

# Setup VMware

CS Club CyberPatriot division

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This article covers the installation of VMware Workstation Player on a Windows 10 machine and setup of a Ubuntu 22.04 LTS virtual machine.

# **1 Motivation**

VMware Workstation Player is a free virtualization software that allows you to run virtual machines on your computer. This is useful for running operating systems in a sandboxed environment, or for running multiple operating systems on the same computer.

For CyberPatriot competition, we will be using VMware Workstation Player to run a virtual machine of Ubuntu®, Windows® Server, and or Cisco® CCNA. The best way to learn how to administrate these operating systems is to use them, and VMware Workstation Player is the best way to do that — unless you intent to mess up your computer.

# **2 Installation**

## **2.1 Download**

Download the latest version of VMware Workstation Player from VMware’s website. You may also choose to download the latest version of VMware Workstation Pro, which is the paid version of VMware Workstation Player from VMware’s website. The later need a license key to be used, but the former is free; however, 30 days of trial is provided, and I believe you are smart enough to find some mechanism to circumvent that (which I shall not describe in further detail out of moral concern). The download website is shown at Figure 1.

In addition, download the latest version of Ubuntu® from Ubuntu’s website as shown at Figure 2.

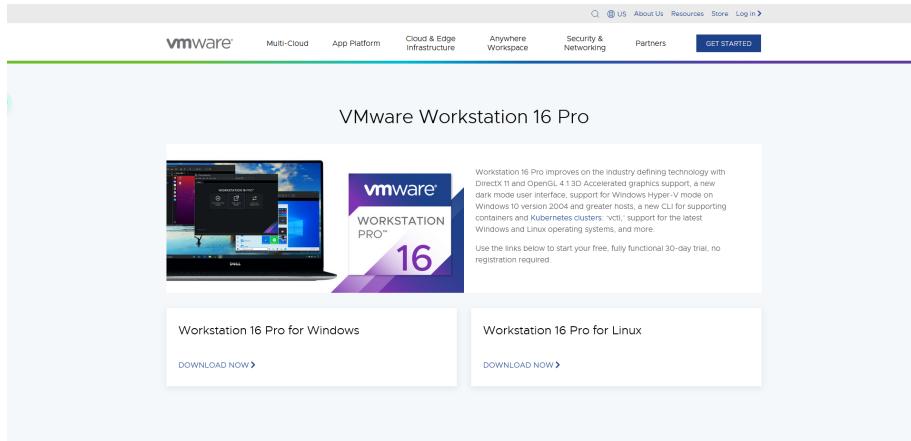


Figure 1: VMware Workstation Player download page

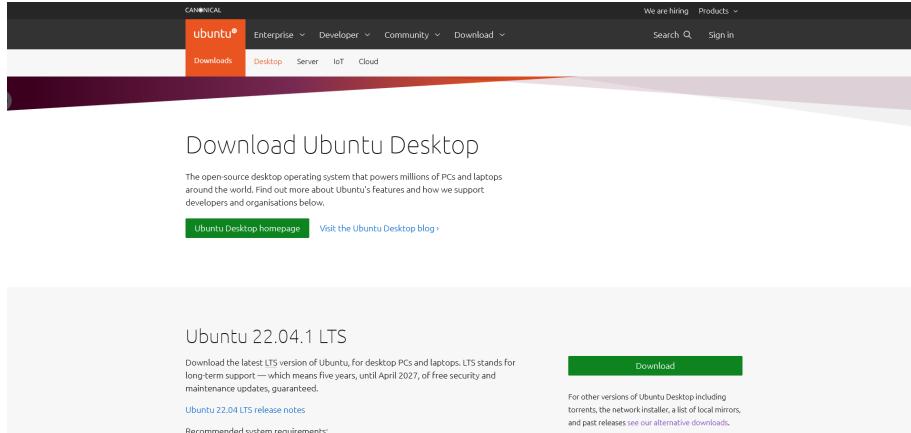


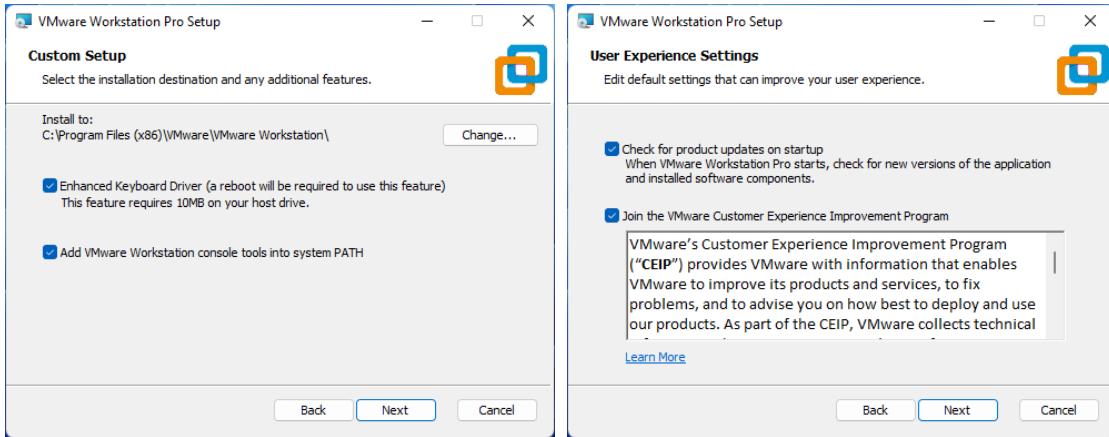
Figure 2: Ubuntu® download page

## 2.2 Installation

I believe the setup of VMware Workstation Player is straightforward, so I shall not go into detail. However, I will provide some screenshots for reference, as shown at Figure 3.

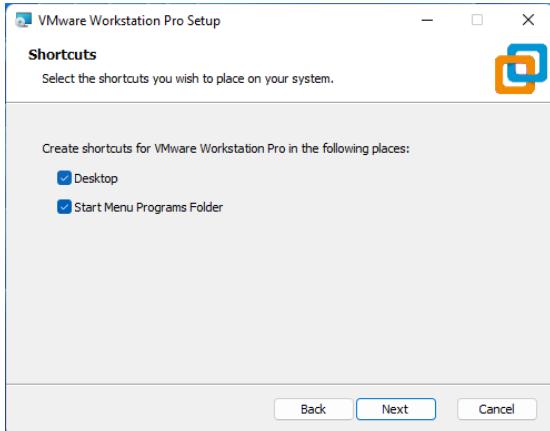
Double click the download file and follow the installation wizard. Upon those, some of the most important steps are shown at Figure 3.

In Figure 3a, we suggest you to click add vmware into PATH and install keyboard

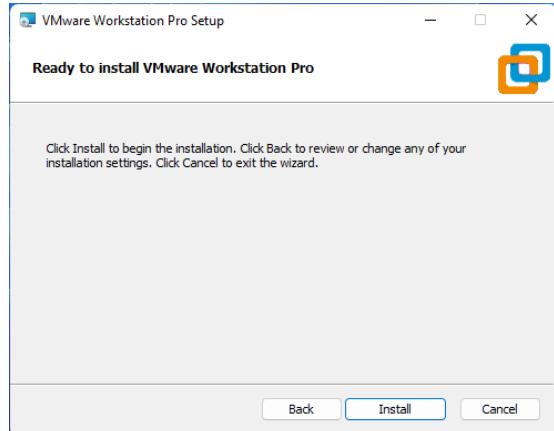


(a) Setup keyboard driver & PATH variable

(b) User experience program



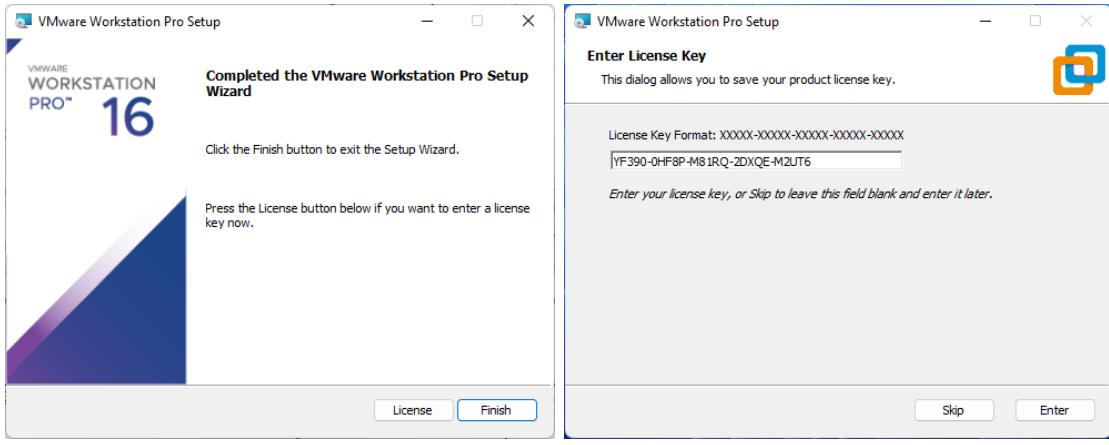
(c) Add links



(d) Install

Figure 3: VMware Workstation Player installation

driver. This will make it easier to use some specific keyboard shortcut in Ubuntu, without letting them being captured by Windows.



(a) Complete

(b) License

Figure 4: VMware Workstation Player License

After that clicking through the rest of the installation, you should see the installation complete as shown at Figure 4a. Click **License** and **Enter a license key** as shown at Figure 4b. Here are some license keys that you can use:

**Version 16** ZF3R0-FHED2-M80TY-8QYGC-NPKYF

**Version 15** • FG78K-0UZ15-085TQ-TZQXV-XVOCD

- ZA11U-DVY97-M81LP-4MNEZ-X3AW0
- YU102-44D86-48D2Z-Z4Q5C-MFAWD

### 3 Setup Ubuntu

#### 3.1 Create a virtual machine

A computer consists of the following components:

- |       |                 |
|-------|-----------------|
| • CPU | • Hard disk     |
| • RAM | • Graphics card |

- Network card(NIC)
- Display

In virtual machine, we can emulate all of these components.

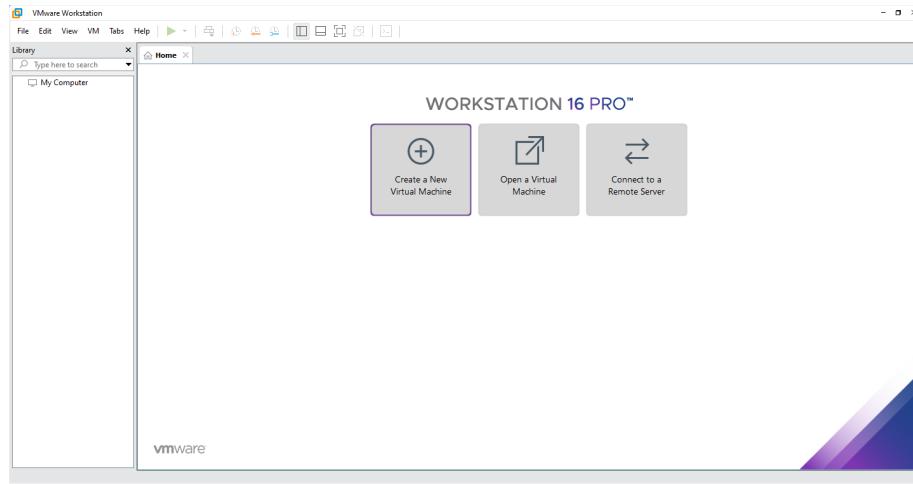
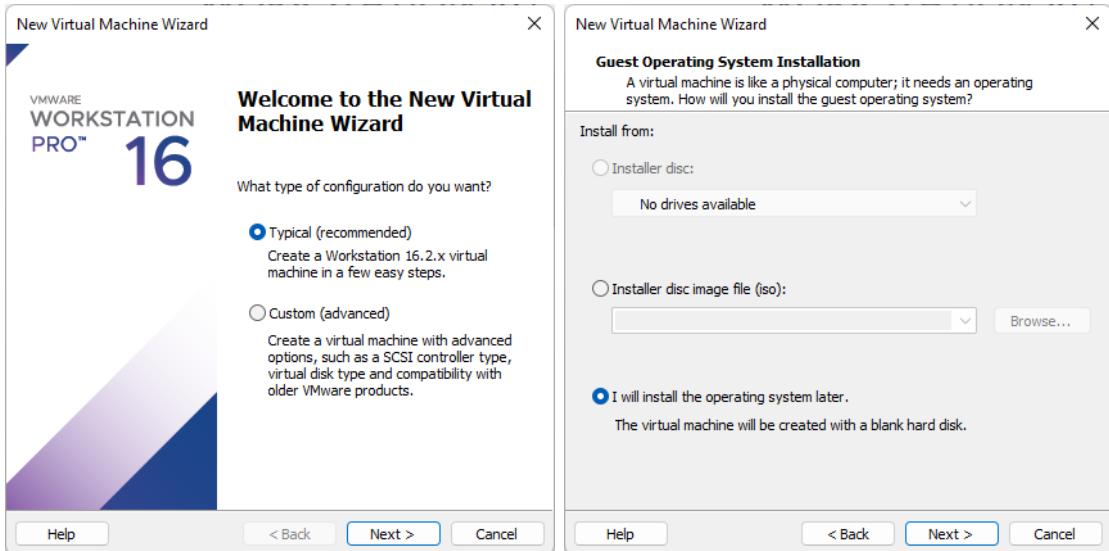


Figure 5: Create a new virtual machine

After installation is complete, you should click **Create a New Virtual Machine** as shown at Figure 5. Then, you should see a wizard that guides you through the creation of a virtual machine, as shown in Figure 6.

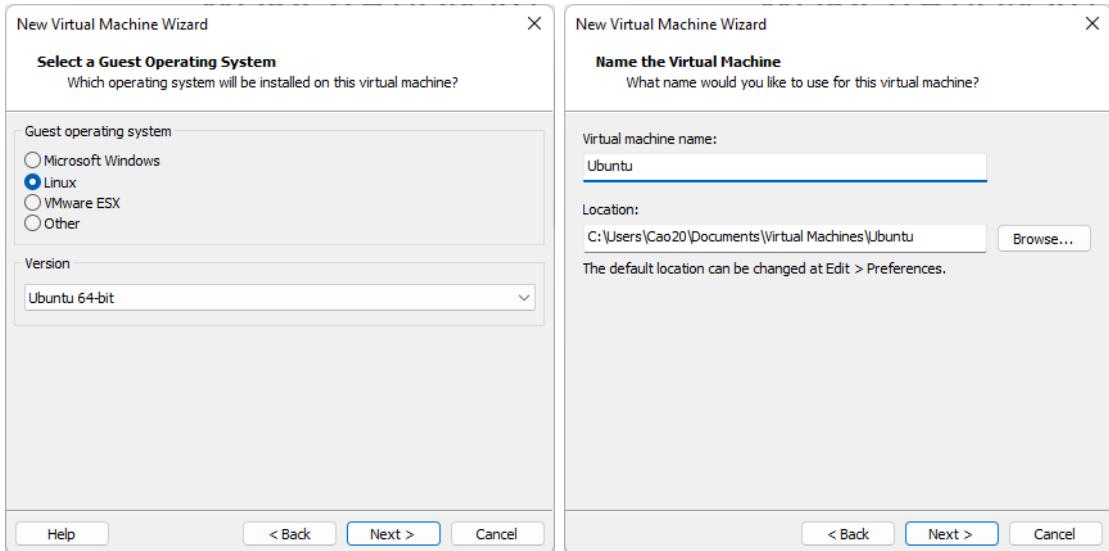


Figure 6: Virtual machine wizard



(a) Choose wizard type

(b) Choose installation media



(c) Choose guest operating system

(d) Name the virtual machine

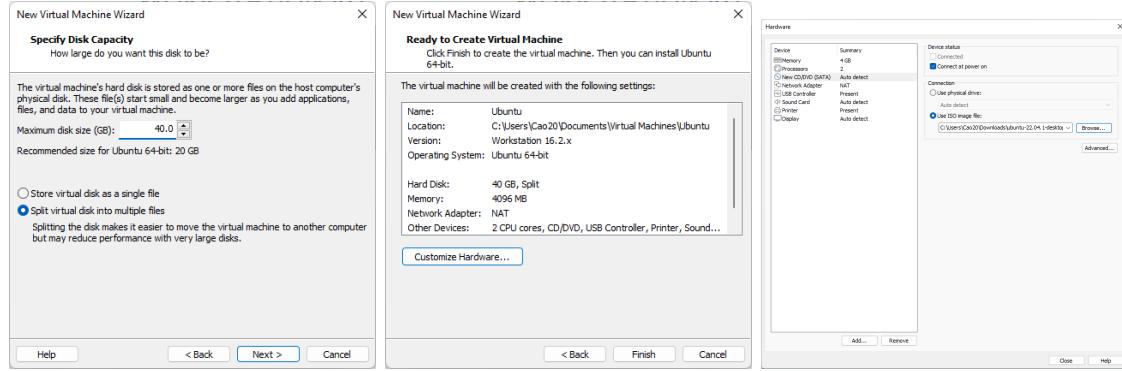
Figure 7: Virtual machine general

First, choose **Typical** and click **Next** as shown at Figure 6.

Do not choose the installation media as one that you downloaded at subsection 2.1, as you won't be able to customize the settings this way. Choose

I will install the operating system later and click **Next** as shown at Figure 7b. After that, select **Linux** and **Ubuntu (64-bit)** as shown at Figure 7c. Then, click **Next**.

Choose any name for your virtual machine as shown at Figure 7d. Then, click **Next**.



(a) Choose disk size & Create (b) Customize hardware fur- (c) Add the installation  
disk ther dia

Figure 8: Customize hardware

After that, create *harddisk* for your virtual machine. You can choose to create a new virtual disk or use an existing one. Click **Create a new virtual disk** and click **Next** as shown at Figure 8a. The size of the disk can be just 20 GB as we will use *snapshot* and we will be able to resize the disk and partitions later. After that, click **Next**. And this will take you to the *Customize hardware* page as shown at Figure 8b. Here, you can customize the hardware of your virtual machine. You can change the amount of RAM, the number of CPU cores, and the amount of video memory. You can also add a network card. Click **Next** after you are done. We will add the installation media here, by clicking **New CD/DVD (SATA)** as shown at Figure 8c. Then, click **Browse** and select the installation media that you downloaded at subsection 2.1. After that, click **Finish**. This is your virtual machine now!

## 3.2 Install Ubuntu

After finish above steps, you can start your virtual machine. You should have a screen that looks like Figure 9.

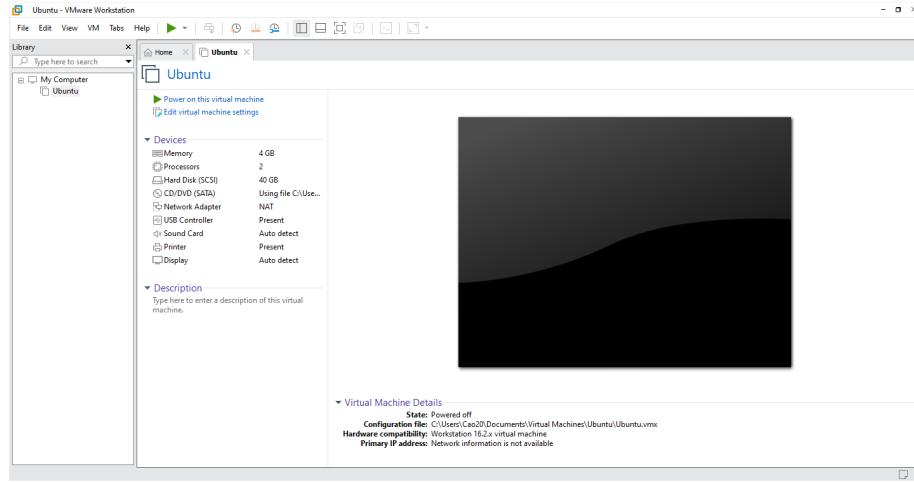


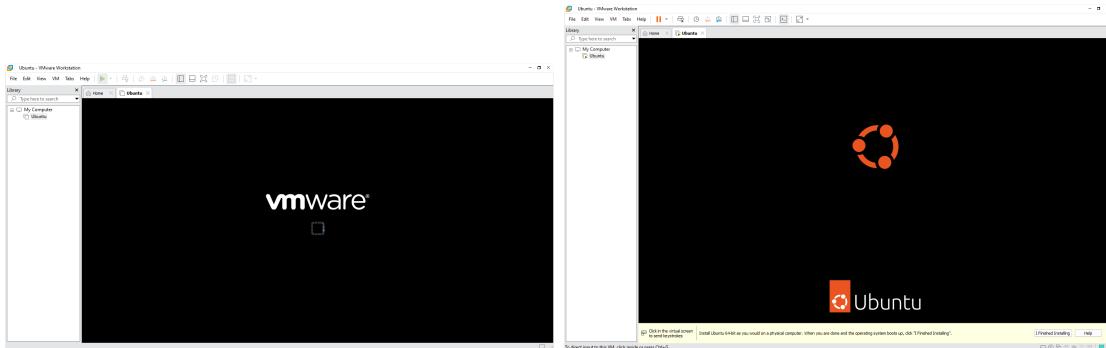
Figure 9: Ubuntu Virtual machine

Click start the virtual machine to boot from the installation media. After that, you should see the *VMware UEFI* animation as shown at Figure 10a. Then, you should see the *Ubuntu Plymouth* animation as shown at Figure 10b. After that, you should see the *Ubuntu Installation* screen as shown at Figure 10c. Click **Install Ubuntu** to start the installation. You can also change the language as desired here.

First, you will be asked to choose the keyboard layout as shown at Figure 11a. Then, you will be asked to install updates and software as shown at Figure 11b. You shouldn't choose install update and install minimal software, unless you intend to use this virtual machine to open document, edit videos, or modify images.

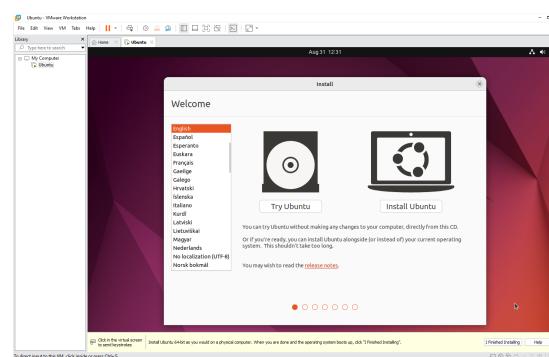
After that, you will be asked to choose the installation partition and type as shown at Figure 11c. You can choose which partition to install Ubuntu. As this is a fresh virtual machine without nothing in it, we will choose **Erase the disk and install Ubuntu**.

Then, you will be asked to choose the time zone as shown at Figure 11d. Finally, you will be asked to choose the username and password as shown at Figure 11e. You



(a) VMware UEFI animation

(b) Ubuntu Plymouth animation



(c) Ubuntu Installation screen

Figure 10: Ubuntu boot to installation

can choose the username and password as you like — for this club, we will use `123456` and `cs` as password and username.

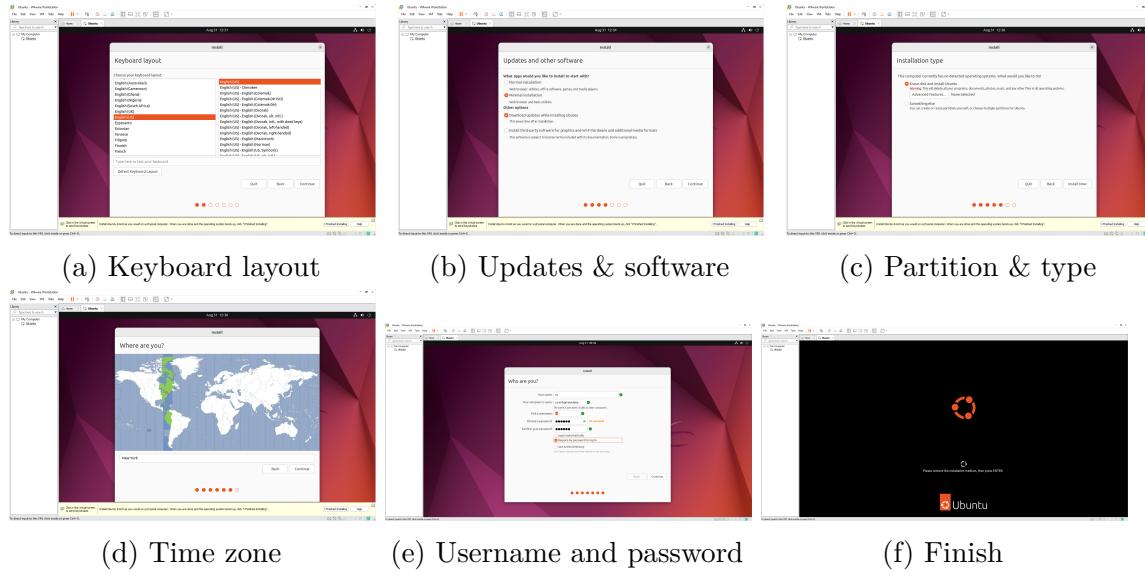


Figure 11: Ubuntu installation

### 3.3 Setup Ubuntu

After finish the installation, you will be asked to restart the virtual machine. Just shutdown the virtual machine and let's remove the CD.

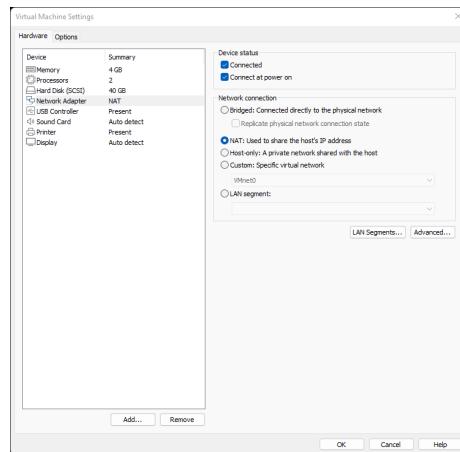


Figure 12: Remove installation media

Since the virtual machine is already installed, remove the installation media by

clicking on the **Edit virtual machine settings**. You should see Figure 12. Click on the **CD/DVD (IDE)** and delete this device. After that, click on the **OK** button to save the settings.

After that, boot the virtual machine we did previously. You should see something like Figure 13.

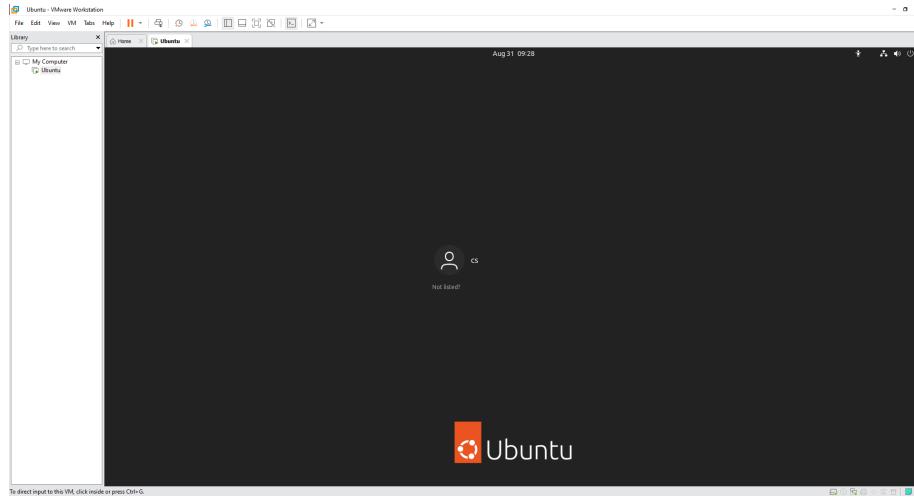


Figure 13: Ubuntu login screen

Type your password and username to login — *Welcome to Ubuntu 22.04 LTS*, the world of Linux.

### 3.4 Terminal

The first thing we need to do is to open the terminal. You can open the terminal by clicking on the **Activities** button and type `terminal`. In addition, typing **Ctrl**+**Alt**+**T** will also open the terminal. You should see the Figure 14.

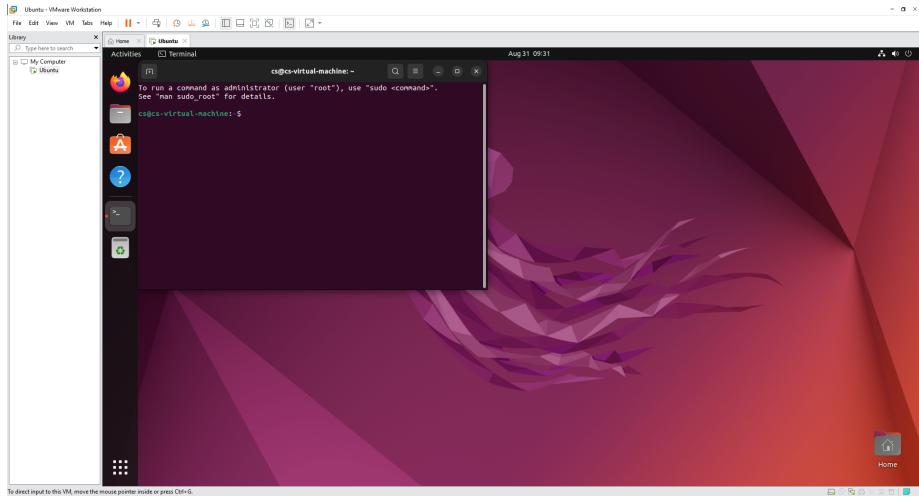


Figure 14: Ubuntu terminal

### 3.5 Install vim

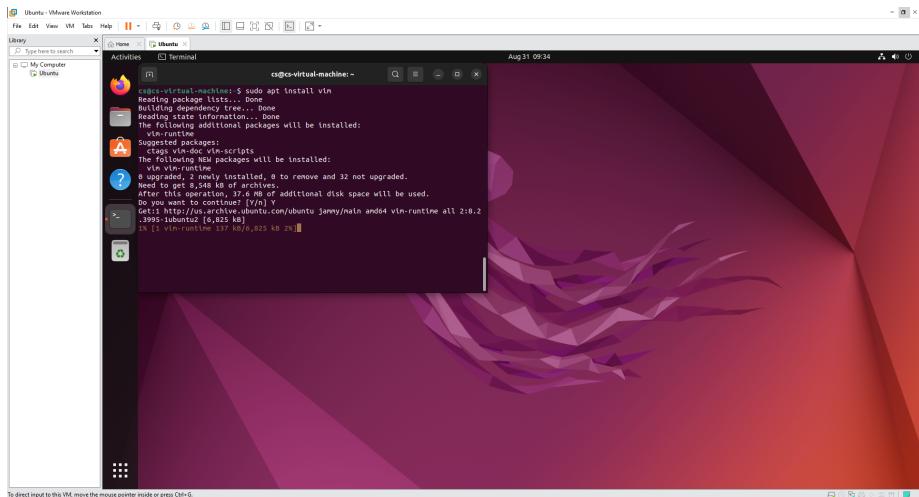


Figure 15: Ubuntu vim

The next thing we need to do is to install `vim`. You can install `vim` by typing `sudo apt install vim` in the terminal. You will be asked to type your password (notice nothing will be shown in the terminal). After that, you will see the Figure 15. You can type `y` to continue the installation.

### 3.6 visudo



It is kind cumbersome to type password everytime we want to do something that requires root permission. To make it easier, we can use `visudo` to add `NOPASSWD` before `ALL`. This will allow us to run command with root permission without typing password.

Use the installed `vim` to edit the `sudoers` file by typing `env EDITOR=vi sudo visudo /etc/sudoers` in the terminal. You will be asked to type your password. After that, something like shown at Figure 16.

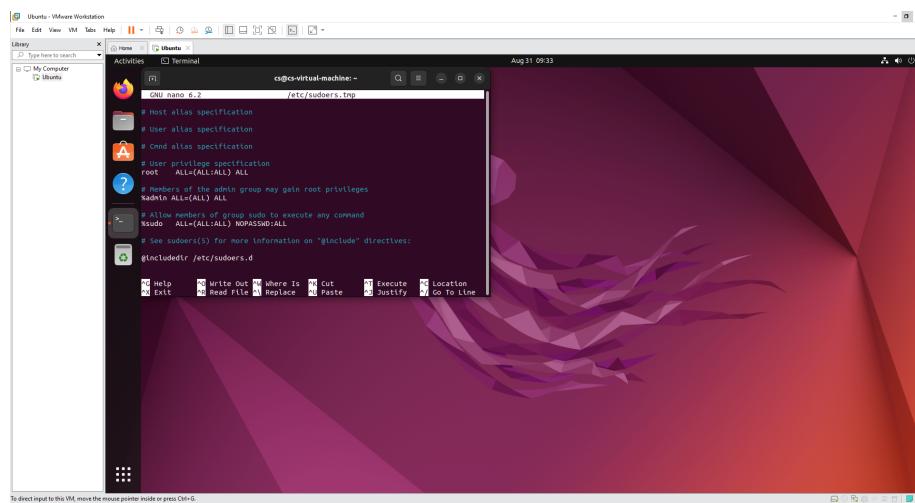


Figure 16: Ubuntu visudo

You can use the `\` to search for `sudo`. After that, type `i` to enter insert mode, which allows you to modify the text. Then, modify this line so that it looks like Figure 16.

```
1 %sudo ALL=(ALL:ALL) NOPASSWD: ALL
```

---

<sup>1</sup>This sign indicates dangerous bend, one might choose to skip this section.

Those fields from left to right are `user / usergroup, hostname, elevated-user : elevated-user-group, command`. Adding `NOPASSWD` before `ALL` will allow us to run command with root permission without typing password.

Then, type `:wq` to save and quit the file.

### 3.7 Setup ssh



SSH, or Secure Shell, is a protocol that allows us to connect to a remote computer. We will use SSH to connect to the virtual machine from our host machine. To setup SSH, we need to install `openssh-server` by typing `sudo apt install openssh-server openssh-client` in the terminal, as shown at Figure 17. Hopefully, you will not be asked to type your password, assuming you follows subsection 3.6 to setup `visudo`.

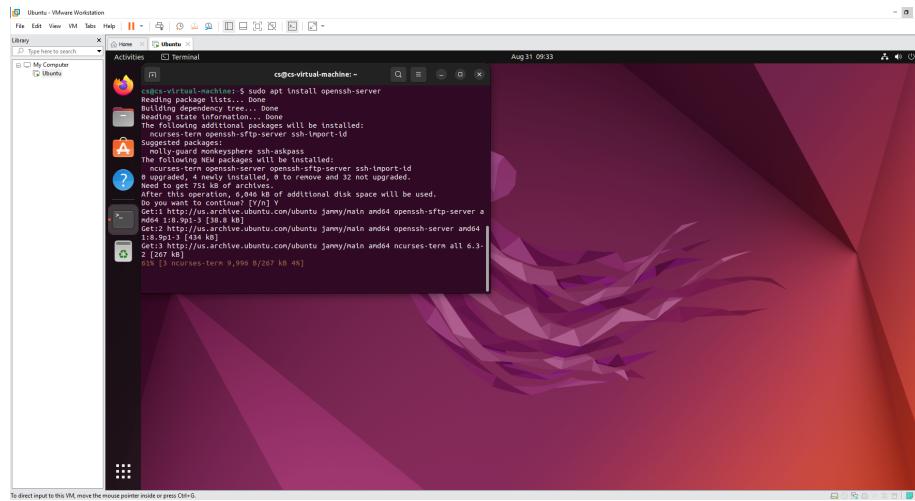
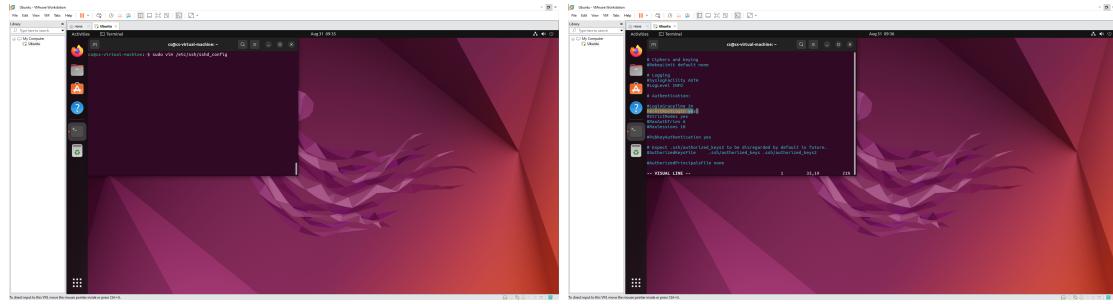


Figure 17: Ubuntu install openssh

After that, we need to edit the configuration file of `ssh` by typing `sudo vim /etc/ssh/sshd_config` in the terminal as shown at Figure 18a. After that, modify the configuration file as shown at Figure 18b — just change to `PermitRootLogin yes`. Then, type `:wq` to save and quit the file.



(a) Ubuntu `sshd` config command

(b) Ubuntu `sshd` config modification

Figure 18: Ubuntu ssh config

After that, we need to enable the `ssh` service by typing `sudo systemctl enable ssh` in the terminal as shown at Figure 19. Enable operation allows the service to start on boot.

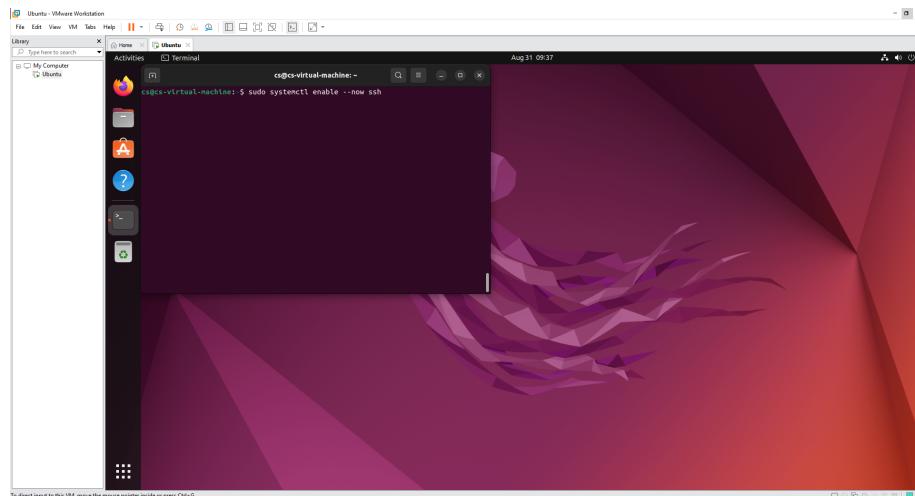


Figure 19: Ubuntu enable ssh

Finally, make sure to enable the root account by typing `sudo passwd root` in the terminal as shown at Figure 20. You will be asked to type the new password for the root account. Type the password twice to confirm. After that, you will see the Figure 20.

Reboot the virtual machine by typing `sudo reboot` in the terminal. After the

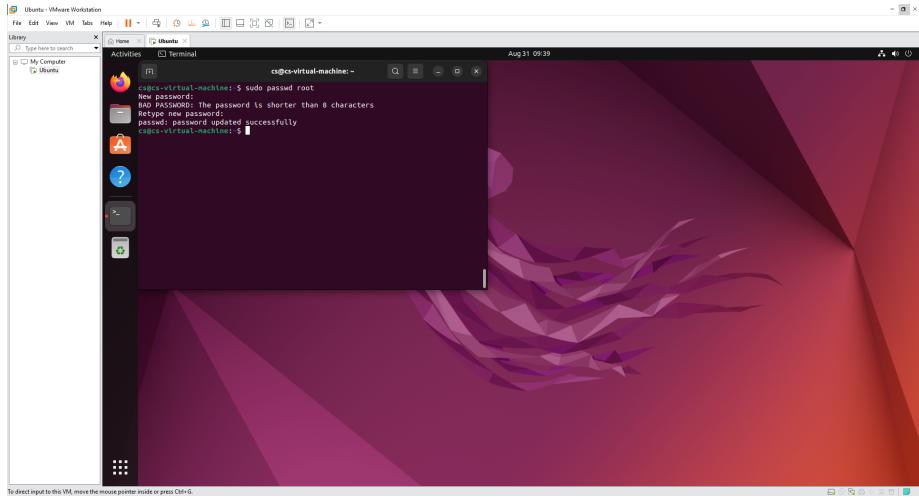


Figure 20: Ubuntu enable root

virtual machine is rebooted, you can connect to the virtual machine from your host machine. Before that, you need to determine the IP address of the virtual machine. You can do that by typing `ip address` in the terminal as shown at Figure 21.

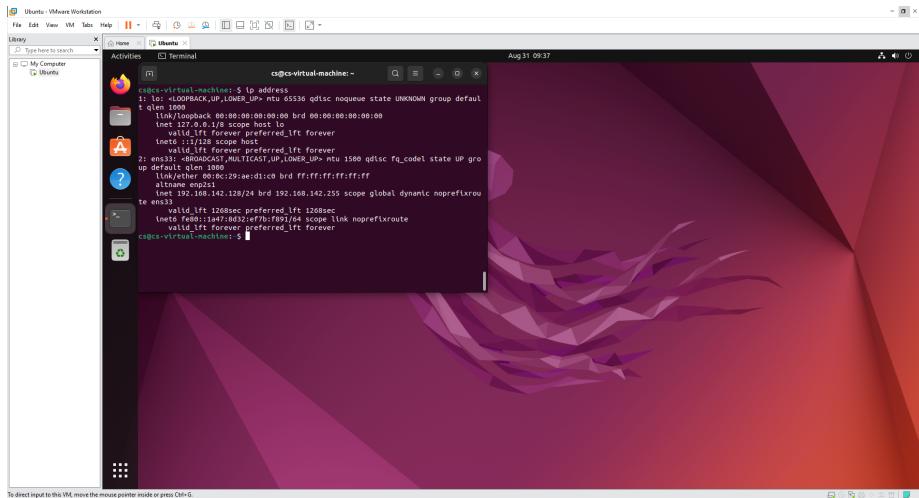


Figure 21: Ubuntu ip address

Record the IP address of the virtual machine. In this case, the IP address is 192.168.142.128. Then, open the terminal by typing **Win + R** and **cmd** in your host

machine, as shown at Figure 22a. Type `ssh root@192.168.142.128` along with password of the root account. You will be connected to the virtual machine as shown at Figure 22b.

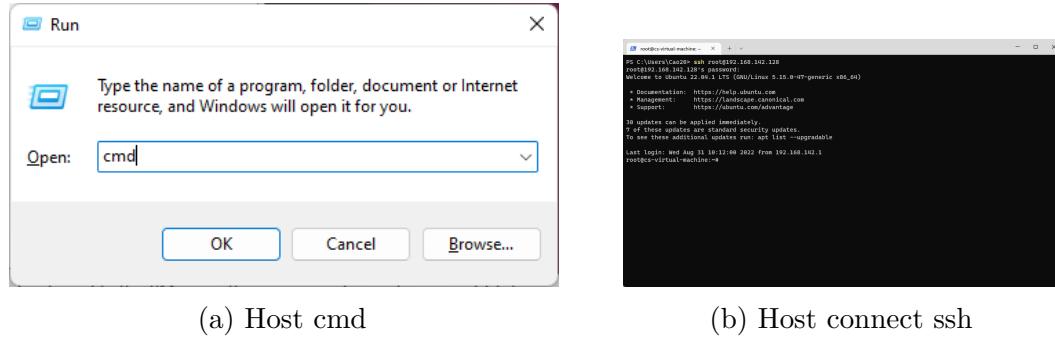


Figure 22: Connect to the virtual machine

The problem with this setup is everytime you need to type the password in order to login into the virtual machine. Hence, you should consider send the public key of your host machine to the virtual machine. `ssh` connection works as follows:

**Establishing connection** The client sends a request to the server to establish a connection.

**Version exchange** The client and server exchange their version of `ssh`.

**Algorithm negotiation** The client and server exchange their supported algorithms. This includes encryption, hashing, and key exchange algorithms.

**Key exchange** The client and server exchange their public keys, e.g., RSA.

**Authenticating** The client and server authenticate each other through password or public key.

**Session establishment** The client and server establish a session.

Notice they can `ssh` can authenticate each other through password or public key. In this case, we will use public key to authenticate each other, i.e., if the data sent

by client encrypted with private key can be decrypted with trusted public key, the host shall believe the client is authenticated, and thus avoided the burden of typing password everytime we want to connect to the virtual machine.

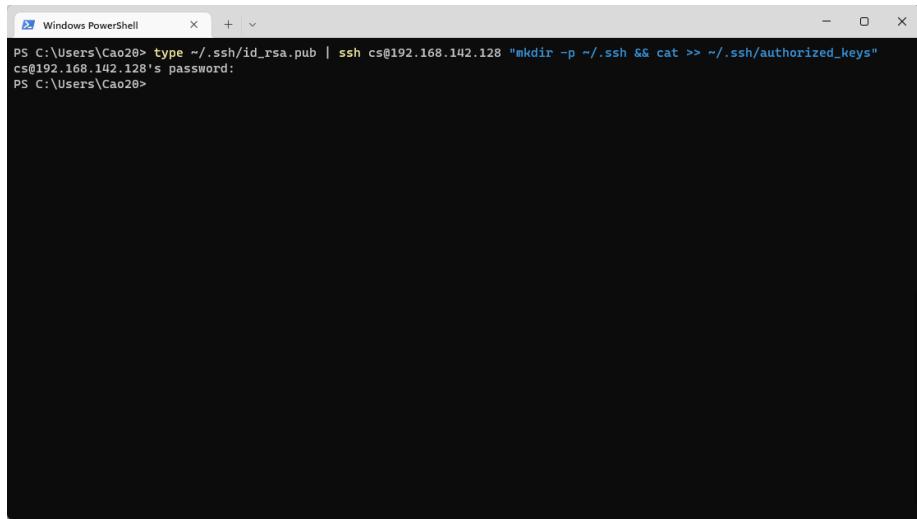
Generate key in your host machine by typing `ssh-keygen` in the terminal as shown at Figure 23. You will be asked to type the location of the key. Press `Enter` to use the default location. Then, you will be asked to type the passphrase. Type the passphrase twice to confirm (or no passphrase at all). After that, you will see the Figure 23.

```
C:\Users\Cao20>ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (C:/Users/Cao20/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in C:/Users/Cao20/.ssh/id_rsa.
Your public key has been saved in C:/Users/Cao20/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:Crsqjki6qc7/CJ66iejl3lbf3vkjFkXFqIHAKLYAkH4 cao20@yubo
The key's randomart image is:
+---[RSA 3072]---+
| .o. .... * . |
| oE . . . . o . |
| . . . . + . |
| . o . . . |
| . o S . |
| .. + . . |
| +=. o o . . |
| /..=o. . . o.. |
| @=o@. . . o.. |
+---[SHA256]---+
C:\Users\Cao20>
```

Figure 23: Host generate key

After that, copy the public key to the virtual machine by typing `type ~/.ssh/id_rsa.pub | ssh root@192.168.142.128 "mkdir -p ~/.ssh && cat >> ~/.ssh/authorized_keys"` as shown at Figure 24. You will be asked to type the password of the root account. Type the password and press `Enter`. After that, you will see the Figure 24.

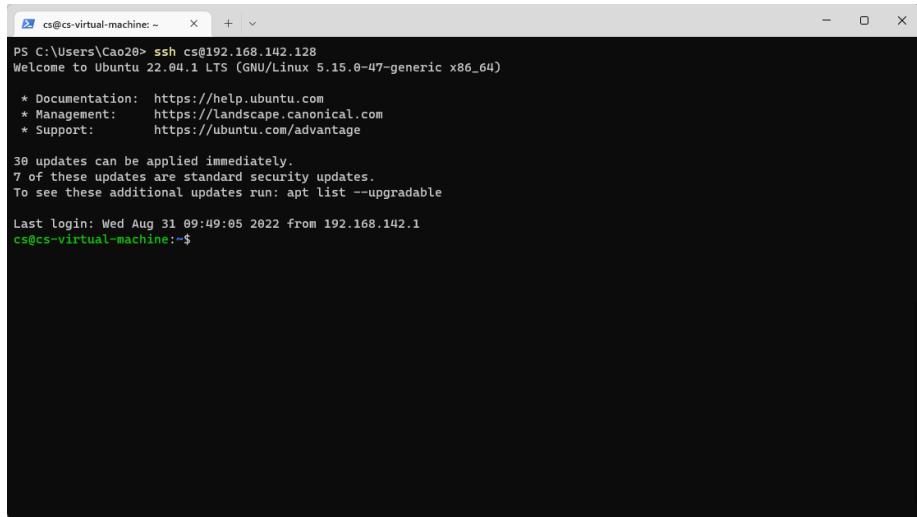
if the client machine is Linux, one can also use `ssh-copy-id` command by typing `ssh-copy-id -i ~/.ssh/id_rsa.pub root@192.168.142.128` in the terminal. After that, you can connect to the virtual machine without typing the password as shown at Figure 25.



A screenshot of a Windows PowerShell window titled "Windows PowerShell". The command entered is:

```
PS C:\Users\Cao20> type ~/ssh/id_rsa.pub | ssh cs@192.168.142.128 "mkdir -p ~/.ssh && cat >> ~/.ssh/authorized_keys"
cs@192.168.142.128's password:
```

Figure 24: Host copy key



A screenshot of a terminal window titled "cs@cs-virtual-machine: ~". The command entered is:

```
PS C:\Users\Cao20> ssh cs@192.168.142.128
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-47-generic x86_64)

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

38 updates can be applied immediately.
7 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Last login: Wed Aug 31 09:49:05 2022 from 192.168.142.1
cs@cs-virtual-machine:~$
```

Figure 25: Host connect ssh without password