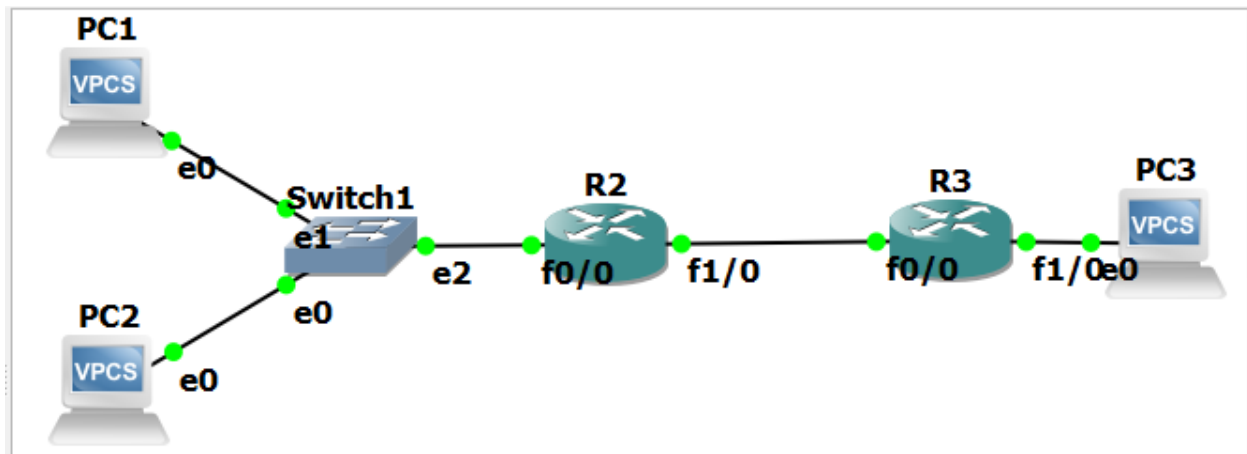


Topology for the lab:



Ping Network Devices:

Step 1 Observations:

At this point, the first PC is able to connect to addresses 10.1.1.2, 10.1.1.3, and 192.1.1.1. Address 10.1.1.2 has an average of 0.001 ms, while address 192.1.1.1 is the slowest. When I tried to ping address 192.1.1.2 using PC1, it resulted in a connection timeout, which was as expected.

```

PC1> ping 10.1.1.2
10.1.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=5 ttl=64 time=0.001 ms

PC1> ping 10.1.1.3
84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.513 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.482 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=0.479 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.599 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.534 ms

PC1> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=15.446 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.013 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=41.664 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=34.250 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=37.428 ms

PC1> ping 192.1.1.2
192.1.1.2 icmp_seq=1 timeout
192.1.1.2 icmp_seq=2 timeout
192.1.1.2 icmp_seq=3 timeout
192.1.1.2 icmp_seq=4 timeout
192.1.1.2 icmp_seq=5 timeout

PC1> 
  
```

Step 3 Observations:

After finishing some configuration settings in step 2, I checked the NAT table for all of the devices in the topology

I could ping all the devices using PC1. It was the slowest when pinging 10.2.1.2, which is the last PC (PC3), which is as expected.

```
PC1> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=14.540 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=15.195 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=15.109 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=15.289 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=15.375 ms

PC1> ping 10.1.1.2
10.1.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=5 ttl=64 time=0.001 ms

PC1> ping 10.1.1.3
84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.539 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.505 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=0.565 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.468 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.448 ms

PC1> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=15.605 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.171 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=15.501 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=15.202 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=15.313 ms

PC1> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=254 time=45.710 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=254 time=44.969 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=254 time=45.354 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=254 time=45.346 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=254 time=45.077 ms

PC1> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=254 time=46.073 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=254 time=45.172 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=254 time=45.132 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=254 time=45.314 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=254 time=45.332 ms

PC1> ping 10.2.1.2
84 bytes from 10.2.1.2 icmp_seq=1 ttl=62 time=75.151 ms
84 bytes from 10.2.1.2 icmp_seq=2 ttl=62 time=60.475 ms
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=45.391 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=45.574 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.249 ms
```

For PC2, when trying to ping address 10.2.1.2 (which corresponds to the address of PC3), there were two instances of timeouts reported. Then, for the rest of the tests, it resumed normally.

```
PC2> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=14.968 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=15.338 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=15.220 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=15.488 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=15.392 ms

PC2> ping 10.1.1.2
84 bytes from 10.1.1.2 icmp_seq=1 ttl=64 time=0.490 ms
84 bytes from 10.1.1.2 icmp_seq=2 ttl=64 time=0.612 ms
84 bytes from 10.1.1.2 icmp_seq=3 ttl=64 time=0.571 ms
84 bytes from 10.1.1.2 icmp_seq=4 ttl=64 time=0.521 ms
84 bytes from 10.1.1.2 icmp_seq=5 ttl=64 time=0.660 ms

PC2> ping 10.1.1.3
10.1.1.3 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=5 ttl=64 time=0.001 ms

PC2> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=14.883 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.273 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=15.239 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=15.320 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=15.459 ms

PC2> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=254 time=44.951 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=254 time=44.894 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=254 time=45.147 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=254 time=45.416 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=254 time=45.087 ms

PC2> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=254 time=45.729 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=254 time=45.130 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=254 time=45.135 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=254 time=45.099 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=254 time=45.073 ms

PC2> ping 10.2.1.2
10.2.1.2 icmp_seq=1 timeout
10.2.1.2 icmp_seq=2 timeout
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=60.012 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=60.071 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.098 ms
```

Lastly, for PC3, there were two timeouts reported each for 10.1.1.2, which is PC1 and is understandable because it is on the other end of the path, and 10.1.1.3, which is the address for PC2. The tests for the routers seemed to have no issues; There were only issues when testing to connect to the other PC devices in the network.

```
PC3> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=254 time=46.098 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=254 time=45.999 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=254 time=45.118 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=254 time=44.993 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=254 time=45.094 ms

PC3> ping 10.1.1.2
10.1.1.2 icmp_seq=1 timeout
10.1.1.2 icmp_seq=2 timeout
84 bytes from 10.1.1.2 icmp_seq=3 ttl=62 time=61.171 ms
84 bytes from 10.1.1.2 icmp_seq=4 ttl=62 time=59.997 ms
84 bytes from 10.1.1.2 icmp_seq=5 ttl=62 time=59.889 ms

PC3> ping 10.1.1.3
10.1.1.3 icmp_seq=1 timeout
10.1.1.3 icmp_seq=2 timeout
84 bytes from 10.1.1.3 icmp_seq=3 ttl=62 time=59.844 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=62 time=59.917 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=62 time=60.072 ms

PC3> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=254 time=46.066 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=254 time=45.060 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=254 time=45.076 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=254 time=45.809 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=254 time=45.858 ms

PC3> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=255 time=15.115 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=255 time=15.699 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=255 time=14.781 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=255 time=15.989 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=255 time=15.139 ms

PC3> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=255 time=15.083 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=255 time=16.006 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=255 time=15.526 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=255 time=15.225 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=255 time=15.096 ms

PC3> ping 10.2.1.2
10.2.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=5 ttl=64 time=0.001 ms
```

NAT inside the access network:

The final NAT Table:

I chose to ping PC1 to PC3

```
PC1> ping 10.2.1.2
10.2.1.2 icmp_seq=1 timeout
10.2.1.2 icmp_seq=2 timeout
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=59.673 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=60.072 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.105 ms

PC1> █
```

Description of steps:

When setting up a GNS3 network topology, you will first create a template router. You will configure this template router using an downloaded image of some router. When setting this up, go to the Dynamips/IOS routers tab and set the idle value to 0x6050b114, or generate your own

idle value. Start by creating the devices (PCs) that are going to connect to each other. Then, going through each path that connects these PC devices together, a router should be supplemented. You'll also want to have a switch connected somewhere in the middle of the path, more preferably, in between a PC and a router. The switch allows devices in the network to communicate with each other using Ethernet cables.

Now, it is time to connect these devices together. You have to be careful because when connecting different devices (whether it be PCs, routers, or switches) you have to make sure that the port that you are connecting to is not already taken by another previous device. For example, if I was connecting PC1 to Switch1, I'll first check if ethernet port 1 is taken or not, if it is, then move on to the next available port, port 2. If that is taken, then check for the next available port. Let's say that port 3 is not currently taken by any device. Now, we can set that connection between PC1 and Switch1 via ethernet port 3.

When connecting from a device to a router, you will do the same process. Except, now you are making a connection to a FastEthernet interface. When connecting to a router, find a port that is not taken. For example, f0/0 designates the first port, while f0/1 designates a second port. The first digit corresponds with the module number of the interface.

Then, opening the console for each device, you will set the ip addresses of each device, and then set the ip address of the port that you are connecting to, specifying the port for the interfaces of the routers when needed. Make sure that the address of the routers match, meaning that they are assigned an interface on the same network (i.e. let's say Router2 has address 192.1.1.1/24, then set Router3's address to 192.1.1.2/24).

In doing this, you can ensure that there is an existing path for all of the devices to reach each other for a working topology.

Just for reference, here are all of the screenshots for the lab (in no particular order):

```

R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface FastEthernet0/0
R2(config-if)#ip addr 10.1.1.1 255.255.255.0
R2(config-if)#no shut
R2(config-if)#
*Nov 30 23:06:15.391: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Nov 30 23:06:16.391: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#
*Nov 30 23:06:24.207: %SYS-5-CONFIG_I: Configured from console by console
R2#show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          10.1.1.1        YES manual up          up
FastEthernet1/0          unassigned      YES unset  administratively down down
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface FastEthernet1/0
R2(config-if)#ip addr 192.1.1.1 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit e
*Nov 30 23:25:19.163: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Nov 30 23:25:20.163: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#
*Nov 30 23:25:26.707: %SYS-5-CONFIG_I: Configured from console by console
R2#show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          10.1.1.1        YES manual up          up
FastEthernet1/0          192.1.1.1       YES manual up          up
R2#

```

```

PC1> ip 10.1.1.2/24
Checking for duplicate address...
PC1 : 10.1.1.2 255.255.255.0

PC1> show ip

NAME       : PC1[1]
IP/MASK    : 10.1.1.2/24
GATEWAY    : 0.0.0.0
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 10020
RHOST:PORT : 127.0.0.1:10021
MTU       : 1500

PC1> ip 10.1.1.2/24 10.1.1.1
Checking for duplicate address...
PC1 : 10.1.1.2 255.255.255.0 gateway 10.1.1.1

PC1>

```

```

PC2> ip 10.1.1.3/24
Checking for duplicate address...
PC1 : 10.1.1.3 255.255.255.0

PC2> show ip

NAME       : PC2[1]
IP/MASK     : 10.1.1.3/24
GATEWAY     : 0.0.0.0
DNS         :
MAC         : 00:50:79:66:68:01
LPORT      : 10018
RHOST:PORT  : 127.0.0.1:10019
MTU         : 1500

PC2> ip 10.1.1.3/24 10.1.1.1
Checking for duplicate address...
PC1 : 10.1.1.3 255.255.255.0 gateway 10.1.1.1

PC2> █

```

```

R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface FastEthernet0/0
R3(config-if)#ip addr 192.1.1.2 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#exit
R3#
*Nov 30 23:29:00.767: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3#
*Nov 30 23:29:01.455: %SYS-5-CONFIG_I: Configured from console by console
*Nov 30 23:29:01.767: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3#show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          192.1.1.2       YES manual up          up
FastEthernet1/0          unassigned      YES unset  administratively down down
R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface FastEthernet1/0
R3(config-if)#ip addr 10.2.1.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#exit
R3#
*Nov 30 23:32:22.919: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Nov 30 23:32:23.919: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R3(config)#exit
R3#
*Nov 30 23:32:25.311: %SYS-5-CONFIG_I: Configured from console by console
R3#show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0/0          192.1.1.2       YES manual up          up
FastEthernet1/0          10.2.1.1        YES manual up          up
R3# █

```

```

PC3> ip 10.2.1.2
Checking for duplicate address...
PC1 : 10.2.1.2 255.255.255.0

PC3> show ip

NAME       : PC3[1]
IP/MASK     : 10.2.1.2/24
GATEWAY     : 0.0.0.0
DNS         :
MAC         : 00:50:79:66:68:02
LPORT      : 10022
RHOST:PORT  : 127.0.0.1:10023
MTU         : 1500

PC3> ip 10.2.1.2 10.2.1.1
Checking for duplicate address...
PC1 : 10.2.1.2 255.255.255.0 gateway 10.2.1.1

PC3>

```

```

PC1> ping 10.2.1.2
10.2.1.2 icmp_seq=1 timeout
10.2.1.2 icmp_seq=2 timeout
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=59.673 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=60.072 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.105 ms

PC1>

```

```

R2#show ip interface brief

```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.1.1.1	YES	manual	up	up
FastEthernet1/0	192.1.1.1	YES	manual	up	up
NVI0	10.1.1.1	YES	unset	up	up

```

R2#

```

```

R3#show ip interface brief

```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	192.1.1.2	YES	manual	up	up
FastEthernet1/0	10.2.1.1	YES	manual	up	up

```

R3#

```



```
PC1> ping 10.1.1.2
10.1.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=5 ttl=64 time=0.001 ms

PC1> ping 10.1.1.3
84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.513 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.482 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=0.479 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.599 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.534 ms

PC1> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=15.446 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.013 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=41.664 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=34.250 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=37.428 ms

PC1> ping 192.1.1.2
192.1.1.2 icmp_seq=1 timeout
192.1.1.2 icmp_seq=2 timeout
192.1.1.2 icmp_seq=3 timeout
192.1.1.2 icmp_seq=4 timeout
192.1.1.2 icmp_seq=5 timeout

PC1> █
```

```
R2(config)#ip route 0.0.0.0 0.0.0.0 192.1.1.2
R2(config)#exit
R2#show
*Dec 1 00:44:30.895: %SYS-5-CONFIG_I: Configured from console by console
R2#show 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-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.1.1.2 to network 0.0.0.0

    10.0.0.0/24 is subnetted, 1 subnets
C       10.1.1.0 is directly connected, FastEthernet0/0
C       192.1.1.0/24 is directly connected, FastEthernet1/0
S*     0.0.0.0/0 [1/0] via 192.1.1.2
R2# █
```

```
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip route 0.0.0.0 0.0.0.0 192.1.1.1
R3(config)#exit
R3#show
*Dec 1 00:46:57.883: %SYS-5-CONFIG_I: Configured from console by console
R3#show 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-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.1.1.1 to network 0.0.0.0

    10.0.0.0/24 is subnetted, 1 subnets
C       10.2.1.0 is directly connected, FastEthernet1/0
C       192.1.1.0/24 is directly connected, FastEthernet0/0
S*     0.0.0.0/0 [1/0] via 192.1.1.1
R3#
```

```
PC1> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=14.540 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=15.195 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=15.109 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=15.289 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=15.375 ms

PC1> ping 10.1.1.2
10.1.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.2 icmp_seq=5 ttl=64 time=0.001 ms

PC1> ping 10.1.1.3
84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.539 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.505 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=0.565 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.468 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.448 ms

PC1> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=15.605 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.171 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=15.501 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=15.202 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=15.313 ms

PC1> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=254 time=45.710 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=254 time=44.969 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=254 time=45.354 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=254 time=45.346 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=254 time=45.077 ms

PC1> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=254 time=46.073 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=254 time=45.172 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=254 time=45.132 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=254 time=45.314 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=254 time=45.332 ms

PC1> ping 10.2.1.2
84 bytes from 10.2.1.2 icmp_seq=1 ttl=62 time=75.151 ms
84 bytes from 10.2.1.2 icmp_seq=2 ttl=62 time=60.475 ms
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=45.391 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=45.574 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.249 ms
```

```
PC2> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=14.968 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=15.338 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=15.220 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=15.488 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=15.392 ms

PC2> ping 10.1.1.2
84 bytes from 10.1.1.2 icmp_seq=1 ttl=64 time=0.490 ms
84 bytes from 10.1.1.2 icmp_seq=2 ttl=64 time=0.612 ms
84 bytes from 10.1.1.2 icmp_seq=3 ttl=64 time=0.571 ms
84 bytes from 10.1.1.2 icmp_seq=4 ttl=64 time=0.521 ms
84 bytes from 10.1.1.2 icmp_seq=5 ttl=64 time=0.660 ms

PC2> ping 10.1.1.3
10.1.1.3 icmp_seq=1 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=2 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=3 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=4 ttl=64 time=0.001 ms
10.1.1.3 icmp_seq=5 ttl=64 time=0.001 ms

PC2> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=255 time=14.883 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=255 time=15.273 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=255 time=15.239 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=255 time=15.320 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=255 time=15.459 ms

PC2> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=254 time=44.951 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=254 time=44.894 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=254 time=45.147 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=254 time=45.416 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=254 time=45.087 ms

PC2> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=254 time=45.729 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=254 time=45.130 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=254 time=45.135 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=254 time=45.099 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=254 time=45.073 ms

PC2> ping 10.2.1.2
10.2.1.2 icmp_seq=1 timeout
10.2.1.2 icmp_seq=2 timeout
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=60.012 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=60.071 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=60.098 ms
```

```
PC3> ping 10.1.1.1
84 bytes from 10.1.1.1 icmp_seq=1 ttl=254 time=46.098 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=254 time=45.999 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=254 time=45.118 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=254 time=44.993 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=254 time=45.094 ms

PC3> ping 10.1.1.2
10.1.1.2 icmp_seq=1 timeout
10.1.1.2 icmp_seq=2 timeout
84 bytes from 10.1.1.2 icmp_seq=3 ttl=62 time=61.171 ms
84 bytes from 10.1.1.2 icmp_seq=4 ttl=62 time=59.997 ms
84 bytes from 10.1.1.2 icmp_seq=5 ttl=62 time=59.889 ms

PC3> ping 10.1.1.3
10.1.1.3 icmp_seq=1 timeout
10.1.1.3 icmp_seq=2 timeout
84 bytes from 10.1.1.3 icmp_seq=3 ttl=62 time=59.844 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=62 time=59.917 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=62 time=60.072 ms

PC3> ping 192.1.1.1
84 bytes from 192.1.1.1 icmp_seq=1 ttl=254 time=46.066 ms
84 bytes from 192.1.1.1 icmp_seq=2 ttl=254 time=45.060 ms
84 bytes from 192.1.1.1 icmp_seq=3 ttl=254 time=45.076 ms
84 bytes from 192.1.1.1 icmp_seq=4 ttl=254 time=45.809 ms
84 bytes from 192.1.1.1 icmp_seq=5 ttl=254 time=45.858 ms

PC3> ping 192.1.1.2
84 bytes from 192.1.1.2 icmp_seq=1 ttl=255 time=15.115 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=255 time=15.699 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=255 time=14.781 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=255 time=15.989 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=255 time=15.139 ms

PC3> ping 10.2.1.1
84 bytes from 10.2.1.1 icmp_seq=1 ttl=255 time=15.083 ms
84 bytes from 10.2.1.1 icmp_seq=2 ttl=255 time=16.006 ms
84 bytes from 10.2.1.1 icmp_seq=3 ttl=255 time=15.526 ms
84 bytes from 10.2.1.1 icmp_seq=4 ttl=255 time=15.225 ms
84 bytes from 10.2.1.1 icmp_seq=5 ttl=255 time=15.096 ms

PC3> ping 10.2.1.2
10.2.1.2 icmp_seq=1 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=2 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=3 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=4 ttl=64 time=0.001 ms
10.2.1.2 icmp_seq=5 ttl=64 time=0.001 ms
```

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface f0/0
R2(config-if)#ip nat inside

*Dec  1 01:00:57.515: %LINEPROTO-5-UPDOWN: Line protocol on Interface NVI0, changed state to up
R2(config-if)#interface f1/0
R2(config-if)#ip nat outside
R2(config-if)#exit
R2(config)#access-list 10 permit 10.1.1.0 0.0.0.255
R2(config)#ip nat inside source list 10 interface f1/0 overload
R2(config)#debug ip nat
      ^
% Invalid input detected at '^' marker.

R2(config)#exit
R2#debug i
*Dec  1 01:03:45.875: %SYS-5-CONFIG_I: Configured from console by console
R2#debug ip nat
IP NAT debugging is on
R2#
```