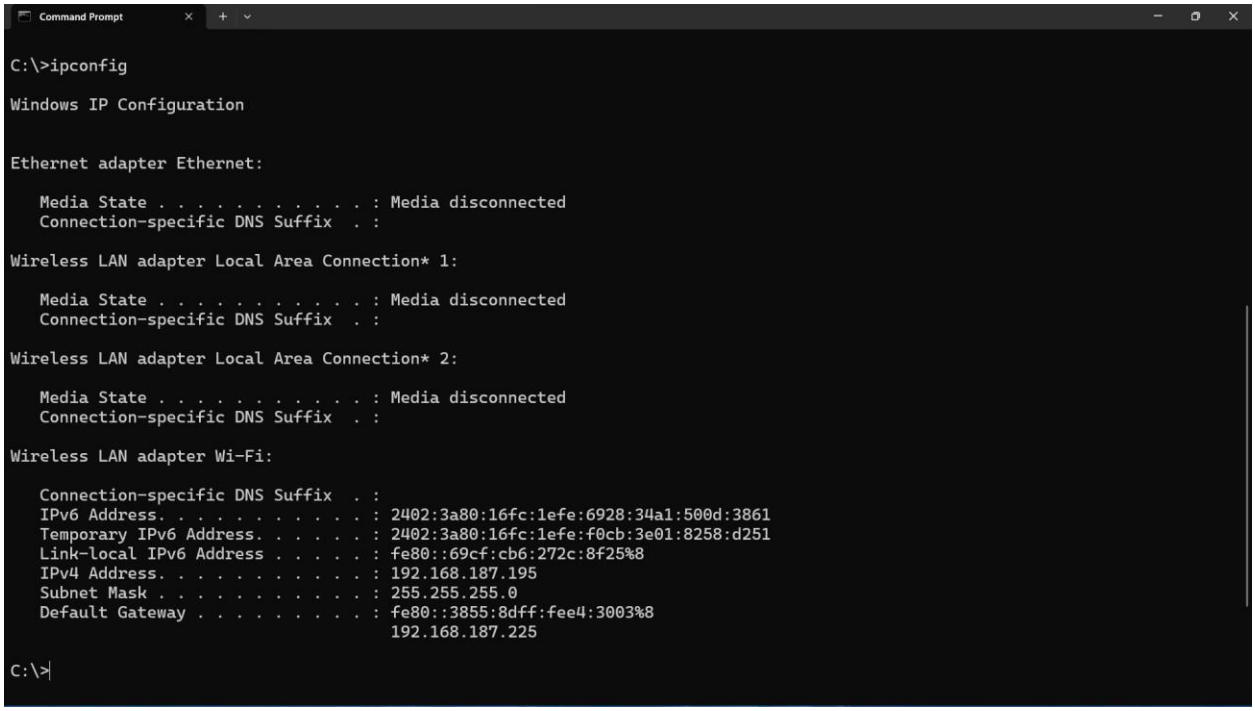
Practical 3: Demonstrate networking command and network configuration commands

1. Ipconfig

- Displays the IP configuration information for all network interfaces on a Windows computer.

- Commonly used options include /release to release the current DHCP lease and /renew to request a new DHCP lease.



Ipconfig

2. Ipconfig/all

- Provides detailed information about the IP configuration, including IP address, subnet mask, gateway, DNS servers, and more for all network interfaces.

- Useful for diagnosing network issues and obtaining a comprehensive view of network setting

```
C:\>ipconfig/all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : LAPTOP-AT3QG1RP
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Mixed
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek Gaming GbE Family Controller
   Physical Address. . . . . . . . . : BC-0F-F3-8D-13-0F
   DHCP Enabled. . . . . . . . . . . : Yes
   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. . . . . . . . . : C8-5E-A9-DB-C8-52
   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 #2
   Physical Address. . . . . . . . . : CA-5E-A9-DB-C8-51
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
```

Ipconfig/all

3. Host Name

- Displays the name of the computer, which is often used to identify it on a network.
- The computer name is set during the Windows installation and can be changed in the system settings.

Host Name

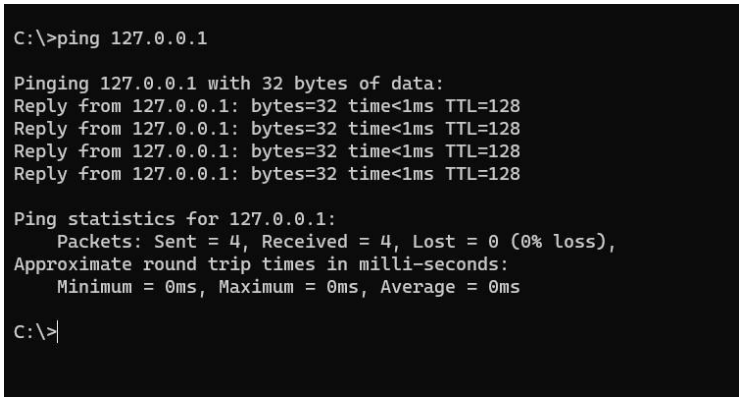
4. Get Mac

- Retrieves the MAC (Media Access Control) addresses of all network interfaces on a computer.
- Useful for identifying hardware devices on a network.

Getmac

5. Ping

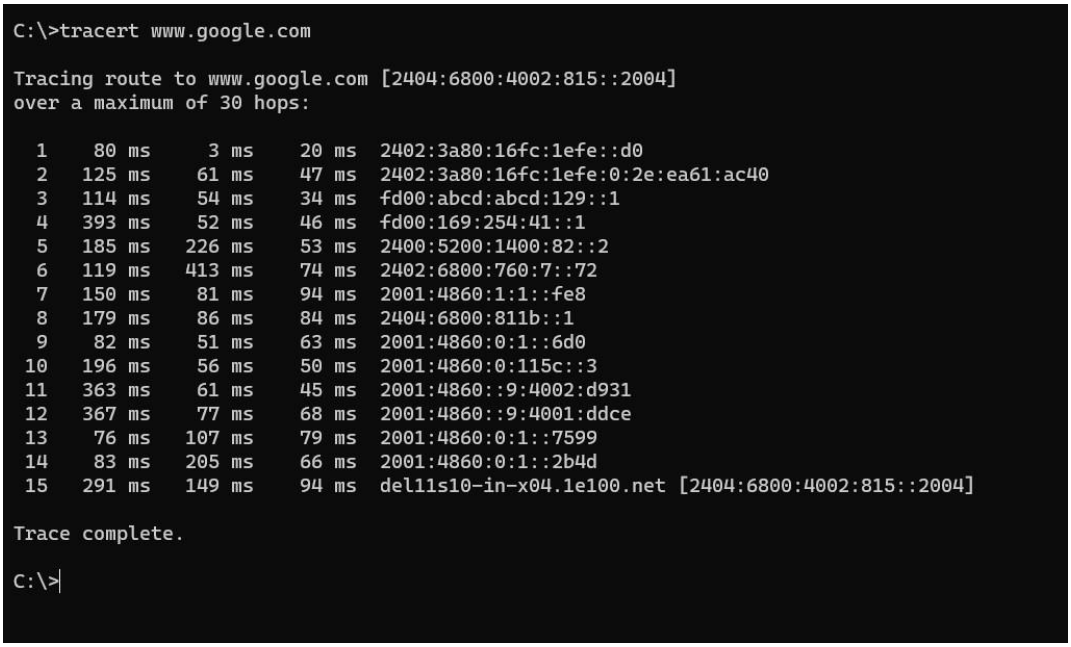
- Sends ICMP Echo Request messages to a specified host to check network connectivity.
- Can be used to troubleshoot and measure network latency.



ping

6. Tracet

- Traces the route that packets take to reach a destination, showing the IP addresses of intermediate routers.
- Helps identify network bottlenecks and troubleshoot connectivity issues.



Tracet

7. Nslookup

- Performs DNS (Domain Name System) queries to retrieve information about domain names, IP addresses, and name servers.

- Useful for troubleshooting DNS-related problems and verifying DNS configurations.

```
C:\>nslookup
Default Server:  UnKnown
Address:  192.168.187.225

> www.google.com
Server:  UnKnown
Address:  192.168.187.225

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
*** Request to UnKnown timed-out
> www.google.com
Server:  UnKnown
Address:  192.168.187.225

Non-authoritative answer:
Name:    www.google.com
Addresses:  2404:6800:4002:815::2004
          142.250.182.164

> www.gmail.com
Server:  UnKnown
Address:  192.168.187.225

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
```

Nslookup

8. Netstat

- Displays active network connections, listening ports, and related network statistics.
- Helpful for monitoring network activity and identifying open ports.

```
C:\>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49675        checkhost:49676        ESTABLISHED
  TCP    127.0.0.1:49676        checkhost:49675        ESTABLISHED
  TCP    127.0.0.1:49679        checkhost:49680        ESTABLISHED
  TCP    127.0.0.1:49680        checkhost:49679        ESTABLISHED
  TCP    127.0.0.1:49681        checkhost:65001        ESTABLISHED
  TCP    127.0.0.1:49686        checkhost:49702        ESTABLISHED
  TCP    127.0.0.1:49702        checkhost:49686        ESTABLISHED
  TCP    127.0.0.1:65001        checkhost:49681        ESTABLISHED
  TCP    192.168.187.195:52431  52.188.247.148:https   TIME_WAIT
  TCP    192.168.187.195:52432  52.188.247.148:https   TIME_WAIT
  TCP    192.168.187.195:52444  ec2-18-194-206-12:https  TIME_WAIT
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:49410  [64:ff9b::14c6:76be]:https  ESTABLISHED
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:52392  [64:ff9b::142a:415b]:https  ESTABLISHED
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:52396  [64:ff9b::cc4f:c5de]:https  ESTABLISHED
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:52419  [64:ff9b::1736:ae0a]:http  CLOSE_WAIT
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:52441  [64:ff9b::14d4:5875]:https  ESTABLISHED
  TCP    [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]:52442  [2620:1ec:c11::239]:https  ESTABLISHED

C:\>
```

Netstat

9. ARP

- Displays and modifies the ARP (Address Resolution Protocol) cache, mapping IP addresses to MAC addresses.

- Can be used to troubleshoot network connectivity issues and update the ARP cache.

```
C:\>arp -a

Interface: 192.168.187.195 --- 0x8
  Internet Address      Physical Address      Type
  192.168.187.225       3a-55-8d-e4-30-03     dynamic
  192.168.187.255       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
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

C:\>
```

ARP

10. Route

- Displays and modifies the computer's routing table, which defines the paths for network traffic.
- Useful for managing and troubleshooting routing configurations.

```
C:\>route

Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
                  [MASK netmask]  [gateway] [METRIC metric]  [IF interface]

  -f           Clears the routing tables of all gateway entries.  If this is
               used in conjunction with one of the commands, the tables are
               cleared prior to running the command.

  -p           When used with the ADD command, makes a route persistent across
               boots of the system. By default, routes are not preserved
               when the system is restarted. Ignored for all other commands,
               which always affect the appropriate persistent routes.

  -4           Force using IPv4.

  -6           Force using IPv6.

  command      One of these:
                 PRINT     Prints  a route
                 ADD       Adds    a route
                 DELETE    Deletes a route
                 CHANGE    Modifies an existing route
  destination  Specifies the host.
  MASK         Specifies that the next parameter is the 'netmask' value.
  netmask      Specifies a subnet mask value for this route entry.
               If not specified, it defaults to 255.255.255.255.
  gateway      Specifies gateway.
  interface    the interface number for the specified route.
  METRIC       specifies the metric, ie. cost for the destination.

All symbolic names used for destination are looked up in the network database
file NETWORKS. The symbolic names for gateway are looked up in the host name
database file HOSTS.

If the command is PRINT or DELETE. Destination or gateway can be a wildcard,
(wildcard is specified as a star '*'), or the gateway argument may be omitted.

If Dest contains a * or ?, it is treated as a shell pattern, and only
matching destination routes are printed. The '*' matches any string,
and '?' matches any one char. Examples: 157.*.1, 157.*, 127.*, *224*.
```

Route

11. Pathping

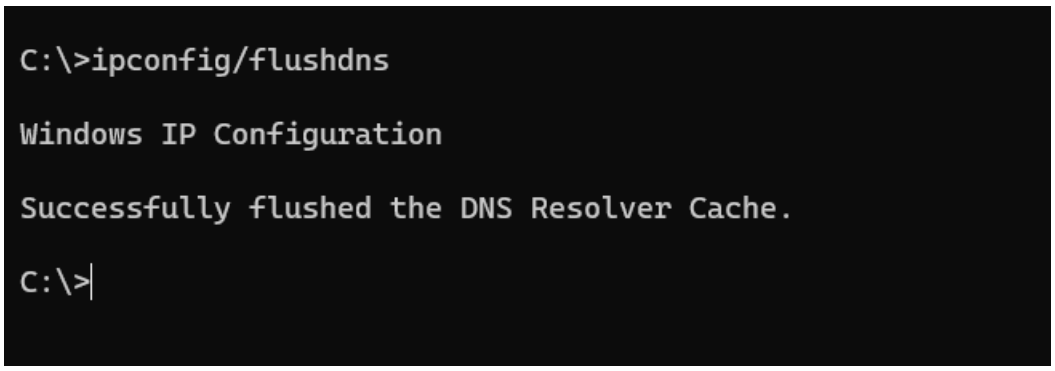
- Combines features of ping and tracert, providing information about network latency and packet loss at each hop.
- Offers a more comprehensive view of network performance.

```
C:\>pathping www.google.com

Tracing route to www.google.com [2404:6800:4002:815::2004]
over a maximum of 30 hops:
  0  LAPTOP-AT3QG1RP [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]
  1  2402:3a80:16fc:1efe::d0
  2  2402:3a80:16fc:1efe:0:2e:ea61:ac40
  3  fd00:abcd:abcd:129::1
  4  fd00:169:254:41::1
  5  2400:5200:1400:82::2
  6  2402:6800:760:7::72
  7  2001:4860:1:1::fe8
  8  2404:6800:811b::1
  9  2001:4860:0:1::6d0
 10  2001:4860:0:115c::3
 11  2001:4860::9:4002:d931
 12  2001:4860::9:4001:ddce
 13  2001:4860:0:1::7599
 14  2001:4860:0:1::2b4d
 15  del11s10-in-x04.1e100.net [2404:6800:4002:815::2004]

Computing statistics for 375 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           LAPTOP-AT3QG1RP [2402:3a80:16fc:1efe:f0cb:3e01:8258:d251]
                                 0/ 100 =  0%   |
  1   13ms     0/ 100 =  0%     0/ 100 =  0%  2402:3a80:16fc:1efe::d0
                                 0/ 100 =  0%   |
  2  ---     100/ 100 =100%   100/ 100 =100%  2402:3a80:16fc:1efe:0:2e:ea61:ac40
                                 0/ 100 =  0%   |
  3  101ms     2/ 100 =  2%     2/ 100 =  2%  fd00:abcd:abcd:129::1
                                 0/ 100 =  0%   |
  4  107ms     0/ 100 =  0%     0/ 100 =  0%  fd00:169:254:41::1
                                 0/ 100 =  0%   |
  5  102ms     2/ 100 =  2%     2/ 100 =  2%  2400:5200:1400:82::2
                                 0/ 100 =  0%   |
  6  139ms     1/ 100 =  1%     1/ 100 =  1%  2402:6800:760:7::72
                                 0/ 100 =  0%   |
  7  125ms     2/ 100 =  2%     2/ 100 =  2%  2001:4860:1:1::fe8
                                 0/ 100 =  0%   |
  8  ---     100/ 100 =100%   100/ 100 =100%  2404:6800:811b::1
                                 0/ 100 =  0%   |
  9  131ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860:0:1::6d0
                                 0/ 100 =  0%   |
 10  132ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860:0:115c::3
                                 0/ 100 =  0%   |
 11  132ms     1/ 100 =  1%     1/ 100 =  1%  2001:4860::9:4002:d931
                                 0/ 100 =  0%   |
 12  155ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860::9:4001:ddce
                                 0/ 100 =  0%   |
 13  150ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860:0:1::7599
                                 0/ 100 =  0%   |
 14  145ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860:0:1::2b4d
                                 0/ 100 =  0%   |
 15  149ms     0/ 100 =  0%     0/ 100 =  0%  del11s10-in-x04.1e100.net [2404:6800:4002:815::2004]

Trace complete.
```

Pathping

12. Ipconfig /flushdns:

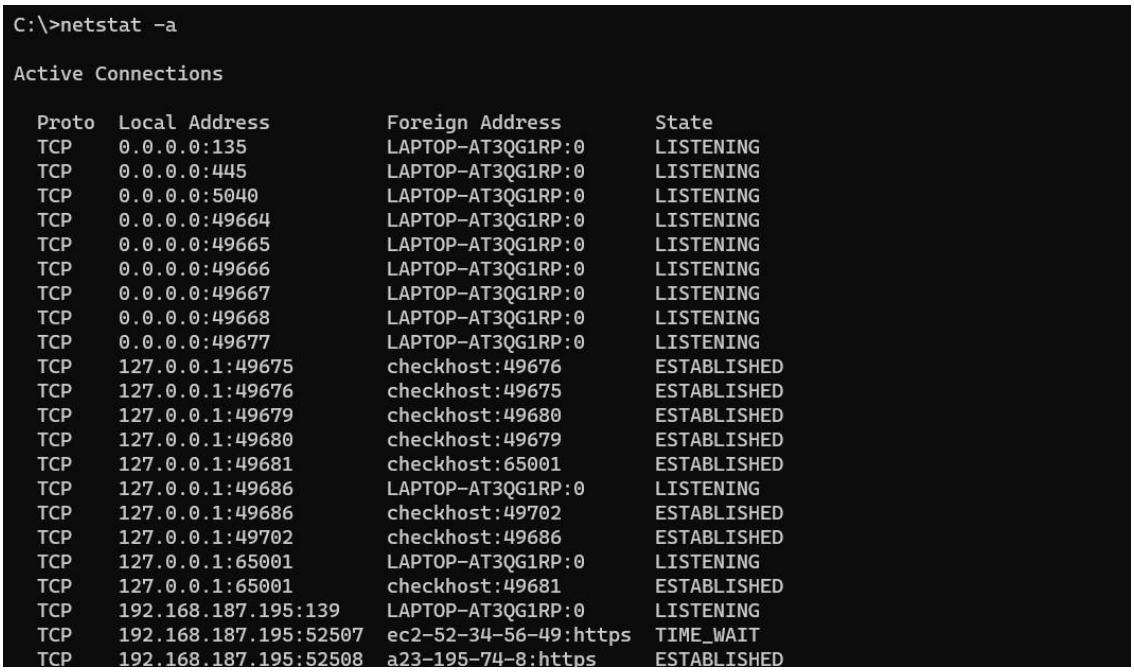
- Clears the DNS resolver cache on a Windows system.
- Helps resolve DNS-related issues by removing outdated or incorrect DNS records.



ipconfig /flushdns:

13. Netstat -a:

- Displays all active connections and listening ports, both TCP and UDP.
- Useful for monitoring network activity and identifying open ports.



```
C:\>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:445            LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:5040           LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49664          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49665          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49666          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49667          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49668          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    0.0.0.0:49677          LAPTOP-AT3QG1RP:0      LISTENING
  TCP    127.0.0.1:49675        checkhost:49676        ESTABLISHED
  TCP    127.0.0.1:49676        checkhost:49675        ESTABLISHED
  TCP    127.0.0.1:49679        checkhost:49680        ESTABLISHED
  TCP    127.0.0.1:49680        checkhost:49679        ESTABLISHED
  TCP    127.0.0.1:49681        checkhost:65001        ESTABLISHED
  TCP    127.0.0.1:49686        LAPTOP-AT3QG1RP:0      LISTENING
  TCP    127.0.0.1:49686        checkhost:49702        ESTABLISHED
  TCP    127.0.0.1:49702        checkhost:49686        ESTABLISHED
  TCP    127.0.0.1:65001        LAPTOP-AT3QG1RP:0      LISTENING
  TCP    127.0.0.1:65001        checkhost:49681        ESTABLISHED
  TCP    192.168.187.195:139    LAPTOP-AT3QG1RP:0      LISTENING
  TCP    192.168.187.195:52507  ec2-52-34-56-49:https  TIME_WAIT
  TCP    192.168.187.195:52508  a23-195-74-8:https     ESTABLISHED
```

Netstat -a

14. netstat -e:

- Provides Ethernet statistics, including the number of bytes and packets sent and received.
- Offers insights into network usage and performance.

```
C:\>netstat -e
Interface Statistics

                           Received            Sent

Bytes                      32756101        13859356
Unicast packets               47334           34125
Non-unicast packets             805            5943
Discards                          0               0
Errors                            0               0
Unknown protocols                 0

C:\>
```

Netstat -e

15. netstat -r:

- Displays the computer's routing table, showing routes for each network destination.
- Helpful for understanding the current routing configuration on the system.

```
C:\>netstat -r
===========================================================================
Interface List
  4...bc 0f f3 8d 13 0f ......Realtek Gaming GbE Family Controller
  9...c8 5e a9 db c8 52 ......Microsoft Wi-Fi Direct Virtual Adapter
  2...ca 5e a9 db c8 51 ......Microsoft Wi-Fi Direct Virtual Adapter #2
  8...c8 5e a9 db c8 51 ......Intel(R) Wi-Fi 6E AX211 160MHz
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0  192.168.187.225  192.168.187.195     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
    192.168.187.0    255.255.255.0         On-link   192.168.187.195    311
  192.168.187.195  255.255.255.255         On-link   192.168.187.195    311
  192.168.187.255  255.255.255.255         On-link   192.168.187.195    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   192.168.187.195    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   192.168.187.195    311
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  8     71 ::/0                     fe80::3855:8dff:fee4:3003
  1    331 ::1/128                  On-link
  8     71 2402:3a80:16fc:1efe::/64 On-link
  8    311 2402:3a80:16fc:1efe:6928:34a1:500d:3861/128
                                    On-link
  8    311 2402:3a80:16fc:1efe:f0cb:3e01:8258:d251/128
                                    On-link
  8    311 fe80::/64                On-link
  8    311 fe80::69cf:cb6:272c:8f25/128
                                    On-link
  1    331 ff00::/8                 On-link
  8    311 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None

C:\>
```

Netstat -r