



Midspace - Secured Web Browsing Certificate Management

Revision 2.01

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1 INTRODUCTION

1.1 General

This document describes how to create, upload and manage self-signed/CA signed certificate for the various Midspan products. Both SSL and TLS security protocols are supported by the unit, although only TLSv1.1 and above are supported by recent web browsers.

**NOTE:**

Heartbleed security flow found in OpenSSL on 2014 was the drive behind abandoning SSLv3 by all web browsers, adopting TLSv1.1 or higher instead.

1.2 Enforcing secured web browsing

To enforce secure web browsing, enable **Web SSL Encryption** from within the configuration web page as in Figure 1.

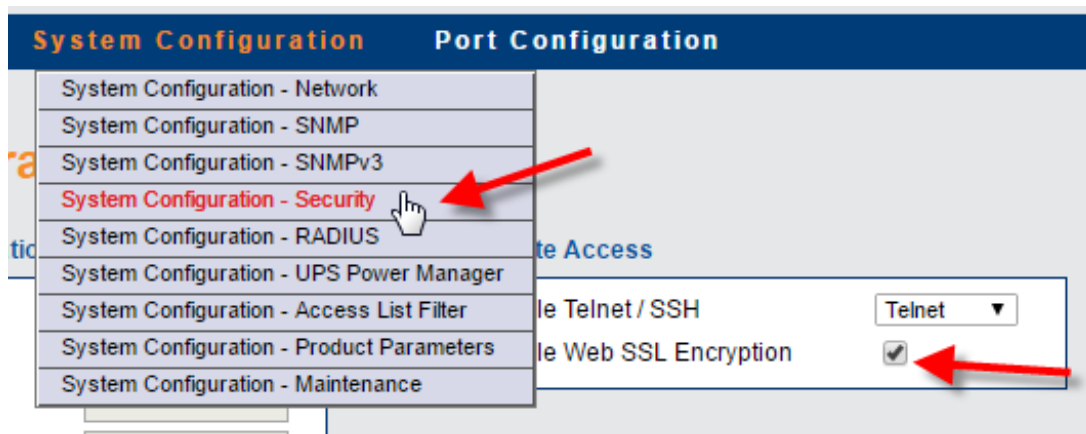


Figure 1

1.3 Secured Web Browsing options

There are several methods to secure web browsing, where CA signed certificates is the most secured.

1.3.1 Browsing the unit over HTTPS using the unit's default self-signed certificate

Advantage – The simplest method, requiring no extra preparations by the IT manager.

Disadvantage – A warning message displayed by the browser, encouraging the user to exit the website unless he is absolutely sure that this is a trusted website. This method is not recommended although it works well for closed networks and devices using absolute IP address.

1.3.2 Self-signed unit certificate

Advantage – No need to pay for every device certificate, and having full control over the certificate's creation and expiration date.

Disadvantage – A self-generated trusted root authority certificate has to be uploaded to every PC/Laptop to be used for browsing the unit over SSL/TLS. Failing to do so will cause the web browser to issue the same warning, advising the user to leave the website since it is not secured.

1.3.3 CA (Certificate Authority) signed certificate

Advantage – The recommended method used by many websites such as Amazon, eBay, etc.

Disadvantage – An annual fee for every certificate signed by the CA. Examples of trusted CA are VeriSign, Symantec, Thawte, etc.

2 CERTIFICATE MANAGEMENT - PACKAGE TOOLS DESCRIPTION

2.1 Package content

The certificate management package is based on an open-source OpenSSL tool, and readymade batch files to ease user interaction with the Open SSL tool. For ease of use, two separate sub folders are available.

2.1.1 Self-Signed Certificate Authority

This folder contains the OpenSSL tool plus two batch files.

1. The first batch file is named **01_Create Trusted Root Certification Authority (done once).bat**. It is used to create Trusted Root Certification Authority which is usually done only once, and has to be uploaded to every web browser used for browsing the Midspan unit over HTTPS
2. The 2nd batch file is named **02_Create Certificate for each Device.bat**. It is used to generate a certificate for every Midspan unit in use (the certificate is IP dependent, and since every device has its own IP, a unique certificate has to be created for every device).

2.1.2 CA-Signed Certificate Authority

This folder contains the OpenSSL tool plus two batch files.

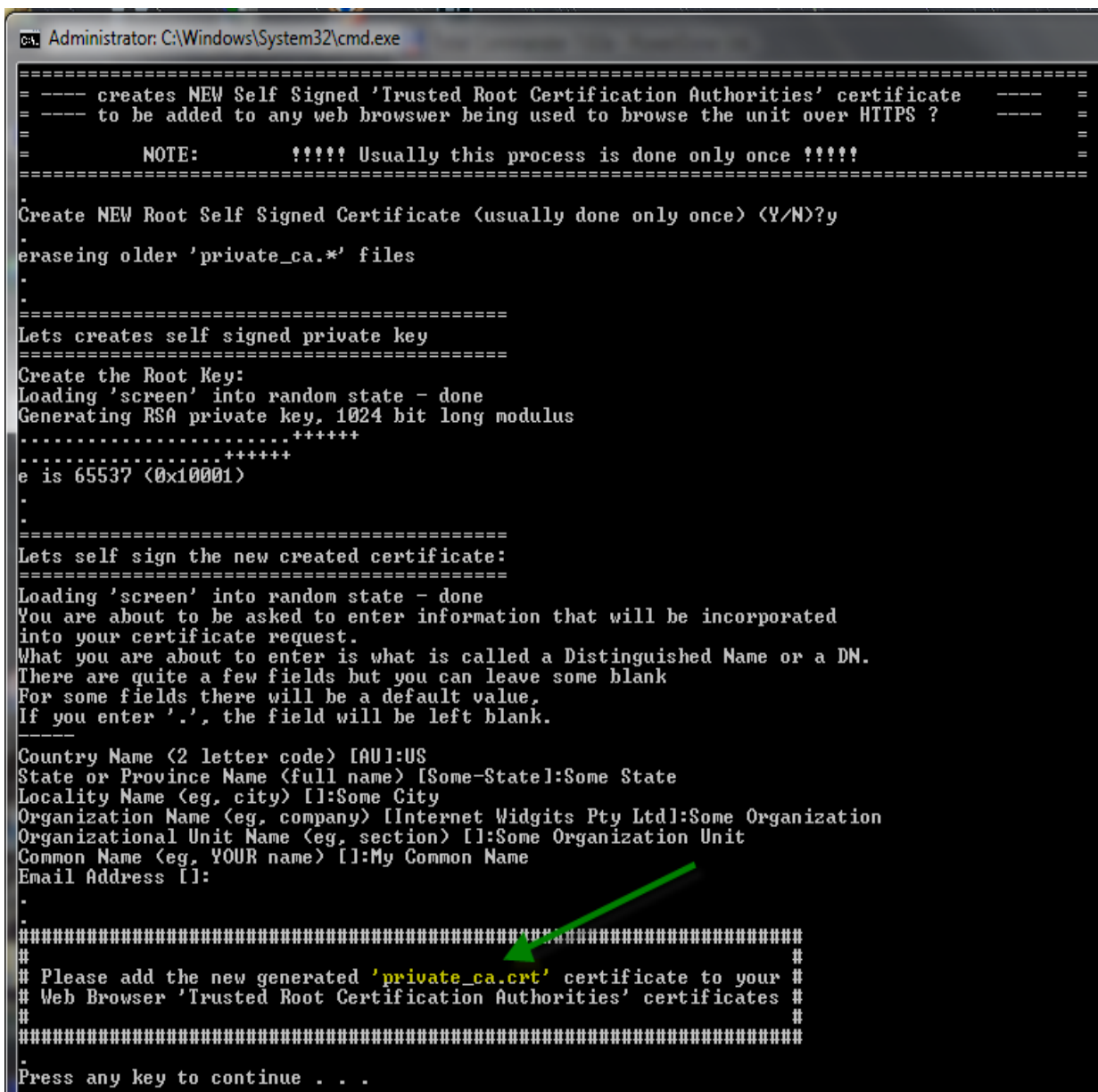
1. The 1st batch file named **01_generate_private_key.bat** is used to create a 2048-bit long private key. Typically, private key generation is done only once.
2. The 2nd batch file named **02_create_certificate_request.bat** is used to create a certificate request to be uploaded to trusted root certificate authorities such as VeriSign, etc. The 2nd batch file has to be executed for every network device to be managed over HTTPS.

3 EXAMPLE OF CREATING SELF-SIGNED CERTIFICATE

This example assumes the unit IP is 192.168.0.50.

3.1 Creating self-signed Certificate Authority file

Run batch file **01_Create Trusted Root Certification Authority (done once).bat**. The batch file will create a 1024bit private key file named **private_ca.key** with expiration date of 10 years (3650 days), which can be easily changed by modifying the batch file. Next, the user will be requested to fill in various fields as in Figure 2, after which it will generate file named **private_ca.crt**, which is the self-signed trusted authority certificate file required to be uploaded to every web browser being used to browse the unit over the Network using HTTPS secured protocol.



```

Administrator: C:\Windows\System32\cmd.exe
=====
= ---- creates NEW Self Signed 'Trusted Root Certification Authorities' certificate ---- =
= ---- to be added to any web browser being used to browse the unit over HTTPS ? ---- =
=
=      NOTE:      !!!!! Usually this process is done only once !!!!!
=====
.
Create NEW Root Self Signed Certificate <usually done only once> <Y/N>?y
.
erasing older 'private_ca.*' files
.
.
=====
Lets creates self signed private key
=====
Create the Root Key:
Loading 'screen' into random state - done
Generating RSA private key, 1024 bit long modulus
.....++++++
.....++++++
e is 65537 (0x10001)
.
.
=====
Lets self sign the new created certificate:
=====
Loading 'screen' into random state - done
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value.
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:Some State
Locality Name (eg, city) []:Some City
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Some Organization
Organizational Unit Name (eg, section) []:Some Organization Unit
Common Name (eg, YOUR name) []:My Common Name
Email Address []:
.
.
#####
#
# Please add the new generated 'private_ca.crt' certificate to your #
# Web Browser 'Trusted Root Certification Authorities' certificates #
#
#####
.
Press any key to continue . . .

```

Figure 2

**NOTE:**

The batch file **01_Create Trusted Root Certification Authority (done once).bat** should be typically executed only once. Running it again will erase and replace the already created **private_ca.crt** file

3.2 Uploading the self-signed trusted root certification authority file to the web browser

Upload the **private_ca.crt** file to web browser **Trusted Root Certification Authorities** list. This procedure has to be repeated for every web browser used to browse the unit over HTTPS.

The example in figures 3, 4, 5 refers to *the Chrome* web browser. Each web browser has its own instructions on how to perform same actions.

1. In Chrome, select **Settings**.
2. Scroll down and press on **Show Advanced Settings**.
3. Scroll down to HTTPS/SSL and select **Manage Certificates**.
4. Select the **Trusted Root Certification Authorities** tab.
5. Select **Import**, and select the **private_ca.crt** file.
6. In the warning message that appears. Select **Yes**.
7. An **Import was Successful** message should appear.

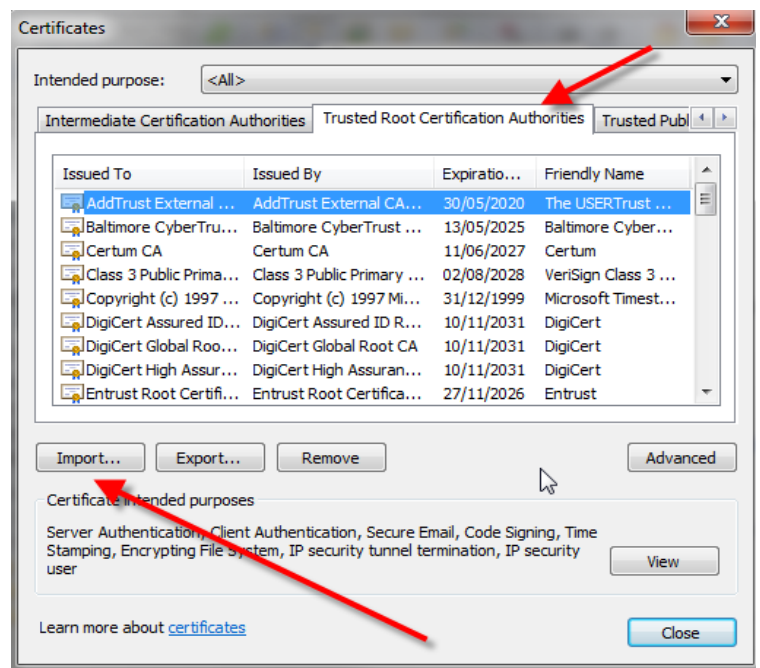


Figure 3

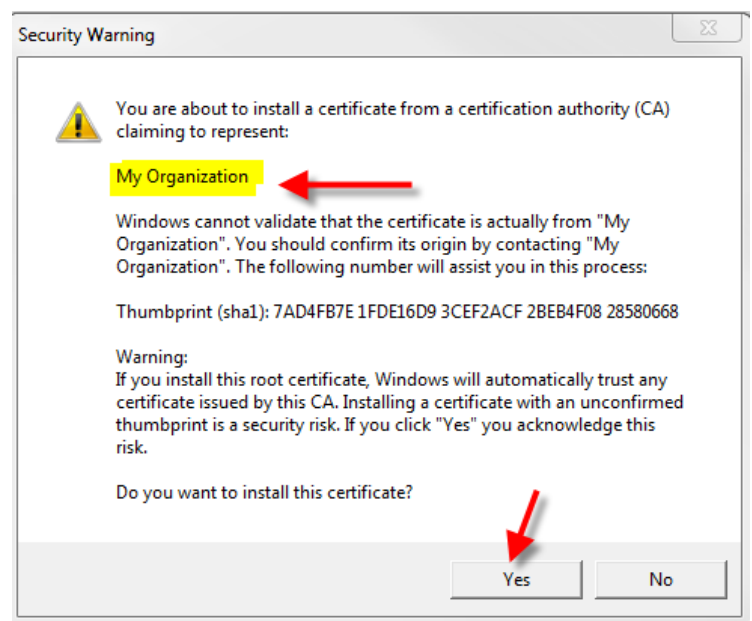


Figure 4

8. Browse again as in figure 3 to **Trusted Root Certification Authority** list and verify that *My Organization* now appears on the list

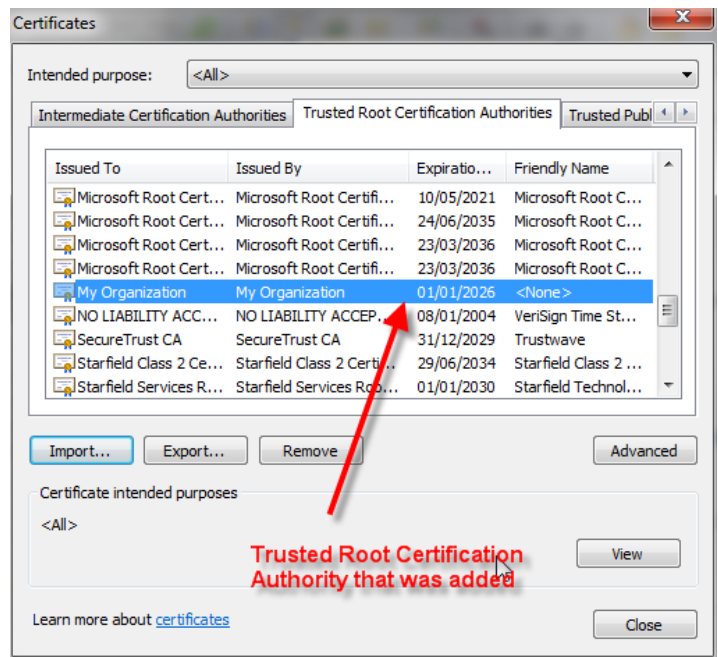


Figure 5

3.3 Creating device-specific certificate

1. Make sure the files **private_ca.key** and **private_ca.crt** which were created in the previous stage are in the same folder where the 2nd batch file is going to be executed.
2. Run **02_Create Certificate for each Device.bat** and fill in the various fields as in Figure 6.
Please note that the Common Name field must match the unit IP address.
3. Now upload the newly created **web_ssl.key** and **web_ssl.crt** certificate files to the Midspan unit over TFTP as described in the next paragraph.

3.4 Uploading self-signed certificate to the unit

1. Run TFTP Server on one of the computers which are reachable by the Midspan unit.
2. Place **web_ssl.key** and **web_ssl.crt** file on the TFTP Server root folder.
3. Browse to the unit over Telnet/SSH (as was configured over the Web), or connect locally over USB.
4. From the main menu, select the **Configuration and maintenance** menu.
5. Within the configuration menu select **Download WEB SSL Certificate from TFTP Server**.
6. Now enter the TFTP Server IP address and certificate filename - **web_ssl.key**
7. Proceed by downloading **web_ssl.crt** certificate into the Midspan unit.

```
Create new unique certificate for additional Network device <Y/N>?y
-
erasing older 'web_ssl.*' files
=====
Lets create unique certificate per each Network Device
=====
Create private Key:
Loading 'screen' into random state - done
Generating RSA private key, 1024 bit long modulus
.....+++++
e is 65537 <0x10001>
-
-
=====
Lets generate certificate sign request:
NOTE - For 'Common Name' field please use device DNS name or IP address
=====
Loading 'screen' into random state - done
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name <2 letter code> [AU]:
State or Province Name <full name> [Some-State]:
Locality Name <eg, city> []:
Organization Name <eg, company> [Internet Widgits Pty Ltd]:My Company
Organizational Unit Name <eg, section> []:My Unit
Common Name <eg, YOUR name> []:192.168.0.53
Email Address []:
-----
Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
-
-
=====
Lets sign the CSR. Please note that files 'private_ca.crt' and
'private_ca.key' must be present
=====
Loading 'screen' into random state - done
Signature ok
subject=C=AU/ST=Some-State/O=My Company/OU=My Unit/CN=192.168.0.53
Getting CA Private Key
-
-
=====
Place file named 'web_ssl.key' and 'web_ssl.crt' on TFTP Server root folder.
'#ECHO' is not recognized as an internal or external command,
operable program or batch file.
'#ECHO' is not recognized as an internal or external command,
operable program or batch file.
=====
Press any key to continue . . .
D:\temp\aa\Self Signed Certificate Authority>
```

Figure 6

3.5 Self-Signed Certificate validation.

- Open Chrome web browser and browse to IP 192.168.0.50. Whenever trying to access configuration or information web pages, the user web browser will be redirected to <https://192.168.0.50>
- Green lock as in Figure 7 on the left side of the URL should indicate that the browsing to the unit is done over secured and validated HTTPS protocol.

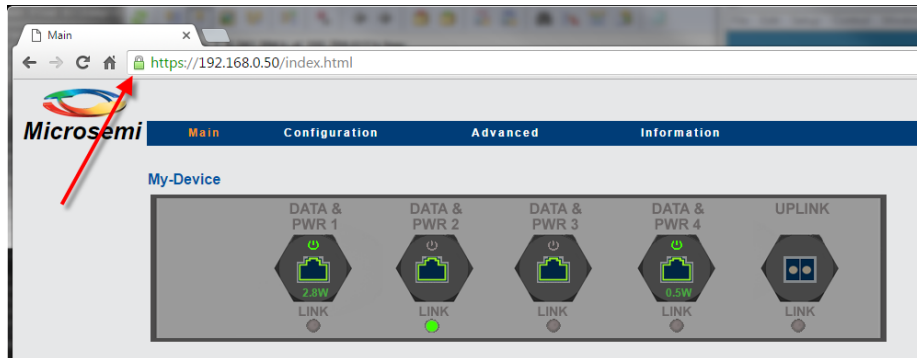


Figure 7

4 EXAMPLE OF CREATING CA-SIGNED CERTIFICATE.

A CA-signed certificate will be typically used whenever the unit is connected to the global public Internet. It has its own domain name as `www.my-unit.com`, and secure web browsing over the internet from any web browser is required without any extra steps from the remote end-user.

Only trusted root certificate authorities which are installed together with the web browser installation can be used to sign the certificate request which will be generated. The user has to pay yearly fee to the certificate authority organization in order to get a signed certificate, which will be typically limited to one or two years before it has to be updated. Examples of such companies are VeriSign, Symantec, Thawte, etc. See Figure 8 for additional examples.

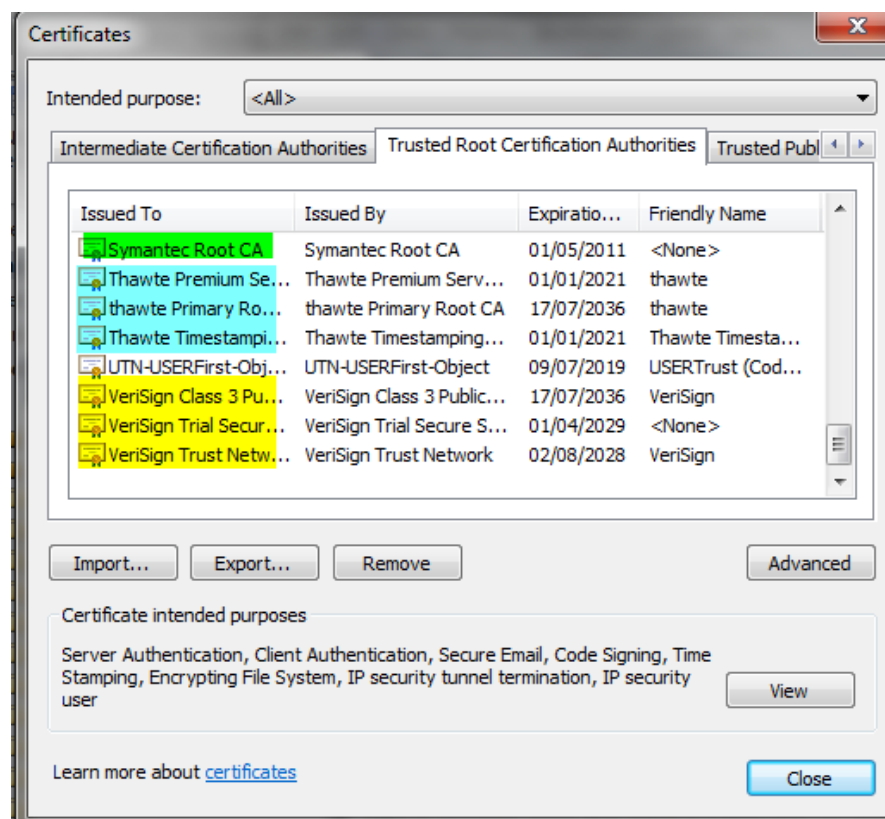


Figure 8

4.1 Generating private key

Run batch file **01_generate_private_key.bat**. The batch file will create 2048-bit private key named **web_ssl.key**.



NOTE:

The batch file **01_generate_private_key.bat** should be typically executed only once. Running it again will erase and replace the already created **web_ssl.key** file

4.2 Generating certificate request

Run batch file **02_create_certificate_request.bat**. After filling-in all the parameters as in Figure 9, a certificate-request file named **web_ssl.csr** will be created. Please note that under **Common Name** you must fill in the unit's domain name e.g., **www.my-unit.com** (there is no support for absolute IP address).

```

C:\> Administrator: Command Prompt

=====
Lets creates certificate request (web_ssl.csr)
=====

Loading 'screen' into random state - done
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:my-state
Locality Name (eg, city) []:my-city
Organization Name (eg, company) [Internet Widgits Pty Ltd]:My-Organization
Organizational Unit Name (eg, section) []:My-Unit
Common Name (eg, YOUR name) []:www.my-dns-name.com
Email Address []:my-email@my-email.com

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
Press any key to continue...
D:\temp\bb\CA Signed Certificate Authority>
  
```

Figure 9

4.3 Signing certificate request

Upload **web_ssl.csr** certificate request to your favorite certificate authority organization. After paying the appropriate fees and filling-in all the required information you will be issued a certificate, similar to the one in Figure 10.

```

-----BEGIN CERTIFICATE-----
MIIEEDzCCavegAwIBAgIJAJ1RYKYV3G9NMA0GCSqGSIb3DQEBCwUAMGIXCzAJBgNV
BAYTAkFUMRMwEQYDUQIEwptB211LUN0YXR1MRIwEAYDUQKEw1NaWYyb3N1bWkx
FDASBgNVBAsTC1BvRSBTeXN0ZW1zMRQwEgYDUQDEwTQb0UgU31zdGVtczAeFw0x
NTA5MDIwODU4MzIaFw0yNTA4MzAwODU4MzIaMGIXCzAJBgNVBAYTAkFUMRMwEQYD
UQIEwptB211LUN0YXR1MRIwEAYDUQKEw1NaWYyb3N1bWkxFDASBgNVBAsTC1Bv
RSBTeXN0ZW1zMRQwEgYDUQDEwTQb0UgU31zdGVtczCCASIwDQYJKoZIhvcNAQEB
BQADggEPADCCAQoCggEBALq523nR1Zuu8h7bfs1BqMSn1ej4JD/jmeIktUvUrJUA
jMFRSAXfjIt0q1drvdjCjyA3wy2Wv11D3WLYAoUlhZSEPMzBBFpUJ2d3Gh10P0YG
ax1MuYA79MCqU5HC8dMw4HHF5guyxxo6zdZLya0o9ahdZoitivQxXUKEHM+UWDPq
Jh32qY+Z3bFuXur8PM4DEmWJBThdeuFU6s05u2muB9CqRYU0U3E/m+5u519xQ0x0
015ywnC/ALMbSUZcN0eFCst1EU5zS5qBw/4UytwROC3MU1IKQDGOsWZUP7v112/J
BxsBebIZpkDbrIJteMSunYdXZP0JF61mF9Nw1kjj4UCAwEAAa0BxzCBxDADBgNV
HQ4EFgQUuIscyUKSNr1zTzc05jX1j3YS2bkwgZQGA1UdIwSBjDCBiYAUuIscyUKS
Nr1zTzc05jX1j3YS2bmhZqRkMGIXCzAJBgNVBAYTAkFUMRMwEQYDUQIEwptB211
LUN0YXR1MRIwEAYDUQKEw1NaWYyb3N1bWkxFDASBgNVBAsTC1BvRSBTeXN0ZW1z
MRQwEgYDUQDEwTQb0UgU31zdGVtczA1JA1RYKYV3G9NMAwGA1UdEwQFMAMBAF8w
DQYJKoZIhvcNAQELBQADggEBAKwqTQid0TAUItxqL291gxJh2oa5r0YNWhiDBS6F
GwcG2KSLLKXmumGCFTzY91i0XpZA/X3dnwjwUfgiyKmmfzhUTpuKNPYa2xBoYhx2
aBWR/jqKSTYF3jX1M2jr4beInU3yQnHu4nyCNYebePwD7JF2c3dDXWMK6Q05sCNO
0kN5XUBTmu4ALquesuX0BjzrGpFUXEWLq6P+G8uzMYI0WrZj+5vISpWAKrPfiMr1
07vcBqXu+LiYb41mueWbpyfiZeDmQuJnu4neLPNnt0Y5/GXMD0SeN86FI2ntkjy0
4E7WtConvIYeknhH8xmT4gHduiSUPJ+fMknt9QUHUK7WFFo=
-----END CERTIFICATE-----
  
```

Figure 10

Copy the certificate provided by the CA to the file named **web_ssl.crt**, and place under the same folder where the 2nd batch file was executed.

4.4 Uploading CA-signed certificate to the unit

1. Run TFTP Server on one of the computers accessible to the PDS-104G unit over the Network.
2. Place the files **web_ssl.crt** and **web_ssl.key** in the TFTP Server root folder.
3. Browse to the unit over Telnet/SSH (as was configured over the web), or serial over USB.
4. From the main menu, select the **Configuration and maintenance** menu.
5. Within the configuration menu, select **Download WEB SSL Certificate from TFTP Server**.
6. Next enter the TFTP Server IP address, CA-signature file **name web_ssl.crt**, and **web_ssl.key**.
7. The unit will download both files and verify validity of both files against the unit internal web server. After successful validation, a success message as in Figure 11 should appear

```

Configuration & Maintenance Menu
-----
1. Enable/Disable PoE Port
2. Network configuration
3. Download configuration file from TFTP Server (reset only Manager module)
4. Upload configuration file to TFTP Server
5. Download WEB SSL Certificate from TFTP Server (reset only Manager module)
6. Software update menu
7. Turn RADIUS,ACL Filter off. Restore all user & password to factory default
8. Restore unit to factory default (excluding IP configuration)
9. Reset Manager module
A. Reset unit
B. Enable/Disable auto ping to Default Gateway to ensure Network connectivity

ESC - Return to previous menu

Download WEB SSL certificate from TFTP Server - are you sure (Y/N,ESC) ?
Verify that Private-Key & Certificate files are on TFTP Server - (Y/N,ESC) ?

Enter remote TFTP Server IP address :192.168.0.40
Enter WEB SSL Private-Key file name (for example web_ssl.key):web_ssl.key
TFTP start....Received 887 bytes

Enter WEB SSL Certificate file name (for example web_ssl.crt):web_ssl.crt
TFTP start....Received 891 bytes

Manager module will be RESET in 1 Sec !!

```

Figure 11



NOTE:

1. A success message doesn't necessary mean that the entire process was done correctly. It only indicates that the two uploaded files' content and format comply with the unit Web Server files format
2. In case any of the two uploaded files doesn't comply with the unit Web Server files format, the web server will discard the new uploaded certificate files and will continue to use the already existing certificate files

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Revision History

| Revision Level / Date | Para. Affected | Description |
|-----------------------|----------------|-----------------|
| 2.01 | | Initial release |
| | | |
| | | |

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