

Lab Exercise 4

Lab Exercise 4.1: Repair a Duplicate IP Address

What You Need

A Computer running a Windows OS (Preferably 10).

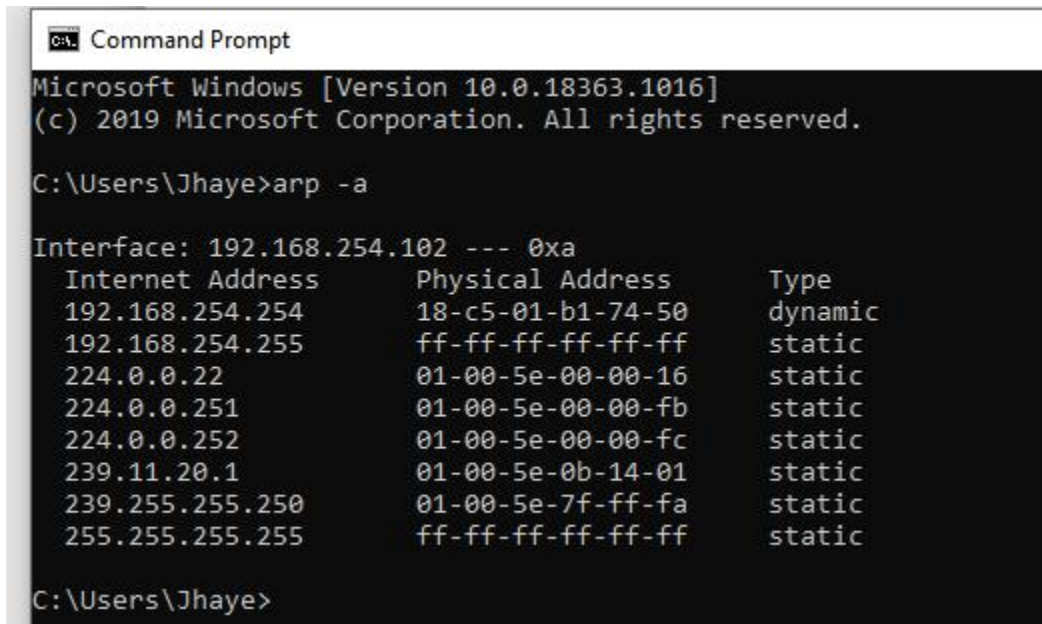
Description/Instruction

Your task is to follow the instructions and attach/paste images of what you did to satisfy the steps.

Tasks

ARP can be a valuable troubleshooting tool for discovering the identity of a machine whose IP address you know, or for identifying two machines assigned the same IP address. Let's see what happens when two devices on the network are assigned the same IP address. First you change the IP address of a local Windows machine to match an IP address of another device—in other words, you “break” the computer. Then you see how the arp command helps you diagnose the problem.

1. Open a Command Prompt window and enter the command `arp -a`. Your device's IP address is listed as the Interface address at the top of the list. Write down this IP address and the address of another device on the network.



```
Microsoft Windows [Version 10.0.18363.1016]
(c) 2019 Microsoft Corporation. All rights reserved.

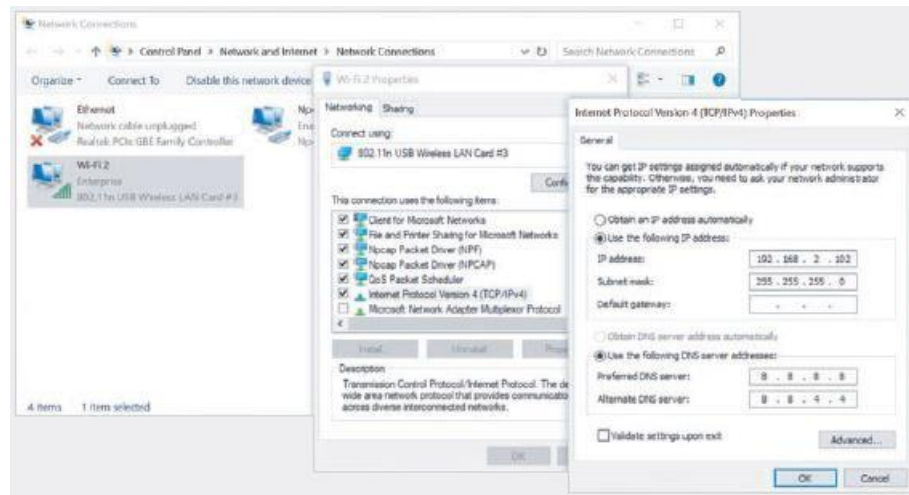
C:\Users\Jhay>arp -a

Interface: 192.168.254.102 --- 0xa
    Internet Address      Physical Address      Type
    192.168.254.254       18-c5-01-b1-74-50    dynamic
    192.168.254.255       ff-ff-ff-ff-ff-ff    static
    224.0.0.22            01-00-5e-00-00-16    static
    224.0.0.251           01-00-5e-00-00-fb    static
    224.0.0.252           01-00-5e-00-00-fc    static
    239.11.20.1           01-00-5e-0b-14-01    static
    239.255.255.250       01-00-5e-7f-ff-fa    static
    255.255.255.255       ff-ff-ff-ff-ff-ff    static

C:\Users\Jhay>
```

2. Open the Network and Sharing Center, click Change adapter settings, right-click the active network connection, and click Properties. If necessary, enter an administrator password in the UAC box and click Yes.

3. Select Internet Protocol Version 4 (TCP/IPv4) and click Properties. Set the IP address to match the other device's IP address that you wrote down in Step 1. The system automatically assigns the Subnet mask, as shown in the figure. Click OK, press Tab, and then click Close.



4. Back at the command prompt, enter `ipconfig /all`.

5. Find the appropriate network connection and identify your computer's current IPv4 address. Has your computer identified the duplicate IP address problem yet? How do you know? Your computer might also have autoconfigured another IP address. If so, what address did your computer resort to?

```

C:\Users\Jhaye>ipconfig /all

Autoconfiguration Enabled . . . . . : Yes

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 12-52-CB-5F-5C-71
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 22-52-CB-5F-5C-71
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes

Wireless LAN adapter Wi-Fi:

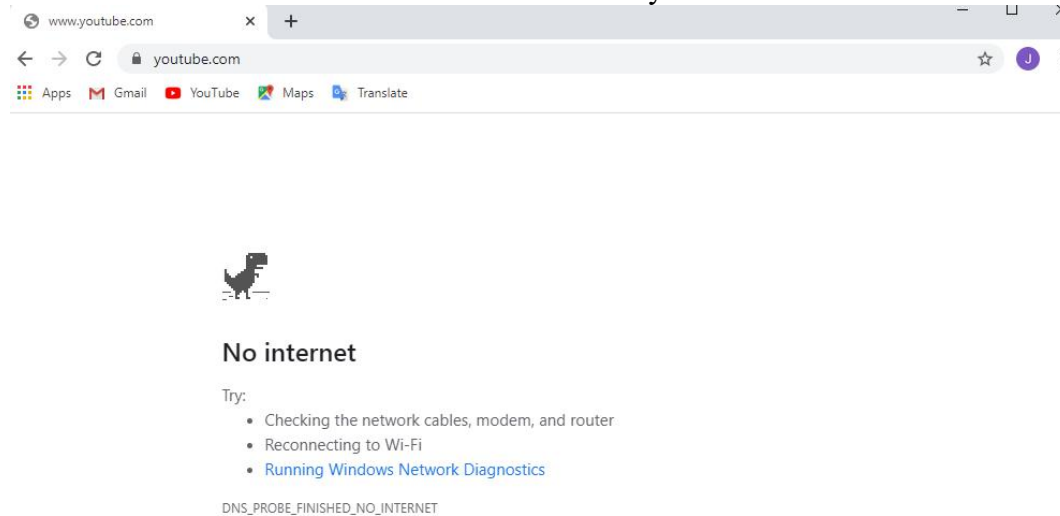
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Qualcomm Atheros AR956x Wireless Network
    Physical Address. . . . . : 30-52-CB-5F-5C-71
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::11cd:27e4:5136:78df%10(Preferred)
    IPv4 Address. . . . . : 192.168.254.254(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 
    DHCPv6 IAID . . . . . : 120607435
    DHCPv6 Client DUID. . . . . : 00-01-00-01-25-F1-C8-27-54-AB-3A-11-3E-
    DNS Servers . . . . . : 8.8.8.8
                           8.8.4.4
    NetBIOS over Tcpip. . . . . : Enabled

C:\Users\Jhaye>arp -a

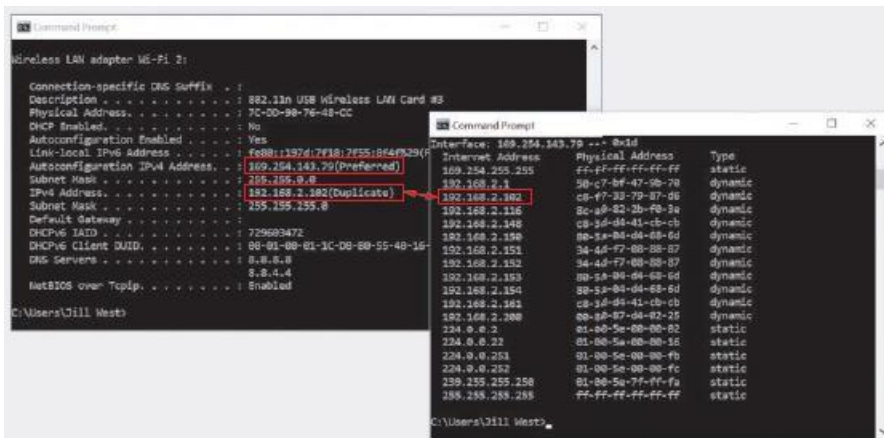
interface: 192.168.254.254 --- 0xa
Internet Address      Physical Address      Type
192.168.254.100       4c-b0-08-8e-6c-3a     dynamic
192.168.254.101       1c-77-f6-d9-fa-2b     dynamic
192.168.254.103       c4-85-08-db-ed-b3     dynamic
192.168.254.254       18-c5-01-b1-74-50     dynamic
192.168.254.255       ff-ff-ff-ff-ff-ff     static
224.0.0.2             01-00-5e-00-00-02     static
224.0.0.22           01-00-5e-00-00-16     static
224.0.0.251          01-00-5e-00-00-fb     static
224.0.0.252          01-00-5e-00-00-fc     static
239.11.20.1          01-00-5e-0b-14-01     static
239.255.255.250      01-00-5e-7f-ff-fa     static
255.255.255.255      ff-ff-ff-ff-ff-ff     static
  
```

-> as you can see the above picture(which is my ss) my computer didn't figure the duplicate IP address. Instead of displaying warning (duplicate) like the figure in No. 6, warning display is (Preferred).

- > but I notice that I cannot visit any website that I want to visit even I'm connected to wi-fi.
- > I also notice that all our devices cannot visit any website.



6. In the window on the left side of the Figure, you can see a warning that the IP address is a duplicate. The system also shows a preferred IPv4 address of 169.254.143.79, which is an APIPA address. How can you tell this is an APIPA address?



->the Automatic Private IP Addressing it is an IP address reserve which is the range from 169.254.0.0/16

7. To confirm the duplication of IP addresses, enter the command `arp -a`. You can see in the figure in item #6 that the local computer's IPv4 address listed on the left matches another IP address in the ARP table on the right, and again you see the APIPA address assigned to the local interface. What are two ways to solve this problem?

- >ipconfig/release then ipconfig/renew
- >or do the the No. 8 Instruction.

8. Open the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box again and select the option Obtain an IP address automatically, then click OK. Close the connection's properties dialog box, the Network Connections window, and the Network and Sharing Center window.
9. Run the ipconfig command or the arp -a command to confirm that a unique IP address has been assigned. What is the new IP address?

```
Interface: 192.168.254.102 --- 0xa
Internet Address      Physical Address      Type
192.168.254.100       4c-b0-08-8e-6c-3a     dynamic
192.168.254.101       1c-77-f6-d9-fa-2b     dynamic
192.168.254.103       c4-85-08-db-ed-b3     dynamic
192.168.254.254       18-c5-01-b1-74-50     dynamic
192.168.254.255       ff-ff-ff-ff-ff-ff     static
224.0.0.2             01-00-5e-00-00-02     static
224.0.0.22            01-00-5e-00-00-16     static
224.0.0.251           01-00-5e-00-00-fb     static
224.0.0.252           01-00-5e-00-00-fc     static
239.11.20.1           01-00-5e-0b-14-01     static
239.255.255.250       01-00-5e-7f-ff-fa     static
255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

10. Close the Command Prompt window.

Lab Exercise4.2: Redirect Command Output to a Text File

A Computer running a Windows OS(Preferably 10).

Description/Instruction

Your task is to follow the instructions and attach/paste images of what you did to satisfy the steps.

Tasks

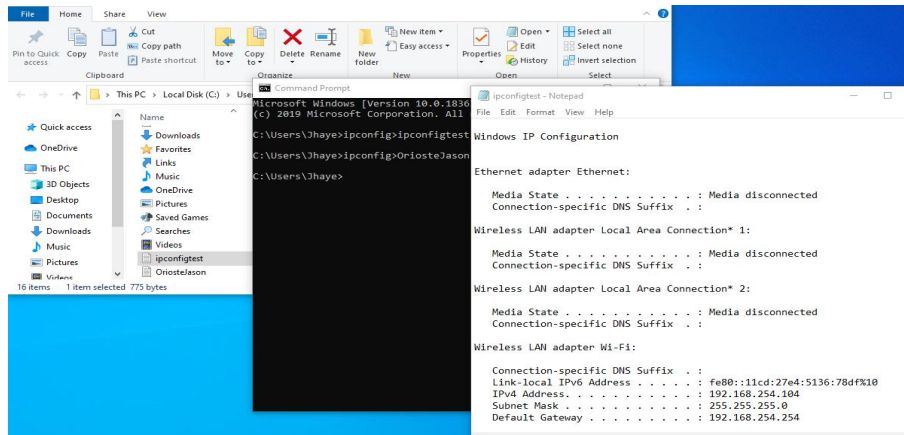
Sometimes when you're using a command such as pathping, the sheer volume of output can be daunting to work with. There's no way to search through the output for specific information, and you can only expand the Command Prompt window so far. One solution to this problem is to redirect the command output to a text file where you can search the text, copy and paste text, and save the output for future reference. To accomplish this feat, you'll need to add a redirection operator to the command whose output you want to export to a text file.

Complete the following steps:

1. First, try this simple command:

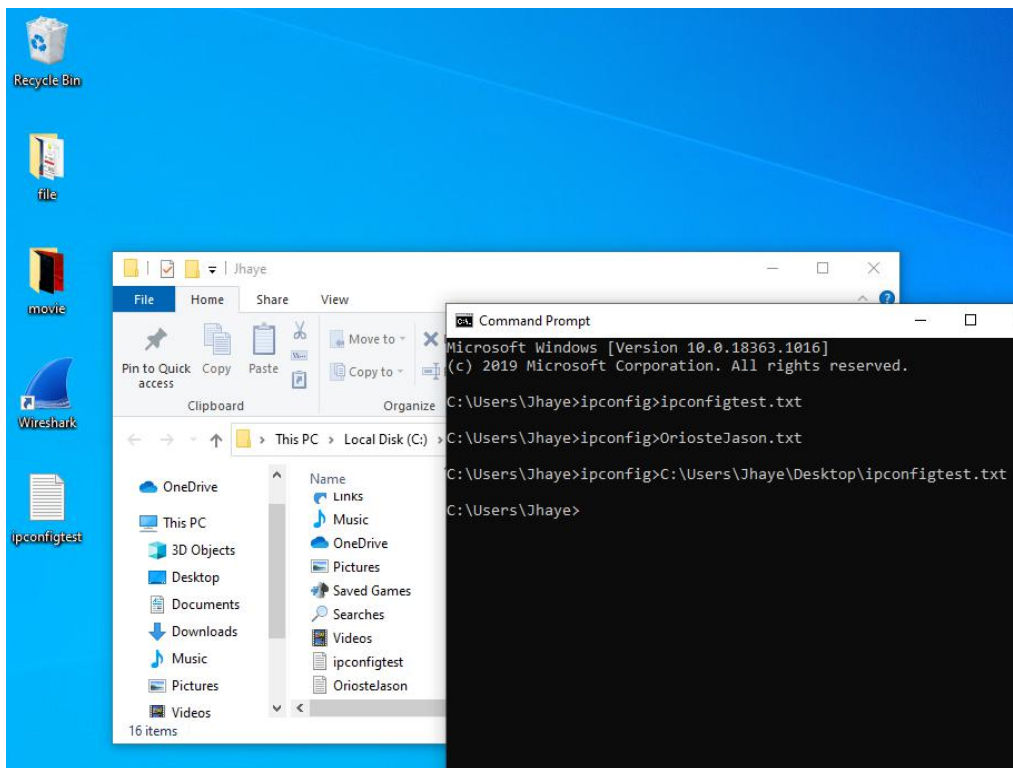
```
ipconfig > ipconfigtest.txt
```

In this case, you have run the ipconfig command and redirected the output to a textfile named ipconfigtest.txt. By default, the file is saved to the current default folder, for example, C:\Users\JillWest.



2. To specify the location of the file when you create it, add the path to the file in the command line. For example, to save the file to the desktop, use the following command(substitute the correct file path to your desktop):

```
ipconfig > C:\Users\Username\Desktop\ipconfigtest.txt
```



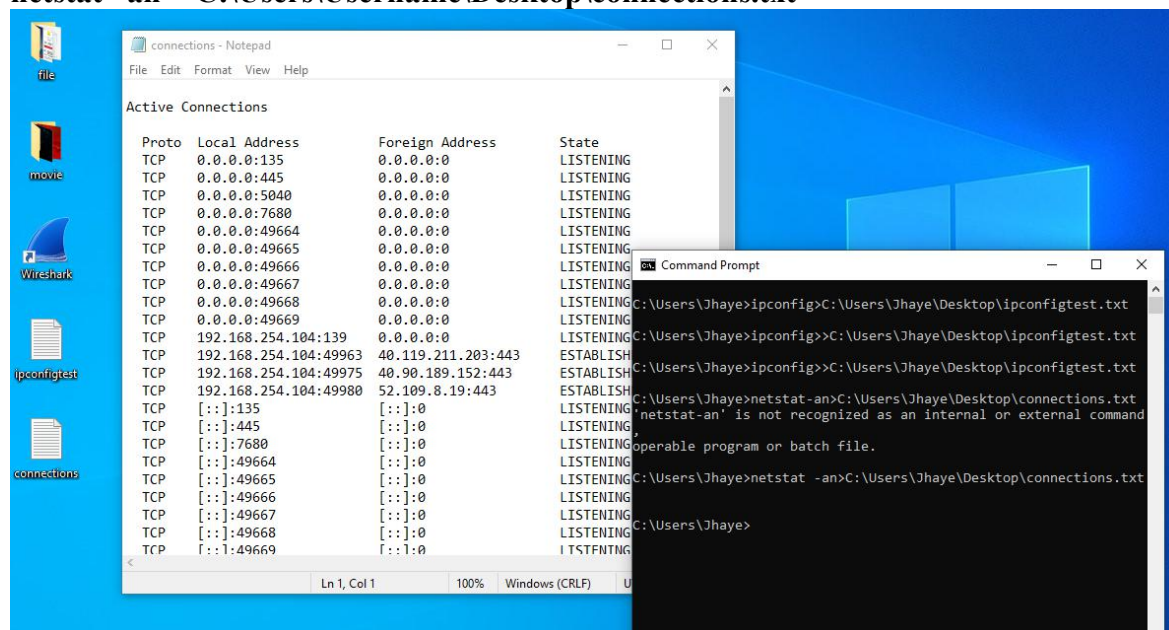
3. If you already have a file on the desktop by that name, the file will be overwritten with the new data. What if you would rather append data to an existing file? In this case, use the >> operator. Enter this command (substitute the correct file path to your desktop):

ipconfig >> C:\Users\Username\Desktop\ipconfigtest.txt

Now the new output will appear at the end of the existing file, and all the data is preserved within this single file. This option is useful when collecting data from repeated tests or from multiple computers, where you want all the data to converge into a single file for future analysis.

4. Where do command parameters fit when redirecting output? Let's use the netstat command to show the IP address and port of each TCP and UDP connection on the computer. In the following command, substitute the correct file path to your desktop to output the data to a new file:

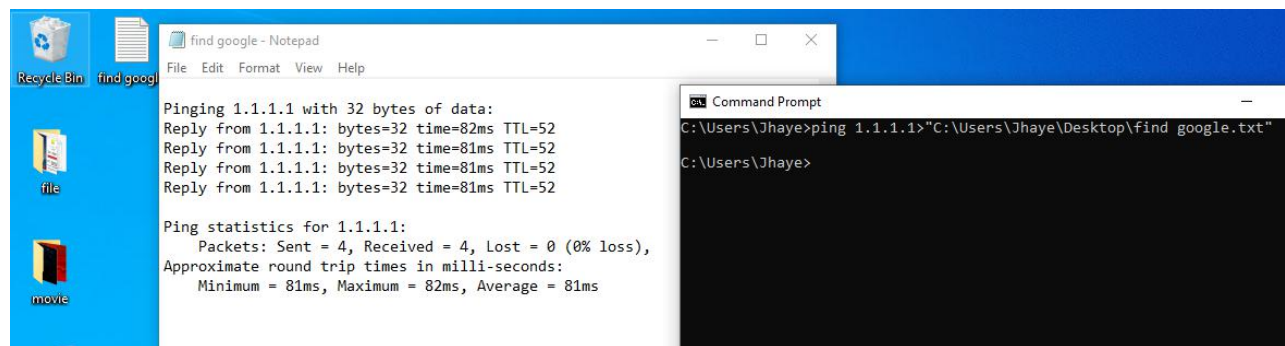
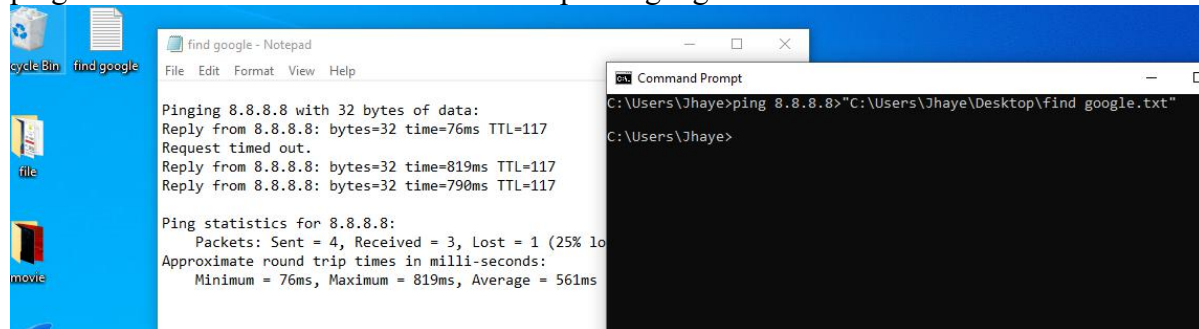
netstat -an > C:\Users\Username\Desktop\connections.txt



Notice that any parameters you want to use should be inserted after the command it self and before the redirection operator.

5. Include a space in the filename by putting quotation marks around the entire filename and location:

`ping 8.8.8.8 > "C:\Users\Username\Desktop\find google.txt"`



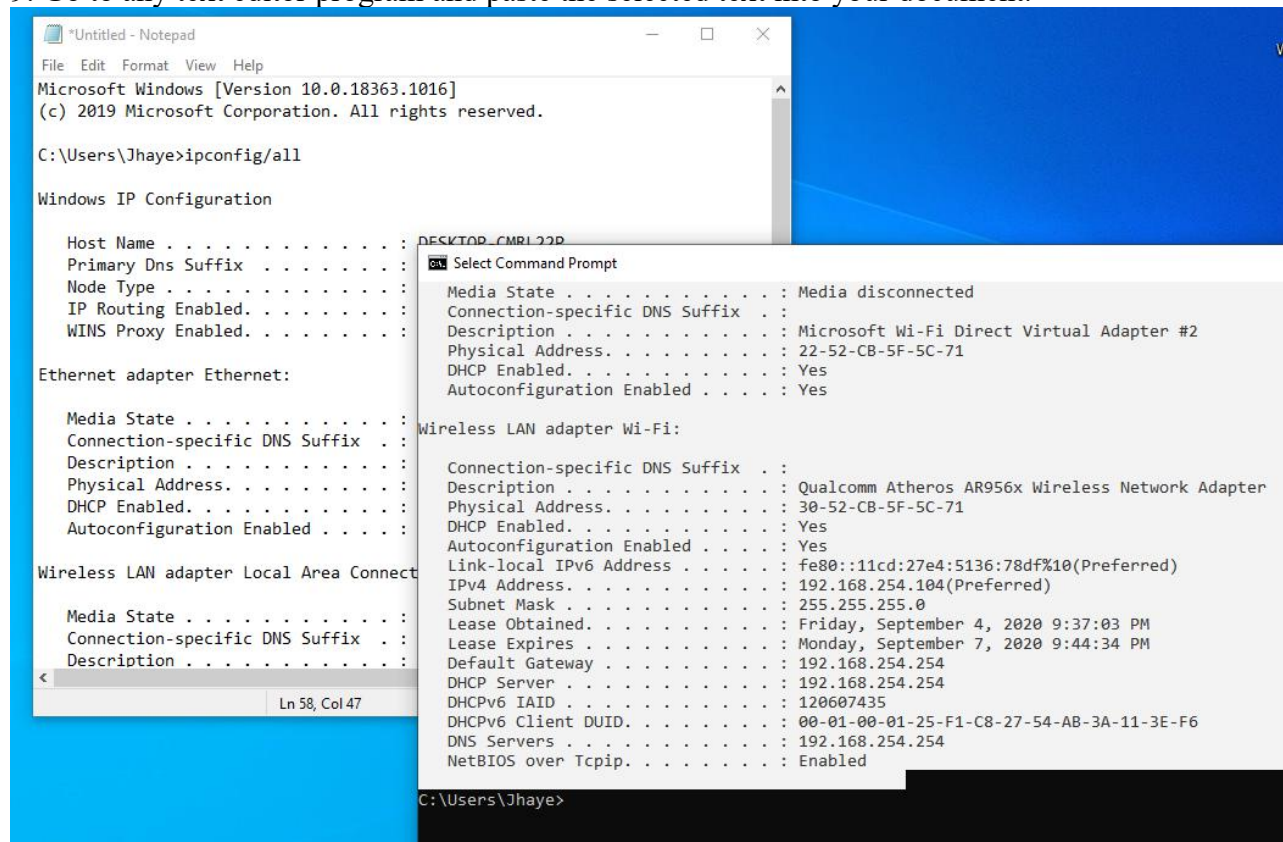
What do you do if you've already run a command, and you desperately want to save some of the data from the output? In Windows 10, you can perform a normal copy-and-paste operation in the Command Prompt window, but you first must instruct Command Prompt to accept keyboard shortcut commands. Complete these steps to see how this works:

6. Run the command `ipconfig /all`. The new output populates your Command Prompt window.

7. Right-click the Command Prompt window title bar, point to Edit, and click Mark.

8. Scroll to where you want to begin collecting the copy. Press and hold the mouse button, drag the mouse to highlight all the text you want to copy, and release. Then press Enter. The text is copied to the Clipboard.

9. Go to any text editor program and paste the selected text into your document.



Lab Exercise4.3: Create a Routing Table

Entry in Windows

What You Need

A Computer running a Windows OS(Preferably 10).

Description/Instruction

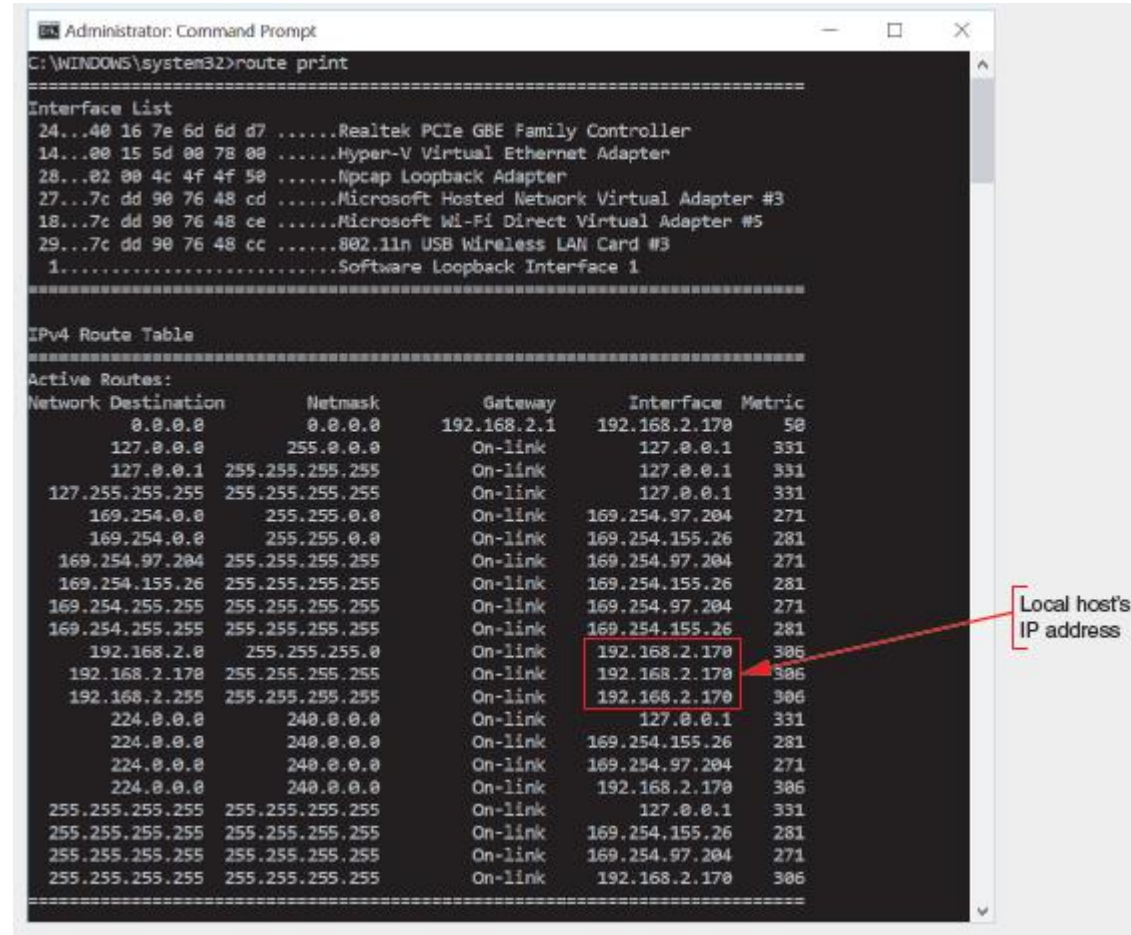
Your task is to follow the instructions and attach/paste images of what you did to satisfy the steps.

Tasks

1. In this chapter, you used both route print and netstat -r to view the routing table. Because you'll need the route command to modify the routing table, open an elevated Command Prompt window and enter the route print command to view the routing table.

The list of interfaces on your computer should look familiar—you saw these when you're an ipconfig in Chapter 3. Several of the IPv4 routes on your routing table should look familiar as well. 127.0.0.1 is your loop back address, and the surrounding 127.x.y.z routes refer to reserved addresses in that domain. In the figure (Several of the active routes on this computer involve its own IP address), you can see that this computer's IP address is 192.168.2.170. You can also see Surrounding reserved addresses for that private domain. 224.0.0.0 is reserved for multicasting, and 255.255.255.255 for certain broadcast messages.

In the IPv6 section on your computer, ::1/128 is the loop back address. FE80::/64 is the link local address, and an FE80 address is the IPv6 address assigned to your computer. FF00::/8 is the multicast address.



```
Administrator: Command Prompt
C:\WINDOWS\system32>route print

=====
Interface List
24...40 16 7e 6d 6d d7 .....Realtek PCIe GBE Family Controller
14...00 15 5d 00 78 00 .....Hyper-V Virtual Ethernet Adapter
28...02 00 4c 4f 4f 50 .....Npcap Loopback Adapter
27...7c dd 90 76 48 cd .....Microsoft Hosted Network Virtual Adapter #3
18...7c dd 90 76 48 ce .....Microsoft Wi-Fi Direct Virtual Adapter #5
29...7c dd 90 76 48 cc .....802.11n USB Wireless LAN Card #3
1.....00 00 00 00 00 00 .....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
0.0.0.0                    0.0.0.0          192.168.2.1      192.168.2.170    50
127.0.0.0                  255.0.0.0        On-link          127.0.0.1        331
127.0.0.1                  255.255.255.255  On-link          127.0.0.1        331
127.255.255.255            255.255.255.255  On-link          127.0.0.1        331
169.254.0.0                255.255.0.0      On-link          169.254.97.204   271
169.254.0.0                255.255.0.0      On-link          169.254.155.26   281
169.254.97.204             255.255.255.255  On-link          169.254.97.204   271
169.254.155.26             255.255.255.255  On-link          169.254.155.26   281
169.254.255.255            255.255.255.255  On-link          169.254.97.204   271
169.254.255.255            255.255.255.255  On-link          169.254.155.26   281
192.168.2.0                255.255.255.0    On-link          192.168.2.170    306
192.168.2.170              255.255.255.255  On-link          192.168.2.170    306
192.168.2.255              255.255.255.255  On-link          192.168.2.170    306
224.0.0.0                  240.0.0.0        On-link          127.0.0.1        331
224.0.0.0                  240.0.0.0        On-link          169.254.155.26   281
224.0.0.0                  240.0.0.0        On-link          169.254.97.204   271
224.0.0.0                  240.0.0.0        On-link          192.168.2.170    306
255.255.255.255            255.255.255.255  On-link          127.0.0.1        331
255.255.255.255            255.255.255.255  On-link          169.254.155.26   281
255.255.255.255            255.255.255.255  On-link          169.254.97.204   271
255.255.255.255            255.255.255.255  On-link          192.168.2.170    306
=====
```

Local host's IP address

```
Command Prompt
Microsoft Windows [Version 10.0.18363.1016]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Jhay>route print
=====
Interface List
 2...54 ab 3a 11 3e f6 .....Realtek PCIe GbE Family Controller
 7...12 52 cb 5f 5c 71 .....Microsoft Wi-Fi Direct Virtual Adapter
17...22 52 cb 5f 5c 71 .....Microsoft Wi-Fi Direct Virtual Adapter #2
10...30 52 cb 5f 5c 71 .....Qualcomm Atheros AR956x Wireless Network Adapter
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
0.0.0.0                    0.0.0.0          192.168.254.254  192.168.254.104  55
127.0.0.0                  255.0.0.0        On-link          127.0.0.1        331
127.0.0.1                  255.255.255.255  On-link          127.0.0.1        331
127.255.255.255            255.255.255.255  On-link          127.0.0.1        331
192.168.254.0              255.255.255.0    On-link          192.168.254.104  311
192.168.254.104            255.255.255.255  On-link          192.168.254.104  311
192.168.254.255            255.255.255.255  On-link          192.168.254.104  311
224.0.0.0                  240.0.0.0        On-link          127.0.0.1        331
224.0.0.0                  240.0.0.0        On-link          192.168.254.104  311
255.255.255.255            255.255.255.255  On-link          127.0.0.1        331
255.255.255.255            255.255.255.255  On-link          192.168.254.104  311
=====
Persistent Routes:
None

IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
1 331 ::1/128 On-link
10 311 fe80::/64 On-link
10 311 fe80::11cd:27e4:5136:78df/128 On-link
1 331 ff00::/8 On-link
10 311 ff00::/8 On-link
=====
Persistent Routes:
```

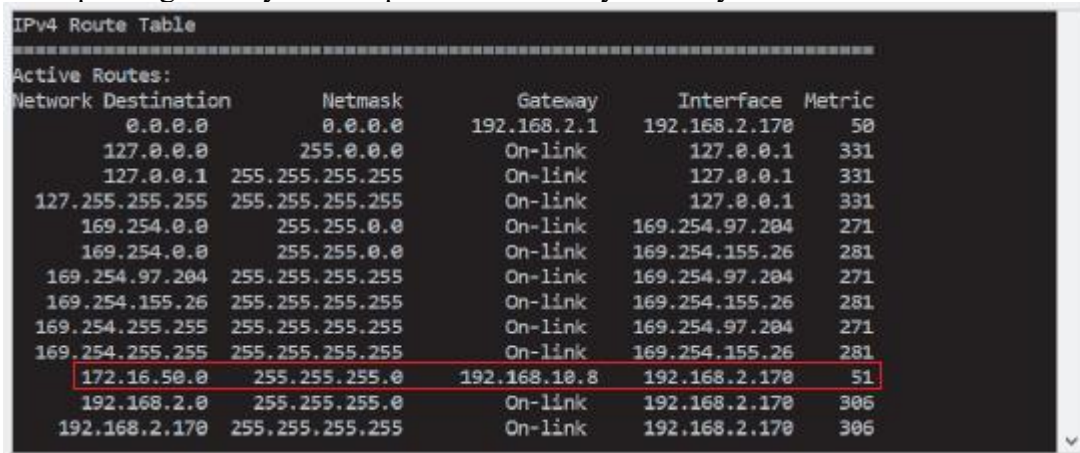
2. Now add an entry to the routing table that will reroute messages destined for the private network 172.16.50.0/24 to another internal IP address, 192.168.10.8. Enter the following command: route add 172.16.50.0 mask 255.255.255.0 192.168.10.8

```
=====
Persistent Routes:
None

C:\Users\Jhay>route ADD 172.16.50.0 mask 255.255.255.0 192.168.10.8
The requested operation requires elevation.

C:\Users\Jhay>
```

3. Now all messages generated by this routing table's local host and addressed to an IP address in the network 172.16.50.0/24 will instead be routed to the host at 192.168.10.8. You can see in figure (The static route has been successfully added) below where this new entry has been inserted. Run route print again on your computer to confirm your entry was recorded.

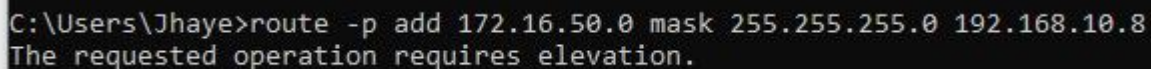


IPv4 Route Table

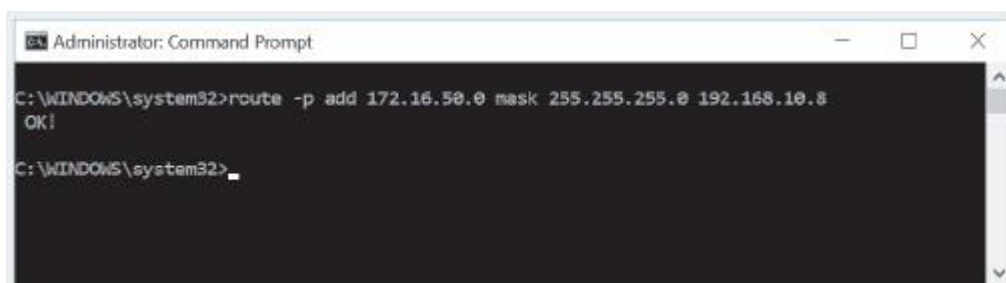
Active Routes:

Network	Destination	Netmask	Gateway	Interface	Metric
0.0.0.0	0.0.0.0	0.0.0.0	192.168.2.1	192.168.2.170	50
127.0.0.0	255.0.0.0	255.0.0.0	On-link	127.0.0.1	331
127.0.0.1	255.255.255.255	255.255.255.255	On-link	127.0.0.1	331
127.255.255.255	255.255.255.255	255.255.255.255	On-link	127.0.0.1	331
169.254.0.0	255.255.0.0	255.255.0.0	On-link	169.254.97.204	271
169.254.0.0	255.255.0.0	255.255.0.0	On-link	169.254.155.26	281
169.254.97.204	255.255.255.255	255.255.255.255	On-link	169.254.97.204	271
169.254.155.26	255.255.255.255	255.255.255.255	On-link	169.254.155.26	281
169.254.255.255	255.255.255.255	255.255.255.255	On-link	169.254.97.204	271
169.254.255.255	255.255.255.255	255.255.255.255	On-link	169.254.155.26	281
172.16.50.0	255.255.255.0	255.255.255.0	192.168.10.8	192.168.2.170	51
192.168.2.0	255.255.255.0	255.255.255.0	On-link	192.168.2.170	306
192.168.2.170	255.255.255.255	255.255.255.255	On-link	192.168.2.170	306

4. Windows resets its routing table during reboot, so add the -p parameter after the word route in the command from Step 2 to make the static route persist beyond reboot. (See figure: The -p parameter will ensure this route persists through reboot)



```
C:\Users\Jhay>route -p add 172.16.50.0 mask 255.255.255.0 192.168.10.8
The requested operation requires elevation.
```



```
Administrator: Command Prompt
C:\WINDOWS\system32>route -p add 172.16.50.0 mask 255.255.255.0 192.168.10.8
OK!
C:\WINDOWS\system32>
```

5. Delete the route you just added with the following command: route delete 172.16.50.0

Lab Exercise 4.4: Create a Path MTU Black Hole

What You Need

A Computer running a Windows OS (Preferably 10).

Description/Instruction

Your task is to follow the instructions and attach/paste images of what you did to satisfy the steps.

Tasks

When a router receives a message that is too large for the next segment's MTU, the router is supposed to respond with an ICMP error message to the sender. Sometimes, though, these error messages are not returned correctly. This can result in an MTU black hole along the path, where messages are being lost for no apparent reason.

You can use the ping command to determine the largest size message that can successfully traverse a path to its destination by adjusting the buffer size of the ICMP echo message. Using too large of a buffer will prevent the messages from returning in response to your ping. Start with a smaller buffer and work your way up to determine the largest MTU the route can handle. The ping parameters needed in Windows are `-f` (do not fragment the IP packet) and `-l` (packet or buffer size is specified following the lowercase L).

What is the largest MTU that can be used to reach the cengage.com host from your computer without creating an MTU black hole? To find out, complete the following steps:

1. Ping cengage.com using an IP packet size of 1024.
2. What is the ping command you used?

```
C:\Windows\system32>ping cengage.com -f -l 1024

Pinging cengage.com [69.32.208.75] with 1024 bytes of data:
Reply from 69.32.208.75: bytes=1024 time=259ms TTL=238
Reply from 69.32.208.75: bytes=1024 time=258ms TTL=238
Reply from 69.32.208.75: bytes=1024 time=259ms TTL=238
Reply from 69.32.208.75: bytes=1024 time=255ms TTL=238

Ping statistics for 69.32.208.75:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 255ms, Maximum = 259ms, Average = 257ms
```

3. Keep increasing the packet size until the packet does not return. Do not allow the packet to be fragmented.

4. What is the largest MTU that gets through?

```
C:\Windows\system32>ping cengage.com -f -l 1470

Pinging cengage.com [69.32.208.75] with 1470 bytes of data:
Reply from 192.168.254.254: Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.

Ping statistics for 69.32.208.75:
    Packets: Sent = 4, Received = 1, Lost = 3 (75% loss),

C:\Windows\system32>ping cengage.com -f -l 1471

Pinging cengage.com [69.32.208.75] with 1471 bytes of data:
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
```

5. What error message appears when an MTU error occurs?

```
C:\Windows\system32>ping cengage.com -f -l 1500

Pinging cengage.com [69.32.208.75] with 1500 bytes of data:
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.

Ping statistics for 69.32.208.75:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Windows\system32>ping cengage.com -f -l 1445
```

Turning in Your Project

Save this file using the format **LabExer4_[YourName]** and upload to Canvas