Original authors: previous VE280 TAs. Detailed author information can be found at https://github.com/ve280/tutorials

Original authors: SU2022 VG151 TAs.

Modified by: FOCS Group

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### Notes

- This tutorial uses Ubuntu as an example, however most distros share a same set of logic when it comes to installation. You may follow this tutorial if you want to install another distro (e.g. Fedora.) Feel free to come to us if you encounter problems.

## Part A - Installation

### 1. Install VirtualBox

- **Download VirtualBox if you haven't yet done so.** Go to https://www.virtualbox.org/.

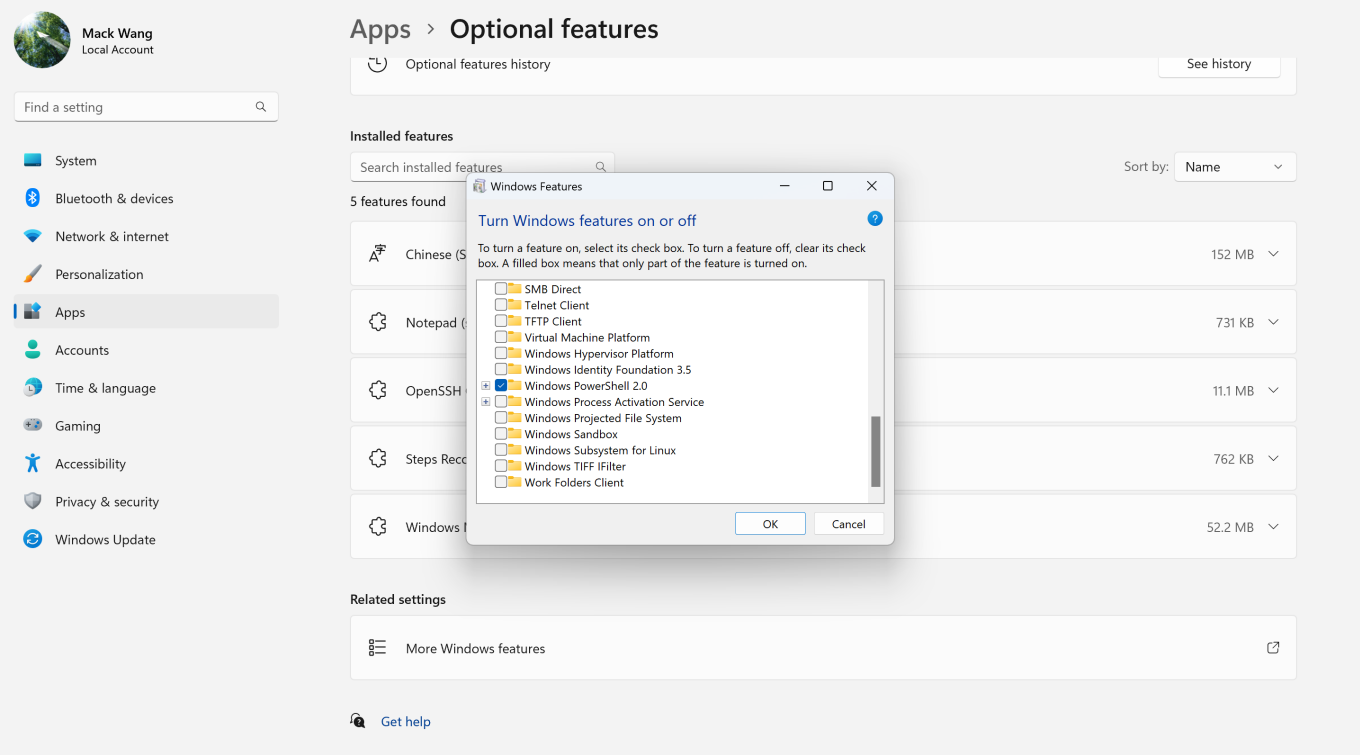
  The tutorial to install VirtualBox for both Windows and Mac is here https://www.wikihow.com/Install-VirtualBox

#### 1.5. Enable Windows Hypervisor Platform if you are on Windows 11 or using WSL

*If you're on an old Windows 10 computer, you can safely skip this step*

If you're using Windows 11 or using WSL on Windows 10, you have Hyper-V setup on your system. Hyper-V and VMware are incompatible; you need to enable Windows Hypervisor Platform in order to use VMware alongside with Hyper-V.

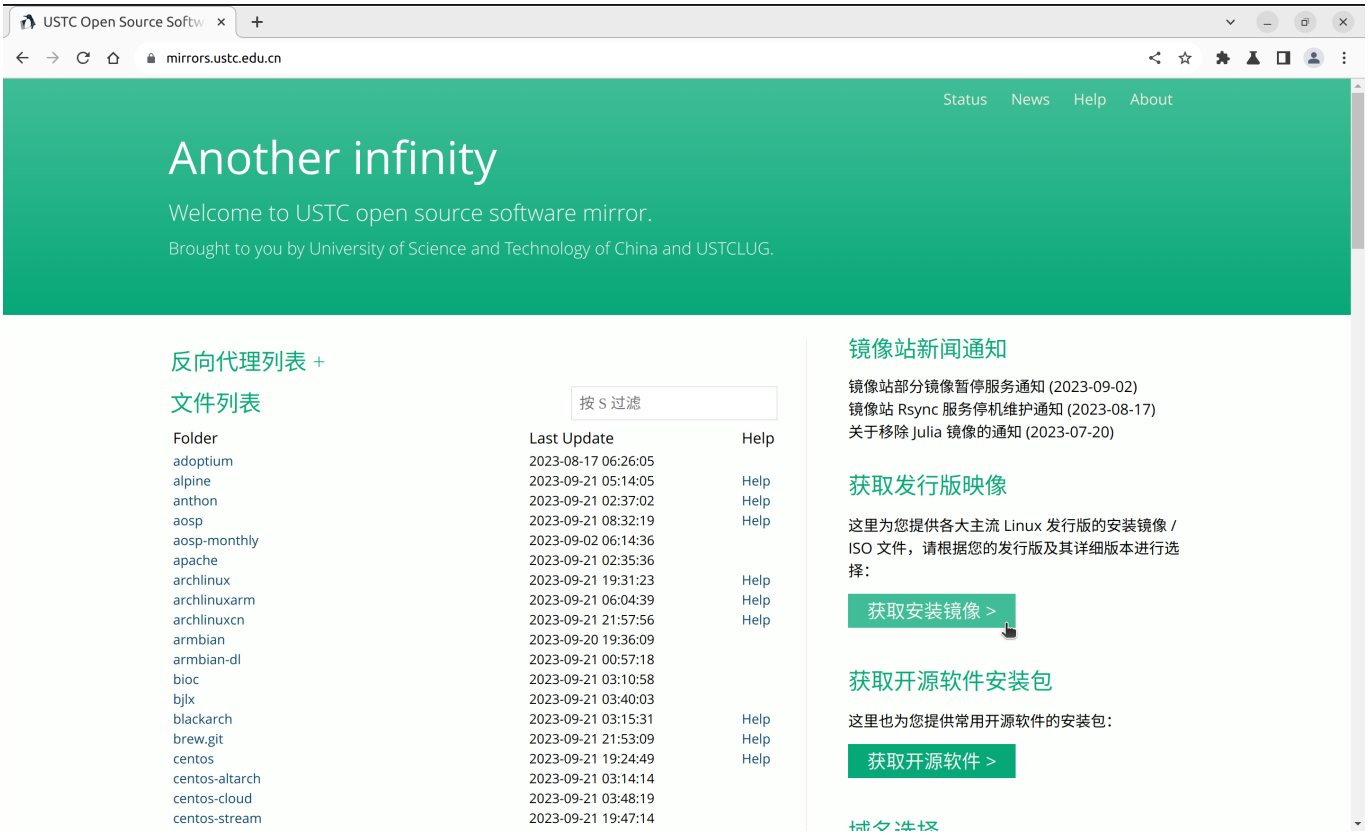
In *Settings*, under *Apps -> Optional Features*, click on *More Windows Features* in the bottom (Win11) or on the right (Win10)




Check **Windows Hypervisor Platform**. Reboot your computer.

## 2. Get a copy of Linux Install image

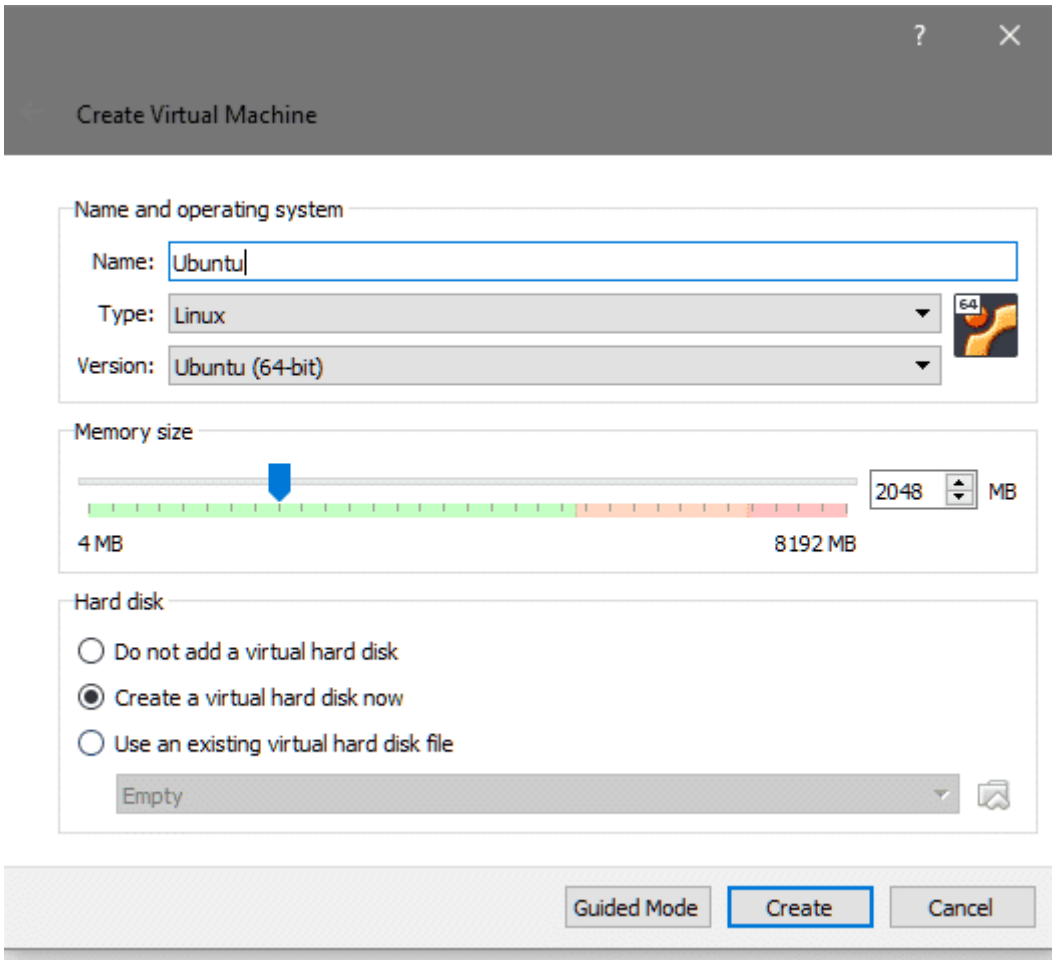
The website where you can download Linux install images is https://mirrors.ustc.edu.cn/



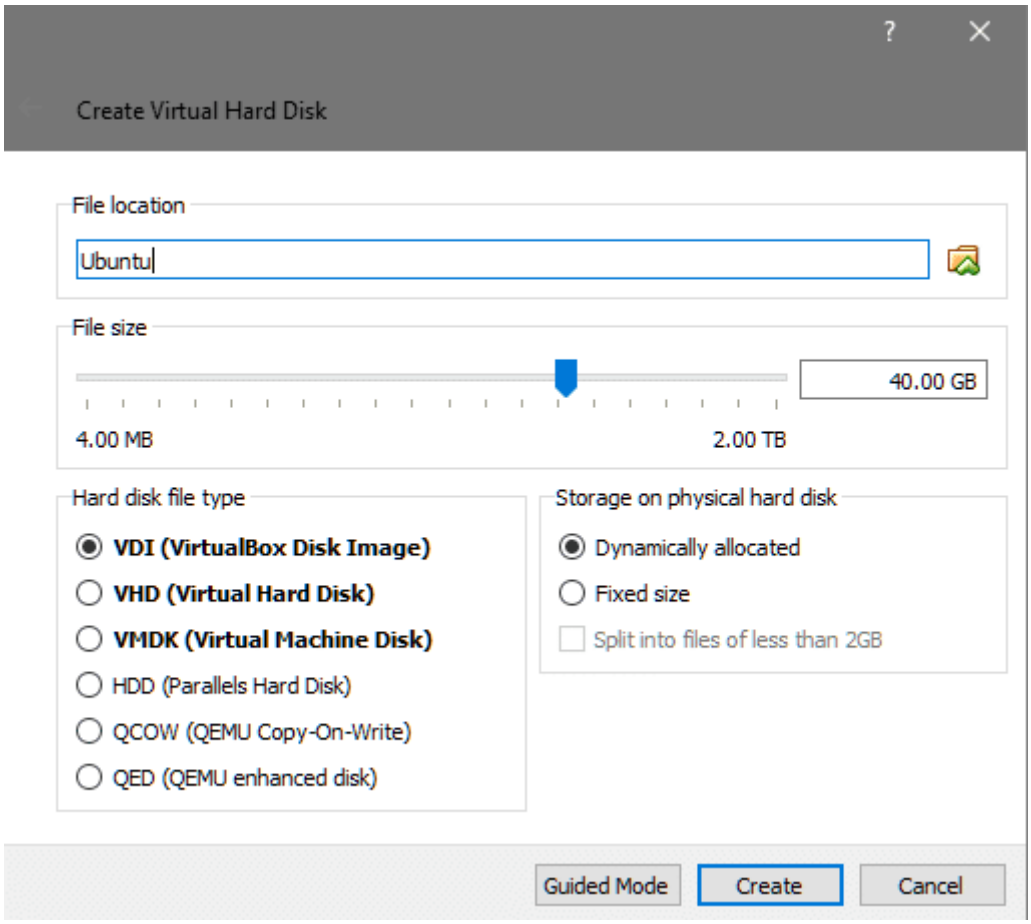

## 3. Create a Virtual Machine

Launch VirtualBox and follow the instructions. Below uses Ubuntu as an example.

- **Click "New".** Click the blue badge in the upper-left corner of the VirtualBox window, which opens a pop-up menu.
- **Enter a name for your virtual machine.** Type whatever you want to name your virtual machine (e.g., Ubuntu) into the "Name" field.
- **Select Linux as the "Type" value.** Expand the "Type" drop-down menu and select **Linux**.
- Select Ubuntu as the "Version" value. **If you plan to use other distros, choose their corresponding value**.
- **Select an amount of RAM to use.** Drag the slider left or right to decrease or increase the amount of RAM that VirtualBox will have available for your Ubuntu virtual machine.
    - The ideal amount of RAM is automatically selected when you get to this page.
    - Make sure not to increase the RAM into the red region; keep the slider in the green region.

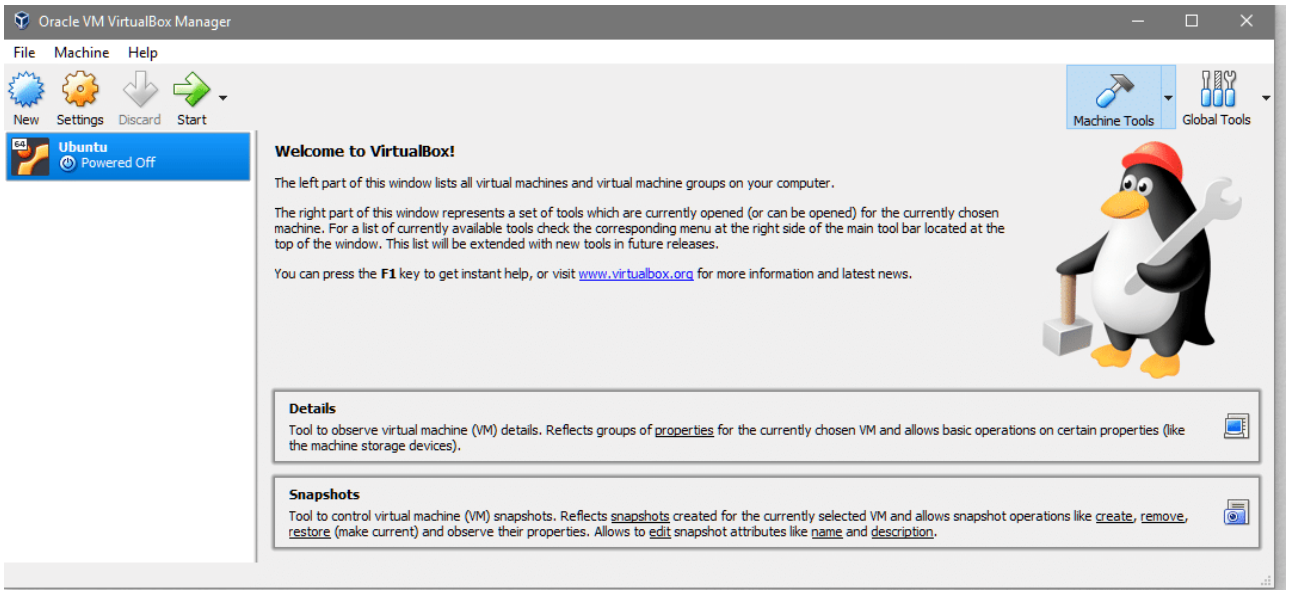



- **Choose the Virtual disk location and size**. It depends on the free space on your disk. You may apply the default settings.




## 4. Install Ubuntu in VirtualBox

- **Double click the virtual machine "Ubuntu" and select your Ubuntu install image**.




- You may ignore VirtualBox warnings about "Auto capture keyboard" and likewise. Check "Do not show this message again" and click OK.
- Wait until you're greeted by a GUI interface, then **select "Install Ubuntu"**.
    - If you are greeted by a blank screen, first shut down VM and go to Settings -> Display, increase `video memory` to above 64MB. Also, change Display -> Graphics Controller to "VMSVGA".

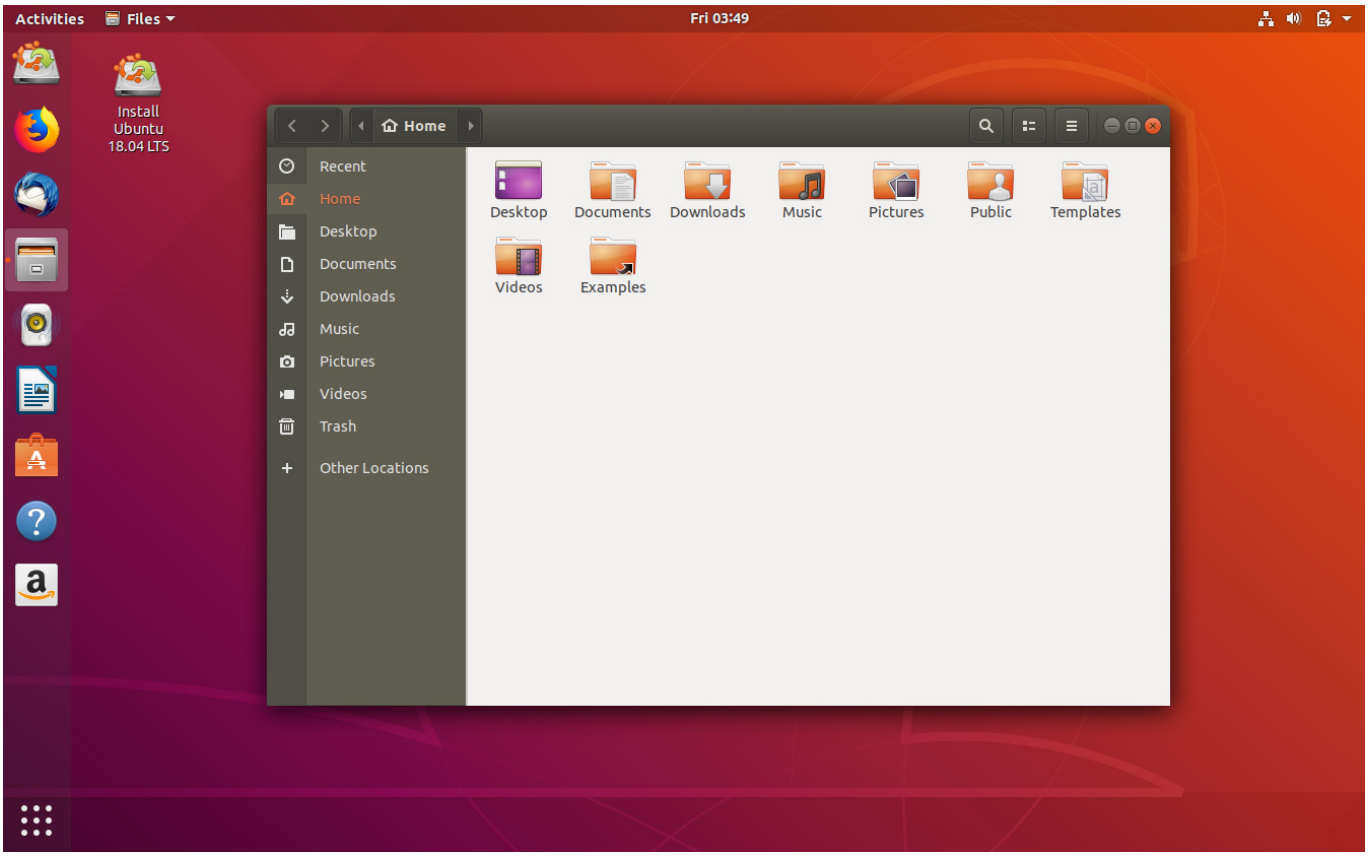
- You are recommended to **choose English as the default language of your new Ubuntu installation**. (You may need to manually install Chinese IME if you choose to do so)
- **You may leave everything at their default value** until you reach the page that asks you where you want to install Ubuntu.
- At the install location page, **check the "Erase disk and install Ubuntu" box then "Install Now".** This may sound scary, but don't worry—nothing on your computer will be erased.
- **Click Continue when prompted.** This confirms that you understand the virtual machine's virtual drive will be "erased" (there's nothing on it anyway) and begins the Ubuntu installation process.

## 5. Setting up Ubuntu

- **Select a time zone then "Continue".** Click a section that correlates with your position on the map. You may choose **"Shanghai"**.
- **Enter your username, computer's name and password**.


- **Wait for Ubuntu to finish installing.** This process may take anywhere from a couple of minutes to half an hour depending on the performance of your computer.
- **Restart the virtual machine and log in**. Remember your password.

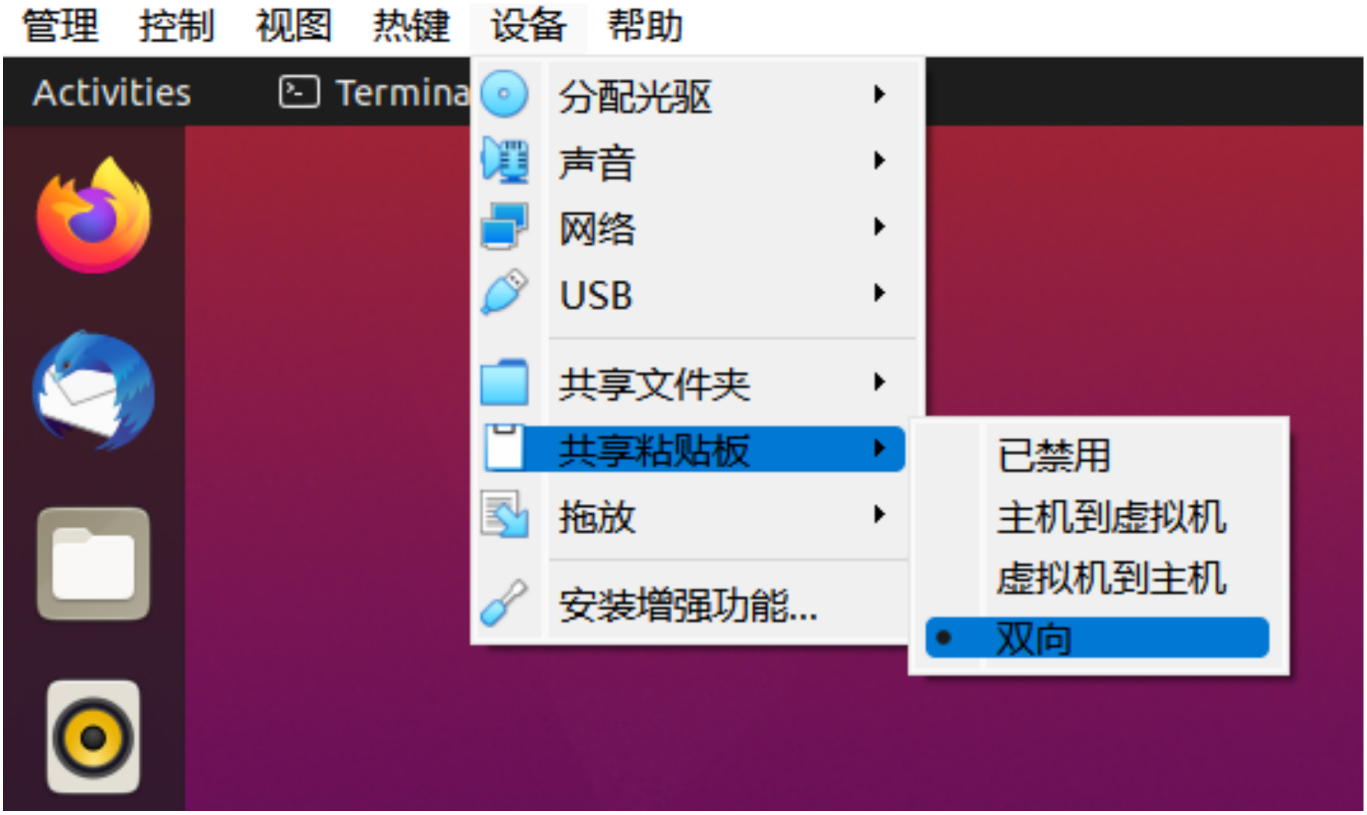
## 6. Enjoy your journey on Linux




- You can install VirtualBox Guest Additions on Ubuntu. It will optimize your operating system with respect to its performance and usability, and can resolve problems like screen stays the same size whatever.
    - Launch a Terminal by Ctrl + Alt + T
    - Type in the following commands one-by-one: `sudo add-apt-repository multiverse`

      `sudo apt install virtualbox-guest-dkms virtualbox-guest-x11`

      Enter your password when prompted.
    - Reboot Ubuntu (**Not your host computer**)
    - Verify that VirtualBox Guest additions are installed by typing `lsmod | grep vbox` in a terminal. If there is some output then installation is sucessful
- You can enable "Copy and Paste" between Host and Ubuntu.
    - Go through the above steps to install VirtualBox Guest Additions first.
    - Go to *Device -> Shared Clipboard*. Select "Bidirectional"
    - Reboot Ubuntu (**Not your host computer**)




- If you find that you virtual machine is reacting quite slow, try the following steps. **Contact us if you're unsure how to perform the following steps**
  - Shut down Ubuntu and allocate more memory in Settings -> System. **Keep the slider in the green region**.
  - Allocate more processor cores in Settings -> System -> Acceleration. Note that this may make your host system unresponsive, so **do not allocate more processor cores than your host computer have**
  - Enable *Nested Paging* in Settings -> System -> Acceleration.
  - Decrease Swappiness.
    - Open a terminal by Ctrl + Alt + T
    - Type `sudo gedit /etc/sysctl.conf` , it will open a file
    - Add a line in the file: **vm.swappiness=10**
    - Save and close the file
    - Type in terminal: `sudo sysctl -p`
  - Note that decreasing Swappiness can decrease the maximum workload your virtual machine can afford.

## Part B - APT Mirror Setup (Optional)

### Skip this step if you want to use FOCS Debian

On `Debian` based systems (including `Ubuntu`), the package manager is called `apt`. You also need a superuser (administrator) privilege to install packages, so you need to use `sudo`, which means "switch user do".

The official repository of `Debian / Ubuntu` may be very slow to visit from China, you can switch them to the SJTUG Mirror. SJTUG Mirror is maintained by members of the SJTU Linux User Group.

- First, backup the `/etc/apt/sources.list` file

```
sudo cp /etc/apt/sources.list /etc/apt/sources.list.backup
```

- Then you can use `nano` to edit the file.

  Type `sudo nano /etc/apt/sources.list`. Locate all occurrences of `cn.archive.ubuntu.com` (or similar entries, like `archive.ubuntu.com`). Replace them with `mirror.sjtu.edu.cn`. You may find the keyboard shortcut **Ctrl** + **** helpful.

- The updated `sources.list` should look like this (**DON'T copy and paste**):

```
deb http://mirror.sjtu.edu.cn/ubuntu jammy main restricted universe
multiverse
# deb-src http://mirror.sjtu.edu.cn/ubuntu jammy main restricted universe
multiverse
deb http://mirror.sjtu.edu.cn/ubuntu jammy-updates main restricted
universe multiverse
# deb-src http://mirror.sjtu.edu.cn/ubuntu jammy-updates main restricted
universe multiverse
deb http://mirror.sjtu.edu.cn/ubuntu jammy-backports main restricted
universe multiverse
# deb-src http://mirror.sjtu.edu.cn/ubuntu jammy-backports main restricted
universe multiverse
deb http://security.ubuntu.com/ubuntu jammy-security main restricted
universe multiverse
# deb-src http://security.ubuntu.com/ubuntu jammy-security main restricted
universe multiverse
```

**(IMPORTANT) After changing the source, you should always call the following command first.**

```
sudo apt update
```

From then, you can install packages from your new source.

You may find these packages helpful:

```
sudo apt install gcc g++ make cmake gdb valgrind git git-lfs
```