



This support document is intended for users with an active VMware vSphere license. If you do not have a VMware vSphere license, you will need to purchase one to operate NETLAB+ until our team releases a version utilizing Proxmox.



## Installation Guide

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This guide documents features available in **NETLAB+ VE version 18.7.1** and later.

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## Introduction

This is the *NETLAB+ Installation Guide*, for the virtual edition of NETLAB+.

NETLAB+ is a remote access solution that allows academic institutions to deliver a hands-on IT training experience with a wide variety of curriculum content options. The training environment that NETLAB+ provides enables learners to schedule and complete lab exercises for information technology courses. NETLAB+ is a versatile solution for facilitating IT training in a variety of disciplines including networking, virtualization, storage, and cybersecurity.

The material in this guide includes instructions on installing a NETLAB+ VE system.

## 1 Delivery and Licensing Options

See the subsections below for information on purchase and licensing options available for new and existing NETLAB+ Customers.

### 1.1 Delivery Options

Delivery options for NETLAB+ VE:

- **Software Only:** Appropriate for those who already have an ESXi management server. NETLAB+ VE will be downloaded as an OVA.
- **Software and Hardware:** A management server may be purchased along with the software. This option is appropriate for customers who do not have a management server or those who currently have a management server but would like a secondary one.



We do not recommend, nor support, running the NETLAB+ VE appliance on an ESXi server that also hosts pod VMs.

### 1.2 Licensing for Existing Customers

Our current policy (as of 11/01/2016) is to offer NETLAB+ VE as a beta release to our existing customers. You will be offered the opportunity to run NETLAB+ VE in parallel with your existing NETLAB+ deployment for 12 months.



If you are interested in trying NETLAB+ VE, or have any comments or questions, please feel free to [contact us](#).

### 1.3 Purchasing Details for New Customers

New customers who do not currently have a NETLAB+ system may submit a [price quote request](#).

## 2 Prerequisites

In preparation for the installation of your NETLAB+ VE system, please review the following list of prerequisites. Attending to these items will be helpful in expediting the install process.

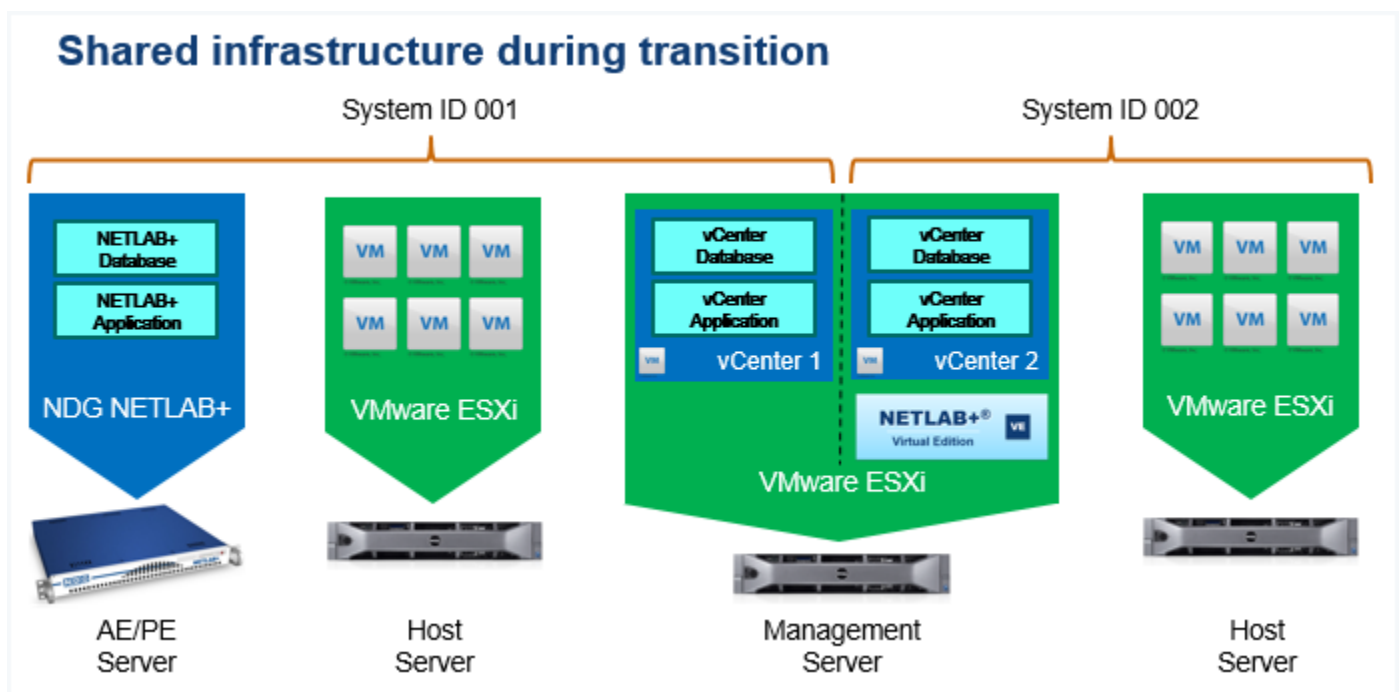
- Review the [NETLAB+ VE Designated Operating Environment Guide](#); the guide includes important information on the hardware and software needed to set up the virtual infrastructure required to install NETLAB+ VE.
- You will be required to accept the [NETLAB+ VE Software License Agreement](#).
- NETLAB+ VE is distributed as an OVA file; purchase may be required. Please visit [www.netdevgroup.com](http://www.netdevgroup.com) for details.

### 2.1 Shared Infrastructure During Transition

For customers transitioning from NETLAB PE or NETLAB AE, NDG recommends the following configuration (see picture below) for a shared infrastructure, which includes a separate vCenter and dedicated host for NETLAB+ VE.



If this recommended configuration is not a practical choice for your system setup, be aware that it is extremely important that your virtual system settings do not overlap between your NETLAB+ AE/PE system(s) and your NETLAB+ VE system. Please set your virtual system IDs and port ranges to unique settings.



### 3 Obtain the OVA File



You will need the customer information email sent to your organization from the Network Development Group (NDG), in order to complete the steps in this section.

The email from Network Develop Group (NDG) includes the following items:

- **Link:** A link to the download page, where you will obtain the OVA (good for 30 days only)
- **Password:** Required to gain access to download the OVA
- **System Serial Number:** The serial number of your NETLAB+ VE system (see the *Manage License* section)
- **License Key:** The license key for your NETLAB+ system (see the *Manage License* section)
- **Active Pod Limit:** The number of pods that may be in use simultaneously, supported by your license

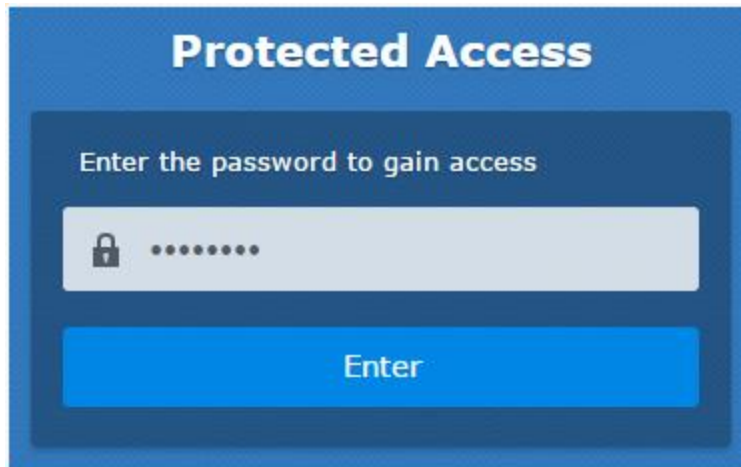
To obtain the OVA file:

1. Click the link in the email from NDG to view the download page.



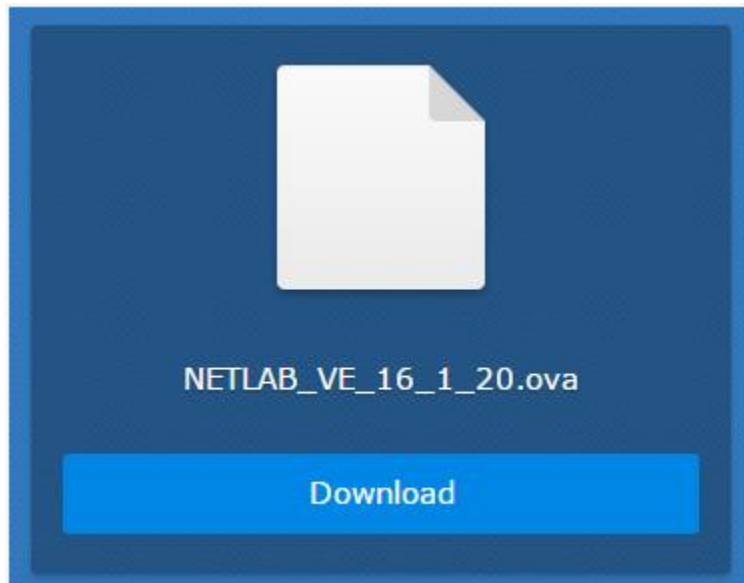
The download link will be functional for **30 days only** from time of receipt.

2. On the download page, enter the password provided from NDG.



The image shows a 'Protected Access' login screen. It has a blue header with the text 'Protected Access'. Below the header, there is a dark blue box containing the text 'Enter the password to gain access'. Underneath this text is a light gray password input field with a lock icon on the left and ten dots representing the password. Below the input field is a blue button with the text 'Enter'.

3. Click the **Download** button to download the OVA file.



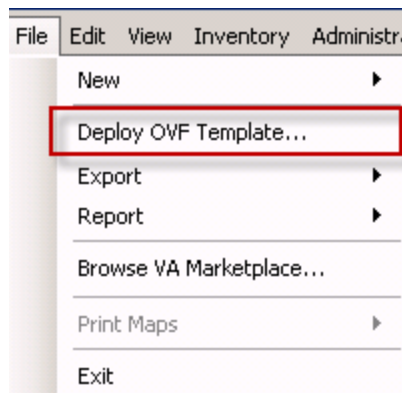
If you have any issues submitting your information on the download page, please [contact NDG Support](#).

## 4 Deploy to the VMware ESXi Management Server



Please refer to the installation and configuration instructions provided in [Remote PC Guide Series - Volume 2, Installation](#) for details on installing the ESXi management server.

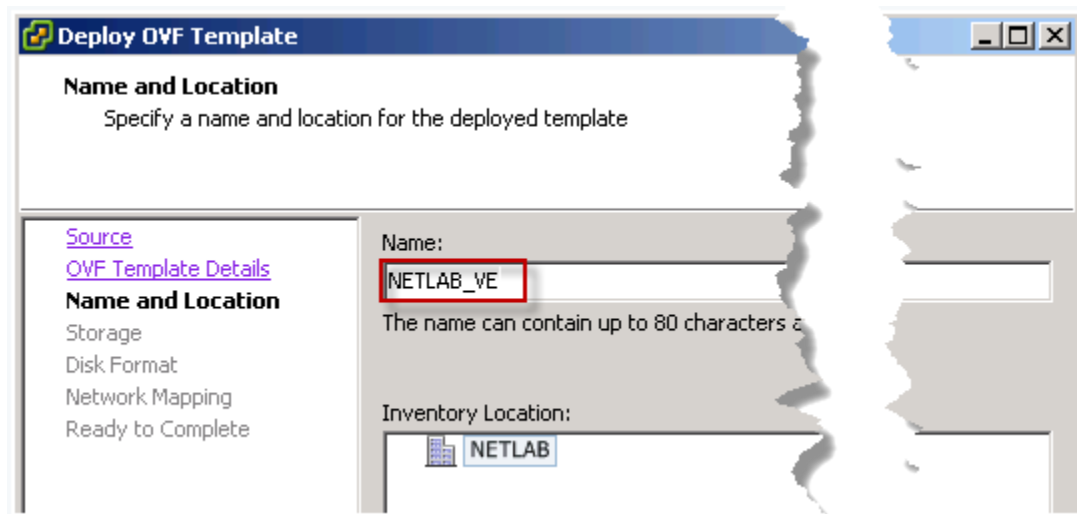
1. Using the vSphere client, navigate to **File > Deploy OVF Template**.



2. Click **Browse** and point to the OVA you downloaded. Click **Next**, review OVA details and click **Next** again.
3. Enter **NETLAB\_VE** as the virtual machine name then click **Next**.



If your system setup has multiple NETLAB+ VE platforms, use the naming convention NETLAB\_VE\_1, NETLAB\_VE\_2, etc...



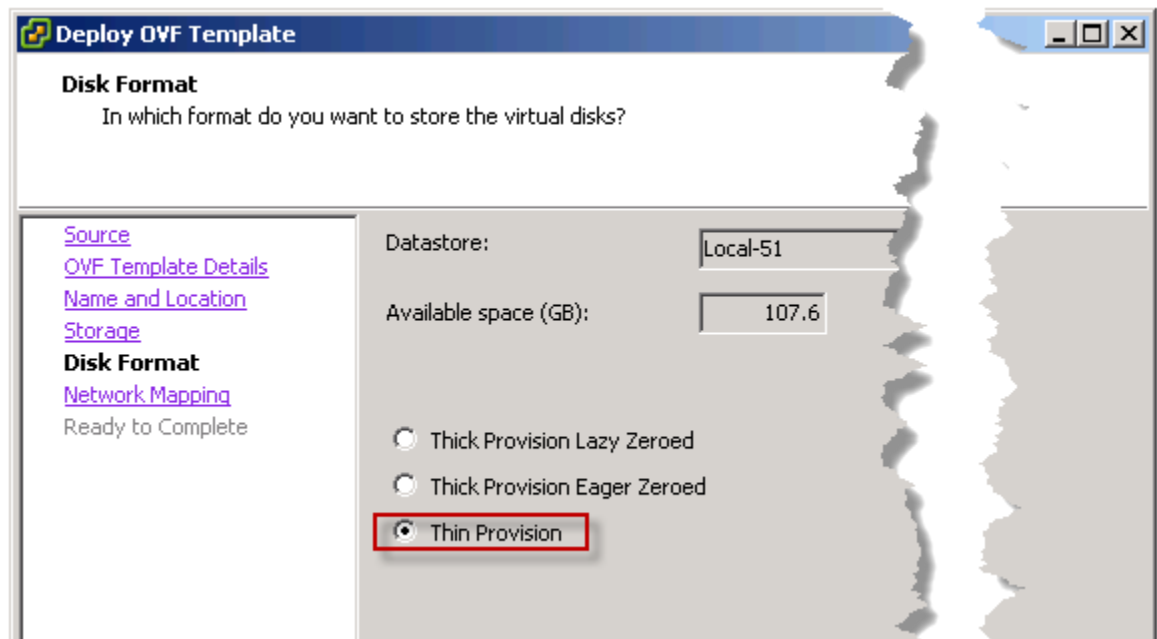
4. Select your destination storage for this virtual machine and click **Next**.



5. Select **Thin Provision** and click **Next**.

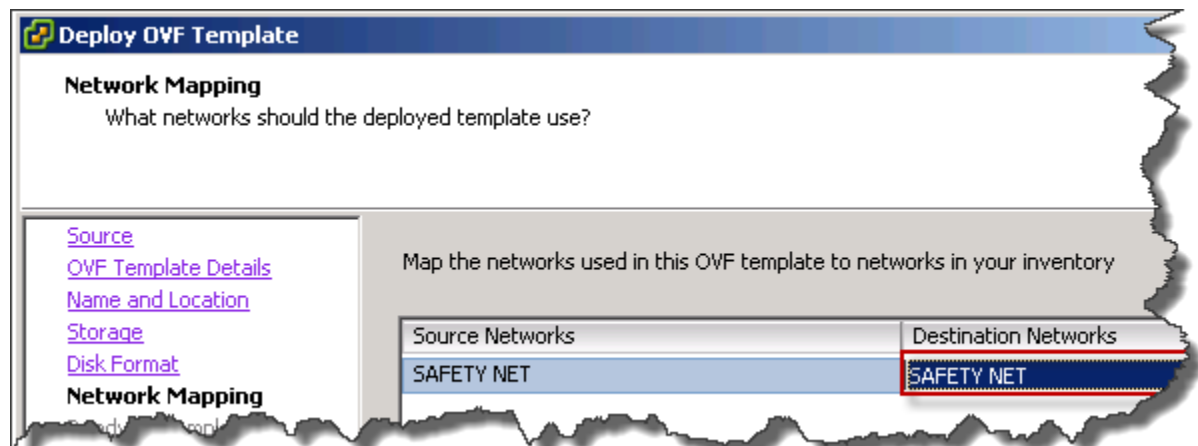


NDG strongly recommends you select **Thin Provision** for deployment. The advantages of expansive storage and performance have greatly increased in recent versions of VMware ESXi.



The screenshot shows the 'Deploy OVF Template' wizard at the 'Disk Format' step. The title bar says 'Deploy OVF Template'. The main heading is 'Disk Format' with the question 'In which format do you want to store the virtual disks?'. On the left, there is a navigation pane with links: 'Source', 'OVF Template Details', 'Name and Location', 'Storage', 'Disk Format' (which is highlighted), 'Network Mapping', and 'Ready to Complete'. The main area shows 'Datastore: Local-51' and 'Available space (GB): 107.6'. There are three radio button options: 'Thick Provision Lazy Zeroed', 'Thick Provision Eager Zeroed', and 'Thin Provision'. The 'Thin Provision' option is selected and highlighted with a red rectangle.

6. Make sure all sources networks are mapped to **SAFETY\_NET** and click **Next**.



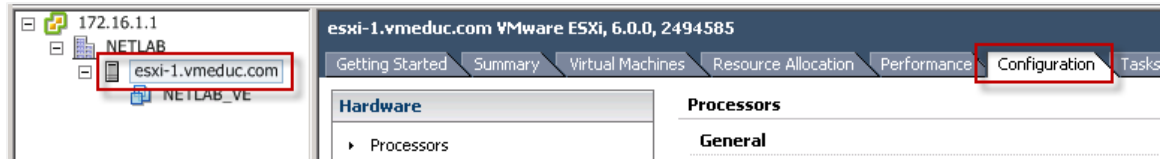
The screenshot shows the 'Deploy OVF Template' wizard at the 'Network Mapping' step. The title bar says 'Deploy OVF Template'. The main heading is 'Network Mapping' with the question 'What networks should the deployed template use?'. On the left, there is a navigation pane with links: 'Source', 'OVF Template Details', 'Name and Location', 'Storage', 'Disk Format', 'Network Mapping' (which is highlighted), and 'Ready to Complete'. The main area has the instruction 'Map the networks used in this OVF template to networks in your inventory'. Below this is a table with two columns: 'Source Networks' and 'Destination Networks'. The 'Source Networks' column contains 'SAFETY NET'. The 'Destination Networks' column contains 'SAFETY NET'. The 'SAFETY NET' entry in the 'Destination Networks' column is highlighted with a red rectangle.

7. Review the deployment settings and click **Finish** to deploy NETLAB+ VE.

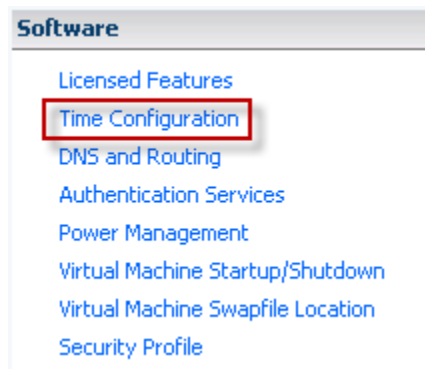
## 4.1 Verify Time Setting on Host

The NETLAB+ VE virtual machine currently uses VMware Tools to synchronize time with the host ESXi server. You will need to verify the host server is configured to synchronize with NTP (Network Time Protocol) so that the time is accurate.

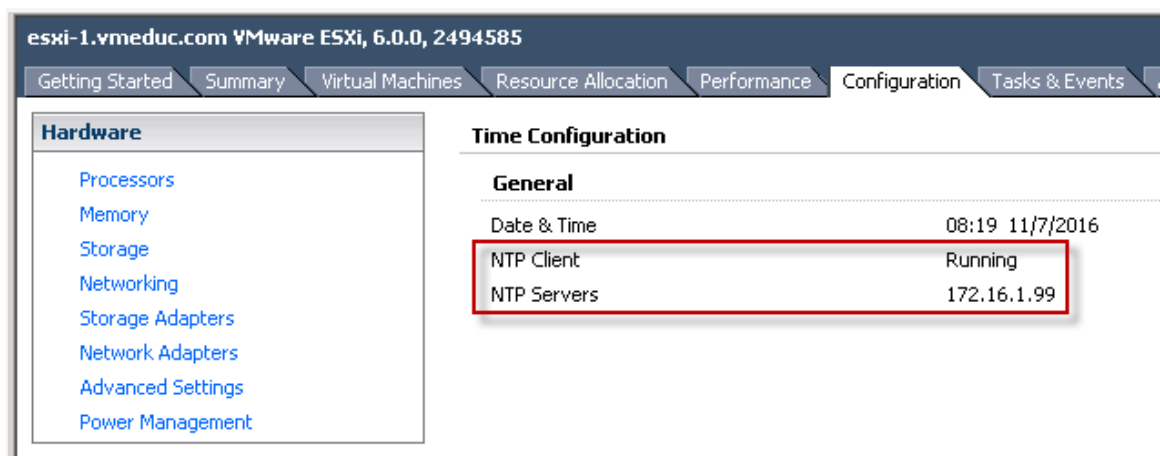
1. Select the ESXi host on the left and click the **Configuration** tab.



2. Select **Time Configuration** under the *Software* section on the left.



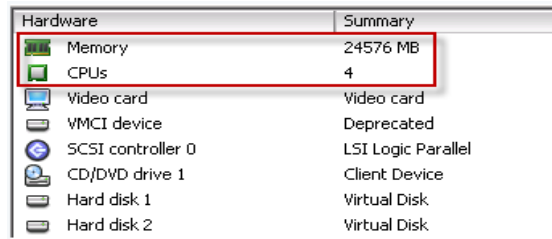
3. Verify that the **NTP Client** is running and the appropriate **NTP Servers** are set.



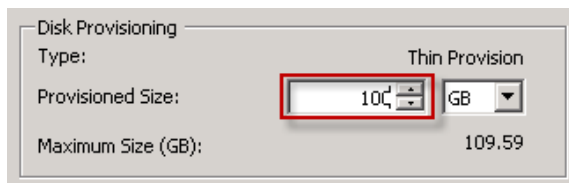
## 4.2 Edit VM Settings

Review and update the virtual machine properties. Adjust the settings for the hardware components as listed below.

1. Select the **NETLAB\_VE** virtual machine on the left side.
2. Click on **Edit virtual machine settings**.
3. Verify Memory is set to **24GB**.
4. Verify CPUs is set to **4**.



5. Adjust Hard Disk 3 to **100GB**.



6. Adjust the settings for network adapters, as shown in the table below.

Network Adapter	Name	Connect at power on - checkbox
Network Adapter 1	NETLAB_LAN_1	checked
Network Adapter 2	NETLAB_LAN_2	NOT checked
Network Adapter 3	SAFETY_NET	NOT checked
Network Adapter 4	SAFETY_NET	NOT checked



Network Adapter 1 is the primary network adapter, which connects to your campus LAN. The default name used by VMware for this adapter is **Management Network**, as shown in the *Verifying vSwitch0 Configuration* section of the [Remote PC Guide Series - Volume 2, Installation](#). We recommend renaming the adapter to **NETLAB\_LAN\_1**.



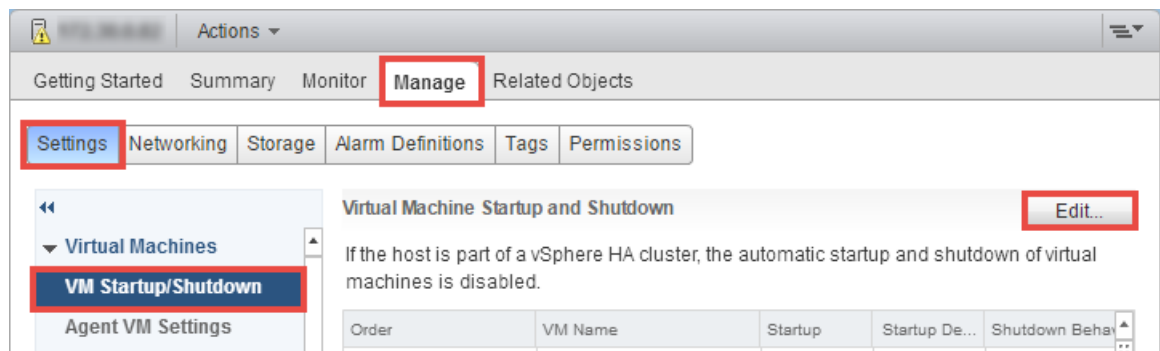
Network Adapter 2 is used in setups that include physical lab devices. Please refer to the [NETLAB+ VE Real Equipment Pod Installation Guide for Cisco Networking Academy](#).

7. Select **Options > VMware Tools**.
8. Verify that **Synchronize guest time with host** is checked.
9. Select **OK**.

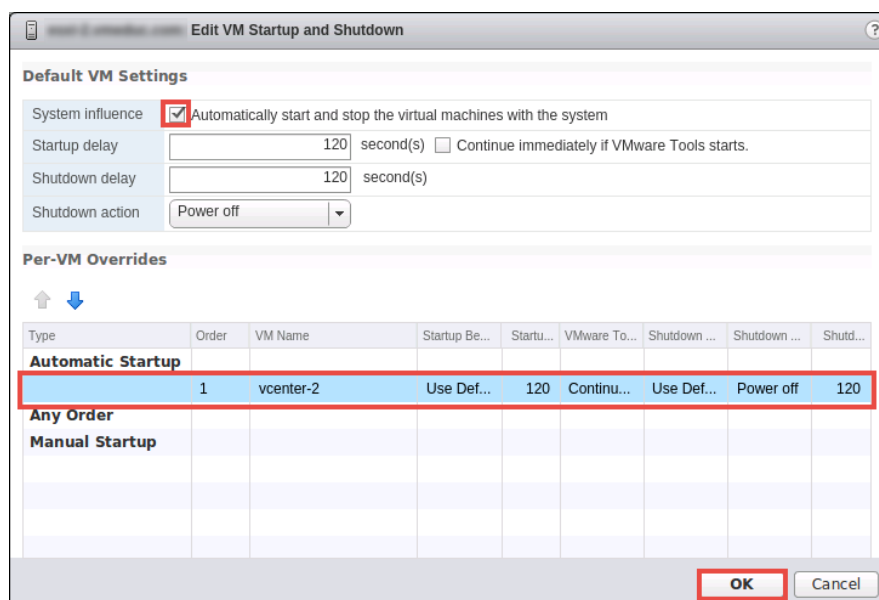
### 4.3 Configure Automatic Startup for NETLAB+ VE and vCenter

For this section, you will configure your NETLAB+ VE and vCenter to start with the ESXi Management Server automatically. This is important because if it is not set up and the ESXi Management Server powers off or is rebooted, the NETLAB+ VE and the vCenter Appliance will not start up, causing a NETLAB+ communication failure.

1. Using the *vSphere Web Client*, navigate to **Hosts and Clusters**.
2. Click on your ESXi host in the inventory pane where the NETLAB+ VE and vCSA reside.
3. With the host selected, select **Manage > Settings** from the top pane.
4. Under Virtual Machines, select **VM Startup/Shutdown** and click **Edit**.



5. On the *Edit VM Startup and Shutdown* window, click the checkbox to **Automatically start and stop the virtual machines with the system**.
6. Select your vCenter VM in the list and click the **Move Up** icon until it is directly under **Automatic Startup** (note that the picture below shows the vCenter VM only, you should also see your NETLAB+ VE listed in your setup).
7. Click **OK**.



8. Close **vSphere Web Client**.

#### 4.4 Power On the Virtual machine

1. Within the vSphere client, click the green button to power on the **NETLAB\_VE** virtual machine.

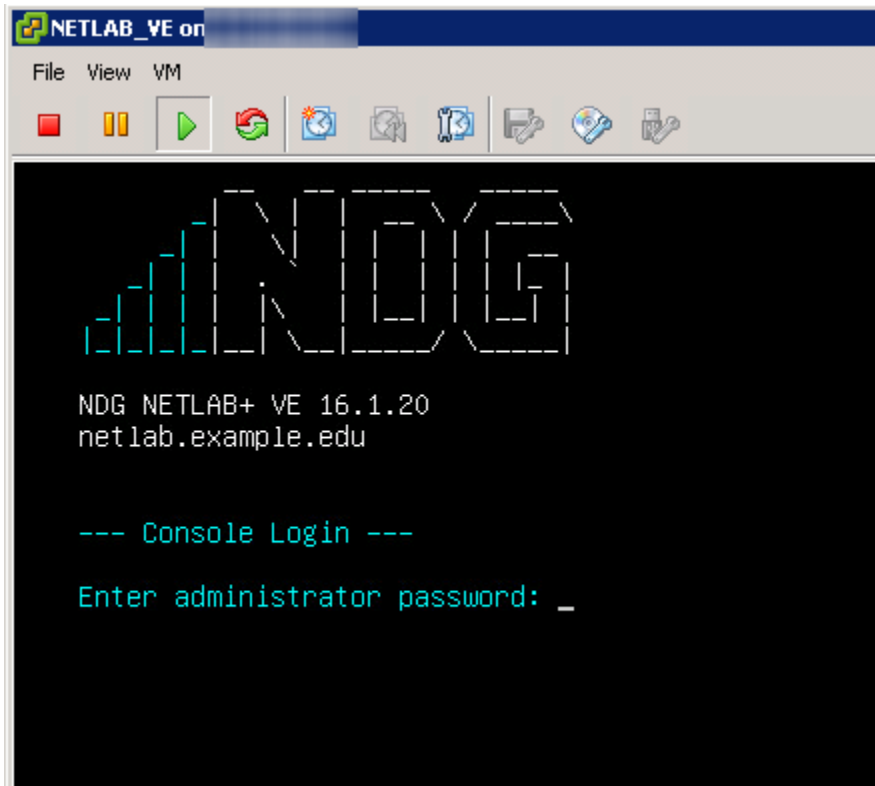


## 5 Configuring the NETLAB+ Console

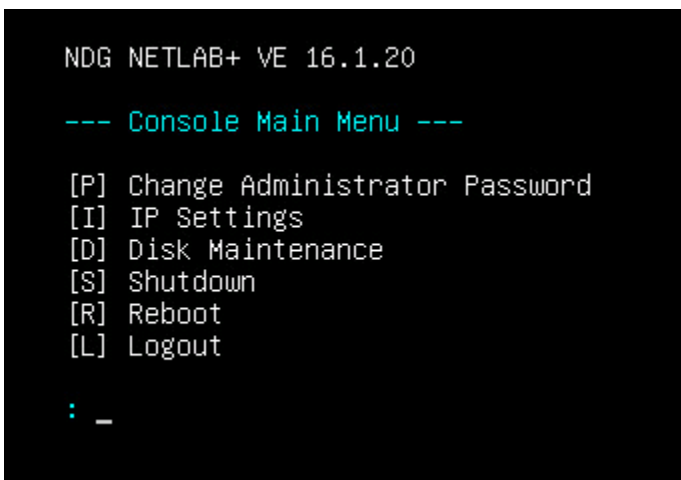
In order to enable web browser access and basic functionality, networking must be configured on the NETLAB+ VE virtual machine console using the VM vSphere client. Complete the steps in the subsections below.

### 5.1 Change the Administrator Password

1. Open a console to the NETLAB+ VE virtual machine.
2. Enter the administrator password, **netlab** (factory default, all lowercase).



3. Press **[P]** to change the Administrator password.



4. Enter a new Administrator password.
5. Confirm the new password by entering it in again.
6. Press any key to continue.



Username and passwords are case-sensitive. Please record your new password in a safe place. This password will also be used to log in to the Administrator web interface.

**Passwords must meet the following requirements:**

- **Not found in the common dictionary and not too simple**
- **7 or more ASCII characters**
- **Contain both numbers and letters**

```
NDG NETLAB+ VE 16.1.20
```

```
--- Change Administrator Password ---
```

```
The administrator password is used to log in to both  
the administrator account from the web interface and  
this console interface.
```

```
Enter new administrator password (blank to quit): *****
```

```
Confirm new password: *****
```

```
*** password changed
```

```
Press any key to continue...
```

## 5.2 Configure Network Settings

1. Press [I] for IP settings from the Console Main Menu.
2. Press [I] for IP address.

```
NDG NETLAB+ VE 16.1.20

--- Current IP Settings ---

Hostname       : netlab.example.edu
IP address     : 192.0.2.2
Subnet mask    : 255.255.255.0
Default gateway : 192.0.2.1
DNS servers    : 8.8.8.8, 8.8.4.4
Web login URL  : https://netlab.example.edu

--- IP Settings Menu ---

[I] IP Address
[H] Hostname
[D] DNS Servers
[T] Test Network Settings (recommended)
[X] Exit

: _
```

3. Review current settings, press [Y] for Yes.
4. Review the requirements, press [Y] for Yes.
5. Enter the IP address.
6. Enter the subnet mask.
7. Enter the default gateway.
8. Press [Y] to apply the settings.
9. Press [H] for Hostname.
10. Review the requirements and then press [Y] for Yes.
11. Enter your Hostname, press **Enter**.
12. Enter [D] for DNS servers.
13. Select [L] or [G], depending on if you are using local or Google (default is [G]).
14. Continue to follow the onscreen prompts to complete the process.
15. Verify that all DNS lookups pass.



UDP port 53 must be open outbound.

16. Press [T] to test the network settings.
17. Review the requirements and then press [Y] for Yes.
18. Verify settings are correct and then press [Y] for Yes to proceed with a network test.



19. Verify that the settings are correct and then press any key to continue. You should see results similar to the following:

```
NDG NETLAB+ VE 16.1.20

--- Network Test ---

These are the current settings that will be tested:

Hostname       : ndg-ve-beta.netdevgroup.com
IP address     : 192.168.1.10
Subnet mask    : 255.255.255.0
Default gateway : 192.168.1.1
DNS servers    : 192.168.1.1
Web login URL  : https://ndg-ve-beta.netdevgroup.com

Are these correct? (Y)es/(Q)uit: y
*** pinging DNS server 192.168.1.1 (icmp)... OK
*** testing DNS lookup to nss.netdevgroup.com... OK
*** testing DNS lookup to www.netdevgroup.com... OK
*** testing DNS lookup to www.google.com... OK
*** testing DNS lookup to www.letsencrypt.org... OK
*** contacting NDG servers using HTTPS... OK
*** resolving ndg-ve-beta.netdevgroup.com to IP address... OK
*** ndg-ve-beta.netdevgroup.com maps to 192.168.1.10
*** outbound traffic appears on the Internet from 192.168.1.10
*** outbound and inbound address are the same... OK
*** 192.168.1.10 open on TCP port 443... OK
*** 192.168.1.10 open on TCP port 80... OK
*** ndg-ve-beta.netdevgroup.com is a NETLAB+ system... OK
*** ndg-ve-beta.netdevgroup.com is this system... OK
*** 12 of 12 tests have passed
*** looks good!
Press any key to continue...
```



Notice the Web login URL displayed, this is the URL used to access NETLAB+.

20. Enter [X] to exit the IP settings.

### 5.3 Disk Maintenance

1. Press [D] for disk maintenance from the Console Main Menu.
2. Note the current size for Hard Disk 3. Press [3] to resize the data disk.

```

NDG NETLAB+ VE 16.1.20

--- Disk Usage ---

VMware Disk  NETLAB+      Size      Used      Avail    Use %
-----
Hard Disk 1   Boot         0.5G     0.1G     0.4G     13.9%
Hard Disk 2   Programs    19.6G    1.3G    17.2G     6.8%
Hard Disk 3   Data         1.9G     0.1G     1.7G     4.9%

--- Disk Maintenance Menu ---

[3] Resize Data Disk
[X] Exit

:

```

3. Review the information. **These steps should have been completed earlier (see Section 0, Step 5).** Select [Y] for Yes.
4. Press any key to continue.
5. Review the size of Hard Disk 3; it should be increased to approximately 98.4GB.

```

NDG NETLAB+ VE 16.1.20

--- Disk Usage ---

VMware Disk  NETLAB+      Size      Used      Avail    Use %
-----
Hard Disk 1   Boot         0.5G     0.1G     0.4G     13.9%
Hard Disk 2   Programs    19.6G    1.3G    17.2G     6.8%
Hard Disk 3   Data       98.4G     0.1G    94.2G     0.1%

--- Disk Maintenance Menu ---

[3] Resize Data Disk
[X] Exit

: _

```

6. Press [X] to exit.
7. Press [L] to logout.






## 6 Connect to the Administrator Interface

The web-based interface allows the administrator to monitor and maintain the NETLAB+ system and devices. This interface is accessible to the administrator.

1. To access the login page, direct a web browser to the address of the NETLAB+ system. Using the most recent available version of the browser you select is recommended. Supported browsers are listed in the table below.




**Cookies** and **JavaScript** must be enabled in your browser. The latest information on supported web browsers is available from **Help > Supported Web Browsers** when signed in to a NETLAB+ account.

	Browser	Minimum Version	Support/Experience
	Google Chrome	54.0	* * * * *
	Mozilla Firefox	46.0	* * * *
	Apple Safari (MAC only)	11.0.3	* * * *
	Microsoft Edge	40.15063.674.0	* *
	Microsoft Internet Explorer		No longer supported

2. Because SSL is not yet configured, you will receive a warning that your connection is not private. Your options to continue will vary, depending on your browser selection. Chrome users should select **Advanced**, as shown below.





### Your connection is not private

Attackers might be trying to steal your information from  (for example, passwords, messages, or credit cards). NET::ERR\_CERT\_COMMON\_NAME\_INVALID

☐ Automatically report details of possible security incidents to Google. [Privacy policy](#)

ADVANCED

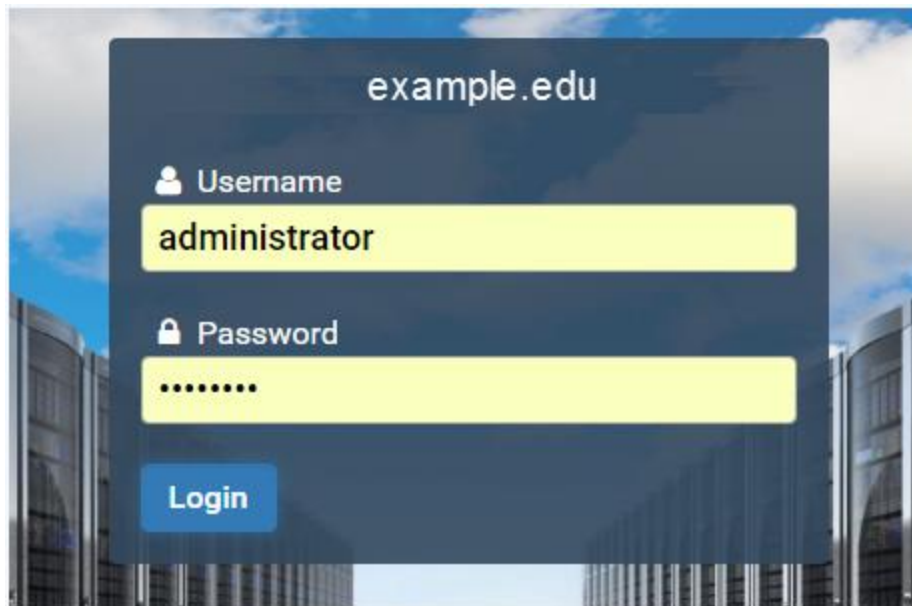
Back to safety

3. Enter the Username  and password , as noted in the table below. Click the **Login** button. The graphics on the page may be different from the example shown below.

Username	Password
administrator	<p>If you changed the password as directed while configuring the NETLAB+ console (see Section 5.1), use your new password.</p> <p>If you have not yet changed the Administrator password, enter the factory default, <b>netlab</b> (lowercase).</p>



If you changed the factory default password while completing NETLAB+ console configuration (see Section 5.1), use your new password.



## 6.1 Change the Administrator Password



If you have already changed the factory default password, skip to the next section.

If you did not yet change the factory default password, the Change Password screen will be displayed during the initial login into the administrator account, requiring you to change the password. NETLAB+ enforces strong passwords.




Username and passwords are case-sensitive. Please record your new password in a safe place.

**Passwords must meet the following requirements:**

- **Not found in the common dictionary and not too simple**
- **7 or more ASCII characters**
- **Contain both numbers and letters**



Changing the administrator account password also changes the the system console password. The same password is used for both functions.


 **Change Password**


New Password

.....

Retype New Password


.....

 Submit

 Help



Notice the **Help** button. You can click the **Help** button on this and other NETLAB+ pages to display information to assist you in entering information and making selections. To hide the help information, click the button again.

 **Change Password**

New Password


.....


Enter your new password here.

Retype New Password

.....

Enter your new password again for confirmation.

 Submit

 Help

- Enter your selection into the **New Password** field.
- Enter the password once again in the **Retype New Password** field and then click **Submit**.



An error message will be displayed if the password entered does not meet the requirements. The message will indicate why the password was unacceptable.

Examples of typical password errors:

- The error message shown below indicates that the password entered did not meet the minimum length requirement.

New Password

**Password must be 7 or more characters.**

- The error message shown below indicates that the new password entered is a simple word found in the common dictionary and therefore not eligible to be a password on the system.

New Password

**Password cannot be a common dictionary word.**

- If the values in the two password fields do not match, an error message will be displayed, similar to the one shown below.

Retype New Password

**The provided passwords do not match.  
Please try again.**



If you receive an error, correct the information in the fields as needed and click **Submit** again.



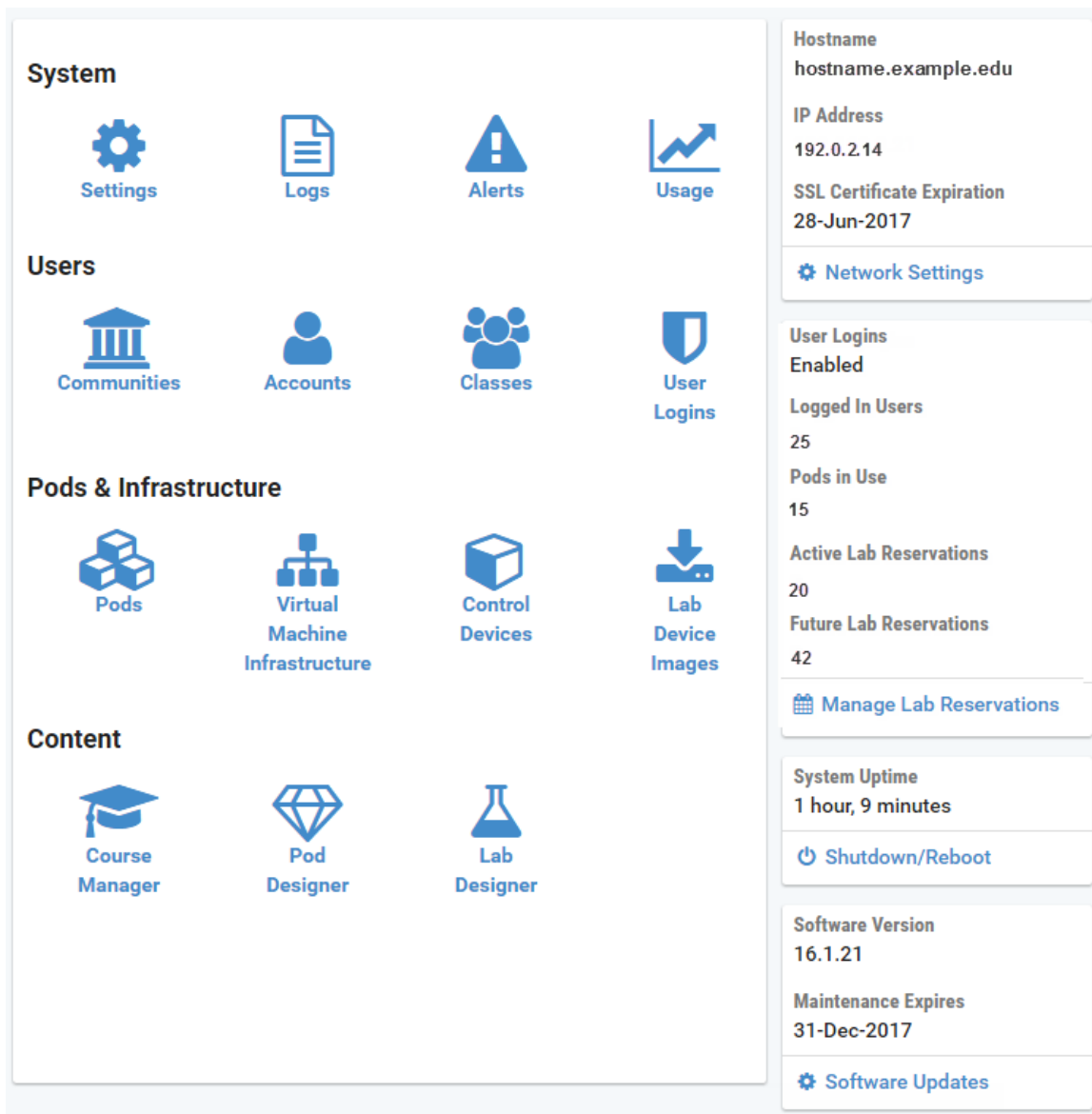
Make note of your new password, you will need it each time you log into the NETLAB+ system.

## 6.2 Administrator Home Page

After a successful login, the Administrator Home page will be displayed. The administrative functions in the main panel include displaying various system logs and alerts, user management, pods and infrastructure, and content management. Select any function by clicking on the icon or the function name. On the right, system information is displayed.



Please refer to the [NETLAB+ VE Administrator Guide](#) for details on the features and functions of NETLAB+ VE that are accessed through the Administrator interface.



The screenshot displays the Administrator Home Page interface, which is organized into a main panel on the left and a sidebar on the right.

**Main Panel:**

- System:** Contains icons for Settings (gear), Logs (document), Alerts (warning triangle), and Usage (line graph).
- Users:** Contains icons for Communities (classroom), Accounts (person), Classes (group of people), and User Logins (shield).
- Pods & Infrastructure:** Contains icons for Pods (cubes), Virtual Machine Infrastructure (server rack), Control Devices (cube), and Lab Device Images (download arrow).
- Content:** Contains icons for Course Manager (graduation cap), Pod Designer (diamond), and Lab Designer (flask).

**Sidebar (Right):**

- System Information:**
  - Hostname: hostname.example.edu
  - IP Address: 192.0.2.14
  - SSL Certificate Expiration: 28-Jun-2017
  - [Network Settings](#)
- User Logins:**
  - User Logins: Enabled
  - Logged In Users: 25
  - Pods in Use: 15
  - Active Lab Reservations: 20
  - Future Lab Reservations: 42
  - [Manage Lab Reservations](#)
- System Uptime:**
  - System Uptime: 1 hour, 9 minutes
  - [Shutdown/Reboot](#)
- Software Information:**
  - Software Version: 16.1.21
  - Maintenance Expires: 31-Dec-2017
  - [Software Updates](#)

## 7 Configuring Your Network Settings



SSL must be configured on your NETLAB+ system in order for it to be fully functional (see subsection below).

Hostname  
hostname.example.edu

IP Address  
192.0.2.14

SSL Certificate Expiration  
2017-06-28

 [Network Settings](#)

The first section of the panel on the right side of the administrator home page provides convenient viewing of the Hostname, IP Address, and SSL Certificate Expiration date of your NETLAB+ system.

Further details are available by selecting **Network Settings**. You may also access the settings by selecting the Settings icon on the Administrator Home page and then selecting **Network Settings**.



### Manage License

Activate and manage system license key.



### Network Settings

Manage network settings and SSL certificates.



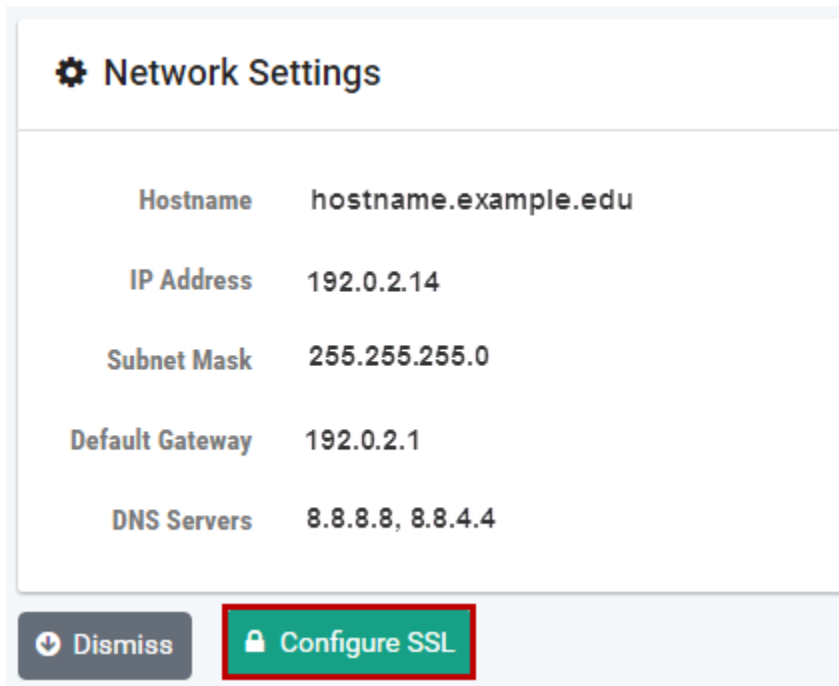
**Network interface settings are modified from the system console.** The web interface allows you to view, but not modify these settings. Use caution when changing network configuration settings. Under some circumstances, if you enter an incorrect value, the erroneous setting may result in your system no longer being accessible using the configuration utility. It would then be necessary to make corrections through the virtual machine console (see previous section).

To see an example of the Network Settings page, continue to the subsection below.



## 7.1 SSL Configuration - Manage Certificates

You must configure connectivity for your NETLAB+ system through SSL. On the Network Settings page, select **Configure SSL**.



The screenshot shows the 'Network Settings' page with a gear icon. It contains the following fields:

Hostname	hostname.example.edu
IP Address	192.0.2.14
Subnet Mask	255.255.255.0
Default Gateway	192.0.2.1
DNS Servers	8.8.8.8, 8.8.4.4

At the bottom, there are two buttons: 'Dismiss' and 'Configure SSL'. The 'Configure SSL' button is highlighted with a red border.

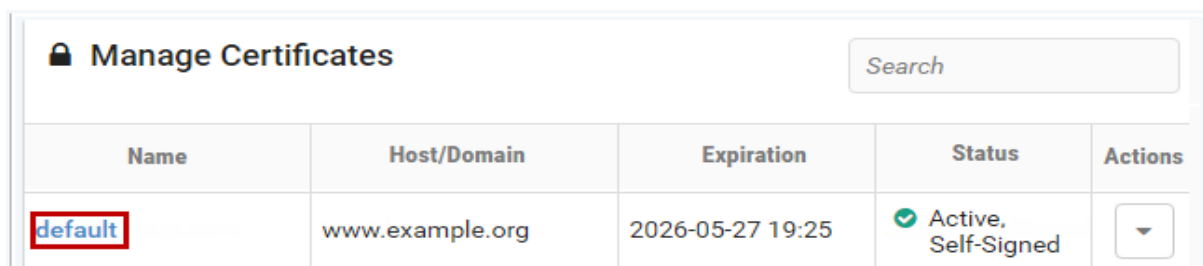
You will notice (see the picture in the section below) that a self-signed SSL certificate is displayed in the list of certificates.




This self-signed certificate is included for configuration purposes. HTML5 viewers will not work with this certificate. It must be replaced with a certificate signed by a trusted certificate authority. The subsections below provide details on your options for replacing the certificate.

### 7.1.1 View Certificate Information


First, we will take a look at the unsigned certificate as an example of how to view certificate information on the system.



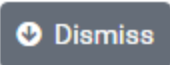

The screenshot shows the 'Manage Certificates' page with a search bar. Below is a table of certificates:

Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Active, Self-Signed	

To view more information about the self-signed certificate, click the certificate name.

 **Active SSL Certificate**

Name	default
Status	✔ Active, Self-Signed
Host(s)	www.example.org
Issuer	None (certificate is self-signed)
Valid From	2016-05-29 19:25
Expiration	2026-05-27 19:25
Private Key	2048 bit

Select the **Details** button to view additional information.


 **Certificate Details - default**

Certificate:  
Data:  
Version: 3 (0x2)  
Serial Number: 143676593751194  
Signature Algorithm: sha256WithRSA  
Issuer:  
CN=www.example.org  
Validity  
Not Before: May 29 19:25:00  
Not After : May 27 19:25:00  
Subject:  
CN=www.example.org  
Subject Public Key Info:  
Algorithm

Click **Dismiss** to return to the previous page.

### 7.1.2 Adding New Certificates


To add a signed certificate to your NETLAB+ system, proceed with one of the following methods, depending on if you need to obtain a certificate or already have a certificate.


**How would you like to add the certificate?**

☐ Generate a certificate signing request, temporary certificate, and new private key.

☐ I have an existing certificate and private key.

☒ Get a certificate from Let's Encrypt™.

 Next

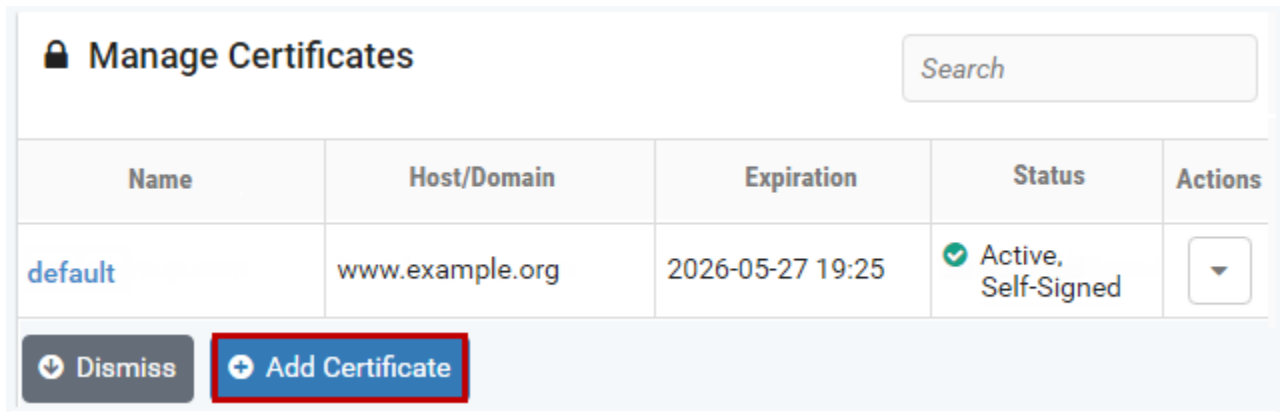
 Cancel

- **Generate a certificate signing request:** You will generate a certificate request, temporary certificate, and new private key through NETLAB+. You will send the request to the Certificate Authority (CA) of your choice. Once you receive a signed version from the CA, you will update the certificate in NETLAB+. See Section [7.1.2.1](#) for details.
- **If you already have a signed certificate and private key for your organization:** (This can be a domain-level certificate). You will proceed by adding the certificate and private key to your NETLAB+ system as described in Section [7.1.2.2](#).
- **Get a certificate from Let's Encrypt™:** Initiate an automated process where your NETLAB+ system will request and obtain a signed certificate from Let's Encrypt, a free certificate authority. See section [7.1.2.3](#).


### 7.1.2.1 Generate a Certificate Request and Replace an Unsigned Certificate with a Signed Certificate

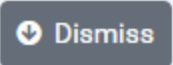
First, you will generate a certificate request and submit it to the CA of your choice.

1. Navigate to **Network Settings > Configure SSL**. If this is your first time adding a certificate, you will see that the self-signed certificate that is included with NETLAB+ is initially the active certificate.

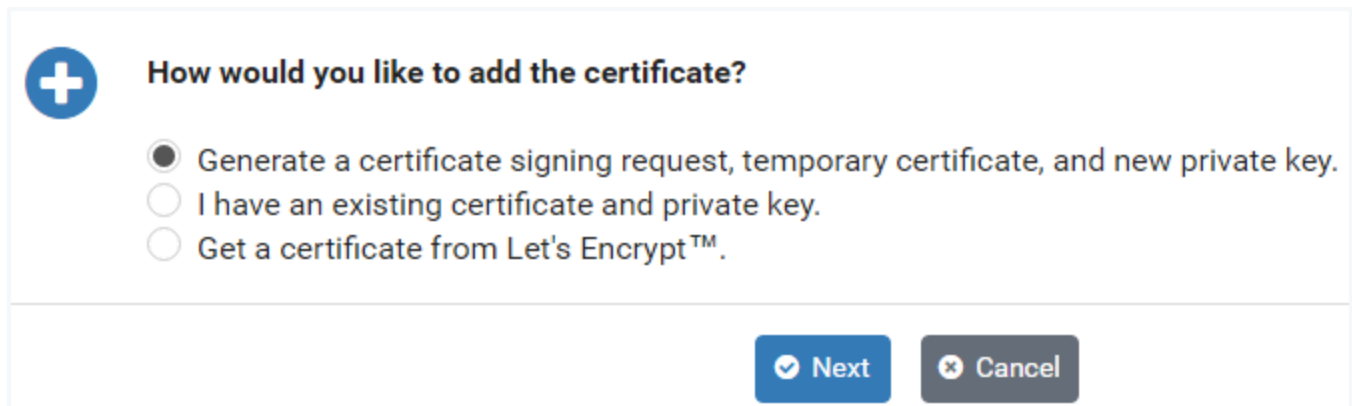


The screenshot shows the 'Manage Certificates' interface. At the top, there is a search bar. Below it is a table with columns: Name, Host/Domain, Expiration, Status, and Actions. The table contains one entry: 'default' with Host/Domain 'www.example.org', Expiration '2026-05-27 19:25', and Status 'Active, Self-Signed'. Below the table are two buttons: 'Dismiss' and 'Add Certificate'. The 'Add Certificate' button is highlighted with a red border.


Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Active, Self-Signed	


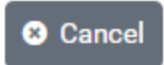
2. Click **Add Certificate**.
3. Select the option to generate a certificate signing request, temporary certificate, and new private key and press **Next**.



The screenshot shows a dialog box titled 'How would you like to add the certificate?'. It has three radio button options: 'Generate a certificate signing request, temporary certificate, and new private key.' (selected), 'I have an existing certificate and private key.', and 'Get a certificate from Let's Encrypt™'. At the bottom are 'Next' and 'Cancel' buttons.

 **How would you like to add the certificate?**

☒ Generate a certificate signing request, temporary certificate, and new private key.  
☐ I have an existing certificate and private key.  
☐ Get a certificate from Let's Encrypt™.

4. Fill in the fields on the form with the information appropriate for your site. For guidance on completing the form, see the field descriptions below, or select **Help**.
5. Click **Submit**.

### Generate New SSL Certificate and Signing Request

Entry Name	<input type="text" value="example.edu"/>
Server Name	<input type="text" value="netlab.example.edu"/>
Organization	<input type="text" value="Example University"/>
Organizational Unit	<input type="text" value="IT Department"/>
City	<input type="text" value="Anytown"/>
State/Region	<input type="text" value="NC"/>
Country	<input type="text" value="United States"/>
Email Address	<input type="text" value="testadmin@example.edu"/>
Private Key Length (bits)	<input type="text" value="2048"/>


#### Field Descriptions - Generate New SSL Certificate

- **Entry Name:** The name used to manage this certificate. The hostname is recommended. Letters must be lowercase. No spaces are permitted.  
Example: netlab.myschool.edu
- **Server Name:** The fully qualified domain name (FQDN) of your server. This must match exactly with what you type in your web browser, or you will receive a name mismatch error. Wildcard certificates cannot be generated by NETLAB+.  
Example: netlab.example.edu
- **Organization:** The legal name of your organization. This should not be abbreviated and should include suffixes such as Inc, Corp, or LLC.  
Example: Digitech College of Southern California
- **Organizational Unit:** The division of your organization handling the certificate.  
Example: Computer Science Department

- **City:** The city where your organization is located. Example: Los Angeles
- **State/Region:** The state or region where your organization is located. This should not be abbreviated. Example: California
- **Country:** The country where your organization is located. Example: United States
- **Email Address:** An email address used to contact your organization. Example: support@example.edu
- **Private Key Length (bits):** The length of the private key to generate in bits. 2048 is recommended and now required by most certificate authorities. 4096-bit certificates are currently not supported for performance reasons.



NETLAB+ has generated a new private key, certificate signing request, and self-signed certificate.

## 6. Select the button to **Download Certificate Signing Request**.



### Certificate generated.



- NETLAB+ has generated a new private key, certificate signing request, and self-signed certificate.
- To make this the active certificate, active it from the certificate management page.
- Usage of self-signed certificates is limited to administrative maintenance only. To use this certificate in production, download the certificate signing request, have it signed by trusted certificate authority (CA), and replace the self-signed certificate with the certificate provided by the CA.


- The certificate signing request (a file of encrypted text named *Entry Name.csr*) will be downloaded to your local machine. Submit this file to the Certificate Authority (CA) of your choice. Typically, a small annual fee is charged by the CA for this service.

After you receive a signed version of your certificate from the CA, you will use it to replace the unsigned version.





- Navigate to **Network Settings > Configure SSL**.
- You will be replacing the self-signed certificate that you created. Notice that the *default* certificate is indicated to be the active certificate; this is necessary since you cannot replace an active certificate. (If the default is not currently the active certificate, select it and the option to activate it on the Action drop-down).
- Select the self-signed certificate you created.

Manage Certificates				
Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Active, Self-Signed	
example.edu	netlab.example.edu	2021-08-11 15:53	Self-Signed	

4. Click the **Replace** button to replace the certificate.

 **SSL Certificate**

<b>Name</b>	example.edu
<b>Status</b>	Self-Signed
<b>Host(s)</b>	netlab.example.edu
<b>Issuer</b>	None (certificate is self-signed)
<b>Valid From</b>	2016-08-11 15:53
<b>Expiration</b>	2021-08-11 15:53
<b>Private Key</b>	2048 bit

 Dismiss Activate Details Replace

5. Paste the signed certificate you received from the CA into the **New Certificate** text box, including the header and footer lines and select **Submit**.
  - a. Paste the contents of the new certificate file (.crt or .pem) above.
  - b. The certificate must be in PEM format. The PEM certificate format uses the following header and footer lines, which should be included:  
-----BEGIN CERTIFICATE-----  
-----END CERTIFICATE-----



When using a chain of certificates, just append the certificates together, one after the other; the server certificate needs to go first, otherwise you will get a mismatch between private and public keys.



If the new certificate is valid, it will overwrite the old certificate - the old certificate is not retrievable.



### Replace Certificate - example.edu

Name example.edu

New Certificate


```
-----BEGIN CERTIFICATE REQUEST-----
MIICXzCCBgkqhkiG9w0BBQ0wggEwCgYIKoZIeHkdR2F0ZWV0LmVkdjEw
HhcNMjAwMjE1MTUwMjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1MjE1
-----END CERTIFICATE REQUEST-----
```

6. Return to the certificate page.
7. Verify that your certificate now indicates it is signed (as shown below).







If the status of the certificate does not indicate signed, it may be necessary to log off the system and close your browser window. The status will be updated when you enter the system again.


8. Click **Activate**.



 **SSL Certificate**

Name	example.edu
Status	<b>Signed</b>
Host(s)	netlab.example.edu
Issuer	Netlab (certificate self-signed)
Valid From	2016-08-11 15:53
Expiration	2021-08-11 15:53
Private Key	2048 bit

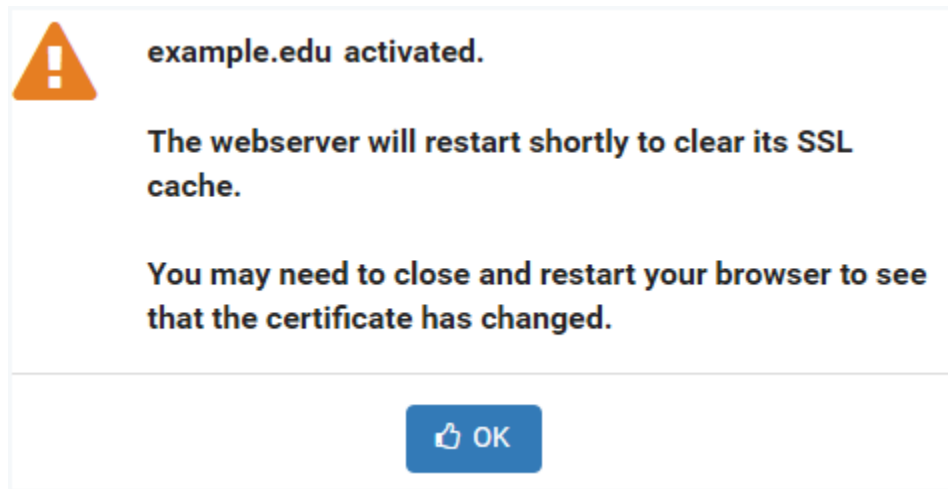
 Dismiss  **Activate**  Details  Replace

9. You will be prompted to confirm that you want to activate the certificate. Select **Proceed**.

 **Do you want to activate certificate 'example.edu'?**

 **Proceed**  Cancel

10. A message will indicate that the certificate has been activated and that the webserver will restart shortly to clear its SSL cache. Click **OK**.



11. Verify that the signed certificate is now active (see the Status in the picture below). If the signed certificate is not active, it may be necessary to log off the system, close your browser window and then re-enter the system.

Manage Certificates				
Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Self-Signed	▼
example.edu	netlab.example.edu	2021-08-11 15:53	✓ Active, Signed	▼

12. Verify that your browser address now indicates HTTPS. It may be necessary to log off the system, close your browser window and then re-enter the system.




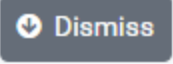
### 7.1.2.2 Add a Certificate and Private Key to NETLAB+

1. Navigate to **Network Settings > Configure SSL**. If this is your first time adding a certificate, you will see that the self-signed certificate that is included with NETLAB+ is initially the active certificate.

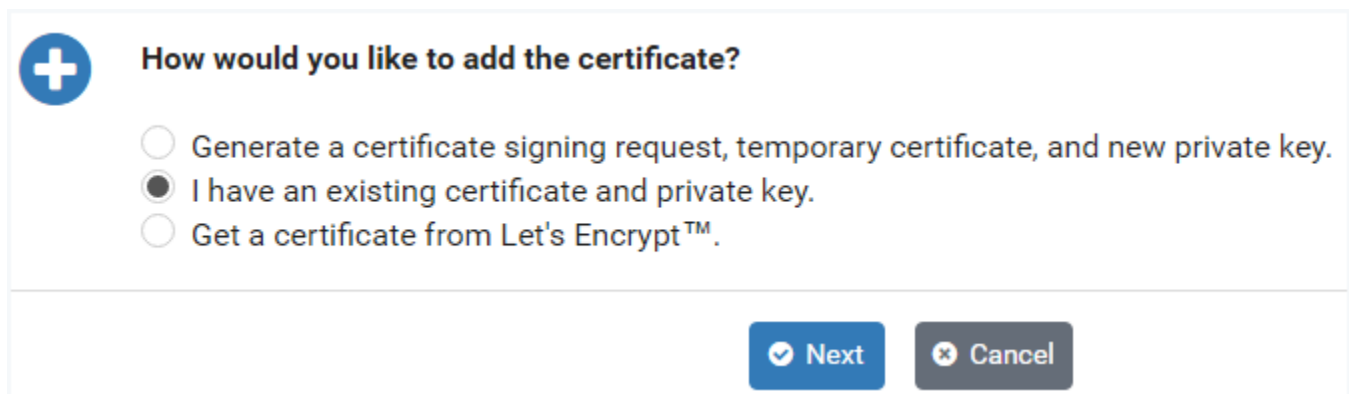


The screenshot shows the 'Manage Certificates' interface. It features a search bar at the top right. Below it is a table with the following columns: Name, Host/Domain, Expiration, Status, and Actions. The table contains one entry: 'default' with Host/Domain 'www.example.org', Expiration '2026-05-27 19:25', and Status 'Active, Self-Signed'. At the bottom of the interface are two buttons: 'Dismiss' and 'Add Certificate'. The 'Add Certificate' button is highlighted with a red rectangle.

Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Active, Self-Signed	

Buttons:  Dismiss  Add Certificate

2. Click **Add Certificate**.
3. If you have a signed certificate and private key for your organization (it may be a domain level certificate), you will add the certificate and private key to your NETLAB+ system. Select the choice, **I have an existing certificate and private key**.




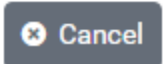
The screenshot shows a dialog box titled 'How would you like to add the certificate?'. It contains three radio button options: 'Generate a certificate signing request, temporary certificate, and new private key.', 'I have an existing certificate and private key.' (which is selected), and 'Get a certificate from Let's Encrypt™'. At the bottom right are two buttons: 'Next' and 'Cancel'.

**How would you like to add the certificate?**

☐ Generate a certificate signing request, temporary certificate, and new private key.

☒ I have an existing certificate and private key.

☐ Get a certificate from Let's Encrypt™.

Buttons:  Next  Cancel

4. Click **Next**. The Add Certificate page will be displayed (see picture on next page).
5. For the **Entry Name**, using the hostname (which is populated in this field as the default value), is recommended.
6. Paste your certificate, including the header and footer lines, into the **Certificate** textbox.
  - a. Paste the contents of the certificate file (.crt or .pem) above.
  - b. The certificate must be in PEM format. The PEM certificate format uses the following header and footer lines, which should be included:  
 -----BEGIN CERTIFICATE-----  
 -----END CERTIFICATE-----



When using a chain of certificates, just append the certificates together, one after the other; the server certificate needs to go first, otherwise you will get a mismatch between private and public keys.

7. Paste your private key, including the header and footer lines, into the **Private Key** textbox.
  - a. Paste the contents of the new certificate file (.crt or .pem) above.
  - b. The private key must be in PEM format. The PEM certificate format uses the following header and footer lines, which should be included:  
-----BEGIN PRIVATE KEY-----  
-----END PRIVATE KEY-----



To protect the private key, there is no user interface to view or download it later. Therefore, you should keep a copy of the private key in a safe place.

8. Press **Submit**.


[illegible]

9. Return to the certificate page.
10. Verify that your certificate now indicates it is signed (as shown below).







If the status of the certificate does not indicate signed, it may be necessary to log off the system and close your browser window. The status will be updated when you enter the system again.


11. Click **Activate**.



 **SSL Certificate**

Name	example.edu
Status	<b>Signed</b>
Host(s)	netlab.example.edu
Issuer	Netlab (certificate self-signed)
Valid From	2016-08-11 15:53
Expiration	2021-08-11 15:53
Private Key	2048 bit

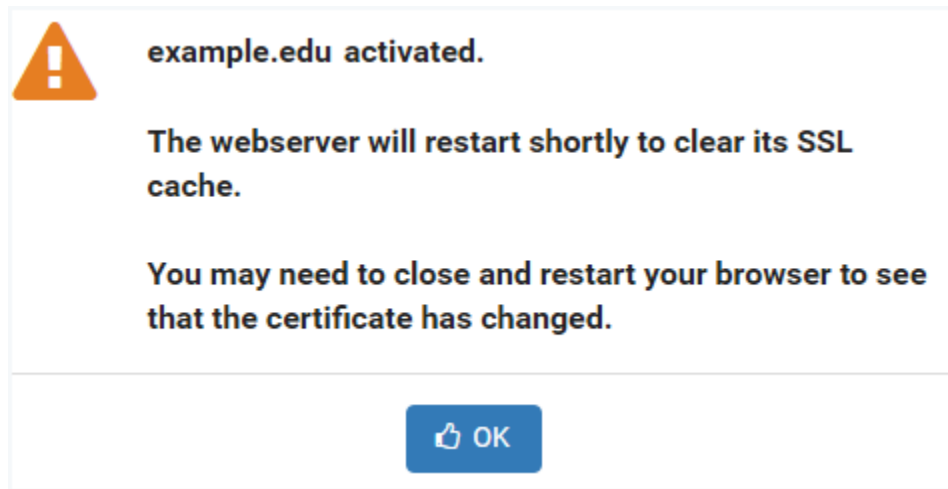
 Dismiss  **Activate**  Details  Replace

12. You will be prompted to confirm that you want to activate the certificate. Select **Proceed**.

 **Do you want to activate certificate 'example.edu'?**

 **Proceed**  Cancel

13. A message will indicate that the certificate has been activated and that the webserver will restart shortly to clear its SSL cache. Click **OK**.



14. Verify that the signed certificate is now active (see the Status in the picture below). If the signed certificate is not active, it may be necessary to log off the system, close your browser window and then re-enter the system.

Manage Certificates				
Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Self-Signed	▼
example.edu	netlab.example.edu	2021-08-11 15:53	✓ Active, Signed	▼

15. Verify that your browser address now indicates HTTPS. It may be necessary to log off the system, close your browser window and then re-enter the system.



### 7.1.2.3 Get a Certificate from Let's Encrypt

Initiate an automated process where your NETLAB+ system will request and obtain a signed certificate from *Let's Encrypt™*, a free certificate authority. Your NETLAB+ system will interact with Let's Encrypt to request the signed certificate and respond to a challenge issued by Let's Encrypt to verify control of the domain.


#### Requirements to use Let's Encrypt with NETLAB+:

- Your system must have an internet-accessible public DNS entry.
- Ports 80 and 443 must be accessible and open through the firewall.



In this automated process, NETLAB+ will respond to a challenge to perform cryptographic math and provide signed, calculated results to prove control of the domain. For more details, see [Let's Encrypt, How It Works](#).

1. Navigate to **Network Settings > Configure SSL**. If this is your first time adding a certificate, you will see that the self-signed certificate that is included with NETLAB+ is initially the active certificate.

 **Manage Certificates**


Search

Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	✓ Active, Self-Signed	▼

Dismiss

Add Certificate

2. Click **Add Certificate**.
3. Select the choice, **Get a certificate from Let's Encrypt™**. Click **Next**.


**How would you like to add the certificate?**

☐ Generate a certificate signing request, temporary certificate, and new private key.
 ☐ I have an existing certificate and private key.
 ☒ Get a certificate from Let's Encrypt™.

✓ Next

✕ Cancel



4. The **Get a Certificate from Let's Encrypt** page is displayed. Enter the appropriate information into the fields (see field descriptions below) and then click **Submit**.

### Get a Certificate from Let's Encrypt

Domain Name

netlab.example.edu

The fully qualified domain name (FQDN) of your server. This must match exactly what you type in your web browser or you will receive a name mismatch error. Wildcard certificates cannot be issued by Let's Encrypt.  
Example: netlab.myschool.edu

Contact Email

admin@example.edu

Let's Encrypt will send email to this address to warn of expiring certs and to notify about changes to their privacy policy.

Submit

Cancel

Help

#### Field Descriptions - Get a Certificate from Let's Encrypt

- **Domain Name:** The fully qualified domain name (FQDN) of your server. This must match exactly with what you type in your web browser, or you will receive a name mismatch error. Wildcard certificates cannot be issued by Let's Encrypt.
- **Contact Email:** Let's Encrypt will send email to this address to warn of expiring certificates and to notify about changes to their privacy policy.

Be sure to enter the address of an email account that is checked on a regular basis to ensure that your organization is kept aware of any issues with the certificate.

5. A message will confirm that the certificate has been generated. Click **Understood**.



If an error occurs indicating too many certificate requests, be aware that [Let's Encrypt enforces rate limits](#). This should not present a problem for typical use. If you have made an excessive amount of certificate renewal requests (perhaps due to testing or development work at your site), refer to the link above for options to resolve this issue.


6. The View Certificate screen is displayed (see picture below). Notice the expiration date. The certificate will expire in **90 days**. Click **Activate**.



NETLAB+ will automatically request a renewal of the certificate from Let's Encrypt every **60 days**. This provides a 30-day window for the automated renewal to successfully take place (allowing for any connectivity issues, power outages, etc. at your site). The renewal will be attempted twice a day until it succeeds.




No intervention will be required, except for situations where system outages for an extensive period prevent the renewal from executing in a timely manner. **See the highlighted box at the end of this section for discussion on initiating a renewal.**


 **View Certificate**


---


Name	letsencrypt
Status	Signed
Host(s)	netlab.example.edu
Issuer	Intermediate X3
Valid From	21-Dec-2016 4:22 AM
Expiration	21-Mar-2017 6:22 AM
Private Key	2048 bit


---

 Dismiss


 **Activate**

 Details


 Renew


 Delete

7. Confirm that you want to activate the certificate by clicking **Proceed**.

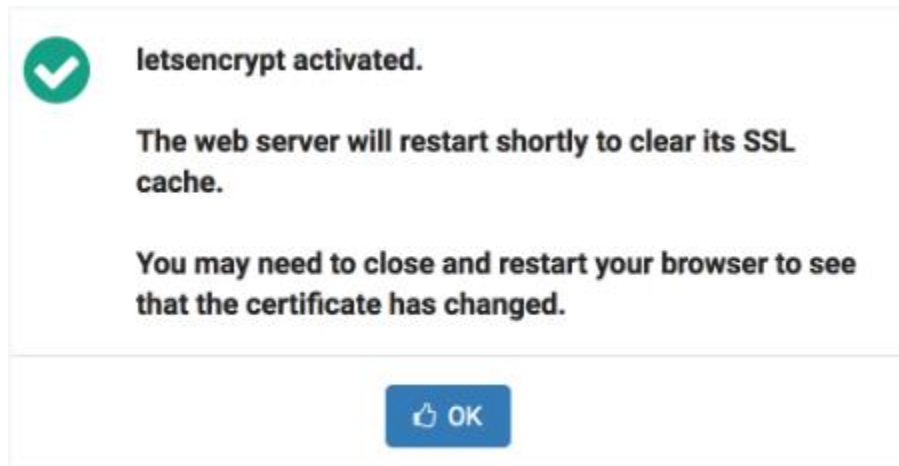
 **Do you want to activate certificate 'letsencrypt'?**

---




 **Proceed**

 Cancel

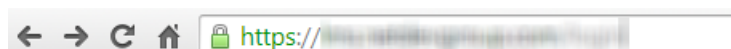
8. The **letsencrypt** certificate is activated. As noted, you may need to restart your browser to see that the certificate has changed.



9. Verify that the letsencrypt certificate is now active (see the status in the picture below). If the letsencrypt certificate is not active, it may be necessary to log off the system, close your browser window and then re-enter the system.

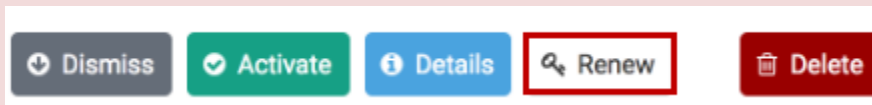
Manage Certificates				
Name	Host/Domain	Expiration	Status	Actions
default	www.example.org	2026-05-27 19:25	Self-Signed	
letsencrypt	netlab.example.edu	2017-03-21 15:53	 Active, Signed	

10. Verify that your browser address now indicates HTTPS. It may be necessary to log off the system, close your browser window and then re-enter the system.

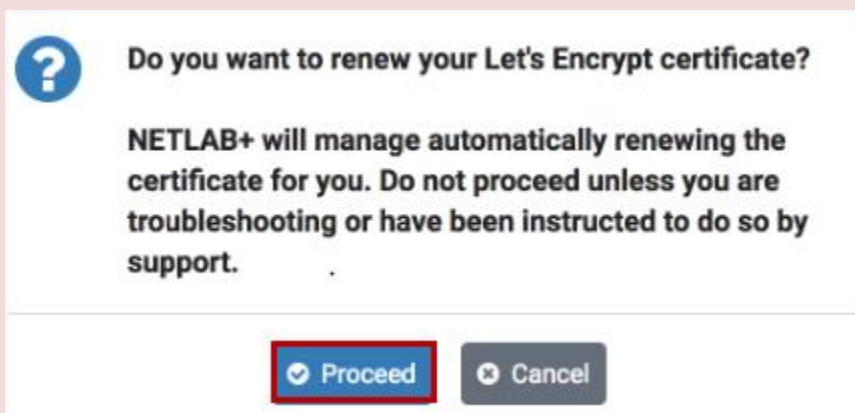


**Under normal operating conditions, no administrator action is required to renew the certificate.** If system outages for an extensive period have prevented the automatic renewal from executing, the certificate will expire at the end of the 90-day period.

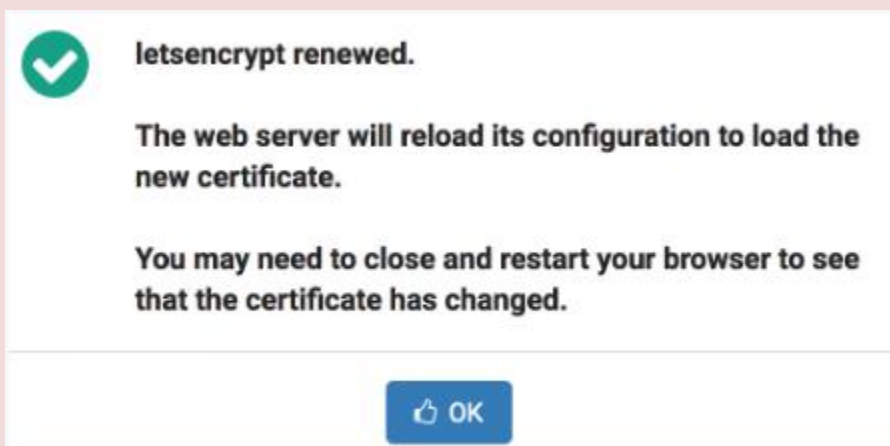
The administrator may initiate a request to renew the certificate by clicking the **Renew** button on the View Certificate page. However, before proceeding, we recommend [contacting our support team](#) for assistance in troubleshooting/resolving any problems with the automated process.



As noted, click **Proceed** if you have been instructed to perform this step by our support team.




A message will confirm the certificate is renewed. Click **OK**. You may need to close and restart your browser to see the updates to the certificate.



## 8 Manage License

Notice the message at the top of the Administrator Home page, indicating that system registration and software license activation is required.



System registration and software license activation required.

No new lab reservations can be made at this time.

[Manage License](#)



You will need the customer information email sent to your organization from the Network Development Group (NDG), in order to complete the steps in this section.

The email from Network Develop Group (NDG) includes the following items needed to activate the license:

- **System Serial Number:** The serial number of your NETLAB+ VE system.
- **License Key:** The license key for your NETLAB+ system (good for 5 activations).

The System Serial Number and License Key must be entered into your NETLAB+ VE system in order to enable activation of its full functionality; including the scheduling of lab reservations. See the *Activate License* subsection below.



**Please keep your license information in a secure place.** You will need to enter it periodically, when major events/changes have taken place on your NETLAB+ VE system. See the *Reactivate License* subsection below.

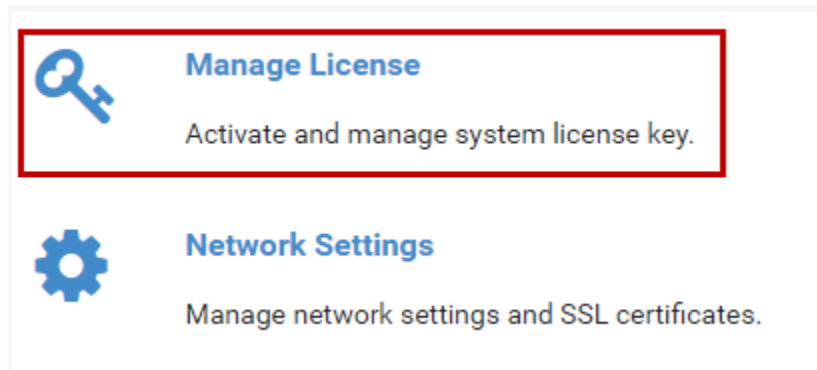
### 8.1 Activate License (Initial Activation)

Complete the following steps to activate your system license key. You will need the System Serial Number and License Key provided to you from NDG.



The NETLAB+ virtual machine must have network connectivity for license activation. Please make sure network setup is completed before activating the license, refer to the *Network Settings* section for guidance.

1. Select Settings from the Administrator Home page and then select **Manage License** (or select **Manage License** on the alert message at the top of the page, see the previous section).



2. The Activate License page will be displayed. Enter the **System Serial Number** and the **License Key** provided from NDG. Select **Activate**.

**Your easiest option for entering the System Serial Number and License Key is to simply copy and paste from the customer information letter.**

If you enter the information into these fields, keep in mind the following:

System Serial Number:

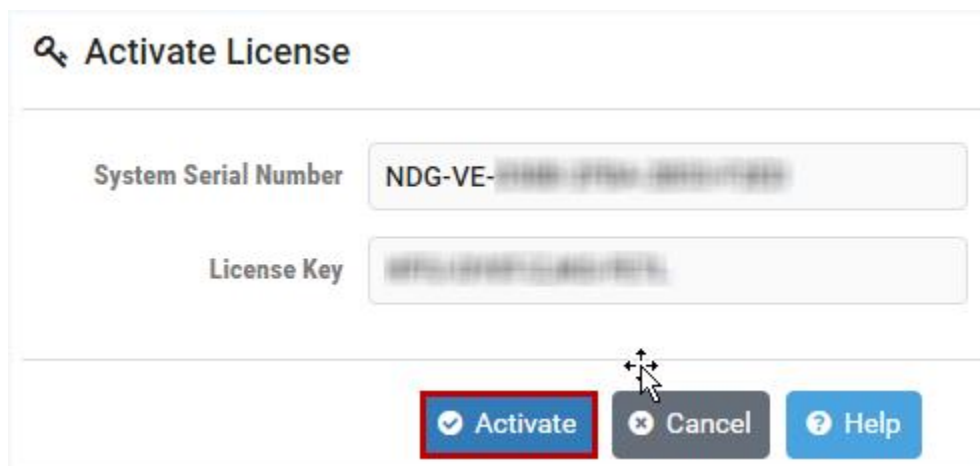
- Can be lowercase/uppercase

- Must include dashes

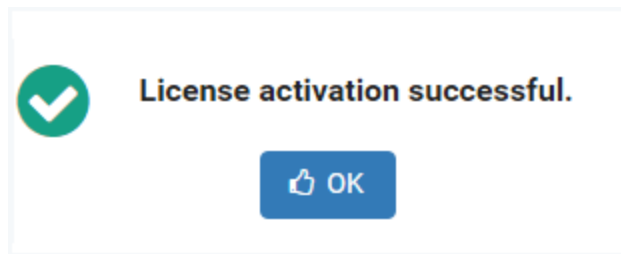
License Key:

- Must be uppercase

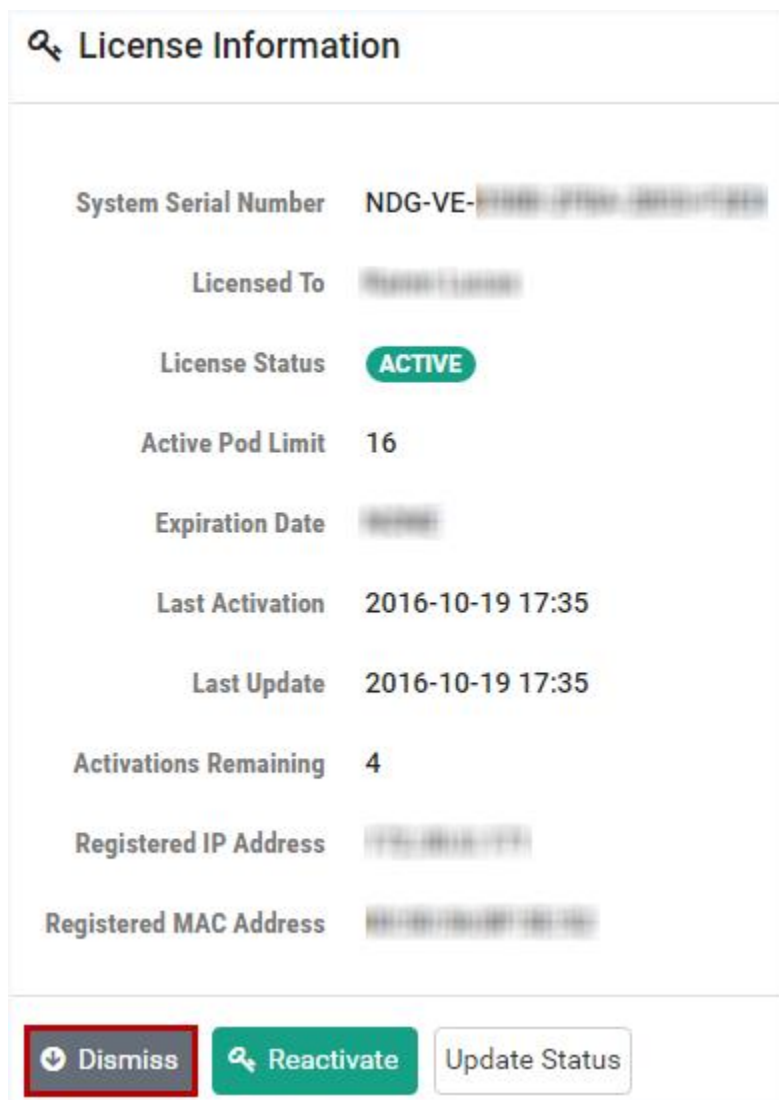
- Must include dashes

A screenshot of the 'Activate License' form. The title 'Activate License' is at the top left. Below it are two input fields: 'System Serial Number' with the value 'NDG-VE-12345-6789-1011-1213' and 'License Key' with the value '12345678901234567890'. At the bottom right are three buttons: 'Activate' (highlighted with a red border), 'Cancel', and 'Help'. A mouse cursor is pointing at the 'Activate' button.

3. A message will display, indicating the license activation was successful. Select **OK**.



4. The License Information page will be displayed. Notice that the license status has been changed to Active. Your system is now fully functional.
5. To ensure the information is updated, click **Update Status**.
6. Click **Dismiss**.



## 9 Backup Your NETLAB+ Virtual Appliance

It is imperative that you establish a plan for making backups of your NETLAB+ virtual appliance on a regular basis to protect against data loss and disaster recovery preparedness. You are also strongly advised to perform a backup before any software update and prior to adding additional content to your NETLAB+ system.



**It is the responsibility of the customer to maintain backups of their NETLAB+ VE system.**

Consider the advantages of setting up an automated backup process; see further discussion in the subsection below. Manual backups using tools available within the *vSphere Web Client* are another option, also described below.



Perform backups on a regular basis, at least once per week or more (depending on the size/volume of use of your system), in addition to backing up before a software or content update.

### 9.1 Automated Backups

To ensure that backups are performed regularly, consider implementing an automated method of creating backups. Taking the time to set up a robust, automated backup process helps protect the investment your organization has made in your NETLAB+ VE system.



Please refer to the [NETLAB+ VE Automated Backups Guide](#) for details on performing automated backups using VMware vSphere Data Protection (VDP).



## 9.2 Manual Backups

You may make a backup your NETLAB+ virtual appliance by creating snapshots and clones of your virtual machine.



**VMware Infrastructure:** The *VMware* infrastructure needs to be fully configured, which includes the setup of the *ESXi* hosts, *vCenter*, Networking and Storage. Please refer to the [NETLAB+ VE Installation Guide](#) for details.

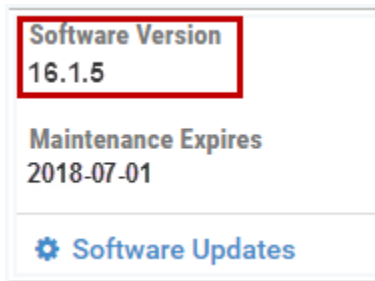
- **Snapshot:** A snapshot preserves the state and data of a virtual machine, including virtual machine settings, power state, and disk state. The Snapshot Manager in the *vSphere Web Client* provides several operations for creating and managing virtual machine snapshots. Refer to VMware documentation for details: <https://www.vmware.com/support/pubs/>



Do not rely on snapshots alone as your backup strategy; you should also create a clone periodically. Consider, for example, creating a daily snapshot and a weekly clone.

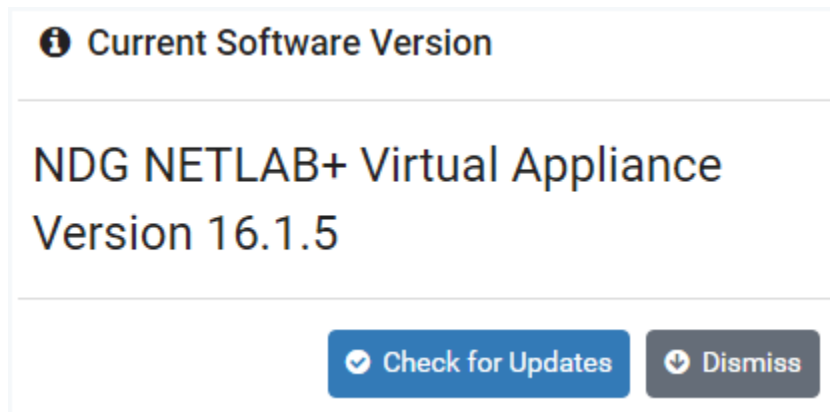
- **Clones:** A clone is a virtual machine that is a copy of the original. The new virtual machine is configured with the same virtual hardware, installed software, and other properties that were configured for the original virtual machine. The cloning task may be performed from the *vSphere Web Client*, refer to VMware documentation for details: <https://www.vmware.com/support/pubs/>

## 10 Check for Software Updates

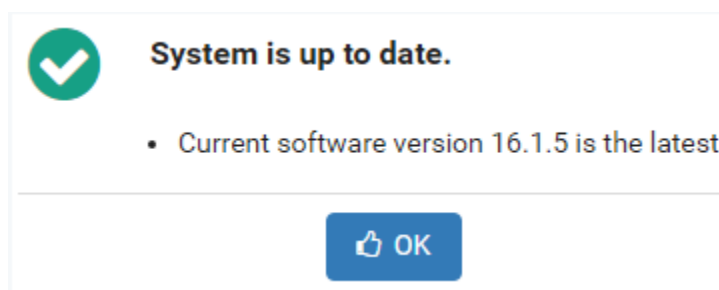


The Software Version of your NETLAB+ system, along with the date that maintenance expires, is displayed in the last panel.

1. Select the **Software Updates** option to check for available software updates.
2. The software version currently running on your NETLAB+ system is displayed. Click Dismiss to return to the Home page, or select the option to **Check for Updates**.



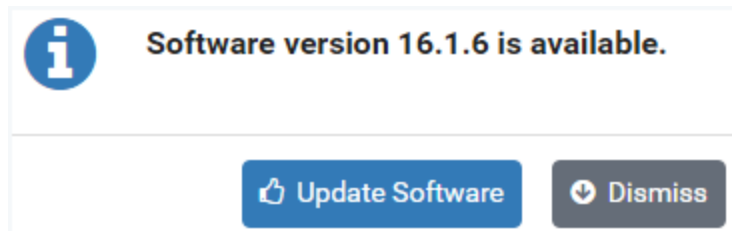
3. If your system has the latest available software, a message will indicate that the **System is Up to Date**. Select **OK**.



Otherwise, a message will indicate a later software version is available. Proceed to the next section for instructions on updating your NETLAB+ software.

## 10.1 Update NETLAB+ Software

If your NETLAB+ system does not have the latest available software, (see the previous section), checking for software updates will result in a message alerting you that a new version is available.



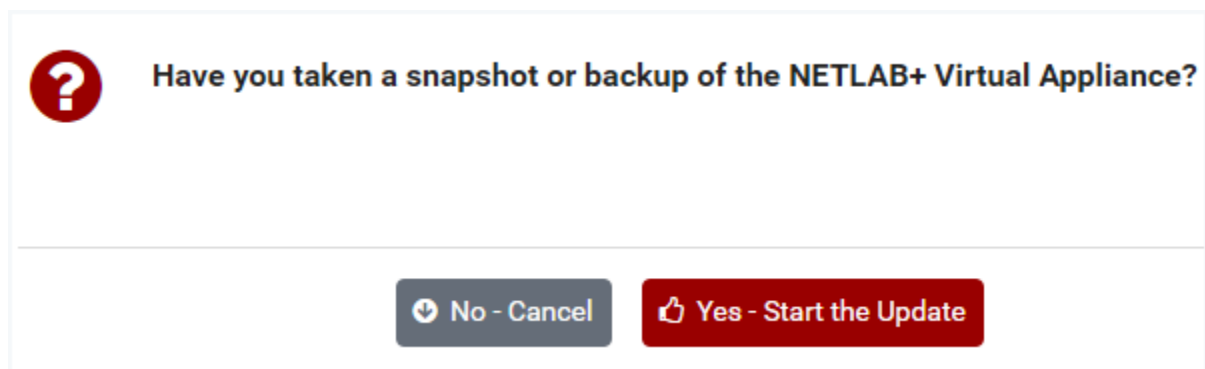
Before updating the software of your NETLAB+ system, it is strongly recommended that you take a snapshot or backup the NETLAB+ virtual appliance. Please see the *Backup the NETLAB+ Virtual Appliance* section.

- Keep in mind that there is no built-in software downgrade or data restore function. A snapshot or backup of the virtual appliance will be required to recover from a failed software update, or if you decide to rollback to a previous software version.
- NDG does not backup software or data in the virtual version of the NETLAB+ product.




To avoid disruption to users, update the system software at a time when there are no active lab reservations.

1. Take a snapshot or backup the NETLAB+ virtual appliance (see the *Backup the NETLAB+ Virtual Appliance* section for instructions).
2. Select **Update Software**
3. You will be prompted to verify that you have taken a snapshot or backup, if you have, select **Yes - Start the Update**.



You may see messages indicating that a Reboot is in progress.

 **Reboot in Progress**

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<b>Current Version</b>	<b>16.1.5</b>
<b>Target Version</b>	<b>16.1.6</b>
<b>Progress</b>	<div></div>
<b>Status</b>	<b>Rebooting - Please Wait</b>

## 11 Documentation Resources



Please refer our website for additional documentation specific to  
NETLAB+ Virtual Edition:  
<https://www.netdevgroup.com/support/documentation/netlabve>