



NETWORK SECURITY FUNDAMENTALS V2

Lab 5: Managing Certificates

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Introduction

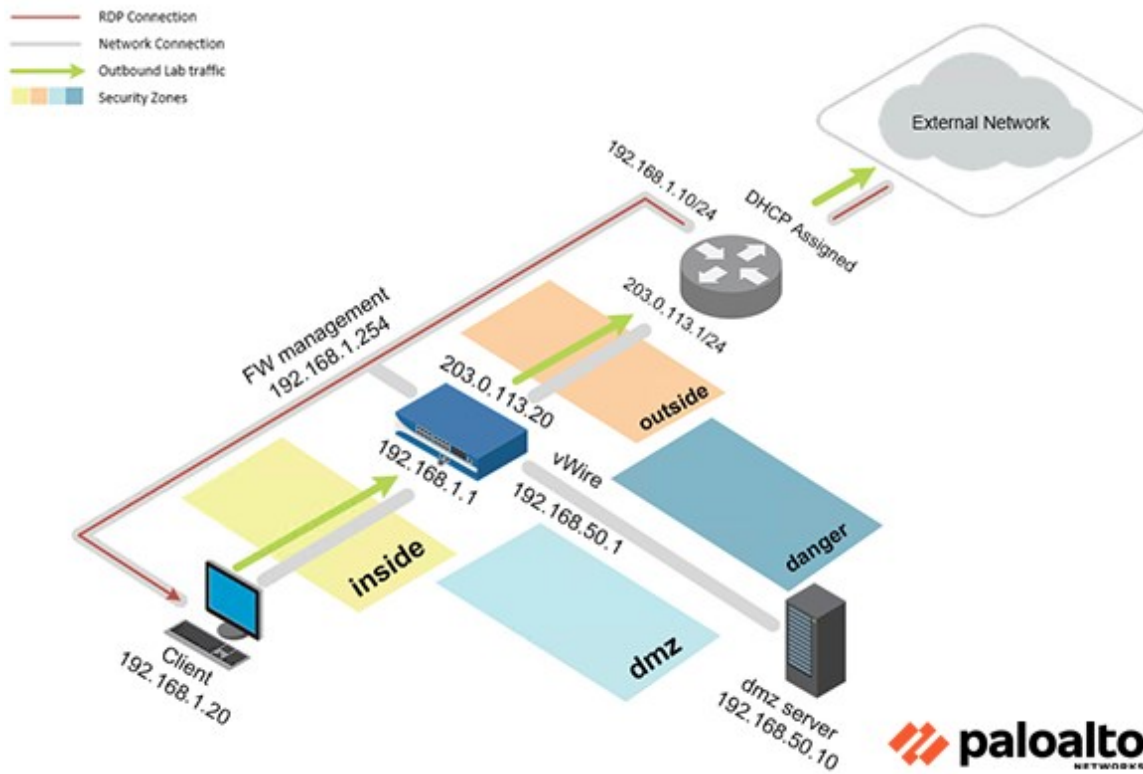
In this lab, you will generate a Self-Signed Root Certificate Authority (CA) certificate and replace the certificate for inbound management traffic. Then, you will import the root CA certificate on the Client machine.

Objective

In this lab, you will perform the following tasks:

- Generate Certificates
- Replace the Certificate for Inbound Management Traffic
- Export Certificate and Commit
- Test Connectivity and Import Certificate on the Client

Lab Topology



Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

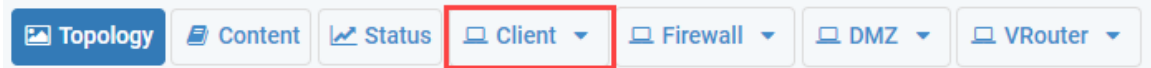
Virtual Machine	IP Address	Account (if needed)	Password (if needed)
Client	192.168.1.20	lab-user	Pal0Alt0!
DMZ	192.168.50.10	root	Pal0Alt0!
Firewall	192.168.1.254	admin	Pal0Alt0!

1 Managing Certificates

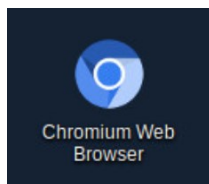
1.0 Load Lab Configuration

In this section, you will load the Firewall configuration file.

1. Click on the **Client** tab to access the Client PC.



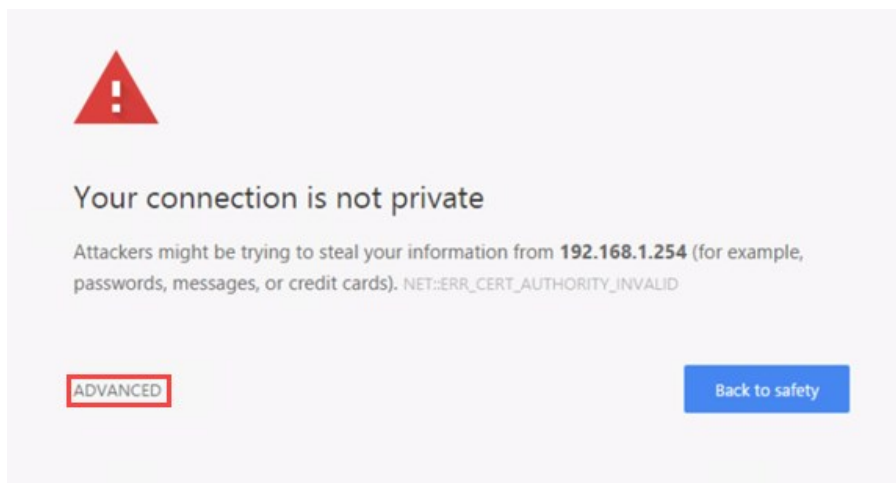
2. Log in to the Client PC as username `lab-user`, password `Pa10Alt0!`.
3. Double-click the **Chromium Web Browser** icon located on the desktop.



4. In the *Chromium address* field, type `https://192.168.1.254` and press **Enter**.

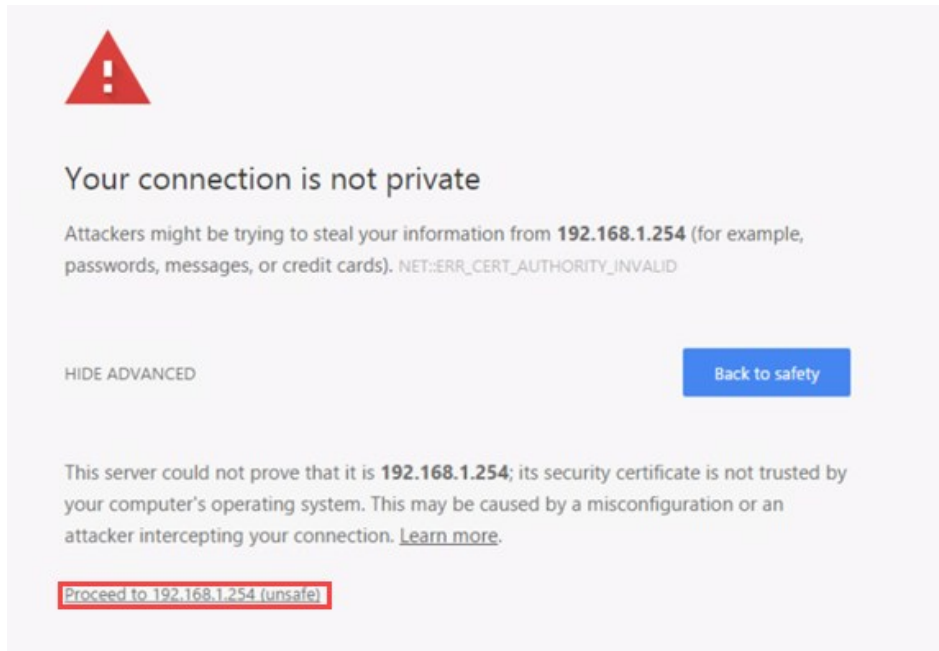


5. You will see a “Your connection is not private” message. Click on the **ADVANCED** link.



If you experience the “Unable to connect” or “502 Bad Gateway” message while attempting to connect to the specified IP above, please wait an additional 1-3 minutes for the Firewall to fully initialize. Refresh the page to continue.

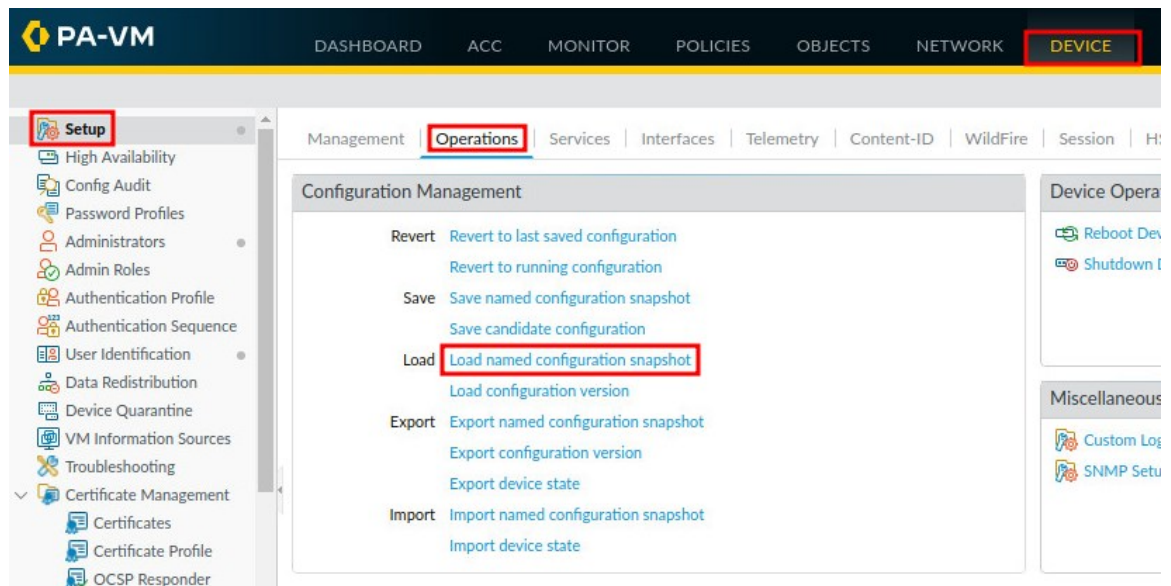
- Click on **Proceed to 192.168.1.254 (unsafe)**.



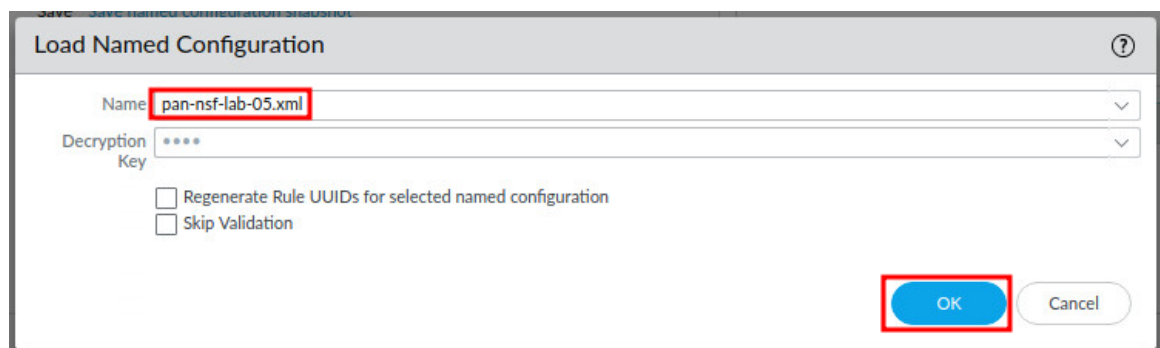
- Log in to the Firewall web interface as username admin, password Pal0Alt0!.



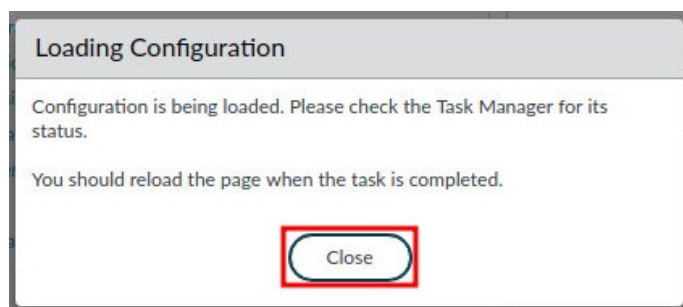
8. In the web interface, navigate to **Device > Setup > Operations** and click on **Load named configuration snapshot** underneath the *Configuration Management* section.



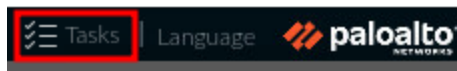
9. In the *Load Named Configuration* window, select **pan-nsf-lab-05.xml** from the *Name* dropdown box and click **OK**.



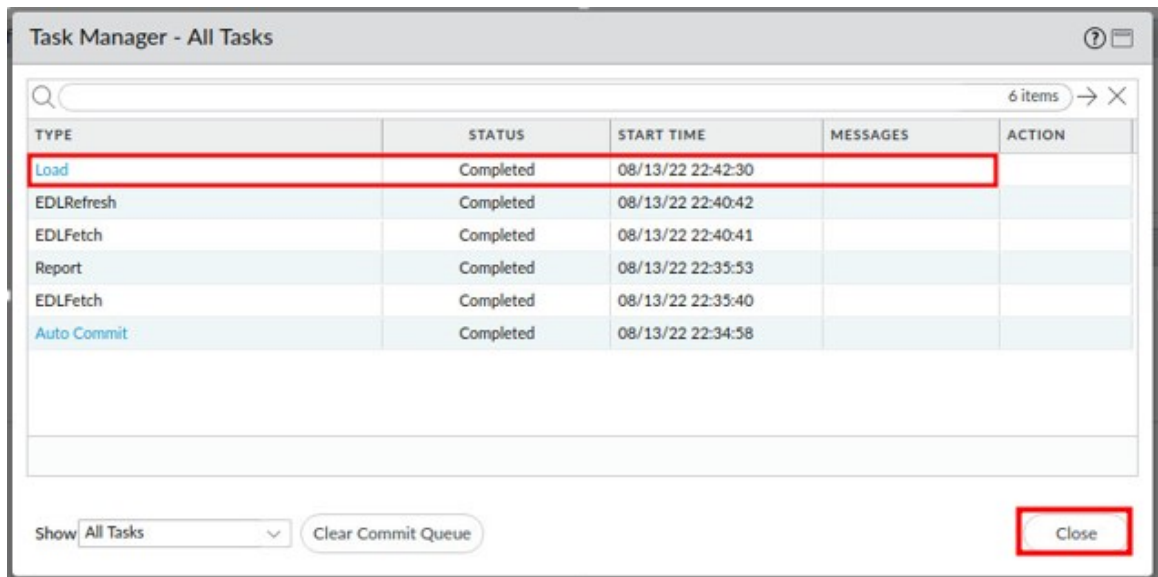
10. In the Loading Configuration window, a message will show *Configuration is being loaded. Please check the Task Manager for its status. You should reload the page when the task is completed.* Click **Close** to continue.



11. Click the **Tasks** icon located at the bottom-right of the web interface.



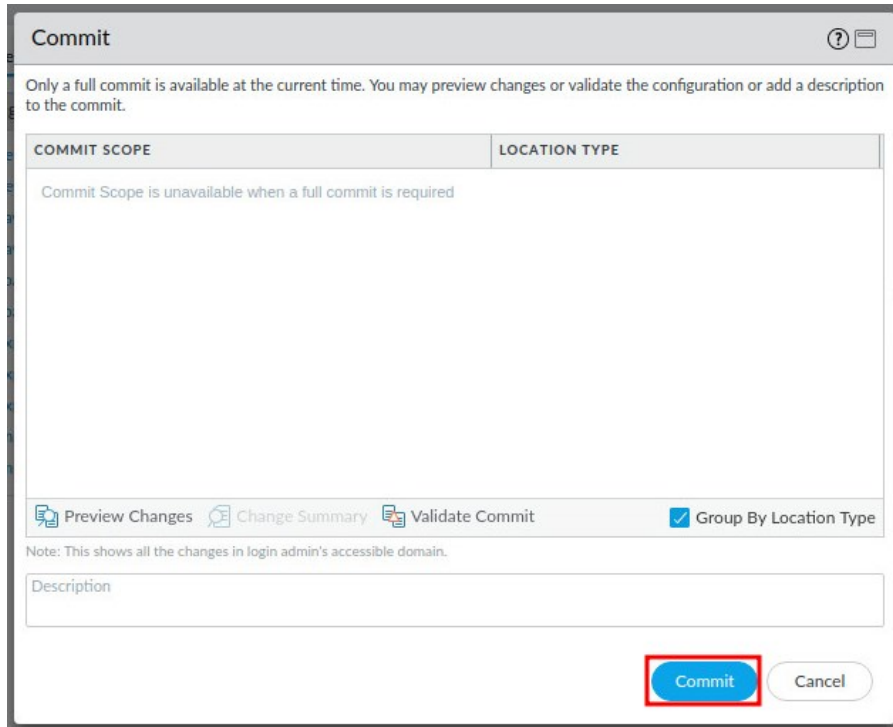
12. In the *Task Manager – All Tasks* window, verify the *Load* type has successfully completed. Click **Close**.



13. Click the **Commit** link located at the top-right of the web interface.

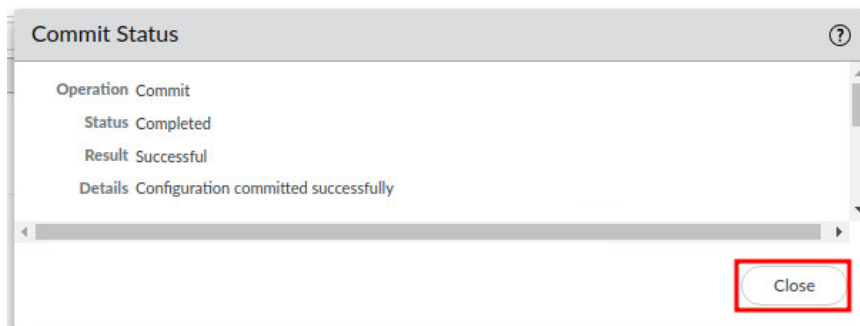


14. In the *Commit* window, click **Commit** to proceed with committing the changes.



The screenshot shows the 'Commit' window. At the top, a message states: 'Only a full commit is available at the current time. You may preview changes or validate the configuration or add a description to the commit.' Below this is a table with two columns: 'COMMIT SCOPE' and 'LOCATION TYPE'. The 'COMMIT SCOPE' column contains the text 'Commit Scope is unavailable when a full commit is required'. Below the table is a row of buttons: 'Preview Changes', 'Change Summary', 'Validate Commit', and a checked checkbox for 'Group By Location Type'. A note below the buttons reads: 'Note: This shows all the changes in login admin's accessible domain.' At the bottom is a 'Description' text field. The 'Commit' button is highlighted with a red rectangle.

15. When the commit operation successfully completes, click **Close** to continue.



The screenshot shows the 'Commit Status' window. It displays the following information: 'Operation Commit', 'Status Completed', 'Result Successful', and 'Details Configuration committed successfully'. A 'Close' button is highlighted with a red rectangle at the bottom right.

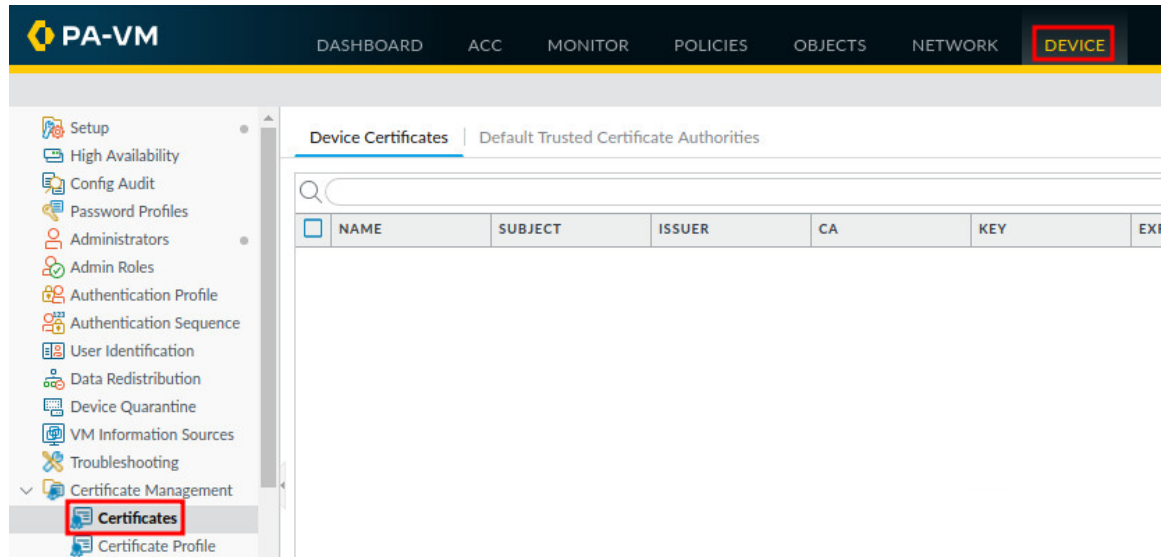


The commit process takes changes made to the Firewall and copies them to the running configuration, which will activate all configuration changes since the last commit.

1.1 Generate Certificates

In this section, you will generate two certificates. The first is a self-signed Root Certificate Authority (CA) certificate, which is the top-most certificate in the certificate chain. The Firewall can use this certificate to automatically issue certificates for other uses. In this lab, you will use the Root CA certificate to generate a new certificate for the Firewall to use for Inbound Management Traffic, replacing the default certificate issued specifically for this lab environment.

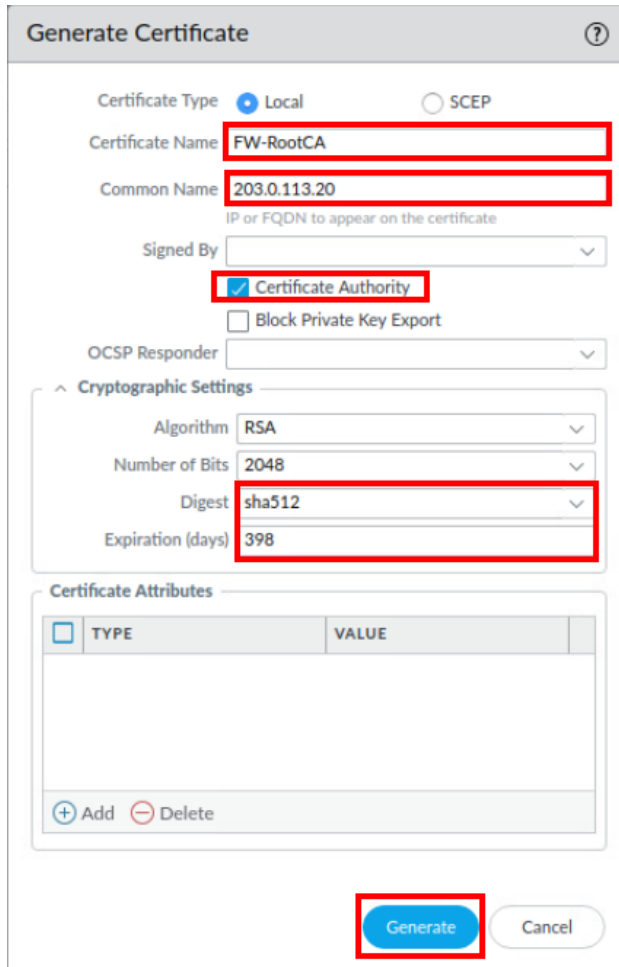
1. Navigate to **Device > Certificate Management > Certificates**.



2. Click on the **Generate** button at the bottom-center of the center section.



3. In the *Generate Certificate* window, type **FW-RootCA** in the *Certificate Name* field. Then, type **203.0.113.20** in the *Common Name* field. Next, click the **Certificate Authority** checkbox. Then, select **sha512** in the *Digest* dropdown. Next, type **398** in the *Expiration (days)* field. Finally, click the **Generate** button.



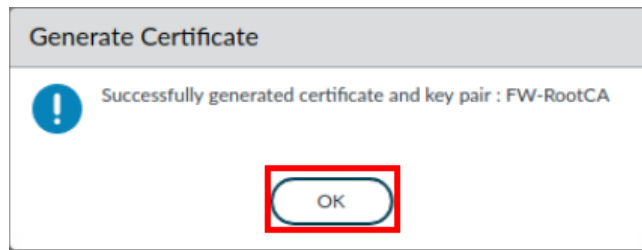
The screenshot shows the 'Generate Certificate' window with the following settings:

- Certificate Type: ☒ Local
- Certificate Name: **FW-RootCA**
- Common Name: **203.0.113.20**
- Signed By: (empty dropdown)
- ☒ Certificate Authority
- ☐ Block Private Key Export
- OCSP Responder: (empty dropdown)
- Cryptographic Settings:
 - Algorithm: RSA
 - Number of Bits: 2048
 - Digest: **sha512**
 - Expiration (days): **398**
- Certificate Attributes: (empty table with columns TYPE and VALUE)
- Buttons: **Generate** and Cancel



This will generate a certificate for the Firewall to act as a root Certificate Authority (CA). The IP address, **203.0.113.20**, used in the Common Name field is the Firewall's outside IP address. It is best practice that a digest algorithm of sha256 or higher is used for enhanced security. By increasing the default digest to **sha512**, you have created a much stronger certificate. The Expiration (days) value of **398** days represents the maximum certificate expiration time supported by modern web browsers.

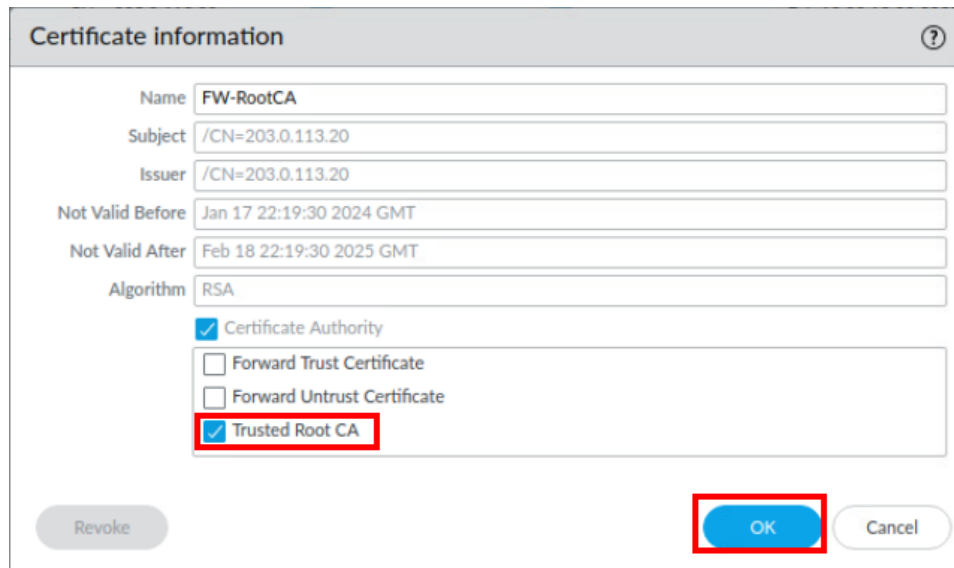
4. In the *Generate Certificate* window, click **OK** to continue.



5. Click on the **FW-RootCA** certificate to edit.



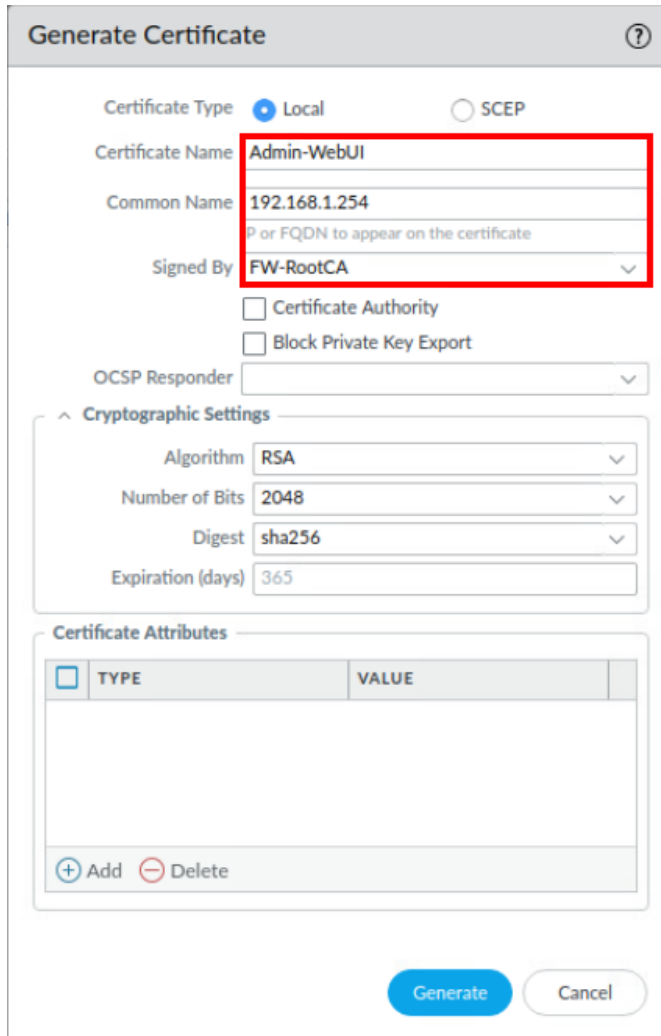
6. In the *Certificate information* window, check the checkbox for **Trusted Root CA** and click **OK**.



7. Click on the **Generate** button at the bottom-center of the center section.



8. In the *Generate Certificate* window, type Admin-WebUI in the *Certificate Name* field. Then, type 192.168.1.254 in the *Common Name* field. Next, select **FW-RootCA** in the *Signed By* dropdown. Continue to the next step to continue filling out information in the same window.



The screenshot shows the 'Generate Certificate' window. The 'Certificate Type' is set to 'Local'. The 'Certificate Name' is 'Admin-WebUI', the 'Common Name' is '192.168.1.254', and the 'Signed By' dropdown is set to 'FW-RootCA'. The 'Cryptographic Settings' section shows 'Algorithm' as 'RSA', 'Number of Bits' as '2048', 'Digest' as 'sha256', and 'Expiration (days)' as '365'. The 'Certificate Attributes' section is empty. The 'Generate' button is highlighted in blue.

TYPE	VALUE
------	-------

+ Add - Delete



The IP address, **192.168.1.254**, used in the Common Name field is the Firewall's inside IP address. Notice you selected the previously created root CA certificate, **FW-RootCA**, to sign this certificate. Client certificates that are used when requesting firewall services that rely on TLSv1.2 (such as administrator access to the web interface) cannot have sha512 as a digest algorithm, therefore you will leave the default **sha256**.

9. In the *Generate Certificate* window, click the **Add** button in the *Certificate Attributes* section. Then, select **Organization = "O" from ...** in the *Type* column. Next, double-click the empty box in the *Value* column, type Palo Alto Networks and press **Enter**.

Certificate Attributes

<input type="checkbox"/>	TYPE	VALUE
<input checked="" type="checkbox"/>	Organization = "O" from "Subject" field	Palo Alto Networks

10. In the *Generate Certificate* window, click the **Add** button in the *Certificate Attributes* section. Then, select **Email = "emailAddress" part of ...** in the *Type* column. Next, double-click the empty box in the *Value* column, type support@paloaltonetworks.com and press **Enter**.

Certificate Attributes

<input type="checkbox"/>	TYPE	VALUE
<input type="checkbox"/>	Organization = "O" from "Subject" field	Palo Alto Networks
<input type="checkbox"/>	Email = "emailAddress" part of "Subject" CN filed (CN=CommonName/emailA...	support@paloaltonetworks...

11. In the *Generate Certificate* window, click the **Add** button in the *Certificate Attributes* section. Then, select **Department = "OU" from ...** in the *Type* column. Next, double-click the empty box in the *Value* column, type Management Interface, and press **Enter**.

Certificate Attributes

<input type="checkbox"/>	TYPE	VALUE
<input type="checkbox"/>	Email = "emailAddress" part of "Subject" CN filed (CN=CommonName/emailA...	support@paloaltonetworks...
<input type="checkbox"/>	Department = "OU" from "Subject" field	Management Interface

12. In the *Generate Certificate* window, click the **Add** button in the *Certificate Attributes* section. Then, select **IP = "IP Address" from ...** in the *Type* column. Next, double-click the empty box in the *Value* column, type 192.168.1.254, and press **Enter**.

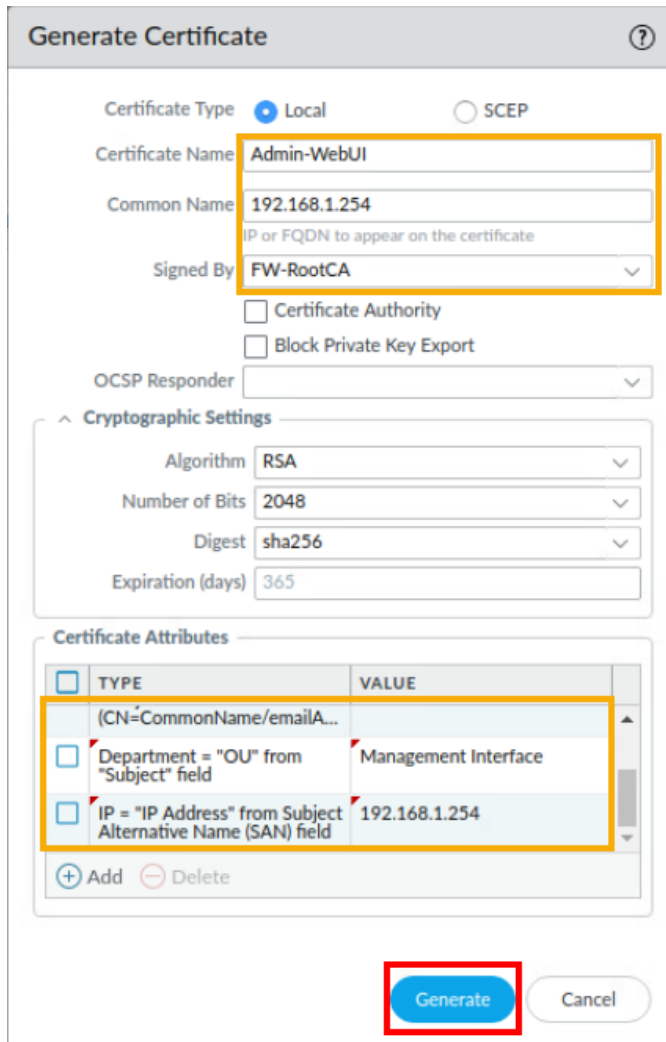
Certificate Attributes

<input type="checkbox"/>	TYPE	VALUE
<input type="checkbox"/>	(CN=CommonName/emailA...	
<input type="checkbox"/>	Department = "OU" from "Subject" field	Management Interface
<input checked="" type="checkbox"/>	IP = "IP Address" from Subject Alternative Name (SAN) field	192.168.1.254
<input type="button" value="+"/>	Add	<input type="button" value="-"/> Delete



Certificate Attributes are used to uniquely identify the firewall and the service that will use the certificate.

13. In the *Generate Certificate* window, review the settings. Then, click the **Generate** button.



The **Generate Certificate** window is shown with the following settings:

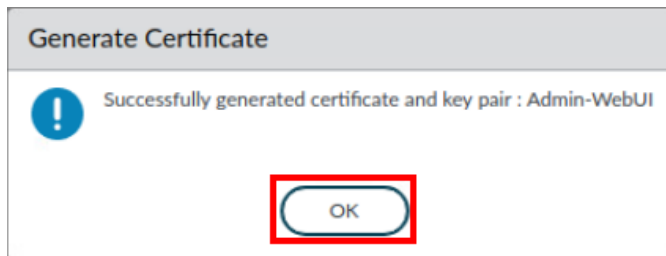
- Certificate Type:** Local (selected), SCEP
- Certificate Name:** Admin-WebUI
- Common Name:** 192.168.1.254 (with subtext: IP or FQDN to appear on the certificate)
- Signed By:** FW-RootCA
- ☐ Certificate Authority
- ☐ Block Private Key Export
- OCSP Responder:** (empty)
- Cryptographic Settings:**
 - Algorithm:** RSA
 - Number of Bits:** 2048
 - Digest:** sha256
 - Expiration (days):** 365
- Certificate Attributes:**

	TYPE	VALUE
<input type="checkbox"/>	(CN=CommonName/emailA...	
<input type="checkbox"/>	Department = "OU" from "Subject" field	Management Interface
<input type="checkbox"/>	IP = "IP Address" from Subject Alternative Name (SAN) field	192.168.1.254

+ Add - Delete

The **Generate** button is highlighted with a red box.

14. In the *Generate Certificate* window, click **OK** to continue.



The **Generate Certificate** window shows a success message: "Successfully generated certificate and key pair : Admin-WebUI". The **OK** button is highlighted with a red box.



Palo Alto Networks Firewalls use certificates in the following applications:

- User authentication for *Captive Portal*, *GlobalProtect™*, *Mobile Security Manager*, and web interface access to a firewall or *Panorama*.
- Device authentication for *GlobalProtect* VPN (remote user-to-site or large scale).
- Device authentication for IPSec site-to-site VPN with Internet Key Exchange (IKE).
- Decrypting inbound and outbound SSL traffic.

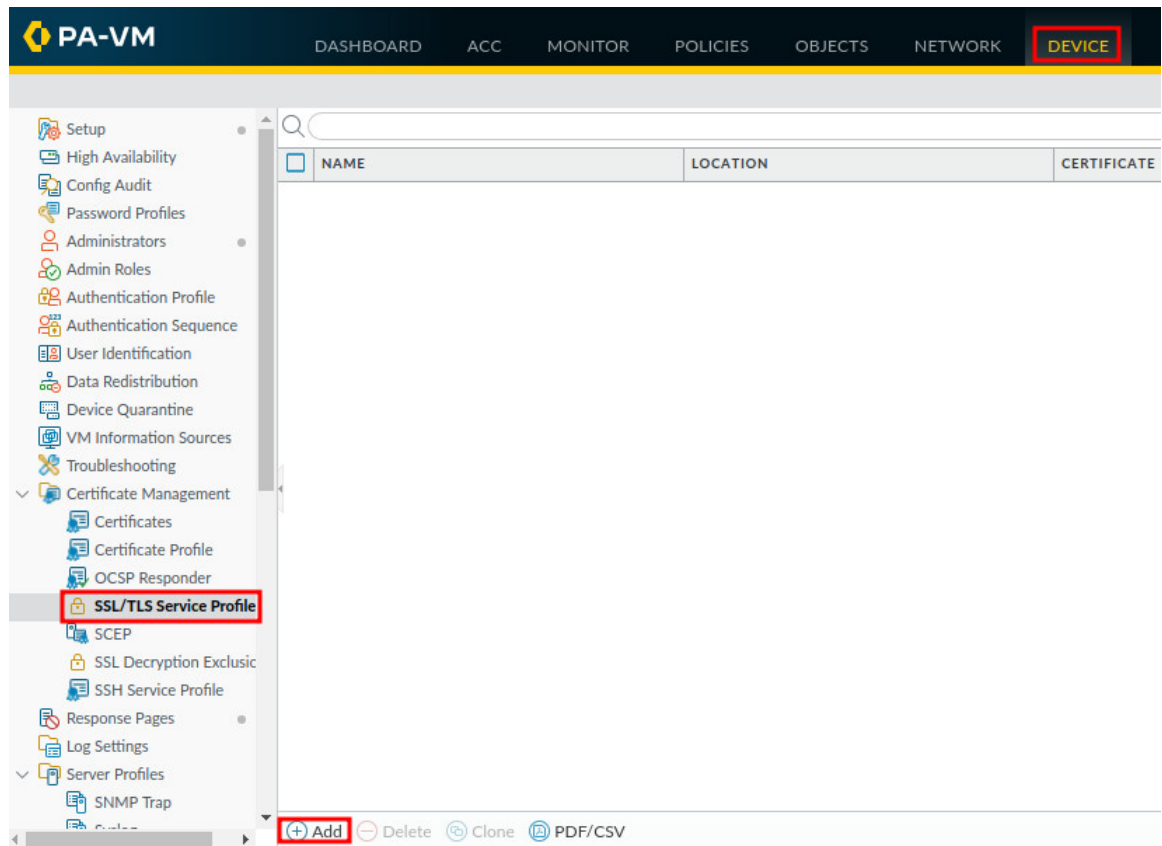
As a best practice, it is recommended you use different certificates for each usage.

In a real-world scenario, you can simplify your certificate deployment by using a certificate that the client systems already trust. It is recommended that you import a certificate and private key from your enterprise certificate authority (CA) or obtain a certificate from an external CA. The trusted root certificate store of the client systems is likely to already have the associated root CA certificate that ensures trust. This prevents you from having to create a root CA certificate and install it on every client system to prevent a certificate error.

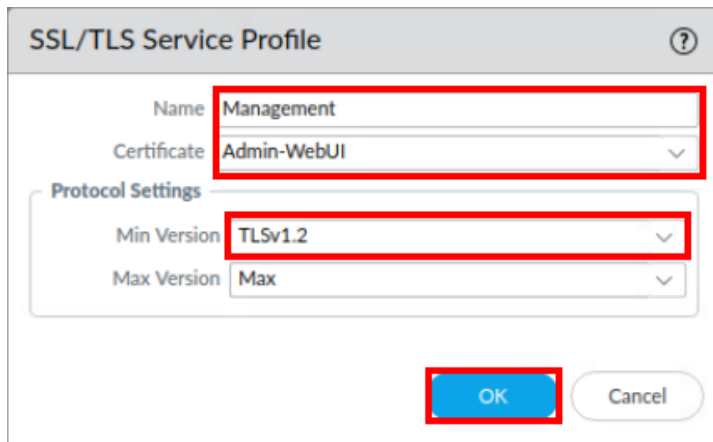
1.2 Replace the Certificate for Inbound Management Traffic

In this section, you will replace the certificate for inbound management traffic. When you boot the Firewall for the first time, it automatically generates a default certificate that enables HTTPS access to the web interface over the management (MGT) interface. To improve the security of inbound management traffic, you will configure an SSL/TLS Service Profile to replace the default certificate with the **Admin-WebUI** certificate you specifically created for this purpose. Then, you will apply the SSL/TLS Service Profile to inbound management traffic.

1. Navigate to **Device > Certificate Management > SSL/TLS Service Profile > Add**.

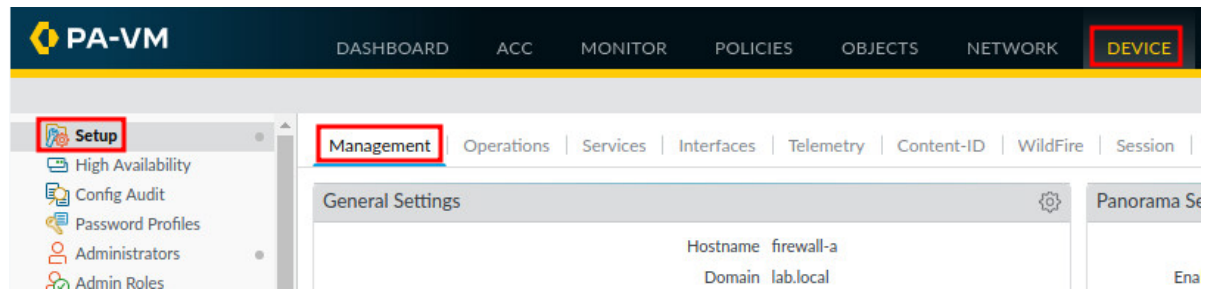


2. In the *SSL/TLS Service Profile* window, type **Management** in the *Name* field. Then, select **Admin-WebUI** from the *Certificate* dropdown. Next, select **TLSv1.2** from the *Min Version* dropdown. Finally, click the **OK** button.

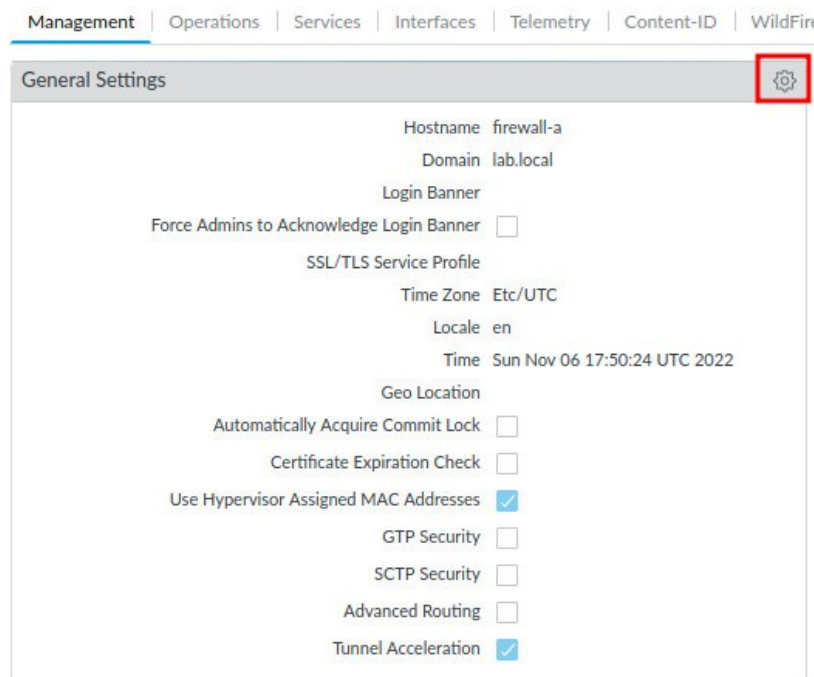


The screenshot shows the 'SSL/TLS Service Profile' configuration window. The 'Name' field is set to 'Management'. The 'Certificate' dropdown is set to 'Admin-WebUI'. Under 'Protocol Settings', the 'Min Version' dropdown is set to 'TLSv1.2' and the 'Max Version' dropdown is set to 'Max'. The 'OK' button is highlighted with a red box.

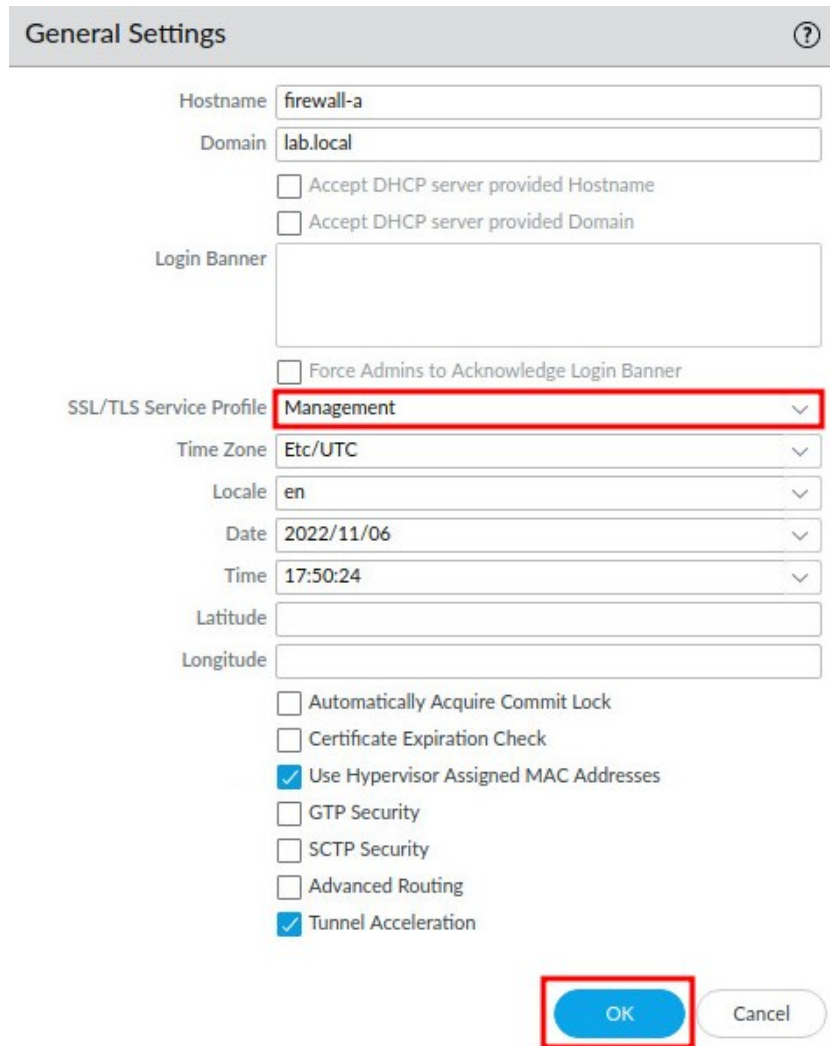
3. Navigate to **Device > Setup > Management**.



4. Click the **gear** icon on the *General Settings* section, located in the center.



5. In the *General Settings* window, select **Management** from the *SSL/TLS Service Profile* dropdown. Then, click the **OK** button.



The image shows a 'General Settings' window with a title bar containing a question mark icon. The window contains several configuration fields and checkboxes. The 'SSL/TLS Service Profile' dropdown is highlighted with a red rectangle and shows 'Management' selected. At the bottom, the 'OK' button is also highlighted with a red rectangle, next to a 'Cancel' button.

General Settings ⓘ

Hostname:

Domain:

☐ Accept DHCP server provided Hostname

☐ Accept DHCP server provided Domain

Login Banner:

☐ Force Admins to Acknowledge Login Banner

SSL/TLS Service Profile: **Management** ▼

Time Zone: ▼

Locale: ▼

Date: ▼

Time: ▼

Latitude:

Longitude:

☐ Automatically Acquire Commit Lock

☐ Certificate Expiration Check

☒ Use Hypervisor Assigned MAC Addresses

☐ GTP Security

☐ SCTP Security

☐ Advanced Routing

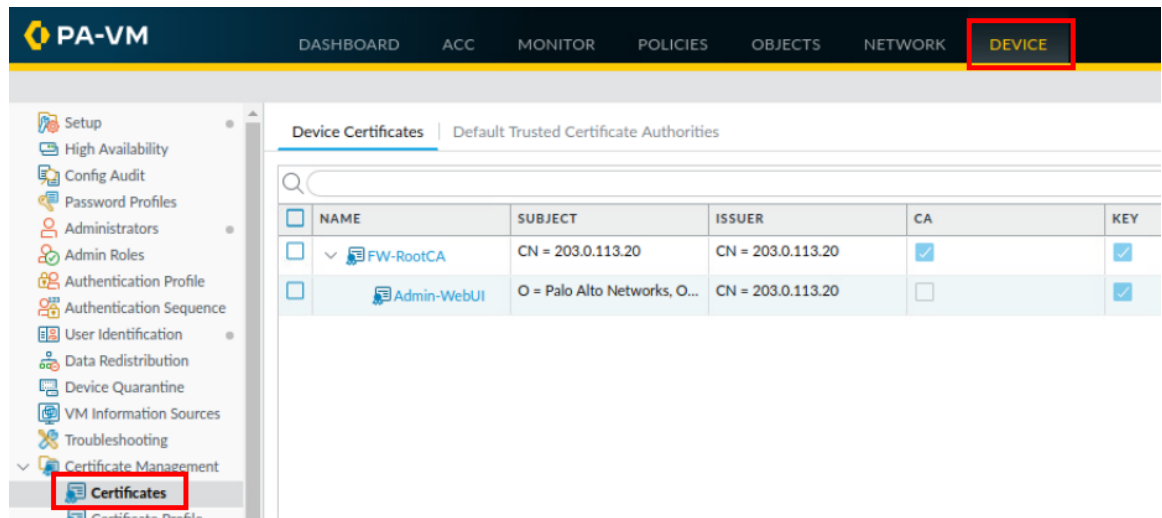
☒ Tunnel Acceleration

OK Cancel

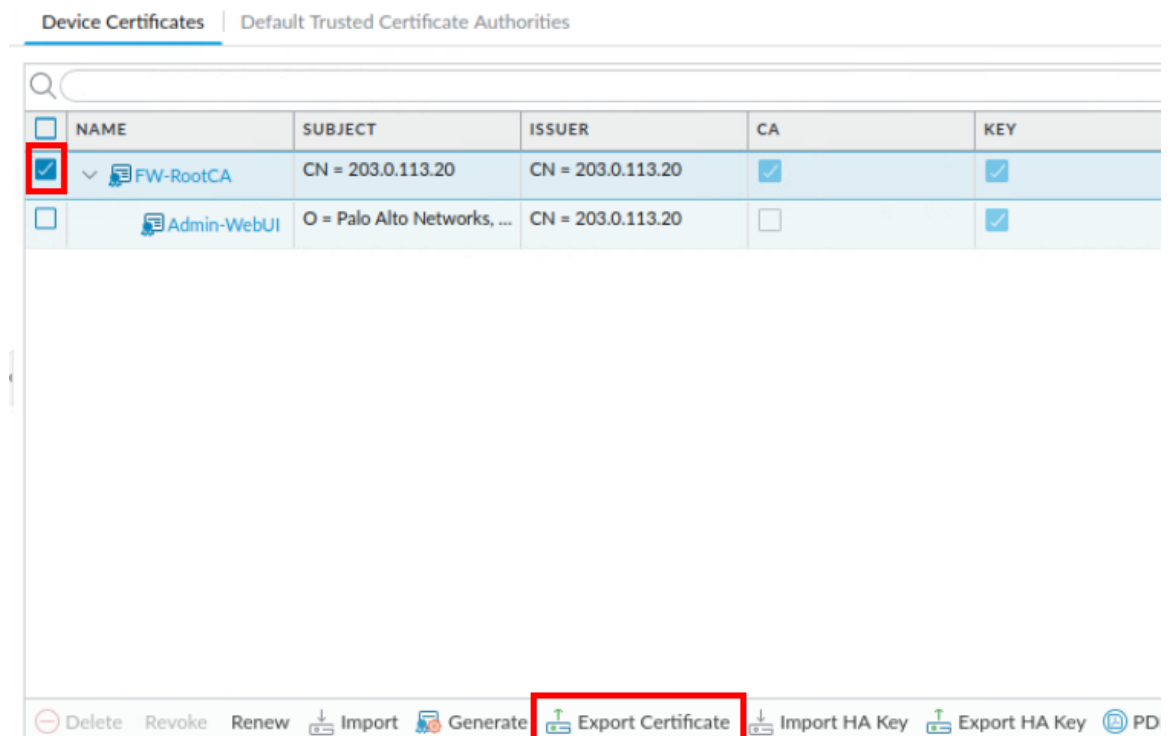
1.3 Export Certificate and Commit

In this section, you will export the **FW-RootCA** certificate. Then, you will commit your changes to the Firewall.

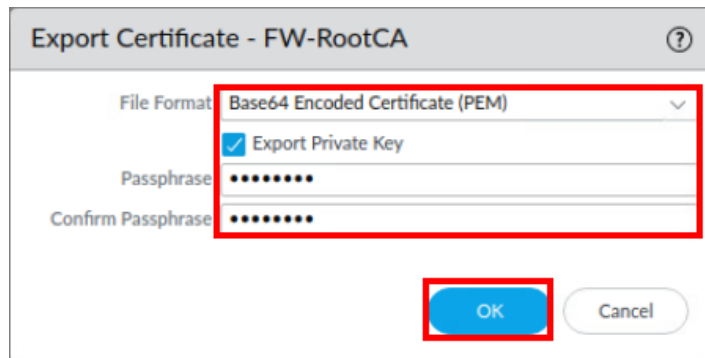
1. Navigate to **Device > Certificate Management > Certificates**.



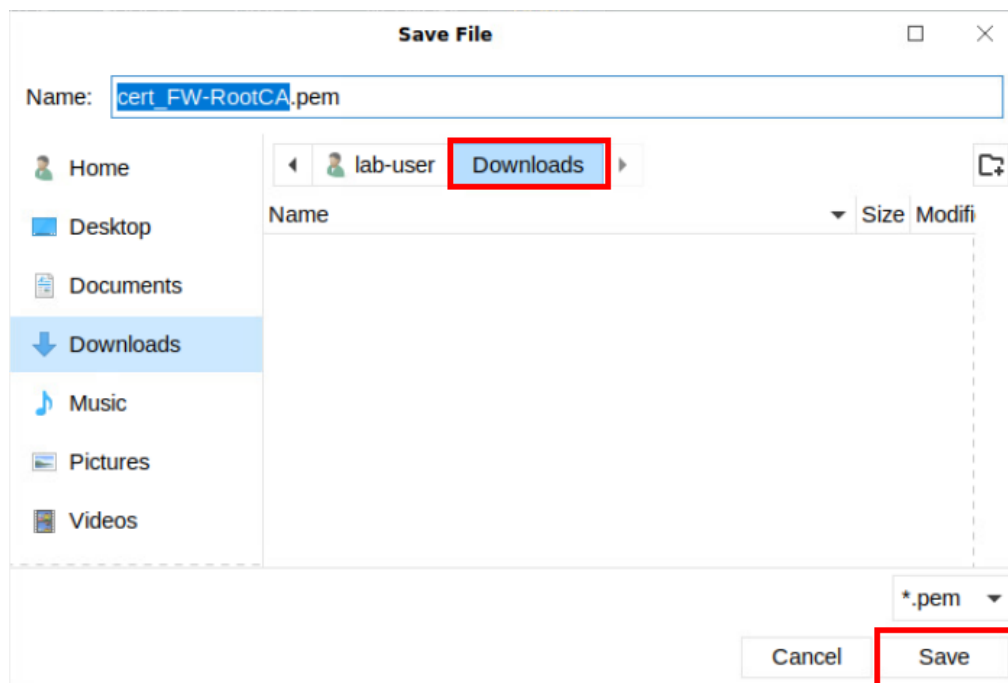
2. Click the checkbox for **FW-RootCA**. Then, click on the **Export Certificate** button at the bottom.



3. In the *Export Certificate – FW-RootCA* window, select **Base64 Encoded Certificate (PEM)** in the *File Format* dropdown. Check **Export private key**. Then, type `palto` for the *Passphrase* and *Confirm Passphrase* fields, and then click on the **OK** button.

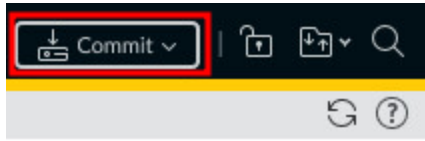


4. In the *Save File* window, make sure `cert_FW-RootCA.pem` is located in the *Name* field, verify that `cert_FW-RootCA` is going to the **Downloads** folder. Then, click the **Save** button.

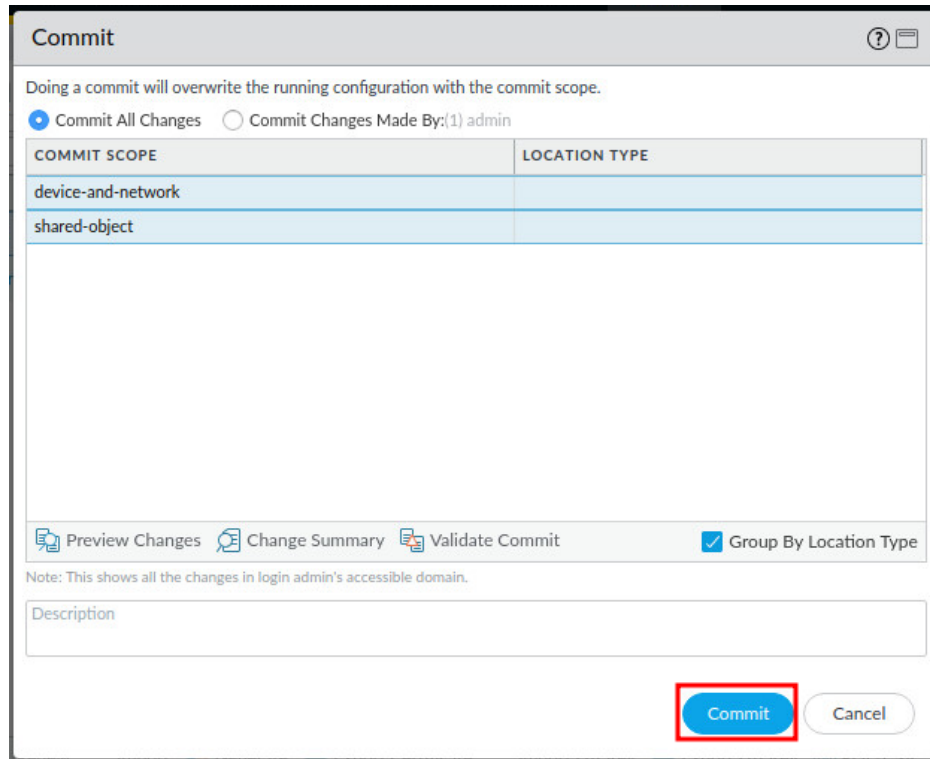


By using the **Base64 Encoded Certificate (PEM) File Format**, this generates a certificate signing request to accept SSL certificates.

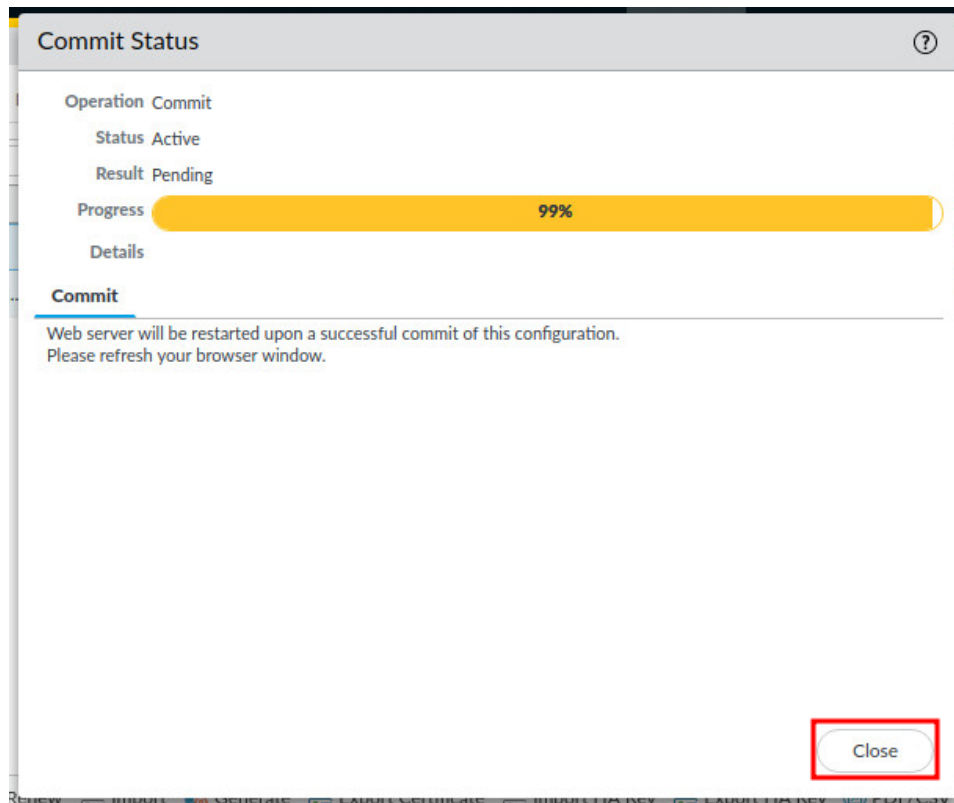
- Click the **Commit** link located at the top-right of the web interface.



- In the *Commit* window, click **Commit** to proceed with committing the changes.

A screenshot of a 'Commit' dialog box. The title bar says 'Commit'. Below the title bar, there is a warning message: 'Doing a commit will overwrite the running configuration with the commit scope.' Below this, there are two radio buttons: 'Commit All Changes' (selected) and 'Commit Changes Made By: (1) admin'. Below the radio buttons is a table with two columns: 'COMMIT SCOPE' and 'LOCATION TYPE'. The table has two rows: 'device-and-network' and 'shared-object'. Below the table, there are three tabs: 'Preview Changes', 'Change Summary', and 'Validate Commit'. To the right of the tabs is a checkbox labeled 'Group By Location Type' which is checked. Below the tabs is a note: 'Note: This shows all the changes in login admin's accessible domain.' Below the note is a text input field labeled 'Description'. At the bottom right of the dialog, there are two buttons: 'Commit' (highlighted with a red box) and 'Cancel'.

- When the commit operation reaches 99%, click **Close** to continue.



Notice the warning about the Web server being restarted, this is because of the authentication changes you made. You will need to click the **Close** button when it gets to 99%, since the web server is restarting, you will not see it get to 100%.

- Click the **X** in the upper-right to close *Chromium*.



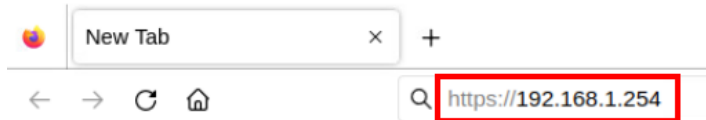
1.4 Test Connectivity and Import Certificate on the Client

In this section, you will test the connectivity to the Firewall. When establishing a secure connection with the Firewall, the Client must trust the root CA that issued the certificate. Otherwise, the Client browser will display a warning that the certificate is invalid and might (depending on security settings) block the connection. To prevent this, you will import the *FW-RootCA* certificate on the Client, creating a trust relationship between the Firewall and the Client machine. Then, you will test connectivity again.

1. Open **Firefox** from the taskbar.



2. In the *Firefox* address bar, type `https://192.168.1.254` and press **Enter**.



3. You will see a “*Warning: Potential Security Risk Ahead*” message. This is because the Client cannot verify the certificate from the Firewall. Notice the error code displays information relating to the certificate not being able to be verified due to an unknown issuer. To view the certificate, click the **Advanced** button, scroll to the bottom of the security window, and select **View Certificate**.



Warning: Potential Security Risk Ahead

Firefox detected a potential security threat and did not continue to **192.168.1.254**. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.

What can you do about it?

The issue is most likely with the website, and there is nothing you can do to resolve it.

If you are on a corporate network or using antivirus software, you can reach out to the support teams for assistance. You can also notify the website's administrator about the problem.

[Learn more...](#)

[Go Back \(Recommended\)](#)

[Advanced...](#)

Someone could be trying to impersonate the site and you should not continue.

Websites prove their identity via certificates. Firefox does not trust 192.168.1.254 because its certificate issuer is unknown, the certificate is self-signed, or the server is not sending the correct intermediate certificates.

Error code: `SEC_ERROR_UNKNOWN_ISSUER`

[View Certificate](#)

[Go Back \(Recommended\)](#)

[Accept the Risk and Continue](#)

4. In the *Certificate for 192.168.1.254* tab, view the contents of the certificate.

Certificate

192.168.1.254		203.0.113.20	
Subject Name			
Organization	Palo Alto Networks		
Organizational Unit	Management Interface		
Common Name	192.168.1.254		
Email Address	support@paloaltonetworks.com		
Issuer Name			
Common Name	203.0.113.20		
Validity			
Not Before	Wed, 17 Jan 2024 22:28:22 GMT		
Not After	Thu, 16 Jan 2025 22:28:22 GMT		
Subject Alt Names			
IP Address	192.168.1.254		
Subject Alt Names			
IP Address	192.168.1.254		
Public Key Info			
Algorithm	RSA		
Key Size	2048		
Exponent	65537		
Modulus	BE:94:F6:37:36:E7:83:D6:7D:0F:83:33:2D:F3:CB:A2:E4:B1:19:5B:A7:39:FB:...		
Miscellaneous			
Serial Number	6E:E0:B0:9A		
Signature Algorithm	SHA-256 with RSA Encryption		
Version	3		
Download	PEM (cert) PEM (chain)		
Fingerprints			
SHA-256	25:64:D0:58:AB:D2:EF:A4:92:34:44:1D:3C:04:F2:D0:A5:85:1C:70:66:F3:CF:...		
SHA-1	66:5E:84:0C:67:BE:EB:0E:4A:B8:98:F4:49:95:BE:00:81:CC:90:66		
Basic Constraints			
Certificate Authority	No		

- Click on the **203.0.113.20** tab near the top to view additional contents of the certificate.

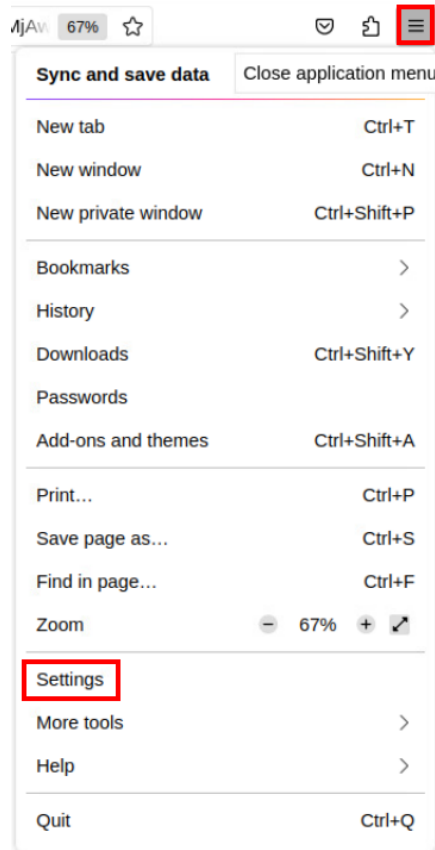
Certificate

192.168.1.254	203.0.113.20
Subject Name Common Name 203.0.113.20	
Issuer Name Common Name 203.0.113.20	
Validity Not Before Wed, 17 Jan 2024 22:19:30 GMT Not After Tue, 18 Feb 2025 22:19:30 GMT	
Public Key Info Algorithm RSA Key Size 2048 Exponent 65537 Modulus CB:99:5E:B5:51:03:4F:AF:A5:62:35:03:37:EE:19:FF:D3:A5:B7:99:36:17:BF:...	
Miscellaneous Serial Number 00:9A:4E:8A:43:05:B1:74:D5 Signature Algorithm SHA-512 with RSA Encryption Version 3 Download PEM (cert) PEM (chain)	
Fingerprints SHA-256 9D:C3:E4:4E:44:82:C0:84:86:91:25:42:97:BB:69:97:35:10:A3:A3:1E:67:5... SHA-1 04:2E:2A:2E:76:3D:FC:2C:E7:03:D1:E3:8F:17:1C:D6:8D:D4:BA:B9	
Basic Constraints	

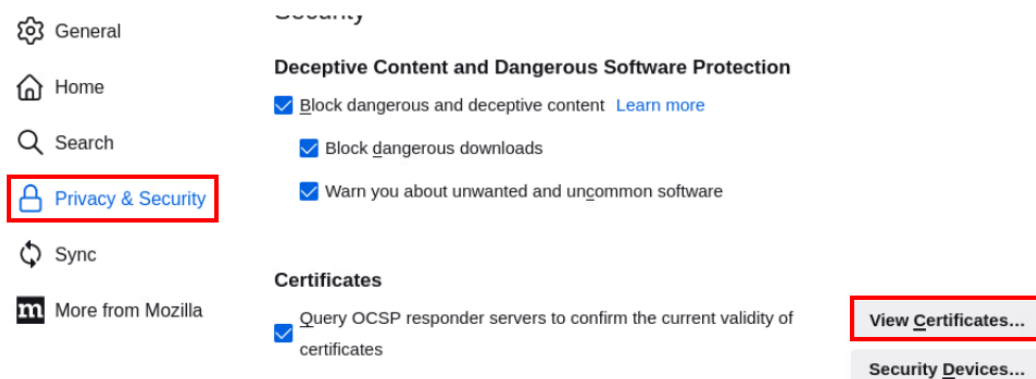


Notice on the general tab it matches the **Admin-WebUI** certificate you created earlier in section 5.1. The sha256 algorithm is being used in the fingerprints. The certificate was issued by **203.0.113.20**, which is the common-name of the root CA certificate, **FW-RootCA**, you created. The Validity Period indicates the certificate is valid for 398 days. The Organization is **Palo Alto Networks**.

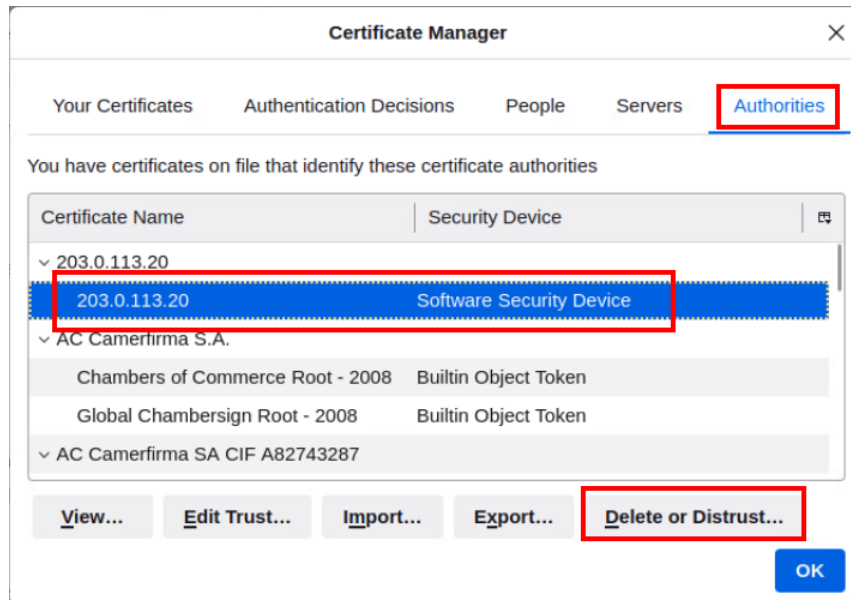
- Before importing certificates, let's make sure to clear the *Firefox* browser of any old, outstanding certificates that may be cached on the system. Click on the **3-bar** menu icon and click **Settings**.



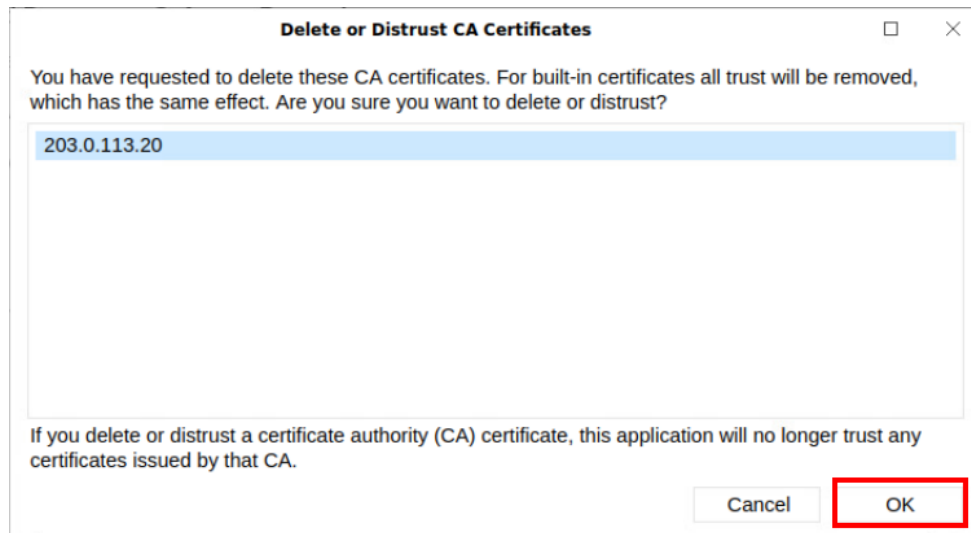
- Click on **Privacy & Security** from the menu on the left and then scroll down to click on the **View Certificates** button.



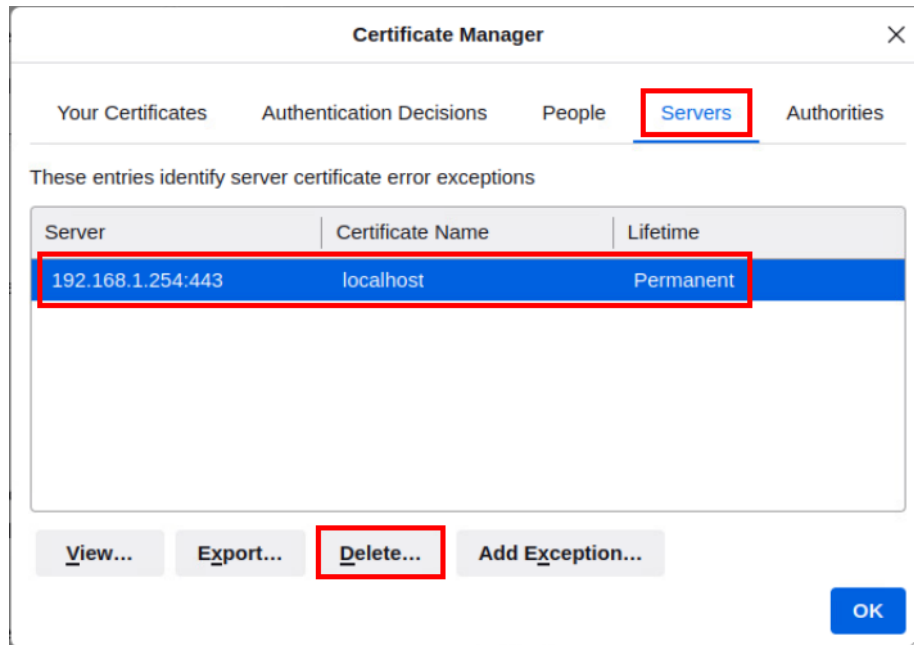
8. In the *Certificate Manager* window, view the **Authorities** tab and select the **203.0.113.20** entry. Click the **Delete or Distrust** button.



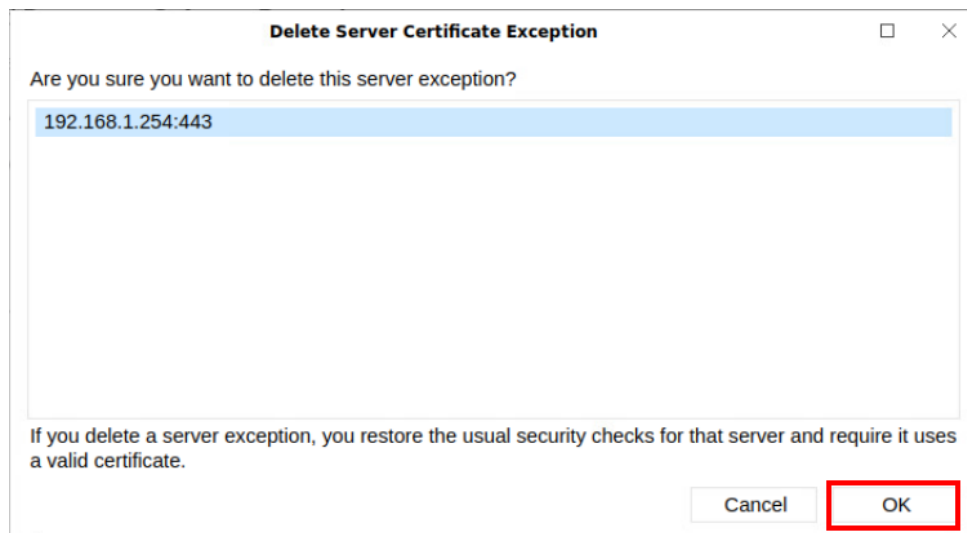
9. Confirm the deletion by clicking **OK**.



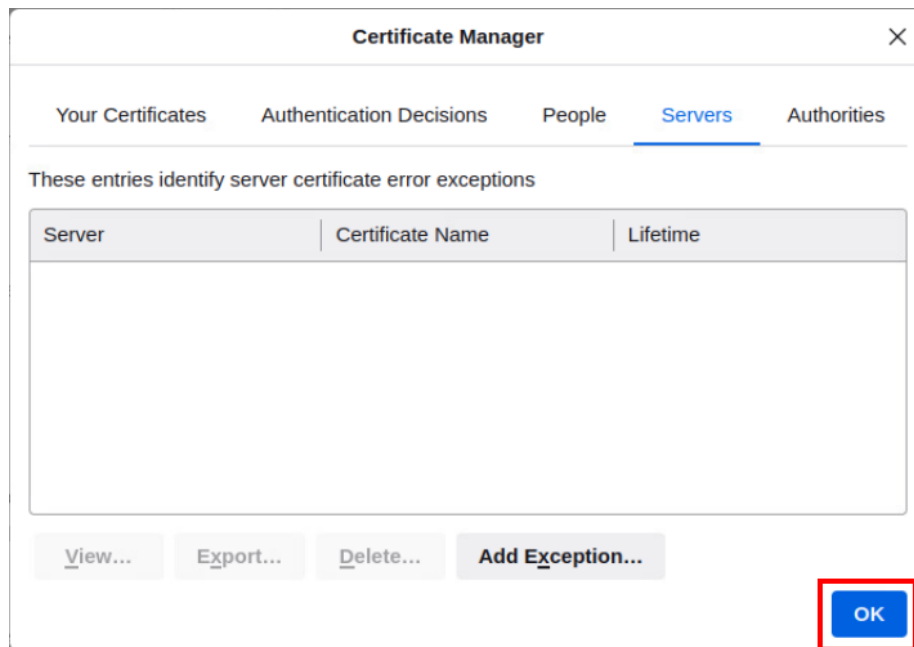
10. Back in the *Certificate Manager* window, confirm the entry is removed. Click on the **Servers** tab. Select the **192.168.1.254:443** entry and click the **Delete** button.



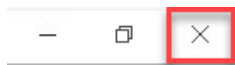
11. Confirm the deletion by clicking **OK**.



12. Back in the *Certificate Manager* window, confirm the entry is deleted and click **OK**.



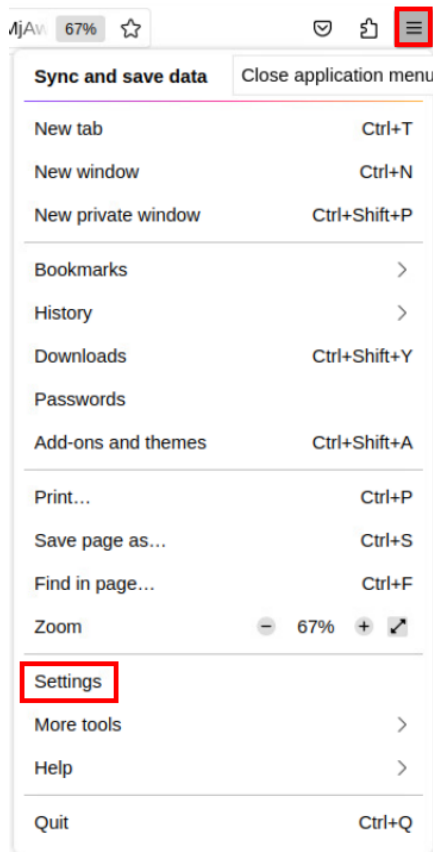
13. Click the **X** in the upper-right to close *Firefox*.



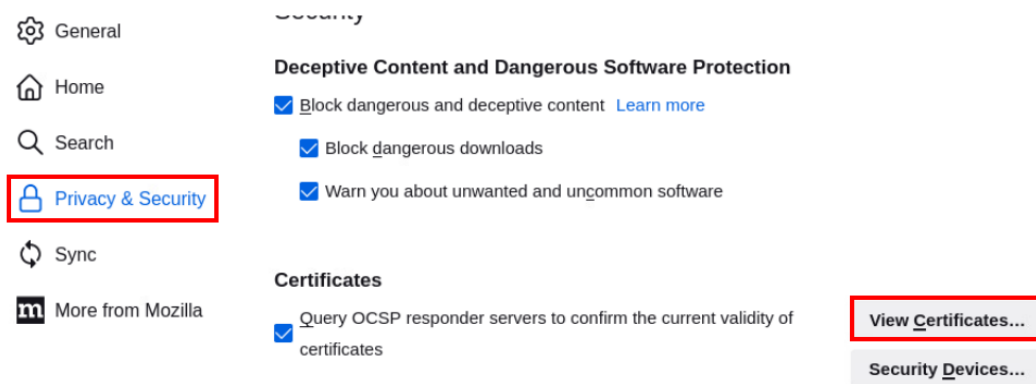
14. To import the **FW-RootCA** certificate, open **Firefox** from the taskbar.



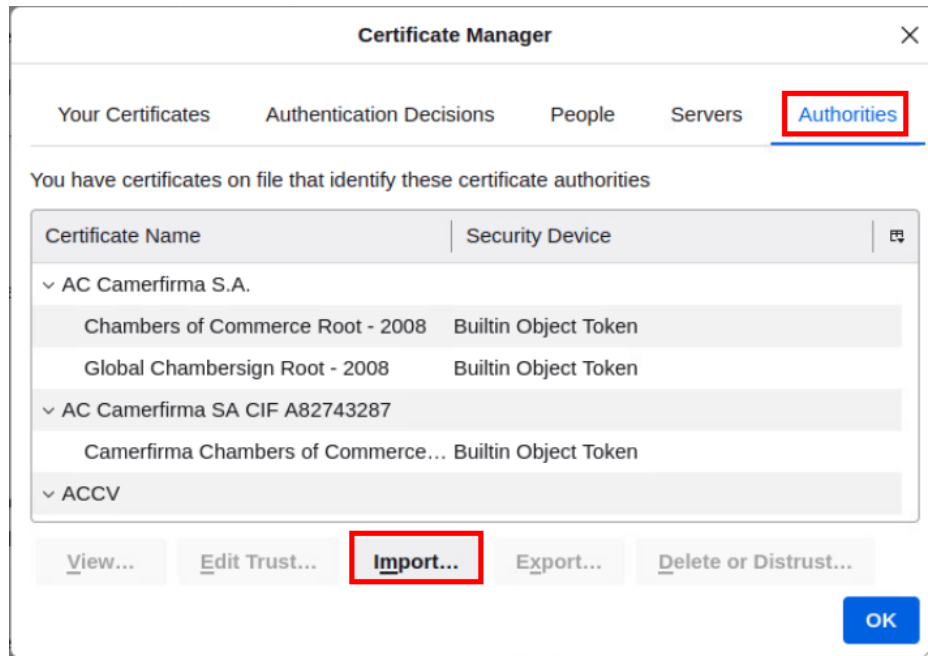
15. Click on the **3-bar** menu icon and click **Settings**.



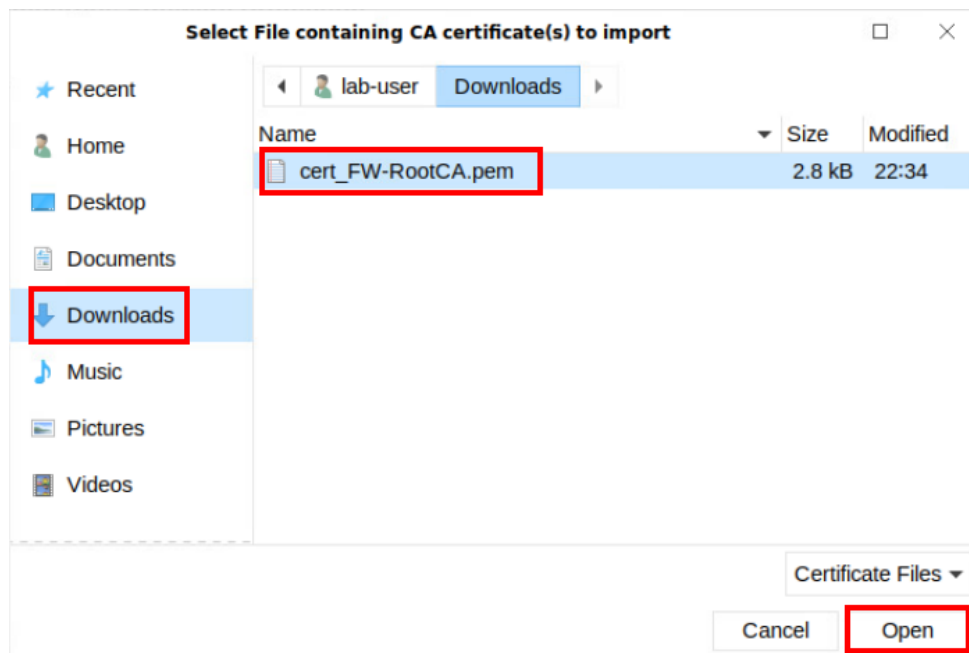
16. Click on **Privacy & Security** from the menu on the left and then scroll down to click on the **View Certificates** button.



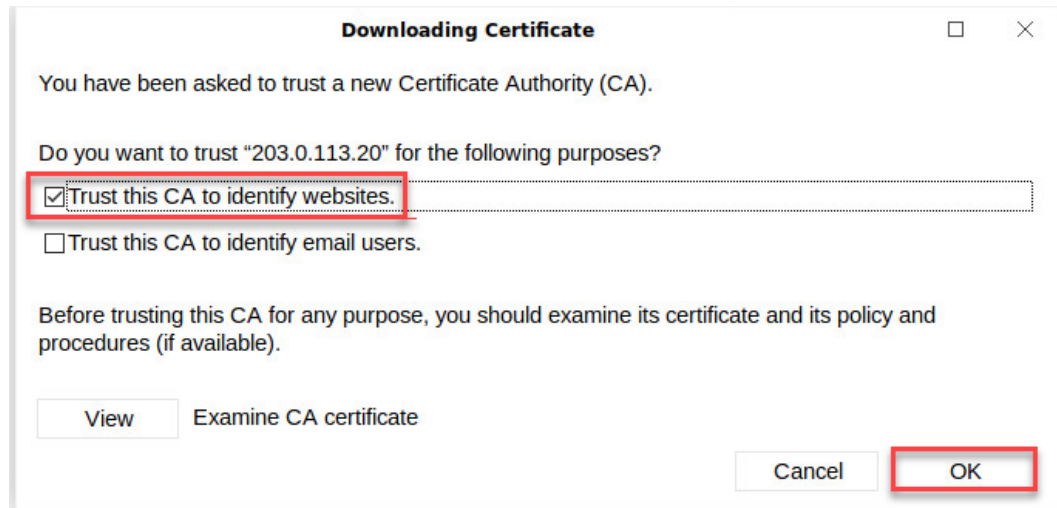
17. In the *Certificate Manager* window, click on the **Authorities** tab followed by clicking the **Import** button.



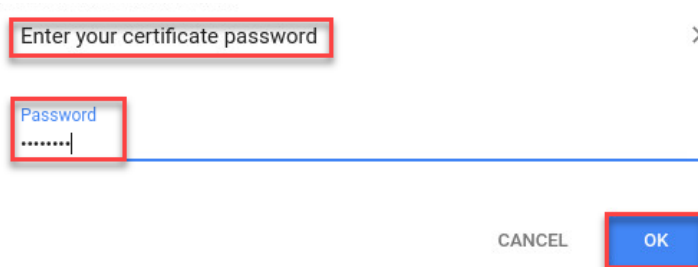
18. In the *Select File containing CA certificate(s) to import* window, navigate to the **Downloads** folder and select the **cert_FW-RootCA.pem** file. Click the **Open** button.



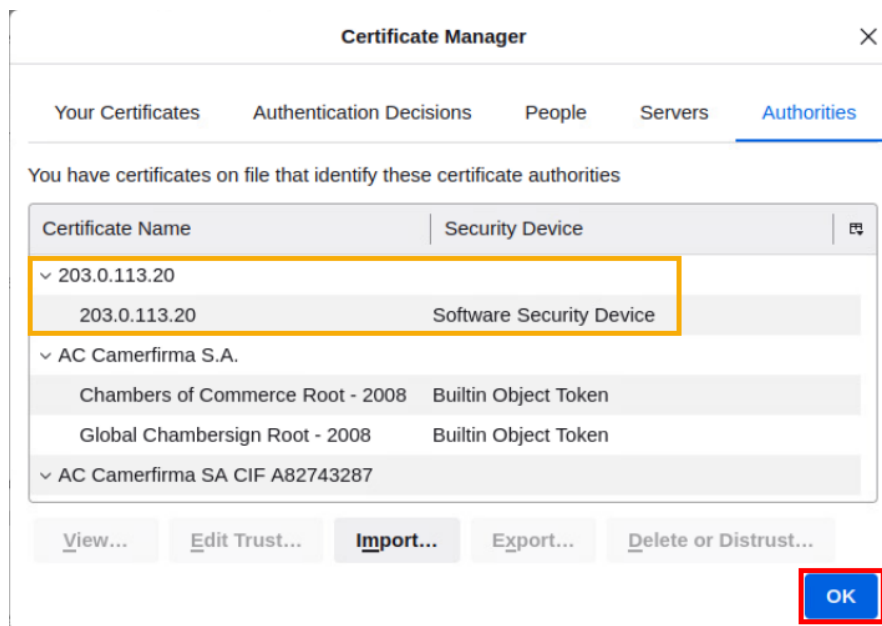
19. In the *Downloading Certificate* window, check the checkbox for **Trust this CA to identify websites**. Click **OK**.



20. If the *Enter your certificate password* window pops up, enter pa1oal to and click **OK**.



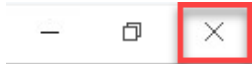
21. In the *Certificate Manager* window, verify the **FW-RootCA** certificate has been imported. Click **OK**.





Notice that the common name of *203.0.113.20* is shown. This is the common name of the firewall.

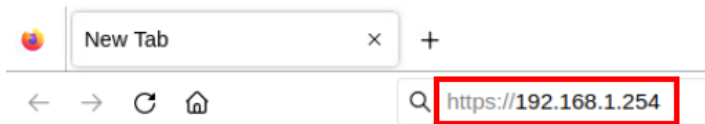
22. Click on the **X** in the upper-right to close *Firefox* so that it can reload properly.



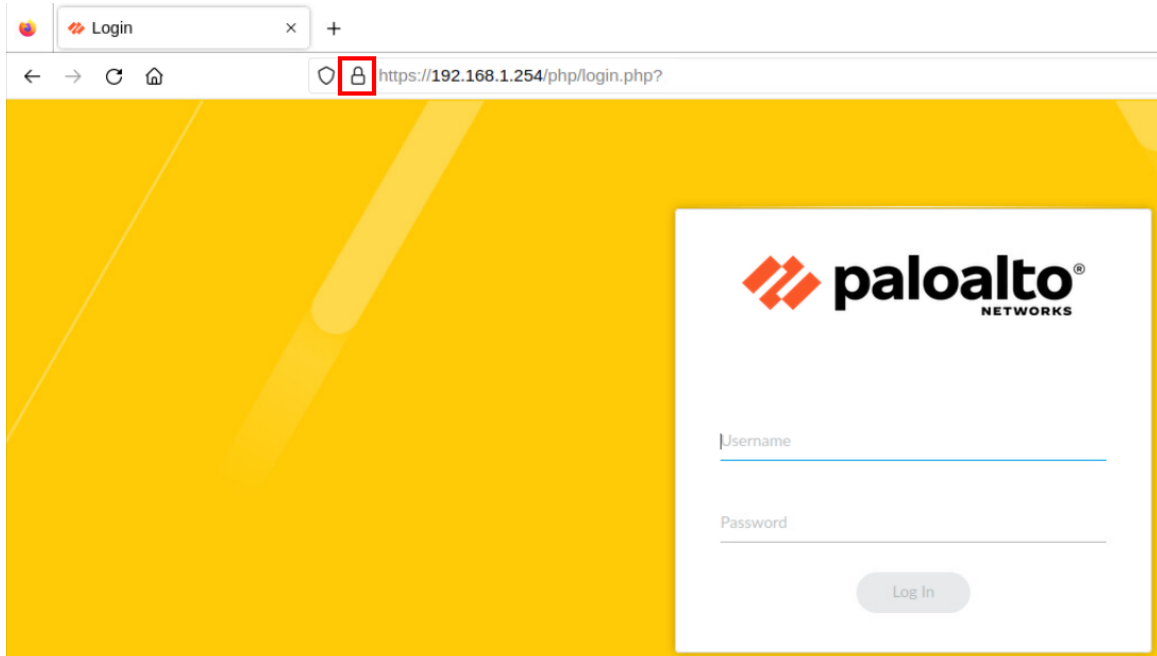
23. Open **Firefox** from the taskbar.



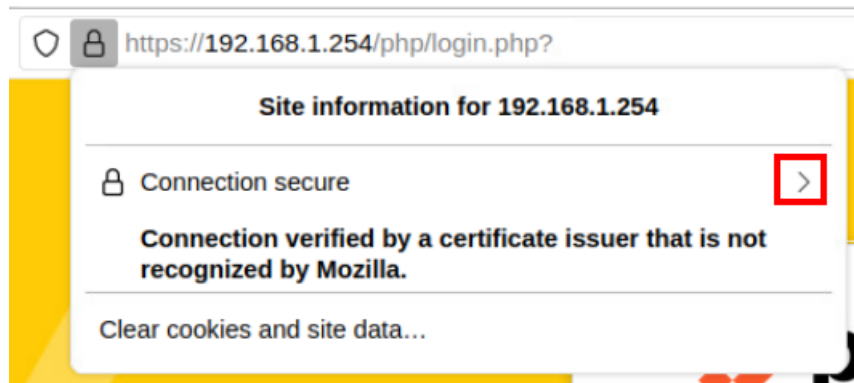
24. In the *Firefox* address field, type `https://192.168.1.254` and press **Enter**.



25. Notice that the login prompt to the firewall immediately appears this time. Also, take notice of the secured padlock icon in the address bar, signaling a secure connection. Click on the **padlock icon**.



26. In the *Site Information for 192.168.1.254* popup, click the **right arrow** to show more information.



27. In the *Connection Security for 192.168.1.254* window, notice the message “You are securely connected to this site”. Below, you will see it has also been “Verified by: 203.0.113.20”.



28. The lab is now complete; you may end the reservation.