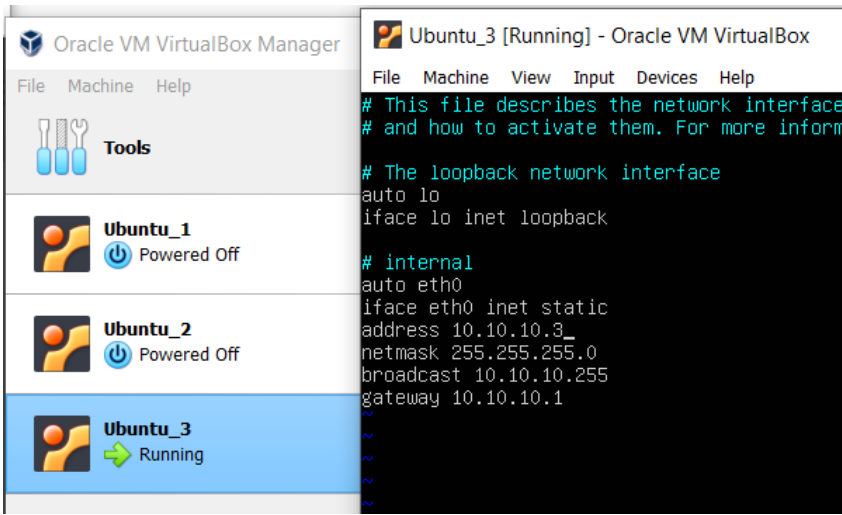# Configuring DHCP, DNS servers and dynamic routing using OSPF protocol

1. Use already created internal-network for three VMs (VM1-VM3). VM1 has NAT and internal, VM2, VM3 – internal only interfaces.
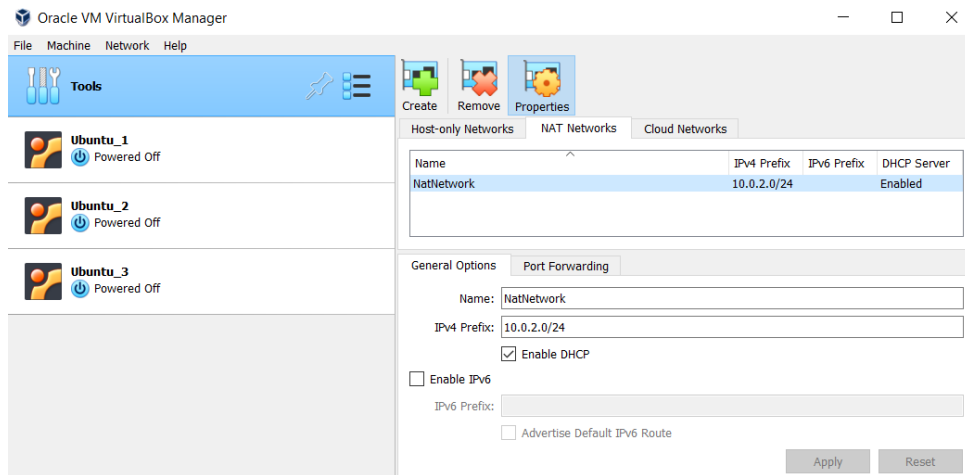

2. Install and configure DHCP server on VM1.

(3 ways: using VBoxManage, DNSMASQ and ISC-DHSPSERVER).

You should use at least 2 of them.

Oracle VM VirtualBox Manager

File Machine Network Help

Tools

Create Remove Properties

Host-only Networks | NAT Networks | Cloud Networks

Name	IPv4 Prefix	IPv6 Prefix	DHCP Server
NatNetwork	10.0.2.0/24		Enabled

General Options | Port Forwarding

Name: NatNetwork

IPv4 Prefix: 10.0.2.0/24

☑ Enable DHCP

☐ Enable IPv6

IPv6 Prefix:

☐ Advertise Default IPv6 Route

Apply   Reset

Ubuntu_1 Powered Off
Ubuntu_2 Powered Off
Ubuntu_3 Powered Off

Ubuntu_1 [Running] - Oracle VM VirtualBox

File   Machine   View   Input   Devices   Help

```
# 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

# NAT
auto eth0
iface eth0 inet dhcp

# Internal
auto eth1
iface eth1 inet static
address 10.10.10.1
netmask 255.255.255.0
```

Ubuntu_1 [Running] - Oracle VM VirtualBox

File   Machine   View   Input   Devices   Help

```
# Add the IPs of all queries to yahoo.com, google.com, and their
# subdomains to the vpn and search ipsets:
#ipset=/yahoo.com/google.com/vpn,search

# You can control how dnsmasq talks to a server: this forces
# queries to 10.1.2.3 to be routed via eth1
# server=10.1.2.3@eth1

# and this sets the source (ie local) address used to talk to
# 10.1.2.3 to 192.168.1.1 port 55 (there must be a interface with that
# IP on the machine, obviously).
# server=10.1.2.3@192.168.1.1#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
# Or you can specify which interface _not_ to listen on
#except-interface=
# Or which to listen on by address (remember to include 127.0.0.1 if
# you use this.)
#listen-address=
                                                         99,1              11%
```
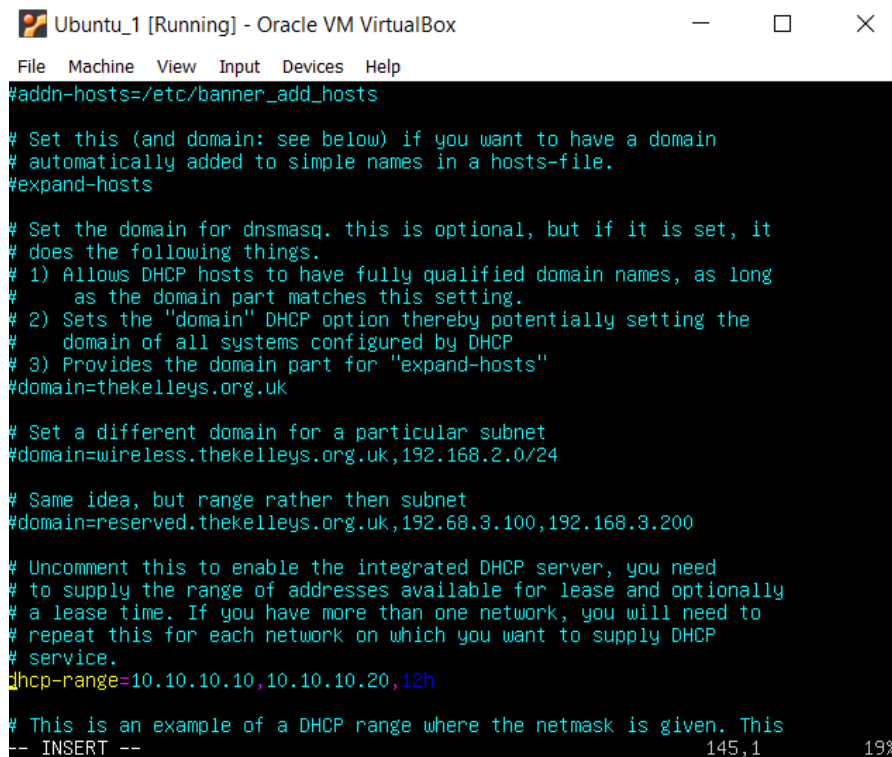
```
#addn-hosts=/etc/banner_add_hosts

# Set this (and domain: see below) if you want to have a domain
# automatically added to simple names in a hosts-file.
#expand-hosts

# Set the domain for dnsmasq. this is optional, but if it is set, it
# does the following things.
# 1) Allows DHCP hosts to have fully qualified domain names, as long
#      as the domain part matches this setting.
# 2) Sets the "domain" DHCP option thereby potentially setting the
#      domain of all systems configured by DHCP
# 3) Provides the domain part for "expand-hosts"
#domain=thekelleys.org.uk

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

# Same idea, but range rather then subnet
#domain=reserved.thekelleys.org.uk,192.68.3.100,192.168.3.200

# 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 netmask is given. This
-- INSERT --                                          145,1          19%
```
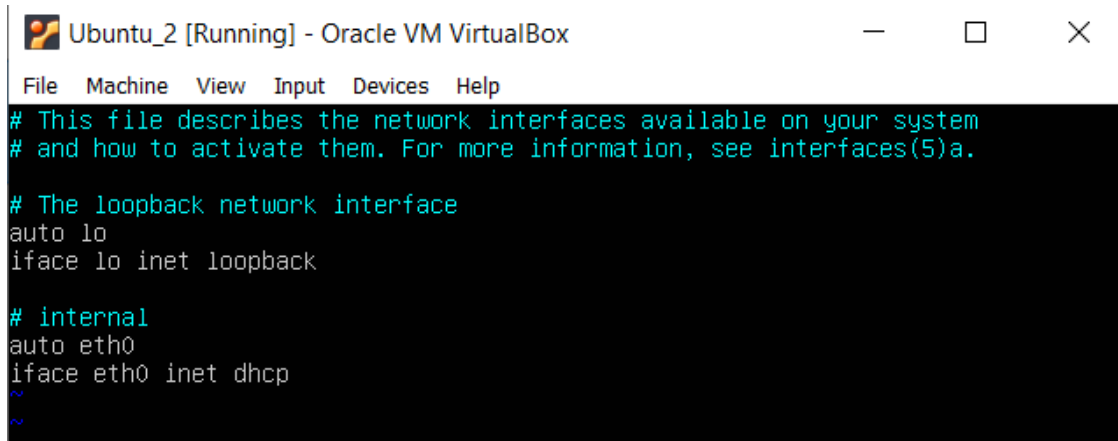
3. Check VM2 and VM3 for obtaining network addresses from DHCP server.


```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5)a.

# The loopback network interface
auto lo
iface lo inet loopback

# internal
auto eth0
iface eth0 inet dhcp
~
~
```

File Machine View Input Devices Help

```
student@CsnKhai:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t
    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: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP gr
oup default qlen 1000
    link/ether 08:00:27:ed:14:1d brd ff:ff:ff:ff:ff:ff
    inet 10.10.10.20/24 brd 10.10.10.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:feed:141d/64 scope link tentative dadfailed
       valid_lft forever preferred_lft forever
student@CsnKhai:~$ _
```
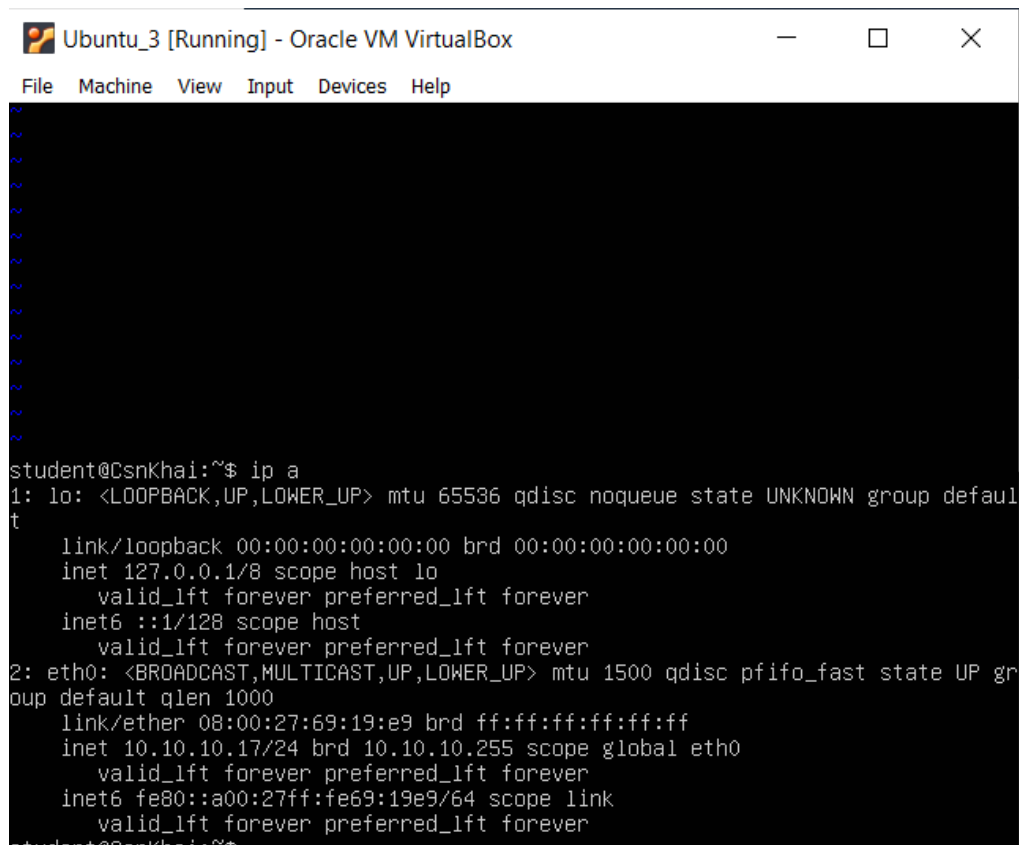
File Machine View Input Devices Help

```
# 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

# internal
auto eth0
iface eth0 inet dhcp
```
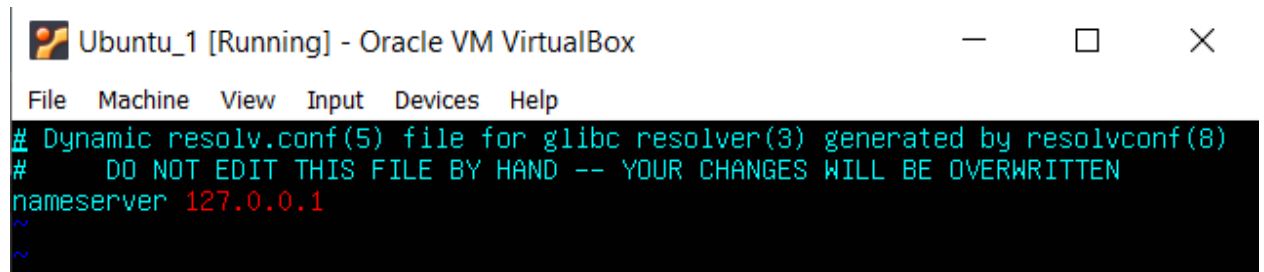
```
student@CsnKhai:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP gr
oup default qlen 1000
    link/ether 08:00:27:69:19:e9 brd ff:ff:ff:ff:ff:ff
    inet 10.10.10.17/24 brd 10.10.10.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe69:19e9/64 scope link
       valid_lft forever preferred_lft forever
student@CsnKhai:~$
```

4. Using existed network for three VMs (from p.1) install and configure DNS server on VM1. (You can use DNSMASQ, BIND9 or something else).


```
# 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
~
~
```

```
# Configuration file for /sbin/dhclient, which is included in Debian's
#       dhcp3-client package.
#
# This is a sample configuration file for dhclient. See dhclient.conf's
#       man page for more information about the syntax of this file
#       and a more comprehensive list of the parameters understood by
#       dhclient.
#
# Normally, if the DHCP server provides reasonable information and does
#       not leave anything out (like the domain name, for example), then
#       few changes must be made to this file, if any.
#

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 1:0:a0:24:ab:fb:9c;
#send dhcp-lease-time 3600;
#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,
        dhcp6.name-servers, dhcp6.domain-search,
        netbios-name-servers, netbios-scope, interface-mtu,
        rfc3442-classless-static-routes, ntp-servers,
        dhcp6.fqdn, dhcp6.sntp-servers;
#require subnet-mask, domain-name-servers;
#timeout 60;
-- INSERT --                                                    21,1         Top
```

5. Check VM2 and VM3 for gaining access to DNS server (naming services).


```
;; ANSWER SECTION:
google.com.             21      IN      A       142.250.186.206

;; Query time: 19 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Sun Aug 20 18:46:22 UTC 2023
;; MSG SIZE  rcvd: 55

student@CsnKhai:~$ dig g.co

; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> g.co
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 2686
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
;; QUESTION SECTION:
;g.co.                          IN      A

;; ANSWER SECTION:
g.co.                   300     IN      A       142.250.186.206

;; Query time: 147 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Sun Aug 20 18:46:46 UTC 2023
;; MSG SIZE  rcvd: 49

student@CsnKhai:~$
```
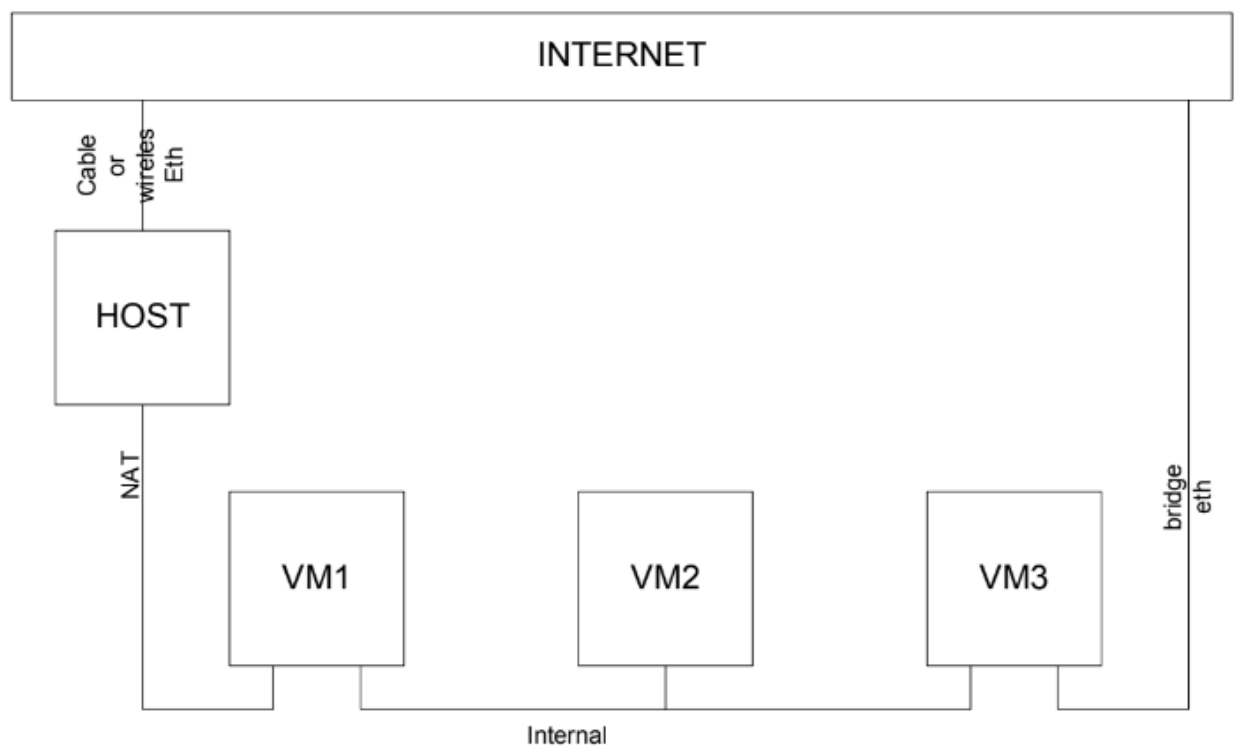
6. ***Using the scheme which follows, configure dynamic routing using OSPF protocol.

7. Check results.