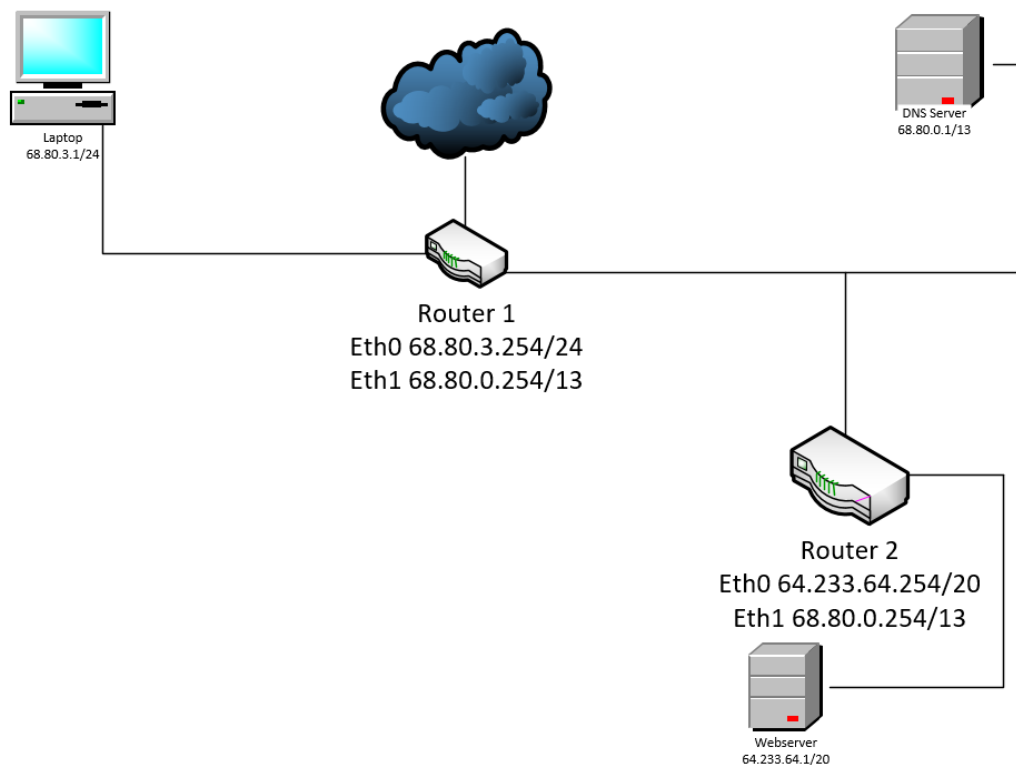


Networking Week 1

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Task 2:

Provide adjusted network drawing with the configured interfaces:



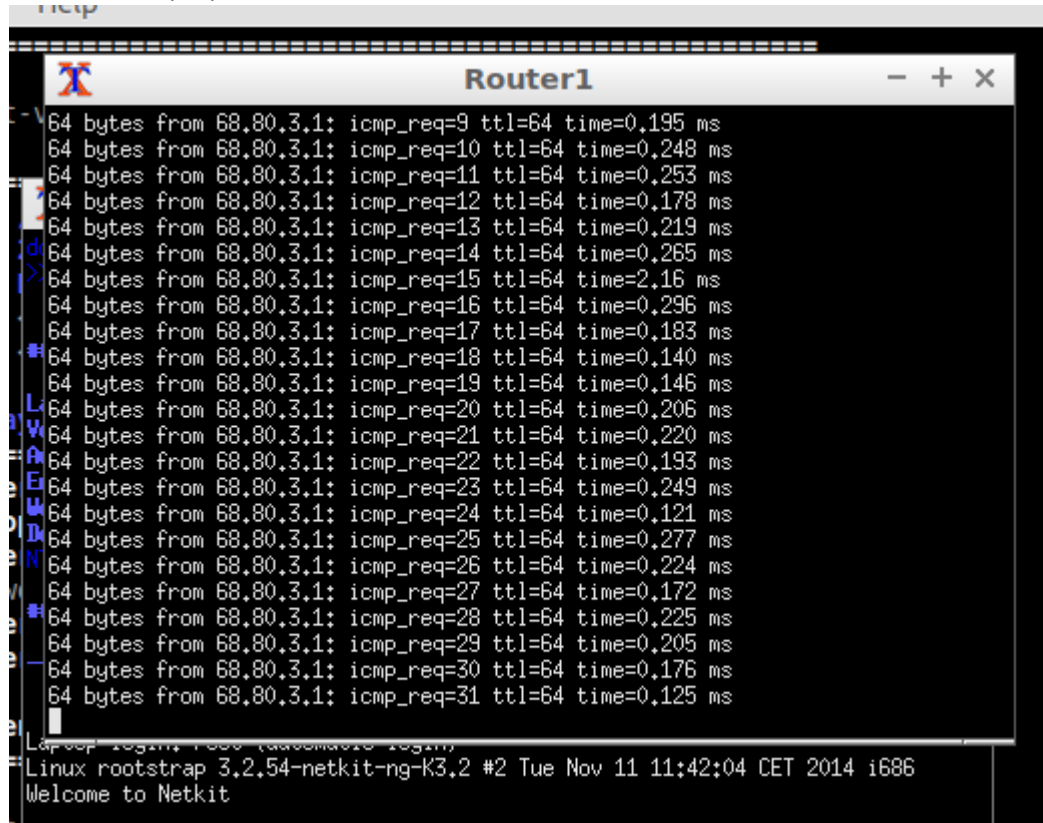
We can't separate the text of the routers. Each icon has just one textbox. So here a little explanation about the Eth's;

Router1: Eth0 should be on the left side of the router and Eth1 should be on the right side of the router.

Router2: Eth0 should be on the bottom of the router and Eth1 should be on the top of the router.

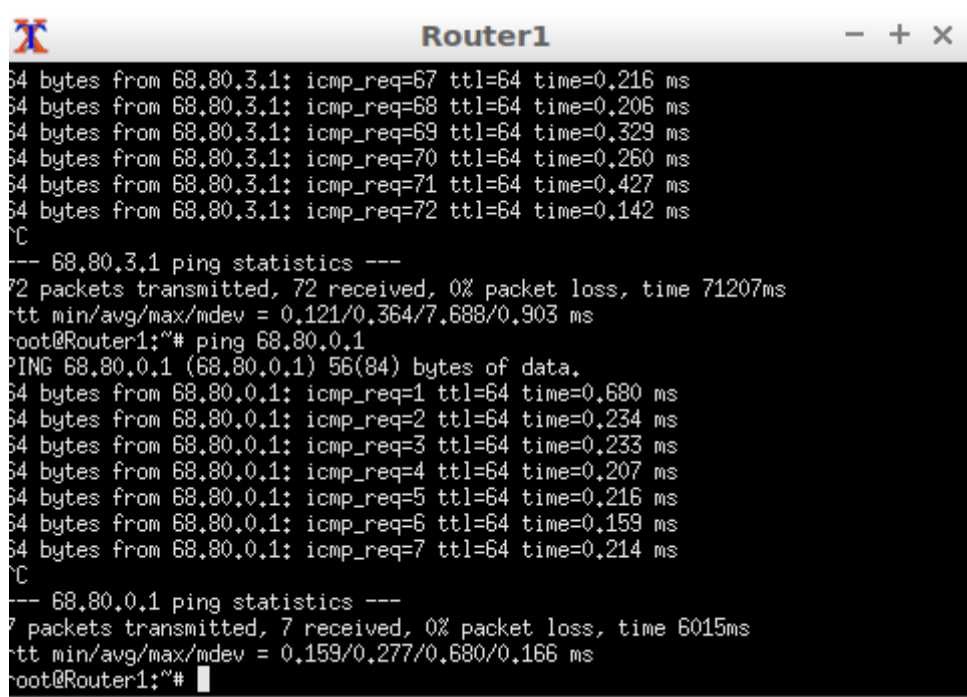
For each of the 3 subnetworks provide a screenshot for a successful ping between two nodes within the same subnetwork.

Router 1 to laptop:



```
Router1
64 bytes from 68.80.3.1: icmp_req=9 ttl=64 time=0.195 ms
64 bytes from 68.80.3.1: icmp_req=10 ttl=64 time=0.248 ms
64 bytes from 68.80.3.1: icmp_req=11 ttl=64 time=0.253 ms
64 bytes from 68.80.3.1: icmp_req=12 ttl=64 time=0.178 ms
64 bytes from 68.80.3.1: icmp_req=13 ttl=64 time=0.219 ms
64 bytes from 68.80.3.1: icmp_req=14 ttl=64 time=0.265 ms
64 bytes from 68.80.3.1: icmp_req=15 ttl=64 time=2.16 ms
64 bytes from 68.80.3.1: icmp_req=16 ttl=64 time=0.296 ms
64 bytes from 68.80.3.1: icmp_req=17 ttl=64 time=0.183 ms
64 bytes from 68.80.3.1: icmp_req=18 ttl=64 time=0.140 ms
64 bytes from 68.80.3.1: icmp_req=19 ttl=64 time=0.146 ms
64 bytes from 68.80.3.1: icmp_req=20 ttl=64 time=0.206 ms
64 bytes from 68.80.3.1: icmp_req=21 ttl=64 time=0.220 ms
64 bytes from 68.80.3.1: icmp_req=22 ttl=64 time=0.193 ms
64 bytes from 68.80.3.1: icmp_req=23 ttl=64 time=0.249 ms
64 bytes from 68.80.3.1: icmp_req=24 ttl=64 time=0.121 ms
64 bytes from 68.80.3.1: icmp_req=25 ttl=64 time=0.277 ms
64 bytes from 68.80.3.1: icmp_req=26 ttl=64 time=0.224 ms
64 bytes from 68.80.3.1: icmp_req=27 ttl=64 time=0.172 ms
64 bytes from 68.80.3.1: icmp_req=28 ttl=64 time=0.225 ms
64 bytes from 68.80.3.1: icmp_req=29 ttl=64 time=0.205 ms
64 bytes from 68.80.3.1: icmp_req=30 ttl=64 time=0.176 ms
64 bytes from 68.80.3.1: icmp_req=31 ttl=64 time=0.125 ms
Linux rootstrap 3.2.54-netkit-ng-K3.2 #2 Tue Nov 11 11:42:04 CET 2014 i686
Welcome to Netkit
```

Router 1 to DNS Server:



```
Router1
64 bytes from 68.80.3.1: icmp_req=67 ttl=64 time=0.216 ms
64 bytes from 68.80.3.1: icmp_req=68 ttl=64 time=0.206 ms
64 bytes from 68.80.3.1: icmp_req=69 ttl=64 time=0.329 ms
64 bytes from 68.80.3.1: icmp_req=70 ttl=64 time=0.260 ms
64 bytes from 68.80.3.1: icmp_req=71 ttl=64 time=0.427 ms
64 bytes from 68.80.3.1: icmp_req=72 ttl=64 time=0.142 ms
^C
--- 68.80.3.1 ping statistics ---
72 packets transmitted, 72 received, 0% packet loss, time 71207ms
rtt min/avg/max/mdev = 0.121/0.364/7.688/0.903 ms
root@Router1:~# ping 68.80.0.1
PING 68.80.0.1 (68.80.0.1) 56(84) bytes of data.
64 bytes from 68.80.0.1: icmp_req=1 ttl=64 time=0.680 ms
64 bytes from 68.80.0.1: icmp_req=2 ttl=64 time=0.234 ms
64 bytes from 68.80.0.1: icmp_req=3 ttl=64 time=0.233 ms
64 bytes from 68.80.0.1: icmp_req=4 ttl=64 time=0.207 ms
64 bytes from 68.80.0.1: icmp_req=5 ttl=64 time=0.216 ms
64 bytes from 68.80.0.1: icmp_req=6 ttl=64 time=0.159 ms
64 bytes from 68.80.0.1: icmp_req=7 ttl=64 time=0.214 ms
^C
--- 68.80.0.1 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6015ms
rtt min/avg/max/mdev = 0.159/0.277/0.680/0.166 ms
root@Router1:~#
```

Router 2 to Webserver:

```
added ifc for Internet
ca Frenken
[ ok ]
>>> End

Router2
Web: <none>
Description:
NT2 Lab 1: A Day in the Life scenario
*****
--- Netkit phase 2 initialization terminated ---
.
.
Router2 login: root (automatic login)
Linux rootstrap 3.2.54-netkit-ng-K3.2 #2 Tue Nov 11 11:42:04 CET 2014 i686
Welcome to Netkit
root@Router2:~# ping 64.233.64.1
PING 64.233.64.1 (64.233.64.1) 56(84) bytes of data:
64 bytes from 64.233.64.1: icmp_req=1 ttl=64 time=0.501 ms
64 bytes from 64.233.64.1: icmp_req=2 ttl=64 time=0.285 ms
64 bytes from 64.233.64.1: icmp_req=3 ttl=64 time=0.210 ms
64 bytes from 64.233.64.1: icmp_req=4 ttl=64 time=0.202 ms
^C
--- 64.233.64.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3021ms
rtt min/avg/max/mdev = 0.202/0.299/0.501/0.121 ms
root@Router2:~#
```

Task 3:

Provide screenshots of the following successful pings.

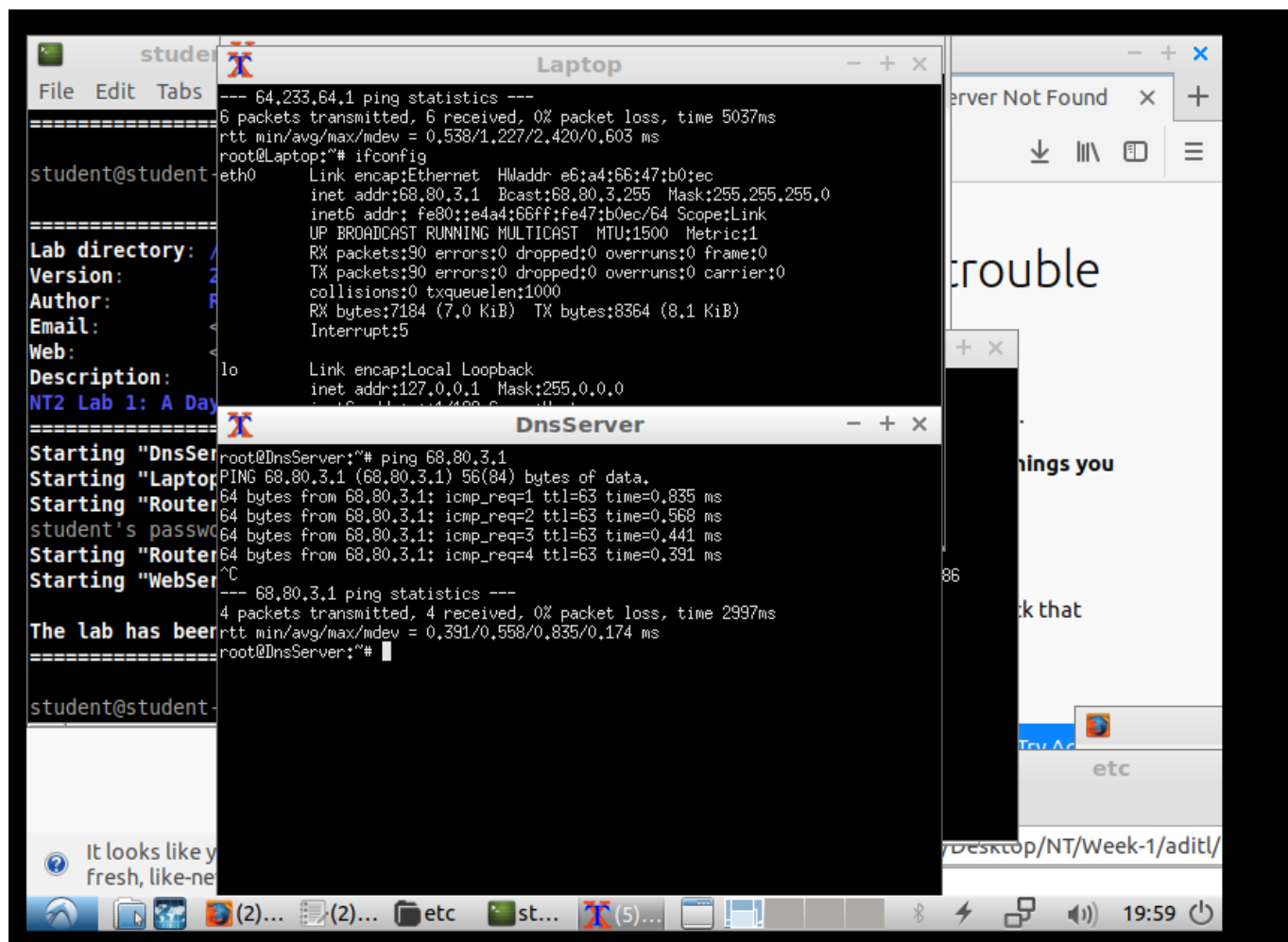
Laptop to WebServer

The screenshot displays a Netkit virtual environment with three main windows: 'student', 'WebServer', and 'Laptop'. The 'student' window shows the lab directory and the starting of various services. The 'WebServer' window shows the network configuration for the 'eth0' interface. The 'Laptop' window shows the successful ping results from the laptop to the web server.

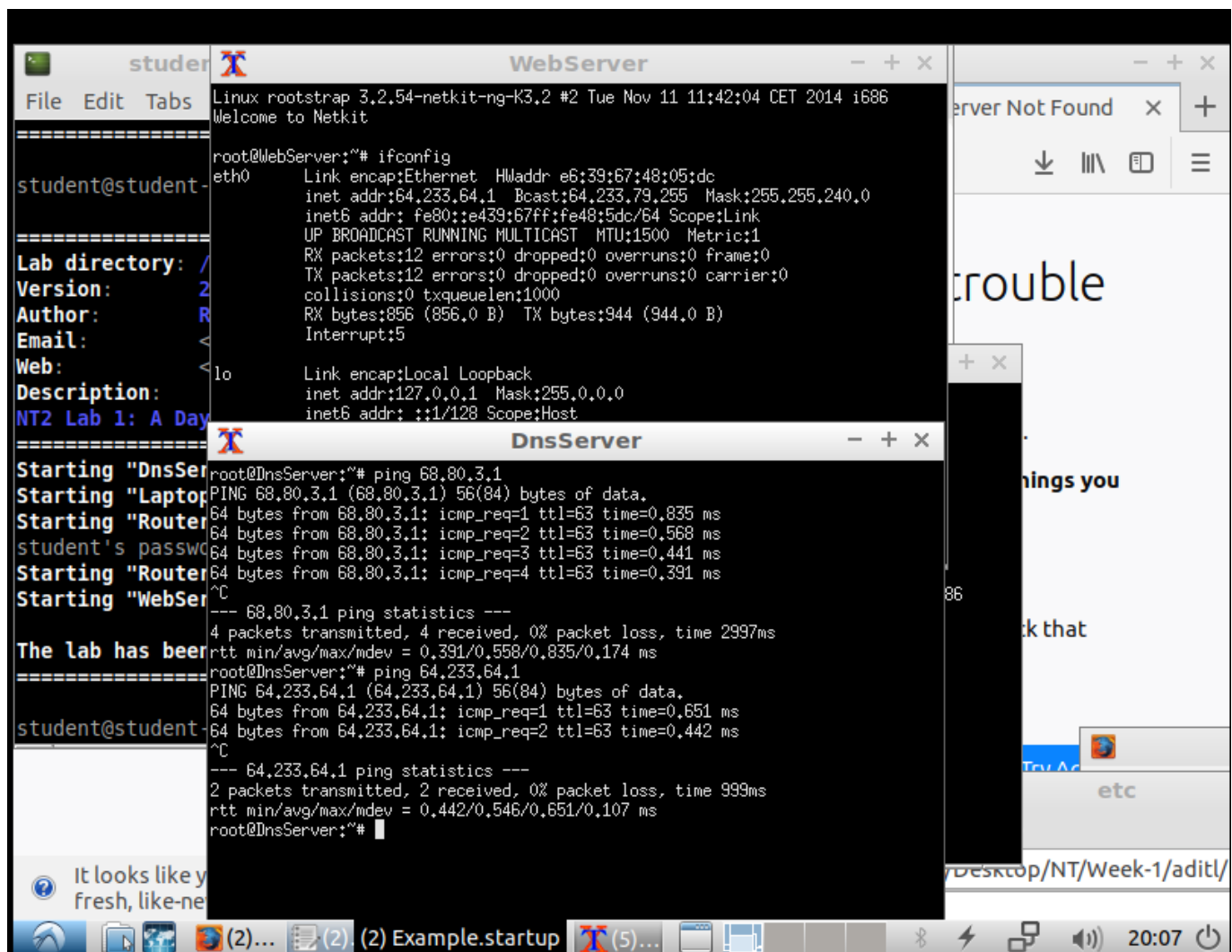
```
student@student-:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr e6:39:67:48:05:dc
          inet addr:64.233.64.1  Bcast:64.233.79.255  Mask:255.255.240.0
          inet6 addr: fe80::e439:67ff:fe48:5dc/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:12 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:856 (856.0 B)  TX bytes:944 (944.0 B)
          Interrupt:5

student@student-:~$ ping 64.233.64.1
PING 64.233.64.1 (64.233.64.1) 56(84) bytes of data:
64 bytes from 64.233.64.1: icmp_req=1 ttl=62 time=1.32 ms
64 bytes from 64.233.64.1: icmp_req=2 ttl=62 time=0.538 ms
64 bytes from 64.233.64.1: icmp_req=3 ttl=62 time=1.13 ms
64 bytes from 64.233.64.1: icmp_req=4 ttl=62 time=1.23 ms
64 bytes from 64.233.64.1: icmp_req=5 ttl=62 time=2.42 ms
64 bytes from 64.233.64.1: icmp_req=6 ttl=62 time=0.717 ms
^C
--- 64.233.64.1 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5037ms
rtt min/avg/max/mdev = 0.538/1.227/2.420/0.603 ms
root@Laptop:~#
```

DnsServer to Laptop



DnsServer to WebServer



Task 4:

What did change after using ARP and why? Provide the screenshots of the changed ARP tables.

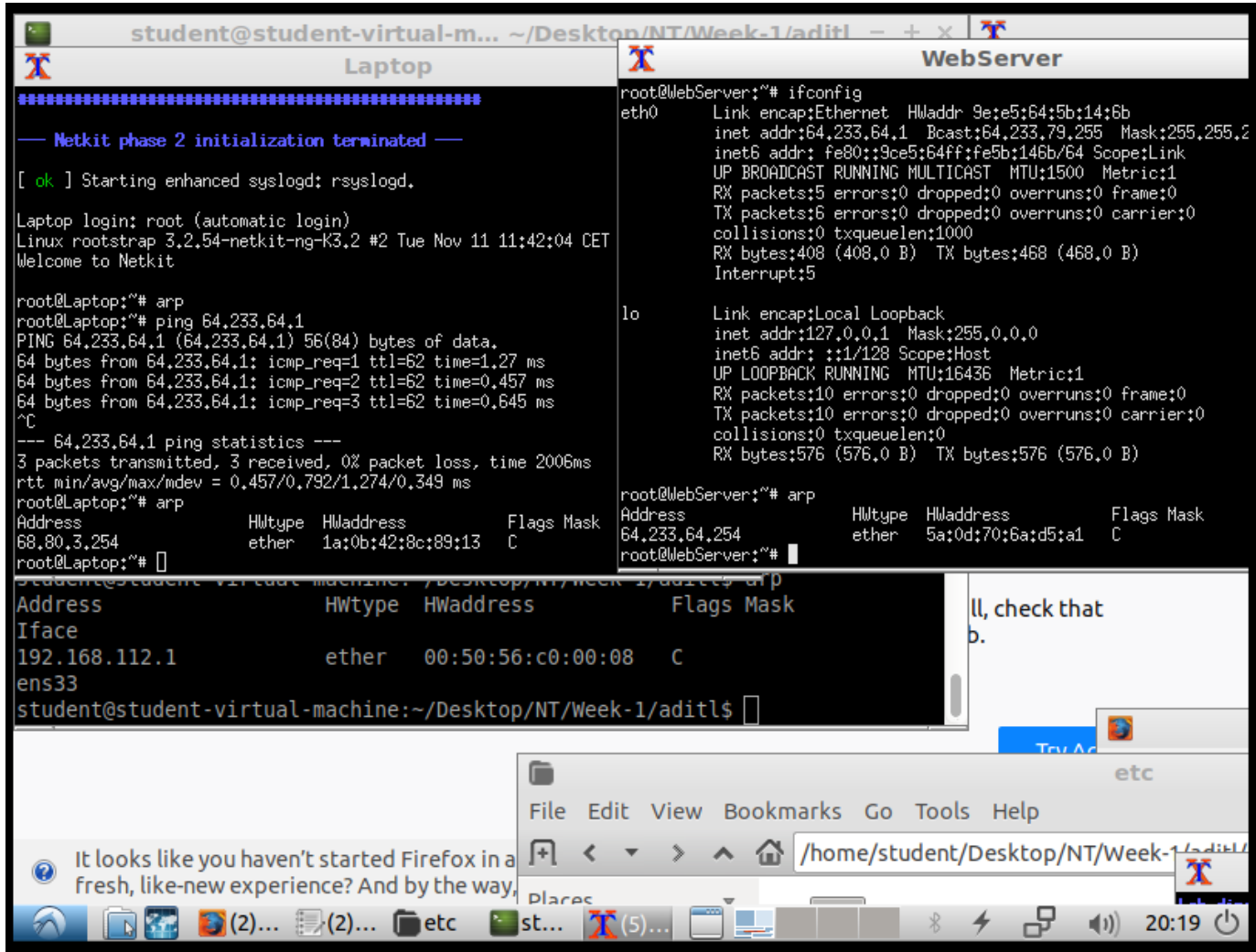
Checking if ARP cache is clean;

So we did use the ARP command in the laptop node and WebServer node. Since we got no response, we assume that the ARP tables are empty.

```
student@student-virtual-m... ~/Desktop/NT/Week-1/aditl - + x
Laptop
=====
Lab directory (host): /home/student/Desktop/NT/Week-1/aditl
Version: 2.0, added ifc for Internet
Author: Renata Frenken
Email: <none>
Web: <none>
Description:
NT2 Lab 1: A Day in the Life scenario
=====
--- Netkit phase 2 initialization terminated ---
[ ok ] Starting enhanced syslogd: rsyslogd.
Laptop login: root (automatic login)
Linux rootstrap 3.2.54-netkit-ng-K3.2 #2 Tue Nov 11 11:42:04 CET 2014 i686
Welcome to Netkit
root@Laptop:~# arp
root@Laptop:~#
=====
Address      HWtype  HWaddress      Flags
Iface
192.168.112.1 ether  00:50:56:c0:00:08  C
ens33
student@student-virtual-machine: ~/Desktop/NT/Week-1/aditl

WebServer
net.ipv6.conf.all.forwarding =
>>> End of Router2 specific st
=====
Lab directory (host): /home/st
Version: 2.0, added ifc for Ir
Author: Renata Frenken
Email: <none>
Web: <none>
Description:
NT2 Lab 1: A Day in the Life s
=====
>>> End of WebServer specific startup script.
=====
Lab directory (host): /home/student/Desktop/NT/Week-1/aditl
Version: 2.0, added ifc for Internet
Author: Renata Frenken
Email: <none>
Web: <none>
Description:
NT2 Lab 1: A Day in the Life s
=====
--- Netkit phase 2 initialization terminated ---
WebServer login: root (automatic login)
Linux rootstrap 3.2.54-netkit-ng-K3.2 #2 Tue Nov 11 11:42
Welcome to Netkit
root@WebServer:~# arp
root@WebServer:~#
=====
File Edit View
+ < >
Places
It looks like you haven't started Firefox in a
fresh, like-new experience? And by the way,
(2)... (2)... etc st... (5)...
Left click to iconify all windows.
Middle click to shade them.
20:15
```

Provide a screenshot of the ARP tables after pinging between Laptop and WebServer.



We did notice that the addresses in the ARP Tables are actually the same IP addresses as given in the routes. Laptop went with a default gateway through router 1. While the WebServer has been reached by Router 2. The ARP tables of the other nodes has been changed as well.

Task 5:

1. Suppose we have the IP address 122.33.196.145/24

Fill in the following items for this address:

1. Network Address:

Since the netmask is 255.255.255.0 a calculation won't be necessary. The network address is 122.33.196.0

2. Broadcast Address

The broadcast address of this network address will be: 122.33.196.255

3. Subnet Mask

The subnet mask is 255.255.255.0 this can also be written as /24.

2. Suppose we have the IP address 163.248.223.229/25

Fill in the following items for this address:

1. Network Address

Thanks to the netmask we can't just determine the network address. We need to do some calculations.

Our netmask is 25. 25 contains 3x8(full byte) and 1.

This means that the netmask can also be written as 255.255.255.192

This makes our network address: 163.248.223.192

2. First Host

Since we can not use our network address it self as a host, the first host will be:

163.248.223.193

3. Last Host

Since we can not use the broadcast address it self as a host, the last host will be:

163.248.223.254

4. Broadcast Address

This one is easy, 163.248.223.255

The routing tables:

We changed the start up files instead of the interfaces. We know that in the future we have to change the interfaces and it would be useful if we already did this. They can be found on the next page.

Laptop

```
ifconfig eth0 up  
  
ifconfig eth0 68.80.3.1 netmask  
255.255.255.0  
  
route add default gw 68.80.3.254  
  
/etc/init.d/networking start
```

Router 1

```
ifconfig eth0 up  
  
ifconfig eth0 68.80.3.254 netmask 255.255.255.0  
  
ifconfig eth1 up  
  
ifconfig eth1 68.80.0.254 netmask 255.248.0.0  
  
route add -net 68.80.0.0 gw 68.80.0.254 netmask 255.248.0.0  
  
route add -net 68.80.3.0 gw 68.80.3.254 netmask 255.255.255.0  
  
route add -net 64.233.64.0 gw 68.80.0.253 netmask 255.255.240.0  
  
/etc/init.d/networking start  
  
sysctl -w net.ipv6.conf.all.forwarding=1
```

DnsServer

```
ifconfig eth0 up  
  
ifconfig eth0 68.80.0.1 netmask 255.248.0.0  
  
route add -net 68.80.3.0 gw 68.80.0.254 netmask  
255.255.255.0  
  
route add -net 64.233.64.0 gw 68.80.0.253  
netmask 255.255.240.0  
  
/etc/init.d/networking start
```

WebServer

```
ifconfig eth0 up  
  
ifconfig eth0 64.233.64.1 netmask  
255.255.240.0  
  
route add default gw 64.233.64.254  
  
/etc/init.d/networking start
```

Router 2

```
ifconfig eth0 up  
  
ifconfig eth0 64.233.64.254 netmask 255.255.240.0  
  
ifconfig eth1 up  
  
ifconfig eth1 68.80.0.253 netmask 255.248.0.0  
  
route add -net 64.233.64.0 gw 64.233.64.254 netmask 255.255.240.0  
  
route add -net 68.80.0.0 gw 68.80.0.253 netmask 255.248.0.0  
  
route add -net 68.80.3.0 gw 68.80.0.254 netmask 255.255.255.0  
  
/etc/init.d/networking start  
  
sysctl -w net.ipv6.conf.all.forwarding=1
```

