry on the client system. You must also pre-deploy additional agent settings such as the default portal IP address and connect method. For more information about registry settings, see Deploy Agent Settings Transparently.	1. Locate the GlobalProtect settings in the registry: `HKEY_LOCAL_MACHINE\SOFTWARE\Palo Alto Networks\GlobalProtect\PanSetup` 2. Create a **DWORD** named `Prelogon` with a value of `1` in the **Value data** field and **Hexadecimal** as the **Base**. This setting enables GlobalProtect to initiate a VPN connection before the user logs into the laptop. 3. Create a **String Value** named `Portal` that specifies the IP address or hostname of the default portal for the GlobalProtect client. 4. Create a **String Value** named `connect-method` with a value of `pre-logon` in the Value data field. This setting enables GlobalProtect to initiate a VPN tunnel before a user logs in to the device and connects to the GlobalProtect portal.

GlobalProtect Multiple Gateway Configuration

In Figure: GlobalProtect Multiple Gateway Topology, a second external gateway has been added to the configuration. Multiple gateways are supported in all of the preceding example configurations. Additional steps include configuring a second firewall as a GlobalProtect gateway. In addition, when configuring the client configurations to be deployed by the portal you can decide whether to allow access to all gateways, or specify different gateways for different configurations.

Figure: GlobalProtect Multiple Gateway Topology



If a client configuration contains more than one gateway, the agent will attempt to connect to all gateways listed in its client configuration. The agent will then use priority and response time as to determine the gateway to which to connect. The agent connects to a lower priority gateway only if the response time for the higher priority gateway is greater than the average response time across all gateways. For more information, see Gateway Priority in a Multiple Gateway Configuration.

Quick Config: GlobalProtect Multiple Gateway Configuration

Step 1 Create Interfaces and Zones for GlobalProtect.

In this configuration, you must set up interfaces on each firewall hosting a gateway.

Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.

On the firewall hosting the portal/gateway (gw1):

- Select **Network > Interfaces > Ethernet** and configure ethernet1/2 as a Layer 3 Ethernet interface with IP address 198.51.100.42 and assign it to the l3-untrust security zone and the default virtual router.
- Create a DNS “A” record that maps IP address 198.51.100.42 to gp1.acme.com.
- Select **Network > Interfaces > Tunnel** and add the tunnel.2 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router.
- Enable User Identification on the corp-vpn zone.

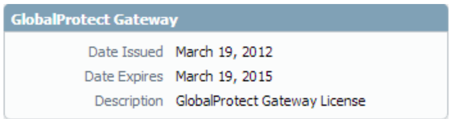
On the firewall hosting the second gateway (gw2):

- Select **Network > Interfaces > Ethernet** and configure ethernet1/5 as a Layer 3 Ethernet interface with IP address 192.0.2.4 and assign it to the l3-untrust security zone and the default virtual router.
- Create a DNS “A” record that maps IP address 192.0.2.4 to gp2.acme.com.
- Select **Network > Interfaces > Tunnel** and add the tunnel.1 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router.
- Enable User Identification on the corp-vpn zone.

Step 2 Purchase and install a GlobalProtect gateway subscription on each gateway if you have users who will be using the GlobalProtect app on their mobile devices or if you plan to use HIP-enabled security policy.

After you purchase the gateway subscription and receive your activation code, install the license on the firewall hosting the portal as follows:

1. Select **Device > Licenses**.
2. Select **Activate feature using authorization code**.
3. When prompted, enter the **Authorization Code** and then click **OK**.
4. Verify that the license was successfully activated.

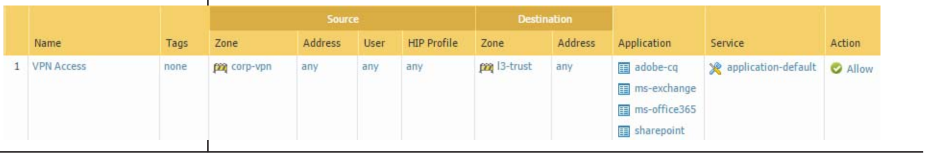


GlobalProtect Gateway

Date Issued March 19, 2012
Date Expires March 19, 2015
Description GlobalProtect Gateway License

Step 3 On each firewall hosting a GlobalProtect gateway, create security policy.

This configuration requires policy rules to enable traffic flow between the corp-vpn zone and the l3-trust zone to enable access to your internal resources (**Policies > Security**).



			Source				Destination				
	Name	Tags	Zone	Address	User	HIP Profile	Zone	Address	Application	Service	Action
1	VPN Access	none	corp-vpn	any	any	any	l3-trust	any	adobe-cq ms-exchange ms-office365 sharepoint	application-default	Allow

Quick Config: GlobalProtect Multiple Gateway Configuration (Continued)		
Step 4	Obtain server certificates for the interfaces hosting your GlobalProtect portal and each of your GlobalProtect gateways using the following recommendations: • (On the firewall hosting the portal or portal/gateway) Import a server certificate from a well-known, third-party CA. • (On a firewall hosting only a gateway) Use the root CA on the portal to generate a self-signed server certificate.	On each firewall hosting a portal/gateway or gateway, select **Device > Certificate Management > Certificates** to manage certificates as follows: • Obtain a server certificate for the portal/gw1. Because the portal and the gateway are on the same interface you must use the same server certificate. The CN of the certificate must match the FQDN, gp1.acme.com. To enable clients to connect to the portal without receiving certificate errors, use a server certificate from a public CA. • Obtain a server certificate for the interface hosting gw2. Because this interface hosts a gateway only you can use a self-signed certificate. The CN of the certificate must match the FQDN, gp2.acme.com.
Step 5	Define how you will authenticate users to the portal and the gateways.	You can use any combination of certificate profiles and/or authentication profiles as necessary to ensure the security for your portal and gateways. Portals and individual gateways can also use different authentication schemes. See the following sections for step-by-step instructions: • Set Up External Authentication (authentication profile) • Set Up Client Certificate Authentication (certificate profile) • Set Up Two-Factor Authentication (token- or OTP-based) You will then need to reference the certificate profile and/or authentication profiles you defined in the portal and gateway configurations you define.
Step 6	Configure the gateways.	This example shows the configuration for gp1 and gp2 shown in Figure: GlobalProtect Multiple Gateway Topology. See Configure a GlobalProtect Gateway for step-by-step instructions on creating the gateway configurations.
On the firewall hosting gp1, configure the gateway settings as follows: Select **Network > GlobalProtect > Gateways** and add the following configuration: **Interface**—ethernet1/2 **IP Address**—198.51.100.42 **Server Certificate**—GP1-server-cert.pem issued by GoDaddy **Tunnel Interface**—tunnel.2 **IP Pool**—10.31.32.3 - 10.31.32.118		On the firewall hosting gp2, configure the gateway settings as follows: Select **Network > GlobalProtect > Gateways** and add the following configuration: **Interface**—ethernet1/2 **IP Address**—192.0.2.4 **Server Certificate**—self-signed certificate, GP2-server-cert.pem **Tunnel Interface**—tunnel.1 **IP Pool**—10.31.33.3 - 10.31.33.118

Quick Config: GlobalProtect Multiple Gateway Configuration (Continued)		
Step 7	Configure the GlobalProtect Portal.	Select **Network > GlobalProtect > Portals** and add the following configuration: 1. Set Up Access to the GlobalProtect Portal: **Interface**—ethernet1/2 **IP Address**—198.51.100.42 **Server Certificate**—GP1-server-cert.pem issued by GoDaddy 2. Define the GlobalProtect Agent Configurations: The number of client configurations you create depends on your specific access requirements, including whether you require user/group-based policy and/or HIP-enabled policy enforcement.
Step 8	Deploy the GlobalProtect Agent Software.	Select **Device > GlobalProtect Client**. In this example, use the procedure to Host Agent Updates on the Portal.
Step 9	Save the GlobalProtect configuration.	Click **Commit** on the firewall hosting the portal and the gateway(s).

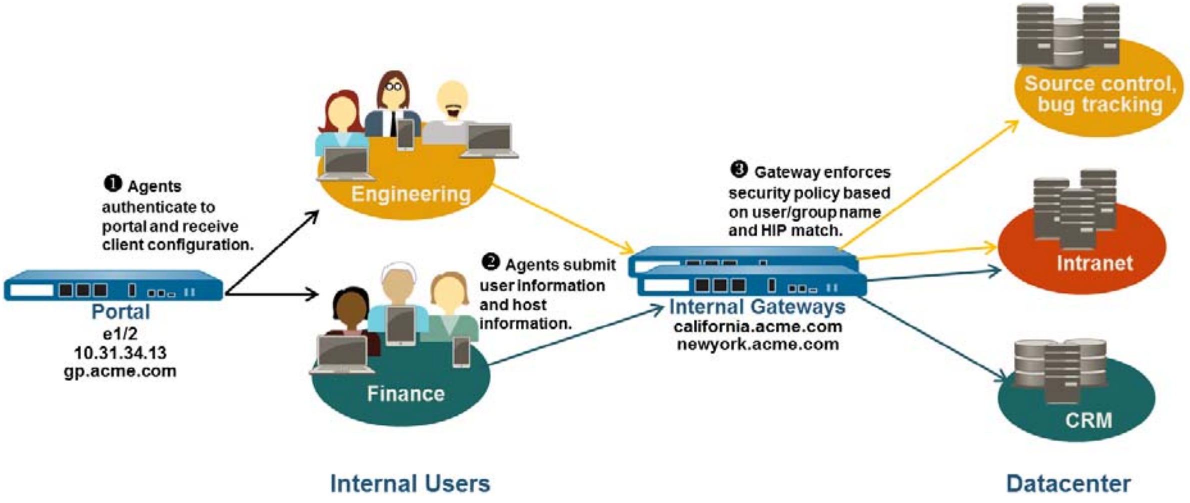
GlobalProtect for Internal HIP Checking and User-Based Access

When used in conjunction with User-ID and/or HIP checks, an internal gateway can be used to provide a secure, accurate method of identifying and controlling traffic by user and/or device state, replacing other network access control (NAC) services. Internal gateways are useful in sensitive environments where authenticated access to critical resources is required.

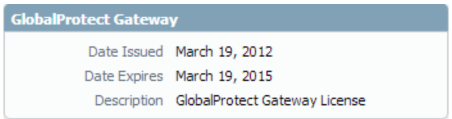
In a configuration with only internal gateways, all clients must be configured with user-logon; on-demand mode is not supported. In addition, it is recommended that you configure all client configurations to use single sign-on (SSO). Additionally, because internal hosts do not need to establish a tunnel connection with the gateway, the IP address of the physical network adapter on the client system is used.

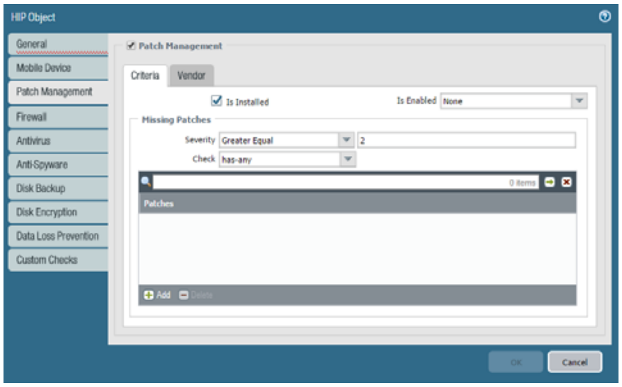
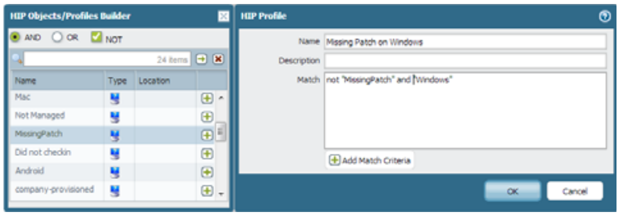
In this quick config, internal gateways are used to enforce group based policies that allow users in the Engineering group access to the internal source control and bug databases and users in the Finance group to the CRM applications. All authenticated users have access to internal web resources. In addition, HIP profiles configured on the gateway check each host to ensure compliance with internal maintenance requirements, such as whether the latest security patches and antivirus definitions are installed, whether disk encryption is enabled, or whether the required software is installed.

Figure: GlobalProtect Internal Gateway Configuration

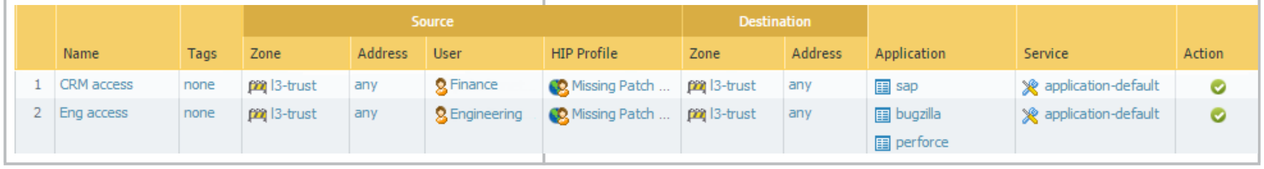

❶ Agents authenticate to portal and receive client configuration.
Portal
e1/2
10.31.34.13
gp.acme.com
Engineering
Finance
❷ Agents submit user information and host information.
❸ Gateway enforces security policy based on user/group name and HIP match.
Internal Gateways
california.acme.com
newyork.acme.com
Source control, bug tracking
Intranet
CRM
Internal Users
Datacenter

Quick Config: GlobalProtect Internal Gateway Configuration

Step 1	Create Interfaces and Zones for GlobalProtect. In this configuration, you must set up interfaces on each firewall hosting a portal and/or a gateway. Because this configuration uses internal gateways only, you must configure the portal and gateways on interfaces on the internal network. Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.	On each firewall hosting a portal/gateway: 1. Select an Ethernet port to host the portal/gateway and then configure a Layer3 interface with an IP address in the l3-trust security zone. (**Network > Interfaces > Ethernet**). 2. **Enable User Identification** on the l3-trust zone.
Step 2	Purchase and install a gateway subscription for each firewall hosting an internal gateway if you have users who will be using the GlobalProtect app on their mobile devices or if you plan to use HIP-enabled security policy.  GlobalProtect Gateway Date Issued March 19, 2012 Date Expires March 19, 2015 Description GlobalProtect Gateway License	After you purchase the gateway subscriptions and receive your activation code, install the gateway subscriptions on the firewalls hosting your gateways as follows: 1. Select **Device > Licenses**. 2. Select **Activate feature using authorization code**. 3. When prompted, enter the **Authorization Code** and then click **OK**. 4. Verify that the license was successfully activated. Contact your Palo Alto Networks Sales Engineer or Reseller if you do not have the required licenses. For more information on licensing, see About GlobalProtect Licenses.
Step 3	Obtain server certificates for the GlobalProtect portal and each GlobalProtect gateway. In order to connect to the portal for the first time, the end clients must trust the root CA certificate used to issue the portal server certificate. You can either use a self-signed certificate on the portal and deploy the root CA certificate to the end clients before the first portal connection, or obtain a server certificate for the portal from a trusted CA. You can use self-signed certificates on the gateways.	The recommended workflow is as follows: 1. On the firewall hosting the portal: a. Import a server certificate from a well-known, third-party CA. b. Create the root CA certificate for issuing self-signed certificates for the GlobalProtect components. c. Use the root CA on the portal to generate a self-signed server certificate. Repeat this step for each gateway. 2. On each firewall hosting an internal gateway: a. Deploy the self-signed server certificates.
Step 4	Define how you will authenticate users to the portal and the gateways.	You can use any combination of certificate profiles and/or authentication profiles as necessary to ensure the security for your portal and gateways. Portals and individual gateways can also use different authentication schemes. See the following sections for step-by-step instructions: • Set Up External Authentication (authentication profile) • Set Up Client Certificate Authentication (certificate profile) • Set Up Two-Factor Authentication (token- or OTP-based) You will then need to reference the certificate profile and/or authentication profiles you defined in the portal and gateway configurations you define.

<table>
<tr><th colspan="3">Quick Config: GlobalProtect Internal Gateway Configuration (Continued)</th></tr>
<tr><td>Step 5</td><td>Create the HIP profiles you will need to enforce security policy on gateway access.
See Use Host Information in Policy Enforcement for more information on HIP matching.</td><td>1. Create the HIP objects to filter the raw host data collected by the agents. For example, if you are interested in preventing users that are not up to date with required patches, you might create a HIP object to match on whether the patch management software is installed and that all patches with a given severity are up to date.

☑ Patch Management
☑ Is Installed
Is Enabled: None
Severity: Greater Equal 2
Check: has-any
2. Create the HIP profiles that you plan to use in your policies.
For example, if you want to ensure that only Windows users with up-to-date patches can access your internal applications, you might attach the following HIP profile that will match hosts that do NOT have a missing patch:

● AND ○ OR ☑ NOT
Name: Missing Patch on Windows
Description:
Match: not "MissingPatch" and "Windows"</td></tr>
<tr><td>Step 6</td><td>Configure the internal gateways.</td><td>Select <b>Network > GlobalProtect > Gateways</b> and add the following settings:
• <b>Interface</b>
• <b>IP Address</b>
• <b>Server Certificate</b>
• <b>Authentication Profile</b> and/or <b>Configuration Profile</b>
Notice that it is not necessary to configure the client configuration settings in the gateway configurations (unless you want to set up HIP notifications) because tunnel connections are not required. See Configure a GlobalProtect Gateway for step-by-step instructions on creating the gateway configurations.</td></tr>
</table>

Quick Config: GlobalProtect Internal Gateway Configuration (Continued)		
Step 7	Configure the GlobalProtect Portal. Although all of the previous configurations could use a **Connect Method** of **User-logon (Always On)** or **On-demand (Manual user initiated connection)**, an internal gateway configuration must always be on and therefore requires a **Connect Method** of **User-logon (Always On)**.	Select **Network > GlobalProtect > Portals** and add the following configuration: 1. Set Up Access to the GlobalProtect Portal: **Interface**—ethernet1/2 **IP Address**—10.31.34.13 **Server Certificate**—GP-server-cert.pem issued by GoDaddy with CN=gp.acme.com 2. Create a GlobalProtect Agent Configuration: **Use single sign-on**—enabled **Connect Method**—User-logon (Always On) **Internal Gateway Address**—california.acme.com, newyork.acme.com **User/User Group**—any 3. **Commit** the portal configuration.
Step 8	Deploy the GlobalProtect Agent Software.	Select **Device > GlobalProtect Client**. In this example, use the procedure to Host Agent Updates on the Portal.
Step 9	Create the HIP-enabled and/or user/group-based security rules on your gateway(s).	Add the following security rules for this example: 1. Select **Policies > Security** and click **Add**. 2. On the **Source** tab, set the **Source Zone** to **l3-trust**. 3. On the **User** tab, add the HIP profile and user/group to match. • Click **Add** in the **HIP Profiles** section and select the HIP profile **MissingPatch**. • Click **Add** in the **Source User** section and select the group (Finance or Engineering depending on which rule you are creating). 4. Click **OK** to save the rule. 5. **Commit** the gateway configuration.



			Source				Destination				
	Name	Tags	Zone	Address	User	HIP Profile	Zone	Address	Application	Service	Action
1	CRM access	none	l3-trust	any	Finance	Missing Patch ...	l3-trust	any	sap	application-default	✓
2	Eng access	none	l3-trust	any	Engineering	Missing Patch ...	l3-trust	any	bugzilla perforce	application-default	✓

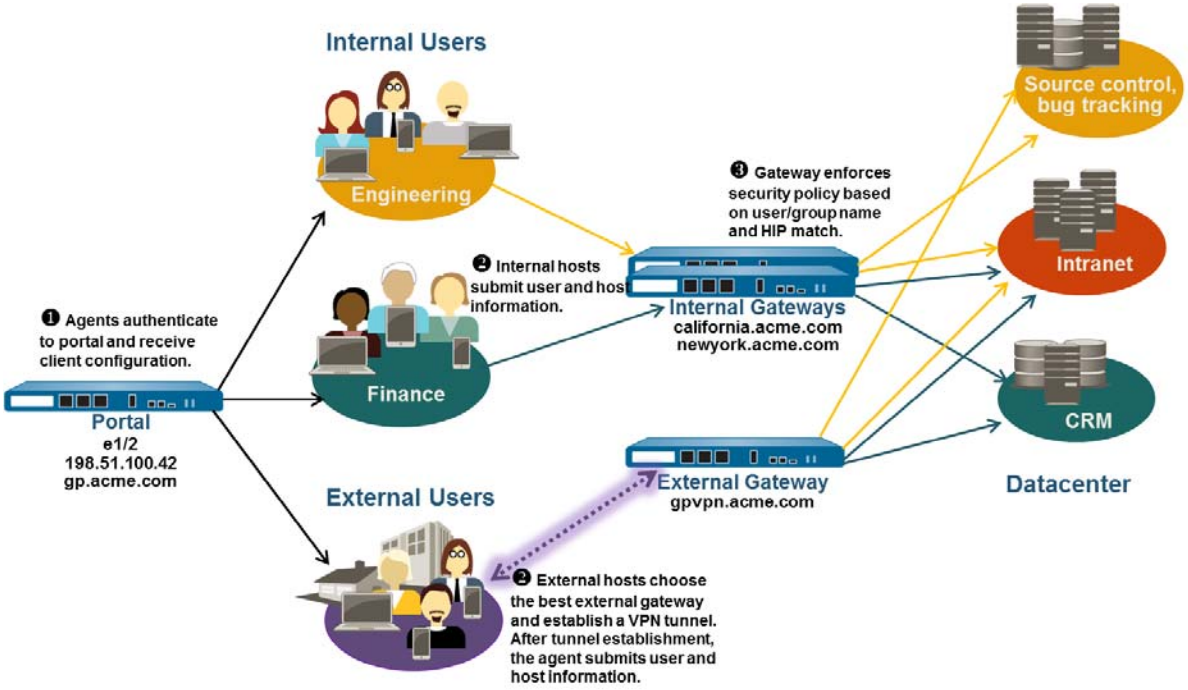
Mixed Internal and External Gateway Configuration

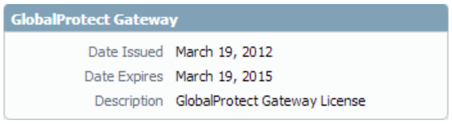
In a GlobalProtect mixed internal and external gateway configuration, you configure separate gateways for VPN access and for access to your sensitive internal resources. With this configuration, agents perform internal host detection to determine if they are on the internal or external network. If the agent determines it is on the external network, it will attempt to connect to the external gateways listed in its client configuration and it will establish a VPN (tunnel) connection with the gateway with the highest priority and the shortest response time.

Because security policies are defined separately on each gateway, you have granular control over which resources your external and internal users have access to. In addition, you also have granular control over which gateways users have access to by configuring the portal to deploy different client configurations based on user/group membership or based on HIP profile matching.

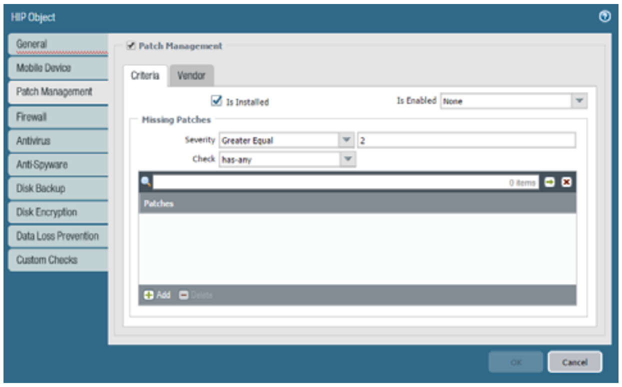
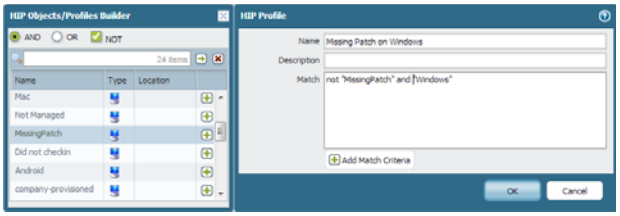
In this example, the portals and all three gateways (one external and two internal) are deployed on separate firewalls. The external gateway at gpvpn.acme.com provides remote VPN access to the corporate network while the internal gateways provide granular access to sensitive datacenter resources based on group membership. In addition, HIP checks are used to ensure that hosts accessing the datacenter are up-to-date on security patches.

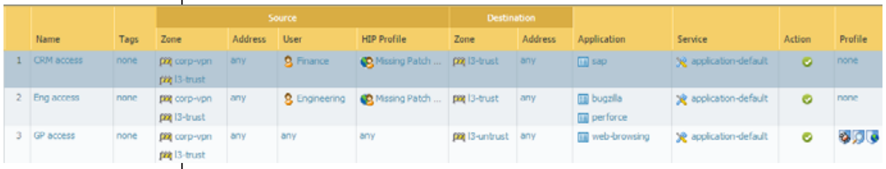
Figure: GlobalProtect Deployment with Internal and External Gateways


Internal Users
Engineering
Finance
External Users
❶ Agents authenticate to portal and receive client configuration.
Portal
e1/2
198.51.100.42
gp.acme.com
❷ Internal hosts submit user and host information.
Internal Gateways
california.acme.com
newyork.acme.com
❸ Gateway enforces security policy based on user/group name and HIP match.
External Gateway
gpvpn.acme.com
❷ External hosts choose the best external gateway and establish a VPN tunnel. After tunnel establishment, the agent submits user and host information.
Source control, bug tracking
Intranet
CRM
Datacenter

Quick Config: GlobalProtect Mixed Internal & External Gateway Configuration		
Step 1	Create Interfaces and Zones for GlobalProtect. In this configuration, you must set up interfaces on the firewall hosting a portal and each firewall hosting a gateway. Use the **default** virtual router for all interface configurations to avoid having to create inter-zone routing.	On the firewall hosting the portal gateway (gp.acme.com): - Select **Network > Interfaces > Ethernet** and configure ethernet1/2 as a Layer 3 Ethernet interface with IP address 198.51.100.42 and assign it to the l3-untrust security zone and the default virtual router. - Create a DNS "A" record that maps IP address 198.51.100.42 to gp.acme.com. - Select **Network > Interfaces > Tunnel** and add the tunnel.2 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router. - Enable User Identification on the corp-vpn zone. On the firewall hosting the external gateway (gpvpn.acme.com): - Select **Network > Interfaces > Ethernet** and configure ethernet1/5 as a Layer 3 Ethernet interface with IP address 192.0.2.4 and assign it to the l3-untrust security zone and the default virtual router. - Create a DNS "A" record that maps IP address 192.0.2.4 to gpvpn.acme.com. - Select **Network > Interfaces > Tunnel** and add the tunnel.3 interface and add it to a new zone called corp-vpn. Assign it to the default virtual router. - Enable User Identification on the corp-vpn zone. On the firewall hosting the internal gateways (california.acme.com and newyork.acme.com): - Select **Network > Interfaces > Ethernet** and configure Layer 3 Ethernet interface with IP addresses on the internal network and assign them to the l3-trust security zone and the default virtual router. - Create a DNS "A" record that maps the internal IP addresses california.acme.com and newyork.acme.com. - Enable User Identification on the l3-trust zone.
Step 2	Purchase and install a gateway subscriptions for each firewall hosting a gateway (internal and external) if you have users who will be using the GlobalProtect app on their mobile devices or if you plan to use HIP-enabled security policy.  GlobalProtect Gateway Date Issued March 19, 2012 Date Expires March 19, 2015 Description GlobalProtect Gateway License	After you purchase the gateway subscriptions and receive your activation code, install the gateway subscriptions on the firewalls hosting your gateways as follows: 1. Select **Device > Licenses**. 2. Select **Activate feature using authorization code**. 3. When prompted, enter the **Authorization Code** and then click **OK**. 4. Verify that the license and subscriptions were successfully activated. Contact your Palo Alto Networks Sales Engineer or Reseller if you do not have the required licenses. For more information on licensing, see About GlobalProtect Licenses.

Quick Config: GlobalProtect Mixed Internal & External Gateway Configuration (Continued)		
Step 3	Obtain server certificates for the GlobalProtect portal and each GlobalProtect gateway. In order to connect to the portal for the first time, the end clients must trust the root CA certificate used to issue the portal server certificate. You can use self-signed certificates on the gateways and deploy the root CA certificate to the agents in the client configuration. The best practice is to generate all of the certificates on firewall hosting the portal and deploy them to the gateways.	The recommended workflow is as follows: 1. On the firewall hosting the portal: a. Import a server certificate from a well-known, third-party CA. b. Create the root CA certificate for issuing self-signed certificates for the GlobalProtect components. c. Use the root CA on the portal to generate a self-signed server certificate. Repeat this step for each gateway. 2. On each firewall hosting an internal gateway: • Deploy the self-signed server certificates.
Step 4	Define how you will authenticate users to the portal and the gateways.	You can use any combination of certificate profiles and/or authentication profiles as necessary to ensure the security for your portal and gateways. Portals and individual gateways can also use different authentication schemes. See the following sections for step-by-step instructions: • Set Up External Authentication (authentication profile) • Set Up Client Certificate Authentication (certificate profile) • Set Up Two-Factor Authentication (token- or OTP-based) You will then need to reference the certificate profile and/or authentication profiles you defined in the portal and gateway configurations you define.

Quick Config: GlobalProtect Mixed Internal & External Gateway Configuration (Continued)		
Step 5	Create the HIP profiles you will need to enforce security policy on gateway access. See Use Host Information in Policy Enforcement for more information on HIP matching.	1. Create the HIP objects to filter the raw host data collected by the agents. For example, if you are interested in preventing users that are not up to date with required patches, you might create a HIP object to match on whether the patch management software is installed and that all patches with a given severity are up to date.  HIP Object — Patch Management ☑ — Criteria ☑ Is Installed Is Enabled: None Missing Patches Severity: Greater Equal 2 Check: has-any Patches: 0 items General Mobile Device Patch Management Firewall Antivirus Anti-Spyware Disk Backup Disk Encryption Data Loss Prevention Custom Checks Criteria Vendor Add Delete OK Cancel 2. Create the HIP profiles that you plan to use in your policies. For example, if you want to ensure that only Windows users with up-to-date patches can access your internal applications, you might attach the following HIP profile that will match hosts that do NOT have a missing patch:  HIP Objects/Profiles Builder ● AND ○ OR ☑ NOT 24 items Name: Mac, Not Managed, MissingPatch, Did not checkin, Android, company-provisioned HIP Profile Name: Missing Patch on Windows Description: Match: not "MissingPatch" and "Windows" Name Type Location Add Match Criteria OK Cancel
Step 6	Configure the internal gateways.	Select **Network > GlobalProtect > Gateways** and add the following settings: • **Interface** • **IP Address** • **Server Certificate** • **Authentication Profile** and/or **Configuration Profile** Notice that it is not necessary to configure the client configuration settings in the gateway configurations (unless you want to set up HIP notifications) because tunnel connections are not required. See Configure a GlobalProtect Gateway for step-by-step instructions on creating the gateway configurations.

<table>
<tr><th colspan="3">Quick Config: GlobalProtect Mixed Internal & External Gateway Configuration (Continued)</th></tr>
<tr><td>Step 7</td><td>Configure the GlobalProtect Portal.
Although this example shows how to create a single client configuration to be deployed to all agents, you could choose to create separate configurations for different uses and then deploy them based on user/group name and/or the operating system the agent/app is running on (Android, iOS, Mac, or Windows).</td><td>Select <b>Network > GlobalProtect > Portals</b> and add the following configuration:
1. Set Up Access to the GlobalProtect Portal:
<b>Interface</b>—ethernet1/2
<b>IP Address</b>—10.31.34.13
<b>Server Certificate</b>—GP-server-cert.pem issued by GoDaddy with CN=gp.acme.com
2. Create a GlobalProtect Agent Configuration:
<b>Internal Host Detection</b>—enabled
<b>Use single sign-on</b>—enabled
<b>Connect Method</b>—User-logon (Always On)
<b>External Gateway Address</b>—gpvpn.acme.com
<b>Internal Gateway Address</b>—california.acme.com, newyork.acme.com
<b>User/User Group</b>—any
3. <b>Commit</b> the portal configuration.</td></tr>
<tr><td>Step 8</td><td>Deploy the GlobalProtect Agent Software.</td><td>Select <b>Device > GlobalProtect Client</b>.
In this example, use the procedure to Host Agent Updates on the Portal.</td></tr>
<tr><td>Step 9</td><td>Create security policy rules on each gateway to safely enable access to applications for your VPN users.</td><td>• Create security policy (<b>Policies > Security</b>) to enable traffic flow between the corp-vpn zone and the l3-trust zone.
• Create HIP-enabled and user/group-based policy rules to enable granular access to your internal datacenter resources.
• For visibility, create rules that allow all of your users web-browsing access to the l3-untrust zone, using the default security profiles to protect you from known threats.</td></tr>
<tr><td colspan="3">
<table>
<tr><th></th><th></th><th></th><th colspan="4">Source</th><th colspan="2">Destination</th><th></th><th></th><th></th><th></th></tr>
<tr><th></th><th>Name</th><th>Tags</th><th>Zone</th><th>Address</th><th>User</th><th>HIP Profile</th><th>Zone</th><th>Address</th><th>Application</th><th>Service</th><th>Action</th><th>Profile</th></tr>
<tr><td>1</td><td>CRM access</td><td>none</td><td>corp-vpn
l3-trust</td><td>any</td><td>Finance</td><td>Missing Patch ...</td><td>l3-trust</td><td>any</td><td>sap</td><td>application-default</td><td>✓</td><td>none</td></tr>
<tr><td>2</td><td>Eng access</td><td>none</td><td>corp-vpn
l3-trust</td><td>any</td><td>Engineering</td><td>Missing Patch ...</td><td>l3-trust</td><td>any</td><td>bugzilla
perforce</td><td>application-default</td><td>✓</td><td>none</td></tr>
<tr><td>3</td><td>GP access</td><td>none</td><td>corp-vpn
l3-trust</td><td>any</td><td>any</td><td>any</td><td>l3-untrust</td><td>any</td><td>web-browsing</td><td>application-default</td><td>✓</td><td></td></tr>
</table></td></tr>
<tr><td>Step 10</td><td>Save the GlobalProtect configuration.</td><td>Click <b>Commit</b> on the portal and all gateways.</td></tr>
</table>

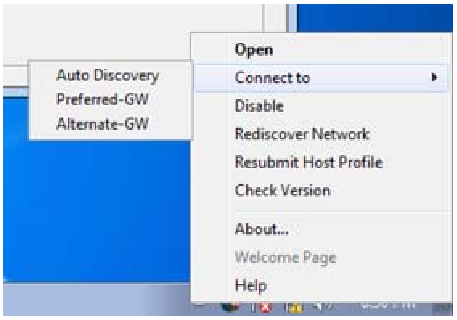
Manual Gateway Selection for Password Resets

When using Active Directory (AD)-based authentication with GlobalProtect, you can reset expired passwords using the manual gateway selection feature with certificate-based authentication. This feature enables users to manually select and connect to a gateway using certificate-based authentication, and then access the password reset service that is exclusively available through this manual gateway. You must have a security policy in place that prevents users from accessing any other resources or services while connected to the manual gateway.

To implement manual gateway selection for password resets, configure the GlobalProtect portal as follows:

Manual Gateway Selection for Password Resets		
Step 1	Log in to the GlobalProtect portal and create a root certificate for issuing self-signed certificates for GlobalProtect components. You can also use your own public-key infrastructure (PKI) to issue and distribute machine certificates to each client system, if you have an existing PKI infrastructure.	To use self-signed certificates, you must first create the root CA certificate. You will then use the root CA certificate to sign the certificates for the GlobalProtect components: 1. To create a root CA certificate, select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 2. Enter a **Certificate Name**, such as GlobalProtect_Root _CA. The certificate name cannot contain any spaces. 3. Verify that there is no value selected in the **Signed By** field (this is what indicates that the certificate is self-signed). If a value is selected, clear the field. 4. Select the **Certificate Authority** check box and then click **OK** to generate the certificate.
Step 2	Generate a self-signed client certificate. Use the root CA on the portal to generate client certificates for each client you plan to deploy.	1. Select **Device > Certificate Management > Certificates > Device Certificates** and then click **Generate**. 2. Enter a **Certificate Name**. The certificate name cannot contain any spaces. 3. In the **Common Name** field, enter a name to identify this certificate as an agent certificate, for example GP_Windows_clients. Because the portal will deploy this certificate to all agents using the same configuration, the name does not need to uniquely identify a specific end user or system. 4. In the **Signed By** field, select the root CA you previously created. 5. (Optional) In the Certificate Attributes section, click **Add** and define the attributes to identify the Global Protect clients as belonging to your organization if required as part of your security requirements. 6. Click **OK** to generate the certificate.
Step 3	Create a client certificate profile.	1. Select **Device > Certificate Management > Certificate Profile** and click **Add** and enter a profile **Name**. 2. Select a value for the **Username Field** to specify which field in the certificate will contain the user's identity information. 3. In the **CA Certificates** field, click **Add**, select the root CA certificate and then click **OK**.

Manual Gateway Selection for Password Resets		
Step 4	Create an alternate gateway using one of the interfaces of the GlobalProtect portal and configure it so that users can manually connect to it.	1. Select **Network > GlobalProtect > Gateways** and **Add** a new gateway or select an existing gateway to modify it. • On the **General** tab, enter a **Name** for the gateway you just created. • Select the **Interface**, **IP Address**, and **SSL/TLS Service Profile** from the drop-down in **Network Settings**. • Verify that the **Authentication Profile** is set to **None**. • Select the **Certificate Profile** you created in Step 3 to authenticate your users. 2. Select **Client Configuration > Tunnel Settings** to configure the tunnel parameters. Select the **Tunnel Mode** check box to enable tunneling and select the **Tunnel Interface** to use from the drop-down. 3. Select **Client Configuration > Network Settings** and add a new configuration. 4. Select **Configs > Network Settings** to specify the **IP Pool** to use. Click **Add** and then specify the IP address range to use. 5. Specify the network configuration settings for the clients on the **Client Configuration > Network Services** tab. You can manually assign the DNS server(s) and **DNS suffix** and WINS servers; or, if the firewall has an interface that is configured as a DHCP client, set the **Inheritance Source** to that interface to assign the GlobalProtect agent the same settings received by the DHCP client.
Step 5	Add the new alternate gateway information in the portal configuration and enable manual connection to it.	1. Select **Network > GlobalProtect > Portal** and select the portal configuration. 2. Select the agent configuration you have defined from the **Agent** tab. 3. Select the **Authentication** tab and configure an Authentication Override to enable the portal to use an encrypted cookie to authenticate agents when refreshing a configuration that has already been cached. Set the **Cookie Lifetime** to **1** day. 4. Select the **Gateways** tab and **Add** the new alternate gateway you have created with these settings: • **Priority**—Select **Manual only** to prevent the GlobalProtect agent from attempting to connect to this gateway when **Auto Discovery** is enabled on the client. • **Manual**—Select this check box to allow users to manually connect to (or switch to) this gateway. 5. Click **OK** twice to close the portal configuration window. 6. Click **Commit** to save the GlobalProtect configuration.

Manual Gateway Selection for Password Resets		
Step 6	Verify that a user with an expired password can log into the alternate gateway.  Auto Discovery Preferred-GW Alternate-GW Open Connect to Disable Rediscover Network Resubmit Host Profile Check Version About... Welcome Page Help	Right click the GlobalProtect icon, select **Connect to** and choose the alternate gateway. The user will then authenticate successfully using the certificate profile and can now access the password reset portal to reset the password. After changing the password, the user can switch back to using their preferred gateway manually or use **Auto Discovery** to enable GlobalProtect to choose the best gateway.