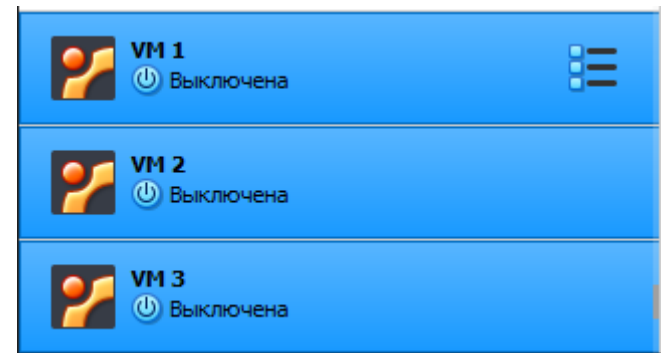




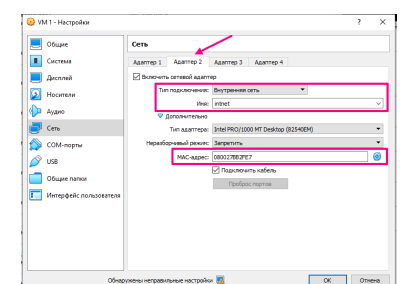
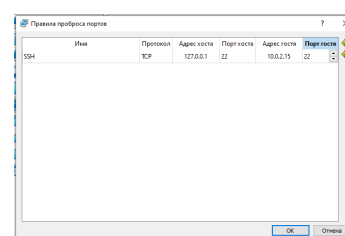
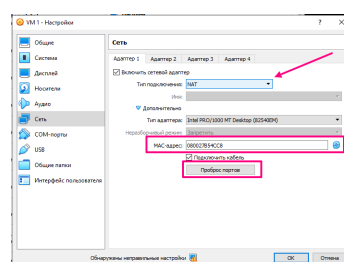
Configuring DHCP, DNS servers and dynamic routing using OSPF protocol

- Create 3 clean Ubuntu virtual machines.



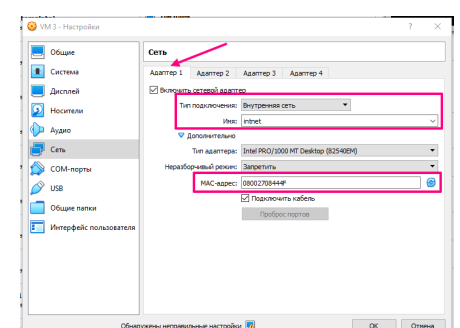
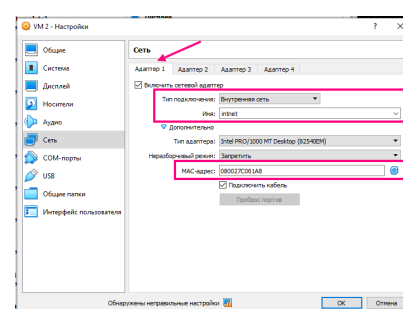
- On the "VM1" let's change network settings on:

- First adapter - NAT.
- Change a MAC-address on the NAT adapter.
- In the Port Forwarding page add SSH connection.
- Second adapter - Internal.
- Change a MAC-address on the Internal adapter.

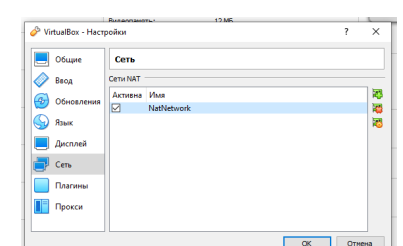
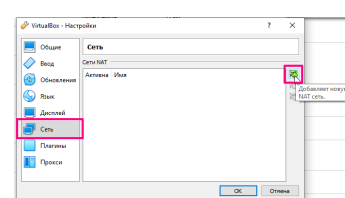
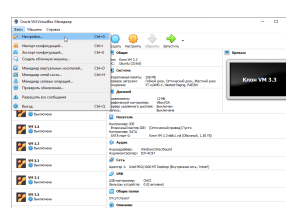


- On the "VM2" and "VM3" let's change network setting on the same way:

- First adapter - NAT.
- Change a MAC-address on the NAT adapter.

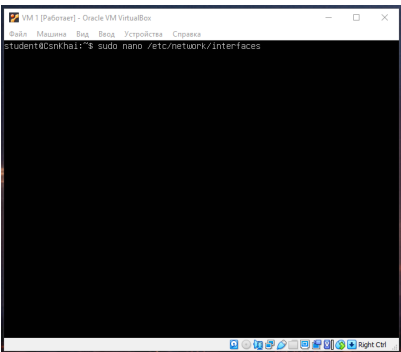


- For DHCP we have to change some Virtual Box settings. Go to "file" » "settings" » "network" » "add new NAT network" » "OK".

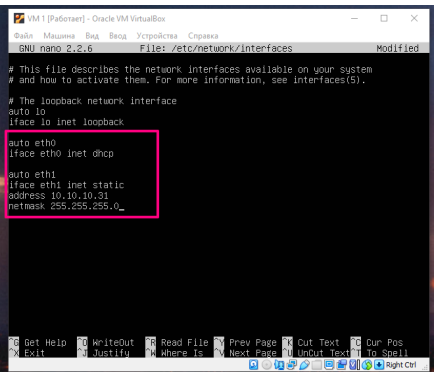


Tune the "VM1":

- Change network interfaces settings for the "VM1":
 - Change the file "*sudo nano /etc/network/interfaces*".
 - Reboot all networks "*sudo ifdown -a*" and then "*sudo ifup -a*".
 - Check the network state using "*ifconfig*".



```
VM1 (Paterson) - Oracle VM VirtualBox
Bash Maumna Bqz Bsqz Ycpolcra Cnpasa
student@csnkhali:~$ sudo nano /etc/network/interfaces
```

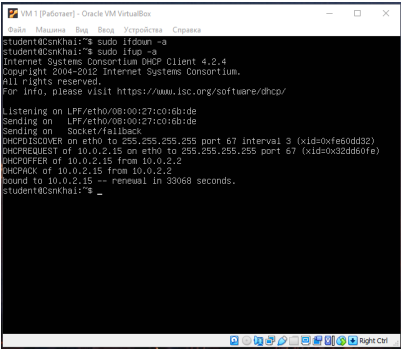


```
VM1 (Paterson) - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/network/interfaces Modified
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

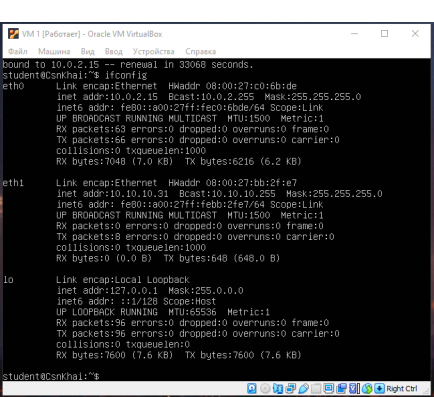
auto eth0
iface eth0 inet dhcp

auto eth1
iface eth1 inet static
address 10.10.10.31
netmask 255.255.255.0
```



```
VM1 (Paterson) - Oracle VM VirtualBox
Bash Maumna Bqz Bsqz Ycpolcra Cnpasa
student@csnkhali:~$ sudo ifdown -a
student@csnkhali:~$ sudo ifup -a
Internet Systems Consortium DHCP Client 4.2.4
Copyright 2006-2015 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/eth0/08:00:27:c0:b8:de
Sending on LPF/eth0/08:00:27:c0:b8:de
Sending on Socket/fallback
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 3 (xid=0xf6dd92)
DHCPREQUEST of 10.0.2.15 on eth0 to 255.255.255.255 port 67 (xid=0x3dd60fe)
DHCPOFFER of 10.0.2.15 from 10.0.2.2
DHCPACK of 10.0.2.15 from 10.0.2.2
bound to 10.0.2.15 -- renewal in 33068 seconds.
student@csnkhali:~$
```



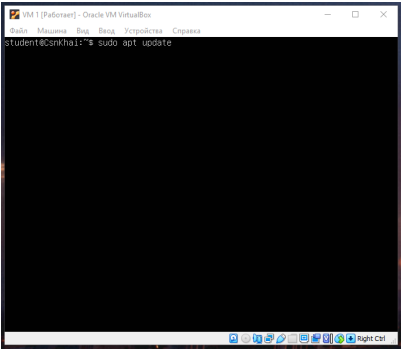
```
VM1 (Paterson) - Oracle VM VirtualBox
Bash Maumna Bqz Bsqz Ycpolcra Cnpasa
student@csnkhali:~$ ifconfig
bound to 10.0.2.15 -- renewal in 33068 seconds.
student@csnkhali:~$ ifconfig
eth0
    Link encap:Ethernet  HWaddr 08:00:27:c0:b8:de
    inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
    inet6 addr: fe80::a00:27ff:fe00:b8:de/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
    RX packets:163 errors:0 dropped:0 overruns:0 frame:0
    TX packets:166 errors:0 dropped:0 overruns:0 carrier:0
    collisions:0 txqueuelen:1000
    RX bytes:7040 (7.0 KB)  TX bytes:6216 (6.2 KB)

eth1
    Link encap:Ethernet  HWaddr 08:00:27:bb:2f:e7
    inet addr:10.10.10.31  Bcast:10.10.10.255  Mask:255.255.255.0
    inet6 addr: fe80::a00:27ff:fe00:b8:de/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
    RX packets:0 errors:0 dropped:0 overruns:0 frame:0
    TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
    collisions:0 txqueuelen:1000
    RX bytes:0 (0.0 B)  TX bytes:648 (648.0 B)

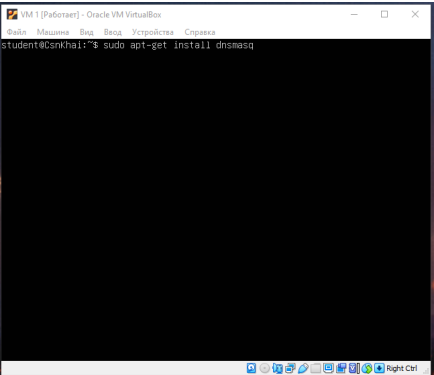
lo
    Link encap:Local Loopback
    inet addr:127.0.0.1  Mask:255.0.0.0
    inet6 addr: ::1/128 Scope:Host
    UP LOOPBACK RUNNING  MTU:65536  Metric:1
    RX packets:96 errors:0 dropped:0 overruns:0 frame:0
    TX packets:96 errors:0 dropped:0 overruns:0 carrier:0
    collisions:0 txqueuelen:0
    RX bytes:7600 (7.6 KB)  TX bytes:7600 (7.6 KB)

student@csnkhali:~$
```

- Install DNSMASQ on the "VM1":
 - Update a list of repository "*sudo apt update*".
 - Install dnsmasq with command "*sudo apt-get install dnsmasq*".

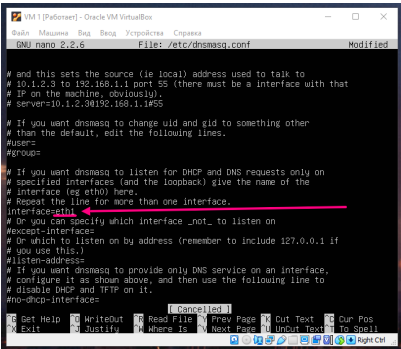


```
VM1 (Paterson) - Oracle VM VirtualBox
Bash Maumna Bqz Bsqz Ycpolcra Cnpasa
student@csnkhali:~$ sudo apt update
```



```
VM1 (Paterson) - Oracle VM VirtualBox
Bash Maumna Bqz Bsqz Ycpolcra Cnpasa
student@csnkhali:~$ sudo apt-get install dnsmasq
```

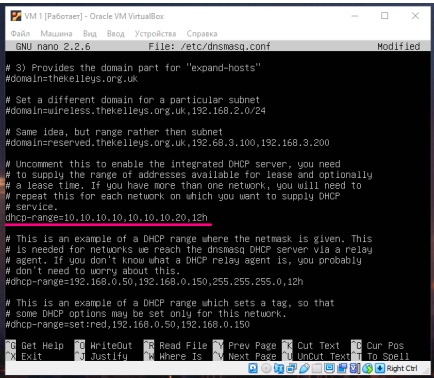
- Tune DNSMASQ on the "VM1":
 - Uncomment the line "interface = eth1" in the file "*sudo nano /etc/dnsmasq.conf*".
 - Uncomment the line and put the rage "dhcp-range=..." in the file "*sudo nano /etc/dnsmasq.conf*".
 - Setting the file "*sudo nano /etc/resolv.conf*".
 - Uncomment the line "prepend domain-name-servers 127.0.0.1;" in the file "*sudo nano /etc/dhcp/dhclient.conf*".



```
VM1 (Paterson) - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/dnsmasq.conf Modified
# and this sets the source (ie local) address used to talk to
# 10.1.2.2 to 192.168.1.1 port 55 (there must be an interface with that
# IP on the machine, obviously).
# server=10.1.2.30192.168.1.1#55

# If you want dnsmasq to change uid and gid to something other
# than the default, edit the following lines.
#user:
#group:

# If you want dnsmasq to listen for DHCP and DNS requests only on
# specified interfaces (and the loopback) give the name of the
# interface (eg eth0) here.
# repeat the line for more than one interface.
interface=eth1
# If you can specify which interface _not_ to listen on
#except-interfaces:
# or which to listen on by address (remember to include 127.0.0.1 if
# you use this.)
#listen-address:
# If you want dnsmasq to provide only DNS service on an interface,
# configure it as shown above, and then use the following line to
# disable DHCP and TFTP on it.
#no-dhcp-interfaces
```



```
VM1 (Paterson) - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/dnsmasq.conf Modified
# 3) Provides the domain part for "expand-hosts"
#domain=thekeleys.org.uk

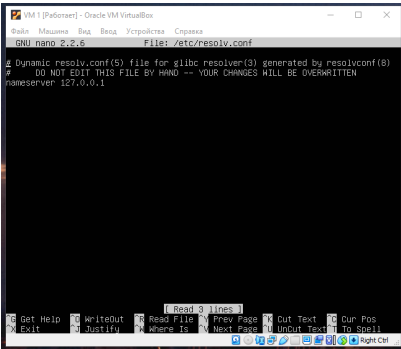
# Set a different domain for a particular subnet
#domain=wireless.thekeleys.org.uk,192.168.2.0/24

# Same idea, but range rather than subnet
#domain=reserved.thekeleys.org.uk,192.168.3.100,192.168.3.200

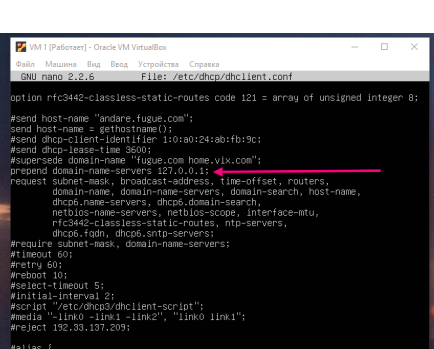
# Uncomment this to enable the integrated DHCP server, you need
# to supply the range of addresses available for lease and optionally
# a lease time. If you have more than one network, you will need to
# repeat this for each network on which you want to supply DHCP
# service.
#dhcp-range=10.10.10.10,10.10.10.20,12h

# This is an example of a DHCP range where the network is given. This
# is needed for networks we reach the dnsmasq DHCP server via a relay
# agent. If you don't know what a DHCP relay agent is, you probably
# don't need to worry about this.
#dhcp-range=192.168.0.50,192.168.0.150,255.255.0.12h

# This is an example of a DHCP range which sets a tag, so that
# some DHCP options may be set only for this network.
#dhcp-range=set:red,192.168.0.50,192.168.0.150
```



```
VM1 (Paterson) - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/resolv.conf
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
# DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
nameserver 127.0.0.1
```



```
VM1 (Paterson) - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/dhcp/dhclient.conf
option rfc3442-classless-static-routes code 121 = array of unsigned integer 8;

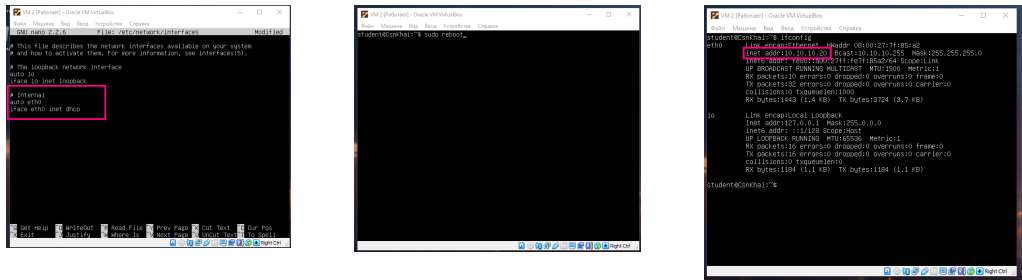
#send host-name "andare.fugue.com";

#send host-name = gethostname();
#send dhcp-client-identifier 10:10:24:80:f0:9c;
#send dhcp-leasefile $0001;
#supersede domain-name "fugue.com home.vix.com";
#prepend domain-name-servers 127.0.0.1;
#request subnet-mask, broadcast-address, time-offset, routers,
#domain-name, domain-name-servers, domain-search, host-name,
#dhcp-name-servers, dhcp-domain-search,
#netbios-name-servers, netbios-scope, interface-mtu,
#rfc3442-classless-static-routes, ntp-servers,
#dhcp-fqdn, dhcp6.sntp-servers;
#require subnet-mask, domain-name-servers;
#timeout 60;
#retry 60;
#reboot 10;
#select timeout 5;
#initial-interval 2;
script "/etc/dhcp/dhclient-script";
#media "link0-link1-link2", "link0 link1";
#reject 192.33.157.209;

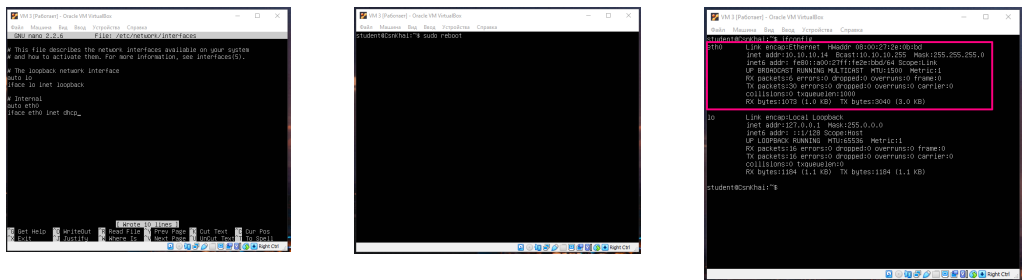
#llns {}
```

Tune the "VM2" and "VM3":

- Tune the "VM2":
 - On the "VM2" change the file "*sudo nano /etc/network/interfaces*".
 - Reboot the "VM2" with "*sudo reboot*".
 - Check the network with "*ifconfig*". We see that the ip-address is given by DHCP.
 - If we don't have an ip-address on the machine, we can try to do "*sudo ifdown -a*" and then "*sudo ifup -a*". If it doesn't help - reboot machine as many times as we need to get the ip-address. Because of VirtualBox we can sometimes don't get an ip-address even if we done everything correct.

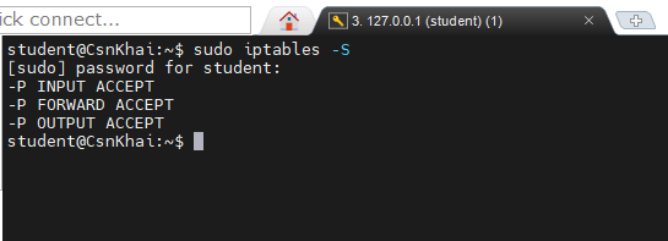


- Tune the "VM3" by the same way:
 - On the "VM3" change the file "*sudo nano /etc/network/interfaces*".
 - Reboot the "VM3" with "*sudo reboot*".
 - Check the network with "*ifconfig*". We see that the ip-address is given by DHCP.

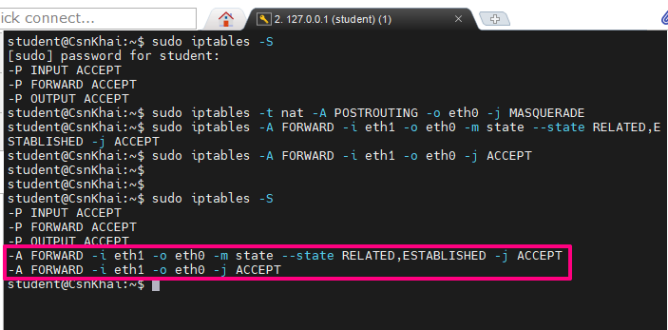


Tune iptables on the "VM1":

- Check on "VM1" "*sudo iptables -S*".



- Do the next commands on the "VM1":
 - "*sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE*".
 - "*sudo iptables -A FORWARD -i eth1 -o eth0 -m state --state RELATED,ESTABLISHED -j ACCEPT*".
 - "*sudo iptables -A FORWARD -i eth1 -o eth0 -j ACCEPT*".
 - "*sudo iptables -S*".



- We have finished. Congratulations!

