



SDN Environment Setup

Install ONOS in VM

Outline

- Objective
- Experiment Environment
- Installation
 - VirtualBox 6.1.46
 - Add VM
 - SDN development environment

Objective

- Prepare a operational environment
 - VirtualBox: Open-source cross-platform virtualization application
 - Run virtual machines
 - Ubuntu: Open-source operating system
 - A most popular OS for software development/
 - Bazel:
 - Free SW tool for “automation of building and testing of SW”.
 - ONOS: Open Network Operating System in SDN
 - Offer a graphic interface for observing network topology
 - OVS: Open vSwitch
 - a multilayer software switch licensed under the Open source Apache 2 license.
 - Mininet: Network Emulator
 - Make virtual network environment setup easily

Outline

- Objective
- **Experiment Environment**
- Installation
 - VirtualBox 6.1.46
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Experiment Environment

- Ubuntu Desktop **22.04**
- Minimum Hardware Requirements:
 - **2** Cores (CPUs)
 - **8GB** RAM
 - **30GB** HDD

Outline

- Objective
- Experiment Environment
- **Installation**
 - VirtualBox 6.1.46
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VirtualBox Installation (1/7)

- Go to [official download page](#)
- Download the “platform packages” for your OS



The screenshot shows the Oracle VM VirtualBox website. The main heading is "VirtualBox". Below it, there's a section titled "Download VirtualBox (Old Builds): VirtualBox 6.1". A red box highlights the "VirtualBox 6.1.46 (released July 18 2023)" section, and a red arrow points to it. The highlighted section lists various operating systems and their corresponding VirtualBox versions, including Windows, macOS, Solaris, and Linux hosts. The Linux hosts section lists various distributions like Oracle Linux, Red Hat Enterprise Linux, CentOS, Ubuntu, Debian, openSUSE, Fedora, and All distributions.

VirtualBox

Download VirtualBox (Old Builds): VirtualBox 6.1

The Extension Packs in this section are released under the [VirtualBox Personal Use and Evaluation License](#). All other binaries are released under the terms of the GPL version 2. By downloading, you agree to the terms and conditions of the respective license.

- [6.1 SDK \(6.1.46\)](#)

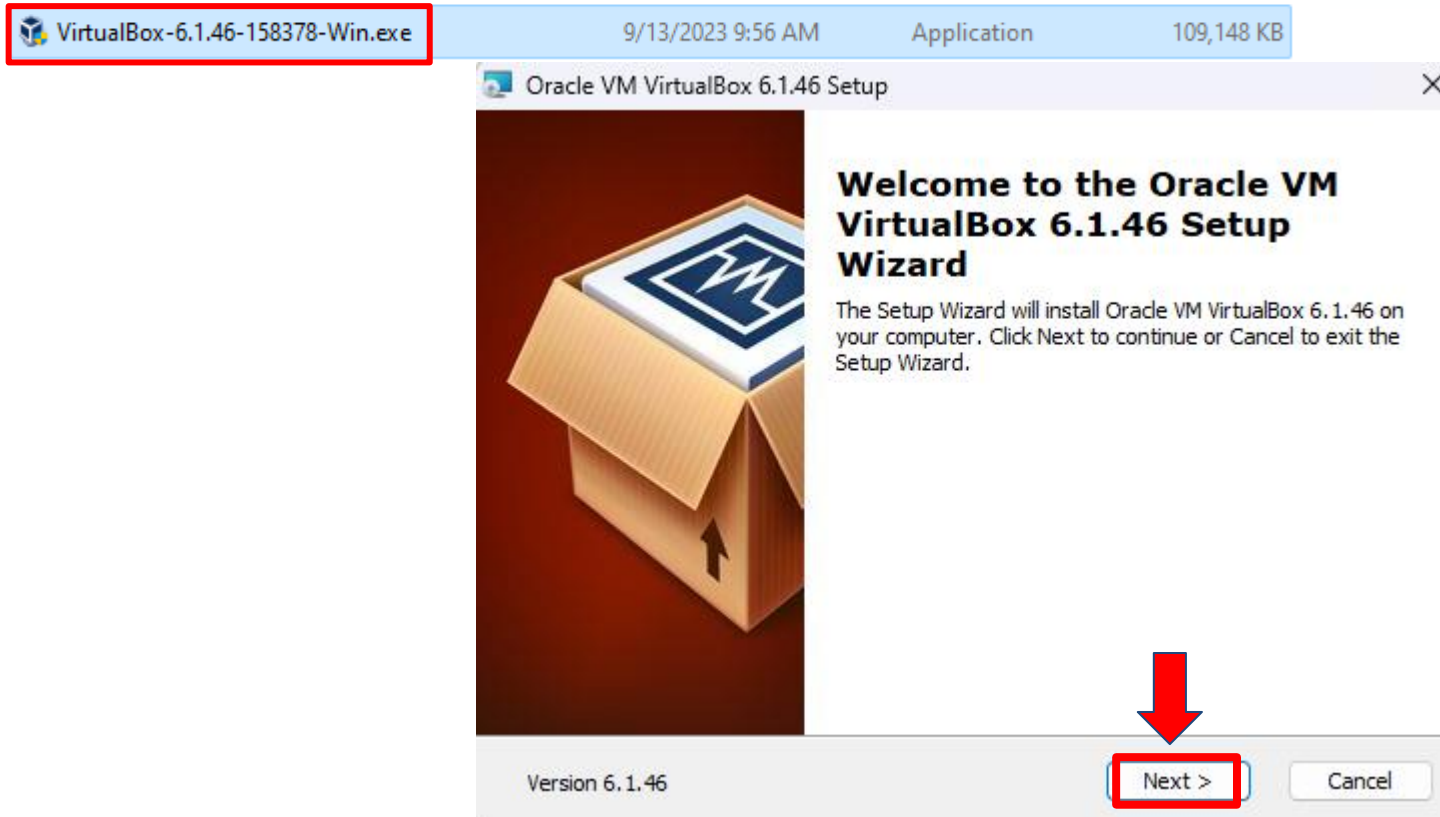
VirtualBox 6.1.46 (released July 18 2023)

- [Windows hosts](#)
- [macOS / Intel hosts](#)
- [Solaris hosts](#)
- [Solaris 11 IPS hosts](#)
- **Linux Hosts:**
 - [Oracle Linux 9 / Red Hat Enterprise Linux 9](#)
 - [Oracle Linux 8 / Red Hat Enterprise Linux 8](#)
 - [Oracle Linux 7 / Red Hat Enterprise Linux 7 / CentOS 7](#)
 - [Oracle Linux 6 / Red Hat Enterprise Linux 6 / CentOS 6](#)
 - [Ubuntu 22.04](#)
 - [Ubuntu 20.04](#)
 - [Ubuntu 18.04 / 18.10 / 19.04](#)
 - [Debian 12](#)
 - [Debian 11](#)
 - [Debian 10](#)
 - [Debian 9](#)
 - [openSUSE 15.3 / 15.4 / 15.5](#)
 - [openSUSE 15.0](#)
 - [openSUSE 13.2 / Leap 42](#)
 - [Fedora 36 / 37 / 38](#)
 - [Fedora 35](#)
 - [Fedora 33 / 34](#)
 - [Fedora 32](#)
 - [All distributions](#)
- [Extension Pack](#)
- [Sources](#)
- [MD5 checksums, SHA256 checksums](#)

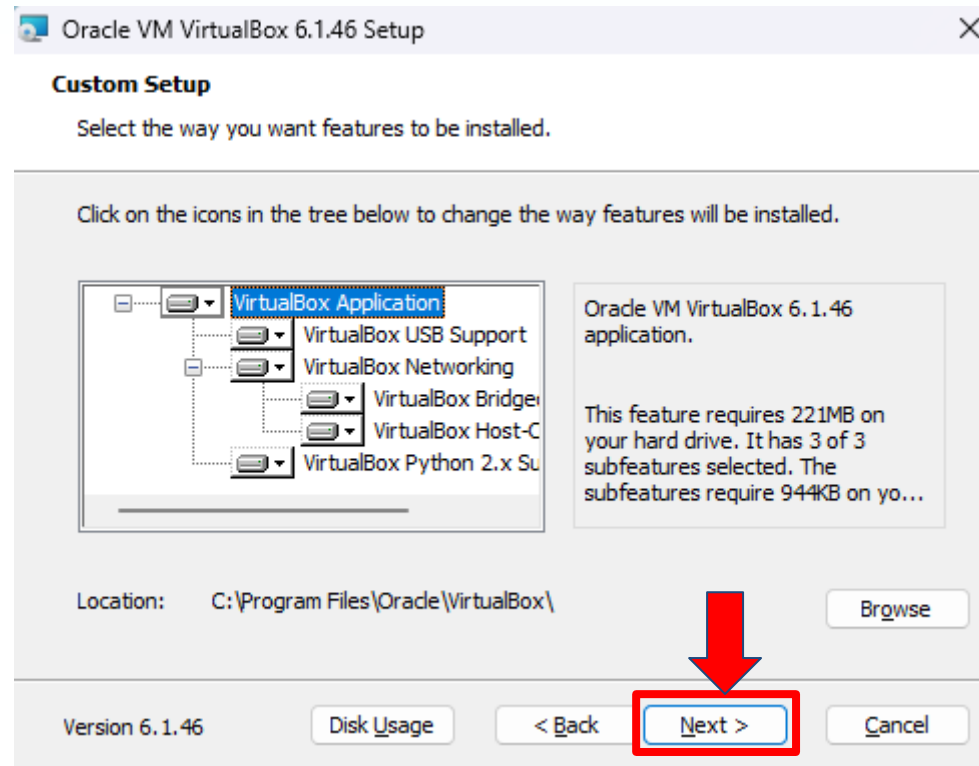
VirtualBox Installation (2/7)

- Start installation

✓ Today

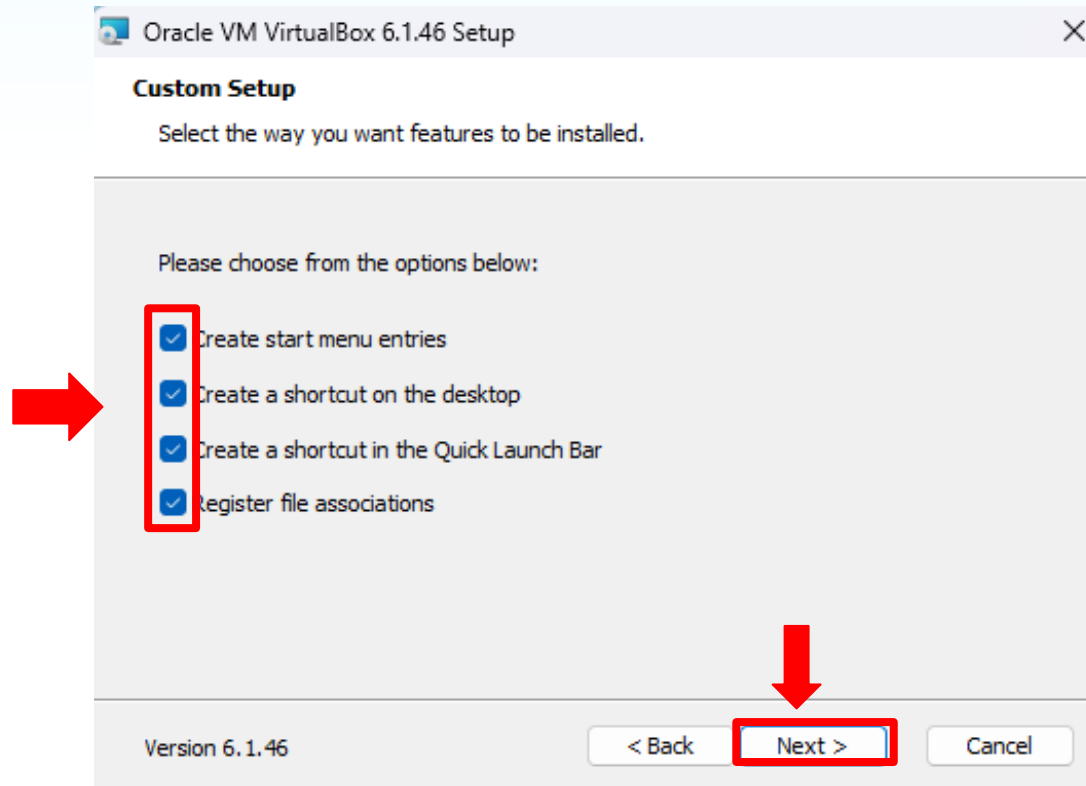


VirtualBox Installation (3/7)

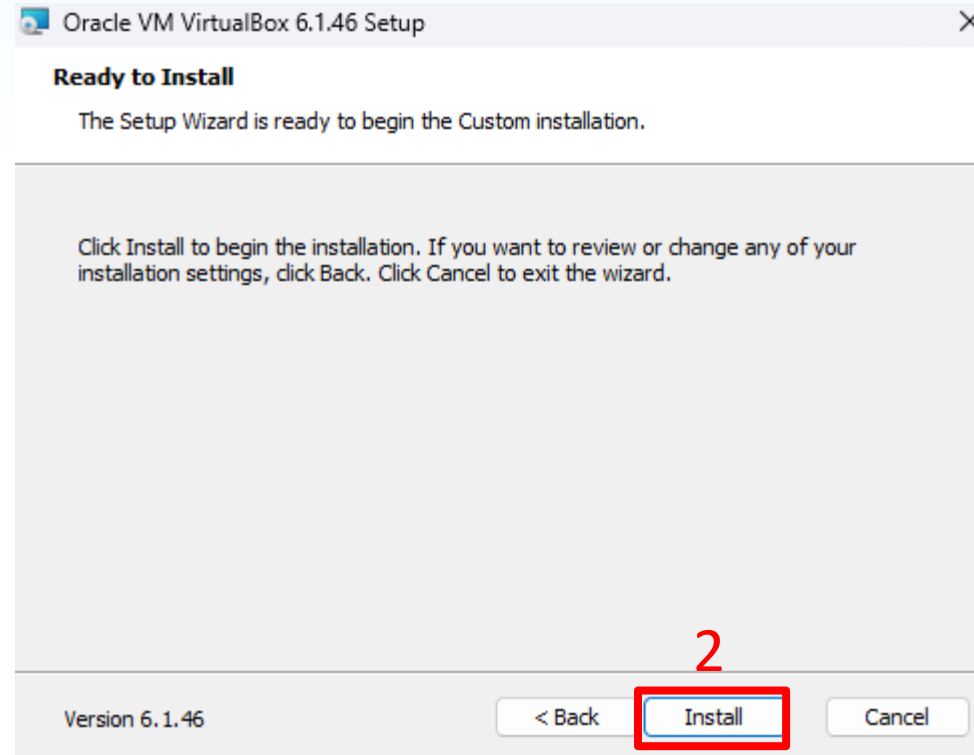


Change installation path if you want

VirtualBox Installation (4/7)



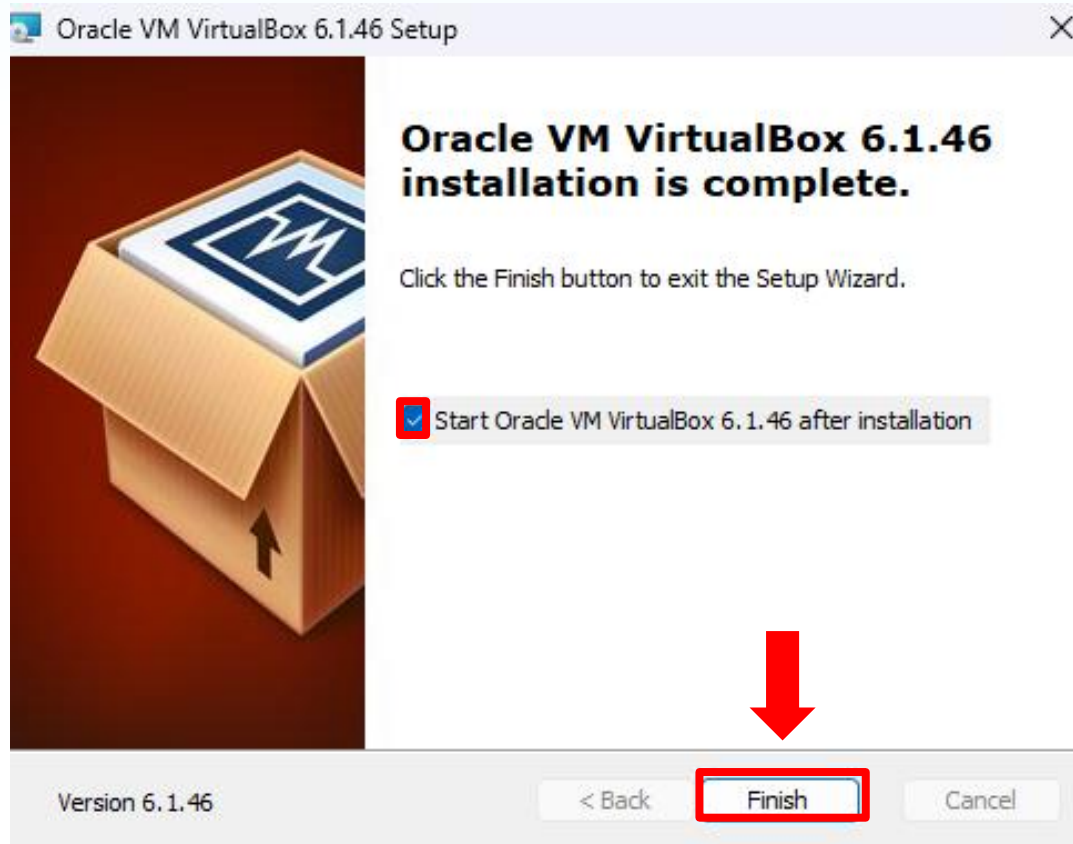
VirtualBox Installation (5/7)



VirtualBox Installation (6/7)



VirtualBox Installation (7/7)



Outline

- Experiment Environment
- Installation
 - VirtualBox 6.1.46
 - Add VM
 - Download image file
 - Virtual machine setting
 - Ubuntu installation
 - SDN development environment

Download image file (1/10)

- Download image file (.iso) first
 - <https://www.ubuntu-tw.org/modules/tinyd0/>
 - **Ubuntu Desktop 22.04**

The screenshot shows the Ubuntu Taiwan website's download page. The top navigation bar includes links for '下載' (Download), '新聞' (News), '論壇' (Forum), '星球' (Planet), 'Wiki', and '聯絡我們' (Contact Us). Below this is a secondary navigation bar with links to '下載 Ubuntu', 'Ubuntu 行為規範 (第二版)', 'Ubuntu@Taiwan 論壇規範', and 'IRC 聊天室'. A Google search bar is also present. The main content area is titled 'Ubuntu 行為規範 (第二版)' and '下載 Ubuntu'. It is divided into four columns: '發行版' (Edition), '版本' (Version), '電腦架構' (Architecture), and '下載選項' (Download Options). In the '發行版' column, 'Ubuntu 桌面版本' (Ubuntu Desktop) is selected. In the '版本' column, '22.04 LTS (5 + 5 年支援)' is selected. In the '電腦架構' column, '64 位元版本' (64-bit) is selected. In the '下載選項' column, the '開始下載' (Start Download) button is highlighted, along with the checkbox for '下載 BitTorrent 種子' (Download BitTorrent seeds). Below the '開始下載' button, there is a link to '或是 至此瀏覽所有版本及檔案' (Or, click here to view all versions and files).

ubuntu® 正體中文站

下載 新聞 論壇 星球 Wiki 聯絡我們

下載 Ubuntu Ubuntu 行為規範 (第二版) Ubuntu@Taiwan 論壇規範 IRC 聊天室

經 Google 技術強化

Ubuntu 行為規範 (第二版)

下載 Ubuntu

發行版

☒ Ubuntu 桌面版本
☐ Ubuntu 伺服器版本

不同發行版具備不同的圖形環境與配套軟體。如果您不知道如何選擇，請選擇 Ubuntu 桌面版本。

版本

☒ 22.04 LTS (5 + 5 年支援)
☐ 20.04 LTS (5 + 5 年支援)
☐ 18.04 LTS (5 + 5 年支援)
☐ 16.04 LTS (5 + 5 年支援)
☐ 14.04 LTS (5 + 5 年支援)

其他版本請至[檔案伺服器](#)直接挑選下載。

LTS (Long Time Support) 版本包含 5 年完整支援 + 5 年延伸安全性維護支援 (ESM, Extended

電腦架構

☐ 32 位元版本
☒ 64 位元版本

目前一般電腦大多使用 64 位元架構，故從 18.04 開始，桌面版也將不再提供 32 位元版本。另外，目前在下載區無 Mac 版本可下載。

下載選項

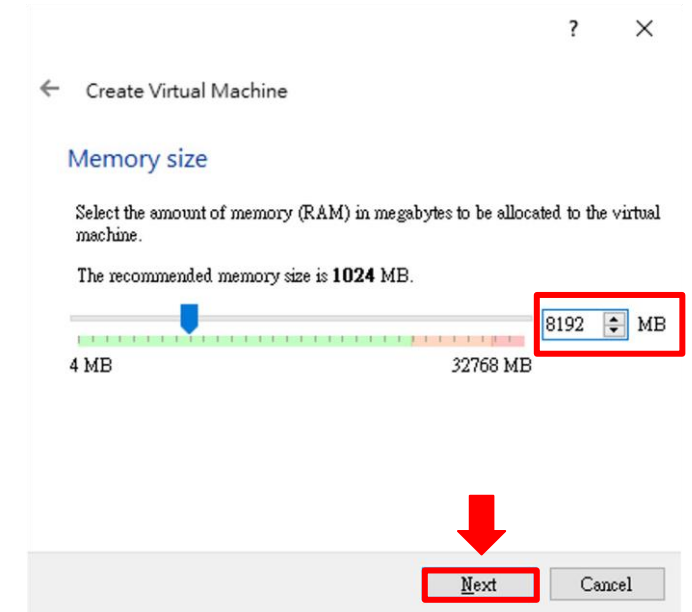
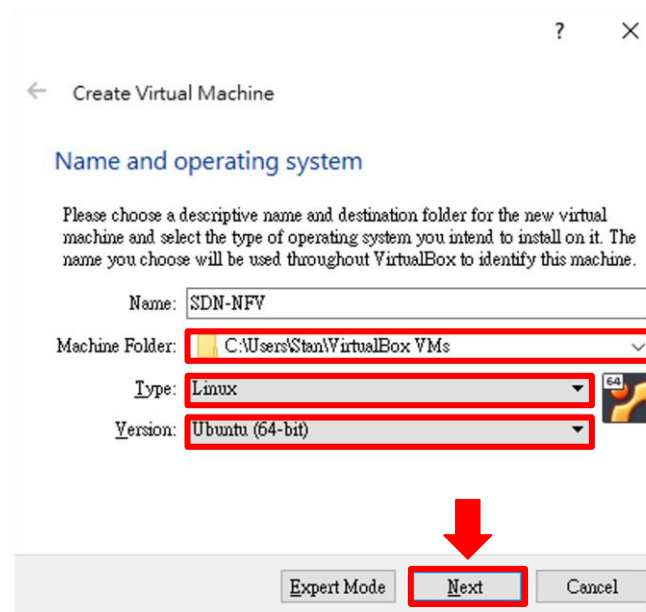
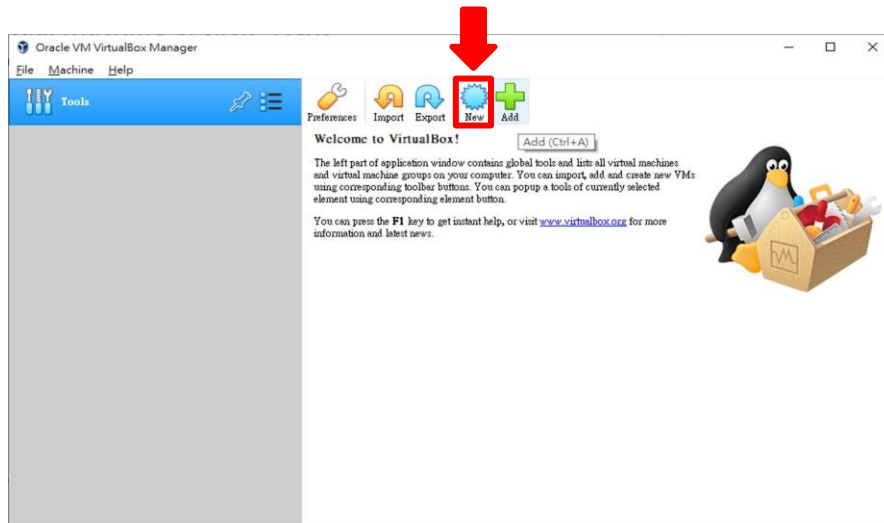
☐ 下載 BitTorrent 種子

[開始下載](#)

或是 [至此瀏覽所有版本及檔案](#)

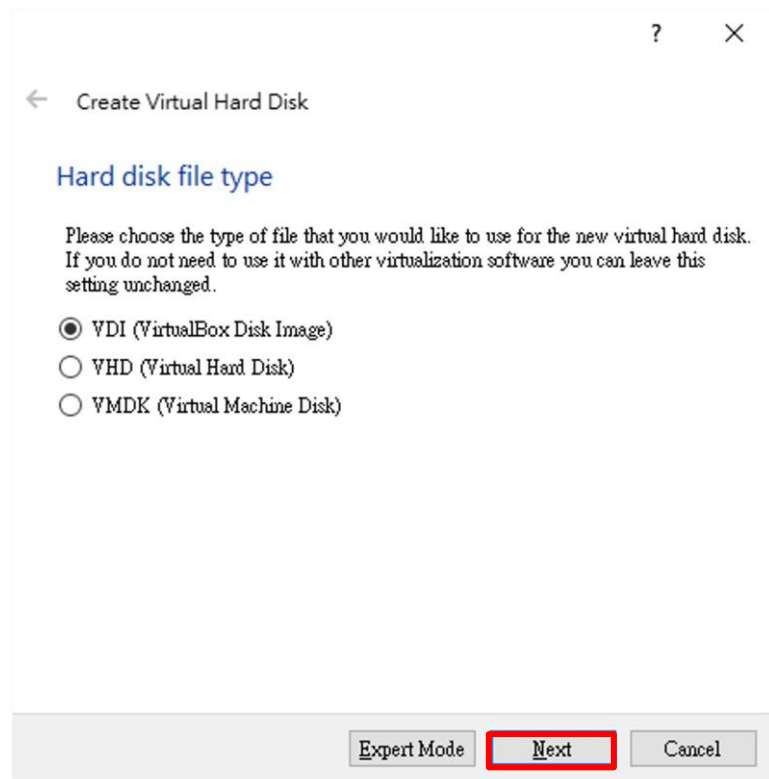
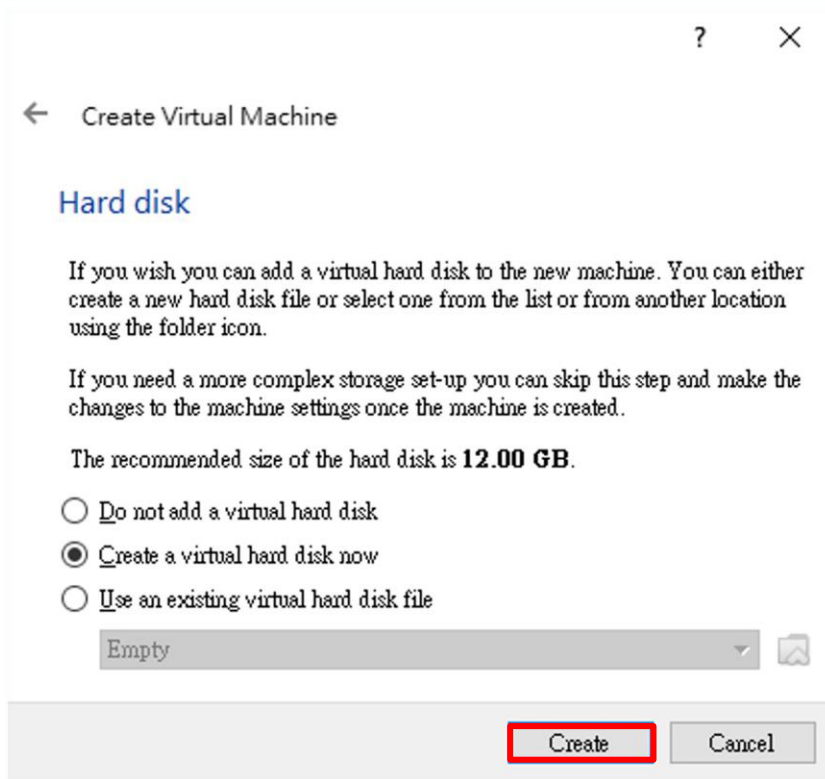
Virtual machine setting (2/10)

1. Start VirtualBox & Click “New”
2. Name the virtual machine (SDN-NFV), then click “Next”
3. Adjust the memory size to 8192MB, then click “Next”



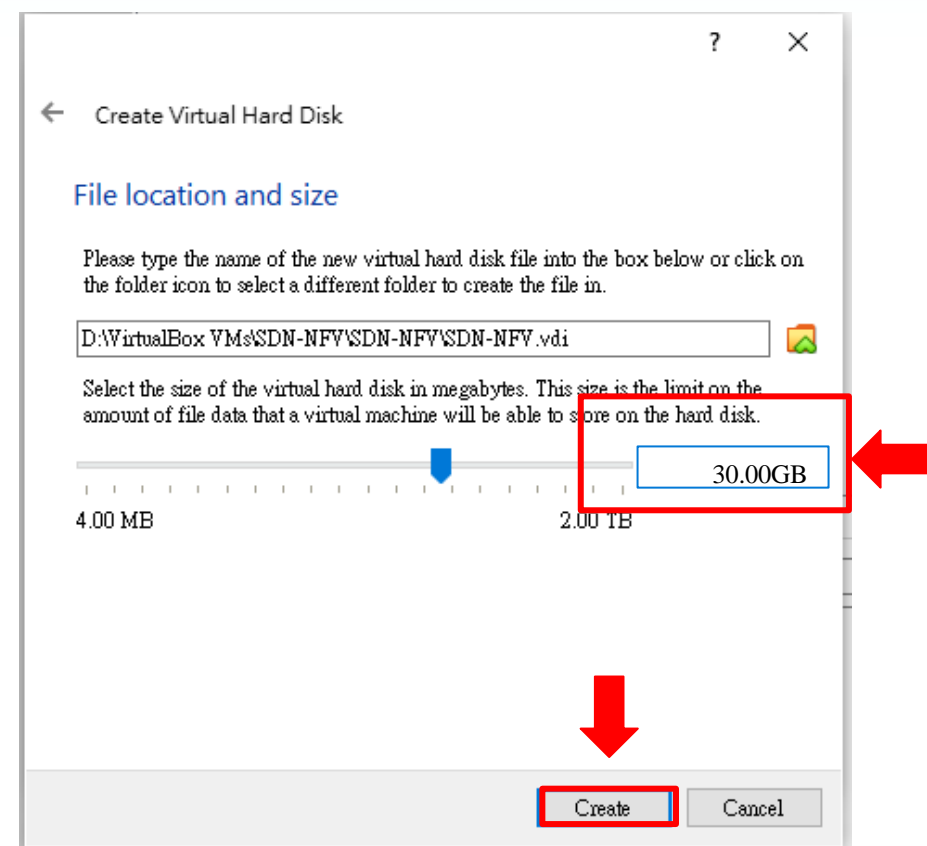
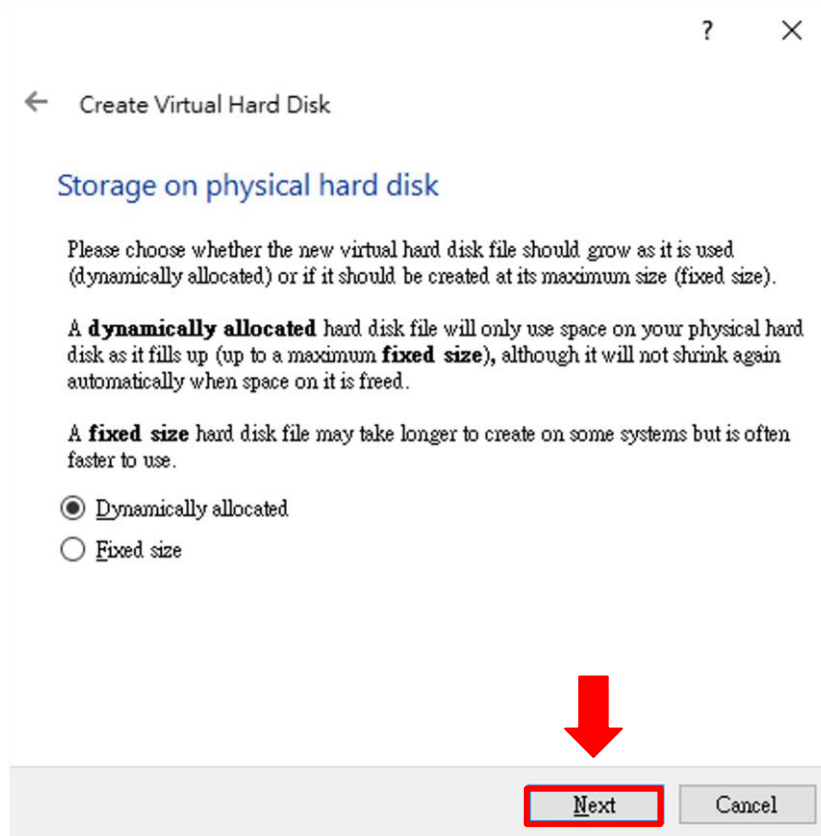
Virtual machine setting (3/10)

1. Click “Create”
2. Click “Next”



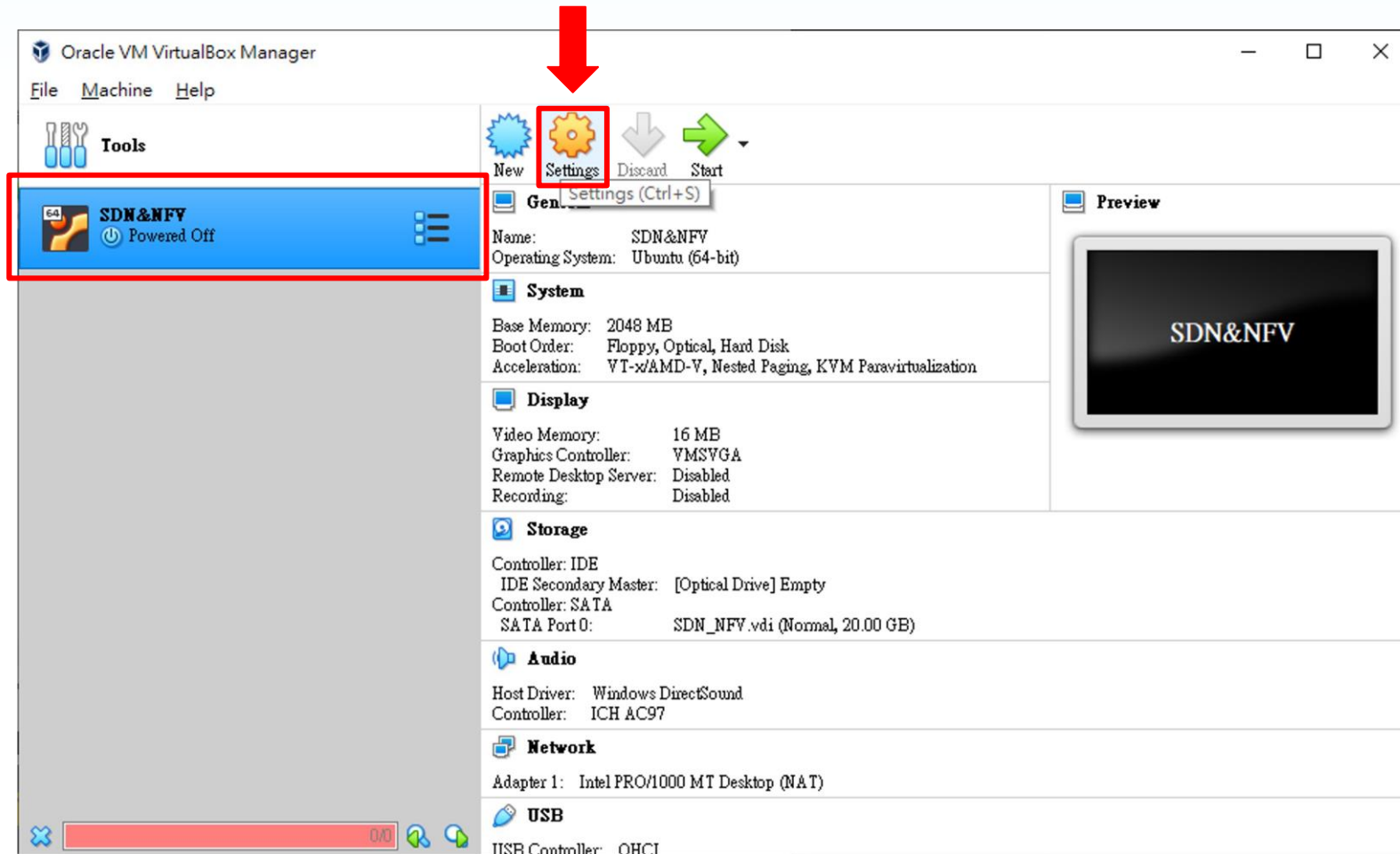
Virtual machine setting (4/10)

1. Click “Next”
2. Adjust the size of virtual HD to **30GB**, then click “Create”



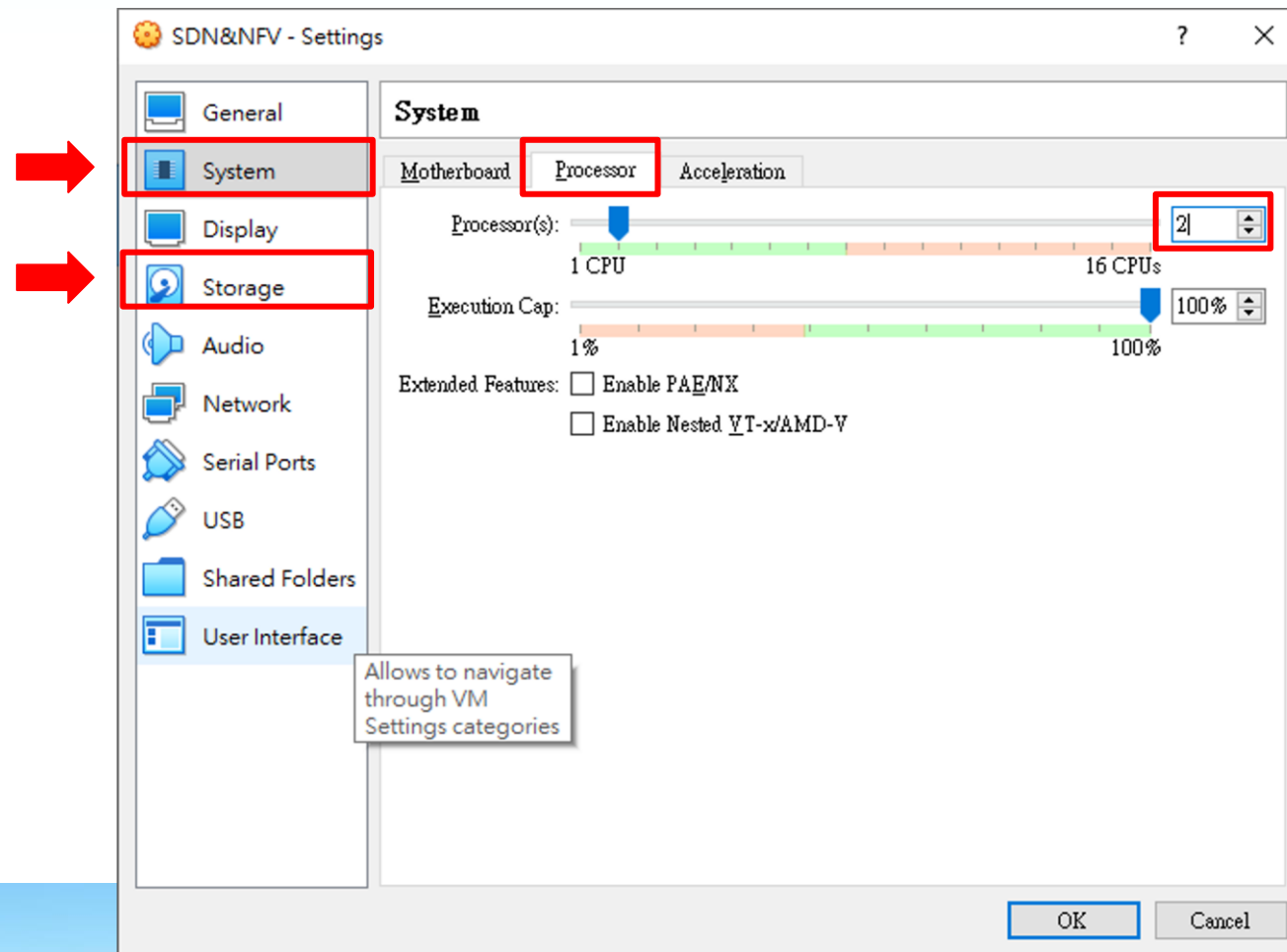
Virtual machine setting (5/10)

- Click “Settings”



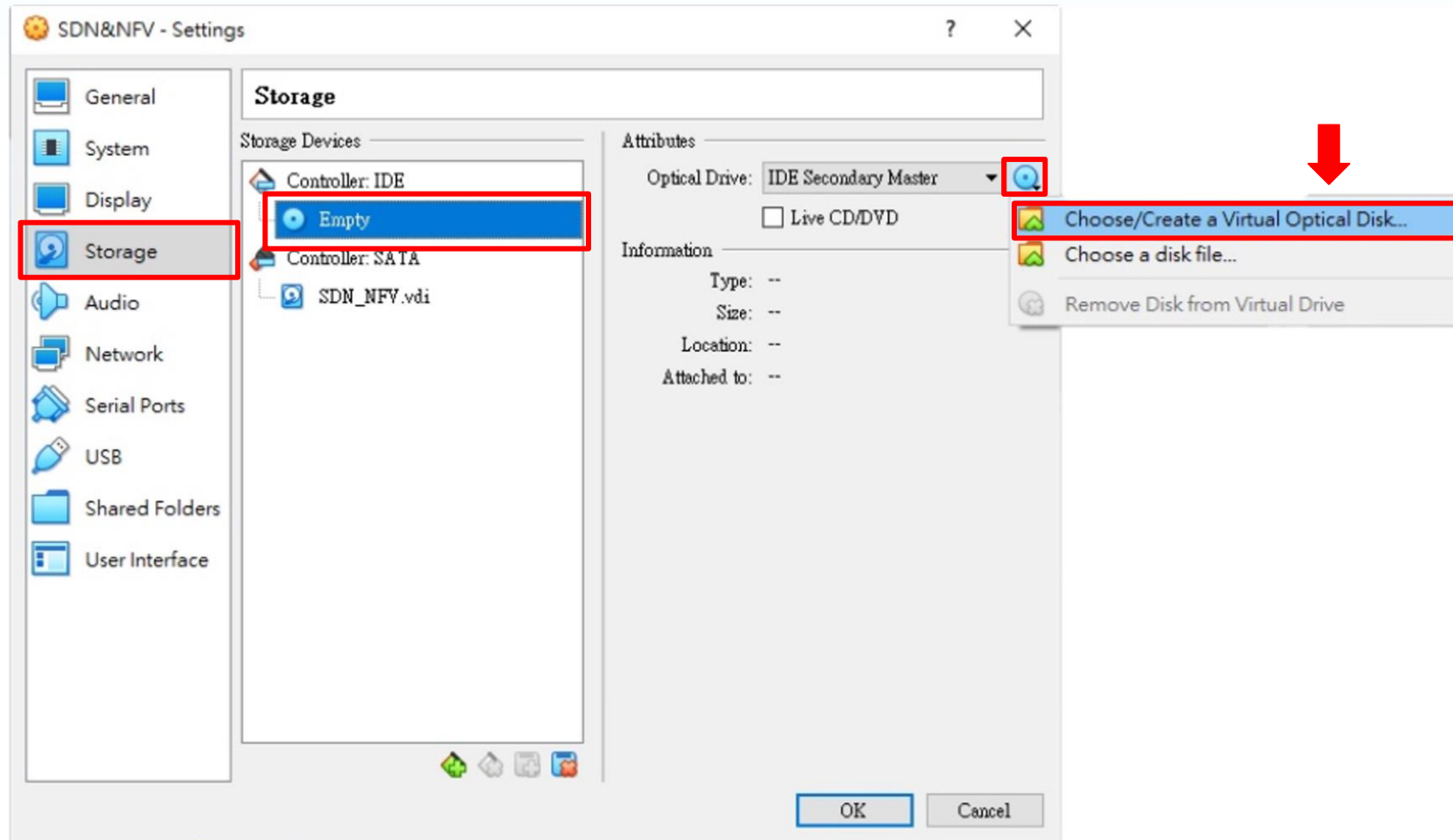
Virtual machine setting (6/10)

- System > Processor
 - Set 2 CPUs, then click “Storage”



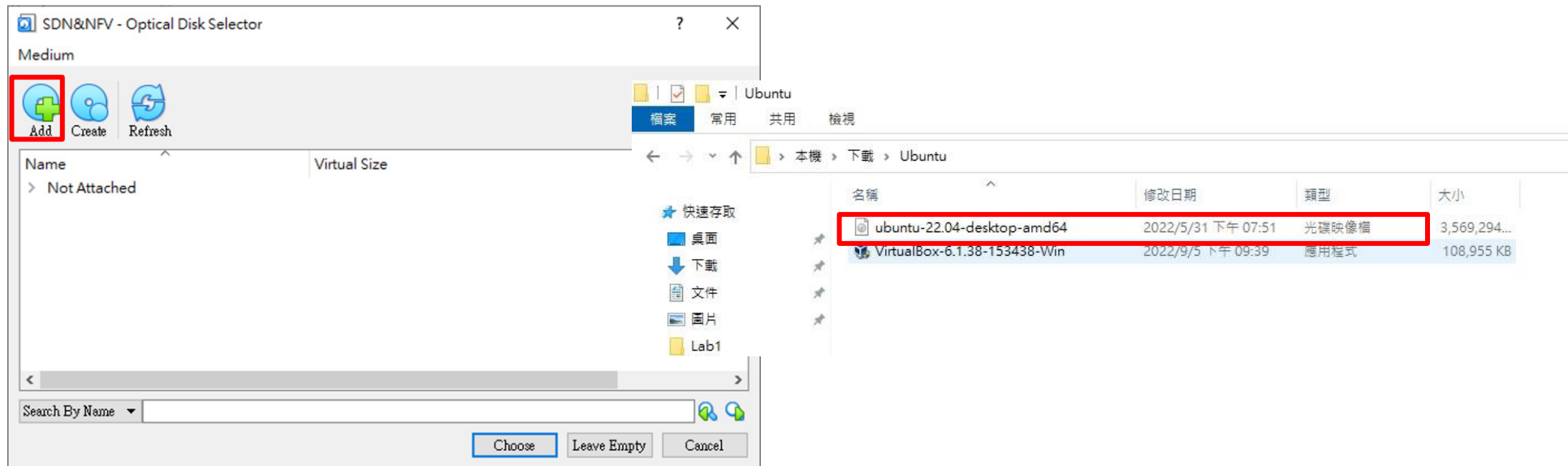
Virtual machine setting (7/10)

- Storage > Controller: IDE



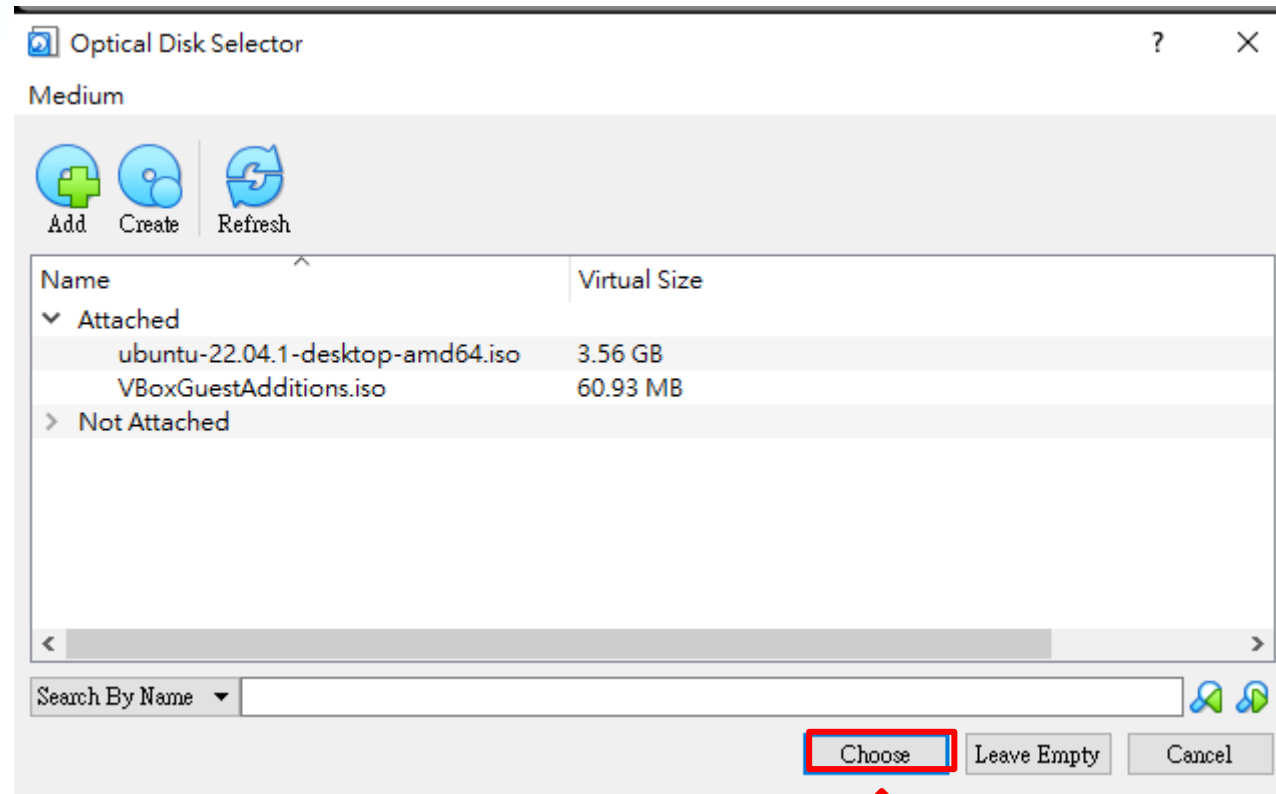
Virtual machine setting (8/10)

1. Click “Add”
2. Choose the previously downloaded image file (.iso)
3. Click “Open”



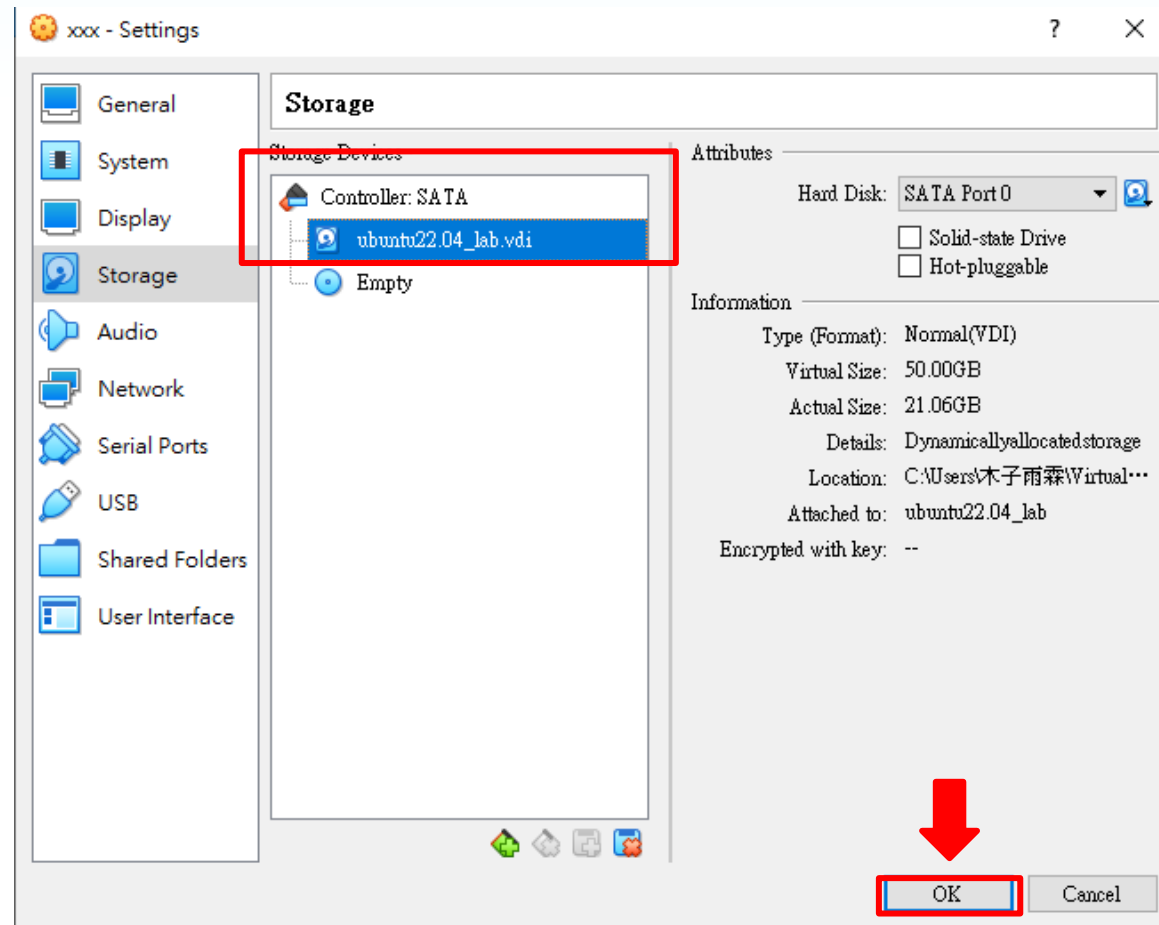
Virtual machine setting (9/10)

- Click “Choose”



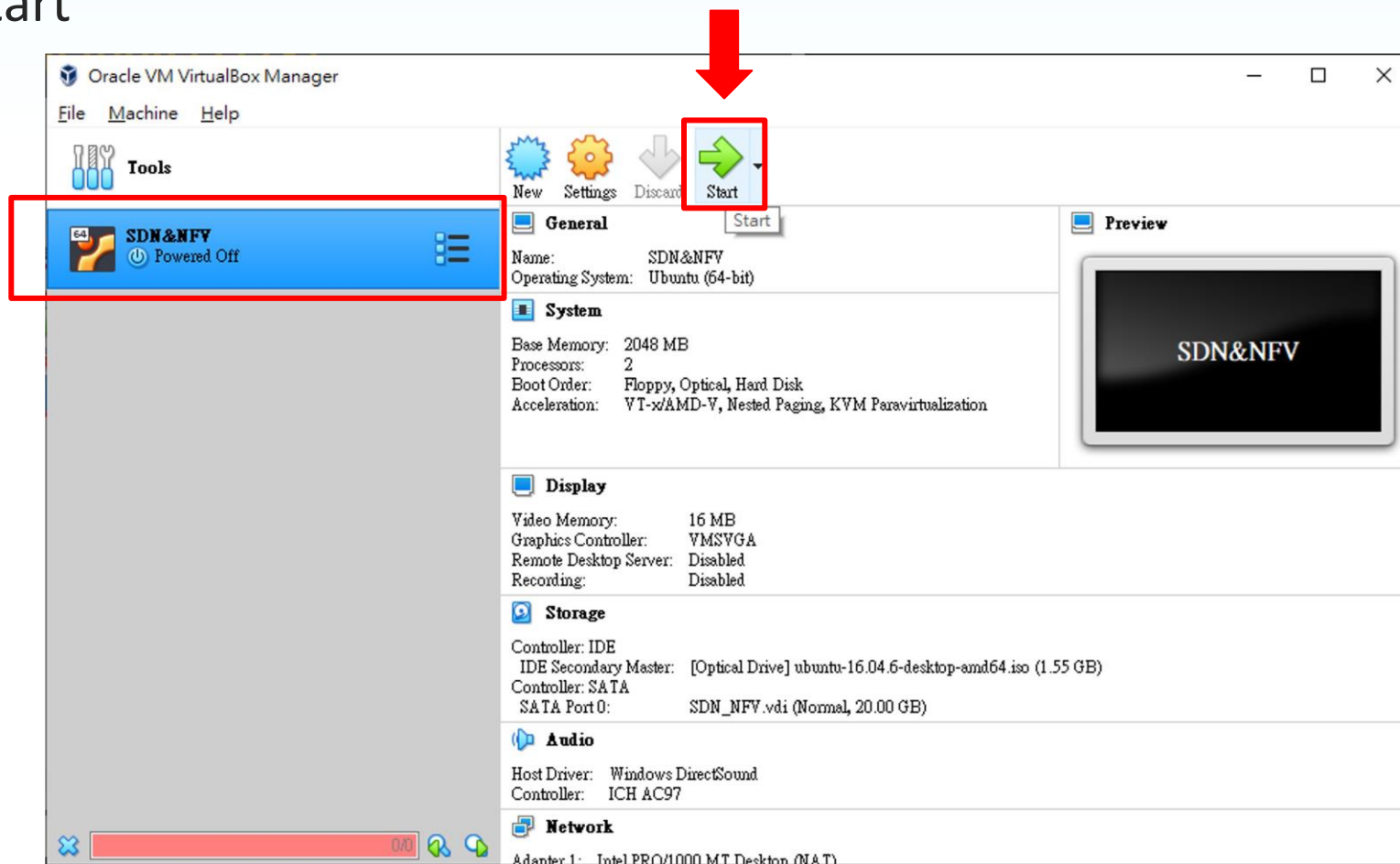
Virtual machine setting (10/10)

- Make sure all settings are right, then click “OK”



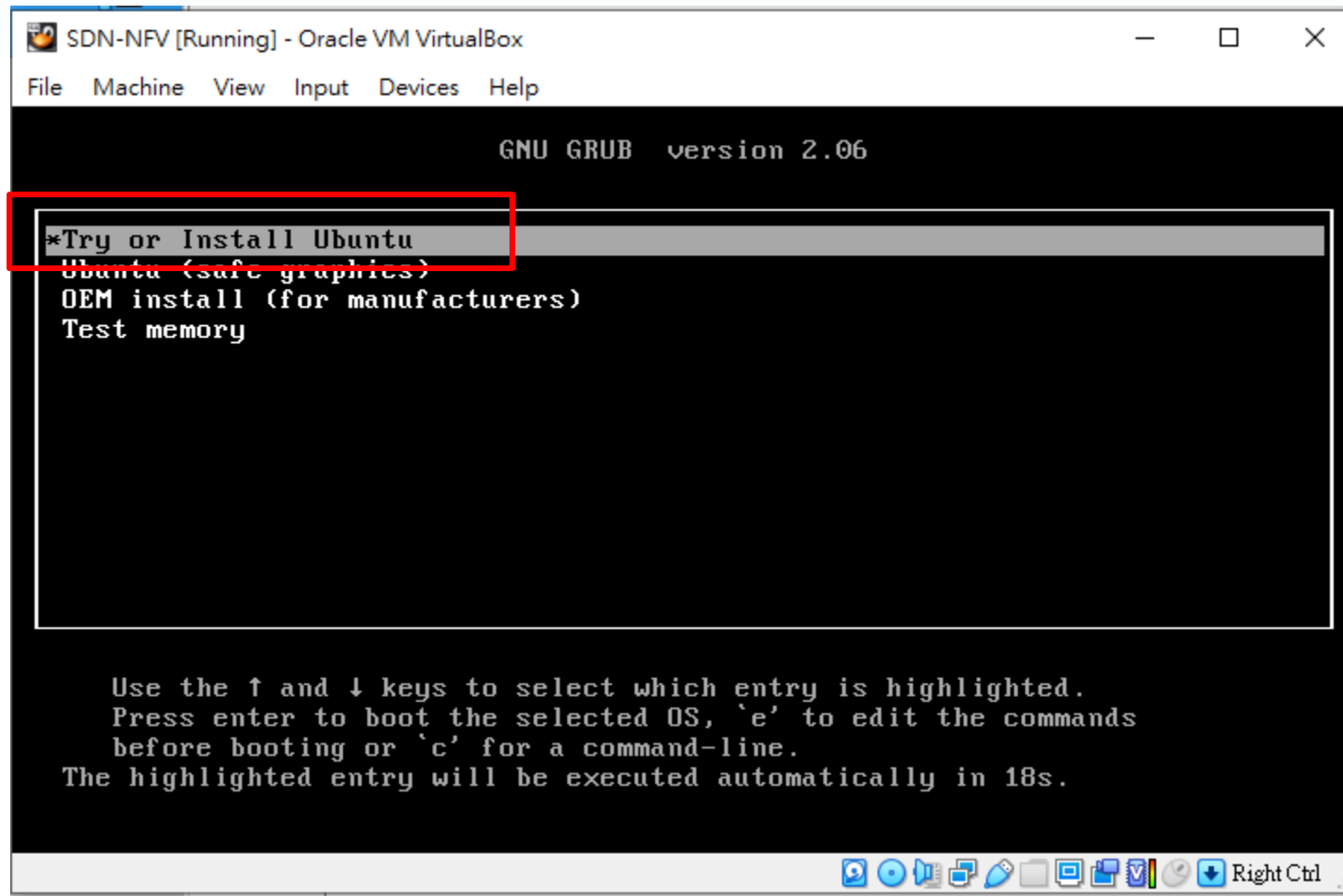
Ubuntu Installation (1/12)

- Click “Start”

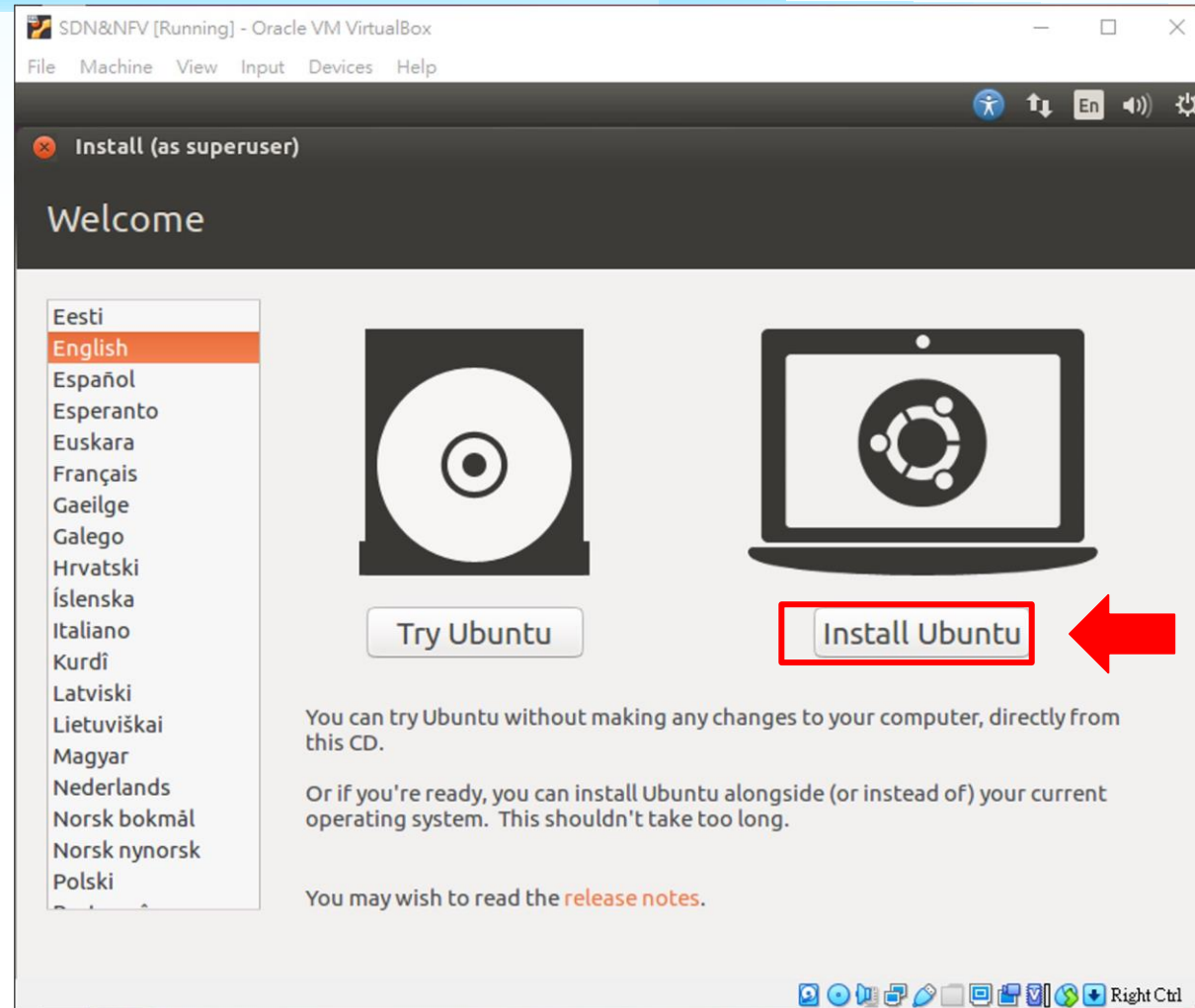


Ubuntu Installation (2/13)

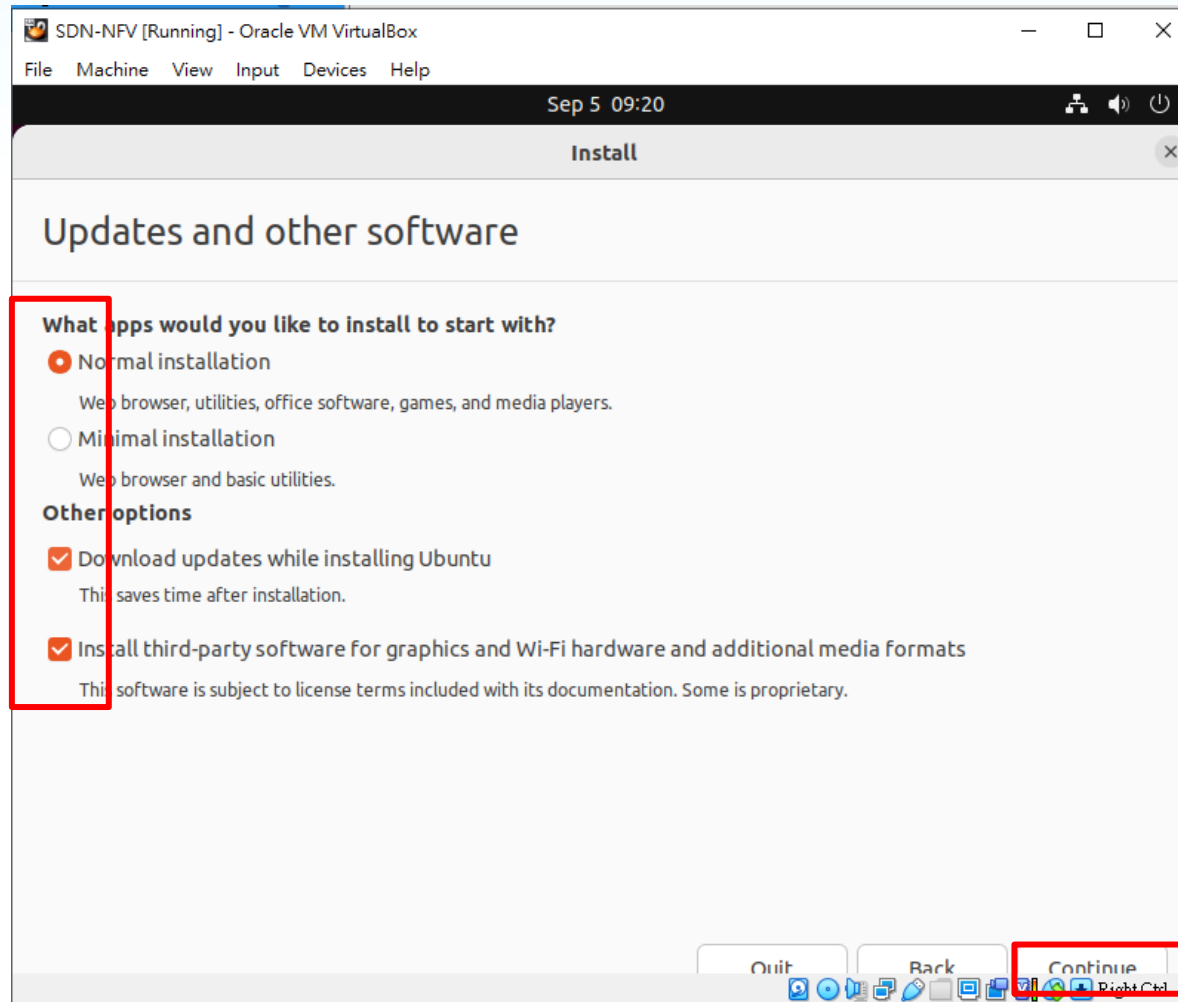
Choose “Try or install Ubuntu” and press “Enter”



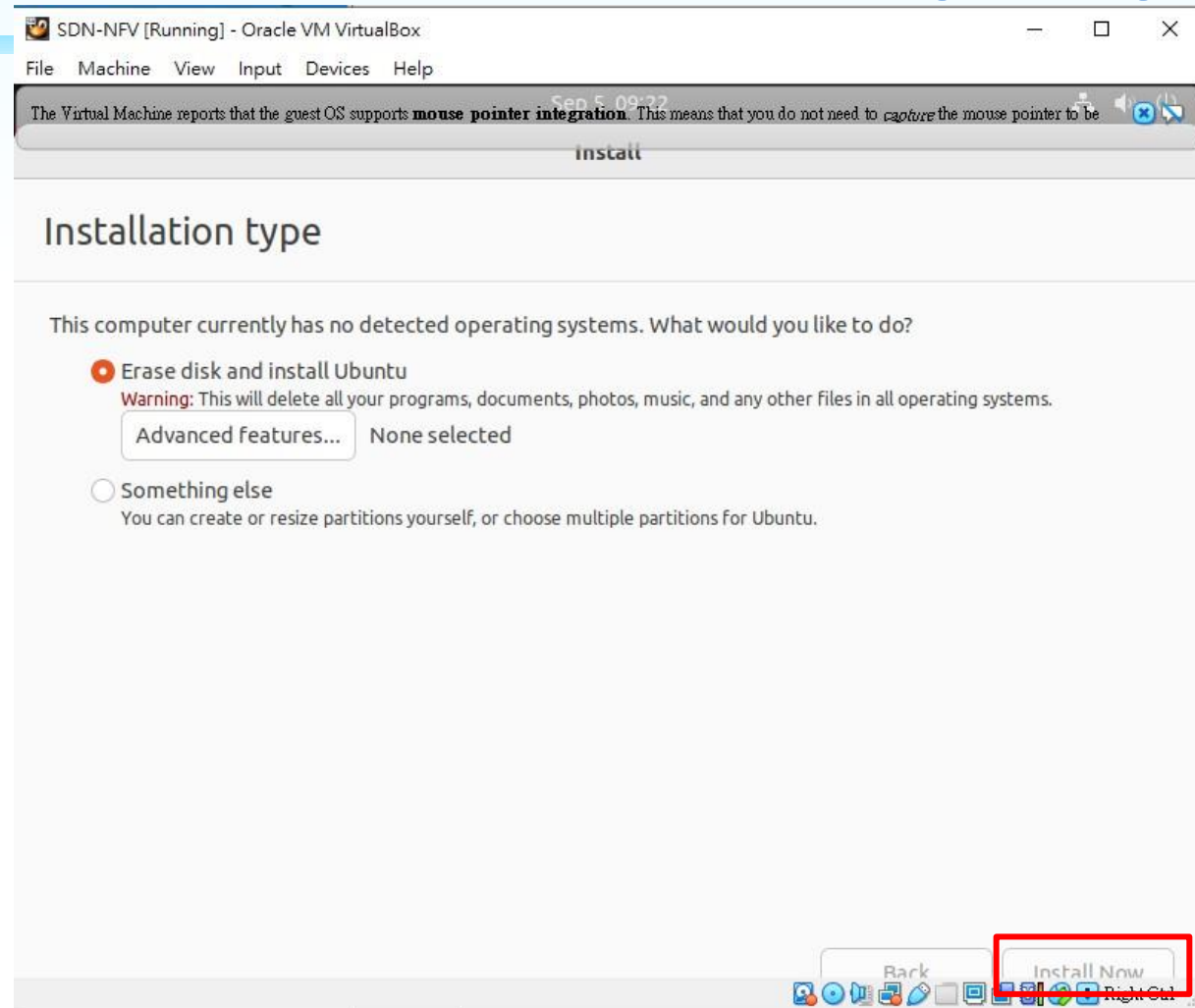
Ubuntu Installation (3/13)



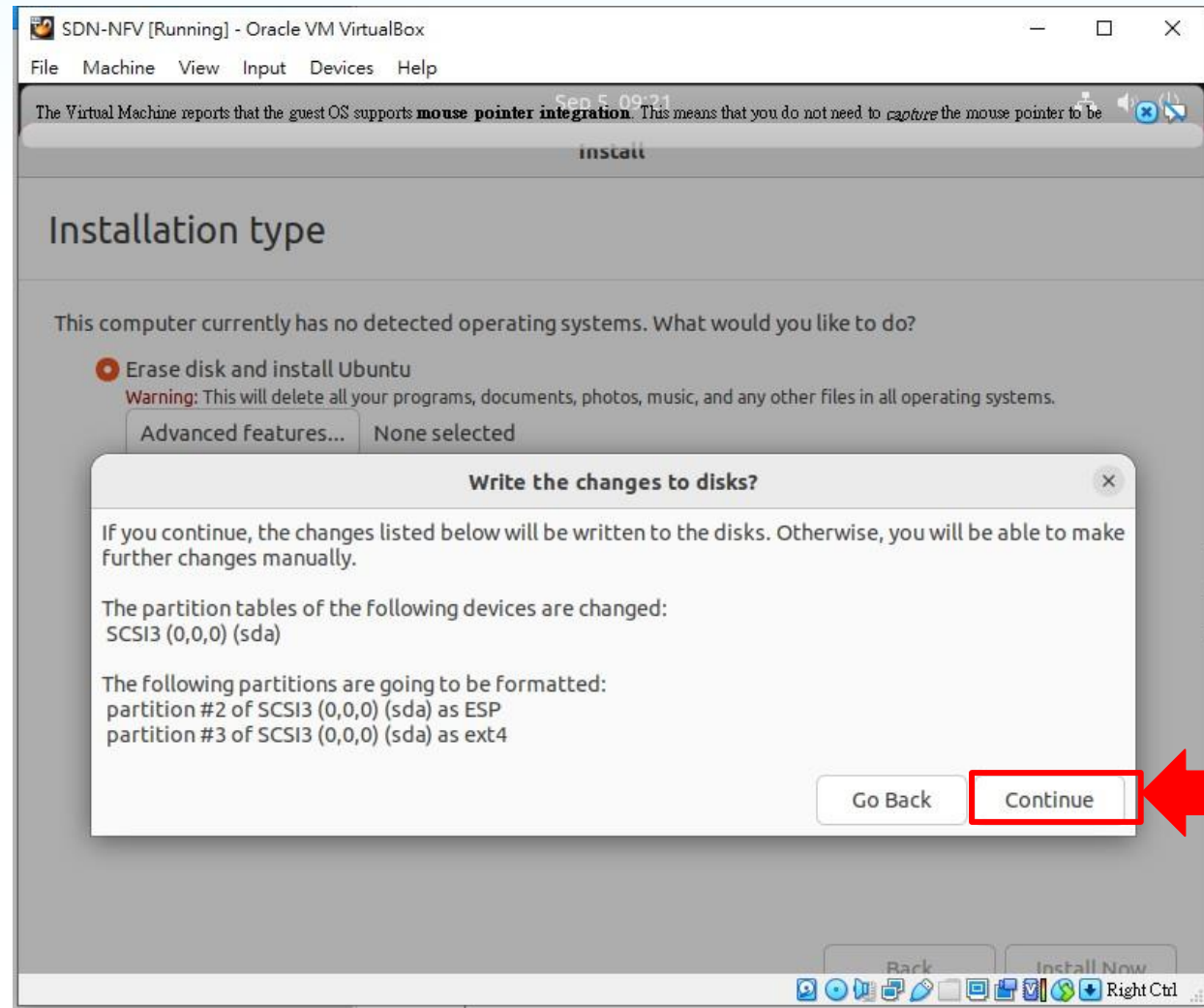
Ubuntu Installation (4/13)



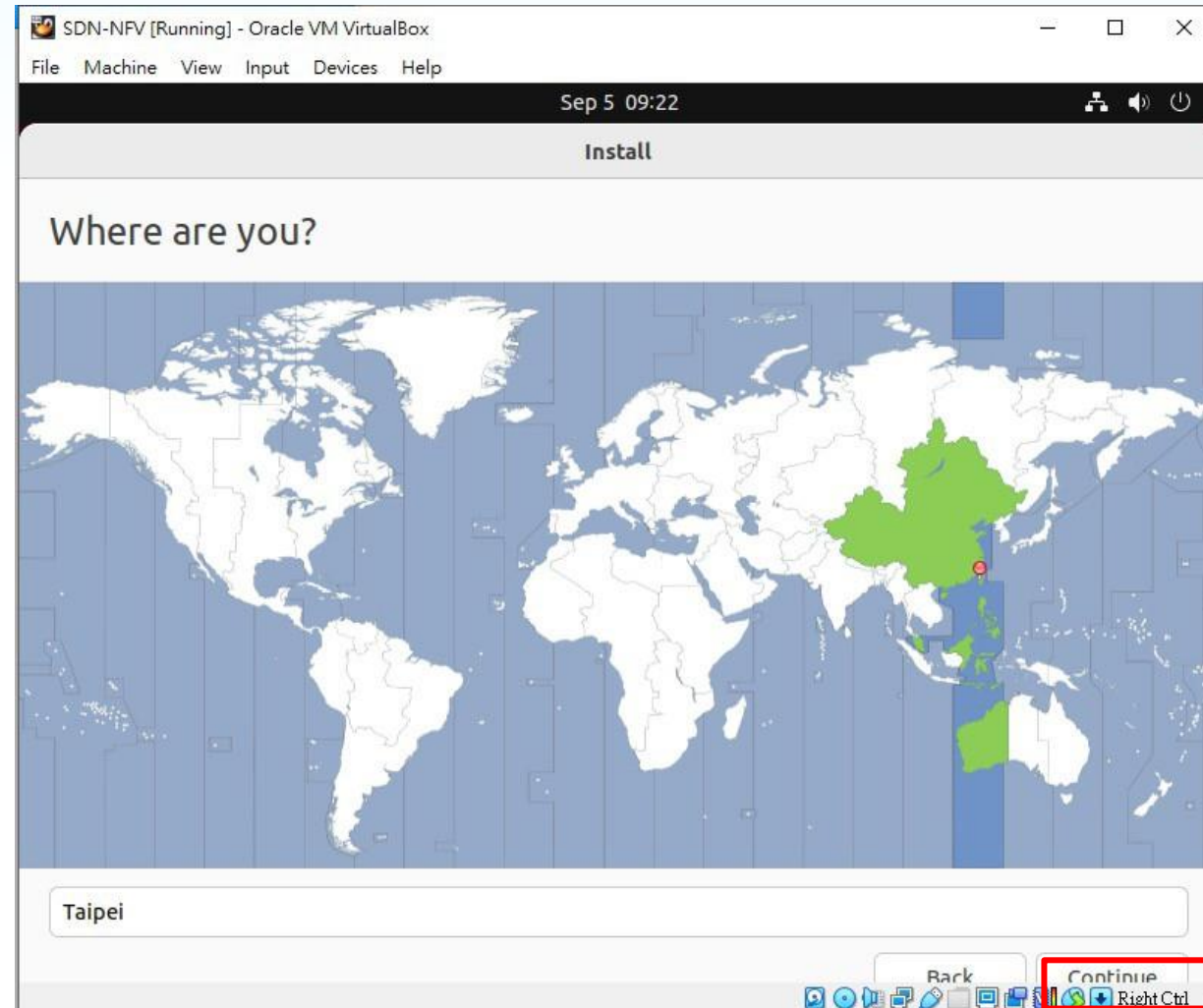
Ubuntu Installation (5/13)



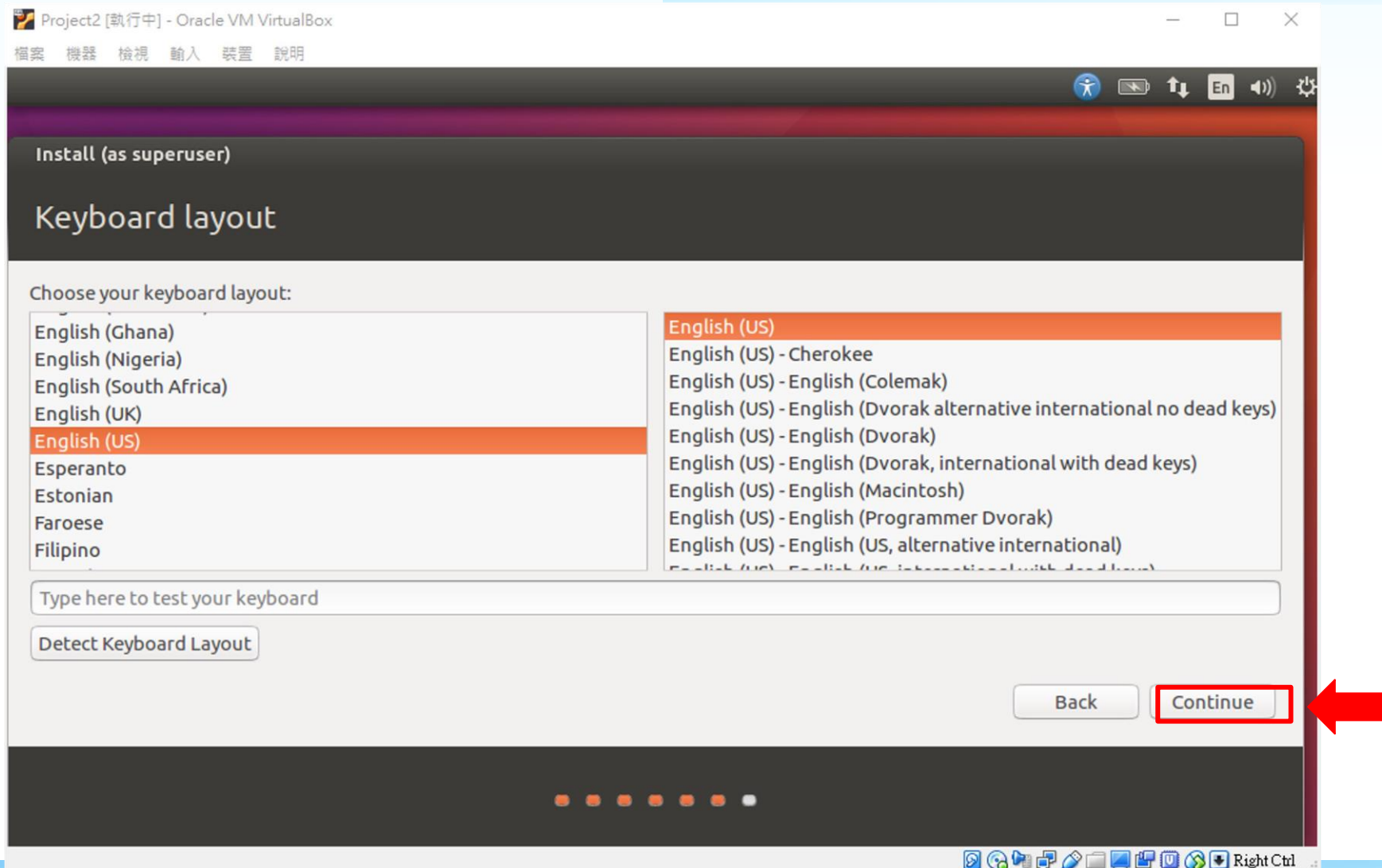
Ubuntu Installation (6/13)



Ubuntu Installation (7/13)



Ubuntu Installation (8/13)



Ubuntu Installation (9/13)

SDN&NFV [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Your name: demo ✓

Your computer's name: SDN-NFV ✓
The name it uses when it talks to other computers.

Pick a username: demo ✓

Choose a password: ●●●● Short password

Confirm your password: ●●●● ✓

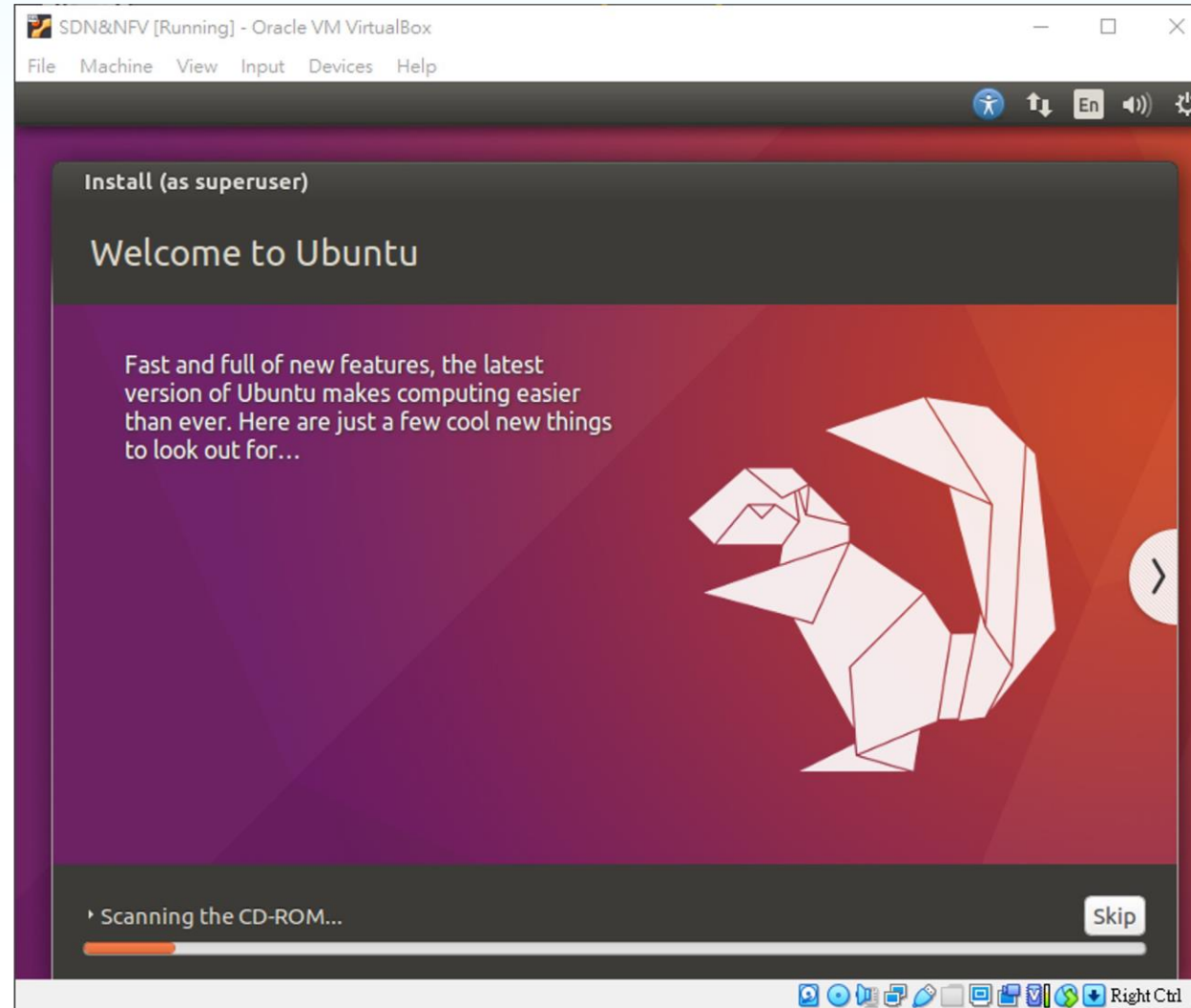
☐ Log in automatically

☒ Require my password to log in

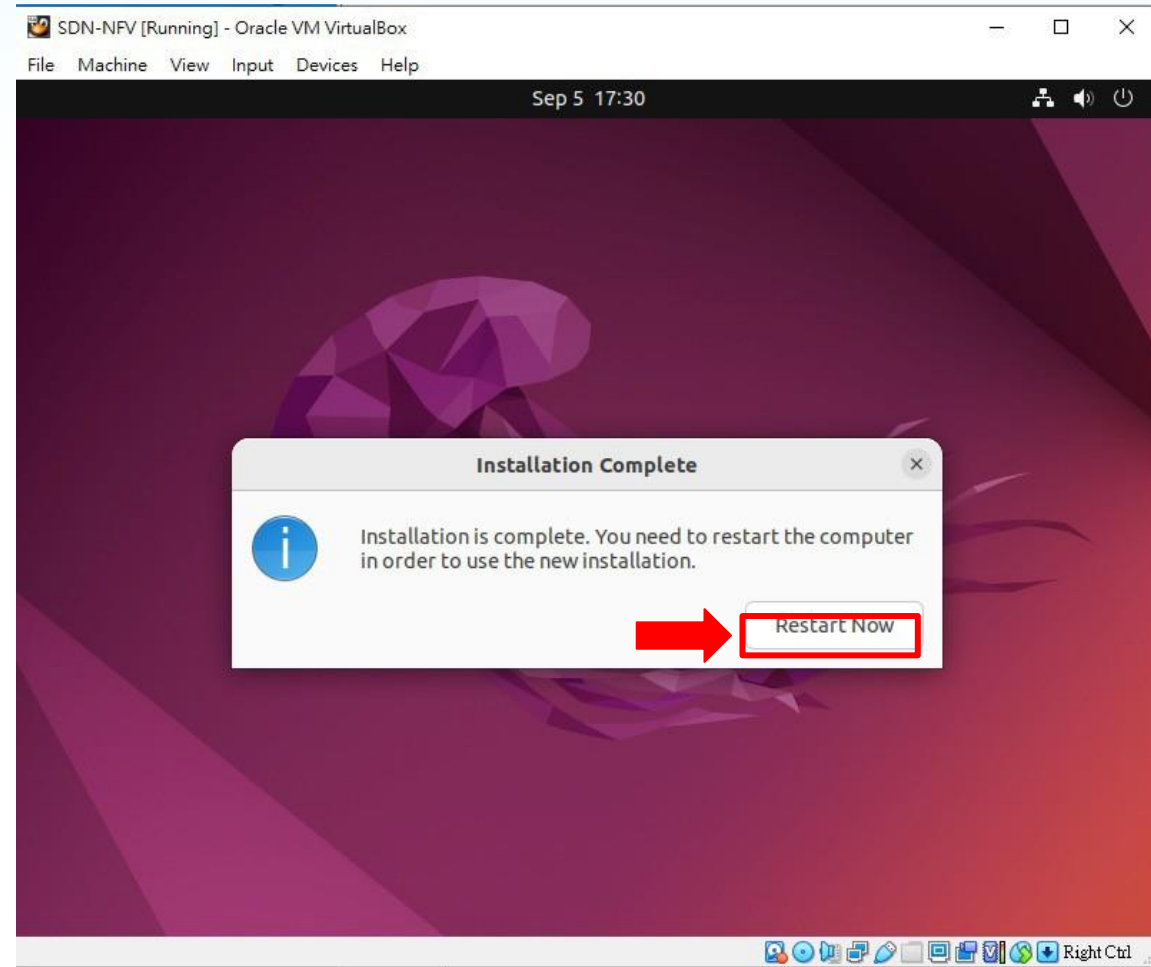
☐ Encrypt my home folder

Back Continue

Ubuntu Installation (10/13)

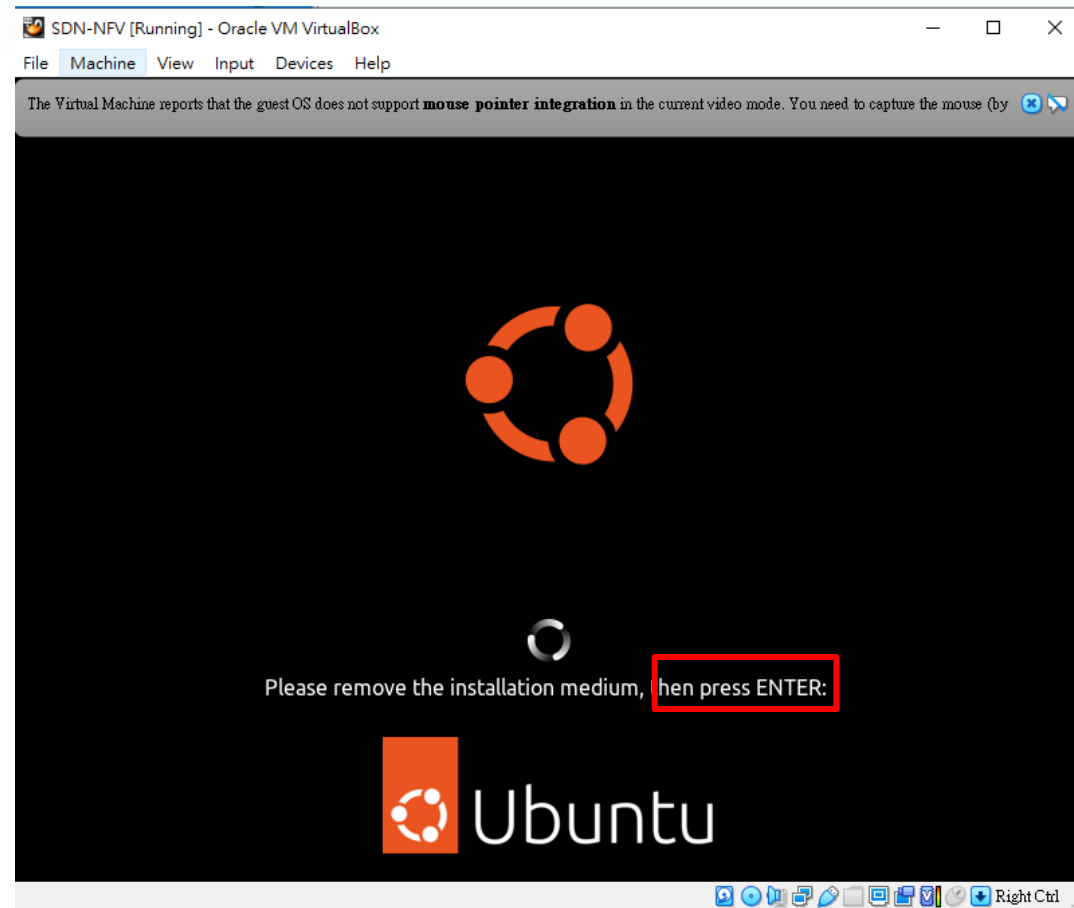


Ubuntu Installation (11/13)

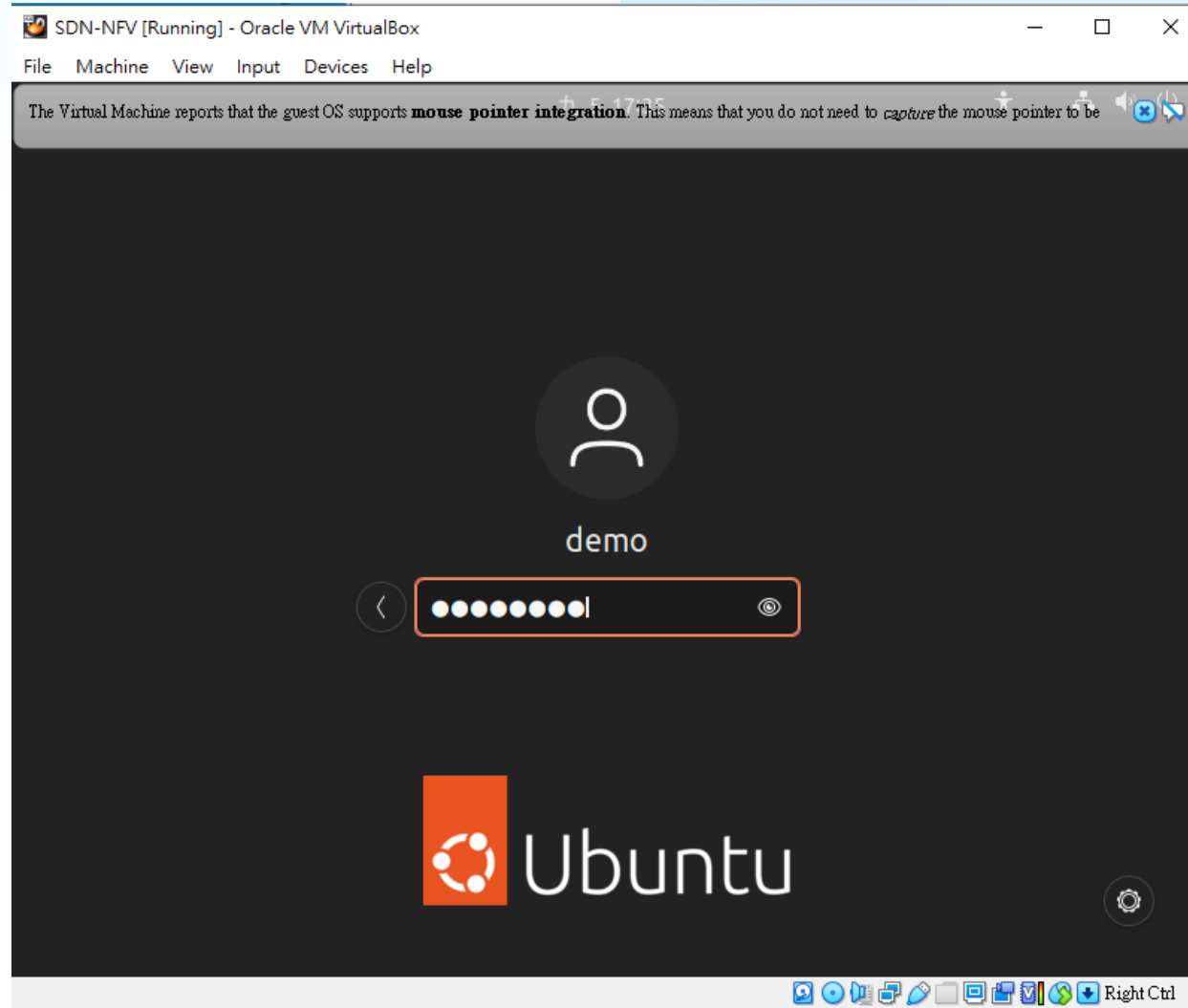


Ubuntu Installation (12/13)

- Press “Enter”, then VM will restart



Ubuntu Installation (13/13)

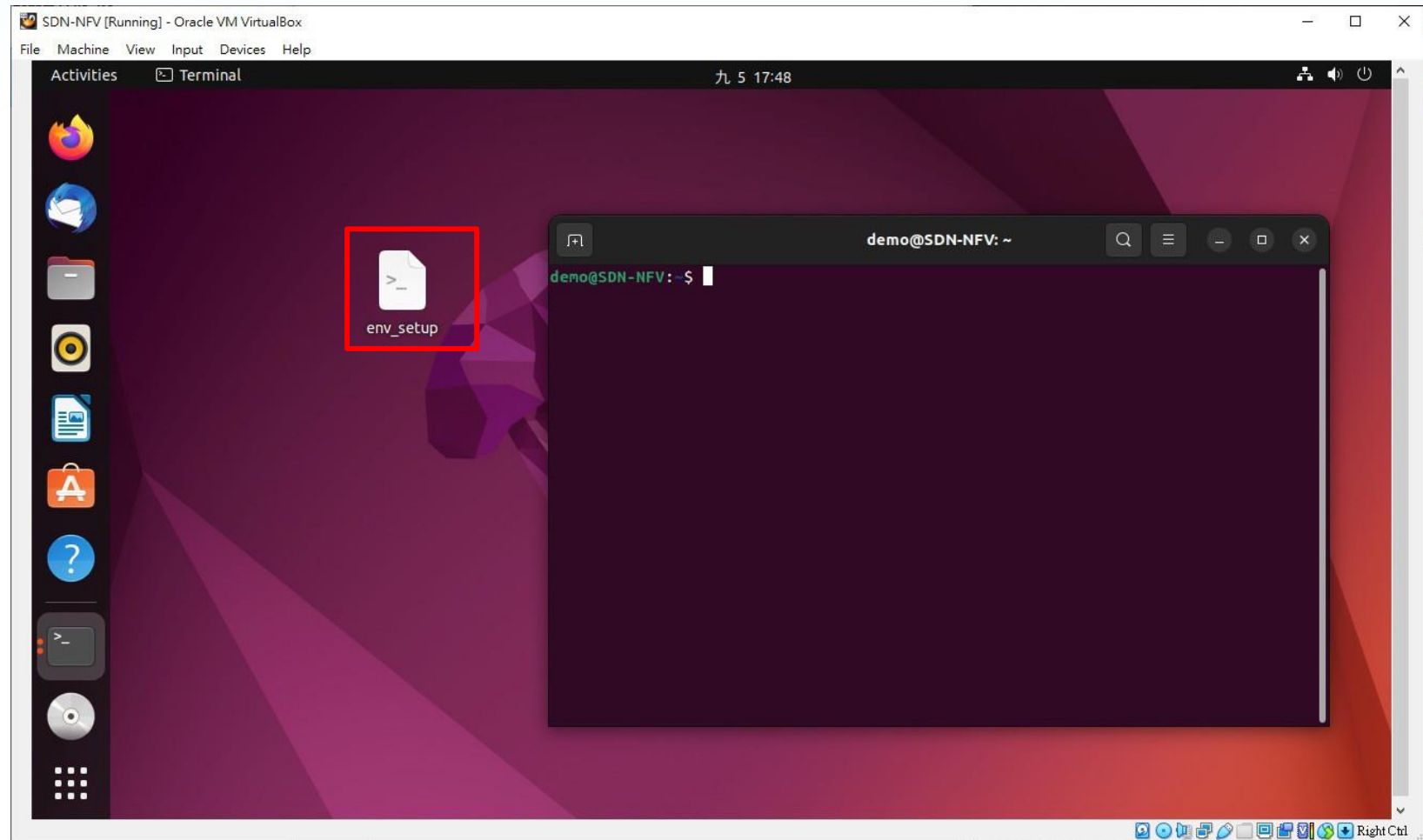


Outline

- Experiment Environment
- Installation
 - VirtualBox 6.1.2
 - Add VM
 - SDN development environment

SDN development environment (1/4)

- Download “env_setup” from e3
- Open terminal



SDN development environment (2/4)

- ❑ Go to directory where the “env_setup” is

```
$ cd ~/Desktop
```

- ❑ Change file permission to execute

```
$ chmod +x env_setup
```

- ❑ Execute the shell script

```
$ ./env_setup
```

```
demo@SDN-NFV:~$ cd ~/Desktop/  
demo@SDN-NFV:~/Desktop$ chmod +x env_setup.sh  
demo@SDN-NFV:~/Desktop$ ./env_setup.sh  
[sudo] password for demo: █
```


SDN development environment (3/4)

- ❑ It will take around 20 minutes (or more)
- ❑ Shell script will automatically install:
 - Bazelisk 1.12.0
 - ONOS 2.7.0
 - Mininet 2.3.0
 - OvS 2.17.2

SDN development environment (4/4)

- ❑ If the installation complete, you'll see finish message

```
make[1]: Leaving directory '/home/demo/ovs'
Start registering Open vSwitch service...
Created symlink /etc/systemd/system/multi-user.target.wants/ovs.service → /etc/s
ystemd/system/ovs.service.
Finished the installation of Open vSwitch.
*****
* The environment setup finished successfully! *
*****
demo@SDN-NFV:~/Desktop$
```

- ❑ Run the command

```
demo@SDN-NFV:~$ source ~/.bashrc
```

- ❑ After this, you have finished your environment setup