

## **CS3530 Hands-on Assignment for Nov 26th, 2020**

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**# Submission Deadline: 23:59 on Dec 4th (FRI), 2020)**

### **# General Information**

1. This assignment is a pair assignment. The same mark will be offered to the pair of students regardless of individual contributions.
2. The assignment is customized for Ubuntu + KVM environment. It is highly recommended for non-Ubuntu users to enable dual boot on your laptop computer and install Ubuntu. If you would like to work on another operating system and virtualization platform, you need to interpret the Ubuntu/KVM terminology to another environment's terminology.
3. Each pair can create a locally copy of this question file, give the answer to the local copy, and submit in a form of PDF file.
4. Only one submission is good enough as far as the student names and IDs are properly mentioned.
5. Do not send any private comment to separately mention the buddy.

## Prerequisite

This assignment assumes that the hand-on assignments 1 and 2 are completed. On your laptop computer, 2 (two) Ubuntu Servers should be already installed as VMs, say VM1 and VM2, using virt-manager, and can ping with each other as shown in Figure 1. Let us call this setup "your LAN". Note that the IP addresses given in the figure is just an example. Other IP addresses can be given to the VMs as far as they are consistent and working.

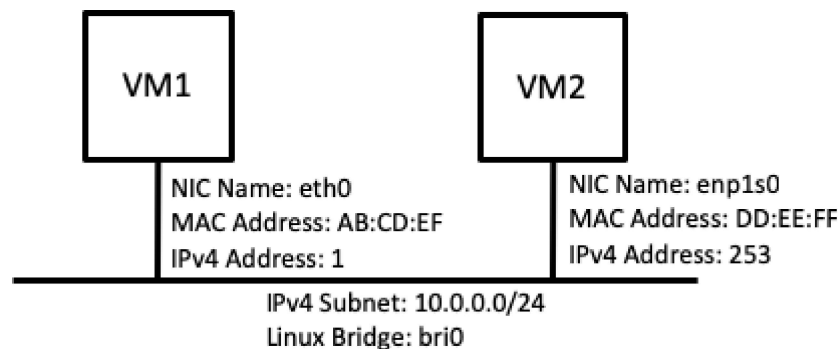
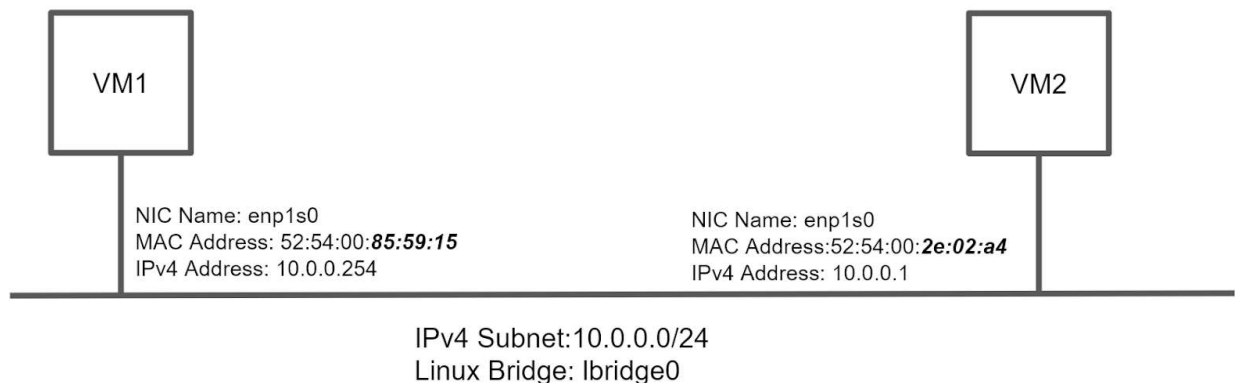


Figure 1. "Example" Network Configuration of 2 VMs connecting to the same Linux bridge and pinging with each other.

## # Part 1: Basic Networking

### Question 1.

**Paste the pictorial illustration of your LAN (Network Diagram) with sufficient information about NIC Name, MAC Address, IPv4 Address, IPv4 Subnet, Linux Bridge those are used to form the network. If needed, you may locally download and edit the template file to prepare the network diagram.**



### Question 2.

**Paste the screen capture of the terminal of VM1 showing the IPv4 address which you configure.**

A\_ubuntu20.0.4 and B\_ubuntu20.0.4 are the names of the first and second virtual machine respectively. Similarly a\_vm and b\_vm are my corresponding usernames for the two machines. Here is the output of `ip -c a` to show the assigned ipv4 address of vm 1:

```
a_vm@avm:~$ ip -c a show enp1s0
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 52:54:00:85:59:15 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.254/24 scope global enp1s0
        valid_lft forever preferred_lft forever
    inet6 fe80::5054:ff:fe85:5915/64 scope link
        valid_lft forever preferred_lft forever
a_vm@avm:~$ _
```

### Question 3.

**Execute ping command from VM1 to VM2 with specifying the number of ICMP Echo Requests to be sent as 10 (ten). 1) Answer the average RTT in msec and 2) paste the screen capture of the terminal of VM1 including the command with appropriate options and the result including RTTs.**

Average RTT was reported as : 0.765 ms

```
a_vm@avm:~$ ping -c 10 10.0.0.1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
64 bytes from 10.0.0.1: icmp_seq=1 ttl=64 time=1.35 ms
64 bytes from 10.0.0.1: icmp_seq=2 ttl=64 time=0.743 ms
64 bytes from 10.0.0.1: icmp_seq=3 ttl=64 time=0.660 ms
64 bytes from 10.0.0.1: icmp_seq=4 ttl=64 time=0.771 ms
64 bytes from 10.0.0.1: icmp_seq=5 ttl=64 time=0.737 ms
64 bytes from 10.0.0.1: icmp_seq=6 ttl=64 time=0.727 ms
64 bytes from 10.0.0.1: icmp_seq=7 ttl=64 time=0.706 ms
64 bytes from 10.0.0.1: icmp_seq=8 ttl=64 time=0.513 ms
64 bytes from 10.0.0.1: icmp_seq=9 ttl=64 time=0.714 ms
64 bytes from 10.0.0.1: icmp_seq=10 ttl=64 time=0.730 ms

--- 10.0.0.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9195ms
rtt min/avg/max/mdev = 0.513/0.765/1.354/0.207 ms
a_vm@avm:~$
```

**Question 4.**

**Run iperf using VM2 as the iperf server (receiver of the traffic) and VM1 as the iperf client (sender of the traffic). Specify the appropriate options (-t 20 -i 1) so that the benchmark lasts for 20 seconds showing the throughput every second. Paste the screen capture of the iperf result on VM1.**

Ran `iperf -s` on vm2 followed by `iperf -c 10.0.0.1 -t 20 -i 1` on vm1:

Here is the output of vm1

```
a_vm@avm:~$ iperf -c 10.0.0.1 -t 20 -i 1
-----
Client connecting to 10.0.0.1, TCP port 5001
TCP window size: 340 KByte (default)
-----
[  3] local 10.0.0.254 port 47822 connected with 10.0.0.1 port 5001
[ ID] Interval           Transfer             Bandwidth
[  3]  0.0- 1.0 sec      1.05 GBytes        8.99 Gbits/sec
[  3]  1.0- 2.0 sec      1.14 GBytes        9.77 Gbits/sec
[  3]  2.0- 3.0 sec      1.16 GBytes       10.0 Gbits/sec
[  3]  3.0- 4.0 sec      1.12 GBytes        9.62 Gbits/sec
[  3]  4.0- 5.0 sec      1.10 GBytes        9.42 Gbits/sec
[  3]  5.0- 6.0 sec      1.04 GBytes        8.93 Gbits/sec
[  3]  6.0- 7.0 sec      1.10 GBytes        9.49 Gbits/sec
[  3]  7.0- 8.0 sec      1.14 GBytes        9.76 Gbits/sec
[  3]  8.0- 9.0 sec      1.18 GBytes       10.2 Gbits/sec
[  3]  9.0-10.0 sec      1.14 GBytes        9.75 Gbits/sec
[  3] 10.0-11.0 sec      1.11 GBytes        9.54 Gbits/sec
[  3] 11.0-12.0 sec      1.08 GBytes        9.29 Gbits/sec
[  3] 12.0-13.0 sec      1.11 GBytes        9.57 Gbits/sec
[  3] 13.0-14.0 sec      1.15 GBytes        9.89 Gbits/sec
[  3] 14.0-15.0 sec      1.01 GBytes        8.66 Gbits/sec
[  3] 15.0-16.0 sec      1.06 GBytes        9.14 Gbits/sec
[  3] 16.0-17.0 sec      1.17 GBytes       10.1 Gbits/sec
[  3] 17.0-18.0 sec      1.17 GBytes       10.0 Gbits/sec
[  3] 18.0-19.0 sec      1.20 GBytes       10.3 Gbits/sec
[  3] 19.0-20.0 sec      1.15 GBytes        9.92 Gbits/sec
[  3]  0.0-20.0 sec     22.4 GBytes        9.62 Gbits/sec
a_vm@avm:~$
```

## # Part 2: DNS and DHCP

In this part, you configure a DNS server and a DHCP server on VM1, and answer the following questions. The DNS server must be configured as a Primary and Authoritative DNS server for your LAN. Specifically, you can refer to "Installation", "Primary Server", and "Testing" in Ubuntu Server Reference [1] to perform the bare minimum configuration. DHCP server configuration can also be found as part of the same reference [2].

[1] <https://ubuntu.com/server/docs/service-domain-name-service-dns>

[2] <https://ubuntu.com/server/docs/network-dhcp>

### Question 5.

**Fill the table to plan your domain.**

Part two of the assignment(Q 5,6,7) were done according to the other team-mates system and these are the ip addresses for them:

Vm1: 10.0.0.105

Vm2: 10.0.0.106

And the mac addresses will be different as well.

Parameters	Value
Domain Name corresponding to your LAN. "cs3530" must not be included. Bring something else.	abc.com
IPv4 Address of DNS Server	10.0.0.105
Hostname of DNS Server	server.abc.com

### Question 6.

**Run dig or nslookup command on VM2 and confirm that 1) the IPv4 address of VM1 is successfully resolved by its hostname, and 2) the hostname of VM1 is successfully resolved by its IPv4 address. Give the answer by pasting the screen capture of dig or nslookup commands executed on VM2.**

```
karan2@client:~$ nslookup 10.0.0.105
105.0.0.10.in-addr.arpa name = server.abc.com.

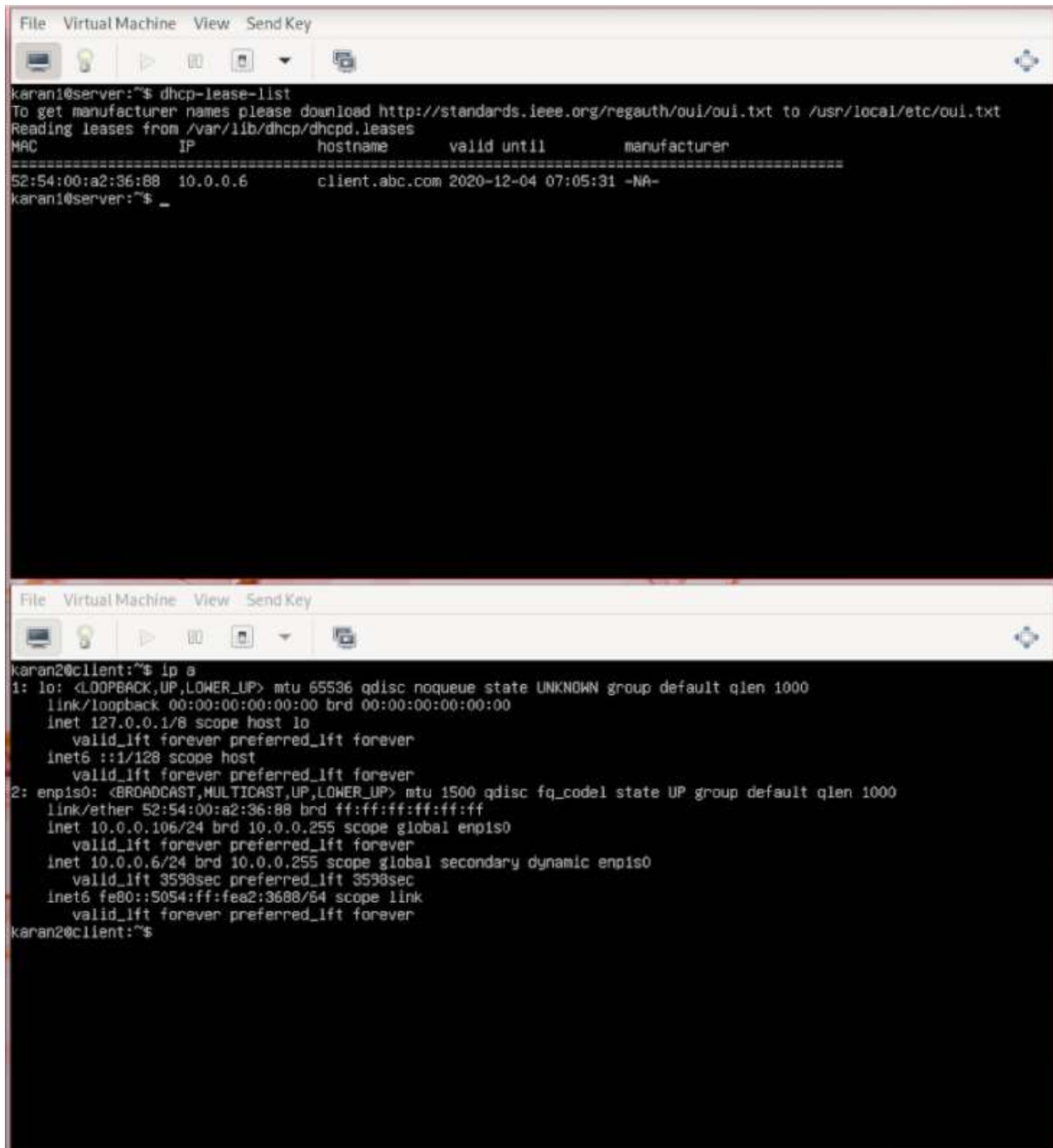
karan2@client:~$ nslookup server
Server:      10.0.0.105
Address:     10.0.0.105#53

Name:   server.abc.com
Address: 10.0.0.105

karan2@client:~$
```

### Question 7.

Configure DHCP server on VM1 so that VM2 in your LAN can configure IPv4 address, Subnet Mask and DNS server using DHCP. In this question, Default Gateway can be left without being mentioned because the router does not exist in your LAN. If VM2 uses static IPv4 address and DHCP Client at the same time, you may observe a NIC may have multiple IPv4 addresses.



The image displays two screenshots of a virtual machine terminal window. The top screenshot shows the output of the 'dhcp-lease-list' command on a server, displaying a table of DHCP leases. The bottom screenshot shows the output of the 'ip a' command on a client, showing network interface details for 'lo' and 'enp1s0'.

```
File Virtual Machine View Send Key
karani@server:~$ dhcp-lease-list
To get manufacturer names please download http://standards.ieee.org/regauth/oui/oui.txt to /usr/local/etc/oui.txt
Reading leases from /var/lib/dhcp/dhcpd.leases
=====
MAC                IP            hostname      valid until    manufacturer
=====
52:54:00:a2:36:88   10.0.0.6      client.abc.com 2020-12-04 07:05:31 -NA-
karani@server:~$ _
```

```
File Virtual Machine View Send Key
karan2@client:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 52:54:00:a2:36:88 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.106/24 brd 10.0.0.255 scope global enp1s0
        valid_lft forever preferred_lft forever
    inet 10.0.0.6/24 brd 10.0.0.255 scope global secondary dynamic enp1s0
        valid_lft 3598sec preferred_lft 3598sec
    inet6 fe80::5054:ff:fea2:3688/64 scope link
        valid_lft forever preferred_lft forever
karan2@client:~$
```