INSTITUTO POLITÉCNICO NACIONAL

ESCUELA SUPERIOR DE CÓMPUTO

Administración de servicios en red

Proyecto Final

Alumnos:

Meza Vargas Brandon David
Romero Angeles Abraham

Equipo:
ADR

Grupo:
4CM13

Profesor:

Gaspar Medina Fabian

INTRODUCCIÓN

En el presente proyecto se realizará una topología donde se aplicarán todos los temas vistos durante el semestre: Enrutamiento, SSH y telnet, 2 ACL, DHCP, NAT, DNS, VLAN y SNMP V3 y a través de un programa hecho en Python que correrá en una máquina virtual visualizaremos todas las configuraciones mencionadas anteriormente.

La topología propuesta es la siguiente:
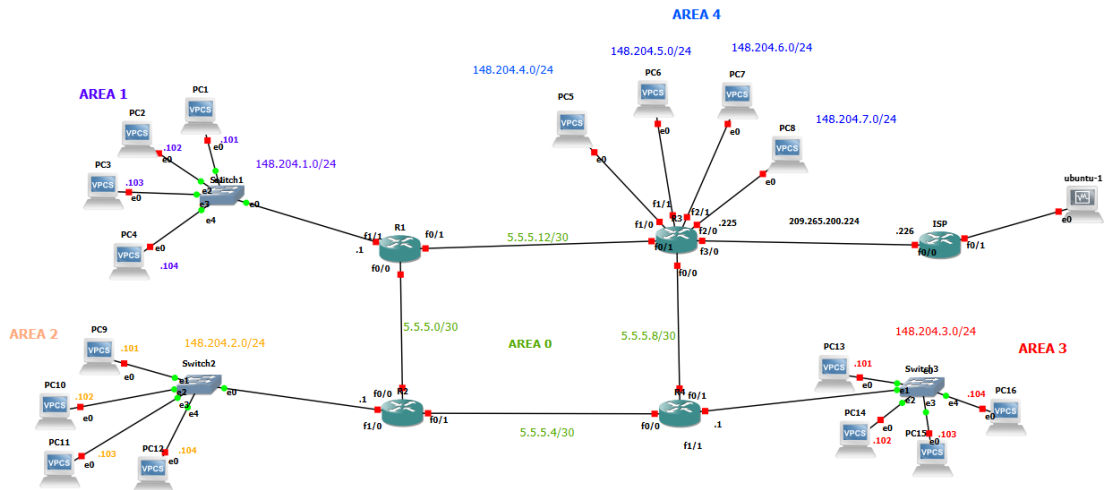
DESARROLLO

Configuración de interfaces

A continuación, se presenta la configuración de las interfaces:

Router 1

```
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface f1/1
R1(config-if)#ip address 148.204.1.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Jun  7 18:15:21.083: %LINK-3-UPDOWN: Interface FastEthernet1/1, changed state to up
R1(config-if)#
*Jun  7 18:15:21.083: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/1 Physical Port Administrative
*Jun  7 18:15:22.083: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1, ch
R1(config-if)#exit
R1(config)#interface f0/0
R1(config-if)#ip address 5.5.5.1 255.255.255.252
R1(config-if)#no shu
R1(config-if)#
*Jun  7 18:16:22.371: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Jun  7 18:16:22.371: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative
*Jun  7 18:16:23.371: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, ch
R1(config-if)#exit
R1(config)#interface f0/1
R1(config-if)#ip address 5.5.5.13 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Jun  7 18:16:46.611: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
R1(config-if)#e
*Jun  7 18:16:46.611: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/1 Physical Port Administrative
*Jun  7 18:16:47.611: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, ch
R1(config-if)#exit
R1(config)#exit
R1#wr
```

Router 2

```
R2(config)#interface f1/0
R2(config-if)#ip address 148.204.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Jun  7 18:16:56.343: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to
R2(config-if)#
*Jun  7 18:16:56.343: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Adminis
*Jun  7 18:16:57.343: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
R2(config-if)#exit
R2(config)#interface f0/0
R2(config-if)#ip address 5.5.5.2 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Jun  7 18:17:14.635: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to
R2(config-if)#
*Jun  7 18:17:14.635: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Adminis
*Jun  7 18:17:15.635: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
R2(config-if)#exit
R2(config)#interface f0/1
R2(config-if)#ip address 5.5.5.4 255.255.255.252
Bad mask /30 for address 5.5.5.4
R2(config-if)#ip address 5.5.5.5 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Jun  7 18:17:54.983: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to
R2(config-if)#
*Jun  7 18:17:54.983: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/1 Physical Port Adminis
*Jun  7 18:17:55.983: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
R2(config-if)#exit
R2(config)#exit
R2#wr
```

Router 3

```
R3(config)#interface f0/1
R3(config-if)#ip address 5.5.5.14 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Jun  7 18:19:50.267: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed stat
R3(config-if)#ex
*Jun  7 18:19:50.267: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/1 Physical Port Ad
*Jun  7 18:19:51.267: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
R3(config-if)#exit
R3(config)#interface f0/0
R3(config-if)#ip address 5.5.5.9 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Jun  7 18:20:06.619: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed stat
R3(config-if)#
*Jun  7 18:20:06.619: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Ad
*Jun  7 18:20:07.619: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
R3(config-if)#exit
R3(config)#interface f3/0
R3(config-if)#ip address 209.165.200.225 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Jun  7 18:21:52.751: %LINK-3-UPDOWN: Interface FastEthernet3/0, changed stat
e to up
R3(config-if)#
*Jun  7 18:21:52.751: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa3/0 Physical Port Ad
ministrative State Down
*Jun  7 18:21:53.751: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
ernet3/0, changed state to up
R3(config-if)#exit
R3(config)#interface f1/0
R3(config-if)#ip address 148.204.4.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Jun  7 18:23:45.243: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed stat
e to up
```

```
e to up
R3(config-if)#exit
*Jun  7 18:23:45.243: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Ad
ministrative State Down
*Jun  7 18:23:46.243: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
ernet1/0, changed state to up
R3(config-if)#exit
R3(config)#interface f1/1
R3(config-if)#ip address 148.204.5.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Jun  7 18:24:01.183: %LINK-3-UPDOWN: Interface FastEthernet1/1, changed stat
e to up
R3(config-if)#
*Jun  7 18:24:01.183: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/1 Physical Port Ad
ministrative State Down
*Jun  7 18:24:02.183: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
ernet1/1, changed state to up
R3(config-if)#
```

Router 4

```
R4(config)#interface f0/0
R4(config-if)#ip adress 5.5.5.6 255.255.255.252
               ^
% Invalid input detected at '^' marker.

R4(config-if)#ip address 5.5.5.6 255.255.255.252
R4(config-if)#no sh
R4(config-if)#exit
R4(config)#
*Jun  7 18:19:50.355: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed stat
e to up
R4(config)#
*Jun  7 18:19:50.355: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Ad
ministrative State Down
*Jun  7 18:19:51.355: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
ernet0/0, changed state to up
R4(config)#interface f0/1
R4(config-if)#ip address 5.5.5.10 255.255.255.252
R4(config-if)#no sh
R4(config-if)#e
*Jun  7 18:20:05.135: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed stat
e to up
R4(config-if)#exit
R4(config)#
*Jun  7 18:20:05.135: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/1 Physical Port Ad
ministrative State Down
*Jun  7 18:20:06.135: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
ernet0/1, changed state to up
R4(config)#interface f1/1
R4(config-if)#ip address 148.204.3.1 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Jun  7 18:20:26.143: %LINK-3-UPDOWN: Interface FastEthernet1/1, changed stat
```

Router ISP

```
ISP(config)#interface f0/0
ISP(config-if)#ip address 209.165.200.226 255.255.255.252
ISP(config-if)#no sh
ISP(config-if)#
*Jun  7 18:22:50.071: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed st
e to up
ISP(config-if)#ex
*Jun  7 18:22:50.071: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port
ministrative State Down
*Jun  7 18:22:51.071: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastE
ernet0/0, changed state to up
ISP(config-if)#exit
ISP(config)#interface f0/1
ISP(config-if)#ip address 192.168.0.1 255.255.255.0
ISP(config-if)#no sh
ISP(config-if)#
*Jun  7 18:23:07.875: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed st
e to up
ISP(config-if)#
*Jun  7 18:23:07.875: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/1 Physical Port
ministrative State Down
*Jun  7 18:23:08.875: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastE
ernet0/1, changed state to up
ISP(config-if)#exit
ISP(config)#exit
```

De la misma manera que se configuro cada router agregaremos las ips correspondientes
a cada computadora conectada a cada router, excepto en las máquinas conectadas al
router 4, en este haremos uso de DHCP.

Enrutamiento

Ahora procedemos con el enrutamiento, usaremos OSPF y lo dividiremos en áreas como se presentó en la topología propuesta en la introducción.

Enrutamiento en Router 1

```
R1(config)#router ospf 1
R1(config-router)#network 148.204.1.0 0.0.0.255 area 1
R1(config-router)#network 148.204.2.0 0.0.0.255 area 2
R1(config-router)#network 148.204.3.0 0. B?
% Unrecognized command
R1(config-router)#network 148.204.3.0 0.0.0.255 area 3
R1(config-router)#network 148.204.4.0 0.0.0.255 area 4
R1(config-router)#network 148.204.5.0 0.0.0.255 area 4
R1(config-router)#network 209.165.200.224 0.0.0.3 area 5
R1(config-router)#network 192.168.0.0 0.0.0.255 area 5
R1(config-router)#network 5.5.5.0 0.0.0.3 area 0
R1(config-router)#network 5.5.5.4 0.0.0.3 area 0
R1(config-router)#network 5.5.5.8 0.0.0.3 area 0
R1(config-router)#network 5.5.5.12 0.0.0.3 area 0
R1(config-router)#exit
R1(config)#exit
R1#wr
Building configuration...
[OK]
R1#
```

Enrutamiento R2

```
R2#confi t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 148.204.1.0 0.0.0.255 area 1
R2(config-router)#network 148.204.2.0 0.0.0.255 area 2
R2(config-router)#network 148.204.3.0 0.0.0.255 area 3
R2(config-router)#network 148.204.4.0 0.0.0.255 area 4
R2(config-router)#network 148.204.5.0 0.0.0.255 area 4
R2(config-router)#network 200.165.200.224 0.0.0.3 area 5
R2(config-router)#network 192.168.0.0 0.0.0.255 area 5
R2(config-router)#network 5.5.5.0 0.0.0.3 area 0
R2(config-router)#network 5.5.5.0 0.0.0.3 area 0
*Jun  7 18:45:05.119: %OSPF-5-ADJCHG: Process 1, Nbr 148.204.1.1
Ethernet0/0 from LOADING to FULL, Loading Done
R2(config-router)#network 5.5.5.4 0.0.0.3 area 0
R2(config-router)#network 5.5.5.8 0.0.0.3 area 0
R2(config-router)#network 5.5.5.12 0.0.0.3 area 0
R2(config-router)#exit
R2(config)#exit
R2#wr
Building configuration...
[OK]
R2#
```

Enrutamiento R3

```
*Jun  7 18:24:43.727: %SYS-5-CONFIG_I: Configured from console by cor
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 148.204.1.0 0.0.0.255 area 1
R3(config-router)#network 148.204.2.0 0.0.0.255 area 2
R3(config-router)#network 148.204.3.0 0.0.0.255 area 3
R3(config-router)#network 148.204.4.0 0.0.0.255 area 4
R3(config-router)#network 148.204.5.0 0.0.0.255 area 4
R3(config-router)#network 209.165.200.224 0.0.0.3 area 5
R3(config-router)#network 192.168.0.0 0.0.0.255 area 5
R3(config-router)#network 5.5.5.0 0.0.0.3 area 0
R3(config-router)#network 5.5.5.4 0.0.0.3 area 0
R3(config-router)#network 5.5.5.8 0.0.0.3 area 0
R3(config-router)#network 5.5.5.12 0.0.0.3 area 0
R3(config-router)#exit
R3(config)#exit
R3#wr
Building configuration...

*Jun  7 18:48:03.811: %SYS-5-CONFIG_I: Configured from console by cor
e
*Jun  7 18:48:04.295: %OSPF-5-ADJCHG: Process 1, Nbr 148.204.1.1 on F
Ethernet0/1 from LOADING to FULL, Loading Done[OK]
R3#
```

Enrutamiento R4

```
R4(config-router)#network 148.204.1.0 0.0.0.255 area 1
R4(config-router)#network 148.204.2.0 0.0.0.255 area 2
R4(config-router)#network 148.204.3.0 0.0.0.255 area 3
R4(config-router)#network 148.204.4.0 0.0.0.255 area 4
R4(config-router)#network 148.204.5.0 0.0.0.255 area 4
R4(config-router)#network 209.165.200.224 0.0.0.3 area 5
R4(config-router)#network 192.168.0.0 0.0.0.255 area 5
R4(config-router)#network 5.5.5.0 0.0.0.3 area 0
R4(config-router)#network 5.5.5.4 0.0.0.3 area 0
R4(config-router)#network 5.5.5.8 0.0.0.3 area 0
R4(config-router)#network 5.5.5.8 0.0.0.3 area 0
*Jun  7 18:44:25.831: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.2
FastEthernet0/1 from LOADING to FULL, Loading Done
R4(config-router)#network 5.5.5.12 0.0.0.3 area 0
R4(config-router)#
*Jun  7 18:44:29.039: %OSPF-5-ADJCHG: Process 1, Nbr 148.204.2.1 o
Ethernet0/0 from LOADING to FULL, Loading Done
R4(config-router)#exit
R4(config)#exit
R4#wr
```

Enrutamiento ISP

```
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#router ospf 1
ISP(config-router)#network 148.204.1.0 0.0.0.255 area 1
ISP(config-router)#network 148.204.2.0 0.0.0.255 area 2
ISP(config-router)#network 148.204.3.0 0.0.0.255 area 3
ISP(config-router)#network 148.204.4.0 0.0.0.255 area 4
ISP(config-router)#network 148.204.5.0 0.0.0.255 area 4
ISP(config-router)#network 209.165.200.224 0.0.0.3 area 5
ISP(config-router)#network 192.168.0.0
*Jun  7 18:41:49.907: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.20€
FastEthernet0/0 from LOADING to FULL, Loading Done
ISP(config-router)#network 192.168.0.0 0.0.0.255 area 5
ISP(config-router)#network 5.5.5.0 0.0.0.3 area 0
ISP(config-router)#network 5.5.5.4 0.0.0.3 area 0
ISP(config-router)#network 5.5.5.8 0.0.0.3 area 0
ISP(config-router)#network 5.5.5.12 0.0.0.3 area 0
ISP(config-router)#network 192.168.0.0 0.0.0.255 area 5
ISP(config-router)#exit
ISP(config)#exit
ISP#wr
Building configuration...
[OK]
ISP#
*Jun  7 18:42:52.839: %SYS-5-CONFIG I: Configured from console k
```

Algunas pruebas haciendo ping desde PC2 a varias redes

```
PC2> ping 148.204.3.1
84 bytes from 148.204.3.1 icmp_seq=1 ttl=253 time=79.577 ms
84 bytes from 148.204.3.1 icmp_seq=2 ttl=253 time=77.545 ms
84 bytes from 148.204.3.1 icmp_seq=3 ttl=253 time=76.705 ms
84 bytes from 148.204.3.1 icmp_seq=4 ttl=253 time=78.017 ms
84 bytes from 148.204.3.1 icmp_seq=5 ttl=253 time=77.368 ms

PC2> ping 148.204.2.1
84 bytes from 148.204.2.1 icmp_seq=1 ttl=254 time=45.912 ms
84 bytes from 148.204.2.1 icmp_seq=2 ttl=254 time=48.679 ms
84 bytes from 148.204.2.1 icmp_seq=4 ttl=254 time=46.307 ms
84 bytes from 148.204.2.1 icmp_seq=5 ttl=254 time=45.781 ms

PC2> ping 148.204.4.1
84 bytes from 148.204.4.1 icmp_seq=1 ttl=254 time=47.683 ms
84 bytes from 148.204.4.1 icmp_seq=2 ttl=254 time=48.115 ms
84 bytes from 148.204.4.1 icmp_seq=3 ttl=254 time=46.653 ms
84 bytes from 148.204.4.1 icmp_seq=4 ttl=254 time=48.791 ms
84 bytes from 148.204.4.1 icmp_seq=5 ttl=254 time=47.246 ms

PC2> ping 192.168.0.1
84 bytes from 192.168.0.1 icmp_seq=1 ttl=253 time=92.510 ms
84 bytes from 192.168.0.1 icmp_seq=2 ttl=253 time=78.186 ms
84 bytes from 192.168.0.1 icmp_seq=3 ttl=253 time=78.736 ms
84 bytes from 192.168.0.1 icmp_seq=4 ttl=253 time=78.314 ms
84 bytes from 192.168.0.1 icmp_seq=5 ttl=253 time=78.212 ms

PC2> ping 209.165.200.226
84 bytes from 209.165.200.226 icmp_seq=1 ttl=253 time=75.767 ms
84 bytes from 209.165.200.226 icmp_seq=2 ttl=253 time=81.070 ms
84 bytes from 209.165.200.226 icmp_seq=3 ttl=253 time=76.627 ms
84 bytes from 209.165.200.226 icmp_seq=4 ttl=253 time=78.241 ms
84 bytes from 209.165.200.226 icmp_seq=5 ttl=253 time=79.224 ms
```

Ping desde ISP

```
.....
Success rate is 100 percent (5/5), round-trip min/avg/max = 76/91/100 ms
ISP#ping 5.5.5.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/64/100 ms
ISP#ping 5.5.5.9

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.9, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/35/60 ms
ISP#ping 5.5.5.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 48/59/68 ms
ISP#ping 5.5.5.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.13, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/61/68 ms
ISP#ping 5.5.5.14

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.14, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/27/36 ms
ISP#
```

SSH y Telnet

Ahora procederemos a configurar SSH y Telnet en nuestro proyecto.

Configuración para R1

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#enable secret 1234
R1(config)#service password-encryption
R1(config)#interface loopback0
R1(config-if)#description
*Jun  7 19:21:24.887: %LINEPROTO-5-UPDOWN: Line protocol on Interface L
k0, changed state to up
R1(config-if)#description loopback0
R1(config-if)#ip address 192.169.1.2 255.255.255.255
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#ip domain-name proyecto.escom.ipn.mx
R1(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
R1(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

```
R1(config)#
*Jun  7 19:24:23.619: %SSH-5-ENABLED: SSH 1.99 has been enabled
R1(config)#ip ssh v 2
R1(config)#ip ssh time-out 30
R1(config)#ip ssh authentication-retries 3
R1(config)#line vty 0 15
R1(config-line)#password cisco
R1(config-line)#login local
R1(config-line)#transport input ssh telnet
R1(config-line)#exit
R1(config)#username cisco privilege 15 password cisco
R1(config)#end
R1#
*Jun  7 19:25:46.691: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
```

R2

```
R2(config)#enable secret 1234
R2(config)#service password-encryption
R2(config)#interface loopback0
R2(config-if)#description
*Jun  7 19:25:06.319: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopba
k0, changed state to up
R2(config-if)#description loopback0
R2(config-if)#ip address 192.169.1.3 255.255.255.255
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#router ospf
% Incomplete command.

R2(config)#router ospf 1
R2(config-router)#exit
R2(config)#ip domain-name proyecto.escom.ipn.mx
R2(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
R2(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

```
R2(config)#ip domain-name proyecto.escom.ipn.mx
R2(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
R2(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

R2(config)#
*Jun  7 19:35:33.071: %SSH-5-ENABLED: SSH 1.99 has been enabled
R2(config)#ip ssh v 2
R2(config)#ip ssh time-out 30
R2(config)#ip ssh authentication-retries 3
R2(config)#line vty 0 15
R2(config-line)#password cisco
R2(config-line)#login local
R2(config-line)#transport input ssh telnet
R2(config-line)#exit
R2(config)#username cisco privilege 15 password cisco
R2(config)#end
R2#
*Jun  7 19:36:30.279: %SYS-5-CONFIG_I: Configured from console by consol
R2#wr
Building configuration...
[OK]
```

R3

```
R3(config)#enable secret 1234
R3(config)#service password-encryption
R3(config)#interface loopback0
R3(config-if)#description
*Jun  7 19:37:24.303: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loo
k0, changed state to up
R3(config-if)#description loopback0
R3(config-if)#ip address 192.169.1.4 255.255.255.255
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#ip domain-name proyecto.escom.ipn.mx
R3(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
R3(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

```
R3(config)#
*Jun  7 19:39:17.547: %SSH-5-ENABLED: SSH 1.99 has been enabled
R3(config)#ip ssh v 2
R3(config)#ip ssh time-out 30
R3(config)#ip ssh authentication-retries 3
R3(config)#line vty 0 15
R3(config-line)#password cisco
R3(config-line)#login local
R3(config-line)#transport input ssh telnet
R3(config-line)#exit
R3(config)#username cisco privilege 15 password cisco
R3(config)#end
R3#
*Jun  7 19:40:30.463: %SYS-5-CONFIG_I: Configured from console by console
R3#wr
Building configuration...
[OK]
R3#
```

R4

```
R4(config)#enable secret 1234
R4(config)#service password-encryption
R4(config)#interface loopback0
R4(config-if)#description loop
*Jun  7 19:35:18.971: %LINEPROTO-5-UPDOWN: Line protocol on Interface Lo
k0, changed state to up
R4(config-if)#description loopback0
R4(config-if)#ip address 192.169.1.5 255.255.255.255
R4(config-if)#no sh
R4(config-if)#exit
R4(config)#ip domain-name proyecto.escom.ipn.mx
R4(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
R4(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

```
R4(config)#
*Jun  7 19:36:41.043: %SSH-5-ENABLED: SSH 1.99 has been enabled
R4(config)#ip ssh v 2
R4(config)#ip ssh time-out 30
R4(config)#ip ssh authentication-retries 3
R4(config)#line vty 0 15
R4(config-line)#password cisco
R4(config-line)#login local
R4(config-line)#transport input ssh telnet
R4(config-line)#exit
R4(config)#username cisco privilege 15 password cisco
R4(config)#end
R4#
*Jun  7 19:37:54.919: %SYS-5-CONFIG_I: Configured from console by console
R4#wr
Building configuration...
[OK]
R4#
```

ISP

```
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#enable secret 1234
ISP(config)#service password-encryption
ISP(config)#interface loopback0
ISP(config-if)#description lo
*Jun  7 19:34:48.891: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopbac
k0, changed state to up
ISP(config-if)#description loopback0
ISP(config-if)#ip address 192.169.1.1 255.255.255.255
ISP(config-if)#no sh
ISP(config-if)#exit
ISP(config)#router ospf 1
ISP(config-router)#passive-interface loopback0
ISP(config-router)#passive-interface fa0/1
ISP(config-router)#exit
ISP(config)#ip domain-name proyecto.escom.ipn.mx
ISP(config)#ip ssh rsa keypair-name sshkey
Please create RSA keys (of atleast 768 bits size) to enable SSH v2.
ISP(config)#crypto key generate rsa usage-keys label sshkey modulus 1024
The name for the keys will be: sshkey

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

```
ISP(config)#
*Jun  7 19:36:48.743: %SSH-5-ENABLED: SSH 1.99 has been enabled
ISP(config)#ip ssh v 2
ISP(config)#ip ssh time-out 30
ISP(config)#ip ssh authentication-retries 3
ISP(config)#line vty 0 15
ISP(config-line)#password cisco
ISP(config-line)#login local
ISP(config-line)#transport input ssh telnet
ISP(config-line)#exit
ISP(config)#username cisco privilege 15 password cisco
ISP(config)#end
ISP#wr
Building configuration...

*Jun  7 19:37:40.903: %SYS-5-CONFIG_I: Configured from console by console[OK]
ISP#
```

Hacemos algunas pruebas antes de conectarnos con la máquina virtual.

```
R1#ssh -l cisco 5.5.5.5

Password:

R2#
```
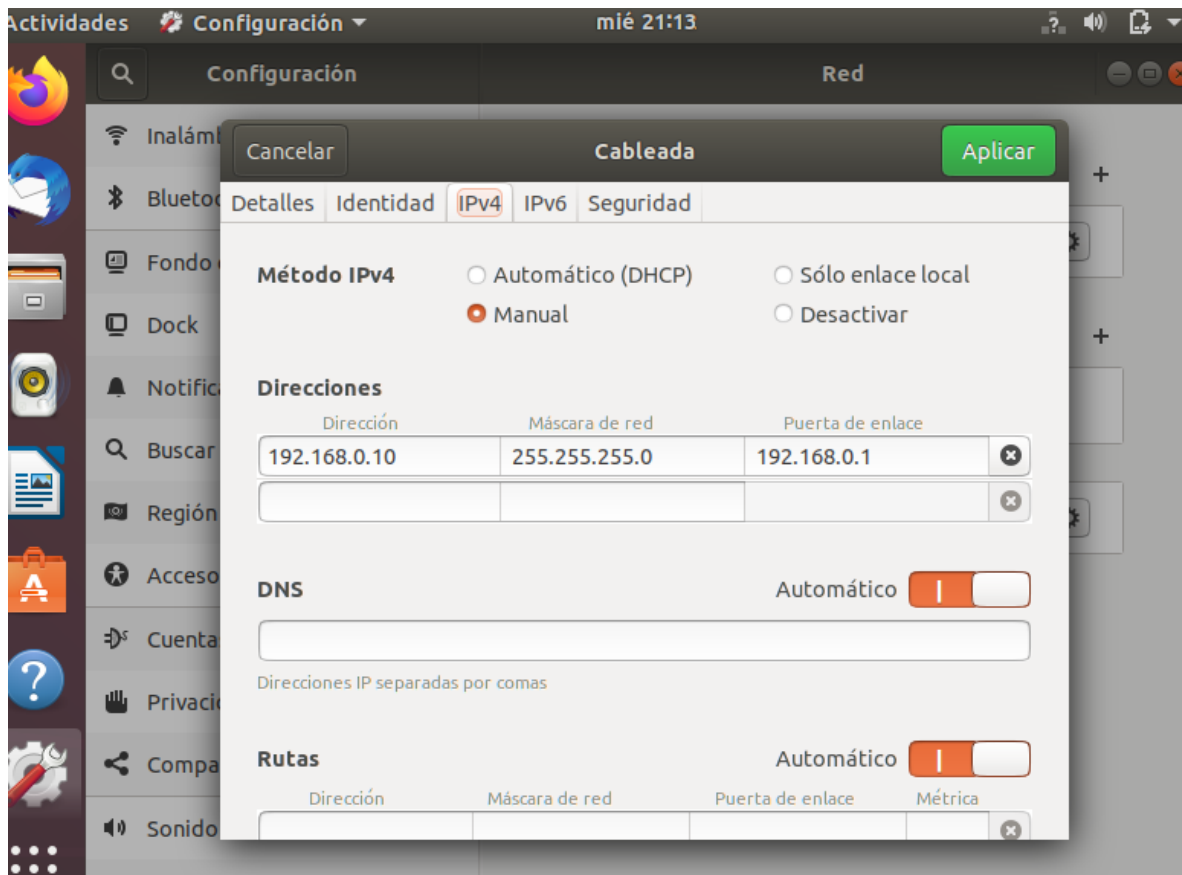
```
R2#exit

[Connection to 5.5.5.5 closed by foreign host]
R1#ssh -l cisco 209.165.200.226

Password:

ISP#
```

Asignamos la configuración a la máquina virtual:

Desde la máquina virtual nos conectamos a algún router y hacemos ping.

Con esto verificamos que tenemos la conexión de SSH y telnet de manera correcta

ACL

Para el proyecto se eligieron hacer 2 listas de acceso estándar de la siguiente manera:

En la primera lista de acceso vamos a bloquear el acceso al router 1 (R1) del host PC11 de tal manera que cualquier paquete que provenga de PC11 no podrá llegar a ningún host del AREA 1.

Probamos que se puede hacer ping del host PC11 a cualquier host ubicado en el AREA 1

Ping de PC11 a PC1

Ping de PC11 a PC2

```
PC11> ping 148.204.1.102
148.204.1.102 icmp_seq=1 timeout
84 bytes from 148.204.1.102 icmp_seq=2 ttl=62 time=36.573 ms
84 bytes from 148.204.1.102 icmp_seq=3 ttl=62 time=41.198 ms
84 bytes from 148.204.1.102 icmp_seq=4 ttl=62 time=42.123 ms
84 bytes from 148.204.1.102 icmp_seq=5 ttl=62 time=41.762 ms
```

Ping de PC11 a PC3

```
PC11> ping 148.204.1.103
148.204.1.103 icmp_seq=1 timeout
84 bytes from 148.204.1.103 icmp_seq=2 ttl=62 time=34.455 ms
84 bytes from 148.204.1.103 icmp_seq=3 ttl=62 time=42.380 ms
84 bytes from 148.204.1.103 icmp_seq=4 ttl=62 time=41.654 ms
84 bytes from 148.204.1.103 icmp_seq=5 ttl=62 time=42.423 ms
```

Creamos la lista de acceso

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip access-list standard 10
R1(config-std-nacl)#deny host 148.204.2.103
R1(config-std-nacl)#permit any
R1(config-std-nacl)#exit
R1(config)#exit
R1#wr
*Jun 11 15:33:12.747: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
```

Asignamos la lista de acceso al puerto FastEthernet0/0

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip access-group 10 in
R1(config-if)#exit
R1(config)#exit
R1#wr
Building configuration...
[OK]
R1#
*Jun 11 15:35:08.779: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

Volvemos a probar si se pueden enviar paquetes desde PC1

Ping de PC11 a PC1

```
PC11> ping 148.204.1.101
*5.5.5.1 icmp_seq=1 ttl=254 time=30.404 ms (ICMP type:3, code:13, Communication administra
tively prohibited)
*5.5.5.1 icmp_seq=2 ttl=254 time=31.778 ms (ICMP type:3, code:13, Communication administra
tively prohibited)
*5.5.5.1 icmp_seq=3 ttl=254 time=28.886 ms (ICMP type:3, code:13, Communication administra
tively prohibited)
*5.5.5.1 icmp_seq=4 ttl=254 time=30.614 ms (ICMP type:3, code:13, Communication administra
tively prohibited)
*5.5.5.1 icmp_seq=5 ttl=254 time=30.822 ms (ICMP type:3, code:13, Communication administra
tively prohibited)
```

Ping de PC11 a PC2

```
PC11> ping 148.204.1.102
*5.5.5.1 icmp_seq=1 ttl=254 time=32.083 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=2 ttl=254 time=30.381 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=3 ttl=254 time=24.994 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=4 ttl=254 time=24.897 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=5 ttl=254 time=31.769 ms (ICMP type:3, code:13, Communication administratively prohibited)
```

Ping de PC11 a PC3

```
PC11> ping 148.204.1.103
*5.5.5.1 icmp_seq=1 ttl=254 time=30.861 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=2 ttl=254 time=32.403 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=3 ttl=254 time=25.114 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=4 ttl=254 time=25.968 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.1 icmp_seq=5 ttl=254 time=22.863 ms (ICMP type:3, code:13, Communication administratively prohibited)
```

Por último, en la segunda lista de acceso, será una lista de acceso nombrada, vamos a bloquear el acceso al router 2 (R2) de toda la subred 148.204.1.0/24 correspondiente al AREA 1.

Probamos que se puede hacer ping de cualquier host del AREA1 a cualquier host del AREA2

Ping de PC1 a PC9, PC10 y PC11

```
PC1> ping 148.204.2.101
148.204.2.101 icmp_seq=1 timeout
84 bytes from 148.204.2.101 icmp_seq=2 ttl=62 time=39.462 ms
84 bytes from 148.204.2.101 icmp_seq=3 ttl=62 time=41.759 ms
84 bytes from 148.204.2.101 icmp_seq=4 ttl=62 time=40.622 ms
84 bytes from 148.204.2.101 icmp_seq=5 ttl=62 time=33.609 ms

PC1> ping 148.204.2.102
148.204.2.102 icmp_seq=1 timeout
84 bytes from 148.204.2.102 icmp_seq=2 ttl=62 time=32.740 ms
84 bytes from 148.204.2.102 icmp_seq=3 ttl=62 time=37.899 ms
84 bytes from 148.204.2.102 icmp_seq=4 ttl=62 time=33.234 ms
84 bytes from 148.204.2.102 icmp_seq=5 ttl=62 time=34.555 ms

PC1> ping 148.204.2.103
148.204.2.103 icmp_seq=1 timeout
148.204.2.103 icmp_seq=2 timeout
148.204.2.103 icmp_seq=3 timeout
148.204.2.103 icmp_seq=4 timeout
148.204.2.103 icmp_seq=5 timeout
```

Ping de PC2 a PC9, PC10 y PC11

```
PC2> ping 148.204.2.101
84 bytes from 148.204.2.101 icmp_seq=1 ttl=62 time=41.516 ms
84 bytes from 148.204.2.101 icmp_seq=2 ttl=62 time=32.471 ms
84 bytes from 148.204.2.101 icmp_seq=3 ttl=62 time=36.689 ms
84 bytes from 148.204.2.101 icmp_seq=4 ttl=62 time=32.977 ms
84 bytes from 148.204.2.101 icmp_seq=5 ttl=62 time=35.640 ms

PC2> ping 148.204.2.102
84 bytes from 148.204.2.102 icmp_seq=1 ttl=62 time=38.502 ms
84 bytes from 148.204.2.102 icmp_seq=2 ttl=62 time=40.763 ms
84 bytes from 148.204.2.102 icmp_seq=3 ttl=62 time=40.226 ms
84 bytes from 148.204.2.102 icmp_seq=4 ttl=62 time=39.465 ms
84 bytes from 148.204.2.102 icmp_seq=5 ttl=62 time=42.202 ms

PC2> ping 148.204.2.103
148.204.2.103 icmp_seq=1 timeout
148.204.2.103 icmp_seq=2 timeout
148.204.2.103 icmp_seq=3 timeout
148.204.2.103 icmp_seq=4 timeout
148.204.2.103 icmp_seq=5 timeout
```

Ping de PC3 a PC9, PC10 y PC11

```
PC3> ping 148.204.2.101
148.204.2.101 icmp_seq=1 timeout
148.204.2.101 icmp_seq=2 timeout
84 bytes from 148.204.2.101 icmp_seq=3 ttl=62 time=39.486 ms
84 bytes from 148.204.2.101 icmp_seq=4 ttl=62 time=42.324 ms
84 bytes from 148.204.2.101 icmp_seq=5 ttl=62 time=34.578 ms

PC3> ping 148.204.2.102
148.204.2.102 icmp_seq=1 timeout
148.204.2.102 icmp_seq=2 timeout
84 bytes from 148.204.2.102 icmp_seq=3 ttl=62 time=39.731 ms
84 bytes from 148.204.2.102 icmp_seq=4 ttl=62 time=40.270 ms
84 bytes from 148.204.2.102 icmp_seq=5 ttl=62 time=38.991 ms

PC3> ping 148.204.2.103
148.204.2.103 icmp_seq=1 timeout
148.204.2.103 icmp_seq=2 timeout
148.204.2.103 icmp_seq=3 timeout
148.204.2.103 icmp_seq=4 timeout
148.204.2.103 icmp_seq=5 timeout
```

Cabe destacar que los ping a el host PC11 no se efectúa debido a que la lista de acceso creada anteriormente.

Creamos la lista de acceso

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip access-list standard bloqsubred
R2(config-std-nacl)#deny 148.204.1.0 0.0.0.255
R2(config-std-nacl)#permit any
R2(config-std-nacl)#interface FastEthernet1/0
R2(config-if)#ip access-group bloqsubred out
R2(config-if)#exit
R2(config)#exit
R2#wr
Building configuration...
[OK]
R2#
*Jun 11 15:59:42.703: %SYS-5-CONFIG_I: Configured from console by console
R2#
```

Probamos nuevamente hacer ping desde los hosts del AREA 1 a los del AREA 2

Ping de PC1 a PC9, PC10 y PC11

```
PC1> ping 148.204.2.101
*5.5.5.2 icmp_seq=1 ttl=254 time=30.186 ms (ICMP type:3, code:13, Communicati
on administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=24.893 ms (ICMP type:3, code:13, Communicati
on administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=32.503 ms (ICMP type:3, code:13, Communicati
on administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=24.263 ms (ICMP type:3, code:13, Communicati
on administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=29.874 ms (ICMP type:3, code:13, Communicati
on administratively prohibited)

PC1> ping 148.204.2.102
*5.5.5.2 icmp_seq=1 ttl=254 time=22.692 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=30.987 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=27.843 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=28.703 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=30.700 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC1> ping 148.204.2.103
*5.5.5.2 icmp_seq=1 ttl=254 time=26.859 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=33.596 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=30.719 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=25.512 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=27.441 ms (ICMP type:3, code:13, Communication administratively prohibited)
```

Ping de PC2 a PC9, PC10 y PC11

```
PC2> ping 148.204.2.101
*5.5.5.2 icmp_seq=1 ttl=254 time=31.823 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=31.740 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=27.462 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=32.695 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=26.731 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC2> ping 148.204.2.102
*5.5.5.2 icmp_seq=1 ttl=254 time=26.797 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=32.215 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=30.074 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=32.316 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=24.455 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC2> ping 148.204.2.103
*5.5.5.2 icmp_seq=1 ttl=254 time=33.262 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=31.966 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=32.710 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=32.759 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=31.694 ms (ICMP type:3, code:13, Communication administratively prohibited)
```

Ping de PC3 a PC9, PC10 y PC11

```
PC3> ping 148.204.2.101
*5.5.5.2 icmp_seq=1 ttl=254 time=31.108 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=31.226 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=25.721 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=29.985 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=27.854 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC3> ping 148.204.2.102
*5.5.5.2 icmp_seq=1 ttl=254 time=24.970 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=33.008 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=26.824 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=22.712 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=27.028 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC3> ping 148.204.2.103
*5.5.5.2 icmp_seq=1 ttl=254 time=27.563 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=2 ttl=254 time=28.849 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=3 ttl=254 time=28.381 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=4 ttl=254 time=22.442 ms (ICMP type:3, code:13, Communication administratively prohibited)
*5.5.5.2 icmp_seq=5 ttl=254 time=26.669 ms (ICMP type:3, code:13, Communication administratively prohibited)
```

DNS

Vamos a configurar el router 4 como un sencillo servidor DNS y a los routers 2 y 3 como sus clientes DNS.

Para ello primero configuramos el router 4 (R4) como el servidor DNS

```
R4#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#ip dns server
R4(config)#ip host proyectoloopback.R4.com 2.2.2.2
R4(config)#int loopback 1
R4(config-if)#ip ad
*Jun 13 17:16:31.335: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopbac
k1, changed state to up
R4(config-if)#ip add 2.2.2.2 255.255.255.255
R4(config-if)#end
R4#write
Building configuration...
[OK]
R4#
*Jun 13 17:16:42.687: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

Para comprobar que nuestro router 4 (R4) ya funciona como un servidor DNS podemos hacer ping al dominio que acabamos de crear

```
R4#ping proyectoloopback.R4.com

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
R4#
```

Ahora vamos a configurar el router 3 (R3) como un cliente DNS conectado con el servidor DNS que es ahora el router 4 (R4)

```
R3#enable
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip domain lookup
R3(config)#ip name-server 5.5.5.10
R3(config)#end
R3#write
*Jun 13 17:21:47.323: %SYS-5-CONFIG_I: Configured from console by console
R3#write
Building configuration...
[OK]
```

Por último, como la dirección ip 2.2.2.2 no tiene una ruta asignada, podemos resolver esto con una configuración estática para que cualquier dirección que se encuentre en la ip del servidor DNS pueda ser accesible.

```
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip route 0.0.0.0 0.0.0.0 5.5.5.10
R3(config)#end
R3#
*Jun 13 17:24:33.619: %SYS-5-CONFIG_I: Configured from console by console
R3#write
Building configuration...
[OK]
```

Para probar que el servidor DNS funciona hacemos ping desde el router 3 (R3) al dominio del servidor DNS

```
R3#ping 5.5.5.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/60 ms
R3#ping proyectoloopback.R4.com

Translating "proyectoloopback.R4.com"...domain server (5.5.5.10) [OK]
```

Para que el router 2 (R2) también sea un cliente DNS del router 4 (R4) repetimos el mismo proceso en su consola.

Configuramos el cliente DNS

```
R2#enable
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip domain lookup
R2(config)#ip name-server 5.5.5.6
R2(config)#end
R2#writ
*Jun 13 17:30:54.203: %SYS-5-CONFIG_I: Configured from console by console
R2#write
Building configuration...
[OK]
```

Hacemos la configuración estática para que cualquier dirección que se encuentre en la ip del servidor DNS pueda ser accesible.

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 5.5.5.6
R2(config)#end
R2#
*Jun 13 17:31:23.815: %SYS-5-CONFIG_I: Configured from console by console
R2#write
Building configuration...
[OK]
```

Probamos hacer ping al dominio del servidor DNS

```
R2#ping proyectoloopback.R4.com

Translating "proyectoloopback.R4.com"...domain server (5.5.5.6) [OK]

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/20/24 ms
R2#
```

Con el comando "show running-config" podemos consultar en el servidor que el DNS esta habilitado

```
R4#show running-config
Building configuration...

Current configuration : 2515 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname R4
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$o5Ac$mIUsS8FANVDoJ4jHUW6QA1
!
no aaa new-model
no ip icmp rate-limit unreachable
!
!
ip cef
no ip domain lookup
ip domain name proyecto.escom.ipn.mx
ip host proyectoloopback.R4.com 2.2.2.2
```

De la misma forma con el comando "show running-config" podemos consultar que los clientes DNS tienen configurado su servidor

Router 2 (R2)

```
R2#show running-config
Building configuration...

Current configuration : 2344 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname R2
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$S7Ok$rSqQp2D9/9qg8BOoERvhp1
!
no aaa new-model
no ip icmp rate-limit unreachable
!
!
ip cef
ip domain name proyecto.escom.ipn.mx
ip name-server 5.5.5.6
```

Router 3 (R3)

```
R3#show running-config
Building configuration...

Current configuration : 3443 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname R3
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$sMXK$JEHUOJGKRoYatdyoafqAh/
!
no aaa new-model
no ip icmp rate-limit unreachable
!
!
ip cef
ip domain name proyecto.escom.ipn.mx
ip name-server 5.5.5.10
no ip dhcp use vrf connected
ip dhcp excluded-address 148.204.4.1 148.204.4.10
ip dhcp excluded-address 148.204.5.1 148.204.5.10
!
ip dhcp pool R3F1_0
   network 148.204.4.0 255.255.255.0
   default-router 148.204.4.1
   dns-server 148.204.5.5
!
```

DHCP Y NAT

Usaremos el router 3 para configurar DHCP y NAT. A continuación, las capturas de esta configuración.

```
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip dhcp excluded-address 148.204.4.1 148.204.4.10
R3(config)#ip dhcp excluded-address 148.204.5.1 148.204.5.10
R3(config)#ip dhcp pool R3F1_0
R3(dhcp-config)#network 148.204.4.0 255.255.255.0
R3(dhcp-config)#exit
R3(config)#ip dhcp pool R3F1_1
R3(dhcp-config)#network 148.204.4.0 255.255.255.0
% A pool already exists for network 148.204.4.0 / 255.255.255.0.
R3(dhcp-config)#network 148.204.5.0 255.255.255.0
R3(dhcp-config)#exit
R3(config)#ip dhcp pool R3F1_0
R3(dhcp-config)#default-router 148.204.4.1
R3(dhcp-config)#dns-server 148.204.5.5
R3(dhcp-config)#exi
R3(config)#ip dhcp pool R3F1_1
R3(dhcp-config)#default-router 148.204.5.1
R3(dhcp-config)#dns-server 148.204.5.5
R3(dhcp-config)#exit
R3(config)#exit
R3#wr
Building configuration...
[OK]
R3#
*Jun  7 20:08:21.151: %SYS-5-CONFIG_I: Configured from console by console
```

Ahora vemos en las PCs que esté funcionando DHCP

```
PC5> show ip

NAME         : PC5[1]
IP/MASK      : 0.0.0.0/0
GATEWAY      : 0.0.0.0
DNS          :
MAC          : 00:50:79:66:68:04
LPORT        : 10090
RHOST:PORT   : 127.0.0.1:10091
MTU:         : 1500

PC5> dhcp
DDORA IP 148.204.4.11/24 GW 148.204.4.1

PC5> show ip

NAME         : PC5[1]
IP/MASK      : 148.204.4.11/24
GATEWAY      : 148.204.4.1
DNS          : 148.204.5.5
DHCP SERVER  : 148.204.4.1
DHCP LEASE   : 86397, 86400/43200/75600
MAC          : 00:50:79:66:68:04
LPORT        : 10090
RHOST:PORT   : 127.0.0.1:10091
MTU:         : 1500

PC5>
```

```
PC6> show ip

NAME         : PC6[1]
IP/MASK      : 0.0.0.0/0
GATEWAY      : 0.0.0.0
DNS          :
MAC          : 00:50:79:66:68:05
LPORT        : 10094
RHOST:PORT   : 127.0.0.1:10095
MTU:         : 1500

PC6> dhcp
DDORA IP 148.204.5.11/24 GW 148.204.5.1

PC6> show ip

NAME         : PC6[1]
IP/MASK      : 148.204.5.11/24
GATEWAY      : 148.204.5.1
DNS          : 148.204.5.5
DHCP SERVER  : 148.204.5.1
DHCP LEASE   : 86398, 86400/43200/75600
MAC          : 00:50:79:66:68:05
LPORT        : 10094
RHOST:PORT   : 127.0.0.1:10095
MTU:         : 1500

PC6>
```

Ahora configuramos NAT de igual forma en el router 3 comenzando por ISP

```
*Jun  7 19:37:40.903: %SYS-5-CONFIG_I: Configured from console by console[OK]
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#ip route 209.165.200.240 255.255.255.240 209.165.200.225
ISP(config)#
```

```
R3(config)#ip route 0.0.0.0 0.0.0.0 209.165.200.226
R3(config)#exit
R3#sh ip
*Jun  7 20:14:06.859: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level
       ia - IS-IS inter area, * - candidate default, U - per-user static r
e
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 209.165.200.226 to network 0.0.0.0

     5.0.0.0/30 is subnetted, 4 subnets
O       5.5.5.4 [110/2] via 5.5.5.10, 00:42:17, FastEthernet0/0
O       5.5.5.0 [110/2] via 5.5.5.13, 00:42:17, FastEthernet0/1
C       5.5.5.12 is directly connected, FastEthernet0/1
C       5.5.5.8 is directly connected, FastEthernet0/0
     209.165.200.0/30 is subnetted, 1 subnets
C       209.165.200.224 is directly connected, FastEthernet3/0
O    192.168.0.0/24 [110/2] via 209.165.200.226, 01:20:43, FastEthernet3/0
     148.204.0.0/24 is subnetted, 5 subnets
O IA    148.204.1.0 [110/2] via 5.5.5.13, 00:42:17, FastEthernet0/1
O IA    148.204.2.0 [110/3] via 5.5.5.13, 00:42:17, FastEthernet0/1
                    [110/3] via 5.5.5.10, 00:42:17, FastEthernet0/0
O IA    148.204.3.0 [110/2] via 5.5.5.10, 00:42:17, FastEthernet0/0
C       148.204.4.0 is directly connected, FastEthernet1/0
C       148.204.5.0 is directly connected, FastEthernet1/1
     192.169.1.0/32 is subnetted, 1 subnets
C       192.169.1.4 is directly connected, Loopback0
S*   0.0.0.0/0 [1/0] via 209.165.200.226
R3#
```

```
R3(config)#router ospf 1
R3(config-router)#default-information originate always
R3(config-router)#exit
R3(config)#ip nat inside source static 192.168.20.254 209.165.200.254
R3(config)#
*Jun  7 20:17:01.711: %LINEPROTO-5-UPDOWN: Line protocol on Interface NVI0, c
hanged state to up
R3(config)#$OL 209.165.200.241 209.165.200.246 netmask 255.255.255.248
R3(config)#ip access-lists extended NAT
                          ^
% Invalid input detected at '^' marker.

R3(config)#ip access-list extended NAT
R3(config-ext-nacl)#permit ip 148.204.4.11 0.0.0.255 any
R3(config-ext-nacl)#permit ip 148.204.5.0 0.0.0.255 any
R3(config-ext-nacl)#permit ip 148.204.4.0 0.0.0.255 any
R3(config-ext-nacl)#exit
R3(config)#ip nat inside source list NAT pool MI_NAT_POOL
R3(config)#inter fa3/0
R3(config-if)#ip nat out
R3(config-if)#ip nat outisde
                       ^
% Invalid input detected at '^' marker.

R3(config-if)#ip nat outside
R3(config-if)#inter fa0/1
R3(config-if)#ip nat inside
R3(config-if)#exit
R3(config)#end
R3#wr
Building configuration...
[OK]
R3#
*Jun  7 20:20:45.287: %SYS-5-CONFIG_I: Configured from console by console
```

239 410.862380	209.165.200.241	209.165.200.226	ICMP	98 Echo (
240 410.877304	209.165.200.226	209.165.200.241	ICMP	98 Echo (
241 411.911669	209.165.200.241	209.165.200.226	ICMP	98 Echo (
242 411.926803	209.165.200.226	209.165.200.241	ICMP	98 Echo (
243 412.958928	209.165.200.241	209.165.200.226	ICMP	98 Echo (
244 412.974071	209.165.200.226	209.165.200.241	ICMP	98 Echo (

SNMP

Ahora vamos a crear las comunidades SNMP en cada router, esto nos ayudará en el programa de Python para monitorear los enlaces.

Router 1

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#snmp-server community public ro
R1(config)#
```

Router 2

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#snmp-server community public ro
R2(config)#
```

Router 3

```
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#snmp-server community public ro
R3(config)#
```

Router 4

```
R4(config)#snmp-server community public ro
R4(config)#
```

Router ISP

```
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#snmp-server community public ro
ISP(config)#
```

CONCLUSIONES

Meza Vargas Brandon David

Este proyecto fue muy interesante de realizar ya que pudimos configurar todos los protocolos vistos a lo largo del semestre en una topología un poco más compleja en la que absolutamente todos los elementos tenían comunicación entre si desde los hosts normales de GNS3 que vimos durante todo el semestre hasta una máquina virtual que no solo estaba en la topología, sino que tenía interacciones con todos los elementos de esta. Por otra parte, el programa a desarrollar en Python también fue interesante un poco desafiante de hacer pero que cuando funciono mostro la información detallada que se solicitaba. Una gran puesta en practica para finalizar el semestre.

Romero Angeles Abraham

El proyecto me pareció una gran oportunidad para poner en practica todo lo visto en clase, desde el entrenamiento simple con OSPF hasta lo que para mí fue la aplicación mas complicada en la topología que fue el SNMP para detectar si un enlace se cortaba, todo eso funcionando en una topología que completamente comunicada cada elemento con cada elemento y aún más demostrativo que a través de una máquina virtual se pudiera ver la información de toda la topología. En fin, me pareció sumamente útil para el aprendizaje este proyecto ya que junto todo lo visto en el semestre pudimos configurar una topología medianamente compleja, pero con muchos elementos y posteriormente desarrollar un programa para desde una maquina virtual ver el funcionamiento de esa topología, muy satisfactorio ver que cuando se pudo realizar correctamente.