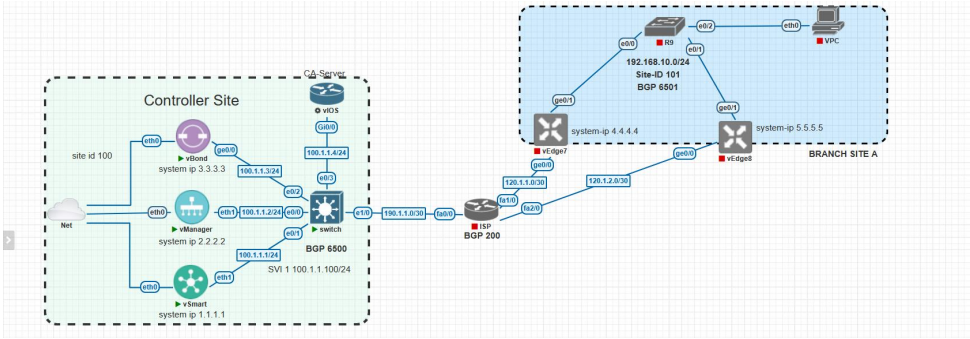
Step by step process to onboard Sdwan Devices (Controllers and Site Routers)

Step1

Onboard the controllers first (vbond, vmanage, vsmart)



Step 2

Get the system configuration done, stating the **Organizational name, site id , system-ip, clock time zone, vbond ip.**

Vsmart System Configuration

```
vsmart# conf t
Entering configuration mode terminal
vsmart(config)# system
vsmart(config-system)# system-ip 1.1.1.1
vsmart(config-system)# organization-name cisco
vsmart(config-system)# vbond 100.1.1.3
vsmart(config-system)# site-id 100
vsmart(config-system)# clock timezone Africa/Accra
vsmart(config-system)# commit
Commit complete.
vsmart(config-system)#
```

Vmanage System Configuration

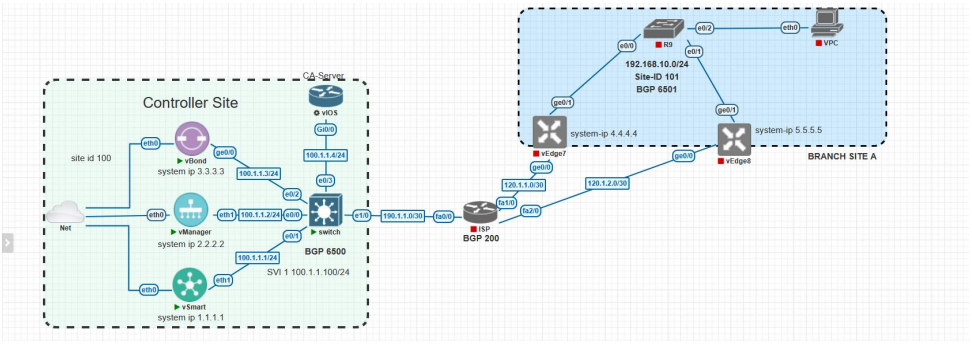
```
vmanage(config)# system
vmanage(config-system)# system-ip 2.2.2.2
vmanage(config-system)# organization-name cisco
vmanage(config-system)# vbond 100.1.1.3
vmanage(config-system)# site-id 100
vmanage(config-system)# clock timezone Africa/Accra
vmanage(config-system)# commit
Commit complete.
vmanage(config-system)#
```

Vbond System Configuration

```
vedge# conf t
Entering configuration mode terminal
vedge(config)# system
vedge(config-system)# system-ip 3.3.3.3
vedge(config-system)# organization-name cisco
vedge(config-system)# vbond local 100.1.1.3
vedge(config-system)# clock timezone Africa/Accra
vedge(config-system)# host-name vbond
vedge(config-system)# commit
Commit complete.
vbond(config-system)#
```

Step 3

Configure the **tranport side** for the controllers by enabling **VPN 0** . The transport side of this SDWAN topology are the physical interfaces connecting from the controllers to the ISP.



In order to get this done, ***we will first create a default static route to the ISP*** and then explicitly specify which physical interfaces we will need to be a part of the **transport vpn , VPN 0.**

VPN 0 cannot be deleted from any of the controllers, it is there by default.
Enable services on each physical interfaces, by creating a tunnel that will allow services suchas **NetConf , sshd, and all others services**

Transport side configuration (VPN 0) will be done for all controllers in this topology.

Vsmart VPN 0 Configuration

```
vsmart(config)# vpn 0
vsmart(config-vpn-0)# ip route 0.0.0.0/0 100.1.1.100
vsmart(config-vpn-0)# int eth1
vsmart(config-interface-eth1)# ip add 100.1.1.1/24
vsmart(config-interface-eth1)# no shutdown
vsmart(config-interface-eth1)# tunnel-interface
vsmart(config-tunnel-interface)# allow-service all
vsmart(config-tunnel-interface)# allow-service sshd
vsmart(config-tunnel-interface)# allow-service netconf
vsmart(config-tunnel-interface)# commit
Commit complete.
vsmart(config-tunnel-interface)#
```

Vmanage VPN 0 Configuration

```
vmanage(config)# vpn 0
vmanage(config-vpn-0)# ip route 0.0.0.0/0 100.1.1.100
vmanage(config-vpn-0)# int eth1
vmanage(config-interface-eth1)# ip add 100.1.1.2/24
vmanage(config-interface-eth1)# no shutdown
vmanage(config-interface-eth1)# tunnel-interface
vmanage(config-tunnel-interface)# allow-service all
vmanage(config-tunnel-interface)# allow-service sshd
vmanage(config-tunnel-interface)# allow-service netconf
vmanage(config-tunnel-interface)# commit
Commit complete.
vmanage(config-tunnel-interface)#
```

VBond VPN 0 Configuration

```
vbond(config)# vpn 0
vbond(config-vpn-0)# ip route 0.0.0.0/0 100.1.1.100
vbond(config-vpn-0)# int ge0/0
vbond(config-interface-ge0/0)# ip add 100.1.1.3/24
vbond(config-interface-ge0/0)# no shutdown
vbond(config-interface-ge0/0)# tunnel-interface
vbond(config-tunnel-interface)# allow-service sshd
vbond(config-tunnel-interface)# allow-service netconf
vbond(config-tunnel-interface)# allow-service all
vbond(config-tunnel-interface)# commit
```

Step 4

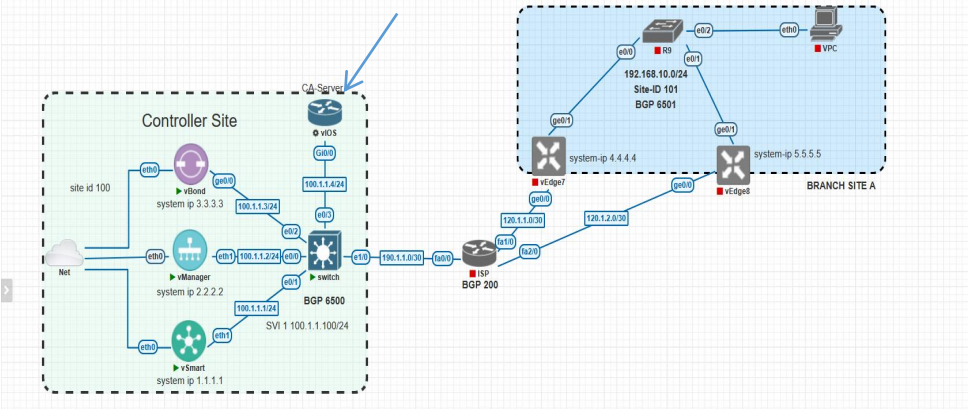
Configure the management vpn on the VManage. The management vpn by default is **VPN 512**. This vpn cannot be deleted.

Vmanage VPN 512 Configuration

```
vmanage(config)# vpn 512
vmanage(config-vpn-512)# int eth0
vmanage(config-interface-eth0)# ip dhcp-client
vmanage(config-interface-eth0)# no shutdown
vmanage(config-interface-eth0)# commit
```

Step 5

Create a **ROOT Certificate Authorizarion Server** on the VIOs Router



Enable **SSH** and **HTTP** services on the router we want to use as the ROOT-CA

SSH Configuration

```
ROOT_CA(config)#crypto key generate rsa label ROOT modulus 2048
% You already have RSA keys defined named ROOT.
% They will be replaced.

% The key modulus size is 2048 bits
% Generating 2048 bit RSA keys, keys will be non-exportable...
*Jun 12 13:55:18.921: %SSH-5-DISABLED: SSH 2.0 has been disabled
[OK] (elapsed time was 3 seconds)

ROOT_CA(config)#
*Jun 12 13:55:21.258: %SSH-5-ENABLED: SSH 2.0 has been enabled
ROOT_CA(config)#ip ssh version 2
ROOT_CA(config)#
```

HTTP Services Configuration

```
ROOT_CA(config)#
ROOT_CA(config)#
ROOT_CA(config)#
ROOT_CA(config)#
ROOT_CA(config)#ip http authentication local
ROOT_CA(config)#ip http server
ROOT_CA(config)#ip http path flash:
ROOT_CA(config)#username admin privilege 15 password cisco
ROOT_CA(config)#
```

<u>Meaning of Each Command</u>

#ROOT_CA(config)# ip http authentication local

Meaning:
This command tells the router to use the **local user database** for authenticating users who access the HTTP server (like when accessing the SCEP enrollment URL).

✓ **Why it's needed**:
When SCEP clients (like other routers) enroll via HTTP, they may need to provide a username and password. This ensures the credentials are checked against local usernames/passwords on the router.

#ROOT_CA(config)# ip http server

Meaning:
This **enables the HTTP server** on the router.

✅ **Why it's needed**:
This is required for the router to serve certificate enrollment pages or files (e.g., the ROOT_CA certificate or the SCEP service itself).

#ROOT_CA(config)# ip http path flash:

Meaning:
This sets the base directory (or path) for the HTTP server to serve files from the router's **Flash memory**.

✅ **Why it's needed**:
When a client requests a file like http://<router-ip>/ROOT.ca, the router looks in flash: to find and serve it.

#ROOT_CA(config)# username admin privilege 15 password cisco

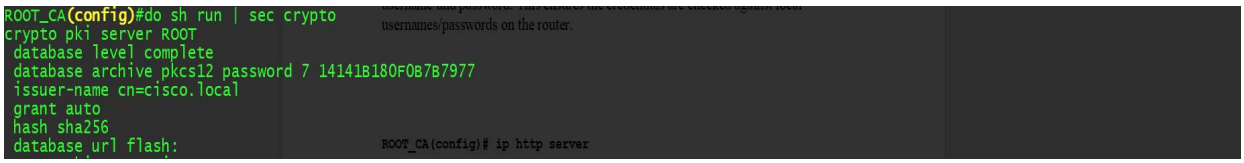
Meaning:
This creates a **local user** named admin with:

Privilege level 15 (full admin access)

Password: cisco

✅ **Why it's needed**:
This is used for HTTP authentication (ip http authentication local), allowing the router to verify the client's username/password when accessing PKI enrollment or certificate files.

ROOT_CA Configuration



Meaning of each command

#crypto pki server ROOT

This **creates and enters configuration mode** for a PKI Certificate Authority server named ROOT.

#database level complete

Specifies that the CA should **store full certificate information** in its database, not just minimal info.

✓ **Benefit**: Useful for tracking and revoking certificates later.

#database archive pkcs12 password cisco123

This tells the CA to **archive certificates and private keys** in **PKCS#12 format** (a secure binary format containing the cert + key), and:

password 7 ... sets the encrypted password used to protect the archive.

7 means the password is encrypted using Cisco's type 7 encoding.

Why: *So certs/keys can be backed up securely (e.g., for disaster recovery).*

#issuer-name cn=cisco.local

Sets the **Common Name (CN)** of the Certificate Authority's certificate to cisco.local.

✓ This becomes the **name of the root CA** in all certificates it issues.

#grant auto

Automatically **approves all certificate requests** without manual admin approval.

NB: Useful in lab or test environments, but in production, you'd typically **manually approve** requests.

#hash sha256

Specifies that the CA should use the **SHA-256 hashing algorithm** for certificate signatures (instead of older/less secure algorithms like SHA-1).

✓ Stronger and more secure hash.

#database url flash:

Tells the CA to **store its database files in the router's** flash: **memory**.

✓ Flash is non-volatile, so the data survives reboots.

Step 6
Uninstall the old root certificate on all controllers

```
vmanage(config)#
vmanage(config)#
vmanage(config)#
vmanage(config)# do request root-cert-chain uninstall
```

Step 7
Download the root certificate from the Root CA on all controllers

```
vmanage(config)# do request download http://admin:cisco@100.1.1.4/ROOT.ca
--2025-06-12 13:35:53--  http://admin:*password*@100.1.1.4/ROOT.ca
Connecting to 100.1.1.4:80... connected.
HTTP request sent, awaiting response... 401 Unauthorized
Authentication selected: Basic realm="level_15 or view_access"
Connecting to 100.1.1.4:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1115 (1.1K)
Saving to: 'ROOT.ca'

ROOT.ca             100%[===================>]   1.09K  --.-KB/s    in 0s

2025-06-12 13:35:53 (316 MB/s) - 'ROOT.ca' saved [1115/1115]
```

Step 8
Install the new root certificate on all controllers

```
vmanage(config)# do request root-cert-chain install home/admin/ROOT.ca
Uploading root-ca-cert-chain via VPN 0
Copying ... /home/admin/ROOT.ca via VPN 0
Installing the new root certificate chain
Successfully installed the root certificate chain
vmanage(config)# do show control local-properties
personality                     vmanage
sp-organization-name            cisco
organization-name               cisco
root-ca-chain-status            Installed

certificate-status              Not-Installed
certificate-validity            Not Applicable
certificate-not-valid-before    Not Applicable
```

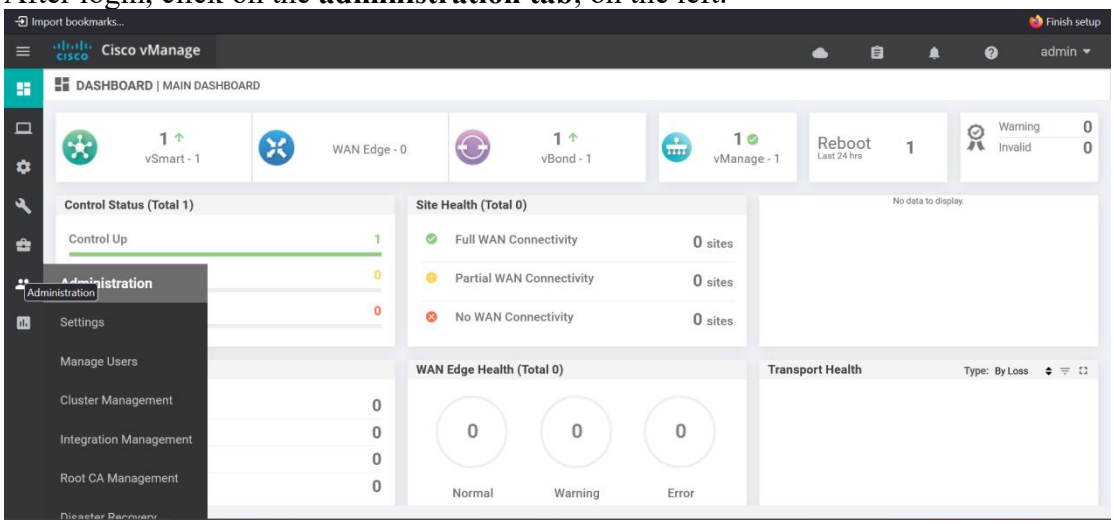
Step 9

Login into the GUI interface of VManage. To do this, you need to retrieve the ip address assigned by the dhcp server on the **management vpn 512**. Use the command below. Copy this **ip address** in your web browser and press enter.

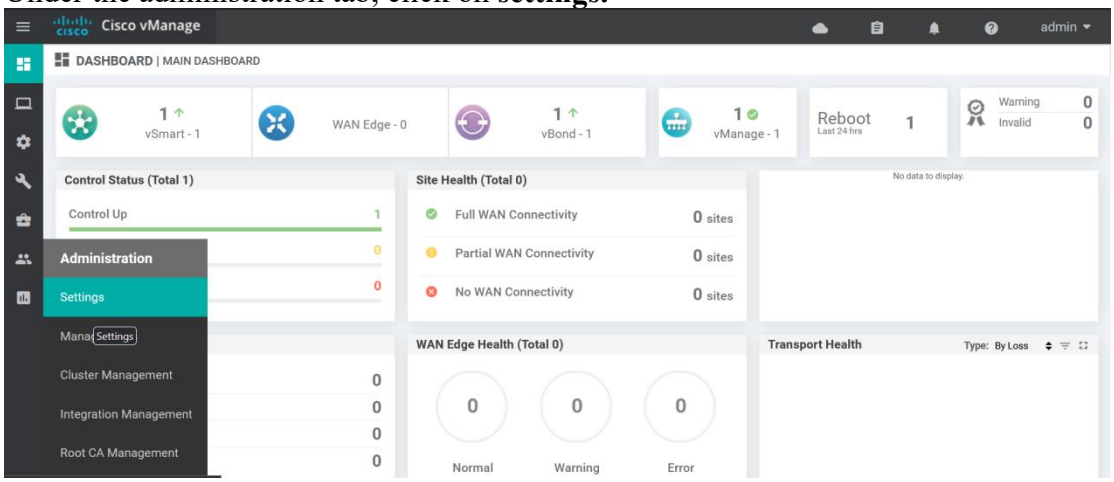
```
vmanage(config)# do show interface vpn 512
interface vpn 512 interface eth0 af-type ipv4
 ip-address      192.168.13.187/24
 if-admin-status Up
 if-oper-status  Up
 encap-type      null
 port-type       mgmt
 hwaddr          50:08:87:00:3e:00
 speed-mbps      1000
 duplex          full
 uptime          0:01:59:05
 rx-packets      5393
 tx-packets      3488
vmanage(config)#
```

Step 10

After login, click on the **administration tab**, on the left.

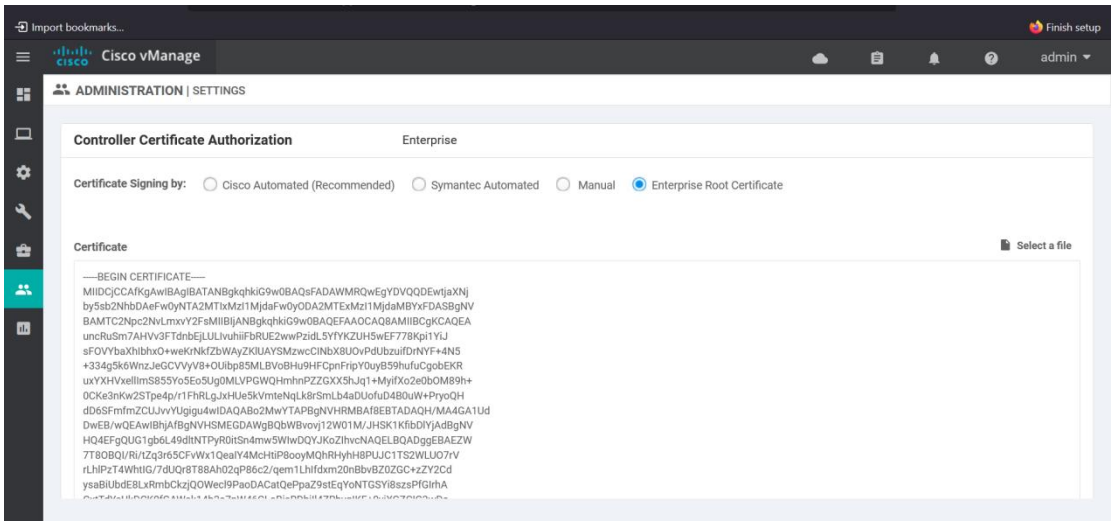


Under the administration tab, click on **settings.**



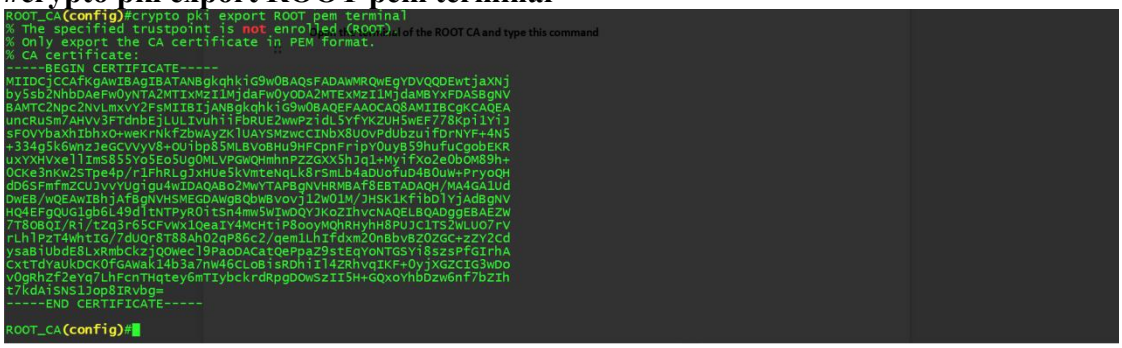
Step 11

Click on Controllers Certificate Authorization section, and click on the “Edit” button on the right. Select the **“Enterprise Root Certificate”** option and paste the root certificate from the **ROOT CA Server** here and click on **Save.**



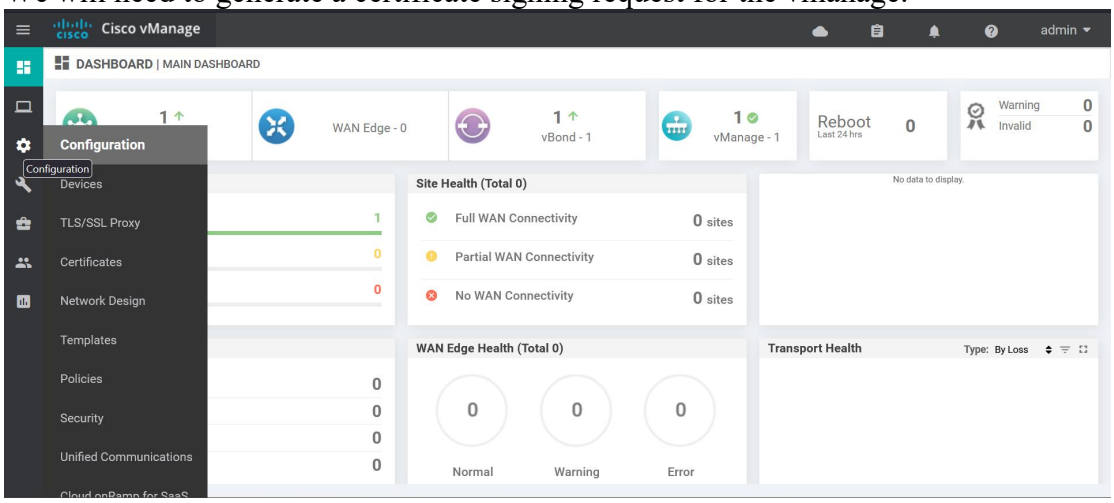
Open the terminal of the ROOT CA and type this command to see the **ROOT CERTIFICATE**

#crypto pki export ROOT pem terminal

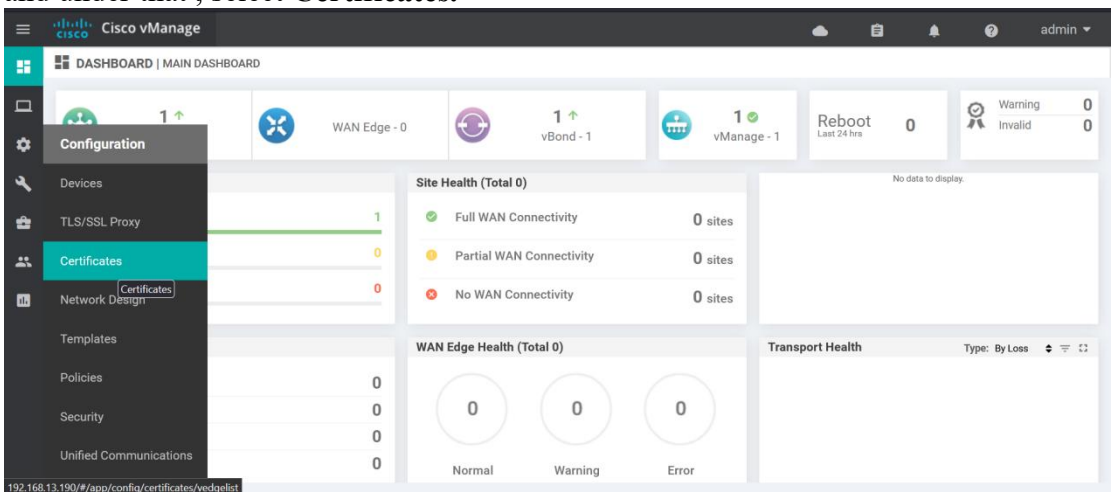


Step 12

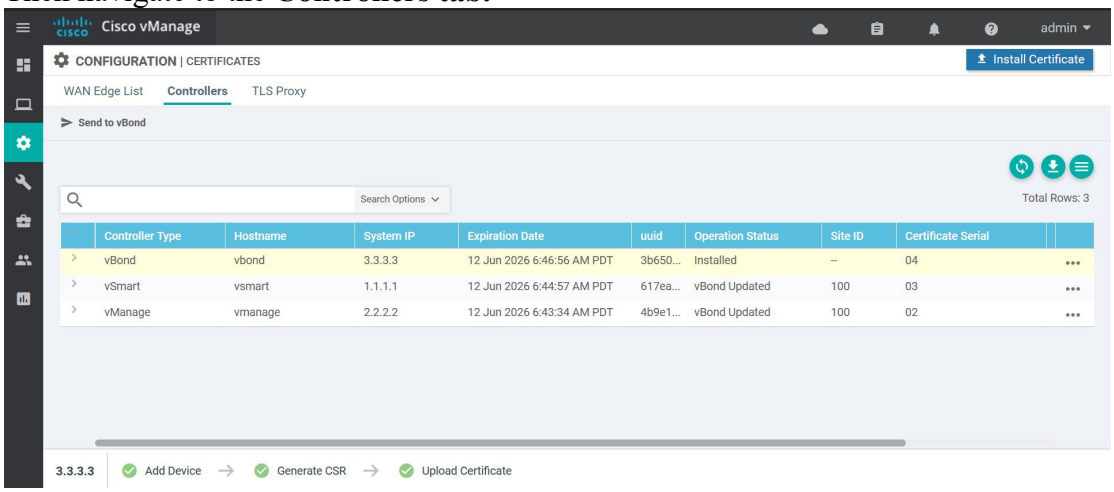
We will need to generate a certificate signing request for the vmanage.



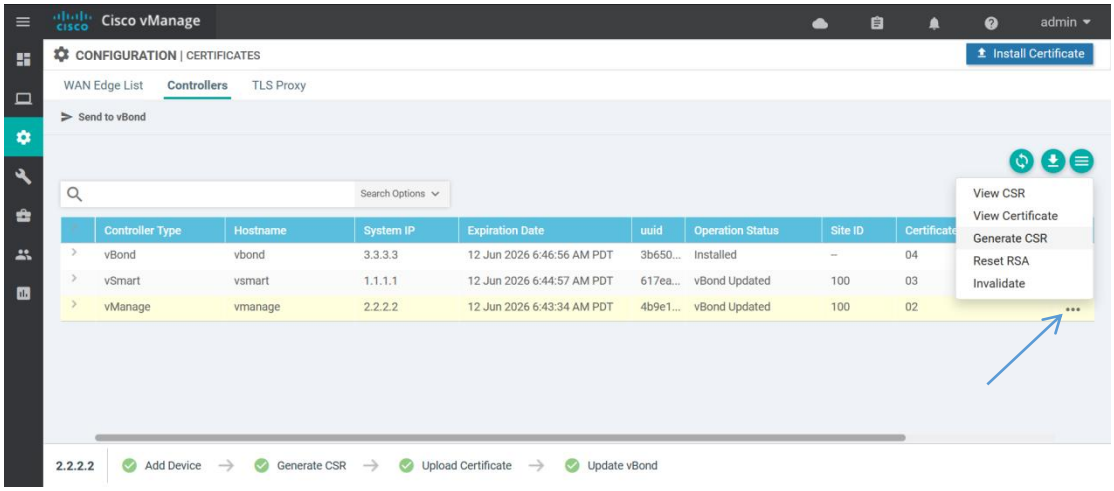
To do this, navigate to the menu on the left side of the panel, click on **Configuration** and under that , select **Certificates.**



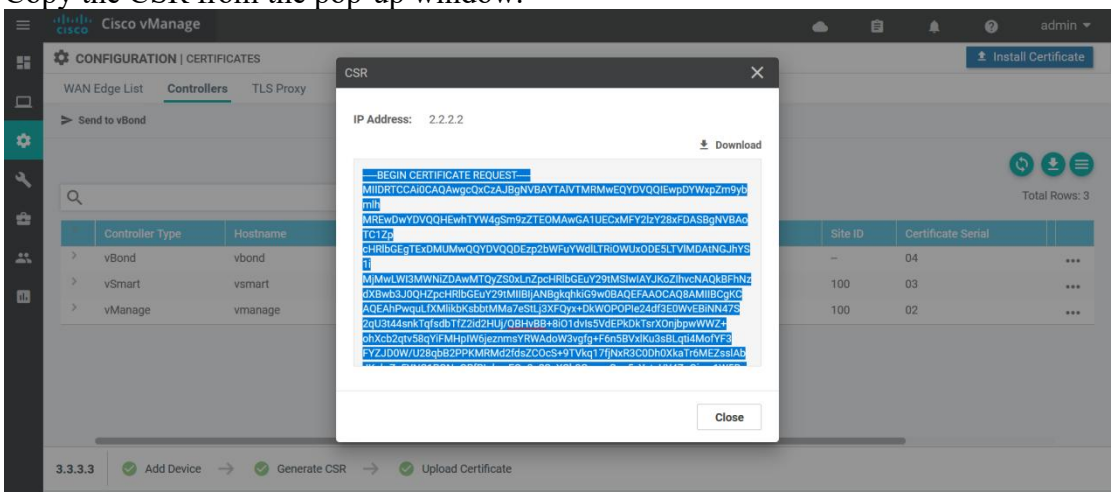
Then navigate to the **Controllers tab.**



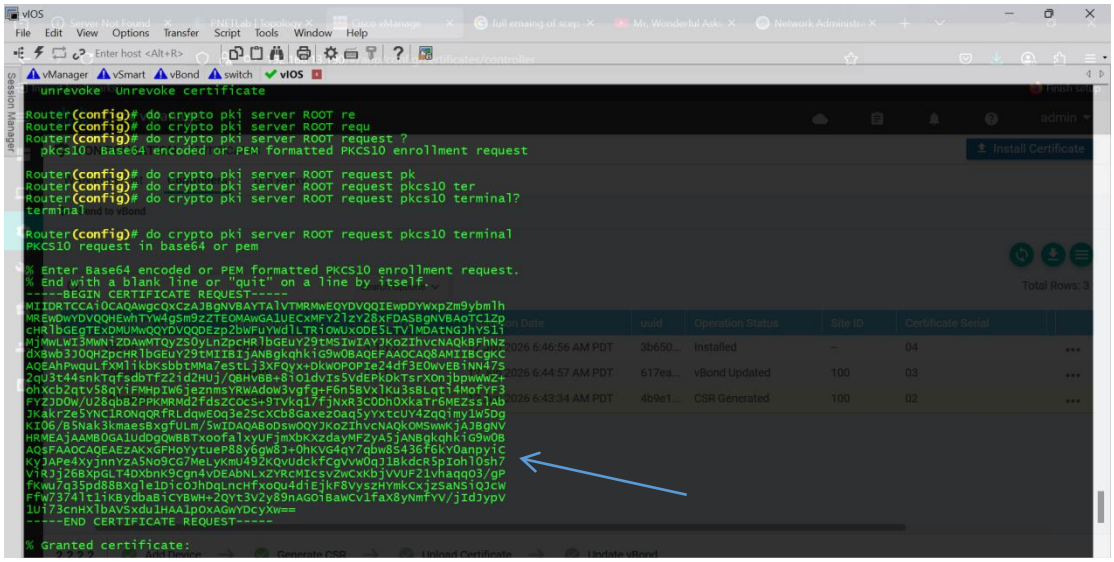
Click on the **“three-dot”** button on the right of the table and select **“Generate CSR”** from the drop-down menu.



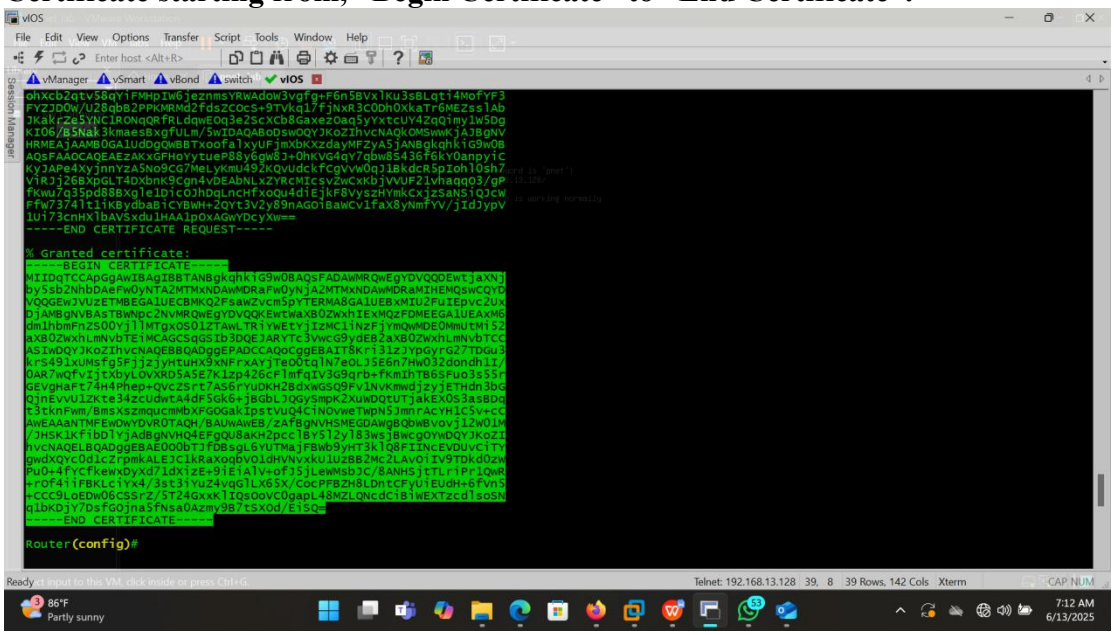
Copy the CSR from the pop-up window.



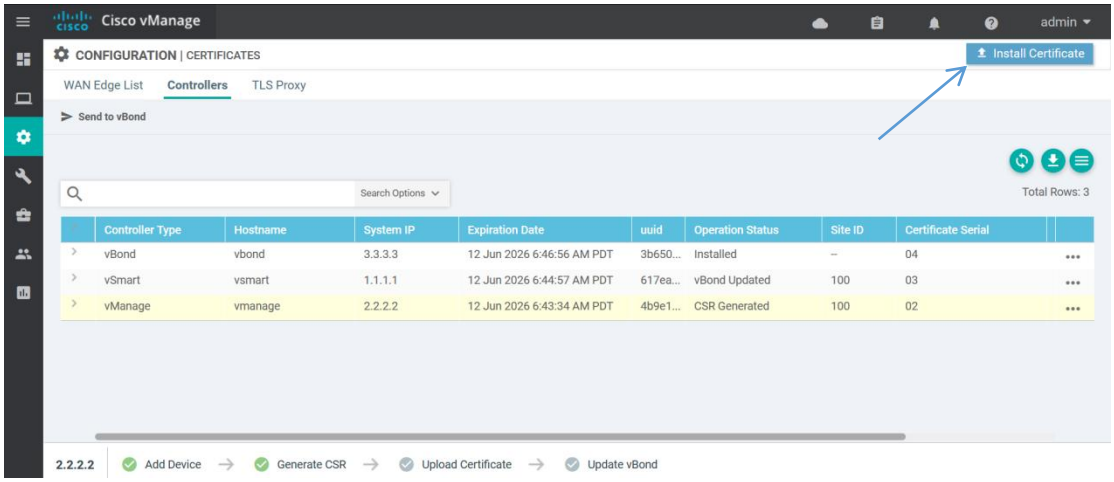
Move to the CA_Server, type this command **#do crypto pki server ROOT request pkcs10 terminal,** then paste the CSR here, and press enter.



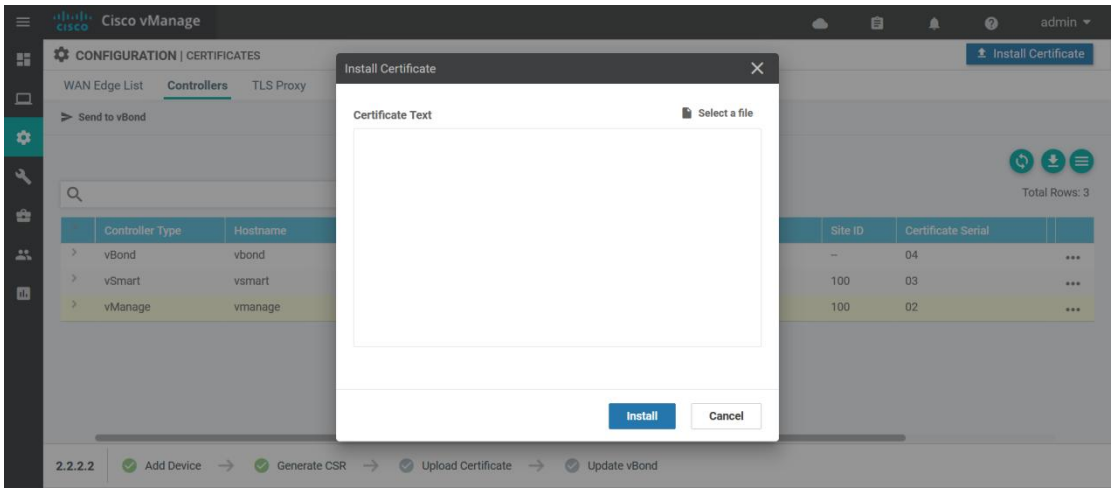
The identity certificate will be generated, and copy what's under the **Granted Certificate starting from, "Begin Certificate" to "End Certificate".**



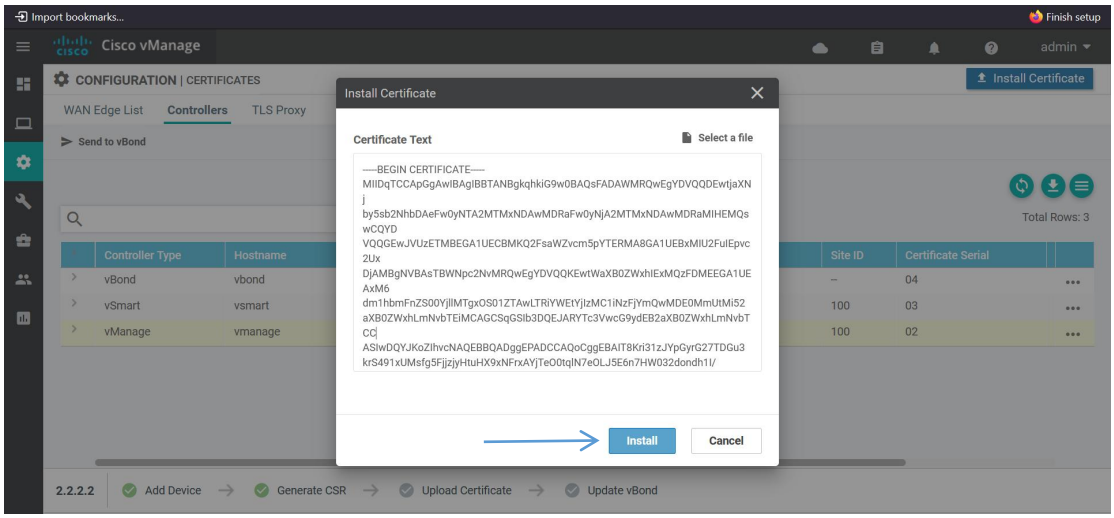
Copy this Granted Certificate and head back to the GUI of the Vmanage, and click on the "Install Certificate Button"



Paste the copied Generated Certificate (Identity certificate) here in the small window.

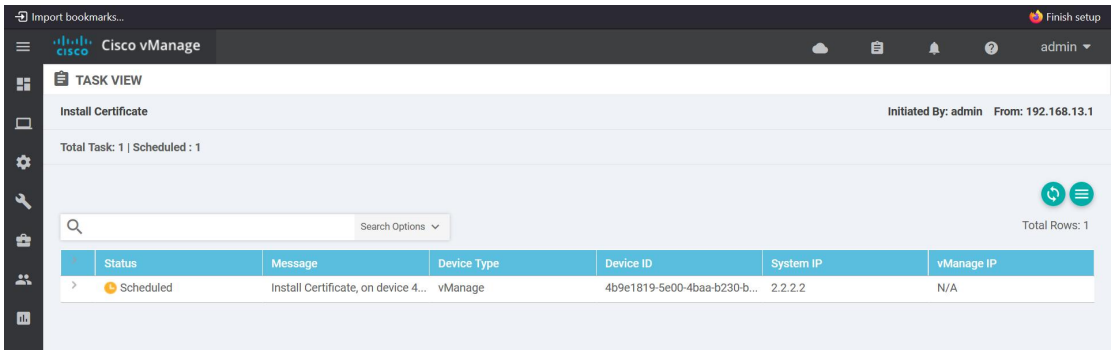


Click on the install button, Repeat this process for all the controllers and the Vedge devices

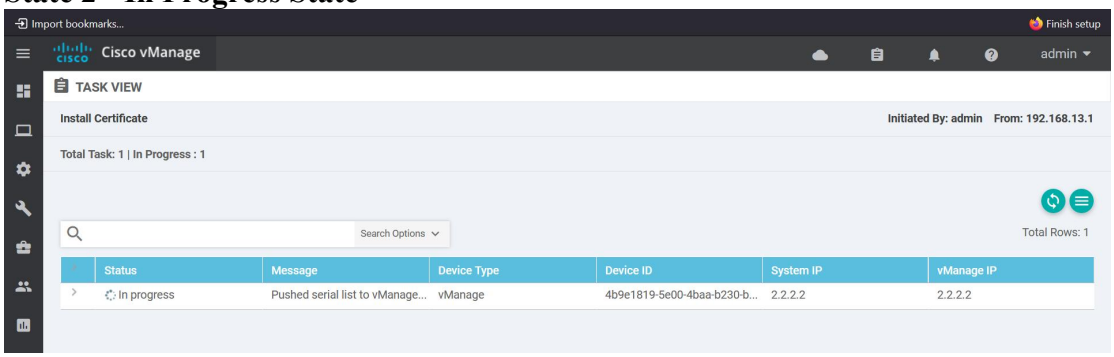


After clicking on the install button, the certificate will go through **3 different states, Scheduled , In Progress, Success State.**

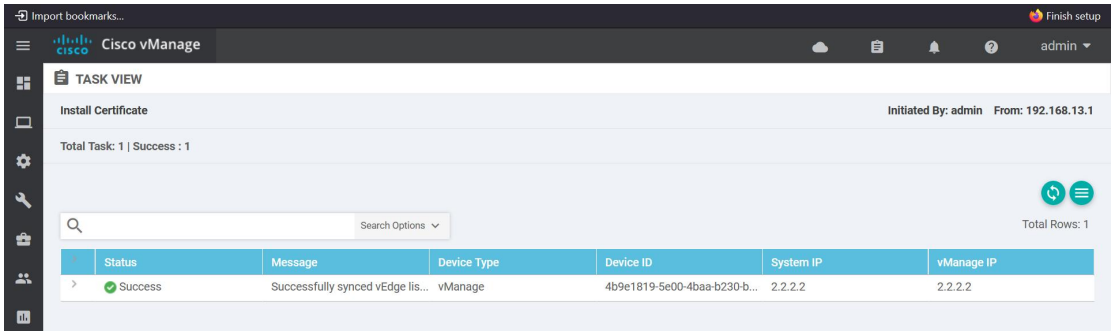
State 1 - Scheduled State



State 2 - In Progress State



State 3 - Success State



Note : if you don't sse the success state then you need to troubleshoot the entires topology, suing the procedure below.

1. First check for reachability between controllers and the **ROOT CA Server**, by pinging from **VPN 0** to the destination ip address of the **ROOT CA Server**.
2. Check if the HTTP and SSH configurations were done appropriately on the **ROOT_CA Server.**
3. Check if **username, privilege** and **password** were configured on the ROOT_CA Server.
4. Make sure the pki server is m
5. Check each line of configuration uner the #crypto pki server <ROOT_Servername>
6. Make sure the old root-cert-chain is uninstalled on all controllers.
7. Download the root-certifcate from the ROOT_CA server on all controllers
8. Make sure the root-certicate in installed on all the controllers. To verify this use, the command, **#do show control local-properties. And check the root-ca-chain-status, you should see "installed".**