Mininet
Installation & How to use

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What is Mininet?

- "Mininet is a network emulator which creates a network of virtual hosts, switches, controllers, and links. Mininet hosts run standard Linux network software, and its switches support OpenFlow for highly flexible custom routing and Software-Defined Networking." – Mininet overview

- You can create various network situation by manipulating link rate, link delay, queue length, loss rate, topology etc.

Installation and Setting

1. Install Virutal Machine

- We recommend to use VirtualBox.

- Download package
  (https://www.virtualbox.org/wiki/Downloads)

- Select according to you OS

- Install the package

2. Download Mininet image

- Mininet image with provided codes is available at following link. (Recommended) (https://drive.google.com/file/d/129AYz4JE4g7ncItpIj2vqLzfpIzHxDxb/view?usp=sharing)

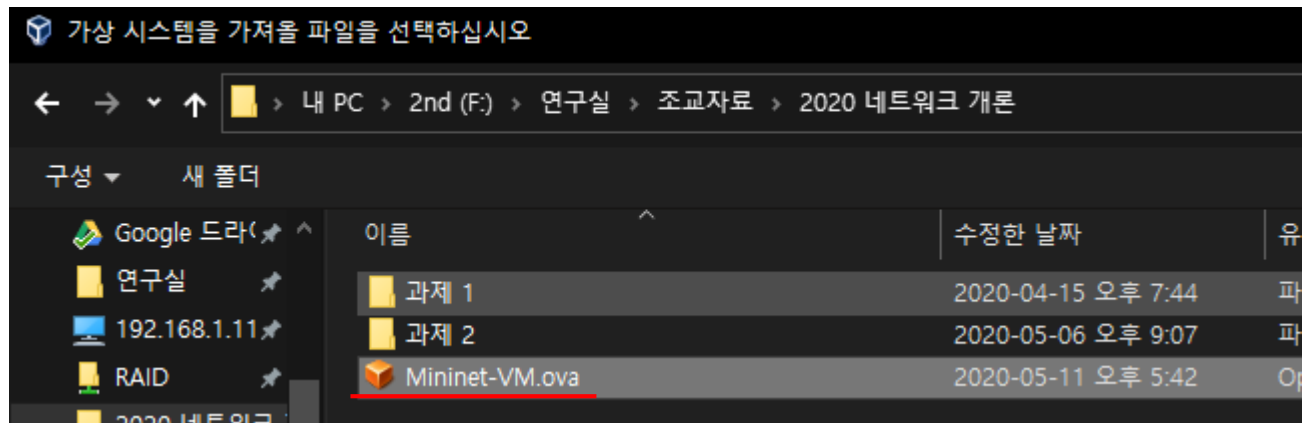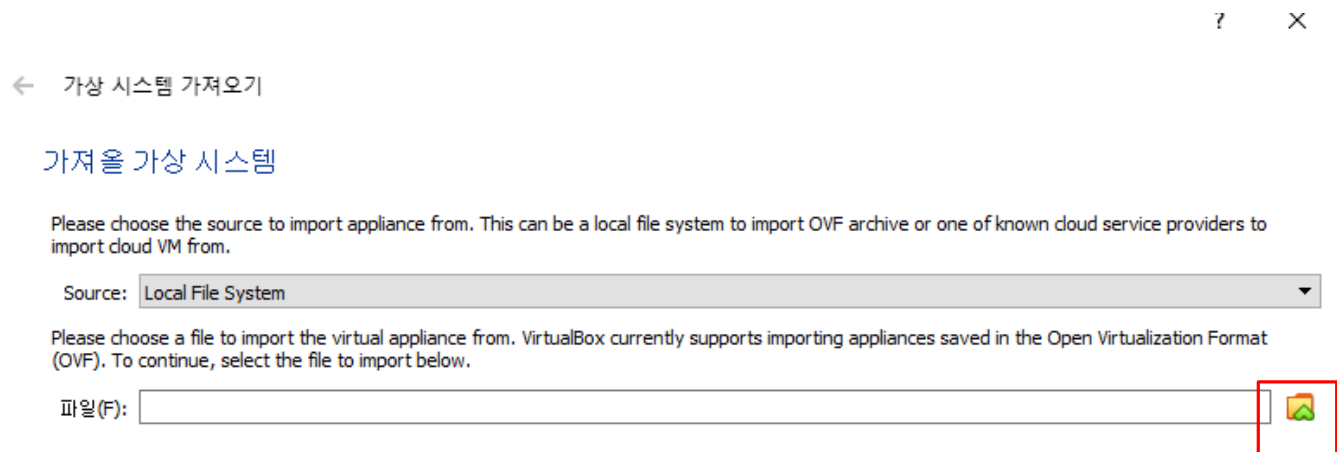- If you want to download original Mininet image, it is available at following link. (https://github.com/mininet/mininet/releases)

3. Import Virtual System

3. Import Virtual System
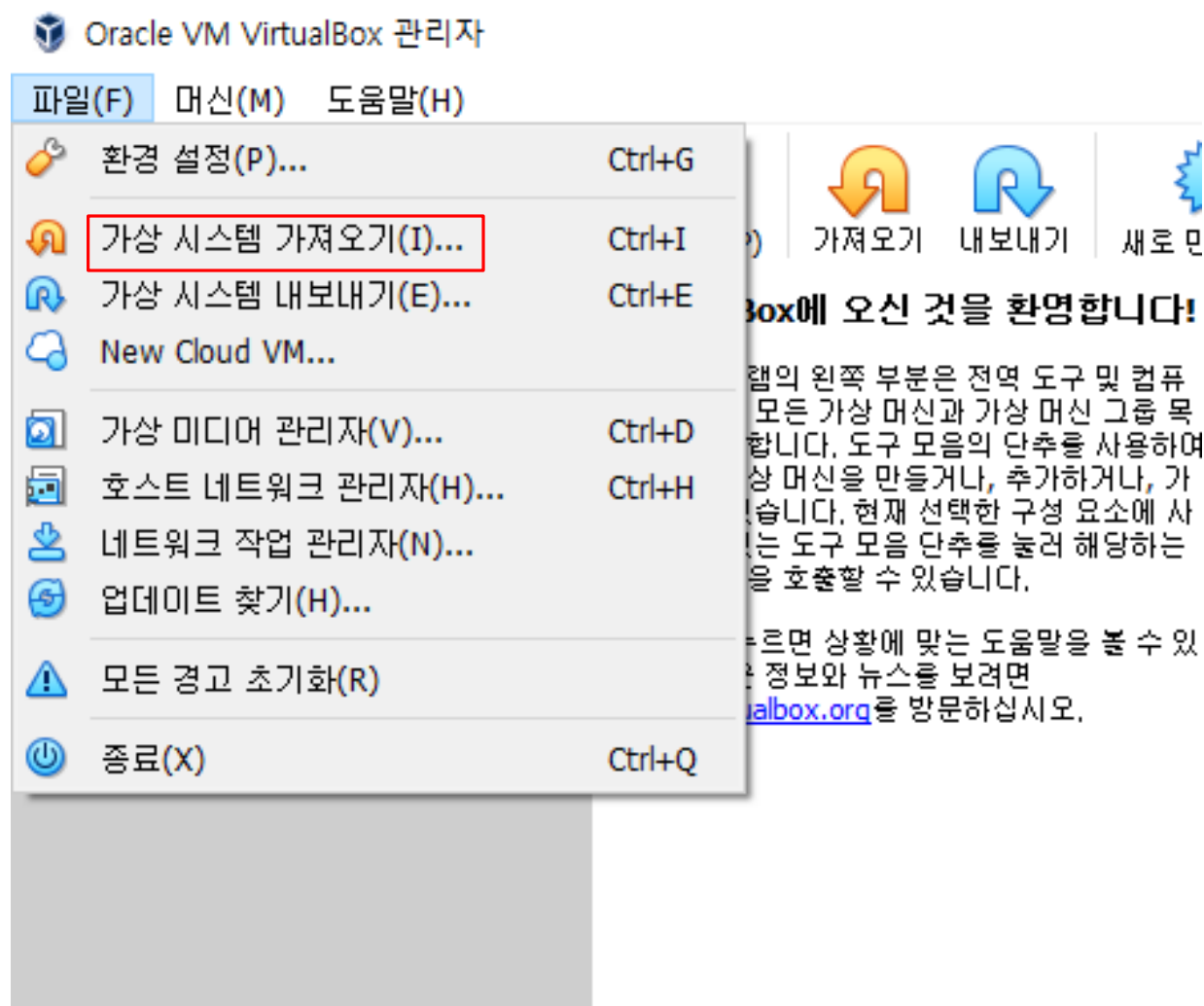
3. Import Virtual System

Select Mininet image

3. Import Virtual System

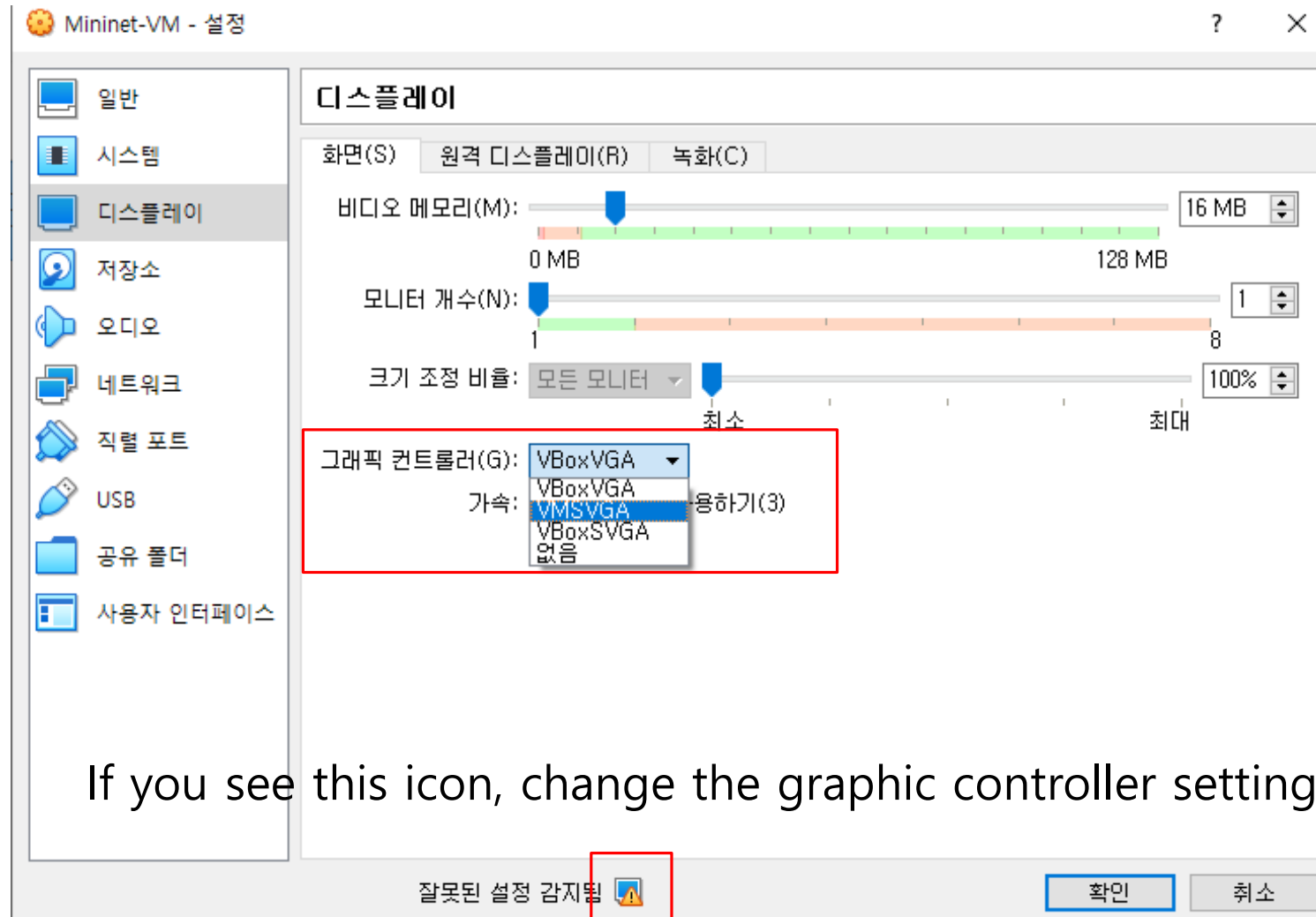Continue to create virtual machine

4. Setting Virtual Machine
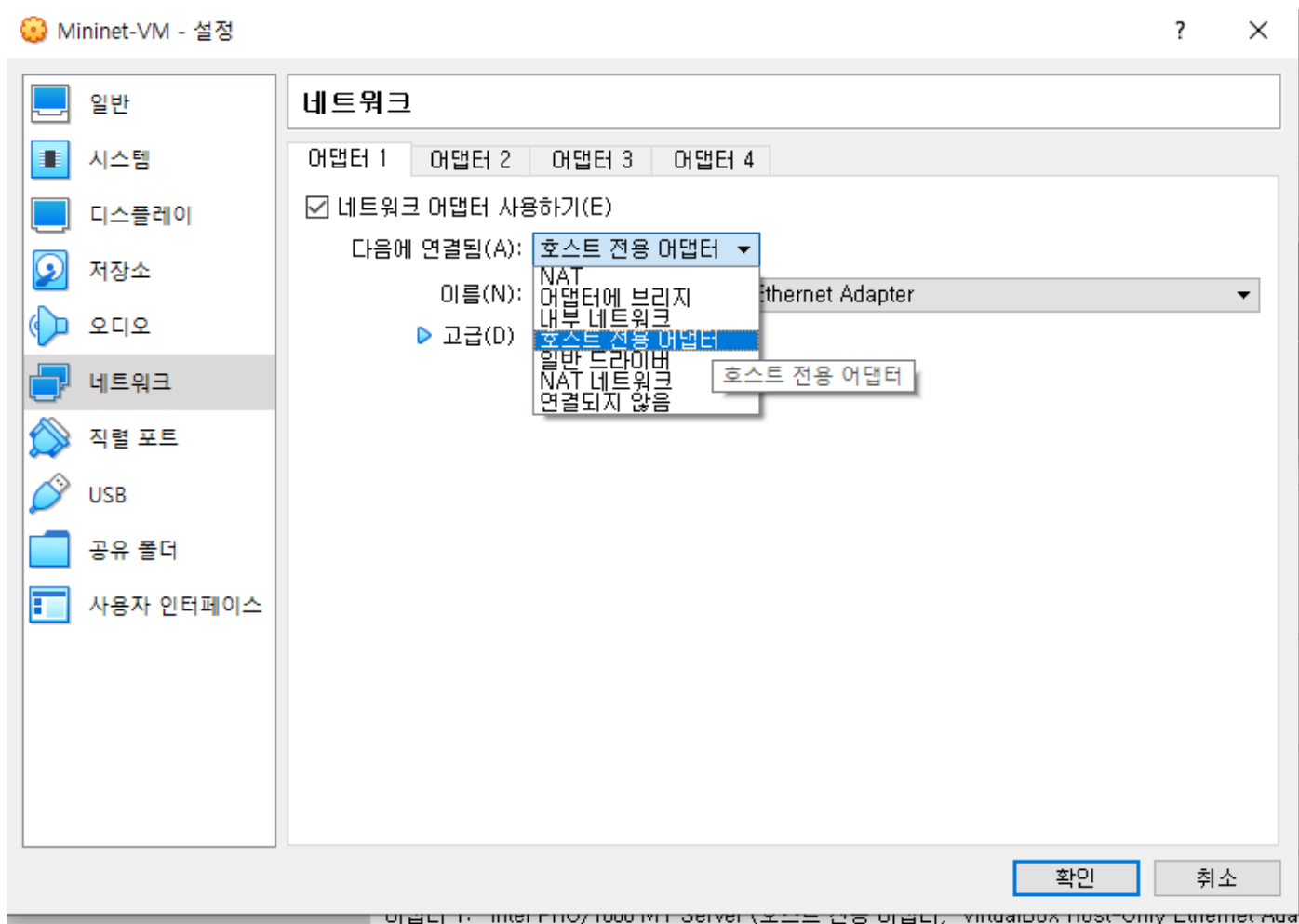
Click "setting"

4. Setting Virtual Machine

If you see this icon, change the graphic controller setting to VMSVGA

4. Setting Virtual Machine

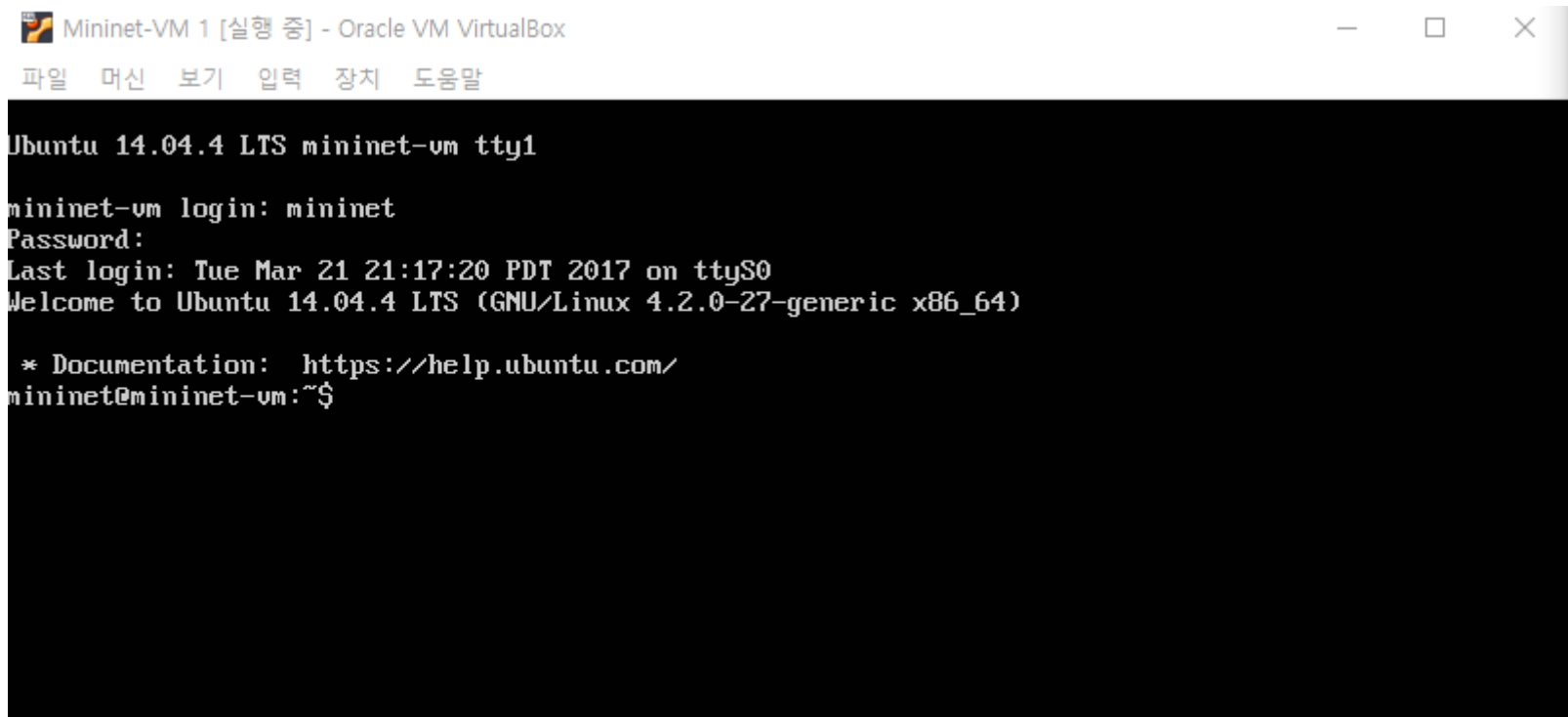Change network from NAT(by default) to Host-only-adapter

5. Start Mininet-VM

Start VM by double clicking it

6. Login

Both ID and password is 'Mininet'

7. Check IP

Use "ifconfig" to check ip address of Mininet machine

How to use Mininet

Use SSH and SFTP

- SSH is for access terminal and GUI platform(wireshark etc).
- We recommend to use "Putty" and "Xming" to use SSH.
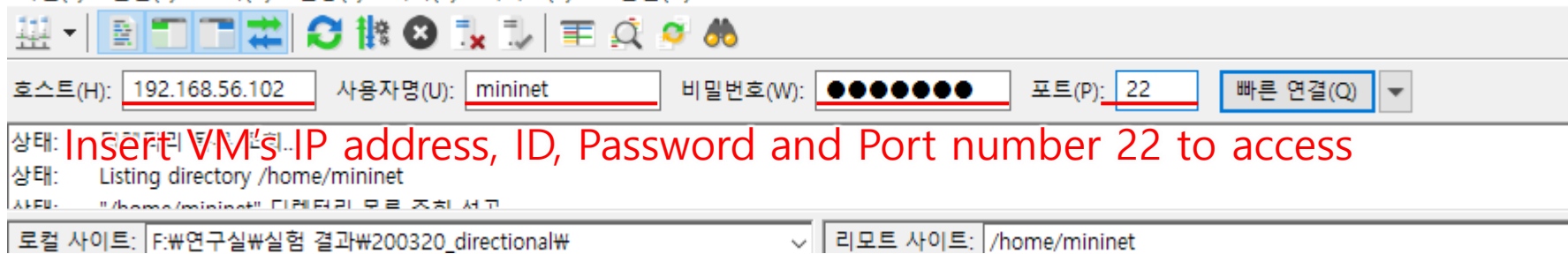- Turn on the the Xming.
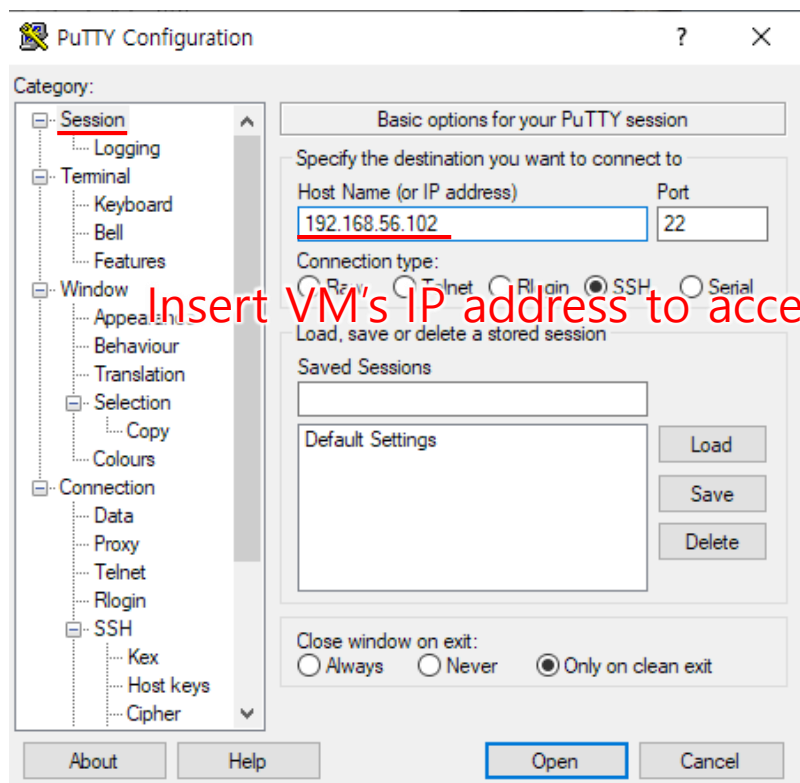
Insert VM's IP address to access
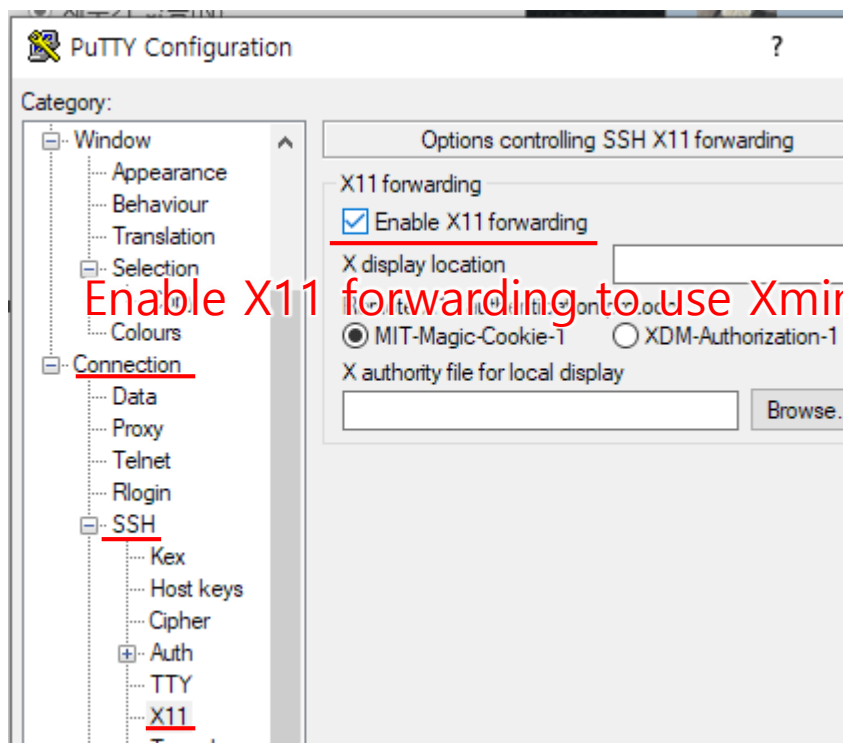
Enable X11 forwarding to use Xming for GUI

Use SSH and SFTP

- SFTP is for access file system via SSH protocol

- We recommend to use "Filezilla" to use SFTP

Insert VM's IP address, ID, Password and Port number 22 to access

Mininet with python API

- We will give you the Basic python code to use the Mininet.

- Put the code file in Mininet VM and execute it with python.

   **"sudo python execute_mn.py <window Size, source Filename, Destination Filename>"**

- This will create 2 Hosts, 2 Switches and 3 Link. The link in the middle of Switches is bottleneck link that we are going to manipulate Bandwidth, Delay, Loss rate.

Client Host   **Switch**   **Bottleneck Link**   **Switch**   **Server Host**
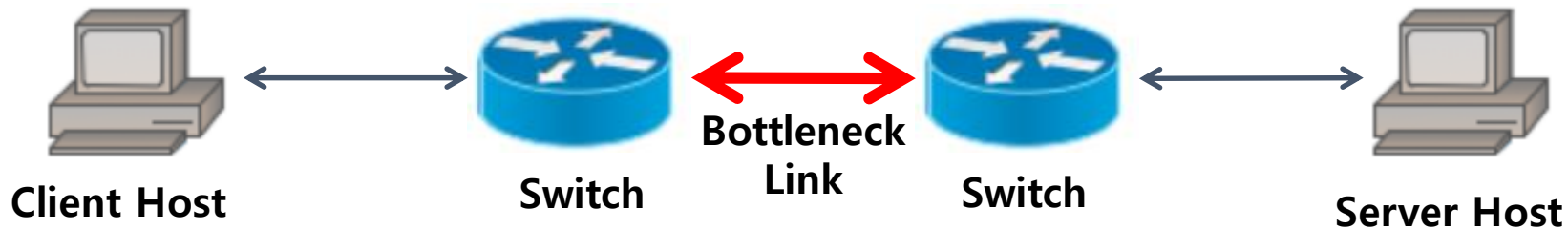
- Please read the comment in code first. Modify it as you want.

Bottleneck Link

Client Host   Switch   Bottleneck Link   Switch   Server Host
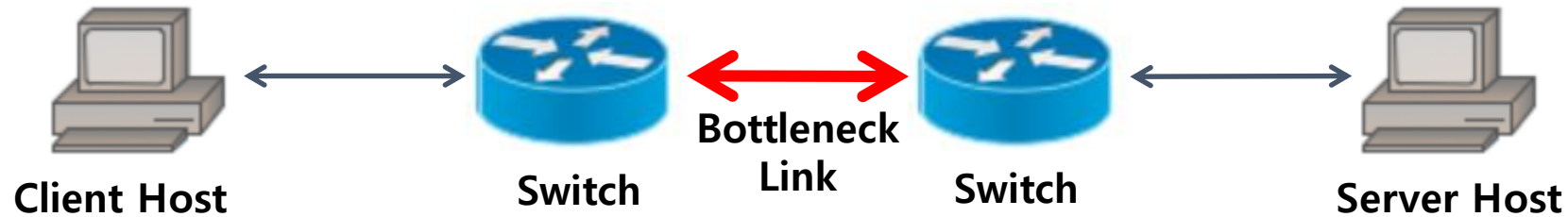
- Bottleneck link is the link in between two switches which are connected to each host.

- You can change three properties of the link described below
  - Bandwidth : How many bits can be transferred through link
  - Delay : How much time will be delayed until the packet start to transfer (one-way propagation delay)
  - Loss Rate : Probability of the random packet loss

Ping, Iperf test

- You can check the connectivity and network performance by ping and iperf. In "execute_my.py" you can use these by uncomment the code below.

```
"execute ping for establish switching table"
net.pingAll() #This code must not be removed


"If you want to test with ping and iperf, uncomment this"
"""
net.pingFull([receiver,sender])
net.iperf([receiver,sender],seconds=10)
"""
```

- **"Ping"** is used to test reachability of a host on an IP network. The result of Ping shows packet loss and RTT.

- **"Iperf"** is used to test the performance of network between two hosts. The result of iperf shows bandwidth between two hosts using TCP.

- **Caution:** "net.pingAll()" must not be removed because of switching table initialize.

Bandwidth test

- You can check the bandwidth by the iperf result.

Delay test

- You can check the delay by the ping result.

Loss Rate test

- You can check the bandwidth by the ping result.

```
myTopo = Assignment3Topo(bw_v = 10, delay_v="10ms", loss_v=0)
```
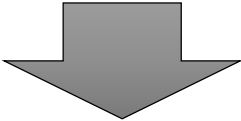
```
Starting test...
*** Ping: testing ping reachability
h1 -> h2
h2 -> h1
*** Results: 0% dropped (2/2 received)
h1 -> h2
h2 -> h1
*** Results:
 h1->h2: 1/1, rtt min/avg/max/mdev 21.407/21.407/21.407/0.000 ms
 h2->h1: 1/1, rtt min/avg/max/mdev 21.143/21.143/21.143/0.000 ms
*** Iperf: testing TCP bandwidth between h1 and h2
*** Results: ['9.55 Mbits/sec', '11.6 Mbits/sec']
Testing fininshed
```

```
myTopo = Assignment3Topo(bw_v = 10, delay_v="10ms", loss_v=10)
```

```
*** Ping: testing ping reachability
h1 -> h2
h2 -> X
*** Results: 50% dropped (1/2 received)
h1 -> X
h2 -> h1
*** Results:
 h1->h2: 1/0, rtt min/avg/max/mdev 0.000/0.000/0.000/0.000 ms
 h2->h1: 1/1, rtt min/avg/max/mdev 22.383/22.383/22.383/0.000 ms
*** Iperf: testing TCP bandwidth between h1 and h2
*** Results: ['1.31 Mbits/sec', '1.48 Mbits/sec']
Testing fininshed
```

Caution: Ping only sent one packet. So packet loss may not be occurred depend on the probability.

Clearing Mininet

- If the program was not terminated successfully(maybe because of error or something) please type following order first.

    "sudo mn –c"

This will clear the Mininet.

Q&A

- If you want to know more about the Mininet, use Mininet official website (http://mininet.org/)

- If you have any question, please use google sheet.