V-LAB
STEP-BY-STEP GUIDE

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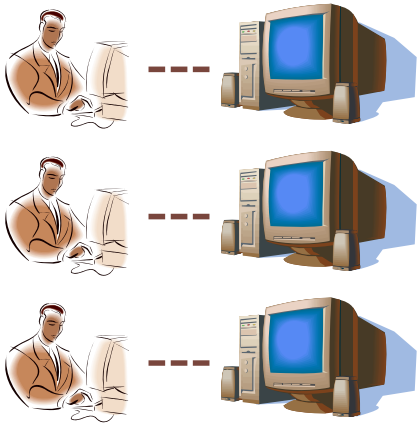
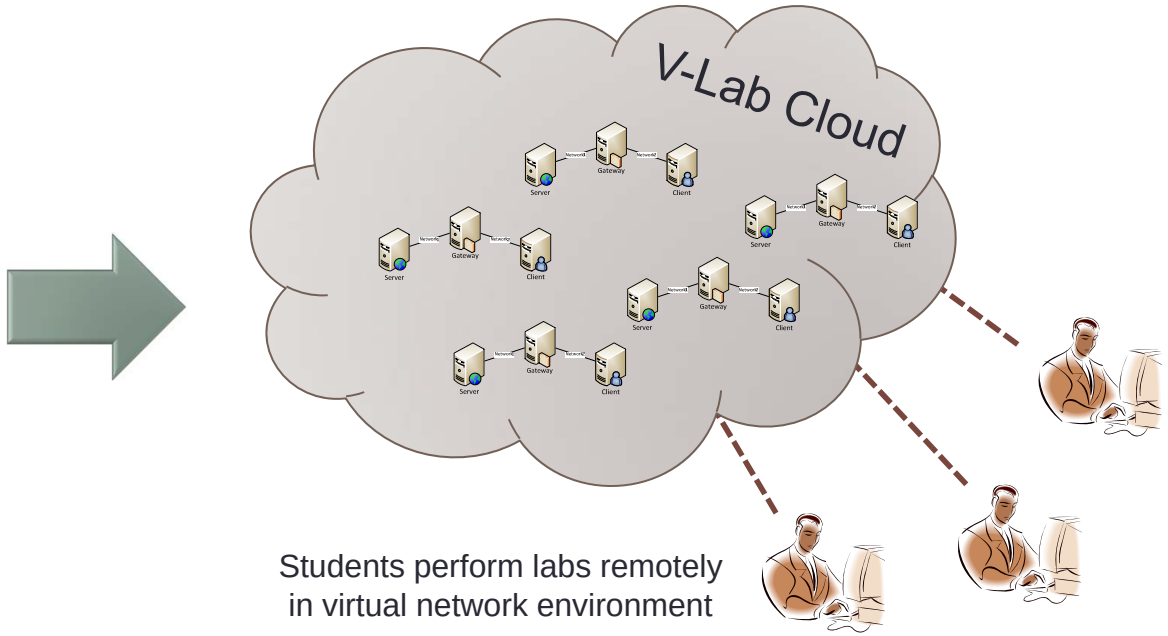
What is V-Lab?

- V-Lab is a Cloud-based Virtual Resource and Service Sharing Platform for Computer and Network Security Education.
- Compose, configure, perform and manage a virtual computer networking system for students to simulate real-life situation.



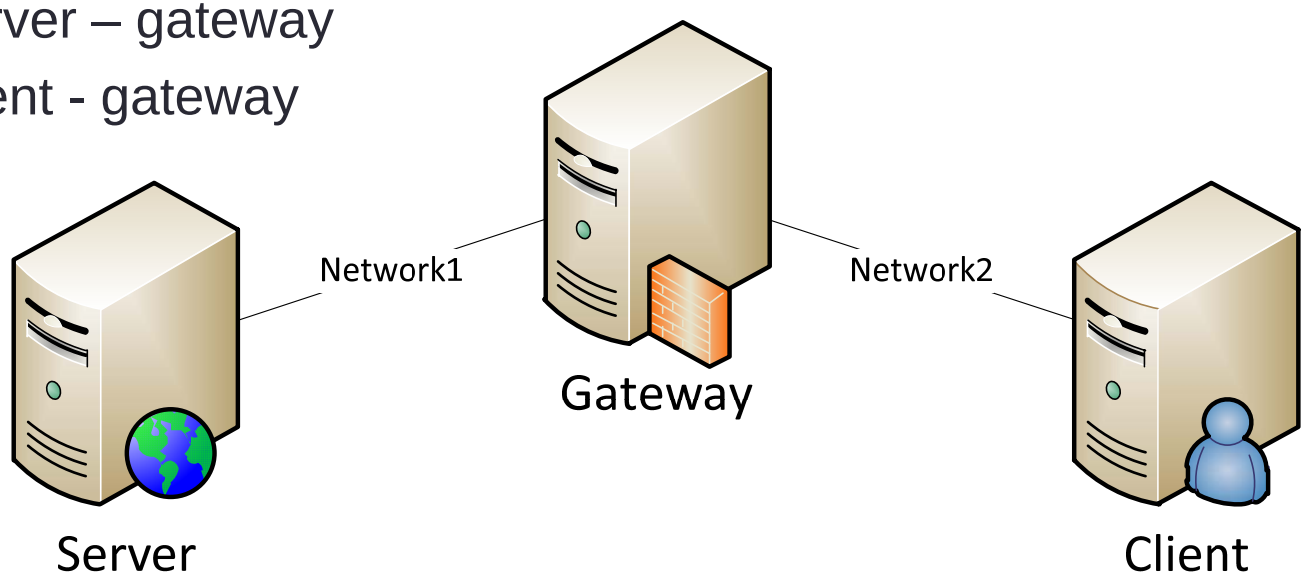
Students perform labs locally
in physical network environment



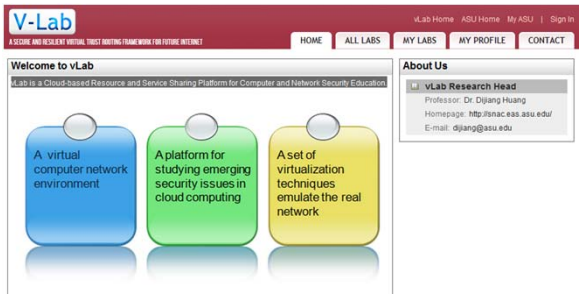
Students perform labs remotely
in virtual network environment

CSE468/598 Network Security Lab

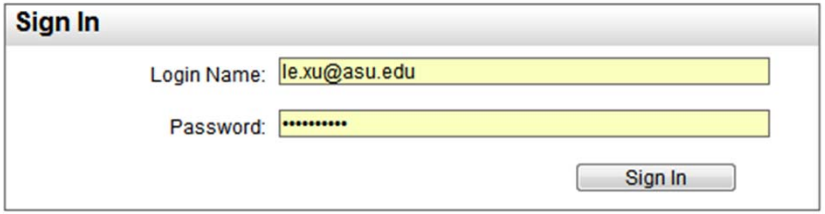
- 3 Virtual Machines: Gateway, Server and Client
  - Gateway: a router for IP forwarding, firewall rules, etc.
  - Server: provides services: Http, Ftp, etc.
  - Client: accesses services via Gateway.
- 2 Virtual Networks
  - Network1: server – gateway
  - Network2: client - gateway



V-Lab Website



- Go to http://vlab.asu.edu
- Click ‘Sign in’ on top right corner.
  - Use the account info in the email to sign in

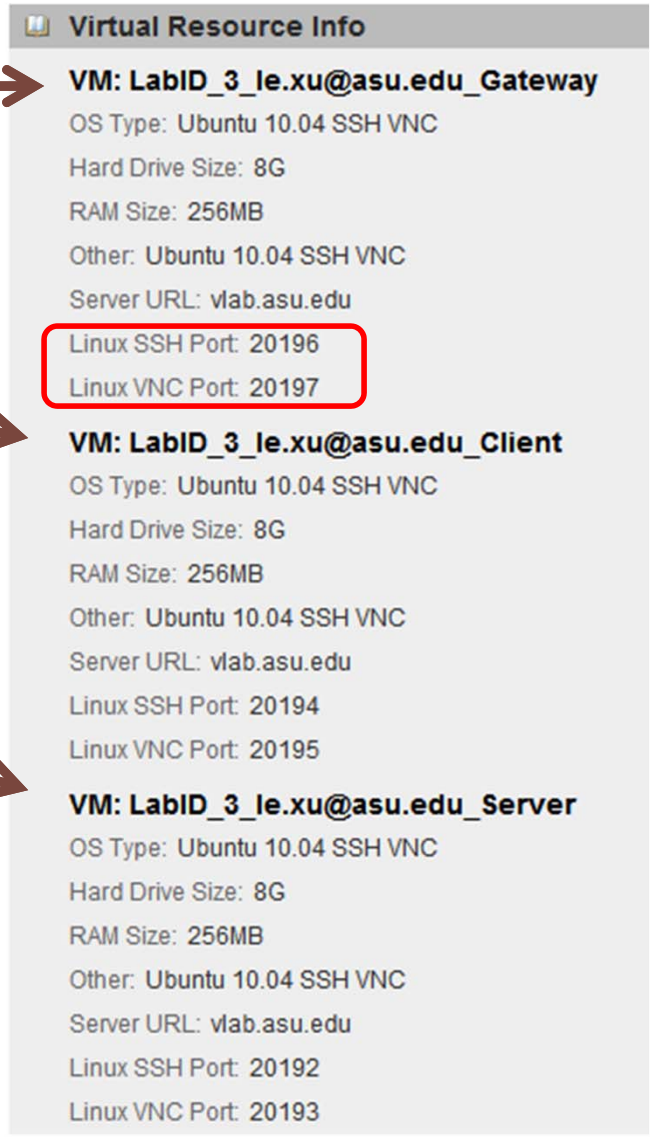


- Click ‘Setup’ on the right column

- Start using virtual resources
  - Next page…

V-Lab Virtual Resources Remote Access

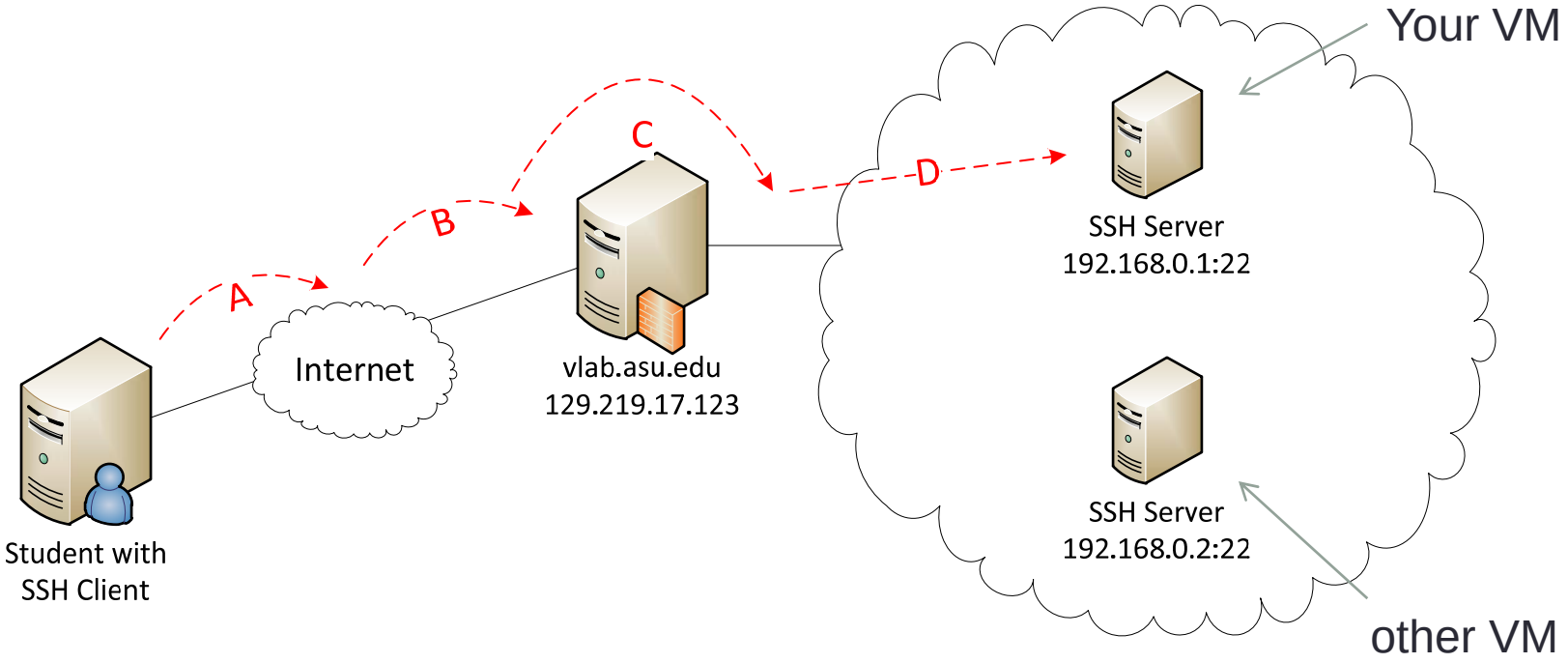
- VM: Gateway
  - SSH Port:
  - VNC Port:
- VM: Client
  - SSH Port:
  - VNC Port:
- VM: Server
  - SSH Port:
  - VNC Port:



- SSH
  - Secure Shell
  - Local Port: 22
- VNC
  - Virtual Network Computing
  - Local Port: 5900, 5901, …
- In V-Lab, we use port mapping to open remote access to students.

V-Lab Virtual Resources Remote Access

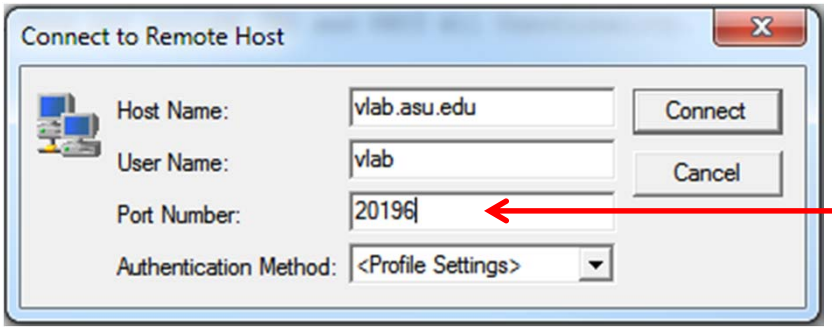
- A: SSH Client sends request to vlab.asu.edu:20196
- B: DNS resolves vlab.asu.edu to 129.219.17.123
- C: V-Lab Gateway maps port 20196 to 192.168.0.1:22
- D: SSH request sent to your own VM.



Task1: SSH connection to your VM

1. Download and install SSH Client software.
   1. Go to http://vlab.asu.edu, click on ‘Support’, download the SSH Client software from left column.
   2. Follow the steps to install SSH Client.
2. Find out your VM’s SSH port number.
3. Make a connection to your VM via SSH.
   1. Open ‘Secure Shell Client’.
   2. Click on ‘Quick Connect’. 

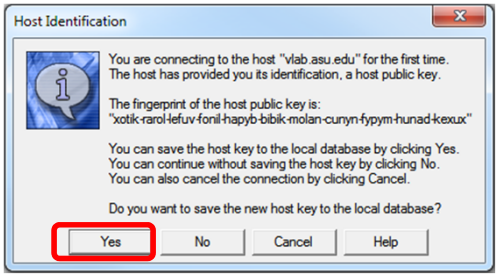
   3. Input destination address and port. User ‘vlab’ as user name.



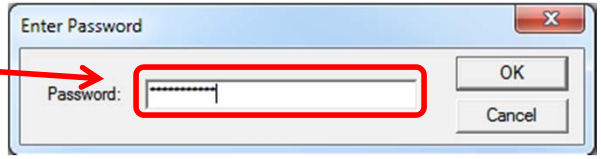
Use your VM’s SSH port here!

Task1: SSH connection to your VM (cont.)

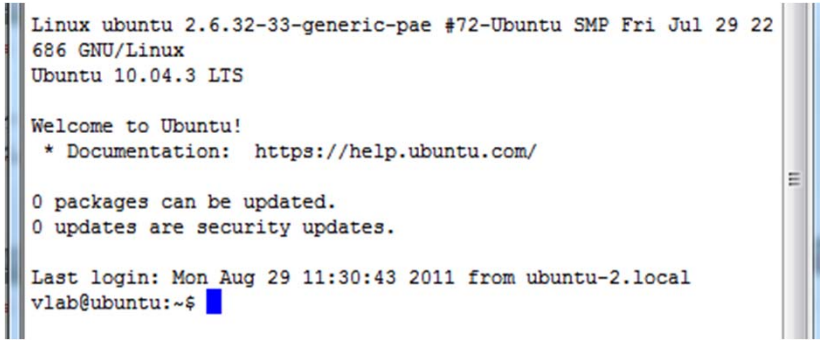
4. Click Connect



5. Input default password: ‘pa$$word123’



6. You should see your VM’s shell:



7. Repeat the steps to connect to all 3 VMs. Remember the server, client and gateway SSH window locations.

Task2: Configure Networks

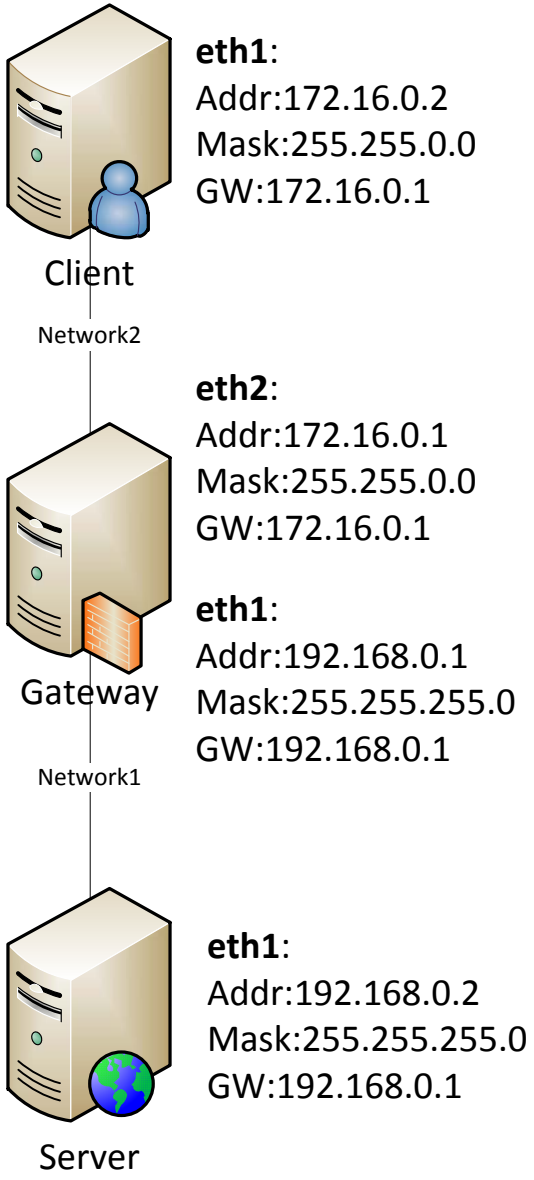
- In VM shell, type: *ifconfig*, enter.
- You can see 2 interfaces:
  - eth0: 10.0.100.x, 10.0.255.255, 255.255.0.0
  - lo: 127.0.0.1, 255.0.0.0, n/a
- Note: eth0 is for remote access only. Do **NOT** touch eth0 on any VM. Or you may lose connection to your VM.

```
vlab@ubuntu:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 9e:9e:6f:7
          inet addr:10.0.100.55  Bcast:10.0.255.
          inet6 addr: fe80::9c9e:6fff:fe7e:d3ba/
          UP BROADCAST RUNNING MULTICAST  MTU:15
          RX packets:26828 errors:0 dropped:0 ov
          TX packets:220 errors:0 dropped:0 over
          collisions:0 txqueuelen:1000
          RX bytes:2246241 (2.2 MB)  TX bytes:34
          Interrupt:10

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric
          RX packets:56 errors:0 dropped:0 overr
          TX packets:56 errors:0 dropped:0 overr
          collisions:0 txqueuelen:0
          RX bytes:4152 (4.1 KB)  TX bytes:4152
```

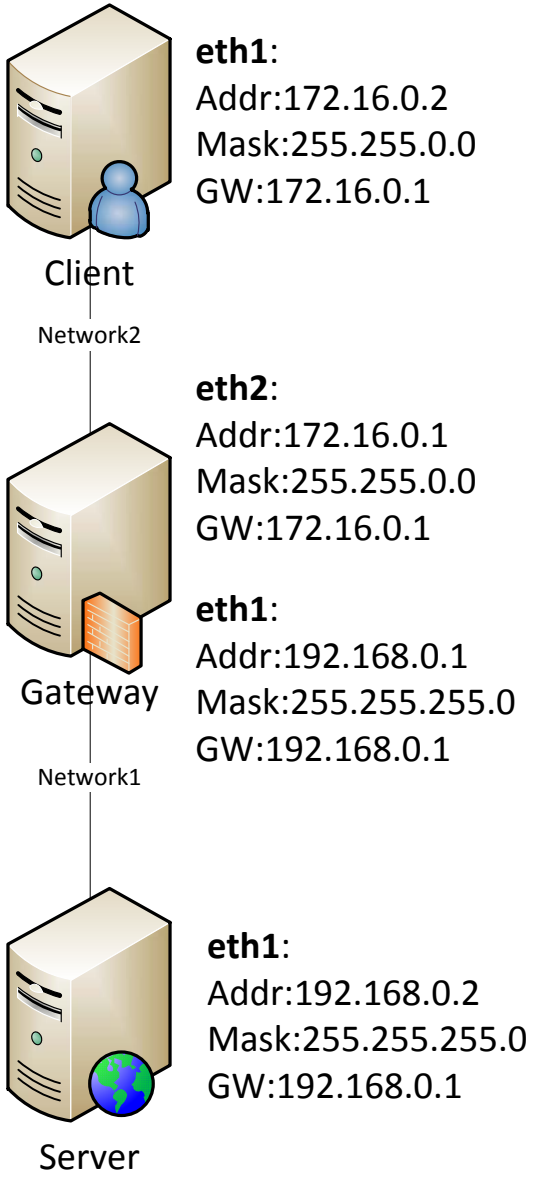
Task2: Configure Networks

- **Goal**: Configure Server and Gateway, so they can ping each other on network1.
  1. In Server VM, type *ifconfig*. You can't see eth1 which is hidden at the moment.
  2. Get super user privilege: *sudo –i,* then type your password: pa$$word123, enter.
  3. Type: *ifconfig eth1 up*
  4. Type: *ifconfig* again and you should see eth1 is up. However, eth1 is not configured at the moment.



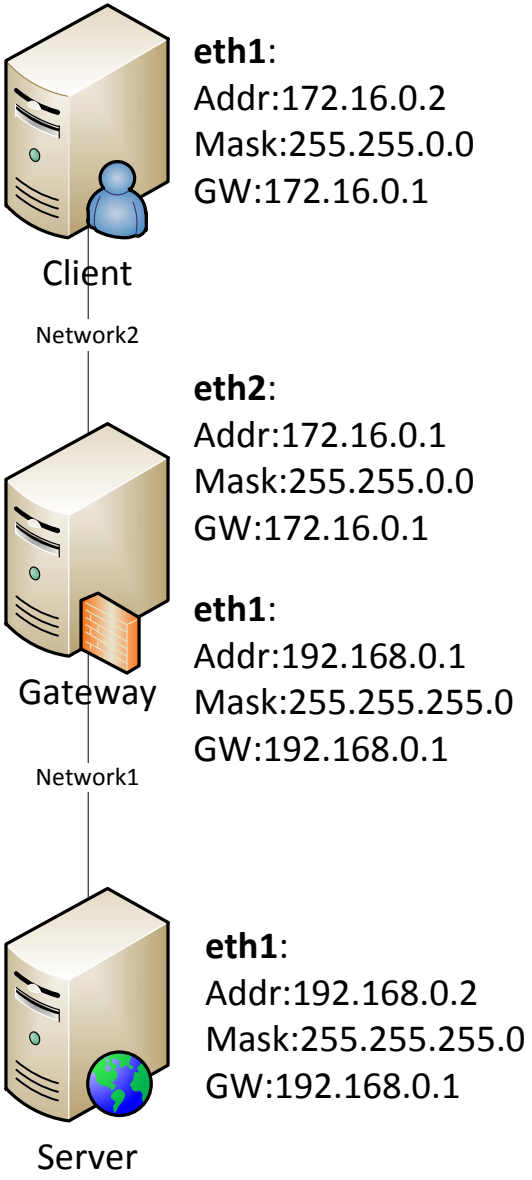
Task2: Configure Networks

5. Change Linux network interface configuration file to set Server eth1 IP address.
6. Type: *cd /etc/network*
7. Type: *vim interfaces*
8. Type: *i*, to enable editing mode.
9. Insert text at the end of the file:
   auto eth1
   iface eth1 inet static
   address 192.168.0.2
   netmask 255.255.255.0
   gateway 192.168.0.1
10. Save file by typing: *ESC, :wq, enter*
11. Restart network: */etc/init.d/networking restart*
12. Type: *ifconfig* again and verify IP of eth1.



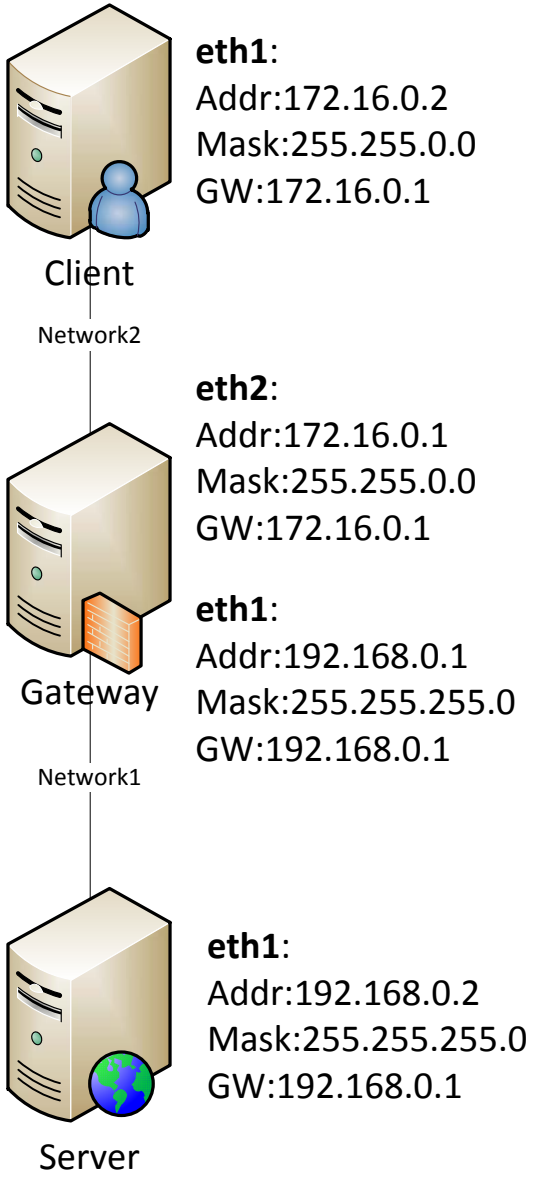
Task2: Configure Networks

13. Go to Gateway VM, use *ifconfig eth1 up* to turn on eth1.
14. Repeat previous steps to configure eth1 of Gateway:
    auto eth1
    iface eth1 inet static
    address 192.168.0.1
    netmask 255.255.255.0
    gateway 192.168.0.1
15. Restart Gateway network and verify IP address.
16. Go to server, type: *ping 192.168.0.1*
17. Go to gateway, type: *ping 192.168.0.2*
18. **Try *ping 192.168.0.3* on server. What will happen?**



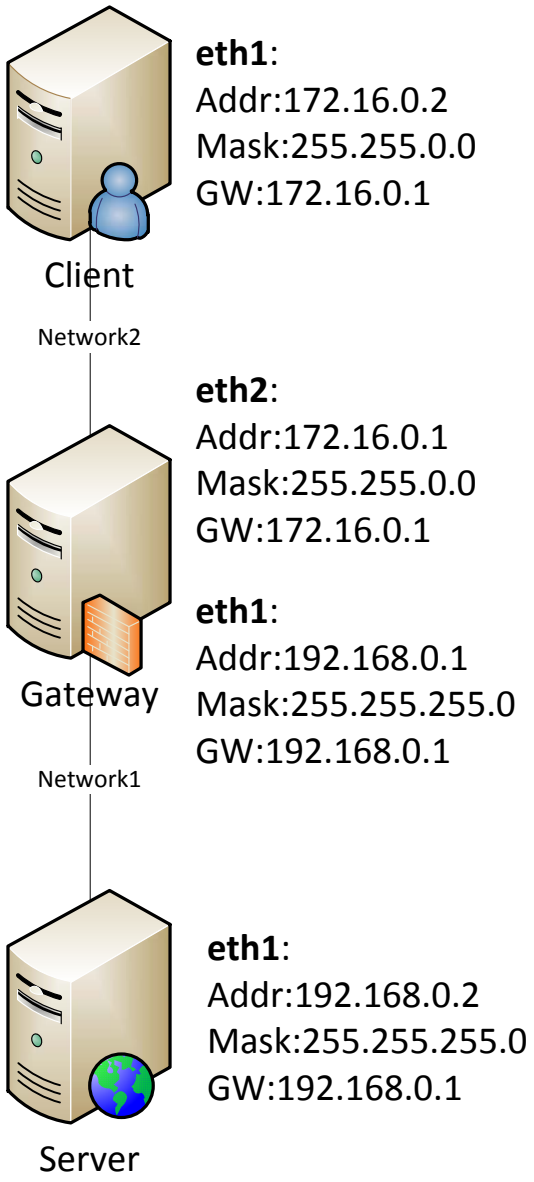
Task3: Configure Networks

- **Goal**: Configure Client and Gateway, so they can ping each other on network2.
  1. Follow the previous steps to show eth1 on Client VM and eth2 on Gateway VM.
  2. Configure Client VM eth1:
     auto eth1
     iface eth1 inet static
     address 172.16.0.2
     netmask 255.255.0.0
     gateway 172.16.0.1
  3. Restart network and verify IP address of eth1.



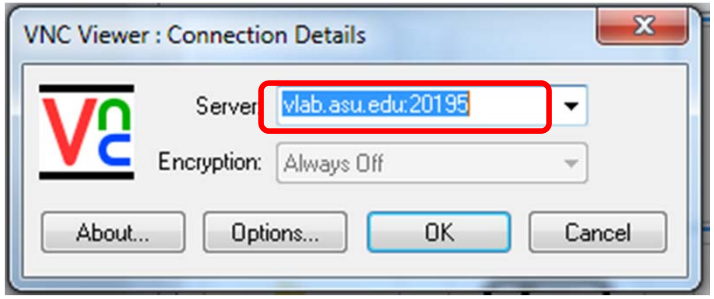
Task2: Configure Networks

4. Go to Gateway VM, insert text at the end of interfaces file:
   auto eth2
   iface eth2 inet static
   address 172.16.0.1
   netmask 255.255.0.0
   gateway 172.16.0.1
5. Restart network and verify IP of eth2.
6. Go to Client, type: *ping 172.16.0.1*
7. Go to Gateway, type: *ping 172.16.0.2*
8. **What will happen if you *ping 192.168.0.1* on Client VM? Why?**



Task3: Install Web Server

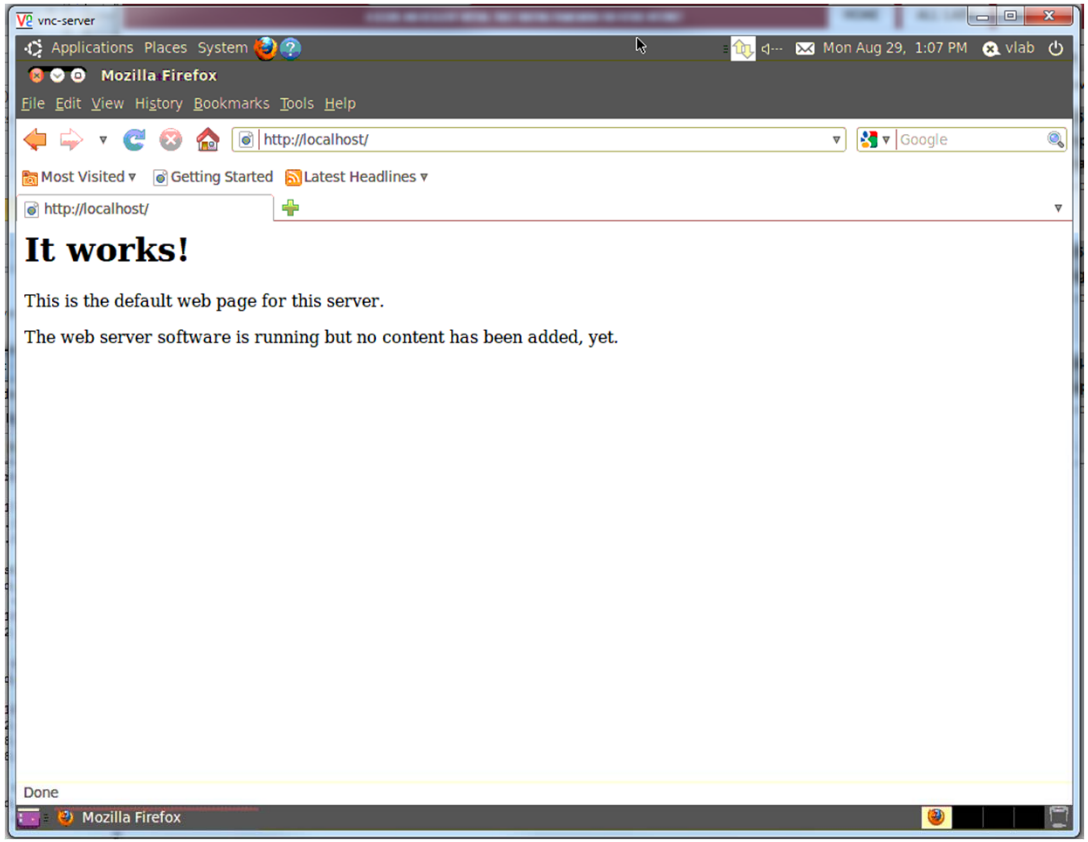
- **Goal**: Install a web server on Server VM using *apt-get*.
  1. Go to Server VM, type: *apt-get update*, Wait for it to finish.
  2. Type: *apt-get install apache2*, type *Y, enter*. Wait for it to finish.
  3. Download & start VNC Client software from V-Lab website.
  4. Find out your Server VM's VNC port number on V-Lab website.
  5. Type: vlab.asu.edu:<your VNC port>, and click OK.



  6. Use password: pa$$word123 to sign in.

Task3: Install Web Server

7. Open Firefox on the top bar.
8. Type URL: *localhost*, enter
9. You can see the web server on server VM is working.



Task4: Access Web Server from Client

- **Goal**: access web server hosted on Server VM from Client VM through Gateway.
  1. Open VNC client, find out Client VM's VNC port and establish a VNC connection to Client VM.
  2. Open Firefox on Client VM, type URL: *192.168.0.2*
  3. **Question: What will happen?**
  4. Go to Gateway SSH shell, type:
     vim /etc/sysctl.conf
  5. Find the line: *#net.ipv4.ip_forward=1*
  6. Type: *i* to enable editing, uncomment the line by removing the #. Save file by *ESC, :wq, enter*
  7. Type: *sysctl -p /etc/sysctl.conf* to apply changes.
  8. Go to Client VM's VNC window, try reload URL: *192.168.0.2*, you should see 'It works!'. Your gateway is forwarding your request from network2 to network1.

Thank you!

- Questions?