

Lab Configuring Cumulus Linux
ISIS and DHCP servers
With Ansible

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Introduction:

In this lab, we use ansible to configure a datacentre infrastructure designed with the leaf and spine topology with the addition of configuring a cumulus router as a DHCP server all linked together with IS-IS. The host devices are all NVIDIA Cumulus Linux virtual machines, and all the automation is sent by the Ansible machine.

Lab Objectives:

- Configuration of spine servers with Ansible
- Configuration of leaf servers with Ansible
- Configuration of DHCP server with Ansible
- Configuring IS-IS

Configurations

Daemons file

This daemons file contains the protocol used for the routing. This daemons file is used in all of the ansible playbooks.

Daemons1.j2

```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 4.8 daemons1.j2
bgpd=no
ospfd=no
ospf6d=no
ripd=no
ripngd=no
isisd=yes
fabricd=no
pimd=no
ldpd=no
nhdpd=no
eigrpd=no
babeld=no
sharpd=no
pbrd=no
fabricd=no
vrrpd=no
```

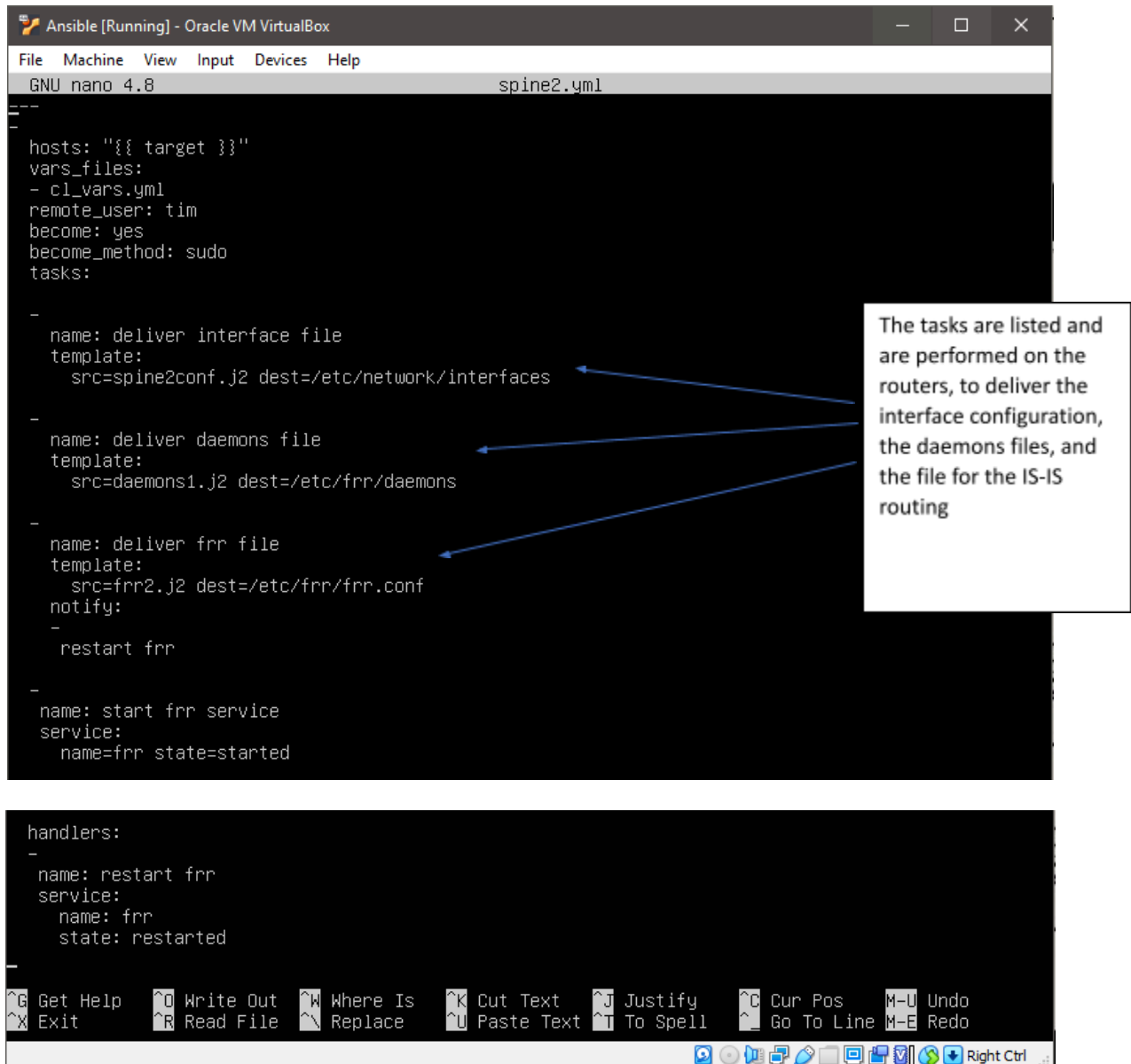
Because we are using IS-IS for the routing we set that to yes and the others to no.

Figure 1.

Spine Servers

The spine routers are configured using the spine2.yml ansible playbook. It contains the daemons file, the frr configuration file and the spine interface configuration. The file starts the frr service and also restarts it with the new configuration.

Spine2.yml

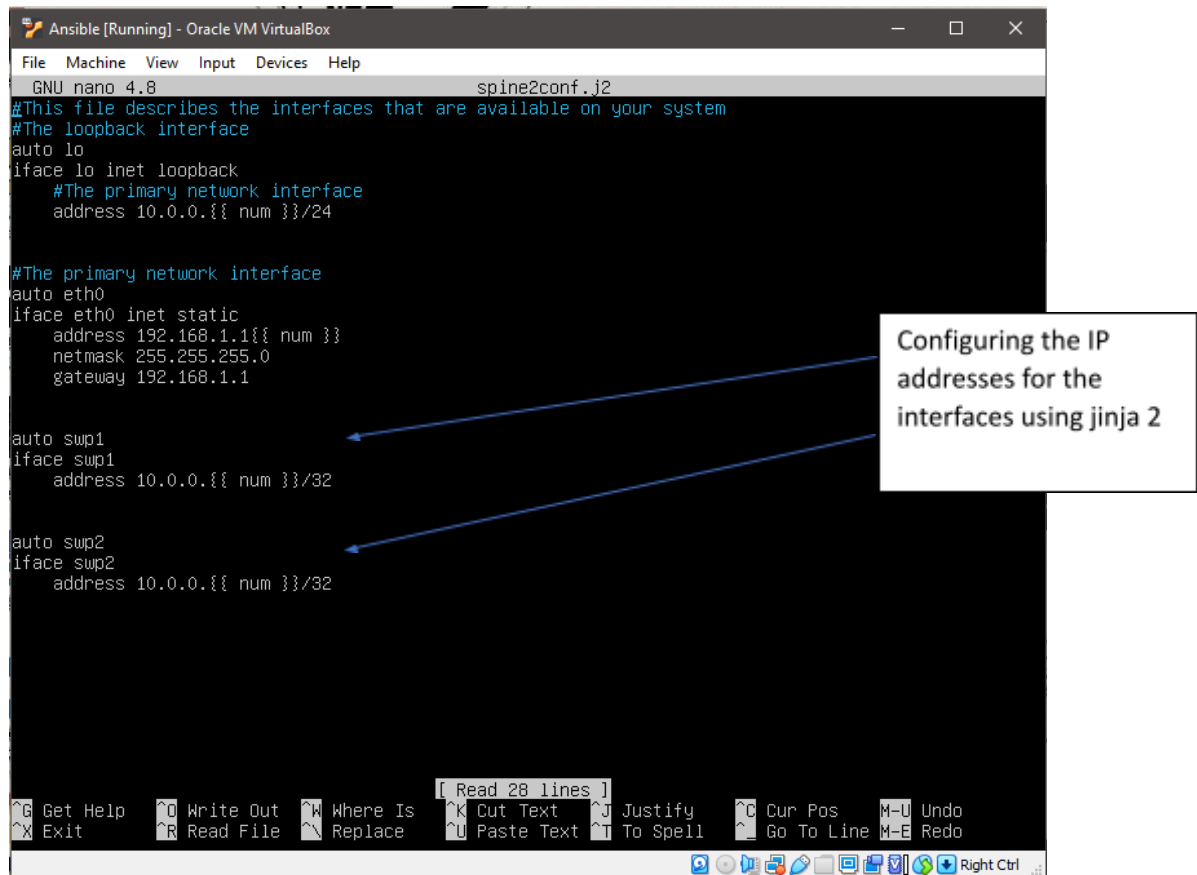


```
---
hosts: '{{ target }}'
vars_files:
- cl_vars.yml
remote_user: tim
become: yes
become_method: sudo
tasks:
-
  name: deliver interface file
  template:
    src=spine2conf.j2 dest=/etc/network/interfaces
-
  name: deliver daemons file
  template:
    src=daemons1.j2 dest=/etc/frr/daemons
-
  name: deliver frr file
  template:
    src=frr2.j2 dest=/etc/frr/frr.conf
  notify:
  -
    restart frr
-
  name: start frr service
  service:
    name=frr state=started

handlers:
-
  name: restart frr
  service:
    name: frr
    state: restarted
```

Figure 2.

Spine2conf.j2



```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 4.8 spine2conf.j2
#This file describes the interfaces that are available on your system
#The loopback interface
auto lo
iface lo inet loopback
#The primary network interface
address 10.0.0.{{ num }}/24

#The primary network interface
auto eth0
iface eth0 inet static
address 192.168.1.1{{ num }}
netmask 255.255.255.0
gateway 192.168.1.1

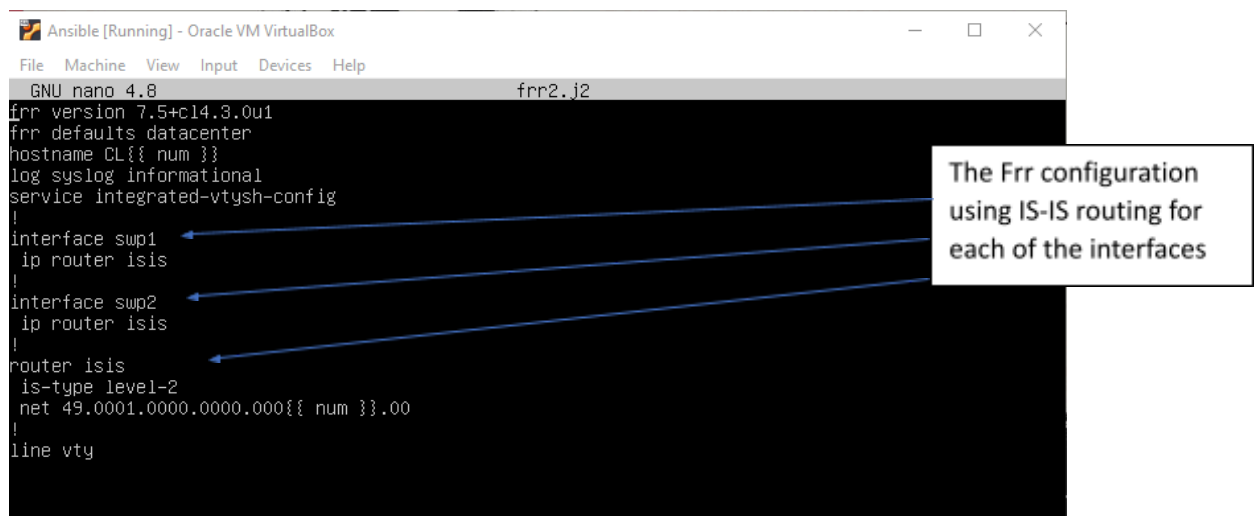
auto swp1
iface swp1
address 10.0.0.{{ num }}/32

auto swp2
iface swp2
address 10.0.0.{{ num }}/32

[ Read 28 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos M-U Undo
^X Exit ^R Read File ^N Replace ^U Paste Text ^T To Spell ^_ Go To Line M-E Redo
Right Ctrl
```

Figure 3.

Frr2.j2



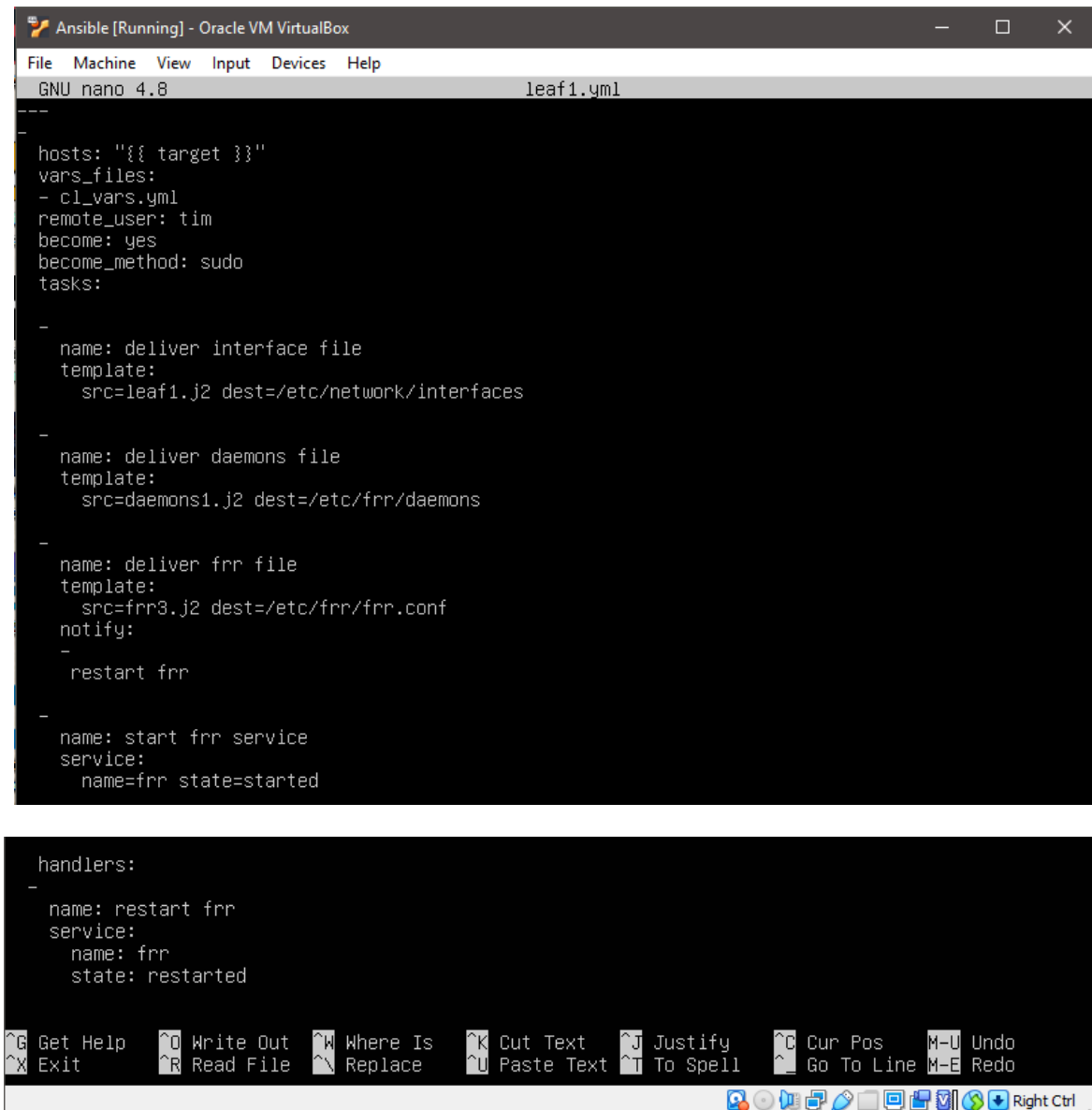
```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 4.8 frr2.j2
frr version 7.5+c14.3.0u1
frr defaults datacenter
hostname CL{{ num }}
log syslog informational
service integrated-vtysh-config
!
interface swp1
ip router isis
!
interface swp2
ip router isis
!
router isis
is-type level-2
net 49.0001.0000.0000.000{{ num }}.00
!
line vty
```

Figure 4.

Leaf servers

These are the files used to configure the leaf routers. It contains the files to configure the leaf interfaces, the daemons file, and last the frr configuration file. The leaf interface file and the frr file contains jinja 2, which is used for putting in variables that are specific to the routers.

Leaf1.yml



```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 4.8 leaf1.yml
---
hosts: "{{ target }}"
vars_files:
- cl_vars.yml
remote_user: tim
become: yes
become_method: sudo
tasks:
-
  name: deliver interface file
  template:
    src=leaf1.j2 dest=/etc/network/interfaces
-
  name: deliver daemons file
  template:
    src=daemons1.j2 dest=/etc/frr/daemons
-
  name: deliver frr file
  template:
    src=frr3.j2 dest=/etc/frr/frr.conf
  notify:
  -
    restart frr
-
  name: start frr service
  service:
    name=frr state=started

handlers:
-
  name: restart frr
  service:
    name: frr
    state: restarted

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos M-U Undo
^X Exit ^R Read File ^_ Replace ^U Paste Text ^T To Spell ^_ Go To Line M-E Redo
Right Ctrl
```

Figure 5.

Leaf1.j2

```
GNU nano 4.8 leaf1.j2
#This file describes the interfaces that are available on your system

source /etc/network/interfaces.d/*.intf

#The loopback interface
auto lo
iface lo inet loopback

#The primary network interface
address 10.0.0.{{ num }}/24

#The primary network interface
auto eth0
iface eth0 inet static
address 192.168.1.1{{ num }}
netmask 255.255.255.0
gateway 192.168.1.1

auto swp1
iface swp1
address 10.0.0.{{ num }}/32

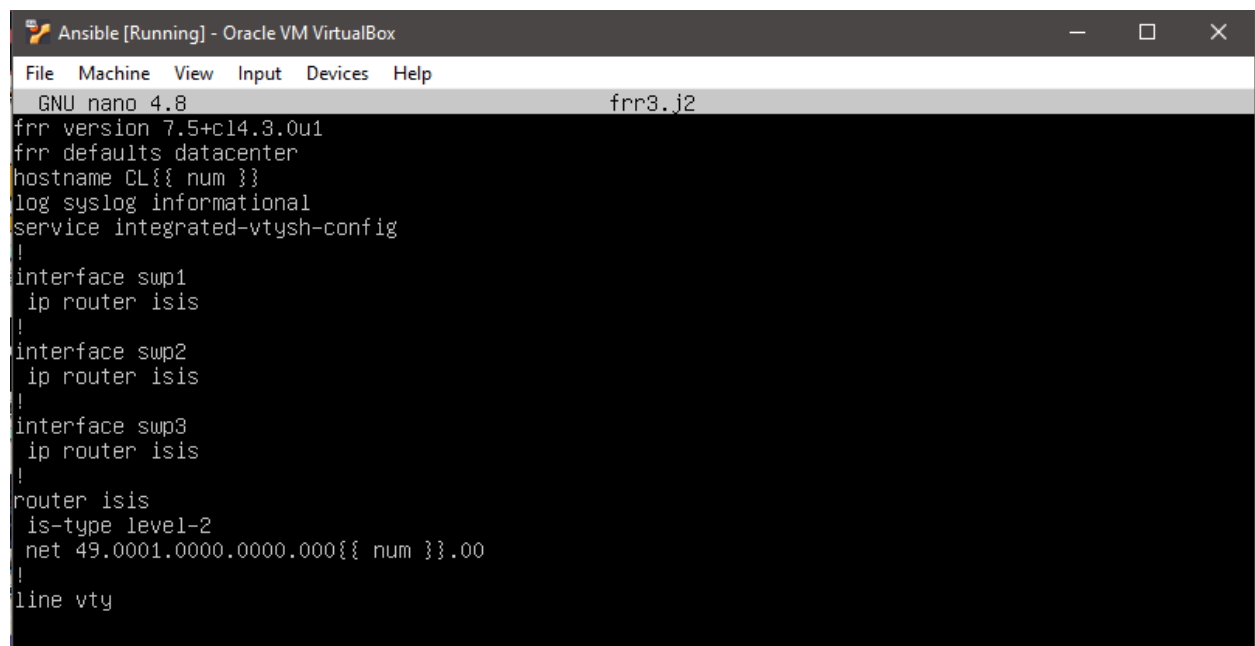
auto swp2
iface swp2
address 10.0.0.{{ num }}/32

auto swp3
iface swp3
address 10.0.0.{{ num }}/32
```

Adding the ip to the interfaces to link them to the spine and DHCP routers.

Figure 6.

Frr3.j2



The image shows a terminal window titled "Ansible [Running] - Oracle VM VirtualBox". The window contains a GNU nano 4.8 editor with a file named frr3.j2. The configuration is for FRR (FRRouting) and includes the following content:

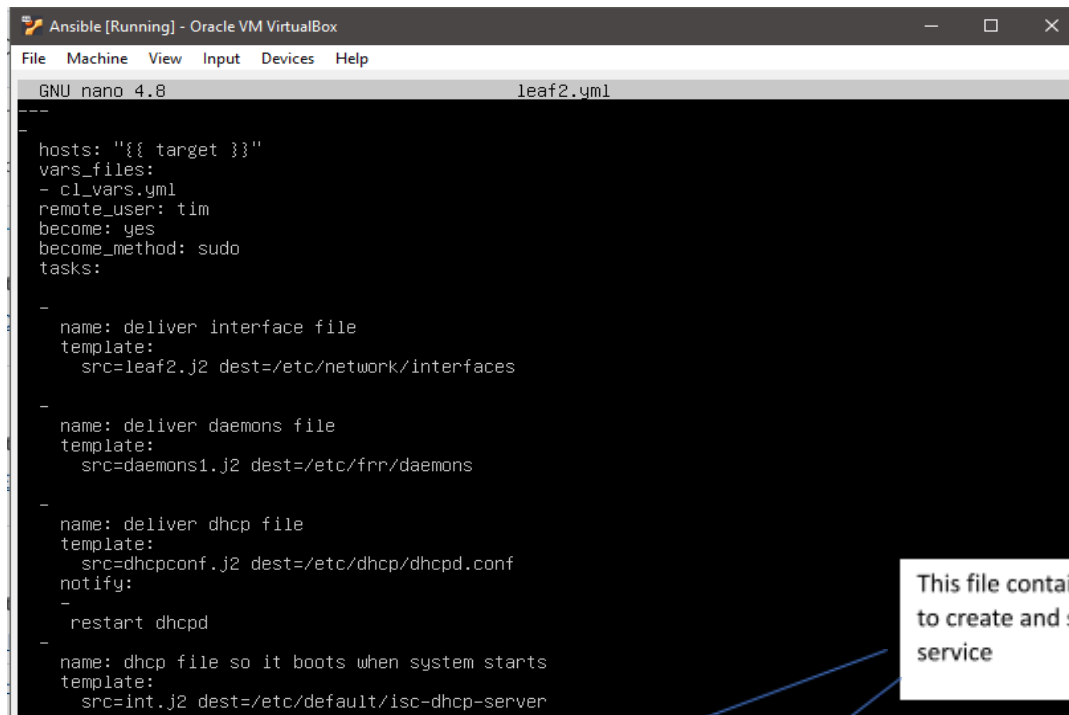
```
frr version 7.5+cl4.3.0u1
frr defaults datacenter
hostname CL{{ num }}
log syslog informational
service integrated-vtysh-config
!
interface swp1
 ip router isis
!
interface swp2
 ip router isis
!
interface swp3
 ip router isis
!
router isis
 is-type level-2
 net 49.0001.0000.0000.000{{ num }}.00
!
line vty
```

Figure 7.

Compute Servers

This ansible playbook contains the file to configure the DHCP server layer. The file contains the interface file, the daemons file and the frf file. In addition, because we also need to configure the routers as DHCP server, included in the file is a DHCP configuration file as well as a file to start the service when the system boots up.

Leaf2.yml



```
GNU nano 4.8 leaf2.yml
--
hosts: "{{ target }}"
vars_files:
- cl_vars.yml
remote_user: tim
become: yes
become_method: sudo
tasks:
-
  name: deliver interface file
  template:
    src=leaf2.j2 dest=/etc/network/interfaces
-
  name: deliver daemons file
  template:
    src=daemons1.j2 dest=/etc/frr/daemons
-
  name: deliver dhcp file
  template:
    src=dhcpconf.j2 dest=/etc/dhcp/dhcpd.conf
  notify:
  - restart dhcpd
-
  name: dhcp file so it boots when system starts
  template:
    src=int.j2 dest=/etc/default/isc-dhcp-server
```

This file contains an extra task to create and start the dhcp service

```
-
  name: deliver dhcp file
  template:
    src=dhcpconf.j2 dest=/etc/dhcp/dhcpd.conf
  notify:
    - restart dhcpd
-
  name: dhcp file so it boots when system starts
  template:
    src=int.j2 dest=/etc/default/isc-dhcp-server
-
  name: start dhcp service
  service:
    name=dhcpd state=started
-
  name: deliver frr file
  template:
    src=frr4.j2 dest=/etc/frr/frr.conf
  notify:
    - restart frr
-
  name: start frr service
  service:
    name=frr state=started

handlers:
-
  name: restart frr
  service:
    name: frr
    state: restarted
```

Get Help Write Out Where Is Cut Text Justify Cur Pos M-U Undo
Exit Read File Replace Paste Text To Spell Go To Line M-E Redo

Right Ctrl

Figure 8.

Leaf2.j2

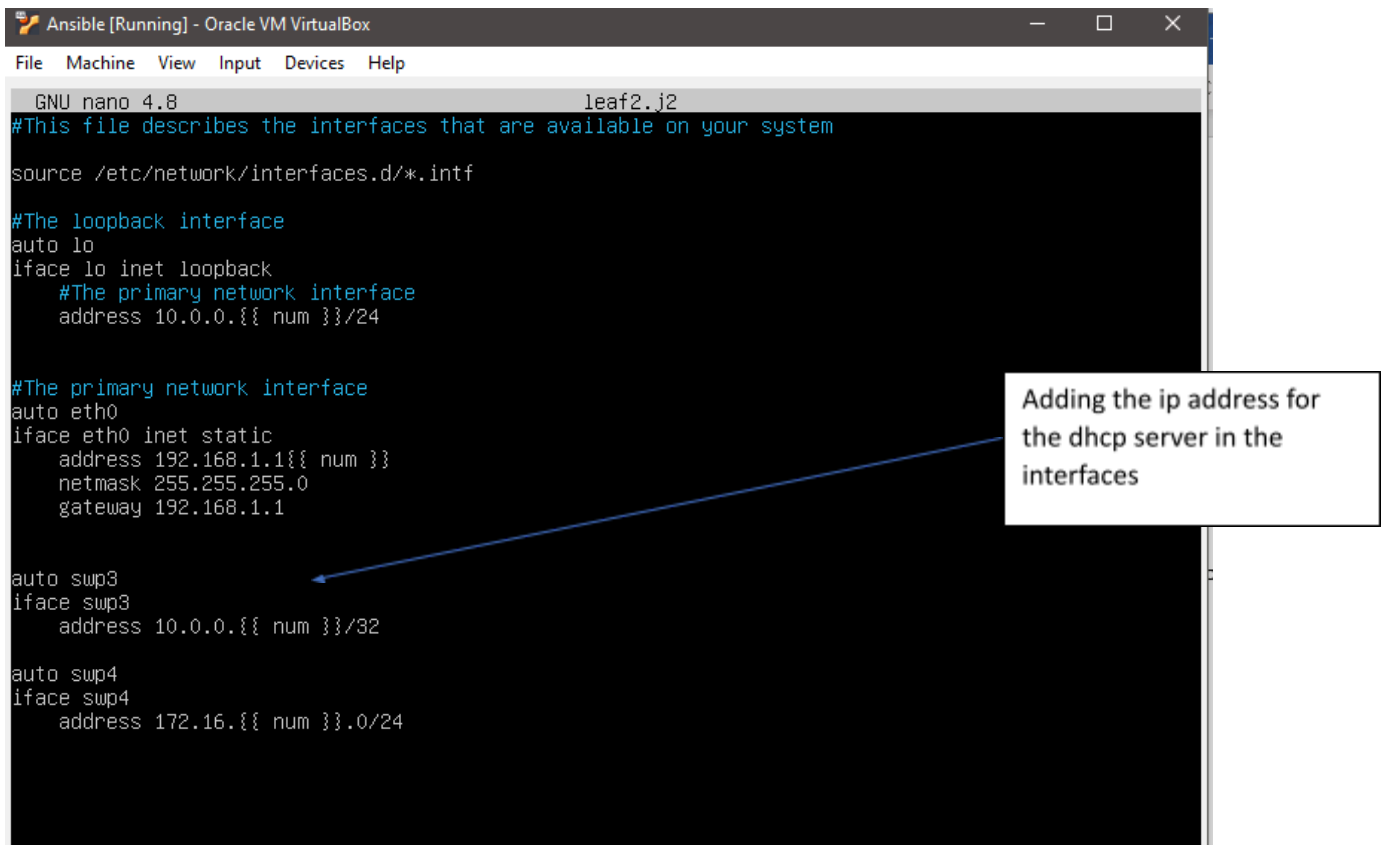


Figure 9.

Frr4.j2

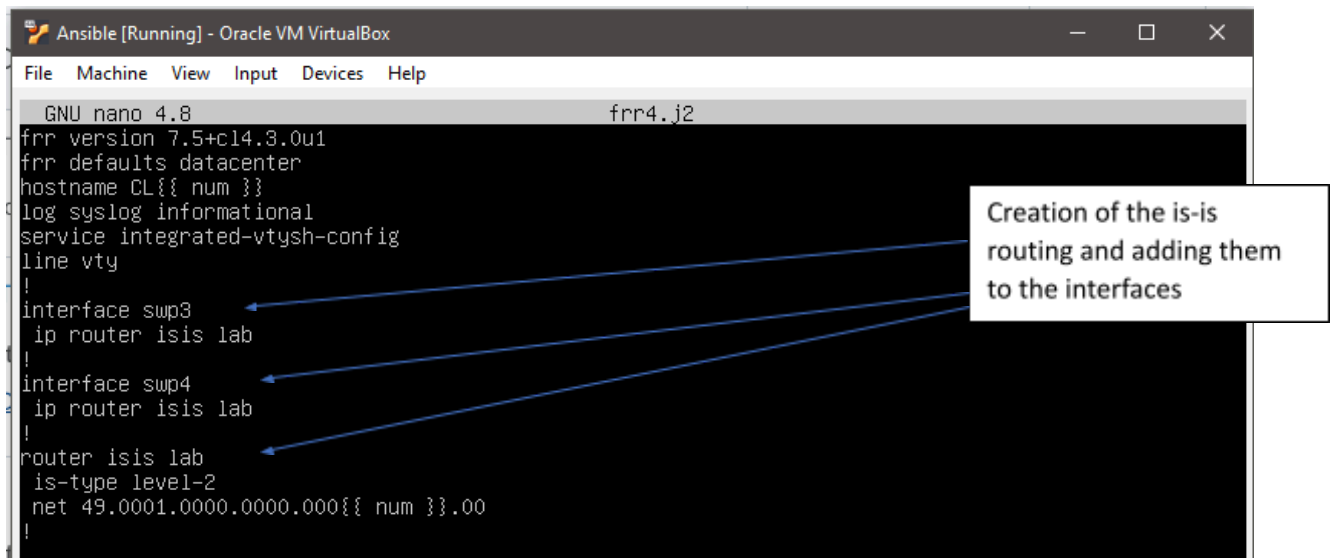
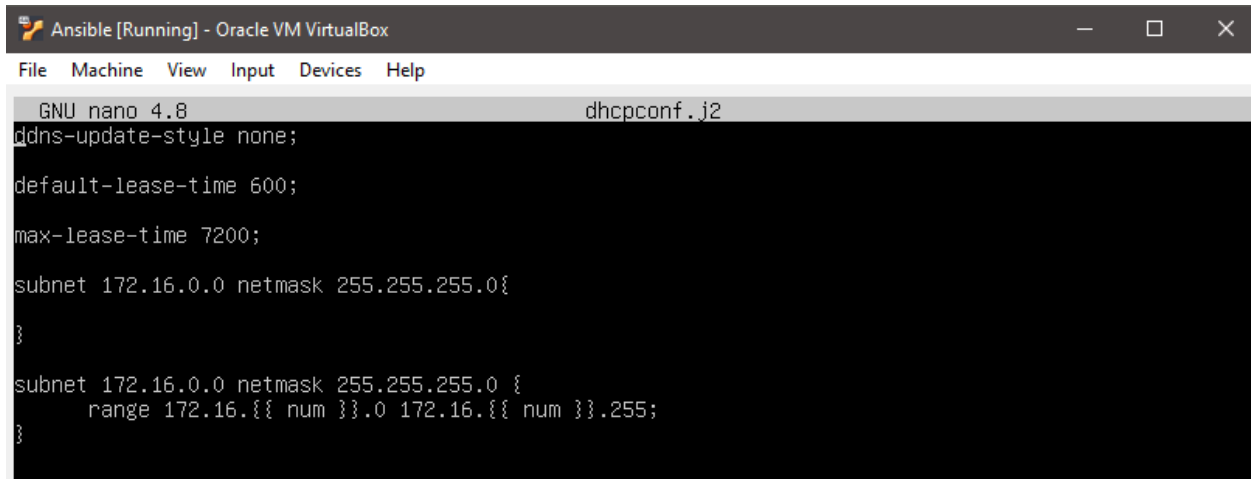


Figure 10.

Dhcpconf.j2

A screenshot of a terminal window titled "Ansible [Running] - Oracle VM VirtualBox". The window shows the content of a file named "dhcpconf.j2" being edited with "GNU nano 4.8". The file contains the following text:

```
ddns-update-style none;

default-lease-time 600;
max-lease-time 7200;

subnet 172.16.0.0 netmask 255.255.255.0{
}

subnet 172.16.0.0 netmask 255.255.255.0 {
    range 172.16.{{ num }}.0 172.16.{{ num }}.255;
}
```

Figure 11.

Int.j2

A screenshot of a terminal window titled "Ansible [Running] - Oracle VM VirtualBox". The window shows the content of a file named "int.j2" being edited with "GNU nano 4.8". The file contains the following text:

```
DHCPD_CONF="-cf /etc/dhcp/dhcpd.conf"

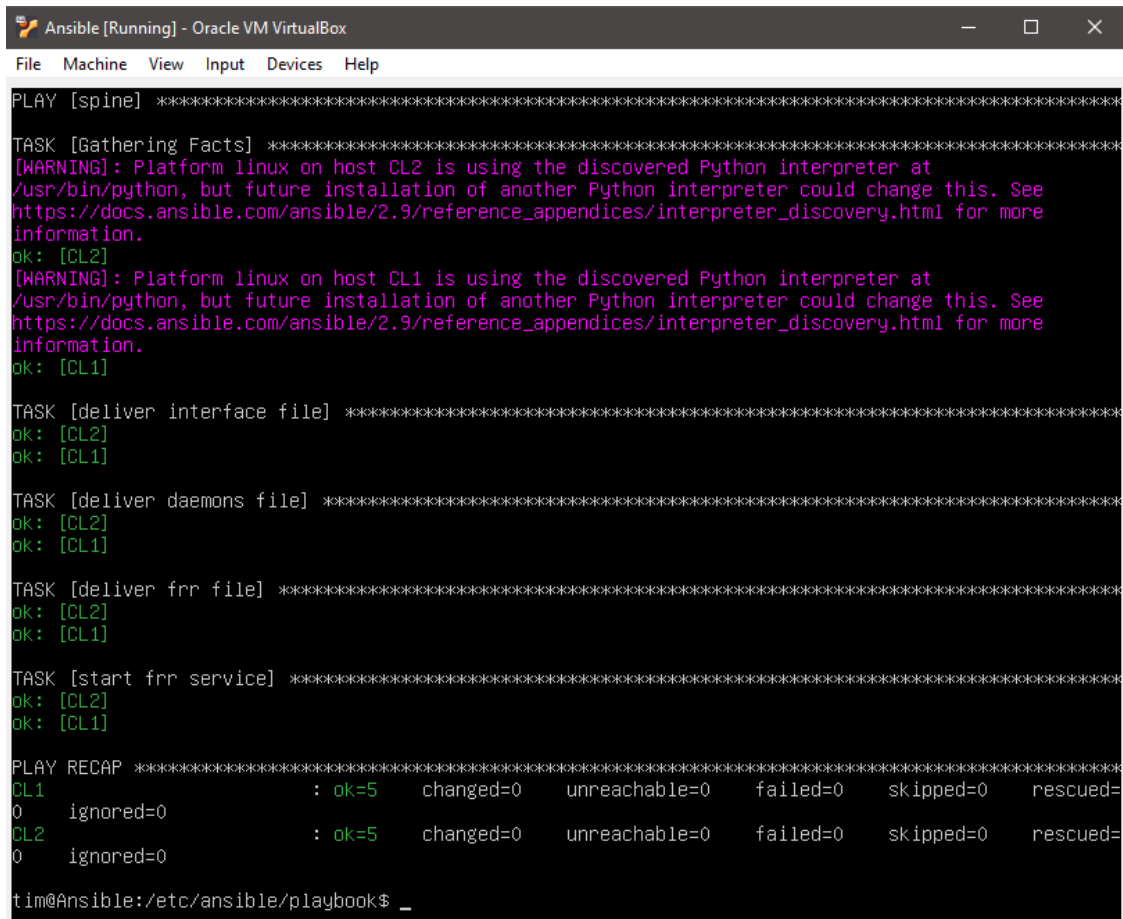
INTERFACES="swp4"
```

Figure 12.

Proof of Functioning

Below are the screenshots of the working playbooks and the IS-IS configuration.

Spine



```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

PLAY [spine] *****

TASK [Gathering Facts] *****
[WARNING]: Platform linux on host CL2 is using the discovered Python interpreter at
/usr/bin/python, but future installation of another Python interpreter could change this. See
https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more
information.
ok: [CL2]
[WARNING]: Platform linux on host CL1 is using the discovered Python interpreter at
/usr/bin/python, but future installation of another Python interpreter could change this. See
https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more
information.
ok: [CL1]

TASK [deliver interface file] *****
ok: [CL2]
ok: [CL1]

TASK [deliver daemons file] *****
ok: [CL2]
ok: [CL1]

TASK [deliver frn file] *****
ok: [CL2]
ok: [CL1]

TASK [start frn service] *****
ok: [CL2]
ok: [CL1]

PLAY RECAP *****
CL1                : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=
0    ignored=0
CL2                : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=
0    ignored=0

tim@Ansible:/etc/ansible/playbook$ _
```

Figure 13.

Leaf

```
Ansible [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

PLAY [leaf] *************************************************************

TASK [Gathering Facts] *********************************************************
[WARNING]: Platform linux on host CL3 is using the discovered Python interpreter at
/usr/bin/python, but future installation of another Python interpreter could change this. See
https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more
information.
ok: [CL3]
[WARNING]: Platform linux on host CL4 is using the discovered Python interpreter at
/usr/bin/python, but future installation of another Python interpreter could change this. See
https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more
information.
ok: [CL4]

TASK [deliver interface file] *********************************************************
ok: [CL3]
ok: [CL4]

TASK [deliver daemons file] *********************************************************
ok: [CL4]
ok: [CL3]

TASK [deliver frr file] *********************************************************
ok: [CL3]
ok: [CL4]

TASK [start frr service] *********************************************************
ok: [CL4]
ok: [CL3]

PLAY RECAP *************************************************************
CL3      : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=
0        ignored=0
CL4      : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=
0        ignored=0

tim@Ansible:/etc/ansible/playbook$
```

Figure 14.

DHCP

```

ok: [CL6]

TASK [deliver interface file] *****
ok: [CL5]
ok: [CL6]

TASK [deliver daemons file] *****
ok: [CL5]
ok: [CL6]

TASK [deliver dhcp file] *****
ok: [CL5]
ok: [CL6]

TASK [dhcp file so it boots when system starts] *****
ok: [CL6]
ok: [CL5]

TASK [start dhcp service] *****
changed: [CL5]
changed: [CL6]

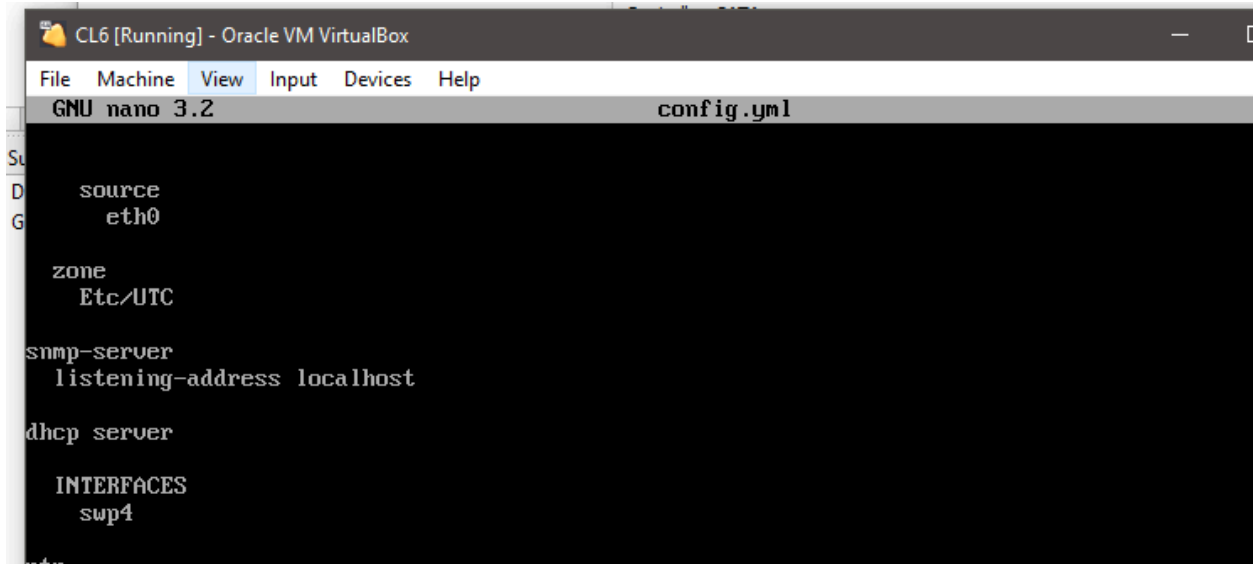
TASK [deliver frn file] *****
ok: [CL5]
ok: [CL6]

TASK [start frn service] *****
ok: [CL5]
ok: [CL6]

PLAY RECAP *****
CL5                : ok=8    changed=1    unreachable=0    failed=0    skipped=0    rescued=
0 ignored=0
CL6                : ok=8    changed=1    unreachable=0    failed=0    skipped=0    rescued=
0 ignored=0
tim@Ansible:/etc/ansible/playbook$ _

```

Figure 15.



```
CL6 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 3.2 config.yml

source
  eth0

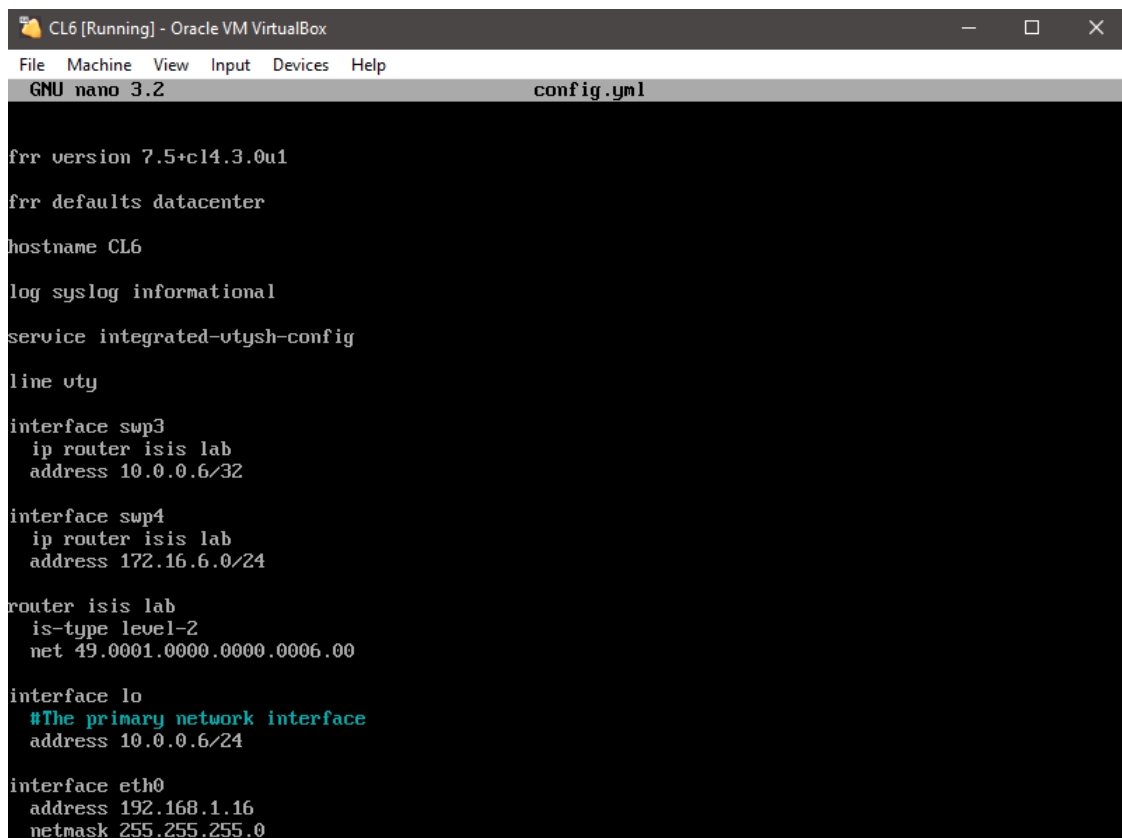
zone
  Etc/UTC

snmp-server
  listening-address localhost

dhcp server

INTERFACES
  swp4
```

Figure 16.



```
CL6 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
GNU nano 3.2 config.yml

frr version 7.5+cl4.3.0u1
frr defaults datacenter
hostname CL6
log syslog informational
service integrated-uttysh-config
line uty
interface swp3
  ip router isis lab
  address 10.0.0.6/32
interface swp4
  ip router isis lab
  address 172.16.6.0/24
router isis lab
  is-type level-2
  net 49.0001.0000.0000.0006.00
interface lo
  #The primary network interface
  address 10.0.0.6/24
interface eth0
  address 192.168.1.16
  netmask 255.255.255.0
```

Figure 17.