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**Observations Report**

Setting up GNS3 requires many different steps but if done correctly and in order, it can be done easily.

First GNS3 must be installed for your device's respective operating system. When prompted input the root password and select the local machine option (opposed to the VM option). Default settings should be used for everything else.

GNS3 comes with a select number of devices (e.g. PCs, switches) not among which are routers–they must be set up manually. To do this, navigate to Preferences -> Dynamips -> IOS routers. From there, you will want to click new at the bottom of the screen and browse to your desired router .image (.bin when compressed) file. You may name this template router anything but keep other default settings the same until the Idle-PC field is reached. If this value is known then input it and press finish otherwise press "Idle-PC finder" and use the given value.

Now that you have all the required devices set up for a basic network, you may add such devices into your network as desired. Devices should be connected via the "Add a link" tool button on the left of the GNS3 window. It should be noted that PCs have one "link port" so they may only be connected to one other device. An example network may have two PCs connected to each other via a router; PC1 connects to f0/0 and f0/1 connects to PC2.

This is the graphical side of setting up a network on GNS3. Additionally, you must connect your devices via commands through your console. Make sure that GNS3 has permission to open your desired console application before proceeding.

Configuring Routers:
- Right click on the router and press the "Console" option from the drop-down.
- Type `config t`
- To configure the router's interfaces type `interface FastEthernet0/(0 or 1)`, "0 or 1" refers to the interface
- Now that the desired interface is selected, assign the intended ip address to said interface using the command `ip addr X.X.X.X 255.255.255.0` where the Xs denote the IP address
- Type `no shut`
- Type `exit` or (CTRL + Z) to exit configuration mode

Configuring PCs:
- Open the PC's console by right clicking on the device and selecting the "Console" option from the drop-down.
- Type `ip X.X.X.X/MASK`, to set the PC's IP address ensuring that this address is not used already (it will check for you)
- Type `show ip` to check the assigned IP address

- Next, type `ip X.X.X.X/MASK Y.Y.Y.Y`, where the first address is the PC's address and the second address is the routers address

Configuring NAT for a Router:
- Go to the console for the desired router and type `config t`
- Configure interface f0/0 as a NAT inside and interface f0/1 as a NAT outside by typing:
  ```
  > interface f0/0
  > ip nat inside
  > interface f0/1
  > ip nat outside
  ```
- Create the range of address inside that will be translated to the address of interface f0/1 by typing:
  ```
  > exit
  > access-list 10 permit X.X.X.0 0.0.0.255
  > ip nat inside source list 10 interface f0/1 overload
  ```
- Check the NAT table on R2 by typing
  ```
  > debug ip nat
  ```

[PC1> ping 10.1.1.1

84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=10.579 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=2.877 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=9.670 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=13.845 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=5.299 ms

PC1> ping 10.1.1.3

84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.203 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.154 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=87.959 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.226 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.220 ms

PC1> ping 10.2.1.2

84 bytes from 10.2.1.2 icmp_seq=1 ttl=62 time=73.325 ms
84 bytes from 10.2.1.2 icmp_seq=2 ttl=62 time=51.512 ms
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=41.755 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=33.319 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=155.914 ms

[R1> ping 10.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 12/14/20 ms

[PC2> ping 10.1.1.1

84 bytes from 10.1.1.1 icmp_seq=1 ttl=255 time=14.598 ms
84 bytes from 10.1.1.1 icmp_seq=2 ttl=255 time=9.422 ms
84 bytes from 10.1.1.1 icmp_seq=3 ttl=255 time=6.238 ms
84 bytes from 10.1.1.1 icmp_seq=4 ttl=255 time=1.472 ms
84 bytes from 10.1.1.1 icmp_seq=5 ttl=255 time=2.429 ms

[R2> ping 10.2.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.2.1.1, timeout is 2 seconds:
!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms

[PC3> ping 192.1.1.2

84 bytes from 192.1.1.2 icmp_seq=1 ttl=255 time=3.614 ms
84 bytes from 192.1.1.2 icmp_seq=2 ttl=255 time=5.525 ms
84 bytes from 192.1.1.2 icmp_seq=3 ttl=255 time=2.498 ms
84 bytes from 192.1.1.2 icmp_seq=4 ttl=255 time=2.585 ms
84 bytes from 192.1.1.2 icmp_seq=5 ttl=255 time=2.734 ms

[PC1> ping 10.2.1.2 (PC1 to PC3)

84 bytes from 10.2.1.2 icmp_seq=1 ttl=62 time=83.552 ms
84 bytes from 10.2.1.2 icmp_seq=2 ttl=62 time=38.699 ms
84 bytes from 10.2.1.2 icmp_seq=3 ttl=62 time=34.788 ms
84 bytes from 10.2.1.2 icmp_seq=4 ttl=62 time=32.094 ms
84 bytes from 10.2.1.2 icmp_seq=5 ttl=62 time=37.902 ms