Lab1: Bring up "Virtualized" x86 System

CSE4009: System Programming

Overview

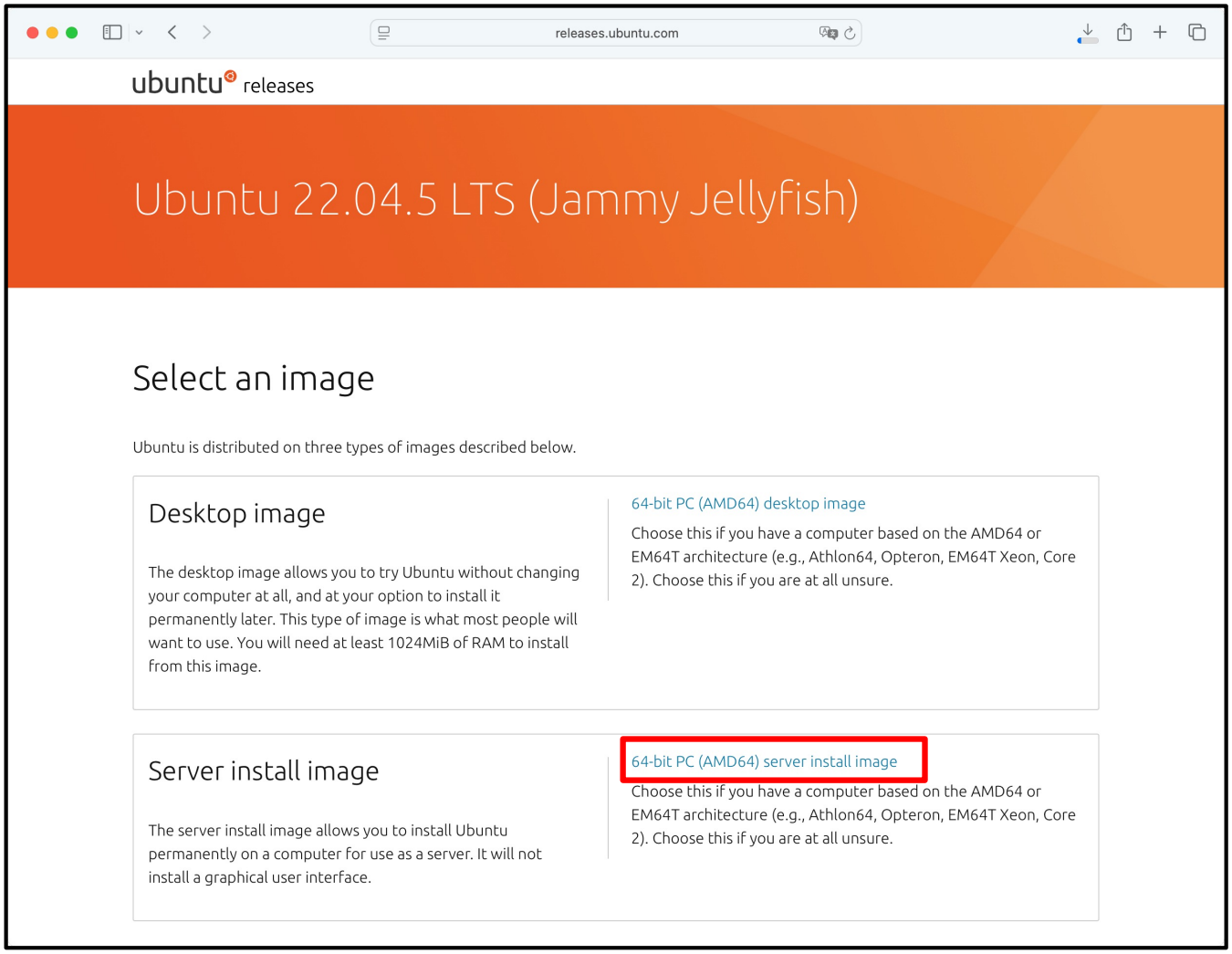
- Download and Install VirtualBox
- Download Linux Server Image (Ubuntu 22.04)
- Create New Virtual Machine (VM) Instance
- Install Linux Server
- Setup Lab Environment
- Your VM as an x86 System

Download and Install Virtual Box

- ***VirtualBox***
  - https://www.virtualbox.org
  - Oracle provides another download page
- ***UTM*** if you use Mx Apple Silicon (ARM)
  - https://mac.getutm.app
  - Make sure your VM is set in "emulate" mode (not virtualize mode)
    - The virtual machine (x86-64) on your computer (aarch64, ARM)

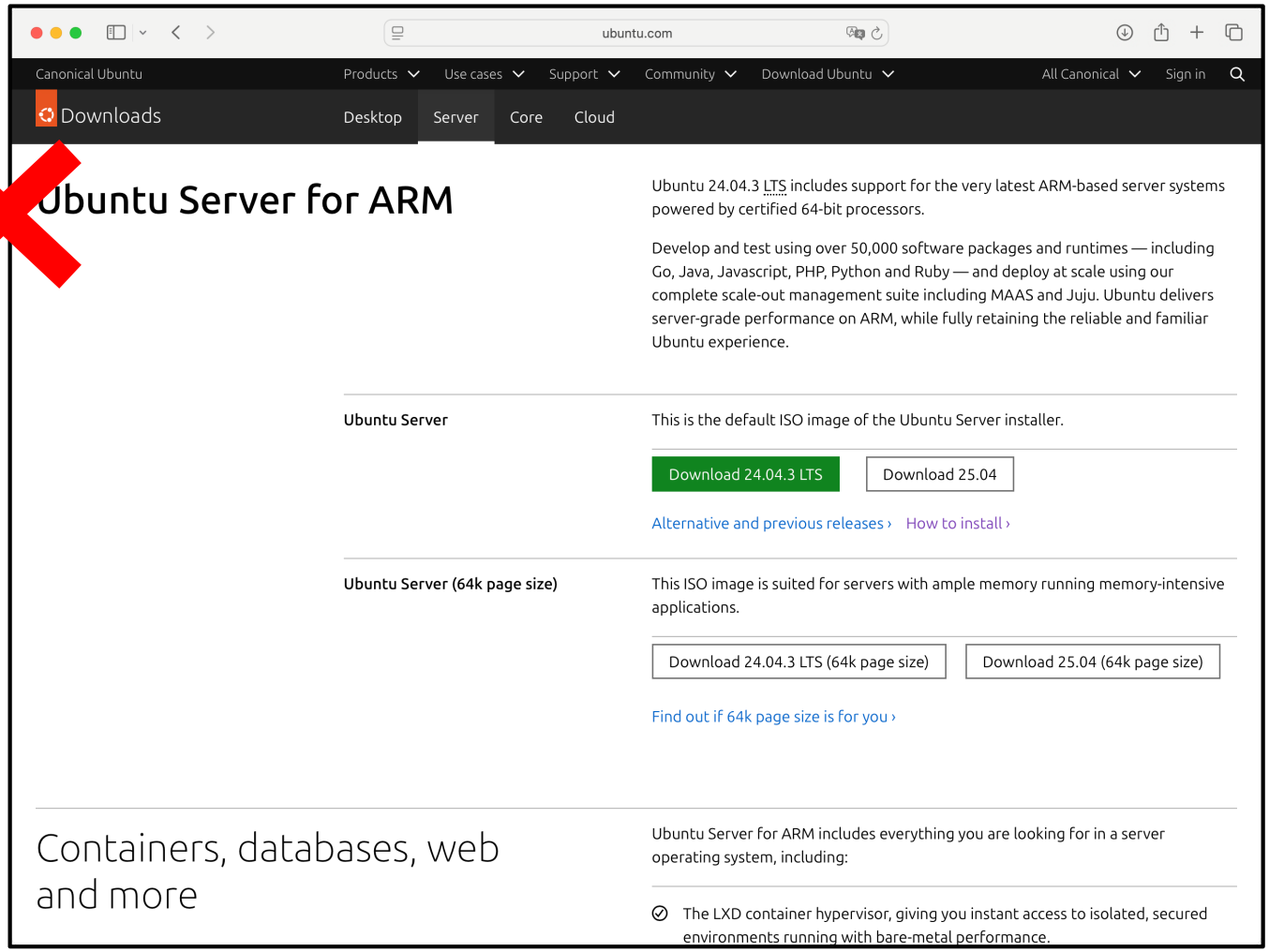
Download Linux Image (Ubuntu 22.04 LTS)

- https://releases.ubuntu.com/22.04/
  - You may need a **server** Image (not desktop)



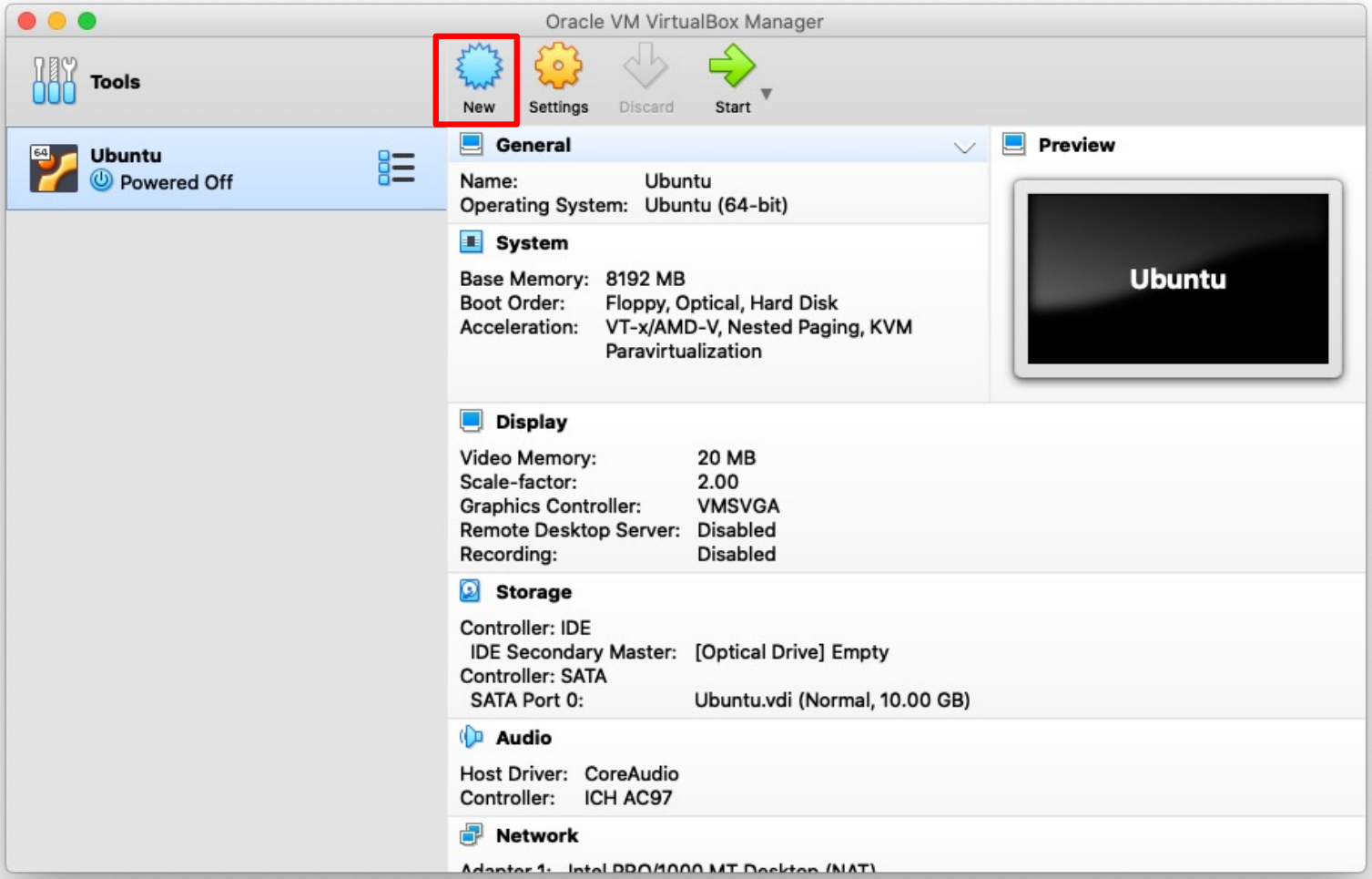
Alternative: Ubuntu For Apple Silicon

- https://releases.ubuntu.com/22.04/
  - The installation image MUST be for x86, not Aarch64(ARM)



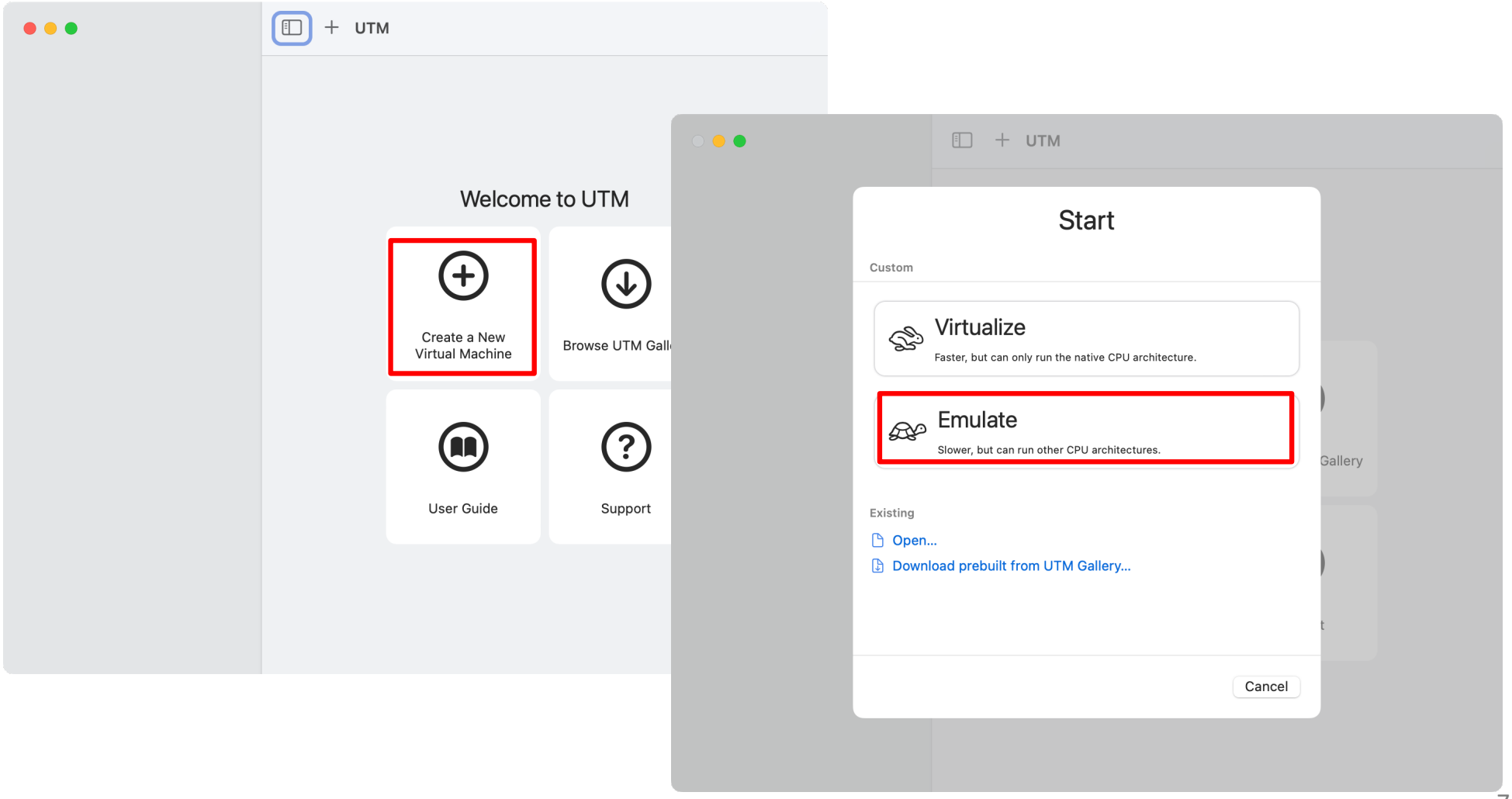
Create Virtual Machine (VM) instance

- Press "New" Button
  - Make sure your VM is set to 64-bit



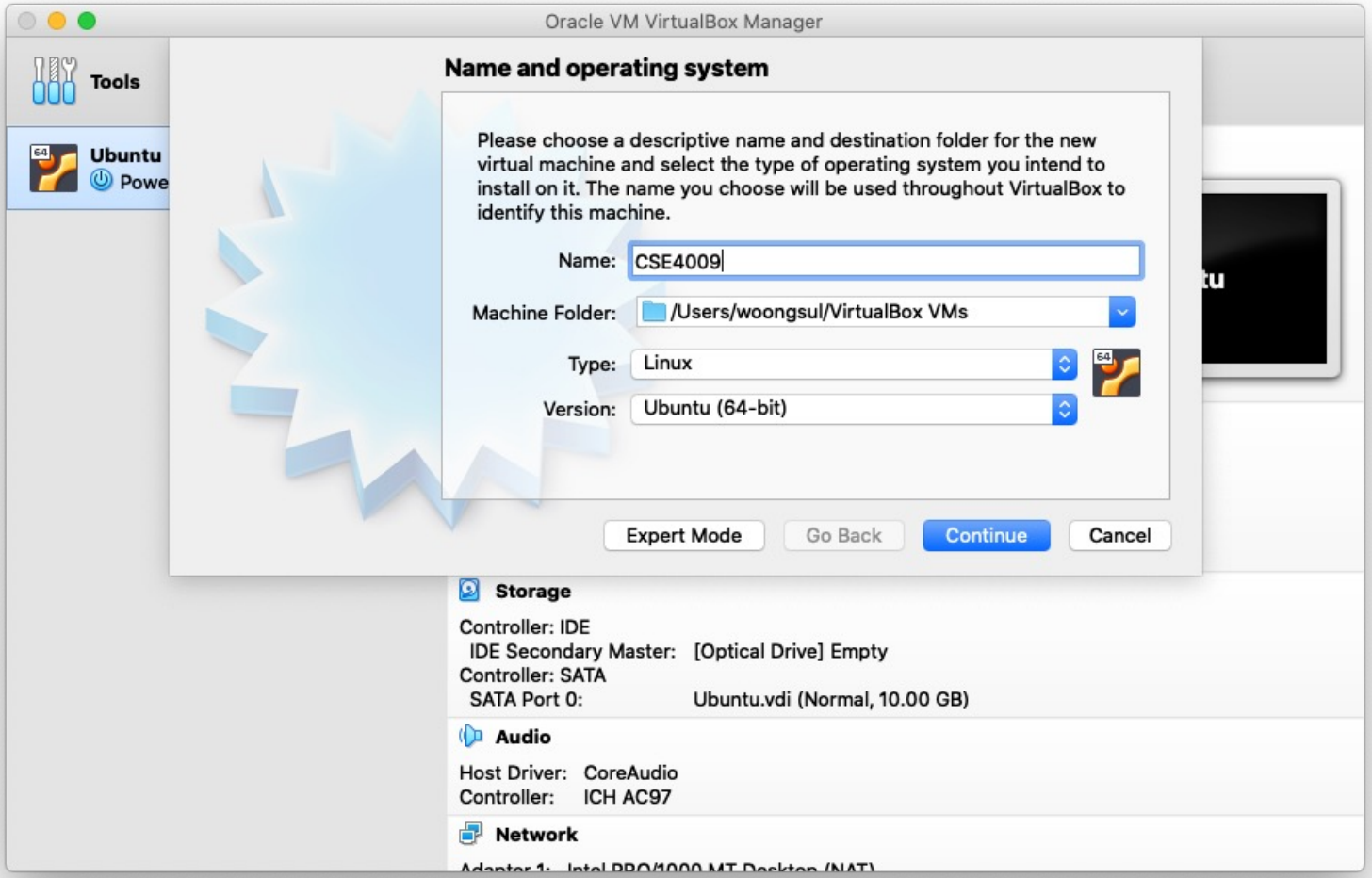
Alternative: Create VM instance for UTM

- Press "New" Button
  - Make sure your VM is set in **emulate** mode (x86 system on ARM)



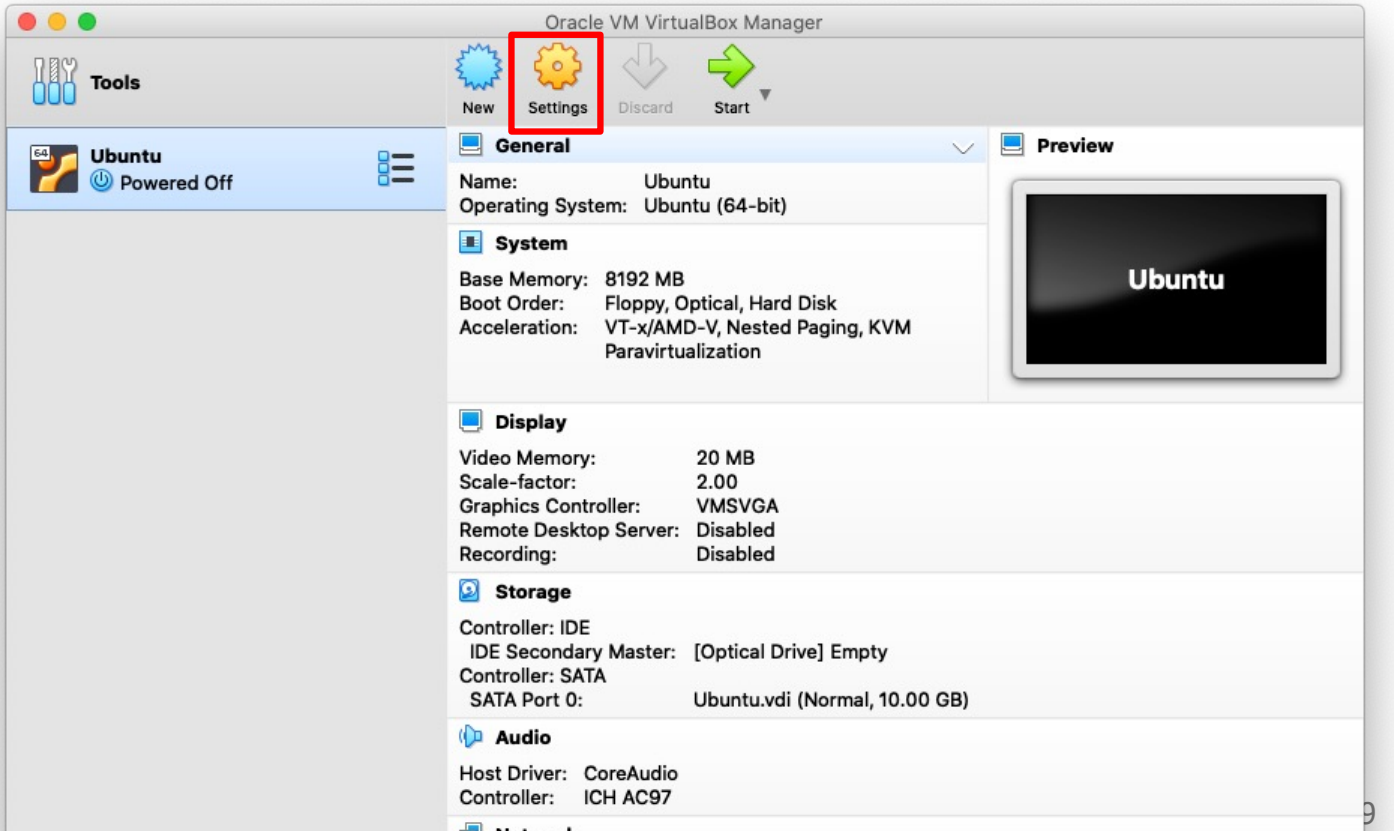
Configure Virtual Machine (VM) instance

- Select Linux – Ubuntu (64-bit)



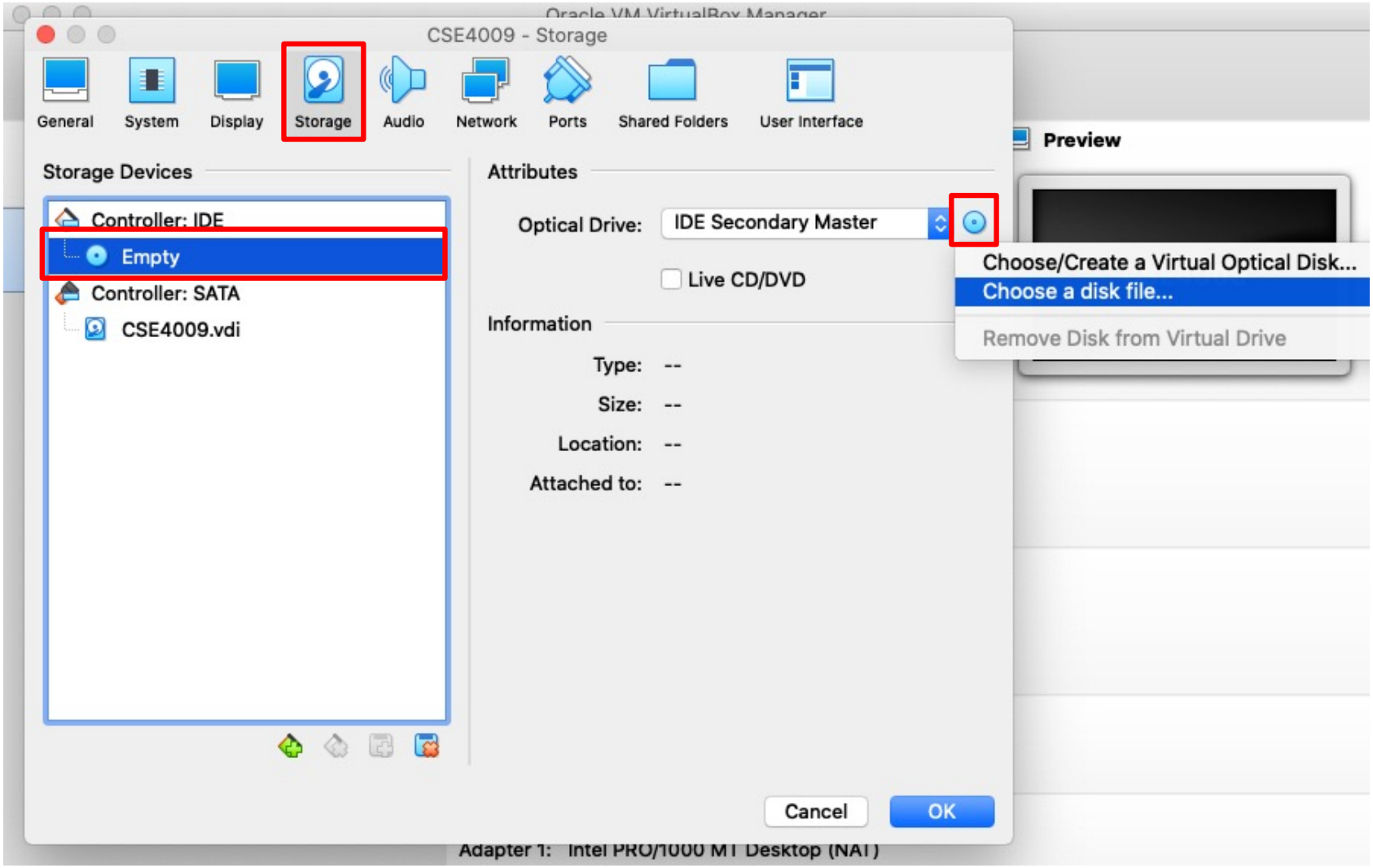
Configure Virtual Machine (VM) instance

- You can adjust memory size and processor count at "Settings"
- My example
  - Processor: 6 out of 12 cores
  - Memory: 8192 MiB out of 16 GiB
  - Storage: 20 GiB



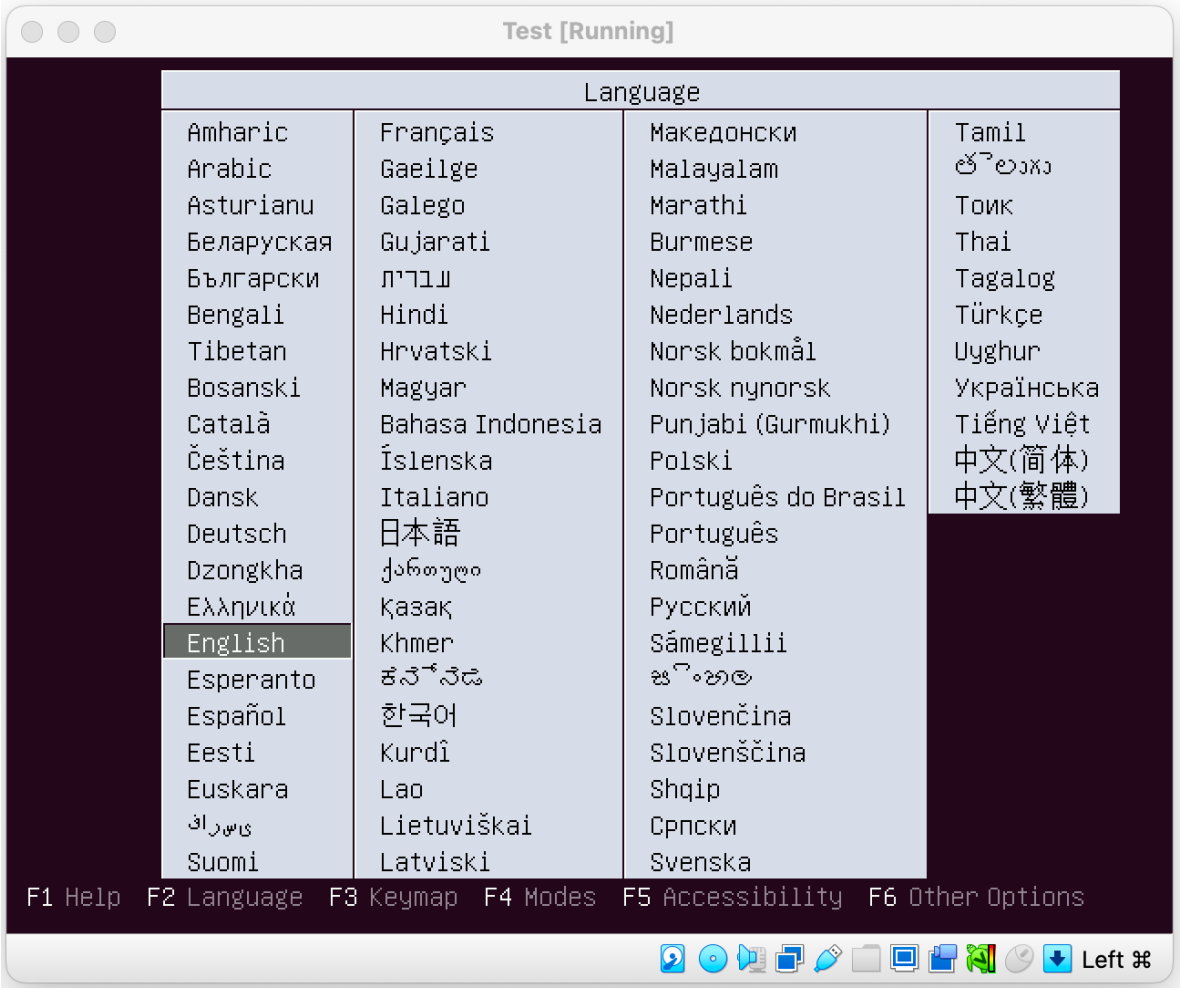
Install ubuntu Server

- Start VM instance with Linux Server Image



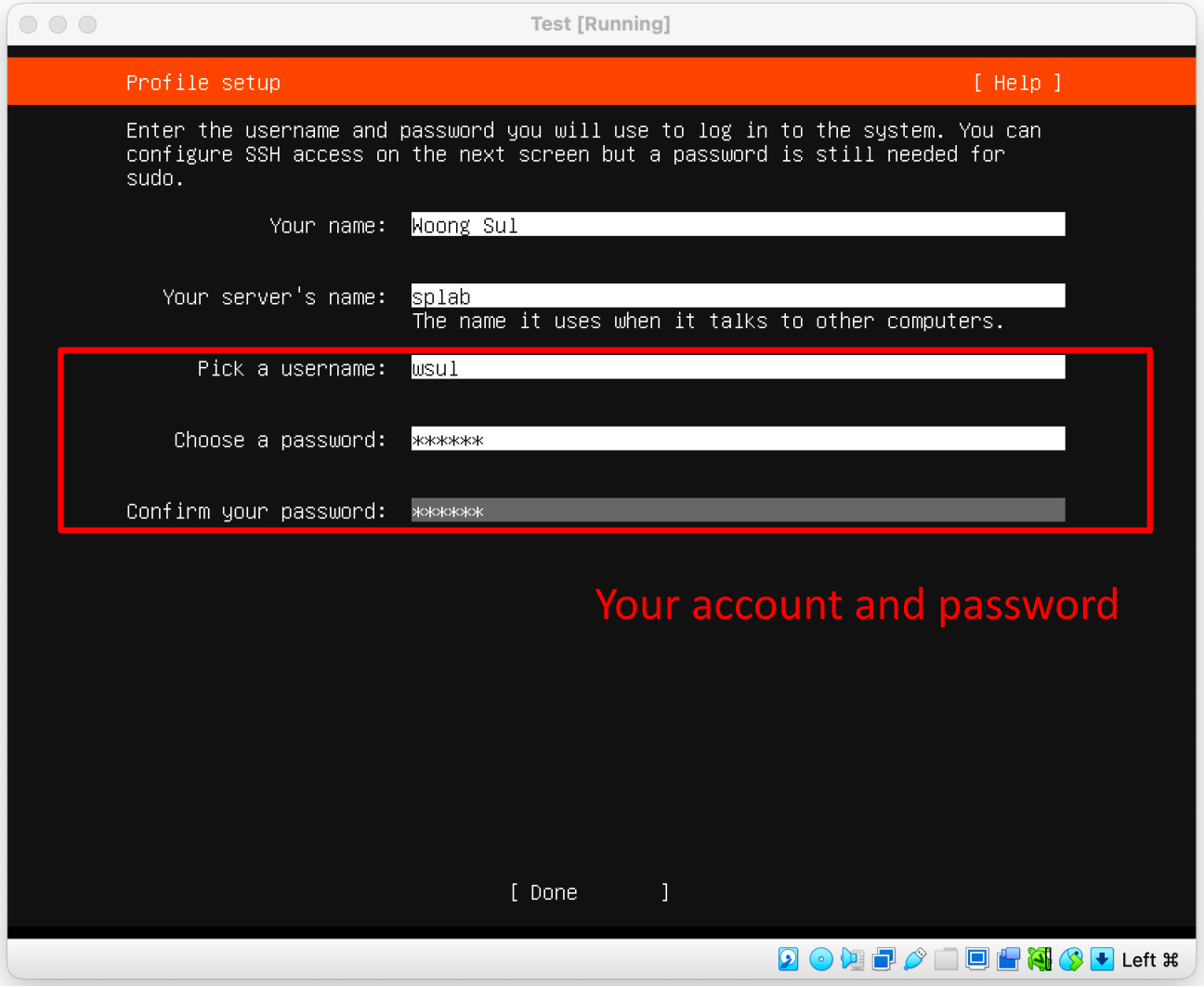
Install ubuntu Server

- Start your VM with the downloaded install image
  - Except for the next slides, skip most of it or use the default options



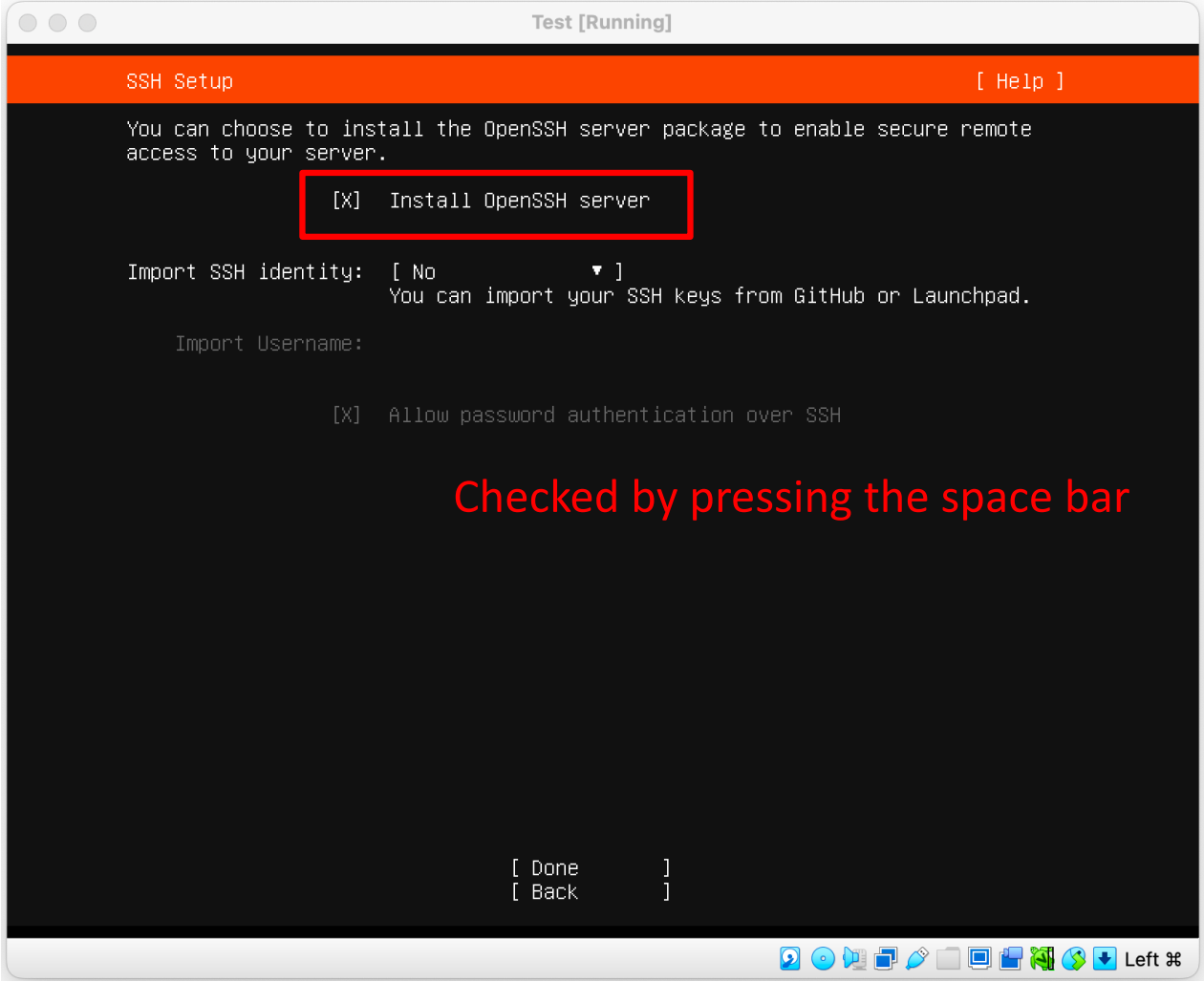
Install ubuntu Server

- Setup your account



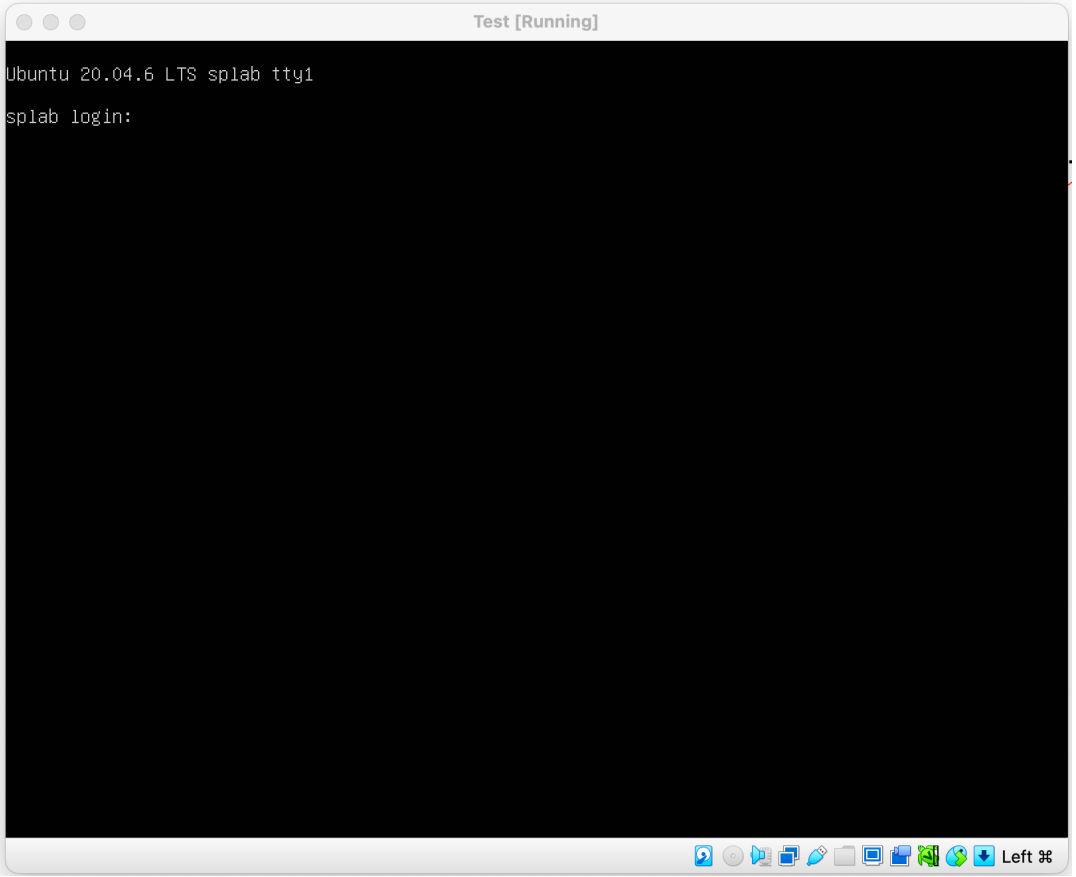
Install ubuntu Server

- Check OpenSSH server
  - Or you can install it later with ***apt-get***



Install System Software

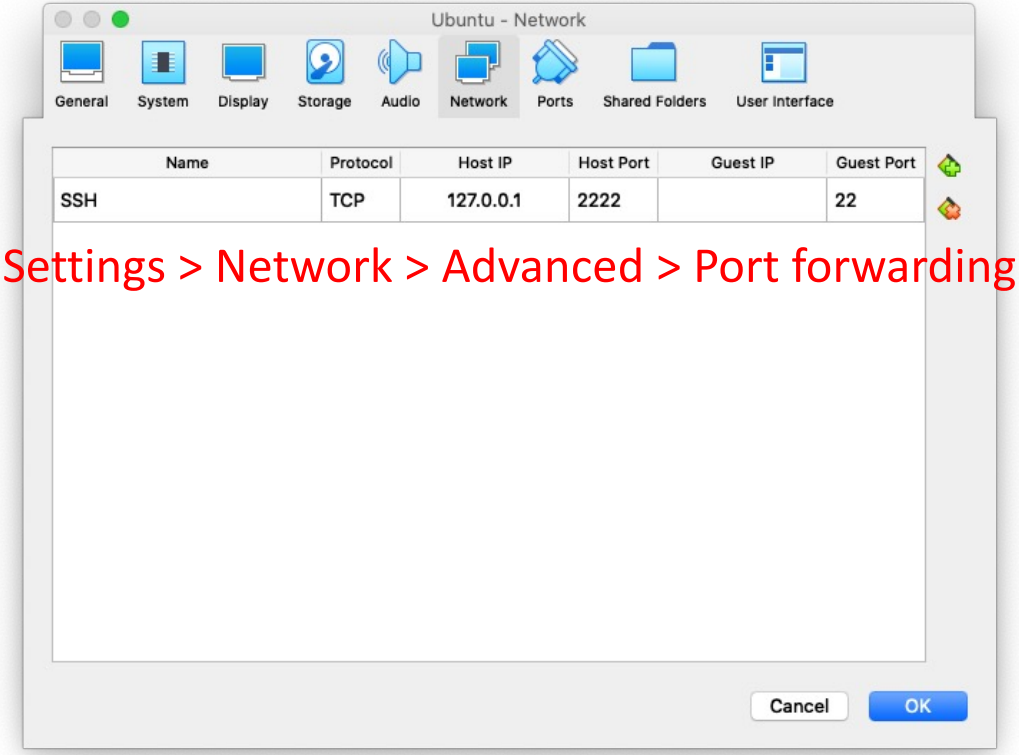
- After rebooting you can log in with your account
  - `sudo apt-get -y install build-essential gdb`
  - `sudo apt-get -y install openssh-server`
  - `sudo apt-get -y install gcc-multilib g++-multilib`



Network Setup

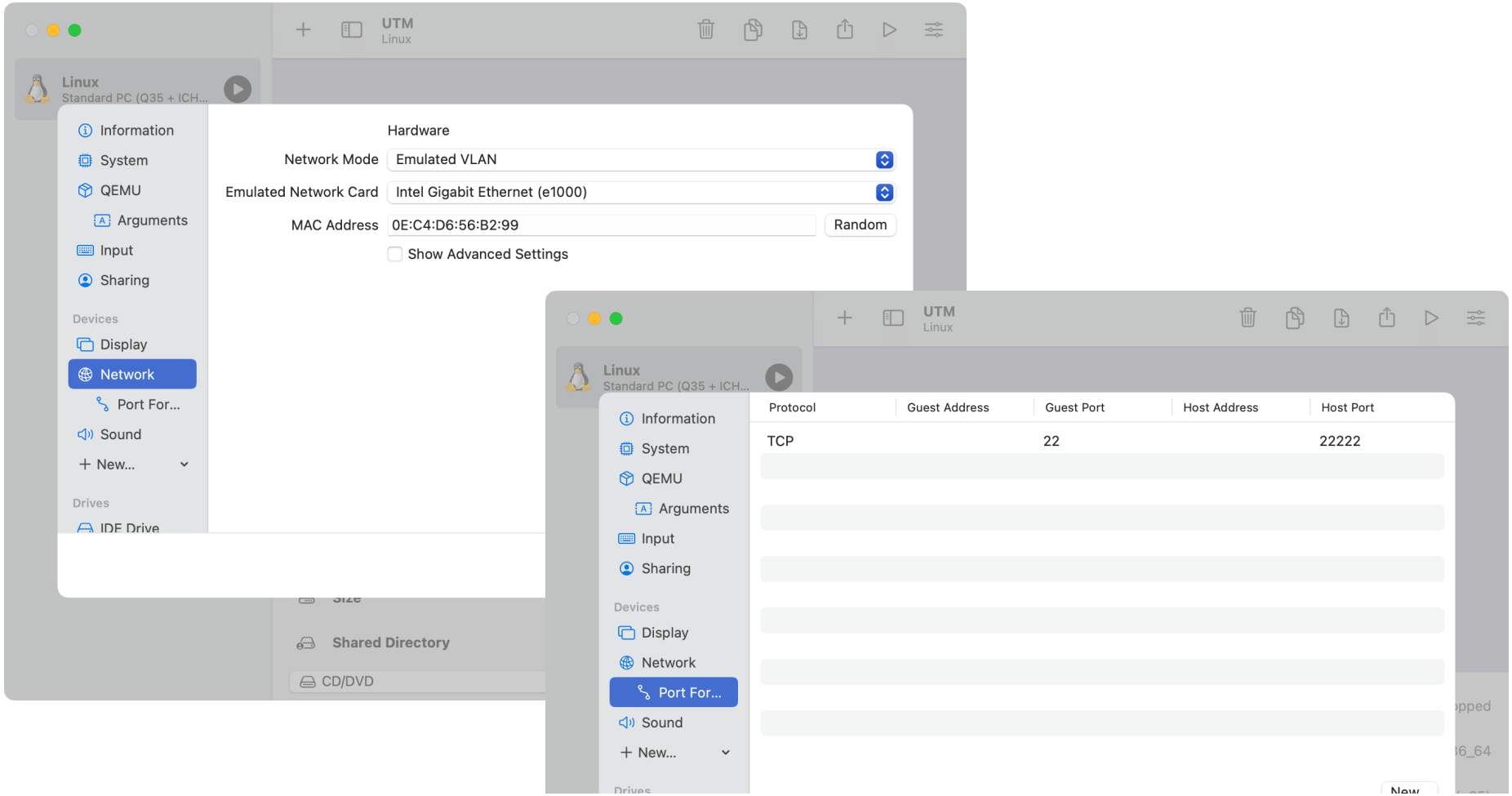
- Instead of typing commands directly to the VM instance
- You can use a terminal connected to the VM
  - Port forwarding: real computer at 2222 to VM at 22(ssh)

```
ssh -p 2222 {account}@localhost
```



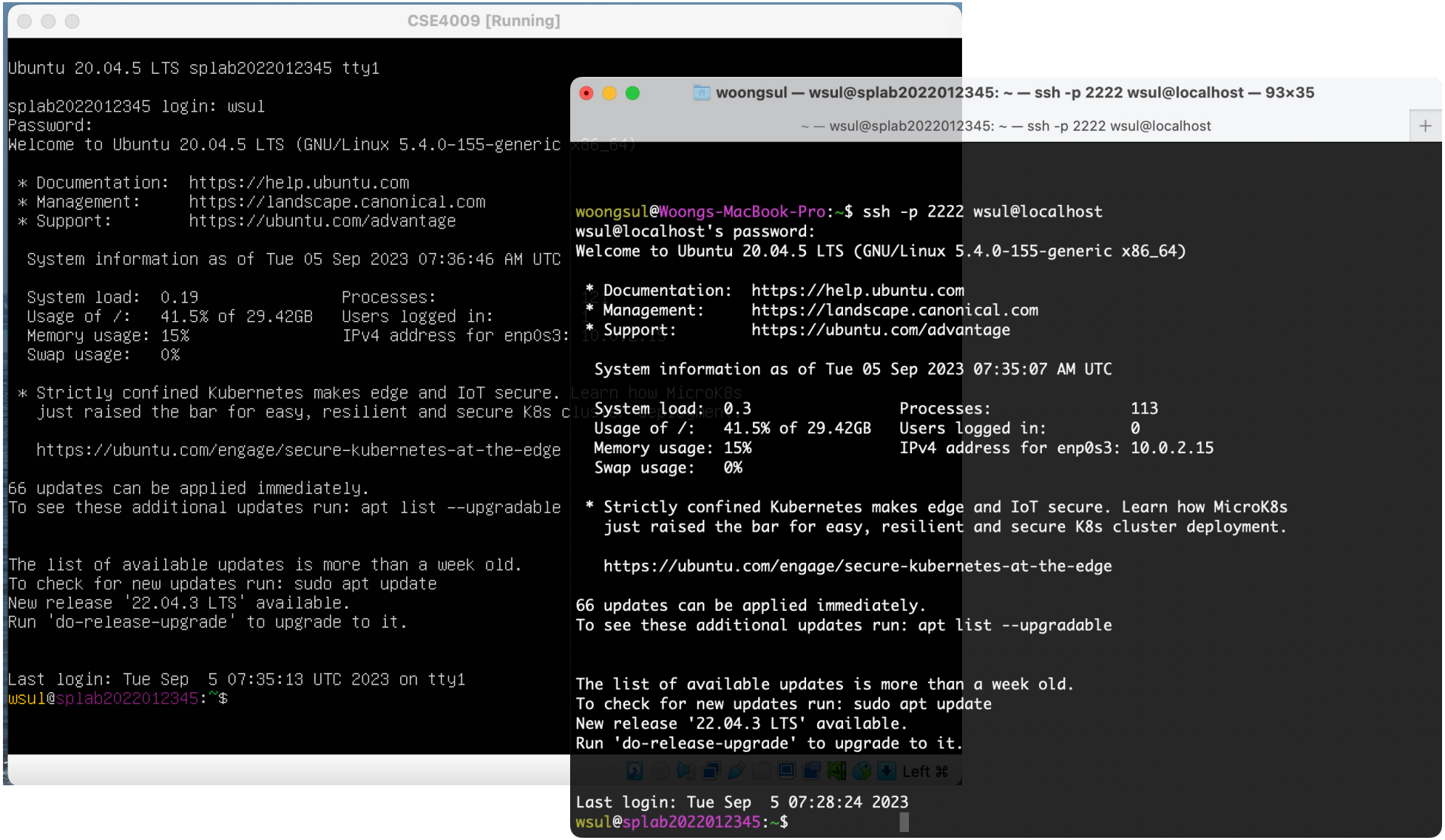
Alternative: Network Setup for UTM

- Set Network Mode to ***Emulated VLAN*** to activiate the ***Port forwarding*** submenu
  - Add the same rule to the previous slide



Almost Done!!

- You can connect to your VM like a remote server



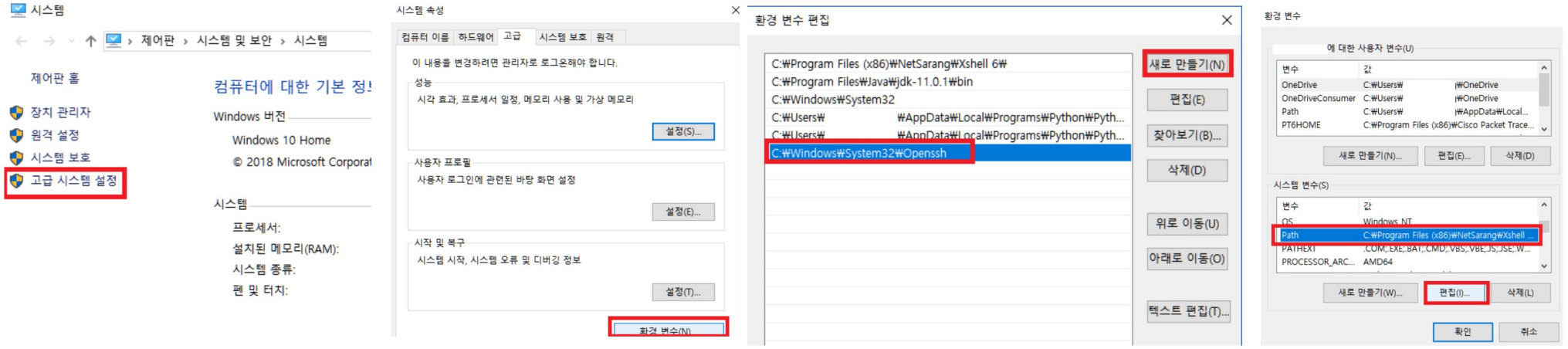
Remote Access to Your VM

```
ssh -p {port} {account}@localhost
```

- ***Terminal.app*** for MacOS users
- ***PowerShell*** or ***gitbash*** for Windows users
  - You may need env setup

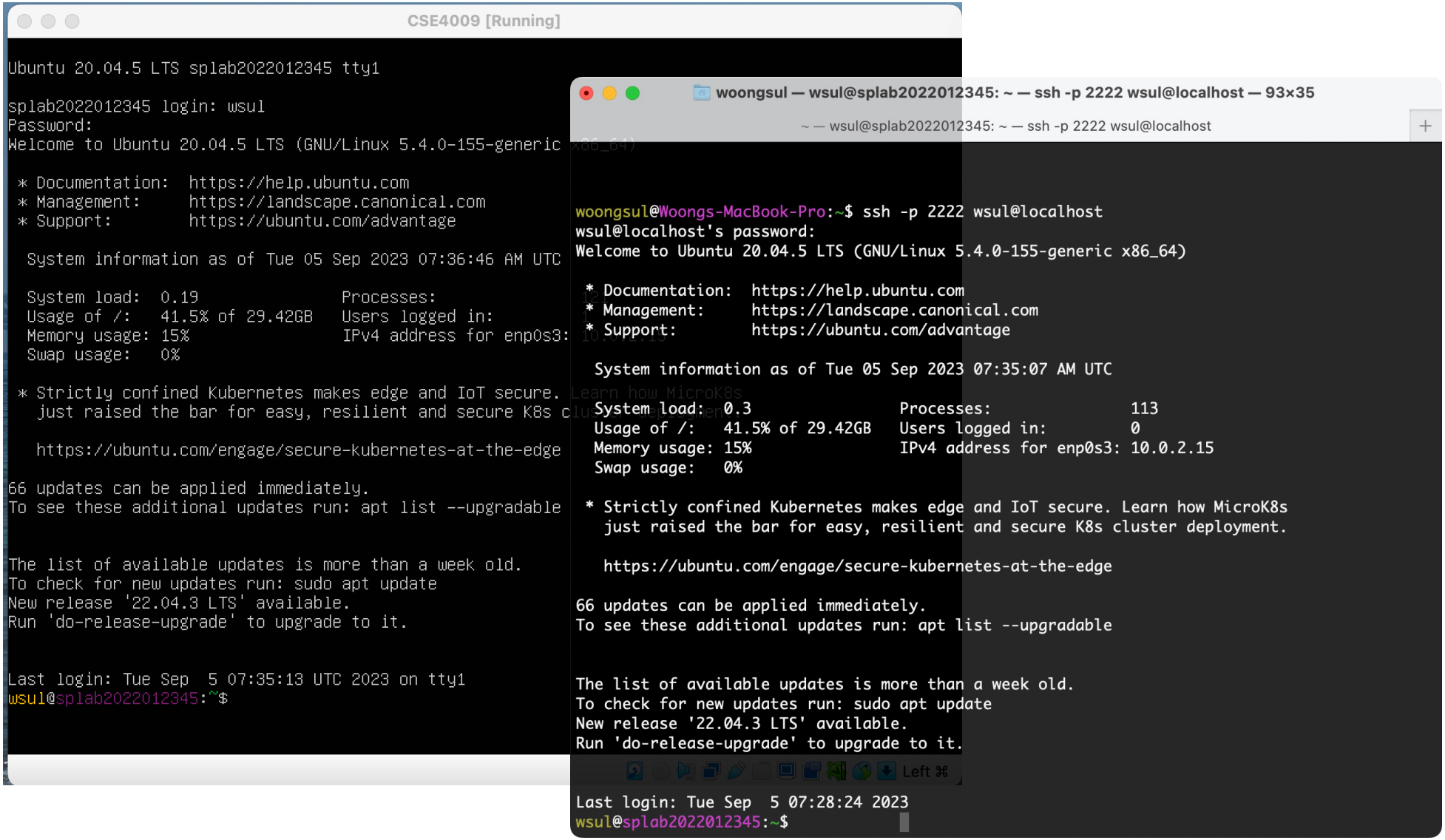
    Control panel > System and Security > Advanced > Environment Variables

    Add {OpenSSH directory path} on "Path"



Almost Done!!

- You can connect to your VM like another remote server



Finally Done!!

- Make sure that your VM appears as an x86 system