

Boot disk 

## Change the Hardisk size as your wish



New 100 GB standard persistent disk

Image

 nested-ubuntu-xenial

Change

Image created from Step 3

Identity and API access 

Service account 

Compute Engine default service account



Access scopes 

- Allow default access
- Allow full access to all Cloud APIs
- Set access for each API

Firewall 

Add tags and firewall rules to allow specific network traffic from the Internet

- Allow HTTP traffic
- Allow HTTPS traffic

 Management, security, disks, networking, sole tenancy

Your free trial credit will be used for this VM instance. [GCP Free Tier](#) 

**Create**

Cancel

# PNETLAB: Build a Private Cloud for Lab is Simple

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## Introduction

### What is PNETLab?

PNETLab (Packet Network Emulator Tool Lab)

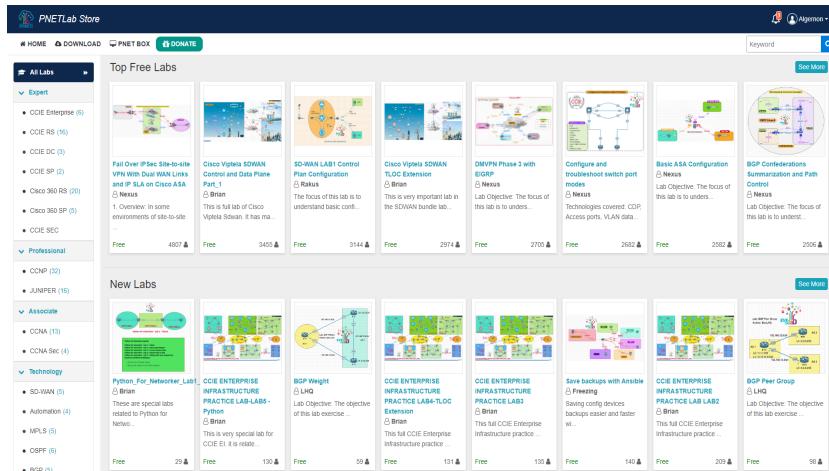
is a platform that allows you to download and share labs with the community. It includes **PNETLab Box** and **PNETLab store**

- **PNETLab Box** (with two modes: Offline and Online))is a virtual machine. It is installed on the local machine and the Lab will run on it, so you do not have to worry about the speed of the lab.
- **PNETLab Store** is a web platform with hundreds of free Labs in the fields of networking, database, system... All you need to do is get lab and learn (IOS, Docker are included in the lab when you download from PNETLab)

Feature	PNETLab Platform	Description
		Offline version with full features of Online Version and Free
	<b>Free</b>	PNETLab is a free platform
		Lab Store is a place to share lab (online) with many people.

		Device Store allow you to get devices with only one click
		Included in the lab when you download from the store (save your time for learning only).
		Included in the devices tab button, just download and use.
		Admin, User (depends on your definition)
		Full Feature, check this link: <a href="#">Link</a>
		Timer for Lab training.
		Add PDF or HTML workbook to the lab file.
		User can run one more lab, the running lab will appear in Running lab tab management.
		Unlimited of node per lab.
		Local and Docker Wireshark integrated.
		Local and HTML Console
		Live Node interface connections
		Integrated PNETLab NAT Cloud
		Multi startup configuration per lab.
		Option custom image template
		Option to change connection color, style
		Rich HTML text editor for text and object management in the lab.
		Admin user can join to the other user lab in the parallel session
		Admin user can open parallel console session to other user nodes
		Admin can manage other user running labs and nodes. Join or stop labs or nodes.
		Information about user HDD resource use
		Switch Lab view mode to Dark or Light mode
		Switch Lab view to 3D Mode
		Change the size of the node icon in lab.
		Proxy Configuration in PNETLab
		Change Label position in the lab
		Commit on Web Guide
		Save the current state of a node as a new device to re-use
		Mange RAM, CPU, HDD for each Node, User, Lab
		Able to limit RAM, CPU, HDD for each User. If getting over the threshold user will not open a new Node or Lab
		Allow user to add more icons

**Sample:** Templates Labs Store



## System requirements Hardware requirements

### Minimal Laptop/PC Desktop system requirements

#### **Prerequisites:**

CPU: Intel CPU supporting Intel® VT-x /EPT virtualization  
 Operating System: Windows 7, 8, 10 or Linux Desktop  
 VMware Workstation 12.5 or later, VMware Player 12.5 or later

#### **PC/Laptop HW requirements**

CPU	Intel i5/i7 (4 Logical processors), Enabled Intel virtualization in BIOS
RAM	8Gb
HDD Space	40Gb
Network	LAN/WLAN

#### **PNETLab Virtual machine requirements**

CPU	4/1 (Number of processors/Number of cores per processor) Enabled Intel VT-x/EPT virtualization engine
RAM	6Gb or more
HDD	40Gb or more
Network	VMware NAT or Bridged network adapter

**Note:** Minimal PC Desktop/Laptop will be able to run small Labs. The performance and quantity of nodes per lab depend on the types of nodes deployed in the lab.

**Example:** IOL image-based nodes: up to 40-50 nodes per lab  
 Dynamips image-based nodes: up to 20-25 nodes per lab  
 vIOS image-based nodes: up to 8-10 nodes per lab  
 CSRv1000 or XRv image-based nodes: up to 2-3 per lab

### Recommended Laptop/PC Desktop system requirements

#### **Prerequisites:**

CPU: Intel CPU supporting Intel® VT-x /EPT virtualization  
 Operation System: Windows 7, 8, 10 or Linux Desktop  
 VMware Workstation 12.5 or later  
 VMware Player 12.5 or later.

#### **PC/Laptop HW requirements**

CPU	Intel i7 (8 Logical processors), Enabled Intel virtualization in BIOS
RAM	32Gb
HDD Space	200Gb
Network	LAN/WLAN

#### **PNETLab Virtual machine requirements**

CPU	8/1 (Number of processors/Number of cores per processor) Enabled Intel VT-x/EPT virtualization engine
RAM	24Gb or more
HDD	200Gb or more
Network	VMware NAT or Bridged network adapter

**Note:** PC Desktops/Laptops will be able to run small to medium Labs. Performance and quantity of nodes per lab depend on the type of nodes deployed in the lab.

**Example:** IOL image-based nodes: up to 120 nodes per lab vIOS image-based nodes: up to 20-40 nodes per lab CSR image-based nodes: up to 10 per lab.

## **Virtual Server system requirements**

#### **Prerequisites:**

CPU: Intel Xeon CPU supporting Intel® VT-x with Extended Page Tables (EPT) Operation System: ESXi 6.0 or later

#### **Server HW requirements**

CPU	Recommended CPU 2x Intel E5-2650v3 (40 Logical processors) or better supporting Intel® VT-x with Extended Page Tables (EPT) Minimum CPU is any Intel Xeon CPU supporting Intel® VT-x with Extended Page Tables (EPT)
RAM	128Gb
HDD Space	2Tb
Network	LAN Ethernet

#### **PNETLab Virtual machine requirements**

CPU	32/1 (Number of processors/Number of cores per processor) Enabled Intel VT-x/EPT virtualization engine
RAM	64Gb or more
HDD	800Gb or more
Network	vSwitch/VMnet

**Note:** Performance and quantity of nodes per lab depends from the type of nodes used in the lab.

**Example:** 120 IOL image-based lab, 20 CSrv1000 image-based nodes per lab

## **Dedicated Server (bare) system requirements**

#### **Prerequisites:**

CPU: Intel Xeon CPU supporting Intel® VT-x with Extended Page Tables (EPT) Operation System: Ubuntu Server 16.04.4 LTS x64

#### **Server HW requirements**

CPU	Recommended CPU Intel E5-2650v3 (40 Logical processors) or better supporting Intel® VT-x with Extended Page Tables (EPT) Minimum CPU is any Intel Xeon CPU supporting Intel® VT-x with Extended Page Tables (EPT)
RAM	128Gb
HDD Space	2Tb
Network	LAN Ethernet

## **Supported virtualization platforms and software**

- VMware Workstation 12.5 or later

- VMware Player 12.5 or later
- VMware ESXi 6.0 or later
- Ubuntu Server 16.04 LTS as platform for bare metal ([roadmap](#))
- Google Cloud Platform

## Unsupported hardware and systems

The following are currently not supported:

- AMD CPU based PC or Server
- VirtualBox virtualization
- Citrix XenServer
- Microsoft HyperV
- Ubuntu 17.X or 18.x as platform

## Offline Mode

### System Mode in PNELab

In first time you login to PNELab, you will get the Initial Screen. You have 2 options: Offline Mode and Online Mode.



#### **Online Mode**

- Need internet to work
- Need to register.
- Support full functions of PNELab
- You can download and use all Labs on the Store
- You can share or sell lab to the Store
- Limit 10 accounts (Can be upgraded)

#### **Offline Mode:**

- Don't need internet to work
  - Don't need to register. Login by default account: **admin/pnet**
  - Support full functions of PNELab
  - You can only download and use Open Labs (The Labs with "Open" in the top) on the Store
  - You can not share or sell lab to the Store
  - Limit 10 accounts (Can be upgraded but require internet)
- 
- When click on Online Mode: Online Mode will be enabled and Offline Mode will be disabled. The Default mode is set to Online.
  - When click on Offline Mode: Offline Mode will be Enabled and Online Mode will be disabled. The Default mode is set to Offline. A default account will be created: **admin/pnet**



You can monitor System Mode at: **System > System Mode**

- You can edit the default login mode, disable or enable mode.
- System also support switch mode by command line.
  - To change default mode using command: **mode default online** or **mode default offline**
  - To reset offline password use command: **mode reset offline** .
  - To reset system mode to original use command: **mode reset all**.

## How to monitor Offline Accounts?

Same as Online Mode, you can create Role and User accounts at : **Accounts**

- You can create maximum 10 Accounts. If you need to extend please contact with us.
- The Offline account will have tag and the Online account will have tag . You can not edit the Online Account.
- To add account click on Add button.

Add Row

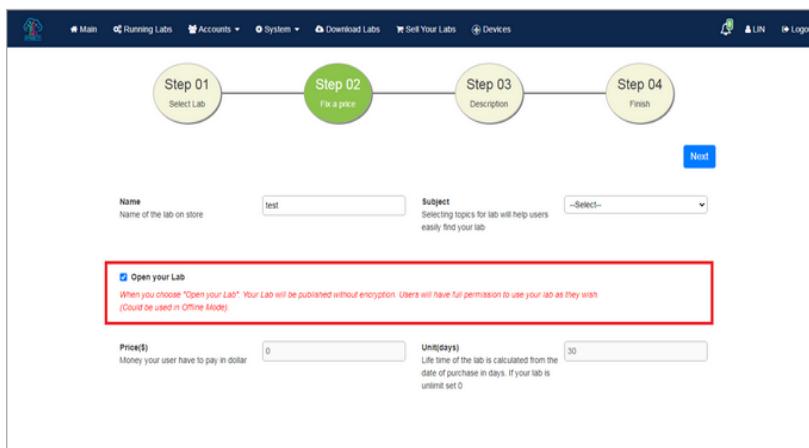
User Name	<input type="text" value="username"/>
Password	<input type="password"/>
Role	<input type="text"/>
Status <small>Does not apply to Admin</small>	<input type="text" value="Active"/>
Active Time <small>Does not apply to Admin</small>	<input type="text"/>
Expired Time <small>Does not apply to Admin</small>	<input type="text"/>
Note	<input type="text"/>

Add Close

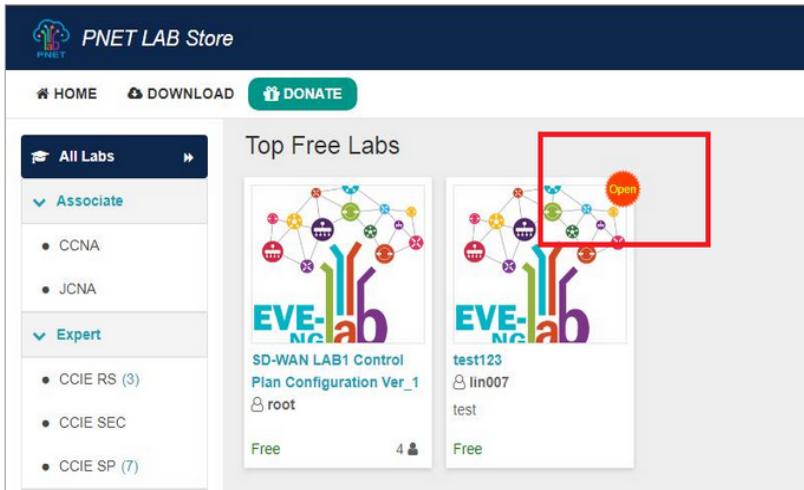
- You need at lease: Username, Password, Role
- You can set Active time and The Expired Time for each user. **NOTE. Those fields do not affect Admin Role.**

## How does Offline Mode work with Lab Store?

From version 4.0.0, users have the option of Open their lab when sharing the Lab on the store. **Offline mode only possible using the Open Lab**



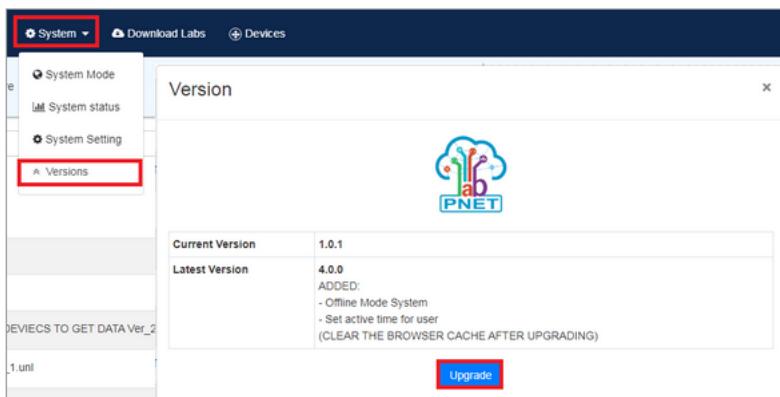
The Open Labs will have the Open Tab like bellow image.



## How to Upgrade PNETLab?

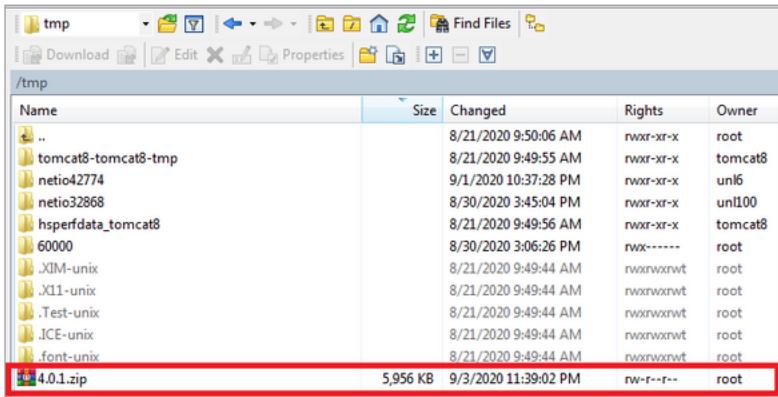
### 1. PNETLab can connect to Internet.

If PNETLab can connect to internet, you can upgrade to latest version very easily by go to : **System > Version > Click on Upgrade button.**



### 2. PNETLab can not connect to Internet.

- Access [link](#) to download the upgrade package. (<https://pnetlab.com/pages/releases>)
- You have to upgrade step by step from your current version to the latest version. (E.g you can upgrade **1.0.1 > 1.0.2 > 1.0.3** . But you **can not** upgrade from **1.0.1 > 1.0.3** it may be get the error.)
- After Download the upgrade patch package. Copy it to **/tmp** folder of PNETLab



SSH to PNETLab with root account and run command to check:

- `cd /tmp`
- `ls -l`

```
* Kubernetes 1.19 is out! Get it in one command with:
  sudo snap install microk8s --channel=1.19 --classic
https://microk8s.io/ has docs and details.
Last login: Thu Sep  3 20:00:08 2020 from 113.22.236.219
root@pnetlab:~# cd /tmp
root@pnetlab:/tmp# ll
total 6004
drwxrwxrwt 12 root    root        4096 Sep  3 20:00 /
drwxr-xr-x  2 root    root        4096 Aug 21 05:50 /
drwxr--r--  1 root    root       6098157 Sep  3 19:39 4.0.1.zip
drwxr-xr-x  2 root    root        4096 Aug 30 11:06 60000
drwxr-xr-x  2 root    tomcat8   tomcat8  4096 Aug 21 05:49 hsperfdata_tomcat8/
drwxr-xr-x  2 tomcat8 tomcat8   4096 Aug 21 05:49 .ICE-unix/
drwxr-xr-x  2 root    root        4096 Aug 21 05:49 .font-unix/
drwxr-xr-x  2 root    unl       4096 Aug 30 11:45 netio32868/
drwxr-xr-x  2 unl     unl       4096 Sep  1 18:37 netio42774/
drwxr-xr-x  2 root    root        4096 Aug 21 05:49 .Test-unix/
drwxr-xr-x  2 tomcat8 tomcat8   4096 Aug 21 05:49 tomcat8-tomcat8-tmp/
drwxr-xr-x  2 root    root        4096 Aug 21 05:49 .X11-unix/
drwxr-xr-x  2 root    root        4096 Aug 21 05:49 .XIM-unix/
root@pnetlab:/tmp# 
```

Unzip upgrade package by command:

- delete old upgrade folder if exist by command: `rm -rf upgrade`
- **`unzip [package] -d ./upgrade`** (Eg: `unzip 4.0.1.zip -d ./upgrade`)
- Check again by command : `ls -l` . You should see the upgrade folder

```
root@pnetlab:/tmp# unzip 4.0.1.zip -d ./upgrade
Archive: 4.0.1.zip
  creating: ./upgrade/system_files/
  creating: ./upgrade/system_files/api.php
  creating: ./upgrade/system_files/app/
  creating: ./upgrade/system_files/app/Console/
  creating: ./upgrade/system_files/app/Console/Commands/
  inflating: ./upgrade/system_files/app/Console/Commands/ConvertName.php
  inflating: ./upgrade/system_files/app/Console/Commands/crontab
  inflating: ./upgrade/system_files/app/Console/Commands/DeviceFactory.php
  inflating: ./upgrade/system_files/app/Console/Commands/harddisk_alert
  inflating: ./upgrade/system_files/app/Console/Commands/harddisk_alert.service
  inflating: ./upgrade/system_files/app/Console/Commands/harddisk_limit
  inflating: ./upgrade/system_files/app/Console/Commands/harddisk_limit.service
  inflating: ./upgrade/system_files/app/Console/Commands/KeepAlive.php
  inflating: ./upgrade/system_files/app/Console/Commands/mode
```

```
root@pnetlab:/tmp# ls -l
total 5980
drwxr--r-- 1 root    root      6098157 Sep  3 19:39 4.0.1.zip
drwxr----- 2 root    root      4096 Aug 30 11:06 60000
drwxr-xr-x  2 tomcat8 tomcat8   4096 Aug 21 05:49 hsperfdata_tomcat8
drwxr-xr-x  2 unl100 unl      4096 Aug 30 11:45 netio32868
drwxr-xr-x  2 unl     unl      42768 4096 Sep  1 18:37 netio42774
drwxr-xr-x  2 tomcat8 root     4096 Aug 21 05:49 tomcat8-tomcat8-tmp
drwxr-xr-x  3 root    root     4096 Sep  3 20:08 upgrade
root@pnetlab:/tmp# 
```

Run below commands to upgrade.

- `chmod 755 -R upgrade`
- `find upgrade -type f -print0 | xargs -0 dos2unix 2>&1`
- `./upgrade/upgrade`

```
root@pnetlab:/tmp# chmod 755 -R upgrade
root@pnetlab:/tmp# find upgrade -type f -print0 | xargs -0 dos2unix
dos2unix: converting file upgrade/upgrade to Unix format ...
dos2unix: Binary symbol 0x1A found at line 2
dos2unix: Skipping binary file upgrade/system_files/images/qemu.png
dos2unix: Binary symbol 0x1A found at line 2
dos2unix: Skipping binary file upgrade/system_files/images/docker.png
dos2unix: converting file upgrade/system_files/vendors-%E2%store/public/react/pa
ges/admin>StatusView.js to Unix format ...
```

```
root@pnetlab:/tmp#
root@pnetlab:/tmp# ./upgrade/upgrade

mysql: [Warning] Using a password on the command line interface can be insecure.
Upgraded successfully
root@pnetlab:/tmp#
```

Login to Web Guide and check again

Version



Current Version	4.0.1
Latest Version	<b>4.0.1</b> Added: - Optimize Topo loading speed - Rotate link label - Option to use Docker Wireshark in Default Console - Set Workspace limit for each user Fixed: - All Bugs from 4.0.0 Note: Clear browser cache after upgrading

[Upgrade](#)

## Installation

### Install PNETLab

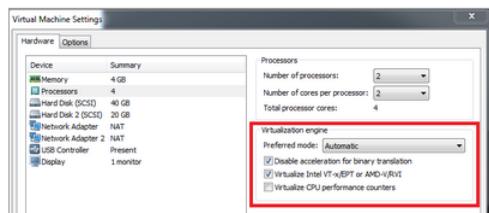


#### Step 01: Download and Deploy

Download the **.ova** file (<https://pnetlab.com/pages/download>) and deploy on virtualization platforms such as VMWare,... **Make sure your box can connect to the internet with online mode**

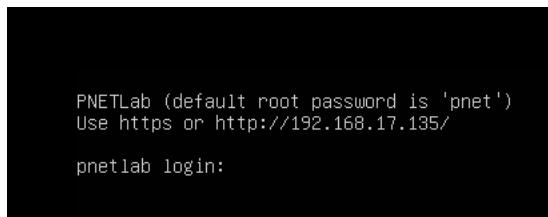
**Note**

- \* If you deploy on vmware set up the vmware like bellow:

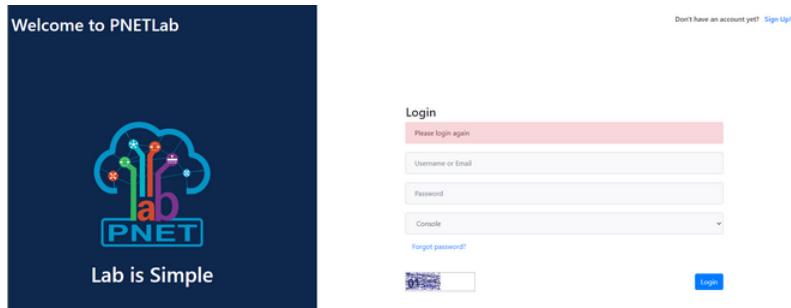


## Step 02: Register and Login

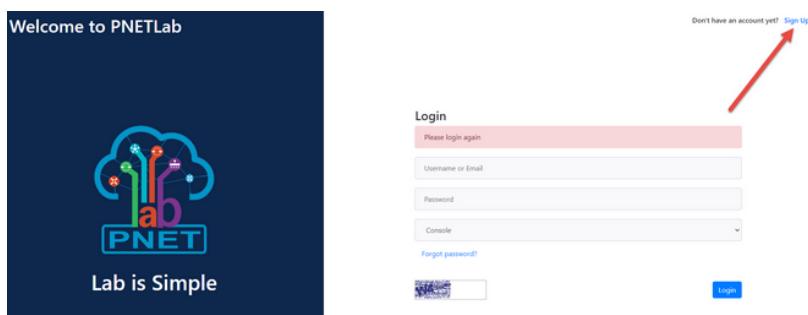
Access to your box by a browser (through IP address in your PNETLab box - in my case, the IP address is: 192.168.111.175)



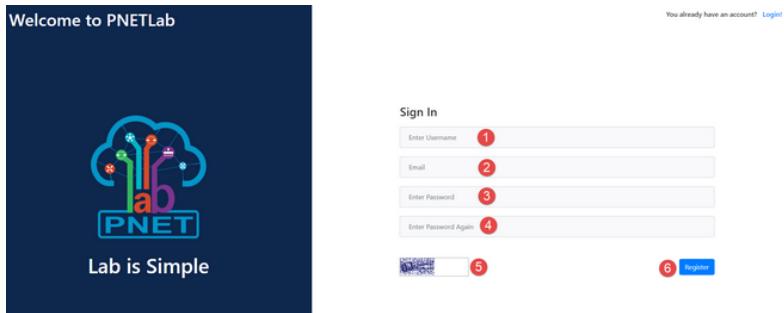
You'll be linked to the **Login** form.



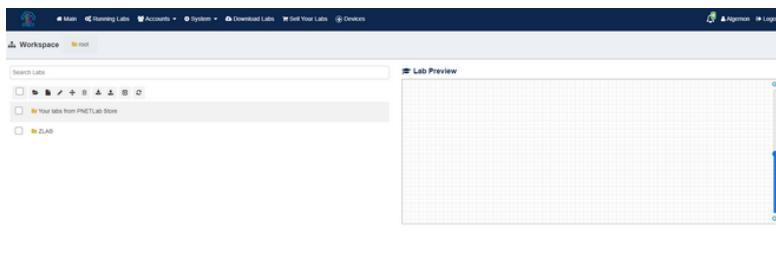
If you still not have an account click on **Sign Up**.



Fill in the **Sign In** form and click **Register**. A confirmation email will be sent to your email address **in 2-3 minutes**. Click the **Verify** button to complete your registration.



After that, you can log into the **PNETLab** box and you can use hundreds of free labs



### Step 03: Go to Store

After login to **PNETLab Box** from Vmware (with your IP address), Click to **logo PNETLab** then you will go to **PNETLab Store**

Category	Lab Name	Description	Status
Top Free Labs	Fall Over IPsec: Site-to-Site VPN With Dual WAN Links and IP SLA on Cisco ASA	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	Cross Vigor Router Control and Data Plane Part_1	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	SD-WAN LAB: Control Plan Configuration	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	Cisco Vigor SDWAN Extension	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	Configure and Troubleshoot switch port modes	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	Basic AAA Configuration	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
	CCIE Enterprise Phase 3 with EIGRP	This is a full lab of Cisco Vigor Router. It has multiple components and configurations.	Free
New Labs	Python For Networker_Lab	These are special labs related to Python for Networker.	Free
	CCIE ENTERPRISE INFRASTRUCTURE PRACTICE LABS-Python	This is a special lab for CCIE 3. It is related to Python.	Free
	BGP Weight	Lab Objective: The objective of this lab exercise...	Free
	CCIE ENTERPRISE INFRASTRUCTURE PRACTICE LABS-FLOC Extension	This full CCIE Enterprise infrastructure practice...	Free
	Save backups with Ansible	Saving config devices Backing up easier and faster!	Free
	CCIE ENTERPRISE INFRASTRUCTURE PRACTICE LAB LAB2	This full CCIE Enterprise infrastructure practice...	Free
	CCIE ENTERPRISE INFRASTRUCTURE PRACTICE LAB LAB3	This full CCIE Enterprise infrastructure practice...	Free

**Note:** There are a lot of Labs from Store, and All labs are free, when you download a lab, you will get Lab file, workbook, and IOS (Go to Step 4 for more detail).

## Step 04: Get Lab and Learn

From PNETLab Store, choose a lab as you want to practice (Example: Save Backups with Ansible)

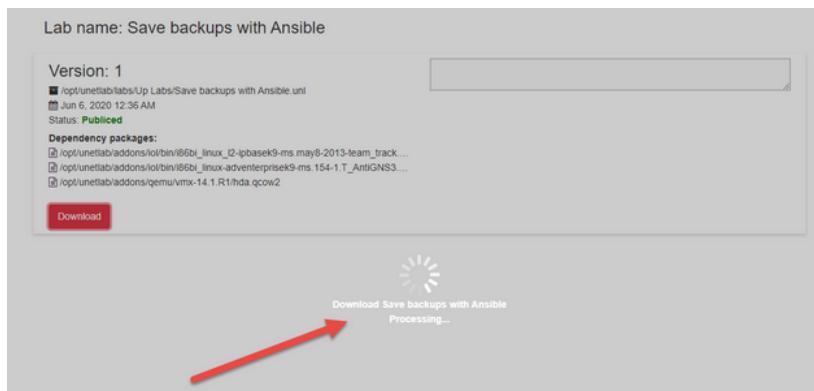
The screenshot shows the PNETLab Store interface. On the left, there's a sidebar with categories like Expert, Professional, Associate, and Technology, each listing specific lab types and counts. The main area displays a grid of lab thumbnails. One lab, titled "Save backups with Ansible", is highlighted with a red arrow pointing to its "Get Lab" button. The lab details show it's free, was created on Jun 6, 2020 at 12:36 AM, and includes a "Freezing" feature.

Click to **Get Lab** button

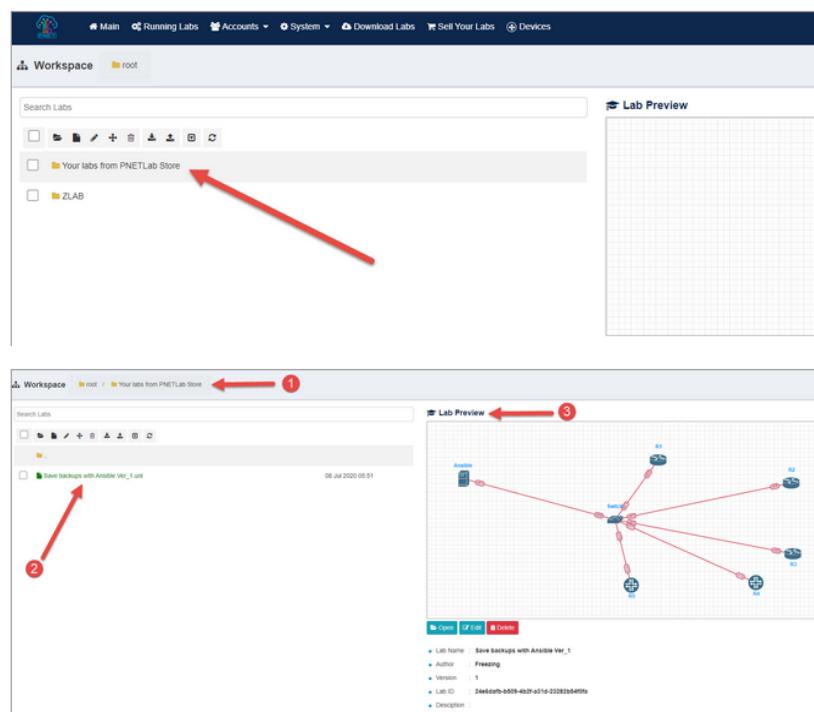
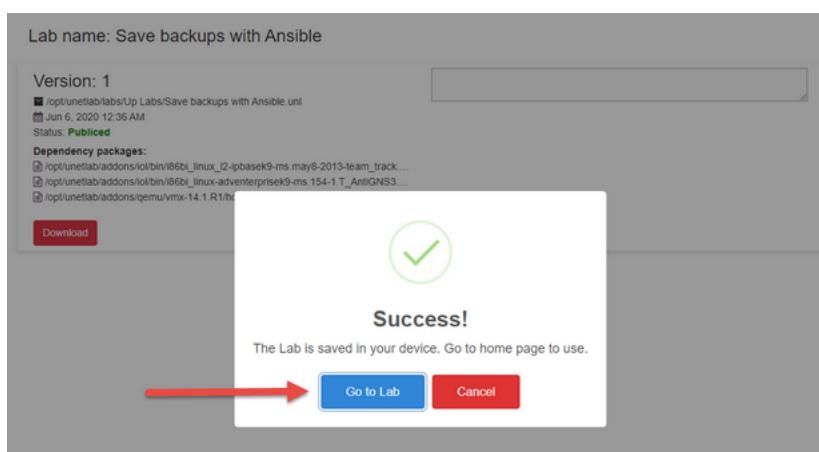
This screenshot shows the detailed view of the "Save backups with Ansible" lab. It includes sections for "1. Requirement", "2. Lab Purpose", and "3. Lab Topology". A red arrow points to the "Get Lab" button at the top left of the page. To the right, there's a "Similar" section listing other labs like "Python For Networker", "Establish L2VPN Pseudo...", "OSPF with Ansible", and "MP-BGP with Ansible".

Then click to **Download** button (Lab is included: **lab file (unl)**, **IOS** and **workbook**)

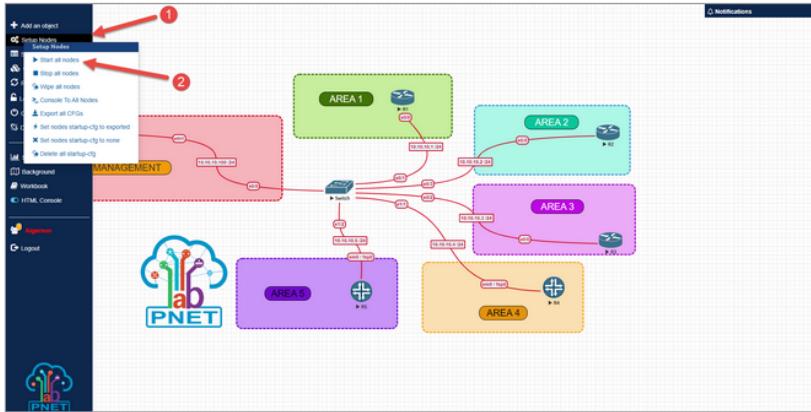
This screenshot shows the "Download" page for the "Save backups with Ansible" lab. It displays the lab name, version (1), creation date (Jun 6, 2020 12:36 AM), and dependency packages. A red arrow points to the "Download" button at the bottom left. Another red arrow points to the dependency packages section, which lists "roplnetlabaddons/robin65b1\_linux\_12-ipbasek9-ms.may6-2013-team\_track", "roplnetlabaddons/robin65b1\_linux-adventurek9-ms.154-1\_T\_AnsiGNS3", and "roplnetlabaddons/qemu/vmx-14.1.R/hda.qcow2".



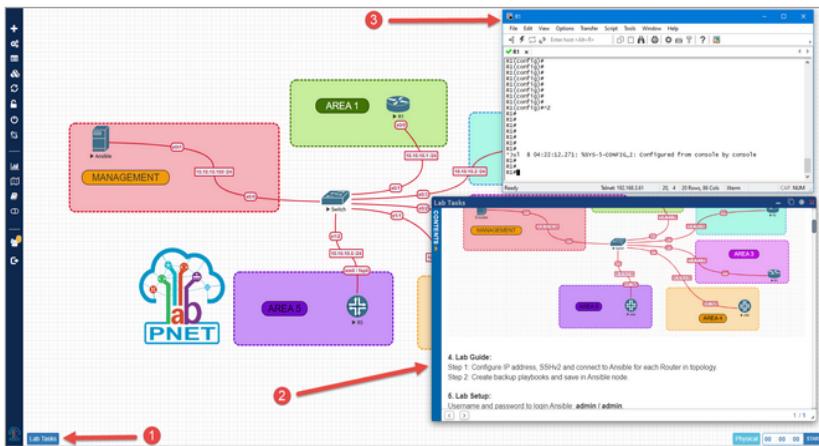
After completes download LAB (**Lab file, IOS, and Workbook**), click to **Go to Lab** button, then Lab will download to the folder: **Your labs from PNETLab Store**



Practice your lab: Open lab then **Start all nodes**

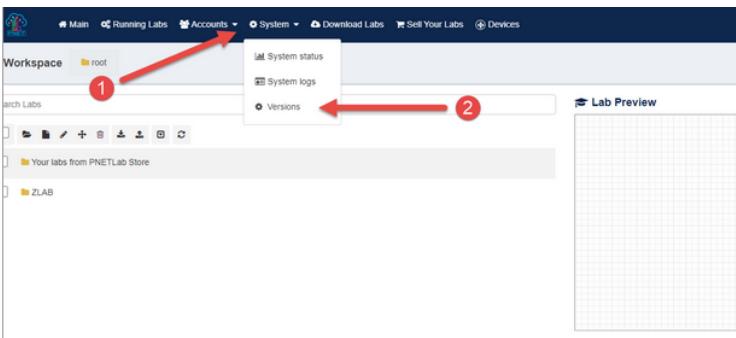


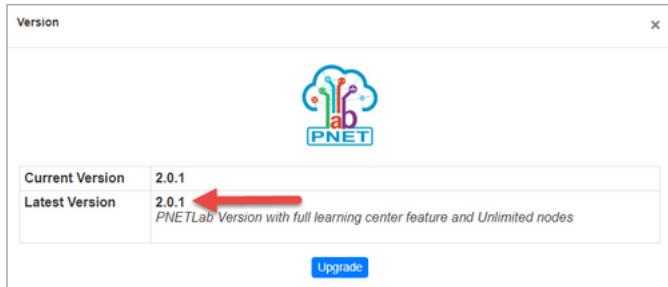
Open **Workbook** (Lab task) and **Console** (There are two type of console: HTML Console and Native Console) then Enjoy your Labbing :)



## How to upgrade PNELab to the newest version

The system will notify you if there is a new version available. You just need to click on System > Version





## Change the Owner or PNETLab Box

- An Account can login to multi PNETLab Boxes. But can not login to multi Boxes at the same time.
- When a PNETLab Box is deploy, it is in no owner state.
- The First Account login to no owner Box will become the Owner of that box. The Owner will have full permission of Admin and can edit Accounts no that Box.
- If you want to change Owner of the Box. Go to Boxes Tab and Release it from your old account.
- When the Box is released, that box will come back No Owner State. Login to that box by new account and the new Account will become the Owner.
- To release a Box, login to page: <https://user.pnetlab.com/store/labs/view>

Access Box Access Email

Index Access Box ID Access Email ID Access Note Access Time

1	564D3272-246C-070A-F5EE-1FF7E2E32BF1	teacherQ@gmail.com	Teacher	Jul 10, 2020 2:50 PM
2	564D3272-246C-070A-F5EE-1FF7E2E32BF1	teacherT@gmail.com	Teacher	Jul 10, 2020 2:50 PM

Period: 1 of 1 Next Total: 2

①

②

Note: You can get the UUID of the box by access the **Users management** on your box.

Email Role Note

Index UUID Version Access Time

1	564D3272-246C-070A-F5EE-1FF7E2E32BF1	2.0.1	Jul 8, 2020 10:04 AM
---	--------------------------------------	-------	----------------------

Period: 1 of 1 Next Total: 3

③

Box ID: 564D3272-246C-070A-F5EE-1FF7E2E32BF1

## How to deploy PNETLab Box on Google Cloud

### 1. Deploy PNETLab on Google cloud by APT

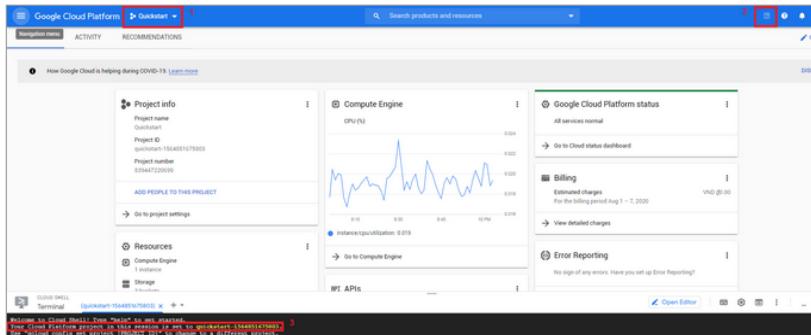
#### Step 1:

Go to <https://console.cloud.google.com/home/dashboard>

You will have **300\$** free in 90 days.

## Step 2:

1. Select your project
2. Click to Button to open terminal
3. Make sure the Project ID is set.



## Step 3:

Run below command in Terminal.

- gcloud compute images create **nested-ubuntu-xenial** --source-image-family=ubuntu-1804-its --source-image-project=ubuntu-os-cloud --licenses <https://www.googleapis.com/compute/v1/projects/vm-options/global/licenses/enable-vmx>

```
Cloudshell:~ (quickstart-1564851675803)$ gcloud compute images create nested-ubuntu-xenial --source-image-family=ubuntu-1804-its --source-image-project=ubuntu-os-cloud --licenses https://www.googleapis.com/compute/v1/projects/vm-options/global/licenses/enable-vmx
PROJECT          FAMILY      DEPRECATED   STATUS
-xenial          quickstart-1564851675803$          READY
@Cloudshell:~ (quickstart-1564851675803)$
@Cloudshell:~ (quickstart-1564851675803)$
@Cloudshell:~ (quickstart-1564851675803)$
```

## Step 4:

- Create a new VM instance base on the images built from Step 3

To create a VM instance, select one of the options:

- New VM instance **>Create a single VM instance from scratch**
- New VM instance from template **Create a single VM instance from an existing template**
- New VM instance from machine image **Create a single VM instance from an existing machine image**
- Marketplace **Deploy a ready-to-go solution onto a VM instance**

Name **shorter than 8 characters**  
pnetlab

Labels **(Optional)**  
+ Add label

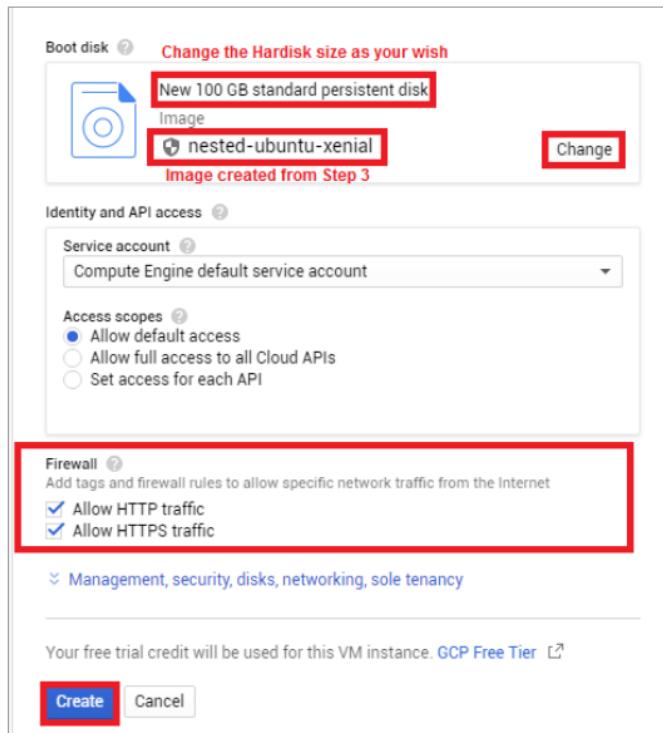
Region **Region is permanent**  
Zone **Zone is permanent**  
us-central1 (Iowa) us-central1-a

Machine configuration

Machine family  
General-purpose Compute-optimized Memory-optimized

Series **Select Intel CPU**  
N2  
Powered by Intel Cascade Lake CPU platform

Machine type  
n2-standard-2 (2 vCPU, 8 GB memory)



## Step 5:

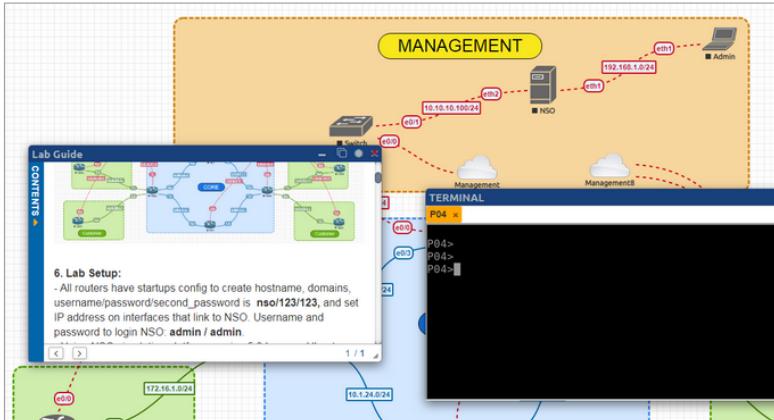
The screenshot shows the VM instances page with one instance named 'pnetlab' listed. The instance has an external IP of '(nic0)'. The 'SSH' button next to the instance details is highlighted with a red box.

- SSH to Instance run below commands:
  - sudo -i
  - echo "deb [trusted=yes] http://repo.pnetlab.com ./" | tee -a /etc/apt/sources.list
  - apt-get update
  - apt-get install pnetlab
- Create Swap memory: (*This memory is located on the hard disk. It serves as the support for the RAM in case the RAM is full. It should be set to half of the RAM.*)
  - sudo -i
  - fallocate -l **1G** /swapfile (You can change the size of Swap as your wish)
  - chmod 600 /swapfile
  - mkswap /swapfile
  - swapon /swapfile
  - cp /etc/fstab /etc/fstab.bak
  - echo '/swapfile none swap sw 0 0' | tee -a /etc/fstab
- Config DNS server:

- Edit file /etc/network/interfaces add line **dns-nameservers 8.8.8.8** to the configuration of interface pnet0
- For example:
  - nano /etc/network/interfaces
  - Change like bellow
  - *iface eth0 inet manual*
  - *auto pnet0*
  - *iface pnet0 inet dhcp*
  - ***dns-nameservers 8.8.8.8***
  - *bridge\_ports eth0*
  - *bridge\_stp off*
  - save: ctrl + X > y > enter
- Restart network service: service networking restart
- **Update Kernel:**
  - sudo -i
  - rm /etc/default/grub.d/50-cloudimg-settings.cfg
  - update-grub
  - reboot
- **System > System setting > Click on Fixpermissions Button.**
- **Change Root password:**
  - sudo -i
  - passwd
  - fill your password
- Check virtualization enable by command: **grep -cw vmx /proc/cpuinfo** It should return 1 or number of CPU core you selected
- Now you can access to **PNETLab** box by **External IP**. (access by **http** not **https**)
- **Follow this guide to upgrade PNETLab to the latest version:**  
<https://pnetlab.com/pages/documentation?slug=how-to-upgrade-pnetlab>

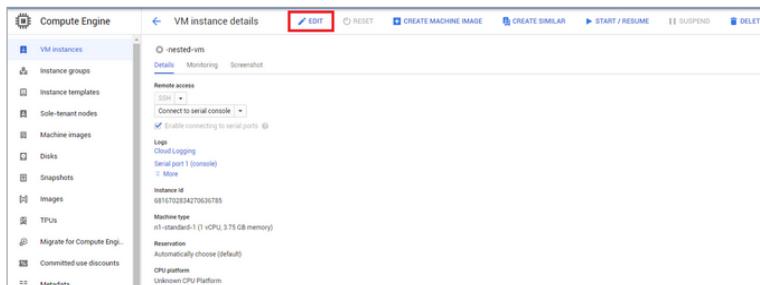
**Note:**

- To console to device you have switch to **HTML Console at the right menu**
- The default account is : **root/eve**. Please change the pass because your box is **public**.
- **All devices on the labs should have password when console to them.**

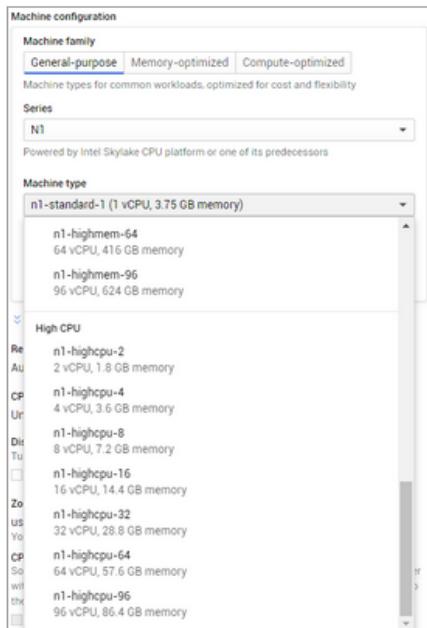


## 2. Expand RAM, CPU, HDD

To edit Ram, CPU, HDD you need to shut PNETLab down first then click on Edit button.



RAM and CPU are attached together. You can drop down and select one of those options. ( Note:The higher the ram and the CPU, the more money you will lose. Choose enough for you)



- To expand the hard disk click on **Add new Disk** button.

Device name ⓘ  
Used to reference the device for mounting or resizing.  
Custom  
persistent-disk-0

Additional disks ⓘ (Optional)  
Existing disk (disk-1)  
+ Add new disk + Attach existing disk

Local disks  
None

Shielded VM ⓘ  
Select a shielded image to use shielded VM features.  
Turn on all settings for the most secure configuration.  
Turn on Secure Boot ⓘ  
Turn on vTPM ⓘ  
Turn on Integrity Monitoring ⓘ

### Note:

- To save money and trial time. Please choose as small as possible
- 200G is the minimum that google recommends so as not to lose performance
- Very easy to add more hard disk, but very difficult to remove a hard disk. It can crash your PNELab instance.

New disk (disk-2, Blank, 200 GB)

Name ⓘ  
Name is permanent  
disk-2

Description (Optional)

Type ⓘ  
Standard persistent disk

Snapshot schedule  
Use snapshot schedules to automate disk backups. Scheduled snapshots ⓘ  
No schedule

Create snapshot schedules to automatically back up your data.  
Learn more about creating snapshot schedules ⓘ

Source type ⓘ  
Blank disk Image Snapshot  
Blank disk

Mode  
 Read/write  
 Read only

Deletion rule  
When deleting instance  
 Keep disk  
 Delete disk

Size (GB) ⓘ  
200

Estimated performance ⓘ

Operation type	Read	Write
Sustained random IOPS limit	150.00	300.00
Sustained throughput limit (MB/s)	24.00	24.00

- Click on Save button and start it again.
- Check to confirm new HDD by command: df -h

```
Interactive serial console:      
```

Password:  
Last login: Fri Aug 21 05:17:27 EEST 2020 on ttyS0  
Welcome to Ubuntu 16.04 LTS

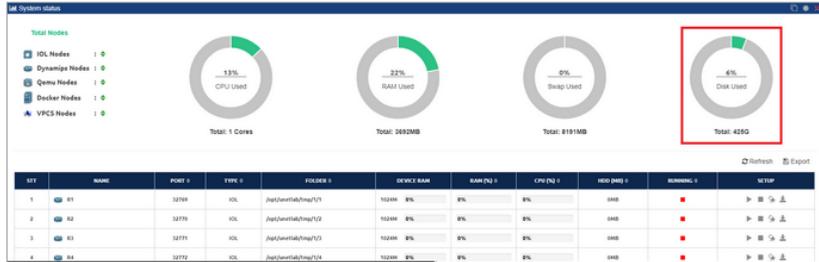
```
* Documentation: https://help.ubuntu.com  
* Management: https://landscape.canonical.com  
* Support: https://ubuntuforums.org/advantage

* Are you ready for Kubernetes 1.19? It's nearly here! Try RC3 with  
sudo snap install microk8s --channel=1.19/candidate --classic

https://microk8s.io/ has docs and details.
```

```
root@nested-vm:~# df -h
```

Filesystem	Type	Total	Used	Avail	Use%	Mounted on
udev	cgroupfs	1.8G	0	1.8G	0%	/dev
tmpfs	cgroupfs	370M	13M	358M	4%	/run
/dev/mapper/	-root	125G	23G	95G	6%	/
tmpfs	cgroupfs	1.9G	0	1.9G	0%	/dev/sda1
tmpfs	cgroupfs	5.0M	0	5.0M	0%	/run/lock
tmpfs	cgroupfs	1.9G	0	1.9G	0%	/sys/fs/cgroup
/dev/sdal	ext4	472M	88M	361M	20%	/boot



## How to upgrade to PNETLab 2.0.X

**PNETLab 2.0.9** is a new version with many features integrated.

1. Lab Store
  2. Docker Integrated
  3. Link style
  4. Change label position
  5. Text Object
  6. Shape Object
  7. Workbook
  8. IOS included in the lab when you download
  9. HTML Console
  10. Multi Startup Configuration for each lab
  11. Multi lab run at the same time
  12. Multi-users can join in 1 lab session
  13. Permission for each lab
  14. Full feature of the learning center
  15. New preview lab engine
  16. Unlimited running devices at the same time
  17. Unlimited devices per lab
  18. Device store, get the device by one click
  19. Change Lab and Folder position by drag and drop
  20. Autoload template, script

21. Dark mode
22. 3D mode
23. Change the size of the node icon.
24. Proxy Configuration
25. Manage RAM, CPU, HDD
26. Limit RAM, CPU, HDD
27. Beautiful Icons

#### **Before Upgrade.**

- After the upgrade, all nodes of all Labs will be Wiped. If you don't export all configuration, all configuration will be lost.
- To Export all configuration of a Lab.
  - Open this Lab
  - **More Option > Start All Node**
  - **More Option > Export Config All Node**

#### **Upgrade.**

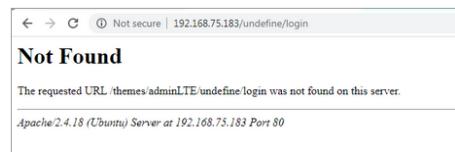
- To Upgrade directly from old versions 1.0.2, 1.0.3 and 1.0.4, Log in to device go to **System > Click on version button.**
- Waiting about 3 - 4 minutes

#### **After Upgrade.**

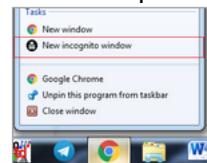
- When the upgrade finished, You will get a message on **Console Screen.**

```
#####
Congratulations, you have successfully upgraded to PNET version 2.0.1
- Added full learning center features
- Unlimited number of nodes running at the same time.
- Change the WEB interface better
#####
Note: Clear the cache and access again when you meet any errors
Thanks!
```

- For the first time after upgrade finished, You may get the error like below screen because the cache's Browser still cache the old version. To avoid this error using Incognito mode of Chrome or FireFox to access to IP of device again.



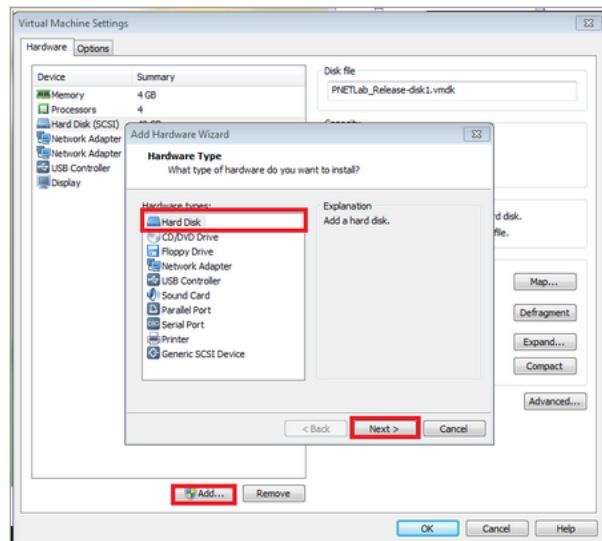
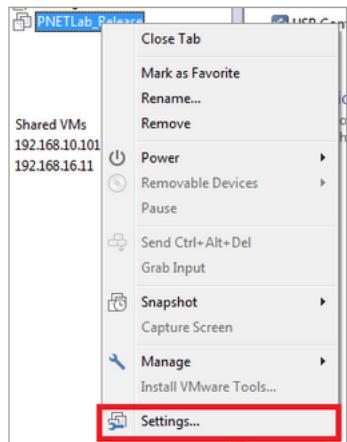
- To open Incognito Mode, Right-Click then select **New incognito window**

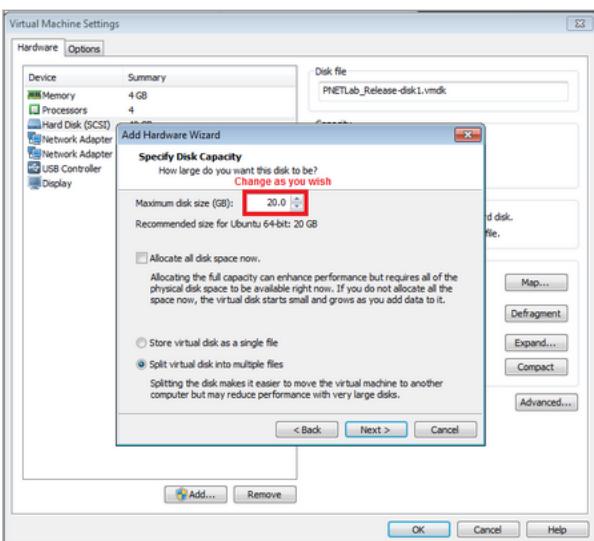
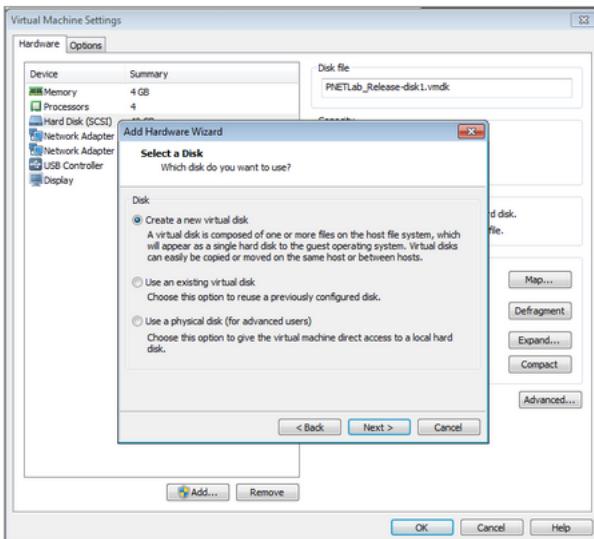
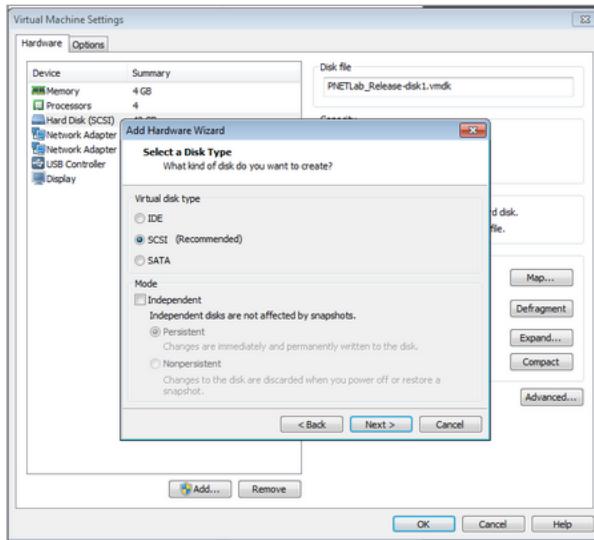


## How to expand HDD for PNETLab

Note:

- If your hard disk is over 90%, system will create a log to the console screen. In that case do not expand the existed HDD, shutdown PNETLab, go to vmware setting and add one more new hard disk.
- Hard drive expansion can damage the hard drive





- Start PNELab and check again by command: `df -h`

```

root@pnetlab:/opt/unetlab/html# df -h
Filesystem           Size  Used Avail Use% Mounted on
udev                  2.0G   0  2.0G  0% /dev
tmpfs                 395M  32M  364M  8% /run
/dev/mapper/vg-root    51G  14G  35G  28% /
tmpfs                 2.0G   0  2.0G  0% /dev/shm
tmpfs                 5.0M   0  5.0M  0% /run/lock
tmpfs                 2.0G   0  2.0G  0% /sys/fs/cgroup
/dev/sda1              472M  83M  365M  19% /boot
root@pnetlab:/opt/unetlab/html# -

```

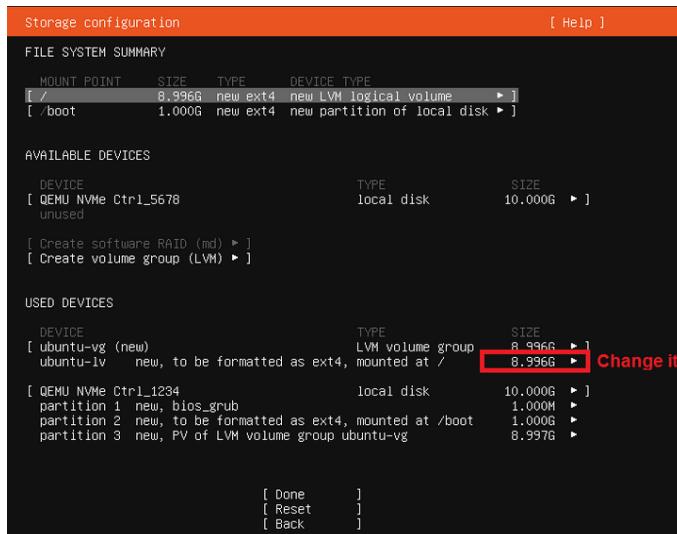
## Install Bare metal

**Step 1:** Download Ubuntu 18.04 from Link:

<https://releases.ubuntu.com/18.04/>

**Step 2: Install Ubuntu.**

- Select install Open SSH
- Set the hard disk. You should give all hardisk you have for ubuntu\_lv



**Step 3: Login as root:**

- Login by account you use to create ubuntu 18.04
- go to root by command **sudo -i**
- Set password for root by command: **passwd**
- Allow root access over SSH run command: sed -i -e "s/.\*/PermitRootLogin .\*/PermitRootLogin yes/" /etc/ssh/sshd\_config
- Run command: service sshd restart
- Delete account you created:
  - exit
  - login by root account
  - userdel [username you created]

**Step 2:** Add repository to end of file: /etc/apt/sources.list

**deb [trusted=yes] http://repo.pnetlab.com ./**

```

root@pnetlab: ~
## Generally, we only consider in the main repository, stability, i.e., include
## newest versions of some applications which may provide useful features.
## Also, please note that software in backports WILL NOT receive any review
## or updates from the Ubuntu security team.
deb http://vn.archive.ubuntu.com/ubuntu bionic-backports main restricted universe
# multiverse
# deb http://vn.archive.ubuntu.com/ubuntu bionic-backports main restricted universe multiverse

## Uncomment the following two lines to add software from Canonical's
## "partner" repository.
## This software is part of Ubuntu, but is offered by Canonical and the
## developer releases as a service to Ubuntu users.
# deb http://archive.canonical.com/ubuntu bionic partner
# deb-src http://archive.canonical.com/ubuntu bionic partner

deb http://vn.archive.ubuntu.com/ubuntu bionic-security main restricted
# deb http://vn.archive.ubuntu.com/ubuntu bionic-security universe
# deb-src http://vn.archive.ubuntu.com/ubuntu bionic-security universe
deb http://vn.archive.ubuntu.com/ubuntu bionic-security multiverse
# deb-src http://vn.archive.ubuntu.com/ubuntu bionic-security multiverse

Do [trusted=yes] http://repolinux.com ./
```

50,1 Bot

### Step 3:

- Make sure your server can connect to internet
- Run bellow commands
  - **echo "nameserver 8.8.8.8" > /etc/resolv.conf**
  - **apt-get update**
  - **apt-get purge netplan.io**
  - **apt-get install pnetlab -y**

Note: May be get error in installing process. run **apt-get update** then install pnetlab again **apt-get install pnetlab -y**

- Reboot

### Step 4: Upgrade to the latest version.

- **Follow this guide to upgrade to the latest version:**  
<https://pnetlab.com/pages/documentation?slug=how-to-upgrade-pnetlab>

## Labs vs Learning Center

### About Learning Center

Learning Center is designed for Group learning.

#### The main features:

- Many people can log in on one PNETLab Box.
- Many people can join in the same Lab session.
- Set permission for the user by Role.
- Set permission for each lab: Who can Open a new Session, Who can Join a Session, Who can edit the Lab.
- Lock the Lab
- Monitor Lab for Admin.

Flow this guides serial to understand and use the Learning Center of PNETLab Box.

1. [How to add Role](#)
2. [How to add Account](#)
3. [How to set Lab Permission](#)
4. [Manage Running Labs.](#)
5. [Manage Accounts on the PNETLab Store.](#)
6. [How to share folder](#)

## How to add Role?

PNETLab Box allow you to create unlimited Role on the Box.

### Note

- **Admin** is the default Role and have full permission.
- The **First Account** login on the new Box will become the **Owner** of the BOX and always is Admin. If you want to change Owner of the Box Refer [Link](#)
- Only **Owner** of the box has permission to edit **Accounts**.

To create a Role: Accounts > Roles Management > Click on Add button

1. Fill the name of the Role: (e.g Student, Teacher...)
2. The Workspace is the folder the user only can work in. The user with this Role can access Workspace folder and all child folder. You can use existed folder or create a new once by click on button
3. Set up permission for the Role
  - **Delete Folder:** The Users can delete the folder on their workspace.
  - **Add New Folder:** The Users can Add a new Folder on their workspace.
  - **Rename or Move Folder:** The Users can change the name or drag drop to move folder on their workspace.
  - **Delete Lab:** The Users can Delete Labs on their workspace.
  - **Add New Lab:** The Users can Add a new Labs on their workspace.
  - **Import Lab:** The Users can using **Import Lab** feature on their workspace.
  - **Export Lab:** The Users can using **Export Lab** feature on their workspace.
  - **Move Lab:** The Users can move Lab on their workspace.
  - **Clone Lab:** The Users can Clone Lab on their workspace.
4. Click on **Add** Button to save the Role. Now you can see the new Role in the table

Role Name					
<input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Clear Filter"/> <input type="button" value="Refresh"/> <input type="button" value="Export"/>					
STT	Role Name	Role Workspace	Role Note	Setup	
1	Teacher	(Lab Share)	OF	<input type="checkbox"/>	<input type="checkbox"/>
					25

To delete a Role, Select the Role and click on **Delete** Button

To Edit a Role click on  on each row.

Note: When you delete a Role. The permission of all related user will be set to **empty** and the user **can not** access the box.

Role Name					
<input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Clear Filter"/> <input type="button" value="Refresh"/> <input type="button" value="Export"/>					
STT	Role Name	Role Workspace	Role Note	Setup	
1	Teacher	(Lab Share)	OF	<input checked="" type="checkbox"/>	<input type="checkbox"/>
					25

## How to add Accounts?

To add account to your box, Accounts > Users Management > Click on Add button

Note: Maximum Account is number of accounts you can add to this box. The default, you can add maximum 10 more accounts. To expand please contact with us.

Email					
<input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/> <input type="button" value="Clear Filter"/> <input type="button" value="Refresh"/> <input type="button" value="Export"/>					
STT	User Name	Email	IP Address	Role	Current Workspace
1	admin	192.168.75.1		Admin	OF
					25

<input type="button" value="Add User"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/> <input type="button" value="Clear Filter"/> <input type="button" value="Refresh"/> <input type="button" value="Export"/>					
STT	User Name	Email	IP Address	Role	Current Workspace
1	admin	192.168.75.1		Admin	OF

**Add User**

Emails  
Insert emails that allow access to this box. Separated by a special character

Role

Note

- Fill emails of users you want to add.
- Select Role you have created before.
- Take the Node. You should take the node for each group to filter easier.
- Click on Add button to add users. Now you can see all users added in the table.
- Edit anything as you want then click on Apply button to take effect

Email					
<input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/> <input type="button" value="Clear Filter"/> <input type="button" value="Refresh"/> <input type="button" value="Export"/>					
STT	User Name	Email	IP Address	Role	Current Workspace
1	admin	192.168.75.1		Admin	OF
2		teacher1@gmail.com		Teacher	OF
3		teacher2@gmail.com		Teacher	OF
					25

- After Apply your change, The users added will receive an alert.
- If Email is existed on PNELab. Alert is send by notification system.
- If Email is not existed on PNELab. An Email will be send

**PNETLab** [Inbox](#)

**04-07-2020 15:35**

Algermon has granted you access to log into the box with the address: 192.168.3.61

noreply.pnetlab@gmail.com <noreply.pnetlab@gmail.com> to me ▾

Hi,

lin007 has granted you access to log into the box with the local address: [192.168.75.183](#)

If you do not have an account, [Register](#) please

PNETLab community

To Edit Account please click on **Edit** on each row. You also edit multi row by select all row you want to change and click on **Edit** button. Click on Apply to apply your change.

## How to set Lab permission?

PNETLab Box allow you to set permission for each Lab. You can set who can open lab, who can join lab, who can edit the lab.

Add a new Lab: Main >

The screenshot shows the 'Add new Lab' form. It includes fields for Name, Version, Author (set to 'pnetlab@gmail.com'), Config Script Timeout (set to 60 seconds), Countdown Timer (set to 60 minutes), and Description. Three sections are highlighted with red boxes:

- Who can Open this Lab:** Options include Admin Only, Everyone, and Admin and Special users. The 'Admin and Special users' option is selected.
- Who can Join this Lab:** Options include Admin Only, Everyone, and Admin and Special users. The 'Admin and Special users' option is selected.
- Who can Edit this Lab:** Options include Admin Only, Everyone, and Admin and Special users. The 'Admin and Special users' option is selected.

At the bottom, there are 'Close' and 'Add' buttons, and a summary table with the following details:

• Lab Name:	Establish L2TPvN Pseudoroute with NS0 WEBUI Ver_1
• Author:	pnetlab@gmail.com
• Version:	1
• Lab ID:	dcfbec04-9ebd-40e0-9b41-4efec38e092
• Description:	

- Fill the Name of the Lab (Name can only contain alphabet, number, space and \_)

### Who can Open this Lab?

When user open a Lab, A new session of this lab will be created and show on Running Lab. By default when a Lab is created, Only Admin and the Author can Open it. Options you can chose:

- Admin Only:** Only Admin can open this lab. **Note if the Author is not an Admin and select this option he will lost permission to open this lab.**
- Everyone:** This lab will be able to opened by anyone if it is placed in their workspace.
- Admin and Special users:** Only Admin and User have email address contained in the list can Open the Lab, if it is placed in their workspace. Click on the text box a window will be opened then you can select all account will have permission to open this lab. You can using filter box to find the email easier.

STT	User Name	Email	Role	Note	
1	LN	prestate@gmail.com	Admin		<input checked="" type="checkbox"/> 1
2		teacher1@gmail.com	Teacher	Teacher	<input checked="" type="checkbox"/> 2
3		teacher2@gmail.com	Teacher	Teacher	<input checked="" type="checkbox"/>

Clear Filter Refresh Export

Cancel Select

### Who can Join this Lab?

The User can see all Running Lab on the Running Labs Tab. Users can only join labs for which they have permission to join. When create a Lab, the Author can chose one of those options.

- **Admin Only:** Only Admin can Join this lab. **Note: if the Author is not an Admin and select this option he will lost permission to Join this lab.**
- **Everyone:** This lab will be able to Join by anyone, if it is placed in their workspace.
- **Admin and Special users:** Only Admin and User have email address contained in the list can Join the Lab , if it is placed in their workspace. Click on the text box a window will be opened then you can select all account will have permission to Join this lab. You can using filter box to find the email easier.

### Who can Edit this Lab?

After joining the Lab. Only people who have the permission to edit the Lab can edit the lesson. Otherwise they just might:

- Start Node
- Stop Node
- Wipe Node
- Console to Node
- Using Workbook
- Timer
- Change Active Config on Multi Config

When create a Lab, the Author can chose one of those options.

- **Admin Only:** Only Admin can Edit this lab. **Note: if the Author is not an Admin and select this option he will lost permission to Edit this lab.**
- **Everyone:** This lab will be able to Edit by anyone, if it is placed in their workspace.
- **Admin and Special users:** Only Admin and User have email address contained in the list can Edit the Lab, if it is placed in their workspace. Click on the text box a window will be opened then you can select all account will have permission to Edit this lab. You can using filter box to find the email easier.

### Manage Running Labs

When user open any lab, A lab session will be created and show in Running Lab . The User who opened the Lab will become the Host of the Lab session.

STT	Actions	Session Lab Path	Running Nodes	Session Host	Joined Members
1		<a href="#">/Your labs from PNETLab Store/Establish L...</a>	2	LIN	

Period: 1 of 1 | Next | Total: 1 | 25

You can see informations about the Host of session, Who are joining lab.

For each Lab Session you can do some action:

- Get information of the Lab by click on the column Session Lab Path
- Join the Lab by click on
- Destroy Lab by click on . Node: Only Host of session and Admin can destroy a Lab.

When you Stop all node on Lab. The Lab session will change status to

STT	Actions	Session Lab Path	Running Nodes	Session Host	Joined Members
1		<a href="#">/Your labs from PNETLab Store/Establish L...</a>	0	LIN	

Period: 1 of 1 | Next | Total: 1 | 25

#### **Node:**

- *Although all the devices in the Lab are shutdowned, the tmp files are still kept. The lab still takes your hard disks so we keep them visible on the Running Lab tab to you can manage them.*
- *The Lab session remain until you destroy it. When you destroy all the tmp files will be deleted and the hard disk will be released. That means all configurations will be lost if you destroy lab without exporting the Lab configuration.*

## Manage Accounts on the PNETLab Store

### Manage Accounts

You can manage all account on all PNETLab Box on the Store.

Index	Access Box ID	Access Email	Access Note	Access Time
1	564D0072-246C-570A-F5EE-1FF7E2E32B91	teacher2@gmail.com	Teacher	Jul 10, 2020 2:50 PM
2	564D0072-246C-570A-F5EE-1FF7E2E32B91	teacher1@gmail.com	Teacher	Jul 10, 2020 2:50 PM

Period: 1 of 1 | Next | Total: 2 | 25

- The Access Box column is the Box's ID. You can get the Box's ID on the User management Tab.

### Manage Boxes

Switch to Boxes Tag you can see all the Boxes owner by you

Index	UUID	Version	Access Time	Release
1	564DBAE5-1E2F-41CD-250A-4FC15A0F789	2.0.1	Jul 9, 2020 2:58 AM	<a href="#">Release</a>
2	73209DC7-9825-18DF-5257-AB359A45CAE1	1.0.2	May 7, 2020 10:26 PM	<a href="#">Release</a>
3	BFE5E693-28E1-AAFC-528B-CDA84B04C984	2.0.1	Jul 7, 2020 9:19 PM	<a href="#">Release</a>
4	564D1830-42F4-A1E9-E129-F29A4A10C996	2.0.1	Jul 9, 2020 12:52 AM	<a href="#">Release</a>
5	564D1770-584E-0629-8014-A65B2975A40E	1.0.3	Jul 9, 2020 4:29 AM	<a href="#">Release</a>
6	564D9E62-CF6E-5CA9-B69C-C23600538818	1.0.3	Jul 9, 2020 9:09 AM	<a href="#">Release</a>
7	564D9A11-2CDD-9E0F-821A-7F4F975539F	2.0.1	Jul 9, 2020 10:59 AM	<a href="#">Release</a>
8	564DADD5-CB70-466C-0F35-D06AF9297716	2.0.1	Jul 9, 2020 3:02 PM	<a href="#">Release</a>
9	564D2722-2462-C70A-F5EE-1FF7E2328P1	1.0.1	Jul 10, 2020 2:50 PM	<a href="#">Release</a>

- When a PNETLab Box is deployed, it is a new Box and the First Account Login to this box will become the Owner.
- If you want to change Owner for a Box just release it and login by new Account.

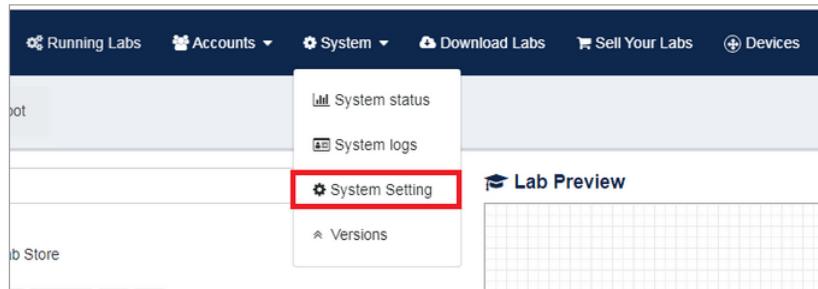
### Manage License

This tag is used in case you want to extend the maximum number of accounts. Contact us to get more information.

## How to share folder?

From version 2.0.8 you can define a list of share folders.

- Only Admin has permission edit the share folder list. To Set up go to System > System Setting



- Select Folders you want to share. Edit the permission for user on Share Folders

Share Folders	
Choose folders to share with all users	
<b>Selected Folders:</b> <input type="checkbox"/> /opt/unetlab/labs/Your labs from PNETLab Store <span style="float: right;">x</span> <input checked="" type="checkbox"/> labs <input checked="" type="checkbox"/> Lab Share1 <input checked="" type="checkbox"/> Lab Share <input checked="" type="checkbox"/> Your labs from PNETLab Store <span style="color: green;">✓</span>	
<b>Share Folders permissions</b> <input type="checkbox"/> Delete Folder <input type="checkbox"/> Add New Folder <input type="checkbox"/> Rename or Move Folder <input checked="" type="checkbox"/> Delete Lab <input type="checkbox"/> Add New Lab <input type="checkbox"/> Import Lab <input type="checkbox"/> Export Lab <input checked="" type="checkbox"/> Move Lab <input type="checkbox"/> Clone Lab <input checked="" type="checkbox"/> Join Lab Session <input checked="" type="checkbox"/> Open New Lab Session	
<input type="button" value="Save"/>	

- After Save. All user will see and have permission access the share folder.

The screenshot shows the PNETLab Lab Workspace. At the top, there's a navigation bar with links like Main, Running Labs, Accounts, System, Download Labs, Sell Your Labs, and Devices. Below the navigation is a breadcrumb trail: Workspace > root > Share Folder. A search bar labeled 'Search Labs' is present. The main area is titled 'Shared Folders' and contains a 'Share Folder' button. There's also a file browser interface with icons for files and folders. At the bottom, it shows a file named 'Lab\_01.uln' and the date '24 Jul 2020 14:06'.

## Manage RAM, CPU, HDD

From Version 2.0.8, PNETLab allow you to manage CPU, RAM, HDD on each Node, each Lab session, each User. You can limit RAM, CPU, HDD for each User

- On Lab Workspace you can monitor information of all node by click on System Status tab. The status table will be auto update after 30 seconds.



- To monitor RAM, CPU, HDD for each User go to **Accounts > Users manager**

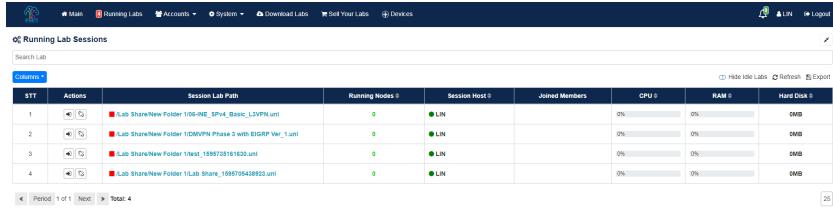
The screenshot shows the Accounts > Users manager page. It has a search bar for Email, Role, and Note. Below the search is a table with columns: STT, User Name, Email #, IP Address, Role, RAM Limit #, CPU Limit #, Hard disk Limit #, Note, and Setup. Two users are listed: vtv (Teacher) and LIN (Admin). At the top right, it says 'Maximum Accounts: 10' and 'Box's ID: 544C0272-246C-470A-F8EE-1FF782E2BFP1'. Below the table are buttons for Add, Edit, Delete, Clear Filter, Refresh, and Export.

STT	User Name	Email #	IP Address	Role	RAM Limit #	CPU Limit #	Hard disk Limit #	Note	Setup
1	vtv	007@gmail.com	192.168.75.1	Teacher	0%	0%	1G	0%	test
2	LIN	prelates@gmail.com	192.168.75.1	Admin	50%	0%	\$1.89	0%	GF

- You can see how many percent RAM and CPU the users are taking.
- The Red Threshold is the limitation of RAM and CPU. To setting it go to Accounts > Roles Manager.

The screenshot shows the 'Edit Role' form. It includes fields for 'Name' (Teacher), 'Permission' checkboxes (Delete Folder, Add New Folder, Rename or Move Folder, Delete Lab, Import Lab, Export Lab, Move Lab, Clone Lab), and 'Note' (a text area). At the bottom, there are 'CPU Limit (%)' (set to 1), 'RAM Limit (%)' (set to 1), and 'Hard disk Limit (MB)' (set to 10). A note below states: 'Note: When crossing the threshold above, the user will not be able to open more nodes or Labs.' There are 'Save' and 'Cancel' buttons at the bottom.

- To manage resource for each Lab, go to **Running Labs**. You can expand the table by click on button 



STT	Actions	Session Lab Path	Running Nodes	Session Host	Joined Members	CPU	RAM	Hard Disk
1	 	#Lab Share/New Folder 10G-NF_SPAv4_Basic_L2VPN uni	0	● LIN	0%	0%	0MB	
2	 	#Lab Share/New Folder 1GmVPN Phase 2 with EIGRP Ver_1 uni	0	● LIN	0%	0%	0MB	
3	 	#Lab Share/New Folder 1uni_1998728161620 uni	0	● LIN	0%	0%	0MB	
4	 	#Lab Share/New Folder 1Lab Share_1998705448992 uni	0	● LIN	0%	0%	0MB	

◀ Period 1 of 1 ▶ Total: 4 25

### Note:

- If your your hard disk is over 90%, system will create a log to the console screen. In that case **do not expand the existed HDD**, shutdown PNELab, go to vmware setting and add one more new hard disk.
- When users cross any limitation, they will not able to open any new node or new Lab.
- You can stop CPU, RAM, HDD limit service by command:
  - `systemctl stop harddisk_alert`
  - `systemctl stop harddisk_limit`
  - `systemctl stop process_limit`

## Working with PNELab

### PNELab Supported Images

#### PNELab Supported Images:

##### 1- IOL (IOS on Linux also known as IOU)

- Supported All L2 and L3 IOL (IOS on Linux also know as IOU)

##### 2- Qemu Images

- Cisco ACS 5.6, 5.8
- Cisco AMP Private cloud
- Cisco ISE 1.2, 1.4
- Cisco ISE 2.1, 2.2, 2.3, 2.4, 2.6
- Cisco ASA 8.0.2 (Single and Multi Context)
- Cisco ASA 8.4 Multicontext Support
- Cisco ASA 9.1.5 Multicontext Support
- Cisco ASAv 9.6.2, 9.7.1 or later
- Cisco DCNM 11.x
- Cisco IPS 7.1
- Cisco Firepower 6.x Management centre (FMC)
- Cisco Firepower 6.x Threat defence ASAv (FTD)
- Cisco Firepower 6.x NGIPSV
- Cisco Firepower 5.4 (NGIPS, FMC)
- Cisco CSR 3.16, 3,17
- Cisco CSR 16.x (Everest, Fuji, etc)
- Cisco CSR SD-WAN 16.x
- Cisco vIOS L3
- Cisco vIOS L2
- Cisco ESA 9.7, 9.8, 10.x, 11.x Email Security Appliance

21. Cisco WSA 8.6, 9.2 10.x, 11.x Web Security Appliance
22. Cisco CDA 1.0 Context Delivery Agent
23. Cisco NXOS Titanium 7.1.0.3
24. Cisco NXOSk9 (require source of 2xCPU and 8G RAM for single node)
25. Cisco Prime Infra 3.x
26. Cisco StealthWatch 7.x
27. Cisco XRv 5.2.2, 5.3.2, 6.0.1, 6.0.2
28. Cisco XRvK9 6.x.x (require source of 4xCPU and 16G RAM for single node)
29. Cisco vWLC, 7.4. 8.0.100, 8.2.x, 8.3.x, 8.6
30. Cisco vNAM Virtual Network Analysis Module 6.2.x
31. Cisco vWAAS 200.5.5, 6.2.3
32. Cisco Viptela SD-WAN 18.x, 19.x
33. Cisco CUCM 11.5.1.11900-26, 12.x
34. Juniper vSRX 12.1.47D
35. Juniper Olive M series
36. Juniper vSRX NG 15.1x49-D40.6, D70, D100, D110
37. Juniper vSRX NG 17.x, 18.x, 19.x, 3.0
38. Juniper vMX 14.1.4R10
39. Juniper vMX 16.1R3.10, 17.x, 18.x, 19.x VCP (control plane node)
40. Juniper vMX 16.1R3.10, 17.x, 18.x, 19.x VFP (forwarding plane node)
41. Juniper vMX 17.1, 17.2, 17.3, 18.x, 19.x VCP (control plane node)
42. Juniper vMX 17.1, 17.2, 17.3, 18.x, 19.x VFP (forwarding plane node)
43. Juniper vQFX 10K VRE 15.1X53, 17.x, 18.x (routing engine)
44. Juniper vQFX 10K VFE 15.1X53, 17.x, 19.x (forwarding engine)
45. Juniper VRR 18.x, 19.x
46. Junos J-Space 16.1
47. Kerio Control Firewall
48. Alcatel 7750SR: 13.0.R3
49. A10, vThunder 2.7.1, 4.x
50. Apple OSX ( <https://github.com/kholia/OSX-KVM> )
51. Aruba: Clearpass 6.x
52. Aruba Virtual Mobility Controller 8.x
53. Aruba CX Switch
54. Arista vEOS 4,17.2F and later versions
55. Barracuda NGFW
56. Brocade vADX 3.01.1
57. Checkpoint FW: R77-20, R77-30, R80-x
58. Citrix Netscaler 11.0.62
59. Dell SonicWall 11.3.0
60. CumulusVX 2.5.3, 3.6, 3.7
61. Cyberoam FW
62. ExtremeOS 21.1.14
63. F5 BIG-IP 12.x, 13.x, 14.x, 15.x
64. F5 BIG-IQ 6.x
65. Fortinet Manager v5.x, v6.x
66. Fortinet Mail 5.3, 5.4
67. Fortinet FGT v5.x, 6.x
68. Fortinet 5.2.3, 5.6, 6.x
69. Huawei USG6000v
70. Huawei Ar1000v Router
71. HP VSR 1000 7.x
72. Infoblox 8.x
73. Mikrotik 6.30.2, 6.40
74. PaloAlto FW 7.0, 7.1, 8.x, 9.x

75. PaloAlto Panorama 8.x, 9.x
76. Pulse Secure
77. pfSense FW 2.3, 2.4
78. Radware Alteon
79. Riverbed VCX 9.x
80. Silver Peak SD-WAN 8.x
81. SonicWALL FW NSv 200.x
82. Sophos XG Firewall, SG UTM
83. S-Terra FW, Gate 4.1,
84. S-Terra CSP-VPN gate 3.1
85. TrendMicro FW VTPS 5.x
86. Versa Networks SD-WAN 16.x
87. VMWare ESXi 6.5, 6.7
88. VMWare vCenter 6.5, 6.7
89. VMWare NSX 6.4
90. VMware SD-WAN Velocloud 3.x
91. VyOS 1.1.6
92. Windows 7
93. Windows 8.1
94. Windows 10
95. Windows Server 2003
96. Windows Server 2008R2
97. Windows Server 2012 R2
98. Windows Server 2016
99. Windows Server 2019
100. Linux TinyCore
101. Linux Slax
102. Linux Mint
103. Linux Kali x64 Full
104. Linux Kali x386 light
105. Linux Ubuntu Desktop 16.04, 18.x
106. Linux DSL 4.4.10
107. Linus Ubuntu Server 16.04, 18.x Webmin
108. Linux NETem: NETem bandwidth limitation, delay, jitter and packet loss.
109. Ostinato traffic generator 0.7, 0.8, 9.0

### **3- Dynamips (Cisco IOS emulation)**

1. Supported all Dynamips (Cisco IOS Emulation)

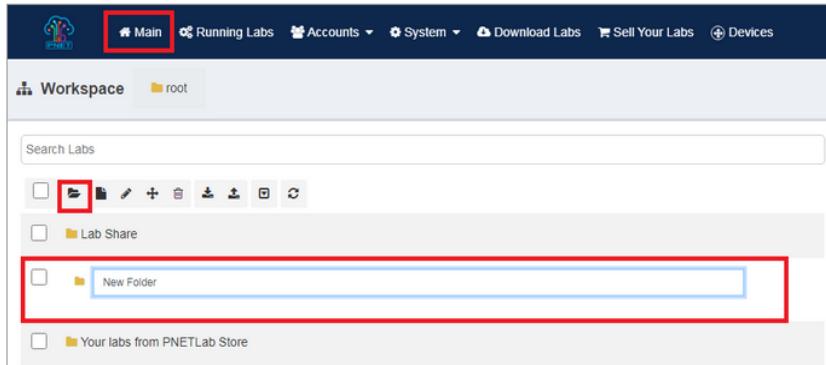
## **Folders and Lab files management**

### **1. Folders Management**

#### ***1.1 Create a Folder.***

The default folder Your labs from PNETLab Store will be auto created when you download Lab form Store.

To create new folder, click on button  on Main Page. A **new Folder** will be create with default name is New Folder change this name as you want



## 1.2 Delete a Folder

Hover on Folder and click on delete button or select folder and click on delete button.



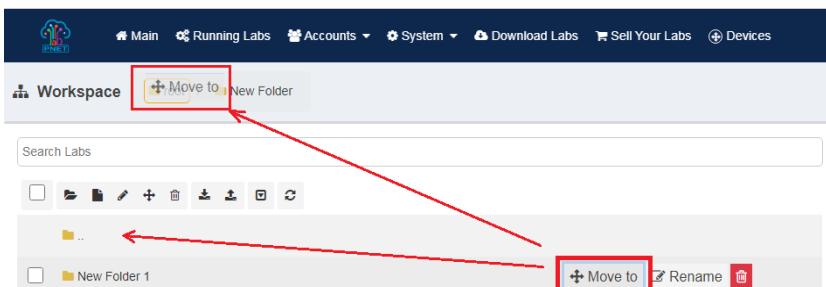
## 1.3 Edit a Folder

Hover on Item then click on Rename button or select on only one folder and click on button



## 1.4 Move the folder

Hover on Item then drag the **Move** button then drag on the folder you want to change to.



You can move multi Folder at the same time by select all the item you want to move and lick on **Move** button.

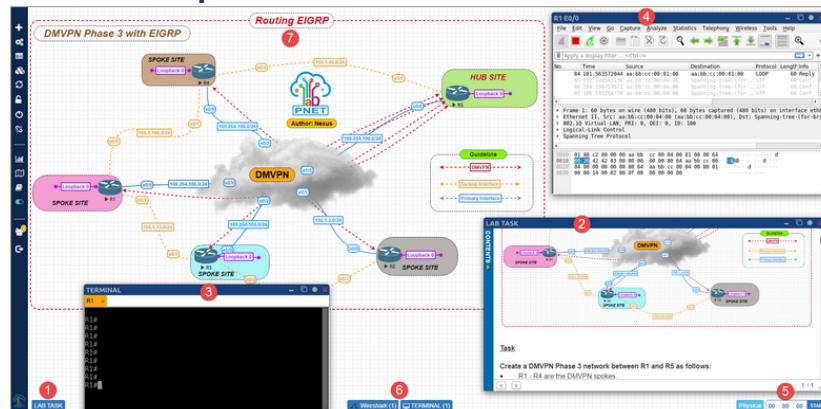


## 2. Lab Management

The lab have all function similar with Folder. You can hover on the lab item and click on function buttons or tick to select lab and use function buttons on function bar.

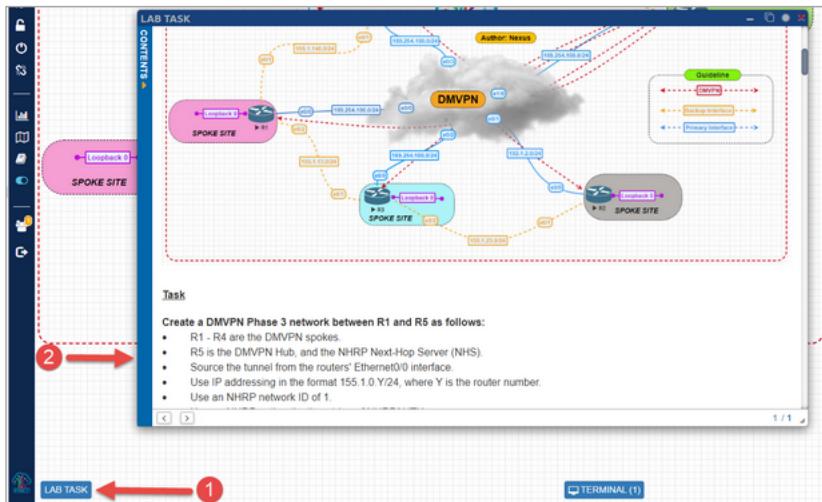
# Working with Lab

## 1. Main Workspace

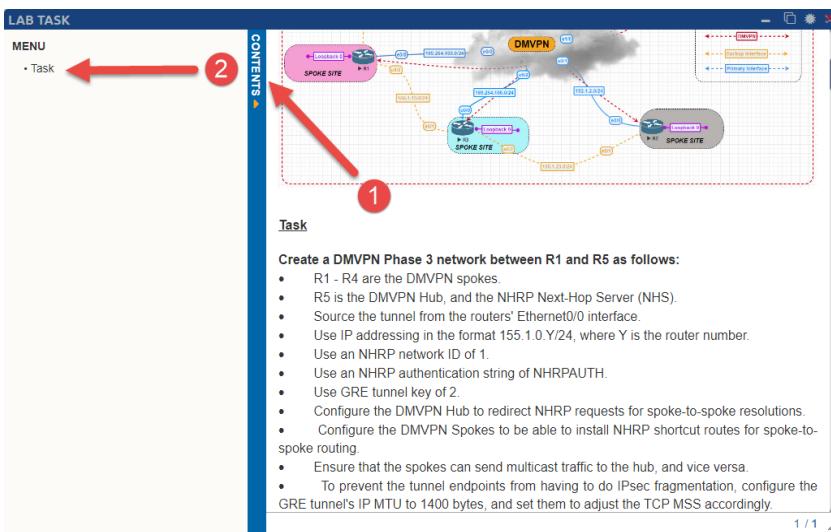


## 2. Workbooks

All workbook are placed at left bottom corner. You can expand or collapse workbook by click on button. There are 2 type of Workbook supported HTML workbook and PDF workbook. More will be discussed later.



Especially, you can open Workbook on an new tab by click on button



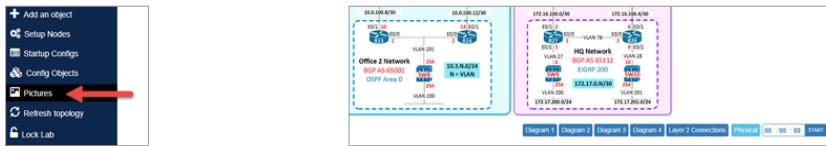
### 3. Countdown Timer

To get used to the stress of exams, you can set a countdown for your Lab. It will display a notification when the time is over and calculate your overtime



### 4. Physical Topology and Logical Topology

- Next to Countdown Timer block is Physical topology and all Logical Topology.
- When you click on Physical topology, all Workbook, Wireshark, Terminal and logical topo will be hired
- When you click on Logical button the image will be showed on main workspace. You can zoom, drag and drop it.
- You can add an Logical Topology by adding an image object



## How to console to devices?

The System support 2 Console Types: **HTML Console** and **Default Console**. With HTML Console you can console or remote to all device without any external package

HTML is set as default when you login but you can switch to Default Console by click on **HTML Console** at menu bar.

### 1. HTML Console

When device is started you can use HTML Console by click on device. Each device will open a new tab in Terminal Window.



- Change order of tabs by drag and drop to new position.
- You can hide Terminal Console by click on - button or click on status button TERMINAL(2)
- Specially, when you click on Button Terminal Window will be opened in a new browser Tab.
- You can get it back to Main Workspace by click on TERMINAL(2)

#### NOTE:

- To Paste to HTML console you can press **Shift + Ctrl + Alt** then paste to Text box
- To Upload file to HTML console host you can press **Shift + Ctrl + Alt** then upload file to Share Folder. Then you can find the file in path: **thinclient\_drives/GUACD/download**

### 2. Default Console

- To work with Default Console you need install some external packages bellow.

#### 2.1 Window

Below one can find a Windows client side pack that will install everything necessary for running telnet, vnc, wireshark, rdp applications when working on/building labs on **PNETLab** includes:

1. Wireshark 3.0.6.0 installation
2. UltraVNC 1.2.3.1 installation
3. putty 0.73 (used as default telnet client)
4. plink 0.73 (for wireshark)
5. all necessary wrappers
6. It will modify windows registry files for proper work
7. It will save all the files on the local PC if one would like to modify for example, using SecureCRT instead of default Putty.
8. Windows 8 and 10 reg files to support tabbed SecureCRT
9. Auto detection of Windows version (7, 8, 10) ( x64 only supported )

Download links:

- [Windows integration pack](#)
- [Windows integration pack mirror](#)

## 2.2 Apple OSX Client Side

Below one can find a Apple OSX client side pack that will install everything necessary for running telnet, vnc, wireshark, when working on/building labs on **PNETLab**. It includes:

1. Wireshark 3.0.6 installation
2. Real VNC installation
3. iTerm installation
4. telnet binary installation
5. all necessary wrappers

### Notice

- Before installing iTerm package, be sure to close iTerm program if it is already installed. This is required for iTerm configuration update.
- Rdp protocol consoles require downloading Microsoft Remote Desktop (Free) on App Store
- On the first usage of capture, you will have to confirm host key and to enter **PNETLab** root password to create and store rsa key for further authentication. When done, close terminal windows and re – launch capture.

### Download Link:

- [ClientPack.dmg](#)
- [Mirror Link Google drive](#)

## 2.3 Linux Client Side

Below you can find a client-side pack for Linux clients while working on/building labs with **PNETLab**

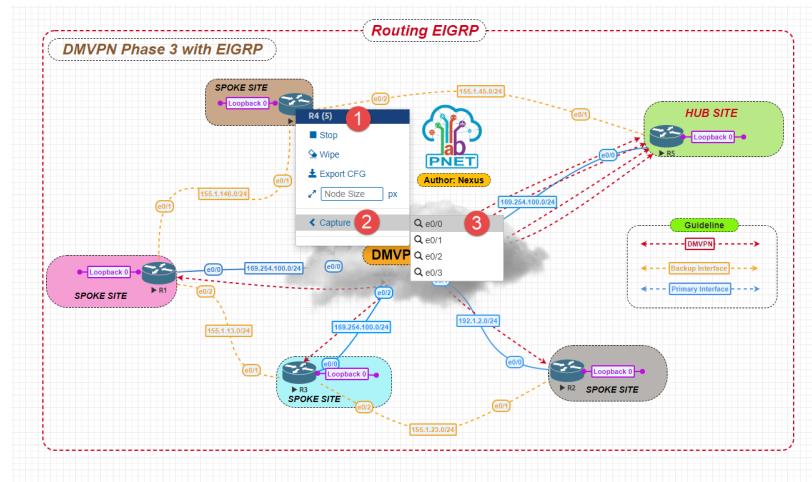
- [Linux Client integration pack](#)

## Wireshark Docker

Similar with Console, **PNETLab Box** support Default Wireshark and Docker Wireshark. You can switch between them by click on **HTML Console** at menu bar.

Default Console will use Default Wireshark and HTML Console will use Docker Wireshark.

To capture package of an interface, **Right Click on device > Capture > Select interface**.

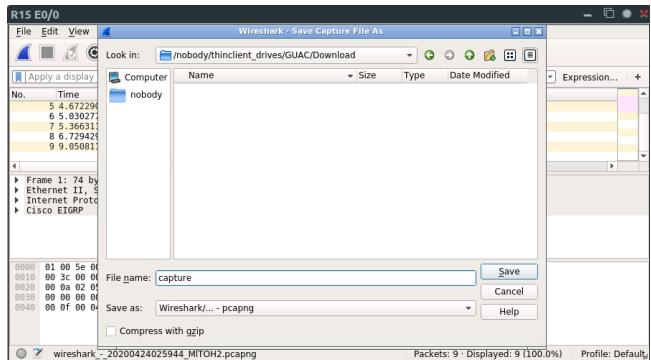


- You can hide Wireshark by click on – button
- When you click on  Button Wireshark Window will be opened in a new browser Tab.  
You can get it back to Main Workspace by click on **Wireshark** button and select the the corresponding tab.



**Notice:** Each Wireshark window corresponds to 1 Wireshark docker so turn off the window if you no longer use it. To close it click on **\*** button.

When using Wireshark Docker, you can save capture file to physical device by save file on path:  
**/nobody/thinclient\_drives/GUAC/Download**

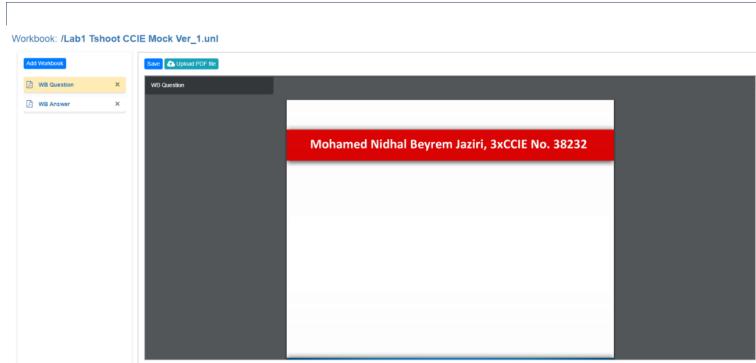


## Workbook, Rich Text and Shape

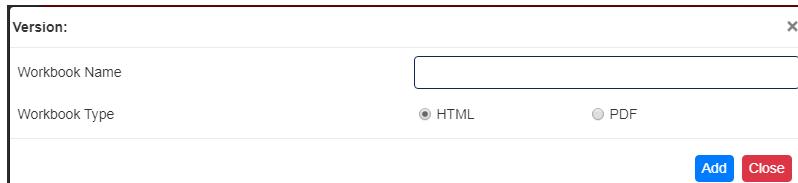
PNETLab Box provides full tools to create Task and Workbook. A powerful text editor is integrated, helping you create Tasks and Workbooks professionally and beautifully

### 1. Workbook

- You can create many workbooks and they are placed at left bottom corner. To create and manage workbooks, click on **Workbook** tab on menu bar.



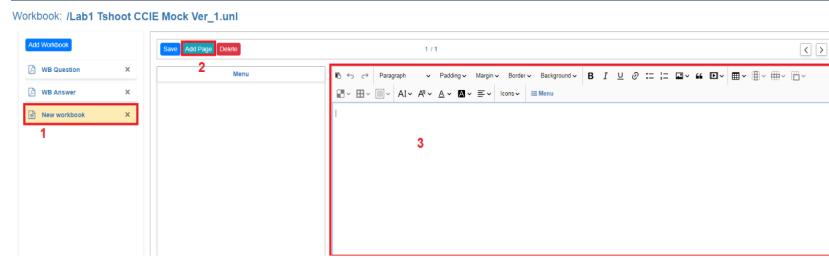
- Workbook manager will be opened on a new tab. To create a new workbook click on **Add Workbook** button.



- As mentioned before there are 2 types of workbook: PDF Workbook and HTML Workbook you have to make a choice when create.

#### 1.1 HTML Workbook

HTML workbook is split to pages. To create a new page click on New Page button. After that, you can start create workbook content with a powerful editor tool.

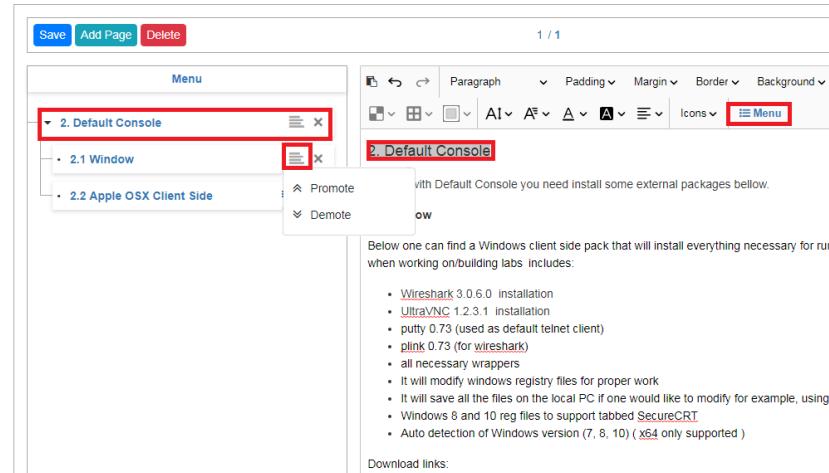


You should split your workbook to pages to improve performance when loading workbook. You can change between pages by click on button at right corner or fill the page you want.

You can delete a page by set it as current page and click on **Delete** Button.

### To create Menu for your workbook

1. Select row you want to set as menu.
2. Click on **Menu** button.
3. A new tab will be created on Menu Box. Create other Menu by repeat the above steps
4. Change level of Menu by click on on Menu tab and select Promote or Demote.
5. Save Workbook and comeback Main Workspace to view result. You can see the workbooks added at the left bottom corner.

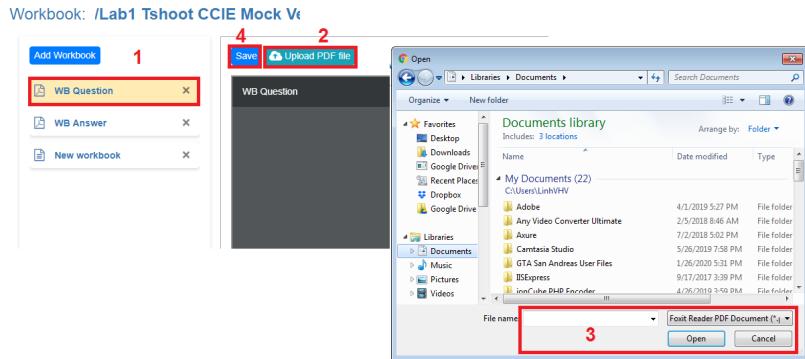


## 1.2 PDF Workbook

If you already have PDF document you can add a PDF Workbook.

**Select Workbook > Upload PDF File > Select File > Preview > Save.**

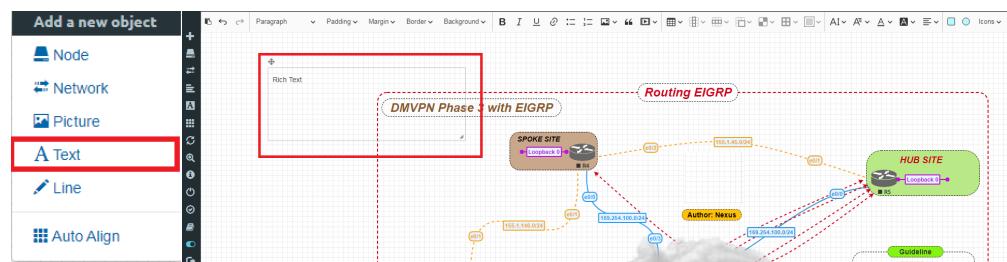
**Notice: You should not upload scanned PDF files because they are often very large in size. Large file size will affect lab performance. Lab .unl file's size less than 50MB.**



## 2. Rich Text

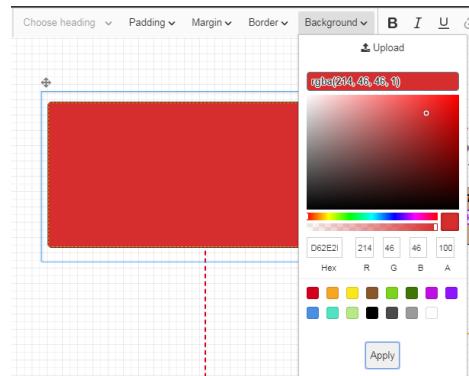
You can create a Rich text by **Right Click > Text**

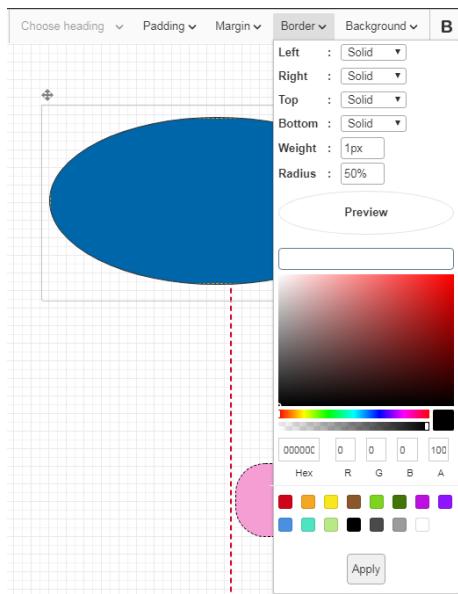
New Text node with full option will be insert directly in Main Workspace.



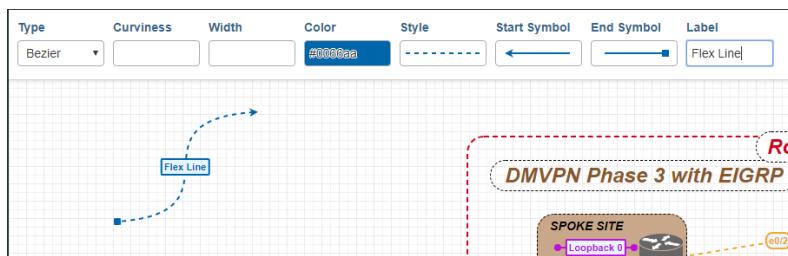
## 3. Shape and Line

Shape is remove from **Add a new object** form. It is integrated into Rich Text. To create new shape click on button . Rich Text will provide many option to custom shape.





To create a new line click on button **Line**. You can edit symbol, line type, ....

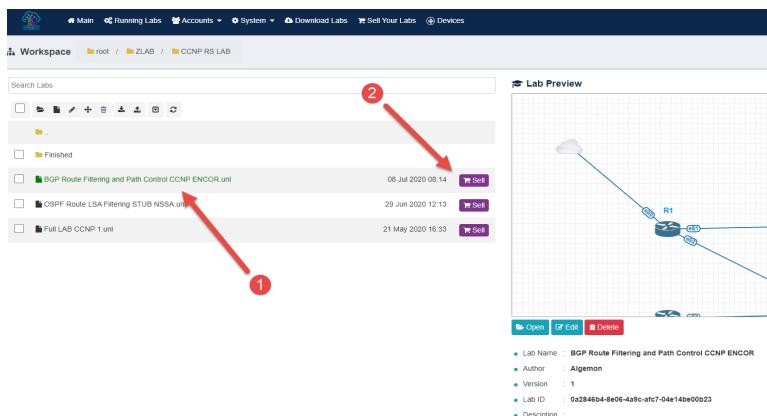


## How to share your lab to PNETLab Store

**Note:** You can only share labs that are owned by you.

### Step 01:

Select the lab you want to share then click to **Sell button**



The system will automatically select the **.unl** file and the dependent packages (If you think it is missing or incorrect you can correct it by selecting other files). Write some information in the Note then click to

## Next button

Step 01  
Select Lab

Step 02  
Fix a price

Step 03  
Description

Step 04  
Finish

UNL file: It is usually located in the directory /opt/unl/elabs

Selected Lab:  
① CCNP ENCOR LAB  
② Template sv3TSEPH  
③ ZLAB

Additional packages  
Select the files that you have added to the lab can run.

Selected file:  
④ /opt/unl/elabs/zlab/CCNP RS LAB/BGP Route Filtering and Path Control

Selected file:  
⑤ /opt/unl/elabs/addons/orbit/652b\_Linux-adventerprisek9-ma.154-1.1\_Arsg - x

Selected file:  
⑥ dynamics  
⑦ ip  
⑧ nse  
⑨ templates  
⑩ scripts  
⑪ scripts

Note  
Release note: Instructing your users to integrate your lab into Box. This content will not be published on the store.  
CCNP ENCOR LAB ②

## Step 02:

**Edit Lab Name** (If you want) and **Select Subject** of your lab then click to **Next button**

Step 01  
Select Lab

Step 02  
Fix a price

Step 03  
Description

Step 04  
Finish

Name  
Name of the lab on store  
① CCNP Route Filtering and Path Control

Subject  
Select interesting topics for lab will help user's review your lab  
② Select...  
③ JUNIPER  
④ CISCO  
⑤ H3C  
⑥ MTC  
⑦ CCIE R&S  
⑧ CCNP  
⑨ CCNA  
⑩ DRVPN  
⑪ VxLAN  
⑫ MicroTik  
⑬ Automation

Unit(days)  
(Available in next version)  
④ The unit days are calculated from the date of purchase in days. If your lab is unlist set 0

## Step 03:

Upload picture for your lab and write something in: Description and Article. Then Click to Next Button

Step 01  
Select Lab

Step 02  
Fix a price

Step 03  
Description

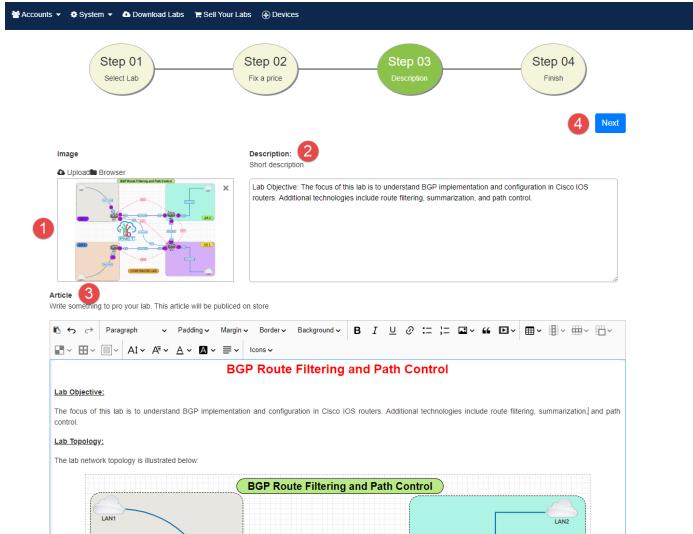
Step 04  
Finish

Image  
Upload Browser  
①

Description:  
Short description  
②

Article  
Write something to pro your lab. This article will be published on store  
③

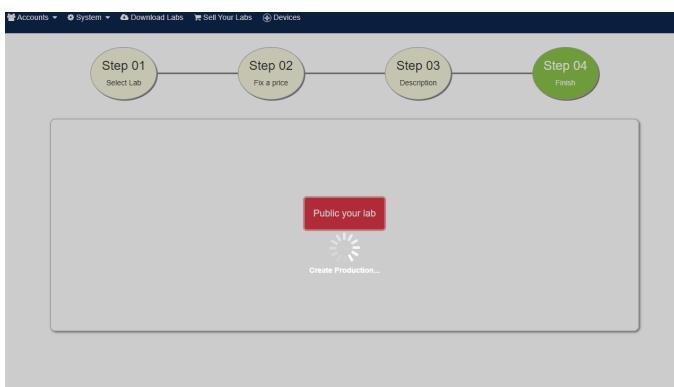
④

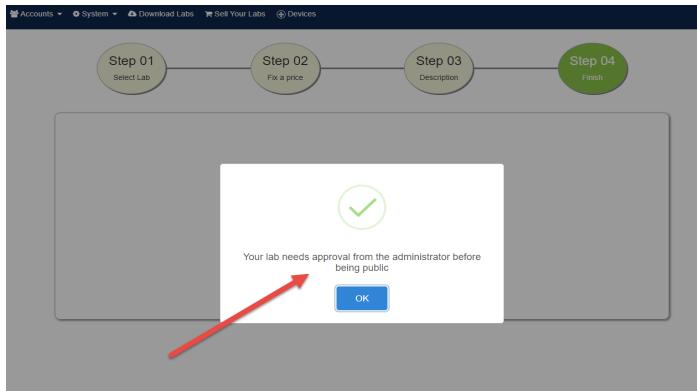


## Step 04:

Click on **Public your lab** button to Start uploading. It will take time please don't close your browser.

**Note:** You can review your configuration by click on **Step** button.





**Note:**

- System will check and ignore the files is existed on the platform
- Your lab will need administrator approval to be published on store
- You can manage the labs you uploaded by click on button **Sell Your Labs**

Lab Name	Description	Status	Actions
BGP Route Filtering and Path Control CCNP ENCOR	Lab Objective: The focus of this lab is to understand BGP implementation and configuration in Cisco ... Jul 8, 2020 2:23 PM Waiting for approve	Waiting for approve	Delete, Unpublic, Versions, Edit
BGP Route Filtering and Path Control	Lab Objective: The focus of this lab is to understand BGP implementation and configuration in Cisco ... May 21, 2020 10:30 PM Published	Published	Unpublic, Versions, Edit
BGP Confederations and Path Control	Lab Objective: The focus of this lab is to understand BGP implementation and configuration in Cisco ... May 11, 2020 11:39 PM Published	Published	Unpublic, Versions, Edit

- You can manage the versions of the lab by click on **Versions** Button

Version: 1	New version
CCNP ENCOR unit	
Jul 8, 2020 2:23 PM	
Status: Waiting for approve	
Dependency packages: Edit	
Download	

- You **can not** delete the lab after the Administrator approve or deny it.
- You **can not** delete and edit Version of the lab after that version is Approved or Denied by the administrator.
- What you can do when the administrator declines your lab?
  - When Administrator declines your lab system will notify you with Administrator's feedback.
  - Edit the lab by click on **Edit** button and save again. Lab status will change to **Waiting for approve** state.
- What you can do when the administrator declines a version of your lab?

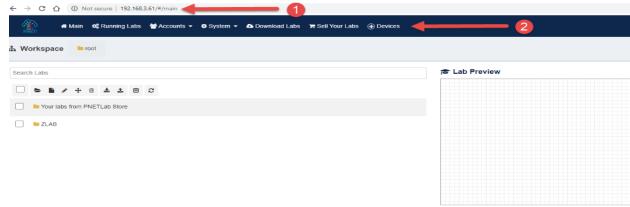
- When Administrator declines a version of your lab system will notify you with Administrator's feedback.
- Ignore Error version and create a new version and upload again.

## Docker in PNETLab

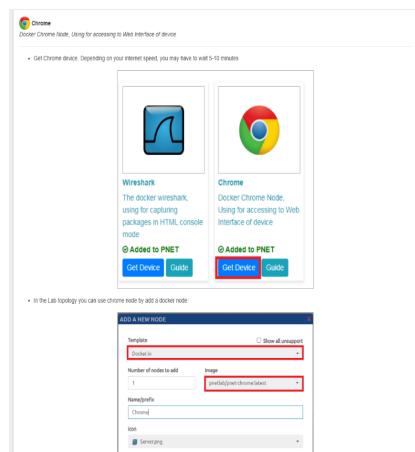
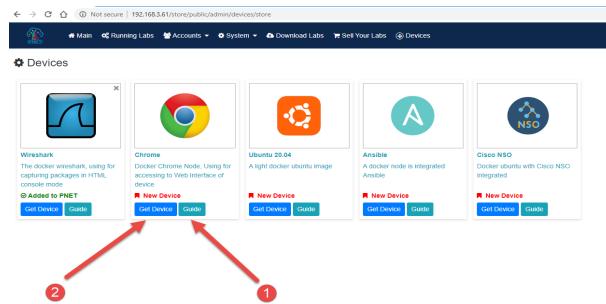
**PNETLab** have integrated Docker stations that allows your server to use its resources more efficiently.

### 1. How to setup Docker in PNETLab BOX

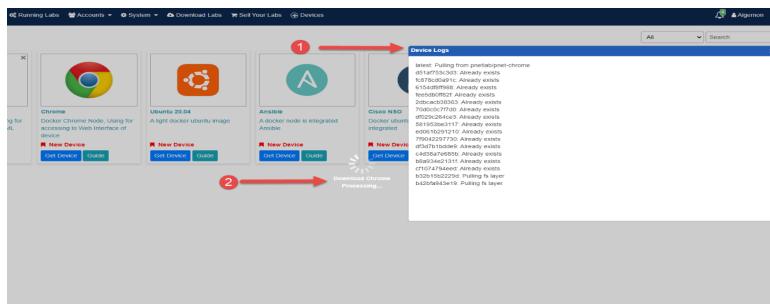
From **PNETLab Box**, Click to **Devices Tab**



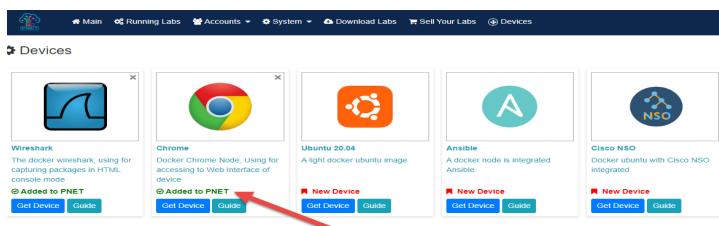
There are a lot of **Dockers in Devices Store**. Select the Docker you want to add to **PNETLab Box** (before you add a **Docker to your PNETLab Box**, you must **read the guideline** to understand how to use that Docker).



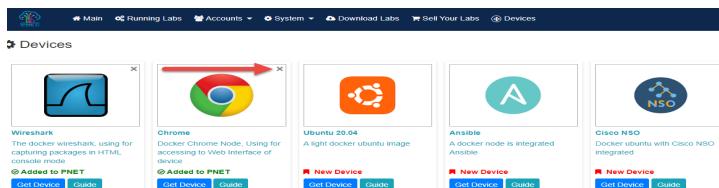
It will take some minutes to download Docker from Server.



After complete to get Docker from Server to your **PNETLab Box**, you will see **Docker added** to **PNETLab Box**



**Note:** If you do not want to use a Docker, just remove that Docker in **Devices Tab**



## Commit Image Docker and Qemu

From version **2.0.7**, PNETLab allow you to Commit the current state of a Qemu or Docker Node to the original image.

- You have 3 option when commit a Node
  - **Commit to original Image:** Apply all the changes of this node to the original Image
  - **Take Snapshot from original Image:** Save current state of this node as a new Device. Note that, Snapshot can not work without the original Image.
  - **Create a completely new Image:** Save the current state of this node as a completely new device. Can operate independently regardless of the original Image. However, it will take more hard drive. (**Qemu only**)
- **For example:** Config a Qemu vIOS with hostname is **State\_01** and Save Configuration to NVRam

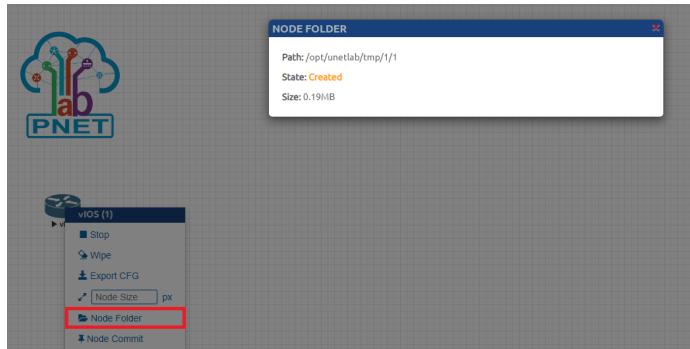
```

TERMINAL
vios.x
*State
*Jul 24 12:21:21.809: %SYS-3-CPUEHOG: Task is running for (1998)msecs, more than (2000)msecs (0/0), process =
% Incomplete command.

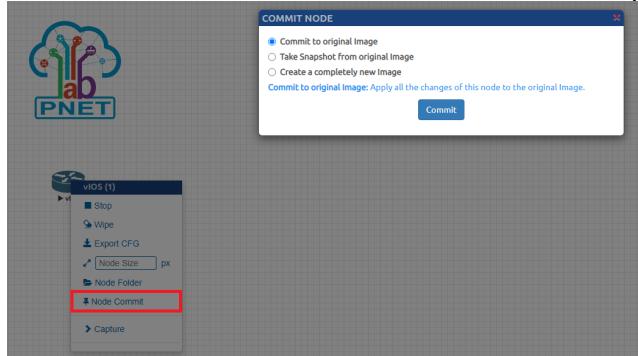
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#hostname State_01
State_01(config)#do wr
Building configuration...
[OK]
State_01(config)#
*Jul 24 12:21:46.069: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios-adventureprise-k9-12.1(4)T1' signing verification
*Jul 24 12:21:46.073: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Please wait...
*Jul 24 12:21:47.179: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfully.
State_01(config)#
State_01(config)#
State_01(config)#

```

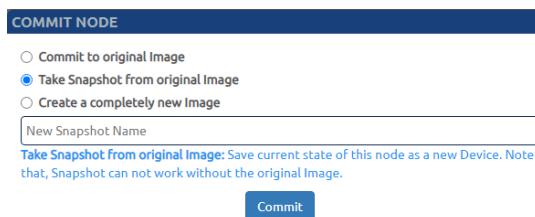
- You can see the node Folder of Node.



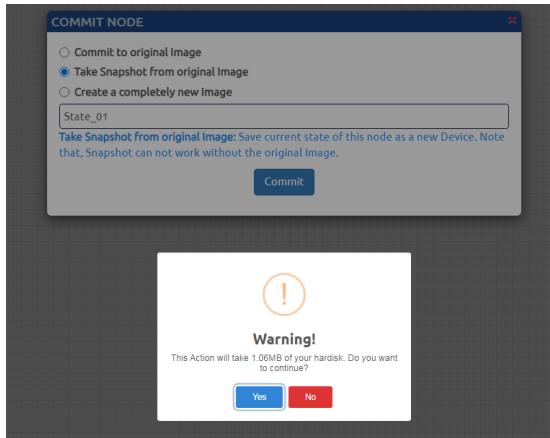
- You can Commit the current state of device by **Right Click > Node Commit**



- If you choose **commit to original Image**, all vIOS devices you create later will have **hostname is State\_01**.
- If you choose **Take Snapshot from original Image**, System will auto save the current state as a new device and you can use this device same as other. You have to define the name for new Snapshot.



Click on the Commit button, system will estimate how many hard disk the new Snapshot will take.

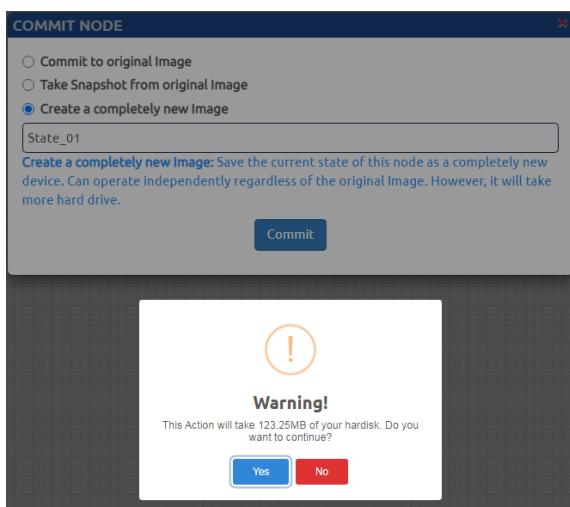


As the picture, The new Snapshot only take **1.06 MB** hard disk. By this way you can create many instance of a image but still save your hard disk.

Click Yes and when finish you can see a new device with the name is the name you set.

### Node:

- This feature is very helpful for some device not support save configuration e.g Juniper. You can create snapshot instead.
- The new image will not work if you remove or edit the original image.
- With Window Node the Snapshot size will not small
- if you select **Create a completely new Image**, a completely new image will be created



## Node:

- This image can operate independently even if the original has been deleted.
- The hard disk needed to save New images will be much bigger than Snapshot

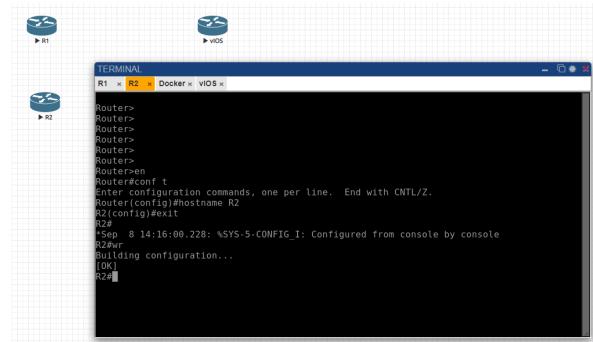
## How to save Configuration of Lab

The configuration of device is saved in Template files of device. When you **Destroy** a Lab session, all template files will be deleted, so if you don't save configuration all the configuration will be lost.

To save configuration of devices in a Lab follow below steps.

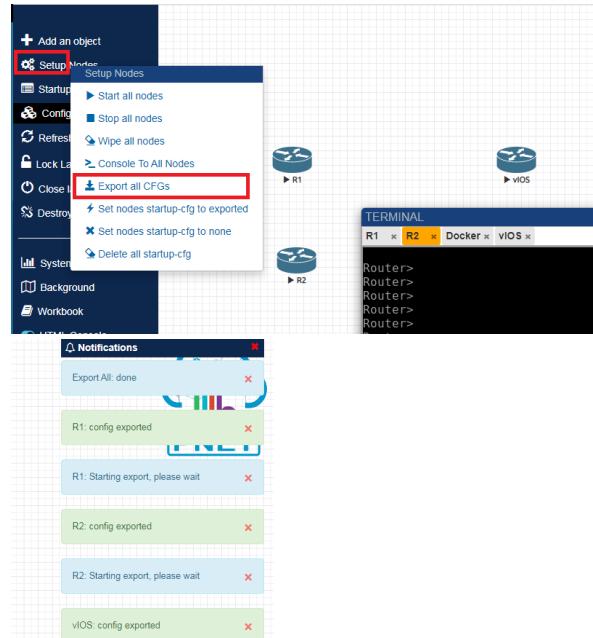
### Step 1: Save running config to startup config

- Start all devices and run command to save running config to start-up config. E.g: wr , commit.



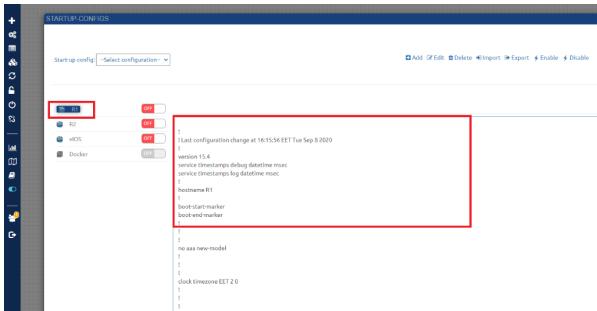
### Step 2: Export CFG off all devices

- **Setup Nodes > Export all CFGs.** Wait until you get the success messages. Note some device like docker not support export config.

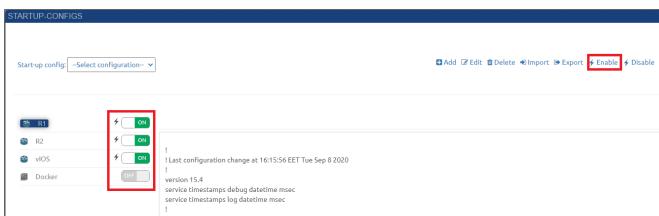


### Step 3: Checking the saved configuration and enable to use startup config.

- Close all Terminal window then go to tab **Start-up Config** you can see the configuration you have just exported.

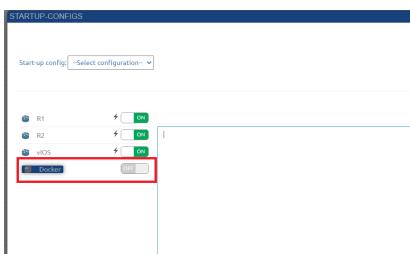


- Click on enable button to turn on startup config to all devices.

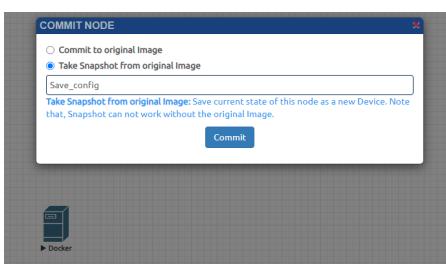


#### Step 4. Commit configuration with device not support Export CFG

- If you see all startup config button is **ON** you can ignore this step.
- Some device is not support save configuration by Export CFG. You might get the error messages. And in startup config tab, you will see the configuration textbox is empty.



- For those devices you can use Commit function in PNETLab to save the current state of device. Right click on device and choose **Commit Node**. To read more about **Commit Node** please refer this [Link](#)



### Create multi startup config for a single Lab

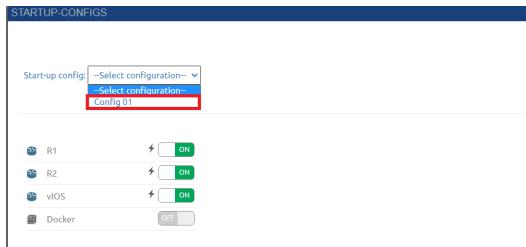
PNETLab support creating multi startup configurations for a single Lab. You can switch between startup configs. *Note: After changing the startup configuration you need to Wipe nodes to take effect*

**Step 1:** Save your Lab configuration. Please refer [Link](#) (<https://pnetlab.com/pages/documentation?slug=how-to-save-configuration-of-lab>)

**Step 2:** Open Startup Config tab then click on Add button. Fill the name of startup configuration.

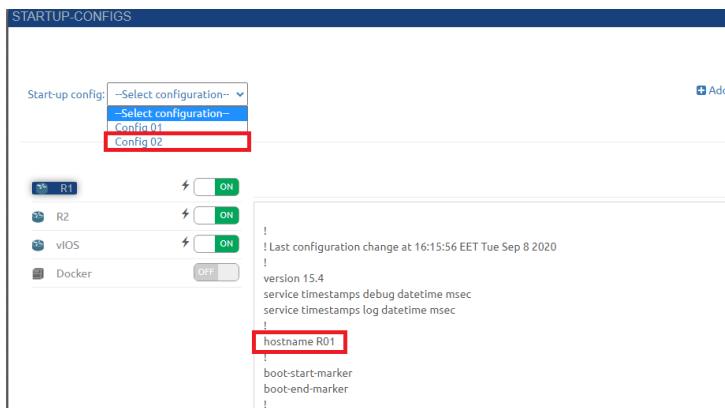


- Now you can see the Config 01 in the Start-up config select box.

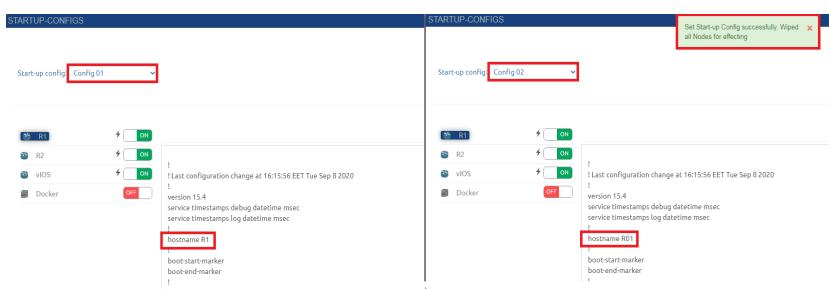


**Step 3:** Close Startup-Configs window and continue doing Lab and changing the Lab's configuration. If you want to save the changed configuration repeat from **Step 1**.

E.g I created **Config 02**. In **Config 02** i changed the host name of R1 to R01



**Step 4:** You can switch between startup configurations by select one of startup config. The configuration in textbox will change corresponds with the Startup config you are selected. Note: Wipe nodes to take effect.

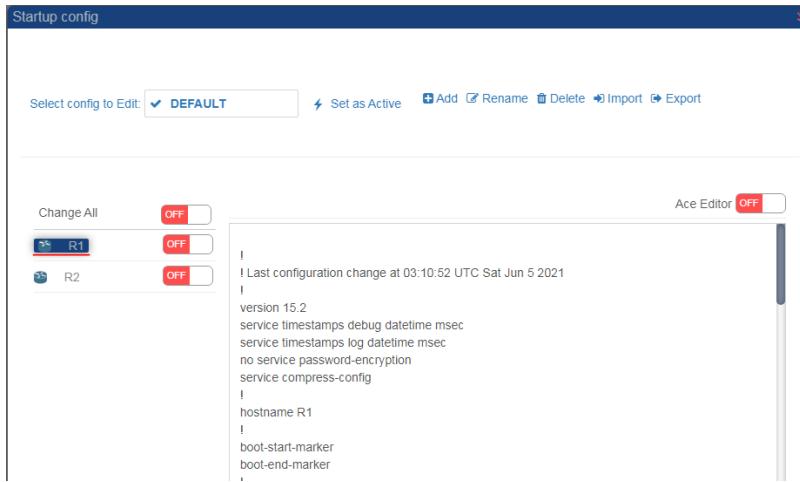


## Export and Import startup Configuration

### 1. Export Startup Configuration.

**Step 1:** Export Configuration of Nodes in LAB refer: <https://pnetlab.com/pages/documentation?slug=how-to-save-configuration-of-lab>

**Step 2:** Go to Left Menu > Start-up Configuration, now you can see configuration of nodes.



**Step 3:** Click on **Export** button. Zip file contain all configuration will be downloaded.

## 2. Import Startup configuration.

**Step 1:** Create a Folder contain all configuration file. Files name in the folder have format: **[node id].txt**. You can get node id in **Left menu > System Status**

The screenshot shows the 'System status' page. It includes two donut charts: 'CPU Used' (0%) and 'RAM Used' (5%). Below the charts, it says 'Total: 23 Cores' and 'Total: 40221MB'. A table lists nodes by type and ID:

SETUP	NODE ID	NODE NAME	PORT	TYPE	FOLDER
▶	1	R1	30035	IOL	/opt/unetlab/tmp/31/35
▶	2	R2	30036	IOL	/opt/unetlab/tmp/31/36

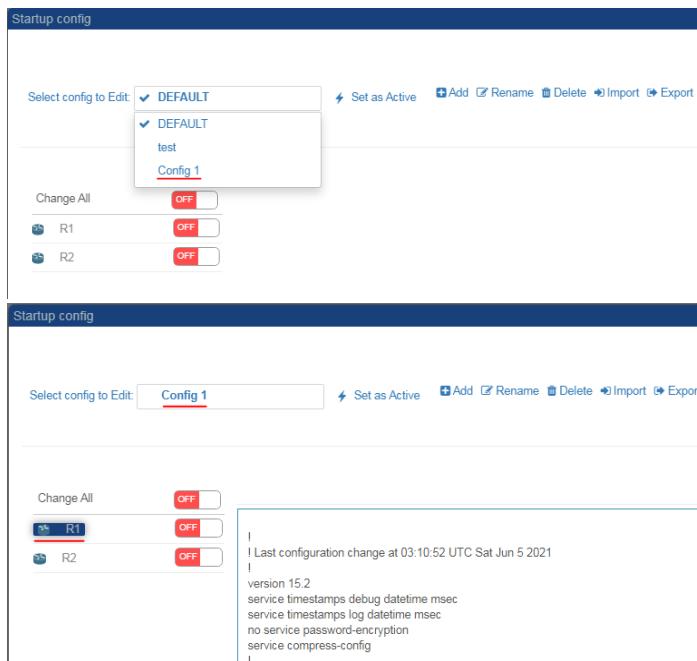
Below the table, there are navigation buttons: '<' (Previous), 'Period', '1 of 1', 'Next', and '>' (Total: 2). To the right, there is a file list table:

Name	Date modified	Type	Size
1.txt	6/5/2021 3:11 AM	TXT File	1 KB
2.txt	6/5/2021 3:11 AM	TXT File	1 KB

**Step 2:** Click on Import Button. Fill import name and select folder in Step 1

The screenshot shows the 'Import Start-up Config' dialog. It has two input fields: 'Start-up Config Name:' containing 'Config 1' and 'Config folder:' containing 'Choose Files | 2 files'. Below the folder field is a note: '(Select Folder contain all config files of Lab)'. At the bottom is a blue 'Import' button.

Now you can see new Startup Configuration that you imported.



## FAQ vs Troubleshoot or Common errors.

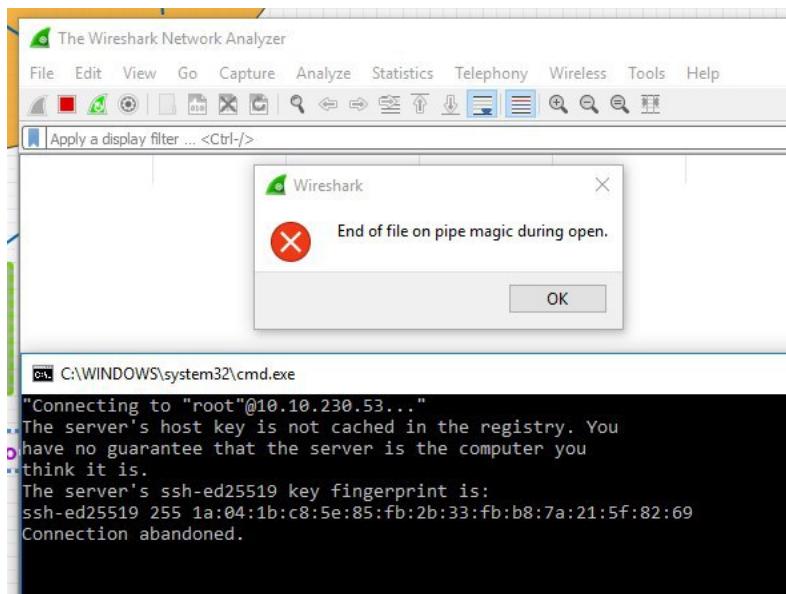
### Fix the Wireshark Default console error

PNETLab support both **HTML console** and **Default console** by native apps like : Putty, SecureCRT, VNC, RDP, Wireshark. To use default console you need to install Client Package. [Follow this link to install](#)

To use **Default console** you can select Default Console when login or switch off **HTML Console** on Right Menu.

#### 1. Fix the Connection abandoned Wireshark

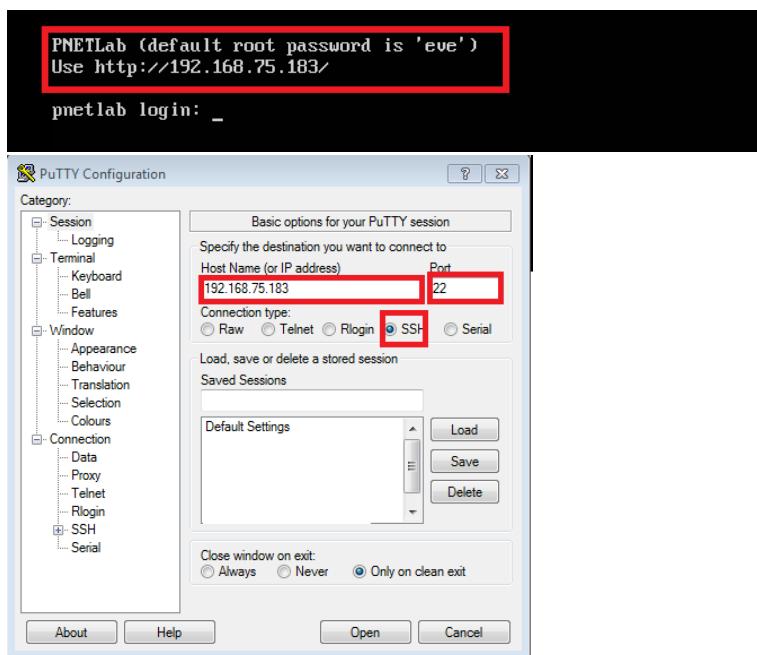
The first time capturing package by default console you may get **Connection Abandoned** error like bellow picture:

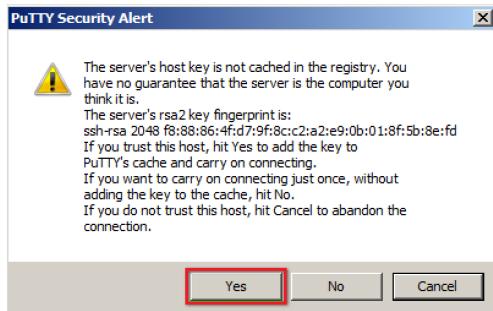


To fix this error follow steps bellow:

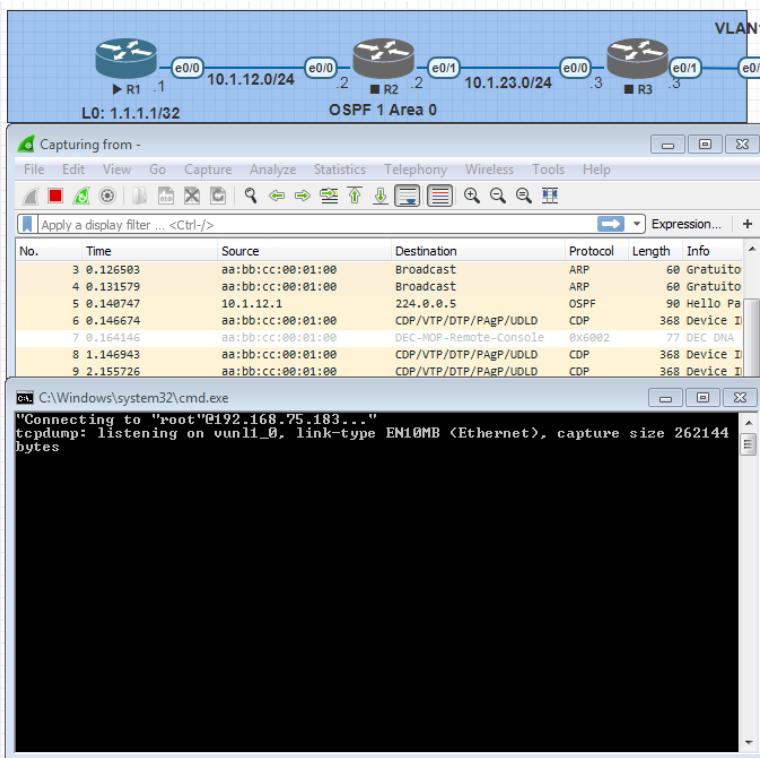
**Step 1:** Install Putty. <https://www.putty.org/>

**Step 2:** Using Putty to SSH to the IP of PNETLab vmware you can find the IP here: **Click Yes when PuTTY ask about saving Key**





**Step 3:** After SSH by PuTTY successfully, try capture again.



## 2. Fix Access Deny error

It happen when you change the password of root account. Find file **wireshark\_wrapper** In case window it placed at: C:\Program Files\EV-NG

change the password as you want.

```
wireshark_wrapper.bat - Notepad
File Edit Format View Help
@ECHO OFF
SET USERNAME="root"
SET PASSWORD="pnet"
SET S=%1
SET S=%S:capture:/%
FOR %F %tokens=1,2 delims=/ "%~% IN ("%S%") DO SET HOST=%~a&SET INT=%~b
IF "%INT%" == "pnet0" SET FILTER="not port 22"
ECHO "Connecting to %USERNAME%@%HOST%..."
"C:\Program Files\EVE-NG\plink.exe" -ssh -batch -pw %PASSWORD% %USERNAME%@%HOST%
"tcpdump -u -i %INT% -s 0 -w -%FILTER%" | "C:\Program Files\wireshark
\wireshark.exe" -k -i -
```

## How to recovery Mysql Database

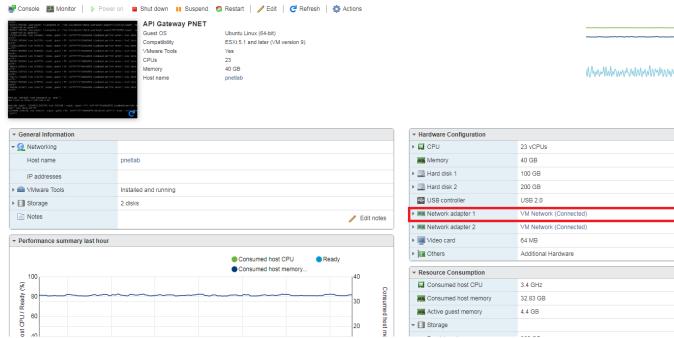
Note: below commands is for version before 4.1.0. From 4.1.0 you just reboot and system will auto recovery mysql service.

To recovery Mysql database use those command:

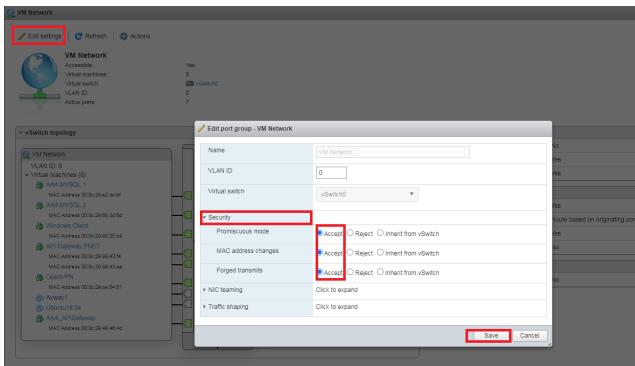
- wget <https://pnetlab.com/assets/system/mysqlRecovery>
- chmod 755 mysqlRecovery
- php mysqlRecovery

## Can not get IP from Cloud Management on ESXI

- Determine the virtual switch that PNETLab is connected to



- Click on that network and setting security like bellow image:



- Make sure the outside network has a **DHCP server**.



## Fix Bug File\_get\_contents

### Reason.

From 18.04 ubuntu enable periodic packages update as default. After updating, the new version of mysql requires SSL to connect then System can not connect to Mysql database and go to Error.

```
file_get_contents(http://127.0.0.1/html5/api/tokens): failed to open stream: HTTP request failed! HTTP/1.1 500
```

### How to fix

- SSH to console screen of PNETLab as root
- Disable SSL of Mysql server by running:
  - `sed -i '/skip_ssl/d' /etc/mysql/mysql.conf.d/mysqld.cnf`
  - `echo "skip_ssl" >> /etc/mysql/mysql.conf.d/mysqld.cnf`
  - `service mysql restart`
- Disable Periodic Update of ubuntu
  - `sed -i 's/Update-Package-Lists "1"/Update-Package-Lists "0"/g' /etc/apt/apt.conf.d/20auto-upgrades`

### Fix Name resolution error

- When login in online mode you will get error "**Can not connect to Server**", because PNETLab can not connect to PNETLab server. When you ping from PNETLab to **pnetlab.com** you will get the error: **Temporary failure in name resolution**
- To fix this you need to config DNS server for PNETLab. You can run this command in PNETLab console to set Google as DNS server.
  - `echo "nameserver 8.8.8.8" > /etc/resolv.conf`
- Try Ping to **pnetlab.com** again. If success, you can login
- If still does not successful, may be your network system does not allow to use DNS of google as DNS. You can set dynamic DNS from your network by run:
  - `rm /etc/resolv.conf`
  - In `-s /run/systemd/resolve/resolv.conf /etc/resolv.conf`
- Try Ping to **pnetlab.com** again.

### How to fix error Synchronize time

Depend on your location, may be your PNETLab can't update the time automatically then your PNETLab can't not download Lab or Login by Online Account.

#### Follow those steps to fixed:

**Step 1:** Go to Console screen of PNETLab and login with **root** account.

**Step 2:** Change your time Zone to UTC by command:

`timedatectl set-timezone UTC`

**Step3:** Edit your time by command: (*The time is updated automatically you don't need to change just copy and pates*)

`date -s '2023-11-03T07:36:42'`

### Device Start and stop immediately

**Device Start and stop immediately** because of some reasons:

#### I. You haven't downloaded the image yet

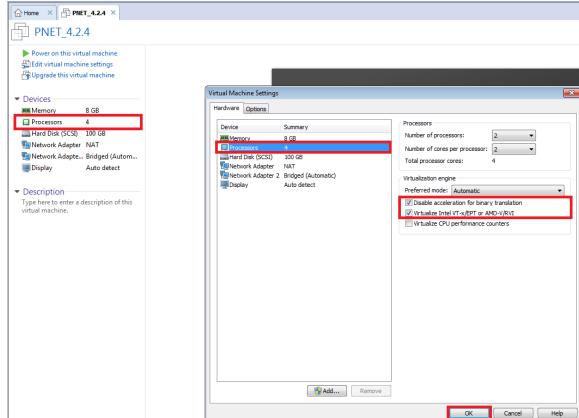
Right click on Node > Edit > You will see tag (**INVALID**) in Image field

To download Image, SSH to Pnetlab and use ishare to search and pull all missing images. Refer ishare

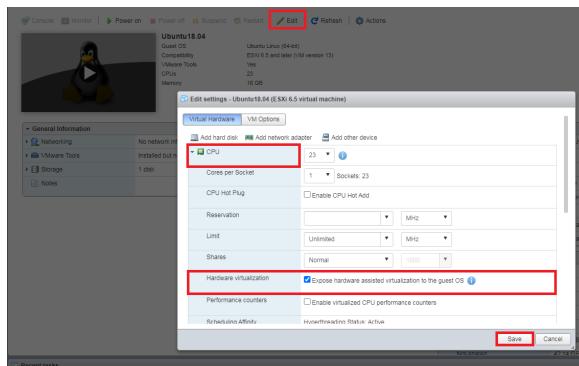
## II. Enable virtualization is disabled

If your qemu device is not bootable, the reason usually is **Enable virtualization** is disabled. To enable virtualization follow steps:

- Shutdown your **PNETLab > Processors > Tick on Virtualize Intel VT -x/EPT or ADM-V/RVI**
- If exist Disable acceleration for binary translation row, select it.

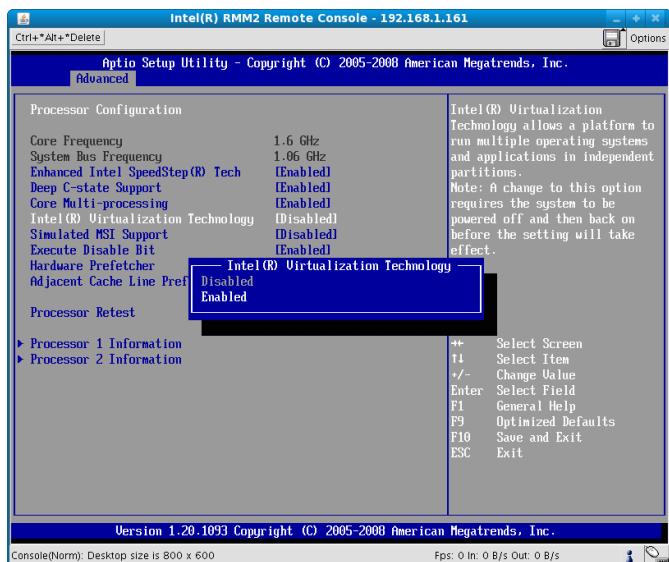


- On ESXI



If have any error log, check if Virtualization is enabled on BIOS or not. To check

- **shutdown your computer** > in starting process press **F2** to access bios > check **Virtualization** is enable or not.
- It is not the same with different laptop vendor. Refer below example:



### III. iourc file is corrupted.

With IOL devices, the reason is usually file **/opt/unetlab addons/iol/bin/iourc** file is corrupted.

To create iourc file again you can upgrade PNETLab to the latest version.

Go to: **system > system setting > Click on fixpermission button.**

### IV. Mac OS Big Sur

If you are using Mac OS Big Sur then you can run this script to fix:

- Connect to internet
- SSH to your Pnetlab
- Run: **wget -O - http://repo.pnetlab.com/kernel\_4.20.17 | bash -i**
- **Reboot pnetlab**

Version	Release Note	Bugs	Status
<b>5.3.11</b>	change logs  tuning text editor in GUI topology (autofit textbox size, tune shapes ,zoom bare in bottom , font changed to orange suitable for dark and white background). FIX HTML5 capture if nodes connected to cloud internal or private . FIX picture in lab not load .		<b>Released</b>

	<p>FIX some bugs related to devices templates .</p> <p>FIX RDP html5 console not work with windows images .</p> <p>FIX multi console on docker images .</p> <p>added rdp-tls to supported console .</p> <p>add custom icon for NAT cloud .</p> <p>suuport macos image use template macos_simple_kvm .</p>		
5.2.7	<p>Change logs :</p> <p>Fix LLDP &amp; LACP and DOT1X .</p> <p>Fix telnet stuck and hangs.</p> <p>Fix random generated mac address for nodes</p> <p>Add custom initial startup configuration the hostname will match name of node in GUI : for vios , viosl2 and iol (rename image bin name to l2_iol-xxxx.bin for switch I3 and l3_iol-xxxx.bin for router ) and Dynmips</p> <p>HTML5 console by default green-black and size font to 12</p> <p>Add spice console for both (HTML5 AND native) html will work until PNETLAB will based on ubuntu 20.04+</p> <p>Support more than 28 interfaces network for some devices</p> <p>Now PNETLAB can detect platform and put right templates to AMD or INTEL folder inside /opt/unetlab/html/templates</p> <p>Fix apt-update &amp;&amp; apt-upgrade</p> <p>Some tweaks and fixes</p> <p>Added new icons</p> <p>Add custom Clouds: Private and Internal</p> <p>Extended online maximum account to 100</p> <p>Support Google Cloud .</p>		Released
5.0.1	Unlimited offline license Opensource all codes		Released
4.2.10	<p>Add feature allow to config Eth1, Eth2, Eth3, Default Route, DNS for Docker</p> <p>Disable SSL in mysql server to fix bug</p> <p><b>"File_get_contents"</b></p> <p>Disable Periodic Update Packages of Ubuntu</p>		Released

	<b>STABLE VERSION:</b> You can comeback stable version from any upper version.  <b>Fixed:</b> Not show image when add a network Wrong interfaces in 3600 dynamips When import lab mark missing images as INVALID Can not edit, delete folder workspace when create user Hide login by online button when online mode is disabled  Added: Support ishare, ishare has more than 200 device images. Refer <a href="#">i-share.top</a> for more information		
4.2.9			Released
4.2.8	<b>Fixed:</b> Can not run IOL after click on fixpermission button Can not run docker in docker LACP not working Can not load startup-config for SRX, VMX, VMX-VPC, SRX-NG		Released
4.2.7	<b>Fixed:</b> Can not load startup config for Qemu Can not change icon for Network Link state not working when device contains Serial interface First NIC not working Link state in IOL consume CPU	Bugs: <ul style="list-style-type: none"><li>• Can not run IOL after click on fixpermission button</li><li>• <b>Can not run docker in docker</b></li><li>• <b>LACP not working</b></li></ul>	Released
4.2.6	<b>Added:</b> Link state change when suspend link on Docker, Qemu, Support Layer 1 keep Alive on IOL ( <b>not affect for Serial interface</b> ) Allow hide or Spin Left menu ( <b>bottom right corner of Menu</b> ) <b>Fixed:</b> Can not capture Wireshark on Juniper Mapping in Picture topology not working	<ul style="list-style-type: none"><li>• Can not load startup config for Qemu: <b>To fix, replace file</b> <b>/opt/unetlab/html/devices/qemu/device_qemu.php</b> <b>by</b> <b>FILE</b></li><li>• Can not change icon for Network</li><li>• Link state not working when device contains Serial interface</li></ul>	Released
4.2.5	<b>Added:</b> Suspend Ethernet link for each Lab Session Auto fit topology to screen	<ul style="list-style-type: none"><li>• Can not capture Wireshark on Juniper</li><li>• Mapping in Picture topology not working</li></ul>	Released

	<p>Print topology as PDF or PNG</p> <p>Allows restarting service over web GUI (<b>System &gt; System Setting</b>)</p> <p>Allows creating separate template file for each IOL and Docker lines</p> <p>Allows Stopping all node of a Lab session in Running Lab table</p> <p><b>Fixed:</b></p> <ul style="list-style-type: none"> <li>Fix bug Can not config or Start up in docker</li> <li>Fix bug Interface Quality conflict between Lab sessions</li> <li>Fix bug Qemu can not boot up in kernel 14.5.0-pnetlab</li> <li>Fix bug can not console to multi node</li> <li>Can not control shape form lab that imported from other platform</li> <li>Multi configuration not working.</li> </ul>	
4.2.4	<p><b>Added:</b></p> <ul style="list-style-type: none"> <li>Bring Auto align back -</li> <li>Support change console port for node (<b>Setup Nodes &gt; Config Nodes &gt; Edit column port</b>)</li> <li>Improve performance when using HTML Console</li> <li>Support edit node when right click on the Topo Image</li> <li>Support limit number of nodes user can run</li> <li>Support limit number of nodes user can run for each lab</li> </ul> <p><b>Fixed:</b></p> <ul style="list-style-type: none"> <li>Fix bug relate to node form editor</li> <li>Fix bug can not capture package in connection with cloud</li> <li>Can not set username password for RDP connection</li> </ul>	<ul style="list-style-type: none"> <li>Console to multi nodes button not working</li> <li>Can not control shape form lab that imported from other platform</li> <li>Multi configuration not working.</li> </ul>
4.2.3	<p><b>Added:</b></p> <ul style="list-style-type: none"> <li>Support delete multi networks and texts at the same time</li> <li>Support Undo and Redo the position of topology</li> </ul> <p><b>Fixed:</b></p> <ul style="list-style-type: none"> <li>Can not edit link</li> <li>Can not add Chinese text</li> <li>Fix bug missing i82559er in ASA</li> </ul>	<ul style="list-style-type: none"> <li>Can not open Lab contain <b>Paloalto</b> device. <ul style="list-style-type: none"> <li>Solution: edit file: /opt/unetlab/html/device/qemu/device_paloalto.php replace "pfSense" to "paloalto"</li> </ul> </li> </ul>

4.2.2	<p><b>Added:</b> Support 2 type of console for Docker and Qemu</p> <p><b>Fixed:</b> Can not load startup config Bug when duplicate Text object, hide label</p>	<ul style="list-style-type: none"> <li>Can not add Chinese text <ul style="list-style-type: none"> <li>Temporary solution: Replace file: /opt/unetlab/html/themes/default/js/functions.js by : <a href="#">File</a></li> </ul> </li> </ul>	Released
4.2.1	<p>Fixed:</p> <p>Connection auto close when using HTML console to RDP to window node</p> <p>Can not use wireshark by native app.</p> <p>Lost configuration when stop device</p> <p>eth_name, eth_fromat not effective</p> <p>Random node position when add multi nodes</p>	<ul style="list-style-type: none"> <li>Can not load startup config</li> <li>Bug when duplicate text object, hide label</li> </ul>	Release
4.2.0	<p><b>Added:</b> Open source code device modules Edit topo without reload page Support dynamips devices Support access to any docker devices over Telnet Support Edit node when they are running Support Edit link width, font size, hide label Perfect preview Lab module New Multi configs module Support edit image, node size of Bridge and cloud</p> <p><b>Fixed:</b> RDP to window node over html console Fix bug can not open SDWAN Lab</p>	<ul style="list-style-type: none"> <li>Connection auto close when using HTML console to RDP to window node <ul style="list-style-type: none"> <li>Temporary solution: replace file: /opt/unetlab/html/includes/functions.php by: <a href="#">File</a></li> </ul> </li> <li>Can not use wireshark by native app. <ul style="list-style-type: none"> <li>Temporary solution: replace file:/opt/unetlab/html/includes/api_nodes.php by: <a href="#">File</a></li> </ul> </li> </ul>	Released
4.1.0	<p>Added: Upgrade from version 16.0.4 to 18.0.4 Bare Install supported. Multi-Language Guacamole new version</p> <p>Fixed: All bugs from 4.0.2</p>	<p>Can not start dynamips devices in Ubuntu 18.04 Docker bug: hang on clock status, and startup config not working.</p> <p>(<b>temporary solution: Replace file /opt/unetlab/scripts/config_docker.py by file on PNETLab Ubuntu 16.04</b>)</p> <p>Link quality not be remove when the link is deleted</p>	Released
4.0.2	<p>Added: Set default console method Allow to select Dependency packages to download when download lab</p> <p>Fixed: All Bugs from 4.0.1</p> <p><b>Note: Clear browser cache after upgrading</b></p>	<ul style="list-style-type: none"> <li>Can not edit Lab when select Admin and Special users (<b>Fixed</b>)</li> </ul>	Released
4.0.1	<p>Added: Optimize Topo loading speed Rotate link label Option to use Docker Wireshark in Default</p>	<ul style="list-style-type: none"> <li>Can not RDP directly to Window node over HTML Console (<b>Fixed</b>)</li> <li>The Device Icons is overlapped. You need to drag Edit form away to select icon (<b>Fixed</b>)</li> </ul>	Released

	<p>Console Set Workspace limit for each user Fixed: All Bugs from 4.0.0 <b>Note: Clear browser cache after upgrading</b></p>		
<b>4.0.0</b>	<p>Added: Offline Mode Active Time and Expired time for each user Note: Clear browser cache after upgrading</p>	<ul style="list-style-type: none"> <li>Can not set Permission on Lab for Offline Accounts (<b>Fixed</b>)</li> <li>Add Lab permission for Share folder not working (<b>Fixed</b>)</li> <li>Can not RDP directly to Window node (<b>Fixed</b>)</li> </ul>	<b>Release</b>