NAT 网络地址转换

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实验地点：济事楼 330　　实验时间：2020 年 10 月 29 日 78 节

【实验目的】

1.通过实验理解、体会地址转换原理（NAT），理解私有网络与互联网互通原理。

2.了解 NAT 技术并能进行相关的配置操作。

3.理解与掌握网络地址转换技术，并理解其对于网络安全的意义。

【实验原理】

1.网络地址转换技术

网络地址转换技术（Network Address Translation,NAT），是指在实施包过滤机制时，通过对 IP 数据包地址进行改变从而实现不同地址类型转换的一种技术。网络地址转换技术用途广泛，可用于私有网络与互联网互通，家庭接入互联网共享等网络应用。其能够解决 IP 地址不足的问题（32 位的 IP 地址并不是太多），同时还能有效保护来自网络外部的攻击，隐藏并保护网络内部的计算机。

2.网络地址转换原理

私有网络开展网络应用，也需要使用 IP 地址，但是是一种私有地址，如同济大学以 10 开头的私有网络地址，通常情况下私有网络地址不能够和互联网进行连通，因为互联网路由器不支持私有地址，其路由表不允许设置私有地址条目，通信时，IP 数据包能够外出到达互联网，但无法返回源节点，而通过实施网络地址转换可以实现私有网络与互联网互通。

其原理为利用连接双方的路由器，在实施包过滤机制时进行地址转换，当从私有网络前往互联网时，就将私有地址转换成一个标准 IP 地址（并在 NAT 转换表中保存这条记录），当从互联网返回私有网络时，就将这个标准 IP 地址再转换回私有地址（通过查看当前 NAT 转换表），如此实现私有网络和互联网互联，私有网络和互联网通常称为内网和外网。

3.网络地址转换技术特点

NAT 技术将外网地址作为工作地址，内网内可以直接使用该工作地址，而外网却不能够直接访问内网地址，必须使用其转换地址，而转换地址需要一定途径才能获得。因此 NAT 技术能够很好解决私有网络和外网的互联问题，让私有网络实现信息服务共享，同时还具备一定的安全作用，可以有效控制对外网对私有网络的主机地址进行访问，允许转换的网络接受外部访问，不允许转换的地址则拒绝访问。

4.网络地址转换技术分类

NAT 将网络划分为内网、外网两部分，内网节点利用 NAT 访问外网时，NAT 将内网地址替换为合法的 IP 标准地址，然后将数据包转发，在数据包从外网返回内网时，NAT 将外网地址替换为内网地址然后转发给相应节点，整个过程通过维护一个 NAT 转换表实现。

网络地址转换分为两种类型：NAT（如上述介绍），NAPT（网络地址端口转换 Network Address Port Translation，将端口地址也加入作为转换内容，能够实现多个私网节点同时共享一个互联网地址，家庭共享上网采用这种方式）。

NAT 又可分为静态 NAT 和动态 NAT，静态 NAT 是实现内网地址和外网地址一对一映射，而动态 NAT 是一个地址池，实现内网地址和外网地址一对多映射，应用较少。

【实验设备】

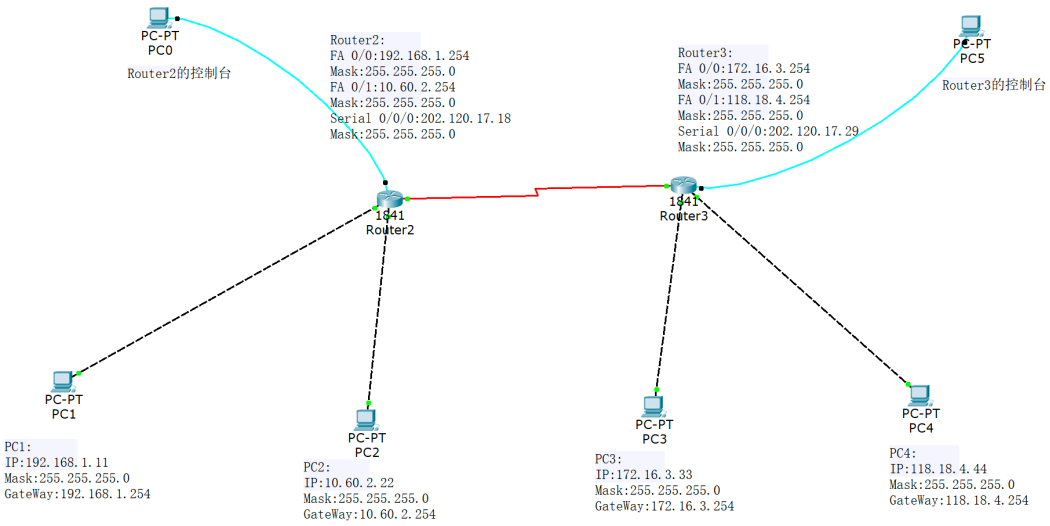
1.一台运行 Windows 的计算机。

2.Cisco 仿真终端软件 Cisco Packet Tracer。

【实验步骤】

1.首先规划网络结构及其拓扑。

2.根据网络拓扑图（如下）配置响应 PC、路由器端口、串口的 IP 地址、子网掩码等信息。



路由器相关配置命令如下：

Router2:

interface FastEthernet 0/0

ip address 192.168.1.254 255.255.255.0

interface FastEthernet 0/1

ip address 10.60.2.254 255.255.255.0

no shutdown

interface Serial 0/0/0

ip address 202.120.17.18 255.255.255.0

Clock rate 56000

no shutdown

Router3:

interface FastEthernet 0/0

ip address 172.16.3.254 255.255.255.0

interface FastEthernet 0/1

ip address 118.8.4.254 255.255.255.0

no shutdown

interface Serial 0/0/0

ip address 202.120.17.29 255.255.255.0

Clock rate 56000

no shutdown

3.在各路由器上配置静态路由协议，让 PC 间能够相互连通（Ping）。

静态路由表配置命令如下：

Router2:

ip route 218.100.3.0 255.255.255.0 serial 0/0/0

ip route 118.18.4.0 255.255.255.0 serial 0/0/0

Router3:

ip route 10.60.2.0 255.255.255.0 serial 0/0/0

ip route 210.120.1.0 255.255.255.0 serial 0/0/0

4.在路由器上配置静态 NAT。

NAT 相关配置命令如下：

Router2:

interface FastEthernet 0/0

ip nat inside //配置以太网端口实施入口 NAT 转换

interface Serial 0/0/0

ip nat outside //配置串口实施出口 NAT 转换

Router3:

interface FastEthernet 0/0

ip nat inside //配置以太网端口实施入口 NAT 转换

interface Serial 0/0/0

ip nat outside //配置串口实施出口 NAT 转换

5.在路由器上定义内、外部网络接口。

配置路由器 NAT 转换相关命令如下：

router2:

ip nat inside source static 192.168.1.11 210.120.1.11

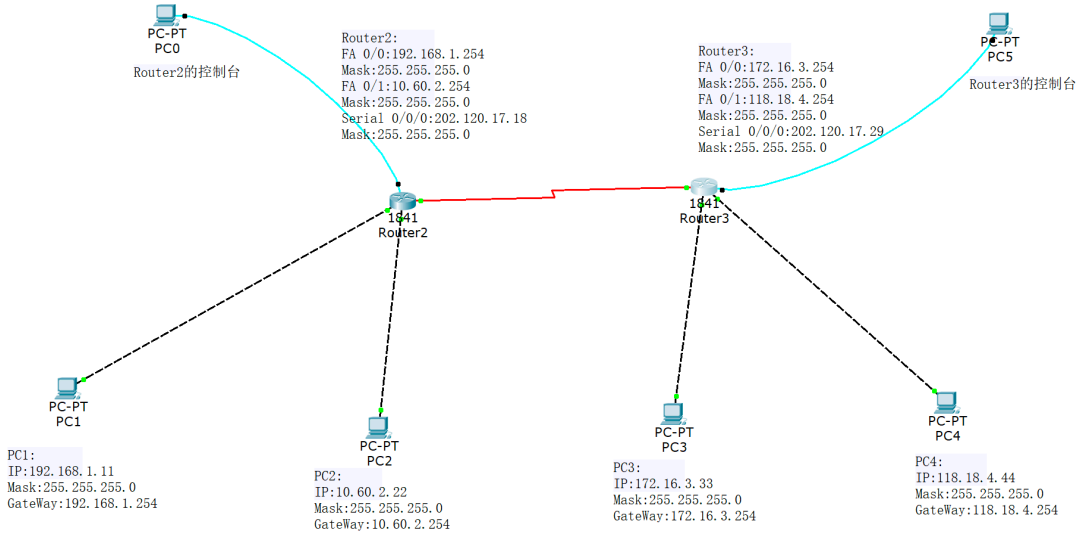
router3:

ip nat inside source static 172.16.3.33 218.100.3.33

6.再次验证各主机之间的连通性，检测从内网访问外网连通性如何，从外网访问内网连通性如何。

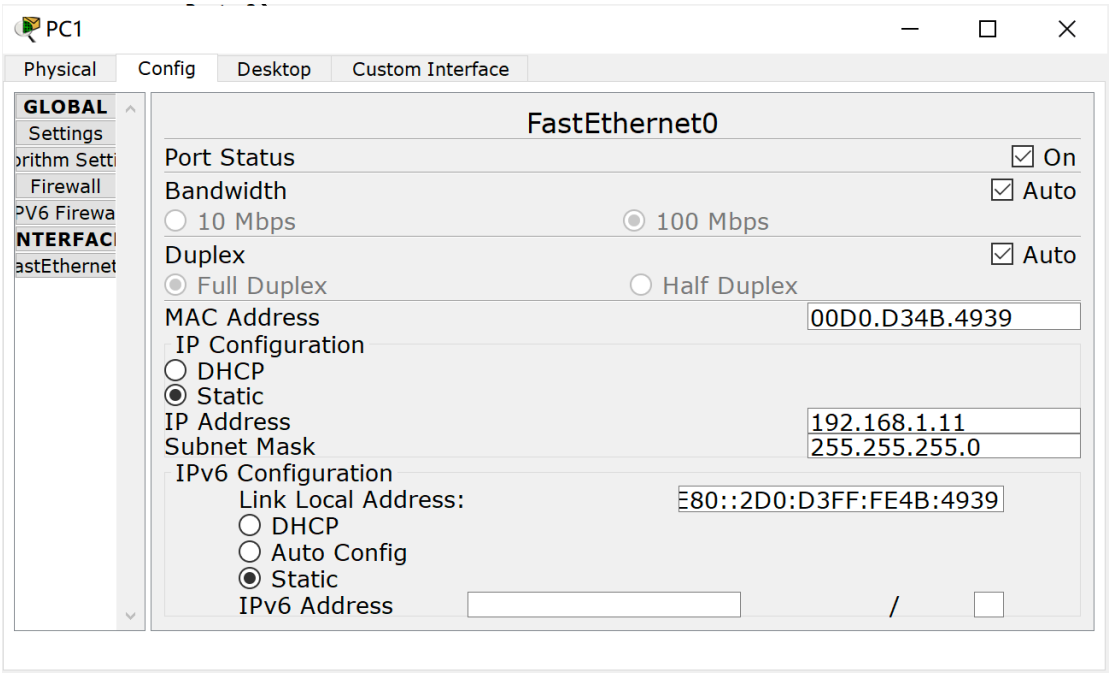
【实验现象】

1.网络拓扑结构如下图。

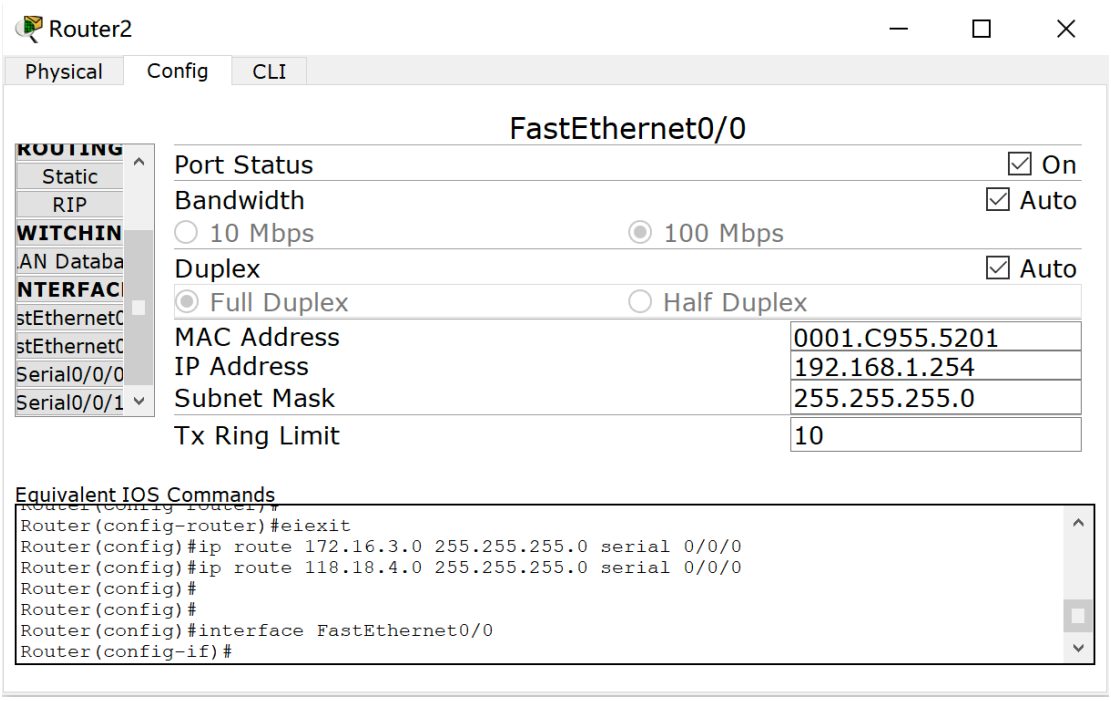


2.PC、路由器端口、串口配置信息如下。

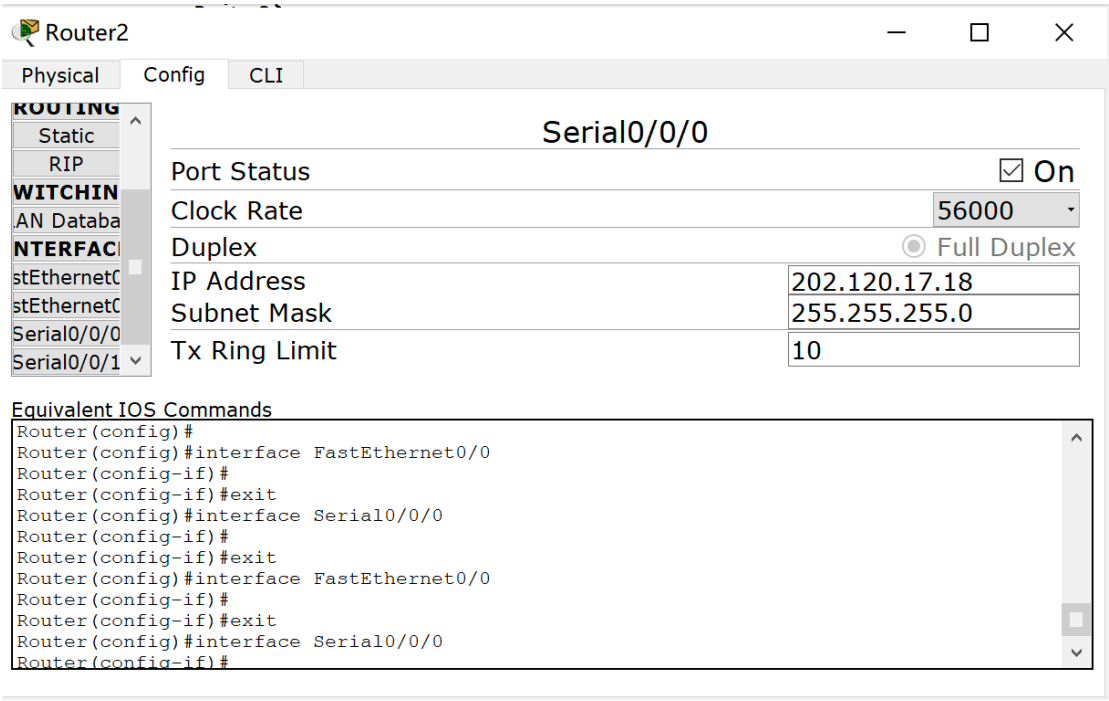
PC 的 IP 地址、子网掩码、网关配置如下。



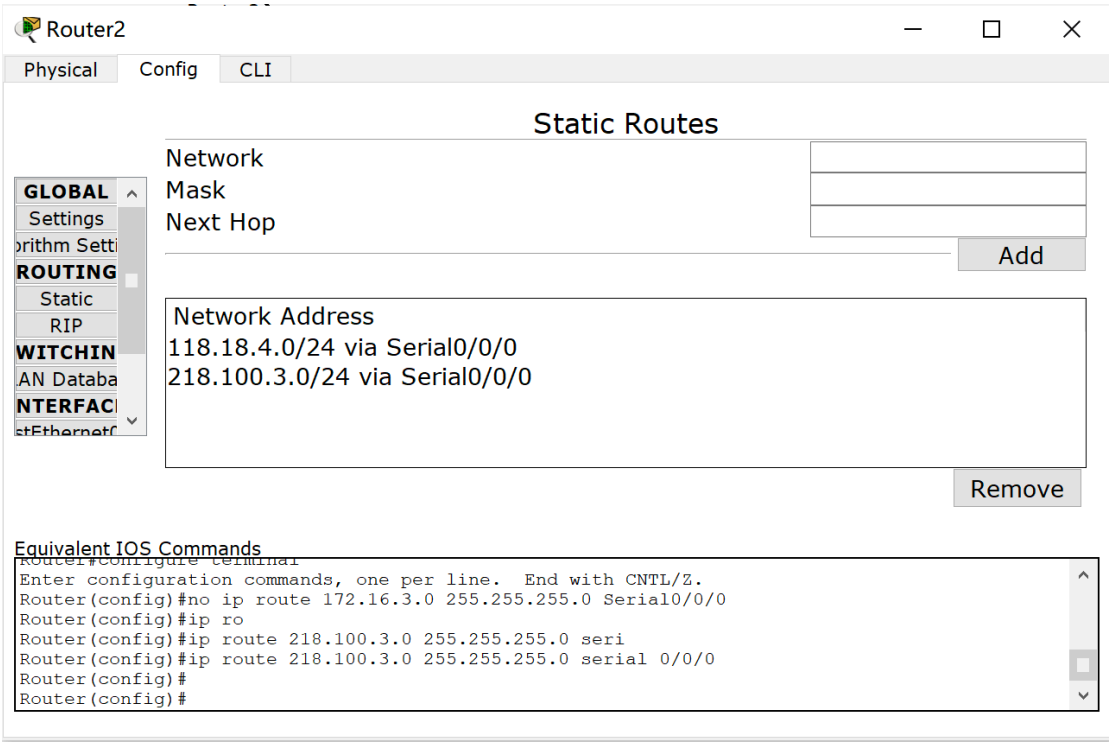
路由器网卡 IP 地址、子网掩码如下。

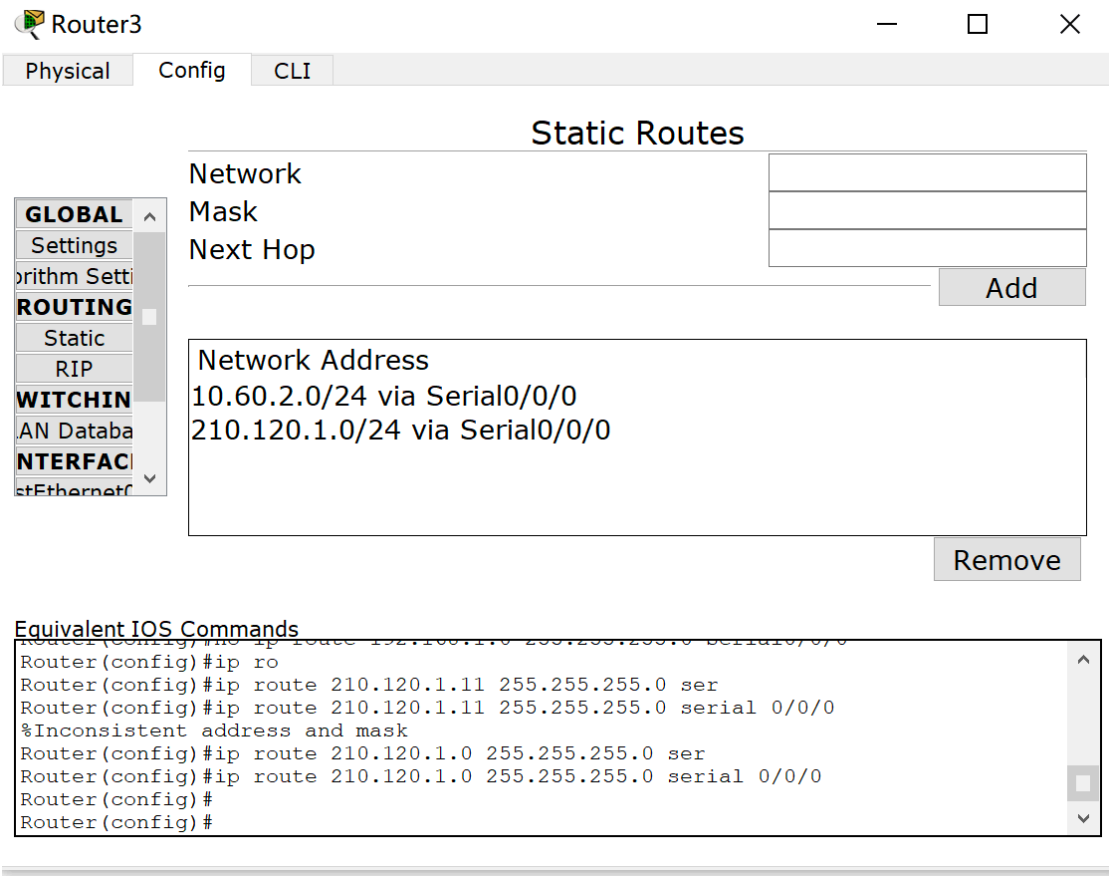


路由器串口 IP 地址、子网掩码配置如下。



3.在路由器上添加静态路由如下。





PC 之间 Ping 连通性测试。

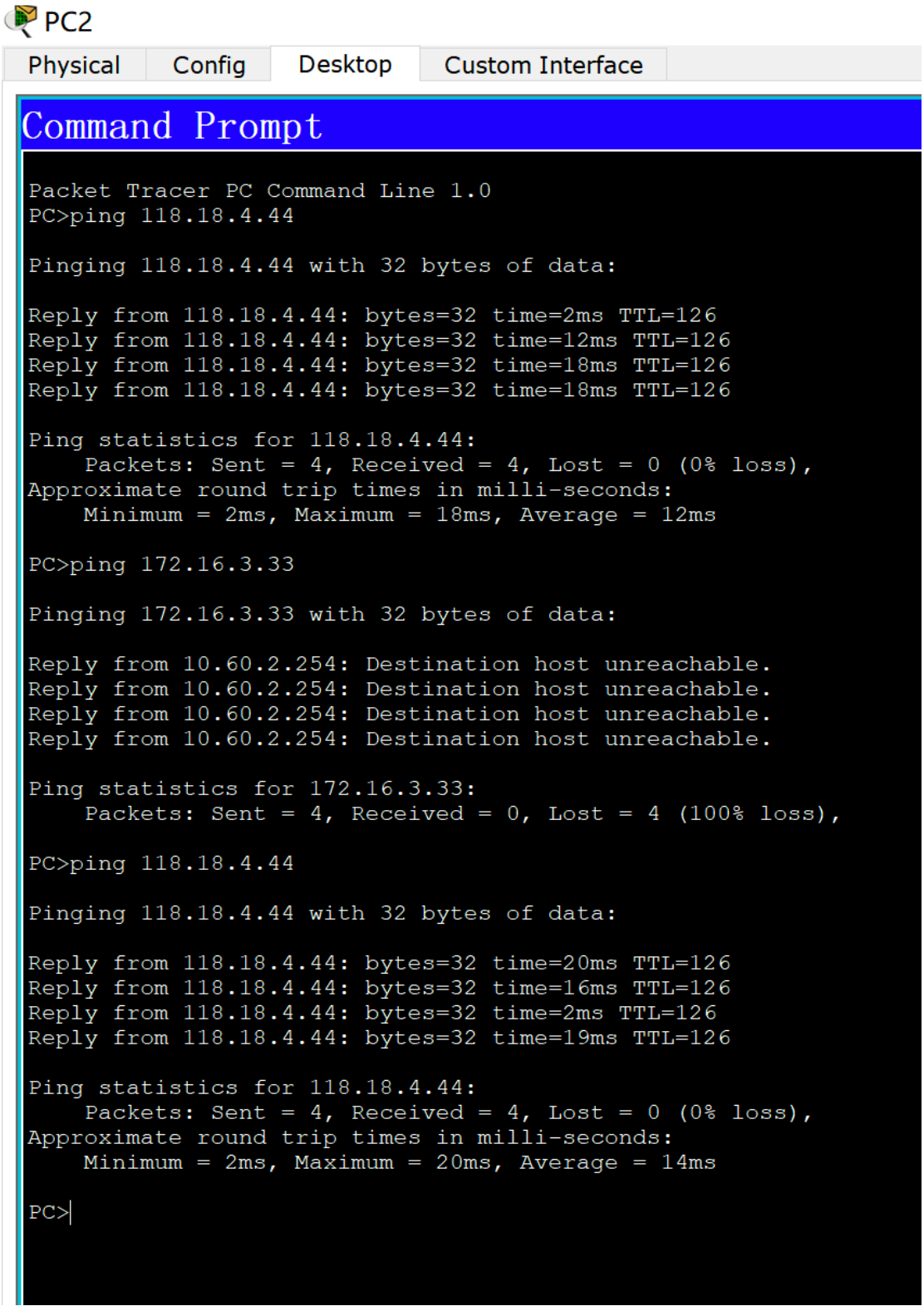
PC1

Physical | Config | Desktop | Custom Interface

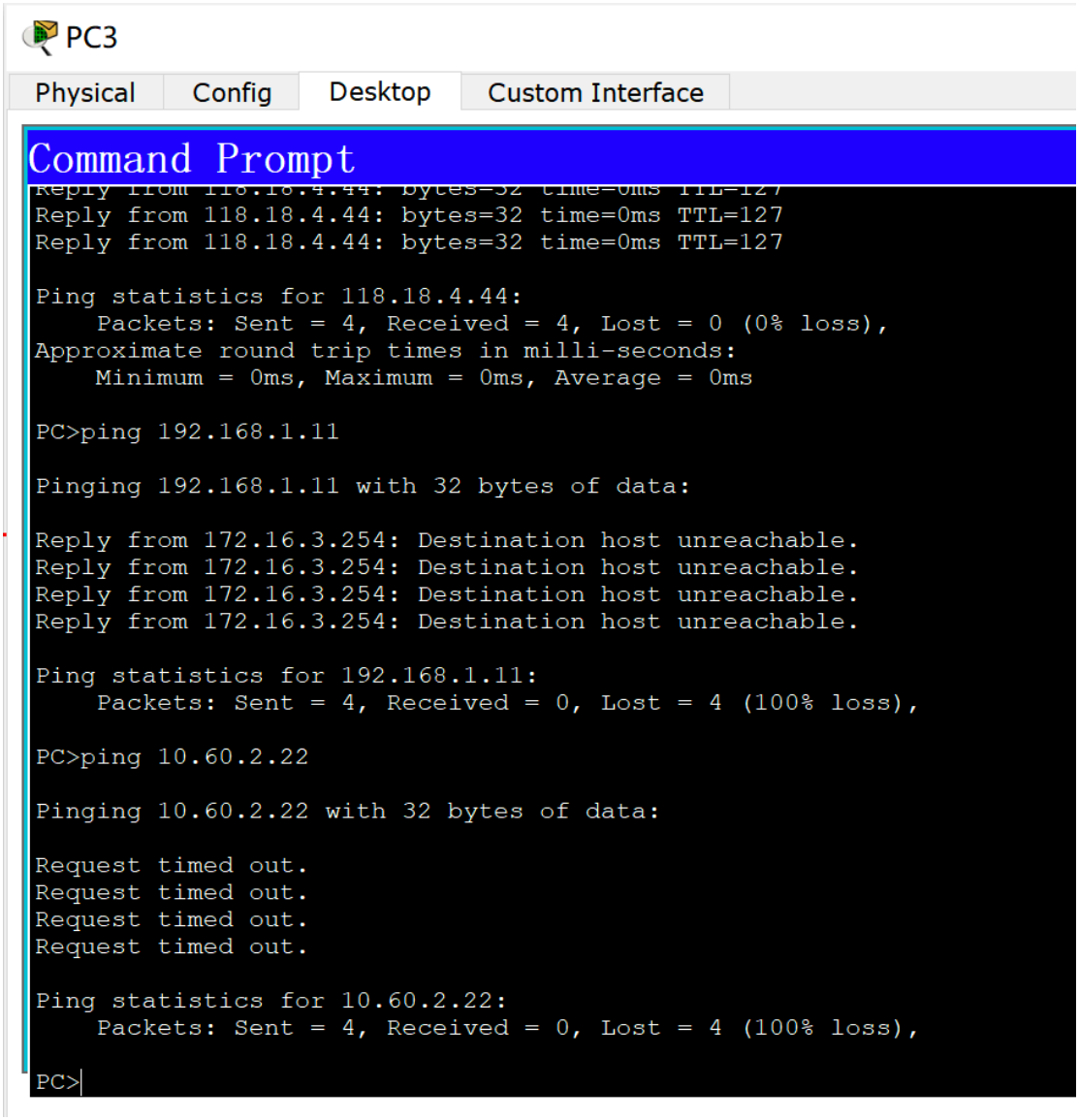
Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping
PC>
PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=1ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Ping statistics for 10.60.2.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=1ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127
Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Ping statistics for 10.60.2.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 172.16.3.33

Pinging 172.16.3.33 with 32 bytes of data:

Reply from 192.168.1.254: Destination host unreachable.
Reply from 192.168.1.254: Destination host unreachable.
Reply from 192.168.1.254: Destination host unreachable.
Request timed out.

Ping statistics for 172.16.3.33:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 118.18.4.44

Pinging 118.18.4.44 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 118.18.4.44:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>
```

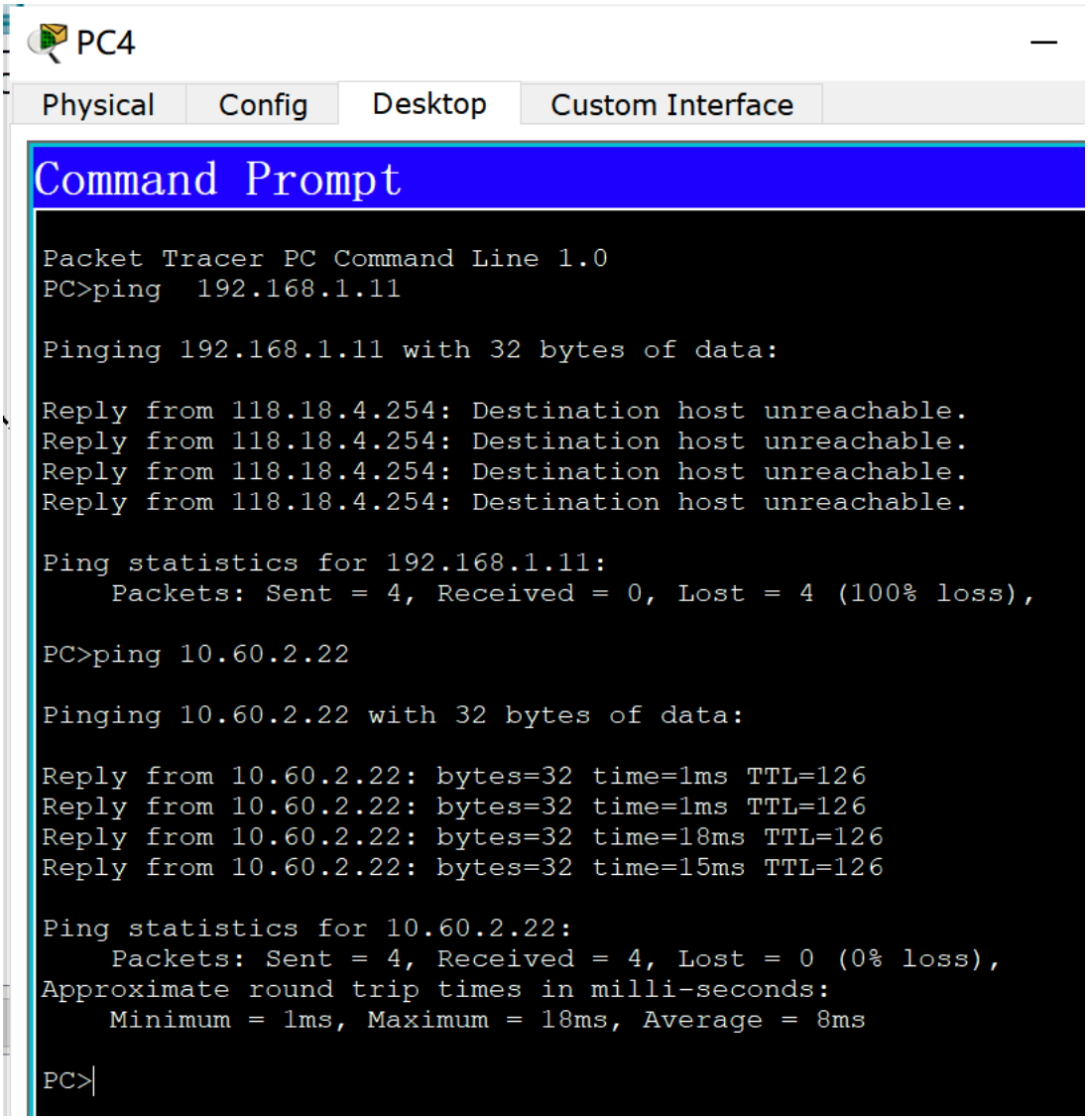
PC1 的 ping 解释：由于 IP 为 10.60.2.22 的主机与 PC1 共同连接于一个路由器，所以无需添加路由表路由器也能进行存储-转发，因此 PC1-PC2 连通；而 172.16.3.33 的主机在另一个子网中且且路由器路由表中没有关于目标地址为 172.16.3.33 的跳转条目，因此收到网关的回复是目标主机不能到达；IP 为 118.18.4.44 的主机由于在路由器路由表中有关于该目标地址的跳转条目，因此路由器能够进行正确的路径选择并将数据包递交到 118.18.4.44，但是在 118.18.4.44 的主机进行回复时，由于其路由器路由表中并没有目标地址为 192.168.1.11 的跳转条目，因此数据包无法返回 192.168.1.11，因此其中的反馈是请求超时，，即只是建立了单方面连接。



PC2 的 ping 解释：由于在其路由表总没有目标地址为 172.16.3.33 的跳转条目，因此反馈为目标主机不可到达；而在本地路由由于具有目标地址为 118.18.4.44 的跳转条目，且在数据包回复时路由表中也有目标地址为 10.60.2.22 的跳转条目。因此本次的数据包发送接受成功，即 PC2-PC4 连通成功。



PC3 的 ping 解释：由于本地路由中没有目标地址为 192.168.1.11 的跳转条目，因此收到回复目标主机不可到达；而本地回复存在目标地址为 10.60.2.22 的跳转条目，因此数据包能够发送到 10.60.2.22 节点，但在数据包返回时，由于其路由上没有目标地址为 172.16.3.33 的跳转条目，因此回复失败，所以收到的回复是请求超时，即只是建立了单方面连接。



PC4 的 ping 解释：由于本地路由不存在目标地址为 192.168.1.11 的跳转条目，因此收到的回复是目标主机不可到达；而由于存在目标地址为 10.60.2.22 的跳转条目，且在数据包返回时路由同样存在目标地址为 118.18.4.44 的跳转条目，因此数据包顺利返回，即 PC2-PC4 连通成功。

4.在路由器上配置静态 NAT。

```
Router>en
Router#interface FastEthernet 0/0
                 ^
% Invalid input detected at '^' marker.

Router#config
Router#configure t
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet 0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#in
Router(config)#interface ser
Router(config)#interface serial 0
Router(config)#interface serial 0/0/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
```

```
Router>
Router>
Router>en
Router#con
Router#config
Router#configure te
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#in
Router(config)#interface fa
Router(config)#interface fastEthernet 0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#inte
Router(config)#interface ser
Router(config)#interface serial 0/0/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
```

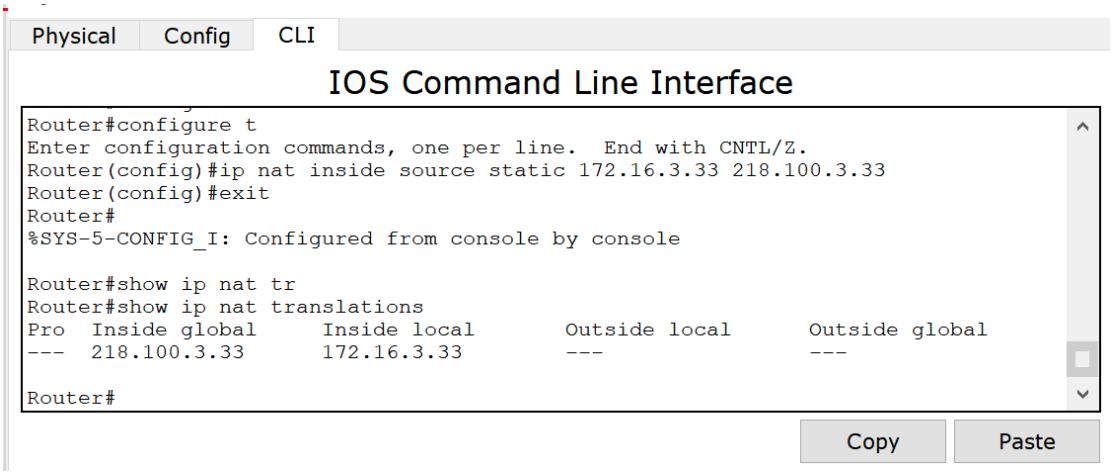
5.配置路由器 NAT 转换。

Router2:

```
% Invalid input detected at '^' marker.

Router#config
Router#configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip nat inside source static 192.168.1.11 210.120.1.11
Router(config)#show ip nat tr
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#show ip nat tr
Router#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
---  210.120.1.11      192.168.1.11       ---                ---

Router#
```

Copy Paste

Router3:



6.使用 ping 命令检测连通性。

PC1：

ping 192.168.1.11

ping 210.120.1.11

ping 10.60.2.22

ping 172.16.3.33

ping 218.100.3.33

ping 118.18.4.44

结果：

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time=5ms TTL=128

Reply from 192.168.1.11: bytes=32 time=12ms TTL=128

Reply from 192.168.1.11: bytes=32 time=1ms TTL=128

Reply from 192.168.1.11: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.11:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 12ms, Average = 4ms

这是自己 ping 自己，只要 TCP/IP 协议正常运载就能成功。

PC>ping 210.120.1.11

Pinging 210.120.1.11 with 32 bytes of data:

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Ping statistics for 210.120.1.11:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

192.168.1.11 与外界连通时，将被 NAT 替换成 210.120.1.11（此时地址也是目标地址 ），此时再查询路由器中的路由表，由于不存在相关路由表项目，所以跳转失败，因此为目标主机不可到达 。

PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Reply from 10.60.2.22: bytes=32 time=0ms TTL=127

Ping statistics for 10.60.2.22:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

由于 10.60.2.22 与 192.168.1.11 共同连接于同一个路由器，因此路由器可以直接进行转发，从而两者是连通的。

PC>ping 172.16.3.33\

PC>ping 172.16.3.33

Pinging 172.16.3.33 with 32 bytes of data:

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Reply from 192.168.1.254: Destination host unreachable.

Ping statistics for 172.16.3.33:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

192.168.1.11 在与外网连通时，会被替换为 210.120.1.11，但在其路由表中找不到相关的路由表项，因此反馈为目标主机不可到达。

PC>ping 218.100.3.33

Pinging 218.100.3.33 with 32 bytes of data:

Reply from 218.100.3.33: bytes=32 time=1ms TTL=126

Reply from 218.100.3.33: bytes=32 time=1ms TTL=126

Reply from 218.100.3.33: bytes=32 time=1ms TTL=126

Reply from 218.100.3.33: bytes=32 time=1ms TTL=126

Ping statistics for 218.100.3.33:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 1ms, Average = 1ms

192.168.1.11 在与外网连通时，会被替换为 210.120.1.11，然后查询其路由表，刚好能够查找到目标地址为 218.100.3.33 的跳转条目，因此数据包成功发送出去，然后在数据包到达路由器时，其同样将 218.100.3.33 替换为 172.16.3.33，然后发送给 172.16.3.33，其数据包的返回恰好相反，路由器将 172.16.3.33 替换为 218.100.3.33，然后发送给目标节点 210.120.1.11。因此 192.168.1.11 和 172.16.3.33 经过 NAT 之后实现了连通，整个过程其实是借助了 210.120.1.11 和 218.100.3.33 两个互谅网 IP 地址来实现的。

PC>ping 118.18.4.44

Pinging 118.18.4.44 with 32 bytes of data:

Reply from 118.18.4.44: bytes=32 time=1ms TTL=126

Reply from 118.18.4.44: bytes=32 time=1ms TTL=126

Reply from 118.18.4.44: bytes=32 time=1ms TTL=126

Reply from 118.18.4.44: bytes=32 time=17ms TTL=126

Ping statistics for 118.18.4.44:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 17ms, Average = 5ms

192.168.1.11 在与外网连通时，会被替换为 210.120.1.11，然后查询其路由表，刚好能够查找到目标地址为 118.18.4.44 的跳转条目，连通成功，然后数据包返回时发送给目标节点 210.120.1.11，路由器接收到数据包后替换目标地址为 192.168.1.11 实现数据发送。

PC>

PC2：

ping 192.168.1.11

ping 210.120.1.11

ping 10.60.2.22

ping 172.16.3.33

ping 218.100.3.33

ping 118.18.4.44

结果：

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time=0ms TTL=127

Reply from 192.168.1.11: bytes=32 time=0ms TTL=127

Reply from 192.168.1.11: bytes=32 time=0ms TTL=127

Reply from 192.168.1.11: bytes=32 time=16ms TTL=127

Ping statistics for 192.168.1.11:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 16ms, Average = 4ms

两个节点连接于同一个路由器，连接成功。

PC>ping 210.120.1.11

Pinging 210.120.1.11 with 32 bytes of data:

Reply from 10.60.2.254: Destination host unreachable.

Reply from 10.60.2.254: Destination host unreachable.

Request timed out.

Reply from 10.60.2.254: Destination host unreachable.

Ping statistics for 210.120.1.11:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

路由表中没有目标节点为 210.120.1.11 的跳转条目，因此跳转失败，目标主机不可到达。

PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=0ms TTL=128

Reply from 10.60.2.22: bytes=32 time=14ms TTL=128

Reply from 10.60.2.22: bytes=32 time=0ms TTL=128

Reply from 10.60.2.22: bytes=32 time=0ms TTL=128

Ping statistics for 10.60.2.22:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 14ms, Average = 3ms

自己 ping 自己，只要 TCP/IP 协议正常运载即可。

PC>ping 172.16.3.33

Pinging 172.16.3.33 with 32 bytes of data:

Reply from 10.60.2.254: Destination host unreachable.

Reply from 10.60.2.254: Destination host unreachable.

Reply from 10.60.2.254: Destination host unreachable.

Reply from 10.60.2.254: Destination host unreachable.

Ping statistics for 172.16.3.33:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

路由表中没有目标节点为 172.16.3.33 的跳转条目，因此跳转失败，目标主机不可到达。

PC>ping 218.100.3.33

Pinging 218.100.3.33 with 32 bytes of data:

Reply from 218.100.3.33: bytes=32 time=23ms TTL=126

Reply from 218.100.3.33: bytes=32 time=13ms TTL=126

Reply from 218.100.3.33: bytes=32 time=15ms TTL=126

Reply from 218.100.3.33: bytes=32 time=17ms TTL=126

Ping statistics for 218.100.3.33:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 13ms, Maximum = 23ms, Average = 17ms

路由表中存在目标地址为 218.100.3.33 的跳转条目，在数据包到达另一个路由器时，其将 218.100.3.33 替换为 172.16.3.33 然后转发给目标节点，在数据包返回时，再将 172.16.3.33 替换为 218.100.3.33 发送给 10.60.2.22，由于路由表中存在该跳转条目，因此数据包顺利返回，两个节点连通。

PC>ping 118.18.4.44

Pinging 118.18.4.44 with 32 bytes of data:

Reply from 118.18.4.44: bytes=32 time=22ms TTL=126

Reply from 118.18.4.44: bytes=32 time=15ms TTL=126

Reply from 118.18.4.44: bytes=32 time=15ms TTL=126

Reply from 118.18.4.44: bytes=32 time=13ms TTL=126

Ping statistics for 118.18.4.44:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 13ms, Maximum = 22ms, Average = 16ms

路由表中存在该跳转条目，数据包发送成功，对方路由器同样存在返回的跳转条目，因此返回成功，两者连通，这就是上面静态路由表的功劳。

PC>

PC3：

ping 192.168.1.11

ping 210.120.1.11

ping 10.60.2.22

ping 172.16.3.33

ping 218.100.3.33

ping 118.18.4.44

结果：

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 172.16.3.254: Destination host unreachable.

Request timed out.

Reply from 172.16.3.254: Destination host unreachable.

Reply from 172.16.3.254: Destination host unreachable.

Ping statistics for 192.168.1.11:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 210.120.1.11

Pinging 210.120.1.11 with 32 bytes of data:

Reply from 210.120.1.11: bytes=32 time=4ms TTL=126

Reply from 210.120.1.11: bytes=32 time=15ms TTL=126

Reply from 210.120.1.11: bytes=32 time=2ms TTL=126

Reply from 210.120.1.11: bytes=32 time=1ms TTL=126

Ping statistics for 210.120.1.11:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 15ms, Average = 5ms

PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=21ms TTL=126

Reply from 10.60.2.22: bytes=32 time=16ms TTL=126

Reply from 10.60.2.22: bytes=32 time=16ms TTL=126

Reply from 10.60.2.22: bytes=32 time=3ms TTL=126

Ping statistics for 10.60.2.22:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 3ms, Maximum = 21ms, Average = 14ms

PC>ping 172.16.3.33

Pinging 172.16.3.33 with 32 bytes of data:

Reply from 172.16.3.33: bytes=32 time=13ms TTL=128

Reply from 172.16.3.33: bytes=32 time=3ms TTL=128

Reply from 172.16.3.33: bytes=32 time=2ms TTL=128

Reply from 172.16.3.33: bytes=32 time=0ms TTL=128

Ping statistics for 172.16.3.33:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 13ms, Average = 4ms

PC>ping 218.100.3.33

Pinging 218.100.3.33 with 32 bytes of data:

Reply from 172.16.3.254: Destination host unreachable.

Reply from 172.16.3.254: Destination host unreachable.

Reply from 172.16.3.254: Destination host unreachable.

Reply from 172.16.3.254: Destination host unreachable.

Ping statistics for 218.100.3.33:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 118.18.4.44

Pinging 118.18.4.44 with 32 bytes of data:

Reply from 118.18.4.44: bytes=32 time=0ms TTL=127

Reply from 118.18.4.44: bytes=32 time=0ms TTL=127

Reply from 118.18.4.44: bytes=32 time=0ms TTL=127

Reply from 118.18.4.44: bytes=32 time=0ms TTL=127

Ping statistics for 118.18.4.44:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>

PC4：

ping 192.168.1.11

ping 210.120.1.11

ping 10.60.2.22

ping 172.16.3.33

ping 218.100.3.33

ping 118.18.4.44

结果：

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Ping statistics for 192.168.1.11:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 210.120.1.11

Pinging 210.120.1.11 with 32 bytes of data:

Reply from 210.120.1.11: bytes=32 time=3ms TTL=126

Reply from 210.120.1.11: bytes=32 time=1ms TTL=126

Reply from 210.120.1.11: bytes=32 time=15ms TTL=126

Reply from 210.120.1.11: bytes=32 time=1ms TTL=126

Ping statistics for 210.120.1.11:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 15ms, Average = 5ms

PC>ping 10.60.2.22

Pinging 10.60.2.22 with 32 bytes of data:

Reply from 10.60.2.22: bytes=32 time=2ms TTL=126

Reply from 10.60.2.22: bytes=32 time=2ms TTL=126

Reply from 10.60.2.22: bytes=32 time=3ms TTL=126

Reply from 10.60.2.22: bytes=32 time=2ms TTL=126

Ping statistics for 10.60.2.22:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 3ms, Average = 2ms

PC>ping 172.16.3.33

Pinging 172.16.3.33 with 32 bytes of data:

Reply from 172.16.3.33: bytes=32 time=0ms TTL=127

Reply from 172.16.3.33: bytes=32 time=0ms TTL=127

Reply from 172.16.3.33: bytes=32 time=0ms TTL=127

Reply from 172.16.3.33: bytes=32 time=0ms TTL=127

Ping statistics for 172.16.3.33:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>ping 218.100.3.33

Pinging 218.100.3.33 with 32 bytes of data:

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Reply from 118.18.4.254: Destination host unreachable.

Ping statistics for 218.100.3.33:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 118.18.4.44

Pinging 118.18.4.44 with 32 bytes of data:

Reply from 118.18.4.44: bytes=32 time=14ms TTL=128

Reply from 118.18.4.44: bytes=32 time=17ms TTL=128

Reply from 118.18.4.44: bytes=32 time=18ms TTL=128

Reply from 118.18.4.44: bytes=32 time=12ms TTL=128

Ping statistics for 118.18.4.44:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 12ms, Maximum = 18ms, Average = 15ms

PC>

【分析讨论】