Waterford
Institute of
Technology

VIRTUAL NETWORKING LAB

Internetworking

ABSTRACT

Building a virtual network using VirtualBox, and GNS with multiple SliTaz machines.

Samantha Sheehan

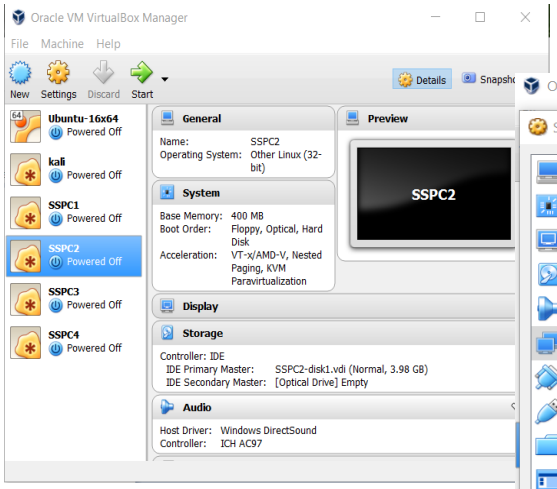
Computer Forensics and Security

Contents

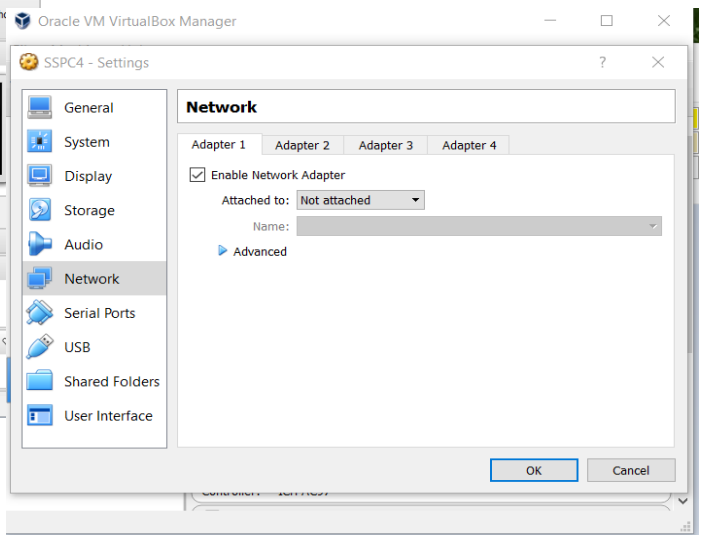
Introduction- Setting up the network 3
Lab 1: Configuring the internal network 5
Initial Configuration 5
Troubleshooting Lab 1 7
Lab 1 completed 8
Lab 2: Accessing the internet 9
Troubleshooting Lab 2 11
Lab 2 completed 12
Bibliography 13

Introduction- Setting up the network

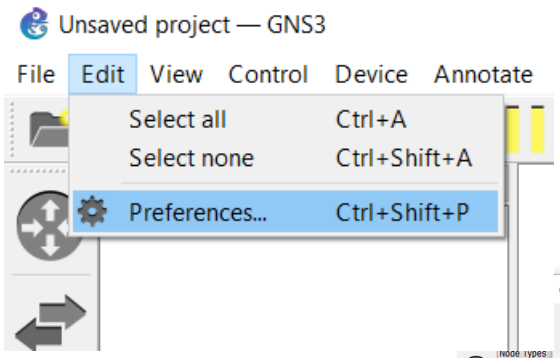
I began the lab by downloading the Slitaz VM from Moodle, and created a new machine in VirtalBox named SSPC1.



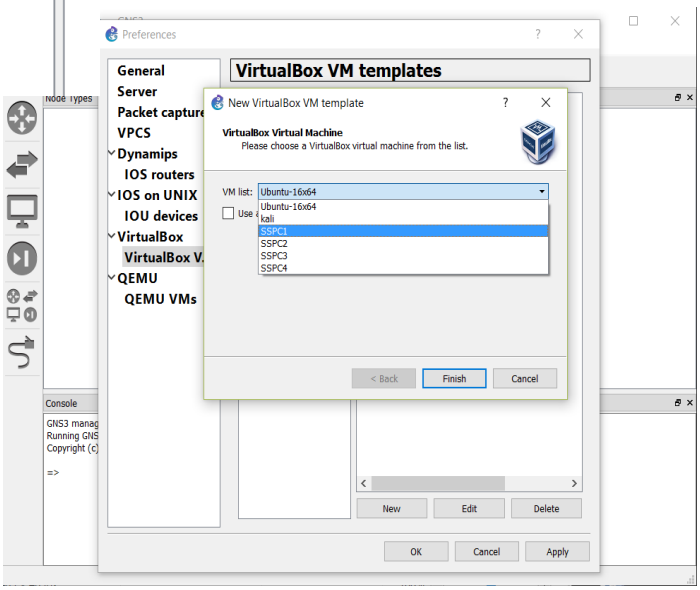
I then changed the machines network settings to allow multiple connections.

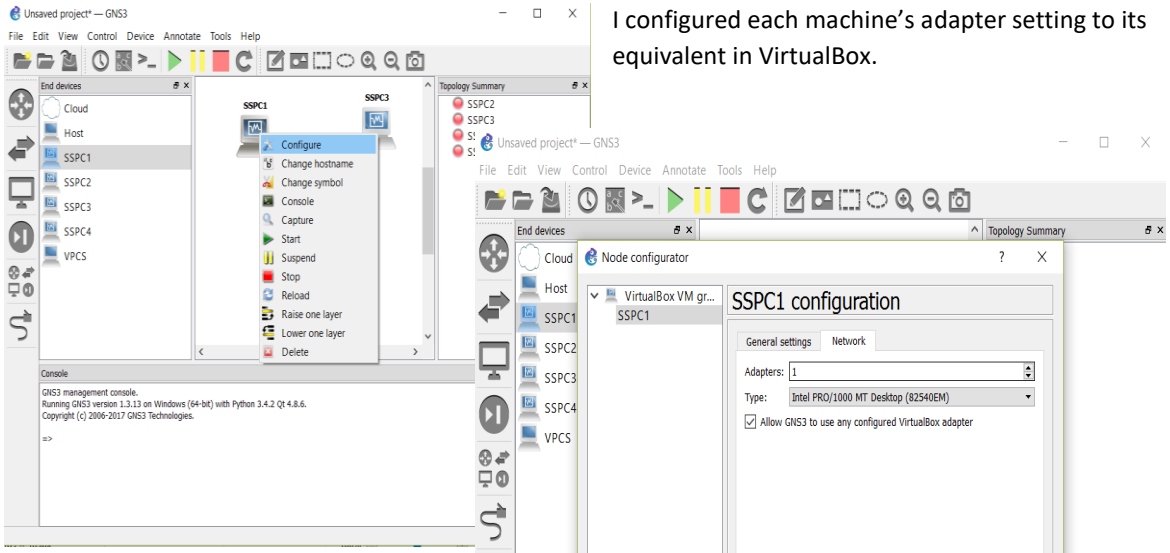


I then created three clones of this machine and named them SSPC2, SSPC3, and SSPC4. I then downloaded GNS3, using the link provided on Moodle and began to configure the topology.



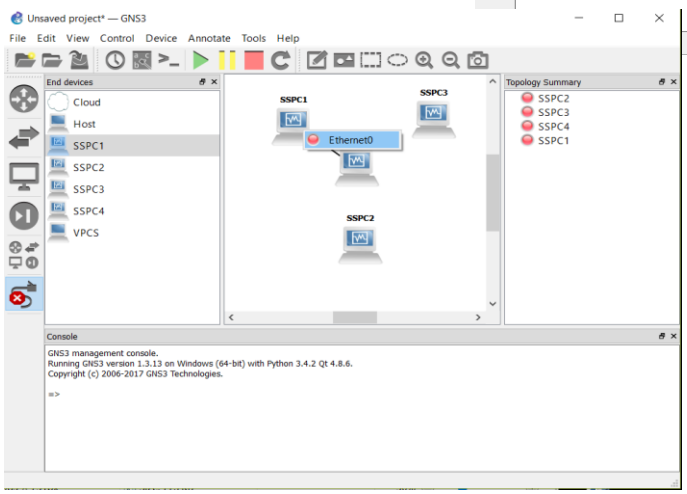
I imported the machines to gns.





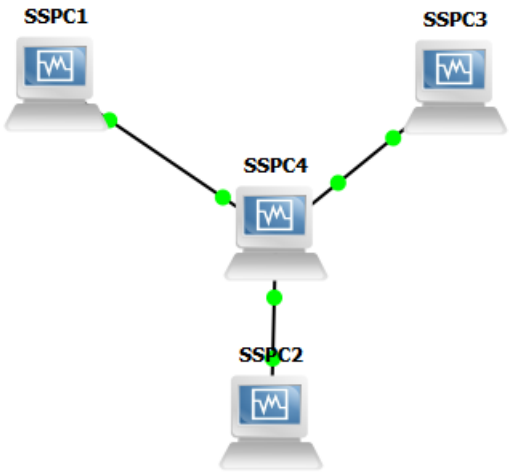
I configured each machine's adapter setting to its equivalent in VirtualBox.

I connected the PC's to mimic the topology in the lab material.



Lab 1: Configuring the internal network

The task in lab 1 is to configure the virtual network as a star topology system, sing SSPC4 as the routing device to forward packets:



Initial Configuration

Firstly, I used the ip link command to check which ports are active on the machines, and set the default ports using the command:

 # sudo rm /etc/udev/rules.d/70-persistent-net.rules

And then rebooted each machine, as stated in the lab material.

I then use ifconfig to check network addresses.

SSPC1 is pre-configured with an IP address of 10.10.14.1, and a subnet mask of 255.255.255.0., and since all the machines are clones of PC1, so are all the others.

I now have to configure each pc its own address so using the guidelines laid out in the lab material I configured each pc using the command:

#sudo ip addr add 10.10.24.2/24 dev eth1
#sudo ip link set eth1 up

And so on for each pc. PC4 has 3 ethernet connections, so each port was assigned an ip on each different network 10.10.14.4, 10.10.24.4, and 10.10.34.4.

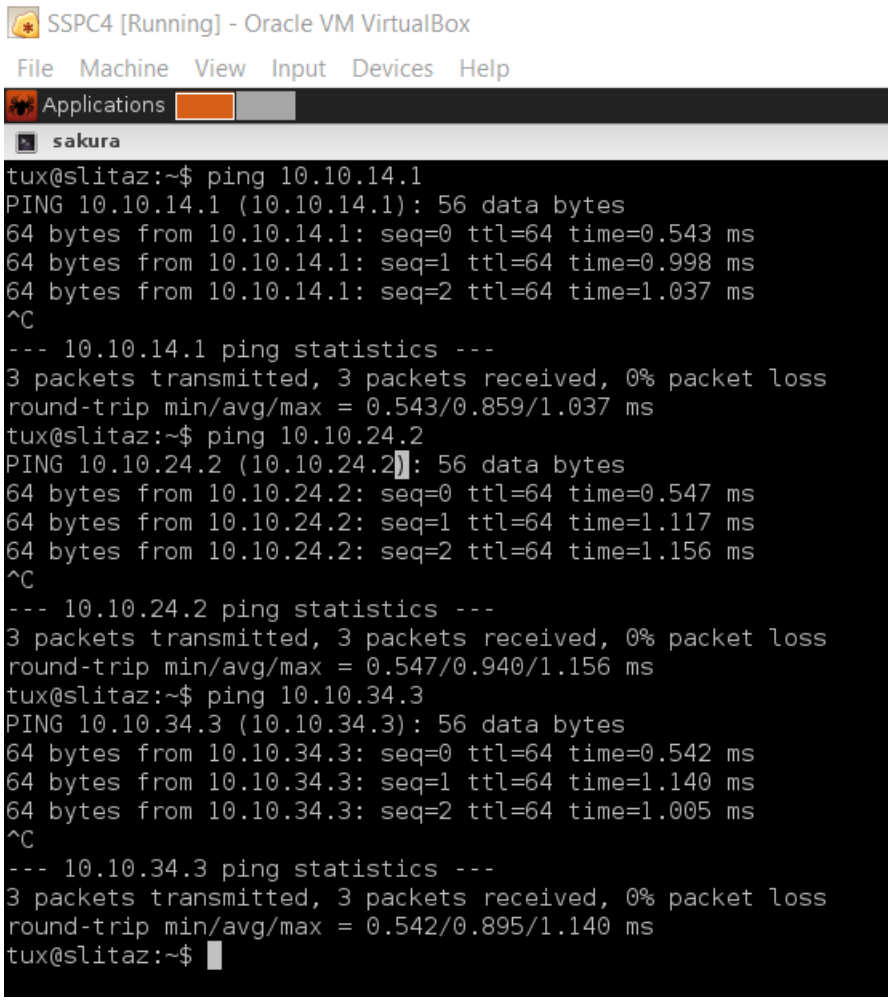
Then I had to edit the pc's initial configuration files to permanently assign a static IP address to each machine. To do this I had to edit the network.conf file:

```
# Set IP address and netmask for a static IP.
IP="10.10.14.4"
NETMASK="255.255.255.0"

# Set broadcast address
BROADCAST="10.10.14.255"

# Set route gateway for a static IP.
GATEWAY="10.10.14.1"

# Set domain name
DOMAIN=""

# Set DNS server for a static IP
DNS_SERVER="10.10.14.4"
```

This is the network.conf file for SSPC4. As SSPC4 has 3 connections I had to assign the IP's of the other ports in the /init.d/local.sh file:

```
#!/bin/sh
#
# /etc/init.d/local.sh: Local startup commands
#
# All commands here will be executed at boot time.
#
mount -t vboxsf -o uid=1000,gid=1000 shared /home/tux/Desktop/shared
ifconfig eth1 10.10.24.4 netmask 255.255.255.0 up
ifconfig eth2 10.10.34.4 netmask 255.255.255.0 up
```

At this point I can ping all three pc's from SSPC4:



I still can't, however, ping the SSPC2, or SSPC3 from SSPC1. I use traceroute and wireshark to follow the packets and see that the packet drop having reached the incoming interface of SSPC4. Following the lab I realise that in order to ping from one pc to another I need to enable IP forwarding so I use the command:

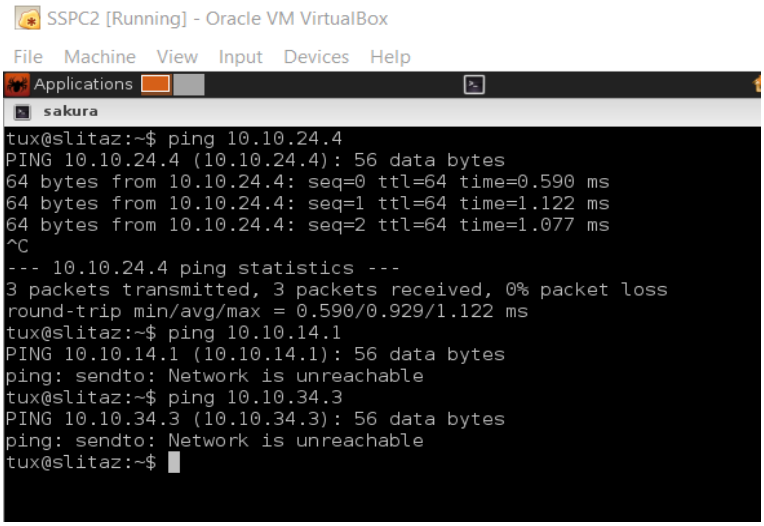
echo 1 > /proc/sys/net/ipv4/ip_forward

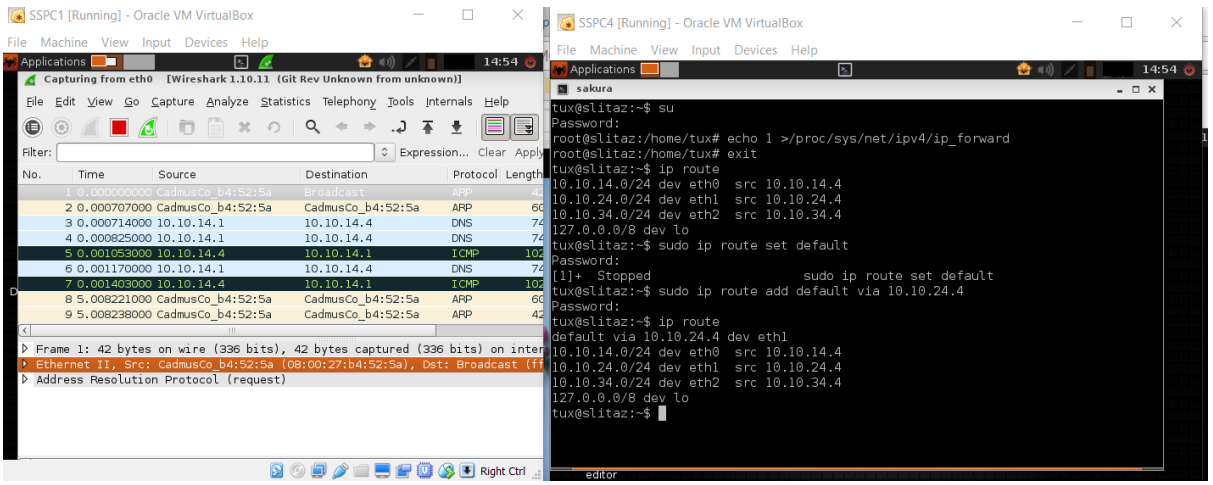
I do this in root mode by typing **su** followed by the password **root**. I then added default static routes on each pc using:

sudo ip route add default via 10.10.14.4 (SSPC1).

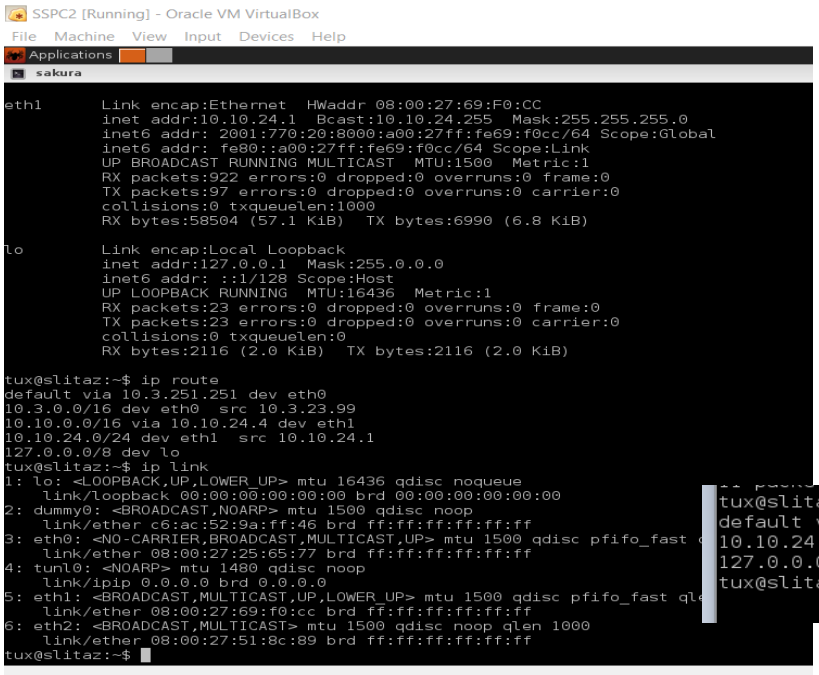
Troubleshooting Lab 1

Having followed the labs instructions at this point I should have been able to connect with each pc from any one of them, however while SSPC1 and SSPC3 could ping back and forth SSPC2 could not connect with either. I checked ip link, and used traceroute and wireshark to follow the ping and see where they were dropping:





After some time, while troubleshooting PC2 I noticed an issue:



The default route was 10.3.251.251. So, I deleted this route using:

#sudo ip route del default via 10.10.251.251

And I added the new default route:

#sudo ip route default via 10.10.24.2

Lab 1 completed

When this issue was resolved, I could ping the entire network from any pc:

SSPC1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Applications

sakura

```
tux@slitaz:~$ ping 10.10.24.2
PING 10.10.24.2 (10.10.24.2): 56 data bytes
64 bytes from 10.10.24.2: seq=0 ttl=63 time=1.227 ms
64 bytes from 10.10.24.2: seq=1 ttl=63 time=1.968 ms
64 bytes from 10.10.24.2: seq=2 ttl=63 time=1.818 ms
^C
--- 10.10.24.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 1.227/1.671/1.968 ms
tux@slitaz:~$ ping 10.10.34.3
PING 10.10.34.3 (10.10.34.3): 56 data bytes
64 bytes from 10.10.34.3: seq=0 ttl=63 time=0.970 ms
64 bytes from 10.10.34.3: seq=1 ttl=63 time=1.816 ms
^C
--- 10.10.34.3 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.970/1.393/1.816 ms
tux@slitaz:~$ ping 10.10.14.4
PING 10.10.14.4 (10.10.14.4): 56 data bytes
64 bytes from 10.10.14.4: seq=0 ttl=64 time=0.365 ms
64 bytes from 10.10.14.4: seq=1 ttl=64 time=0.910 ms
64 bytes from 10.10.14.4: seq=2 ttl=64 time=1.041 ms
^C
```

SSPC2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Applications

sakura

```
tux@slitaz:~$ ping 10.10.14.1
PING 10.10.14.1 (10.10.14.1): 56 data bytes
64 bytes from 10.10.14.1: seq=0 ttl=63 time=1.104 ms
64 bytes from 10.10.14.1: seq=1 ttl=63 time=1.850 ms
^C
--- 10.10.14.1 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 1.104/1.477/1.850 ms
tux@slitaz:~$ ping 10.10.34.3
PING 10.10.34.3 (10.10.34.3): 56 data bytes
64 bytes from 10.10.34.3: seq=0 ttl=63 time=0.960 ms
64 bytes from 10.10.34.3: seq=1 ttl=63 time=1.971 ms
^C
--- 10.10.34.3 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.960/1.465/1.971 ms
tux@slitaz:~$ ping 10.10.24.4
PING 10.10.24.4 (10.10.24.4): 56 data bytes
4 bytes from 10.10.24.4: seq=0 ttl=64 time=0.466 ms
4 bytes from 10.10.24.4: seq=1 ttl=64 time=1.098 ms
C
-- 10.10.24.4 ping statistics ---
packets transmitted, 2 packets received, 0% packet loss
ound-trip min/avg/max = 0.466/0.782/1.098 ms
```

SSPC3 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Applications

sakura

```
tux@slitaz:~$ ping 10.10.14.1
PING 10.10.14.1 (10.10.14.1): 56 data bytes
64 bytes from 10.10.14.1: seq=0 ttl=63 time=0.922 ms
64 bytes from 10.10.14.1: seq=1 ttl=63 time=1.611 ms
^C
--- 10.10.14.1 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.922/1.266/1.611 ms
tux@slitaz:~$ ping 10.10.24.2
PING 10.10.24.2 (10.10.24.2): 56 data bytes
64 bytes from 10.10.24.2: seq=0 ttl=63 time=0.989 ms
64 bytes from 10.10.24.2: seq=1 ttl=63 time=1.852 ms
^C
--- 10.10.24.2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.989/1.420/1.852 ms
tux@slitaz:~$ ping 10.10.34.4
PING 10.10.34.4 (10.10.34.4): 56 data bytes
64 bytes from 10.10.34.4: seq=0 ttl=64 time=0.444 ms
64 bytes from 10.10.34.4: seq=1 ttl=64 time=0.955 ms
^C
--- 10.10.34.4 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.444/0.699/0.955 ms
tux@slitaz:~$
```

SSPC4 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Applications

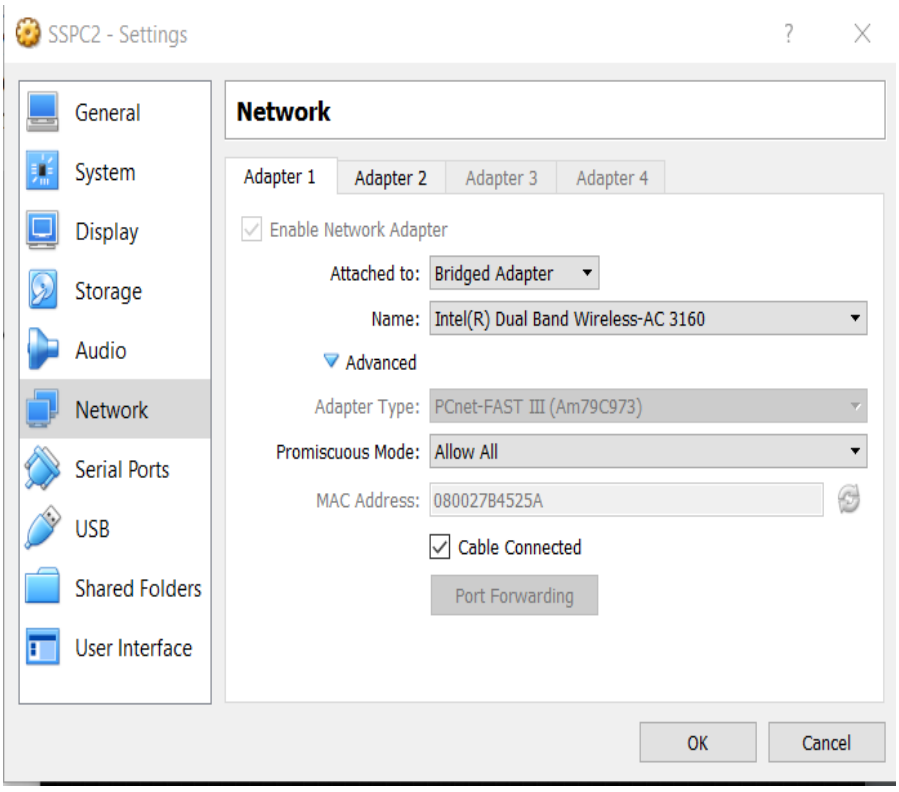
sakura

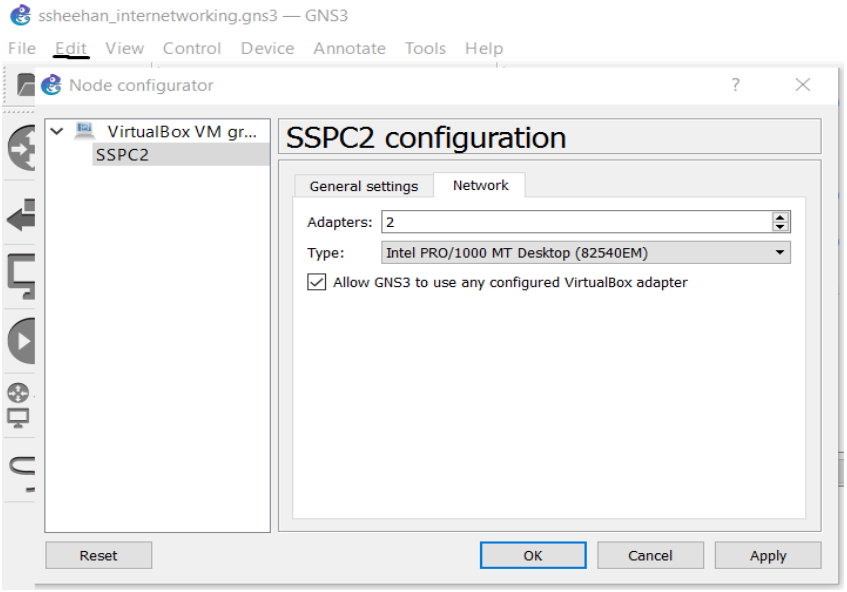
```
tux@slitaz:~$ ping 10.10.14.1
PING 10.10.14.1 (10.10.14.1): 56 data bytes
64 bytes from 10.10.14.1: seq=0 ttl=64 time=0.543 ms
64 bytes from 10.10.14.1: seq=1 ttl=64 time=0.998 ms
64 bytes from 10.10.14.1: seq=2 ttl=64 time=1.037 ms
^C
--- 10.10.14.1 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.543/0.859/1.037 ms
tux@slitaz:~$ ping 10.10.24.2
PING 10.10.24.2 (10.10.24.2): 56 data bytes
64 bytes from 10.10.24.2: seq=0 ttl=64 time=0.547 ms
64 bytes from 10.10.24.2: seq=1 ttl=64 time=1.117 ms
64 bytes from 10.10.24.2: seq=2 ttl=64 time=1.156 ms
^C
--- 10.10.24.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.547/0.940/1.156 ms
tux@slitaz:~$ ping 10.10.34.3
PING 10.10.34.3 (10.10.34.3): 56 data bytes
64 bytes from 10.10.34.3: seq=0 ttl=64 time=0.542 ms
64 bytes from 10.10.34.3: seq=1 ttl=64 time=1.140 ms
64 bytes from 10.10.34.3: seq=2 ttl=64 time=1.005 ms
^C
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.542/0.895/1.140 ms
tux@slitaz:~$
```

Lab 2: Accessing the internet

The task in this lab was to configure NAT to allow the virtual network to access the internet via a bridged adapter connection to the physical PC.

I start off again in the machine settings in VirtualBox, under the network section changing the port connection to a bridged adapter. Under the advanced tab I changed the settings to allow all in Promiscuous Mode and checked the cable connected box.





I then had to edit the settings in GNS3 to allow the virtual box interface to be used in the network, I accessed this setting in the device configuration, and checked the box.

I then edited the default route in SSPC4 to the IP address of SSPC2.

#sudo ip route add default via 10.10.24.2

And deleted the default route on PC2.

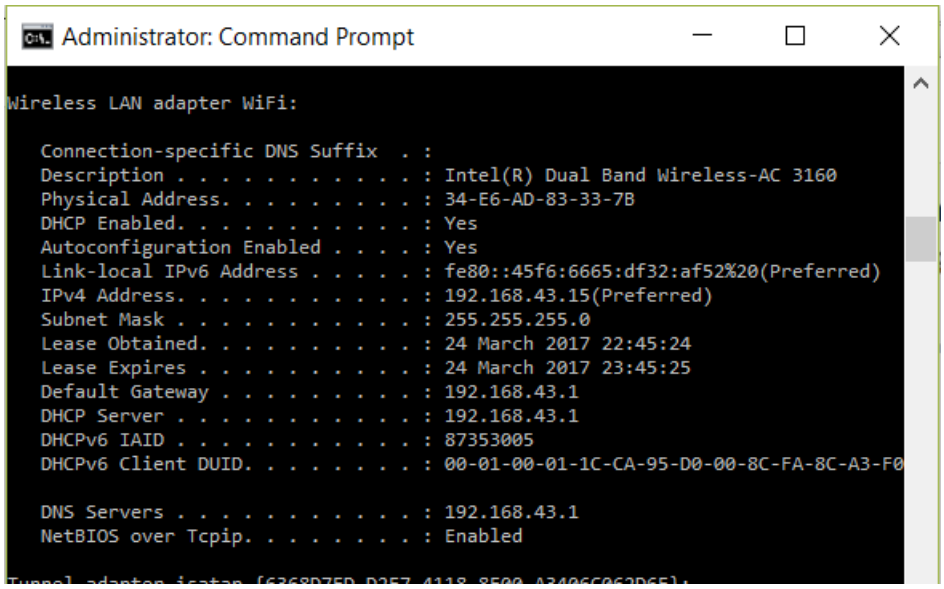
#sudo ip route del default via 10.10.24.4

Because I deleted SSPC2's default route I added a new static route to allow packets from SSPC2 to access the internal network.

#sudo ip route 10.10.0.0/16 via 10.10.24.4

This allowed traffic to flow from SSPC2 to all pc's in the 10.10 network prefix.

I then had to configure Eth0's IP address on SSPC2 to match the address of my physical pc, I used the ipconfig/all command in my CMD to find the IP address:



I edited the network.conf file in PC2 to match the information I found here and rebooted the machine.

Once I rebooted I entered root mode using the command **su** and the password **root** and allowed IP forwarding on SSPC2 to allow traffic to be forwarded through the network.

 # echo 1 > /proc/sys/net/ipv4/ip_forward

While in root mode I used the following command to set the DNS server:

echo nameserver 8.8.8.8 > /etc/resolv.conf

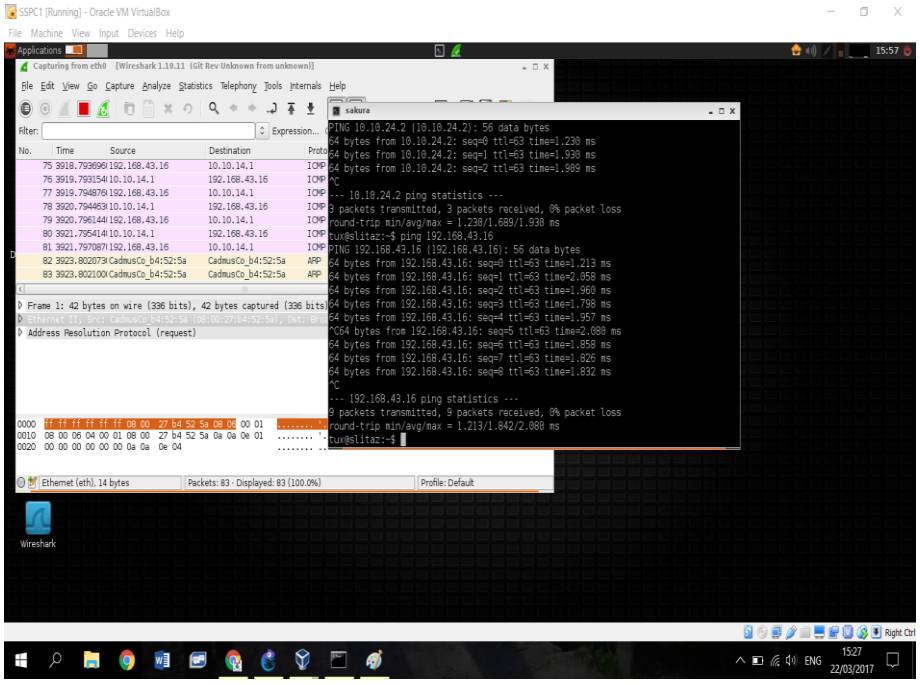
I used wireshark and traceroute to track packets leaving SSPC1 and SSPC3, and then configured NAT on SSPC2 using

sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE

to allocate public addresses to the private network and pinged again.

It still didn't ping and using wireshark I realised packets were reaching SSPC2's eth0 and being dropped there.

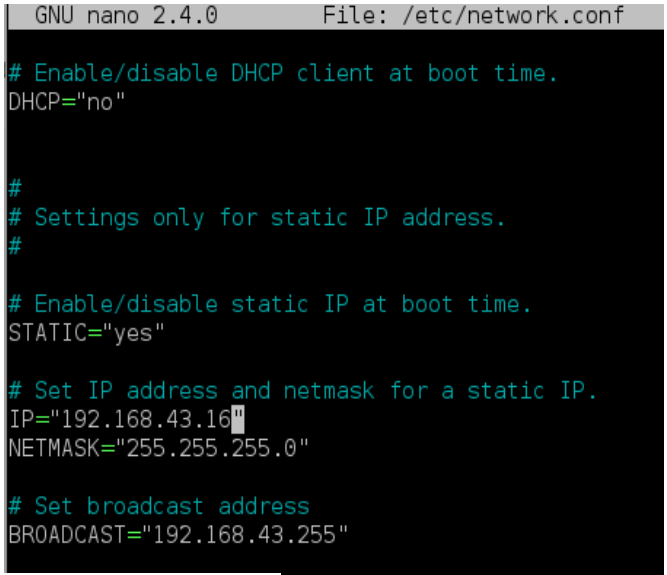
I tried to ping interface eth0 of PC2 on my 192.168.43.16 address from SSPC1 and the ping was successful, meaning the problem had something to do with my configuration of the bridged adapter as packets were travelling fine inside the network:

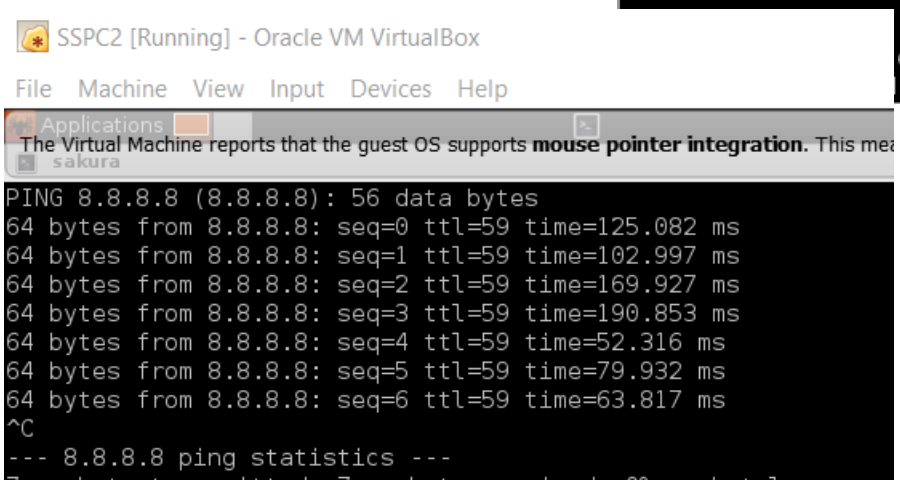


Troubleshooting Lab 2

At this point I tried to ping google from PC2, and this failed also. I spent some time trying to troubleshoot and when I couldn't figure it I shut down GNS3. When I opened it up again the next day I set up the pc's with some commands which have to be entered, like the 10.10.0.0/6 static route on SSPC2, and when I was finished I tried to ping Google from SSPC2 and it pinged. It bothered me, why was it pinging now and not before? So I started to look around the settings I configured in PC2 and I realised one thing was different, my IP in my home network had changed from previously being .16 to now being .15.

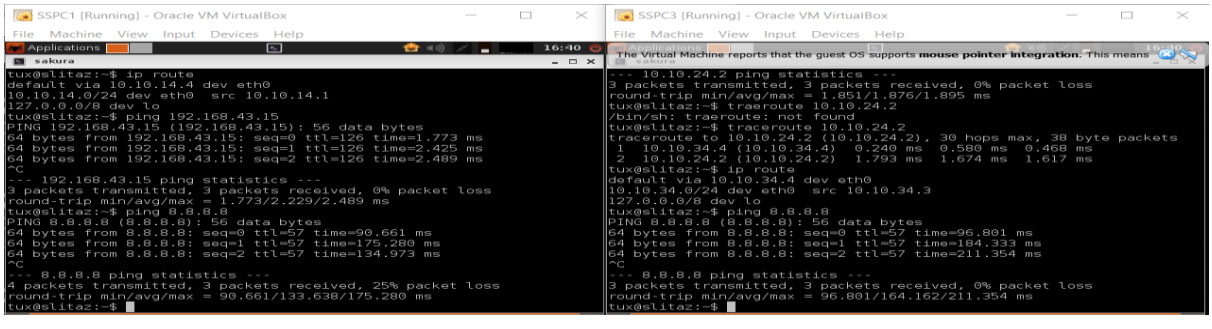
I had configured the address to match my own IP addess and this was preventing my access to the outside network. Once the IP addresses remained on the same network, but not the same addresses I couls access outside networks from SSPC2.





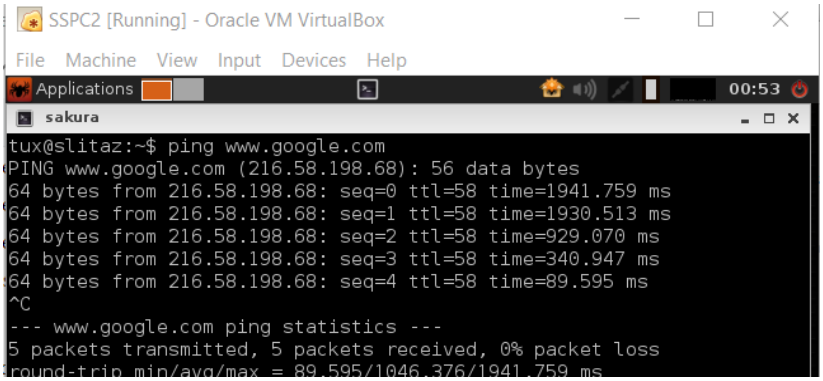
I then tried again to ping google from SSPC3 and once again couldn't access the network. After some time, I realised that at some point during my troubleshooting of SSPC2 I had done a reboot of the machine and forgot to add the static route back to the 10.10.0.0/16 network. I added the route to the network and again tried fruitlessly to ping Google.

While I was troubleshooting the network, I realised that from SSPC1, SSPC3 and SSPC4 I could ping outside the network, as long as I specified an IP address, both pc's pinged 8.8.8.8:



I was also successful pinging other outside addresses like 8.8.8.4 and some of Google's 216 addresses and my pc's 192.168.43.15 address.

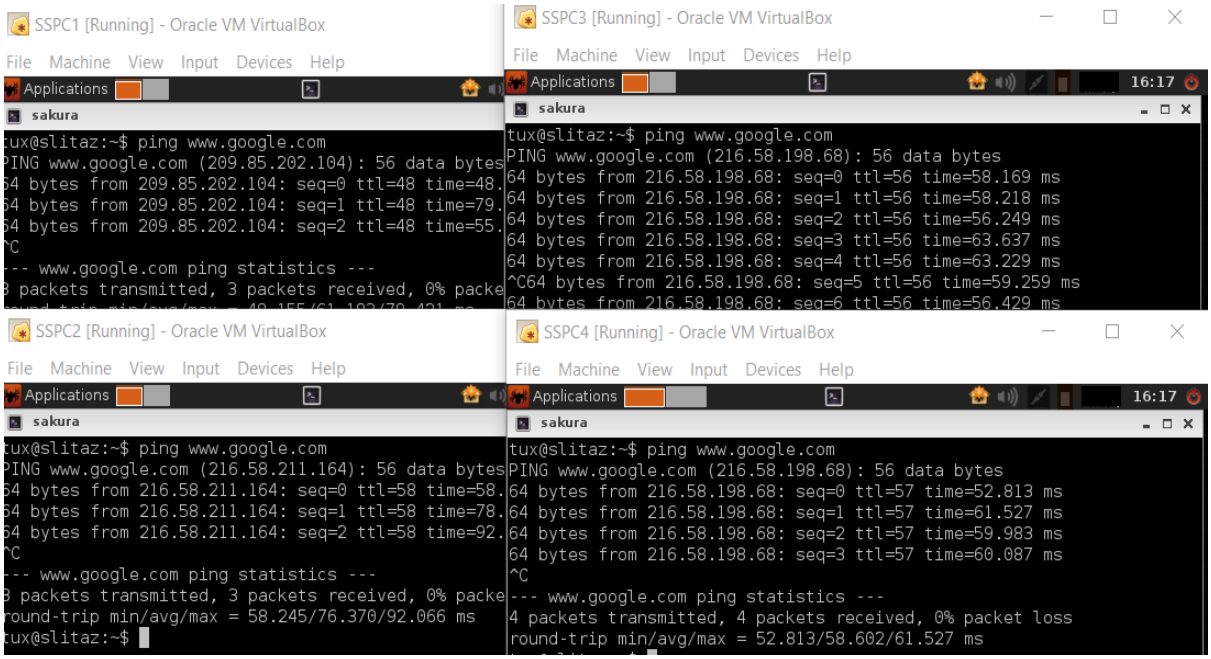
When I tried to ping www.google.com from SSPC1,SSPC3 or SSPC3 I was getting the error 'bad address', however I could ping www.google.com from SSPC2.



After a frustrating few days I spoke to Amanda in the tutorials, and she explained to me what a DNS server was. I thought maybe this was the issue and tried on SSPC3 changing the DNS server which was originally 10.10.34.4 to 8.8.8.8.

Lab 2 completed

Once I changed the server on all the machines I could ping www.google.com and could acces the internet in the browsers:



Bibliography

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Frisby, Richard, Virtual Networking Lab Exercise Part 2, https://moodle.wit.ie/pluginfile.php/3168308/mod_resource/content/2/Virtual%20Networking%20Lab%20Exercise%20Part%202.pdf