The Installation Guide for the VM Image of EstiNet 11 Network Simulator and Emulator

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Produced and maintained by EstiNet Technologies Inc.

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Revision History

Rev.	Date	Revision Description
1.0	April 15, 2020	Initial version
1.1	August 12, 2020	Add the part of 5G R15

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1. Install VMware Workstation Player

Because "EstiNet Network Simulator and Emulator" must be installed in Fedora 24(64bit) Operation System, we recommend that users install the Operation System and Simulator in "Virtual Machine" **VMware Workstation Player**. We introduce how to install VMware Player as below.

a. Please download VMware Player from website of VMware Inc. as below and select the type of Operation System which you have. We selected **VMWare Workstation Player for Windows** (as Figure 1). https://my.vmware.com/en/web/vmware/free#desktop_end_user_computing/vmware_workstation_player/15_0

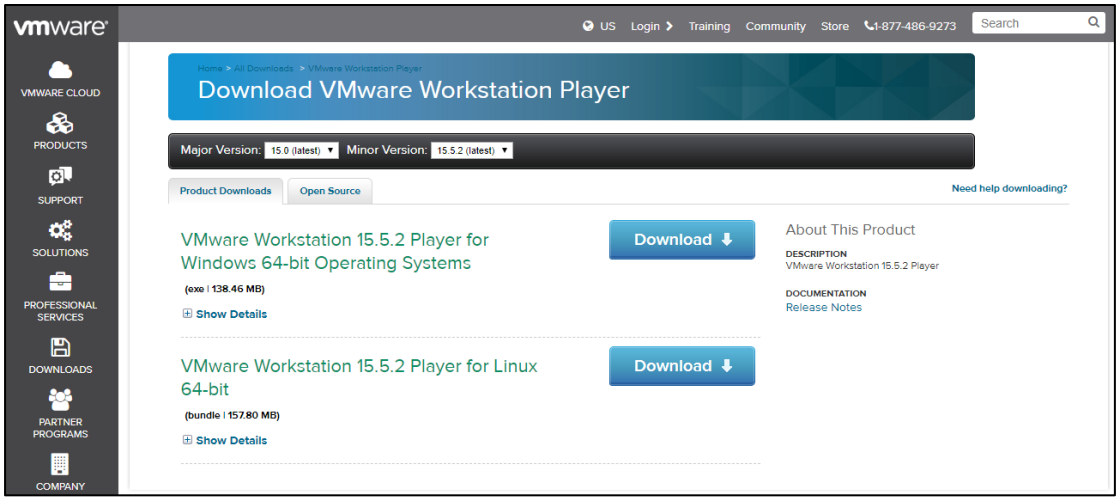

Figure 1 Download VMware Workstation Player

b. To download the EstiNet 11 virtual machine image (VM image), please reference the License Key and downloaded information from Delivery Notice.

EstiNet provides three ways to download the EstiNet VM image.
The first one is Google Drive (https://drive.google.com/drive/folders/0Bx3dD-IqTv0IYlhrRFMzR2RZUU0).
The Google Drive Monolithic VM image is (https://drive.google.com/drive/folders/1Ux4En_OWnWZ24LrjoiULmTScIv5cRvTu?usp

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=sharing).
The Google Drive Sliced VM image is (https://drive.google.com/drive/folders/1ZcD2lQKrPMi8XKKffKBYAmNcD39bwjzg?usp=sharing).

The second one is MEGA (https://mega.nz/#F!Mv5nEY6D!A5_AdqZpo-8PQi266yBzXg).
The MEGA Monolithic VM image is (https://mega.nz/#F!wmwDXKoS!Pw3oYKmnxYBQgauGHTEU8g).
The MEGA Sliced VM image is (https://mega.nz/#F!Mv5nEY6D!A5_AdqZpo-8PQi266yBzXg!IjpFAKpQ).
Please reference Page 6 for the description of Monolithic and Sliced VM image.

The third one is EstiNet FTP server.
FTP Download Link: "ftp://ftp.estinet.com/"
FTP Account: EstiNet_Trial
FTP Password: estinet
Directory: /EstiNet_Trial/VMImage/Monolithic

Users could download VM image from MEGA and Google Drive by browser.

User could download VM image from EstiNet FTP server by FileZilla (The Free FTP solution https://filezilla-project.org/). Please un-compress VM image file after the download of the VM image file is completed.

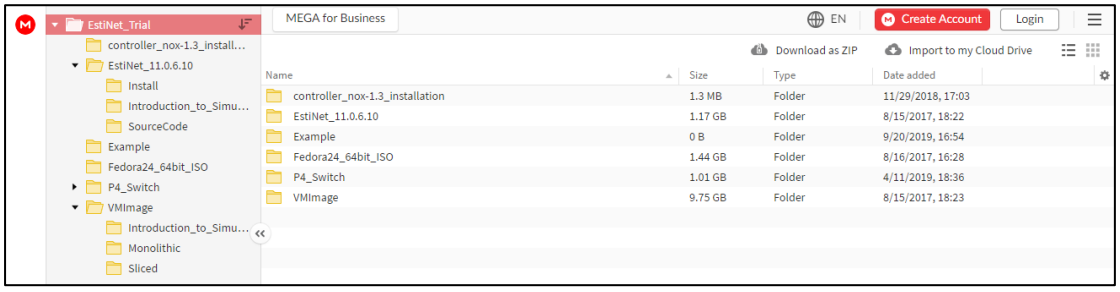

Figure 2 MEGA

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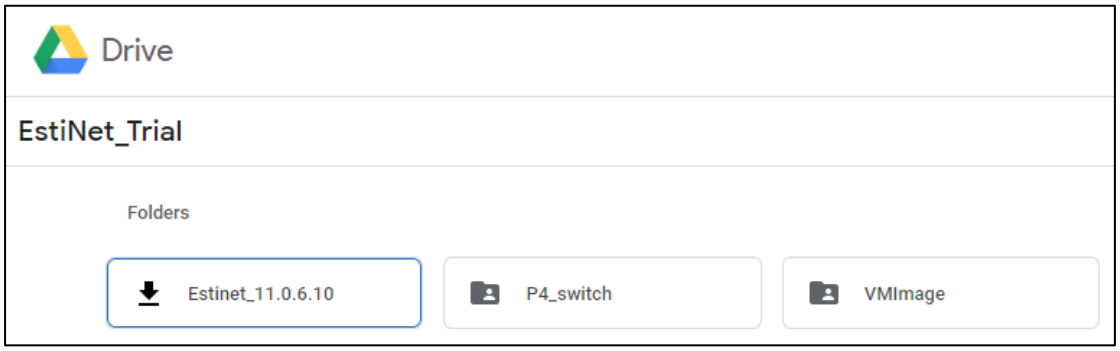

Figure 3 Google Drive

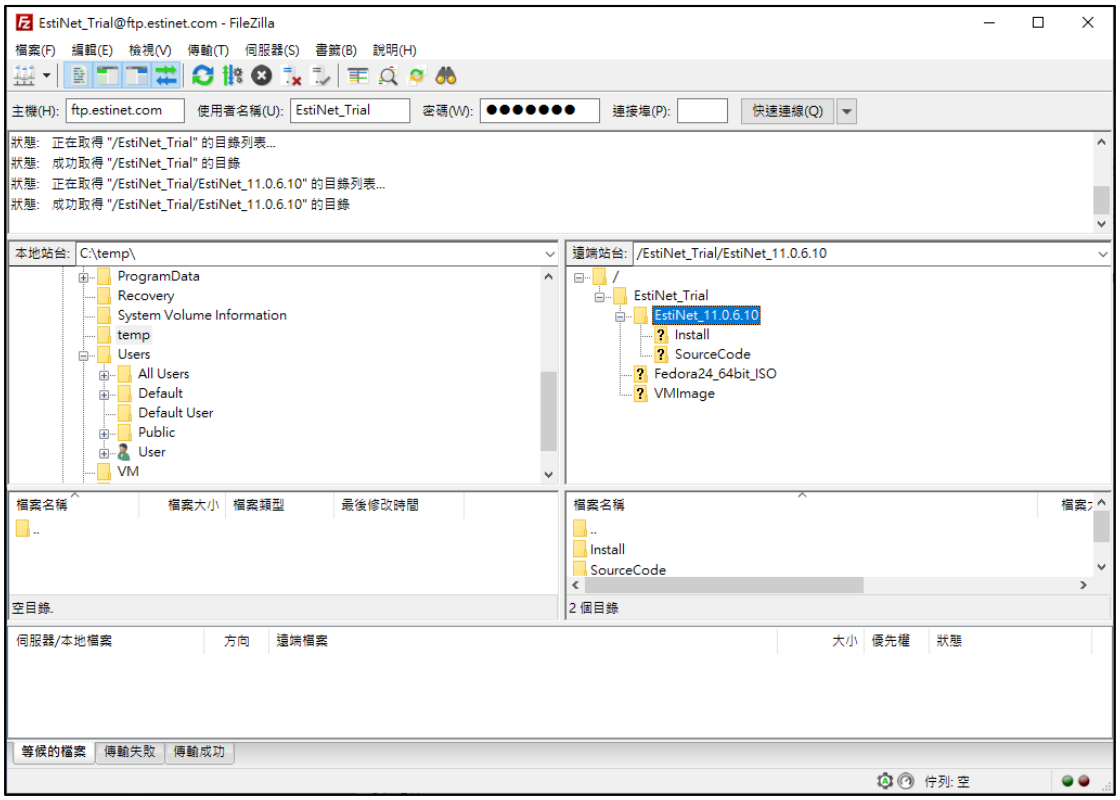

Figure 4 FileZilla

c. Please download and install a free application 7-Zip (https://www.7-zip.org/download.html) to extract the compressed file (either monolithic or sliced files). For monolithic file **EstiNet_40GB.7z**, just double click this file to open the 7-Zip software. Then click **Extract** to extract this decompressed

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file.

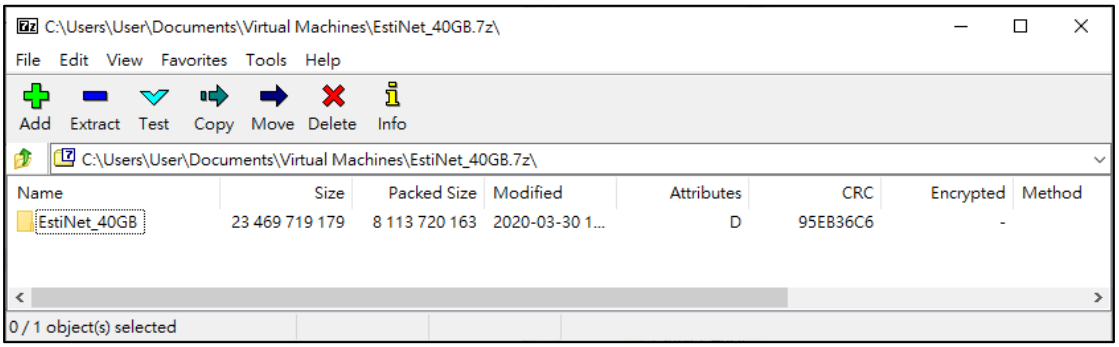

Figure 5 How to Extract the monolithic file by 7-zip

For sliced files, double click the Sliced file folder then click the first sliced file **EstiNet_40GB.7z.001**, just double click this file to open the 7-Zip software. Then click **Extract** to extract this decompression file.

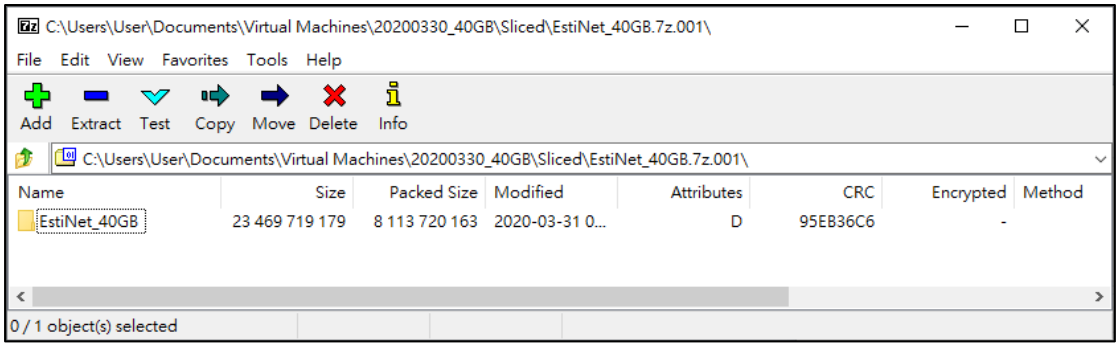

Figure 6 How to Extract the Sliced file by 7-zip

When extracting the monolithic/sliced file is completed, users will get a file folder [**EstiNet_40GB**] in the same directory.

d. After installing **VMWare Workstation Player** and decompress EstiNet VM image, please open the "**VMWare Workstation Player**" such as . Then

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double click "**Open a Virtual Machine**".

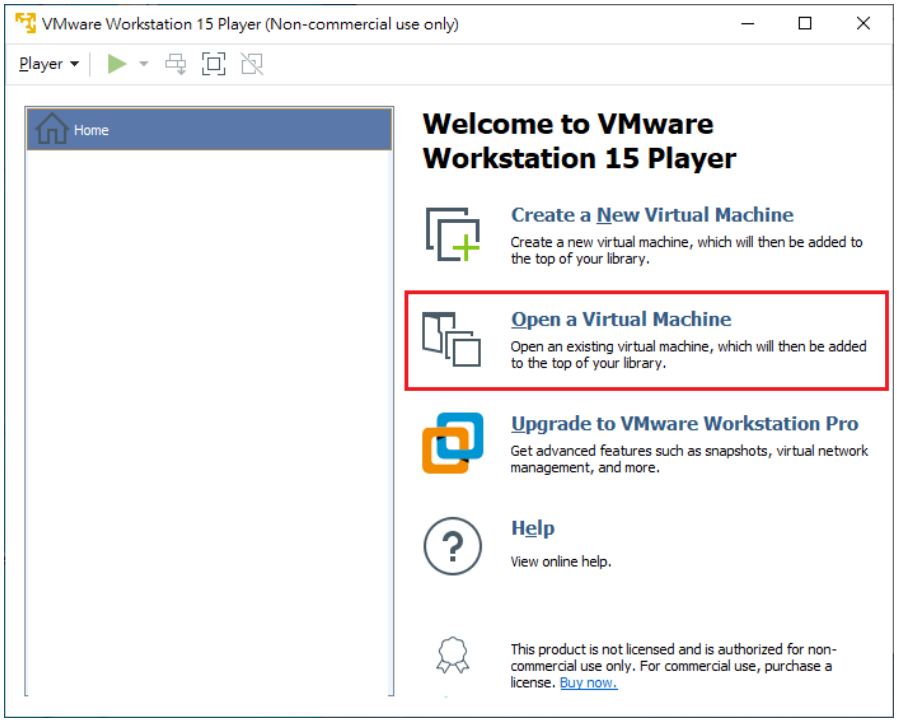

Figure 7 Click Open a Virtual Machine

e. Please select the path of VM image file **EstiNet_40GB.vmx**, then click "**Open**".

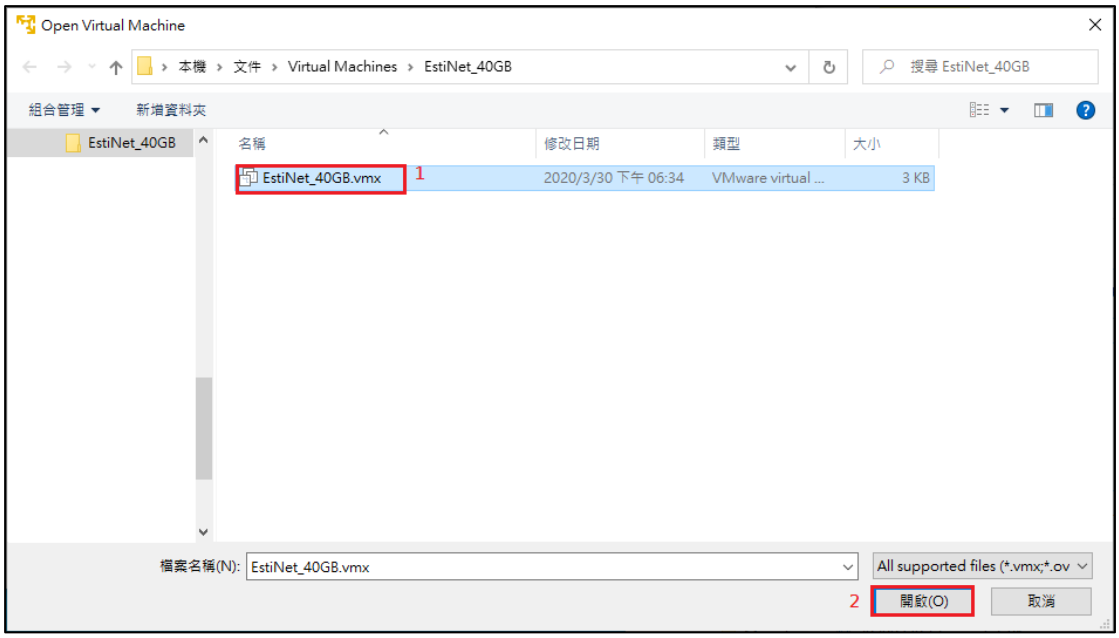

Figure 8 Open VM file EstiNet_40GB.vmx

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f. Please click "**Play virtual machine**" to power on EstiNet_40GB VM image.

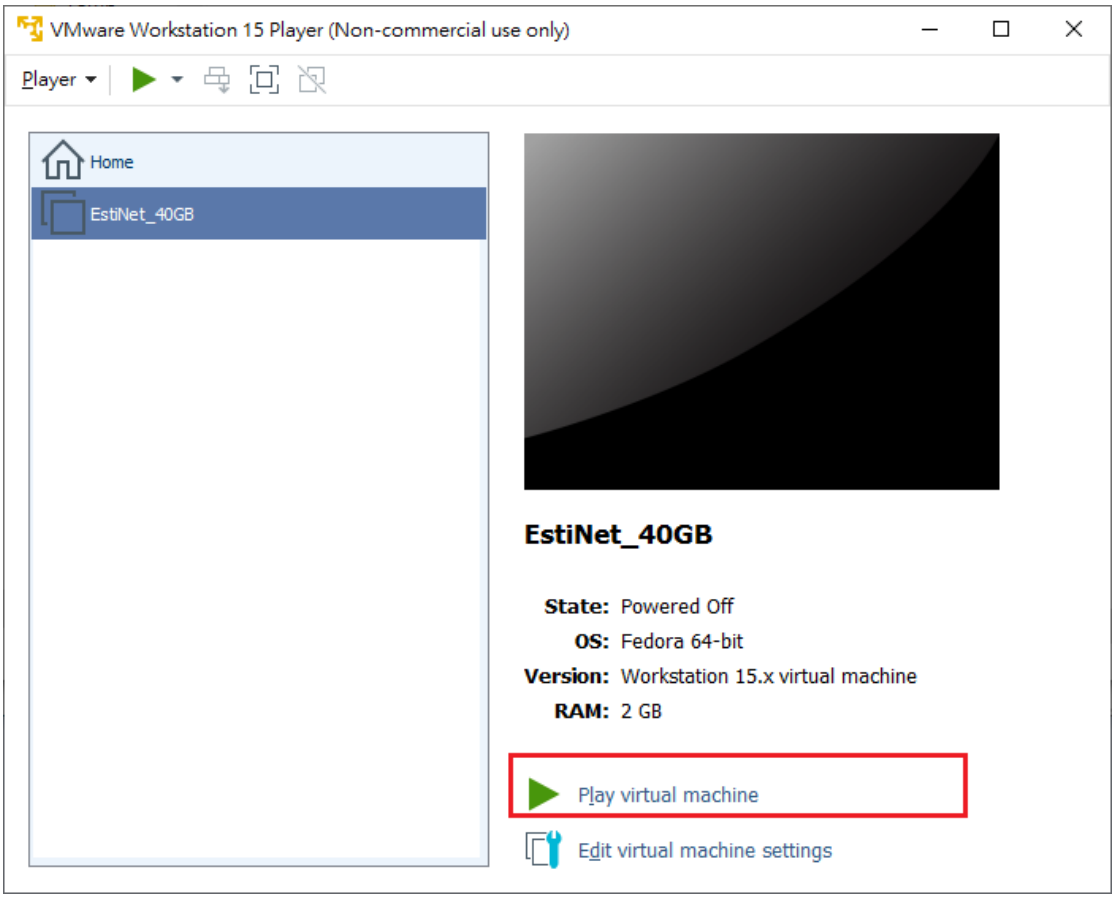

Figure 9 Play EstiNet X virtual machine

g. When loading EstiNet VM image, it will pop-up a dialogue box. Please

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select **I Copied It** (as Figure 10 Dialogue box).

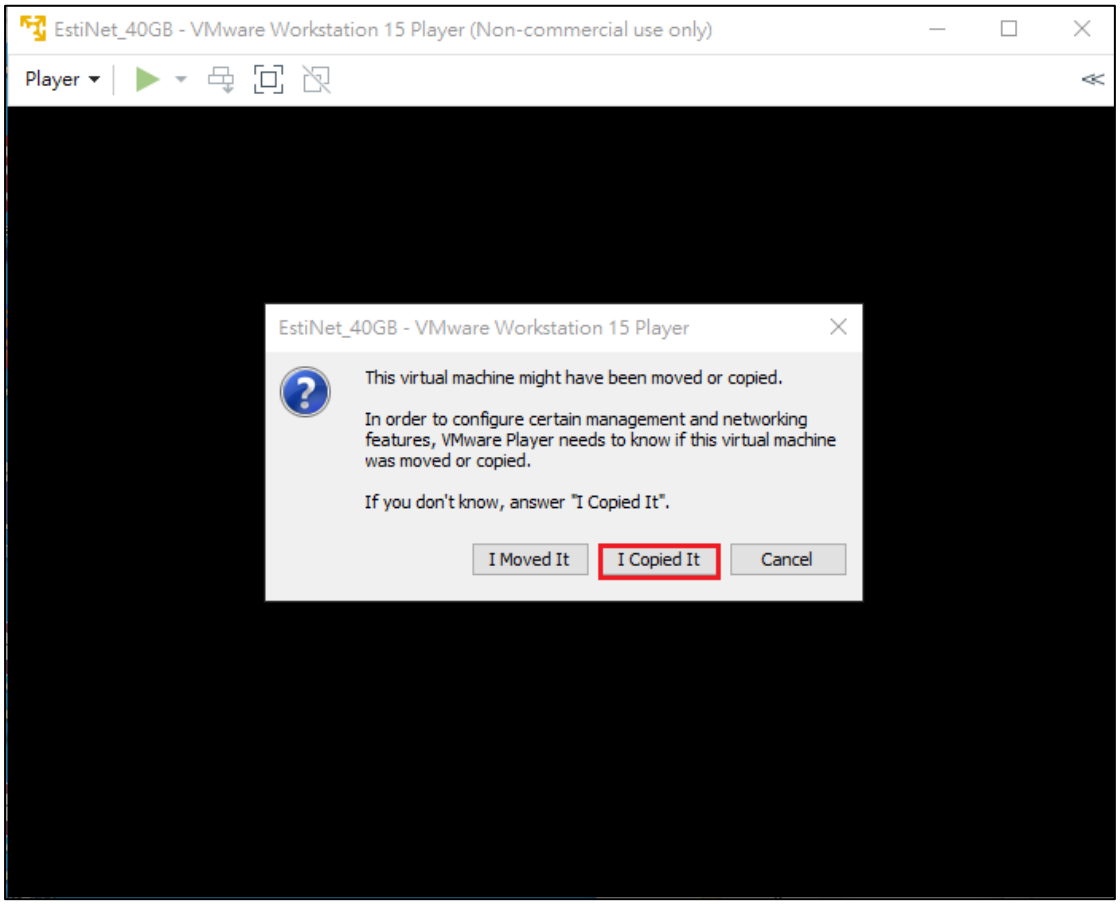

Figure 10 Dialogue box

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2. To start up the EstiNet Simulator

2.1 The Boot menu

a. Choose the EstiNet kernel such as “Fedora (4.11.12. estinet20200330.fc24) 24 (Workstation Edition)” on the selection screen.

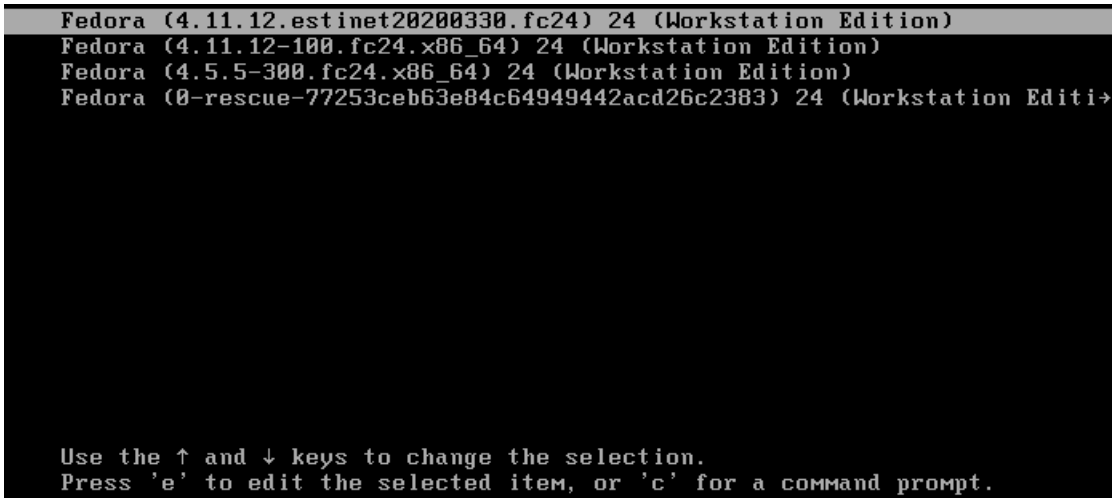

Figure 11 Choose the EstiNet kernel on the operation selection screen

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b. Login to Fedora24 with user name “**estinet**” and password “**estinet**”.

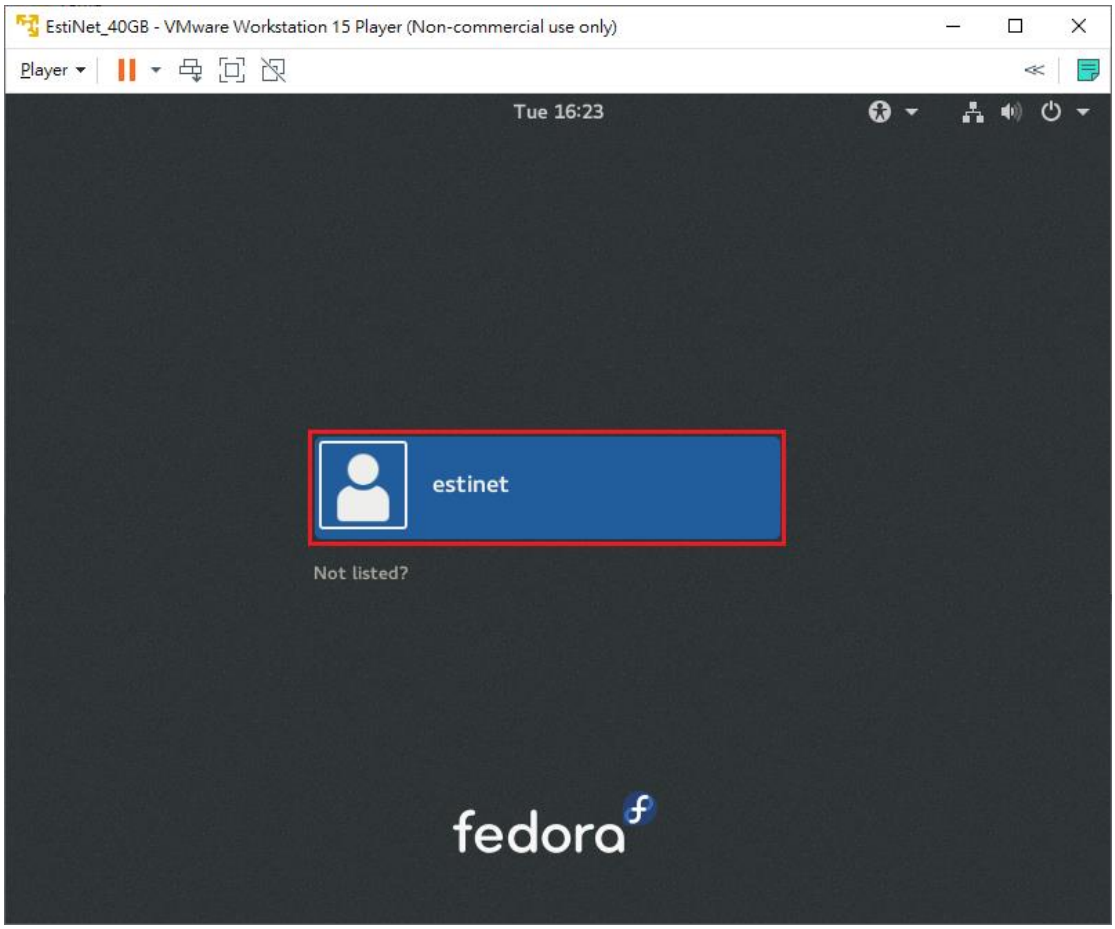

Figure 12 Login with user name “estinet”

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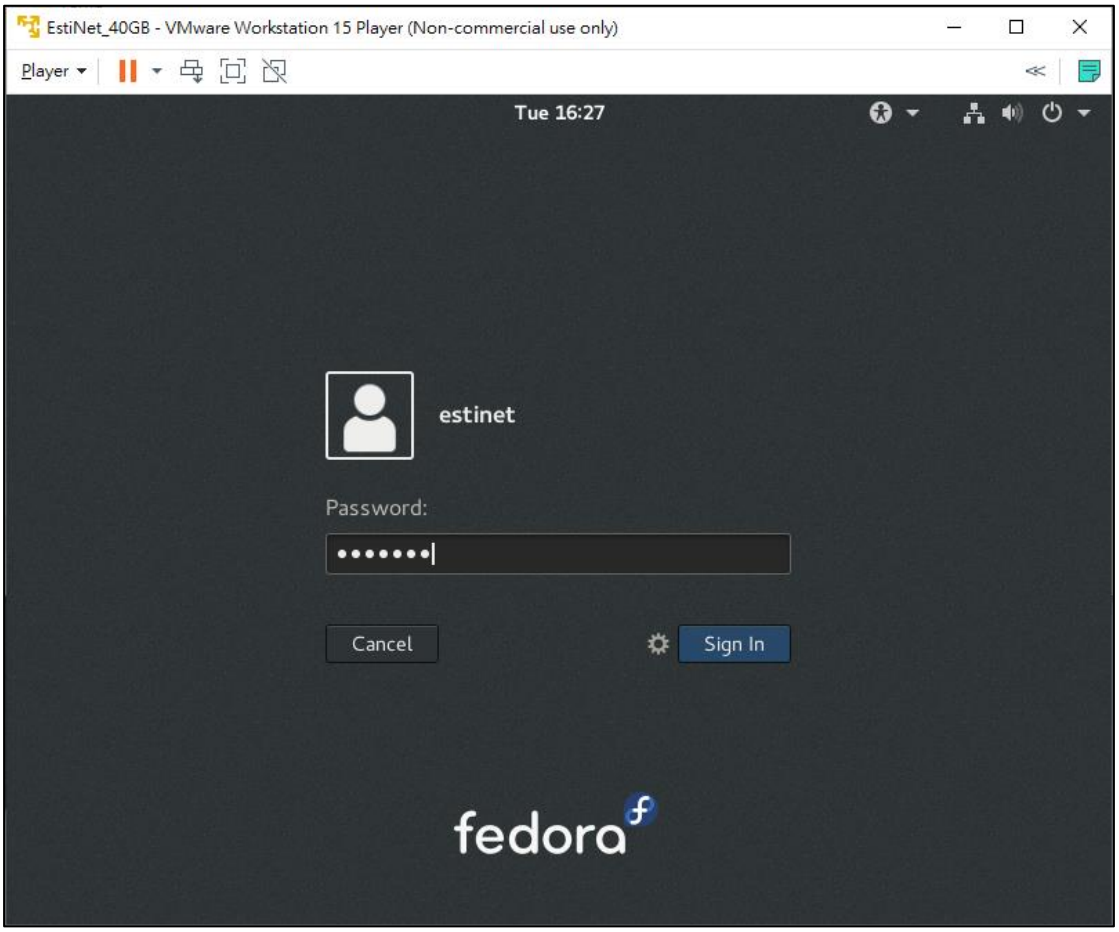

Figure 13 Login with password “estinet”

2.2 Network Setting

a. After login, please check the Network status is working properly or not. If your Fedora24 environment is the same, please jump to step **j**.

Figure 14 Network status is working properly

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b. If the network connection status is failed, please reference the steps below to make it work properly.

Figure 15 Network connection failed

c. Please click “Power button” then select “Settings”.

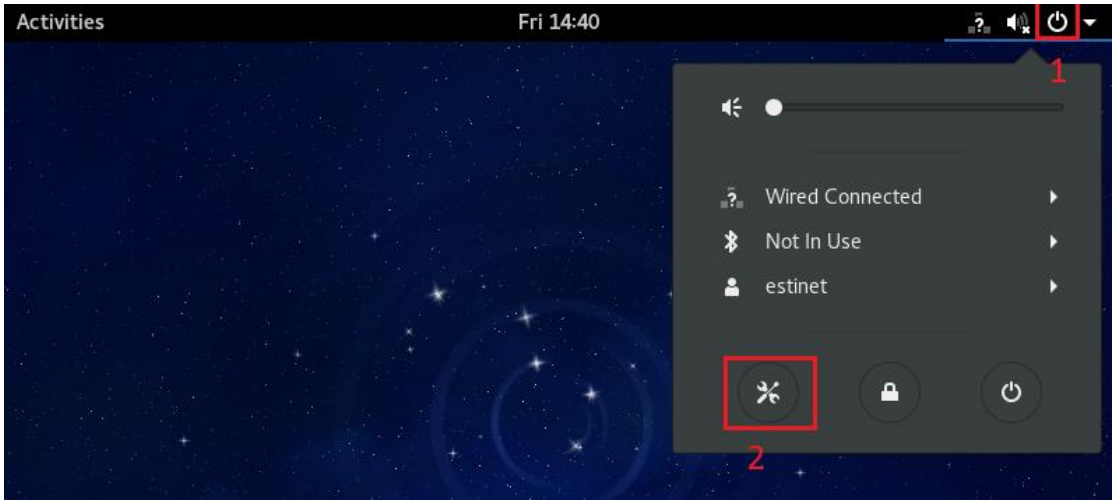

Figure 16 Click “Settings”

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d. Click the Network button.

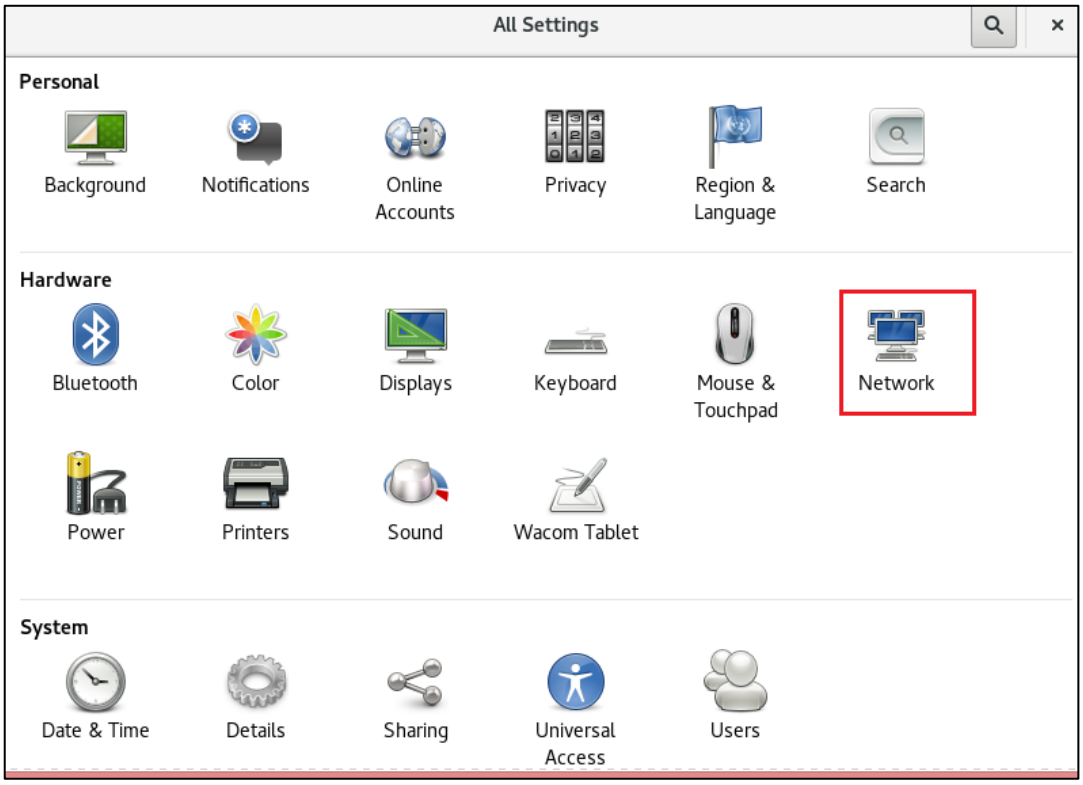

Figure 17 Click the Network button

e. After going into the Network settings, please click “Add Profile“.

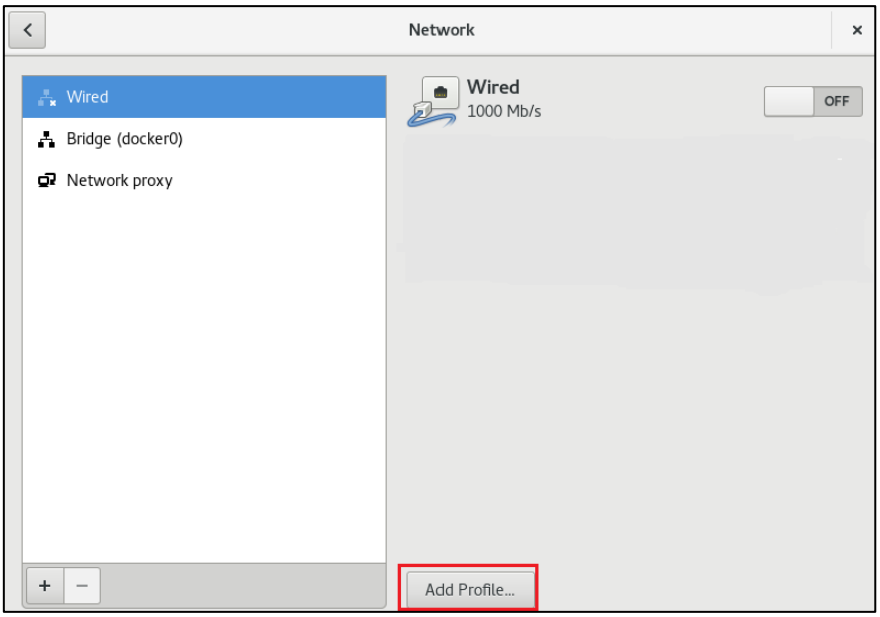

Figure 18 Click “Add Profile”

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f. Go to the window “Profile” and click “Add”, the network should be running.

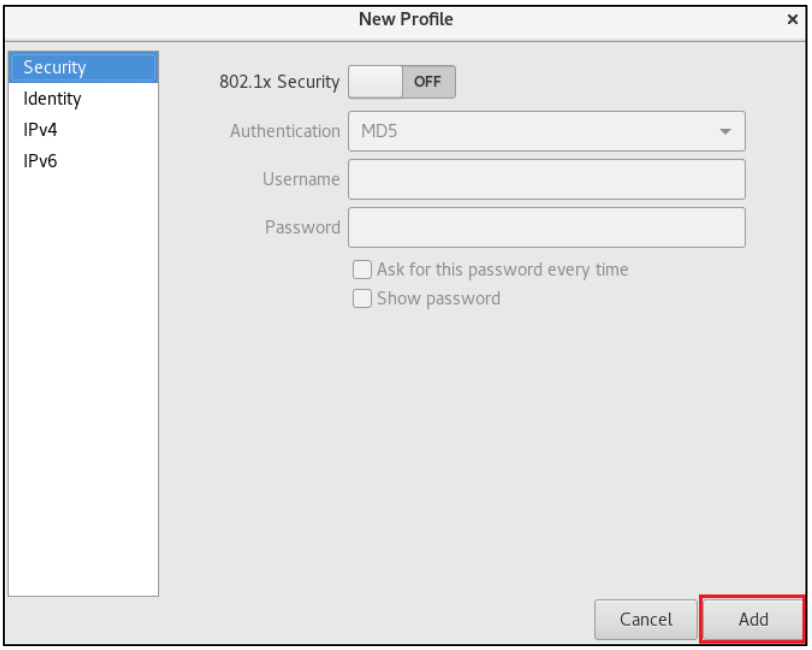

Figure 19 Click “Add”

g. If the network still doesn’t work well after pre-steps **b~f**, please click **Player→Manage→Virtual Machine Settings** in the upper left corner.

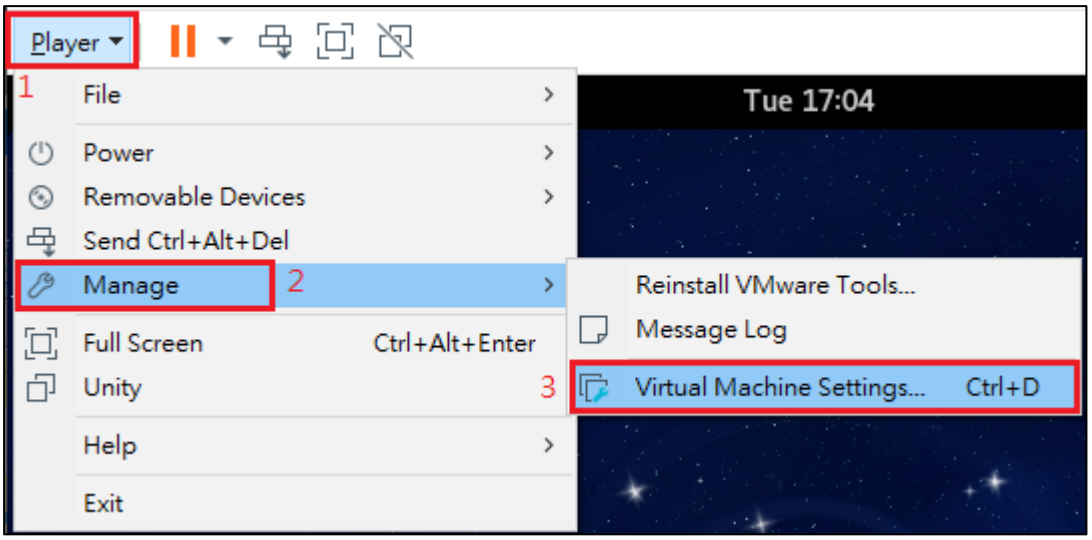

Figure 20 Click Player→Manage→Virtual Machine Settings

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h. Click “**Network Adapter**” on window Virtual Machine Settings. There are two ways for this setting. The one is click “**NAT: Used to share the host’s IP address**”.

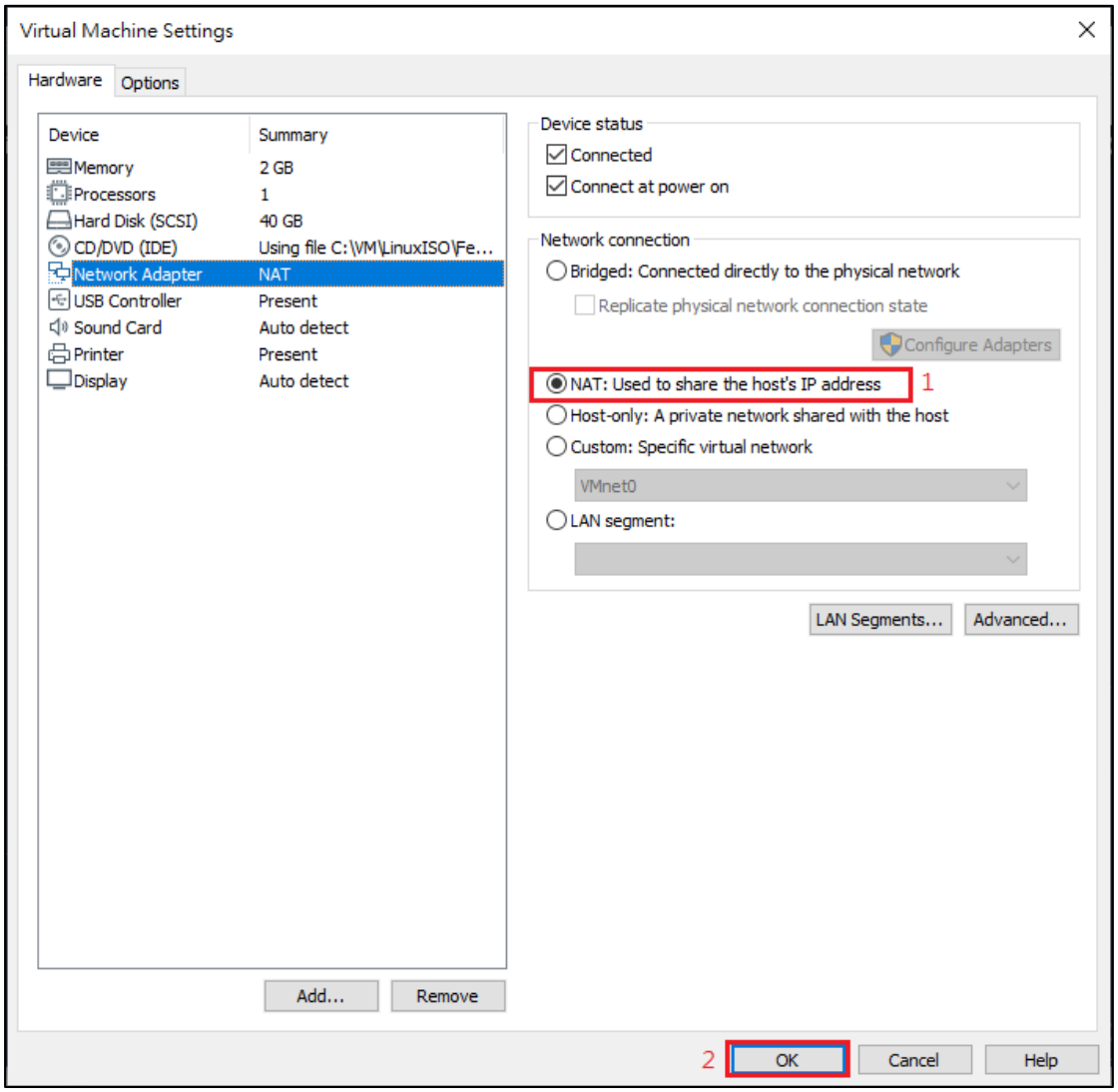

Figure 21 Network Adapter “NAT”

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i. The other one is select "**VMnet (NAT)**" to replace "**WMnet (Host-only)**" on "**Custom: Specific virtual network**".

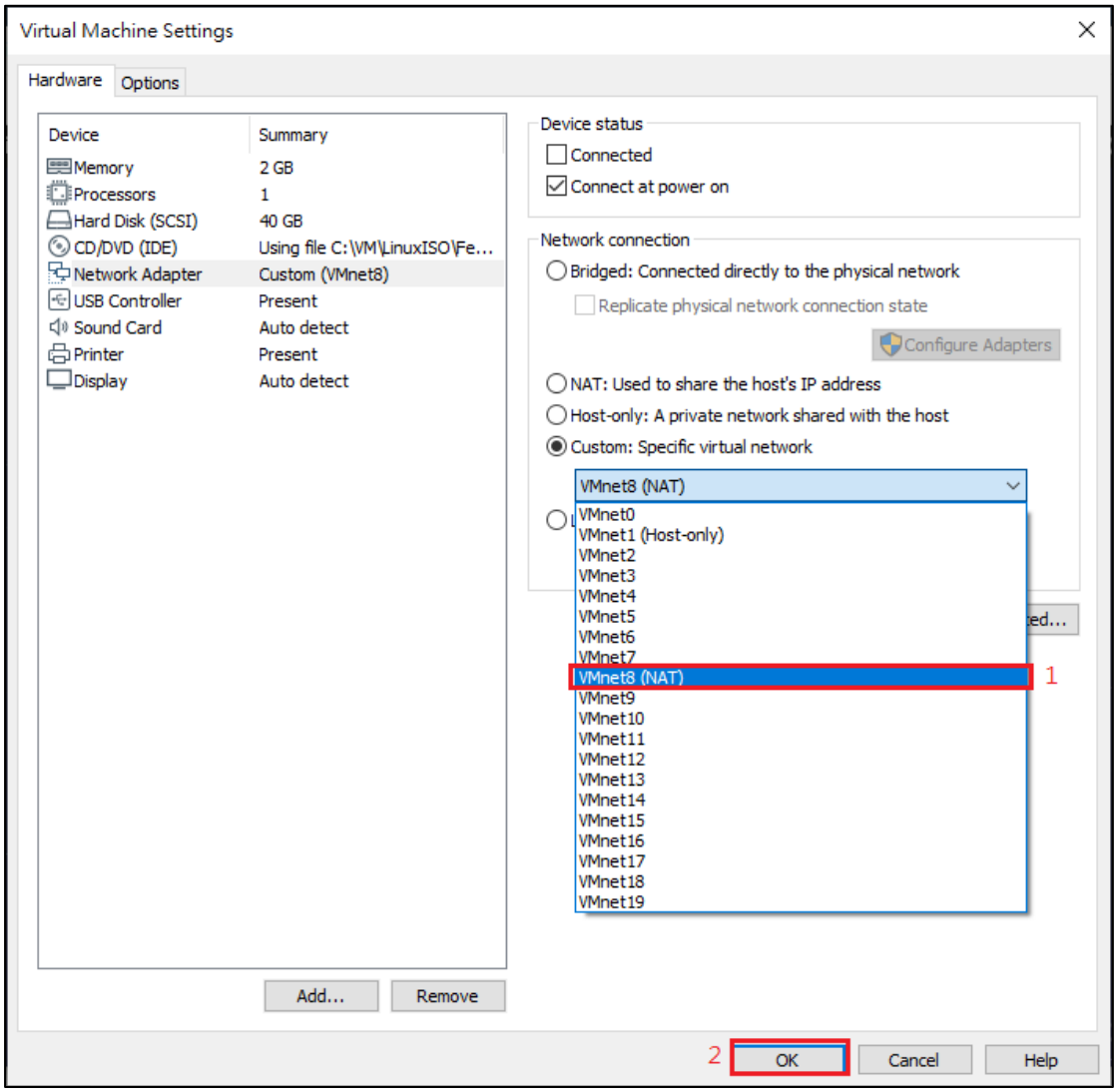

Figure 22 Choose VMnet(NAT)

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j. To open a window “Terminal”, please click “**Activities**” in the upper left corner then select “**Terminal**”. After opening the window “terminal”, please input “**su –**“ with Password “**estinet**” to get root privilege.

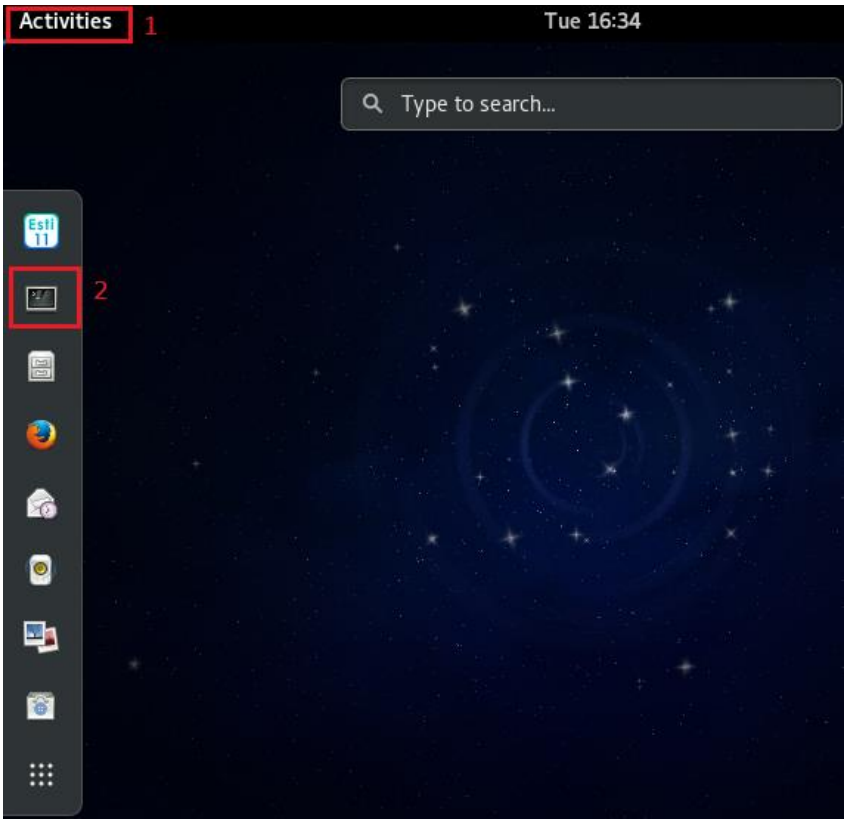

Figure 23 Open window “Terminal”

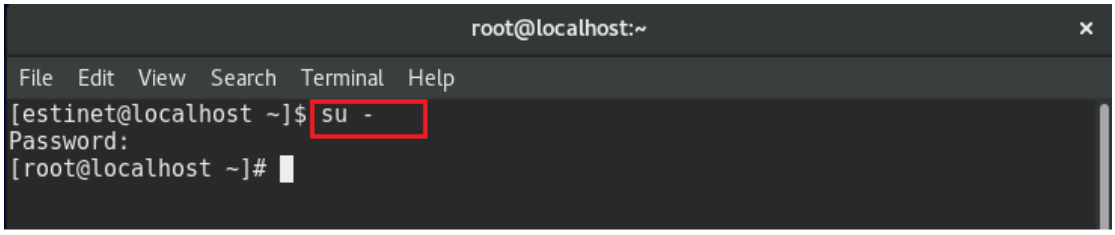

Figure 24 To get root privilege

k. Execute **#ifconfig** to confirm the network device has a local IP after all settings.

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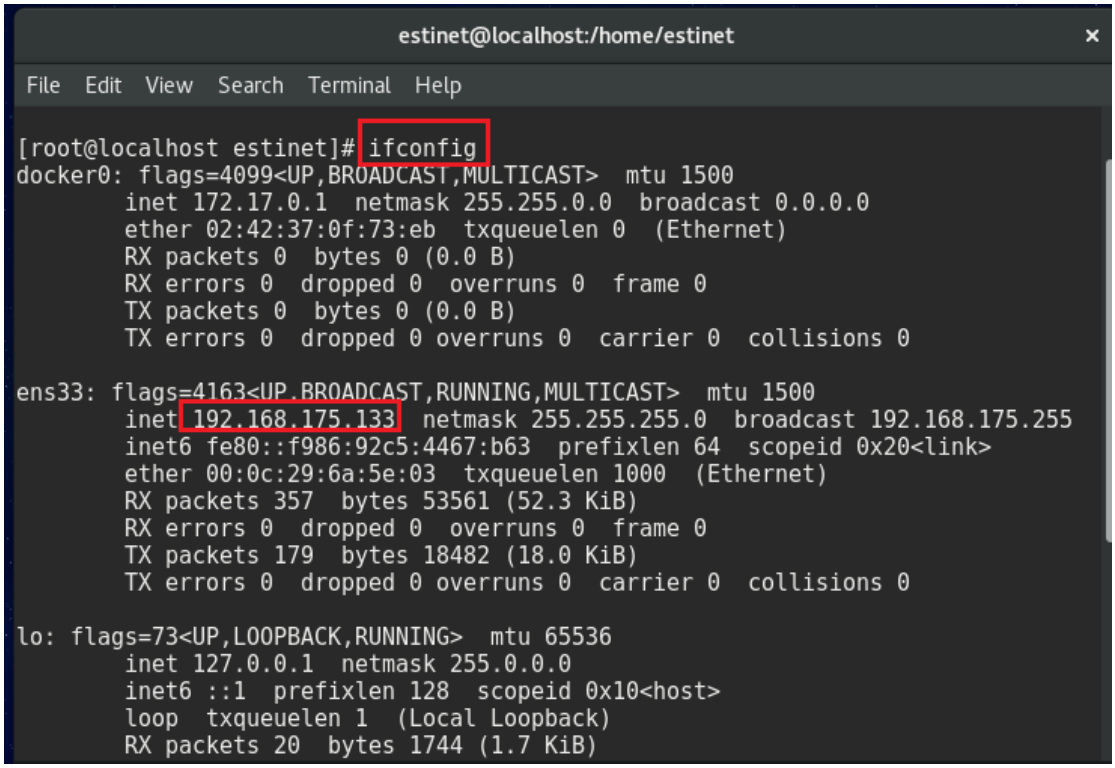

Figure 25 Execute Ifconfig to get network information

l. To make sure that the network device can connect to the Internet. For example: #ping www.google.com

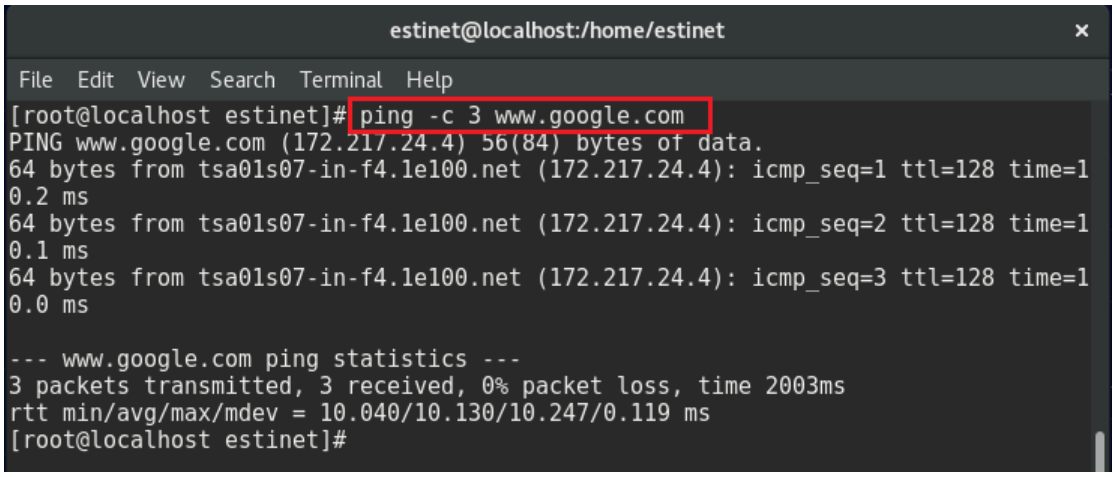

Figure 26 Ping www.google.com

m. To make sure the network device can connect to EstiNet License Server correctly.

EstiNet license server is using domain name : lic1.estinet.com、IP :

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175.99.151.2 and Port: 22220 to provide license service. If your Internet has a firewall to block the specific IP and port connection, please provide this information (domain name, IP and Port number) to the “Computer and Information Networking Center” or MIS (Management Information System) in your site.

Test 1: Get root privilege and execute # **telnet lic1.estinet.com 22220**. If the Network connection is successful, you could see this message.

```
[root@localhost tools]# telnet lic1.estinet.com 22220
Trying 175.99.151.2...
Connected to lic1.estinet.com.
Escape character is '^]'.
```

Figure 27 To execute # telnet lic1.estinet.com 22220

Test2: Get the root privilege and execute # **nslookup lic1.estinet.com**. If your DNS server can parse the EstiNet license server IP address successfully, you should get the result as: license server IP address is 175.99.151.2 and domain name is lic1.estinet.com.

```
[root@localhost tools]# nslookup lic1.estinet.com
Server:         192.168.152.2
Address:        192.168.152.2#53

Non-authoritative answer:
Name:   lic1.estinet.com
Address: 175.99.151.2
```

Figure 28 To execute # nslookup lic1.estinet.com

If you can connect to the Internet successfully, but you can’t find any message mentioned above; please **apply to free them with TCP connection** for using EstiNet simulator (domain name: lic1.estinet.com, Port: 22220) in your organization.

2.3 First time to start up the EstiNet Simulator with License Key

After login to Fedora24, please open a terminal.

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Figure 29 Open terminal

You have to use the command "**`su -`**" with password "**estinet**" to switch to a user with the root privilege.

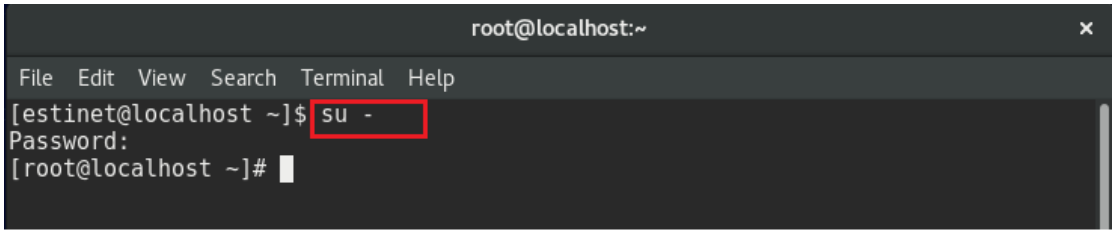

Figure 30 Get root privilege

If this is your first time to run EstiNet, you have to execute the command named "**estinet_inputkey**" to enter the license key which was send to your e-mail by EstiNet. Next, you have to execute the command named "**estinet_reserve**" to obtain the permission from the license server to run EstiNet. The commands "**estinet_inputkey**" and "**estinet_reserve**" only need to be executed one time. Next time when users run EstiNet simulator, they don't need to execute these two commands. Users should start up the EstiNet simulator as 2.4 General steps to star up the EstiNet Simulator.

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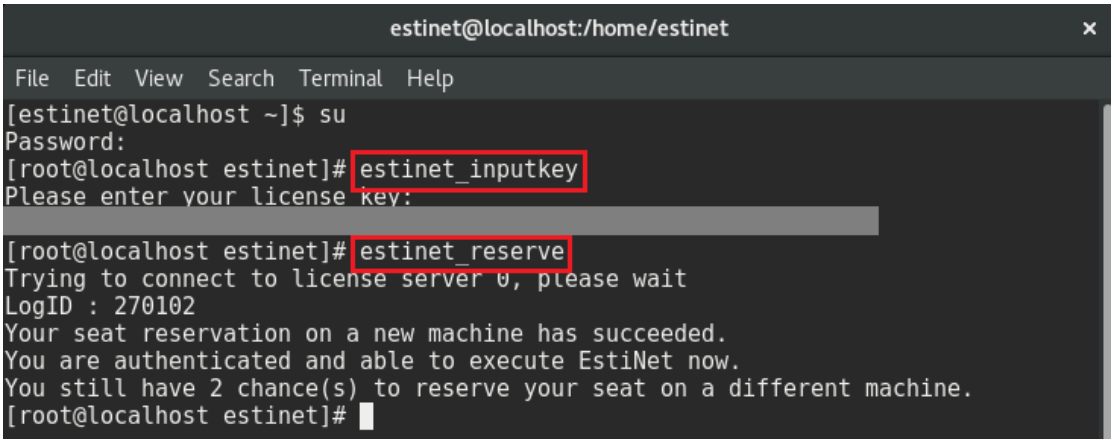

Figure 31 Obtain the permission from the license server to run EstiNet

2.4 General steps to star up the EstiNet Simulator

After license identification, users could open the EstiNet simulator to do the simulation. There are two ways to open the EstiNet simulator. The first way is to click the “Activities” then search for “EstiNet” or click the “**Esti**” icon directly .Please input the root Password “**estinet**” to open the simulator.

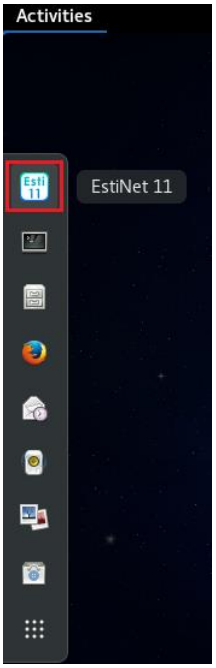

Figure 32 Click “Esti” icon

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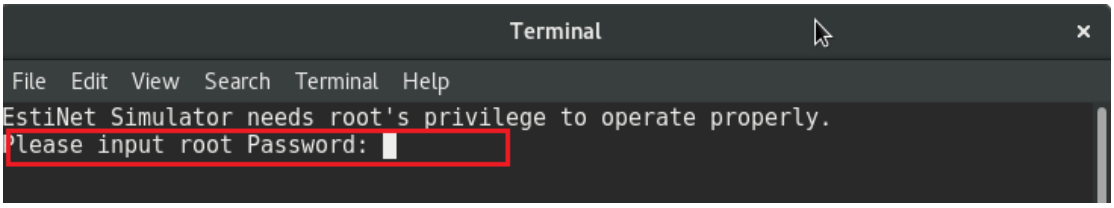

Figure 33 Input root Password

The second way is to open a terminal. To execute the command "**su -**" to switch to a user with password "**estinet**" to get the root privilege. Then execute the command "**estinetjd**".

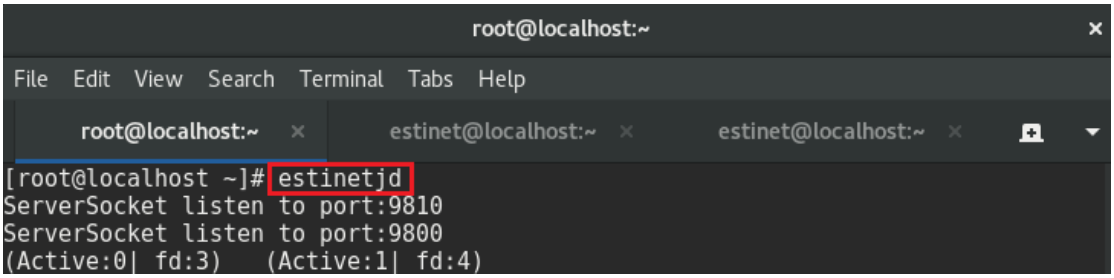

Figure 34 To execute the command estinetjd

Open the second terminal (Users could use "**Ctrl**" + "**Shift**" + "**T**" to open another terminal). To execute the command "**su -**" with password "estinet" to get the root privilege. Then execute the command "**estinetss**".

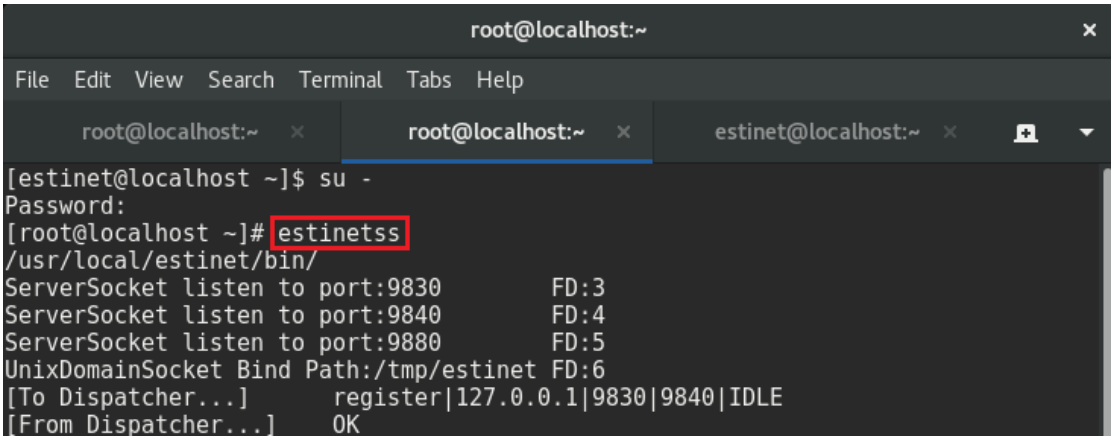

Figure 35 To execute the command estinetss

Open the third terminal, to execute the command "**su -**" with password "**estinet**" to get the root privilege. Then execute the command "**estinetgui**". The EstiNet simulator

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will be opened automatically.

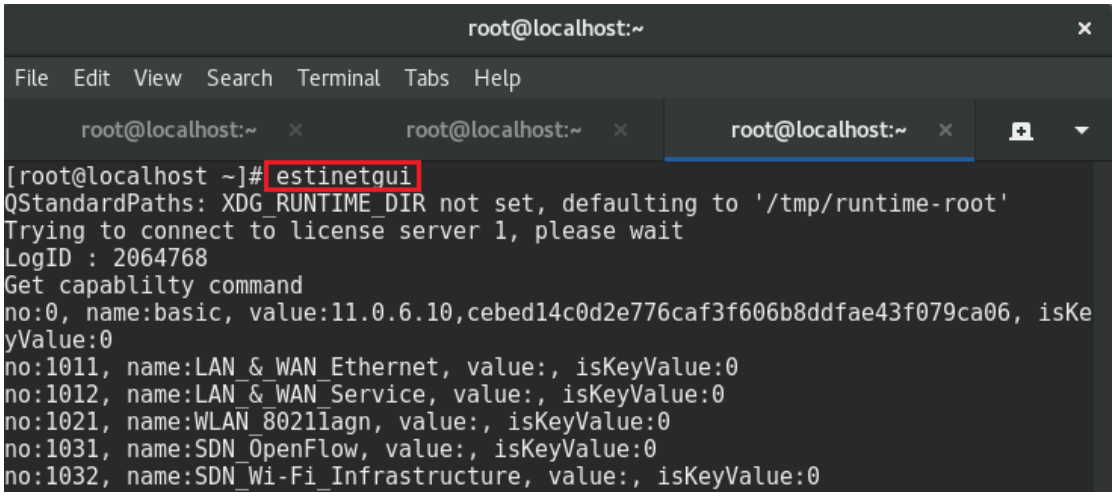

Figure 36 To execute the command estinetgui

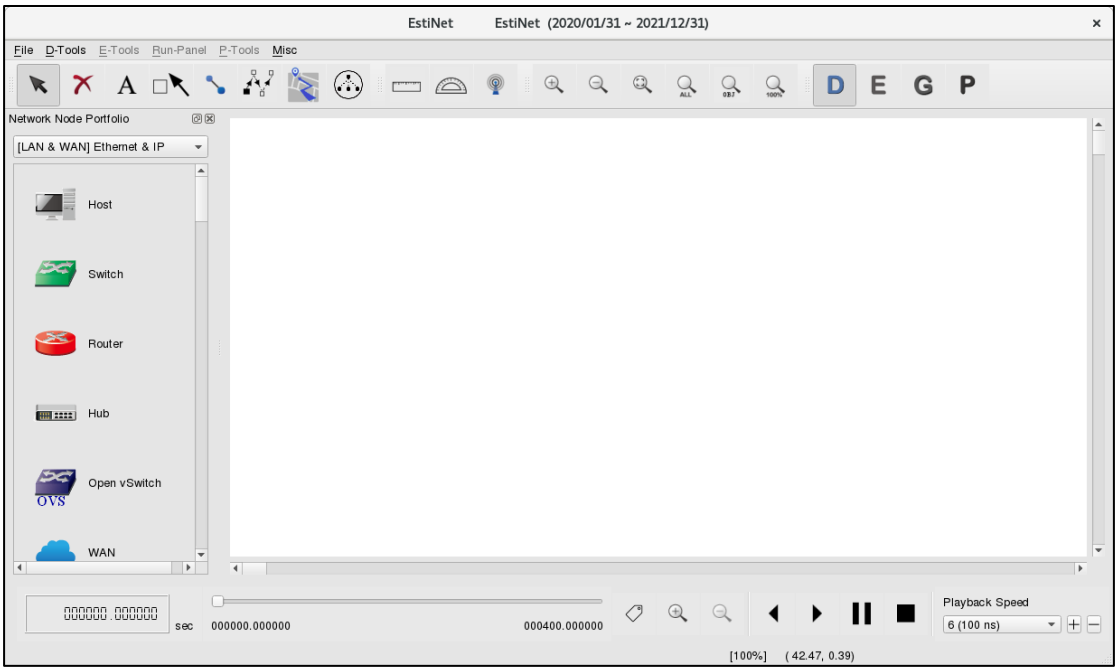

Figure 37 Complete to open the EstiNet Simulator

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3. The introduction for EstiNet 11 operation

3.1 Environment Introduction

EstiNet provides a highly-integrated and professional GUI environment in which a user can easily conduct network simulations. EstiNet supports common wired and wireless network devices such as hub, switch, router, host, IEEE 802.11(a/g/n) ad hoc mode and infrastructure mode. EstiNet also supports NAT, DNS, 5G and SDN OpenFlow. All nodes are shown in Figure 38.

PS. EstiNet will create 5G Nodes in the future. Currently, please use EstiNet 5G examples directly.

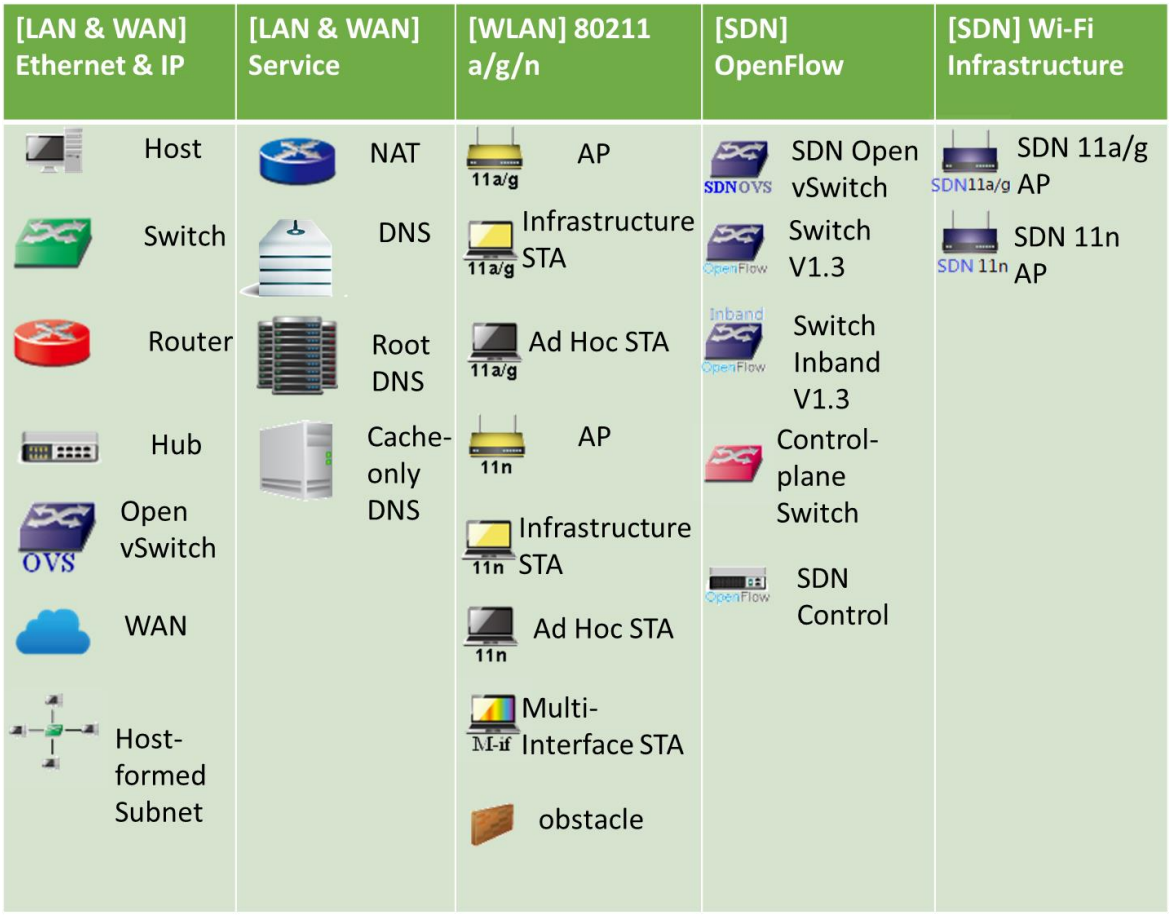

Figure 38 Network Node Portfolio

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There are five areas in EstiNet GUI (Figure 39):

Menu Bar: The menus in the Menu bar allow users to access all available operations. There are 6 types of menus: **File**, **D_Tools**, **E_Tools**, **Run-Panel**, **P_Tools** and **Misc**.

User Control: It provides icons of control functions to operate or modify network topology. For example, icons like zoom in or zoon out and four kinds of simulator operation status

.

Network Node: It supports network nodes to draw network topology in working area.

Working Area: The area that user could draw and modify network topology and setup the property of network node.

PlayBack: It provides playback control buttons to display the simulation result in working area.

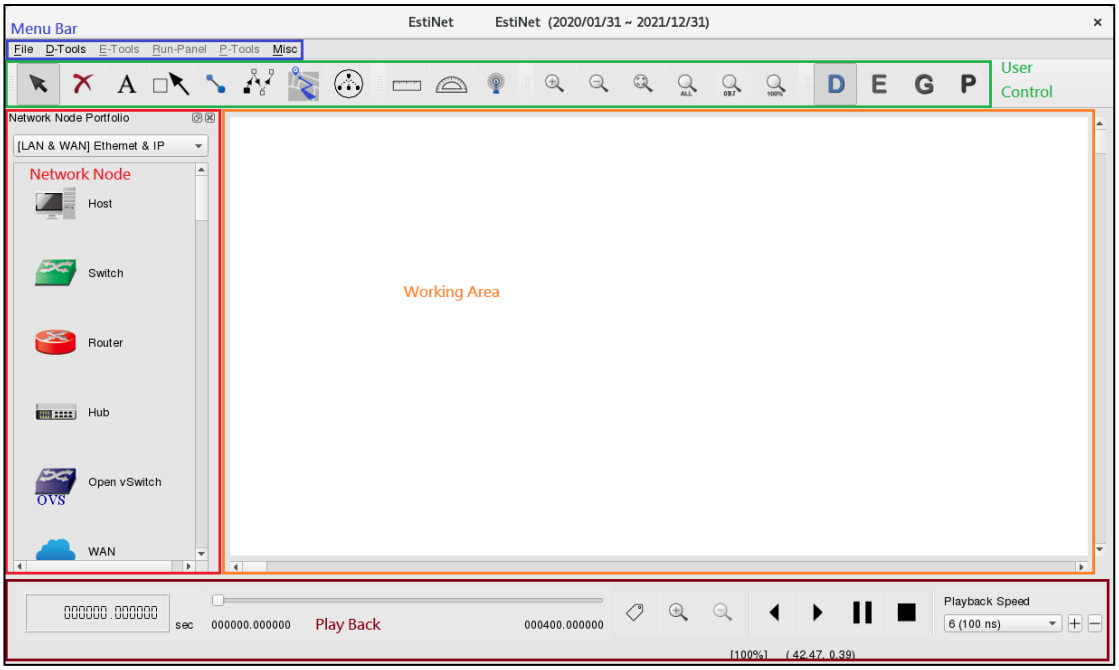

Figure 39 EstiNet Simulator Platform

3.2 Operation Flow

There are four status in simulator operation flow:

D status (Draw a Network

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Topology), **E status (Edit Parameters),** **G status (Generate Configuration Files) and** **P status (Play Back Results)** in Figure 40. For more operation details, please reference the EstiNet operation demo video in P32.

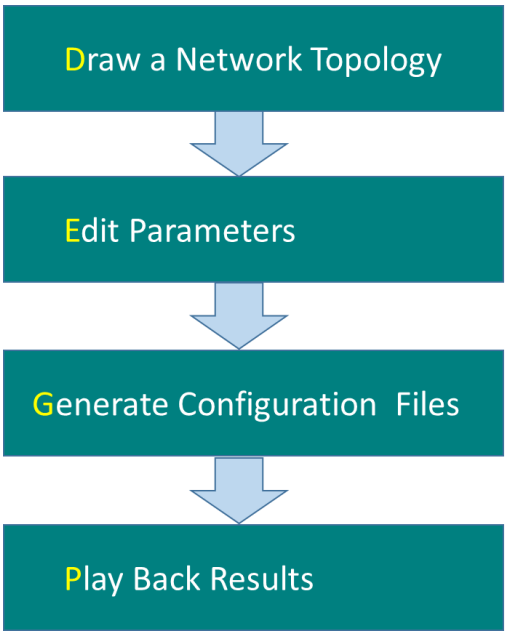

Figure 40 Flow status of EstiNet Simulator

4. How to use 5G in EstiNet Simulator?

EstiNet supports 5G from EstiNet11 simulator. It includes the simulation scenario for 5G core network, RAN (base station) and UE (mobile phone). The docker container **estinet11/fedora24:v1** which include free5GC could be executed for 5G simulation. EstiNet provides 5G examples to users for reference.
The examples already in the directory /home/estinet/EstiNet_topology/free5gc of EstiNet VM image. Users could download the document and topology from from
(1) Google Drive
(https://drive.google.com/drive/folders/14OonSancXdAuicTR3Yrq_307bEtYEWy6?usp=sharing).

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(2) MEGA (https://mega.nz/#F!Mv5nEY6D!A5_AdqZpo-8PQi266yBzXg).

(3) EstiNet FTP server.

FTP Download Link: "ftp://ftp.estinet.com/"

FTP Account: EstiNet_Trial

FTP Password: estinet

Directory: EstiNet_5G_Experiment

There are two examples. One is the basic case **free5gc_basic** which include 5G core network with one RAN and two UEs (Figure 41). Users could trace packet detail log of each node at playback mode (Figure 42, Figure 43). Please reference document **EstiNet_5G_Experiment** for more details.

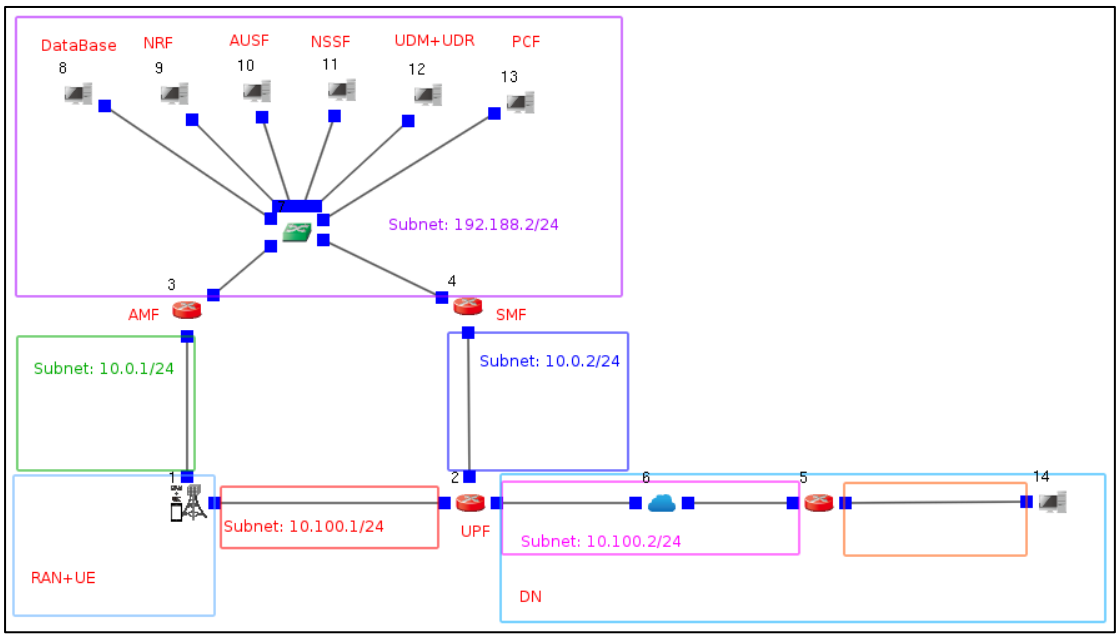

Figure 41 5G core network with one RAN and two UEs

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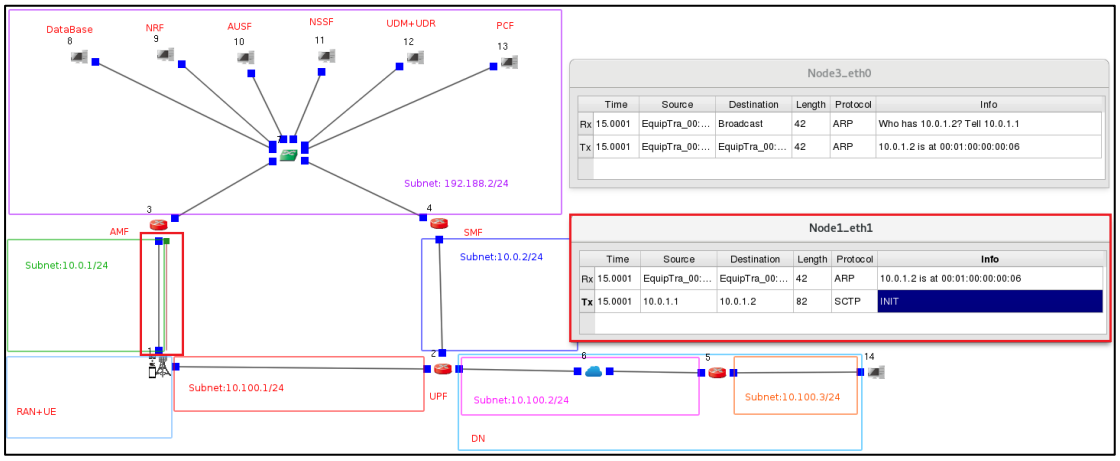
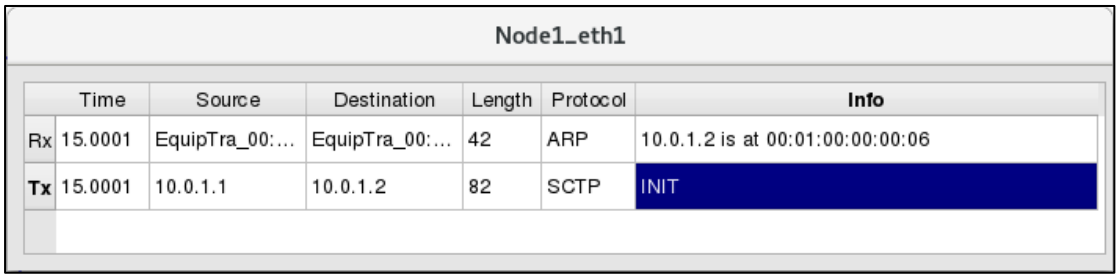


Figure 42 Packet detail log of each node



Node1_eth1

	Time	Source	Destination	Length	Protocol	Info
Rx	15.0001	EquipTra_00:...	EquipTra_00:...	42	ARP	10.0.1.2 is at 00:01:00:00:00:06
Tx	15.0001	10.0.1.1	10.0.1.2	82	SCTP	INIT

Figure 43 Packet detail log of each node

The other is the case **free5gc_mec** which include two MEC (Multi-access Edge Computing) and two RANs (Figure 44). The MEC functions in this example is null. Users could load their MEC docker container into EstiNet simulator to simulation synchronously. Please notice that the version must be the same or newer than EstiNet11 version 11.0.6.27.

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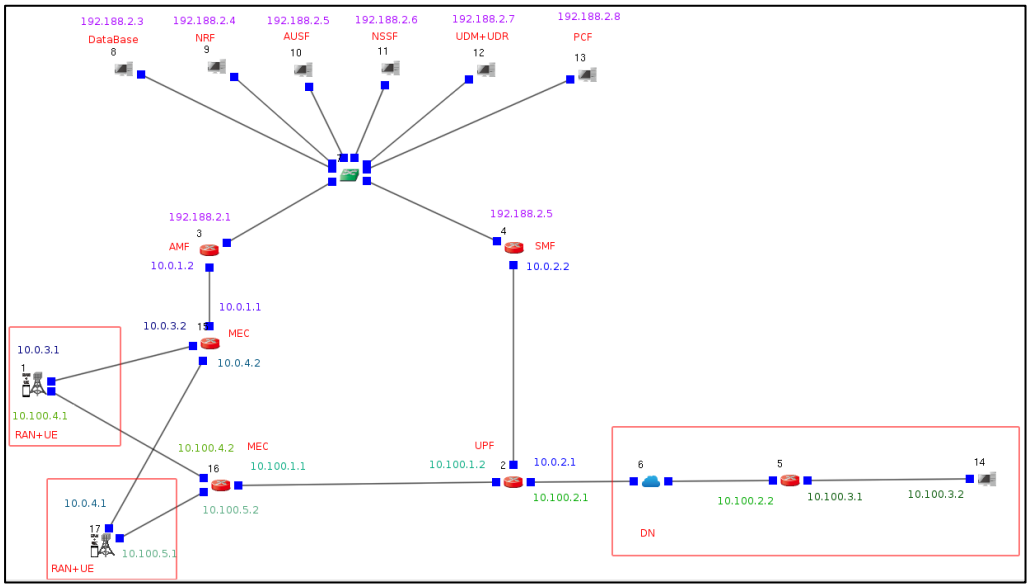

Figure 44 5G core network with two MEC and two RAN

5. How to use P4 Switch in EstiNet Simulator?

EstiNet supports P4 switch in EstiNet simulator. Users could load and use their docker container in EstiNet simulator. EstiNet provides P4 switch examples to users for reference.

Users should update the EstiNet installation package which include the docker container of P4 switch in EstiNet simulator. Please download this installation package from

(1) Google Drive (https://drive.google.com/drive/folders/1ybx66buIsWXmn77hMrydd7uJtaxUADe6?usp=sharing).

(2) MEGA (https://mega.nz/#F!Mv5nEY6D!A5_AdqZpo-8PQi266yBzXg).

(3) EstiNet FTP server.

FTP Download Link: "ftp://ftp.estinet.com/"

FTP Account: EstiNet_Trial

FTP Password: estinet

Please go into the directory [P4_switch]. The installation package is in [EstiNet_10.0.6.1237]. Please reference P33 “If users need to update a new version

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of EstiNet simulator" for more details. Please go into directory [Example] for P4 switch example and document. After users install EstiNet_10.0.6.1237, they could select docker container **estinet10/p4_switch** to use P4_switch. Users should reinstall the newest version of EstiNet_11.0.6.xxxx to use 5G EstiNet11 and P4_switch..

Appendix

Login information in VM Image

User name: estinet
Password: estinet
Root password: estinet

The EstiNet operation demo video:

(1) Open an EstiNet Simulator
https://youtu.be/YfwaxbM42zM

(2) An introduction of Nodes on D state in EstiNet Simulator
https://youtu.be/6j3AABmzCKo

(3) How to create a simple SDN (Software Defined Network) topology in EstiNet Simulator
https://youtu.be/c6QUe2OYW9E

(4) How to use switch and router in EstiNet Simulator
https://youtu.be/71fG-DZz9TA

(5) How to use NAT, DNS and DHCP in EstiNet Simulator
https://youtu.be/o2Bx9jNP7WI

(6) How to simulate an ARP spoofing for security issue in EstiNet Simulator
https://youtu.be/qhCA_aizhrA

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File directory in VM Image

Installation package path:
/home/estinet/Downloads/estinet-11.0.6.xxxx.xxxxxxx-1.fc24.x86_64.release
Source Code path: /home/estinet/Downloads/estinetse_all

If users need to update to a new version of EstiNet simulator:

(1) Please download the EstiNet X installation package and decompress this package.

#tar xvf estinet-11.0.6.xxxx.xxxxxxx-1.fc24.x86_64.release.tar.bz2

(2) Then go into the directory of estinet-11.0.6.xxxx.xxxxxxx-1.fc24.x86_64.release

#cd estinet-11.0.6.xxxx.xxxxxxx-1.fc24.x86_64.release

To execute install.sh

#./install.sh

(3) After the installation is complete, please reboot the operation system. After restarting the operation system and reopening the EstiNet simulator, users could check the installation version from the Toolbar, Misc=> Copyright.

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OK