实验 10 网络、DNS 与 DHCP 配置

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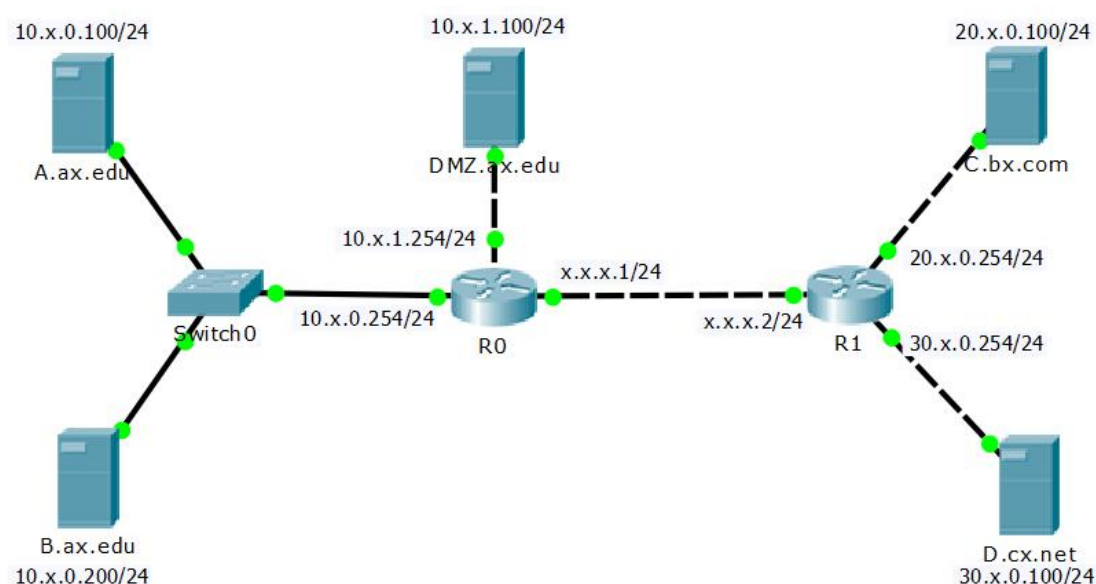
一、实验目的
1．熟悉 Linux 网络基本配置管理
2．熟悉 Linux 静态路由和动态路由管理
3．学习 VPN 的基本配置
4．熟悉 DNS 服务的基本配置管理
5．熟悉 DHCP 服务的基本配置管理

二、实验要求
1．填写实验报告，请将关键命令及其结果进行截图(请确保截图中的文字清晰可见)
2．导出为 pdf 文件，文件名为用户名-姓名-lab10.pdf，在规定截止时间之前上传作业）
3．实验步骤中只要出现 x 的地方必须替换成你自己的用户名序号，如你的用户名为 s23，则要求把 x 替换成 23。
4．实验步骤后面出现的（备份 n）表示完成该步骤后，对所有虚拟机在关机状态（卸载掉可能已挂载的光盘）进行一次备份（请为该次备份添加好说明），以便将来恢复到该状态。

三、实验网络拓扑图（除交换机外，所有主机和路由器均用 CentOS7 虚拟机模拟）

四、实验步骤
（一）静态路由配置
1 .新建一台虚拟机 ax-mini，虚拟机去掉软驱，然后最小化安装 CentOS7，语言选英文，并配置好 yum 光盘源，利用光盘源安装配置好 autofs 实现自动挂载光盘，并设置 autofs

服务开机自动启动，以方便利用光盘安装软件包，卸载光盘，stop 并 disable 防火墙 firewalld，禁用 selinux，关机后设置其内存为 256M，然后对虚拟机进行备份。
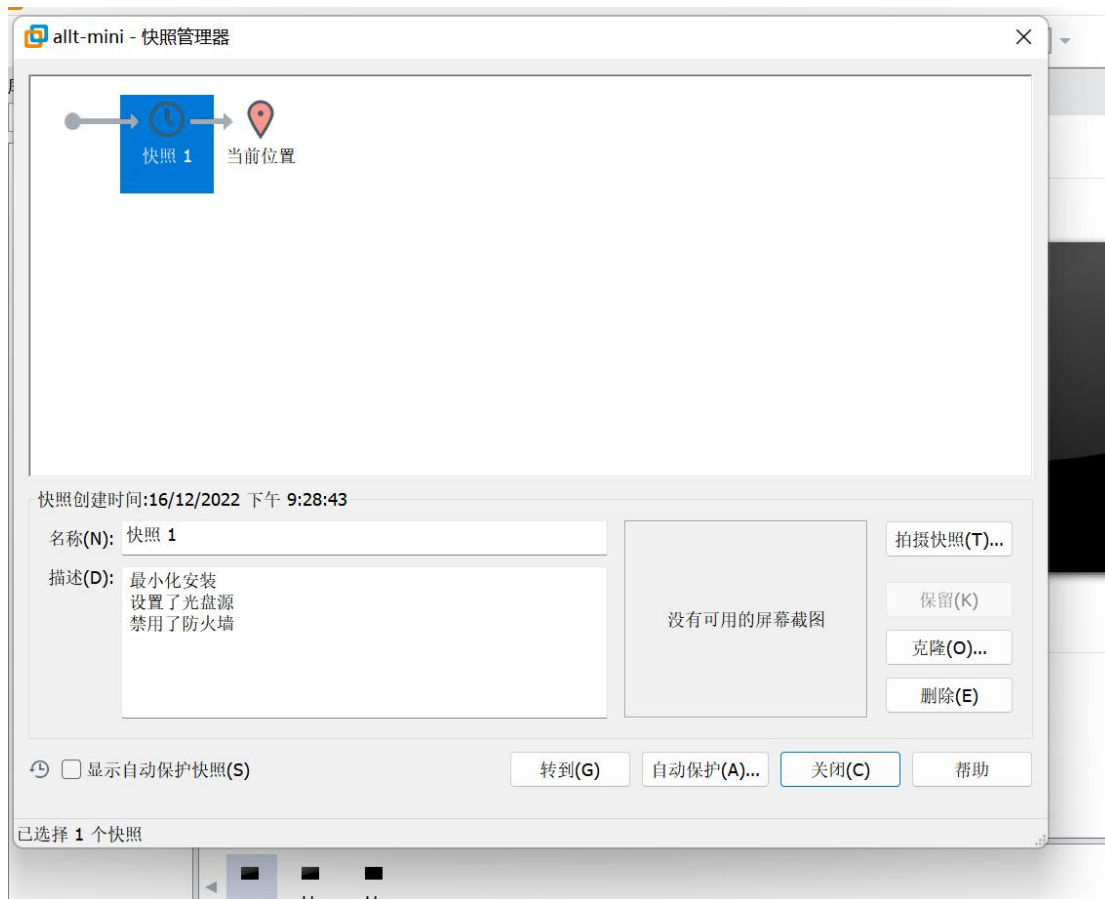
```
# CentOS-Media.repo
#
#  This repo can be used with mounted DVD media, verify the mount point for
#  CentOS-7.  You can use this repo and yum to install items directly off the
#  DVD ISO that we release.
#
# To use this repo, put in your DVD and use it with the other repos too:
#  yum --enablerepo=c7-media [command]
#
# or for ONLY the media repo, do this:
#
#  yum --disablerepo=\* --enablerepo=c7-media [command]

[c7-media]
name=CentOS-$releasever - Media
baseurl=file:///media/cdrom/
gpgcheck=1
enabled=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7

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```
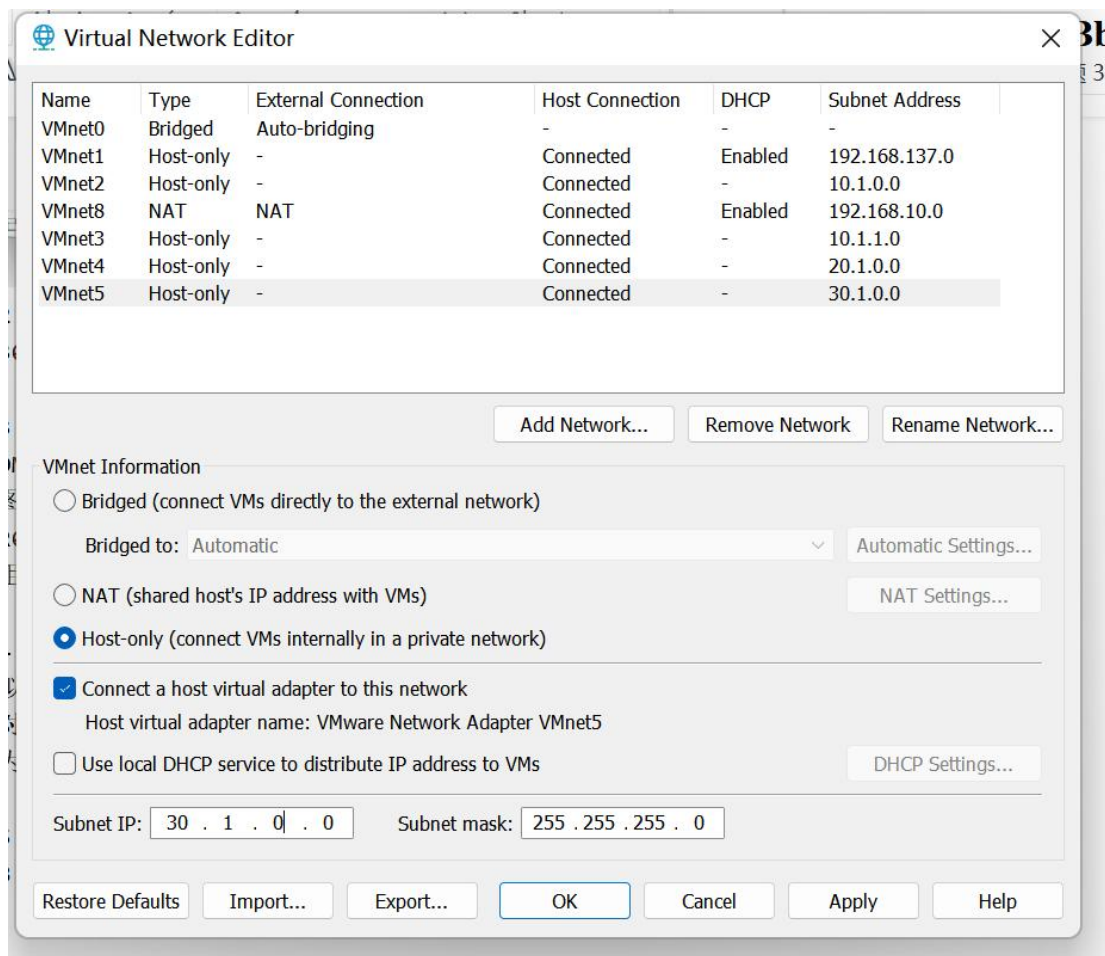
```
~
~
"CentOS-Media.repo" 20L, 566C written
[root@192 yum.repos.d]# mkdir  /media/cdrom
[root@192 yum.repos.d]# mount /dev/cdrom /media/cdrom/
mount: no medium found on /dev/sr0
[root@192 yum.repos.d]# yum install -y autofs
Loaded plugins: fastestmirror
Determining fastest mirrors
file:///media/cdrom/repodata/repomd.xml: [Errno 14] curl#37 - "Couldn't open file /media/cdrom/repodata/repomd.xml"
Trying other mirror.
```

```
mkdir: cannot create directory '/media/cdrom': File exists
[root@192 yum.repos.d]# yum install -y  autofs
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
epel/x86_64/metalink                                                    | 5.5 kB  00:00:00
 * base: mirrors.bfsu.edu.cn
 * epel: mirror2.totbb.net
 * extras: mirrors.bfsu.edu.cn
 * updates: mirror.lzu.edu.cn
```

```
Last login: Fri Dec 16 06:39:33 on tty1
[root@192 ~]# systemctl start autofs
[root@192 ~]# systemctl enable autofs
Created symlink from /etc/systemd/system/multi-user.target.wants/autofs.service to /usr/lib/systemd/system/autofs.service.
[root@192 ~]# systemctl stop firewolld
Failed to stop firewolld.service: Unit firewolld.service not loaded.
[root@192 ~]# systemctl stop firewalld
[root@192 ~]# systemctl disable firewalld
Removed symlink /etc/systemd/system/multi-user.target.wants/firewalld.service.
Removed symlink /etc/systemd/system/dbus-org.fedoraproject.FirewallD1.service.
[root@192 ~]# _
```
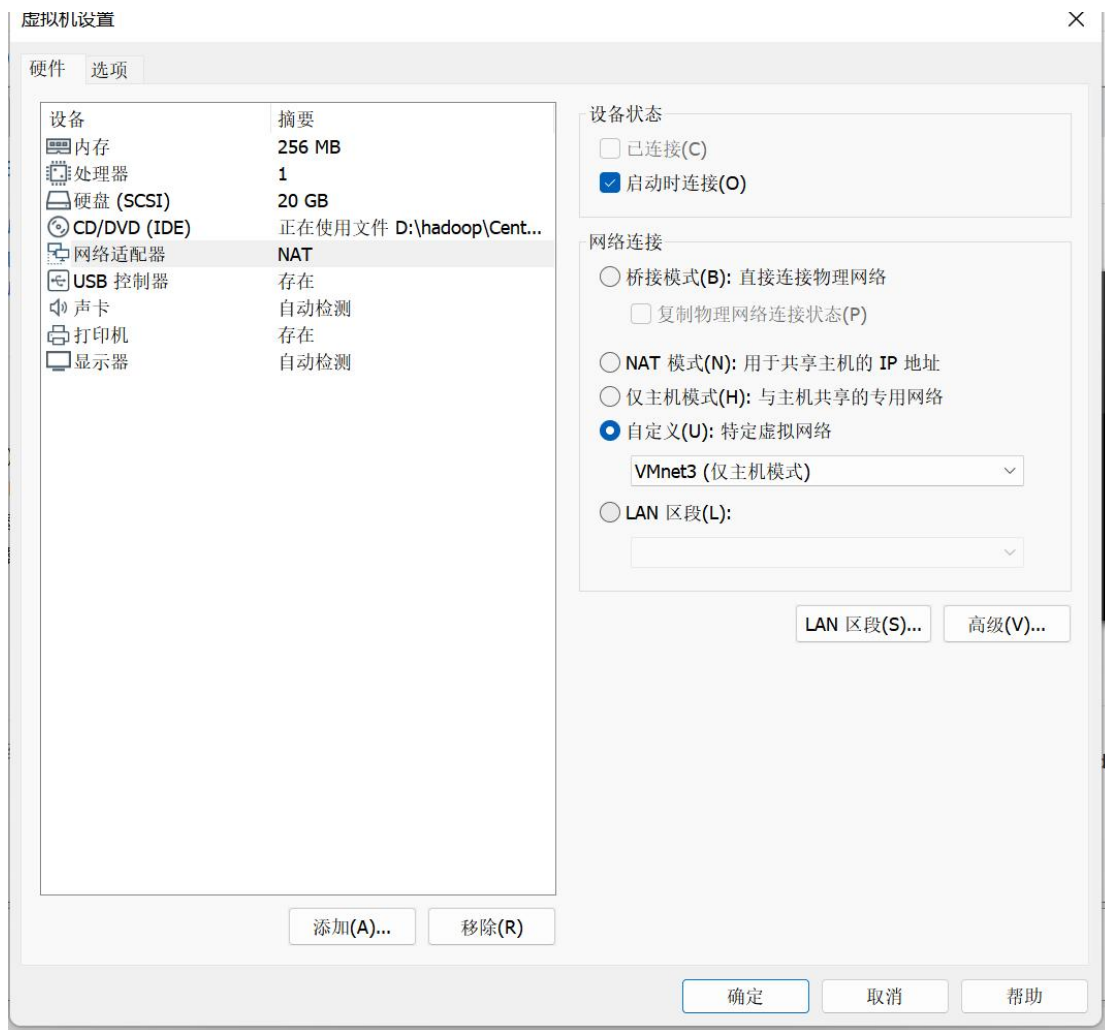
服务开机自动启动，以方便利用光盘安装软件包，卸载光盘，stop 并 disable 防火墙 firewalld，禁用 selinux，关机后设置其内存为 256M，然后对虚拟机进行备份。

2．为 VirtualBox 添加 4 个仅主机网络（10.x.0.0/24、10.x.1.0/24、20.x.0.0/24、30.x.0.0/24），且不要启用这些仅主机网络的 DHCP 服务。
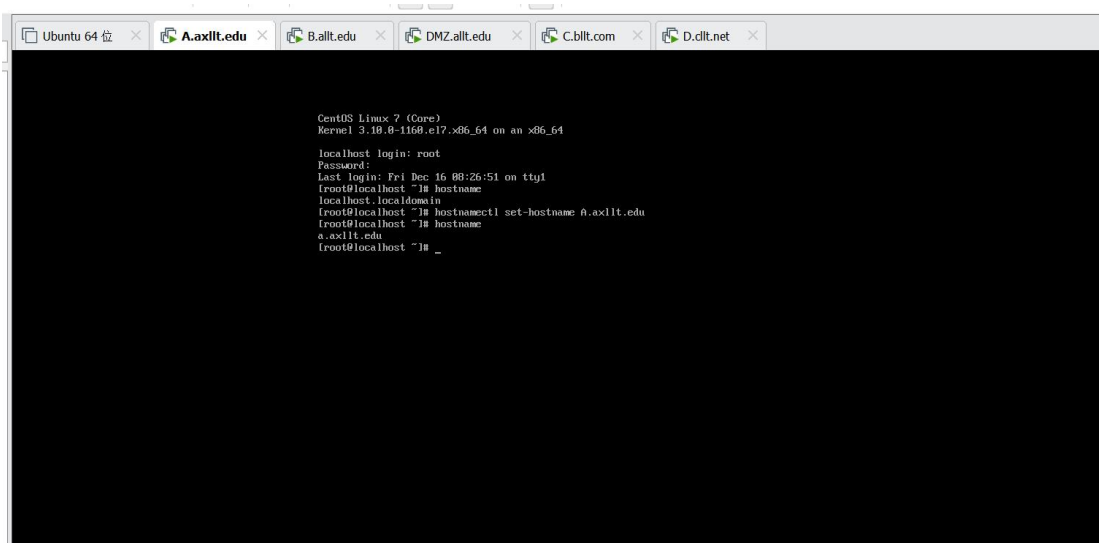
3．从 ax-mini 的<mark>备份</mark>复制出 7 台虚拟机，虚拟机名称分别为主机 A.ax.edu、B.ax.edu、DMZ.ax.edu、C.bx.com、D.cx.net 和路由器 R0.ax.edu、R1.ispx.com。根据网络拓扑图为各台虚拟机<mark>修改网络连接并根据需要添加网卡并设置好网卡所连接的网络</mark>，其中 R0.ax.edu 和 R1.ispx.com 之间的 x.x.x.0/30 为<mark>内部网络</mark>，将这 7 台虚拟机编组成一个组。<mark>（备份 1）</mark>

4. 启动所有虚拟机，根据虚拟机名称永久设置所有虚拟机的主机名，并永久设置好所有虚拟机的接口 IP 地址（**注意：请在配置网卡 IP 地址前先检查网卡的 mac 地址和网卡名称的对应关系，一定不要弄错!!!**），要求所有路由器上停止并禁用 NetworkManager 服务。并为所有主机配置好永久默认网关，为所有路由器永久启用路由转发功能。**（备份 2）**

永久设置主机名

设置 ip 地址


```
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=none
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens33
DEVICE=ens33
ONBOOT=yes
IPV6_PRIVACY=no
IPADDR=10.1.0.100
PREFIX=24
GATEWAY=10.1.0.254_
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-- INSERT --
```

```
[root@a network-scripts]# nmcli con down  ens33
Connection 'ens33' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/Acti
veConnection/9)
[root@a network-scripts]# nmcli con down  enp03
Error: 'enp03' is not an active connection.
Error: no active connection provided.
[root@a network-scripts]# nmcli con down  ens33
Error: 'ens33' is not an active connection.
Error: no active connection provided.
[root@a network-scripts]# nmcli con up  ens33
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnecti
on/10)
[root@a network-scripts]# ip a
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
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 10
00
    link/ether 00:0c:29:eb:b2:12 brd ff:ff:ff:ff:ff:ff
    inet 10.1.0.100/24 brd 10.1.0.255 scope global noprefixroute ens33
       valid_lft forever preferred_lft forever
    inet6 fe80::c205:8dce:a56a:35d5/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@a network-scripts]#
```

所有路由器上停止并禁用 NetworkManager 服务

```
CentOS Linux 7 (Core)
Kernel 3.10.0-1160.el7.x86_64 on an x86_64

192 login: root
Password:
Last login: Fri Dec 16 08:26:51 on tty1
[root@192 ~]# hostnamectl set-hostname R0.allt.adu
[root@192 ~]# bash
[root@r0 ~]# systemctl stop NetworkManager
[root@r0 ~]# systemctl disable NetworkManager
Removed symlink /etc/systemd/system/multi-user.target.wants/NetworkManager.service.
Removed symlink /etc/systemd/system/dbus-org.freedesktop.nm-dispatcher.service.
Removed symlink /etc/systemd/system/network-online.target.wants/NetworkManager-wait-online.service.
[root@r0 ~]#
```

没在 vmware 找到内部网络，所以用的是 net 地址 r1 是 192.168.10.136,r0 是 192.168.10.137
R0 的 route 表

```
        20.1.0.0/24 via 192.168.10.136
        30.1.0.0/24 via 192.168.10.136
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```

配置完 systemctl restart network

```
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~
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~
"route-ens38" 2L, 62C written
[root@r0 network-scripts]# systemctl restart network
[root@r0 network-scripts]# ip r
default via 192.168.10.2 dev ens38 proto dhcp metric 102
10.1.0.0/24 dev ens33 proto kernel scope link src 10.1.0.254 metric 100
10.1.1.0/24 dev ens37 proto kernel scope link src 10.1.1.254 metric 101
20.1.0.0/24 via 192.168.10.136 dev ens38 proto static metric 102
30.1.0.0/24 via 192.168.10.136 dev ens38 proto static metric 102
192.168.10.0/24 dev ens38 proto kernel scope link src 192.168.10.137 metric 102
[root@r0 network-scripts]#
```

R1 的路由表

```
    10.1.0.0/24 via 192.168.10.137
    10.1.1.0/24 via 192.168.10.137
~
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~
```

步骤与 R0 一致
启动路由转发功能
Vi /etc/sysctl.conf

```
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).
net.ipv4.ip_forward=1
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~
"/etc/sysctl.conf" 11L, 471C written
[root@r1 network-scripts]# sysctl -p
net.ipv4.ip_forward = 1
[root@r1 network-scripts]#
```

5．启动所有虚拟机，为 R0 添加默认路由，为 R1 添加静态路由，测试验证 5 台主机 A.a**x**.edu、B.a**x**.edu、DMZ.a**x**.edu、C.b**x**.com、D.c**x**.net 之间能两两 ping 通。（备份 3）

A.allt.edu


```
3 packets transmitted, 0 received, 100% packet loss, time 2002ms

[root@a ~]# ping 10.1.0.200
PING 10.1.0.200 (10.1.0.200) 56(84) bytes of data.
64 bytes from 10.1.0.200: icmp_seq=1 ttl=64 time=0.857 ms
^C
--- 10.1.0.200 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.857/0.857/0.857/0.000 ms
[root@a ~]# ping 10.1.1.100
PING 10.1.1.100 (10.1.1.100) 56(84) bytes of data.
64 bytes from 10.1.1.100: icmp_seq=1 ttl=63 time=0.940 ms
^C
--- 10.1.1.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.940/0.940/0.940/0.000 ms
[root@a ~]# ping 20.1.0.100
PING 20.1.0.100 (20.1.0.100) 56(84) bytes of data.
64 bytes from 20.1.0.100: icmp_seq=1 ttl=62 time=1.66 ms
^C
--- 20.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.666/1.666/1.666/0.000 ms
[root@a ~]# ping 30.1.0.100
PING 30.1.0.100 (30.1.0.100) 56(84) bytes of data.
64 bytes from 30.1.0.100: icmp_seq=1 ttl=62 time=1.16 ms
^C
--- 30.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.166/1.166/1.166/0.000 ms
[root@a ~]#
```
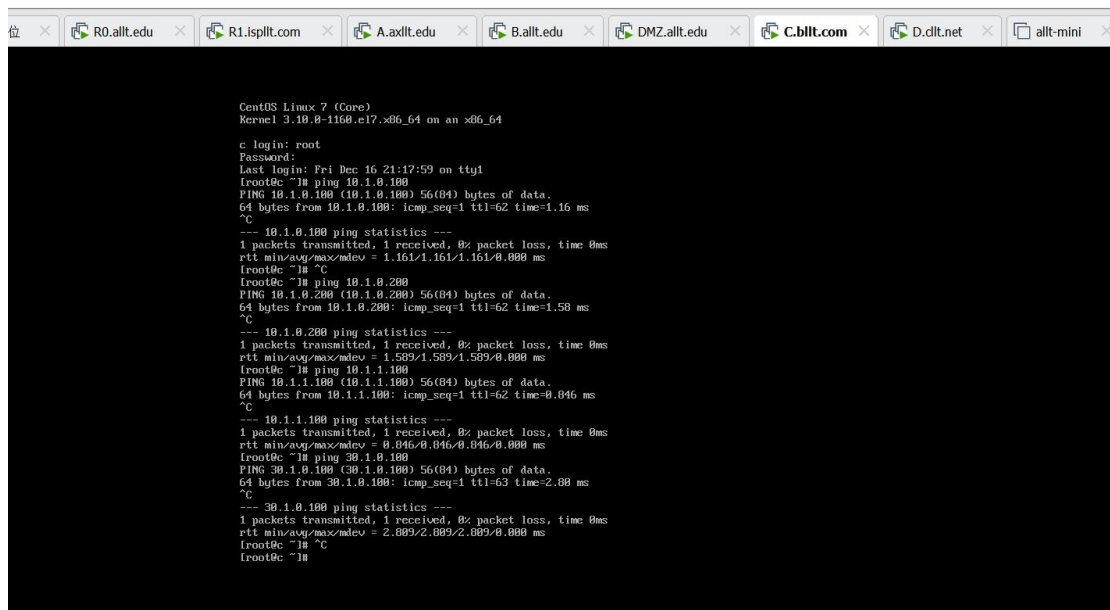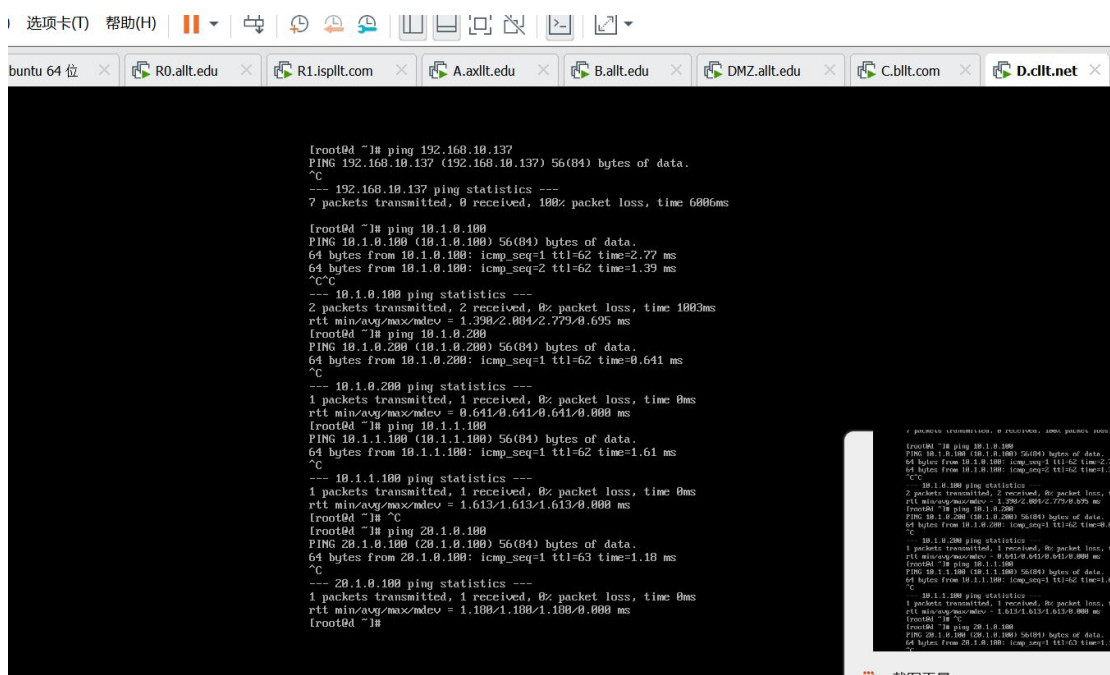
B．allt.edu

```
CentOS Linux 7 (Core)
Kernel 3.10.0-1160.el7.x86_64 on an x86_64

b login: root
Password:
Last login: Fri Dec 16 21:17:03 on tty1
[root@b ~]# ping 10.1.0.100
PING 10.1.0.100 (10.1.0.100) 56(84) bytes of data.
64 bytes from 10.1.0.100: icmp_seq=1 ttl=64 time=0.571 ms
^C64 bytes from 10.1.0.100: icmp_seq=2 ttl=64 time=0.597 ms
64 bytes from 10.1.0.100: icmp_seq=3 ttl=64 time=0.754 ms
^C
--- 10.1.0.100 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 0.571/0.640/0.754/0.085 ms
[root@b ~]# ping 10.1.1.100
PING 10.1.1.100 (10.1.1.100) 56(84) bytes of data.
64 bytes from 10.1.1.100: icmp_seq=1 ttl=63 time=1.62 ms
^C
--- 10.1.1.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.623/1.623/1.623/0.000 ms
[root@b ~]# ping 20.1.0.100
PING 20.1.0.100 (20.1.0.100) 56(84) bytes of data.
64 bytes from 20.1.0.100: icmp_seq=1 ttl=62 time=0.988 ms
^C
--- 20.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.988/0.988/0.988/0.000 ms
[root@b ~]# ping 30.1.0.100
PING 30.1.0.100 (30.1.0.100) 56(84) bytes of data.
64 bytes from 30.1.0.100: icmp_seq=1 ttl=62 time=0.750 ms
^C
--- 30.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.750/0.750/0.750/0.000 ms
[root@b ~]# _
```

DMZ.ax.edu

```
Last login: Fri Dec 16 21:17:30 on tty1
[root@dmz ~]# ping 10.1.0.100
PING 10.1.0.100 (10.1.0.100) 56(84) bytes of data.
64 bytes from 10.1.0.100: icmp_seq=1 ttl=63 time=0.828 ms
^C
--- 10.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.828/0.828/0.828/0.000 ms
[root@dmz ~]# ping 10.1.0.200
PING 10.1.0.200 (10.1.0.200) 56(84) bytes of data.
64 bytes from 10.1.0.200: icmp_seq=1 ttl=63 time=0.518 ms
^C
--- 10.1.0.200 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.518/0.518/0.518/0.000 ms
[root@dmz ~]# ping 10.1.1.100
PING 10.1.1.100 (10.1.1.100) 56(84) bytes of data.
64 bytes from 10.1.1.100: icmp_seq=1 ttl=64 time=0.132 ms
^C
--- 10.1.1.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.132/0.132/0.132/0.000 ms
[root@dmz ~]# ping 30.1.0.100
PING 30.1.0.100 (30.1.0.100) 56(84) bytes of data.
64 bytes from 30.1.0.100: icmp_seq=1 ttl=62 time=1.24 ms
^C
--- 30.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.240/1.240/1.240/0.000 ms
[root@dmz ~]# ping 20.1.0.100
PING 20.1.0.100 (20.1.0.100) 56(84) bytes of data.
64 bytes from 20.1.0.100: icmp_seq=1 ttl=62 time=1.57 ms
^C
--- 20.1.0.100 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.573/1.573/1.573/0.000 ms
[root@dmz ~]#
```

C.bllt.com

D.cllt.net

（二）动态路由配置

6．启动所有虚拟机，删除所有静态路由，在路由器上安装 quagga 服务和 telnet 服务及客户端。在路由器上配置 rip 路由协议，并测试 vtysh 和 telnet 登录路由器，配置好后进行全网连通性测试。（备份4）

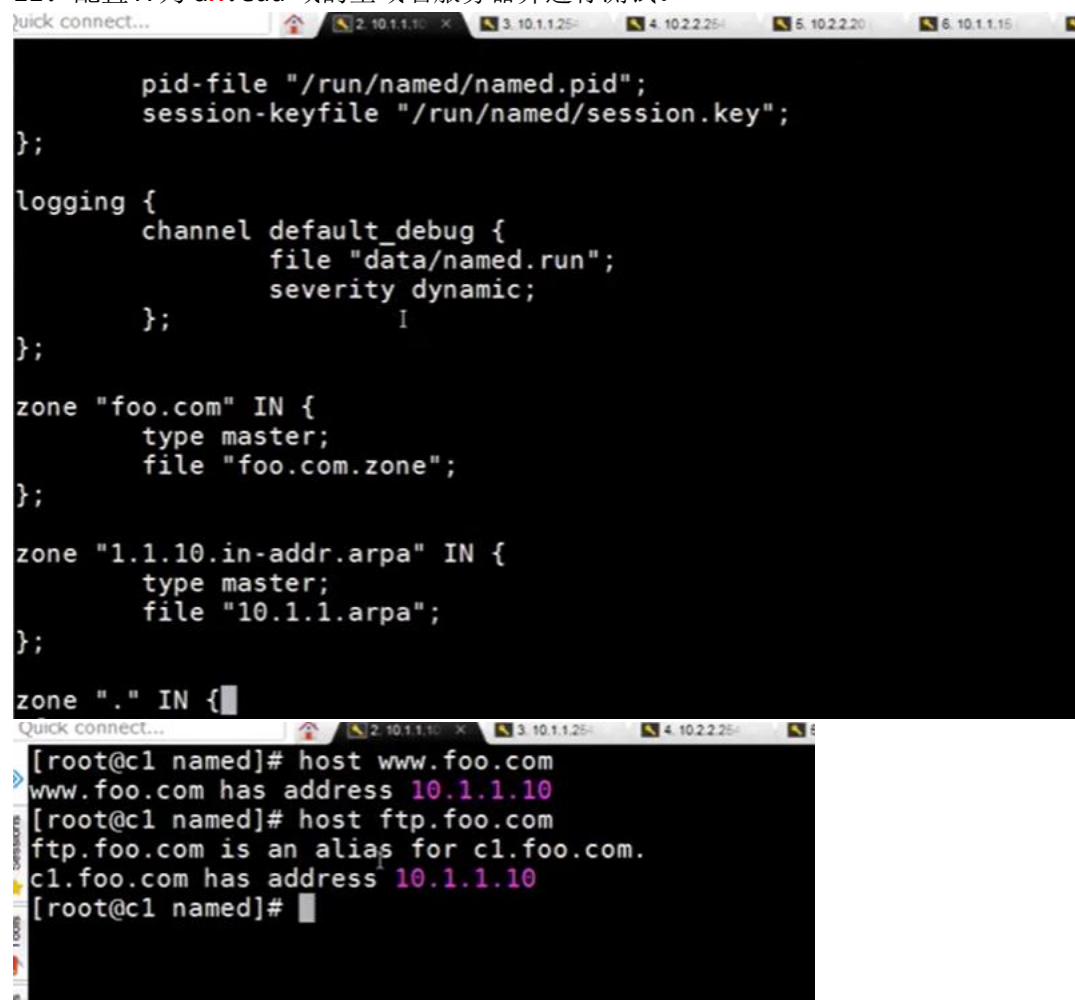7．启动所有虚拟机，删除路由器上的 rip 相关配置，重新配置 ospf 路由并进行全网连通性测试。（备份5）

（三）VPN 配置

8．把所有虚拟机恢复到（备份 3）状态，启动所有虚拟机，配置主机 A.ax.edu 和 C.bx.com 之间的主机到主机的 vpn，测试并抓包验证该 vpn 连接。（备份 6）

9．把所有虚拟机恢复到（备份 3）状态，启动所有虚拟机，然后在路由器 R0.ax.edu 和 R1.ispx.com 上配置 10.x.0.0/24 和 30.x.0.0/24 之间的网络到网络的 vpn，测试并抓包验证该 vpn 连接。（备份 7）

（四）DNS 服务配置
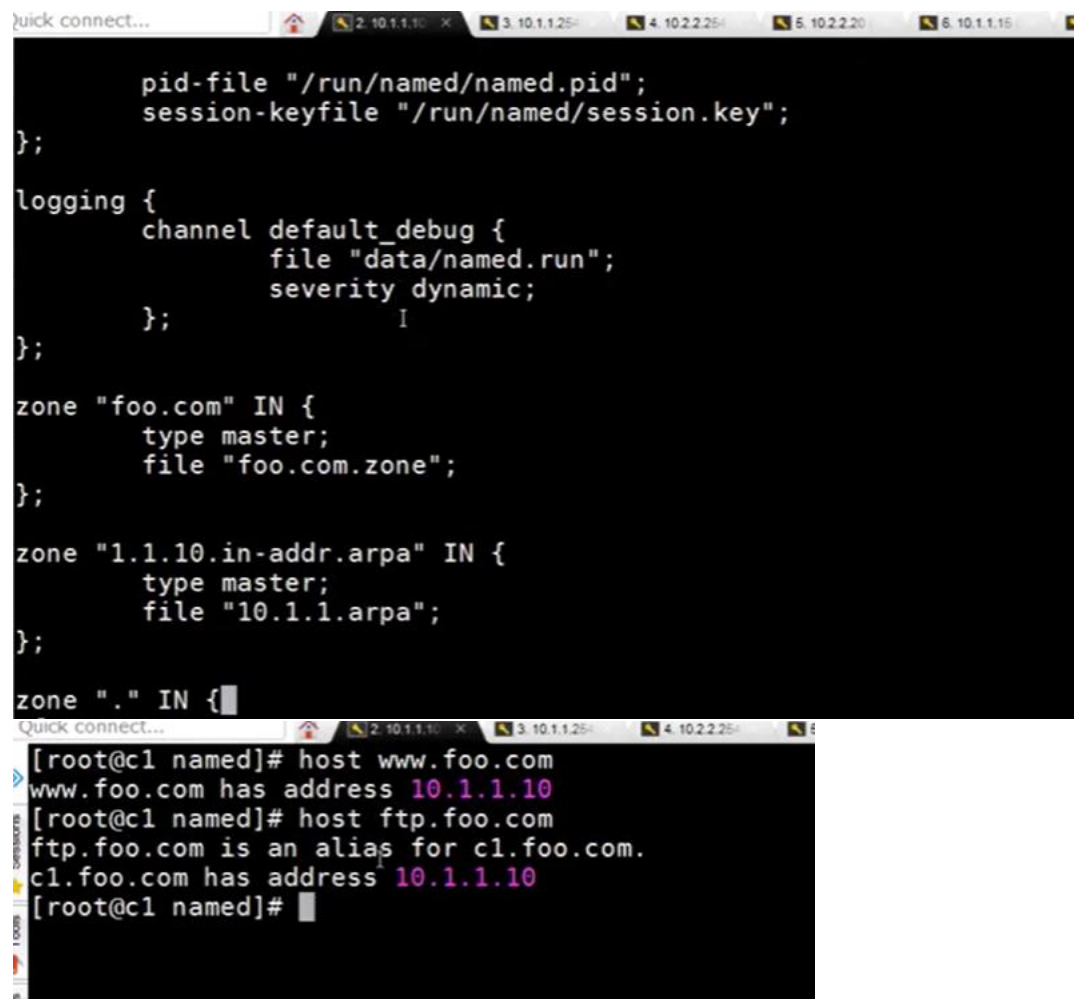
10．把所有虚拟机恢复到（备份 3）状态，启动所有虚拟机，即所有主机能通过静态路由互相 ping 通的状态。

11．配置 A 为 ax.edu 域的主域名服务器并进行测试。

12．配置 B 为 ax.edu 域的从域名服务器并进行测试。

```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```

```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

13．配置 C 为 bx.com 域的主域名服务器并进行测试。


```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```
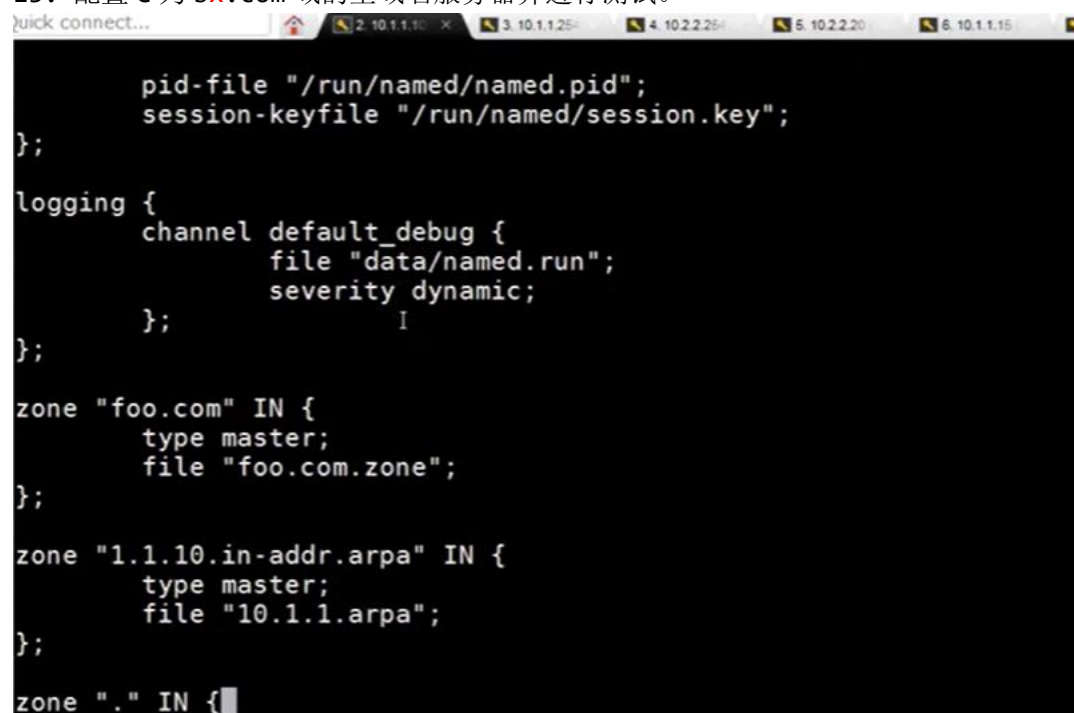
```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

14．配置 D 为 cx.net 域的主域名服务器并进行测试。


```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```



```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

15．配置 R1 为 com 域和 net 域的主域名服务器，并委派 bx.com 域给 C，委派 cx.net 域给 D，然后对委派进行测试。

```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```
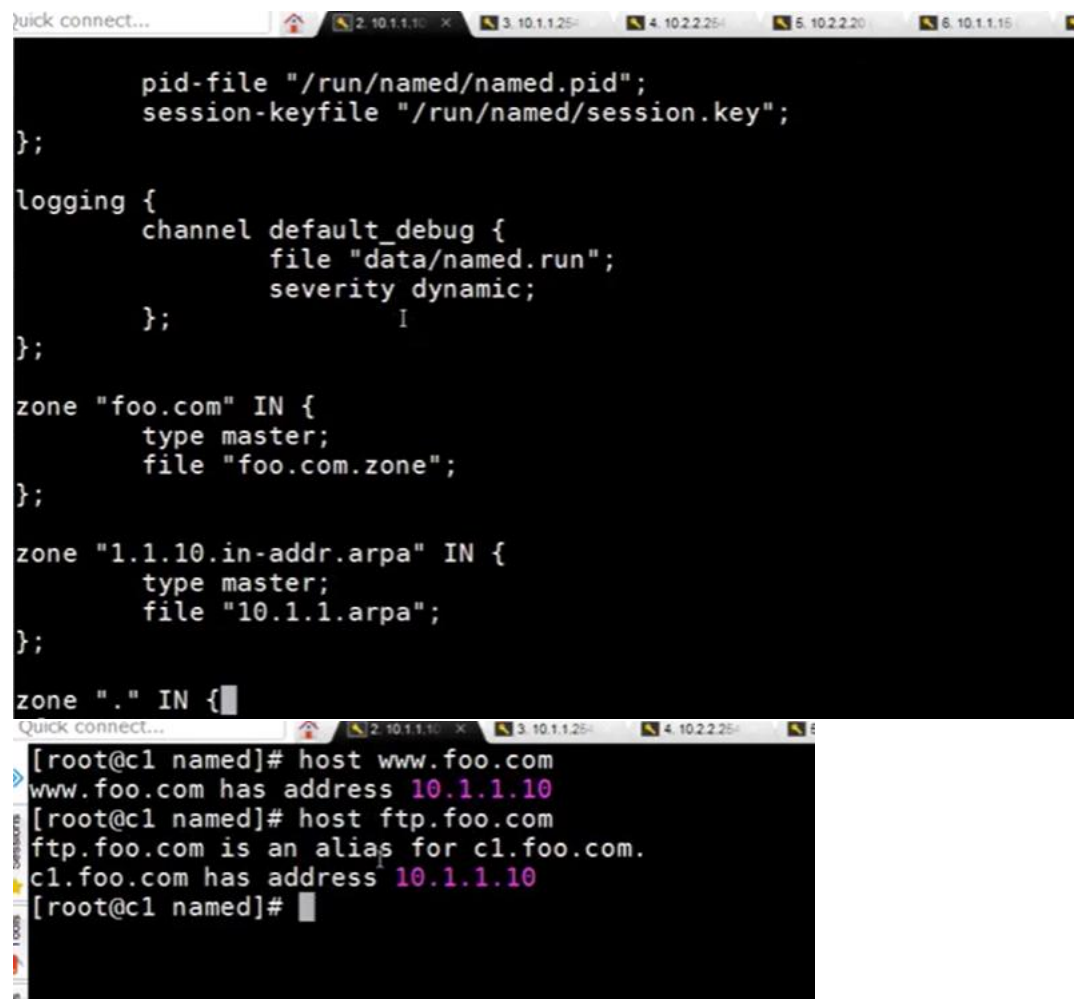
```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

16．配置 DMZ 为本地域名服务器，设置其将所有查询转发给 R1，并进行测试。


```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```
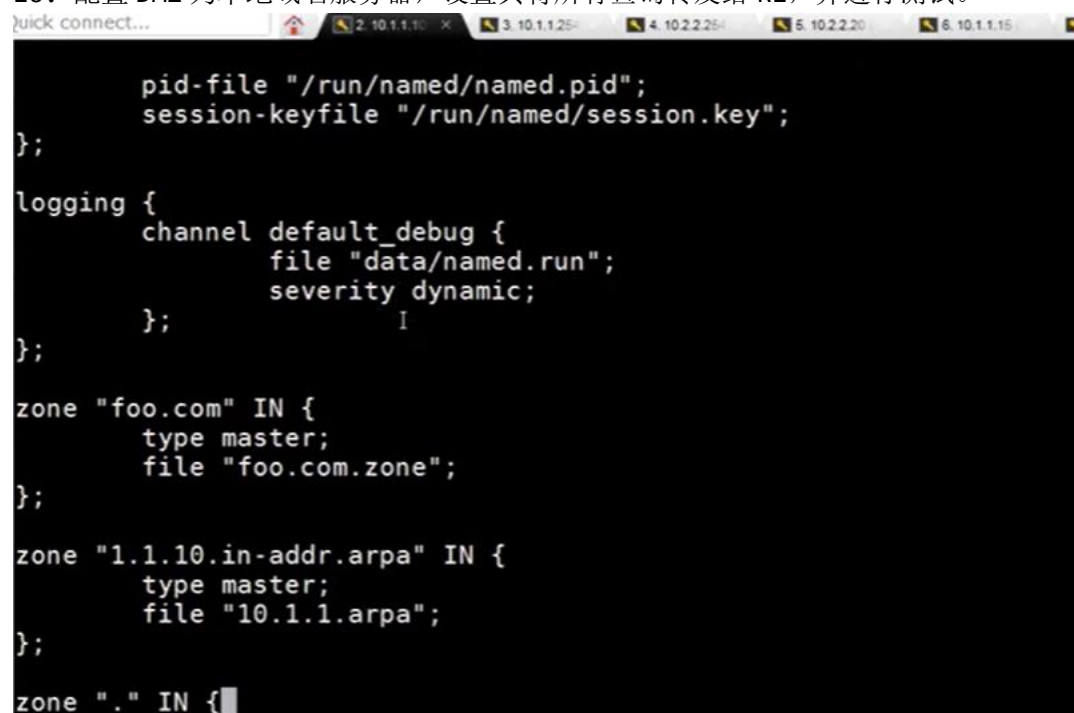
```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

17．配置 R1 将对 ax.edu 域的请求转发给 A，并进行测试。

```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```

```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

18．配置 A、B、C、D 的本地域名服务器为 DMZ，并进行域名解析测试。（备份 8）

```
        pid-file "/run/named/named.pid";
        session-keyfile "/run/named/session.key";
};

logging {
        channel default_debug {
                file "data/named.run";
                severity dynamic;
        };
};

zone "foo.com" IN {
        type master;
        file "foo.com.zone";
};

zone "1.1.10.in-addr.arpa" IN {
        type master;
        file "10.1.1.arpa";
};

zone "." IN {
```

```
[root@c1 named]# host www.foo.com
www.foo.com has address 10.1.1.10
[root@c1 named]# host ftp.foo.com
ftp.foo.com is an alias for c1.foo.com.
c1.foo.com has address 10.1.1.10
[root@c1 named]#
```

（五）DHCP 服务配置

19．在 R0 上配置 DHCP 服务，为 10.x.0.0/24 网段的主机分配 10.x.0.50~59 的 IP 地址、默认网关及 DNS 服务器(R0 相应接口上的 IP 地址)，为 30.x.0.0/24 网段的主机分配 30.x.0.70~79 的 IP 地址、默认网关及 DNS 服务器(R0 相应接口上的 IP 地址)。

```
default-lease-time 600;
max-lease-time 7200;
log-facility local7;

subnet 10.2.2.0 netmask 255.255.255.0 {
  range 10.2.2.150 10.2.2.170;
  option domain-name-servers 1.1.1.1;
  option domain-name "bar.com";
  option routers 10.2.2.254;
  option broadcast-address 10.2.2.255;
}

host c6 {
  hardware ethernet 08:00:07:26:c0:a5;
  fixed-address fantasia.fugue.com;
}
```

20．在 R1 上配置并启动 DHCP 中继代理服务。

```
default-lease-time 600;
max-lease-time 7200;
log-facility local7;

subnet 10.2.2.0 netmask 255.255.255.0 {
  range 10.2.2.150 10.2.2.170;
  option domain-name-servers 1.1.1.1;
  option domain-name "bar.com";
  option routers 10.2.2.254;
  option broadcast-address 10.2.2.255;
}

subnet 10.1.1.0 netmask 255.255.255.0 {
  range 10.1.1.110 10.1.1.130;
  option domain-name-servers 10.1.1.10;
  option domain-name ".com";
  option routers 10.2.2.254;
  option broadcast-address 10.2.2.255;
}

host c6 {
  hardware ethernet 08:00:27:f3:4e:8b;
  fixed-address 10.2.2.180;
```

21．将 B 和 D 配置为通过 DHCP 自动获取 IP 地址。

```
[root@c5 ~]# nmcli conn up enp0s3
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnecti
on/9)
[root@c5 ~]# ip a
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
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
000
    link/ether 08:00:27:61:04:bc brd ff:ff:ff:ff:ff:ff
    inet 10.1.1.110/24 brd 10.1.1.255 scope global noprefixroute dynamic enp0s3
       valid_lft 596sec preferred_lft 596sec
    inet6 fe80::541c:3b40:9fae:bf40/64 scope link tentative noprefixroute dadfailed
       valid_lft forever preferred_lft forever
    inet6 fe80::54c8:9009:f82b:4967/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@c5 ~]# ls _
```

22．测试并查看 B 和 D 自动获取 IP 地址的情况。（备份 9）

```
[root@c5 ~]# nmcli conn up enp0s3
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnecti
on/9)
[root@c5 ~]# ip a
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
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
000
    link/ether 08:00:27:61:04:bc brd ff:ff:ff:ff:ff:ff
    inet 10.1.1.110/24 brd 10.1.1.255 scope global noprefixroute dynamic enp0s3
       valid_lft 596sec preferred_lft 596sec
    inet6 fe80::541c:3b40:9fae:bf40/64 scope link tentative noprefixroute dadfailed
       valid_lft forever preferred_lft forever
    inet6 fe80::54c8:9009:f82b:4967/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@c5 ~]# ls _
```