



CERT Solution Guide - EST Server Configuration Guide

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Preface

Revision History

Revision	Description	Date
1.0	Initial release of document for Release 2020.3.0	September 2020

About this Guide

This guide contains the pre-defined procedure for Enrollment over Secure Transport (EST) server configuration.

Audience

This guide is intended for those who want to configure EST in the AppViewX GUI.

Text Conventions

The following text conventions are used in this document:

Convention	Description
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
<code>codeblock</code>	Indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

Chapter 1: Overview

Enrollment over Secure Transport (EST) is a simple and functional certificate management protocol. EST works in the client-server model. AppViewX offers both EST server and client functionalities with TLS based authentication between the server and client as per the protocol. This document helps with the configuration of the EST in the AppViewX GUI.

Chapter 2: AppViewX EST Client Security

AppViewX EST Clients provides two levels of security:

- Encrypts the authentication data using Installer Generator.
- Creates DATA-CHALLENGE during the installation using unique machine parameters and agent gets executed only when DATA-CHALLENGE decryption is successful.

AppViewX EST Installer Generator

Traditional EST Enrollment methods like curl or wget will have an Authentication Certificate kept open in the user machine.

AppViewX provides a solution to this using AppViewX Installer Generator Software, which encrypts the complete authentication data to a Single DATA file and during the installation we need to copy only the DATA file to the user machine. This restricts the user from reading or modifying authentication DATA.

AppViewX EST Installer

During the Installation of the AppViewX EST Client, it creates an encrypted DATA-CHALLENGE secret, which contains unique machine parameters and, in each execution, it triggers a request only when DATA-CHALLENGE decryption is successful. This protects agents from copying and executing from another machine.

Chapter 3: Prerequisites

Before configuring the EST server, the user has to make the following changes in the AppViewX server:

- Make sure that the `<avx-platform-gateway-est>` and `<avx-vendor-cert-est-agent>` services are running in the cluster.

```
[appviewx@snode2 ~]$ kubectl get services -A | grep est
external-system      avx-platform-gateway-est      NodePort    10.181.89.37    <none>      5301:38739/TCP
snode1               avx-vendor-cert-est-agent     ClusterIP    10.185.120.24  <none>      5306/TCP
[appviewx@snode2 ~]$
```



Note: If services are running, note the port number that is shown after 5301:<est_external_port>. This port must be configured in EST Settings UI.

- Make sure that the namespace for below services are configured with respective data center (DC) names:
 - `avx_platform_gateway_external=<dc name>`
 - `avx_vendor_cert_est_agent=<dc name>`

Chapter 4: Enable EST Services

If EST services are not running, follow the steps to run the EST services:

1. Open the terminal window.
2. Add the `avx_vendor_cert_est_agent` and `avx_platform_gateway_external` in `ENABLED_PLUGINS` in `appviewx.conf` that is available inside the scripts folder `</home/appviewx/appviewx_kubernetes/scripts>`.
3. Specify the data center (DC) where the gateway must be deployed.

```
ENABLED_PLUGINS=appviewx_dependencies,avx_commons,avx_crontab,avx_config_server,avx_platform_core,avx_platform_anc,avx_platform_queue,avx_platfo
rm_gateway,avx_platform_gateway_external,avx_platform_web,avx_subsystems,avx_vendors,avx_subsystems_sync,avx_visual_page_builder,avx_vendor_cert
_network_discovery,avx_vendor_cert_scep_agent,avx_vendor_cert_intune_agent,avx_vendor_cert_est_agent,avx_vendor_cert_acme_agent
SSH_OTHER_USER=appviewx

avx_commons=absecon
avx_config_server=absecon
avx_platform_core=absecon
avx_platform_queue=absecon
avx_subsystems=absecon
avx_subsystems_sync=absecon
avx_vendors=absecon
avx_platform_gateway=absecon
avx_platform_web=absecon
avx_platform_anc=absecon
avx_platform_gateway_external=absecon
avx_visual_page_builder=absecon
avx_vendor_cert_network_discovery=absecon
avx_vendor_cert_scep_agent=absecon
avx_vendor_cert_intune_agent=absecon
avx_vendor_cert_est_agent=absecon
avx_vendor_cert_acme_agent=absecon
```

4. Execute the command: `<plugins_install.sh>`
5. Verify the EST is enabled by executing the command: `<kubectl get services -A | grep est>`

```
[appviewx@snode2 ~]$ kubectl get services -A | grep est
external-system          avx-platform-gateway-est      NodePort    10.101.89.37    <none>      5301:30739/TCP
smedc1                   avx-vendor-cert-est-agent     ClusterIP   10.105.120.24  <none>      5306/TCP
```

6. Verify the plugin status and port number, do the steps as follows:
 - a. Execute the `<kubectl get services -A | grep est>` command and make sure that the “avx-vendor-cert-est-agent” and “avx-vendor-cert-est-agent” is running.
 - b. Make sure that the port number is 5301:30021 in `avx-platform-gateway-est`.



Note: The number 5301:30021 must be used in the UI configuration.

```
-bash-4.2$ kubectl get services -A | grep est
absecon                  avx-vendor-cert-est-agent     ClusterIP   10.101.59.249  <none>      5306/TCP
external-system          avx-platform-gateway-est     NodePort    10.100.79.210  <none>      5301:30021/TCP
```

- c. Execute the `<kubectl get pods -n external-system -o wide>` command to identify the nodes running in the EST service. EST will be available on all the nodes where external system runs.

```
-bash-4.2$ kubectl get pods -n external-system -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE
avx-platform-gateway-676f67587b-54jj8 1/1     Running   5           64d   10.244.198.136   trialnode2.appviewx.net
avx-platform-gateway-676f67587b-h6xrf 1/1     Running   4           62d   10.244.251.30    trialnode3.appviewx.net
avx-platform-gateway-676f67587b-tbqcs 0/1     NodeAffnity 0           64d   <none>          trialnode3.appviewx.net
-bash-4.2$
```

- d. Ping to the node names to get IP addresses.

```
-bash-4.2$ ping trialnode2.appviewx.net
PING trialnode2.appviewx.net (192.168.61.82) 56(84) bytes of data.
64 bytes from trialnode2.appviewx.net (192.168.61.82): icmp_seq=1 ttl=64 time=0.225 ms
64 bytes from trialnode2.appviewx.net (192.168.61.82): icmp_seq=2 ttl=64 time=0.098 ms
^C
--- trialnode2.appviewx.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.098/0.161/0.225/0.064 ms
-bash-4.2$ ping trialnode3.appviewx.net
PING trialnode3.appviewx.net (192.168.61.83) 56(84) bytes of data.
64 bytes from trialnode3.appviewx.net (192.168.61.83): icmp_seq=1 ttl=64 time=0.149 ms
64 bytes from trialnode3.appviewx.net (192.168.61.83): icmp_seq=2 ttl=64 time=0.206 ms
64 bytes from trialnode3.appviewx.net (192.168.61.83): icmp_seq=3 ttl=64 time=0.114 ms
^C
```

7. [Optional] Create a separate group for EST if required or use Else use the Default Group, where the “Certificate Request Needs Approval” should be disabled for the associated CA Policy.

Group : Create

Group Details

* Select Group Hierarchy ⓘ

* Group Name ⓘ

8. Create a CA policy and associate with group. For more details, refer to CERT+ Admin Guide.

- a. Disable “Certificate Requests Need Approval?” in the Policy Details page.

The screenshot shows the 'CA Policy : Create' interface. Under the 'Policy Details' heading, there is a text box with the instruction: 'Define rules and templates to ensure certificate attributes are in compliance with the Organization.' Below this, the 'Policy Name' is set to 'EST_Policy'. The 'Description' field contains the text: 'You can tell us more about your rules and guidelines.' The 'Policy Enforcement Type' is set to 'Strict' (radio button selected). The 'Certificate Requests Need Approval?' toggle is currently turned off. A note below the toggle states: 'When enabled, it will enforce the peer approval process for any requests made for new/renew /regenerate/reissue or revocation of certificates. Peer approving the request is defined in the approval workflow.'

- b. To configure a policy with AppViewX details, click **AppViewX** in the **Certificate Authority** pane on the left side of the screen.
- c. In the CA detail section, select **CA Accounts** from the dropdown list.
- d. Add validity, and then click **Add**.
- e. Select Bit length as 2048 and above (AppViewX Client supports 2048 RSA)
- f. Select ECDSA curves based on requirement.
- g. Select the hash function as SHA-256 and above.
- h. Click **Save CA Details**.
- i. Select the Group that is created earlier and update policy.
9. Upload a client authentication issuer certificate in AppViewX application.
- a. By default, AppViewX EST Client software’s (Windows/Linux/Mac) will have an Authentication Certificate Encoded within the Software (which will be encrypted and kept within Client Software), user will never have direct access to it and this will be used for agent to communicate with AppViewX EST Server.
- b. For initial validation, you can use default encoded authentication certificates in client software and issuer certificate. The file will be available in a common share folder with the following file name.
- The file name **<AppViewXIntermediateCA_D2 E3 B6 15 EE E6 2D 4C 1D 99 AC 11 6D 47 B5 CD.crt>**
 - Upload above file in the respective appviewx environment and trust it in EST Settings.
 - To upload a certificate, log in to AppViewX application with valid credentials.
 - Click the menu button located in the upper left corner of the screen.

The left navigation pane appears.

- v. Click **CERT+** > **Certificate Inventory**.
- vi. Click **Upload** > **CA Certificate**.
- vii. Select CA, and then upload the file.
 - Note the Serial Number “B5:CD” of the CA Certificate (This needs to be added as “Issuer Certificate in EST Client Authentication Configuration” later).
 - If you want to use non AppViewX Certificate as the Issuer CA for EST Authentication. Refer the “EST Server Update FP5 Authenticate with External CA” guide and section Adding External CA Trust Certificate for EST Client Authentication
 - Description: TLS Authentication handshake is happening in the GW and by default GW is holding only AppViewX Intermediate and AppViewX Root in the EST_TRUSTED_CA_CERTS, AppViewX GW will be sending these Certificates as the DN(Distinguished Name) response to the Clients.
 - During TLS Handshake Client Validates whether the DN response from Server contains the CA Certificate which Signed Client’s Authentication Certificate. If not, client will not send the authentication Certificate to the Server, assuming this is not the right Server.



Note: OCSP and CRL Validation of Client Authentication Certificate for EST request is disabled by default in AppViewX. To enable reach out to AppViewX Support (support@appviewx.com).

If it is getting enabled, make sure OCSP or CRL responder is reachable from AppViewX to validate the client certificate status else all the client enrollment requests will fail with status “OCSP or CRL responder is not reachable”.

Chapter 5: Create Client Authentication Certificate Using AppViewX CA

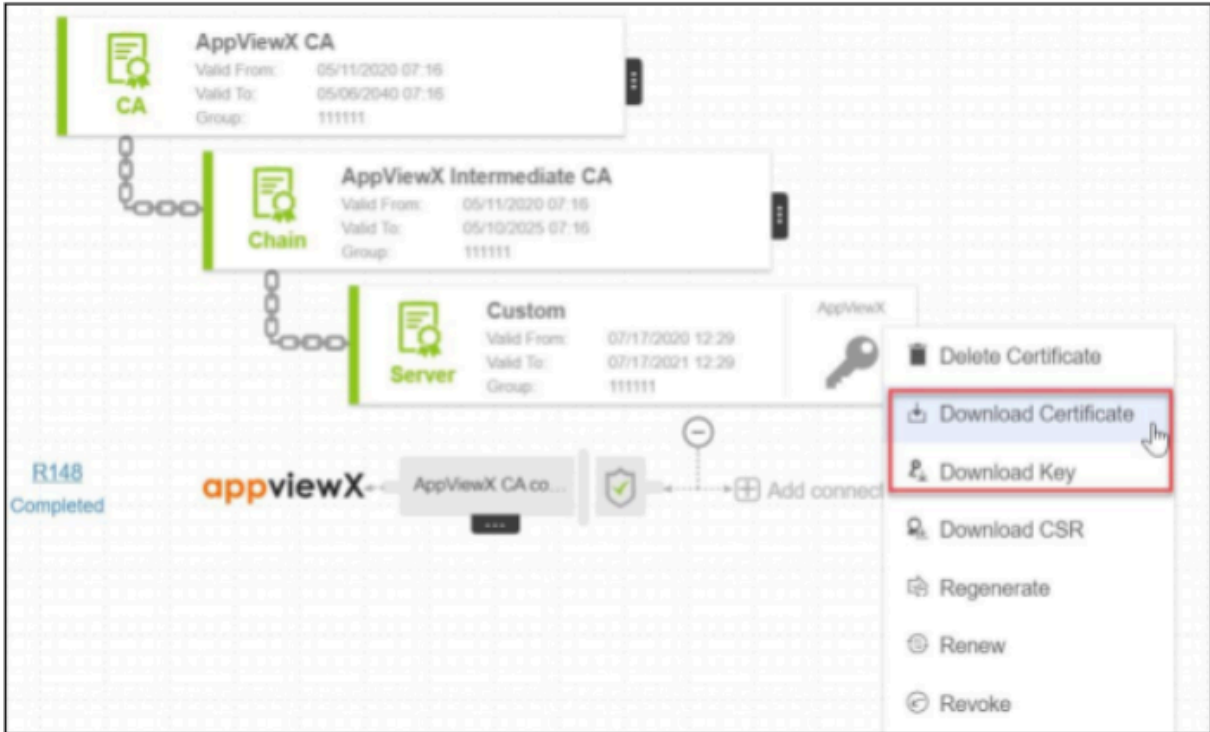
If the user does not have a client authentication AppViewX CA certificate, user can use AppViewX CA. To use a client authentication AppViewX CA certificate:

1. Log in to the AppViewX application with valid credentials.
2. Click the menu button.
The left navigation pane appears.
3. Click **CERT+**.
The **CERT+** left navigation pane appears.
4. Expand **CERTIFICATE Inventory**.
5. Select **Enroll Certificate**, and then **Server**.
The **Enroll Server Certificate** page appears.
6. In the **General Information** section of the **Enroll Server Certificate** page, select the desired **Assign Group** from the dropdown list.



Note: By default, the **Default** option is selected.

7. In the **CA Details** section, select/enter the details as required.
8. Select a **CSR Generation** mode: AppViewX, Upload CSR, HSM, or Endpoint.
9. Under the **CSR Parameters** section, enter a Common Name for the certificate.
10. While creating certificates, you can attach supporting documents by uploading it in the **Attachment** section.
11. Click **Add** to generate the certificate. The certificate holistic view with the newly created CSR appears.
12. Click **Submit**.
13. On the submit dialog box, enter relevant comments and click **Yes**.
14. Click **Refresh** on the top-right to refresh the holistic view. Now, a chain of certificates is displayed.
15. Hover over the vertical eclipse icon on the certificate and download the Certificate and Key.



Note: The user has to trust the AppViewX Intermediate CA certificate and select this certificate as **Issuer Certificate** during the EST configuration.

Chapter 6: EST Configuration

- Supported Operations

Supported Operations

The AppViewX EST agent supports three operations as shown in the below table.

Supported Operation	Operation Path
Distribution of CA certificates	/cacerts
Enrollment of clients	/simpleenroll
Re-enrollment of clients	/simplereenroll

Chapter 7: Best Practices

- Example URLs

Example URLs

- For default: `<https://est.appviewx.com:<port_number>/well-known/est>`
- For AppViewX Enrollment: `<https://est.appviewx.com:<port_number>/well-known/est/appviewx/simpleenroll>`
- For AppViewX Re-enrollment:

```
<https://est.appviewx.com:<port_number>/well-known/est/appviewx/simplereenroll>
```

Chapter 8: [Optional] Adding External CA Trust Certificate for EST Client Authentication

- By Default AppViewX Intermediate and AppViewX Root will be available in the location with filenames “default_inter.crt”, “default_root.crt”

- Execute the command

```
[appviewx@pesrv07-arch-94-20 ~]$ kubectl describe secret client-cacerts-est -n external-system
Name:         client-cacerts-est
Namespace:    external-system
Labels:       <none>
Annotations:
Type:         Opaque

Data
====
default_inter.crt: 1505 bytes
default_root.crt:  1281 bytes
[appviewx@pesrv07-arch-94-20 ~]$
```

- Add below plugins in the ENABLED_PLUGINS list

```
ENABLED_PLUGINS=appviewx_dependencies,avx_platform_gateway_external,avx_platform_gateway
```

```
# Comma separated values of absolute paths of certs
#EST_TRUSTED_CA_CERTS=/home/appviewx/appviewx_kubernetes/scripts/digicert.crt
```

- And run `./plugins_install.sh`

Chapter 9: [Optional] Change SSL Certificate for EST-HTTPS Communication

- By default there will be self Signed Certificate available in the location.
- Add below plugins in the ENABLED_PLUGINS list

```
ENABLED_PLUGINS=appviewx_dependencies,avx_platform_gateway_external,avx_platform_gateway
```

```
# Please specify the absolute paths of files for the labels below
# EST_SERVER_ACCESS_CERT=
# EST_SERVER_ACCESS_KEY=
# Comma separated values of absolute paths of certs
#EST_TRUSTED_CA_CERTS=/home/appviewx/appviewx_kubernetes/scripts/digicert.crt
```

- And run `./plugins_install.sh`

```
[appviewx@pesrv07-arch-94-20 ~]$ kubectl describe secret server-tls-est -n external-system
Name:          server-tls-est
Namespace:     external-system
Labels:        <none>
Annotations:
Type:          kubernetes.io/tls

Data
====
tls.crt: 1046 bytes
tls.key: 1704 bytes
```

Chapter 10: Gateway - EST Logs

To access the EST logs:

1. Access the terminal window.
2. Go to **<Installed_Path>/logs** directory and find with the name format **<avxgw-MTLS-<yyyy-mm-dd>.log>**. For example, **<avxgw-MTLS-2021-03-17.log>**.
 - If the file size exceeds 100 MB, it will be rolled over and the latest logs will be available in the latest file that is named with an incrementing counter starting from 1 such as **avxgw-MTLS-<yyyy-mm-dd>.<incrementing_counter>.log**. For example, **<avxgw-MTLS- 2021-03-17.1.log>**.
 - EST Plugin Logs:
`</home/appviewx/appviewx/logs/avx-vendor-cert-est-agent-<pod_name>.log>`

Chapter 11: Verification of the EST Server

To verify the EST server:

1. Access the terminal window.
2. Go to **<appviewx/logs>** directory and execute the `<kubectl get pods -A | grep est>` command.
3. Go to **-f <pod_name>.log** directory.
4. Access CACerts URL from browser or Try curl from another machine.

```
@avxp11294:~/Desktop/Training/Auth_Cert$ curl -k https://192.168.205.29:30021/.well-known/est/cacerts
{"response":null,"message":"No client certificate obtained to perform authentication.","appStatusCode":"CERT-ENROLLMENT-010","tag
@avxp11294:~/Desktop/Training/Auth_Cert$
```

5. Check the log file.

```
02 Jul 2021 11:42:43.553 ERROR [transformer-2c421060ddb] AvxGenericRequestProcessor:139 - Exception during processing
AvxServiceException [ErrorCode=AVX_CERT-ENROLLMENT-010, Tags={upstream_error=true}, HttpStatusCode=401, Message={
  "errorCode" : "CERT-ENROLLMENT-010",
  "Error Message" : "No client certificate obtained to perform authentication.",
  "Probable causes" : {
    "1" : "User not authorized to access api: est-get-cacerts",
    "2" : "ACF permission given to user for est-get-cacerts is not yet updated"
  }
}
```

6. The response indicates that the EST is listening on Port and trying to do Certificate Authentication with Client.

Chapter 12: Testing EST Enrollment by using CURL

To test the EST enrollment:

1. After the successful verification, create a test folder in the Linux client machine.
2. Copy the `<est_auth.crt>` and `<est_auth.key>` from the common share directory <https://drive.google.com/drive/folders/1K4G5L8yB5TOwvLCAPjNC3IQWBWtIWua0>
3. Generate the CSR in the same folder with `<openssl>` command.
`openssl req -new -newkey rsa:2048 -nodes -keyout rsakey.key -out req.p10`
4. Trigger GetCA certs request using CURL command (update server IP and Pathseg depends on Server Config).
5. Make sure that the authentication CERT and Key is present in same location `<curl -k --cert ./est_auth.crt --key ./est_auth.key https://<server_ip>:30021/.well-known/est/cacerts -o cacert.p7>`. You will receive `<cacert.p7>` file with Configured CA Certificate in Step 9.

```
shibi.vg@vxp11294:~/Desktop/Training/EST$ curl -k --cert ./est_auth.crt --key ./est_auth.key https://192.168.205.29:30021/.well-known/est/cacerts -o cacert.p7
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 3258 100 3258 0 0 14742 0 --:--:-- --:--:-- --:--:-- 14742
shibi.vg@vxp11294:~/Desktop/Training/EST$
```

6. Convert the received CA Certificate to pem `<openssl base64 -d -in cacert.p7 | openssl pkcs7 -inform DER -outform PEM -print_certs -out cacert.pem>`.
7. Trigger enrollment request by using CURL and make sure that the authentication Cert, Key, and CSR are present in same location.

```
<curl -k --cert ./est_auth.crt --key ./est_auth.key https://192.168.205.29:30021/.well-known/est/simpleenroll -o ./signed_cert.p7 --data-binary @req.p10 -H "Content-Type: application/pkcs10" --dump-header ./resp.hdr>
```

```
shibi.vg@vxp11294:~/Desktop/Training/EST$ curl -k --cert ./est_auth.crt --key ./est_auth.key https://192.168.205.29:30021/.well-known/est/simpleenroll -o ./signed_cert.p7 --data-binary @req.p10 -H "Content-Type: application/pkcs10" --dump-header ./resp.hdr
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 2886 100 1901 100 985 173 89 0:00:11 0:00:10 0:00:01 508
shibi.vg@vxp11294:~/Desktop/Training/EST$
```

8. Verify the content of `<signed_cert.p7>`.

```

shibl.v@avxpl1294:~/Desktop/Training/EST$ more signed_cert.p7
MIAGCSqGS1b3DQEHAQCAMIACAQExADCABgkqhkiG9w0BBwEAAKCAMIIFRjCCBC6g
AwIBAgIQdEIyw0JEU/m7Esa4exae6jANBgkqhkiG9w0BAQsFAADBuMSEwHwYDVQQD
DBHbChBwWV3WCBJbnRlcm1lZGhldGUgQ0ExFTATBgNVBAoMDEFwczZpZXdYIElu
YzEQMA4GA1UEBwwHU2VhdHRsZTETMBEGA1UECAwKV2FzaGluZ3RvbWJELMAGGA1UE
BhMCMVVMwHhcNMjEwNzAyMTMxMTIxWWhcNMjEwNzAyMTMxMTIxWjBYMQswCQYDVQ
EwJVVzETMBEGA1UECAwKU29tZS1TdGF0ZTEhMB8GA1UECgwYU29tZS1TdGF0ZTEh
Z2l0cyBQdHkgTHRkMREwDwYDVQQDDAhlc3R0ZXN0MTCCASIdDQYJKoZIhvcNAQEB
BQADggEPADCCAQoCggEBAL6umAd6QcUk7kU+B9LONik0eTXU5j3Jphz9FwInTcoE
Ws3MLB7PuRZuBfLcm4CFwDUx+5FP0rZqUukB+8aJCoNSEGvfXD0VaAQDx7ao4p
YLBvrdALGXwfs0oGDWZSTJv7VmApBYUfrdqZ01wNvp6f2l9ImPn507hHyjleHaS
3NP1PTL7Y46ahaUaAZZIRRZgTqnIUbZI+ZQGe/h1E6DM5KPgCUJcS6LXIffQdedoc
N86Wxcr9lV1KIpeZkaKfHJANQ+Xhg9xfufee1wI3tU3nwTR20azifMlgKI0c3Jj9
CUtgT0V+Q/L9YRYILKCys3trLpucyysNDw8bpaYczcCAWEAAA0CAfQwggHwMB0G
A1UdDgQWBBRv0KbsVhIrpI8N0p/patKSTbns3zATBgNVHSUEDDAKBggrBgEFBQcD
AjAMBgNVHRMBAf8EAjAAMBGA1UdEQQMMAAqBCCVzdHRlc3QxMIGaBgNVHSMegZIW
gY+AFCPAbr44o7vqqlu9jg/tGLN8tv0noWwkyzBhMRQwEgYDVQQDDAtBChBwWV3
WCBBDQTEVMBMGA1UECgwMQXBwVmllldiggS5jMRAwDgYDVQQHDAAdZWF0dGxLMRMw
EQYDVQQIDApYXNoaW5ndG9uMQswCQYDVQQGEwJVU4IQL2wd+E/P40q36w7tz7uj
WDB0BgNVHR8EbTBwMGZ6BlhmNwB51hcHZ4LTEubGFuZmFwcHJpZXd4Lm5ldC9j
b250cm9sbGVyL2F2eG9yYD9jcmxGaWxLTmFtZT02MzAzNTA5MTCyNTc3NjI0MjQw
Njc4NzcxMDU2NTkyNjgwNjM2MCSjcmwWgYMGCCsGAQUFBwEBBHCwdTBzBggrBgEF
BQcwAYZncG0tYXB2eC0xLmXhYi5hcHB2aWV3eC5uZXQvY29udHJvbGxlc19hdnkv
Y3NwP2lzc3Vlcnlcm1lhbG51bWJlcj02MzAzNTA5MTCyNTc3NjI0MjQwNjc4Nzcx
MDU2NTkyNjgwNjM2MDANBgkqhkiG9w0BAQsFAAOCAQEAM9LR9PN90DCtqJCf6lh
qrTzYJ1cqY2pD76Q1E9CvvQu+q0Kd8X9dA14GYEk8Ny00YKDFksj+oCeju59v0fT
02zJz5McbETQeq7NQQlxVM0MiXBcypzVeC+iiQZJ3zH3lyAC1le71E3zg2pZAdfe
c87MT0Utfbh3d6g4UX7FjV8KqTvLn7h56CC+2wXmysAx54mh+s6m10Pvk5Ou0Bg5
ZpPHVYAxAuHeIDhguMAjMa9XiGmTteMFnl1ZnGVHgb1pZ7KvXVCA6U76wahn+q
VN42mpGLq9BJCZ1RASkaT8FMse/sA00xjbb0Wgypiu43nybo0izT8oB4oQQbbnwF
ZQAAMQAAAAAAAA=
shibl.v@avxpl1294:~/Desktop/Training/EST$ █

```

9. Convert the enrolled p7 Certificate in to pem

```
<openssl base64 -d -in signed_cert.p7 | openssl pkcs7 -inform DER -outform PEM -print_certs -out signed_cert.pem>.
```

10. Make sure that you have received <cacert.p7> file with Configured CA Certificate.