



# SDN Environment Setup

Install ONOS in VM

# Outline

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- Objective
- Experiment Environment
- Installation
  - VirtualBox 6.1.38
  - Add VM
  - SDN development environment

# Objective

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- 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

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# Experiment Environment

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- Ubuntu Desktop **22.04**
- Minimum Hardware Requirements:
  - **2 Cores (CPUs)**
  - **8GB RAM**
  - **25GB HDD**

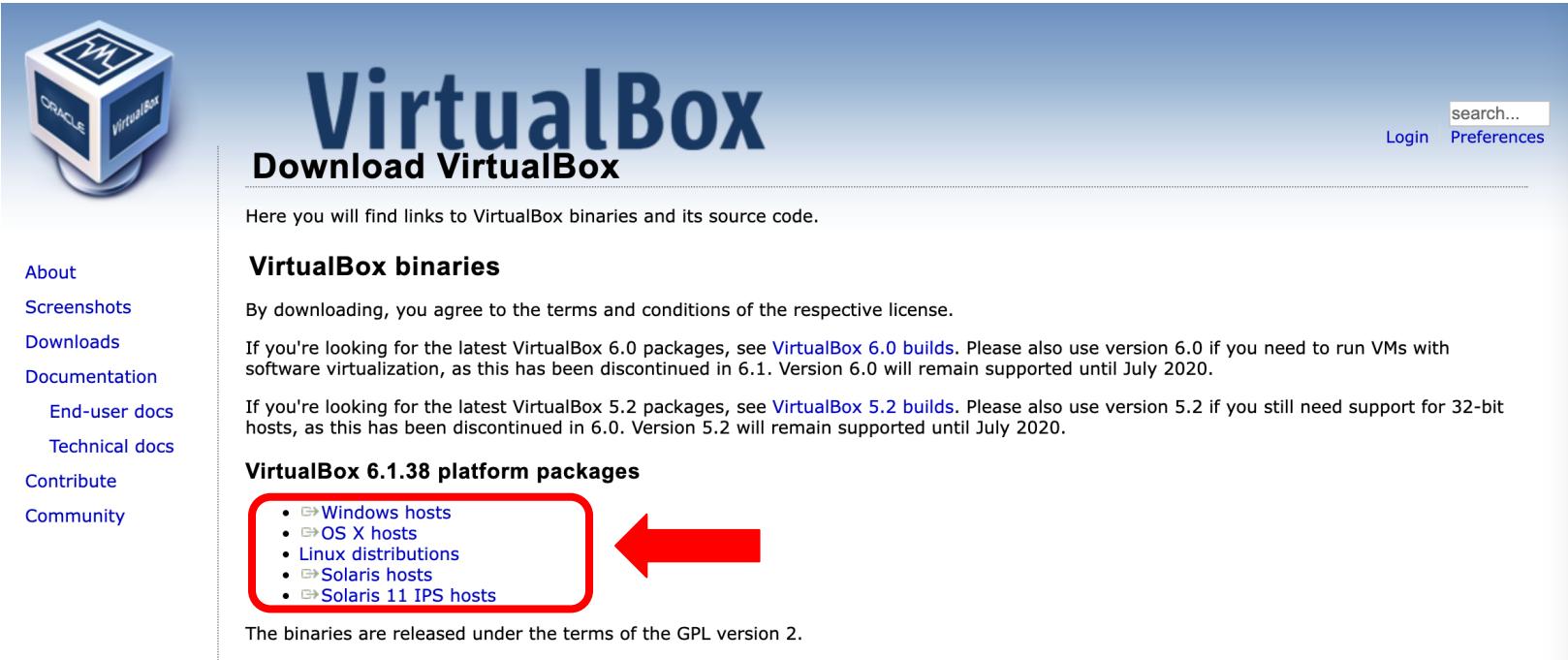
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# VirtualBox Installation (1/7)

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



The screenshot shows the official Oracle VirtualBox download page. At the top left is the VirtualBox logo. The main title is "VirtualBox" with "Download VirtualBox" below it. To the right are search, login, and preferences links. On the left, a sidebar lists links: About, Screenshots, Downloads, Documentation, End-user docs, Technical docs, Contribute, and Community. The main content area starts with a note about finding binaries and source code. It then has a section titled "VirtualBox binaries" with a note about agreeing to terms and conditions. Below that, it discusses the latest 6.0 builds and the discontinued 6.1 builds. Another section discusses the latest 5.2 builds. At the bottom, there's a section for "VirtualBox 6.1.38 platform packages" which includes a list of host types: Windows hosts, OS X hosts, Linux distributions, Solaris hosts, and Solaris 11 IPS hosts. This list is enclosed in a red box and has a red arrow pointing to it from the left.

Here you will find links to VirtualBox binaries and its source code.

### VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 6.0 packages, see [VirtualBox 6.0 builds](#). Please also use version 6.0 if you need to run VMs with software virtualization, as this has been discontinued in 6.1. Version 6.0 will remain supported until July 2020.

If you're looking for the latest VirtualBox 5.2 packages, see [VirtualBox 5.2 builds](#). Please also use version 5.2 if you still need support for 32-bit hosts, as this has been discontinued in 6.0. Version 5.2 will remain supported until July 2020.

### VirtualBox 6.1.38 platform packages

- [Windows hosts](#)
- [OS X hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)
- [Solaris 11 IPS hosts](#)

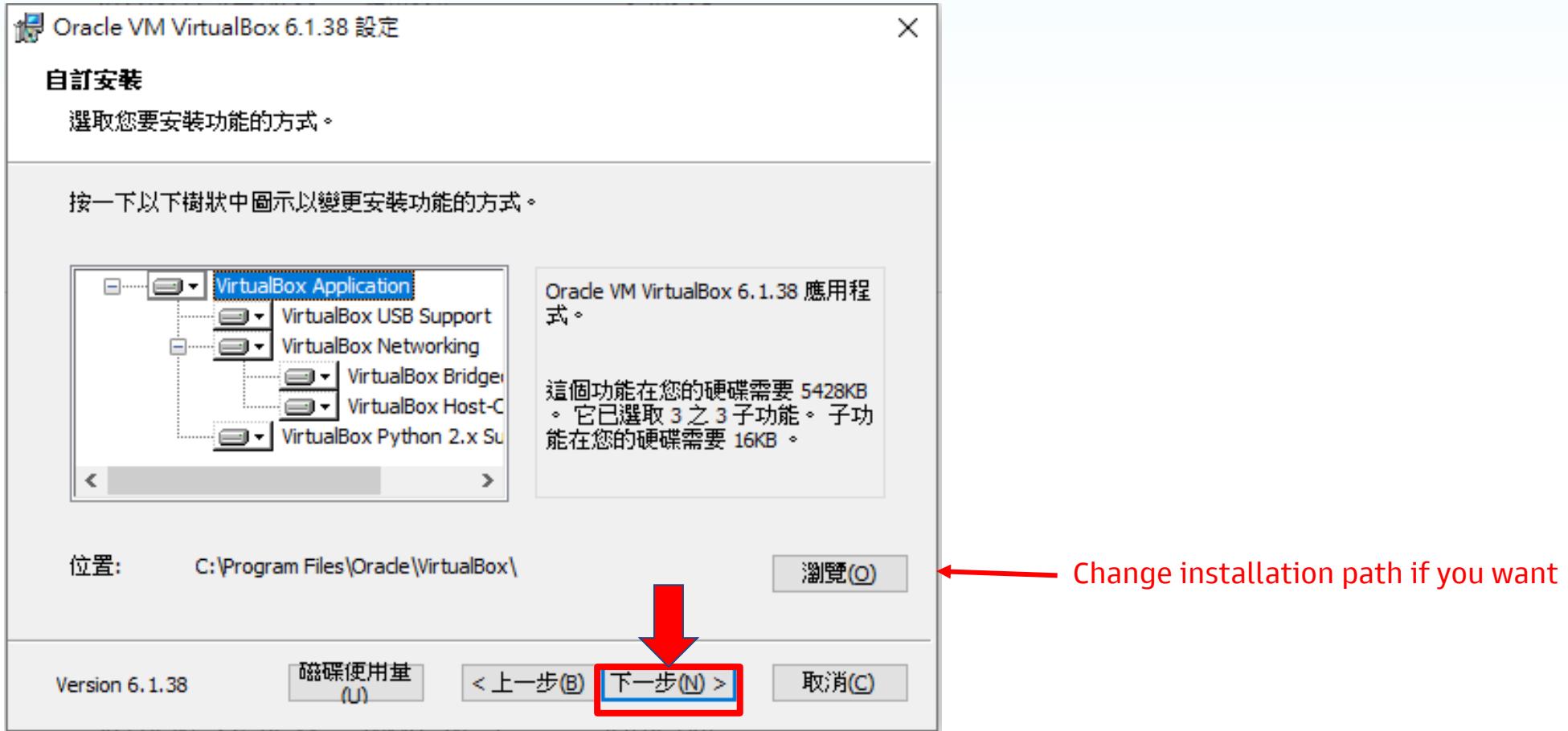
The binaries are released under the terms of the GPL version 2.

# VirtualBox Installation (2/7)

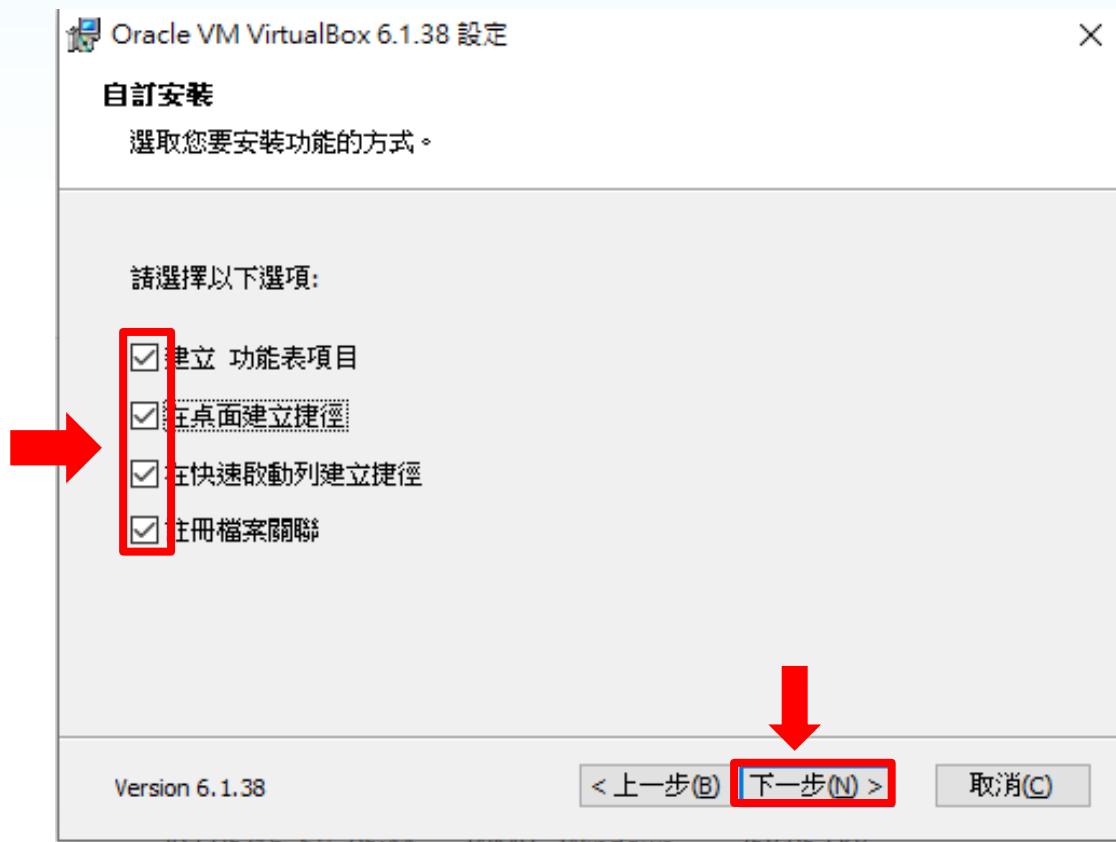
- Start installation



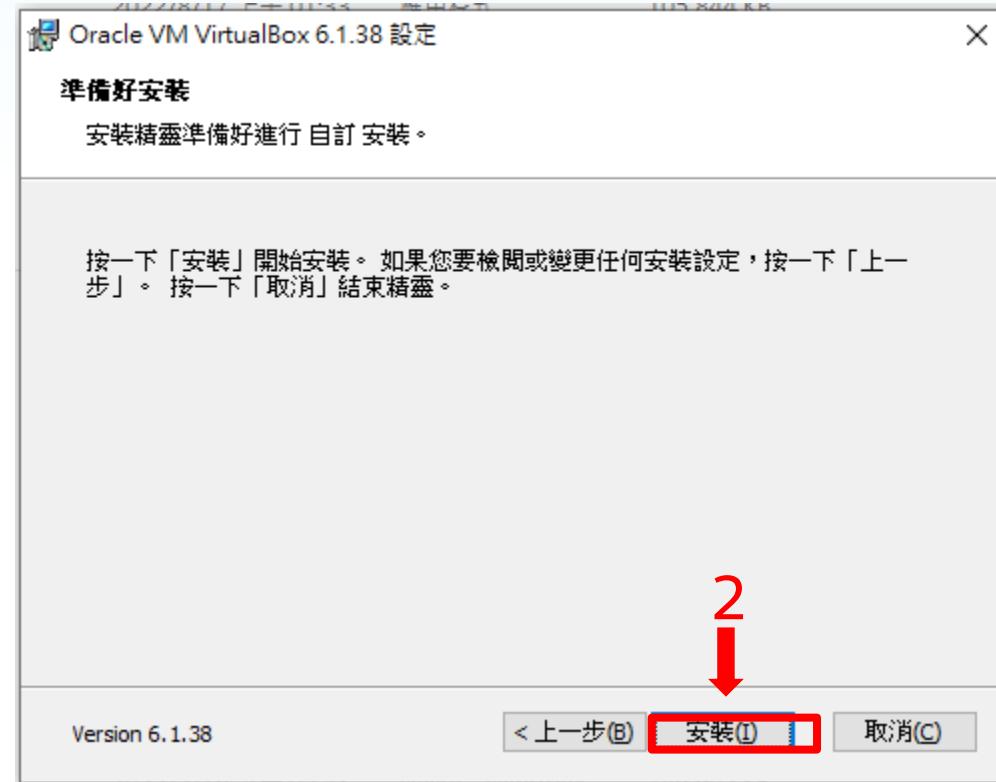
# VirtualBox Installation (3/7)



# VirtualBox Installation (4/7)



# VirtualBox Installation (5/7)



# VirtualBox Installation (6/7)



# VirtualBox Installation (7/7)



# Outline

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- Experiment Environment
- Installation
  - VirtualBox 6.1.38
  - Add VM
    - Download image file
    - Virtual machine setting
    - Ubuntu installation
  - SDN development environment

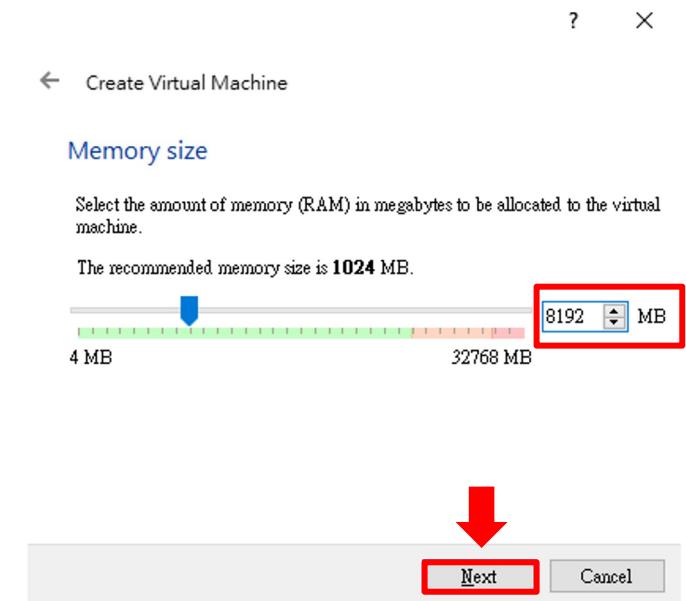
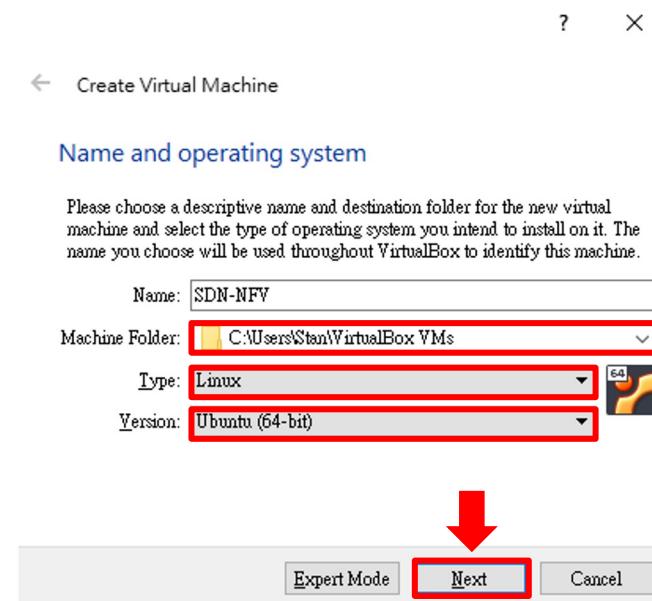
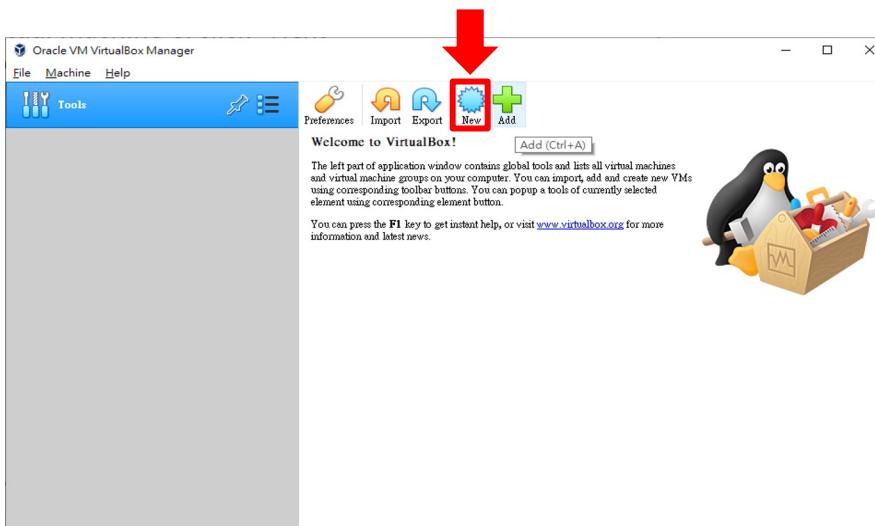
# Download image file (1/10)

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



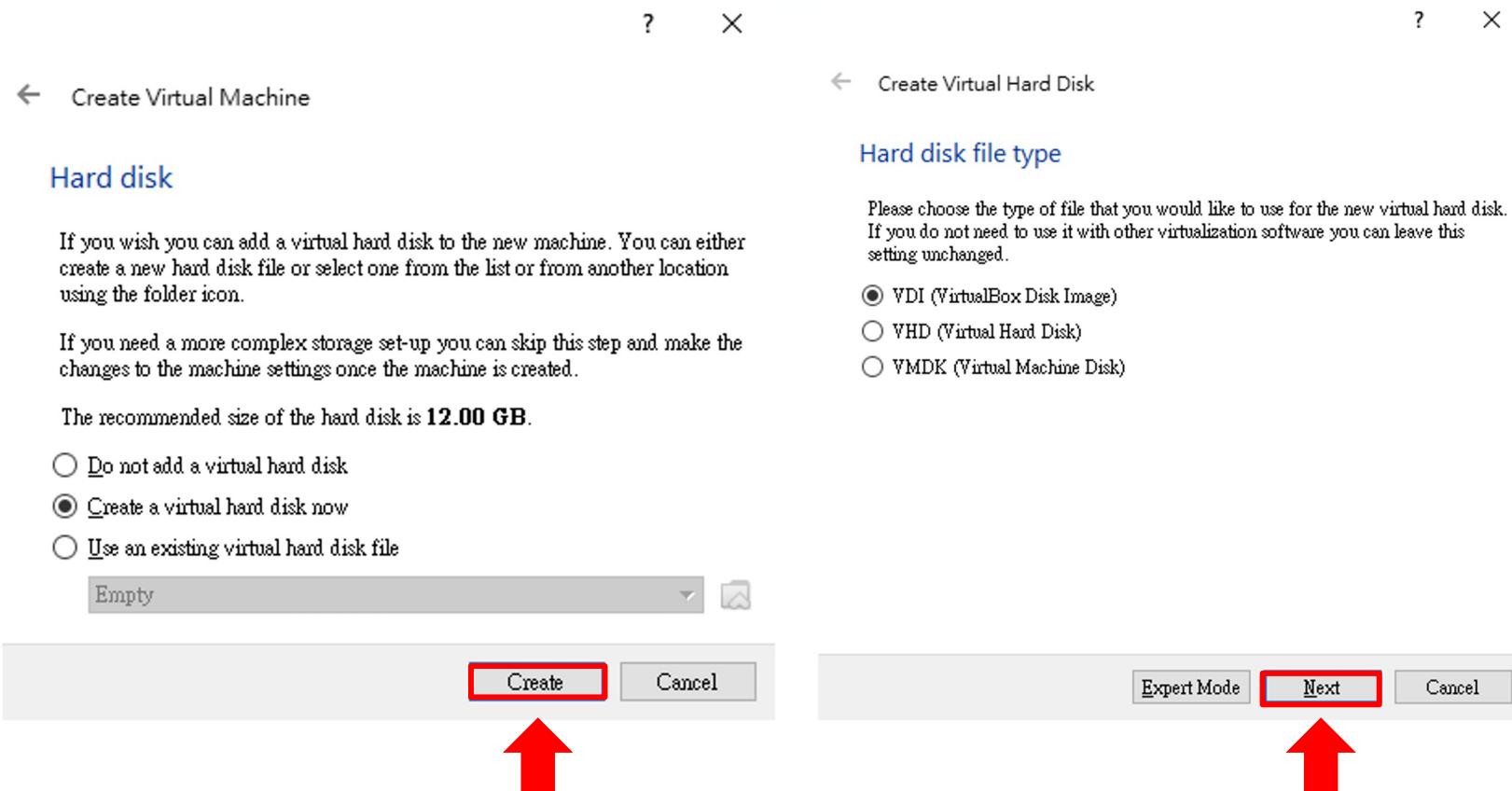
# Virtual machine setting (2/10)

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"



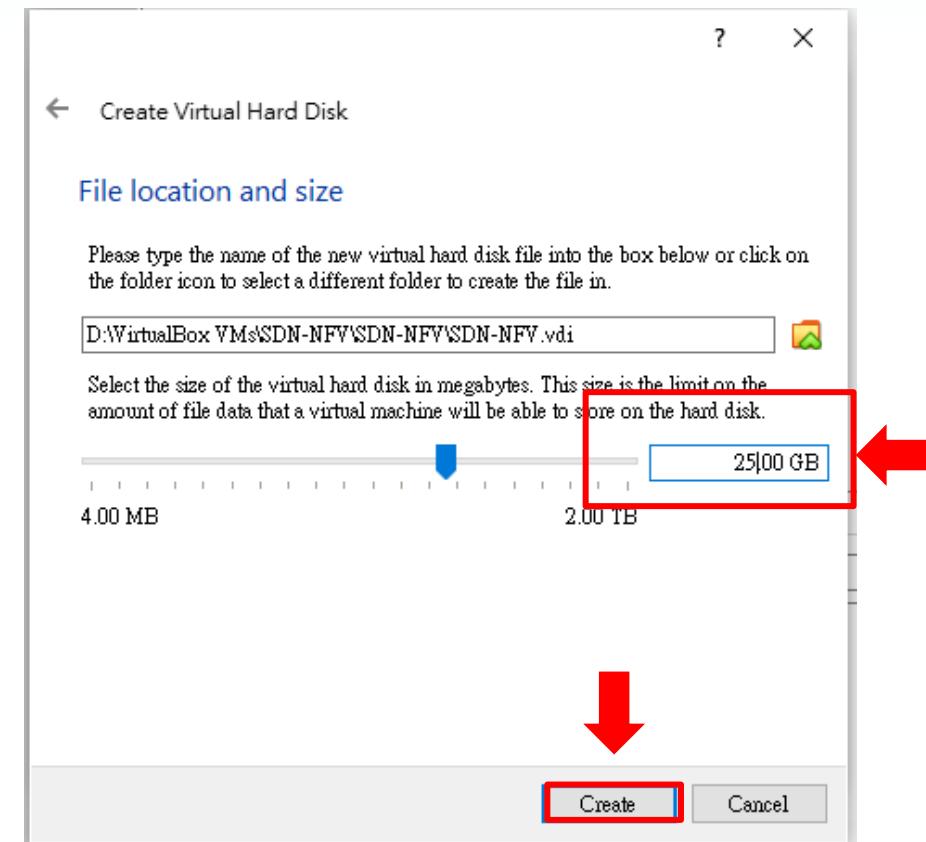
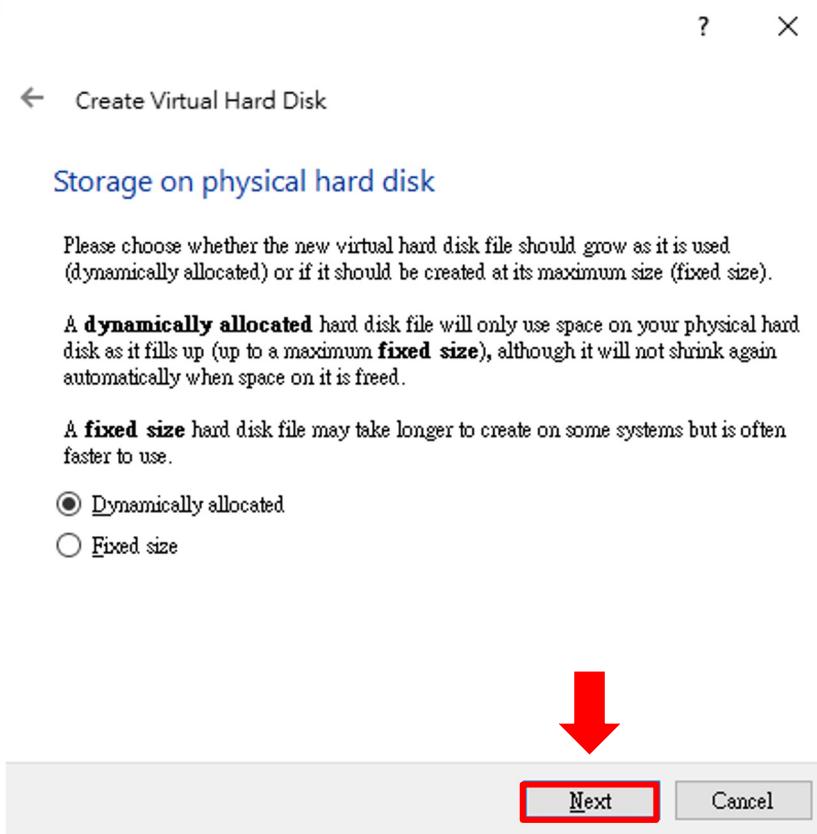
# Virtual machine setting (3/10)

1. Click "Create"
2. Click "Next"



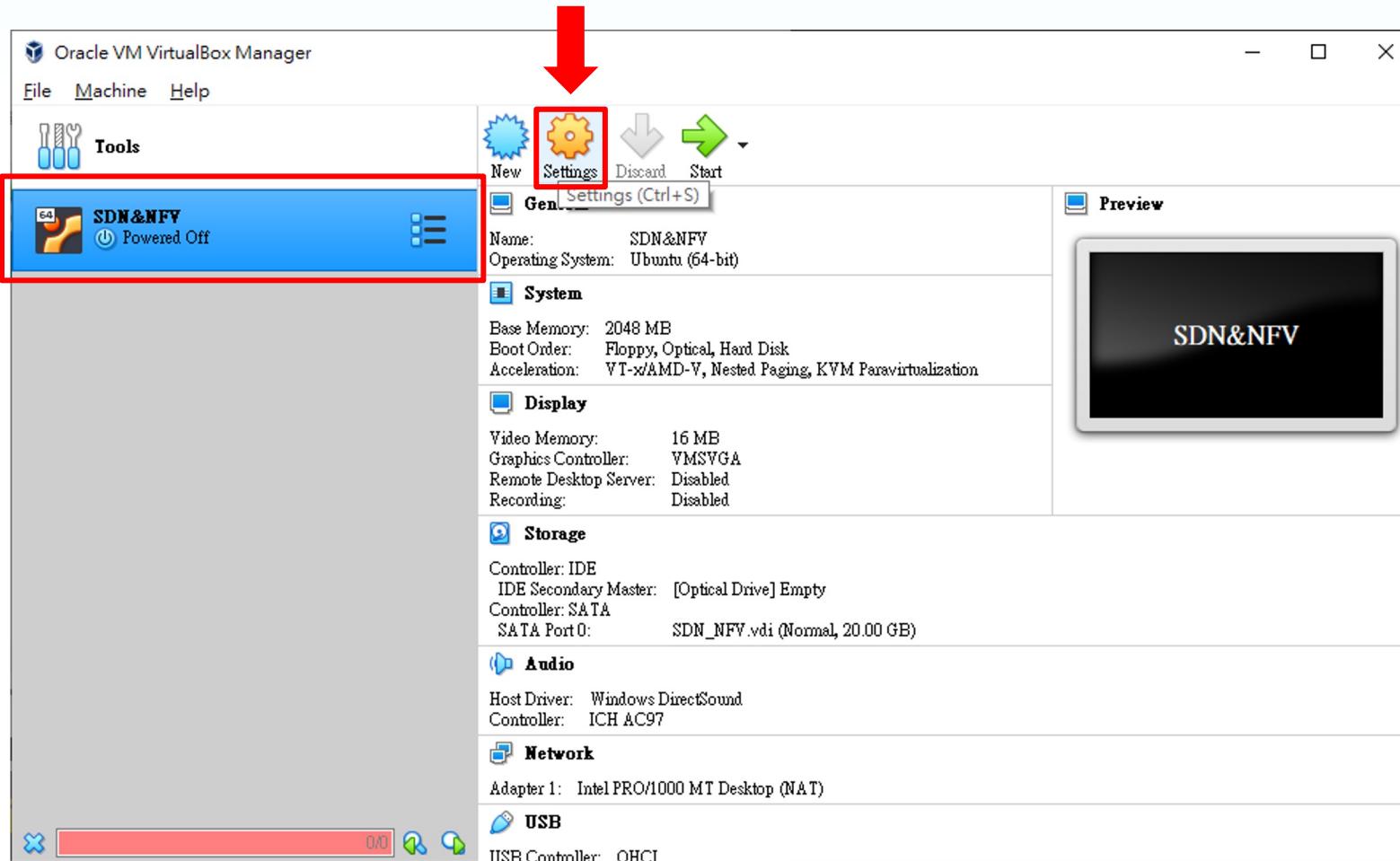
# Virtual machine setting (4/10)

1. Click “Next”
2. Adjust the size of virtual HD to **25GB**, then click “Create”



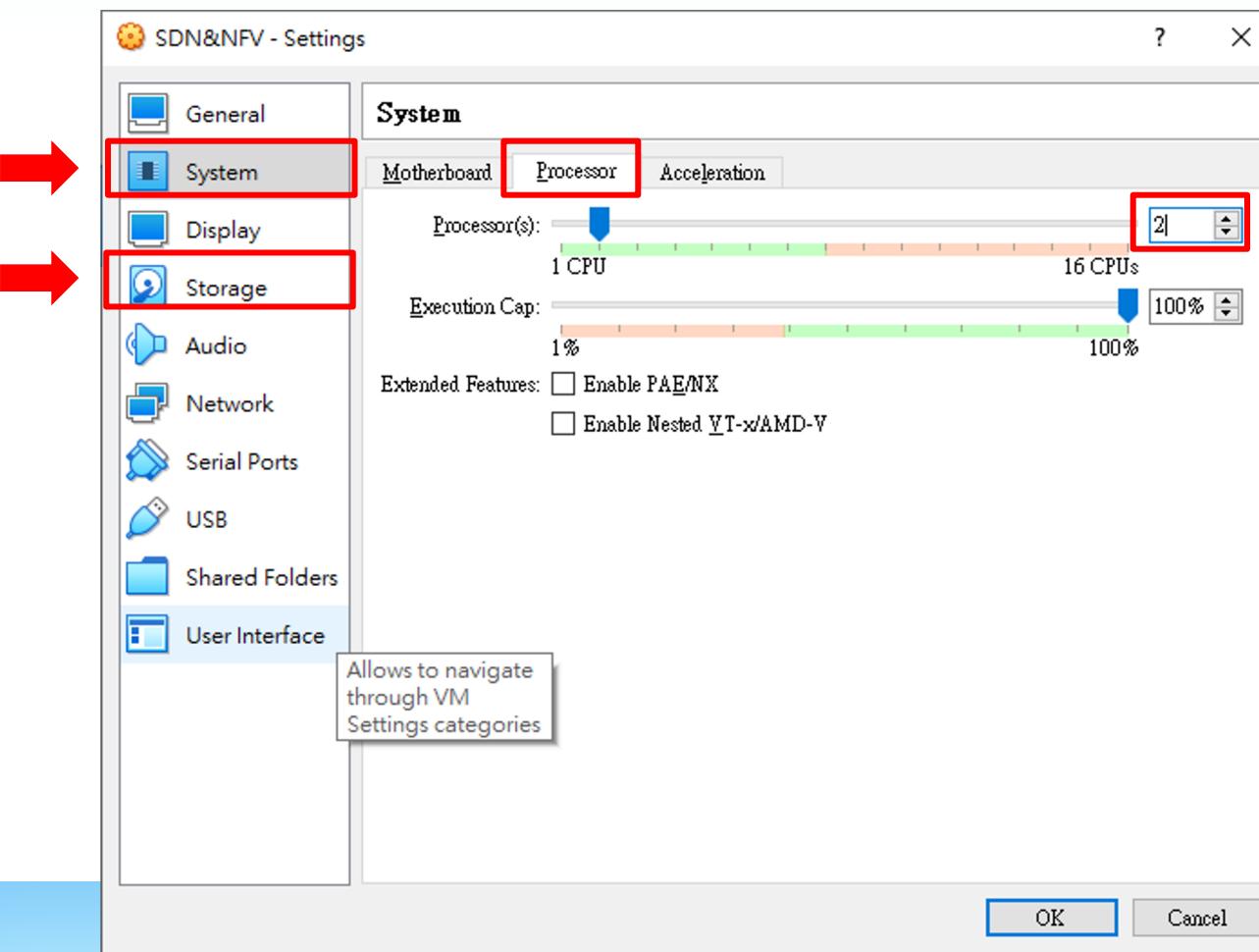
# Virtual machine setting (5/10)

- Click “Settings”



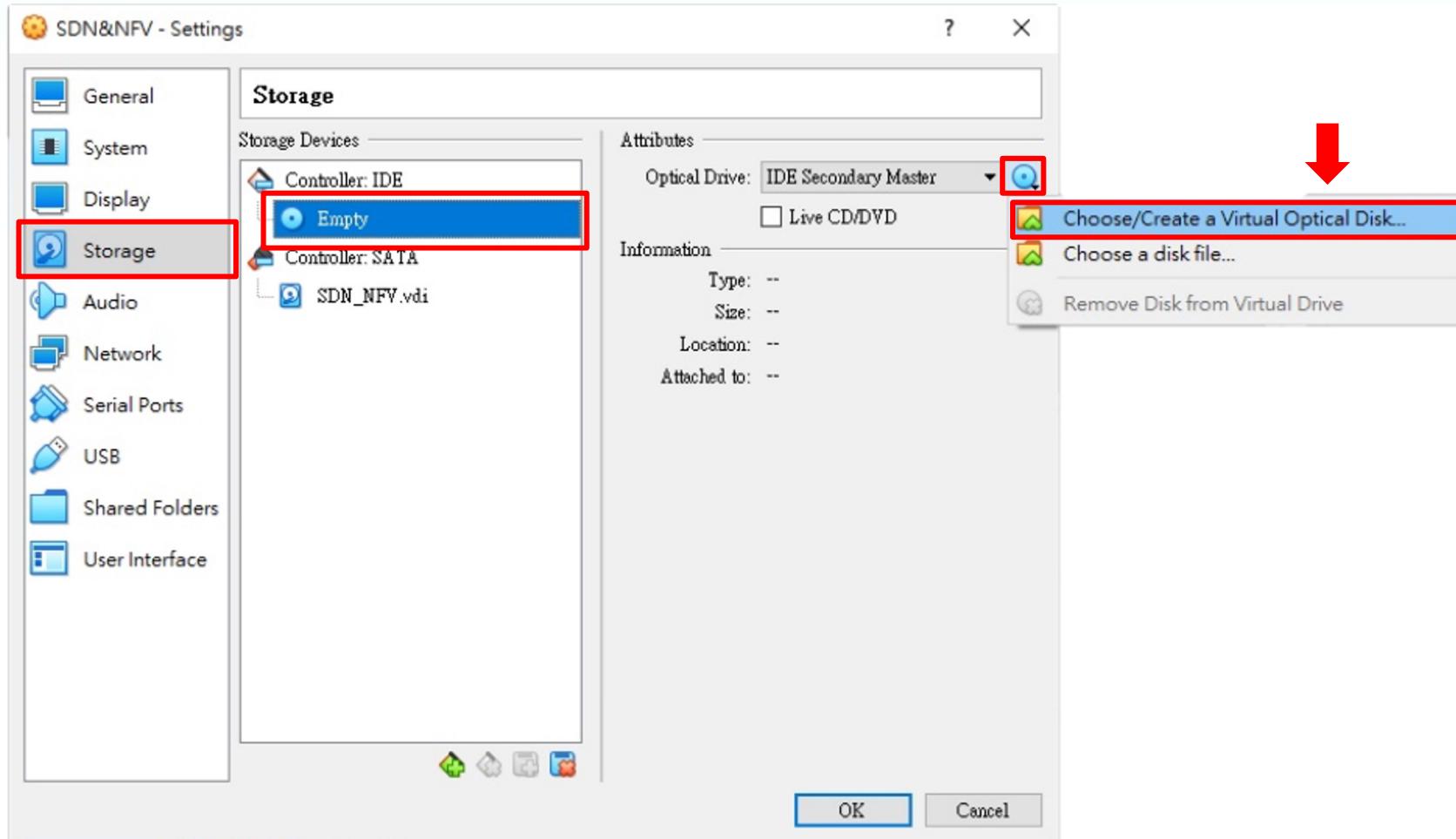
# Virtual machine setting (6/10)

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



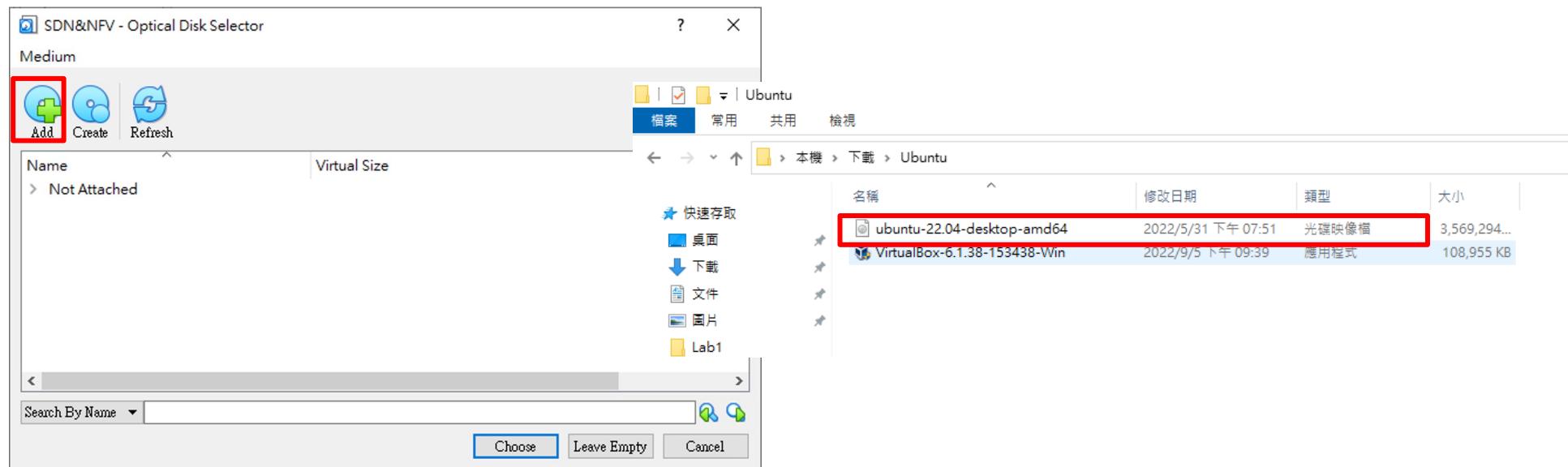
# Virtual machine setting (7/10)

- Storage > Controller: IDE



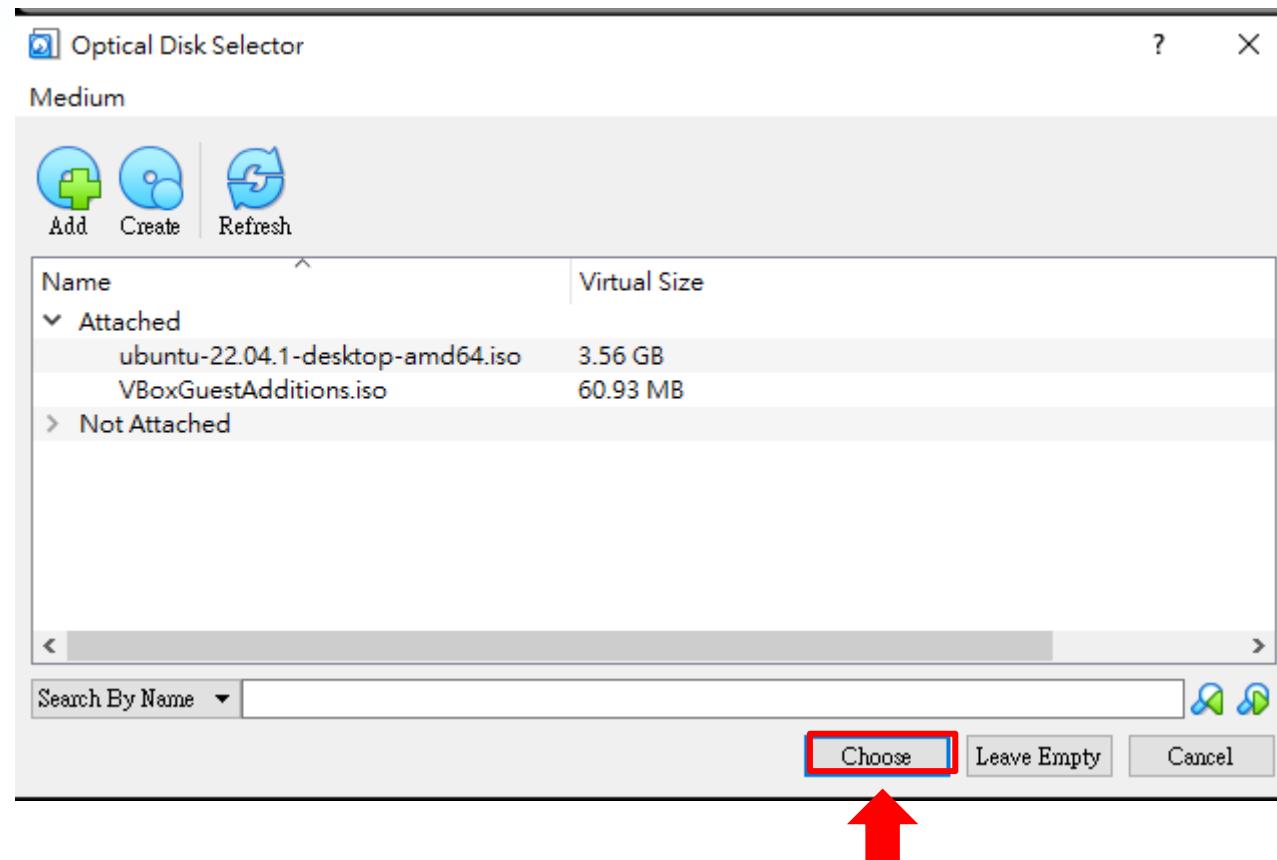
# Virtual machine setting (8/10)

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



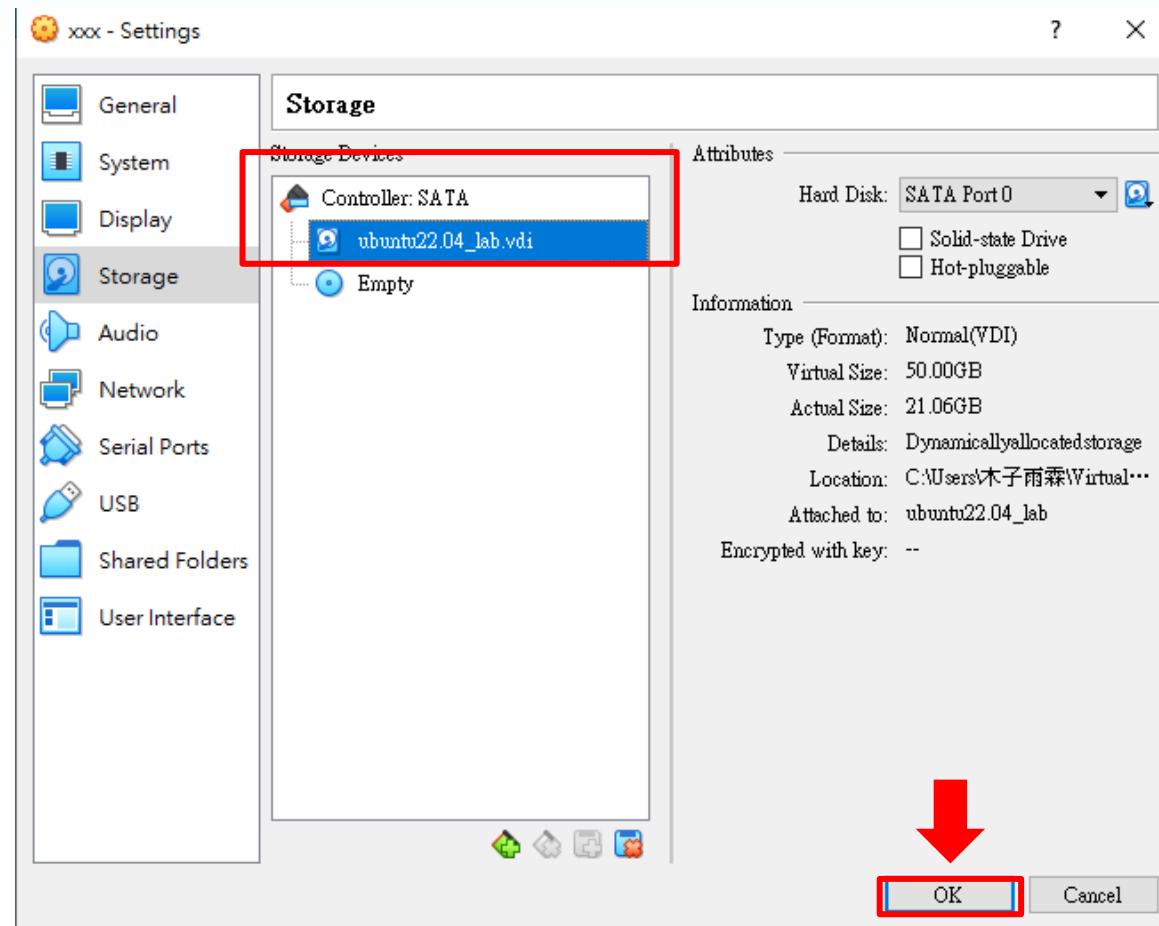
# Virtual machine setting (9/10)

- Click “Choose”



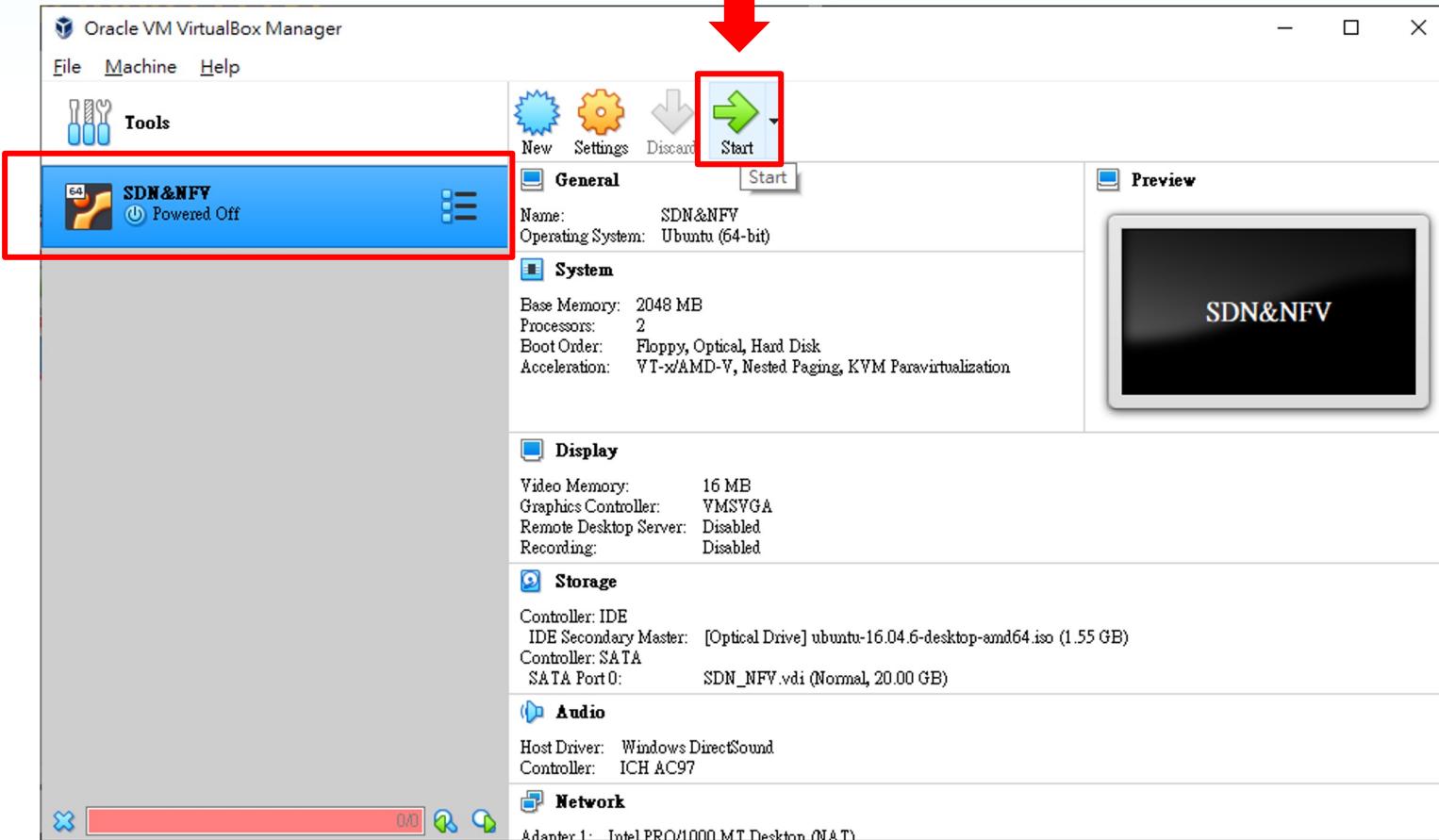
# Virtual machine setting (10/10)

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



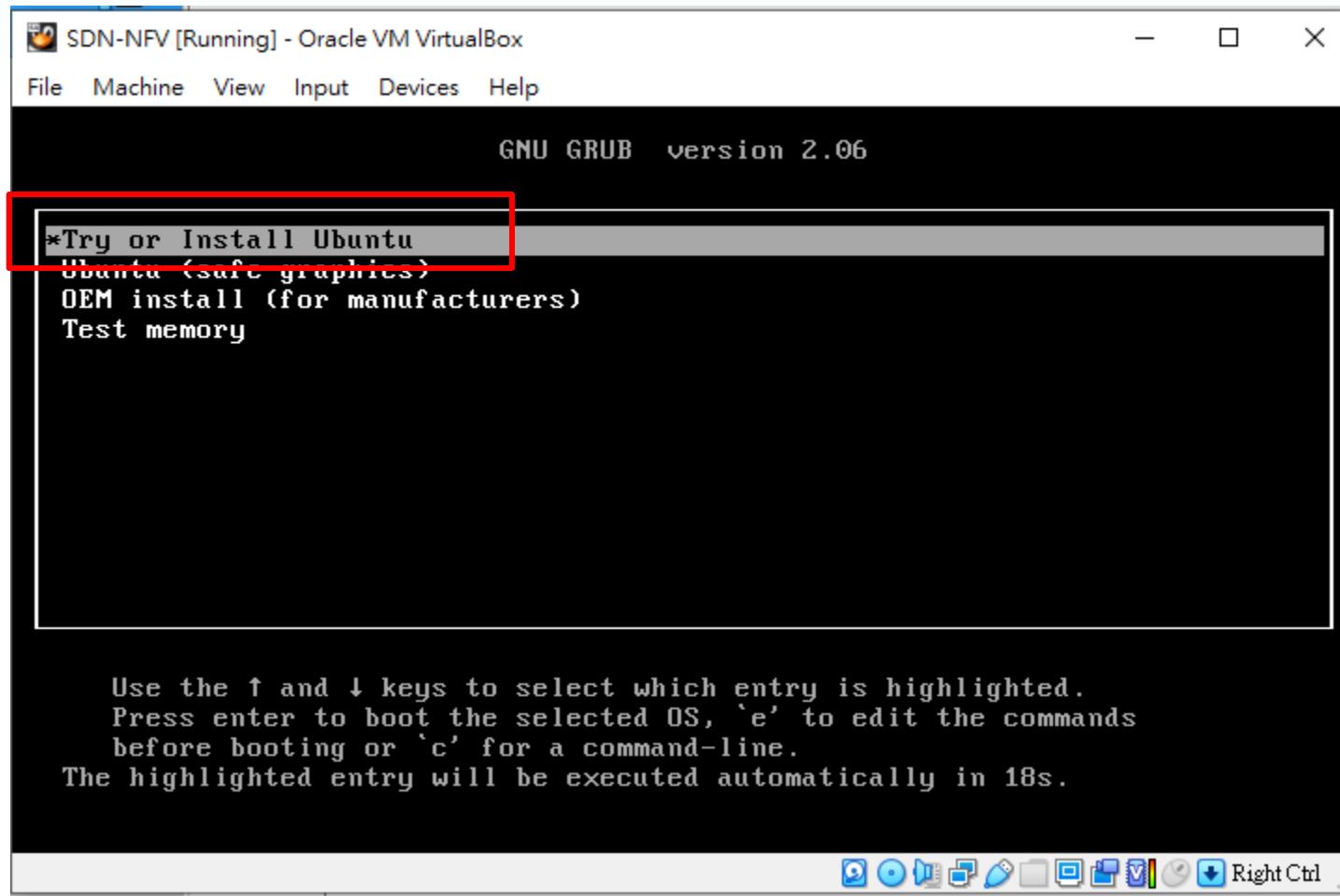
# Ubuntu Installation (1/12)

- Click “Start”

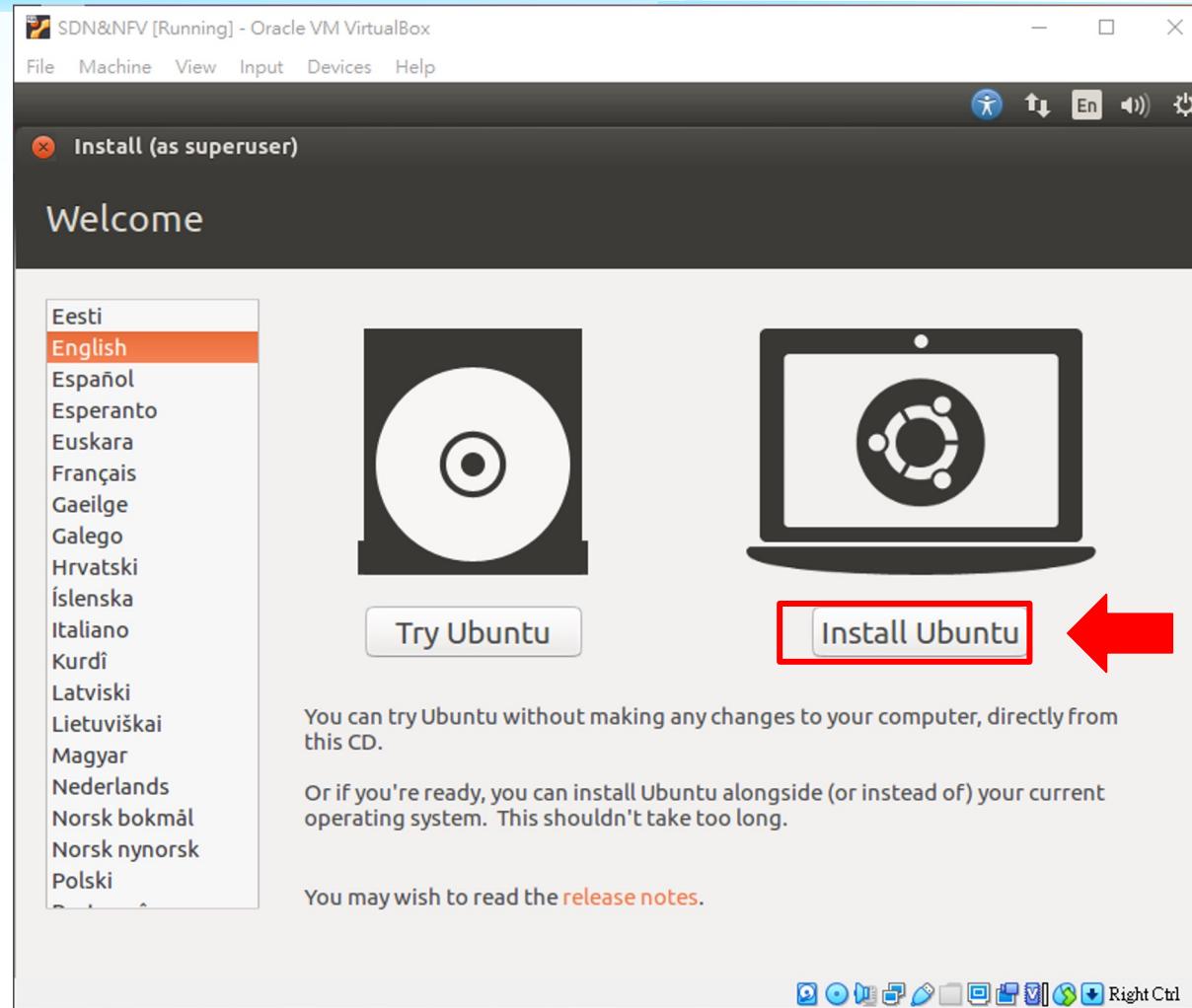


# Ubuntu Installation (2/13)

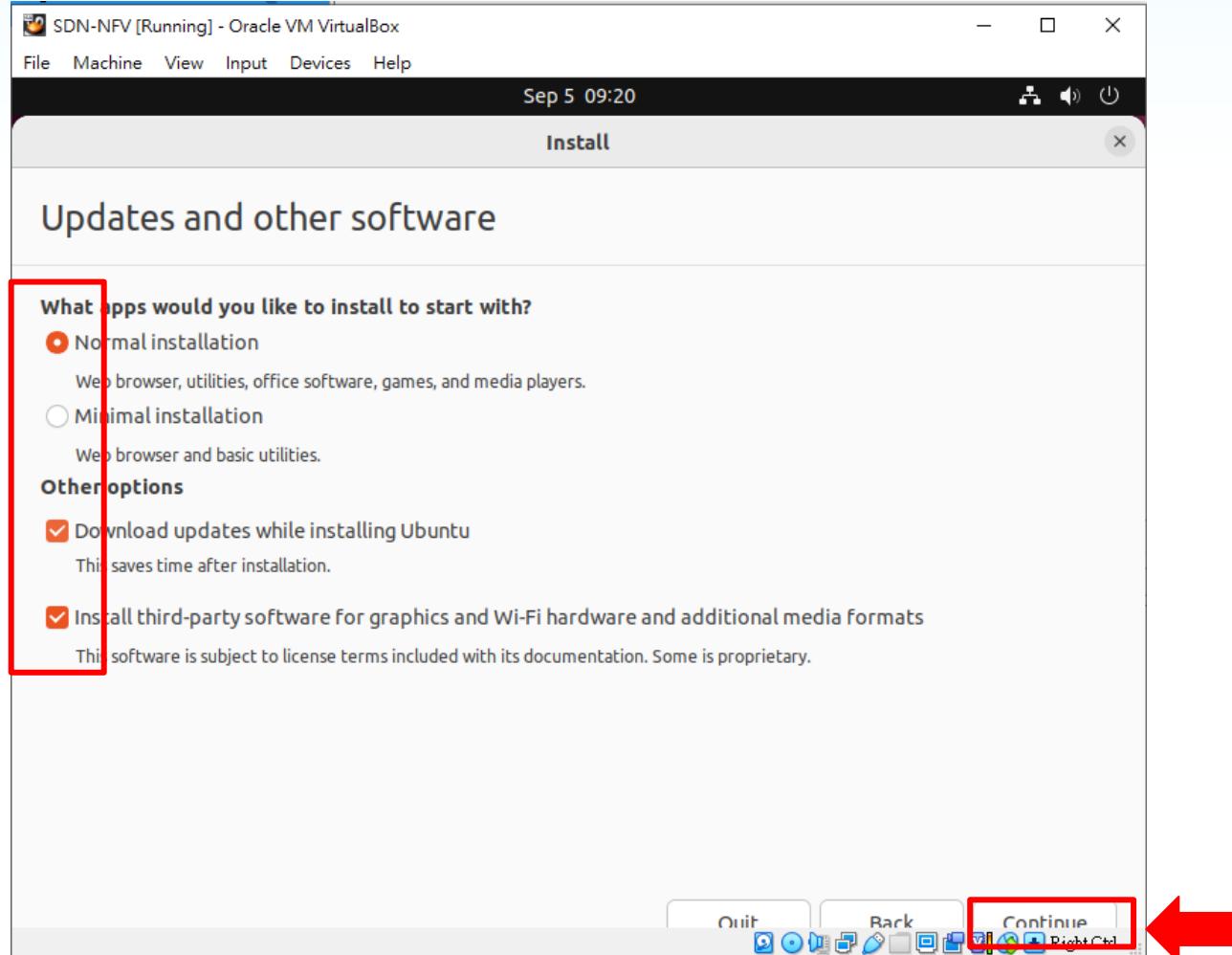
Choose "Try or install Ubuntu" and press "Enter"



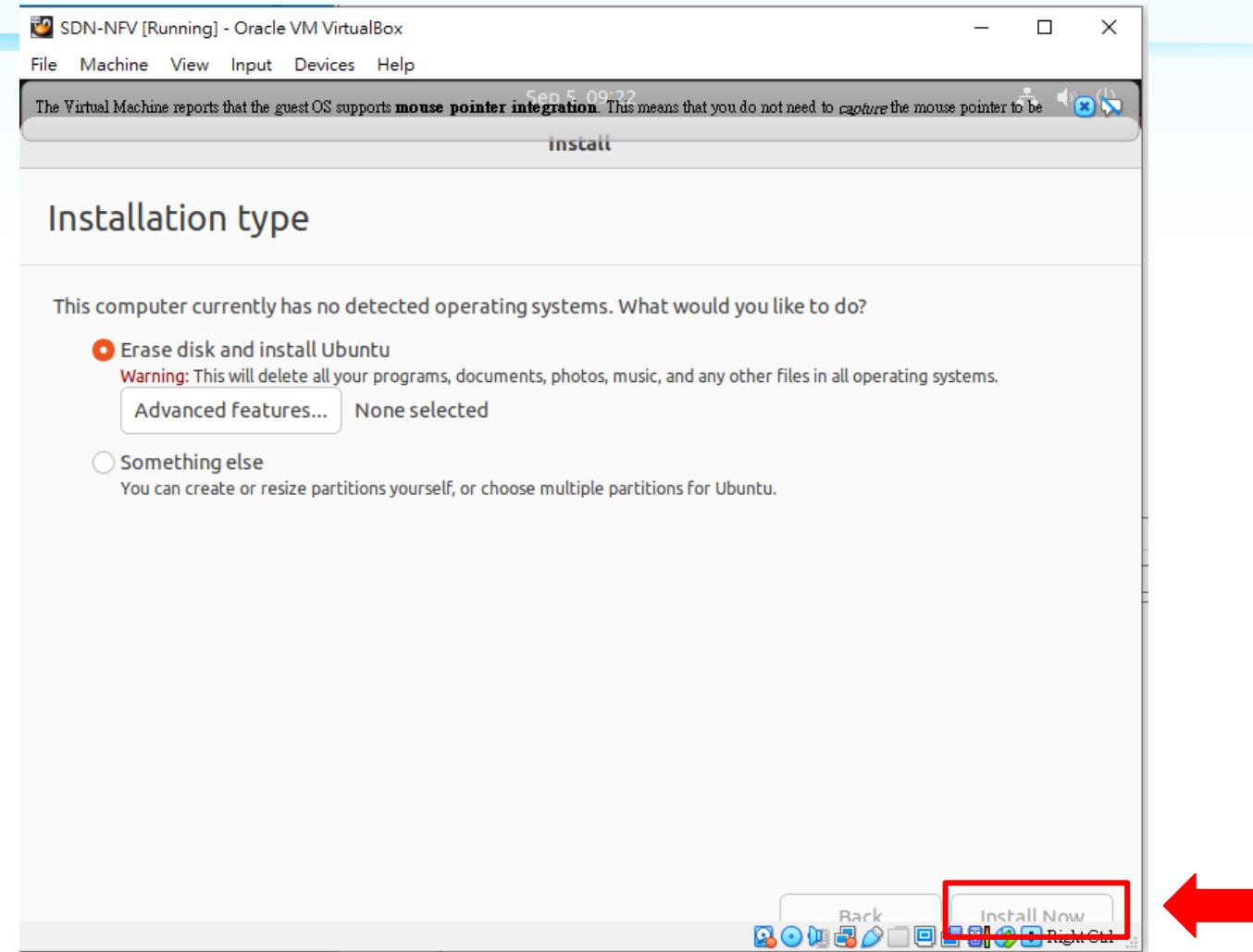
# Ubuntu Installation (3/13)



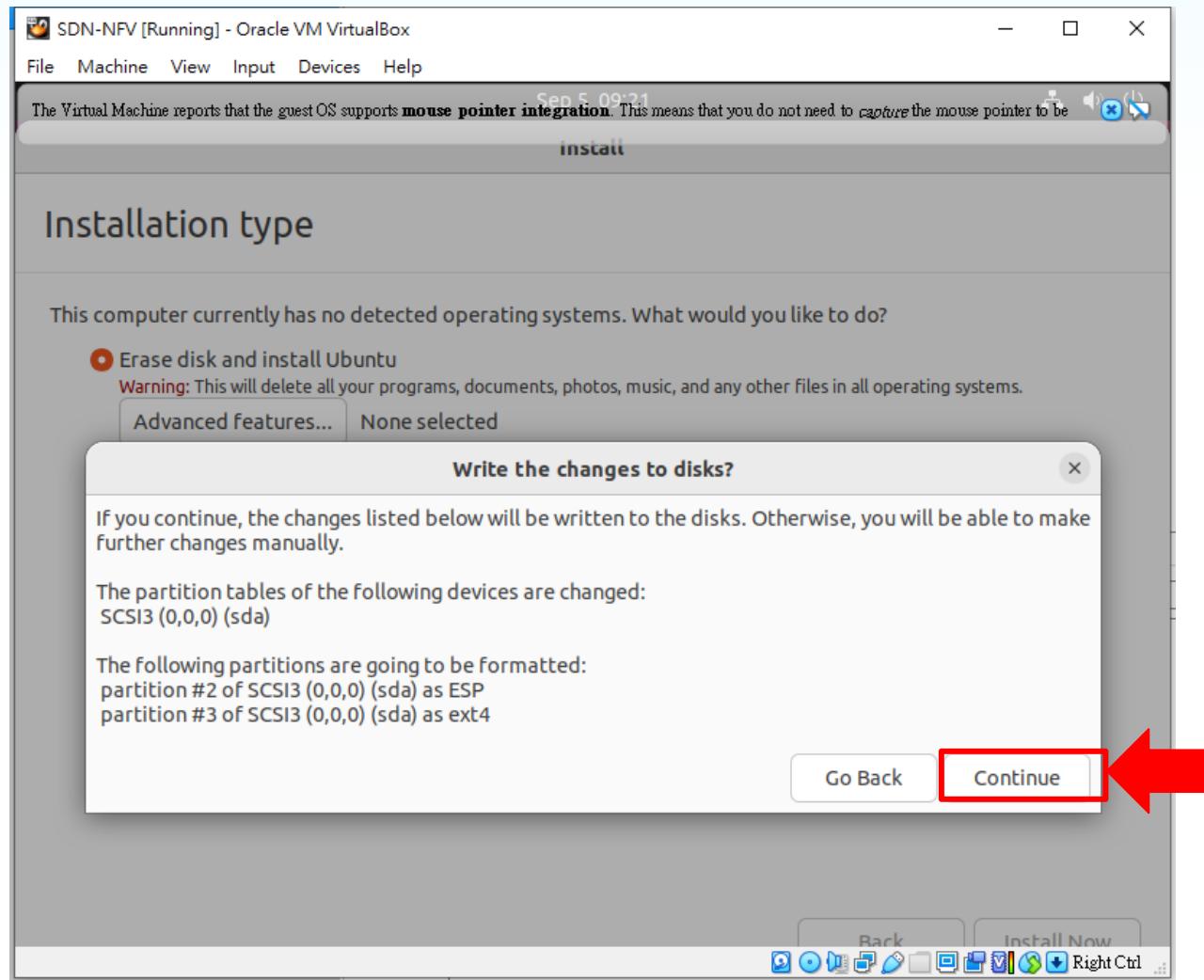
# Ubuntu Installation (4/13)



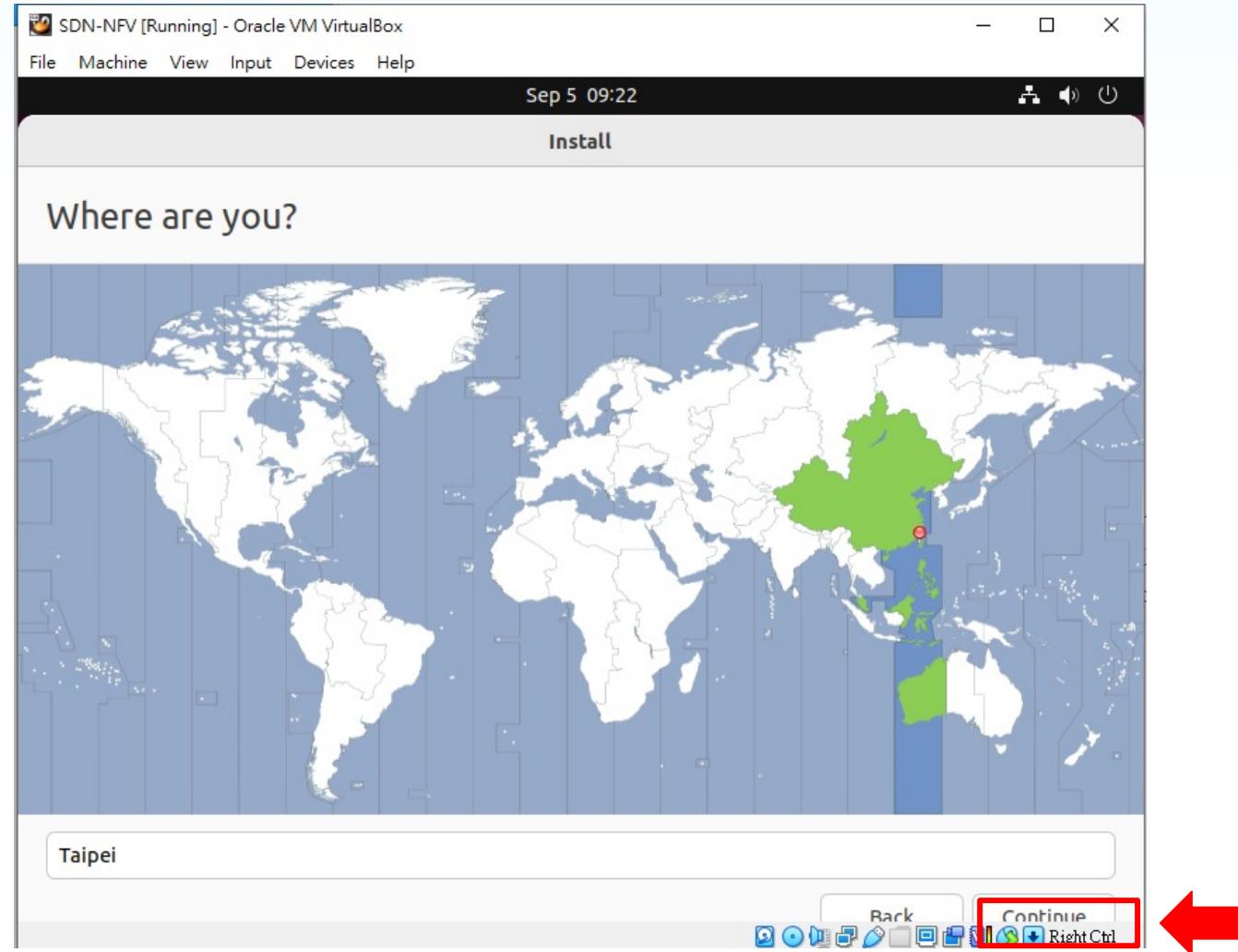
# Ubuntu Installation (5/13)



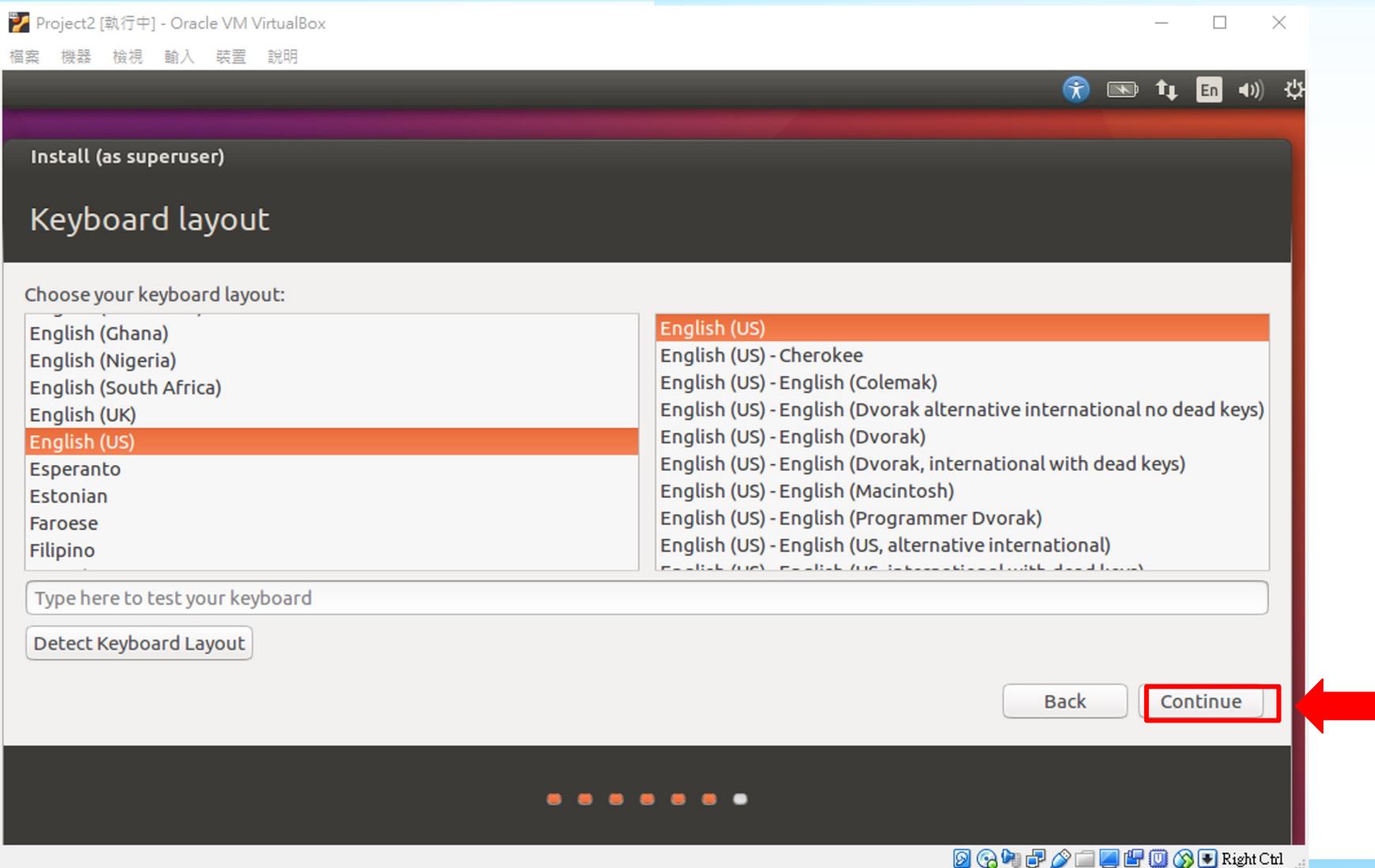
# Ubuntu Installation (6/13)



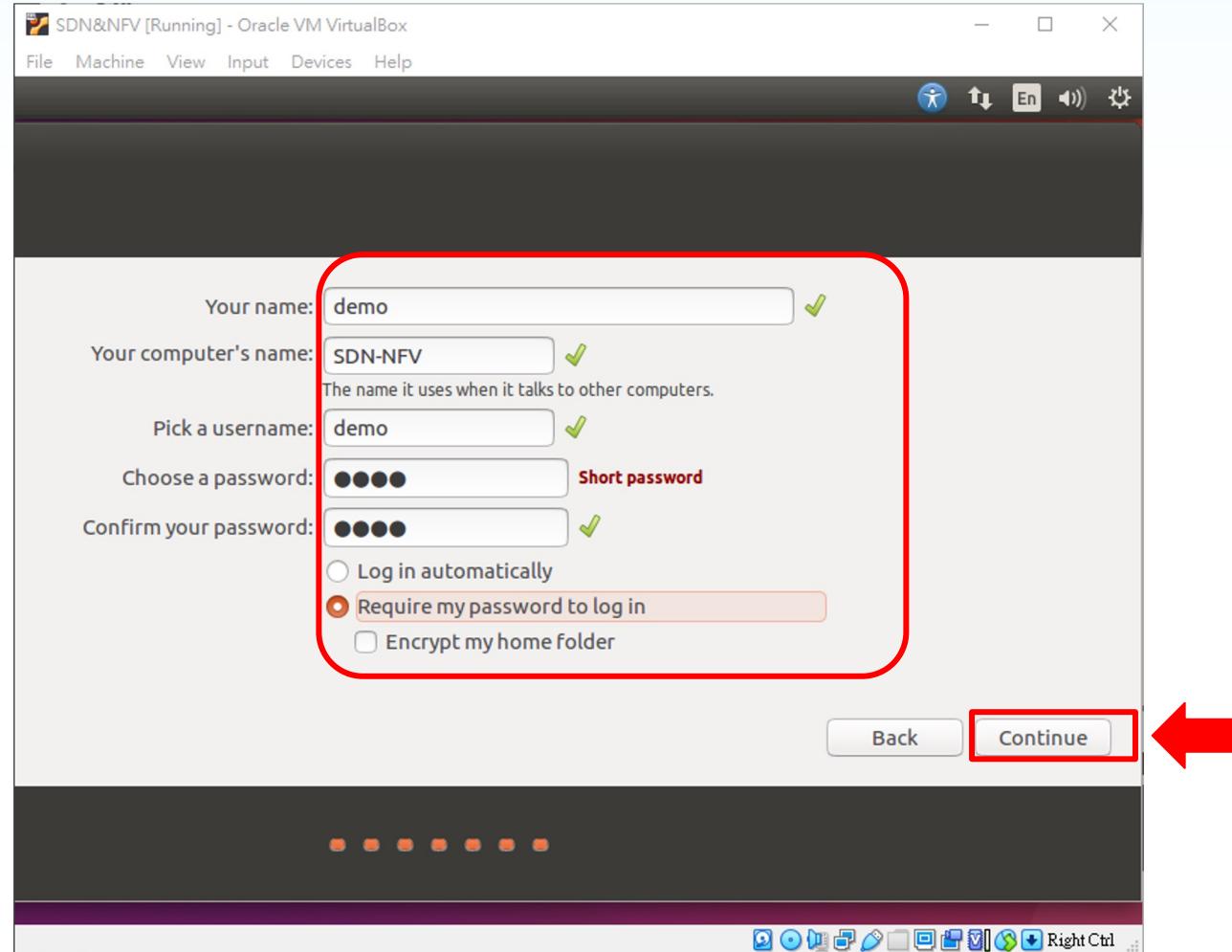
# Ubuntu Installation (7/13)



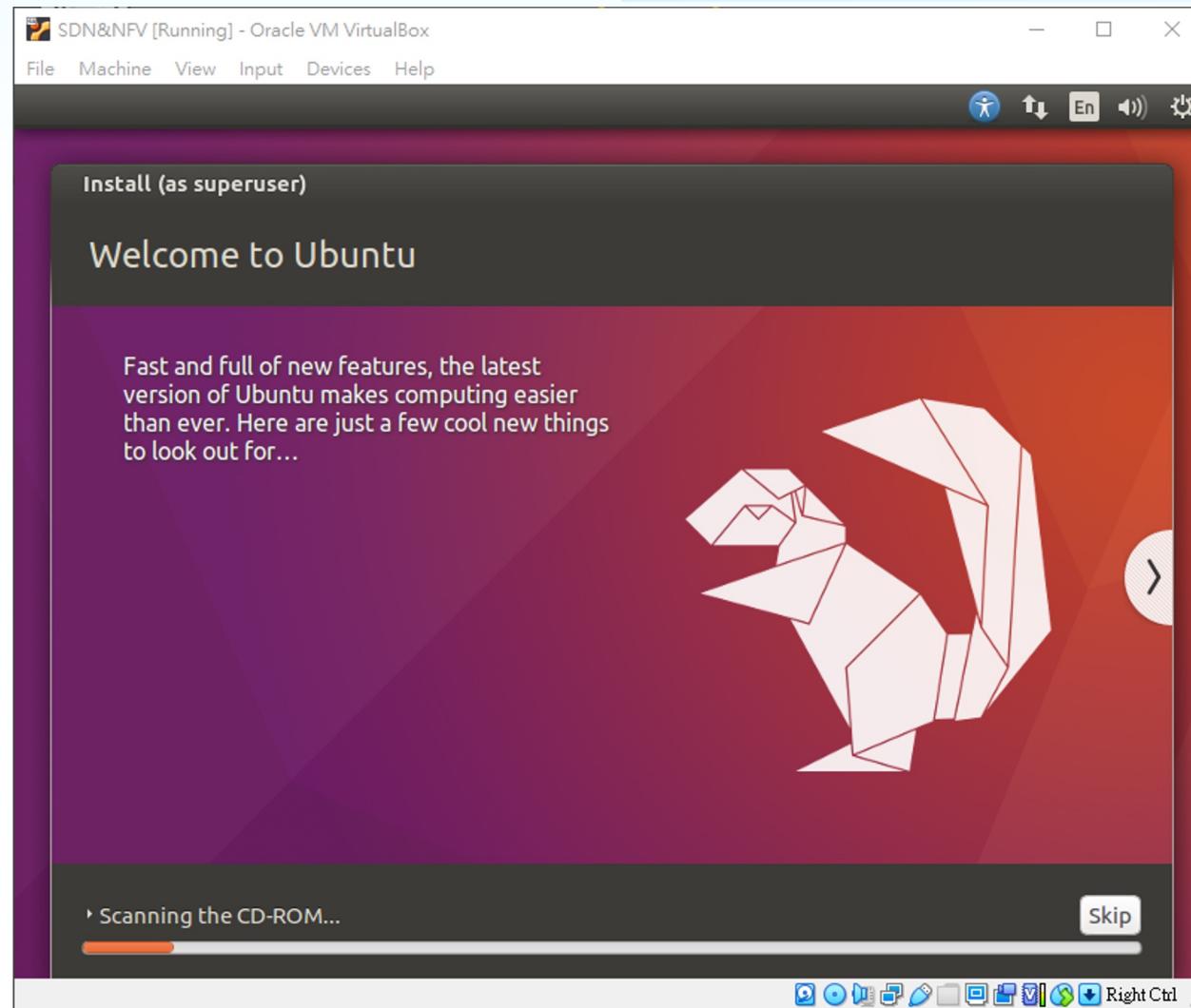
# Ubuntu Installation (8/13)



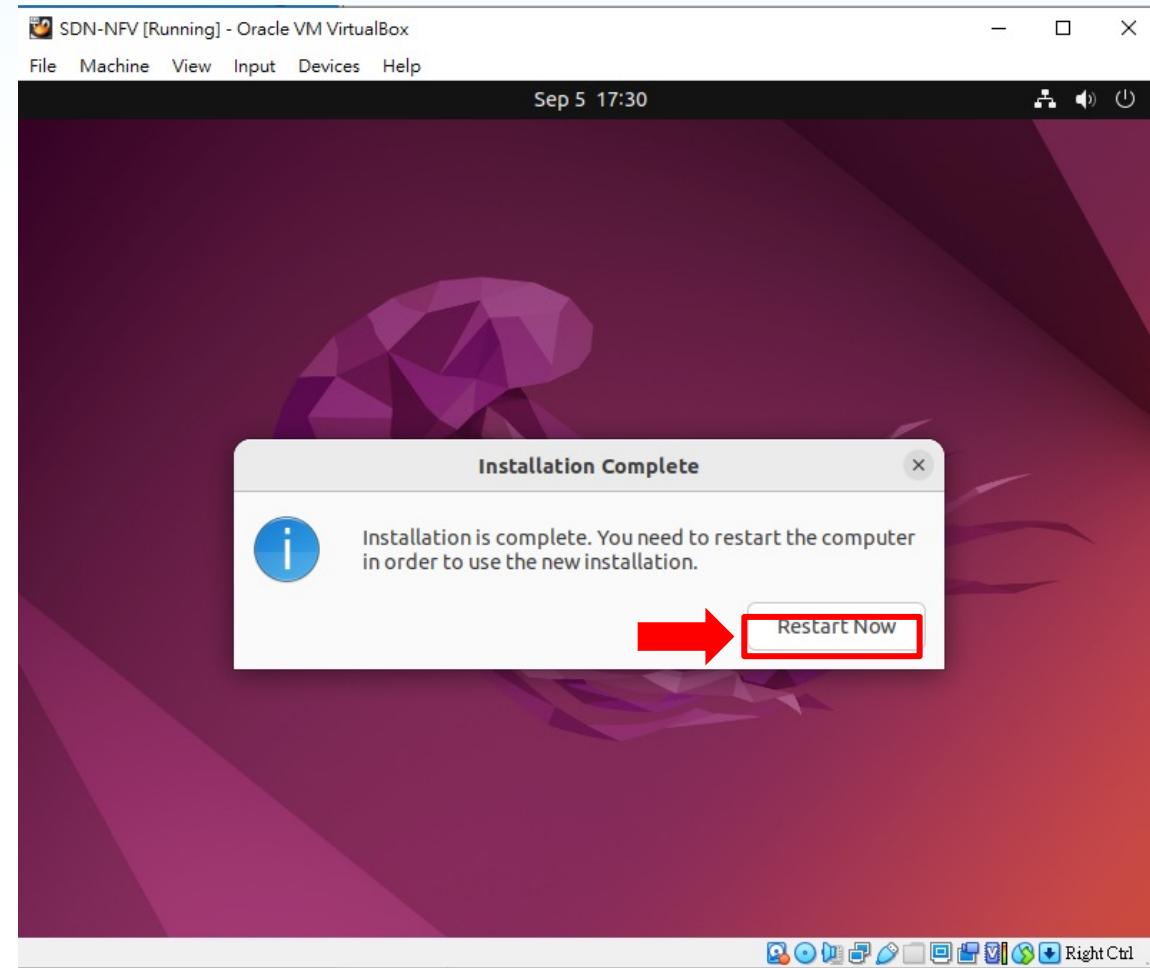
# Ubuntu Installation (9/13)



# Ubuntu Installation (10/13)

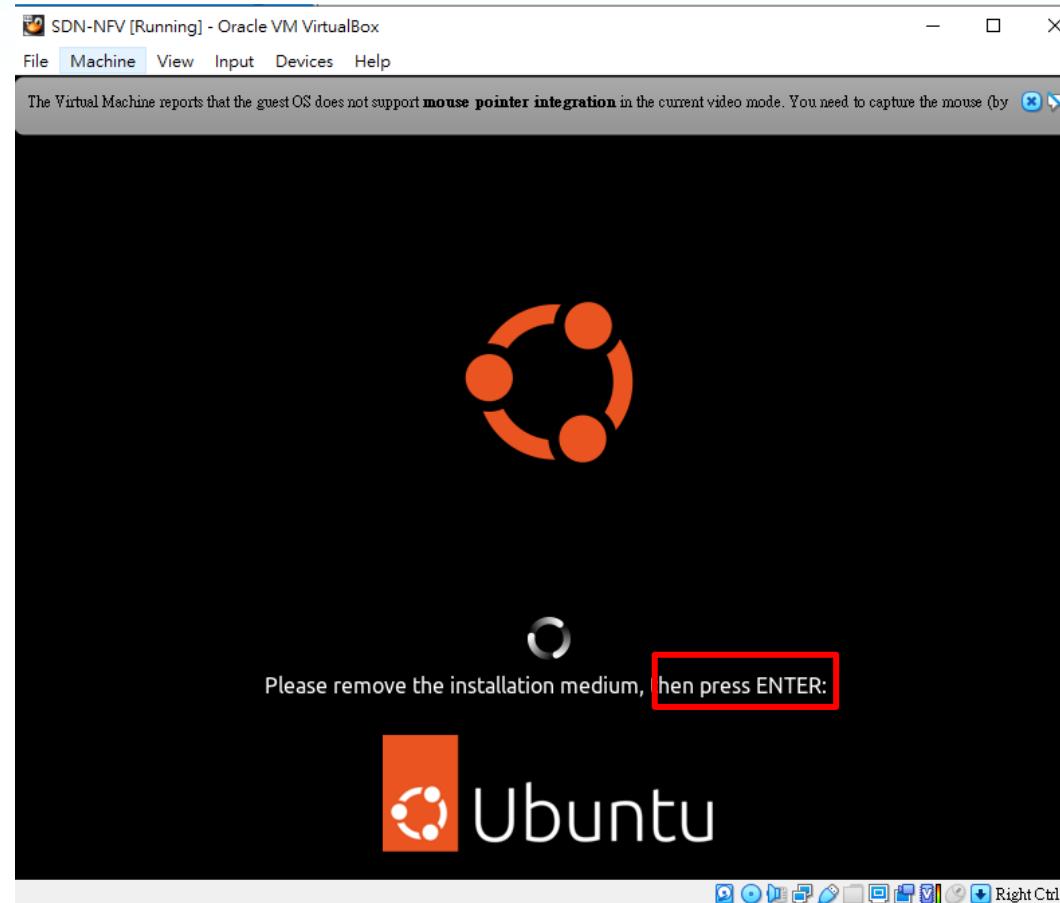


# Ubuntu Installation (11/13)

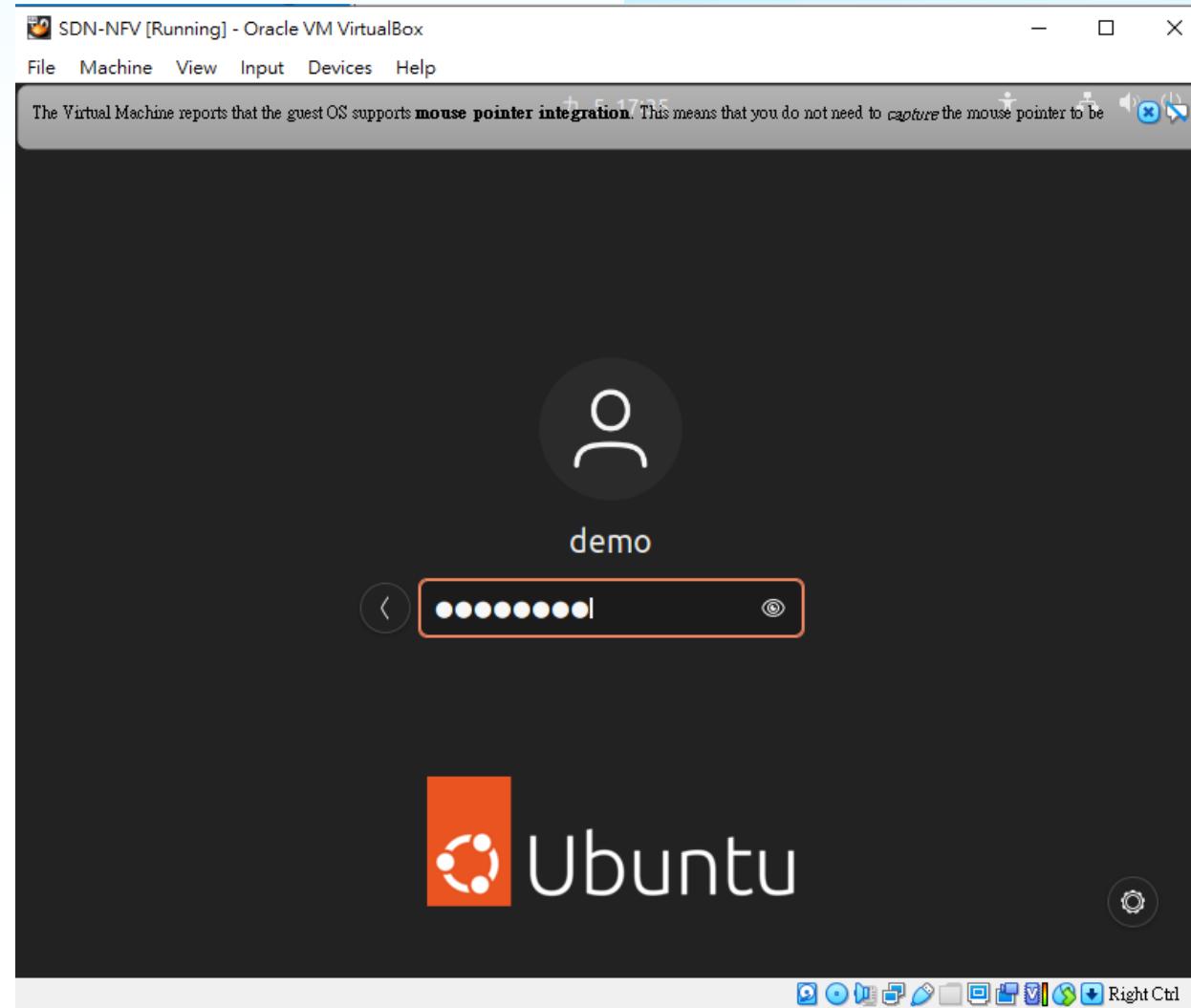


# Ubuntu Installation (12/13)

- Press “Enter”, then VM will restart



# Ubuntu Installation (13/13)



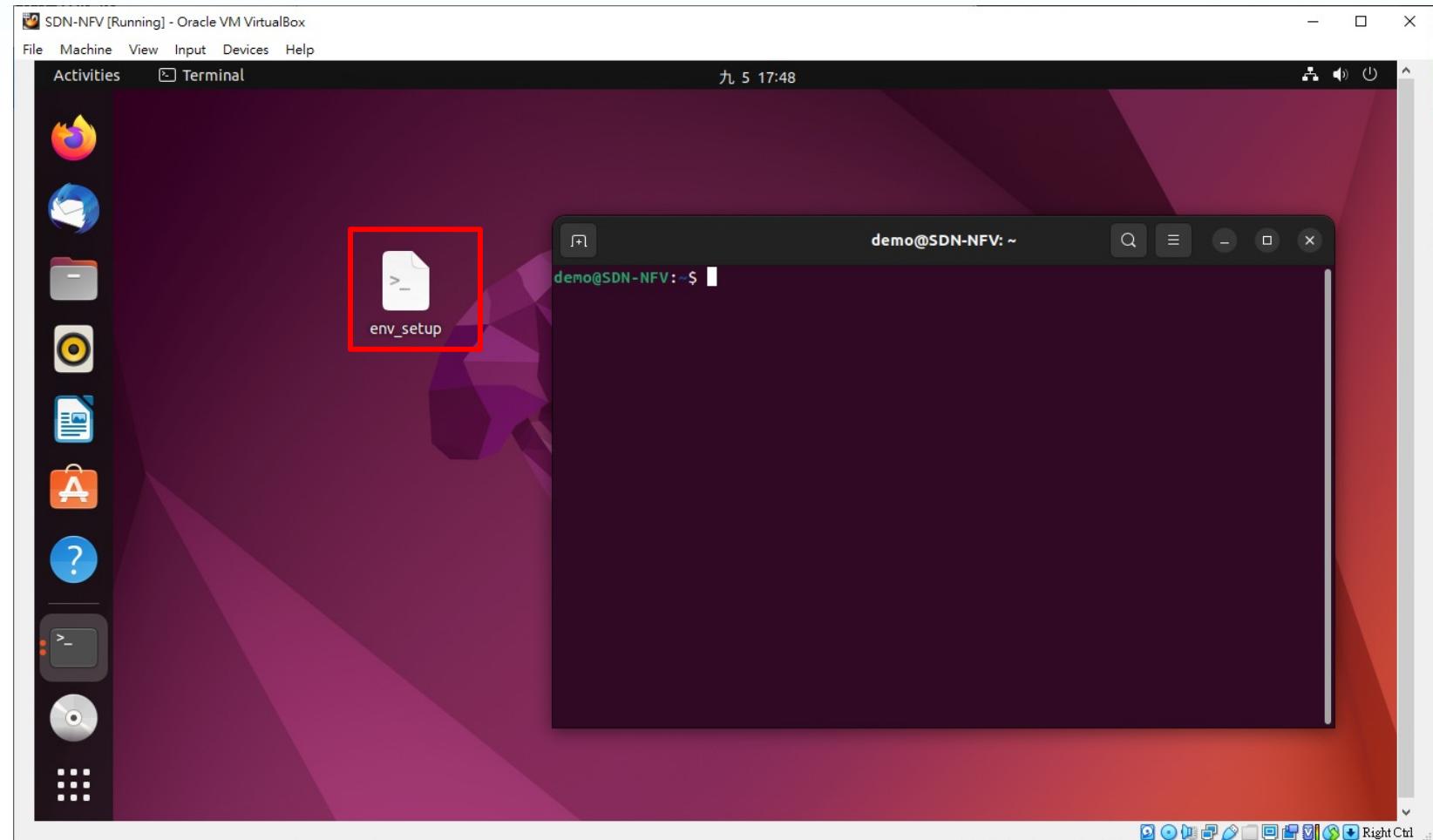
# Outline

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- 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)

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- 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/
systemd/system/ovs.service.
Finished the installation of Open vSwitch.
*****
* The environment setup finished successfully!
*****
demo@SDN-NFV:~/Desktop$ █
```

- After this, you have finish your environment setup