

Environment Setup (2022 OS Project)

Through the course project, you will build a simple FTP server and client to experiment with the key OS features.

Now, for the first part of the project, you are asked to set up the development environment for the simple FTP server and client. If you are familiar with the setup of virtual machines and Ubuntu Linux, you may jump directly to [\[Complete the gRPC Quick Start in C++\]](#) in the following. Otherwise, you can start from [\[Set up virtual machine \(VMware\)\]](#).

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1. Set up virtual machine (VMware)

中文參考網站：

 [免費虛擬機器VMware Workstation 16 Player下載與安裝](#)

English version reference site：

[Download and Install VMware Workstation Player/Pro \(16/15/14\) \(minitool.com\)](#)

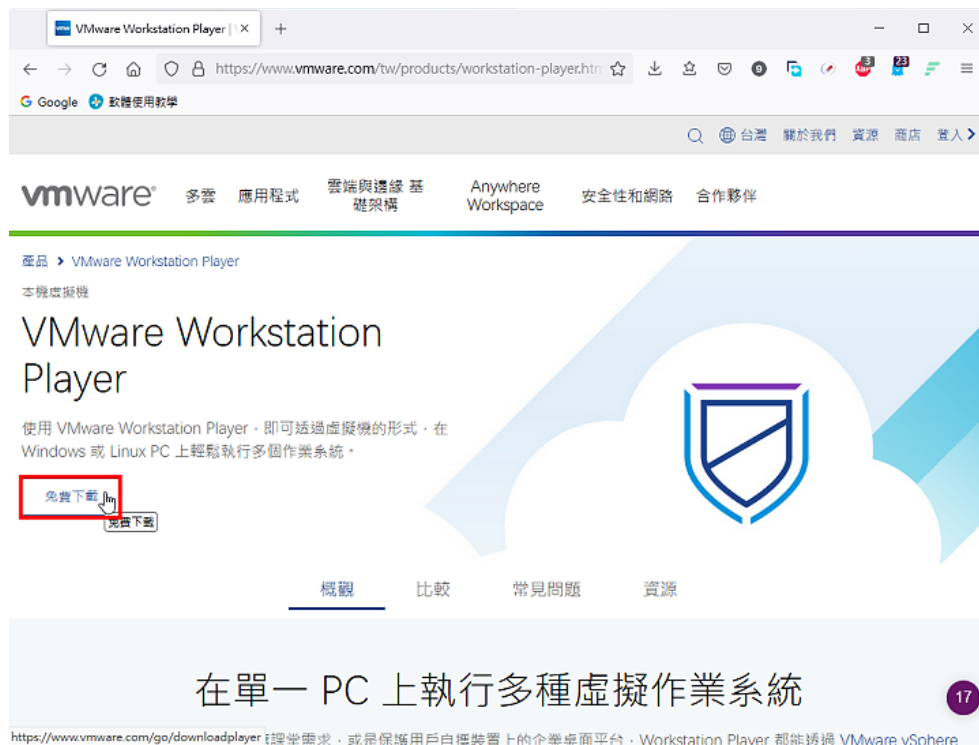
1. Link to VMware's official website, search 「Workstation Player」, click 「VMware Workstation Player | VMware | TW」.
<https://www.vmware.com/tw.html>



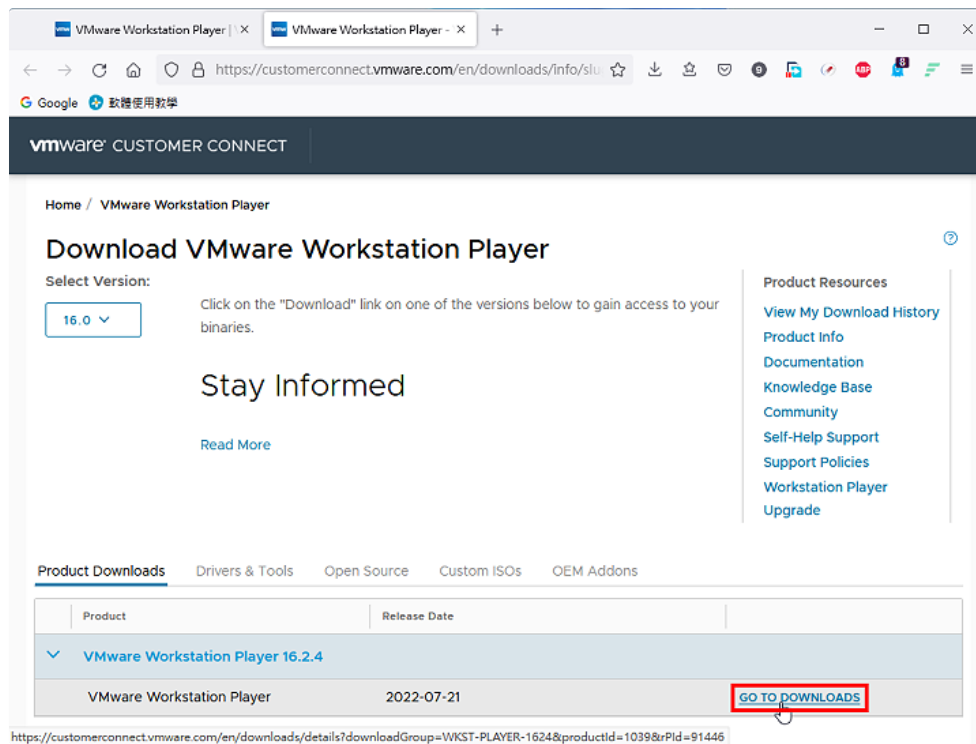
VMware Workstation Player | VMware | TW

裝置支援 Workstation Player Workstation Pro 支援 4K/5K/Retina 顯示器 ... 安全功能 Workstation Player Workstation Pro Microsoft 虛擬化式安全性 (Guest) 支援 ... Workstation Player Workstation Pro 指令行操作 : vmrun 和 VIX

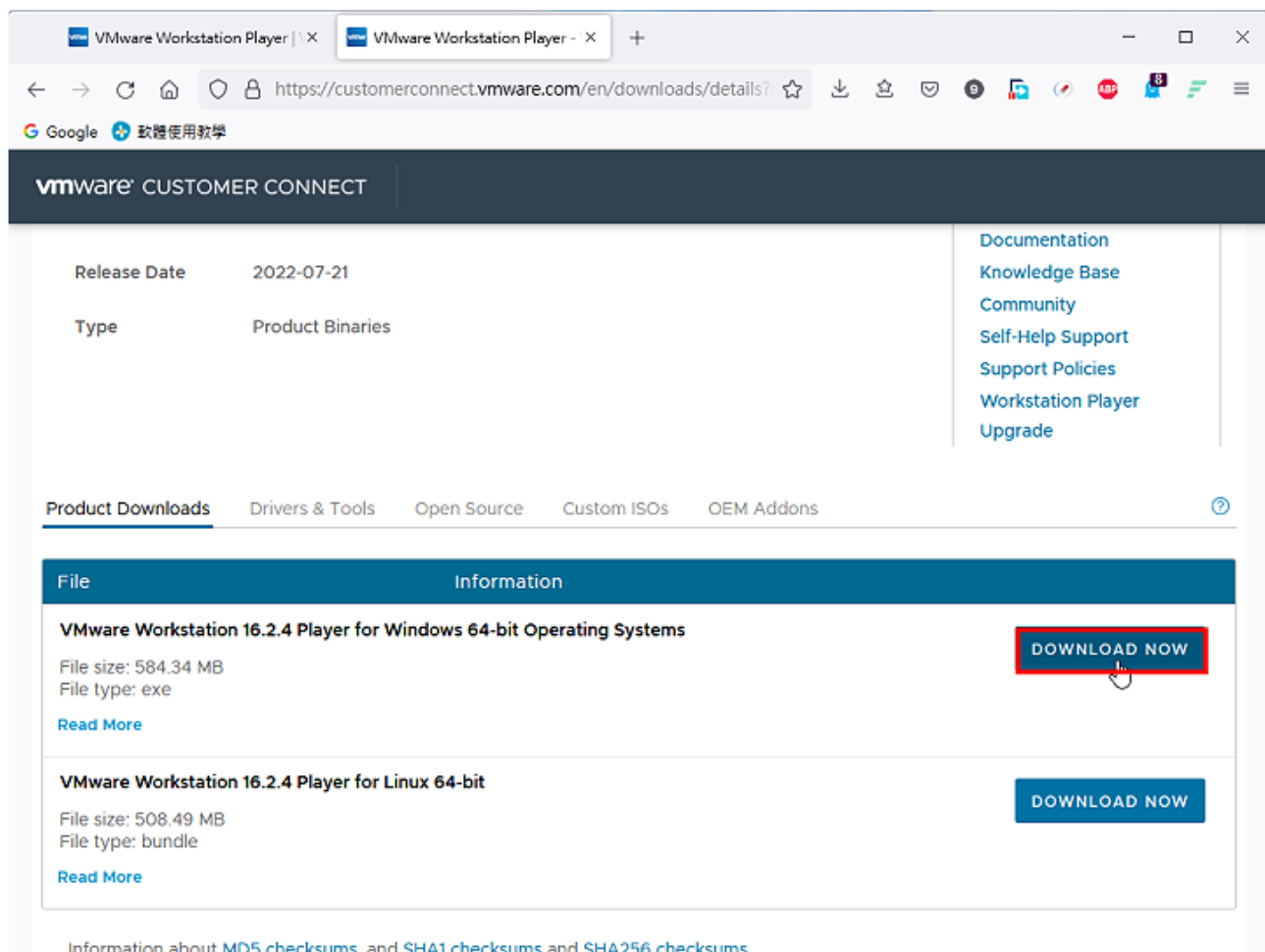
2. Click 「免費下載」.



3. Click 「GO TO DOWNLOADS」.

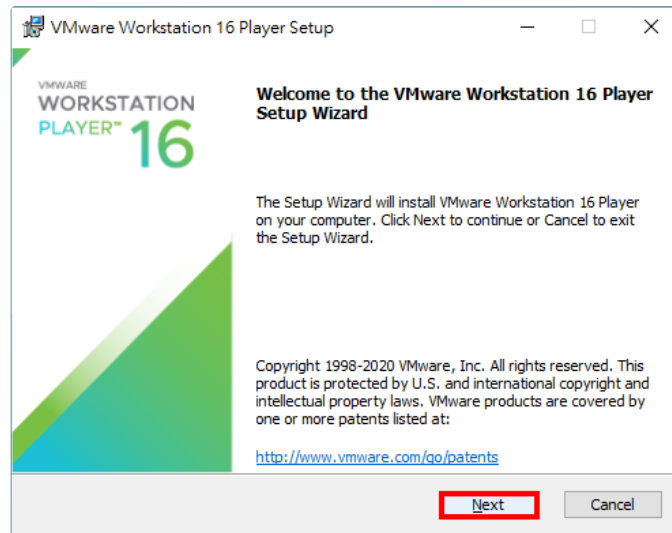


4. Click 「DOWNLOAD NOW」。

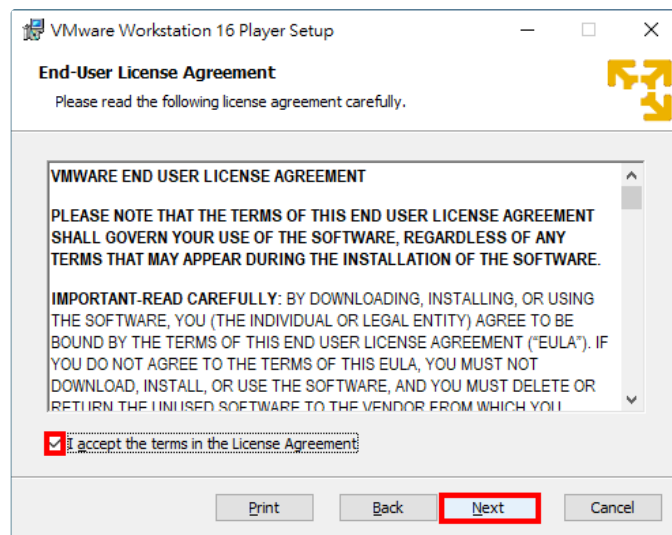


5. Once downloaded, execute the .exe, ready to start the installation.

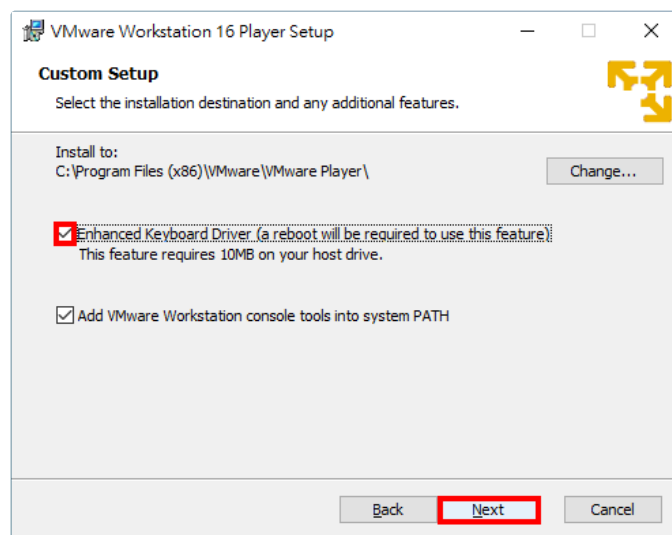
6. Click 「Next」。



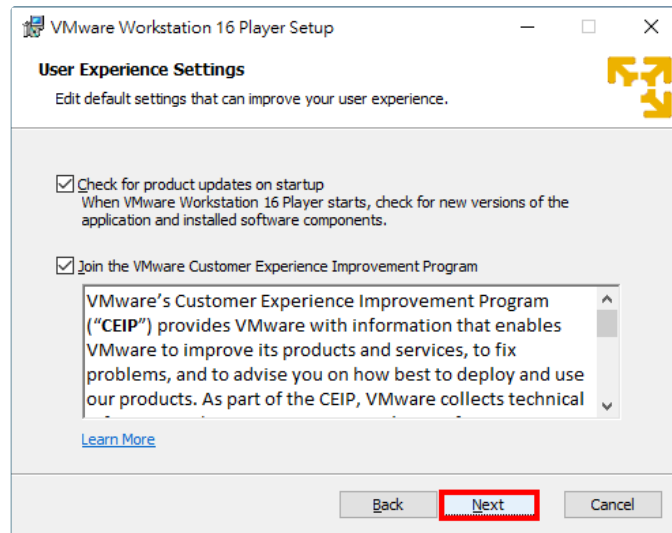
7. Choose 「I accept the terms in the License Agreement.」。



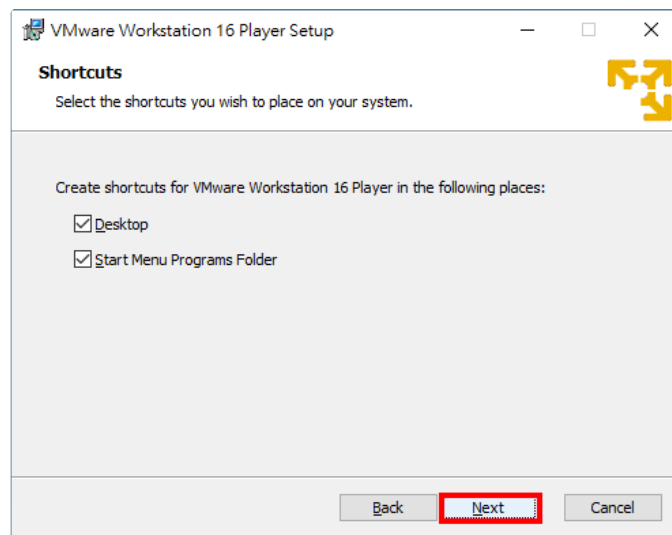
8. Choose 「Enhanced Keyboard Driver...」。



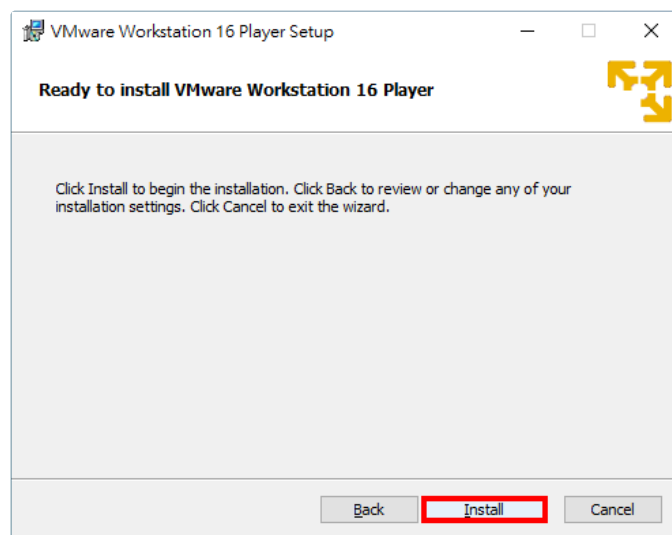
9. Choose 「Next」。



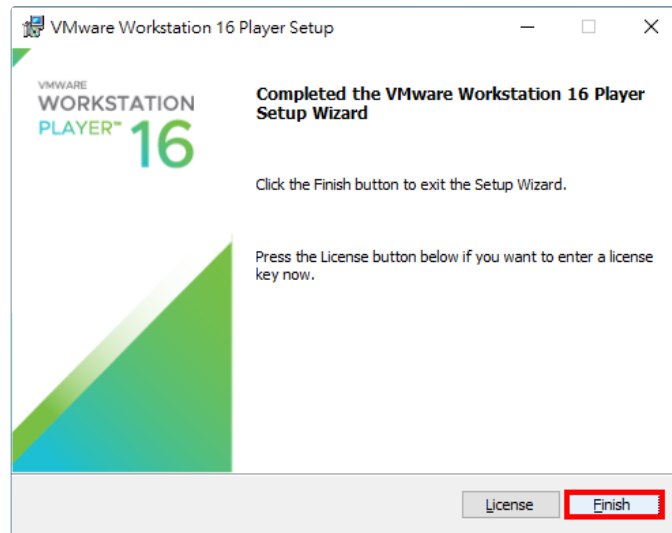
10. Click 「Next」。



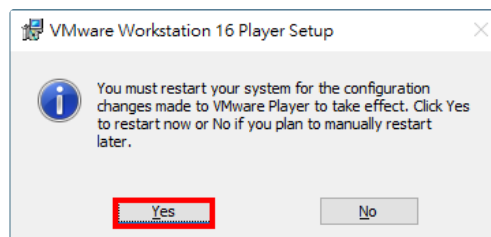
11. Click 「Install」。



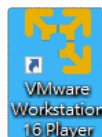
12. Wait for the installation to complete , click 「Finish」 。



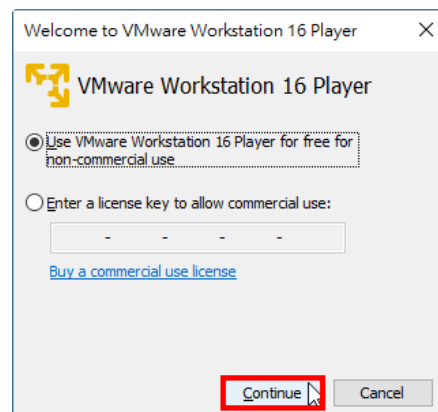
13. Click 「Yes」 , and need to restart.



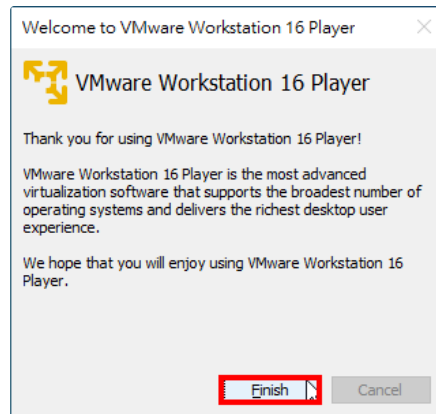
14. Open the VMware Workstation 16 Player.



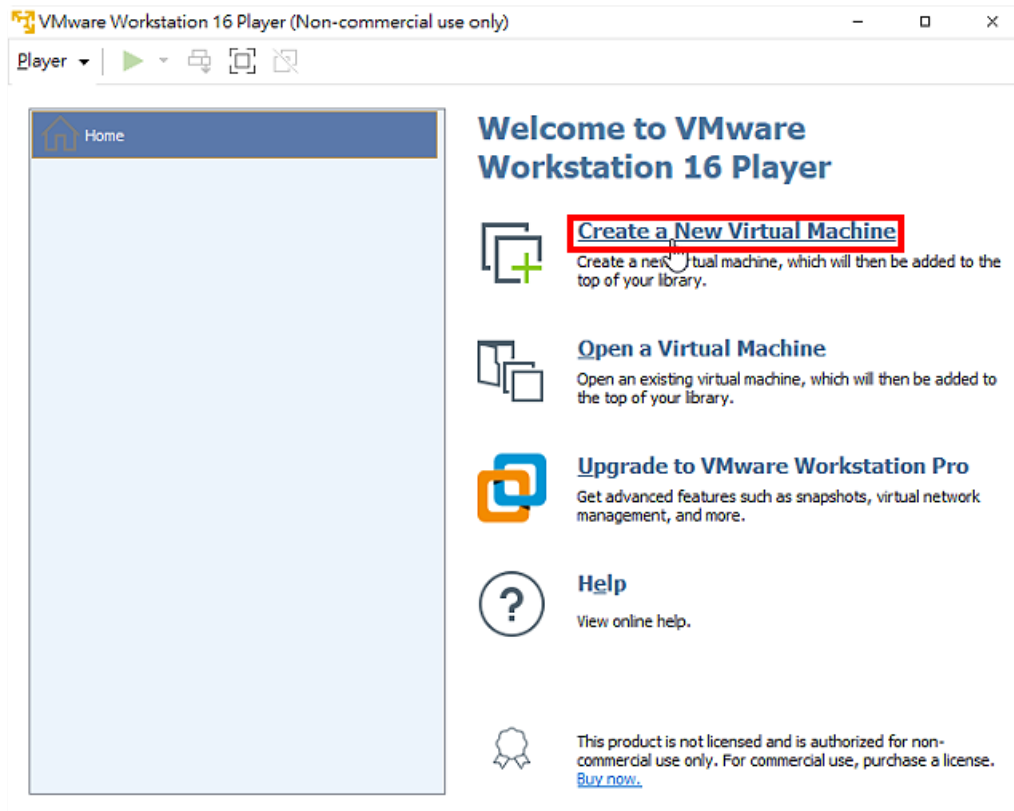
15. Click 「Continue」 。



16. Click 「Finish」 。



17. You finish the installation of VMware.



2. Set up Ubuntu 20.04.4 LTS

中文參考網站：

[VMware Workstation 16 Player安裝Ubuntu 20.04](#)

[安裝Ubuntu 20.04 @ 軟體使用教學 :: 隨意窩 Xuite日誌](#)

English version reference site :

[Installing Linux Ubuntu Version 20.04 in VMware Workstation Player - Windows 11 Installation Guides \(dellwindowsreinstallationguide.com\)](#)

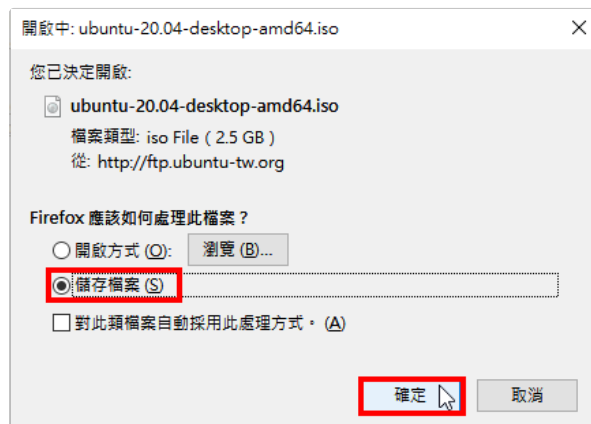
1. Link to the Ubuntu official website , choose select the same options as below image, click 「開始下載」 . <http://www.ubuntu-tw.org/modules/tinyd0/>

2.

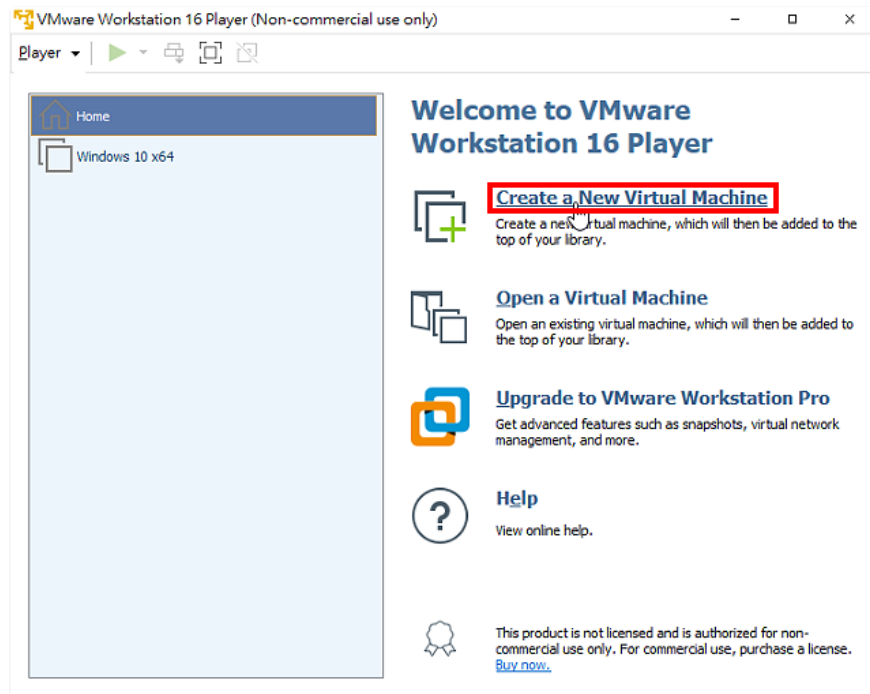
The screenshot shows the Ubuntu Taiwan website with the following structure:

- Header:** Navigation links (下載, 新聞, 論壇, 星球, Wiki, 聯絡我們) and the Ubuntu logo with "正體中" (Traditional Chinese).
- Sub-header:** Links for "下載 Ubuntu", "Ubuntu 行為規範 (第二版)", "Ubuntu@Taiwan 論壇規範", and "IRC 聊天室".
- Search Bar:** A Google search bar with the text "經 Google 技術強化".
- Main Content:**
 - 標題:** 下載 Ubuntu
 - 發行版 (Release):** Radio buttons for "Ubuntu 桌面版本" (selected) and "Ubuntu 伺服器版本". Text below explains that different release versions have different graphical environments and software packages, and suggests choosing the desktop version if unsure.
 - 版本 (Version):** Radio buttons for LTS versions: 22.04 LTS (5+5 years support), 20.04 LTS (5+5 years support) (selected), 18.04 LTS (5+5 years support), 16.04 LTS (5+5 years support), and 14.04 LTS (5+5 years support). Text below explains LTS (Long Time Support) versions include 5 years of complete support and 5 years of extended security maintenance (ESM), totaling 10 years of support. The current LTS version is 22.04 LTS (2022/04 - 2027/04 - 2032/04). A link is provided for "The Ubuntu lifecycle and release cadence".
 - 電腦架構 (Architecture):** Radio buttons for 32-bit and 64-bit (selected). Text below states that most computers use 64-bit architecture, so from 18.04 onwards, the desktop version will no longer provide 32-bit versions. Additionally, no Mac version is available for download in the current section.
 - 下載選項 (Download Options):** A checkbox for "下載 BitTorrent 種子" (Download BitTorrent seeds) and a "開始下載" (Start Download) button. A link "或是 至此瀏覽所有版本及檔案" (Or click here to browse all versions and files) is also present.

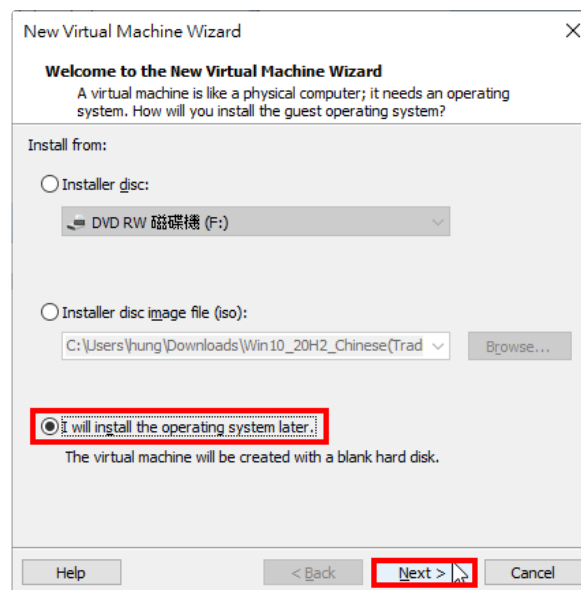
Choose 「儲存檔案」。



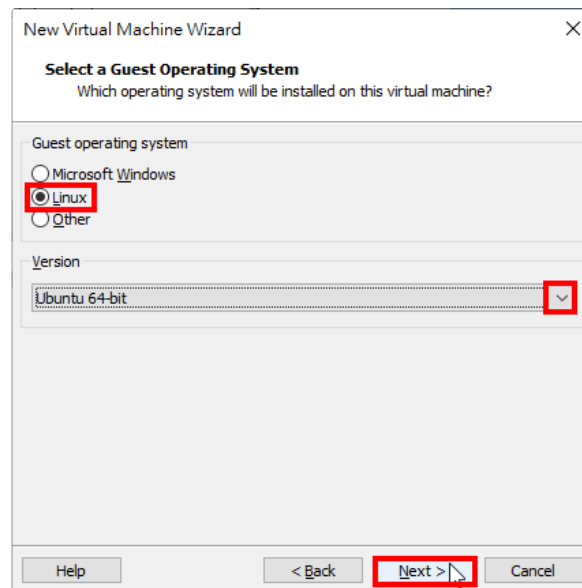
3. Go back to VMware , click 「Create a New Virtual Machine」。



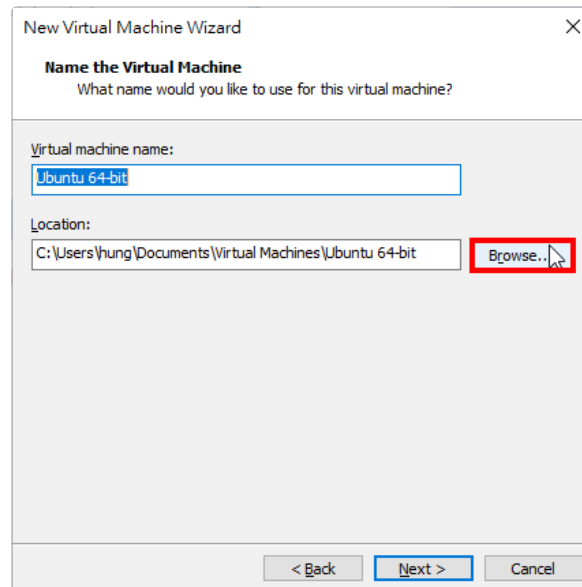
4. Choose 「I will Install the operating system later」。



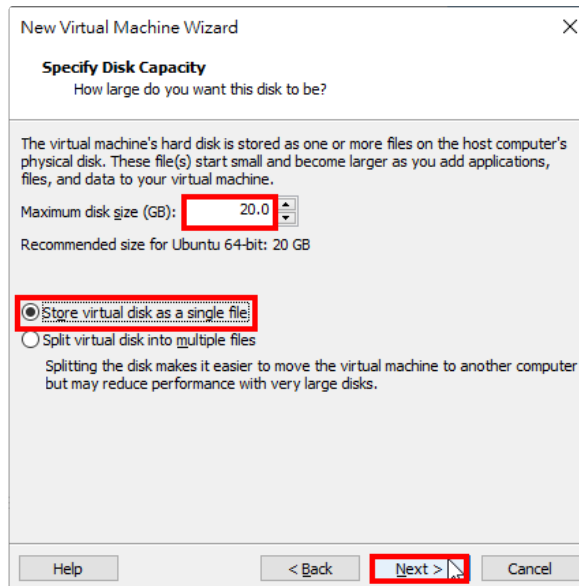
5. Choose 「Linux」 OS system , and choose 「Ubuntu 64-bit」 version .



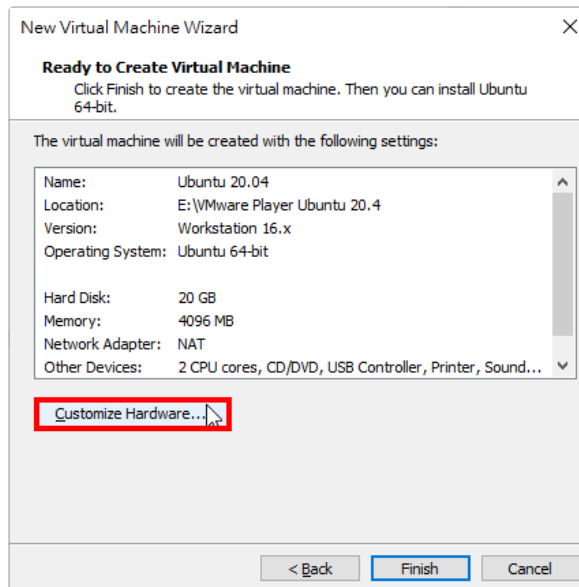
6. Name your VM and select your Location to install .



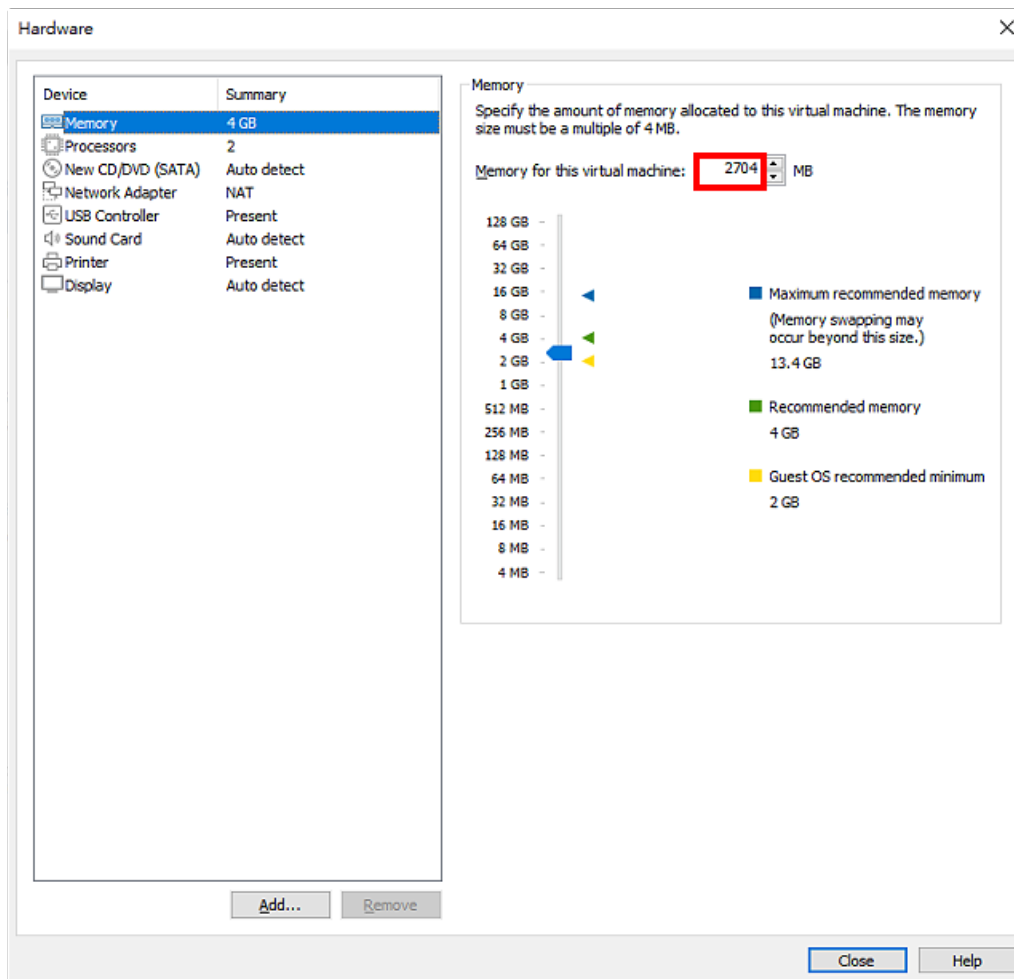
7. Set the size of your VM disk, and choose 「Store virtual disk as a single files」 .



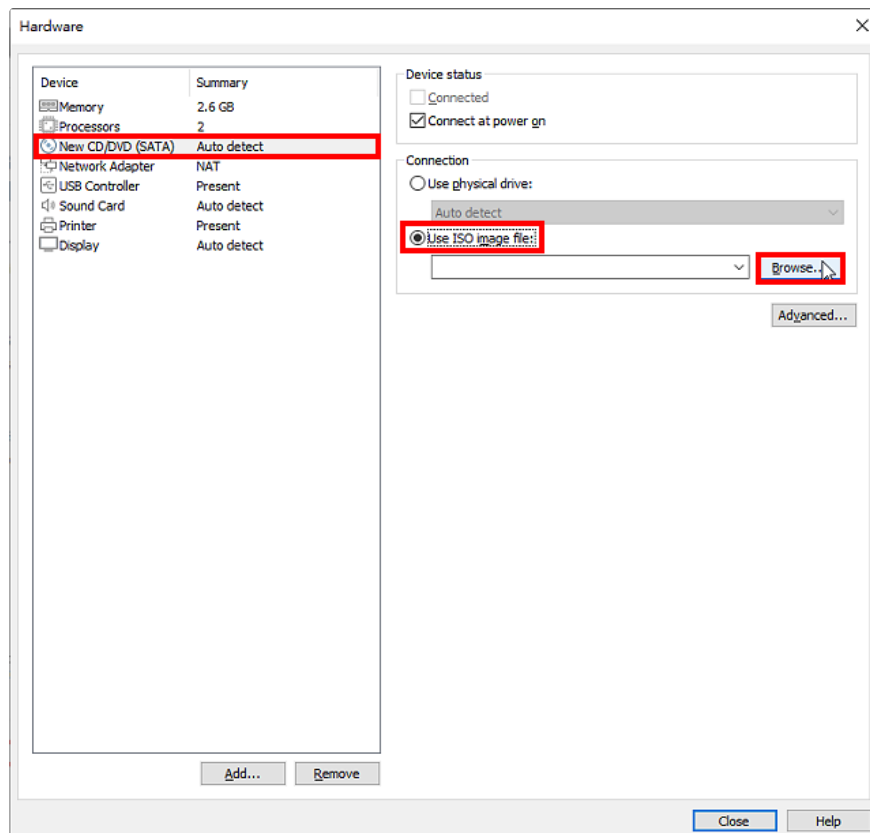
8. Click 「Customize Hardware...」。



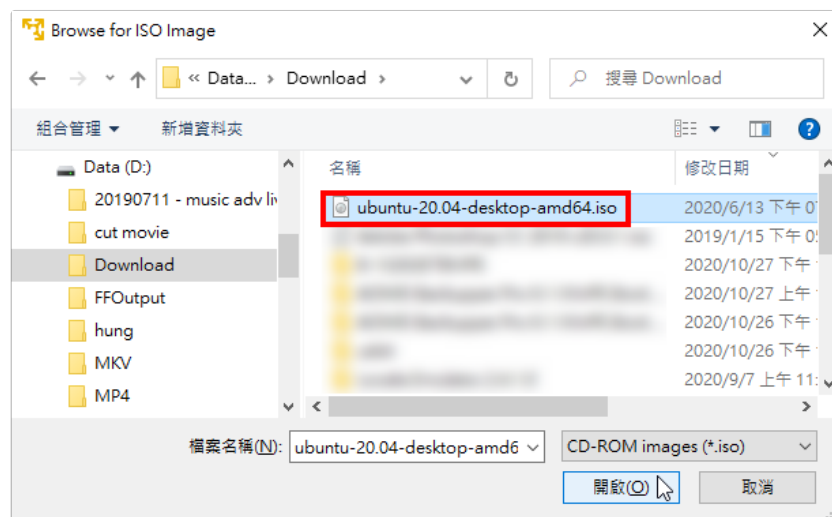
9. In 「memory」 option, adjust the memory to an appropriate size. (Theoretically, the bigger the better, but it is better not to exceed 1/2 of the actual computer)



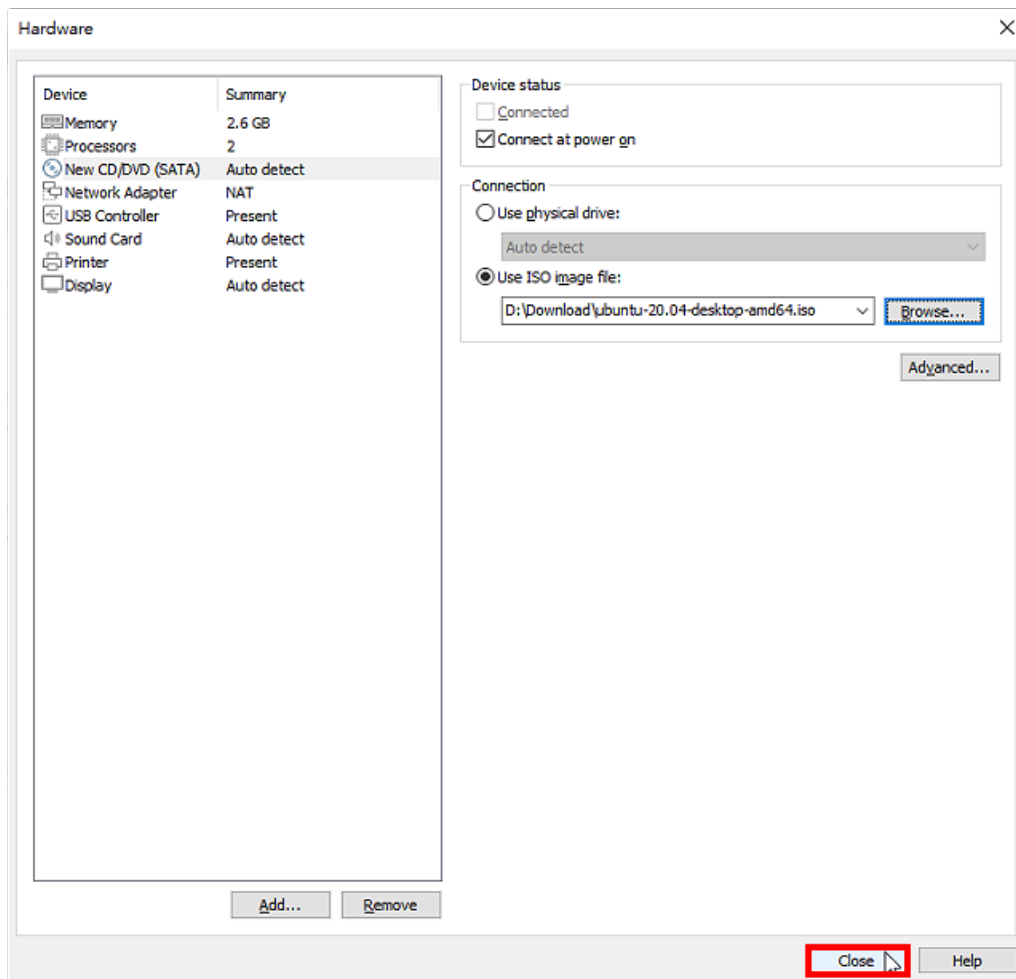
10. In 「New CD/DVD」 options , choose 「Use ISO image file:」 , click 「Browse...」 .



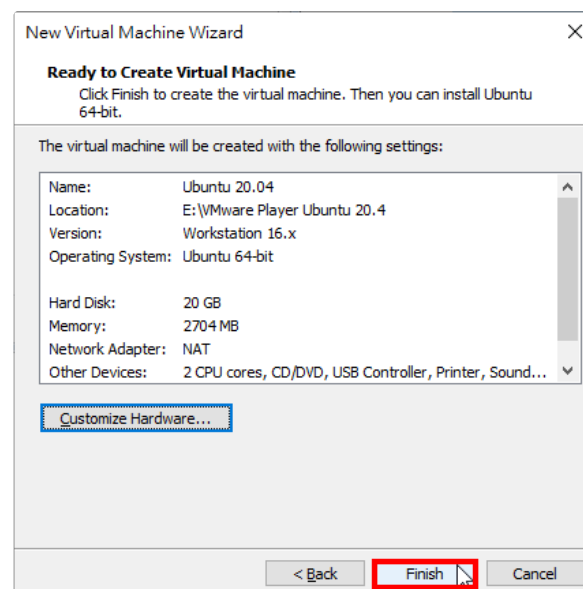
11. Selection 「ubuntu-20.04-desktop-amd64.iso」 we downloaded in step 2. before, and click 「開啟」 .



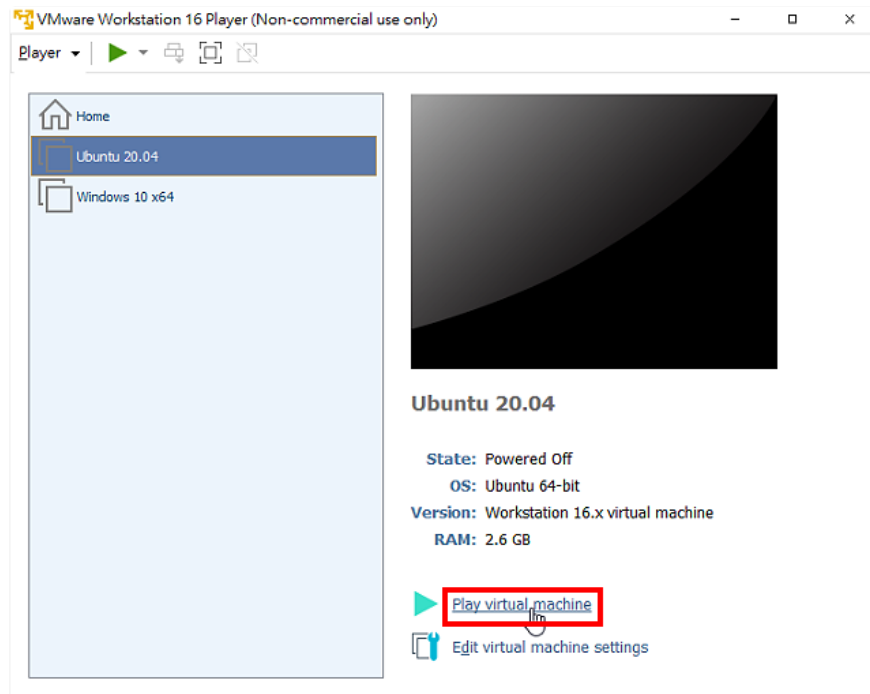
12. Setting is finished, click 「close」 .



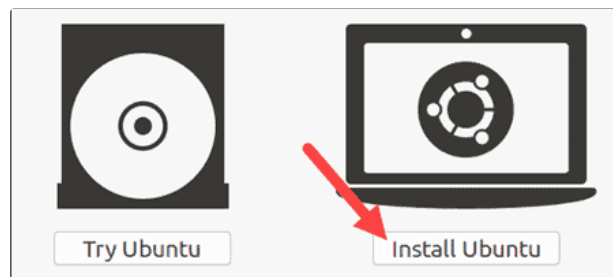
13. Click 「Finish」 。



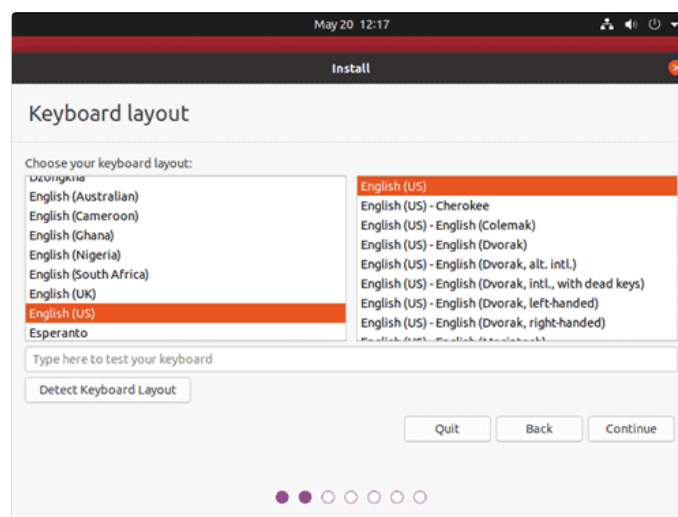
14. Click 「Play virtual machine」 , ready to install the Ubuntu.



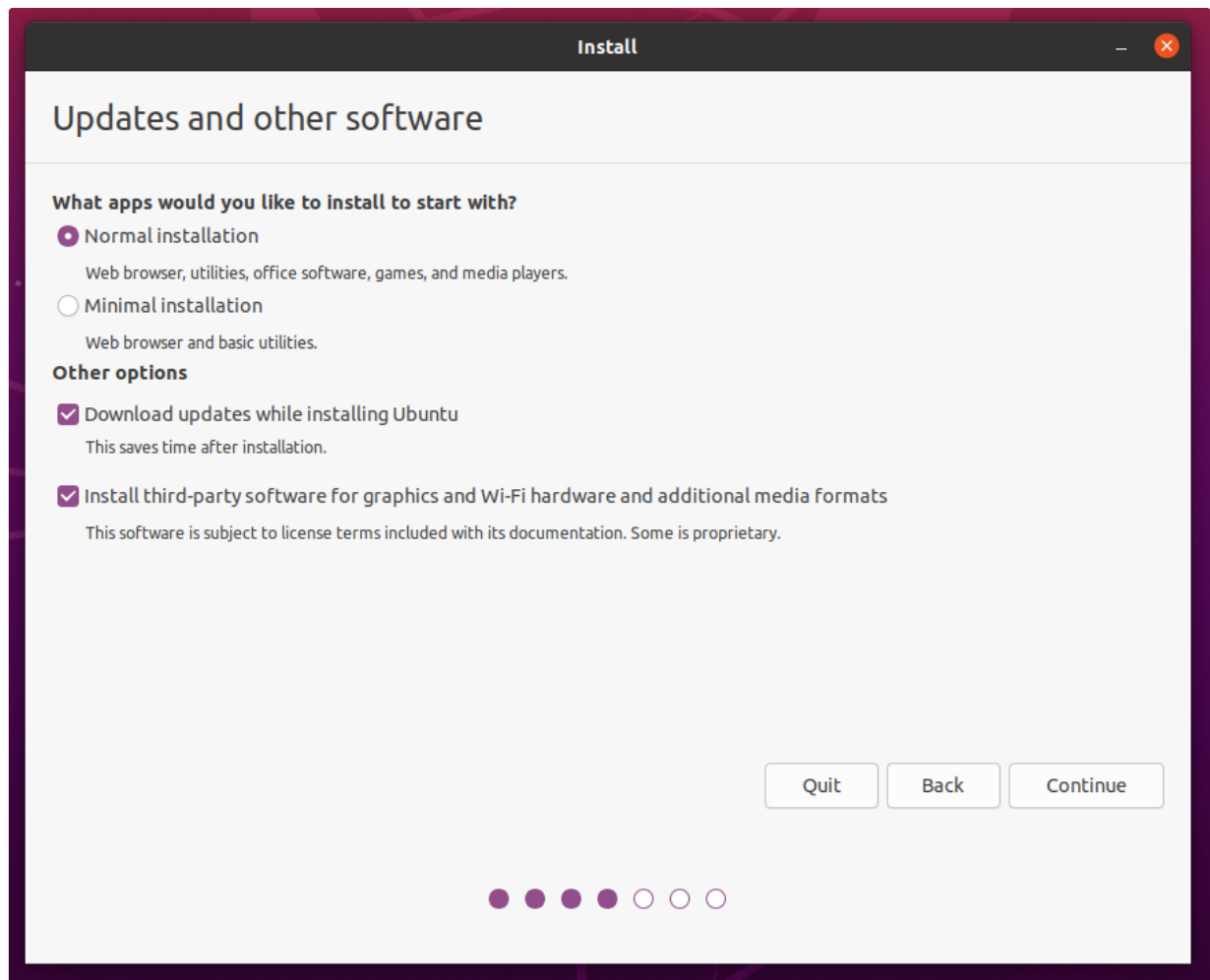
15. Choose your language (English or Chinese ...) , click 「Install Ubuntu」 .



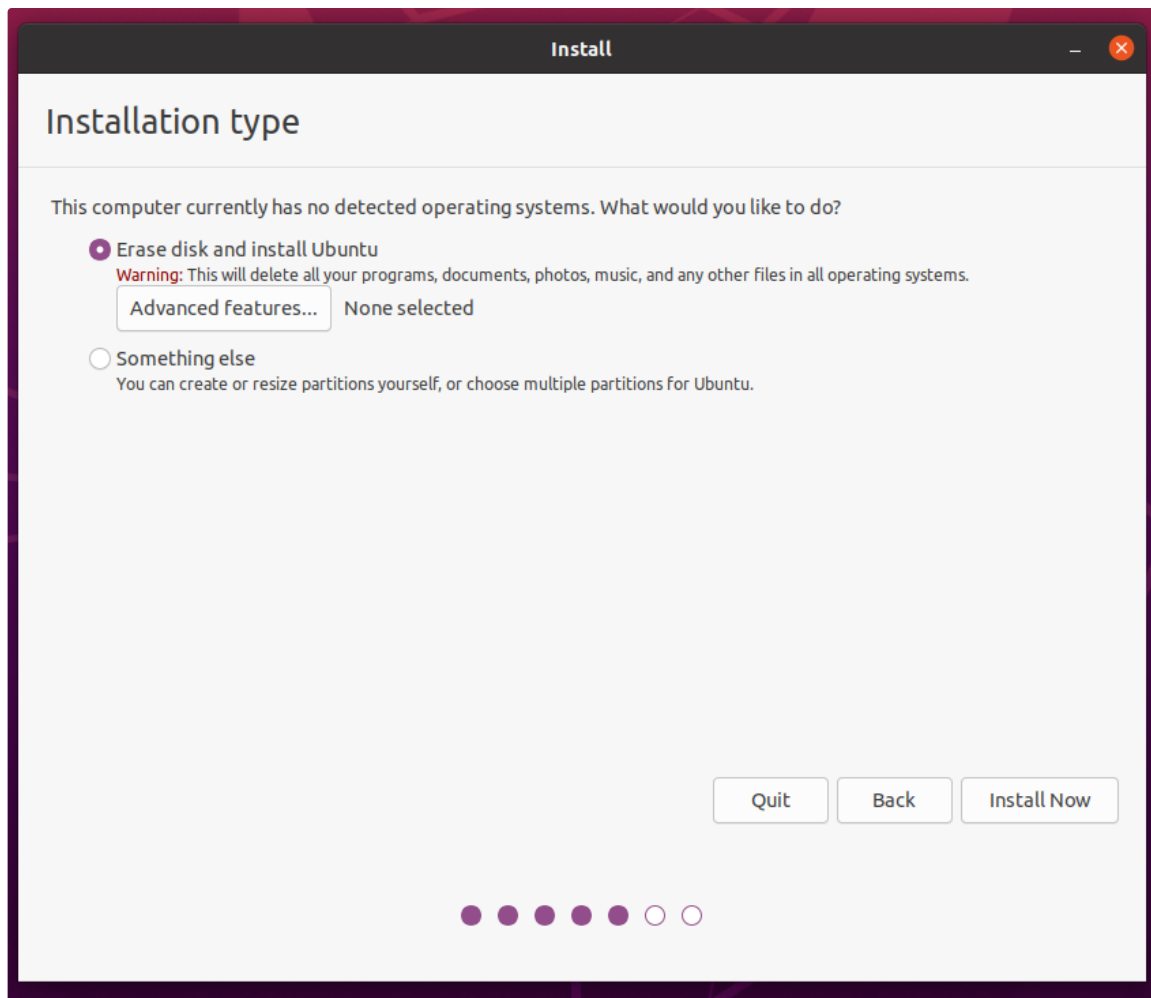
16. Select 「English (US)」 , click 「continue」 .



17. Choose 「Install third-party」 , click 「continue」 .



18. click 「Install now」



19. Use the time zone of 「Taipei (台北)」, click 「Continue」。

Where are you?



Taipei

Back

Continue



20. Set your name, password

Install

Who are you?

Your name: Focal

Your computer's name: focal-install

The name it uses when it talks to other computers.

Pick a username: focal

Choose a password: Good password

Confirm your password:

☐ Log in automatically

☒ Require my password to log in

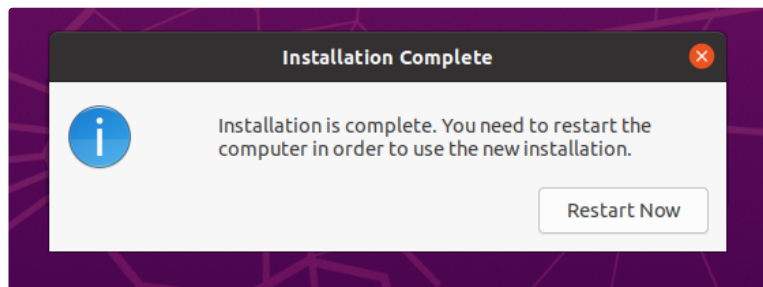
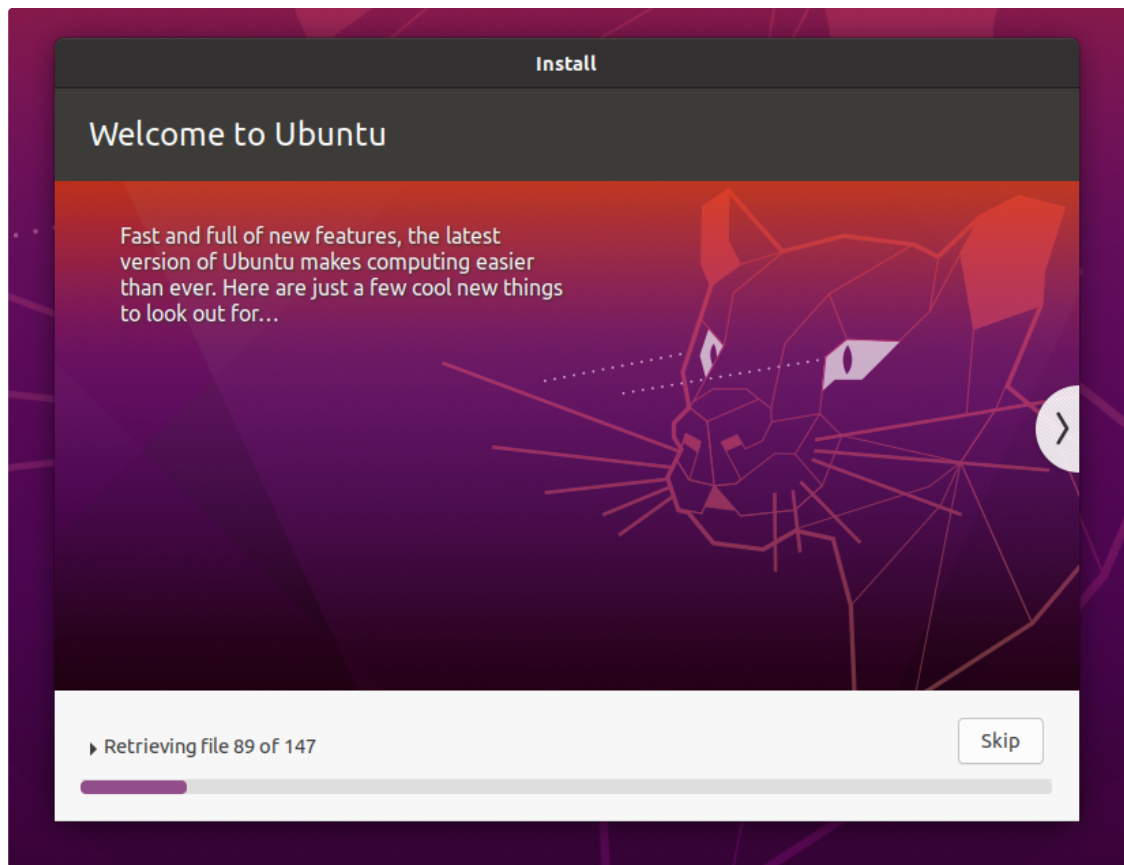
☐ Use Active Directory

You'll enter domain and other details in the next step.

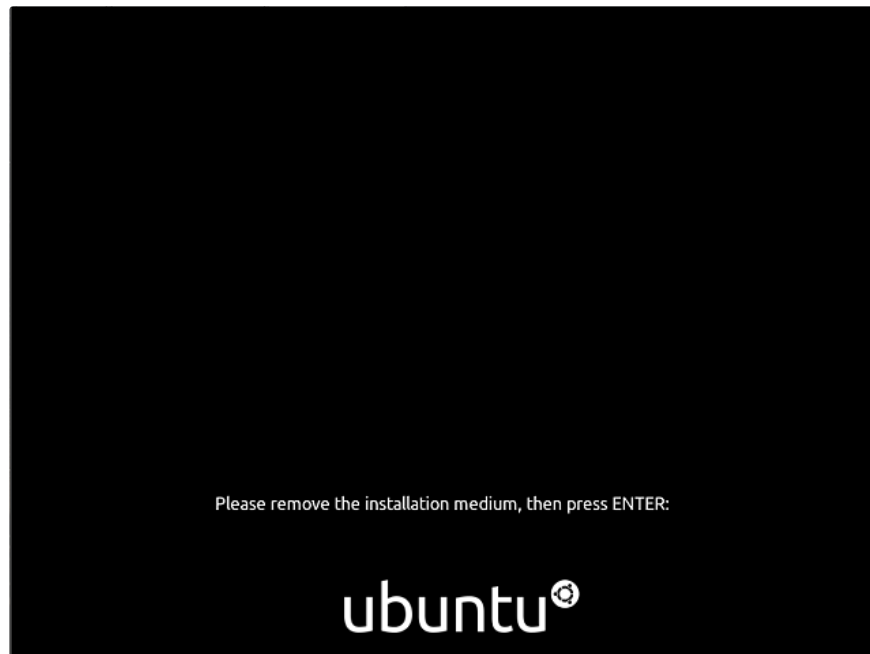
Back

Continue

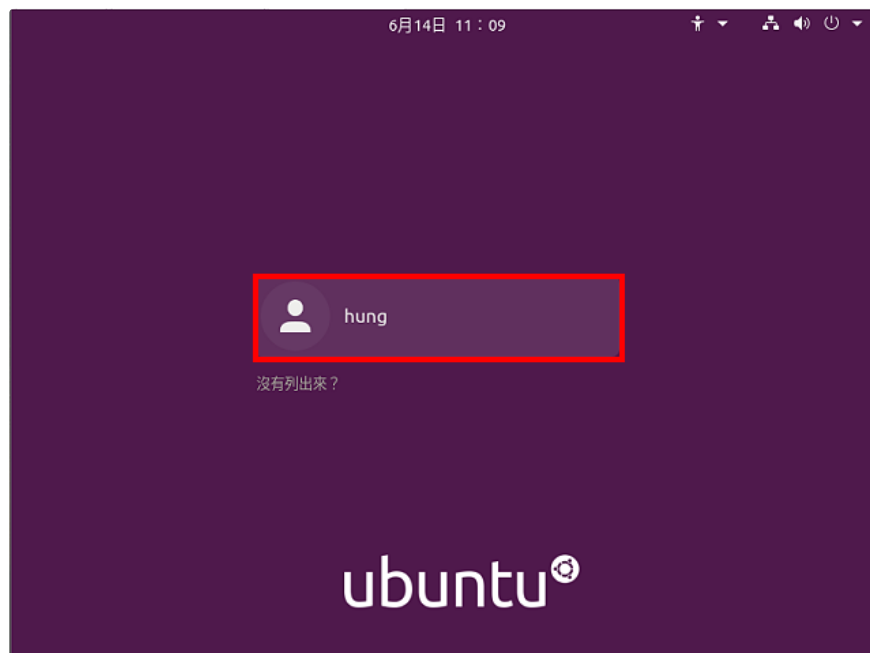
21. wait for installation, click 「Restart Now」 once the installation finished.



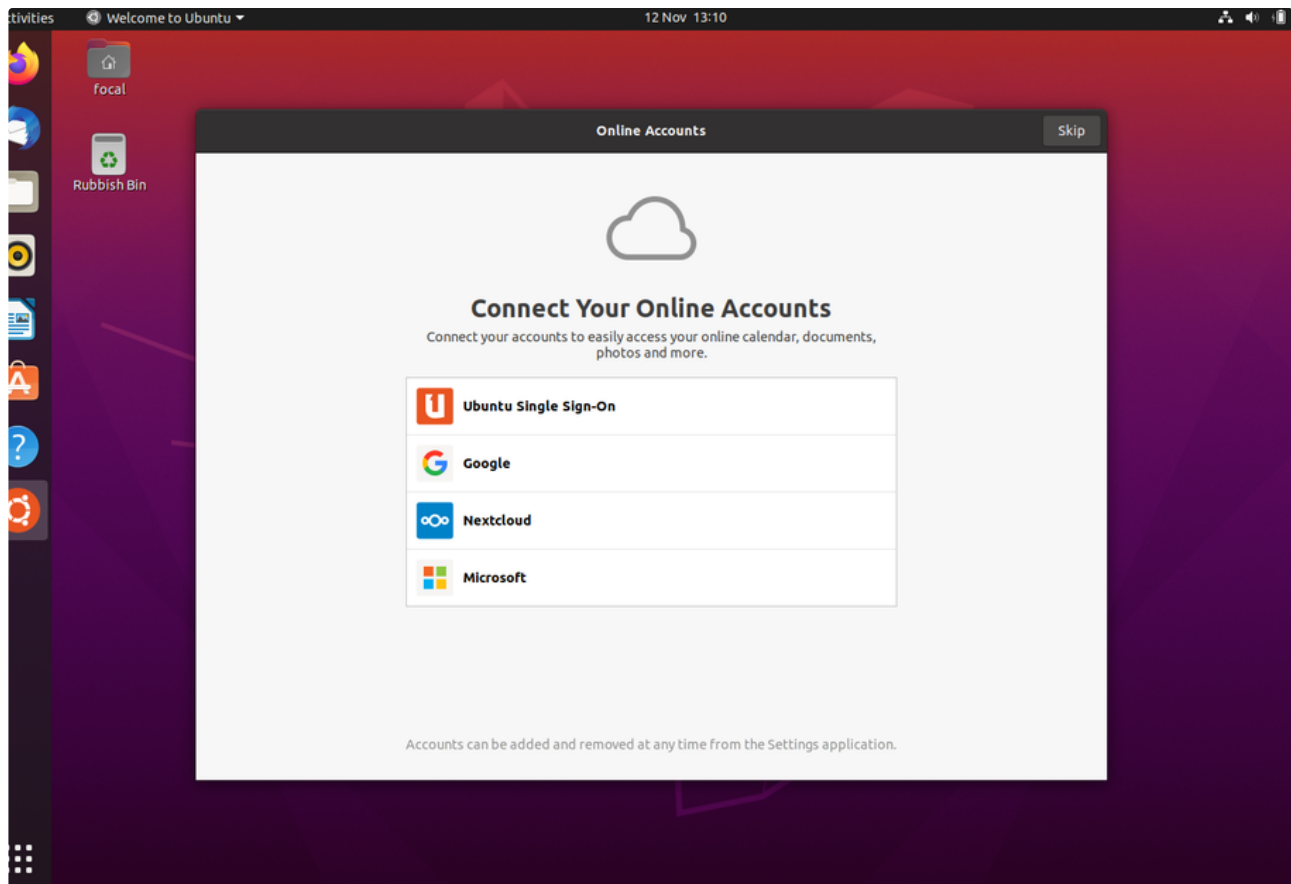
22. Remember to press 「Enter」。



23. Select the user and input your password.



24. Can install anything you want ~



3. Complete the gRPC Quick Start in C++

Reference site :

[gRPC Quick Start in C++](#)

[How to Install Protobuf on Ubuntu 20.04 \(github.com\)](#)

0. Open the terminal



1. Install some tools that will be used.

```
$ sudo apt-get install pkg-config  
$ sudo apt install -y cmake  
$ sudo apt-get install build-essential autoconf automake libtool make g++ unzip  
$ sudo apt-get install libgflags-dev libgtest-dev  
$ sudo apt-get install clang libc++-dev  
$ sudo apt install git
```

2. Download gRPC

```
$ git clone https://github.com/grpc/grpc.git  
$ cd grpc  
$ git submodule update --init
```

3. Install protobuf

```
$ cd third_party/protobuf/
$ git submodule update --init --recursive
$ ./autogen.sh
$ ./configure

// need much time !!
$ make
$ make check
$ sudo make install
$ sudo ldconfig
$ protoc --version // Check if the installation was successful
```

4. Compile and install gRPC

```
$ cd grpc/
$ mkdir -p cmake/build
$ pushd cmake/build
$ export MY_INSTALL_DIR=$HOME/.local
$ export PATH="$PATH:$MY_INSTALL_DIR/bin"
$ mkdir -p $MY_INSTALL_DIR

$ cmake -DgRPC_INSTALL=ON -DgRPC_BUILD_TESTS=OFF -DCMAKE_INSTALL_PREFIX=$MY_INSTALL_DIR ../..
$ make
$ make install
```

5. Demo

```
$ cd grpc/examples/cpp/helloworld/
$ mkdir -p cmake/build
$ pushd cmake/build
$ cmake -DCMAKE_PREFIX_PATH=$MY_INSTALL_DIR ../..
$ make
```

#Open the example server and client

```
$ ./greeter_server
$ ./greeter_client
```

Greeter received: Hello world

<Submission Checklist>

Prepare a report in PDF format with the following items

A1. Open a terminal window on Ubuntu Linux and type in the shell command 'top' to show the running processes on the system.

A2. Do a screenshot of the whole Ubuntu desktop environment (including the terminal window running *top*).

A3. Paste the screenshot in your report.

B1. Run the example gRPC client program and the gRPC server program on two different virtual machines.

B2. Modify the programs so that the client running in VM₁ can **send the 'world' string to the server in VM₂, and the server can return the 'Hello world' string back to the client.**


B3. In the report, describe the changes you have made and attach a copy of the screenshots of both VMs from running Step B2.

Reference

 [免費虛擬機器VMware Workstation 16 Player下載與安裝](#)

[Download and Install VMware Workstation Player/Pro \(16/15/14\) \(minitool.com\)](#)

[Installing Linux Ubuntu Version 20.04 in VMware Workstation Player - Windows 11 Installation Guides \(dellwindowsreinstallationguide.com\)](#)

 [VMware Workstation 16 Player安裝Ubuntu 20.04](#)

[安裝Ubuntu 20.04 @ 軟體使用教學 :: 隨意窩 Xuite日誌](#)

[Quick start | C++ | gRPC](#)

[How to Install Protobuf on Ubuntu 20.04 \(github.com\)](#)

[\(2条消息\) Ubuntu安装GRPC_蓬莱道人的博客-CSDN博客](#)

[\(2条消息\) ubuntu20.04 编译安装 grpc-c++_Bart_的博客-CSDN博客](#)