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.

NETLAB+®

Administrator Guide

Document Version: 2023-09-05

This guide documents features available in **NETLAB+ version 22.7.0** and later.

Current NETLAB+ users of version 21.*X.X* and earlier: Please see the *NETLAB+ Data Transfer Utility Guide* for details on the required procedure to upgrade your NETLAB+ system to version 22.*X.X*.

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Introduction

This is the *NETLAB+ Administrator 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 accessing the NETLAB+ system as an administrator through the web-based interface and also focuses on the tasks performed by the NETLAB+ administrator to monitor and maintain a NETLAB+ system.

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1 Initial Login

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

In order to use the Web-based Interface, several basic installation tasks must be completed, details are provided in the *NETLAB+ Installation Guide*.

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	98	* * * * *
Mozilla Firefox	97	* * * *
Apple Safari (MAC only)	15	* * * *
Microsoft Edge	98	* * * *
Microsoft Internet Explorer		No longer supported

2. If 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.

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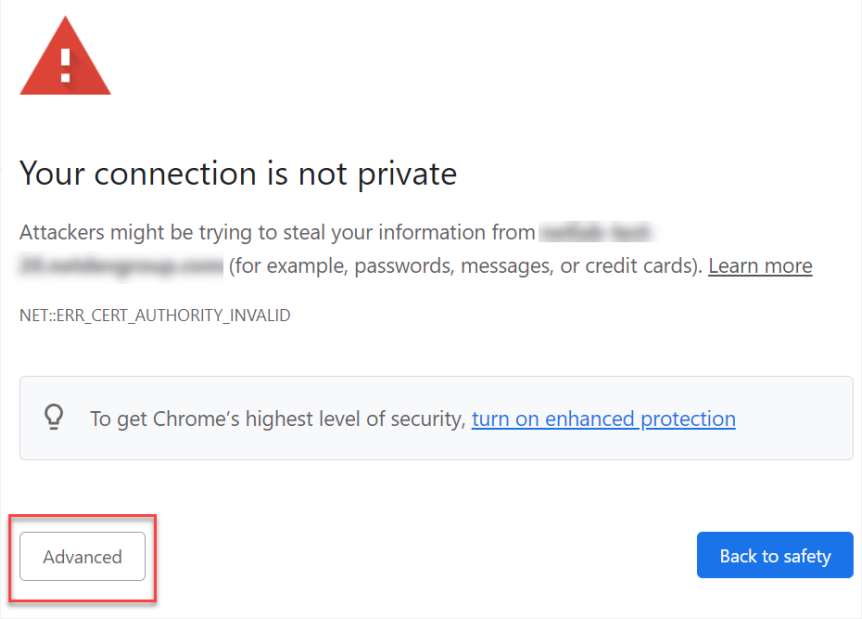
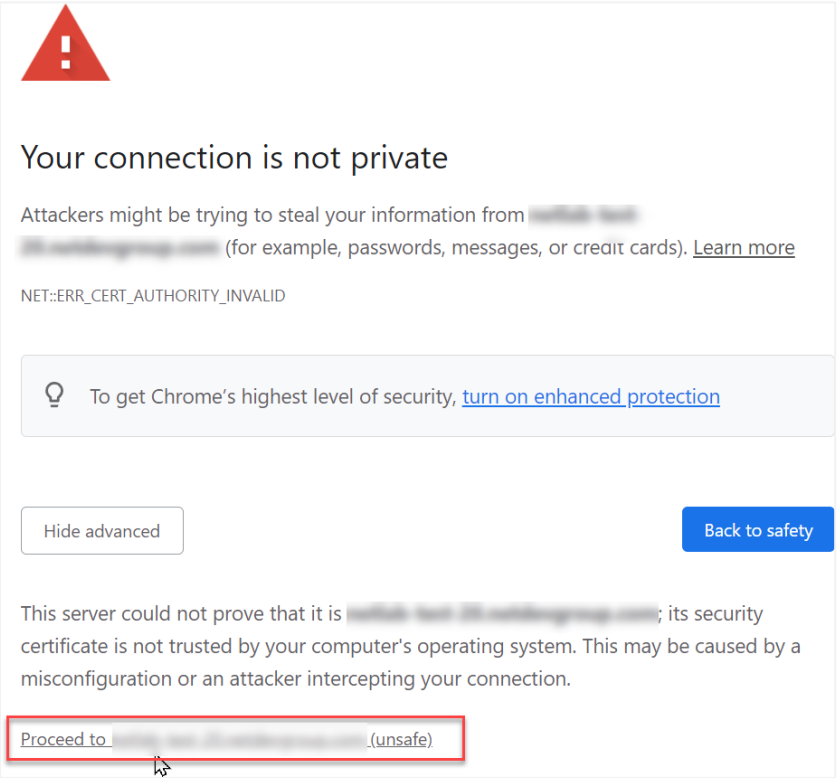
The *SSL Configuration - Manage Certificates* section provides instructions on replacing the self-signed certificate included for configuration purposes. HTML5 viewers will not work with this certificate. It must be replaced with a certificate signed by a trusted certificate authority.



3. Select the option to **Proceed** to the page (the options displayed vary, depending on your browser selection).



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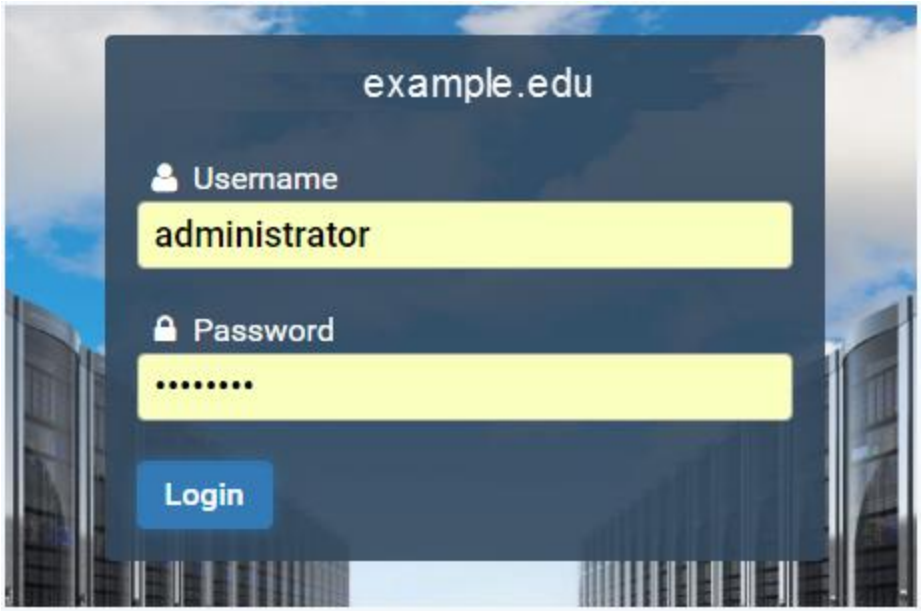
4. Enter the Username and password, as noted in the table below. Click the **Login** button. The graphics on the page may be different from the example shown below.

Username	Password
administrator	If you changed the password as directed while configuring the NETLAB+ console (see the previous section), use your new password. If you have not yet changed the administrator password, enter the factory default, **netlab** (lowercase).

If you changed the factory default password while completing initial configuration, as per the *NETLAB+ Installation Guide*, use your new password.



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1.1 Change Password During Initial Login

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

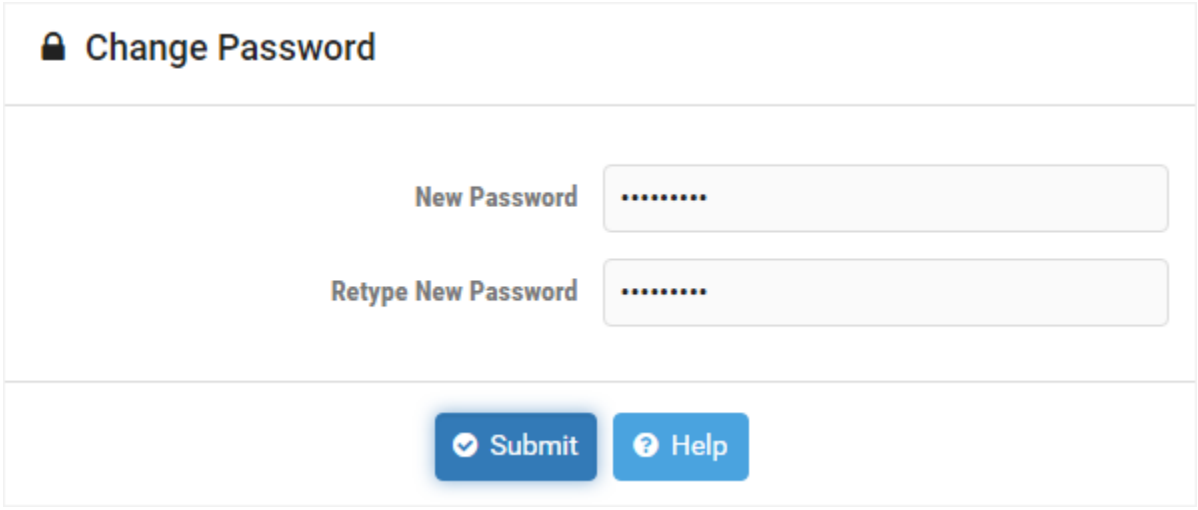
If you did not yet change the factory default password, the Change Password screen will be displayed during the initial login into the administrator account, requiring you to change the password. NETLAB+ enforces strong passwords.

Please record your new password in a safe place.

Passwords must meet the following requirements:

The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

- Must contain 8 or more characters.
- Must not contain more than 64 characters.
- Must not contain any common English dictionary words that are more than 3 characters long.
- Must not contain the user ID for this account.
- Must not contain the email address for this account.
- Must not contain any names associated with this account.



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.

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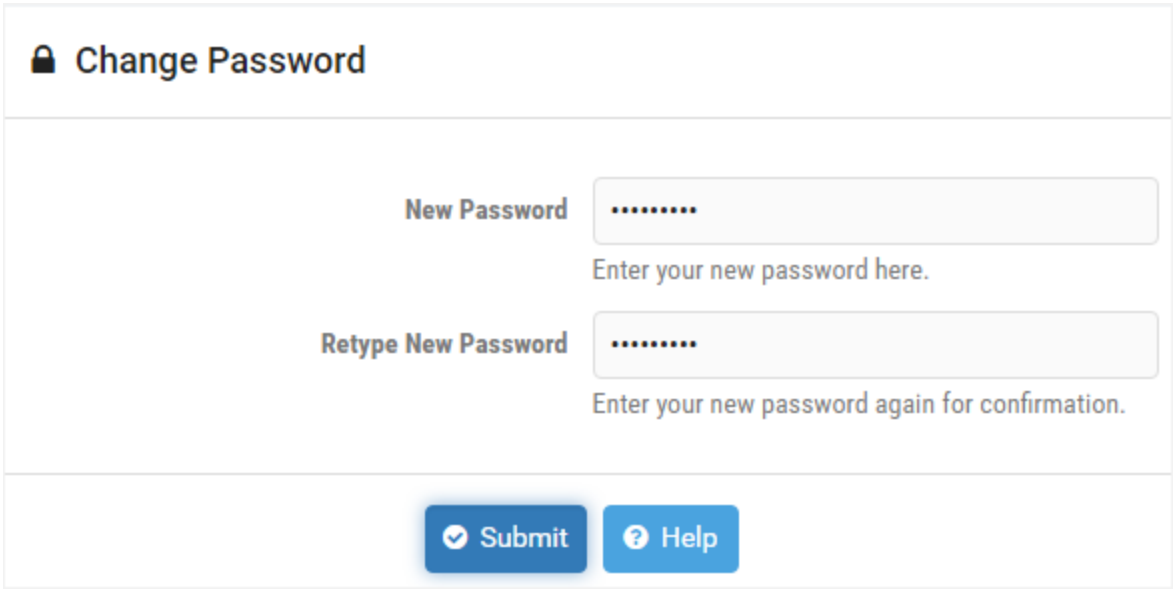
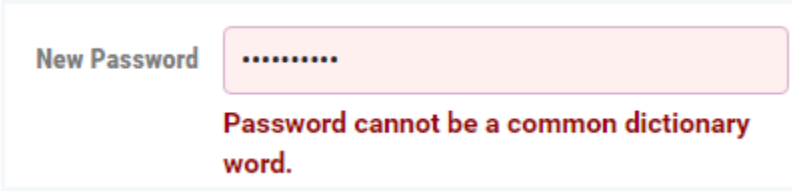


1. Enter your selection into the **New Password** field**.**
2. Enter the password once again in the **Retype New Password** field and then click **Submit**.

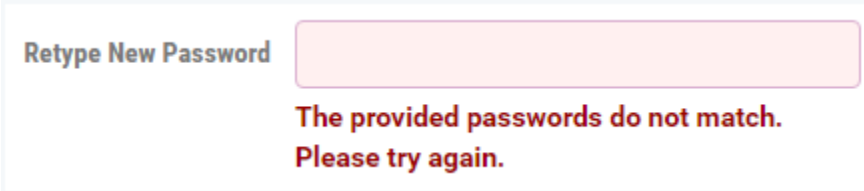
An error message will be displayed if the password entered does not meet the requirements. The message will indicate why the password was unacceptable.

Examples of typical password errors:

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



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



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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.

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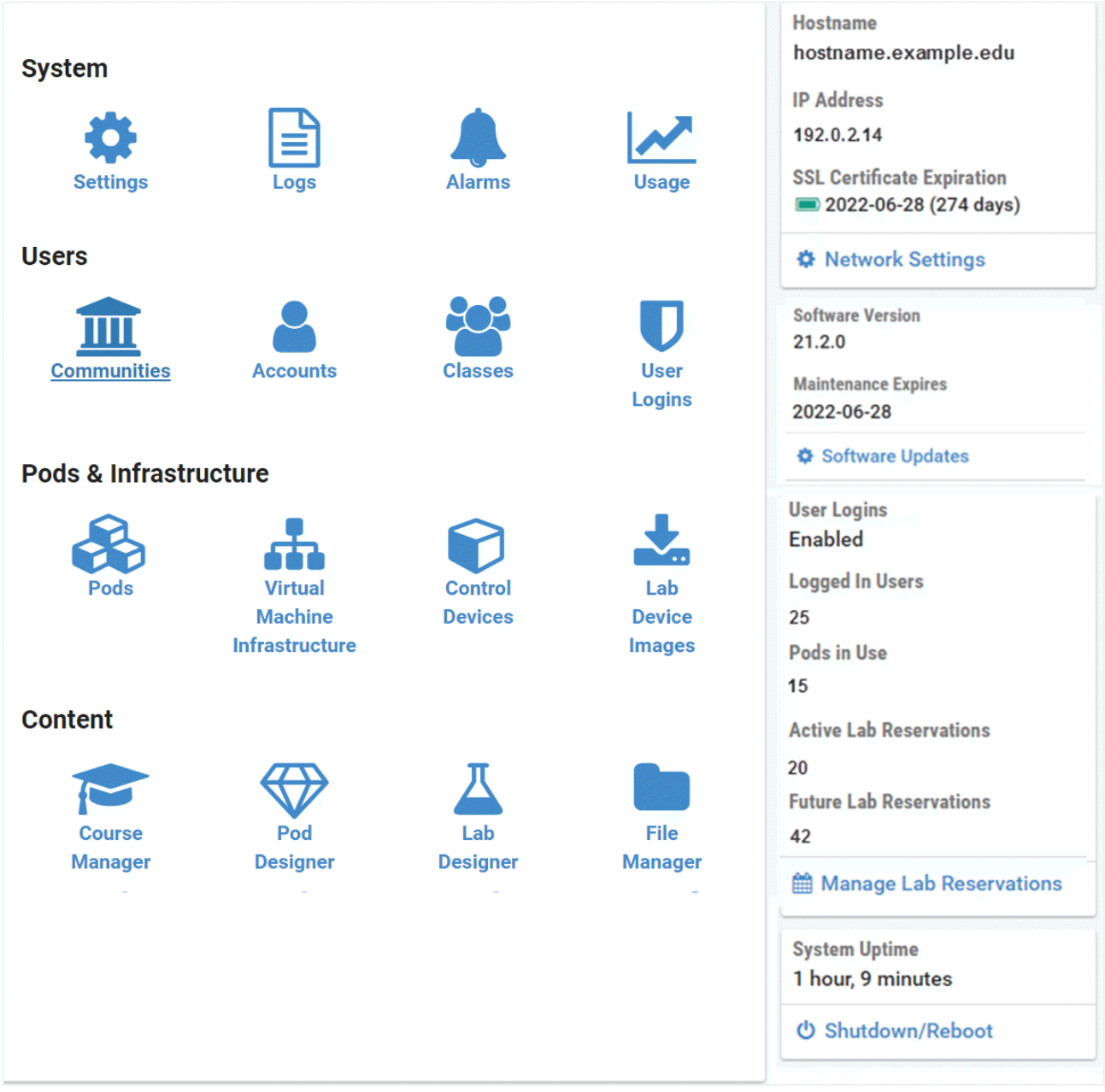
2 Using the Administrator Interface

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.



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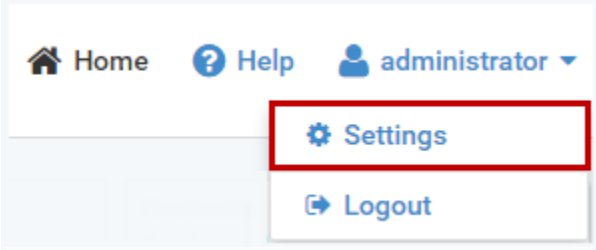
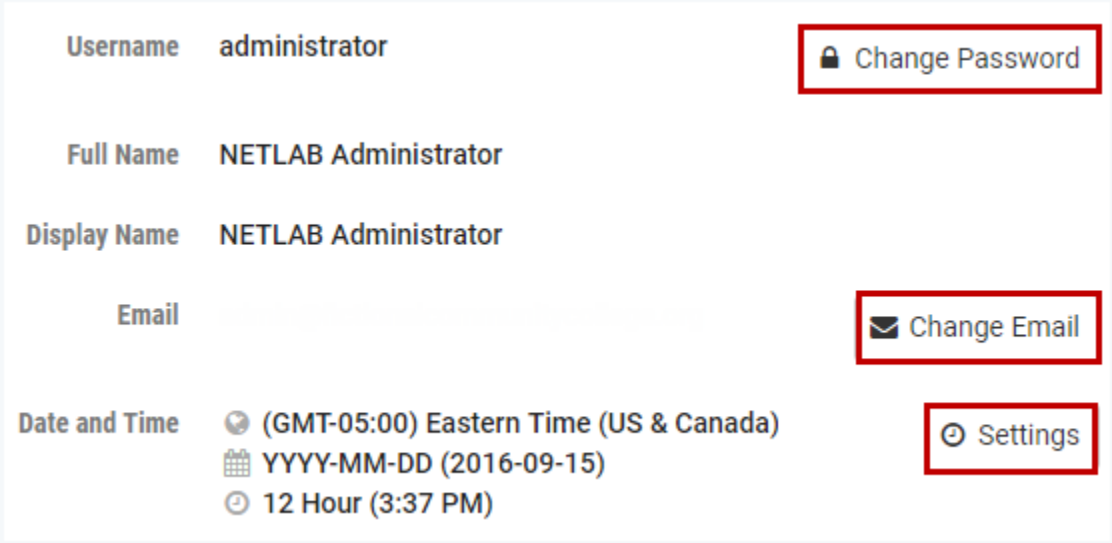
2.1 Modify Settings

The settings you made during your initial login may be modified at any time, as needed.

- To access the Settings page, click administrator in the top-right corner and select **Settings**.



The Settings page will display your current settings.



The **Change Password**, **Change Email,** and **Settings** buttons may be selected to update the information displayed.

2.1.1 Change Password

Using the *Password Policy* settings, the NETLAB+ administrator can choose to set the number of days an account password can exist before it must be changed for the administrator, instructors, and students. Once the number of days has been reached, users will be prompted to set a new password.

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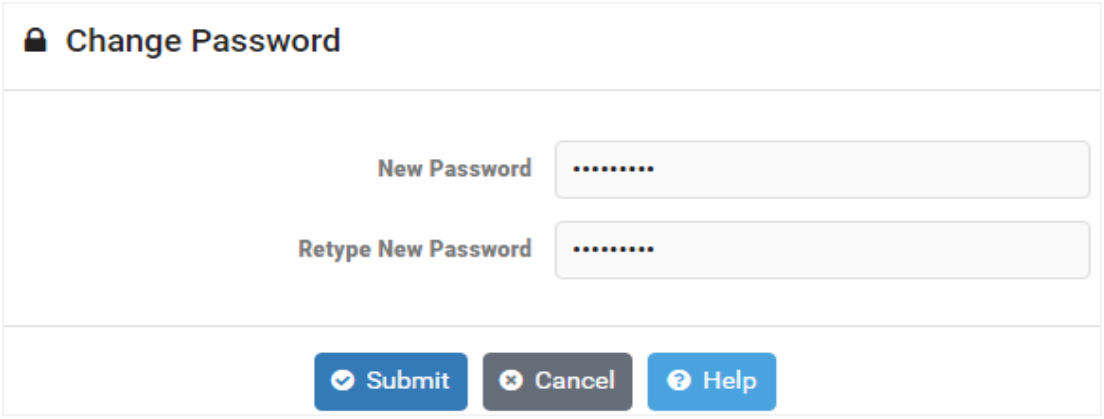
1. Click the Change Password button on the Settings page to display the **Change Password** page.



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

Passwords must meet the following requirements:

The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

- Must contain 8 or more characters.
- Must not contain more than 64 characters.
- Must not contain any common English dictionary words that are more than 3 characters long.
- Must not contain the user ID for this account.
- Must not contain the email address for this account.
- Must not contain any names associated with this account.

2. Enter your selection into the **New Password** field**.**
3. Enter the password once again in the **Retype New Password** field.
4. To proceed with updating your password, select the **Submit** button. You will return to the Home page.

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

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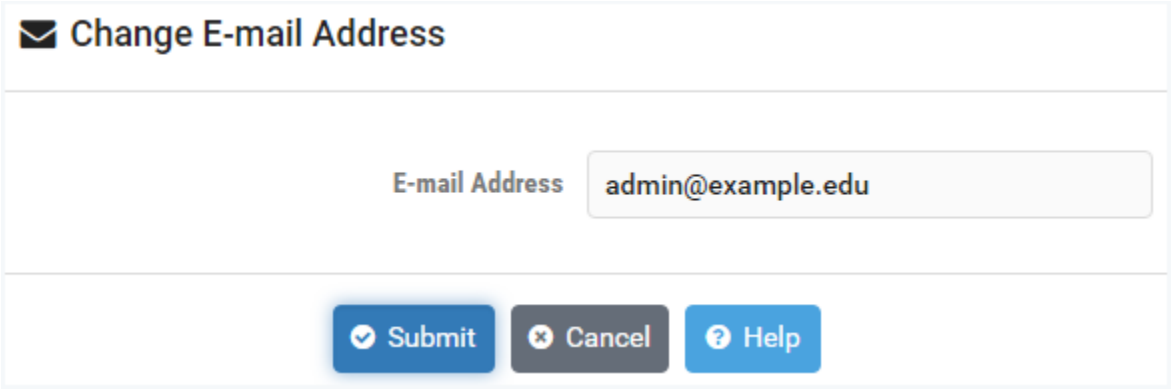
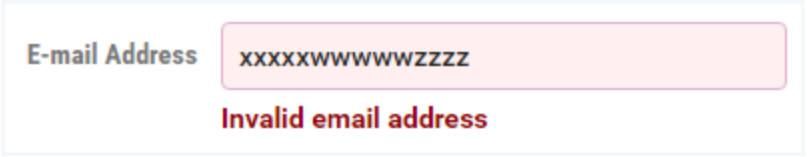
2.1.2 Change E-mail

1. Click the Change E-mail button on the Settings page to display the **Change E-mail Address** page. Entering an e-mail address is optional.



2. Update the **E-mail Address** field as desired. Click **Submit** to save changes and return to the Home page.



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

2.1.3 Change Date and Time Settings

1. Click the Settings button on the Settings page to display the **Date and Time Settings** page. These settings are especially important to ensure that information is accurately displayed when using the scheduler.

When traveling, you can change your time zone to match the local time.

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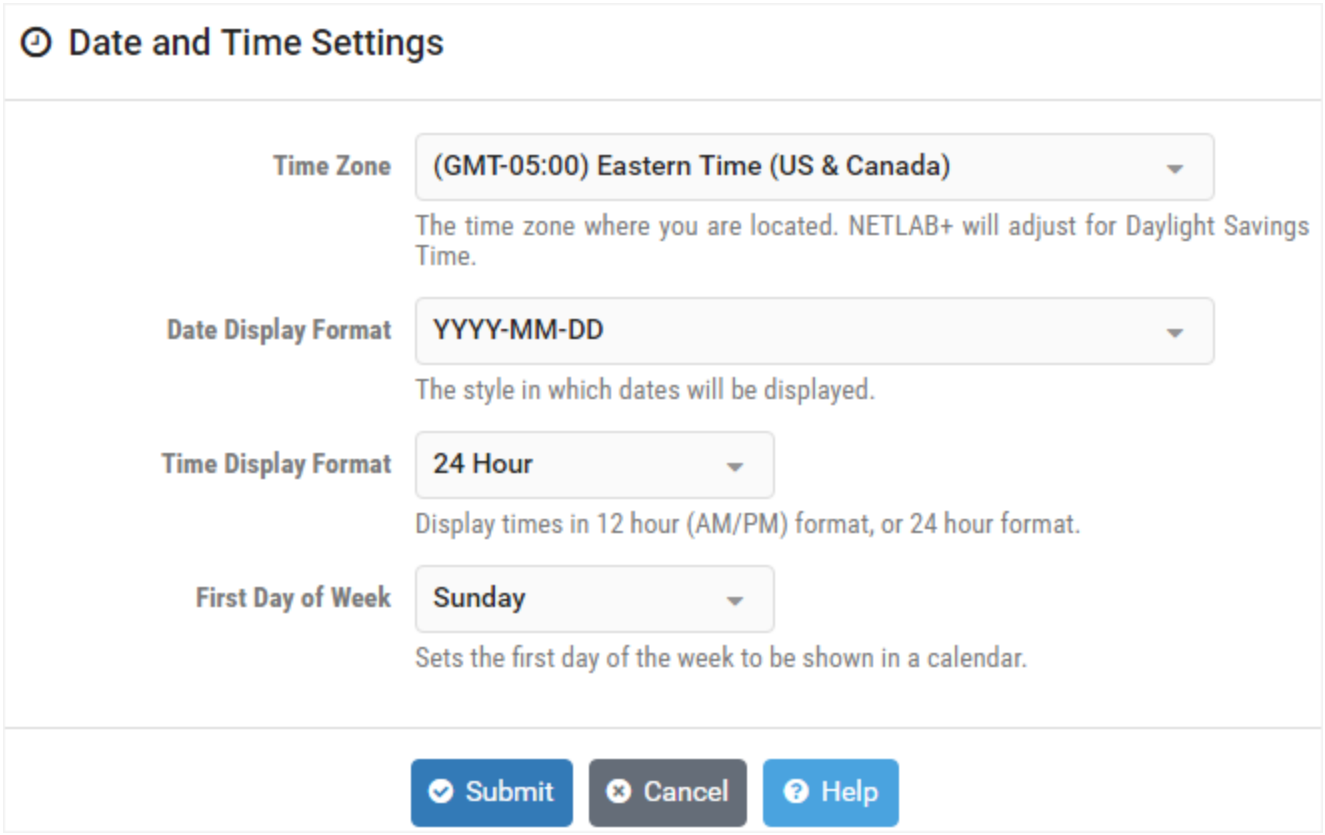
Recall that you can display help information for guidance on updating the values on a page by clicking the **Help** button. The Date and Time Settings page is shown below, with help displayed.



2. Select the **Time Zone** where you are located. NETLAB+ will adjust for Daylight Savings Time.
3. Choose the **Date Display Format** you prefer. This is the style in that dates will be displayed (for example, *YYYY-MM-DD*).
4. Select the **Time Display Format**. Time may be displayed in 12-hour (AM/PM) format or 24-hour format.
5. Set the **First Day of the Week** to be shown in the scheduling calendar.
6. When you are finished making modifications, click **Submit**. The MyNETLAB page will be displayed. (Or, to return to the MyNETLAB page without saving changes, click **Cancel**.)

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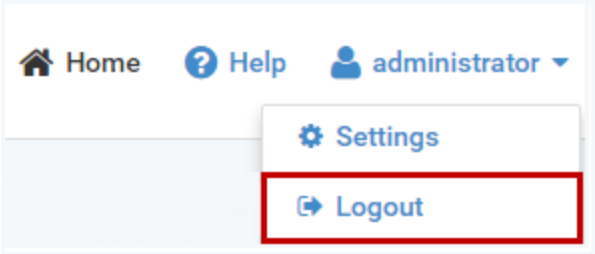
2.2 Logout

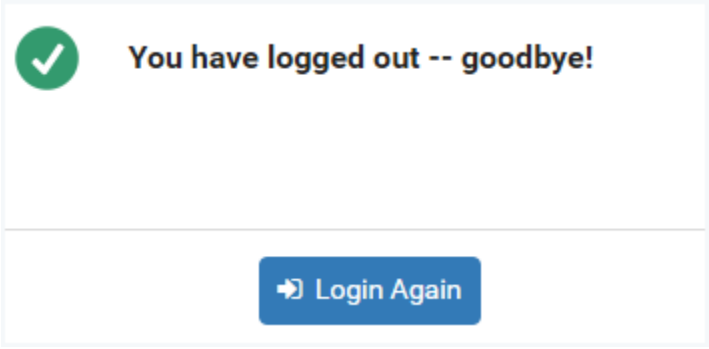
The **Logout** link is used for logging out of the NETLAB+ system.

1. Click **administrator** in the top-right corner of the Home page and select **Logout**.



Logging out of the system is particularly important when using a shared computer, to prevent others from gaining access to your Administrator account.

2. A confirmation message will display; select the button if you want to **Login Again** and return to the login screen.



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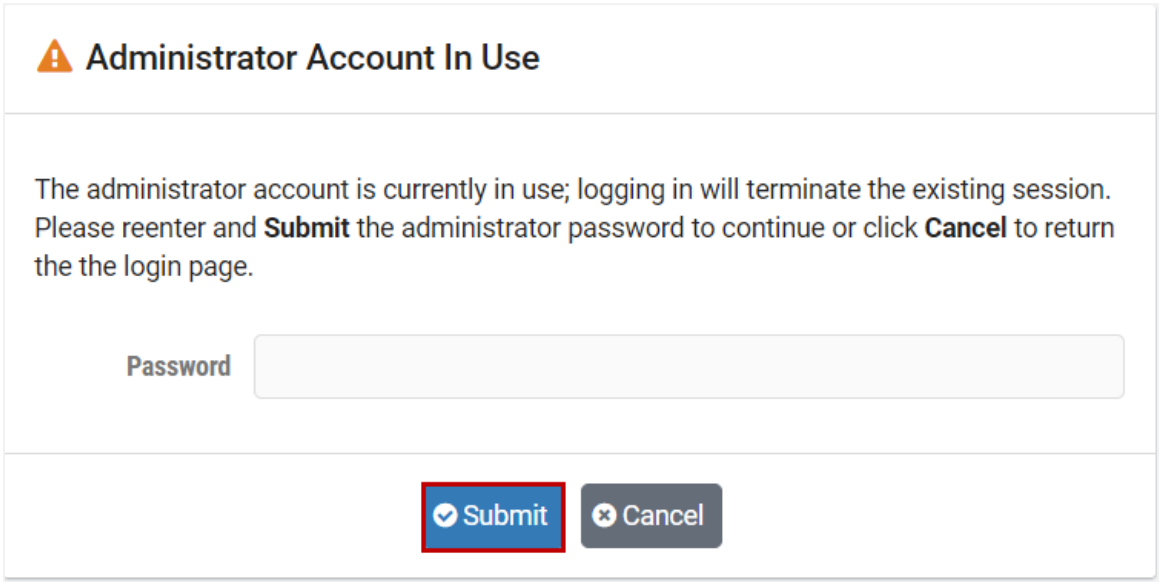
2.3 Administrator Account In Use Warning

The NETLAB+ administrator account does not allow multiple login sessions to run concurrently. If the administrator account is currently in use, a subsequent login will terminate the existing session.

A warning will display if the administrator account is currently in use, allowing the user to choose to continue logging in (which will terminate the existing session) or cancel and return to the login page. This can help prevent interruptions when working with others or when interacting with NDG Support.



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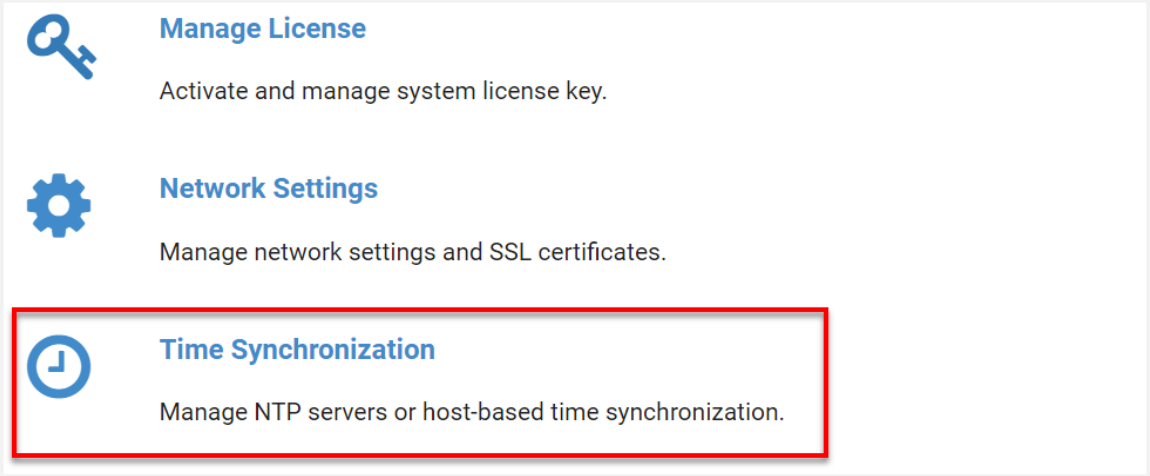
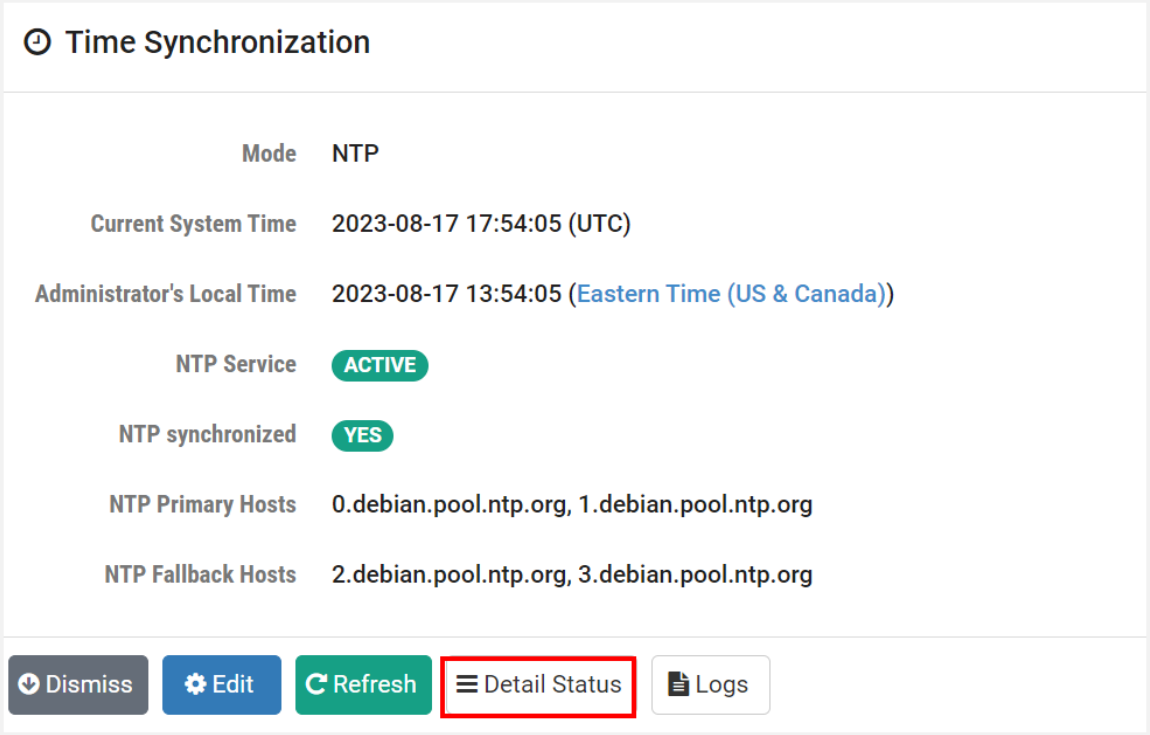
3 Time Synchronization

NETLAB+ includes an option to manage NTP servers or host-based time synchronization. With the default method, NTP, NETLAB+'s time client relies on access to the NTP hosts designated for time service. Time synchronization settings can be configured as needed.

1. To see the current settings for Time Synchronization, select **Admin > System Settings > Time Synchronization.**



2. The Time Synchronization page will be displayed, showing the current settings. Additional settings can be displayed by selecting the **Detail Status** button.



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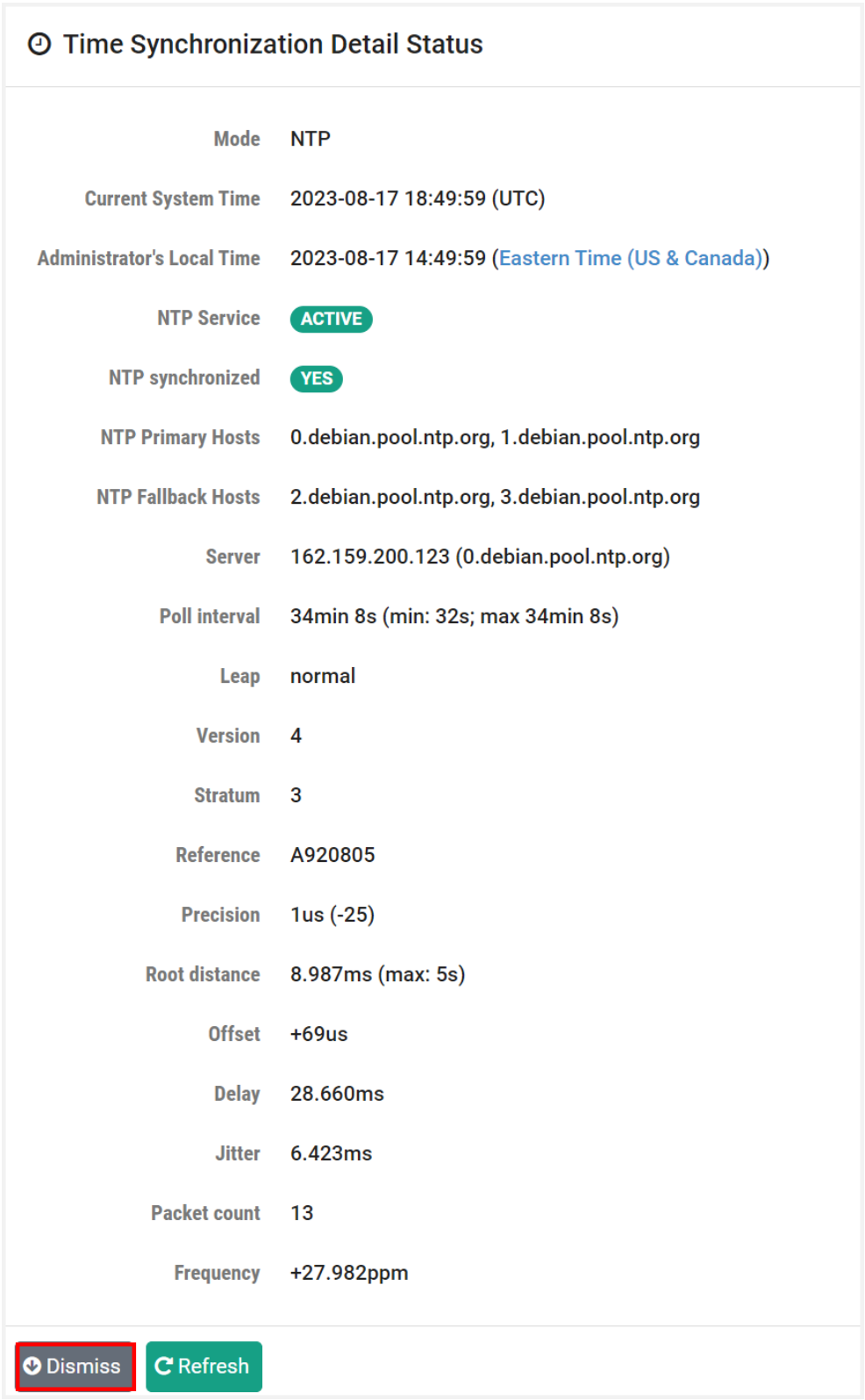
3. The Time Synchronization Detail Status page will be displayed, showing additional details that may be helpful for troubleshooting. Review the details shown and then click **Dismiss**.



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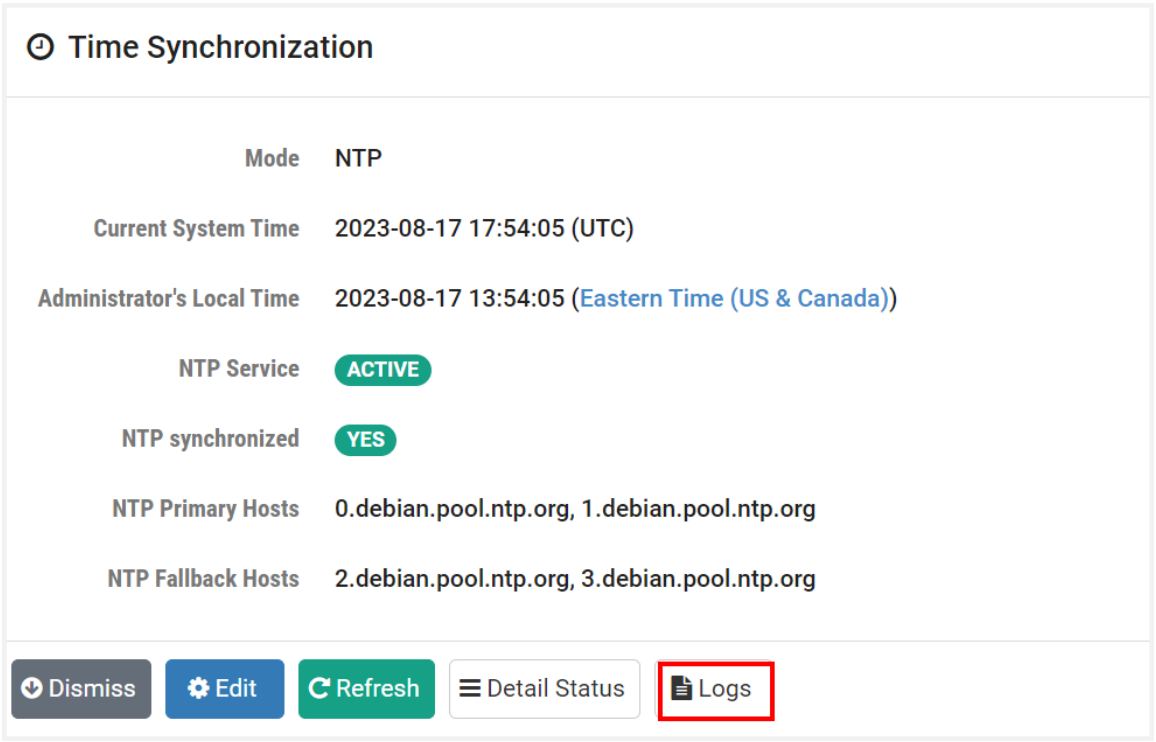
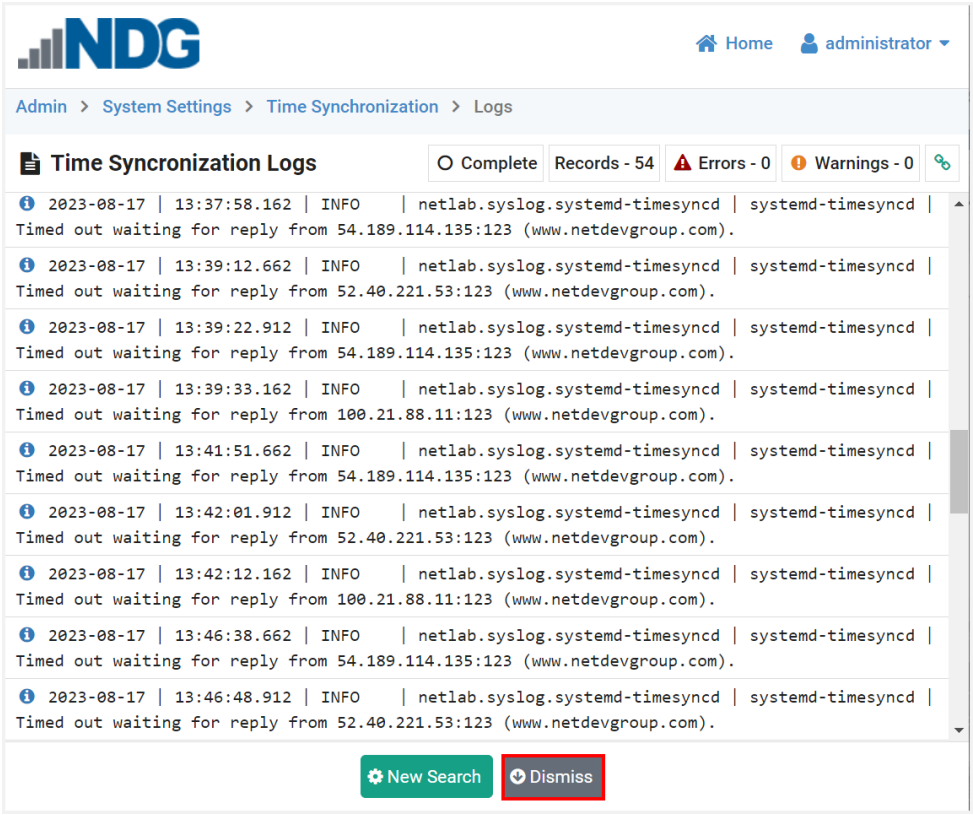
4. Next, back on the Time Synchronization page, you may review system log entries filtered to display entries related to Time Synchronization. Select the **Logs** button.



5. The Time Synchronization Logs page will be displayed. Click **Dismiss**.



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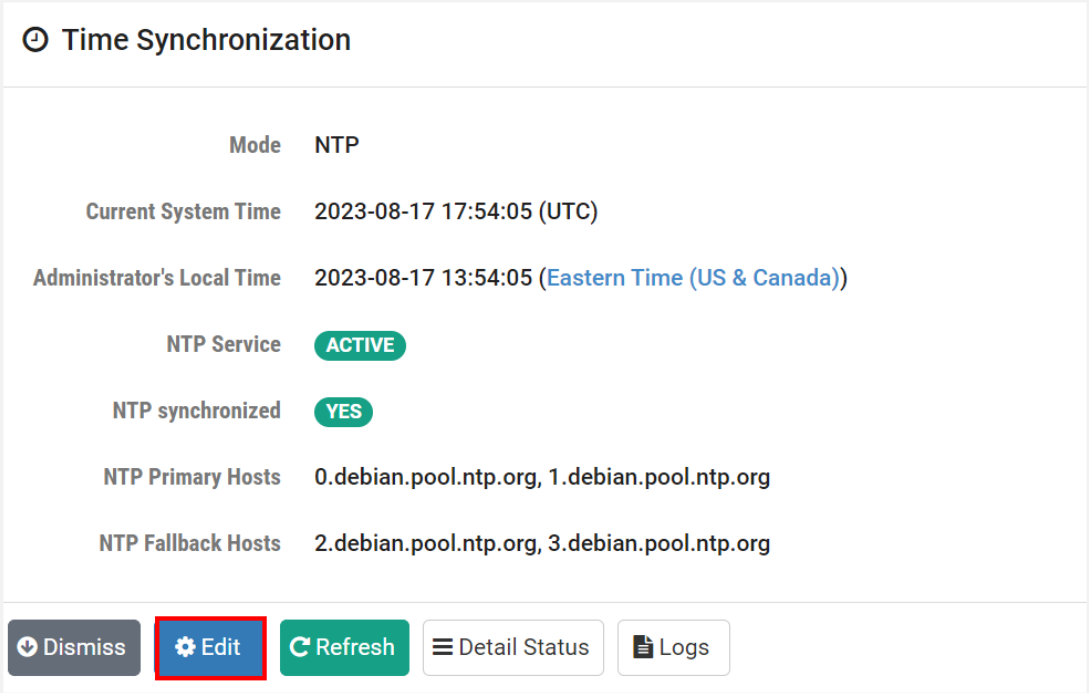
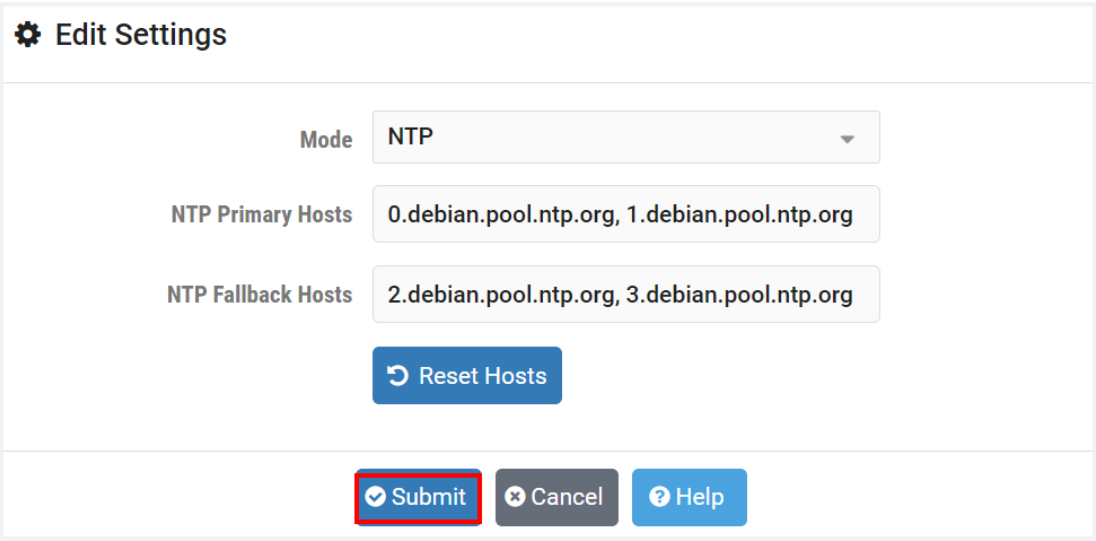
6. Next, on the Time Synchronization page, notice that the Mode being used is the default, NTP, and that the NTP Primary Hosts and NTP Fallback Hosts are listed. To edit the settings, select the **Edit** button.

> **NTP mode is recommended**, rather than HOST. Reliance on time from VMware Tools is not reliable because the hosts are not being configured with NTP, or the host site does not provide/allow NTP.



7. The Edit Settings page will be displayed, showing the current settings for the mode. Refer to the field descriptions below and make changes as needed. Click **Submit**.



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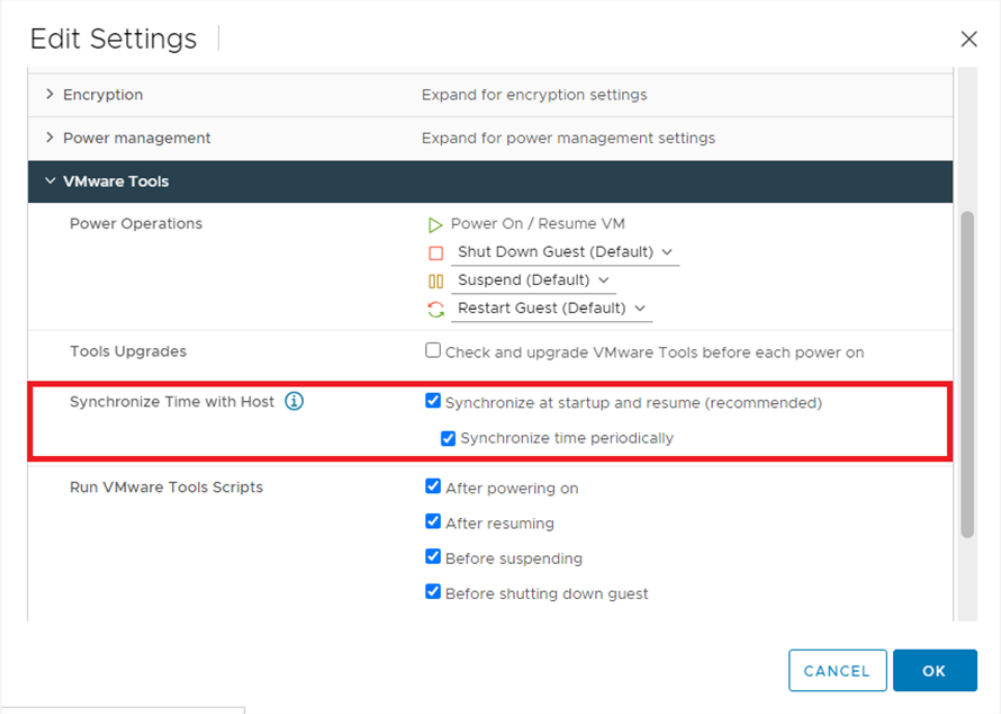
Field Descriptions – Time Synchronization

- **Mode**: Time synchronization mode, select from the following:

  - **NTP:** An NTP configuration with user-specified NTP hosts.
  - **HOST:** Disable NTP and allow the VM host to manage time synchronization (not recommended). If you do choose this option, you must access the time synchronization settings through the VMware interface to configure your VMware settings to **Synchronize Time Periodically** with the host.



- **NTP Primary Hosts:** A comma-separated list of primary NTP service hosts. Values may include IP addresses or fully qualified domain names. The default value may be revised if firewall and/or security policies at your organization do not allow access to the host(s) listed. The default value is: *0.debian.pool.ntp.org, 1.debian.pool.ntp.org*. To return to the default settings, use the Reset Hosts option to set all of the NTP host fields to their original default values. Note that the changes must be submitted for them to take effect.

- **NTP Fallback Hosts:** A comma-separated list of fallback NTP service hosts. Values may include IP addresses or fully qualified domain names. The default value may be revised if firewall and/or security policies at your organization do not allow access to the host(s) listed. The default value is: *2.debian.pool.ntp.org, 3.debian.pool.ntp.org.* To return to the default settings, use the Reset Hosts option to set all of the NTP host fields to their original default values. Note that the changes must be submitted for them to take effect.

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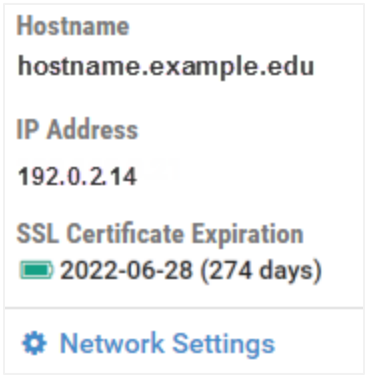
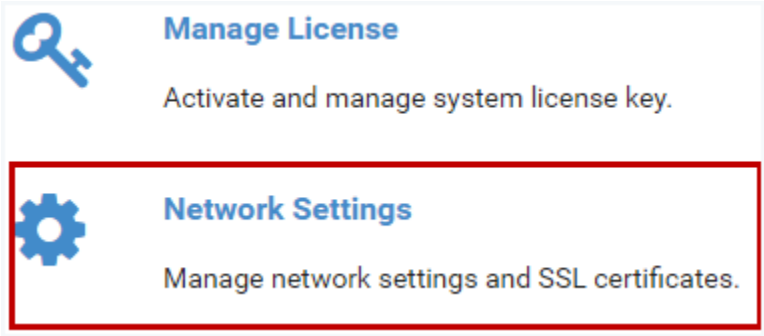
4 Network Settings



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**.



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.

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

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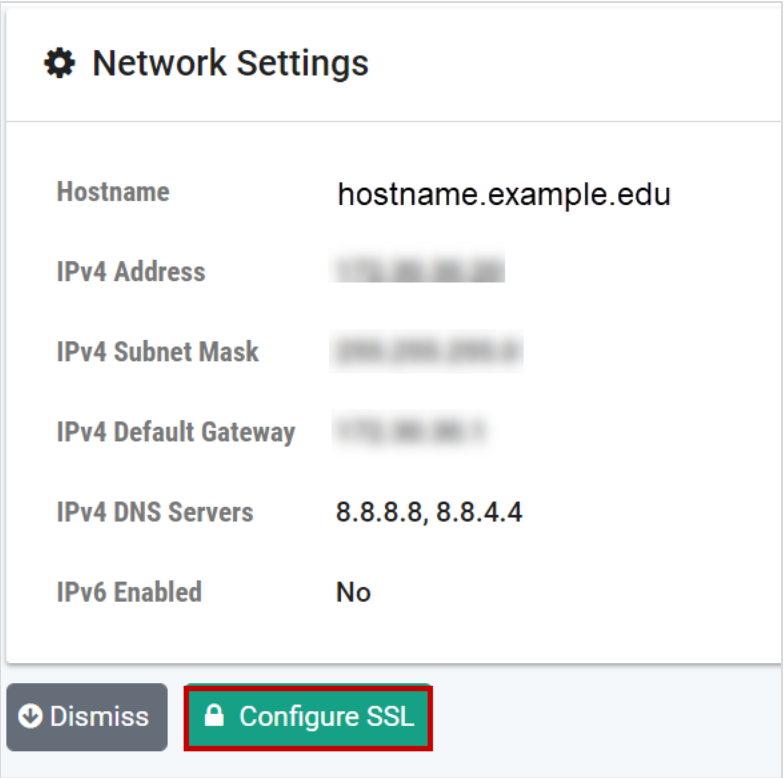
4.1 SSL Configuration - Manage Certificates

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



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.

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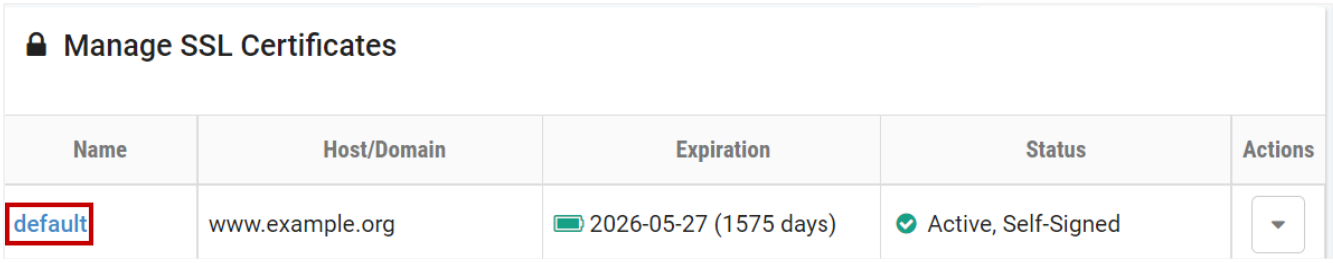
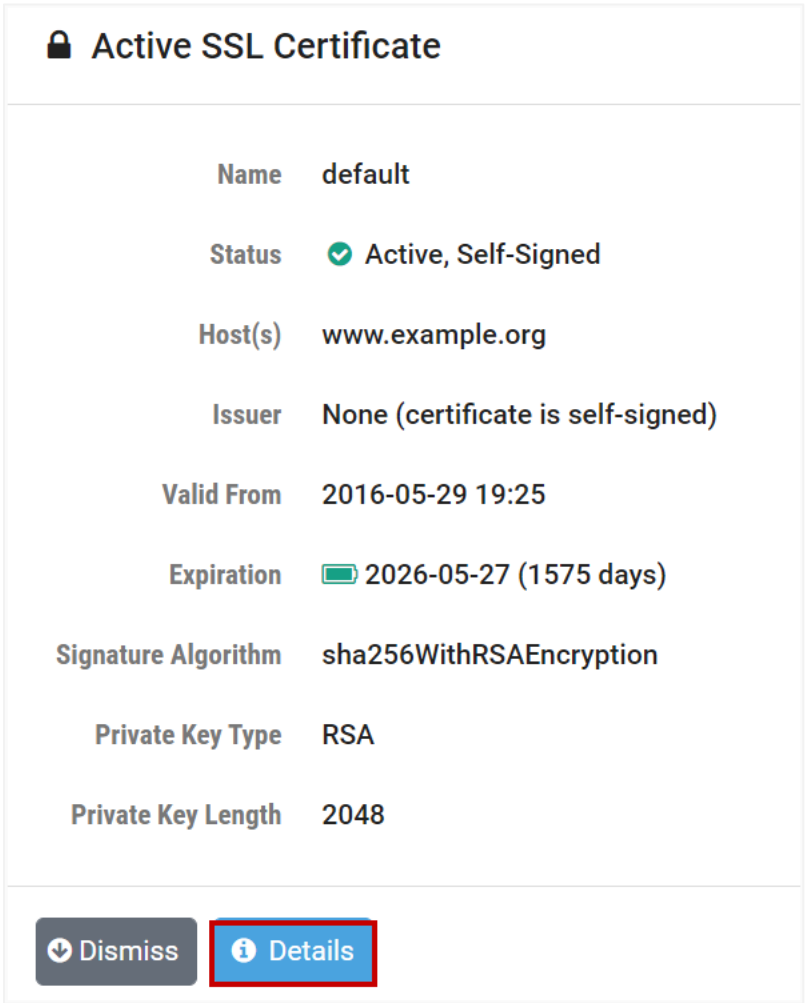
4.1.1 View Certificate Information

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



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



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

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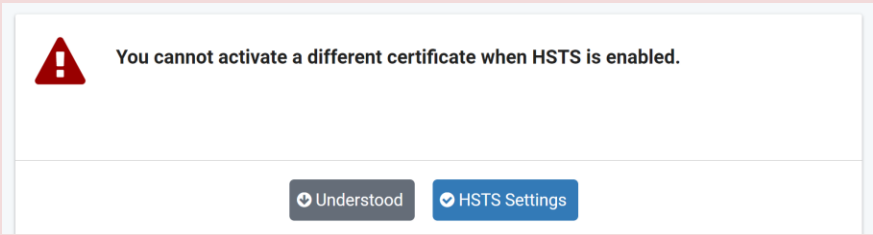
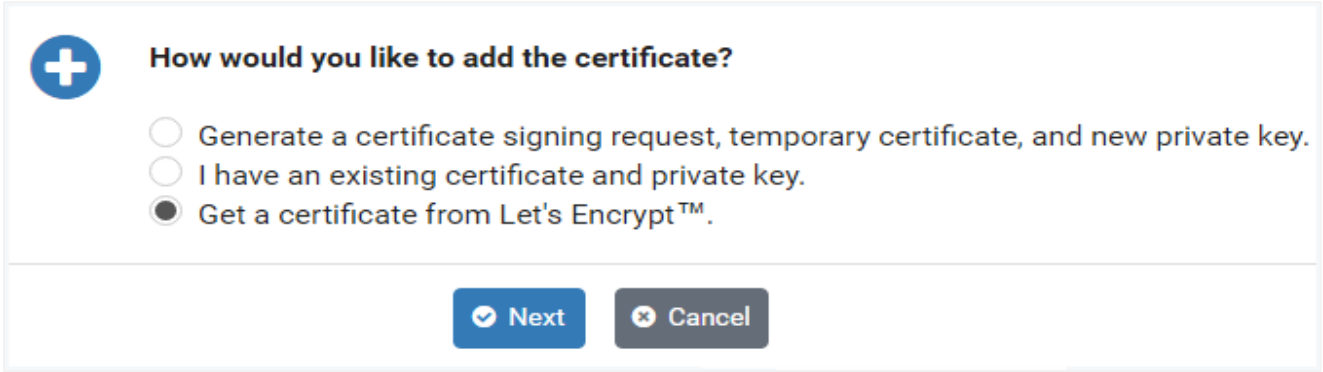
Click **Dismiss** to return to the previous page.

4.1.2 Adding New Certificates

Please be aware that SSL Configuration will not allow a certificate change when HSTS is enabled. See the *Web Server Security* section for information on enabling/disabling HSTS.



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.



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- **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 4.1.2.1 for details.

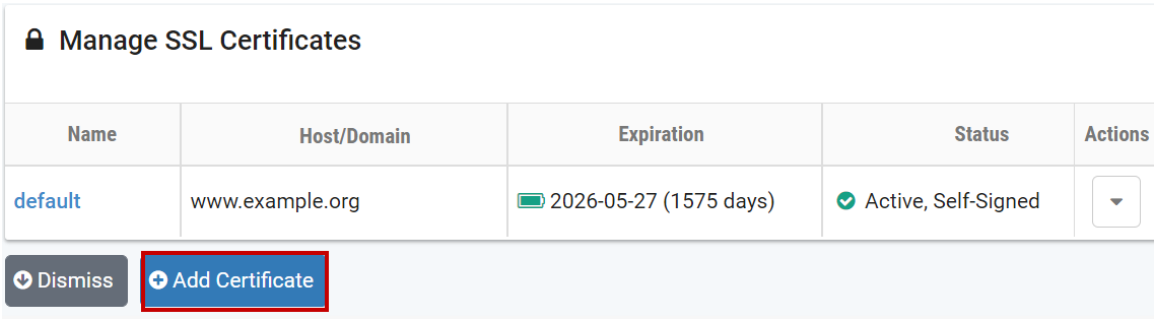
- **If you already have a signed certificate and private key for your organization**: (This can be a domain-level certificate). You will proceed by adding the certificate and private key to your NETLAB+ system, as described in 4.1.2.2.

- **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 4.1.2.3.

4.1.2.1 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.



2. Click **Add Certificate**.

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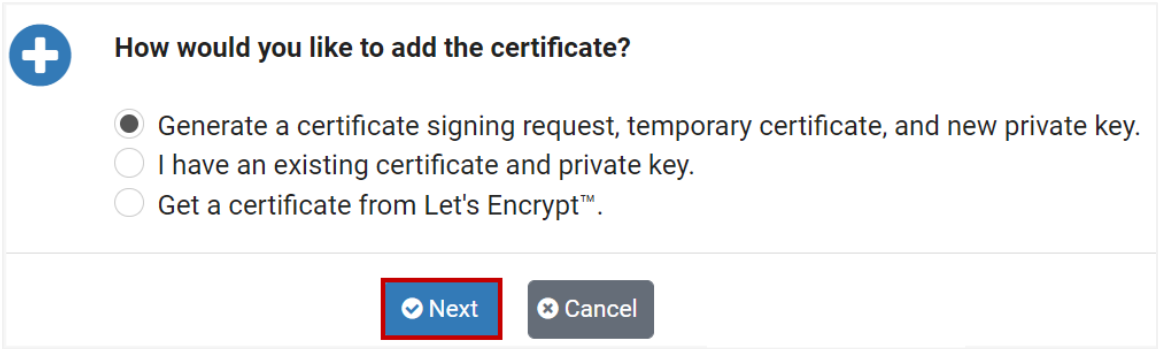
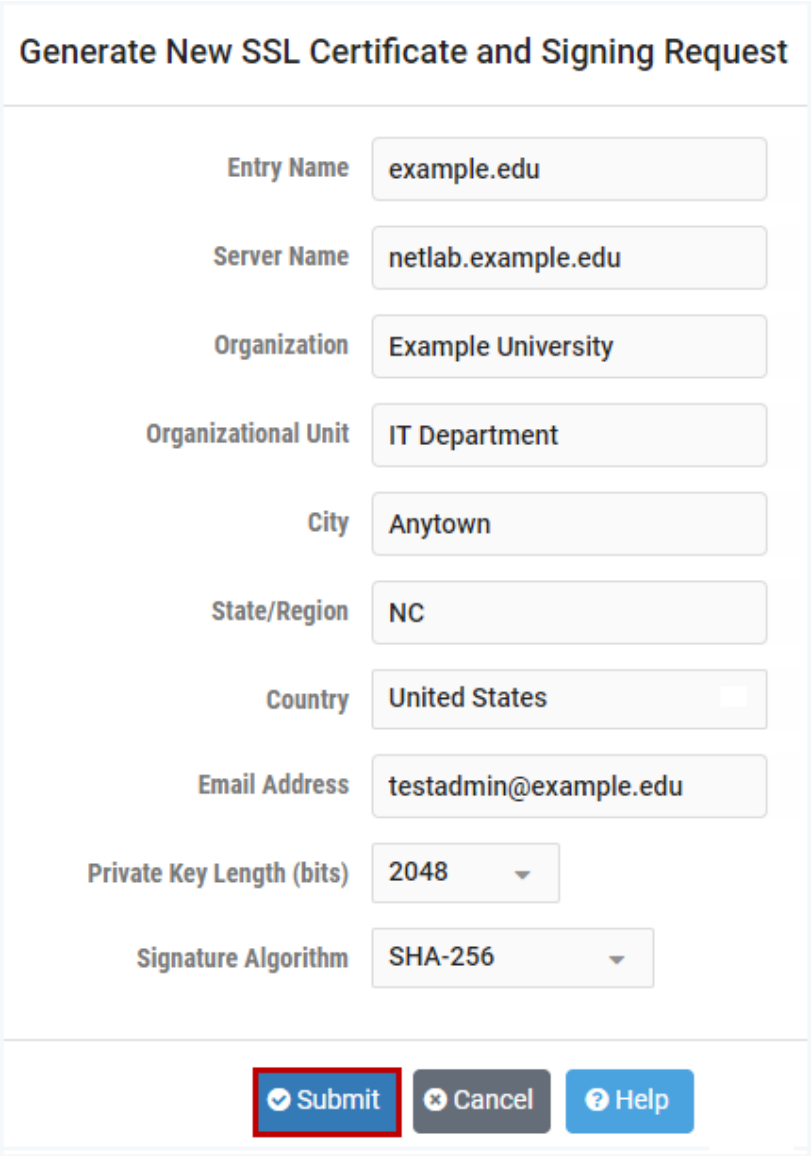
3. Select the option to generate a certificate signing request, temporary certificate, and new private key, and press **Next**.



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.** NETLAB+ will generate a new private key, certificate signing request, and self-signed certificate.



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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 name must match exactly 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 is now required by most certificate authorities. 4096-bit certificates are currently not supported for performance reasons.

- **Signature Algorithm:** The algorithm used to sign the request. SHA-256 is now used by most certificate authorities. SHA-1 is an older algorithm and is no longer recommended.

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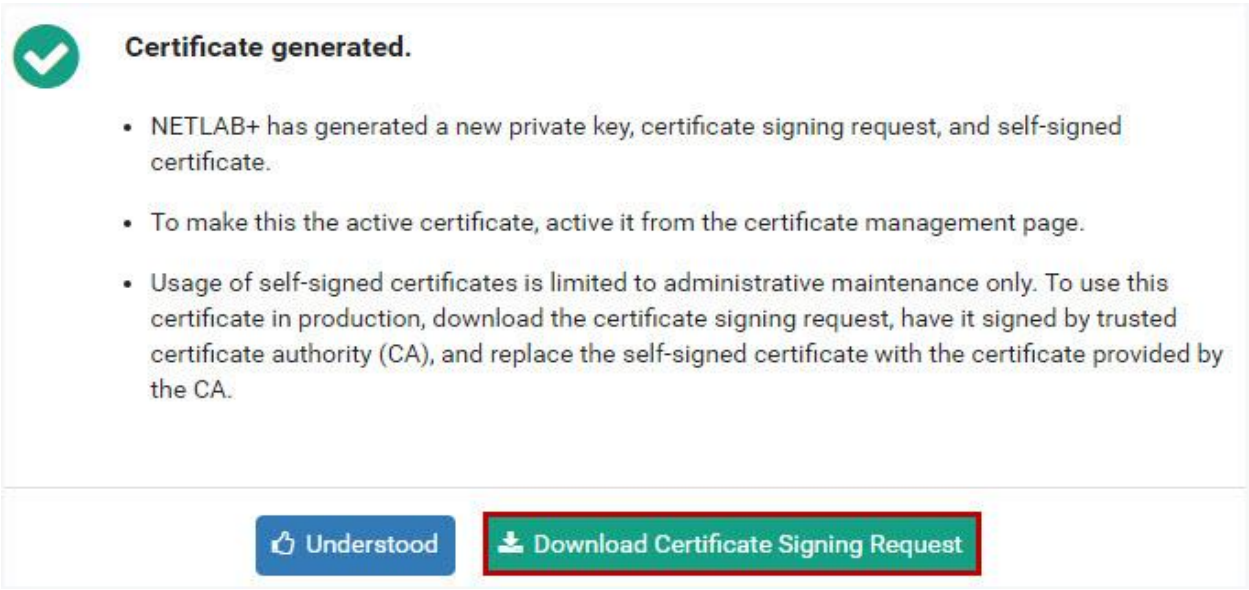
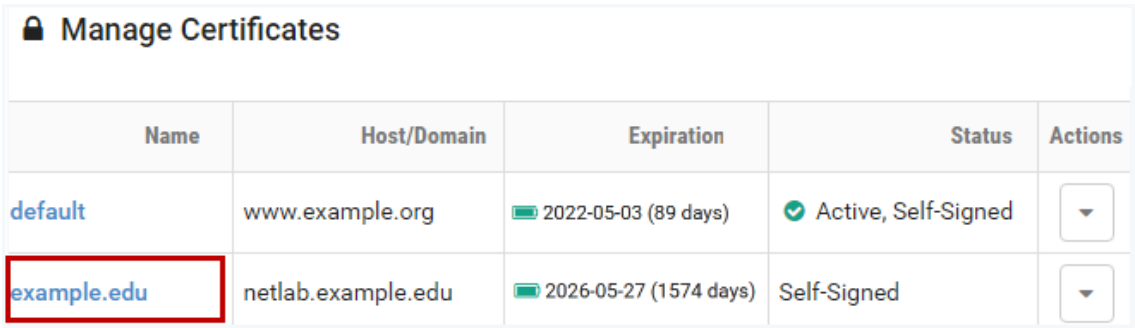
6. Select the button to **Download Certificate Signing Request.**



7. 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.

1. Navigate to **Network Settings > Configure SSL**.
2. 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 dropdown).
3. Select the self-signed certificate you created.



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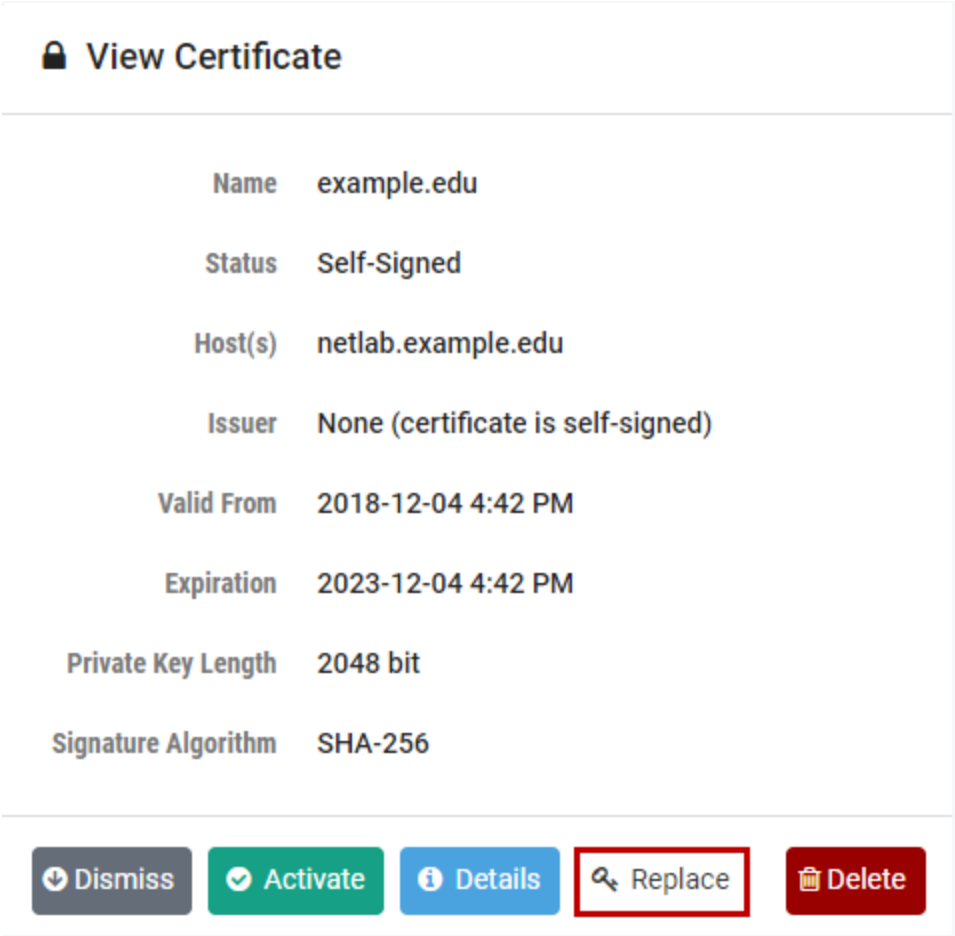
4. Click the **Replace** button to replace the certificate.



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.

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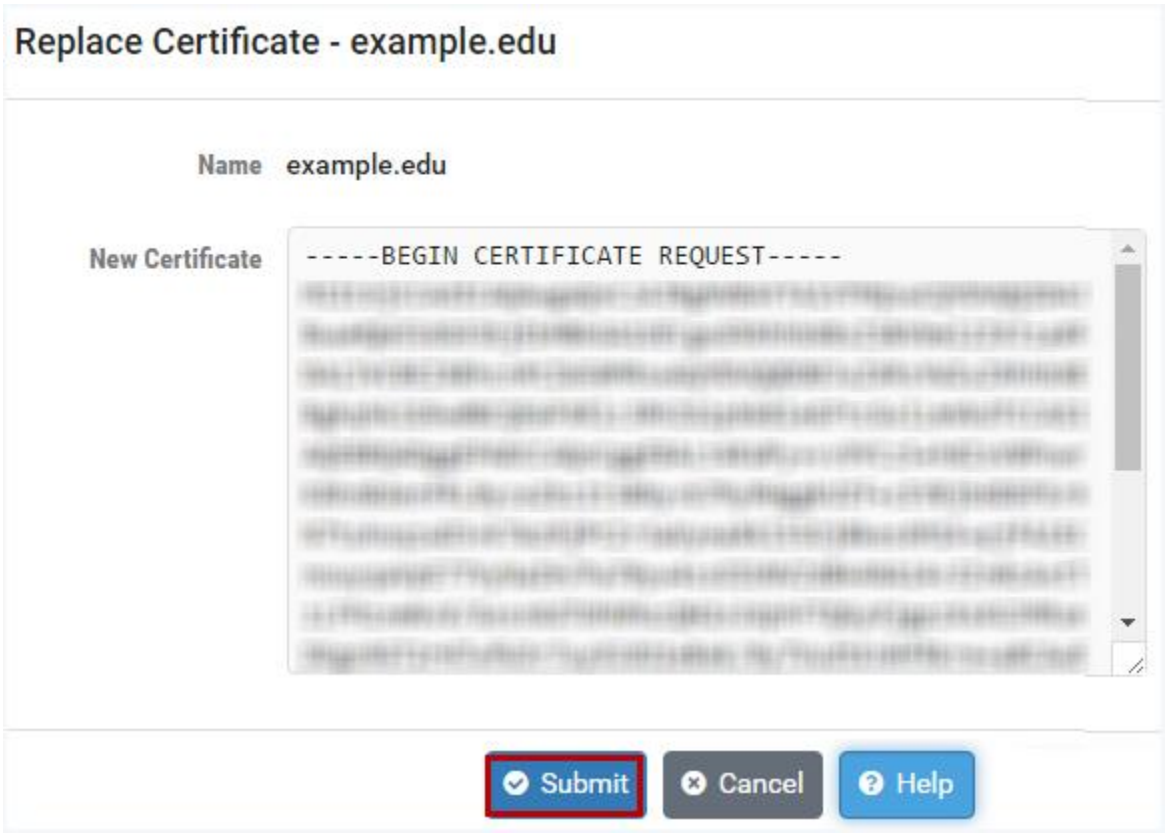

6. Return to the certificate page.
7. Verify that your certificate now indicates it is signed (as shown below).

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.

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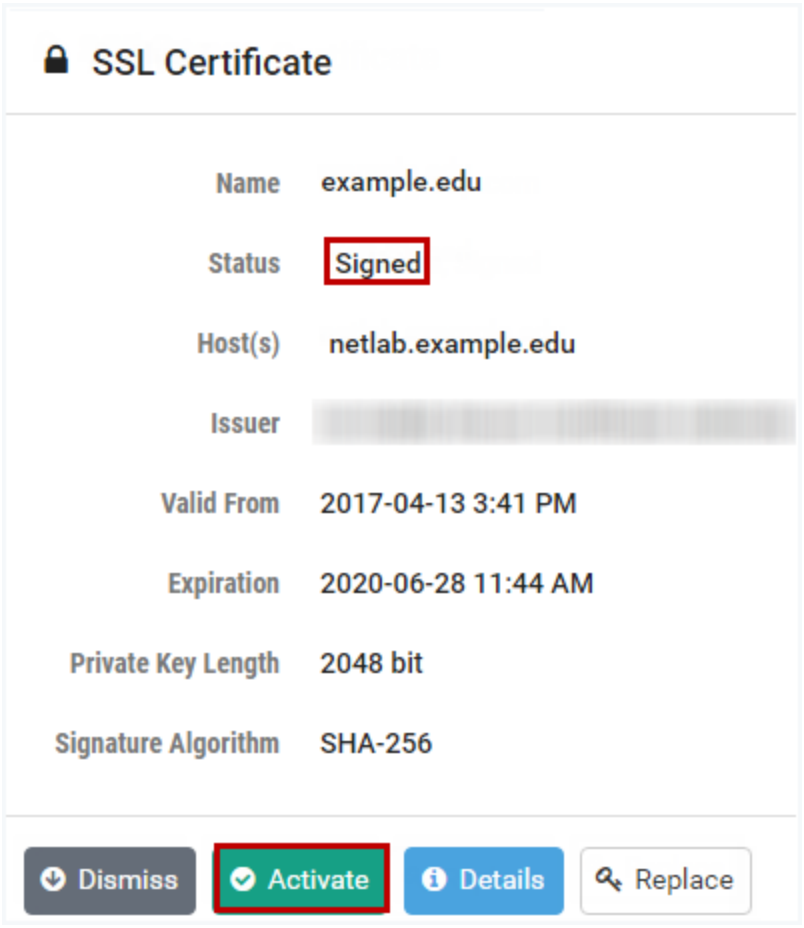
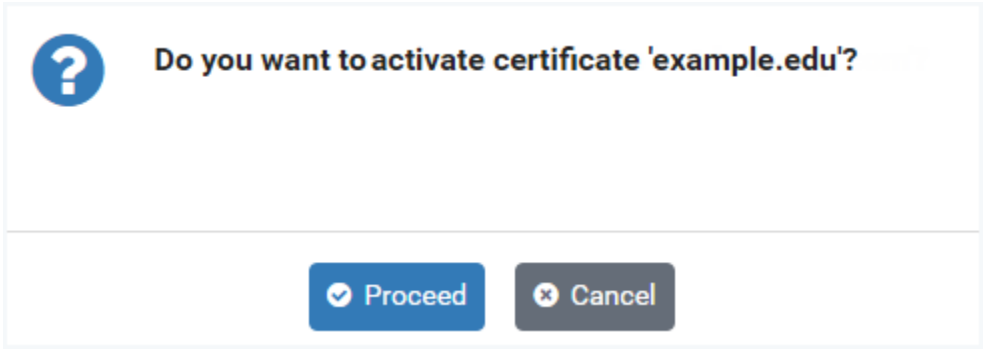
8. Click **Activate**.



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



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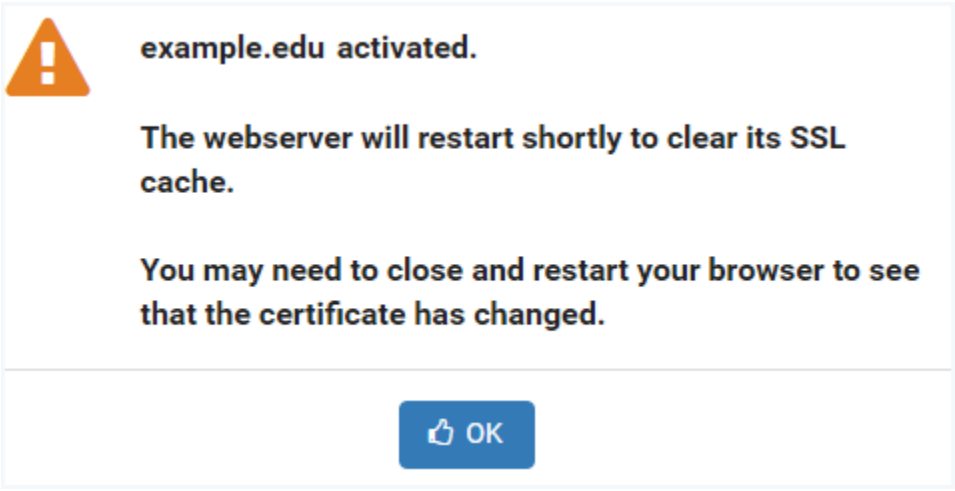
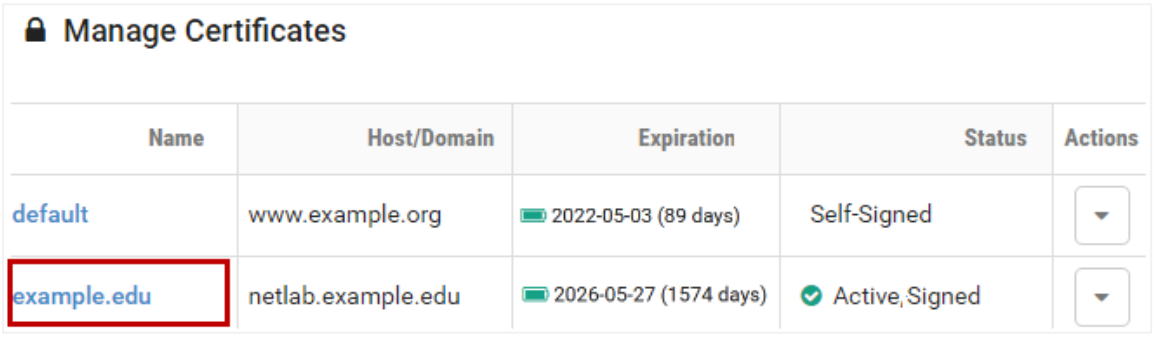
10. A message will indicate that the certificate has been activated and that the webserver will restart shortly to clear its SSL cache. Click **OK**.



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.



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.

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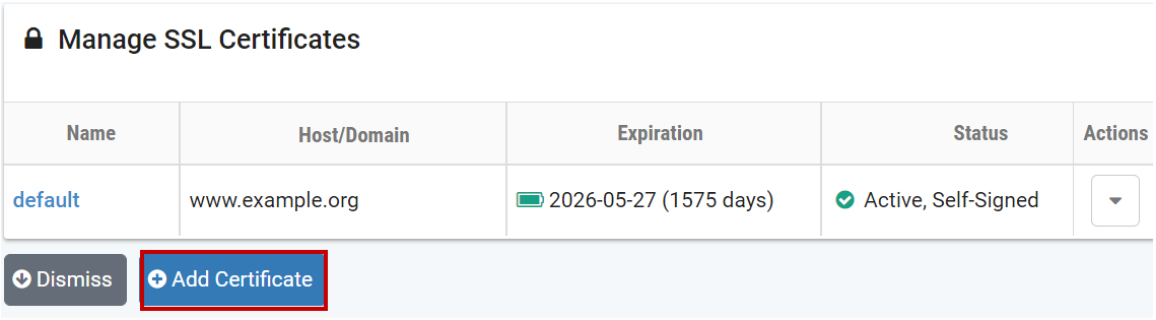
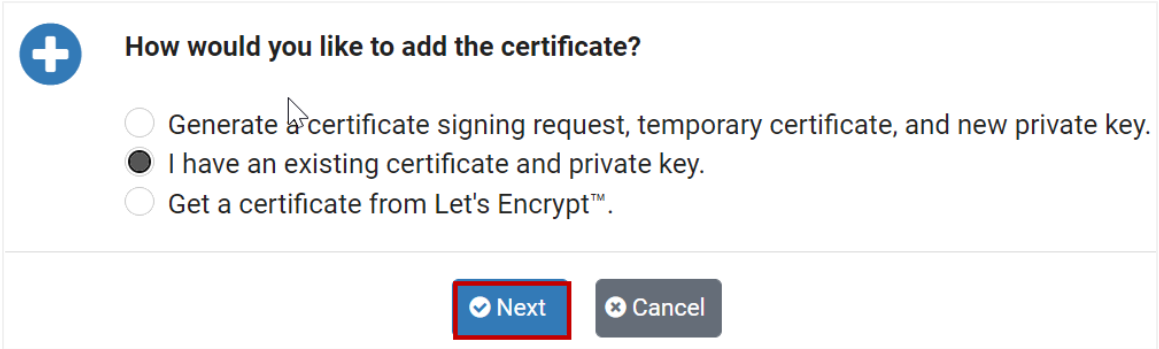
4.1.2.2 Add a Certificate and Private Key to NETLAB+

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.



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**.



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.

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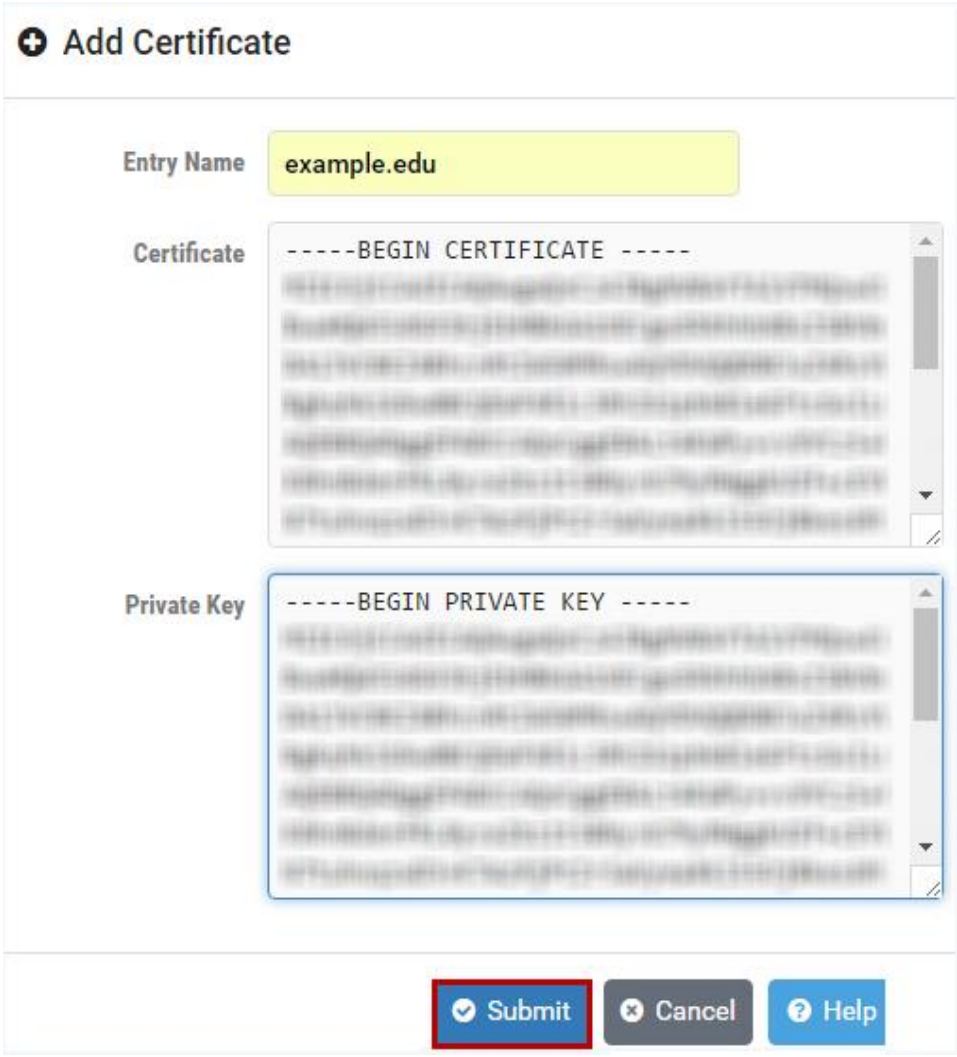
7. Paste your private key, including the header and footer lines, into the **Private Key** textbox.
    a. Paste the contents of the new certificate file (.crt or .pem) above.
    b. The private key must be in PEM format. The PEM certificate format uses the following header and footer lines, which should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



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

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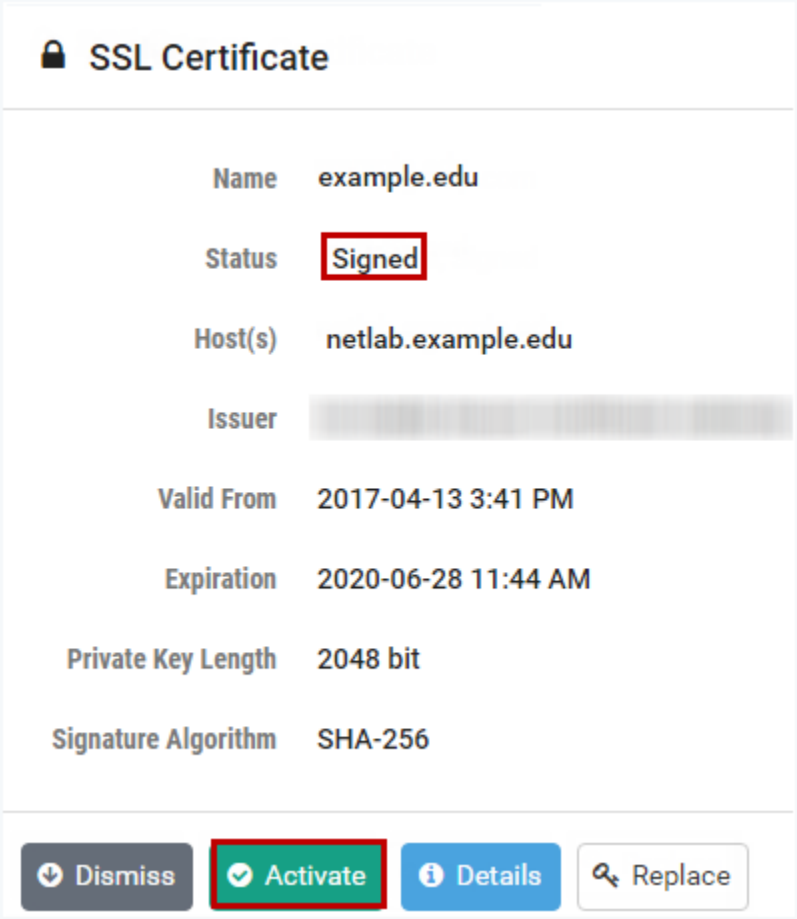
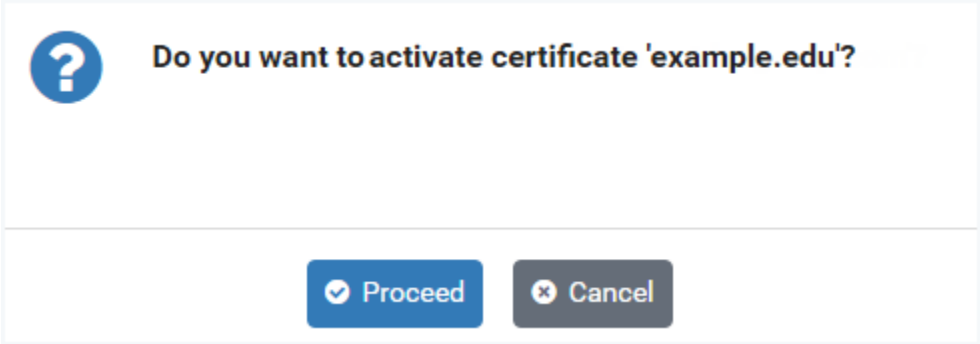
If the status of the certificate does not indicate signed, it may be necessary to log off the system and close your browser window. The status will be updated when you enter the system again.

11. Click **Activate**.



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



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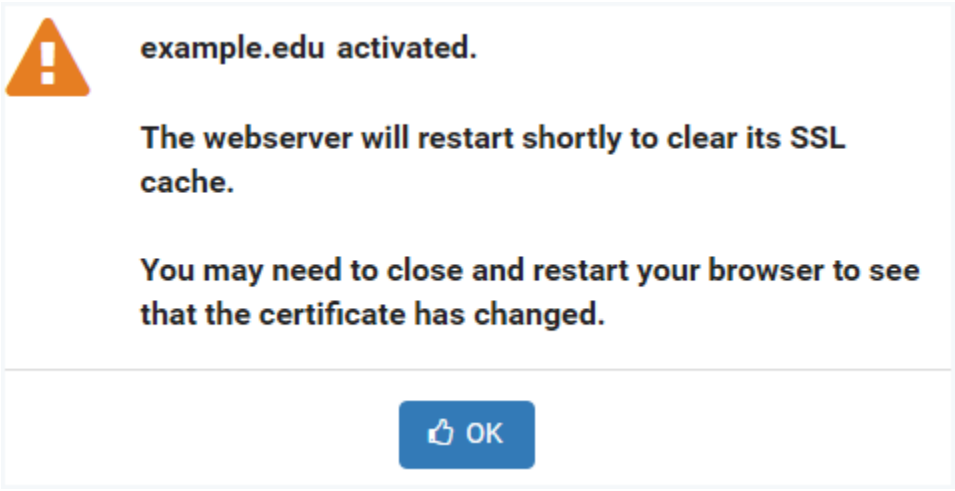
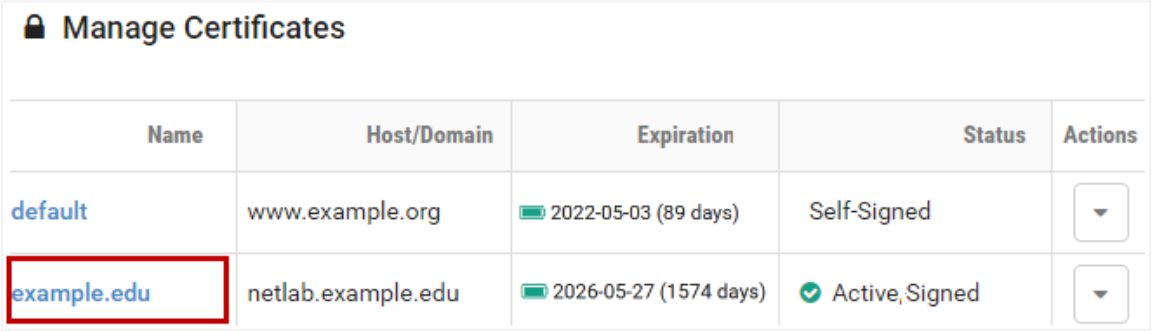
13. A message will indicate that the certificate has been activated and that the webserver will restart shortly to clear its SSL cache. Click **OK**.



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.



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.

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4.1.2.3 Get a Certificate from Let's Encrypt

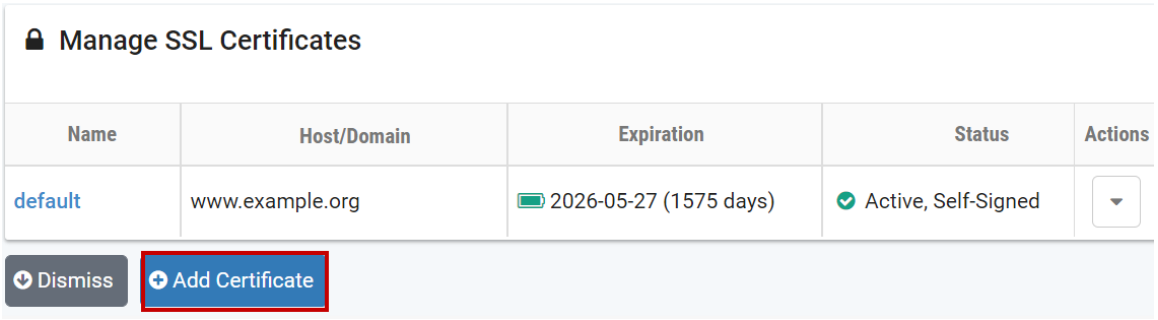
Initiate an automated process where your NETLAB+ system will request and obtain a signed certificate from *Let's Encrypt™*, a free certificate authority. Your NETLAB+ system will interact with Let's Encrypt to request the signed certificate and respond to a challenge issued by Let's Encrypt to verify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

Requirements to use Let's Encrypt with NETLAB+:

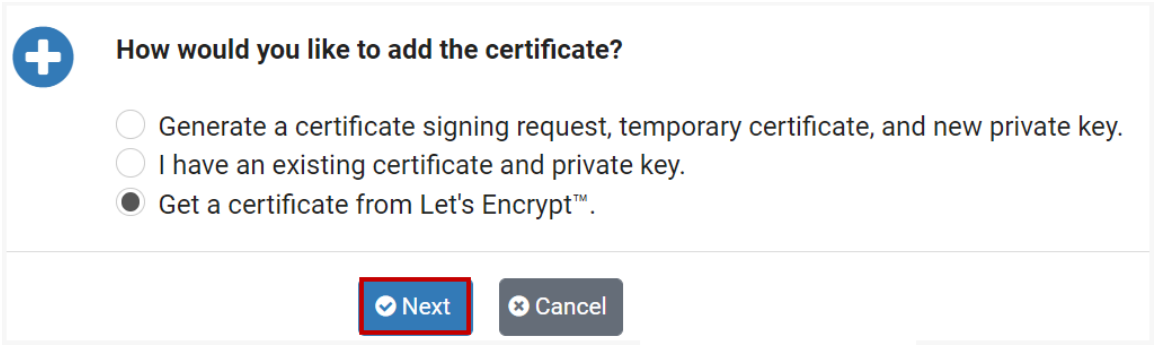
- **Your system must have an Internet-accessible public DNS entry.**
- **Ports 80 and 443 must be accessible and open through the firewall.**

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.



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



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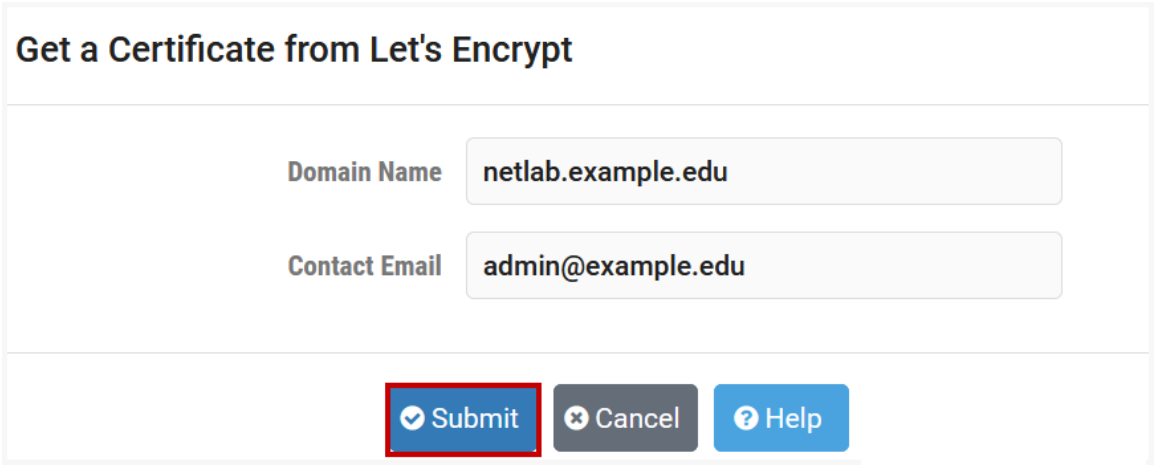
4. The **Get a Certificate from Let's Encrypt** page is displayed. Enter the appropriate information into the fields (see field descriptions below) and then click **Submit**.



Field Descriptions - Get a Certificate from Let's Encrypt

- **Domain Name:** The fully qualified domain name (FQDN) of your server. This name 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.

- **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.

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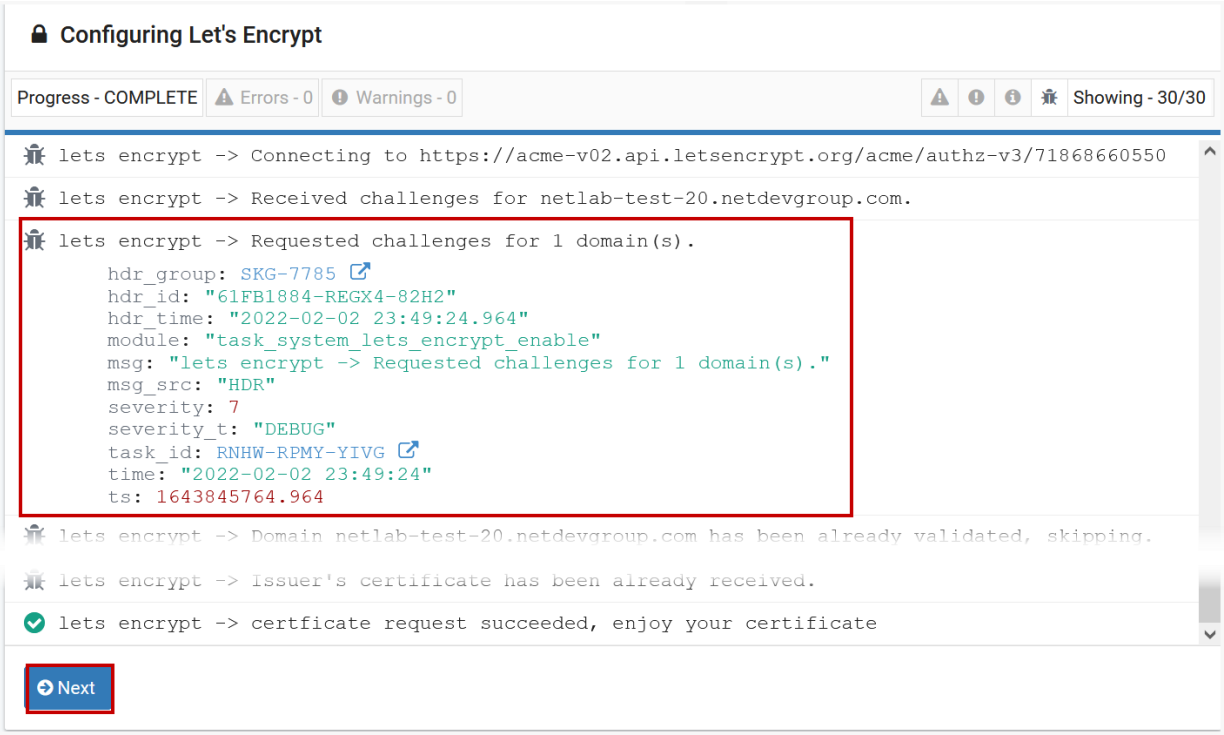
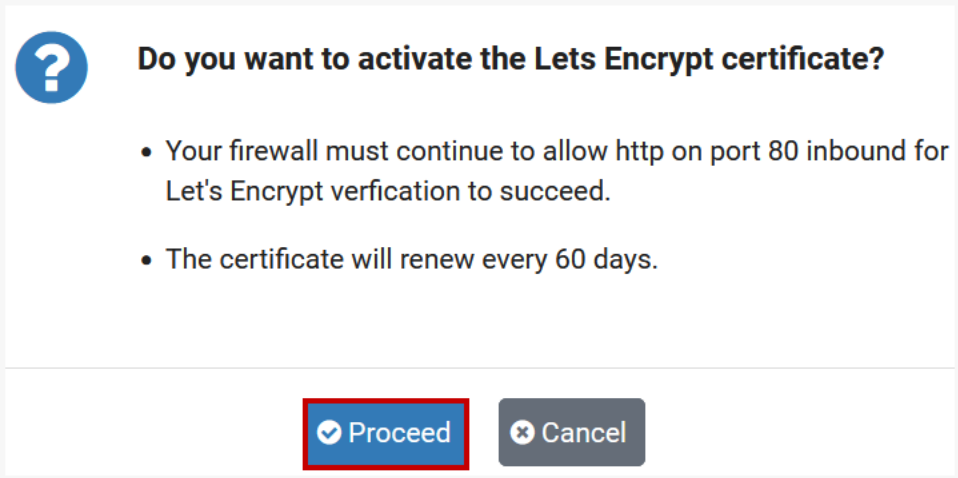
5. As the configuration proceeds, you will see a log showing the progress of each step. As shown below, you may click any line to view expanded details. Click **Next** to proceed.



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

6. When prompted to activate the Let's Encrypt certificate, click **Proceed**.



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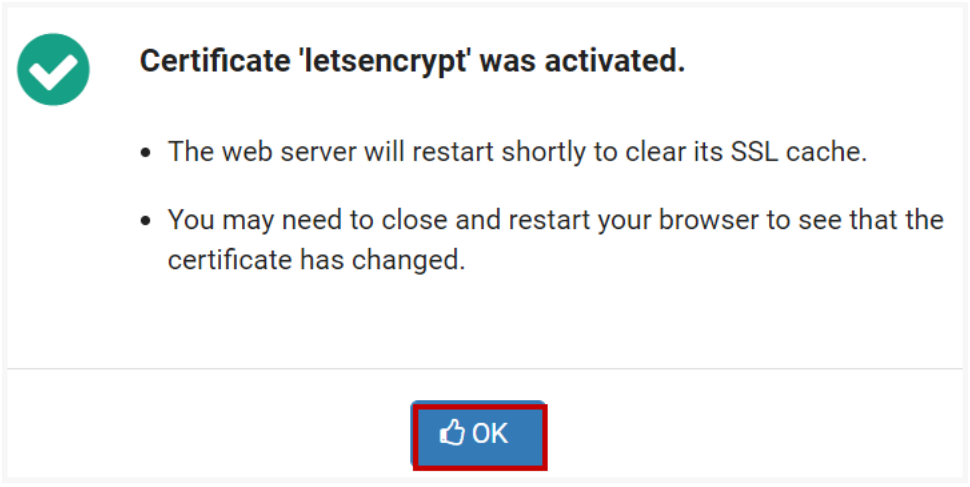
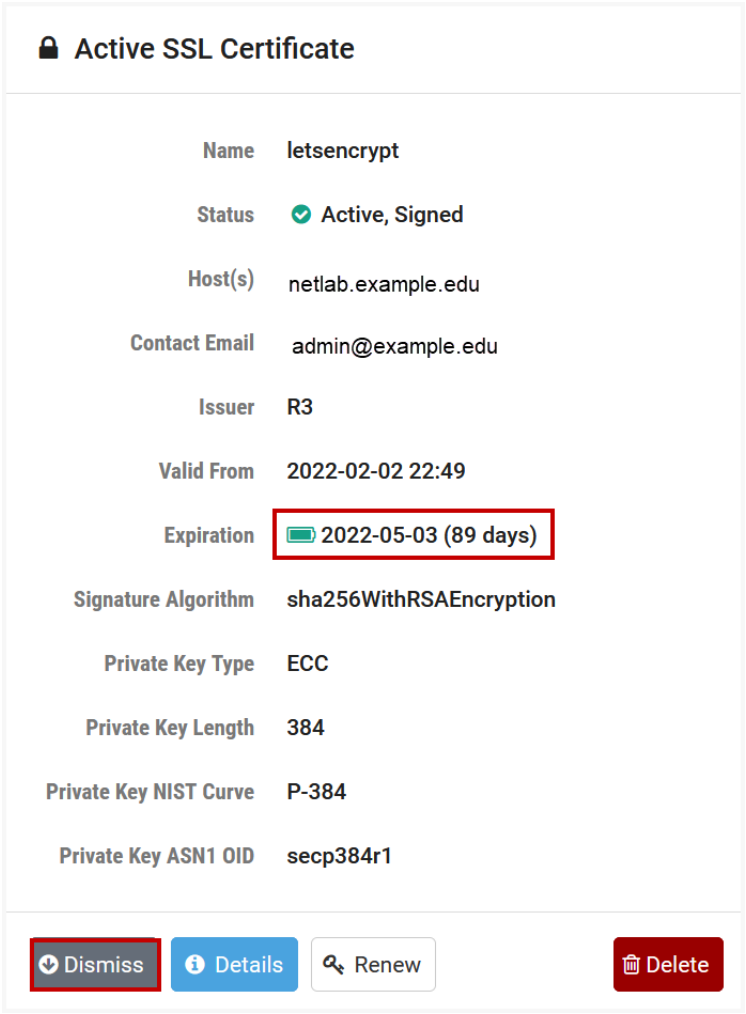
6. The letsencrypt certificate is activated. As noted, you may need to restart your browser to see that the certificate has changed. Click **OK**.



7. The Active SSL Certificate window will be displayed. Notice the expiration date. The certificate will expire in **89 days**. Click **Dismiss**.



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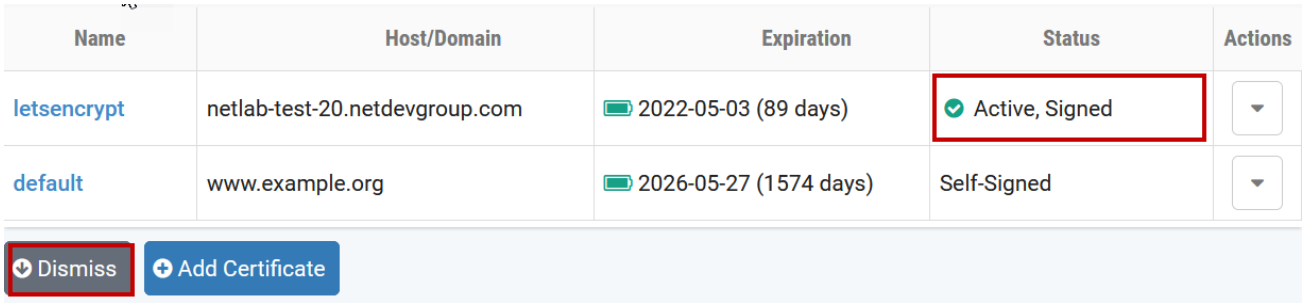
NETLAB+ will automatically request a renewal of the certificate from Let's Encrypt every **60 days**. This provides a 30-day window for the automated renewal to successfully take place (allowing for any connectivity issues, power outages, etc. at your site). The renewal will be attempted twice a day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

8. 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. Click **Dismiss**.



9. 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.

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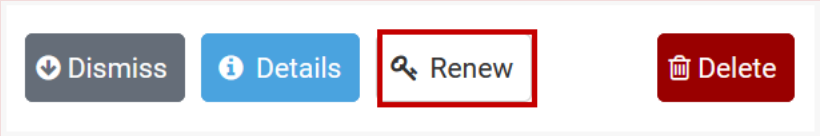
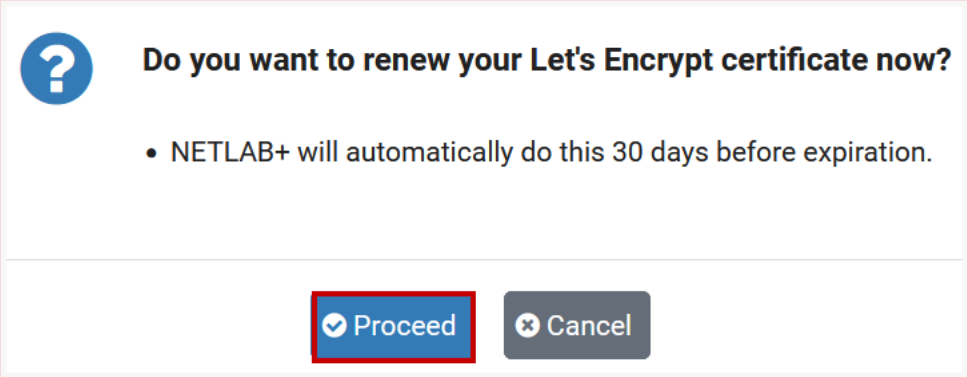
Under normal operating conditions, no administrator action is required to renew the certificate. If system outages for an extensive period have prevented the automatic renewal from executing, the certificate will expire at the end of the 90-day period.

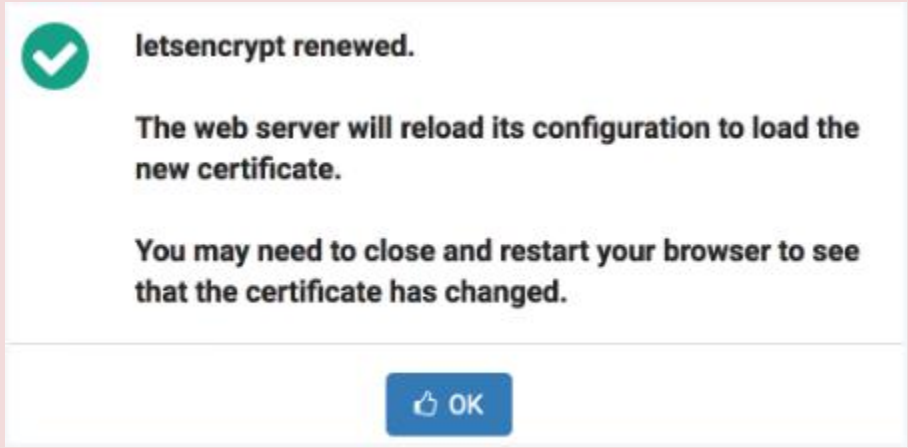
The administrator may initiate a request to renew the certificate by clicking the **Renew** button on the View Certificate page. However, before proceeding, we recommend contacting our support team for assistance in troubleshooting/resolving any problems with the automated process.



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.



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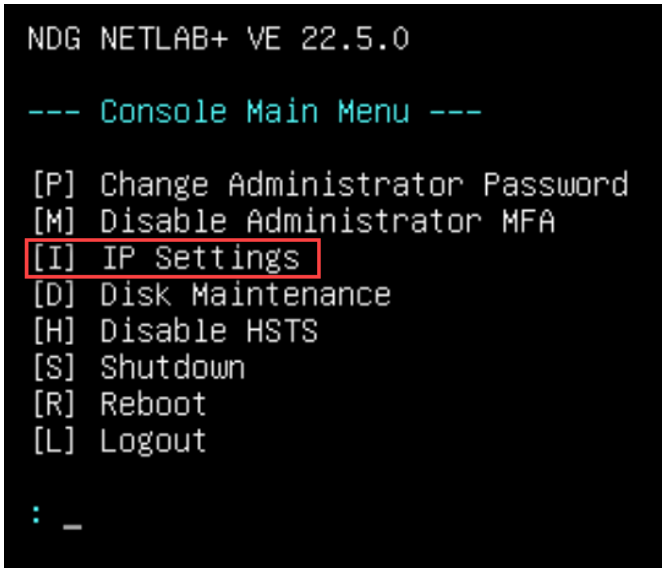
4.1.3 Reset SSL Certificate to Default

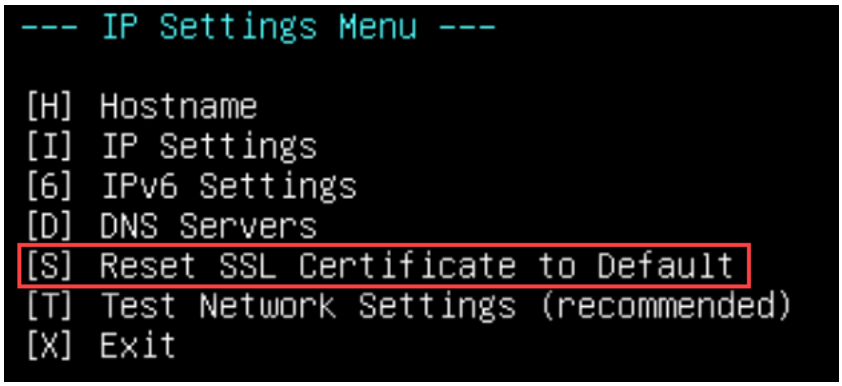
NETLAB+ includes a console option to reset the SSL certificate to default should an error condition with the certificate prevent access to the web interface.

Resetting the SSL certificate to default will allow the administrator to regain administrator access to the web interface. This default 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.

1. Log in to the virtual machine system console (requires VMware vCenter access).
2. Press **[I]** for IP Settings from the Console Main Menu.



3. From the IP Settings Menu, press **[S]** for Reset SSL Certificate to Default.



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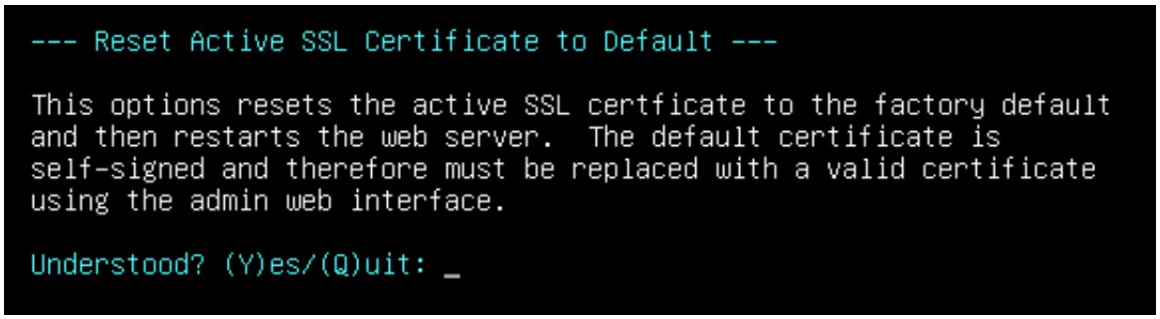
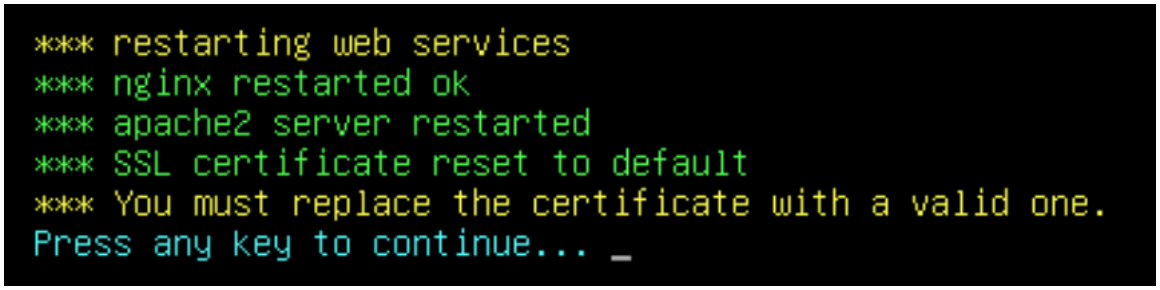
4. Review the information shown and then press [**Y**] for Yes.



5. Press any key to continue.



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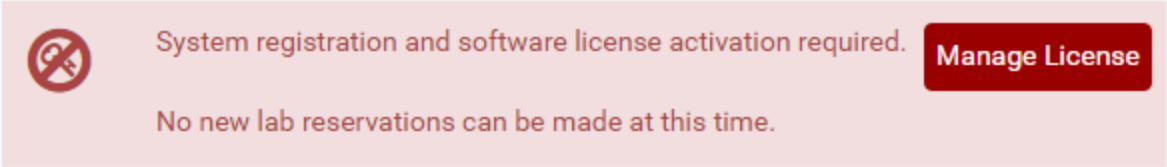
5 Manage License

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



You will need the customer information email sent to your organization from 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+ 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+ system in order to enable activation of its full functionality, including the scheduling of lab reservations. See the *Activate License (Initial Activation)* 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+ system. See the *Reactivate License* subsection below.

5.1 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

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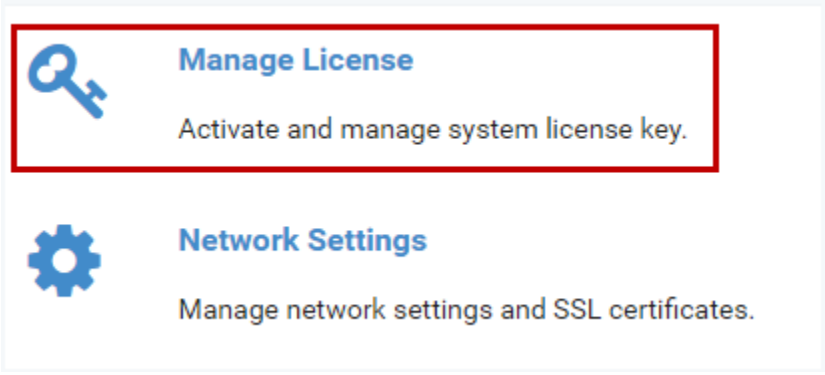
1. Select Settings from the administrator Home page and then select **Manage License.**



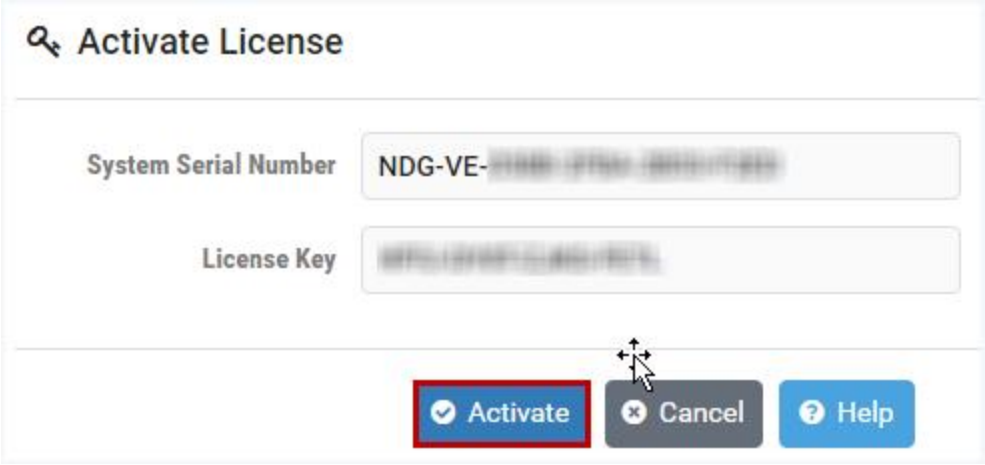
2. The Activate License page will be displayed. Enter the **System Serial Number** and the **License Key** provided by NDG. Select **Activate**.

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



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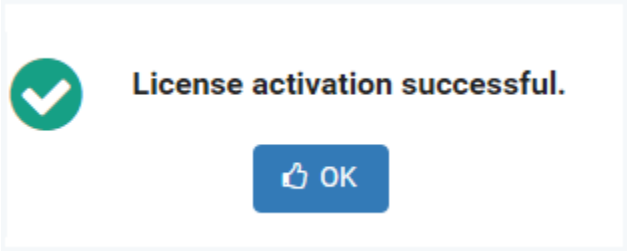
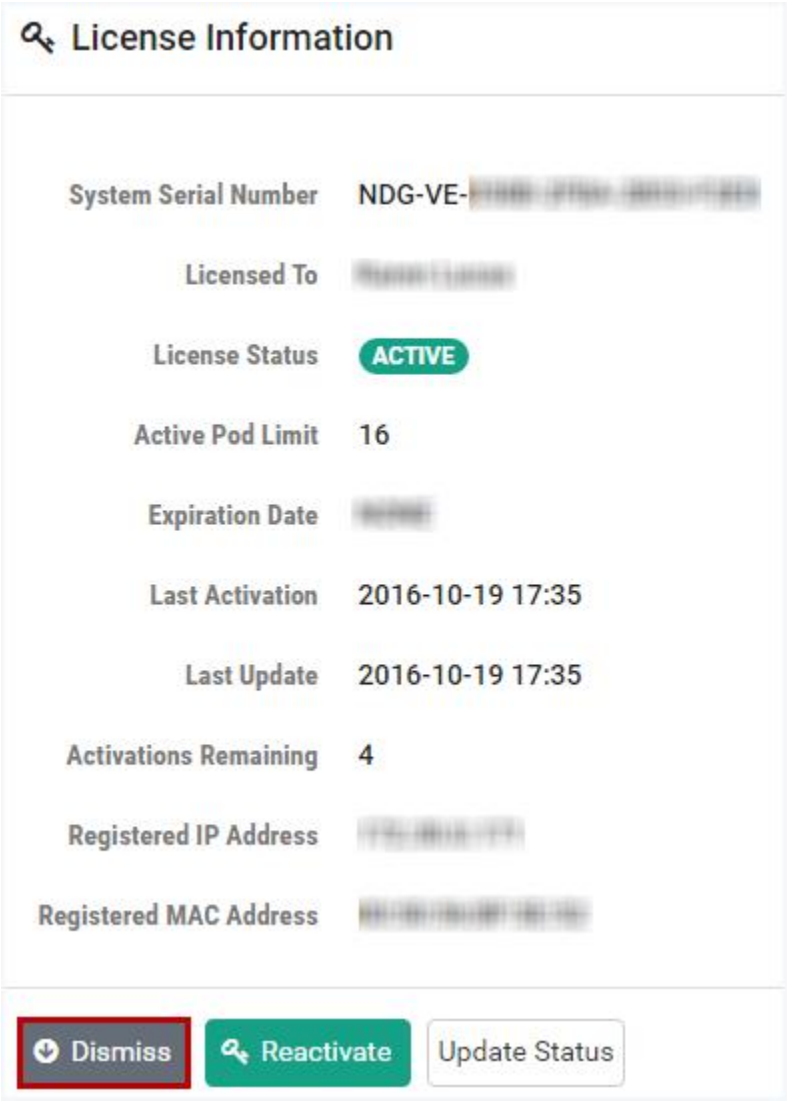
3. A message will display, indicating the license activation was successful. Select **OK.**



4. The License Information page will be displayed. Notice that the license status has been changed to Active. Your system is now fully functional. Review the other information on this page, including the Activations Remaining (see the next section, *Reactivate License*, for further discussion).
5. To ensure the information displayed is updated, click **Update Status**.
6. Click **Dismiss**.



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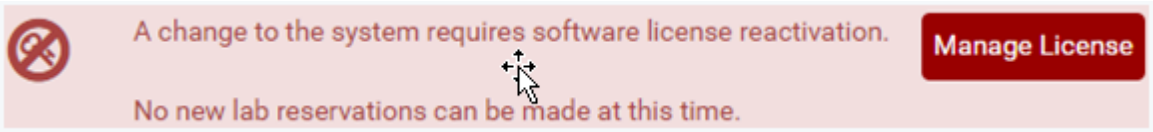
5.2 Reactivate License

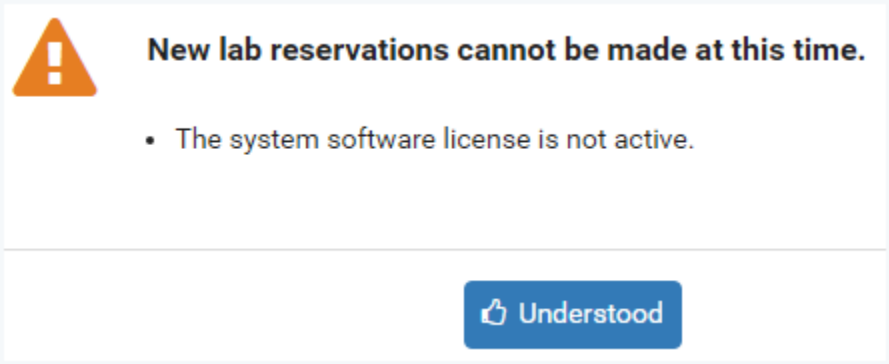
In some cases, modifications made to the NETLAB+ system will require software license reactivation. Events that will trigger the requirement to reactivate include:

- Change of MAC address
- Change of IP address
- Change of virtual machine UUID
- Restoration of the NETLAB+ virtual appliance from a backup

When reactivation is required, the administrator Home page will display the following alert.



Also, be aware that the following message will be displayed to users if a user attempts to schedule a lab reservation while the software license is not active.



Your license key allows five (5) activations only. A "fresh" license key may be requested from NDG support (see www.netdevgroup.com).

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

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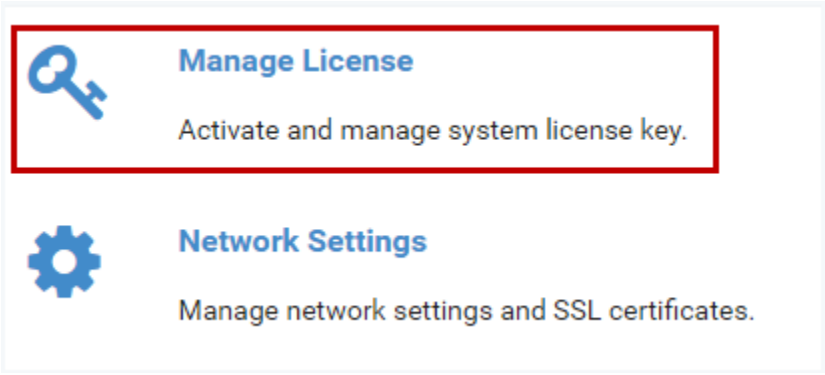
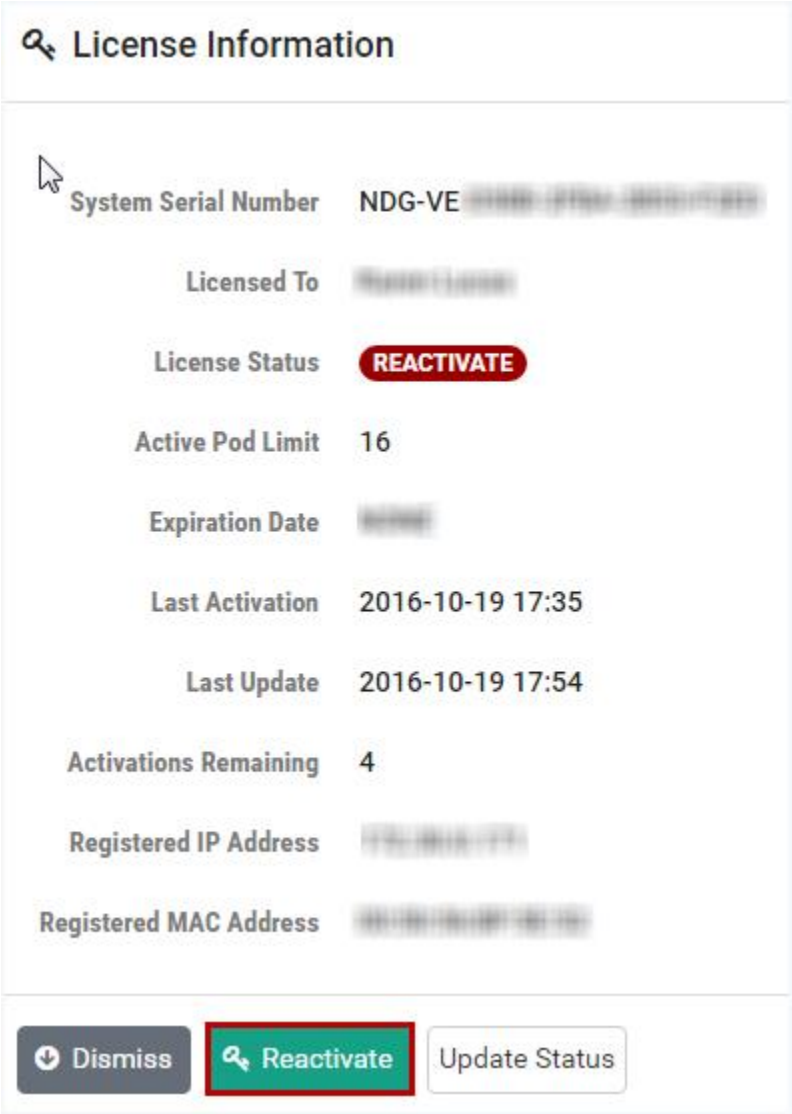
1. To reactivate the license, select Settings from the administrator Home page and then select **Manage License** (or select **Manage License** on the alert message at the top of the administrator Home page).



2. The License Information page will be displayed. Notice that the License Status is Reactivate. Select the **Reactivate** button.



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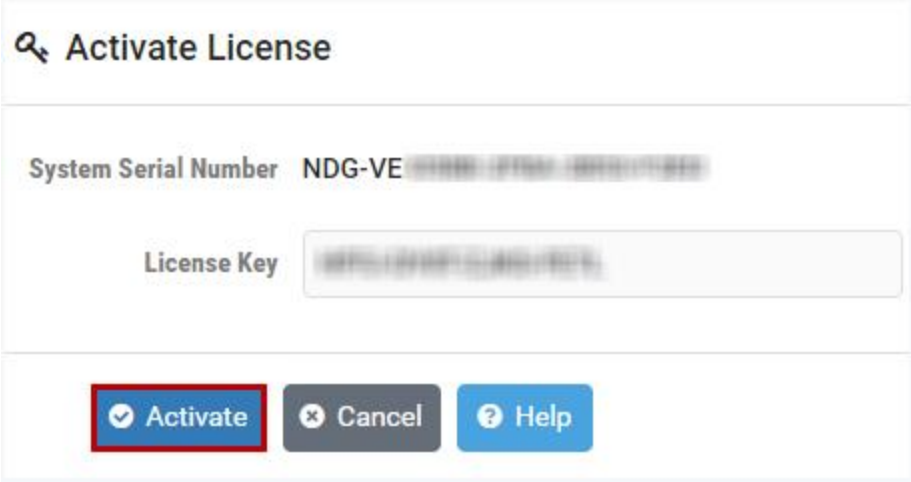
3. The Activate License page will be displayed. Refer to the information provided by NDG and verify that the **System Serial Number** displayed matches the information from NDG. Each NETLAB+ license key is valid for one system. Enter the **License Key** provided by NDG. Select **Activate**.

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

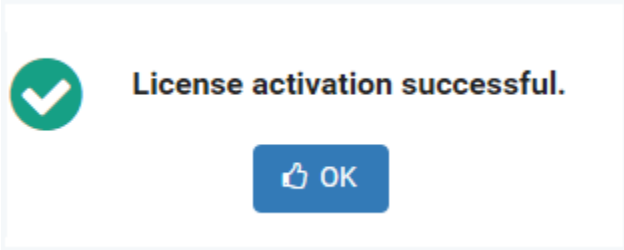
If you enter the information into these fields, keep in mind the following:

System Serial Number:
- Can be lowercase/uppercase
- Must include dashes

License Key:
- Must be uppercase
- Must include dashes



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



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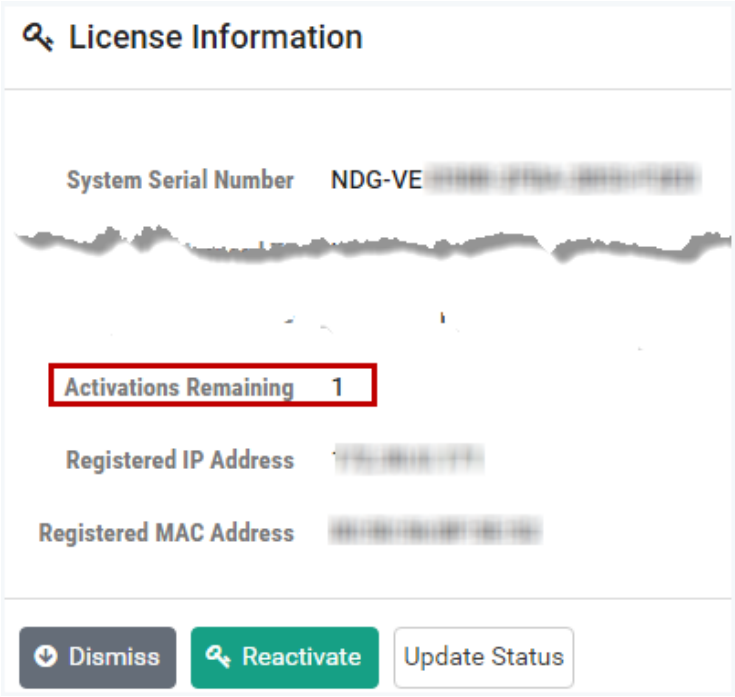
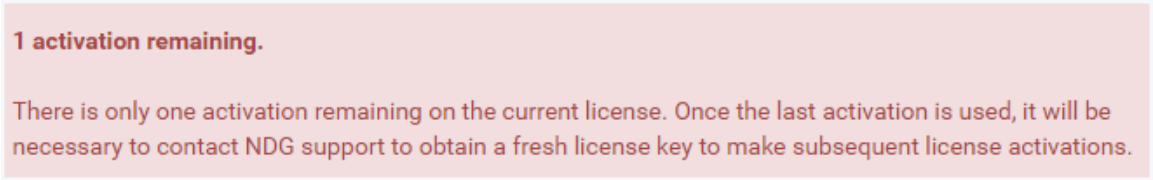
5. The License Information page will be displayed. Notice that the license status has been changed to Active, full system functionality is restored.

It may be necessary to click the Update Status button to update the information displayed following a reactivation.



6. Review the license information on the License Information page, including the Activations Remaining. If you have only one (1) activation remaining, an alert message will display at the top of the License Information page. Click **Dismiss** after reading.



Your license key allows five (5) activations only. A "fresh" license key may be requested from NDG support (see www.netdevgroup.com).

You do not have to wait until you have used up all 5 activations to request a new license key. We recommend that you request a new license key when you have one activation remaining, doing so will ensure your that you have always have a valid license key on hand.

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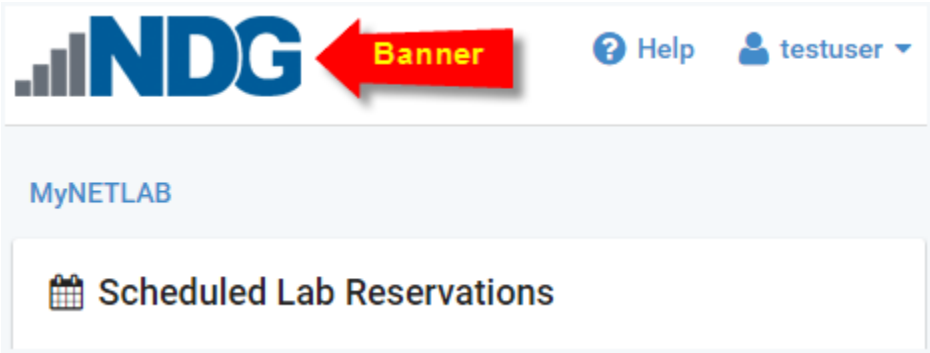
6 Appearance

Custom branding of your NETLAB+ system allows you to use your own logos and graphics to make your system uniquely identifiable and can serve as an asset for your marketing strategy. The administrator may customize the NETLAB+ user interface by modifying the settings for displaying certain interface elements, such as login and banner logos.

First, we will look at the default images provided for the display elements. The default Login Form and Login Logo are displayed on the default Login Background in the picture below.

The picture below shows the default Banner Logo on the MyNETLAB+ page of a student account.



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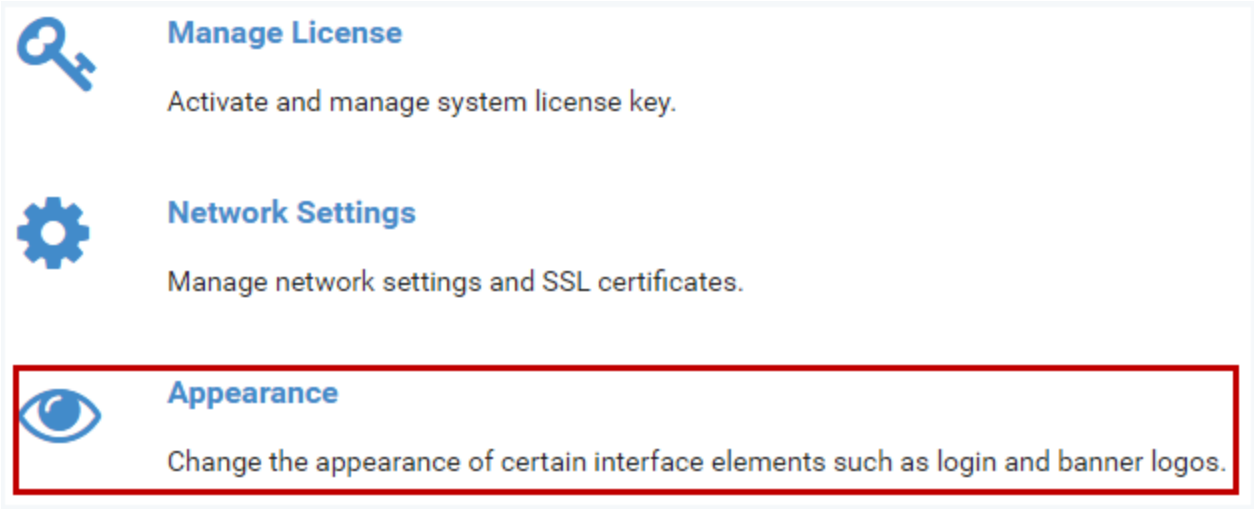
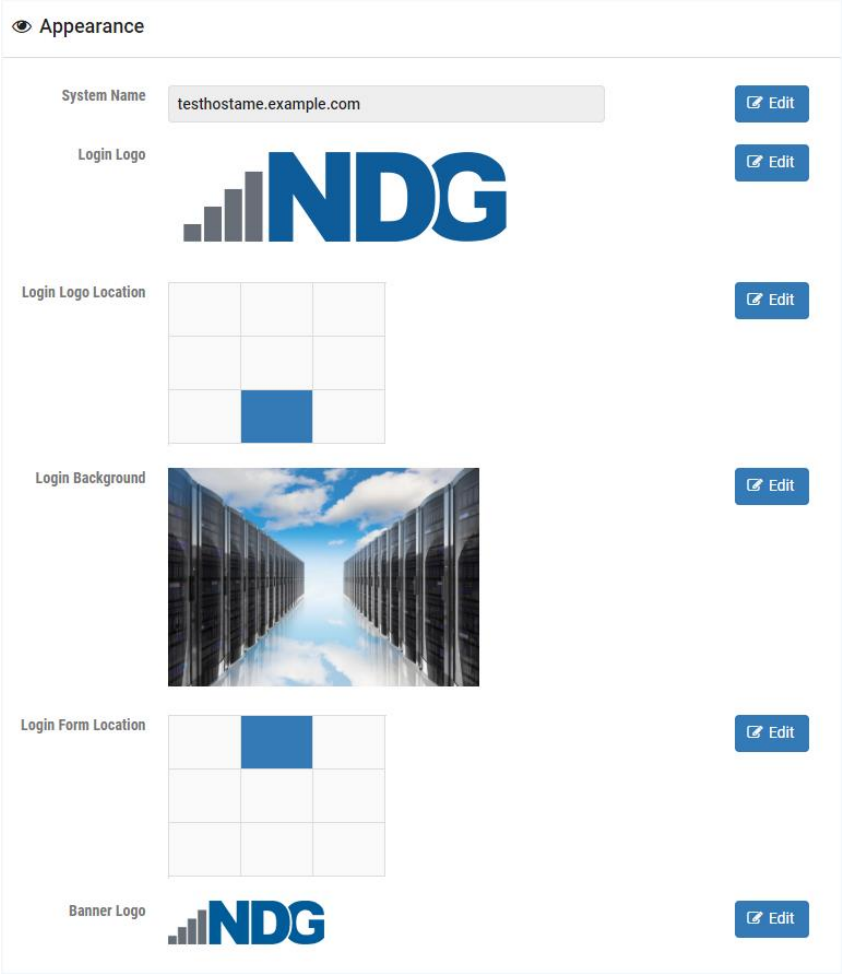
To customize the appearance of your NETLAB+ system, select **Settings > Appearance**.



The Appearance page is displayed. The System Name, Login Logo, Login Logo Location, Login Background, Login Form Location, and Banner Logo may be updated by selecting their respective Edit button, located to the right of each element. The interface elements are discussed in the subsections below.



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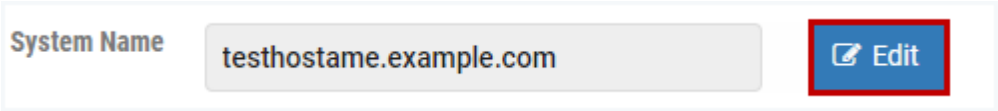
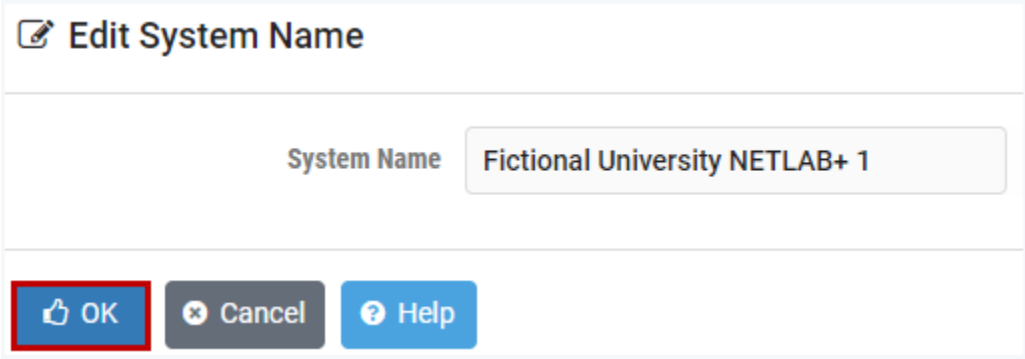
6.1 System Name

Assigning a custom system name can make it easier for users to identify which NETLAB+ they are logging into if they have access to more than one NETLAB+ system. The name will be displayed on the login page instead of the hostname.

1. To enter a custom name, select the **Edit** button to the right of the System Name on the Appearance page.



2. Enter a name for your system and then select **OK** (if no system name is provided or if it is cleared, the hostname will be displayed once again).



6.2 Login Logo

You may replace the logo on the NETLAB+ login page by uploading an image file with your own logo. Acceptable file formats include .gif, .jpg, and .png. Images with heights greater than 100 pixels will be scaled down to 100 pixels.

3. To replace the default logo, select the **Edit** button to the right of the Login Logo on the Appearance page.

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4. The Edit Login Logo page is displayed. Click the checkmark box next to **Select a Login Logo.**

5. A window will open, allowing you to select the image file you would like to use for the NETLAB+ login page.

Acceptable file formats include .gif, .jpg and .png. Images with heights greater than 100 pixels will be scaled down to 100 pixels.

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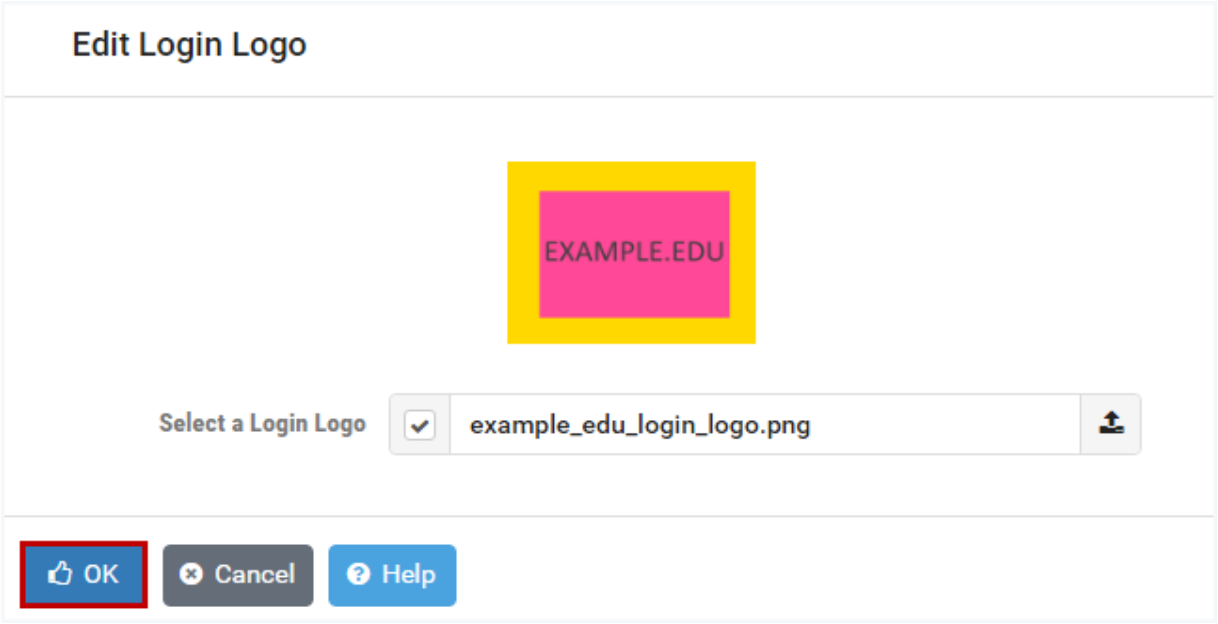
6. The image file you select will be displayed on the Edit Login Logo page. Click **OK**.

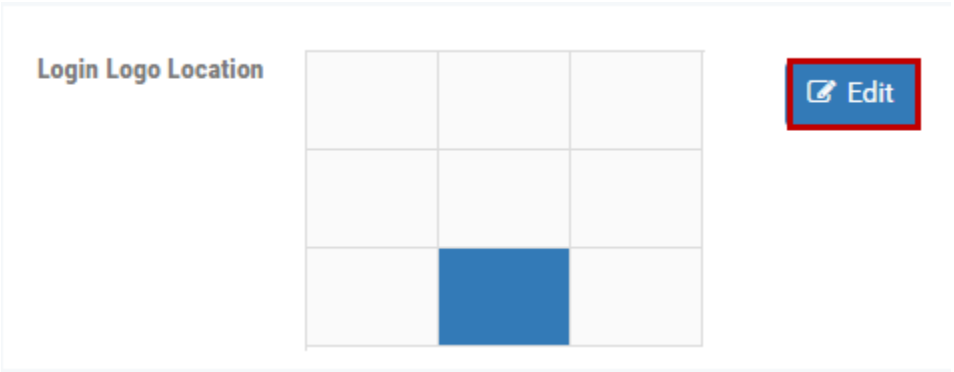


To restore the default Login Logo, simply click OK without selecting a file.

6.3 Login Logo Location

You may select the preferred position on the login page for the Login Logo.

1. Select the **Edit** button to the right of the Login Logo Location grid. Notice the default location indicated on the grid below is in the center, at the bottom of the page.



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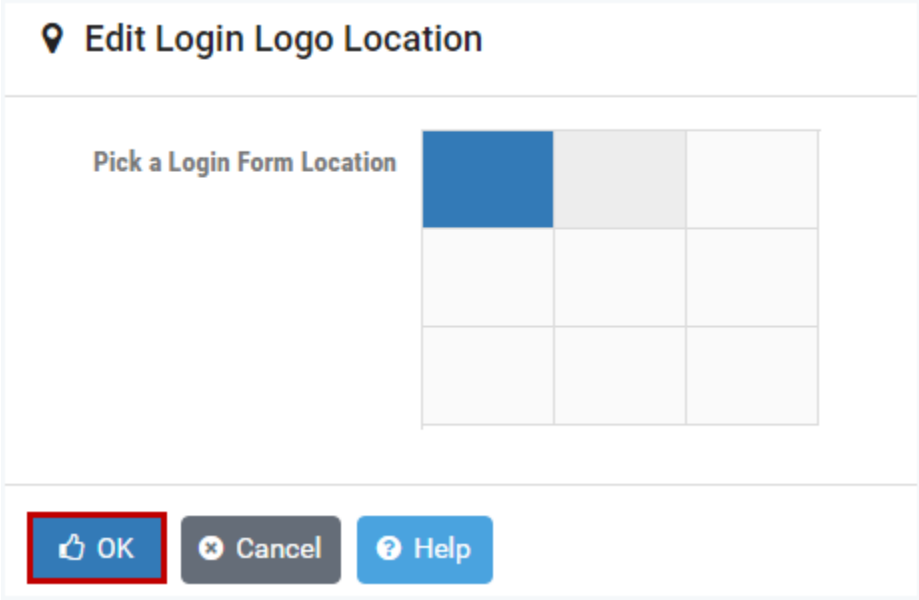
2. The Edit Login Log Location page is displayed. Choose a cell from the grid below that best resembles the preferred location of the logo on the NETLAB+ login page. In the example below, the cell in the upper-left has been selected. Click **OK**.



Please note that the Login Logo and Login Form cannot occupy the same location.

6.4 Login Background

You may replace the background on the NETLAB+ login page by uploading an image file with your own background. Acceptable file formats include .gif, .jpg, and .png. Background images may be scaled and/or cropped to accommodate the size of users' browser windows.

1. To replace the default background, select the **Edit** button to the right of the Login Background on the Appearance page.

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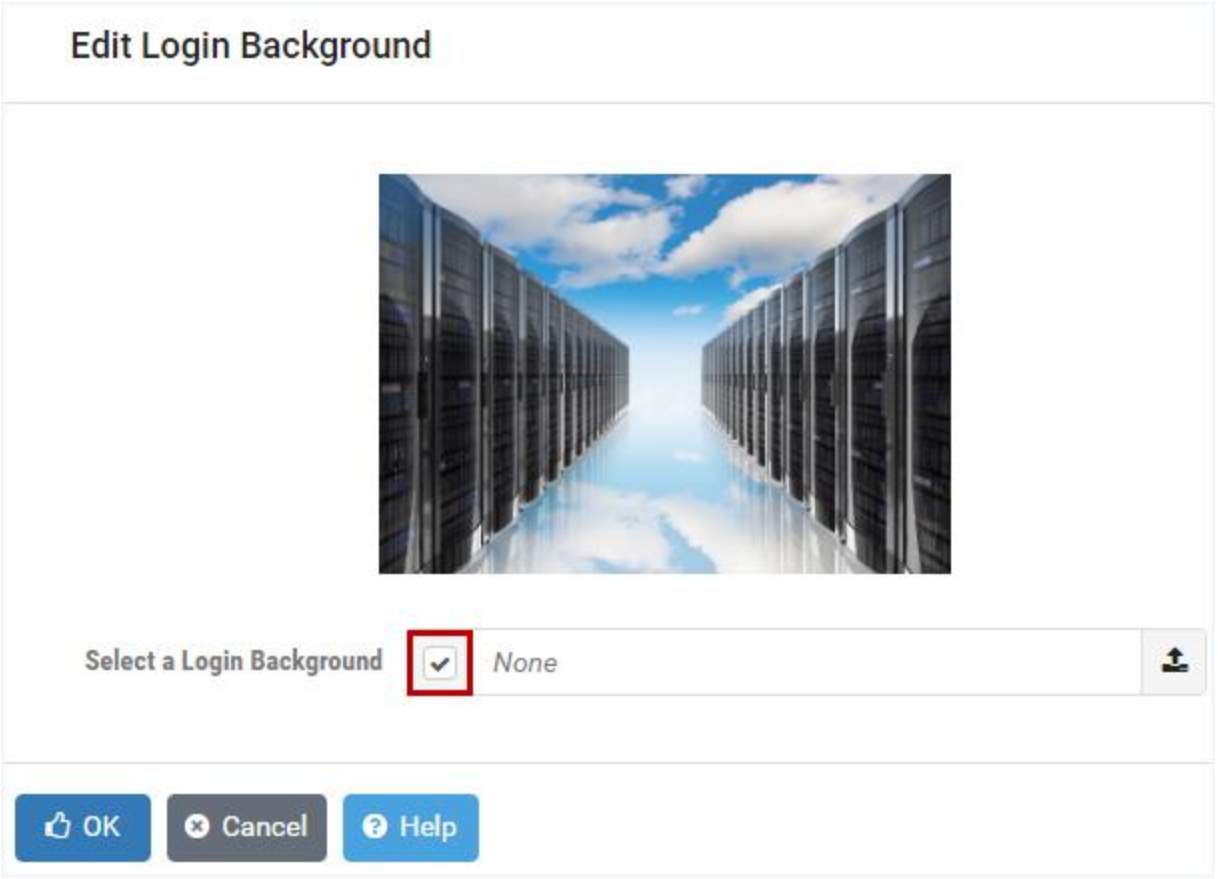
2. The Edit Login Background page is displayed. Click the checkmark box next to **Select a Login Background.**



3. A window will open, allowing you to select the image file you would like to use for the NETLAB+ login background.

Acceptable file formats include .gif, .jpg and .png. Background images may be scaled and/or cropped to accommodate the size of users' browser windows.

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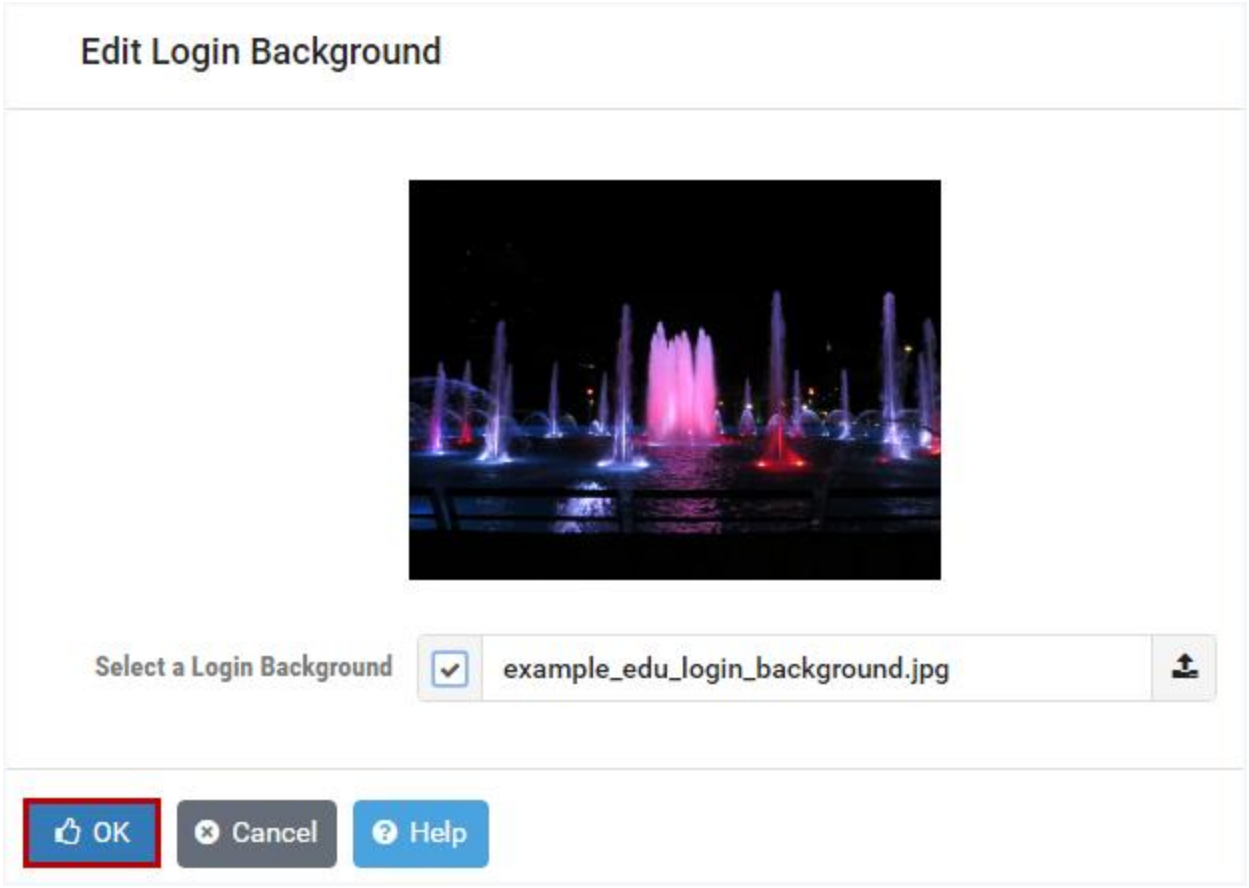
4. The image file you select will be displayed on the Edit Login Background page. Click **OK**.



To restore the default Login Background, simply click OK without selecting a file.

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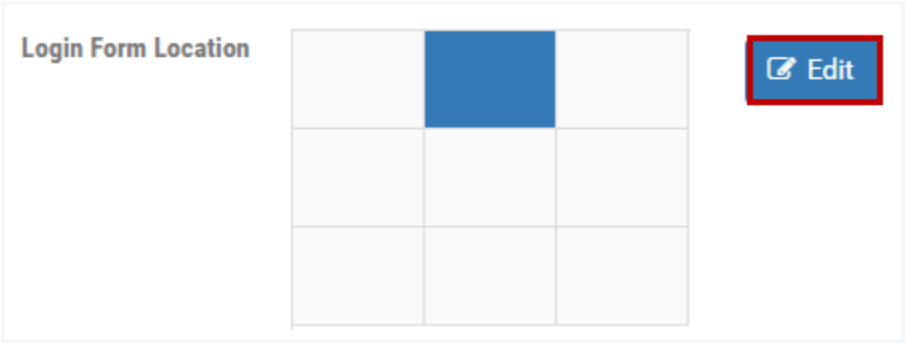
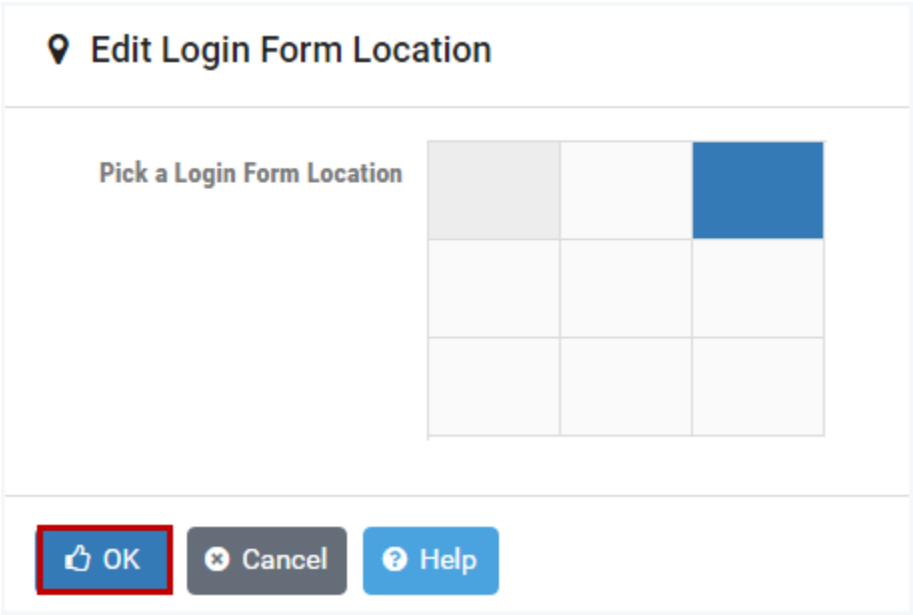
6.5 Login Form Location

The login form contains the fields in which users enter their username and password. You may select the preferred position on the page for the Login Form.

1. Select the **Edit** button to the right of the Login Form Location grid. Notice the default location indicated on the grid below is in the center, at the top of the page.



2. The Edit Login Form Location page is displayed. Choose a cell from the grid below that best resembles the preferred location of the form on the NETLAB+ login page. In the example below, the cell in the upper-right has been selected. Click **OK**.



Please note that the Login Logo and Login Form cannot occupy the same location.

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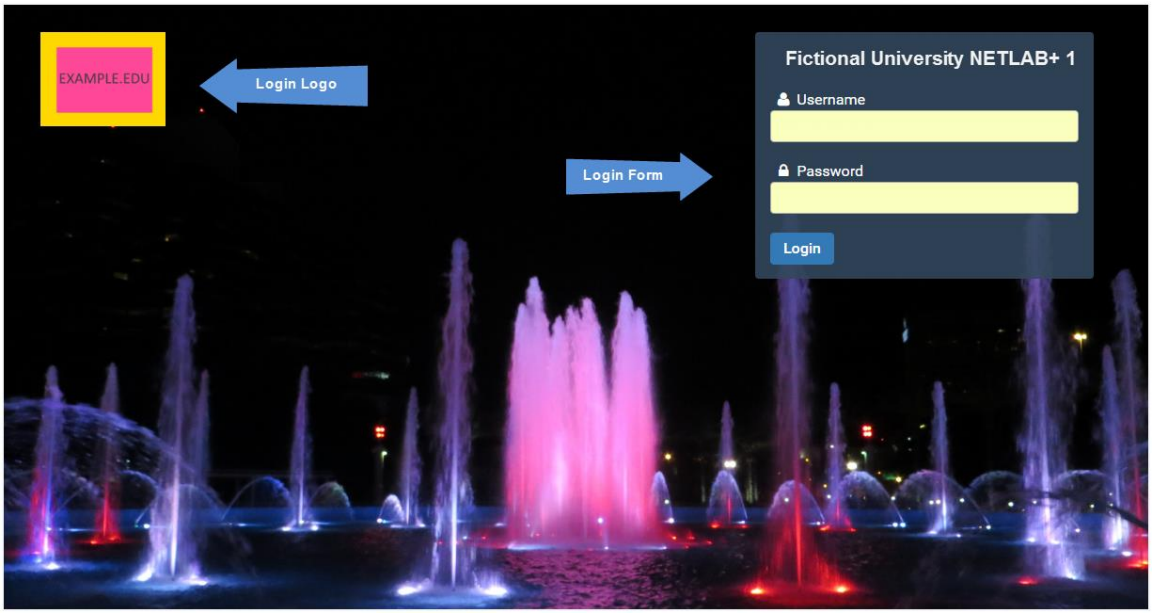
The picture below shows the updated login screen, with the Login Logo and Login Form, including the custom system name, placed in the selected preferred positions on the updated background image.



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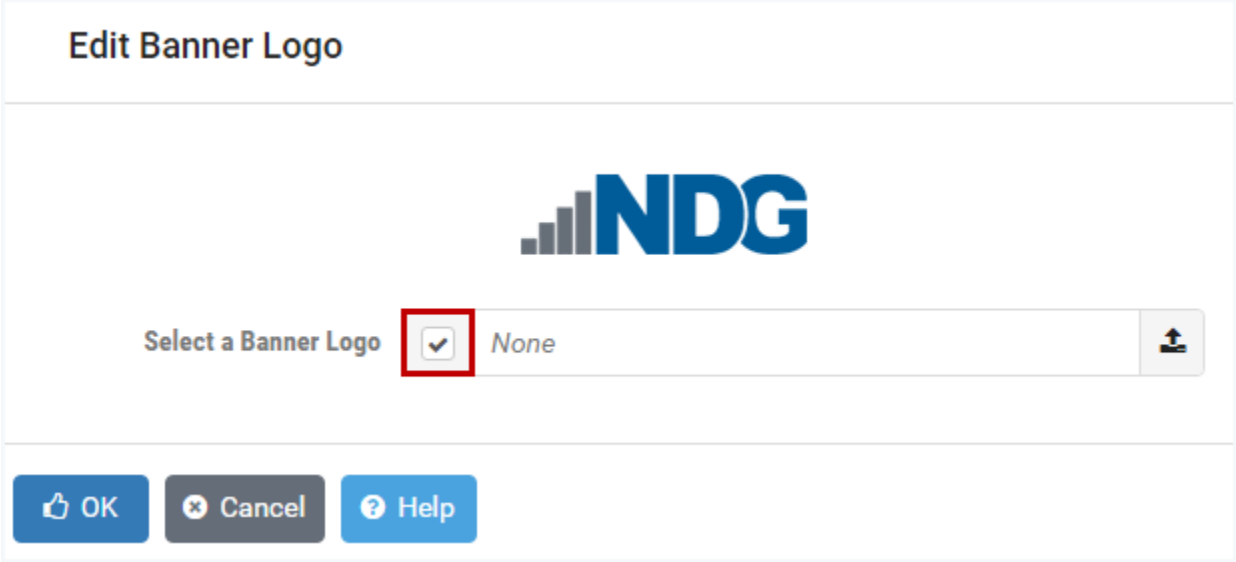
6.6 Banner Logo

You may replace the banner by uploading an image file with your own banner logo. Acceptable file formats include .gif, .jpg, and .png. Images with heights greater than 40 pixels will be scaled down to 40 pixels.

1. Notice that the NDG logo is the default Banner Logo. To replace the default logo, select the **Edit** button to the right of the Banner Logo on the Appearance page.

2. The Edit Banner Logo page is displayed. Click the checkmark box next to **Select a Banner Logo.**



3. A window will open, allowing you to select the image file you would like to use for the Banner Logo.

> Acceptable file formats include .gif, .jpg and .png. Images with heights greater than 40 pixels will be scaled down to 40 pixels.

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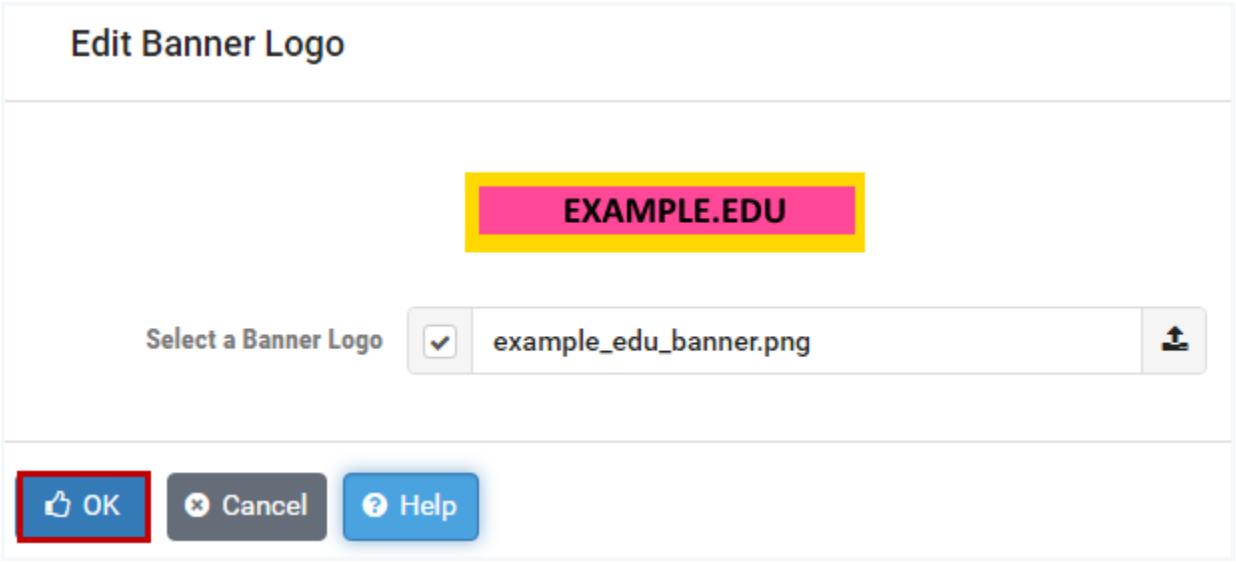
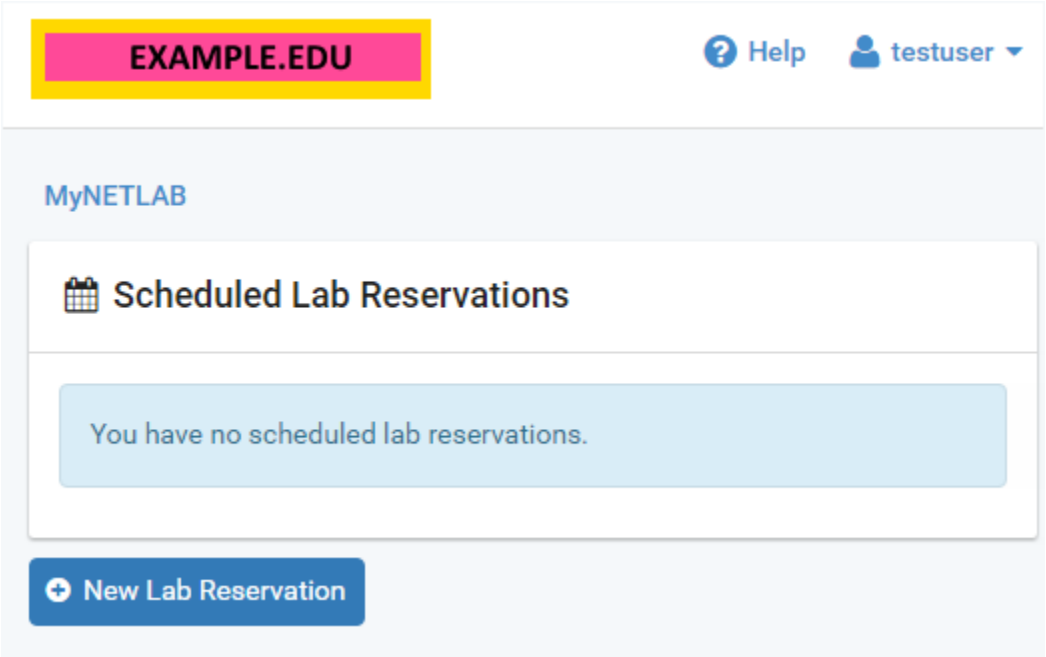
4. The image file you select will be displayed on the Edit Banner Logo page. Click **OK**.



To restore the default Banner Logo, simply click OK without selecting a file.

The updated banner will be displayed on all user accounts. The picture below shows the banner displayed on the MyNETLAB+ page of a student account.



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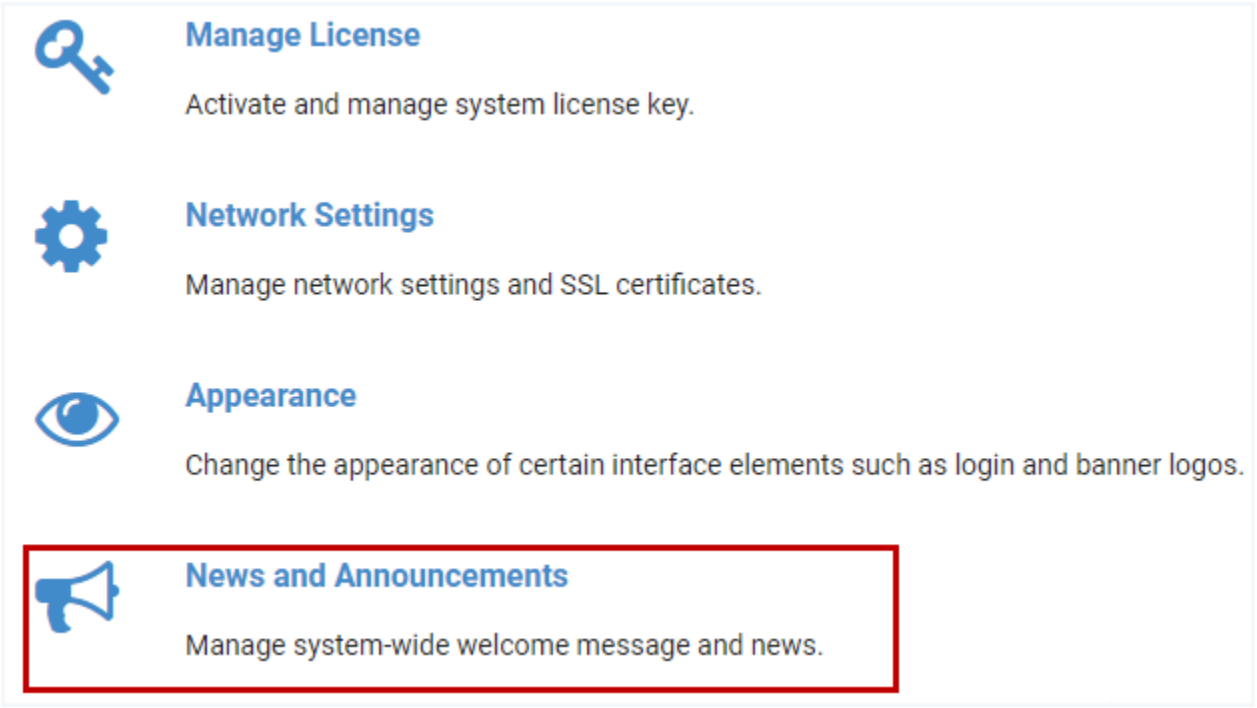
7 News and Announcements

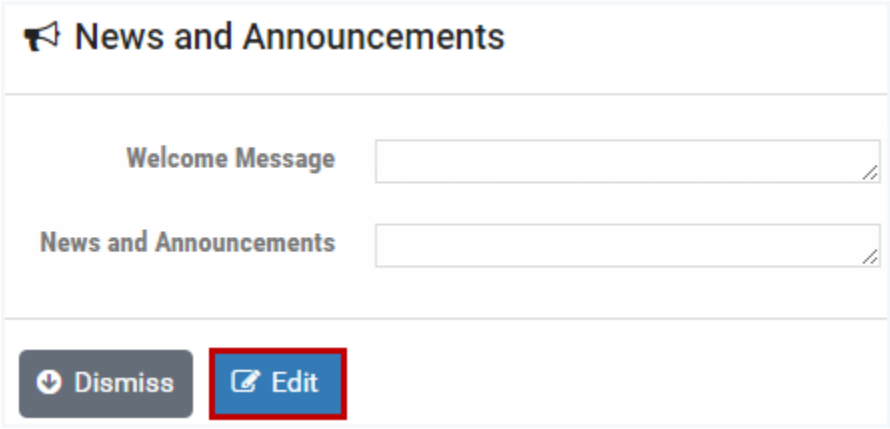
System news and announcements are displayed at the top of the MyNETLAB page. Using this feature provides a way to communicate with all users of your NETLAB+ system.

System-wide settings will be displayed on the MyNETLAB page of all users, above any community Welcome Message or News and Announcements.

1. To manage the system-wide welcome message and news, select Settings from the administrator Home page and then select **News and Announcements.**



2. Select the **Edit** button.



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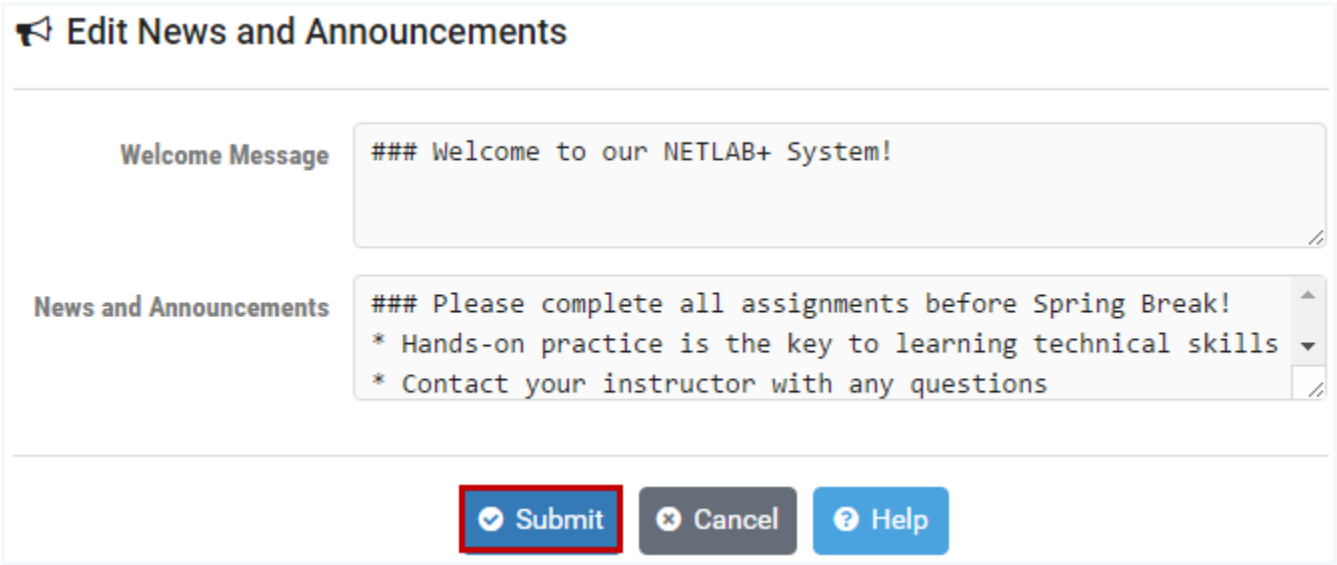
3. Enter information into the Welcome Message and/or News and Announcements fields. See the field descriptions below. Click **Submit**.

GitHub Flavored Markdown is supported, as shown in the example below. Not familiar with GitHub Flavored Markdown? A quick Internet search will lead you to information on syntax and examples.



Field Descriptions - News and Announcements

- **Welcome Message:** Define a welcome message for the system. The message is displayed on the MyNETLAB page in its entirety, above any community welcome message or community news. GitHub Flavored Markdown is supported. Links will open in separate tabs or windows.

  Welcome messages can also be set for specific communities. See the *Manage Communities* section.

- **News and Announcements:** Define news and announcements for the system. This is displayed on the MyNETLAB page above any community welcome messages or community news. Space for news and announcements is constrained to a scrollable region, so it is suitable for longer text. GitHub Flavored Markdown is supported. Links will open in separate tabs or windows.

  News and Announcements can also be set for specific communities. See the *Manage Communities* section.

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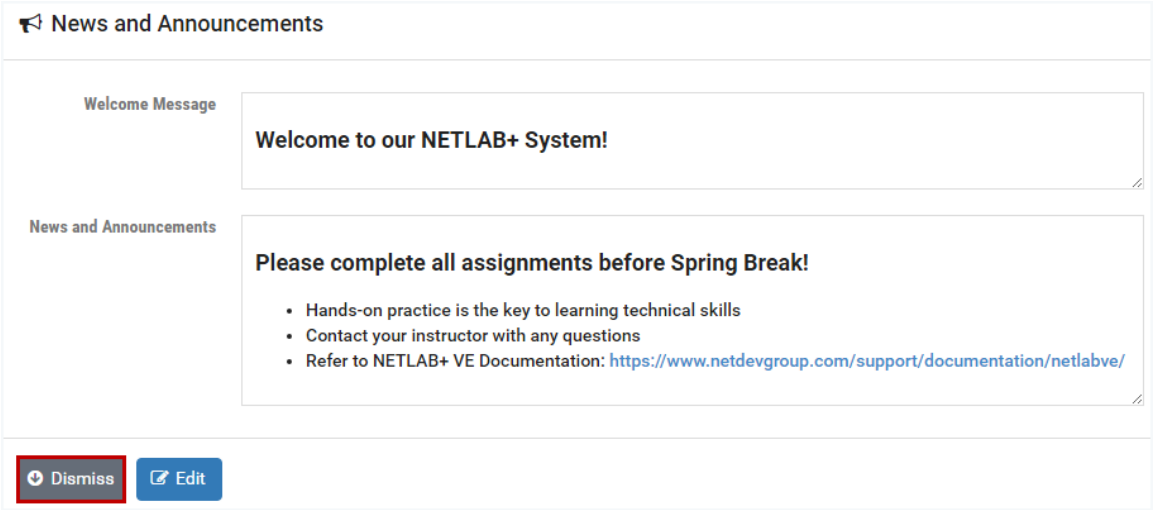
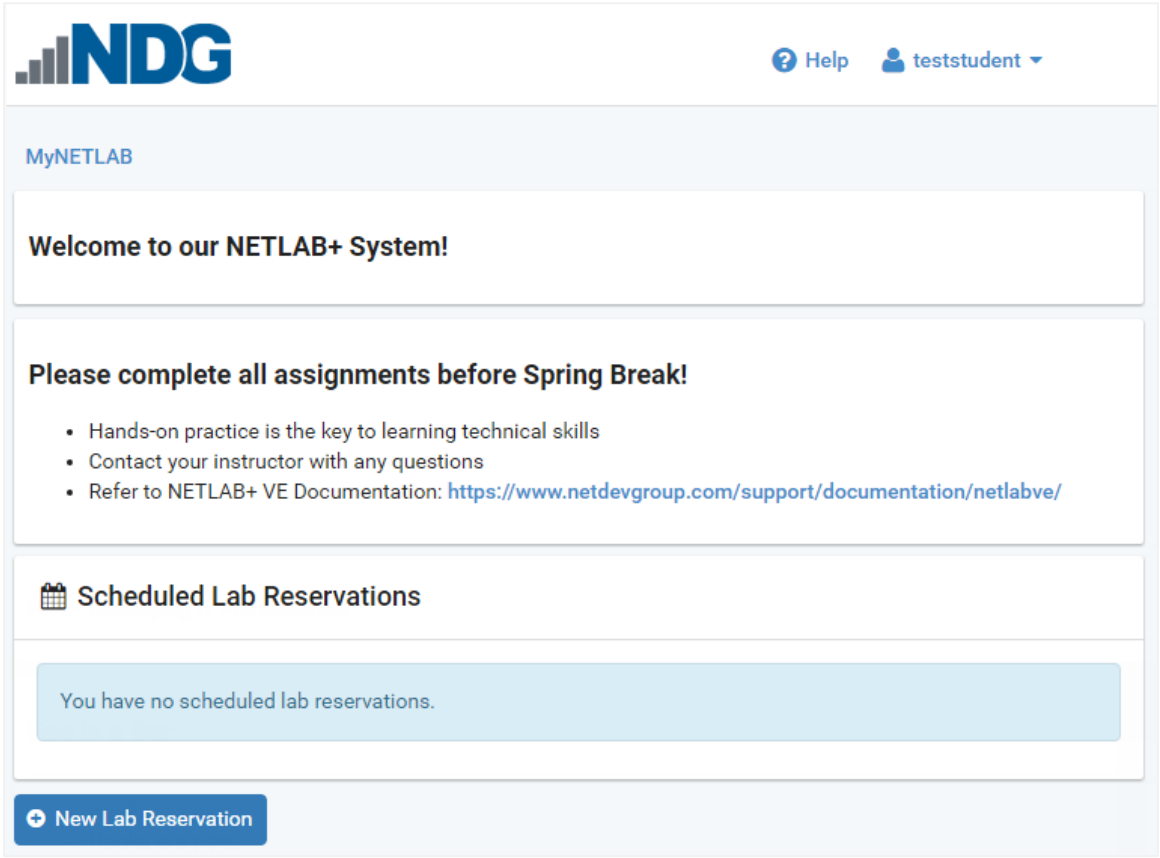
4. The News and Announcements page displays the information that has been entered. Any markdown included will be rendered as it will appear on the MyNETLAB page for all users.



5. Click **Dismiss** to return to the System Settings page. Select Home at the top-right to return to the administrator Home page.

Here, we show how the Welcome Message and the News and Announcements will be displayed when a student logs into the system.



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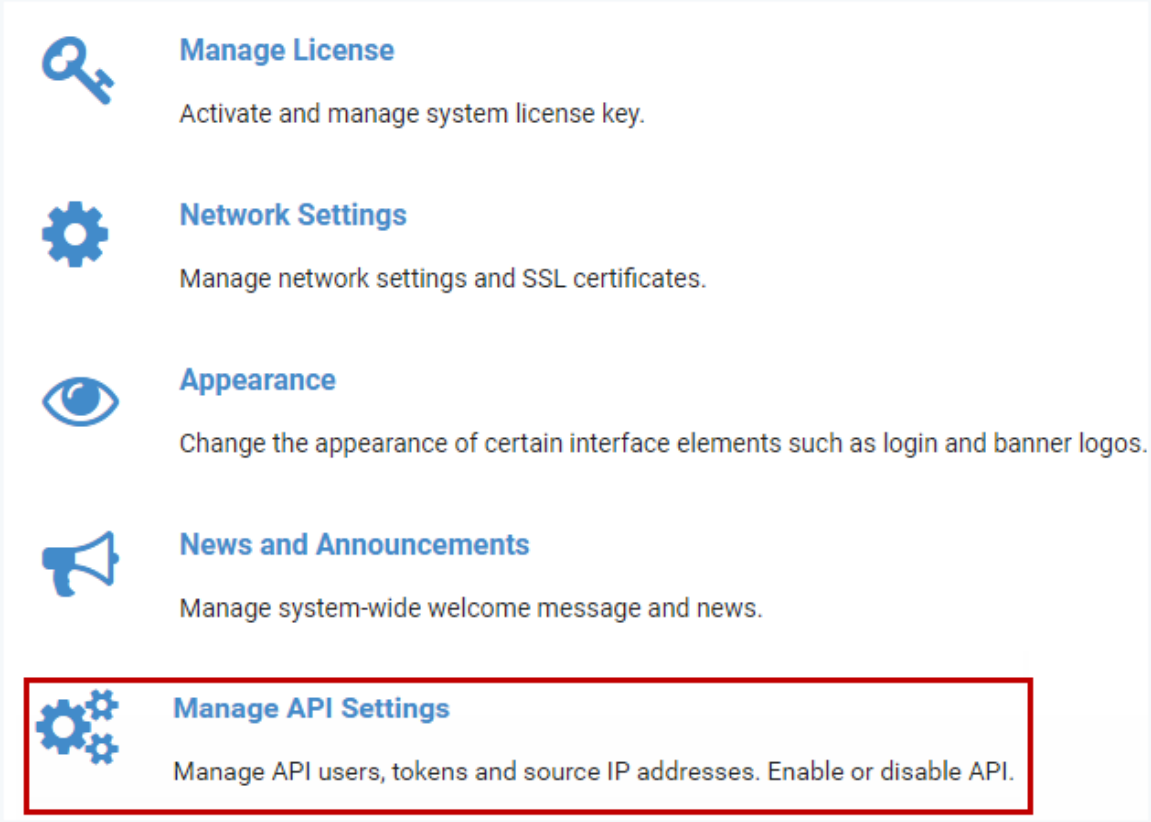
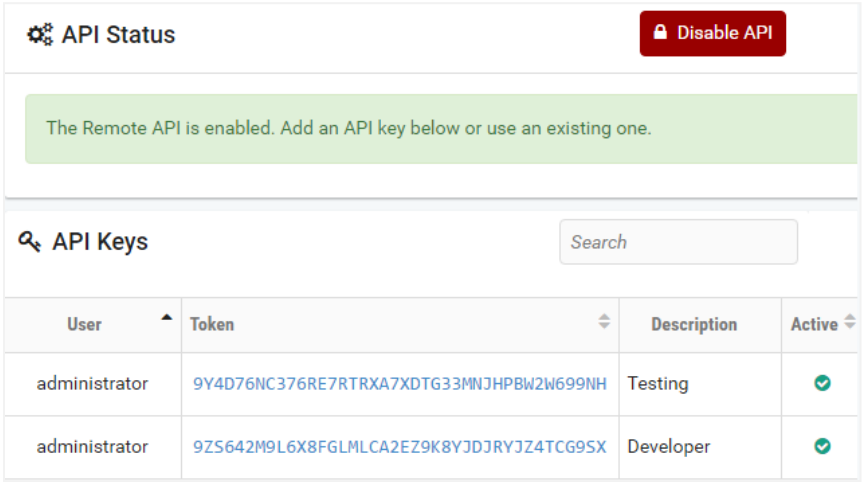
8 Manage API Settings

New to NETLAB+ is the ability to communicate with the system through APIs (Application Program Interface), allowing customers to create custom automation scripts for many of NETLAB+'s administrative functions, such as automatically adding accounts from a Learning Management System (LMS).

To view and manage API settings, select Settings from the administrator Home page, and then select **Manage API Settings.**



The API status and any existing API keys are displayed.



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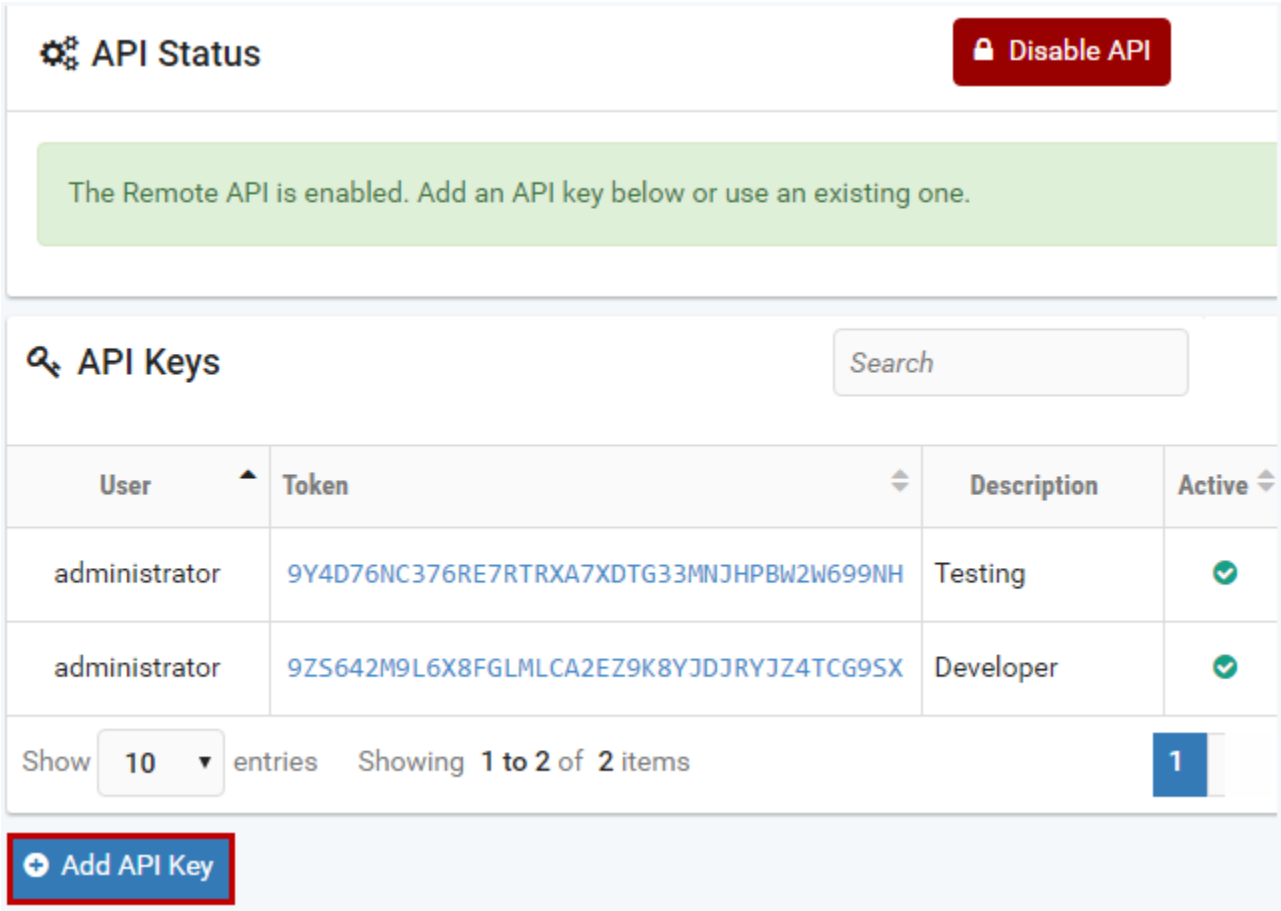
8.1 Add an API Key

API Keys are required in order to authorize other Linux machines to use automated NETLAB+ functions.

Details on the use of API keys are provided in the NETLAB+ Software Development Kit (SDK), available from NDG.

1. Select the **Add API Key** button.



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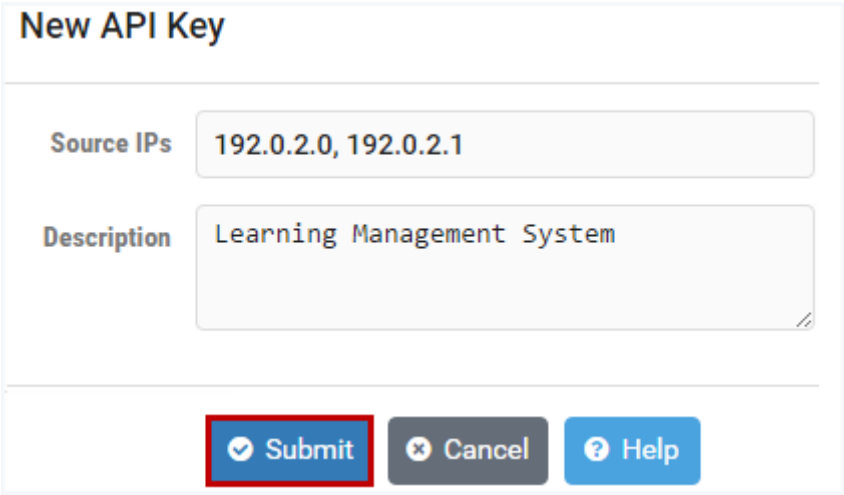
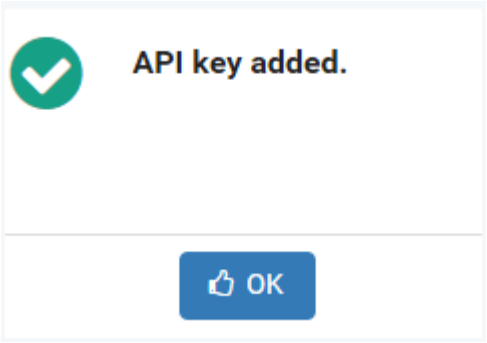
2. The New API Key page is displayed. Enter information into the fields. Refer to the field descriptions below. Click **Submit**.



Field Descriptions - New API Key

- **Source IPs:** A list of comma-separated IP addresses. Only connections from one of these IP addresses will be allowed for this API key.
- **Description:** Include a description to help identify your API key.

3. A message indicates the API key has been added. Click **OK**.



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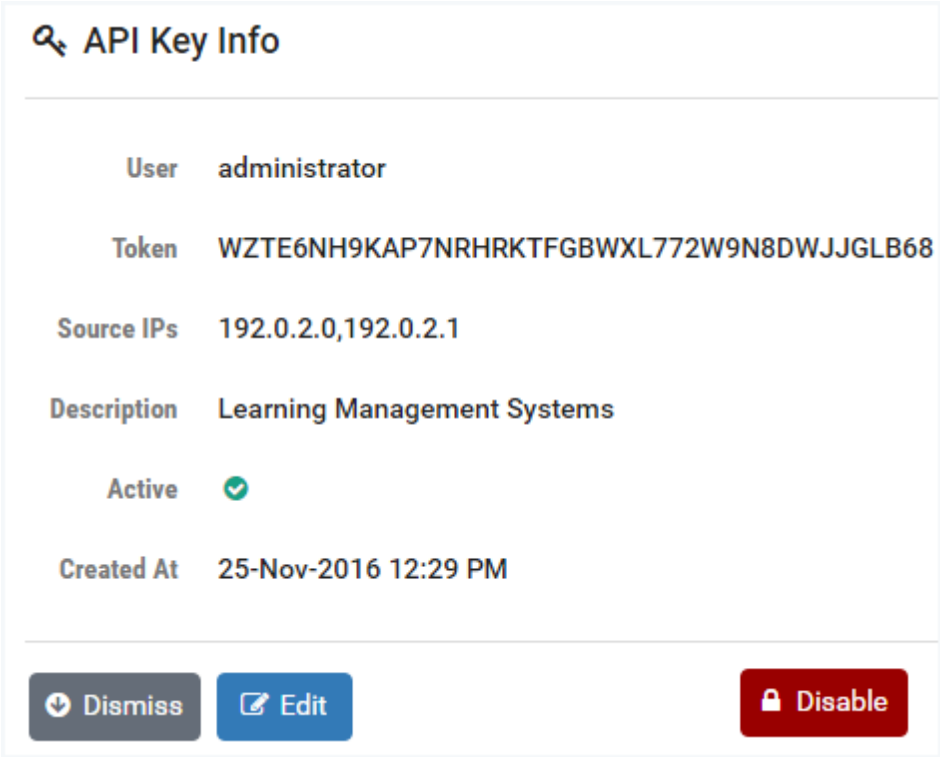
4. The API key Info page is displayed. Notice that a Token has been generated. This token will be used to authorize the machine(s) at the Source IP address(es) to use NETLAB+ functions.



5. To return to the Manage API Settings page, click Dismiss or continue to the next section to edit the API Key Info.

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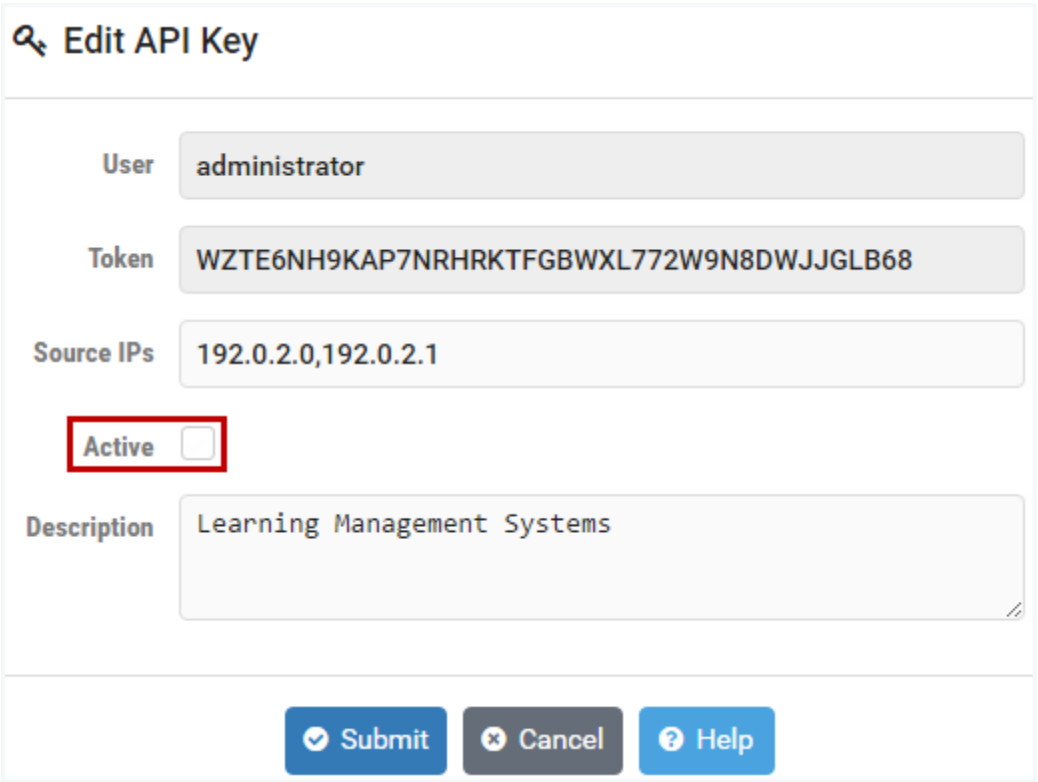
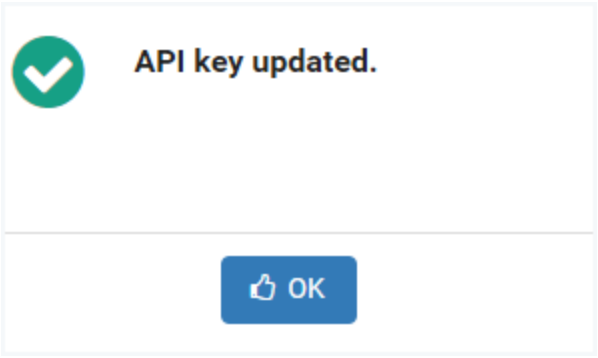
8.2 Edit an API Key

1. To edit an API key, select the Edit button on the API key Info page (see the previous section). The values for User (only the administrator is currently allowed) and Token cannot be modified. You may modify the source IPs and select/deselect the checkbox for Active to enable/disable this API key. You may modify the Description. After making any changes, click **Submit**.

In the example below, we have unchecked the Active box to disable this API.



2. A message indicates the API key has been updated. Click **OK.**



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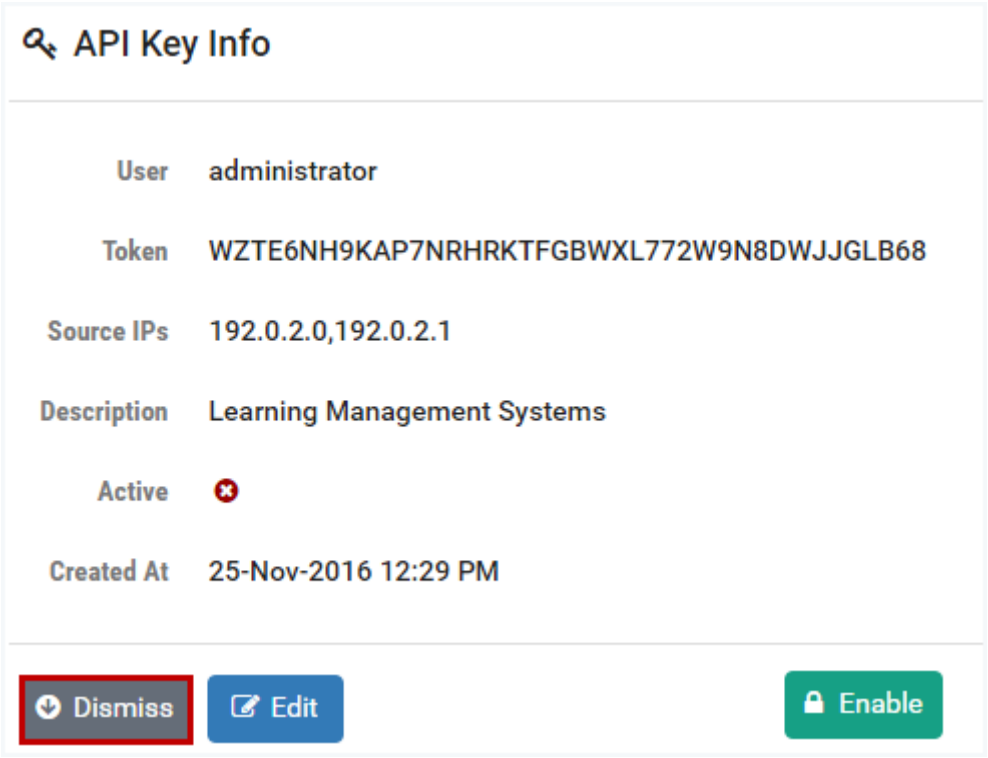
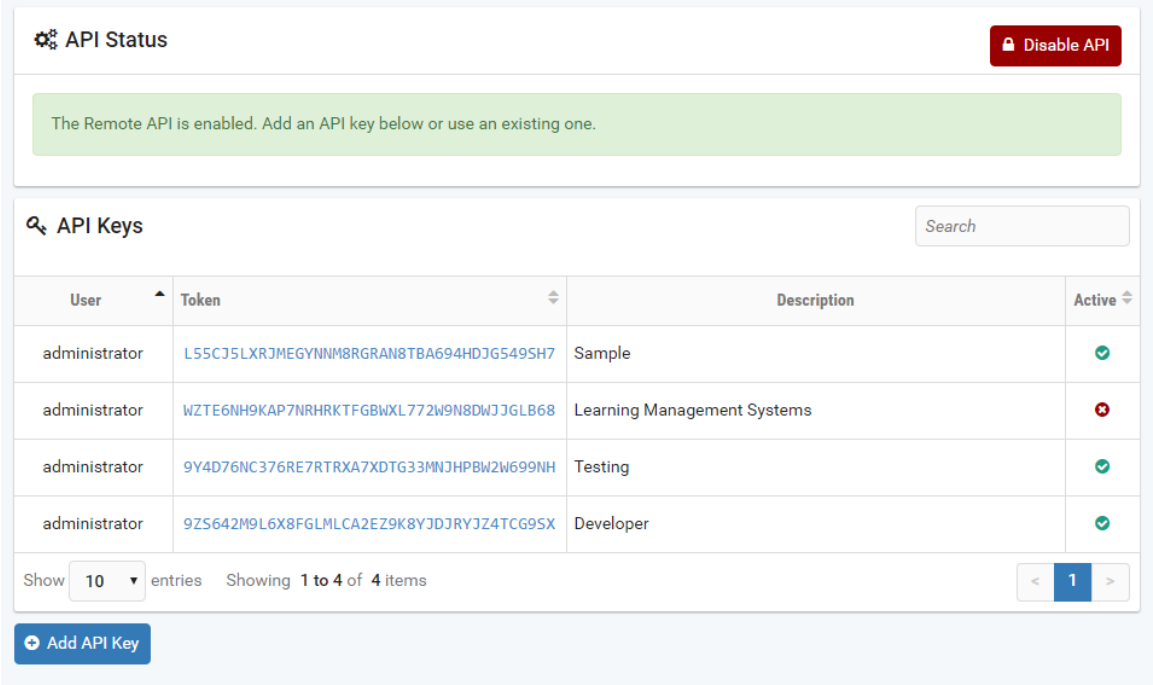
3. You will return to the API Key Info page. Notice the symbol, indicating that the key is not active. Notice that API keys can also be enabled/disabled from this page (by selecting the Enable button). Click Dismiss.



You will return to the Manage API Settings page.



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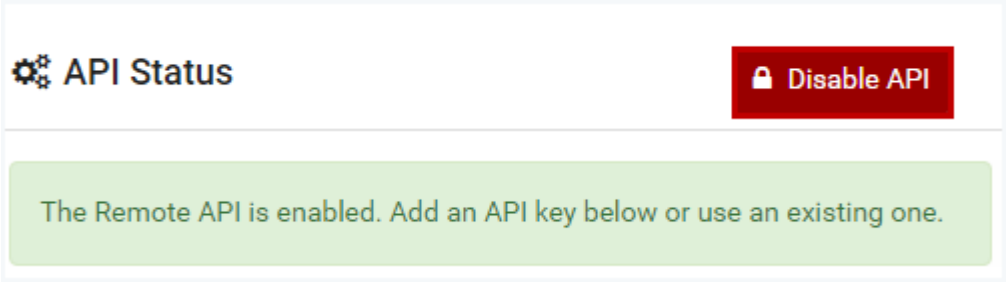
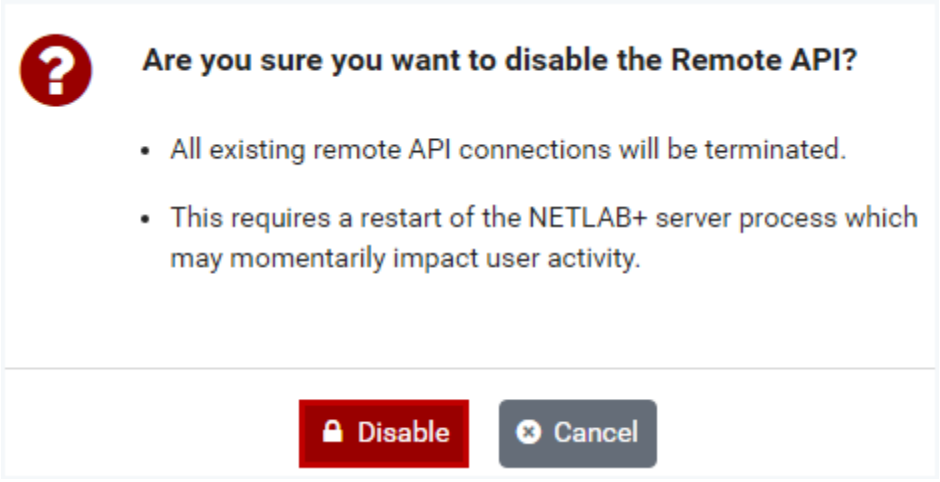
8.3 Disable API

In the previous section, we showed, as part of the edit function, how an individual API key can be disabled. In this section, we show how to disable all remote API connections.

1. To terminate all existing remote API connections, select the **Disable API** button located at the top-right of the Manage API settings page.

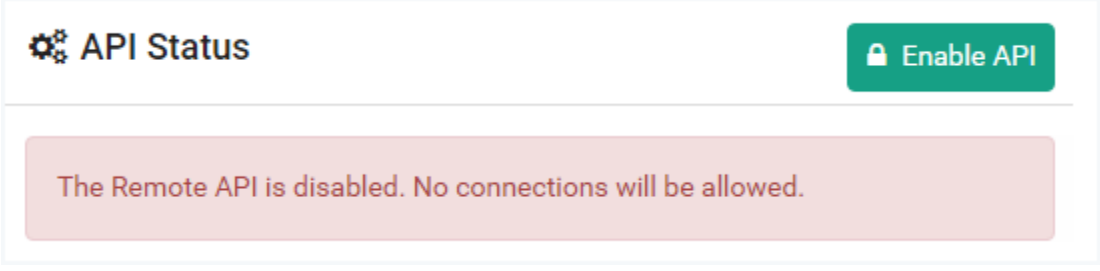


2. You will be prompted to confirm this action; click **Disable**.



Disabling API requires a restart of the NETLAB+ server process, which may briefly affect user activity.

3. The API Status now indicates that the Remote API is disabled; no connections will be allowed unless the Remote API is enabled.



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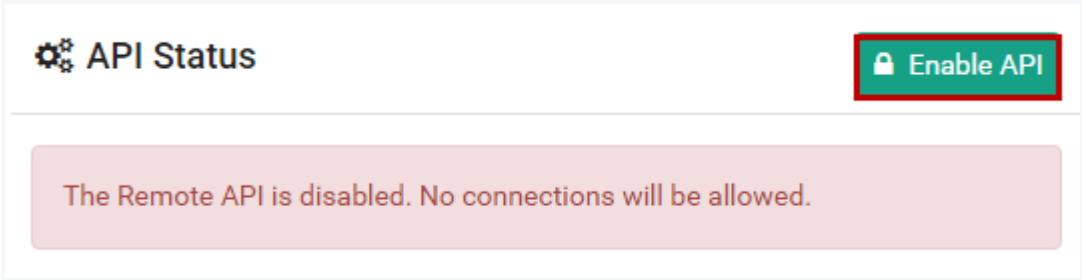
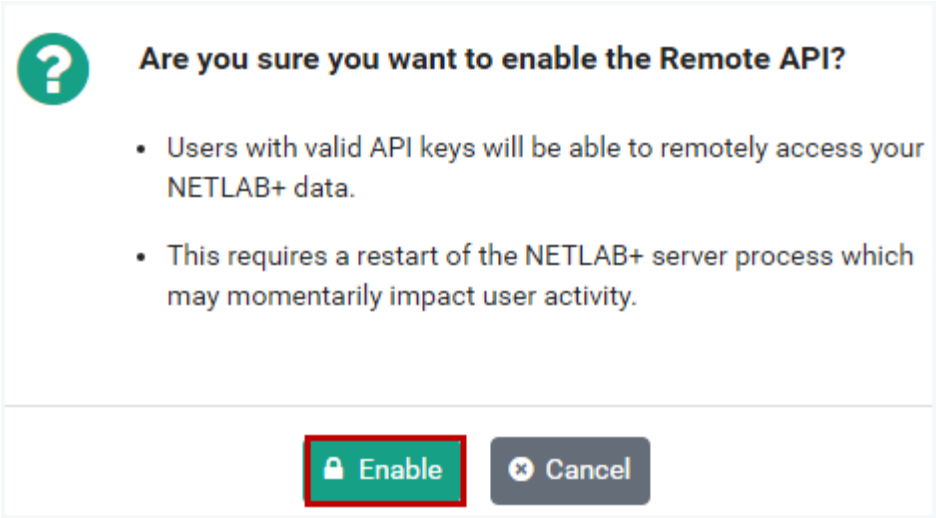
8.4 Enable API

1. To enable the remote API and all users with valid API keys to remotely access your NETLAB+ data, select the **Enable API** button, located at the top-right of the Manage API settings page.

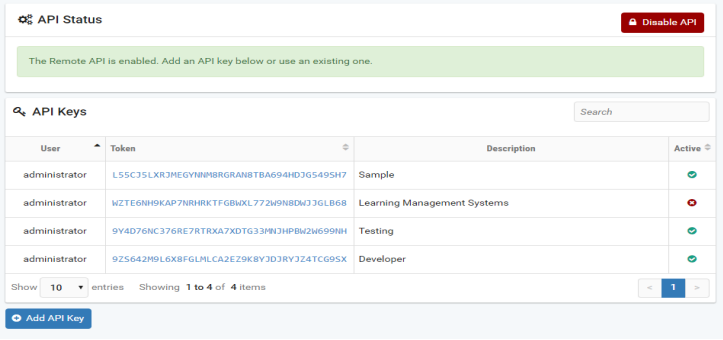


2. You will be prompted to confirm this action. Click **Enable**.



Enabling API requires a restart of the NETLAB+ server process, which may briefly affect user activity.

The API status now indicates the Remote API is enabled. Any existing API keys are displayed.



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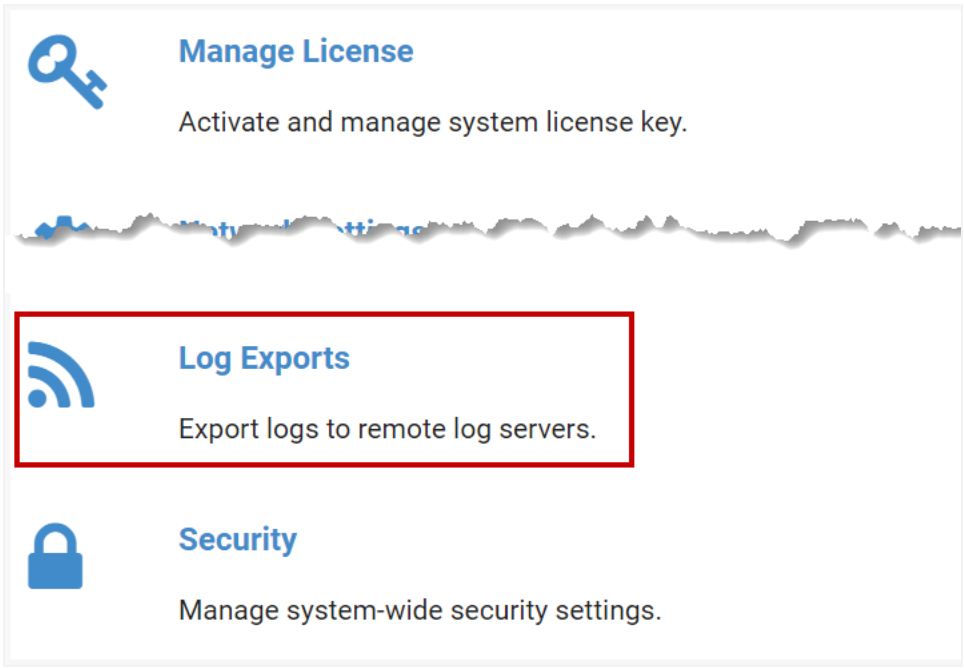
9 Log Exports

Your NETLAB+ system can be configured to export log files to the server of your choice. The Log Exports option enables you to direct the storage of log file(s) to the host(s) you select, filtered according to tags used to categorize each log record. From the administrator Home page, select **System Settings > Log Exports**.

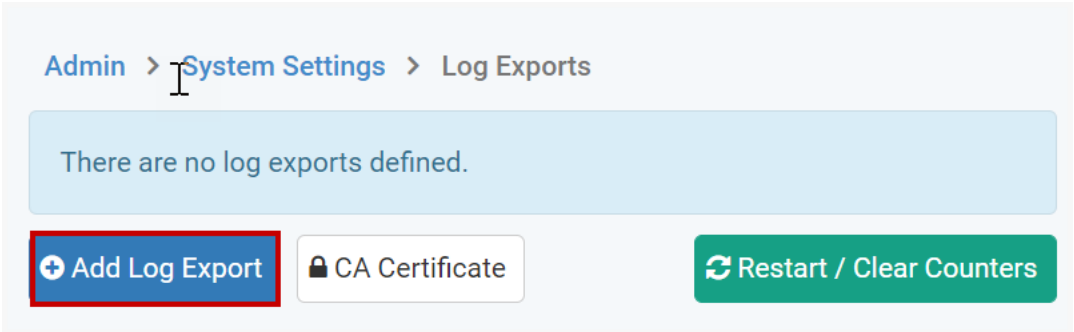


Continue on to the subsection below for instructions on adding a log export.

9.1 Add Log Export

Specify the server and the configuration details to enable NETLAB+ to maintain log files on the server(s) of your choice.

1. From the Log Exports page, select the **Add Log Export** button.



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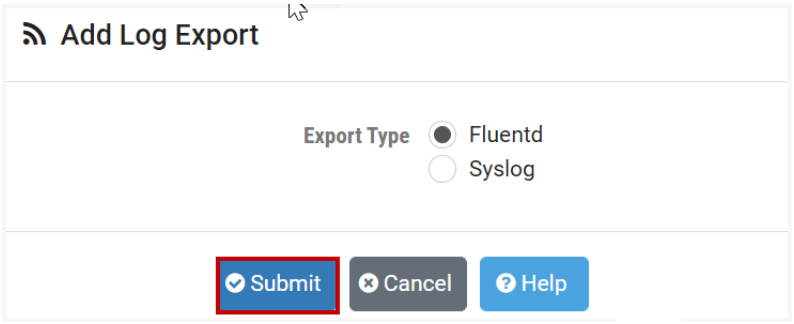
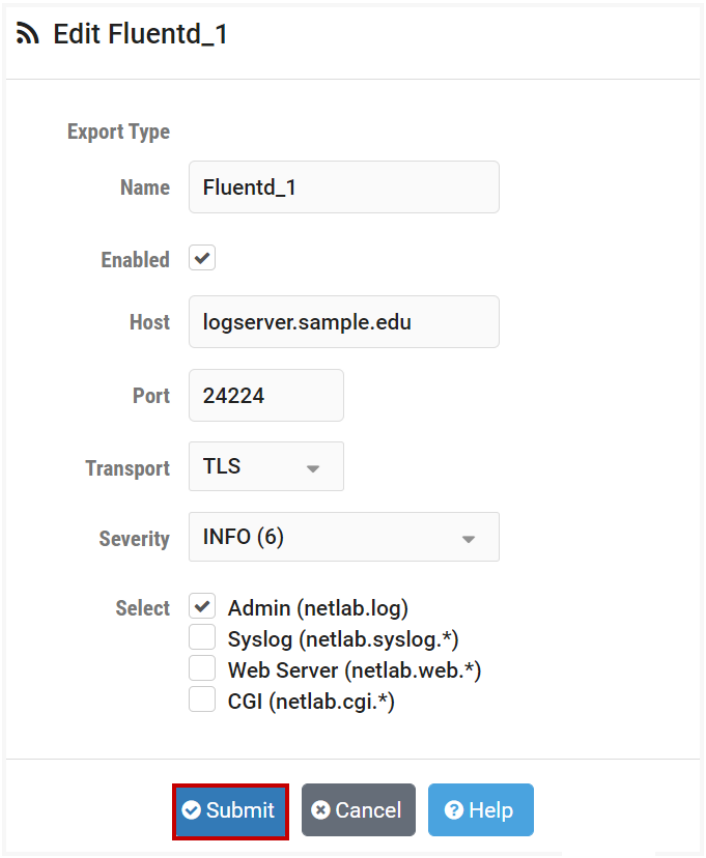
2. The **Add Log Export** page will be displayed; see the field descriptions below. For this example, we will use the **Fluentd** export type. Click **Submit**.

Fluentd is the recommended choice as the export type, since it provides structured, more detailed log entries.



3. The Add Log Export page will now display additional fields to configure. See the field descriptions below for guidance on making selections, then click **Submit**.



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Field Descriptions – Add Log Export

- **Export Type:** Choose the type of file to be exported.
  - **Fluentd:** Export structured log records to a remote Fluentd or Fluentbit (open source data collectors) server. Choosing this format provides detailed, structured data and is, therefore, the recommended choice.
  - **Syslog:** Export unstructured log records to a remote Syslog server in RF5424 format. This option gives a more limited amount of data, with records including just the basics - date/time plus the log message.

- **Name:** The identifier name of the export must be unique and must start with an ASCII letter. The name can contain ASCII letters, numbers, and underscores.

- **Enabled:** Use to temporarily enable or disable this log export target.

- **Host:** The IP address or fully qualified hostname or the remote log server.

- **Port**: The TCP or UDP port number that the remote log server is listening on.

- **Transport**: The desired transport protocol. Choose either TCP, UDP, or the TLS option, which enables TCP with TLS encryption.

- **Severity:** The logging verbosity level. Values are cumulative, e.g., a setting of WARNING(4) also includes ERROR(3), FATAL(2), and ALERT(1).

  For security reasons, records with a severity level DEBUG(7), TRACE(8), and TRACE(9) are for debugging only and cannot be exported.

- **Select:** Check the appropriate box(es) to indicate the types of records to be exported. Each log entry has a tag. Select one or more tags to filter the records written to the file.

  Service logs (with tag netlab.service.*) are for debugging only and cannot be exported, for security reasons.

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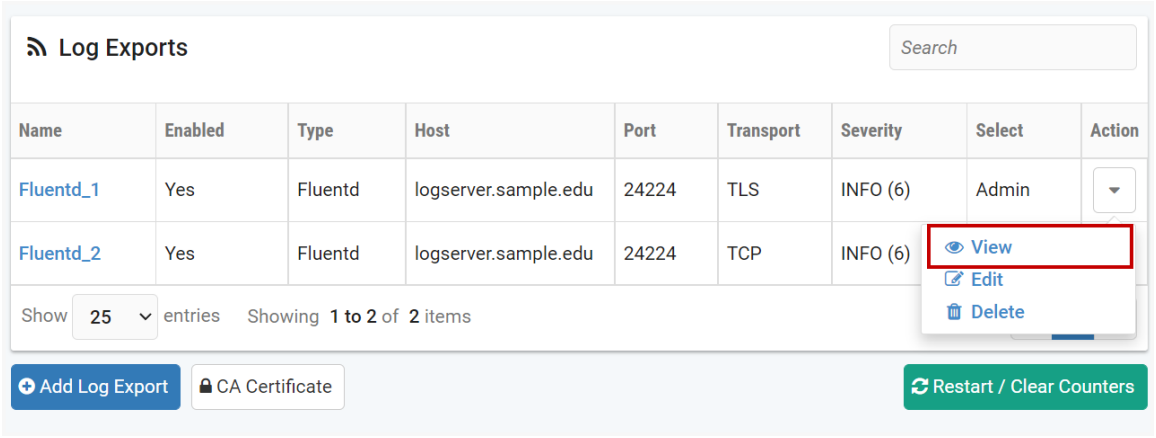
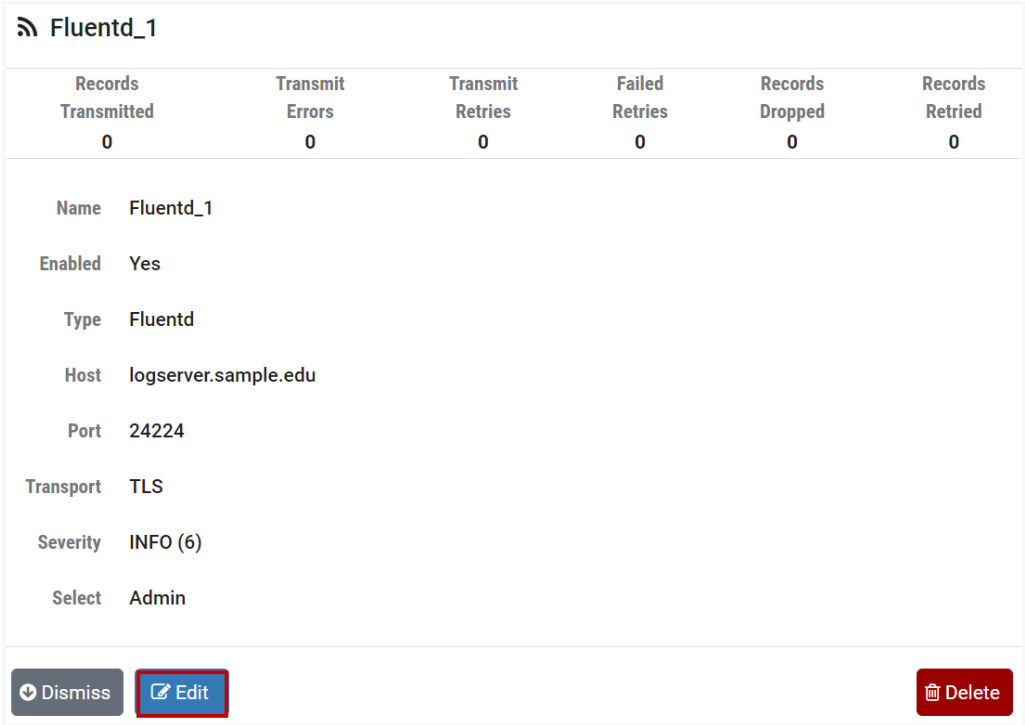
9.2 View and Edit Log Exports

All log exports that have been configured are listed on the Log Exports page.

1. To view the settings of a log export, select the Action dropdown button on the row and select **View**.



2. Details of the log export configuration will be displayed. To modify any of the values, select **Edit**.



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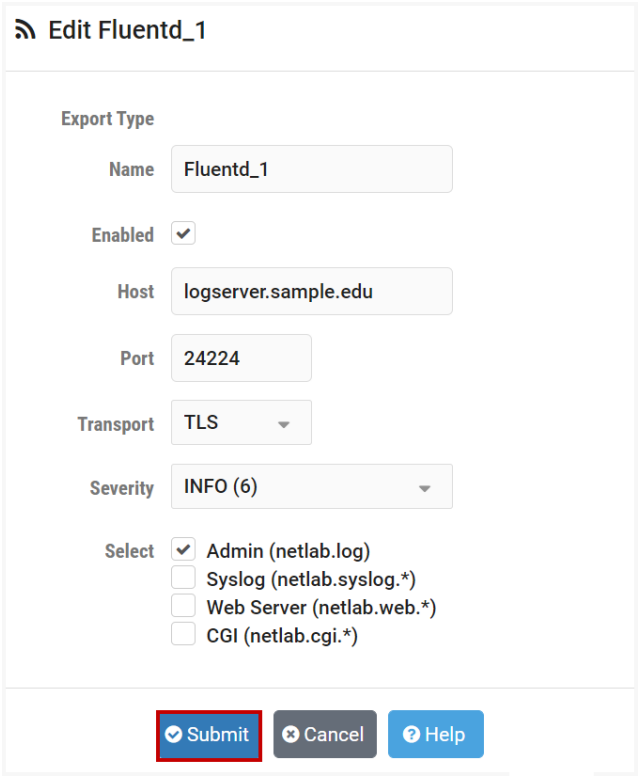
3. Edit the fields as desired (see field descriptions in the previous section), and then click **Submit**.

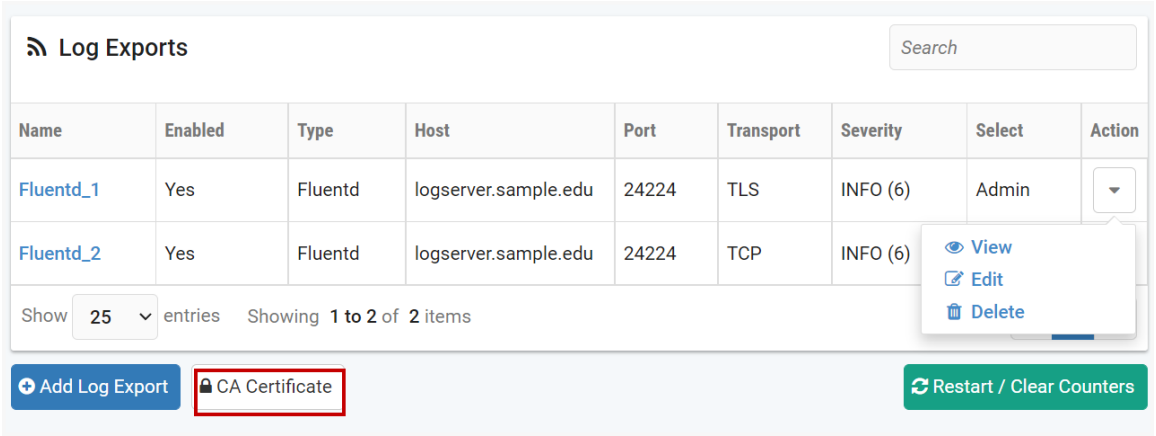


9.3 Certificate for TLS Encryption

REVISIONS PENDING: We discussed adding examples to this section.

If you have chosen the TLS option as the desired transport protocol (see the first record in the image below) for your exported log(s), you may need a CA Certificate to complete the configuration process on your server. Follow the steps below to view the certificate.

1. On the Log Exports page, select the **CA Certificate** button.



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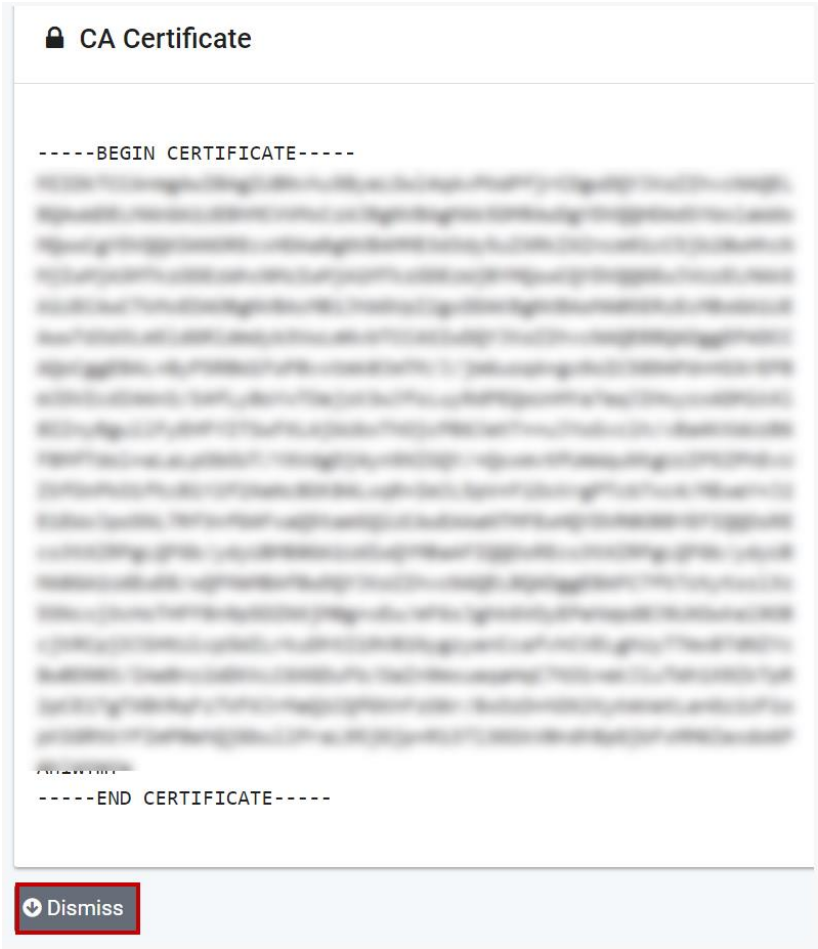
2. The CA Certificate is displayed. Use this CA certificate to configure your Fluentd or Rsyslog log servers with TLS. Click **Dismiss**.



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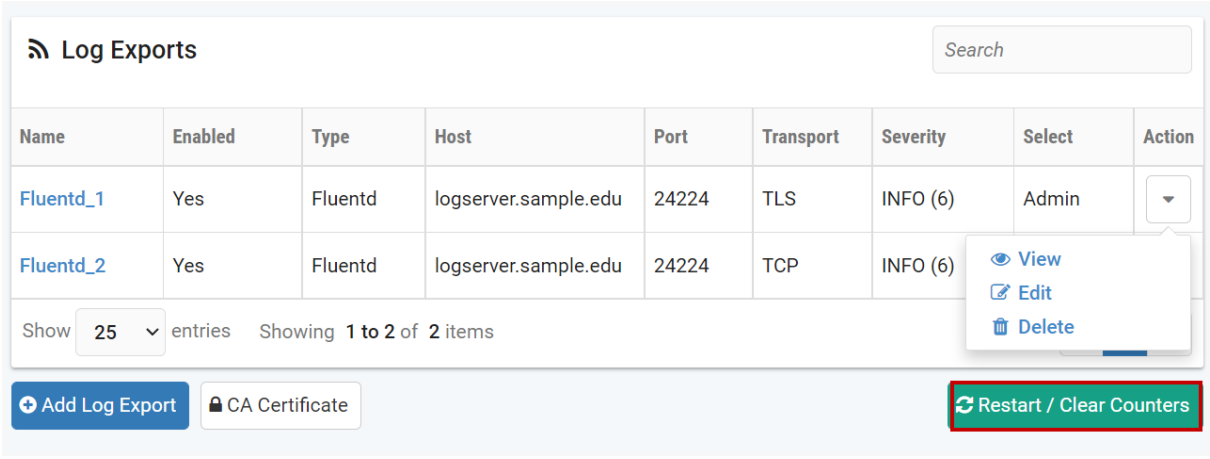
9.4 Restart / Clear Counters

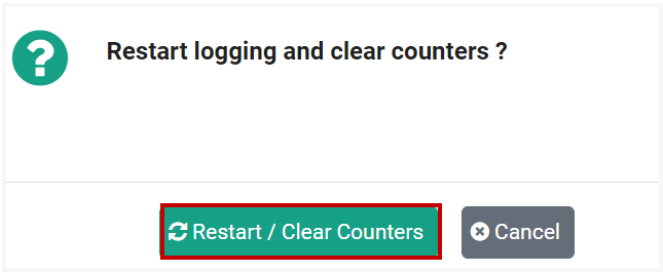
The counters maintained by the log exports can be reset to zero.

Resetting the counters to zero can be helpful following troubleshooting/problem resolution.

1. On the Log Export page, select the option to **Restart/Clear Counters**.



2. You will be prompted to confirm; select **Restart / Clear Counters**.



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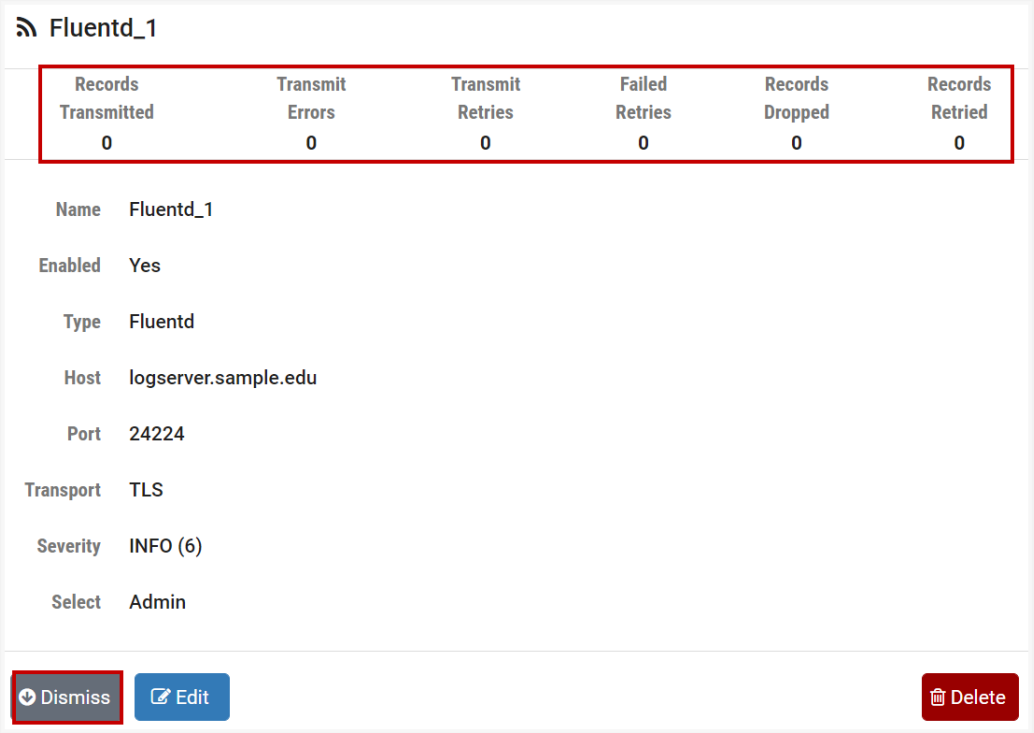
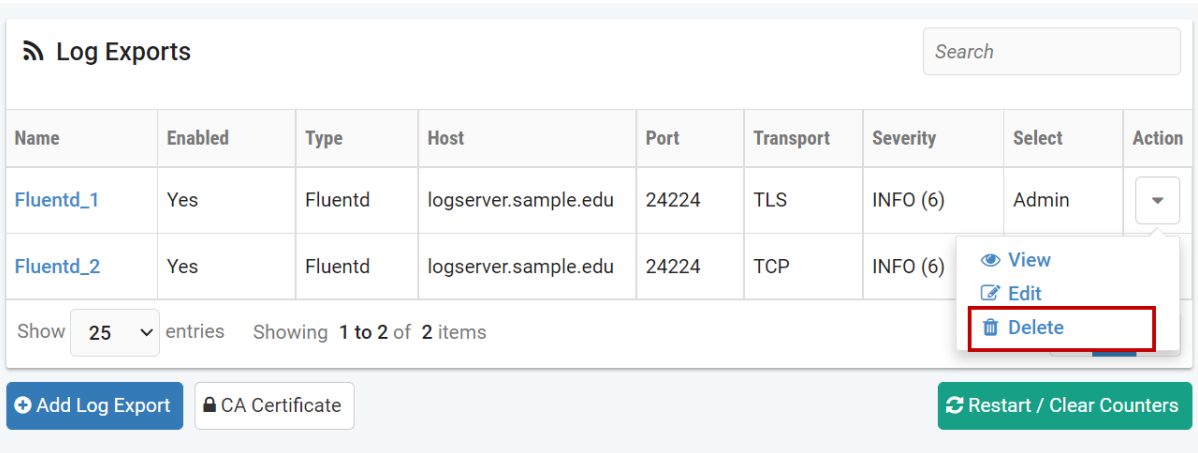
3. View any of the log exports to see the counters have been reset to zero, and click **Dismiss.**



9.5 Delete Log Export

1. To delete a log export record, select the Action dropdown button on the row and select **Delete**.



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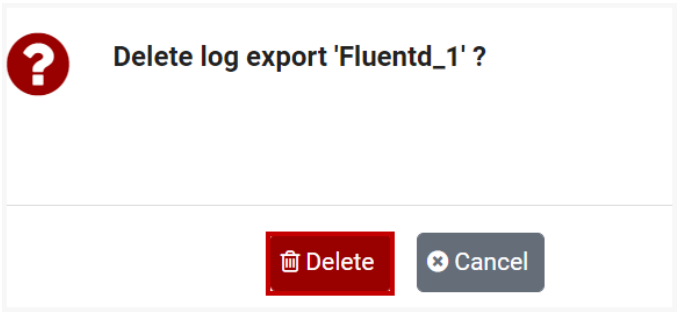
2. Select **Delete** to confirm.



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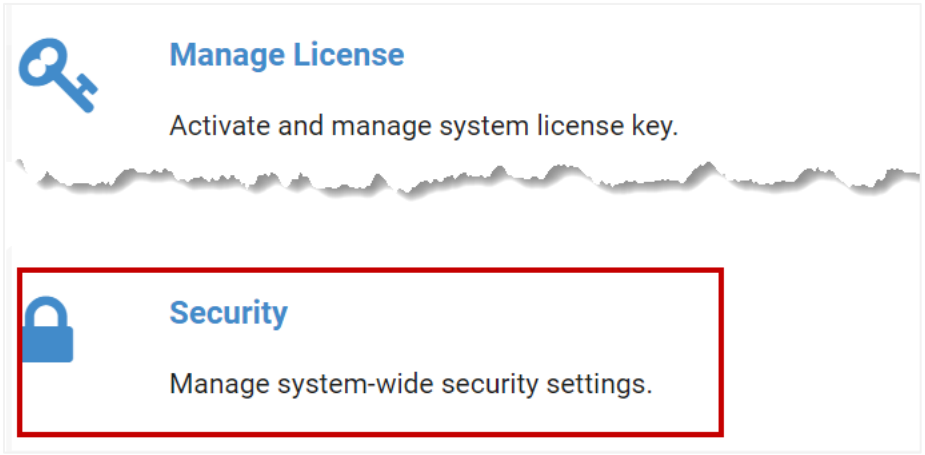
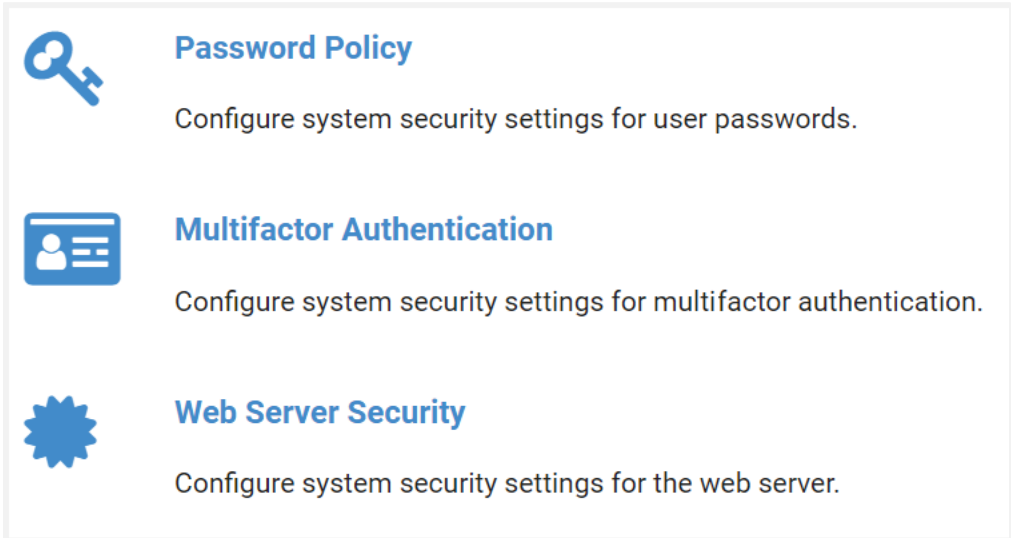
10 Security

To manage system-wide security settings, select **System Settings > Security**.



Security options shown include Password Policy, Multifactor Authentication, and Web Server Security. We will explore these in the subsections below.



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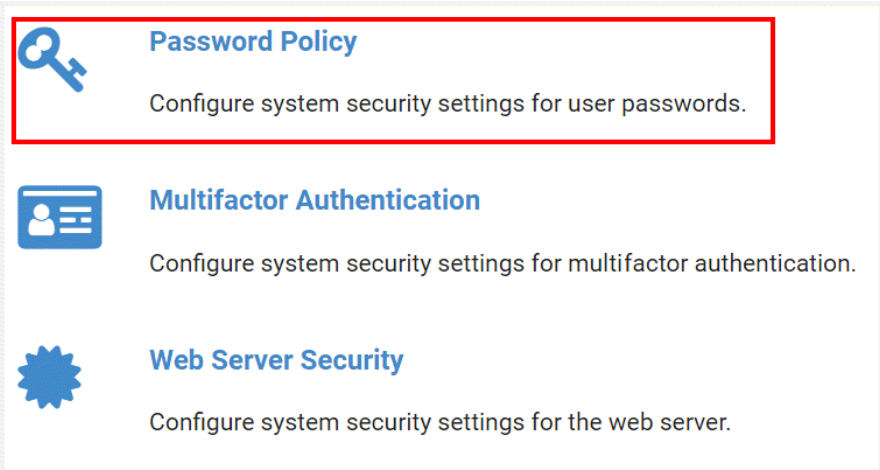
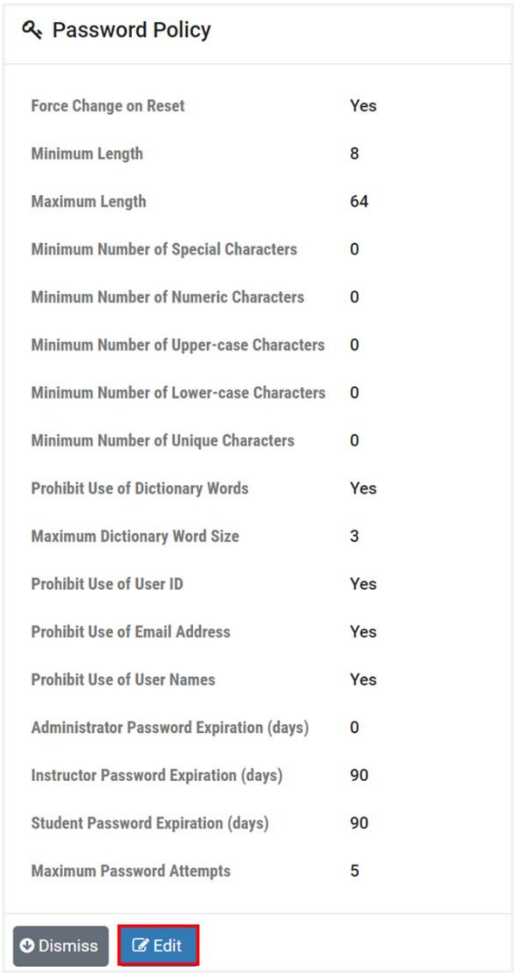
10.1 Password Policy

You may customize the password policy settings to meet the requirements of your organization. Follow the steps below to view and edit the settings.

1. From the Security page, select **Password Policy.**



2. The Password Policy page will be displayed. To edit the settings, select **Edit**.



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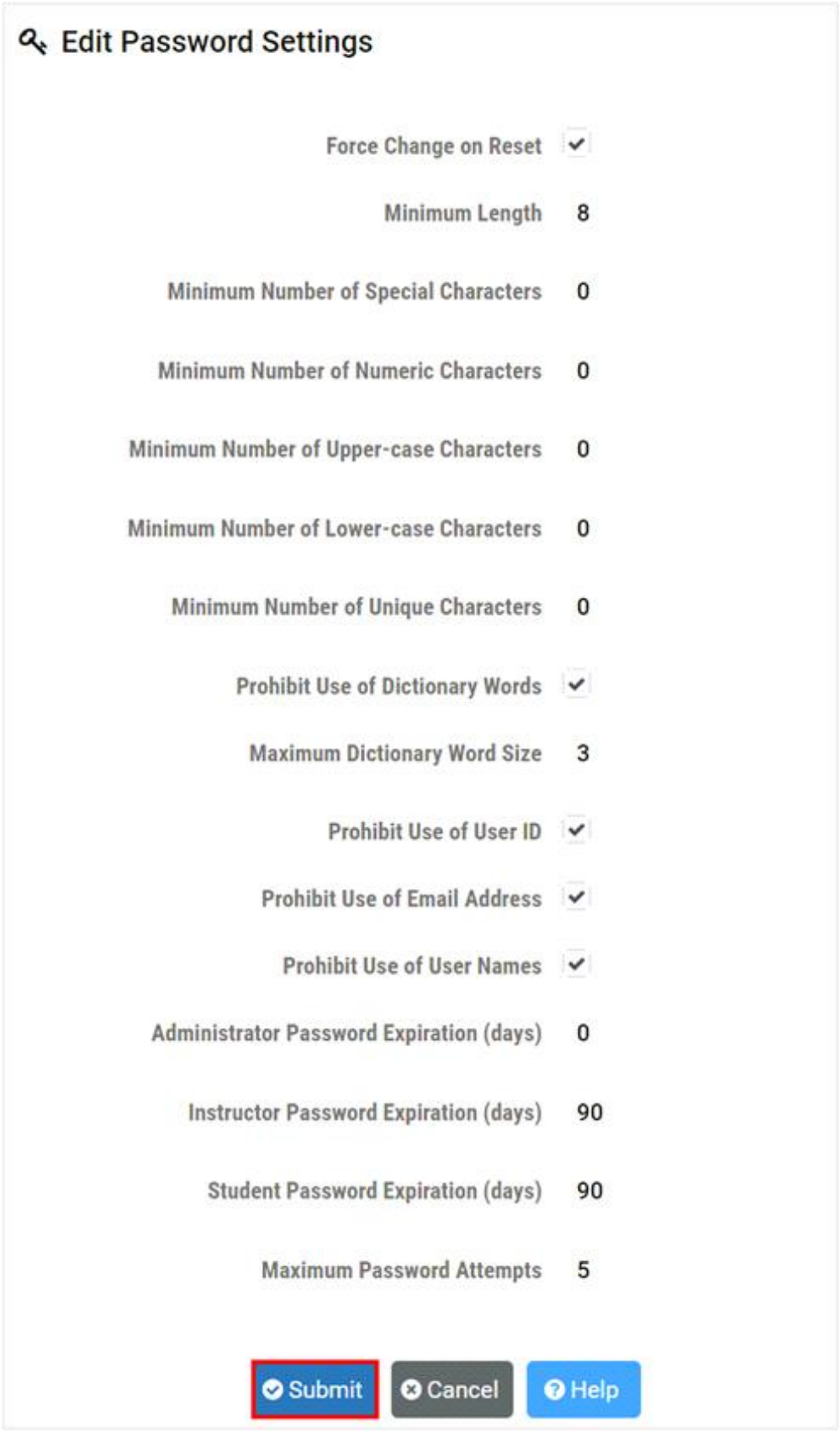
3. The Edit Password settings page is shown. See the field descriptions below for guidance on making your selections for these settings, and then click **Submit**.



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Field Descriptions – Edit Password Settings

- **Force Change on Reset**: If true (checked), users will be required to CHANGE their password upon their next login, after it has been set/reset by another user (such as the administrator or lead instructor). This value is true by default, and changing it should be avoided if at all possible.

- **Minimum Length:** The minimum number of characters required in a valid password.

- **Minimum Number of Special Characters:** The minimum number of special characters required in a valid password.

- **Minimum Number of Numeric Characters**: The minimum number of numeric characters required in a valid password.

- **Minimum Number of Upper-case Characters**: The minimum number of upper-case characters required in a valid password.

- **Minimum Number of Lower-case Characters** The minimum number of lower-case characters required in a valid password.

- **Minimum Number of Unique Characters**: The minimum number of unique characters required in a valid password.

- **Prohibit Use of Dictionary Words** If true (checked), valid user passwords may not contain any common English dictionary words with a number of characters more than or equal to the value specified for Maximum Dictionary Word Size.

- **Maximum Dictionary Word Size:** The maximum size, in characters, of common English dictionary words that a valid password may contain.

- **Prohibit Use of User ID:** If true (checked), valid user passwords may not contain the user's ID.

- **Prohibit Use of Email Address:** If true (checked), valid user passwords may not contain the user's email address.

- **Prohibit Use of User Names**: If true (checked), valid user passwords may not contain any of the user's names.

- **Administrator Password Expiration (days):** The number of days an administrator account password can exist before it must be changed. A value of 0 disables the expiration of administrator passwords.

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- **Instructor Password Expiration (days):** The number of days an instructor account password can exist before it must be changed. A value of 0 disables the expiration of instructor passwords.

- **Student Password Expiration (days):** The number of days an student account password can exist before it must be changed. A value of 0 disables the expiration of student passwords.

- **Maximum Password Attempts:** The maximum number of failed password attempts allowed before a user is locked out of their account.

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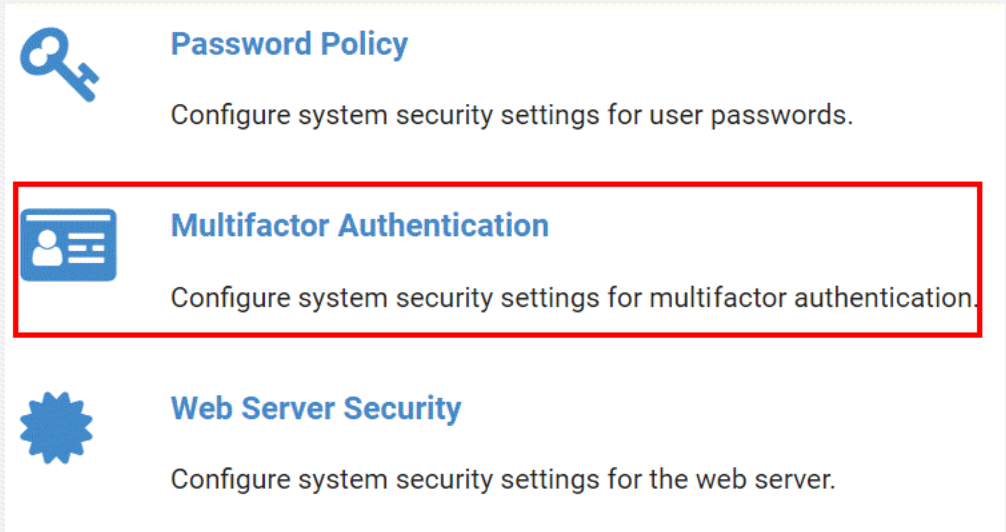
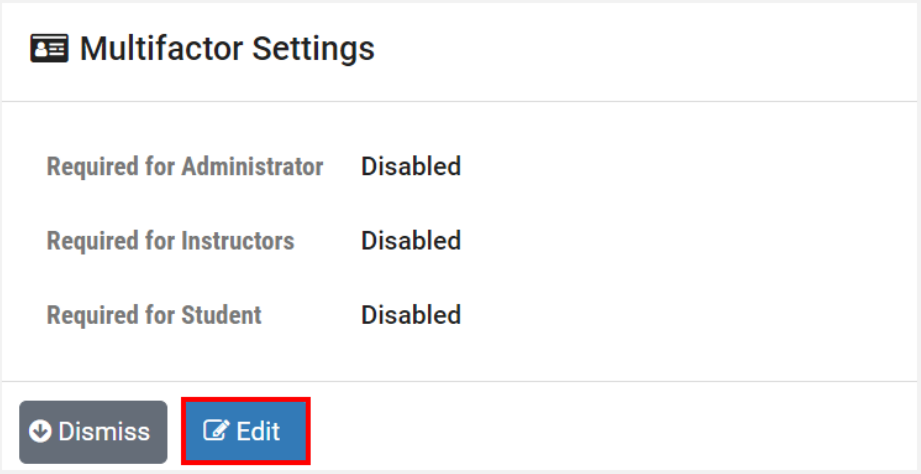
10.2 Multifactor Authentication

NETLAB+ supports multifactor authentication (MFA). MFA requirements are set through the NETLAB+ administrator interface for the administrator, instructors, and students. In this section, we will show how to configure system security settings for multifactor authentication.

1. From the Security page, select **Multifactor Authentication.**



2. The Multifactor Settings page will be displayed; select **Edit** to modify the settings.



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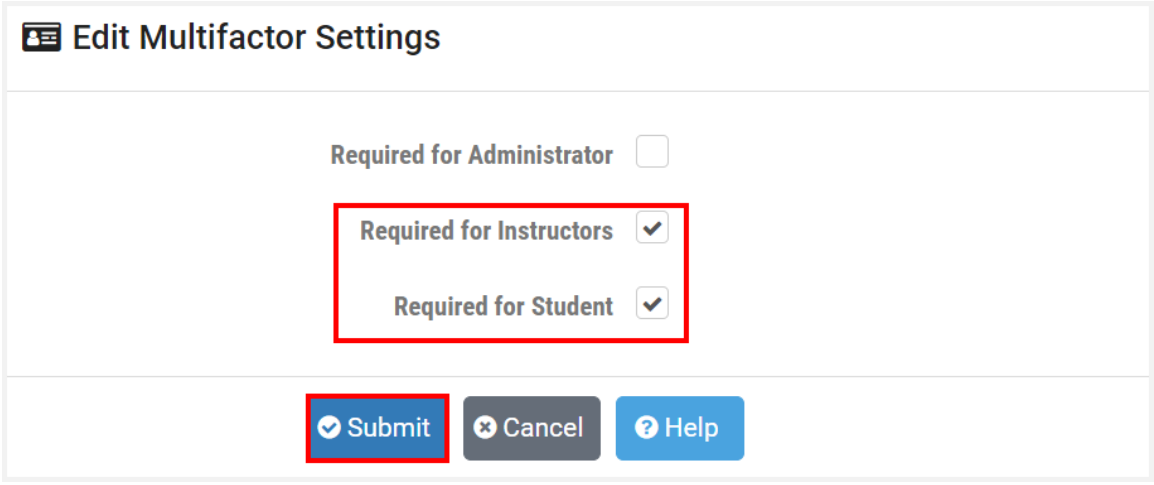
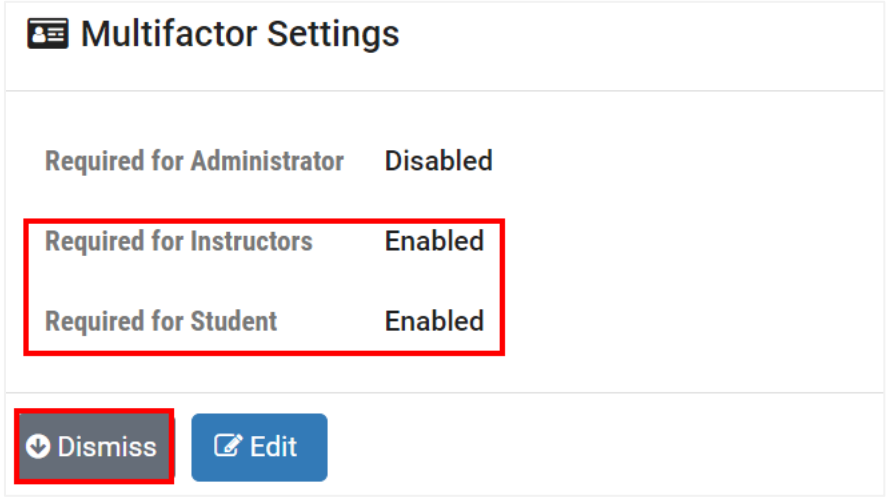
3. On the Edit Multifactor Settings page, select the checkbox(es) for which MFA requirements will be applied and then press **Submit**. In the example below, MFA will be required for students and instructors but not for the administrator.



4. The Multifactor Settings page now shows that multifactor authentication requirements are enabled for instructors and students. Click **Dismiss**.



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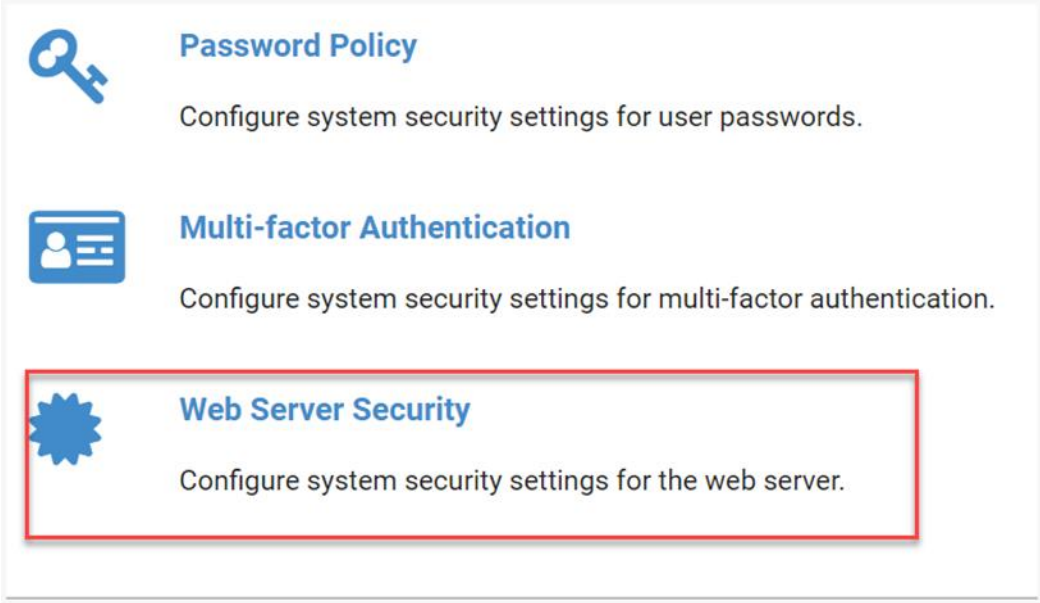
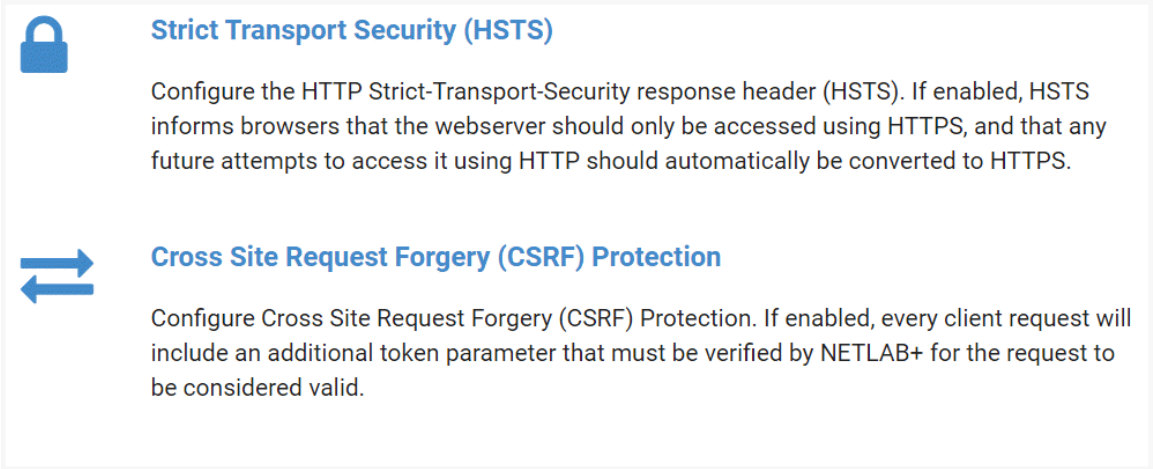
10.3 Web Server Security

To configure the web server security settings, select **Security > Web Server Security.**



The web server security options include Strict Transport Security (HSTS) and Cross Site Request Forgery (CSRF) Protection. We will describe these options in the subsections below.



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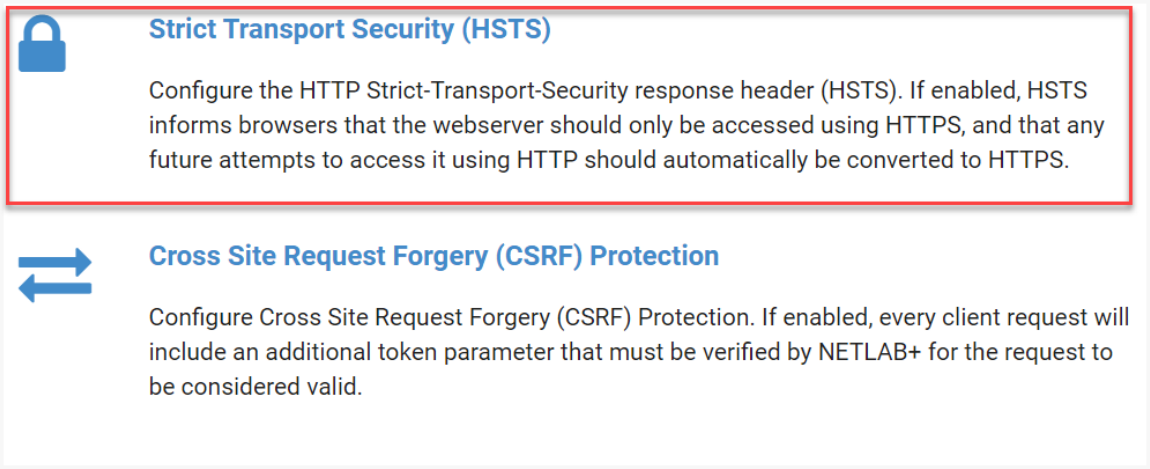
10.3.1 Strict Transport Security (HSTS)

Follow the steps below to configure Cross Site Request Forgery (CSRF) Protection. If enabled, every client request will include an additional token parameter that must be verified by NETLAB+ for the request to be considered valid.

1. Go to **Security > Web Server Security**.
2. Select **Strict Transport Security (HSTS)** to configure the HTTP Strict-Transport-Security response header (HSTS).



3. The **Strict-Transport-Security (HSTS)** page will be displayed, allowing you to enable/disable HSTS.

If enabled, HTTP Strict-Transport-Security response header (HSTS) informs browsers that the site should only be accessed using HTTPS, and that any future attempts to access it using HTTP should automatically be converted to HTTPS. Please refer to the subsection below for a detailed description of HSTS.

If your SSL certificate becomes invalid (including Let's Encrypt), HSTS can lock users out of the web interface, including the administrator.

- If HSTS is enabled, the administrator must be vigilant in maintaining a valid SSL certificate at all times.
- A menu option in the virtual machine system console is provided to disable HSTS if the administrator becomes locked out of the web interface (see *Recover from HSTS Lockout*).

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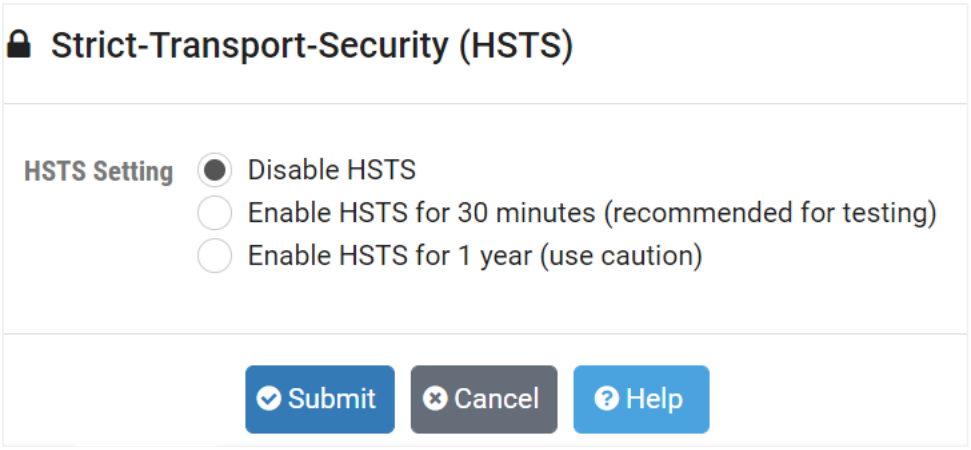

10.3.1.1 Overview of HSTS

HTTP Strict Transport Security (HSTS) is a policy mechanism that helps to protect websites against man-in-the-middle attacks such as protocol downgrade attacks and cookie hijacking. It allows web servers to declare that web browsers (or other complying user agents) should automatically interact with it using only HTTPS connections, which provide Transport Layer Security (TLS/SSL), unlike the insecure HTTP used alone.
The HSTS Policy is communicated by the server to the user agent via an HTTP response header field named "Strict-Transport-Security". HSTS Policy specifies a period of time during which the user agent should only access the server in a secure fashion. Websites using HSTS often do not accept clear text HTTP, either by rejecting connections over HTTP or systematically redirecting users to HTTPS (though this is not required by the specification).

The protection only applies after a user has visited the site at least once, relying on the principle of Trust on first use. The way this protection works is that a user entering or selecting a URL to the site that specifies HTTP, will automatically upgrade to HTTPS, without making an HTTP request, which prevents the HTTP man-in-the-middle attack from occurring.

NETLAB+ automatically forwards HTTP requests on port 80 to HTTPS on port 443 (except for Let's Encrypt verification requests), so it is not technically necessary to enable HSTS. However, many security reporting tools will complain if HSTS is not enabled.

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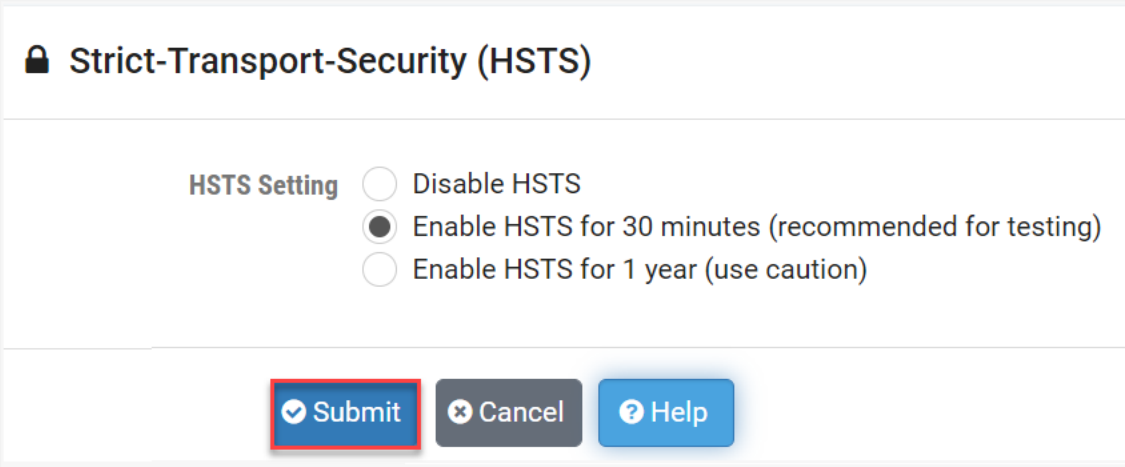
10.3.1.2 Enable HSTS

If enabled, HSTS informs browsers that the web server should only be accessed using HTTPS, and that any future attempts to access it using HTTP should automatically be converted to HTTPS.

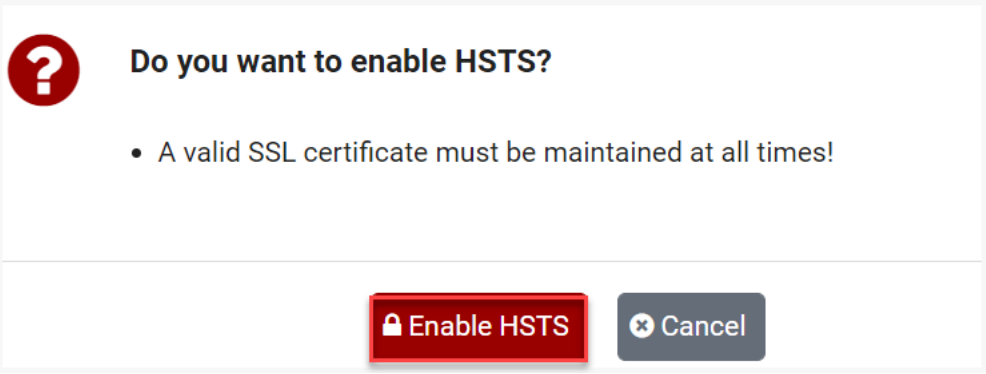
1. On the Strict-Transport-Security (HSTS) page, select the option to **Enable HSTS for 30 minutes**.

> Choosing the 30-minute option initially is recommended, as it will allow you time to test access to your NETLAB+ system and ensure the setting yielded desirable results, while alleviating concerns of getting locked out of the system.



2. Click the button to confirm that you want to **Enable HSTS**.

> NETLAB+ will refuse to enable HSTS if the active SSL certificate is not valid, as this would surely lead to lockout from the web interface. This includes the default self-signed SSL certificate or any expired SSL certificate.



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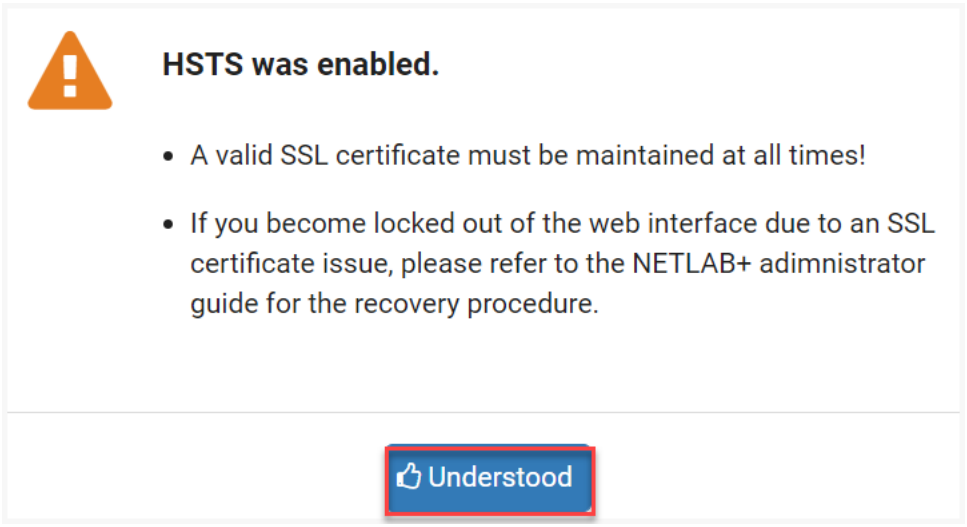
3. Click **Understood**.



4. After testing, you may, at your discretion, follow these steps once again, this time choosing the option to **Enable HSTS for one year**.

10.3.1.3 HSTS Lockout

If your SSL certificate becomes invalid while HSTS is enabled, users may become locked out of the NETLAB+ web interface with an error message from the browser, similar to the image below. This includes the administrator!

See the next section for instructions on recovering from HSTS lockout.

To prevent this situation, the administrator must be vigilant in maintaining a valid SSL certificate at all times, even if using Let's Encrypt. The expiration date of your active SSL certificate is displayed on the administrator home page. Always renew your certificates well in advance of the expiration date. If using Let's Encrypt, the certificate should auto-renew about 60 days prior to expiration.

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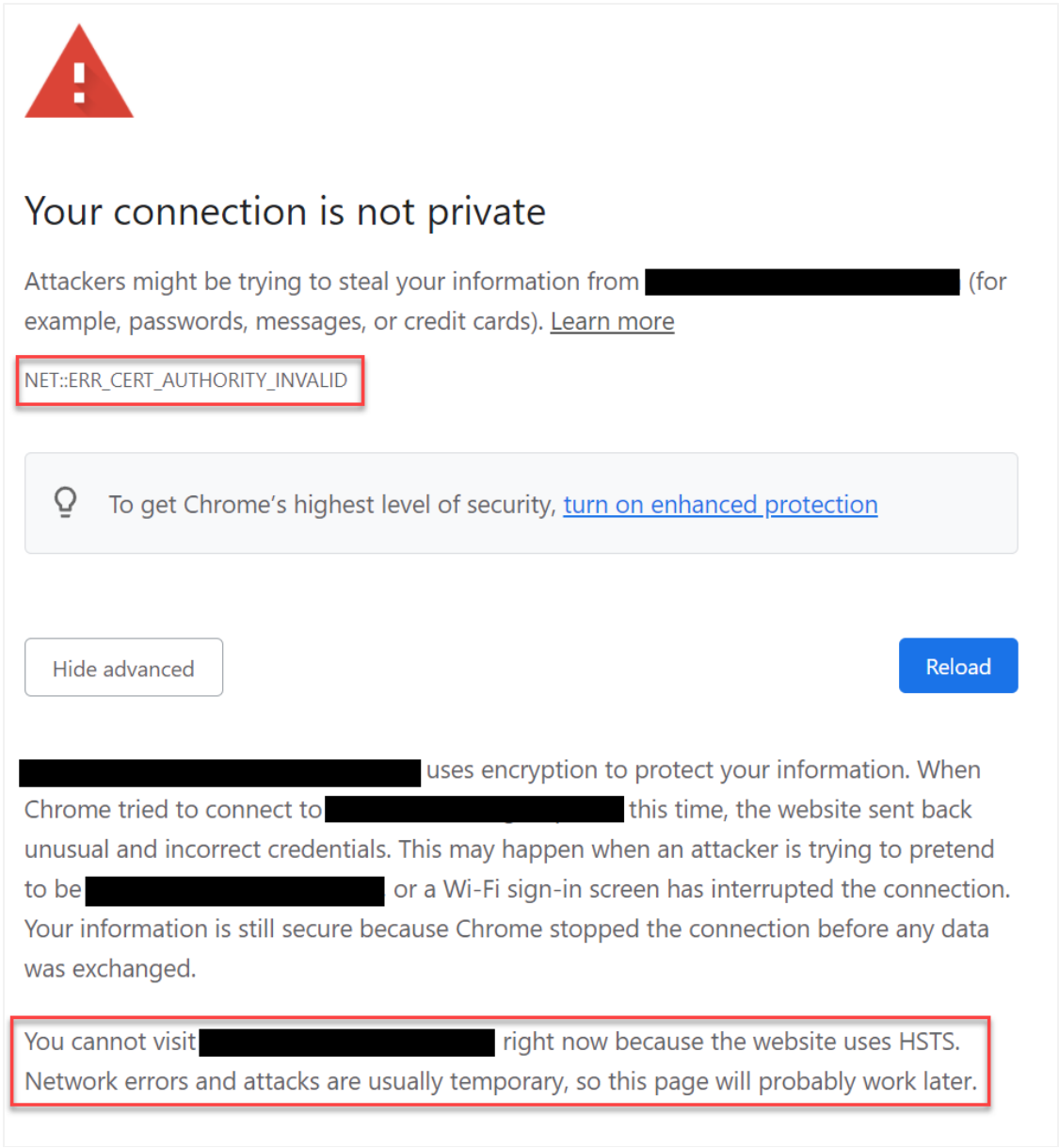

10.3.1.4 Recover from HSTS Lockout

The following steps can be taken to resolve HSTS lockout. The steps in the example below were performed using Google Chrome; the appearance on your system may vary depending on your choice of web browser.

1. Log in to the virtual machine system console (requires VMware vCenter access).
2. Choose menu option **[H] Disable HSTS**.

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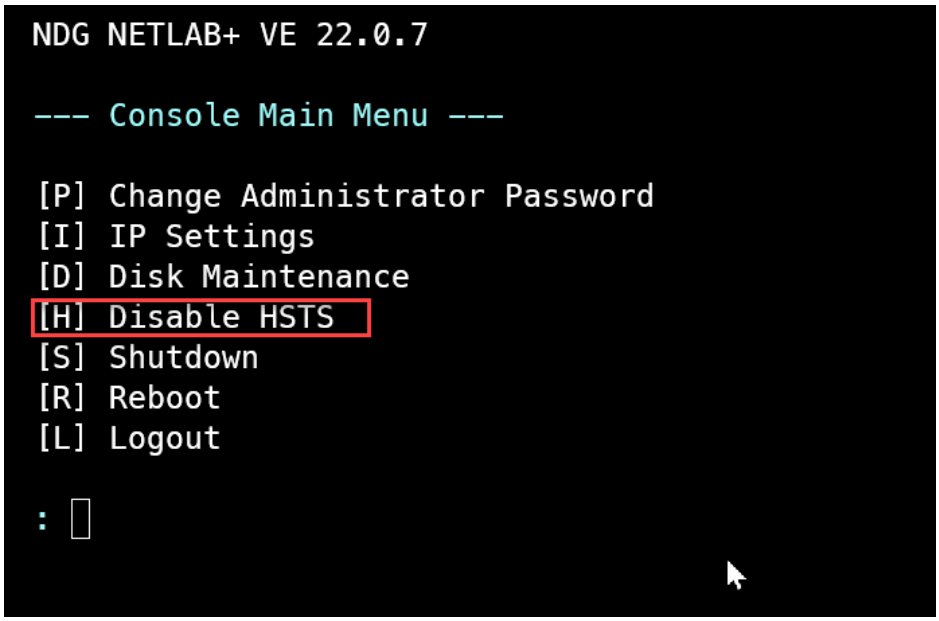

3. Respond to the prompt by entering **Y** to disable HSTS.

4. Open a Private Browsing window or tab (a.k.a. Incognito Mode).

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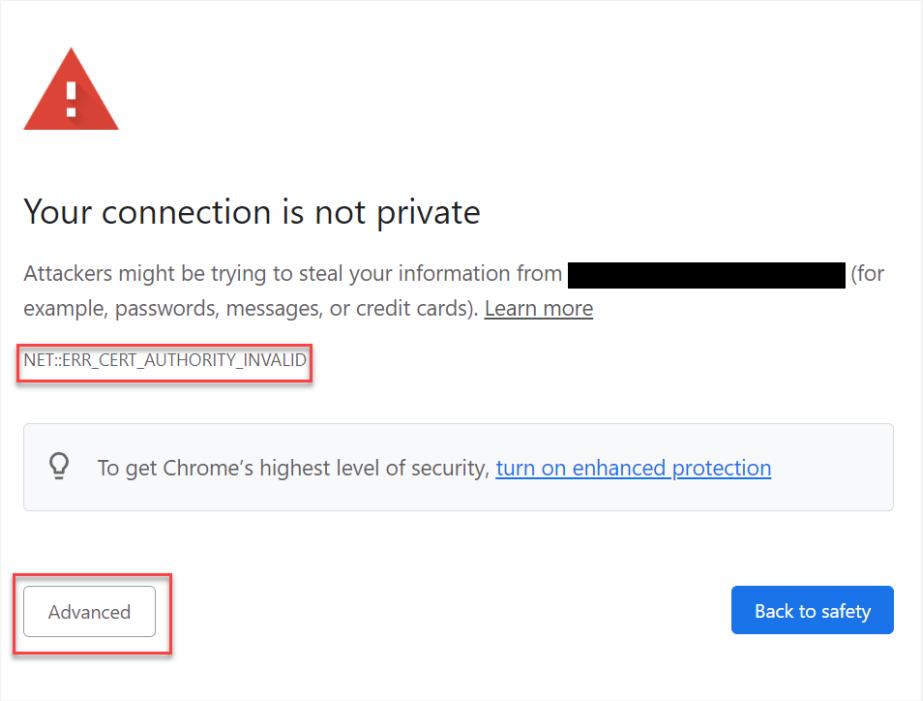
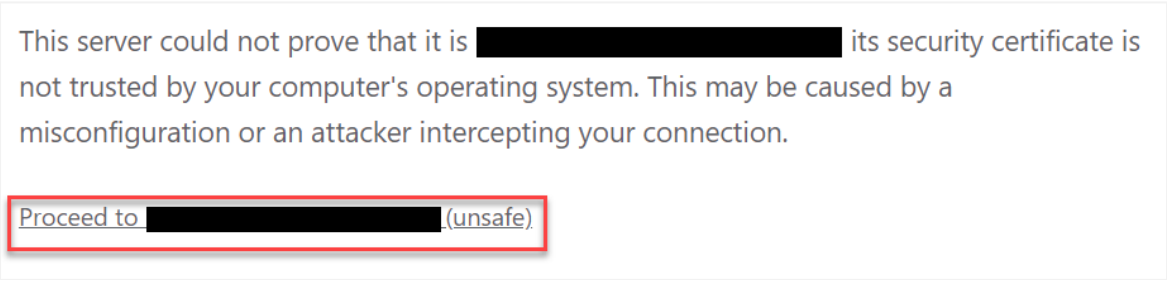
5. Attempt to access your NETLAB+ system. You should see the *Your connection is not private* dialog. Click the **Advanced** button.



6. Click the **Proceed to <website> (unsafe)** link.

> If you do not see the option to *Proceed* and instead see C*annot visit because HSTS is enabled*, be sure you are using a Private Browsing session (per step 4). You can also try a different browser provided it has not received an HSTS header from the affected NETLAB+ system.



7. Log in to the NETLAB+ administrator account using the web interface.
8. Update your SSL certificate to a valid one and activate it (see *SSL Configuration - Manage Certificates*).
9. Verify that users are now able to log in.
10. Re-enable HSTS if desired.

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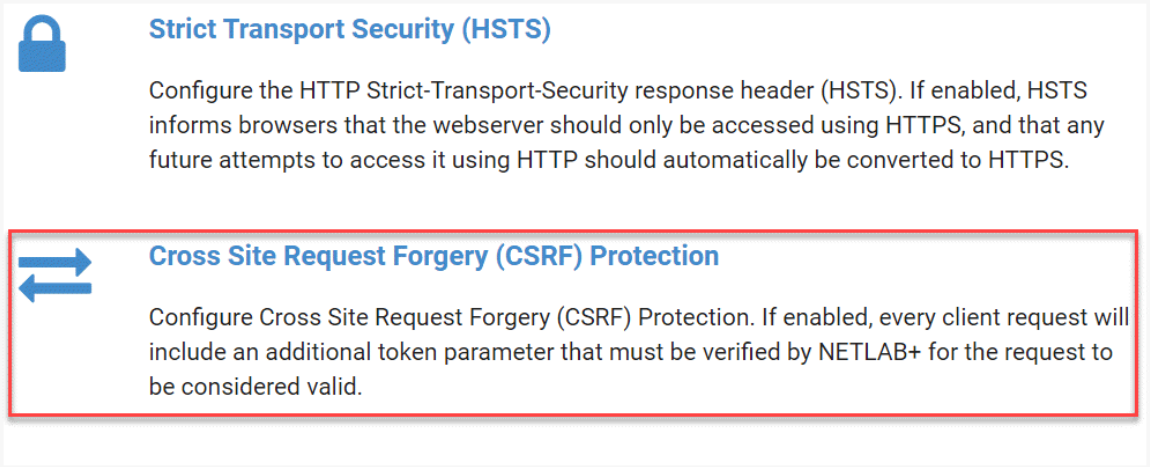
10.3.2 Cross Site Request Forgery (CSRF) Protection

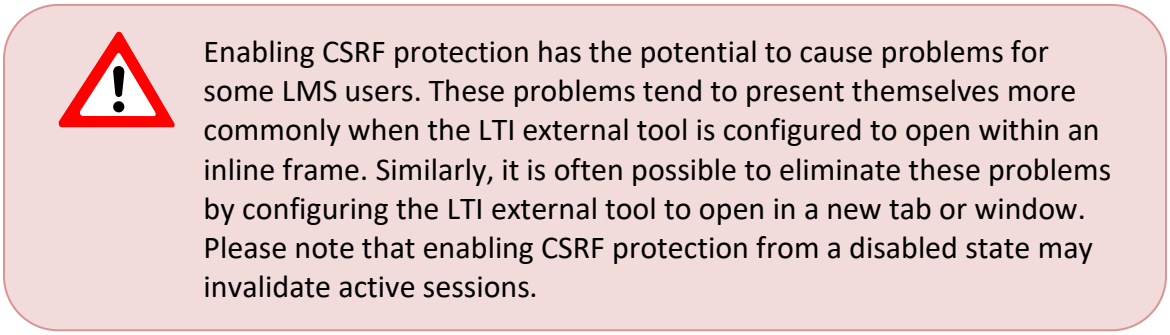
Follow the steps below to configure Cross Site Request Forgery (CSRF) Protection to help prevent attackers from highjacking users' sessions and submitting service requests on their behalf.

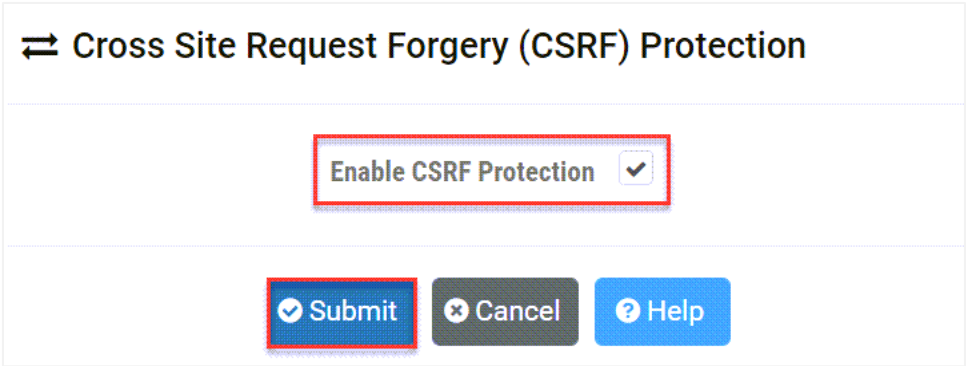
If enabled, every client request will include an additional token parameter that must be verified by NETLAB+ for the request to be considered valid.

1. Go to **Security > Web Server Security**.
2. Select **Cross Site Request Forgery (CSRF) Protection.**



3. The CSRF page will be displayed. To **Enable CSRF Protection**, check the checkbox and then click **Submit**.





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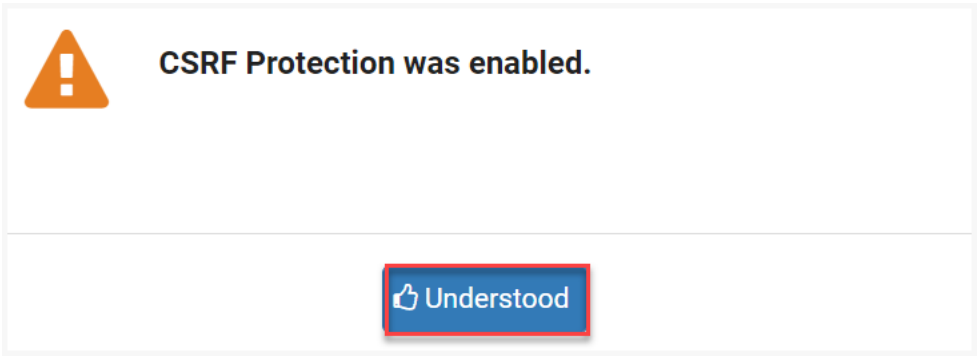
4. A message will display, confirming that CSRF was enabled. Click **Understood**.



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11 Prometheus Metrics

Prometheus is an open-source application that collects and stores metrics as time series data. This data can be visualized with applications such as Grafana. Both Prometheus and Grafana are applications that are deployed separately from NETLAB+.

NETLAB+ provides several Prometheus exporters; node exporter, NETLAB+ exporter, and nginx. Node exporter provides access to system level metrics. The NETLAB+ exporter provides metrics specific the NETLAB+ application. Prometheus collects and stores its metrics as time series data. Prometheus data can then be visualized with Grafana. Prometheus and Grafana are applications that are deployed separately from NETLAB+. This feature satisfies HECVAT On-Prem OFID-05 for remote monitoring.

In the subsections below, we will configure exporting of system metrics to Prometheus and Grafana.

11.1 Configure Exporter

An exporter exposes one or more URLs from which Prometheus can scan for metrics. One or more metric exporters can be bound to a listener port. The exporter types are:

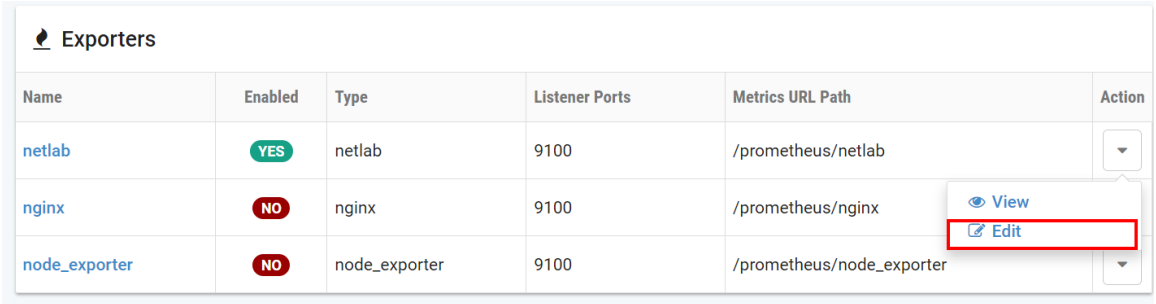
node_exporter: Collects metrics for the operating system and kernel.

netlab: Collects metrics pertaining to NETLAB+.

nginx: Collect metrics for the web server

Perform the following steps to configure an exporter.

1. Go to **Security > Admin > Prometheus Metrics**.
2. To view the settings of an exporter, select the Action dropdown button on the row of the Exporters table and select **Edit**.



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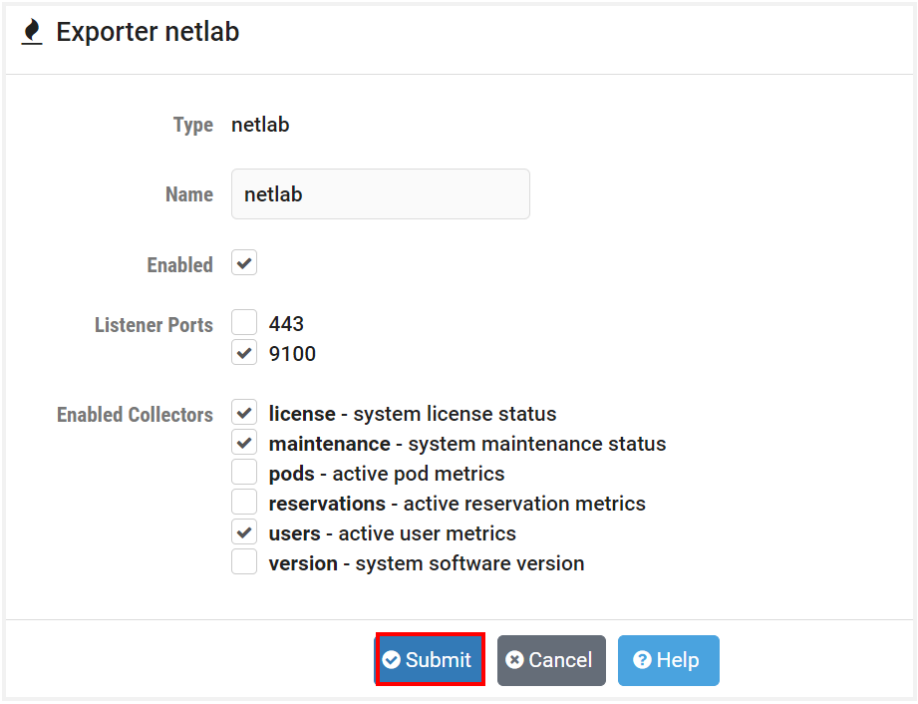
3. The **Exporter Edit** page will be displayed. Edit the values on the page as appropriate (refer to the field descriptions below), and then click **Submit.**



Field Descriptions – Exporter Edit

- **Type**: Specify the type of exporter (node_exporter, netlab, nginx).
- **Name:** Exporter name can contain lowercase ASCII letters (a-z) and numbers (0-9), and must start with a lowercase ASCII letter (a-z).
- **Enabled:** Check to enable this exporter.
- **Listener Ports:** The TCP port numbers that this exporter will be enabled on.
- **Enabled Collectors:** A collector is part of an exporter that represents a set of metrics.
    - **License:** System license status
    - **Maintenance:** System maintenance status
    - **Pods:** Active pod metrics
    - **Reservations:** Active reservation metrics
    - **Users:** Active user metrics

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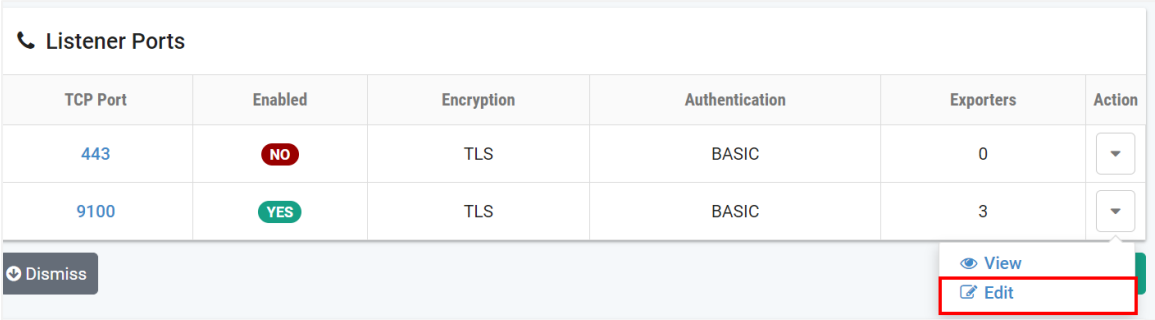
11.2 Configure Listener Ports

A listener port is a TCP port that can accept a connection from Prometheus. One or more metric exporters (that have been enabled and configured as per the previous section) can be bound to a listener port.

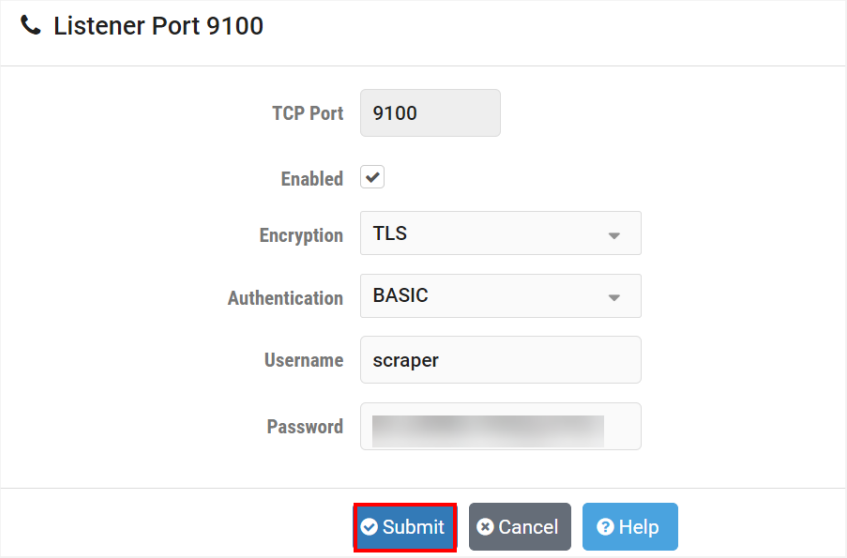
Port 9100 is recommended if your Prometheus server is located inside your site firewall.

Port 443 (the standard HTTPS port) can be used for a Prometheus server residing outside the site firewall, without opening an additional dedicated port through the firewall.

1. Go to **Security > Admin > Prometheus Metrics**.
2. To view the settings of a listener port, select the Action dropdown button on the row on the Listener Ports table and select **Edit**.



3. The Listener Port Edit page will be displayed. Edit the values on the page as appropriate (refer to the field descriptions below) and then click **Submit.** Select and configure any additional exporters desired.



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Field Descriptions – Edit Listener Port

- **Enabled:** Check to enable this listener port. One or more exporters must be assigned to the port.

- **Encryption:** Select the encryption type for this port.

- **Authentication:** Type of authentication to use.
  - **BASIC**: Require username and password (recommended).
  - **NONE**: Disable authentication (not recommended).

- **Username**: The username that must be sent by Prometheus to authenticate.

- **Password**: The password that must be sent by Prometheus to authenticate. Password strength must comply with the system password policy.

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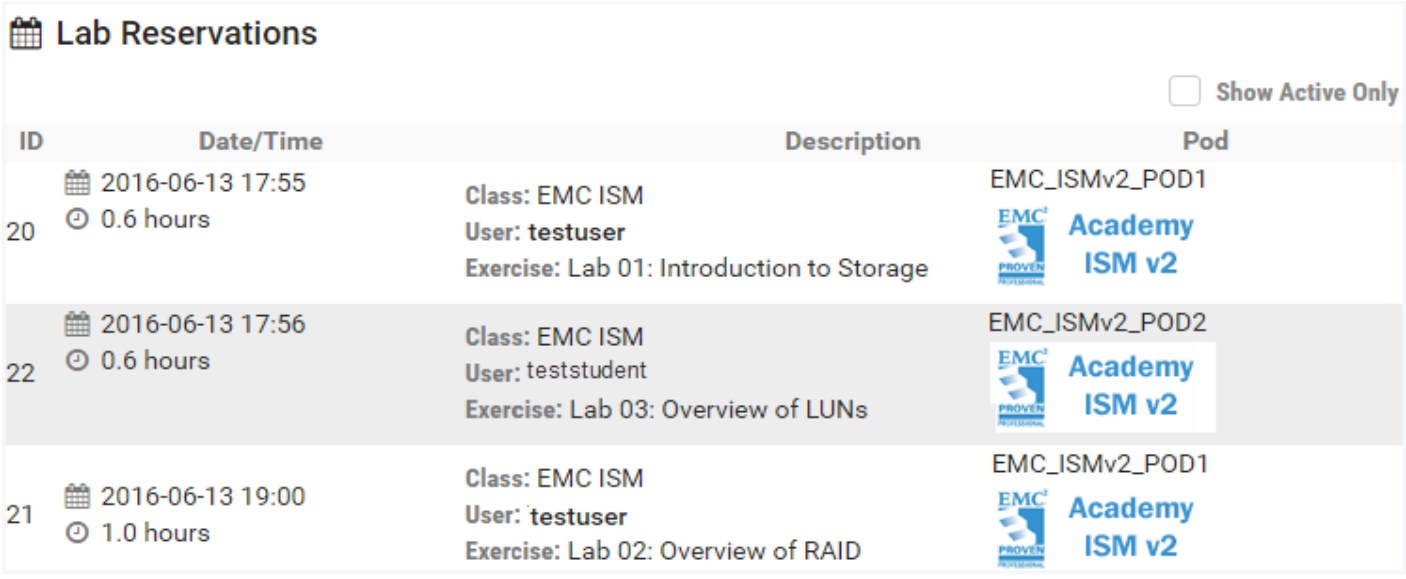
12 Manage Lab Reservations

The third panel on the right side of the administrator Home page indicates if User Logins are enabled, the number of Logged in Users currently using your system, the number of Pods in Use, number of Active Reservations, and the number of Future Lab Reservations on your system.

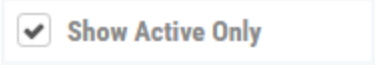
Being aware of the active reservations can be helpful to avoid interrupting users when you are planning to do system maintenance such as software updates.

12.1 Display a List of Lab Reservations

Select **Manage Lab Reservations** to display details for all lab reservations on the system.



To filter the lab reservation list to display only reservations that are currently active, select the **Show Active Only** box.



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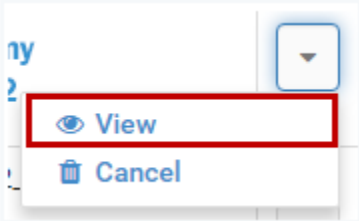
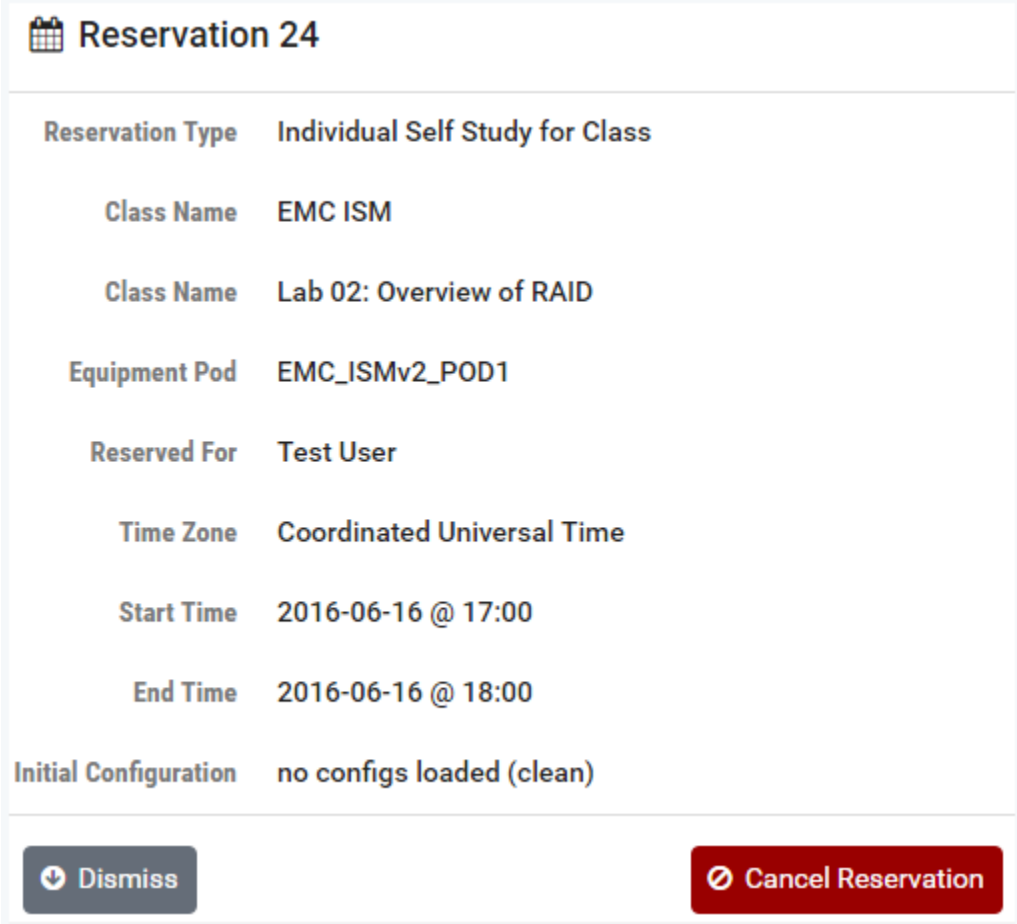
12.2 See Details of a Lab Reservation

1. Select the button at the end of a row to display the option to View or Cancel the lab.



2. Select **View** to display lab reservation details.

> The details of a lab reservation may also be displayed by clicking anywhere on the row of the lab reservation list.



3. Select **Dismiss** to return to the list of lab reservations or select **Cancel Reservation** to cancel the lab reservation (described in the next section).

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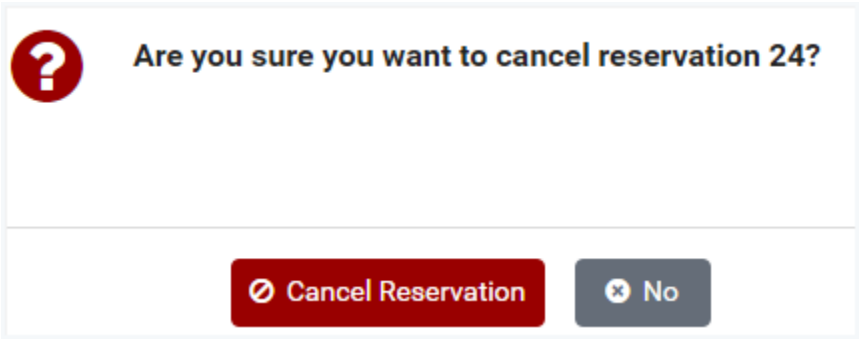
12.3 Cancel a Lab Reservation

If you select the Cancel Reservation button on the reservation detail display (shown in the section above), you will be prompted to confirm that you want to cancel the reservation.

You may have noticed that the option to cancel a reservation was also available from the Action dropdown on the reservation list (see the picture in the previous section). This is one example of how the NETLAB+ user interface is designed to be versatile and provides multiple ways to access the options frequently used.

1. Select the **Cancel Reservation** button.



2. The cancelation will be confirmed. Select **OK** to return to the Home screen.

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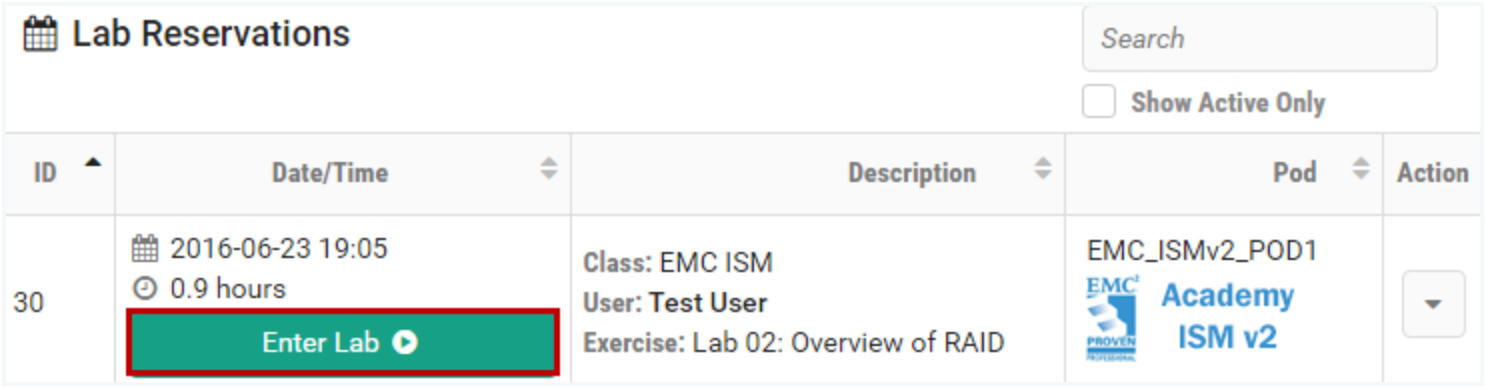
12.4 Enter a Lab Reservation

The **Enter Lab** button will be displayed in the lab reservation list for all active lab reservations (labs that are currently in progress). Entering a lab can be helpful to the administrator when troubleshooting issues with equipment pods.



The administrator may enter a lab session and perform the same actions as an instructor. Please see the *Enter a Lab Session section of the NETLAB+ Instructor Guide* for details.

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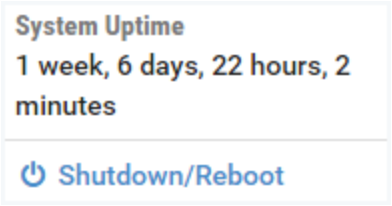
13 Shutdown/Reboot



Statistics on System Uptime are displayed on the fourth panel on the right side of the administrator Home page. From here, you may select to **Shutdown/Reboot** the NETLAB+ system.

Using the Shutdown/Reboot function, the administrator can perform a graceful shutdown and reboot of the NETLAB+ system.

The reboot process will cause any users connected to the NETLAB+ server to be disconnected.

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14 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+ 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, a 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.

14.1 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+ system.

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

14.2 Manual Backups

You may make a backup of 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+ Installation Guide* for details.

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- **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/

14.3 NETLAB+ Restoration from Backup

Should you find it necessary to restore your NETLAB+ system from a backup, it will be necessary to reactivate your NETLAB+ system by entering your license key. Please refer to the *Manage License* section for details.

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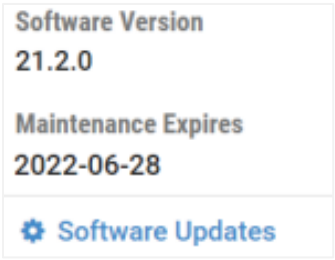
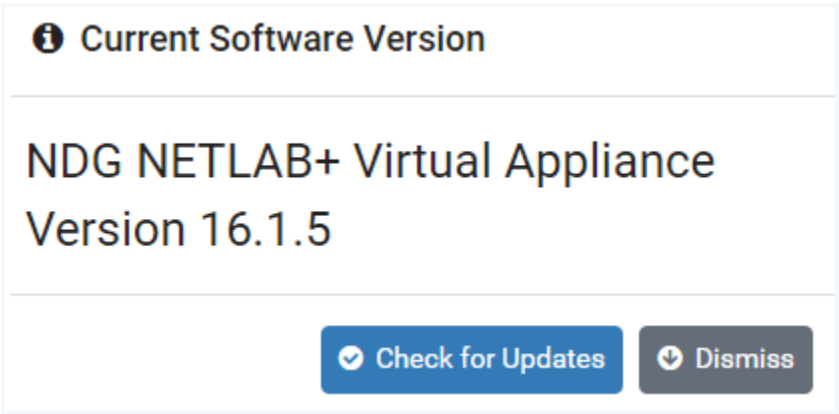
15 Software Updates

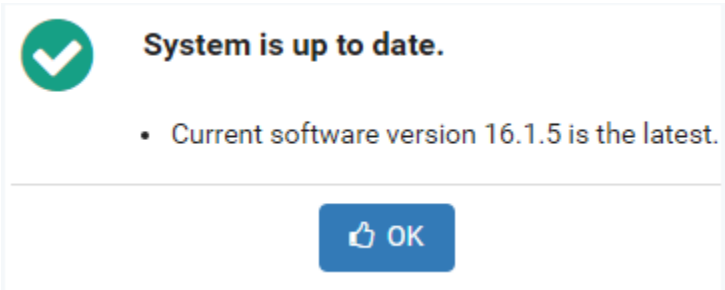


The Software Version of your NETLAB+ system, along with the date that maintenance expires, is displayed in the second panel.

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.

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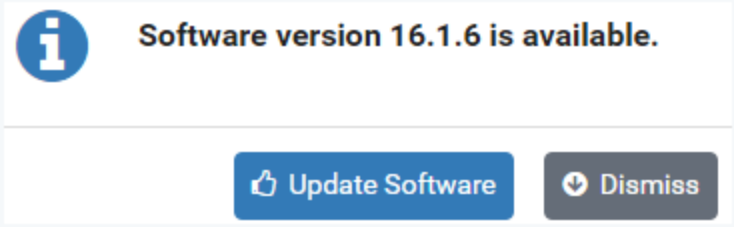
15.1 Update NETLAB+ Software

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.



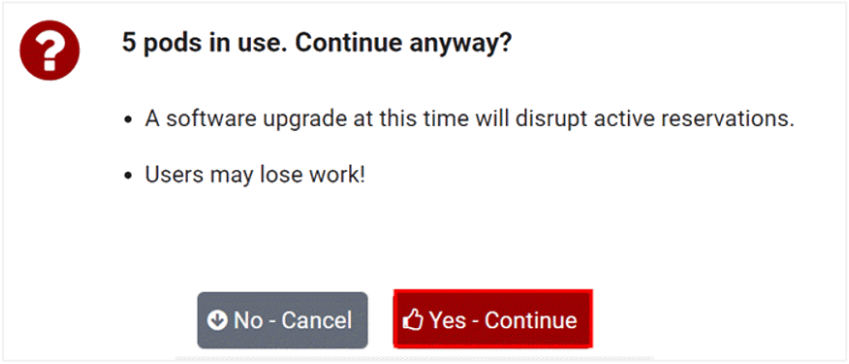
Before updating the software of your NETLAB+ system, it is strongly recommended that you take a snapshot or backup the NETLAB+ virtual appliance. Please see the *Backup the NETLAB+ Virtual Appliance* section.

- 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 roll back to a previous software version.

- NDG does not back up 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 Your NETLAB+ Virtual Appliance* section for instructions).
2. Select **Update Software.**
3. If there are active reservations, the number of pods in use will be displayed, and you will be prompted to confirm to continue. You may press **Yes** to continue, but keep in mind that any current reservations will be disrupted.



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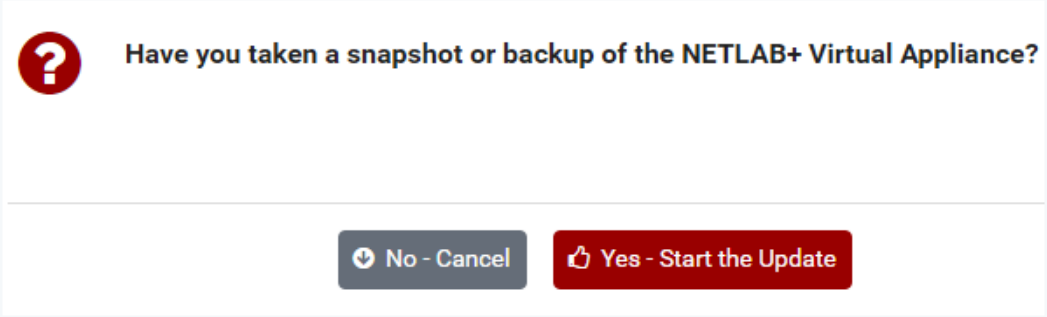
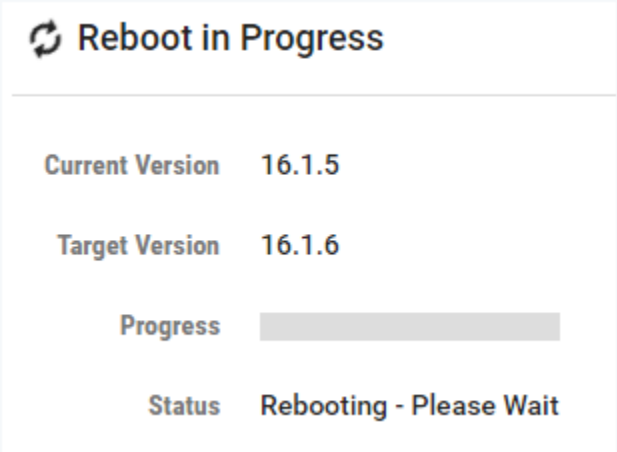
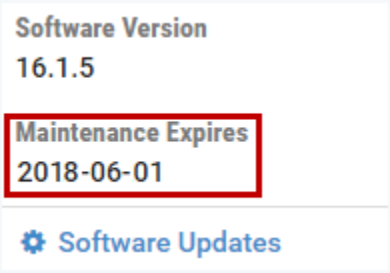
4. You will be prompted to verify that you have taken a snapshot or backup; if you have, select **Yes - Start the Update**.



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



15.2 Maintenance Expiration Date



For your convenience, your NETLAB+ system displays the status of your system maintenance agreement. The maintenance fee covers the cost of technical support and software updates. The last day of your current maintenance agreement is displayed.

You are strongly encouraged to arrange payment to continue your maintenance support prior to the Maintenance Expires date to avoid any disruption of services.

To submit a price quote request, please see:
https://www.netdevgroup.com/price_quote

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Software updates are made available only to systems that are current on their maintenance.

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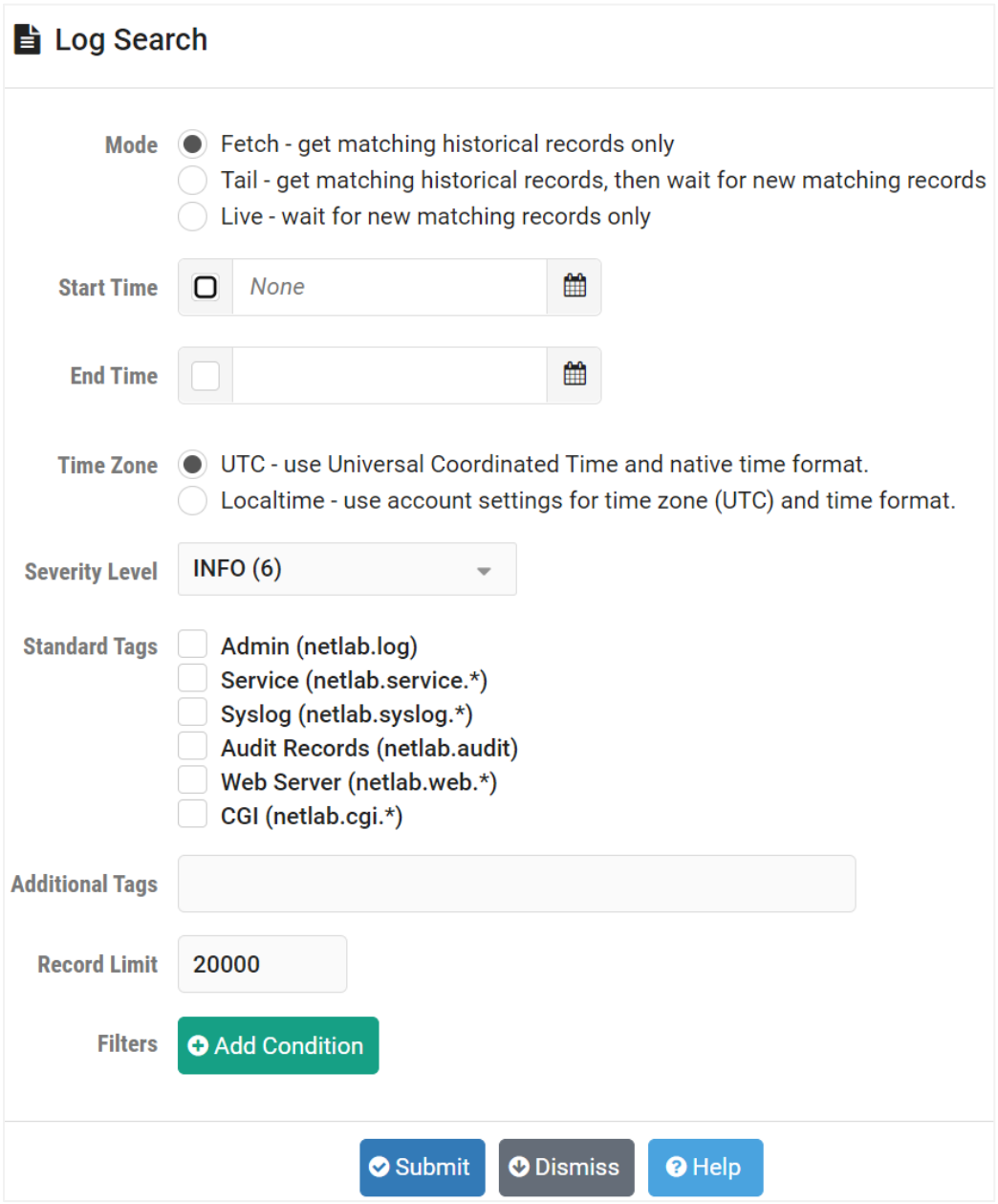
16 Logs

The status of the system and NETLAB+ events are recorded in the NETLAB+ database and available to view and export as logs. Events and errors are dated and time-stamped. Each record is categorized with a tag.

The logs contain entries for each event occurring in the NETLAB+ system, including changes to system configuration, user logins, user authentication issues, automated processes, creation and deletion of accounts and classes, and webserver access. The events that are tracked by NETLAB+ can be used by the administrator or support team as needed.

The **Log Search** page is accessed by selecting **Logs** on the administrator Home page. See the field descriptions below for details and the subsections below for examples.



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Field Descriptions – Log Search

- **Mode:** The mode determines if the search will include log records from the past, as they occur, or both.

Selecting the Tail or Live mode can be particularly helpful when troubleshooting, as they allow you to view entries for events as they occur.

  - **Fetch:** Get matching historical records only.
  - **Tail:** Get matching historical records, then wait for new matching records.
  - **Live:** Wait for new matching records only.

- **Start time**: Displays log entries occurring after the specified time.

- **End time**: Display log entries occurring before the specified time. This option is not applicable when Tail or Live mode has been selected.

- **Time Zone:** Select the time zone and display format for date and time. UTC is the native time zone and format (ISO 8601) in which time is stored and is not subject to Daylight Savings Time (DST) anomolies. Localtime will display date and time in time zone and format selected in the administrator settings. Localtime may show gaps and duplicate times on the day that DST starts and ends respectively.

- **Severity Level:** The severity level of log records to include in the search, up to and including the selected level. Values are cumulative, e.g., a setting of WARNING(4) also includes ERROR(3), FATAL(2), and ALERT(1).

- **Standard Tags:** Standard tag filters to apply; each log entry has a tag. If none are checked, then no filters are applied.

- **Additional Tags:** Additional tags, separated by commas. Wildcards (*) are allowed.

- **Record Limit:** Maximum number of records to process before stopping. Specify 0 or no value to remove this limit, but be aware that the browser could become unresponsive.

- **Filters:** Click **Add Condition** to view the pop-up screen that will allow you to specify filter conditions to search structured data within log records. Rules within a group are AND conditions. Groups are treated as OR conditions.

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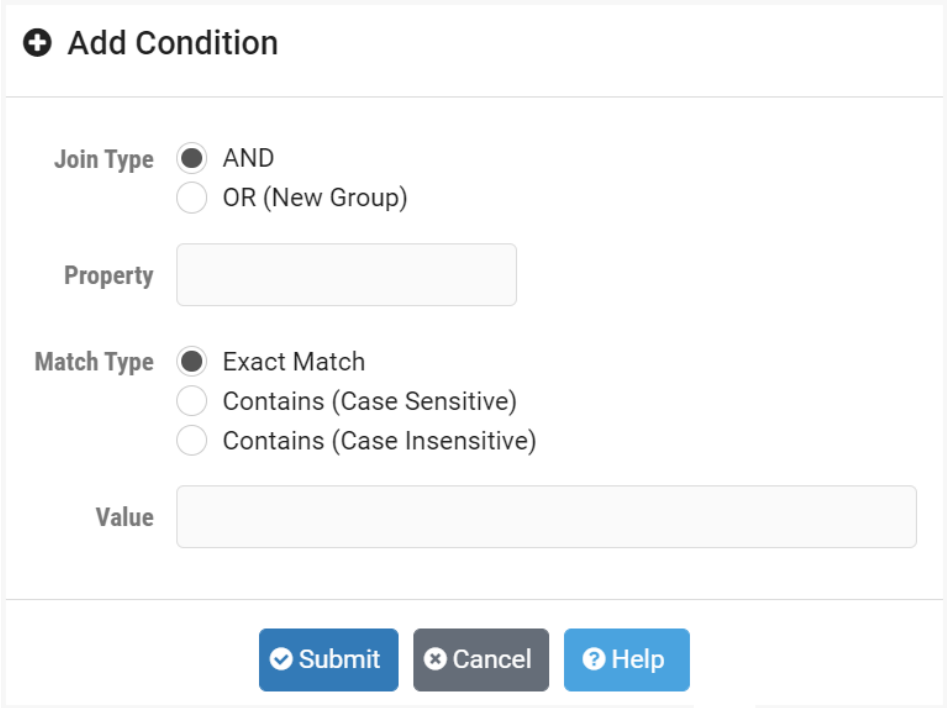

Field Descriptions – Add Condition

- **Join Type:** When more than one condition is specified, the Join Type is used to specify how conditions are joined. Each condition belongs to a group. Rules within the same group are joined with AND; the log record must match all conditions within the group to be selected. Each group is joined with OR; log records that match any group are selected. The AND option adds a new condition to the current group. The OR option starts a new group.

- **Property:** The property key within structured data to match. The pulldown list shows common properties.

- **Match Type:** Determines how the value is matched; options include Exact Match, Contains (Case Sensitive), and Contains (Case Insensitive).

- **Value:** The value to be matched.

16.1 Log Search Example A

In this example, we'll search for events occurring in the NETLAB+ system, starting from February 1, 2022.

1. Select **Logs** on the administrator Home page to display the Log page.
2. For **Start Time**, select the date of February 1, 2022.
3. From the Standard Tags checkboxes, select the **Admin (netlab.log)** checkbox.
4. Leave all other values at their defaults and then click **Submit**.

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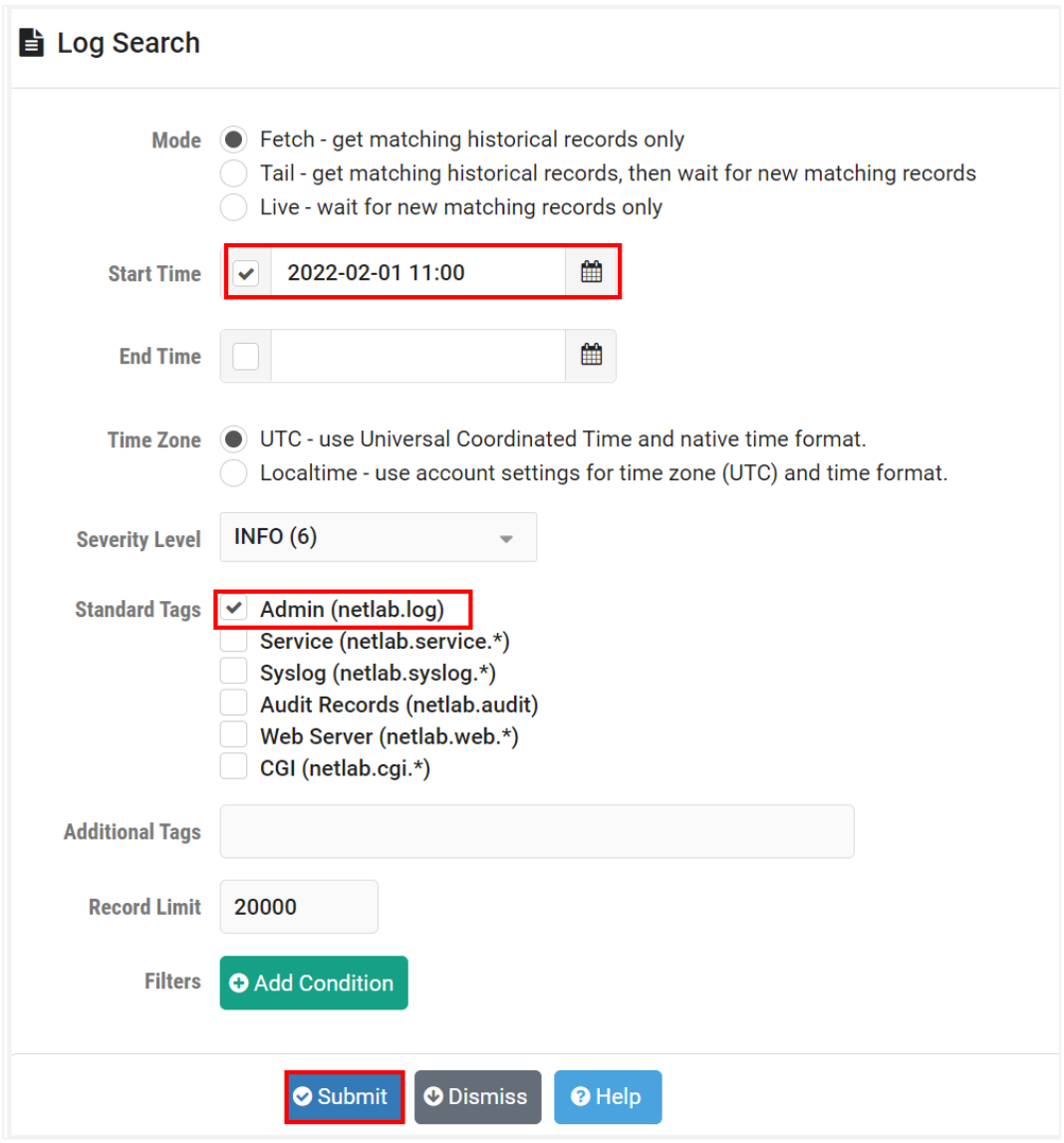

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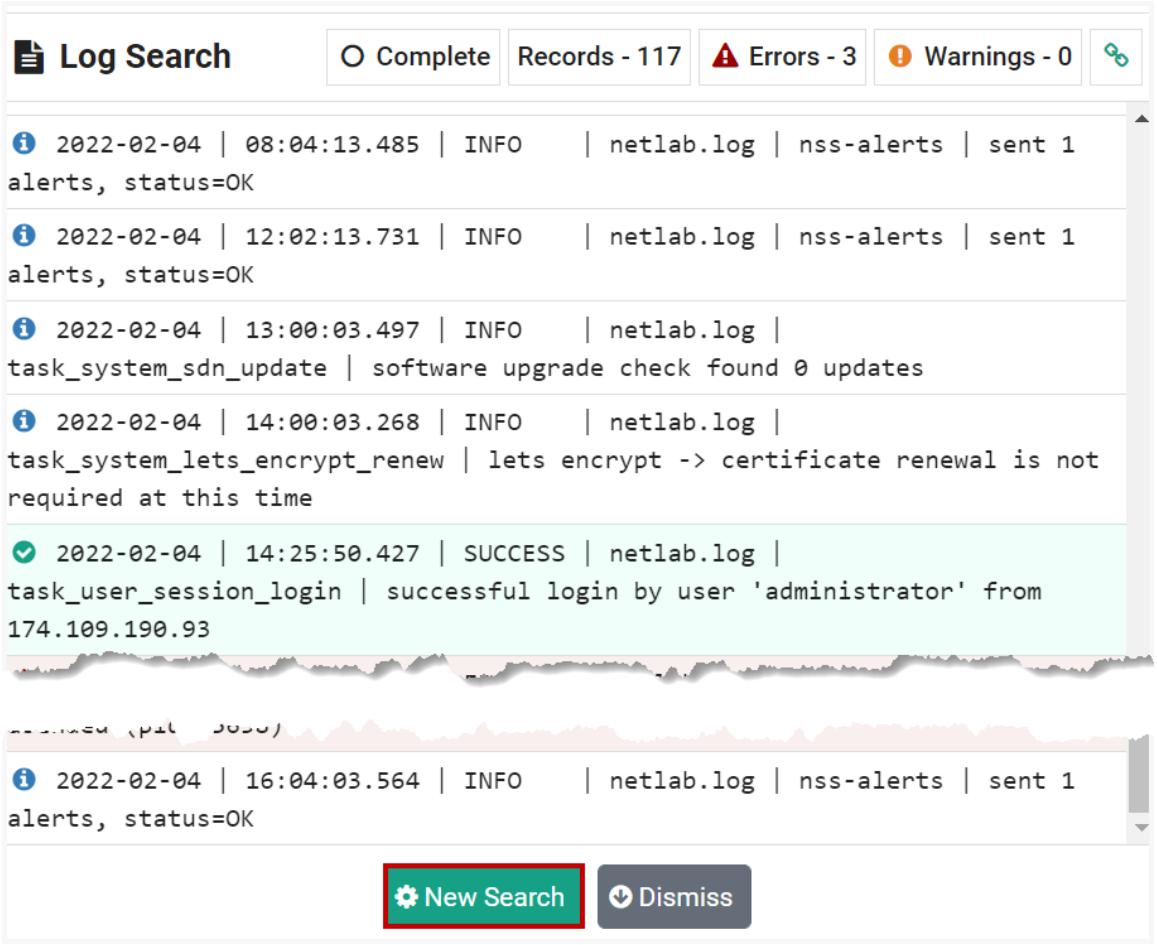
5. The results of the log search are displayed. Additional details are available by clicking any line in the log (as shown in the next example). Click **New Search** to return to the Log Search page.



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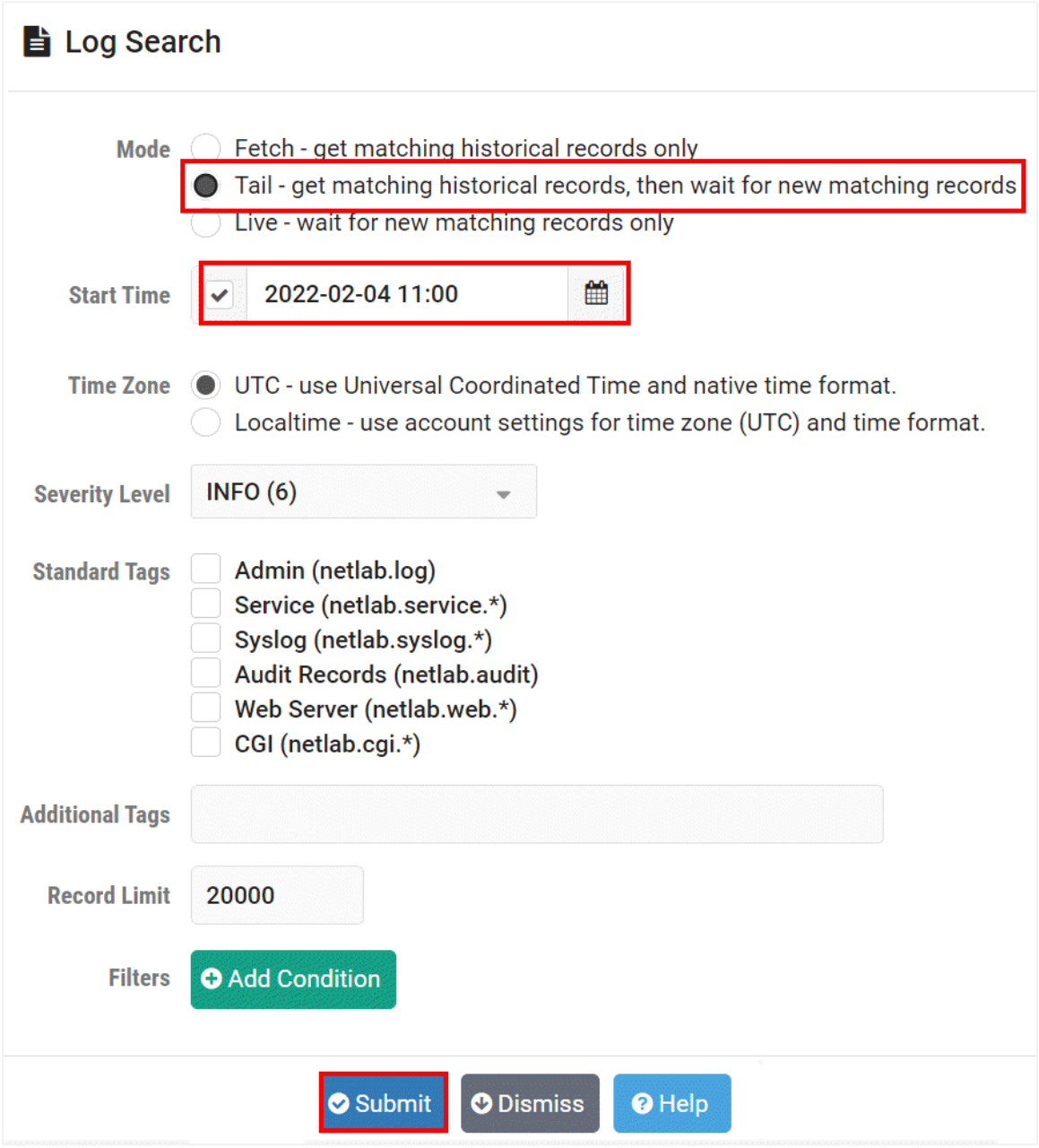
16.2 Log Search Example B

In this example, we'll select records starting from February 4, 2022, and use the Tail mode to continue viewing records as they occur.

1. Select **Logs** on the administrator Home page to display the Log Search page.
2. Select **Tail** for mode.
3. For **Start Time**, select the date of February 4, 2022.
4. Leave all other values at their defaults and then click **Submit**.



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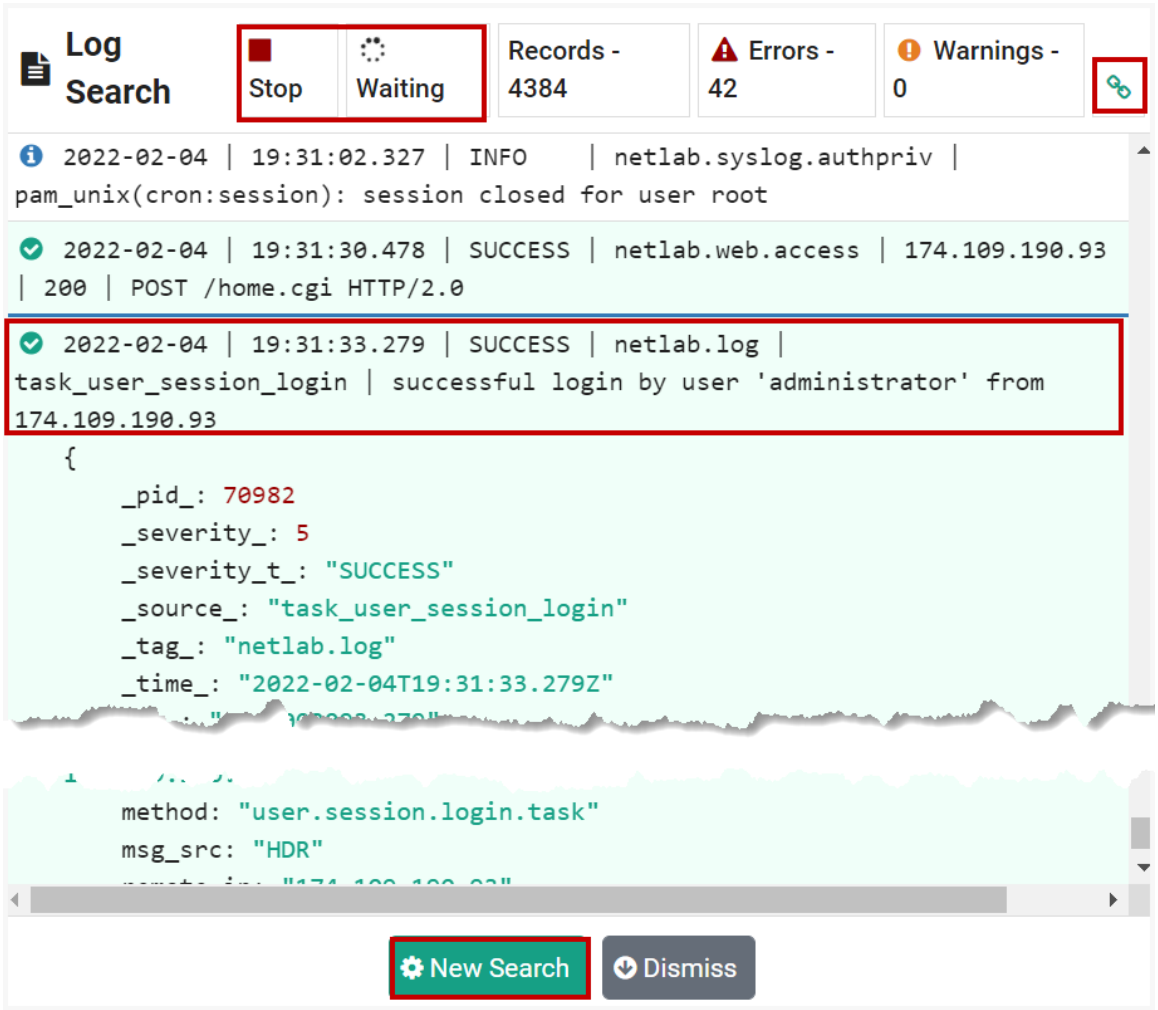
5. The results of the log search are displayed. There are several items of interest to observe before clicking **New Search** to return to the Log Search page.

   - The heading at the top of the page indicates **Waiting;** since we used Tail mode, we may remain on this page and wait to see new records as they occur. If **Stop** is selected, no more new records will be added.
   - The button in the upper-right corner toggles enable/disable auto scroll. When enabled, new records will be visible at the bottom of the page, as they occur.
   - Additional details are available by clicking any line in the log. In this example, we have expanded a record showing details of a successful login by the administrator.



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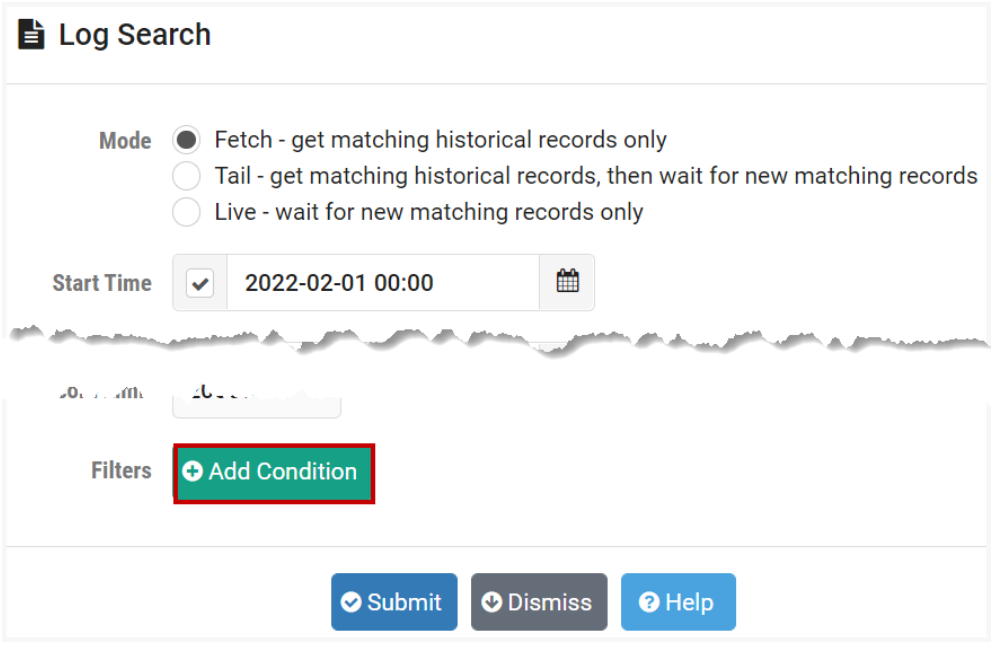
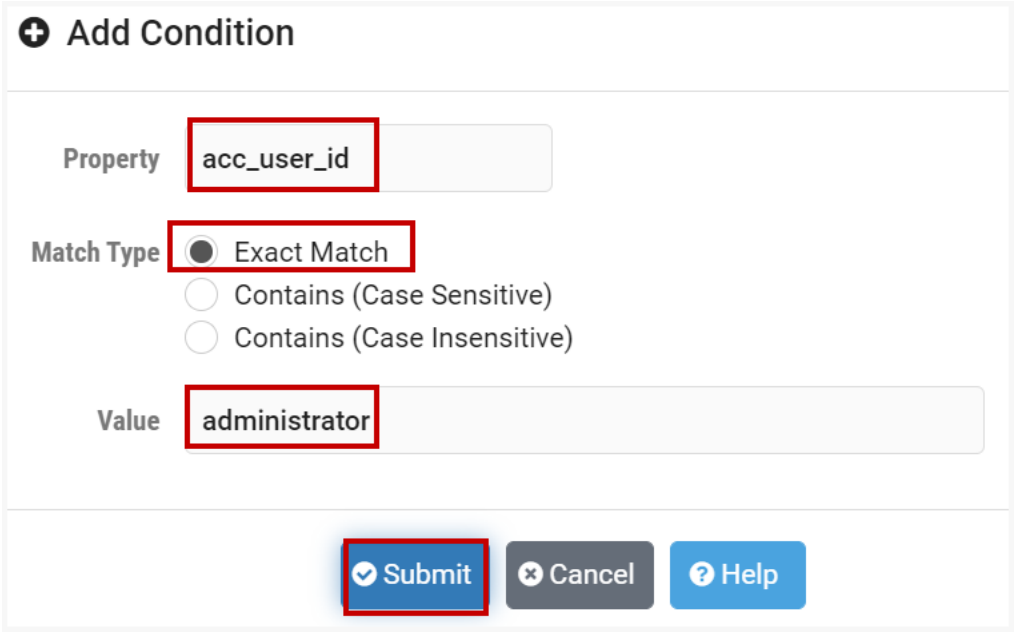
16.3 Log Search Example C

In this example, we will build a query by specifying filter conditions.

1. Select **Logs** on the administrator Home page to display the Log Search page.
2. For **Start Time**, select the date of February 4, 2022.
3. Select the **Add Condition** button.



4. The Add Condition pop-up page is displayed. Select **acc_user_id (account name)** from the Property dropdown menu.
5. Select the Match Type radio button for **Exact Match.**
6. Enter **administrator** as the Value.
7. Click **Submit**.



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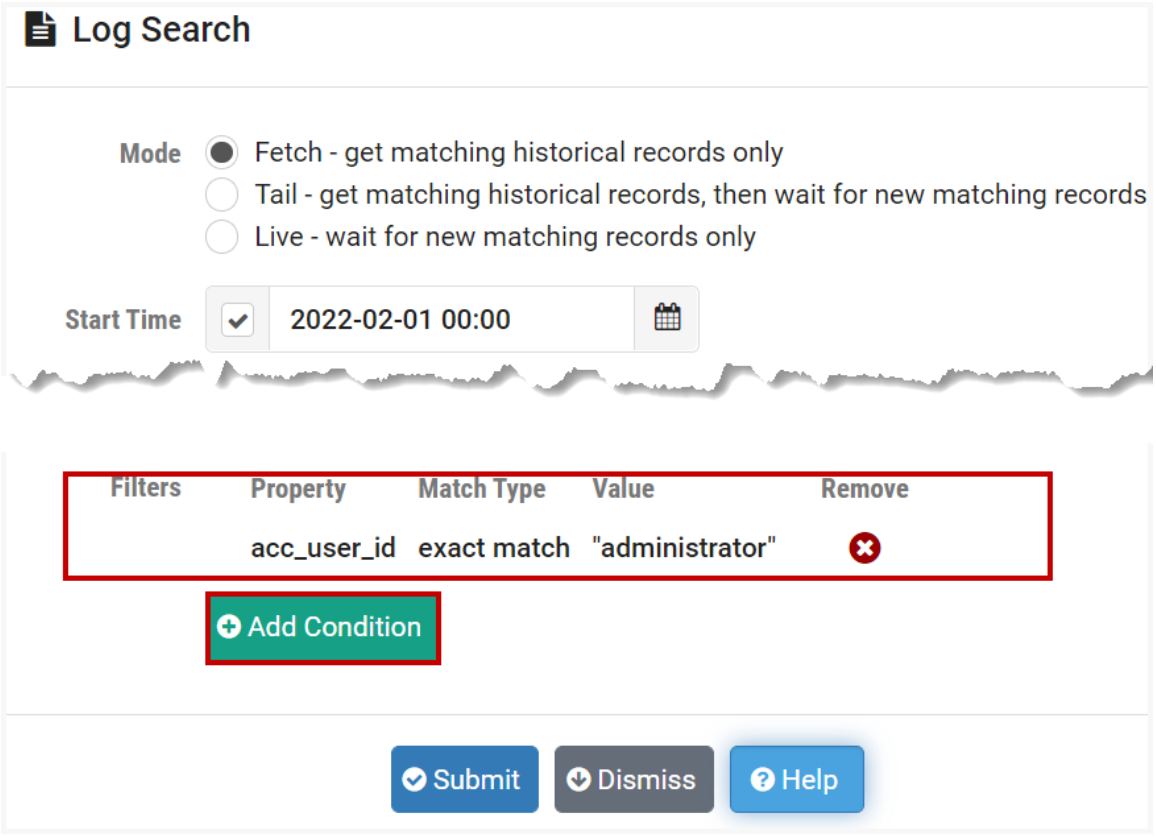
8. The filter condition has been added to the Log Search page. Once again, click **Add Condition**.



9. The Add Condition pop-up page is displayed. Select **AND** as the Join Type.
10. Select **message** from the Property dropdown menu.
11. Select the Match Type radio button for **Contains (Case Insensitive).**
12. Enter **login** as the Value.
13. Click **Submit**.

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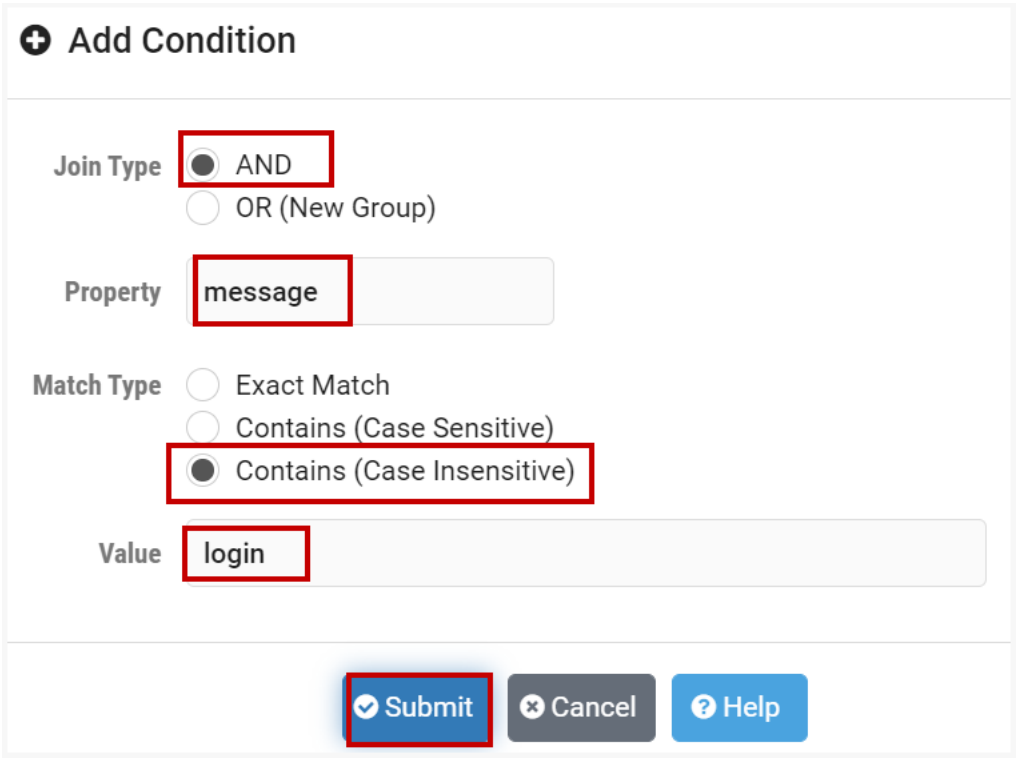
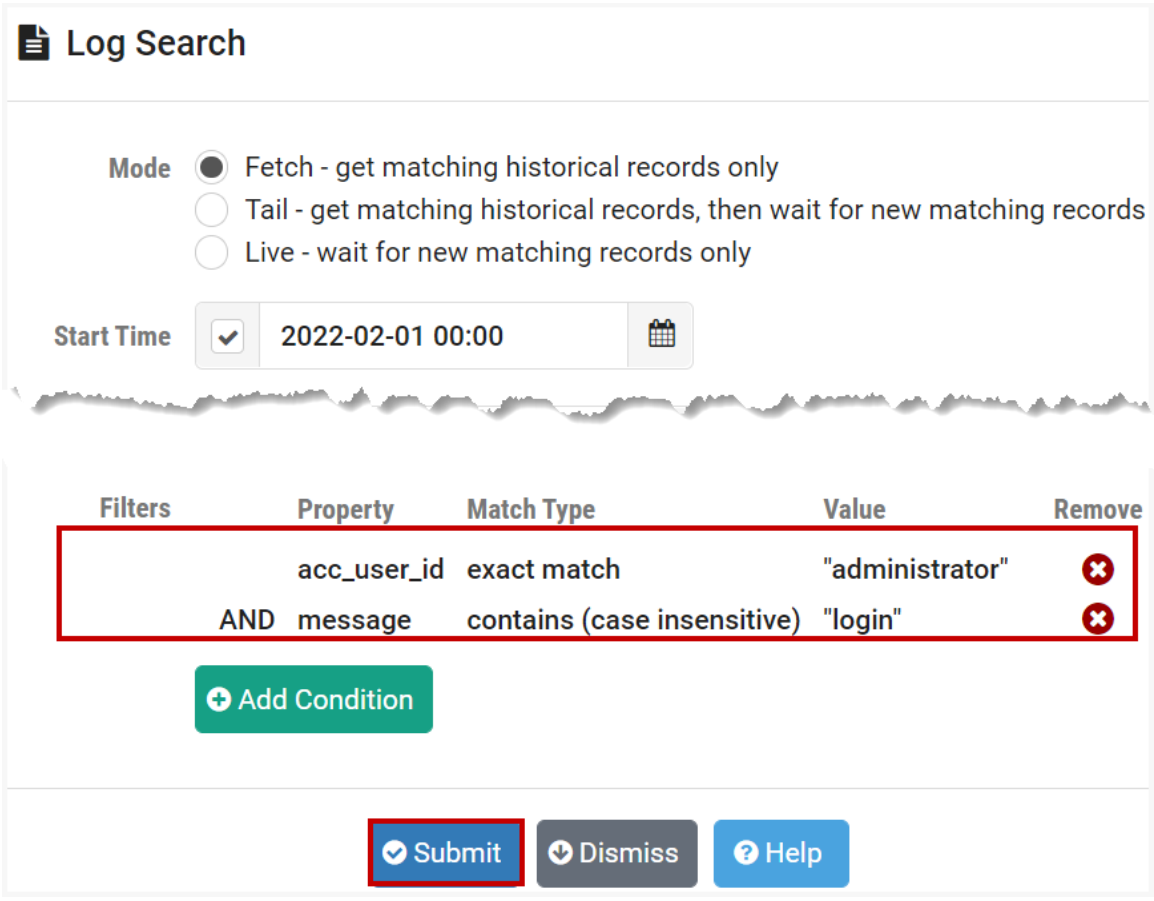


14. The second filter condition has been added to the Log Search page. Since the conditions are joined with the **AND** join type, records must meet both conditions in order to be selected. Click **Submit**.



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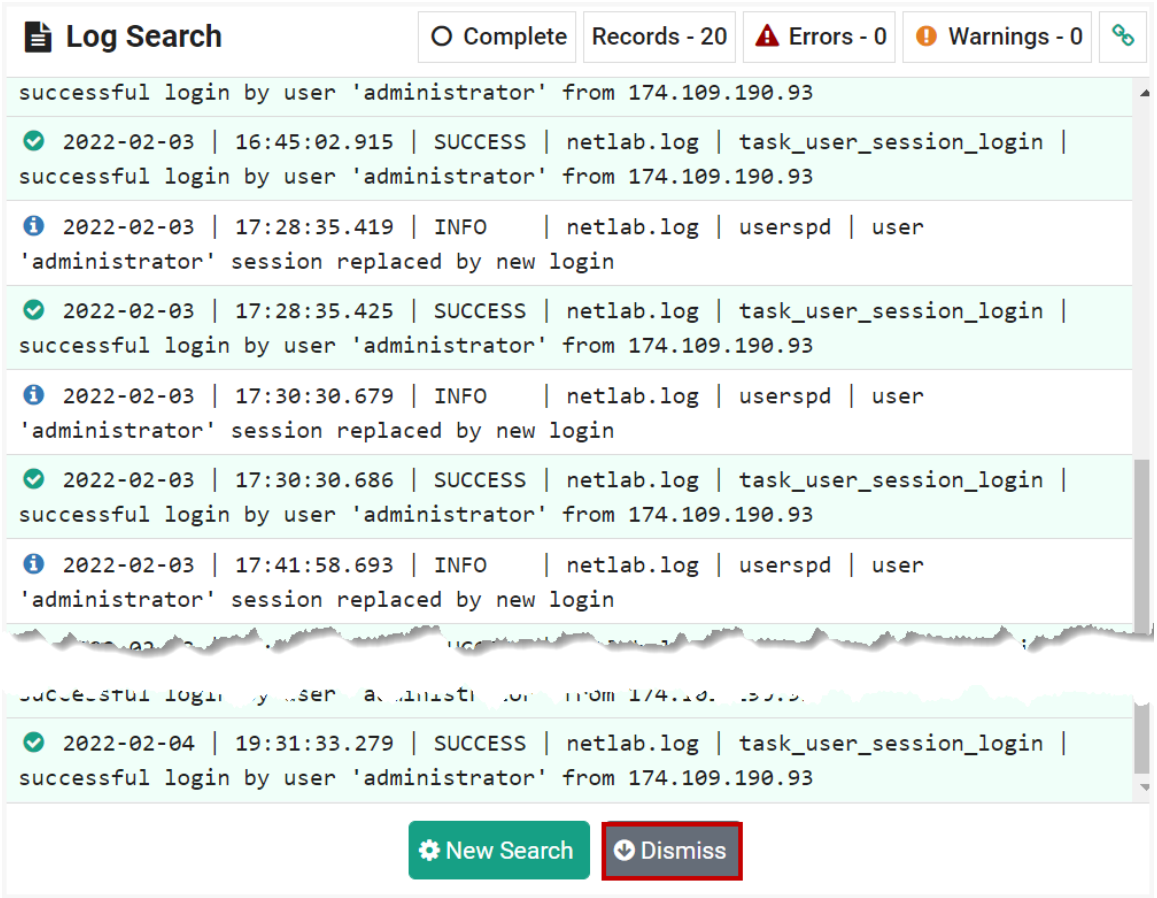
15. The results of the search are displayed. To return to the administrator Home page, click **Dismiss**.



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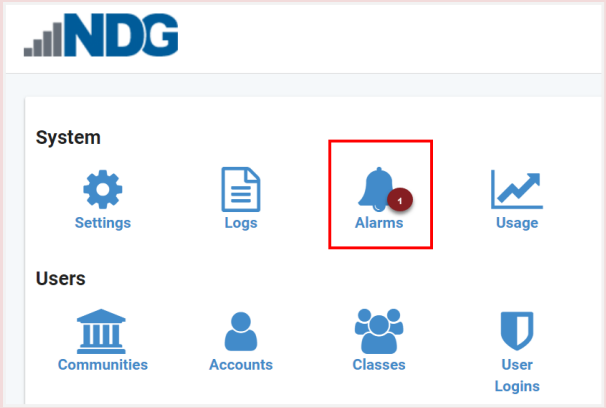
17 Alarms

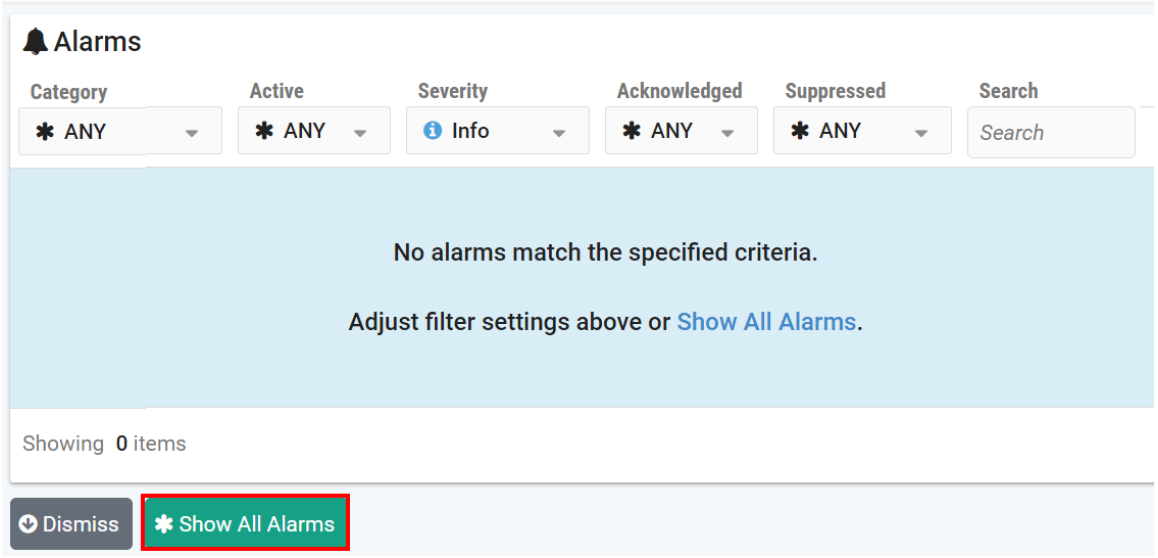
The status of the operation and interaction of the various components of the NETLAB+ system may be examined by viewing system alarms.

In the steps below, we will view the alarms and demonstrate the use of the filter settings to match specified criteria.

You may see a number displayed next to the Alarms icon, this indicates there are alarms that may require your attention.



1. Select **Alarms** on the administrator Home page to display the Alarms page.
2. Select the option to **Show All Alarms** by pressing the button as shown below, or by clicking the link near the center of the page. See the field descriptions below for guidance on filter settings.



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Field Descriptions – Alarms Filter Settings

- **Category:** The default setting,*, matches all categories, or you may filter according to the following categories: Software Updates, Virtual Data Centers, or Virtual Hosts.

- **Active:** The default setting,*, matches all active alarms, or you may filter according to whether the alarm is active by selecting Yes or No.

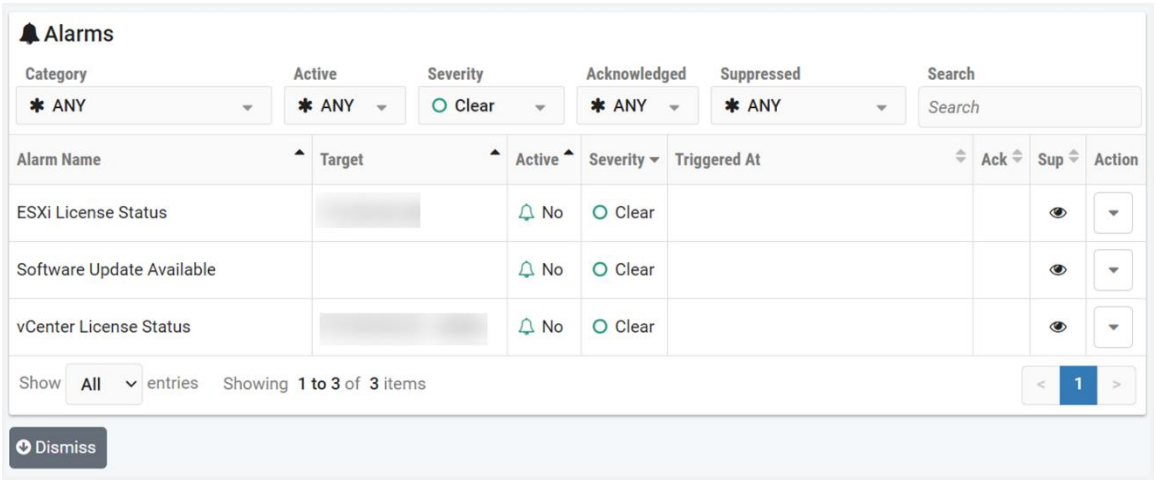
- **Severity:** Select the severity level of alarms to view. Selections available are: Clear, Info, Warn, Major, and Critical.

- **Acknowledged:** The default setting,*, matches all acknowledged alarms, or you may filter according to whether the alarm is acknowledged by selecting Yes or No.

- **Suppressed:** The default setting,*, matches all suppressed alarms, or you may filter according to whether the alarm is Unsuppressed, Paused (when an active alarm is paused, it remains paused until it becomes inactive), or Stopped (when an alarm is stopped it will be suppressed in the list view until it is manually resumed).

- **Search:** Select alarms based on the search criteria you enter in this field.

3. You will likely see several alarms displayed, similar to the example below, reflecting the status of various components that make up your NETLAB+ system.



Field Descriptions – Alarms Table

- **Alarm Name:** A descriptive name identifying the alarm.

- **Target:** The IP address and/or FQDN related to the alarm.

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- **Active:** If the alarm is Active, this value will be Yes; otherwise, No.

- **Severity:** The severity level of the alarm is shown as Clear, Info, Warn, Major, or Critical.

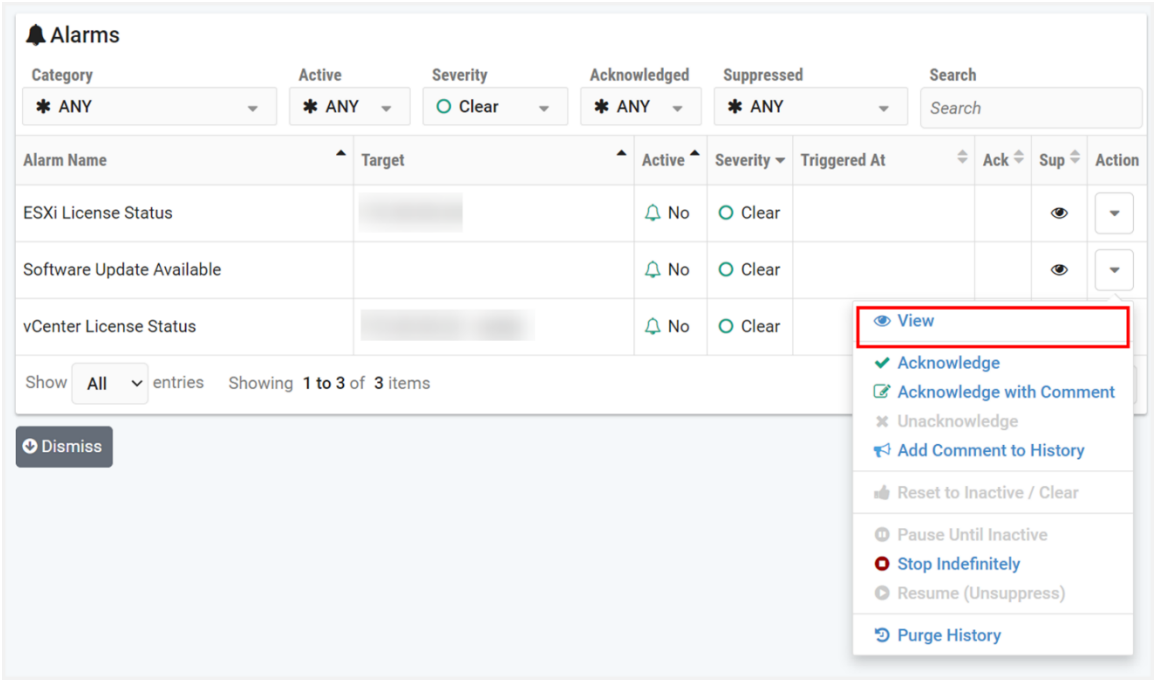
- **Triggered At**: The date/time the alarm was triggered (this information may not be available for all alarms).

- **Ack:** When the administrator chooses to acknowledge an alarm, it will be indicated by a checkmark in this field. A comment may also be added. This can be helpful when troubleshooting (for example, to indicate when a potential issue has been researched and identified). Acknowledging an alarm does not change its active state or severity.

- **Sup:** Stopping an alarm will normally suppress the alarm in the list view until it is manually resumed. To temporarily view stopped alarms in the alarm list, change the Suppress option to STOP or ANY. Resume the alarm to unsuppress it.

- **Action:** Select to view, acknowledge, stop, or purge the history of an alarm from list view.

4. Click the **Action** button on any row and select **View** to see the details and status of the alarm.



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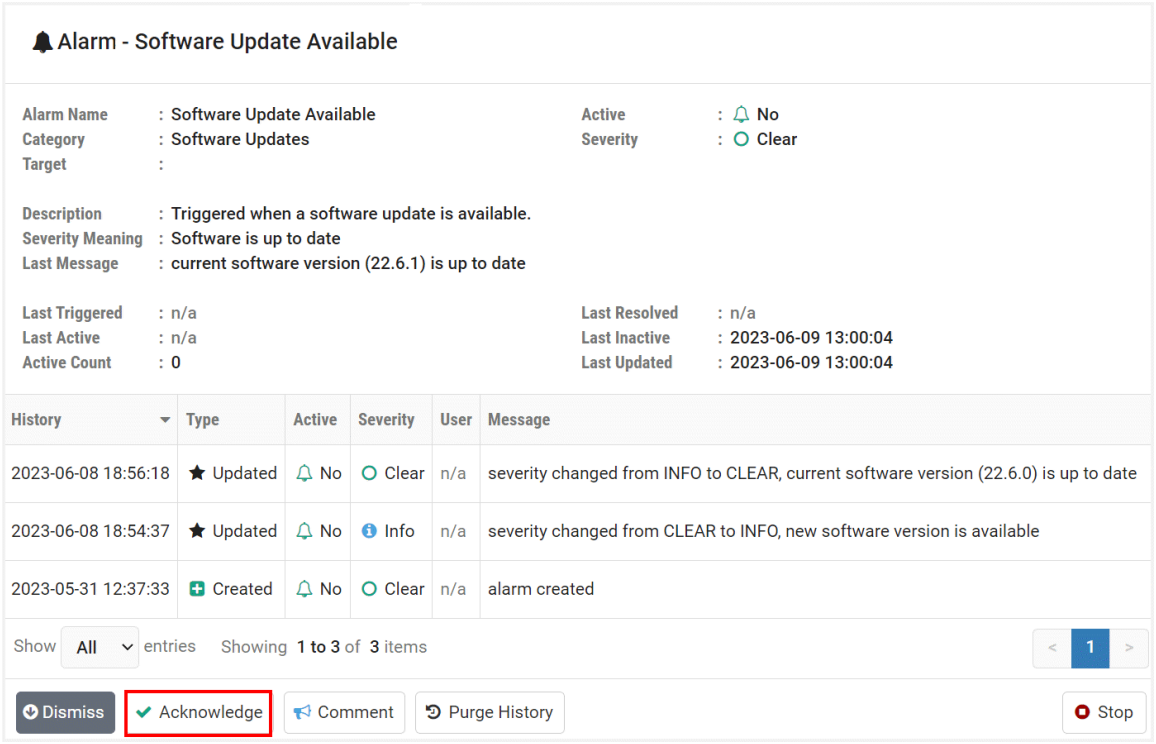
5. The alarm's history is shown; see the field descriptions below. For this example, we will acknowledge the alarm. Click **Acknowledge**.



Field Descriptions – Alarm History Table

- **History:** Shows the date and time the event took place.
- **Type:** Shows the type of event that took place at the time indicated.
- **Active:** If the alarm is Active, this value will be Yes; otherwise, No.
- **Severity:** The severity level of the alarm is shown as Clear, Info, Warn, Major, or Critical.
- **User**: If the event is created by the administrator, the administrator will be listed as the user. If triggered via automation, the value will be N/A.
- **Message:** A brief description or comment may be included in this field.

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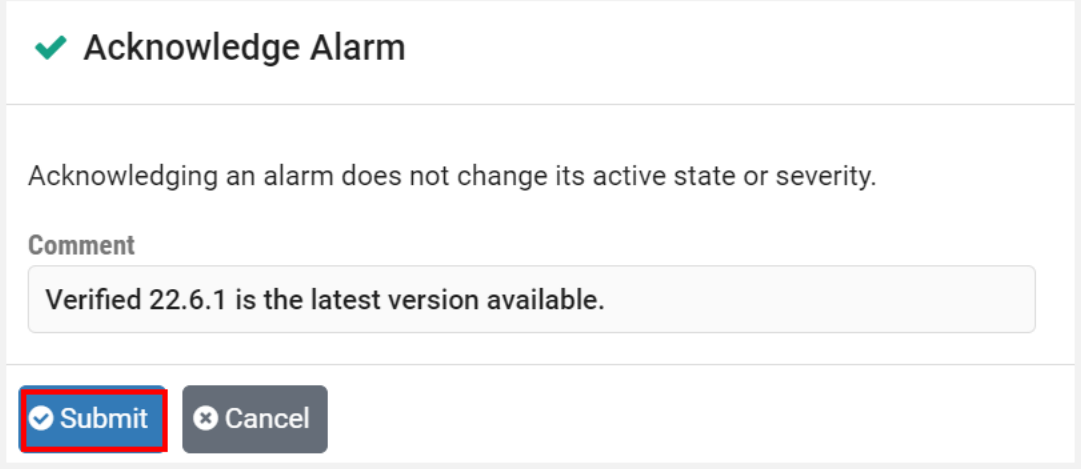
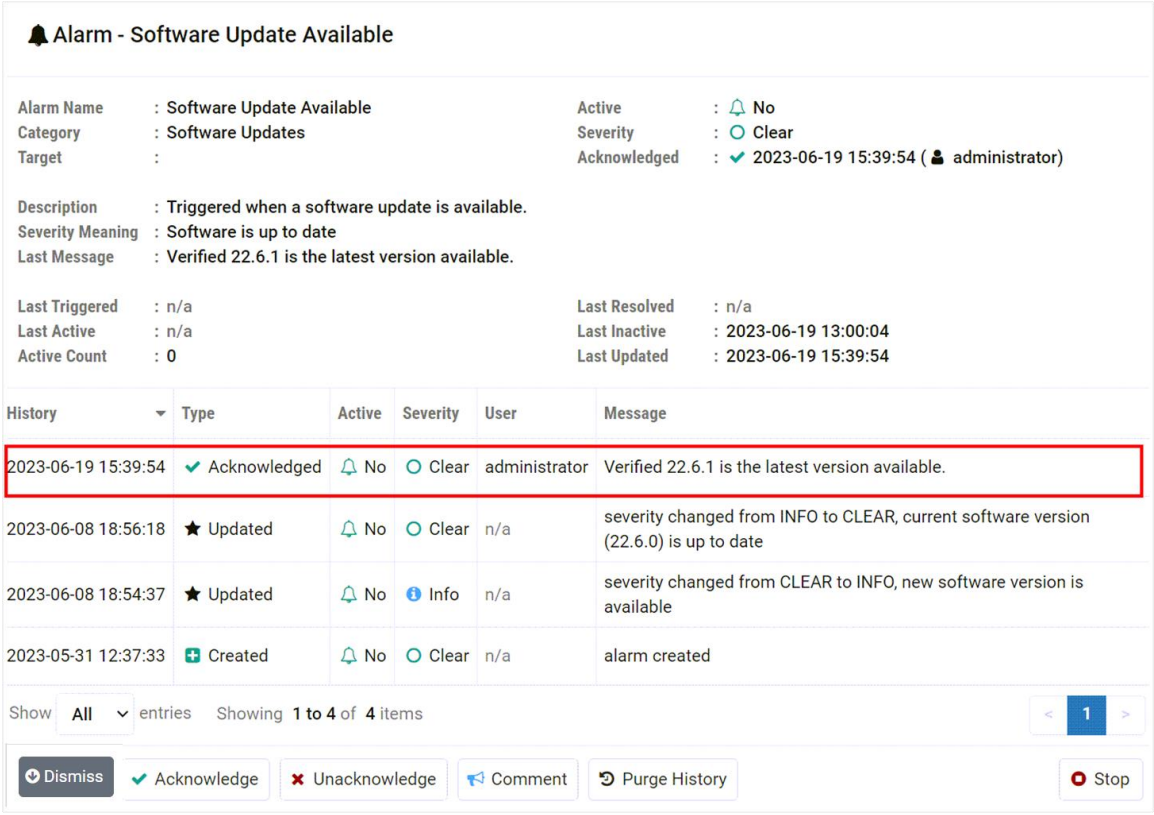
6. The Acknowledge Alarm page is shown. Adding a comment, as shown below, is optional. Click **Submit**.



7. The alarm history now indicates that the alarm has been acknowledged.



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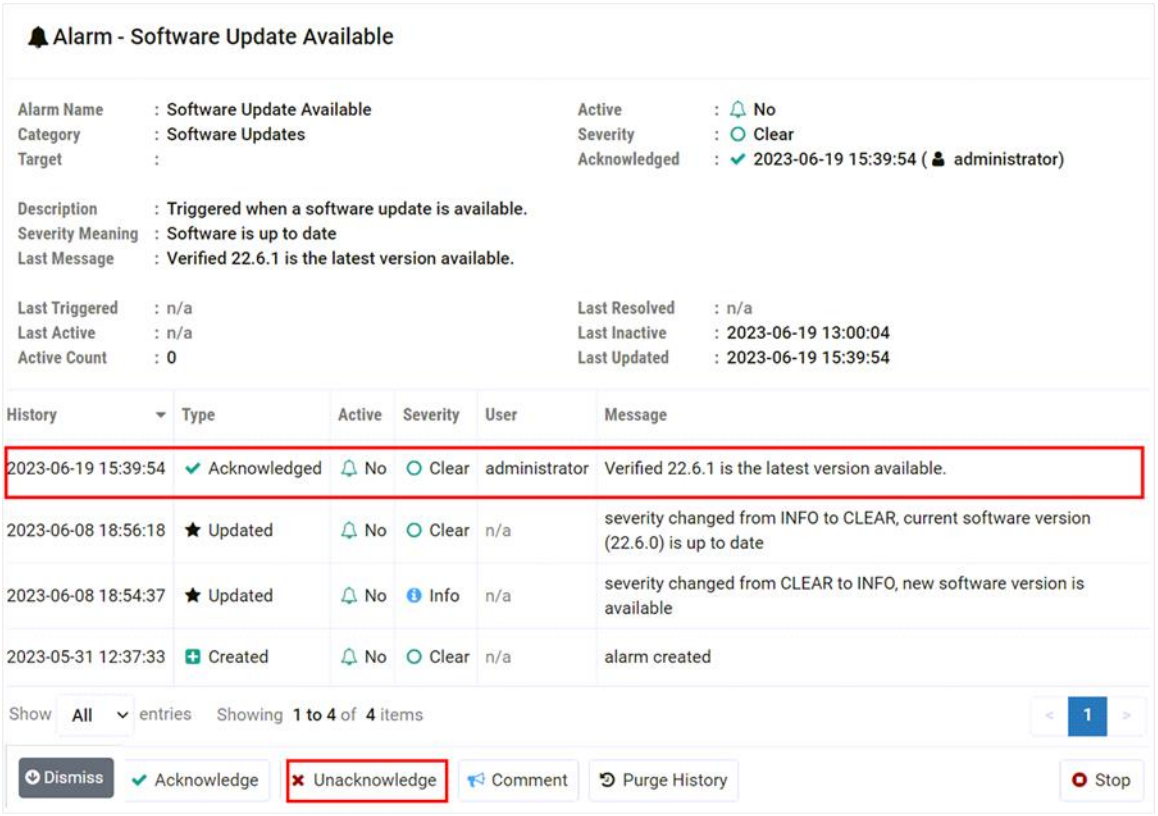
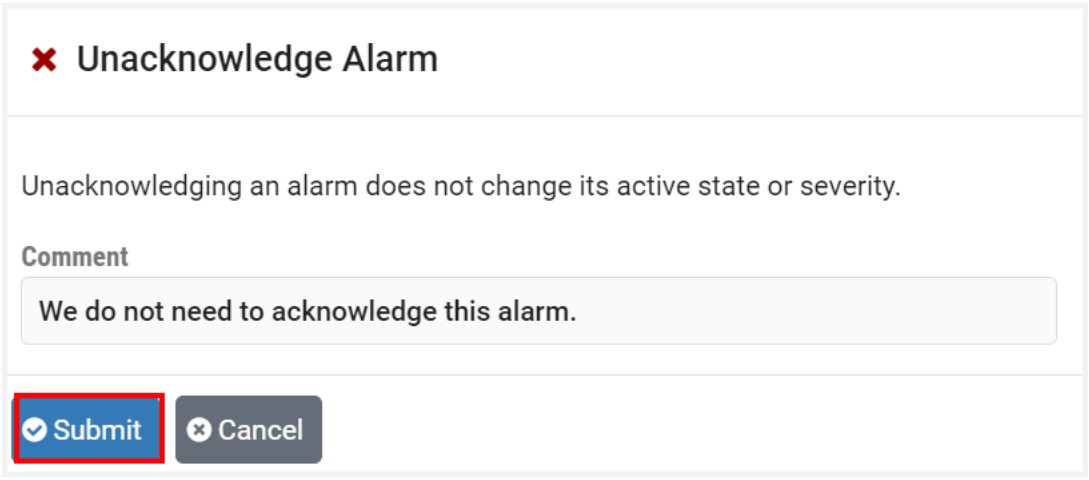
8. Next, we will remove the acknowledgment by selecting **Unacknowledge.**



9. Add a comment (optional), and then click **Submit**.



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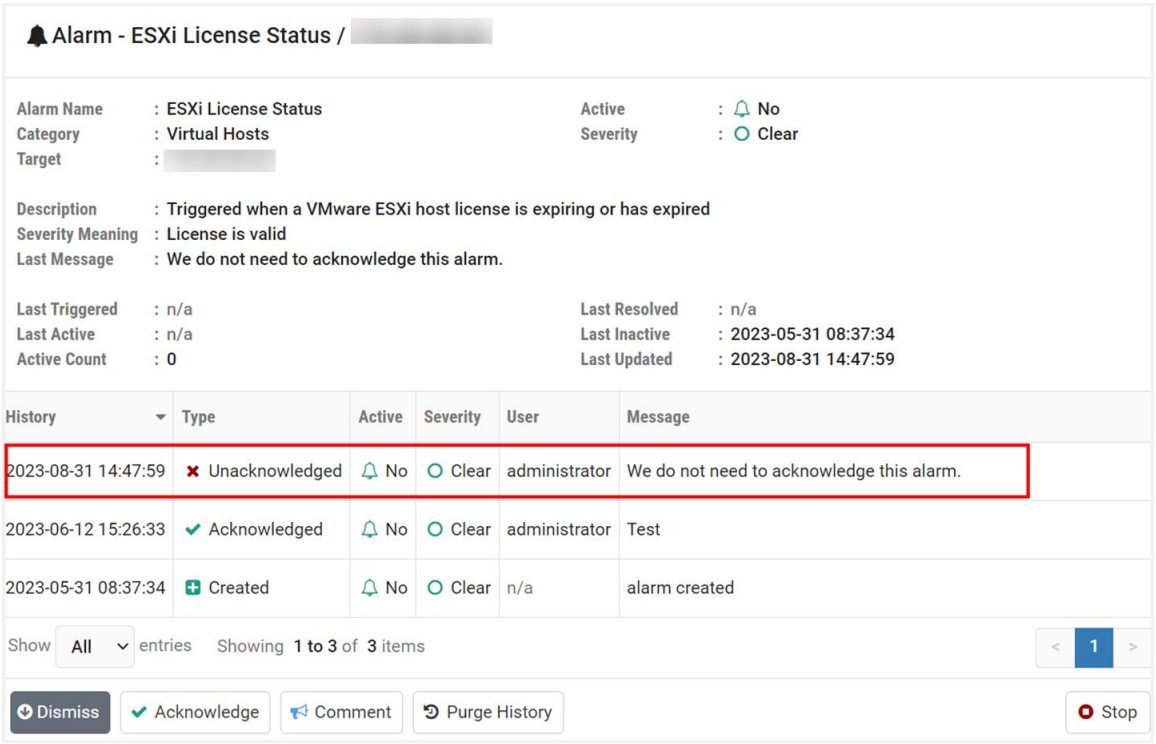
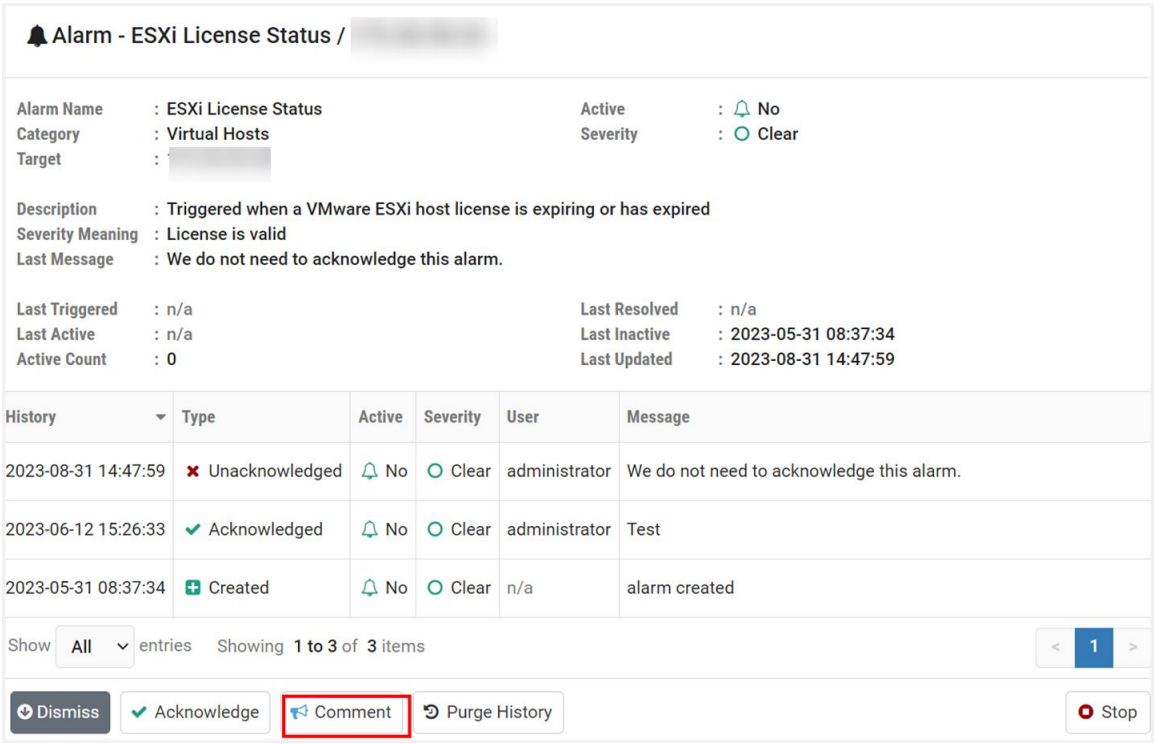
10. The alarm history now indicates that the alarm has been unacknowledged.



11. This time, we will simply add a comment to the alarm history. Click **Comment**.



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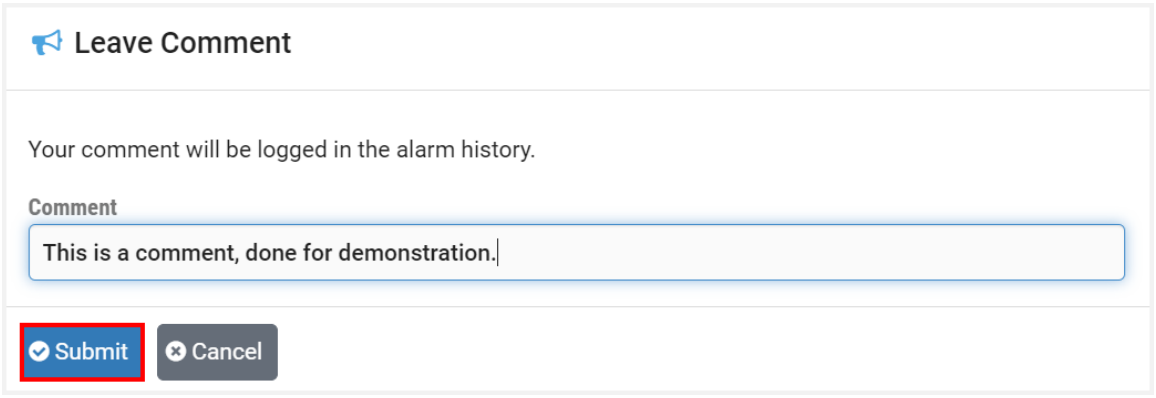
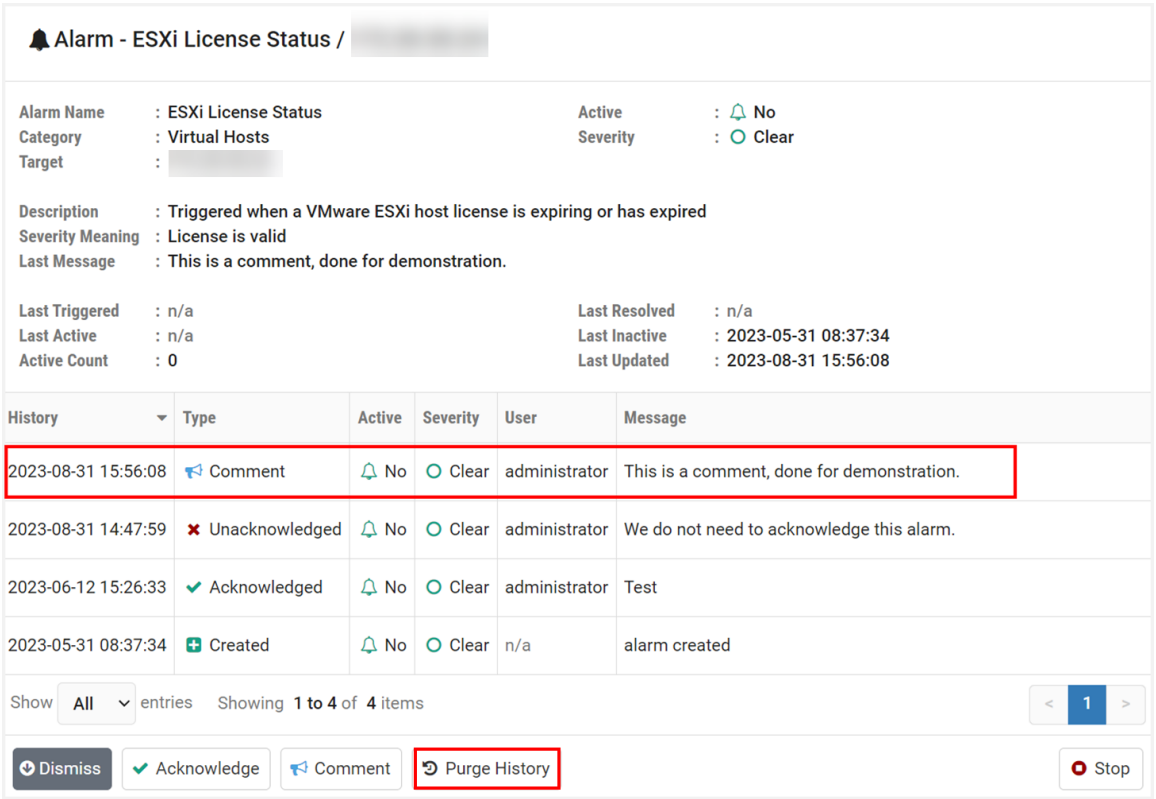
6. Enter a comment and then click **Submit**.



7. The alarm history now shows the comment. Next, we will purge the alarm history; this can be helpful to remove old or irrelevant information when troubleshooting. Click **Purge History**.



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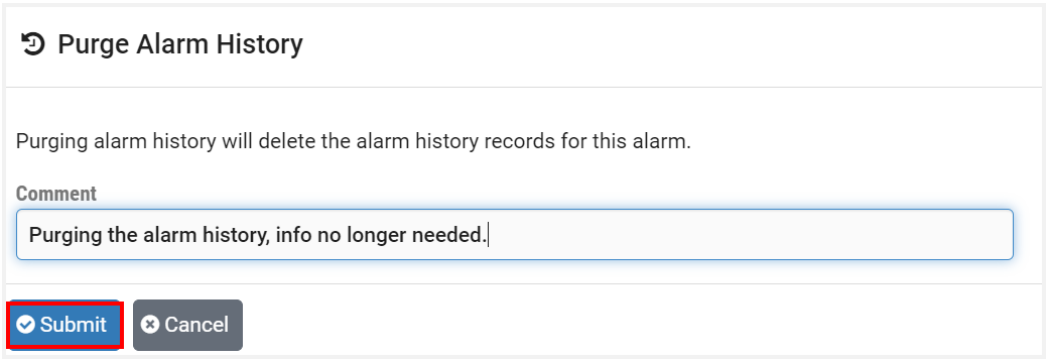
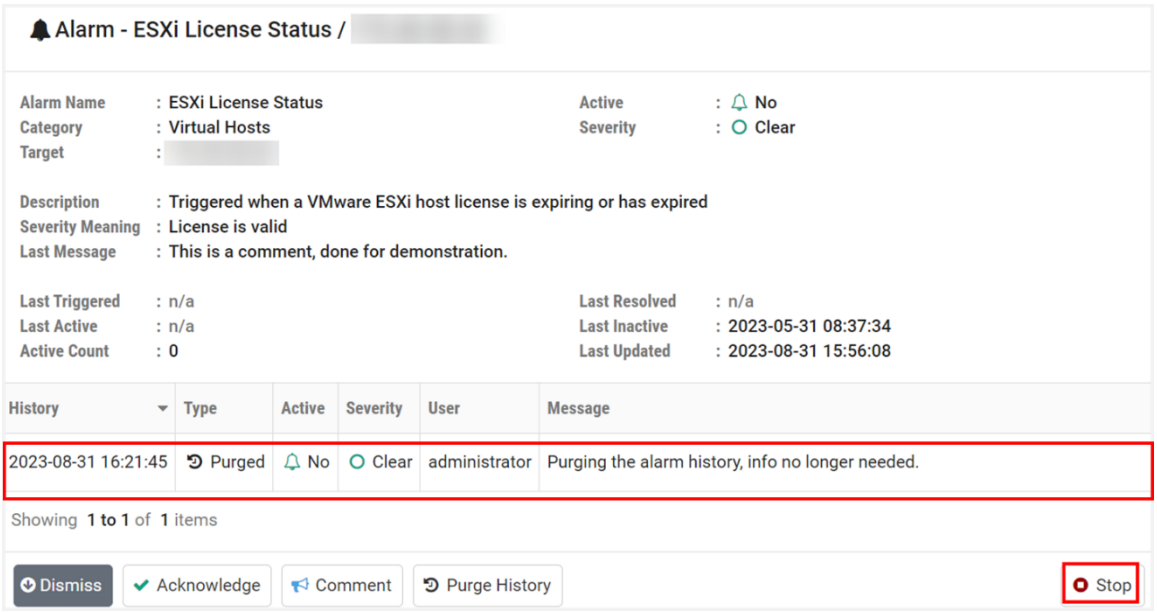
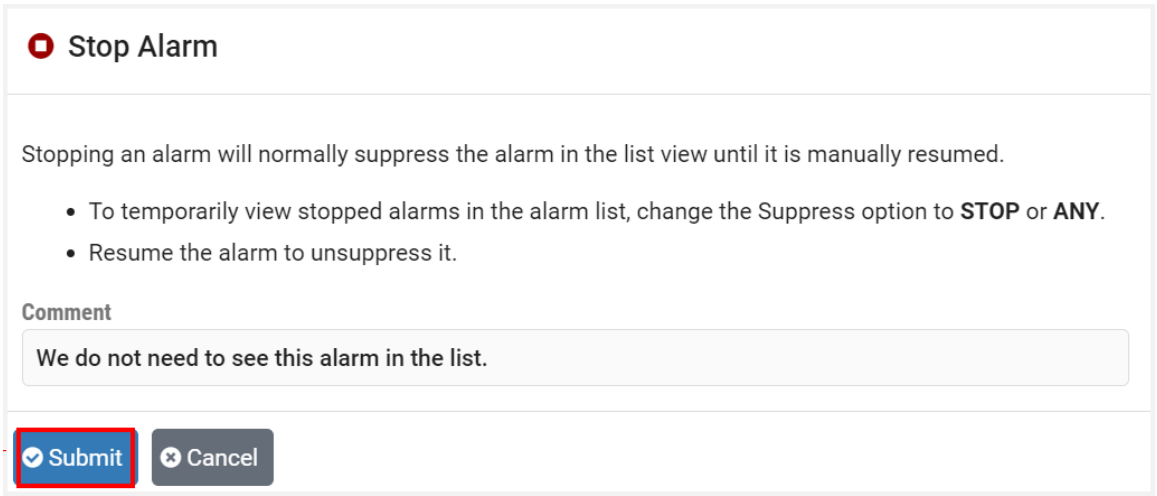
8. Add a comment (optional), and then click **Submit**.



9. The alarm history has been purged, as shown below. Let's also explore how to stop an alarm. Click the **Stop** button.



10. Add a comment (optional), and then click **Submit**.



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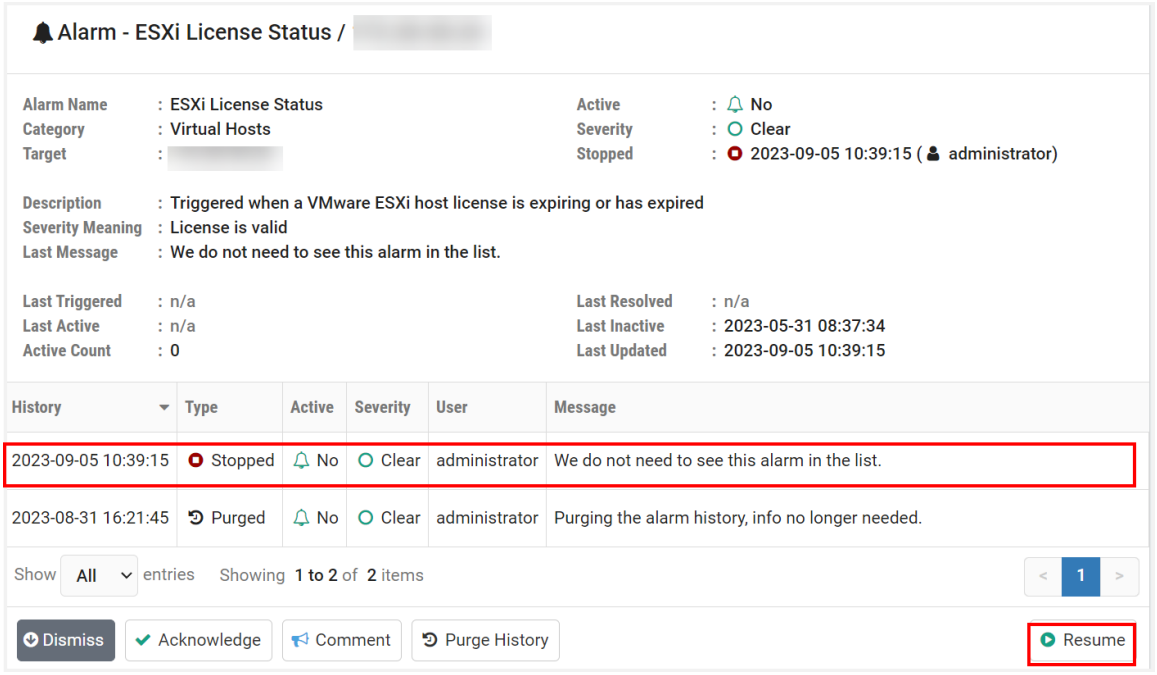
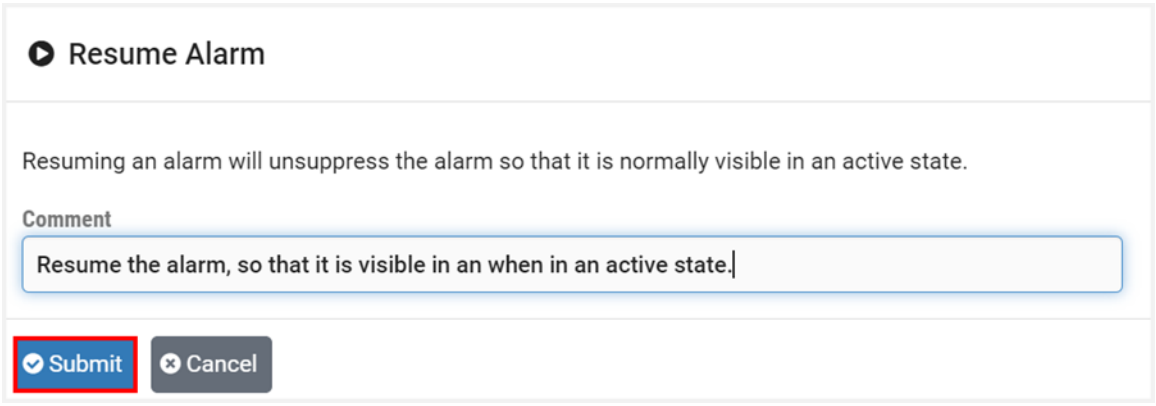
11. The alarm page now indicates the alarm has been stopped. We will now start the alarm again by selecting **Resume**.



12. Add a comment (optional), and then click **Submit**.



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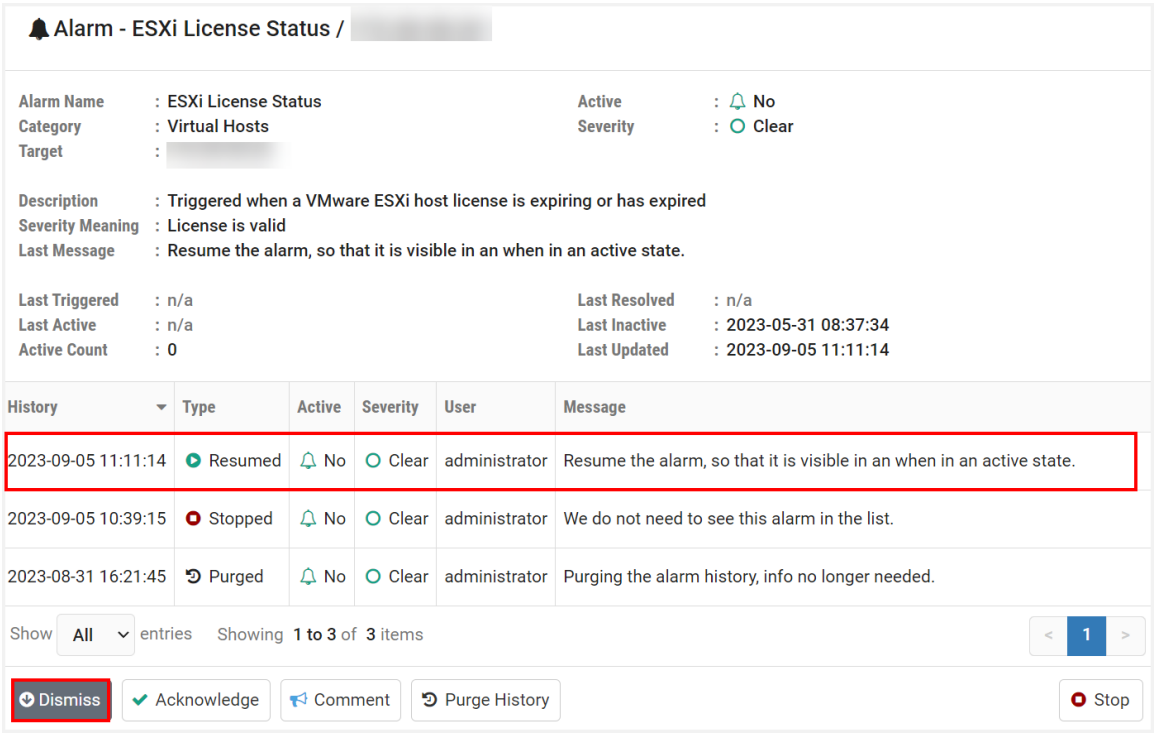
13. As shown below, the alarm has resumed. Click **Dismiss**.



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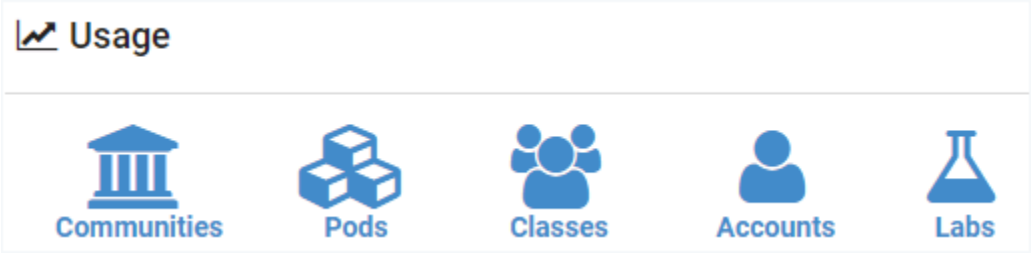
18 Usage

Usage reporting provides valuable feedback on the use of your NETLAB+ system, which allows your organization to easily assess how equipment resources are being used, along with examining user activity at a variety of levels. The reporting information can be exported to a CSV file, allowing you to add the data to your own spreadsheets or reporting system. The ability to review the amount of use your NETLAB+ system is receiving provides helpful information to share within your organization and can be an indicator of when to consider expanding your system. Viewing usage information can help you answer questions such as:

- *How can I see a summary of the usage of my NETLAB+ system?* (Community Usage)
- *Does my NETLAB+ system have enough pods to serve our learners?* (Pod Usage)
- *Are our learners attending their lab reservations?* (Account Usage)

From the administrator Home page, select **Usage**.



There are several levels of reporting available, each with a selection of sorting options. Usage information includes Reservations Made, Labs Attended, Hours Reserved, and Hours Attended, summarized according to your selection of usage level.

Usage Levels (see subsections below for details):

- **Communities:** Usage is summarized at the community level.
- **Pods:** Usage is reported per equipment pod for selected classes.
- **Classes:** Usage is reported for selected classes.
- **Accounts:** Usage is reported for individual users.
- **Labs:** Total number of labs and lab hours per user.

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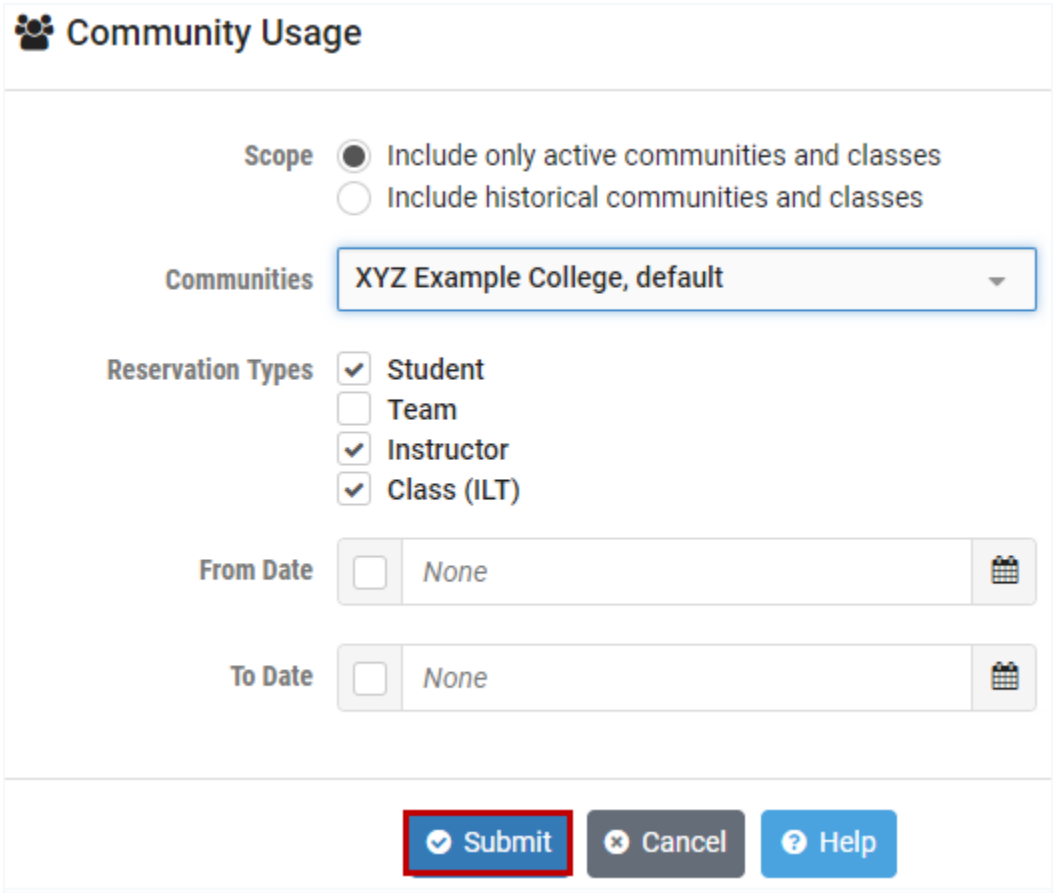
18.1 Community Usage

Usage information, grouped by community, is displayed when community usage reporting is selected. The report may be customized by selecting options (see field descriptions below).

1. To generate usage reporting at the community level, select **Usage > Communities** from the administrator Home page.
2. Use the options on the page to construct a query to search the log entries (optional, see field descriptions below).
3. Click **Submit** to view the results.



Field Descriptions - Community Usage

- **Scope:** Select the scope of communities and classes to be displayed on the report.
    - **Include only active communities and classes:** Choose to limit community and class selections to those that currently exist or expand selections to include deleted items that only reside in historical records. Typically, instructors will be more interested in active communities and classes,

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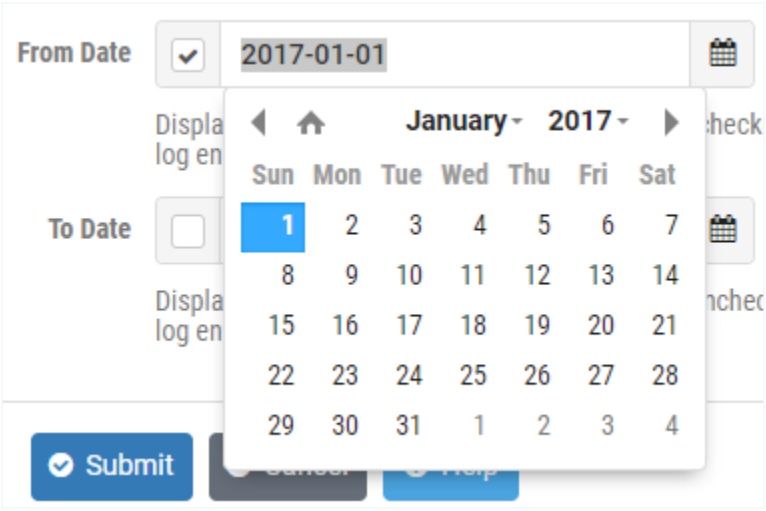
which will provide a view of what students are doing in the classes they are teaching.

- **Include historical communities and classes:** The inclusion of historical data is useful for looking at how NETLAB+ is being utilized, in general, over longer periods of time.

- **Communities**: If your NETLAB+ system contains multiple communities, you may select the communities for which you want to generate usage reporting.

- **Reservation Types:** Select the type(s) of reservations to include in the usage report.

- **From Date** and **To Date:** An optional From Date and/or To Date may be applied by selecting the checkbox and then selecting a date on the calendar pop-up. The information displayed will be limited by the selected date range. If left unchecked, the report will contain lab usage information starting from the earliest log entry available, through the present.



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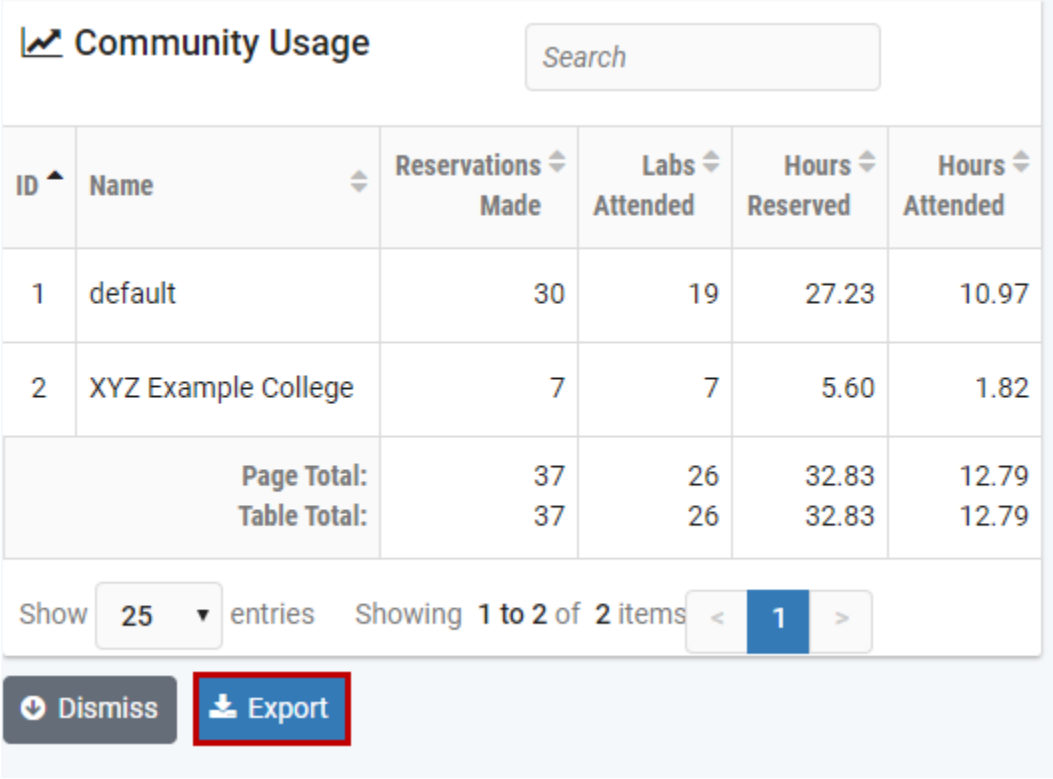
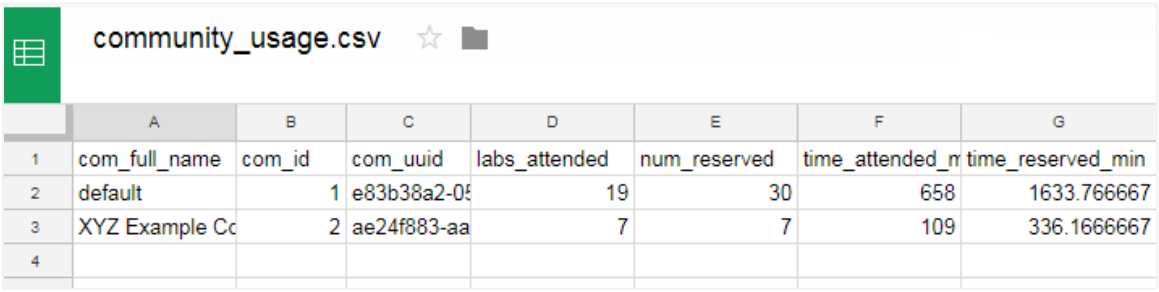
4. The Community Usage report is displayed. The information includes Reservations Made, Labs Attended, Hours Reserved, and Hours Attended. You may sort the data in ascending/descending order by clicking any of the header fields. Next, we will export the data by selecting **Export**.



5. The data has been exported to a file, **community_usage.csv**. Locate the file in your computer's downloads folder (the folder name may vary depending on your preferences and settings). The file can be viewed with a spreadsheet program or text editor.



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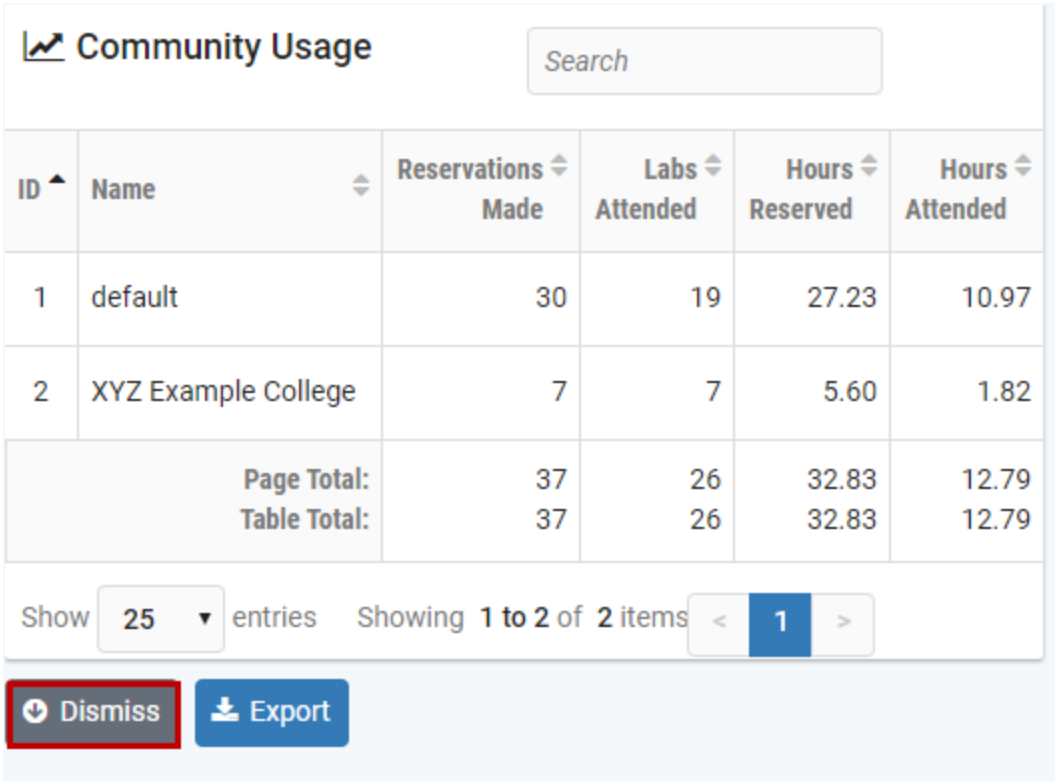
6. When you are finished viewing the report in NETLAB+, click **Dismiss**.



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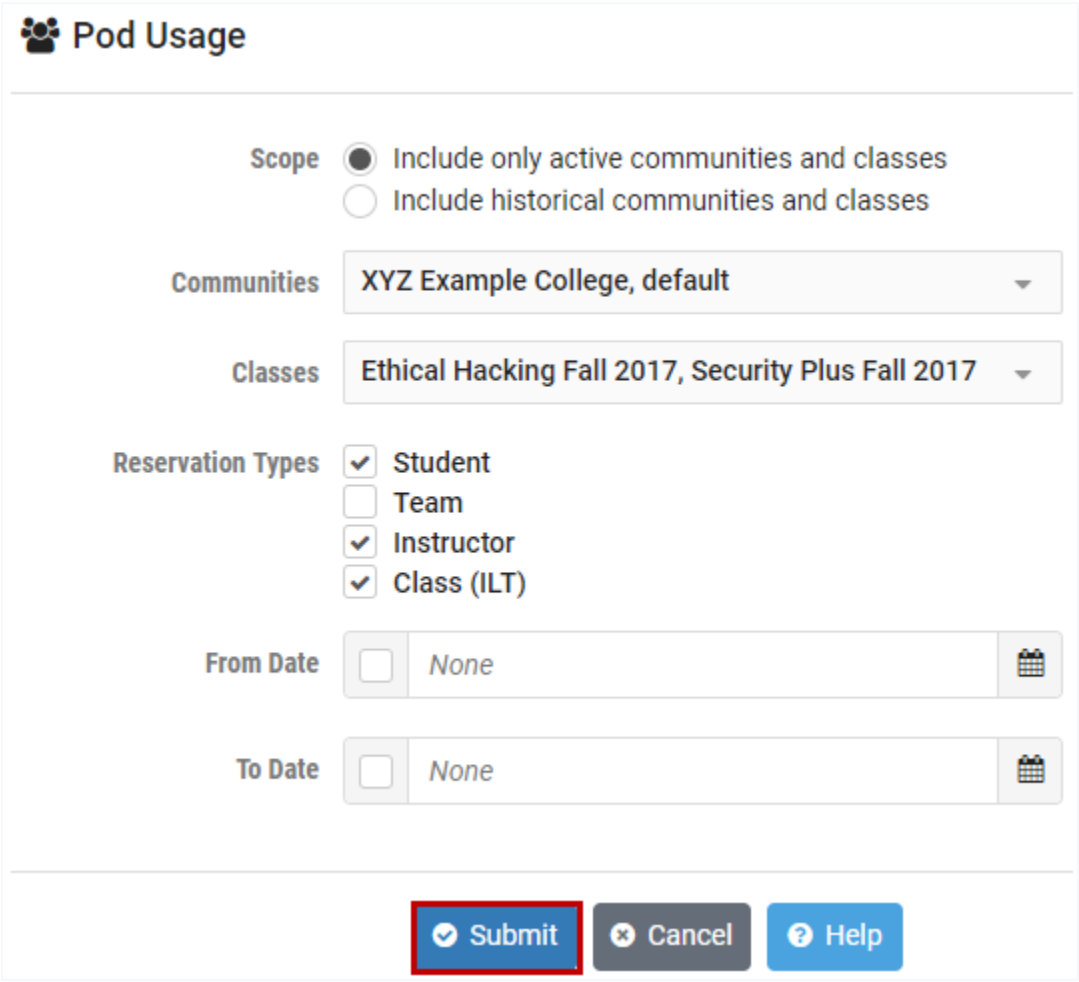
18.2 Pod Usage

Usage information, summarized at the pod level, is displayed when pod usage reporting is selected. The report may be customized by selecting options (see field descriptions below). The report will only contain statistics for currently installed pods. Pods that have been deleted from the system will not be included.

1. To generate usage reporting at the pod level, select **Usage > Pods** from the administrator Home page.
2. Use the options on the page to construct a query to search the log entries (optional, see field descriptions below). The report will include usage data for all pods associated with the class(es) selected.
3. Click **Submit** to view the results.



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Field Descriptions - Pod Usage

- **Scope:** Select the scope of communities and classes to be displayed on the report.
    - **Include only active communities and classes:** Choose to limit community and class selections to those that currently exist or expand selections to include deleted items that only reside in historical records. Typically, instructors will be more interested in active communities and classes, which will provide a view of what students are doing in the classes they are teaching.
    - **Include historical communities and classes:** The inclusion of historical data is useful for looking at how NETLAB+ is being utilized, in general, over longer periods of time.
- **Communities**: If your NETLAB+ system contains multiple communities, you may select the communities for which you want to generate usage reporting.
- **Classes:** The reporting will include data for all pods associated with the classes you select.
- **Reservation Types:** Select the type(s) of reservations to include in the usage report.
- **From Date** and **To Date:** An optional From Date and/or To Date may be applied by selecting the checkbox and then selecting a date on the calendar pop-up. The information displayed will be limited by the selected date range. If left unchecked, the report will contain usage information starting from the earliest log entry available, through the present.

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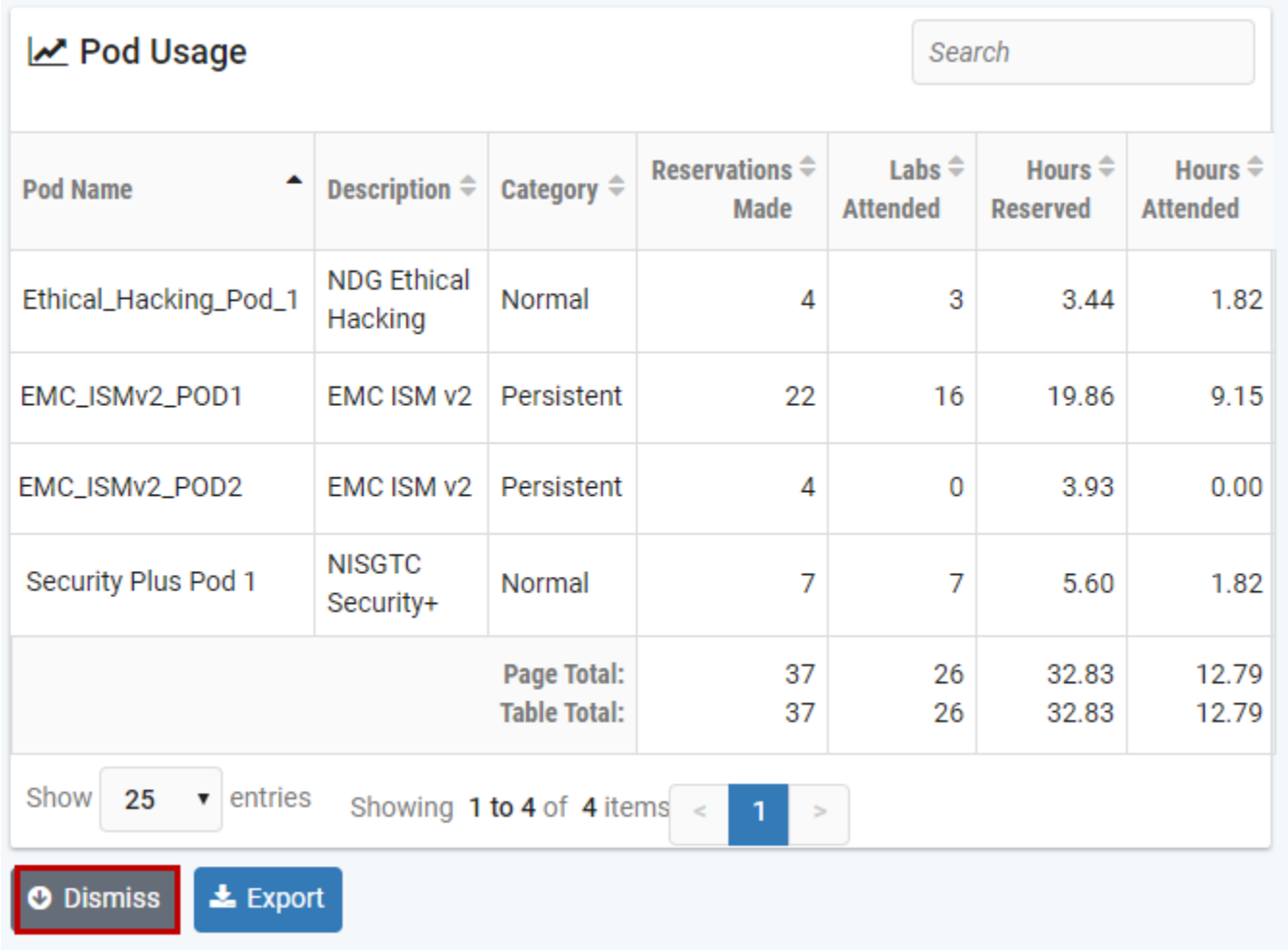
4. The Pod Usage report is displayed. The information includes Pod Name, Description, Category, Reservations Made, Labs Attended, Hours Reserved, and Hours Attended. You may sort the data in ascending/descending order by clicking any of the header fields. When you are finished reviewing the information, click **Dismiss**.

The Pod Usage data may be exported to a **pod_usage.csv** file. Refer to the previous section for an example of exporting usage data.



Pod Usage

Search

Pod Name	Description	Category	Reservations Made	Labs Attended	Hours Reserved	Hours Attended
Ethical_Hacking_Pod_1	NDG Ethical Hacking	Normal	4	3	3.44	1.82
EMC_ISMv2_POD1	EMC ISM v2	Persistent	22	16	19.86	9.15
EMC_ISMv2_POD2	EMC ISM v2	Persistent	4	0	3.93	0.00
Security Plus Pod 1	NISGTC Security+	Normal	7	7	5.60	1.82
		Page Total:	37	26	32.83	12.79
		Table Total:	37	26	32.83	12.79

Show 25 entries Showing 1 to 4 of 4 items < 1 >

Dismiss Export

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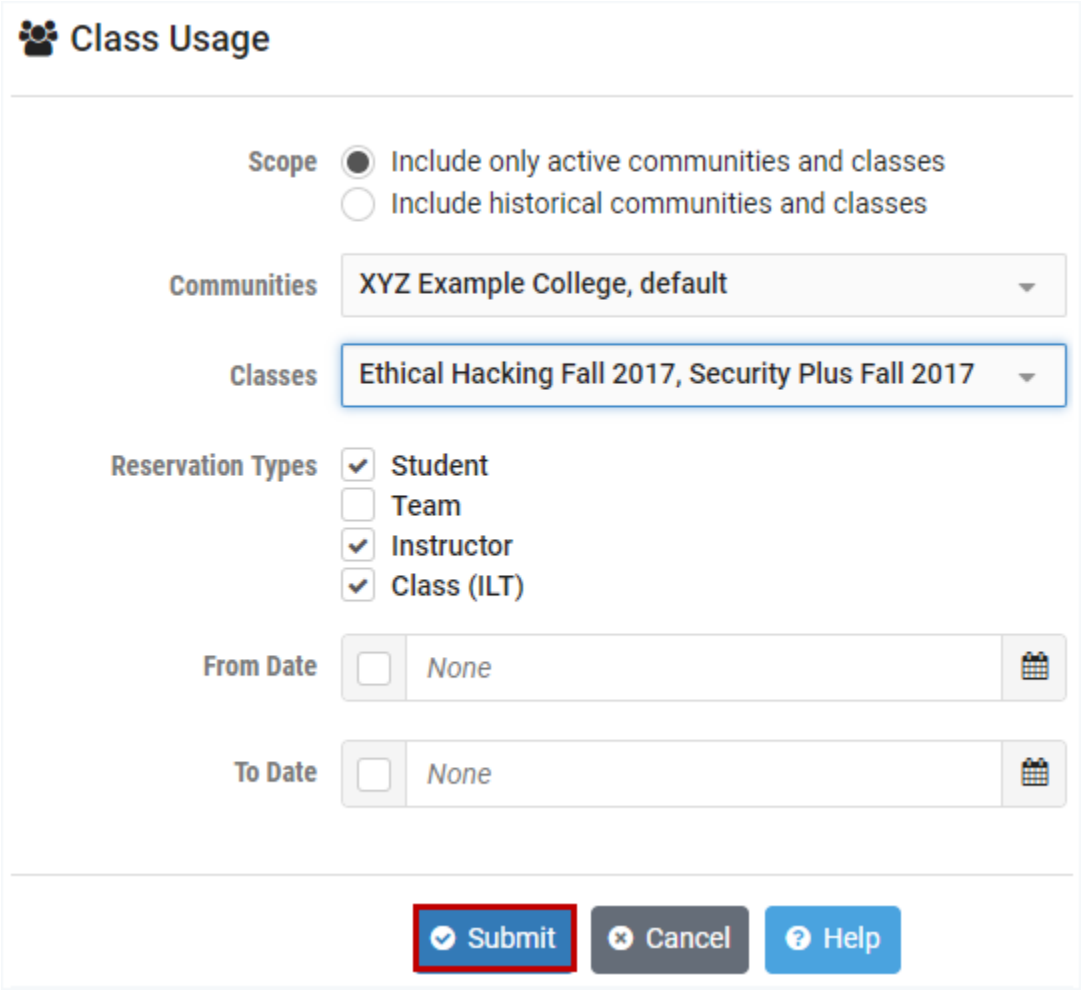
18.3 Class Usage

Usage information at the class level is displayed when class usage reporting is selected. The report may be customized by selecting options (see field descriptions below).

1. To generate usage reporting at the class level, select **Usage > Classes** from the administrator Home page.
2. Use the options on the page to construct a query to search the log entries (optional, see field descriptions below).
3. Click **Submit** to view the results.



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Field Descriptions - Class Usage

- **Scope:** Select the scope of communities and classes to be displayed on the report.
    - **Include only active communities and classes:** Choose to limit community and class selections to those that currently exist or expand selections to include deleted items that only reside in historical records. Typically, instructors will be more interested in active communities and classes, which will provide a view of what students are doing in the classes they are teaching.
    - **Include historical communities and classes:** The inclusion of historical data is useful for looking at how NETLAB+ is being utilized, in general, over longer periods of time.
- **Communities**: If your NETLAB+ system contains multiple communities, you may select the communities for which you want to generate usage reporting.
- **Classes:** The reporting will include data for all classes you select.
- **Reservation Types:** Select the type(s) of reservations to include in the usage report.
- **From Date** and **To Date:** An optional From Date and/or To Date may be applied by selecting the checkbox and then selecting a date on the calendar pop-up. The information displayed will be limited by the selected date range. If left unchecked, the report will contain usage information starting from the earliest log entry available, through the present.

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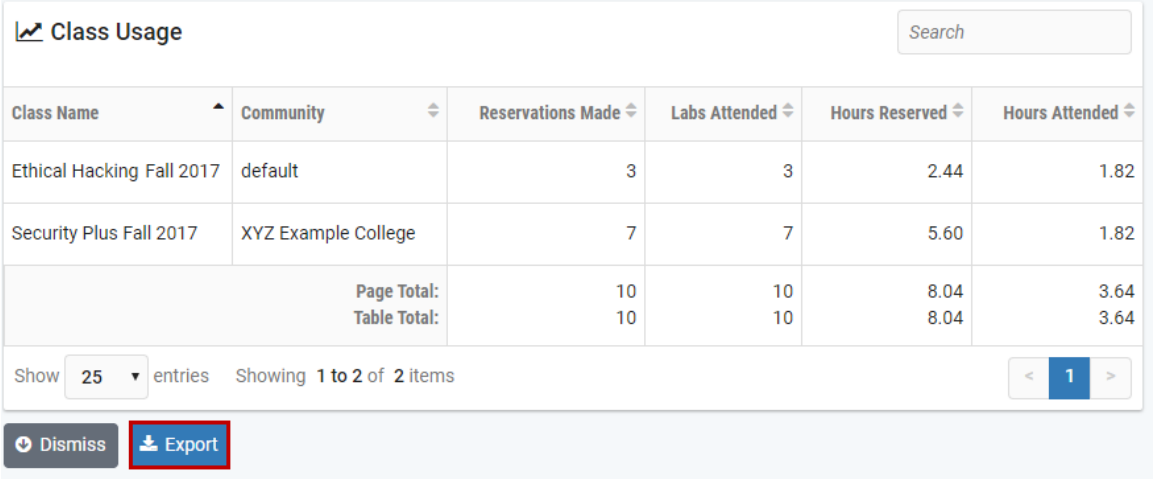
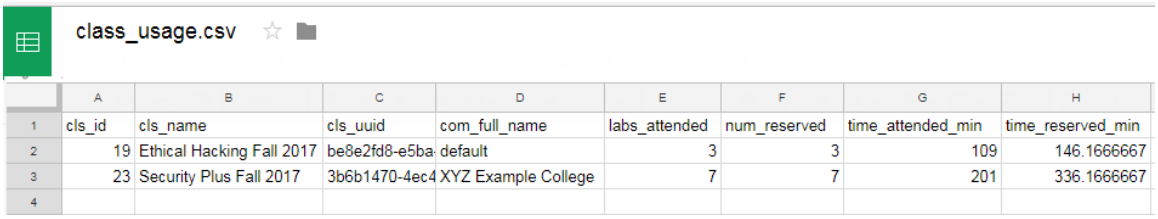
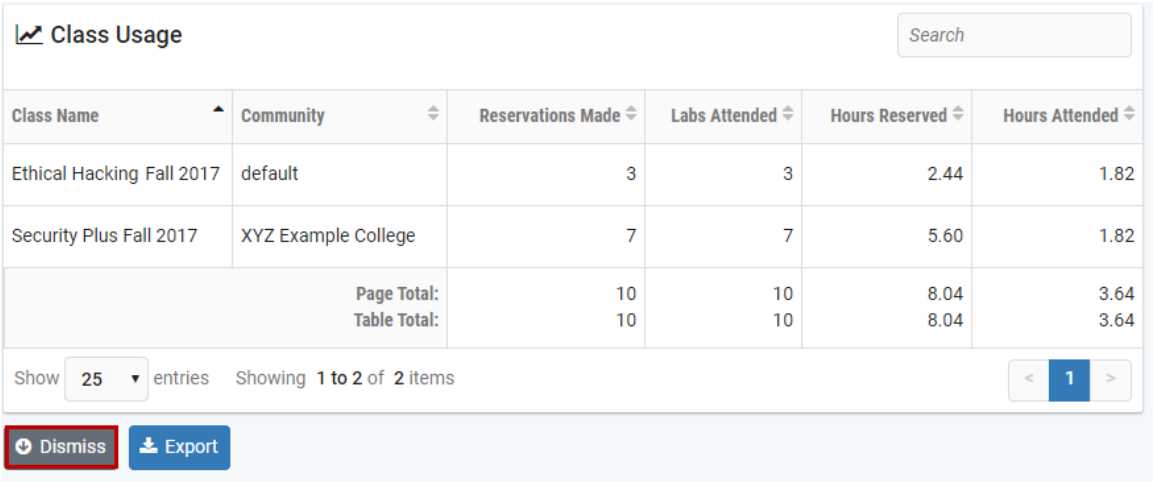
4. The Class Usage report is displayed. The information includes Class Name, Community, Reservations Made, Labs Attended, Hours Reserved, and Hours Attended. You may sort the data in ascending/descending order by clicking any of the header fields. Next, we will export the data by selecting **Export**.



5. The data has been exported to a file, **class_usage.csv**. Locate the file in your computer's downloads folder (the folder name may vary depending on your preferences and settings). The file can be viewed with a spreadsheet program or text editor.



6. When you are finished reviewing the information in NETLAB+, click **Dismiss**.



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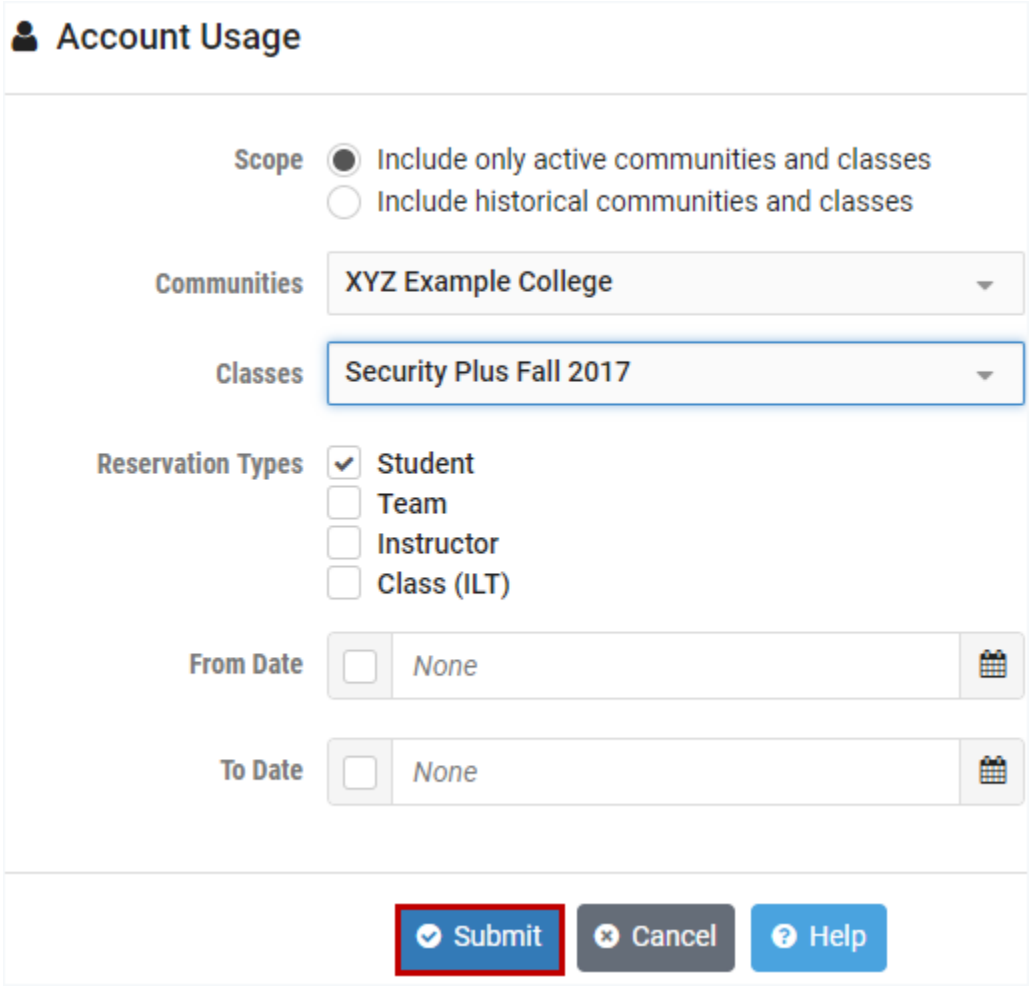
18.4 Account Usage

Usage information at the individual account level is displayed when account usage reporting is selected. The report may be customized by selecting options (see field descriptions below).

1. To generate usage reporting at the account level, select **Usage > Accounts** from the administrator Home page.
2. Use the options on the page to construct a query to search the log entries (optional, see field descriptions below). For this example, we have selected only one of the communities on our system.

3. Click **Submit** to view the results.



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Field Descriptions - Account Usage

- **Scope:** Select the scope of communities and classes to be displayed on the report.
    - **Include only active communities and classes:** Choose to limit community and class selections to those that currently exist or expand selections to include deleted items that only reside in historical records. Typically, instructors will be more interested in active communities and classes, which will provide a view of what students are doing in the classes they are teaching.
    - **Include historical communities and classes:** The inclusion of historical data is useful for looking at how NETLAB+ is being utilized, in general, over longer periods of time.
- **Communities**: If your NETLAB+ system contains multiple communities, you may select the communities for which you want to generate usage reporting.
- **Classes:** The reporting will include data for all accounts associated with the classes you select.
- **Reservation Types:** Select the type(s) of reservations to include in the usage report.
- **From Date** and **To Date:** An optional From Date and/or To Date may be applied by selecting the checkbox and then selecting a date on the calendar pop-up. The information displayed will be limited by the selected date range. If left unchecked, the report will contain usage information starting from the earliest log entry available, through the present.

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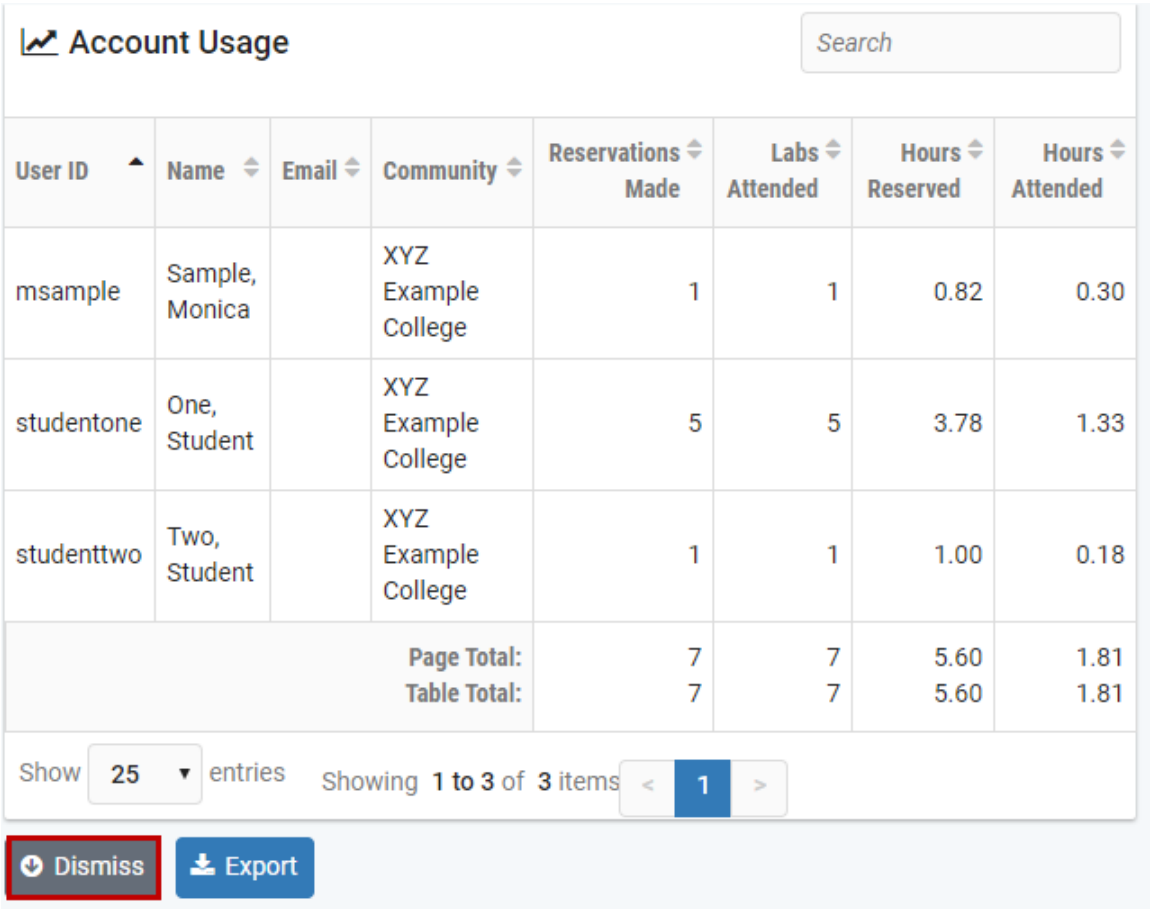
4. The Account Usage report is displayed. The information includes User ID, Name, Email, Community, Reservations Made, Labs Attended, Hours Reserved, and Hours Attended. You may sort the data in ascending/descending order by clicking any of the header fields. Notice in the example below that we are displaying information for only one of the communities on the system. When you are finished reviewing the information, click **Dismiss**.

The Account Usage data may be exported to an **account_usage.csv** file. Refer to the previous section for an example of exporting usage data.



Account Usage

Search

User ID	Name	Email	Community	Reservations Made	Labs Attended	Hours Reserved	Hours Attended
msample	Sample, Monica		XYZ Example College	1	1	0.82	0.30
studentone	One, Student		XYZ Example College	5	5	3.78	1.33
studenttwo	Two, Student		XYZ Example College	1	1	1.00	0.18
			Page Total:	7	7	5.60	1.81
			Table Total:	7	7	5.60	1.81

Show 25 entries Showing 1 to 3 of 3 items < 1 >

Dismiss Export

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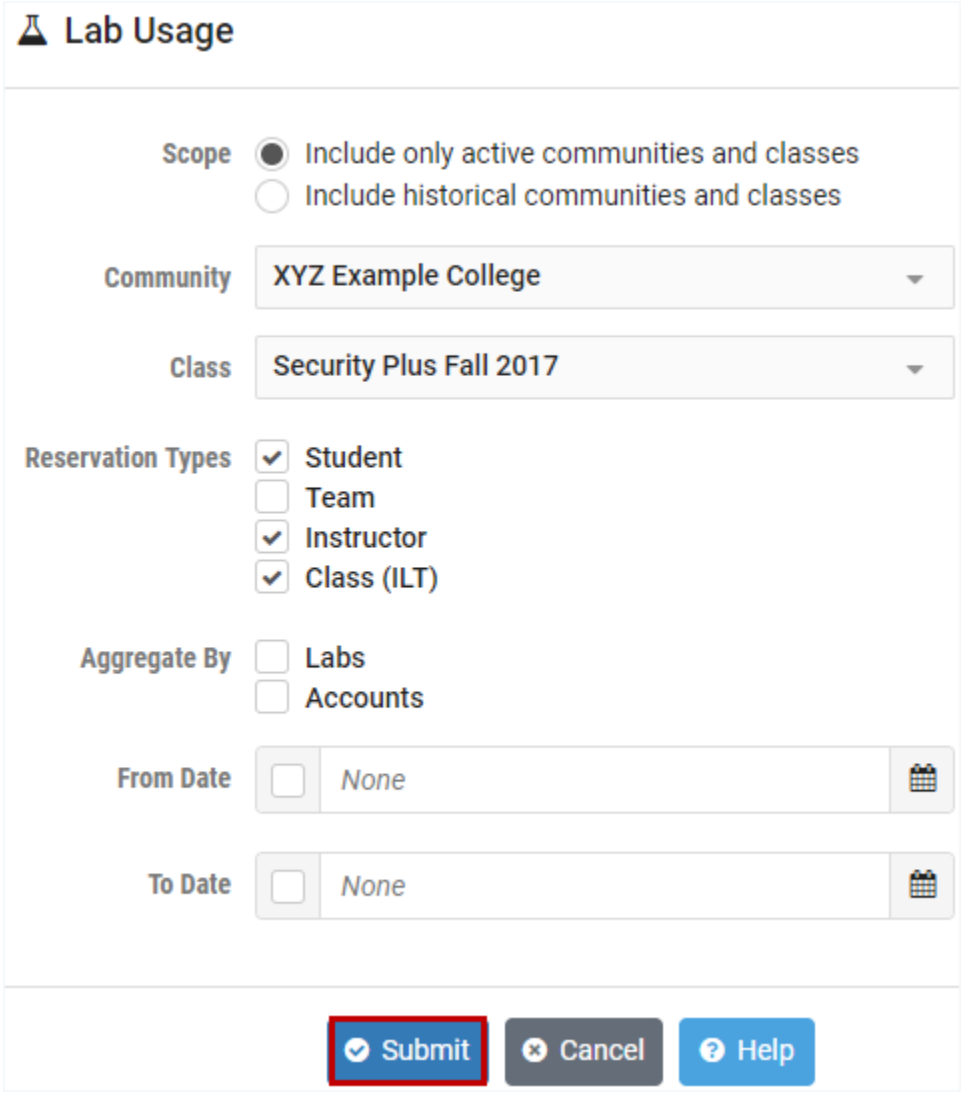
18.5 Lab Usage

Usage information at the lab level is displayed when Lab Usage reporting is selected. The report may be customized by selecting options (see field descriptions below). Lab Usage data may be aggregated (grouped) by labs and/or accounts.

1. To generate usage reporting at the lab level, select **Usage > Labs** from the administrator Home page.
2. Use the options on the page to construct a query to search the log entries (optional, see field descriptions below). In the example below, the option to aggregate is not selected (we will show that in a second example below).
3. Click **Submit** to view the results.



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Field Descriptions - Lab Usage

- **Scope:** Select the scope of communities and classes to be displayed on the report.
    - **Include only active communities and classes:** Choose to limit community and class selections to those that currently exist or expand selections to include deleted items that only reside in historical records. Typically, instructors will be more interested in active communities and classes, which will provide a view of what students are doing in the classes they are teaching.
    - **Include historical communities and classes:** The inclusion of historical data is useful for looking at how NETLAB+ is being utilized, in general, over longer periods of time.
- **Community**: You may select the community for which you want to generate usage reporting. Only one community may be selected.
- **Class:** The reporting will include data for all labs associated with the class you select. Only one class may be selected.
- **Reservation Types:** Select the type(s) of reservations to include in the usage report.
- **Aggregate By**: Choose the Labs and/or Accounts option to aggregate (group) the lab usage information
- **From Date** and **To Date:** An optional From Date and/or To Date may be applied by selecting the checkbox and then selecting a date on the calendar pop-up. The information displayed will be limited by the selected date range. If left unchecked, the report will contain usage information starting from the earliest log entry available, through the present.

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1. The Lab Usage report is displayed. The information includes User ID, Name, Email, Community, Reservations Made, Labs Attended, Hours Reserved, and Hours Attended. You may sort the data in ascending/descending order by clicking any of the header fields. In the example below, the data is sorted by User ID. The report includes detail for every lab attended by each user. Click any of the detail rows of the report to view the lab history, specific to the reservation. We'll discuss lab history in the next section. Click **Dismiss** to return to the previous page.

The Lab Usage data may be exported to a **lab_usage.csv** file. Refer to the Class Usage section above for an example of exporting usage data.

Lab Usage: Security Plus Fall 2017

Search

User ID	Name	Exercise	Start Time	Hours Attended
studentone	One, Student	Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	0.15
studentone	One, Student	Lab 03: Protocols and Default Network Ports - Connecting to a Remote System	2017-08-02	0.23
studenttwo	Two, Student	Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	0.18
studentone	One, Student	Lab 02: Configuring the pfSense Firewall	2017-08-02	0.35
studentone	One, Student	Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	0.28
msample	Sample, Monica	Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	0.30
			Page Total:	1.81
			Table Total:	1.81

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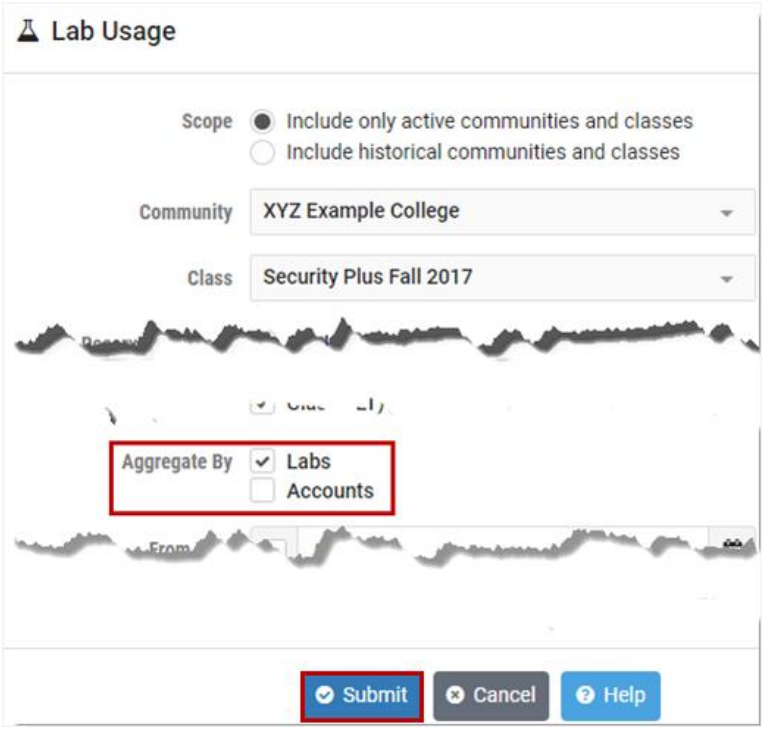
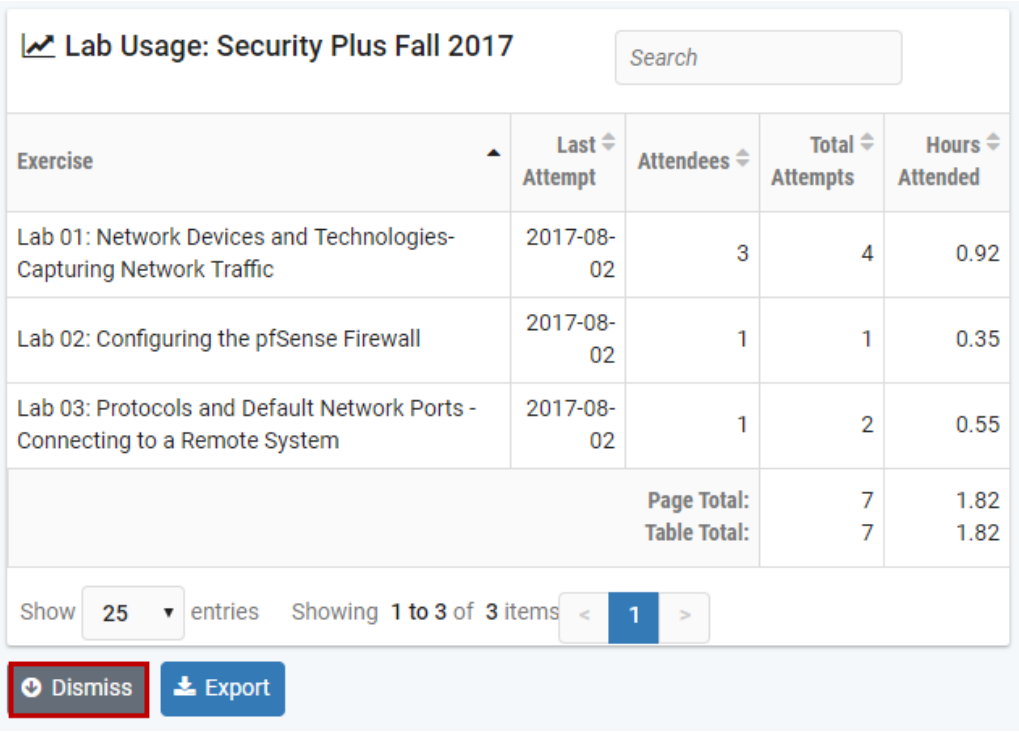
In this example, we will generate the report again, but this time, we will aggregate our results by labs.

1. From the Lab Usage page, select **Labs** and click **Submit**.



2. Now, our report shows one detail line per lab, with summary information for the number of Attendees, Total Attempts, and Hours Attended for all learners in the class. Click **Dismiss**.



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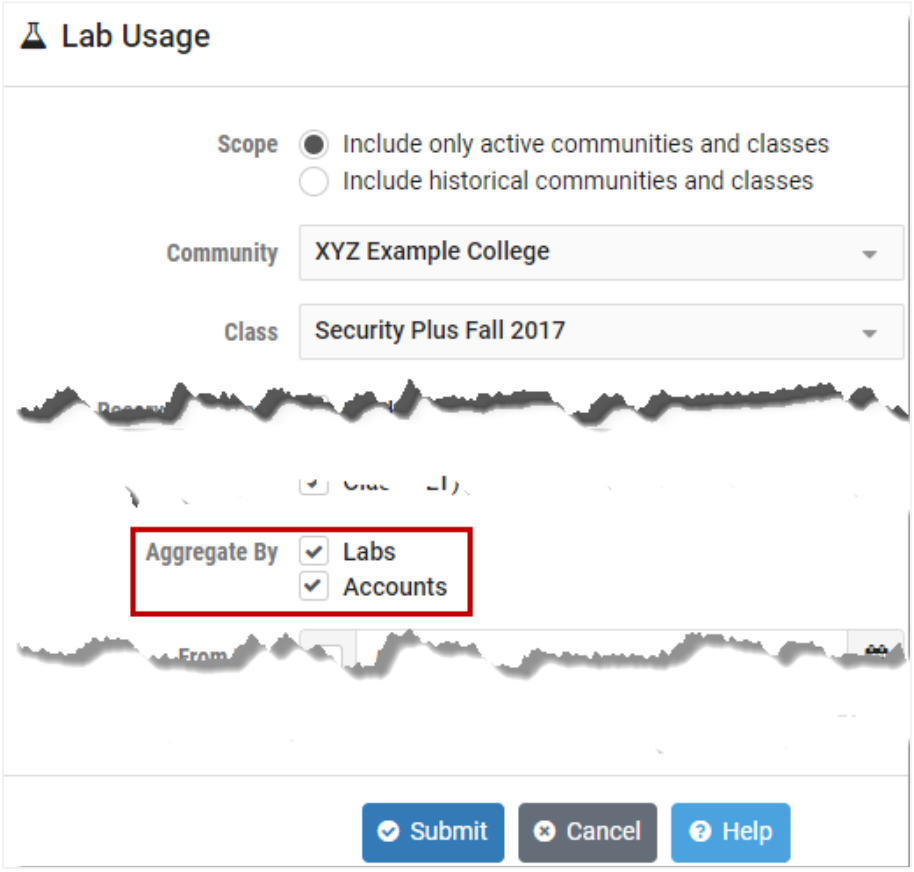
For this example, we will generate the report again, aggregating our results by both **Labs** and **Accounts**.

1. Select the options as shown and click **Submit**.



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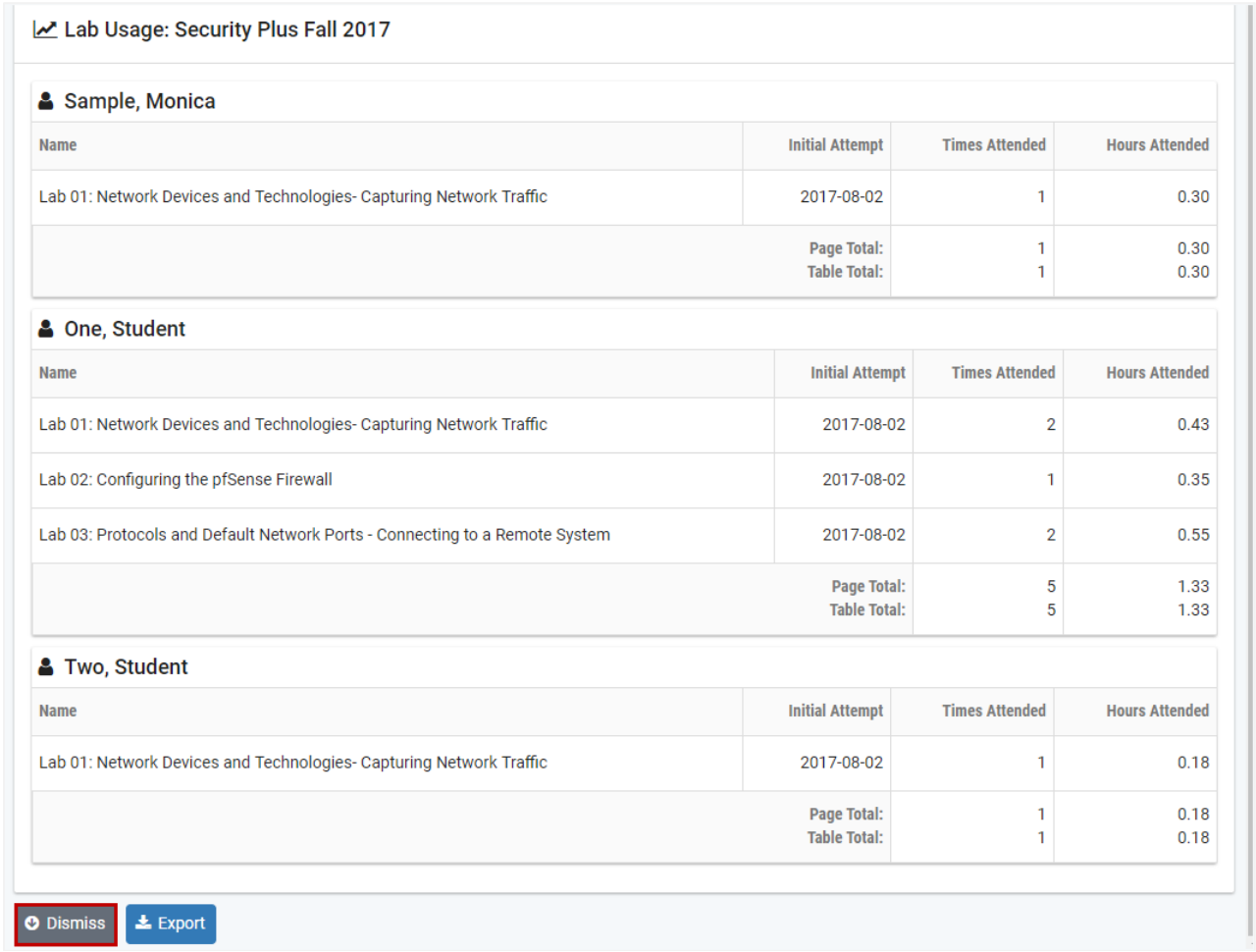
2. Here is an excerpt of the results; notice the report is now grouped by account. When you are finished viewing the results, click **Dismiss**.



Lab Usage: Security Plus Fall 2017

Sample, Monica

Name	Initial Attempt	Times Attended	Hours Attended
Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	1	0.30
	Page Total:	1	0.30
	Table Total:	1	0.30

One, Student

Name	Initial Attempt	Times Attended	Hours Attended
Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	2	0.43
Lab 02: Configuring the pfSense Firewall	2017-08-02	1	0.35
Lab 03: Protocols and Default Network Ports - Connecting to a Remote System	2017-08-02	2	0.55
	Page Total:	5	1.33
	Table Total:	5	1.33

Two, Student

Name	Initial Attempt	Times Attended	Hours Attended
Lab 01: Network Devices and Technologies- Capturing Network Traffic	2017-08-02	1	0.18
	Page Total:	1	0.18
	Table Total:	1	0.18

Dismiss Export

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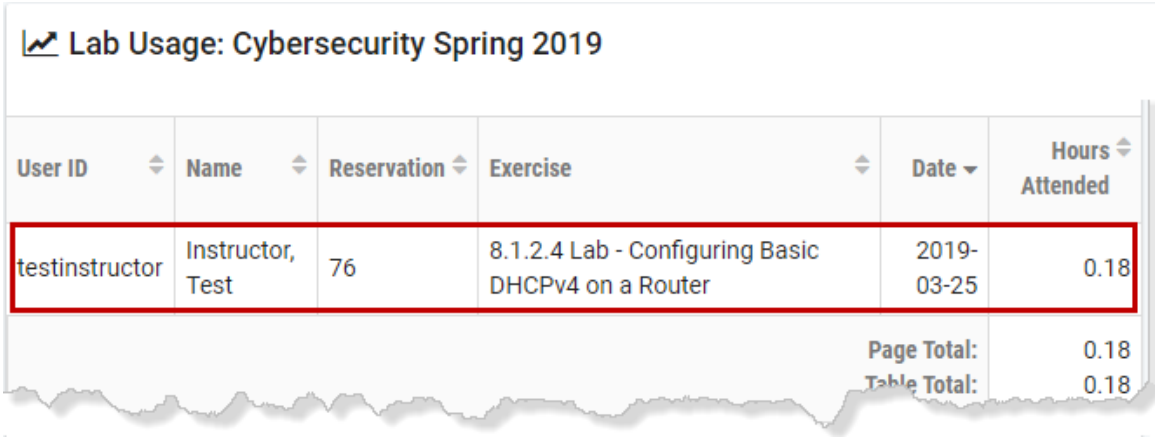
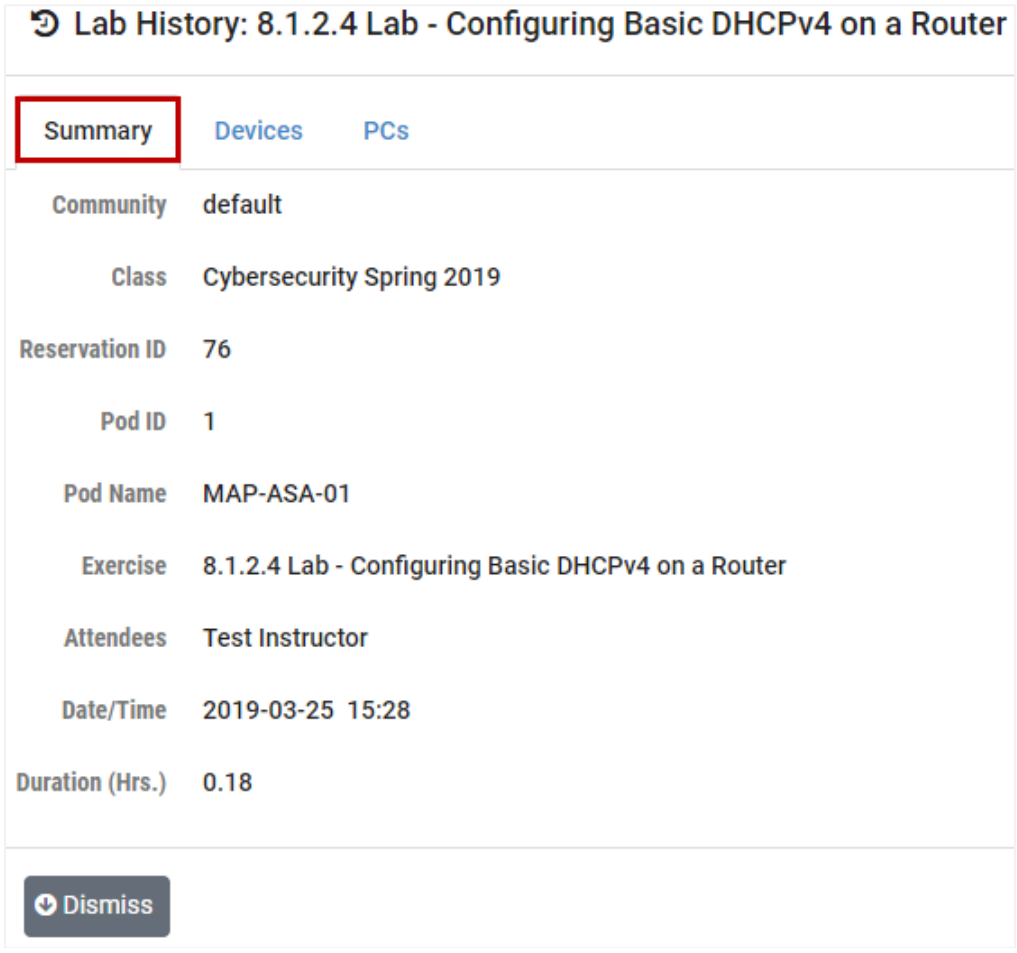
18.5.1 Lab History and Screenshots

In the previous section, we discussed how to generate a lab usage report. We will now take a look at lab history details for a reservation listed on the report.

1. To see the lab history for a reservation listed on a Lab Usage report, click on a reservation detail row on the report.



2. The Lab History **Summary** tab will be displayed, showing details specific to the reservation.



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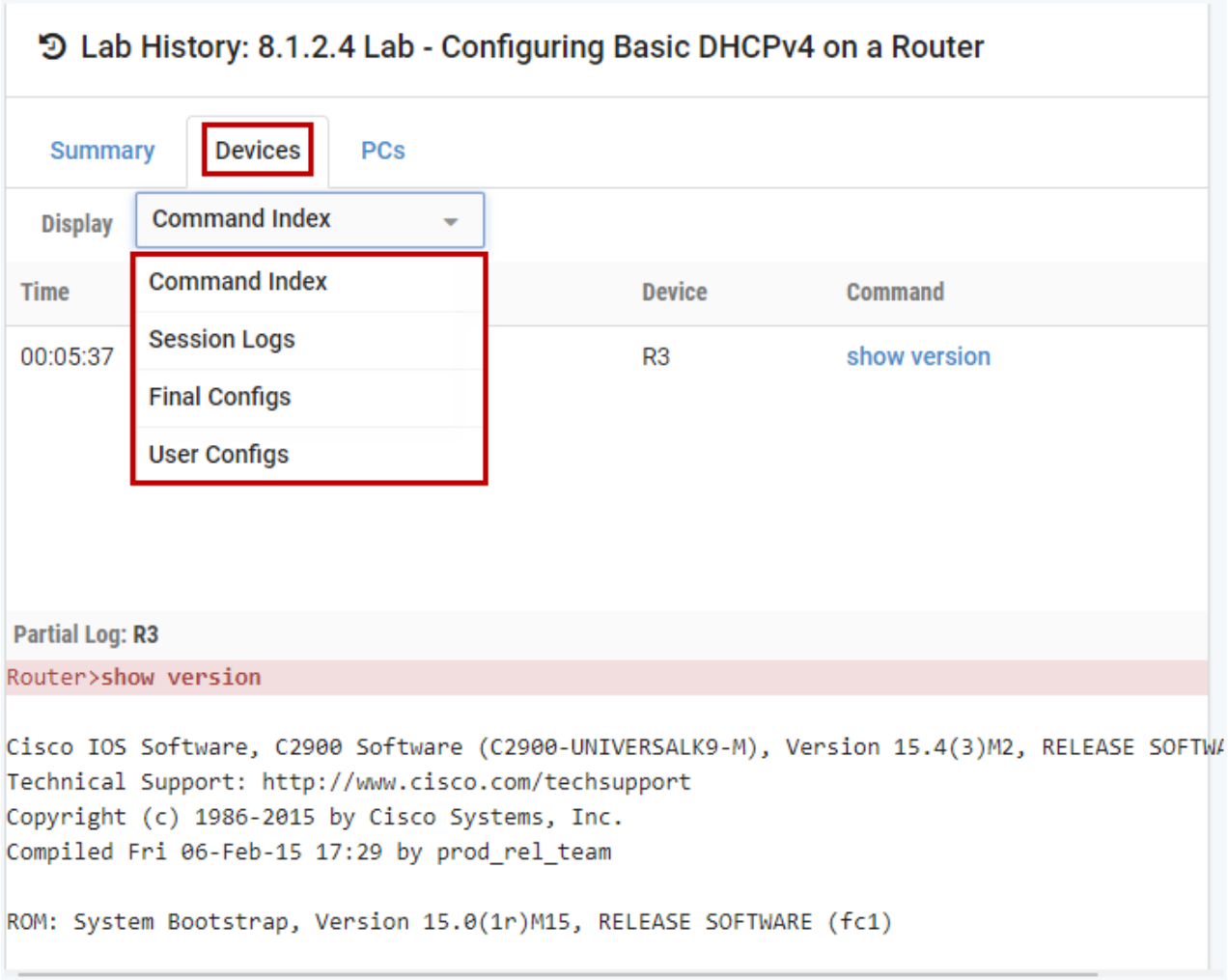
3. If the lab topology includes lab devices (physical devices, such as routers and switches), you will find details of your interaction with those devices on the **Devices** tab. The display options are listed below. Click **Dismiss** to return to the lab list (it may be necessary to scroll down if you are on the Devices tab).

   Display Options on the Devices Tab

   - **Command Index:** A listing of the commands entered during the lab.
   - **Session Logs:** A log of the activity occurring on the selected device.
   - **Final Configs:** The configuration file saved by NETLAB+ at the end of the lab session for the selected device.
   - **User Configs:** Configuration files saved by the user during the lab session for the selected device.

   Here, the **Command Index** has been selected.



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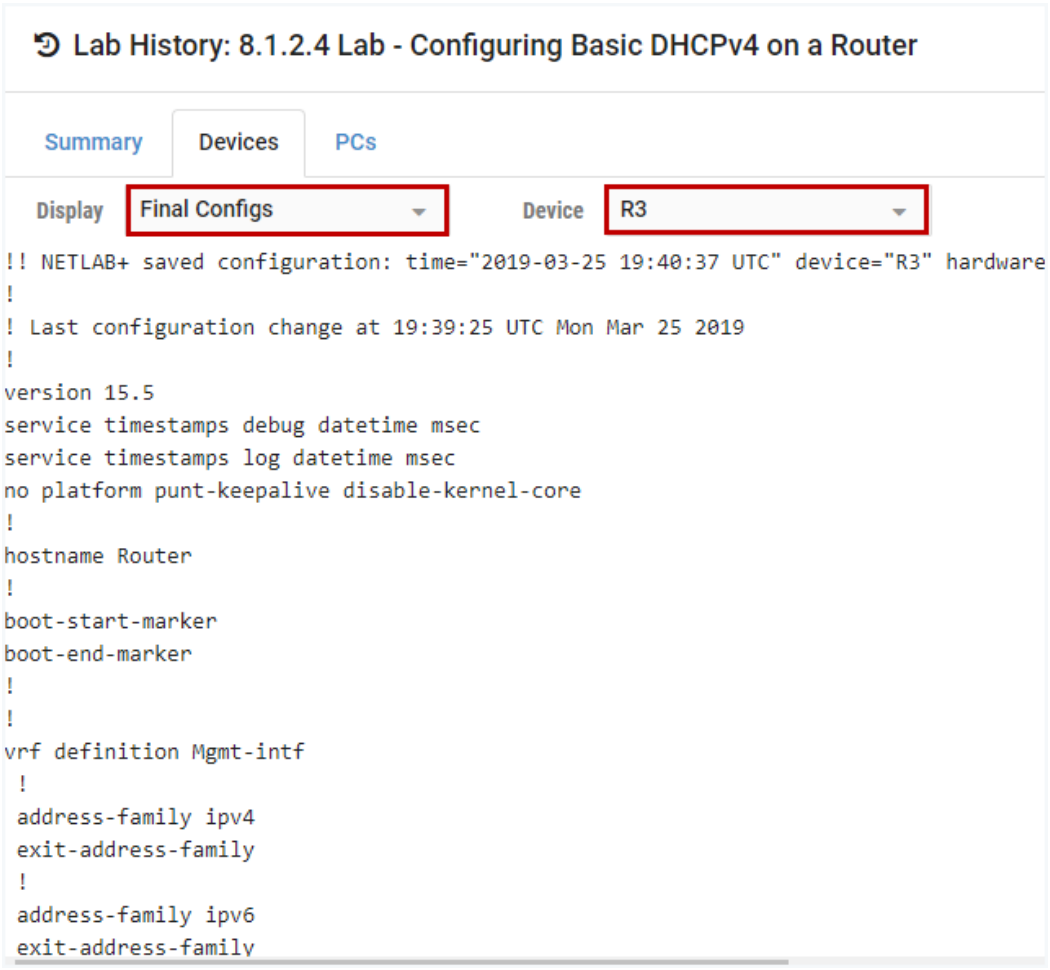
In the example below, the **Final Configs** for device ***R3*** are displayed.



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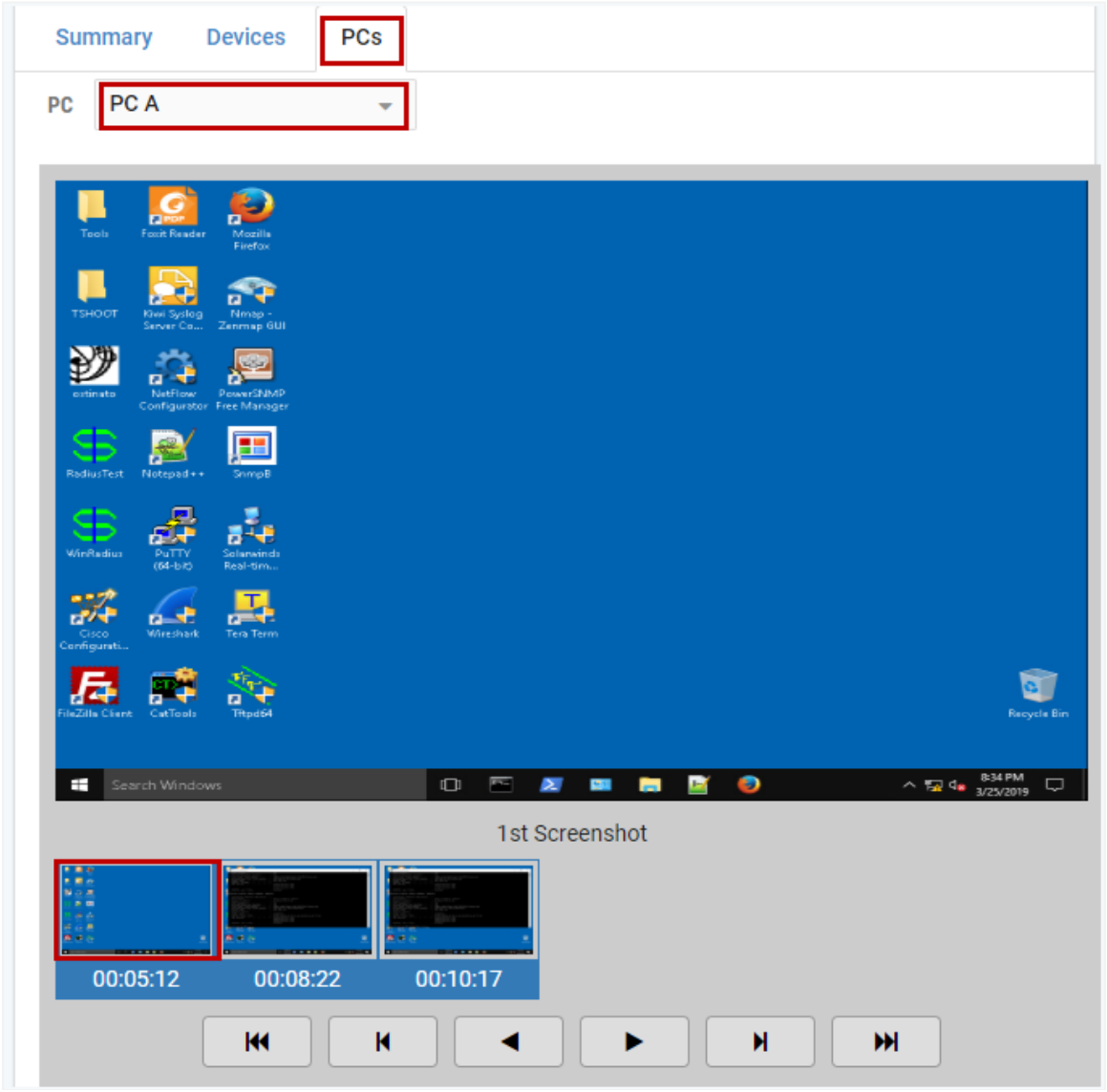
4. If the lab topology includes PCs, click on the **PCs** tab to view any screenshots of remote PCs that were captured during the lab session. If more than one PC is included in the topology, select a device on the dropdown (for example, **PC A** is selected below). Thumbnail images are displayed at the bottom of the page. Click on any thumbnail to display the screenshot. You may also scroll through the screenshots using the button controls below the thumbnails.

In the picture below, notice the timestamps under the thumbnails. These indicate the point at which the image was taken as hours, minutes, and seconds from the beginning of lab.



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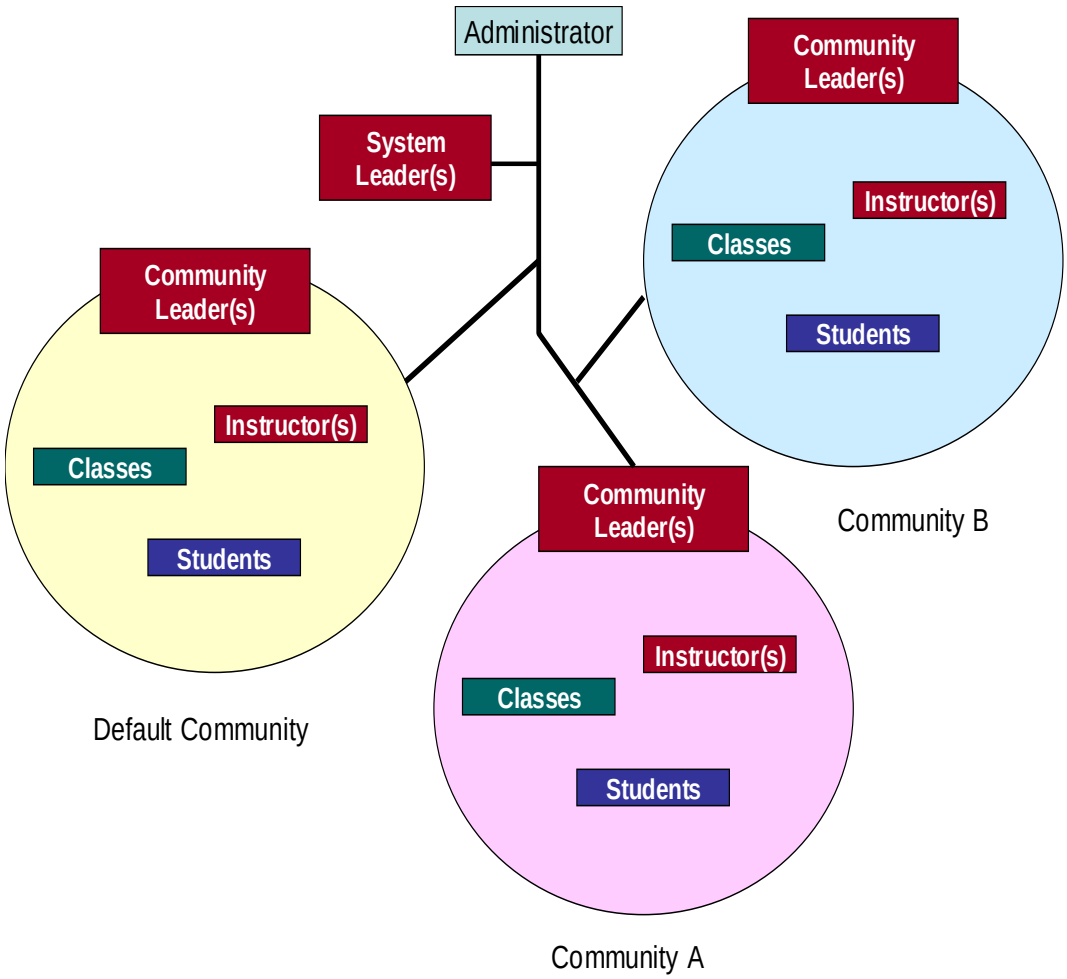
19 Manage Communities

A *community* is a distinct group of instructors, students, and classes. Instructors may only manage students and classes within their own community (unless they are granted system-wide privileges by the administrator). Each community reflects a separate autonomous group using the NETLAB+ system. There is no sharing of accounts or class records between communities.

The ability to support multiple communities on NETLAB+ is designed to facilitate the sharing of a NETLAB+ system among several different groups (schools, institutions, academies, etc.). Blocks of time on equipment pods may be allocated by community to ensure that each community receives a predetermined share of lab resources.

Each school using your system should be defined as a community. If the system is being used by a single school, the default community assignment should be used.

Multiple communities are optional. Keep in mind that each instructor, student, and class can belong to only one community. If you do not wish to use communities, all of your accounts and classes must reside in the default community.



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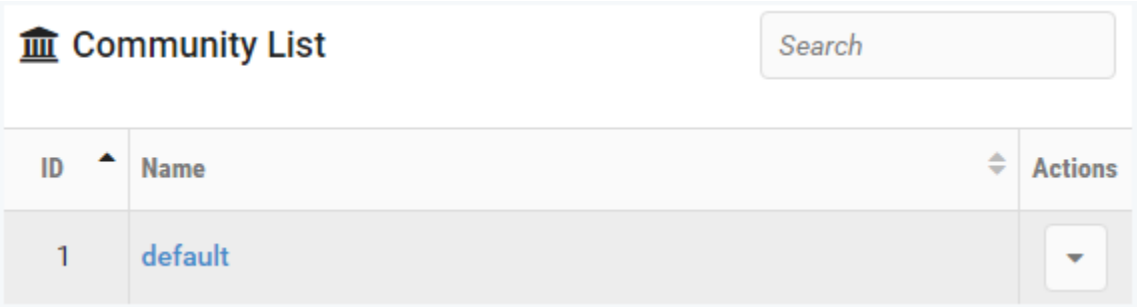
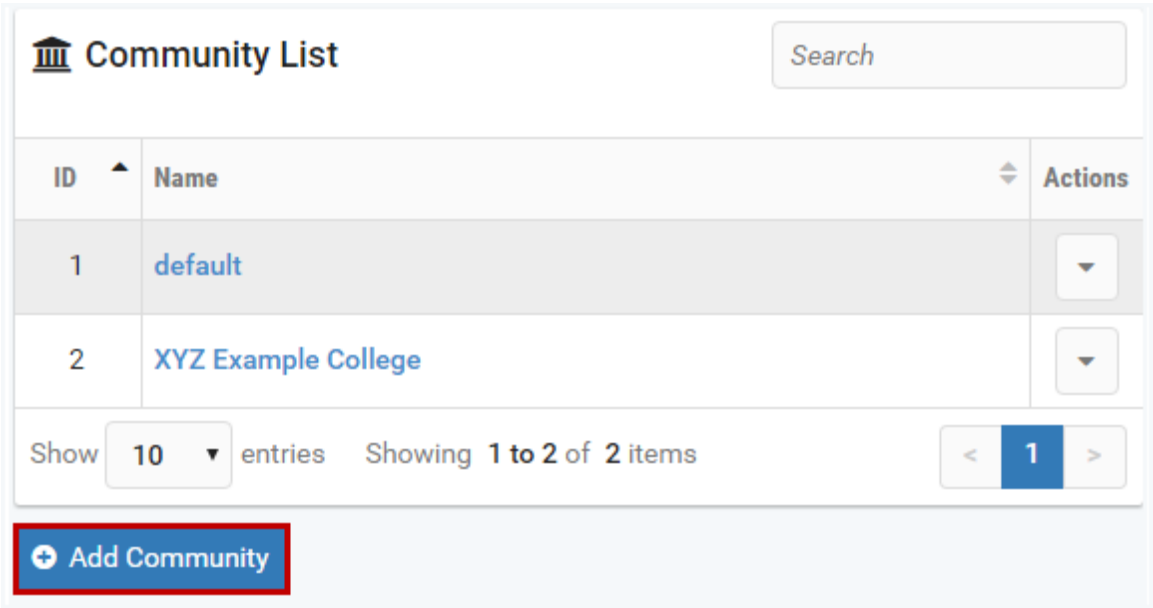
You can view a list of the communities on your NETLAB+ system by selecting the Communities icon on the home page. Your system will have at least one community, the **default**.



19.1 Add New Communities

Only the NETLAB+ system administrator may add new communities to the system.

1. Select **Add Community** to display the Add Community page.



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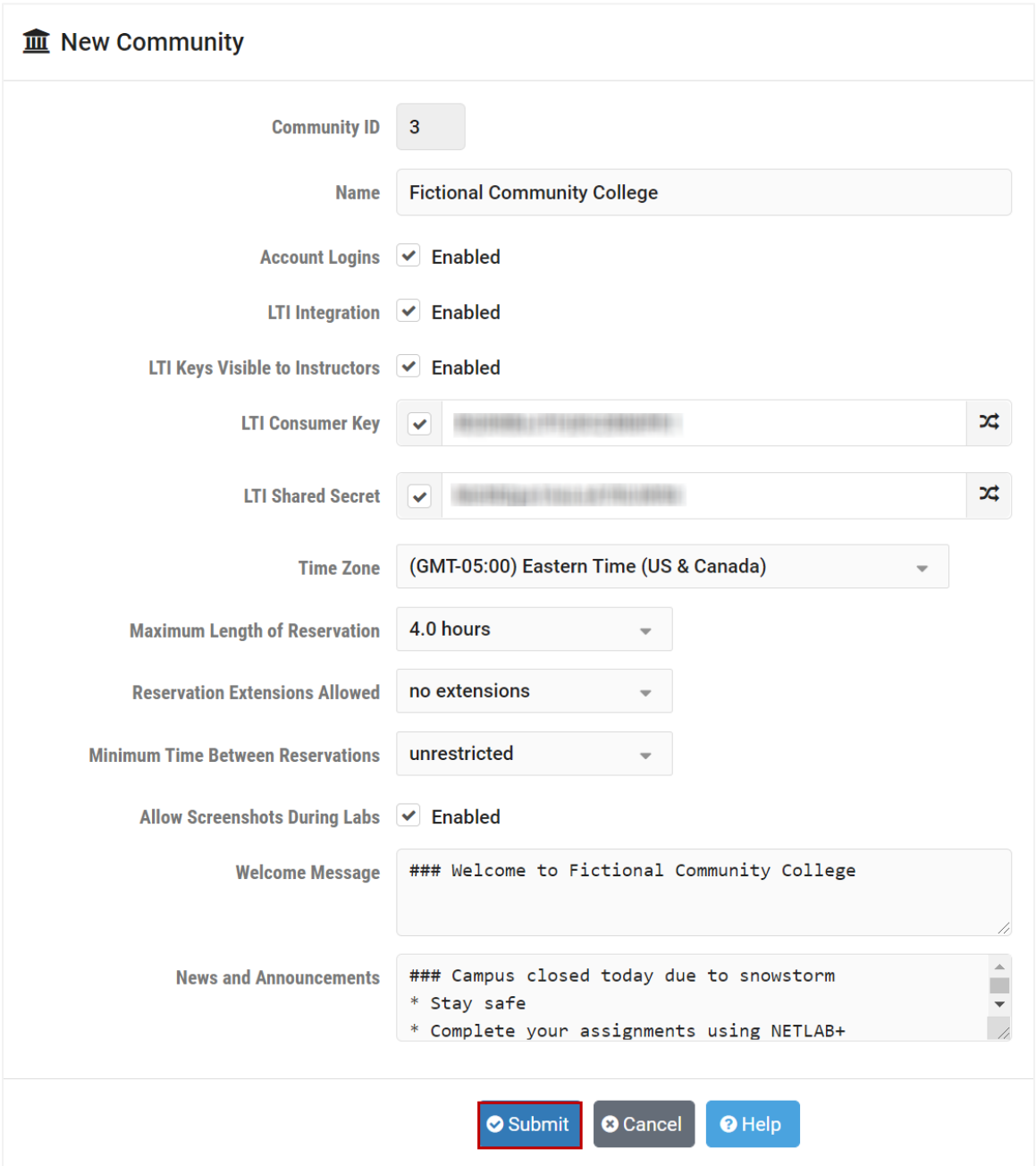
2. Enter information and change default settings as needed for the fields on the page. See the field descriptions below or display the field descriptions by selecting **Help**.



3. After entering information into the fields on the page, select **Submit** to add the community to the system.

Field Descriptions - Community (New/Edit)

- **Community ID:** A numeric identifier for this community. This value determines the order in which this community is displayed in the community list. You may accept the default, or select a different number. Other communities will be renumbered relative to your selection.

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- **Name:** A name for this community.

- **Account Logins**: Enable or disable logins by users in this community.

- **LTI Integration**: Enable and disable NETLAB+ LTI integration features for an LMS. Learning Tools Interoperability (LTI) is a standard protocol developed by the IMS Global Learning Consortium for integrating any Learning Management System (LMS) with any learning application.

- **LTI Keys Visible to Instructors**: If enabled, instructors will be provided with this community's Consumer Key and Shared Secret when exporting an LMS Common Cartridge for their class. These keys will be required to use NETLAB+ as an external tool within an LMS. If disabled, instructors will be referred to the NETLAB+ administrator to provide the keys or enable the NETLAB+ external tool for the LMS. See the *Export LTI Cartridge* section for details.

- **LTI Consumer Key**: A key that is used to identify this community as a consumer to an LMS. This will be required to configure NETLAB+ as an external tool. Changing this value will invalidate any existing NETLAB+ external tools for this community on the LMS. The button on the right of the field can be used to generate a random value, but custom values may be used. If this value is changed unintentionally, its submission can be prevented by unchecking the checkbox on the left.

- **LTI Shared Secret:** A secret used by this community to establish ownership of the Consumer Key. This will be required to configure NETLAB+ as an external tool. Changing this value will invalidate any existing NETLAB+ external tools for this community on the LMS. The button on the right of the field can be used to generate a random value, but custom values may be used. If this value is changed unintentionally, its submission can be prevented by unchecking the checkbox on the left.

- **Time Zone:** The time zone where the community is located. NETLAB+ will adjust for Daylight Savings Time. User accounts created in this community will inherit this value as their default time zone.

- **Maximum Length of Reservations:** The maximum length of time a reservation can be scheduled by an individual student or team. This setting does not restrict reservations made by instructors. Instructors can establish lower (more restrictive) maximums per. They cannot establish higher (less restrictive) maximums for a class than the value set here.

- **Reservation Extensions Allowed:** The maximum number of times a reservation can be extended by a student or team, provided the next time slot for the reserved pod is available. An extension adds 30 minutes to the reservation. An extension can be requested from the lab interface when there are 15 minutes or less available on the Time Remaining clock. This setting does not limit

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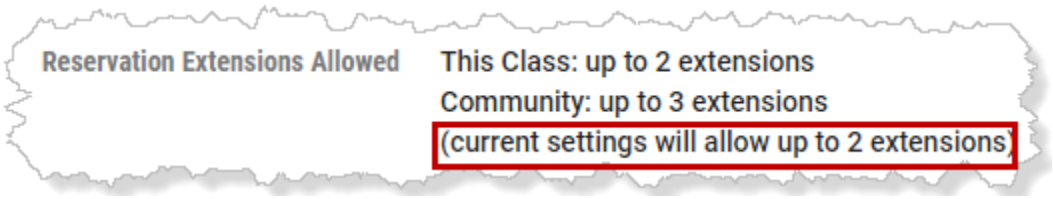
instructors; they may always request an extension in the final 15 minutes if the next time slot is available.

The number of extensions that a student or team can request in a single reservation will be the more restrictive of the community and class settings. Be sure to review the class settings for Reservation Extensions Allowed, which will indicate the current settings. Please refer to the *Add Classes* section for details on setting reservation extensions at the class level.

Example: If the class setting allows 2 extensions and the community setting allows 3 extensions, the more restrictive setting of up to 2 reservation extensions will be allowed.)



- **Restrictions for All Users:**
  - An extension cannot be made before T-00:15 on the displayed Time Remaining. This is about 26 minutes from the blocked end time and 16 minutes of the usable time remaining.
  - The next 30-minute time slot must not be already scheduled by another reservation.
  - The extension cannot exceed the maximum pods in use limit and/or proactive resource awareness settings selected by the NETLAB+ administrator.

- **Restrictions for Students and Teams:**
  - The number of extensions that a student or team can request is limited by community and class settings.
  - For backward setting compatibility, communities and classes do not allow extensions to be made by students or teams by default.
  - The administrator must specifically allow extensions for students and teams per community.
  - The instructor must specifically allow extensions for students and teams per class.
  - A learner may not extend an ILT reservation. Only a lead instructor can extend an ILT reservation.

- **Minimum Time Between Reservations:** The minimum time that must elapse before an individual student or team in a class can make successive reservations. This setting does not restrict reservations made by instructors. Instructors can define higher (more restrictive) minimums per class. They cannot establish lower (less restrictive) minimums than the value set here.

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- **Allow Screenshots During Labs:** If enabled, lab users are permitted to submit screenshots, along with a description of any remote PC displayed in their lab environment. These screenshots are included in the lab history and may later be viewed in the Lab Usage interface by attendees and their instructors.

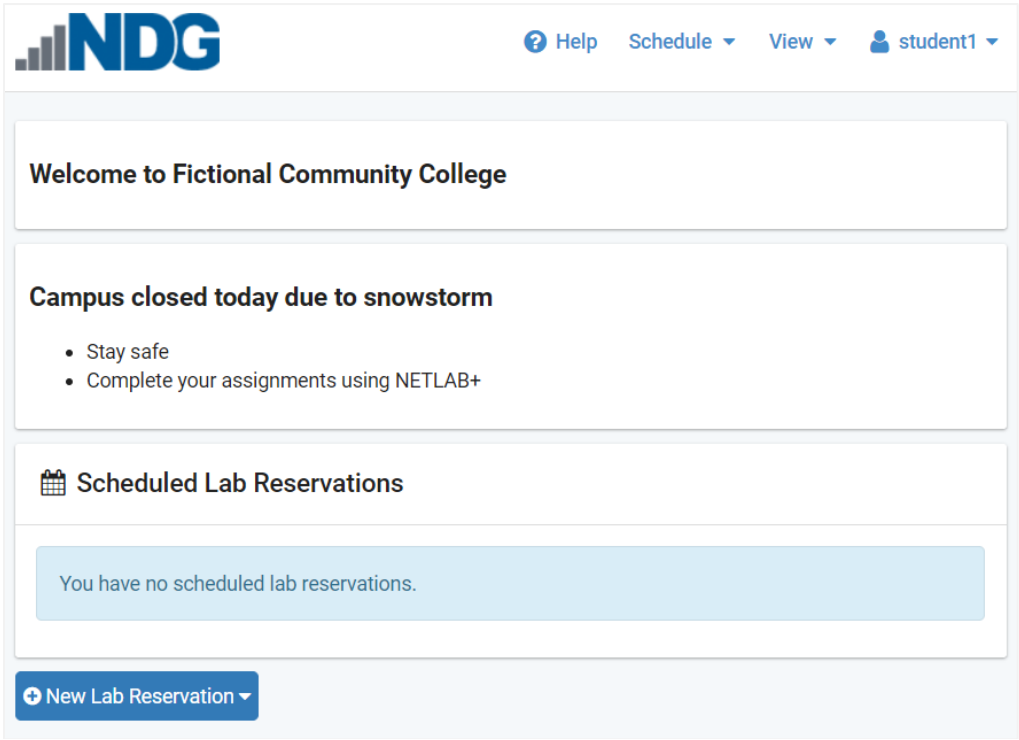
- **Welcome Message:** Define a welcome message for the community. This is displayed on the MyNETLAB page in its entirety, below any system-wide welcome or system-wide news. GitHub Flavored Markdown is supported. Links will open in separate tabs or windows.

  System-wide welcome messages can also be set. See the *News and Announcements* section.

- **News and Announcements:** Define news and announcements for the community. This is displayed on the MyNETLAB page, below all other system or community messages. Space for news and announcements is constrained to a scrollable region, so it is suitable for longer text. GitHub Flavored Markdown is supported. Links will open in separate tabs or windows.

  System-wide news and announcements can also be set. See the *News and Announcements* section.

Here, we show how the Welcome Message and the News and Announcements will be displayed when a student logs into the system. In this example, notice that both system-wide and community messaging are displayed, with system-wide messaging displayed first.



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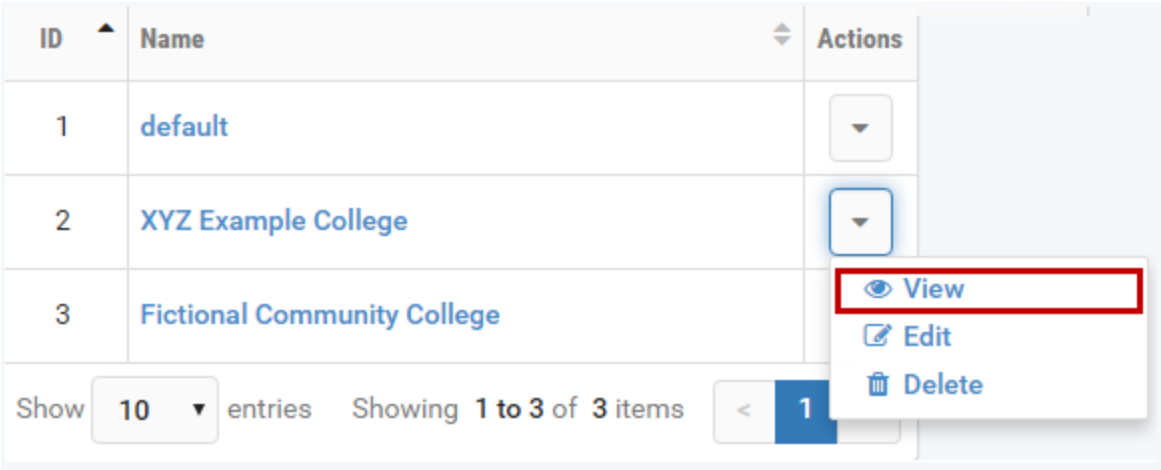
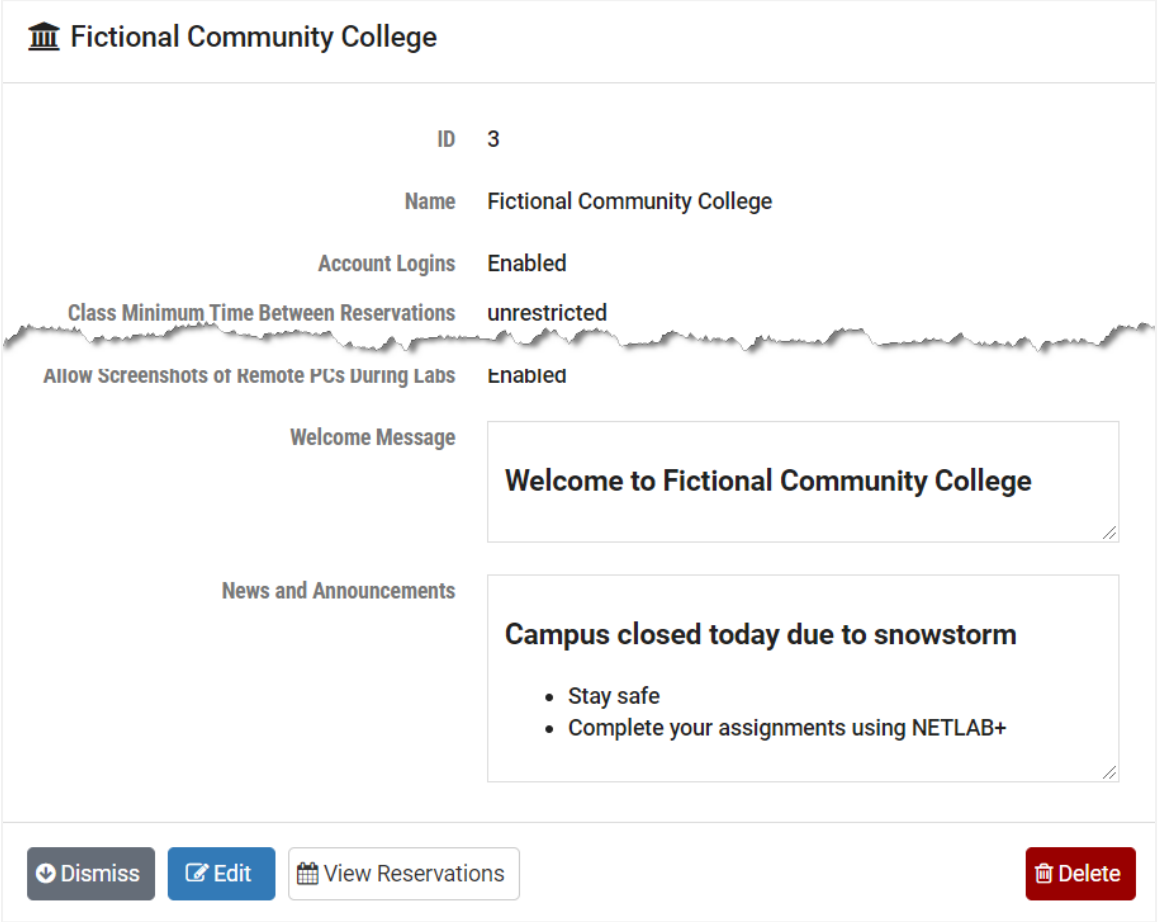
19.2 View Community Records

1. To view a community record, select the Action button on the row of the community record. The dropdown options to View, Edit, and Delete the community records will be displayed.



2. Selecting **View** will display the community record details. Options available from this page include **View Reservations,** to view a list of scheduled lab reservations for this community and **Edit** (details in next section).



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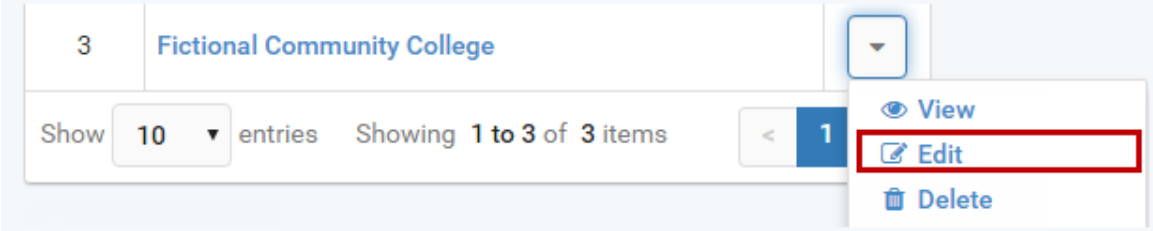
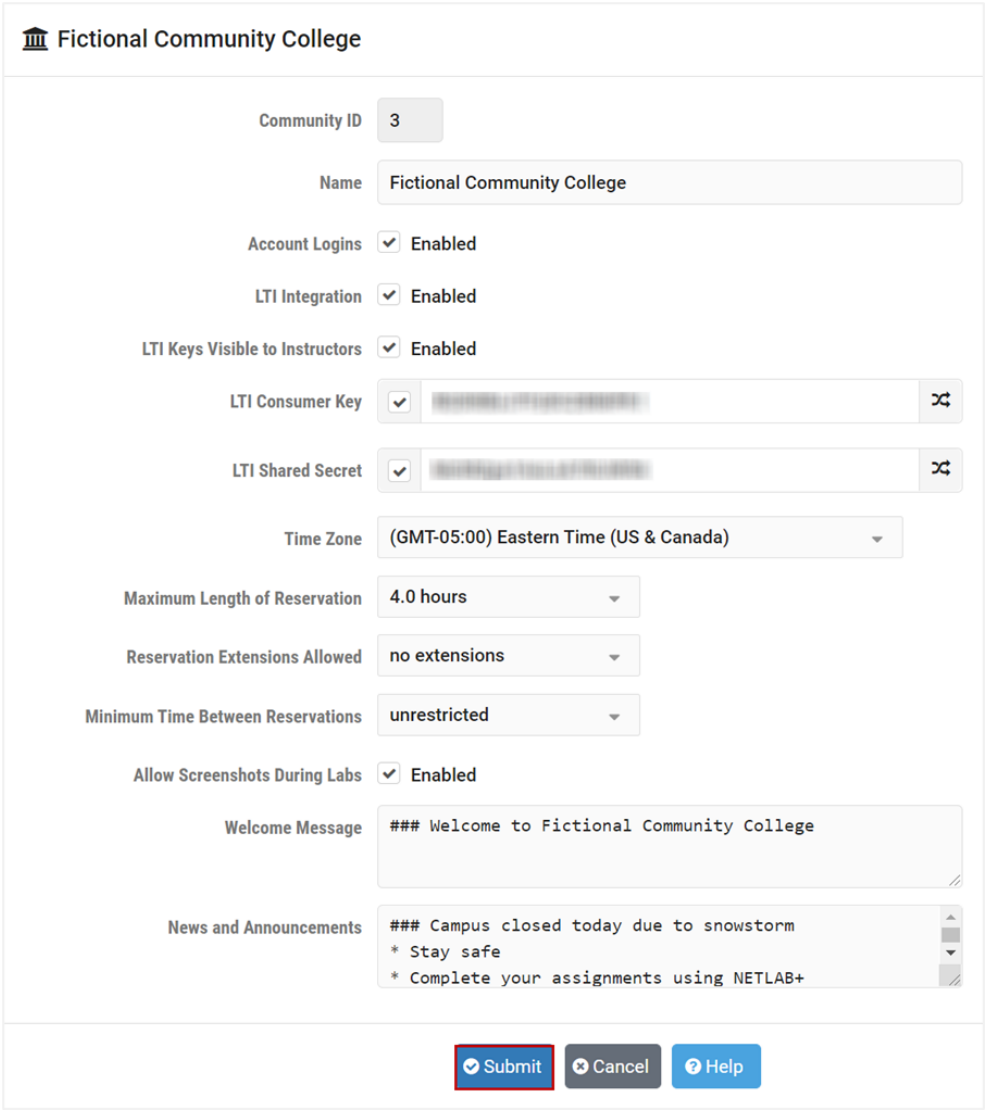
19.3 Edit Community Records

1. To view a community record, select the Action button on the row. The dropdown options to View, Edit, and Delete the community record will be displayed.



2. Select **Edit** on the dropdown to edit any of the fields in the community record. The edit screen will be displayed.



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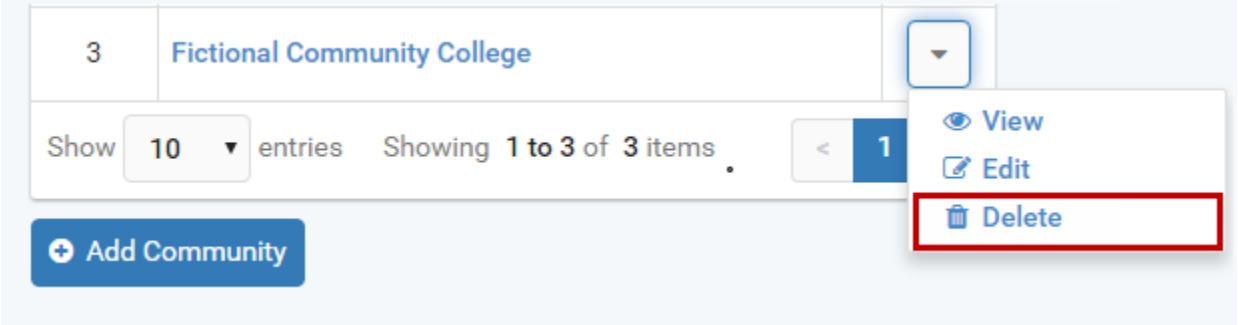
3. Refer to the *Add New Communities* section above for details of the fields on this page (or select **Help** to display descriptions). Click **Submit** to save changes to the record.

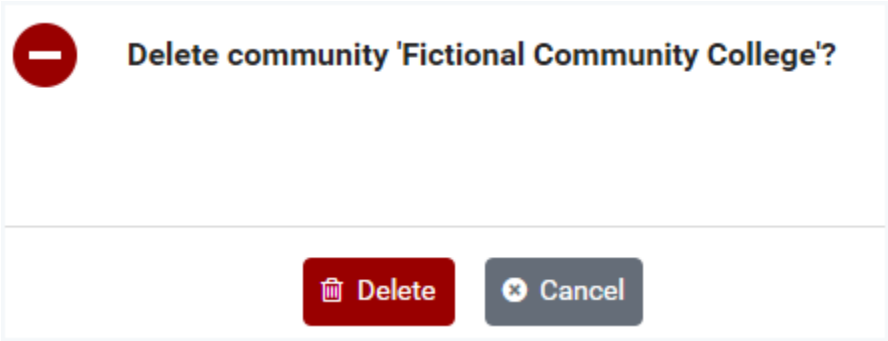
GitHub Flavored Markdown is supported, as shown in the example below. Not familiar with GitHub Flavored Markdown? A quick Internet search will lead you to information on syntax and examples.

19.4 Delete Community Records

5. To delete a community record, select the Action button on the row. The dropdown options to View, Edit, and Delete the community record will be displayed.



6. Select the **Delete** button to delete the community record. A confirmation screen will be displayed.



7. Select **Delete** to confirm that you wish to delete the record.

All classes and accounts for the community must be deleted prior to deleting a community record.

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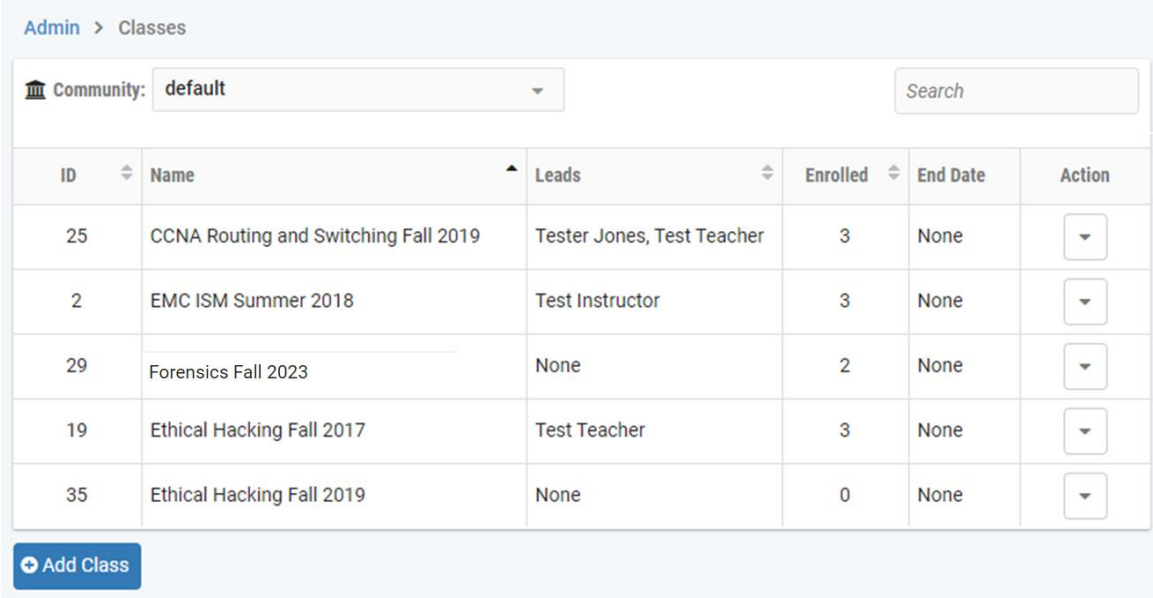
20 Manage Classes

Information for each class using the NETLAB+ system must be entered. The NETLAB+ administrator may manage classes for all communities. Instructors may be granted system-wide and community-wide privileges as appropriate to manage classes.

To manage classes, click the **Classes** icon on the administrator Home page. A list of the classes that have been entered for the selected community will be displayed. Classes are listed with the name of the class, lead instructor, the number enrolled, and end date (if specified).



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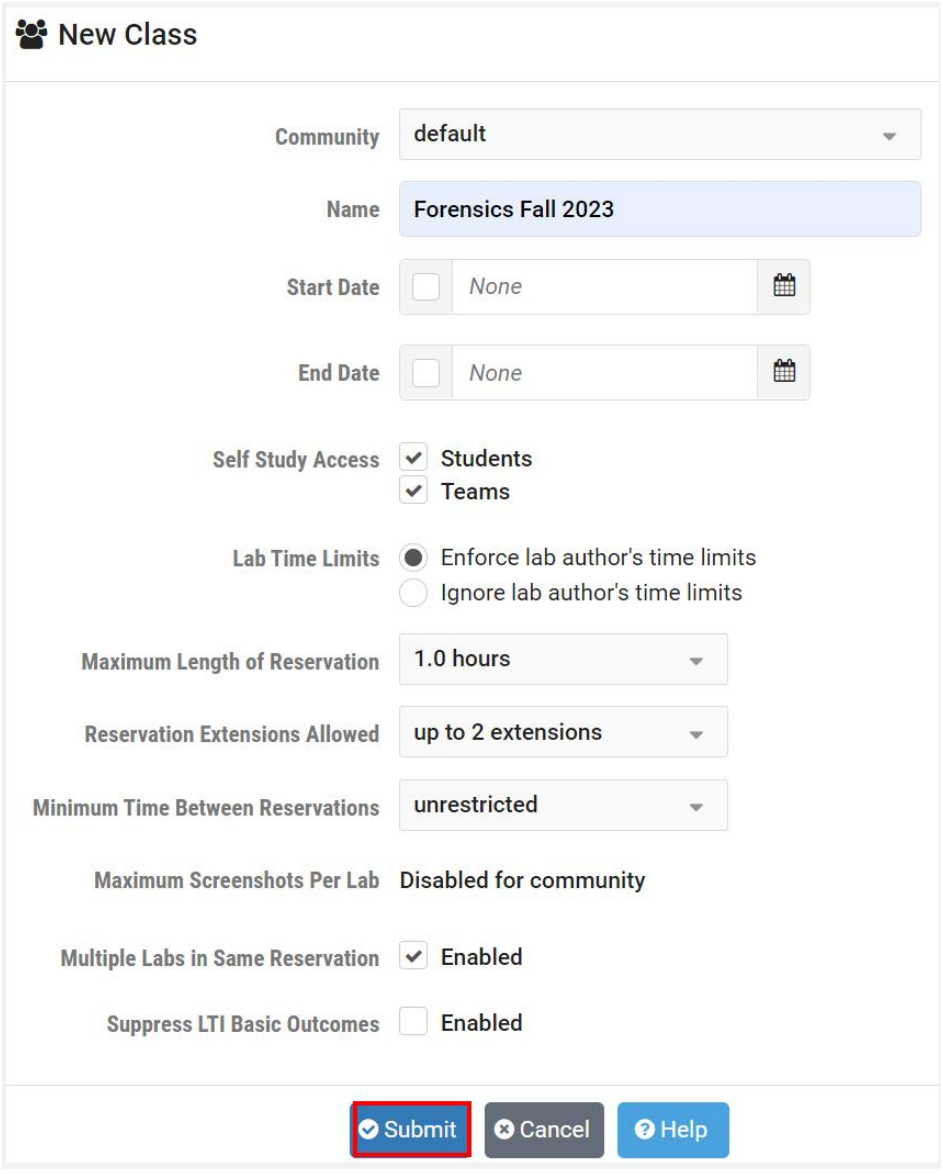
20.1 Add Classes

1. To add a class to the system, select the **Add Class** button at the bottom of the Classes page.
2. Enter the class information into the **New Class** form. The **Name** field is required; other fields may be filled out now (refer to the field descriptions below) or later through the Edit function. Click **Submit**.

It is best practice to use a class name that defines the time-frame that the class is offered, such as including "Spring 2019" as part of the name.

Having a descriptive class name and using the class for that semester only (as opposed to editing and reusing the class record for another semester) will help to ensure that usage statistics provide an accurate



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Field Descriptions - Class (Add/Edit)

- **Community:** The NETLAB+ system may contain multiple communities. Each community reflects a separate autonomous group that is using the NETLAB+ system. See the *Manage Communities* section for details.

- **ID:** Each class is assigned a unique numeric identification number. This number will be displayed once the class has been added.

- **Name:** The name of the class must be unique in the NETLAB+ system. It is best practice to use a class name that defines the time-frame that the class is offered, such as including "Fall 2019" as part of the name.

  Having a descriptive class name and using the class for the specified semester only (as opposed to editing and reusing the class record for another semester) will help to ensure that usage statistics provide an accurate representation of system use.

- **Start Date:** An optional starting date for the class. New pod reservations for this class may not be made before this date.

  If the starting date is changed later, existing equipment resource reservations are not affected.

- **End Date:** An optional ending date for the class. New pod reservations for this class (student or instructor) may not be made after this date.

  If the ending date is changed later, existing lab reservations are not affected.

- **Self Study Access - Students, Teams**: If Students is selected, individual students in the roster can schedule lab reservations. Team reservations may be made if Teams is selected (team assignments must be made by the instructor, see *Group the Class Roster Into Teams*).

- **Lab Time Limits**

  - **Enforce lab author's time limits (if any)**: When a lab author specifies a time limit for a lab exercise, NETLAB+ will always use this limit to determine the length of an individual or team reservation. When a lab time limit is enforced, the Maximum Length of Reservation setting (described below) will have no effect on the reservation length. The time limit is only imposed upon learners making their own individual or team reservations. Individual or team reservations created by the lead instructor on behalf of individual learners or teams in the class are not restricted by the lab author's time limit.

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- **Do not enforce lab author's time limits**: NETLAB+ will disregard any time limits set by lab authors. Individuals and teams may determine how much time is allocated for any lab, up to the Maximum Length of Reservation setting (see below).

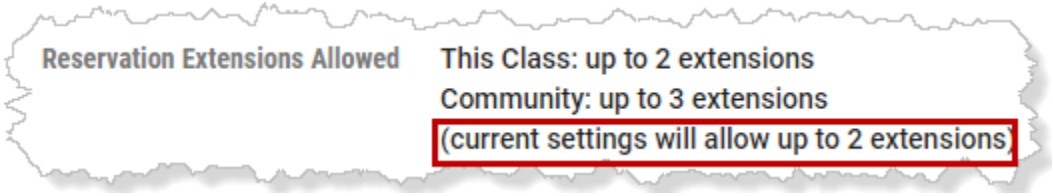
- **Maximum Length of Reservation:** Sets the maximum length (in hours) of an individual or team lab reservation. Lab exercises can also have a time limit. The lower of the two times is used. The maximum time lengths of lab reservations for all classes within a community are subject to community maximums if a community maximum has been set. You may not establish a higher (less restrictive) maximum for the class; it will not override the community maximum. A lower (more restrictive) maximum time length for the class may be enforced by setting a value that is lower than the community maximum.

  Lead instructors and instructor-led reservations are not bound by this restriction.

- **Reservation Extensions Allowed:** The maximum number of times a reservation can be extended by a student or team, provided the next time slot for the reserved pod is available. An extension adds 30 minutes to the reservation. An extension can be requested from the lab interface when there are 15 minutes or less available on the Time Remaining clock. This setting does not limit instructors; they may always request an extension in the final 15 minutes if the next time slot is available.

  The number of extensions that a student or team can request in a single reservation will be the more restrictive of the community and class settings. Be sure to review the class settings for Reservation Extensions Allowed, which will indicate the current settings. Please refer to the *Add New Communities* section for details on setting reservation extensions at the community level.

  Example: If the class setting allows 2 extensions and the community setting allows 3 extensions, the more restrictive setting of up to 2 reservation extensions will be allowed.)



  - **Restrictions for All Users:**
    - An extension cannot be made before T-00:15 on the displayed Time Remaining. This is about 26 minutes from the blocked end time and 16 minutes of the usable time remaining.
    - The next 30-minute time slot must not be already scheduled by another reservation.

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        - The extension cannot exceed the maximum pods in use limit and/or proactive resource awareness settings selected by the NETLAB+ administrator.

    - **Restrictions for Students and Teams:**
        - The number of extensions that a student or team can request is limited by community and class settings.
        - For backward setting compatibility, communities and classes do not allow extensions to be made by students or teams by default.
        - The administrator must specifically allow extensions for students and teams per community.
        - The instructor must specifically allow extensions for students and teams per class.
        - A learner may not extend an ILT reservation. Only a lead instructor can extend an ILT reservation.

- **Minimum Time Between Reservations:** Sets the minimum amount of time between successive reservations made by an individual or team. This setting can be used to prevent excessive scheduling of labs. For example, a setting of **48 hours** prevents the same individual or team from scheduling lab exercises less than 48 hours apart. The default value, **no limit** will allow a student or team to make unlimited reservations. The minimum time between reservations for all classes within a community is subject to community minimums if a community minimum has been set. You may not establish a lower (less restrictive) minimum for the class; it will not override the community minimum. A higher (more restrictive) minimum time between lab reservations for the class may be enforced by setting a value that is higher than the community minimum.

  Lead instructors and instructor-led reservations are not bound by this restriction.

- **Maximum Screenshots Per Lab:** The maximum number of screenshots a student may take in a single lab. A value of 0 effectively disables the screenshot feature for the class. The screenshots feature is available only if it has been enabled for the community by the administrator.

- **Multiple Labs in Same Reservation:** If enabled, a student or team may change lab exercises within the same reservation. The Exercise tab will be displayed during lab access. Only labs compatible with the reserved pod type will be available for selection. This option only affects Student or Team reservations. Instructor-led training reservations always allow the lead instructor to change exercises.

- **Suppress LTI Basic Outcomes:** If enabled, LTI Basic Outcomes will not be submitted to the LMS and no grades will be entered into the class grade book.

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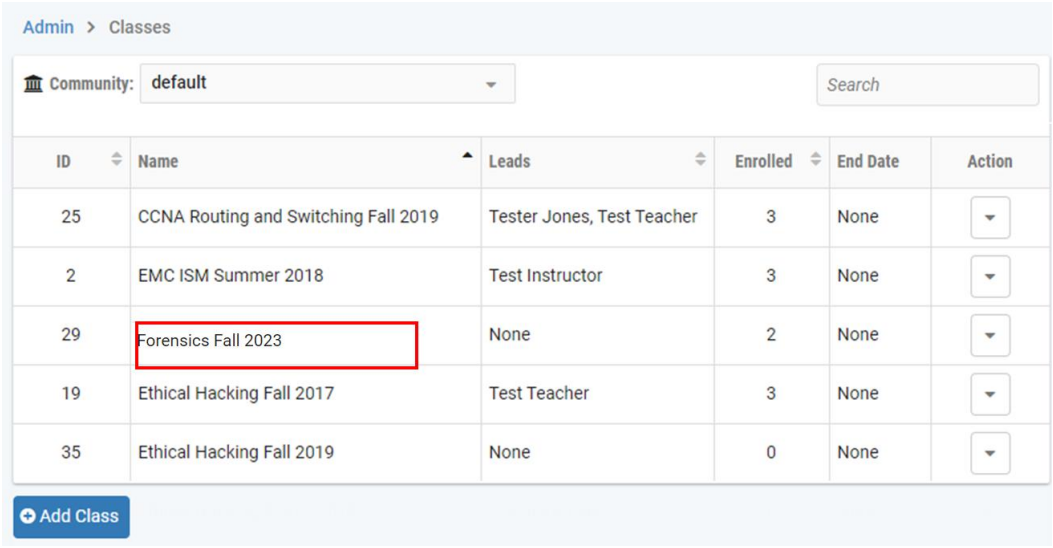
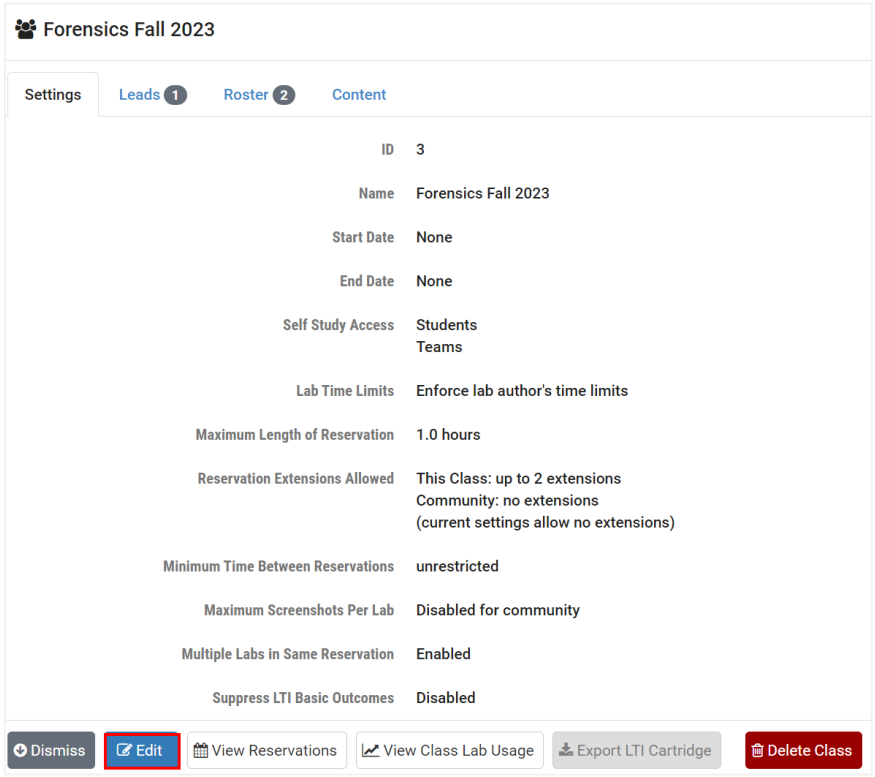
20.2 Edit Class Information

Follow the steps below to edit information for a class.

1. Edit the information for an existing class by clicking the class name in the class list displayed on the class manager page. Here, we will select the record for the recently created **Ethical Hacking Fall 2019** class.



2. A page showing the current settings for the class will be displayed. Select the **Edit** button to make the information for the displayed class available for editing.



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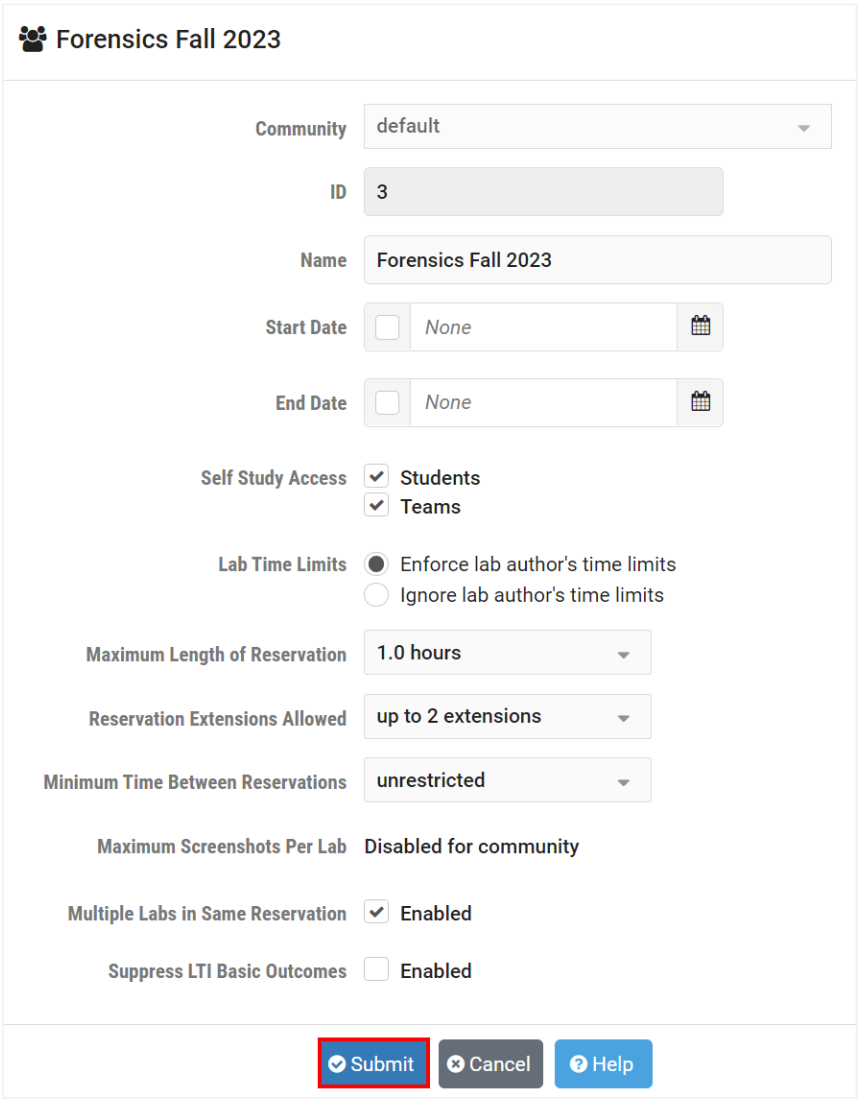
Notice the options available from the Settings tab of the class details page that provide additional data about the class. These options are also available from the administrator Home page, but selecting them from this page allows easy access to class level information:

- The **View Reservations** option will display a list of scheduled lab reservations for this class (see the *Display a List of Lab Reservations* section for details).
- Select the option to **View Class Lab Usage** to view lab usage statistics for this class (see the *Lab Usage* section for details).

3. The fields on the class edit page are identical to those on the new class page. Edit the information as needed. Please see the *Add Classes* section for a detailed description of each field on the page. When you have finished editing, click **Submit**.



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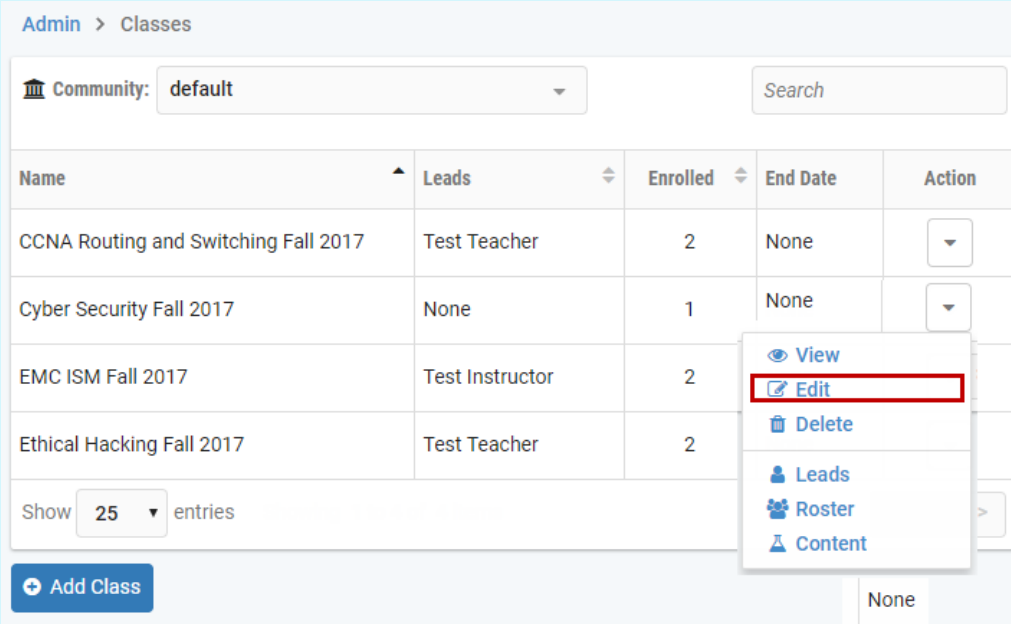
The NETLAB+ user interface is designed to be versatile and provides multiple ways to access the options frequently used.

As you gain experience with the NETLAB+ system, you will notice that there is often more than one way to access an option. For example, in addition to the method described above in this section, the option to **Edit** a class record is also available from the Action dropdown on the class list.



20.3 Export LTI Cartridge

NETLAB+ supports integration with your school's LMS. Follow the steps below to obtain the common cartridge needed for LTI integration for the class.

1. If the option to enable LTI Integration has been enabled at the community level, you may select the option to **Export an LTI Cartridge** that you can import into your school's LMS in order to configure access to the class.

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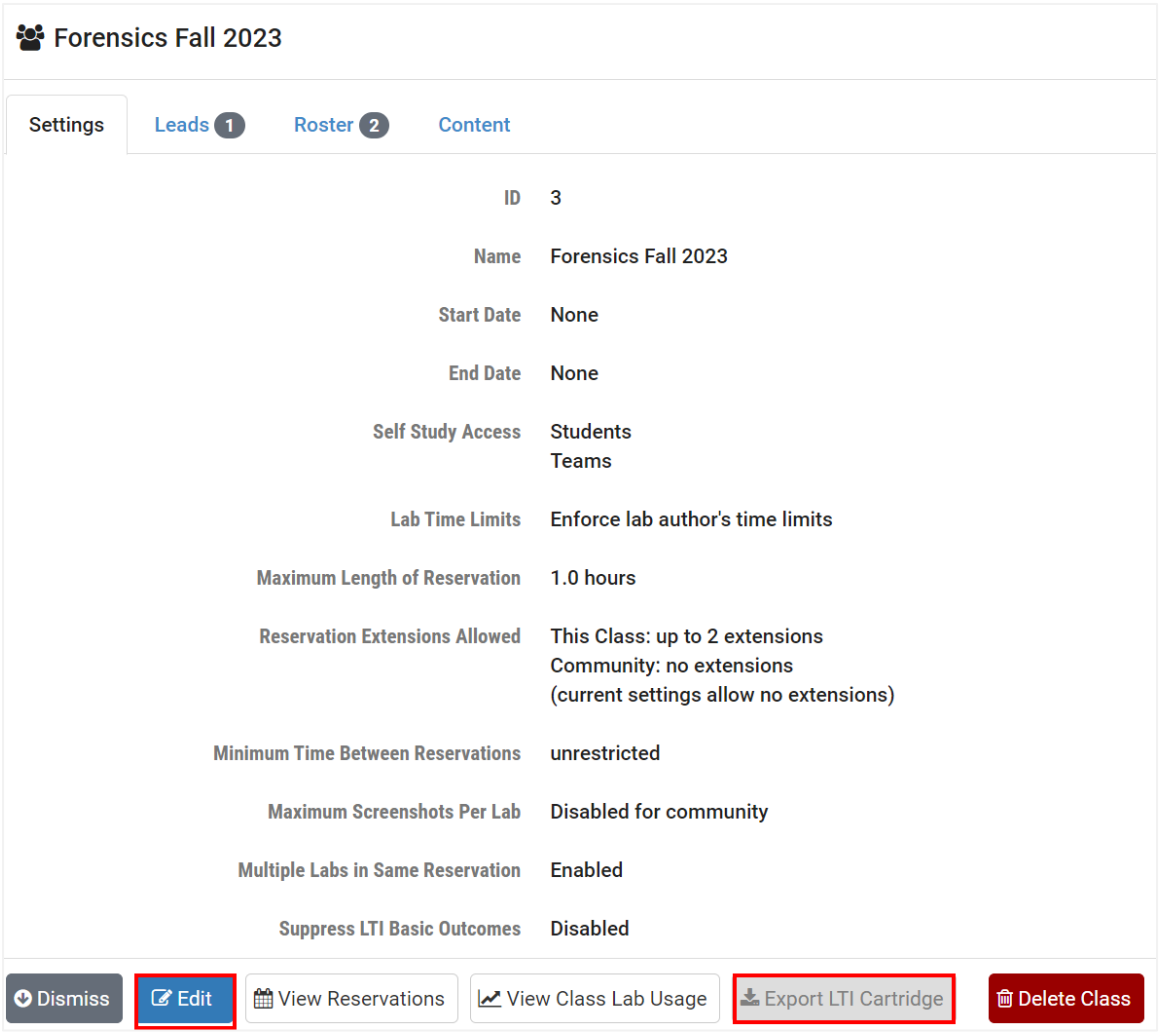

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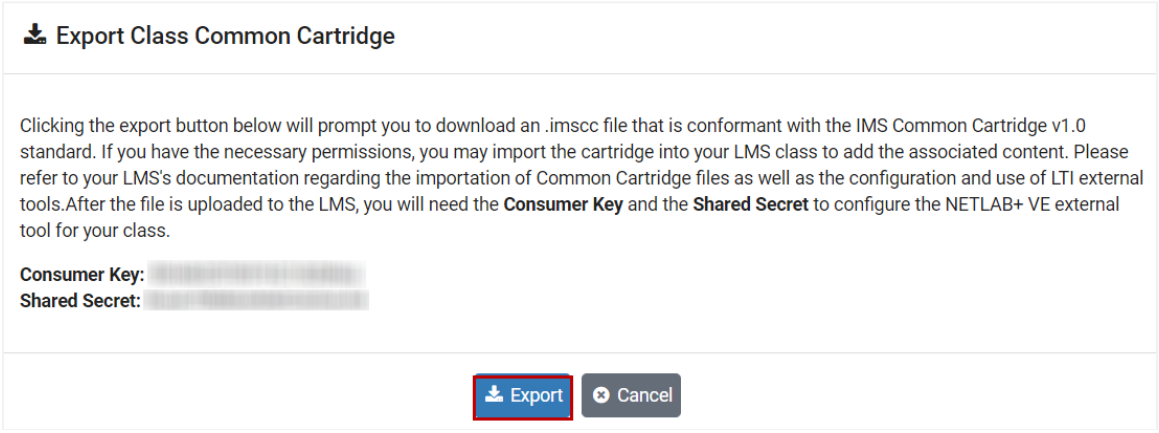
2. The **Export Class Common Cartridge** page will be displayed. Clicking the **Export** button will prompt you to download an *.imscc* file that is conformant with the IMS Common Cartridge v1.0 standard. If you have the necessary permissions, you may import the cartridge into your LMS class to add the associated content.



Please refer to your LMS's documentation regarding the importation of Common Cartridge files as well as the configuration and use of LTI external tools. After the file is uploaded to the LMS, you will need the **Consumer Key** and the **Shared Secret** to configure the NETLAB+ external tool for your class.

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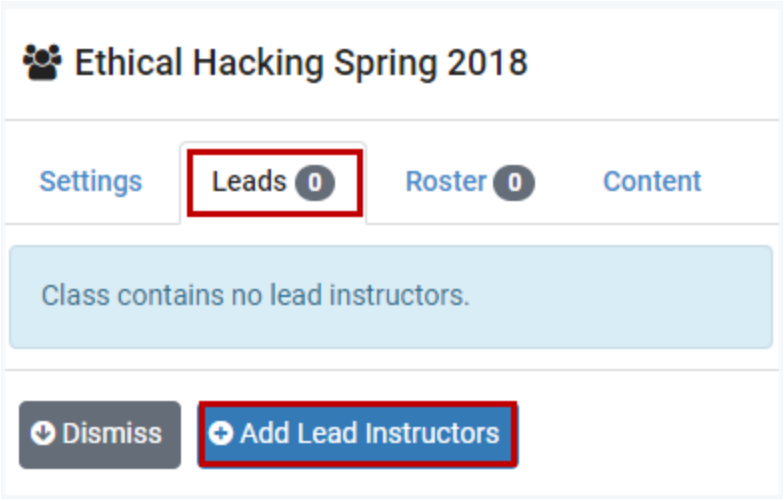
20.4 Assign Lead Instructors

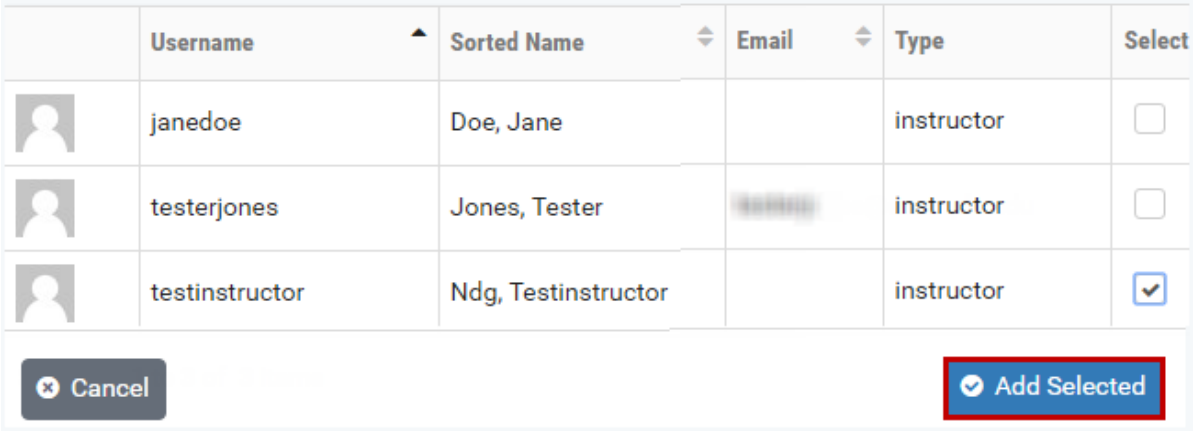
At least one lead instructor should be defined for each class. Typical actions performed by lead instructors:

- Lead instructors may update class settings.
- Lead instructors may make reservations for instructor-led training sessions for the class.
- Lead instructors may allow individual students to make reservations themselves, depending on the settings selected for the class.
- A lead instructor has the option to participate in any lab reservation associated with the class.
- A lead instructor may manage the class roster.
- A lead instructor may select the content to be enabled for the class.

1. To add lead instructors to a class, select the **Leads** tab of the class record, and then click the button to **Add Lead Instructors**.



2. A list of the instructors in the community is displayed. Select the lead instructor(s) for the class by checking the **Select** checkbox and then pressing the **Add Selected** button.



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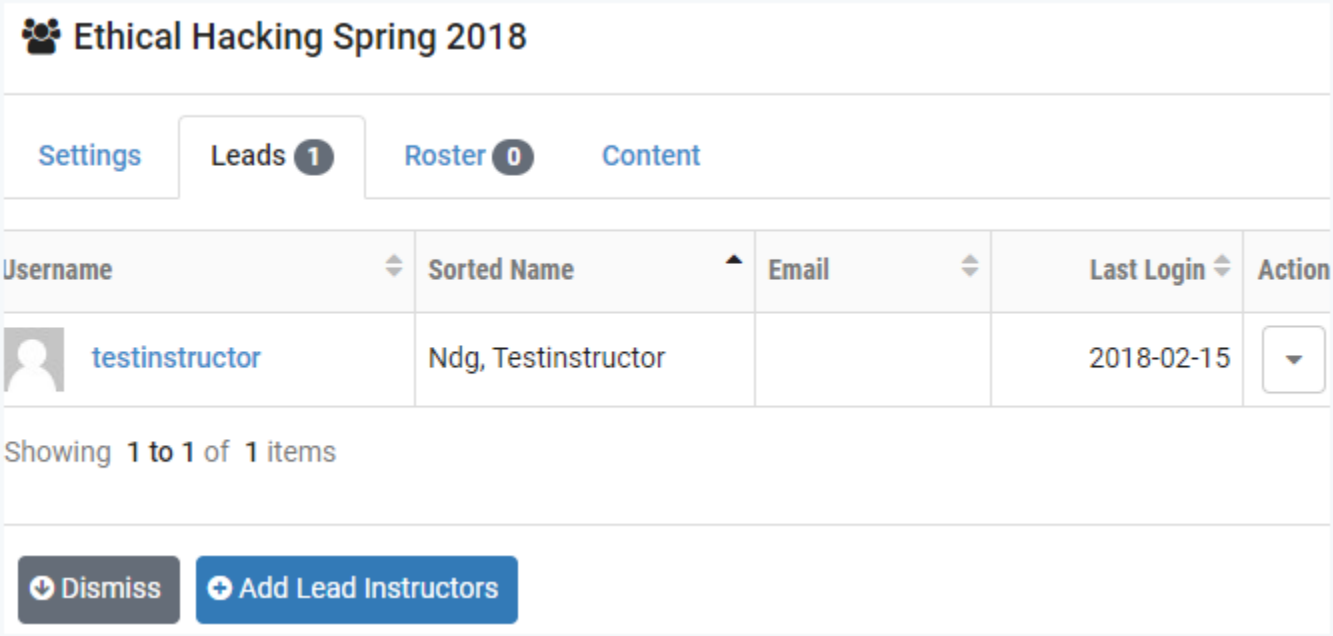
If there are no instructor records available to select, you will need to add an instructor account. See the Add Accounts section for details.

The selected instructor(s) is now listed on the Leads list.



20.5 Remove Lead Instructors

A lead instructor may be dropped from a class.

The NETLAB+ administrator has the option of removing a lead instructor, even if the action would result in there being no lead instructor assigned to the class. Be aware however, that this results in a class record that is accessible only by the NETLAB+ administrator (until the administrator assigns another lead instructor).

1. To remove a lead instructor from a class, select the **Leads** tab of the class record to display the list of lead instructors.
2. Select the **Drop from Leads** option on the Action dropdown of the record for the lead instructor to be removed.

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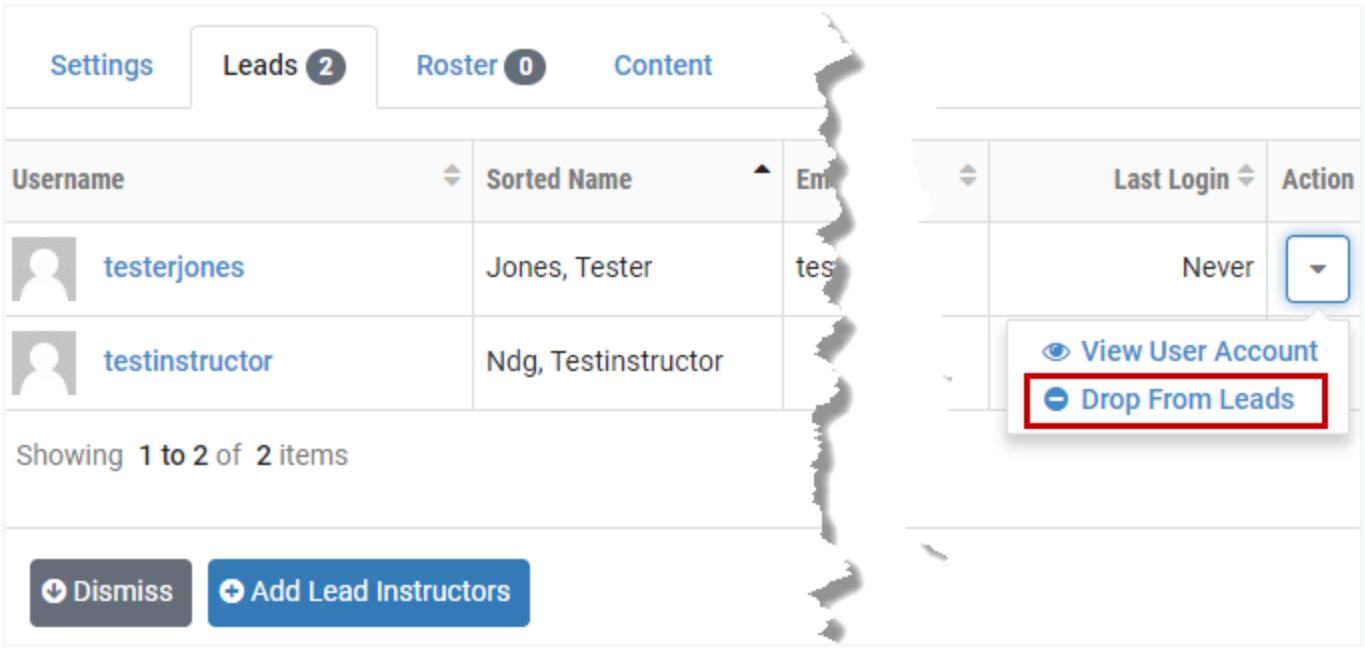
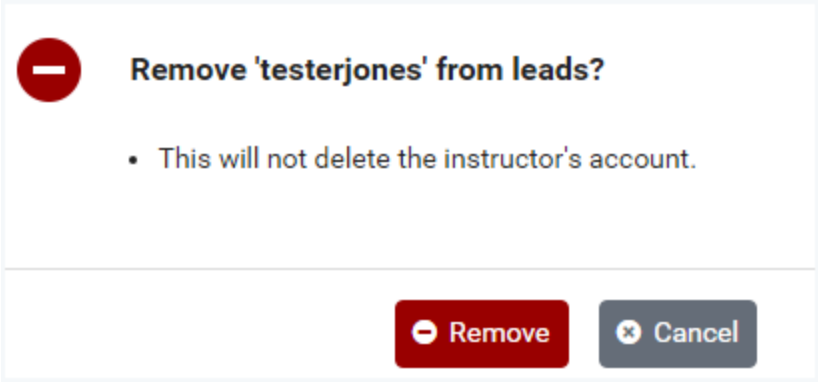


3. You will be prompted to confirm that the lead instructor should be removed from the class.



4. Click **Remove** to confirm.

> Removing an instructor as class lead will not remove the instructor's user account from the NETLAB+ system.

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20.6 Manage a Class Roster

A class *roster* is a list of members, which may include student accounts, instructor accounts, or both. All members must belong to the same community. A class may contain one or more *lead instructors* (trainers). All other users in the roster (who are not leads) are *learners*.

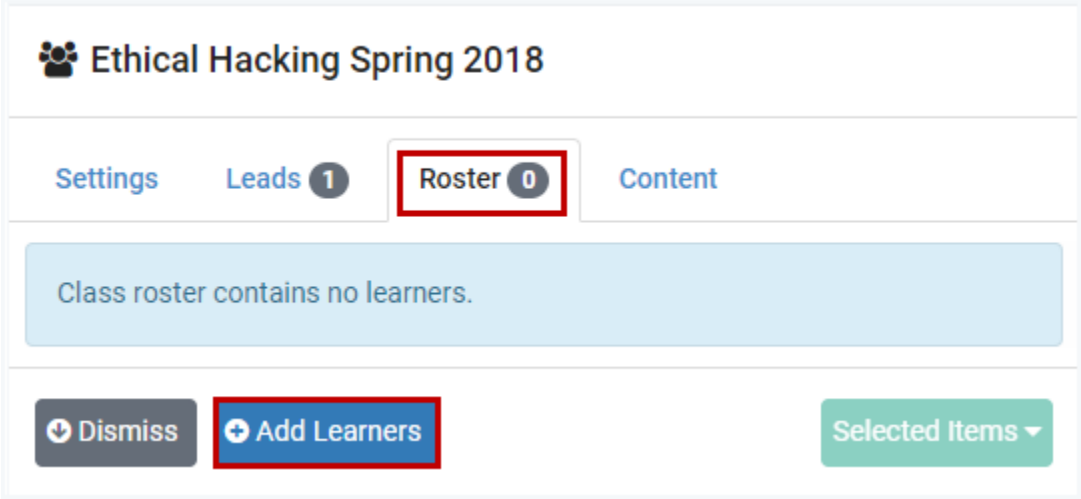
As students join and withdraw from a class, periodic changes will be needed to the class roster. Details are provided in the subsections below.

20.6.1 Add Learners to the Class Roster

One method of adding learners to a class is to select learners from the list of users in the community. This is a good approach when accounts have already been created for the learners that you want to add to the class roster.

Learners can also be assigned to a class during the process of creating a user account. See the *Manage User Accounts* section for details.

1. Select the **Roster** tab on the class page to add learners. A list of learners assigned to the class will be displayed, or the page will indicate that learners have not yet been added to the class roster. Click the **Add Learners** button.



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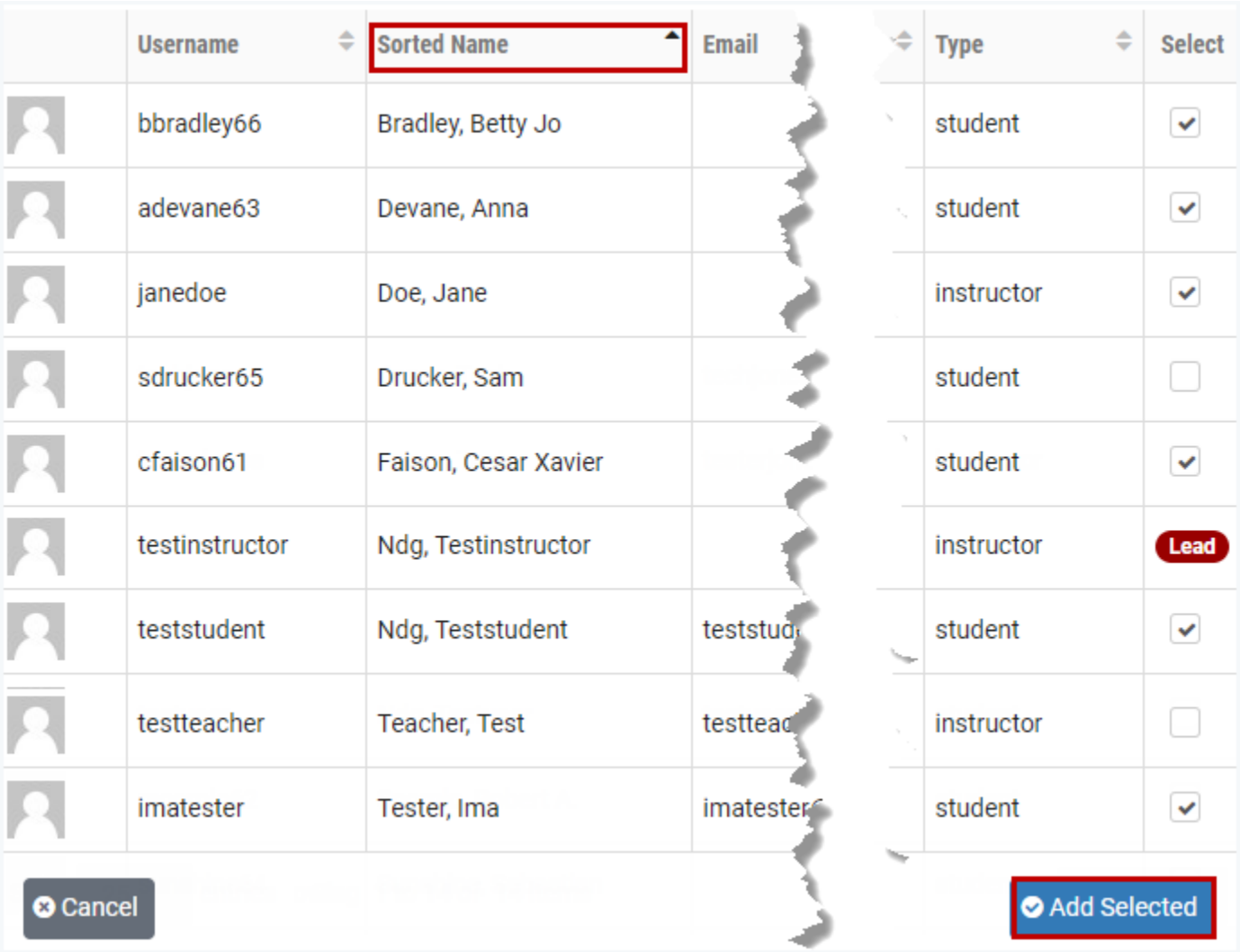
2. A list of the user accounts in the community will be displayed. The list includes both instructors and students. Add learners to the class roster by clicking the appropriate Select checkbox(es) and then click the **Add Selected** button.

To customize the order of the list, select any of the column headers and click to toggle between sorting the list in ascending/descending order. Notice that the user list below is ordered by Sorted Name, which you may find convenient to display the list in order by the users' *lastname*. *firstname*.



In the example above, six learners have been selected, five students and one instructor (instructors may be added to classes as learners or lead instructors). Notice also that the list shows that ***testinstructor*** has already been selected as a class lead instructor.

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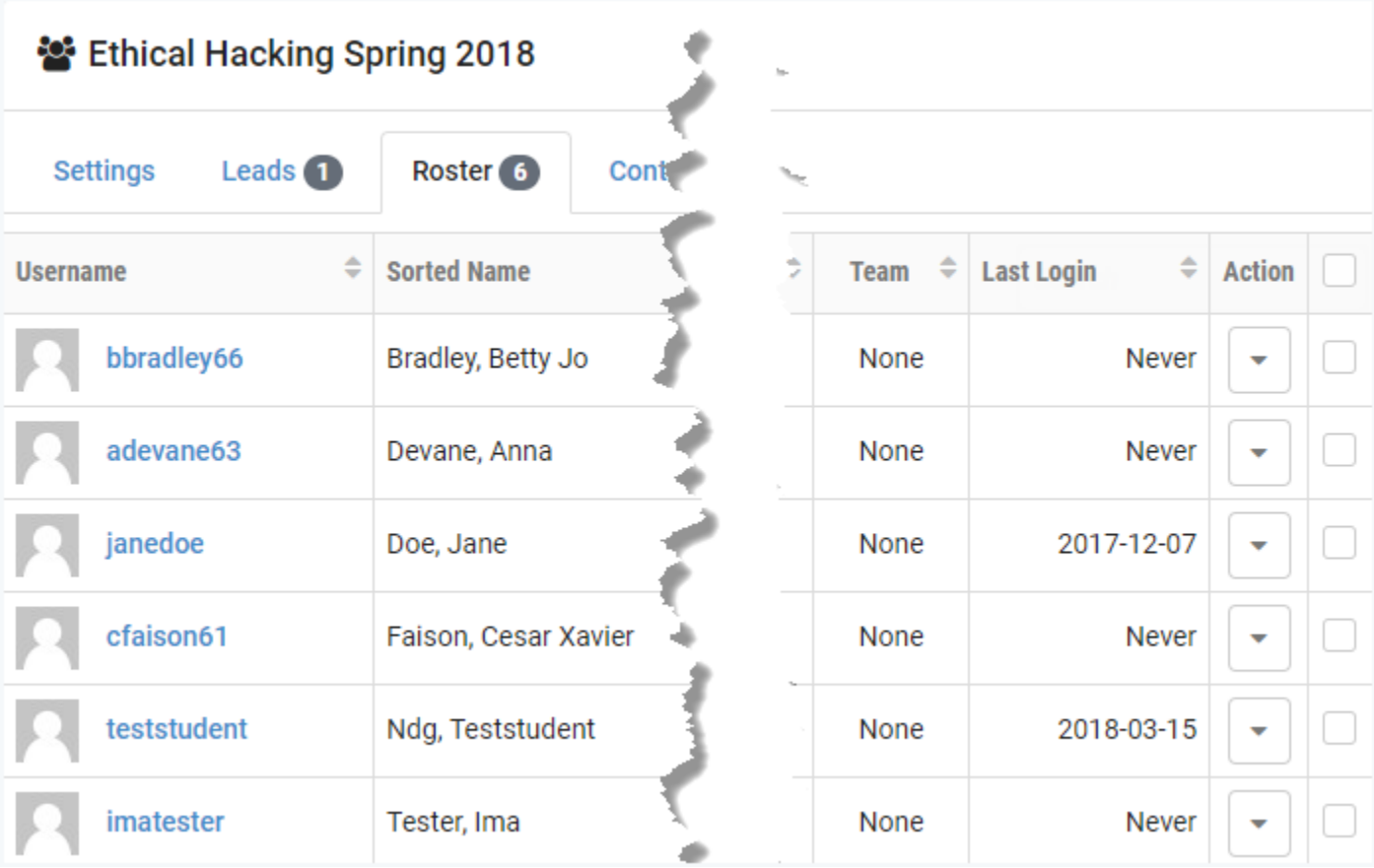
The learners are now listed in the class roster. Notice that the date of the Last Login into NETLAB+ is listed for each class member.



20.6.2 View User Account Details from the Class Roster

There are several options available from the class roster that allow you to view additional information pertinent to individual class members, including viewing user account details.

1. Click the **Action** dropdown on any of the detail rows and select **View User Account**.

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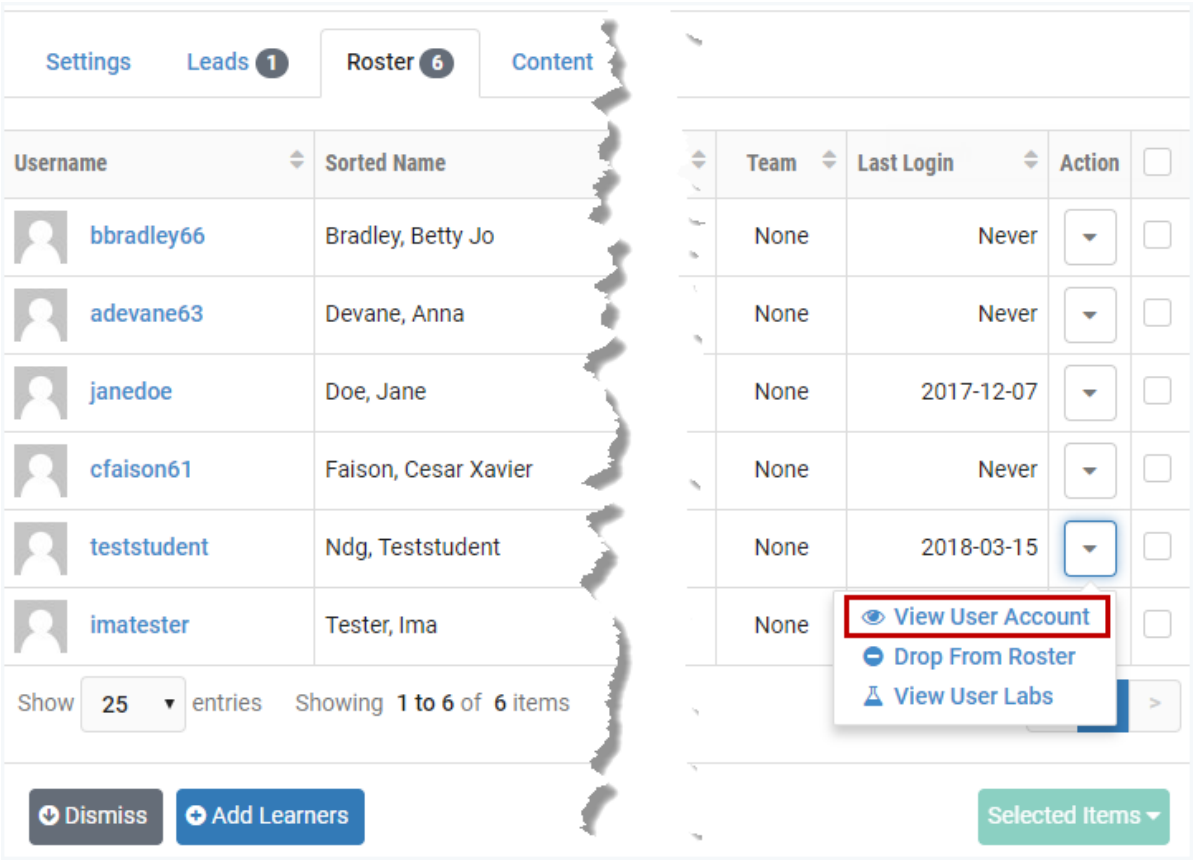
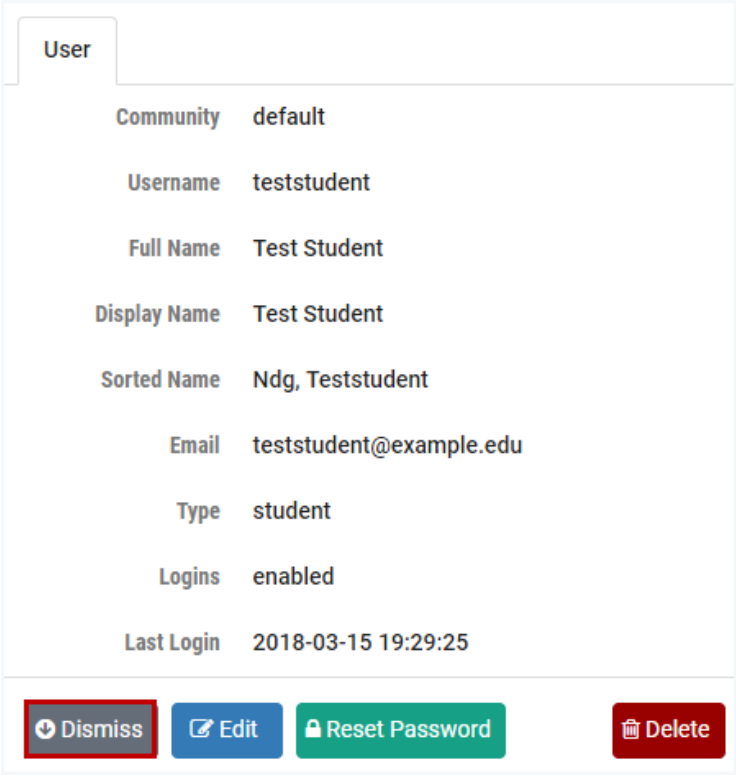


2. The User detail page will be displayed. Please refer to the *Manage User Accounts* section for more information on the options available from this page. Click **Dismiss** to return to the class roster.



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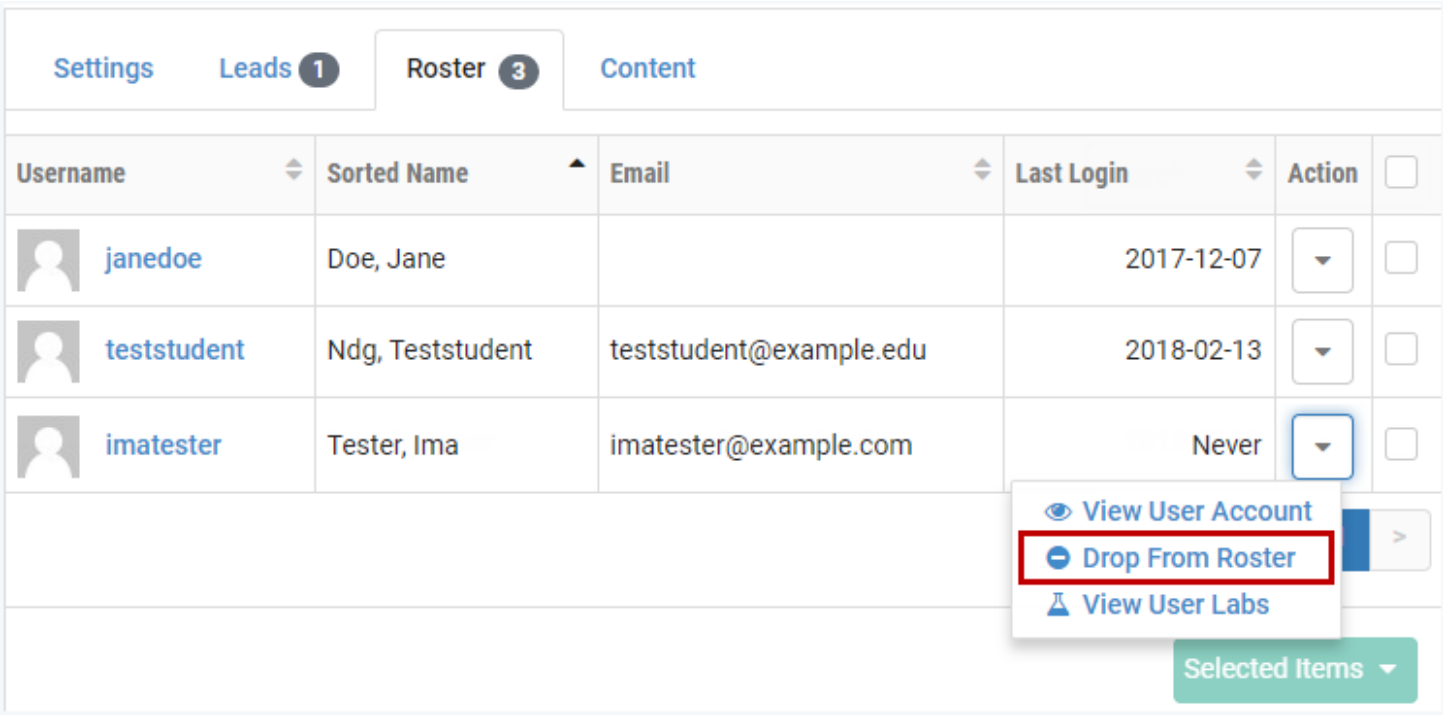
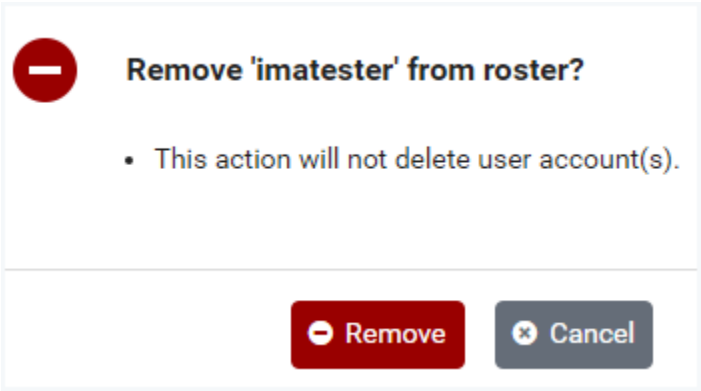
20.6.3 Drop Learners from the Class Roster

1. Learners may be removed from the class roster by selecting the **Drop From Roster** option on the Action dropdown.



2. You will be prompted to confirm the removal of the user from the class roster. Click **Remove** to confirm the action.



Dropping a learner from the roster does not delete the user account. The account remains on the system and may be added to other class rosters.

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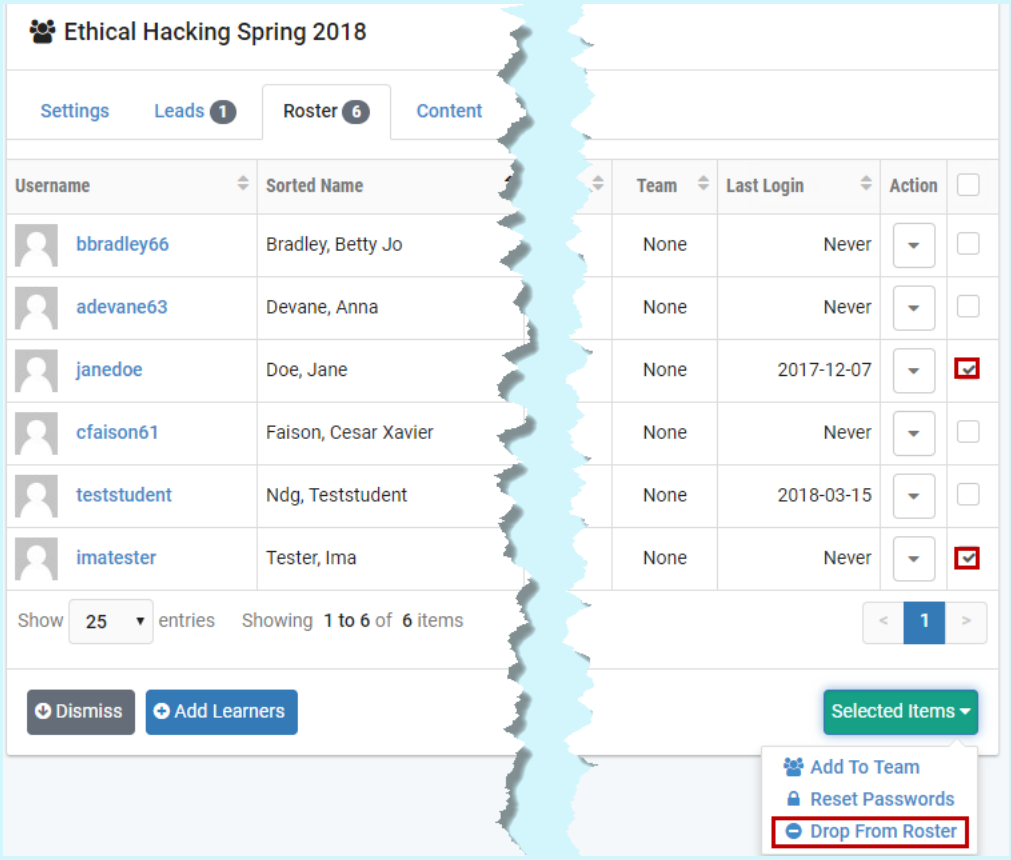
Need to drop multiple users? You may use the following method to drop multiple learners at once:

1. Check the Select boxes for each respective user.
2. Click the Selected Items button and select **Drop from Roster**.
3. You will be prompted to confirm the action.



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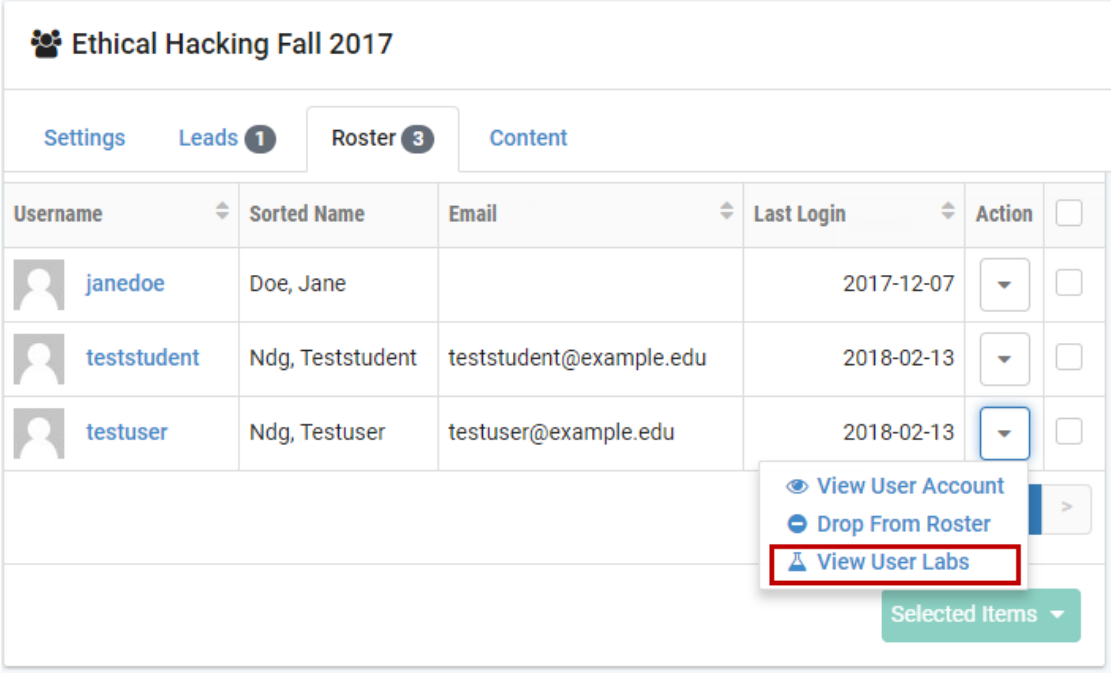
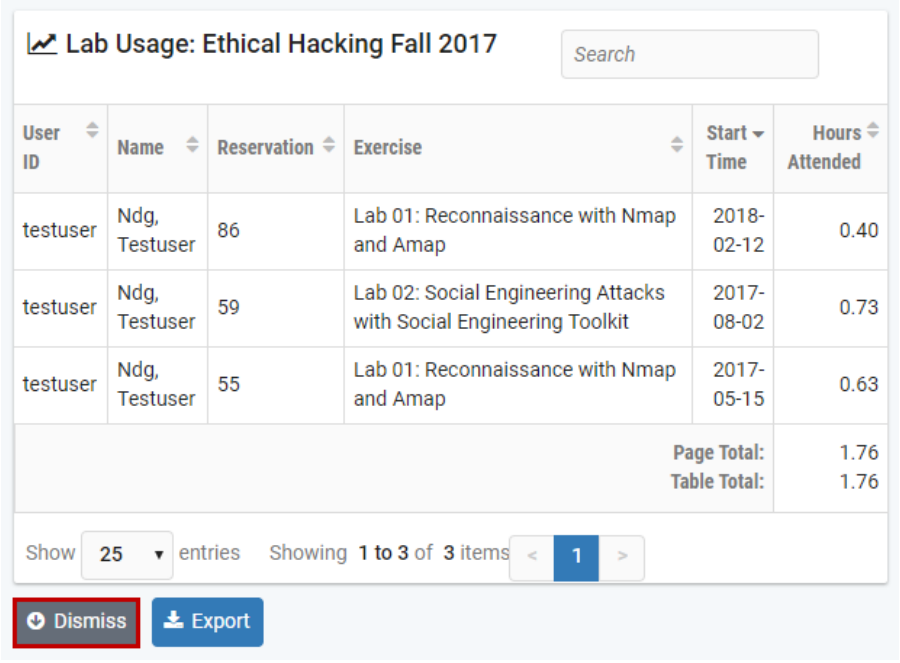
20.6.4 View User Labs from the Class Roster

There are several options available from the class roster that allow you to view additional information pertinent to individual class members, including viewing lab usage details.

1. Click the **Action** dropdown on any of the detail rows and select **View User Labs**.



2. The lab usage details will be displayed, showing the labs completed by the learner for this class. For more discussion on lab usage reporting, please see the *Lab Usage* section. Click **Dismiss** to return to the roster.



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20.6.5 Group the Class Roster Into Teams

Classes can be configured to allow students to have self-study lab access both as individuals and as part of an assigned team. The use of teams is optional.

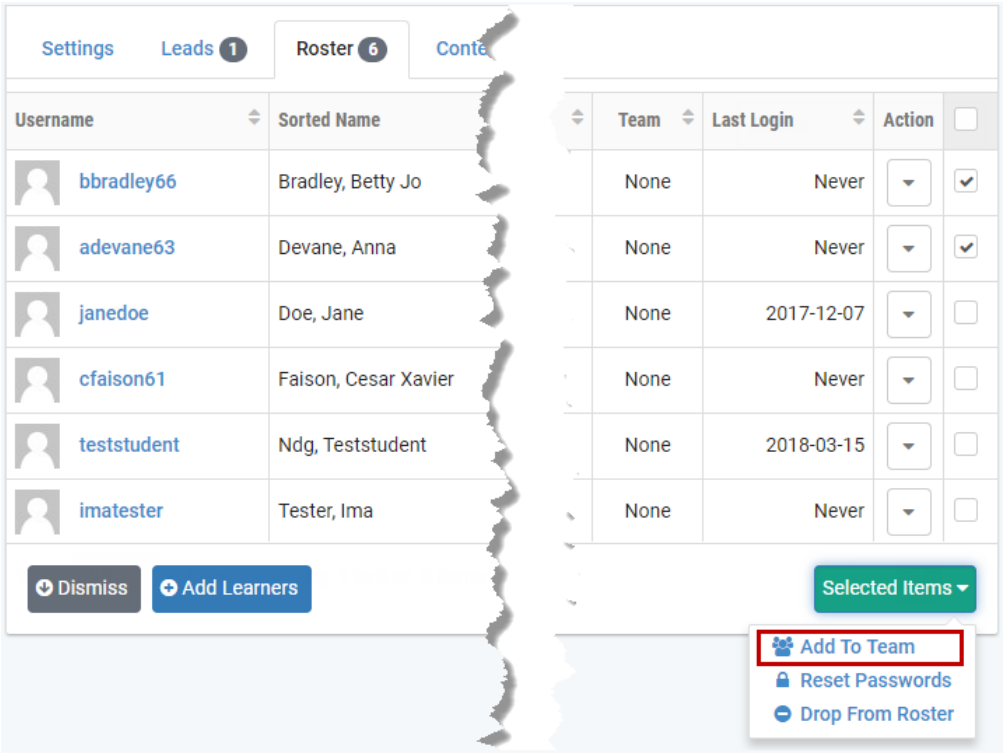
The class setting for self-study lab access must be enabled for teams, in order for team members to be able to schedule lab reservations. See the *Add Classes* section for details on class settings.

You may place class members into teams labeled A to Z. Teams allow students to work in groups for self-study reservations and share access to equipment at the same time. Students may not change their own team assignment; however, the lead instructor(s) can adjust team assignments as needed.

Lead instructors are not assigned to a team and may participate in the lab reservations for any team.

Here, we will group the 6 learners on the ***Ethical Hacking Spring 2018*** class roster into 3 teams. We will select the learners to add to each team.

1. Using the checkboxes, select the members of the class roster to be placed together on a team. We will assign the first 2 learners on the roster to a team.
2. Click the Selected Items box and select the option to **Add to Team**.



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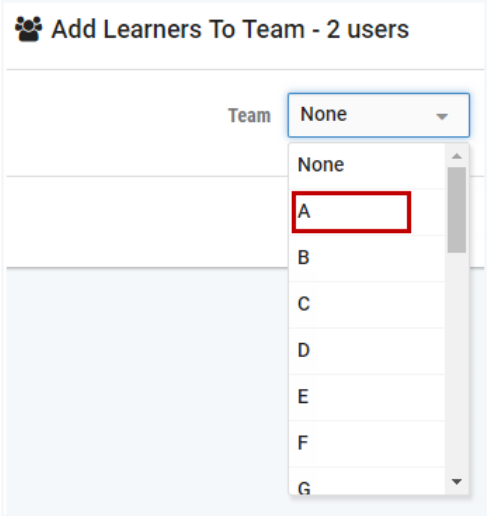
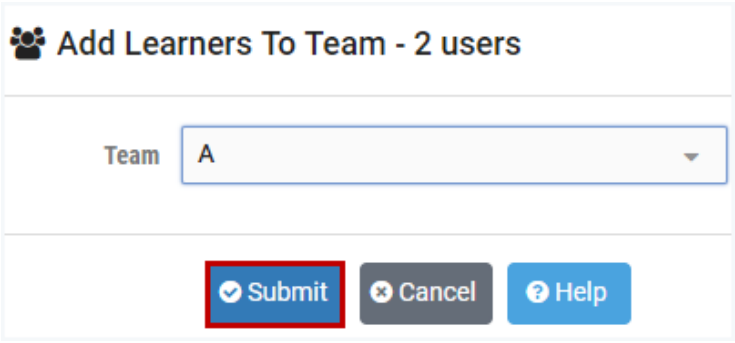
3. The Add Learner to Team page will be displayed and will indicate that 2 users will be assigned. On the **Team** dropdown, select ***A***.



4. Click the **Submit** button.



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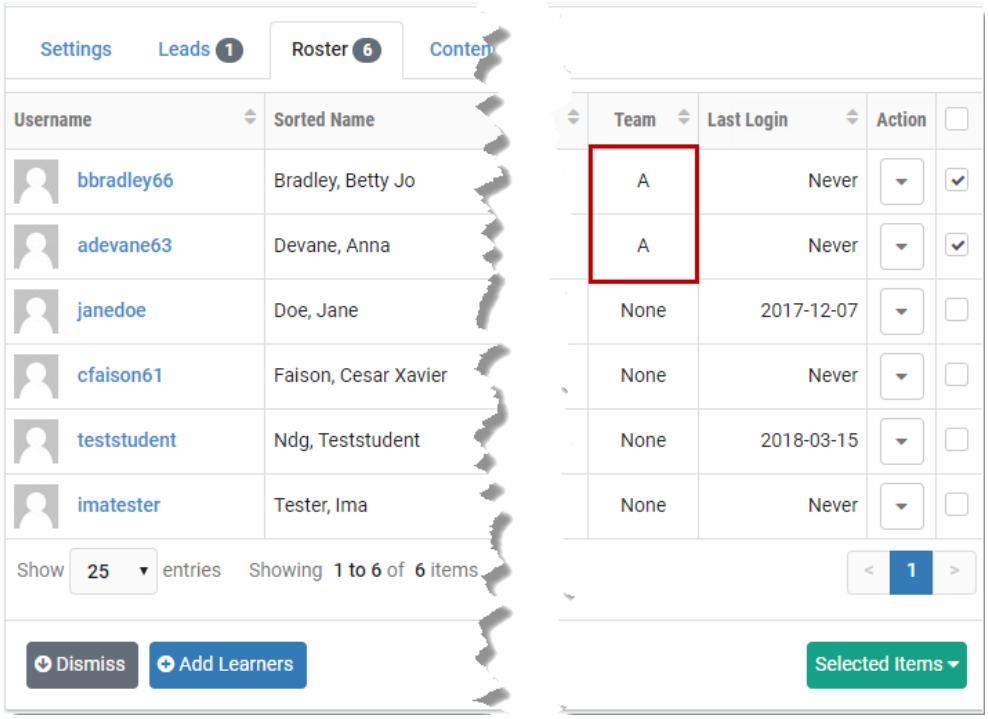
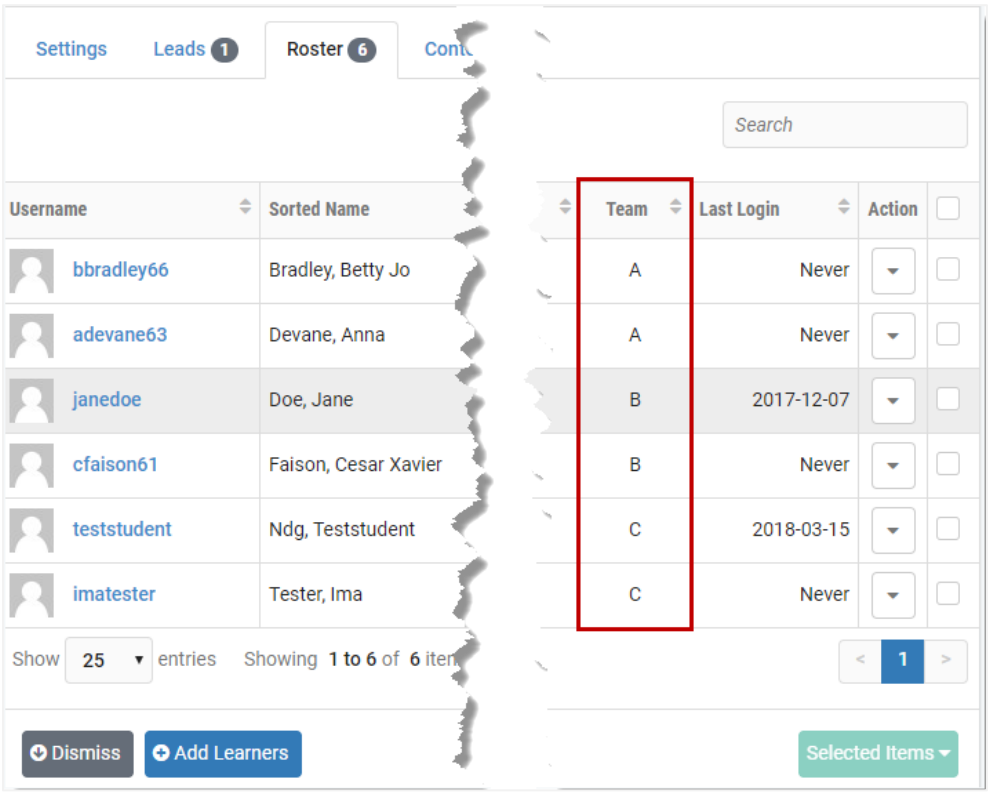
5. The team assignment of ***A*** is now shown on the class roster for the 2 selected roster members.



6. Repeat the process of selecting members of the class roster and making assignments for each team. In the example below, teams ***B*** and ***C*** have been assigned; all members of the class roster have been added to a team.



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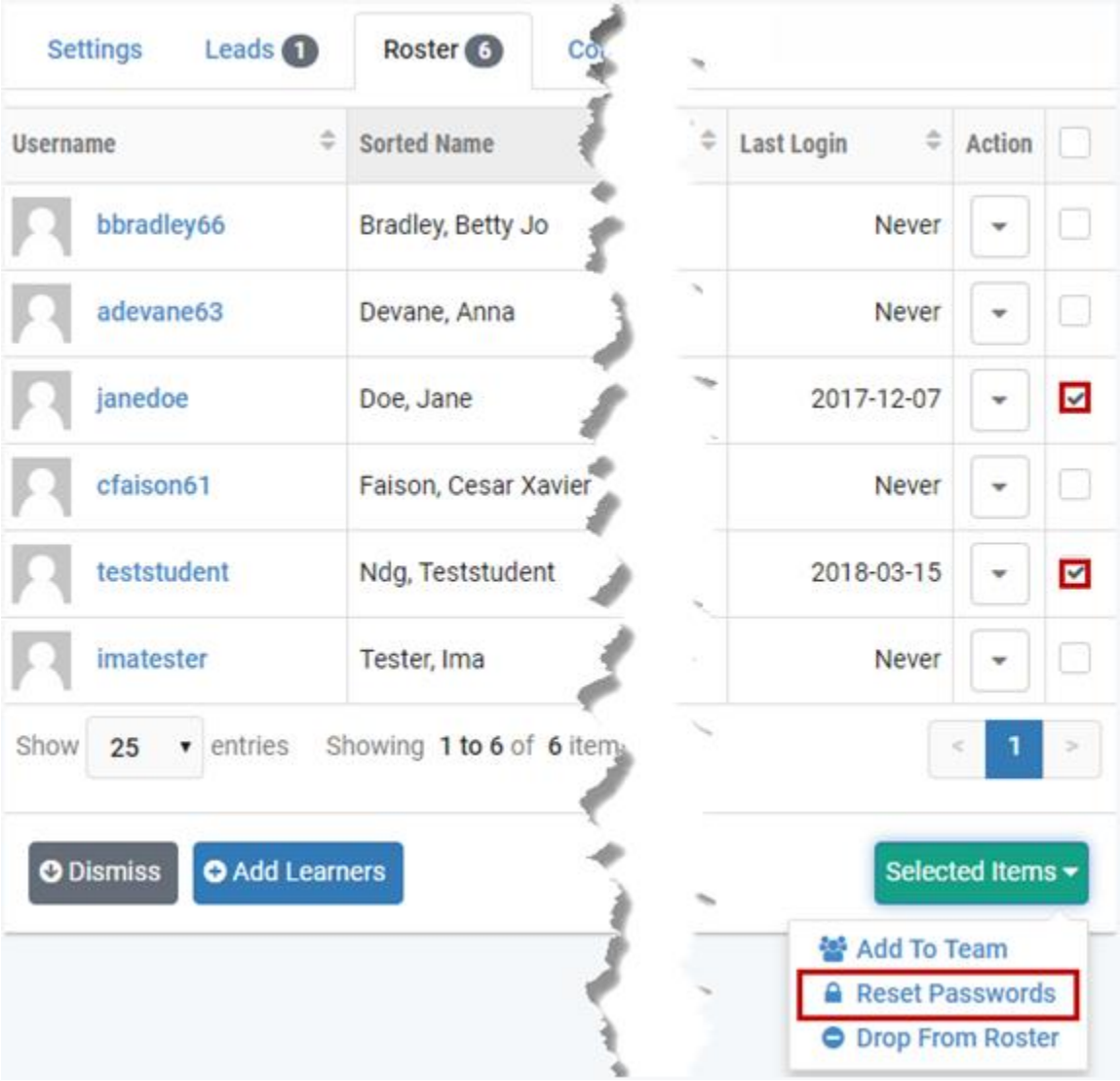
20.6.6 Reset Account Passwords for One or More Learners

It may be necessary to reset an account password if a user has lost or forgotten their current password. If you need to reset the password for multiple users in a class, you may do so by performing the following steps.

Users will be required to reset their password during their next login (unless you amended the default password policy setting). The option to *Reset Account Passwords* is also available through the account management options.

1. Check the Select boxes for each respective user on the class roster (the checkbox at the top of the column may be used to select all users).
2. Click the Selected Items button and select **Reset Passwords**.



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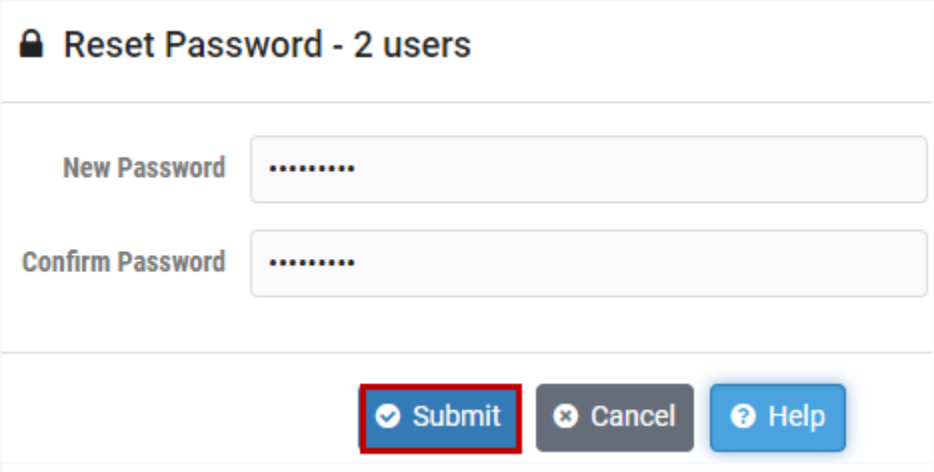
3. The Reset Password page will be displayed. Enter the new, temporary password for the account(s) and then re-enter it to confirm. Click **Submit**.

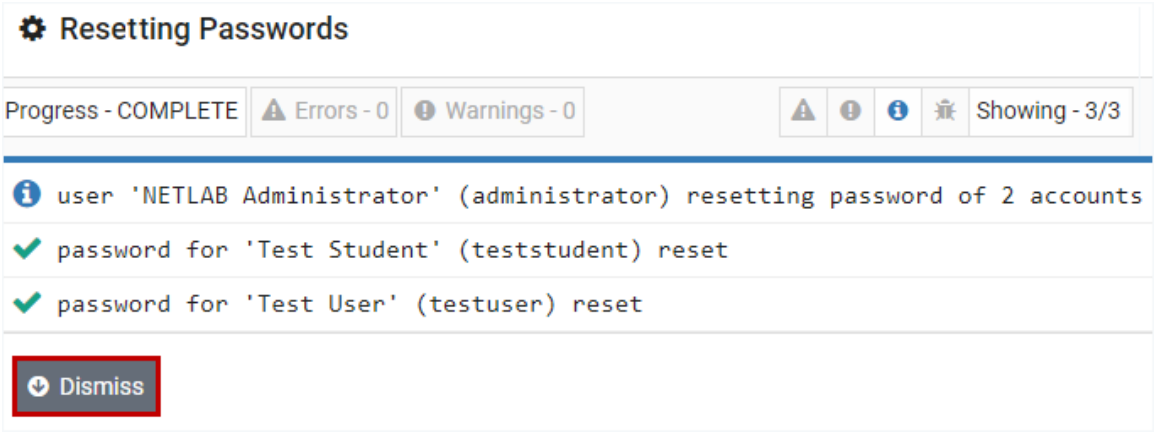
   Passwords must meet the following requirements:

   The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

   - Must contain 8 or more characters.
   - Must not contain more than 64 characters.
   - Must not contain any common English dictionary words that are more than 3 characters long.
   - Must not contain the user ID for the account.
   - Must not contain the email address for the account.
   - Must not contain any names associated with the account.



4. You will see system log entries indicating the progress of the password reset for each user. When complete, click **Dismiss**.



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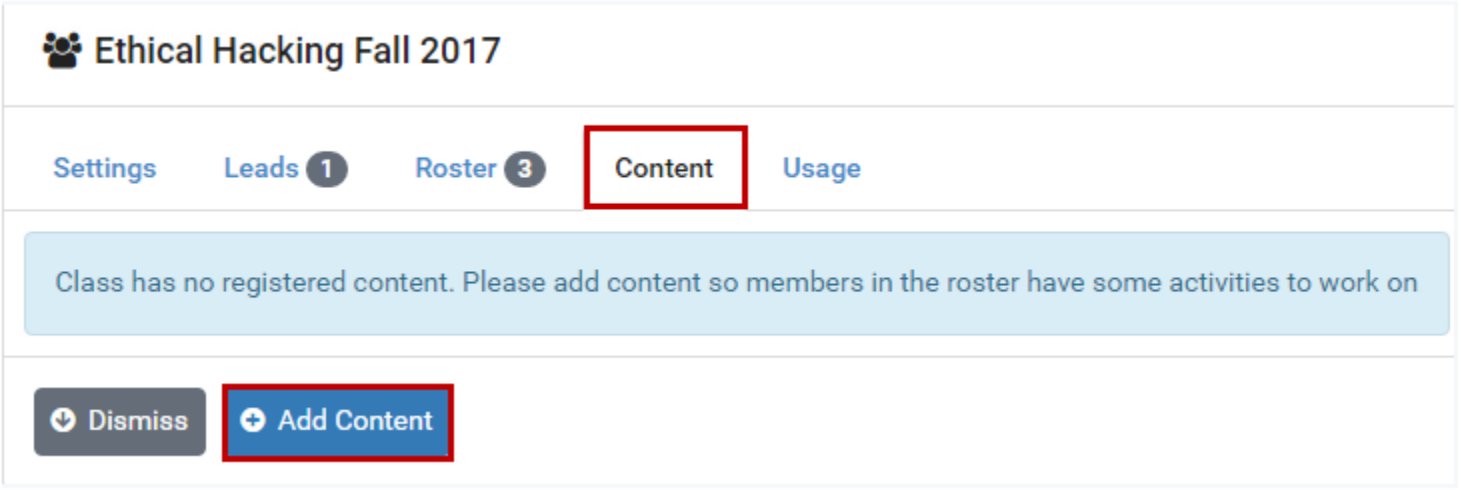
20.7 Add Content to a Class

Select the content appropriate for the class. Selecting the content will make available the appropriate instructional material (typically, lab exercises for scheduled lab reservations).

1. Select the Content tab on the class record and click the **Add Content** button.



2. A list of **Available Lab Content** is displayed. In the example below, the content for NDG Ethical Hacking is selected for the class.

The Available Lab Content on your system will vary, depending on the courses that have been added to your NETLAB+ system and the vendor programs in which your organization participates.

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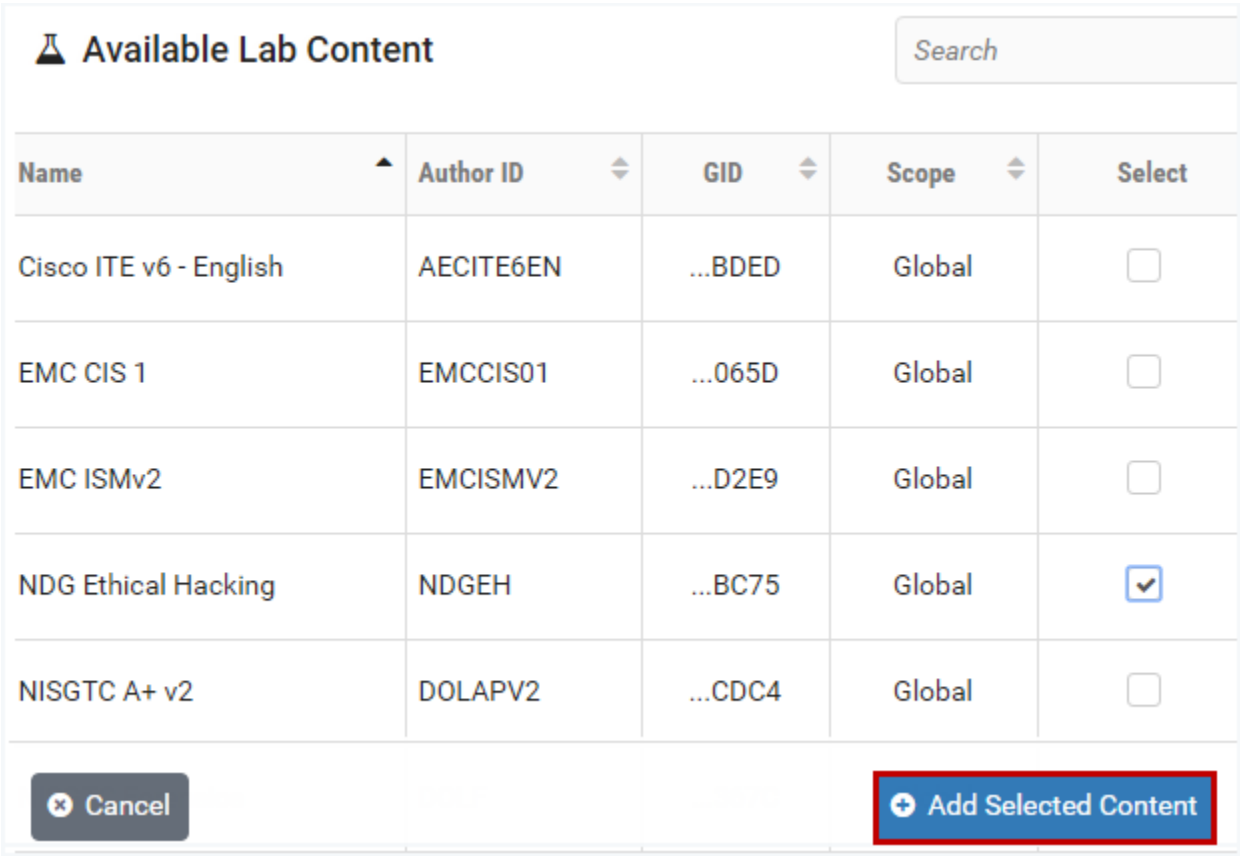
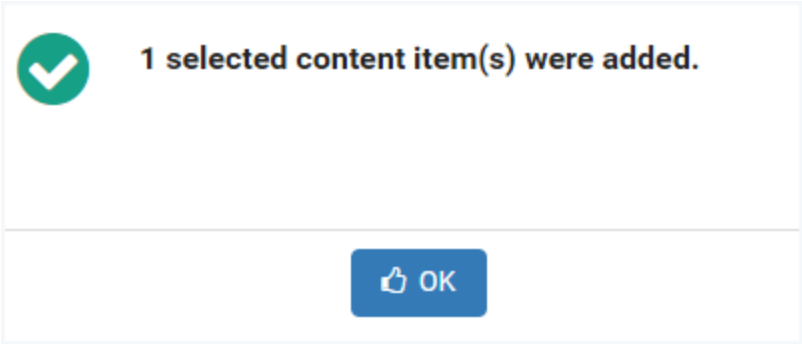


3. Click the **Add Selected Content** button. A message will confirm that the content has been added.



4. Click **OK** to return to the class details.

NDG Ethical Hacking is now included in the content list. The total number of **Labs** performed and the number of **Hours** of lab reservation time currently indicate zero, since the content has just been added.

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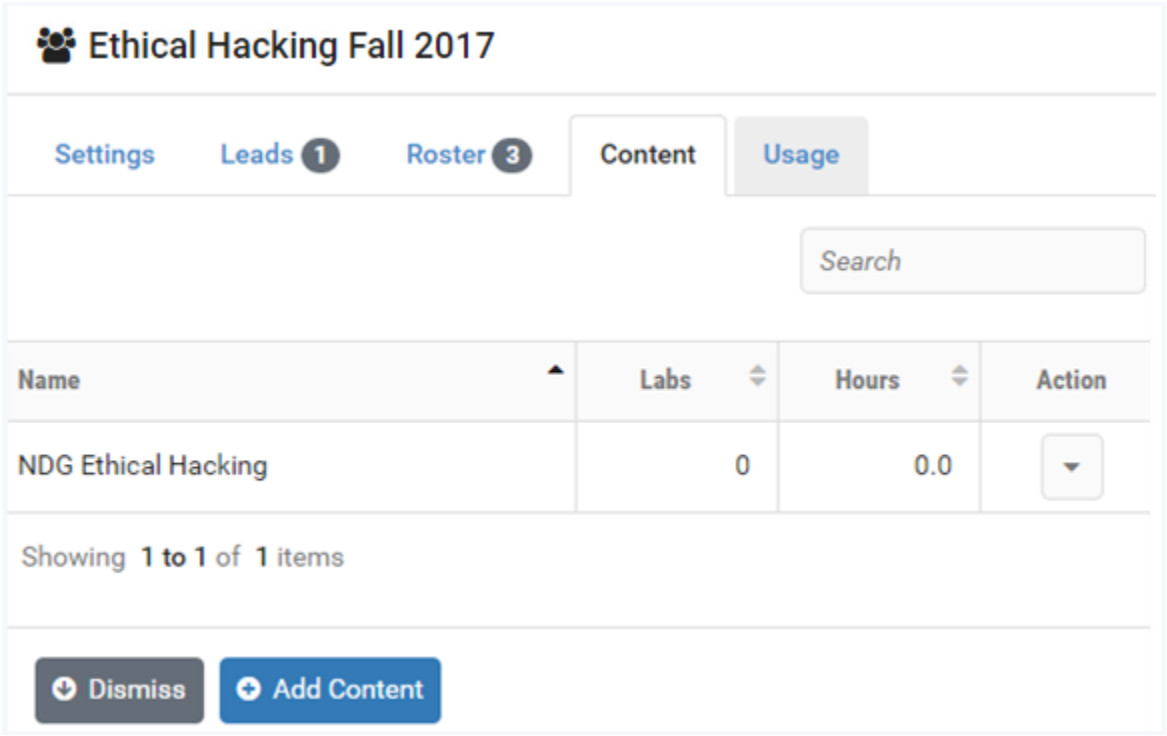
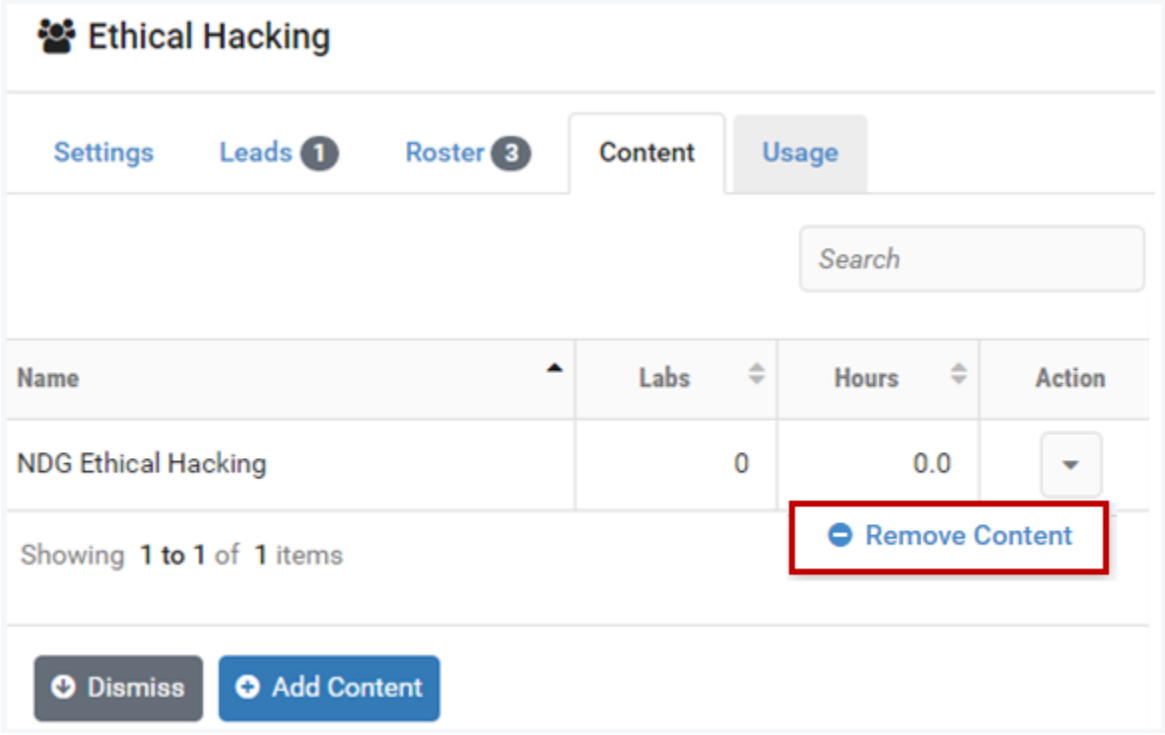


20.8 Remove Content from a Class

The option to **Remove Content** is available on the Action dropdown of the Content tab for a class.



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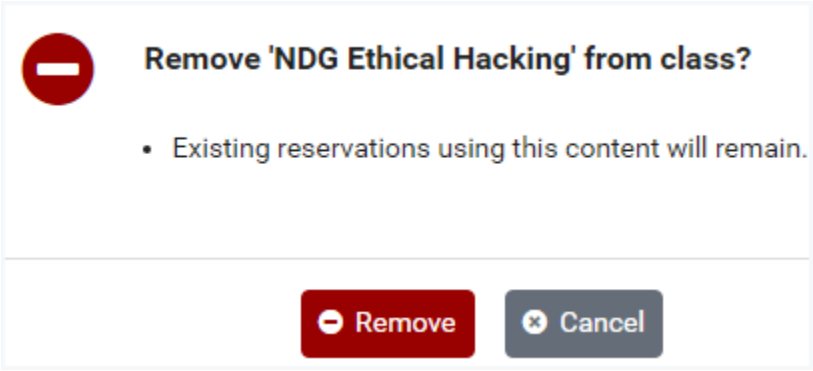
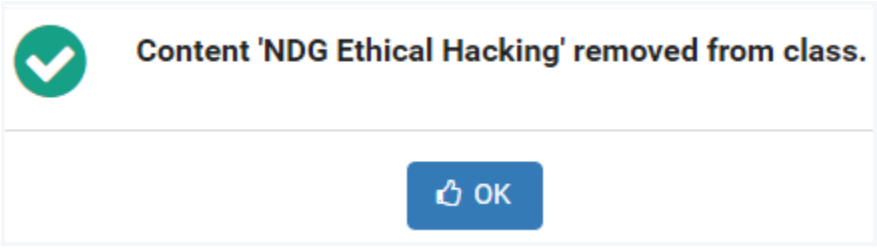
1. Select **Remove Content** on the Action dropdown. You will be prompted to verify that you want the content removed. As noted, removing the content will not affect lab reservations already made for this class.



2. Select **Remove** to confirm that you want to remove the content. A message will verify that the content has been removed from the class.



3. Select **OK**.

20.9 Delete Classes

Class records may be removed from the NETLAB+ system. All information associated with the class, including the class roster, will be removed from the system. The option to delete the accounts for students exclusively enrolled in the class may be selected.

In the steps below, we will delete the Cyber Security class, but before we proceed, let us examine the class roster. There are four learners enrolled. Assume the following for the example below:

- Two of the learners in the class roster: *teststudent* and *testuser,* are enrolled in an Ethical Hacking class, in addition to being enrolled in the Cyber Security class.

- The other two student accounts (highlighted below) *student1* and *student2,* are enrolled in the Cyber Security class **exclusively;** these learners are not enrolled in any other classes. You may choose to delete these accounts when deleting the class.

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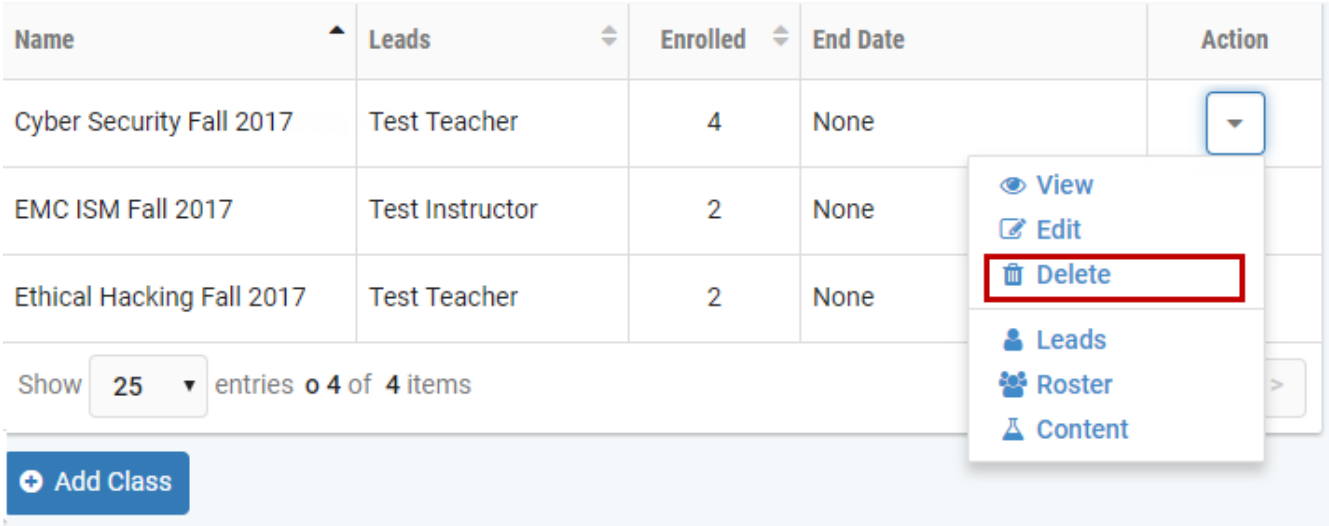
1. To delete a class record, select a class on the class list and click the **Delete** option on the Action dropdown.



2. When deleting a class, you may choose to either retain or delete the student accounts on the class roster. Accounts will not be deleted if the student is enrolled in other classes. Below, the checkbox is selected to **delete student accounts exclusively in this class roster**. Click **Delete**.

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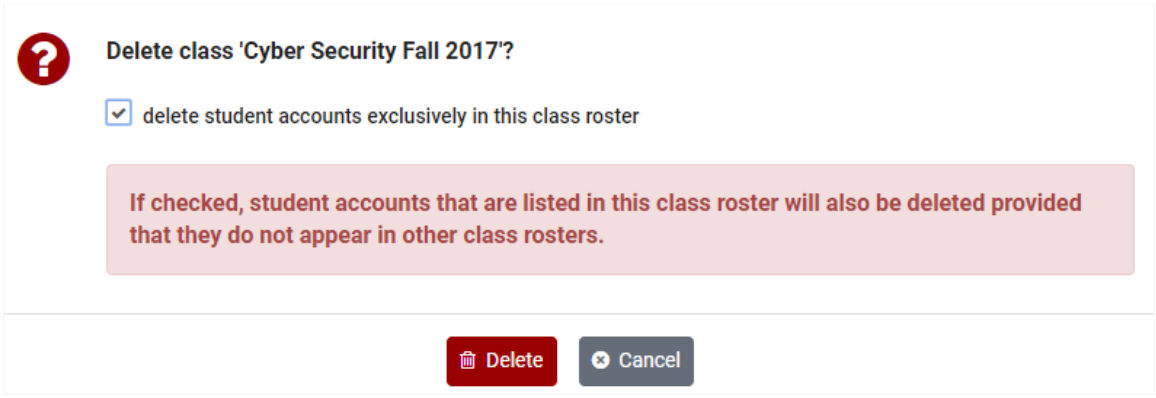
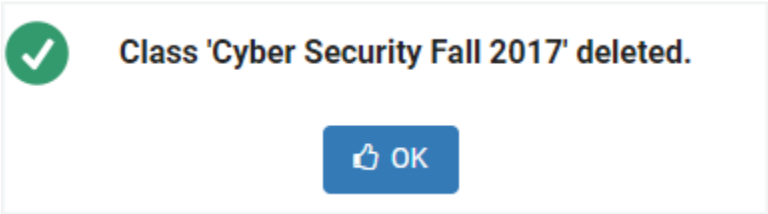
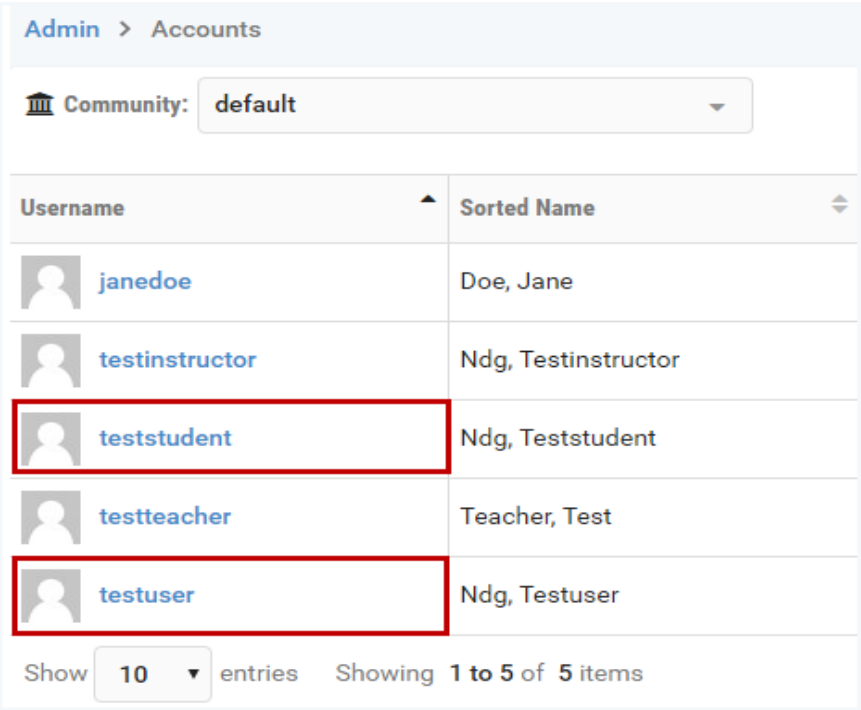


3. The class has been deleted from the NETLAB+ system. Select **OK** to return to the list of classes.



Because the option to **delete student accounts exclusively in this class roster** was checked, two student accounts: *student1* and *student2,* have been deleted. The *teststudent* and *testuser* accounts are still present on the system (see the Accounts list below, see also the *Manage User Accounts* section).



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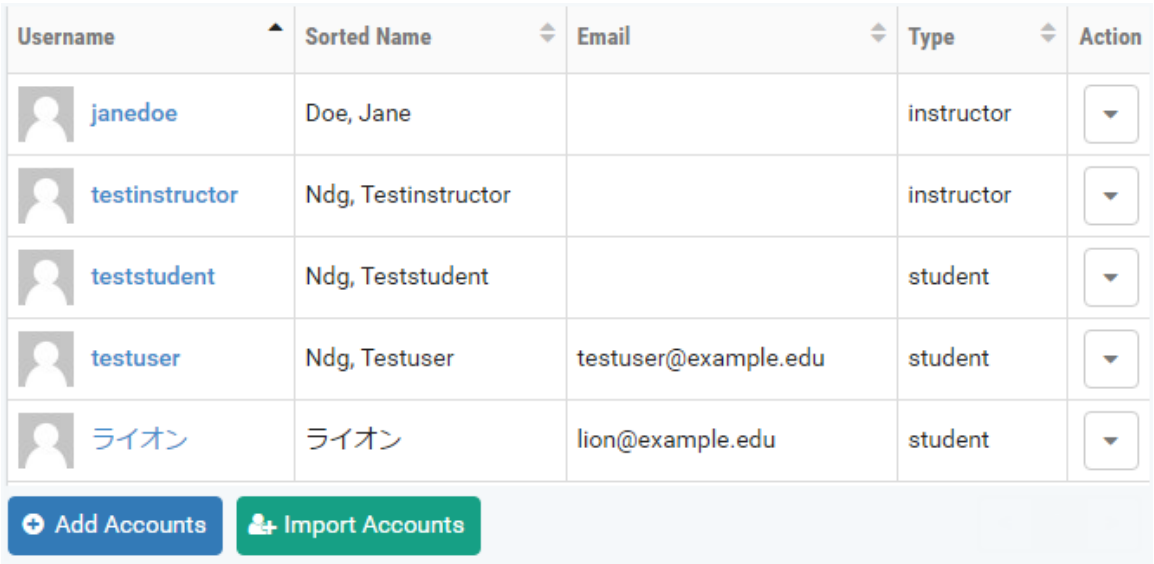
21 Manage User Accounts

This function is used to add, delete, and modify account information for both student and instructor accounts. At least one instructor account should be set up by the NETLAB+ administrator. A student account should be created for each student to allow them to participate in labs.

The NETLAB+ administrator and instructors with system-wide privileges may manage accounts for any community.

To manage user accounts, click the **Accounts** icon on the administrator Home page. Accounts functions include adding new accounts to the system and making modifications to existing accounts. These functions are described in the subsections below.



Notice that the last account shown in the example above contains Japanese characters. The UTF-8 character set is supported.

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21.1 Add Accounts

An account should be created for each user to allow them to participate in labs and have access to content. The NETLAB+ administrator may add both instructor and student accounts. Instructors may also add new accounts, depending on the privilege setting of their account. There are two methods of adding user accounts to NETLAB+, which are explained in detail in the subsections below.

- **Importing data from a file**: If you have the information needed to create the user accounts in a file (see requirements below), you may import this information into NETLAB+. This is a good choice when you have a file available from a class roster or LMS and many accounts to add.
- **Entering data:** Create user accounts individually by entering the data into a form. This is a good option when you just need to add a few accounts quickly.

21.1.1 Importing Data from a File

User account information can be imported into NETLAB+ from a comma or tab-delimited file (*.csv or *.txt). An account should be created for each user to allow them to participate in lab reservations. Account information may be imported into NETLAB+ from a file with these characteristics:

1. The file must be in a comma or tab-delimited file format (*.csv or *.txt).
2. The first row of the file may contain column headers that identify each field to import.
3. The file may contain additional, extraneous columns of data. You will select which columns are used by NETLAB+.
4. The file must include the data fields, as described below.

You will achieve the best possible results with NETLAB+ recognizing your input data by using the specified field names (bolded below) as column headers, although some variation is acceptable.

Field Descriptions - Account Information File

Required Fields (these fields must be included in the input file):

- **Username**: A user identifier that is unique to each user. **REQUIRED**
  The username credential used to log in to the account. The Username can contain letters, numbers, and the following punctuation characters: period (.), at sign (@), hash (#), underscore (_), and hyphen (-). The UTF-8 character set is supported.

Be aware that usernames are now case insensitive (example: *TestUser213* is considered the same as *testuser213*).

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- Name Information for each user. **REQUIRED (choose Option 1 or 2).**
  You have two options as to how this information may be imported, depending on the data available in your input file. The UTF-8 character set is supported.

  Option 1: Your file includes name data in one field:

  - **Full Name**: The name given to a user at birth. The user's complete name including any inherited names, given names, or initials. Note that certain titles, prefixes, and suffixes can interfere with name processing and automation.

  Option 2: Your file includes name data in two fields:

  - **Given/First Name**: The name given to a user at birth.
  - **Family/Last Name**: The name shared by the user's family.

Select either Option 1 or Option 2. If your input file includes the Fullname (name information in a single field), there is no need to specify the Given/Firstname, Family Last Name fields.

When using Option 2, be aware that the import process will function even if you have users that only have a Given/Firstname or only have a Family/Last Name. The import process has the flexibility to accept usernames with just one word (see user "Prince" in Example 1,

Optional Fields (you have the option to import this information into NETLAB+)

- **Display Name:** Users (instructors and students) will see this name in collaborative applications, such as instructor-led training. If this field is not included in the input file, it will be automatically populated during the input process. You may edit the Display Name as needed.

  This name may be visible to student accounts. Do not use personally identifiable information in this field when privacy must be maintained.

- **Sorted Name:** This name will be seen by instructors and administrators in sorted lists. If this field is not included in the input file, it will be automatically populated during the input process. You may edit the Sorted Name as needed.

  Using the Sorted Name field allows the option of displaying lists, such as class rosters, in order by *last name, first name*.

- **Email**: An email address for the user.

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- **Initial Password**: The account users will be required to change this password during their initial login (unless you have amended the default password policy setting).

  Passwords must meet the following requirements:

  The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

  - Must contain 8 or more characters.
  - Must not contain more than 64 characters.
  - Must not contain any common English dictionary words that are more than 3 characters long.
  - Must not contain the user ID for the account.
  - Must not contain the email address for the account.
  - Must not contain any names associated with the account.

To import a file:

1. Select a comma or tab-delimited file from the local file system that contains the account data to be imported. Files used for importing accounts must contain lines with an equal number of commas or tab-separated values and carry a ".csv" or ".txt" file extension.
2. Identify the required information in the input file (see information above on the required fields).
3. After the account information has been imported from the file, you will complete the process of adding accounts on the Enter New Account Information page, where you will have the option to change the community setting and modify the account type (student vs. instructor) as needed, depending on your instructor privileges.

21.1.1.1 Importing Data Example A

In this example, we will import account data from a comma-delimited file. Let's look at the file using a spreadsheet program, so we can view the data and make the appropriate choices for importing account information.

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user_accounts_import_test_a.csv

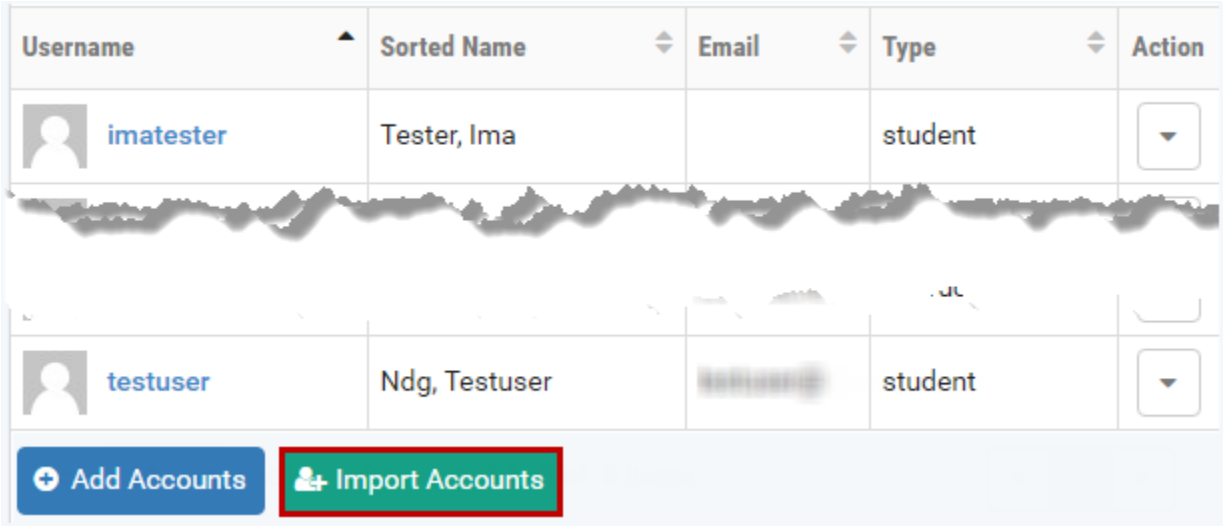
	A	B	C	D	E
1	Username	Given/First Name	Family/Last Name	Housing	
2	croberts21	Carly	Roberts	dorm	
3	tgarmin22	Todd	Garmin	dorm	
4	jsmith23	John	Smith	off campus	
5	tbarnes24	Ted	Barnes	dorm	
6	prince16	Prince		fraternity	
7					

Notice a few important things about this file:

- The file name user_accounts_import_test_a.csv is a comma-delimited file, which is an acceptable format for importing.
- The file includes the recommended column headers in the first row.
- The file includes the required **Username** field.
- The file includes name information in a format meeting one of the two acceptable options (see above). In this case, the fields, **Given/First Name** and **Family/Last Name** are present, which meets the requirements for Name Information Option 2.
- In the 6th row, the record displayed ("Prince") does not have a value in the Family/Last Name field. This user's name is a single word only, and that is OK.
- An additional field, Housing, is present in the file. This data has no relevance to this process; however, it is not necessary to remove this data from the file; it will simply be ignored.

To Import the data:

1. On the accounts page, select the option to **Import Accounts**.



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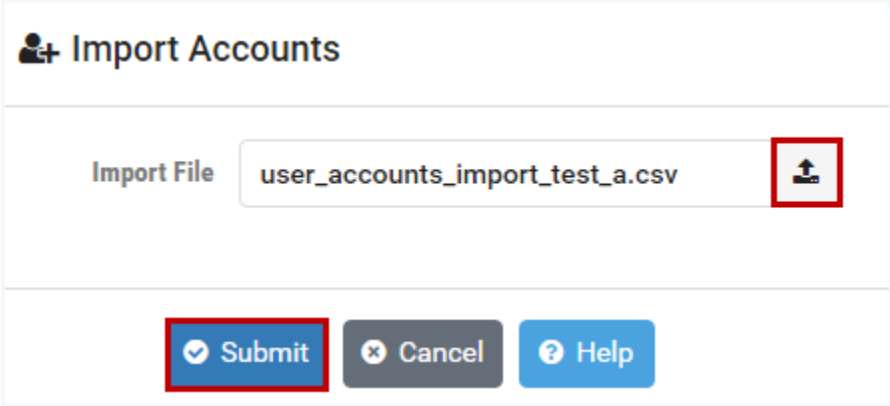
2. Select the **Import File** button.
3. Navigate your file system and select the file that includes the data that you want to import. Here, we will import **user_accounts_import_test_a.csv**.



4. Select the **Submit** button.
5. The data that NETLAB+ was able to extract from the file is shown in a table. Notice that the last column, which contains the unneeded housing data, is grayed out, and the checkbox at the top is not selected. This is fine since we do not want to import this data.

The import process is designed to behave in an intuitive manner. It will examine your file to draw logical conclusions regarding the data you will be importing. If necessary, you may make adjustments by selecting/deselecting the check boxes indicating each column of data to be imported and resetting the dropdowns indicating the field that the column contains.

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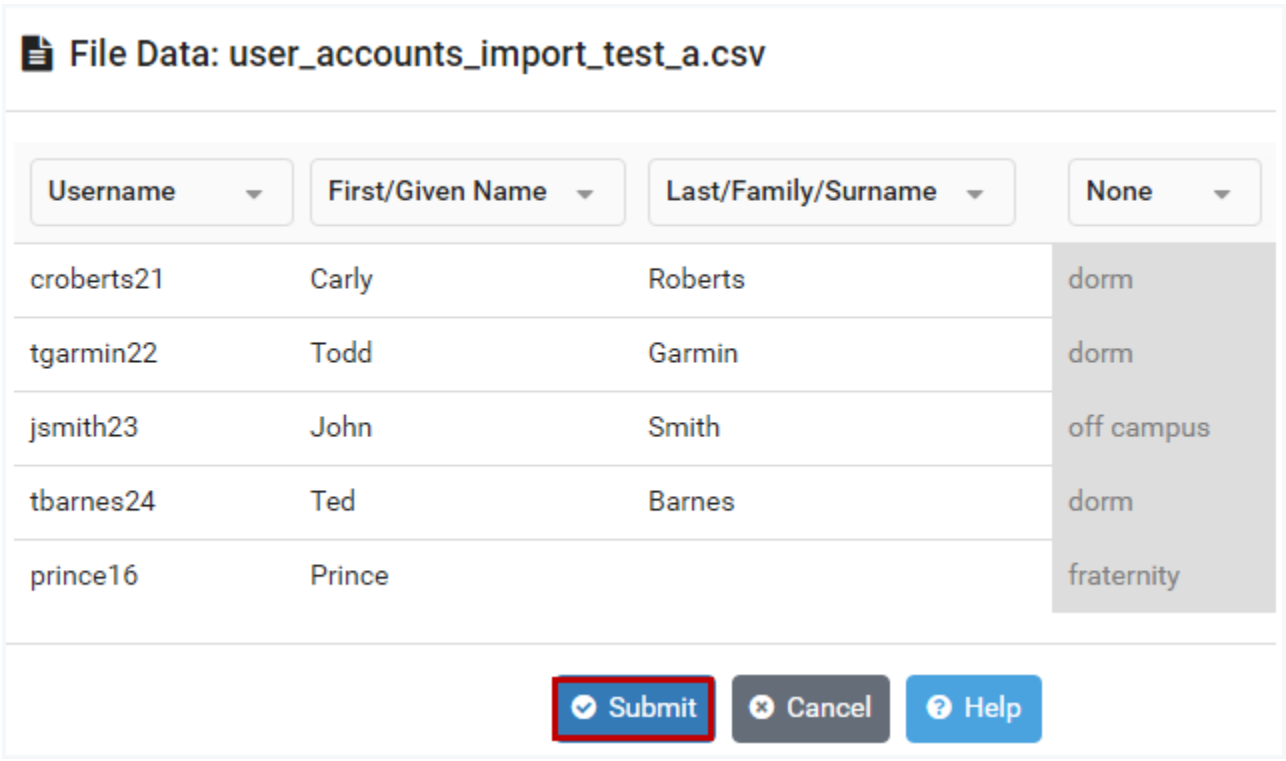

6. Select the **Submit** button.
7. The imported information will be included on the **Import Accounts** page. The process of adding the new accounts will be completed here.

    a. An initial password must be specified. If initial passwords were not included with the imported account data (as in this example), a Default Initial Password must be entered, which will be used for all new accounts being created on this page.

Recall that the import data in this example included name information separated in two fields (first name, last name). The input process has combined this data to create the values for Full Name, Display Name and Sort Name.

    b. The import process has generated Full Names based on the input data provided and populated the Full Name for each record. The values may be edited as needed.
    c. The import process has generated Display Names based on the input data provided and populated the Display Name field for each record. The values may be edited as needed.
    d. The import process has generated Sorted Names based on the input data provided and populated the Sorted Name field for each record. The values may be edited as needed.
    e. We did not import email addresses, nor have we entered them here. Assume for this example that students will enter their email addresses themselves when they initially access their accounts.

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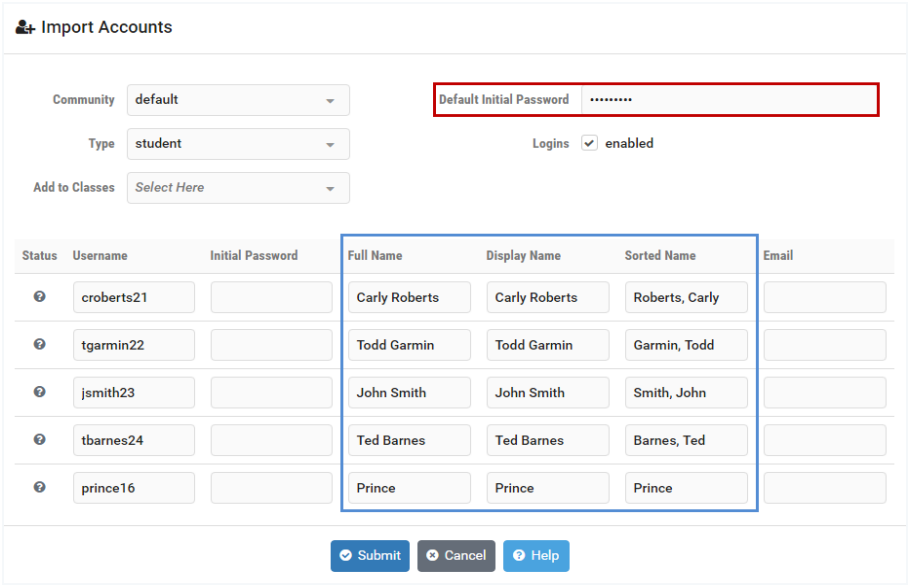

8. Once again, select the **Submit** button. This will complete the process of adding the new accounts to your system.

21.1.1.2 Importing Data Example B

In this example, we will again import account data from a comma-delimited file. Let's look at the file using a spreadsheet program, so we can view the data and make the appropriate choices for importing account information.

user_accounts_import_test_b.csv

	A	B	C	D	E	F
1	cfaison61	Cesar Xavier Faison	bus	History		
2	rscorpio62	Robert A. Scorpio	train	Technology		
3	adevane63	Anna Devane	onsite	Literature		
4	sunshine64	Sebastian Sunshine	bicycle	Technology		
5	sdrucker65	Sam Drucker	car	Accounting		
6	bbradley66	Betty Jo Bradley	train	Veterinary		
7	bbradley66	Betty Jo Bradley	train	Veterinary		
8						

Notice a few important things about this file:

- The file name user_accounts_import_test_b.csv is a comma-delimited file, which is an acceptable format for importing.
- The file does not include the recommended column headings. As you will see, we can still use the file "as is"; however, the import process may require user intervention to determine the appropriate data to import.
- The file includes a column with a unique identifier to be used as a **Username**.

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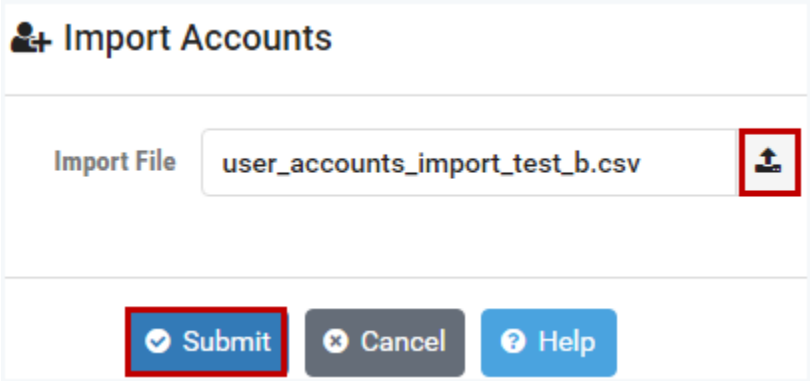
- The file includes name information in a format meeting one of the three acceptable options (see above). In this case, a single name field containing both Given/First Name and Family/Last Name is present, which can be used as **Display Name**, Name Information Option 3.
- Two additional columns are present in the file. This data has no relevance to this process; however, it is not necessary to remove this data from the file; it will simply be ignored.
- The file includes an error, a duplicate record (see lines 6 & 7). We will see how this error will be identified in the import process below.

1. As in Example 1, select **Import Accounts >** Import **File** .
2. Navigate your file system and select the file that includes the data that you want to import. Here, we will import **user_accounts_import_test_b.csv**.



3. Select the **Submit** button.
4. The data that NETLAB+ was able to extract from the file is shown in a table. All of the table data is grayed out since the import process did not have sufficient information to determine what fields contain input data.

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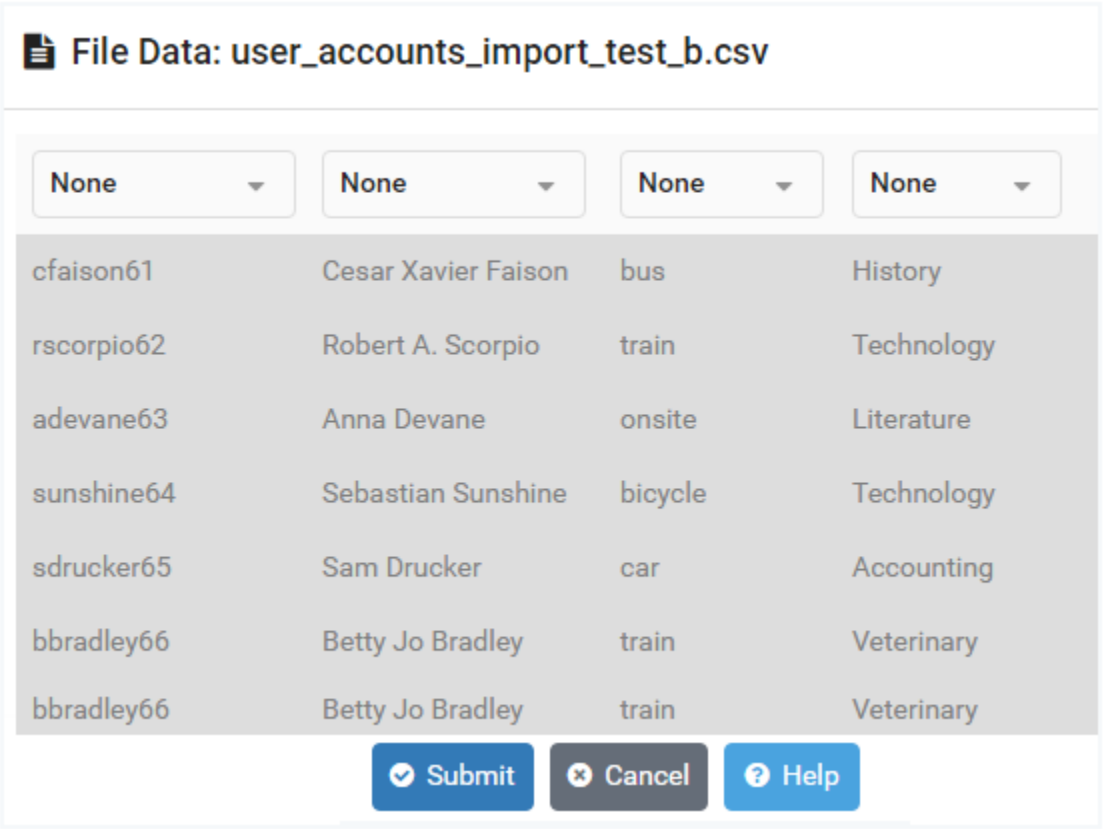
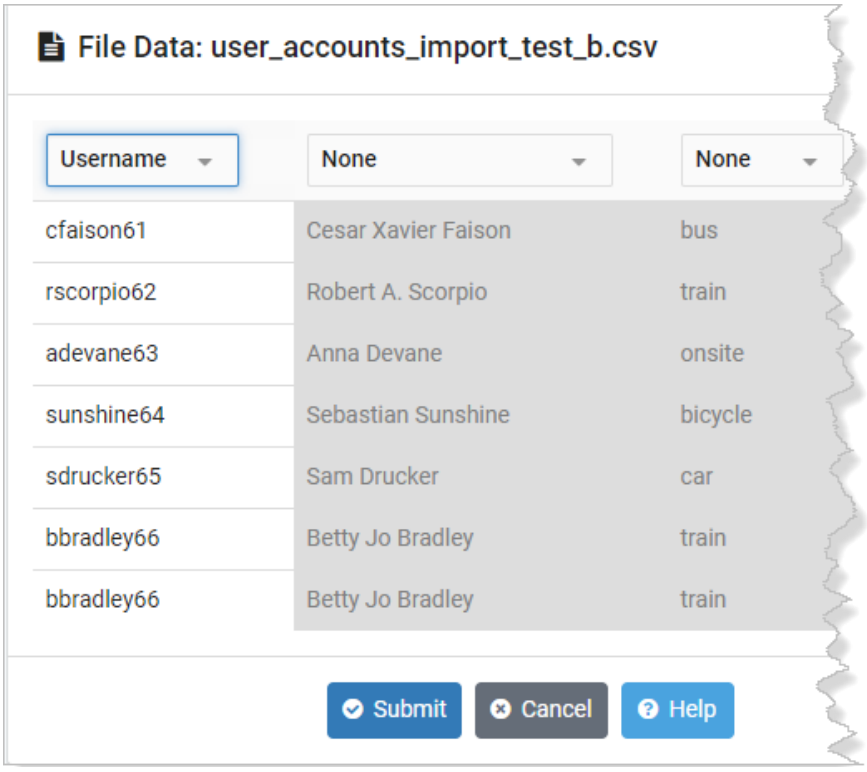


5. Select the first column and set the dropdown to **Username**.



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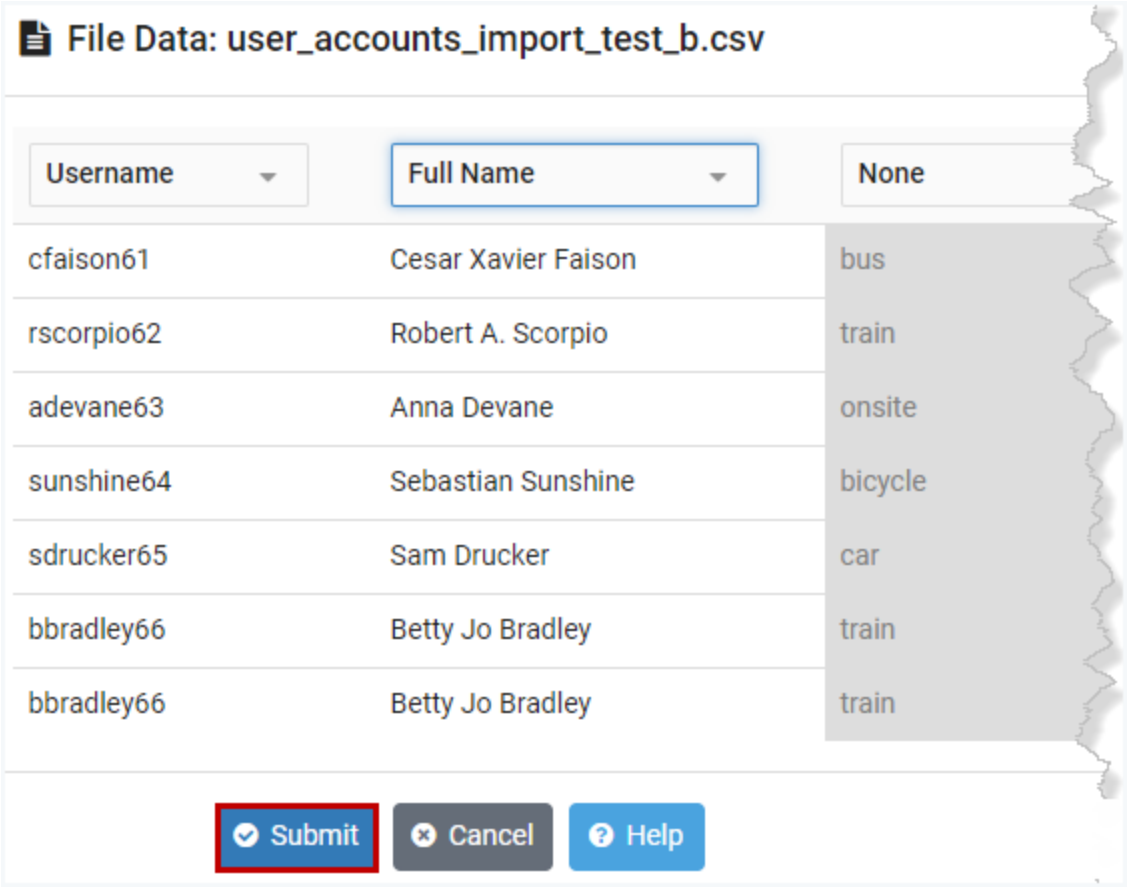
6. Select the second column and set the dropdown to **Full Name**.



7. The other data columns that are still grayed out are not needed and will not be imported. Click the **Submit** button.

   The imported information will be included on the **Import Accounts** page. The process of adding the new accounts will be completed here.

   a. An initial password must be specified. If initial passwords were not included with the imported account data (as in this example), a Default Initial Password must be entered, which will be used for all new accounts being created on this page.
   b. The import process has generated Display Names based on the input data provided and populated the Display Name field for each record. The values may be edited as needed.
   c. The import process has generated Sorted Names based on the input data provided and populated the Sorted Name field for each record. The values may be edited as needed.
   d. We did not import email addresses, nor have we entered them here. Assume for this example that students will enter their email addresses themselves when they initially access their accounts.
   e. Notice the list of accounts to be imported includes a duplicate for username *bbradley66* (last record in the list).

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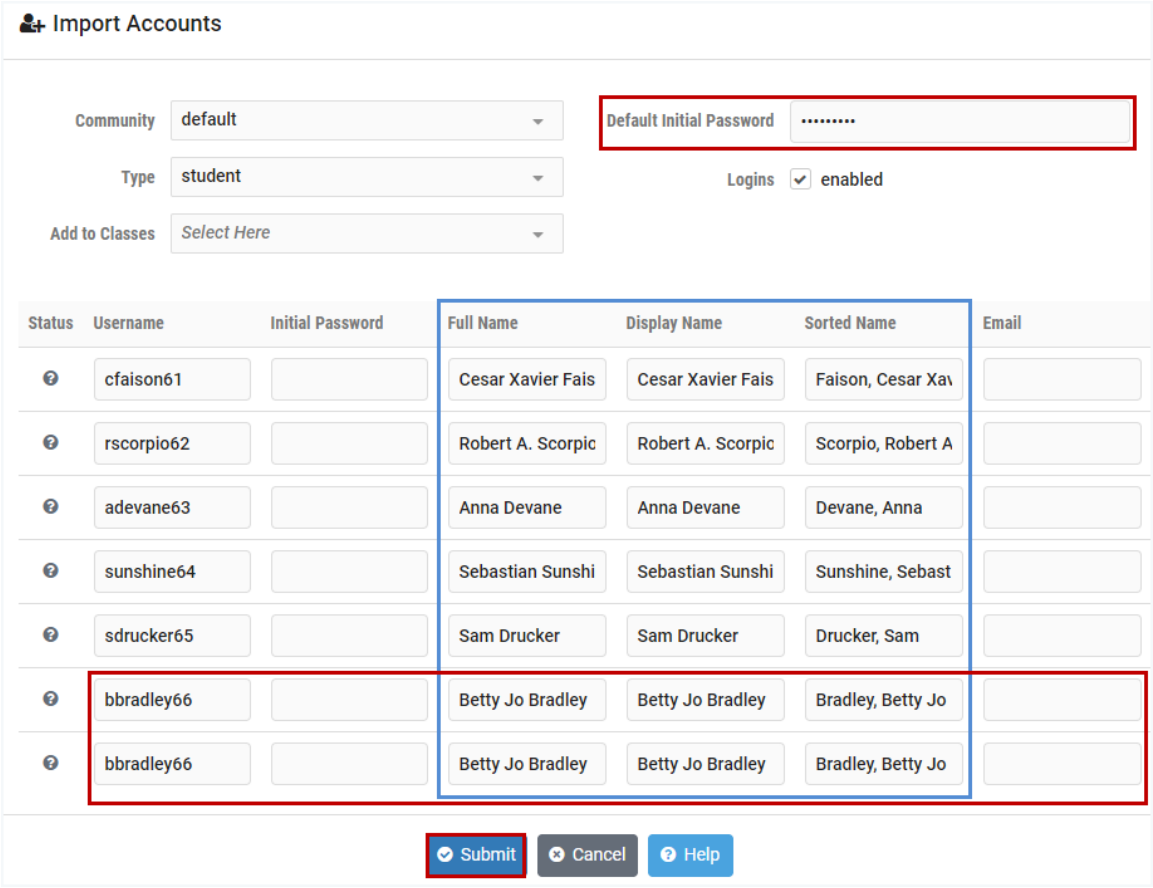
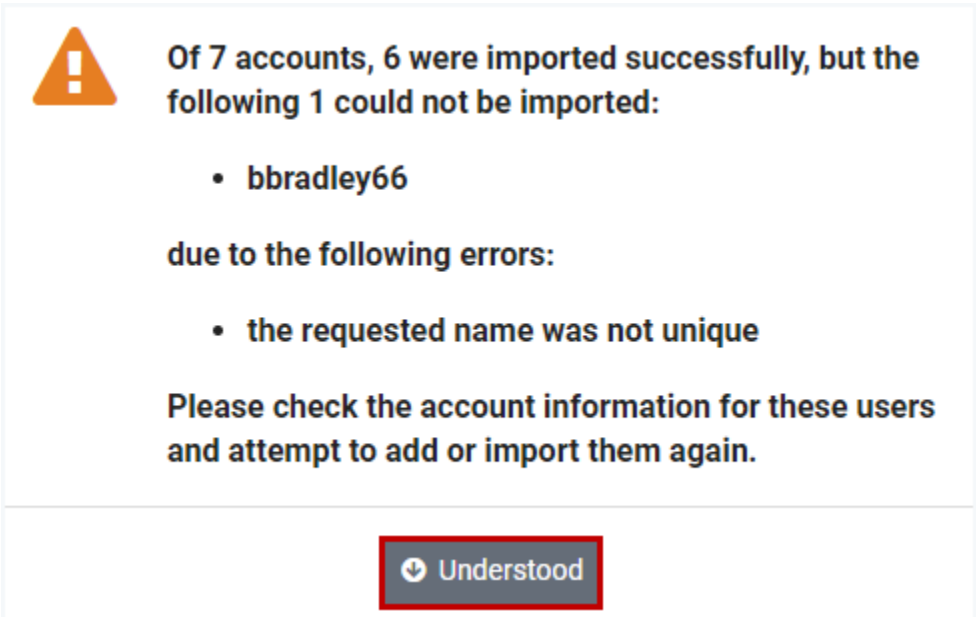
8. Click the **Submit** button.



9. An alert message will indicate that 6 accounts were imported successfully, but the duplicate record was not imported. Usernames must be unique in NETLAB+. Click **Understood**. This will complete the process of adding accounts to your system.



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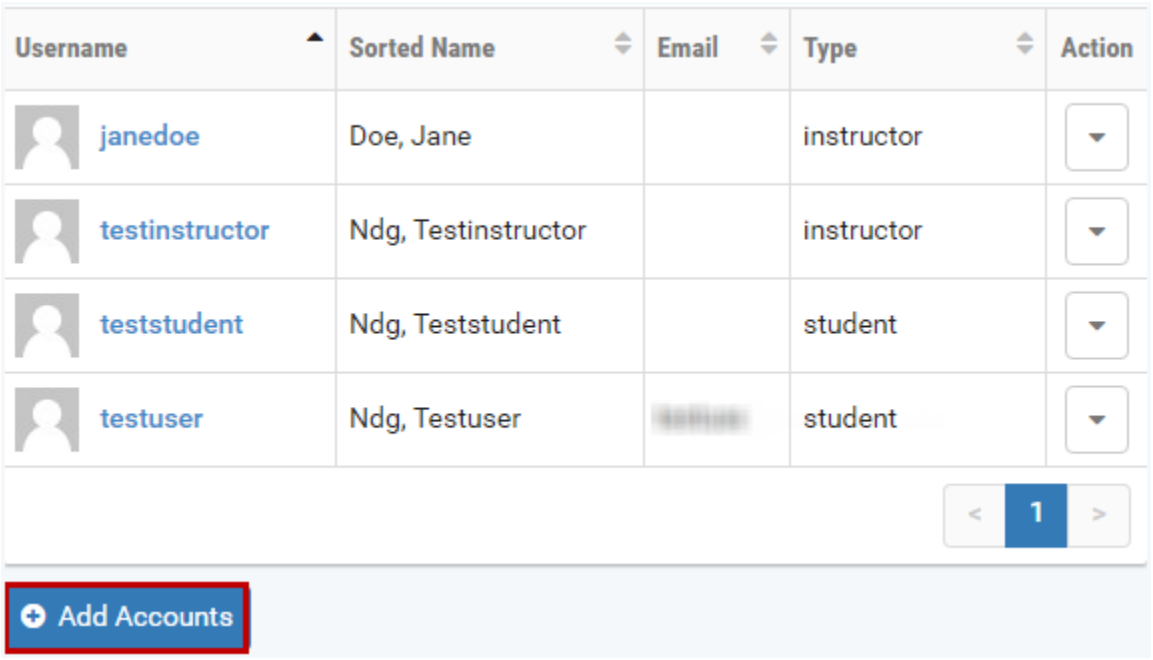
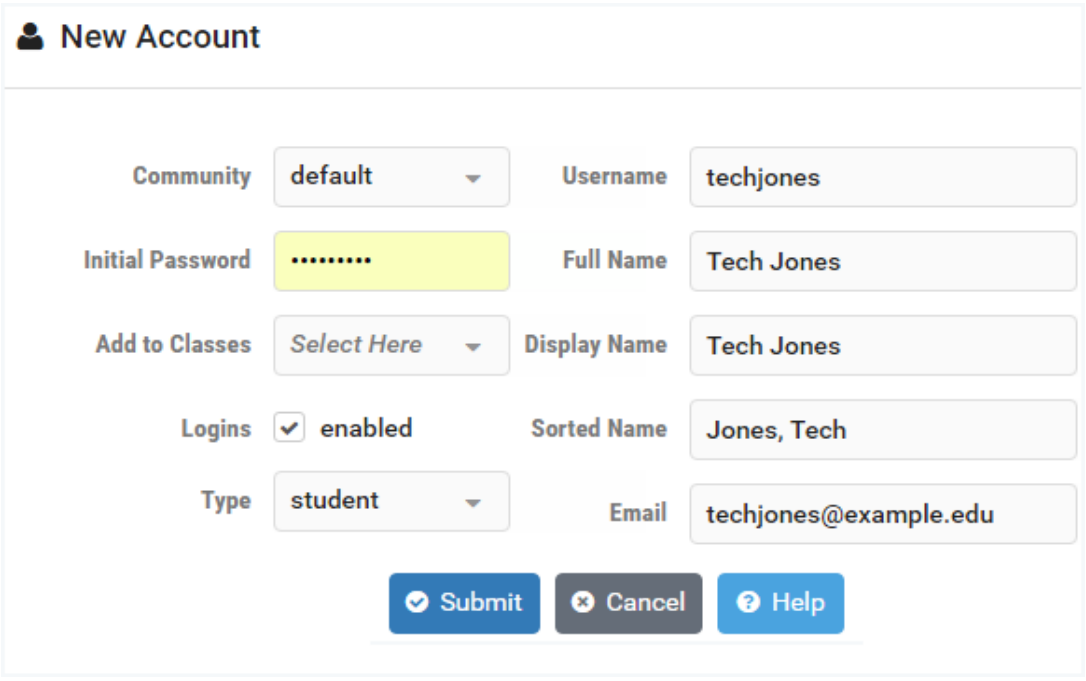
21.1.2 Entering Account Data

1. Select the **Add Accounts** button to display the add accounts screen.



2. The New Account page will be displayed. Complete the form with the appropriate details for the new user. Refer to the field descriptions at the end of this section. In the example below, a student account is being created for user *techjones**.***



3. Select **Submit** at the bottom of the page to add the new account to the system.

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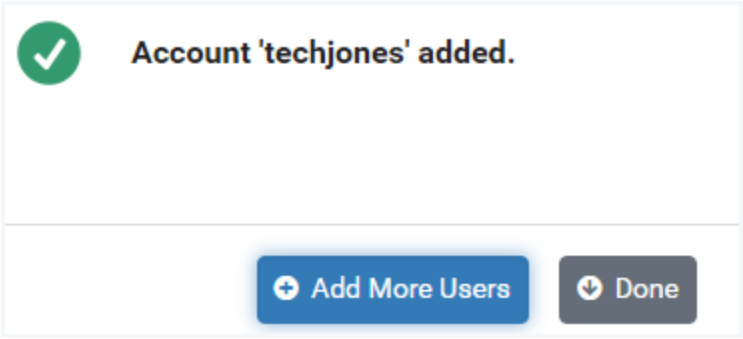
4. A confirmation message will indicate that the account has been added. Select **Add More Users** to add more accounts or select **Done** to return to the Accounts list.



Field Descriptions - Account (New/Edit)

- **Community:** All users belong to a community. If only one community is present on the system, all users will be members of the **default** community.

- **Initial Password**: Assign an **Initial Password** to the accounts by entering a value for the initial password. The account users will be required to change this password during their initial login.

  Passwords must meet the following requirements:

  The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

  - Passwords must meet the following requirements:
  - Must contain 8 or more characters.
  - Must not contain more than 64 characters.
  - Must not contain any common English dictionary words that are more than 3 characters long.
  - Must not contain the user ID for the account.
  - Must not contain the email address for the account.
  - Must not contain any names associated with the account.

- **Add to Classes:** Add the user to the class roster for one or more classes available in the community. The dropdown will display a list of available classes, which may be checked to select.

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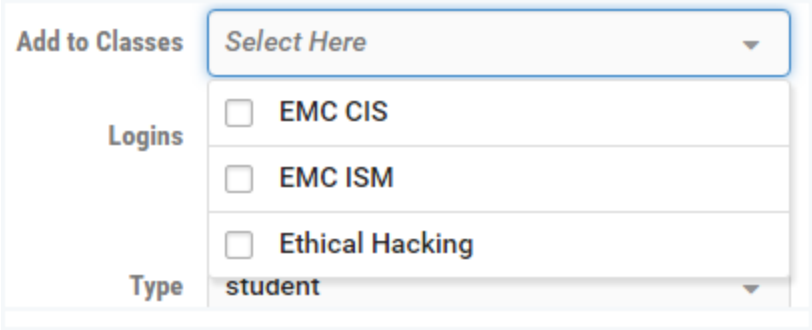

In many cases, you may find it convenient to add a student to a class roster at the same time that you create the student account. You may also add users to a class roster after the user accounts have been created. See the *Add Learners to the Class Roster* section.

- **Logins enabled:** Check to enable logins for this user. If unchecked, logins will be disabled for this user.

- **Account Type:** The account type, **student or instructor,** must be selected for each account. Once an instructor record is created, the instructor may be assigned as a lead instructor for a class or may join a class as a *learner.* A class may contain one or more *lead instructors* (trainers). All other users in the roster (who are not leads) are *learners*.

- **Username:** The username credential used to log in to the account. Username can contain letters, numbers, and the following punctuation characters: period (.), at sign (@), hash (#), underscore (_), and hyphen (-). The UTF-8 character set is supported.

Be aware that usernames are now case insensitive (example: *TestUser213* is considered the same as *testuser213*).

- **Full Name:** This name will be used by instructors and administrators for managing the user account. Users with student accounts will see their own full names in their user settings. Users with student accounts will not see the full names of other users during collaborative activities such as instructor-led training. The UTF-8 character set is supported.

- **Display Name:** Users (instructors and students) will see this name in collaborative applications, such as instructor-led training. This field will be automatically populated based on the value you enter into the Full Name field. You may edit the Display Name as needed.

This name may be visible to student accounts. Do not use personally identifiable information in this field when privacy must be maintained.

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- **Sorted Name:** This name will be seen by instructors and administrators in sorted lists. This field will be automatically populated based on the value you enter into the Full Name field. You may edit the Sorted Name as needed.

- **Email:** The user's email address. Entering an email address is optional; account users will be prompted to add/update their email address and time zone information when they initially log in to their account.

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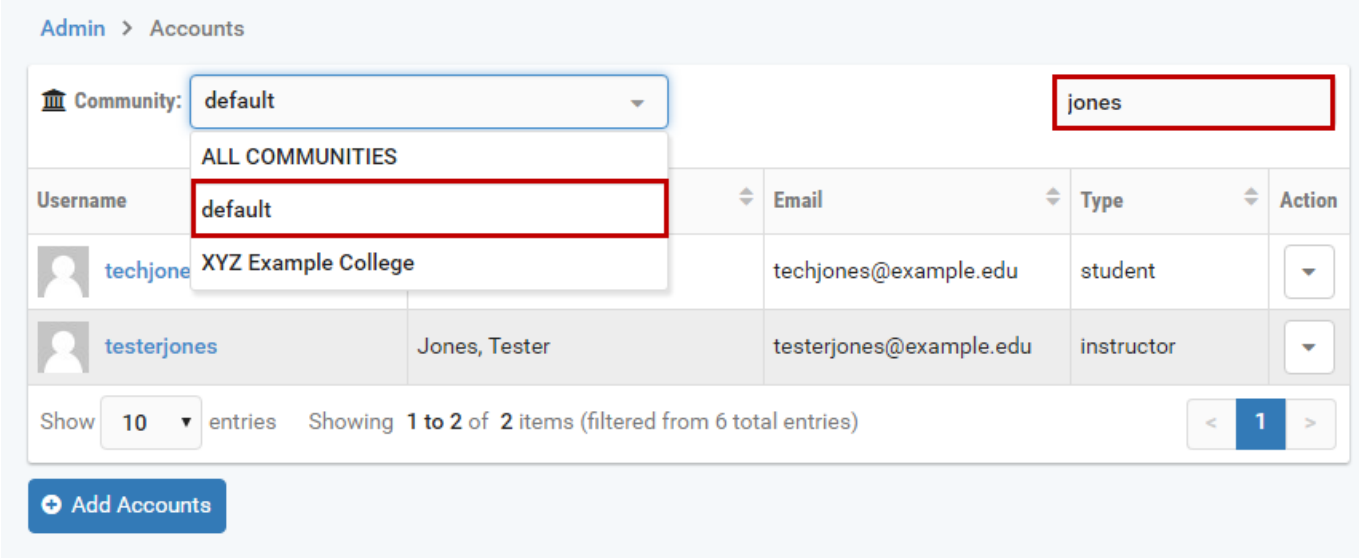
21.2 Edit Accounts

The NETLAB+ administrator may edit information in any instructor or student account in any community. An instructor with system-wide instructor privileges may manage accounts in any community. Granting an instructor community-wide privileges will allow the instructor to manage student and instructor accounts within their community. Instructors with normal privileges can only manage student accounts within their own community.

1. Locate the record(s) you wish to edit by entering a full or partial Username or Fullname in the search box. This may allow you to avoid scrolling through a long list if there are a large number of accounts in your community. You may select a community (if there are multiple communities on your NETLAB+ system) to narrow down your selections. The results of your search query will be displayed in a list.



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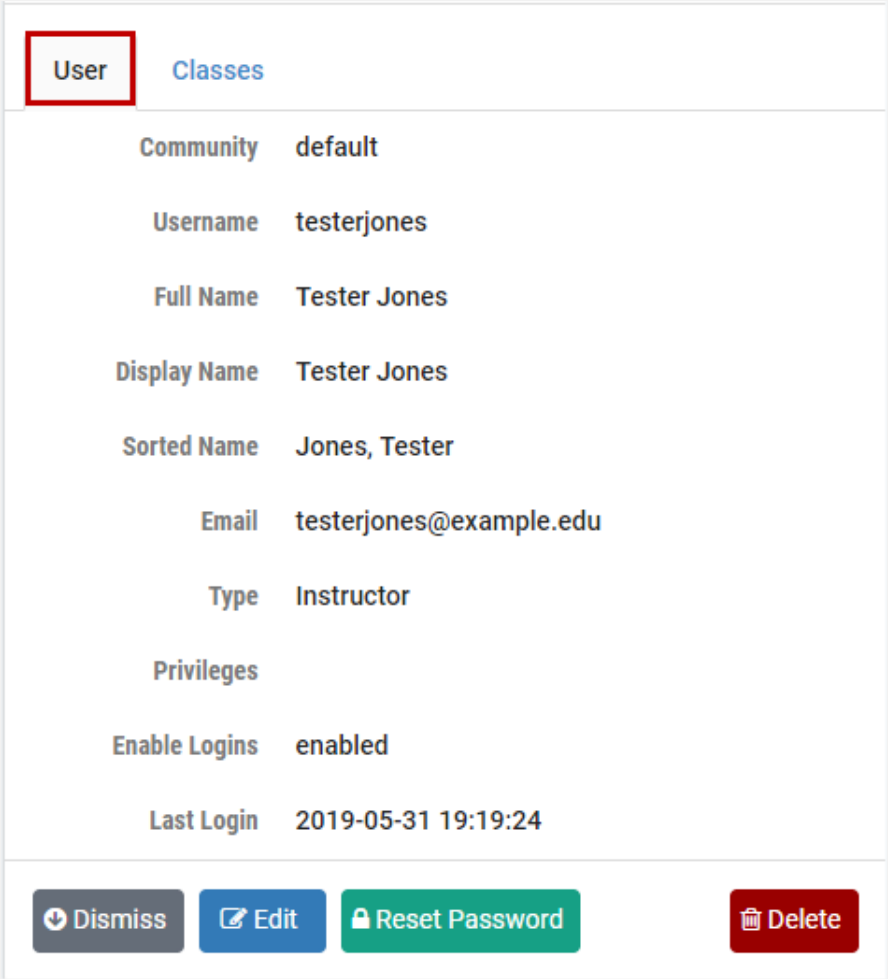
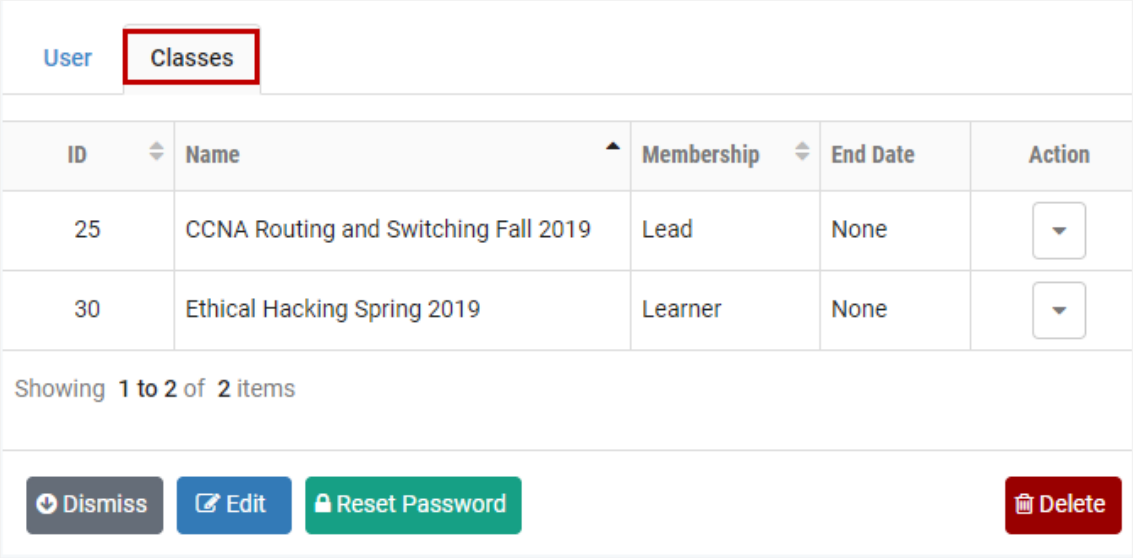
2. Select an account by clicking on a **Username**. The User tab of the account detail page will be displayed.



3. Click on the **Classes** tab to see a list of the classes in which the user is enrolled as a learner or lead instructor.



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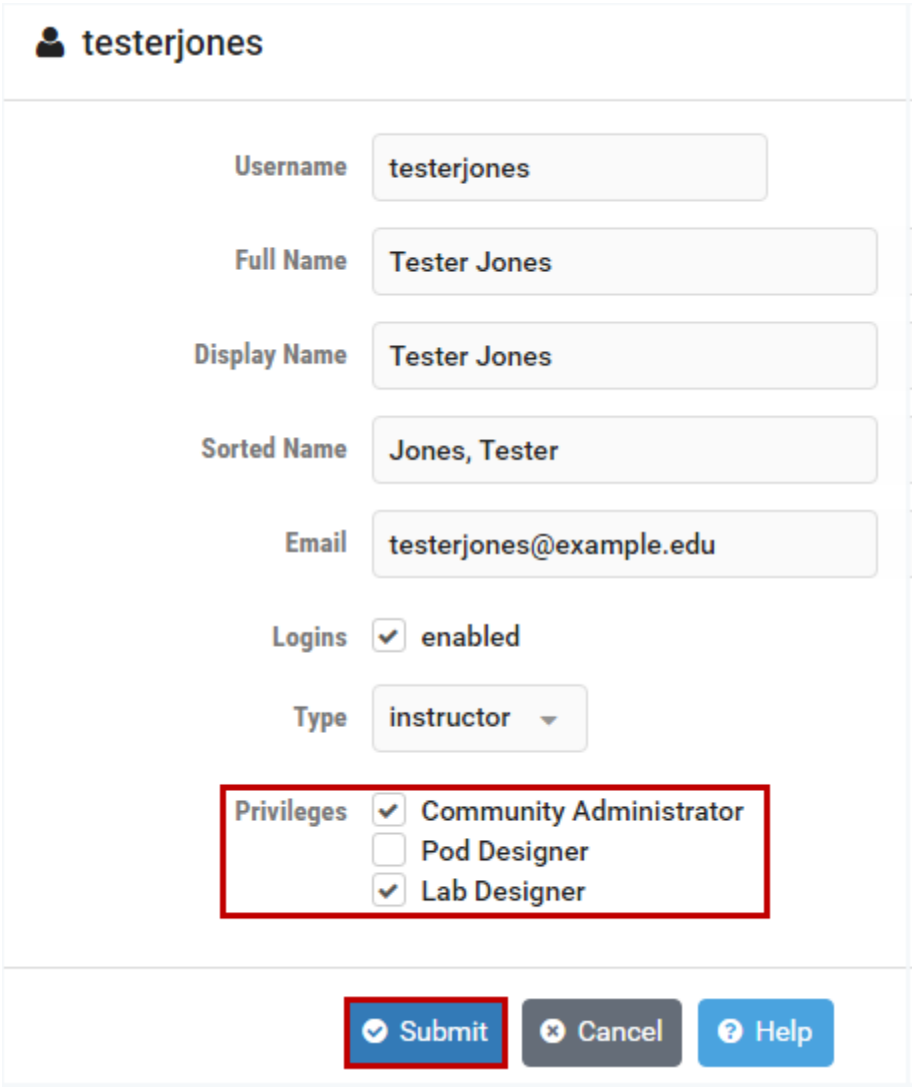
4. To proceed to the edit page for this account, select the **Edit** button. The account edit page may be used to modify the account name, email address, and to enable and disable account logins. When account logins are disabled, the user will not be able to log in to the NETLAB+ system. For instructor accounts, as shown in the example below, the user privileges may be edited.



In this example, the instructor has been granted Community administrator privileges and access to the Lab Designer tool. Instructor privileges are discussed in the Modify Instructor Privileges section.

5. Select **Submit** to save changes to the account record.

Please refer to the *Entering Account Data* section for a detailed description of the fields on this page or select the Help button to display the descriptions.

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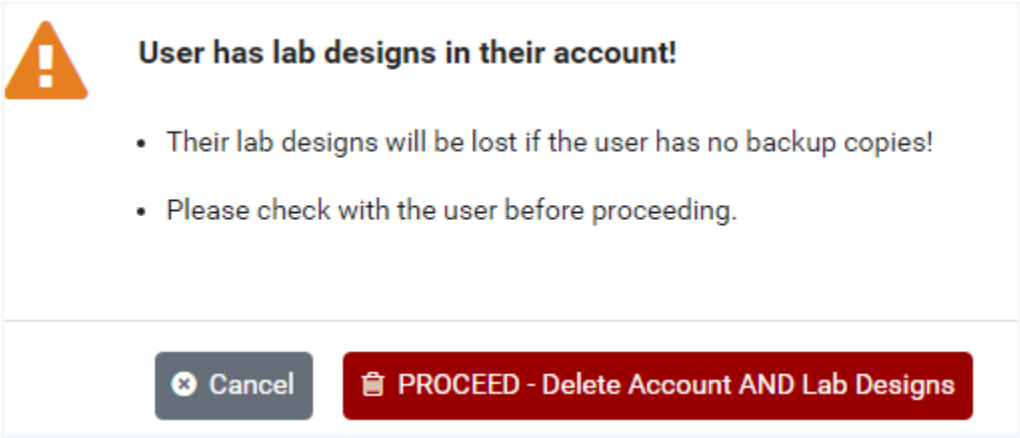
21.3 Delete Accounts

As the NETLAB+ administrator, you may delete any account, in any community.

Considerations before you delete an account:

- Keep in mind that accounts may be assigned to multiple classes.
- If the accounts are for students who will continue to use your NETLAB+ system in other classes, you can keep the accounts and add them to the class roster of other classes as needed.
- Be particularly cautious when deleting instructor accounts. If the account includes lab designs, the lab designs will be deleted along with the account. The following message will be displayed if the account you select to delete includes lab designs.



To delete an account, perform the following steps:

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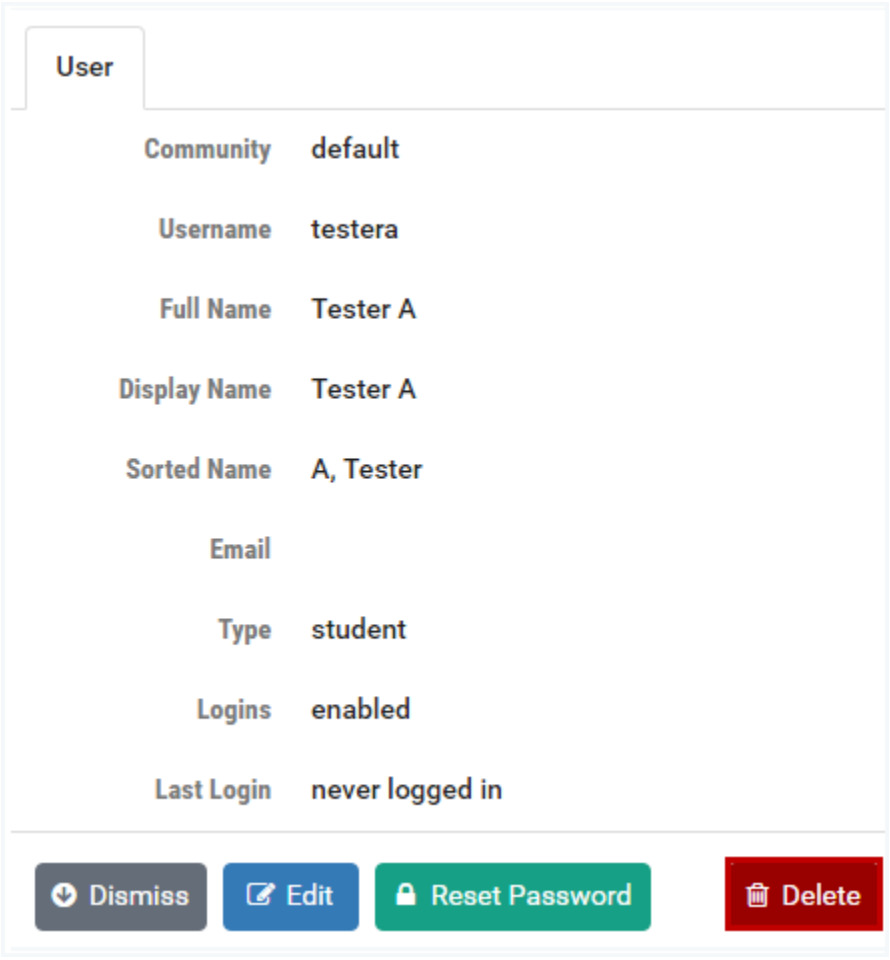
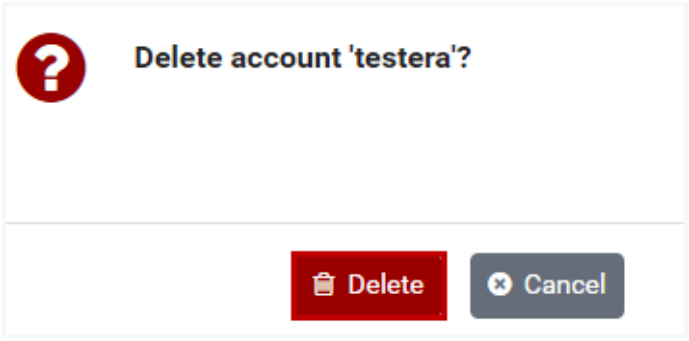
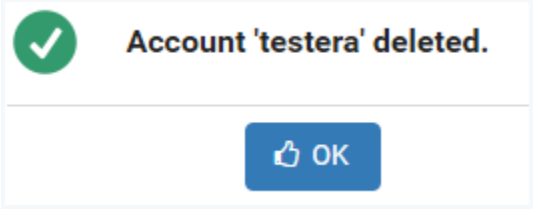
1. As described in the *Edit Accounts* section, select the account detail page of the account you want to delete, and then click **Delete**.



2. Click **Delete** to confirm that you want to delete the account.



3. A message will indicate the account has been deleted, click **OK**.



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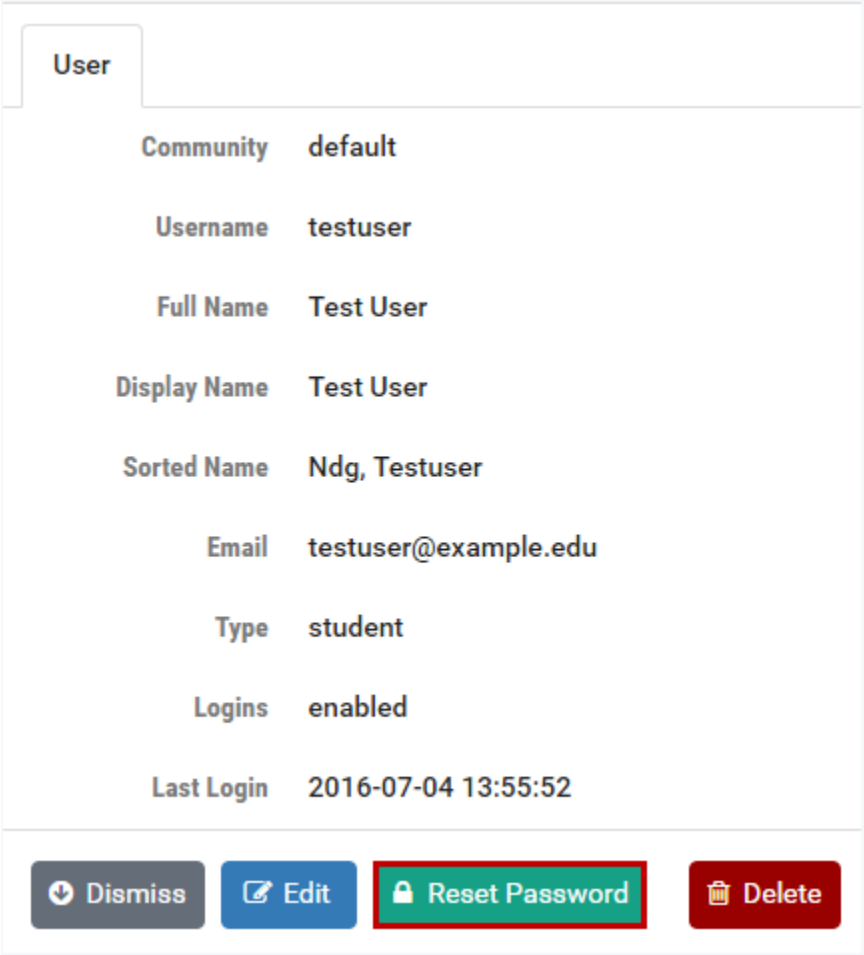
21.4 Reset Account Passwords

It may be necessary to reset an account password if a user has lost or forgotten their current password. You may use the reset password function. Upon initial login following the reset, the user will be required to change the password.

1. As described in the *Edit Accounts* section, select the account detail page of the account for which you want to reset the password.



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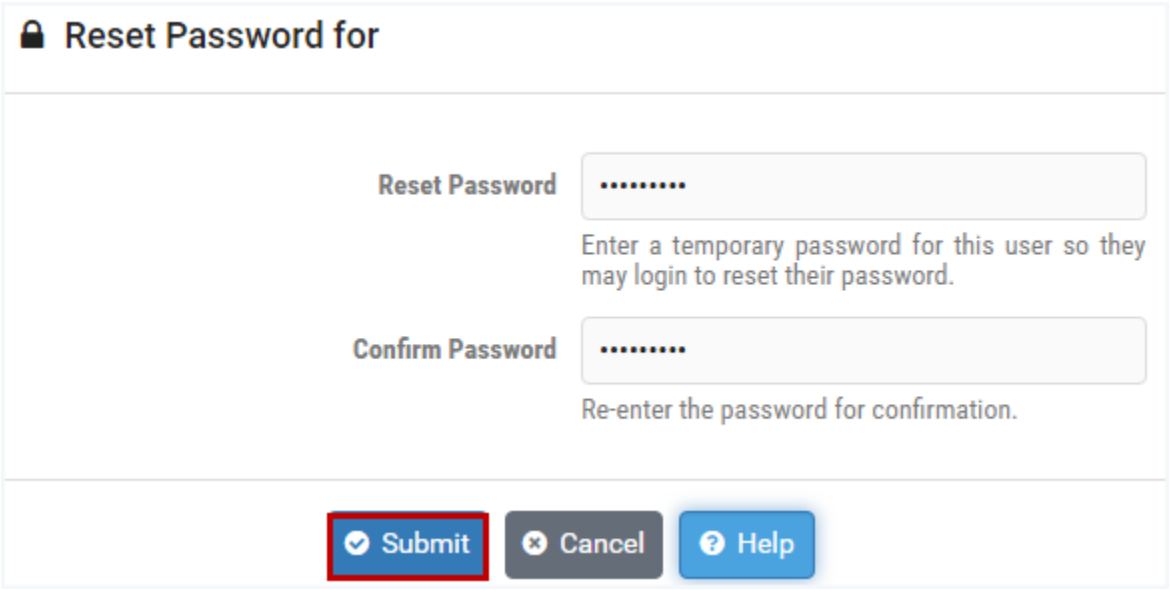
2. Select the **Reset Password** button to display the password reset screen. **Passwords must meet the following requirements:**

   The default requirements shown below can be revised by the NETLAB+ administrator by editing the *Password Policy* settings.

   - Must contain 8 or more characters.
   - Must not contain more than 64 characters.
   - Must not contain any common English dictionary words that are more than 3 characters long.
   - Must not contain the user ID for this account.
   - Must not contain the email address for this account.
   - Must not contain any names associated with this account.



3. Enter the new, temporary password for the account and then re-enter it to confirm.
4. Click **Submit**.

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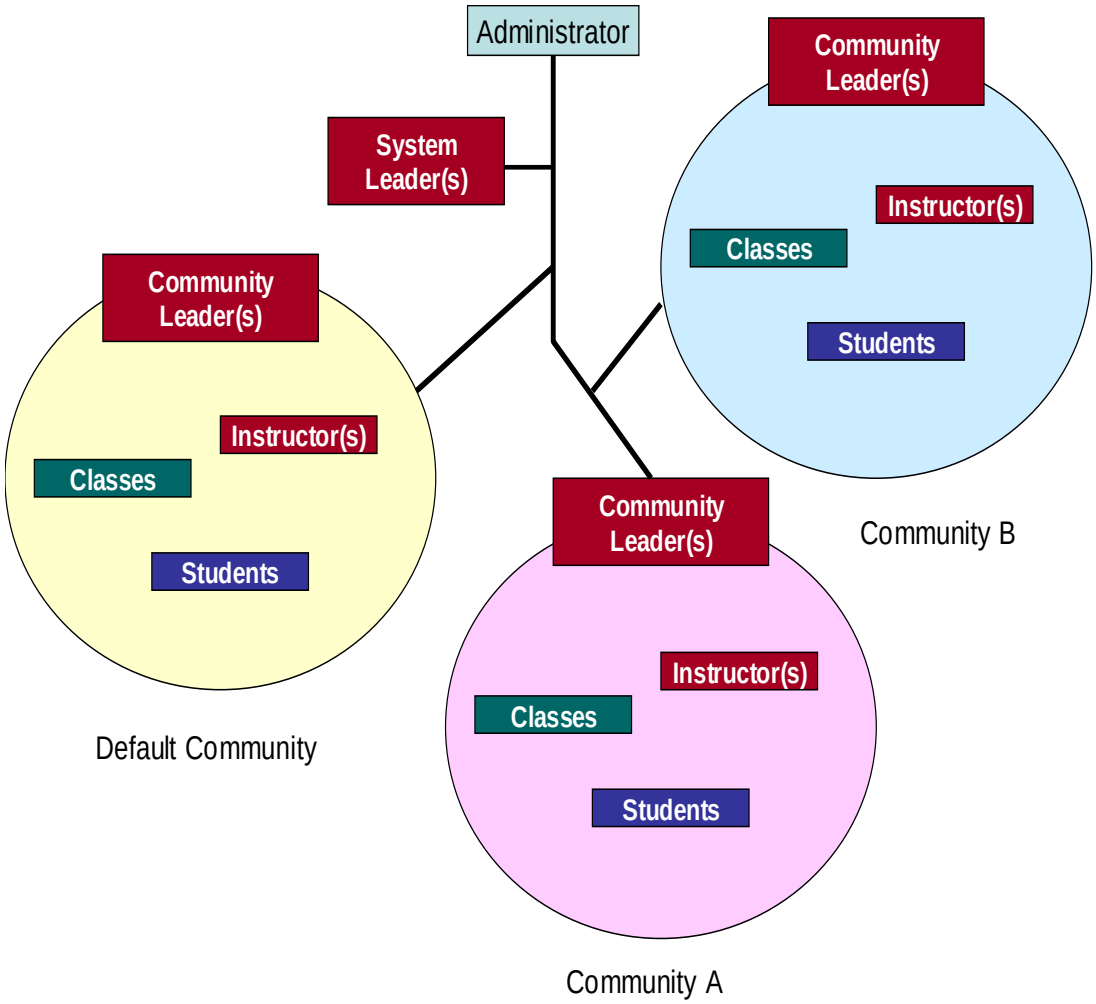
21.5 Modify Instructor Privileges

The NETLAB+ administrator may edit information for any instructor or student account in any community. If there are have multiple communities on your NETLAB+ system, it may be helpful to grant *system-wide account manager* privileges to an instructor to allow the instructor to manage accounts and classes in any community without accessing the administrator account.

Granting an instructor *community administrator* privileges will allow an instructor to manage both student and instructor accounts within their own community. Instructors with *normal privileges* (the default) can only manage student accounts within their own community.



Only the NETLAB+ administrator can grant community-wide or system-wide privilege to an instructor account. Instructor accounts are created with normal privileges by default. Additional privileges may be granted by the administrator (see steps in this section below).

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Summary of Instructor Privileges

Normal Instructor Privileges (no additional privileges selected)

- Can create and manage student accounts in their community.
- Can create and manage classes for which they are a lead.
- Can cancel lab reservations made by students in their classes.
- Cannot manage other instructor accounts.

Community Administrator

- Can create and manage student accounts in their community.
- Can create and manage instructor accounts in their community.
- Can create and manage classes in their community.
- Can attend all lab reservations in their community (except instructor personal reservations).
- Can cancel lab reservations made by instructors and students in their community.

Pod Designer

- Can access the Pod Designer tool. The *Pod Designer* is used to create a custom pod layout. A pod design is a template used to create one or more actual pods on a NETLAB+ system.

Lab Designer

- Can access the Lab Designer tool. The *Lab Designer* provides a means of creating a series of custom laboratory exercises that may be made available for class use. A lab design is a set of labs and related reference material that may include documents, images, and preset configuration files for each lab exercise.

Pod Access Control List (ACL) Manager

- Instructors may be appointed as Pod ACL Managers.

> Pod ACL Manager access is granted on a per-pod basis (see the *Configure Pod ACL* section).

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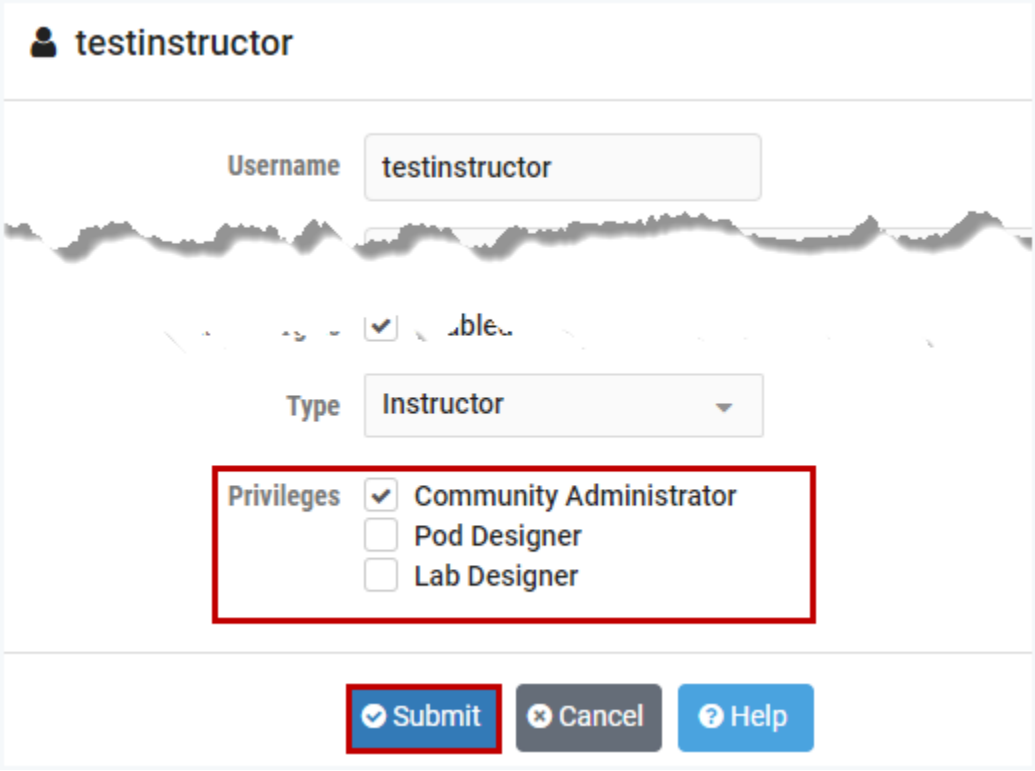
1. To modify the privileges for an instructor, select the edit page for the instructor account (as shown in the *Edit Accounts* section).
2. Click the checkboxes to indicate the privileges (described in the summary above) to grant to the instructor.



3. Click **Submit** to update the record with the modified privileges.

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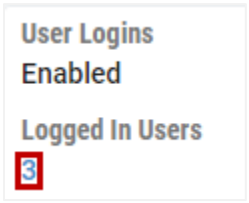
22 User Logins

This option allows the administrator to suspend/enable student and instructor account access. Access may be disabled for all, or a selection of accounts. Access should be disabled while performing disruptive administrative tasks such as software updates and installing pods. In the first two subsections below, we will show how to disable and enable logins for all users. In the third subsection, we will force logout and disable logins for selected users.

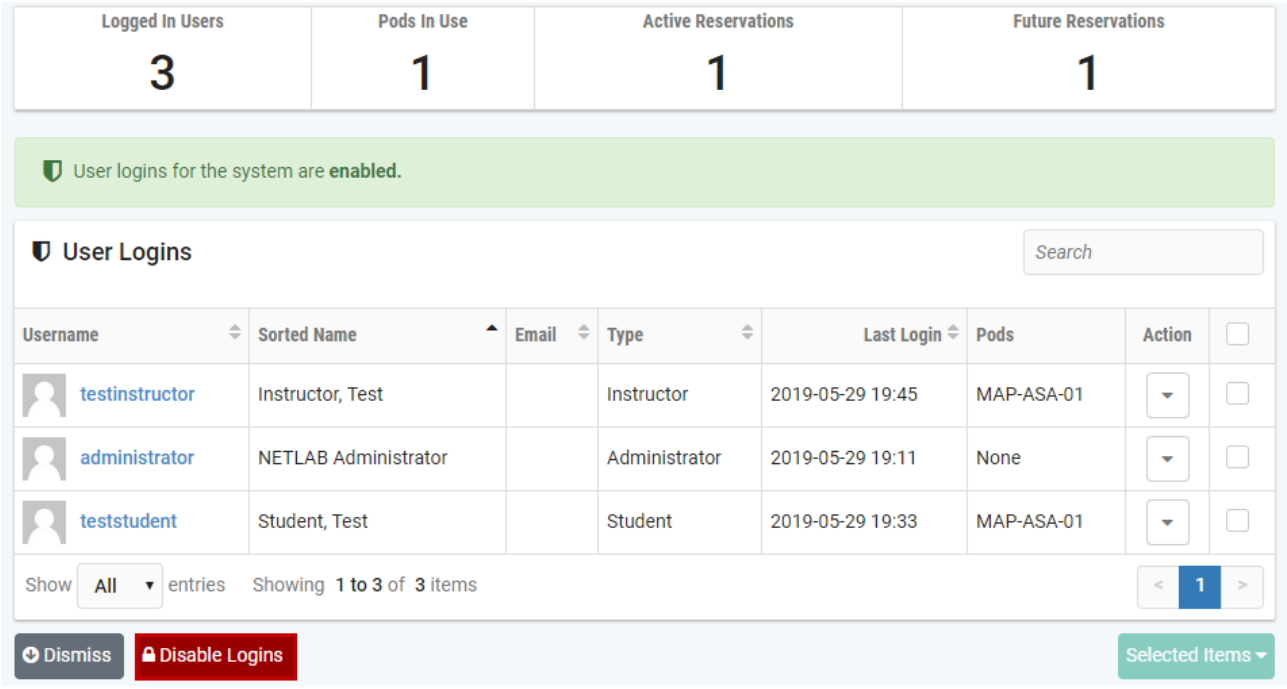


The current status of user logins on the system is displayed in the third panel on the right side of the administrator Home page. Clicking the number of Logged in Users will display the User Logins page, which may also be accessed by selecting the User Logins administrator option, as described below.

Logins may also be enabled/disabled for individual users, see the *Manage User Accounts* section.

22.1 Disable User Logins

1. To disable User Logins, select the **User Logins** option on the administrator Home Page.
2. The User Logins page is displayed. Notice that the number of Logged in Users, Pods in Use, Active Reservations, and Future Reservations are displayed. Details for each of the users currently logged in are also listed, including the pods in use. Click **Disable Logins**.



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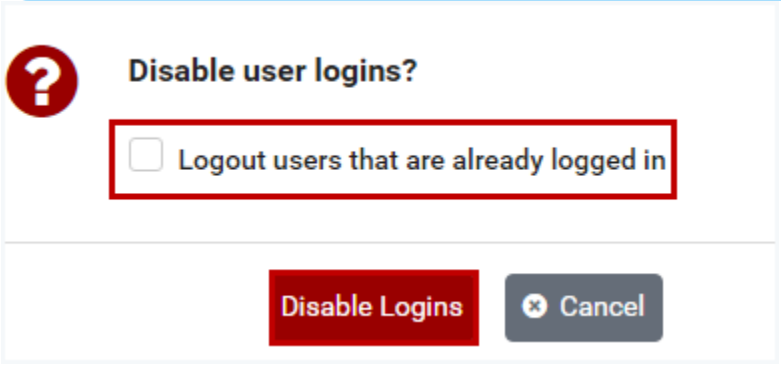
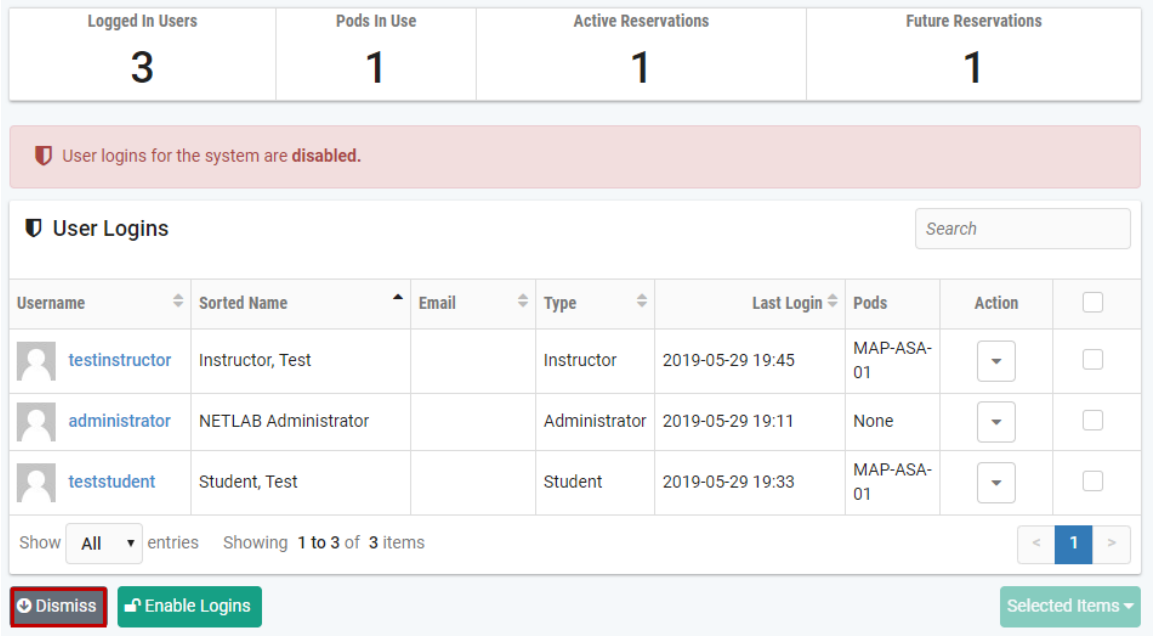
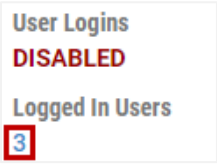
3. You may choose to log out users that are currently logged in or allow users currently logged in to remain logged in (but prevent new logins). For this example, the administrator has opted to allow current users to remain logged in, by unchecking the **Logout users that are already logged in** checkbox. Click **Disable Logins**.

The administrator can monitor the system and see when all users are logged out before completing any maintenance tasks. This can be a good strategy to avoid disrupting users with work in progress.



4. The User Logins page now indicates that user logins for the system are disabled. Instructor and student accounts will be prevented from logging in. Click **Dismiss** to return to the administrator Home page.





Notice that the third panel on the right side of the administrator Home page now shows that User Logins are disabled. Clicking the number of Logged in Users would display the user login detail page once again, with information on the 3 users currently logged in.

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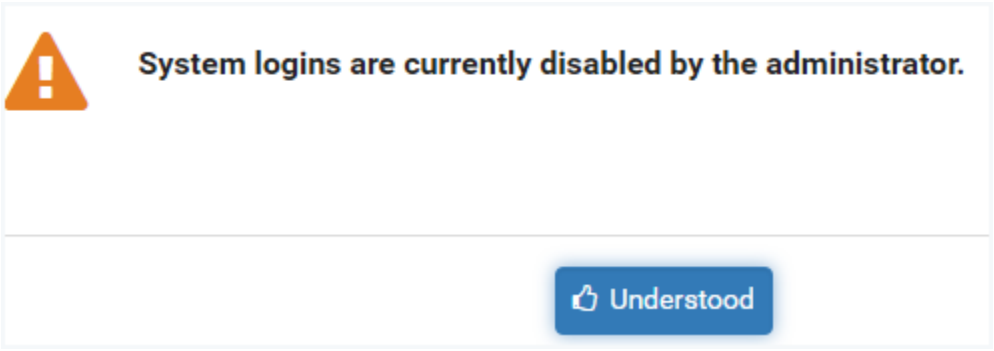
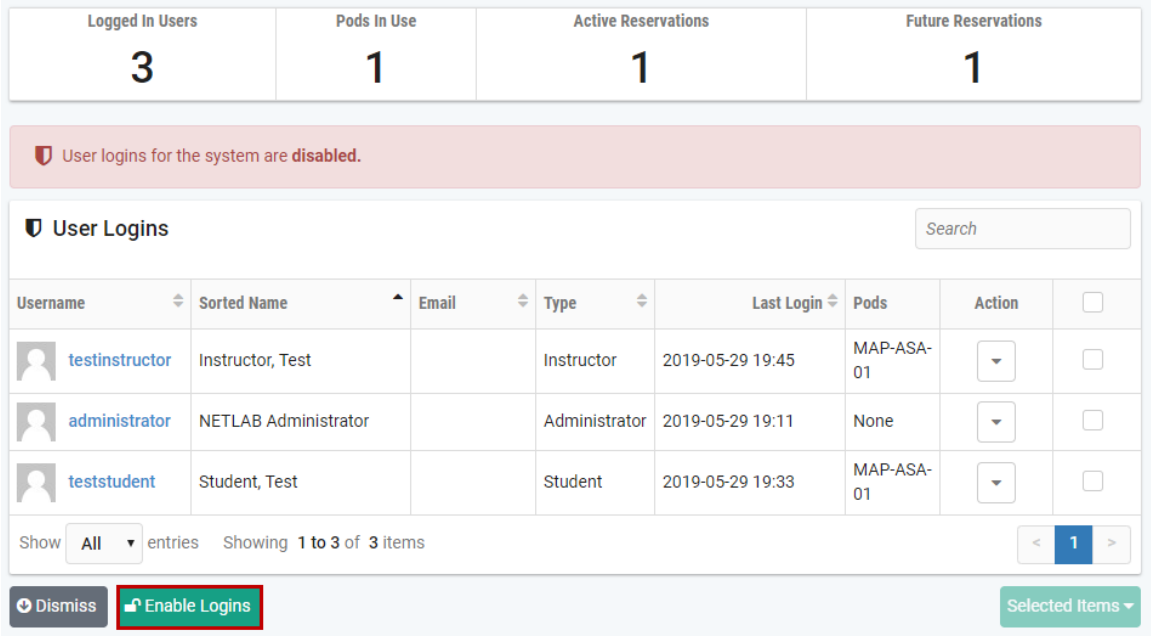
If an instructor or student attempts to log into the NETLAB+ system while user logins are disabled, the following message will be displayed.



Be sure to enable logins (see next section) after completing any maintenance tasks!

22.2 Enable User Logins

1. To enable User Logins, select the **User Logins** option on the administrator Home Page.
2. The User Logins page is displayed. Notice that the number of Logged in Users, Pods in Use, Active Reservations, and Future Reservations are displayed. Details for each of the users currently logged in are also listed, including the pods in use. In this example, we see 2 users logged in (these users were logged in prior to logins being disabled – as shown in the example in the previous section), plus the administrator. Click **Enable Logins**.



3. Confirm the action by clicking **Enable Logins**.

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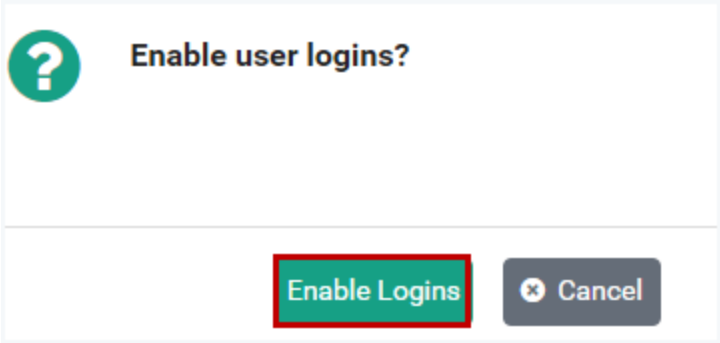
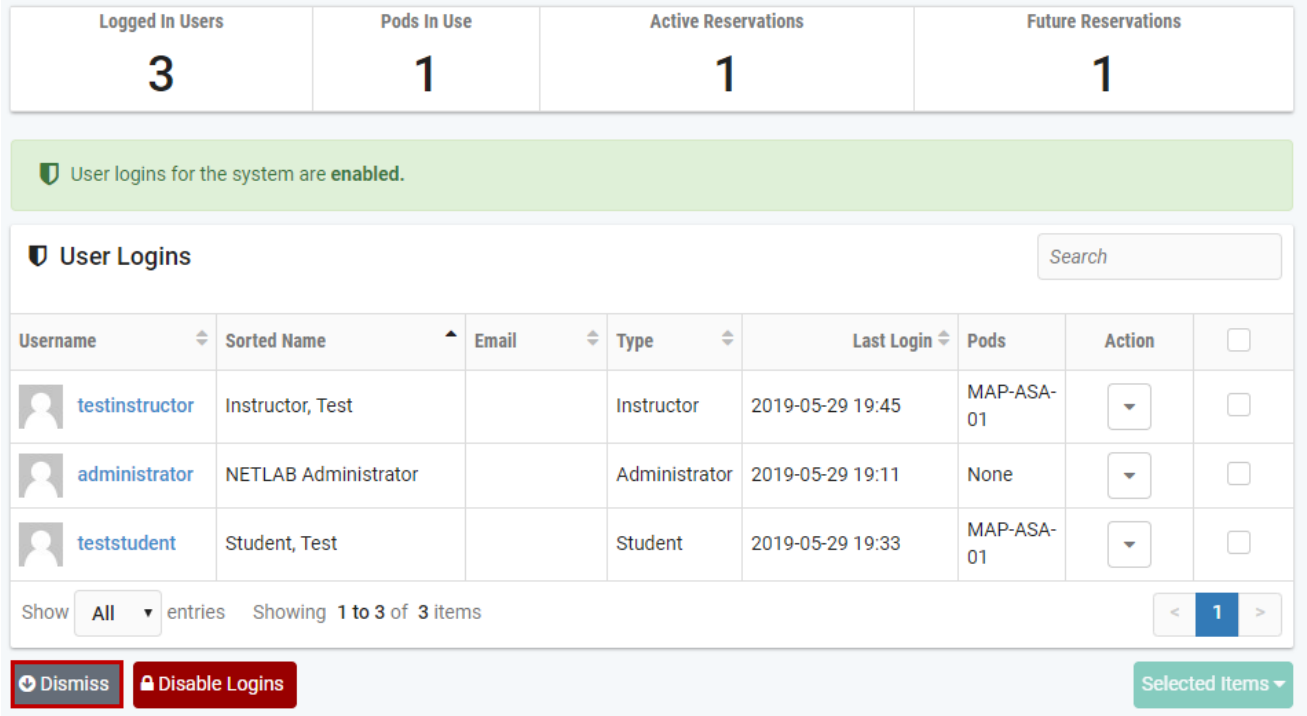


4. The User Logins page now indicates that user logins for the system are enabled. Click **Dismiss** to return to the administrator Home page.



22.3 Force Logout and Disable User Logins for Selected Accounts

In the previous sections, the actions of the administrator disabled and enabled logins for all users on the NETLAB+ system. In this section, we will demonstrate how the administrator can force selected users to log out and (optionally) prevent the selected users from logging back in.

1. Select the **User Logins** option on the administrator Home Page.

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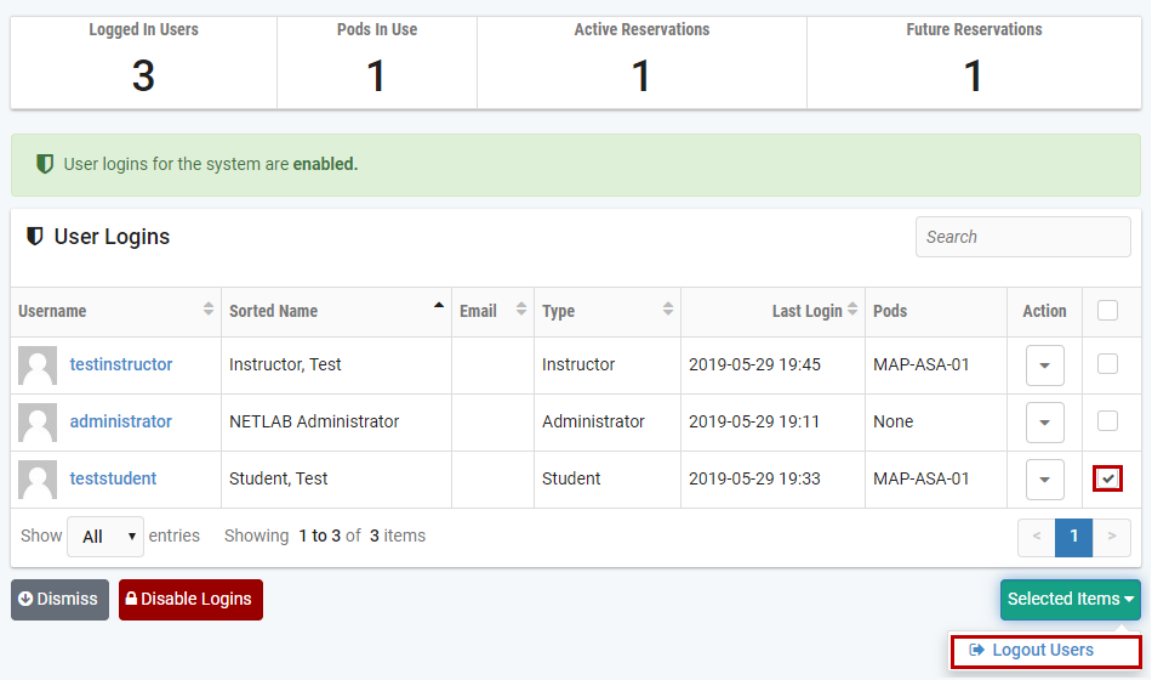
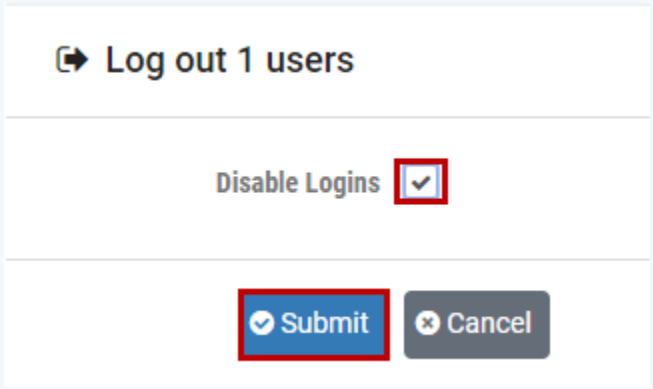
2. The User Logins page is displayed. Notice that the number of Logged in Users, Pods in Use, Active Reservations, and Future Reservations are displayed. Details for each of the users currently logged in are also listed, including the pods in use. For this example, we will select the *teststudent* account by clicking the selection checkbox, and then choosing the Selected Items option to **Logout Users**.



3. A pop-up window will display the number of users selected to log out. For this example, we will select the Disable Logins checkbox, which will prevent the selected user(s) from logging in again. Click **Submit**.



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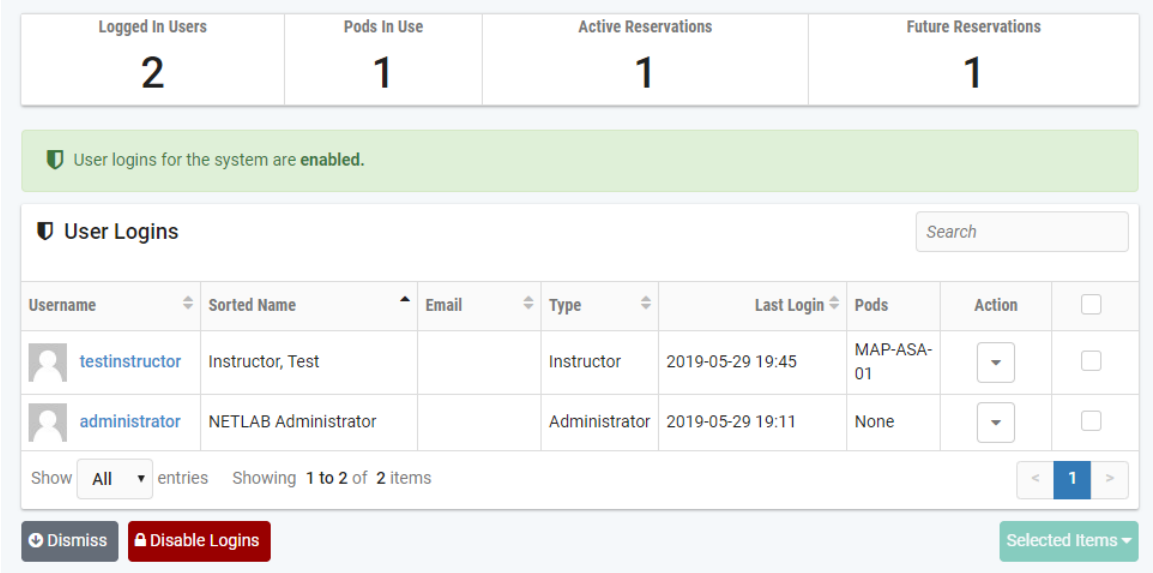
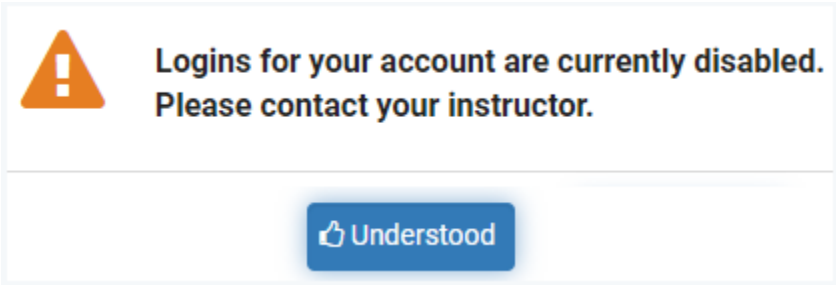
4. The Users Logins screen now shows only 2 users, *teststudent* is no longer logged in.



If *teststudent* attempts to log back in, the following message will be displayed.



Logins may be re-enabled for individual users, see the *Manage User Accounts* section.

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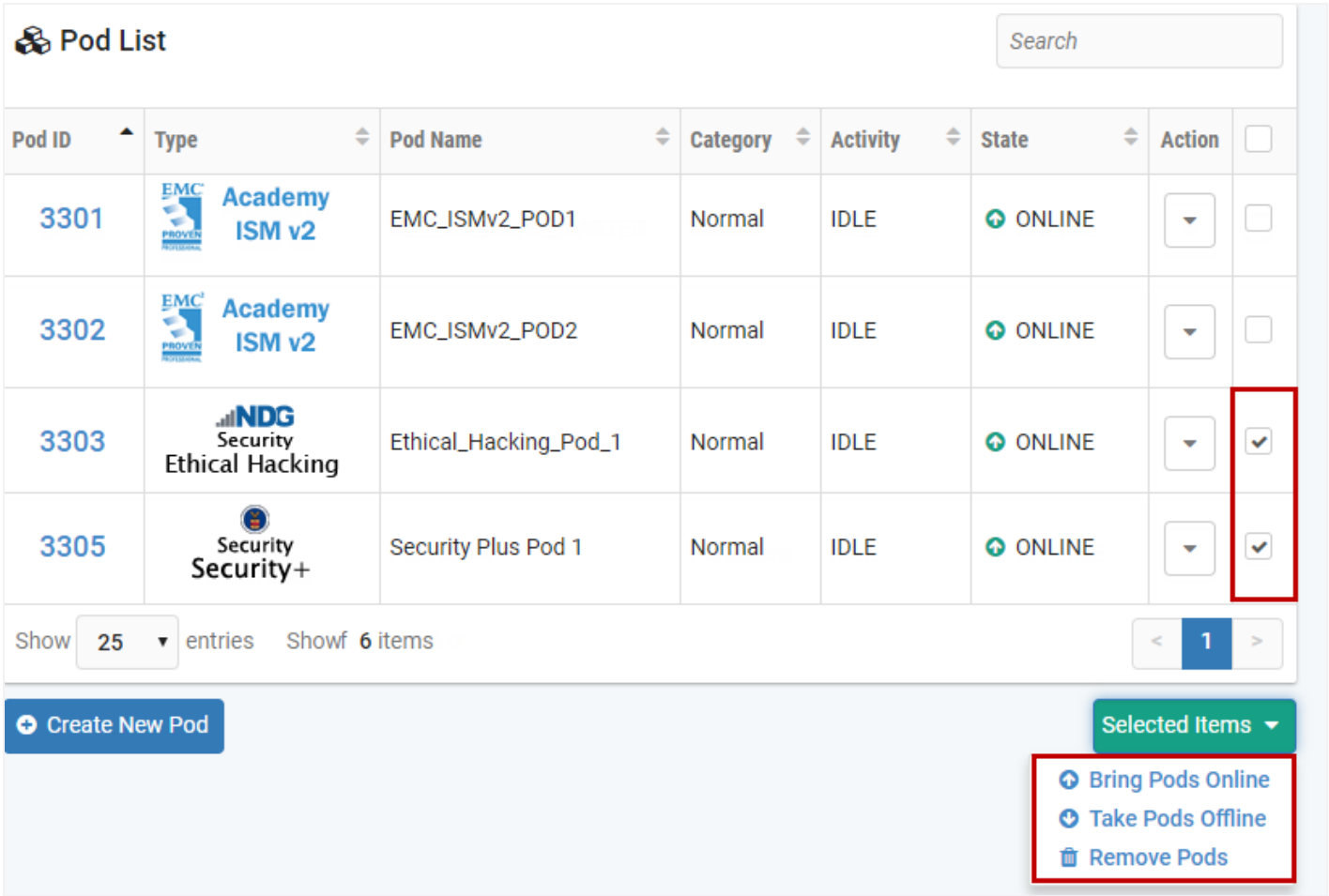
23 Pods

Equipment pods contain lab devices that are accessed by others. The pods depicted in this guide may not be available at your site.
The equipment pods available on your system will vary, depending on the courses that have been installed and your organization's participation in vendor programs.

The pod list, shown below, displays a summary of information about the pods currently available on the NETLAB+ system.

You may perform operations on multiple pods on the pod list page by selecting the checkbox on the detail row for each pod and then choosing an option on the **Selected Items** dropdown list.



New pods may be added to the system by following the steps detailed in the next section.

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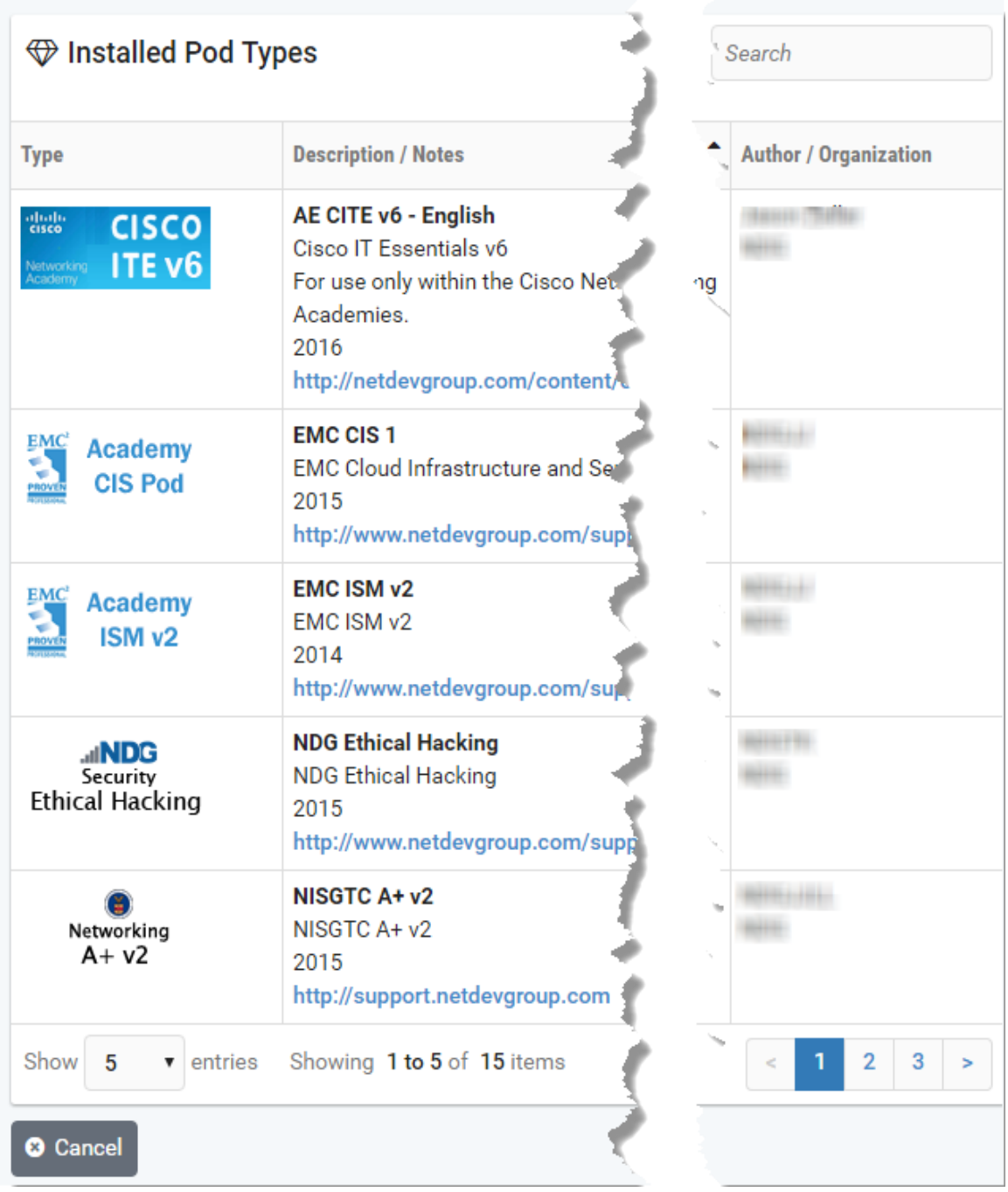
23.1 Adding New Pods

The instructions for this section should be followed for each pod the administrator wishes to add to the NETLAB+ system. Click to select a pod type from the list of pod types provided. The equipment pods available on your system will vary, depending on the courses that have been installed and your organization's participation in vendor programs.

Please refer to the Course Manager section to access resources that provide guidance on installing equipment pods on your NETLAB+ system.



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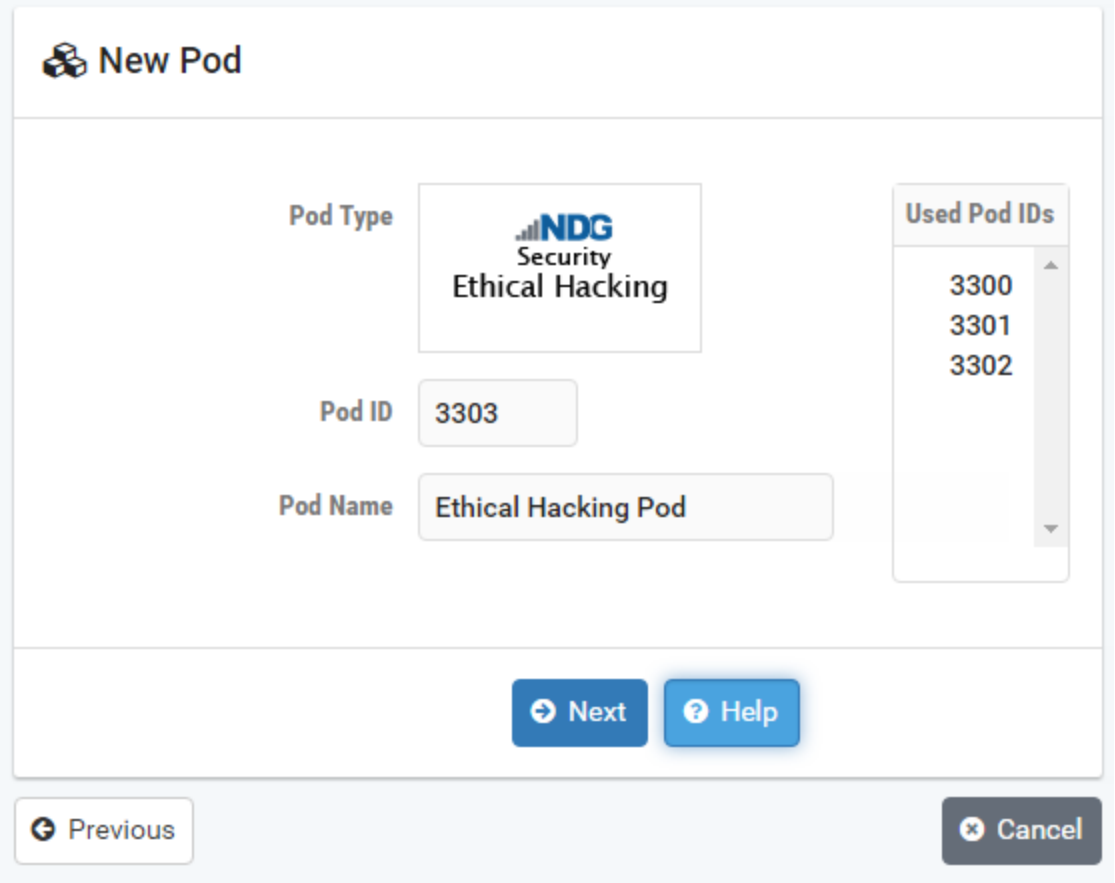
Enter the appropriate values for Pod ID and Pod Name (or accept the defaults, see field descriptions below). Click **Next.**



Field Descriptions - New Pod

- **Pod ID:** Each pod must be assigned a unique numeric ID. You may assign any unused number or accept the default, the next available number.

  Best practice: Assign pods of a similar type to a series of consecutive numbers. For example, if you intend to add 10 NDG Ethical Hacking Pods, you could use Pod IDs 3303-3312.

- **Pod Name:** Each pod is assigned a name. This name will appear in the scheduler, along with the pod type. You may assign a name of your choice or accept the default, "Pod *ID*", where *ID* is the numeric Pod ID.

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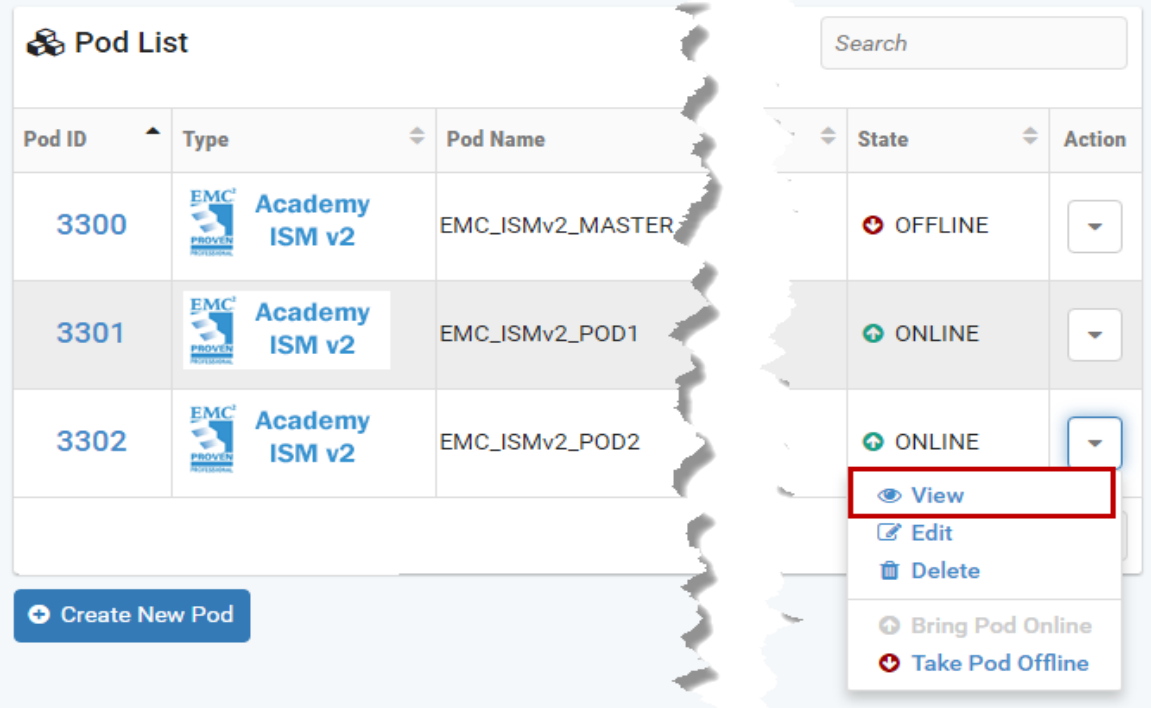
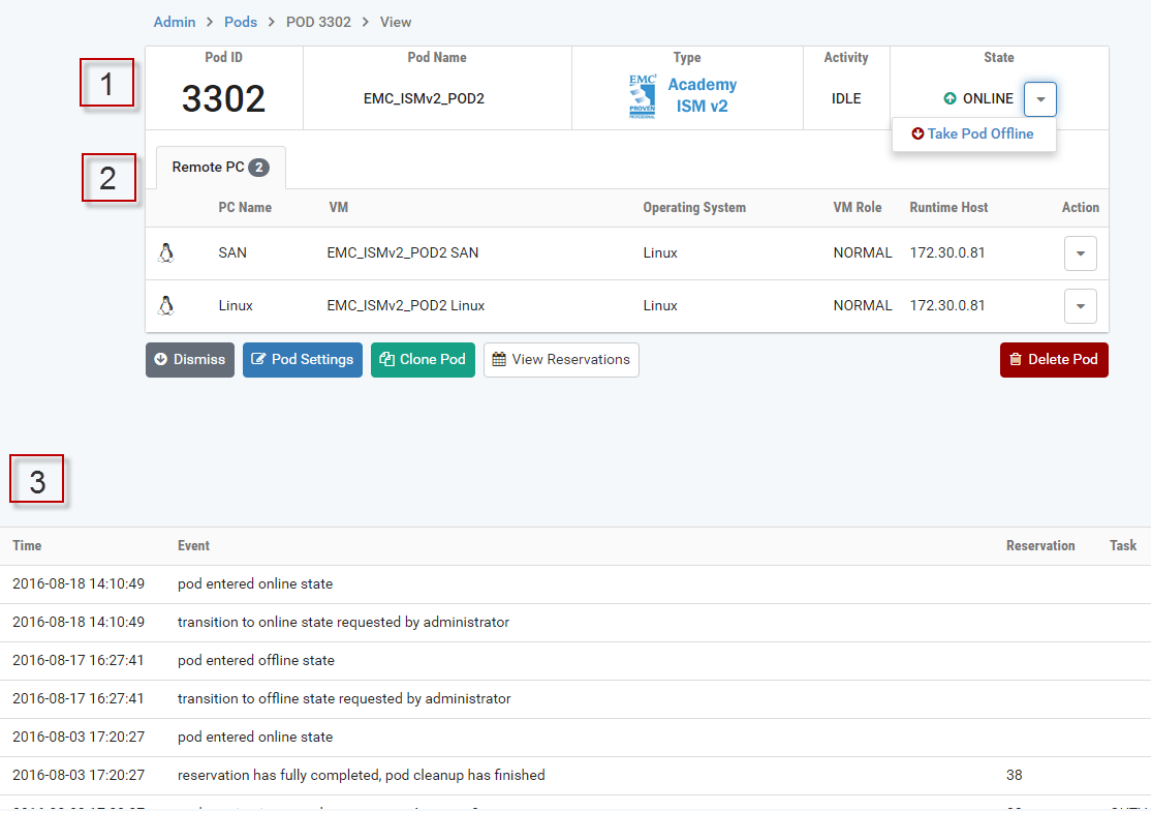
23.2 View Pod Details

To view the details of a pod, select the **View** option on the Action dropdown.



The pod detail page will be displayed. The numbered sections are described below.



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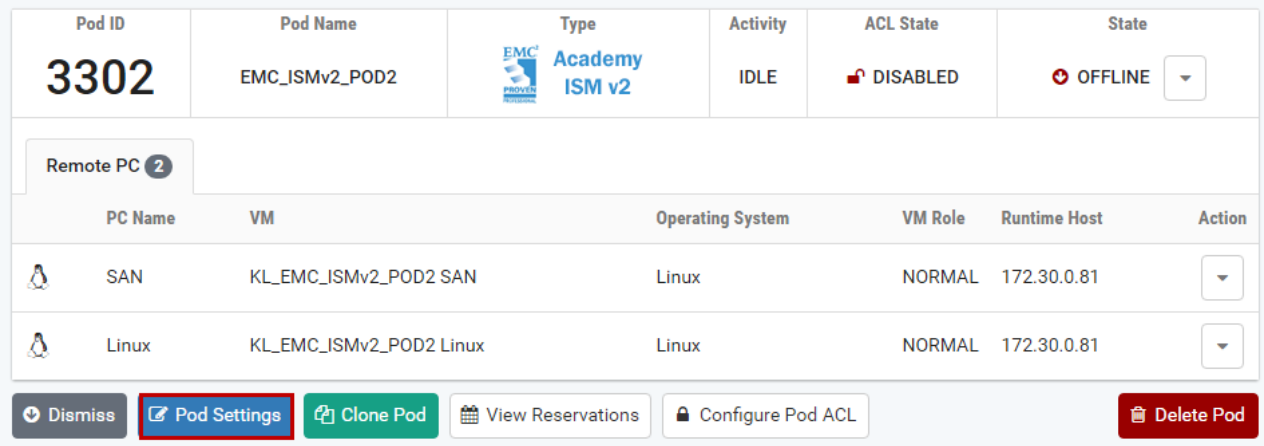
There are three main sections of the pod detail page (numbered in the picture above).

1. **Pod Status Information:** Located at the top, indicating the pod's status. **Pod ID, Pod Name, Type, Activity,** and **State** are listed. The dropdown option on the State field allows you to take the pod Offline/Online (depending on the pod's current state).
2. **Remote PC:** Each virtual pod will typically include one or more Remote PCs. In the example shown above, there are two Remote PCs, a SAN, and a Linux machine.
   There are several buttons in this portion that perform the following actions:
   - **Dismiss:** Return to the Pod List
   - **Pod Settings:** Select to modify the settings for the remote PCs in the pod (see section below).
   - **Clone Pod:** Create a copy of the pod (see section below).
   - **View Reservations:** See the current lab reservations for this pod.
   - **Delete Pod:** Remove the pod.
3. **Pod Event Log:** A listing of the time and events of pod operation, including when the pod was created, taken online/offline, and instances of remote PCs activity (power on, power off).

23.3 Pod Settings

To edit the settings of a pod, perform the following steps.

1. Select **Pod Settings** on the pod detail page.



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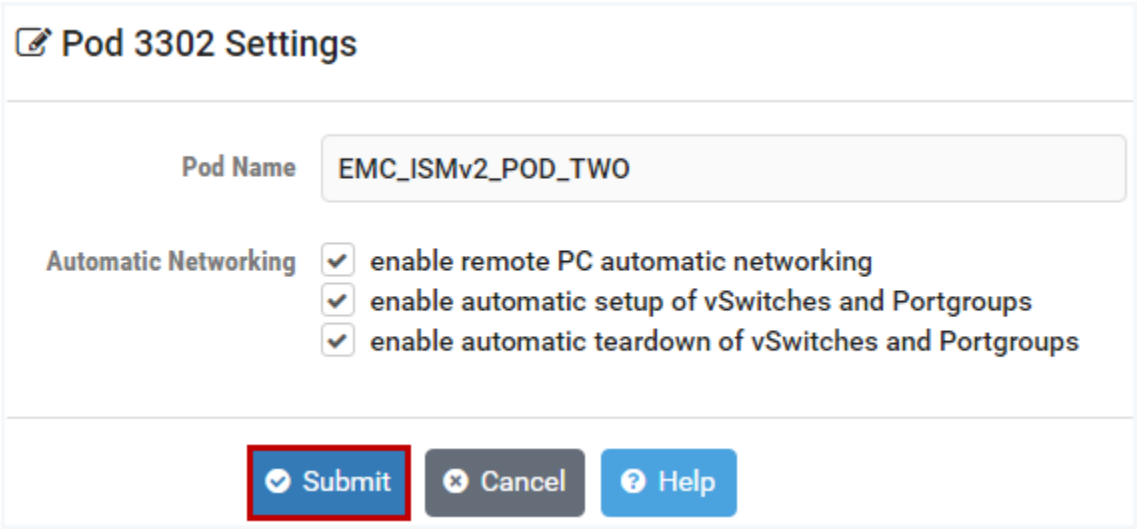
2. The Settings page for the pod will be displayed. Review the settings as needed. For guidance on completing the form, see the field descriptions below, or select **Help**.

NDG recommends keeping Automatic Networking settings enabled.



3. Click **Submit** to save changes and return to the pod detail page.

Field Descriptions - Pod Settings

- **Pod Name:** The user-defined name of the pod. This name will appear in the scheduler, along with the pod type.

- **Automatic Networking:** These settings determine how NETLAB+ typically handles the configuration of the pod. The settings are checked by default.
  - enable remote PC automatic networking
  - enable automatic setup of vSwitches and Portgroups
  - enable automatic teardown of vSwitches and Portgroups

NDG recommends keeping the Automatic Networking settings enabled (checked) for typical pod operation. If you do have reason to modify these settings, such as to support a custom pod design, be sure that you understand the configuration maximums of your system.

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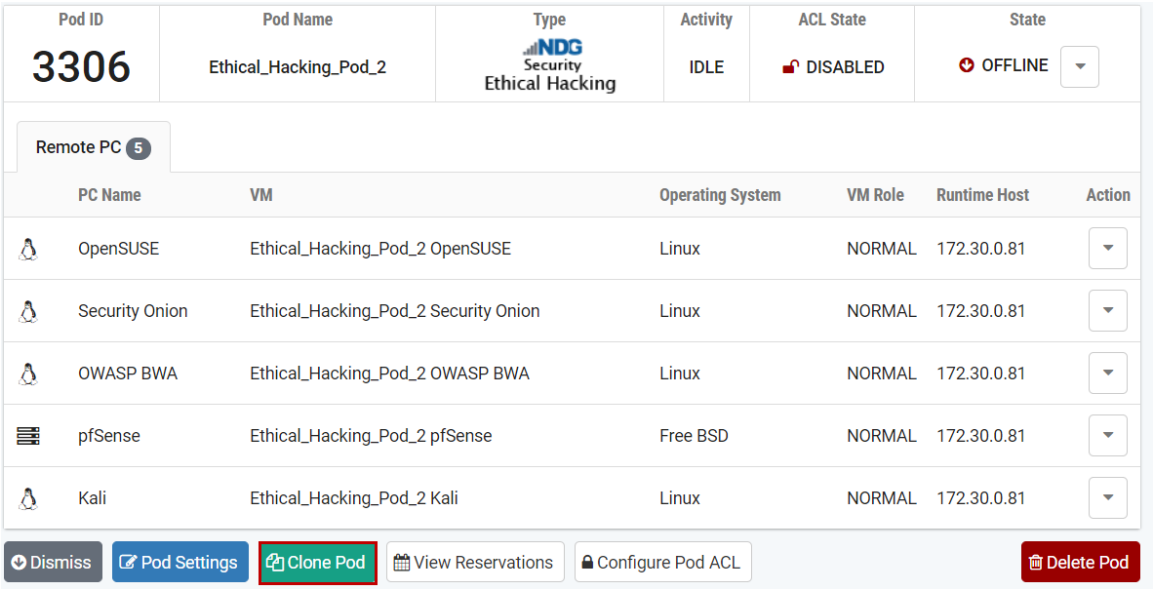
23.4 Clone Pod

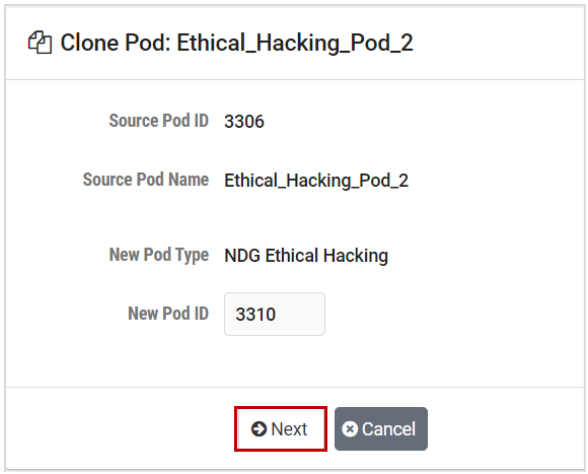
If a pod contains only virtual machines, NETLAB+ can clone the entire pod in one operation. Each virtual machine in the source pod is cloned and added to both the NETLAB+ inventory and vCenter in one operation. To clone a pod, follow the steps below.

The basic functionality of pod cloning is presented here. Please refer to *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure* for additional details and guidance.

1. Select the **Clone Pod** button on the pod detail page.



2. Assign a **New Pod ID.** Each pod must be assigned a unique numeric ID. You may enter any unused number or accept the default, the next available number. Click **Next**.



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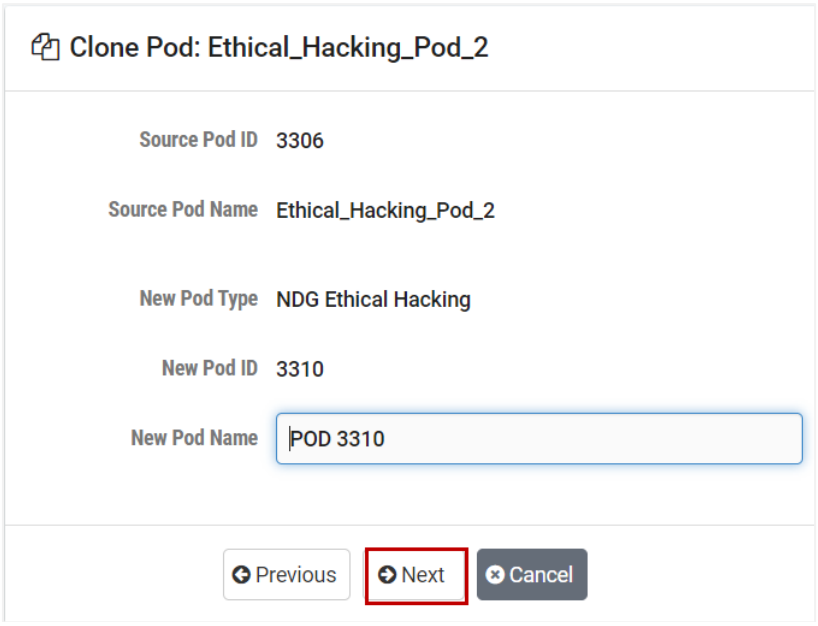
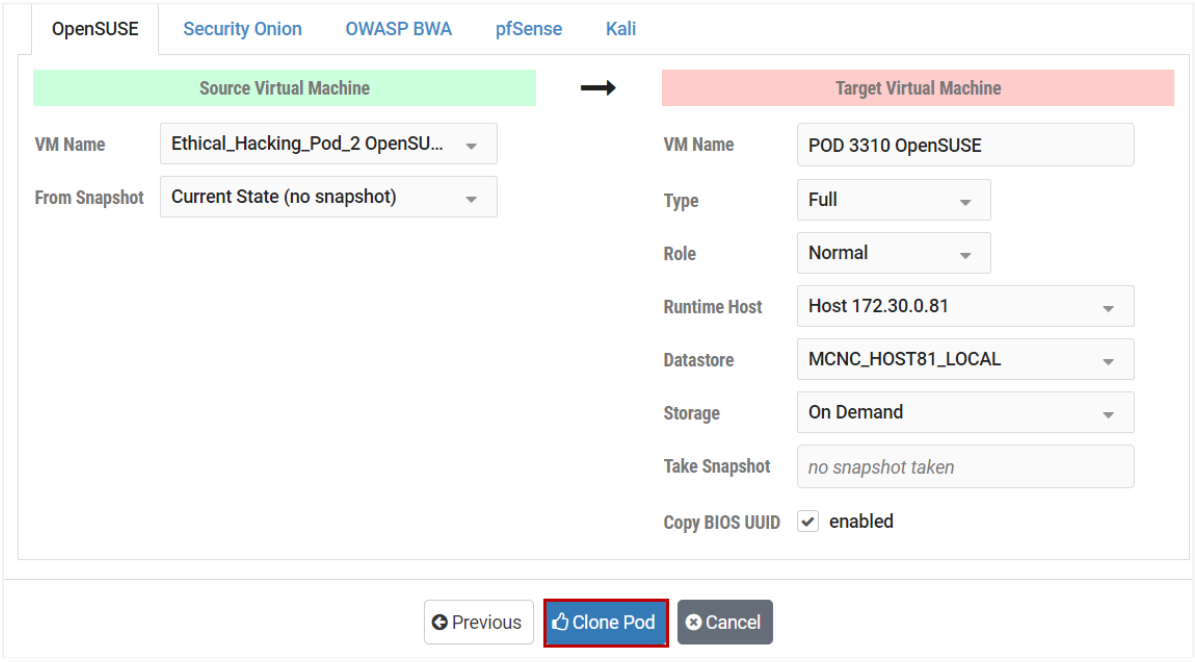
3. Enter a **New Pod Name**, or use the default value. Click **Next**.



4. Click on the tabs to configure the virtual machine settings for each remote PC in the pod. Refer to the field descriptions below. You may also refer to the *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure* for additional guidance in making your selections.



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Field Descriptions – Clone Pod (must be set for each virtual machine in the pod)

- **VM Name:** A descriptive name for the virtual machine. The default name is *Pod ID + Source Virtual Machine Name.*

- **Type:** Select the type of virtual machine clone.

    - **Linked:** A copy of a virtual machine that shares virtual disks with the parent virtual machine in an ongoing manner. This conserves disk space and allows multiple virtual machines to use the same software installation. Linked clones can be created very quickly because most of the disk is shared with the parent VM.

    - **Full:** An independent copy of a virtual machine that shares nothing with the parent virtual machine after the cloning operation. The ongoing operation of a full clone is entirely separate from the parent virtual machine.

- **Role:** Assign the clone to the role it will play in the inventory.

    - **Master:** A virtual machine used as the basis for cloning other virtual machines. Master VMs can be assigned to pods, modified, and powered on.

    - **Normal:** A virtual machine that can be assigned to a pod. A normal VM will typically revert to a specified snapshot at the start of a lab reservation.

    - **Persistent:** A virtual machine that can be assigned to a pod and retains its state between labs. A persistent VM is typically used in conjunction with Pod Assigner to create long-term personal pods.

- **Runtime Host:** The host server where the virtual machine will run.

- **Datastore:** The VMware datastore that will contain the new VM's virtual disk files.

- **Storage Allocation:** Indicate the type of storage allocation to be used for the virtual machine.

    - **On Demand:** Allocates storage for the new virtual machine as needed; this favors storage reduction at the expense of decreased write performance.

    - **Preallocated:** Allocates all storage for the new virtual machine in advance; this favors better write performance at the expense of increased storage.

- **Take Snapshot:** A snapshot name on the source virtual machine from which to base the clone. If this parameter is set, the clone is based on the snapshot point.

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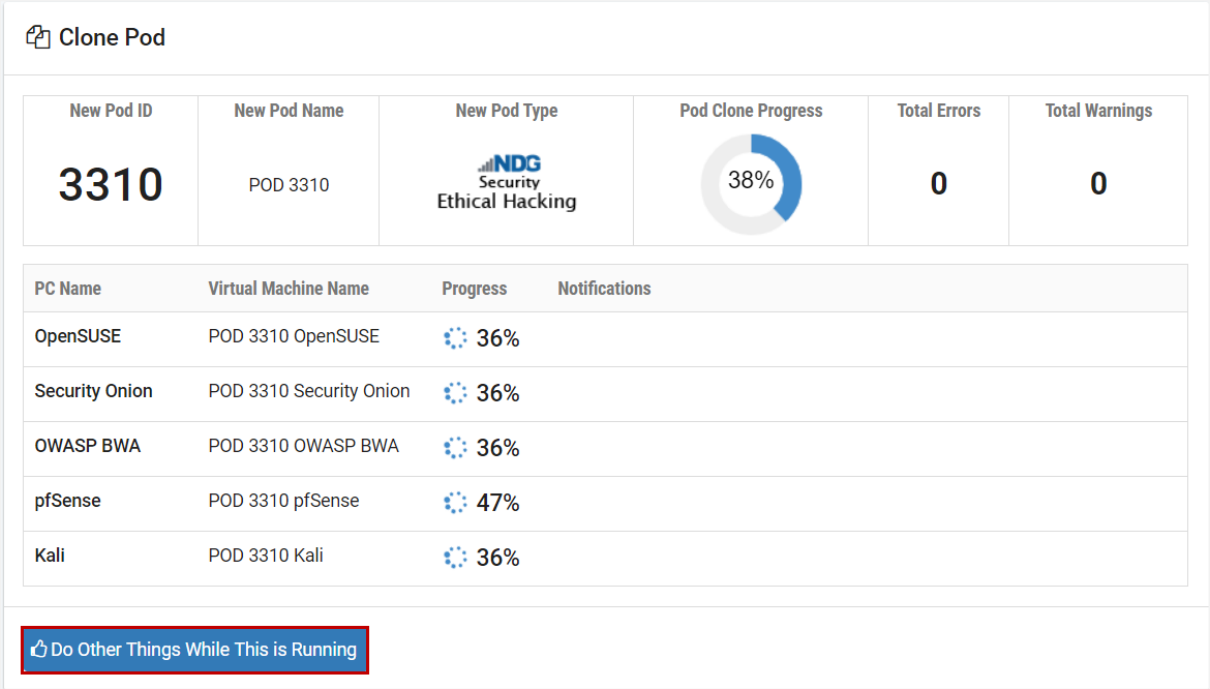
This means that the newly created virtual machine will have the same configuration as the virtual machine at the time the snapshot was taken. If this property is not set, the clone is based on the virtual machine's current configuration. Linked cloning requires this parameter to be set to a snapshot.

- **Copy Bios UUID:** If the checkbox is checked (enabled), this VM's BIOS UUID will be copied to any VM cloned from this VM.

5. The progress of the cloning process will be displayed. This process may take several minutes to complete. You may continue to view the progress or select the button to **Do Other Things While This is Running**.



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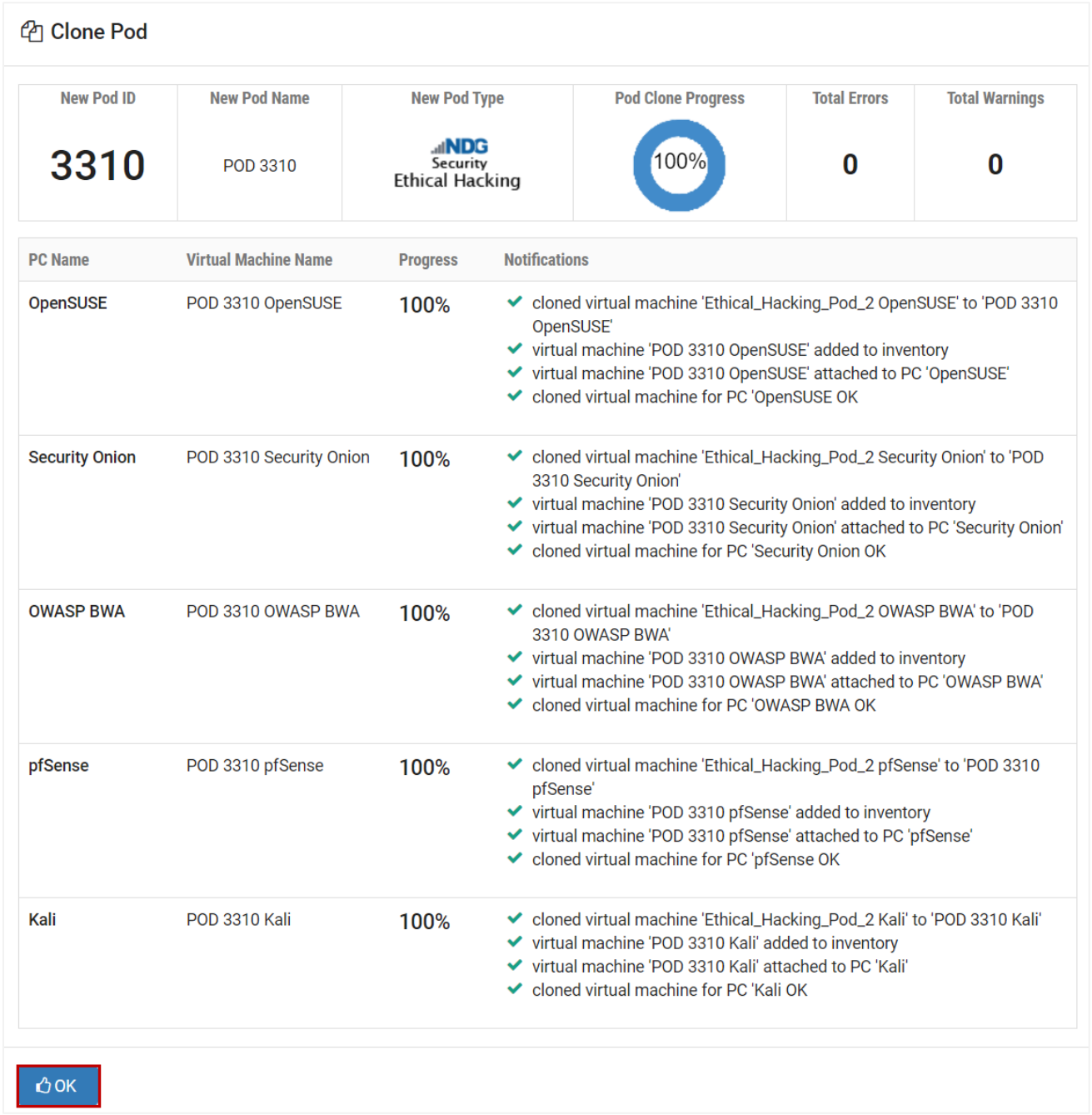
6. When the cloning process has completed, Pod Clone Progress will indicate 100%. Click **OK**.



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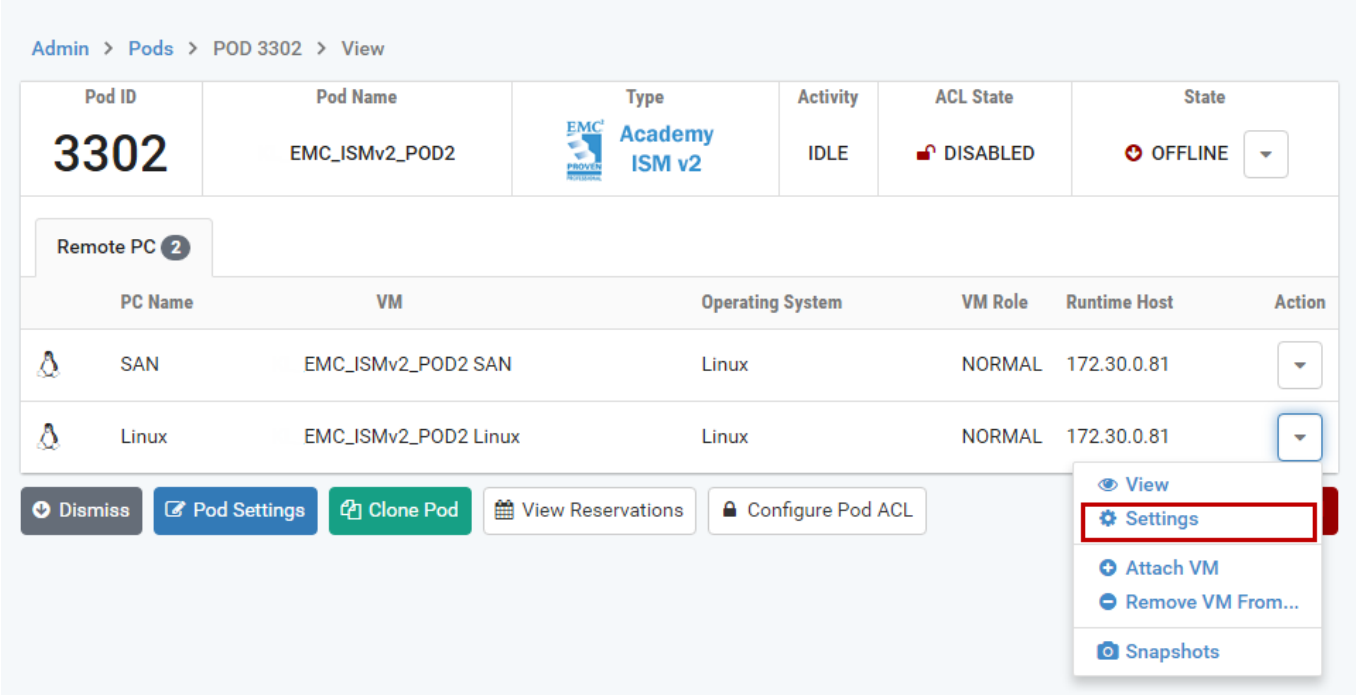
23.5 PC Settings

Each virtual pod will typically include one or more remote PCs. In order to manage the settings of a remote PC, the pod must be offline. In the example below, we will examine the settings of the Linux remote PC in *Pod 3302*. Notice that the pod has been taken offline.

NETLAB+ content specific documentation includes pod installation guides with details on the appropriate PC settings for the remote PCs in a pod. Please refer to the pod installation guide specific to the type of pod you are installing for guidance on PC settings.

1. Select the **Settings** option in the Action dropdown for the Linux remote PC.



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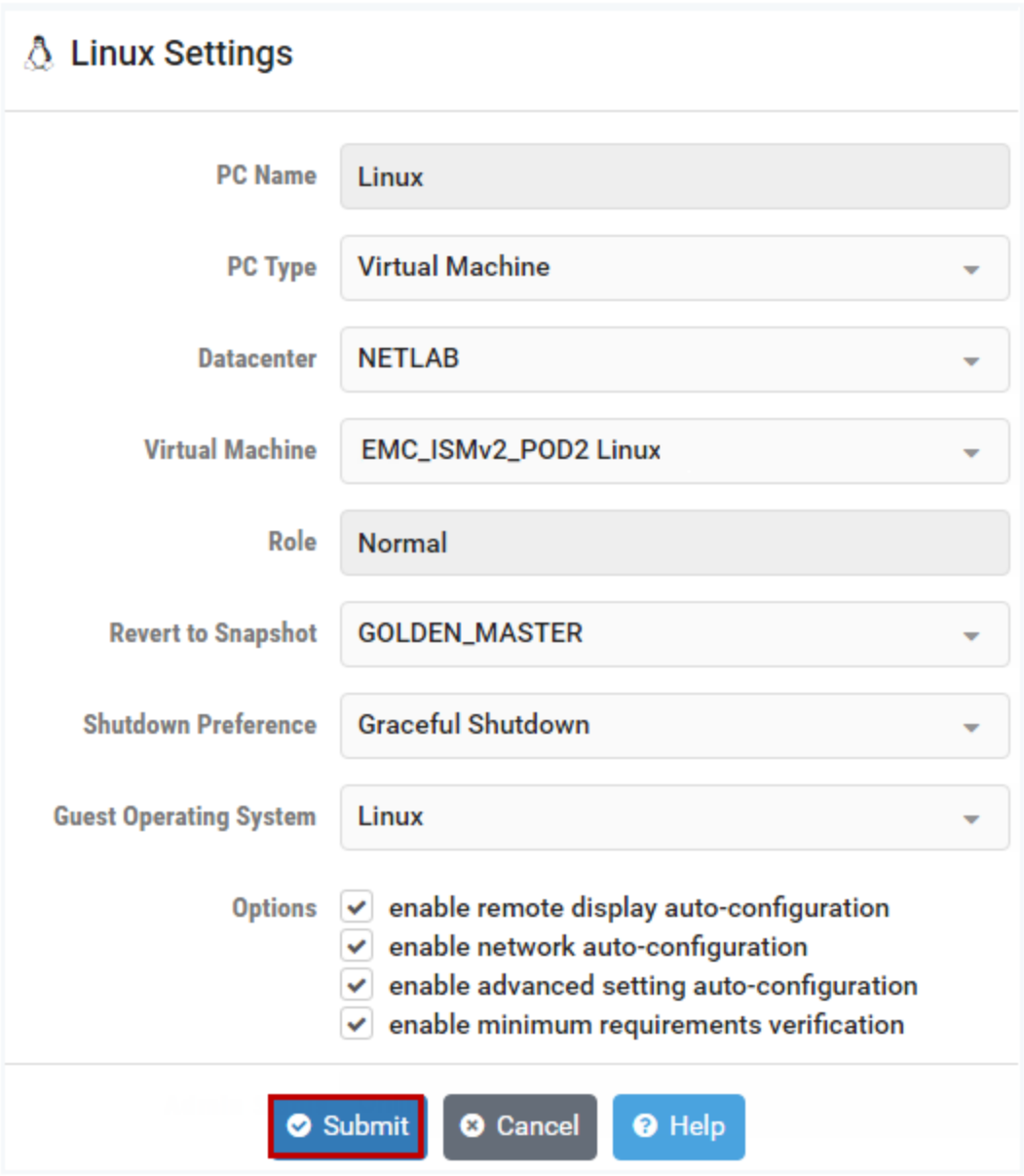
2. The Settings page for the Linux machine will be displayed. Review and revise the settings as needed. For guidance on completing the form, see the field descriptions below, or select **Help**.



3. Click **Submit** to save changes and return to the pod detail page.

Field Descriptions - PC Settings

- **PC Name:** The name of the PC, as defined in the pod design.

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- **PC Type:** The type of PC.
    - **Absent:** The PC will not be implemented in this pod.
    - **Use Virtual Machine Inventory:** Use a virtual machine defined in the NETLAB+ Virtual Machine Inventory. The VMI offers the most advanced VM configuration and automation capabilities available in NETLAB+.

- **Datacenter:** The virtual datacenter that contains the virtual machine to be used for this PC (unless overridden by a lab).

- **Virtual Machine:** The virtual machine that will be used for this PC.

- **Role:** The role the virtual machine plays in the inventory.
    - **Template:** A pristine virtual machine image used as the basis for cloning many virtual machines. Template VMs cannot be powered on, modified, or assigned to pods.
    - **Master:** A virtual machine used as the basis for cloning other virtual machines. Master VMs can be assigned to pods, modified, and powered on.
    - **Normal**: A virtual machine that can be assigned to a pod. A normal VM will typically revert to a specified snapshot at the start of a lab reservation.
    - **Persistent:** A virtual machine that can be assigned to a pod and retains its state between labs. A persistent VM is typically used in conjunction with Pod ACLs to create long-term personal pods.
    - **Runtime:** A temporary on-demand virtual machine that exists for one lab or lab reservation. These VMs are created and destroyed by NETLAB+ based on pod settings.

- **Revert to Snapshot:** The snapshot that will be used to revert the virtual machine to a clean state during pod initialization, user-initiated scrub action, and at the end of a lab reservation. Note: This setting does not apply to virtual machines whose role is Persistent.

- **Shutdown Preference:** The preferred shutdown sequence if the virtual machine is still powered on at the end of a lab reservation. If Revert to Snapshot is configured (on a non-persistent VM), it is reverted first. If the virtual machine is still powered on after reverting to the snapshot, the preferred shutdown sequence is executed. Otherwise, the final power state will be the same as the snapshot state.
    - **Graceful Shutdown:** Performs an orderly shutdown from the operating system if possible (i.e., VMware Tools is installed on the VM). If an orderly shutdown is not possible, the virtual machine is powered off.

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- **Power Off:** Just like hitting the power button. It does not perform an orderly shutdown of the VM.
- **Suspend:** Suspend the virtual machine in its current state. When powered on, it will resume in the same state without booting. This option requires a complete disk snapshot of the virtual machine's memory and page files, so you should use the suspend option only if you have plenty of disk storage. The network connection state is not preserved.
- **Keep Running:** The virtual machine is left in the powered-on state. This is rarely desirable since host resources are not freed. In conjunction with Keep Running, a Revert to Snapshot setting of NONE is probably the right choice.

- **Guest Operating System:** The operating system running on this virtual machine.

- **Options:** Enable or disable automated features.

  - **Enable remote display auto-configuration:** If enabled, NETLAB+ will automatically configure remote display parameters on the VM after a power-on or revert to snapshot operation. This option allows VMs to be cloned without manual customization of the remote display settings. Therefore, we recommend you enable this setting and be happy about it.
  - **Enable network auto-configuration:** If enabled, NETLAB+ will automatically bind the virtual machine's network adapters to the correct port group. This option allows VMs to be cloned without manual customization of networking bindings. This option is ignored if the pod type does not support automatic networking. If this setting is disabled and/or the pod type does not support automatic networking, then the virtual machine network adapters must be manually bound to the correct port group(s) using the vSphere client.
  - **Enable advanced setting auto-configuration:** If enabled, NETLAB+ will automatically program advanced virtual machine settings that may be required for a particular pod type. For example, nested VM support for the VMware IT Academy program. It is usually safe to enable this option. It will be ignored if the pod type does not require advanced settings.
  - **Enable minimum requirements verification:** If enabled, NETLAB+ will verify that the current settings of the virtual machine meet or exceed any minimum requirements established for the remote PC to which it is assigned. It is usually safe to enable this option. The setting will be ignored if the pod type does not specify a set of minimum requirements for the remote PC.

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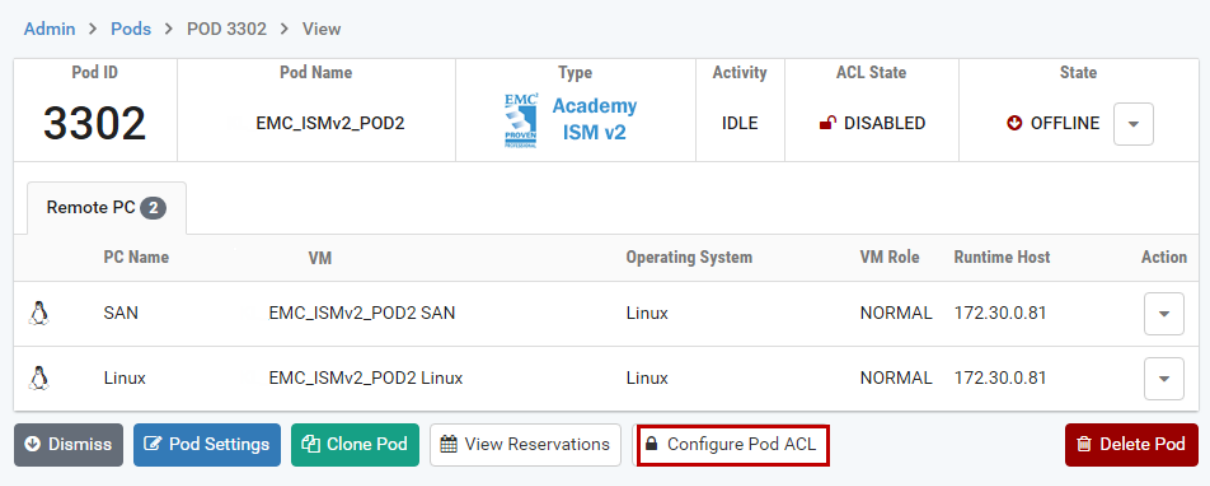
23.6 Configure Pod ACL

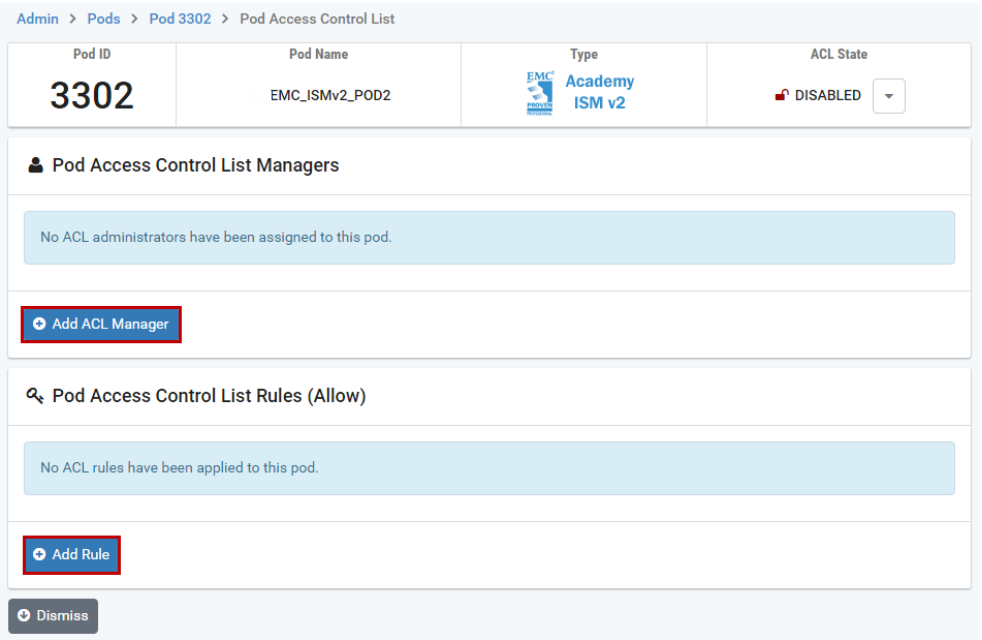
Access to a pod may be managed using a *Pod Access Control List (ACL),* a set of rules that define the communities, classes, teams, and/or users that may access the pod. If an ACL list is specified, the pod will only be visible in the scheduler to the users meeting the criteria defined by the pod rules. You may delegate the management of access to the pod by assigning instructors to be *ACL Managers.* An instructor who is added to the list of ACL managers may manage the pod's ACL.

To configure the ACL, select **Configure Pod ACL** on the pod detail page.



The Pod Access Control List page is displayed. This page includes two functions, explained in the subsections below.

- Pod Access Control List Managers - Add ACL Manager
- Pod Access Control List Rules (Allow) - Add Rule



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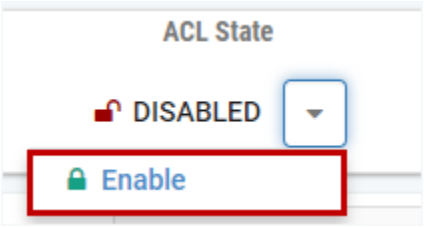
Keep in mind that once ACL rules have been configured (as described below), the pod's ACL State must be enabled in order for the ACL rules to function. Click the ACL State dropdown in the upper-right corner and select **Enable**.

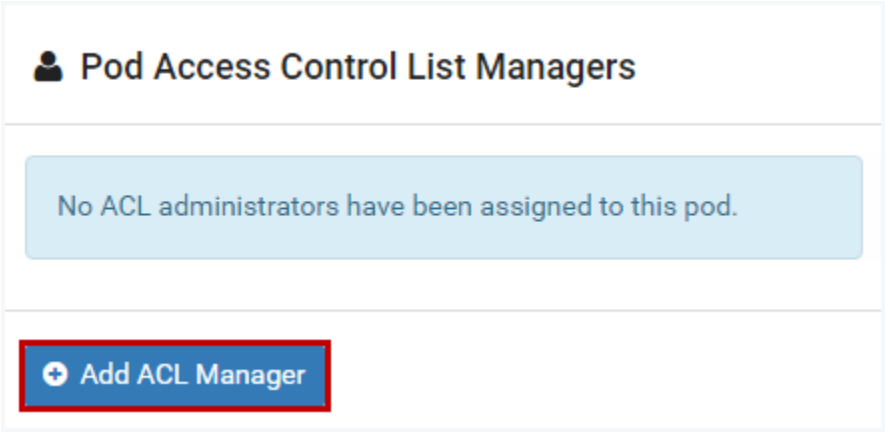


23.6.1 Pod Access Control List Managers

As the administrator, you may wish to delegate pod access management to instructors. By assigning an instructor to act as a Pod Access Control List (ACL) Manager for a pod, the instructor will have access to manage the ACL rules of the pod.

To assign an instructor to be an ACL manager for a pod, perform the following steps.

1. On the pod detail page, select **Add ACL Manager**.



2. The **Add ACL Manager** page will be displayed. If your NETLAB+ system contains multiple communities, select the instructor's community. In the example below, we will select an instructor from the *default* community.
3. Select the instructor from the dropdown Account list (in the example below, we will use the *testteacher* instructor account) and then click **Submit**.

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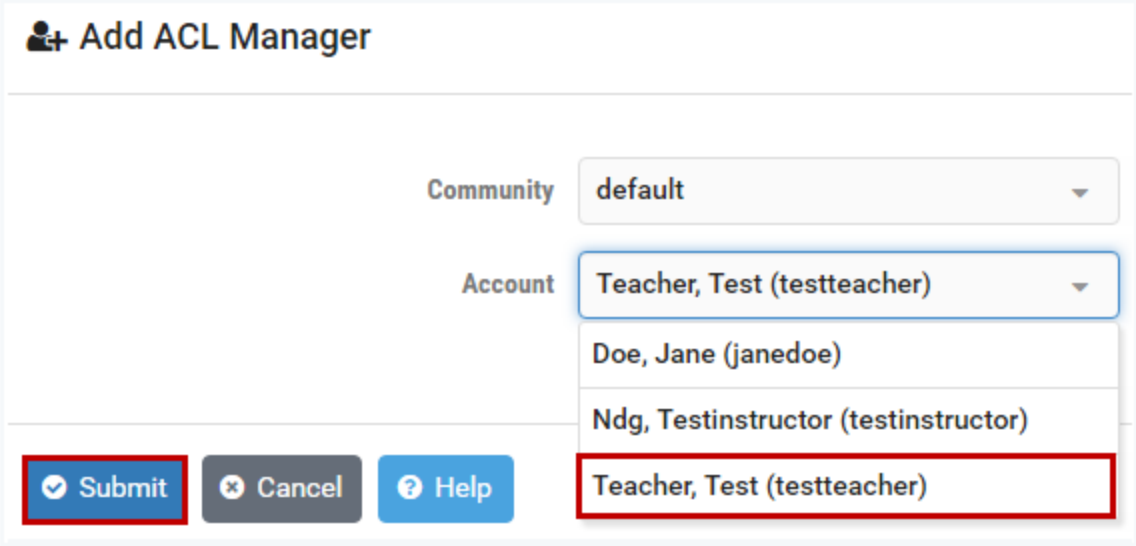
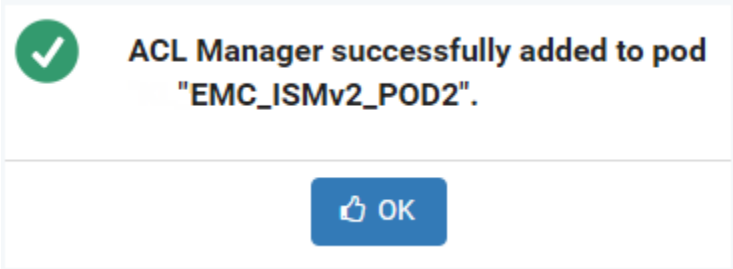
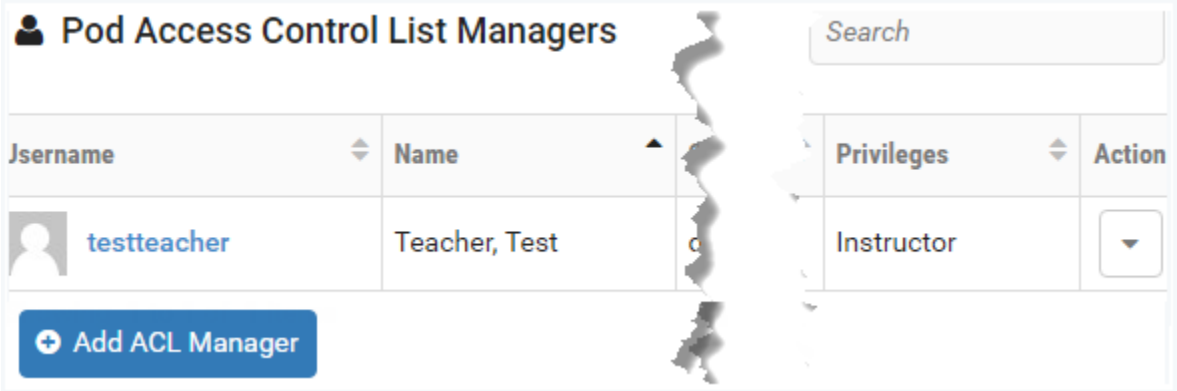


4. A message will be displayed, indicating the ACL Manager has been added to the pod. Click **OK**.



5. The *testteacher* account is now shown in the list of Pod Access Control List Managers. Click Dismiss (at the bottom of the page) to return to the pod detail page.



Instructors may be removed from the ACL Manager list by selecting Remove on the Action dropdown.

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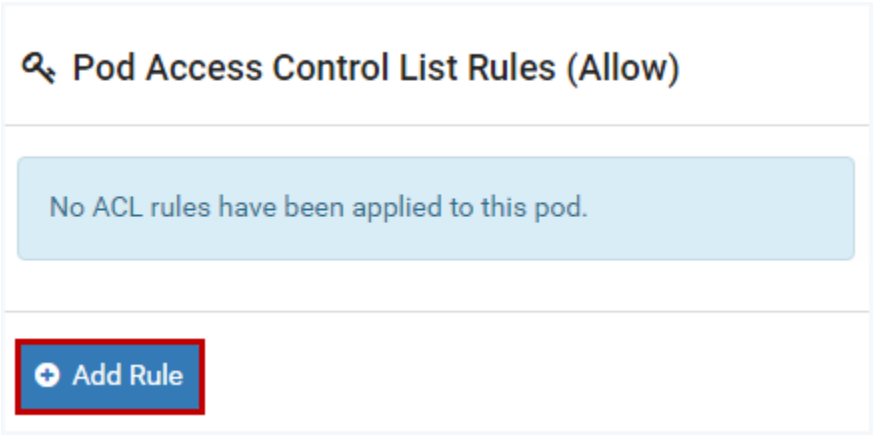
23.6.2 Pod Access Control List Rules

Access to a pod may be managed using a Pod *Access Control List (ACL),* a set of rules that define the communities, classes, teams, and/or users that may access the pod.

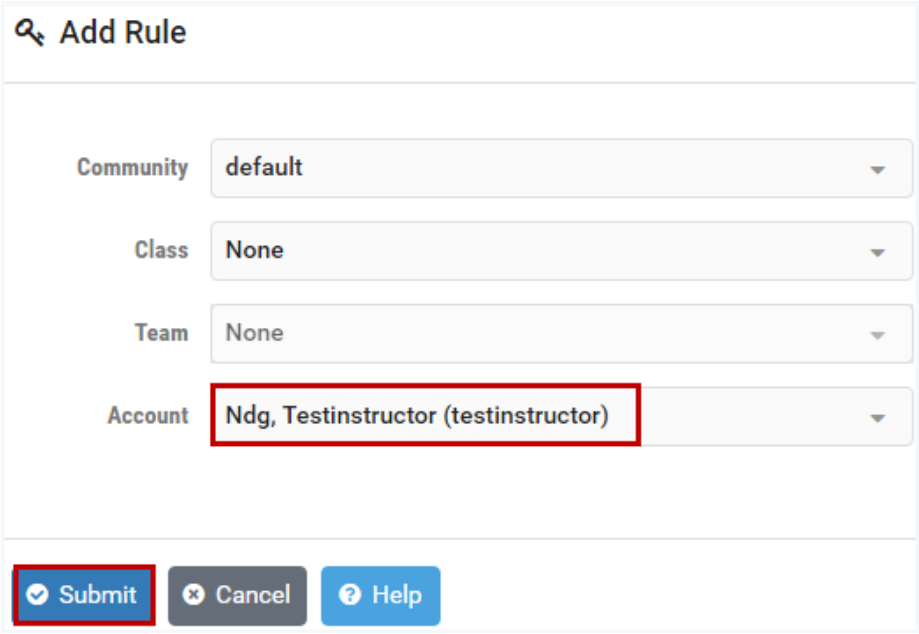
If a pod ACL list is specified, the pod will only be visible in the scheduler to the users meeting the criteria defined by the pod rules.

To add pod access control list rules, perform the following steps.

1. On the pod detail page, select **Add Rule**.



2. The **Add Rule** page will be displayed. For details on completing this page, see the field descriptions below for guidance or select Help. In the example below, we will add a pod rule that will allow *testinstructor* to access the pod by selecting the instructor name in the **Account** field and then clicking **Submit**.



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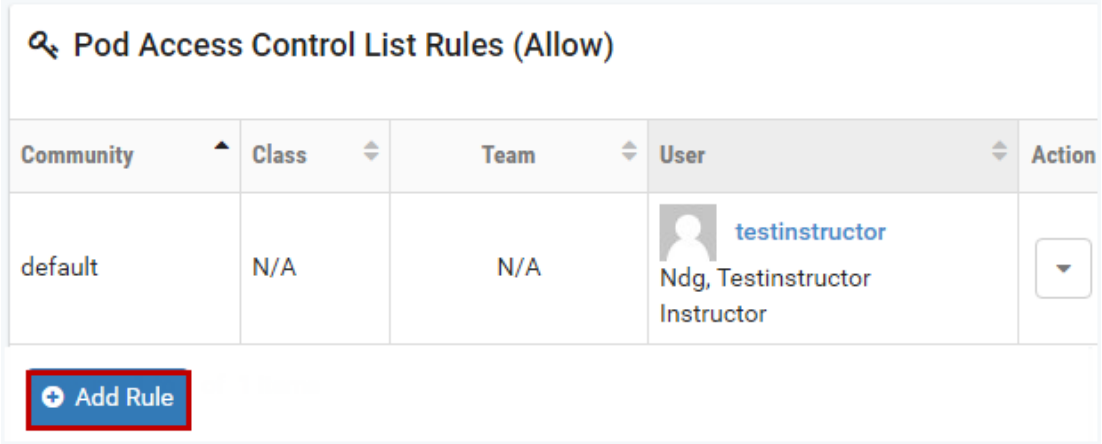
Field Descriptions - Add Rule page

- **Community:** Select the community that will be allowed to schedule the pod.
- **Class:** Select the class that will be allowed to schedule this pod.
- **Team:** Select the team that will be allowed to schedule this pod. A Team (a subset of a class) may only be selected if a Class has been selected. Please note that Team and Account selections are mutually exclusive.
- **Account:** Select the account that will be allowed to schedule this pod. Please note that Account and Team selections are mutually exclusive.

3. A message will indicate that the ACL rule has been added to the pod. Click **OK**.

4. The pod rule that specifies that *testinstructor* has access to the pod is now displayed in the Pod Access Control List Rules. The pod will be visible in the scheduler exclusively to *testinstructor.* We will continue this example by adding another pod rule, to allow additional users to access the pod. Click **Add Rule**.



5. Once again, the **Add Rule** page will be displayed. This time, we will add a pod rule that will allow all learners in the *EMC ISM* class to access the pod by selecting the class name in the **Class** field and then clicking **Submit**.

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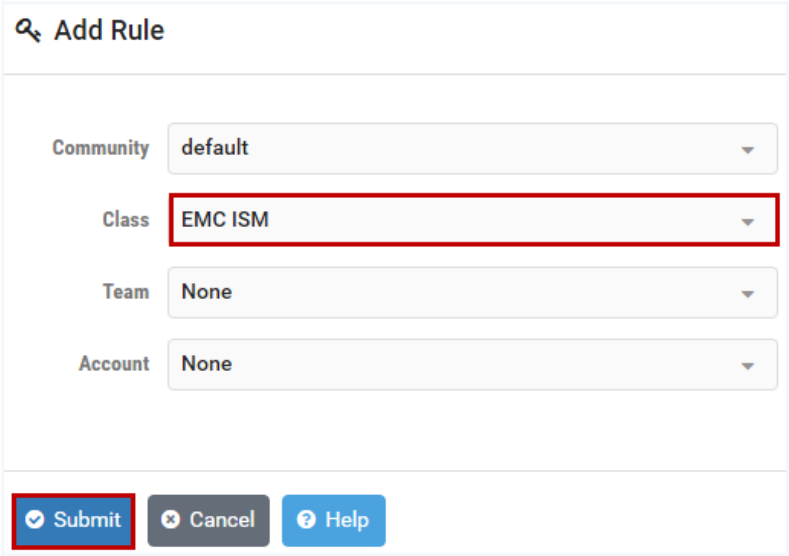
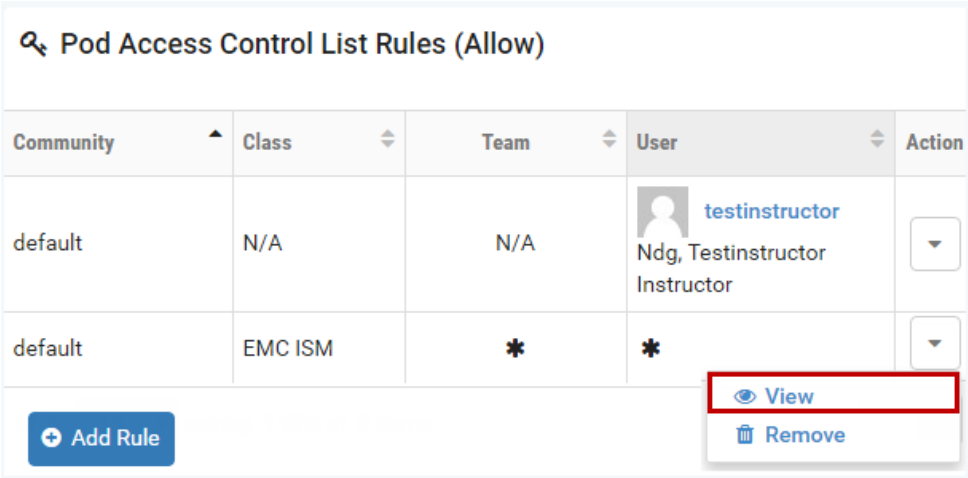


6. A message will indicate that the ACL rule has been added to the pod. Click **OK**.

7. The pod rule that specifies that all learners in the *EMC ISM* class have access to the pod has been added to the list of Pod Access Control List Rules. The pod is now visible in the schedule to *testinstructor* and to all learners (notice the wildcard "*" indicator in the Team and User fields) in the *EMC ISM* class. To review the details of a pod rule, select **View** on the Action dropdown.



8. Details of the rule are displayed. The option to delete the rule is also available. Click **Dismiss**.

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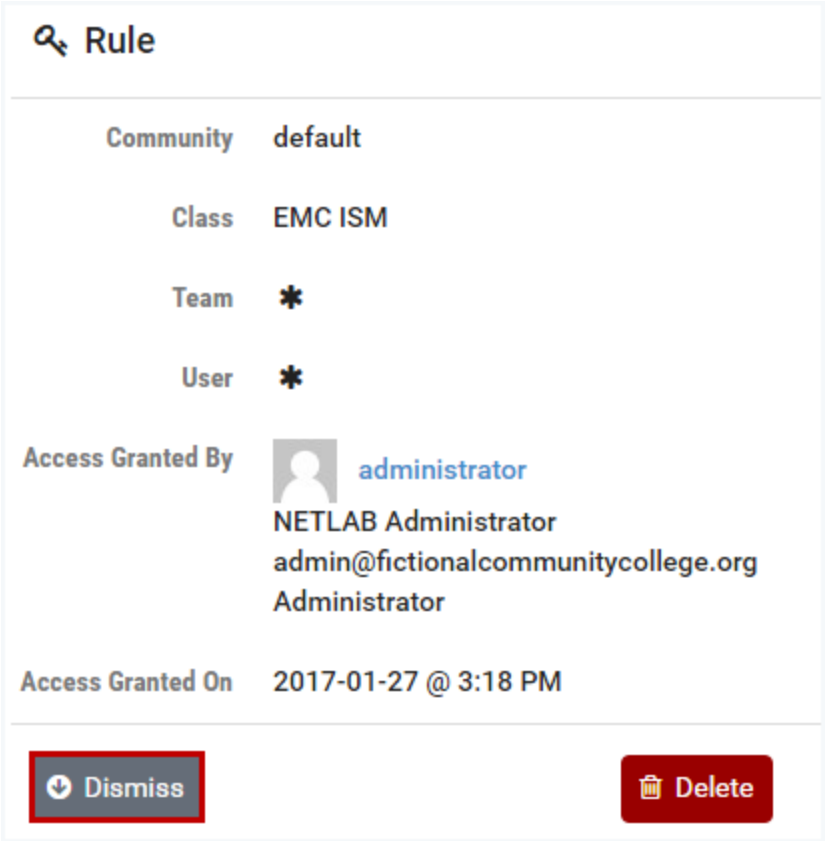
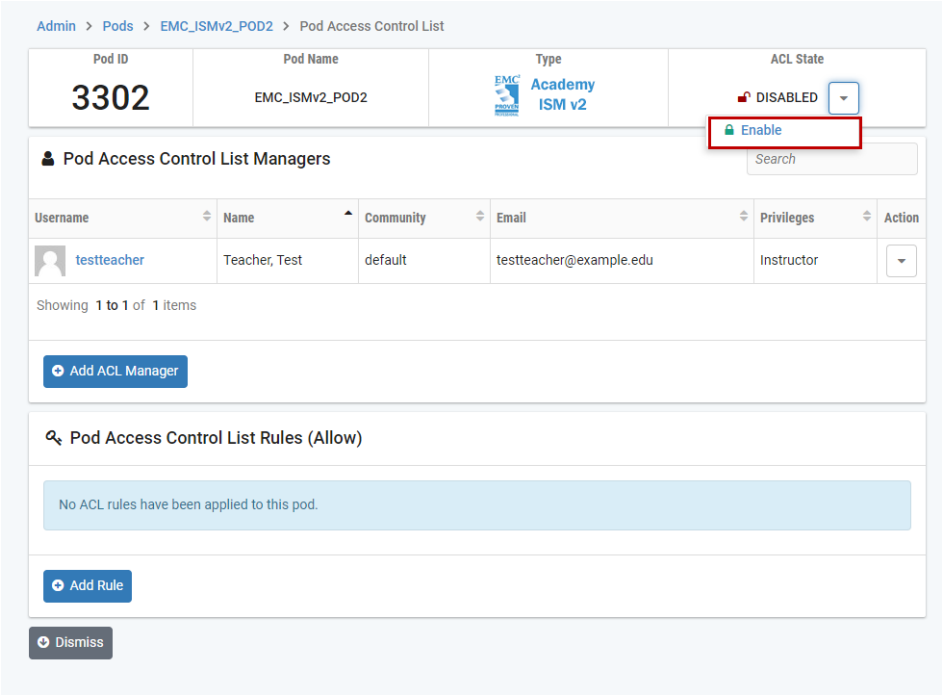


9. Once all ACL rules have been configured, the pod's ACL State must be enabled in order for the ACL rules to function. Click the ACL State dropdown in the upper-right corner and select **Enable**.



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23.7 Resources for Pod Planning and Installation

Please refer to the *Course Manager* section to access resources that provide guidance on installing equipment pods on your NETLAB+ system, including course-specific pod planning and installation guides.

Additional resources can also be found in the NETLAB+ supported content section of the NDG website.

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24 Virtual Machine Infrastructure

The virtual machine infrastructure consists of four components used to manage your NETLAB+ system virtual machine environment. The components are described below, including guidance on referencing our library of documentation resources.

24.1 Virtual Machine Inventory

The Virtual Machine Inventory allows you to import, clone, and manage the inventory of virtual machines to be used with NETLAB+. The inventory is a mapping between NETLAB+ remote PCs and virtual machines in one or more vSphere datacenters. The inventory also tracks information that is not stored in vCenter about virtual machines, such as the role each VM plays in NETLAB+ and parent/child relationships between virtual machines.

For detailed guidance on the use of the Virtual Machine Inventory, please refer to *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure*. Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the guide.

24.1.1 Importing VMs into the Virtual Machine Inventory

The following procedure is used to import an existing virtual machine or template from vCenter into the NETLAB+ Virtual Machine Inventory.

1. From the Virtual Machine Infrastructure administrator page, select **Virtual Machine Inventory.** All virtual machines in the inventory are listed. If this is your first time importing VMs to the inventory, there is no list displayed.
2. Click the **Import Virtual Machines** button at the bottom of the page to add VMs to the inventory. If you have added more than one datacenter to your NETLAB+ system, you will be prompted to select a datacenter.

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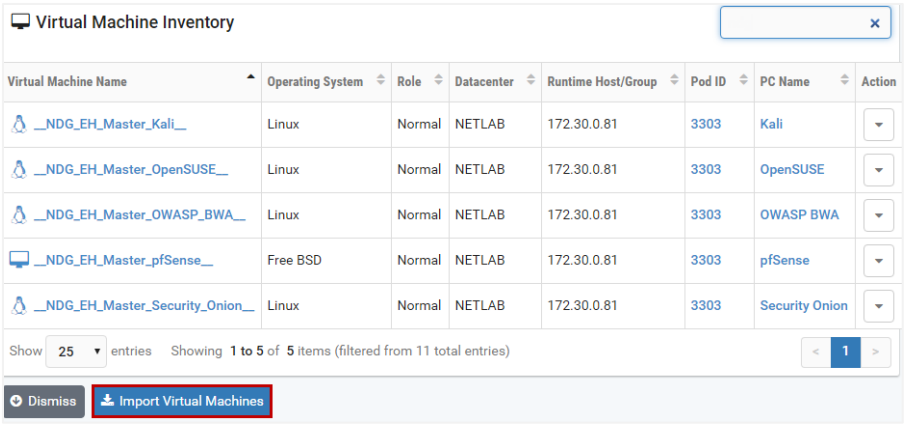
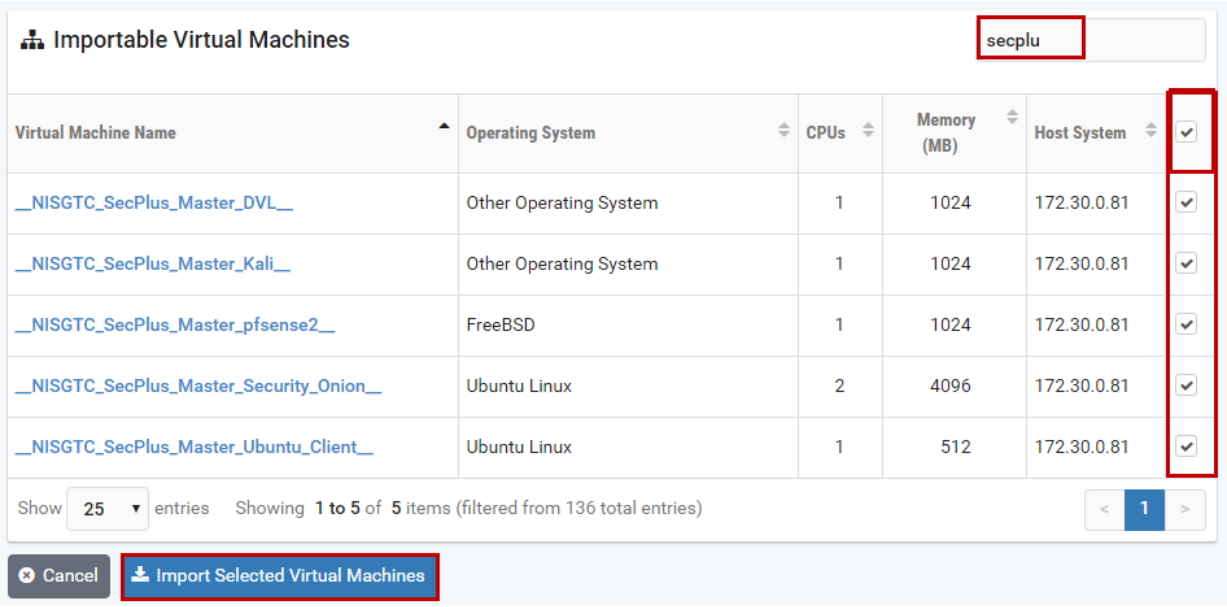


3. NETLAB+ will scan the datacenter to discover virtual machines that are not currently in the inventory. You may then click the checkbox next to the virtual machine(s) you wish to import (see the box below for tips on selection) and then click **Import Selected Virtual Machines**.

NETLAB+ provides several tools that can make selecting virtual machines more convenient, particularly when dealing with a long list. In the example below, a partial name "secplu" (for security plus) was entered in the search box to filter the list of virtual machines displayed. The checkbox at the top of the last column was selected, which functions as a "select all", resulting in all of the virtual machines displayed being selected for import.



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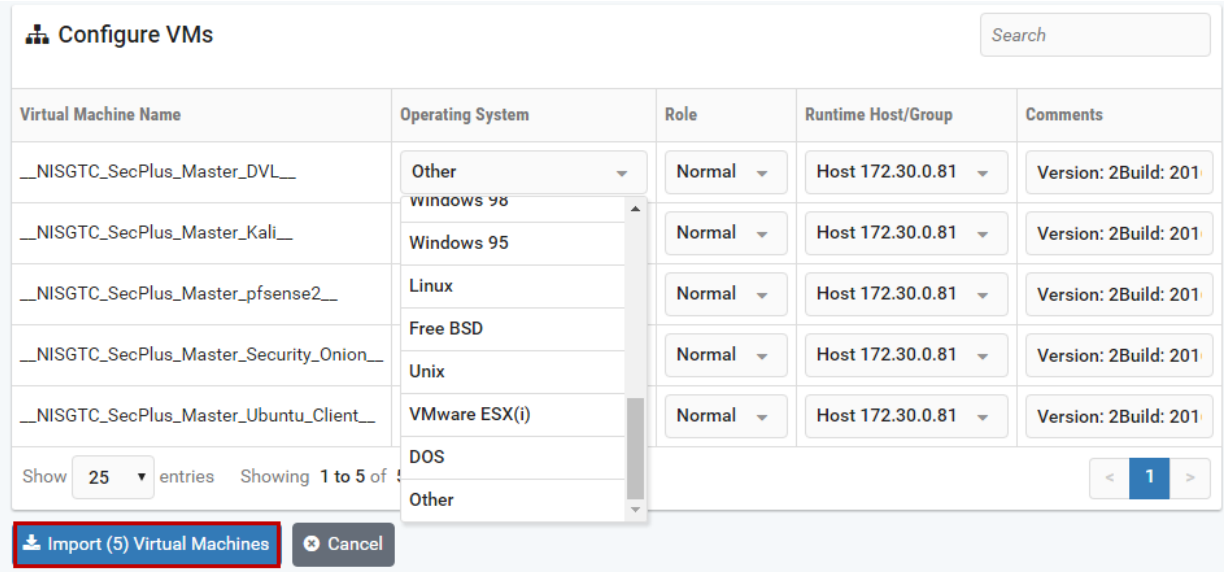
4. Select the appropriate configuration settings for each virtual machine (refer to the field descriptions below) and then click **Import Virtual Machines**. The VMs will be added to the Virtual Machine Inventory.



Field Descriptions - Configure VMs

For detailed guidance on the use of the Virtual Machine Inventory and making the appropriate selections for the settings listed below, please refer to *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure*. Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the guide.

- **Operating System:** This should match the operating system installed on the virtual machine. The default value is usually correct. However, if the virtual machine is running a nested/virtualized instance of VMware ESXi, you should change this value from "Other" to "VMware ESXi".

- **Role**: Select the role that this virtual machine will play in your inventory. If the virtual machine is marked as a *Template* in vCenter, it will also be set to *Template* in NETLAB+ (no selection is provided in this case).

- **Runtime Host/Group**: Select the physical VMware ESXi host that will run the virtual machine. The host currently assigned in vCenter is the default choice for virtual machines that are not marked as templates (master, normal, or persistent VMs). Template VMs cannot be powered on and, therefore, cannot be assigned to a host. The runtime host should not be changed unless the virtual machine's disk files reside on a SAN, and all physical ESXi hosts have access to the virtual machine disk files.

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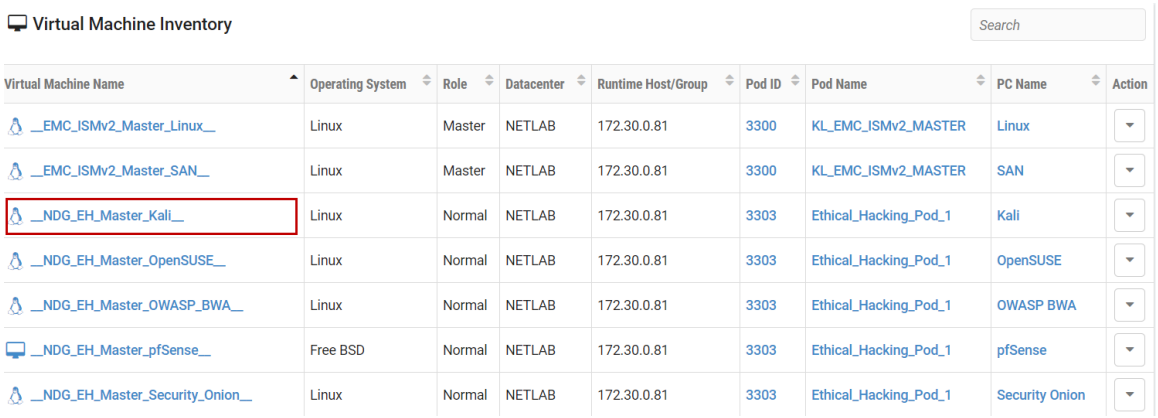
- **Comments**: Add any additional information to help identify the VM and its intended use.

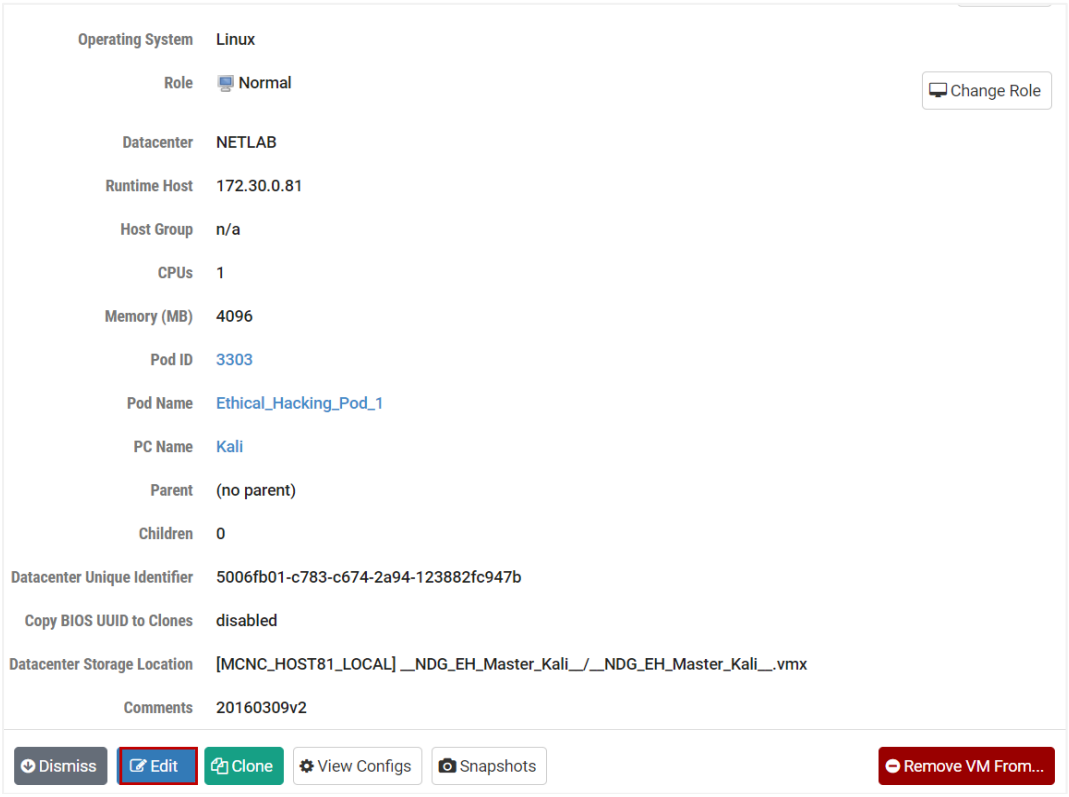
24.1.2 Editing Details of a Virtual Machine in the Inventory

To edit the details of a VM in the Virtual Machine Inventory, follow the steps below.

1. From the Virtual Machine Infrastructure administrator page, select **Virtual Machine Inventory.** All virtual machines in the inventory are listed.
2. To view the details for a VM, click on a **Virtual Machine Name**.



3. The details of the VM are displayed. Select the **Edit** button.



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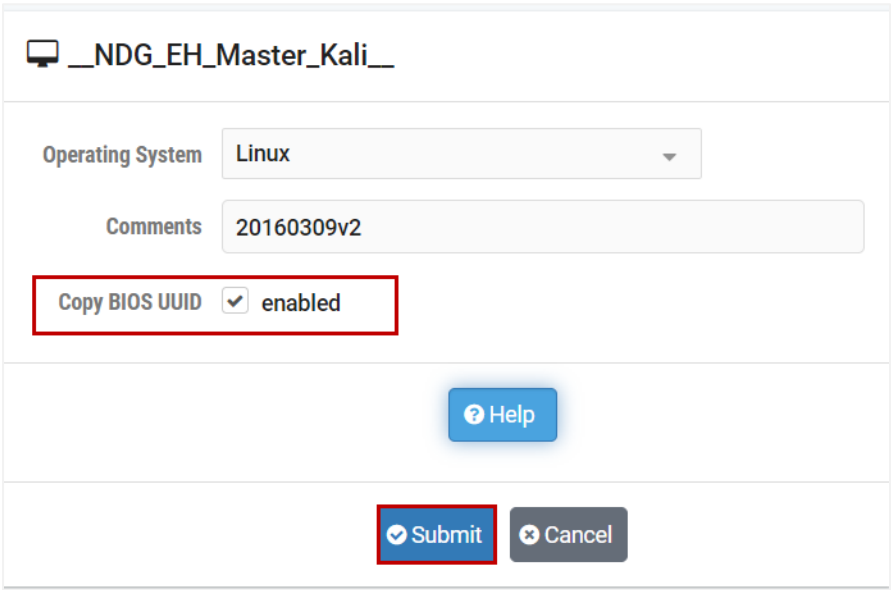
4. The VM settings that may be edited are displayed; please see the Field Descriptions below. In the example below, we have enabled the Copy BIOS UUID by selecting the checkbox. Click **Submit**.



Field Descriptions – VM Edit Page

- **Operating System:** This should match the operating system installed on the virtual machine. The default value is usually correct. However, if the virtual machine is running a nested/virtualized instance of VMware ESXi, you should change this value from "Other" to "VMware ESXi".

- **Comments**: Add any additional information to help identify the VM and its intended use.

- **Copy BIOS UUID**: If the checkbox is checked (enabled), this VM's BIOS UUID will be copied to any VM cloned from this VM (see the next section for details on VM cloning).

24.1.3 Cloning a Virtual Machine in the Inventory

NETLAB+ provides a convenient way to clone virtual machines. In order to clone virtual machines within NETLAB+, you must first create a source virtual machine to be used as the source for the clone. Creating virtual machines is discussed in detail in *Remote PC Guide Series - Volume 4, Creating and Configuring Virtual Machines for NETLAB+*. The source virtual machine must also be registered in the NETLAB+ inventory.

1. To clone a virtual machine, select the source virtual machine to be cloned in the NETLAB+ Virtual Machine Inventory. In this example, we have selected a virtual machine that has been designated as a master.
2. Begin the cloning process by selecting the **Clone** button.

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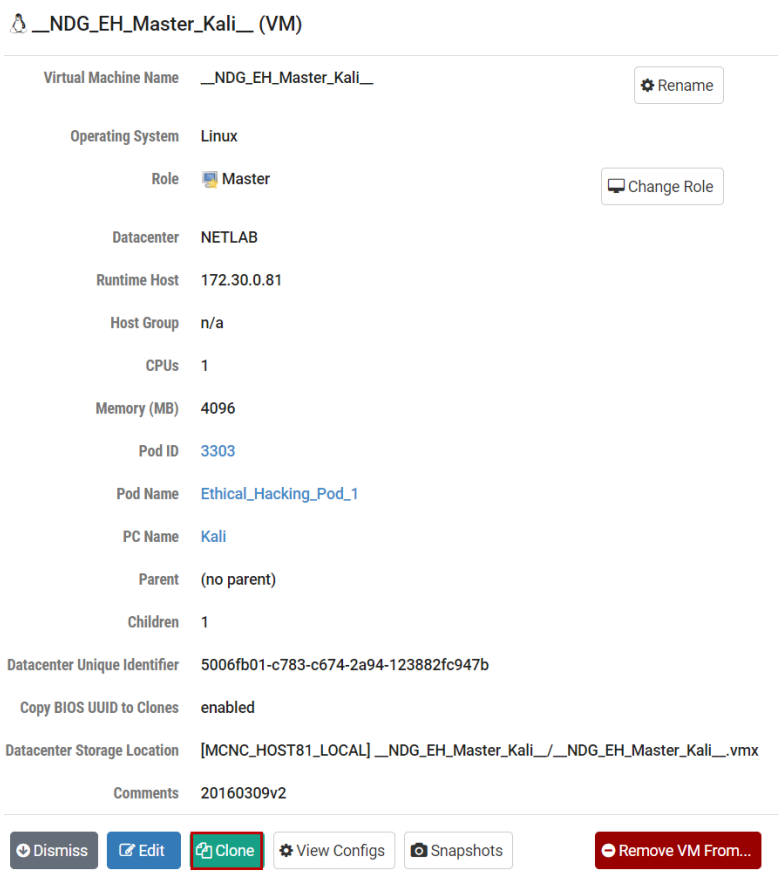
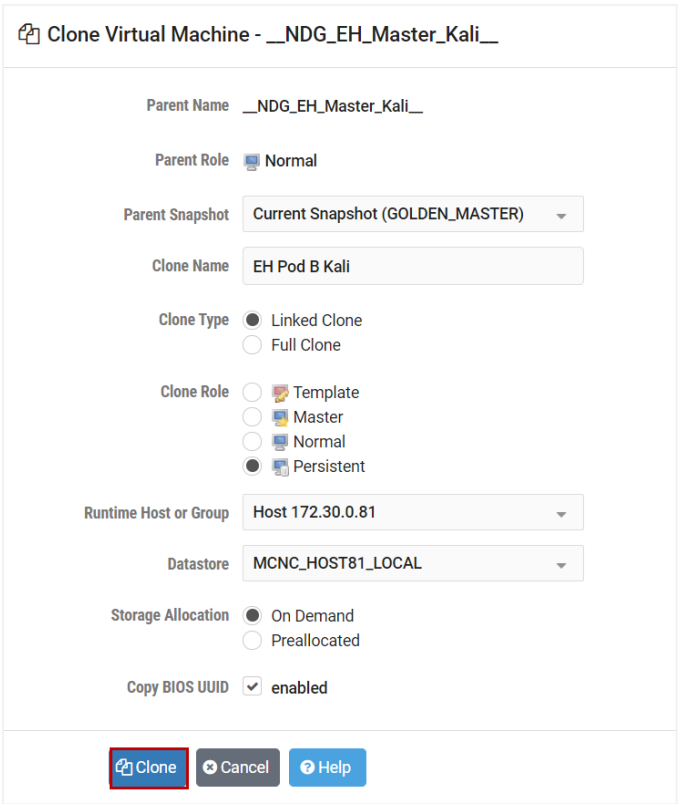


3. The **Clone Virtual Machine** page will be displayed. Select the appropriate settings for the fields (see field descriptions below) and then select **Clone**.



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Field Descriptions – Clone Virtual Machine

- **Parent Name:** The name of the existing parent virtual machine. In this example, we are making a clone of a virtual machine designated as a master. This master is the parent of the virtual machine.

- **Parent Role:** The role the parent virtual machine plays in the inventory.

- **Parent Snapshot:** A snapshot name on the parent virtual machine from which to base the clone. If this parameter is set, the clone is based on the snapshot point. This means that the newly created virtual machine will have the same configuration as the virtual machine at the time the snapshot was taken. If this property is not set, the clone is based on the virtual machine's current configuration. Linked cloning requires this parameter to be set to a snapshot.

- **Clone Name:** The name of the new virtual machine.

- **Clone Type:** There are two types of clones:

    - **Linked Clone:** A copy of a virtual machine that shares virtual disks with the parent virtual machine in an ongoing manner. This conserves disk space and allows multiple virtual machines to use the same software installation. Linked clones can be created very quickly because most of the disk is shared with the parent VM.

    - **Full Clone:** An independent copy of a virtual machine that shares nothing with the parent virtual machine after the cloning operation. The ongoing operation of a full clone is entirely separate from the parent virtual machine.

- **Clone Role:** Assign the clone to the role it will play in the inventory.

    - **Template:** A pristine virtual machine image used as the basis for cloning many virtual machines. Template VMs cannot be powered on, modified, or assigned to pods.

    - **Master:** A virtual machine used as the basis for cloning other virtual machines. Master VMs can be assigned to pods, modified, and powered on.

    - **Normal:** A virtual machine that can be assigned to a pod. A normal VM will typically revert to a specified snapshot at the start of a lab reservation.

    - **Persistent:** A virtual machine that can be assigned to a pod and retains its state between labs. A persistent VM is typically used in conjunction with Pod Assigner to create long-term personal pods.

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- **Runtime Host or Group:** The host server where the virtual machine will run.

- **Datastore:** The VMware datastore that will contain the new VM's virtual disk files.

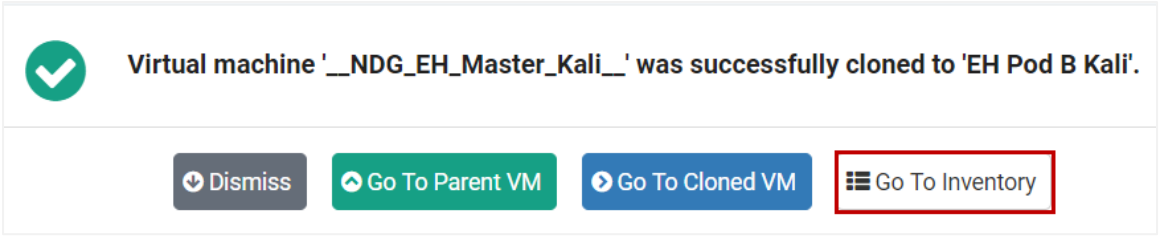
- **Storage Allocation:** Indicate the type of storage allocation to be used for the virtual machine.

    - **On Demand** allocates storage for the new virtual machine as needed; this favors storage reduction at the expense of decreased write performance.

    - **Preallocated** allocates all storage for the new virtual machine in advance; this favors better write performance at the expense of increased storage.

- **Copy BIOS UUID**: If the checkbox is checked (enabled), this VM's BIOS UUID will be copied to any VM cloned from this VM.

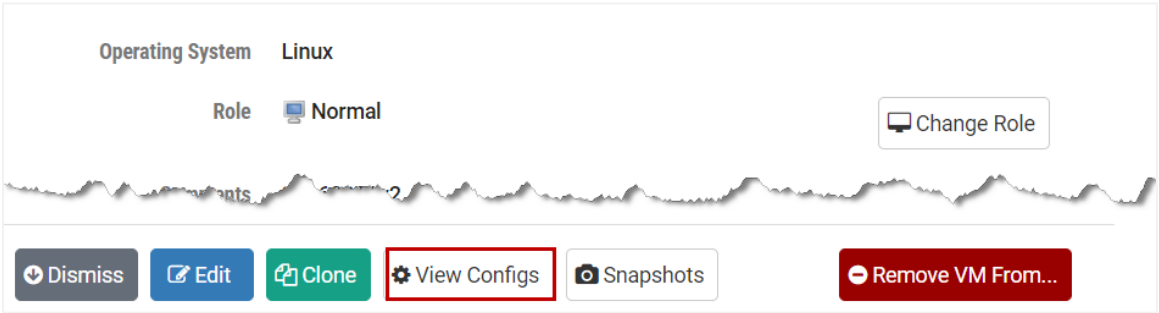
4. The results of the cloning process will be displayed. To return to the inventory, select **Go To Inventory**.



24.1.4 Viewing Configs of a VM in the Inventory

Follow the steps below to view the **.vmx** settings for any VM in the Virtual Machine Inventory.

1. Select a virtual machine in the Virtual Machine Inventory to display the details of the VM.
2. Select the **View Configs** button.



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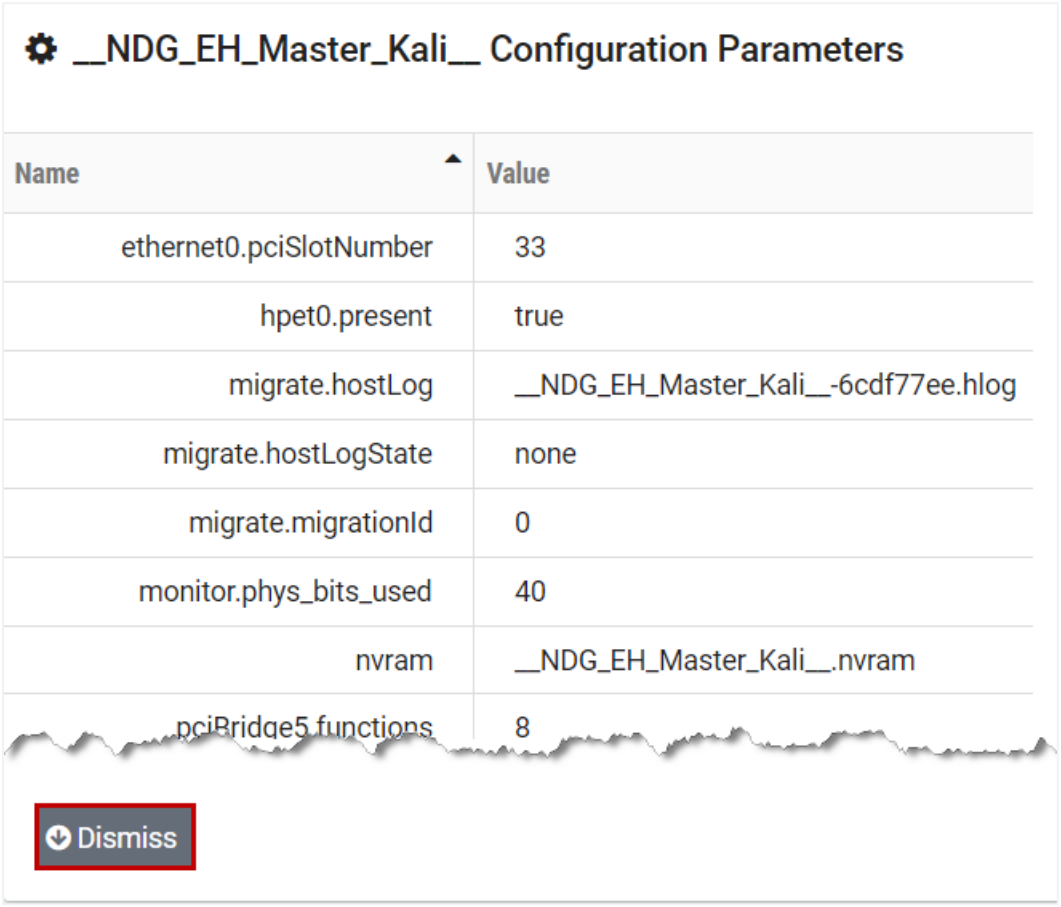
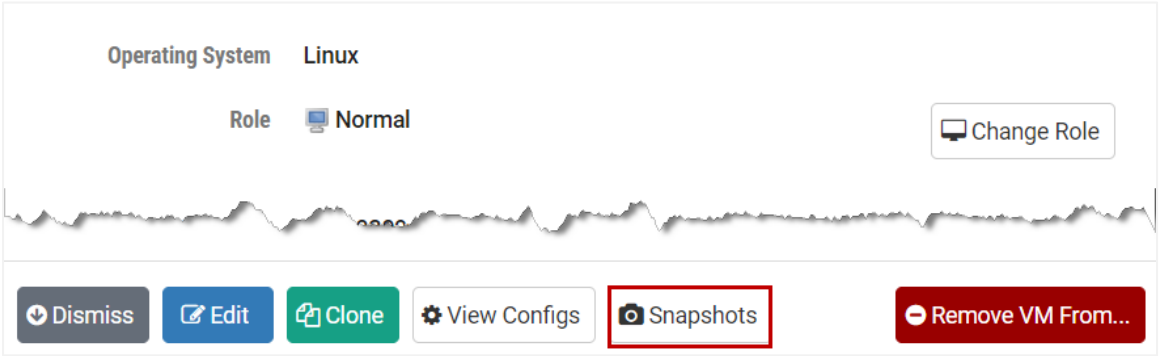
3. The configuration parameters for the VM will be displayed. When you are finished viewing the information, click **Dismiss**.



24.1.5 Managing Snapshots for a VM in the Inventory

Follow the steps below to access the Snapshot Manager for any VM in the virtual machine inventory.

1. Select a virtual machine in the Virtual Machine Inventory to display the details of the VM.
2. Select the **Snapshots** button.



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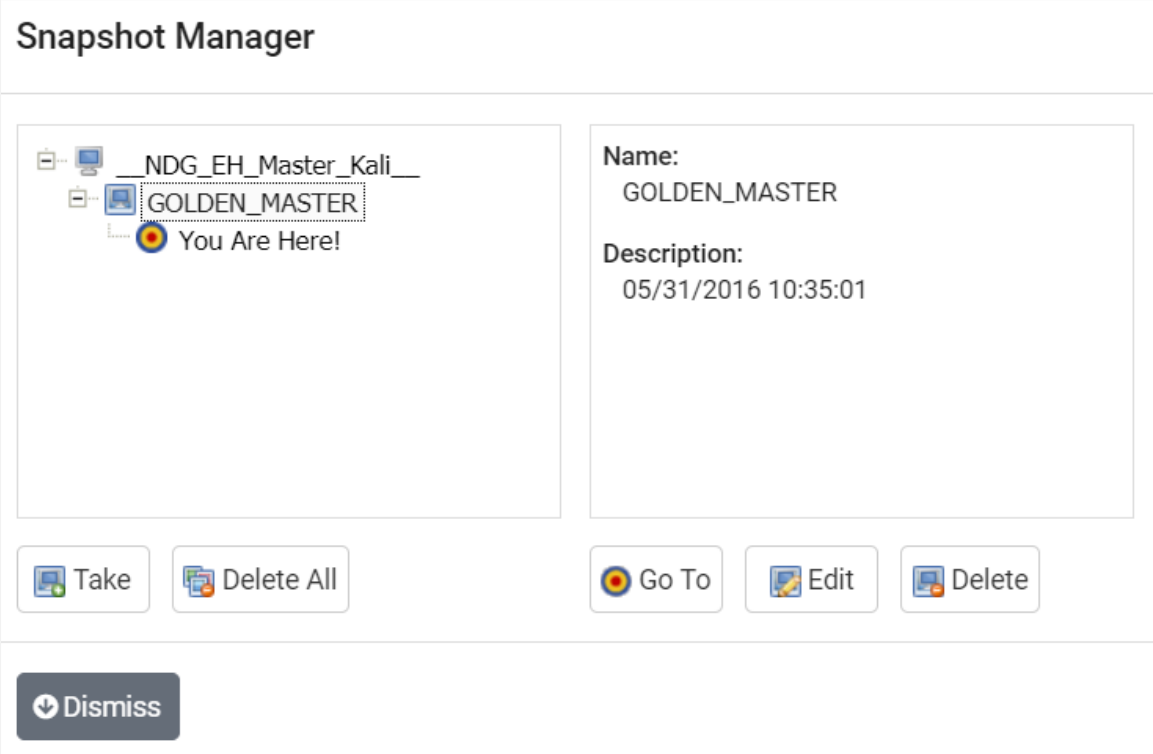
3. The **Snapshot Manager** will be displayed.

For detailed guidance on the use of the Snapshot Manager, please refer to the *Virtual Machine Snapshots* section of *Remote PC Guide Series - Volume 4, Creating and Configuring Virtual Machines for NETLAB+.*
Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the



24.2 Virtual Datacenters and Management Agents

Define the virtual datacenters that contain your virtual machines and management agents (i.e., vCenter) used to broker NETLAB+ automation requests.

For detailed guidance see the *Registering a Virtual Datacenter in NETLAB+* section of the *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure* including information on adding and testing datacenter settings. Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the guide.

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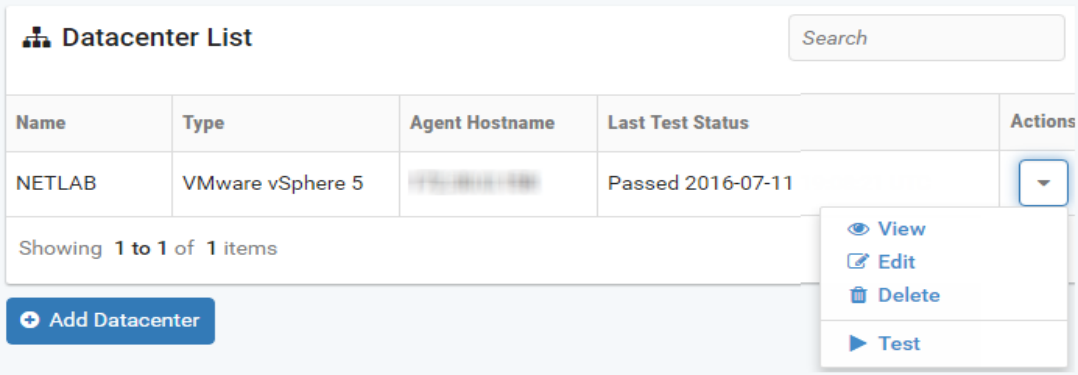
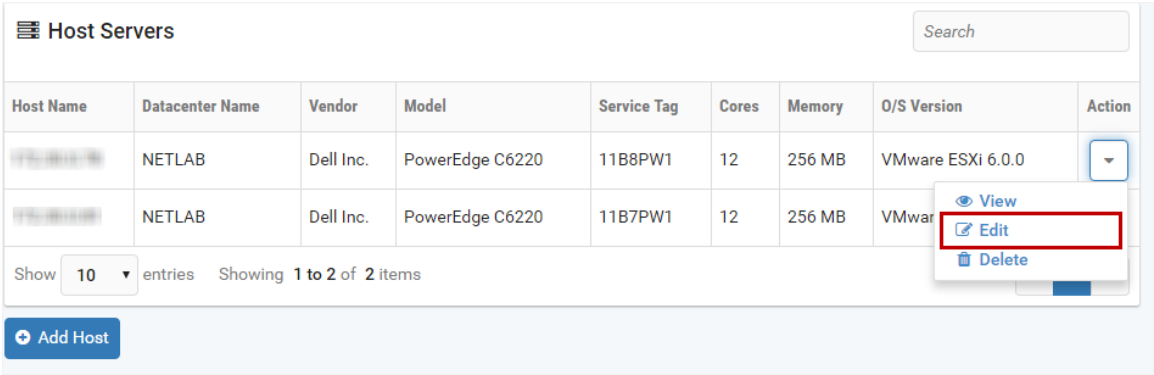


24.3 Virtual Machine Host Servers

Define the virtual machine host servers in your datacenter that are available to NETLAB+.

To edit settings for a virtual machine host server, follow the following steps.

1. Using the Action dropdown, select the option to **Edit** a Host Server.



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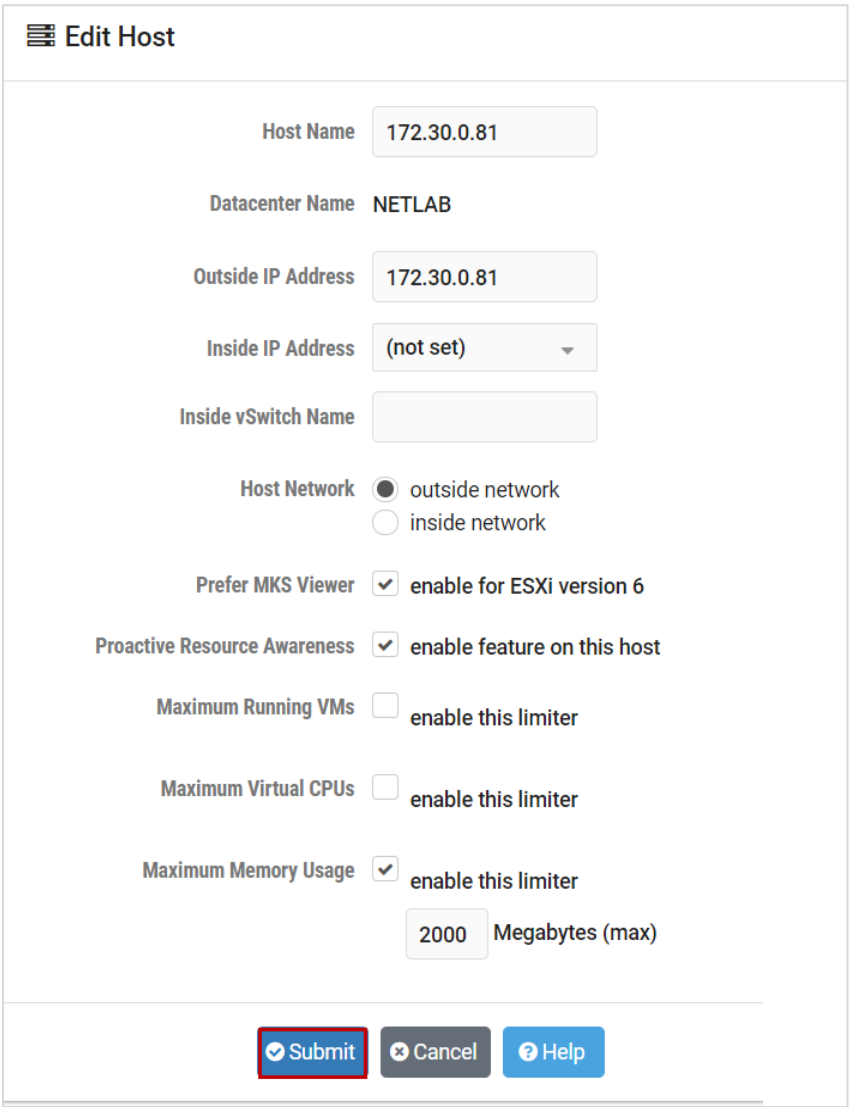
2. The Edit Host page will be displayed. Please refer to the field descriptions below. Update the values as appropriate for your host server and then click **Submit**.



Field Descriptions – Edit Host

- **Host Name**: The name of the host EXACTLY as it appears in the management agent (i.e., vCenter). This can be a host name, full qualified domain name, or IP address.

- **Datacenter Name**: The name of the datacenter is displayed in this field.

- **Outside IP Address**: The IP (version 4) address of the network interface on this host that is reachable by the NETLAB+ outside network interface. These interfaces are usually connected to a campus LAN segment. You may leave this blank if you want NETLAB+ to communicate with this host over the NETLAB+ inside network (i.e., control switch).

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- **Inside IP Address**: The IP (version 4) address of the network interface on this host that is reachable by the NETLAB+ inside network interface. Inside interfaces connect to ports on the NETLAB+ control switch. IP addresses designated for inside host interface are in the 169.254.0.X range. An inside interface and IP address is required on this host when connecting to a NETLAB+ control switch (for VMs interacting with real lab equipment).

- **Inside vSwitch Name**: The name of the virtual switch that has an uplink port to a control switch on the inside network. This is typically vSwitch1 or vSwitch0 on a VMware ESXi host when the host is configured per the NDG documentation. This value is required to enable automatic networking of virtual machines in real equipment pods. If blank, automatic networking for real equipment pods will not occur.

- **Host Network:** Select the option of Outside Network or Inside Network. The network will be used to communicate between the NETLAB+ server and this host server. The outside network is recommended.

- **Prefer MKS Viewer:** Opt-in available for ESXi 6.0 and 6.7 hosts. This setting only affects hosts running ESXi version 6. If enabled, NETLAB+ will use the more advanced VMware MKS (mouse, keyboard, screen) viewer. If unchecked, NETLAB+ will use a VNC viewer for remote display. See the next section for additional discussion on the MKS viewer.

  Selecting the MKS viewer provides the advantage of desktop resize to match the client display area for single-user reservations. (student or instructor). VMware tools and adequate video memory to support desktop resizing capability are required on the guest operating system.

  If the host is running ESXi version 7 or higher (NETLAB+ support of ESXi 7 to be announced, when available), NETLAB+ will always use MKS (as VNC is no longer supported as of version 7). NETLAB+ will use VNC if the host is running ESXi version 5 and lower.

- **Proactive Resource Awareness:** Check this box to enable Proactive Resource Awareness on this host. When enabled, the scheduling system will ensure that the resources on this host are not oversubscribed at any one time based on your maximum resource settings. Enabling this feature will make these additional options available for selection:
  - **Maximum Running VMs:** The maximum number of virtual machines that can be running on this host at one time.
  - **Maximum Virtual CPUs:** The maximum number of virtual CPUs that can be running on this host at one time.

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- **Maximum Memory Usage:** The maximum amount of memory (in Megabytes) that can be allocated by virtual machines on this host. This does not include overhead memory used by the host and/or virtual machines. (Examples: 2000 = 2 Gigabytes, 70000 = 70 Gigabytes)

For detailed guidance, see the *Adding ESXi Hosts in NETLAB+* section of the *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure*. Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the guide.

24.3.1 MKS Viewer Considerations and Troubleshooting

As mentioned in the previous section, the option to use the more advanced MKS (mouse, keyboard, screen) viewer, replacing the VNC viewer, is available for host servers running ESXi 6.

The option to select the MKS viewer is available for hosts running ESXi 6 only. If the host is running ESXi version 7 or higher, NETLAB+ will always use MKS (as VNC is no longer supported as of version 7). NETLAB+ will use VNC if the host is running ESXi version 5 and lower.

Selecting the MKS viewer provides the advantage of the ability to resize the desktop to match the client display area, allowing a full-screen display for single-user reservations (instructors and students). Lab reservations for instructor-led training or team reservations do not include this capability.

VMware tools and desktop resizing capability are required on the guest operating system. A solid, one-color background should be selected for the VM. A desktop background image or a gradient color selection will result in very slow screen updates and consume significantly more bandwidth than a solid one-color background.

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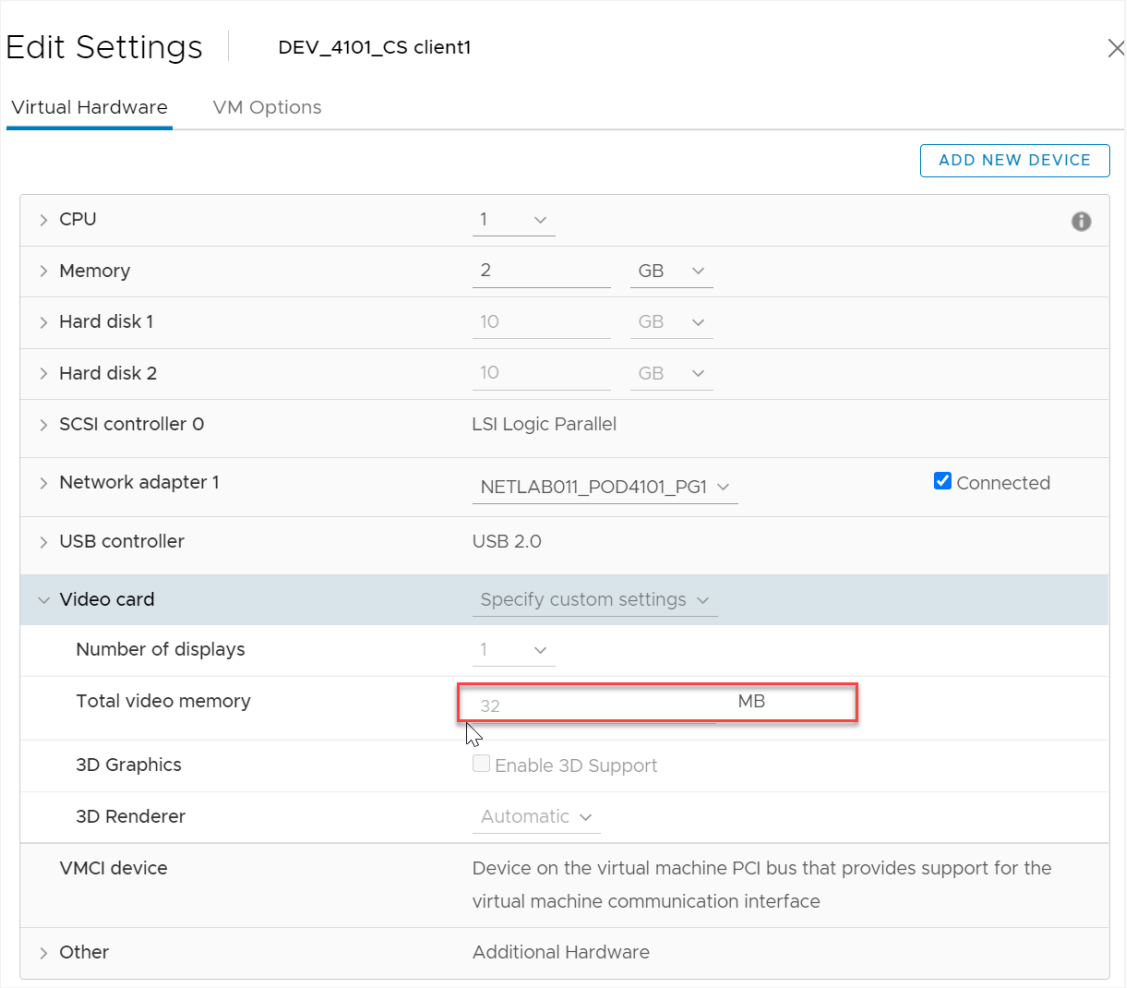
Adequate memory must be allocated in the VM in order to support full-screen use. Total video memory of at least 32MB is recommended.



32MB of memory provides sufficient memory for a 4k display.

Display Resolution Standard	Width, in Pixels	Height, in Pixels	1-Monitor Overhead
VGA	640	480	1.20MB
WXGA	1280	800	4.00MB
1080p	1920	1080	8.00MB
WQXGA	2560	1600	16.00MB
UHD (4K)	3840	2160	32.00MB

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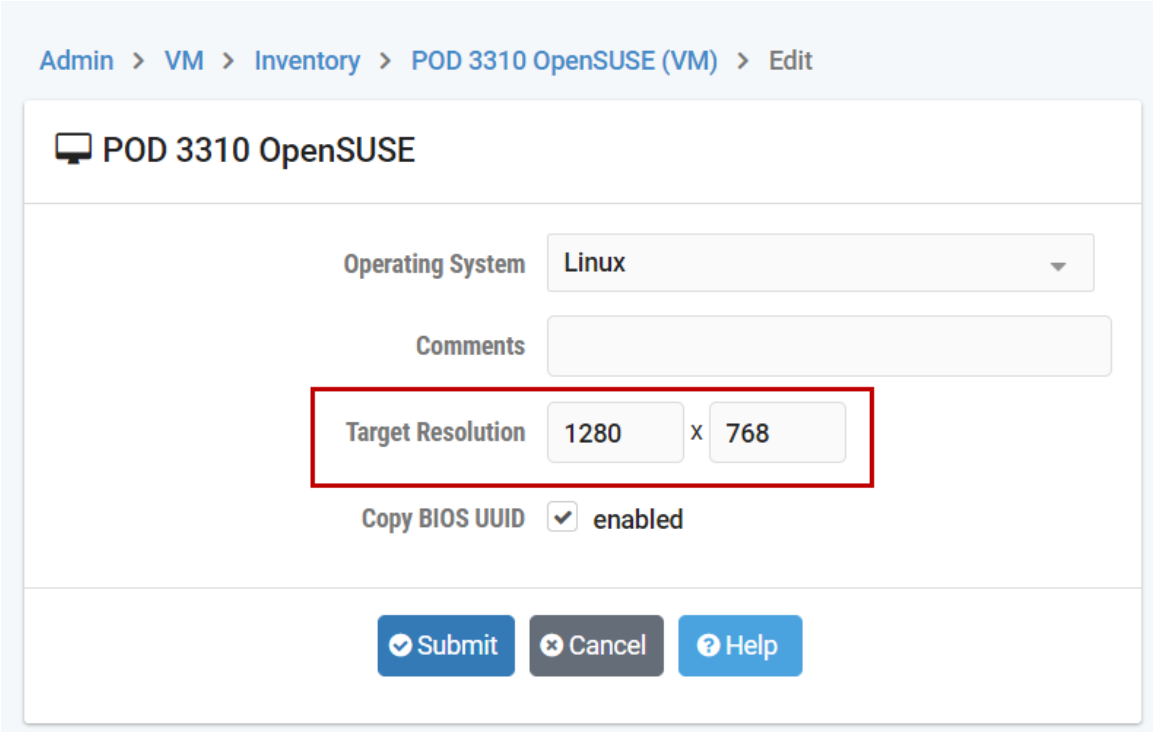
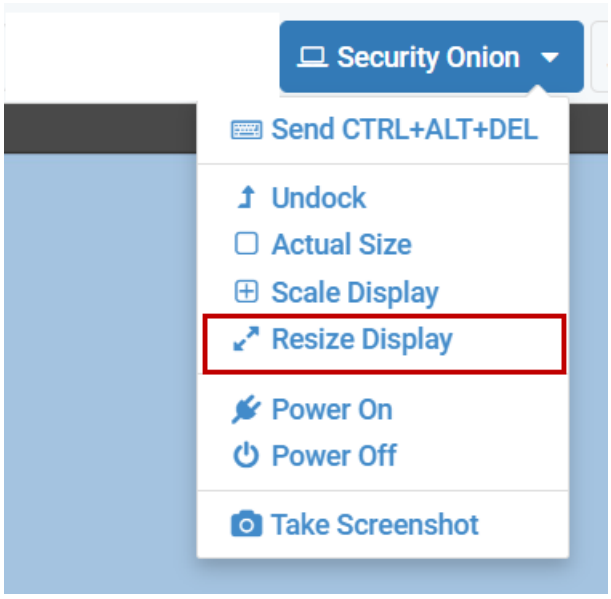
Review the settings for **Target Resolution** for the VM by selecting the VM in the NETLAB+ Virtual Machine inventory. The target resolution should match the value set for the VM's desktop size.



When a VM is selected by a user during a lab session, the option to **Resize Display** will be available if the MKS viewer has been selected for the host server and properly configured.



This is particularly helpful to use after entering full-screen mode (select F11 if using Windows) since it will enable users to make use of the entire screen's "real estate" as the working area.

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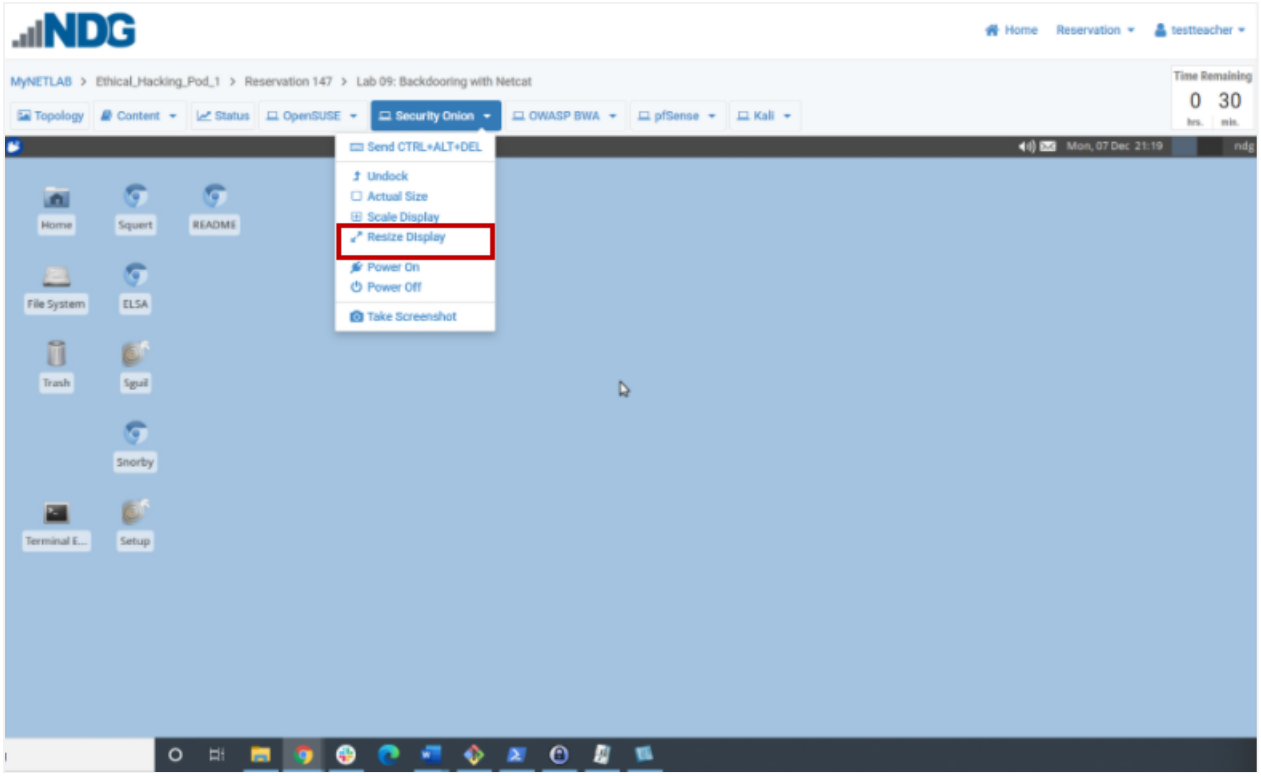
Be aware that in some cases (depending on the selected OS and other VM settings), the Resize Display option will not function until the user has first performed their initial login to the VM, as per the instructions provided in the lab content.



If the Resize Display option is not available for selection (greyed out) or not functioning as expected, review the items below.

Troubleshooting Checklist – MKS Viewer

1. Has the option to **Prefer MKS Viewer** been selected for the host server? This option is available only for ESXi 6. For ESXi version 7 or higher, NETLAB+ will always use MKS.
2. Be aware that the **Prefer MKS Viewer** setting will determine which viewer is used, depending on its value at the time of lab initialization. Lab reservations in progress will not reflect a change in viewer selection.
3. Is **VMware Tools** installed on the VM?
4. Is the **Total Video Memory** for the VM set to at least 32MB?
5. Is the lab reservation for a single user (instructor or student)? The Resize Display option is not available in ILT or team reservations.
6. Has the user completed their initial login into the VM? In some cases (depending on the selected OS and other VM settings), the Resize Display option will only function after the user has performed their initial login to the VM, as per the instructions provided in the lab content.

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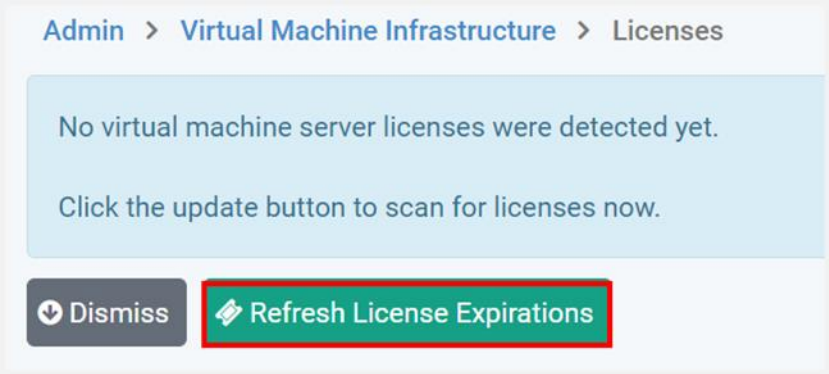
24.4 Virtual Machine Server Licenses

This option is used to view virtual machine server licenses and check expiration dates. In some cases, it may be necessary to refresh NETLAB+'s local data for VM datacenters and managed hosts.

Refreshing license expirations allows the administrator to update NETLAB+s view of hosts and datacenters for any reason (for example, an ESXi OS update).

1. Go to **Admin > Virtual Machine Infrastructure > Licenses.**
2. Select the **Refresh License Expirations** button.



3. Review the licensing information shown in the virtual machine inventory to verify the licensing information is now up to date.

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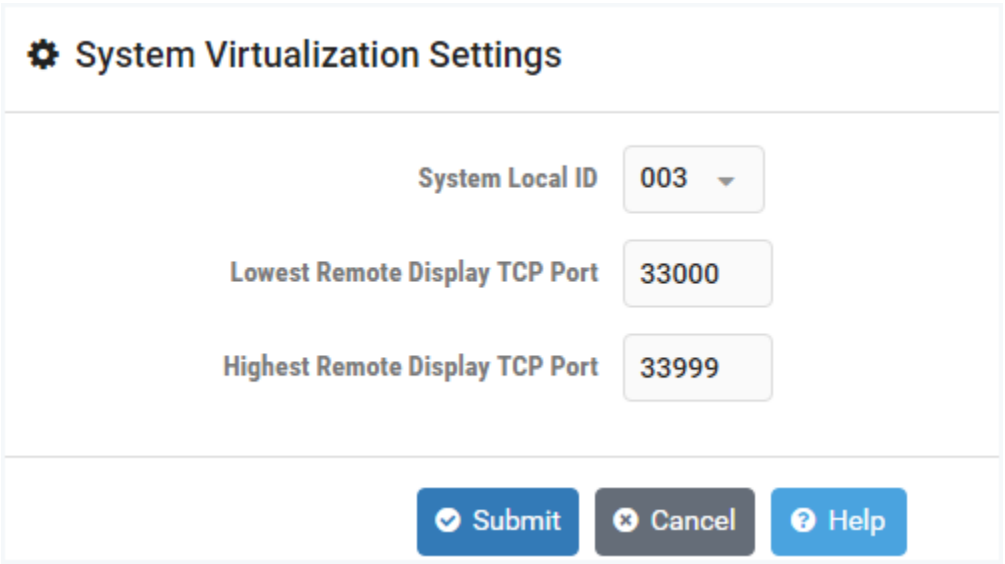
24.5 System-wide Virtualization Settings

View and update system-wide virtualization settings. These settings are changed when deploying multiple NETLAB+ systems that share a common Virtual Machine Infrastructure.

Typically, you should use the default settings unless your VMI is shared with multiple NETLAB+ systems.

For detailed guidance, see the *Setting the Local System ID When Using Multiple NETLAB+ Systems* section of the *Remote PC Guide Series - Volume 3 Configuring the NETLAB+ Virtual Machine Infrastructure*. Please be aware that you will see some variation in the user interface between your NETLAB+ system and the version of NETLAB+ in the guide.



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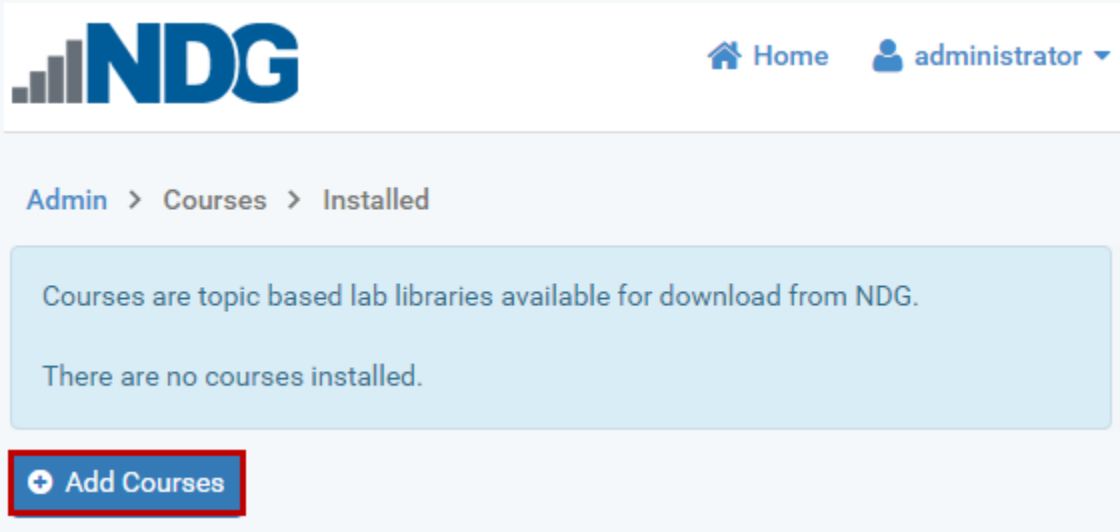
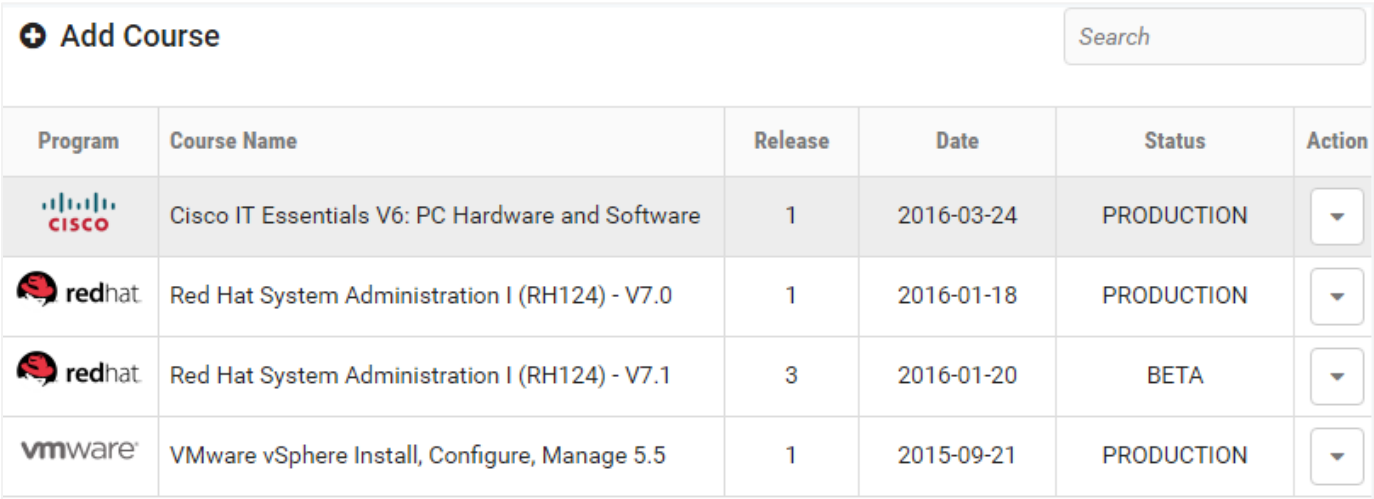
25 Course Manager

The NETLAB+ Course Manager acts as a course catalog, listing all courses (topic-based lab libraries) that are available for download from NDG. You will use the Course Manager to select lab libraries to install on your NETLAB+ system.

When you initially select the Course Manager, it will indicate that there are no courses installed.



Select **Add Courses** to display the list of courses.



The Course Manager displays the following information for each course:

- **Program:** Indicates the vendor program (if any) with which the lab library is associated. In many cases, you must be a registered participant in order to download the lab library.

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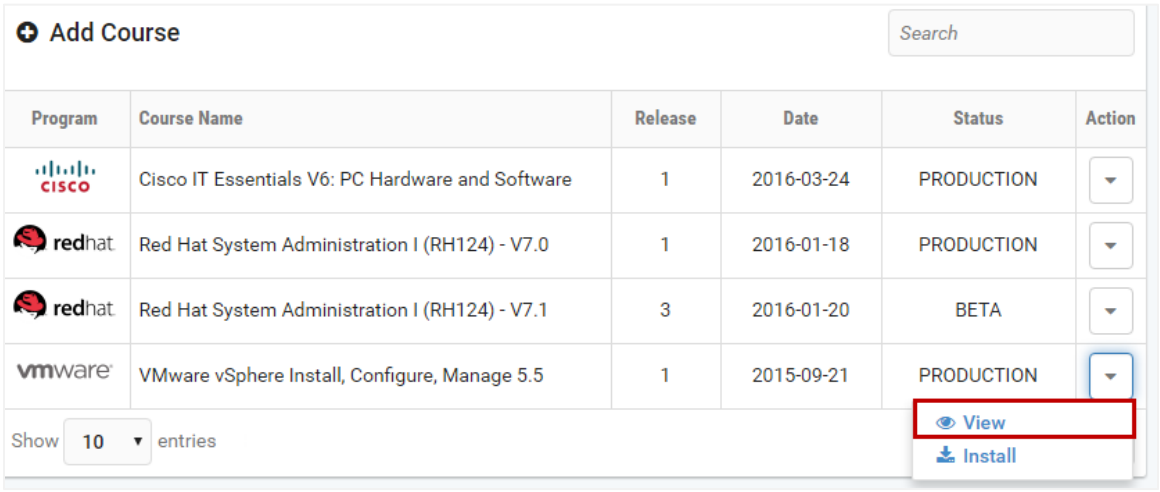
The Course Manager displays all lab libraries available. Your access to download the course materials may be limited by your organization's participation in vendor programs.

- **Course Name:** List the course name associated with the lab library.
- **Release:** Indicates the release number of the lab library. Multiple releases of a lab library may be available due to updates/bug fixes, revisions, and/or to support updates to course material released by the vendor.
- **Date:** Indicates the date released.
- **Status:** The status of the release version of the lab library is displayed.
  - **Production:** The release is available for use.
  - **Beta:** The release has been made available for evaluation purposes.

25.1 View Course Details

To view course details, select **View** on the Action dropdown, as shown below (or simply click on the row of course information).



The course details are displayed (same information as what appeared on the course list).

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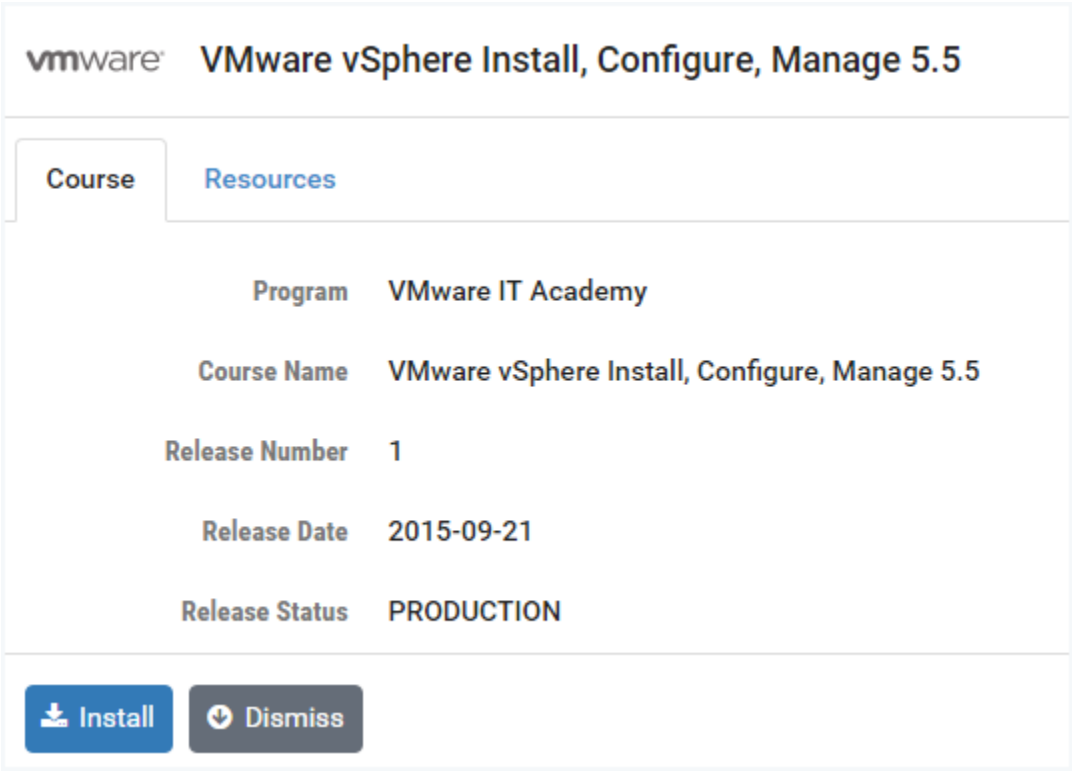
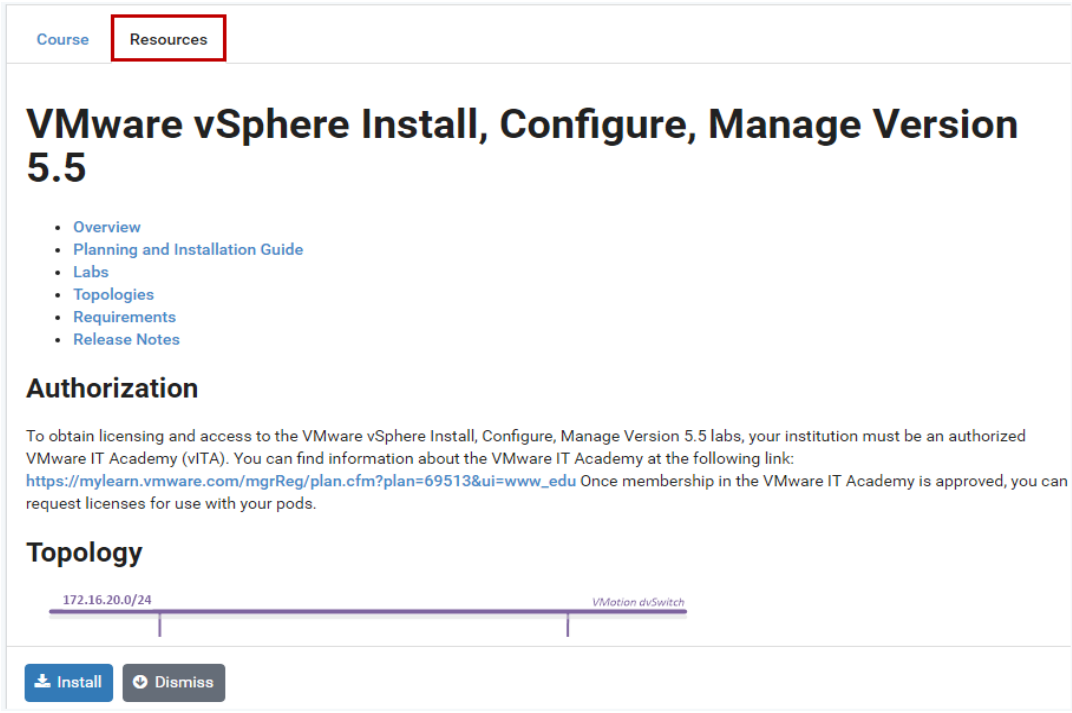


Select the Resources tab to see the resource information related to the course. The information will include a link to the planning and installation guide, which provides instructions on installing pods and creating virtual machines to meet the specific requirements to support the labs associated with the course. If authorization is required in order to access the labs, you will find links to the appropriate vendor program. You will also be able to view a picture of the topology.



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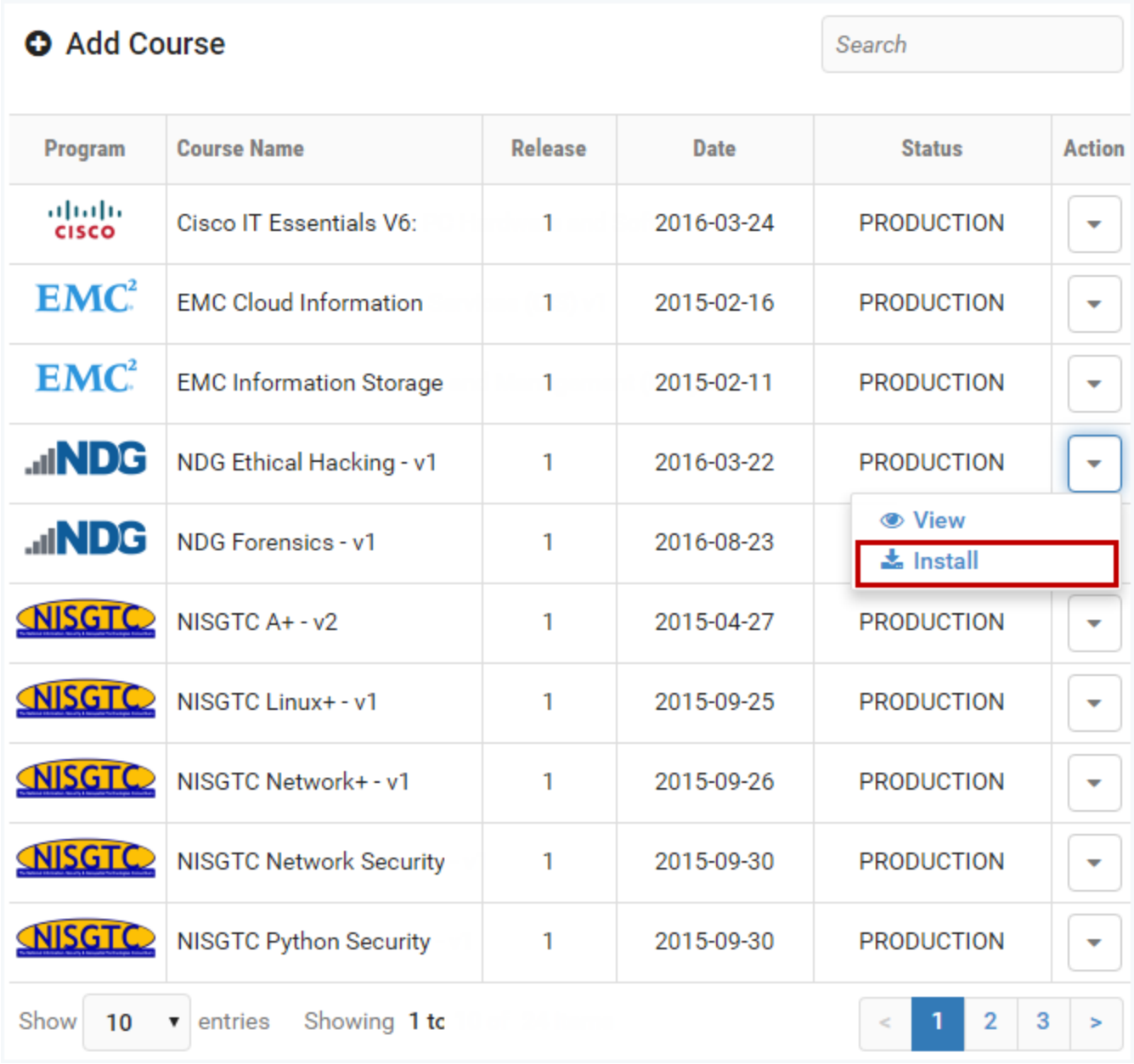
25.2 Install a Course

Follow the steps below to add a course to your NETLAB+ system:

1. To select a course from the list of courses, right-click on the Action dropdown and select **Install**.

Searching for a course? Enter the (full or partial) program or course name in the search box to filter the list of courses displayed.



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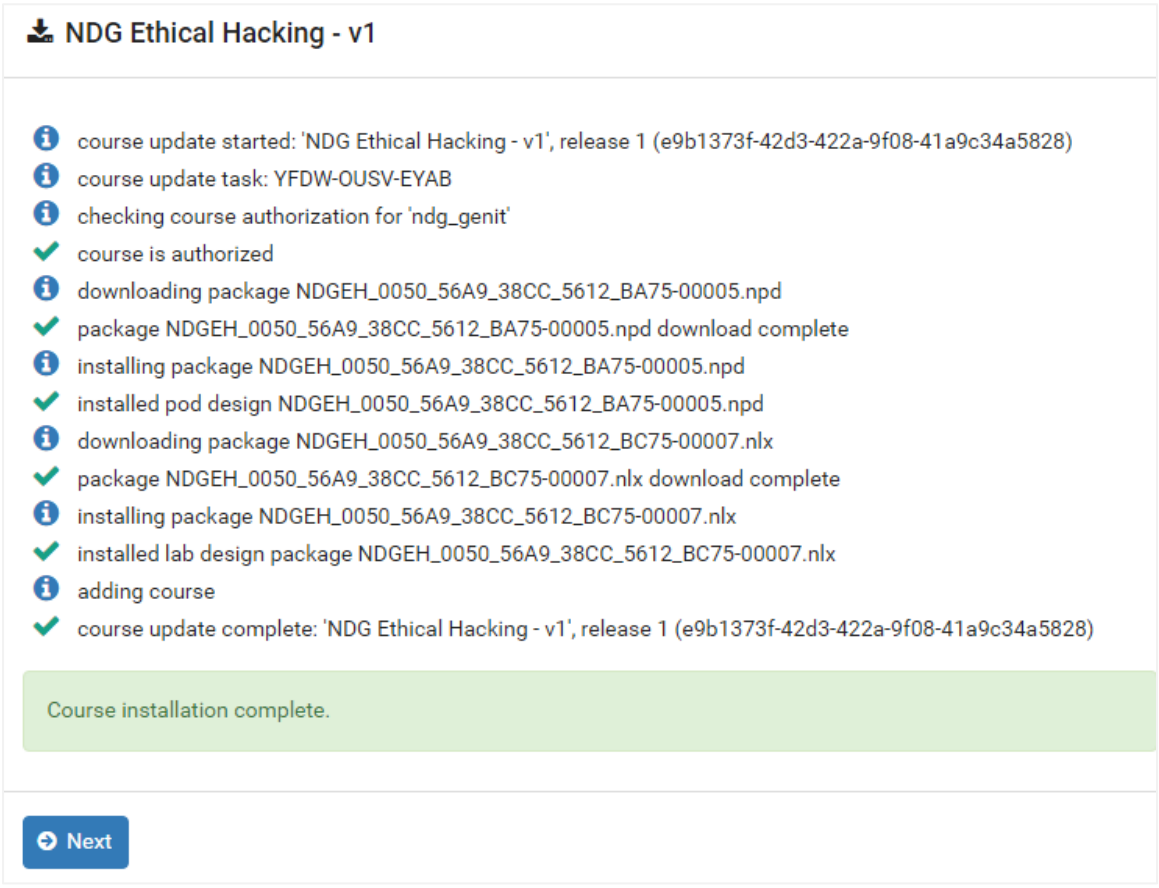
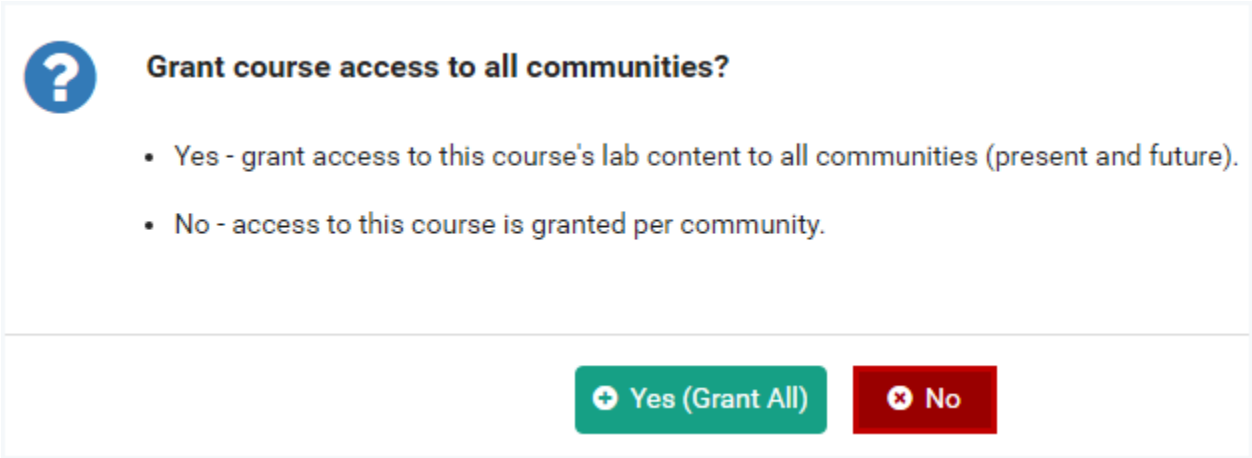
2. You will see messages displayed indicating the status of the installation for various components associated with the course, including course authorization, pod design, and lab design. Click **Next**.



3. You will be prompted to grant access to the course's lab content to all communities or to grant access per community. For this example, we will select **No**, so that we can select which communities on the system have access to the course content.



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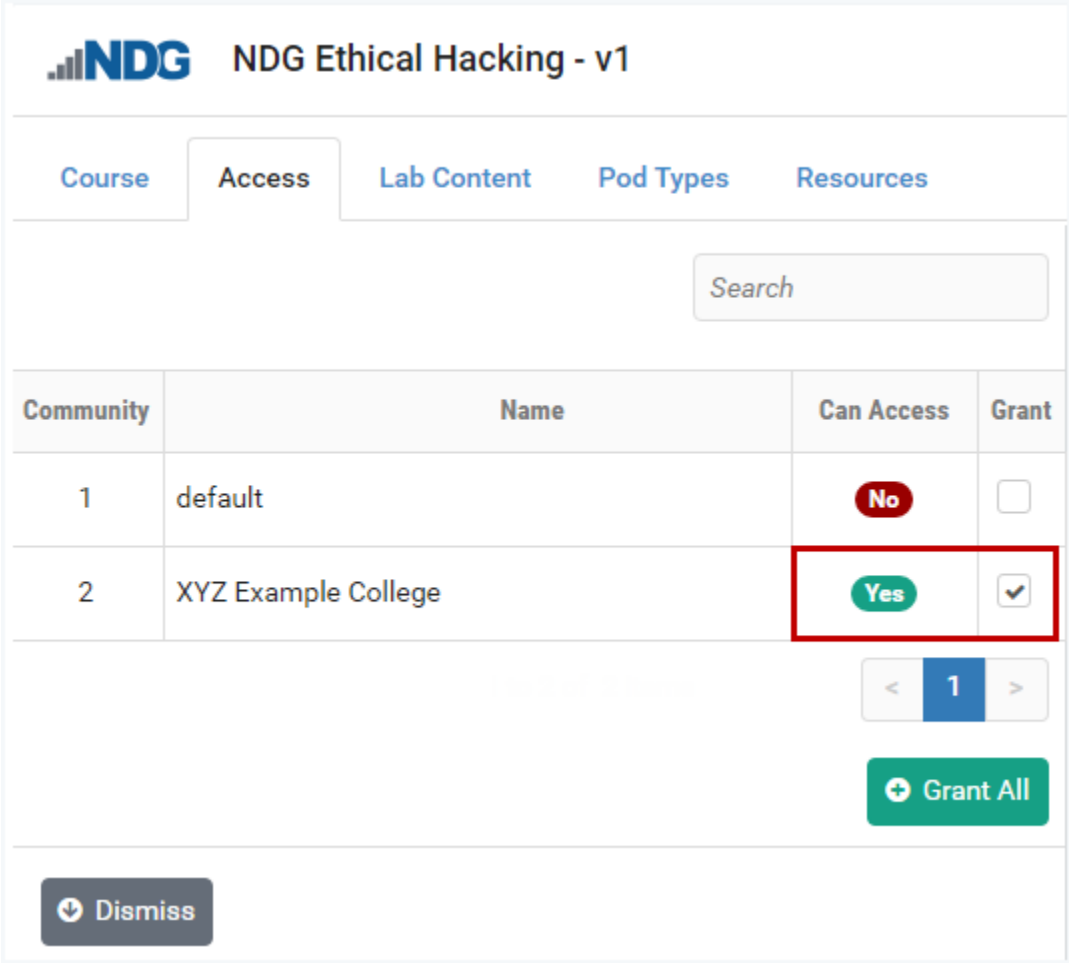
4. The access tab for the course is displayed. To grant access to a community, click the **Grant** checkbox for the community and notice that **Can Access** changes from No to Yes. In the example below, course access has been granted to *XYZ Example College*.

If you were to decide to grant access to all communities listed, you could do that in one-step by selecting **Grant All.**



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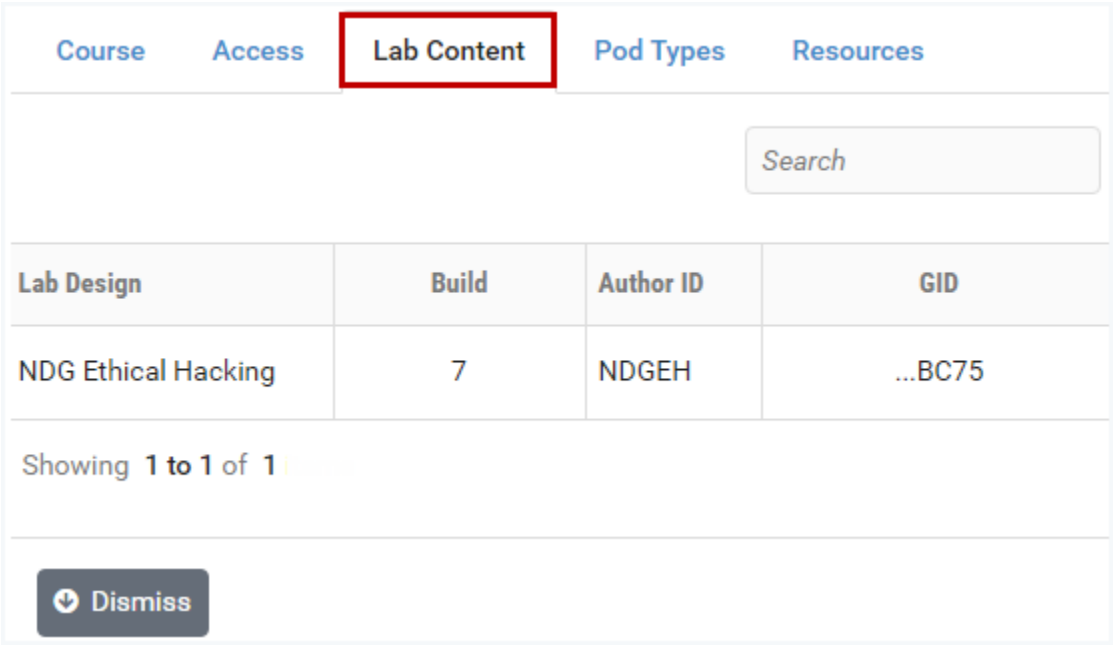
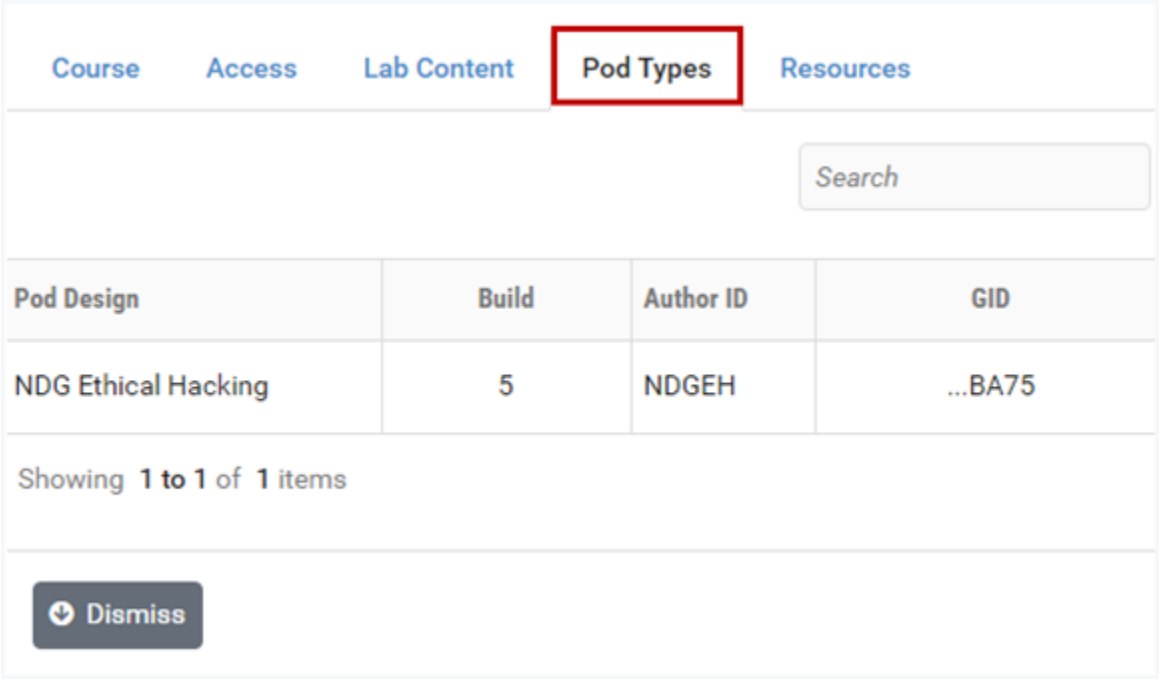
5. Before selecting Dismiss, a quick review of the course components installed is recommended. Select the Lab Content tab and see the Lab Design information.



6. Pod Design information is available on the **Pod Types** tab.



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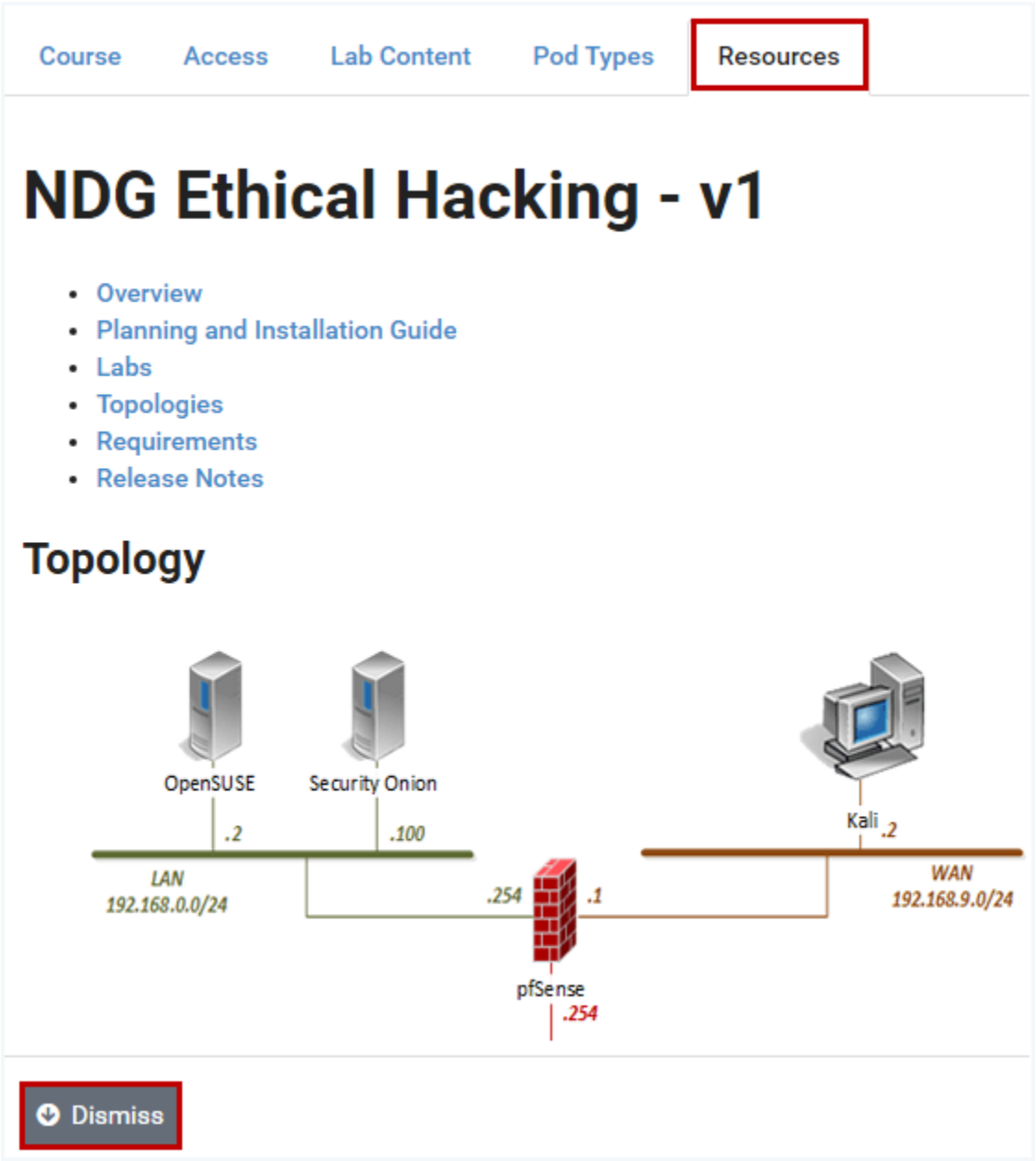
7. Select the **Resources** tab to see the resource information related to the course. The information will include a link to the planning and installation guide, which provides instructions on installing pods and creating virtual machines to meet the specific requirements to support the labs associated with the course. You will also see a picture of the topology.

Installing a course is the first step in making a lab library available to users. The administrator must also complete the process of installing pods and creating virtual machines as per the instructions provided in the Planning and Installation Guide specific to the course.



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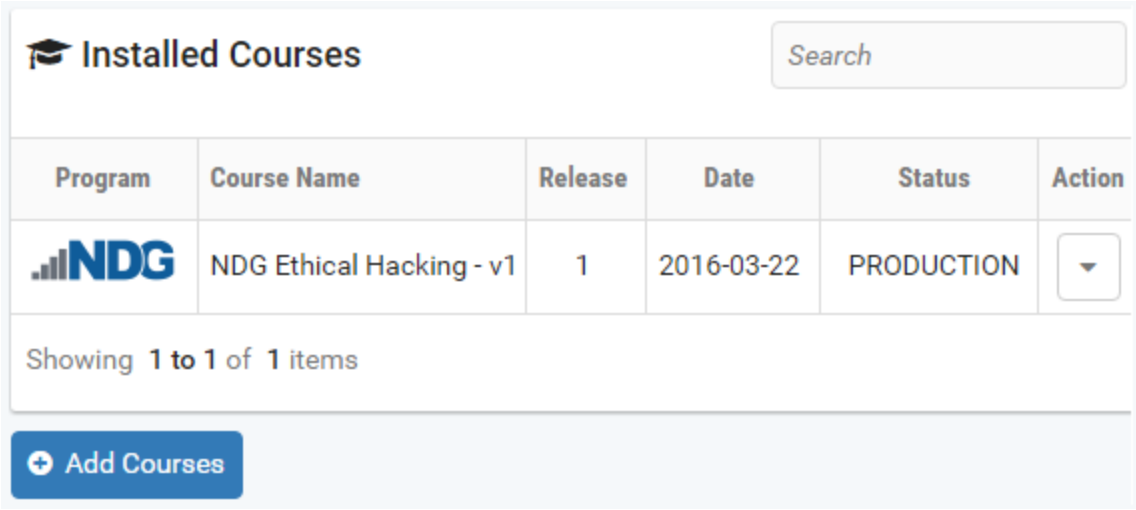
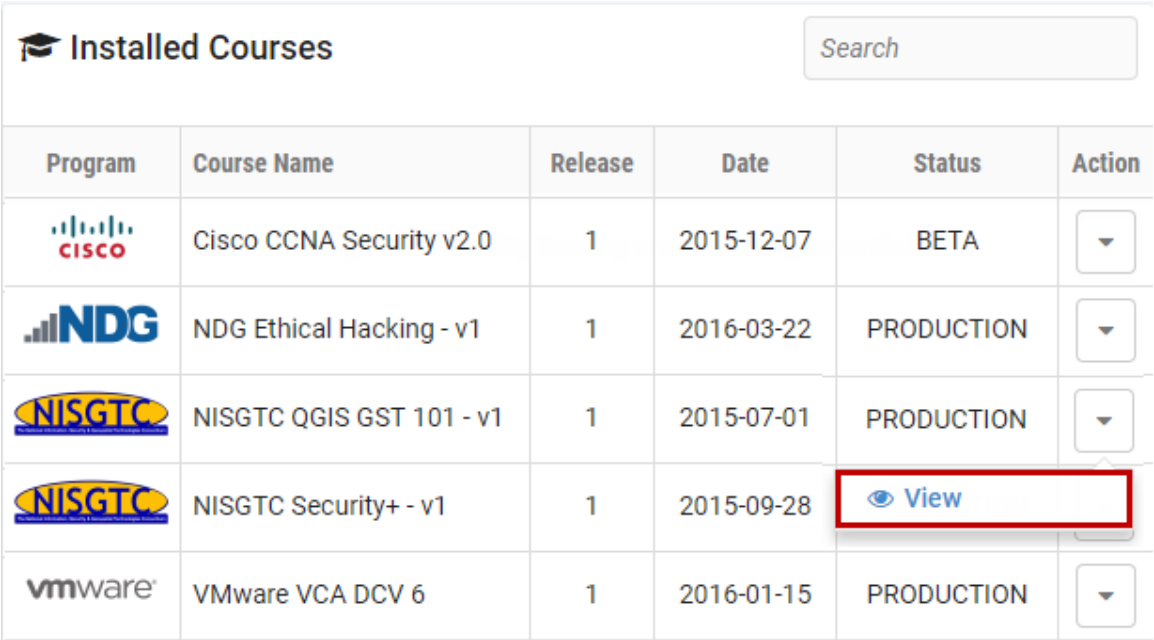
8. Click **Dismiss** to return to the list of installed courses.



25.3 Delete a Course

Follow the steps below to delete a course that is installed on your NETLAB+ system:

1. From the list of Installed Courses in the Course Manager, click the Action dropdown on the row of the course and select **View**.



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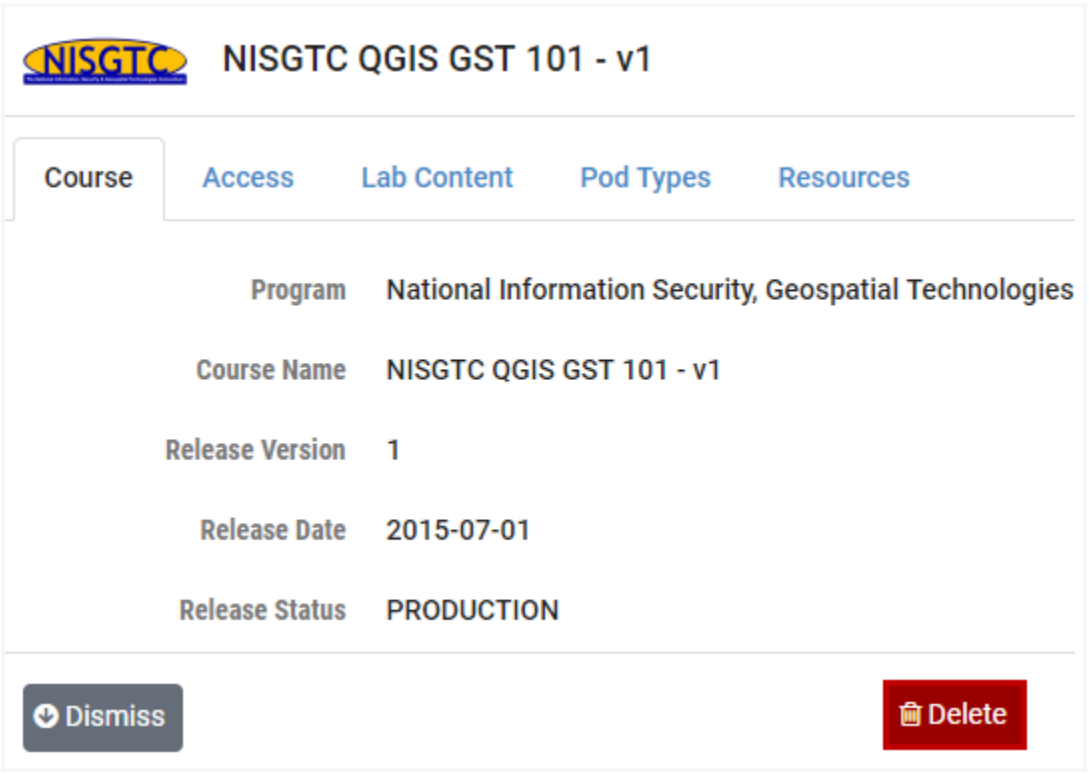
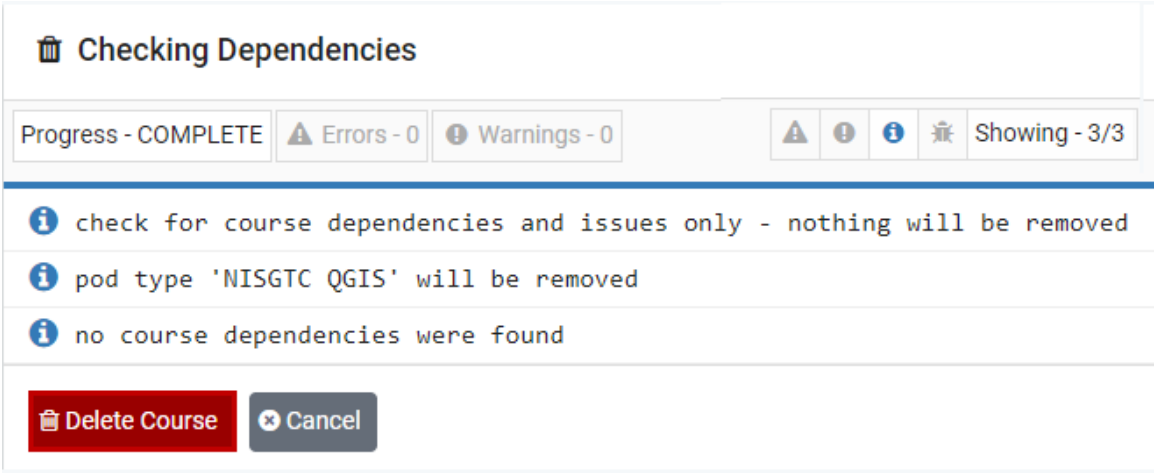
2. The course detail page will be displayed. Select the option to **Delete** the course.



3. A check for dependencies will be performed. Click **Delete Course**.

If the check for dependencies reveals that the course content is currently being used, be sure to carefully review the information and proceed only if you are certain that removing access to the content is desirable.



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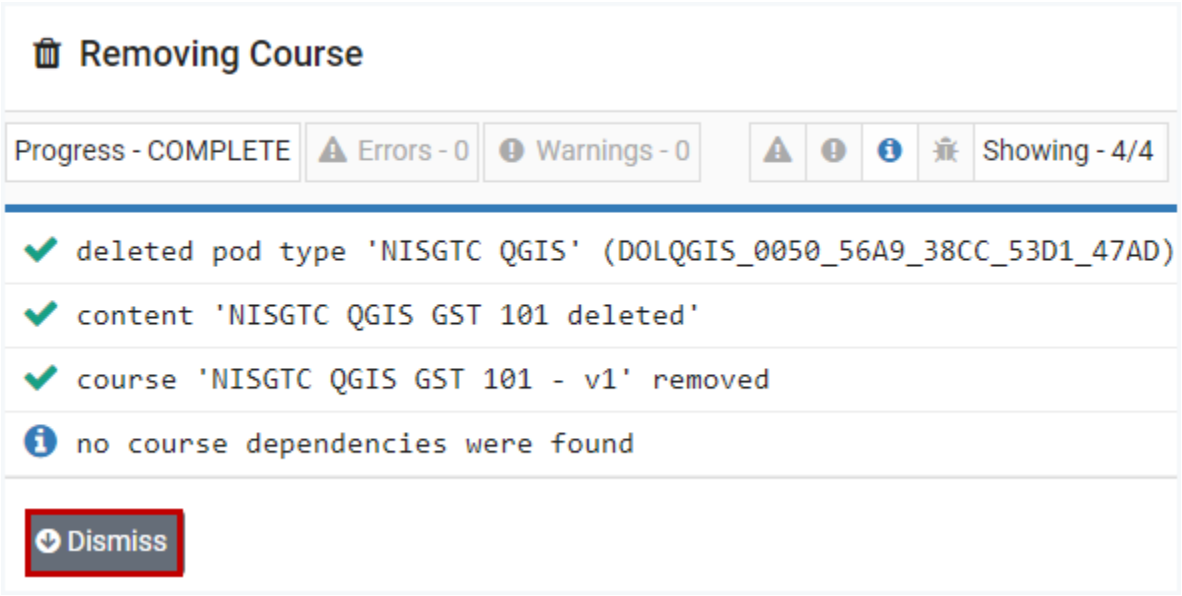
4. The progress of the processes performed to delete the course will be displayed; when complete, click **Dismiss**.



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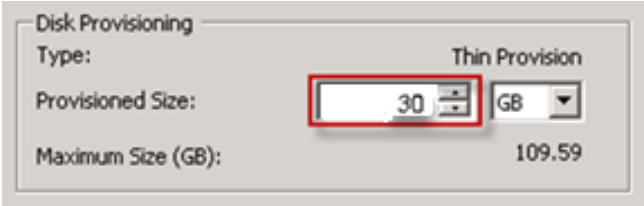
26 Disk Maintenance

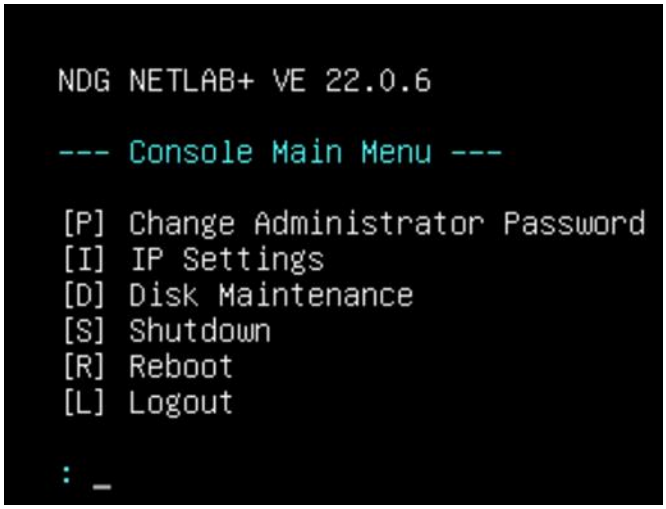
Should it become necessary to increase the size allocated to the disks supporting your NETLAB+ infrastructure, you may revise the settings by following the procedure described below.

Disk size cannot be modified if snaphots are present. It will be necessary to delete any snapshots prior to adjusting disk size.

1. Using the vSphere Client, adjust the Provisioned Size of the disk as necessary. See *the Deploy to the VMware ESXi Management Server* section of the *NETLAB+ Installation Guide* for details on accessing the settings in the vSsphere client. In the example screenshot below, Disk 3 (data) has been increased to a size of 30GB.



2. Next, you must adjust the disk size in NETLAB+, working through the NETLAB+ console. See the *Configuring the NETLAB+ Console* section of the *NETLAB+ Installation Guide* for details on accessing the NETLAB+ console. From the Console Main Menu, select **[D]** Disk Maintenance.



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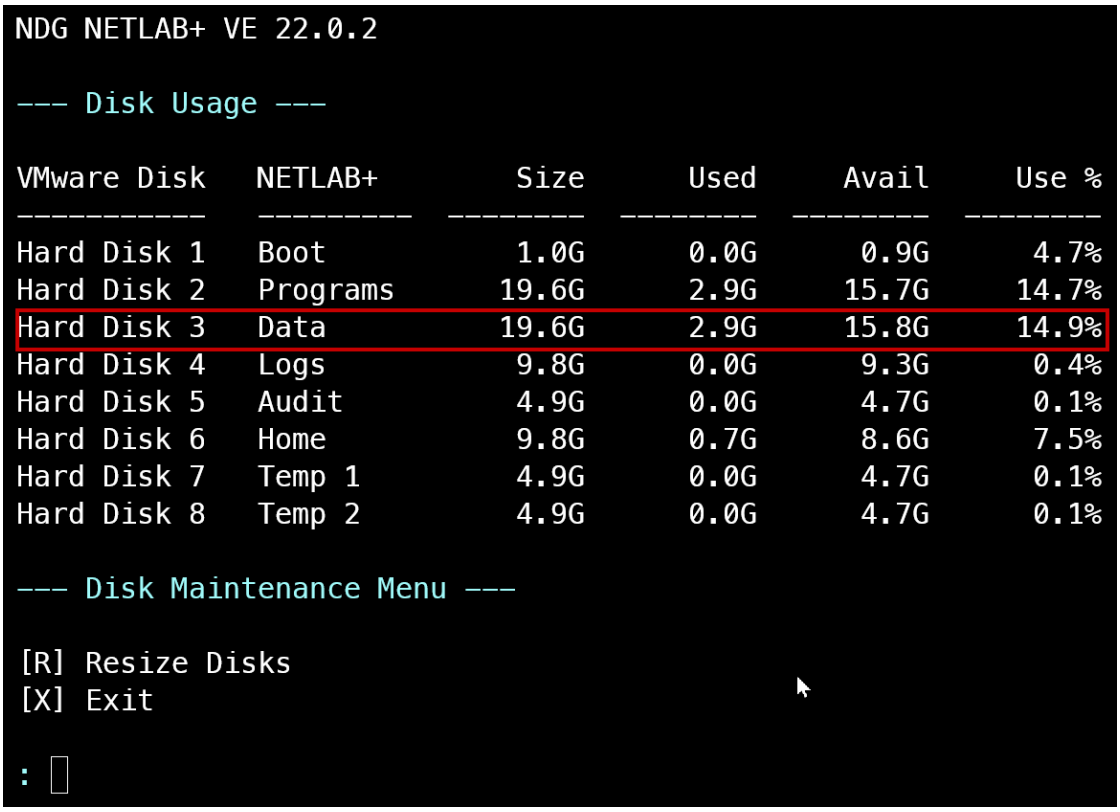
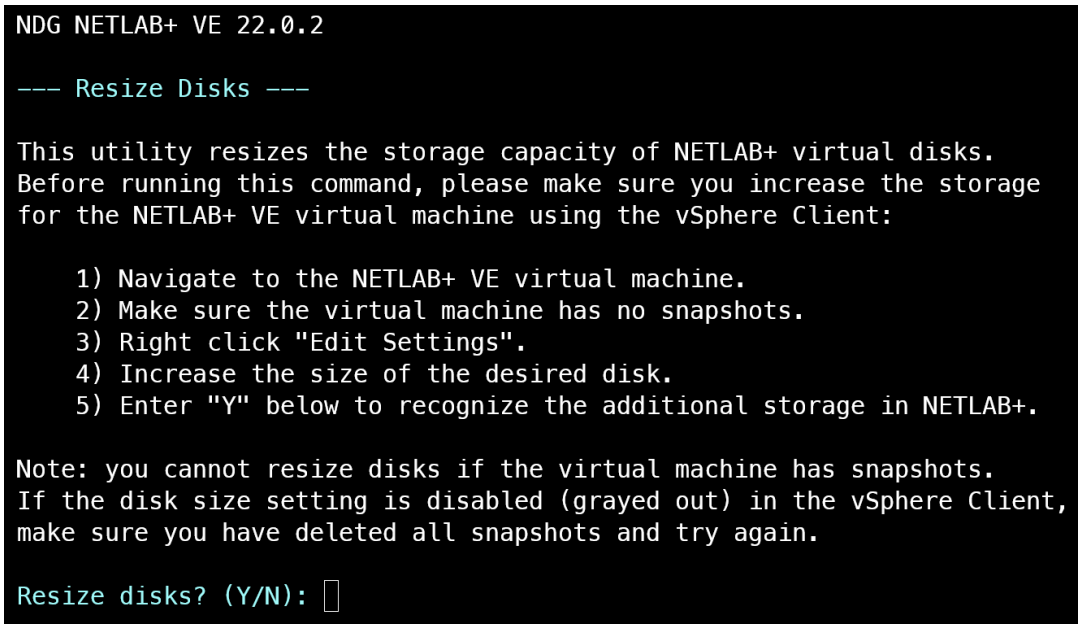
3. Note the current size for Hard Disk 3. Press [**R**] to resize the data disk.



4. Review the information and verify that the requirements listed have been met. Select [**Y**] for Yes to proceed with resizing.



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5. The new size of Hard Disks 3 should show an increase to approximately 29.5G. Press any key to continue.

Be aware that Hard Disk 1, the book disk, is NOT resizable.

```
Resize disks? (Y/N): y
Resizing disks, please wait...
*** Skipping Hard Disk 1, boot disk is not resizable
VMware Disk   NETLAB+    Previous       New      Gain
-----------   ---------  --------  --------  --------
Hard Disk 2   /dev/sdb      19.6G     29.4G      9.8G
Hard Disk 3   /dev/sdc      19.6G     29.5G      9.9G
Hard Disk 4   /dev/sdd       9.8G      9.8G        0G
Hard Disk 5   /dev/sde       4.9G      4.9G        0G
Hard Disk 6   /dev/sdf       9.8G      9.8G        0G
Hard Disk 7   /dev/sdg       4.9G      4.9G        0G
Hard Disk 8   /dev/sdh       4.9G      4.9G        0G
Press any key to continue...
```

6. Press **[X]** to exit.
7. Press **[L]** to log out.

```
NDG NETLAB+ VE 22.0.6

--- Console Main Menu ---

[P] Change Administrator Password
[I] IP Settings
[D] Disk Maintenance
[S] Shutdown
[R] Reboot
[L] Logout

: _
```


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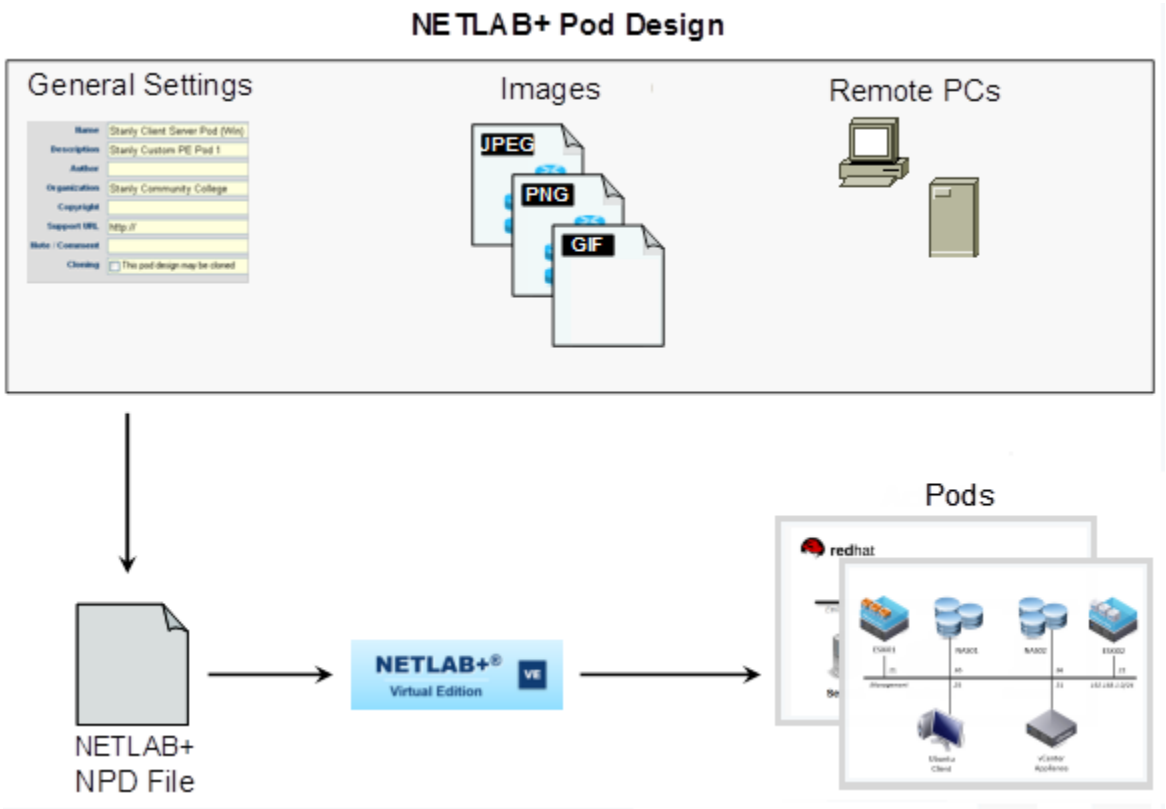
27 Pod Designer

Pod Designer is used to create a custom pod layout. A *pod design* is a template used to create one or more actual pods on a NETLAB+ system.

The Pod Designer tool is used to gather the required information about remote PCs and images. This data is stored in a *Pod Design File*. Pod design files are portable. They can be shared, exported, and installed on other NETLAB+ systems. A set of options and passwords control how the pod design can be used.

See the subsections below for details on performing basic tasks in Pod Designer, including viewing a list of installed pod designs and pod design details.

Please refer to the *NETLAB+ Pod Design Guide* for details on implementing custom pod designs.



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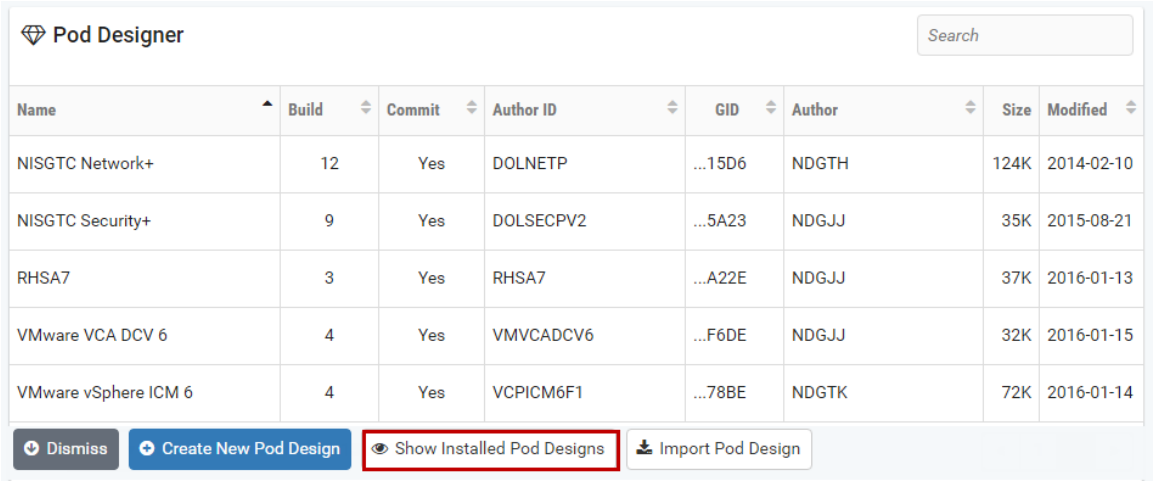
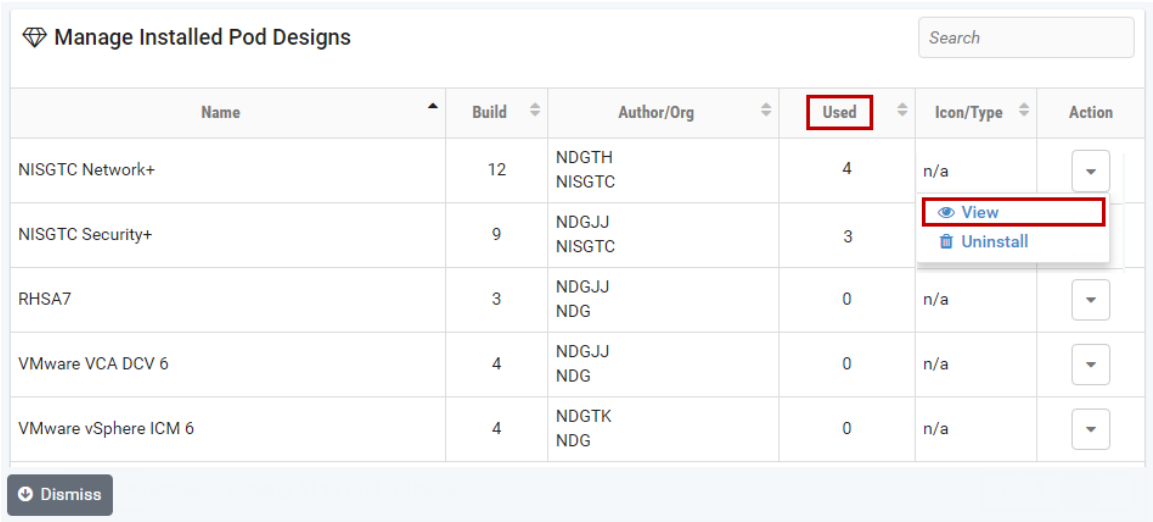
27.1 Viewing Pod Designs

To see a list of the pod designs available on your NETLAB+ system:

1. The **Pod Design List** is displayed when the Pod Designer option is selected on the administrator interface.
2. To see the pod designs that have been installed in the local NETLAB+ pod type database on this system, click **Show Installed Pod Designs.**



3. The currently installed pod designs will be displayed. The **Used** column indicates the number of instantiated pods of each type. Click on a pod for additional details and management options. Select the **View** option on the Action dropdown to see additional details for any of the pods displayed.



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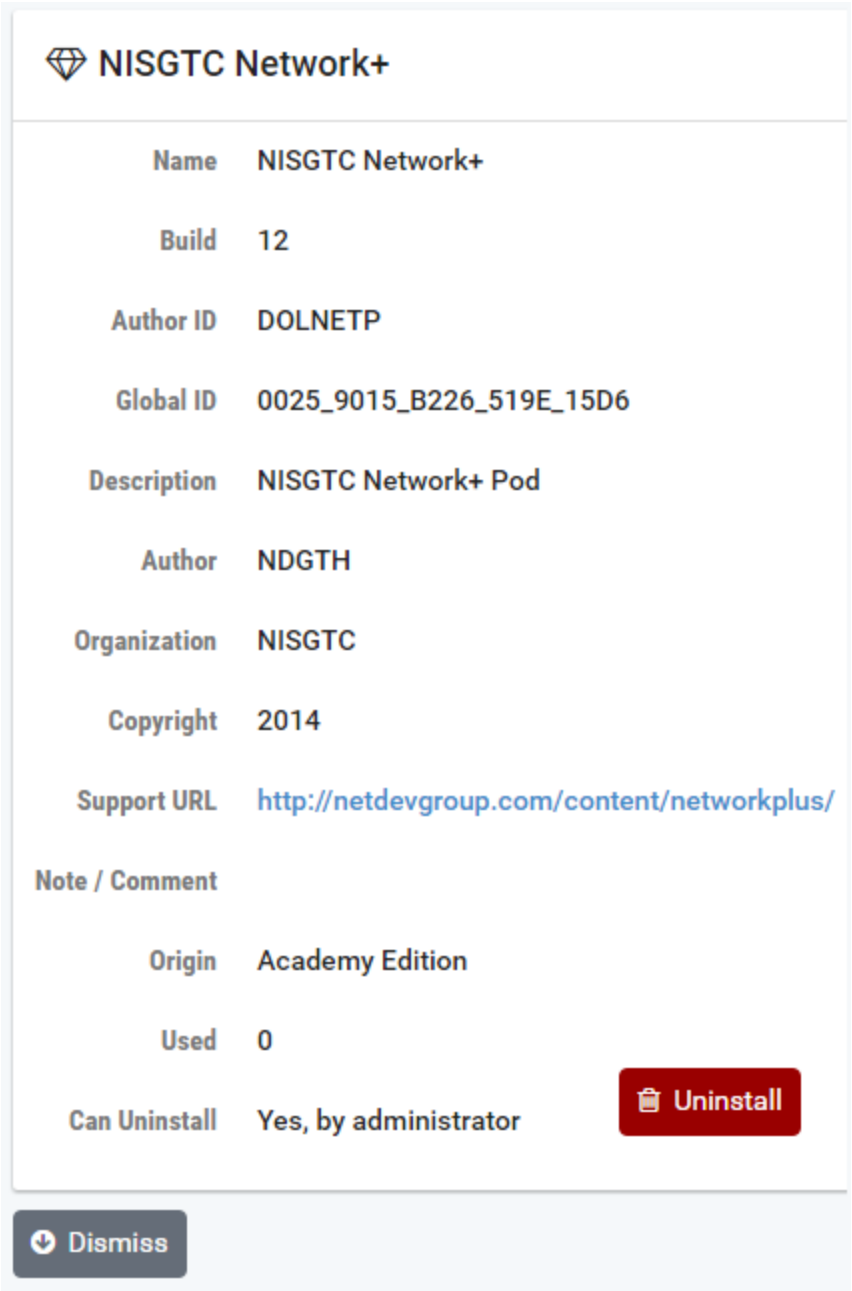
4. Details of the pod design are displayed. Note that the option to Uninstall the pod is available. Click **Dismiss** to return to the list of installed pod designs.



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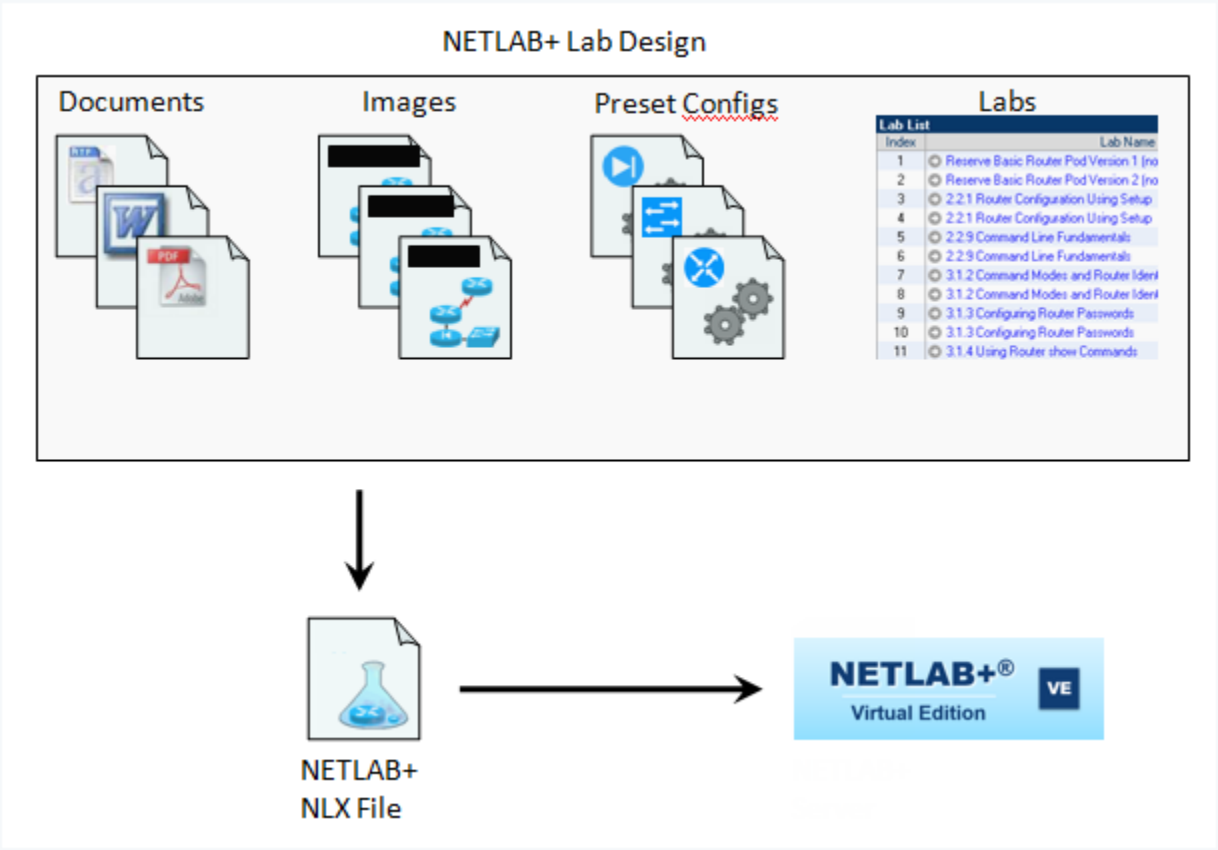
28 Lab Designer

The *Lab Designer* provides a means of creating a series of custom laboratory exercises that may be made available for class use.

A lab design is a set of labs and related reference material that may include documents, images, and preset configuration files for each lab exercise. This data is stored in a *Lab Design File*. Lab design files are portable. They can be shared, exported, and installed on other NETLAB+ systems. A set of options and passwords control how the lab design can be used.

See the subsections below for details on performing basic tasks in Lab Designer, including viewing and managing access to lab designs.

Please refer to the *NETLAB+ Lab Design Guide* for details on implementing custom lab designs.



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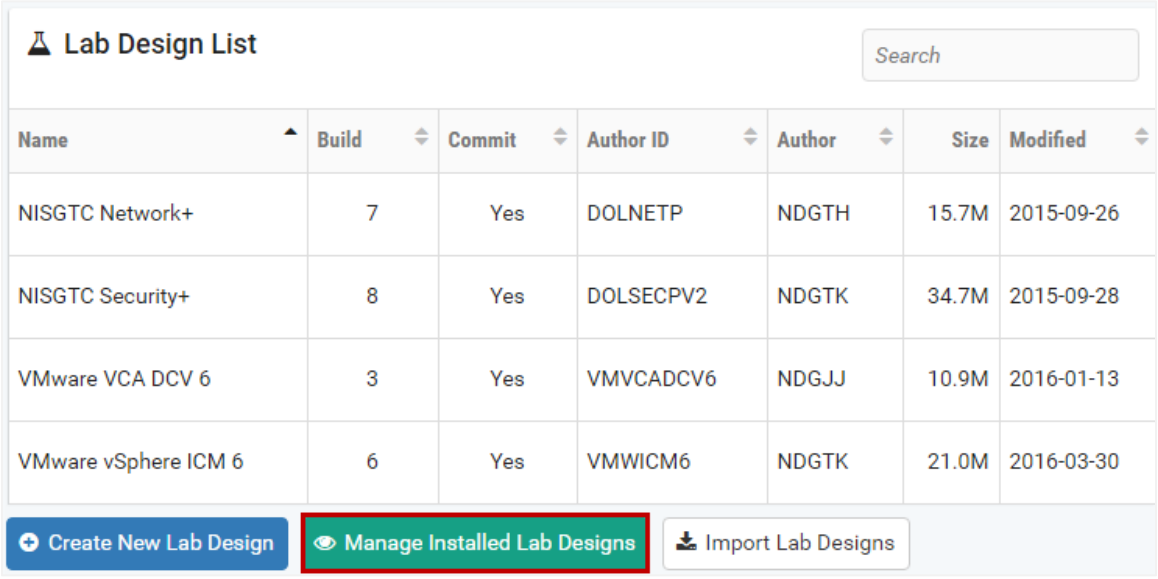
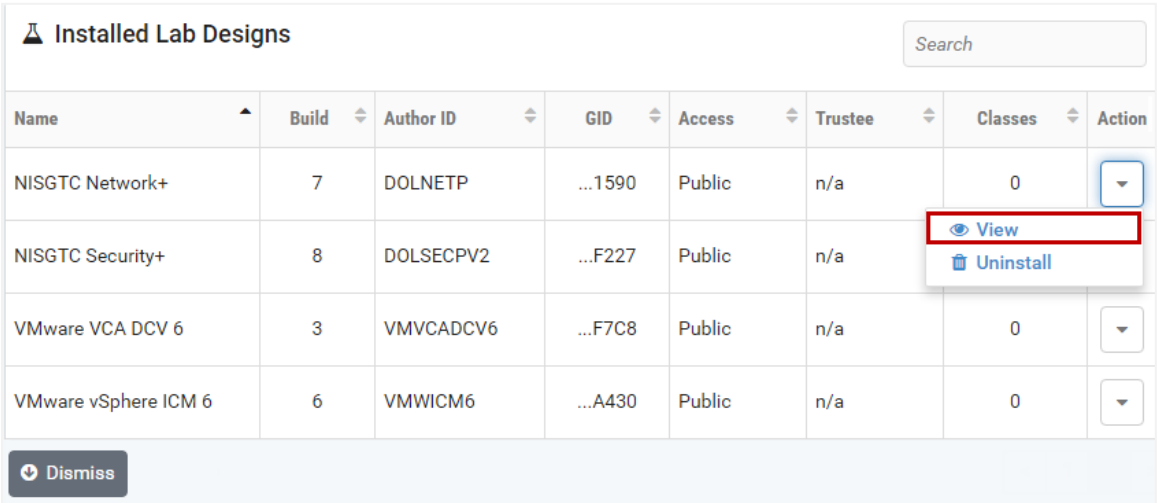
28.1 Viewing Lab Designs

To see a list of the lab designs available on your NETLAB+ system:

1. The **Lab Design List** is displayed when the Lab Designer option is selected on the administrator interface. This list shows the lab design files that reside locally on this system and are tied to your account. These lab designs may be viewed and modified by you.
2. A lab design must be installed before it can be used by the system. Click **Manage Installed Lab Designs** to install lab designs and make them available to users.



3. The currently installed lab designs will be displayed. The scope of a lab design can be public or private (see the Access column). Private lab designs can be used only by one instructor (the trustee). The Classes column indicates the number of classes that use the design. Select the **View** option on the Action dropdown for additional details and management options for any of the labs displayed.



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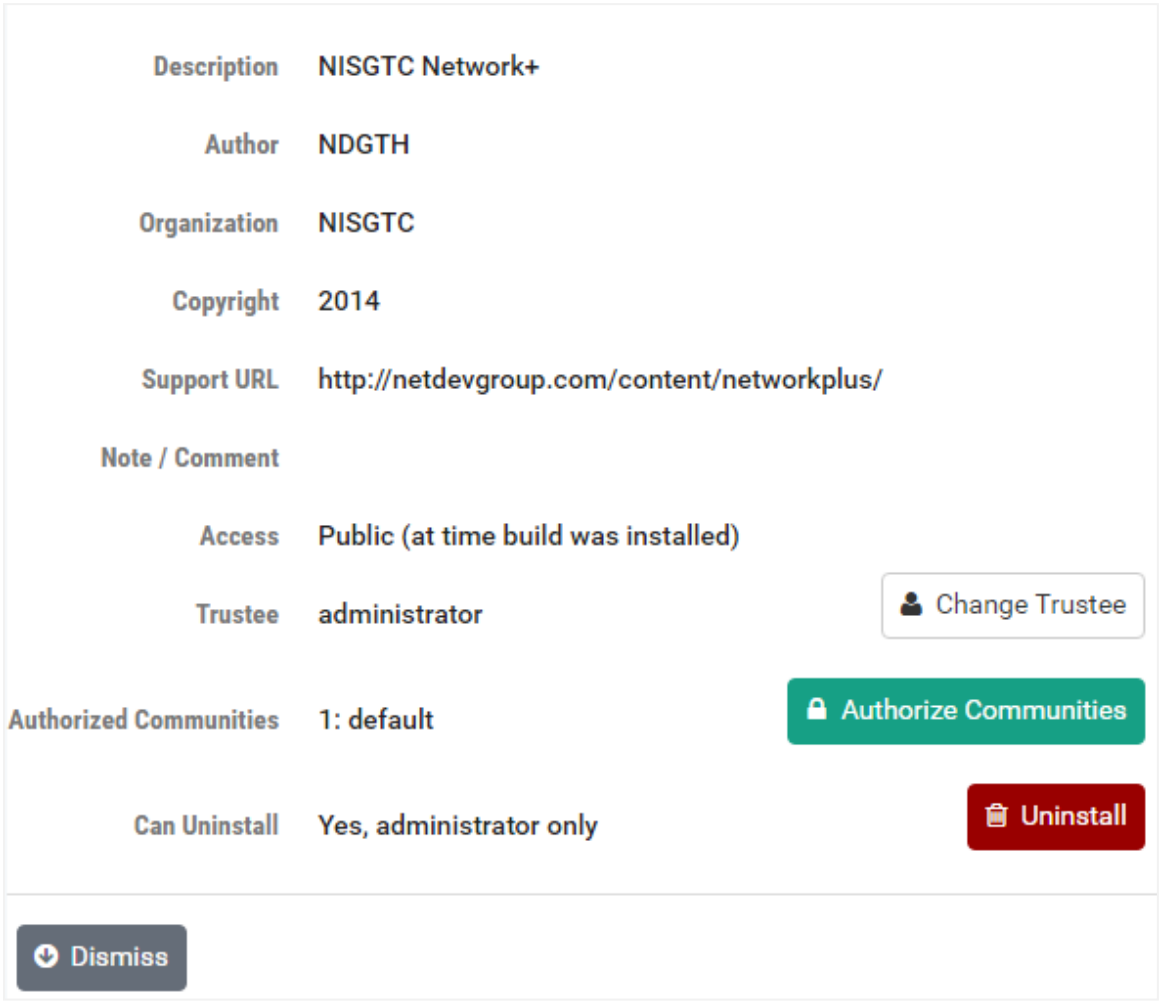
4. Details of the lab design are displayed.



28.2 Managing Lab Designs

There are several options available from the lab design detail page (see picture above).

- **Change Trustee:** Only the designated trustee can install updates to a globally installed lab design. The trustee can only be changed from the administrator account. The administrator can appoint any instructor or himself as trustee.

- **Authorize Communities:** Select this option to authorize access to the lab design by specific communities.

- **Uninstall:** Remove the lab design from any classes currently using it.

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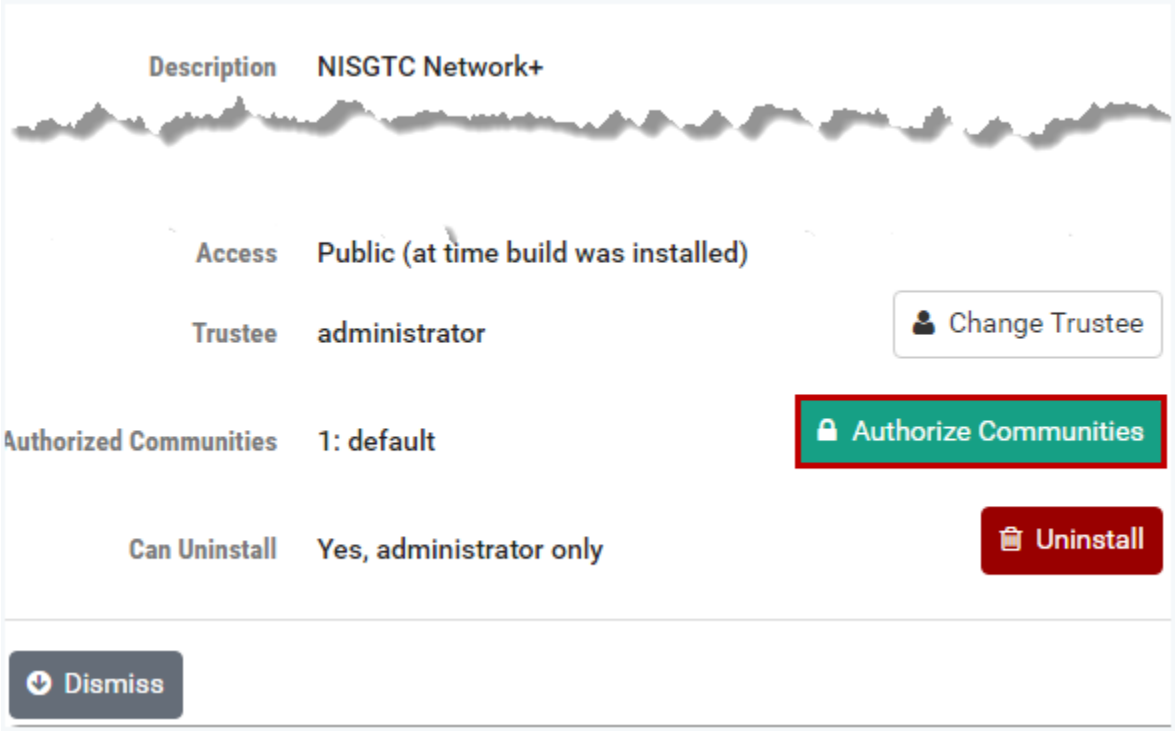
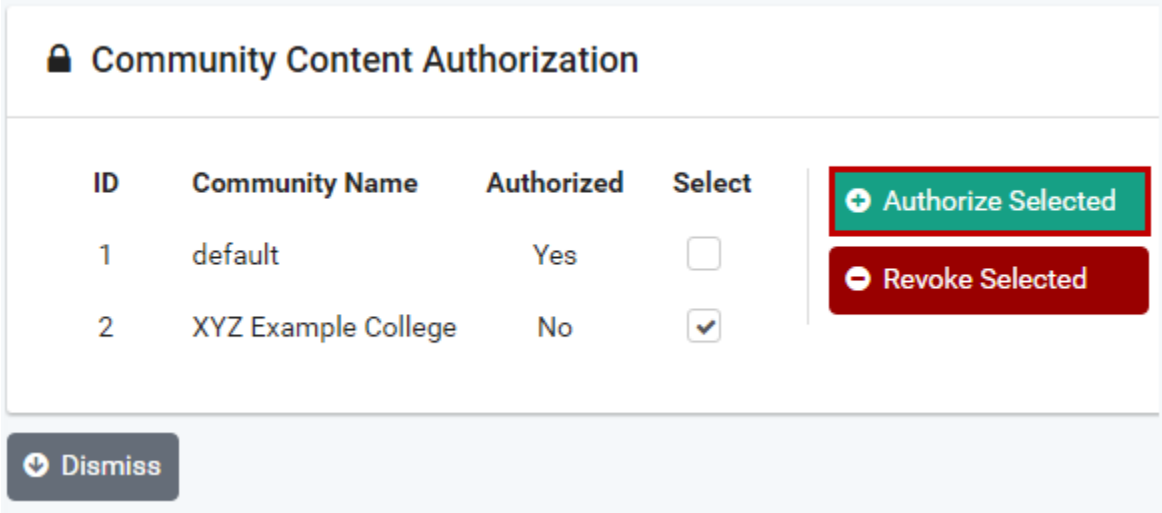
28.2.1 Authorize Lab Design

You may authorize access to a lab design by a specific community if you have chosen to define multiple communities on your NETLAB+ system.

1. On the Lab Design detail page, accessed from the Installed Lab Designs list, select the option to **Authorize Communities**.



2. The Community Content Authorization page will be displayed, indicating the communities that are currently authorized to use the lab design. Here, we see that XYZ Example College is not currently authorized. We will authorize it to use the lab design by selecting the **Select** checkbox and clicking **Authorize Selected**.



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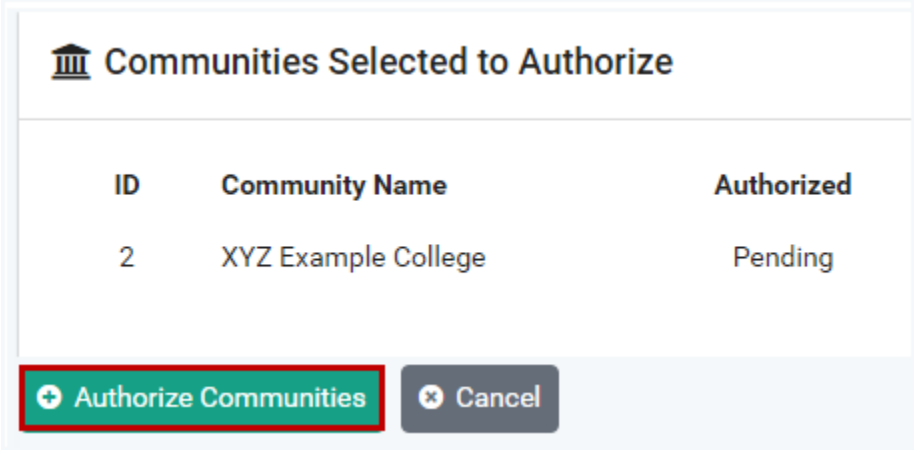
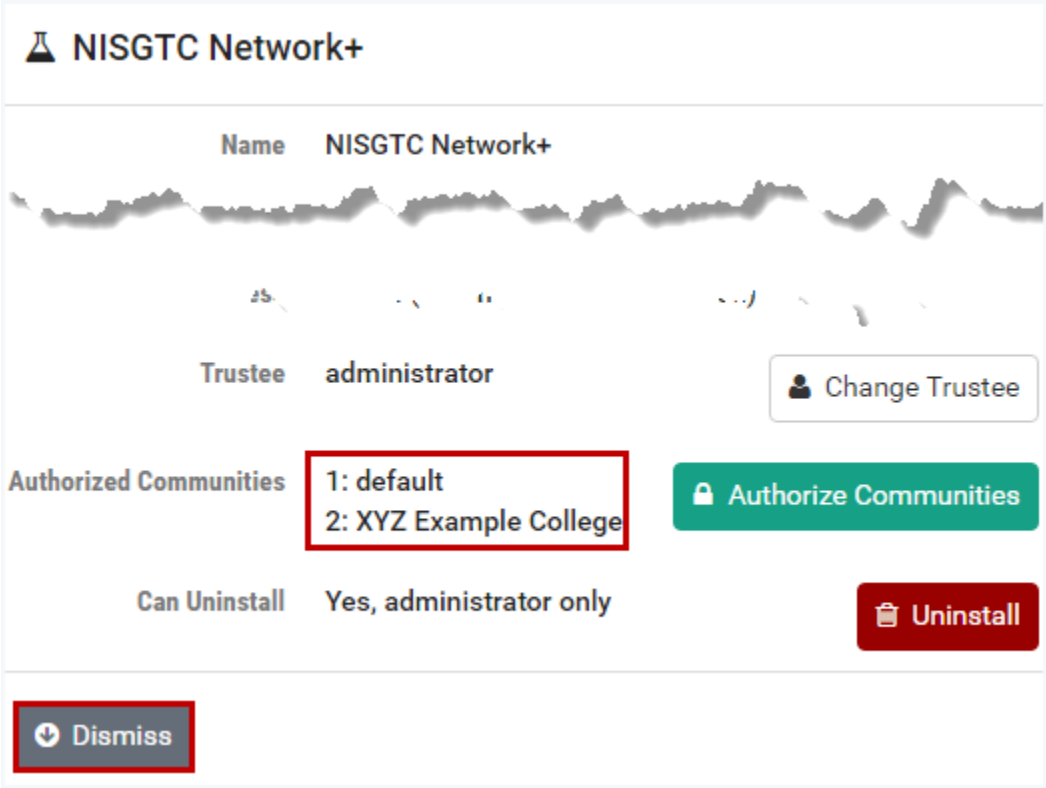
3. The Communities Selected to Authorize page will be displayed. Proceed by selecting **Authorize Communities.**

> By authorizing the selected communities, you certify that ALL members of the communities have the legal right to use the lab content provided in this lab design and that your organization is in compliance with all copyrighted material provisions and addendums to the NETLAB+ license agreement.



4. XYZ Example College has been added to the list of authorized communities. Click **Dismiss** to return to the Installed Lab Designs list.



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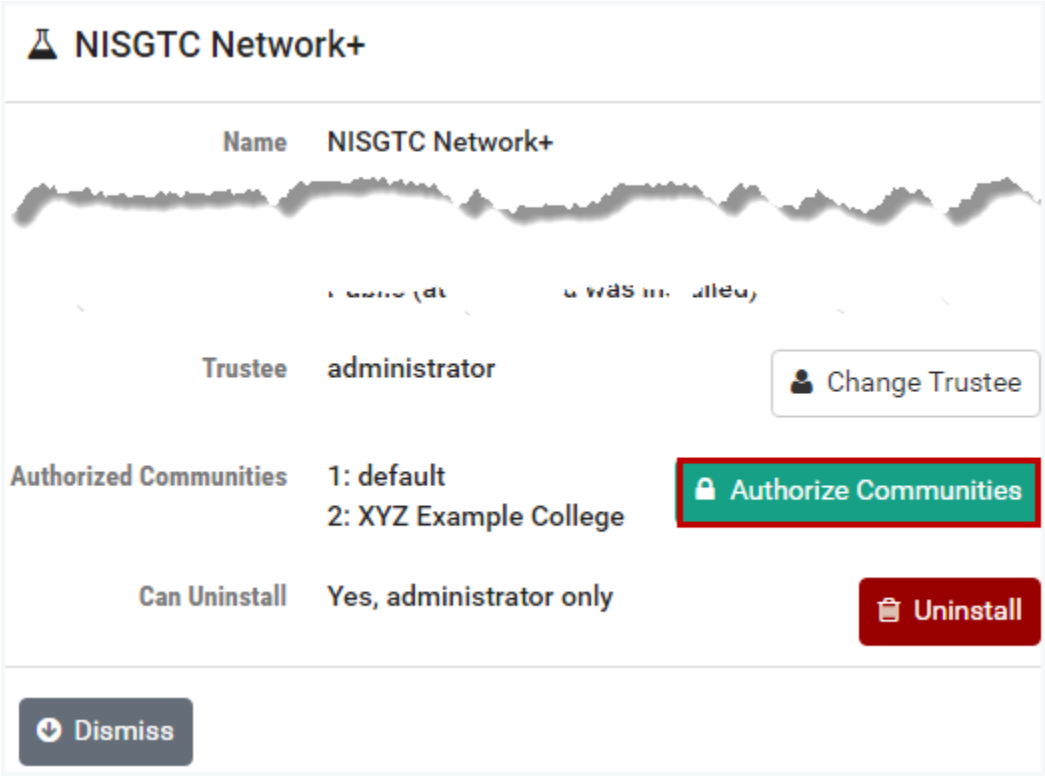
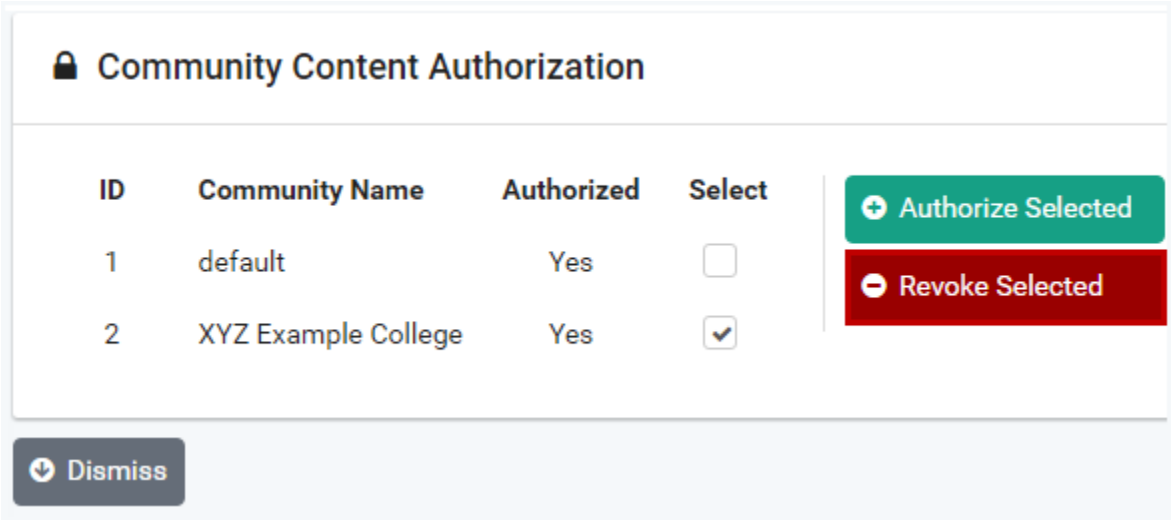
28.2.2 Revoke Lab Design Authorization

You may revoke access to a lab design for specific communities.

1. On the Lab Design detail page, accessed from the Installed Lab Designs list, select the option to **Authorize Communities**.



2. The Community Content Authorization page is displayed, indicating the communities that are currently authorized to use the lab design. Here, we will revoke the authorization for XYZ Example College to use the lab design by selecting the **Select** checkbox and clicking **Revoke Selected**.



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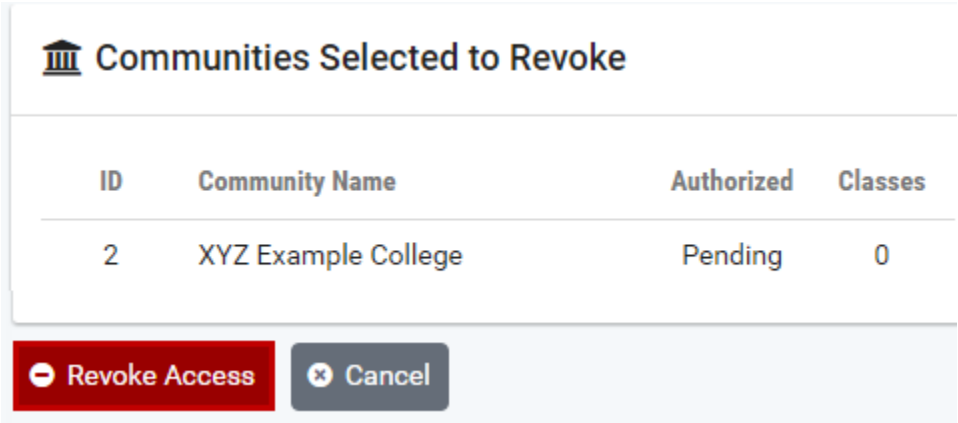
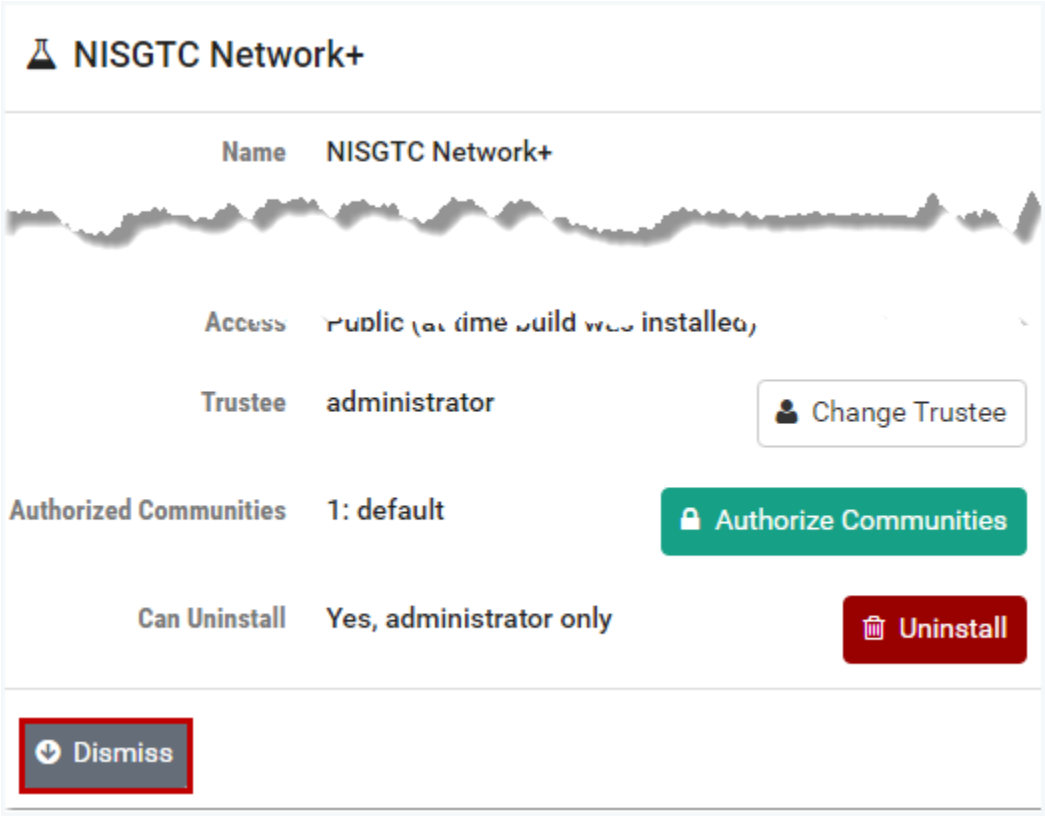
3. The Communities Selected to Revoke page will be displayed. Proceed by selecting **Revoke Access.**



4. XYZ Example College has been removed from the list of authorized communities. Click **Dismiss** to return to the Installed Lab Designs list.



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29 Manage Configuration Files

The File Manager is used to view, add, change, or delete configuration files and folders. NETLAB+ can upload and download configuration files to console-based devices such as routers, switches, and firewall devices in the lab. These files are stored in the NETLAB+ file system. The NETLAB+ file manager provides access to files and folders.

- *Files* contain the actual device configurations.

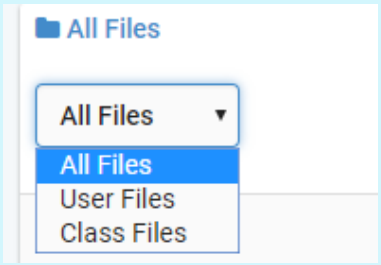
- *Folders* may contain other folders and configuration files. Folders may be either class (shared) folders or account (specific to the user) folders.
    - The files in the class shared folder may be accessed by the students enrolled in the class. Students may view files, copy files, and load devices with configuration files and folders. Students do not have access to add, edit, or delete items in the class shared folder.
    - Account folders may be accessed by the user or by the NETLAB+ administrator.

29.1 Configuration File Management

Using the File Manager, you can create and edit configuration files and folders. Users may find it helpful to create a configuration file outside of a lab reservation when practicing router commands or create files to use in later sessions. These configuration files can be saved and later applied to one or more routers in the topology during a lab session.

1. From the MyNETLAB home page, in the Content section, click the **File Manager** option.
2. A list of folders will be displayed. Notice the list includes both account folders and class folders. In the subsections below, we will show examples of editing a configuration file and creating configuration files and folders.

The default list display is All Files. You may change the display option to filter the list to show User Files or Class Files only.



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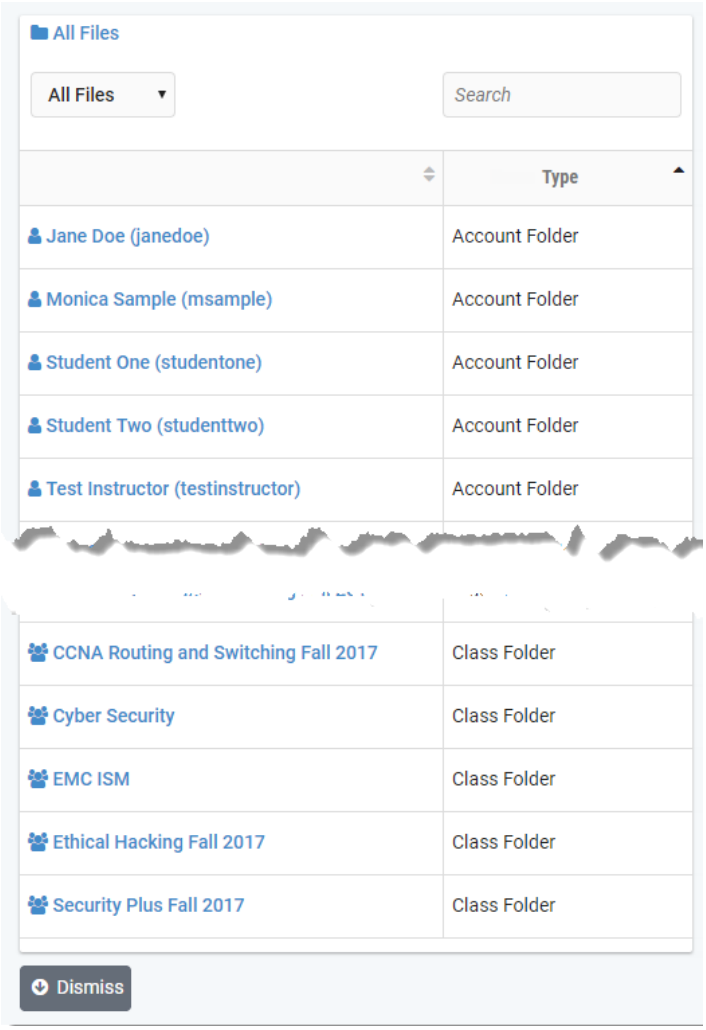

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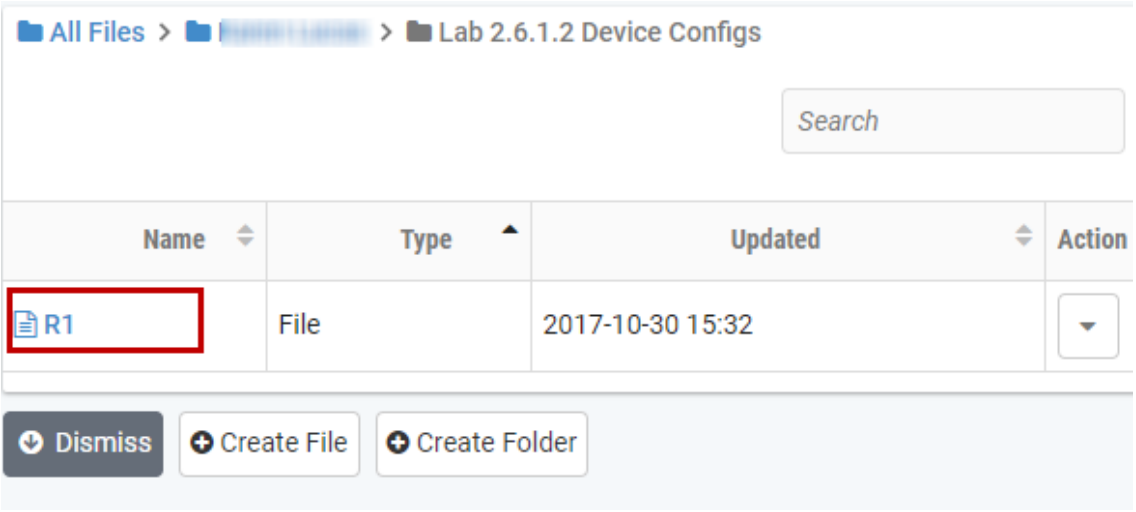
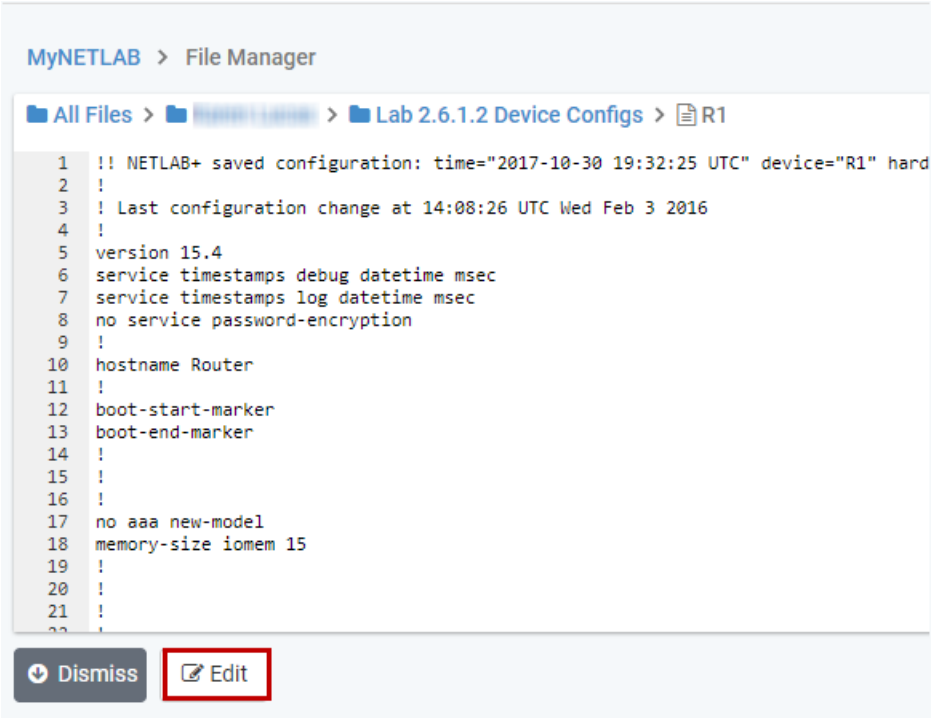
29.1.1 Viewing and Editing Configuration Files

Configuration files may be viewed and edited outside of a lab reservation. The files can be saved and later applied to one or more lab devices in the topology during a lab session. For the purpose of this example, we assume that the configuration files and folders referenced have been created during a recent lab session.

1. Select the L*ab 2.5.1.2 Device Configs* folder and then click the ***R1*** file to open it.



2. The *R1* file is displayed. For this example, we will not only view the file but also edit it. Click the **Edit** button.



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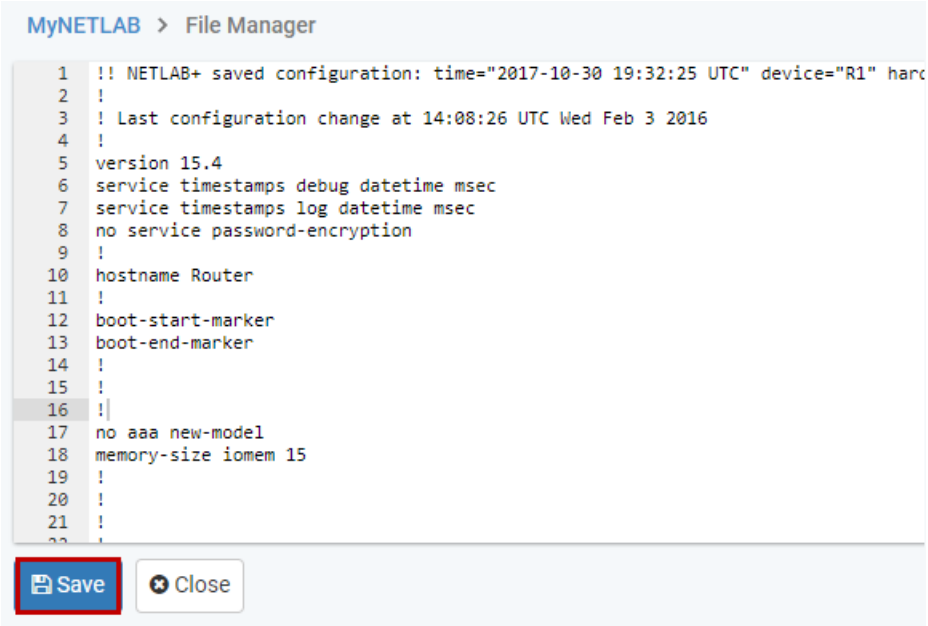
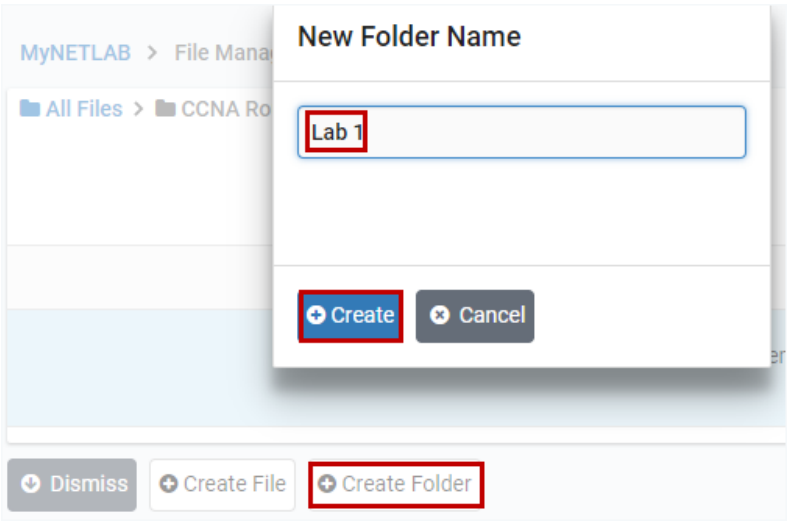
3. Click inside the window and edit the file as desired. Select **Save** to save the modified version.



29.1.2 Creating Folders and Files

Configuration files and folders may be created outside of a lab reservation. The files can be saved and later applied to one or more lab devices in the topology during a lab session.

1. In this example, we will be creating a folder and configuration file in the *CCNA Fall 2017 Routing and Switching* folder. To create a subfolder for your file, select **Create Folder**, enter a folder name, and then select **Create**.



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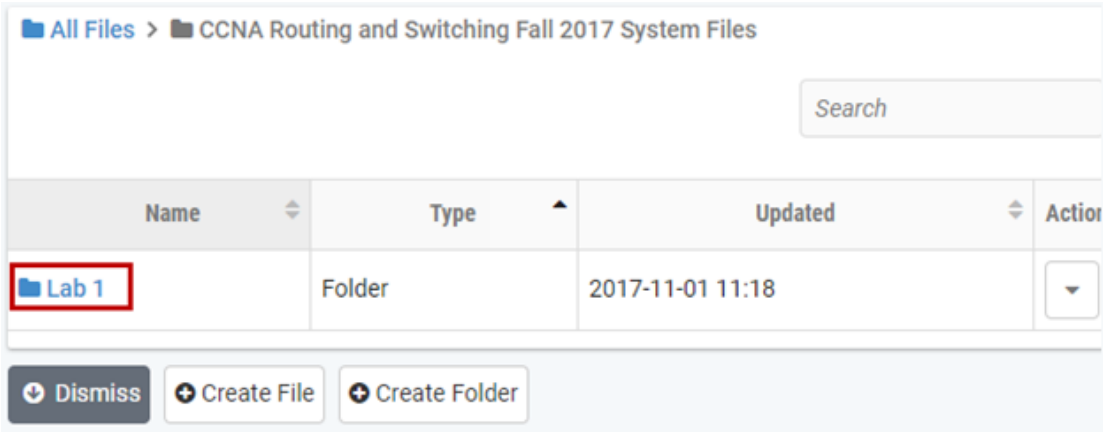
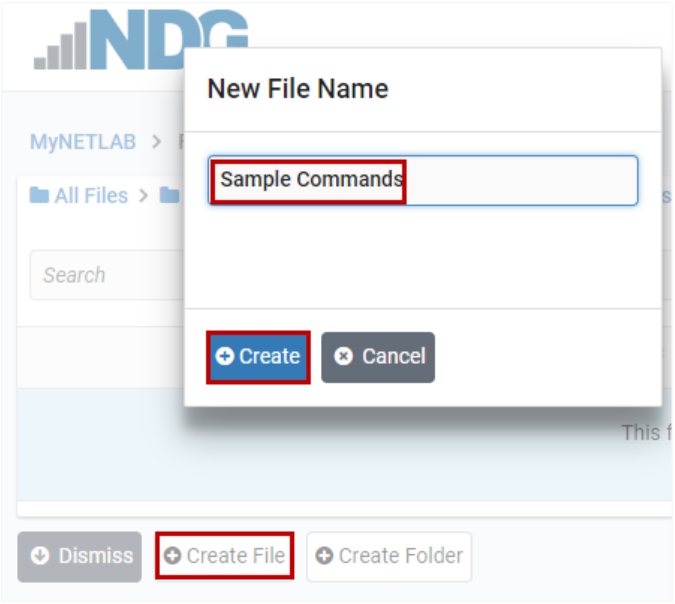
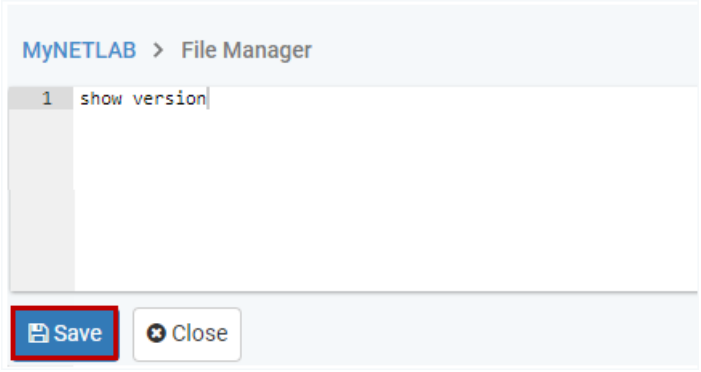
2. The ***Lab 1*** folder will be displayed in the folder list. Click the folder name to select it as the current folder.



3. Select the **Create File** button, enter a file name, and then click **Create**.



4. After entering CLI commands, select **Save** to store the configuration file.



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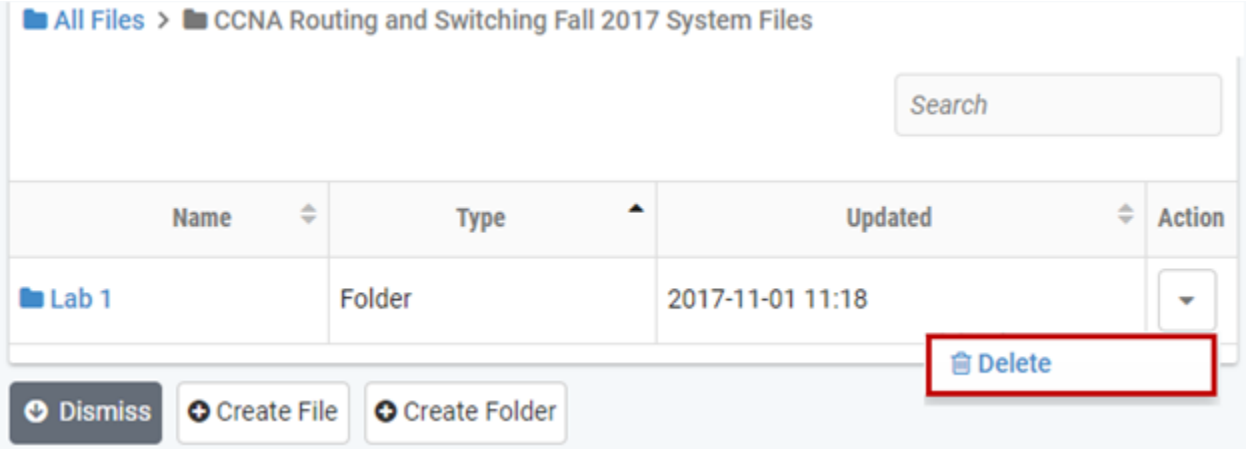
29.1.3 Deleting Folders and Files

To delete a file or folder in the current directory, click the Action dropdown and select **Delete**.



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