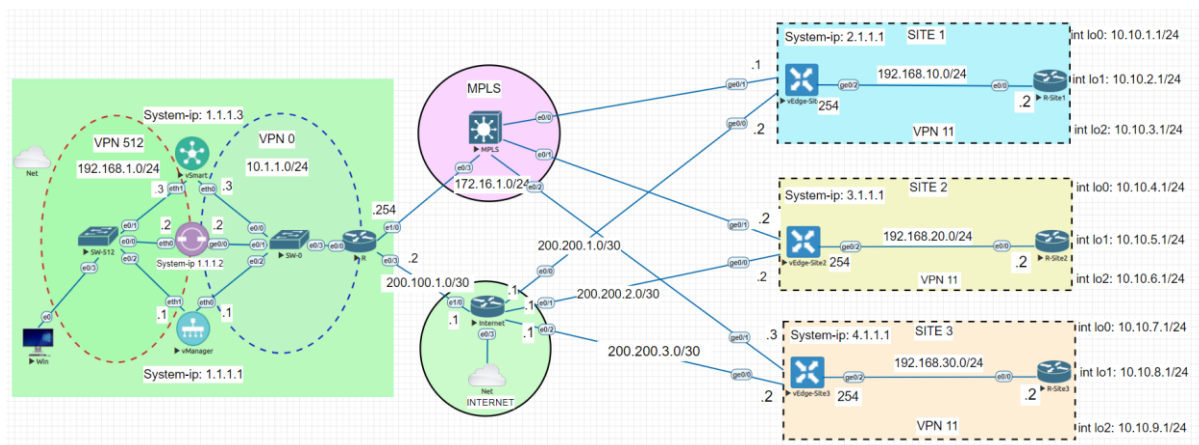


## LAB 3: TRIỂN KHAI HỆ THỐNG CISCO SD-WAN VỚI HAI ĐƯỜNG TRANSPORT

### I. Sơ đồ



Thông tin của các thiết bị

| Tên thiết bị | Username | Password | Version    |
|--------------|----------|----------|------------|
| vManage      | admin    | Admin    | 20.10.1    |
| vBond        | admin    | Admin    | 20.10.1    |
| vSmart       | admin    | Admin    | 20.10.1    |
| vEdge        | admin    | Admin    | 20.10.1    |
| PC           |          | Test123  | Windows 10 |

**BẢNG 1: Bảng quy hoạch IP**

| Host         | VPN 0                           | VPN 512        | VPN 11            |
|--------------|---------------------------------|----------------|-------------------|
| vManage      | 10.1.1.1/24                     | 192.168.1.1/24 |                   |
| vBond        | 10.1.1.2/24                     | 192.168.1.2/24 |                   |
| vSmart       | 10.1.1.3/24                     | 192.168.1.3/24 |                   |
| vEdge-site 1 | 200.200.1.2/30<br>172.16.1.1/24 |                | 192.168.10.254/24 |
| vEdge-site 2 | 200.200.2.2/30<br>172.16.1.2/24 |                | 192.168.20.254/24 |

|              |                                 |  |                   |
|--------------|---------------------------------|--|-------------------|
| vEdge-site 3 | 200.200.3.2/30<br>172.16.1.3/24 |  | 192.168.30.254/24 |
|--------------|---------------------------------|--|-------------------|

## II. Yêu cầu:

Dựng hệ thống Cisco SD-WAN theo sơ đồ trên.

Cấu hình các thiết bị để đảm bảo để bảo các địa chỉ IP WAN (VPN0) ở các site có thể thấy nhau

Cấu hình Bring up controller: vSmart, vBond, vManage và các vEdge

## III. Thực hiện:

3.1. Cấu hình các thiết bị để đảm bảo để bảo các địa chỉ IP WAN ở các site có thể thấy nhau

- Cấu hình vmanage:

```
config ter
system
host-name vmanage
system-ip 1.1.1.1
site-id 1000
organization-name VnPro
vbond 10.1.1.2
vpn 0
interface eth0
no shut
ip address 10.1.1.1/24
tunnel-interface
allow-service all
exit
ip route 0.0.0.0/0 10.1.1.254
vpn 512
interface eth1
ip add 192.168.1.1/24
no shut
```

## commit and-quit

- Cấu hình vsmart:

```
config ter
system
host-name vsmart
system-ip 1.1.1.3
site-id 1000
organization-name VnPro
vbond 10.1.1.2
vpn 0
int eth0
no shut
ip add 10.1.1.3/24
tunnel-interface
allow-service all
exit
ip route 0.0.0.0/0 10.1.1.254
vpn 512
interface eth1
ip address 192.168.1.3/24
no shut
commit and-quit
```

- Cấu hình vbond:

```
config ter
system
host-name vbond
system-ip 1.1.1.2
site-id 1000
```

```
organization-name VnPro
vbond 10.1.1.2 local vbond-only
vpn 0
interface ge0/0
ip address 10.1.1.2/24
tunnel-interface
encapsulation ipsec
allow-service all
ip route 0.0.0.0/0 10.1.1.254
vpn 512
int eth0
no shutdown
ip address 192.168.1.2/24
commit and-quit
```

- Cấu hình vedge 1:

```
conf t
system
host-name vedge1
system-ip 2.1.1.1
site-id 1
organization-name VnPro
vbond 10.1.1.2
vpn 0
int ge0/1
ip add 172.16.1.1/24
tunnel-interface
encapsulation ipsec
color mpls
```

```
no shutdown
allow-service all
exit
ip route 10.1.1.0/24 172.16.1.254
vpn 512
int eth0
no shut
commit and-quit
```

- Cấu hình vedge 2:

```
conf t
system
host-name vedge2
system-ip 3.1.1.1
site-id 2
organization-name VnPro
vbond 10.1.1.2
vpn 0
int ge0/1
ip add 172.16.1.2/24
tunnel-interface
encapsulation ipsec
allow-service all
color mpls
no shut
ip route 10.1.1.0/24 172.16.1.254
exit
commit and-quit
```

- Cấu hình vedge 3:

```
conf t
system
host-name vedge3
system-ip 4.1.1.1
site-id 3
organization-name VnPro
vbond 10.1.1.2
vpn 0
int ge0/1
ip add 172.16.1.3/24
tunnel-interface
encapsulation ipsec
allow-service all
color mpls
no shut
ip route 10.1.1.0/24 172.16.1.254
exit
commit and-quit
```

- Cấu hình router Internet:

```
conf t
hostname internet
interface Ethernet0/0
ip address 200.200.1.1 255.255.255.252
ip nat inside
no shut
!
interface Ethernet0/1
```

```
ip address 200.200.2.1 255.255.255.252
ip nat inside
no shut
!
interface Ethernet0/2
ip address 200.200.3.1 255.255.255.252
ip nat inside
no shut
!
interface Ethernet0/3
ip add dhcp
no shut
ip nat outside
!
interface Ethernet1/0
ip address 200.100.1.1 255.255.255.252
ip nat inside
no shut
!
ip route 10.1.1.0 255.255.255.252 200.100.1.2
access-list 1 permit any
ip nat inside source list 1 interface Ethernet0/3 overload
```

- Cấu hình router R:

```
conf
hostname R
!
interface Ethernet0/0
ip address 10.1.1.254 255.255.255.0
```

```
no shut
```

```
!
```

```
interface Ethernet0/3
```

```
ip address 200.100.1.2 255.255.255.252
```

```
no shut
```

```
!
```

```
interface Ethernet1/0
```

```
ip address 172.16.1.254 255.255.255.0
```

```
no shut
```

```
!
```

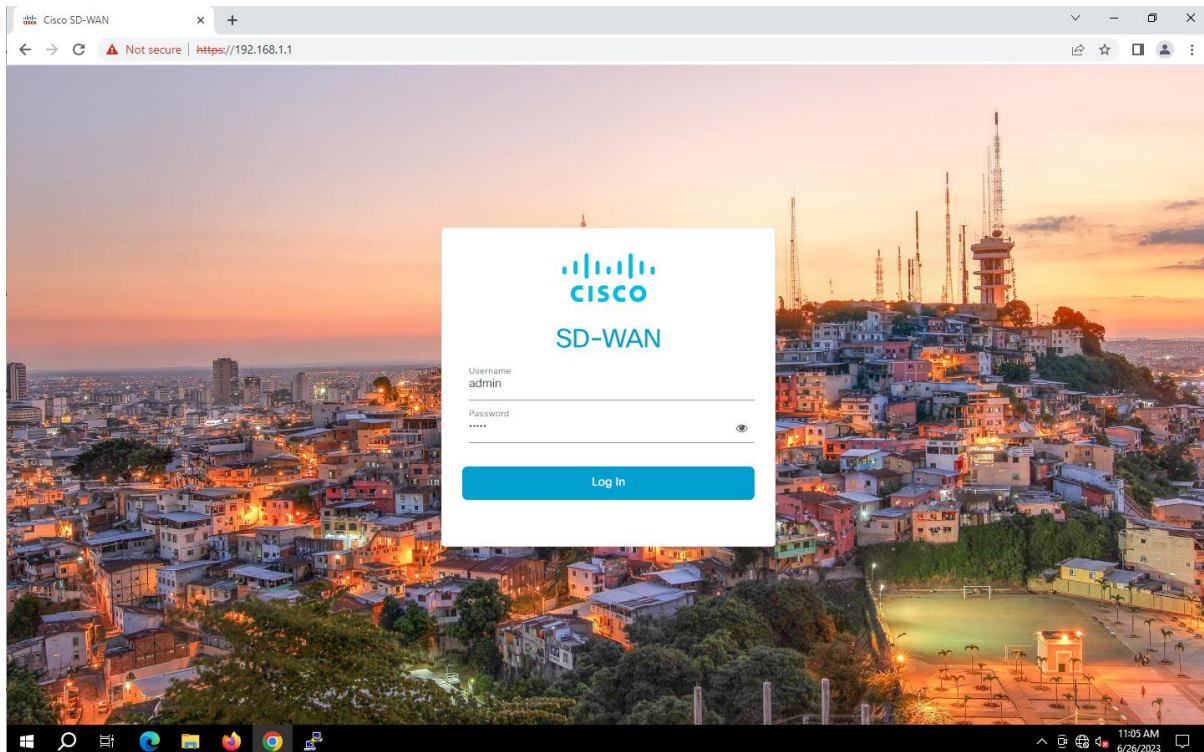
```
ip route 0.0.0.0 0.0.0.0 200.100.1.1
```

### 3.2. Cấu hình Bring up controller: vSmart, vBond, vManage và các vEdge

Sau khi đã cấu hình cơ bản cho cả các thành phần controller trong SD-WAN fabric ta tiến hành promote vManage lên thành CA( Certificate Authority). Dùng trình duyệt trên pc (trong sơ đồ lab) login vào portal vManage:

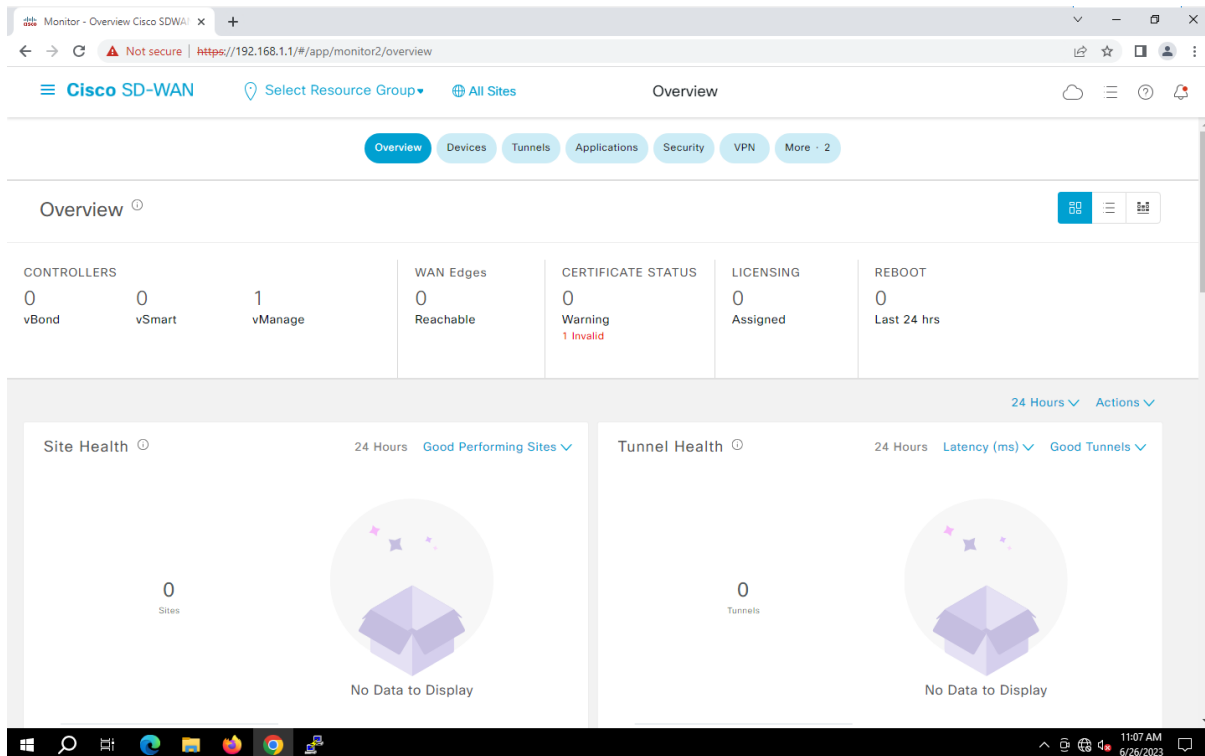
<https://192.168.1.1:8443>

Kết nối thành công vào vManage.



## IV. Kiểm tra:

Kết nối thành công vào vManage.



Ở bài lab này chúng ta sẽ dùng vManage làm server chứng thực. Dùng openssl để tạo và ký certificates từ vshell

- Sau khi kết nối thành công vManage ta sẽ tiến hành promote vManage lên thành CA: dùng terminal console trên vManage:

+ Gõ lệnh vshell để vào Shell mode cấu hình openssl: “**vshell**”

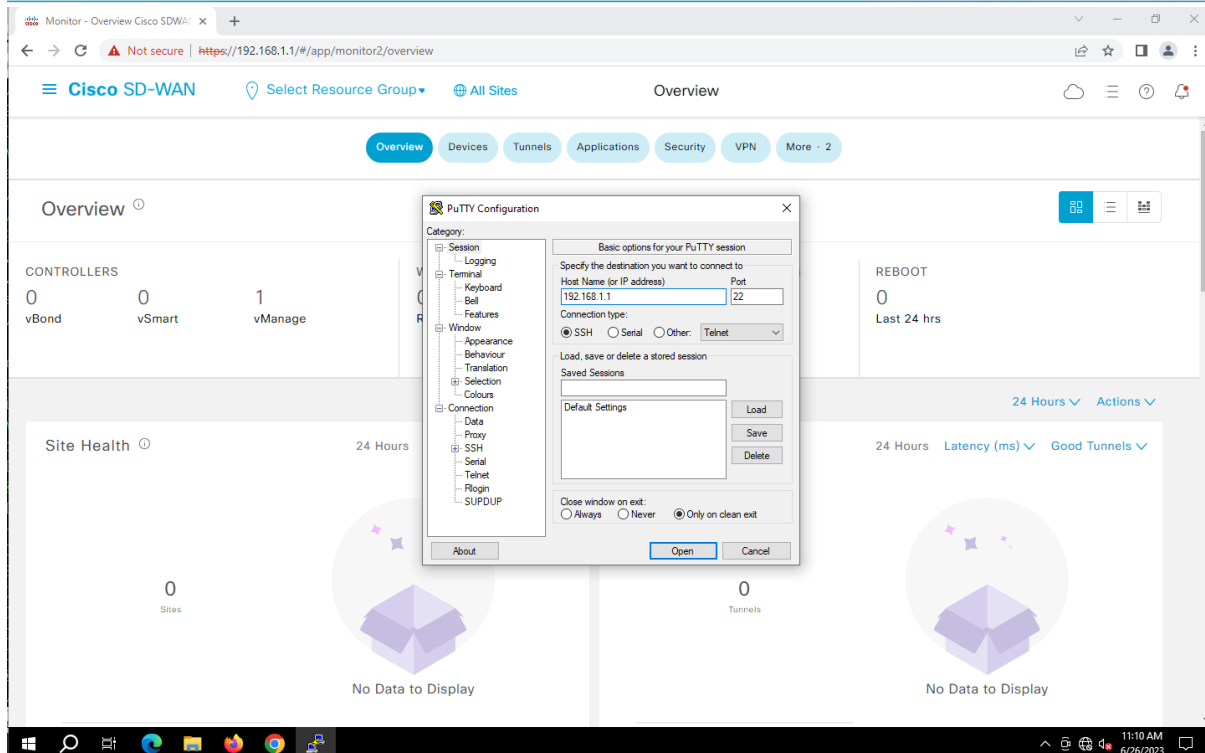
+ Tiếp theo generate key RSA 2048 ta gõ lệnh : “**openssl genrsa -out ROOTCA.key 2048**”

+ Sau khi đã có key ta sẽ generate 1 ROOTCA ta gõ lệnh: “**openssl req -x509 -new -nodes -key ROOTCA.key -sha256 -days 2000 -out ROOTCA.pem**”

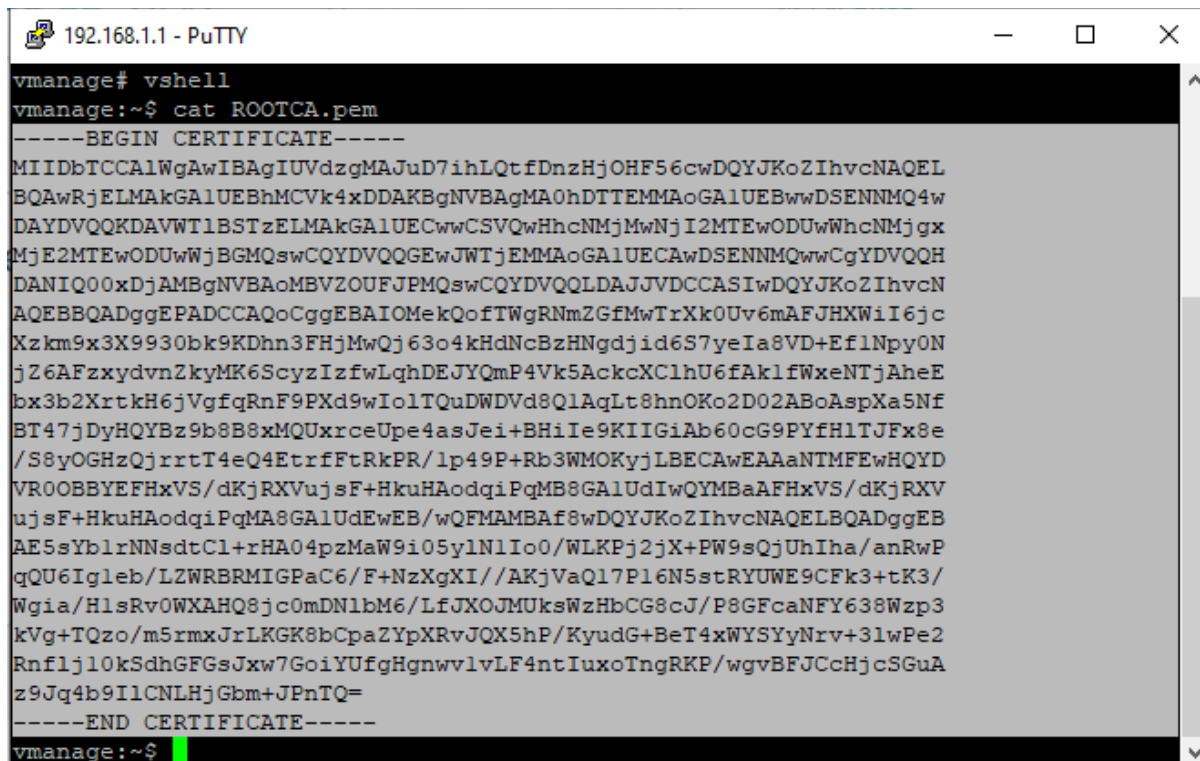
+ Tiếp theo ta gõ theo tùy chọn, còn không gõ gì thì cứ enter cho qua

```
-----
Country Name (2 letter code) [AU]:VN
State or Province Name (full name) [Some-State]:HCM
Locality Name (eg, city) []:HCM
Organization Name (eg, company) [Internet Widgits Pty Ltd]:VNPRO
Organizational Unit Name (eg, section) []:IT
Common Name (e.g. server FQDN or YOUR name) []:
Email Address []:
vmanage:~$
```

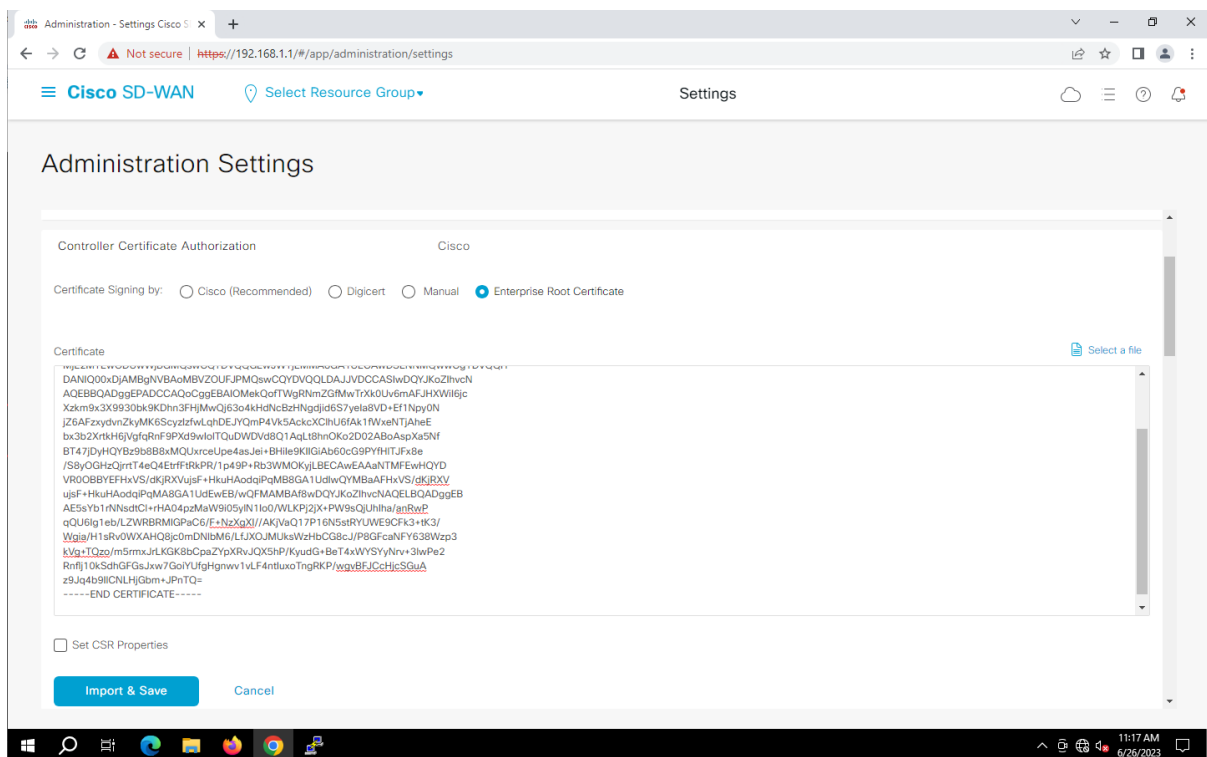
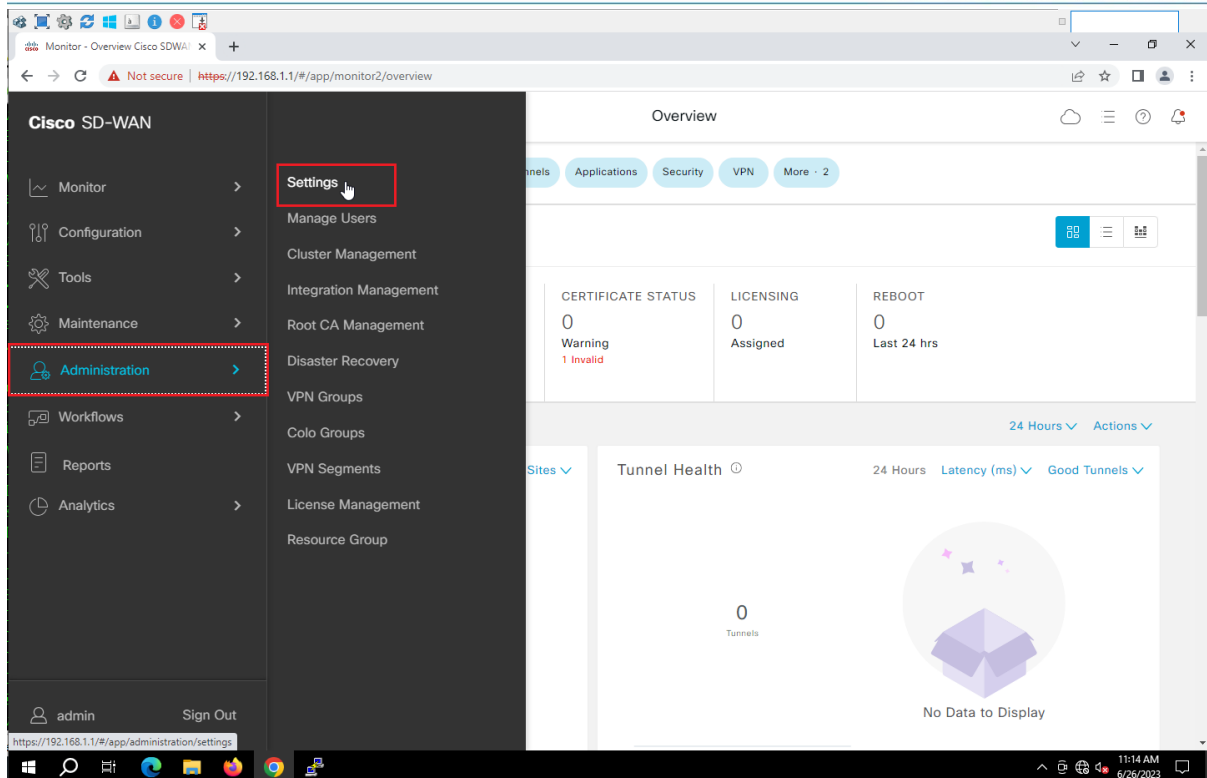
- Tiếp theo vào PC (trong sơ đồ lab) SSH vào vmanage với ip: 192.168.1.1



+ Ta vào shell mode với lệnh **vshell** gõ lệnh: **cat ROOTCA.pem** để đọc chứng chỉ số, sau đó ta copy chứng chỉ số đó từ begin đến end



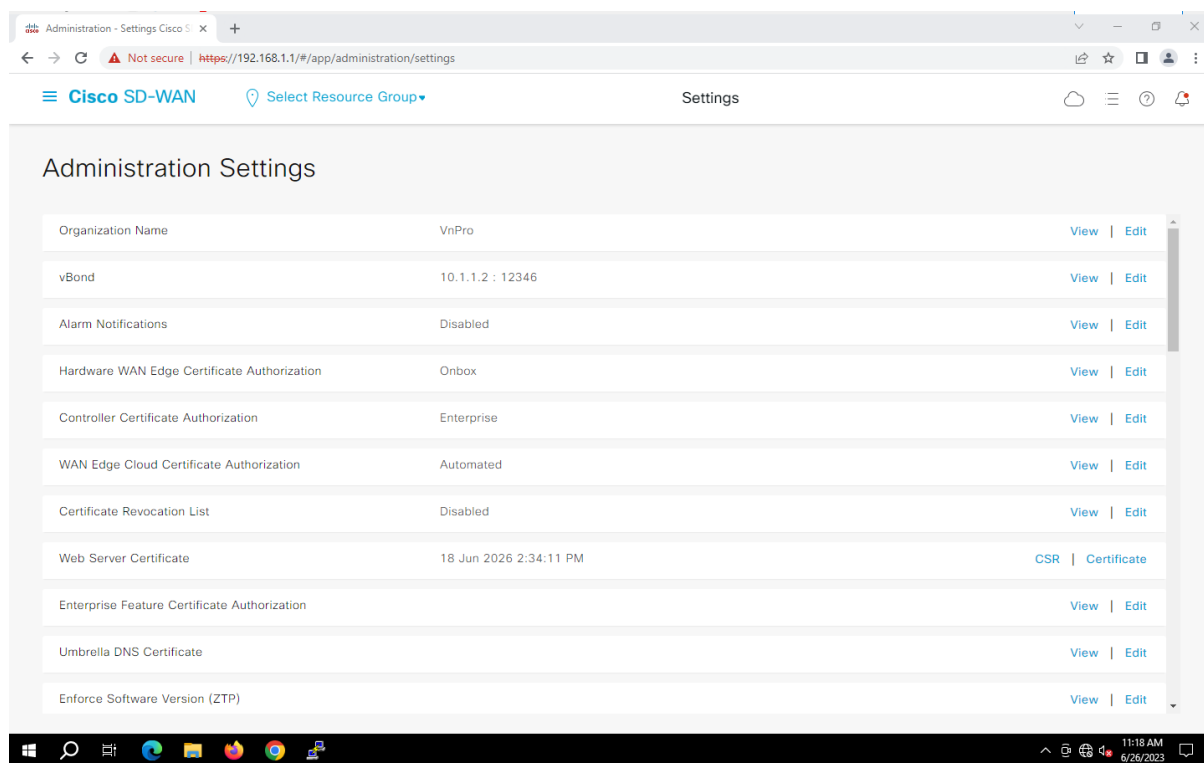
- Sau đó ta vào **Administration** → **Setting** → **Controller Certificate Authorization** → chọn **Enterprise Root Certificate** rồi paste vào Certificate chọn **Import & Save**



Ta chỉnh lại :

+ Organization name: **“VnPro”**

+ Vbond: “ 10.1.1.2”



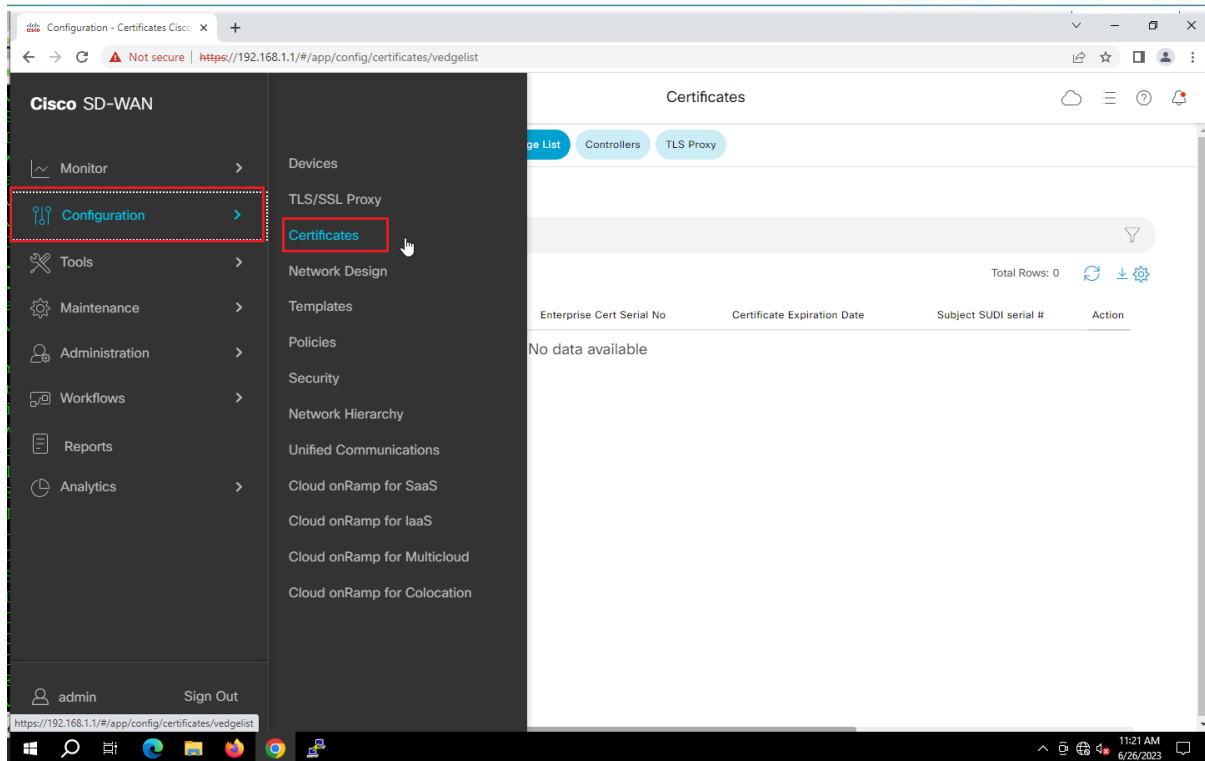
==> vManage đã được promote lên thành CA

- Dùng vManage để ký chứng thực cho vManage, vSmart, vBond.

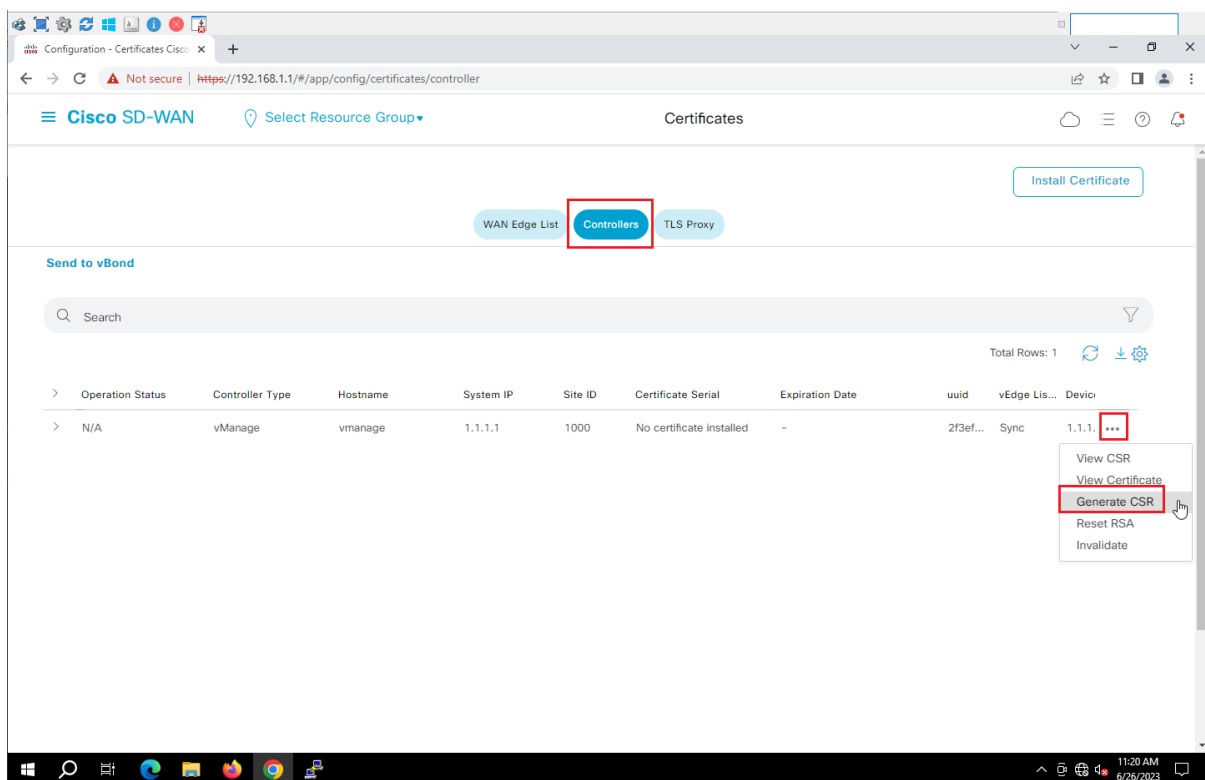
### Vmanage

+ Truy cập vào giao diện web để tạo một yêu cầu ký chứng thực

+ **Configuration** → **Certificates** → **Controllers** → **vManage** → **Generate CSR** để tạo file *vmanage\_csr*

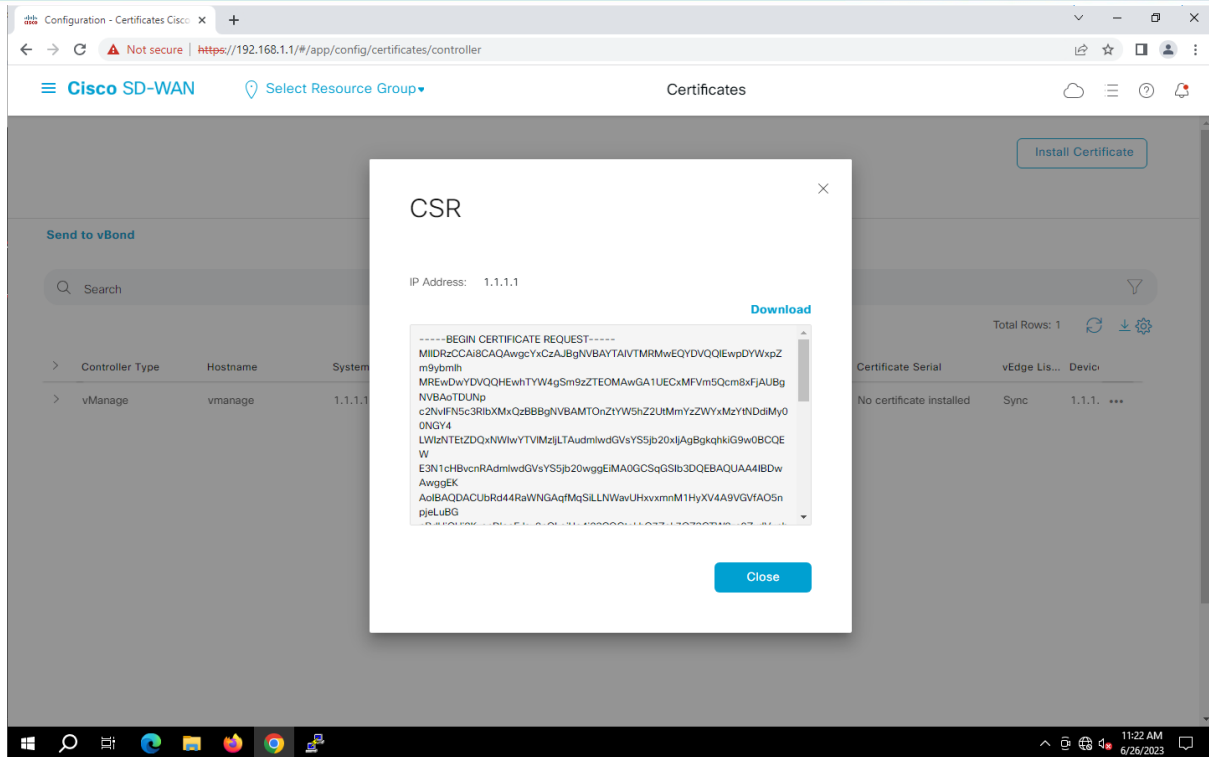


The screenshot shows the Cisco SD-WAN Configuration interface. The left sidebar contains a menu with 'Configuration' highlighted. The main content area is titled 'Certificates' and shows a table with columns: Enterprise Cert Serial No, Certificate Expiration Date, Subject SUDI serial #, and Action. The table is currently empty, displaying 'No data available'.



The screenshot shows the Cisco SD-WAN Configuration interface with the 'Certificates' tab selected. The table now contains one row of data. A context menu is open over the 'Device' column, showing options: View CSR, View Certificate, Generate CSR (highlighted), Reset RSA, and Invalidate.

| Operation Status | Controller Type | Hostname | System IP | Site ID | Certificate Serial       | Expiration Date | uuid     | vEdge Lis... | Device  |
|------------------|-----------------|----------|-----------|---------|--------------------------|-----------------|----------|--------------|---------|
| N/A              | vManage         | vmanage  | 1.1.1.1   | 1000    | No certificate installed | -               | 2f3ef... | Sync         | 1.1.1.1 |

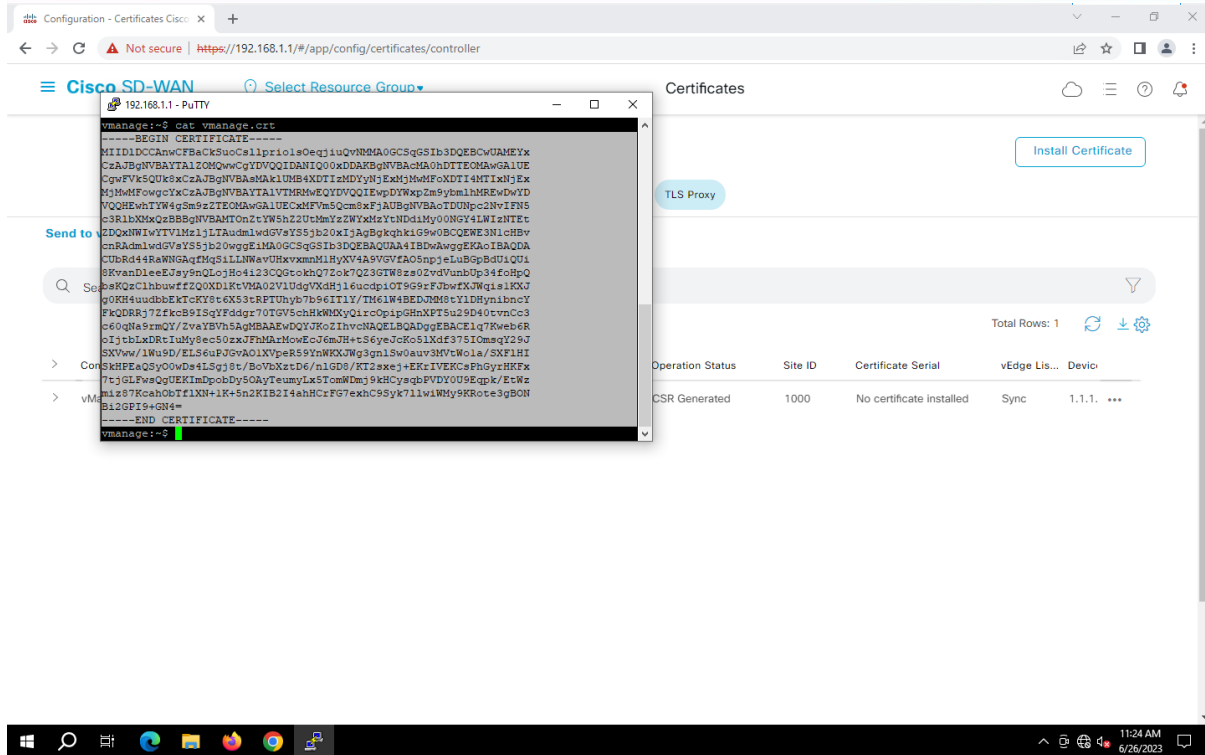


- Sau khi tạo xong file csr, ta dùng khóa ROOTCA.key để ký file vmanage\_csr ta vừa tạo ra với câu lệnh như sau: **openssl x509 -req -in vmanage\_csr -CA ROOTCA.pem -CAkey ROOTCA.key -CAcreateserial -out vmanage.crt -days 2000 -sha256** ==> tạo file *vmanage.crt*

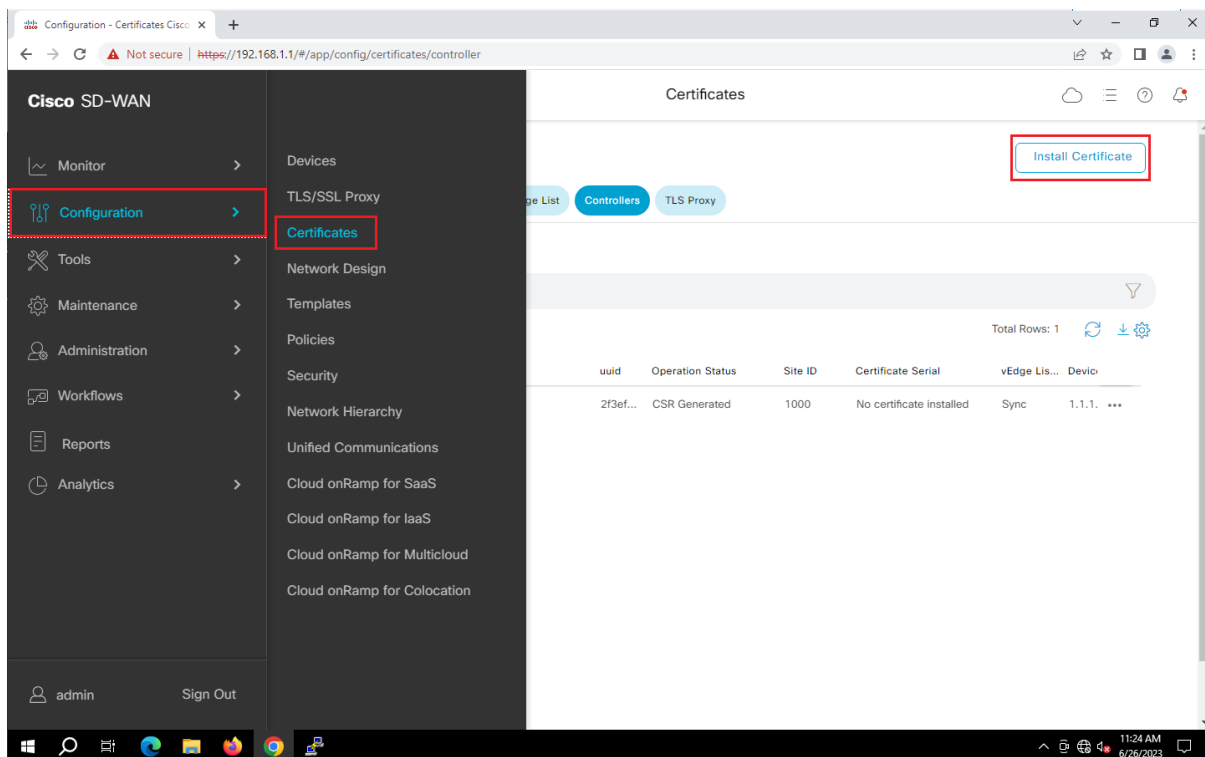
**Kiểm tra kết quả là:** đã ký thành công

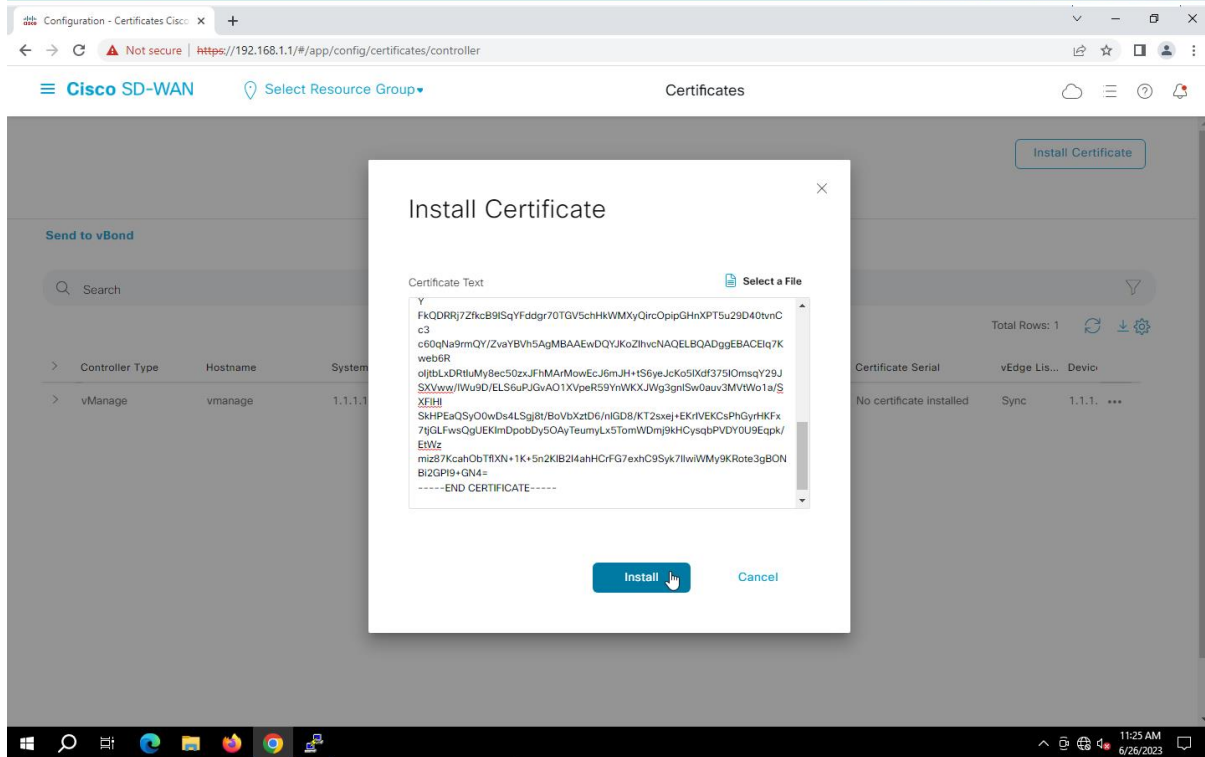
```
vmanage:~$ openssl x509 -req -in vmanage_csr -CA ROOTCA.pem -CAkey
Acreateserial -out vmanage.crt -days 2000 -sha256
Signature ok
subject=C = US, ST = California, L = San Jose, OU = VnPro, O = Cisc
o Systems, CN = vmanage-2f3ef136-47b3-44f8-b351-d415b0a5e39c-0.vipt
ela.com, emailAddress = support@viptela.com
Getting CA Private Key
vmanage:~$
```

- Ta vào trong PC (trong sơ đồ lab) vào putty gõ địa chỉ **192.168.1.1** rồi SSH Dùng lệnh **cat vmanage.crt** để đọc file *vmanage.crt*

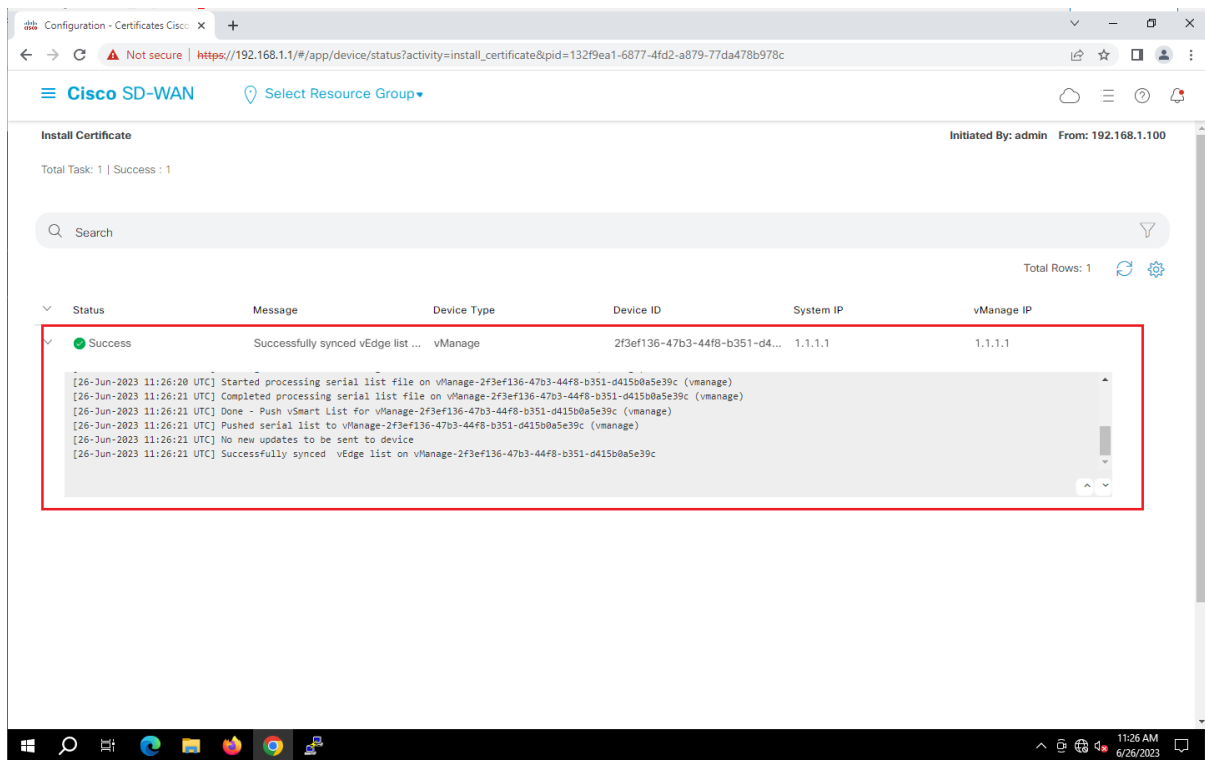


- Và cài đặt chứng thực trên giao diện web: **Configuration → Certificates → Controllers → Install Certificate:**



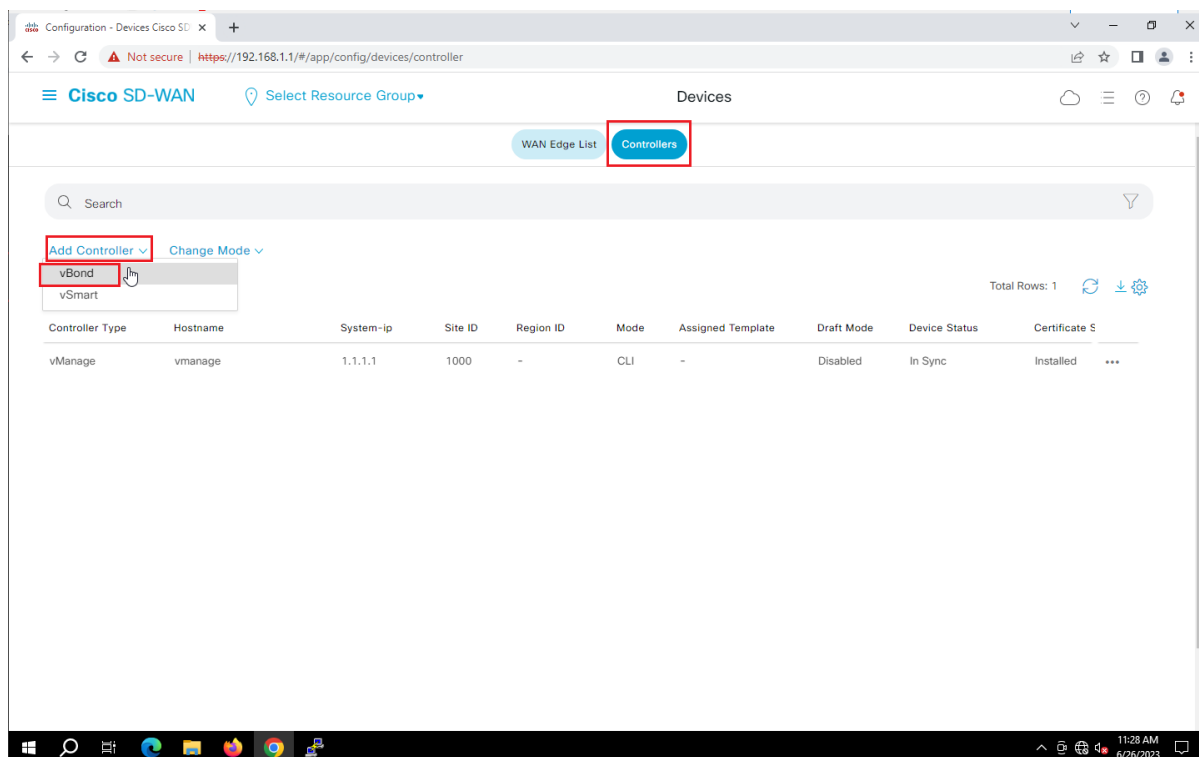
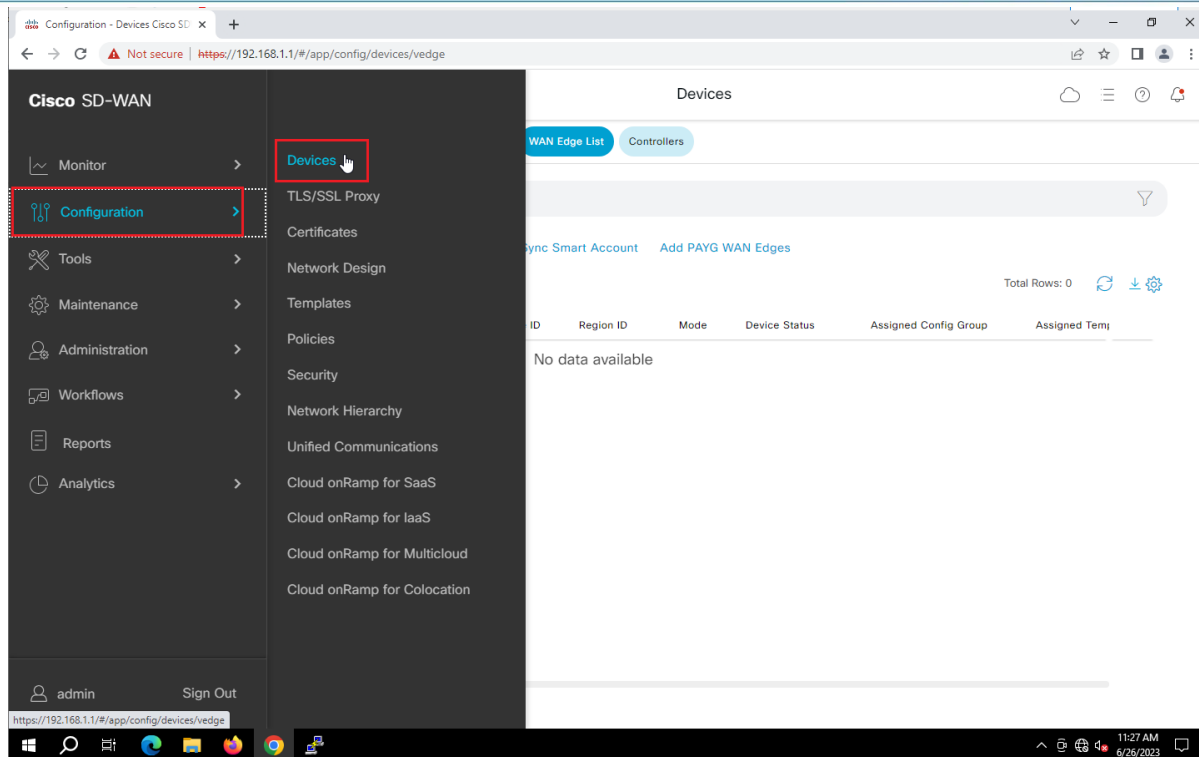


## Kiểm Tra: Đã xác thực thành công vManage

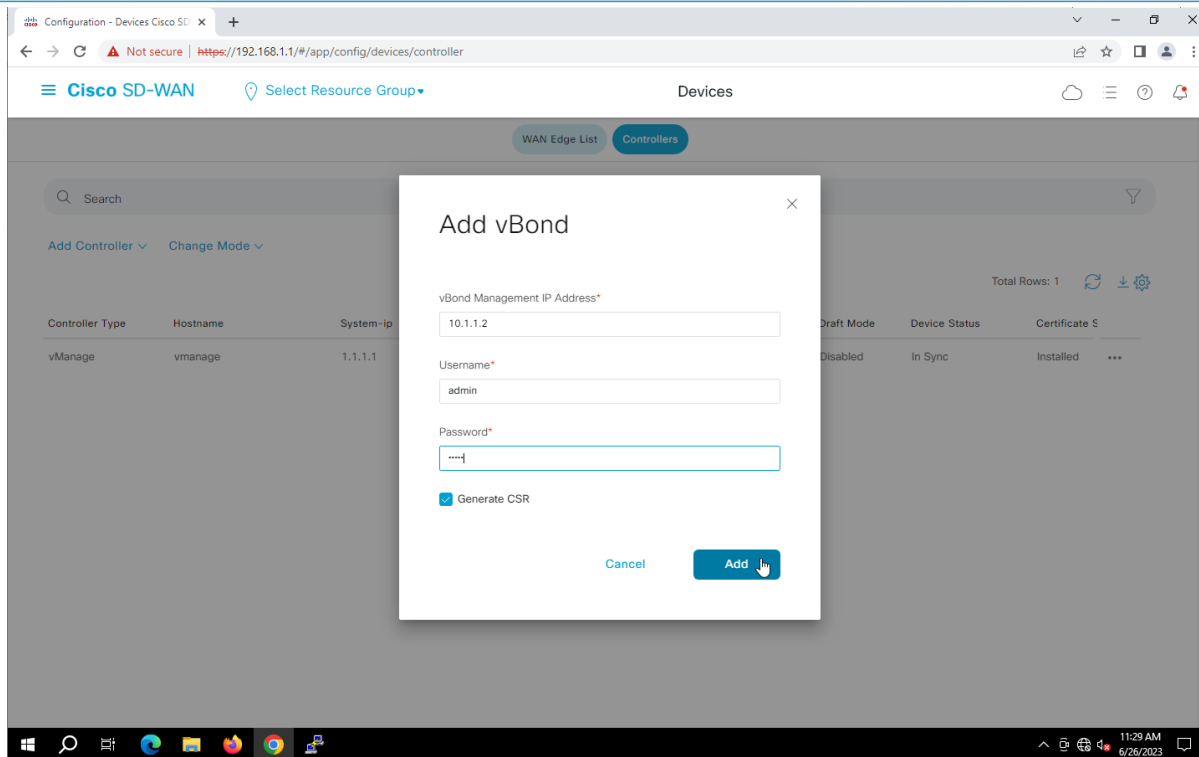


## VBond

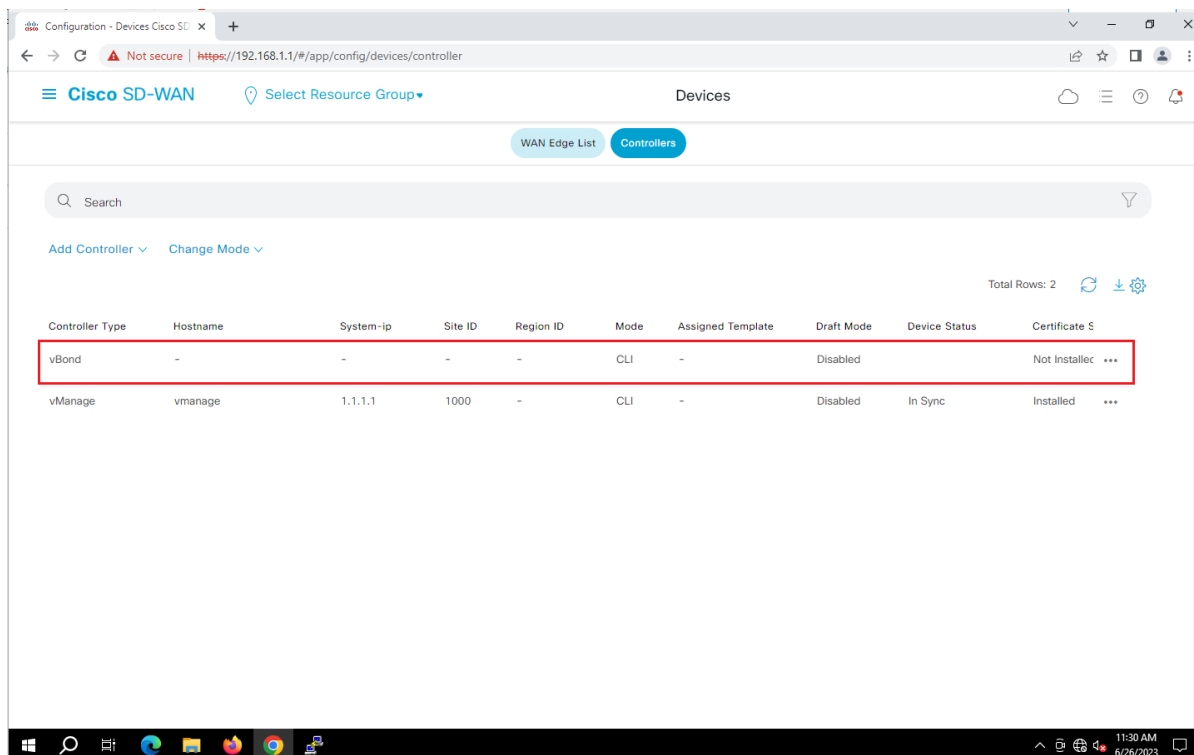
Vào Configuration → Device → Controller → Add controller



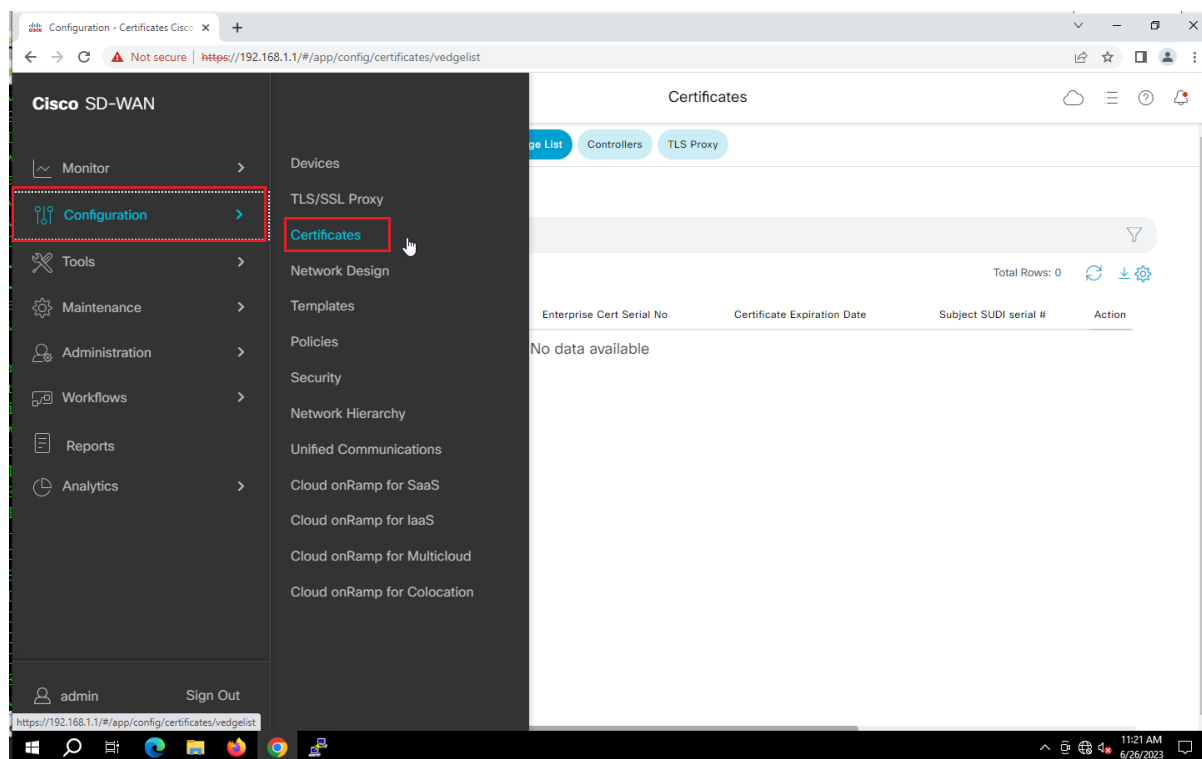
- Cấu hình vbond Management ip address: 10.1.1.2, username: admin, password: Admin



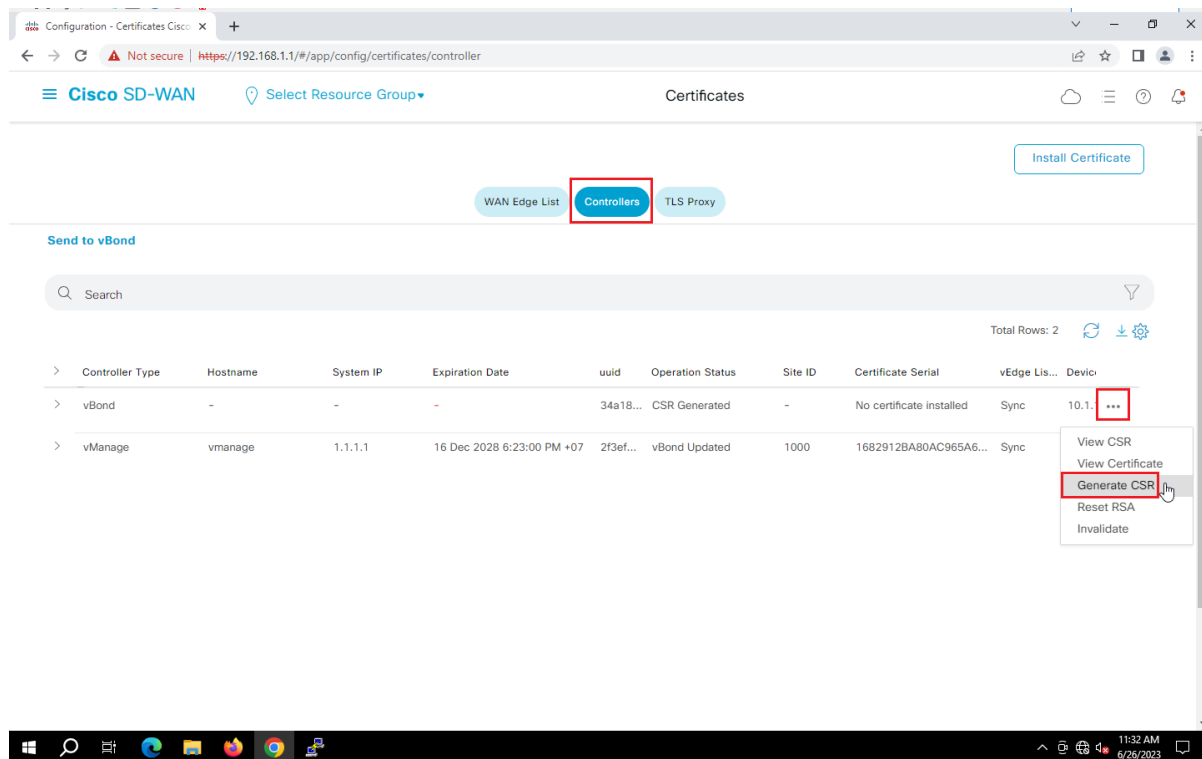
## Kiểm tra: xuất hiện vbond



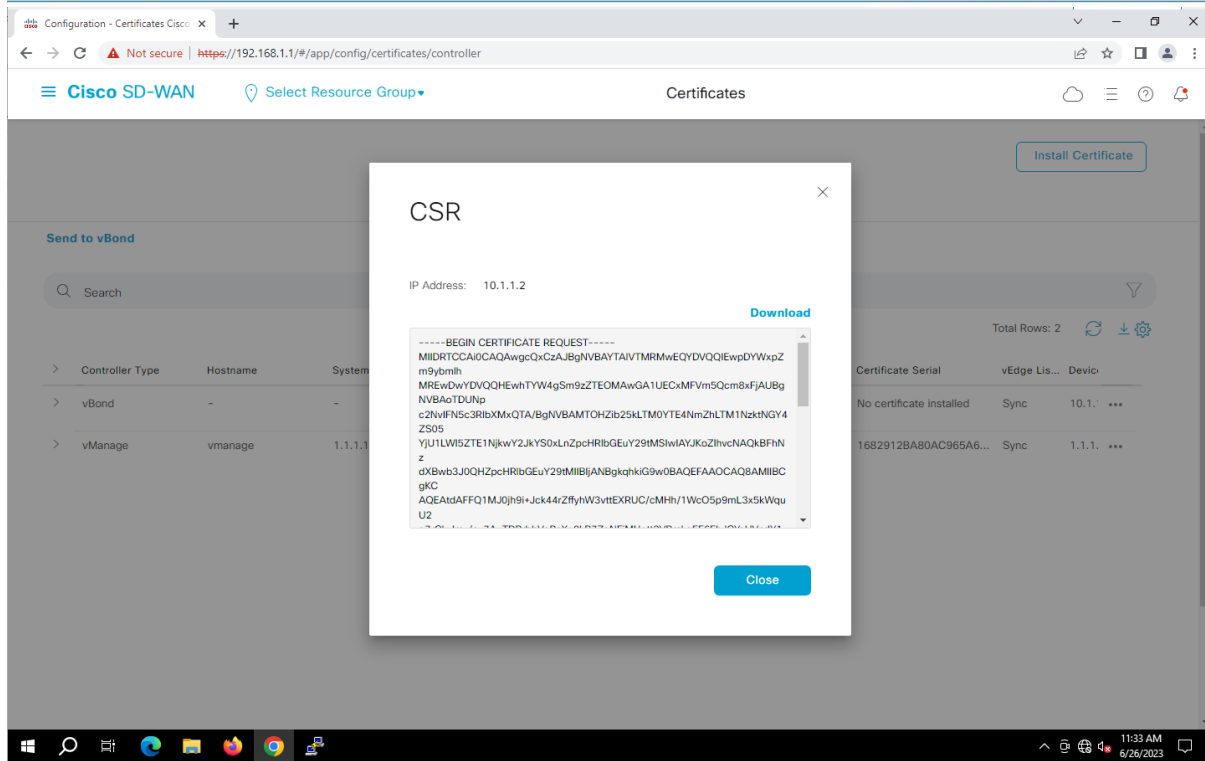
## - Tạo file `vbond_csr` bằng cách chọn Generate CSR



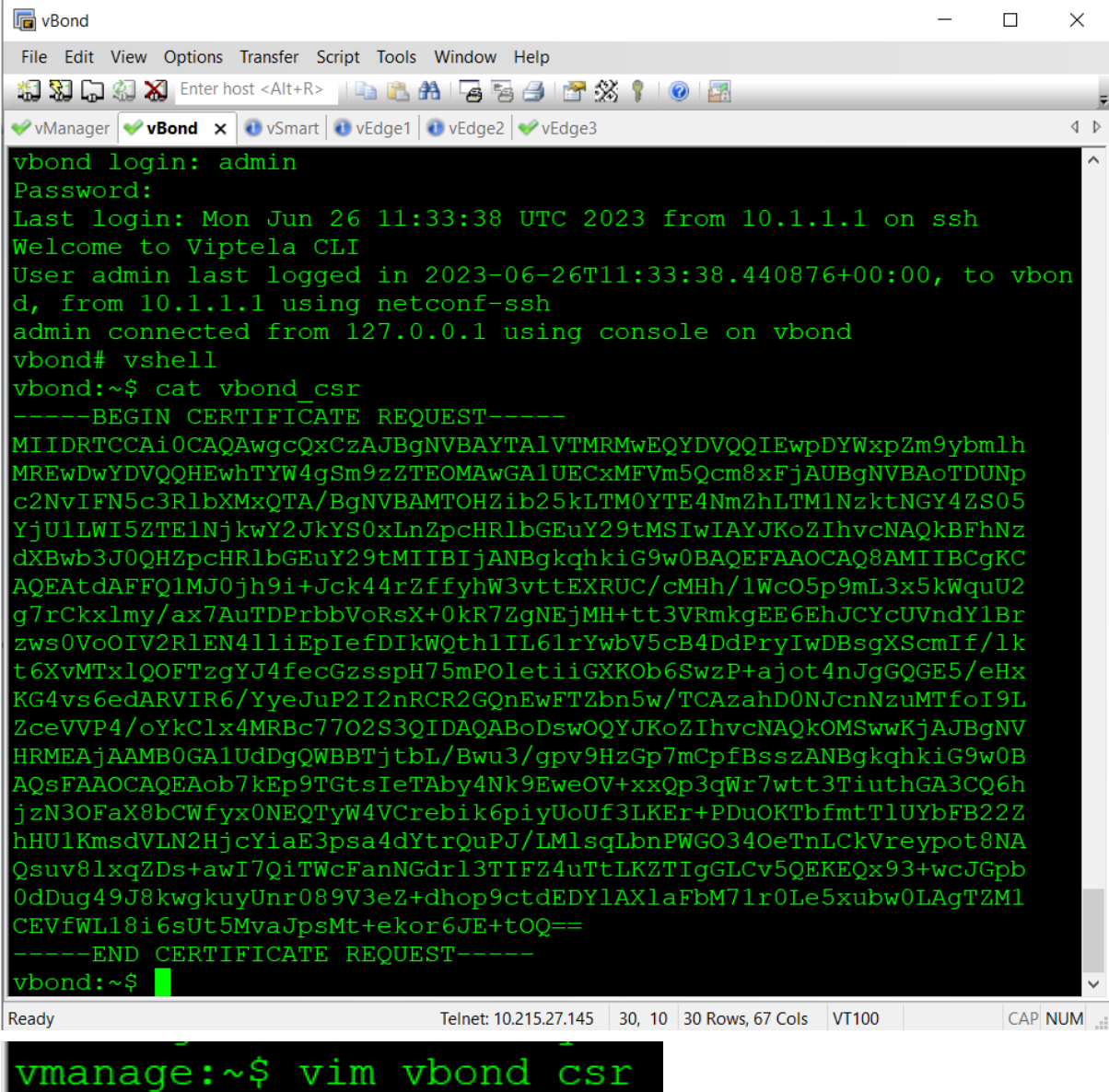
The screenshot shows the Cisco SD-WAN Configuration interface. The left sidebar contains a menu with options: Monitor, Configuration, Tools, Maintenance, Administration, Workflows, Reports, and Analytics. The 'Configuration' option is highlighted with a red dashed box. The main content area shows the 'Certificates' page with tabs for 'Edge List', 'Controllers', and 'TLS Proxy'. The 'Certificates' page displays a table with columns: Enterprise Cert Serial No, Certificate Expiration Date, Subject SUDI serial #, and Action. The table is currently empty, showing 'No data available'.



The screenshot shows the Cisco SD-WAN Configuration interface, specifically the 'Certificates' page. The 'Controllers' tab is selected and highlighted with a red box. Below the tabs, there is a search bar and a table with columns: Controller Type, Hostname, System IP, Expiration Date, uuid, Operation Status, Site ID, Certificate Serial, vEdge Lis..., and Device. The table contains two rows: one for 'vBond' and one for 'vManage'. The 'vBond' row is highlighted, and a context menu is open over the 'Device' column, showing options: View CSR, View Certificate, Generate CSR (highlighted with a red box), Reset RSA, and Invalidate.



- Vào console vbond gõ **cat vbond\_csr** và copy chứng chỉ số từ begin đến end
- Sau đó qua console vmanage tạo file **vbond\_csr** bằng câu lệnh: **vim vbond\_csr** dán chứng chỉ số vừa copy ở vbond bằng cách gõ **i** rồi kích chuột phải để dán, sau đó gõ **esc :wq** để thoát ra.



```
vBond
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager vBond x vSmart vEdge1 vEdge2 vEdge3
vbond login: admin
Password:
Last login: Mon Jun 26 11:33:38 UTC 2023 from 10.1.1.1 on ssh
Welcome to Viptela CLI
User admin last logged in 2023-06-26T11:33:38.440876+00:00, to vbond, from 10.1.1.1 using netconf-ssh
admin connected from 127.0.0.1 using console on vbond
vbond# vshell
vbond:~$ cat vbond_csr
-----BEGIN CERTIFICATE REQUEST-----
MIIDRTCCAi0CAQAwgCQxCzAJBgNVBAYTAlVTMRMwEQYDVQQIEwpDYWxpZm9ybmlh
MREwDwYDVQQHEwhTYW4gSm9zZTEOMAwGALUECxFVjM5Qcm8xFjAUBgNVBAoTDUNp
c2NvIFN5c3RlbXMxQTA/BgNVBAMTOHZib25kLTM0YTE4NmZhLTM1NzktNGY4ZS05
YjU1LWl5ZTE1NjkwY2JkYS0xLnZpcHRlbGEuY29tMSIwIAYJKoZIhvcNAQkBFhNz
dXBwb3J0QHZpcHRlbGEuY29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKC
AQEAtdAFFQ1MJ0jh9i+Jck44rZffyhW3vttEXRUC/cMHh/1WcO5p9mL3x5kWquU2
g7rCkxlmY/ax7AuTDPrbbVoRsX+0kR7ZgNEjMH+tt3VRmkGEE6EhJCycUVndY1Br
zws0VoOIV2RlEN4lliePIefDIkWQth1IL6lrYwbV5cB4DdPryIwDBsgXScmIf/lk
t6XvMTxlQOFTzgYJ4fecGzsspH75mPOletiiGXKOb6SwzP+ajot4nJgGQGE5/eHx
KG4vs6edARVIR6/YyeJuP2I2nRCR2GQnEwFTZbn5w/TCAzahD0NJcnNzuMTfoI9L
ZceVVP4/oYkClx4MRBc77O2S3QIDAQABODswOQYJKoZIhvcNAQkOMSwKjAJBgNV
HRMEAjAAMB0GA1UdDgQWBBTjtbL/Bwu3/gpv9HzGp7mCpfBsszANBgkqhkiG9w0B
AQsFAAOCAQEAob7kEp9TGtsIeTAby4Nk9EweOV+xxQp3qWr7wtt3TiuthGA3CQ6h
jzN3OFax8bCWfyx0NEQTyW4VCrebik6piyUoUf3LKEr+PDuOKTbfmtTlUYbFB22Z
hHU1KmsdVLN2HjcYiaE3psa4dYtrQuPJ/LMlsqLbnPWGO34OeTnLCkVreypot8NA
Qsuv8lxqZDs+awI7QiTWcFanNGdrl3TIFZ4uTtLKZTIgGLCv5QEKEQx93+wcJGpb
0dDug49J8kwgkuyUnr089V3eZ+dhop9ctdEDYlAXlaFbM7lr0Le5xubw0LAgTZM1
CEVfWL18i6sUt5MvaJpsMt+ekor6JE+toQ==
-----END CERTIFICATE REQUEST-----
vbond:~$
```

Ready Telnet: 10.215.27.145 30, 10 30 Rows, 67 Cols VT100 CAP NUM

```
vmanage:~$ vim vbond_csr
```

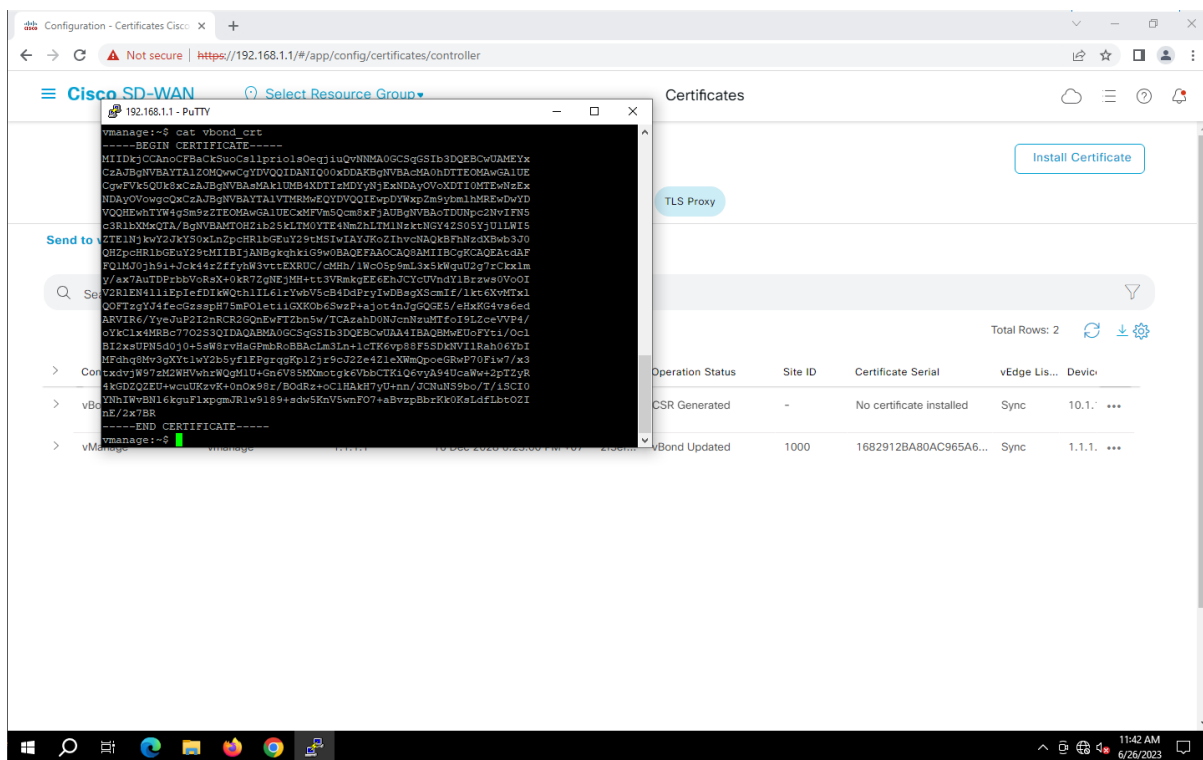
```
vManager
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager x vBond vSmart vEdge1 vEdge2 vEdge3
-----BEGIN CERTIFICATE REQUEST-----
MIIDRTCCAi0CAQAwgcQxCzAJBgNVBAYTA1VTMRMwEQYDVQQIEwpDYWxpZm9ybmlh
MREwDwYDVQQHEWhTYW4gSm9zZTEOMAwGAlUECxFVWm5Qcm8xYjAUBGNVBAoTDUNp
c2NvIFN5c3RlbXMxQTA/BgNVBAMTOHZib25kLTMT0YTE4NmZhLTMT1NzktNGY4ZS05
YjU1LWI5ZTE1NjkwY2JkYS0xLnZpcHRlbGEuY29tMSIwIAYJKoZIhvcNAQkBFhNz
dXBwb3J0QHZpcHRlbGEuY29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKC
AQEAtdAFFQ1MJ0jh9i+Jck44rZffyhW3vttEXRUC/cMHh/1WcO5p9mL3x5kWquU2
g7rCkxlmY/ax7AuTDPrrbbVoRsX+0kR7ZgNEjMH+tt3VRmkgEE6EhJCYcUVndY1Br
zws0VoOIV2R1EN4lliEpIefDIkWQthl1L6lrYwbV5cB4DdPryIwDBsgXScmIf/lk
t6XvMTxlQOFTzgYJ4fecGzssPH75mPOletiiGXKOb6SwzP+ajot4nJgGQGE5/eHx
KG4vs6edARVIR6/YyeJuP2I2nRCR2GQnEwFTZbn5w/TCAzahD0NJcnNzuMTfoI9L
ZceVVP4/oYkClx4MRBc7702S3QIDAQABOdswOQYJKoZIhvcNAQkOMSwKjAJBgNV
HRMEAjAAMB0GA1UdDgQWBBTjtbL/Bwu3/gpv9HzGp7mCpfBsszANBgkqhkiG9w0B
AQsFAAOCAQEAOB7kEp9TGtsIeTaby4Nk9EweOV+xxQp3qWr7wtt3TiuthGA3CQ6h
jzN3OFaX8bCWfyx0NEQTyW4VCrebik6piyUoUf3LKEr+PDuOKTbfmtTlUYbFB22Z
hHU1KmsdVLN2HjcyiaE3psa4dYtrQuPJ/LMlsqLbnPWGO34OeTnLCkVreypot8NA
Qsuv8lxqZDs+awI7QiTWcFanNGdrl3TIFZ4uTtLKZTIgGLCv5QEKEQx93+wcJGpb
0dDug49J8kgwkuyUnr089V3eZ+dhop9ctdEDYlAXlaFbM7lr0Le5xubw0LAgTZM1
CEVfWL18i6sUt5MvaJpsMt+ekor6JE+toQ==
-----END CERTIFICATE REQUEST-----
~
~
~
:wq
Ready Telnet: 10.215.27.145 24, 4 30 Rows, 67 Cols VT100 CAP NUM
```

- Tiếp tục ở console vmanage dùng câu lệnh: “openssl x509 -req -in vbond\_csr -CA ROOTCA.pem -CAkey ROOTCA.key -CAcreateserial -out vbond.crt -days 500 -sha256” để chuyển file *vbond\_csr* sang *vbond.crt*

```
vmanage:~$ openssl x509 -req -in vbond_csr -CA ROOTCA.pem -CAkey RO
reateserial -out vbond.crt -days 500 -sha256
Signature ok
subject=C = US, ST = California, L = San Jose, OU = VnPro, O = Cisc
o Systems, CN = vbond-34a186fa-3579-4f8e-9b55-b9e15690cbda-1.viptel
a.com, emailAddress = support@viptela.com
Getting CA Private Key
vmanage:~$
```

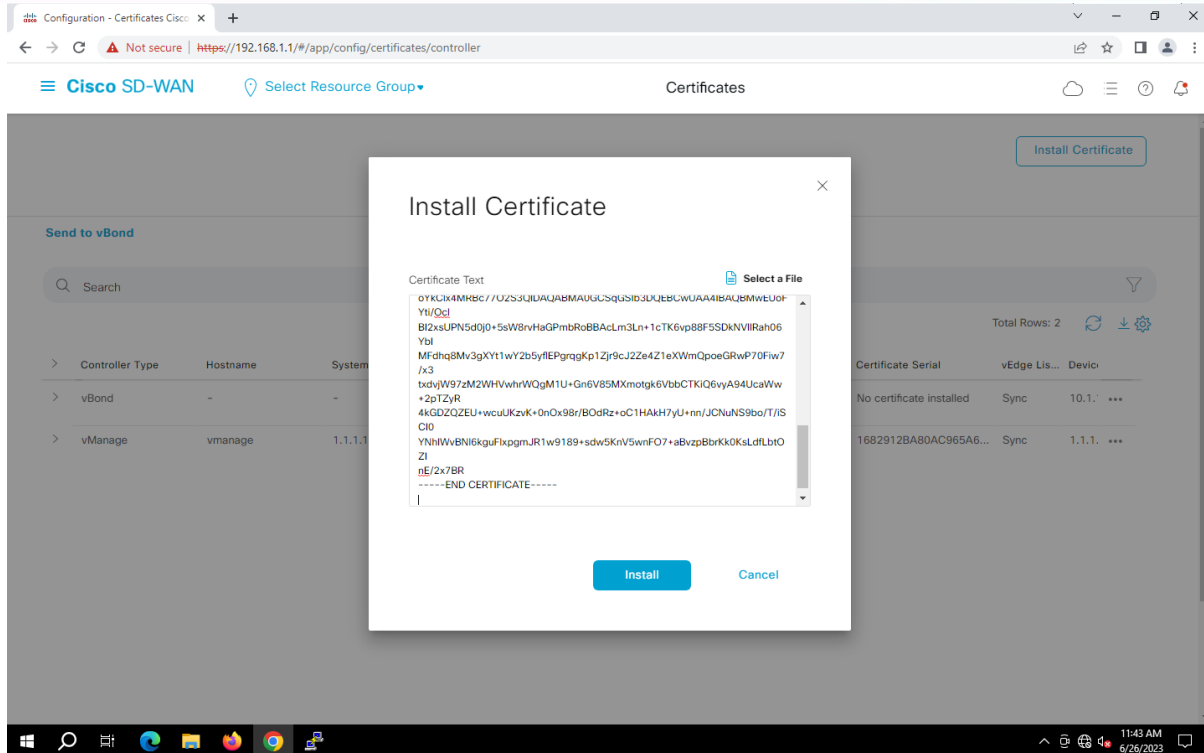
```
vmanage:~$ ls -l
total 32
-rw----- 1 admin admin 1700 Jun 26 11:08 ROOTCA.key
-rw----- 1 admin admin 1249 Jun 26 11:08 ROOTCA.pem
-rw----- 1 admin admin 41 Jun 26 11:40 ROOTCA.srl
-rw-r--r-- 1 admin admin 566 Jun 26 10:03 archive_id_rsa.pub
-rw----- 1 admin admin 1298 Jun 26 11:40 vbond.crt
-rw----- 1 admin admin 1212 Jun 26 11:40 vbond.csr
-rw----- 1 admin admin 1302 Jun 26 11:23 vmanage.crt
-rw-r--r-- 1 root root 1212 Jun 26 11:22 vmanage.csr
vmanage:~$
```

- Vào PC (trong sơ đồ lab) ssh vào vmanage, dùng **cat vbond.crt** để copy chứng chỉ số

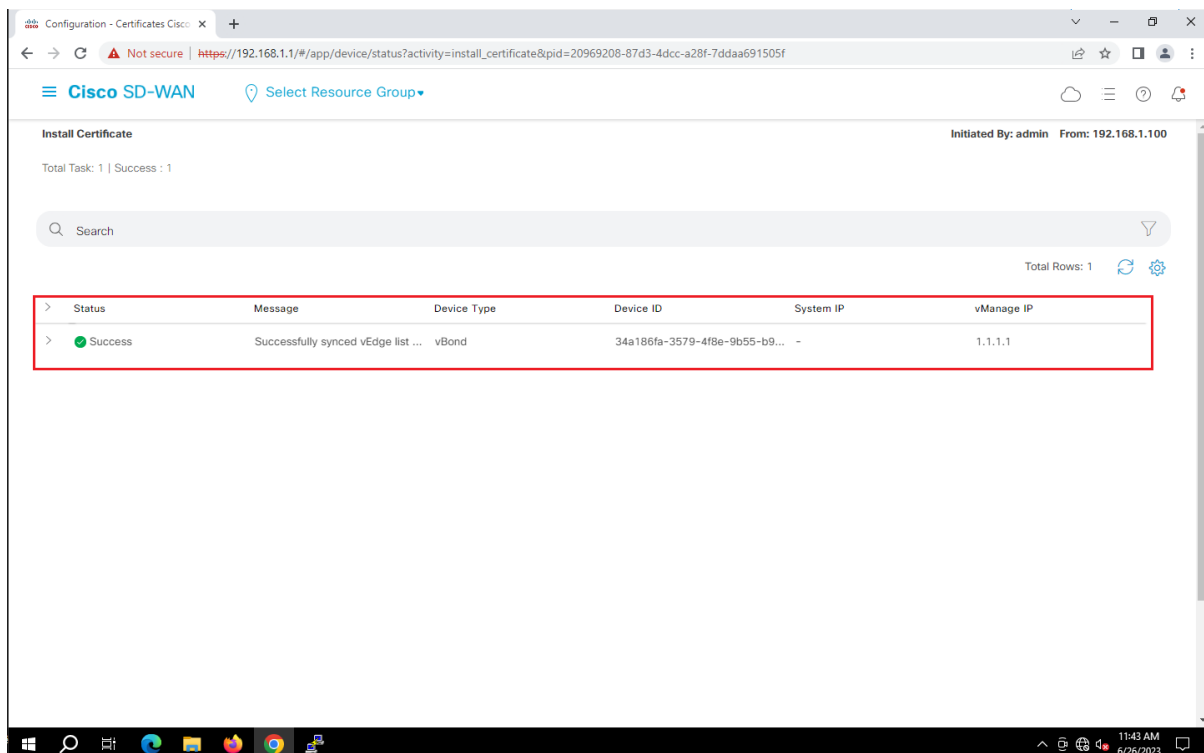


The screenshot shows a web browser window with the Cisco SD-WAN configuration page. The 'Certificates' tab is active, displaying a table of certificates. A terminal window is open, showing the command 'cat vbond.crt' and its output, which is a large block of base64-encoded text. The browser interface shows the 'Certificates' tab with a table of certificates. The table has columns for Operation Status, Site ID, Certificate Serial, vEdge Lis..., and Devic... The table shows two rows: 'CSR Generated' and 'VBond Updated'.

- Sau đó vào giao diện trên web vmanage chọn Install Certificate

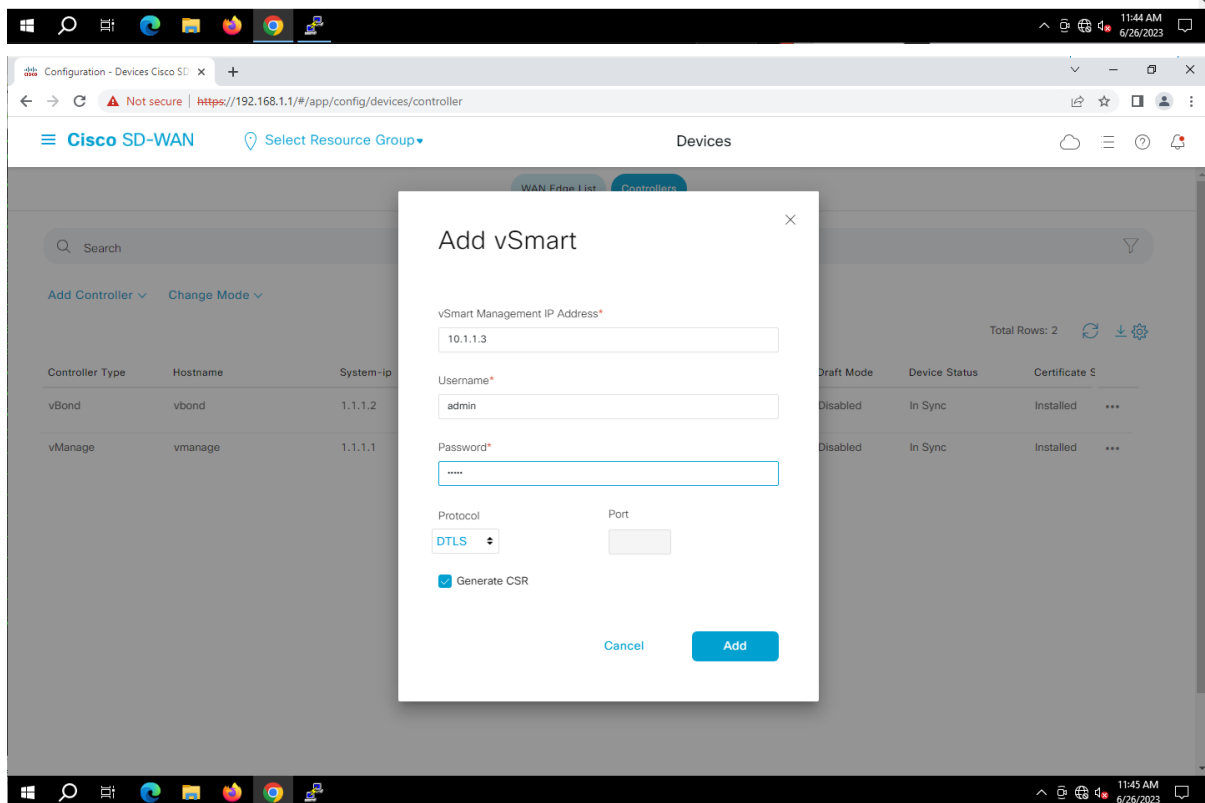
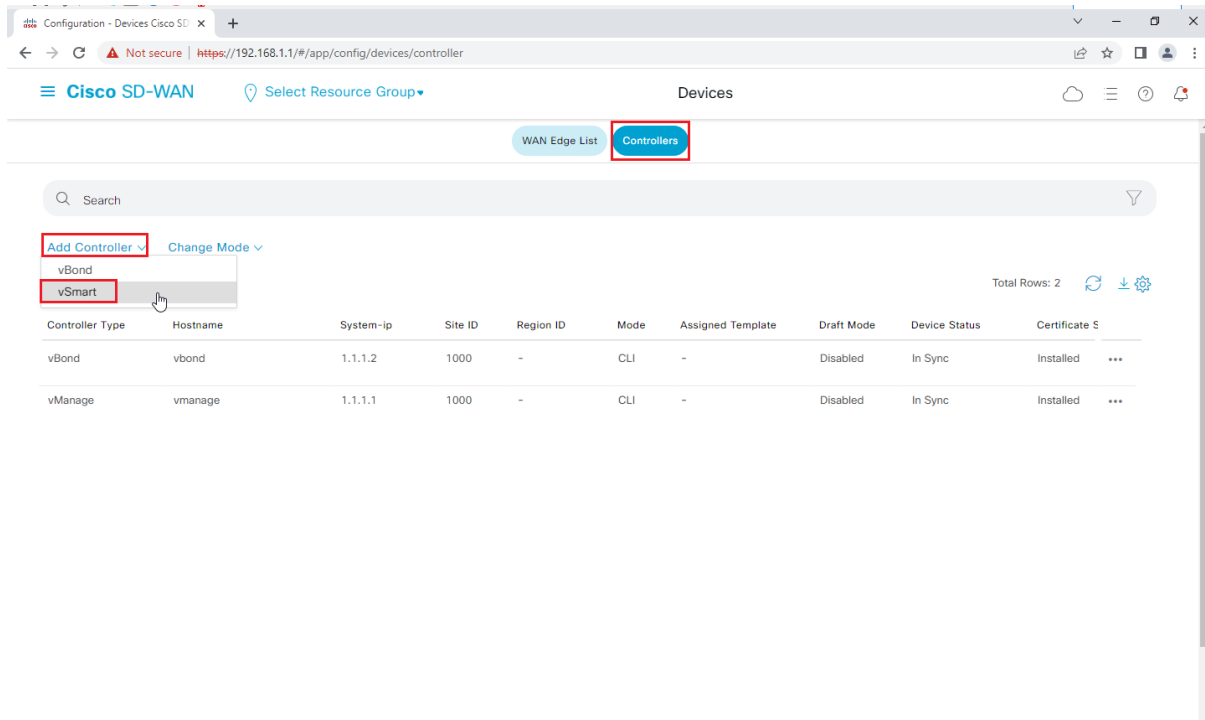


## Kiểm tra kết quả: thành công

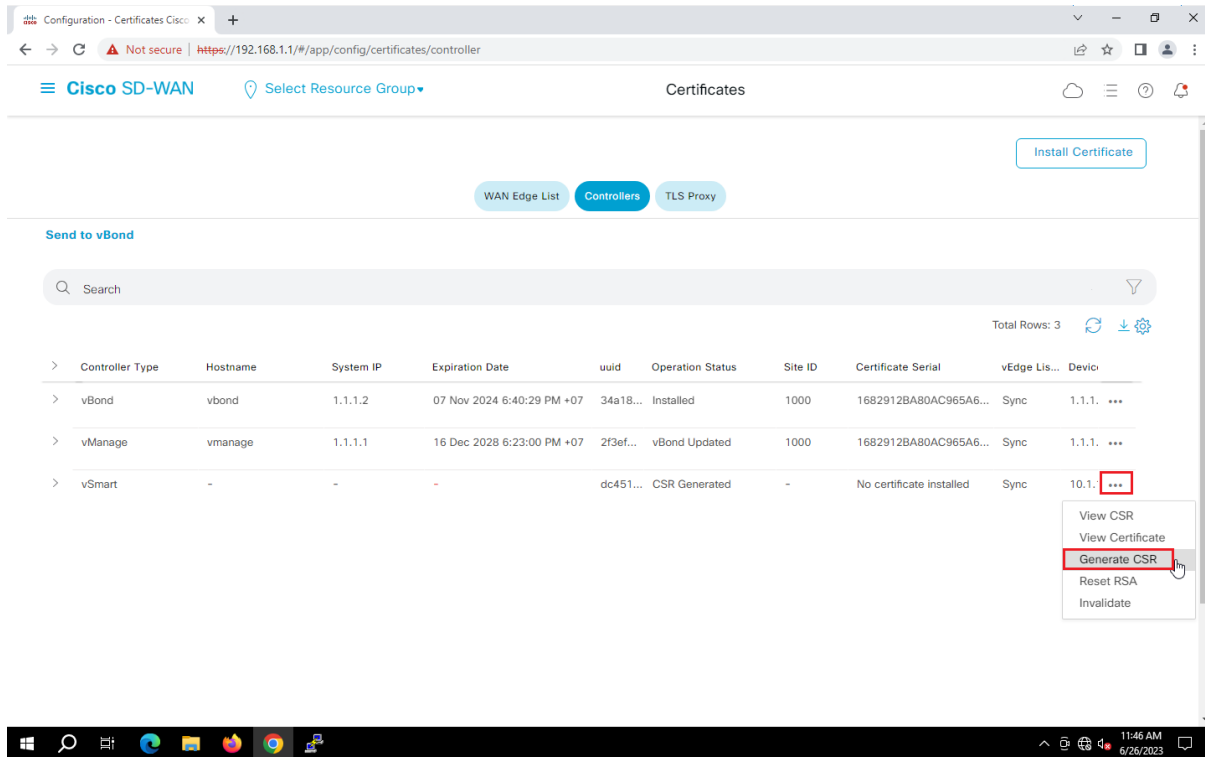


## VSmart: tương tự vbond

- Cấu hình vSmart Management ip address: 10.1.1.3, username: admin, password: Admin



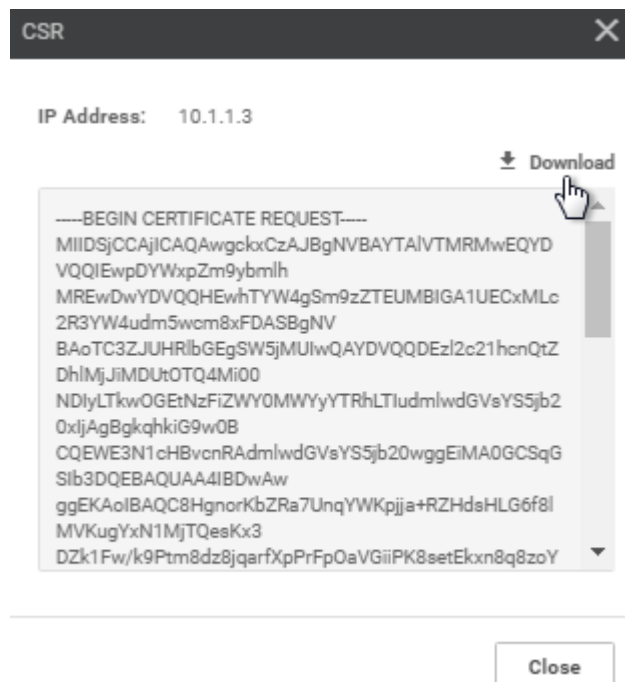
## - Tạo file *vsmart\_csr* bằng cách chọn Generate CSR



The screenshot shows the Cisco SD-WAN configuration interface for Certificates. The 'Controllers' tab is selected. A table lists the controllers:

| Controller Type | Hostname | System IP | Expiration Date            | uuid     | Operation Status | Site ID | Certificate Serial       | vEdge Lis... | Device     |
|-----------------|----------|-----------|----------------------------|----------|------------------|---------|--------------------------|--------------|------------|
| vBond           | vbond    | 1.1.1.2   | 07 Nov 2024 6:40:29 PM +07 | 34a18... | Installed        | 1000    | 1682912BA80AC965A6...    | Sync         | 1.1.1. ... |
| vManage         | vmanage  | 1.1.1.1   | 16 Dec 2028 6:23:00 PM +07 | 2f3ef... | vBond Updated    | 1000    | 1682912BA80AC965A6...    | Sync         | 1.1.1. ... |
| vSmart          | -        | -         | -                          | dc451... | CSR Generated    | -       | No certificate installed | Sync         | 10.1. ...  |

A dropdown menu is open for the vSmart controller, showing options: View CSR, View Certificate, **Generate CSR** (highlighted), Reset RSA, and Invalidate.



The screenshot shows a dialog box titled 'CSR' with the IP Address '10.1.1.3'. A 'Download' button is visible. The main content area displays the generated CSR text:

```
-----BEGIN CERTIFICATE REQUEST-----
MIIDSjCCAjICAQAwgckxCzAJBgNVBAYTAiVTMRMwEQYD
VQIIEwpDYWxpZm9ybmlh
MREwDwYDVQQHEwhTYW4gSm9zZTEUMBGA1UECjMLc
2R3YW4udm5wcm8xZDAsBgNV
BAoTC3ZJUHRlbGEgSW5jMUIwQAYDVQQDEzIc21hcnQtZ
DhlMjJiMDUtOTQ4Mi00
NDlyLTkwOGEtNzFiZWY0MwYyYTRhLTludmldwGVsYSSj2
0xIjAgBgkqhkiG9w0B
CQEWE3N1cHBvcnRAdmldwGVsYSSj20wggEIMA0GCSqG
Sib3DQEBAQUAA4IBDwAw
ggEKAolBAQC8HgnorKbZRa7UnqYWKpjj+RZHdsHLG6f8l
MVKugYxN1MjTQesKx3
DZk1Fw/k9Ptm8dz8jqarfXpPrFpOaVGiiPK8setEkxn8q8zoY
-----
```

A 'Close' button is located at the bottom right of the dialog.

- Vào console vsmart gõ **cat vsmart\_csr** và copy chúng chỉ số từ begin đến end

```
vsmart login: admin
Password:
Last login: Mon Jun 26 11:47:40 UTC 2023 from 10.1.1.1 on ssh
Welcome to Viptela CLI
User admin last logged in 2023-06-26T11:47:40.694319+00:00, to vsmar
rt, from 10.1.1.1 using netconf-ssh
admin connected from 127.0.0.1 using console on vsmart
vsmart# vshell
vsmart:~$ cat vsmart_csr
-----BEGIN CERTIFICATE REQUEST-----
MIIDRjCCAi4CQAQAwgcUxCzAJBgNVBAYTA1VTMRMwEQYDVQQIEWpDYWxpZm9ybmlh
MREwDwYDVQQHEWhTYW4gSm9zZTEOMAwGA1UECxMFVm5Qcm8xFjAUBGNVBAoTDUNp
c2NvIFN5c3RlbnBMXmQxYjBABgNVBAMTOXZzbWFyZC1kYzQ1MWU1Zi1mODFlLTQ2ZDgt
YTY0ZS00NjFjYTJjMGU0OWEtmTS52aXB0ZWxhLmNvbTEiMCAGCSqGSIB3DQEJARyT
c3VwcG9ydEB2aXB0ZWxhLmNvbTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoC
ggEBALcNI4oS59fMfcJCa9DexfitZXhe57khUaKA9Vwrvn9VYYmNo6t5M91a8mQX
Gavz8rAw33PEEiw+fLSE+qVtJ8xDSYEIwCFxNQLMGRXIZXLYGaln8xpoeda2PAz5
uao7TIwkcke+YYWkPfsz8K9KvrlcgQBli8uz1Bk0/Or1/tDmAfbby0kx6N+bXhom
L0ldit8hiy9us4TQmsDHelCZfiymNyWUCa5kaO90KkbREVRRuv/rSzhArtBFdsKs
ktYnX2IQY17+t4SQKH9umzJnjHMxWUx41WmzmFXg7uxJ8gou/DGWVegN1LRyH/2r
FSkgvvQU6q3buRhQj7T5ydujrHCawEAaa7MDkGCSqGSIB3DQJEJDjEsMCowCQYD
VR0TBAlWADAdBgNVHQ4EFgQUJ1knH8AY39r7WpZPGSxBmweZuFkwDQYJKoZIhvcN
AQELBQADggEBAcTlsKyX/Vf6VpxRn3vyp/u3GSTlrASq1FNCwhB2de5r2pYWNpPR
En/4NqEUQkbPhRqVl9CGQWeDkKXcgTn5lbCSMEUAfrGTxiBnqe7xQ2FSd7JhcZvU
O9g4U63SYx/TLz8QZ9D3VO+fw3MiKF4FJYGESFnd9ZCeunIsBeG5Qk/6qWKzadb7
+4XvJigl25xt81kn8MmsJ3KqKpsACT64KCLIWqrL606bqzUEjOCKjEBLf8eM1Ba
McucToHIKUISA9sjQd04/dxV3ql0vUq4wtvQiweB2eGj/GOTYcgICiIAXBxj+vbj
rsHKOmQ590Dv8J5DLThwcxAmyFK64cyOYDc=
-----END CERTIFICATE REQUEST-----
vsmart:~$
```

- Sau đó qua console vManage tạo file *vsmart\_csr* bằng câu lệnh: **vim vsmart\_csr** dán chứng chỉ số vừa copy ở vbond bằng cách gõ “i” rồi kích chuột phải để dán, sau đó gõ “**esc :wq**” để lưu và thoát ra.

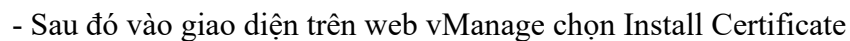
```
vmanage:~$ vim vsmart csr
```

```
vManager
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager x vBond vSmart vEdge1 vEdge2 vEdge3
-----BEGIN CERTIFICATE REQUEST-----
MIIDRjCCAi4CAQAwgcUxCzAJBgNVBAYTAlVTMRMwEQYDVQQIEwpDYWxpZm9ybmlh
MREwDwYDVQQHEWhTYW4gSm9zZTEOMAwGA1UECzMFMV5Qcm8xZjAUBGNVBAoTDUNp
c2NvIFN5c3R1bXMxQjBBAW5BAMTOXZzbWYyZDk1YzQ1MWU1Zi1mODFlLTQ2ZDgt
YTY0ZS00NjFjYTJjMGU0OWEtMS52aXB0ZWxhLmNvbTEiMCAGCSqGSIB3DQEJARYT
c3VwcG9ydEB2aXB0ZWxhLmNvbTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoC
ggEBALcNI4oS59fmfcJCa9DexfitZXhE57khUaKA9Vwrvn9VYyMNo6t5M91a8mQX
Gavz8rAw33PEEiw+fLSE+qVtJ8xDSYEIwCFxNQLMgRXIZX1YGaln8xpoeda2PAz5
uao7TIwkcke+YYWkPfsz8K9KvrlcgQBli8uz1Bk0/0r1/tDmAFbbY0kx6N+bXhom
L0ldit8hIy9us4TQmsDHelCZfiymNyWUCa5kAO90KkbREVRuv/rSzhArtBFdsKs
ktYnX2IQY17+T4SQKH9umzJNjHMxWUx41WmzmFXg7uxJ8gou/DGWVegN1LRyH/2r
FSkgwvQU6q3buRhQj7T5ydujRHcCAwEAAaA7MDkGCSqGSIB3DQEJDjEsMCowCQYD
VR0TBAlwADAdBgNVHQ4EFgQUJlknH8AY39r7WpZPGSxBmweZuFkwDQYJKoZIhvcN
AQELBQADggEBACtIsKyX/Vf6VpxRn3vyp/u3GSTlrASq1FNCwhB2de5r2pYWNpPR
En/4NqEUQkbPhRqV19CGQWeDkKXcgTn51bCSMEUAFrGTxiBnqe7xQ2FSd7JhcZvU
O9g4U63SYx/TLz8QZ9D3VO+fw3MiKF4FJYgESFnd9ZCeunIsBeG5Qk/6qWKzadb7
+4XvJig125Xt81kn8MmsJ3KqKpsAct64KCLIWqR1606bgzUEjOCKjEBLff8eM1Ba
McuCToHIkUISa9sjQd04/dxV3q10vUq4wtvQiweB2eGj/GOTYcgICiIAXBxj+vbJ
rsHKOmQ590Dv8J5DLThwcxAmfYK64cyOYDc=
-----END CERTIFICATE REQUEST-----
~
~
~
:wq
Ready Telnet: 10.215.27.145 24, 4 30 Rows, 67 Cols VT100 CAP NUM
```

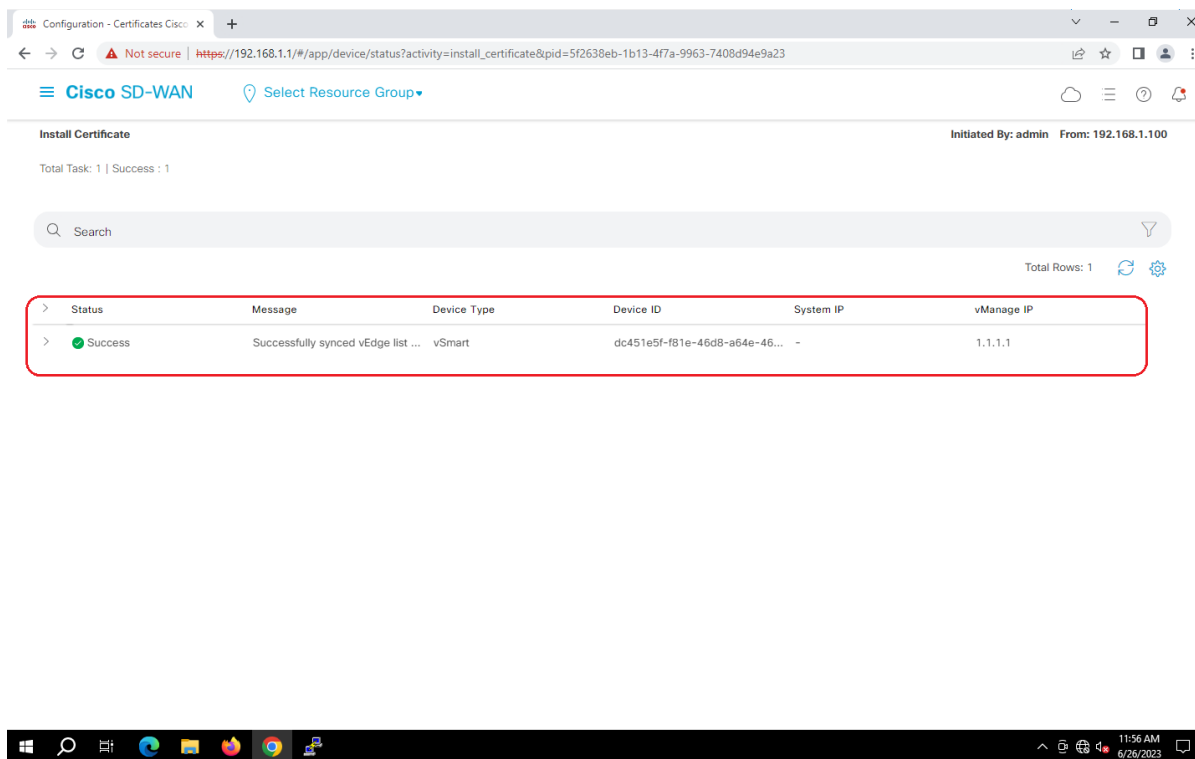
- Tiếp tục ở console vmanage dùng câu lệnh: **“openssl x509 -req -in vsmart\_csr -CA ROOTCA.pem -CAkey ROOTCA.key -CAcreateserial -out vsmart.crt -days 500 -sha256”** để chuyển file *vsmart\_csr* sang *vsmart.crt*

```
vmanage:~$ openssl x509 -req -in vsmart_csr -CA ROOTCA.pem -CAkey R
createserial -out vsmart.crt -days 500 -sha256
Signature ok
subject=C = US, ST = California, L = San Jose, OU = VnPro, O = Cisc
o Systems, CN = vsmart-dc451e5f-f81e-46d8-a64e-461ca2c0e49a-1.vipte
la.com, emailAddress = support@viptela.com
Getting CA Private Key
vmanage:~$
```

- Vào PC (trong sơ đồ lab) ssh vào vManage, dùng **cat vsmart.crt** để copy chứng chỉ số



## - Kết quả thành công:

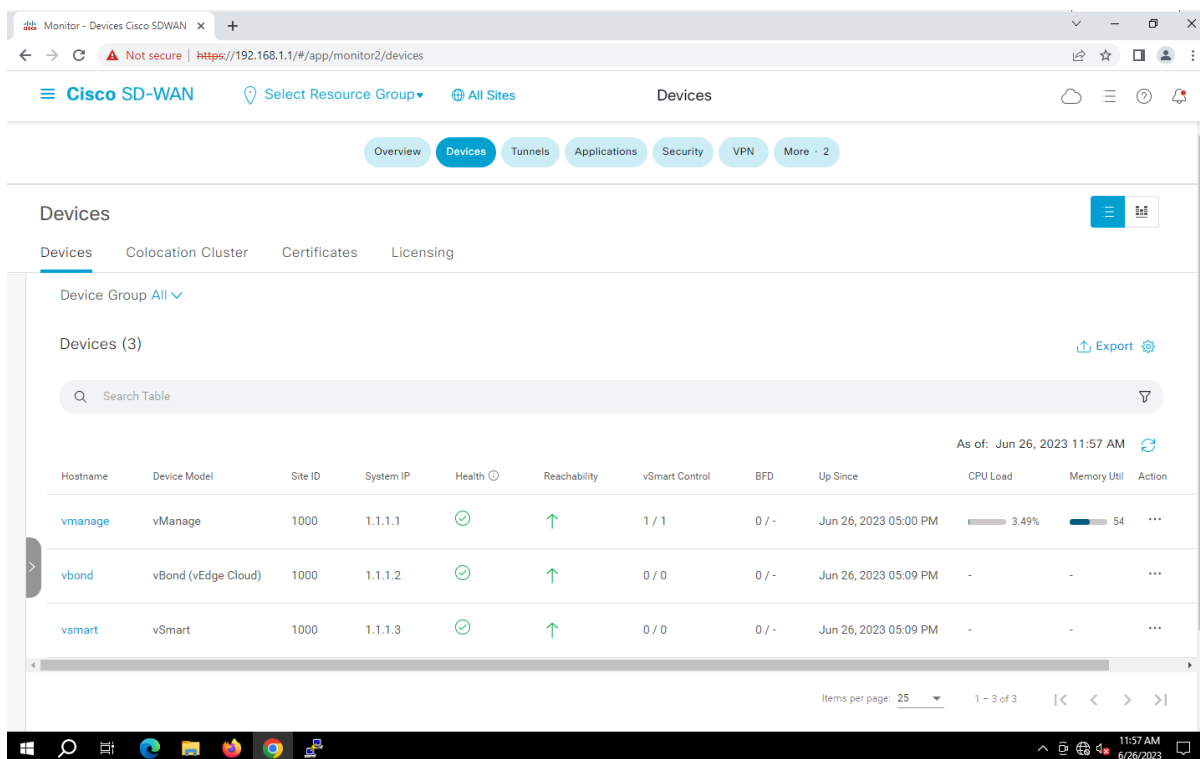


The screenshot shows the Cisco SD-WAN Configuration - Certificates page. The browser address bar indicates the URL: [https://192.168.1.1/#/app/device/status?activity=install\\_certificate&pid=5f2638eb-1b13-4f7a-9963-7408d94e9a23](https://192.168.1.1/#/app/device/status?activity=install_certificate&pid=5f2638eb-1b13-4f7a-9963-7408d94e9a23). The page title is "Install Certificate". The status bar shows "Initiated By: admin" and "From: 192.168.1.100". The task progress is "Total Task: 1 | Success: 1". A search bar is present. Below the search bar, a table displays the results of the certificate installation:

| Status  | Message                            | Device Type | Device ID                     | System IP | vManage IP |
|---------|------------------------------------|-------------|-------------------------------|-----------|------------|
| Success | Successfully synced vEdge list ... | vSmart      | dc451e5f-f81e-46d8-a64e-46... | -         | 1.1.1.1    |

The table indicates that the certificate installation was successful for the vSmart device.

## - vManage, vSmart, vBond đã bring-up thành công



The screenshot shows the Cisco SD-WAN Monitor - Devices page. The browser address bar indicates the URL: <https://192.168.1.1/#/app/monitor2/devices>. The page title is "Monitor - Devices Cisco SDWAN". The navigation bar shows "Overview", "Devices", "Tunnels", "Applications", "Security", "VPN", and "More - 2". The "Devices" tab is selected. The page shows a list of devices under the "All" group. The table displays the status of the devices:

| Hostname | Device Model        | Site ID | System IP | Health | Reachability | vSmart Control | BFD   | Up Since              | CPU Load | Memory Util | Action |
|----------|---------------------|---------|-----------|--------|--------------|----------------|-------|-----------------------|----------|-------------|--------|
| vmanage  | vManage             | 1000    | 1.1.1.1   | ✓      | ↑            | 1 / 1          | 0 / - | Jun 26, 2023 05:00 PM | 3.49%    | 54          | ...    |
| vbond    | vBond (vEdge Cloud) | 1000    | 1.1.1.2   | ✓      | ↑            | 0 / 0          | 0 / - | Jun 26, 2023 05:09 PM | -        | -           | ...    |
| vsmart   | vSmart              | 1000    | 1.1.1.3   | ✓      | ↑            | 0 / 0          | 0 / - | Jun 26, 2023 05:09 PM | -        | -           | ...    |

The table indicates that all three devices (vManage, vBond, and vSmart) are successfully brought up and operational.

### 3.3. Thiết lập thiết bị vEdge vào hệ thống Cisco SD-WAN

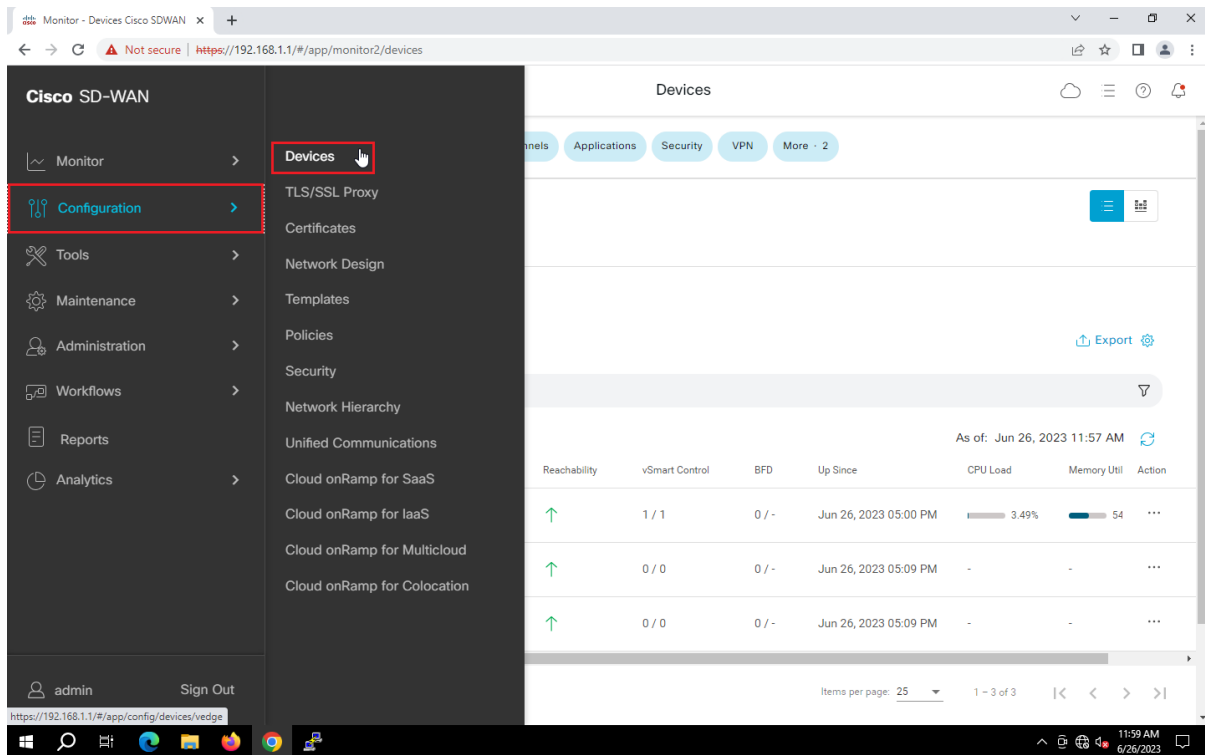
#### Cấu hình license vEdge

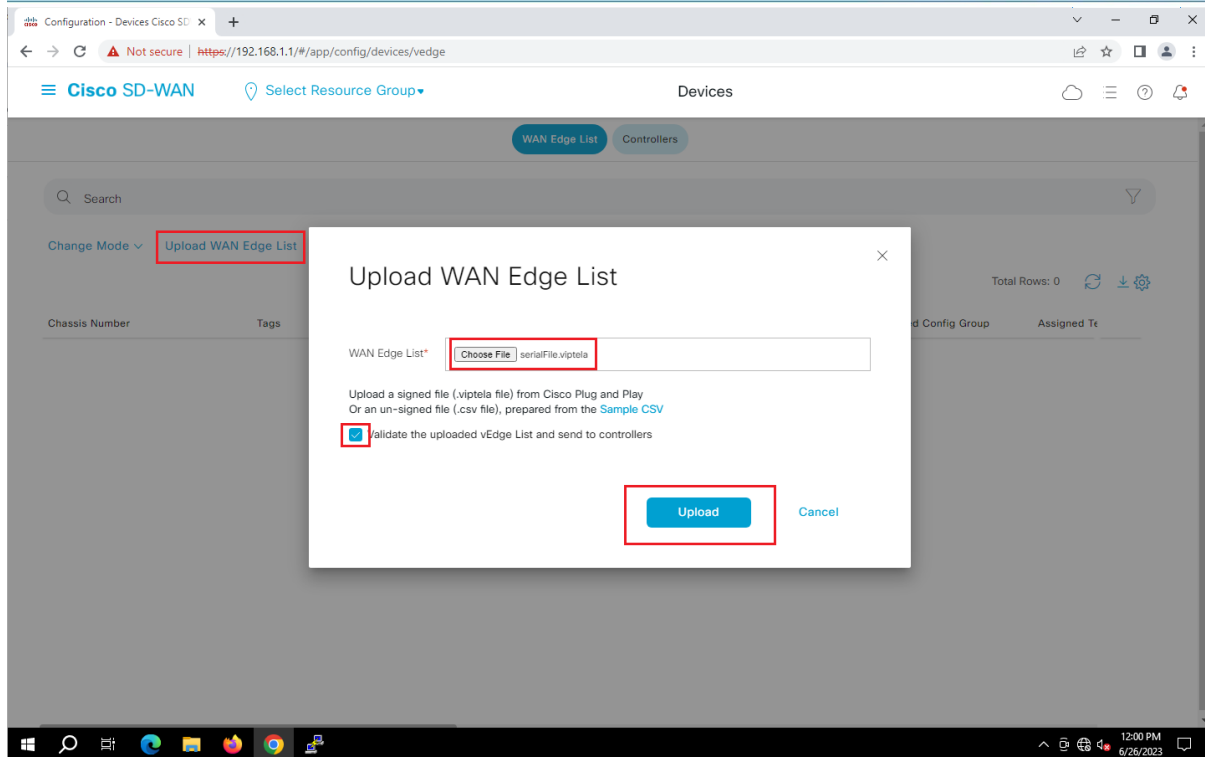
Để có được file (serialFile.viptela) thì ta phải có một smart account hoặc có thể download nó tại đây:

[https://drive.google.com/file/d/1rEcGj2ufgs\\_lqK\\_PO-mZe7MmZqQcYFf/view?usp=sharing](https://drive.google.com/file/d/1rEcGj2ufgs_lqK_PO-mZe7MmZqQcYFf/view?usp=sharing)

(cần chỉnh lại organization name trong phần cấu hình các thiết bị là: **VnPro** để có thể upload được file này)

Chọn **Configuration->Devices->Upload WAN Edge List** và chọn file trong phần download (serialFile.viptela)





Configuration - Devices Cisco SD-WAN

Not secure | https://192.168.1.1/#/app/config/devices/vedge

Cisco SD-WAN Select Resource Group

Devices

WAN Edge List Controllers

Search

Change Mode ▾ Upload WAN Edge List

Chassis Number Tags

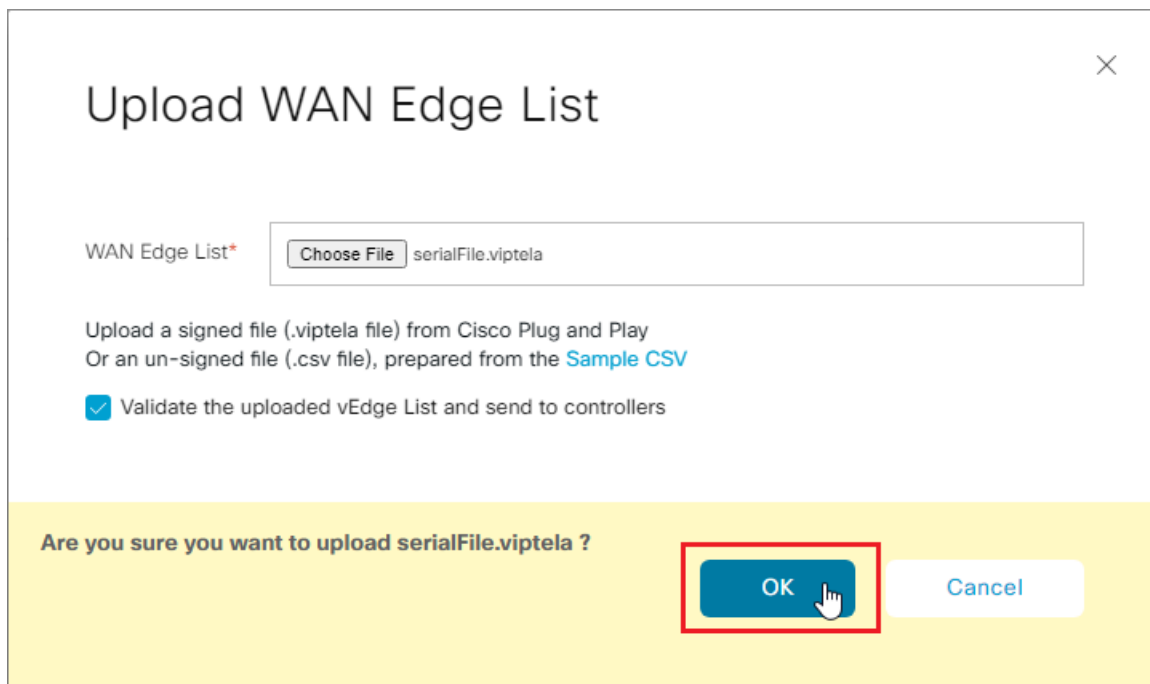
Upload WAN Edge List

WAN Edge List\* Choose File serialFile.viptela

Upload a signed file (.viptela file) from Cisco Plug and Play  
Or an un-signed file (.csv file), prepared from the [Sample CSV](#)

☒ Validate the uploaded vEdge List and send to controllers

Upload Cancel



Upload WAN Edge List

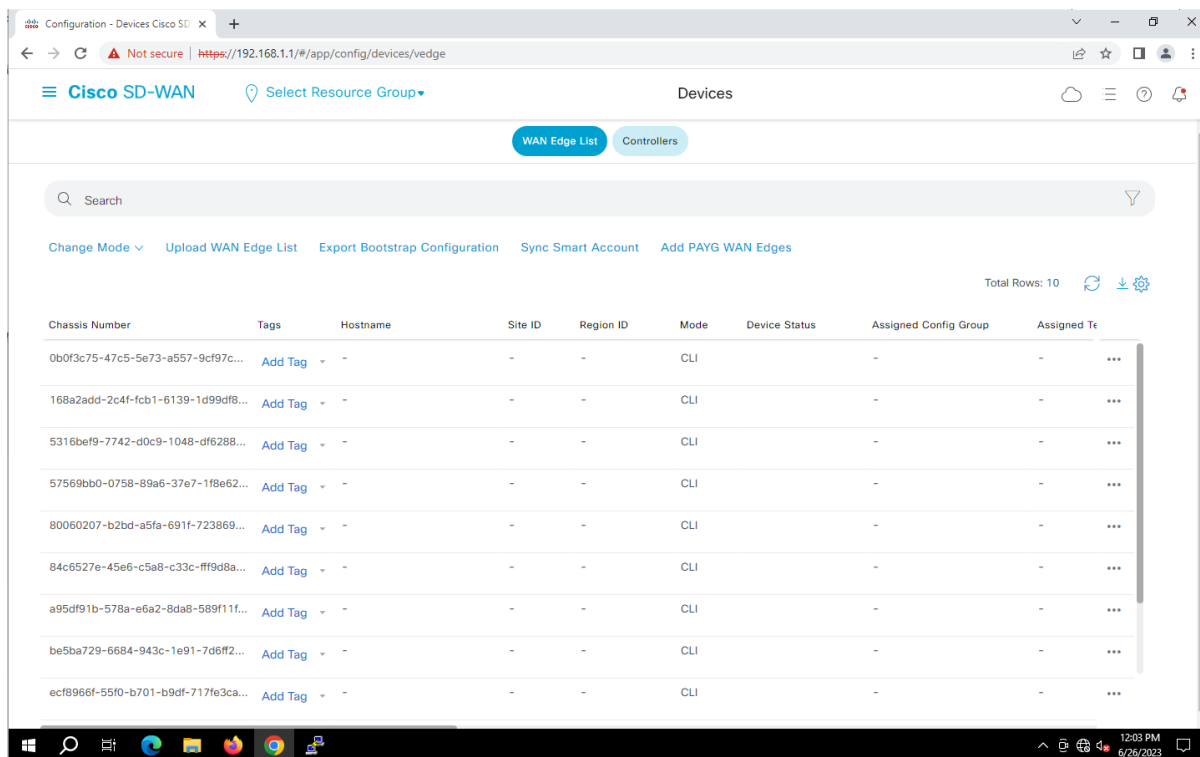
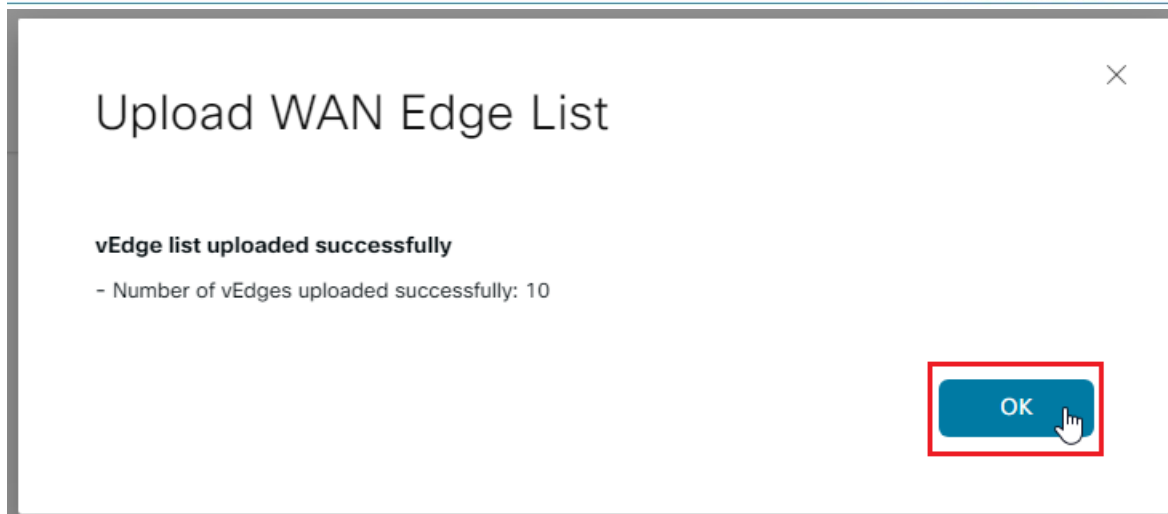
WAN Edge List\* Choose File serialFile.viptela

Upload a signed file (.viptela file) from Cisco Plug and Play  
Or an un-signed file (.csv file), prepared from the [Sample CSV](#)

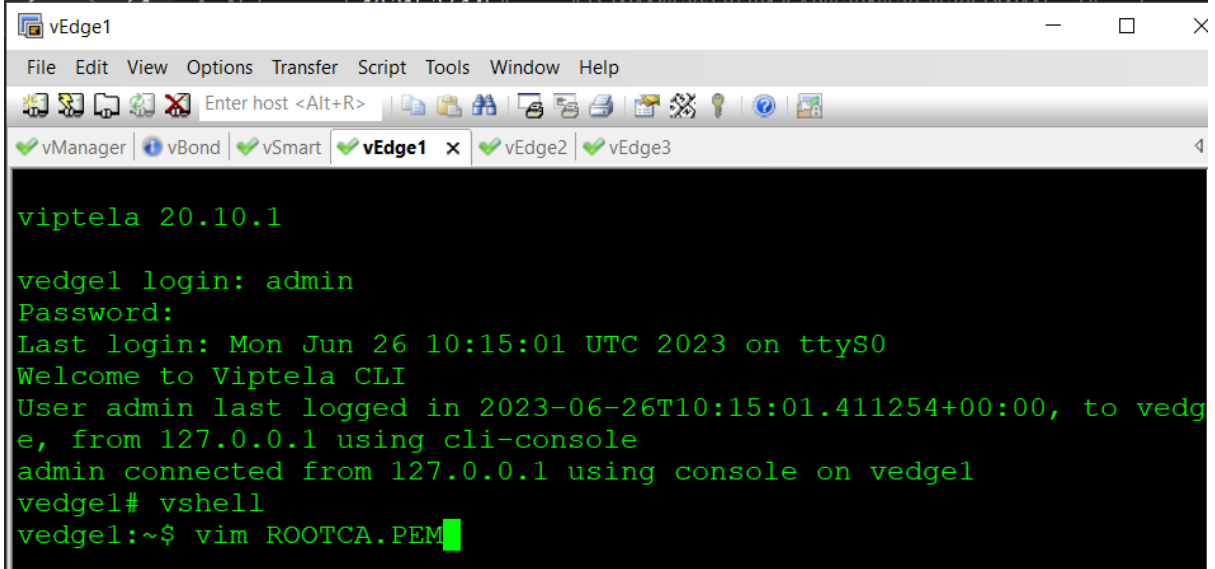
☒ Validate the uploaded vEdge List and send to controllers

Are you sure you want to upload serialFile.viptela ?

OK Cancel



Vào vshell của vEdge up license như đã làm trên vManage



```
vEdge1
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager vBond vSmart vEdge1 x vEdge2 vEdge3

viptela 20.10.1

vedgel login: admin
Password:
Last login: Mon Jun 26 10:15:01 UTC 2023 on ttyS0
Welcome to Viptela CLI
User admin last logged in 2023-06-26T10:15:01.411254+00:00, to vedg
e, from 127.0.0.1 using cli-console
admin connected from 127.0.0.1 using console on vedgel
vedgel# vshell
vedgel:~$ vim ROOTCA.PEM
```

```

vEdge1
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager vBond vSmart vEdge1 x vEdge2 vEdge3
-----BEGIN CERTIFICATE-----
MIIDbTCCA1WgAwIBAgIUvdzgMAJuD7ihLQtfdnzhjOHF56cwDQYJKoZIhvcNAQEL
BQAwRjELMAkGA1UEBhMCV4xMjE2MTUwODUwWjBGMQswCQYDVQQLDAJJVDCCASIdQYJKoZIhvcN
AQEBBQADggEPADCCAQoCggEBAlOMekQofTWGRNmZGfMwTrXk0Uv6mAFJHXWiI6jc
Xzkm9x3X9930bk9Kdhn3FHjMwQj63o4kHdNcBzHNgdjid6S7yeIa8VD+EflNpy0N
jZ6AFzxydvnZkyMK6ScyzIzfwLqhDEJYQmP4V6k5AckcXClhU6fAk1fWxeNTjAheE
bx3b2XrtkH6jVgfgRnF9PXd9wIo1TQuDWDVd8Q1AqLt8hnOKo2D02ABOAspXa5Nf
BT47jDyHQYBz9b8B8xMQUxrceUpe4asJei+BHiIe9KIIGiAb60cG9PYfH1TJfX8e
/S8yOGHzQjrrtT4eQ4EtrfFtRkPR/1p49P+Rb3WMOKyjLBECawEAAaNTMFEwHQYD
VR0OBBYEFHxVS/dKjRXVujSF+HkuHAodqiPqMB8GA1UdIwQYMBaAFHxVS/dKjRXV
ujSF+HkuHAodqiPqMA8GA1UdEwEB/wQFMAMBAf8wDQYJKoZIhvcNAQELBQADggEB
AE5sYblrNNSdtCl+rHA04pzMaW9i05y1N1Io0/WLKPj2jX+PW9sQjUhIha/anRwP
qQU6IglEb/LZWRBRMIGPaC6/F+NzXgXI//AKjVaQ17P16N5stRYUWE9CFk3+tK3/
Wgia/H1sRv0WXAHQ8jc0mDN1bM6/LfJXOJMUksWzHbCG8cJ/P8GFcaNFY638Wzp3
kVg+TQzo/m5rmxJrLKGK8bCpaZYpXrVJQX5hP/KyudG+BeT4xWYSYyNrv+3lwPe2
Rnflj10kSdhGFGsJxw7GoiYUfgHgnwv1vLF4ntIuxoTngRKP/wgvBFJCCcHjCSGuA
z9Jq4b9I1CNLHjGbm+JPnTQ=
-----END CERTIFICATE-----
~
~
:wq

```

Ready Telnet: 10.215.27.145 24, 4 30 Rows, 67 Cols VT100 CAP NUM

Thoát vshell và request license

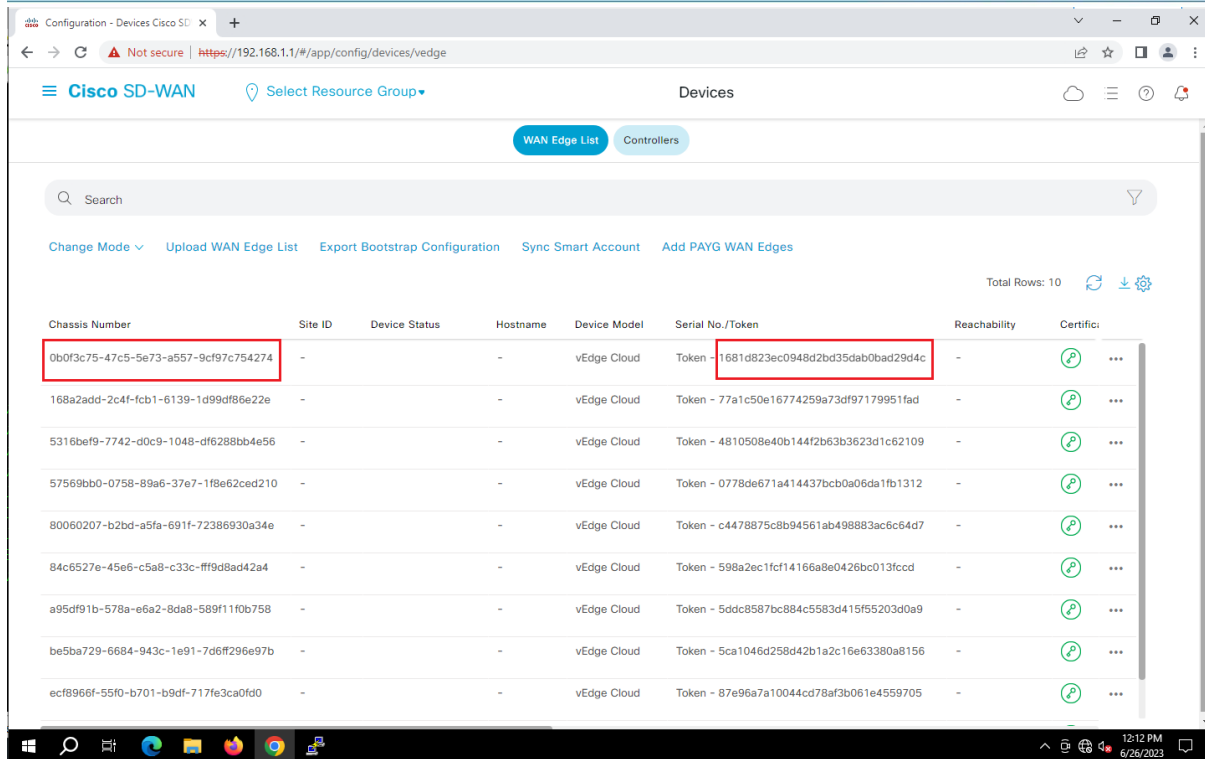
**request root-cert-chain install /home/admin/ROOTCA.PEM**

```

vedgel# request root-cert-chain install /home/admin/ROOTCA.PEM
Uploading root-ca-cert-chain via VPN 0
Copying ... /home/admin/ROOTCA.PEM via VPN 0
Updating the root certificate chain..
Successfully installed the root certificate chain
vedgel#

```

Vào web vManage chọn **Configuration -> Certificates** chọn **chassis number** và **token**



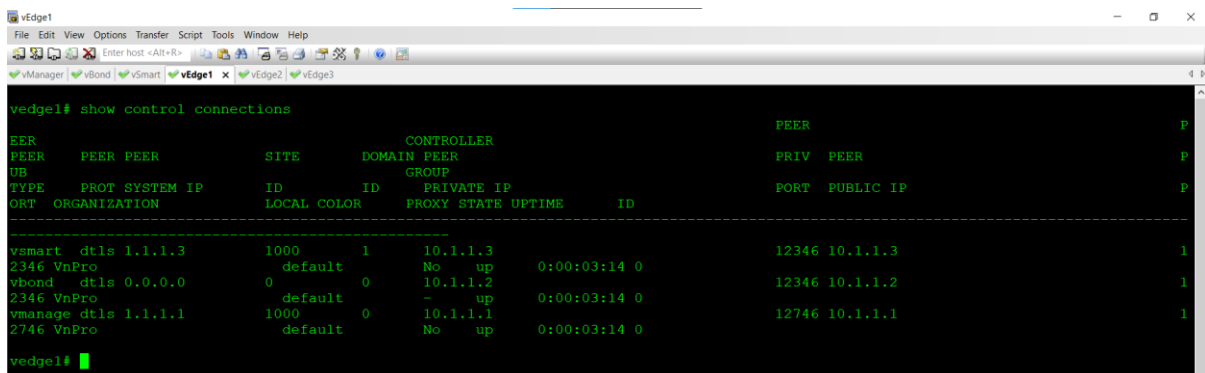
| Chassis Number                       | Site ID | Device Status | Hostname | Device Model | Serial No./Token                         | Reachability | Certific:                                                                           |
|--------------------------------------|---------|---------------|----------|--------------|------------------------------------------|--------------|-------------------------------------------------------------------------------------|
| 0b0f3c75-47c5-5e73-a557-9cf97c754274 | -       | -             | -        | vEdge Cloud  | Token - 1681d823ec0948d2bd35dab0bad29d4c | -            |  |
| 168a2add-2c4f-fcb1-6139-1d99df86e22e | -       | -             | -        | vEdge Cloud  | Token - 77a1c50e16774259a73df97179951fad | -            |  |
| 5316bef9-7742-d0c9-1048-df6288bb4e56 | -       | -             | -        | vEdge Cloud  | Token - 4810508e40b144f2b63b3623d1c62109 | -            |  |
| 57569bb0-0758-89a6-37e7-1f8e62ced210 | -       | -             | -        | vEdge Cloud  | Token - 0778de671a414437bcb0a06da1fb1312 | -            |  |
| 80060207-b2bd-a5fa-691f-72386930a34e | -       | -             | -        | vEdge Cloud  | Token - c4478875c8b94561ab498883ac6c64d7 | -            |  |
| 84c6527e-45e6-c5a8-c33c-fff9d8ad42a4 | -       | -             | -        | vEdge Cloud  | Token - 598a2ec1fc14166a8e0426bc013fcd   | -            |  |
| a95df91b-578a-e6a2-8da8-589f11f0b758 | -       | -             | -        | vEdge Cloud  | Token - 5ddc8587bc884c5583d415f55203d0a9 | -            |  |
| be5ba729-6684-943c-1e91-7d6ff29e97b  | -       | -             | -        | vEdge Cloud  | Token - 5ca1046d258d42b1a2c16e63380a8156 | -            |  |
| ecf8966f-55f0-b701-b9df-717fe3ca0fd0 | -       | -             | -        | vEdge Cloud  | Token - 87e96a7a10044cd78af3b061e4559705 | -            |  |

Vào lại Putty và gõ lệnh **request vedge-cloud activate chassis-number *chassis-number* token *token***

(chassis number và token đã chọn trong mục certificate)

```
vedge1# request vedge-cloud activate chassis-number
Value for 'chassis-number' (<Chassis number/uuid of the device>): 0
b0f3c75-47c5-5e73-a557-9cf97c754274
Value for 'token' (<Serial number of the device>): 1681d823ec0948d2
bd35dab0bad29d4c
vedge1#
```

## IV. Kiểm tra



```
vedge1# show control connections
```

| EER        | PEER         | PEER    | SITE    | DOMAIN  | CONTROLLER | PEER  | P          |            |
|------------|--------------|---------|---------|---------|------------|-------|------------|------------|
| UB         | TYPE         | PROT    | SYSTEM  | IP      | ID         | GROUP | PRIV       | PEER       |
| ORT        | ORGANIZATION |         |         |         | LOCAL      | COLOR | ID         | PRIVATE IP |
|            |              |         |         |         | PROXY      | STATE | UPTIME     | ID         |
| vsmart     | dtls         | 1.1.1.3 | 1000    | 1       | 10.1.1.3   |       | 12346      | 10.1.1.3   |
| 2346 VnPro |              |         | default | 0       | No         | up    | 0:00:03:14 | 0          |
| vbond      | dtls         | 0.0.0.0 | 0       | default | 0          |       | 12346      | 10.1.1.2   |
| 2346 VnPro |              |         | default | 0       | -          | up    | 0:00:03:14 | 0          |
| vmanage    | dtls         | 1.1.1.1 | 1000    | 0       | 10.1.1.1   |       | 12746      | 10.1.1.1   |
| 2746 VnPro |              |         | default | 0       | No         | up    | 0:00:03:14 | 0          |

## vEdge1

```
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
vManager | vBond | vSmart | vEdge1 x | vEdge2 | vEdge3
vedge1# show control local-properties
personality                                vedge
sp-organization-name                      VnPro
organization-name                        VnPro
root-ca-chain-status                      Installed
root-ca-crl-status                       Not-Installed

certificate-status                        Installed
certificate-validity                      Valid
certificate-not-valid-before              Jun 26 12:15:40 2023 GMT
certificate-not-valid-after               Jun 23 12:15:40 2023 GMT
```

Configuration - Devices Cisco SD-WAN

Not secure | https://192.168.1.1/#/app/config/devices/vedge

Cisco SD-WAN Select Resource Group

Devices

WAN Edge List Controllers

Search

Change Mode Upload WAN Edge List Export Bootstrap Configuration Sync Smart Account Add PAYG WAN Edges

Total Rows: 10

| Chassis Number                      | Hostname | Site ID | Device Status | Device Model | Serial No./Token       | Reachability | Certificate State |
|-------------------------------------|----------|---------|---------------|--------------|------------------------|--------------|-------------------|
| 0b0f3c75-47c5-5e73-a557-9cf97c...   | vedge1   | 1       | In Sync       | vEdge Cloud  | E907EB62               | reachable    | ...               |
| 168a2add-2c4f-fcb1-6139-1d99df8...  | vedge2   | 2       | In Sync       | vEdge Cloud  | 7CAA31B5               | reachable    | ...               |
| 5316bef9-7742-d0c9-1048-df6288...   | vedge3   | 3       | In Sync       | vEdge Cloud  | 9DF3CF1B               | unreachable  | ...               |
| 57569bb0-0758-89a6-37e7-1fb62...    | -        | -       | -             | vEdge Cloud  | Token - 0778de671a...  | -            | ...               |
| 80060207-b2bd-a5fa-691f-723869...   | -        | -       | -             | vEdge Cloud  | Token - c4478875c8...  | -            | ...               |
| 84c6527e-45e6-c5a8-c33c-fff9d8a...  | -        | -       | -             | vEdge Cloud  | Token - 598a2ec1cf1... | -            | ...               |
| a95df91b-578a-e6a2-8da8-589f11f...  | -        | -       | -             | vEdge Cloud  | Token - 5ddc8587bc...  | -            | ...               |
| be5ba729-6684-943c-1e91-7d6ff2...   | -        | -       | -             | vEdge Cloud  | Token - 5ca1046d258... | -            | ...               |
| ecf8966f-55f0-b701-b9df-717fe3ca... | -        | -       | -             | vEdge Cloud  | Token - 87e96a7a100... | -            | ...               |

12:45 PM 6/26/2023



CÔNG TY TNHH TƯ VẤN VÀ DỊCH VỤ CHUYÊN VIỆT

TRUNG TÂM TIN HỌC VNPRO

ĐC: 276 - 278 Ung Văn Khiêm, P.25, Q.Bình Thạnh, Tp Hồ Chí Minh

ĐT: (028) 35124257 | Hotline: 0933427079 Email: vnpro@vnpro.org

Monitor - Overview Cisco SD-WAN

Not secure | <https://192.168.1.1:8443/#/app/monitor2/overview>

Cisco SD-WAN Select Resource Group All Sites Overview

Overview Devices Tunnels Applications Security VPN More · 2

### Overview

| CONTROLLERS |        |         | WAN Edges | CERTIFICATE STATUS | LICENSING                | REBOOT      |
|-------------|--------|---------|-----------|--------------------|--------------------------|-------------|
| 1           | 1      | 1       | 3         | 0                  | 0                        | 0           |
| vBond       | vSmart | vManage | Reachable | Warning            | Assigned<br>3 Unassigned | Last 24 hrs |

#### Site Health

24 Hours Good Performing Sites

0 Sites

No Data to Display

#### Tunnel Health

24 Hours Latency (ms) Good Tunnels

0 Tunnels

No Data to Display

Windows taskbar: Firefox, 1:56 PM, 6/26/2023