

Prerequisites

```
C:\Users\break\Desktop\routinglab>vboxmanage modifyvm vm2 --nic3 nat  
C:\Users\break\Desktop\routinglab>
```

```
vm2 [Running] - Oracle VM VirtualBox  
vm2 login: debian  
Password:  
Last login: Wed May 26 16:06:33 CEST 2021 on tty1  
Linux vm2 4.19.0-8-amd64 #1 SMP Debian 4.19.98-1 (2020-01-26) x86_64  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
debian@vm2:~$ sudo -i  
root@vm2:~# ip ad  
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  
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 52:54:00:00:00:21 brd ff:ff:ff:ff:ff:ff  
    inet 10.1.2.102/24 brd 10.1.2.255 scope global eth0  
        valid_lft forever preferred_lft forever  
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 52:54:00:00:00:23 brd ff:ff:ff:ff:ff:ff  
    inet 10.2.3.102/24 brd 10.2.3.255 scope global eth1  
        valid_lft forever preferred_lft forever  
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 08:00:27:33:73:97 brd ff:ff:ff:ff:ff:ff  
    inet 10.0.4.15/24 brd 10.0.4.255 scope global dynamic enp0s9  
        valid_lft 86382sec preferred_lft 86382sec  
root@vm2:~# iptables -t nat -A POSTROUTING -o enp0s9 -j MASQUERADE
```

```
vm1 [Running] - Oracle VM VirtualBox  
Debian GNU/Linux 10 vm1 tty1  
vm1 login: debian  
Password:  
Last login: Wed May 26 16:06:11 CEST 2021 on tty1  
Linux vm1 4.19.0-8-amd64 #1 SMP Debian 4.19.98-1 (2020-01-26) x86_64  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
debian@vm1:~$ ip ad  
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  
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 52:54:00:00:00:12 brd ff:ff:ff:ff:ff:ff  
    inet 10.1.2.101/24 brd 10.1.2.255 scope global eth0  
        valid_lft forever preferred_lft forever  
debian@vm1:~$ ping 8.8.8.8  
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:  
64 bytes from 8.8.8.8: icmp_seq=1 ttl=112 time=31.6 ms  
64 bytes from 8.8.8.8: icmp_seq=2 ttl=112 time=27.4 ms  
64 bytes from 8.8.8.8: icmp_seq=3 ttl=112 time=27.5 ms  
^C  
--- 8.8.8.8 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 6ms  
rtt min/avg/max/ndev = 27.431/28.846/31.572/1.937 ms
```

Task 1

Configure location of the new DNS zone with name lsa2020.pl

```
vm2 [Running] - Oracle VM VirtualBox
GNU nano 3.2                                named.conf.local

// Do any local configuration here

// Consider adding the 1918 zones here, if they are not used i
// organization
//include "/etc/bind/zones.rfc1918";

zone "lsa2020.pl"{
    type master;
    file "/etc/bind/db.lsa2020.pl";
};
```

Change lsa2020.pl zone's configuration

```
vm2 [Running] - Oracle VM VirtualBox
GNU nano 3.2                                db.lsa2020.pl

; BIND data file for local loopback interface
$TTL      604800
@         IN      SOA     localhost. root.localhost. (
                        2      ; Serial
                        604800 ; Refresh
                        86400  ; Retry
                        2419200; Expire
                        604800 ) ; Negative Cache TTL
;
ns1       IN      NS      ns1.lsa2020.pl.
@         IN      A       127.0.0.1
@         IN      AAAA    ::1
ns1       IN      A       10.1.2.102
vm2       IN      A       10.1.2.102
www       IN      CNAME   vm2.lsa2020.pl.
vm1       IN      A       10.1.2.101
```

modify bind server options:

```
vm2 [Running] - Oracle VM VirtualBox
GNU nano 3.2 named.conf.options Modified
acl "trusted" {
    10.1.2.0/24
};

options {
    directory "/var/cache/bind";

    // If there is a firewall between you and nameservers you want
    // to talk to, you may need to fix the firewall to allow multiple
    // ports to talk. See http://www.kb.cert.org/vuls/id/800113

    // If your ISP provided one or more IP addresses for stable
    // nameservers, you probably want to use them as forwarders.
    // Uncomment the following block, and insert the addresses replacing
    // the all-0's placeholder.

    // forwarders {
    //     0.0.0.0;
    // };

    //=====
    // If BIND logs error messages about the root key being expired,
    // you will need to update your keys. See https://www.isc.org/bind-keys
    //=====
    dnssec-validation auto;

    recursion yes;
    allow-recursion {trusted;};
    listen-on {10.1.2.102;};
    allow-transfer {none;};

    forwarders {
```

Restart DNS:

```
vm2 [Running] - Oracle VM VirtualBox
// you will need to update your keys. See https://www.isc.org/bind-keys
//=====
dnssec-validation auto;

recursion yes;
allow-recursion { trusted; };
listen-on { 10.1.2.102; };
allow-transfer { none; };

forwarders {

root@vm2:/etc/bind# systemctl restart bind9
root@vm2:/etc/bind# systemctl status bind9
● bind9.service - BIND Domain Name Server
   Loaded: loaded (/lib/systemd/system/bind9.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2021-05-26 13:27:26 CEST; 4s ago
     Docs: man:named(8)
  Process: 22529 ExecStart=/usr/sbin/named $OPTIONS (code=exited, status=0/SUCCESS)
 Main PID: 22530 (named)
    Tasks: 4 (limit: 394)
   Memory: 11.2M
   CGroup: /system.slice/bind9.service
           └─22530 /usr/sbin/named -u bind

May 26 13:27:26 vm2 named[22530]: zone 127.in-addr.arpa/IN: loaded serial 1
May 26 13:27:26 vm2 named[22530]: zone lsa2020.pl/IN: loaded serial 2
May 26 13:27:26 vm2 named[22530]: zone 255.in-addr.arpa/IN: loaded serial 1
May 26 13:27:26 vm2 named[22530]: zone localhost/IN: loaded serial 2
May 26 13:27:26 vm2 named[22530]: all zones loaded
May 26 13:27:26 vm2 systemd[1]: Started BIND Domain Name Server.
May 26 13:27:26 vm2 named[22530]: running
May 26 13:27:26 vm2 named[22530]: zone lsa2020.pl/IN: sending notifies (serial 2)
May 26 13:27:27 vm2 named[22530]: managed-keys-zone: Key 20326 for zone . acceptance timer complete:
May 26 13:27:27 vm2 named[22530]: resolver priming query complete
lines 1-21/21 (END)Quit
root@vm2:/etc/bind# _
```

Test if it's working on VM2

```

root@vm2:/etc/bind# nslookup ns1.lsa2020.pl
Server:          10.1.2.102
Address:         10.1.2.102#53

Name:   ns1.lsa2020.pl
Address: 10.1.2.102

root@vm2:/etc/bind# dig vm1.lsa2020.pl

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> vm1.lsa2020.pl
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 12813
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 2

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags: udp: 4096
; COOKIE: b314e3a53e449be435d4ca3e60ae31e598aa17f482d0e047 (good)
;; QUESTION SECTION:
;vm1.lsa2020.pl.                IN      A

;; ANSWER SECTION:
vm1.lsa2020.pl.                604800  IN      A      10.1.2.101

;; AUTHORITY SECTION:
lsa2020.pl.                    604800  IN      NS      ns1.lsa2020.pl.

;; ADDITIONAL SECTION:
ns1.lsa2020.pl.                604800  IN      A      10.1.2.102

;; Query time: 0 msec
;; SERVER: 10.1.2.102#53(10.1.2.102)
;; WHEN: Wed May 26 13:32:53 CEST 2021
;; MSG SIZE rcvd: 121

```

VM1 test

```

vm1 [Running] - Oracle VM VirtualBox
GNU nano 3.2 /etc/resolv.conf

nameserver 10.1.2.102
$

root@vm1:/etc# host vm2.lsa2020.pl
vm2.lsa2020.pl has address 10.1.2.102
root@vm1:/etc# ping vm1.lsa2020.pl
PING vm1.lsa2020.pl (10.1.2.101) 56(84) bytes of data:
64 bytes from vm1 (10.1.2.101): icmp_seq=1 ttl=64 time=0.014 ms
64 bytes from vm1 (10.1.2.101): icmp_seq=2 ttl=64 time=0.026 ms
64 bytes from vm1 (10.1.2.101): icmp_seq=3 ttl=64 time=0.027 ms
^C
--- vm1.lsa2020.pl ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 44ms
rtt min/avg/max/mdev = 0.014/0.022/0.027/0.007 ms
root@vm1:/etc# _

```

DHCP server installation

Install DHCP server on VM2

```
vm2 [Running] - Oracle VM VirtualBox
Selecting previously unselected package policycoreutils.
Preparing to unpack .../5-policycoreutils_2.8-1_amd64.deb ...
Unpacking policycoreutils (2.8-1) ...
Setting up selinux-utils (2.8-1+b1) ...
Setting up policycoreutils (2.8-1) ...
selinux-autorelabel-mark.service is a disabled or a static unit, not starting it.
Setting up libiscfg-export163 (1:9.11.5.P4+dfsg-5.1+deb10u5) ...
Setting up isc-dhcp-common (4.4.1-2) ...
Setting up libirs-export161 (1:9.11.5.P4+dfsg-5.1+deb10u5) ...
Setting up isc-dhcp-server (4.4.1-2) ...
Generating /etc/default/isc-dhcp-server...
Job for isc-dhcp-server.service failed because the control process exited with error code.
See "systemctl status isc-dhcp-server.service" and "journalctl -xe" for details.
invoke-rc.d: initscript isc-dhcp-server, action "start" failed.
■ isc-dhcp-server.service - LSB: DHCP server
   Loaded: loaded (/etc/init.d/isc-dhcp-server; generated)
   Active: failed (Result: exit-code) since Wed 2021-05-26 13:51:10 CEST; 23ms ago
     Docs: man:systemd-sysv-generator(8)
   Process: 22804 ExecStart=/etc/init.d/isc-dhcp-server start (code=exited, status=1/FAILURE)

May 26 13:51:08 vm2 dhcpd[22816]: bugs on either our web page at www.isc.org or in the README file
May 26 13:51:08 vm2 dhcpd[22816]: before submitting a bug. These pages explain the proper
May 26 13:51:08 vm2 dhcpd[22816]: process and the information we find helpful for debugging.
May 26 13:51:08 vm2 dhcpd[22816]:
May 26 13:51:08 vm2 dhcpd[22816]: exiting.
May 26 13:51:10 vm2 isc-dhcp-server[22804]: Starting ISC DHCPv4 server: dhcpdcheck syslog for diagn
stics. ... failed!
May 26 13:51:10 vm2 isc-dhcp-server[22804]: failed!
May 26 13:51:10 vm2 systemd[1]: isc-dhcp-server.service: Control process exited, code=exited, status
=1/FAILURE
May 26 13:51:10 vm2 systemd[1]: isc-dhcp-server.service: Failed with result 'exit-code'.
May 26 13:51:10 vm2 systemd[1]: Failed to start LSB: DHCP server.
Processing triggers for man-db (2.8.5-2) ...
Processing triggers for libc-bin (2.28-10) ...
Processing triggers for systemd (241-7~deb10u7) ...

Progress: [ 96%] [#####]
```

Change configuration


```
GNU nano 3.2 /etc/default/isc
# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf)
#DHCPDv4_CONF=/etc/dhcp/dhcpd.conf
#DHCPDv6_CONF=/etc/dhcp/dhcpd6.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid)
#DHCPDv4_PID=/var/run/dhcpd.pid
#DHCPDv6_PID=/var/run/dhcpd6.pid

# Additional options to start dhcpd with.
# Don't use options -cf or -pf here; use DHCPD_CONF and DHCPD_PID.
#OPTIONS=""

# On what interfaces should the DHCP server (dhcpd) listen?
# Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACESv4="eth0"
INTERFACESv6=""
```

vm2 [Running] - Oracle VM VirtualBox

```
GNU nano 3.2 /etc/dhcp/dhcpd.conf Modified
ddns-update-style none;

# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.
#authoritative;

# Use this to send dhcp log messages to a different log file (you also
# have to hack syslog.conf to complete the redirection).
#log-facility local7;

# No service will be given on this subnet, but declaring it helps the
# DHCP server to understand the network topology.
subnet 10.1.2.0 netmask 255.255.255.0 {
    range 10.1.2.1 10.1.2.254;
    option routers 10.1.2.102;
}

#subnet 10.152.187.0 netmask 255.255.255.0 {
#}

# This is a very basic subnet declaration.
#subnet 10.254.239.0 netmask 255.255.255.224 {
#    range 10.254.239.10 10.254.239.20;
#    option routers rtr-239-0-1.example.org, rtr-239-0-2.example.org;
#}

# This declaration allows BOOTP clients to get dynamic addresses,
# which we don't really recommend.
#subnet 10.254.239.32 netmask 255.255.255.224 {
#    range dynamic-bootp 10.254.239.40 10.254.239.60;
```

Start DHCP server:

```
root@vm2:/etc/bind# systemctl start isc-dhcp-server
root@vm2:/etc/bind#
```

VM1 modify interface

```
vm1 [Running] - Oracle VM VirtualBox
GNU nano 3.2 /etc/network/interfaces.d/40-network-cfg
# Network configuration
auto lo
iface lo inet loopback

auto eth0
iface eth0 inet dhcp
# address 10.1.2.101/24
# gateway 10.1.2.102
```

Start interface:

```
root@vm1:/etc# ifup eth0
Internet Systems Consortium DHCP Client 4.4.1
Copyright 2004-2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

[ 2970.109064] e1000: eth0 NIC Link is Up 1000 Mbps Full Duplex, Flow Control:
Listening on LPF/eth0/52:54:00:00:00:12
Sending on LPF/eth0/52:54:00:00:00:12
Sending on Socket/fallback
Created duid "\000\001\000\001(\0364WRT\000\000\000\022)".
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 7
DHCPOFFER of 10.1.2.1 from 10.1.2.102
DHCPREQUEST for 10.1.2.1 on eth0 to 255.255.255.255 port 67
DHCPACK of 10.1.2.1 from 10.1.2.102
bound to 10.1.2.1 -- renewal in 253 seconds.
root@vm1:/etc# _
```

```
root@vm1:/etc# dhclient eth0
root@vm1:/etc# ip ad
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
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 52:54:00:00:00:12 brd ff:ff:ff:ff:ff:ff
    inet 10.1.2.1/24 brd 10.1.2.255 scope global dynamic eth0
        valid_lft 536sec preferred_lft 536sec
    inet 10.1.2.2/24 brd 10.1.2.255 scope global secondary dynamic eth0
        valid_lft 598sec preferred_lft 598sec
root@vm1:/etc#
```