

A thick dark blue vertical bar runs along the left edge of the page. A blue arrow-shaped banner points to the right from this bar, containing the date. Below the banner, several thin, curved lines in dark blue and light grey sweep upwards from the bottom left corner.

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Tema4: Protocolo IP y encaminamiento

Escenario 3

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Ejercicio

Disponemos de Tres Host conectados a un router Linux.

Redes:

- 10.0.100.0/24 → h1 y r1
- 10.0.110.0/24 → r1, h2 y r2
- 10.0.120.0/24 → r2 y h3

Tarea:

- Configurar los hosts y el router de forma que todos sean alcanzables.

Entrega:

- Esquema gráfico de la configuración.
- Comandos de configuración de cada nodo.
- Verificación de conectividad (ping) entre nodos.
- Captura de tráfico en el router r2 mostrando tráfico entre h1 y h3.

Configuración

Para hacernos una idea del ejercicio, lo plasmaremos en un diagrama, indicando las partes y su conexión:

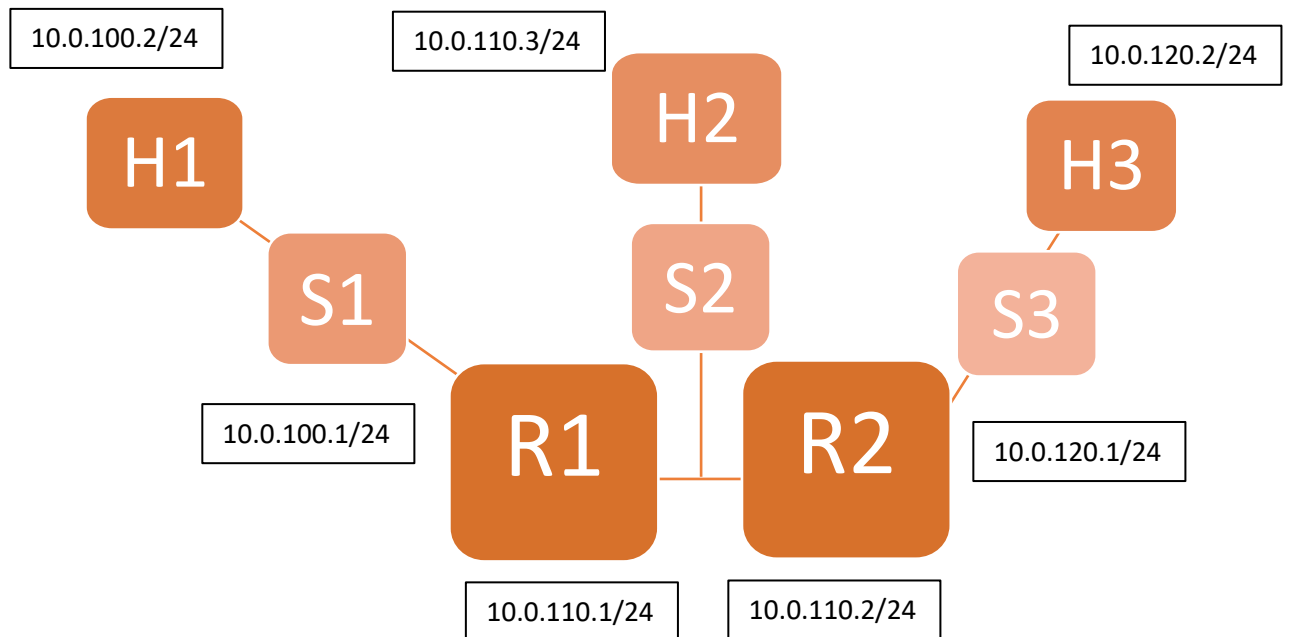


Ilustración 1

R1, R2 → Router

S1, S2, S3 → Switches

H1, H2, H3 → Host

Configuración de cada nodo

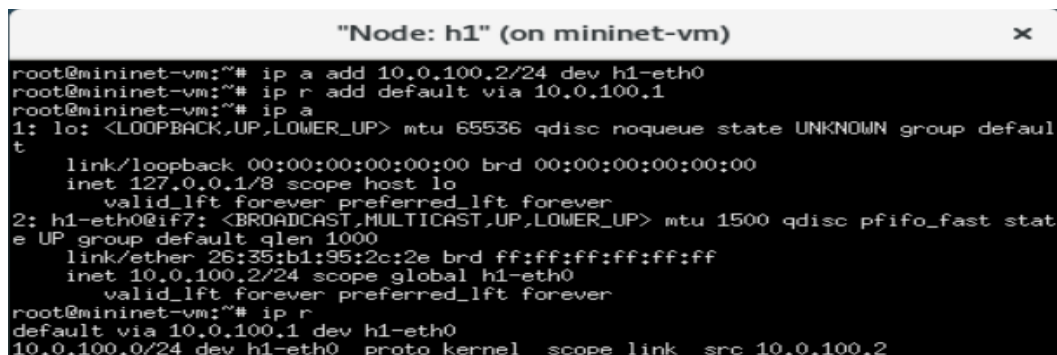
En primer lugar, necesitamos configurar las direcciones Ip de cada Host y para ello usaremos el siguiente comando:

Ip a add {dirección Ip /máscara de red} dev {interfaz de red}

A continuación, también con el siguiente comando crearemos la tabla de encaminamiento de cada nodo:

Ip r add {Ip de destino} via {Ip de origen}

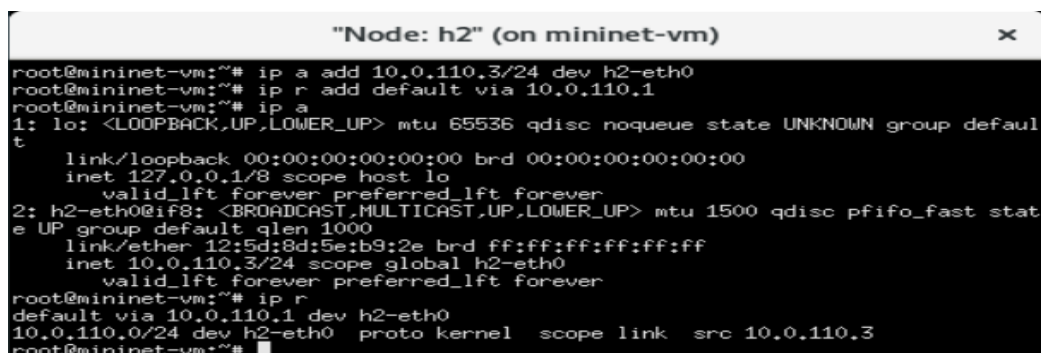
Por ejemplo, para el H1 sería:



```
"Node: h1" (on mininet-virtual-machine)
root@mininet-virtual-machine:~# ip a add 10.0.100.2/24 dev h1-eth0
root@mininet-virtual-machine:~# ip r add default via 10.0.100.1
root@mininet-virtual-machine:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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: h1-eth0@if7: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 26:35:b1:95:2c:2e brd ff:ff:ff:ff:ff:ff
    inet 10.0.100.2/24 scope global h1-eth0
        valid_lft forever preferred_lft forever
root@mininet-virtual-machine:~# ip r
default via 10.0.100.1 dev h1-eth0
10.0.100.0/24 dev h1-eth0 proto kernel scope link src 10.0.100.2
```

Ilustración 2

Y para H2 Y H3:



```
"Node: h2" (on mininet-virtual-machine)
root@mininet-virtual-machine:~# ip a add 10.0.110.3/24 dev h2-eth0
root@mininet-virtual-machine:~# ip r add default via 10.0.110.1
root@mininet-virtual-machine:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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: h2-eth0@if8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 12:5d:8d:5e:b9:2e brd ff:ff:ff:ff:ff:ff
    inet 10.0.110.3/24 scope global h2-eth0
        valid_lft forever preferred_lft forever
root@mininet-virtual-machine:~# ip r
default via 10.0.110.1 dev h2-eth0
10.0.110.0/24 dev h2-eth0 proto kernel scope link src 10.0.110.3
root@mininet-virtual-machine:~#
```

Ilustración 3

```
"Node: h3" (on mininet-virtual-machine)
root@mininet-virtual-machine:~# ip a add 10.0.120.2/24 dev h3-eth0
root@mininet-virtual-machine:~# ip r add default via 10.0.120.1
root@mininet-virtual-machine:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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: h3-eth0@if9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 42:ec:be:b5:3d:40 brd ff:ff:ff:ff:ff:ff
    inet 10.0.120.2/24 scope global h3-eth0
        valid_lft forever preferred_lft forever
root@mininet-virtual-machine:~# ip r
default via 10.0.120.1 dev h3-eth0
10.0.120.0/24 dev h3-eth0 proto kernel scope link src 10.0.120.2
root@mininet-virtual-machine:~#
```

Ilustración 4

Y, por último, necesitamos configurar las diferentes interfaces de red que tienen los routers R1 y R2. Usaremos el mismo comando:

```
"Node: r1" (on mininet-virtual-machine)
root@mininet-virtual-machine:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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: r1-eth1@if10: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether d2:2c:1c:66:87:a8 brd ff:ff:ff:ff:ff:ff
3: r1-eth2@if11: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 5e:cb:05:2b:0f:99 brd ff:ff:ff:ff:ff:ff
root@mininet-virtual-machine:~# ip a add 10.0.100.1/24 dev r1-eth1
root@mininet-virtual-machine:~# ip a add 10.0.110.1/24 dev r1-eth2
root@mininet-virtual-machine:~#
```

Ilustración 5

```
"Node: r2" (on mininet-vm) x
root@mininet-vm:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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: r2-eth1@if12: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 4a:ef:64:f3:9e:d3 brd ff:ff:ff:ff:ff:ff
3: r2-eth2@if13: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 36:45:c5:b4:72:06 brd ff:ff:ff:ff:ff:ff
root@mininet-vm:~# ip a add 10.0.110.2/24 dev r2-eth1
root@mininet-vm:~# ip a add 10.0.120.1/24 dev r2-eth2
```

Ilustración 6

Configuración encaminamiento

Ahora, procederemos a configurar las tablas de encaminamiento de los routers. Para ello, usaremos el comando anteriormente utilizado. Por último, así es como quedaría ambos routers.

Para el router R1:

```
root@mininet-vm:~# ip r add default via 10.0.110.2
```

Ilustración 7

Para el router R2:

```
root@mininet-vm:~# ip r add default via 10.0.110.2
```

Ilustración 8

Verificación de conectividad (ping)

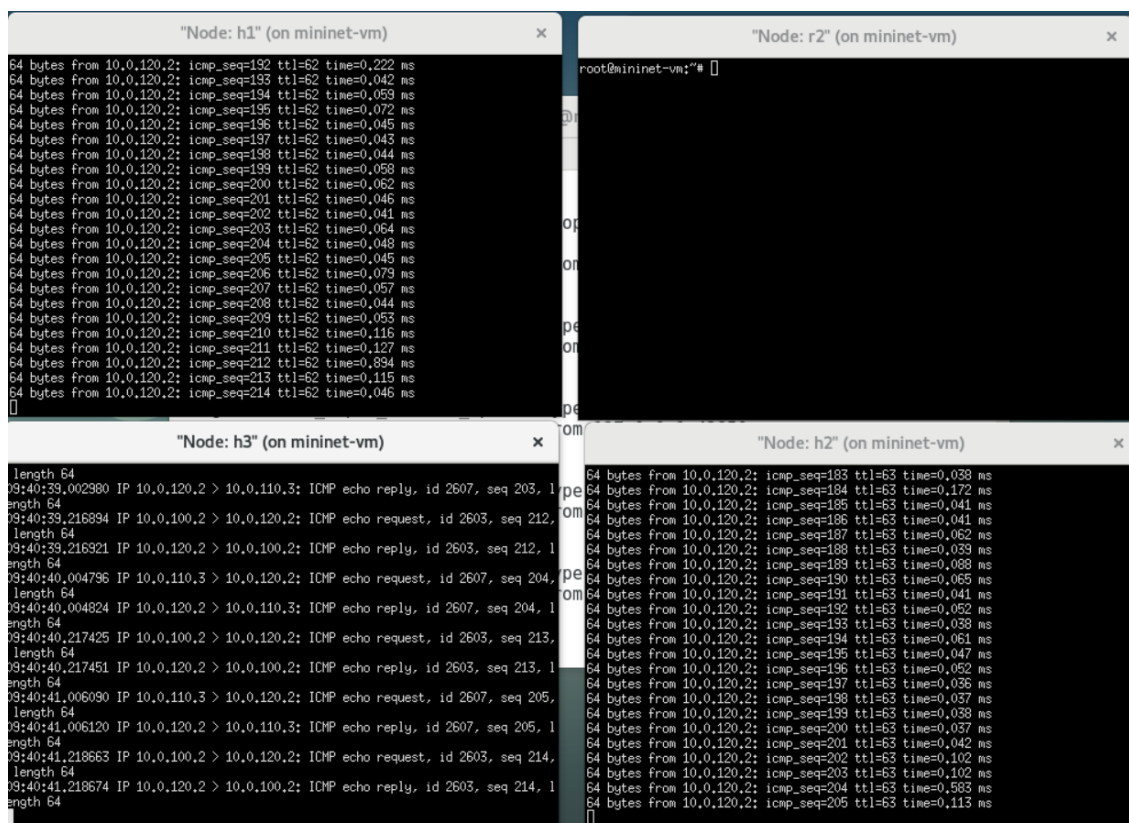
Una vez hecha la tabla de encaminamiento, usaremos el comando:

Ping {Ip de destino}

Para comprobar que, efectivamente, nos llegan los paquetes de datos, usaremos el comando:

Tcpdump -i {interfaz de red}

En primer lugar, mandaremos ping de H1 Y H2 hacia H3:



```
"Node: h1" (on mininet-vm) x
64 bytes from 10.0.120.2: icmp_seq=192 ttl=62 time=0.222 ms
64 bytes from 10.0.120.2: icmp_seq=193 ttl=62 time=0.042 ms
64 bytes from 10.0.120.2: icmp_seq=194 ttl=62 time=0.069 ms
64 bytes from 10.0.120.2: icmp_seq=195 ttl=62 time=0.072 ms
64 bytes from 10.0.120.2: icmp_seq=196 ttl=62 time=0.045 ms
64 bytes from 10.0.120.2: icmp_seq=197 ttl=62 time=0.043 ms
64 bytes from 10.0.120.2: icmp_seq=198 ttl=62 time=0.044 ms
64 bytes from 10.0.120.2: icmp_seq=199 ttl=62 time=0.058 ms
64 bytes from 10.0.120.2: icmp_seq=200 ttl=62 time=0.062 ms
64 bytes from 10.0.120.2: icmp_seq=201 ttl=62 time=0.046 ms
64 bytes from 10.0.120.2: icmp_seq=202 ttl=62 time=0.041 ms
64 bytes from 10.0.120.2: icmp_seq=203 ttl=62 time=0.064 ms
64 bytes from 10.0.120.2: icmp_seq=204 ttl=62 time=0.048 ms
64 bytes from 10.0.120.2: icmp_seq=205 ttl=62 time=0.045 ms
64 bytes from 10.0.120.2: icmp_seq=206 ttl=62 time=0.079 ms
64 bytes from 10.0.120.2: icmp_seq=207 ttl=62 time=0.057 ms
64 bytes from 10.0.120.2: icmp_seq=208 ttl=62 time=0.044 ms
64 bytes from 10.0.120.2: icmp_seq=209 ttl=62 time=0.063 ms
64 bytes from 10.0.120.2: icmp_seq=210 ttl=62 time=0.116 ms
64 bytes from 10.0.120.2: icmp_seq=211 ttl=62 time=0.127 ms
64 bytes from 10.0.120.2: icmp_seq=212 ttl=62 time=0.894 ms
64 bytes from 10.0.120.2: icmp_seq=213 ttl=62 time=0.115 ms
64 bytes from 10.0.120.2: icmp_seq=214 ttl=62 time=0.046 ms

"Node: r2" (on mininet-vm) x
root@mininet-vm:~# 

"Node: h3" (on mininet-vm) x
length 64
09:40:39.002980 IP 10.0.120.2 > 10.0.110.3: ICMP echo reply, id 2607, seq 203, l
length 64
09:40:39.216894 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2603, seq 212, l
length 64
09:40:39.216921 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2603, seq 212, l
length 64
09:40:40.004796 IP 10.0.110.3 > 10.0.120.2: ICMP echo request, id 2607, seq 204, l
length 64
09:40:40.004824 IP 10.0.120.2 > 10.0.110.3: ICMP echo reply, id 2607, seq 204, l
length 64
09:40:40.217425 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2603, seq 213, l
length 64
09:40:40.217451 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2603, seq 213, l
length 64
09:40:41.006090 IP 10.0.110.3 > 10.0.120.2: ICMP echo request, id 2607, seq 205, l
length 64
09:40:41.006120 IP 10.0.120.2 > 10.0.110.3: ICMP echo reply, id 2607, seq 205, l
length 64
09:40:41.218663 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2603, seq 214, l
length 64
09:40:41.218674 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2603, seq 214, l
length 64

"Node: h2" (on mininet-vm) x
64 bytes from 10.0.120.2: icmp_seq=183 ttl=63 time=0.038 ms
64 bytes from 10.0.120.2: icmp_seq=184 ttl=63 time=0.172 ms
64 bytes from 10.0.120.2: icmp_seq=185 ttl=63 time=0.041 ms
64 bytes from 10.0.120.2: icmp_seq=186 ttl=63 time=0.041 ms
64 bytes from 10.0.120.2: icmp_seq=187 ttl=63 time=0.062 ms
64 bytes from 10.0.120.2: icmp_seq=188 ttl=63 time=0.039 ms
64 bytes from 10.0.120.2: icmp_seq=189 ttl=63 time=0.088 ms
64 bytes from 10.0.120.2: icmp_seq=190 ttl=63 time=0.065 ms
64 bytes from 10.0.120.2: icmp_seq=191 ttl=63 time=0.041 ms
64 bytes from 10.0.120.2: icmp_seq=192 ttl=63 time=0.052 ms
64 bytes from 10.0.120.2: icmp_seq=193 ttl=63 time=0.039 ms
64 bytes from 10.0.120.2: icmp_seq=194 ttl=63 time=0.061 ms
64 bytes from 10.0.120.2: icmp_seq=195 ttl=63 time=0.047 ms
64 bytes from 10.0.120.2: icmp_seq=196 ttl=63 time=0.052 ms
64 bytes from 10.0.120.2: icmp_seq=197 ttl=63 time=0.036 ms
64 bytes from 10.0.120.2: icmp_seq=198 ttl=63 time=0.037 ms
64 bytes from 10.0.120.2: icmp_seq=199 ttl=63 time=0.038 ms
64 bytes from 10.0.120.2: icmp_seq=200 ttl=63 time=0.037 ms
64 bytes from 10.0.120.2: icmp_seq=201 ttl=63 time=0.042 ms
64 bytes from 10.0.120.2: icmp_seq=202 ttl=63 time=0.102 ms
64 bytes from 10.0.120.2: icmp_seq=203 ttl=63 time=0.102 ms
64 bytes from 10.0.120.2: icmp_seq=204 ttl=63 time=0.583 ms
64 bytes from 10.0.120.2: icmp_seq=205 ttl=63 time=0.113 ms
```

Ilustración 9

Ahora, de H1 y H3 hacia H2:

```
"Node: h1" (on mininet-vm) x
64 bytes from 10.0.110.3: icmp_seq=210 ttl=63 time=0.104 ms
64 bytes from 10.0.110.3: icmp_seq=211 ttl=63 time=0.042 ms
64 bytes from 10.0.110.3: icmp_seq=212 ttl=63 time=0.364 ms
64 bytes from 10.0.110.3: icmp_seq=213 ttl=63 time=0.043 ms
64 bytes from 10.0.110.3: icmp_seq=214 ttl=63 time=0.043 ms
64 bytes from 10.0.110.3: icmp_seq=215 ttl=63 time=0.039 ms
64 bytes from 10.0.110.3: icmp_seq=216 ttl=63 time=0.102 ms
64 bytes from 10.0.110.3: icmp_seq=217 ttl=63 time=0.482 ms
64 bytes from 10.0.110.3: icmp_seq=218 ttl=63 time=0.036 ms
64 bytes from 10.0.110.3: icmp_seq=219 ttl=63 time=0.085 ms
64 bytes from 10.0.110.3: icmp_seq=220 ttl=63 time=0.380 ms
64 bytes from 10.0.110.3: icmp_seq=221 ttl=63 time=0.063 ms
64 bytes from 10.0.110.3: icmp_seq=222 ttl=63 time=0.184 ms
64 bytes from 10.0.110.3: icmp_seq=223 ttl=63 time=0.040 ms
64 bytes from 10.0.110.3: icmp_seq=224 ttl=63 time=0.040 ms
64 bytes from 10.0.110.3: icmp_seq=225 ttl=63 time=0.051 ms
64 bytes from 10.0.110.3: icmp_seq=226 ttl=63 time=0.057 ms
64 bytes from 10.0.110.3: icmp_seq=227 ttl=63 time=0.043 ms
64 bytes from 10.0.110.3: icmp_seq=228 ttl=63 time=0.038 ms
64 bytes from 10.0.110.3: icmp_seq=229 ttl=63 time=0.057 ms
64 bytes from 10.0.110.3: icmp_seq=230 ttl=63 time=0.056 ms
64 bytes from 10.0.110.3: icmp_seq=231 ttl=63 time=0.046 ms
64 bytes from 10.0.110.3: icmp_seq=232 ttl=63 time=0.042 ms

"Node: r2" (on mininet-vm) x
root@mininet-vm:~#

"Node: h3" (on mininet-vm) x
64 bytes from 10.0.110.3: icmp_seq=195 ttl=63 time=0.101 ms
64 bytes from 10.0.110.3: icmp_seq=196 ttl=63 time=0.042 ms
64 bytes from 10.0.110.3: icmp_seq=197 ttl=63 time=0.550 ms
64 bytes from 10.0.110.3: icmp_seq=198 ttl=63 time=0.073 ms
64 bytes from 10.0.110.3: icmp_seq=199 ttl=63 time=0.105 ms
64 bytes from 10.0.110.3: icmp_seq=200 ttl=63 time=0.039 ms
64 bytes from 10.0.110.3: icmp_seq=201 ttl=63 time=0.103 ms
64 bytes from 10.0.110.3: icmp_seq=202 ttl=63 time=1.84 ms
64 bytes from 10.0.110.3: icmp_seq=203 ttl=63 time=0.041 ms
64 bytes from 10.0.110.3: icmp_seq=204 ttl=63 time=0.088 ms
64 bytes from 10.0.110.3: icmp_seq=205 ttl=63 time=1.93 ms
64 bytes from 10.0.110.3: icmp_seq=206 ttl=63 time=0.173 ms
64 bytes from 10.0.110.3: icmp_seq=207 ttl=63 time=0.102 ms
64 bytes from 10.0.110.3: icmp_seq=208 ttl=63 time=0.052 ms
64 bytes from 10.0.110.3: icmp_seq=209 ttl=63 time=0.034 ms
64 bytes from 10.0.110.3: icmp_seq=210 ttl=63 time=0.047 ms
64 bytes from 10.0.110.3: icmp_seq=211 ttl=63 time=0.040 ms
64 bytes from 10.0.110.3: icmp_seq=212 ttl=63 time=0.038 ms
64 bytes from 10.0.110.3: icmp_seq=213 ttl=63 time=0.053 ms
64 bytes from 10.0.110.3: icmp_seq=214 ttl=63 time=0.050 ms
64 bytes from 10.0.110.3: icmp_seq=215 ttl=63 time=0.038 ms
64 bytes from 10.0.110.3: icmp_seq=216 ttl=63 time=0.039 ms
64 bytes from 10.0.110.3: icmp_seq=217 ttl=63 time=0.066 ms

"Node: h2" (on mininet-vm) x
length 64
09:45:10.909509 IP 10.0.110.3 > 10.0.120.2: ICMP echo reply, id 2669, seq 215, l
length 64
09:45:10.953407 IP 10.0.100.2 > 10.0.110.3: ICMP echo request, id 2661, seq 230,
length 64
09:45:10.953421 IP 10.0.110.3 > 10.0.100.2: ICMP echo reply, id 2661, seq 230, l
length 64
09:45:11.909902 IP 10.0.120.2 > 10.0.110.3: ICMP echo request, id 2669, seq 216,
length 64
09:45:11.909912 IP 10.0.110.3 > 10.0.120.2: ICMP echo reply, id 2669, seq 216, l
length 64
09:45:11.953817 IP 10.0.100.2 > 10.0.110.3: ICMP echo request, id 2661, seq 231, l
length 64
09:45:11.953829 IP 10.0.110.3 > 10.0.100.2: ICMP echo reply, id 2661, seq 231, l
length 64
09:45:12.909310 IP 10.0.120.2 > 10.0.110.3: ICMP echo request, id 2669, seq 217, l
length 64
09:45:12.909333 IP 10.0.110.3 > 10.0.120.2: ICMP echo reply, id 2669, seq 217, l
length 64
09:45:12.954232 IP 10.0.100.2 > 10.0.110.3: ICMP echo request, id 2661, seq 232, l
length 64
09:45:12.954242 IP 10.0.110.3 > 10.0.100.2: ICMP echo reply, id 2661, seq 232, l
length 64
```

Ilustración 10

Y, por último, de H2 y H3 a H1:

```
"Node: h1" (on mininet-vn) x
length 64
09:49:13.762143 IP 10.0.100.2 > 10.0.120.2: ICMP echo reply, id 2739, seq 152, l
length 64
09:49:14.334037 IP 10.0.110.3 > 10.0.100.2: ICMP echo request, id 2743, seq 144,
length 64
09:49:14.334047 IP 10.0.100.2 > 10.0.110.3: ICMP echo reply, id 2743, seq 144, l
length 64
09:49:14.761614 IP 10.0.120.2 > 10.0.100.2: ICMP echo request, id 2739, seq 153,
length 64
09:49:14.761623 IP 10.0.100.2 > 10.0.120.2: ICMP echo reply, id 2739, seq 153, l
length 64
09:49:15.333578 IP 10.0.110.3 > 10.0.100.2: ICMP echo request, id 2743, seq 145,
length 64
09:49:15.333588 IP 10.0.100.2 > 10.0.110.3: ICMP echo reply, id 2743, seq 145, l
length 64
09:49:15.761941 IP 10.0.120.2 > 10.0.100.2: ICMP echo request, id 2739, seq 154,
length 64
09:49:15.761950 IP 10.0.100.2 > 10.0.120.2: ICMP echo reply, id 2739, seq 154, l
length 64
09:49:16.333824 IP 10.0.110.3 > 10.0.100.2: ICMP echo request, id 2743, seq 146,
length 64
09:49:16.333834 IP 10.0.100.2 > 10.0.110.3: ICMP echo reply, id 2743, seq 146, l
length 64

"Node: h3" (on mininet-vn) x
64 bytes from 10.0.100.2: icmp_seq=144 ttl=62 time=0.047 ms
64 bytes from 10.0.100.2: icmp_seq=145 ttl=62 time=0.047 ms
64 bytes from 10.0.100.2: icmp_seq=146 ttl=62 time=0.044 ms
64 bytes from 10.0.100.2: icmp_seq=147 ttl=62 time=0.044 ms
64 bytes from 10.0.100.2: icmp_seq=148 ttl=62 time=0.057 ms
64 bytes from 10.0.100.2: icmp_seq=149 ttl=62 time=0.046 ms
64 bytes from 10.0.100.2: icmp_seq=150 ttl=62 time=0.046 ms
64 bytes from 10.0.100.2: icmp_seq=151 ttl=62 time=0.072 ms
64 bytes from 10.0.100.2: icmp_seq=152 ttl=62 time=0.047 ms
64 bytes from 10.0.100.2: icmp_seq=153 ttl=62 time=0.219 ms
64 bytes from 10.0.100.2: icmp_seq=154 ttl=62 time=0.058 ms
64 bytes from 10.0.100.2: icmp_seq=155 ttl=62 time=0.229 ms
64 bytes from 10.0.100.2: icmp_seq=156 ttl=62 time=0.042 ms
64 bytes from 10.0.100.2: icmp_seq=157 ttl=62 time=0.040 ms
64 bytes from 10.0.100.2: icmp_seq=158 ttl=62 time=0.281 ms
64 bytes from 10.0.100.2: icmp_seq=159 ttl=62 time=0.050 ms
64 bytes from 10.0.100.2: icmp_seq=160 ttl=62 time=0.242 ms
64 bytes from 10.0.100.2: icmp_seq=161 ttl=62 time=0.232 ms
64 bytes from 10.0.100.2: icmp_seq=162 ttl=62 time=0.046 ms
64 bytes from 10.0.100.2: icmp_seq=163 ttl=62 time=0.232 ms
64 bytes from 10.0.100.2: icmp_seq=164 ttl=62 time=0.040 ms
64 bytes from 10.0.100.2: icmp_seq=165 ttl=62 time=0.040 ms
64 bytes from 10.0.100.2: icmp_seq=166 ttl=62 time=0.038 ms

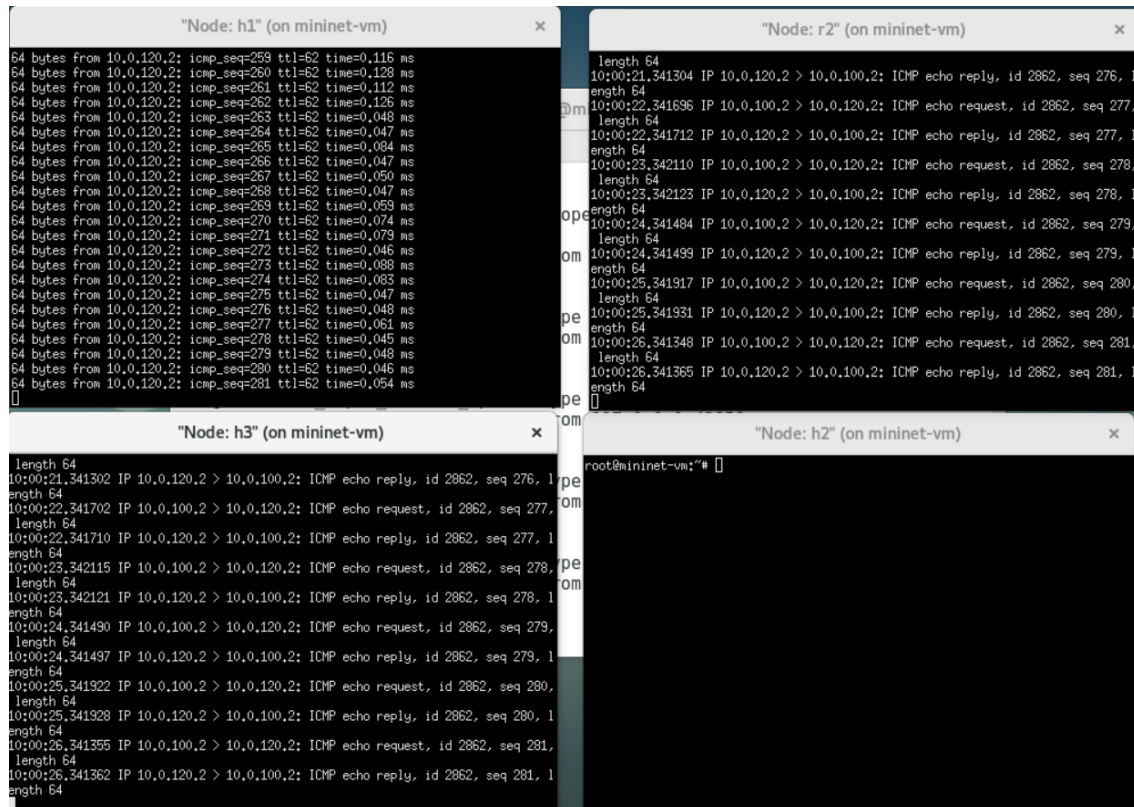
"Node: h2" (on mininet-vn) x
64 bytes from 10.0.100.2: icmp_seq=136 ttl=63 time=0.187 ms
64 bytes from 10.0.100.2: icmp_seq=137 ttl=63 time=0.069 ms
64 bytes from 10.0.100.2: icmp_seq=138 ttl=63 time=0.033 ms
64 bytes from 10.0.100.2: icmp_seq=139 ttl=63 time=0.037 ms
64 bytes from 10.0.100.2: icmp_seq=140 ttl=63 time=0.039 ms
64 bytes from 10.0.100.2: icmp_seq=141 ttl=63 time=0.047 ms
64 bytes from 10.0.100.2: icmp_seq=142 ttl=63 time=0.035 ms
64 bytes from 10.0.100.2: icmp_seq=143 ttl=63 time=0.065 ms
64 bytes from 10.0.100.2: icmp_seq=144 ttl=63 time=0.042 ms
64 bytes from 10.0.100.2: icmp_seq=145 ttl=63 time=0.174 ms
64 bytes from 10.0.100.2: icmp_seq=146 ttl=63 time=0.038 ms
64 bytes from 10.0.100.2: icmp_seq=147 ttl=63 time=0.174 ms
64 bytes from 10.0.100.2: icmp_seq=148 ttl=63 time=0.048 ms
64 bytes from 10.0.100.2: icmp_seq=149 ttl=63 time=0.038 ms
64 bytes from 10.0.100.2: icmp_seq=150 ttl=63 time=0.196 ms
64 bytes from 10.0.100.2: icmp_seq=151 ttl=63 time=0.048 ms
64 bytes from 10.0.100.2: icmp_seq=152 ttl=63 time=0.226 ms
64 bytes from 10.0.100.2: icmp_seq=153 ttl=63 time=0.188 ms
64 bytes from 10.0.100.2: icmp_seq=154 ttl=63 time=0.036 ms
64 bytes from 10.0.100.2: icmp_seq=155 ttl=63 time=0.174 ms
64 bytes from 10.0.100.2: icmp_seq=156 ttl=63 time=0.036 ms
64 bytes from 10.0.100.2: icmp_seq=157 ttl=63 time=0.049 ms
64 bytes from 10.0.100.2: icmp_seq=158 ttl=63 time=0.111 ms

"Node: r2" (on mininet-vn) x
root@mininet-vn:~#
```

Ilustración 11

Captura de tráfico en R2

Para comprobar la conectividad, vamos a hacer un Tcpcdump en el router para comprobar la entrada y salida de los paquetes de datos entre H1 Y H3:



The image shows four terminal windows from a Mininet VM environment, each displaying network traffic captures. The windows are titled: "Node: h1" (on mininet-vm), "Node: r2" (on mininet-vm), "Node: h3" (on mininet-vm), and "Node: h2" (on mininet-vm). The "Node: h1" and "Node: h3" windows show ICMP echo request and reply packets between 10.0.120.2 and 10.0.100.2. The "Node: r2" window shows ICMP echo request and reply packets between 10.0.120.2 and 10.0.100.2. The "Node: h2" window shows a root prompt and no traffic.

```
"Node: h1" (on mininet-vm) x
64 bytes from 10.0.120.2: icmp_seq=259 ttl=62 time=0.116 ms
64 bytes from 10.0.120.2: icmp_seq=260 ttl=62 time=0.128 ms
64 bytes from 10.0.120.2: icmp_seq=261 ttl=62 time=0.112 ms
64 bytes from 10.0.120.2: icmp_seq=262 ttl=62 time=0.126 ms
64 bytes from 10.0.120.2: icmp_seq=263 ttl=62 time=0.048 ms
64 bytes from 10.0.120.2: icmp_seq=264 ttl=62 time=0.047 ms
64 bytes from 10.0.120.2: icmp_seq=265 ttl=62 time=0.084 ms
64 bytes from 10.0.120.2: icmp_seq=266 ttl=62 time=0.047 ms
64 bytes from 10.0.120.2: icmp_seq=267 ttl=62 time=0.050 ms
64 bytes from 10.0.120.2: icmp_seq=268 ttl=62 time=0.047 ms
64 bytes from 10.0.120.2: icmp_seq=269 ttl=62 time=0.059 ms
64 bytes from 10.0.120.2: icmp_seq=270 ttl=62 time=0.074 ms
64 bytes from 10.0.120.2: icmp_seq=271 ttl=62 time=0.079 ms
64 bytes from 10.0.120.2: icmp_seq=272 ttl=62 time=0.046 ms
64 bytes from 10.0.120.2: icmp_seq=273 ttl=62 time=0.088 ms
64 bytes from 10.0.120.2: icmp_seq=274 ttl=62 time=0.083 ms
64 bytes from 10.0.120.2: icmp_seq=275 ttl=62 time=0.047 ms
64 bytes from 10.0.120.2: icmp_seq=276 ttl=62 time=0.048 ms
64 bytes from 10.0.120.2: icmp_seq=277 ttl=62 time=0.061 ms
64 bytes from 10.0.120.2: icmp_seq=278 ttl=62 time=0.045 ms
64 bytes from 10.0.120.2: icmp_seq=279 ttl=62 time=0.048 ms
64 bytes from 10.0.120.2: icmp_seq=280 ttl=62 time=0.046 ms
64 bytes from 10.0.120.2: icmp_seq=281 ttl=62 time=0.054 ms
[]

"Node: r2" (on mininet-vm) x
length 64
10:00:21.341304 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 276, l
length 64
10:00:22.341696 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 277,
length 64
10:00:22.341712 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 277, l
length 64
10:00:23.342110 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 278,
length 64
10:00:23.342123 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 278, l
length 64
10:00:24.341484 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 279,
length 64
10:00:24.341499 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 279, l
length 64
10:00:25.341917 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 280,
length 64
10:00:25.341931 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 280, l
length 64
10:00:26.341348 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 281,
length 64
10:00:26.341365 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 281, l
length 64
[]

"Node: h3" (on mininet-vm) x
length 64
10:00:21.341302 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 276, l
length 64
10:00:22.341702 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 277,
length 64
10:00:22.341710 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 277, l
length 64
10:00:23.342115 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 278,
length 64
10:00:23.342121 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 278, l
length 64
10:00:24.341490 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 279,
length 64
10:00:24.341497 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 279, l
length 64
10:00:25.341922 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 280,
length 64
10:00:25.341928 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 280, l
length 64
10:00:26.341355 IP 10.0.100.2 > 10.0.120.2: ICMP echo request, id 2862, seq 281,
length 64
10:00:26.341362 IP 10.0.120.2 > 10.0.100.2: ICMP echo reply, id 2862, seq 281, l
length 64
[]

"Node: h2" (on mininet-vm) x
root@mininet-vm:~# []
```

Ilustración 12